Part – I

Review of Literature

Ardhavabhedaka
Ayurveda Perspective

Ardhavabhedaka
Modern Perspective

Siras

Sirasoola (Pain)

Para nasal sinuses

Marma in head and neck

Nasya karma

Pranayama
1. ARDHAVABHEDAKA
ayurveda perspective

1.1. Nirukthi

"Ardhe tu moordhah so ardhavabhedaka"

As it appears in half of the head it is called *Ardhavabhedaka*.

*Ardhavabhedaka* is the most excruciating disease among the diseases of head causing headache. *Ardhavabhedaka* is experienced by women more than men in the ratio 3:2 and the mean age of onset is 19 years. The initial attack of this disease is mostly in the first decade of life in almost 20% of cases. Almost 60% of these cases have a family...
history. Though there are not many variations in the personality of ardhavbedaka patients, it is mostly seen among the persons who are more anxious, intelligent ambitious and tidy ones ie, pittakaphaja prakriti. Its significance is that it affects only one part of the head or only half of head.

1.2. **Aetiological factors**

While the etiological factors of Shirorogas are considered, Charaka describes these in detail for each specific siroroga where as a detail description is not seen in Susrutha samhitha. Vaghbata mentions the causative factors of siroroga in general.

Suppression of natural urges, day sleeping, night awakening, intoxication, speaking aloud, exposure to frost and easterly wind, excessive sexual indulgence, inhalation of undesirable smell, exposure to dust, smoke, snowfall and sun, intake of heavy sour food and rhizomes including tubers etc. in excessive quantity, excessive drinking of cold water, injury to head, vitiation of ama, lamentation, suppression of tears, cloudy atmosphere, anxiety and adaptation of regimen contrary to those prescribed for the locality and season; predisposes to vitiation of dosas like vata, which get aggravated resulting in the vitiation of raktadhatu in the head. This causes diseases with various symptoms in head (Ch.Su.17/8–11), one of which is our current day study problem, ardhavabhedaka.
The etiological factors relating to aahara and vihaara of sirasoola is narrated in Charaka samhitha, Ashtangasamgraha, Ashtangahridaya and Madhavanidana.

1.2.1. Dosha Hethu

Charaka have called this disease as a vataja or vatha kaphaja disease. Vagbhata have classified this disease as a type of vataja sirasoola. In this disease, vatadosha is obstructed by kapha dosha producing pain in half the region of the cranium. Some of the writers considers this disease as a vata pittaja condition. The disease is described among sannipathaja diseases, so some other writers project it as tridoshaja disease.

But the study of etiology and symptoms of this disease proves this to be a vataja or vata–kaphaja disease. But due to vyadhiswabhava (nature of disease) it speedily progress into sannipatika disease, so the above diversities of opinion about the pathogenesis and doshaswabhava of this disease are to be considered on the merit of individual cases alone and hence is to be approached likewise. Texts are on the concerted opinion that prakupit vayu is obstructed by the kapha so this vata dosha dries the kapha. For the process of drying up, Ooshma is necessary which is maintained by pitha dosha. Prakupitha vatha present in the cervical; supra orbital and temporal and frontal regions produces penetrating pain in the head. In this way the combination of pitta dosha is necessary in the dryness of kapha, and this should be the probable explanation of Susrutha's
classification of this disease as tridoshatmaka.

<table>
<thead>
<tr>
<th>Susrutha</th>
<th>Tridosha</th>
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<tr>
<td>Charaka</td>
<td>Vata, Vata kapha</td>
</tr>
<tr>
<td>Vagbhata</td>
<td>Vata</td>
</tr>
</tbody>
</table>

1.2.2. Aahara hethu

Pungent and non-nutritious food, stomach full diet, alcoholism, langanam.

1.2.3. Vihaarahethu

Purovayu (Eastern wind), excessive coitus, holding wegas, film seeing, exercise, mental stress. etc.

1.2.4. Parambarya Hethu

Heriditory +++

Ardhavbedaka occurs due to the affection of vitiated vata on blood vessels cause constriction of blood vessels of mastishkavaranakala (meninges), Kapala (extra cranial) or Masthulunga (brain). Initially the blood vessels will be constricted followed by their dilatation causing vasodilatation. Sleeping late and mental stress can also evoke this type of headache. Shirobhishata (head injury) can also provoke the same. Fatty foods, chocolates and oranges, tomatoes, onions, pineapples are also said
to precipitate this head ache. Hormonal changes occurring during menstruation can also cause this.

The prakupitha vayu due to the aetiological factors independently or due to kapha bandha becomes more powerful and resides in the region of the cranium producing ardhavabhedaka.

1.2.5. Specific aetiological factors

In take of rough (rooksha) food, over eating during indigestion, exposure to easterly wind and dews, excessive coitus, suppression of urges exertion and physical exercise.

1.2.6. Symptomatology

Severe pain like cutting and churning in half of carotid region, eyebrow, temple, ear, eye, forehead (Ch.Si.9/75–76). A violent and excruciating pain or aching nature felt in one half of the cranium making the patient feel giddy (Su.Ut25/12). Severe pricking pain in temples, feeling of severe pain as though the ghata (area above the temples) gets open, the center of he brows and forehead fall out, ears are painful and have
noise in them, eye feel as though being plucked out, the head feels loose in all its joints, there is severe pulsation in the net work of veins (blood vessels), rigidity of the lower jaw and the shoulders, intolerance to light, running nose, relief of pain with out any reason occasionally and reduction in its severity by massaging anointing with oil and fomentation. All these symptoms appear in half of the head in Ardhavabhedaka. (A.H.Ut.23/4–7b).

Symptoms of Ardhavabhedaka

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>CS</th>
<th>SS</th>
<th>AS</th>
<th>AH</th>
<th>MN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe pain in the cervical region</td>
<td>+</td>
<td>+</td>
<td>+</td>
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<tr>
<td>Severe pain in supra orbital region</td>
<td>+</td>
<td>+</td>
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<td>+</td>
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<tr>
<td>Severe pain in the temporal region</td>
<td>+</td>
<td>+</td>
<td>-</td>
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<td>+</td>
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<tr>
<td>Ear ache</td>
<td>+</td>
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<td>-</td>
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<td>+</td>
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<tr>
<td>Pain of the eyes</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Severe pain in the half of the frontal region</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Pain in the temporal region</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Manyathovata pida</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Burning pain</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Netrendriya nasa</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Karnendriya nasa</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Penetrating pain the half region of the cranium</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
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<tr>
<td>Brama</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Pakshata akramanam</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Swayam pida shamanam</td>
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</tbody>
</table>
1.2.7. Samprapthi

Vata vitiated due to the aetiologica factors mentioned previously singly or accompanied by Kapha seizes the of the head and then produces the symptoms of Ardhavabhedaka (Ch.Si.9/74–75).

Contents of samprapthi

<table>
<thead>
<tr>
<th>Place of origin</th>
<th>Mastishka</th>
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<tr>
<td>Region of spreading</td>
<td>Half region of the cranium</td>
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<tr>
<td>Adisthanam</td>
<td>Ardhamastishkam</td>
</tr>
<tr>
<td>Vyakthi</td>
<td>Ardhamastishkam</td>
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<td>Srothasa</td>
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</tr>
<tr>
<td>Types of Dushti (infection)</td>
<td>Sanga (obstruction)</td>
</tr>
</tbody>
</table>

1.2.8. Involvement of doshas in Ardhavabhedaka

Vagbhata states Ardhavabhedaka as a division of vataja sirasoola claiming that only vata is involved. According to Charaka vata alone or vatha and kapha may be involved. According to Sushrutha it is tridoshajanya. Vatha pitha kapha, three doshas are involved.

1.2.9. Course and Prognosis

It occurs either by a fortnight or a month and subsides of its own
accord. When greatly aggravated it destroys either the eye (sight) or ears (hearing) (A.H.Ut.23/8). According to Susrutha this disease either follows no distinct periodicity or recurs at regular intervals of ten days or of a fortnight (Su.Ut.25/12)

1.2.10. Differential diagnosis

Ardhavabhedaka by term itself means that it is unilateral pain felt in head region. The differentiation from the vataja sirasoola is done by its pattern of distribution. In vataja sirasoola the symptoms mentioned in Ardhavabhedaka occur bilaterally.

In pittaja sirasoola there is a feeling of hot fumes coming out from the head, fever, profuse sweating, burning sensation in the eyes, fainting, pain becomes less at night and by cold things.

In kaphaja sirasoola there is loss of taste, feeling of heaviness of the head, rigid and cold veins, non pulsating, lassitude, mild pain during day severe pain at nights, stuper, sweating of eye sockets, itching inside the ears and vomiting.

In suryavartha, vata followed by pitta produces severe throbbing pain in temples, eyebrows and forehead commencing with the rise of the sun, increase in severity in the midday and on being hungry of uncertain comfort to hot or cold and subsides later (after the sun sets).
1.3. Line of treatment

Chathursnehas in the maximum dose, evacuation, purgation, tubular fomentation, old ghee, unctuous enema, upanaha, cranial pouch and cauterization are recommended (Ch.Si.9/77–78).

The head should be anointed and ghee should be consumed at night followed by drinking warm water. Masha, kulatha, or mudga may be consumed with milk. Application of poultice or fomentation with balls of meat and corns (well cooked) are beneficial. Pouring warm milk boiled with dasamul and other drugs mitigating vata should be done.

In ardhavabhedaka, the same treatment together with those relevant to the increased dosha is to be done.

1.3.1. Pathyapathya

Pathyam

1. Kriyakarma: Swedana, nasya, dhoomapana, vamana, virechana, sirolepa, langana, seka, sirovasthi, raktamokshana, agnikarma, upanaha.

2. Ahara (Diet): Puranaghritham, shali, shashtikadhanyam, yusha (soup), dugdha (milk), jangalamamsa, sanyyab, madhumastha, thilathaila, coconut water, kanjika, thakra.masham, kulatham, mudgam.
3. **Vegetables**: Sigru, patolam, vastuka, karavellaka.

4. **Fruits**: Amraphalam, amalaki, dadima, mathulunga, jambeera, draksha, coconut.

5. **Medicines**: Hareethaki, amalaki, bhoonimba, nimba, amritha, nisa, kushta, bringaraja, kumari, mustha, useera, karpooora, gandhasara.

"Swedho nasyam dhoomapanam vireko lepa chardi langanam seershavasti:

**Rakthomukthirvahinkarmopanahoj jeernam sarpi:**

salaya: shashtikacha||
Yusho dugdham dhanwamamsam padolam
 sigru draksha vasthukam karavellakam|
 Amra dhatri dadimam mathulungam
 thailam thakram kanjikam narikelam||
 Pathya kushtam bringarajam kumari
 musthoseeram Chandrika gandhasara:
 Karpoorajava ranyathimanena varga:
 sevyo marthye: seersharoge yadhaswam||"  
(Baishajyaraknavali)

"Kshavajrimgamootrabashpanidra vit vegamajjanam|
Dhushtam neeram virudhannam sahyavindhya sarijanam.||
Danthakashta dhivanidra sisorogae parithyajel "
(Baishajyaraknavali)

Ardhavabhedaka mention in Ayurvedic classics can be compared
to the migraine. The salient features of *Ardhavabhedaka*, which are in resemblance to Migraine, are

**Apathyam**

1. **Vegadharanam**: Sneezing, yawning, micturition, sleep, lacrimation, stool excretion.

2. **Aharam** (Diet): Consuming cooked and uncooked food, impure water, curd, lassie, cool drinks, water of rivers of *Sahya*, *Vindhyas*, *Kadal*, *kapha* producing diet.

3. **Viharam**: *Diwaswapana*, *ratrijagarana*, *danthadhavanam*, etc.

**1.3.2. Prevention of Ardhavabhedaka**

1. Natural urges are not to be suppressed

2. Day sleep is to be avoided

3. Night awakenings is also contra indicated

4. Exposure to sun, smoke snow, dew, should be restricted

5. The food which is excessive rough (*athirooksha*) is to be avoided

6. Eating only when the food taken previously is digested

7. Regular following of dhinacharya, rithucharya and other regimens.

8. Following the general code of ethics.
Migraine is one of the most common complaints encountered by primary care physicians and neurologists. It is a condition that causes disability, be it often temporary, and strains the personal and professional development. Mankind, through writings since the dawn of recorded history, knows this painful condition. If it was a scourge or an encouragement to Caesar, Paul, Kant and Freud, it is also a daily fact of life to anonymous millions who suffer in secrecy and silence.

In the first century of Christian era Aretaeus of Cappadocia
described it as heterocrania. The French word Migraine is said to be derived from “megrim” which in turn was derived from the Latin word “hemicrania”.

Migraine is an episodic headache separated by headache-free intervals with any two of unilateral distribution, aura symptoms, nausea and family history of similar headaches (Vahlquist 1955)

Migraine is an episodic headache with or without cerebral disturbance with intervening periods of relative freedom from headache and without evidence of any primary structural abnormalities. (W. Lance)

Migraine is a paroxysmal disorder with relative freedom from symptoms between attacks. The attacks consist of transient focal neurological symptoms and/or headache. The transient focal neurological symptoms are almost always sensory in nature, generally visual and sometimes somatosensory. However, the headache is usually so intense that interferes with the ability to function and is associated with other symptoms such as light and noise sensitivity, nausea and vomiting. These symptoms usually follow the onset of the headache and increase in intensity as the headache progresses. The transient focal neurological symptoms on the other hand, almost always precede the onset of the headache or occur during its initial phase. These symptoms are often referred to as aura symptoms.

The attacks of migraine generally last less than one hour when
they merely consist of transient focal neurological symptoms but last from hours to days when headache is present. When the transient focal neurological symptoms occur without headache, the condition is referred to as isolated migraine aura or migraine aura without headache.

When both the transient focal neurological symptoms and headache occur, the condition is referred to as classic migraine or migraine with aura. When the headache occurs by itself, the condition is referred to as common migraine or migraine without aura. According to the International headache society the simplified diagnostic criteria for migraine with and without aura are:

2.1. **Migraine without Aura**

- Attacks lasting 4 to 72 hours
- At least two of the following for headache characteristics
  - Unilateral
  - Pulsating
  - Moderate to severe
  - Aggravated by movement
- At least one associated symptom:
  - Nausea or vomiting
  - Photophobia
  - Phonophobia
To fulfill criteria of IHS, patient must have had at least five such attacks and have no other medical problem. Duration applies to untreated or unsuccessfully treated attacks with moderate to severe intensity, in the sense disturbing or precluding daily activities.

2.2. **Migraine with aura**

One or more transient focal neurological aura symptoms. Gradual development of aura symptoms over >4 min, or several symptoms in succession

- Aura symptoms last 4-60 minutes
- Headache follows or accompanies aura with 60 minutes.

2.3. **Epidemiology**

Migraine is a very common disorder across the life span, with highest prevalence during the peak productive years between the ages of 25 and 55 years. Prevalence is greater in females than in males after the age of 12 yrs but the sex ratio varies with the age. The female to male
ratio is 3:2. Migraine is inversely associated with income perhaps because loss of jobs or inability to study due to frequent attacks.

