



CONCEPT OF CEREBELLAR ATAXIA AND ITS MANAGEMENT THROUGH AYURVEDA – A BIRD VIEW

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ABSTRACT

Stability of movement and co ordination for anywork is must so control all the movements are very much necessary for health. Control of movement is distributed throughout the central nervous system (CNS). The role of the cerebellum is concerned with the timing, coordination and integration of movements, including eye movements and speech. Therefore, lesions affecting the cerebellum would result in a disorder of movement coordination often termed as cerebellar ataxia. Etiology of cerebellar ataxia can be classified based on the onset, progression, location of lesions, based on distribution, hereditary. In classics of Ayurveda we get scattered references about cerebellar ataxia by seeing its etiology, signs and symptoms we can correlate to kapha vruta vyanavata, Mastulunga kshaya, Pranavrutha vyana, Nirupasthamba vatavyadhi, shiromarmopagata, Indriyagata Vata. Ayurveda stressed on the holistic approach to diseases, and hence, treatment is aimed at both the dosha (causal factor) and the vyadhi (disease). The present study deals with an overview of Cerebellar ataxia in ayurveda and its management.

KEYWORDS: Cerebellar ataxia, Anukta vatavyadhi, Vatavyadhi, Lakshanas, Chikitsa.

INTRODUCTION

Stability of movement and co ordination for anywork is must so control all the movements are very much necessary for health. Ataxia defines the disturbances of co-ordinated muscle activity.^[1] It is the degenerative disorder of cerebellum, its afferent or efferent connections.^[2] Cerebellum is known as little brain and mainly controls and coordinates the movements of the body. The cerebellum (Latin word means “little brain”) is the largest part of Hindbrain. The role of the cerebellum is concerned with the timing, coordination and integration of movements, including eye movements and speech. Ataxia (from the Greek, meaning ‘Lack of order’) is a term used to describe a number of abnormal movements that may occur during the execution of voluntary movements including in coordination, delay in movements, dysmetria (inaccuracy in achieving a target), dysdiadochokinesia (inability to perform movements of constant force and rhythm) and tremor.

The lesions affecting the cerebellum would result in a disorder of movement coordination often termed as

Cerebellar Ataxia.^[3] Cerebellar ataxia was recognized medically in 1893 by French neurologist Pierre Marie, who described a hereditary form of the condition. Current, global epidemiological studies on ataxia have estimated an overall ataxia occurrence rate 26/100,000 in children, and for dominant hereditary cerebellar ataxia an occurrence rate of 2.7/100,000 and the frequency of recessive hereditary cerebellar ataxia as 3.3/100,000.^[4] Ataxia is usually caused by cerebellar dysfunction or impaired vestibular or proprioceptive afferent input of cerebellum.

In western system, the closet mirror for consciousness is the nervous system, and this illustrates the primacy of neurology in Ayurveda. *Vayusyantra tantra dhara, Prana, udana, samana, vyana, apana, athmaha.*, The *vata*, in its normal state of functioning sustains all the organs of the body. It consists of *Prana, udana, samana, apana and vyana*. It restrains and impels the mental activities. It co-ordinates all the sense faculties. In classics of Ayurveda we get scattered references about cerebellar ataxia by seeing its etiology, signs and

symptoms we can correlate to *kapha vruta vyanavata*^[5], *Mastulunga kshaya*^[6], *Pranavrutha vyana*^[7], *Nirupasthamba vatavyadhi*^[8], *shiromarmopagata*^[9], *Indriyagata Vata*.^[10] *Shiras* is the seat of *kapha*. Any degeneration causes depletion of *kapha* and ultimately resulting in the vitiation of *vayu*. Treatment regimens have been described to combat the various symptoms seen in the course of the disease.

Neuroanatomy In Cerebellar Ataxia

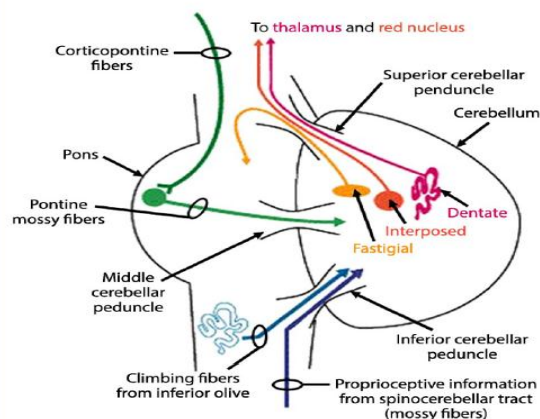


Fig 1.

