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A SYSTEMIC REVIEW ON ANKLE SPRAIN -AN AYURVEDIC PERSPECTIVE

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Abstract

The function of Acharya Sushruta is crucial in Ayurveda. In addition to becoming one of the world's first surgeons, Acharya Sushruta was also one of the first people to examine the human body. In the discipline of Ayurveda, Acharya Sushruta was the first to explain the clinical significance of anatomical features such as the plexus, Sira (vein), artery, Dhamni (artery), kurcha (brush-like structure), and Asthi (bones). One of the robust and vital anatomical structures in the human body, the Snayu supports every joint in the body for its intended purpose. Similar to Snayu, ligaments and tendons are defined as human structures that are connected, respectively, by muscle and bone in contemporary anatomy. Snayu binds all the joints together. There are four sorts of Snayu based on their shape and location: Pratanvati, Vritta, Sushira, and Prithula. Since snayu and ligaments are quite similar, excessive stretching, ripping, or damage to the ligaments results in excruciating agony. The most frequent injuries among sportsmen and sportspeople are ligament injuries. Ankle injuries are the most prevalent type of ligament injury, happening to the knee, ankle, wrist, thumb, neck, or back.

Keywords - Snayu, Ligaments, Injuries, etc.

Introduction

One of the foundational topics underlying the principles of Ayurveda is Sharir Rachana. One of the structures, Snayu, whose anatomical location has been detailed by Acharya Sushruta in Sharirsthan. The body's strength is dependent on Snayu, Asthi, Mamsa, and other factors. Snayu is a crucial structure that aids in weight bearing by connecting the body's Mamsa (muscle) and Asthi (bone). Snayu is also referred to as Vatavahanaadi in Ayurvedic literature. If this is the case, harm to this structure—as opposed to any other in the body—may cause excruciating agony. It can be seen as pain since it is just the result of Vata's vitiation, and pain cannot exist without Vata.[1] The sandhi, or joint, is essential for movement and other essential bodily processes. The joint's strength is determined by Snayu, Asthi (bone), and Mamsa (muscles). Snayu helps to keep joints stable when the body is in motion. Any traumatizing injury to the joint results in excruciating pain, swelling, spraining, and abnormal joint mobility. Sprains are categorized as first, second, or third grade, depending on how much the ligaments are stretched. Sprains are typically caused by this. Ankle sprains are the most typical kind of foot and ankle injury.[2]

Materials and Methods

To achieve the aims and objectives of this study, a comprehensive review of relevant Ayurvedic texts was conducted. This included examining primary sources such as Brihattrayi and Laghutrayi, as well as other classical texts. Additionally, contemporary scientific literature and dictionaries were consulted. For a thorough exploration, data was gathered from various databases and research portals including Google Scholar, PubMed, Medline, AYUSH Research Portal, and the Digital Helpline for Ayurveda Research Articles (DHARA). Dissertation works from Ayurveda colleges and studies available on web-based search engines like ResearchGate were also included. Journal articles were systematically searched and analyzed. This multi-faceted approach ensured a comprehensive collection and presentation of data relevant to the study.

Ayurvedic Concept of the Anatomical Aspects of Gulpha

Gulpha: Definition and Etymology

The term **Gulpha** is derived from the Sanskrit root **"Gal"**, with **"fuk"** as the affix. This etymology reflects its meaning and significance in Ayurvedic anatomy. Synonyms for Gulpha include **Khulaka**, **Khudaka**, **Khallaka**, **Kuduka**, **Charna Granthi**, and **Pada Granthi**.[3]

Gulpha is described in Ayurvedic literature as a **sandhi** (joint) located in the bilateral lower limbs at the junction where the **paada** (foot) meets the **jangha** (leg). It is defined as the joint connecting the foot and leg, crucial for both movement and support. According to **Acharya Sushruta**, the Gulpha is a union of the Jangha and Charna and is also known as **Gulpha Marma**. **Acharya Indu** further describes Gulpha as the joint between Jangha and Charna, emphasizing its structural and functional significance.[4]

Sanghat: Concept and Definition

The term **Sanghat** originates from the root **"han"** with the prefix **"sam"** and the suffix **"gaj"**, and signifies a complex form of **sandhi**. In Ayurvedic terminology, Sanghat represents a more complex structure compared to a simple joint. **Acharya Ghanekar** explains that Sanghat refers to the union of two or more articular surfaces of bones, supported by surrounding structures such as muscles, tendons, and ligaments. These structures provide additional stability, making Sanghat a specialized type of sandhi.[5]

Sandhi itself is defined as the connection where two or more bone surfaces join. The word **Sandhi** comes from **"Dha"** (to hold) and **"Ki"** (affix), indicating a joint where bones are held together. Synonyms for Sandhi include **Slesha** and **Anekartha Sangraha**. In the context of anatomy, Sandhi refers to the connection of bones through various supportive structures.

