



## PHYSIO-PATHOLOGICAL STUDY OF MIGRAINE AND ITS PACIFICATION WITH MARMA CHIKITSA

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### ABSTRACT

The term 'migraine' for very long has been used to refer to severe headache but it has more to it. There are certain physiologic changes occurring in brain that lead to pain in half side of head usually with associated symptoms like nausea, vomiting and visual disturbances. The exact cause of migraine is not known but various postulates explain the pathophysiology of migraine and its course. It is believed to be because of either vascular, neurochemical, neuronal and hormonal changes. Severe migraine pain can be disabling while mild to moderate pain can interfere with one's day-to-day activity. Besides far advancements in pharmacology, the rising incidences of migraine put a great threat to society especially when it hampers daily activities. It is a primary headache so no organic pathology can be appreciated in imaging of brain. Diagnosis is based on history, presenting symptoms and exclusion of other pathology. Ayurveda describes *ardhvaabhedaka* as pain in half side of head. The causes and symptoms of *ardhvaabhedaka* as mentioned in classical texts have close resemblance to migraine. The management of migraine by drugs alone is not fruitful. The need of the hour is an alternative method for decreasing pain severity and frequency of attacks which is the ultimate goal of management. It can be achieved by unique but less explored concept of 'marma therapy'. It is seen as healing power of vital points in body. But Marma therapy has more to it. Migraine besides far advancements in pharmacology is a rising issue. It is the second most common cause of headache which can be very debilitating. Marma therapy can prove to be a milestone in management of migraine. It needs to be explored more.

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### INTRODUCTION

Migraine at its most basic level is headache with associated features. It is a terrible headache that tends to recur and is often accompanied by a feeling of nausea and photophobia. The pain is usually felt on one side of the head. One may experience flashing lights, zigzag lines, bright spots, partial loss of vision, or numbness or tingling in the hand, tongue, or side of the face. Moving around worsens the headache.

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While no medical tests confirm migraine, the diagnosis is based mainly on the history and above-mentioned symptoms. Basically, headache can be a symptom of an illness while migraine is an illness. Various postulates have been framed to explain migraine. It is thought to be a vascular disorder caused by a tightening (constriction) and sudden opening (dilation) of the blood vessels in the head, neck, or scalp. Others believe that an abnormal release of neuro-chemicals in the brain, such as serotonin or noradrenaline may cause the throbbing pain of migraine. Recent advances in studies come up with cortical spreading depression (CSD) theory an abnormal impulse transmission in brain that justifies the aura in migraine. The sensitivity of brain towards CSD is said to be genetic.

There is no one vindication that can completely explain migraine. In Ayurveda, *ardhaavabhedak* (meaning literally the unilateral pain) resemble the classical migraine. All the *acharyas* have classified it under *shiroroga* (pain in head). Acharya *Madhav* and *Chakrapani* include conditions that involve pain in head under *shiroroga*. *Ardhaavbhedaka* is made of two words *ardha* + *bhedak*. *Ardha* means half and *bhedaka* means piercing or extrication. *Ardhaavbhedaka* suggests piercing or extricating type of pain in half part of head. The exact cause of migraine headaches is unknown. It is thought to be due to abnormal brain activity causing a temporary alteration in the nerve signals, chemicals and blood flow in the brain which get triggered by variety of factors. Migraine headaches can be very debilitating affecting 1 in 4 households in America. It is the second most common cause of headache. It is more common in women (2 to 3:1) and a family history is always present (60% cases). Majority of patients 80% have migraine without aura. It is identified as one of the top 20 disability causing diseases by World Health Organisation (WHO). Because of mounting incidences of migraine even after vast pharmacological advances; it becomes important to have an alternate approach to it. There are several non-pharmacological approaches like identification and avoidance of specific triggers, regulated lifestyle, healthy diet, regular exercise, regular sleep patterns, and avoidance of excess caffeine, alcohol and stress that help in managing migraine. Marma therapy although very ancient but very less explored practise of ayurveda has a significance potential in maintaining health as well as preventing diseases by channelizing body's energy in right course. Stimulation of marma points present in head region can prove to be of great prophylactic assist in managing migraine pain. There are various aspects of this therapy. The patient can be educated about application of these aspects at the initial stages of attack in the prodromal and aura stage as well as between subsequent attacks. It will not only decrease the frequency of attack but also decrease severity of pain. Ayurveda has holistic approach of healing body, mind and soul. Proper practise of marma therapy on daily basis will also help relieve stress which is leading triggering factor in migraine.