Prevalence of migraine in general population is estimated as 6% in men and 15% -18% in women.

The incidence of migraine was lower in males than in females and occurred at an earlier age. The incidence of migraine with aura in males was 6. 6 per 1000 person-years and peaked at 5 to 6 years of age. The peak incidence of migraine without aura in males was 10 per 1000 person-years and peaked between the ages of 10 and 11 years.

For females, the incidence of migraine with aura was 14. 1 per 1000 person-years, with a peak at ages 12 to 13 years. The incidence of migraine without aura was 18. 9 per 1000 person-years and peaked at the ages 14 to 17 years.

2.4. Synonyms

Hemicrania, bilious attack, sick headache.

2.5. Aetiology

The aetiology of migraine is complex. Although the pathophysiology of parts of migraine attack, notably the aura and the headache phases seem to be at least partly understood, the true cause of migraine, that is why and how a migraine attack begins is not known.
Every one may suffer from one or two migraine attacks in life indicating that the migraine attack in itself is not an abnormal feature. The tendency to get the recurrent attacks (i.e. existence of a lower threshold for specific or non specific internal and external migraine trigger factors) is abnormal. Patients suffering from recurrent attacks are considered to suffer from the disease migraine.

2.6. Age and Sex

The age of onset is usually at or shortly after puberty, much less frequently in middle life or later, though an onset at about the menopause is not uncommon in women. The highest prevalence is seen between the ages of 25 and 55 years. Prevalence is greater in females than in males after the age of 12 years but the ratio varies with age.

2.7. Hereditary

Migraine is often inherited as a Mendelian dominant trait. Many migraine sufferers have affected relatives. It is very likely as yet unproven that hereditary factors are important in the individual susceptible to migraine attacks. The association of migraine with a large number of hereditary diseases open the possibility to choose candidate chromosomes for linkage studies.

Familial hemiplegic migraine is linked to chromosome 19 p and to at least one other locus. Hereditary paroxysmal cerebellar ataxia is linked to the same region on chromosome 19, which suggests a possible
role of an ion channel gene in familial hemiplegic migraine and should be investigated further. The familial hemiplegic migraine chromosome 19p locus also seems to be involved in normal migraine.

2.8. Intracranial Disturbance of Function

Migraine is due to arterial spasm, followed by dilatation, occurring with in the distribution of the common carotid artery. During the scotomatous phase of an attack, focal electro encephalographic changes have been observed in the opposite cerebral cortex, consistent with cortical ischaemia (Engel et al. 1945) and during this phase it has also been observed that amyl nitrite will temporarily abolish the scotoma (Schumacher and Wolff, 1941).

There is a generalized, rather than focal, reduction in blood flow during the aura. Occlusion of the retinal arteries has been observed during an attack, (Graveson 1949, Brien 1971) and has a persistent visual field defect due to ischaemic pappillopathy (McDonald and Sanders, 1971). The arterial spasm in the retina and or the visual cortex is responsible for the subjective visual disturbances and other cortical symptoms at the onset of the attack, while subsequent vasodilatation causes the headache and is manifest in flushing of the face, congestion of the superficial temporal artery and of the conjunctiva and the nasal mucosa on the side of the headache.
2.9. **Ocular Factors**

Refractive errors and defective ocular muscle balance are often blamed for migraine, though probably usually with little justification. Attacks may certainly be precipitated, however, by unusual visual stimuli, such as bright light.

2.10. **Allergy**

The importance of allergy was stressed by Balyeat (1933). Sufferers from migraine may often be shown to be sensitive to one or more food proteins or other allergens, including pollen and tobacco, and may suffer from other disorders of an allergic nature.

2.11. **Dietetic Factors**

Excessive consumption of animal fat or alcohol may be followed by an attack. So, too, may miss a meal (Hockaday et al 1971).

2.12. **Psychological Factors**

Major sector of the sufferers from migraine, are the most intelligent and industrious members of the community. Attacks of migraine may be precipitated by mental fatigue anxiety, or by other forms of stress. However, Waters (1971) found no evidence that individuals with migraine were more intelligent or higher social class. Many women suffering frequent attacks at about the time of the menopause are found to be depressed and treatment of the depression is then beneficial. The personality features
most commonly seen consist of characteristics of inflexibility and shyness in childhood giving rise to adult perfectionism, rigidity, resentment, ambitiousness and efficiency in short a constitutional predisposition to sustained emotional states. Persistence towards successes, difficulty in sexual adjustment, perfectionism, conventionality, intolerance and in general obsessive-compulsive features are associated with migraine to a greater degree than would be accounted for by chance.

2.13. **Endocrine and Metabolic Factors**

On the whole there is little evidence that endocrine abnormality is important. The occurrence of menstrual migraine has been quoted in favour of an ovarian disturbance. Water-retention occurs in some cases, Goldziecher (1941) Sicuten et al (1961) showed that the urinary excretion of 5-hydroxyindolacetic acid may be increased in severe attacks suggesting an intermittent release of 5-hydroxytryptamine (Serotonin) into the circulation (Curzon et al. 1966). An evidence was also found to suggest that the catabolism of serotonin and nor epinephrine is increased in the plasma during migraine headache. Adams et al. (1968) biopsied temporal arteries during attack and found that the tunica adventitia of the arteries in such patients has a marked capacity to bind noradrenaline.

2.14. **Association with Epilepsy**

Some writers on the association of migraine with epilepsy have
laid much stress. Both are common disorders. Many have thought that the relationship is coincidental. Occasionally a severe attack of migraine may terminate in an epileptic attack. But loss of consciousness at the height of an attack is more often syncopal (Bickerstaff, 1961).

2.15. **Association with Hypertension**

The onset of arterial hypertension in middle adult life may be associated with late onset migraine, especially when the hypertension is paroxysmal.

2.16. **Head Injury**

Migraine may appear for the first time following head injury and head trauma may trigger an attack.

2.17. **Intra Cranial Lesions**

Very rarely typical migrainous symptoms appear in association with cerebral arterio venous malformations aneurysms and tumours. Such associations may be no more than coincidence; but suspicion of an underlying lesion should be raised when symptoms always recur on the same side.

2.18. **Trigger factors**

Trigger factors are events that bring on a migraine attack. Trigger factors are both exogenous and endogenous in nature. About 20% of patients relate their attacks to eating specific foods or drinks when the
migraine usually follows some hours later. The most potent endogenous trigger factor is the oestrogen cycle in women, which largely accounts for the two or three times higher prevalence of migraine in women, than in men. Other endogenous trigger factors are fatigue, lack of sleep, oversleeping and missing meals. Attacks are more common at weekends and holidays.

An important exogenous trigger factor of migraine is stress. Emotional stress is a common precipitant. Other exogenous trigger factors are weather changes, alcoholic beverages and dietary products.

The weather changes include exposure to sun, rapid changes in barometric pressure. Strong stimuli such as bright and flickering lights, vivid visual patterns, loud noise, strong smells. The dietary products precipitating the migraine attack include chocolate, cheese, citrus, fruits, caffeine, icecream, eggs, liver, onions, bananas, tomatoes, fatty food, food additices such a sodium nitrite, mono sodium glutamate. Foods, which are commonly implicated, contain tyramine and phenyl ethylamine. The alcoholic beverages include the red wine, white wine, beer etc.

2.19. Classification

In the headache classification as proposed in 1962 by the National institute of Neurological Diseases and Blindness (NINDB), migraine is classified under the category of vascular headaches of the migraine type.
This category includes:

1. Classic migraine
2. Common migraine
3. Cluster headache
4. Hemiplegic migraine
5. Ophthalmoplegic migraine
6. Lower half headache (facial migraine)

These headache conditions are thought to have in common, as an important pain mechanism, extra cranial arterial vasodilation. In the headache classification as proposed by the international headache society in 1988, migraine represents a separate category, in this category; seven forms of migraine are distinguished as shown in the table. The two major forms of migraine in this classification, migraine without aura and migraine with aura correspond to common and classic migraine of the NINDB classification.

2.20. IHS Classification of Primary Headache

Migraine

- Migraine without aura
- Migraine with aura
  - Migraine with typical aura
  - Migraine with prolonged aura
Familial hemiplegic migraine
Basilar migraine
Migraine aura without headache
Migraine with acute onset aura
Ophthalmoplegic migraine
Retinal migraine
Childhood periodic syndromes that may be precursors to or associated with migraine
Benign paroxysmal vertigo of childhood
Alternating hemiplegia of childhood
Complications of migraine
Status migrainosus
Migrainous infarction
Migrainous disorder not fulfilling the above criteria.

Classification of migraine according to international classification of diseases

Migraine
Migraine without aura (common migraine)
Migraine with aura (classical migraine)
With typical aura
With prolonged aura
With acute onset aura
Hemianopic and other visual migraine
Hemisensory migraine
Migraine with aphasia
Basilar migraine
Migraine aura (all types) without headache.
Familial hemiplegic migraine
Multiple types of aura
Other specified migraine with aura
  Status migrainosus
  Complicated migraine
    Migrainous cerebral infarction
  Other migraine
  Ophthalmoplegic migraine
  Retinal (monocular) migraine
  Childhood periodic migrainous syndromes
  Abdominal migraine
  Benign paroxysmal vertigo of childhood
  Alternating hemiplegia of childhood
  A typical migraine
  Migraine, unspecified.

2.21. Diagnostic Criteria

Diagnosing the cause of headache in general practice is a daunting task given the myriad of clinical problems that are seen daily. To treat migraine adequately, it is necessary to make the correct diagnosis. The
lack of classification system and diagnostic tests have hampered doctors for many years.

There are however some guiding principles, that allows safe, accurate and rapid diagnosis of headache problems. The IHS classification system for headache published in 1988 listed operational diagnostic criteria for migraine.

With regard to the diagnosis of migraine without aura, the IHS classification requires at least five attacks which fulfill the following criteria:

1. The headaches last from between 4 and 72 hours (though in children below the age of 15, they may last for as little as 2 hours).

2. The headaches have at least two of the following four features: unilateral location, pulsating quality, moderate or severe intensity, and aggravation by walking stairs or similar routine physical activity. The intensity of headaches is rated as moderate when they inhibit and severe when they prohibit daily activities.

3. The headaches are associated with nausea or vomiting or with photophobia and phonophobia (i.e. light and noise sensitivity). The diagnosis of migraine with aura is based on the aura symptoms and not on the headache (i.e. the features of the headache are irrelevant).
The IHS classification requires at least two attacks, which fulfill three of the following four criteria:

1. There are one or more fully reversible aura symptoms, indicating focal cerebrocortical or brain-stem dysfunction.

2. At least one of the aura symptoms develop gradually over more than four minutes, or two or more symptoms occur in succession.

3. None of the aura symptoms last longer than 60 minutes but if more than one aura symptom is present, the accepted duration is proportionally increased.

4. The headache follows the aura symptoms with a symptom-free interval of less than 60 minutes but may also begin before or simultaneously with the aura.

In general practice, the various subgroups of migraine with aura are probably of little significance. An exception is the subgroup migraine aura without headache in which the aura symptoms are not followed by headache. This is a relatively common condition, which in the older patient needs to be differentiated from transient ischemic attacks.

In migraine with prolonged aura one or more of the aura symptoms last longer than 60 minutes but shorter than one week and neuroimaging is normal.
If neuroimaging is abnormal (i.e. shows ischemic infarction) or one or more of the aura symptoms lasts longer than one week, migrainous infarction is diagnosed.

Migrainous infarction is a sub group of complications of migraine and can occur in migraine without aura as well. It is also referred to as complicated migraine or migraine complicated by stroke.

In migraine with acute onset aura the aura symptoms develop fully within four minutes. However, inaccurate history is given as the most common reason for the acute onset of the aura symptoms.

Familial hemiplegic migraine is a rare (childhood) condition of headaches associated with hemiparesis, in which at least one first degree relative is also affected.

Basilar migraine is likewise a rare condition that mostly affects young adults. In this condition, the aura symptom (e.g. double vision, bilateral paresthesias, or decreased level of arousal) originates from the brain stem or from both occipital lobes. The condition must be differentiated from migraine associated with anxiety and hyperventilation, or with vasovagal lability.

Retinal migraine is a form of migraine with aura, although it is classified as a separate condition. The aura symptoms are visual in nature
but are monocular rather than homonymous. They also are fully reversible, last less than 60 minutes, and are followed by headache with a symptom free - interval of less than 60 minutes.

In ophthalmic migrain the headaches are associated with paresis of one or more of the cranial ocular nerves (i.e. the oculomotor, trochlear, or abducens nerves). In the majority of cases, the oculomotor nerve is involved and often only the parasympathetic nerve fibers, resulting in a dilated pupil that is unresponsive to light.

Status migrainosus or migraine status is one of the two complications of migraine, the other being migrainous infarction. Status migrainosus is the term used for migraine headaches lasting longer than 72 hours, although a headache - free interval of less than four hours between consecutive headaches may occur. As with migrainous infarction, status migrainosus can occur in migraine without aura as well as in migraine with aura.

2.22. Differential Diagnosis

To simplify the differential diagnosis of migraine, headaches can be divided into either chronic or sub-acute, and then subdivided into either episodic or constant. They are then divided into localised or generalised headaches.
Chronic Episodic headaches

♦  Chronic episodic headache, unilateral anterior or hemicranial site

Most commonly: Migraine or cluster headache may represent episodic tension-type headache, post traumatic headache, temporal arteritis or cervicogenic headache.

♦  Chronic episodic headache, unilateral posterior site

Most commonly: Migraine, chronic cluster, occipital neuralgia (if unilateral with sensory numbness) or headache originating from the neck.

Less likely: hypothalamic or cavernous sinus lesion such as temporal arteritis (occipital artery involvement) or posterior fossa/skull base lesion.

♦  Chronic episodic headache, generalised

Most commonly: migraine or episodic tension-type headache.

Less likely: hypnic headache or an organic headache

Eg. Caused by temporal arteritis sphenoid sinusitis or a mitochondrial disease.

Chronic constant headache

♦  Chronic constant headache unilateral anterior location

Probably: Chronic cluster, or its variant (hemicrania continua), or tension type headache.
Less likely: Migrane is far less likely. Organic causes include temporomandibular joint dysfunction, temporal arteritis, supra orbital nerve entrapment, localised skull metastasis or benign tumour of the skull or soft tissue.

♦ Chronic constant headache, generalised

Most likely: chronic tension type headache

Less likely: idiopathic intracranial hypertension or analgesic rebound headache

Many patients with fibromyalgia and chronic fatigue syndrome have headache as a clinical manifestation.

Other possible organic causes: Paget's disease, skull metastasis, central nervous system infection and metabolic (CO₂ narcosis, PaCO₂ > 50mm Hg. with our hypoxia) toxic (chronic CO poisoning) or endocrine (hypothyroidism, prolactinoma) disorders.

Subacute Headache (1 to 6 weeks)

♦ Subacute constant headache in unilateral location

Primary disorders: status migrainosus, cluster headache or cluster variant (hemicrania continua).

