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# Routes of Drug Administration: An Ayurvedic Approach

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## ABSTRACT

Main aim of treatment is to cure the disease and restore the health. In Pharmacology safety and efficacy are the basic parameters for all concerns. For that matter the maximum amount of the drug should be available at the site of action but with least systemic side effects, which depends upon the apt choice of the route of administration of the drug. Different routes such as oral routes, nasal route, dermal route, urethral, vaginal, rectal routes have been practiced since ancient times depending upon the site of morbid *dosha*, disease, patient condition and pharmaceutical preparation to be administered. Each route has its own advantages and disadvantages. It is not enough to know only one route, as different routes have to be chosen under different circumstances. Here an attempt has been made to explain various routes of drug administration as referenced in Ayurveda.

**Key Words** *Routes of administration, Ayurveda, Desha, Dosha, Marga*

## INTRODUCTION

Ayurveda is an ancient science of healing the ailing in a holistic way. Here the drugs are used in a versatile manner and the same drug may be used in a variety of ways. Even the same drug may have different actions when administered through different routes. For example *Eranda taila* has purgative action when administered orally but acts as anti inflammatory and painkiller when applied externally. *Gunja* seed paste applied on the scalp acts as *Keshya*, its seed powder used as *Nasya* relieves headache and is also prescribed orally for contraceptive purposes. External application of *Vidanga* is useful in curing the skin ailments but its internal use is helpful in curing worm

infestation. Thus in classics we come across so many examples where the route of drug administration may generate altogether different action. Also bioavailability varies with the route chosen and it is so chosen that the maximum amount of the drug be available at the site of action but with least systemic side effects. The choice of an appropriate route in a given situation is observed to depend upon a variety of factors. In modern pharmacology drug related factors such as physical and chemical properties of the drug viz solid, liquid, gas, fineness of powder, solubility, stability, pH, lipophilicity; rate and extent of absorption of the drug from different routes etc. as well as patient related factors such as rapidity with which the response is desired (routine treatment or



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emergency), condition of the patient (unconscious, vomiting), site of desired action (localized/generalized), effect of digestive juices and effect of first pass metabolism of the drug are generally considered<sup>1</sup>.

The right route is one of the "Five rights" -the right patient, the right drug, the right time and the right dose, which are generally regarded as standard for safe medication practices<sup>2</sup>.

As per *Charaka* drugs are administered keeping in view of *Desha* (location), *Kala* (time), *Pramana* (dose), *Satmaya* (adaptability), *Asatmya* (non-adaptability)<sup>3</sup> and also *Aushada kalpana* (pharmaceutical preparation) *Bala* (strength) *Agni* (digestive power) *Satva* (mental state) are considered as per the context.

The term *Desha* means location, both in the patient's body and his place of habitation. Out of these the location of vitiated *Dosha* in a patient's body directs the choice of route of drug administration, especially for the local route. For example local ailments by doshas vitiated in oral cavity, eyes, ears, nasal cavity, vagina, anal canal or on the skin directs the choice of local routes of drug administration. As per classics nasal route, oral route, dermal route and rectal route are the prime routes for the administration of the drugs especially for *Panchkarma* therapies. As per the common guidelines indicated for *Panchkarma* therapies (curative treatment), the nearby channels are selected for easy elimination of the vitiated *Dosha* from the body. For example if the vitiated *Dosha* are located in the stomach then drug is administered through mouth, if the vitiated *Dosha*

are located in the head then drug is generally administered through nose and if the vitiated *Dosha* are located in the colon and rectum then drug may be administered through anus. Pre procedures of local *Snehan Swedan* are administered through skin.

Also for the treatment of *Visarpa*, *Pidika* etc. skin diseases located on approachable parts of the body, the local applications of *pradeha*, *pralepa* are done<sup>3</sup>.

There is no clear description available in classics about *Bheshaja paryoga marga* (Routes of drug administration) for the drugs used in palliative treatment but are generally used on similar lines as that of curative treatment. There are references available for various channels of drug administration of various drugs in different conditions.

