Therapeutic Role of Ayurveda in Sports Injuries of *Janu Sandhi* (Knee Joint)

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ABSTRACT

The musculoskeletal system, also known as the locomotor system, is responsible for providing support, stability, and movement to the human body through the coordinated functioning of bones, muscles, joints, ligaments, tendons, cartilage, and associated connective tissues. Among all joints, the knee joint plays a crucial role in weight-bearing activities and locomotion, including walking, running, and jumping. Due to its complex anatomical structure and continuous mechanical stress, the knee joint is highly susceptible to sports-related injuries such as sprains, ligament tears, fractures, and dislocations.

In Ayurveda, the knee joint is described as *Janu Sandhi* and is considered an important *Marma* region formed by the union of *Mamsa* (muscle), *Asthi* (bone), *Sandhi* (joint), *Sira* (vessels), and *Snayu* (ligaments/tendons). Participation in outdoor sports and strenuous physical activities further increases the risk of musculoskeletal injuries involving the knee joint. Ayurveda offers a holistic and cost-effective approach for the prevention, management, and rehabilitation of such injuries through various therapeutic modalities including *Snehana* (oleation therapy), *Swedana* (sudation therapy), *Janu Basti*, and other *Panchakarma* procedures. These therapies help in reducing pain, inflammation, stiffness, and improving joint stability and functional recovery.

The present review aims to explore the anatomical, clinical, and Ayurvedic perspectives of sports-related knee joint injuries and to evaluate the role of Ayurvedic therapeutic interventions in their management. Information for this review was collected from classical Ayurvedic texts, modern anatomical literature, and published scientific sources related to sports medicine and musculoskeletal disorders. The study highlights that Ayurvedic therapies, herbal formulations, Yoga, and Rasayana Chikitsa may play an important role in pain management, tissue healing, rehabilitation, and enhancement of musculoskeletal strength. An integrative approach involving Ayurveda and modern rehabilitation techniques may provide effective, safe, and economical management for sports injuries of the knee joint.

Keywords: Ayurveda, *Janu Sandhi*, Knee Joint, Sports Injuries, Musculoskeletal Disorders, *Snehana*, *Swedana*, *Janu Basti*.

INTRODUCTION

The musculoskeletal system, also known as the locomotor system, is responsible for providing structural support, stability, and movement to the human body. It comprises bones, muscles, joints, cartilage, tendons, ligaments, and other connective tissues that work in coordination to facilitate body movements. Although bones form the structural framework and provide leverage, movement is produced by the alternate contraction and relaxation of muscles. The integrated functioning of these structures is essential for maintaining posture, mobility, and physical performance.

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Among all joints, the knee joint is one of the most important and mechanically stressed joints of the body. It plays a vital role in weight-bearing activities and locomotion, including walking, running, jumping, and other athletic movements. Due to its complex anatomical structure and continuous exposure to mechanical stress, the knee joint is highly susceptible to sports-related injuries. According to World Health Organization (WHO) statistical data, the knee joint accounts for a major proportion of sports injuries, with an incidence rate reported to be approximately 65%. these injuries represent a significant concern in sports medicine and athletic rehabilitation.

METHODOLOGY

Ayurvedic review

In Ayurveda, the knee joint is referred to as *Janu Sandhi* and is considered an important *Marma* (vital anatomical site). Acharya Sushruta described *Sandhi* as the site of union of bones and classified joints into eight different types, namely *Kora, Ulukhala, Samudga, Pratara, Tunasevani, Vayastunda, Mandala,* and *Shankhavarta*. Among these, *Janu Sandhi* is categorized under *Kora Sandhi*. The term *Janu* denotes the junction between *Janga* (leg) and *Uru* (thigh).

Furthermore, *Janu Marma* is considered a vital point formed by the union of *Mamsa* (muscle), *Asthi* (bone), *Sandhi* (joint), *Sira* (vessels), and *Snayu* (ligaments/tendons). Injury to this region may result in severe functional impairment, including *Khanjata* (difficulty in walking or limping).Therefore, the protection, prevention, and management of knee joint injuries hold significant importance in both modern medicine and Ayurveda.

