E ISSN 2350-0204

IJAPC

VOLUME 11 ISSUE 3 2019

www.ijapc.com
Greentree Group Publishers (GGP))

Int J Ayu Pharm Chem

REVIEW ARTICLE

www.ijapc.com

e-ISSN 2350-0204

Panchakarma A Ray of Hope for Duchenne Muscular Dystrophy

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ABSTRACT

The Duchene muscular dystrophy is a genetic disorder. It affects every 1: 3600 live male births due to mutation in dystrophin gene. DMD is characterized by progressive symmetrical muscular weakness that affects proximal muscles more than distal. Patient lose the ability to stand, walk and loss of ambulation before 10 years, with progression of the disease most patients succumb to death in their early 20s.In *Ayurveda*, it has been classified under *Adibalapravrittavyadhi.* Here pathogenesis occur due to the *Beejabhagavayava dushti* which lead to *Medomamsa dushti* further vitiates the *Vata.*So *Vata* as the prime *dosha* to cause neurological disorders, vitiates *rasa, rakta, mamsa, jala, agni & oja* and leads to gradual progression of muscle wasting.In *Ayurvedic Rasayana* group medicines and specified *Panchakarma* therapies are more effective and helpful on *Dhatu Kshaya*, which enhance quality of the life and longer survival upon Duchene muscular dystrophy.

KEYWORDS

DMD, Dystrophin , Adibalapravruttavyadhi, Medomamsa Dusti , Panchakarma

Greentree Group Publishers

Received 20/08/19 Accepted 24/10/19 Published 10/11/19

INTRODUCTION

The word dystrophy derived from Latin and Greek roots meaning of faulty nutrition. The disease was first described by Neapolian physician Giovanni Semmola in 1834[1]. Dystrophinopathies are a group of disorders resulting from mutations in the dystrophin gene Duchenne muscular dystrophy (DMD) & Becker muscular dystrophy (BMD) combinedly known as DBMD are the most succeeding dystrophies to be suffered by children all over the globe. Prevalence of DMD is three times higher than BMD. DMD is one of the serious form of recessive X – linked inherited disorder primarily affecting skeletal and cardiac muscles[2]. Dystrophin is cytoskeletal protein and it forms dystroglycal-glycoprotein complex. This complex maintains the integrity of muscle cells. Absence of dystrophin protein results in the destabilization of the entire dystroglycan-glycoprotein complex, hence muscle mass does not grow well which leads to weakness of muscles. Mostly symptoms appear in the skeletal muscles, Cardiac and Phrenic Muscles. Most patients die because of heart failure or respiratory problems. Each child of a carrier mother has a 50% chance of inheritance of DMD. Diagnosis of these disorders is based on clinical presentation, genetic testing, Muscle biopsy and muscle imaging. No any treatment is at present in DMD definitely in any medical field. In Modern corticosteroids, physical therapy, respiration assistance and gene therapy is administered to the patient. With the increasing prevalence of disease in young children, multiple centers pertaining to special care are also foundered in India[3]. After birth, the Sequencing of presentation starts with mild delayed milestones during toddler period, often toe – walking, difficulty to raise from floor and frequent falls. By the age of 5 years a marked disparity between physical ability and surrounding peers occur. During 2nd decade of life; respiratory, cardiac & orthopaedic involvement takes place and without any medical intervention, leads to a cost of life expectancy (at the age of 18 to 20 years)[4]. In *Ayurveda*, the disease cannot be directly correlated to any of a particular disease entity. This disease can be attributed under the concept of *adibalapravritta vyadhi*[5] *Khavaigunya* of *mamsavahastrotas* causing *dhatvagni* impairment[6]. DMD can be considered as an imbalance of *vatadosha*, *saptadhatu* (basic elements for formation of *garbha* both as functional & structural - to the level of *dhatwagni*) and *ojas* considering its progressive degeneration to systemic involvement. The cardinal feature is *chestahani* (decreased mobility), which