As per the classical references the main routes of drug administration are:

1. *Mukha marga* (Oral route)
2. *Nasa marga* (Nasal route)
3. *Akshi marga* (Ocular route)
4. *Karna marga* (Otic route)
5. *Twak marga* (Cutaneous route)
6. *Mutra marga* (Urethral route)
7. *Yoni marga* (Vaginal route)
8. *Guda marga* (Rectal route)

### **1. *Mukha marga* (Oral route)**

Here the drug is administered through the mouth. Oral ingestion is the commonest mode of drug administration. This route is preferred for both localized and systemic action of the drug. For



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local action *Gandusha* (Oil pulling/procedure of holding any liquid preparation in the buccal cavity), *Kavala* (procedure of holding oil or liquid preparation in the buccal cavity and moving it briskly), *Pratisarana* (rubbing)<sup>4</sup>, *Dantadhavan*, *Jivha nirlekhana* are employed in the oral cavity and *Amalapittahara* drugs generally exert local action in the stomach. A variety of dosage forms such as *Panchvidha kashaya kalpna*, *Asava*, *Arishta*, *Avleha*, *Vati*, *Churna* are commonly administered through oral route for systemic action. Sometimes *Dhumpana* (Smoking for the therapeutic purposes using a pipe) is also used for systemic action<sup>5</sup>.

This route is the safest, convenient, non-invasive, painless and the cheapest one. But this route has some limitations also, as certain irritant or non palatable drugs cannot be administered by this route. Also it is not suitable for emergencies since the action of the drug is slower and can't be used for an uncooperative/ unconscious/vomiting patient. Moreover, the drug is exposed to first pass metabolism; some drugs are destroyed by digestive juices or in the liver. Therefore all drugs cannot be given through this route.

### 2. *Nasa marga* (Nasal route)

Here the drug is administered through the nose. For the treatment of diseases related to the head, nasal administration is advised because the nose is said to be the gateway of the head. For this purpose the inhalation therapy is given which is of five types: *Navan* (inhalation of drugs in the form of nasal drops), *Avapida* (insufflations of drugs in thin paste/expressed juice form), *Dhmapana*

(insufflations of the drugs in the powder form), *Dhuma* (inhalation of the drug in the form of smoke), *Prati-marsha Nasya* (application of medicated oil in the nostrils)<sup>6</sup> having both systemic and local actions. Due to the large but constricted surface, rich blood supply, thin mucous membrane (5 $\mu$ m) of the nasal cavity drugs are readily absorbed through this route and are transferred quickly into the systemic circulation thus bypassing the liver. *Navan nasya* (oily preparation) is the best amongst all the procedures as the olfactory mucosa has high affinity towards the lipophilic substances by transcellular absorption. It can even be improved by pre procedures of local *Snehana- Swedana*, which cause vasodilatation and thus increase the absorption. The medicaments are administered in supine position with head hanging down the table end so that these may approach the cranium through cribriform plate easily. All the procedures generate their effect by acting on various important vessels and nerves of the area. Increased nasal secretions may hamper the absorption. (For this reason *Nasya* is generally avoided at night hours). So *Prayogic dhmapana* is advocated as pre procedure to control the nasal secretions. In this way this route has always been a very important route in Ayurveda to treat the ailments of local nasal cavity, head and neck and also has a good approach for lungs and bronchi. In modern medicine also apart from the local effects this route has been used for systemic ailments e.g. Calcitonin nasal spray is used to treat bone loss in women with post menopausal osteoporosis.



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But this route has certain drawbacks also such as local irritation may occur, poor patient compliance, *Nasya* therapy given in over dose, in too cold or too hot state may produce side effect like thirst, eructation<sup>7</sup>.

### 3. *Akshi marga* (Ocular route)

Drug is administered through the eyes. Ocular route of administration is generally used for localized action. Different therapeutic procedures that are practised to treat the disorders of the eyes include *Seka*, *Ashchyotana*, *Pindi*, *Vidalaka*, *Tarpana*, *Putpaka* and *Anjana*<sup>8</sup>.

*Seka* is the procedure of pouring thin streams of medicine in liquid form over the closed eye from a height of four *Angula*. The procedure of dropping medicines in liquid form on the eyes from a height of two *Angula* with the eyes kept open is known as *Ashchyotana*. *Pindi* is the procedure of bandaging the paste of herbs on the eyes. *Vidalaka* is a simple smearing of the herbal paste on the skin surface of the eyelids leaving the eyelashes. In *Tarpana* a circular frame (about two *angula* height) of black gram paste is made around the eye and is filled with medicated oil/ghee for 10-15 min. In *Putpaka* the medicine in liquid form is prepared by a special procedure of heating and is then poured and retained over the eyes similar to that in *Tarpana*. *Anjana* is the application of the medicine to the outer or the inner aspect of the eyelid. Medicines in different forms like *Varti* (pill), liquid, powder are used in the form of *Anjana*. The therapeutic efficacy of the *Anjana* in the pill form is said to be maximum, whereas the therapeutic efficacy of the *Anjana* in powdered

form is said to be minimum. *Anjana* may be applied either with a rod or finger. Medicine reaches the eyes with maximum local concentration and effect. But risk to vision and of infection is also there by wrong application of the medicines. Thus there is generally poor patient compliance.

