Today's Modern world has given priority to sports. During the sports events, injuries are common. Injuries to soft and hard tissues are the problems faced by sports persons as they have to undergo physical strain or stress in the field. If Ayurveda can provide a remedy which is cost effective, easily available and free from side effects, it would be a great boon in the field of sports. In Ayurveda management of sports injury has not been mentioned separately. But sports injury can be managed on the basis of Ayurvedic principles.Thus, after reading this book we will comes to know that Ayurveda incorporate several principles, concepts and therapy that can be efficiently used for improving sports medicine along with contemporary science. The collaboration of Ayurveda with modern medicine can develop An advance branch of sports medicine to maintain overall health (physical and psychological) of sport person in a more natural and effective way for rehabilitation of sport person.we hope this book would be useful for present & future researchers of ayurveda, sport person especially for those intersted in know the ayurveda sport medicine & its practical implication in different sports.

Dr. Sandeep Madhukar Lahange, working as Assistant Professor in the P. G. Department. of Sharir Rachana, NIA, Ministry of AYUSH Govt. of India, Jaipur since last 9 years. He published more than 65 research articles & worked as Editorial Board Member & reviewer in more than 20 National and international peer reviewed, indexed Journals.

978-620-2-07808-5

Utilities of Ayurveda Medicine

Sandeep Lahange
Kunjbihari Saini
Archana Bhanagre

Sports Medicine in Ayurveda: Nutrition & Fitness through Ayurveda

LAP LAMBERT Academic Publishing

Lahange, Saini, Bhanagre

Sandeep Lahange
Kunjbihari Saini
Archana Bhanagre

Sports Medicine in Ayurveda: Nutrition & Fitness through Ayurveda

Sandeep Lahange
Kunjbihari Saini
Archana Bhanagre

Sports Medicine in Ayurveda: Nutrition & Fitness through Ayurveda

LAP LAMBERT Academic Publishing

Imprint
Any brand names and product names mentioned in this book are subject to trademark, brand or patent protection and are trademarks or registered trademarks of their respective holders. The use of brand names, product names, common names, trade names, product descriptions etc. even without a particular marking in this work is in no way to be construed to mean that such names may be regarded as unrestricted in respect of trademark and brand protection legislation and could thus be used by anyone.

Cover image: www.ingimage.com

Publisher:
LAP LAMBERT Academic Publishing
is a trademark of
International Book Market Service Ltd., member of OmniScriptum Publishing Group
17 Meldrum Street, Beau Bassin 71504, Mauritius

Printed at: see last page
ISBN: 978-620-2-07808-5

Zugl. / Approved by: dr. sarvepalli radhakrishnan rajasthan ayurved university, jodhpur, 2017

Sports Medicine in Ayurveda: Nutrition & Fitness hrough Ayurveda

By
Dr. Sandeep Madhukar Lahange
Dr. Kunj Biharee Saini
Dr. Archana Nivrutti Bhangare

Acknowledgement

We feel a sense of pride and enthusiasm in presenting first edition of this book. The preparation of a book on Sports Medicine in Ayurveda should have the scope to adequately accommodate the growing changes in the field of sports medicine in present era. This book has been prepared keeping the twin factors of the reformation of ayurvedic sports medicine knowledge and its importance in different sports injuries which will be of much help not only for sports person but also every ayurveda students, physician to understand the responsibility of ayurveda in sports medicine in present modern scenario.

We are extremely grateful to all others who have directly and indirectly rendered their services for this work. The readers are welcome to send their suggestion and comments, which we believe will defiantly lead to improvement of the book.

Dr. Sandeep Madhukar Lahange Dr.Kunj Biharee Sain Dr. Archana Nivrutti Bhangare

Sr. No.	Abbreviations	Meaning
1	अ.ह्र.सू.	Ashtanga Hrdayam Nidana Sthana
2	अ.ह्र.शा.	Ashtanga Hrdayam Sharira Sthana
3	भा.प्र.पू.ख.	Bhavaprakasha Poorvakhantam
4	च. चि.	Charaka Samhita Chikitsa Sthana
5	च.सू.	Charaka Samhita Sutra Sthana
6	का.स.शा.अ.	Kashyapa Samhita Sharira Adhyaya
7	ऋ.मं.सू.का.	Rigveda Mantra Sutra Kanda
8	शा.पू.ख.	Sarangadhra Samhita Purva khanda
9	सु.चि.	Susrutha Samhita Chikitsa Sthana
10	सु.नि.	Susrutha Samhita Nidana Sthana
11	सु.शा.	Susrutha Samhita Sharira Sthana
12	सु.सू.	Susrutha Samhita Sutra Sthana

INDEX

S.No.	Contents	Page No.
1.	**Introduction**	4 - 10
2.	**Review of *Ayurvedic* literature**	
	Review of *Sandhi*	8 - 16
	Review of *Kora Sandhi*	17 - 23
	Kora Sandhigata sthana	24 - 26
	Sports and *Ayurveda*	29 - 32
	Common condition related to sports injury in Ayurveda	33 - 39
3.	**Sports injuries**	40 - 69
4.	**Avurveda Management of sports injuries**	70 – 93
5	**Role of *Rasayana* Therapy**	94 - 95
6	**Role of *Aahar* Diet and *Vyayama* in Sports**	96 - 97
7	***YOGA* AND SPORTS**	98 - 101
8.	**Discussion**	102- 122
9.	**Protocol for *Ayurvedic* Management of Sports Injuries**	123 - 130
10.	**Conclusion**	131 -133
11.	**Bibliography**	134-137

LIST OF TABLES

S.No.	Name of Topic	Page No.
1.	Synonyms of the *Sandhi* maintains by the different *Acharaya*	20
2.	The *Sandhi* and their anatomical location in the body	22
3.	Reference related to *Kora Sandhi* in different *Sthana* of *Charaka Samhita*	22
4.	Reference related to *Kora Sandhi* in different *Sthana* of *Sushruta Samhita*	23
5.	Reference related to *Kora Sandhi* in different *Sthana* of *Astanga Hridya Samhita*	24
6.	Reference related to *Kora Sandhi* in different *Sthana* of *Bhel Samhita*	24
7.	Reference related to *Kora Sandhi* in different *Sthana* of *Harita Samhita*	25
8.	Reference related to *Kora Sandhi* in different *Sthana* of other *Samhita*	25
9.	The correlation between types *Asthi* in *Ayurveda* with bones of modern anatomy and type of fracture occur at particular bone	36
10.	The types of *Kandbhagna* and their modern correlation	37
11.	The classification of sports injuries on the basis of consequence of injuries	41
12.	The sports injuries related to elbow joint	62
13.	The sports injuries related to wrist joint	64
14.	The sports injuries related to interphalanges joint	65
15.	The sports injuries related to knee joint	66
16.	The sports injuries related to ankle joint	68
17.	The external therapies used in *Shoola*	89
18.	The internal therapies used in *Shoola*	89

19.	The external therapies used in *Shopha*	90
20.	The internal therapies used in *Shpoha*	91
21.	The external therapies used in *Vrana*	92
22.	The internal therapies used in *Vrana*	92
23.	The external therapies used in *Bhagna*	93
24.	The internal therapies used in *Bhagna*	93
25.	The doses of *Ayurvedic* drugs	94
26.	The various hinge joints strengthening techniques through yoga	100
27.	Subdivision of joints and their correlation with types of *Sandhi* in *Ayurveda*	105

Introduction

Ayurvedic authorities, under the composition of *Ayurvedic* science in the form of compendia's have given utmost importance to the knowledge of *Sharir Rachana*. Out of these *Samhita*, *Sharir Sthan* of *Sushruta* is a descriptive presentation of anatomy. The fascinating journey that begins the exploration of human body starts with an introduction to the disciplines of anatomy and. We learn about human body by studying its anatomy. The structure of a body allows physiology performance of certain function of the body such as the bones join together and forms joints which are very necessary for the variety of movements. In this elaborate description of *Sharir Rachana*, *Sushruta* has explained *Sandhi* which are presentation of arthrology in the 5th chapter of *Sharir Sthan* titled as '*Sharir Sankhya Vyakaranam Shariram'*.

According to *Aacharya Sushruta* only *Asthi Sandhi* should be taken into account as there was other *Sandhi* of *Peshi*, *Snayu* and *Sira* etc. were innumerable and should be excluded while counting. So according to *Sharir Rachana* the definition of *Sandhi* can be taken as union of two or more bones. *Sandhis* are 210 in number, which are responsible for various movements, and are disseminated throughout the body. In the analysis of skeletal frame work of humans it is observed that the numerous bones of various shapes and sizes come together to form the skeleton and those bones are variously united together to form joints. Then the whole skeleton is built up on a joint system in which the participating bones or cartilages in a particular joints are either immovable, united together or they are united in such way that spaces are left between the participating joints so as to allow movements between themselves. The day to day activities largely depends upon the *Sandhi* as they are allowing one to earn his living.

Ayurveda is an ancient Indian science dealing with the principles of health and disease. According to *Ayurveda*, the human body contains *Asthi*, *Sandhi*, *Snayu*, *Peshi* etc. which supports and help in movement and locomotion. Movement of body parts or

whole body's locomotion is un-doubtfully the functions of various joints of the body. *Sandhi* (joint) is responsible for transmission of weight and also for the movement of an individual. The classification of *Sandhi* and its further subdivision has been based on structures which are seen in between the bony ends, the type of movement occurring in joint and the various functions done by the joints. Functionally joints are classified as *Cheshtavanta* (movable) and *Sthira* (immovable).

Aacharya Sushruta had described eight types of *Sandhi* based on the structure as well as movements ensue at particular joint. They are *Kora, Ullukhala, Samudga, Pratara, Tunnasevani, Vayastunda, Mandala* and *Shankhavarta.* This classification is done based on the structure of the joints which are seen in between the two bony ends. *Kora Sandhi* is uniaxial joint and move only on one axis. As per the description of *Haranchandra* the *Kora Sandhi* can be correlated to Hinge type of joint. The *Sandhi* looks like the hinge seen in doors and windows which hold the arms tightly. The movements are seen on only one axis like *Sankocha* (flexion) and *Prasara* (extension). The *Kora sandhi* are seen in the following region, *Anguli* (interphalangeal), *Manibandha* (Wrist), *Gulpha* (Ankle), *Janu* (Knee) and *Kurpara* (Elbow). Here the flexion and extension type of movements are observed. This is Hinge type of joint according to modern anatomical classification and they play very vital role in walking, running, exercise, sports etc.

In *Charak Samhita* the definition of *Vyayam* shows that sports are already mention in *Ayurveda.* The explanation of *Vyayama* shows that stability, continuity, elasticity of a person is very essential in sports and it can be achieved through *Vyayama*. This corporal action is well described in *Ayurveda* which provide stability and strength to the body is known as physical exercise. Above definition create a sign about sports in *Ayurveda*. Any sports activity gives all benefits of *Vyayam*. So now a days sport is creating an important role in our life. Every sports person in his career of sport undeniably suffers from various types of injuries. In maximum sports activities, *Sandhis* are much more injured then the other body parts, especially of *Kora Sandhi* (hinge joint); like knee joint injuries, ankle joints injuries, elbow joint injuries, wrist joint injuries, interphalangeal joint injuries Because these joint are involve in most of the sports such as cricket, football, long jumpers, athletes, etc.

In present era the reflection of these past sports can be visualized such as during ancient period there were many sport events like Dagger, *Mallayuddha*, Running, Javelin, Shooting, Marathon, Wrestling, Long Jump, Horse Races, Elephant Fighting, Hunting, Swimming, Riding, Rowing, Dancing, Gymnastics, Boxing and Weightlifting etc. While playing these sports if person gets any sort of sports injuries they were treated with the help of *Ayurvedic* treatment modalities.

A sports injury can be defined as any kind of injury, pain, or physical damage that occurs as a result of sport, exercise or physical activity. Although the term sports injury can be used to define any injury sustained as a result of sport, it is most commonly used for injuries that affect the musculo-skeletal system, which include the muscles, bones, tendons, cartilage and associated tissue. The hinge joints are vital for movement and vulnerable to injury. It contains number of muscles, ligaments, tendons and bones. Hinge joint is involving in so many outdoor sports which causes various types of injuries such as fracture, dislocation, sprains, strains, inflammation and wound. Sports injuries are injuries that happen when playing sports or exercising. Some are from accidents. Other can results from poor training practices or improper gear. Some people get injured when they are not in proper condition .not warming up or stretching enough before you play or exercise can also lead to injuries.

According to *Ayurveda,* disease occurs in the body due to two factors one is *Nija* (within the body) and other is *Agantuja* (external factors),likewise sports injuries are also occurs mainly due to sudden impact or due to continues wear and tear. When an injury occur due to sudden impact, body respond to that condition which lead to immobility and other inflammatory responses, it's a protective mechanism of body, due to excessive body activity strained muscles, ligaments and tendons can get injured excess of toxin can accumulate in individual organ systems and can lower both mental and physical sharpness. In *Samhita* also, we find references of sport injuries under exogenous diseases (*Aagantuja rogas*) caused due to the contact of external factors like fire, poisonous substances and also due to trauma. In classifying diseases, *Shusruta Samhita* has included the category of diseases caused in a weak person due to fight with a stronger one (*Sanghaatabala-pravrtta-vyadhi).* This can be correlated with traumatic diseases such *Shoola* (pain), *Shopha* (swelling), *Vranashopha* (inflammatory swelling), *Vrana* (wound),

Kandbhagna (fracture), *Sandhimukata* (dislocation), *Sanayugatavata* (ligament, tendon and nerve injuries) caused due to various games such as boxing, wrestling, martial arts etc.

Acute (traumatic) and chronic (overuse) these are two types of sports injury. Acute injury is a sudden injury that is usually associated with a traumatic event such as clashing into another player during sports or a fall from a bike. You body undergo changes during this period and often it is a negative one. A traumatic impact can cause your bone to crack, muscles to tear or ligaments to snap. You will experience a sudden sharp pain that is often severe, immediate swelling and even cold purple regions in your body that indicates a lack of proper blood circulation in that injured part. You may even lose your stability if your knee ligaments are torn and you will be unable to place your body Weight on it. Chronic injuries can be also called overuse injuries as the name suggests, it is caused by overuse of particular part of body either through sports or exercises. They develop slowly and last a long time. Their symptoms are mild compared to acute injuries and the pain they cause are also little. This causes the patient to ignore the injury and carry on with their activities. Over time, it will build up and cause more problems. Some common Symptoms of chronic injuries include experiencing pain whenever you engage in sport activities, swelling after each game and constant aching when you are not doing anything. In other words, chronic injuries are lifestyle threatening as they restrict you from participating in many things. Some examples of chronic injuries are stress fractures caused by repeated loading of a particular part, causing tiny Cracks in your bone each time. Tennis players also commonly suffer from tennis elbow which is effectively pain near the elbow due to over use. There are so many sports injuries related to hinge joint like; tennis elbow, golfers elbow, wrist sprain, mallet finger, anterior knee pain lateral ligament injury, menisci injury, ankle sprain, Extensor tendinitis, tarsal tunnel syndrome, Achilles tendinopathy etc.

The injury may be acute or chronic but it has to be treated immediately. In *Ayurved Samhitas* we can't find any direct explanation of sport injuries but with the help of classics we can explain sport injuries. Usually most of the sport injuries occur in hinge joints due to exposure during various sports a part from emergency(head and injuries to spinal cord) and surgical conditions(ligament tear etc.,) based on *Ayurved* we can treat the conditions apart from these two. The common symptoms of sport injuries are pain, swelling, dislocation, fracture, wound and Hematoma in *Ayurved* we find detail

description of these. The common among above mentioned symptoms is pain. In *Ayurved* for treating pain they explained *Shoola Hara, Vedana Sthapana Dravya,Vata Chikitsa* like *Snehana, Swedana and Basti.* If the injury is associated with swelling we use *Shotha Hara Dravya* such as *Shoth Hara Mahakshaya Shoth Hara Lepa*, and such herbal drugs which have anti-inflammatory properties in it. If the sports injury is associated with skin injury such as abrasion, laceration, wound etc. in this condition we use *Shodhan*, *Ropana Dravyas* are use. In hematoma treatment is done by *Agnikarma* and *Kshara Karma*. In case of acute injury such as fracture, dislocation, treatment is done same as that of *Bhagana Chikita* as described in our classics. *Acharaya Shusruta* has given detailed description about *Bhagna Chikitsa*.

Ayurveda plays an important role not only in treatment but also in prevention and control of sports injuries. To avoid injuries to sportsman *Ayurveda* has mentioned certain treatment modalities such as proper diet, *Rasayan* therapy, *Abhayanga*, exercise and yoga etc. yoga keeps strong as physically and mentally to every Sportsman as well as treats the various Sports injuries with the help of different techniques of *yoga.* All the treatment modalities which are explained here are not only useful in injuries of *Kora Sandhi* but also helpful in sport injuries of other joints. Due to shortage of time, this work is focused only on protocol related to common management of injuries of *Kora Sandhi* such as external therapy and internal therapy.

- External therapy: *Lepana*, *Upanaha*, *Abhyanga* (*Ruksha*, *Sneha*), *Parisheka*, *Swedana*, *Janu Basti*.
- Internal therapy: *Herbal* medications, *Panchakarma* processes like *Basti*, *Nasya*, and *Virechana* etc.
- *Anushastra Karma* like *Agni Karma*, *Raktamokshana, Jaloukacharan* etc.
- A part from all these physiotherapy, yoga *Asanas*, *Bandha* these also equally beneficial in any kind of sport injuries.
- Thus with the help of combination of principles, techniques and treatment modalities of *Ayurveda* and *Yoga*, the sports injuries of *Kora Sandhi* has been treated very efficiently and economically.

AIMS AND OBJECTIVES OF WORK:

1. A critical study on *Sandhi Sharir* in relation to *Kora Sandhi* (Hinge Joint) on its *Rachanatamak* purview.
2. Analytical study of *Kora Sandhi* (Hinge Joint) w. s. r. to Sports injuries.
3. To design the *Ayurvedic* Protocol for management of sports injuries related to *Kora Sandhi* (Hinge Joint).

MATERIALS AND METHODS OF WORK:

1. Review of *Ayurvedic* literature from *Ayurvedic* Classics including relevant commentaries about *Sandhi Sharir* specially *Kora Sandhi* and its components like *Snayu*, *Asthi*, etc.
2. Review of relevant modern literature will be consulted for comparative study of Hinge Joints and its components like Ligaments, Bones, and Meniscus etc.
3. Review of relevant literature will consulted for hinge joint related sports injuries.
4. Review of relevant literature of *Ayurvedic* medicine and procedures that can be used to design the *Ayurvedic* protocol for management of sports injuries related to *Kora Sandhi* (hinge joint).
5. Other print media, online information, journals, magazines etc. related to topic will explore.

NEED OF STUDY

As we can see that sports fraternity is suffering from various grades of joint disorders from pain to severe disabilities. Modern science provides quick relief through the treatment but rehabilitant process is often too tedious and time taking with several adverse effects**.**

Ayurveda, have described ages before several joint injuries and given the treatment accordingly, Joints been complex structure get injured or inflamed in various ways. So, it is needful to Study various related diseases and their changes from normality in preview of joint structure i.e. their anatomy.

Many contacts sports like running, cricket, football, long jump etc. rely mainly on joints thus having distorting effect. Thus, this study is undertaken to understand anatomical point of View of injuries of *Kora Sandhi* specially in sports; also preventive and healing aspect of *Ayurvedic* medicines both externally (*Snehnana* and *Swedanana*)and internally, which will be utmost helpful in both treatment and prevention of joint related injuries.

AYURVEDIC REVIEW

The human body is mainly supported by the bones, which does *Dharana* (holding) of body. These bones are interconnected with the help of various joints. Because of which these bones are joined together and able to hold the body in proper way. The movement of the body is possible only due to the *Sandhi's*. For better knowledge of the *Sandhi* it is very important to know its structural as well as functional aspect.

The skeletal frame work of the humans or any other species consist of number of bones of various shape and size. The whole skeletal system is built by joints, which supports the whole body. The bones and cartilages in a particular joint are either immovably united together or they are united in such a way that spaces are left in between them so as to allow movements between themselves leading to movement of the joint.

Sandhi is taking major role in locomotion of the body as well as other movements of the body such as flexion, extension, adduction, abduction, rotation etc. Without *Sandhi* it is impossible to move the body. Even if a single *Sandhi* is not working properly then there is difficulty in normal movement of the body in day to day life. This can be better observed when one cannot move a joint when it is casted.

Etymology[1]

Before proceeding it is very essential to know the meanings of the word *Sandhi*, its origin, literal meaning so as to understand the entire knowledge pertaining to the word and subject.

- The word '*Sandhi'* belongs to *Pullinga*
- '*Sam'Upasarga* has been used.
- It is originated by *Dha'Dhatu*,
- *Ki'Pratyaya* is used.

So the meaning of the word '*Sandhi'* is 'to unite' or a 'meeting point'

Definition of *Sandhi*

[1] सम् शब्द कल्पद्रुम पंचम भाग राजा राधाकान्त देवा) धातु एवं कि प्रत्यय-धा ,उपसर्ग-पृ. सं. 240(

The *Sandhi* can be defined as the meeting point or union of two or more structures. If this definition is taken into account then there is innumerable *Sandhi* or joints in the body. So to simplify it, different *Aacharyas* had given their opinion. According to *Acharya Sushruta* only *Asthi Sandhi* should be taken into account where as other *Sandhi* of *Peshi*, *Snayu* and *Sira* are innumerable and should be excluded while counting. So according to *Sharir Rachana* the definition of *Sandhi* can be taken as union of two or more bones[2]. While describing about *Sandhi Aacharya Sharangdhara* explained as where there is union of two organs or body parts in the body that can be termed as *sandhi.*[3] The *Rigveda* defines *sandhi* as the union[4]. The *Amarkosha* gives definition of *Sandhi* as "the one which unites".[5] *Vaidyak Shabda Sindhu* denotes *Sanyoga Sthana* (meeting or joining place) of *Asthi* (Bones) is *Sandhi.*[6] The *Atharva Veda* defines *Sandhi* as *Parva*.[7]

So based on different opinion of different *Aacharya* as described above it can be concluded as the union of two or more bones should be termed as *Sandhi*.

Synonyms

In different *Ayurvedic* and non-*Ayurvedic* literature, various synonyms of word *Sandhi* are mentioned as follows:

Amarkosha – Sandhi, Shlesha,

Abhinav Paryayavachi Kosha – Samyoga, Bhaga, Bheda, Sadhana and Avakasha

Adarsha Hindi Sanskrit *Kosha – Sammilana, Sangama, Maitrikarana*

Anekartha Sangraha – Sanyoga, Shlesha

***Sandhi Sankhya* (Number of Joints)**

As mentioned earlier if definition of *Sandhi* is taken as union of two or more structure then the number of joints will be innumerable. So while counting only the *Asthi, Sandhi* is counted.

---

[2] अस्थ्नां तु सन्धयो ह्येते केवलाः परिकीर्तिताः। पेशीस्नायुसिराणां तु सन्धिसङ्ख्या न विद्यते॥ (सु.शा. 5/33)

[3] सन्ध्यश्चांगसंधानाद देहे प्रोक्ताः कफान्विताः(शा.पू.ख.5/37)

[4] सन्धाता सन्धि (ऋ. मं.8/सू.1/मं.8)

[5] सन्धि सन्धानम् । (अमरकोषद्वि. का .क्षात्र वर्ग 8/18)

[6] सन्धि अस्थि संयोगस्थाने । (वैधकशब्द सिंधु पृ.1095)

[7] .....परुंषि संद्धौ..... । (अथर्ववेद कां. 10/सू. 1/मं.8)

Aacharya Charaka has mentioned that there are 200 numbers of *Sandhi*[8]. *Aacharya Vagbhata* has mentioned 210 *Sandhi*[9]and also has given the reference of *Aacharya Dhanvantari* who mentioned 210 *Sandhi*. *Aacharya Aatreya* mentioned 2000 *Sandhi*.[10]*Aacharya Sushruta* has given detailed description of *Sandhi* mentioning its total number to be 210 and he also has given the distribution of number of *Sandhi* according to *Shadanga*[11]. *Aacharya Bhavamishra* has followed the opinion of *Aacharya Sushruta* and has given the number of *Sandhi* as 210. *Aacharya Kashyapa* has mentioned 381 numbers of *Sandhi*.[12]

Based on *Shadanga*, *Acharya Sushruta* mentioned, joints are two hundred and ten , sixty eight are in extremities, fifty nine in trunk and eighty three above towards neck ; in each toe of the foot there are three while two in the great toe making a total of fourteen; one each in knee, ankle and hip thus seventeen in one leg; so are in the other leg and two arms; three are in the pelvic bones, twenty four in vertebral column, the same in sides, eight in chest, the same in neck, three in throat, eighteen attached to *Hrdaya-Kloma*, in the roots of teeth equal to (the number of)teeth ,one each in *Kakalaka* (uvula) and nose, two in the circles of lids situated in eyes, one each in cheeks, ears and temples, two jaw joints, two above eye brows and temples ,five in skull bones and one is in vertex.[13]

Embryology

In the third month of fetal life five *Pindakas* or lump like protuberances appear to give rise to five parts i.e. two upper limbs, two lower limbs and the head[14].

Panchamahabhootas* of *Sandhi

---

[8] द्वे संधि शते || (च.शा.7/14)

[9].....संधिनां च शतद्वयम् (अ.ह.शा.3/16)

[10] धन्वन्तरिस्तु त्रीण्याह, सन्धीनां च शतद्वयम् |
दशोत्तरं -अथात्रेयमतं ब्रूते----सहस्रे द्वे निजगादात्रिनन्दनः॥ (अ.ह.शा. 3/16)

[11] संख्यास्तु दशोत्तरे द्वे शते|| (सु.शा.5/27)

[12] त्रीणि संधिशतान्येकशीतानी । (का.स.शा.अ.3/16)

[13] तेषां शाखास्वष्टषष्टिः, एकोनषष्टिः कोष्ठे, ग्रीवां प्रत्यूर्ध्वं त्र्यशीतिः एकैकस्यां पादाङ्गुल्यां ..... (सु.शा.5/27)

[14] तृतीयेहस्तपादशिरसांपञ्चपिण्डका| निर्वर्तन्तेऽङ्गप्रत्यङ्गविभागश्चसूक्ष्मोभवति (सु. शा.3/15)

Each and every object in the universe is composed of five basic elements i.e. *Panchmahabhootas*. Even the *Sandhi Utpatti* is based on the *Panchamahabhoota Sidhanta*. The following factors will elicit the same,

1. As *Sandhi* is the meeting place of two *Asthi. Asthi* are *Prithviguna Pradhana* so it indicates the involvement of *Prithvi Mahabhoota*.
2. The space which is seen in the *Sandhi* and in between articular surfaces indicates towards the presence of *Akasha Mahabhoota*.
3. The synovial fluid which is present between the articular surfaces shows the presence of *Jala mahabhoota*.
4. The rise of temperature which is seen after articulation between bony ends definitely indicates the presence of *Agni mahabhoota*
5. The various movement and functions of *Sandhi* are because of *Vata*. Thus indicating the presence of *Vayu mahabhoota*.

Sandhi as Pitruja Bhava

The factors responsible for the development of *Garbha* are known as "*Garbhotpadakara Bhavas'*. They are *Matruja*, *Pitruja*, *Aatmaja*, *Satmaja*, *Rasaja*, and *Satvaja.* These *Bhavas* are responsible for growth & development of various structure as well as characteristics of the fetus. The hard structures of the foetus are believed to be developed from the *Pitruja Bhava*. They are *Kesha*, *Smashru*, *Nakha*, *Asthi*, *Danta*, *Sandhi, Sira, Snayu, Dhamani* etc.[15]

Pitruja Bhavas consists of most of *Kathina* structures of the body such as *Asthi, Nakha, Danta, Snayu* etc. Structures like *Asthi, Snayu* etc plays an important role in formation of the *Sandhi. Snayu* provides the stability to the *Sandhi*. So as *Asthi, Danta, Snayu* etc are developed from *Pitruja Bhava*, we can say that *Sandhis* are also developed from *Pitruja Bhava*.

Sandhi* and *Dosha[16]

[15] तत्र गर्भस्य पितृजमातृजरसजात्मजसत्त्वजसात्म्यजानि शरीरलक्षणानि व्याख्यास्यामः गर्भस्य केशश्मश्रुलोमास्थिनखदन्तसिरास्नायुधमनीरेतःप्रभृतीनि स्थिराणि पितृजानि.....(सु.शा.3/31)

[16] सन्धिस्थः श्लेष्मा सर्वसन्धिसंश्लेषात् सर्वसन्ध्यनुग्रहं करोति (सु.सू.21/14)

Acharyas described that *Sandhis* are formed by *Shleshaka Kapha*. In between articular surfaces of bones *Shleshaka Kapha* is situated. This *Shleshaka Kapha* binds all the *Sandhis*

Sandhi* and *Kala

The fourth *Kala* is known as *Shleshma dhara Kala* which is located in the *Sandhis*. It binds the bony ends together and is essential for the proper functioning of the joints.[17]

Sandhi and Srotas

Sandhis are considered as the one of the *Moola Sthana's* of *Majjavaha Srotas*. When *MajjaVaha Srotas* gets vitiated due to *Nidana*, there are symptoms like joint pains, crepetaion of attempted movement; vertigo etc. hence for proper functioning of *Sandhi, MajjaVaha Srotas* must be normal.[18]

Classification of *Sandhi*

The knowledge of *Sandhi Sharir* is very essential to understand their structure as well as function. *Sandhi* plays an active role in location as well as other functions of the body such as flexion, extension, adduction, abduction etc. Importance of *Sandhi* can only be understood when one cannot move his knee when it is casted or can move his finger if it is splinted.

The classification of *Sandhi* and its further subdivision has been done based on structures which are seen in between the two bony ends, the type of movement occurring in joint and the various functions done by the joints.

Aacharya Sushruta in his text has given a proper and adequate knowledge of *Sandhi* and its classification very clearly in *Sharir Sthana*. Other *Samhitas* like *Ashtanga Samgraha, Ashtanga Hridaya, Sharangadhara Samhita, Bhavaprakasha Nighantu* etc have followed the opinion of *Aacharya Sushruta* and given the similar opinion about classification of *Sandhi* i.e. *Sandhi Vargikarana*. Main classification of *Sandhi* is of two types

---

[17] चतुर्थी श्लेष्मधरा सर्वसन्धिषु प्राणभृतां भवति |स्नेहाभ्यक्ते यथा ह्यक्षे चक्रं साधु प्रवर्तते |
सन्धयः साधु वर्तन्ते संश्लिष्टाः श्लेष्मणा तथा || (सु.शा.4/14-15)

[18] रुक् पर्वणां भ्रमो मूर्च्छा दर्शनं तमसस्तथा |अरुषां स्थूलमूलानां पर्वजानां च दर्शनम् मज्जप्रदोषात्,|| (च.सू.28/17)

1. Based on *Kriya*
2. Based on *Rachana*

1 *Kriyanusara Vargeekarana* (Based on Movement)

Aacharya Sushruta has made the classification of the *Sandhi* based on their movement. Functionally the *Sandhi* are of two types[19]

- *Chestavanta or Chala Sandhi*
- *Sthira or Achala Sandhi*

Chestavanta Sandhi means the joints which are movable. *Sthira* or *Achala Sandhi* is the joints which are immovable. The *Sandhi* which are situated in the *Shakha* (extremities), *Hanu* (mandible), *Kati* (in the back, pelvic, vertebral region) are *Chestavanta Sandhi* where as remaining *Sandhi* are *Sthira* in nature.[20]

The *Chestavanta Sandhi* is further classified into two types based on their extent of movement. -

- *Bahu Chesta*. (Freely movable)
- *Alpa Chesta*. (Slightly movable)

The *Sandhi* of *Shakhas*, *Hanu* and *Kati* are *Bahuchala* and the *Sandhi* of *Prushta* etc. are *Alpa Chesta*.[21]

2 *Rachananusara Sandhi Vargeekarana.* (Based on structure)

Aacharya Sushruta has described eight types of *Sandhi* based on the structure. They are *Kora, Ulukhala, Samudga, Pratara, Tunnasevani, Vayasatunda, Mandala* and *Shankhavarta* this classification is done based on the structure of the joints which are seen in between the two bony ends[22].Similar type of classification is also seen in modern anatomy, but some variations are seen in explanation. In the opinion of *Bhavamishra* similar classification is seen but the only difference of opinion is regarding the nomenclature. He mentioned *Tunnasevani* as *Toonasevani* and *Vayastunda* is named as

---

[19] संध्यस्तु विधाश्चेष्टावन्त स्थिराच्च । (सु.शा.5/26)

[20] शाखासुहन्वोःकट्यांचचेष्टावन्तस्तुसन्धयः।
शेषास्तुसन्धयःसर्वेविज्ञेयाहिस्थिराबुधैः ॥ (सु.शा.5/26)

[21] अन्येतुमन्यते-चेष्टावन्तःसन्धयोद्विधाः, बहुचेष्टाःअल्पचेष्टाश्चेति|
तत्रशाखासुअधोहनुकोट्योश्चबहुचेष्टाः।पृष्ठवंशादौअल्पचेष्टाः ॥ (प्रत्यक्ष शारीर प्र.अ.पृ. 115)|

[22] त एते सन्धयोऽष्टविधाः- कोरोलूखलसामुद्गप्रतरतुन्नसेवनीवायसतुण्डमण्डलशङ्खावर्ताः(सु. शा. 5/31)

Kakatunda.