## MATERIAL AND METHODS

**The present study is conducted after thoroughly undergoing:**

- Critical reference of books of *brihatrayee* in relation to *shiroroga*.
- Recent advancements in physiopathology by various scholars on *migraine*.
- Google search using keywords migraine, *ardhavbhedaka*, trigeminocervical pain pathway.
- Literary review of marmas per *Sushruta Samhita*.
- Various books concerned with marma therapy and its applicability in today's world.

A correlation is made between ayurvedic and modern concept of headache. And a compilation of particulars is made in light of modern view of *migraine*. Role of marma therapy as adjuvant to present line of management is appreciated.

### Observation

**Anatomy and physiology of headache:** Healthy nervous system mediates stimulation of peripheral nociceptors because

of tissue injury, visceral distension or any other reason that leads to pain and is physiological. While pain can also be produced when central nervous system (CNS) and peripheral nervous system (PNS) are damaged or inappropriately activated. Headache may be a result of either of two mechanisms. Thus headache can be physiological phenomena as well. Headache can be of primary or secondary origin. In primary or benign headaches clinical examination and investigation including imaging are normal. Migraine is one such headache. Others being tension-type headache and cluster headache. There are few structures in the head that are pain producing including scalp, middle meningeal artery, dural sinuses, falx cerebri, and proximal segments of large pial arteries.

### The key structures involved in primary headache are

- The large intracranial vessels and dura mater
- The peripheral terminals of trigeminal nerve that innervate these structures
- The caudal portion of trigeminal nucleus
- The pain modulatory systems in the brain that receive input from trigeminal nociceptors.

The innervation of large intracranial vessels and dura mater by trigeminal nerve is trigeminovascular system. All headaches are mediated by trigeminocervical nucleus and initiated by noxious stimulation of nerve endings that synapse on nucleus. Headache can be prevented once patient identifies these noxious stimulants. Sensory information processing depends majorly on glutamate neurotransmission in a variety of complex cortical and sub-cortical regions. Neuromodulatory systems of the brain are characterised by projections originating from small clusters of cells located in brainstem and hypothalamus. Monoaminergic cell groups are the neurons that contain one of the neurotransmitters serotonin, dopamine, norepinephrine and epinephrine. Monoamines are key neuromodulators involved in variety of physiological and pathological brain functions. They regulate sleep-wake cycle and influence sensory responses. In migraine, there is spreading front of depolarisation followed by hyperpolarisation in cortical cells leading to paroxysmal alteration in cortical modulation pathways from the brainstem. The spreading depression process occurs at a rate of 3mm/min. corresponding to spread of symptoms of aura.

Neurotransmitter 5-hydroxytryptamine (5-HT aka serotonin) is also known to be involved in pathogenesis of migraine. 5-HT receptors or serotonin receptors are a group of G-protein coupled receptors present in central nervous system (CNS) and peripheral nervous system (PNS). At least 14 different 5-HT receptors exist in humans. They influence various neurological processes like anxiety, aggression, appetite, cognition, learning, memory, nausea and sleep (Fauci, 2008). The triptans stimulate 5-HT receptors selectively. 5-HT<sub>1B/1D</sub> constricts blood vessels and inhibits release of inflammatory neuropeptides. Drugs like sumatriptan act as agonists for serotonin 5-HT<sub>1B</sub> and 5-HT<sub>1D</sub> receptors at blood vessels and nerve endings in the brain.

**Ayurvedic perspective of migraine:** Acharya *Sushruta* and *Bhavprakash* have explained eleven *shiroroga*. *Ardhavbhedaka* is one such *roga* that literally means pain in half side of head.