Possible organic causes are: temporal arteritis painful ophthalmoplegia, subdural haematoma or lateral venous sinus thrombosis (from sinusitis, oral contraceptives hypercoagulable state, haematological or rheumatological disorders).
♦ **Subacute intermittent, unilateral headache without side shifting**

*Most commonly:* episodic cluster migraine or tension type headache.

*Less likely:* Post-traumatic headache, trigeminal neuralgia, glossopharyngeal or occipital neuralgia, cervicogenic headache, tolosa-hunt syndrome or temporal arteritis.

♦ **Subacute constant, generalized headache**

*Most likely:* tension type headache or status migrainosus.

*Less likely:* CNS infection (viral, tuberculous, parasite infection, brain abcess) CNS vasculitis (isolated or related with connective tissue disorders). Systemic infection (toxic - vascular headache after viral infection) low cerebrospinal fluid pressure headache, metabolic, toxic or endocrine disorders or subarachnoid haemorrhage.

♦ **Sub acute posterior headache**

*Benign causes:* include occipital neuralgia and cervicogenic headache.

*Organic causes:* include uncontrolled severe hypertension, posterior fossa stroke, brain tumour, vertebrobasilar dissection or bony C-spine or skull base lesions including osteomyelitis, paget’s disease.
of bone with platybasia (flattening and invasination of skull bases) multiple myeloma and atlanto-axial subluxation from rheumatoid arthritis.

*Other Primary Headache Disorders*: The criteria for tension type headache were devised to distinguish the qualities of this headache from migraine.

**IHS criteria for various forms of tension type headache**

♦ **Tension type headache**

At least two of the following Pain characteristics

1. Pressing/tightening (non pulsating) quality
2. Mild or moderate intensity (may inhibit but does not prohibit activities)
3. Bilateral location
4. No aggravation by walking stairs or similar routine physical activity.

Both of the following;

1. No nausea or vomiting (anorexia may occur)
2. Photophobia and Phonophobia are absent, or one but not the other is present.

At least one of the following;

1. History and physical and neurologic examinations do not suggest one of the disorders listed in groups 5-11 (headaches secondary to organic or systemic metabolic disease).
2. History and/or physical and/or neurologic examinations do suggest such disorder, but it is ruled out by appropriate investigations.

3. Such disorder is present, but tension type headache does not occur for the first time in close temporal relation to the disorder.

♦ **Episodic tension-type headache**

Diagnostic criteria:

a. At least 10 previous headache episodes. Number of days with such headache < 180/year (<15/month).

b. Headache lasting from 30 min to 7 days.

○ **Chronic tension type headache**

Diagnostic criteria

a. Average headache frequency > 15 days/months (>180d/y) for >6 months.

○ **Tension-type headache associated with disorder of pericranial muscles**

At least one of the following:

1. Increased tenderness of pericranial muscles demonstrated by manual palpation or pressure algometer.

2. Increased electromyographic level of pericranial muscles at rest or during physiologic tests.
Tension-type headache unassociated with disorder of pericranial muscles:

No increased tenderness of pericranial muscles. In this study, electromyography of pericranial muscles shows normal levels of activity.

IHS Diagnostic criteria for cluster Headache

A. At least five attacks fulfilling B-D.

B. Severe unilateral orbital, supraorbital, and/or temporal pain lasting 15 to 180 min untreated.

C. Headache is associated with at least one of the following signs, which have to be present on the pain side.
   1. Conjunctival injection
   2. Lacrimation
   3. Nasal congestion
   4. Rhinorrhea
   5. Forehead and facial sweating
   6. Miosis
   7. Ptosis
   8. Eyelid edema

D. Frequency of attacks: from one every other day to eight per day.

E. At least one of the following:
   1. History and physical and neurologic examinations do not suggest one of the disorders listed in groups 5-11 (headaches secondary to organic or systemic metabolic disease).
2 History and physical or neurologic examinations do suggest such disorder, but it is ruled out by appropriate investigations.

3 Such disorder is present, but migraine attacks do not occur for the first time in close temporal relation to the disorder.

- Cluster headache, periodicity undetermined.
- Episodic cluster headache

Description: Occurs in periods lasting 7 days to 1 year separated by pain-free periods lasting >14 days.

- Chronic cluster headache

Description: Attacks occur for more than 1 year without remission or with remissions lasting < 14 days.

2.23. Symptomatology

The symptoms of migraine are limited mostly to the migraine attack: Between the attacks, usually patients are relatively symptom-free. The central symptom of the migraine attack is headache, though it is sometimes absent (as in migraine aura without headache). The headache of migraine is usually so intense as to be associated with at least some degree of disability. Typically it is limited to one side of the head, but this is certainly not always the case. When limited to one side, the headache alternates sides, though it may exhibit a preference for one side or the other. Within the head, the headache of migraine is often located in the...
temple and sometimes also in or behind the eye. Other preferential locations are in the forehead and in the back of the head, often just behind the ear. The headache is either throbbing or sharp- steady in nature, especially in the temple. It is aggravated by such physical activity as going up a flight of stairs, bending over, coughing, sneezing or straining. The headache is generally alleviated somewhat by lying down and by applying pressure or a cold pack to the temple, eye or forehead.

The migraine headache almost always occurs associated with other symptoms. These symptoms generally occur after the onset of the headache and build up in intensity as the headache progresses.

The associated symptoms of the migraine headache can be divided into two groups: autonomic symptoms and sensory symptoms.

The Autonomic symptoms consist of

1. Pallor of the face
2. Coldness of the hands and feet
3. Lack of appetite
4. Nausea
5. Vomiting
6. Diarrhoea

They are probably caused by excessive activation of the sympathetic nervous system, secondary to the pain.
The sensory symptoms consist of:

1. Increased sensitivity to light (Photophobia)
2. Increased sensitivity to noise (phonophobia)
3. Increased sensitivity to smell (Odorophobia)

The increased sensitivity sometimes reaches a degree at which exposure to light or noise actually increases the intensity of pain. Similarly, increased sensitivity to smell can reach an extent at which exposure to an odor, even when pleasant (e.g. perfume), aggravates the intensity of the nausea and causes vomiting. The cause of the sensory symptoms is not known, but they are probably also secondary to the headache. They may be due to the increased arousal caused by the pain through stimulation of the reticular activating system. However, in the increased sensitivity to the light (photophobia), a peripheral mechanism also may be involved—possibly the relaxation of the muscles of accommodation through activation of the rudimentary sympathetic innervations of these muscles. Such a peripheral mechanism also may explain the blurring of vision especially of near vision, as is regularly observed during migraine headaches. This blurring of vision often is not recognized as an associated symptom of migraine and is sometimes taken for a migraine aura symptom.

In so-called Classic migraine or migraine with aura, the migraine headache is preceded by transient focal neurological symptoms. These symptoms are generally referred to as aura symptoms and are almost always sensory in nature. They occur before the onset of the headache or during
the initial phase of headache development. They are relatively short in
duration and generally last from 10 to 30 minutes.

The aura symptoms of migraine are most often visual in nature
but also can be somatosensory. The typical presentation of the visual aura
of the migraine is the scintillating scotoma also referred to as fortification
spectra or teichopsia. It usually begins near the center of vision as a
twinkling star that develops into a circle of bright, sometimes colourful,
flickering zigzag lines. The inside of the circle subsequently opens up and
develops into a semicircle or horseshoe; which further expands into the
periphery of one visual field. On the inside of the semicircle or horseshoe,
a band of dimness follows in the wake of the crescent of flickering zigzag
lines. The visual disturbance ultimately fades away in the periphery of the
visual field in which it developed.

The typical presentation of the somatosensory disturbance of
migraine is the digitolinguai syndrome. It consists of a feeling of numbers
or tingling that starts in the fingers of one hand.

Subsequently, the numbness gradually extends upward into the
arm and, at a certain point, also involves the nose-mouth area on the same
side. The progression of the numbness, like that of the scintillating scotoma,
is slow and usually takes from 10 to 30 minutes. The digitolinguai syndrome
is always unilateral and must be differentiated from the bilateral paresthesias
of hyperventilation syndrome.
Sometimes the numbness is so intense that the involved extremity
is perceived as being weak, but examination will disprove this. If real
muscle weakness occurs with migraine, the condition is either hemiplegic
migraine or migrainous infarction. Hemiplegic migraine is a rare, familial
condition of childhood. Migrainous infarction is a migraine attack
complicated by stroke. However, if a stroke occurs during a migraine
attack, it usually results in homonymous hemianopia rather than in
hemiparesis. The occurrence of stroke with migraine is a one-time event
and generally results in permanent symptoms.

2.24. Migraine as a symptom

Migraine-like symptoms may sometimes be caused by
arteriovenous malformations, internal carotid dissection, epilepsy,
mitochondrial DNA disorders (e.g. Mitochondrial encephalomyopathy with
lactic acidosis and stroke like episodes MELAS), and by cerebral autosomal
dominant arteriopathy with sub cortical infarction and leucoencephalopathy
(CADASIL). Thus, like epilepsy migraine is a syndrome that can be caused
by a wide range of cerebral disorders.

2.25. Alarm symptoms and signs

In patients with a typical history of migraine and an uneventful
standard neurological examination ancillary investigations are redundant.
The following alarm symptoms may warrant a scan.
♦ Aura symptoms always at the same side or with acute onset without spread or either of very brief (<5 min) or unusually (> 60 min) duration
♦ Sudden changes in migraine characteristics
♦ Sudden substantial increase in attack frequency
♦ Onset above age 50
♦ Aura without headache
♦ High fever
♦ Abnormal neurological examination.

A change in character of the patient's habitual headache must alert the physician to the possibility a cerebral tumour or some other organic disability.

2.26. Course and prognosis

The frequency of attacks of migraine varies considerably in different patients. Often the disorder seems to possess a rhythm, which is little influenced by outside factors. The attacks may occur once a week. Once a fortnight, or once a month with great regularity. Attacks un which headache occurs alone are usually more frequent than those in which it is preceded by sensory symptoms. The latter usually recur at intervals of several months.

Occasionally a patient has repeated frequent attacks, a condition which may be called status hemicranialis, by analogy with status epilepticus.
Headache preceded by visual symptoms may occur more than once a day for a period of days. Apart from treatment, attacks tend to grow less frequent and less severe as the patient grows older and usually cease in late middle life. It is not uncommon for the character of the attack to change. For example, visual symptoms may cease to appear or occur without headache. Migraine does not shorten life, but frequent severe and uncontrolled attacks may be exhausting and debilitating. Depression is a common accompaniment in middle life, especially in women, and vigorous treatment of the latter may improve the migraine dramatically. In some such cases it is difficult to be sure when migrainous headache ends and tension headache begins and in this circumstance the patient is rarely free from some form of pain in the head. In a small number of cases permanent hemianopia or other visual field defects have followed an exceptionally severe attack. In such cases teichopsisia may persist for weeks.

Very rarely permanent aphasia and hemiplegia occur, but this should always suggest an organic lesion rather than migraine and angiography are usually indicated. Ultimately, on follow-up there is a significantly higher incidence of hypertension and of cardiac infarction, but not of stroke in sufferers from migraine (Leviton et al; 1974).

2.27. Pathophysiology

There is a clinical evidence that at least three mechanisms are involved in the pathogenesis of migraine headache. These are Extra cranial...
arterial vasodilation extra cranial neurogenic inflammation decreased inhibition of central pain transmission.

Extracranial arterial vasodilation was first studied in 1930's by Graham and Wolff. The artery preferentially involved in the mechanism of extra cranial vasodilation is the frontal branch of superficial temporal artery, giving rise to pain in temple, so characteristics of migraine. During the headache the artery is relatively dilated on the side of the pain. The dilation is relative, as there is generalised vasoconstriction during the migraine headache, probably caused by the increased activity of the sympathetic nervous system and responsible for the pallor of the face and coldness of the hands and feet.

Neurogenic inflammation is an inflammation caused by the release of chemicals from the primary sensory nerve fibers that are involved in pain transmission. These chemicals which include substance P, calcitonin gene related peptide, and neurokinin A, are released from the nerve fibers when they are activated. In migraine, the nerve fiber activation may be caused by the dilation of the extra cranial arteries. Because the extracranial arteries have nerve fibers that coil around them, dilation results in stretching and hence activation of these nerve fibers. In the 1950's Chapman and wolf first studied neurogenic inflammation as a mechanism involved in the pathogenesis of migraine headache. More recently, it has been observed that during the attack, the level of calcitonin gene-related
peptide is increased in the external jugular vein, calcitonin gene-related peptide in one of the chemicals involved in neurogenic inflammation and the external jugular vein drains the extracranial tissues.

2.28. Central Mechanism

Apart from neurogenic inflammation, there is probably also a central mechanism involved in the decrease in pain threshold at the site of the pain. Enkephalin is an endogenous opioid, which inhibits the transmission of pain signals in the central nervous system. Its level was found to be decreased during the migraine headache in comparison to the headache free interval and in comparison to controls. Biochemical studies have also revealed an intermittent release of 5 Hydroxy tryptamine (serotonin) into the circulation.

2.29. Examination

The physical and neurological examination of a migraine patient includes.

1. Auscultation of heart and carotid arteries
2. Blood pressure to exclude hypertension
3. Fundoscopic Exam (Focal signs are rare unless there has been migrainous cerebral infarvtion or there is an underlying lesion. Horners syndrome may be found in migrainous neuralgia and persists sometimes between attacks, ophthlmoplegia and cycloplegia may persist in ophthalmoplegic migraine.
4. Examination of cranial nerves
5. Checking of deep tendon reflexes
6. Palpation of peripheral pulses
7. Palpation of neck and head muscles
8. Evaluation of movement and balance
9. A mental status examination (can be done while obtaining the history).

2.30. Investigations

Usually the diagnosis of migraine is made by taking good history, clinical examination and its follow up. For patients with a clear history of migraine and normal findings from neurological examination investigations have an extremely low yield.

♦ Routine haematological tests
♦ X-ray skull- Posteranterior and lateral view
♦ Ophthalmoscopy
♦ Lumbar puncture to study CSF pressure cytology and biochemistry
♦ Electro encephalogram

Special Investigations
♦ Carotid and basilar angiography
Pneumo encephalography
Brain scanning
C.T.Scan
SPECT Scanning (Single-Photon Emission tomography)
PET (Positron emission Tomography)

Routine haematological tests are worthwhile since anaemia and polycythaemia may exacerbate migraine.

Thrombocytopenia has been shown to be associated with the appearance or exacerbation of migraine possibly because of the excessive release of 5-HT from platelets, which are being destroyed. Plain X-rays of skull may show calcification in vascular malformations or tumours and occasionally provide evidence of raised intracranial pressure. Specialised neuroradiology is not indicated unless headache or focal features always recur on the same side or there are persistent neurological signs. EEG changes, focal changes correlating with the site of neurological symptoms in classical attacks. Persistent lateralized or localized EEG abnormalities are not, in themselves an indication for further investigation. There is some evidence that the morbidity of carotid angiography is higher in patients with migraine than in those with other neurological disorders.

