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AN AYURVEDIC MANAGEMENT OF SPINAL MUSCULAR ATROPHY (SMA) – A CASE STUDY

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ABSTRACT

Spinal Muscular Atrophy (SMA) is the second leading genetic disorder inherited in the autosomal recessive pattern due to the absence of the SMN1 gene characterized by loss of motor neurons and progressive muscle wasting, often leading to dependent life and decreased life span. In Ayurveda, this condition can be considered as *Kulaja Vyadhi* wherein the patient's *Mamsa* and *Snayu* is affected by *Vata*. This can be regarded as *Mamsa-Snayugata Sarvanga Vata*. It is said that *Prakruta Vata dosha* is the life, it is the strength, it is the sustainer of the body, it holds the body and life together. If it is *Vikruta* it produces *Sankocha, Khanja, Kubjatva, Pangutva, Khalli* and *Soshana* of *Anga*. So, in this disease aggravated *Vata* does the vitiation of *Mamsa* and *Snayu* thus leading to *Soshana* of both, resulting *in Stambha, Nischalikarana* of *Avayava*. A 21years female patient was admitted to our I.P.D with c/o of reduced strength in all four limbs leading to the inability to walk and to maintain erect posture during standing and sitting positions. Based on *Ayurvedic* principles the patient was initially subjected to *Avaranahara Chikitsa* followed by *Brimhana* line of management.

Keywords: *Mamsagata vata, Snayugata vata, Sarvanga vata*, Spinal muscular atrophy (SMA)

INTRODUCTION

It is a human outlook to dream of begetting healthy & flawless offspring, but it is unfortunate to have increased incidences of the unhealthy pediatric population with irremediable major neurological disabilities. The management of such ailments has become rather confusing to the present-day clinicians and apparent remedies if present is highly not sure & expensive.

Motor neuron diseases or motor neurone diseases (MNDs) are a group of rare neurodegenerative disorders that selectively affect motor neurons, the cells which control voluntary muscles of the body. They include amyotrophic lateral sclerosis (ALS), progressive bulbar palsy (PBP), pseudobulbar palsy, progressive muscular atrophy (PMA), primary lateral sclerosis (PLS), spinal muscular atrophy (SMA) and monomeric amyotrophy (MMA), as well as some rarer variants resembling ALS.[1]

Spinal muscular atrophy (SMA) is a group of hereditary diseases that progressively destroys motor neurons—nerve cells in the brain stem and spinal cord that control essential skeletal muscle activity such as speaking, walking, breathing, and swallowing, leading to muscle weakness and atrophy. Motor neurons control movement in the arms, legs, chest, face, throat, and tongue. When there are disruptions in the signals between motor neurons and muscles, the muscles gradually weaken, begin wasting away and develop twitching (called fasciculation)[2]

Spinal muscular atrophy is due to an abnormality (mutation) in the *SMN1* gene which encodes SMN, a protein necessary for the survival of motor neurons. Loss of these neurons in the spinal cord prevents signalling between the brain and skeletal muscles. Another gene, *SMN2*, is considered a disease-modifying gene, since usually the more the *SMN2* copies, the milder is the disease course. The diagnosis of SMA is based on symptoms and confirmed by genetic testing.[3]

In an age of onset, symptoms and rate of progression there is wide variability. To account for these differences, the chromosome 5 SMA often is classified into types 1 to 4. Approximately the degree to which motor function is affected depends on the age at which the onset of SMA symptoms occurs. The earlier the age of onset, the greater the effect on motor function. Children who present symptoms at birth or in infancy typically have the lowest level of functioning (type 1). SMA onset in children (types 2 and 3), teens or adults (type 4) generally relates to increasingly higher levels of motor function. Other rare forms of SMA (non-chromosome 5) are caused by mutations in genes other than SMN[4].

SMA is the second most common serious autosomal recessive disorder after cystic fibrosis, with an estimated incidence of 1 in 6,000 to 1 in 10,000 live births, with a carrier frequency of 1/40 1/60 (2, 3). Although no medical treatment is available, investigations have elucidated possible mechanisms underlying the molecular pathogenesis of the disease.

If SMA effects appear after a child's first 18 months of life. Some people with type 3 don't have signs of disease until early adulthood. Type 3 symptoms include mild muscles weakness, difficulty walking and frequent respiratory infections. Over time, symptoms can affect the ability to walk or stand. Type 3 SMA doesn't significantly shorten life expectancy.