Table 1.1. Various approaches to marma therapy

S.No.	Pharmacological (with medicines)	Non-pharmacological (without medicines)
1.	Abhyanga (massage)	Mardana (pressure application)
2.	Udvartan (dry powder)	Pranic / energy healing
3.	Aroma therapy	Marmavedhana (needling)
4.	Medicinal paste:	
	a. Lepa	
	b. Parishek	
	c. Dhara	
5.	Herbal treatment:	
	a. Local	
	b. Oral medicines	

Table 1.2. Brief description of marmas related to migraine

S.No.	Marma	Type	No.	Dimension	Location
1.	Adhipati	Sandhi	1	Ardhaangula	Posterior fontanelle. Top of the cranium.
2.	Sthapni	Sira	1	Ardhaangula	In between eyebrows.
3.	Apaang	Sira	2	Ardhaangula	Outer corner of eye at the tail of eyebrow. Lateral side of orbital fossa
4.	Seemant	Sandhi	5	Swapaanitala	Coronal, sagittal & lambdoid sutures in skull.
5.	Vidhur	Snayu	2	Ardhaangula	Behind & below ear. Just below mastoid bone
6.	Shankh	Asthi	2	Ardhaangula	In between tragus of ear & lateral corner of eye.
7.	Krikatika	Sandhi	2	Ardhaangula	At junction of head & neck posteriorly. Atlanto-occipital joint.

Sandhi- joint; sira- channels supplying vital fluid and energy; snayu-ligament/tendons/spinctor muscles/apponeurosis; asthi- bone; ardhanga-one half finger breadth; swapaanitala- fist size or four finger breadth; sadyapranahara- immediate death; vishalyaghna- causing death if foreign body is removed; vaikalyakar-causing deformity; kaalantarpranahara- causing death after sometime

This pain is episodic and recurs in 15 days, 10 days or with sudden attack. Some *acharyas* say that when *vata* long with *kapha* occludes either side of the head, episodes recur in 3, 5, 15 days or after a month. Thus ayurveda explains the episodic nature of *ardhaavbhedaka*. The causes of *ardhaavbhedaka* include *rukshabhojan* (dry foods), *adhyashan* (having food in undigested state), *purvavata* (contact with dry winds), *avshyaya* (exposure to dew), *vegasandharan* (suppression of natural urges), *aayas* and *ativyayam* (over exertion). All these factors aggravate *vata* alone or *vata* along with *kapha*. These vitiated *doshas* pierce half side of the head and cause various symptoms. There is stiffness in half side of the head alongwith excruciating pain in brow region, temporal region, neck, around ears, eyes, either half of frontal region. The sites of pain explained in ayurveda correspond to the course of trigeminal nerve. It is main nerve involved in physiopathology of migraine. The pain can aggravate to a point where it destroys visual or auditory sensation.

According to some other *acharyas*, *ardhaavbhedak* is a result of vitiation of all three *doshas*. *Vata's* influence is the association of nervous system and of pain. *Pitta's* influence is involvement of circulatory system. *Kapha's* influence is inflammation in brain tissue. The degree of pain severity varies as per duration of exposure to triggering factor or the constitution of patient as it may last for few hours or even days. The causative factors of *ardhaavbhedaka* hold a close resemblance to the triggering factors of migraine that are food items containing tyramine (red wine, aged cheese, smoked fish, chicken livers, figs, and some beans), or nitrates (like bacon, hot dogs and salami); food additives like monosodium glutamate, caffeine; alcohol; hormonal changes like menstruation, ovulation, birth control pills, menopause; excessive exercise, fatigue; visual stimuli like bright light, glare; olfactory stimuli like perfumes; auditory stimuli loud noise or music, too much or too little sleep, skipping meals or fasting causing low blood sugar, stress and anxiety<sup>7</sup>. Over the time, one can assess the factors that trigger migraine attack in them by keeping a record of the same so as to avoid such triggers in future.

