

AN ANALYTICAL STUDY OF MAMSA DHATU IN SPORTS PERSONS WITH SPECIAL REFERENCE TO MUSCULOSKELETAL DISORDERS

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ABSTRACT

Ayurveda is the science that imparts all the knowledge of life. It defines health and factors which are responsible for its maintenance and promotion. As this science of life i.e. *Ayurveda* is meant for human beings, all the substances, their properties and actions are described in relation to *purusha*. In *ayurveda* described various components of human body starting from micro to macro level. In our ancient literature defines the conglomeration of *Dosha*, *Dhatu* and *Mala*, which are the basis of the *Sharir*. In *ayurveda* seven types of *Dhatu* are defined in which our present study based on the *Mamsa Dhatu*. Sports medicine is one of the emerging concepts of *ayurveda* which deals maintenance of good physical and mental status. Strength and power are related to muscle size; thus, athletes competing in sports and generate more force in a specific period. Many sports injuries are a result of minor trauma to musculoskeletal structures, which hampers the performance of players. In present study is a conceptual and analytical study in which the scholar must compile, analyzes, correlate and elaborate the role of *Mamsa dhatu* (Anatomical and Physiological) in sports persons in context of musculoskeletal disorders in our ancient science and its contemporary science. In the present study the researcher must be tried the relation between the best *Mamsa dhatu* and its role in the performance. In sports persons can cause major muscle tissue adaptation and muscular injuries during their training program. In this study literature material collected with the help of ayurvedic text, modern text, internet and research article. In Ayurveda the concept of *Dhatvagni* which is responsible for *uttrotar dhatupak*. The *Mamsa dhatu* which strengthens and support our body (*Lepan Karma*), so the formation of best *Mamsa dhatu* enhance performance in players and prevent the musculoskeletal disorders (which is commonly susceptible for sports persons).

Keywords: *Mamsa dhatu*, sports injury, musculoskeletal disorders.

INTRODUCTION

Ayurveda is an ancient medicine system of the India. It basically focused on healthy living than treatment of disease. According to *ayurveda*, the human body is composed of four basic component- the *dosha*, *dhatu*,

mala and *agni*. There is immense significance of all these basics of the body in *ayurveda*. The term “*Dhatu*” is derived from the Sanskrit root “*Du Dhatra*” “*Dharan Poshanayo*” which means *Dharan*

(to support) and *Poshan*(to nourish).That which support the body,mind and life is called“*Dhatu*”,that which promotes the growth of the body. They are as *Rasa, Rakta, Mamsa, Meda, Asthi, Majja and Sukra*. Two kinds of *dhatu*s are present one is *sthayi* or *poshya dhatu* and other is *asthayi* or *poshak dhatu*. In *ayurveda*the term *dhatu* is being used for *dosha,dhatu and malain* balanced state. The bodily tissue (*dhatu*) being made of *Panchmahabhuta* constitution. Each *dhatu* has its own *Updhatu* and *mala* which are formed in the process of“*dhatu paka kriya*”.

In this study to elaborate the *Mamsa dhatu* (muscles tissue) structure,functions, changes and diseases in context to sports persons. The *mamsa dhatu* comes after *rakta dhatu* in evolutive process of *Sapta Dhatu*. According to *acharya Sushrut,sira,snayu,asthi* and *sandhi* of body are covered by *mamsa dhatu*. Observing all these aspects as well as structural identify the *peshi, asthi, sandhi, snayu and kandara* can be considered under musculoskeletal system in *ayurveda*. *Mamsa dhatu* or muscle tissue plays an important role for providing movements, support,stability,strength for human body.

