

HYPOTHETICAL EVALUATION OF ACTION OF NASYA ON CENTRAL NERVOUS SYSTEM

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ABSTRACT

From ancient period like period of charak samhita, different routes for drug administration were in practice. In ayurved classics, different routes such as oral, rectal, nasal etc. are described for drug administration as well as shodhan also. Main purpose behind description of various routes is either administration of drug or removal of doshas from nearest site. Nasya is nothing but route of drug administration. Nasya means administration of medicine through nose. According to charak samhita, nasya is the best treatment for shirorogas. As nose is gateway for shir (head), medicine administered through it occupies various parts of the head and removes morbid doshas adherent to it. It not only removes doshas but also gives strength to organs, channels etc. in the head so useful in healthy conditions also. With mass of only 2 kg. (3% of total body weight) nervous system is one of the smallest yet complex systems. It has two main subdivisions – central nervous system (C.N.S.) and peripheral nervous system (P.N.S.). C.N.S. consists of the brain and the spinal cord. It plays very vital role in maintaining the health. C.N.S. is protected by two barriers namely blood brain barrier (B.B.B.) and blood C.S.F. barrier. But these barriers are major problem in treating C.N.S. disorders. These barriers hinder entry of drug molecule into the brain. They allow only specific molecules to enter the brain tissue. So treatment targeting towards brain is main hurdle in C.N.S. disorders. To overcome this problem nasal route for drug administration is preferred by modern medicine also which in other words is nasya. Nasal route is easily accessible and efficient route. So here review is presented about action of nasya on C.N.S. according to ayurved and modern science.

Keywords- Nasya, central nervous system, absorption and action of drug given as nasya.

INTRODUCTION

Ayurved emphasizes on maintaining health rather than treating diseases. So many *upakramas* mentioned in ayurved are useful for maintaining health as well as treating the diseases. One of these *upakramas* is *nasya*. *Nasya* means medication through nostrils. Drug administered through nasal route is called as *nasya*¹. Though ayurved is very ancient science, at that time also routes for drug administration other than oral were in practice. Nasal route, parental route, topical (skin, cornea)

etc. were well practiced for drug administration.

Nasya is specifically designed route for *shirorogas*². It has very significant role on diseases of *murdha*, *netra*, *shrotra*, *kantha*, etc. It has many types according to its role e.g. *shodhan nasya*, *shaman nasya* and *bruhan nasya* etc³. *Acharya charak* also explained types of *nasya* according part of drug used. Eg. *Patra nasya*. *Pushpa nasya* etc⁴.

Central nervous system is subdivision of complex nervous system. It consists of the brain and spinal cord. It inte-

grates and correlates many different kinds of sensory information, thoughts, emotions and memories⁵. Thus it plays vital role in maintaining health. Because of its importance, it is protected by many things. Two of them are blood brain barrier and blood C.S.F. barrier. C.N.S. diseases have a great challenge for entry of medicine into brain tissue at present also. The capillary endothelial cells in the brain have tight junctions & lack of large paracellular spaces. Neural tissue with capillaries form blood brain barrier. Blood brain barrier (B.B.B.) protects brain cells from harmful substances and pathogens by preventing passage of many substances from blood to brain tissue⁶. A few water soluble substances cross B.B.B. but proteins and most antibiotic drugs do not pass at all through it. So another consequence of B.B.B.'s efficient protection is that it also prevents passage of drugs for C.N.S. disorders. Blood Brain Barrier hinders entry of maximum drugs into C.N.S. Blood- C.S.F. barrier is present at choroid plexus. It permits certain substances to enter C.S.F. but exclude others. Both these barriers are lipoidal & limit the entry of non lipid soluble drugs. Only lipid soluble drugs therefore able to penetrate & have action on C.N.S.⁷. Overcoming the difficulty of delivering drugs to specific regions of the brain presents a major challenge to the treatment of most brain disorders. In its neuroprotective role BBB hinders the delivery of many potentially important diagnostic & therapeutic agents to the brain. Only a small class of drugs actually crosses BBB. There are only a few diseases of the brain that consistently respond to this category⁸.

Nasal route also allows drugs which do not cross BBB to enter CNS & it eliminates the need for systemic delivery

& thereby reducing unwanted systemic side effects.