indicates decrease in *chalaguna*. Recent advancements are addressing towards multi-systemic complications. Various treatment advances are been undertaken, currently FDA has accepted EXONDYS 51™ (eteplirsen) injection[7] . Which is useful for DMD children with a confirmed deletion / mutation of Exon 51 only[8]. Stem cell therapy and gene therapy are still in the preliminary stages of development. Absence of specific treatment makes it more important to consider complementary and alternate approach of management. According to *Ayurveda*, for nourishment, strengthening and rejuvenation of mamsadhatu we should administer Balya (strenthening), *Rasayana* (rejuvenative) , *Agnivardhana* (digestive & carminative) & *Vatadoshahara* drugs . *Panchakarma* therapy in the form of *Abhyanga*, *Shalishashtika Pindasweda*, *Basti* has been taken along with *Ayurvedic* regimen render the patient longer survival with muscular dystrophy.

AIMS AND OBJECTIVES

1) To study etio-pathogenesis of DMD through both modern and Ayurveda perspectives.

2) To promote Ayurvedic treatment principles in managing DMD.

MATERIALS AND METHODS

This review was done by compiling the classical Ayurveda literature, Ayurveda Paediatric books, modern paediatric books, magazines, research journals, thesis and dissertations Pub med, WHO guidelines for Muscular Dystrophy, AIIMS guidelines, CCRAS database, websites etc.

Confirmation of the diagnosis

1. Serum Creatine kinase [9]

2. Routine blood Investigation

3. Muscle biopsy

4. The genetic tests commonly used to identify dystrophin mutations are multiplex PCR[10] .

5. Multiplex ligation-dependent probe amplification[11].

6. Single-condition amplification/internal primer[12].

7. Multiplex amplifiable probe hybridization[13].

CLINICAL MANIFESTATION

The clinical features of muscular dystrophy depends on the age group of child for example- In infancy: In this age group boys are rarely symptomatic at birth or in early infancy, although some are mildly hypotonic.

Insidious onset with gradually progressive course.

Positive Gower's sign[14].

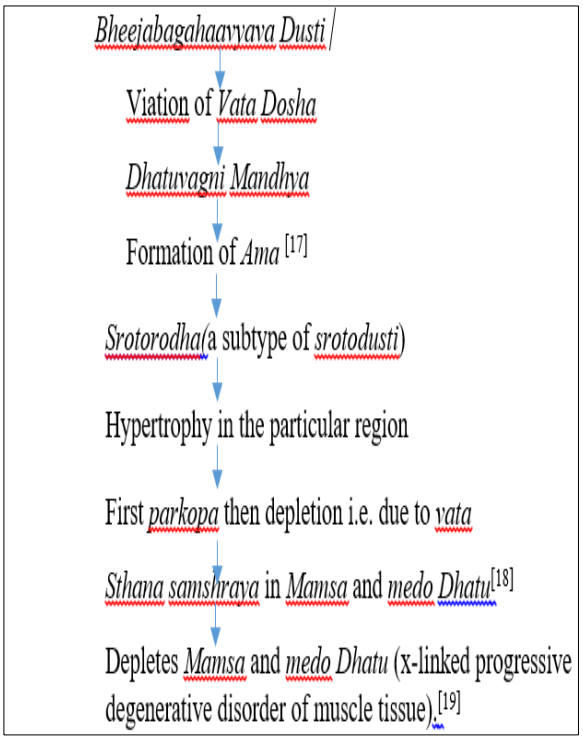
Difficulty in climbing upstairs and getting up from sitting position, pelvic muscles involvement more than shoulder muscles. Pseudohypertrophy in some muscle and atrophy in others.

Cardiomyopathy: Persistent tachycardia and myocardial failure, is affected in 50-80% of patients with DMD.

Intellectual impairment: 20-30% has an IQ <70 in case of DMD affected children's. The learning disabilities are mostly found in affected patients but still allow them to function in a regular classroom, particularly with remedial help.

PATHOGENESIS

Pathogenesis can be given by the concept of *Adibala Parvritta Vyadhi* viz., *Sushruta's vyadhi vargikarana* [15] and let it *Asadhya Roga*[16].