The cerebellum and its afferent and efferent connections, the vestibular system, and the proprioceptive sensory pathway (Figure 1) are all involved in ataxia. The cerebellum is usually separated into the midline cerebellum and the cerebellar hemispheres. Lesions in each of these regions can result in a different presentation of ataxia. For example, damage to midline cerebellar structures usually presents with gait and truncal ataxia, while damage to the unilateral cerebellar hemisphere usually causes ipsilateral cerebellar ataxia. Understanding this neuroanatomy and correlation to coordination can help with localization. The correlations are listed in Table-1, although significant clinical overlap exists among them. Carbon, oxygen, hydrogen and other molecules form the foundation of our Central and peripheral nervous system, our neurotransmitters, as well as the rest of our world.

In contrast, The word *Ayurveda* is derived from “*Ayuu*”, meaning life span, and *Veda* means knowledge. According to *Ayurveda*, “*Dhrihaya*” or longevity means a complete balance in body; mind and soul associated with longevity, without this balance a person cannot enjoy the real benefit of longevity i.e., a state of permanent happiness and peace. According to *Ayurveda*, there are four basic goals of human life namely, *Dharma* (religion), *Artha* (economy), *Kama* (sensepleasure) and *Moksha* (liberation). To practice and fulfill these basic goals of life one needs good health. In brief *ayu* is a life science which deals with the physical, mental, spiritual and socioeconomic status of health which enumerate not only happy life but also enumerate the satisfaction of life which is concerned with longevity. This deals with the metaphysics,

molecular biology, incognition. *Ayurveda* does not rely on molecular structures to define our world, human system, or treatments. The *Ayurveda* system structures the body from five elements (earth, water, fire, air and space), only a few of which are material in nature. Earth and water constitute all the physical structure we know in the western molecular system: our muscles, bones, viscera, skin, and so forth. This is the brain tissue, spinal cord, sensory organs and peripheral nerves. Fire is the transformative energy transitioning one substrate to another. The fire elements reflects the function of all the catalytic enzymes, hormones, immune cells and neurotransmitters affecting change across our millions of metabolic reactions and the subsequent heat that is made to keep us at a homeostatic temperature. Fire is also the digestion of perception into experience and memory.

Vascular identity

The cerebellum is supplied by three main arteries that arise from the vertebral arteries. The posterior inferior cerebellar artery supplies the dorsal medulla (including parts of the vestibular nuclei and the inferior cerebellar peduncle) and the vermis and inferior cerebellum. The anterior inferior cerebellar artery supplies the lateral pons (including the facial nucleus and parts of the vestibular nuclei and the middle cerebellar peduncle) and the cerebellar flocculus and adjacent parts of the inferior surface of the cerebellum. The anterior inferior cerebellar artery also gives rise to the internal auditory and labyrinthine arteries. The superior cerebellar artery is the largest of the three arteries; it supplies the upper pons (including superior cerebellar peduncle) and the superior part of the cerebellum.^[11]

Clinical manifestation with Neuro-Pathophysiology of Cerebellar ataxia

Cerebellar dysfunction may result in significant functional difficulties with upper and lower limb movement, oculo-motor control, balance and walking. Such difficulties can affect employability, increase carer burden and reduce a person's perceived quality of life.^[12] Although it is a complex and poly centric condition, Interpreting studies of pathophysiology in turn crucially depends on our understanding of the healthy cerebellum in both motor and non-motor functions.

Dysarthria, communication and language - Dysarthria is commonly observed with lesions affecting the rostral paravermal region of the anterior lobes. Commonly speech is described as scanning in nature consisting of hesitations, accentuation of some syllables and the addition of pauses or omission of appropriate pauses; in around 50% of cases slurring may be evident. Language impairments that are not attributed to dysarthria, such as poor understanding of speech, reading and naming tasks, and agrammatism have been reported following cerebellar damage. These are felt to arise from disruption to reciprocal pathways between the right cerebellar hemisphere and left cerebral hemisphere and highlight the role of the cerebellum in pre-articulatory speech.^[13]

Limb movement

Dyssynergia and incoordination- People with cerebellar ataxia are slow to start movements; they have an increased reaction time. In keeping with an important role of the cerebellum in planning predictive movements fast, ballistic movements that are entirely preplanned are inaccurate. People with cerebellar ataxia in particular show marked deficits in multi-joint movements, called dyssynergia. The cerebellum may coordinate the activity in different effectors such as between the eye, arm, leg or head.^[14]

Dysmetria and tremor- A triphasic pattern of muscle activation consisting of alternating agonist–antagonist–agonist activity is normally observed with fast single joint movements. Both animal and human studies highlight that following cerebellar dysfunction/inactivation there may be a prolonged duration of the initial agonist burst that accelerates the limb and a delay in the onset of the subsequent antagonist muscle burst. Alternating agonist–antagonist contractions driven by proprioceptive feedback may arise, resulting in a tremor.^[15] Cerebellar tremor is a type of action tremor. It is seen while maintaining a posture (postural tremor) and while moving (kinetic tremor). Tremor at rest is not seen with pure cerebellar dysfunction.^[16]

