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REVIEW ARTICLE: AYURVEDIC APPROACH IN MANAGEMENT OF CEREBRAL PALSY

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ABSTRACT

Cerebral palsy basically is a physical disability arising out of intracranial lesions leading to paralytic disorders, weakness, incoordination or functional deviations of the motor system. Cerebral palsy is anon-progressive disorder. There is no permanent cure of cerebral palsy has been found yet. As its main etiology include insult to growing brain. So it is a difficult task to regenerate neurons for proper functioning of brain. Cerebral palsy leaves the patient with lifelong physical and mental handicapped. Hence, a considerable burdens to parents and society and proved as life long suffering for the patient. The aim of this article is to review the recent literature relating to etiology, epidemiology, and advances in the treatment of CP.There are many clinical studies have been conducted in *Ayurveda* and very positive results were obtained in both physical and mental aspects. *Ayurvedic* drugs and *panchkarma* procedures might play role in neuroplasticity.

KEYWORDS: Non-progressive, *Ayurvedic* drugs, *Panchkarma* procedures, neuroplasticity

INTRODUCTION

Cerebral palsy is the most common cause of chronic motor disability in children. It is described as "It is a group of permanent disorders of movement and posture, causing limitation of activity, attributable to non – progressive disturbances that occurred in the developing fetal or infant brain, often accompanied by disturbances of sensation, perception, cognition, communication and behavior, epilepsy and secondary musculoskeletal problems.[1] Approximately 50% of cerebral palsied children have an intelligence quotient(IQ) below 70, as compared with 3% of the general population. Deafness, frequently unexpected, is common

particularly high-tone deafness. Refractive errors are common. Dental problems are also common, such as gingivitis due to defective chewing, tooth grinding and malocclusion.[2] Globally population based studies reports prevalance of CP ranging from 1.5 to more than 4 per 1,000 live births or children of a defined range. Prevalence of cerebral palsy has increased among low birth weight infants, particularly those weighing less than 1000gm at birth, primarily because of intra cerebral hemorrhage and periventricular leukomalacia.[3] The wide variability is due to differences in inclusion criteria and age cut off. The basic pathophysiology is harmful cascade pathways triggered off by a hypoxic, ischemic, infectious or inflammatory insult resulting from heterogeneous causes. These can begin in-utero (at conception or antenatal) and continue during and after delivery.[1] It is ubiquitous and it occurs all around the world, causing considerable hardship to affected individuals and their families. The prevelance of CP has increased somewhat due to the survival of very premature infants.[4] It mainly occurs due to mal development and disorderly anatomic organization of brain, perinatal hypoxia, birth trauma, acid base imbalance, indirect hyperbilirubinemia, intra-uterine or acquired infections.[5]

As in *Charak samhita* symptoms of *vataprokapa* has been mentioned like joint stiffness, pain, stiffness in limb, neck etc, diplegia, monoplegia, convulsions.[6] The exact correlation with the cerebral palsy is not found in Ayurveda but most of the symptoms of cerebral palsy correlates with the *vatavyadhi. Vatavyadhi* can be well managed through *snehana*, *swedana*, *basti*.[7,8,9]

Cerebral palsy in Ayurveda can be considered as *Shiro-Marmabhighataja Bala Vata Vyadhi*, which may manifest itself in any of the following main clinical presentations such as spastic monoplegia (*EkangaRoga*), hemiplegia (*Pakshavadha*), spastic diplegia (*Pangu*), spastic quadriplegia (*SarvangaRoga*), choreoathetoid (*Vepathu*) phakka(a kind of nutritional disorders), *pangulya*(locomoter disorders), *mukatva*(dumbness), *jadatva*(mental disorders) which are described under *vatavyadhi* in the text.[10,11]

Etiology

The cause of CP can be generally classified as prenatal, perinatal and postnatal causes. However, sometimes it is impossible to determine the precise cause of cerebral palsy in the individual patient. The prenatal causes include genetic factors, intrauterine infection during pregnancy, radiation, cerebral infarction, metabolic and toxic factors and hypoxia. Approximately half of all cases of cerebral palsy are associated with preterm delivery and

