



Case Study

AYURVEDIC INTERVENTIONS IN MOTOR NEURON DISEASE

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ABSTRACT

Motor neurons are the neurons through which the brain exerts control over skeletal muscles of the body. Motor neuron diseases are rare heterogeneous group of neurologic disorders characterized by progressive degeneration of motor neurons.

A 55-year-old woman diagnosed as motor neuron disease was admitted to Vaidyaratnam Ayurveda College Hospital, on 2/11/2023, for a 21 day duration, presenting with complaints of weakness of both upper limbs associated with muscle wasting predominantly on right shoulder and wrist since 1 year. The clinical and laboratory features suggested a diagnosis of brachial amyotrophy diplegia, a regional variant of ALS.

According to Ayurveda, *Avarana vatavyadhis* are found to have close resemblance to Motor Neuron Diseases and her symptomology can be correlated to *Kaphavruta Vyanavata*. The patient underwent *Avaranagna* and *Vata vyadhi chikitsa*. Assessment of the patient was done before and after treatment by physical examination, ALSFRS-R and Neuro QoL scale. A satisfactory improvement was observed with gradual gaining of upper limb strength and quality of life. This case study demonstrates that brachial amyotrophy diplegia can be symptomatically managed with Ayurvedic therapy.

INTRODUCTION

Motor neuron diseases/MND result from selective loss of function of the lower and upper motor neurons controlling the voluntary muscles of the limbs or bulbar region.^[1] The pathologic hallmark of motor neuron degenerative disorders is death of lower motor neurons and upper or corticospinal motor neurons. The aetiology of ALS remains undetermined with 90% to 95% of cases occurring as sporadic. Between 5% and 10% of cases of MND are familial, and mutations in the free radical scavenging enzyme superoxide dismutase (SOD-1) and in a number of other genes, including TDP-43 and FUS, have been identified. ^[2] The most favoured hypothesis is that it is the result of complex genetic environmental interactions as the causal factor for motor neuron degeneration^[3]. The average age of onset is 65, with 10% presenting before 45 years^[4].

MND is incurable for the most part and average life expectancy is only 2 to 3 years from the onset of symptoms^[1]. Survival for more than 3 years is unusual, although there are rare cases who survive for a decade or longer. Death usually resulting from respiratory failure and no treatment has been shown to influence outcome substantially. Riluzole, a sodium-channel blocker that inhibits glutamate release, slows progression slightly, increasing life expectancy by 3–4 months on average^[2].

Amyotrophic lateral sclerosis (ALS) is the commonest among MND. The term ‘amyotrophy’ refers to atrophy of muscle fibres consequent to denervation of muscles due to anterior horn cell degeneration and ‘lateral sclerosis’ refers to sclerosis or hardening of anterior and lateral corticospinal tracts which are replaced by progressive gliosis^[3]. It is arguably the most devastating of the neurodegenerative disorders where a mixed upper and lower motor neuron deficit is found in the limbs. ALS occurs worldwide, usually with an incidence of 2 per 100,000 person years and prevalence of 4.5 per 100,000 people^[5].

Some ALS patients have disease isolated to a single spinal region for many years as a regional variant. Brachial amyotrophic diplegia (BAD) is a rare

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segmental form of motor neuron disease, regional variant of ALS which presents with asymmetric lower motor neuron weakness largely confined to the upper extremities^[6]. Isolated variants of ALS progress more slowly than classical ALS and associated with longer survival^[7]. So Treatment must aim to overcome, or minimize, the diverse disabilities.

This condition can be correlated to '*Kaphavruta Vyanavata* manifesting symptoms like *Gathi skhalithatvam* (impairment in movement), *Guru gatravtm* (feeling of heaviness of the body) and *Parva graha* (catching pain in joints)^[8]. Treatment modalities which are *Avaranagna* (clearing occlusion) and *Vata vyadhi hara* (combating diseases due to morbid *Vata*) are effective in such manifestations.



Figure 1: Intrinsic muscles (thenar & hypothenar) & extrinsic muscles of hand before treatment



Figure 2: Intrinsic muscles (thenar & hypothenar) & extrinsic muscles of hand after treatment



Figure 3: Shoulder muscles before and after treatment

Case Report

Patient Information

A 55 years old female patient, a known case suggestive of extensive anterior horn cell disease, diagnosed as motor neuron/ALS with clinical and laboratory features approached VAC hospital on November 2, 2023, presenting with complaints of weakness of bilateral upper limbs (Right>Left), difficulty to lift right upper limb, wasting of muscles in right shoulder, bilateral hands and upper back with frequent cramps and fasciculations since 1 year. Her weakness began in the intrinsic muscles of hands of bilateral upper limbs especially on right little and ring finger, thenar, hypothenar muscles and gradually spread over to the proximal right arm and shoulder girdle which later progressed to involve the left arm after 6 months.