CT scanning is likely to reveal evidence of infarction in patients with persistent neurological deficit.
2.31. Treatment of Migraine

Treatment of migraine is of two kinds, Pharmacological and Non-pharmacological. Drugs may be used in the acute abortive therapy as well as in the prophylactic therapy.

Treatment for an acute attack should result in mild or no headache by two hours after drug ingestion; while prophylactic treatment should result is 50% reduction in frequency of attacks. Non-pharmacological treatment consists of general measurements, physiological counseling behavioral managements and relaxation therapy.

Most patients with frequent headaches are from psychological counseling and relaxation therapy. Dietary restrictions include avoidance of recognizable triggering factors.

Treatment of Acute attacks

The treatment of an acute attack of migraine can be divided into;

1. Non specific treatment
2. Specific treatment

Non-specific treatment covers up the symptoms with an action that includes analgesia.

Specific treatment includes anti migraine drugs, which can arrest the migrainous process without having a direct analgesic action.
Preventive Treatment

The aim of preventive treatment is to reduce the frequency and severity of attacks while keeping side effects to a minimum.

Preventive treatment is indicated only for patients who have sufficiently frequent attacks that are not relieved by treatments for acute attacks.

No one drug is clearly superior when its potential side effects are also considered as migraine is one of the psychosomatic disorder practices preventing psychosomatic disturbances, changes in the life style and behavioral pattern might yield much to the prevention of migraine. These practices are to be followed should be made part of life. Some of which are;

1. One should not deviate from generally approved principles nor one should break any code of conduct.
2. One should not be in the habit of postponing things nor should one indulge in any activity without proper examination.
3. One should not be a slave to the senses nor should let loose his fickle mind.
4. One should not inflict too much burden over the intellect or the senses.
5. One should avoid over dilatory practices.
6. One should not do things in a fit of anger or rejoicing.
7. One should not be under continuous grief.
8. One should not be conceited over achievements nor be desperate in loss.
9. One should always remember his own nature.
10. One should have faith in the correlation of cause and effect and should always act on it.
11. One should not be complacent about his own action.
12. One should not lose spirit nor one should remember his insults (Ch.Su.8.27).
13. One should not be impatient or over bold.
14. Neglect the maintenance of servants.
15. One should have non-reliance on his own kins man.
16. One should not enjoy alone.
17. One should not have uncomfortable character, conduct, manners and diseases.
18. One should neither rely on every body nor suspect every body.
19. One should not be to meticulous at all time (Ch.Su. 8/26).
20. One should not speak ill of noble persons and teachers.
21. One should follow the path of knowledge, charity, friendship, compassion, happiness detachment and peace.
Prevention of *Ardhavabhedaka*

1. Natural urges are not to be suppressed
2. Day sleep is to be avoided
3. Night awakenings is also contra indicated
4. Exposure to sun, smoke, snow, dew, should be restricted
5. The food which is excessive rough (athirooksha) is to be avoided
6. Eating only when the food taken previously is digested
7. Regular following of dhinacharya, rithucharya and other regimens.

**Prevention through Pranayama**

To succeed in the search for health and well being one need to establish a diet and life style that will sustain and promote a positive approach. According to *yoga*, diet has a profound effect on both body and mind and one cannot attain true mastery over mind without balance in the diet and life style. According to *yoga* food is classified into three categories.

1. ‘*Satvic*’ or food which is the most health promoting, adding vitality and energy to the whole body in the balanced way.
2. ‘*Rajstik*’ or food which tends to raise levels of physical activity and lead to emotional upsurges and is detrimental in the long-term.
3. 'Tamasic' or food, which have a negative or harmful effect on the body and mind.

Yoga always prescribes the 'Satvicfood'. The food that are purest, fresh, fragrant and tasty. They include organically grown natural foods without additives such as fresh green vegetables, fruits, cereals, diary products, nuts and seeds.

These help to maintain clarity of thought, decision-making and intellectual and contemplative thinking and keeps more joyful, cheerful and calm. The aim behind consuming *satvic* food is to achieve moderation, which is the basis of balanced diet in pranayama, and removes over indulgence in any form of food. Intake of stimulant drinks saucy, as tea, coffee and soft drinks should be reduced gradually.

The way we eat is also important in yoga. Eating is regarded as a scared act. We should try to have our meals in a quiet pleasant frame of mind giving full attention to the food allowing our body to turn its resources to the task of digestion.

The same yogic principles as for diet apply to the other aspect of daily life. The general aim is to establish a well-ordered calm life.
3. SIRAS

In a living being the sīras (head) is the substratum of “élan—vital” and all the sense faculties. So it occupies the place amongst the vital organs of the body.

Synonyms of Siras

Mastaka, Urdhakaya, Urdhwanga, Uttamanga, Munda, Seersha, Urdhwahridaya Urdhwajatru, Urdhwakapasaya.

Importance of Siras

Adharva veda mentions sīras as devakosh. Taittareeyopanidhad
mentions *siras* as *manomayakosha*. *Saktyopanishad* while stating the importance of *siras* says that the power of *chittah* is concentrated in the centre of "Bhru" *pradesha* which is present in the *siras* so *siras* is considered to be *uttamanga*.

According to *Yogasastra* *siras* is considered to be the seat of *sahasrarachakra*. The texts of palmistry considers the "Sirshodayakala" (i.e. the time of delivery of the head) as the time of birth of an individual in fixing up the horoscope. *Amarakosha* mentions the synonyms such as "Uttamanga" "Siram" and "Sirsham", *sounaka* while participating in the discussion of division of *Angapratyanga*, states that *siras* is the first organ to be formed. *Bhela* while stating the seat of *siras* says that it is "Talwantargatah" and uses the terminology *Sirohridaya*.

According to *Charaka* *siras* is the seat of *prana* and all the sense organs. *Chakrapani* commenting on this statement states that *prana* over here can be considered as *pranavata* as the seat of *pranavata* is the *siras*. *Siras* is also the seat of *prana* which is the composite of *agni*, *soma*, *vayu*, *satwa-rajo-tamo* gunas, five sense organs and *panchabhutas*. *Charaka* mentions *siras* as one among the "Trimarmas", (*siras*, *hridaya*, *vasthi*) while stating the *dasapranayatanas*. While the ancient cultures were considered the *siras* was given the importance.

It can be observed that the highest punishment ordered by the
kings in the Ancient India was the Sirah Khandana i.e the death sentence siromundana was also a type of punishment given. Bowing the head in the head in front of God and elders shows that we dedicate ourselves to them.

Charaka, stating that the importance of siras states that in head senses, channels carrying them and vital breath are located as rays in the sun (Ch.Si.9/4) Susrutha, keeping the sareera rachana and sirorachana in view states that siroabhishata leads to immediate death, unmadha and bhaya. Vagbhata also states that as all the indriyas and the prana are seated in the siras and there is a need for its protection. (A.H.Ut.24/57). Vagbhata compares siras to an aswatha vriksha which has the urdhamoola and adhahshakas (Ah.Ut.14/58). If the whole body is considered to be an aswatha vriksha then the siras can be compared to be its root.

The destruction of roots leads to the destruction of the whole tree. In the same way the disease of the head must also be pacified immediately with utmost care or the whole body may be affected. Charaka while stating the importance of trimarmas states that there are one hundred and seven vital parts in the body located in trunk and extremities. In case of affliction of any of them there is excruciating pain because any of the specific attachment of conscious to them. Of them those located in trunk are more important than those located in extremities because the latter are dependent on former. Of them also the hridaya, vasti and siras are the important ones because they are the roots of the body (Ch.Si.9/13).
Any injury or damage to the trimarmas may affect the body immediately as by the destruction of substratum the dependant is also destroyed. By their affliction, severe disorders appear. Hence these should be protected particularly from external injury as internal factors (Ch.Si.9/15).

The preventive measures were also stated for the diseases of heart, head and urinary bladder. The vital breath of man resides in heart, head and urinary bladder. Hence one should make every effort to protect them. The protection includes avoidance of impending factors, observance of code of conduct for the healthy and remedy of disorder if acisen (Ch.Si.9/9,10). If all the above said points are considered, Siras can be definitely given the status of the Uttamanga.
4. SIRASOOLA

Ardhavabhedaka is mention in Charaka samhitha, Ashtanga hridaya and Susrutha samhitha. Susrutha has defined shoolas an excruciating pain, which is felt as pierced by a shanku (a spear), into any part of the body.

Both sensory and motor faculties of the nervous system come under the domain of vatha. It is a known fact that pain is perceived by the specialized sensory nerve endings and signals transmitted to brain for appropriate physiological adjustments. Thus, shoola can be held as a disorder in which, functions of vatha are compromised and impaired. Strictly
according to the Ayurvedic method of understanding the pathogenesis, it can be summarised that vitiation of *vatha dosha* is the main pathological hallmark in the genesis of *shoola*.

Pain is of many types and is chiefly a subjective matter as which type of pain the patient experiences. Cutting pain, piercing pain, throbbing pain, and penetrating pain, unexplainable pain—yes—pain cannot be categorized. Likewise, *shoola* and *ruja* are only two varieties of pains, thought it can be safely said that *shoola* applies to visceral structures, where as *ruja* chiefly is held as pain connected with bones, joints etc. In the case of the *uthamanga* (head), both *ruja* (*siroruja*) and *shoola* (*shira shoola*) are used. further; *shoola* is regarded as an inflammatory type of pain. While discussing the role of *doshas* in the manifestation of *paka*, Vaghbhata has emphasized this fact. The word *thoda* also finds application (*shirasthoda*). The ancient Hindu legend goes on narrating *shoola* in relation of the voracious hunger of Lord Vishnu.

While describing the patho-symptomatology of *sira-soola*, it has been narrated that the vitiated *Vatha dosha* consequently produces severe, drilling type of pain (as the labyrinthine interior of the *shanku*) in various regions of the cranium, which is translated by the individual as head ache. However, headache is postulated as only a symptom found in umpteen disorders of any part of the body, not necessarily the cranium alone, according to the latest medical experts.
Symptomatically, headache is a condition ranging from a simple unpleasant feel to an intolerably disastrous pain. By its very nature, pain is subjective and complex. It is not easily measured, diagnosed, or treated. Chronic pain is often debilitating and has devasting consequences for its sufferers and those around them. Chronic pain affects a patient’s physical and emotional well being a challenging problem that often requires specialized care.

To understand pain management, we need to appreciate how pain is very complex. We can’t “pain” in a test tube to study it. Also, pain **per se**, can’t be seen in an X-ray or MRI. Pain is experienced!

When pain is severe, it affects a person’s life. People who suffer from severe pain are often restricted in their activities in both work and play. Pain can also interfere with sleep and concentration. Thus, either directly or indirectly, pain can influence one’s emotional well-being. To add to this complexity, one’s activities can also affect pain. Too much physical activity at one time can aggravate an injury. Conversely, insufficient activity can lead to weak muscles. Since the body’s muscles act as “shock absorber”, “weak muscles” can lead to more pain.

Emotions themselves can also affect pain. A simple example of this is how stress can cause the body’s muscles to tense, which often leads to more pain! Also, if one becomes depressed, one has more time to focus on one’s pain. Current research is constantly revealing more and more
information regarding “mind and body” connections. One important example includes neurotransmitters, chemicals used by the brain and nervous system for the transmission of information. Certain neurotransmitters can increase pain signals in the nervous system while others apparently decrease pain signals. Not surprisingly, neurotransmitters affect brain functions including emotions.
Para nasal sinuses are air filled spaces present with some bones around nasal cavities. They are frontal, maxillary, sphenoid and ethmoid. All of them open into the nasal cavity through its lateral wall. Functions make the skull lighter and add resonance to voice.

Anatomy of the sinuses (also called paranasal sinuses): The human skull contains 4 major pairs of hollow air-filled sacks called sinuses. These connect the space between the nostrils and the nasal passage. Sinuses help insulate the skull, reduce its weight, and allow the voice to resonate within it.
- Frontal sinuses (in the forehead)
- Maxillary sinuses (behind the cheek bones)
- Ethmoid sinuses (between the eyes)
- Sphenoid sinuses (behind the eyes)

The sinuses are a set of four areas of hollow cavities that are located in the skull and can range from an inch or smaller in size. There are a few theories on the purpose of sinuses, which are that they help to enhance vocals, and that they act as humidifiers for the air that's breathed in. They are usually empty except for the presence of a pink tissue that's layered within.

The largest sinus cavities are located in the cheekbones, while the ethmoid sinuses can be found at the nasal bridge.

The sinuses are a set of four areas of hollow cavities that are located in the skull and can range from an inch or smaller in size. There are a few theories on the purpose of sinuses, which are that they help to enhance vocals, and that they act as humidifiers for the air that's breathed in. They are usually empty except for the presence of a pink tissue that's layered within.

The largest sinus cavities are located in the cheekbones, while the ethmoid sinuses can be found at the nasal bridge.
5.1. **Frontal sinus**

Frontal sinus lies in the frontal bone deep to super ciliary arch extent upward above the medial and of eyebrow and back ward into the medial part of the roof of the orbit.

Open into middle meatus of nose at the anterior and of hiatus semilunaris.

Left and right sinuses are unequal in size, rarely one or both may be absent.

- Height X width X anterior posterior depth = 2.5 cm.
- Better developed in males than females
- Arterial supply – supra orbital artery
- Venous drainage – in to the anastomatic vein (supra orbital vein and superior ophthalmic vein)
- Lymphatic drainage – sub mandibular nodes
- Nerve supply – supra orbital nerve

5.2. **Maxillary sinus**

Maxillary sinus lies in the body of maxilla, largest paranasal sinus pyramidal shape. Open into middle meatus of nose in the lower part of hiatus semilunaris.
Left and right sinuses are unequal in size, rarely one or both may be absent.

- Height X width X anterior posterior depth
  
  = 3.5 cm X 2.5 cm X 3.5 cm

- First Para nasal sinus to develop

- Arterial supply – facial, infra orbital, greater palatine artery

- Venous drainage – Facial vein

- Lymphatic drainage – sub mandibular nodes

- Nerve supply – infra orbital, alveolar nerve

5.3. Sphenoidal sinus

Sphenoidal sinuses lies with in the body of sphenoid bone left and right sinuses are separated by a septum

Sinus open into sphenoethmoidal recess of the corresponding half of nasal cavity.

- Related superiorly – chiasma and hypophysis cerebri

- Laterally – internal carotid artery and cavernous sinus

- Arterial supply – Post ethmoidal and internal carotid artery.

- Venous drainage – cavernous sinus

- Lymphatic drainage – Retro pharyngeal nodes

- Nerve supply – Posterior ethmoidal nerve and branches of pterygo palatine ganglion.
5.4. Ethmoidal sinus

Numerous small inter communicating spaces lie within the labyrinth and ethmoid bone. They are completed from above by the sphenoidal conchae and the orbital process of the palatine bone and anteriorly by lacrimal bone.

Sinus divided into anterior, middle and post group.

**Anterior**
- Made up of 1–11 air cells
- Open into anterior part of hiatus semilunaris of nose
- Lymphatic drainage – sub mandibular nodes
- Nerve supply – Anterior ethmoidal vessels and nerves.