One to one correlation of an all-modern disease to the *Ayurvedic* disease is not possible[5]. But based on the etiopathogenesis, and symptomology it can be considered as '*Mamsa Snayugata Sarvanga Vata*'[6] as well as *Kulaja Vyadhi* as *bheeja gata margavaroda janyavata Vyadhi*[7] under the conglomeration of *Vata Vyadhi* (Neurological Disorder) that have an overlap of the symptoms of SMA. Contributory factors like inappropriate *Ritu* (ovulation cycle), *Kshetra*(uterus), *Ambu* (amniotic fluid), *Bheeja* (Sperm and Ovum), presence of *garbopagatakara bhavas* (activities or substance which are not favourable for growth and survival of foetus)[8] etc…and *Vatakara Ahara Vihara* all these factors may have an unwanted effect on child impeding its normal growth and development subsequently leading to many diseases, deformities and even death. Hence a formulated *Ayurvedic* protocol can improve the condition of SMA patients, providing a quality life minimizing their dependency.

CASE REPORT:

Basic information of the patient:

A 21-year Female patient visited GAMC Bangalore with complaints of reduced strength in all four limbs leading to inability to walk and maintain erect posture during standing and sitting positions. She was a Hindu by religion and was born to middle class, illiterate, consanguineous parents

Chief complaints (*Pradhana vedana visesha*):

Reduced strength in all four limbs, inability to walk and maintain erect position during standing and sitting position for 7 years.

Associated complaint:

B/L shoulder joint pain and B/L knee joint pain, stiffness and heaviness all over the body along with *spandana* (fasciculation), slight muscle wasting in left LL since 5years

History of present illness (*vedana vyadhi vrittanta*):

A female patient aged about 21 years, was healthy before 5 years, she gradually developed pain in right UL and Left LL and then the pain started to right LL and left UL after that she felt weakness in all four limbs lead to difficulty in walking, she consulted orthopediatrician there they have advised doing MRI and CPK, in that MRI report was normal, CPK is elevated. There they have instructed medicine for 6month, she took medicine for 4 months. Symptoms are gradually increased after that she didn't consult any doctor for 4 years and for better management she had admitted to our hospital.

History of past illness (*Purva Vyadhi Vrittanta):*

Nothing significant

Treatment history: The patient took allopathic treatment for 4 months then she discontinued the medication (Detail history is not known) and come to GAMC Bangalore for better relief.

Family history (*Kualja Vrittanta*): Parents had consanguineous marriage & Patient's Mother and Young brother was known to have same symptoms both have died

History of consanguineous marriage is found

Personal history *(Vaiyaktika Vrittanta):*

Diet: Non-vegetarian

Appetite: Good

Micturition: 4-5 times/day

Bowel: Once /Day

Habits: Nothing Specific

Examination: Vitals were normal, no abnormalities were found in the cardiovascular system, respiratory system, gastrointestinal system.

Table 1: *Rogi Pariksha*

Prakriti	*Kapha pitta*
Sara	*Pravara*
Samhanana	*Madhyama*
Pramana	*Madhyama*
Satmya	*Madhyama*
Satva	*Madhyama*
Ahara Sakti	*Pravara*
Vyayama Shakti	*Avara*
Vyayah	*Baala* (21 years)

Table 2: *Samprapti Ghataka*

Nidana	*Bheeja Dosha*
Dosha	*Vata (Vyana) (Chala guna)*
Dushya	*Mamsa, Snayu*
Agni	*Bhutagni and Dhatvagni*
Roga Marga	*Madhyama*
Adhistana	*Shiras*
Srotas	*Mamsa*
Sroto Dushti	*Sanga(abstractions)*
Vyakta Sthana	*Sarva Shareera*

Central Nervous System Examination:
HMF: Conscious & Well oriented
Motor System Examination:

- Muscle bulk was Normal
- The tone was Normotonia in all four limbs
- Power was 1/5 in all the four limbs
- Deep tendon reflexes are absent

Sensory system Examination: Intact
Investigations:
MRI of whole spine finding was normal
C.P.K. (Creatine Phosphokinase): 905.8U/L

Differential Diagnosis:
Acute flaccid paralysis
DMD
Poliomyelitis
Gullian Barre Syndrome
Amyelotropic lateral sclerosis
Diagnosis: The patient was diagnosed with Spinal Muscular Atrophy
Treatment Protocol: Treatment protocol comprises 58 days which includes external procedures and internal oral medication

Table 3: Treatment is given

Dates	Treatment given	Improvements observed
9/2/2021 to 16/2/2021	*Sarvanga abhyanga with Mahanarayana taila f/b Dhashamoolakashaya Seka*	Heaviness in the body got reduced up to 20%
17/2/2021 to 26/2/2021	*Sthanika abhyanga with Sahacharadi taila f/b Sthanika Udwarthana*	Stiffness and heaviness in the body got reduced up to 40%
27/2/2021 to 2/3/2021	Oral medications only	
3/3/2021 to 9/3/2021	*Sthanika abhyanga with f/b Patrapinda Sweda*	Muscle bulk in the left LL have increased
10/3/2021 to 18/3/2021	*Sarvanga abhyanga with Sahacharadi taila f/b Dashamoolakashaya seka*	*Spandana* (fasciculations) in the B/L shoulder and thigh got reduced
19/3/2021 to 25/3/2021	Oral medication only	
26/3/2021 to 1/4/2021	*Sarvanga abhyanga with Dhanwantaram taila f/b Dhanyamla dhara*	Stiffness and heaviness in the body got reduced up to 60%