The individual *Sandhi* classified on the basis of *Rachana* (Structure) will be described in detail.

Kora Sandhi

As per the description of *Haranchandra* the *Kora Sandhi* can be correlated to Hinge type of joint. The *Sandhi* looks like the hinge seen in doors and windows which hold the arms tightly. The movements are seen on only one axis like *Aakunchana* and *Prasarana*.

The *Kora Sandhi* are seen in the following region, *Anguli*, *Manibandha*, *Gulpha*, *Janu* and *Kurpara*. [23]Here the flexion and extension type of movements are observed. This is Hinge type of joint according to modern anatomical classification.

Ulukhala Sandhi

These types of *Sandhi* looks like stone grinder used in the kitchen in olden days. That's why it is named so. One articulating end is round and the other articulating end will be having pit or cavity in which the round end of other bone fixes. The *Ulukhala* variety of joints is found at *Kaksha* (shoulder), *Vankshana* (hip) and *Dashana (*tooth).[24]

They are further classified into two types. These are *Sthira* (fixed) such as teeth and their socket and *Chestavanta* (movable) such as Shoulder and hip joints.

This can be correlated with ball and socket type of joints according to modern classification.

Samudga Sandhi

This *Sandhi* looks like a box. The articulating end will be having a fossa or cavity and the other end will be slightly elevated and they articulate. It is included in *Ishatchala* type.

These *Samudga Sandhi* are seen at *Ansakuta (*sternoclavicular joint), *Guda* (sacrococcyxgeal joint), *Bhaga* (symphysis pubis) and *Nitamba* (sacroiliac). [25]These are *Alpachestavanta Sandhi*. This type of *Sandhi* can be correlated with Saddle variety of joints according to modern classification.

Pratara Sandhi

[23] तेषामङ्गुलिमणिबन्धगुल्फजानुकूर्परेषु कोराः सन्धयः (सु.शा.5/32)

[24] कक्षावङ्क्षणदशनेषूलूखलाः (सु.शा. 5/32)

[25] अंसपीठगुदभगनितम्बेषु सामुद्गाः (सु.शा.5/32)

According to *Aacharya Dalhana*, the articulating surfaces of this variety of joint are flat in nature and floating, supported by cushion and friction seen in between the articulating surfaces.[26]These types of joints are located in *Greeva* and *Prushtavansha* (intervertebral joints), as per *Aacharya Sushruta*. [27]These can be correlated with gliding variety of joints according to modern classification.

Tunnasevani Sandhi

Aacharya Dalhana has also told that the articulating edges are dentate and embedded into one another. These are *Sthira Sandhi* (immovable joints) and found at *Shirakapala* (flat bones of the head) and *Katikapala* (flat bones of pelvis)[28]. *Aacharya Gananathasen* has commented that the articulating surface of these types of joints resembles dentate edges which are supported and jammed together or embedded into one other.[29]

Vayasatunda Sandhi

According to *Acharya Gannathsen* the *Hanu* which is situated within *Shankhasthi* is considered as the *Vayasatunda Sandhi*[30]situated beside the *Bahyakarna Vivara*. It resembles the *Kakamukha* (beak of crow) hence it is named so. Even *Sushruta* has got similar opinion about *Vayastunda Sandhi*[31]. It is *Chala Sandhi*; here the flexion, extension and lateral movement are seen. Joint of Temporal and mandible bones are considered as *Vayasaunda Sandhi* (Temporomendibular joint)

Mandala Sandhi

According to *Aacharya Dalhana* the *Sandhi* which are oval or round are *Mandala Sandhi*. [32]These are usually made up of cartilages. They are *Sthira Sandhi*. These types of *Sandhi* are present in *Kantha*, *Hrudaya* and *Netra*. [33]These can be correlated with round and cartilaginous or membranous and fixed variety of joints.

---

[26].....तदाकृतय) | प्रतरा :सु.शा.5/27 डल्हण कृत टीका(

[27] ग्रीवापृष्ठवंशयोः प्रतराः, (सु.शा.5/32)

[28] शिरःकटीकपालेषु तुन्नसेवन्यः (सु.शा.5/32)

[29] तुन्न सेवन्य)| :संधय:कपालान्तराला:शिर :नाम परस्परप्रवेशिनीभिर्दन्तुरधरादिभिनिर्मिता:प्रत्यक्षशारीर गणनाथ सेन पृ.117(

[30] शंखास्थिगताभ्याम्) || सन्धि.....प्रत्यक्षशारीर गणनाथ सेन पृ.117(

[31] हन्वोरुभयतस्तु वायसतुण्डाः (सु.शा.5/32)

[32] मंडलो मंडलाकृति) |सु.शा.5/27 डल्हण कृत टीका(

[33] कण्ठहृदयनेत्रक्लोमनाडीषु मण्डलाः (सु.शा.5/32)

Shankhavarta Sandhi

Haranacharya stated that these types of *Sandhi* are circular in nature and resembles the circles of snail or *Shankha*.[34]According to *Sushruta* these types of *Sandhi* are found in *Shrotra* (internal ear) and *Shringataka* (base of nose)[35].

Among 8 types of *Sandhi* explained in *Ayurveda*, *Kora* and *Ulukhala* are considered as movable joints, *Samudaga*, *Pratara* and *Vayastunda* are having fewer movements. *Tunnasevani*, *Mandala*, *Shankhavarta* are stable joints, among these *Mandala* and *Shankhavarta* are joints of *Tarunasthi*.

Stability of *Sandhi*

Since *Sira* (veins), *Snayu* (ligaments), *Asthi* (bones), *Asthiparva* (joints of bones) and *Sandhi* (other joints of muscles etc.) of the body are covered by muscles, they are strong.[36]

Kora Sandhi

Prior to the study of any subject, the explanatory word about the Subject being discussed, how then term has been derived from, should be known.

Etymology[37]

The word '*Kora'* belongs to *Pullinga*

It is originated by '*Kul Sastayane'Dhatu*

'*Ach' Pratayay* is used. So the meaning of the '*Kora* 'is *Garta*

Definition

According to *Dalhana* Meaning of *Kora* is '*Garta'*[38]. *Acharya Bhavprakash* says that meaning of *Kora* is *Nalika*.[39]*Haranchandra* in commentary of *Sushruta Samhita* mentioned *Kapaat* etc. is taken for *Nibandhan* of a special devise called *Kora* is known that the *Kabja* (hinge)[40].

The word *Kora* is understood as *Kabja*

---

[34] शंखावर्त 27/5 .शा .सु) |.....शंखभ्रमः :हराणचन्द्र कृत टीका(

[35] श्रोत्रशृङ्गाटकेषु शङ्खावर्ताः | (सु.शा.5/32)

[36] सिरास्नाय्वस्थिपर्वाणि सन्धयश्च शरीरिणाम् |
पेशीभिः संवृतान्यत्र बलवन्ति भवन्त्यतः || (सु.शा.5/49)

[37] कोर पु. कुल संस्त्याने अच् लस्य रः । (वाचस्पत्यम् तृतीय भाग पृ .स.2267)

[38] कोरो नाम गर्तस्तदाकृतयः कोराः, कोरः कलिका तदाकृतय इत्यन्ये | (सु.शा.5/27 डल्हण कृत टीका)

[39] कोरः= गर्तः । नलिकेत्यन्ये । (भा.प्र.पू.ख.3/242 पृ.सं.63)

[40] कोरो नाम कपाटादिनिबन्धनार्थो "यन्त्रभेद" कब्जा इत्याख्यायते । (सु.शा. 5/27 हाराणचन्द्र कृत टीका)

Kora –Kabja-movable joints as of fingers, door

SYNONYMS

Table No. 1 Shows Synonyms of the *Kora Sandhi* Mention By Different *Acharya.*

S. No.	Synonyms	*Acharayas*
1	*Kungmal*, *Kolak*, *Mrunnal*	*Amarkosha*
2	*Gartt*, *Kalika*	*Dhahalna*
3	*Gartt*, *Nalika*	*Bhavprakash*
4	*Kabja*	*Sanskrit* English *Kosha*

SAMHITAS-

As per the description of *Haranchandra* the *Kora Sandhi* can be correlated to Hinge type of joint. The *Sandhi* looks like the hinge seen in doors and windows which hold the arms tightly. The movements are seen on only one axis like flexion and extension. The *Kora Sandhi* are seen in the following region, *Anguli* (interphalangeal, metacarpophalangeal, and metatarsophalangeal), *Manibandha* (Wrist), *Gulpha* (Ankle), *Janu* (Knee) and *Kurpara* (Elbow). Here the *Aakunchana* (flexion) and *Prasarana* (extension) type of movements are observed. This is Hinge type of joint according to modern anatomical classification. In *Charaka Samhita* there is description related to number of *Sandhis* only, but there is no further explanation based on its *Rachana*, apart from this he explained *Kora Sandhi* based on its situation in the various regions of body.

In *Sushruta Samhita* there is prime description of *Kora Sandhi* in *Sharira Sthana* in which clear explanation of *Kora Sandhi* is available. In the context of sites related to *Sandhi Marma Acharya* has used the terms *Gulpha*, *Kurpara*. *Manibandha*, *Jaanu*[41]. *Acharya Dalhana* in *Nibadha Sangraha*: while doing commentary on the 5th chapter of *Sharir Sthana* he said that there are 68 *Sandhis* present in *Shakha* among which the sites related to *Kora Sandhi* is narrated.[42]

[41].....जानुकूर्परसीमन्ताधिपतिगुल्फमणिबन्धकुकुन्दरावर्तकृकाटिकाश्चेति सन्धिमर्माणि । (सु.शा.6/7)

[42] तेषां शाखास्वष्टषष्टिः, एकोनषष्टिः कोष्ठे, ग्रीवां प्रत्यूर्ध्वं त्र्यशीतिः । (सु.शा.5/27)

Acharya Haranachandra in *Sushrutharta Sandeepana*: while doing commentary on the 5th chapter of *Sharir Sthana* he explained definition of *Kora Sandhi*. *Acharya Sharangadhara* has followed the same as explained by *Acharya Sushruta* in relation to *Sandhi* he accepted 8 types of *Sandhi* among which he placed *Kora Sandhi* as first.

Arunadatta commentator of *Astanga Hridaya* in *Sharir Sthana* 3rd chapter explained 8 types of *Sandhi* among which *Kora Sandhi* is explained 1st but considered only 4(*Gulpha*, *Manbandhna*, *Anguli*, *Janu*) sites for *Kora Sandhi* by excluding *Kurpura*[43].

Based on *Ayurvediya Sharir Rachana* where the two bony ends when connected look like *Kora* hence called *Kora Sandhi*. It may be understood like *Kalika* or *Kabja*. Door or box to bind iron or brass *Kabja* (hinge) like structure of the *Sandhi* says it is *Kora Sandhi.* According to *Abhinav Sharir Rachana Kora Sandhi is* equated to synovial type of hinge joint. The shape of the articular surface is such that movement is possible only in one plane because the collateral ligament is very tight, so this type of joint is called *Kora Sandhi*.

Based on *Pratyaksha Sharir* the description related to *Kora Sandhi* is explained in 1st chapter of *Sandhi Snayu* as follows:[44]

Four types are explained:

1) *Khallakora* : Just as the flail runs in mortar the articulation of the joint resemble the same E.g. *Manibandhana Sandhi*, *Gulpha Sandhi*
2) *Parasparakora*; these are the joints formed by bones with resembles to the saddle of horse such articulation is *Parasparakora* e.g. *Agusthamula Sandhi* (saddle joint or reciprocal reception).

---

[43] संधयस्त्वष्टधाज्ञेया मणिबंधे जानुनि । गुल्फे अगुलौ कोर संज्ञा (अ.ह्.शा 3/16 अरुण दत्त टीका)

[44] तत्र कोरा नाम सन्धयो बहुचेष्टाः, उतानकोरगर्भेष्वस्थिप्रान्तेषु उत्सेधवतामस्थिभागानां सन्धानरूपाः|
ते चतुर्विधाः – खल्लकोरः, परस्परकोरः, चक्रकोरः, संदंशकोरश्चेति । तेषु-

(1) खल्ल्कोरः मणिबन्धे गुल्फसन्धौ च स्वनामव्याख्यातः|
(2) परस्परकोरः पर्याणकसदृशस्थालकयोः परस्परसन्धानरूपः, यथा-अंगुष्ठ्मूले ।
(3) चक्रकोरः मध्यकीलमाश्रित्य चक्रस्येव विवर्तनप्रदः सन्धिः, यथा-चूडावलयासहितस्य शिरसो दन्तचूडख्यकशेरुकया ।
(4) सन्दंशकोरः सन्दंशाकोरस्यास्थिभागस्य सन्धाने यथा-कूर्परसन्धौ । (प्रत्यक्षशारीर प्र.अ.पृ. 116-117)|

3) *Chakrakora*; in this type, the joint will take the support of centrally situated flail and rotates .this resembles to how the wheel rotates by support of flail. e. g. atlanto axial articulation.
4) *Sandanshkora* ; Articulation which looks like forceps between process of bones is *Sandansh Kora* e.g. elbow joint

Table No. 2 Shows the *Sandhi* and their Anatomical Location in the Body.

S. No.	Name of the *Kora Sandhi*	Anatomical Location
1	*Anguli Sandhi*	Interphalangeal, Metacarpophalangeal, Metatarsophalangeal joint
2	*Manibandha Sandhi*	Wrist joint
3	*Gulpha Sandhi*	Ankle joint
4	*Janu Sandhi*	Knee joint
5	*Kurpara Sandhi* `	Elbow joint

REFERENCES OF *KORA SANDHI* IN DIFFERENT *AYURVEDIC* TEXTS

Table No. 3- Shows References Related to *Kora Sandhi* in Different *Sthana* of *Charaka Samhita*

S. No.	Name of The *Sthana*	Name of the *Sandhi*	References
1	*Sharir Sthana*	*Anguli*	C. Sha .8/51
2	*Sharir Sthana*	*Gulpha*	C. Sha. 8/51

3	*Chikitsa Sthana*	*Janu*	C. Chi 28/55
4	*Chikitsa Sthana*	*Anguli*	C. Chi 29/26

Table No. 4- Shows References Related to *Kora Sandhi* in Different *Sthana* of *Sushruta Samhita.*

S. No.	Name of *Sthana*	Name of *Sandhi*	References
1	*Sutra*	*Gulpha, Janu*	Su.Su.35/12
2	*Sutra*	*Manibadna, Kurapra*	Su.Su.35/13
3	*Nidana*	*Gulpha*	Su.Ni.1/54
4	*Nidana*	*Anguli*	Su.Ni.1/75
5	*Nidana*	*Janu*	Su.Ni. 1/76 ,12/13
6	*Sharir*	*Gulpha,Janu,Manibadana, Anguli, Kurpra*	Su.Sha.5/31
7	*Sharir*	*Gulpha, Manibadna*	Su.Sha.5/12
8	*Sharir*	*Gulpha, Janu*	Su.Sha.5/16
9	*Sharir*	*Anguli*	Su.Sha.5/19
10	*Sharir*	*Anguli, Janu, Gulpha*	Su.Sha.5/46
11	*Sharir*	*Janu, Kurpara, Gulpha, Manibadna*	Su.Sha.6/12
12	*Sharir*	*Gulpha, Manibadan, Janu*	Su.Sha.6/14
13	*Sharir*	*Gulpha*	Su.Sha.6/25
14	*Chikitsa*	*Janu, Gulpha, Manibadna*	Su.Chi.3/32-33
15	*Chikitsa*	*Anguli,Gulpha,Manibadna*	Su.Chi.5/4

16	*Chikitsa*	*Janu*	Su.Chi.38/75

Table No. 5- Shows References Related to *Kora Sandhi* in Different *Sthana* of *Astanga Hridaya Samhita*

Sr. No.	**Name of *Sthana***	**Name of *Sandhi***	**References**
1	*Sharir*	*Manibadna,Kurpara,Gulpha,Janu*	Aa. H.Sha. 4/44-45
2	*Sharir*	*Gulpha*	A.H.Sha.4/4
3	*Sharir*	*Janu*	A.H.Sha.4/6
4	*Sharir*	*Gulpha,Manibadna*	A.H.Sha.4/59
5	*Sharir*	*Manibadna,Janu,Kurpara*	A.H.Sha.4/60-61
6	*Nidana*	*Janu*	A.H.Ni.15/52

Table No. 6-Shows References Related to *Kora Sandhi* in Different *Sthana* of *Bhel Samhita*

Sr. No.	**Name of the *Sthana***	**Name of the *Sandhi***	**References**
1	*Sutra*	*Anguli, Janu*	Bhe.Su. 25/36
2	*Sharir*	*Anguli, Janu, Gulpha*	Bhe.Sha.7/2
3	*Sharir*	*Gulpha*	Bhel.Sha.7/5
4	*Indriya*	*Janu, Anguli*	Bhe.In.2/12
5	*Indriya*	*Janu*	Bhe.In.2/16

6	*Chikitsa*	*Anguli*	Bhe.Chi.24/48-49

Table No. 7- References Related to *Kora Sandhi in Different Sthan* of *Harit Samhita*

Sr. No	Name of the *Sthan*	Name of the *Sandhi*	References
1	Third	*Manibandna,Kurpara,Janu*	Ha.S. 57/29-30
2	Third	*Gulpha*	Ha.S. 20/22
3	Third	*Janu*	Ha. S. 22/3
4	Third	*Gulpha*	Ha.S. 22/10
5	Third	*Kurpra*	Ha. S.57/30-31

Table No. 8- References Related To *Kora Sandhi in Different Sthan* of *Other Samhita*

Sr. No.	Name of The Texts Book	Name of The *Sandhi*	References
1	*Sharagdhar*	*Gulpha,Janu*	Sha. Pu. 3/73
2	*Jalpkalptaru Tika*	*Gulpha,Janu,Kurpara,Manibandh Anguli*	Ch.Sha.7/PageNo.2055
3	*Jalpkalptaru Tika*	*Janu, Gulpha*	Ch. Sha. 7/Page No. 2055
4	*Nibandh Sangrah*	*Anguli*	Su. Sha. 5/Page No. 366-67
5	*Arundattakrita Tika*	*Janu, Gulpha, Manibandh, Anguli*	As. H. Sha. 3/16
6	*Arundattkrit Tika*	*Anguli,Gulpha Janu*	As. H. Sha. 3/16 Page No. 199

STHANA (REGION) OF *KORA SANDHI*

The *Kora Sandhi* are seen in Anguli, *Manibandha*, *Gulpha*, *Janu* and *Kurpara* Region of the body.

GULPHA SANDHI

Etymologically the word '*Gulpha'* has been derived from Sanskrit roots '*Gal'*

which means ankle, the root of the ankle, reaching down to the ankle. It is a *Pullinga* word according to Sanskrit grammar. So the derivation of the *Gulpha* is from 'gal' *Dhatu*, (root) '*Fuk' Prateya* (affix)[45]

Synonymos: *Padagranthi*, *Guthika*, *Charana Granthi*, *Ghuntakaa*, *Gunthaha*, *Kundaka*, *Khulkaha*, *Khudakah*, *Khalakaha*.

Gulpha Sandhi is one of the important *Sandhi* of the lower extremity. It is mainly associated with movements and locomotion. Even this *Sandhi* is included under *Sandhi Marmas*. Structurally, it is classified under *Kora Sandhi* and functionally it is *Bahuchala Sandhi*. *Sushruta* has mentioned that it is a joint which is situated between or at the union of *Pada* and *Jangha*.[46]When we go through the classification of *Marma* it has been considered under one of the *Sandhi Marma* and when the classification is made on *Parinama* then it included under *Rujakara Marma*. According to *Gananathsen* the typical location of *Gulpha* is the *Sandhi* situated below the *Jangha Sandhi* and above the *Kurchashira Marma*.[47]The importance of *Gulpha Sandhi* is further elicited by adding it into *Sandhi Marma*, *Asthi Sangatha* and in *Chikitsa Sthana* of *Vijayarakshita*.

JANU SANDHI

"*Janu* "word is neutral gender

"*Jan"Dhatu "Yanch" Pratayaya*[48]

Acharya Sushruta has described the junction of *Uru* and *Jangha* as *Janu* (knee), it denotes the knee joint which is counted as a *Marma*. It causes lameness; its length is four fingers[49] According to *Ashtanga Sangraha, Janu* is classified as *Kapalastha* and the word *Janu Mandal* is used for *Janu*.

Acharya Dalhana has commented as "*Janghav Sandhi*" which denotes that it is two in number. *Janu Sandhi Marma* a *Sandhi Marma*[50]present in *Sakthi* that is lower extremity

---

[45] गल्+कलिगलिभ्यां फगस्योच्च । इति फक् अकारस्योत्वां च ॥ (शब्द कल्पद्रुमपृ279.)

[46] पादजङ्घयोः सन्धाने गुल्फो…….(सु.शा.6/25)

[47] गुल्फसन्धि पाद्संन्धिर्वा नाम जंघास्थ्नोरधःप्रान्तयोः कुर्चशिरसा संधिः खल्ल्कोराख्याः (प्रत्यक्षशारीरद्वि.अ.पृ. 144)

[48] शब्द कल्पद्रुम (पृ.स.531)

[49] जङ्घोर्वोः सन्धाने जानु, तत्र खञ्जता; जानुन ऊर्ध्वमुभयतस्त्र्यङ्गुलमानो….. (सु.शा.6/25)

[50] गुल्फौ द्वौ मणिबन्धौ द्वौ द्वे द्वे कूर्चशिरांसि च। रुजाकराणि जानीयादष्टावेतानि बुद्धिमान् ॥ (सु.शा.6/14)

and is of the *Vaikalyakar Marma*.[51]

MANIBANDHA SANDHI

In *Ayurveda*, *Manibandha* is explained in different aspects. *Manibandha* is explained under *Marma sharir* as *Manibandha Marma*, in *Sandhi Sharir* as *Manibandha Sandhi*, in *Paribhasha Sharir* as *Asthisanghat* and also as situation of *Jaala*.[52] *Manibandha Sandhi* is the *Sandhi* of the upper limb. It is located at the junction of forearm and palm. *Manibandha Sandhi* is a type of *Kora Sandhi* composed of *Manibandha Marma* with *Rujakara* character i. e. on injury cause severe pain.

According to *Acharya Sushruta*, *Manibandha Marma* is situated in upper extremities between the lower end of the radius and three lateral bones of proximal row of carpus and they are two in number and *Rujakara*[53]in *Parinama*, injury especially to *Manibandha* causes loss of function of the hand;[54]this *Manibandha Marma* is 2 *Angula* in *Parinam*.[55]

KURPARA SANDHI

According to *Pratyaksha Sharir* the *Kurpara Sandhi* is the example of *Sandanshkora.*

Synonyms

Amarkosha- Kaphoni, *Kuhanika*

Sushruta- Bhujmadhya[56]

According to *Sushruta*, *Marma* is a conglomeration of anatomical structures, namely, *Mamsa* (muscle), *Sira* (blood vessels), *Snayu* (ligaments and nerve), *Asthi* (bone), and *Sandhi* (joints).[57] According to *Ayurveda* the *Kurpara Marma* is a *Sandhi Marma* (structurally) and *Vaikalykara Marma* (prognostically). It is present in-between *Prakoshta*

---

[51] ……..जानुकूर्परसीमन्ताधिपतिगुल्फमणिबन्धकुकुन्दरावर्तकृकाटिकाश्चेति सन्धिमर्माणि || (सु.शा.6/7)

[52] मांससिरास्नाय्वस्थिजालानि प्रत्येकं चत्वारि; तानि मणिबन्धगुल्फसंश्रितानि परस्परनिबद्धानि परस्परगवाक्षितानि चेति, यैर्गवाक्षितमिदं शरीरम् (सु.शा.5/12)

[53] गुल्फौ द्वौ मणिबन्धौ द्वौ द्वे द्वे कूर्चशिरांसि च । रुजाकराणि जानीयादष्टावेतानि बुद्धिमान् (सु.शा.6/14)

[54] ……..विशेषतस्तु मणिबन्धे कुण्ठता (सु.शा. 6/25)

[55] सिद्यङ्गुलद्वयमितं मणिबन्धगुल्फ…. (सु.शा.6/29)

[56] कूर्परोभुजमध्यं, तयोरन्तरायामो दैर्घ्यं षोडशाङ्गुल इत्यर्थः| 'षोडशाङ्गुल' इत्यस्य स्थाने मणिबन्धकूर्परान्तरं षोडशाङ्गुलं…… (सु.सू. 35/12 डहल्ण कृत टीका)

[57] .....जानुकूर्परसीमन्ताधिपतिगुल्फमणिबन्धकुकुन्दरावर्तकृकाटिकाश्चेति सन्धिमर्माणि (सु.शा.6/7)

(humerus), *Prakanda* (radius, and ulna) *Asthi*[58]. Measurement of the *Marma* is 3 *Angula*[59]

ANGULI SANDHI

Acharayas while describing the site of *Kora Sandhi*, *Anguli* has been described first. In the body, *Anguli* is present in *Urdhav Shakha* (*Hasta*) and *Aadha Shakha* (*Pada*). From anatomical point of view in each *Anguli* there are three phalanges and in *Angustha* there are two phalanges therefore in each *Anguli* there are three *Asthi* and in *Angustha* there are two *Asthi*.[60]The conjugation of *Asthi* is called as *Sandhi* therefore in *Anguli* the conjugation of phalanges leads to formation of *Sandhi*, which is a type of *Kora Sandhi*, which in anatomy is called as interphalangeal joint. Again based on regional classification they are called as *Karanguli Sandhi* and *Padha Anguli Sandhi.* In *Sushrut Samhita Acharya Sushrut* has described three three *Sandhi* in *Anguli* and two two *Sandhi* in *Angustha*, making a total of 14 *Anguli Sandhi* in each limb.[61] In *pratayash sharir* of *Kaviraj Ganathsen* described same as *Sushruta*

In *Abinava Sharir* according to *Pandita Damodara Goud*, in each *Anguli* there are three phalanges there conjugation results in two two *Sandhi* and in *Angustha* there are two two phalanges, there conjugation results in formation of one *Sandhi*. Hence there are total of 9 *Anguli Sandhi* in each limb.

The first bone attached to carpal bone is called first phalanx, middle one is called as middle phalanx and the third is called as distal phalanx.

[58] प्रकोष्ठप्रगण्डयोः संन्धाने कूर्पर नाम, तत्र कुणि (सु. शा. 6/25)

[59] त्रीण्येव जानु सपरं सह कूर्पराभ्याम् (सु.शा.6/29)

[60] एकैकस्यां तु पादाङ्गुल्यां त्रीणि त्रीणि तानि पञ्चदश..... (सु.शा.5/46)

[61] एकैकस्यां पादाङ्गुल्यां त्रयस्त्रयः, द्वावङ्गुष्ठे, ते चतुर्दश.....(सु.शा.5/28)

SPORTS AND *AYURVEDA*

Ayurveda is science of life which deals with the health, durability and quality life of each and every individual. In Ayurveda there is no direct description of sports and its related injuries but we find references of exogenous diseases (*Aagantuja Rogas*) caused due to the contact of external factors like fire, poisonous substances and also due to trauma. In classifying diseases, *Susruta Samhita* has included the category of diseases caused in a weak person due to fight with a stronger one (*Sanghaatabala-pravrtta-vyadhi).* This can be correlated with traumatic diseases such as **sprain, muscle injuries, wounds, fractures, dislocation** which caused due to various games such as boxing, wrestling, martial arts etc. *Ayurveda* gives enormous description of *Vranashopha* (inflammatory swelling), *Vrana (*wound*)*, *Kandabhagna* (fracture), and dislocations (*Sandhi-Mukta*) and also their treatments are mentioned in *Samhita* which fall under the branch of *Shalya-Tantra*. There is also description of symptoms like *Shoola* (pain), *Shopha* (swelling), *Snayugatvata* (ligament and tendon injury) etc. and their *Ayurvedic* management. Sports medicine is a special branch of modern medicine. All the subjects of it are described in *Ayurveda.* A full description about *Ayu*, *Vyayama*, and good built of body, *Dincharya* and *Ritucharya* shows that over *Ayurveda Acharya* were very conscious about good health. Exercise has been an important part of the *Ayurvedic* routine for thousands of years before it becomes a modern aid. Through exercise one gets rid of heaviness and stiffness of the body because it burns *Ama* (digestion impurities) and creates more flexibility, lightness, smoothness and easiness. Other benefits include enhanced firmness, endurance, and ability to do work. It pacifies all three *Doshas* and creates balance suitable for the body type and season. It enhances the digestion, and if done properly, it dissolves impurities in the tissues. Exercise enhances immunity and capacity for food. It removes fatigue, sops early aging, and retards weight gain. The word *Vyayama* creates a sign sports in *Ayurveda.*

The term '*Ayu'* stands for the combination of the body, sense organs, mind and soul, and its synonyms are *Dhari* (the one that prevents the body from decay), *Jiivit*

(which keeps alive), *Nityaga* (which serves as a permanent substratum of this body) and *Anubandha* (which transmigrate from one body to another[62]).

Acharya Charaka has described the definition of *Vyayama* shows that for good sports fitness *Vyayama* how much needed. Such a physical action which is describe and is capable of bringing about bodily stability and strength is known as physical exercise[63]. This has to be practiced in moderation.

Acharaya Sushruta explains physical exercise as a sense of weariness from bodily labour, and it should be taken every day. After taking physical exercise, the whole body should be massaged, until it gives rise to a comfortable sensation in the limbs. It makes the body stout and strong, helps the symmetrical growth of the limbs and muscles, improves the complexion and the digestive powers, prevents laziness and makes the body light and glossy, firm and compact.[64]

Physical exercise causes physical development, luster, compactness of body parts, stimulation of digestive power, absence of idleness, firmness, lightness, cleanliness, tolerance to fatigue, exhaustion, thirst, heat, cold etc. and provides optimum immunity. There is no anti-obesity measure equal to physical exercise; one who performs physical exercise regularly can't be overcome by enemies, he can't be attacked and subdued suddenly by senility and his musculature becomes firm. Physical exercise brings about lightness, ability to work, stability, and resistance to discomfort and alleviation of *Doshas* (especially *Kapha*).it stimulates the power of digestion.[65]*Acharya Charaka* tells about the benefits of *Vyayama* that physical exercise brings about lightness, ability to work, stability, resistance to discomfort and alleviation of *Doshas* (especially *Kapha*). It stimulates the power of digestion.[66]*Acharaya Vagbhatta* says about the *Vyayama* the

---

[62] शरीरेन्द्रियसत्वात्मसंयोगो धारि जीवितम्| नित्यगश्चानुबन्धश्च पर्यायैरायुरुच्यते|| (च. सू. 1/42)

[63] शरीरचेष्टा या चेष्टा स्थैर्यार्था बलवर्धिनी| देहव्यायामसङ्ख्याता मात्रया तां समाचरेत्|| (च. सू. 7/31)

[64] शरीरायासजननं कर्म व्यायामसञ्ज्ञितम् ।तत् कृत्वा तु सुखं देहं विमृद्गीयात् समन्तत॥ (सु.चि.24/36)
शरीरोपचयः कान्तिर्गात्राणां सुविभक्तता ।दीप्ताग्नित्वमनालस्यं स्थिरत्वं लाघवं मृजा॥ (सु. चि.24/37)

[65] लाघवं कर्मसामर्थ्यं स्थैर्यं दुःखसहिष्णुता। दोषक्षयोऽग्निवृद्धिश्च व्यायामादुपजायते ॥ (च. सू. 7/32)

[66] स्वेदागमः श्वासवृद्धिर्गात्राणां लाघवं तथा| हृदयाद्युपरोधश्च इति व्यायामलक्षणम्|| (च. सू. 7/1)

lightness of body, ability to do hard work, good appetite, and loss of excess fat, stable and constitute physique accrue from physical exercise.[67]

PERSONS WHO ARE RESTRICTED FOR *VYAYAMA*

Exercise is contraindicated for persons who are emaciated due to excessive sexual activity, weight lifting and by travelling on foot and for those who are in grip of anger, grief, fear, exhaustion and for the children, for the old persons for persons having *Vatika* constitution and profession of speaking too much. One should not do exercise while he is hungry and thirsty also.[68]Physical exercise should be avoided by one suffering from intrinsic hemorrhage, emaciation, consumption, dyspnoea, cough and wound, after taking food, wasted due to sex and afflicted with thirst and giddiness.[69] People, who are suffering from above described disease, should not do physical exercise.

