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Anatomical view of administration route of *Murdha Taila*

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ABSTRACT

The basic concept of Ayurveda is to maintain people's health through disease prevention and treatment. Ancient Ayurvedic scholars have given due importance to various forms and routes of administration of medicine through the nearest route as per convenience to get the speedy results. *Murdha Tailam* in *Panchakarma* treatment is one of the most effective methods to deal with the different types of disease related to *Urdwajatru*. *Murdha Tailam* includes *Shiro Pichu*, *Shiroabhyanga*, *Shiro Lepa* and *Shirovasti*. According to modern science anatomical peculiarities of scalp play a key role in facilitating the absorption of the drug administered through scalp. This route is also important as it is the nearest route for the diseases of head and neck. The different procedures adopted via scalp also help to stimulate the CNS, activate the functions of thalamus, used in trichological, dermatological disorders and diseases of head and neck, psychosomatic diseases. According to Ayurveda in poisoned conditions also scalp route is used as one of the drug administration route. This article deals with a review on anatomical view of administration route of *Murdha Taila* i.e., scalp as a route of drug absorption.

Key words: *Murdha Taila*, *Shiropichu*, *Shirovasti*, *Scalp*, *Transcranium*

INTRODUCTION

Among the various modes of administration of medicines, *Ayurveda* has adopted scalp as a route of administration of medicines in the form of modalities like *Shiroabhyanga* (massaging the head with oil), *Shirodhara* (pouring medicated oil from a distance), *Shiropichu* (keeping an oil soaked cloth), *Shirovasti* (oil is held on the head), *Shirolepanam* (application of medicated paste), *Shiropanaha* (bandaging), *Shirovyadhan* (venipuncture) etc. *Murdha Tailam* in *Panchakarma* treatment is one of the most effective

methods to deal with the different types of disease related to *Urdwajatru*. *Murdha Tailam* includes *Shiro Pichu*, *Shiroabhyanga*, *Shiro Lepa* and *Shirovasti*. *Shiras* is considered as the governing center of the body as it controls all activities. In a healthy living organism, *Ayurveda* postulates the unique principle of *Dosha*, *Dhatu*, and *Mala* harmony.^[1] The administration of the drug through scalp are indicated in trichological abnormalities like premature falling and graying of hair, they are also applicable in *Vata Vyadhi* as well as diseases of head, neck, nose, eyes etc. and even the *Manasika Vyadhi*. It is also indicated in life threatening conditions due to poisoning. This probably indicates that the action of these modalities is not limited to localized entities but it acts on systemic diseases also. As *Murdhataila* is effective in *Trichological* abnormalities, *Urdvajathrugata Vikara*, *Vatavyadi* and *Manasika Vyadi*, need to be studied scientifically to investigate its mode of action. The platform being the scalp which has some peculiarities, these peculiarities may help in better absorption and action.

Head is considered as the governing center of the body where *prana* (life) with sensory organs resides.^[2] It is

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also considered one among the *Trimarma* (three vital spots).^[3] Out of 107 *Marma* 37 *Marma* are located in *Shiras*. *Shiras* is also considered as the *Adhishtana* (seat) of *Mana*^[4] (mind), *Buddhi* (intelligence). *Charaka* considers *Shiras* as the abode of the *Indriyas* and *Indriya Pranavaha Srotas*.^[5] So among all organs of the body *Shirahs* (head) is given prime importance and called as *Uthamanga*.^[6]

Different Mode of administration of medicine through the Scalp (*Shiras*)

a) *Murdha Taila*

Administration of *Sneha* (oil) in pure or medicated form through the scalp for fixed time duration is called *Murdhataila*. It is a type of *Bahyasneha* (external oleation therapy). This *Bahyasneha* is of four types. These are *Shiroabhyanga*, *Shiroseka*, *Shiropichu*, and *Shirobasti*.^[7] *Abhyanga* refers to massaging the head with oil. It provides a cooling effect on the head. It is indicated in the dryness of the scalp, itching and to remove dirt from the scalp.^[8] *Shiroseka* is the procedure of pouring oil on the head from a particular height with specific pressure and duration. It is indicated in diseases like *Arunshika* (multiple eruptions on the scalp), severe headache, burning sensation, suppuration as well as any wound on the scalp.^[9] *Pichu* is keeping an oil-soaked cloth in *Shiropadesha* for some duration. It is indicated for hair loss, and dryness of scalp and *Netrastambha* (steadiness of eyes).^[10] In *Shirobasti*, oil is held on the head till secretion appears in the mouth and nose.^[10] *Shirobasti* is useful in loss of sensation, Bell's Palsy, sleeplessness, dryness of nose and mouth, Blindness, and severe *Shirorogas*.^[11] For a healthy person to maintain his health, *Shirobasti* is indicated up to 1000 *Matra* (approximately 5-6 minutes) while 10000, 8000 and 6000 *Matra Kala* are for *Vataja*, *Pittaja*, *Kaphaja* diseases respectively.^[12] Among these four types, the former is more effective than the previous.^[13] It means that more the time the oil remains in contact with the scalp, its efficacy to pacify the vitiated *Doshas* increases. Depending on the conditions, *Takra* (buttermilk) or *Ksheera* (milk) are also used instead of oil. *Charaka* has recommended *Shirodhara* and *Shirolepa* with the help of *Sheeta* drugs