Internal medication (*Abhyantara aushada Prayoga*):

1) *Bhrihat Vata Chintamani* (2 tab two times after food in a day)
2) *Ashwagandha ksheera paka* (After food 20ml two times a day)
3) *Vatagajankusha rasa* (After food 3 tab three times in a day)
4) *Lashunadi vati* (After food 2 tab two times in a day)

Pathya:
Balya, Brimhana, Mamsa Rasa, Shali dhyana, Yoosha.
Apathya:
Ruksha, Asuchi, Abhiyandi, Vatakara Ahara and *vihara*

DISCUSSION

Understanding SMA – an *Ayurvedic* perspective/ insight
Diagnosis: SMA can be correlated to '*Mamsa Snayugata Sarvangavata'*
Vata vitiation leads to the movement (*gamana*) of *Vata* in different *Dhatus* or *Margavarodha. Margavarodha* causes *Dhatu sosha* (*karotyavatamargatvaad rasadi kopasoshayet*)[9]
The vitiated vata in the body will vitiate the *Garbha, Shukra, Arthavam* (Bija) (*Garbha sukra rajonasha spandanam gatrasuptataa)*
In the *Bijas* the affected part in the *bija* correspondingly affects a similar part of the fetus (*yasya yasya havayavasya bhije bijabage*)[10]leading to *Vata Sanchaya* and *Prakopa* which causes *Sthanasamsraya* in *Mamsa* and *Snayu* due to *Kha Vaigunya* leads to *Mamsa Snayugata Sarvangavata.*

As per modern science, it is a genetic disorder in which the **motor neurons** in the **anterior horn of the spinal cord** are damaged subsequently motor functions (movements) are affected because of the loss of alpha motor neurons. *Vata* is responsible for both sensory and motor functions (*sarva hi cheshtah vatena sa pranah praninam smritah*) in the body. In this condition, the task of *vata* is affected due to the vitiation of *vata.*

Role of Physiotherapy:

(*Lagavam karma…vyayamadupajate*)[11] physiotherapy is done to improve functional mobility, to strengthen and stimulate the growth of muscles, to improve the ability to move parts of the body, to prevent joint stiffness and muscle atrophy (wasting of the muscles) of the limbs.

The treatment protocol planed for the present patient and executed was based on the following principle.

To remove *margavarodha (Kapha avarana*) if any and followed by *kevala* or *samanya vata chikitsa*.

Ayurvedic treatment for SMA is primarily aimed at arresting/ slowing down the progression of illness and helping alleviate the symptoms. However, in many cases, an attempt was made to reactivate the neurons in the spinal column.

The vitiated *Vata* produces specific diseases because of the specific nature of the causative factors and the seats of manifestation, specific treatment should be given based on-site, *dhushyas* etc. as per person.

A common line of treatment for vitiated *Vata*- Ghee, oil, muscle fat, bone marrow, *seka, abhyanga, vasti, snigdha, sweda,* to stay in a windless place, cover with blankets, *mamsa rasa,* milk food and sweet, sour and salty food. All these will be good for *Vata* vitiated persons.

Treatment Limits the progress of the motor neuron degeneration, optimizing neuron activity, Preventing further complications by *Vathanulomanam* & *rasayanam.*

Dhatvagni niyamana is achieved which further Stops further muscle atrophy, promote muscle tonicity by *Dhatu poshana* and Improves tissue immunity.

Abhyanga, Patrapinda sweda, Dhanyamla dhara helps in the fortification of neuromuscular coordination (stimulating the nerve endings by nourishing thus maintaining proper motor functions).

CONCLUSION

In this patient, a remarkable improvement in muscle tone, power & regaining back of a few motor skills with our interventions in a short span gives hope of further progress of symptoms and helps to improve quality of life (QOL). Treatment intervention in the early stages helps in getting a major benefit at later ages. Previously it was believed that neurons do not repair or rejuvenate after injury, but the new concept of neuroplasticity says that CNS can repair their neurons by axonal sprouting to take over the function of damaged neurons. Going by the results of this case study, we can conclude - *Ayurvedic* modality of treatment is helpful for better management of SMA. Through a Multi-disciplinary approach - Ayurveda as baseline therapy associated with other evolving therapies like physiotherapy, occupational, behaviour therapies would certainly do a lot for the improvement of QOL. Hence, further research can be done on a larger sample.

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