SIGNS AND SYMPTOMS OF GOOD BUILT

Persons having proportionate musculature and compactness of the body no doubt posses very strong sensory and motor organs and as such they are not overcome by the onslaught of diseases. They can withstand hunger, thirst, the heat of the sun, cold and physical exercise. They have proper assimilation and digestion.[70].

CONCEPT OF HEALTH

A healthy mind in a healthy body is a concept which is relevant in the context of sports medicine. Like in other branches of medicine, sports medicine also emphasizes on prevention rather than cure. The sports physician's primary duty is to make the best effort to maintain or restore health and functional ability of the sportsperson.

Physicians who have the responsibility of an entire sports team are not only concerned with the health and well-being of individual athletes but also with the overall health, hygiene and well-being of the entire team. Expert physicians in this field also play

---

[67] लाघवं कर्मसामर्थ्यं दीप्तोऽग्निर्मेदसः क्षयः| विभक्तघनगात्रत्वं व्यायामादुपजायते|| (अ.ह्र.सू. 10/2)

[68] अतिव्यवायभाराध्वकर्मभिश्चातिकर्शिताः|क्रोधशोकभयायासैः क्रान्ता ये चापि मानवाः||
बालवृद्धप्रवाताश्च ये चोच्चैर्बहुभाषकाः| ते वर्जयेयुर्व्यायामं क्षुधितास्तृषिताश्च ये|| (च. सू. 7/35)

[69] रक्तपित्ती कृशः शोषी श्वासकासक्षतातुरः । भुक्तवान् स्त्रीषु च क्षीणस्तृड्भ्रमार्तश्च वर्जयेत् ।(सु.चि.24/50)

[70] सममांसप्रमाणस्तु समसंहननो नरः| दृढेन्द्रियो विकाराणां न बलेनाभिभूयते||
क्षुत्पिपासातपसहः शीतव्यायामसंसहः| समपक्ता समजरः सममांसचयो मतः||(च. सू. 21/17-18)

a crucial role in assisting the sportspersons to bring out the optimal best in their performance.

PHYSICAL FITNESS

Physical fitness comprise of two related concepts; general fitness (a state of health and well being) and specific fitness (a task-oriented definition based on the ability to possess the qualities required for a certain sport). A symmetrical individual is a quintessence for a classical sportsperson.

Physical strength of a sportsperson is very important. But they should have a strong mind too. It is the mind that generates a winner. In *Ayurveda*, the psychological temperament of a person is described as the mental constitution. This is dictated by the predominance of a particular attribute in the admixture of the major attributes namely *Sattva, Rajas* and *Tamas*. Mental strength provides efficiency to tackle circumstances of adversities and assists the person to attain propriety. People predominant in the pure (*Sattva*) tolerate everything through their will power. Sportsman spirit is usually expressed by such people. One predominant with *Rajas* tolerates being supported by others while the person predominant with *Tamsa* will be confused on confronting problems even if helped by others.

Unlike the humoral constitution, mental temperament is amenable to changes. By training and self control, one can attain better mental strength. Thus, a person with predominance of the insert principle (*Tamas*) can be gradually converted to pure temperament predominant in *Sattva* through the intermediary dynamic temperament predominant in *Rajas.* The tackling of mental problems is termed 'winning of mind '(*Sattvavjaya Chikitsa*) in *Ayurveda.*

COMMON CONDITIONS RELATED TO INJURIES IN AYURVEDA

In *Ayurveda* we find the references of sport injuries under exogenous diseases (*Aagantuja Rogas*) caused due to the contact of external factors like fire, poisonous substances and also due to trauma. In classifying diseases, *Susruta Samhita* has included the category of diseases caused in a weak person due to fight with a stronger one (*Sanghaatabala-pravrtta-vyadhi).* This can be correlated with traumatic diseases such as *Bhagna* (bony injuries), *Sandhimukta* (joint injuries), *Mansagatvata* (sparin), *Snayugatvata* (ligament, nerve and tendon injuries), *Vrana* (wound), *Shopha* (inflammation) caused due to games such as boxing, wrestling, martial arts etc.

The common symptoms of sport injuries are pain, swelling, dislocation, fracture; wound, sprain and strain in *Ayurveda* we find detail description of these symptoms like *Shoola, Shopha, Vrana Shopha, Vrana, Bhagna* and *Snayugatvata.*

SANDHI VIDDHA LAKSHANA-

When the joints, either movable or immovable are injured, there will be increased swelling, very severe pain, loss of strength of the joints; splitting pain; edema and loss of function of the joints are the symptoms[71].

SHOPHA

In sports person traumatic injuries are more common and these injuries manifest as pain and swelling in involved tissues. Inflammation is the commonest in sports injuries such as bursitis, tendinitis, Bruise etc. Sports injuries can affect any part of the body, including the muscles, bones, joints and connective tissue (ligaments, tendons). Inflammation is the body's reaction, towards any type of sports injuries. Swelling is a normal reaction of the body to an injury. It is an abnormal enlargement of a body part due to sports injury. Edema is described as fluid or swelling that has accumulated in the tissue outside the joint capsule. Effusion is described as that is inside the joint capsule, such as swollen ankle and knee. Inflammation can be correlated to *Shopha* in *Ayurveda.*

[71]शोफातिवृद्धिस्तुमुला रुजश्च बलक्षयः पर्वसु भेदशोफौ | क्षतेषु सन्धिष्वचलाचलेषु स्यात् सन्धिकर्मोपरतिश्च लिङ्गम् | (सु.सू. 25/38)

Ayurvedic texts have two terms *Shopha* and *Shotha* to indicate inflammatory swelling and edema. It is of six kinds i.e. one each by *Vata*, *Pitta*, *Kapha*, *Rakta*, *Sanipata* and *Aagantu*[72]. *Aagantuja* (Produced by extraneous cause like blow, injury, insect bites, foreign bodies, poison etc,) symptoms of *Pitta* and *Rakta* kinds of oedema and red colour are its symptoms[73]. The *Abhigataja* type of swelling is caused by excision, incision, comminution, fracture, exposure to excessive pressure, grinding assault, grievous hurt, trying by rope act.[74]

SHOOLA

Muscles strain and ligaments sprain are the most common injuries that cause pain in the young athlete. They can be caused by athletic overuse, improper body mechanics and technique, lack of proper conditioning, insufficient stretching as well as trauma. Pain is a protective body mechanism which alerts the person about the harmful condition or experience that occurs in the body. Pain can be somatogenic or psychological. The somatogenic pain occurs due to physiological cause or external injuries. Vitiated *Vata* starts destruction in joints by creating pain and inflammation in joints.[75]

In *Ayurveda*, it is known as *Shoola*. *Shoola* can be in any region, but it is caused due to the aggravation of the *Vata Dhosha*. *Vata Dhosha* is responsible for every movement and action in the body. The hindrance in *Vata* flow leads to the pain, the obstruction in *Vata* flow cause pain. According to *Acharya Sushruta* without vitiated *Vata* there will be no pain, pain in any part of the body is caused by the *Vata Dosha*, without *Pitta* there is no ripening and without *Kapha* there is no pus, hence during the stage of ripening of the oedema (inflammatory) all the *Dosha* are involved.[76]

VRANA

Common type of skin wounds in physical activity injuries includes abrasion, blisters and lacerations. Wounds of the integumentary system occur frequently in athletics.

---

[72] स षड्विधो वातपित्तकफशोणितसन्निपातागन्तुनिमित्तः (सु.सू.17/4)

[73].....पित्तरक्तलक्षण आगन्तुर्लोहितावभासश्च ॥ (सु.सू.17/5)

[74] तत्रागन्तवश्छेदनभेदनक्षणनभञ्जनपिच्छनोत्पेषणप्रहारवधबन्धनवेष्टनव्यधनपीडनादिभिर्वा..... | (च.सू.18/4)

[75] हन्ति सन्धिगतः सन्धिञ्च शूलाटोपौ करोति च ॥ (मा.नि. पू. 22/21)

[76] वाताद्दते नास्ति रुजा न पाकः पित्ताद्दते नास्ति कफाच्च पूयः |
तस्मात् समस्तान् परिपाककाले पचन्ति शोफांस्त्रय एव दोषाः ॥ (सु.सू.17/12)

Wound can occur in many sports, and assessment and care of such trauma in an essential skill. The purpose of this is to do review of *Vrana* (wound) that may occur in sport and their acute management. *Vrana* is the commonest painful condition that every sports person being suffers in their life and skin is the largest organ in body. *Vrana* may be classified as *Nija* and *Agantuja*, where *Agantuja Vrana* or *Sadhyovrana* with a correlation to traumatic wound.

SANDHI GATA VRANA

The discharge does not appear even after pressure, when the wound is present over the joint *(Sandhi)* but when there is flexion, extension, elevation, depression or by running, coughing and straining it comes out. It will be slimy, sticky and appears as if churned with blood. *Sushruta* in his *ChikitsaSthana 2nd* chapter *Sadyovrana Adhyaya* explained the *Sadyovrana* in detail which comes under *Aagantuja Vrana*. *Aagantuja Vrana* is a fresh wound caused by various external agencies such as bites of animals, birds, snakes, trauma from sharp or blunt objects, *Agni*, *Kshara*, corrosive drugs, arrows etc.[77]

Sushruta has classified the *Aagantuja Vrana* into varieties according to their nature, depth, by the violence, surrounding tissue. These are *Chhinnam* (excised wound), *Bhinnam* (deep punctured wound), *Viddham* (superficially punctured wound), *Kshathaja* (incised wound), *Pichchita (*contusion), and *Ghrista* (lacerated wound).[78]

***BHAGNA* (FRACTURE & DISLOCATION)**

Fracture and dislocations are both of the common hazards in sports injuries such as colle's fracture, scaphoid fracture, phalangeal fracture, dislocations of the finger joints, Patella dislocation etc. Especially *Sushruta* has mentioned trauma is the major cause of bone injury & joint dislocations, in perceptive of *Ayurvedic* literature various references are available regarding *Bhagna* about their etiological factors and treatment. In such conditions our body requires assistance for healing assisting or helping an injured bony tissue /cartilaginous tissue is termed as *Bhagna Chikitsa* in ancient *Ayurvedic* literature.

---

[77] तयोः शारीरः पवनपित्तकफशोणितसन्निपातनिमित्तः; आगन्तुरपि पुरुषपशुपक्षिव्यालसरीसृपप्रपतनपीडनप्रहाराग्निक्षारविषतीक्ष्णौषधशकलकपालशृङ्गचक्रेषुपरशुशक्तिकुन्ताद्यायुधाभिघातनिमित्तः । (सु.चि.1/3)

[78] छिन्नं भिन्नं तथा विद्धं क्षतं पिच्चितमेव च ।घृष्टमाहुस्तथा षष्ठं तेषां वक्ष्यामि लक्षणम् ॥ (सु.चि.2/9)

He has classified these effects in different groups and co-related with the types involved as mentioned below[79].

Table No. 9 Shows the Correlation between types *Asthi* in Ayurveda with bones of Modern anatomy and types of Fractures occur at particular bone.

Sr. No.	In *Ayurveda*	In modern	Type of fracture
1	*Tarunasthi*	Cartilage bones	*Namyati*(Bents)
2	*Nalakasthi*	Long bones	*Bhagna*(Break)
3	*Kaplaasthi*	Flat bones	Punctured
4	*Ruchakasthi*	Teeth and irregular bones	Cracked
5	*Valaya*	Curved bones	Breaks

Classification of Bone Injuries

All skeletal injuries are classified basically in 2 types-

1) *Savrana Bhagna*- open or compound fracture
2) *Avrana Bhagna*- closed or simple fracture

This classification is important in the management of fractures; *Sushruta* has clear idea between a fracture and dislocation. So he has classified traumatic injuries into

1) *Sandhimukta*- dislocations 2) *Kandabhagna*- Fractures[80]

These injuries further classified into 6 types of dislocation& 12 types of fractures. Those are

Sandhimukta[81]

According Acharya Sushrut there are 6 types of *Sandhimukta* (dislocation) as follows

1) *Utklista*-fracture dislocation
2) *Vishshlista*- dislocation due to tear of ligament
3) *Vivartita*- anterio posterior dislocation
4) *Avakshipta*- downward displacement

[79] तरुणास्थीनि नम्यन्ते भज्यन्ते नलकानि तु ।कपालानि विभिद्यन्ते स्फुटन्ति रुचकानि च॥ (सु.नि.15/17)

[80] तत्र भङ्ग(ग्न)जातमनेकविधमनुसार्यमाणं द्विविधमेवोपपद्यते सन्धिमुक्तं, काण्डभग्नं च (सु.नि.15/4)

[81] तत्र सन्धिमुक्तम्- उत्पिष्टं, विश्लिष्टं, विवर्तितम्, अवक्षिप्तम्, अतिक्षिप्तं, तिर्यक्क्षिप्तमिति षड्विधम् ॥ (सु.नि.15/5)

5) *Atikshipta*- gross displacement

6) *Tiryakakshipta*- oblique displacement[i]

Table No. 10 shows the types of *Kandabhagna* and their Modern Correlation

SR. NO.	*KANDABHAGNA*	IN MODERN
1	*Karkataka*	Depressed fracture
2	*Ashwakarna*	Complete oblique fracture
3	*Churnita*	Comminuted
4	*Pichita*	Compressed fracture
5	*Asthichalita*	Periosteal evulsions fracture
6	*Kandabhagna*	Complete compound fracture
7	*Majjanugata*	Impaction fracture
8	*Atipatita*	Complete compound fracture
9	*Vakra*	Green-stick fracture
10	*China*	Incomplete fracture
11	*Patita*	Comminuted fracture
12	*Sputita*	Fissured fracture[82]

Etiology of *Bhagna*[83]

Generally *Bhagna* is occurring due to *Abhighataja* condition. *Sushruta's* attempt to specify the *Nidanas* as follows:

Patana: fall from a height, fall into pits, fall on the ground with outstretched hands etc.

Peedana: violent pressure or compression affects directly or indirectly over the bones.

Prahara: strong blow from blunt instruments such as stick or *Mushti Prahara*

Akshepana; Violent jerks, vigorous movements, sudden and severe contractions of muscles causes *Akshepana*.

[82]काण्डभग्नमत ऊर्ध्वं वक्ष्यामः- कर्कटकम्, अश्वकर्ण, चूर्णितं, पिच्चितम्, अस्थिच्छल्लितं, काण्डभग्नं, मज्जानुगतम्, अतिपातितं, वक्रं, छिन्नं, पाटितं, स्फुटितमिति द्वादशविधम् ॥ (सु.नि.15/8)

[83] पतनपीडनप्रहाराक्षेपणव्यालमृगदशनप्रभृतिभिरभिघातविशेषैरनेकविधमस्थ्नां भङ्गमुपदिशन्ति ॥ (सु.नि.15/3)

Vyalamrugadashana: bites, nail injuries or attack of wild beasts which was very common in Ancient days

Balavadvigraha: strong block from heavy or strongly built personality

*Abhigatavishesha***:** trauma caused by different reasons results in varieties of fracture including different bones.

The fracture of the bones due to sports injuries has been including in *Abhigata Vishesha Nidana* of *Bhagna*.

General signs and symptoms of *Kandabhagna*

Profound swelling, inability to bear tapping, rotating and touching; producing sound(at the site) when pulled, part of the body hanging down loosely, appearance of various kinds of pain, and not finding comfort in any position these are in brief , the general symptoms of fracture of shaft of bones[84].

General signs and symptoms of *Sandhimukta*

Inability to perform actions such as extension, contraction, rotation and vigorous (quick) movements, severe pain and inability to withstand touch (guarding) are the general symptoms of dislocation.[85]

Snayugata Vata

Snayu are present in human body in close relation to *Sandhi*, *Snayu* provide weight bearing capacity to human body. *Snayu* has a very proximate relationship with biological air or functional element knows as *Vata*. *Vata* is a chief factor responsible for various physiological activities in human body. *Vata* when provoked or vitiated by any internal and external factor can reside in *Snayu* resulting in instantaneous manifestation of disease and may produce pain, stiffness, bending, limping, tremors, and swelling etc.

In the development of *Agantuja* disease, the *Dosha's* especially *Vata* will cause *Rakta Dushti* and the main symptoms will be pain, swelling and redness[86].

---

[84] श्वयथुबाहुल्यं स्पन्दनविवर्तनस्पर्शासहिष्णुत्वमवपीड्यमाने शब्दः सस्ताङ्गता विविधवेदनाप्रादुर्भावः सर्वास्ववस्थासु न शर्मलाभ इति समासेन काण्डभग्नलक्षणमुक्तम् ॥ (सु.नि.15/9)

[85] तत्र प्रसारणाकुञ्चनविवर्तनाक्षेपणाशक्तिरुग्रुजत्वं स्पर्शासहत्वं चेति सामान्यं सन्धिमुक्तलक्षणमुक्तम् ॥ (सु.नि.15/6)

[86] अत्र क्षतच्छेददाहाद्यैर्भिघातज ॥श्रमाश्च तिस्मन् पवनः प्रायो रक्तमं प्रदूषयन् ।
सव्यथिशोफवैवर्ण्य, सरुजं कुरुते ज्वरं ॥ (अ.ह.नि 2/38-39)

Anatomically *Snayu* is similar to ligaments and tendons. Especially *Pratanvati* type can be correlated to ligaments and *Vrutta Snayu* are also known as tendons. Injuries of ligaments and tendons called sprain and strain respectively e.g. ankle sprain, tennis elbow, golfers elbow wrist sprain etc.

In *Ayurveda* it can be correlated to *Snayugatavata* .the symptoms and treatment of *Snayugatavata* has been explained in *Ayurveda*. *Snayugatavata* is developed when the *Vata Dosha* aggravates due to *Atichesta*, *Ativyayam*, etc. and gets localized in *Snayu*s[87] Aggravation of *Vayu* in tendons and ligaments causes *Bahya Abhyantara Aayam* – opithotonus and emprosthotonos- backward or forward bending of body *Khalli* (neuralgic pain in feet, shoulders, etc) *Kubjatva*- hunchback and other *Vatika* diseases pertaining to the entire body or a part there of [88].

Just as a boat with wooden planks placed side by side, when fastened tightly by ropes in many ways becomes capable of carrying weight in water, steered by a man (boat man), similarly the human body will be able to carry weight, so long as the joints are fastened tightly by ligaments in many ways. Neither bones, muscles, veins nor joints kill the person, but the ligaments can do this.[89]

[87] लङ्घनप्लवनात्यध्वव्यायामातिविचेष्टितैः| धातूनां सङ्क्षयाच्चिन्ताशोकरोगातिकर्षणात्|| (च.चि.28/16)

[88] बाह्याभ्यन्तरमायामं खल्लिं कुब्जत्वमेव च| सर्वाङ्गैकाङ्गरोगांश्च कुर्यात् स्नायुगतोऽनिलः|| (च.चि.28/35)

[89] नौर्यथा फलकास्तीर्णा बन्धनैर्बहुभिर्युता | भारक्षमा भवेदप्सु नृयुक्ता सुसमाहिता ||
एवमेव शरीरेऽस्मिन् यावन्तः सन्धयः स्मृताः | स्नायुभिर्बहुभिर्बद्धास्तेन भारसहा नराः ||
न ह्यस्थीनि न वा पेश्यो न सिरा न च सन्धयः | व्यापादितास्तथा हन्युर्यथा स्नायुः शरीरिणम् ||(सु.शा.5/41-43)

SPORTS INJURIES

A sports injury can be defined as any kind of injury, pain, or physical damage that occurs as a result of sport, exercise or physical activity. Although the term sports injury can be used to define any injury sustained as a result of sport. It is most commonly used for injuries that affect the musculo-skeletal system, which include the muscles, bones, tendons, cartilage and associated tissue. Sports injuries are injuries that happen when playing sports or exercising. Some are from accidents. Other can results from poor training practices or improper gear. Some people get injured when they are not in proper condition. i. e. not warming up or stretching enough before you play or exercise can also lead to injuries. Most serious injuries, such as head, neck and spinal cord trauma, are usually considered separate to common sport injuries like sprains, strains, fractures and contusions.[90]

Type of Sports injuries [91]

1. Acute injuries
2. Chronic injuries

Acute injuries - Acute injuries may be due to extrinsic cause, such as a direct below, either as a result of contact with another player or equipment, or intrinsic causes, such as a ligament sprain or muscle tear. It may be classified according to the particular site injured e.g. bone, cartilage, joint, ligament, muscles, tendon, bursa, nerve or skin. Acute injuries, such as a sprained ankle, strained back or fractured hand, occur suddenly during activity. Signs of an acute injury include the following:

- Inability to move a joint through its full range of motion
- Extreme tenderness in an upper limb
- Swelling
- Sudden, severe pain
- Inability to place weight on a lower limb

[90] Sports injuries diagnosis and treatment christer role A &C black 1 st edition page no. 1
[91] Clinical sports medicine peter brukner and karim khan 3rd edition page no. 9

Chronic injuries -The causes of the chronic sports injuries are usually divided into extrinsic factors such as training, surfaces, shoes, equipment and environmental conditions, or intrinsic factors such as malalignment, leg length discrepancy, muscles imbalance muscles weakness, lack of flexibility and body composition. Chronic injuries usually result from overusing one area of the body while playing a sport or exercising over a long period. The following are signs of chronic injuries.

- Pain when performing an activity
- A dull ache when at rest
- Swelling
- Tenderness
- Weakness

Table 11- shows the classification of sports injuries on the basis of consequence of injury[92].

Sr. No.	Site	Acute Injuries	Chronic Injuries
1.	Bone	Fracture, Periosteal Contusion	Stress Fracture, Bone Strain, Stress Reaction, Osteitis, Periostis)
2.	Articular Cartilage	Osteochondral/Chondral Fractures, Minor Osteochondral Injury	Chondropathy (e.g. Softening, Fibrillation)
3.	Joint	Dislocation/Subluxation	Synovitis, Osteoarthiritis
4.	Ligament	Sprain	Inflammation
5.	Muscle	Strain, Contusion, Cramp, Acute Compartment Syndrome	Chronic Compartment Syndrome, Fibrosis

[92] Clinical sports medicine peter brukner and karim khan 3rd edition page no. 8

6.	Tendon	Tear (Complete Or Partial)	Tendinopathy (Includes Paratenonitis, Tenosynovitis, Tendinosis, Tendinitis)
7.	Bursa	Traumatic Bursitis	Bursitis
8.	Nerve	Neuropraxia	Entrapment Minor Nerve Injury/ Irritation Adverse Neural Tension
9.	Skin	Laceration, Abrasion, Puncture Wound	Blister Callus

As well as classifying a sports injury as acute and chronic, sports injuries are also classified according to their severity. These are graded into one of three Classifications-

- **MILD -** A mild sports injury will result in minimal pain and swelling. It will not adversely affect sporting performance and the affected area is neither tender to touch nor deformed any way.
- **MODERATE -** A moderate sports injury will result in some pain and swelling. It will have a limiting affect on the sporting performance and the affected area will be mildly tender to touch. Some discoloration at the injury site is usually very tender to touch.
- **SEVERE-** A severe sports injury will result in increased pain and swelling. It will not only affect sporting performance, but will also affect normal daily activities. The injury site is usually very tender to touch, and discoloration and deformity are common.

Traumatic injuries account for most in contact sports such as ice hockey, association football, rugby league, rugby union, Gaelic football and Canadian football because of the dynamic and high collision nature of these sports. Collision with the ground, objects, and other players are common, and unexpected dynamic forces on limbs and joints can cause sports. Every sports person in his career suffers from various joint injuries, especially of hinge joint; like knee joint injuries, ankle joint injuries, elbow joint injuries, wrist joint

injuries, and interphalangeal joint injuries. The extensive use of these joint causes tears, stretching, inflammation, wound, fracture, dislocation etc. Traumatic injuries can include-

1. Strains (muscle/tendon injuries) 2. Sprains (ligament injuries)
3. Contusions and hematomas 4. Fracture
5. Dislocation 6. Inflammation (tendinitis, bursitis etc.)
7. Pain in tibia (shin splints) 8. Wounds (abrasions, lacerations etc.).

1) **Sprains-**

These are the most common type of sports injury by far, and can occur in almost any type of physical activity. A sprain occurs when a ligament (band of connective tissue that attaches bind to other bones) tear or overstretches. These can range from minor to complete tears in the ligament. Sprain is an injury to a ligament, the band of connective tissues that joins the end of one bone with another. Sprain is caused by trauma such as a fall or blow to the body that knocks a joint out of position and, in the worst case, ruptures the supporting ligaments. Sprains can range from first degree (minimally stretched ligament) to third degree (a complete tear). Areas of the body most vulnerable to sprains are ankles, knees and wrists. Signs of a sprain include varying degrees of tenderness or pain, bruising, inflammation, swelling, inability to move a limb or joint or joint looseness, laxity, or instability.

2) **Strain**

A strain is an injury to a muscle or tendon, and is often caused by overuse, force or stretching. A strain is a partial or complete tear of muscles or tendon. It is an acute, noncontact injury that results from overstretching or over contraction. Symptoms of a strain include pain, muscle spasm, and loss of strength. While it is hard to tell the difference between mild, moderate and severe strain as if these are not treated professionally can cause damage and loss of function.

3) **Contusion**

About 95% of sports injuries are minor soft tissue traumas. The most common sports injuries are a bruise (contusion). A contusion is an injury to the soft tissues often produced by a blunt force such as a kick, fall or blow. The result will be pain, swelling, and discoloration of skin.

4) **Fracture (Stress fracture)**

Stress fracture commonly referred to as a broken bone. Fracture is a fairly common sports injury caused by a onetime injury to the bone (an acute fracture), repeated stress on a bone over time (a stress fracture) can also occur. Small cracks or complete break will occur with an acute fracture. Most are classified as emergencies, and may even need surgery to complete repair. A stress fracture occurs most of the time in the legs or feet from sports that cause repetitive impact, such a running or jumping sports. The bones in the mid foot (metatarsals) in runners are especially vulnerable to stress fractures.

5) **Dislocation**

A dislocation occurs when extreme force is put on a ligament, allowing the ends of two connected bones to separate. Ligament is flexible bands of fibrous tissue that connect various bones and cartilage. Ligaments also bind the bones in a joint together. Stress on joint ligaments can lead to dislocation of the joint. The most commonly dislocated joint is the shoulder.

6) **Tendinitis**

Tendinitis is the inflammation of a tendon. The tendon is the thick cord that attaches the muscle to the bone. The tendons have been stretched beyond their capacity in a repetitive motion. Tendinitis is rarely caused by a sudden injury. Tendinitis can occur in different areas in the body, including the elbow, shoulder, hip, knee, thumb, and achlilles heel. Causes of tendinitis include poor posture, which strains joints and puts pressure on tendons, an abnormal bone or joint, such as those caused by arthritis and improper stretching and condition.

Symptoms include tenderness in the affected area, which can run along the entire muscle. Pain is generally felt with gripping and turning motion. Pain may be gradual or sudden and severe, depending on the condition causing tendinitis. It is also characterized by loss of motion in the affected area.

7) **Shin splints**

A shin splint is when pain, soreness and slight swelling of the front, inside, and back of the lower leg (tibia). This pain is usually at the front outside part of the lower leg, but can also occur in the foot and ankle (anterior shin splints) or where

the bone meets the calf muscles at the inner edge of the bone (medial shin splints). Shin splints are common with runners and even more, so when the runner runs on hard surfaces. Failing to warm up or stretch improper running techniques.

8) **Wound**

Common types of skin wounds in physical activity injuries include abrasion, blisters and lacerations. Wounds of the integumentary system occur frequently in athletics. Wound can occur in many sports and assessment and care of such trauma in an essential skill. The purpose of this is to review of wound that may occur in sport and their acute management. Wound is the commonest painful condition that every sports person being suffers in their life and skin is the largest organ in body.

SPECIFIC SPORTS INJURIES

Many people play sports in some way or another, whether they are playing for fun in their backyard or competitively on a team. Exercising by playing sports can be very beneficial to your health. But sometimes these benefits to your health are outweighed by negative things, such as an injury .The severity of these injuries can range from minor to very serious, with some injuries requiring surgery to fully heal. These injuries may be caused from poor training practices, improper equipment, flawed techniques, or may just be an accident. Injuries can also occur when a person is not properly condition to play the sport, such as not warming up or stretching muscles beforehand.

Specific sports injury related to elbow joint- Elbow joint injuries are common in sports like boxing, martial arts, snowboarding, skateboarding, tennis, ice hockey, handball, volleyball and similar sports. Some of specific sport injuries related to elbow joint are following-

Lateral epicondylitis (Tennis Elbow)[93]

Tennis elbow is a common injury and got its name because tennis players tended to get it. Tennis elbow is inflammation or degeneration of the tendon attaches to the bony bit (lateral epicondyle) on the outside of the arm or elbow. The main tendon involved is that of the extensor carpi radialis brevis muscle. Although the injury is called tendinitis

[93] Sports injuries diagnosis and treatment christer role A &C black 1 st edition page no. 172

(inflammation of the tendon) a more common occurrence is thought to be tendinosis (degeneration).

A common cause in tennis is poor backhand technique or a grip that is too small. A small grip will mean the muscles in the elbow must work harder and become inflamed.

There is tenderness on palpation over the lateral epicondyle and pain, weakness on a resisted waiter test.

Medial epicondylitis (Golfer's Elbow)[94]

Medial epicondylitis is tendinosis of the medial epicondyle on the inside of the elbow. It is in some ways similar to tennis elbow, which affects the outside at the lateral epicondyle. The anterior forearm conditions several muscles that are involved with flexing the digits on the, and flexing and pronating the wrist. The tendons of these muscles come together in a common tendinous sheath, which originates from the medial epicondyle of the humerus at the elbow joint. The condition is called golfer's elbow because in making a golf swing this tendon is stressed.

There is tenderness on palpation over the medial humerus epicondyle and pain and weakness is caused by resisted elbow. The pain is normally caused due to stress on the tendon as a result of the large amount of grip exerted by the digits and torsion of the wrist which is caused by the use and action of the cluster of muscles on the condyle of the ulna.

Cubital tunnel syndrome

There is compression, traction or irritation of the ulnar nerve as it passes through the structures of the medial elbow. The primary complaint is medial elbow pain exacerbated by throwing.

The cubital tunnel proper is formed by the medial epicondyle anteriorly, the elbow joint laterally, and the two heads of the flexor carpi ulnaris medially. There are structures proximal to within, and distal to the tunnel that can cause compression, entrapment, traction, subluxation, or irritation of the ulnar nerve. The final common pathway of cubital tunnel syndrome is the onset of nerve ischemia and fibrosis. The syndrome will initially produce varying degrees of medial elbow pain with occasional radiation to the medial forearm. Paresthesia may occur in the two fingers which have ulnar innervation. Athletes will often present before onset of weakness.

[94] Sports injuries diagnosis and treatment christer role A &C black 1 st edition page no. 171

Posterior elbow pain[95]- The main causes of posterior elbow pain are olecranon bursitis, triceps tendinitis and posterior impingement.

1. **Olecranon bursitis**-Olecranon bursitis may present after a single episode of trauma or more commonly, after repeated trauma, such as falls onto a hard surface affecting the posterior aspect of the elbow. This is commonly seen in basketballers. It is seen in individuals who rest their elbow on a hard surface for long periods of time and is known as 'students elbow' the olecranon bursa is a subcutaneous bursa that may become filled with blood and serous fluid.
2. **Triceps tendonitis**- Posterior elbow pain dyring resisted elbow extension. It is common in throwing sports or hammering. Patients are principally male and are involved in high-intensity throwing or heavy manual labor. The precipitating injury is traction of the tendon at its olecranon insertion site during resisted elbow extension. Tenderness at triceps insertion.
3. **Posterior impingment-**Posterior impingment is probably the most common cause of posterior elbow pain. It occurs in two situations. In the younger athlete there is the 'hyperextension valgus overload syndrome' repetitive hyperextension valgus stress to the elbow results impingement of the posterior medial corner of the olecranon tip on the olecranon fossa, over time this causes osteophyte formation, exacerbating the impingement and leading to a fixed flexion deformity.

   In the older patient the most common cause is early osteoarthritis, which often predominantly affects the radiocapitellar joint. Generalized osteophytes form through the elbow. Impingement of these osteophytes posteriorly results in posterior pain.