This study is based on *mamsa dhatu* in sports persons in relation to musculoskeletal disorders. The muscles,their tendons, ligaments, bones and joints are together responsible for the movement of the body, support, stability, strength and allow for various types of physical activities like sports, dancing and strenuous workout etc. Various kinds of musculoskeletal disorders are presently seen nowadays in sports persons, they are more prone to many musculoskeletal disorders, trauma, injuries, progressive degenerative diseases, systemic and mental diseases during their career or sports life. In our ancient text of *ayurveda* all the *acharyas* have mentioned about excessive physical activities, trauma, injuries cause vitiated *Vatadosha* which is responsible for musculoskeletal disorders in sports persons.

Need of Study

Muscles, tendons,ligaments and bone are gracefully coupled together to provide an efficient system for movement, and together with joint cartilage and ligaments they allow for physical activities, these are all

components of musculoskeletal system and provide movements,stability,endurance and strength for human body. Similarly in *ayurveda* the *Mamsa dhatu* plays the same role, it provides *dharan* and *poshan karma* .Its main function is *lepana*, according to *acharyas*, when *dhatupaka kriya* takes place after the digestion of the food and form the various types of the *dhatu*, the *mamsa dhatu* is formed from *rakta dhatu* which develops and nourish the *meda dhatu*.So, when we consume *shadrasatmak aaahar* in *samyoga* and *samkaal* then the *uttam rasa dhatu* is formed and this *uttam rasa dhatu* forms the *uttarottar dhatu* (through the various types of *dhatu pakanayay*). So, when well-nourished *mamsa dhatu* is formed it provides good strength, power, protection, flexibility and movability, because of good *mamsa dhatu* or muscle tissue the injuries of these system is less. Sports persons are more susceptible for musculoskeletal disorders like muscles, tendon, ligaments, joints injuries. Many scholars around the globe are working on musculoskeletal disorders in sports persons but the *mamsadhatu* and its contents ,changes in this *dhatu* during endurance and resistance exercise and their effects on *mamsadhatu* and its components are not well explored,Therefore this study is focused on anatomical,physiological and pathological changes in *mamsa dhatu* and its components in sports persons.

Aim and Objectives

1. To study the *mamsa dhatu* and its contents in sports persons in context to musculoskeletal disorders according to *ayurveda* as well as modern science.
2. To study the treatment of musculoskeletal disorders in *ayurveda* and its benefits for sports persons which enhance their performance, strength and endurance.
3. To understand and correlate the allied symptoms and related diseases in *ayurvedic* text with modern texts.

Materials

Review work done and literature from the classical *ayurvedic samhita* as well as contemporary science, various research articles, journals, reference books

and data available internet etc have been incorporated in the study.

Method: Present study is a conceptual, literary and analytical study.

Review of Literature

The scholar has tried to correlate and analyse the *ayurvedic* literature about *mamsa dhatu* and its for-

mation, functions, *mamsa dhatu vridhhi* and *kshya-lakshana*, *mamsa dhatu janyavikar*, *mool of mamsavahasrotas*, *snayu*, *kandara* and its *dhushti lakshana*, *mamsasar lakshana* with Morden literature in relation to sports persons in context to musculoskeletal disorders.

Table 1: Following points are mentioned by our *acharyas* in relation to *mamsa dhatu*-

Lakshana	Acharya Charak	Acharya Sushrut	Acharya Vagbhatta(A. H., A. S.)
Mamsavridhdhilakshana	-	+	+
Mamsakshyalakshana	+	+	+
Mamsajroga	+	+	
Mamsavahasrotas	+	+	+
Mamsasar purusha lakshana	+	+	
Mamsadhara kala		+	

