



ANATOMICAL STUDY OF MUSCULOSKELETAL COMPONENTS DESCRIBED IN SUSHRUT SAMHITA AND ITS APPLIED ASPECT IN CHIKITSA

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ABSTRACT

The human body is a complex organism, the gross mechanical properties of which are enabled by an interconnected musculoskeletal network controlled by the nervous system. The nature of musculoskeletal interconnection facilitates stability, voluntary movements, and robustness to injury. It is also known as the locomotor system and was previously known as the activity system. The skeleton is the structure that gives us shape and protects our internal organs. It offers a supportive framework for the attachment of muscles to facilitate movement. Our bones also act as a site for the production of blood cells and a store of minerals, particularly calcium. The skeleton has five main functions: Support, protection, movement, blood cell production, and mineral storage. Despite being ancient science, Ayurveda describes human Anatomy and Musculoskeletal elements. In Ayurveda, Peshi, Ashti, Sandhi, Snayu, Kandara, along with Jaala, Kurcha, Mamsarajju, Seevani, Sangatha, and Simanta, are described as part of the Musculoskeletal system.

Musculoskeletal symptoms or injuries are among the most common reasons for seeking medical attention. Despite the high prevalence of musculoskeletal disorders in all fields of clinical practice, clinicians continue to describe poor confidence in their musculoskeletal clinical skills. Here in this research work, an overview of the Ayurveda review of Musculoskeletal Elements and their clinical importance has been discussed. Diseases related to muscu-

loskeletal elements are increasing day by day. Comprehensive knowledge about these elements will help us to understand the diseases better and proper and effective management.

Keywords: *Musculoskeletal Elements, Ayurveda, Peshi, Asthi, Sandhi, Snayu, Kandara, Jaala, Kurcha, Mamsarajju, Seevani, Sangatha, Chikitsa*

INTRODUCTION

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 helps in movement and locomotion. The movement of body parts or the whole body's locomotion is undoubtedly the function of various musculoskeletal constituents of the human anatomy. The musculoskeletal component is the macroscopic or gross structure that provides support, configuration, strength, and motion to the body. It comprises bones, muscles, cartilage, tendons, ligaments, joints, and additional connective tissue that holds together and supports other tissues and organs. In Ayurveda, scattered references regarding the identical components of the structures are available. Peshi, Asthi, Sandhi, Snayu, Kandara, Jala, Kurcha, Mamsarajju, Sevani, Sanghata and Simanta can be mentioned in this aspect.¹ There is a specific enumeration of almost all the structures available in classics. Historically, Ayurveda has described different musculoskeletal components, their injuries and treatment accordingly. Ayurveda has mentioned specific treatment modalities such as proper diet, Rasayana therapy, Abhayanga, exercise and yoga, etc., which seem necessary today. Thus, this conceptual study has been undertaken to understand the basic concept of Musculoskeletal Components described in Sushrut Samhita and how this acknowledgement can be used for treatment.

Acharya Sushruta describes various musculoskeletal components, including the muscles, bones, tendons, cartilage, and associated tissue. The musculoskeletal components are vital for the stability and locomotion of the body and are thus vulnerable to injury. It contains several muscles, ligaments, tendons and bones, which cause various types of injuries such as frac-

tures, dislocation, sprains, strains, inflammation wounds, etc. We can see that individuals having injuries to these components suffer from various grades of disorders, from pain to severe disabilities. Modern science provides quick relief through treatment, but the rehabilitative process is often too tedious and time-consuming, with several adverse effects.