DIAGNOSTIC CRITERIA

Patients presenting with the clinical picture of proximal muscle weakness, difficulty while standing, climbing staircase, pseudo-hypertrophy of calf muscles, positive Gower's sign, 6min walking test with confirmative test as serum CPK values, testing for DMD mutation in blood sample (Genetic test - multiplex PCR), EMG – NCV Test, Histopathological report.

DISSCUSION

Ayurveda and DMD:

According to Acharya charak[20] , the very definite cause for defective progeny is vitiation of *beeja* & *beejabhaga*. The part in *beejabhaga* is vitiated that *anga* originating from the part of *beeja* will be deformed and this can be related to genetic diseases due to chromosomal disorders. So, this can be related to the cause of disease effecting X chromosomes and thus causing DMD in male child and females as carrier.

Role of *vata, rasa, rakta, mamsadhatu, jala, agni and ojas* in DMD

Mamsa dhatu is formed by conjoining of *rasa* , *rakta* with *vata* , *jala* & *agni*[21]. *Acharya vagbhata* says , *vata* is the main cause for birth of deformed child. When it gets vitiated, it dries up the channels of *rasa* etc *dhatu* (lack of nourishment to foetus) leading to newborn suffering from further

vatavyadhi (neurological disorder) or born with birth defects. These both can be considered as the reason for dystrophy in children as a genetic origin[24] . During *Dhatu nirmana* (tissue formation) , *katu awasthapaka* gets vitiated due to derangement in *agni* thus afflicting *Vata* , produces *visham mahabhuta* ; which turn into improper formation of *dhatu*. Further, *Dhatu parmanu* is also produced abnormally because of these *visham mahabhuta* and now the destruction occurs by *swabhava* (natural). This finally depletes the *oja* causing respiratory & cardiac complications[22].

Samprapti:

The pathogenesis of dystrophy can be understood by *Mamsavaha srotodushti vikara* which occur due to defect in *shukra / shonita* (deformity in X chromosome) or vitiated *matruja bhavas* (sudden mutation of gene) leading to *beejabhaga / avayavadushti*. Due to *beejadushti*, *vatavaishamyata* (disproportionate) occurs, causing improper formation of *mamsa dhatu* by the influence of *dhatwagni of rakta & mamsa*[23]. Due to decrease in *dhatwagni* there is formation of *ama (*indigestion) and due to this faulty nutrition it causes progressive degeneration of *mamsadhatu* (muscle tissue)[24].While *srotorodha* (obstruction due to metabolic waste) produces hypertrophy of particular region and so first occurs as *prokopa* and then depletion of *vata* element takes place.

Roopa:

The clinical features can be correlated as *Mamsa kshaya* of *sphik* (muscle wasting of thigh), *mamsasphik, uru, jangha vrudhi* (hypertrophy of muscles of thigh, chest, abdomen and hip), *gurugatrata* (heaviness of muscles) *adhimamsa* (hyperplasia of muscle), *prabhrutayo mamsadoshaja* (inflammation of necrosis of muscle) [25].

Chikitsa:

The basic line of management concentrates on correction of *dhatuparinama prakriya*. *Ayurveda* considers the significance of *agni*, which is the main factor for *uttarottaradhatu* (every next tissue) formation. Thus correction of this *dhatwagni*, by administering *deepana and pachana* drugs strengthen the *dhatu* and further elimination of metabolic waste is to be done[26]. *Acharya vagbhata* said that the usage of *rukshana dravya* for *bruhmhana* treatment modalities; as a pre-operative procedure which helps in removal of *srotorodha* and do *sthirikarana of anga*[27] .Though *vata* is the prime *dosha* to neurological conditions and *basti* is considered as *ardha chikitsa* and ultimate amongst all but still in conditions like DMD, a multi-dimensional approach should be followed.