Mamsa dhatu is unctuous, stable, solid, smooth. Its colour is brownish and is intermediate between red colour of blood and yellowish whitish colour of *medas* according to *acharya Charak*. It is mainly made up of *prathavimahabhuta* as per *Acharya Chakradatta*. The *rakta* being conjoined with *vayu*, *jala* and *agni* becomes stable to form *mamsa dhatu* according to *acharya Charak*. They have defined about *mamsasar purusha lakshanas*, the characteristics of a person with ideal *mamsa dhatu* (muscular tissue) are- his *shankha Pradesh* (temples), *lalat* (forehead), *akshi* (eyes), cheeks, *hanu* (mandibular region), *ganda Pradesh* and *grevapradesha* (neck), *sakandha* (shoulders), *vakshapradesha* (chest), *udar* (abdomen), *sfik* (hips), *asthi-sandhi* (bones and joints) are well covered with muscles and are steady, solid and heavy. These persons have good resistance, forbearance, good patience, endurance and wealthy life, these all characteristics are similarly present in sports persons which perform either endurance exercise or resistance exercise. Both the exercises increase the bulk of muscles, strength and power of muscles and enhancing the performance of the individuals, these exercises bring about neural and muscular adaptations, this increases the capacity of an athlete to exert force through voluntary muscular contraction.

In our text all the *acharyas* must mentioned about *Vyayam* and its benefits for human body. Progressive-

ly increasing resistance and successive bouts of exercise in order to maintain a high level of effort, is one fundamental principle of training strongly associated with muscular hypertrophy. Muscular hypertrophy involves an increase in size of its component cells.

Origin of the muscle tissue is mesodermal. Muscle tissue is a soft tissue and gives rise to muscles ability to contract. The body contains three types of muscle tissue- skeletal, smooth and cardiac muscle. In this topic we must explained about only skeletal muscles and its disorders in relation to sports persons. Skeletal muscle, striated in structure and under voluntary control, is anchored by tendons to bone and is used to effect skeletal movement such as locomotion and maintain posture. An average adult man is made up of 42% of skeletal muscle and female is made up of 36%. The myofibers are present in muscle tissue and these myofibers are also two types-

- (1) type 1 muscle fibre or slow twitch fibre
- (2) type 2 muscle fibre or fast twitch fibre.

In sports persons during resistance and endurance exercise causes hypertrophy of the skeletal muscles, resulting in a plethora of beneficial performance outcome- increase muscle fibre, increased explosive strength and power capacity in the lower extremities, increased work capacity, increased fat oxidation and glucose sparing and increased in fast twitch (type 2 a and 2 b). Many Researches show that high intensity

loading produces greater development of fast twitch muscle fibres when compared to lower intensity. The fast twitch muscle fibres reign supreme in nearly every athletic endeavour, except long endurance training. The properties of fast twitch muscle fibres will promote optimal performance foundations. In many researchers, it was concluded that human skeletal muscle makes both general and specific adaptations to a training stimulus and these physical training alters the appearance of muscles. The two types of muscle hypertrophy are present –

(1) Sarcoplasmic hypertrophy - In sarcoplasmic hypertrophy causes increase glycogen in muscles and shows a greater increase in muscle size in body builders.

(2) Myofibrillar hypertrophy- In myofibrillar hypertrophy the actin and myosin contractile proteins increase in numbers and add to muscular strength as well as small increase in the size of the muscle and making it more dominant in Olympic weightlifters. Example of increased muscular hypertrophy are seen in various professional sports, mainly in boxers, weightlifters, wrestlers, basketball, baseball, ice hock-

ey and soccer may also train for increased muscle hypertrophy to better suit their position of play.

Athletes training for these sports train extensively not only in strength but also in cardiovascular and muscular endurance. These hypertrophies occur at an increased rate due to testosterone in male more than in female, biological factors such as DNA, sex nutrition proper training can affect muscular hypertrophy. A positive energy balance, when more calories are consumed rather than burned, is required for anabolism and therefore hypertrophy is present. An increased requirement for protein (milk, egg, lean meat and soya protein) in athletes training for muscle hypertrophy. During workout, increased blood flow to metabolically active areas causes muscles increase in size also known as being “pumped up”, neovascularisation is also there.

The reverse, when structural proteins are lost and muscle mass decreases, is called atrophy of muscle. Age related muscle atrophy is called “Sarcopenia”. Cellular components of muscles can also undergo changes in response to changes in muscle use.