The present research aims to search all the components and place them on one platform, focusing on structural or functional aspects. The structures contain various types and subtypes, and their interpretation is necessary to impart newer and higher concepts and technology in the field of research for the applied purpose. For instance, muscles are mainly classified into three types. However, in *Ayurveda*, they are distributed in 12 varieties according to their morphological identity and shape. Different kinds of *Sandhi and their characteristics need to be analysed from a modern anatomical point of view*. Other structures related to musculoskeletal systems like *Jala, Kurcha, Mamsarajju, Sevani, Sanghata and Simanta* also need to be understood along with the modern anatomical point of view. The applied aspects of all the structures are highlighted in different classical texts. It is also necessary for scientific understanding of these components to improve *Chikitsa* and *Ayurveda* science. In this work, a novel attempt will be made to elucidate exclusive and extensive integrated knowledge of the musculoskeletal components described in *Sushruta Samhita* and its applied aspect in *Chikitsa*. "Observing all these aspects as well as the structural identity, the following structures can be considered under musculoskeletal components in Ayurveda-

Table No. 1: Musculoskeletal components and their numbers according to different Acharya.

Sr. no.	Musculoskeletal Components	Charak	Ashtanga Hridaya	Sushruta
1.	Mamsa/Peshi	400	500(male) 520(female)	500(male)
2.	Asthi	360	360	300
3.	Sandhi	200	200	210
4.	Snayu	900	900	900
5.	Sira	700	700	700
6.	Kandara	16	16	16

PESHI (Muscular Structures)

According to Acharya Susruta, through Vayu's action, the compact form of Mamsa Dhatu converts into Peshi. Providing the body with strength and support and covering the internal structures, including the blood vessels, nerves, and bones, are listed as Peshi's primary tasks. The movements of various body parts are attributed to it; according to Bhavaprakasha, Mamsavaha Srotas mula is mentioned as Snayu, Twacha and Raktavahi Dhamani. As the nerves innervate the myotome, the blood vessels supply protein, calcium and other nutrients to the muscles. In contrast, the skin gives support and protects the skeletal muscles. Therefore, these three structures are directly related to the muscles' development, nourishment and maintenance. In specific congenital disorders like pseudo-muscular disorders and myasthenia gravis, vessels and nerves are involved, which can be considered Mamsavaha Srotas. The other references by Peshi are discussed, focusing on their enumeration and classification based on attributes. Peshi listed 500, with an additional 20 for women. Nevertheless, there is currently no such detailed inventory accessible for modern anatomy. It was associated with 600 to 850 in recent data, primarily as 640. Therefore, it is challenging to interpret muscles in both fields. Nonetheless, in the current study, we tried to integrate as much of the contemporary anatomical aspect as possible by analysing the Peshi concerning enumeration, functions, and types.

There are five hundred Peshis in our body. Four hundred Peshis are in the upper and lower limbs.

Sixty-six Peshis are in the middle part of the body, and thirty-four Peshis are in the head and neck. In females, there are twenty extra Peshi². Considering the Angaprathyanganiirmana of Susrutha, Peshi evolved from Pisita with the influence of Ayu and Ushma.³ The main functions of Peshis are to give strength and support to the body and protect internal structures. Acharya Bhavaprakash mentions that Peshis are responsible for the movement of movements.

KANDARA (Tendons)

Tendons are responsible for body movements like extension, contraction, etc. They are sixteen in number, eight of which are in the extremities, four in the neck, and four in the back⁴.

SNAYU (Ligament)

Snayu connects the joints and muscles. Snayu are of four types as Sushir (Porous), Prthu (Broad), Pratanavati (Stretched), Vritta (Circular). Pratanavati is present in extremities and all bony joints. Vritta is known as Kandara by experts⁵. Sushira is present at the end of Amashaya (Stomach), Pakvashaya (large intestine) and Basti(urinary bladder). Prithu is present in Parshva (flanks), Uras (Chest), Prishta (Back) and Sira (Head). Snayu helps the human body to carry weight. Snayu are 900 in number. Of these, 600 are in the Shakha (Extremities), 230 in the Kostha (trunk), and 70 in the Griva (Neck) and above.⁶

DHAMANI (Arteries)

There are different opinions about Sira and Dhamani. The origin of both Sira and Dhamani are from the umbilicus. There are 24 Dhamani in the body. As per Susrutha, Dhamani differs from Sira regarding continuous pulsatory movement. However, according

to *Charaka*, there are two hundred *Dhamani* in the body.