in *Pittaja Shirorogas*. He also asks to make paste using milk and use it in the form of *Pradeha* (thick application) or decoction made out of all drugs that can be used for *Shirodhara*.^[14] In the case of *Kaphaja Shiroroga* along with other modalities, he has asked to use *Pralep* with *Kaphahara* drugs.^[15]

Charaka and *Sushruta* suggests to do *Parisheka* and *Lepa* in deadly *Shankhaka Roga* (one type of headache).^[16] Similarly in case of *Ardhavybedak* (one type of headache), *Shirobasti*.^[17] and in the case concerning *Suryavartaka Shirodhara* (one type of headache)^[18] also it is indicated. *Bhavamishra* directs to utilize *Shirobasti* in the case of *Shirograha* (stiffness of head).^[19] The practice of *Murdhataila* also prevents headache, baldness, cracking of the skin of the scalp, falling, and primitive graying of hair. It may perk up the glow and complexion of the face and provides calmness of mind. and clarity to sense organs. It also gives strength to the voice, lower jaw, and head.^[20] It is advised in disorders like insomnia, anxiety, depression, etc., as it induces good sleep, promotes relaxation, relieves fatigue, and recreates the body and mind.

b) *Kakapada Chikitsa*

In the case of last *Visha Vega* (different stages of poisoning) which is life-threatening and hence to save the life *Acharyas* have asked to take multiple incisions on the scalp as if a crow footprint and to keep blood dried flesh and other medicines on it.^[21] *Acharya Charaka* says if the *Kapha Marga* gets obstructed due to any kind of toxin then one needs to make incisions on head of the person in the form of crow footprint and apply *Bilwa* and *Charmakasha Lepa* (paste) on that and to place the flesh of ewe/cow/buffalo/roaster, anyone among these to absorb the toxins from the blood. The piece of the flesh has to be repeatedly replaced with a new one. Similarly *Lepa* also has to be changed.^[22]

c) *Rasa Chikitsa*

In *Rasa Chikitsa* there are references which directs the administration of *Suchimukhi Rasa* through the *Brahmarandhra* on the scalp in *Gunja Pramana* (of the size of a rosary pea) with the help of a needle. This medicine is indicated in the case of Tetany, cold extremities, and unconscious status.^[23]

METHODOLOGY

The information related to the *Murdha Taila*, *Shiras*, *Twak*, *Anatomy* and *Physiology of Scalp and Scalp appendages* were compiled from the various texts of *Ayurveda - Charak Samhita, Sushruta Samhita, Ashtanga Hridaya, Ashtanga Sangraha*, Modern text books of *Anatomy and Physiology* and various recent Research articles and dissertation were reviewed. Discussion and conclusion was made on the above collected data.

DISCUSSION

Modern concept

The soft tissue covering the cranium is considered the scalp. They are skin, superficial fascia, epicranial aponeurosis, loose areolar tissue, and the pericranium.^[24] Skin is a complex tissue made up of stratified epithelium. It also has many appendages like hair follicles, sebaceous glands, sweat glands, apocrine and eccrine glands. Skin serves many important functions in our body. It helps in temperature regulation, water regulation, and electrolyte balancing. Skin has mainly 2 layers, the Epidermis and the Dermis. The epidermis again consists of multiple layers like Stratum corneum, Stratum lucidum, Stratum granulosum, Stratum spinosum, and Stratum basale. The dermis has lymphatics, sensory and motor nerve ending.^[25]

The drug which is administered through the scalp needs to penetrate into different layers of the scalp for better absorption and action. The structure of the scalp has some peculiarities. This peculiarity may help in better absorption and action of the drug.