**Middle**
- Made up of 1–7 air cells
- Open into middle meatus of nose
- Lymphatic drainage – sub mandibular nodes
- Nerve supply – posterior ethmoidal vessels and nerves

**Posterior**
- Made up of 1–7 air cells
- Open into superior meatus of nose
- Lymphatic drainage – Retro pharyngeal nodes

Para Nasal Sinuses – 75
Nerve supply – posterior ethmoidal vessels, nerves and orbital branches of pterygo palatine ganglion.

5.5. Sinus Infection

Sinus infection, or sinusitis, is an inflammation of the sinuses and nasal passages. A sinus infection can cause a headache or pressure in the eyes, nose, cheek area or on one side of the head. A person with a sinus infection may also have a cough, a fever, bad breath, and nasal congestion with thick nasal secretions. Sinusitis is categorised as acute (sudden onset) or chronic (long term, the most common type).

The sinuses contain defenses against foreign bacteria (germs). If a disruption occurs that affects the normal host defenses inside the sinuses, those defenses may allow bacteria, which are normally present in the nasal passages, to enter any of the sinuses. Once there, the bacteria may stick to the lining cells and cause a sinus infection.

Acute sinusitis usually lasts less than 8 weeks or occurs no more than 3 times per year with each episode lasting no longer than 10 days. Medications are usually effective against acute sinusitis. Successful treatment counteracts damage done to the mucous lining of the sinuses and surrounding bone of the skull.

Chronic sinusitis lasts longer than 8 weeks or occurs more than 4 times per year with symptoms usually lasting more than 20 days.
These sinuses are covered with a mucus layer and cells that contain little hairs called cilia on their surface. These help trap and propel bacteria and pollutants outward. The ostiomeatal complex (OMC) connects the nasal passage to the Para nasal sinuses.

5.5.1. Sinus Infection Causes

Acute sinusitis usually follows a viral infection in the upper respiratory tract, but allergens (allergy-causing substances) or pollutants may also trigger acute sinusitis. A viral infection causes damage to the cells of the sinus lining. This damage leads to inflammation. The lining thickens with fluid that obstructs the nasal passage. This passage connects to the sinuses. The obstruction disrupts the process that removes bacteria normally present in the nasal passages, and the bacteria begin to multiply and invade the lining of the sinus. This causes sinus infection symptoms. Allergens and pollutants produce a similar effect.

Bacteria that normally cause acute sinusitis are streptococcus pneumoniae, Haemophilus influenzae, and Moraxella catarrhalis. These micro-organisms, along with Staphylococcus aureus and anaerobes (bacteria that live without oxygen), are involved in chronic sinusitis.

5.5.2. Sinus headache

A sinus headache is the result of trapped or congestion mucus building up in the para—nasal sinus cavities; this results in pain and
pressure felt around the eyes, temple, cheeks, upper teeth and forehead regions.

If you are experiencing any of the above you could be suffering from a sinus headache.

Your sinuses are bony air-filled cavities in your head that are connected to your nose through small openings (ostia). When you get a cold, a sinus infection or have an allergy attack these openings can become infected; the mucus membranes inflamed and the entire cavity blocked by excess mucous which is unable to drain. It is this excess mucous that creates the pressure in your head and ultimately the painful sinus headache you feel.

Everyone experiences sinus headaches differently with regards to their levels of intensity and duration. Sinus Headaches can range from a minor nagging pain in the head region to pain so unbearable that one cannot even sleep or continue life normally.

Symptoms

The following are symptoms of Sinus Headaches:

* Headaches with congestion
* Pain and pressure around the eyes, ears, across the cheeks and forehead
* Ache feeling in the upper teeth
Fatigue, fever and cold shivers
• Facial swelling
• Head pain which feels like a tension headache or migraine

In some cases one may suffer with sinus headaches even if no accompanying sinusitis symptoms are experienced.

Sinus symptoms which may be associated with Sinus Headaches:
• Post nasal drip
• Colored mucus (mucus may be yellow or green in colour)
• Blocked nasal passages
• Throat irritations or coughing
• A light-headed feeling

Causes of Sinus Headaches
• Exposure to cold, an allergy or the development of a sinus infection can cause swelling of the mucous membranes and result in congestion. In cooler weather climates or cold weather such as during fall or winter, the severity of sinus headaches may increase.
• Environmental triggers, such as mold, pollen, and cigarette smoke can also intensify the frequency and severity of sinus headaches.
Bending forward or lying down can at times make your sinus headache worse.

Sinus Headaches have been found to be a result of Allergic Rhinitis.

Respiratory infections can cause sinus headaches.

Nasal irrigation — using a neti-pot or saline sprays has tremendous benefits.

Some people experience headaches unrelated to sinuses, which could actually be:

- Tension headaches: caused by muscle contraction and stress.
- Migraines: usually intense, may be throbbing and pounding or felt more on one side of the head.
- Cluster headaches: rare headaches that occur in “clusters” and are relatively short in duration, but cause tremendous pain.

The key to treating a sinus headache is to follow 3 easy steps:

- Identify if the pain and pressure you are experiencing is a sinus headache.
- Reduce any mucus membrane swelling and inflammation in the sinus cavities and nasal passages.
- Promote effective drainage of any trapped or blocked mucous in these areas.
Here are some other things you can do at home to lessen the effects and pain of sinus headache:

- Drink plenty of fluids to thin the secretions and keep them flowing.
- Take hot showers to loosen the mucus.
- Alternate hot and cold compresses—place the hot compress across your sinuses for 3 minutes, then the cold compress for 30 seconds.
- Nasal irrigation — using a neti-pot or saline sprays has tremendous benefits.

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- Tension headaches: caused by muscle contraction and stress.
- Migraines: usually intense, may be throbbing and pounding or felt more on one side of the head.
- Cluster headaches: rare headaches that occur in “clusters” and are relatively short in duration, but cause tremendous pain.
Among the one hundred and seven marmas in the body charaka maintains that hridaya vasthy and sirus, as the important. They are the main seats of prana, and hence when they are injured, it will affect the prana thereby vitiating the humours.

Chakrapanidatta comments that injuries on these vital organs affect the prana as it is seated here. He compares this to the destruction of wall paint which occurs simultaneously when the wall is destroyed. Any
destruction to any of these three vital organs will destroy the prana and also could turn fatal or cause irreparable damage.

In sidhisthana, Charaka emphasizes the importance of these three marmas in relation to other marmas. He says that there are one hundred and seven marmas including the shakhas represents antaradhy and the sira. He says that pain will be in these parts when injured than that of any other part of the body. This is because the chetana is seated in this area. Here also Charaka describes siro marma as one.

Sankha Adhipa, Sringataka and Matruka are siromarmas included in sadhyapranahara marmas In Ashtanga hridaya Vaghbata says that there are ten jeevitha dhamas namely Sira, rasanabandanam (posterial part of the tongue) etc. (Khanda, Raktha, Nabhi, Asthi, Sukra, Oja and Guda).

6.1. Siras

The sirsas, being, the nerve centre governing all nervous activity of the commands a position of paramount significance. It is intimately related to the sense of perception and is the centre of prana as well. It is therefore justified being spoken as Uttamanga.

It is the principal site for the formation of kapha is indicative of its origin in the sirsas.
The body is considered as a tree, upside down, comparing the root as sira and appendages as branches throw light on the importance of *siras*.

Being the centre of the *prana* and *indriyas*, it is to the body what the sun is to the sky.

### 6.1.1. Marma of head and neck

There are thirty seven *marmas* in the head and neck region.

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Name</th>
<th>Asraya</th>
<th>Prognosis</th>
<th>No</th>
<th>Extend</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Nila</td>
<td>Siramarma</td>
<td>Vaikalyakaram</td>
<td>2</td>
<td>4panithalam</td>
</tr>
<tr>
<td>2.</td>
<td>Manya</td>
<td>Siramarma</td>
<td>Vaikalyakaram</td>
<td>2</td>
<td>4panithalam</td>
</tr>
<tr>
<td>3.</td>
<td>Matruka</td>
<td>Siramarma</td>
<td>Sadhyapranaharam</td>
<td>8</td>
<td>4panithalam</td>
</tr>
<tr>
<td>4.</td>
<td>Krikadika</td>
<td>Sandhimarma</td>
<td>Vaikalyakaram</td>
<td>2</td>
<td>½ panithalam</td>
</tr>
<tr>
<td>5.</td>
<td>Vidhura</td>
<td>Snayumarma</td>
<td>Vaikalyakaram</td>
<td>2</td>
<td>½ panithalam</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Dhamanimarma)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Phana</td>
<td>Siramarma</td>
<td>Vaikalyakaram</td>
<td>2</td>
<td>½ panithalam</td>
</tr>
<tr>
<td>7.</td>
<td>Apangam</td>
<td>Siramarma</td>
<td>Vaikalyakaram</td>
<td>2</td>
<td>½ panithalam</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Snayumarma)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Avarthana</td>
<td>Sandhimarma</td>
<td>Vaikalyakaram</td>
<td>2</td>
<td>½ panithalam</td>
</tr>
<tr>
<td>9.</td>
<td>Sankha</td>
<td>Asthimarma</td>
<td>Sadhyapranaharam</td>
<td>2</td>
<td>½ panithalam</td>
</tr>
<tr>
<td>10.</td>
<td>Utkesepa</td>
<td>Snayumarma</td>
<td>Visalyaghnam</td>
<td>2</td>
<td>½ panithalam</td>
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<tr>
<td>11.</td>
<td>Sthapani</td>
<td>Siramarma</td>
<td>Visalyaghnam</td>
<td>1</td>
<td>½ panithalam</td>
</tr>
<tr>
<td>12.</td>
<td>Sringataka</td>
<td>Siramarma</td>
<td>Sadhyapranaharam</td>
<td>4</td>
<td>4panithalam</td>
</tr>
<tr>
<td>13.</td>
<td>Simanta</td>
<td>Sandhimarma</td>
<td>Kalantharapranaharam</td>
<td>5</td>
<td>4panithalam</td>
</tr>
<tr>
<td>14.</td>
<td>Adhipathi</td>
<td>Sandhimarma</td>
<td>Sadhyapranaharam</td>
<td>1</td>
<td>½ panithalam</td>
</tr>
</tbody>
</table>

_Marma of Siras – 84_
Among the above said thirty seven marmas there are 15 Sadhyapranaharamarmas.

1. Sankha - 2  
2. Adhipa - 1  
3. Sringataka - 4  
4. Matruka - 8

There are only three vaishalyaghna marma.

1. Sthapani - 1  
2. Utkshepam - 2

There are five Kalanthara pranahara marma

1. Seemanthas - 5

There are 14 Vaikalyakara marmas

1. Phana - 2  
2. Apanga - 2  
3. Vidhura - 2  
4. Nila - 2  
5. Manya - 2  
6. Krikatika - 2  
7. Avartha - 2
There is no marma in siras which is in rujakara group. Among 37 marmas there are—

<table>
<thead>
<tr>
<th>Marmas</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Siramarma</td>
<td>15</td>
</tr>
<tr>
<td>Dhamanimarma</td>
<td>06</td>
</tr>
<tr>
<td>Sandhimarma</td>
<td>10</td>
</tr>
<tr>
<td>Snayumarma</td>
<td>04</td>
</tr>
<tr>
<td>Asthimarma</td>
<td>02</td>
</tr>
</tbody>
</table>

Based on the dimensions the siromarma are classified into;

<table>
<thead>
<tr>
<th>Parimana</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Swapnithala</td>
<td>04</td>
</tr>
<tr>
<td>Ardhangula</td>
<td>33</td>
</tr>
</tbody>
</table>

Generally, injury to any of the siromarmas will lead to wry neck, facial paralysis, deviation of the eyes, loss of motor function, cough, difficulty of breathing, lock jaw, dullness, slowness of speech, closing of eyelids, tremor of the cheek, yawning, salivation, loss of voice.

6.2. Nila and manya marma

According to Vaghbata, there are four siras on either sides of kantanadi corresponding to hanu sandhi (Tempero mandibular joint) named as Nila and Manya. If subjected to injury they cause absence of voice, alteration of sound, loss of sense of taste.

Susrutha says that there are four damani on either sides of
kantanadi. Two of them are known as Nila and other as Manya. One nila and one Manya are situated on either side of Larynx. An injury to any of these produces dumbness and change of voice. This is a Siramarma, and vaikalyakara marma.

6.3. Apanga marma

The site of this marma is near the external canthus of eyes and below the lateral end of the eyebrows. Injury to this lead to blindness or impaired vision by trauma to the optic nerves and other nerves supplying eye on its lateral margin.

This is included in the siramarma by Susrutha, where as Vagbhata puts this in snayu marma group. They are grouped under vaikalyakara marma and are two in number.

Anatomical structures corresponding to this marma

- Zygomatic and Temporal vessels
- Zygomatic and Temporal nerves
- Ophthalmic division of fifth cranial nerve (Trigeminal-Lacrimal nasociliary and frontal)
- Sixth cranial nerve supplying rectus lateralis muscle (Abducent)
- Trochlear and occulomotor nerve.
Injury to this cause paralysis of the lateral rectus and affects the movement of eyeballs. Injury to lacrimal nerve decreases the secretion of tears. This will lead to improper diminished vision.

6.4. Sankha marma

The site of the marma is in between the ear and the eye brows just above the termination of the super ciliary arch. It corresponds to temple. Injury to this marma endangers life.

They are two in number. Their ashraya is asthi. They come under sadya pranahara group.

Anatomical structures corresponding to this marma:

- Temporal bone of the skull
- The temporal lobe of the brain
- Basal ganglia
- Superficial temporal artery
- Middle meningeal artery.

6.5. Utkshepa Marmam

The situation of this marma is above the sankha and near the hairy margin on the scalp on both sides of head. Injury to this marma by a foreign body keeps the person alive as long as it is kept within the wound or it falls down on its own accord, after the formation of the tissue.
which acts as a barrier between the foreign body and the injured tissue of the body. But if it is drawn out immediately after the injury, the person dies at once due to bleeding. They are two in number and its prognosis is Visalyaghna in nature.

Anatomical structures corresponding to this marma

- Temporal fascia
- Parietal branch of superficial temporal artery
- Zygomatic temporal nerve
- Temporalis muscle.

6.6. Sthapani marmam

The site of this marma is in between the two super ciliary arches underneath the bony vault. Injury to this marma leads to same consequence of Utkshepa marma. If the foreign body is removed from the wound immediately after the injury, severe bleeding results in brain through the vein communicating the big sirsas resulting in loss of nerve energy and death. Its ashraya is sira and prognosis is Visalyaghna in nature.

Anatomical structures corresponding to this marma;

- A vein from the nose entering through the formen caecum joints the superior sagittal sinus
- The brain with its covering underneath the frontal bone corresponding to marma
6.7. **Seemantha Marmam**

They are five in number and is included in the *Kalanthara pranahara* marma. The situation of this *marma* is on the scalp. They correspond to the five important sutures of the skull. Injury to these marmas lead to insanity, fear and intellectual disturbances from trauma. They comes under the *sandhi marma* category. Prognosis is *Kalanthara pranahara*. The *seemantha marma* can be correlated to sutures, which are seen around the scalp.