   Distal biceps tendon rupture

   There is acute pain in the elbow and sudden weakness in elbow flexion. This is an acute injury, where the tendon usually ruptures close to the distal insertion at the radius during an excessive elbow extension or flexion maneuver. Pain and weakness is provoked by resisting elbow flexion. There is often significant swelling, bruising or haemarthrosis.

   Medial collateral ligament sprain[96]

[95] Clinical sports medicine peter brukner and karim khan 3rd edition page no. 302

Sprain of MCL of the elbow may occur as an acute injury, as the result of chronic excessive valgus stress due to throwing. Those occur particularly in baseball pitchers and javelin throwers. The repeated valgus stress, leads initially to inflammation of the ligament, then scarring and calcification and occasionally ligament rupture.

Rupture of the MCL may occur in a previously damaged ligament or in a normal ligament subjected to extreme valgus stress, for example- elbow dislocation. The degree of instability should be assessed by applying valgus stress to the elbow at 30^0 of flexion.

On examination, there will be localized tenderness over the ligament and mid instability on valgus stress.

Posterior dislocation [97]

Elbow dislocation is the most common dislocation in sports; it is the second most common dislocation after that of the shoulder. The elbow is amazingly stable, relying more on bony anatomy configuration for stability rather than ligaments. Considerable force is necessary to dislocate the elbow.

The most serious acute injury to the elbow is posterior dislocation of the elbow. This can occur either in contact sports or when falling from a height such as while pole vaulting. The major complication of posterior dislocation of the elbow is impairment of the vascular supply to the forearm.

Olecranon fracture[98]

Olecranon fracture is a fracture of the bony portion of the elbow. The injury is fairly common and often occurs following a fall or direct trauma to the elbow. The olecranon is the proximal extremity of the ulna which is articulated with the humerus bone and constitutes a part of the elbow articulation. Its subcutaneous location makes it vulnerable to direct trauma.

Olecranon fracture occurs from a fall onto an outstretched hand or from direct trauma to the elbow.

---

[96] Clinical sports medicine peter brukner and karim khan 3rd edition page no. 300

[97] Clinical sports medicine peter brukner and karim khan 3rd edition page no. 304

[98] Clinical sports medicine peter brukner and karim khan 3rd edition page no. 303

Intense elbow pain after a direct blow or fall is presentation of people with olecranon fractures. Swelling over the bone site is seen and an inability to straighten the elbow is common. Examination brings out a palpable defect indicating a displaced fragment or a comminuted fracture.

Sports injuries related to wrist joint[99]

Scaphoid fracture

There is localized pain and swelling over the medial base of the wrist. Wrist movement and gripping are painful. It is common in ice hockey, rugby, handball and similar sports. These symptoms are caused fracture of the scaphoid bone through trauma caused by a direct fall on to an outstretched hand or direct impact. Athletes will complain of wrist pain, wrist swelling, and wrist stiffness after a fall on the outstretched hand. Tenderness is elicited over the anatomic snuffbox between the tendon of the extensor pollicis longus and brevis or over the tubercle at the scaphotrapezial joint. A through radiographic assessment is essential.

Wrist sprain

The wrist sprain is an injury to the ligaments of the wrist. It usually occurs on the outside, either on the thumb side or the pinky side. It can happen suddenly, when the wrist gets fallen on or smashed, or after several occurrences. When an athlete falls on the wrist, the ligament, tendons, and muscles take the majority of the beating, which causes the ligaments to stretch and tear. This injury can be brought on by brittle, weak ligaments sprain are characterized by pain, tenderness, swelling, redness, warmth, and bruising. There will often be an ache in the wrist and the athlete will have reduced range of motion. The pain is especially concentrated where the wrist bends or rotates.

Lunotriquetral ligament injury

Tears in the lunotriquetral ligament result from a fall on an outstretched hand, with the wrist in extension and radial deviation. The patient will report ulnar-sided wrist pain, weakness and other mechanical complaints. Tenderness is maximal over the lunotriquetral interval.

Scapholunate dissociation

[99] Sports injuries diagnosis and treatment christer role A &C black 1 st edition page no. 152-157

Scapholunate dissociation is due to scapholunate ligament tear and loss of secondary restrains. Rotator subluxation of the scaphoid may occur as a result of disruption of its ligamentous attachments due to acute trauma (e.g. a fall on the dorsiflexed hand). Examination reveals tenderness 2 cm distal to lister's tubercle on the radial side of the lunate. There may be little or no swelling. The key examination maneuver is Watson's test. If the test causes pain or reveals dorsal movement of the scaphoid, scapholunate instability is present.

Ulnar nerve compression

The ulnar nerve may be compressed at the wrist as it passes through Guyon's canal. This injury is most commonly seen in cyclists due to supporting body weight over a long duration ride because of poor bike fit or a failure to use several relaxed handlebar grip position. It also occurs in karate players and a recent study highlighted the risk of hand neurovascular changes in basball players, especially catchers, from repeated trauma associated with catching a ball. Within Guyon's canal, the nerve lies with the ulnar artery between the pisiform bone on the ulnar side and the hamate radially.

Symptoms include pain and paresthesia to the little finger and ulnar side of fourth finger. Weakness usually develops later.

Squeaker's wrist

There is exercise- induced pain, crepitation and swelling 6-8 cm proximal to lister's tubercle the wrist. These symptoms are caused by a peri-tendinous bursitis between the first (abductor polucis longus, extensor pollucis brevis) and second (extensor carpi radialis longus, extensor carpi radialis brevis) extensor compartments. This condition often affects rowers, weightlifters and squash players. Clinical finding fluctuating in squeaker's wrist is bursae and crepition in wrist movements.

De Quervain's tenosynovitis

There is localized, sometimes intense exercise-induced pain and swelling over the radial part of the wrist. This is common in racket sports. These symptoms are cause by compression of the abductor pollucis longus and extensor pollucis bervis by swollen, inflamed or hypertrophied tendon sheaths.

There is tenderness on palpation over the radial part of the wrist and finkelstein's test is positive.

Triangular fibrocartilage complex tear

The triangular fibrocartilage complex lies between the ulna and the carpus. It is the major stabilizer of the distal radioulnar joint. The complex consists of the triangular fibrocartilage, ulnar meniscus homolog, ulnar collateral, numerous carpal ligaments and the extensor carpi ulnaris tendon sheath. The TFCC is a common site of wrist pain. Compressive loads to the wrist, especially if accompanied by ulnar deviation e.g. in diving, golf and racquet sports may tear the central portion of the cartilage.

Symptoms are tenderness and swelling over the ulnar aspect of the wrist, pain on resisted wrist dorsiflexion and ulnar deviation, a clicking sensation on wrist movement and reduced grip strength.

Sports injuries related to interphalangial joint[100]

Mallet finger

Mallet finger is a flexion deformity of the distal interphalangeal joint that is the result of a disruption in the extensor mechanism. The unopposed force of the flexor digitorum profundus moves the terminal phalanx into flexion. Injury is usually the result of forcible flexion of the joint during active extension, usually when catching a ball, hence the injury is commonly called baseball or drop finger. Two forms of mallet finger exist one involving only the tendon and the other involving an avulsed fracture fragment.

Jersey finger

A jersey finger is the result of the avulsion of the flexor digitorum profundus when a flexed distal interphalangeal joint is forced into extension. Injuries can occur when a player grabs another jersey during game, or when lifting a latch on a car door. The ring finger is most commonly affected. Patients are unable to flex the distal interphalangeal joint and have swelling and prominence of the digit.

Fractures of phalanges

Proximal phalanx fracture-Fracture of the proximal phalanx may lead to functional impairment due to the extensor and flexor tendons coming into contact with callus and exposed bone. To control and reduce the fracture under ring block, the metacarpophalangeal joint should be flexed to $70^{0.}$ The proximal interphalngeal joint is

[100] Sports injuries diagnosis and treatment christer role A &C black 1 st edition page no. 160-165

then flexed and longitudinal traction applied in line with the shaft of the fragment to oppose the fracture.

Middle phalanx fracture-Fracture of the middle phalanx involves hard cortical bone. Generally oblique or transverse, these fractures heal slowly. The central slip of the extensor tendon attaches dorsally to the base of the bone and the flexor digitorum inserts on the volar surface more distally.

Distal phalanx fractures-Fracture of the distal phalanx are usually caused by crushing injuries, such as fingers being jammed between a fast –moving ball and a stick or a bat. They are usually non-displaced.

Dislocations of the finger joints

One or more joints may dislocate and the joint capsule ruptures, causing bleeding and other soft tissue injuries. There is intense localized pain deformation (bayonet position, where distal phalanx is retracted over the dislocated joint by flexor tendons) of a meta-carpo-phalangeal, proximal inter –phalangeal joint after direct trauma from a hard ball or a fall on a stretched –out fingers. There is tenderness on palpation and swelling over the deformed joint. Dorsal proximal interphalangeal joint dislocations are the most common hand dislocation. They usually result from a hyper-extension stress with some degree of longitudinal compression such as may occur in ball sports.

Rugby finger

There is localized exercise induced pain and inability to flex the distal interphalangeal or proximal interphalangeal joint of the third finger. These symptoms are caused by rupture of the volar plate with or without avulsion of a bony fragment or the flexor tendon insertion. It occurs when the finger is hyper-extended by force during an attempt to flex.

Skier's thumb

There is pain and swelling over the ulnar aspect of metacarpophalngeal 1st after getting stuck or from a direct impact to the thumb during a fall. These symptoms are caused by rupture of the ulnar collateral ligament at the 1st metacarpophalangeal joint with or without avulsion of a bony fragment.

There is localized tenderness on palpation and inability to stabilize the MCP joint in an ulnar deviation test.

Trigger finger

Trigger finger is caused by a tenosynovitis in the flexor tendon. The tendons that bend the finger glide easily with the help of pulleys. These pulleys hold the tendons close to the bone. This is similar to how a line is held on fishing rod. Trigger finger occurs when the pulley becomes too thick, so the tendon cannot glide easily through it.

Trigger fingers are more common seen in rock climbers. Repeated and strong gripping may lead to the condition.

Trigger finger may start with discomfort felt at the base of the finger or thumb, where the finger joints the palm. This area is often sensitive to pressure. You might feel a lump there. Other symptoms may include pain, popping, catching feeling and limited finger movement.

Sports injuries related knee joint [101]

Knee injuries are very common, particular in contact sports. A majority of the injuries that halt professional careers affect the knee. Before going into detail about these injuries it must emphasis the vital importance of the neuro-muscular control of the kinetic chain. Any weakness in the chain, such as poor ankles or poor core stability, can predispose to knee injuries.

Anterior cruciate ligament injury

The anterior cruciate ligament lies deep within the knee joint, connecting the thigh bone with the shin bone. Its function is to prevent excessive forward movement of the shin in relation to the thigh and also to excessive rotation at the knee joint. The ACL can be injured in several different ways, most notably by landing from a jump onto a bent knee then twisting, or landing on a knee that is a over –extended. In collision sports, direct contact of the knee from opponents can cause damage to the ACL. The typical athlete suffers a hyperextension or valgus rotation sprain. In many cases it is a non- contact injury, where the player loses balance and twists the knee, the ligament can rupture partially or completely. In growing athletes the bone insertion can be avulsed (tibia spine fracture). This injury is often associated with other injuries to cartilage, menisci, capsule

[101] Clinical sports medicine peter brukner and karim khan 3rd edition page no. 460-511

or other ligaments. The symptoms are pain and immediate haemarthrosis, caused by bleeding from the ruptured ligament. This is an injury common in contact sports such as football, rugby and other high intensity sports such as downhill skiing. At the moment of injury the person may experience a snapping sensation deep within the knee. There will be pain, proportional to the force and degree of damage to other structures within the knee joint. In some cases the person may feel able to continue playing, but as soon as the ligament is put under strain during sports activity, the knee joint will become unstable. The reason is that the person is unable to carry on the restraining function of the ACL is absent and there is excessive rotation and forward movement of the shin in relation to the thigh. After a couple of hours the knee joint will become painfully swollen due to what is called a haemartheosis- bleeding within the joint. This swelling provides a protective function by not allowing the person to use their knee.

Posterior cruciate ligament injury (PCL)

It is most commonly found after a motor vehicle accident dashboard injury or sports injury and caused by forced posterior translation of the tibia. Mainly Posterolateral knee injury associated with 60% of posterior cruciate ligament injuries. The PCL is the primary restraint to posterior drawer and secondary restraint to external rotation. Under a posterior tibial load isolated sectioning of the PCL results in an increased posterior translation of the knee under a posterior tibial load. This increase in laxity is relatively small at full extension and most pronounced at 90^0 of flexion. Only small rotator or valgus laxity results from isolated PCL injury.

Sports injuries to the PCL injuries come from an outside force or blow in contrast to the typical deceleration twisting mechanism of an ACL injury. The most common methods of incurring sports related PCL injuries, injury are a direct blow to the anterior tibia or a fall onto the flexed knee with the foot in planter flexion.

Anterior knee pain

Anterior knee pain is the most common presenting symptom in many physiolotherpiest and sports physician. Two common cause of anterior knee pain in sports people are patellofemoral pain and patellar tendinopathy. Other causes of anterior knee pain such as fat pad impingement, which may mimic features of both patellofemoral pain and patellar tedinopathy. Gradual onset of diffuse or localized exercise induces pain

around the anterior part of knee. Prolonged sitting or squatting often trigger the symptoms (positive 'movie sign '- so named because you are in the same position for a long period when watching a movies at the cinema) as can walking down stairs.

This depends on the underlying diagnosis. If there is effusion, the cause is often intra articular; if not, it is more likely to be extra articular. If no structure pathologies can be found the problem can be functional, for example induced by poor core stability, pain referred from the back or poor ankle control. A systematic and thorough approach in the clinical examination is crucial for a successful outcome. Test of core stability, proprioception, muscle strength, balance and flexibility of the entire kinetic chain must be thoroughly evaluated.

Patellofemoral syndrome (runner's knee)

Pain deep to the patella often results from excessive running, especially down hill; hence, this type of pain is often called "runner's knee" the pain results from repetitive mice trauma caused by abnormal tracking of the patella relative to the patellar surface of the femur, a condition known as the patellofemoral syndrome. This syndrome may also result from a direct blow to the patella and from osteoarthritis of the patellofemoral compartment. In some cases, strengthening of the vastus medialis corrects pattellofemoral dysfunction. This muscle tends to prevent lateral dislocation of the patella resulting from the Q- angle because the vastus medialis attaches to and pulls on the medial border of the patella. Hence, weakness of the vastus medialis predisposes the individual to the patellofemoral dysfunction and patellar dislocation.

Patellar tendinitis (jumper's knee)

Athletes involved in sports that require quick accelerations and jumping, for example- running, track, tennis, volleyball, basketball and soccer. Patient with patellar tendinitis typically complain of pain localized to the inferior pole of the patella along the origin of the patellar tendon. Patients can also complain of pain localized to the patellar tendon insertion on the tibial tubercle, although this is less common. During the early stages of the injury, pain typically occurs after activity. As the injury worsens and becomes more chronic, pain can occur during and prior to activity. Periods of more intense pain localized to the tendinous origin can occur during activity as symptoms worsen.

Patient will have tenderness and swelling along the entire tendon indicating peritendinitis and tenosynovitis. Symptoms of pain can usually be reproduced with resisted knee extension and palpation of the tendon. Continuity of the quadriceps and patellar tendons should be evaluated to rule out partial or complete tendon ruptures.

Medial collateral ligament injury (MCL)

The symptoms are immediate haemarthrosis and pain in the medial part of the knee. If only the external portion is ruptured there will be superficial bruising rather than haemarthrosis. This is an injury common in contact sports such as football, rugby and other high intensity sports. The MCL ruptures during an excessive valgus sprain and usually causes the inability to continue sport.

In many cases this is a non- contact injury, where the players loses their balance and twists the knee. The ligament can rupture partially or completely, externally from its origin on the femur to its insertion on the tibia or internally at the insertion into the medial meniscus. This injury is, consequently, frequently associated with other injuries to cartilage, menisci, capsule or other ligaments.

There is haemarthrosis or medial bruising and swelling. If there is an isolated rupture of the insertion to the meniscus, there is a capsule rupture as well and blood can penetrate from the joint and cause a menicocapsular lesion. The valgus stress test is positive if the rupture is complete.

Lateral collateral ligament injury (LCL)

The symptoms are immediate haemarthrosis and pain in the lateral part of the knee. This injury is common in contact sports such as football, rugby and other high-intensity sports. LCL rupture occurs during a varus sprain and cause an inability to continue sport. The forces involved are high; since the lateral knee structures are stronger than the medial, these injuries are rare.

The ligament can rupture either partially or completely. This injury is often associated with injuries to the ACL, PCL, cartilage, menisci, capsule or the posterior lateral corner.

There is haemarthrosis in most cases. If there is a capsule rupture, blood can penetrate from the joint and cause bruising around the lateral part of the knee. The varus stress test is positive if the rupture is complete.

Patella dislocation

The knee gives way (often popping sound) followed by immediate haemarthrosis and pain in the anterior part of the knee, preventing further activity. The medial patella retinaculum ruptures allowing the knee cap to migrate laterally. The knee cap can lock the knee in the flexed position by getting stuck outside the lateral femur condyle. The patella dislocates during valgus hyper- extension sprain or from direct side trauma. The first time this happens the diagnosis is clear unless there is a spontaneous reduction. In many cases it is however a non-contact injury where the player loses their balance and twists the knee. This injury is often associated with other injuries to cartilagr, menisci, capsule or ligament.

There is intra-articular bleeding in most cases. In first dislocation, if there is a retinaculum rupture, blood can penetrate from the joint and cause bruising around the medial anterior part of the knee. There is distinct tenderness on palpation around the patella. Since there are often associated injuries, examination must also include tests for cruciate ligament, menisci and cartilage.

Meniscal tear

Effusion and exercise induced pain often combined with mechanical problems of locking, clicking, clunking or discomfort on impact. This injury is common in sports such as football running and other high- intensity contact sports but is also common, with no major trauma, as degenerative tear in older athletes.

In many cases this injury occurs from direct or indirect trauma or in association with other ligament injuries. It can occur from around 10 years of age and throughout life. There are numerous ways the meniscus can rupture, horizontal, vertical, bucket handle or complex tears. The tear can be localized posterior, centrally or anteriorly, causing different symptoms and signs.

There is effusion in most cases. The compression rotation test is positive. There is often tenderness on palpation of the affected joint line and there are complementary tests for the same purpose, there are often associated injuries, examination must include tests for ligaments, Cartilage and capsular structures.

Sports injuries related to ankle joint[102]

Injuries to the ankle are among the most common lower extremity injuries in sports

[102] Sports injuries diagnosis and treatment christer role A &C black 1 st edition page no. 44-52

Ankle sprain

A sprained ankle is one of the more common injuries caused by participation in sports. It refers to soft tissue damage (mainly ligaments injuries to the ankle are among the most common lower extremity injuries in sports.) around the ankle, usually by an inversion injury (where the ankle is twisted inwards) or an eversion injury (where the ankle is twisted outwards)**.** Because of the position of the bones around the ankle, the inversion injury is far more common. This injury causes damage to the lateral ligaments on the outside of the ankle.

The most commonly injured ligament is the anterior talo fibular (ATF) ligament which, as the name suggests; joint the fibular and talus bones together. If the force to the ankle is more severe, the calocaneo fibular ligament is also damaged. The posterior talo fibular ligament is very rarely damaged in comparison to the other two ligaments.

In the case of an eversion, injury the damage occurs on the medial of the ankle. The ligament on the inside of the ankle is called the deltoid ligament and is very strong. It is so strong in fact that the bone on the inside of the ankle can be pulled off, in what is called an avulsion fracture, before the ligament is damaged.

As well as damage to the ligaments, the capsule which surrounds the ankle joint is also damaged. The damage causes bleeding within the tissues and the ankle begins to swell up and can be extremely painful.

With a first degree sprain there is pain when turning the foot in or out and also pain when the damaged area is touched. With a second degree sprain the pain is more severe, there is swelling all around the area and it is painful to walk. With a third degree sprain the the pain is excruciating and walking is impossible. There is gross swelling and there may be deformity if the ankle is dislocated.

Maisonneuve fracture

Medial ligament injuries or medial malleolar fractures extending through the interosseous membrane and associated with a fracture of the proximal fibula are called Maisonneuve fractures. This type of injury can be difficult to detect. Palpation of the proximal fibula must be done to avoid missing this potentially unstable ankle injury.

Pain consistent with a sprain will be present in the ankle, and may be worsened upon moving the foot. It might feel impossible to put your body weight on the foot. If this is

accompanied by tenderness in the fibula bone, which extends from the ankle to below the knee, then a Maisonneuve's fracture is likely. The area can become inflamed, bruised or reddened, and the ankle will feel substantially unstable.

Peroneal tendinopathy

Peroneal tendinopathy is an injury to the peroneal tendons. These tendons run along the outside of the ankle bone. A tendinopathy is an inflammation or a small tear in the tendons. Tendinopathy often needs some long term attention.

The peroneus longus and brevis muscles dorsiflex and evert the ankle to provide functional lateral ankle stability. An injury often complicates an acute lateral ankle sprain. The patient may attend with an acute injury or a longer history of chronic subluxation. Rupture of the peroneal retinaculum may lead to subluxation of the peroneal tendons.

Extensor tendinitis

Tibialis anterior tendinopathy causes pain over the anterior ankle and midfoot. This pain is exacerbated by dorsiflexion of the foot. It is an overuse injury associated with excessive hill running and may be precipitated by poor footwear. The athlete is tender over the anterior ankle joint and the pain is exacerbated by resisted dorsiflexion. With tendonitis of the extensor hallucis longus, there is pain on resisted dorsiflexion of the first toes. With tendonitis of the extensor digitorum, there is pain on resisted dorsiflexion of the toes.

Tarsal tunnel syndrome

Tarsal tunnel syndrome (TTS), also known as posterior tibial neuralgia, is a compression neuropathy and painful foot condition in which the tibial nerve is compressed as it travels through the tarsal tunnel.

This compression may be a result of trauma, an inversion injury, overuse, excessive pronation, ill-fitting footwear, or chronic flexor tenosynovitis. The patient has medial ankle pain radiating into the arch of the foot, heel and occasionally the toes. The pain is aggravated by prolonged standing, walking and running. Rarely, there is paraesthesia and numbness over the sole of the foot.

Patients with TTS typically complain of numbness in the foot radiating to the big toe and the first 3 toes, pain, burning, electrical sensations, and tingling over the base of the foot and the heel.

Depending on the area of entrapment, other areas can be affected. If the entrapment is high, the entire foot can be affected as varying branches of the tibial nerve can become involved.

Ankle pain is also present in patients who have high level entrapments. Inflammation or swelling can occur within this tunnel for a number of reasons. The flexor retinaculum has a limited ability. To stretch, so increased pressure will eventually cause compression on the nerve within the tunnel. As pressure increases on the nerves, the blood flow decreases. Nerves respond with altered sensations like tingling and numbness. Fluid collects in the foot when standing and walking and this makes the condition worse. As small muscles lose their nerve supply they can create a cramping feeling.

Achillies tendinopathy

A stretch, tear or irritation to the tendon connecting the calf muscle to the back, the heel, Achilles tendon injuries can be so sudden and agonizing that they have been known to bring down charging professional football players in shocking fashion.

The most common cause of Achilles tendon tears is a problem called tendinitis, a degenerative condition caused by aging or overuse. When a tendon is weakened, trauma can cause it to rupture.

Achilles tendon injuries are common in middle- aged “weekend warriors” who may not exercise regularly or take time to stretch properly before an activity. Among professional athletes, most Achilles injuries seem to occur in quick- acceleration, jumping sports like football and basketball, and almost always end the season’s competition for the athlete. It is estimated that Achilles tendinitis accounts for around 11% of all running injuries. The Achilles tendon is the large tendon at the back of the ankle. It connects the the large calf muscles to the heal bone and provides the power in the push off phase of the gait cycle. The Achilles tendon can become inflamed through overuse as well as a number of contributory factors. The Achilles tendon has a poor supply which is why it is slow to heal.

Etiology

- Overuse. Too much use is the basic cause of overuse injuries; however other factors can make an overuse injury more likely.
- Running up hills will mean the Achilles tendon has to stretch more than normal on every stride. This is fine for a while but will mean the tendon will fatigue sooner than normal
- Over pronation or feet which roll in can place an increased strain on the Achilles tendon. As the foot rolls in the lower leg rotates inwards also which twists the Achilles tendon place twisting stresses as well as stresses along its length.

Symptoms-

- Pain and stiffness in the Achilles tendon especially in the morning. This pain may be described as diffuse along the tendon rather than specific.
- There may benodules or limps in the Achilles tendon, particularly 2 cm above the heel.
- Pain in the tendon when walking especially uphill or up stairs.

Anterior impingement ("footballer's ankle")

Repetitive forced dorsiflexion and planterflexion of the ankle produces traction osteophytes at the margin of the joint capsule, and exocytose develop on the anterior tibia and talus. It also occurs in basketball, triple jump, long jump. And dance and may follow from ankle instability. There is pain on running, lunging, or kicking with diffuse anterior ankle joint pain and swelling after activity. The pain is caused by impingement of soft tissues. Examination confirms local tenderness and pain on dorsiflexion. Anterior impingement test is positive (active dorsiflexion with the heel on the ground).

Anterolateral impingement

Anterolateral impingement syndrome of the ankle is caused by entrapment of the hypertrophic soft tissue in the lateral gutter. The impingement process begins when an inversion sprain tears the anterior talofibular, and calcaneofibular ligament. The ligamentous injury is not severe enough to cause chronic instability; however, inadequate immobilization and rehabilitation may lead to chronic inflammation in the ligament, resulting in formation of scar tissue. This tissue then becomes trapped between the talus and the lateral malleolus, causing irritation, pain and further synovitis. The end result is chronic lateral ankle pain.

This injury usually results from an acute ankle sprain or recurrent ankle sprains. The patient complains of chronic pain that may persist between sprains or with pain and catching at the anterior aspect of the lateral malleolus. The pain is usually worse on dorsiflexion. There is synovitis, soft tissue thickening, and scar tissue developing from the injured capsule and anterior talofibular ligament. A menisci soft tissue lesion often develops.

Lateral ligament injuries

Lateral ligament injuries occur in activities requiring rapid changes in direction, especially if these take place on uneven surfaces (e.g. grass fields). They are also seen when a player, having jumped, lands on another competitor's feet. They are one of the most common injuries seen in basketball, volleyball, netball and most football codes.

The usual mechanism of lateral ligament injury is inversion and planterflexion, and this injury usually damages the anterior talofibular ligament before the calcaneofibular ligament. This occurs because the ATFL is taut in planter flexion and the CFL is relatively loose. Also, the ATFL can only tolerate half the strain of the CFL before tearing. Complete tear of the ATFL, CFL and PTFL resulting a dislocation of the ankle joint and is frequently associated with a fracture.

Table- 12 shows the sports injuries related to elbow joint

Sr. No.	Name of Joint	Sports Injury	Sports	Type of Sports Injury	Involved Structure	Line of Treatment
1	Elbow joint	lateral epicondylitis	Tennis players, racquet players	Chronic	Tendon of extensor carpi radialis brevis	• R.I.C.E. • Splint • Physical • Exercise
2		Medial epicondylitis	Golfer's players	Chronic	Tendon of flexor carpi radialis longs	• R.I.C.E. • Physical • Exercise

3		Cubital tunnel syndrome	Weight lifters	Chronic	Ulnar nerve	• Streghthing • Stretching
4		posterior elbow pain ➢ Olecranon bursitis	Basketsballer's	Chronic	Bursa	• Antiinflammatory drugs
		➢ Triceps tendonitis	Weightlifter	Chronic	Tendon of triceps	• Anti-inflammatory drugs
		➢ Posterior impingment	Racket, throwing boxing	Chronic	Osteophytes bone	• R.I.C.E. • Physical exercise
5		Biceps tendon rupture	Cricket, throwing	Acute	Tendon of biceps	• R.I.C.E. • Physical therapy
6		Posterior dislocation	Contact sports collision	Acute	ulna bone	• Conservative treatment • Reduction • Fixed
7		Olecranon fracture	direct trauma contact sports	Acute	Olecranon	• Immobilization • Reductio

						n

❖ **RICE = Rest, Ice, Compression and Elevation**

Table-13 shows sports injuries related to wrist joint

Sr. No	Name of joint	Sports injury	Sports	Type of sports injury	Involved structure	Line of treatment
1	Wrist joint	Scaphoid fracture	Hockey, handball	Acute	Scaphoid bone	• Immobilization • Rehabilitation
2		Wrist sprain	Basket ball, Baseball	Acute	Ligament	• Stretching • Strengthening • R. I. C. E.
3		Lunotriquetral ligament injury	Hockey, football ,basketball	Acute	Lunotriquetral ligament	• Immobilization • R. I. C. E. • Exercise
4		Scapholunate dissociation	Volleyball, Goalkeepers	Acute	Scapholunate Ligament Tear	• Reduction • Repair of Ligament • Internal Fixation
5		Ulnar nerve compression	Cyclists, Karate Players	Chronic	Ulnar Nerve	• Conservative Treatment • Anti-Inflammatory • Splinting

6		Squeaker's wrist	Squash Players, Weight Lifters, Rowers	Chronic	Tendenous Bursitis	• NSAIDs • R.I.C.E. • Exercise
7		De quervain's tenosynovitis	Racket	Chronic	Tendon	• Anti-Inflammatory • Splinting • Stretches • Strengthening
8		Triangular fibrocartilage complex tear	Racquet, Golf Players	Acute	Ligaments	• NSAIDs • Immobilization • Casting

Table-14 shows sports injury related to interphalanges joint

Sr. No.	**Name of joint**	**Sports injury**	**Sports**	**Type of sports injury**	**Involved structure**	**Line of treatment**
1	Interphalanges joint	Mallet finger	Cricket, base ball	Acute	Tendon	• Mallet bandage • Exercise
2		Jersey finger	Football	Acute	Tendon of flexor digitorum profundus	• Repair of tendon • Rehabilitation
3		Fracture of phalanges	Ball playing,	Acute	Bone fracture	• Reduction • Fixation

4		Dislocation of finger joints	Football, basketball	Acute	Ligament, bone	• Reduction • Reposition
5		Rugby finger	Rugby player	Acute	Volar plate	• Splinting • NSAID's • Physical therapy
6		Skier's thumb	Scottish,	Acute	Ligament	• Splint • Immobilization
7		Trigger finger	Rock Climber's	chronic	Tenosynovitis	• Anti-inflammatory drugs • Night splints

Table-15 shows the sports injury related to knee joint

Sr. No.	**Name of Joint**	**Sports Injuries**	**Sports**	**Type of Injury**	**Involved Structure**	**Line of Treatment**
1	Knee joint	Anterior cruciate ligament injury	Football, basketball, netball	Acute	Ligament	• Bracing • Physical therapy • Rebuilding the ligament
2		Posterior cruciate ligament injury	Football players	Acute	Ligament	• R.I.C.E. • Immobilization • Physical therapy • Rebuilding

						ligament
3		Anterior knee pain	Runner's, jumpers, soccer players	Acute	Cartilage, tendons, patella	• NSAIDs • Strengthen and stretch • Exercises
4		Patellofemoral syndrome	Runners, cyclists, basketball players	Chronic	Patella bone Muscles	• NSAID's • R.I.C.E. • Exercise
5		Patellar tendinitis	Jumping sports (volleyball, high, long jumps)	chronic	Tendon	• R.I.C.E. • Exercise • NSAID's
6		Medial collateral ligament injury	Football , rugby	Acute & chronic	Ligament	• R.I.C.E. • Rehabilitation • NSAID's
7		Lateral collateral ligament injury	Football, rugby	Acute &chronic	Ligament	• R.I.C.E. • Rehabilitation • NSAID's
8		Patella dislocation	Soccer, gymnastics, ice hockey	Acute	Bone	• Rehabilitation • Physical therapy • NSAID's
9		Meniscal tear	Running, squatting	Acute	Cartilage	• Conservative treatment

						• Rehabilitation

Table-16 sports injuries related to ankle joint

Sr. No.	Name of Joint	Sports Injury	Sports	Type of Sports Injury	Involved Structure	Line of Treatment
1	Ankle joint	Ankle sprain	Soccer, football, Basketball	Acute	Ligament , Tendon	• R. I. C. E. • NSAIDs • Exercise
2		Maisoneuve fracture	Cycling ,dancing, gymnastics	Acute	Medial ligament, interosseous membrane, fibular bone	• Rehabilitation • Stretching • Exercise
3		Peroneal tendinopathy	Running ,dancing, basketball	Chronic	Tendon	• R. I. C. E. • NSAIDs • Stretching • Exercise
4		Extensor tendinitis	Running	Chronic	Tendon	• R. I. C. E. • NSAIDs
5		Tarsal tunnel syndrome	Running, jumping	chronic	Posterior tibial nerve	• R. I. C .E. • NSAIDs • Stretching Exercise • Strengthening

6		Achillies tendinopathy	Running, rock climbers, jumping	Chronic	Tendon	• R. I. C.E. • NSAIDs • Rehabilitation
7		Anterior impingement	Football	Chronic	Synovitis	• NSAIDs • Exercise
8		Anterolateral impingement	basketball	Acute	Ligament, soft tissue	• NSAIDs • Exercise • Ankle Brace
9		Lateral ligaments injuries	Basket ball, football, volleyball	Acute	Ligament	• R.I.C.E. • NSAIDs • Exercise

AYURVEDIC MANAGEMENT OF SPORTS INJURIES

Ayurveda is an intricate system of healing for treating chronic or acute ailments. The specialty is with the maintenance of physical, mental and social health of an individual and society as a whole. There is a lot of knowledge available regarding different treatment modalities for injuries, such as uses of drugs and dietetics as well as practices of rehabilitation. The fitness of the sportsman is not merely his healthy condition but it is a state of physical and mental endurance to extreme stress. Even though the injuries of any other kind do not distinctly vary from those of sports, the etiology and line of treatment may have to be considered with different view. Apart from the injuries, extreme fatigue, Stress and allied problems also have taken place in the field of sports medicine.

