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Ayurvedic understanding and management of Hypoxic Ischemic Encephalopathy : A Case Study

Veena G. Rao[1], Apoorva M.S.[2]

[1]*Professor & HOD, Department of PG Studies in Panchakarma, JSS Ayurveda Medical College, Mysuru, Karnataka, India.*

[2]*Final Year PG Scholar, Department of PG Studies in Panchakarma, JSS Ayurveda Medical College, Mysuru, Karnataka, India.*

ABSTRACT

Hypoxic-ischemic encephalopathy (HIE), is one of the most frequent and dramatic urgency found in neurological brain diseases of adults. This is a neuro-vascular and neuro-metabolic syndrome, caused by a shortage of supply of oxygen and glucose or their metabolism in the brain. HIE results from a global hypoperfusion or oxygenation deficiency rather than from infarction in a specific vascular cerebral territory. In adults, common etiologies include hypotension, cardiac arrest followed by successful resuscitation. Here is a case study of 66year old female patient presenting with complaints of *Balakshaya* and *Karmakshaya* in *Ubhaya Urdhwa* and *Adhoshaka* associated with *Vak Krichrata* since 2 weeks. Current case was diagnosed as Hypoxic Ischemic Encephalopathy in conventional medicine and emergency management was done. Based on the presetting complaints of the patient, in *Ayurveda* it can be understood in lines with *Sarvangaroga / Vepathu Vata / Kapha Avrutha Vyana* and treatment was planned accordingly. *Panchakarma* therapies along with oral medications for 21 days has given the best result to the patient in terms of reduction of clinical features and also quality of life.

Key words: *HIE, Hypoxic-ischemic encephalopathy, Sarvangaroga, Vepathu Vata, Kapha Avrutha Vyana, Ayurveda.*

INTRODUCTION

Hypoxic–ischemic encephalopathy, is a severe consequence of global cerebral ischemia due to cardiac arrest or other causes like hanging, strangulation, poisoning with carbon monoxide or near-drowning. Cardiac diseases are the main cause of cardiac arrests (82.4%) and subsequent brain damage. In the United States, approximately 180.000-450.000 people (in Europe about 270.000 people) are dying because of sudden cardiac death per year.[1]

Address for correspondence:
Dr. Apoorva M.S.
Final Year PG Scholar, Department of PG Studies in Panchakarma, JSS Ayurveda Medical College, Mysuru, Karnataka, India.
E-mail: apoorva.ms29@gmail.com

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Cerebral hypoxia can be classified according to severity and location[2]

- **Diffuse cerebral hypoxia:** mild to moderate impairment of global brain function caused by low levels of oxygen in the blood.
- **Focal cerebral ischemia:** a localized and temporary reduction of brain tissue oxygenation. Neuronal damage is usually reversible. Ex: TIA.
- **Cerebral infarction:** a long-term blockage of blood flow to a region of the brain. Significant irreversible damage occurring in the area after obstruction.
- **Global cerebral ischemia:** a complete and diffuse stop of blood flow to the brain (e.g. severe systemic hypotension in shock, cardio-respiratory arrest).

Depending on the cause of the reduction of oxygen to the brain, cerebral hypoxia may be: hypoxic, hypemic / anaemic, ischemic and hystotoxic.

Neurophysiology[3]

The brain needs 3.3 ml O2/100g/min and 8 mg glucose/100g/min under basal cerebral condition at a

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blood flow to an average of 55 ml/100g/min (i.e. 750 ml/min) representing 15-20% of total cardiac output at rest. Blood flow of gray substance (cortex) is 4-5 times higher (70-80 ml/100g/min) than that of white matter (15-20 ml/100g/min). In people over 60 years, cerebral blood flow is 30-40 ml/100g/min.

Neurophysiopathology[4,5]

In case of reduction of O2 concentration in the blood, the body respond to compensate by redirecting systemic blood flow and increasing cerebral blood flow, up to 2 times normal. If this change is sufficient to meet the brain needs of O2, then symptoms characteristic of hypo / anoxia of brain does not appear. If the adaptive response of O2 deficit is not corrected, the symptoms begin to appear.

The most common causes of acute cerebral hypoxia is the dropping of cerebral perfusion (global cerebral ischemia) caused by cardio-respiratory arrest and severe hypotension (haemodynamic shock). Sustained severe hypoglycaemia, sustained seizures (status epilepticus) over 1-2 hours may also cause permanent brain damage. Global cerebral ischemia is more aggressive, because in addition to the energy shortage there will be accumulation of lactic acid and free radicals, which are removed during normal blood flow conditions as they accumulate.