SIRA (Veins)

Sira are the vessels that take the *Dosha* (impurities) along. There are 700 *Sira* in the body. *Sira* can be compared to blood vessels or lymph vessels. *Mridupaka* of *Meda sneha*, along with *Pitta Ushma* and *Vayu*, are the responsible factors for the origin of *Sira*. According to *Veda*, there are 360 bones in the human body. However, according to *Shalya Tantra*, there are only 300 bones. Out of these, 120 are in the *Shakha* (extremities), 117 in the *Shroni* (pelvis), *Parshva* (flanks), *Pristha* (back), and *Uras* (chest) together, 63 above the neck.

Asthi (Bones)

Kapala is present in *Janu* (knee), *Nitamba* (buttocks), *Amsa* (shoulder), *Ganda* (cheek), *Talu*(palate), *Sankha* (temples), and *Siras*(head). *Rucaka* is in the teeth⁷. *Taruna* is present in *Ghrana* (nose), *Karna* (ear), *Griva*(neck), and *Akshikosa* (orbit of the eye) *Valaya* is present in *Parsva* (flanks), *Prishta* (back), and *Uras* (chest). The remaining are *Nalakasthi*⁸.

Sandhi (Joints)

Chestavanta is present in *Shakha* (extremities), *Hanu* (lower jaw) and *Kati* (waist); all the remaining joints are *Sthira*.⁹ *Sandhi* is two hundred and ten in total number. Of these, sixty-eight are in the *Shakha*, fifty-nine in the *Koshta* (trunk), and eighty-three in the neck and above it (head). *Kora* is found in the *Angulis* (fingers), *Mani bandha* (wrist), *Gulpha* (ankle), *Janu* (knee) and *Kurpara* (elbow) *Ulukhala* are found in the *Kaksha* (axilla), *Vankshana* (groin) and *Dasana* (teeth) *Samudga* is found in the *Amsapitha* (shoulder), *Guda* (rectum/anus) and *Nitamba* (buttocks) *Pratara* is found in *Griva* (neck) and *Prstavamsa* (vertebral column) *Tunnasevani* is found in the *Sirah Kapala* (flat bones of the head) and *Kati Kapala* (flat bones of the pelvis) *Vasayatunda* are present at the two sides of the *Hanu* (lower jaw) *Mandala* in the *Nadi* (tubes) of *Kantha* (throat), *Hridaya* (heart), *Netra* (eye) and *Kloma* (trachea)¹⁰.

Histologically, muscle develops from muscular tissue, while bone and cartilage develop from osseous tissue and chondroblast, which are initially mesen-

chymal. The white fibro-elastic tissue forms tendons, ligaments, fascia, etc. Some components in Ayurveda exhibit all these aspects, and they can be interpreted accordingly.

DISCUSSION

The human body comprises various tissues, organs, and systems, described with certain aspects, such as classification according to structure, functions, locations, and their applied aspects. Ayurveda is also described and classified along with certain applied elements of the tissues, structures and systems present in the human body. The anatomical, physiological, and pathological understanding of any structure or system is essential for preventing and treating diseases related to that structure or system. Musculoskeletal structures are mentioned in classics scattered in different contexts. Therefore, the discussion is an essential step in concluding research work. After the present research work is completed, the literary material collected regarding the musculoskeletal components in Ayurveda, like *Peshi*, *Asthi*, *Sandhi*, *Snayu*, etc., are observed and logically interpreted with modern anatomical aspects and their clinical importance in disease management.