The Proposed line of treatment for DMD

First line –*Srotosodhana*

Dhatwagni deepana-pacana (rukshana)

Second line – *Dhatukshaya janya Vatavyadhi Chikitsa* (to promote tissue metabolism)

Third line –*Brumhana chikitsa.*

***PANCHAKARMA* IN DMD**

1. *Deepana and Pachana (like udvartana, pariseka with dhanyamla* – (at tissue level)

2. *Snehapana*[28] *– with Tikta Gruta, Amritprasha Gruta, Indukantam Ghruta,*

3. SarvangaAbyanga with Balaashwagadha-lakshadi Taila, Mahanarayana Taila, Mahamashadi Taila[29]*,*

4. Swedana (Shastikashali pinda sweda[30]*, patrapotlipinda sweda*[31]*, mamsakizhi)*

5. Virechana with Trivtrut Leha (best in children).

6. Basti (of brumhana property) - Mamsa rasa basti, Mustadi-yapana basti

7. Anuvasana basti with Ashwagandha Ghruta, Changalyadi Ghruta[32]

8. Nasya with Masha Taila, Kshirabala Taila

Mechanism of action of *Panchakarma* on DMD

In India, with this incidence and no cure in contemporary system of medicine.In *Ayurveda, Paraspar dhatu paka* concept is of prime importance[33]. *Dhatu paka avastha* clearly signifies the importance of *Agni* which is responsible for the formation of the next *dhatus.* In *Panchakarma, Deepana* and *pachana dravyas* are given to correct *agni* , balanced *doshas* and for elimination of metabolic toxins from the *Dhatu*[34]. In *Poorva karma Acharyas* gave the concept of *"Brhmanyastu mrudu langyet* " in which for better *Brihmana* treatment *Rukshana* modalities are used [35] . *Udvartana* helps in *Sthiri karana of angas* and the removal of *srotorodha.* Initially for *Deepana parishekha* with *Dhanyamla Dhara can be done* [36-37] *Panchakarma* procedures i.e. *Vamana, Virechana, Niruha, Anuvansana and Nasya* are of prime importance[38]. *Vamana* of *mrudu* kind i.e. if the person is present with *kapha sthana gata pitta or utkilshta kapha lakhashanas*, then using the drugs like *Madana phala* which has *anapaitava as guna,* has least complications and it corrects the depleted *Medas*[39-40]. *Vacha* as dravya for the vamana can be given because it gives better improvement in children for the neuromuscular disorder [41]. *Mrudu Virechana* is explained under *Vatsya upkarma* and it has *anulomana* as well as *tridoshahara* property[42]. *Amritprasha ghruta and Tikta ghrutas* are used as *shodhana snehapana,* because *tikta rasa* is *Srotoshodhaka*. *Virechana* does the detoxification which lead to better

absorption of *Rasyana* Drugs, other *Brihmana Dravyas* and correction of *Agni* [43]. In *Gambhir Dhatu gata vikara*, especially *Brihmana* variety of *basti* like *Mamsa rasa Basti* and *yapana basti (contains madhanaphala*) with *kala* and *karma* format, considering the condition, can be administered[44]. *Tikta Ghruthas*, *Ashwanganadha ghrutha* and *Chagalayadi ghrutha* can be administered as *Anuvanasa basti*[45-46]. *Virechana and basti* are explained in the principle treatment of *Medomamsa dusti*[47]. *Nasya* has less importance ,it is assumed that it can be used for the treatment of various associated symptoms like depression due to its *mana prasdana action* [48] .After the purification *Rasyana* therapy can be adopted. *Charaka and Yogaratnakar* told in the treatment principle of *Vataroga* that *upakarmas like Abhyanga*, *Svedana* are having prime treatment modalities [49]. Both types of *Snehana, bahya and abhyantra* helps to pacifies the *vata dosha*[50] . *Abhyanga* a variety of *bhaya sneha* with oil like *Bala – ashwagandha-lakshadi taila, Mahanaryana Taila and Mahamamsadi taila* are *vataghana* and improves the tonicity of the muscle[51-52]. Whereas *swedana like Shastikashaali pinda swedana* also improves the tone of the body [53]. *Swedana karma* increases the metabolic activity which in turn increases the oxygen demand and blood flow.