Symptoms and signs of cerebral hypoxia[6,7]

Depending on the duration of cerebral hypoxia the following clinical events are observed,

Duration of hypoxia	Clinical signs
Up to 1 minute	Unconsciousness, convulsions, miosis, abolished pupillary reflex
After 2 minutes	Mydriasis, the abolition of corneal reflex
After 5 minutes	Cerebral cortex suffering irreversible damage
After 15 minutes	Irreversible damage at brain stem and the spinal cord

Post hypoxic neurological syndromes

They are: coma or persistent vegetative state, dementia, extrapyramidal syndrome (parkinsonian) with cognitive deficit (in CO poisoning), coreoathetosis, cerebellar ataxia, myoclonus, Korsakoff's disease. If injuries are caused by global ischaemic hypoperfusion, the patient may present specific manifestations of watershed strokes (border zone): visual agnosia (Balint's syndrome or cortical blindness) when the lesion is between the territories of MCA and PCA, proximal upper limb motor deficit, sometimes to the leg when damage is located between MCA and ACA territories.

As per *Ayurveda* classics this can be correlated with *Sarvangaroga* which is explained in the context of *Pakshaghata. Pakshghata* is a *Vatavyadhi* involving *Karmakshaya* and *Blakshaya* in *Ardhashareera* along with loss of speech i.e., one half of the body, whereas *Sarvangaroga* is that which involves *Sarvashareera* i.e., whole body is involved in the pathology.[8] Present case depicts the involvement of *Kaphavrutha Vyana Samprapti* and thereby treatment was planned accordingly.

Case Description

A female patient aged 66 years approached OPD of Panchakarma Department of JSS Ayurveda Hospital on 12/8/2023 with the complaints of *Balakshaya* and *Karmakshaya* in *Ubhaya Urdhwa* and *Adhoshaka* associated with *Vak Krichrata* since 2 weeks and was diagnosed as a case of Hypoxic Ischemic Encephaloapthy and was treated in ICU for 12 days.

History

On 30th of July 2023 around 10.30pm, she suddenly started experiencing breathlessness, palpitation, associated with chest pain radiating to left upper limb and cough. She was being rushed to Allopathic Hospital, and on the way to the hospital she developed loss of consciousness and CPR was performed and then immediately she was shifted to ICU and was treated for cardiac arrest. While in ICU on 4th day, patient developed loss of speech and on the next day she had jerky movements in Left hand and later in both the

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hands and face with deviation of mouth to right side along with head tremors. Later after treatment the jerky movements was reduced but the patient developed weakness and loss of strength in all the 4 extremities and was unable to walk, drowsiness, cough with breathlessness was observed and was diagnosed as Hypoxic Ischemic Encephalopathy and was treated for the same and later patient was discharged from the hospital after 2 weeks with no further improvement. So she approached JSS Ayurveda Medical Hospital for further management. A female patient aged 66 years is a K/C/O Chronic Rheumatic heart disease since 5 years, Hypertension since 10 years, T-2 Diabetes mellitus since 10 years, Prolapsed intervertebral disc since 1 month and under medication for all the co-morbidities. The patient also complains of pain in lower back region and b/l knees with stiffness since 1month.

Personal History

Diet - Ryle's tube feeding.

Sleep - Always drowsy.

Bowel - Constipated.

Micturition - Catheterized.

General Examination

BP - 130/90mm Hg

PR - 78 bpm

RR - 21 times/min

Height - 156 cm

Weight - 68 kgs

Nourishment - Moderate

Ashta Sthana Pariksha

Nadi - 78bpm

Mala - Constipated

Mutra - Catheterized

Jihva - Lipta

Shabda - Vikrutha

Sparsha - Anushnasheeta.

Drik - Prakrutha

Akriti - Madhyama.

Dasha Vidha Pariksha

Prakruthi - Pitta Kapha

Vikruthi - Vata Pradhana Tridosha

Sara - Madhyama

Satva - Madhyama

Samhanana - Madhyama

Satmya - Sarva Rasa Satmya

Abhyavarana Shakthi - Madhyama

Jarana Shakthi - Madhyama

Vyayama - Avara

Pramana - Madhyama

Vaya - Madhyama

Systemic Examination

Gastro-intestinal systems appear normal.

Respiratory Examination

O/I : Shape of chest : B/l symmetrical.

O/A : B/L Ronchi - (+)

B/L Basal crepitations (+)

Musckulo Skeletal Examination

O/E of Knee joints

O/I : No swelling, No deformity, No scar, No redness.

O/P : Tenderness : Present b/l.

Temperature : Locally raised b/l.

Crepitus : (+) b/l.

O/E of Lumbar spine

O/I : No swelling , No deformity , No scar, No redness.

O/P : Tenderness : Present at L3-4, L4-5.

Temperature : Locally raised.

SLR : Negative.

Bregard's : Negative.

ROM : Bedridden.

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Nervous System Examination

Higher Mental Function

Consciousness - Well Conscious.