Common musculoskeletal disorders in sports persons, they are following as-

Disorders name	Some players name	Prevalence of disorder
Ankle sprains	In 2011, Maurice Pounce and Tim Duncan.	About 25,000 ankle sprains in us per day.
Rupture or injury of Anterior cruciate ligament of knee joint, commonly seen in football players.	Tiger Woods and Tom Brady	Approx, 150,000 ACL injuries each year in U.S.
Articular cartilage injuries	Brandon Graham, Philadelphia Eagles.	36% among all athletes and 59% in basketball players and runners.
Meniscal tears	Adam Moore had a torn meniscus and T.J Schiller.	61 out of 100,000 persons per year. female suffers meniscal injuries more than male.
Overuse injuries, like repetitive microtrauma, tennis elbow, swimmers' shoulder, runner knee, Achilles tendonitis, bursitis, muscle ache, dislocations, tear of ligaments, inflammation of patella, tendinopathies and planter Fasciosis etc.		3.5 million kids are treated for overuse injuries each year. 50% of all injuries. cricket
Rotator cuff injury	Monica Seles, professional tennis player	5-40% and increased with age.
Impingement refers to mechanical compression or tear of rotator cuff tendons.	Seen in tennis players, pitchers and swimmers.	
Shoulder dislocations	Lance Armstrong, pro-	70,000 cases occur each year.

	Professional cyclist.	
Stress fractures	5 to 30 %	Yao Ming, NBA basketball player.
Acute muscle injuries like hamstring and calf muscles injuries.	Jason Roy.	Sports like track and field, rugby and football, cricket
Acute and chronic hand injuries		Boxing, judo and weightlifters.

These above table shows the structural disorders in sports persons due to weakness, impairment of muscular tissue but some other systemic diseases also present in sports persons like, sudden cardiac death 1:75,000 per year in high school and college athletes, 25 to 35% hypertrophic cardiomyopathy due to increase physical activities causes increased blood flow and cardiac output, 14% coronary artery abnormalities in Reggie Lewis, Boston Celtics, taking many steroidal drugs for enhancing the performance in the Olympics and professional sports, which helps in construction in new proteins, increase muscle mass, strength and stimulate normal biological activity, but in other hand these steroids causes many dangerous side effects like enlargement of heart (LVH), increase bad cholesterol and high risk of high blood pressure. Simply exercise and activity, is beneficial for our musculoskeletal tissue, making them stronger and more functional. But the remodelling process involves both the breakdown and build up tissue, if the breakdown occurs more rapidly than build up an overuse injury occurs.

Some people are more prone than others to overuse injuries. Body alignment, such as knock-knees, bow legs, unequal legs length and flat or high arched feet and other anatomical factors also impact overuse injuries, weakness of muscular tissue and ligaments, improper innervations and blood supply of muscular tissue is the also main causes of injuries or disorders. Other causes of injuries can be personal reasons like improper nutrition of the body, environmental reasons, acquired reasons, physiological distortions in the body, infection, chronic diseases, psychological factors, gender, age and lack of adequate knowledge of the proper exercise and lack of training. Over training wears down the immune system and does not allow the body to fully recover.

Previous studies have shown that an excess of athletic activity can depress our immune system. During light exercise is supposed to enhance the immune response but intense exercise causes free radical production, which is associated with oxidative damage of the muscle tissue, liver, blood and involves other tissues, which may contribute to heart diseases, cancer, premature aging, impaired immune system and causes assault your cell membranes with a resulting loss of cell viability and an increase in musculoskeletal damage. Dr. Cooper says, the way of free radicals are produced during exercise is through ischemia reperfusion. Those who regularly engage in endurance sports are at risk of causing permanent structural changes to heart muscles which scientists describe as “cardiotoxic”. During exercise stimulates gluconeogenesis in the liver and increases protein breakdown in the muscles. Those who endure high and consistent cortisol levels are at more risk of falling ill, when cortisol is in the bloodstream, more bone tissue is broken down than is deposited and higher risk of fractures, breakage, loss in bone density can lead to osteoporosis and arthritis, which can haunt excessive players in later life, aching muscles, poor workout performance, swelling of lymph node and abnormal heart rate.

