

CRITICAL AND ANATOMICAL UNDERSTANDING OF THE CONCEPT NASA HI SHIRASO DWARAM

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ABSTRACT

“*Nasa hi Shiraso dwaram*” signifies importance of *Nasa* as route to *Shiras* which is *uttamangiya sharira*. Reckoning back, *Garuda Purana* also states different characteristic features pertaining to the organ *Nasa*. It is one of the important *Gnyanendriya* among five, for the sensation of smell which is landmark of ‘odour of sanctity’ and is cosmetologically important. In the classical literature of *Sushruta Samhita*, the remedial procedure has been stated which helps the organ to acquire desired shape and reposition it for normal functioning in case of fracture or deviation known as *Sandhana karma*. As an organ of respiration, it extends its support for survival of human beings right from birth to last breath. Being located in *Shiro bhaga* it extends its connection to other sense organs and the higher centre i.e. brain. As one of the *Bahirmukha Srotas* it serves as route of spread of infection and also to expel the *Nasa*

mala. The modern texts equally emphasise this fundamental fact and the virus of poliomyelitis enter through this route to cause the infection in central nervous system leading to fatal conditions such as meningitis, encephalitis etc. The other important aspect as a gate way to *Shiras* is explained in *Ayurvedic* classics through the concept of *Nasya* (*Shirovirechana karma*) in which the medicine is administered through *Nasa* reaches the *Sringataka Sira marma* (Cavernous sinus) through nasal mucosa and nasal veins, and clarifies the *doshas*. Hence this article aims at understanding the concept by being the gateway to *Shiras*.

INTRODUCTION

Etymological derivation.

□ □ □ ^[4]

Its *Stree linga Shabda*, नासिका

समानार्थकः घ्राण, गन्धवहा, घोणा, नासा, नासिका

Indriya Pancha Panchaka^[2]

- Gyanendriya- Ghranendriya
- Indriyarthā- Gandha
- Indriyadravya- Prithvi
- Indriya Buddhi -Gandha jnana
- Indriya Adhithana- Nasa.

शिरस्³ –

Its *Napunsaka linga*, शिखरम्

समानार्थकः उत्तमाङ्ग, शिरस्, शीर्ष, मूर्धन्, मस्तक, कम्, वराङ्ग

Description of NASA and SHIRAS in the classics of Ayurveda

NASA

Nasa is about 4 *angula* in *pramana*, the transverse diameter of the internal surface of the *nasaputa* is *threetyamsha anguli* (1/3rd of finger) and according to others the transverse diameter of *nasaputa* is 2/3 *angula*.^[4] There are 2 *Peshi*, 24 *Sira* and 2 *Dhamani* in *Nasa*.^[5] The synonyms according to *Rajanighantu* are *ghrana*, *gandhavaha*, *shringini*, *nasika*.^[6] It is predominated by *Prithvi Mahabhuta* and its function is to perceive *gandha*, the concerned *Buddhi* of this *Indriya* is *ghranendriya buddhi* which decides the differentiation of smell. On the internal surface of both the nasal passages are 2 *Phana marma* and injury to this *marma* leads to loss of sensation of smell. *Sushruta Samhita* states *Shirsha pratyanga Nasa*.^[7] *Acharya Charaka* states the site of *Ghranendriya* is *Nasika*, while defining the sites of *Pancha gnyanendriya* and all of which are produced from the combination of *Satwika* and *Rajasika Ahankar*. The *mala* of *nasika* is called *singhana*. According to *Yoga Shastra* the description of *Nadi Ida* and *Pingala* is described for the right and left nostrils. St. Hildegard of Bingen said “with eyes, the human being perceives his path; with the nose, he understands it”.

An important sense organ for respiration and olfaction and also as per the current discussion for administration of drugs intranasally to cross blood brain barrier and provide major relief rate in neurological disorders.^[8] Made of two symmetric cavities divided by septum along mid sagittal plane lined with a layer of mucosa with total area of both the cavities is 150 cm.^[2]

Nose is the derivative of ectoderm, in the 16th week of intra uterine life nose grossly takes the typical appearance and ossify in 5th month. Nasopharynx develops from a part of foregut, para nasal sinuses from diverticulae originating from lateral nasal wall, nasal septum from globular and maxillary process of both sides.^[9]

Whenever there are accidental injuries, the cerebro spinal fluid leaks out from the nose that have made modern scientists believe the old theoretical facts.