Modern review

The knee joint is the largest and one of the most superficial joints of the human body. Anatomically, it is classified as a compound synovial hinge joint that primarily permits flexion and extension movements, which are essential for daily activities such as standing, walking, running, climbing, and squatting. In addition to hinge movements, the knee joint also allows limited rotational and gliding movements, contributing to its functional versatility and mobility.

The knee joint is designed to provide both mobility and stability; however, this high degree of mobility also makes it highly vulnerable to injuries, particularly during contact and non-contact sports activities. Due to its complex anatomical structure and significant weight-bearing function, the knee joint is frequently subjected to mechanical stress and trauma. Sports-related knee injuries may range from mild soft tissue injuries to severe ligament tears, fractures, and dislocations. Among these, ligament sprains are considered the most common injuries encountered in athletes and physically active individuals.

Musculoskeletal Elements of the Knee Joint

The knee joint is a synovial hinge joint that primarily permits flexion and extension movements. In addition to these movements, it also allows limited gliding, rolling, and rotational movements around a vertical axis, which contribute to its stability and functional mobility.

Articular surfaces

The knee joint is formed by the articulation between the medial and lateral condyles of the femur, the medial and lateral condyles of the tibia, and the patella. These articular components together provide stability and smooth movement of the joint during locomotion and weight-bearing activities.

Fibrous capsule

The fibrous capsule of the knee joint is thin and extensive. Anteriorly, it is deficient and is replaced by the quadriceps femoris tendon, patella, and ligamentum patellae. The capsule provides structural support while allowing adequate mobility of the joint.

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Muscles

The major muscles associated with the knee joint include the quadriceps femoris, hamstrings, and calf muscles. These muscles act synergistically to facilitate flexion, extension, and stabilization of the knee joint. Additional muscles contributing to knee movements include the tensor fasciae latae, popliteus, and articularis genus muscles.

Ligaments

Extracapsular Ligaments

The fibrous capsule of the knee joint is reinforced by five major extracapsular ligaments, which provide mechanical stability to the joint. These include:

Patellar ligament

Fibular collateral ligament

Tibial collateral ligament

Oblique popliteal ligament

Arcuate popliteal ligament

Intracapsular Ligaments

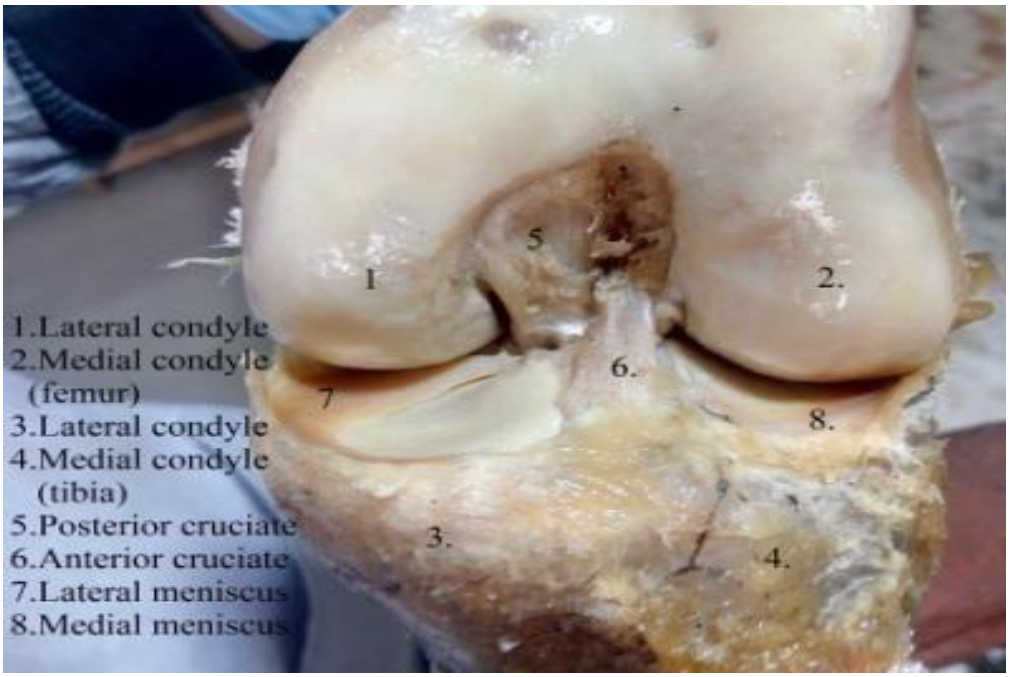
The intracapsular structures of the knee joint play a crucial role in maintaining joint stability and smooth movement. These structures include:

Cruciate ligaments – anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL)

Menisci – medial and lateral menisci

Transverse ligament of the knee

The cruciate ligaments provide anteroposterior stability to the knee joint, while the menisci act as shock absorbers and help in the distribution of body weight across the joint surfaces.



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Bursa

Numerous bursae are present around the knee joint, serving to reduce friction between moving structures during physical activities. The largest communicating bursa of the knee joint is the suprapatellar bursa. In addition, four smaller bursae are located posteriorly, while two non-communicating bursae are situated anterior to the patella and beneath the patellar tendon. These bursae play an important role in minimizing friction, reducing mechanical stress, and facilitating smooth movement during locomotion and sports activities.

Sports Injuries of the Knee Joint

Due to its complex structure, high mobility, and weight-bearing function, the knee joint is highly susceptible to sports-related injuries. These injuries may involve ligaments, muscles, tendons, menisci, bursae, and bony structures of the joint.

Sprain

Ligament sprains are among the most common sports injuries affecting the knee joint. Commonly involved ligaments include:

Medial collateral ligament (MCL)

Lateral collateral ligament (LCL)

Anterior cruciate ligament (ACL)

Posterior cruciate ligament (PCL)

Meniscal tear

The medial and lateral menisci are prone to tears during twisting or rotational movements of the knee joint, especially in athletes and sports persons.

Strain

Muscle and tendon strains commonly affect structures associated with the knee joint, including:

Quadriceps muscles

Hamstring muscles

Patellar tendon

Popliteal tendon

Inflammatory conditions

Bursitis

Inflammation of the bursae around the knee joint may occur due to repetitive stress or trauma. Common types include:

Prepatellar bursitis

Infrapatellar bursitis

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Tendinitis

Inflammation of tendons around the knee joint commonly involves:

Patellar tendinitis

Hamstring tendinitis

Popliteal tendinitis

Syndromes Associated with Knee Joint Injuries

Patellofemoral Pain Syndrome

This condition is characterized by mild to severe pain originating from abnormal contact between the posterior surface of the patella and the femur.

Plica syndrome

Plica syndrome occurs when the synovial plica, a fold of the synovial membrane of the knee joint, becomes irritated, enlarged, or inflamed.

Iliotibial band syndrome

This syndrome results from repetitive friction of the iliotibial band over the lateral femoral epicondyle, leading to inflammation and pain on the lateral aspect of the knee.

Hoffa's syndrome

Hoffa's syndrome occurs when the infrapatellar fat pad becomes impinged between the distal femur and the patella, usually following direct trauma to the knee joint.

Fractures

Sports injuries may also result in fractures involving:

- Tibial fractures
- Femoral fractures
- Patellar fractures

Dislocation

Dislocations involving the knee joint include:

- Patellar dislocation
- Tibiofemoral dislocation
- Femoral dislocation[12]

Ayurvedic Management of Knee Joint Injuries

Ayurveda is an ancient and holistic system of medicine that originated in India thousands of years ago. The uniqueness of Ayurveda lies not only in the treatment of diseases but also in the promotion and maintenance of physical, mental, and social well-being of individuals. Ayurvedic therapeutic principles emphasize prevention, health preservation, and restoration of functional balance within the body.