Force generation - Asthenia, a generalized weakness, was described by Holmes (1922). This was more marked in the acute stages and with extensive cerebellar lesions and was not universally seen; indeed normal grip force has been reported in cerebellar ataxia. People with cerebellar ataxia also show more variability in maintaining a constant level of force. The deficits in force generation may affect precise manipulative tasks. This, along with poor coupling between grip and load forces and inappropriate finger placement on an object, can lead to excessive self-generated torques acting on the object.^[17]

Balance and gait dysfunction

Postural sway and balance -People with lesions affecting the anterior lobe, vermis and the interconnected fastigial nucleus have an increase in postural sway with an associated head and truncal tremor between 2 and 5 Hz.^{81–86} The sway is greatest in the anteroposterior direction. Instability in the medio-lateral direction is also seen in response to alterations in the available sensory input, following a postural perturbation or while stepping.^[18]

Gait and falls -While walking, people with cerebellar dysfunction show prolonged time in double stance, poor inter-limb coordination and an increased variability in their stride length and individual joint kinematics, although their base of support may not be increased as is often presumed. Although primary deficits in balance can have a direct and marked impact on walking, dysmetria/ dyssynergia affecting the lower limbs can also impact on dynamic balance while walking. Incorrect foot

placement due to incoordination of the lower limb, as is seen in cerebellar ataxia, can therefore result in poor dynamic balance while walking. A more medial foot placement than required, for example, can result in the body falling laterally.

Deficits in balance and walking may contribute to the high reported incidence of falls in cerebellar ataxia. However, the causes of falls are often multifactorial and the relative contribution of intrinsic and extrinsic (environmental) factors in falls aetiology in cerebellar dysfunction remains to be elucidated.^[19]

Concepts of Ayurveda in Degenerative disorder- Cerebellar Ataxia

Ayurveda classics had explain about the Degenerative disorder in detail with scattered references in different condition i.e., *vataprakopa lakshana*, *Dhatukshaya lakshana*, *vatavyadhi*, *nirupastambha*, *Anukta*, *avarana*, *kevalavataja*, *anonya avarana*, *gata vata*.

Nirusthamba vatavyadhi is the disease caused by *vata* exclusively, since it is neurodegenerative disorder caused due to degenerative changes in the cerebellum, this can be consider as *dhatukshayajanya* – *nirupastambhit vaatyadhi*. This samprapthi can be consider for cerebellar ataxia.

Hetusevana (prayaha vataprakopaka)

↓
Rukshata, kharata, parushata produced in different srotas

↓
Vayupuran at riktasthana i.e. prakupita vayu 'kha' vaigunyanashrita

↓
Dhatukshayanita i.e. Nirupastambhita Vatavyadhi

Pranavata controls *prayatna* action of *udana* and in turn *gati* induced by *vyana vata* becomes impaired. Due to decreased *prayatna* (action potential), there is less *urja karma* (ATP production) leading to decreased *bala* (cellular metabolism) and there is *ama dravya* produced at cellular level. This *ama* leads to cellular *strotorodha* (obstruction) and *vimargagamana* of iron which then reacts with oxygen to produce free radicals (*ama visha*) and destroy the cell. At the end, *vata prakopa* occurs and manifest the features of ataxia. *prana* as *avaraka* (which obstructs) and *vyana* as *avarya* (which is getting obstructed) participate in pathogenesis. *Avarana* initiates pathogenesis followed by *dhatu* (body elements) *kshaya* (diminution) and *vata vyadhi*.

As in normal state, *Vyana Vayu* performs its *Rasa-Rakta Vikshepana Karma* normally. But when it gets vitiated, *Dhamani Sankocha* occurs due to its *Ruksha*, *Shita* and *Khara Gunas*, resulting in the reduction of *Srotovivar* (lumen of the Channels). Due to this there will be narrowed pathway, *Avarodha* (obstruction) occurs in *Rasa-Rakta-Vikshepana Karma*, causing decreased

functioning in the particular site. The *vata*-specific nervous tissue, known as *prana vayu*, includes the movement of impulses along the nerves, as well as neurotransmitter movements across the synaptic space. Most of the western nervous system ailments arise from dysfunctional *vata dosha*.

Vataja Ahara& Vihara, abhigata
 ↓
Vata Prakopa
 ↓
This prakupita vata fills the Rikta srotas
 ↓
Leads to vata vikara (vata guna like laghu, chala guna vrudhi)

Majjavaha Srotas gets vitiated by the *Nidana* like *Utpesha* (Crush injuries), *Atyabhishyanda* (Excessive consumption of *Ahara* which causes *Vishyandana* in *Srotas*), *Abhigata* (Injury that causes tissue

discontinuity), *Prapidana* (Compression injuries) and *Virudha Sevana* (Intake of incompatible foods) as stated above *Utpesha* refers to *Sandhi Asthi Gharshana/Churnana*. *Samprati of Majjavaha Dushti* will be like this in *Utpesha*.