**Phases of migraine:** Migrane can get complicated with symptoms that change over minutes, hours or days. They undergo several stages: prodromal phase (before attack), aura, attack, postdromal (after attack). Prodromal phase is stage of early signs which may occur hours or day before attack. Patient is either hyperexcited or depressed, irritable, excessive thirst, sleepy with excessive yawning. Aura is when strange feelings start. It occurs in 1 in 3 cases. It may not happen in every headache though. Patient feels visual, tactile or sometimes auditory hallucinations. If drug as well as marma therapy started in these phases, there is more relief to patient compared to effect of marma therapy done at the time of attack. The next phase of attack is when actual headache begins. Headache may vary in severity, typically affects either half of head but may vary. There is more sensitivity to light, auditory stimulus. Pain worsens with physical activity. It is this phase when associated features like nausea, vomiting, lightheadedness occur. Once the attack is over, patient doesn't feel well for upto a day. It is post-dromal phase. Patient is tired, confused and headache of less severity may persist. All phases of migraine may or may not be present simultaneously. Sometimes migraine aura may occur without headache and vice-versa. Marma therapy done at pro-dromaland aura phase can be effective in increasing pain threshold and decrease severity of attack in existing or subsequent attacks.

**Trigeminovascular pathway and aura associated migraine:** The exact cause of migraine is not known. It is thought that migraine develops as a result of genetic abnormality that makes the neurovascular system hyperexcitable. Migraine at most basic level is a form of sensory processing disturbance. There is an electrical phenomena i.e. cortical spreading depression (CSD) in antidromic fashion (conduction of impulse opposite from normal direction). In migraine, conduction of impulse is along the axon but away from the axon terminal and towards the soma (cell body). The antidromic activity initiates a cascade of events in distal trigeminal nerve terminals and there is release of neurotransmitter substance P (Sub P), neurokinin A (NKA) and calcitonin gene-related peptide (CGRP) alongwith

serotonin, glutamate, prostaglandins, inflammatory cytokines. They bind to receptors on intracranial blood vessels and cause vasodilation and inflammation. This reactivates the trigeminal nerve especially peripheral branches of ophthalmic branch but in orthodromic fashion. It is manifested as headache during migraine. This signal is relayed to trigeminal nucleus in brainstem. It forwards pain impulses to thalamus and finally to sensory cortex. Prolong activation of trigeminal nerve cause peripheral sensitisation of intracranial artery. The threshold for activating primary nociceptors is lowered. In sensitised tissues, normally innocuous stimuli can produce pain. This leads to throbbing pain due to pulsating artery. The pain increases with activity or movements. If pain is not treated successfully at this level (first order neuron), second and third order neurons extending to midbrain through thalamus and cortex are activated continuously. This leads to central sensitisation causing pain even from cutaneous stimuli and patient develops resistance to treatment. Recent studies state that CSD is a slowly propagating depolarisation wave that can get evoked in cortex, cerebellum, basal ganglia and thalamus. CSD theory including transient hyperperfusion of region of brain followed by sustained hypo perfusion explains aura associated migraine. CSD has a triggering effect on trigeminovascular system which gets activated and causes headache.

**Pain threshold to assess role of marma therapy:** In simple words, it is the minimal experience of pain which an individual can appreciate. Although pain is considered to be unpleasant but it is a defensive bodily mechanism that warns us against serious complications. Stimulation of peripheral receptors of sufficient intensity has different response and tolerance of the pain in different individual. This difference is measured as pain threshold. The minimal point where an individual starts feeling pain sensation due to evoking of motor response to a stimulus is pain threshold. It is measured using algometer<sup>11</sup>. In migraine patients, pain threshold before and after marma and therapy application can be assessed using pressure algometry.