According to *Ayurveda*, Musculoskeletal disorders can be compared with the diseases affecting *Peshi*, *Asthi*, *Sandhi* and the associated structures such as *Mamsa*, *Sira*, *Snayu*, *Kandara*, etc. These structures constitute *Madhymarogamarga*. According to *Acharya Madhava*, knowing the *Dosha* movement is essential in formulating treatment protocols. *Acharya Chakrapani* says that it helps predict *Sadhyaasadhya*. Disease caused by a single *Dosha* afflicting one *Rogamarga* with *Chatushpada* is a sign of a good prognosis (*Sukha Sadhya*). The disease occurring in two *Rogamarga* is *Krichsadhya*, even though it is new (*Nava*)—diseases seated in the deeper *Dhatus* like *Meda*, *Asthi* are paliable(*Yapya*). A disease involving three *Rogamarga* is incurable *Prathyakheya*. Knowledge of *Rogamarga* helps identify *Doshagathi*. Through this, we can understand the disease process and its treatment procedure. The concept of *Roga-*

marga is explained in the *Brihatrayi* except *Susrutha Samhita*.¹¹

Musculoskeletal disorders (MSDs) are injuries or discomforts that affect the human musculoskeletal system, which includes Joints, Ligaments, Muscles, Nerves, Tendons, and structures that support the limbs, neck, and back. MSDs are a growing healthcare concern worldwide, accounting for the second most significant cause of disability, whereas lower back pain remains the single greatest cause of disability. Pain (often persistent) and limitations in mobility, dexterity, and functional ability characterise musculoskeletal conditions, reducing people's ability to work and participate in social roles, associated with mental well-being and, at a broader level, impacts community prosperity. Osteoarthritis, back and neck discomfort, fractures due to bone fragility, injury, and systemic inflammatory disorders such as rheumatoid arthritis are the most frequent musculoskeletal ailments. The most prevalent symptoms of musculoskeletal illness are pain and limited mobility, with pain generally persisting for lengthy periods. MSDs are classified as *Vatavyadhi* in *Ayurveda*, which includes all sorts of musculoskeletal diseases.¹² Ayurvedic treatment of MSDs is based on the cause of the ailment, which is either an aggravation of *Vata dosha* or a depletion of *Dosha*. So, when morbid *Doshas* accumulate, *Shodhana* treatment and *Brihana chikitsa* should be performed. Panchakarma is a specialist Ayurveda branch consisting of five therapeutic procedures: *Vamana*, *Virechana*, *Basti*, *Nasya*, and *Raktamokshana*. Among them, *Basti* is a medicinal treatment in which medicated substances are delivered via anal channel using the *Basti Yantra*. According to Charaka, *Basti* is the most significant therapeutic method for treating all forms of *Vata* diseases. They stated that *Basti*, like *Apatarpana* or *Santarpana*, may be employed in a multifaceted strategy depending on the medications used. *Niruha basti* is one that primarily uses *Kwatha dravya*. It comprises *Madhu*, *Saindhava*, *Sneha*, *Kalka*, and a decoction. It is so named because it expels morbid *Doshas* from the body. *Niruha basti* has several synonyms, including *Madhutailika*, *Yapana*, *Yuktaratha*, and *Siddha*

Basti. *Anuvasana Basti* primarily contains medicinal substances that are utilised and required in fewer quantities than *Niruha*. *Sushruta* further splits it into three categories based on dosages, namely *Sneha*, *Anuvasana*, and *Matra*. When *Snehana* or *Brihana* is necessary, this *Basti* is utilised. After reviewing various research papers, it was discovered that much research work has been done on the role of *Basti* in musculoskeletal disorders and that *Basti* therapy is very effective and produces statistically significant results in both subjective and objective parameters assessed on various validated scales.