ACTION OF NASYA ACCORDING TO AYURVED -

In Charak Samhita, *nasya* is mentioned as best treatment for *shirorogas* because drug introduced through it enters *uttamang* (~brain) and removes morbid *doshas* responsible for diseases⁹. For explaining how *nasya* removes *doshas*, example of *munja* & *ishika* is given in commentary of *chakrapani*. According to *chakrapani*, drug administered as a *nasya* enters into head and draws out exclusively morbid *doshas* as *ishika* is taken out after removing the fibrous coating of *munja* adhered to it¹⁰. *Acharya Gangadhar* gives different opinion in his commentary. He states that *nasya* medicine enters into *shir* and removes *doshas* which are adherent to *majjapeshi*(~brain tissue)¹¹.

In *Sushrut Samhita*, '*mastulungagam*' (passage of brain matter through nose) is symptom mentioned in *atiyoga* (excess activity) of *virechana nasya*¹². It states that *acharya Sushrut* was already aware of the fact of relation between nose and brain.

In *Ashtang Hridaya*, *nasa* is described as gateway (opening) for head. So drug administered through it goes to head and destroys its diseases. So *nasya* is special treatment for *urdhvajatrugat vyadhi*¹³. In *Ashtang sangraha* also, nose is mentioned as entrance gate for head. Medicine introduced through it occupies *shrungatak marma* and all channels of eye, ear, throat and removes morbid *doshas*¹⁴. *Sushrut* has explained *shrungatak marma* as a *sira marma* present in the middle of the confluence of *siras* supplying nourishment to the nose, ears, eyes & tongue.

Action of nasya according to modern – Modern science accepts the concept of close relationship between nose and

brain. So we will see that how drug will absorb and how it will act on C.N.S. according to modern also.

Drug transport through nasal route –

1) Through nasal mucosa (Diffusion Method) -

The nasal cavity is covered by a thin mucosa which is well vascularized. A drug molecule can therefore quickly be transferred across the single epithelial cell layer directly to the systemic blood circulation without first pass hepatic & intestinal metabolism¹⁵.

Drug absorption through mucosal surface is generally efficient because stratum corneum epidermis, the major barrier to the absorption across the skin is absent in nasal cavity.

Lipid soluble drugs diffuse by dissolving in lipoidal matrix of membrane. A more lipid soluble drug attains higher concentration in the membrane & diffuses quickly¹⁶. Drops spread more extensively than spray¹⁷. Three drops cover most of walls of nasal cavity with patient in a supine position & head tilted back¹⁸. Small unchanged particles easily pass through this layer by following processes.

a) Paracellular transport – It is aqueous route of transport. It is slow, passive & only useful for drugs with low molecular weight.

b) Transcellular process – Transport through lipoidal route, only for lipophilic drugs.

c) Drugs also cross cell membrane by an active transport route through the openings of tight junctions.

2) Vascular Pathway –

The nasal tissue is highly vascularized making it an attractive site for rapid & efficient systemic absorption. Rich vascular plexus permits topically administered drugs to rapidly achieve effective blood levels while avoiding intravenous catheters¹⁹.

If blood flow to the nasal mucosa is poor, absorption of drug will be poor²⁰. Lipid soluble drugs pass readily across the whole surface of capillary endothelium. Capillaries having large paracellular spaces do not obstruct absorption of even large lipid in soluble molecules or ions²¹. Application of heat & muscular exercise accelerates drug absorption by increasing blood flow²².

Vascular path transportation is possible through the pooling of nasal venous blood into the facial vein. It occurs naturally. The facial vein has no valves. It communicates freely with the intracranial circulation. It communicates through pterygoid plexus with the cavernous venous sinus²³.

Such pooling of blood from nasal veins to venous sinuses of the brain is more likely to occur in head lowering position due to gravity, the absorption of drug into meninges & related intracranial organ.

3) Neurological Pathway –

If drug administered through nose contacts the olfactory mucosa, there are good evidences that suggest molecule transport can occur directly across this tissue & into CSF. Olfactory mucosa is located in the upper nasal cavity, just below the cribriform plate of the skull. It contains olfactory cells which transverse the cribriform plate & extend up into the cranial cavity²⁴. When medication molecules come in contact with specialized mucosa, they are rapidly transported directly into the brain, skipping BBB & achieving very rapid CSF levels. Major divisions of olfactory tract leads directly to a portion of the amygdale called corticomedial nuclei that lie immediately beneath the cortex in the pyriform area of the temporal lobe²⁵.