Onset was abrupt as she noticed loss of strength in right hand with hyper flexed posture of little and ring finger one morning waking up from sleep. She was unable to extend her fingers from hyper flexed position. This began troubling her day to day activities. She was unable to use her right arm to perform delicate tasks such as cutting vegetables, holding utensils or using small tools.

The condition worsened in spite of taking medications and consulting several neurologists. Later as per the advice of physicians, MRI, USG, EMG and Nerve conduction studies (NCS) was done to reach the conclusive diagnosis as MND and started medication and physiotherapy. There was no known history of similar complaints of arthritis or any neurological illness in her family.

Her right little and ring finger weakness decreased as a result of the treatment. However, six months prior, she suffered a fall that broke her wrist, necessitating the immobilisation of her right arm and the end of her physical therapy for the mean time.

Since then she developed severe weakness on her whole right upper limb and was not able to lift her arm above shoulder. It was associated with severe wasting on intrinsic and extrinsic hand muscles (figure 1, 2) and shoulder (figure 3). She also developed wasting on muscles of left hand after 6 months. Involuntary fasciculation were evident throughout the upper limbs and upper back. For all these complaints patient came for further Ayurvedic management.

Personal History

Patient was a tailor and used to work continuously and take minimum breaks. Despite being predominantly vegetarian, the patient regularly consumed fish 4-5 days a week. Due to the demands of her tailoring profession, she had a habit of untimely food intake. Her appetite was moderate and she took a fixed amount of meal irrespective of her hunger. The

patient reported micturition occurring 4-5 times/day and 1-2/night while her sleep was disturbed and less for the past many years.

Treatment History

She took 1 year continuous course of allopathic medication for polyarthritis and got complete relief 4 years back. For the last 3 years, patient gradually developed severe weakness on upper limbs, muscle wasting, muscle cramps, fasciculations and is under medication Rilutor 50mg along with physiotherapy.

Clinical Findings

General and Physical Examination

Presenting a neat and tidy general appearance, the patient was conscious, well oriented, and spoke normally displaying a normal gait but reduced arm swing. There was slight drooping of shoulder to right and shoulder muscles were seen flaccid and weak. She possess a moderate built with a height of 160cm, weight of 63kg, and a calculated body mass index of 24.6kg/m². Pallor, icterus, cyanosis, clubbing, oedema and lymphadenopathy were notably absent. Vitals were recorded within normal limits.

Systemic Examination

Neurological examination revealed normal cranial nerve functions except right accessory nerve. The tone of upper extremities was reduced. On examination there was atrophy and weakness of upper extremities predominantly on right. Motor testing demonstrated 3/5 strength on shoulder abduction, internal and external rotation, 3/5 on elbow flexion and extension, wrist and finger extension and abduction on right. 4/5 in finger extensors, shoulder flexors and extensors on left. Facial strength, neck flexors and extensors, left wrist and elbow flexors and extensors and lower extremities were normal (5/5).

Fasciculation and muscle twitching were evident throughout the upper limbs and upper back. Deep Tendon reflexes were diminished in the upper extremities and normal at knees and ankles. There was no sensory loss and bladder involvement. Respiratory and bulbar function was normal.

Dashavidha Pareeksha

Prakrithi: Kapha Pitha Prakriti was calculated using Prakrithi Ayusoft tool.

Vikrithi: Doshas vitiated are Samana Vayu, Vyana Vayu, Pachaka Pitta, Sleshaka Kapha, Tarpaka kapha Dushyas affected are Rasa, Mamsa, Meda.

Saram, Samhananam, Sathwam & Pramana are Madhyama, Amla (sour), Lavana (salty) Katu (pungent) Satmya. Ahyavaharana sakthi is Avara while Jarana Sakthi Madhyama.

Vyayamasakthi is Avaram, Vaya is Madhyama

Kshanadi kala is Sarath and Vyadhyavastha is Puranam Bhoomi deshamb is Sadharanam and Deha deshamb is Shakha, Rogamargam is Madyama.

Diagnostic Assessment

Patient has satisfied the EI Escorial criteria for MND/ALS – World Federation of Neurology.

MRI Brachial Plexus with Screening of Cervical Spine as suggested by the rheumatologist was done on 8/ 12/22 shows no focal/compressive lesions and normal morphology and signal intensities in bilateral brachial plexus. There was only mild diffuse disc bulges at C5-6 & C6-7 levels, abutting the bilateral C6 & C7 nerve roots respectively.