### 4. *Karna marga* (Otic route)

Here the drug is administered through the ear. Otic route is generally used for localized action in the ear and sometimes for head and neck also. Therapies like *Karna dhavan* - irrigation of the external ear with medicated decoction helps to remove impacted wax and heals local injuries, *Karna dhoopana* - fumigation of ear disinfects the external and middle ear, *Karna purana* - filling the external ear with medicated oil prevents and treats the diseases of vitiated *Vata dosha* in the ear, earache and even deafness also. It also helps to relieve headache, the stiffness of the neck and mandible<sup>9</sup>.

The drug administered is absorbed through the mucous membrane of the auditory canal. The oil preparations especially nourish the nerves innervating the area. Since ear being an important and sensitive hearing organ, improperly administered medicine may injure the eardrum or any other consequences may occur.

### 5. *Twak marga* (Cutaneous route)

This route of drug administration through the skin is utilised for both local and systemic actions. Factors affecting drug permeation through skin includes molecular weight of the medicine which is generally preferred less than 500 Dalton for



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cutaneous drug delivery of drug by passive diffusion, pH of the skin which is responsible for regulating permeability of Stratum corneum, hydration of Stratum corneum enhances the bioavailability of the drug but its thickness decreases the absorption of the drug, temperature increases movement of drug to the dermis but decreases the local delivery of the drug and lipid soluble drugs have more permeability through this route<sup>10</sup>. The drug applied over skin penetrates into the epidermis through Stratum corneum which is further transported to systemic circulation via cutaneous circulation and lymphatics.

Dermal drug delivery for localized action includes various types of *Mukhlepa* (topical application of the herbal paste on the face) e.g. *Doshaghana mukhlepa* is efficacious in cleaning the morbidity of *Doshas* located in the face, *Vishaghna mukhlepa* is an anti poisonous *Lepa*, *Varnakara mukhlepa* improves the colour and complexion of the face<sup>11</sup>.

References regarding various medicated powders, pastes (*Lepa*, *Aalepa*, *Parlepa*, *Pardeha* etc.) oils, decoctions etc. are available as per the context for varied local actions of healing, cooling, heating, lubricating, disinfecting etc.

Apart from local action, dermal drug delivery for systemic actions is unique in Ayurveda. Therapies like *Snehan* (oleation), *Swedan* (foementation/Sudation therapy), *Abhyanga* (gentle oil massage in specific direction), *Sanvahana* (pleasurable form of massaging by squeezing the muscles of the lower extremities)<sup>12</sup>, *Sharira parimarjana* (sponging)<sup>13</sup>, *Udvardana*

(massage by medicated pastes) alleviates *Vata*, dissolves *Kapha* and *Medas* makes the body part firm. *Udhgharshana* (rubbing with dry powder) is known to cure itching, allergic skin rashes; *Utasadana* (gentle massage with oil and powdered herbs) makes the features of the body of the women graceful, feeling of lightness and cleanliness. Local rubbing of powder drugs dilate the vessels and stimulate *Bhrajaka agni* situated in the skin<sup>14</sup>. *Mardana* (oil massage with pressure) are used purposefully for local or systemic action.

Dermal route is a convenient and encouraging route for patients; maximum drug can be administered at the site of action with least systemic adverse effects and drug interactions. But cutaneous route has poor absorption of ionic drugs and also not suitable for drugs having large molecular size.

### 6. *Mutra marga* (Urethral route)

It is an exceptional drug route used in Ayurveda since time immemorial. This route is generally preferred for localized action therapies such as *Uttara basti* (urethral douche) - administration of medicines through urethral passage in both the sexes and in females *Uttara basti* can be given through vaginal route also. In male patient the liquid drug is advised to be released in the urethral part of erected phallus (*Hrishta medra*)<sup>15</sup> as blood circulation is good in the spongy area which may drain the drug to the circulation. *Uttara basti* cures the impurities of semen, menstrual disorders, diseases of vagina, retained placenta, gravel disease, bladder stone and the diseases of bladder in respective gender<sup>16</sup>. Advantage of this route is



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that it is non invasive, OPD procedure but poor patient compliance as it may be an embarrassing procedure for someone.

