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Study of Musculoskeletal Component In Ayurveda: A Review Article**Sachin Sharma¹, Sakshi², Subhas Upadhyay³**¹PG Scholar, ² Sriganganagar College of Ayurvedic Science & Hospital, Tantia University, Sri Ganganagar,³Principal, Sriganganagar College of Ayurvedic Science & Hospital, Sri Ganganagar, Rajasthan**Abstract**

Ayurveda describes various components of body starting from micro to macro level. Musculoskeletal components are macroscopic or gross structures which include Bones, Muscles, Cartilages, Tendons, Ligaments, Joints and other connective tissues that support and bind tissues and organs together. In Ayurveda Peshi, Asthi, Sandhi, Snayu, Kandara along with Jala, Kurcha, Mamsarajju, Sevani, Sanghata and Simanta can be considered as identical components of these structures. Scattered references are available regarding certain aspects of these components which are necessary to be analyzed and correlated from modern anatomical concepts. To highlight the concept of muscular tissue as well as its structural and functional entities are identified in terms of various terminologies like mamsavahasrota, mamsadhara kala, mamsavahasrotamoola and Peshi etc. Different types Peshi like bahala, pelava, sthula, anu, prithu, vritta, hrishwa, dirgha, sthira, mridu, slakshna, karkasa etc are also interpreted with modern Anatomical point of view. All the broad muscles like Trapezius, Rectus abdominis, Diaphragm etc are discussed under bahala, Brevis muscles can be understood with hrishwa, vritta comes under Teres muscles of the body. Skeletal elements are discussed under Asthivahasrota, Asthidhara kala, along with its functional aspect. Likewise other components viz. Sandhis, Snayu, Kandara along with related structures is discussed in relation to morphophysiological aspect. The present study thus analyzes all the structures available in classics relating to musculoskeletal components with logical interpretation and correlates them with most nearest identity.

Key word- Musculoskeletal component, Peshi, Asthi, Sandhi, Snayu, Kandara.**Corresponding Author:- Sachin Sharma, (PG Scholar),** Sriganganagar College of Ayurvedic Science & Hospital, Sri Ganganagar, Rajasthan. sachin17191@gmail.com**Received – 30/08/2020****Revised- 23/09/2020****Accepted – 28/09/2020**

INTRODUCTION

The musculoskeletal system includes- Bones, Muscles, Joints, Ligaments, Tendons and other connective tissues for supports and binds tissues and organs together. They are responsible for movements, supports, stability and protection of the body. Observing all these aspects as well as structural identity, the Peshi, Asthi, Sandhi, Snayu and Kandara can be considered under musculoskeletal components in Ayurveda. Apart from these structures some other anatomical components viz. Jala, Kurcha, Mamsarajju, Sevani, Sanghata and Simanta also come under this system. Histologically, muscle develops from muscular tissue while bone and cartilage develop from osseous tissues and chondroblasts respectively, which are mesenchymal in origin. The white fibro-elastic tissues form tendons, ligaments and fascia etc. The components like Mamsa, Asthi, Snayu, Kandara etc. exhibit all these aspects Ayurveda and they can be interpreted accordingly.

Thus the present work carried out in following way-

- Available references regarding musculoskeletal components from Brihatrayee, Laghytrayee along with related text books in Ayurveda and modern Anatomy along with recent

electronics databases were taken and studied.

- Morpho-physiological aspects of musculoskeletal components were studied and analyzed from both Ayurvedic as well as modern anatomical point of view.

Discussion

Peshi Peshi is the compact form of mamsa dhatu formed by the action of vayu. It exhibits with lengthy and fleshy appearance. The main functions of Peshi are to give strength and support to the body, and cover to protect the internal structures along with vessels, nerves and bones. Bhavaprakasha mentioned that Peshi responsible for movements of different parts of the body. These references make it clear that Peshi means muscle which is made up of muscle tissues that constitute by elongated, cylindrical muscle fibres and the main function of muscle is to provide movements of the body along with maintenance of posture and body position. Histologically mamsadhara kala can be understood along with intermuscular septum, as well as epimysium, perimysium, endomysium which are covering of a muscle, fasciculi,

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and individual muscle fibre respectively. Three terminologies namely visamrinala, pankaudaka and bhumi are mentioned relating to mamsa where visamrinala exhibit ramification of veins, pankaudaka can be identified with specific muscle, while bhumi place for lamina of muscle tissue. Mamsavahasrotamula is mentioned as snayu, twacha and raktavahi dhamani. As the nerves innervate the myotome, the blood vessels are the suppliers of protein, calcium and other nutrients to the muscles, whereas the skin gives supports and protects the skeletal muscles. Therefore, these three structures are directly related to developments, nourishment and maintenance of the muscles. In certain congenital disorders like neuromuscular disorder, myasthenia gravis, there is involvement of vessels and nerves which can be considered as the involvement of mamsavaha srota. In classics, Peshi are enumerated as 500 in number with 20 extra in female. However, in modern Anatomy there is no such specific enumeration available yet. Recent data correlated it as 600 to 850, mostly as 640. Hence interpretations of muscles from the numerical aspect in both sciences are difficult. Different characteristics and types of Peshi mentioned in Ayurveda can be understood along with the modern view as follows-

Bahala (broad and large) - All the broad and large muscles are included here under. Example –Diaphragm, Rectus abdominis, Trapezius etc. However Dalhana concept i.e. bahutara indicate as muscles layers of wall like external, intermediate and internal muscles layers of thoracic wall.