low birth weight. The precise nature of this relationship is not clear although hypoxia and hypotension are important factors. Although the perinatal risk factor of birth asphyxia is a well-recognized cause of cerebral palsy particularly in the term baby, the incidence of birth asphyxia among cases of cerebral palsy is not high.[12] As in Ayurveda there is no such disease is mentioned which can be exactly correlated with cerebral palsy but some of the etiopathological factors have been mentioned causing some of symptoms like cerebral palsy in children. In *Shusruta samhita* it is mentioned that if conception occurs during menses the baby will be still birth or having some defective organs or will die at an early age.[13] Also there are some restriction given for pregnant lady like she should avoid *vavaya(*sexual intercourse), *vyayam*(exercise), *aptarapan*(fasting), *divaswapan*(taking sleep during day, *ratrijagaran(*awakening during night), *shoka*(mental stress, anxiety), *yanaarohan*(excessive travelling) *vega-vidharan*(ignoring natural urges like vomiting, evacuation of bowl or bladder). If pregnant lady does not follow these indication it will led to disease and dysfunction of her body organs and same thing happen to her foetus.[14] If the factors causing garbhavriddhi are not appropriate then it will led to either death or deformity in foetus.[15] There are *garbhaupaghatkar bhava* mentioned in *Charak samhita* which may cause deformities in foetus or even death of foetus.[16] Lady consuming food capable of vitiating *Vatadosha* will give birth to an inactive child with deformed limbs and neurological deficits.[17] Genetic forms of CP account for about 2% in European populations but are thought to cause a substantial proportion in consanguineous families. Large consanguineous family from Oman have been identified with spastic diplegia, microcephaly, and mental retardation. There was phenotypic variability among different individuals, but spastic diplegia, microcephaly, and mental retardation were three constant traits present in all affected individuals.[18] If a mother or infant suffer from any of these associated conditions, it does not mean this will result in CP, rather it means higher prevalence of CP.[19]

Classification

Common classification systems that are in use are as follows:[1]

Topographic classification	Physiological classification	Modified Swedish classification
1. Quadriplegia 2. Hemiplegia 3. Diplegia 4. Monoplegia 5. Triplegia	1. Spastic • Quadriplegia • Hemiplegia • Diplegia 2. Extra-pyramidal 3. Mixed	1. Spastic 2. Tetraplegic 3. Hemiplegic 4. Diplegic 5. Ataxia 6. Dyskinetic Mainly choreoathetotic Mainly dystonic

How *Ayurveda* can help a CP patient

A team of member is required in modern management where each has their own limitations and is highly expensive.[20]Botulinum toxin A is recommended for localized spasticity and diazepam and tizanidine for short term treatment of generalized spasticity. Subsequently the development of severe lever arm disease or contractures make these modalities redundant and surgery a better option.[1] The child with CP may even develop other postsurgical complications like hyper extensibility etc. There is no permanent cure of cerebral palsy has been found yet. Only symptomatic management is available and allopathic management is also associated with side effects. There is no cure for this lifelong condition but education, therapy and technology can maximize the affected child's potential by improving his functional abilities and quality of life. All treatment efforts are aimed to provide better quality of life, gaining independence in physical activity and daily routine, attending school and having decent social life. Management of *Vatavyadhi* in cerebral palsy patient has been proved to be very beneficial in many case studies and clinical trials.About 15 research article and case study on cerebral palsy in ayurveda had been reviewed and 3 of 15 articles were selected to analyze results as shown below.

Role of *Panchkarma* Procedures

1. Basti

According to *acharaya Charak basti* is considered as the *ardha chikitsa* of *Vatadosha. Acharaya Charaka* aptly highlighted *Basti* as *Vasti vataharanamshreshtham*.[21] *Basti* indeed is the half of the entire management of diseases. It is the best treatment for vatavyadhi in all age groups. *Basti Chikitsa* is also considered as one of the best treatment for disorders of *Marmas-"Bastikarmam Samam Nasti Kinchit Karma Marmaparipalanam.*"[ch.si.22] *Niruhabasti* is indicated in diseases like *shosha, stambha, kampa* and *aakshepaka*.[ch.si.23] Patients of cerebral palsy have symptoms similar to *above mentioned disease*. So by the review of many article on ayurvedic management in cerebral palsy *Basti Chikitsa* proved to be very effective.

A case study was done on Sishunamaka Basti in cerebral palsy patient at IPGT & RA, GAU, Jamnagar. This is a unique *basti* especially designed by *acharya Kashyapa* for the elimination of all kinds of diseases exclusively in children. A 6 years old boy was not able to stand and walk without support till to this age associated with stiffness in the lower limbs.Spastic cerebral palsy with diplegia has been diagnosed by the complete history, and

clinical examination, MRI brain which revealed the evidence of HIE changes due to asphyxia. After completion of treatment child was able to stand and walk without support for 5-7 minutes, able to climb upstairs with support, decrease in drooling and also constipation was relieved, as *basti* was given for 11 days and there was regularization of bowel in the child. Even there was improvement in overall nutrition as basti used in the present study was *Sneha basti*.[10]