Anatomical structures corresponding to this marma

- Sagittal sutures
- Parietal sutures
- Occipital sutures
- Frontal sutures

6.8. **Sringataka**

In the middle of the siras that irrigate the nose, ear, eye and tongue, there is a cross way or the *sringatakas*. 
They are four in number. According to Susrutha they are dhamani marma. They are sadyapranahara marma. The site of this marma in thalu (soft palate) where the cavities of the four indriyas (the sense of taste, hearing, smell and vision) meet. Any injury here will lead to bulbar paralysis and above said symptoms. The opening of all these in the thalu are termed as sringatika marma which are four in numbers.

Being a siramarma and four in number this is also suggestive of the Circulus arteriosus of Willis.

Anatomical structures corresponding to this marma

- Brocas centre
- Visio sensory centre
- Centre of hearing
- Centre for taste and smell
- Soft palate.

6.9. Adhipathi Marma

With in the vault (crown) of the head above there is commingling (together) of the siras and joints. This is like the whorls of the hair and is called the adhipathi, the master. If injured this leads to immediate death.

It comes under sandimarma category, sadyapranahara in prognosis.
according to Gananathasen, Adhipathi marma is the junction of five siras termed mahasiravartha. It is a sadyapranahara marma. It is seated inside the paschima kapala. In another context he says that this marma is a randra in the paschima Madhya seemantha of kapala.

This is that part in the body which, when injured causes severe pain, respiratory and circulatory failure and in blood pressure.

The description is a template for brain and the whorls of hair are suggestive of convolutions, sulci and gyrii of the cortical surface.

The situation of this is with in the cranial vault. It correspond to an area called Medulla oblongata (Adhipathi) in the mid brain nearer its surface- where the ten cranial nerves of both the sides take their origin as nuclei from the middle line appearing as if hairs spread out in emicircular manner of each side.

Anatomical structures corresponding to this marma

- Medulla oblongata
- Cardiac centre
- Respiratory centre
- Vasomotor centre
- Nuclei of ten cranial nerves.
Nasyakarma is one among the Panchakarma. The importance of administering medical treatment through nostrils was realised very early in India both for prophylactic and curative purposes. This operation is useful in cases pertaining to head, eyes, ears, nose etc. The nasya dravya administered through nostrils reaches the sringataka srotas and from there again it spreads into various srotas and brings about the vitiated doshas from urdhanga to sringataka which is a sadyapranahara sira marma. It is a composite structure consisting of four siras in connection with four
sense organs i.e. nose, ear, eye and tongue. As srinigata is the most important group of sroths in urdhwanga, drugs acting through these srotas are certain to bring about srotho sudhi in urdhawanga. Nasyakarma is also called siro virechana. Most of the drugs bring about the draveekarana, vilayana and chedana of vitiated doshas. Purging out of the vitiated doshas which have their stay in siras is called siro virechana. According to the views of some of the authors the action of Nasyakarma may be analysed as

1) by general blood circulation after absorption through nervous membrane
2) by direct pooling into venous sinuses of brain via inferior ophthalmic viens
3) by absorption directly into csf.

Many nerve endings which are arranged in peripheral surface of nervous membrane olfactory, trigeminal etc will be stimulated by nasyadravya and impulses are transmitted to the CNS resulting in better circulation and nourishment of the organs. The chief function of the nose is to warm the air while it passes through the labyrinths of the intricate passages into the nose and also to filter the air of certain impurities contained in the atmosphere.

Nasyakarma is specially recommended in diseases of head, back of the throat and ears. It is aimed at cleansing and elimination of offending
agents. While in others the fragrance of materials used for Nasya is believed to enter into the intricate passages in the sphenoidal and ethmoidal sinuses and acts as a disinfectant and stimulant. Nasyakarma hasa been prescribed regularly and is found to be specially used in insanity. The counter irritation caused by the irritant remedies used in nasyakarma has been found to be useful.

Before performing the Nasyakarma as a preoperative stage local snehana and swedana are done. Then the patient is made to lie down on his back with his head bent a little backward. The luke warm medicine is instilled after closing one nostril and the medicine is put into the other nostril and viceversa. After the administration of nasya the palms soles and ears are to be massaged for a little while. Dhoomapana and gandoosha are done as the post operative procedures. The patient is supposed to avoid the dirt, smoke, sun, wind, liquor, liquid foods, full bath, journey and mental emotions like anger etc. during this period. If the nasya is administered properly the patient should feel lightness of the head and the should have good sleep without any disturbance.

7.1. Types of Nasya

Charaka has classified into 5 types;

Naavana nasya: Navana is one of the important and well applicable therapies of Nasya Karma. Navana is administered by instilling the drops of a medicated oil or ghritha in the nose. Charaka has described
Pranadi (dropper) for it. Navana is generally the Sneha Nasya and known as Nasya in general.

Snehana (unctuousness)

As the word Sneha suggests, sneha nasya gives strength to all the Dathu and as Dathuposhaka.

**Dosage Schedule for Sneha nasya**

<table>
<thead>
<tr>
<th>Type of dose</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heena matra</td>
<td>8 drops in each nostril</td>
</tr>
<tr>
<td>Madhyama matra</td>
<td>16 drops in each nostril</td>
</tr>
<tr>
<td>Uttama matra</td>
<td>32 drops in each nostril</td>
</tr>
<tr>
<td>Boja has mentioned</td>
<td>8 drops $\rightarrow$ Prayokika Sneha nasya</td>
</tr>
<tr>
<td></td>
<td>16 drops $\rightarrow$ Snaihika nasya.</td>
</tr>
</tbody>
</table>

**Benefits of Sneha Nasya**

1. Who practices nasya at the proper time will keep sight, smell and hearing unimpaired
2. Beard and hair will not grow in abundance
3. Hair will not fall turn grey or tawny.
4. Rigidity of neck, head ache, facial paralysis, rhinitis, hemicrania (Ardhavabhedaka) and tremors of the head will be pacified.
5. The joints, sinus and tendons of cranium will be well nourished by the nasya and will acquire great strength

6. The face will be cheerful and plump; the voice will become mellow, firm and stentorian

7. All sense organs will be clarified and greatly strengthened

8. There will be no sudden invasion of disease occur in the upper part of the body (Urdha jatru)

9. The effects of senility will be retarded.

**Sodhana Nasya**

Susruta's sirovirechana type is included in sodhana type of Navana nasya. It eliminates the vitiated dhosha.

<table>
<thead>
<tr>
<th>Type of dose</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heena matra</td>
<td>4 drops</td>
</tr>
<tr>
<td>Madhyama matra</td>
<td>6 drops</td>
</tr>
<tr>
<td>Uttama matra</td>
<td>8 drops</td>
</tr>
</tbody>
</table>

**Indication**

Ardhavabhedaka, urdha jatrugatha kapharogas, urdha jatrugatha sopha, sirogaurava, sirasoola, etc.
NavanaKala

<table>
<thead>
<tr>
<th>Season</th>
<th>Time of Nasya</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seetha kala</td>
<td>Noon</td>
</tr>
<tr>
<td>Sarath and Vasantha</td>
<td>Morning</td>
</tr>
<tr>
<td>Grishma Ritu</td>
<td>Evening</td>
</tr>
<tr>
<td>Varsha Ritu</td>
<td>Sunny day</td>
</tr>
</tbody>
</table>

Avapeeda Nasya

It is a type of sodhana nasya. The word Avapeeda means it is extracted juice of leaves or paste (Kalka) of required medicine is prepared which is placed in white and clean cloth and is squeezed to obtain the required quantity of juice, directly into the nostril of the patient.

It is mainly of two types:

1. Sthambana Nasya
2. Sodhana Nasya

For sodhana purpose Kalka of Tikshna Dravya like saindava, Pippali etc. have been mentioned as Avapeeda Nasya and for Sthambana purpose Sthambana drugs have been described.

Chakrapani has mentioned 3 types of Avapeeda Nasya: Sodhana, Sthambana and Samana.
Pradhamana or Dhmapana Nasya

It is a type of Sodhana Nasya. Blowing of fine powder into the nose is called as Pradhamana nasya. Dhmapana mentioned in Charaka and Pradhamana described in Susrutha.

Method

In pradhamana nasya, choorna (powder of drug) is administered by nasal passage with the help of Nadiyantra. Videha has described another method for Pradhamana, in which fine powder of drug kept in a podali made athin cloth is used to inhale, so that smallest particles of the medicine enter into the nostrils. Dose of Dmapana nasyais three mucyuthi (3 pinch).

For the Pottali method choorna should be 2 thola i.e. 20 gms.

Dhuma Nasya

Dhooma nasya is defined as medicated smoke inhaled through nose and exhaled through oral route. Acharya Susrutha had not described it as a type of nasya. The inhalation and exhalation of Dhuma through mouth is known as Dhoomapana and is not included in nasya. Inhalation of Dhuma through mouth and exhalation through nose is prohibited in the classics as it is harmful to eye sight. Dhooma nasya are

1. Prayogika
2. Snaikika
3. Vairechanika.
Charaka has mentioned special Dhoomanadi to errhine smoke. It should be of 24 angula length of measuring own finger. This measurement is for virechana type. 32 angula length for snaihika dhuma and 36 angula length of prayogika dhuma is advocated. Dhuma nasya indicated in Siro roga, netra roga and nasa roga.

**Marsa—Prathmarsha Nasya**

*Marsa* and *prathimarsa nasya* both consists of introduction of oil through the nostrils. It is well tolerated and is very much easier procedure.

*Prathimarsa nasya* and *Marsa* are same in principle. But the main difference between them is of dose. In *prathimarsa nasya* 2 drops are given while in *marsa nasya* the dose is 6 to 10 drops.

**Marsa**

According to Vaghbata dropping / instillation of *sneha* in the nostrils from 6 to 10 drops is known as *Marsa*. It is gives quick result than *Prathimarsa nasya* but has more vyapat (complications).

Prathimars : *Prathimarsa nasya* could be given daily and even in all the seasons in morning and evening.

**Summary of Procedure of Nasya**

1. Before giving *Nasya*, Prior arrangement of the material and equipment should be done.
2. The patient should be examined for yogyata and ayogyatha

3. Advice the patient to pass the natural urges like urine and stool

4. *Mridhu abhyanga* (massage) should be done on scalp, forehead, face, and neck for 8 to 15 minutes

5. *Sevana* with cloth dipped in hot water may be given over *Sira, Mukha, Nasa, Manya, Griva and Kanta* region

6. Advice the patient to lie down in supine position with ease for nasya table

7. Head should be "Pralambitha (head down position approximately about 45° angle)

8. Then instill the luke warm medicine (adequate dose; not too cold, not too hot) in both nostrils

9. Advice the patient is to remain relaxed while taking *Nasya* Patient should avoid speech, anger, sneezing, laughing and shaking of head during *Nasya prayoga*

10. Observe the samyk, ayoga and Atiyoga Symptoms

11. After administration of *Nasya* advice the patient to lie supine for about 2 minutes. After administration of *nasya*, feet, shoulders, palms, and ears should be massaged

12. The patient should be advised to avoid swallowing of *nasya aushadhi and kaphadhi dosha*
13. The medicine instilled in the nose comes out with the morbid
dosha repeatedly, especially vitiated kapha, advice the
patient to spit out

14. Then advice to patient to take dhuma nasya; do the
gandoosha

15. Patient is advised to stay at windless place and take light
meal and Luke warm water.

Practical consideration in Nasya karma.

1. Nasya should be preceded by sodhana or at least
Sadyovirechana in order to get desired therapeutic actions
especially in case of generalized aggravation of dosha

2. In kapha -vatha dosha thaila, in kevala vatha dosha vas
and in pitta dosha ghritha or majja sneha should be used

3. For pradhana Nasya in place of Nadi, straw can be used

4. The snehana nasya should be started from 8 drops and the
increase 2drops daily maximum up to 16 - 20 drops

5. Generally after nasya karma, Haridra dhuma is enough

6. In patient suffering from snoring, prathimarsa nasya should
be used at bed time. Definitely patient will get improvement
with in a week, but it should be continued for 3 - 6 months

7. For quicker action churna nasya should be given in case of
emergency conditions such as Apasmara, Sanyasa etc.
8. Dhuma and kavala should be done after nasya

9. To get the optimum therapeutic results abhyanga, swedana and skillfull administration of nasya are highly essential

10. Pradhamana nasya is very effective in convulsive disorders

11. If the patient faints at the time of nasya, then immediately cold water should be sprinkled on forehead and face

12. Katuthaila and saindhavayukta sarpi should be used for nasyakarma especially for kshirapa.
The word pranayama is the union of two words i.e. ‘Prana’ and ‘Ayama’. Prana means a subtle life force, which provides energy to different organs including mind and also controls many vital life processes (eg: circulation, respiration, etc.) Ayama signifies the voluntary effort to control and direct this prana.

Breathing is one of vital activities governed by prana on the gross level. This is the only pranic activity available to us, which could be exercised voluntarily. Secondly this system of pranic activity is linked with
the nervous function (mental activity) on one hand and consciousness (chitha) on the other. Yoga has taken best advantage of this situation considering that the mind could be controlled effectively with the voluntary control over breathing which in turn could control materialistic inclinations of chithah.

Therefore, Pranayama essentially becomes a process by which “prana” is controlled by regulating the breathing voluntarily. Just like we have speed breakers on the road to control the flow of traffic we bring a “pause” in the breathing. So pranayama means a voluntary and temporary pause in the movement of breath.

\[Tasminsati shavasa praswasayorgati vicchedah pranayamah\]

(P.Y.SII 49)

Meaning to say that the pause brought in the movement of inhalation and exhalation is nothing but pranayama.

Patanjali has explained four types of pranayama (P.Y.S.II 50-51) on the basis of the nature of the pause sthambhavriti - that causes a temporary suspension of breath.

1. Pause after or at the end of a prolonged (deergha) very slow (manda) exhalation (praswasa)

2. Pause after or at the end of deep and prolonged inhalation (shwasa)
3. Pause is brought at any time one wants to bring for a considerable time. It may be somewhere between usual inhalation and exhalation. This is prolongation of a break in the breathing (sthambavritthi)

4. The practitioners experience pause at any time without his voluntary efforts after a long practice of above three types of pauses.

In Yogic literature when the breath is held after exhalation it is called Bahyakumbhaka. When the breathing is stopped after inhalation it is known as Abhyantara Kumbhaka. While the fourth type of pause as mentioned above which comes automatically after a long practice of pranayama is called Kevala Kumbhaka.

The author of Hathayogapradeepika mentions eight varieties of pranayama (H.P II 44) not on the basis of nature of Kumbhaka but on the basis of nature of inhalation and exhalations, which are gone through before and after Kumbhaka. The techniques of all the eight kumbhakas are same but the technique of inhalation and exhalations before and after kumbhaka is different for each type of pranayama.