Later as per the advice of a neurologist who suspected carpal tunnel syndrome Nerve conduction studies (NCS) was done on 29/09/22 and it revealed evidence of mild right median nerve entrapment neuropathy and moderate right ulnar motor axonopathy without evidence of entrapment across the elbow.

Findings are suggestive of proximal motor root involvement of fibers traversing right median and ulnar nerves in addition to the distal median neuropathy (CTS).

Electromyography (EMG) findings on 14/02/23

The electrophysiological study is suggestive of bilateral peroneal motor axonopathy in lower limbs and right upper limb motor axonopathy affecting right median and right ulnar nerves.

EMG study showed features of acute denervation and chronic reinnervation from all 4 segments (bulbar, thoracic, cervical and lumbar) suggestive of an extensive anterior horn cell disease

ESR, complete blood count and thyroid profile were within normal limits. Electromyography dated 14/02/2023 (EMG) shows suggestive of MND

In USG right shoulder on 16/09/23 supraspinatus, infraspinatus, teres minor, subscapularis and long head of biceps appears atrophic.

The signs and symptoms of the patient, the investigation reports and examination findings together confirmed the diagnosis of regional variant of ALS.

Roganirnaya Upayas

Nidanamb: Vishama and Pramithashana, Athi Ayasamb, jara janya

Poorvaroopamb: Gathra gurutwamb, Shoolamb

Roopamb: Soshamb, Gathra gurutwamb, Gathi skhalithatvamb, Parva grahamb

Upasayamb – Ushnamb, Rookshamb

Srothamb affected are Rasavahamb srotamb, Annavahasrotamb, Mamsavahamb and Medavahamb.

The final diagnosis establishes the condition as *Kaphavruta Vyanavata*.

Therapeutic Intervention

Details of Ayurvedic medications and external procedures from November 3, 2023 to December 24, 2023 are summarized in Tables 1 and Table 2.

Table 1: Oral Ayurveda medication used

S.No	Oral Medication 3/11/23 - 24/11/23	Dose	Time
1	<i>Badra darvyadi Kasayamb</i>	60ml B.D with lukewarm water	twice daily before food
2	<i>Manasamithram Gulikamb</i>	0-0-1	After food, bed time
3	<i>Aswagandhamb Churnamb</i>	1tsp with hot milk	1 tsp-0-1 tsp
4	<i>Tab Somnamb</i>	0-0-2	After food, bed time

Table 2: External procedures used

Date	Procedure	Medicine	Days
3/11/23-10/11/23	<i>Utsadamb</i>	<i>Kolakulathadi choornamb + Dhanyamla</i>	7 days
10/11/23-17/11/23	<i>Choornamb Pinda Swedamb</i>	<i>Kolakulathadi choornamb + Dhanyamla</i>	7 days
17/11/23-21/11/23	<i>Rajayapanamb Vasthib</i>	<i>Madhu (honey) - 85g Saindhavamb Lavamb (rock salt) - 15g Snehab -Rasnamb dashamoolamb ghrithamb - 85g Kalkamb- 30 g Satapushpamb (Anethumb sowamb Kurz) - 6g Madukamb (Glycyrrhizamb glabramb Linn) - 6g Kutajapalamb(Holarrhemb antidyshentericamb Wall) - 6g</i>	4 days

		<p><i>Daruharidra (Berberis aristata DC) - 6g</i> <i>Priyangu (Callicarpa macrophylla vahl) -6g</i> <i>Ksheera Kashaya- 400 ml</i> Milk processed with <i>Mustadi Yapana Basti Kwatha</i> drugs boiled with 1600ml water, reduced to 400ml and added with 400ml milk, again boiled and reduced to 400ml <i>Mamsarasa (soup/decoction of goat meat) - 200ml</i> All the above ingredients are mixed in standard sequence for <i>Vasthi</i> preparation to form a homogenous emulsion which was indirectly heated on a water bath.</p>	
17/11/23-23/11/23	<i>Upanaham</i> over Right shoulder	<i>Jeevanthyadi Churnam</i> mixed with <i>Dhanyamla</i>	7 Days
23/11//23	<i>Virechana</i>	<i>Avipathy choornam</i> 20 gm with lukewarm water	1 Day
24/11/23	Discharged		
24/11/23-30/11/23	<i>Lasuna Rasayanam</i>	<i>Lasuna Rasayana- 10ml Swarasa + 5ml buttermilk + 20 drops Sahacharadi 21 Avarthi,</i>	6 am in empty stomach

Follow-Up and Outcome

The patient was advised to take *Lashuna rasayana* for 7 days following strict *Pathya*. *Dhanwantaram Gulika* was advised to take during this period for any abdominal pain or discomfort. She was also advised *Mashasaindavadi Taila*^[9] for external application on alternative days as *Upashaya*. A follow-up was done after 1 week of being discharged and significant improvement in the clinical findings as well as marked reduction was noted in the assessment scales.