Utpesha
 ↓
Sandhi Asthi Gharshana
 ↓
Shelshaka Kapha Kshaya
 ↓
Vata Vriddhi → Majja Kshaya (Sroto dushti)

Due to *Utpesha*, *Sandhi Asthi Gharshana* will happen leading to *Shelshaka Kapha Kshaya* which in turn causes *Vata Vriddhi* and *Majja Kshaya* which eventually causes *Majjavaha Srotodushti*.

Understanding of Neuroanatomy with clinical features of Ataxia^[20]

Neuroanatomy	Function	Ataxia or Ataxia like presentation arising from damage of the region
Cerebellar Hemisphere, including dentate nuclei	Integration of sensory input and motor planning for coordination of complex tasks	Ipsilateral limb ataxia, dysdiadochokinesia, dysmetria, intention tremors and scanning speech
Midline cerebellar structures(vermis, fastigial and interposed nuclei, the vestibulocerebellum, and the paravermis)	Motor execution, rapid and slow eye movements, balance, lower extremity coordination and vestibular function	Gait ataxia and imbalance, truncal ataxia, dysmetria, ocular findings, head bobbing and vertigo
Posterior Lobe (flocculonodular lobe)	Integration of information from vestibular nuclei	Nystagmus, postural instability and gait ataxia
Cerebral Cortex (Frontal lobe)	Planning and initiating gait	Frontal ataxia(bruns apraxia), magnetic gait (different from ataxic gait), but associated pathology in this region can worsen ataxia
Brainstem (Vestibular nuclei, inferior olivary nuclei, pontine nuclei, cerebellar peduncles)	Relay signals in and out of cerebellum	Ataxia associated with cranial nerve dysfunction and motor sensory deficits
Spinal Cord (Cuneate fasciculus, gracile fasciculus and spinocerebellar tracts (mossy fibres)	Conduction of sensory pathways	Sensory ataxia
Musculoskeletal System (gleuteal muscles)	Stabilizing the weight-bearing hip	Waddling gait rather than ataxia, but associated pathology in this region can worsen ataxia.
Peripheral sensation system and visual system	Proprioception, visual cues	Sensory ataxia with Romberg sign, can worsen cerebellar ataxia
Vestibular system(labyrinth of the inner ear, vestibular nerve, vestibular nuclei)	Sense of balance and special orientation, equilibrium	Disequilibrium, loss of balance associated with dizziness and vertigo, tinnitus and hearing impairment, nystagmus

Etiology of Cerebellar Ataxia^[21]

a) Etiology based on the chronicity.

ONSET	CAUSES
ACUTE (hours to days)	INTOXICATION: Alcohol, lithium, phenytoin, barbiturates. INFECTIONS: Acute viral cerebellitis, cerebellar abscess VASCULAR: Infarction (AICA, PICA syndromes), Hemorrhage, subdural hematoma
SUBACUTE (days to weeks)	INTOXICATION : Mercury, solvents, Glue NUTRITIONAL: B1 and B12 deficiency DEMYELINATING: Multiple sclerosis NEOPLASTIC: Glioma, Metastases
CHRONIC (months to years)	AUTOIMMUNE CAUSES: Paraneoplastic syndromes HYPOTHYROIDISM INFECTIONS: Syphilis (tabes dorsalis) • CONGENITAL LESIONS: Arnold-Chiari and Dandy Walker Syndromes. • INHERITED: SCA, Friedreich's Ataxia,

b) Based on location of lesion

CEREBELLAR HEMISPHERIC SYNDROME(unilateral)	Ipsilateral limb ataxia, tremor, hypotonia	infarct, neoplasm
ROSTAL VERMIS SYNDROME(anterior lobe and vermis)	Gait and postural Ataxia	Chronic Alcoholism
CAUDAL VERMIS SYNDROME(vestibulocerebellum)	Trunk Ataxia, dysarthria and nystagmus	Medulloblastomas
PANCEREBELLAR SYNDROME(bilateral hemispheres+vermis)	Truncal & bilateral limb ataxia, dysarthria, oculomotor disturbances.	Neurodegenerative diseases, acute alcoholic intoxication.
CEREBELLAR PEDUNCLES	Dramatic cerebellar symptoms	

c) Based on progression

PROGRESSION	CAUSES
PROGRESSIVE ATAXIA	Spinocerebellar ataxia (SCA)
STATIC ATAXIAS	Vascular causes
REVERSIBLE ATAXIA	Infectious causes Thyroid Drugs Toxins
INTERMITTENT SYMPTOMS	Episodic Ataxias(inherited etiology)

d) Based on Distribution

FOCAL ATAXIA	SYMMETRICAL ATAXIA
Vascular causes Multiple sclerosis Cerebellar Abscess Cerebellar Glioma HIV Congenital causes	Intoxication Nutritional Infectious Hypothyroidism