The olfactory nerves differ from other cranial nerves in its close relation with the brain. The olfactory nerves are

connected with the higher centers of brain. i.e. limbic system, consisting mainly of amygdaloidal complex, hypothalamus, epithalamus, anterior thalamic nuclei parts of basal ganglia etc²⁶. So the drugs administered here stimulate the higher centers of brain which shows action on regulation of endocrine and nervous system functions.

There are three mechanisms underlying the direct nose to brain drug delivery – one is intracellular transport mediated route & two extracellular transport mediated routes. Intracellular transport mediated route is a relatively slow process, taking hours for intranasally administered substances to reach the olfactory bulb.

In first extracellular transport mediated route, drug could first cross the gap between the olfactory neurons in the olfactory epithelium which are subsequently transported into olfactory bulb. In second route, drug may be transported along the trigeminal nerve to bypass BBB. After reaching the olfactory bulb of trigeminal region, the drug may enter into other regions of brain by diffusion.

DISCUSSION:

Direct entry of medicine into C.N.S.- According to *ayurved*, nose is gateway for head. Drugs administered through nose spreads over *shrungatak marma* as well as channels within head, nose, eye, throat and removes the morbid doshas. Thus nasya is the best treatment for *shirorogas* as it goes faster to target organ and also it bypass the first metabolism.

As discussed earlier, close relationship between nose and brain is also accepted by modern science. Anatomical & physiological study of nose shows that nasal mucosa (olfactory mucosa) is the only site which directly connects brain & external environment. Drug administered through nose gets absorbed through three ways – 1) through nasal mucosa, 2)

through vascular path and 3) through neural pathway. By these routes drug have direct entry into C.N.S. and hence bypass the BBB which is the major drawback in treating nervous diseases.

Lipid form of medicine facilitates drug absorption- Maximum kalpas used for *nasya* are prepared in lipid base. This facilitates the absorption of medicine through mucous membrane and capillaries. According to pharmaceutical research, lipid soluble drugs diffuse by dissolving in lipid matrix of membrane. A more lipid soluble drug attains higher concentration in the membrane and diffuses quickly. Lipid soluble drugs pass readily across the whole surface of the capillary endothelium.

Effect of position of patient on drug absorption- In *ayurved*, position of patient is given as supine with head tilted. Due to this position, drug molecules come in contact with olfactory mucosa which is the pathway for medicine. This is also proved by pharmacological studies.

Surface area for drug absorption- Larger the surface area more will be absorption. Arrangement of conchae and meatuses increases surface area in internal nose. Ideally drug doses should be divided in half and each nostril receives half the dose, which doubles the surface area. This is the same as described in *ayurved* classics.

Effect of form of medicine- Administration of medicine is described in the form of drops. Current studies indicate that drops spread more extensively than spray, powder etc.

Effect of paschat karma- According to *ayurved*, after giving nasya patient should receive *tapasweda*, *mardan*, *dhum* and *kawal*. It increases efficacy of the treatment as well as removes remaining doshas. Modern studies also proved that application of heat and muscular exercise accele-

rates drug absorption through vascular path by increasing blood flow.

Experimental studies- Injection of dyes in the ventricles of rabbits & monkeys showed that the CSF is drained via the olfactory neurons into olfactory neurons originating from the olfactory bulb; connect the brain with nasal cavity by penetrating the cribriform plate, which brings the neurons into the nasal mucosa. This coined the idea that this transport route could also exist in the opposite direction which would imply direct access from the nasal cavity to the brain thus circumventing the BBB.

CONCLUSION

From above discussion it is clear that, *nasya* is the best treatment for CNS diseases as well as for maintaining its health. Method is safe, convenient and painless and does not require excess sterile techniques. Nasal cavity's easily accessible rich vascular plexus permits direct entry of topically administered drugs directly into blood stream and avoids gastrointestinal destruction as well as hepatic first pass metabolism. The neural connections between the nasal mucosa & brain provide a unique pathway for non-invasive delivery of therapeutic agents to the CNS. The high permeability, high vasculature & low enzymatic environment of nasal cavity are well suitable for systemic delivery of drug molecules via nose. Thus relevancy of '*nasya hi shiraso dwaram*' can be proved which ultimately explains action of *nasya* on central nervous system.

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