**Marmaand Mode of Action of Marma Therapy:** Marmas are basically the seats of *prana* (essentials of life). These are vulnerable or sensitive zones in body. The concept of marma therapy is very unique to ayurveda. Marma therapy focuses on subtle and sensitive energy points that are vital to body. It cleanses the blockage in energy channels *strotas* by increasing blood flow to the affected area. The Sanskrit derivation of marma i.e. *maaryatiitimarmani* means serious damage or injury to marmas can even lead to death of individual. The knowledge of these vital points in ancient times helped the warriors to hinder the opponent in wars. So these points can be used to both kill and heal with specific handling. Marma point is a junction at which any of the five structures muscle, vein, ligament, bone and joint meet<sup>12</sup>. Various classifications of the marmas are given by *acharyason* basis of their composition, site and outcome of injury. Marmas vary in number, size and location in the body. Acharyas have given 107 marmas inside and over body. Out of these, 37 marmas are said to be above clavicle (in head and neck region). Some of these might be concerned with pacification of headache in migraine. The outcome of injury to every marma is varying. Some of marmas on getting injured lead to sudden death due to spontaneous loss of prana (life) while in others there is gradual loss of life. Some cause serious deformity while others cause extricating pain. It depends upon the constitution of marma and *mahabhutas* (basic element) related to it Marma points can act as therapeutic areas as well as lethal areas. Various methods of

marma therapy are explained in table 1.1 Out of all these, marma therapy with *abhyanga*, *mardana* and *lepa* are found to be effective in migraine. Therapeutic touch is the main method for dealing with marmas. *Sparshanindriya* (touch sensation) is said to be *sarvavyaapiindriya* (generalised sensation) in our text. Touch conveys prana which is the main healing power of life. Since ayurveda believes in holistic approach of treatment, a therapeutic touch not only heals the body but the mind and soul as well. This pertains to relieving stress oriented migraine. Prana from the practitioner affects the individual at receiving end. So the practitioner with strong power of prana can heal marma points by his pranic energy. On the other hand, a practitioner with little development of prana may not be very effective even if technically correct.

#### **Abhyanga: marma massage/oil massage**

Various ayurvedic medicated oils can be used. For different doshas, different oil bases are used. In *Vatadosha* sesame, almond, olive, ghee are used. In *pittadosha*, coconut, sunflower safflower, ghee is used. In *kaphadosha*, mustard, safflower, apricot oil are preferably used. These oil bases are cooked with various herbs like *ashwagandha* (*Withaniasomnifera*), sandalwood, *bala* (*Sidacordifolia*) etc. depending upon the dominant dosha. Massage oils cooked with herbs provide synergistic action. The massage should be done in clock-wise direction when tonification or strengthening of internal organs is the aim. But when aim is to reduce excess doshas, tissue growth or detoxification anti-clockwise massage preferably by thumb for 3-5 minutes two times a day is done.

#### **Mardana: acupressure**

Mardana means 'applying pressure'. It is suitable for smaller marmas particularly in extremities and head. Pressure is applied using thumb or fingers (index or middle) which hold a greater force in slight circular motion conditions being same as in marma massage. A steady and moderate pressure is applied slowly and gently. It is increased gradually in strength. Usually each marma is stimulated for 20 times on an average in single sitting. Pressure is applied for 0.8 seconds every time. 2-3 sittings can be given every day.

#### **Lepa: Herbal Paste therapy**

Oil, ghee, aloe gel, honey can be used as base and mixed with herbs. Oil is best known as *vatadoshashaamak* (*vata* pacifying), ghee as *pitta* pacifying and honey as *kapha* pacifying. Sesame oil is the best for pain relief. Herbal pastes of ginger, calamus, nutmeg and clove over marma area over head is preferred. Herbal lepa is of three types depending upon its thickness. *Pralepa* is thin and cold, *pradeha* is thick and *alepa* is of medium thickness.

**Neurophysiological aspect of marma therapy:** Marmas are the seat of prana. Prana in ayurveda are directly associated to *vata*. On damage to the marmas, *vata* gets vitiated that leads to pain. Pain cannot be perceived in body without vitiation of *vata* as mentioned in our text. Severity of pain depends upon the area of that marma involved in injury as well the composition of marma. The therapy may involve mild massage or gentle pressing over marma point. It has been discovered that stimulation of large type A-beta sensory fibres from peripheral tactile receptors can depress transmission of pain

signals from the same body area. This may be result from local lateral inhibition in spinal cord. This is the reason why rubbing skin near painful areas is effective in relieving pain.