Based on some signs and symptoms it can be correlated to *kapha vruta vyanavata*, *Mastulunga kshaya*, *Pranavrutha vyana*, *Nirupasthamba vatavyadhi*, *shiomarmopagata*, *Indriyagata Vata*. Here the *nidan*as of *Vata vyadhi* can be considered. *Vayu* gets aggravated by the following *nidan*as such as Intake of *Ruksha* (unctuous), *sheeta* (cold), *alpa* (scanty) and *laghu* (light) food. *Ati vyavaya* (Excessive sexual indulgence), *Ati prajagara* (remaining awake at night). *Vishama upachara*(inappropriate therapeutic measures); *Ati Doshaasruksravana*(administration of the therapies which cause excessive elimination of *Dosha* and blood); *langhana*(keeping fast in excess); *plavana*(swimming in excess); *Ati adhva*(walking excess); *Ativyayama*(excessive exercise); *vichesta*(other physical activities in excess); *dhatu kshaya*(loss of *dhatu*);

excessive emaciation due to *chinta*(worry), *shoka*(grief) and due to *vyadhi*(affliction by diseases). *Dukha shayya asana*(sleeping and sitting over uncomfortable bed); *krodha*(anger); *divaswapna*(sleeping during day time); *vegasandharanat* (suppression of natural urges); due to formation of *ama*; *abhigata*(trauma); *abhojana*(abstention from food); *marmabhighata* (injuries to *marmas*). Riding over *gaja*(elephant), *ustra*(camel), *ashwa*(horse) or *sheegrayana*(fast moving vehicle) and *patamsanat* (falling down from the seats on these animals and vehicles).^[22]

Majjavahasrotodushti Nidana are *Utpesha* (Crush injuries), *Atyabhishtyanda* (Excessive consumption of *Ahara* which causes *Vishyandana* in *Srotas*), *Abhigata* (Injury that causes tissue discontinuity), *Prapidana*

(Compression injuries) and *Virudha Sevana* (Intake of incompatible foods).^[23]

Samprapthi Ghataka

Dosha: vata pradhana (prana vata, udana vata & Vyana vata)

Dushya: Rasa, rakta, mamsa, medas, majja

Adhistana: sarvasharira

Srotas: rasavaha, raktavaha, mamsavaha, medavaha

Sroto dusti prakara: sanga

Vyadhi svabhava: ashukari/chirakari

Sadhyaasadhya: kruchra sadhya/Yapya.

Understanding Signs and Symptoms through the Clinical Examination of Cerebellar Ataxia^[24]

Signs and symptoms of cerebellar ataxia	Clinical tests	Assess
Limb movement		
Dyssynergia	Finger to nose, Heel to shin test	Ability to move joints simultaneously/ decomposition of multipoint movements
Dysmetria	Finger to finger test Great toe–finger test (have trunk supported to isolate any limb dysfunction)	Speed of motion Variability of spatial path Over/undershoot
Tremor Kinetic Intention Postural	Holding a position, e.g. (1) arms outstretched with palms down; (2) index to index (hold two index fingers medially)	Tremor amplitude and frequency Assess for titubation 3 Hz tremor of the head
Disidiadochokinesia	Alternating pronation–supination Alternating wrist flexion/extension while tapping the thigh Ankle dorsiflexion/plantarflexion	Rate of movement
Asthenia and hypotonia	Passive motion of the limb Test muscle strength	Assess resistance to motion Assess strength
Balance and gait dysfunction		
Balance and gait dysfunction	Stand with eyes open/closed Stand in tandem/on one foot Balance in response to perturbation, volitional upper/lower limb Walking	Rate, direction and amplitude of sway (vision) and phase between upper and lower body Size of response to postural perturbation Walking – accuracy of foot placement/ degree of sway/time in double stance/ stride length/base of support
Oculomotor		
Nystagmus (e.g. gaze-evoked downbeat; rebound nystagmus) Fixation deficits (e.g. flutter; macroscopic oscillations)	Ability to fixate into finger 30 cm away with gaze in primary position and when looking at eccentric targets and on returning gaze to midline	Ocular alignment/presence of nystagmus (rhythmic oscillatory movements of the eyes) type/presence of eye movements (e.g. flutter/ocular bobbing)
Saccadic smooth pursuit up/down/side to side Poor vestibulo-ocular reflex cancellation	Follow a target moving up/down/side to side Hold arms together out in front with thumbs pointing up. Fixate gaze on the thumbs while sitting in a chair that is moved side to side	Number of catch-up saccades Ability to maintain gaze fixation
Dysmetric saccades	Ability to rapidly shift gaze from one eccentric target to another (up and down/side to side)	Latency, velocity and precision (over/undershoot of the target as seen by the need to make more than one saccade to reach the target)
Reduced velocity of divergent eye movement	Ability to shift gaze from targets close to and far away from subject. Ability to follow targets moving to and from target	Latency, velocity and precision
Abnormal vestibulo-ocular reflex and optokinetic response	Sit on a chair and fixate an earth fixed target while the chair rotates side to side Look at an optokinetic drum (ask patient to count the stripes)	Ability to fixate on the target Movement of the eyes in the direction of rotation and re-alignment to the midline
Dysarthria		
	Ability to maintain sustained vowel phonation; repeat syllables Repeat a sentence speech/read a standard passage of text	Intelligibility; rhythm; speed; presence of hesitations, accentuation of syllables and addition/omission of pauses