The Gulpha Sandhi is a crucial joint in the lower extremities, responsible for locomotion and weight-bearing. Structurally, it is classified as a **Kora Sandhi** and functionally as a **Bahuchala Sandhi**.[6]

Gulpha Marma: Characteristics and Importance

Gulpha Marma is a significant anatomical site located at the junction of the Jangha (leg) and the Pada (foot). According to **Acharya Sushruta**, Gulpha Marma is a critical Marma

point, characterized by its role in pain perception even after trauma management. In **Astangha Samgraha**, Gulpha Marma is described as the joint between the foot and the leg, with the leg being the region between the knee and the ankle.[7]

Gulpha Marma is classified as a **Shaka Marma**, with a measurement of **2 Anguli Praman** (two finger widths) and is categorized under **Sandhi Marma**. It is also a **Rujakar Marma**, where the elements of **Agni**, **Soma**, and **Vayu** are predominant. Injury to this Marma can result in severe consequences such as limb shortening, lameness, decreased strength, restricted movement, muscle atrophy, and joint swelling.

Acharya Sushruta noted that Vata Dosha exacerbates the effects of Marmabighata (trauma to Marma), leading to significant pain and functional impairments. **Acharya Charaka** also mentioned that injuries to bones, muscles, and ligaments can lead to long-term complications such as delayed healing and persistent pain.[8]

The symptoms associated with **Gulpha Sanghat Abhighata** (trauma to the Gulpha joint) can be compared to modern conditions like **Pott's Fracture** and **Maisonneuve's Fracture**, which are fractures around the ankle joint.

Understanding the concept of **Rujakar Marma** is vital for effective trauma management. There are eight Rujakar Marmas, and improper treatment of these points can lead to deformities and long-term disability. Therefore, a thorough understanding of the anatomical and functional aspects of Gulpha Marma is essential for successful therapeutic interventions.[9]

Summary Table

Aspect	**Description**
Gulpha	The ankle joint at the junction of the foot (paada) and leg (jangha), significant for movement and support. Synonyms include **Khulaka**, **Khudaka**, **Khallaka**, **Kuduka**, **Charna Granthi**, and **Pada Granthi**.
Sanghat	A specialized form of Sandhi, involving the union of two or more bones supported by muscles, tendons, and ligaments for added stability. **Acharya Ghanekar** describes it as a complex joint structure.

Sandhi	A general term for a joint where bones are held together. Derived from **"Dha"** (to hold) and **"Ki"** (affix), indicating the connection of bones through supportive structures.
Gulpha Marma	A critical Marma point at the junction of the leg and foot, involved in pain perception and associated with injuries leading to long-term complications. It is classified as **Shaka Marma** and **Rujakar Marma**.

Modern Concept of the Anatomical Aspects of the Talocrural (Ankle) Joint

Overview of the Talocrural Joint

The **talocrural joint**, commonly known as the ankle joint, is a crucial uniaxial joint located in both lower extremities. It is a type of **compound synovial hinge joint** that facilitates the essential movements of the ankle. The talocrural joint is primarily formed by the articulation between the tibia, the fibula (specifically the malleoli of the fibula), and the upper end of the **talus** bone. This joint plays a pivotal role in mobility and stability during walking, running, and other weight-bearing activities.[10]

Figure 1 illustrates the basic structure of the talocrural joint, while **Figures 2 to 6** show various anatomical views and components.

Anatomy of the Talocrural Joint

1. **Joint Structure and Ligaments**
    - **Articular Capsule**: The joint capsule of the ankle joint is weak anteriorly and posteriorly but is reinforced by robust medial and lateral ligaments.
    - **Medial Collateral Ligament (Deltoid Ligament)**: This ligament supports the medial side of the joint and is divided into three parts:
        - **Tibionavicular Ligament**: Anterior fibers that connect the tibia to the navicular bone.
        - **Tibiocalcaneal Ligament**: Middle fibers that extend from the tibia to the calcaneus.
        - **Tibiotalar Ligament**: Posterior fibers further divided into anterior

and posterior parts, extending from the tibia to the talus.

- **Lateral Collateral Ligament**: This ligament supports the lateral aspect of the joint and is also divided into three parts:
  - **Anterior Talofibular Ligament**: Connects the talus to the fibula at the front.
  - **Posterior Talofibular Ligament**: Connects the talus to the fibula at the back.
  - **Calcaneofibular Ligament**: Connects the calcaneus to the fibula.