Mode of Action of *Basti*

The gastrointestinal tract has a nervous system all of its own called the "Enteric nervous system" or the "Gut brain". Just like the larger brain in the head, researchers say, this system sends and receives impulses, records experiences and respond to emotions. Its nervecells are bathed and influenced by the same neurotransmitters. The gut can upset the brain just as the brain can upset the gut. It lies entirely in the wall of the gut, beginning in the esophagus and extending all the way to the anus. The number of neurons in this enteric system is almost equal to the number in the entire spinal cord. Enteric nervous system normally communicates with central nervous system through the parasympathetic system (via vagus nerve) and sympathetic (e.g.; via pre vertebral ganglia) nervous system and the gastrointestinal tract also receive a plentiful supply of afferent nerve fibers, through the vagus nerves and spinal afferent pathways. Thus, there is a rich interaction, in both directions, between the enteric nervous system, sympathetic pre vertebral ganglia and the CNS. ENS system has the capacity to alter its response depending on factors such as bulk and nutrient composition. Thus *Basti dravya* when administered into rectum may stimulate the sensory system due to the chemical composition and pressure effect over the bowel. As the total nervous system is interrelated so this regular stimulation on ENS has positive effect over CNS also.[11]

2. Combined *Panchkarma* Therapy[17]

Another case study was done in a CP patient aged 1 years 8 months at IPGT & RA, GAU, Jamnagar.

Total duration of treatment was 80 days, started with 5 days *Udvartana* followed by 7 days *Sarvanga Abhyanga* and *Swedana* along with *Pratimarsha Nasya* and 8 days *Yoga Basti*. Total 3 courses was given of this 20 days schedule with 10 days interval in between. *Udvartana* was done with *Yava* (Barley) and *Kulattha Churna* (Horse gram powder) in same proportion for 20 minutes. *Abhyanga:* with *BalaTaila* for 20 minutes followed by sudation

for 5 minutes. *Pratimarsha Nasya*: with *Panch Indriyavivardhana Taila* at the dose of 2 bindu each nostril per day for 7 days after *Abhyanga* and *Swedana.*

This study shown 50% improvement in Neck holding, 33% improvement in sitting and standing according to CDC grading for milestones. Fine motor has shown 66.67%, language, personal and social milestone has shown 16.67% improvement. Here, *Panch Indriyavivardhana Taila Nasya* (Nasal drops) given has direct effect on the brain. As the name of oil suggested that it acts over all the five *Indriyas* and all these *Indriyas* having connection with the brain. *Nasa* (nose) is the portal route for administration of oil, this stimulates the olfactory nerve which is connected with the higher centres of brain which are damaged in CP. The lipid content of oil absorbed through blood brain barrier and reached to the damaged site and stimulates the nerves, increase the blood supply that ultimately leads to nervous sensation in different parts of the body. Thus here we can say that neck holding which is much delayed milestone may be achieved by the *Nasya* very fast. Also *Nasya* helps in fine motor and language function.

Improvement in growth can assess by the increased anthropometric parameters. *Udvartana* (massage with dry powder) have qualities like *Ruksha, Kaphahara* and blockage-removing properties help to open up minute channels which improve blood and lymphatic circulation and also do some nerve stimulation. Once *aavarana* (blockage) is removed, vitiated *vata* can be pacified by further treatment.

Massage with oil nourishes skin by its *Mridu, Snigdha, Guru, Picchila Guna. Swedana* (Sudation) pacifies the *Vayu*, which causes rigidity and contracture due to its *Ruksha and Shita Guna* and *Swedana* removes it by its *Ushna Guna.* Ashworth scale shows 40% improvement in spasticity. Initially minute channels opened by *Udvartana* which further helps to absorb more oil in the process of massage by the skin into the body. *Snehana* therapy (*Abhyanga*) is useful for promoting strength, nourishment (bulk), vitality (energy) to the deficient part and particularly required areas of the body. Skin is considered as the main abode of *Vata* along with Pakvashaya.[15] As *Abhyanga* and *Shashtika shali pinda Sweda* involve cutaneous manipulation, it is considered as one of the prime procedures for mitigating *Vata.* These modalities of external therapy may act by dermal mechanisms of drug absorption and action. Primarily it acts by two mechanisms viz., local and central. The local mechanisms include cutaneous stimulation causing the arterioles to dilate and thereby achieving more circulation. It also assists venous and lymphatic drains. This state of hyper

circulation also enhances the transdermal drug absorption and assimilation. Massage causes movement of the muscles thereby accelerating the blood supply, which in turn helps in relieving the muscular fatigue and reduces stiffness. Skin is an organ with rich sensory nerve endings, which on stimulation gives abundant sensory inputs to the cortical and other centers in CNS. This fact was exploited since thousands of years for stimulation of higher centers of central nervous system, which is evident when it is referred that *Snehana* and *Swedana* are the prime mode of treatment in treating neurological conditions. *Abhyanga* procedure is the mechanical stimulation more precisely the pressure application during massage. Pressure application done in proper way can help in reduction of motor neuron hyper-excitability by reducing the alpha motor neuron activity. In a study, cerebral palsy symptoms in children were decreased following massage therapy.

