Review Article

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A REVIEW ON CONCEPTUAL STUDY OF MUSCULAR DYSTROPHIES: AN AYURVEDIC PERSPECTIVE

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ABSTRACT

Muscular dystrophies (M.D.) are a category of hereditary illnesses defined by degeneration of the skeletal muscles that control mobility, culminating in muscle atrophy, weakness, confinement to a wheelchair, and eventually death. The most common muscular dystrophy is Duchenne muscular dystrophy (DMD), caused by a lack of the dystrophin gene. In Ayurvedic scriptures, muscular dystrophy is not explicitly linked to any ailment. The notion of Adibala pravritta vyadhi in Ayurveda helps to explain this aetiology. Pathogenesis occurs here due to Beejobhagavayava dushti, which leads to Mamsa Vata dushti. Because there is no specific treatment for muscle dystrophies in any medical system, the modern therapeutic approach of M.D is corticosteroids, physical therapy, respiratory assistance and gene therapy. In muscular dystrophy patients, Ayurvedic treatments such as Santarpana chikitsa, a collection of herbo-mineral medications, and specific Panchkarma therapies have an apparent protective effect and a prolonged survival rate. The current review article discusses the notion of muscular dystrophy from an Ayurvedic perspective and treatments and drugs that can help with the disease.

Keywords: Muscular dystrophy, Duchenne muscular dystrophy, Adibala pravritta vyadhi, Santarpana chikitsa.

INTRODUCTION

Muscular dystrophies are a group of genetically inherited primary muscular diseases that are characterized by gradual and irreversible muscle weakening. Various dystrophies are mentioned based on the primary muscle involved, age of onset and degree of progression.

Duchenne muscular dystrophy is the most common type of muscular dystrophy, affecting one out of every 3600 boys born worldwide. It has an X-linked recessive inheritance pattern. Females will typically be carriers for the disease while males will be affected. The son of a carrier mother has a 50% chance of inheriting the defective gene from his mother. A mutation in the dystrophin gene, which codes for the protein dystrophin, causes this condition. Dystrophin is the protein that connects each muscle fibre's cytoskeleton to the underlying basal lamina. Muscles that lack dystrophin are vulnerable to mechanical injury and go through repeated cycles of necrosis and regeneration. The regenerated muscle is damaged due to a lack of dystrophin.

The continuous process of damage and repair and eventually replacement of muscle with fibro-fatty tissue is responsible for progressive muscle wasting that begins at the age of 3-5 years, delay in motor development and finally wheelchair confinement followed by premature death at about 30 years from cardiac or respiratory complications.[1]

The direct link of DMD with any particular disease is not present in our traditional books. Because Vata dosha is linked to practically all major neuromuscular ailments, this condition can be classified as Adibala-pravritta mamsa Vata kshaya due to Srotorodha (obstructive pathology occurring in channels). Aatmakarmaja and Beejadosha increase Khavaigunya in the Mamsa dhatu, causing Vata vitiation and Mamsadhatvagni impairment. Instead of the proper Mamsa dhatu, the depleted Dhatvagni forms Ama It is followed by Kapha dosha vitiation. While Srotorodha causes hypertrophy in a specific area, it also presents as Prakopa followed by Vata depletion. This complex pathogenesis is responsible for progressive wasting and necrosis of the affected muscle fibers.

MUSCULAR DYSTROPHY

The following is a list of muscular dystrophy classifications based on inheritance:

X-Linked Recessive Muscular Dystrophies
- Becker M.D
- Duchenne M.D

Autosomal Recessive Muscular Dystrophies
- Congenital MD
- Limb-girdle dystrophy

Autosomal Dominant Muscular Dystrophies
- Myotonic dystrophy
- Oculopharyngeal dystrophy
- Facioscapulohumeral muscular dystrophy
- Distal myopathies

DUCHENNE MUSCULAR DYSTROPHY

It is the most prevalent and severe[2] form of muscular dystrophy in children, affecting children of all races and ethnic groups. It is characterized by progressive weakening, intellectual impairment,

calve's hypertrophy, and connective tissue proliferation in the muscle[3].

Clinical Features

Duchenne muscular dystrophy affects children before they reach the age of five, and they may have a history of delayed walking. At the age of 3-4 years, gait abnormalities become apparent. At this stage, waddling gait, Gower sign, and calf muscle pseudohypertrophy are classical findings. The onset of neck flexor muscle weakening is quite early. Between the ages of 3 and 6, the progression of weakness may reach a halt. As a result, walking difficulties increases, contractures form, and lumbar lordosis increases. Natural history studies have found that in untreated Duchenne muscular dystrophy, the age at which independent ambulation is lost is between 8.8 and 10.5 years. There is worsening kyphoscoliosis, increased upper limb weakness, and bulbar dysfunction after the loss of ambulation. Weakness of intercostals and diaphragmatic muscles with spinal deformity affects respiratory function. A drop in vital capacity of 20% or more causes nocturnal hyperventilation. The most common cardiac symptoms of Duchenne muscular dystrophy include cardiomyopathy and arrhythmias. Children with deletions of exons 48 to 53 are especially prone to cardiac complications. Respiratory insufficiency and cardiomyopathy are the most common causes of death in Duchenne muscular dystrophy patients. Variable degrees of intellectual incapacity and reduced gastric motility are further clinical characteristics of Duchenne muscular dystrophy.