In classics of Ayurveda we get scattered references about cerebellar ataxia, this scattered references of *anukta vyadhi* is collected from *samhithas*.

If *vyana vata* is occluded by *kapha*, then there will be *Guruta* (heaviness) in *Sarvagatranam* (all over the body), *Ruja* (pain) in *Sarvasandhyaasthi* (all the joints and bones), and *Gatisanghasthata adhika* (excessive loss of mobility). Injury to *shiras* give rises to *manya-stambha* (torticollis), *Ardhita* (facial paralysis), *Chakshu-vibhrama* (agitation of eyes), *moha* (unconsciousness), *udvestana* (cramps), *ceshta-nasha* (loss of motor activities), *kasa* (cough), *shvasa* (dyspnea), *hanu-graha* (lock-jaw), *mukatva* (dumbness) *gadgadadva* (lulling speech), *akshi-nimilana* (closure of eye lids), *ganda-spandana* (twitching of cheeks), *jrumbana* (yawning), *lala srava* (excessive salivation), *svara hani* (aphasia), *vadana jihmatva* (twisting of face).^[25]

According to Dalhana he says that the shape of the brain is like freezed butter ghee i.e. *shiraso baladhaanam styanam grithakaram mastulunga ucchyathe*.^[26] Similarly Acharya Sushruta has explained that *ardhavileena grithakaro mastakamajja* i.e. Cerebellum is a part mid brain so its atrophy can be compared with *Mastulungakshaya/ Majjakshaya* in Ayurveda.^[27] Acharya Vagbhata has quoted the *majja kshaya* as *Asthyanam majjani soushiryam bhrama timira darshanam*, here *bhrama* can be co related with loss of balance in cerebral ataxia.^[28]

If *Vyana vata* is occluded by *pranavayu* then there will be symptoms like *sarvendriyanam shoonyatvam* (there will be loss of the functions of all the senses), *gnatva smrithibalakshayam* (there will be loss of memory as well as strength).^[29] *Nirupasthambha vata vyadhi* is the disease caused by the *vata* exclusively and there is no any other occlusion present with it.^[30]

In *Asthanga hrudaya*, in *vata vyadhi nidhana* it is said that *Shrothraadhisu indriyaadhareshu, kudhaha indriyanam vadham vinashanam karothe* i.e. in the ear and other sense organs, it causes loss of or diminution of their sensory function.^[31] When *Vata Dosha* is vitiated through *Nidana Sevana*, Vitiated *Vata Dosha* disturbs the *Karma* of *Indriya*. As *Hasta, Pada, Vani* are *Karmendriya*^[32], affected in cerebellar ataxia.

INVESTIGATIONS^[33]

- CT head: Head CT may detect a mass in the posterior cranial fossa and is extensively used in the clinical evaluation of acute stroke, especially for the rapid exclusion of intracerebral hemorrhage
- MRI Brain: for the structural lesion in the cerebellum or brainstem MRI is more appropriate. It is especially useful for ischemic stroke and infratentorial structural lesion evaluation.
- If drug-induced ataxia is suspected, therapeutic drug levels should be examined. Phenobarbital and butabarbital overdose may occur accidentally or

intentionally. The therapeutic range of lithium is narrow, and regular monitoring of blood levels is required.

- In acute evaluation of ataxia blood alcohol levels should always be tested. A level of 150 mg/dL to 300 mg/dL will almost always affect coordination and balance.
- Other laboratory tests include vitamin B6 and vitamin B12 levels, thyroid stimulating hormone (TSH), heavy metal levels (bismuth, lead, mercury), HIV, syphilis, Lyme and toxoplasmosis serology, paraneoplastic panel.
- For inherited ataxias, genetic tests are available for the CAG expansions involved in SCA1, SCA2, SCA3 (Machado-Joseph disease), SCA6, SCA7, SCA12, SCA17. CTG expansion associated with SCA8; GAA expansion in Friedreich ataxia; penta-nucleotide.

MANAGEMENT OF CEREBELLAR ATAXIA

Although ataxia is generally not curable but treatable with Ayurveda, a great deal can be done to ease symptoms and improve the quality of life of the patient. Treatment for coordination and balance problems usually involves the use of adaptive devices that help the patient attain as much independence as possible. The most important goal in the management of patients with ataxia is to identify treatable entities like as lesion must be recognized promptly and treated appropriately.