Generally, it is believed that cancer arises, or a pre-existing cancer is encouraged, during the process of healing, rather than directly by the trauma.

1. However, repeated injuries to the same tissues might promote excessive cell proliferation, which could then increase the odds of a cancerous mutation. Chronic inflammation also cause mutation, it can contribute to proliferation, survival angiogenesis and migration of cancer cells by influencing the tumour microenvironment.
2. Some hormones play a role in the development of cancer by promoting cell proliferation, insulin-like growth factors and their binding protein play

a key role in cancer and suggestive possible carcinogenesis.

3. Osteosarcoma may be promoted by growth hormones.
4. A relationship between breast injury and fat necrosis, nearly 50% of participants had a breast injury during sports activity. In a study of female boxers, 9 out of these 61 athletes (14.7%) have a sign of fibrocystic breast, 61% fibroadenomas and some cystic lesions.
5. Athletes particularly cyclists and men who do strenuous jarring, activity frequently is supposed to be prone to testicular cancer. A study shown the relationship of testicular seminoma with several factors was explored using a case-control study.
6. Cycling, horseback riding, motor cycling and soccer sports players are more prone to testicular cancer because of more frequent groin region injury, cycling has been reported to cause acute testicular torsion (Jackson & Craft, 1978), mild associated with subsequent testicular cancer risk. Other cancer like Ca of breast, endometrium, prostate, ovary, testis, thyroid and bone etc.

DISCUSSION

The musculoskeletal injuries and changes of *mamsa dhatu* (anatomical, physiological and pathological) during their sports life. As we all known that our *acharyas* mentioned *mamsa dhatu* in detailed, so we tried to correlate the *mamsavriddhi* and *mamsakshayalakshana* in sports persons, according to *Acharya Sushrut* and *Vagbhatta* both of mentioned *guru gatrata* and *vridhhi* in *sfik, ganda, otha, upastha, uru, bahu, janghain mamsavriddhi*, so in this study it has been correlate the *gurugatrata* with sarco-plasmic hypertrophy a type of muscular hypertrophy and myofibrillar hypertrophy with *vridhhi* i.e. Increases number of actin and myosin protein fibres. In description of *vyayam* all the *acharyas* have defined about benefits of *vyayam* i.e. *Vibhaktaghangatratvma*, which is like increase size of muscles that is present in muscle hypertrophy and endurance similar with *du-khasahisnuta*.

Muscle atrophy is like *mamsakshayalakshana* in which muscle wasting (*sfik, greeva, udar, shuskata*), cachexia is present, both of conditions present in sports person. *Acharya Vagbhatta* has described *sandhi vedna* as a *lakshana of mamsakshaya* i.e. similar to weakness or degenerative changes in bones, and the various studies have been shown the overuse injuries and long term performed endurance and resistance exercise influenced negative effect our bone tissue and causes weakness of muscle tissue also. Our *Acharyas* have been described *mamsadhatu dushtiroga* which is influence all the body. Scholar has to be tried to analyse and correlate the *Adhimamsa, granthi and Arbud* with various types of tumour and cancer i.e. occurs in sports persons like testicular, breast, bone cancer, other cystic growth and fibroadenoma. *Acharya Vagbhatta* has illustrated the *kantha roga and rakta-vikar* i.e. Like thyroid diseases and blood disorders and heart diseases. Many previous study have shown the direct relation to over injuries and intense or endurance exercise with wears down the immune system, which causes the damage of muscular tissue and cancer cachexia is developed it is a severe muscle wasting, systemic inflammation and disabling clinical condition, It is quite similar to *mamsa kshaya janyalakshana*. *Dhamnishaithilya* described by *acharya Sushrut* in *mamsa kashya lakshana* i.e. Quite like coronary artery abnormalities which is also occurs in sports persons. *Acharya Charak* also defined the *snayusirakandaradoshajaroga* in which *stambha, sankoch, khalli, granthi, sphuran* and *suptata* is present, the same musculoskeletal disorders and symptoms present in sports persons like tendinitis muscle spasm, stiffness, acute muscle injuries ligaments tear, haematoma in affected area. *Mool of mamsavahasrotas* mentioned by our ancient *acharyas* i.e. *snayu, shat tavcha* and *raktavahidhamni*, it interpreted that the *snayujanyavikar* like musculoskeletal injuries. A positive energy balance, when more calories are consumed rather than burned, is required for anabolism and therefore hypertrophy is present. An increased requirement for protein in athletes training for muscle hypertrophy. During workout, increased blood flow to metabolically active areas causes muscles increase to size also