As the sports buzz has risen in these days, at the same proportion propensity for sports injuries are inclining especially in the areas of joints like elbow, wrist, knee etc. particularly with outdoor games. Though the sports are professionalized and commercialized, the amateur sports are even now the main stay in India. Sports medicine, as a separate medical specialty has a fairly recent origin and it is quite pertinent to ask how a medical system, that is more than five thousand years old, can make any contribution in a field like sports medicine which, by stretch of imagination, is not more than a few decades old.

In traditional medical system we definitely do not find direct references regarding a specially called sports medicine nor do we have readymade management plans for sports related ailments. It requires a lot of close observation and correct perception of this field. Hence a blind critique can easily shut the doors on any exploration on the topic concluding that "*Ayurveda* has nothing to do with sports medicine" but when we observe with the open mind of a curious scientist, we find enormous possibilities. It makes us appreciate a very significant contribution that *Ayurveda* can make to improve the effectiveness of sports medicine as a whole. This attempt aims at exploring the scope of *Ayurveda* in making very significant contribution to the field of modern sports injuries and thereby, could revolutionize and contributes a great deal to the *Ayurvedic* sports medicine.

UNDERSTANDING SPORTS MEDICINE AND SPORTS INJURIES

Sports medicine is a branch of medicine which can be defined precisely as medicines developed in response to the sportsmen needs and increasing their physical performance and prevents sports injuries. Sports medicine has two goals to achieve. Primarily physical and mental fitness of the sportsman and second goal is treating the sporting injuries of the sportsman. *Ayurvedic* treatment procedures like *Panchakarma* (purification & rejuventory system), yoga (meditation) *Rasayana (*Rejuvenation) and herbal compounds can do wonderful impacts in sports medicine. Sports medicine is the application of various medical principles to the sports activities, physical exercise and performance endeavors. It is related to the physiological as well as patho-physiological aspects of sports and athletics injuries. It is not only prevention and treatment of injuries, but it is a scientific investigation of training methods and practices in sports also.

AIMS OF*AYURVEDIC* SPORTS MEDICINE

- ***Prakritisthaapana* (conditioning of sports person):** to regain physical fitness of a sports person and send him back to the field as early as possible.
- **To evaluate the effect** of various principles of *Ayurvedic* management in different sports injuries.

OBJECTIVES OF *AYURVEDIC* SPORTS MEDICINE

- Prevention of injuries and illness related with sports and other activities.

- Early treatment of sports related injuries and illness.
- Improvement of physical fitness and performance of sportsperson.
- Design of treatment, exercise and nutrition programs for maintaining peak physical performance.
- Treatment of acute and chronic injuries.
- Rehabilitation of sports injuries with *Panchakarma* treatment and exercises.
- Conditioning by complementary therapy of *Ayurveda*, physiotherapy and yoga
- Better and quick result for post operative and traumatic complication.
- Early recovery and back to sports.
- Special treatment to promote strength and tone of the muscles.
- *Ayurvedic* herbal combination for better performance.
- Yoga and *Ayurveda* make sports person physically and mentally fit to complete internal level.

ROLE OF *AYURVEDA IN* SPORTS MEDICINE

Panchakarma therapies and internal medications are highly beneficial and useful for sports person. There are different types of treatment for different activities, e.g. for endurance athlete, treatment and medicine will be different from a power training sports. This kind of scientific approach has to be adopted in sports, from the traditional medicine. *Vaidya* of *Kalari Gurukul* organization engaged in treating sports injuries by using conventional *Marma Chikitsa* (special treatment for injuries, contusion, sprain, dislocation and fractures).

HOW TO MAINTAIN THE FITNESS AND PREVENTION FROM SPORTS INJURY

Current sports medicines contain Supplementation with a multi-vitamin or anti-oxidant which appears to be safe; however large doses may result in serious toxicities. *Ayurveda* describes various rejuvenative therapies with the help of special class of medicinal preparations called *Rasayana* that are believed to rebuild the body and mind, prevent degeneration and postpone aging or rather reverse the aging process. Determining the frequency, intensity and duration of exercise is important. Running is most commonly associated activity; however other aerobic activities (e.g. swimming) and team sports (e.g.

basketball) also have the potential for exercise addiction. *Ayurveda* has special directions regarding exercise which are mentioned under the daily regimen (*Dinacharya*) to keep fit and healthy.

The aim of a sportsperson is to maintain 'positive health to achieve their goal in winning the game'. Hence sportspersons need to resort to a specific type of diet, exercise etc., without which achieving the goal will be impossible. *Ayurveda* maintains the health of the sportsperson by following the norms of daily regimen, seasonal Regimen *(Dincharya, Ritu-Charya*) and good behavior (*sadvritta*). *Ayurveda* also cures the sports injuries through its unique measures, thereby serving both prevention and cure.

CLINICAL CONDITIONS IN *AYURVEDA* RELATED SPORTS INJURY AND THEIR MANAGEMENT

Concepts of sports injuries and their management can be spotted in *Ayurvedic Samhitas* like- *Bhagna* (fracture & dislocations), *Vrana* (wound), *Vranashopha* (inflammatory conditions), *Sadhyovrana* (acute wounds), *Snayugatavata* (tendon &ligament injury) descriptions of *Vata Vyadhi* (chronic & painful conditions) related to musculoskeletal and neuro- motor system.

Treatment protocols in Ayurvedic sports medicine

There are five main aim of Ayurvedic sports medicine as-

i. Management of injuries
ii. Rehabilitation of injuries
iii. Active mobilization
iv. Passive mobilization
v. Strengthening

- The foremost aims of Internal Medication are

i. To boost up tissue healing
ii. To alleviate pain
iii. In order to strengthen the injured part

- The foremost aims of External Therapies are

i. To alleviate pain
ii. ii. Strengthens joints

iii. iii. To improve function

- The foremost aims of *Lepa / Aalepa / Upanaha* is

i. To alleviate pain

ii. ii. To promote tissue healing

A. MANAGEMENT OF *SHOPHA*

In *Ayurveda* the process of inflammation is known as *Shopha*. The basic line of treatment for the *Shopha* is of *Sanshaman (Vatashamak* and *Vedanashamak* drugs*)* by using local application of medicines and *Shodhan Chikitsa*.

Alepa

Poulticing is the first line of treatment for *Shopha*. It is common for all kinds of swelling which contain kalka (paste) of various *Vatashamaka, Vedanashamaka* drugs that applied on the site of swelling. *Acharya Sushrut* says the *Apatarpana* is the first, general and principal remedy in all types of *Shopha* (swelling).[103] Blow *Shloka* clearly explains the indication of *Lepa*. It should be applied in acute swelling and in painful conditions. So in the acute management of *Shopha, Lepa* is the best option[104].

Bandha

Bandha means bandaging due to which wound healing, and stability of the bony joints is obtained[105]. In Abhigataj *Shopha*, symptoms start with pain and then bring about the vitiation of *Doshas*. Such swellings are cured when treated with such therapies as bandages including talisman, incantations, administration of medicines, and application of ointments, fomentation and cold sponging.[106] Anti inflammatory drugs has been mentioned in Ayurveda like *Shothahara Gana*, *Varana Shothhar Gana*, *Vishgna Dravyas*

---

[103] अपतर्पणमाद्य उपक्रमः; एष सर्वशोफानां सामान्यः प्रधानतमश्च | (सु.चि.1/11)

[104] शोफेषूत्थितमात्रेषु व्रणेषूग्ररुजेषु च | यथास्वैरौषधैर्लेपं प्रत्येकश्येन कारयेत् || (सु.चि.1/14)

[105] आलेप आद्य उपक्रमः एष सर्वशोफानां सामान्यः प्रधानतमश्च, तं च प्रतिरोगं वक्ष्यामः- ततो बन्धः प्रधानं,तेन शुद्धिर्व्रणरोपणमस्थिसन्धिस्थैर्यं च |(सु.सू.18/3)

[106].....बन्धमन्त्रागदप्रलेपप्रतापनिर्वापणादिभिश्चोपक्रमैरुपक्रम्यमाणाः प्रशान्तिमापद्यन्ते|| (च.सू. 18/5)

(for allergic inflammatory conditions) etc. *Patla*, *Agnimantha*, *Syonaka*, *Bilva*, *Kasmarya*, *Kantakarika*, *Brahati*, *Salaparni*, *and Prisniparni* these ten drugs consist of anti inflammatory contents which control inflammation[107].

Treatment of *Vranashopha*-

In ayurveda there are seven successive treatments for swelling leading to an wound[108] as follows-

1. *Vimlapana* (softening by kneading with fingers)
2. *Avasechana* (bloodletting)
3. *Upanaha* (warm poultices)
4. *Patana* (incising)
5. *Shodhana* (cleaning)
6. *Ropana* (healing)
7. *Vaikritapaha* (moving/warding off the abnormalities)

B. ***SHOOLA* (Pain due to External Injuries)**

Snehana is preferred as a highly effective form of therapy for all sports of aliments. Massage helps reduce pain because it pacifies *Vata*, allay joint and muscle stiffness, increases circulation mobilizes toxins and relaxes the body. Based on *Astanga Hridaya* for the *Vata, Pitta* and *Kapha Dosha* of the body, *Basti* (enema), *Virechana* (purgation) and *Vamana* (emesis) are the best therapies respectively. *Acharay Charak* has described *Shoola Prashamana* and *Vedana Sthapana Mahakashaya*. *Pippli*, root of

[107] पाटलाग्निमन्थश्योनाकबिल्वकाश्मर्यकण्टकारिकाबृहतीशालपर्णीपृश्निपर्णीगोक्षुरका इति दशेमानि श्वयथुहराणि भवन्ति (च.सू. 4/16)

[108] आदौ विम्लापनं कुर्याद्द्वितीयमवसेचनम् । तृतीयमुपनाहं तु चतुर्थी पाटनक्रियाम् ॥
पञ्चमं शोधनं कुर्यात् षष्ठं रोपणमिष्यते । एते क्रमा व्रणस्योक्ताः सप्तमं वैकृतापहम् ॥ (सु.सू. 17/22-23)

Pippali, *Chavya*, *Chitraka*, *Srigavera*, *Marica*, *Ajamoda*, *Ajaganda*, *Ajaji* and *Gandira* are drugs for alleviating pain.[109]

Saala, *Katphala*, *Kadama*, *Padmaka*, *Tumba*, *Mocharasa*, *Sirisha*, *Vanjula*, *Elavaluka* and *Ashoka* these ten drugs are sedatives and help in pain symptom[110]. Internal as well as external herbal drugs are also administered in pain. The drugs like *Yavani*, *Ajmoda*, *Chandrashoor*, *Dhtura*,*Rasna*, *Kadamba*, *Vetus*, *Jalavatus*, *Suchi*, *Parsikyavani*, *Guggulu*, *eranda*, *Tagar, Rashon*, *Devdaru*, *Medask*, *Muchkunda* etc. are *Shoolhara* in nature.

***Lepa*:**

The literally meaning of Lepa is application of paste of herbs on the affected area and leaves it to dry. It is usually applied in cases of swelling, injury, sprain etc.

Panchkarma* in *Shoola

Pain can be described as any physical suffering or discomfort caused by illness or injury. Frequent uses of pain killer lower the resistance power. Ayurveda explains the origin of pain is due to vitiated *Vata Dosha*, once *Vata Dosha* is treated efficiently the pain subsides automatically. In *Ayurveda* there are various panchakarma procedures explained for the Management of pain due to vitiation of vata in sports injuries as follows-

1. ***Snehana* and *Swedana*** *:*

The procedure includes application of medicated oil which is selected according to type of pain followed by sudation therapy (steam, dry heat, *PatraPottali*, *Pinda Sweda*, etc.) Usually done in cases of sprain, back ache, muscular injury as in sports injury. Lumbar pain can as well managed by various types of *Basti* therapy. *Kati Basti, Janu Basti, Manya Basti* are region related procedures performed at respective site to manage pain and at the same time strengthen them, For increased performance. *Abhyantara*

[109] पिप्पलीपिप्पलीमूलचव्यचित्रकशृङ्गवेरमरिचाजमोदाजगन्धाजाजीगण्डीराणीति दशेमानि शूलप्रशमनानि भवन्ति (च. सू. 4/17)

[110]शालकट्फलकदम्बपद्मकतुम्बमोचरसशिरीषवञ्जुलैलवालुकाशोका इति दशेमानि वेदनास्थापनानि भवन्ति (च. सू. 4/18)

Snehana (Internal oleation) is the best therapy to control *Vata Dosha*; 2-3 tsp of ghee everyday will serve the purpose.

2. ***Agnikarma*:**

Agnikarma is basically performed in two ways like direct heat and indirect heat. Most commonly we used indirect *Agnikarma* in which a small rod of Gold with a blunt end, specially designed for this purpose is placed on the affected area and the heat is transferred through the other end by a candle, till the patient can bear the heat. It works effectively and gives immediate relief. Usually done in conditions like joint pain, pain due to cervical or lumbar spondylosis, sciatica, the procedure is done along the path of the nerve, frozen shoulder. The other way (direct heat) is useful in pain at heels which is done by *Mruttika Shalaka* (earthen rod),

3. **Bloodletting:**

Bloodletting again is performed in various ways the common methods used in practice are as follows-

a) ***Jalaukavcharan* (Leech therapy)**

Leech only sucks the impure blood from the body. In conditions like painful cracked heels or soles and palms due to excessive dryness, swelling in various tissues or joints, pain due to contused wound where blood capillaries get ruptured and the blood gets accumulated under the skin resulting in pain. Leeches are usually used where the cause of pain lies in blood tissue. The moment the impure blood is sucked out the pain disappears.

b) **Bloodletting by syringe** or scalp vein

In this method blood is removed by puncturing the vein in patients where blood pressure constantly remains high without any definite symptoms bloodletting plays an efficient role in local pain, redness, swelling etc.

c) ***Viddha Karma***

This is a miniature of bloodletting; a very small puncture is done with the help of an insulin needle. During this process the knowledge of vital points and symptom related points is essential.

C. ***Vrana (*wound)**

The healing process of *Vrana* is a natural process which starts immediate after injury. *Sushruta* has described the sixty mainfold measures (*Shastivranopkarma*) for a *Vrana* management from its manifestation to the normal rehabilitation of hairs in the scar tissue. He has divided the wound treatment as *Aushadi Chikitsa* and *Shastra Chikitsa.*

There are six kinds of swellings (*Shopha*), and the following eleven measures commencing with *Apatarpana* and ending in *Virechana*, should be regarded as their cure. These are the proper remedies for a swelling and do not prove hostile to cases of swelling which are transformed into wound.[111]

Treatment of *Sadhyovrana* (acute wound)

Immediate general treatment is to pacifying the heat released at the site of injury due to *Pitta* aggravation by special cooling measures. Portions of *Sneha* (oily or fatty liquids) and using the same as a washing should be advised in such cases. Preparations of *Veshavaras* and other *Krisharas* largely mixed with oil or clarified butter should be used as poultices and fomentations with the *Masha* pulse, etc. and the use of oily unguents and emulsive *Basti* (enematas) prepared with decoctions of *Vatashamaka* drugs should be applied for first four *Sadhyovrana*.[112]Cold washes and cooling plasters should be used in these cases for the alleviation of the burning and suppuration as well as for the cooling of the heat for *Pichcita* and *Ghrista.*

Vrana Bandhana

[111] षड्विधः प्रागुपदिष्टः शोफः, तस्यैकादशोपक्रमा भवन्त्यपतर्पणादयो विरेचनान्ताः; ते च विशेषेण शोथप्रतीकारे वर्तन्ते, व्रणभावमापन्नस्य च न विरुध्यन्ते; शेषास्तु प्रायेण व्रणप्रतीकारहेतव एव || (सु.चि. 1/10)

[112] स्नेहपानं हितं तत्र तत्सेको विहितस्तथा | वेशवारैः सकृशरैः सुस्निग्धैश्चोपनाहनम् ||
धान्यस्वेदांश्च कुर्वीत स्निग्धान्यालेपनानि च |वातघ्नौषधसिद्धैश्च स्नेहैर्बस्तिर्विधीयते || (सु.चि. 2/24-25)

Badhan plays an important role to keep the *Vrana* clean and facilitates to fasten the healing process. *Bandhana* is preventive measure to protect the *Vrana* from the secondary contamination of dust, *Krimi* etc. and give support to *Asthi*, *Asthi- Bhanga*, *and Sandhi- Mukta* and keep *Vrana* as *Mradu* (soft), promotes circulation and helps to avoid the displacement of *Shodhana* and *Ropana- Dravya* and keep the wound surface dry. *Vrana Bandhana* protects the *Vrana* while walking on uneven places, standing, sitting, and sleeping and during journey by vehicles. In case of a lateral and wide-mouthed wound on the extremities, the bone-joints should be duly set and joined together as instructed before and the wound should be sutured and speedily bandaged in the manner of a *Vellitaka* bandage (spiral bandage), or with a piece of skin tied in the *Gophana* (slig bandage) or such other form as would seem proper and beneficial and oil should be poured over it. [113]

Raktamokshana

Bloodletting should be resorted to in a case of newly formed swelling for its resolution and for alleviating the pain. Bleeding is recommended in the case of a wound which is indurate, marked by a considerable swelling and inflammation and is reddish black or red coloured, extremely painful, gagged in its shape and considerably extended at its base (congested).[114]Healing of *Vrana* has been an important problem since ancient time. Our *Acharayas* have given beautiful description about *Vrana* and *Varnaropana*. For good healing drug must have two properties i.e.

- *Vrana Shodhana* for cleaning of wound
- *Vrana Ropana* for healing of wound

***Vrana Shodhana* for cleaning of wound**

[113] शाखासु पतितांस्तिर्यक् प्रहारान् विवृतान् भृशम् | सीव्येत् सम्यङ्निवेश्याशु सन्ध्यस्थीन्यनुपूर्वशः ||
बद्ध्वा वेल्लितकेनाशु ततस्तैलेन सेचयेत् | चर्मणा गोफणाबन्धः कार्यो यो वा हितो भवेत् ||(सु.चि.2/ 34-35)

[114] वेदनोपशमार्थाय तथा पाकशमाय च । अचिरोत्पतिते शोफे कुर्याच्छोणितमोक्षणम् ॥
सशोफे कठिने ध्यामे सरक्ते वेदनावति । संरब्धे विषमे चापि व्रणे विस्रावणं हितम्॥ (सु.चि. 1/27-28)

The decoction of *Haritaki*, *vibhitaka*, *Amalaki*, *Khadira*, *Daru-Haridra*, drugs belonging to *Nyagrodhadi* group, *Bala*, *Kusha* and tender leaves of *Nimba* and *Kola* helps in the cleaning of wound.[115]Decoctions of *Sankhini*, *Ankoth*, *Suman*, *Karavira*, *Suvarchala* and drugs of *Aragvadhadi* group, are for cleaning of wound.[116]The wise physician should do fumigation of the wound by using *Srivestaka*, *Sarjarasa*, *Sarala*, *Devdaru* and piths (of trees like *Sala*, *Sara* etc.) for cleaning the wound.[117]

***Vrana Ropana* for healing of wound**

Acharya Charak has described *Madhuka*, *Madhuparni*, *Prisniparni*, *Ambasthaki*, *Samanga*, *Mocarasa*, *Dhataki*, *Lodhra*, *Priyangu*, and *Katphala* these ten drugs are healers of wounds[118]. Decoction, hot infusion or cold infusion prepared from barks of trees which are not in potency, is the best for healing. Paste of *Samanga*, *Soma*, *Sarala*, *Somavalka*, *Candana* and drugs of *Kakolyadigana* is best for healing the wounds.[5] *Raskriya* prepared from barks of drugs of *Nayagrodhadi Gana* and *Triphala* can also used for wound *Healing*[119]. *ArkadiGana*, mitigates *Kapha*, *Medas* and poison, alleviates worm, leprosy and heals wounds especially.[120] *Kashaya*, *Varti*, *Kalka*, *Gharta*, *Taila*, *Rasa-Kriya* and *Avacurnana* are the measures for the cleaning (*Sodhana*) of a wound and for helping its granulation (*Ropana*). The eight acts (from *Chedana* to *Sivana*) are surgical operations. *Sonitasthapana*, *Ksara- Karma*, *Agni-Karma*, *Yantra*, *Ahara*, *Raksa-Vishodhana*, *Bandhana*, *Snehana*, *Vamana*, *Virechana* and *Basti* are very cost-effective in management of *Vrana*.[121] A cut wound should be treated with its own specific measure and Remedies,

---

[115]त्रिफला खदिरो दार्वी न्यग्रोधादिर्बला कुशः| निम्बकोलकपत्राणि कषायाः शोधना मताः|| (च.चि.25/84)

[116]शाङ्खिन्यङ्कोठसुमनःकरवीरसुवर्चलाः । शोधनानि कषायाणि वर्गश्चारग्वधादिकः ॥ (सु.सू. 36/12)

[117]श्रीवेष्टके सर्जरसे सरले देवदारुणि । सारेष्वपि च कुर्वीत मतिमान् व्रणधूपनम् ॥ (सु.सू. 36/22)

[118]मधुकमधुपर्णीपृश्निपर्ण्यम्बष्ठकीसमङ्गामोचरसधातकीलोध्रप्रियङ्गुकट्फलानीति दशेमानि सन्धानीयानि भवन्ति (च.सू.4/9)

5सोमामृताश्वगन्धासु काकोल्यादौ गणे तथा ।क्षीरिप्ररोहेष्वपि च वर्तयो रोपणाः स्मृताः॥ (सु.सू. 36/24)

[119] त्वक्षु न्यग्रोधवर्गस्य त्रिफलायास्तथैव च ।रसक्रियां रोपणार्थे विदधीत यथाक्रमम् ॥| (सु.सू. 36/30)

[120] अर्कादिको गणो ह्येष कफमेदोविषापहः । कृमिकुष्ठप्रशमनो विशेषाद्व्रणशोधनः॥ (सु.सू. 38/17)

[121] तेषु कषायो वर्तिः कल्कः सर्पिस्तैलं रसक्रियाऽवचूर्णनमिति शोधनरोपणानि, तेष्वष्टौ शस्त्रकृत्याः, शोणितास्थापनं

while a bruised one should be treated as a case of *Bhagna*. The first line of treatment of a mangled or contused wound (*Ghrsta*) is to extinguish pain, after which it should be dusted with the power of proper medicinal drugs (such as *Sala*, *Sarj*, *Arjuna*, etc.) [122] Application of the paste of *Manasila*, *Ela*, *Manjistha*, *Laksha*, *Haridra*, and *Daru Haridra* along with ghee and honey helps in the promotion of healthy skin over the wound[123].

Pathya –Apathya

Mithyahara-Vihara play an important role in the transformation of a *Shudha-Vrana* into *Dusta- Vrana*, *Virudha- Ahara*, *Asatmaya-Ahara*, *Atibhuktha*, *Shoka*, *Krodha*, diva-*Swapana*, sexual indulgence and other exercise etc. are the causes of *Dusta- Varana* by the vitiation of *Dosha.*

D. **MANAGEMENT OF *BHAGNA***

Ayurvedic treatment for bone fracture and dislocation in its external and internal use for herbal medicines in various forms, which shows great results in reducing pain, healing wounds, and joining bones. *Acharya Sushruta* has described that depressed fracture hanging down should be set by raising it up, while an elevated and fractured joint should be reduced by pressing it down, by pulling it in its upward position in the event of its being lowered down. An intelligent physician should set all dislocated joints, whether fixed or movable, by the mode of reduction, known as *Achana*, *Pidana*, *Sanksepa* and *Bandhana* (bandaging)[124]. A crushed or dislocated joint should not be shaken and cold lotions or washes and medicated plasters (*Pradeha*) should be applied to the part. The

---

क्षारोऽग्निर्यन्त्रमाहारोरक्षाविधानंबन्धविधानंचोक्तानि,स्नेहस्वेदनवमनविरेचनबस्त्युत्तरबस्तिशिरोविरेचननस्यधूमक वलधार णान्यन्यत्र वक्ष्यामः ॥ (सु.चि.1/9)

[122] क्षते क्षतविधिः कार्यः पिच्चिते भग्नवद्विधिः । घृष्टे रुजो निगृह्याशु चूर्णैरुपचरेद्व्रणम्॥ (सु. चि. 2/76)

[123] मनःशिलैला मञ्जिष्ठा लाक्षा च रजनीद्वयम्| प्रलेपः सघृतक्षौद्रस्त्वग्विशुद्धिकरः परः |(च.चि 25/114)

[124] अवनामितमुन्नह्येदुन्नतं चावपीडयेत् | आञ्छेदतिक्षिप्तमधो गतं चोपरि वर्तयेत् ॥
आञ्छनैः पीडनैश्चैव सङ्क्षेपैर्बन्धनैस्तथा | सन्धीञ्छरीरे सर्वांस्तु चलानप्यचलानपि |
एतैस्तु स्थापनोपायैः स्थापयेन्मतिमान् भिषक् ॥ (सु.चि.3/17-19)

fractured or dislocated part should be first covered with a piece of linen soaked in clarified butter. Splint should then be placed over it and the part properly bandaged.[125]

The ancient *Ayurvedic* texts have described *Asthibhagna Chikitsa'* thoroughly. This includes.

(1) Principals of *Bhagna Chikitsa*.

(2) General management of *Bhagna*.

(3) Specific management for *Kora Sandhi Bhagna*.

(4) *Pathya- Apathya*

(5) Clinical criteria of fracture healing

(1) **Principals of Bhagna *Chikitsa*.**

1) *BhagnaSthapana* (reduction)

2) *KushaBandhana* (retention)

3) *Karmavarthana*(rehabilitation)

I. *BhagnaSthapana* (reduction)

BhagnaSthapana is not required in all the *Bhagna*. In case of incomplete fractures or when the fracture is of stable variety, reduction is not required. On the other hand it is very essential in fractures where the fracture fragment is unstable, like supracondylar fracture of humerus, femur etc. aim of *Bhagnasthapana* is to approximate the fracture ends and to achieve proper alignment. These are two main techniques mentioned in *ShushrutaSamhita* for closed manipulation namely *Anchana* and *Peedana*.

***Anchana* (Traction)**

[125] उत्पिष्टमथ विश्लिष्टं सन्धिं वैद्यो न घट्टयेत् । तस्य शीतान् परीषेकान् प्रदेहांश्चावचारयेत् ||

अभिघाते हृते सन्धिः स्वां याति प्रकृतिं पुनः । घृतदिग्धेन पट्टेन वेष्टयित्वा यथाविधि ||

पट्टोपरि कुशान् दत्वा यथावद्बन्धमाचरेत्॥ (सु.चि.3/20-21)

It is a technique in which the wide gap between the fragments may be corrected. Anteriorly, medially, laterally or posteriorly displaced fragments can be brought in alignment by the application of traction.

***Peedana* (pressure)**

It is another technique where in fractured fragments are approximated through gentle and controlled pressure. The *Vinamana* and *Unnamana* techniques can be incorporated within *Peedana* only. In case *Vinamana* (depressed) fracture; the fragment should be carefully lifted up. In case of *Unnamana* (elevated) the raised fragment should be pressed down.

II. *Kusha Bandhana* (retention)

Kushabandhana is a technique that ancient Indian surgeons practiced for fracture immobilization. In this technique they have applied the barks certain plants like bamboo, banyan, and *Pipal* which were referenced regarding external applications of pastes of bamboo pith, latex of banyan, and *Pipal* like trees. This procedure was practiced based on the season, time constitution, and strength, of an individual. While manipulating the broken bones, *Unnamana* (elevation of depressed fragment) and *Vinamana* (depression of elevated fragment) were followed by traction and retention. The tree barks he has recommended are *Ashwatha*, *Vamsha*, *Kakubha*, *Madhuka*, *Palasha*, *Sala*, *Udumbara*, *Vata* trees should be used as splints (*Kusha*).[126]

III. *Karmavarthana* (rehabilitation)

The importance of physiotherapy in a limb injury was also appreciated by *Sushruta*. After proper union it is desirable that that the joints or the fracture parts must regain normal functions and shape. For his *Sushruta* has given importance to rehabilitation. Various devices including exercise were being suggested by the *Acharyas*. In the fracture of carpal, metacarpal and phalangeal joints, initially the use of mud ball and at a later period the use of salt and the pieces of stone have been suggested.[127] This also suggests that an injured part should not be put into action immediately, but gradually the movements may

[126] मधूकोदुम्बराश्वत्थपलाशककुभत्वचः | वंशसर्जवटानां च कुशार्थमुपसंहरेत् || (सु.चि.3/6)

[127] मृत्पिण्डं धारयेत् पूर्वं लवणं च ततः परम् | हस्ते जातबले चापि कुर्यात् पाषाणधारणम् || (सु.चि.3/35)

be restored. After immobilization gentle massage with specific oils gradually restores the movements in the part and enhances circulation.

(2) General treatment of *Bhagna*

In case of fracture associated with the wound or a compound fracture locally a mixture of "*Nyagrodhadi GanaDravyas*" in paste form, *Madhu* and *Ghee* should be applied.[128]

Parishechana

In this procedure a cold decoction of the drugs of the *Nyagroghadi* group should be used in washing (the affected part), whereas in the presence of (excessive) pain, (the part) should be washed with milk boiled with the drugs of the *Pancha-Mula*, or simply with the oil known as the *chakra- taila* made lukewarm[129]. By using *Pariseka* the body removes the sense of fatigue, and brings about the **adhesion of broken joints.** It alleviates the pain which usually attends of the burns, scalds, bruises and laceration, and subdues the actions of the deranged *Vayu*.[130]

Lepana (ointment or plaster)

It is carried on the fractured site. *Lepana* should be prepared using *Manjisth*, *Madhuka*, red sandal wood and *Shali*-rice mixed *Shata-Dhauta* clarified butter (i.e. clarified butter washed one hundred times in succession) should be used for plastering the fracture. [131]This *Lepa* reduces local pain and swelling. The ingredients get absorbed per cutenously and helps bone healing. After this the *Anchana* like procedures is to be followed. After completing the general measures *Acharya* has described the treatment part of various kinds of fractures occurring in the each bone of body.

(3) Treatment of *Kora Sandhi* dislocation

---

[128] सव्रणस्य तु भग्नस्य व्रणं सर्पिर्मधूत्तरैः ।प्रतिसार्य कषायैस्तु शेषं भग्नवदाचरेत् ॥(सु.चि.3/14)

[129] न्यग्रोधादिकषायं तु सुशीतं परिषेचने । पञ्चमूलीविपक्वं तु क्षीरं कुर्यात् सवेदन॥
सुखोष्णमवचार्यं वा चक्रतैलं विजानता ॥ (सु.चि.3/11)

[130] सेकः श्रमघ्नोऽनिलहृद्भग्नसन्धिप्रसाधकः । क्षताग्निदग्धाभिहतविघृष्टानां रुजापहः ॥ (सु.चि 24/31)

[131] आलेपनार्थं मञ्जिष्ठां मधुकं रक्तचन्दनम् ।शतधौतघृतोन्मिश्रं शालिपिष्टं च संहरेत्॥ (सु.चि.3/7)

A dislocation of (*Kurpara Sandhi*) elbow joint should be first rubbed with the thumb, after which it should be pressed with a view to set it in its right place by fixing and expanding the same. After that the affected part should be sprinkled over with any oleaginous substance. The same measures should be adopted in the case of a dislocation of the knee joint (*Janu Sandhi*), the ankle joint (*Gulpha Sandhi*) and the wrist joint (*Mani-Bandha*).[132]In case of the phalanx fracture or dislocation, it should be first set in its natural position and bandaged with pieces of thin linen and should be then sprinkled with ghee. This ancient method resembles with modern management, in which the affected part is supported by bandaging it along with a splint or neighbor finger[133]. Along with all these measures ancient *Acharya* have described numerous medicinal preparations for the faster union of the fractured bone. These are chiefly described as general tonics to provide liberal amount of proteins, fats calcium and other minerals. General treatment of *Bhagna* includes *Asthi Sandhana* these drugs are *Madhuka*, *Madhuparni*, *Prisniparni*, *Ambasthaki*, *Samnga*, *Mocharasa*, *Dhataki*, *Lodhra*, *Priyangu* and *Kataphala*.[134]These *Asthisandhaniya Dravyas* not only hasten the bony union but also make it strong they are also good for general health. In addition to all these, *Acharya Sushruta* advises to take the milk of cow, processed with *Gritha*, drugs of *Madhuragana* and *Laksha* daily during the morning hours.