Antah Parimarjana Chikitsa

There are three types of antah parimarjana chikitsa, they are a) Shodhana, b) Shamana and c) Rasayana.

• Role of Shodhana

Basti: *Vata* is responsible for the cognitive and neo-cognitive functions of the brain and secretion of various chemical neurotransmitters and hormones. *Vata prakopa* is mainly due to *marga avarna* and *strotavarodha*. For *Strotavarodha*, *strotoshodhana* should be done, which can be done with *Tikta rasa*. The body is so weak that we cannot perform the classical *shodhana* procedures, as they will further raise the level of *vikrit vata*. So, we can easily administer *basti*. We can say that *Tikta ksheer basti* is a type of *Yapana basti* and is *Balya* and *brimhana*. So *Tikta ksheera basti* is used to pacify *vata dosha* and to eliminate *kshaya*. Considering the *dhatukshaya*, the *santarpana chikitsa* in the form of *yapana basti* can be used as it causes *yapana* of *aayushya* along with its *dirghakalanuvartana*.

Nasya prayoga: *Avapidana nasya* can be adopted with *lashuna* or *durva* (in condition like *avarana*). *Nasya karma* helps in reducing the giddiness by acting on CNS and gives strength to *twacha, skandha, griva, aasya, vaksha*.

Mrudu Virechana: *Mrudu Shodana* by giving *snehapana* (arohanartha) with *Ashwagandha Ghrita* or *Ksheerabala Taila* or *brahmi ghrita*. *Mrudu virechana*

satala ghrita, tilavaka ghrita and eranda taila+ ksheera. Gandharvahastadi taila(Based on patients strength vaidya can decide the dose.) After virechana –after samasarjana krama jataraagni vrudhi-again give snehana and swedana.

Specific treatment of Indriyagata Vata is described as Nasya.^[34]

Shamanoushadhi in Cerebellar ataxia

Some of the commonly used shamanoushadhis in all kind of vata rogas are Bhadradaru, kushta, meshashringi, bala, atibala, sahachara, agnimantha.

• Herbomineral preparation

Yogendra rasa, Brihat vata chintamani Rasa, Brahmi vati, Ashwagandha Ghrita, Brahmi Ghrita, Kalyanaka Ghrita, Mahakalyanaka Ghrita, Vidaryadi Kashaya, Sahacharadi Kashaya.

- **Rasayana:** Ashwagandha Rasayana, Ajamamsa Rasayana, Brihat Chagaladi Ghrita.
- **Bahirparimarjana Chikitsa:** It can be classified into 3 types.
- **Abhyanga:** Whole body massage with medicated oil which relieves the symptoms. The general line of treatment for nirupastambhita vatavyadhi was taken into consideration, Sarvanga abhyanga, padabhyanga are balya and vatahara karma. These karmas enhance the muscle power and thus helps in attaining the maximum balance of body.
- **Swedana:** Swedana therapy in the form of Sankara Sweda again and again told directly in Indriyagata vata. In Swedana-shastikashali pinda Sweda, patrapinda sweda, nadi sweda can be done, swedana helps in the nourishment of muscles and peripheral nerve.
- **Mastishkya:** Shirodhara, shiropichu, shiroabhyanga and shirobasti are categorised under Mastishkya. Among which Shirodhara also helps in reduction of anxiety along with marked reduction in disturbed sleep pattern. As Shirah is the placement of all Indriya, that Shirobasti, are essential.

These karmas enhance the muscle power and thus help in attaining the maximum balance of body.

Satwavyajaya chikitsa

Satva refers to Mind; Avajaya refers to bringing the mind under the control.

The aim of this therapy is to restrain mind from the unwanted thought process, replacing the negative ideas, proper channelling of presumptions and proper advise through jnanam(knowledge), Vijnanam(analytical thinking), Dhairya(courage), Smriti(memory), Samadhi(concentration).

Different therapies and counselling can be adopted such as - Symptoms such as tremor, stiffness, spasticity, sleep disorders, muscle weakness, depression (or

frustration, sadness, and anger) can be addressed with targeted medications, treatments, different therapies and counselling.

- **Occupational therapy:** This can help the person manage better around the house and at work. It may involve some home adaptations, wheelchair assessment, and making the kitchen more practical.
- **Speech therapy:** This can help with swallowing, coughing, choking, and speech problems. If speech becomes very difficult, the speech therapist can help the person learn how to use speech aids.
- **Orthopedic care:** This can help treat curvature of the spine.
- **Physical therapy:** This can help maintain strength and improve mobility.
- **Counseling:** Sessions can help the person manage frustration and depression that may arise when symptoms affect physical mobility and coordination.