SHIRAS

Shiras, one among *Dasahapranayatana*^[10], which is quoted as *uttamanga* of *shareera* is higher seat for dire organs of the body such as *gnyanendriya* where *Nasa* being one among them. *Murdha*, *murdhni*, *shirsha*, *masthaka*, *munda*, *karoti*, *greevha* *pratyurdhwa* are the synonyms attributed to *shiras*. *Maharshi Kumara Shira Bharadwaja* states the first organ to be evolved in *garbha* is *Shiras*^[11], as it is the substratum for all the essential *Indriya* and as a supportive fact the modern texts also states, it as the controlling and regulating centre of the human body. It is the seat of *Prana vata*, *Alochaka pitta* and *Tarpaka kapha*. In the concept of *Shadanga Shareera*, the sixth part is *Shiras*, while according to some *Acharya* the word *Shirogreeva* implies head and neck.

In modern literature, body division is stated as

1. Upper and lower extremities.
2. Thorax and abdomen.
3. Head and neck.

Based on the above classification, head and neck would fit to be considered as the definite place of *Shiras*.

Going through classical literature, *Shiras* is the seat of *prana* and all *indriya*, description of *Purusha Sooktha* starts with *Shiras*. *Atharva veda* states *Shiras* as *Devakosha*, in *Taittiriya Upanishad* *Shiras* is explained as *Manomaya kosha*. *Yoga shastra* speaks *Shiras* as seat of

Sahasrara chakra, Acharya Bhela quotes *Shiras* as *Shiro hrudaya*. Acharya Vagbhata describes body as *urdhwa moola* and *adaha shaka*^[12], and if the root is destroyed, the plant perishes hence protect *Shiras* from diseases and injuries. Even in our culture while praying and as a mark of respect the head is bowed and for extreme punishment *Shiromundana* was empowered which logically, culturally, and equally prove the utmost importance of *Shiras*.

Having such collective importance on one hand, it is a recognised locative spot for the four major sensory organs i.e. Eyes, Ears, Nose and Tongue respectively. *Nasa* which serves as *dwara* (pathway) to *Shiras* need a clear emphasis and thought about its anatomical and physiological correlation, to prove *Nasya* as the practical evidence of this principle and as by Acharya Charaka *Nasya karma* is the best therapy for *Shiro rogas*.^[13]

THE CONCEPT “NASA HI SHIRASO DWARAM” THROUGH THE LENS OF AYURVEDA

Ayurveda considers Nose as the most direct gateway for *Masthishka* or *Shiras*, medication when instilled through nostrils, believed to reach the *Shringataka Marma* which is a vital anatomical junction, from there the medicine spreads throughout *Murdha*. By the property of drug installed either it nourishes the tissues of brain parenchyma or eliminates the *dosha* from *Uttamanga*.

Nasya in *Ayurveda* is been told as *chikitsa* in disorders such as *Pakshagata*, *Ardita*, *Nidralpata*, *Ardhavabhedaka*, *Shirashula*, *Timira*, *Karnanaada*, *Khalitya*, *Palitya* etc. When keenly looked into above stated disorders they are the disorders where primarily *Uttamanga* and *Gnyanendriya* are involved.

According to Ashtanga Sangraha

नासा हि शिरसो द्वारं तेन तद्व्याप्य हन्ति तान्।

मुञ्जादीषिकामिवोद्धृत्य केवलं मूर्धजं रजः ॥¹⁴

The nose is indeed the gateway to the head. Through this route, the medicine pervades the head and destroys the diseases, just as one would pull out the central stalk (pith) from a blade of *Munja* grass.

This analogy explains that nasal medication doesn't just mask symptoms; it physically "scratches" and extracts deep-seated toxins (*Doshas*) from the brain's recesses.