2. **Muscles and Tendons**
   - **Anterior Compartment Muscles**: These muscles act as **dorsiflexors** of the ankle and include:
     - **Tibialis Anterior**
     - **Extensor Hallucis Longus**
     - **Extensor Digitorum Longus**
     - **Peroneus Tertius**
   - **Posterior Compartment Muscles**: These muscles act as **plantar flexors** of the ankle and include:
     - **Tibialis Posterior**
     - **Flexor Digitorum Longus**
     - **Flexor Hallucis Longus**
   - **Lateral Compartment Muscles**: Contributing to the stability and movement of the ankle, these include:
     - **Peroneus Longus**
     - **Peroneus Brevis**

3. **Vascular and Nerve Supply**
    - **Blood Supply**: The ankle joint receives blood from the malleolar branches of the **anterior and posterior tibial arteries**, and the **peroneal artery**.
    - **Venous Drainage**: The blood from the foot is drained by the **dorsal venous arch**, which connects to the **greater and lesser saphenous veins**.
    - **Nerve Supply**: The sciatic nerve divides into the **common peroneal nerve** and the **tibial nerve**, which provide sensation and motor functions to the ankle and foot.
4. **Joint Movements**
    - **Dorsiflexion**: Moving the foot upward towards the shin.
    - **Plantar Flexion**: Moving the foot downward away from the shin.

Table 1 summarizes the primary anatomical features of the talocrural joint.[11]

Anatomical Feature	**Description**
Type of Joint	Uniaxial Synovial Hinge Joint
Bones Involved	Tibia, Fibula (Malleoli), Talus
Ligaments	Medial: Deltoid Ligament (Tibionavicular, Tibiocalcaneal, Tibiotalar); Lateral: (Anterior Talofibular, Posterior Talofibular, Calcaneofibular)
Anterior Muscles	Tibialis Anterior, Extensor Hallucis Longus, Extensor Digitorum Longus, Peroneus Tertius
Posterior Muscles	Tibialis Posterior, Flexor Digitorum Longus, Flexor Hallucis Longus
Lateral Muscles	Peroneus Longus, Peroneus Brevis
Blood Supply	Anterior & Posterior Tibial Arteries, Peroneal Artery

Nerve Supply	Common Peroneal Nerve, Tibial Nerve
Venous Drainage	Dorsal Venous Arch, Greater and Lesser Saphenous Veins
Movements	Dorsiflexion, Plantar Flexion

Comparison of Gulpha Sanghat and Talocrural Joint[12]

The anatomical aspects of **Gulpha Sanghat** in Ayurveda are closely related to the modern understanding of the talocrural joint. Both concepts address the structural and functional aspects of the ankle joint, emphasizing its importance in maintaining stability and facilitating movement.

- **Gulpha Sanghat** can be compared to the **medial and lateral collateral ligaments** of the modern ankle joint:
    - **Medially**, the deltoid ligament functions similarly to the **Gulpha Sanghat** in Ayurvedic terms, providing stability and support.
    - **Laterally**, the lateral ligament complex, including the anterior talofibular ligament, mirrors the importance of the **Gulpha Sanghat** in maintaining joint stability.

Injuries to both **Gulpha Sanghat** and the **ankle joint** result in similar symptoms such as pain and swelling, reinforcing the anatomical and functional parallels between the two concepts.

Clinical Implications

Understanding the anatomy of the talocrural joint is essential for diagnosing and managing various conditions such as sprains, fractures, and other injuries. Both Ayurvedic and modern perspectives provide valuable insights into the structure and function of the ankle joint, offering comprehensive approaches to treatment and rehabilitation.[13]

Discussion

The **Gulpha Sandhi**, or ankle joint, is a crucial component of the lower limb anatomy, located at the junction of the **foot** (paada) and the **leg** (jangha). This joint plays a vital role in various body movements, including **standing, running,** and **climbing**. Anatomically, the Gulpha Sandhi is classified as a **kora** variety of joint and is functionally a **Bahuchala Sandhi**. In contemporary anatomical terms, it is equivalent to the **talocrural joint complex**.[14]

- **Kora Variety**: Refers to the cylindrical or hinge-like structure of the joint that allows motion primarily in one plane.
- **Bahuchala**: Indicates that the joint supports significant weight and movement, essential for daily activities and dynamic motions.

Modern Anatomical Comparison: The Ankle Joint

The **ankle joint**, or **talocrural joint**, is a **compound synovial hinge joint** that facilitates dorsiflexion and plantar flexion of the foot. It is formed by the tibia, the fibula (including its malleoli), and the upper end of the talus bone.