DISCUSSION

The common sign and symptoms of Ataxia includes gait impairment, imbalance while walking with impaired walking pattern, poor co-ordination of movements and tremors, visual abnormalities, speech disturbances, sensory loss for vibration, abnormal reflexes and irregular pattern of swallowing. Autonomic abnormalities like hypohydrosis, urinary dysfunction, hampered muscle functions within or surrounding the eyes and muscular atrophy in the distal portions of limbs. Etiology of cerebellar ataxia can be classified based on the onset, progression, location of lesions and based on distribution.

As the natural course of the pathology cannot be altered by the modern medicine, the scope of Ayurveda interventions in such nervous disorders has been increasing because of its holistic approach. Understanding such disorders in Ayurveda perspective is need of the hour. Nervous system and its disorders are described under the heading of vata vyadhi in Ayurveda. In Ayurveda, vatavyadhis are divided into two broad categories namely diseases due to Vishudha vata(vitiation of vata alone) and diseases due to Avarana(due to blockade in the natural flow of vata by its types or by other dosa or dhathu or mala). Proper knowledge of the types of Proper knowledge of the types of vata(prana, udana, samana, vyana, apana their normal functions, categorizing the disorder either as vishuddha vata janya or avarana janya helps in understanding the diagnosis, prognosis and how to plan the treatment protocol. Ayurveda by seeing etiology and symptoms it kapha vruta vyanavata, Mastulunga kshaya, Pranavrutha vyana, Nirupasthamba vatavyadhi, shiromarmopagata, Indriyagata Vata. Due to indulgence in vataja ahara, vihara and abhighata, there is vata and rakta pradushana leading to vata vyadhi. Difficulty in coordination leads difficulty in walking, difficulty in hold the things, difficulty in speech - all these functions are performed by Indriya-Karmendriya, Indriyas lose its

functions is described as *Indriyagata Vata*. Specific treatment of *Indriyagata Vata* is described as *Shirobasti*, *Nasya*, *Karnapurana*. As *Shirah* is the placement of all *Indriya*, that *Shirobasti*, *Nasya* are essential in *Indriyagata Vata*.

Cerebellar means brain similar to *Mastulunga* or *majja* in ayurveda and Atrophy is similar to *Kshaya Awashtha* in *Ayurveda*. According to *Vyadhiviparit Chikitsa Sidhhanta Kshaya Pradhana Vyadhi* should be treated by *Brumhana Chikitsa*. *Chakrapani* considered *Mastulunga* as *Shirogat Sneha*.

Virechana acts on *masthiska* by acting on *pittadara kala* due to its similarity with *majjadara kala*. *Yapana basti* which does *ayusho yapana* (rejuvenation of brain cell) which is also *mamsa-bala janana*, *vishama Jwara hara*, *sholahara* and *rasayana*. *Shirodhara*, *Shirobasti*, *Abhyanga*, and *Svedana* are *balya* (promote strength) and *vatahara* (pacify morbid *vata*). *Svedana* also aids *kaphaharana* (pacifies morbid *kapha*). This promotes *samprapti vighattana* (undoing the pathogenesis) and plays a crucial role in bringing about the desired result.

CONCLUSION

- For all the activities, movements Balance are all controlled by *vatadosha*, its normal function of *vatadosha*.
- Cerebellar ataxia is described as difficulty in maintaining balance and coordinated movements. Cerebellar atrophy is degenerative changes of cerebellum represents as ataxia.
- The common sign and symptoms of Ataxia includes gait impairment, imbalance while walking with impaired walking pattern, poor co-ordination of movements and tremors, visual abnormalities, speech disturbances, sensory loss for vibration, abnormal reflexes and irregular pattern of swallowing. Autonomic abnormalities like hypohydrosis, urinary dysfunction, hampered muscle functions within or surrounding the eyes and muscular atrophy in the distal portions of limbs.
- There are many reasons for cerebellar ataxia CNS vasculitis, multiple sclerosis, infection, bleeding, infarction, tumors, direct injury, toxins (e.g., alcohol), genetic disorders.
- The impact of cerebellar ataxia on life expectancy varies depending on the type of condition, age of onset, severity, and other factors. Many affected individuals have normal life expectancy and learn to cope with their condition; some even enjoy relatively normal lives. For others, however, ataxia can impinge on work, home life, and recreation. Many affected persons find that their jobs become difficult to perform with ataxia.
- In classical texts of ayurveda there is no separate description for cerebellar ataxia but we get scattered references, this scattered references of *anukta vyadhi* is collected from *samhithas*.
- By seeing their etiology, signs and symptoms *kapha*

vruta vyanavata, *Mastulunga kshaya*, *Pranavrutha vyana*, *Nirupasthamba vatavyadhi*, *shiromarmopagata*, *Indriyagata Vata*. *Hetu & Samprapti* plays important role in the treatment of neurological disorders.

- The holistic approach by *Ayurveda Shodhana* and *Shamana Chikitsa* is helpful in the treatment of ataxia.

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