#### The therapy works by:

- Pacifying *vata* by gently pressing the marma point. *Vata* is the chief *dosha* involved in pain as per text. According to acharyas '*vataadritenaastiruja*' means every pain occurs with involvement of *vata*<sup>19</sup>. Marma point is the seat of *prana* which is another name for *vayu*. Pressing these vital points channelize *vata* especially *vyaanvata* which is concerned with autonomic activity.
- Gentle but consequent pressure might increase the pain threshold for subsequent migraine attacks. It is an entirely subjective phenomenon which can be assessed by observing the alteration in frequency of attacks.
- Gentle pressing of skin leads to release of natural opiates of brain. These are *beta-endorphins*, *met-enkephalin*, *leu-enkephalin*, and *dynorphin*. The two *enkephalins* are found in brainstem and spinal cord in the portios of analgesia system. And the beta-endorphin is present in both hypothalamus and pituitary gland. Thus nervous signals entering the periaqueductal gray matter and periventricular areas lead to activation of analgesia system and there is release of natural opiates from brain. They suppress many pain signals entering through peripheral nerves.
- Marma therapy might act as a prophylactic to reduce the attack frequency or severity which is one of the goals of migraine preventive treatment.
- One of the postulates of migraine is vasodilatation of intracranial vessels because of substances released by trigeminal nerve terminals. *Abhyanga* (gentle massage) of vital point with *sheetaviryachandanaaditaila* (medicated oil with cold property) or *hrita* (ghee) might decrease vasodilatation and hence pain.

The marmas supposed to be involved in preventive and prophylactic management of migraine are:

- Adhipatimarma
- Sthapnimarma
- Apaangmarma
- Seemantmarma
- Vidhuramarma
- Shankhamarma
- Krikatikamarma

All these marmas are present in head region. Brief description of these marmas are given in table 1.2.

#### Conclusion

Migraine is inherited, disabling, episodic headache occurring because of sensory hypersensitivity. It is ranked sixth among disability causing diseases by World Health Organisation (WHO) is a primary headache with associated features like nausea, vomiting and/or photophobia. It comprises of recurring attacks of varying degree. The headache may be a throbbing pain of mild, moderate or severe intensity, at one side of the head usually. The pain may persist for hours to days. The frequency of attacks is also variable. There are several

triggering factors of which patient should be aware to prevent attack. Since the imaging of brain and pathological findings are usually normal, investigations can be done to rule out secondary causes like meningitis, sinusitis, post-traumatic, tumor or cervicogenic.

In ayurveda, a very fine description of half side headache has been given as *ardhvbhedak*. The close resemblance of its aetiology with triggering factors of migraine can be appreciated. *Acharyas* have given various pharmacological treatment of migraine including oral as well as local application of drugs. Role of marma therapy in management of migraine remains less explored. The earliest mention of marma is found in *rigveda*. Acharya *Sushrut* identified and defined 107 vital points of human body. They channelize energy within mind, body and soul. Their role in maintaining health as well as therapeutics is a science that is getting recognition. It can prove to be a milestone in coping with the stress and other lifestyle disorders and hence needs to be more explored. Migraine is managed by various pharmacological measures. But non-pharmacological measures cannot be and should not be ignored. The need of the hour is balance between both approaches. Marma therapy includes both approaches. Marma therapy should be done by expertise in the field. For prophylactic measures, the patient shall be educated about the implementation of marma therapy. Somebody who is aware of impending prodromal stage and aura can start marma therapy at these stages as the first twenty minutes are crucial for management in migraine. Anti-migraine drugs can offer better relief in earlier stages of attack. Once the pain neurons in the brain become sensitised, patient becomes resistant to drugs. Marma stimulation might decrease the severity of attack and act as an adjuvant to drug therapy. The role of marma therapy at the time of attack still needs to be explored.

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