According to Ashtanga Hridaya

ऊर्ध्वजत्रुशर्वकारेषु शर्विषान्नस्य शर्यते। नासा शिशिरसो द्वारं तेन तद्व्याप्यन्ति तान्॥१॥ (अ.ह-20/1)

According to *Ashtanga Hridaya*, for the treatment of *Urdhwajatrugata Vikara*, *Nasya* is considered as best route for the administration of drug. The nose is indeed the gateway to the head; Through it, it pervades and eliminates them. This verse highlights that *Nasya* therapy is particularly beneficial for *Urdhwajatrugata Vikara* in the body. It indicates the importance of nasal passages as a direct route to the head, through which medicinal substances administered can effectively reach and alleviate these disorders. And He also pronounced *Nasa* as a route to Shiras.^[15]

According to Charaka Samhita

ऊर्ध्वजत्रुविकारेषु विशेषान्नस्यमिष्यते ।

द्वारं हि शिरसो नासा तेन तद्व्याप्य हन्ति तान् ॥¹⁵

For diseases of the supraclavicular region (head and neck), *Nasya* is specifically desired. Since the nose is the gateway to the head, medicine administered there pervades the head and destroys the diseases."

Charaka compares the human body to an inverted tree (*Arvaakshaakhaamupari-mulam*), where the head is the root. Just as you water the roots of a tree to nourish the branches, you administer medicine to the nose to nourish the entire body's sensory and nervous systems.

According to Sushruta

औषधमौषधसिद्धो वा स्नेहो नासिकाभ्यां दीयत इति नस्यम्^{|16}

He further clarifies that the *Shringataka Marma* is a "*Sira Marma*" (vascular junction) where the vessels of the nose, eyes, ears, and tongue meet, validating the nasal passage as a systemic entry point to these organs.

नासिका हि शिरसो द्वारं तस्मिन् प्रणिहितं भेषजं

शृङ्गाटकं मर्म सम्प्राप्य घ्राणश्रोत्राक्षिजिह्वापथः^{|17}

The nose is the gateway to the head. Medicine administered through the nostrils reaches the *Shringataka Marma* and from there spreads through the pathways of the nose, ears, eyes, and tongue."

Sushruta identifies the *Shringataka Marma* (anatomically related to the cavernous sinus and olfactory bulb region) as the "internal distribution centre." The nasal gateway is effective because it connects directly to this vital junction of all cranial nerves.

According to Ashtanga Hridaya

ऊर्ध्वजत्रुविकारेषु विशेषान्नस्यमिष्यते | नासा हि शिरसो द्वारम् तेन तद्व्याप्य हन्ति तान् |¹⁸

The nose is indeed the gateway to the head; through this [route], the medicine pervades [the head] and destroys [the diseases/toxins found there].

According to Sharangadhara

नस्तः कर्म च कुर्वीत शिरोरोगेषु शास्त्रवित् |

यथाक्रमं यथोद्दिष्टं विधिनोक्तं मनीषिभिः ||¹⁹

An expert physician should perform *Nasya Karma* (nasal therapy) for all diseases of the head (*Shiroroga*), following the specific procedures and sequences prescribed by the wise sages.

According to Bhavaprakash

नासायां भवं नस्यम् |²⁰

That which is "born of" or administered through the nose is called *Nasya*.

Bhava Mishra teaches that because the nose is the "root" of the head, nasal medications provide direct nourishment (*Snehana*) and purification (*Sodhana*) to the sensory organs and the brain, treating conditions like hair fall, premature greying, and neurological deficits.

According to Madhava Nidana

While *Madhava Nidana* focuses on diagnosis (*Nidana*) rather than treatment *shlokas*, it categorizes diseases of the head (*Shiroroga*) that necessitate this "gateway" approach.

By identifying conditions like *Ardhavabhedaka* (migraine) and *Suryavarta* (sinusitis-related headache), *Madhava* establishes the pathology that requires the nasal route for effective drug delivery to the head.^[21]

PHYSIOLOGY OF OLFACTION^[22]

Even though it is the least appreciated of our senses, the sense of smell is paradoxically the

most refined. It is a very high perceptive ability; the human being is capable of differentiating up to ten thousand different smells and remembering them. The olfactory nerve ends in the higher centres of brain whereas of other four sense organs must be processed in the thalamus before being directed towards the various zones of the brain. It is the rhinencephalic part of the brain which identifies and deciphers olfactory stimuli, smells from our environment can influence our regulative systems, our energy potential and therefore our entire state of being.