- **Articular Capsule**: The joint capsule is weaker anteriorly and posteriorly but is reinforced by strong medial and lateral ligaments.
    - **Medial Collateral Ligament (Deltoid Ligament)**:
        - **Tibionavicular Ligament** (anterior fibers)
        - **Tibiocalcaneal Ligament** (middle fibers)
        - **Tibiotalar Ligament** (posterior fibers, divided into anterior and posterior parts)
    - **Lateral Collateral Ligament**:
        - **Anterior Talofibular Ligament**
        - **Posterior Talofibular Ligament**
        - **Calcaneofibular Ligament**

- **Muscles and Tendons**:
    - **Anterior Compartment**: Dorsiflexors of the ankle.
        - **Tibialis Anterior**
        - **Extensor Hallucis Longus**
        - **Extensor Digitorum Longus**
        - **Peroneus Tertius**
    - **Posterior Compartment**: Plantar flexors of the ankle.
        - **Tibialis Posterior**
        - **Flexor Digitorum Longus**
        - **Flexor Hallucis Longus**
    - **Lateral Compartment**: Stabilizers of the ankle.
        - **Peroneus Longus**
        - **Peroneus Brevis**
- **Blood Supply**: From the anterior and posterior tibial arteries and the peroneal artery.
- **Nerve Supply**: Via the common peroneal nerve and the tibial nerve.
- **Venous Drainage**: Through the dorsal venous arch into the greater and lesser saphenous veins.

The talocrural joint allows for essential movements such as **dorsiflexion** and **plantar flexion**, and its stability is primarily provided by its ligaments and tendons.

Ruja and Its Relation to Ankle Joint Injuries

In Ayurvedic terminology, **Ruja** refers to the sensation of pain experienced by the mind and body due to injury. It is the initial sign of tissue morbidity and can be provoked by trauma to soft tissues like skin, fascia, tendons, ligaments, and periosteum.

- **Ruja**: Represents the pain resulting from injuries or trauma. For instance, an injury to the **Gulpha Marma** (ankle joint) causes significant Ruja, as described in Ayurvedic texts.
- **Stambha**: Refers to functional disability or restriction of movement, which can result from inflammation or trauma to the joint capsule and surrounding tissues.
- **Khanjata**: Denotes limping or lameness, a condition often observed in ankle injuries such as ligament ruptures, which lead to restricted motion and altered gait.

In **Shabadkalpadruma**, Stambha is described as "Kriyanirodhaha" — a term meaning functional impairment caused by injury. This concept aligns with how injuries to the ankle joint, such as **Pott's fracture** or **Maisonneuve's fracture**, lead to similar symptoms of pain and swelling.

Comparative Analysis: Gulpha Sandhi and Modern Ankle Joint Injuries

In modern clinical practice, the **ankle joint** can sustain various injuries due to excessive forces, resulting in conditions such as sprains, fractures, and other structural damage.

- **Sprains**: Injury to the ligaments, especially the lateral collateral ligaments, is common due to their inherent weakness compared to the medial collateral ligaments.
- **Fractures**: Conditions like Pott's fracture and Maisonneuve's fracture are examples of severe injuries to the ankle joint that result from excessive distraction or compression forces.

Table 1 compares the symptoms and causes of injuries in the Gulpha Sandhi and the modern ankle joint: [15]

Aspect	**Gulpha Sandhi**	**Modern Ankle Joint**
Location	Junction of the foot and leg	Ankle joint formed by tibia, fibula, and talus
Type of Joint	Kora, Bahuchala	Compound Synovial Hinge Joint

Movements	Standing, Running, Climbing	Dorsiflexion, Plantar Flexion
Injuries	Trauma leading to Ruja, Stambha, Khanjata	Sprains, Fractures, Tendon Injuries
Symptoms	Pain (Ruja), Functional Disability (Stambha), Limping (Khanjata)	Pain, Swelling, Restricted Motion
Anatomical Structures	Tendons, Ligaments, Bones	Ligaments (Medial and Lateral Collateral), Tendons, Blood Vessels, Nerves
Functional Impact	Joint Stability, Movement Restrictions	Stability, Weight Bearing, Mobility

Conclusion

The **Gulpha Sandhi** is a significant anatomical and functional component of the lower limb, critical for various movements such as standing, running, and climbing. It is anatomically equivalent to the **talocrural joint complex** in modern medicine. **Anatomy**: The Gulpha Sandhi can be compared to the talocrural joint, which consists of a complex arrangement of bones, ligaments, muscles, and tendons. **Injuries**: Both Gulpha Sandhi and modern ankle joint injuries lead to similar symptoms such as pain, swelling, and functional impairment. **Management**: Understanding the anatomical and functional aspects of the Gulpha Sandhi is essential for effective injury management and treatment. Effective management of Gulpha Sandhi injuries requires a deep understanding of both traditional Ayurvedic concepts and contemporary anatomical knowledge. This integrated approach is crucial for diagnosing conditions and developing effective treatment strategies for ankle joint injuries.

Conflict of Interest -Nil

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