Muscle Features

Hypertrophy of calf muscles is a striking feature; calf, glutei, deltoid, brachioradialis and tongue muscles may appear large, sternal head of pectoralis major, and supraspinatus are atrophied.

When To Suspect DMD

Suspicion of the diagnosis of DMD should be considered irrespective of family history, and it is usually triggered in one of three ways:
• The most prevalent symptom is an abnormal muscular function in a male child.
• Increase serum creatine kinase tested for unrelated indications.
• Increased transaminases (aspartate aminotransferase and alanine aminotransferase) produced in muscle and liver cells.

Confirm Diagnosis

Even though DMD is first confirmed by the absence of dystrophin protein expression on muscle biopsy, a blood sample is usually required. The following tests should be performed to verify a DMD diagnosis:
• Multiplex PCR is a standard genetic test for detecting dystrophin mutations.[4]
• Multiplex ligation-dependent probe amplification.[5]
•Internal primer/single-condition amplification.[6]Multiplex amplifiable probe hybridization.[7]
• Creatine kinase levels rise in conditions of active muscle fiber necrosis and injury, making it a good screening test for muscle disease in clinical practice.[8] The levels are usually very high, ranging from 5000 to 150000 IU/L (normal is less than 200 IU/L).

Complications

• Involvement of respiratory muscles and respiratory failure.
• Pharyngeal weakness
• Scoliosis and thoracic deformities.
• Cardiomyopathy that results in CCF.
• Intellectual disability.
• Disabilities in learning.

Management

There is no cure for any form of muscular dystrophy in today's medical science. Treatment only aids in the prevention and reduction of deformities.

Monitoring

• **Pulmonary Function Tests –** Every six months for non-ambulatory patients and once a year for ambulatory individuals.
• **Echocardiography -** Once every two years for children under the age of ten, and once a year for children beyond ten.
• Calcium and phosphate levels in the blood are measured once a year.

Physical Therapy

• Effective stretching and proper positioning at various joints, assistive devices to prevent contractures, avoid high-resistance strength training, and surgery for fixed contractures and spinal deformities.

Other Components

• Cardiovascular and respiratory treatment.
• Controlling gastrointestinal issues.
• Psychosocial supervision.
• Genetic counselling and family education.

Newer Therapies

• Exon skipping
• Cell therapy
• Gene therapy

A multidisciplinary team is needed to manage a child with Duchenne muscular dystrophy. Maintaining strength and joint range of motion through exercise, physiotherapy, and avoiding extended immobility are the mainstays of management. Corticosteroids are the only therapies known to increase strength and prolong ambulation in children with DMD. Pulmonary and cardiac care, nutrition, calcium balance, proper vaccination, and orthopaedic treatment are all included in supportive management.

AYURVEDIC PARLANCE

Matruja beejabhaga avayava dushti as Cause for Muscular Dystrophy
Shukra and Artava seeds have chromosomes with genes that symbolise the organs produced in the future. In Ayurveda, these are known as Beeja and Beeja bhaga. The Beeja (a division of sperm or ovum responsible for the production of a specific organ; the closest term in contemporary genetics is the Chromosome) or Beejabhaga (a component of Beeja; the most relative term in modern genetics is the Gene) are responsible for the development of the corresponding organs. When Doshas vitiate these, the corresponding derived Avayavas (organs) get deformed.[9] Because Mamsa dhatu is a type of Matruja bhava, any Vikruti to Stree beeja will increase the chances of Muscular Dystrophy. If the part of the Beeja (seed) responsible for the production of Mamsa dhatu becomes vitiated, Mamsa dhatu will become vitiated as well. If it is not vitiated, there would be no vitiation of the Mamsa dhatu either.[10]

Muscular Dystrophy is a Kind of Adibala pravrutta vyadhi
Adibala pravruttha vyadhi is a type of Adhyatmika vyadhi caused by Shukra and Shonita[11], which leads to vitiation of Beeja bhaga and Beeja bhaga avayava dusti, resulting in Muscular Dystrophy manifestation.