After completing the initial 14 days of *Rukshana Kriya* and *Langhana* treatment followed by

14 days of localised and generalized treatment for managing the muscle wasting and weakness by *Upanaham*, *Brimhana vasthi* and *Lashuna rasayana* there was slight change in the ALSFRS-R Score from 27 to 32. There was evident atrophy on shoulder and wrist muscles. After treatment the flabby muscles become tight and atrophy reduced on shoulder. But there was no notable change on atrophied wrist muscles. The neuro quality of life score after treatment recorded a score suggesting improvement especially in mental status and helps her satisfy social roles. She also got rid of her sleep disturbance.

Table 3: NEURO-QOL Scale^[10]

Domains	Max score	Before treatment	After treatment
Communication	25	21	21
Ability to participate in social roles and activities	40	14	22
Anxiety	40	35	20
Depression	40	28	16
Emotional & behavioral dyscontrol	40	18	20
Fatigue	40	29	16
Lower extremity function (Mobility)	40	38	38
Positive affect and well-being	45	11	33
Sleep disturbance	40	26	16
Upper extremity function (Fine motor, ADL)	40	13	20
Stigma	40	17	11
Satisfaction with social roles and activities	40	17	30
Cognition function	40	36	38

Table 4: ALS Functional Rating Scale–Revised (ALSFRS-R)^[11]

Function	Finding	Score BT	Score AT
Speech	Normal	4	4
Salivation	Normal	4	4
Swallowing	Normal	4	4
Handwriting	Able to grip pen but unable to write initially	1	3
Cutting food and handling utensils	Needs to be fed initially but after treatment somehow can still feed slowly although require someone to cut food	0	1
Dressing and hygiene	Earlier needs attendant for self-care later seeking only Intermittent assistance	1	2
Turning in bed and adjusting bed clothes	Previously can initiate but not turn or adjust sheets alone, later she could turn alone or adjust sheets, but with great difficulty	1	2
Walking	Normal	4	4
Climbing stairs	Normal	4	4
Breathing	No dyspnea, orthopnea, respiratory insufficiency	4	4

DISCUSSION

The present condition is considered as *Avarana janya Vataroga* with special designation as '*Kaphavruta Vyanavata*' with its close resemblance to clinical features of Motor Neuron Disease. MND shows predominant involvement of both *Vata* and *Kapha* in *Samprapti*. The aggravated *Kapha* causes *Avarana* (obstruction), leads to *Vata prakopa* and produces MND^[12]. Clearing the *Srothas* and optimizing the course of *Vata* are the principal factors in treatment. The treatment was planned mainly focusing on lessening the progression of disease and improving the strength of weakened limbs. Thus incorporating *Amapachana*, *Deepana*, *Swedana*, *Kostashodhana*, *Brimhana* and *Rasayana chikitsa*.

The concept of addressing the *Avaraka* first in *Avarana janya vatavyadhi* is followed here, starting with therapy mitigating *Avaraka* (occluded) *Kapha dosha*. Thus *Udvardana*, a *Rookshana* procedure was done as the foremost therapy.

Udvardana/Utsadana (rubbing of medicated warm powder) with *Kolakulathadi choornam* in *Dhanyamla* helps in the removal of *Srotorodha* and brings *Sthiri karana* of body parts. It is *Amapachana* and *Avaranagna* and also increases *Uttarottara Dhatwagni* functions.

Rooksha potali sweda was done with *Kolakulathadi choornam* in *Dhanyamla* steam. *Swedana* helps to pacify *Kapha* and facilitates the removal of the *Avarana* to *Gati* of *Vata*. *Swedana karma* also increases the metabolic activity which in turn increases the oxygen demand and blood flow. This vasodilatation stimulates the superficial nerve ending causing a reflex dilatation of the arterioles. Cutaneous vasodilatation during hyperthermia is controlled by a sympathetic cholinergic active vasodilator system where

acetylcholine largely mediates an increase in sweating. Due to the effect of heat on the sensory nerve ending there will be a 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^[13].