3. Another Clinical study was conducted on the efficacy of *Rajayapana Basti* and *Baladi Yoga* in motor disabilities of cerebral palsy in children in Department of *Kaumarabhritya*, SDM College of Ayurveda and Hospital, Hassan. *Rajayapana Basti* and *Baladi Yoga* group have shown improvements in understanding ability (13.43%), speech (10%) and performance skill (11.11%), in fine motor functions such as putting small object in to a container (14.3%), throws the ball in all direction (21.8%), use of thumb and index finger (10.93%), retaining 2 inch cube in fist (19.04%), folds paper and inserts into envelope (10.30%), in gross motor functions such as in crawling (26.7%), sitting (31.7%), standing (13.75%), walking (9.5%) and claps hands (13.9%) respectively.[25]

4. Effects of Herbal Drugs on Brain

1. *Brahmi* :The results of experiment with Bacopa monniera extract treatment in rats with higher doses for longer period induce significant increase in dendritic length and branching both in the apical and basal dendrites in Hippocampal CA3 neuronal dendritic. Structural changes in hippocampal CA3 neurons, which improve their learning and memory. The rats had been treated with BM showed improvement in spatial learning performance and enhanced memory retention compared to normal control rats.[26]
2. *Bramhi Ghrita*: *Bramhi Ghrita* (a polyherbal formulation contains Bacopa monneri, Evolvulu salsinoids, Acorus calamus, Saussurea lappa and cow's ghee) has effect on learning and memory in experimental animals (rats).[27]

3. *Brahmi rasayana: Brahmi rasayana* (comprises of B. monnieri, Eugenia caryophyllus, Elettaria cardamomum, Cinnamomum zeylanicum, Piper longum and Piper nigrum) improves learning and memory in mice.[28]
4. Celastrus paniculatus: The *Jyotismati* oil from seeds of Celastrus paniculatus showed cognitive enhancing properties in adult rats.[29]
5. Centella asiatica: Fresh leaf extract of Centella asiatica enhanced dendritic arborization in rats, neuroprotective effect in rats.[30,31,32]
6. Convolvulus pluricaulis: The aqueous extract of Convolvulus pluricaulis reported neuroprotective property in wistar rats and enhance learning and memory in mice.[33]

Neuroplasticity

Previously, it was believed that neurons do not repair or rejuvenate after any injury, but the new concept of neuroplasticity says that CNS have the ability to repair their neurons by axonal sprouting to take over the function of damaged neurons. The ability of the nervous tissue to recover its function damaged by intervention into the organization of the nerve tissue is considered to be one of the manifestations of neuroplasticity. As other forms of plasticity, the mechanisms of restitution are controlled by genetic programs which determine the activity of individual neural element. These programs are triggered by changes in the internal environment of the nervous tissue which accompany the pathologic process. Reparation may result from changes in the efficacy or in the number of synapses, from the rearrangement or from sprouting of dendritic and axonal branches. Reparation is accompanied by reorganization of local neuronal circuits, or by changes in the relation between functional brain units. Research is therefore currently looking for a method how to reinforce the regenerative capacity of the nervous system. The intrinsic neuroplastic mechanisms may be activated by natural mechanisms or by proper medication. The dormant process or regeneration may be activated and bring about the recovery of injured neuronal circuits.[34] Concept of neuroplasticity opens up new hope for cerebral palsy patient. As from the various case study and trial of ayurvedic management it can be concluded that *panchkarma* procedures and herbal drugs might play role in regeneration of neurons.

CONCLUSION

From the review of recent articles on *Ayurvedic* management of cerebral palsy it can be concluded that *Ayurveda* management has definitely provide improved in gross motor functions, fine motor function and language and performance skill. As this diseases is

incurable if we are able to make small changes in earlier life it will reflect as a major benefit in later age. Plasticity of brain is maximal in first few years of life. Hence early intervention in early period of life can have greater impact on brain. Thus, *panchkarma* procedures and drugs with neuro-regenerative, nootropic properties can induce neuroplasticity of brain in cerebral palsy patient and surely improves the quality of life in cp patient.

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