Samprapti (Pathogenesis) of Muscular Dystrophy
Because both Vriddhi (aggravation) and Kshaya (depletion) are present in this ailment, the general rule is that all Vriddhi is caused by nourishing factors and is followed by Kapha. All Kshayas are caused by unnourishing components and thus are followed by Vata, which can be concluded.[12] If Kapha and its Samana guna ama (undigested substance with similar qualities) create Srotorodha (channel obstruction), Vata prakopa can result, causing wasting or Sosha (depletion) of the affected region. In Ayurveda, 13 Agni (digestive fires) are depicted, each responsible for digestion and metabolism. Each Dhatu has a corresponding Agni, which is responsible for the Dhatu's metabolism (tissue).[13]As a result, Ayurvedic treatment for the illness, as mentioned earlier, should include not just Brimhana (nourishing treatment) but also Srotoshodhaka (to relieve channel obstruction), Raktaprasadaka (to promote blood flow), and Dhatvagnivardhak (to increase tissue fire).

General Principles of Treatment and Prevention of (Muscular Dystrophy)
Muscular dystrophy is classified as Meda-mamsadhatu dusthi in Ayurvedic scriptures and vitiated Vata dosha plays a significant part in the disease. Line of treatment is mainly at three levels –
• First line – Srotoshodhana*,* which includes Lekhana oushadhi and Dhatwagni deepan.
• Second line – Dhatukshaya janyavatavyadhi chikitsa (to enhance tissue metabolism) • the Third line – followed by Brumhana chikitsa

Chikitsa
By adopting specific treatment modalities, we can improve the quality of life and postpone the disease progression. These are the following: -

Bahir Parimarjan Chikitsa
- Abhyanga: Vatahara, Brumhana Snehas like Mahamasha taila, Balashwagandha taila, Ksheerbala taila, lakshadi taila, bala dhatryadi taila, chandanbalalaxadi taila.
- Swedana: shastika shali pinda sweda, masha pinda sweda etc.

Antar Parimarjana Chikitsa: In Mamsa kshaya and Apatarpana vikaras, Yapana basti and Brumhana basti are mentioned.
- Yapana basti: mustadi raja yapana basti, as it is Balya, Brumhana.
- Matra basti/Sneha basti/Anuvasana basti with brahmana dravyas like ashwagandha ghrita, balashwagandhadi tailam, ksheerbala taila.

Shaman Oushadis
- Churnas: ashwagandha churna, kapikacchu churna, Shatavari churna.
- Kashayas: bhadradarvadi kashayam, devdarvadi kashayam, indukantham kashayam, vidaryadi Kashaya, kalyanaka ksheer Kashaya.
- Asava & arishta: ashwagandharishta, balarishta, dashamoolarishta, draksharishta, vidaryasava, pippalyasava, arvindasava.
- Rasoushadhis: ekangveera rasa, vasanta kusumakara rasa, Swarna makshika bhasma.
- Shamana snehapana: kushmanda ghruta, ashwagandha ghruta, indukanta ghruta.

Rasayana: Aja mamsa rasayana, ashwagandha rasayana, Narasimha rasayana, kushmanda rasayana, chyavanprash rasayana, Agastya rasayana.

In muscular dystrophies, vidharyadigana dravya, kakolyadigana dravya*,* and laghupanchmoola dravya siddha kalpas are helpful.

Importance of Mamsa Sevana in Muscular Dystrophy: Flesh is the only thing that can stouten the body, especially in carnivorous animals, because they eat meat.[14] Emaciated and dry patients should be fed well-prepared meat from predatory animals, which is particularly bulk promoting. Aja mamsa sevana is the ideal since it possesses qualities that are like human flesh.[15]

CONCLUSION

Muscular dystrophy is a hereditary illness with no specific treatment in any medical system and an unpreventable prognosis. Muscular dystrophy is described in Ayurvedic texts as Adibala pravritta vyadhi*,* which occurs due to Beeja bhagavayava dusti*,* which leads to Mamsa Vata dushti and the manifestation of vitiated Vata dosha. The importance of Agni, who is responsible for producing the following Dhatu*,* is indicated in the Dhatupaka avastha. In the long-term management of DMD, Purva-panchakarma therapies (Snehana, SSPS) combined with Anuvasana basti are beneficial. Basti karma offers the Shamana of provocative Vata, evident in Muscular Dystrophy. The reason brings a chain of Dhatu kshaya leading to Vata prakopa and further Dhatu kshaya due to Vata prakopa. Thus, Basti should be administered to correct Agni, balance Doshas, remove metabolic toxins from Dhatu, and provide nourishment to the various Dhatus*.* Various research works on Vatavyadhi with particular reference to DMD have been conducted in multiple Indian institutes, concluding that herbo-mineral medicines, in conjunction with Panchakarma therapies, play a significant role in preventing DMD complications. Yogic exercises combined with Panchakarma therapy are very effective in preventing and treating various complications in children with muscular dystrophy. Single Ayurvedic drugs with properties such as Medhya (memory-boosting), Balya (strengthening), Agnivardhana (digestive & carminative), Vatadoshahara (Vata pacifying) and Rasayana (rejuvenating) are administered both internally and externally as a primary guideline for nourishment, followed by strengthening and rejuvenation of Mamsadhatu.

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