The 40 or so bundles of axons collectively from the left and right olfactory nerves (cranial nerve 1) the olfactory nerves terminate in the brain in paired masses of grey matter called the olfactory bulbs, which are located below the frontal lobes of cerebrum and lateral to the Crista Galli of the Ethmoid bone. Within the olfactory bulbs, the axon terminals of olfactory receptors, the first order neurons form synapses with the dendrites and cell bodies of second order neurons in the olfactory pathway.

Axons of olfactory bulb neurons extend posteriorly form the olfactory tract. These axons project to the lateral olfactory area, which is located at the limbic system and includes some of the amygdala. Because many olfactory tract axons and in the lateral olfactory area, it is probably the primary olfactory area, where conscious awareness of smell begins. Connections to other limbic system regions and to the hypothalamus account for our emotional and memory evoked response to odours. Examples include sexual excitement upon smelling a certain perfume, nausea upon smelling a food that once made you violently ill. Or an odour evoked memory of a childhood experience.

From the lateral olfactory area, pathways also extend to the frontal lobe, both directly and indirectly via the thalamus. An important region for odour identification and discrimination is the orbitofrontal area.

People who suffer damage in this area have difficulty in identifying different odours. Positron emission tomography studies suggest some degree of hemispheric cateralisation. The orbitofrontal area of the right hemisphere exhibits greater activity during olfactory processing.

PHARMACOKINETICS OF INTRANASAL ADMINISTRATION^[23]

It is nothing but nose to brain drug delivery mechanism as per modern literature and

Ayurveda to have clear emphasis on the concept.

Intranasal administration refers to the delivery of drugs through the nasal passages or cavity, facilitating direct absorption through the nasal mucosal membrane into the bloodstream. This route effectively bypasses the gastrointestinal tract and first-pass metabolism in the liver, allowing for a more efficient delivery of therapeutic agents. The advantages of intranasal drug administration include enhanced patient compliance, convenience of use, security, quick action commencement, and minimized systematic exposure. Drugs delivered via the intranasal route are typically cleared more quickly compared to those administered orally. Various dosage forms for intranasal delivery have been developed, including nasal sprays, emulsions, liposomal, suspensions and dry powders. The nasal passages represent the only olfactory areas in direct contact with the external environment, providing a direct and non-invasive access point to the CNS. This route of administration effectively supports systemic drug delivery while circumventing gastrointestinal degradation and hepatic effects commonly associated with oral administration.

The drug delivery pathway through the nasal cavity involves several steps:

First, the drug is carried to the vestibular area, where it is retained in the nasal mucosa. From there, the drug molecules can reach the brain via multiple pathways.

(1) Trigeminal nerve-mediated transport, (2) olfactory nerve-mediated transport, and (3) vesicular and lymphatic transport pathways. The nasal route of administration provides a unique opportunity for direct interaction between the olfactory epithelium, the external environment, and the CNS, allowing for targeted delivery of therapeutic agents to the brain while circumventing the BBB. This targeted intranasal delivery enhances the efficacy of neurotherapeutics, one significant disadvantage is the restricted volume of a drug that can be safely administered due to the relatively small size of the nasal cavity, the surface area is roughly 150 cm^2 , and the total volume is about 20 ml.

Through the modern literature we can understand intranasal drug action under the headings of.

1. Olfactory Pathway (Direct to forebrain).
2. Trigeminal Pathway (Direct to brainstem).
3. Lymphatic and vascular transport.

In modern pharmacology to strengthen this particular aspect of intra nasal route administration, DAVP a synthetic analogue of vasopressin, the hormone of the posterior pituitary gland, is administered by this route (Trans nasal route). The other drugs administered by this route are GnRH and calcitonin. It is important that no poisonous substance be administered by this route as it may reach the brain along with lymphatic channel.