In Ayurveda, *Basti* treatment is considered *Ardha Chikitsa*¹³, which implies that it can heal sickness if selected and appropriately executed according to the nature of the *Dosha*, *Dushya*, *Vyadhi*, and patient. There are a few *Basti* that are very efficient in practising musculoskeletal disorders. These are *Vaitarana Basti*, *Ksara Basti*, *Saindhavadi Taila Basti* and *Panchamooladi kaal basti* in RA. *Taila Basti* is specially indicated where *Vata Shaman* is required, like in osteoarthritis, sciatica and disc degenerative disorder, whereas *Yapana Basti* is given where nourishment of *Dhatu* is needed, like in muscular dystrophy, spondylitis disease, avascular necrosis of femur etc. Panchakarma focuses on boosting blood circulation, relieving congestion, and increasing muscular tone; it is best to employ both therapies together.

Musculoskeletal disorders (MSDs) are detriments or discomforts that affect the human musculoskeletal system, including Joints, Ligaments, Muscles, Nerves, Tendons, and other forms that hold the limbs, neck, and back. MSDs are a growing healthcare concern worldwide, accounting for the second most significant cause of disability, whereas lower back pain remains the single greatest cause of disability. Pain (often persistent) and limitations in mobility, dexterity, and functional ability characterise musculoskeletal conditions, reducing people's ability to work and participate in social roles, with associated effects on mental well-being and, at a broader level, impacts on community prosperity. Osteoarthritis, back and neck discomfort, fractures due to bone fragility, injury, and systemic inflammatory disorders such as rheumatoid

arthritis are the most frequent musculoskeletal ailments. The most prevalent symptoms of musculoskeletal illness are pain and limited mobility, with pain generally persisting for lengthy periods.

There are so many herbal drugs, *Aushadhi yoga*, *Lepa*, *Guggulu Kalpa*, *Ghrita*, *Rasa Kalpa* and *Panchakarma Procedures* like (*Snehana*, *Swedana*, *Janu basti*, *Raktamokshana* etc.) Which play an essential role in the management of Musculoskeletal Elements injuries. Rasayana and Yoga also play a crucial role in maintaining the proper anatomy, stability, strength, mobility and elasticity of the Musculoskeletal system.¹⁴In *Ayurveda*, we find references to Musculoskeletal Injuries caused by contact with external factors like trauma, fire, poisonous substances, etc. This can be correlated with traumatic diseases such as *Bhagna* (bony injuries), *Sandhi Mukta* (joint injuries), *Mamsagatvata* (sprain), *Snayugatvata* (ligament, nerve and tendon injuries), *Vrana* (wound), *Shopha* (inflammation) caused due to games such as boxing, wrestling, martial arts etc. Thus, in *Ayurveda*, we observed various Musculoskeletal Elements in terms of *Peshi*, *Asthi*, *Sandhi*, *Snayu*, and *Kandara*, along with *Jala*, *Kurcha*, *Mamsarajju*, *Sevani*, *Sanghata*, *Simanta*, etc. Several clinical procedures are safe, sound, cost-effective, and well-known for preventing and managing musculoskeletal disorders.

CONCLUSION

Ayurveda view of Musculoskeletal Elements comprised *Peshi*, *Asthi*, *Sandhi*, *Snayu*, and *Kandara* along with *Jala*, *Kurcha*, *Mamsarajju*, *Sevani*, *Sanghata*, *Simanta* etc. Comprehensive knowledge regarding every element is available in *Ayurveda* Samhita. *Asthi* gives a proper framework to the body. *Peshi*, *Kandra*, and *Snayu*, along with *Asthi*, help the movement of the body. Associated structures like *Sira* and *Dhamani* help provide proper nourishment to these structures. Musculoskeletal symptoms or Injuries are caused by the contact of external factors like trauma, fire, poisonous substances, etc cause musculoskeletal symptoms or Injuries. This can be correlated in *Ayurveda* with traumatic diseases such as *Bhagna* (bony injuries), *Sandhi Mukta* (joint

injuries), *Mamsagatvata* (sprain), *Snayugatvata* (ligament, nerve and tendon injuries), *Vrana* (wound), *Shopha* (inflammation) etc. There are several clinical procedures and therapies to prevent and handle Musculoskeletal Disorders.

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