According to Patanjali, a slightest change brought in the normal speed of breathing (gati vicchedah) is pranayama. So prolonged inhalation and exhalation done systematically will be a pranayama. Obviously to do
this voluntary control is necessary. Therefore voluntary control brought on any one of the three i.e. inhalation, exhalation or the pause, on all the three will be called pranayama.

**Characteristics of Pranayama**

*Pranayama* essentially consists of a voluntary control on the breathing and probably due to this fact many people refer it to as breathing exercise. Various breathing exercises have been developed with the purpose of providing more oxygen to the system. In *pranayama* on contrary, emphasis seems to be given on the development of *kumbhaka* i.e. a controlled phase of breath holding.

Practice of *pranayama* requires a conscious control over the breathing. One remains fully aware of what he is doing during different phases of *pranayama*.

*Pranayama* is never done mechanically. Awareness of breathing is most important while practicing *pranayama*. *Pranayama* breathing does not produce any emotion nor it expresses any thought or desire.

Each cycle of *pranayama* is a complex voluntary act consisting of three different phases *Puraka*, *Kumbhaka* and *Rechaka*. The technique of *pranayama* includes specific rules regarding the method of breathing in terms of

1. Force of breathing
2. The duration of each phase of breathing
3. Number of rounds of *pranayama*
4. Attention on breathing.

When the force of breathing is reduced, it increases the duration of that particular phase. Tradition advocates definite proportion of time for these phases of *Pranayama*.

Important principles to be commonly observed during the practice of almost all types of *Pranayama*.

1. One has to sit in any suitable meditative asana keeping the spine in a straight and well-balanced condition. Eyes are closed gently, so that at least one major external stimulation is cut off. This helps one to pay attention to the inner happenings.
2. Inhalation for *puraka* and exhalation for *rechaka* is slow, smooth and without any haste. The flow of air is kept uniform having same force all through out i.e. in most controlled way.
3. Every *puraka* and *rechaka* must end quietly. The habit of expanding the chest or contracting the body musculature violently at the end of *puraka* and *rechaka* respectively is avoided consciously.
An attempt of snatching the air at the end of *puraka* and forcing out some more air at the end of *rechaka* would disturb the next cycle of *Pranayama*. Therefore *puraka* and *rechaka* should end pleasantly and smoothly without any strain.

4. *Rechaka* is always given longer time than *puraka*. The orthodox proportion between *puraka* and *rechaka* is 1:2. In an effort to give double time for *rechaka* one should not prolong it too much which may otherwise hasten the following *puraka*. Best way is to judge first the time for which one can prolong the *rechaka* easily and to allot just half of the time for *puraka*.

5. An orthodox practice of *pranayama* consists minimum ten rounds at a stretch at a time. Traditional texts like *Hatha-pradeepika* however recommends 80 rounds at a time and such four sittings in a day i.e. in the morning, afternoon, evening and at night. Obviously then the total cycles will be 320 / day.

6. Increase in the airway resistance is another peculiarity of *Pranayama*. Inhaling or exhaling through only right or left nostril at a time as in *anulom vilom pranayama* reduce the air passage. Naturally the volume of the air and the volume of blood reaching the lungs will be different as the ventilation is approximately reduced to 50%.
Aims and objectives of Pranayama

Any activity, which requires a total concentration of our mind, will also control our breath, which may even be stopped for a while. e.g: while threading needle our breathing is stopped for a few minutes. This shows clearly that there is a correlation between our mind and breathing, a pranic activity. The emotions and mental activities are related to nervous system and through it they change our breathing. This means that if we try to manipulate our breathing voluntarily, we can tackle the life force which is deeply connected with mind (nervous activity) and therefore with the emotions.

Pranayama aims primarily at the control on the mind. When the mind is standstill no thought processes or emotional disturbance is possible. Thus by controlling the mind we would be able to control different emotions and as a result the temperament, moods, desires and natural instincts of vrittis (mind) are controlled automatically.

By practicing pranayama the ability to perceive the reality is intensified. The mind is trained and made capable of the process of dharana. Since the mind
becomes steady and peaceful after the practice of Pranayama, it becomes suitable and capable to concentrate on one subject at a time.

Different nādis are also purified with the practice of Pranayama. This is known as nādisuddhi. Nādis in Yoga are the channels or the passages for the transmission of nerve impulse or the conduction of the pranic activity for the circulation of the blood or lymph or even for the flow of air through them. Most important nādi, which opens after the long practice of pranayama, is sushumna. Pranayama eliminates all types of mala from the body and the mind. Mala in Yoga is that toxic factor which gives rise to an imbalance in the body and mind by obstructing or blocking the normal functions of nādis.

During Pranayama the breathing is consciously made even deep and rhythmic. This will bring about noticeable relaxation, tranquility, and balance sense of well being to the mind. In this situation one’s egoconsciousness, which is the seat of the instincts and desires, cannot interfere with mind as usual. When ego is controlled the behavioral pattern can also change.

Thus the practice of Pranayama contributes in transforming the total personality. This helps one in controlling his non-Yogic tendencies, instincts and urges arising in his mind (chittah vṛitti nirodhah).

In recent years scientists have admitted the role of psyche in so
called somatic diseases and the term psychosomatic diseases is given to such diseases, where the cause is not the infection but the psychic tension and disturbance. *Hathayoga* claims to cure all these diseases when *Pranayama* is practiced properly. It also warns that if *Pranayama* is not practiced judiciously then many diseases may arise e.g.: asthma, hiccough, pain in the head, ear and eyes etc. It seems possible since the breathing is associated with the autonomic nervous system and autonomic nervous system on the other hand with mental and emotional reaction. By judicious practice of *pranayama* one attains sound health, steady and peaceful mind, slim and lustrous body (H.P.II.16-18).

**Different time ratios**

In order to maintain uniformity and rhythmicity in all round or cycles of *pranayama*, and to allow one to practice within his limitations, different time proportions are followed during the practice. Such time ratios provide best proportion and the combination of *puraka*, *kumbhaka* and *rechaka* phases as far as their duration is concerned.

The purpose behind this seems to

1. Provide one, some means to measure one's own capacity so that one may not transgress and over step ones own limitations and wreck the delicate and vital mechanisms of respiration.
2. Stimulate the Autonomic Nervous system and other breathing reflexes in most rhythmic regular and systematic manner
so as to condition them for higher spiritual forces and render them tough against day-to-day stress and tensions.

The most favored view is to have the proportion of 1:4:2 for *puraka*, *kumbhaka* and *rechaka* respectively. Of course it is hard to reach this ratio in the beginning.

According to this ratio if *puraka* is done for 5 seconds, *kumbhaka* should be of 20 seconds, and *rechaka* to be prolonged for 10 seconds.

Another tradition (*Goraksha Samhitha*) (Ch. 14) suggest *matras* in the ratio of 6:8:5 for safe and convenient practice of *pranayama*. To start with one can start from 1:1:2 and then to introduce gradually the ratio 1:2:2 and so on. A feeling of distress or air hunger at any stage indicates some strain in following the proportion. One has to reduce the time for *puraka* in case so that other phases are also reduced in their duration and then whole practice is easier. The phase of *kumbhaka* should be introduced just in the form of a small pause between *puraka* and *rechaka* and then its duration may be increased gradually and cautiously.

**Mechanism of Pranayama**

**Puraka Phase**

*Shwas*, is the natural involuntary process of inspiration regulated by the respiratory center in medulla oblongata. *Puraka* is the voluntary prolongation of the inspiratory phase. It is well controlled in terms of
time, force, ventilation and depth as per the proportion. Inhalation in *puraka* is done in a very smooth way by keeping the force uniform. The speed at which the lungs are filled is thus regulated. When we increase the duration and prolong the phase of inhalation the force is automatically decreased.

In *bhashrika pranayama* however one breathes inward out very rapidly, giving just half a second for one cycle, consisting of *puraka* and *rechaka* of the first part of *bhashrika* (120 cycles/minute). In *lom-vilom* and *suryabhedan pranayama puraka* is done only through right or left nostril at a time. In *ujjayi* and *bhramari pranayama* controlling glottis and throat muscles reduces the ventilation. Thus the mechanism of inspiration is modified voluntarily during *puraka*.

During the phase of *puraka*, the lungs are expanded considerably and the walls of alveoli are stretched maximum. As we continue the phase of inhalation with our strong voluntary control the normal stretch reflex is inhibited and therefore no exhalation is possible. The chest continues to get expanded under cortical control. The stretch receptors are thus trained to withstand more and more stretching. This helps us to hold the breath for a long time easily.

As we continue to inhale the intrapulmonary pressure is also raised. The diaphragm does not move freely as the abdomen is kept slightly inward and controlled. Therefore, the alveoli in the upper pulmonary part
are filled with air. One uses his inspiratory capacity for prolonged phase of *puraka*. This has a beneficial effect on the gaseous exchange which then takes place efficiently throughout the day.

Normally we finish our inhalation in 1.5 to 2 seconds during which the exchange of gases is almost completed. Now although the need of oxygen is very less we are prolonging our inhalation from 2 to 5 seconds. Instead of usual 500 ml of air we are now breathing in 1 to 1.5 liters of air and the volume of blood reaching the lungs is also more. The exchange of $O_2$ and $CO_2$ is very effective.

**Kumbhaka phase**

Here only *antark umbhaka* is considered. *Kumbhaka* is the voluntarily controlled suspension of breath. After the particular stage in *puraka* as per the ratio is observed one stops inhalation and retains the inspired air in the lungs for the proportionate time. The intrapulmonary pressure (in alveoli), which is raised to one's optimum capacity, is maintained during the *kumbhaka* stage. The alveoli and bronchioles are stretched to their optimum level. The stretch receptors however cannot bring about the reflex contraction of the lungs and the respiratory muscles cannot relax as they do normally due to strong cortical control.

The ideal duration of *kumbhaka*, is that which would enable one to give double time for *rechaka* than that of *puraka*. The duration of
kumbhaka is gradually increased over a long practice of pranayama so that the respiratory center is gradually acclimatized and trained to withstand higher and higher and higher CO\textsubscript{2} concentrations in the alveoli and blood.

The metabolic processes continuously produce CO\textsubscript{2}, which is picked up by the blood under normal respiration and is promptly thrown out of the body. But now when we retain the breath of a considerable time, the CO\textsubscript{2} level (concentration) is going to increase in the blood.

Obviously the exchange of O\textsubscript{2} and CO\textsubscript{2} across the thin walls of alveoli and blood capillaries would take place more efficiently as they get more time. However the exchange of gases will not be possible after a particular stage when there is a starvation of the gases on both the sides. i.e. in the alveoli and in the blood.

The chemoreceptors located in medulla oblongata near the entry of the IX and X cranial nerves are sensitive to amount of CO\textsubscript{2} in the blood.

The increasing concentration of CO\textsubscript{2} in the blood stimulates these chemoreceptors, which in turn send the impulses to the respiratory center. The respiratory center, which would have otherwise started exhalation, is now helpless against the strong voluntary control from the cortex. So in a way we are training these chemoreceptors to tolerate more and more tension of CO\textsubscript{2} during kumbhaka.
After some stage in antarkumbhaka an inner urge to exhale arises for the first time, which is generally neglected by our volition. The second inner urge to exhale is still stronger than the first one, which also is sometimes ignored. The third and the strongest desire however arise which usually one cannot and should not neglect. Now rechaka should be started without any delay. This way without crossing the limits one can increase capacity to perform kumbhaka for longer durations.

The peripheral chemoreceptors, which are sensitive to lowered O₂ level in the blood, would also send powerful stimulation to the respiratory center to start exhalation. As the CO₂ goes on accumulating during kumbhaka, the chemoreceptors report of promptly to pneumotoxic center which in turn tries to stimulate expiratory center the autonomic or the reflex mechanism of respiration is fortunately far more powerful than the control from the higher centers. That is why after a particular stage it is not possible to hold the breath further. The receptors will however get acclimatized to the increasing concentrations of CO₂ gradually by regular practice.

**Rechaka phase**

After retaining breath for sufficient length of time as per the time ratio in a comfortable manner, then rechaka is started. Rechaka is a voluntarily controlled exhalation as compared to the normal exhalation (praswasa). The control as in puraka is brought in terms of time, force,
ventilation and flow of air. In order to increase the duration of *rechaka* as per the time ratio, the exhalatory force is reduced and the limited air is allowed to escape. For this purpose, exhalation is carried out through the right or left nostril only or through both the nostrils by contracting the glottis partially at the same time. Thus creating slight airway resistance regulates the volume of the air to be expelled out per unit of time. This helps in prolonging the exhalation and to reduce the force of air going out. In *rechaka* one uses his expiratory reserve volumes for exhaling completely before starting next *puraka*.

Now the intra pulmonic pressure is slowly reduced and the alveoli are also gradually deflated. By this time when one is exhaling slowly, the percentage of CO₂ is still increasing in the blood and the chemoreceptors in the medulla are trying to inhibit exhalation and to start inhalation by stimulating the inspiratory center.

Similarly the peripheral chemoreceptors are also trying to bring about reflex inspiration, as they are sensitive to the lowered O₂ concentration in the blood.

But both the reflexes are controlled by one strong volition and we continue to breathe out. The purpose seems to acclimatize these receptors to higher CO₂ tensions in the blood as stated above in *kumbhaka*.
It may be noted that CO\textsubscript{2} has got a cooling effect on the nervous system up to certain limits and has been found to reduce anxiety when administered in the form of a mixture containing 65% CO\textsubscript{2} and 35% O\textsubscript{2}. This would help mind to undergo meditation state.

The duration of rechaka is however so adjusted that there is no feeling of 'air hunger' of any stage. If it is not well adjusted in proportion the following puraka is hurried and the whole proportion of pranayama cycle is disturbed.

**Significance of double timeproportion for Rechaka**

One is supposed to follow 1:2 ratios for the duration of puraka and rechaka. Even when kumbhaka is given four times more duration in 1:4:2-time ratio, rechecks is given double time than puraka. Really speaking puraka is the true measure as other phases depend on for the proportion. Puraka is to be adjusted so as to give double proportion to rechaka. This is possible after knowing one's capacity to prolong the phase of exhalation. For example, if one is able to breathe out for only 8 seconds comfortably he should adjust his puraka for only 4 seconds.

*Rechaka* is the significance of double duration on the basis of psychophysiological principles.

1. Normally, the instinct of inhalation is always stronger than that of exhalation. This is due to increase in CO\textsubscript{2} tension in
the blood at the end of normal expiration. When we prolong the phase of exhalation we tackle this chemoreceptor reflex and discard the urge of inspiration. Prolonged duration of *rechaka* facilitates such training of chemoreceptors to withstand more and more concentrations of CO₂ in the blood. This is actually a preparation for *keval kumbaka* to happen one day, which is nothing but an amount of respiration in the mid stage during or in between the inhalation and exhalation for some time.

2. It is our common experience that we feel relaxed whenever we exhale deeply and smoothly. The experiments have shown that various tensions as well as anxiety are reduced during the prolonged exhalations. Prolonged *rechaka* would then liberate more psycho physiological tensions and one would feel calm and quiet. The degree of physiological arousal is responsible for any emotion to occur. Prolonged exhalation gives rise to the parasympathetic tone in the body and reduces the level of excitations and therefore one feels relaxed and peaceful.