(4) ***PATHYA-APATHYA*:**[135]

A fractured patient must avoid the use of *amla Lavana*, *KatuRasa*, and *Kshara* and should follow the strictest continence, avoid over exposure to sun and physical exercises.

(5) **CLINICAL SIGNS OF IDEALLY UNITED BONE**[136]:

---

[132] कौर्परं तु तथा सन्धिमङ्गुष्ठेनानुमार्जयेत् |अनुमृज्य ततः सन्धिं पीडयेत् कूर्पराच्च्युतम् ||
प्रसार्याकुञ्चयेच्चैनं स्नेहसेकं च दापयेत् |एवं जानुनि गुल्फे च मणिबन्धे च कारयेत ॥ (सु.चि. 3/32-33)

[133] भग्नां वा सन्धिमुक्तां वा स्थापयित्वाऽङ्गुलीं समाम् ।अणुनाऽऽवेष्ट्य पट्टेन घृतसेकं प्रदापयेत् ॥ (सु.चि. 3/24)

[134] मधुकमधुपर्णीपृश्निपर्ण्यम्बष्ठकीसमङ्गामोचरसधातकीलोध्रप्रियङ्गुकट्फलानीति दशेमानिसन्धानीयानि भवन्ति || (च.सू. 4/5)

[135] लवणं कटुकं क्षारमम्लं मैथुनमातपम् |व्यायामं च न सेवेत भग्नो रूक्षान्नमेव च|| (सु.चि.3/4)

[136] भग्नं सन्धिमनाविद्धमहीनाङ्गमनुल्बणम् | सुखचेष्टाप्रचारं च संहितं सम्यगादिशेत् || (सु.चि.3/70)

1) No swelling or hardness on palpation.
2) Absence of shortening and deformity.
3) Painless and easy movements

All these are the signs of a healthy and complete healed bone that are always expected from every surgeon. In such a detailed, scientific manner, ancient *Acharayas* have described the condition of *Asthibhadna*. *Acharya Sushruta* has elaborately described types of bones, causes of bone injuries, its clinical features, and dislocation and their management. In his text named *Sushrut Samhita* the principles of management of fracture mentioned by *Sushruta* has been never changing principles even after any advancement of techniques in modern surgery.

Treatment of *Snayugata Vata*

On the basis of its sign and symptoms, ligament, tendon and nerve injury can be correlated with the condition of *Snayugata Vata* described in *Ayurveda*. *Acharya Sushruta* has advocated various treatment modalities' such as *Snehana*, *Upanaha*, *Agnikarma*, and *Bandhana* for *Snayugata Vata*[137]. Almost these, *Agnikarma* seems to be more effective in providing distinct and instant relief.

***ABHYANGA* (MASSAGE)**

Ayurveda emphasizes the role of *Abhyanga* (massage) after the tenure of exercise. *Abhyanga* is beneficial for muscle fatigue and prevent small injuries affecting the muscle fibers. *Acharya Charak* has described as a pitcher, a dry skin, and an axis become strong and resistant by the application of oil, so by the massage of oil the human body becomes strong and smooth-skinned, it is not susceptible to the diseases due to *Vata*; it is resistant to exhaustions and exertions. [138]

Advantage of regular massage

[137] स्नेहोपनाहाग्निकर्मबन्धनोन्मर्दनानि च । स्नायुसन्ध्यस्थिसम्प्राप्ते कुर्याद्वायावतन्द्रितः॥ (सु.चि.4/8)

[138] स्नेहाभ्यङ्गाद्यथा कुम्भश्चर्म स्नेहविमर्दनात्| भवत्युपाङ्गादक्षश्च दृढः क्लेशसहो यथा||
तथा शरीरमभ्यङ्गाद्दृढं सुत्वक् च जायते| प्रशान्तमारुताबाधं क्लेशव्यायामसंसहम्|| (च.सू.5/85-86)

One who practices *Abhyanga* (oil massage) regularly on the body, even if subjected to injuries or strenuous work is not much injured; his physique is smooth, flabby, strong and charming. By applying the oil massage regularly the onslaught of aging is slackened[139]. By massaging oil in the feet, roughness, immobility, dryness, fatigue and numbness are instantaneously cured; tenderness, strength and steadiness of feet are affected; the eye sight becomes clear and *Vata* is relieved thereby. Prevention from cracking of feet, constriction of vessels and ligaments of feet is ensured if massage is applied to the feet.[140] Charka says about *Abhyanga*" that a man constantly doing *Abhyanga* posses limbs which are smooth to touch and which are well developed. He will be too strong, handsome and will not be affected by early old age and who will not be affected by with external injuries even if he has to perform heavy and tiresome work". This is the clear indication that *Abhyanga* can do a miracle in sports medicine. Generally, we can classify the effect of *Abhyanga* in sports medicine as follows-

1. It increases the strength of the muscles
2. Helps in the recovery of injuries
3. Reduces the rate of injury comparable with others
4. Prevents from fatigue
5. Very effective for mental concentration
6. Prevent muscle soreness, muscle pull, muscle cramps

Charaka advises the massage after exercises which would enable the body to endure extreme strain. It reduces fatigue after stress. He further emphasizes that by massage, one gets the power of endurance, if afflicted by injury.

Modern medical science too agrees upon the advantage of massage. Dr. Peter N. Sparryn says it may help to drain inflammatory exudates from injuries in the early stages, valarie Steel notes that massage and transverse friction certainly have place. Vertebral and

[139] न चाभिघाताभिहतं गात्रमभ्यङ्गसेविनः| विकारं भजतेऽत्यर्थं बलकर्मणि वा क्वचित्||
सुस्पर्शोपचिताङ्गश्च बलवान् प्रियदर्शनः| भवत्यभ्यङ्गनित्यत्वान्नरोऽल्पजर एव च|| (च.चि.5/88-89)

[140] खरत्वं स्तब्धता रौक्ष्यं श्रमः सुप्तिश्च पादयोः| सद्य एवोपशाम्यन्ति पादाभ्यङ्गनिषेवणात्||
जायते सौकुमार्यं च बलं स्थैर्यं च पादयोः| दृष्टिः प्रसादं लभते मारुतश्चोपशाम्यति||
न च स्यादृगृध्रसीवातः पादयोः स्फुटनं न च| न सिरास्नायुसङ्कोचः पादाभ्यङ्गेन पादयोः|| (च.सू.5/90-92)

peripheral mobilization and manipulation technique are useful methods of treatment. Connective tissue massage is useful in the management of a person of the soft tissue lesions, seen in sport. It helps in re absorption of haematoma and stimulates blood flow in the affected parts. Some of the *Ayurvedic* massage techniques are as follows-

a) ***Udvartana***-Upward and downward movements with oils and dry powders, with the help of palm of hand and also fingers [141]

b) ***Udgharshana***– more forceful rubbing creating greater friction generally with dry powders. [142]*Sushruta* advises *Udgharshana* with *Phenaka* (*Samudraphena*) to strengthen the calf and thigh muscles. [143]

c) ***Utsadana-***very gentle rubbing especially with medicated oils. [144]

d) ***Mardana&Unmardana*[145]-** *Vagbhata* advises *Mardane* i.e. Downward movements of hands while squeezing the muscles after exercise[146]. *Sushruta* recommends both *Mardana* and *Unmardadana* (Opposite to the former) in *MamsagataVata*.

e) ***Samvahana*[147]–** Gentle tingling massage with oils causes a pleasing sense and reduces fatigue. *Samvahana* helps on regaining the vitality in muscles.

f) ***Padabhyanga-***[148]Massage with feet to be more vigorous and emphasis on greater pressure and crushing effect. It is has been only after proper oelation, possibly muscles become more strong and stress resistant.

---

[141]उद्वर्तनं वातहरं कफमेदोविलापनम् | स्थिरीकरणमङ्गानां त्वक्प्रसादकरं परम् || (सु.चि.24/51-52)

[142] उद्धर्षणमस्नेहौषधचूर्णादिभिघर्षण्म । (सु. चि.24/52 डल्हण कृत टीका)

[143] ऊर्वोः सञ्जनयत्याशु फेनकः स्थैर्यलाघवे | (सु.चि.24/55))

[144] सस्नेहकल्केनोउद्धर्षणोत्सादनम। (सु.चि.24/53 डल्हण कृत टीका)

[145] स्नेहाभ्यङ्गोपनाहाश्चमर्दनालेपनानिच|त्वङ्मांसासृक्सिराप्राप्तेकुर्यात्चासृग्विमोक्षणम्||
स्नेहोपनाहाग्निकर्मबन्धनोन्मर्दनानिच|स्नायुसन्ध्यस्थिसम्प्राप्तेकुर्याद्वायावतन्द्रितः|| (सु.चि.4/7-8)

[146] तंकृत्वाऽनुसुखंदेहंमर्दयेच्चसमन्ततः| (अ. ह्.सु.2/12)

[147] संवाहनंमांसरक्तत्वक्प्रसादकरंसुखम्|| (सु.चि.24/83)

[148] निद्राकरो देहसुखश्चक्षुष्यः श्रमसुप्तिनुत् ।
पादत्वङ्मृदुकारीचपादाभ्यङ्गःसदाहित॥ (सु.चि.24/70)

g) ***Peedana*** **and** ***Avapeedana-*** in this massage kneading of individual muscle is undertaken with the help of knuckles and fingers. *Peedana* is deep kneeding. One more *Pari-Peedana* is circular kneeding.

h) ***Udveshtana&Upaveshtana-*** Massage applied to the limbs especially over shoulders, thighs and waist. *Udveshtana* is upward movement and *Upaveshtana* the opposite.

Apart from all such techniques many more have been described like *Latavestana* (Spiral friction), *Mandhana* (Muscle rolling), *Sandhi Chalalana* (Joint movements), *Samdanshika* (Pulling), *Harshana* (Vibration) *Praharshana* (Percussion), *Chedyam* (Hacking) *Tadana* (Slapping), *Samputaka* (Boxing), *Vadyam* (Tapping) *Asphalana* (Clapping), *Marjana* (Sweeping) etc[149].The medicated oils, powders, pastes and such other materials used during massage have potentiality of improving the fitness of the sportsman and obviously have place in injury too.

AYURVEDIC MANAGEMENT DIFFERENT SPORTS CONDITIONS

Table No. 17 Shows the External Therapies Used in *Shoola*

Sr. No.	Type of Therapies	Name of The Drugs
1	***Taila***	1. *ErendaTaila* 2. *Shoolgajendra Taila*
2	***Lepa***	1. *Hingwadi Lepa,* 2. *Rajikadi Lepa*, 3. *Tila Gutika Lepa*

Table No. 18 Shows the Internal Therapies Used in *Shoola*

Sr. No.	Type of Therapies	Name of The Drugs

[149] Laxmipathi A: "Message" A text book of Ayurveda Vol. VI, Section I, Bezwada.

1.	**Single drugs**	1. *Pippali* 6. *Ajamoda* 2. *Ajaganda* 7. *Ajaji* 3. *Gandir* 8. *Root* of *Pippali* 4. *Chavya* 9. *Chitraka* 5. *Srigavera* 10. *Gandira*
2.	***Churnas***	1. *Sankha Curna* 4. *Mustadi churna* 2. *Narach Churna,* 5. *Haritki Khanda* 3. *Tumburyadh*
3.	***Vati /Gutika***	1. *Sankha Vati*, 3. *Shoola Vajrani Vati* 2. *Suraprabha Vati* 4. *Tiladi Gutika*
4.	***Kashaya***	1. *Baladi Kwatha*, 3. *Patoladi Kwath* 2. *Dasmoola Kwath*
5.	***Rasaushadhi***	1. *Shoolgajkeshri Ras* 2. *Triphla Loham*

Table No. 19 shows the External Therapies Used In *Shopha*

Sr. No.	**Type of Therapies**	**Name of The Drugs**
1	***Taila***	1. *Shodhshardul Taila* 3. *Panchmoola Taila* 2. *Punarnvadi Taila* 4. *Sushakmool Taila*
2	***Lepa***	1. *Nyugrayadi Lepa* 3. *Dashanga Lepa* 2. *Darviyadi Lepa*

Table No. 20 Shows the Internal Therapies Used In *Shopha*

Sr. No.	Type of Therapies	Name of The Drugs
1	**Single Drugs**	1. *Agnimantha* 6. *Shakotaka* 11. *Prisniparni* 2. *Patla* 7. *Syonaka* 12. *Salaparni* 3. *Gambhari* 8. *Bilva* 13. *Brahati* 4. *Mankanda,* 9. *Kantakarika* 14. *Kantakarika* 5. *Bilva* 10. *Kasmarya*
2	***Churnas***	1. *Pippalyadi Churna* 4. *Shothadi churna* 2. *Dasmoola Haritaki* 5. *Punrnvadi churna* 3. *Shodhshardul Churna*
3	***Vati /Gutika***	1. *Dugdha Vati* 3. *Takra Vati* 2. *Kshira Vati,* 4. *Gudadi vatika*
4	***Kashya***	1. *Dhanwantram Kwatha* 4. *Dasmoola Kwatha* 2. *Triphaladi Kwatha* 5. *Punarnvastka Kwatha* 3. *Phaltrikadi Kwath*
5	***Asav- arishta***	1. *Vasavasava*, 3. *Abhyarista* 2. *Punarnvasava* 4. *Punarnvadharista*
6	***Rasausdhi***	1. *Shodhari Loha* 3. *Shophari Ras* 2. *Shodhari Rasa*

Table No. 21 shows the External Therapies Used In *Vrana*

Sr. No.	Type of Therapies	Name of The Drugs	
1	***Taila***	1. *Nirgundi Taila* 2. *Durvadi Taila* 3. *Tiktadi Taila*	4. *Angaraka Taila* 5. *Chakra Taila* 6. *Nimba Taila*
2	***Ghrita***	1. *Jatayadi Ghrita* 2. *Goradham Ghrita*	3. *Karpura Ghrita*
3	***Lepa***	1. *Manashiladi Lepa* 2. *Paradadi Malahar* 3. *Panchvalkal Lepa*	4. *Nimbaptra Lepa* 5 .*Dhasanga Lepa* 6. *Sarivamola Lepa,*
4	***Churna***	1. *Laksha Churna* 2. *Nimbaptra Churna*	3. *Manjisthachurna*

Table No. 22 Shows the Internal Therapies Used In *Vrana*

Sr. No.	Type of Therapies	Name of The Drugs	
1	**Signal drugs**	*1. Tulsi* *2. Vetus* *3. Kranja* 4. Turmeric	5. *Devdaru* 6. *Kadamba* *7. Neem*
3	***Guggulu***	1. *Vidhangadi Guggulu* 2. *Vatak Gugglu*	4. *Amritadi Guggulu* 5. *Vidangadi Guggulu*

		3. *Saptvinshtiko Guggulu*

Table No. 2 Shows the External Therapies Used In *Bhagna*

Sr. No.	Type of Therapies	Name of The Drugs
1	***Taila***	1. *Chakra Taila* 4. *Gandha Taila* 2. *Bhagnsandhana Taila* 5. *Gandhaprasarini Taila* 3. *Agarvadi Taila*
2	***Lepa***	1. *Manjisthadi Lepa*

Table No. 24 Shows the Internal Therapies Used In *Bhagna*

Sr. No.	Type of Therapies	Name of The Drugs	
1	**Single drugs**	1. *Madhuka* 2. *Prisniparni* 3. *Samnga* 4. *Dhataki* 5. *Priyangu*	6. *Madhuparni,* 7. *Ambasthaki,* 8. *Mocharasa,* 9. *Lodhra,* 10. *Kataphala*
2	***Churnas***	1. *Asthisanharadi Churna* 2. *Chaturbhadra Curna*	3. *Ashwagandha Churna*
3	***Guggulu***	1. *Abha Guggulu*	2. *Laksha Guggulu*
4	***Yogas***	1. *Rasonadi Yoga* 2. *Abhadi Yoga*	3. *Gristkshira Yoga*

Table No. 25 Shows the Doses of *Ayurvedic* Drugs

Sr. No.	Type of Drugs	Dose	*Anupana*
1	Single herbal drugs	3-5 gm BD	Warm water or honey
2	*Churna*	3-5 gm BD	Warm water honey
3	*Guggulu*	400-500 mg TDS	Warm water
4	*Rasausdhi*	250-500 mg BD	Honey
5	*Asav-arista*	5-20 ml BD	Equal quantity of water
6	*Kashya*	30-40 ml BD	Water
7	*Vati/gutika*	2-3 *Vati* BD	Warm water

ROLE OF *RASAYANA* THERAPY

"*Rasayana*" means the way of obtaining good quality of *Rasa*. The word *Rasa* represents the seven *Dhatus* because they all are nourished by *Rasa* yield of *Aahar Rasa* (digestive product of food). The quality of the *Rasa* in the body directly governs the state of health of an individual. So the meaning of obtaining optimum standard of *Rasa* is to be *Rasayana*. The purpose of *Rasayana* is to obtain strength, immunity, *Ojas*, vitality, will power and determination and it also strengthen the sense. One of the results of *Rasayana* is *Oja*, which is the factor responsible for *Vyasdhikshamtav* (immunity).

Ayurveda describes a variety of herbal and mineral mixtures, called *Rasayanas*. They contain not only highly concentrated nutrients, but also develop a unique effect on the mind and body by virtue of their specific compilation. Each of the different ingredients complement and reinforce each other synergistically, and can therefore be optimally absorbed by the body. *Amla* juice has been designated as sport *Rasayana* for physically active person. It has holistically nourishing and balancing as well as a natural anabolic (muscle building) effect. It supports the immune system in a holistic manner, and also has been proven to reduce cell-damaging substances known as free radicals. Free radicals are highly destructive molecular fragments that are increasingly produced at high levels of exertion. The physical and mental stamina of sportsman indicate perfect health with the help of balance condition of *Tridosha* and *Saptdhatu*. However for *Dhatupachaya* and *Balavriddhi* (strength) naturally the *Rasayana* therapy is most suitable and can be adopted during the training programme. For practical purpose *Kuti Praveshika* (indoor) type of *Rasayana* is prescribed in *Ayurveda*. Single *Rasayana* herb or formulation of various such herbs can be given for the physical as well as mental health, and specific formulations are indicated by choosing Such *Rasayana* drugs, which would improve the *Mamsadhatu* and *Snayu* (musculature). They may be selected as per the need and personality of the sportsman. There are so many formulation of *Rasayana* drugs like *Ashwgnada* (withania somnifera), *Musali* (asoaragys adscebdes), *Sheerini* (mimusps hexandra), *Ala*(sida cordifolia), *Vidari* (pueraria tuberose), *Kushmanda* (beninean sahispida), *Shalaparani* (desmodium ganetica), *Khajura* (phoenix sylvestric), *Amra* (manzifera indica), *Kadali* (musa paradisiacal), *Amalaki, Madooka parni, Shatavari, Lashuna, Vacha, Bhallataka, Pippali, Haritaki, Guduchi, Bhibitaki* etc. There are some mineral drugs like *Shilajatu* (bituman), *Abhraka* (mica), *Loha*, *Tamra* (copper), which are also important for improvement in physical and mental power of the sport person. The benefits of *Rasayana* are longevity, good memory and intelligence, freedom from disease, youthful age, and excellence of luster, complexion and voice, optimum strength, good functioning of sense organs. *Rasayana* creates new tissues in the body having optimum quality and it prevents ageing[150].

[150] दीर्घमायुः स्मृतिं मेधामारोग्यं तरुणं वयः। प्रभावर्णस्वरौदार्यं देहेन्द्रियबलोदयम्॥

Importance *of Rasayana* Therapy

1. It provides proper nutrition to each tissue.

2. It increases *Jataragni* and as well as *Dhatvagni* and hence the function of *PanchaBhoutik Agni* also gets improved.

3. Hence all the tissues in the body are formed having their best qualities.

4. It removes the *Kleda*, *Ama* and other waste products which are actually responsible for ageing process. These waste products are also called as free radicals and *Rasayana* removes these free radicals from the body. This action of *Rasayana* is known as antioxidant and it has now been found in most of the herbs having *Rasayana* action.

5. It gives strength to the *Srotas* or channels in the body.

6. It increases *Ojas* and strength of the body.

7. It normalizes the *Doshas* in the body.

8. It is also useful in maintaining the *Satva* quality of the mind. Hence the mind and the sense organs and the motor organs become optimum in their qualities. Thus, *Rasayana* therapy is the special treatment modality in *Ayurveda*. It improves durability as well as quality of the life.

ROLE OF AAHAR DIET AND VYAYAMA IN SPORTS

Concept of Diet in Ayurveda and its Importance in Sports-

Diet is one of the important and basic biological needs of sportsman. It is the foundation for good health. It is essential for life, growth and repair of human body, regulation of body mechanism and production of energy for Work. The above functions of diet can be achieved only through adequate nutrition which should consist of essential

---

वाक्सिद्धिं वृषतां कान्तिमवाप्नोति रसायनात्| लाभोपायो हि शस्तानां रसादीनां रसायनम्|| ॥ (अ.ह्र.सू.39/1-2)

nutrients in the required proportion. These nutrients include Proteins, Carbohydrates, Fats, Minerals and Vitamins. Nutritious diet is always recommended for healthy body and mind. In case of Sportsman nutritious diet plays an important role in their performance. Because during sports training, the energy requirement of the players is high as such the diet should be accordingly planned otherwise the players Will not have the Stamina to Withstand the training and the player Will show the signs of fatigue which may result in internal and external injuries to the players.

In the regimen of diet, *Ayurvedic* foods and food habits are noted and those suitable are adopted. There is a range of meats of flesh-eating animals and otherwise, given by *Charaka* which are said to be *Mamsavardhaka* in the treatment of *Rajayakshma* (tuberculosis) that may be screened for non-vegetarian food for sportsman.[151] In various sports activities mostly involved structures are Asthi for various locomotory activities by means of *Mamsa* (muscles) hence *Asthiposhak* and *Mamsavardhaka* foods mentioned in classics must be advised for sports person. *Acharya Charak* in *Sutrastana* 26th chapter said various food items these helps in proper nourishment of *Mamsa* and Asthi, in any injury there will be decrease in *Rakta Dhatu* to compensate this *Acharya* has advised to consume the *Rakta* of animals mentioned in *Mamsa Varga* eg: *Mamsa Varga*, *Shaali Varga* etc.

VYAYAMA (EXERCISE) AND SPORTS

The training in sports is of prime importance for fitness, and involves physical exercise, which improves the tonicity and strength of muscles and also tones up cardiac and respiratory functions. Obviously our ancient *Acharyas* knew these benefits and have stressed upon regular *Vyayama* (exercise) not merely as a part of sports but as a daily regimen they also know that apart from many general advantages, Musculature is developed due to *Vyayama*. *Sushrata* and *Vagbhata* called it *Suvibhaktata* and *Vibhakta Gatratvam*.[152]Endurance to high amount of stress is indicated by *Charaka* as

[151] दद्यान्महिषशब्देन मांसं मांसाभिवृद्धये | मांसेनोपचिताङ्गानां मांसं मांसकरं परम् || (च.चि.8/154)

[152] शरीरायासजननं कर्म व्यायामसञ्ज्ञितम् | तत् कृत्वा तु सुखं देहं विमृद्गीयात् समन्ततः |
शरीरोपचयः कान्तिर्गात्राणां सुविभक्तता | दीप्ताग्नित्वमनालस्यं स्थिरत्वं लाघवं मृजा |
श्रमक्लमपिपासोष्णशीतादीनां सहिष्णुता | आरोग्यं चापि परमं व्यायामादुपजायते || (सु.चि.24/37-40)

DuhkhaSahishnuta[153]and by *Vaghhata* as Karma *Samarthya*[154]i.e. capacity to strain to maximum extent. In fact, strength is a function of Neuro-Musculo-Skeletal system and closely related to muscle cross-sectional area. Its development is indispensable for success in sports.

YOGA AND SPORTS

According to *Ayurveda*, the human body contains *Asthi*, *Sandhi*, *Snayu*, *Peshi* etc. This supports and helps in movement and locomotion. Every sports person in his career suffers from various sports injuries, specially of Golfer`s elbow, Tennis elbow, Wrist strain, Sprained ankle, planter fasciitis, rotator cuff tear, iliotibial band syndrome etc. the extensive use of a joint cause tears, stretching, inflammation, trauma etc. in athletes, cricketers, long jumpers etc. Here treatment required is faster and long lasting. Recently research studies proved that *Yogas* are very effective in sports, health and fitness related fields such as aerobic training, strength training, body building, and endurance sports. A combined approach of *Ayurveda*, physiotherapy and yoga can be in successfully employed sports, for training sports person, treating injuries and rehabilitation. *Yoga* is useful for all type of sports to help prevent injuries. One gets extra agility which helps avoid damage, provides more strength and improves a player's ability to react to a situation. *Yoga* works not only at physical level but also at psychological level, ensuring well-rounded development. Yoga is both preventive and therapeutic and has shown to offer both physical and mental benefits to the body and mind.

Although most poses are not aerobic in nature, they do in fact send oxygen to the cells in the body by way of conscious deep breathing and sustained stretching and contraction of different muscle groups. Whatever sport choose to practice, yoga can enhance and complement your ability. Most sports build muscular strength and stamina, often in specific areas of the body. Yoga can help to check any imbalance in muscular

[153] लाघवं कर्मसामर्थ्यं स्थैर्यं दुःखसहिष्णुता । दोषक्षयोऽग्निवृद्धिश्च व्यायामादुपजायते॥ (च.सू.7/32)

[154] लाघवं कर्मसामर्थ्यं दीप्तोऽग्निर्मेदसः क्षयः। विभक्तघनगात्रत्वं व्यायामादुपजायते ॥ (अ.ह्र.सू.2/10)

development and will enable both your body and your mind to function more efficiently. If your body is flexible and supple you will be less prone to sports injuries, as your joints will be kept lubricated. Skiing demands mental alertness as well as good balance.

Importance of Yoga in Sports

i. Improved strength

Routine and consistent practice of the various yoga *Asanas* has helped me build strength and improve lean muscle mass. Most notably with respect to several muscle groups under-utilized in my chosen athletic disciplines of swimming, cycling and running. These gains have enhanced core body stability and supportive but otherwise under-developed muscles surrounding the more utilized muscles, creating a more balanced and optimally functional overall strength.

ii. **Balance -**Through a consistent yoga practice, coordination the balance has improved immensely.

iii. Flexibility

Yoga invariably improves joint and muscular flexibility, which is crucial to the body's overall structural soundness. Enhanced joint and muscle pliancy translates to a greater range of a motion, or an increase in the performance latitude for a particular movement or series of movements

iv. Free your mind

The ability to create a stress free mind is a significant benefit of yoga practice. The physical practice is used as a tool to enhance breath control. This helps improve focus and concentration, allowing clarity of thought and clear decision making. Mental practice in any sport will teach you how to gain control of your emotional states. So arousal levels and anxiety don't impede your performance. Thus *yoga* improves our body as follows-

- Strengthens deep connective tissue preventing or minimizing injury.
- Creates an overall body flexibility. Increases range of motion and mobility.
- Dramatically enhances physical balance by developing the athlete's awareness of his body's center place, thus keeping their body balanced in action, moment by moment,

giving the ability to recover from or prevent falls, while enhancing agility and maneuverability.

- Improves circulation, massages internal organs and glands for optimum health.
- The yoga breath circulates and detoxifies the lymph fluid to speed up recovery time from training 15% faster, eliminating fatigue.
- The yoga breath builds up increases one's life force energy.
- Enhances sensory acuity, mental focus, concentration, mental clarity, will power, and determination.
- Dissolves pre competition anxiety and stress. Helps to balance & manage emotions that could cloud focus, concentration & judgment.
- Trains the athlete gets and stays in the mental zone.

Table no. 26 shows the various hinge joint strengthening techniques through *yoga.*

1. **Techniques of Wrist joint Strengthening by *yoga.***

Urdhva Hastasana	*Urdhva Baddhaguliyasana*
Ardha Parshva Hastasana	*Bhujangasnaat* The Wall
Bharadvajasana	Hands And Knee Pose
Bakasana (*Crow Pose)*	*Mayurasana (Peacock Pose)*
*Adhomukha Vrksansana (*Handstand)	*Vasisthasana (*Side Plank Pose)

Ankle joint strengthening *Yoga*

Ustrasana (camel pose)	*Utkatasana* (chair pose*)*
Garudasana (Eagle pose)	*Malasana (*Garland Pose)
*Ardha Chandrasana (*Half Moon Pose)	*Virasana (*hero pose)
Natarajasana (Lotus Of The Dance Pose)	*Vrksasana (*Tree Pose)
*Virasana (*Reclining hero pose)	*Talasana (*Scale Pose)

Elbow joint strengthening *Yoga's*

Side plank	*Trikonasana*
Garudasana	Cow –face pose arms
Cobra pose	*Adho Mukha Savanasana*

Knee Joint Strengthening *Yoga's*

Padangusthasna Big Toe Pose	*Baddha Konsasana (*Bound Ankle Pose)
Setu Bandha Sarvangansana (Bridge Pose)	*Sukhasana (*Easy Pose)
*Malasana (*Garland Pose)	*Utthita Trikonsana (*Extended Triangle Pose)
*Ardha Bhekasana (*Half Frog Pose)	*Ardha Chandrasana (*Half Moon Pose)
*VirasanaheronposeKrounchasana (*HeroPose)	*Uttanasana (*Standing Forward Bend)
Upavistha Konsana (Wide- Angle Seated Forward Bend)	*Makrasana,Tadasana.Veerasana,Bhujangasna*

Interphalangeal joint strengthening *Yoga's*

Salbhasana	*Ahdo Mukha Urksana*
Kapotasana	*Urdhva Dhanursana*
Parsva Bakasana	*Eka Pada Koundiyanasa*

DISCUSSION

Discussion is the process to re-examine the work done. It improves the knowledge and discussion with the literature become basic establishment of the concepts. To communicate the findings with the results, discussion is essential. It can either support the hypotheses or it may revolutionize the concept totally. According to ancient research methodology before establishing any theory, *Upanayana* (Discussion) is the prior step to *Nigamana* (Conclusion). Discussion is a process of re-examining oneself. It forms a base for conclusion. In spite of a detailed classical study and experimentation in various ways, a theory is accepted only after the proper reasoning *(Tarka)* of observations. The findings and observations are evident by the discussion. Hence discussion is very much crucial part of any scientific research.

When we observe the entire human skeleton system the bones are arranged in different manner with intermittent joint and its different shape. All this is to fit the survival of the body, to the external environment few joints are found between the bones without any gap to provide rigid supports. Few joints are movable found between the bone

with a shape left to allow movement and space filled with lubricating fluid i.e. synovial fluid. According to the modern sciences the numbers of the joint in the child are more than an adult. As few joints are fuse together in the adults, as they are lodging the vital organ of the body. Joints are not only of anatomical and structural importance, their knowledge is also needed for medicinal science. Joint disorders are the most common life-style disorders encountered in clinical practice. Their incidence is increasing constantly keeping in pace with the evolution. Sandhis are the abodes of *Kapha*, mainly *Shleshaka Kapha* which helps in keeping them functional and integrated along with providing good lubrication. Sandhis are also *Marmas* or important delicate points or sensitive structures, the injury of which leads to death (damage, degeneration) or deformity. A thorough structural and functional knowledge of the *Sandhis* is needed to address their pathology. *Sandhi Sharir* or study of joints in *Ayurveda* is based on the ancient wisdom of the *Ayurveda* seers and teachers. Their way of seeing and classifying the joints looks different but all appreciations go its way because it was the first attempt made at understanding the most important structures of our body. Arthrology of modern day anatomy is the essence of all these basics which were provided long back in timeline. After going through conceptual literature in detail, the present study entitled as "**Analytic study of *Kora Sandhi* with special reference to Sports Injuries and their *Ayurvedic* Management"** reveals some interesting points which are discussed thoroughly to draw probable conclusions at various levels.