Udvartana- Due to *Medo-Kaph har* property it is very effective to treat hypertrophy of calf muscles and strength of muscles [54] It also stimulates nerve ending, relax muscles and relives pain [55] .

Abhyanga - It stimulates circulatory system, vasodilatation resulting to nourishment & strengthening of muscles, reduces connective tissue thickening and provide flexibility by decreasing fibrous adhesions from hypertrophied muscles. It has shown reduction in toe walking, relieving contractures, nourishment of atrophied muscles, increasing muscle power and assisting muscle tone[56].

Shashtika Shali Pinda Sweda

1. It should be applied followed by *Abhyanga*; muscular dystrophy is the result of *Medo-Mamsa* imbalance disorders that's why SSPS was found very effective for nourishment as well as providing strength of the muscles and nervous tissue to the affected child.

2. *Brimhaniya Snehika* sudation done by bolus of luke warm *Shashtika Shali (Oryza Sativa Linn) with Vatahara Kwatha* and milk. *Balamoola Kwatha as Vatahara Kwatha* for SSPS was used due to its *Kapha-Pitta-Vatahara* properties, [57] and *Balamool kwatha* was its ability to alleviate *Saptadhatugata-vata* (normalize the

functions of *Vayu* in all the tissues of body, due to its main ingredient is *Bala* which is best drug in alleviating *Vata dosha* [58] .

Swedana - Fomentation has been demonstrated to produce decrease in gamma activity, which reduces stretch on muscle spindles resulting in decreased muscle spasm. Elevating muscle temperature can also alter strength and endurance. It also results in decreased joint stiffness and increased tissue extensibility, thus facilitating ease of motion and range of movements[59]. Due to *Swedana* vasodilatation occur which stimulates the superficial nerve endings which leads to reflex stimulation of sweat glands in the areas exposed to heat. This rise in temperature induces muscle relaxation and increases the efficacy of muscle action as the increased blood supply ensures the optimum condition for the muscle contraction [60] . The secretion of sweat is under nervous system control. The hair of the skin is tactile sense organs and their secretion produces some nervous changes and can bring about changes in conduction of nerve stimuli, by changing sodium-ion concentration.

Virechana - Samyaka *Virechana* do *Srotovishuddhi*, *Agni Vriddhi* and *Vata Anulomana*. Which leads to absorption of *bruhmana & rasayana dravya*[61].

Basti- It is to be instilled as *karma / kaala basti*, considering it as *Gambheer dhatugata vikara*[62].

Yapana basti -acts as *lekhana & brumhana*. It is *medohara*, increases *agni* [63]. It has regulating effect on gut- brain (ENS)[64] .

Anuvasanabasti –

Anuvasana Basti Krama is the treatment for *Vata Vyadhies* (diseases occurring due to vitiation of *Vata*), *Pakwashaya (Vata Sthana)*, which is the main site for action of Vasti dravya, when the *Vata* is controlled then *pitta and kapha* function in body also corrected, due to which *agni* got corrected and proper *Mamsa and Meda dhatu* (muscles tissue)formation occur. Some examples of *Basti* which can be used in muscular dystrophy i.e *Mamsa rasa basti and Mustadiyapana basti*, improves *dhatukshaya* (depletion of body tissue) [65] .

Nasya – has a property of *Mana prasadana* action [66].

CONCLUSION

In Modern medicine there is no specified treatment for Duchene Muscular dystrophy.In Ayurveda *Purva-Panchakarma* procedures (*Snehana, SSPS), Basti* is useful in the long term management of DMD. *Basti* controls the *Vata* and improves *Agni*, balancing *Doshas,*

eliminate metabolic toxins from *Dhatu*.Various research works has been done on *Vatavyadhi* in various institute of India, where it can be concluded that herbo-mineral medicine along with *Panchakarma* therapy has a major role to prevent further complication of DMD.In *Ayurveda*, *panchakarma* procedures can provide patients of DMD, longer survival.

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