The dermis has rich blood supply. The blood supply to dermis is again influenced by neural and hormonal factors. The rate of absorption can be influenced by vasoactive drugs and environmental temperature by altering blood flow to the capillaries.^[26] The transdermal administration advances over the oral route by keeping away from the degradation of drugs, hepatic first-pass metabolism, and adverse effects affecting the gastrointestinal tract.

In the intracellular mechanism of transdermal transportation, the molecules directly penetrate into the corneocytes. The rate of absorption is inversely proportional to the size of corneocytes. Studies show that the superficial corneocytes were smaller on the scalp than that of the volar aspect of forearm.^[27]

Mainly fat-soluble substances are administered through *Murdha Taila*. Stratum corneum cannot prevent the penetration of non-polar molecules but only slow down it. Their lipophilic nature and small molecular size also help them to get absorbed into the skin easily. Thereby these molecules can enter the bloodstream if administered through topical applications in quantifiable ways. The stratum basale layer of the epidermis is responsible for the cutaneous biotransformation. Here phase 1 and phase 2 metabolism take place. Phase I reactions include intramolecular modification, involves oxidation, reduction, and hydrolysis. Phase II reactions involves, conjugation of the drug with an endogenous substrate by process of acetylation, glucuronidation, sulfation (also called sulfonation), and methylation. Usually, 2 - 6% of metabolism as that of the liver takes place through the epidermal layer. But sometimes the biotransformation may be several times as active as that of the liver.^[28] Biotransformation may depend upon the nature of drugs used. This may be utilized in the transdermal delivery system of drugs as metabolism can influence the rate of absorption.

Another important mode of absorption is through the shunting route. In shunting route molecules will be absorbed through sweat glands, sebaceous glands, and hair follicles.^[29] Compared to other areas of the body scalp skin is rich in sweat glands, sebaceous glands, and hair follicles. Abundance of these structures in the scalp allows for a significantly greater relative dermal absorption of molecules compared to other areas of the body. Presence of hair follicles, sebaceous glands, and the sweat glands also help in increasing the absorption by increasing the surface area.^[30] Shunt route is important because it helps to bypass the stratum corneum which is the main resistance for absorption through skin. Further absorption takes place through the dermis as it is highly vascular. The

loops of capillaries located at the epidermis-dermis junction enhance the absorption. The molecules absorbed through by intercellular/ intracellular or through skin appendages utilize the highly vascular property of dermis for further transport. In a study conducted on fresh cadaver reveals that there are abundant drops of blood created by massaging the scalp.^[31] So the rate of absorption can be further accelerated by increasing the vascularity of the skin. The vascularity depends on various factors like temperature, pressure, etc. and absorption can be increased by maintaining these factors. Here in *Murdhataila* also the exposure time with the medicine, the temperature and pressure maintained also help in increasing the rate of absorption. The rate of absorption is enhanced by massaging (in *Abhyanga*), local application (in *Picchu*, *Lepa* and *Upanaha*) of medicine, and pouring the medicated oil from a particular height (in *Parisheka*). This increases vascularity and metabolic activities in the dermal blood vessels. It also helps in opening the skin pores to permit the transfer of molecules to the general circulation there by towards the target site.

The scalp has a rich blood supply. The arterial supply of the scalp is from both internal and external carotid arteries.^[32] Medicine absorbed through the scalp skin will reach the circulation through different veins draining the scalp. Especially through emissary veins, from there it drains into dural venous sinuses. Thus, the drugs ultimately reach the blood circulation and from there to the site of action.

The absorption can be through diffusion also. Vascular Haversian canals criss-cross the bones imparting porosity to the bone so that, drug molecules can diffuse across the flat cranial bones. Diffusion is also possible through the cranial bone sutures. On reaching the intracranial sinuses the drug molecules can diffuse into the nerve tissue of the brain. This is made possible by the sluggish blood flow in the sinuses, which provide enough time for the diffusion of the drug molecule into the brain tissue.^[30] Lipophilicity, smaller molecular size, luminal surface of brain capillary, composition of CSF, change on molecular and ionic surfaces, specific

binding of transporter proteins, ionic concentration are the key factors deciding the blood brain barrier.