DISCUSSION ON *SANDHI* AND *KORA SANDHI*

The *Gyanendriya* are sensory in function and *Karmendriya* are motor in function. The *Karmendriyas*, *Hasta* and *Pada* are doing *Grahana* and *Gamana* respectively. The function *Grahana* (to receive and give) and *Gamana* (moving from one place to other) is only because of *Sandhis*. In *Ayurvedic* classics the term *Sandhi* has a wider meaning than just being a union of two bones. *Aacharya Sushruta* has told joints between *Peshi*, *Sira* and *Snayu* etc. in our body. But in *Ayurveda Sandhi* refer to only to the junction of bones. The junction of *Sira, Snayu, Peshi* etc. is numerous, so it is not counted in number. *Sushruta* used the word "*Kevala*" for it. *Dalhana* also appreciate it that, *Sandhi* can just taken in the meaning of junction of two bones. There are many structures in the body like arteries, veins, muscles, nerves etc. so joints of these structures are also many and looking

or counting them is very difficult and describing joints of these structures not seems to be necessary in medical science. So our *Aacharyas* have not written anything about these joints. They have counted only bony joints and have written about shape, type, structure etc. of them.

The *Sandhis* are giving various varieties of movements to the body. In this elaborative explanation, *Maharsi Sushruta* explained and classified the joint according to their shape & movement. The *Sandhis* have been classified on the basis of structures and functions; structurally they have been classified in to 8 types viz *Kora*, *Ulukhala*, *Samudga*, *Pratara*, *Tunnsevani*, *Vayasatunda*, *Shankhavarta* and *Mandala*. Similar classification is mentioned by modern science but only six types are there and explanation looks similar. The function classification is based on movements of the body. They are *Sthira* and *Chestavanta*. The *Chestavanta* are further classified into *Bahuchala* (freely movable) and *Ishatchala* (slightly movable). The similar classification was mentioned in modern science as: Synarthrosis (immovable), Amphiarthrosis (slightly movable), diarthrosis (freely movable) which may be correlated with the classification mentioned in *Ayurvedic* classics. *Acharyas* also described that *Sandhi's* are having *Shleshaka Kapha* in between articular surfaces of bones. These *Shleshaka Kapha* bounds all the *Sandhi's*.

For descriptive purpose *Sandhi* is classified on the base on structure and function. Based on *Kriya* of *Sandhi* it is divided into 2 categories – *Sthira* and *Chala* the word meaning of *Sthira* refers to stable i.e. without movement, while *Chala* sub classified into *Alpachala* and *Bahuchla* by word meaning there are having fewer movement and freely movable respectively.

Functional classification of modern literature joints are in 3 types and can be correlated with *Ayurveda* types of *Sandhi* like Synarthrosis (immovable) as *Sthira Sandhi,* Amphiarthrosis (fewer movement) as *Alpa Chala* and Diarthroses (feely movable) as *Bahuchala.* In *Ayurveda* there have been 8 types of *Rachanatmaka* (structural classification) of joints because all these are named on the basis of shape or structure like as *Kora Sandhi* (hinge joint), *Ulukhala* (mortar), *Samudga* (box or cavity), *Pratara , Tunnasevani* (suture), *Vayastunda* (crow beak), *Mandala* (annular) and *Shankhavarta* (circle in snail). All these are interpreted with the classification of joint on the basis of their structure or shape. In modern science there are mainly 3 types on the basis of

structure like fibrous joint, Cartilaginous joint and Synovial joint and *Rachanatmaka* (structural classification) joints of *Ayurveda* can also show a relationship with them.

Table no. 27 Shows subdivision of joints and their correlation with types of *Sandhi* in *Ayurveda*

Sr. No.	**Name of the Joint**	**Subdivision**	**Correlation With types of *Sandhi* in *Ayurveda***
1	Fibrous joint	Suture	*Tunnsevani*
		Syndesmosis	-
		Gomphosis	-
2	Cartilaginous joint	Primary	*Mandala*
		Secondary	*Vayastunda*
			Sankhavarta

Above table shows comparison on the basis of shapes, four joints like *Kora, Ulukhala, Samudga and Pratara* are correlated with Hinge, Ball& Socket, Saddle and Gliding variety of synovial joint respectively. While *Mandala, Sankhavarta* are primary cartilaginous joint in which slight movement is seen &*Vayastunda* is secondary cartilaginous joint in this *Tunda* refers to beak i.e. disc present in *Sandhi* hence correlated. The last *Tunnsevani* here *Tunn* refer to material (fibrous) when this is sutured or stitched it resembles dentate hence included under sutured variety of fibrous joint. This classification holds good in modern parameters which classifies the joints in to mainly two varieties Synovial and non synovial joints. The Synovial joints are again classified in to Hinge, pivot, Condyloid, Saddle, Ball& socket joint. *Anguli, Manibandh, Gulpha, Janu, Kurpara* are included under *Kora Sandhi* which are truly movable joint.

The nomenclature of this *Sandhi* is based on its shape. The articular surfaces have concavity at the bony ends hence called as *Gartvat Sandhi*. In *Kora Sandhi* the articular surfaces articulate such that movement takes place in one direction, hence called as uniaxial joint. It resembles *Kalikavata* in shape because the *Sandhi* is covered by *Snayus*.

In this type of joint the articular surfaces are joined in such a way that it can move only in one axis just like opening and closing of a door, hence it is called as *Kabjavat Sandhi*. As per the description of *Haranchandra* the *Kora Sandhi* can be correlated to Hinge type of joint. The *Sandhi* looks like the hinge seen in doors and windows which hold the arms tightly. The movements are seen on only one axis like flexion and extension. *Haranchandra* in commentary of *Susrut Samhita* mentioned *Kapaat* etc. is taken for *Nibandhan* of a special devise called *Kora* is known that the *Kabja* (hinge) Because of presence of *Nalikaasthi* in it, *Acharyas* called it as *Nalikavat*. *Acharya Gananath* divides the *Kora Sandhi* into four types they are *Khallakora, Parasparakora, Chakrakora* and *Sandanshkora.* The *Kora Sandhi* are seen in the following region, *Anguli* (interphalangeal, metatarsophalangeal, metacarpophalangeal joint), *Manibandha* (Wrist), *Gulpha* (Ankle), *Janu* (Knee) and *Kurpara* (Elbow). Here the flexion and extension type of movements are observed. This is Hinge type of joint according to modern anatomical classification. *Ayurvedic* Texts has been described the *Kora Sandhi* In Various Context. The *Kora Sandhis are* very important joints of the body. They are responsible for various movements of the body such as standing, running and climbing holding, throwing etc. These are the most involved joints during the locomotion and in almost all of the Sports.

In modern science *Kora Sandhi* is called as hinge joint or ginglymus. Examples of hinge joint are inter- phalangeal joint, knee joint, ankle joint and elbow joint. But the Modern science considers wrist joint as ellipsoid joint because of presence of biaxial movements, i.e. flexion, extension, abduction and adduction and in hinge type the movement of the joint is only in uniaxial i.e. only flexion, extension. This type of movement can take place at Interphalangeal joint which is a complete hinge joint, while the metacarpophalangeal joint condyloid type and metatarsophalangeal joint is plane synovial joint. Wrist joint is an ellipsoid joint. Elbow is a hinge joint between humerus and radius. Knee joint is a hinge joint between condyles of femur and tibia. Ankle joint is a hinge joint between talus and tibia. Hence according to modern science knee, ankle, interphalangeal, and elbow are included under hinge variety. In *Ayurveda* wrist joint, metacarpophalangeal joint and metatarsophalangeal joint are also included under *Kora Sandhi*. The reason being that joints are classified on the basis of structure in *Ayurveda* where as in modern science it is

on the basis of movement, joints having uniaxial movement are included hinge variety. That is why wrist joint is not included under hinge variety.

The hinge joints are vital for movement and vulnerable to injury. It contains number of muscles, ligaments, tendons and bones. Hinge joint is involving in so many outdoor sports which causes various types of injuries such as fracture, dislocation, sprains, strains, inflammation and wound. Sports injuries are injuries that happen when playing sports or exercising. Some are from accidents. Other can results from poor training practices or improper gear. Some people get injured when they are not in proper condition, not warming up or stretching enough before you play or exercise can also lead to injuries. *Kora Sandhi* includes maximum joints of upper and lower limbs, which are commonly involved in sports injury. The joints included under *Kora Sandhi* like *Manibandha, Anguli, Kurpara, Janu*, *Gulpha* are commonly injured during sports. This proves that joints are commonly involved in sports. These joints are involved in hyperflexion, hyperextension. Even though whole body is involved, but commonly involvements of these joints are Maximum.

Elbow joint is made up of bone, cartilage, ligament, and fluid. Muscles and tendons help the elbow joint move. It is hinge type synovial joint, located 2-3 cm. inferior to the epicondyles of humerus. The three important ligaments are radial collateral ligament, ulnar collateral ligament and annular ligament support the elbow joint. Elbow injuries are common in sportsman. Upper extremity injuries account for 65% of injuries in sportsman, especially in athletes involving throwing, racket sports and are weight bearing activities etc. The elbow is an important joint that allows for range of motion and mobility in the arm. There are various types of elbow injury, but the most common ones include dislocation, fracture, and a condition known as biceps tendon rupture, Tennis elbow, golfer's elbow, medial collateral ligament sprain, posterior elbow pain, and cubital tunnel syndrome.

Wrist joint is an ellipsoidal type of the synovial joint. The wrist is the most common areas where ligament injuries occurs, causing the pain in area. The structures involved in the formation of wrist are fibrous capsule, dorsal and palmar radio-carpal ligament, ulnar collateral ligament, radial collateral ligament, dorsal radio ligament, palmar ulno-carpal ligament, median nerve these all structures forms the wrist joint. There are four principle

mechanism of injury described; throwing, weight bearing twisting, and impact injuries.

The wrist is a wonderful tool and works with your hand, forearm and elbow. You can circle your wrist and it will move forewords and backwards and this movement is necessary in many racquet sports, especially the cocking of the wrist in badminton. It is therefore important to learn correct technique to avoid injury. In volleyball the wrist is involved in powerful movements, and in canoeing a repetitive action, also golf wrist injuries are common. It is no wonder that the wrist can be not only sprained or strained but develops wrist pain from other causes.

The wrist joint has multiple axes of movement; flexion, extension, and radial- ulnar occur at the radiocarple joints, and pronation- supination occurs at the distal and proximal radioulnar joints. These movements provide mobility for hand function.

Injuries to the wrist often occur due to a fall on the outstretched hand. In sportsman, the most common wrist injuries are fractures of the scaphoid, wrist sprain, squeaker's wrist, ulnar nereve compression, scapholunate dissociation, de quervain's tenosynovitis, lunotriquetral ligament injury, triangular fibrocartilage complex tear.

The knee is the largest and hinge joint that is responsible for weight bearing and movement and one of the most easily injured. It is made up of five main things; bones, cartilage, ligaments, menisci, and tendons. The knee joint contains two joints; the tibiofemoral joint with its associated collateral ligaments, cruciate ligaments and menisci; and the patellofemoral joint, which obtains stability from the medial retinaculum and the large patellar tendon passing anteriorly over the patella. We refer to the tibiofemoral joint as the knee joint.

Knee is a complex joint with many components, making it vulnerable to a variety of injuries. It is frequently affected in sports as compared to other events.

The most common knee injuries include fractures around the knee, patella dislocation, and sprains and meniscal tear, anterior knee pain, patellar tendinitis, ligaments injury (medial collateral ligament, lateral collateral ligament anterior cruciate ligament, posterior cruciate ligament) . In many cases, injuries involve more than one structure in the knee. Pain and swelling are the most common signs of knee injury.

The ankle joint is a hinge joint formed between tibia and fibula and talus and allows the foot to bend upwards (dorsiflexion) and downwards (planterflexion). The joint also allows

s small amount of rotation. Two bones of the foot, the talus and calcaneus connect to form the subtalar joint which allows foot to rock side to side (inversion/eversion).

The joints ability comes from the structural arrangement of the bones and the surrounding ligaments. Ligaments provide stability by preventing the amount of side to side movement

The main function of the foot is to support our body weight as well as us the ability to walk and run and remain mobile. Playing such a pivotal role to our mobility the foot and and ankle are often susceptible to injury, typically from overuse. Each injury is completely different depending on its severity and the individual concerned, as we all react differently to injury and have different recovery times. An ankle injury occurs when the ankle joint is twisted too far out of its normal position. Most ankle injuries occur either during sports activities or while walking on an uneven surface that forces the foot and ankle into an unnatural position.

Sports requiring jumping, turning and twisting movements such as basketball, volleyball, netball and football; and explosive changes of direction such as soccer, tennis and hockey are particularly vulnerable to ankle injuries.

Ankle injuries are commonly categorized by the kind of tissue you injure e.g. bone (fracture), ligament (sprained ankle), muscle (strain or tear), or tendon (Achillies tendinopathy, peroneal tendinopathy or extensor tendonitis) the most common ankle injury are sprains and fractures (maisonneuve fracture)

The interphalangeal joints of the foot are between the phalanges of the toes. They are hinge joints, and each has a plantar and two collateral ligaments. The only movements permitted in the joints of the digits are flexion and extension; these movements are more extensive between the first and second phalanges than between the second and third.

The interphalangeal joints of the hand are the hinge joints between the phalanges of the hand. There are two sets one is the proximal interphalangeal joints, those between the first and second phalanges, second is the distal interphalangeal joints those between the second and third phalanges. It is one palmer fibrocartilaginous ligament and two collateral bands running downwards and forwards. The only movements permitted in the interphalangeal joints are flexion and extension.

When we go through the classification of *Marmas* it has been considered under the one of *Sandhi Marma*. The injury to this *Sandhi* will cause agonizing pain, stiffness and

lameness, because of which one may get hampered of this duties. This *Sandhi Marma* is of two *Angula Pramana* and belongs to *Rujakara Marma*. *Acharya Sushruta* has propounded at the junction of *Leg* and thigh regions known as *Jangha* and *Uru* is *Janu* (knee), it causes lameness, its length is four fingers. According *Acharya Sushrut* the knee joint has counted *Jaanu Marma* as a *Vaikalyakara Marma*. The *Aghat Parinam* is *Khanjta* is told as a symptom which will persist after an injury on knee joint. So it is clear that knee joint has a similar importance in modern as well as in *Ayurveda* from injury aspect. *Kurpara Sandhi* is situated in the upper limb. It is 3 numbers, structurally it is of *Sandhi Marma*, prognostically it is of *Vaikalya Kara Marma*, and it is present between *Prakoshta, Prakanda*. Measurement of the *Marma* is 3 *Angula*, injury it this *Marma* leads to dangling of hand, deformity of upper limb, Stiffness or restricted movement of upper limb. In *Ayurvedic* point of view *Kurpara Marma Abhighataja* leads to deformity of elbow, produces swinging of arm, stiffness of arm, painful restricted movement of upper limb. Because of this disability our *Acharyas* have mentioned that *Kurpara Marma* is *Vaikalyakara Marma*. In day to day life, various sports activity, improper use of forearm and arm, any nerve injury, muscles weakness, will hamper the function of elbow joint. The condition of deformity is coined as" "*KUNI* i. e. improper movement or condition like tennis elbow, golfer's elbow. In *Ayurveda*, *Manibandha* is explained in different aspects. *Manibandha* is explained under *Marma sharir* as *Manibandha Marma*, in *Sandhi Sharir* as *Manibandha Sandhi*, in *Paribhasha sharir* as *Asthisanghat* and also as situation of *Jaala. Manibandha Sandhi* is situated in upper extremities, located at junction between forearm and palm. In *Ayurveda Manibandha Marma* described as a *Sandhi Marma* and *Rujakar Marma. Sushrut* mention *Agath Parinam* on *Manibandha marma* is "*Kunthta* "means the wasting of hand; this clearly shows that there is a definite specific relation of the injury and prognosis of *Manibandha Marma* and wrist injuries. While describing the site of *Kora Sandhi*, *Anguli* has been described first. In the body, *Anguli* is present in *Urdhaw Shakha* (*Hasta*) and *Aadha Shakha* (*Pada).* In *Ayurvedic* classics has described three three *Sandhi* in *Anguli* and two two *Sandhi* in *Angustha*, making a total of 14 *Anguli Sandhi* in each limb. Injuries to the finger are extremely common in sports, particularly hand ball sports such as basketball and volleyball. Because these injuries involve small joints that may not be functionally disabling to the athlete (depending on hand dominance

and which finger is injured), their importance can often be minimized and their disability overlooked. Finger injuries in sports are common, and can range from mild sprains to severe fracture or dislocation. The proximal interphalanges joints is the most commonly injured joint and other common finger injuries mallet finger, jersey finger, dislocation of the finger joints, skier's thumb, trigger finger are included.

DISCUSSION ON SPORTS AND SPORTS INJURIES IN *AYURVEDA*

In *Ayurveda* there is no direct description of sports and its related injuries but we find some references of exogenous diseases (*Aagantuja Rogas*) caused due to the contact of external factors like fire, poisonous substances and also due to trauma. In classifying diseases, *Sushruta Samhita* has included the category of diseases caused due to *Sanghaatabala-pravrtta-vyadhi.* This can be correlated with traumatic diseases such as sprain, abrasion, muscle injuries, wounds, fractures, dislocation etc. which caused due to various games such as boxing, wrestling, running, martial arts etc. A full description about *Ayu*, *Vyayama*, and good built of body, *Dincharya* and *Ritu Charya* shows that over *Ayurveda Acharya* were very conscious about good health. Exercise has been an important part of the *Ayurvedic* routine for thousands of years before it becomes a modern fad. Exercise gets rid of heaviness and stiffness of the body because it burn *Ama* (digestion impurities) and creates more flexibility, lightness, smoothness and easiness. Other benefits include enhanced firmness, endurance, and ability to do work. It pacifies all three *Doshas* and creates balance when suitable for the body type and season. It enhances the digestion, and if done properly, it dissolves impurities in the tissues. Exercise enhances immunity and capacity for food. It banishes fatigue, sops early aging, and retards weight gain.

In *Charaka Samhita* the definition of *Vyayama* shows that for good sports fitness *Vyayama* how much needed. Such a physical action which is described and is capable of bringing about bodily stability and strength is known as physical exercise. According to *Acharya Charak* the definition of *Vayayama* crate a sign of sports in *Ayurveda*. There is also no direct description of sports and sports injuries related to *Sandhi*. But *Acharya Sushruta* has described the *Lakshana* of *Sandhi Vidhha*. When the joints, either movable or immovable are injured, there will be increased swelling, very severe pain, loss of strength of the joints; splitting pain; edema and loss of function of the joints. These

Lakashana has similar to symptoms of sports injuries. Because these symptoms are found in all type of sports injury related to *Sandhi*.

In *Ayurveda* common conditions included under sports injury are, *Shoola* (pain), *Shopha* (inflammation), *Vrana* (wound), *Bhagna* (fracture/dislocation) and *Snayugatvata* (ligaments, tendons and nerves injuries). Every sports injuries have pain condition is almost present during any type of sports injuries like fracture, inflammation, dislocation and wound etc.

In ancient time also there were many sports just like modern era, both having same motto of physical plus intellectual fitness and entertainment. Sports of modern era are like Cricket, Football, and Volley Ball, Badminton etc. while sports of ancient era were like Horse Riding, Hunting, Wrestling, Running, and Sword Fighting etc. This proves that in ancient era also many sports were played, to maintain physical plus psychological health and to increase stamina, flexibility and stability. Sports injuries are the injuries that occur during participating in any sporting events. In many cases, these types of injuries are due to overuse of a part of the body when participating in a certain activity. For example runner's knee is a painful condition generally associated with running, while tennis elbow is a form of repetitive stress injury at the elbow, although it does not often occur with tennis players. Other types of injuries can be caused by a hard contact with something. This can often cause a broken bone or torn ligament or tendon.

Sports injuries can be broadly classified as either traumatic or overuse injuries. Traumatic injuries account for most injuries in contact sports such as Association football, rugby league, rugby union, Australian Rules football, Gaelic football and American football because of the dynamic and high collision nature of these sports. These injuries range from bruises and muscle strains, to fractures and head injuries. A bruise or contusion is damage to small blood vessels which causes bleeding within the tissues. A muscle strain is a small tear of muscle fibers and a ligament sprain is a small tear of ligament tissue. The body's response to these sports injuries is the same in the initial five day period immediately following the traumatic incident is inflammation. According to modern all of these sign and symptoms are also present in any type of sports injuries, so we can say that indirectly sport injuries are also mentioned in *Ayurveda*.

According to *Ayurveda* disease occurs in the body due to two factors one is *Nija* (within the body),other is *Aganthu* (external factors), sports injuries mainly occur due to sudden impact or due to continues wear and tear. When an injury occur due to sudden impact, body respond to that condition which lead to immobility and other inflammatory responses, it's a protective mechanism of body, due to excessive body activity strained muscles, ligaments and tendons can get injured excess of toxin can accumulate in individual organ systems and can lower both mental and physical sharpness. There are so many sports injuries related to hinge joint like; tennis elbow, golfer's elbow, wrist sprain, mallet finger, anterior knee pain lateral ligament injury, menisci injury, ankle sprain, Extensor tendinitis, tarsal tunnel syndrome, Achilles tendinopathy etc.

Sports medicine is the specially branch of modern medicine while *Ayurveda* is a Holistic system of healing that originated in India thousands of years ago. The specialty of this science is that it deals not only with the cure of disease but also with the maintenance of physical, psychological and social health of an individual and society as a whole. *Ayurvedic* treatment procedures like *Panchkarma* (purificatory & rejuventory) can do wonderful impact in sports medicine. Recently research studies proved that *Ayurvedic* medicine and treatment are very effective in sports, health& fitness related fields such as aerobic training, strength training, bodybuilding, endurance sports, games like football, volley ball, basketball, cricket and tennis etc. A combined approach of *Ayurveda*, physiotherapy and yoga 'can be in successfully employed sports, for training sports person, treating injuries and rehabilitation.

Today's Modern world has given priority to sports. During the sports events, injuries are common. Injuries to soft and hard tissues are the problems faced by sports persons as they have to undergo physical strain or stress in the field. If *Ayurveda* can provide a remedy which is cost effective, easily available and free from side effects, it would be a great boon in the field of sports. In *Ayurveda* management of sports injury has not been mentioned separately. But sports injury can be managed on the basis of *Ayurvedic* principles, but it has separate branch in modern science, which is more costly and has many adverse effects. *Ayurveda Acharya* gives vast description of wounds (*vrana*), fractures (*Bhagna*), and dislocations (*Sandhi-Mukta*) and also their treatments are mentioned in *Samhita* which fall under the branch of *Shalya-Tantra*. There is also

description of symptoms like *Shoola* (pain), *Shopha* (swelling), *Snayugatvaat* (ligaments, tendons and nerves injuries) etc. and their *Ayurvedic* management.

When we consider Symptoms of sports injuries from external to internal, 1st symptom produced will be muscular pain/ spasm, swelling, then tendon tear, ligament tear, bursitis, fracture ultimately all these conditions effects the a joints which are involved in those particular sport activities. Sports injuries happen in any joint or part of the body during sports activities shows same common symptoms like pain, swelling, spasm, fracture etc. only the name of injury may be differ according to structures involve, name of the sports or site of common injury in particular sport like tennis elbow, golfers knee etc. So here we discussed only several common injuries that can go on very frequently in any types of sport activities.

Sports injuries are classified under two categories on the basis of onset like acute, chronic and according to severity mild, moderate, severe. *Ayurveda Acharya* also explained various acute and chronic clinical conditions regarding *Shoola* (pain), *Shopha* (swelling), *Vrana* (wound) etc. Since sport injuries related to *Kora Sandhi* (hinge joint) are same as sports injuries at any joint or part of the body we included only most common sports injuries in this study. In all these sports injuries the common conditions observed are pain, swelling, inflammation, wound, strain and sprain, fracture, dislocation etc. we can interpret these conditions with *Shoola, Shopha, Vranashopha, Vrana, Snayugatavata, Kandabhagna* and *Sandhimukata* respectively and based on these the treatment protocol has been designed.

Pain is the first and foremost symptom seen in all kind of injuries, in modern sciences they advise analgesics, anti-inflammatory and steroids produces instant relief but prolong use of this causes several side effects as the age progresses like osteoarthritis, gout, osteoporosis etc, hence to avoid these complications we must follow *Ayurveda* protocol which is beneficial for sports person in any sports injuries. Pain is produced as a result of irritation to nerve ending, here *Vata* refers to *Vatavaha Sansthana* i.e. nervous system without irritation or involvement of this *Shoola* and *Ruja* cannot be produced. Treatment of *Shoola /Ruja* is categorized under 2 types these are *Shodhana* and *Shamana*. In *Shamana* therapy *Lepa, Alepa, Taila* etc. are used externally, where as single drugs, *Churna, Vati, Aasava* and *Arista, Kwatha, Gutika, Guggulu, Ras Aushdhi* etc. are used

internally while in *Shodhana* therapy *Snehana, Swedana, Basti, Agnikarma, Raktamokshana* is done. The best treatment for *Vata* is by *Taila (Shamana*) and *Basti (Shodhana*). By application of *Taila* it relives *Shoola/Vedana,* when we see the properties of this it has *Ushna* (heat), *Sthira* (stable), *Yonivishodhanam*, by *Ushna* quality it penetrates the skin there by producing sedative effect and *Yonivishodhanam* refers to it helps in eliminating the toxins pertaining to that region.

Depending on the cause of pain the appropriate medicine has to be choosed from above protocol.

Shopha resulting after sports injuries comes under *Aagantuja* type of *Shopha. Aagantuja Shopha* arises due to *Abhi* (trauma), *Bheda* (splitting of tissues), and *Kshata* (injury). Swelling will be hot in touch, red in color and will have similar symptoms as those of *Pittaj* and *Raktaj Shopha.* The commonly traumatic joint disorders are fracture, dislocation, strain, and sprain. In all such conditions initial complaint of sportsman will be pain associated with swelling with or without deformity. Pain and swelling are the primary sign and symptom of any kind of sports injuries.

While looking for a natural treatment to reduce swelling; we must go for *Ayurvedic* treatment. *Ayurveda* offers some excellent natural medicine and therapies such as *Ayurvedic* oil, *Lepa, Alepa* and massage that reduces swelling, pain and inflammation of joints. Many herbals have documented anti-inflammatory properties without side affect of commonly prescribed medications. Application of oil is the important because of the action of medicine is very fast, and can penetrate the skin layers. *Lepa* along with reducing pain and swelling also helps in proper healing of wound and management of its complications. So *Lepa* is highly useful in reducing the swelling and also to control the pain. In *Ayurveda, Alepa* is the first line of treatment advised for every *Shopha* due to *Raktaprasandana Karma* and hot potency (*Ushna Veerya*) of many *Lepas* (like *Manjisthadi Lepa*) help to penetrate into the local tissue that will dilation the peripheral vessels, thus resulting in venous dilation followed by increased peripheral arterial blood flow. This may be the reason for reduction of the swelling at the affected area. *Ushana Guna, Madhura Rasa* of the *Lepa Dravya* probably act as *Vata Shamaka*, thus result in reliving the pain , the *Madhura* and *Snigdha* properties of this act as anti inflammatory.

After *Alepa, Bandhana Karma* is advised in *Shopha* because it helps in *Shodhana* (purify by disinfecting), *Ropana* (healing) and stabilized the bones and joints.

The *Vranashopha* is described as earlier phase of *Vrana* (wound). *Sushruta* has mentioned detail description of inflammatory swelling under the heading of *Vranashopha* which has 3 stages. *Sushruta* explains sixty procedures for management of *Vranashopha* (inflammatory swelling) and *Vrana* (wound). Out of these first eleven from *Virechana* were mentioned for *Vranashopha* specially and rest other forty eight procedures were truly for *Vrana*. It is very important to know all about *Vranashopha* as treatment in this stage can prevent hazardous complications occur by infected wound. According to *Ayurveda* different kinds management are required in different stages of *Vranashopha* like in early stage (*Amawastha*) only rubbing (*Vimlapana*), olation (oil massage), application of medicated paste (*Alepa*), *Upanaha* (poultice), are needed while in suppurative stage (*Pakwawastha*) surgical procedure like incision (*Bhedana*) after this *Shodhana* (antiseptic measures), *Ropana* (healing measures), and *Vaikritapaha* (to restore normalcy to the scar) are required. When *Vranashopa* is not treated in proper way it is converted in to *Vrana* (wound) in chronic stage. Wounds are the result of injuries to the skin that disrupt the other soft tissue. Wound healing is a complex and protracted process of tissue repair and remodeling in response to injury. Various plants products have been used in treatment of wounds over the years. Wound healing herbal extracts promote blood clotting, fight infection, and accelerate the healing of wounds. Several herbal, mineral, and animal originated drugs are described in the *Ayurveda* for their *Vranaropaka* (wound healing) properties. Wound healing procedures described by *Sushruta* still holds its place today. The faster the wound healing, the faster is the recovery of the sport person enabling him to resume his daily routine. These included various purification therapies (*Shodhana*) and local applications (*Ropana*) of natural resources, which are available very easily and heal the wound faster without any sepsis.

Some *Ayurvedic* medicinal plants has described in *Ayurveda*, which have wound healing properties, for example Madhu has *Vranaropaka* properties as per the principles of the sixty *Upakaramas* of *Vrana* management described in the *Sushruta Samhita*. It has excellent properties to heal the wound by virtue of its *Sodhana* (purification), *Ropana* (healing), and *Sandhana* (union) actions. Even though healing is a natural process, it is

inhibited by various factors. Deranged *Doshas* cannot be treated with a single drug all the times. There fore number of herbal drugs having different properties has been described as *Vrana Shodhaka* and *Vrana Ropaka* Karma in the management of *Vrana.*

Shodhana has been two types, *Abhyantra Shodhana* (internal purification) included *Vamana, Virechana, Basti* and *Shirovirechana* while *Bahya Shodhana*(external purification) incorporated *Raktamokshana*, *Vrana Prakshalana, Vrana Pichu, Vrana Lepa,* and *Vrana Bast* these are also very essential in healing of *Vrana(*wound*). Ropana Karma* means to promote or quickens the healing process. At present the modern system of medicine could not find such *Karma* which promotes the process of healing except anti-infective and debriding agents, *Ropana* drugs has been used in the form of *Kalka, Kashaya, Varti, Ghrita, Taila, Churna* etc.

Fractures are incredibly common in sport, particularly in contact sports such as football, rugby etc. Stress fractures are also very common in sports which involve repetitive movements and forceful movements such as long distance runners' often suffer from stress fracture in the foot, wrists, and hands. Contact sports such as football or an activity which involve excessive stretching or falling can cause dislocations. The most common joints that are dislocated are the shoulder, fingers and hand. Elbows, knee can be dislocated but are less common. General symptoms presents in fractures include swelling, redness and pain.

Treatment generally depends on the fracture but rest is universally recognized as the most important form of treatment. Initially ice will usually be applied to the affected area; this will help to reduce swelling .anti inflammatory medication and pain relief will also be prescribed to ease pain and further reduce swelling. In many cases, the fractures bone will be immobilized for a period of time; this may involve having a plaster cast fitted, wearing a sling or using crutches it will allow minimum time to heal the fracture. Treatment depends on site of joint which has been dislocated and the severity of the injury. It might include manipulations to reposition your bones, medicine, a splint or sling, and rehabilitation. When all these are properly done than only the recovery of the joint will occur quickly. *Ayurveda* has mentioned different types of fracture and dislocations without any diagnostic interventions such as radiological investigations along with treatment according to severity of wound. *Sushruta* has explained 12 types of fracture and

6 types of dislocations which are same as modern orthopedic contexts. In addition to this he also divided these classifications according to the *Nidana* (etiology) of fracture such as fall, strike, compression etc. There is not only similarity of types of fracture and dislocations but principle of treatment is also same to that of modern era modalities. So we also used these modalities for the management of *Bhagna* which are very valuable and cost effective. *Acharya Sushruta* has mentioned four principles of skeletal injuries which are almost same as that of modern aspect of treatment like *Anchana Karma* which is very much similar to traction as modern aspect of treatment, *Pidana karma* which means manipulation is done by local pressure on the injured part so that nature of dislocation or fracture of joint part is examined properly**,** *Sankshepana karma* in which opposition and stabilization of dislocated and fractured part has been adjusted accurately and lastly *Bandana karma* has been done for immobilization of the injured part by applying or sprinkling various measures like use of different medicated *Lepa*, decoctions and oils followed by uses of splits to support the injured part for better results. In modern science also same procedure has been done with the help of modern techniques.