In relation with Pelava (Small)- All the minor muscles can be considered here under. Dalhana comment as Alpa (little) in this regard which exhibit the small muscles like platysma, pyramidalis etc.

Sthula (Big)– It can be understood along with all the heavy, large and big muscles of the body. Dalhana comment as tadviparita (opposite of) indicates opposite to Anu (very small) which mean for large muscles of the body. For example- gluteus maximus, pectoralis major, diaphragm etc.

Anu (Very Small)- Dalhana mentioned as sukshma (minute), both the concept indicate the very small muscles like stapedius, pyramidalis, subclavius etc.

Prithu (Flat)- Dalhana comments as vistirna. Analyzing both the concepts the flat and broad muscles which covered a large area can be considered hereunder. Examples- latissimus dorsi, trapezius, external oblique etc.

Vritta (Round)-Dalhana comments as vartula, this can be understood along with the round shape (teres) muscles of the

body. Example- teres major, teres minor etc.

Hrswa (Short) - Dalhana mentioned as adirgha. All the short muscles (brevis) can be considered here.

Examples- adductor brevis, extensor hallucis brevis etc.

Dirgha (Long) - Means the long muscles, for example, longus colli, longus capitis, Sartorius (longest muscle of body). However, Dalhana's concept i.e. Ayata means rectangular in shape.

Sthira (Firm)- Mentioned as kathina by Dalhana. Both concepts indicate all the firm and stable muscles like deltoid, rectus femoris etc.

Mridu (Soft)- Kumala word is mentioned by Dalhana. All the soft muscles of the viscera like cardiac, muscles of stomach etc. can be correlated in this regard.

Slakshna (Smooth) - Is mentioned as sparsasukha by Dalhana which indicate mucosal and sub mucosal membrane of viscera. Dalhana's concept in this regard indicates the functional aspect of muscles exposed externally which are rich by nerve supply as well as vascular supply. It can also be understood with muscles of lip and labial muscles.

Karkasha (Rough) - In relation with karkasha, Dalhana mentioned the word tatviparita i.e. opposite to slakshna. Rough,

serrated and border having with irregular muscles can be considered here under.

Asthi Embryologically -

Asthi are derived from pitrija bhava i.e. paternal origin, which are hard and heavy in nature (kathina, gourava). Asthi are predominantly formed by the prithvi mahabhuta, where vayu cause porosity (soushirya) in them. In relation with mahabhoutic composition (basic body elements), prithvi mahabhuta predominance can be understood along with organic as well as inorganic compositions of bone like calcium phosphate, calcium carbonate, calcium fluoride and magnesium phosphate which are responsible for the rigidity and hardness of bone. With the action of Vayu i.e. bibhajana, the three types of cells viz. Osteoblast, Osteocyte and Osteoclast get differentiated. Here osteogenic cells differentiate and develop into Osteoblast which in turn are responsible for forming new bones where the excess growth is prevented by Osteoclast, while the Osteocytes are stable cells in bone. In the subsequent development of bones i.e. ossification, governed by two processes, i.e. membranous and cartilaginous ossification. Here in both processes, bony plates called lamellae are formed, followed by trabeculae and finally, by different canals like lacunae, canaliculae etc. inside

the whole bone. These growths, differentiations, and developments are exclusively governed by vayu. The character soushirya indicate porosity which is a special character in this tissue, influenced by ruksha (dryness) and sukshma guna (minuteness) of vayu. These porous spaces can be understood along with various channels and spaces like haversian canal, lacunae, canaliculi as well as medullary canal. In relation to embryological origin the whole hard structures like nails, teeth, bones, ligaments, vessels, hair etc. are mentioned as of paternal origin. In modern embryology also, there is some similarity regarding these elements where they are derived from a single germinal layer i.e. mesoderm. It is observed that ligaments and tendons are white fibrous tissues, while elastic layer present in tunica media of vessels develop from yellow elastic tissues. In all these tissues protein and collagen play a major role? Cartilage is formed by chondroblasts along with presence of albuminoids which are of three types. Among them hyaline and fibro consist of excess cartilage cell. All these impart rough appearance of ligaments, tendons, cartilage, artery etc. which seem logical by placing them under a single source of origin i.e. pitrija bhava. Asthi are mentioned as strongest structures of body,