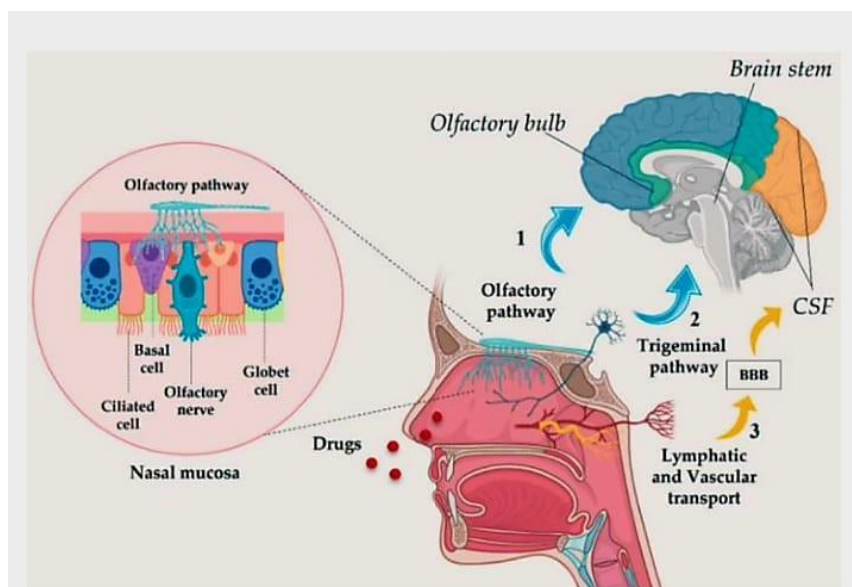


Figure 1: Drug delivery route from the nasal cavity to the brain: (1) through the intracellular route of the olfactory nerve leading to the olfactory bulb, (2) via the intracellular pathway of the trigeminal nerve to the brainstem, (3) through the lymphatic and vascular systems to reach the cerebrospinal fluid across the BBB.

As the statistics of neurological diseases increased in the world, the science faced a challenge to administer the neuroprotective drugs to cross blood brain barrier and the best route they could elicit was nasal route so that drugs non-invasively by pass the blood brain barrier through the above said three pathways.

The other way to understand this nose to brain mechanism is by two pathways, one being intracellular and the other being extracellular. Intracellular pathway starts with endocytosis by olfactory sensory cells, followed by axonal transport to their synaptic clefts in olfactory bulb where the drug is exocytosed. The transsynaptic process is repeated by olfactory neurons, thereby distributing the drug to other brain regions. In the extracellular mechanism, drugs are directly transported into the cerebral spinal fluid by first passing through the paracellular space across the nasal epithelium, then through the perineural space to the

subarachnoid space of the brain.

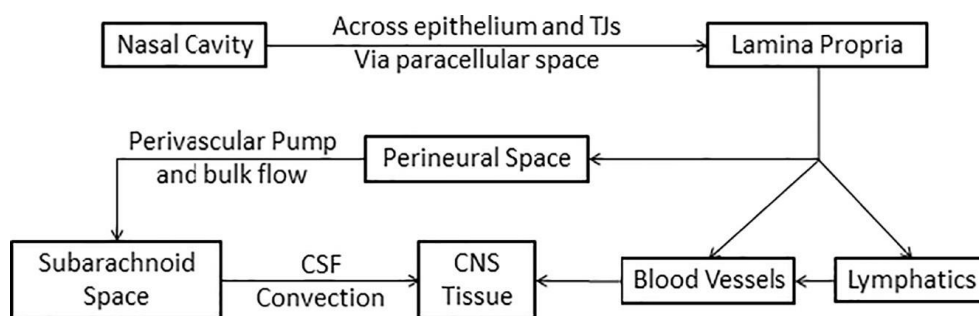


Figure 2. Extracellular mechanism for transportation to the CNS following intranasal administration.

DISCUSSION

Medicine which is administered through *Nasa* travels via *Nasavaha Sira*, *Dhamani* and *Srotas* reaches the *Sringataka Marma*, a vital point which is identified as *Sira Marma* where blood vessels supplying the Nose, Eyes, Ears, and Tongue converge. From this junction the drug spreads into the *Murdha* and reaches the functional centres of *Netra*, *Shrota*, *Kantha* and *Siramukha*. By virtue of its *Virya* it scrapes the morbid *doshas* from the *Shiras* and expels them.