After seven days of *Udvardana* and *Rooksha potali sweda*, patient felt lightness in body and increased appetite. Later *Kevala vata vyadhi chikitsa* was done by 7 days of *Raja yapana vasthi* along with localised treatment was done for managing the wasting by *Upanaham* over Right shoulder with *Jeevanthyadi Churnam* in *Dhanyamla*. *Upanaha* is the treatment of choice when *Vata* is localized in tendons, joints and veins^[9]. It increases the tone and strength of muscle and thus highly beneficial in hypotonic muscle. It also promotes the passage of the nutritive materials and improves the power of *Dhatu*. To mitigate *Vataprakopa*, *Brimhana*, *Balya* and *Rasayana* type of treatment was adopted.

Rectal route administration of medicated oil or instantly prepared emulsion is the method employed in *Vasti Chikitsa* (medicated enema). *Brimhana* variety of *Vasti/Raja yapana vasthi*^[14] with *Sneha dravya* as *Rasna dashamoola ghritha* clearly shows its efficacy in this condition and further helps in improving from the *dhatukshaya* caused by the *Vata*. Rectal administration of drug (drug absorption at lower half of rectum) can bypass the hepatic metabolism of drugs and can ensure a comparatively faster absorption of drug^[15]. Being primarily rich in medications with qualities such as *Tikta rasa*, *Jeevaniya*, and *Balya*, it also helps in *Mamsa* and *Majja poshana*.

The generation of reactive oxygen species within cells is believed to be a primary factor in the aging process. These molecules cause oxidative damage at a number of targets. Oxidative stress is thought to contribute to the development of wide range of degenerative diseases including neurodegeneration in motor neuron diseases.^[16] *Rasayana* is the mode through which excellent *Dhathus* starting from *Rasa* can be attained and thus *Rasayana* therapy plays important role in *Jara Vyadhi Nashana* (prevention of oxidative stress or premature wears and tears of body tissues) and promotion of strength and health of an individual.

Lasuna, through its *Guru Snigdha Guna* and *Ushna Veerya*, aids in the pacification of *Vata* and can cure sickness at the *Dhatu* level and also aids in the elimination of *Avarana Vyadhis*^[17]. *Acharya vagbhata* has emphasized the significant role of *Lasuna* as *rasayana* in the treatment of *Vata Avaranas* except from *Pitta* and *Raktha*^[17].

Virechana does the detoxification which lead to better absorption of *Lashuna Rasayana* and other *Brumhana Dravyas* along with correction of *Agni*.

Pachana/Deepana medicines are also explained as a mode of *Rukshana chikitsa* and it is also must in the treatment of MND initially with external *Deepana* procedures with *Dhanyamla*.

Acharyas while explaining the *Dhatupaka avastha* clearly signifies the importance of *Agni* which is whole and sole responsible for the formation of the next *Dhatu*.

Thus correction of *Agni* should be done by administration of *Deepana* and *Pachana dravyas*. In order to strengthen the process, *Doshas* must be balanced and metabolic toxins must be eliminated from *Dhatu*s through *Shodhana*.

Bhadra darvyadi kashaya^[18] is *Tridosha samana* especially *Vata/Vata Kapha samana, Vatanulomana*. It has *Sarva deha* and *Akshēpa hara viśēshatwam* (effective for convulsive disorders). It has special action on *Srothas* and shows excellent result in cerebellar pathologies/involuntary movement disorders/myotonia/myoclonus chorea/cramps etc^[19].

Ashwagandha curṇa is *Mano dosha hara*, *Balya, Brimhana* (nourishing property to the tissues), *Vrshya* and *Rasāyana*. It is enriched with anti-stress, anxiolytic, adaptogenic, anti-rheumatic, antioxidant attributes. *Aferin* (extract of *Withania Somnifera*) in early stage treatment reduces level of SOD 1 (superoxide dismutase) and extends lifespan in a mouse model of ALS^[20].

Abhyanga with *Masha Saindhava Thaila* is very beneficial in *Sankocha* (contractures) due to *Vata* especially in contraction and spasticity of muscles, cramps etc.

Patient complained of disturbed sleep and depression. So *Tab Somna & Manasamitra vataka* was advised. *Manasamitra vataka* is also *Manodosha hara* and indicated for anxiety disorders, and stress.

CONCLUSION

There was slight betterment in gross and fine motor activities of the patient with gradual gaining of upper limb power, amelioration of her symptoms, decreasing the disability and improving quality of life. This case study demonstrated that brachial amyotrophic diplegia can be satisfactorily managed and Health related QoL can be increased with Ayurvedic oral medicines and *Rasayana* therapy.

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