Axoplasmic flow is a cellular process. Here movement of mitochondria, lipids, synaptic vesicles, proteins, and other organelles to and from a neuron cell body, takes place through the cytoplasm of its cell body. In the spread of certain diseases also Axoplasmic flow has a role. Rabies virus uses the reverse axoplasmic flow from the site of the bite to reach CNS.^[33] Tetanus bacteria travel from the site of infection to the brain along the endoneurium of nerve fibers through binding the nidogen proteins.^[35] Poliovirus is also transmitted from GIT through a reverse axoplasmic flow. Neurotropic viruses, such the herpes viruses, travel inside axons using cellular transport machinery.^[34,35] Axoplasmic transport of tracer substances introduced experimentally helps to trace neuronal connections. So, it's a question whether this axoplasmic route may help in the intracellular movement of medicated oils. *Murdhataila*, especially *Sirodhara* helps to produce a sedative and soothing effect. *Shirodhara* also activates the functions of the thalamus and the basal forebrain by increasing the blood supply to these structures.^[36] The person feels sleepy and relaxed after doing *Shirodhara*. This may be due to the rise of neurotransmitter serotonin and chatecholamine.^[37] The secretion of serotonin is by the stimulation of thalamus and basal ganglia. During *Shirodhara* there will be constant vibes and pressure exerted over the paranasal sinuses especially frontal sinus. Through the fluid medium of CSF it may stimulate the thalamus and basal ganglia. This principle may be adopted in the treatment of conditions like anxiety, schizophrenia, stroke, obesity, hypertension, nausea, migraine, vascular disorders, depression, OCD etc. *Murdhataila* is mainly indicated in *Shiroroga* as the scalp is the nearest route to reach the *Shira*. Above all when the drug is administered through the scalp, the first-pass metabolism can be avoided as it allows the drug to be absorbed directly into the systemic circulation.

Ayurvedic concept

Skin is the largest sense organ that covers or resides in other *Indriya* (sense organs) also.^[38] *Charakacharya*

directs to use *Lepa* and *Pariseka* (pouring medicated liquid).^[39] This may be because *Bhrajaka Pitta* apart from contributing the color to the skin, it also digests the applied medications to the skin with modalities of *Abhyanga*. *Lepa*, *Pariseka*, *Dhara*, *Pichu*, *Upanaha*, etc.^[40] This processed part is taken away through the pores of *Romakupa* by numerous *Thiryakdhamani* (blood vessels). These four *Thiryakdhamani* divide and redivide to become innumerable. Their terminal part opens into *Romakupa* (hair root)^[41] and nourishes the *Utharothara Dhathu* (tissues).

The *Dhatwagni* also plays a role in reaching medication up to the level of different *Dhathus*. The actions may also depend on the property and potency of drugs used. The sufficient time duration of medicines in contact with skin and temperature maintained in the treatment modality also aids in increasing the rate of absorption. This highlights the importance of the duration of contact of drugs and time duration taken to reach *Utharothara Dhathu*. These may be the reason for more effectiveness of selection of this route than rest in many conditions. The action of different modalities of drug administration through scalp is not limited to localized entities but it acts on systemic diseases also.

According to Ayurveda the absorption and action of *Murdha Taila* is being done by the *Guna* (properties) of the *Taila* and other drugs used in the procedure. By the *Theekshna*, *Sukshma* and *Ushna Guna*, the medicines penetrate the *Srothas* and by *Vyavayi* property it speedily spreads. Further absorption and movement are done by *Drava & Sara Guna*. There by it reaches the target site. Other properties like *Snigdha Guna* helps in *Snehana* and *Kledana*, *Guru Guna* helps in nourishment, *Sheeta Guna* increase pleasure and enthusiasm, *Mrudu Guna* reduces the stiffness and the *Pichila Guna* gives strength. *Manda Guna* helps the drugs to remain in contact with *Dosha*, *Dhatu* and *Mala* for longer time. It is found to be effective in various diseases like GAD (Generalized Anxiety Disorders)^[42] insomnia,^[43] stress,^[44] *Pakshaghata* (hemiplegia) and various trichological conditions.^[45] There are many advancements in the topical application in modern medicine.

CONCLUSION

Pachana (metabolism) of the drugs administered through the scalp in the form of *Murdha Taila* is done by *Bhrajaka Pitta* and gets absorbed into *Thiryak Dhamani* through the abundant hair roots (*Roma Kupa*) from there it reaches the *Utharothara Dhathu* with the help of specific *Dhatwagni* in stipulated time. *Panchadnyaendriya* (sense organs) which takes seat in *Shiras* is being connected by *Manas*. So, the *Murdha Taila* administered may even maintain the physical and mental well being. Axoplasmic transport also serves as the intracellular movement of medications used through the scalp. The scalp skin is the best route for the administration of *Murdha Taila* in *Shirogata Roga* due to these factors that, Scalp has comparatively thinner epidermal layer, Rich in blood supply, due to the abundance of sebaceous and sweat glands, presence of emissary veins.

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