which remain undestructed (navinachyanti) even after the decay of all the structures like muscles, skin etc. It is mentioned as adharasyatotha, sarakaye asthini¹⁸ and responsible for deha (body), dharana (support), by providing attachment of muscles, vessels as well as other structures of body. All these references can be incorporated directly by the functions of bone which constitute the framework of body and gives shape and form to the body. It supports, gives strength and transmit weight of the body. Caraka mentioned Asthivahasrota which can be understood along with the nutrient forams and canals present in bones which are extended into the modularly cavity. Asthidhara kala can be understood as periosteum as well as endosteal layers of bone. Observing all these references, the word Asthi can be directly correlated with bone. Other references regarding Asthi are available in relation with distributions as well as enumeration. The distribution and numeration of bone in Ayurveda and modern anatomy are differing due to various causes. For example, Ayurveda considered all the hard structures along with teeth, teeth sockets, nails, cartilages of trachea, nose ear etc. They also counted each rib separately in three different parts as like arbuda, sthalaka and parshuka which increased the

total numbers. Extended or protruded parts in bones like transverse processes of the vertebra are counted separately.

Sandhi

The concept of joint according to modern and Ayurveda is different. According to Ayurveda joints are the places of junctions of any two or more parts (anga) of the body. It may be joints between bones (asthi sandhi), joints between muscles (peshi sandhi), joints between vessels (sira sandhi) etc. But in modern science joints are the region of the skeleton where two or more bones meet, articulate and they are supported by varieties of connective tissues. From numerical aspect also there is no similarity in both the sciences. In modern science, there are no specific numbers mentioned but recent data shows that the number varies from 340 to 360. In Ayurveda, the total number of joint is mentioned as 210. However in classics only the asthi sandhis i.e. bony joints are described in details where some similarities with modern science regarding the types with characteristics are noticed. From the aspect of action i.e. movements of joints, Ayurveda mentioned two types of joint viz. Chestavanta which can be understood along with movable or Diarthrosis joints and Sthira can be understood along with immovable or Synarthrosis joints. Apart

from these two joints slightly movable or amphiarthrosis joint is also mentioned in modern anatomy which is not mentioned in Ayurveda under this classification.

Snayu

From the different characteristic as well as functional aspect, snayu can be correlated with fascia, ligaments, tendons and nerves cord. The specific characteristics of Snayu like sanakara, dhanushi, etc clearly indicate snayu is a fibrous structure which is exhibit like rope of bow. The term pratana bhavanti can be understood along with reticulated network like distributions of white fibrous tissue. Sarangadhara mentioned that snayu are the structures that bind the muscles, bones etc together which clearly indicate as ligaments and tendons of the body.

The types of snayu are –

Pratanawati snayu can be understood with ligaments or tendons,

Vritta snayu can be understood with yellow elastic tissue as the characteristic mentioned as vritta indicates as round.

Prithu means for flat and broad which can be understood along with flattened or ribbon shape tendons and aponeurosis.

Susirasnayu can be understood with sphincter of pylorus from its character. In relation to applied aspect, Susruta mentioned that the injury of the snayu causes severe pain due to which hamper

the activities of the body. This can be understood along with the sprain of ligaments of joints. The main sign and symptoms of a sprain are pain, swelling, and spasm combination of which causes difficult to use the injury parts leading to obstruct or hindrance of normal activities.

Kandara

Kandara can be understood along with the big (mahatya, mahasnayu) and round shape (vrittasnayu) tendons. Susruta mentioned the word nakhaagravaroha for the tendons (kandara) which can be understood as insertion of the tendons. He mentioned about the insertion of tendons of hand and feet as the nakhaagra varoha which can be understood along with the flexor and extensor tendons of the digits which are extensions of the forearm muscles. In case of feet also the extended tendons of the leg muscles like extensor digitorum longus, extensor hallucis brevis and longus etc to the phalanges can be understood in this regard. In relation with tendons bind to neck and heart (greevahridayanibandhani) is difficult to correlate where the insertion mentioned as media which can be understood as pubic regions rather than considered it as penis. Kandara mentioned in relation with back (sroniprithagatanam) vimba is mentioned as part of insertion which can be understood as sacrum. Tendons of back

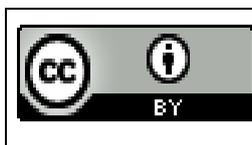
can be understood along with the anterior longitudinal ligament, posterior longitudinal ligament and ligamentum flavum. Regarding murdha, it is mentioned as uruvakshyapindadigatanam, which is difficult to understand with Susruta's view, but from Dalhana's comment, it can be understood as tendons (kandara) related to neck (greeva) that are attached with the head. This can be considered as ligamentum nuchae which is a fibro elastic intermuscular septum extended from external occipital protuberance to the spine of C₇ i.e. seventh cervical spine.

CONCLUSION

After going through this study we conclude that Musculoskeletal components are observed in terms of Peshi, Asthi, Sandhi, Snayu, Kandara along with Jala, Kurcha, Mamsarajju, Sevani, Sanghata and Simanta by observing their composition, characteristics as well as functional aspect. Peshi formed by mamsa dhatu can be understood with muscle, and muscle tissue. Sometime the aponeurosis, or fascia or even small ligaments are also considered as Peshi. Asthi are the hardest and strongest components of the body, formed by osseous tissue i.e. Asthi dhatu, which is the main framework as well as strength giver of the body

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