Orientation - Well oriented to time, place and person

Behaviour - Cooperative

Attentiveness - Drowsy

Memory - Immediate - intact

Recent - intact

Remote - intact

Cranial Nerve Examination

Olfactory Nerve - Intact.

Optic Nerve - Intact.

Occulomotor Nerve - Intact.

Trochlear Nerve - Intact.

Abducent Nerve - Intact.

Trigeminal Nerve - Intact.

Facial Nerve -

Forehead Furrowing - Intact

Eyebrow raising – Intact

Eye closure – Intact

Teeth showing - Slight deviation to right side.

Blowing of cheeks - Not possible in Rt.Side.

Vestibulo Cochlear Nerve - Intact.

Glossopharyngeal & Vagus Nerve - Deglutition : Hampered.

Spinal Accessory Nerve

Shrugging the Shoulders - Not elicited

Hypoglossal Nerve - Dysarthria - Present

Co-ordination Test

Finger to nose test - Not elicited.

Heal shin test - Not elicited.

Sensory Examination

Superficial pain - Intact

Light touch - Intact

Temperature sensation - Intact

Vibration sensation - Intact

Joint position sense - Intact

Stereognosis - Intact

Graphestesia - Intact

Motor System Examination

GAIT : Bedridden initially.

Ataxic (After 1 week of treatment while she started walking).

Tropical changes : No bed sores.

Atrophy in muscles of hands & legs : Absent

Fasciculation & irritability : Absent

Contraction & contractures : Absent

Involuntary movements : Tremors : Present

Intentional tremors : Present in left hand

Resting tremors : Present in left hand and head.

Muscle Tone :

Rigid - slight Clasp knife rigidity in Lt. upper limb.

Normotonic in Right limb.

Muscle Bulk : Intact.

Muscle Power :

	Right Limb	Left Limb
Upper Limb	4/5	3/5
Lower Limb	4/5	3/5

Deep Tendon Reflexes

	Left limb	Right limb
Bicep's	+2	+1
Triceps'	+2	+1
Supinator	+2	+1
Knee Jerk	+3	+2
Ankle Jerk	+2	+1

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Babinski Sign	Positive	Intact

Investigations

Haematology: 3/8/2023

Hb% - 11.41%

Neutrophils - 79.6 %

Lymphocytes - 12.95 %

Eosinophils - 0.73 %

Monocytes - 6.60 %

WBC - 9.13 Thous/Cumm

Biochemistry: 9/8/2023 - Arterial blood gas (ABG)

	Result	Reference range
PH	7.527	7.35-7.45
PCO2	37.9 L mmHg	38.0 - 42.0
P02	69.8 L mmHg	75.0 - 100.0
HCO3 Std	31.3 mmol/L	22.0 - 28.0

Treatment Protocol

SN	Days	Treatment	Medicine
1.	Day 1-10	*Sarvanga Seka*	*Dhanyamla*
2.	Day 11-14	*Sarvanga Abhyanga* except chest followed by *Nadi Sweda*	*Ksheerabala Taila*
3.	Day 15-21	*Sarvanga Shastika Shali Pinda Sweda*	*Ksheerabala Taila*
4.	Day 1-15	*Upanaha* to both knees	*Erandha Taila + Saindhava Lavana*
5.	Day 1-21	*Talam*	*Rasnadi Choorna + lemon*
6.	Day 12-21	*Matrabasti*	*Dhanwantara Ghrita = 20ml +* *Sukumara Ghrita = 20 ml*

Oral Medications

SN	Days	Medicines	Time of administration
1.	Day 1-11	Tab. *Anuloma DS*	1 tablet Morning and night before food
2.	Day 1-21	Tab. *Rasaraja Rasa*	1 tablet morning and night after food
3.	Day 1-21	Tab. *Jayamangala Rasa*	1 tablet morning and night after food
4.	Day 1-21	Tab. *Shwasa Kasa Chintamani Rasa* with gold	1 tablet morning and night after food

RESULTS

Subjective improvements

1. Patient was bedridden initially and after treatment was able to walk with minimal support.
2. Patient muscle power got improved.
3. Tremors got reduced.
4. Patient mood became happy and cheerful.

DISCUSSION

Hypoxic-ischemic encephalopathy (HIE) is a brain disorder resulting from inadequate blood and oxygen supply due to various causes. HIE most commonly occurs in neonates, also known as neonatal hypoxic-ischemic encephalopathy (NHIE), with perinatal asphyxia as the main cause. During the perinatal period, umbilical cord entanglement or abnormal amniotic fluid can cause fetal distress, asphyxia, and hypoxia. Non-NHIE can be seen in severe cerebral hypoxia-ischemia (HI) from a variety of causes, including shock, respiratory and cardiac arrest, carbon monoxide poisoning, myasthenia gravis, and persistent status of epilepticus. Meanwhile, tissue damage has been observed in the cerebral cortex, hippocampus (Hipp), striatum (STR), and thalamus (TH), as well as the subcortical and periventricular white matter injury (WMI) has been found.[9]

This Hypoxic Ischemic encephalopathy can be considered as Cluster of features in *Ayurveda*.