known as being “pumped up”, neovascularisation is also there, these statement is quite similar to Acharya Hemadri’s statement, he has commented that, each dhatu has its own dhatvagni which is helps formation of proper dhatu, when dhatvagni is weak so dhatu vridhhi is takes place but, when dhatvagni is strong, then the dhatu kashaya is present that means this positive energy balance theory causes muscle hypertrophy which is same as dhatu vridhhi.

Treatment or management of the musculoskeletal disorders in sports persons are various types, sports medicine is a vast subject. The most common recommended treatment in modern medicine is RICE method i.e. rest, ice, compression and elevation, use of NSAID pain relievers, immobilization of affected area and rehabilitation exercise to restore proper range of motion. Also, a programme of strengthening and stretching the affected area should be followed so that scar tissue will not build, electrical stimulation, alternating cold and hot packs and massage. In certain conditions, may require surgery to repair the damaged tissue.

Similarly, in ayurveda Acharya charak has defined chikitsa of mamsadoshajavikar, such as sansudhhi (purification included pancha karma), shastra, kshar and agni karma (included surgery, cauterization), some internal (ayurvedic formulations) and external (lepa, snehan and sweda) medicine also mentioned.

In modern, they take some performance enhancing substances like anabolic steroids that stimulates muscles formation and increased muscle mass, some growth hormone its main role to promote the healing of muscles and allowing for more sustained high-level performance. Like Morden medicine in ayurveda the Rasayana, jeevneeya and balaya dravyas (mamsa, ksheer, dadhi and ghrutavarga) have been broadly described by acharyas which enhance our body growth, improve our immunity and increase our workout capacity, strength and endure. In ayurvedic text Acharya Charak has defined the agrya dravya, in which mamsa is described as a superior or best in brihan dravya, so the principle of “samanyavridhikar-nam” the sports persons takes red meat which is best source of protein and makes body built and provide good muscle mass. All the Acharyas have illustrated

the concept of Abhyang or external Snehan in chapter of Dincharya, these Abhyang or snehan also improve strength of muscle, increase compactness of the body and make more stronger musculoskeletal system. Agni is also an important factor in ayurveda, when agni works proper so digestion of food is proper and best dhatu will be form. Yogaasan (dhanurasana, setubandhasana, bhujangasana, parvatasana etc), pranayam and physiotherapy is beneficial for sports persons for muscle strengthen, good digestion good structural, physiological, mental status.

CONCLUSION

In this present study, the scholar has correlated our ancient classical text with Morden text and interpretation that the both the literature about mamsa dhatu and its disorders are quite same in relation to sports persons. If the sports persons follow the ayurvedic treatment and lifestyle so they enhance their capacity and reduce the musculoskeletal disorders. One who takes anabolic steroids for enhancing their endure, this drug has very dangerous adverse effects, use of ayurvedic treatment and rasayana therapy beneficial for their body system. Ayurveda’s knowledge of the subtle body system makes it an excellent choice for patients ready to take responsibility of their own healing way and realize healing of entire body, mind and soul i.e. called shareer.

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