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In recent years, Ayurveda has gained increasing recognition in the field of sports medicine due to its holistic and rehabilitative approach toward musculoskeletal disorders and sports-related injuries. Ayurvedic treatment modalities, particularly Panchakarma therapies, have demonstrated beneficial effects in improving recovery, reducing pain and inflammation, enhancing physical performance, and restoring joint function.

Sports activities such as football, volleyball, basketball, cricket, tennis, bodybuilding, endurance training, and aerobic exercises place significant mechanical stress on the knee joint, thereby increasing the risk of injuries. An integrative therapeutic approach involving Ayurveda, physiotherapy, and yoga can be effectively utilized for sports training, injury prevention, treatment, and rehabilitation of athletes.

Acharya Charaka has emphasized the importance of *Abhyanga* (therapeutic oil massage) and stated that individuals who regularly undergo Abhyanga develop strong, well-nourished, and flexible limbs, and become less susceptible to external injuries. This highlights the preventive and protective role of Ayurvedic therapies in maintaining musculoskeletal health and physical endurance.

Various medicinal herbs and formulations used in Ayurveda, such as *Ashwagandha (Withania somnifera)*, *Tulsi (Ocimum sanctum)*, *Haridra (Curcuma longa)*, *Guggulu (Commiphora mukul)*, and *Aloe vera*, possess anti-inflammatory, immunomodulatory, antioxidant, and rejuvenating properties. These herbal medicines may help enhance recovery, improve immune response, reduce tissue inflammation, and support musculoskeletal healing in sports-related knee joint injuries.

Treatment of Knee Joint Injuries in Ayurveda

Ayurveda offers a comprehensive and holistic approach for the management of knee joint injuries through various therapeutic procedures, herbal formulations, Panchakarma therapies, and rehabilitative measures. These treatment modalities primarily aim to reduce pain, inflammation, stiffness, swelling, and restore functional mobility of the knee joint.

Lepa (topical applications)

Local application of medicated pastes (*Lepa*) plays an important role in relieving pain, swelling, stiffness, and inflammation associated with knee joint injuries. Commonly used formulations include:

- *Gairika* with *Katha* mixed in gum water
- *Dashanga Lepa*
- *Aragwadhapatradi Lepa*
- *Shothahara Lepa*

These formulations possess anti-inflammatory and analgesic properties that help in local healing and reduction of edema.

Management of Synovitis

In conditions such as synovitis, medicated oils and herbal extracts are commonly used, including:

- *Tulsi Patra Taila*
- *Dhattura Patra Swarasa*

These therapies help in reducing inflammation, pain, and stiffness of the affected joint.

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Panchakarma and External Therapies

Snehana (Oleation Therapy)

Snehana using *Vata-shamaka Taila* helps in lubrication of the joint, reduction of stiffness, and improvement of mobility. Commonly used medicated oils include:

- *Tila Taila*
- *Mahanarayana Taila*

Swedana (sudation therapy)

Swedana therapy helps in relieving pain, muscle spasm, stiffness, and inflammation. Commonly used decoctions include:

- *Maharasnadi Kwatha*
- *Dashamoola Kwatha*

Nadi sweda

Nadi Sweda is performed using steam generated from *Vata-hara* herbs such as:

- *Nirgundi Patra*
- *Eranda Patra*
- *Vasa Patra*

Pinda sweda

Shashtika Shali Pinda Sweda is beneficial in strengthening muscles, improving circulation, and promoting tissue nourishment.

Patra pottali sweda

This therapy involves fomentation using boluses prepared from *Vata-shamaka* herbs such as:

- *Rasna Patra*
- *Nirgundi Patra*
- *Eranda Patra*

It is particularly useful in reducing pain, stiffness, and inflammation.