Acharya Sushruta has already described the treatment for fracture and dislocations of *Kora Sandhi*. We can interpret these treatments for fracture and dislocation of sports injuries. A dislocation of (*Kurpara Sandhi*) elbow joint should be first rubbed with the thumb, after which it should be pressed with a view to set it in its right place by fixing and expanding the same. After that the affected part should be sprinkled over with any oleaginous substance. The same measures are also adopted in the case of a dislocation of the knee joint (*Janu Sandhi*), the ankle joint (*Gulpha Sandhi*) and the wrist joint (*Mani-Bandha*). In case of the phalanx fracture or dislocation, it should be first set in its natural position and bandaged with pieces of thin linen and should be then sprinkled with ghee. This ancient method resembles with modern management, in which the affected part is supported by bandaging it along with a splint or adjoining finger. One of the main advantages of *Ayurvedic* treatment for bone fracture and dislocation is it's both external and internal use of different herbal medicines in various forms, such as paste, barks, decoctions, *Ghritas*, oil form etc, which shows enormous results in reducing pain, healing wounds, and re-joining the fractured bones. *Chakra Taila, Ghandha Taila* oil massage therapies are also a popular method adopted in *Ayurveda*, in shaping the bones back to

their original from and *Panchkarma* has been also given depending on the conditions of the patient. The sports man is advised to consume *Shali* rice, meat soup, milk, ghee, pea soup and weight promoting food and liquids. This is not only nourishes the body but also bestow sturdiness to the joints. *Sushruta* has been also explained various types of bandage like *Swastika*, *Anuvellita*, *Kosha* etc. in fracture or in dislocation of joints. *Acharya Sushruta's* line of treatment is very much similar to the modern treatment which is practiced today.

There are also different types of tendon, nerve, and ligament injuries in sports like Golfer's elbow, tennis elbow, carpal tunnel syndrome, ankle sprain, and wrist sprain etc. which shows common symptoms resembling pain, swelling, redness etc. In ayurveda all these symptoms or conditions has been occur due to vitiation of *Vata* named as *Snayugatavata*. It has been occurred due to *Atichehsta, Ativayayama*, i.e. injuries due to overuse or over exercise. In *Snayugatavata*, *Snehana, Upnaha, Agnikarama,* and *Bandhana* has been done simultaneously. *Snehana* followed by *Upanaha* followed by *Agnikaram* it is best remedy for reducing pain and finally *Bandhan* is done to stabilize the injured body component.

In classics to avoid injury some principle treatment are also explained by which physical and psychological fitness of sports person ensured. In *Ayurveda* we have some concepts like *Rasayan*, *Aahar*, *Abhayanga*, yoga for improving the strength and immunity of every individual due to which injuries may be minimized or avoided. These therapies have important role in before, during and after sports injuries as these therapies keep the body strong physically and spiritually to avoid or fight against any sport injury.

SIGNIFICANCE OF *RASAYANA* IN SPORTS

Rasayana has anti-oxidant property and removes free radicals and has a major role in preventing complications of post injury. In sports injuries the physical and mental fitness of the person will be impaired which affect the natural performance of the sport person. So to get rid from injuries or fitness one must use *Rasayan* therapy. *Rasayan* therapy is a boon to mankind. Different *Rasayana* like *Naimittik, Aachar* and *Kutipraveshik etc.* has been explained in the classics, which are responsible for

Vyasdhikshamtav (immunity) of the body. Apart from this it has been also shown its utility in provide proper nutrition to each tissue, gives strength to the *Srotas* or channels in the body, normalized the *Doshas* in the body, increase *Ojas (*mental strength*)*, physical strength of the body, maintaining the *Satva* quality of mind and improves durability as well as quality of the life so to enchase fitness of body and mind we must consume *Rasayana* or rejuvenation therapy. Herbal drugs like *Aswagandha, Satavari, Kushmanda, Vidarighnada* etc. by its *Rasayana* properties produces *Shresta/Preshasta Bhava* of *Rasadi Dhatu*, prevents the aggravation or vitiation of *Vata* and also due to its anti-oxidant properties they help in scavenging the free radicals produced during physical activities, thus increase the metabolic rate of the body.

SIGNIFICANCE OF *AAHARA* IN SPORTS

In case of sportsman nutritious diet plays an important role in their performance. During sports training, the energy requirement of the players is relatively high therefore the diet should be accordingly planned otherwise the players will shows the signs of fatigue which may result in internal and external injuries to the players. Sport person must need a balanced food to maintain their stamina. Good food habit provides them energy to perform their activities in a better way. The relation between diet and *Bala* is already well explained in the *Ayurvedic* classics. *Ahara Sampata* is described as one of the *Bala Vridhikara* and *Sharir Vridhikara Bhava*. Either vegetarian or mixed type of diet if it digested properly can produce strength in the body. Different types of *Ahara Varga* have been described in *Ayurvedic* classics. *Acharyas* have mentioned *Pathya-Apathya* concerning conditions of *Vrana, Bhagna, Shotha* etc. If *Pathya* is followed it helps in speedy recovery, where as *Apathya* delays recovery. In injuries there is *Dhatukshya* so intake of *Dhatuposhaka Ahara* helps in recovery of injuries. Every sportsman should take *Aahara* according to its own *Parkariti*. Ayurveda gives comprehensive descriptions of food substances which increases muscle mass and physical ability. In *Ayurveda* Nutritious food should be taken according to eight factors such as nature of food, processing of food, combination, quantity, place, time dietetic rules and constitution i.e. genetic makeup. An *Ayurvedic* practitioner can play significant role in developing a detailed nutritional plan which will support these eight factors in accordance with the individual goals.

SIGNIFICANCE OF *ABHAYANGA* IN SPORTS

In sports injuries major affected body structures are muscles, nerves, tendons, ligaments etc. hence to increase the strength of all these components *Abhayanga* plays a prime role. By *Abhayanga* one attains strength, stability flexibility to muscles, nerves, tendons, ligaments etc. So every sports person must apply *Abhayanga* regular way for muscles sprain, muscles fatigue, improve mental concentration and fast recovery of damage.

SIGNIFICANCE OF *YOGA* IN SPORTS

Yoga focuses on harmony between mind and body. *Yoga* consists of various movements, breath techniques, postures of relaxation and mediation in order to establish a healthy, lively and balanced approach to life. *Yoga* plays an important role in games and sports also. *Yoga* improves near about all physical fitness and wellness components required by sportsman. *Yoga* works on strength, flexibility, balance, agility, endurance, core, stability, recovery and overall strength, among other things. *Yoga* is able to mobilize joints, stretch tissue and ligaments, tone muscles, bring flexibility to the spine and strengthen internal organs. *Yoga* exercises are based on the formula of stretching, relaxation, deep breathing, and increasing circulation and can play a key role in cultivating mind control and concentration which helps a sportsperson to perform at their peak level. Many *Yoga* poses has been explained in this dissertation related to *Kora Sandhi* for their strengthening.

The management protocol is designed for "2"purpose one is *Prakritisthapana* i.e. regaining physical fitness of sports person and send him back to the field as early as possible, meanwhile the other is to evaluate the effect of management principle of *Ayurveda* in various sports injuries. *Ayurveda* has very effective remedies that can either be used principally or as a supportive therapy in numerous orthopedic problems encountered by sports persons. One therapy is known as *Marma* Point Therapy. The use of pressure points called *Marma* forms an important part of this therapy in *Ayurveda*. Just as acupuncture points are used by Chinese medicine, *Marma* points are used by *Ayurvedic* physicians to heal, and support strength. *Ayurveda* also has very simple herbal formulations that can hasten the process of recuperation after a surgery, rehabilitation of an injured muscle, bone, performance

levels. For enhancing the physical power of a person, *Ayurveda* offers herbal supplement support. *Ayurvedic* herbal formulas are said to have components that can enhance the performance level. These were widely used in ancient times by warriors to enhance their performance during war as well as from getting tired easily. Some of these are *Mahakashaya Brimhaneeya Dasaimani* (Muscle builder), *Jeevaneeya Dasaimani* (Vitiliser) *Balakara Dasaimani* (Promotes strength) and *Sramahara Dasaimani* (Promotes cheer). These formulas are non-steroidal and probably act by increasing the secretion of the biological hormones and enzymes in the body.

Sports injuries happen in any joint or part of the body during sports activities shows same common symptoms like pain, swelling, spasm, fracture etc. Only the name of injury may differ according to structures involved, name of the sports or common site of injury in particular sports like tennis elbow, golfers knee etc. So here we discussed only several common injuries that can go on very frequently in any types of sport activities. In this dissertation I discussed only about the common sports injuries related to joints like *Shoola, Shopha, Vranashopha, Vrana, Kandabhana, Sandhimukta, Snayugata Vata* etc. occur during any sports activities and its management on the basis of *Ayurveda* knowledge explained in *Samhita* and relevant *Ayurveda* literature.

Protocol for *Ayurvedic* Management of Sports Injuries

Treatment protocols in Ayurvedic sports medicine include 5 main aims-

vi. Management of injuries
vii. Rehabilitation of injuries
viii. Active mobilization
ix. Passive mobilization
x. Strengthening

E. **Management of *Shoola* (Pain due to External Injuries)**

External Therapies for *Shoola*

Sr. No.	Type of Therapies	Name of The Drugs
1	***Taila***	1. *ErendaTaila* 2. *Shoolgajendra Taila*
2	***Lepa***	1. *Hingwadi Lepa,* 2. *Rajikadi Lepa*, 3. *Tila Gutika Lepa*

Internal Therapies for *Shoola*

Sr. No.	Type of Therapies	Name of The Drugs	
1.	**Single drugs**	1. *Pippali*	6. *Ajamoda*
		2. *Ajaganda*	7. *Ajaji*
		3. *Gandir*	8. *Root* of *Pippali*
		4. *Chavya*	9. *Chitraka*
		5. *Srigavera*	10. *Gandira*

2.	***Churnas***	1. *Sankha Curna* 4. *Mustadi churna* 2. *Narach Churna,* 5. *Haritki Khanda* 3. *Tumburyadh*
3.	***Vati /Gutika***	1. *Sankha Vati*, 3. *Shoola Vajrani Vati* 2. *Suraprabha Vati* 4. *Tiladi Gutika*
4.	***Kashaya***	1. *Baladi Kwatha*, 3. *Patoladi Kwath* 2. *Dasmoola Kwath*
5.	***Rasaushadhi***	1. *Shoolgajkeshri Ras* 2. *Triphla Loham*

F. Management of *Shopha*

External Therapies for *Shopha*

Sr. No.	**Type of Therapies**	**Name of The Drugs**
1	***Taila***	1. *Shodhshardul Taila* 3. *Panchmoola Taila* 2. *Punarnvadi Taila* 4. *Sushakmool Taila*
2	***Lepa***	1. *Nyugrayadi Lepa* 3. *Dashanga Lepa* 2. *Darviyadi Lepa*

Internal Therapies for *Shopha*

Sr. No.	**Type of Therapies**	**Name of The Drugs**		
1	**Single Drugs**	1. *Agnimantha*	6. *Shakotaka*	11. *Prisniparni*
		2. *Patla*	7. *Syonaka*	12. *Salaparni*
		3. *Gambhari*	8. *Bilva*	13. *Brahati*
		4. *Mankanda,*	9. *Kantakarika*	14. *Kantakarika*

		5. *Bilva* 10. *Kasmarya*
2	***Churnas***	1. *Pippalyadi Churna* 4. *Shothadi churna* 2. *Dasmoola Haritaki* 5. *Punrnvadi churna* 3. *Shodhshardul Churna*
3	***Vati /Gutika***	1. *Dugdha Vati* 3. *Takra Vati* 2. *Kshira Vati,* 4. *Gudadi vatika*
4	***Kashya***	1. *Dhanwantram Kwatha* 4. *Dasmoola Kwatha* 2. *Triphaladi Kwatha* 5. *Punarnvastka Kwatha* 3. *Phaltrikadi Kwath*
5	***Asav- arishta***	1. *Vasavasava*, 3. *Abhyarista* 2. *Punarnvasava* 4. *Punarnvadharista*
6	***Rasausdhi***	1. *Shodhari Loha* 3. *Shophari Ras* 2. *Shodhari Rasa*

Treatment of *Vranashopha*-

8. *Vimlapana* (softening by kneading with fingers)
9. *Avasechana* (bloodletting)
10. *Upanaha* (warm poultices)
11. *Patana* (incising)
12. *Shodhana* (cleaning)
13. *Ropana* (healing)
14. *Vaikritapaha* (moving/warding off the abnormalities)

G. ***Vrana (*wound)**

External Therapies for *Vrana*

Sr. No.	Type of Therapies	Name of The Drugs
1	***Taila***	1. *Nirgundi Taila* 2. *Durvadi Taila* 3. *Tiktadi Taila* 4. *Angaraka Taila* 5. *Chakra Taila* 6. *Nimba Taila*
2	***Ghrita***	1. *Jatayadi Ghrita* 2. *Goradham Ghrita* 3. *Karpura Ghrita*
3	***Lepa***	1. *Manashiladi Lepa* 2. *Paradadi Malahar* 3. *Panchvalkal Lepa* 4. *Nimbaptra Lepa* 5 .*Dhasanga Lepa* 6. *Sarivamola Lepa,*
4	***Churna***	1. *Laksha Churna* 2. *Nimbaptra Churna* 3. *Manjisthachurna*

Internal Therapies for *Vrana*

Sr. No.	Type of Therapies	Name of The Drugs
1	**Signal drugs**	*1. Tulsi* *2. Vetus* *3. Kranja* 4. Turmeric 5. *Devdaru* 6. *Kadamba* *7. Neem*
3	***Guggulu***	1. *Vidhangadi Guggulu* 2. *Vatak Gugglu* 3. *Saptvinshtiko Guggulu* 4. *Amritadi Guggulu* 5. *Vidangadi Guggulu*

H. **Management of *Bhagna***

External Therapies for *Bhagna*

Sr. No.	Type of Therapy	Name of The Drugs
1	***Taila***	1. *Chakra Taila* 4. *Gandha Taila* 2. *Bhagnsandhana Taila* 5. *Gandhaprasarini Taila* 3. *Agarvadi Taila*
2	***Lepa***	1. *Manjisthadi Lepa*

Internal Therapies for *Bhagna*

Sr. No.	Type of Therapies	Name of The Drugs
1	**Single drugs**	1. *Madhuka* 6. *Madhuparni,* 2. *Prisniparni* 7. *Ambasthaki,* 3. *Samnga* 8. *Mocharasa,* 4. *Dhataki* 9. *Lodhra,* 5. *Priyangu* 10. *Kataphala*
2	***Churnas***	1. *Asthisanharadi Churna* 3. *Ashwagandha Churna* 2. *Chaturbhadra Curna*
3	***Guggulu***	1. *Abha Guggulu* 2. *Laksha Guggulu*
4	***Yogas***	1. *Rasonadi Yoga* 3. *Gristkshira Yoga* 2. *Abhadi Yoga*

Treatment of *Kora Sandhi* dislocation

In cases Dislocation of the elbow joint (*Kurpar Sandhi*) knee joint (*Janu Sandhi*), the ankle joint (*Gulpha Sandhi*) and the wrist joint (*Mani-Bandha*) following procedure should be apply one after another respectively.

- The joint should be first rubbed with the thumb.

- It should be pressed with a view to set it in its right place by fixing and expanding the same.
- After that the affected part should be sprinkled over with any oleaginous substance.
- In case of the phalanx fracture or dislocation, it should be first set in its natural position and bandaged with pieces of thin linen and should be then sprinkled with ghee.

***Pathya-Apathya*:**

A fractured patient must avoid the use of *amla Lavana*, *KatuRasa*, and *Kshara* and should follow the strictest continence, avoid over exposure to sun and physical exercises.

Doses of *Ayurvedic* formulation

Sr. No.	**Type of Drugs**	**Dose**	***Anupana***
1	Single herbal drugs	3-5 gm BD	Warm water or honey
2	*Churna*	3-5 gm BD	Warm water honey
3	*Guggulu*	400-500 mg TDS	Warm water
4	*Rasausdhi*	250-500 mg BD	Honey
5	*Asav-arista*	5-20 ml BD	Equal quantity of water
6	*Kashya*	30-40 ml BD	Water
7	*Vati/gutika*	2-3 *Vati* BD	Warm water

I. Treatment of *Snayugata Vata*

Snehana, *Upanaha*, *Agnikarma*, *BandhanA, Agnikarma* etc.

J. Regular procedures for wellbeing of sport person

1. ***Abhyanga*** **(Massage)**

a) *Udvartana,* b) *Udgharshana,* c) *Utsadana,* d) *Mardana*&*Unmardana,* e) *Samvahana* , f) *Padabhyanga,* g) *Peedana* and *Avapeedana*, h) *Udveshtana*&*Upaveshtana*.

2. Rasayana **Therapy**

Aachara rasayana, Kuti Praveshika Rasayana, *Rasayana* drugs**-** *Ashwgnada* (withania somnifera), *Musali* (asoaragys adscebdes), *Sheerini* (mimusps hexandra), *Ala*(sida cordifolia), *Vidari* (pueraria tuberose), *Kushmanda* (beninean sahispida), *Shalaparani* (desmodium ganetica), *Khajura* (phoenix sylvestric), *Amra* (manzifera indica), *Kadali* (musa paradisiacal), *Amalaki, Madooka parni, Shatavari, Lashuna, Vacha, Bhallataka, Pippali, Haritaki, Guduchi, Bhibitaki* etc. There are some mineral drugs like *Shilajatu* (bituman), *Abhraka* (mica), *Loha*, *Tamra* (copper),

5. ***Aahar*****(Diet)**

Mamsavardhaka, *Asthiposhak*, *Majjavardhak*,

6. *Yoga*

Techniques of Wrist joint Strengthening by *yoga.*

Urdhva Hastasana	*Urdhva Baddhaguliyasana*
Ardha Parshva Hastasana	*Bhujangasnaat* The Wall
Bharadvajasana	Hands And Knee Pose
Bakasana (*Crow Pose)*	*Mayurasana (Peacock Pose)*
*Adhomukha Vrksansana (*Handstand)	*Vasisthasana (*Side Plank Pose)

Ankle joint strengthening by *Yoga*

Ustrasana (camel pose)	*Utkatasana* (chair pose*)*
Garudasana (Eagle pose)	*Malasana (*Garland Pose)
*Ardha Chandrasana (*Half Moon Pose)	*Virasana (*hero pose)
Natarajasana (Lotus Of The Dance Pose)	*Vrksasana (*Tree Pose)

*Virasana (*Reclining hero pose)	*Talasana (*Scale Pose)

Elbow joint strengthening by *Yoga*

Side plank	*Trikonasana*
Garudasana	Cow –face pose arms
Cobra pose	*Adho Mukha Savanasana*

Knee Joint Strengthening by *Yoga*

Padangusthasna Big Toe Pose	*Baddha Konsasana (*Bound Ankle Pose)
Setu Bandha Sarvangansana (Bridge Pose)	*Sukhasana (*Easy Pose)
*Malasana (*Garland Pose)	*Utthita Trikonsana (*Extended Triangle Pose)
*Ardha Bhekasana (*Half Frog Pose)	*Ardha Chandrasana (*Half Moon Pose)
*VirasanaheronposeKrounchasana (*HeroPose)	*Uttanasana (*Standing Forward Bend)
Upavistha Konsana (Wide- Angle Seated Forward Bend)	*Makrasana,Tadasana.Veerasana,Bhujangasna*

Interphalangeal joint strengthening by *Yoga*

Salbhasana	*Ahdo Mukha Urksana*
Kapotasana	*Urdhva Dhanursana*
Parsva Bakasana	*Eka Pada Koundiyanasa*

CONCLUSION

On the completion of any work the achievements as well as the drawbacks have to be narrated. These can be placed under the umbrella of the conclusion or the *Nishkarsha.* Conclusion is the essence of any study, thus any research work is to be completed by giving a final conclusion which reflects the work accomplished as well as paves the path for further works.

After such vivid and explicit discussion on whole work can be concluded as follows-

- As per classics we concluded *Kora Sandhi* as hinge joints in contemporary sciences based on its movement in uniaxial plane are included in *Kora Sandhi* with exception of wrist joint, metacarpophalangeal and metatarsophalangeal joint as it has movement in biaxial plane. Meanwhile as per *Ayurveda* these joints are also included under *Kora Sandhi* on the basis of its structure and more common or trendy movement.
- *Kora Sandhi* are more prone to sports injuries due to limitation of movement of joint (only in uniaxial plane), due to over stretching, movement of *Kora Sandhi* other than its own axis and maximum numbers of *Kora Sandhi* are present mainly in upper and lower extremity which are mainly involved during utmost sports activity.
- Location of *Marma* points at the region of *Kora Sandhi* makes its more vulnerable to sports injuries. Among *Kora Sandhi* all are included in *Sandhi Marma* except *Anguli Sandhi* and its *Viddha Lakshana* are quite dangerous like pain, swelling, fracture, deformities etc. which similar to that of symptoms of sports injuries. As these vital areas are prone to maximum injuries and also there are common symptoms or injuries occur during sports activity, management protocol is designed to protect, manage and maintain all these vital areas during and after sports injuries.
- The concept of sports injuries is mentioned and explained in our classics in the form of conditions like *Abhighataja Shoola, Shopha, Vranashopha, Vrana, Kandbhagna, Sandhimukta, Snayugata Vata* etc. These are nothing but the common sports injuries happen during maximum number of sports activities.

- Management protocol is designed in the form of external therapy, internal therapy and miscellaneous therapies on the basis of availability, necessity, variety and efficiency.
- In external therapies, *Taila, Lepa, Aalepa* and various modalities of *Panchkrama* therapy are included. *Lepa* are mainly use for *Shopha, Bhagna, Shoola* while *Taila* are use for its *Shoolahara* properties. *Panchkarma* therapy in the form of *Snehana*, *Swedana* and various type of *Basti* are included in protocol for purification of whole body of sports person due to its *Shamana* and *Shodhana* properties.
- Internal therapies, consist of herbal formulation like drugs having properties of *Tikta, Kshaya Rasa, Shothahara, Shoolahara, Vranashodhaka, Vranaropka, Vranashophahara, Asthisandhaniya* are considered in management of different types of sports injuries.
- In miscellaneous therapies, special emphasis is given on *Rasayana*, *Yoga*, exercise, *Abhaynga* and diet as daily regimen of sports person. As these maintain the stamina and physical and psychological health due to the regular practices of *Yoga* and exercise, occurrence of injuries become less due to the flexibility, fitness provided by *Yoga* and *Abhaynga*. *Rasayana* provide the advance immunity and nutritious diet is prime importance for sports person. Para surgical procedures like *Agnikarama, Raktamokshana, Bandhana* are also included as it reduces inflammation, alleviates pain, tenderness and promote healing process.
- Thus, we can conclude that *Ayurveda* incorporate several principles, concepts and therapy that can be efficiently used for improving sports medicine along with contemporary science. The collaboration of *Ayurveda* with modern medicine can develop An advance branch of sports medicine to maintain overall health (physical and psychological) of sport person in a more natural and effective way for rehabilitation of sport person.

Further scope

- There is description of only *Kora Sandhi* in this dissertation. Description of *Sandhi* other than *Kora Sandhi* in whole body may be studied in purview of sports injury.

- There may be clinical trial of management protocol of sports injuries with special reference to *Shoola, Shopha, Vranashopha, Vrana, Kandabhagna,* and *Sandhimukta.*
- If this management protocol is conjoined with modern treatment its evidence based clinical trial may be more valuable in coming era.

BIBLIOGRAPHY

1. *Abhinava Shareeram* Pandit Damodar Sharma Gaur: 1st ed. Shri Baidyanath Ayurved Bhavan Pvt. Ltd., Calcutta, 1964.
2. Agni Purana - Acharya Baldevopadhyaya - Chowkhambha Sanskrita Series, Varanasi-1, 1966
3. Amarkosha - Shri Amar Singh - Chowkhambha Sanskrita Series, Varanasi-L, 1971
4. *Ashtanga Hridaya* of *Vagbhatta* edited with *'Nirmala' Hindi* commentary by Dr. Brahmanand Tripathi, Chaukhambha Sanskrit Pratisthan, Delhi, Reprint 2009.
5. *Ashtanga Hridaya* of *Vagbhatta* with the commentaries *Sarvangasundara* of Arundutta & Ayurved Rasayana of Hemadri edited by Pt. Bhisagacharya Hari Shadashiv Shastri Paradkar Vaidya,Chaukhamba Surbharati Prakashan , Varanasi, Reprint 2007.
6. *Ashtanga Samgraha* of *Vagabhatta* edited by Pandit Lalchandra Shastri Vaidya, Shri Vaidyanath Ayurveda Bhawan, Nagpur, 1st edition, 1989.
7. *Ashtanga Samgraha* of *Vagabhatta* with the *Shashilekha Sanskrit* commentary edited by Indu Chowkhambha Sanskrit Series office.
8. Atharvaveda - Shriram Sharma Acharya - Sanskrita Sansthana, Bareli, 2001
9. *Bhaishajya Ratnavali*, Commentary by Ambika Dutta Shastri,16th Ed., Chaukhambha Sanskrit Sansthan, Varanasi (India), 2002
10. *Bhavprakash, Bhav Mishra*5th ed. Vidyotini Commentary by Brahma Shankar Shastri, Chaukhamba Sanskrit Series, Varanasi, 1969.
11. *Bhela Samhita* of *Aacharya Bhela* edited by Shri Girija Dayal Shukla, Chaumkhambha Vidya Bhavan, 1st edition, 1969.
12. *Charak Samhita* with '*Ayurvedadipika*' sanskrit commentary by Sri Chakrapanidutta, '*Tattvaprakasin*i' hindi commentary of 'Ayurvedadipika' and on some places hindi commentary of *'Jalpakalpataru*' of Gangadhar edited by Dr. Lakshmidhar Dwivedi part 1&2 , Published by Chowkhambha Krisnadas Academy , Varanasi.

13. *Charak Samhita* with *Charak Chandrika* Hindi commentary by Pt. Dr. Brhamnand Tripathi foreword by Dr. Ganga Sahay Pandey part 1 , Published by Chaukhamba Surbharati Prakashan , Varanasi.
14. *Charak Samhita* with *Charak Chandrika* Hindi commentary by Pt. Dr. Brhamnand Tripathi foreword by Dr. Prabhakar Deshapande Part 2, Published by Chukhamba Surbharati Prakashan , Varanasi.
15. *Charaka Samhita* (text with English transtation)- Prof. P.V. Sharma, Chaukhambha Crientalia, Varanasi, 1st edition, 1981.
16. *Charaka Samhita* of A*gnivesha* revised by Charaka & supplemented by Dridhabala with Ayurveda Dipika commentary by Chakrapanidatta edited by Vaidya Yadavaji Trikaji Acharya, Chukahmba Surbharati Prakashan Varanasi, Reprint 2009.
17. *Charaka Samhita* with Vidyotini hindi commentary by Pt. Kashinath Shastri & Dr. Gorakhanatha Chaturvedi, Part-1&2, Published by Chaukhambha Bharti Academy Edition 1996.
18. Clinical Sports Medicine –Peter Brukner and Karim Khan, 3rd Edition, 2008
19. Clinical Anatomy - Richard S. Snell - Lippicott Williams & Wilkins, 8"Edition, 2010
20. Clinical Oriented Anatomy - Keith L. Moore - Sixth Edition, Lippicott Williams and Wilkins
21. Cunninghams Manual of Practical Anatomy - G.J. Romanese - Oxford University Press, 2005
22. *Dravyaguna Vijnana*, by Dr. Gyanendra Pandey, Vol. (I,II,III),2nd edition, Chaukhambha Krishnadas Academy Varanasi, 2002
23. *Dravyaguna Vijnana*, Illustrated by Dr. J.L.N.Sastry, Vol. II, 1st edition, Chaukhamba Orientalia, Varanasi. 2010
24. *Dravyaguna Vijnana*, by Yadavji Trikamji Acharya, part 2, 4th Ed., Shri sharma Ayurveda Mandir publication, Varanasi, 1986
25. *Dravyaguna Vijnana*, P.V.Sharma, Vol.II, 13th Ed.,Chaukhambha Bharati Academy, Varanasi,1992

26. Derek Armfield MD; Patrick J. McMahon MD, editor;Current Diagnosis &Treatment in Sports Medicine, 1st Edition; McGraw-Hill. 2007.
27. Domhnall McAuley, Thomas M Best, editor; Evidence-based Sports Medicine, London, BMJ Books, 2002.
28. Essentials of Medical Physiology - Third Edition, (K. Sembulingam & Prema Sembulingam) - Jaypee Brothers Medical Publishers (P) Ltd. New Delhi.
29. Evidence Based Sports Medicine- Domhnall Macanley & Thoms M. Best-Bmj Books
30. Gray's Anatomy – the anatomical basis of medicine and surgery,PL Williams, Bannister LH, Berry MM Collins P, Dussek JE, Ferguson MWJ. (eds) :38th ed. New York, Churchill Livingstone, 1995
31. *Harita Samhita* : C.D. Published by Maharshi Ayurveda.
32. Human Anatomy; Regional and Applied Dissection and Clinical, Volume 2, ed.Fifth 2010, B.D. Chaurasia; CBS Publishers and Distributors Pvt. Ltd, New Delhi.
33. *Kashyapa Sahmhita* of *Vriddha Jivaka* revised by Vatsya with Sanskrit Intoducation by Pandit Hemaraja Sharma, Chaukhamba Sanskrit Series, 2002
34. *Manav Sharir Rachana by* Prof. D.G. Thatte, 1st ed. Ayurved and Unani Tibbi Academy, Lucknow.
35. Medical Dictionary, 23rd edition, Williams and Witkins com., Stedman, Calcutta, Indian Reprint III, 1982
36. Pratyaksha Sharir Kosh - S.C.Sengupta - Hindi Sahitya Sammelan, Prayag , 1942
37. Pratyaksha Sharir(Hindi) - Gananath Sen - Chowkhambha Sanskrita Series, Varanasi-1, 1971
38. Pratyaksha Sharir (Sanskrit) - Gananath Sen - Chowkhambha Krishnadas Academy 2007
39. Rigaveda - Acharya Gopal Prasad Kausik - Ganga Book Dipo Ghiyamandi Mathura 1969
40. Sangyapanchak Vimarsh - Gananath Sen- Kalpataru Palace, 1931
41. Sanskrita Shabdarth Kaustumbh - Shri Dwaraka Prasad Sharma - L' Edition, 1928

42. Shabdakalpadrum - Shri Varada Prasad -Chowkhambha Sanskrita Series, Varanasi-1, 1961
43. Shabdastoma Mahanidhi-Shri Taranath Bhattacharya - Chowkhambha Sanskrita Series, Varanasi-1, 1967
44. *Sharangadhara samhita* of *Sharangadhara* with the commentaries Aadhamallas dipikas And kasiramas gudhartha-dipika edited by Pt. Parashuramshatri Vidyasagar, introduction by Prof. C.B. Jha, 1st edition, published by Chaukhamba Surbharati Prakashan, Varanasi.2006
45. *Shararngadhara Samhita* of *Sharngadhar* edited with Jiwanprada hindi Commentary by Dr. Smt. Shailaja Srivastava, Chaukhambha Orientalia Varanasi, 2nd Edition 1998
46. Sharir Kriya - Vaidya Ranjit Ray Desai - Shri Vaidyanath Ayurved Bhavan, Nagpur, 5"Edition 34.Sushruta Samhita - Dalhan Teeka - 6" Edition, 1997
47. Sports injuries hand book diagnosis and management – Christer Rolf A & C Black 1st Edition , 2007
48. *Sushrut Samhita Sharir Sthanam, hindi commentaty Ayurved Rahasya Deepika by* Dr Bhaskar Govind Ghaneka,: reprint 1998, Mehar Chand Lachmandas Publication, New Delhi.
49. *Sushruta Samhita* of *Sushruta* with Ayurveda Tatva Sandipika hindi commentary by kaviraja Ambika Dutta Shastri, Chaukhambha Sanskrit Sansthan Varanasi, Part 1-2 9th edition 1995.
50. *Sushruta Samhita of Sushruta* with the Nibhandhasangraha commentary of Sri Dalhanacharya and the 'Nyayachandrika Panjika' of Sri Gayadasacharya on Nidanasthana edited by Vaidya Yadavji Trikamji Acharya, Chaukhamba Surbharati Prakashan, Varanasi.2012
51. Upanishad - Pt. Sriram Sharma Acharya - Brahmavarchas Shantikunj Haridwar Uttranchal, 2002
52. Vachaspatyam - Shri Taranath - Chowkhambha Sanskrita Sers: Varanasi- L, 1962
53. *Vaidhya Shabdasindhu*, Chowkhambha Sanskrit Series, Varanasi.
54. Yoga for sports: a journey towards health and healing. - BKS Lyengar 2015.

Dr. Sarvepalli Radhakrishnan Rajasthan Ayurved University, Jodhpur, 2017.