Acharya Charaka stated, "*Nasa Hi Shiraso Dwaram*," meaning that the nose is the gateway to the head. This concept highlights the anatomical and physiological relationship between the nasal cavity and the brain. *Nasya* therapy is believed to facilitate the delivery of medicinal substances to the cranial region, thereby helping eliminate vitiated *Doshas* responsible for various disorders.

The nasal cavity contains specialized olfactory mucosa that lines the upper one-third of the nasal cavity, including the roof formed by the cribriform plate and the adjoining medial and lateral walls up to the level of the superior nasal concha. Unlike the respiratory mucosa, the olfactory mucosa is thinner, less vascular, and contains specialized bipolar olfactory receptor neurons. These receptors, located in the olfactory area beneath the cribriform plate of the ethmoid bone, possess olfactory cilia that detect odorant molecules and transmit impulses through the olfactory nerve.

The olfactory nerve fibres pass through the sieve-like foramina of the cribriform plate to reach the olfactory bulb within the anterior cranial fossa, where they synapse with mitral and

tufted cells in specialized structures called olfactory glomeruli. Axons from these cells form the olfactory tract, which projects to the primary olfactory cortex, including the anterior perforated substance, piriform cortex, and periamygdaloid region. Further transmission occurs to the secondary olfactory cortex (entorhinal cortex) located in the uncus and anterior part of the Para hippocampal gyrus, followed by the tertiary olfactory cortex in the orbitofrontal region, where conscious perception of smell occurs.^[24]

CONCLUSION

Acharya Charaka has aptly stated, "*Nasa Hi Shiraso Dwaram*", emphasizing that the nose serves as the gateway to the head. This fundamental Ayurvedic principle forms the basis of *Nasya Karma*, one of the five principal procedures of *Panchakarma*, specifically indicated for the prevention and management of *Urdhvajatrugata Vikara* (disorders affecting the region above the clavicle). The unique anatomical relationship between the nasal cavity and the central nervous system supports the classical concept that the nasal route provides direct access to the cranial structures.

The therapeutic efficacy of *Nasya* can be understood through its two broad classifications: *Shodhana Nasya*, which facilitates the elimination of aggravated *Doshas* and purification of the head region, and *Shamana Nasya*, which pacifies vitiated *Doshas* and alleviates disease symptoms. Depending on the disease condition and therapeutic objective, these procedures help restore the physiological balance of the head and neck region.

Modern anatomical and physiological evidence further substantiates the Ayurvedic concept of *Nasa Hi Shiraso Dwaram*. The presence of the olfactory epithelium, its close association with the cribriform plate, and the direct neuronal connections to the olfactory bulb and higher cortical centres provide a plausible pathway for the transport of therapeutic agents from the nasal cavity to the brain, bypassing the blood-brain barrier. This nose-to-brain pathway has gained increasing attention in contemporary medicine as a promising route for targeted drug delivery to the central nervous system.

Thus, *Nasya Karma* plays a significant role in the management of both *Sthanika* (local) and *Sarvadaihika* (systemic) disorders. The convergence of classical Ayurvedic wisdom with modern scientific understanding reinforces the relevance of *Nasya* as an effective therapeutic modality and validates the timeless principle of "*Nasa Hi Shiraso Dwaram*" in the context of present-day clinical practice and research.

The formulation of antipsychotic drugs for intranasal delivery holds significant potential for enhancing pharmacokinetic profiles and improving the pharmacologic al efficacy of these medications, ultimately leading to increased patient compliance. By utilizing the intranasal route, antipsychotic formulations can leverage various advanced DDS, including liposomes, nanoparticles, Nano gel, and other Nano carriers. These innovative approaches can facilitate more effective drug transport through the nasal cavity.

As neurological diseases are increasing in present era, there are many evidences and research works conducted at a very scientific level that prove drugs when administered through nasal cavity gets transported to brain crossing the blood brain barrier as molecules of the drug instilled in nasal cavity reaches the brain parenchyma through lymphatic's, vessels, olfactory and trigeminal nerve and disperse throughout the brain.

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