Raktamokshana (bloodletting therapy)

Raktamokshana may be beneficial in conditions associated with localized inflammation, pain, edema, and stiffness of the knee joint. Procedures such as:

- *Jalaukavacharana* (leech therapy)
- *Siravedha* (venesection)

Are traditionally employed to reduce local congestion and inflammatory symptoms.

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Agnikarma

Agnikarma (therapeutic cauterization) can be performed locally over the knee joint in chronic painful conditions associated with stiffness and restricted movement. It is considered effective in alleviating musculoskeletal pain and improving functional activity.

Janu basti

Janu Basti is a specialized Ayurvedic procedure in which warm medicated oil is retained over the knee joint for a specific duration. It is highly beneficial in conditions such as:

- Knee pain
- Swelling
- Osteoarthritis
- Joint stiffness
- Degenerative disorders of the knee joint

This therapy helps in strengthening periarticular structures, improving lubrication, and enhancing joint mobility.

Ayurvedic medicinal formulations

Guggulu Kalpa

The following *Guggulu* formulations are commonly used in sports-related knee joint injuries:

- *Simhanada Guggulu*
- *Yogaraja Guggulu*
- *Kaishora Guggulu*
- *Abha Guggulu*

These formulations possess anti-inflammatory, analgesic, and rejuvenating properties.

Kwatha and Kashaya

Commonly used Ayurvedic decoctions include:

- *Dashamoola Kwatha*
- *Kanchanara Kashaya*
- *Maharasnadi Kashaya*

These preparations help in reducing inflammation and improving musculoskeletal function.

Rasa kalpa

Important herbo-mineral preparations include:

- *Shankha Bhasma*

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- *Kukkutandatvak Bhasma*
- *Punarnava Mandoora*
- *Saptamrita Loha*
- *Brihat Vata Chintamani Rasa*
- *Ekangaveera Rasa*
- *Rasaraja Rasa*

These medicines are traditionally indicated for strengthening bones, joints, and neuromuscular structures.

Ghrita preparations

Medicated ghee preparations commonly used include:

- *Panchatikta Ghrita*
- *Ashwagandha Ghrita*

These formulations provide nourishment and support tissue regeneration.

Vati preparations

- *Asthiposhaka Vati*
- *Maharasnadi Ghanavati*
- *Punarnavashtaka Ghanavati*

These formulations are beneficial in improving bone and joint health.

Taila preparations

Commonly used medicated oils include:

- *Tila Taila*
- *Mahanarayana Taila*
- *Vishagarbha Taila*
- *Mahamasha Taila*
- *Panchaguna Taila*

These oils are widely used for external therapies in pain management, muscle strengthening, and rehabilitation of knee joint injuries.

Yoga and *Rasayana* Therapy

Yoga

Yoga plays a significant role in the rehabilitation and strengthening of the knee joint following sports-related injuries. Regular practice of specific *Asanas* helps improve joint stability, flexibility, muscular strength,

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balance, and circulation, thereby promoting faster recovery and functional restoration of the knee joint. Commonly recommended yogic postures include:

- *Vajrasana*
- *Swastikasana*
- *Padmasana*
- *Tadasana*

These asanas help strengthen the periarticular muscles, improve posture and mobility, and support overall musculoskeletal health.

Rasayana therapy

Rasayana Chikitsa is considered one of the most important therapeutic approaches in Ayurveda for rejuvenation, tissue nourishment, and enhancement of physical strength and immunity. In the management of knee joint disorders and sports injuries, *Rasayana* therapy plays a vital role in maintaining the structural integrity, stability, strength, flexibility, and functional mobility of the knee joint.

Various herbal drugs and rejuvenative formulations are beneficial in accelerating recovery and improving musculoskeletal health. Important Rasayana drugs and formulations include:

- *Shatavari* (*Asparagus racemosus*)
- *Ashwagandha* (*Withania somnifera*)
- *Asthishrinkhala* (*Cissus quadrangularis*)
- *Methi* (*Trigonella foenum-graecum*)
- *Chyawanprasha*
- *Ashwagandha Paka*
- *Brahma Rasayana*

These formulations possess rejuvenating, strengthening, anti-inflammatory, antioxidant, and tissue-healing properties that support rapid recovery and rehabilitation in knee joint injuries.