3. In order to observe a particular time ratio in each cycle of pranayama a total concentration is necessary. When rechaka is prolonged smoothly we remain aware of the force flow of air and the time thus keeping the mind away from
(perception of) external stimulations and the thought processes for a maximum time.

4. Increased duration of rechaka makes the exhalation most complete. As one is using his expiratory reserve volume the air containing maximum percentage of CO₂ is completely squeezed out of lungs (except dead space volume and residual volume). When we inhale for puraka of the next cycle of pranayama we get maximum quantity of a fresh air equivalent to 75% of our vital capacity. This offers better scope for effective gaseous exchange. If rechaka phase is not sufficiently prolonged some amount of air remains in the alveoli at the end of incomplete exhalation.

Volume of air, which contains accumulated CO₂, would be mixed with incoming fresh air and the amount of O₂ reaching the alveoli will be less in every cycle. One may not be able to keep proper ratio of time, as he feels suffocated after a few rounds. Therefore double proportion of rechaka seems to be appropriate.

Conclusion

In short, during the practice of pranayama we tackle all the respiratory reflexes on account of volitional control on the respiration. The impulses from both the CNS and ANS are better integrated due to
rhythmic and proportionate stimulation of the proprioceptors and
viscerceptors as well as the vagus nerve.

The emotions are positively influenced due to this rhythmic and
smooth breathing pattern adopted every day. Like emotions, mental
activities are also related with breathing. As the mind is engaged fully in
breathing unnecessary thought processes are checked. As the cognitive
intellectual and the ego based analytical processes of the mind are minimal
or even absent the mind becomes more balanced which enables us to
experience higher levels of consciousness or to get into the meditational
state as the power of concentration also increases.

*Pranayama* has not been developed to supply oxygen. It is meant
for controlling and balancing Autonomic nervous system and influences other
autonomic functions as well.

**Anulom Vilom Pranayama**

This *pranayama* is also known as *Lom-Vilom*,
*Nadi shodana* or *Nadi Suddhi pranayama*. The
main characteristic feature of this pranayama is the
alternate breathing through
the left and the right nostril with or without *kumbaka*. Many of us may not be aware of the fact that we breathe mostly through only one nostril at a time and even the force of breathing is also not equal for both the nostrils. *Swara yoga*, the science of breath claims that there is a natural rhythmic and alternate change in the dominance of one nostril to that of the other occurring every one-hour. It also believes that a particular type of nostril dominance is preferable for preparing one mentally emotionally and physiologically for a particular activity in the day life style. This is because certain physical activities and physiological conditions were observed to be associated with a predominant flow through a particular nostril.

Right nostril dominance is supposed to be associated with the digestion of food, outward directedness, more vigorous activity, more active, and aggressive nature and more alertness for the external happenings. Where as left nostril dominance is related to more passive psychological state more quiet and receptive mood, which helps one in getting easily directed towards the inner environment.

*Yoga*, not only recognized this uninostril dominance from the beginning but also has correlated certain psychological changes and behavioral tendencies with uninostril dominance.

*Modern science* has revealed several chronic functional disorders ranging from simple intellectual asthenia to visceral dysfunctions like asthma,
peptic ulcer, cerebral palsy, dysmenorrhoea etc associated with permanent single nostril dominance on account of the septal deviation or some other obstruction in the nostril. Various mental and emotional disturbances have been observed to influence the natural rhythm of the alternate nostril dominance by changing nasal congestion and secretions. Physical factors like temperature, humidity, irritants, breath holding as well as exercise are known to alter nasal airflow, although this would bring about the changes in both the nostrils equally.

Physiologically our body tries to adjust itself with the environmental temperature changes through alternate vasodilatation and vasoconstriction mechanism. It is an autonomic function. As there are many cyclic, changes in the external environment like day and night cycle, various body activities are governed by cyclic functions of the autonomic nervous system. One such periodic function is “nasal cycle” i.e. regular alternation in nasal congestion from one nostril to the other thereby shifting the nasal airflow resistance from right to left and left to right nostril several times a day.

Engorgement of erectile tissue due to vasodilatation causes congestion and produces resistance to the airflow in that nostril. At the same time blood flow to the other nostril is reduced due to vasoconstriction of the blood capillaries, the erectile tissue shrinks and thus the airflow resistance is decreased in this nostril.
The volume of air passing through this nostril is increased. This is rhythmic alteration of degree of congestion of the mucosal membrane of each nostril. If the left nostril is less congested and offers less resistance to the airflow, that means a greater air volume is flowing through the left nostril and hence this condition is referred to as “left nostril dominance”.

Both sympathetic and parasympathetic efferent nerves of autonomic nervous system innervate the nose. The sympathetic stimulation causes vasoconstriction and thereby decongestion of the nostril which increases the airflow through that nostril. At the same time the parasympathetic action results in the increased blood flow (vasodilatation) to the erectile tissue in the other nostril and bring about congestion thereby blocking the nostril. Thus a rhythmic shift in autonomic nervous system tone is responsible for alternate nostril dominance. There is no wonder then, if the emotional and psychological states are found to affect and disturb this natural rhythmic function, since the emotions and tensions are related with the ANS and its centers in the limbic portion of brain.

It has been found that nasal cycle exists in about 85% people in the form of left or the right nostril dominance remaining 15% people will show either equal partial blockage or equal wide opening of both the nostrils. This may be for a short time when one nostril is opening the other is getting blocked at the same time.
It has been observed that the human performance also depends on the particular nostril. The endocrine function has been demonstrated to be related to the change in the nostril dominance. The cerebral hemispheric activity of one side as judged by EEG technique was also found to be correlated with the nostril dominance on the contra lateral side.

In short, our ancient yogis knew the fact that the nasal cycle is the only medium in our hand to control and balance the autonomic functions of the body. The balanced function on all the levels of the nervous system is essential for the maintenance of a good health.

Yoga believes that left nostril breathing dissipates more heat from the body or in other words it has a cooling and calming effect on the body. Left nostril is known as “Idanadi” or “Chandranadi”. Idanadi represents the constructive anabolic or energy conservation aspect of the pranic function. The right nostril is known as “Pingala nadi” or “Suryanadi”. It has got healing and activating and strengthening effect on the body. It represents destructive catabolic or energy consuming aspect of the body.

The main purpose of anulom-vilom pranayama is to purify the principal channels of energy (nadis) within the body. It is believed that because of the irregular schedules of meals, sleep, stress, pollution, infections and other disrupting forces the nadis are filled with impurities or the toxic substances (malas) and are there fore blocked. The flow of prana may be obstructed.
Gherand samhitha advocates that one should perform the alternate nostril breathing before the main pranayama as it will cleanse these nadi/s (Gh.S.Ch.V.38-43,53) Hatha pradeepika (HP.Ch.II-7-10) gives a detailed technique of this pranayama, in order to remove different malas from the body and the mind when both the nadi/s work evenly and simultaneously the third nadi starts functioning. This nadi is known as sushumna nadi. Prana is supposed to travel through this nadi during pranayama. For this purpose it is necessary to purity all these nadi/s with the help of Anulom-Vilom pranayama. So that vital force would flow through them and establishes a control over the mind. This cleansing of the nadi/s may be accomplished in three months or even earlier according to hathayoga.

Technique of Anulom-Vilom Pranayama

1. One sits comfortably in padmasana or in any suitable meditative asana.

2. Spine is maintained in a balanced and straight position and the abdomen is controlled after moving it slightly inward.

3. After this one forms a special mudra of the right palm by folding and supporting the index and middle finger together at the bottom of the thumb. The ring finger and small finger are used for closing left nostril. The right nostril is closed with the help of the thumb.

4. One inhales slowly and deeply through the left nostril. The
force and flow of the breath is kept uniform till the inhalation is complete. This is *puraka* phase.

5. At the end of *puraka* the left nostril is immediately closed with the help of ring finger and little finger since the right nostril was already closed before *puraka* now both the nostrils are closed. Breath is retained according to one’s capacity. This is *kumbhaka* phase when there is moderately strong desire to release the breath one opens the right nostril just by removing the thumb from it and starts exhaling slowly and smoothly through the right nostril. This is *rechaka* phase. Now the next *puraka* is done through the right nostril. After doing *kumbhaka* as before the *rechaka* is performed through the left nostril. This is considered as 1 round of *nadi suddhi*.

Such 3, 7, 10 or even more rounds are gone through at a stretch. *Puraka* phase is long, slow and *manda*. While *rechaka* phase is more prolonged and slower in nature. This helps to maintain a ratio of 1:2:2 or 1:4:2 for *puraka kumbhaka* and *rechaka*. Breathing is however very smooth and without any frictional sound.

Left nostril Right nostril

1. *Puraka* 2. *Kumbhaka*
Since the breathing is done through only one nostril at a time during puraka and rechaka, the minute ventilation is reduced. Another reason for this is the controlled prolongation of both the phases as per ratio. The amount of air reaching the lungs is restricted while the volume of blood being circulated in the lungs remains unchanged. That is, the ratio between the air and blood volume in the lungs is altered. The gaseous exchange therefore takes place more efficiently.

The awareness is directed towards breathing process, which reduces the perception of the disturbing sensory inputs from the external environment. This helps one to become more sensitive to and conscious of the flow of the air in the beginning and later on of the inner happenings. This will also restore the natural regular rhythm and balance in the nasal cycle phenomenon.

Nostrils are supplied with both sympathetic and parasympathetic branches of autonomic nervous system, which are also related with other autonomic functions of the body as well as the opposite forces working with mental, emotional and psychological activities of the individual. It is also related to right and left hemispheric activity and the autonomic control on the endocrinal functions.

During the practice of this pranayama the cortical activity in relation with the intellect analysis, ego, consciousness and the thought processes is greatly reduced to a minimal.
It therefore appears that the rhythmic and proportionate as well as consciously controlled breathing through two nostrils alternately, brings about a harmony in the two oppositely working neural activities and establishes the balance in them.

It brings tranquility and peace to the mind making it more balanced and stable. The soothing effect of this Pranayama on the nervous system reduces various emotional tensions and one feels relaxed and light. This will have a bearing upon the emotional behaviour of the individual if one practices it for a long period. Calmness and mental relaxation are easily felt immediately after the practice of Pranayama, this Pranayama has also been reported to improve the function of digestion and sleep.

Thus anulom vilom pranayama is conducive to the development of proper inner awareness that will help one to perceive special sensory inputs from the interoceptors in the spinal area starting from the sacral region in higher practices. It purifies (sets right or corrects) all the neural functions and therefore it is essentially practiced before other Pranayamas.

Seetkari Pranayama

In Seetkari Pranayama the sound “see” or “seet” is made during inhalation. The Sanskrit word “kari” means that which produces. The practice produces the sound “see” and it also produces coolness.
Technique

1. Sit in a comfortable meditative posture with an erect spine. Exhale from both the nostrils.

2. Fold the tongue backwards and press the tip of the tongue by the hard palate leaving narrow openings on either side of the tongue. Inhale through these side openings making a hissing sound.

3. Allow the breath to be stopped with ease.

4. Exhale slowly and continuously through both the nostrils.

5. Then allow the breath to stop with ease and release.

This Pranayama has a cooling effect. When the air enters through the mouth, it cools the tongue and lowers the temperature of the blood leaving the lungs and thus of the whole body. Heat produced in the lower energy centers particularly those connected to the reproductive and excretory organs are reduced. Seetkari established harmony in the endocrine system and regulates the hormonal secretions of the reproductive organs. When the breath is taken in through the mouth the nerves in the nose, which register the moisture, temperature, ions etc. in the air are not stimulated, though of course the ions and air are nevertheless absorbed into body.

Seetkari makes a person virile and attractive. Passion is the form of heat in the body and mind, which in sensual life is expressed and discharged in the natural way. This results in an energy loss. Through
Seetkari pranayama the mental and emotional inflammation of passion is reduced. Seetkari particularly works on the heat/cold aspect of the body. Control of any two opposite forces in the body/mind leads to control of other aspects of the physical, mental emotional and psychic makeup.

Seetkari eliminates indolence and the need and desire to eat drink and sleep. Through the practice of seetkari pranayama the body and mind can both be brought into a state of harmony and thereafter will become the dominating quality.

Sheetali Pranayama

Sheetali means the “cooling breath” and it also means calm, passionless, unemotional. This practice not only cools and calms the physical body, but also affects the mind in the same way.

Technique

1. Sit in any comfortable meditative posture with an erect spine. Exhale from both the nostrils.
2. Fold up the sides of the partially protruded tongue, so as to form a long narrow tube resembling the beak of a bird. Pressing the lips round the tongue further narrows the passage. Inhale, making a hissing noise and perceive the cooling effect of the air as it passes through the tongue.
3. Allow the breath to be stopped effortlessly. Exhale through both nostrils.
4. Then allow the breath to be held comfortably before the next inhalation. The benefits of sheetali and sheetkari are basically the same. These two practices are unique because inhalation is done through mouth. When you breathe through the teeth or tongue the air is cooled by the saliva and this cools the blood vessels in the mouth, throat and lungs. In turn the stomach, liver and whole body are cooled. Because sheetali and sheetkari soothe away mental tension, they are useful techniques for alleviating psychosomatic diseases. They also purify the blood and improve digestion.

There is only slight difference between sheetkari and sheetali. In sheetkari awareness is focused on the hissing sound, and in sheetali it is kept on the cooling sensation of the breath. There are also minor differences, which affect different parts of the nervous system but ultimately, the impulses are sent to the central nervous system and brain.

Bhramari Pranayama

*Bhramari* “the humming bee’ Pranayama is so called, because the sound made during respiration imitates that of a black bee.

*Technique*

1. Sit erect in *Padmasana*
2. Breathe in through both the nostrils in such a way that a
fine sound like the one produced by the male bee is heard.

3. Allow the breath to stop effortlessly.
4. Slowly exhale while producing a sound from the mouth and nose, so as to produce a sweet, musical humming sound like a female bee.
5. Hold the breath.

**Bhramari** helps to awaken psychic sensitivity and awareness of subtle vibrations. The sound produced in *bhramari* is very soothing and thus the practice relieves mental tension and anxiety and helps in reducing the anger.

**Chandranulom Pranayama**

In *Hathayoga* literature *surya* means right and *chandra* means left. Here the inhalation and exhalation are through left nostril (*chandra nadi*) only. Right nostril is kept closed all the time.

**Technique**

1. Sit erect in *padmasana* or *vajrasana* with head, trunk and
spine in a straight line. Close your eyes and exhale completely.

2. Inhale through left nostril slowly and steadily without making any sound.

3. Exhale slowly, continuously and silently.

4. Have inhalation and exhalation for the same duration. During exhalation the chest goes down and the abdomen is taken in. Both the chest and abdomen expand during inhalation rhythmically.

5. There is no holding of the breath.

6. One can have about 10 to 15 rounds to start with and can go up to 30 rounds.

7. One inhalation and one exhalation means one round.

8. One must practice at least 3 months to perceive the benefits.

9. The whole practice is to be done in a very relaxed manner with least exhaustion.