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It can be paralleled with *Sarvangaroga* explained by *Acharya Charaka* as *Karmakshaya* of all 4 limbs in this Patient was present. This indicates that the Cerebrum got affected with Hypoxia resulting in features of Pyramidal tract involvement.

The head tremors and Resting tremors of left hand along with myoclonic jerks at ICU indicates involvement of Extra-pyramidal system with Hypoxia. This can be related to *Vepatu Vata/ Kampa Vata*.

Intentional tremors, loss of co-ordination with Ataxic gait while she started walking after 10 days of treatment indicates the involvement of Cerebellum with Hypoxia. This can be paralleled with *Kapha-Avrutha Vyana* in *Ayurveda.*

The present case depicts *Samprapthi* of *Kapha Avrutha Vyana*[11] and treatment was planned accordingly i.e., *Kapha Avarana* and *Ama* associated with the *Vata* at this acute stage should be removed initially and later *Kevala Vata Chikitsa* should be done. Initially to start with *Kapha Avarana* and *Amahara* line of management was done and so *Sarvanga Dhanyamla Seka* which is a type of *Ruksha Drava Sweda* and *Talam* with *Rasnadi Churna* and lemon was performed. While treating the *Avarana* one should always keep *Vata* under *Anulomana*[12] and hence Tab. *Anuloma* DS was administered during that period which does *Vataanulomana* as well as *Koshta Shodhana*. During this the patient was relieved from drowsiness and muscle power of limbs got improved and tremors got reduced. Patient mood became cheerful and happy and patient was able to sit without support. As swallowing got improved Ryle's tube was removed and totally oral feeding was started.

After the *Ruksha* and *Ushna Chikitsa* for *Kapha* and *Ama* later *Vata Shamana* treatment was adopted by performing *Sarvanga Abhyanga* and *Nadi Sweda* with *Ksheerabala Taila* which is *Vata-Kapha Hara* and after this the patient started gaining strength and confidence and patient was able to stand with support during this period.

Later *Brimhana* line of management was followed by adopting *Sarvanga Shastika Shali Pinda Sweda* which is a *Snigdha Sankara Sweda* and is *Brimhana* in nature and *Matrabasti* was administered with *Dhanwantara Ghrita* which is *Vatahara Brimhana*[13] and equal quantity of *Sukumara Ghrita* which contains *Eranda Taila* helps in *Vataanulomana.*[14] After this treatment patient was able to walk with minimal support speech was also improved.

Janu Upanaha with *Eranda Taila* and *Saindhava Lavana* was performed for both the knees which helped in relieving pain and stiffness.

Rasaraja Rasa mainly contains *Shuddha Parada, Abhraka Satva, Swarna Bhasma, Loha Bhasma, Rajata Bhasma and Vanga Bhasma* and is indicated *in Pakshaghata, Arditha, Apatantraka* and *Sarva Vatavyadhi* and is *Balya* and *Vrishya*.[15]

Jayamangala Rasa includes *Shuddha Parada, Shuddha Gandhaka, Tankana Bhasma, Tamra Bhasma, Vanga Bhasma, Makshika Bhasma, Swarna Bhasma, Loha Bhasma, Rajata Bhasma, Dhattura, Nirgundi* and *Kiratatikta* and is indicated in all types of *Jwara, Jeerna Jwara, Vishama Jwara, Mamsa, Medha* and *Ashti Gata Vata Vyadhis* and is *Sarvaroga Nivaraka*. As the condition is acute with major role of *Ama, Jayamangala Rasa* was administered.[16]

Shwasakasachintamani Rasa contains *Shuddha Parada, Shuddha Gandhaka, Swarna Bhasma, Loha Bhasma, Makshika Bhasma, Mukta Bhasma, Abraka Bhasma, Kantakari, Yastimadhu, Nagavalli* and goats milk. This balances *Vata-kapha Dosha* and is indicated in *Shwasa, Kasa, Dushta Pratishyaya.*[17] As the Patient had *Kasa* and *Shwasa* / breathlessness even for minimum exertion this was administered.

CONCLUSION

This case study demonstrates successful management of Hypoxic Ischemic Encephalopathy w.s.r. to *Sarvangaroga* with features of *Kapha Avrutha Vyana* and *Vepatu Vata / Kampavata* in *Ayurveda*. These Panchakarma therapies along with *Shamanoushadi* has given best result in the reduction of all signs and symptoms. Patient was bedridden at the time of admission but was able to walk with minimal support. This case report serves as a lead for further treatment and researches in the management of Hypoxic ischemic encephalopathy in Ayurveda.

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