RESULTS

The review revealed that sports injuries of the knee joint commonly involve ligaments, menisci, muscles, tendons, bursae, and surrounding soft tissues. Common conditions observed include ACL and PCL injuries, collateral ligament sprains, meniscal tears, patellofemoral pain syndrome, tendinitis, bursitis, fractures, and dislocations.

Ayurvedic therapies demonstrated significant therapeutic potential in the management and rehabilitation of these conditions. *Snehana* and *Swedana* were found useful in reducing pain, stiffness, and inflammation, while *Janu Basti* improved lubrication and joint mobility. *Patra Pottali Sweda* and *Pinda Sweda* strengthened muscles,tendon,ligaments. E

Herbal formulations such as *Guggulu* preparations, *Dashamoola Kwatha, Ashwagandha, and Rasayana* drugs supported tissue healing and musculoskeletal strengthening. Yoga and Rasayana therapies improved flexibility, balance, endurance, and rehabilitation outcomes.

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DISCUSSION

The knee joint is one of the most complex and functionally important joints of the musculoskeletal system. It is composed of specialized connective tissues including bones, cartilage, muscles, ligaments, tendons, menisci, and synovial structures, which collectively provide stability, mobility, support, and controlled movement to the body. Due to its anatomical complexity and major weight-bearing function, the knee joint is highly vulnerable to sports-related injuries and is more frequently affected compared to other joints of the body.

Sports injuries involving the knee joint commonly affect the joint capsule, collateral and cruciate ligaments, menisci, patella, surrounding muscles, and tendons. These injuries may vary from mild sprains and strains to severe conditions such as ligament tears, fractures, and joint dislocations, leading to pain, swelling, stiffness, restricted movement, and functional disability.

Although classical Ayurvedic texts do not directly describe sports injuries as a separate clinical entity, the fundamental principles of Ayurveda provide a comprehensive approach for understanding and managing musculoskeletal injuries. In the present era, where sports-related injuries are increasingly common, Ayurveda has significant potential in the fields of prevention, treatment, rehabilitation, and performance enhancement.

Various Ayurvedic therapeutic modalities such as *Snehana, Swedana, Janu Basti, Raktamokshana, Agnikarma*, and different Panchakarma procedures play an important role in reducing pain, inflammation, swelling, stiffness, and improving joint function. In addition, several herbal drugs, *Aushadhi Yoga, Guggulu Kalpa, Ghrita, Taila, and Rasa Kalpa* formulations possess analgesic, anti-inflammatory, rejuvenating, and tissue-healing properties that support recovery in knee joint injuries.

Furthermore, *Rasayana* Chikitsa and Yoga contribute significantly to strengthening the musculoskeletal system, maintaining joint stability, improving flexibility, enhancing mobility, and promoting faster rehabilitation. Integrating Ayurvedic therapies with modern rehabilitation approaches may provide a safe, cost-effective, and holistic strategy for the management of sports-related knee joint injuries.

CONCLUSION

Ayurveda offers a comprehensive and holistic approach for the prevention, management, and rehabilitation of sports injuries involving *Janu Sandhi* (knee joint). Its therapeutic principles not only help in symptomatic relief but also promote tissue healing, functional restoration, and long-term musculoskeletal health.

Various Ayurvedic treatment modalities including *Snehana, Swedana, Janu Basti, Panchakarma, Agnikarma*, and *Rasayana* therapies play an important role in reducing pain, inflammation, stiffness, and improving joint mobility and functional recovery. Herbal formulations and Yoga further support musculoskeletal strengthening, rehabilitation, and enhancement of physical performance.

Therefore, the integration of Ayurvedic therapies with modern rehabilitation techniques may provide an effective, safe, economical, and holistic approach for the management of sports-related knee joint injuries.

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