### 7. *Yoni marga* (Vaginal route)

Here the drug is administered through the vagina. This route mainly targets gynaecological disorders through localized action of the drugs. Therapies like *Yoni varti* (Vaginal wick) of the circumference of an index finger is prepared of powdered drugs mixed with some adhesive material, intended to be kept in the genital tract for a short duration and followed by vaginal washing with lukewarm water<sup>17</sup>. It is equivalent to pessaries used in contemporary medical science. *Yoni dhawan* (Vaginal douche) -washing of the vaginal canal with decoctions<sup>18</sup>. *Yoni pichu* (Tampon) -a sterile cloth dipped in the medicated oil, is kept in the vagina for a specific period<sup>19</sup>. *Yoni dhupan* (Fumigation of the vaginal tract with medicated smoke)- fumes of the drugs having *Katu, Tikta, Ushana* properties and volatile oils enter into the minute, deeper units of genital tract tissues and disinfect them. And they also dilate the blood vessels of the vaginal tract<sup>20</sup>. *Yoni purana* is a procedure in which vaginal cavity is filled with the paste of drugs<sup>21</sup>.

Dense network of blood vessels present in the vagina makes it an excellent route for absorbing therapeutic constituents from various options of vaginal preparations to deal local ailments of female genital tract with least systemic side effects. But there may be poor patient compliance due to embarrassing procedure and mucosal irritation.

### 8. *Guda marga* (Rectal route)

Here the drug is administered through the rectal route producing both localized and systemic effects in the body. Therapies such as *Gudavarti* (rectal suppository) produce localized action in the anus. It is composed of drugs with *Ushana* and *Teekshana* properties which facilitate the expulsion of *Vata* and accumulated faecal matter. *Basti* therapy in Ayurveda is unique and is said to be the best to cure systemic *Vaatik* diseases. *Anuvasan basti* which predominantly contains oil soluble lipophilic constituents of medicinal herbs dispensed in *Sneha* or oil base, get easily absorbed by simple diffusion/transcellular transportation from enteral mucous membrane, whereas water soluble components in the decoction form of *Asthapan basti* get absorbed by filtration/intracellular transportation. Both types of *Basti* are generally given alternatively to avoid saturation of the mucous membrane for absorbing either type of components. *Basti* in Ayurveda is said to control almost all the diseases and no therapeutic measure other than *Basti*, cleanses the body as quickly and easily as *Basti* does. It causes depletion of *Dosha* and nourishment of *Dhatu* instantaneously and simultaneously and is free from any adverse effects<sup>22</sup>.

Advantages of drug administration through rectal route are that it can even be given to vomiting patient, irritant drugs which cannot be given orally can be given through this route as a OPD procedure and about 50% of the medicine bypasses the liver. But the procedure needs



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assistance and technique, otherwise local injury may occur. Also the patient may feel embarrassed.

### DISCUSSION

Route of drug administration affects the rate of onset of action, bioavailability of the drug in general circulation and at the target site and thus affects the magnitude of the therapeutic response. Broadly drugs are administered into the body through local routes and systemic routes. Drugs administered through *Akshi marga*, *Karna marga*, *Mutra marga*, *Yoni marga* generally exert local actions whereas drugs administered through *Mukha marga*, *Nasa marga*, *Twak marga*, *Guda marga* have both systemic and local actions. Route of drug administration is selected based on the physico-chemical and pharmacological properties of the drugs, site of action needed and properties of different pharmaceutical preparations such as tablet, *Swaras*, powder, oil, fumes, decoctions, paste etc. Sometimes special preparations of same drugs are prepared for administration through a particular route for better availability and action. This clearly indicates the scientifically developed logics behind the selection of route of drug administration in Ayurvedic science.

### CONCLUSION

Understanding the routes of drug administration will help the physician for assuring maximum therapeutic effects of the drug in shorter duration, maximum availability at site of action with minimum adverse effects. Parenteral route is not much practiced in Ayurveda due to holistic

approach. Ayurveda considers treating the man as a whole and giving the drug as a whole due to which larger molecular size of the drug does not permit the absorption of the drugs through parenteral route. So, attempts must be made by the researchers to develop such preparations suitable for this route also so that Ayurveda can play its significant role in treating emergency conditions as well.



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