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RESEARCH ARTICLE

TARPANA [SATIATING THE EYES]: THE SUPREME OCULAR THERAPY

Jayakrishnan A[1]* and Krishna Prabha A[2]

[1]Department of PG studies in Shalakya Tantra, Amrita School of Ayurveda, Amrita ViswaVidyapeetam University, Kollam, Kerala

[2]Department of PG studies in Kayachikitsa, Parul Institute of Ayurveda, Parul University, Limda, Vadodara, Gujarat

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ABSTRACT

Tarpana is one of the popular ocular therapies that is performed in Ayurveda. Among the "*kriyakalpa,"tarpana*has a very superior position as it is tissue targeted, fast acting, simple but innovative method of drug administration to various parts of eyes including the posterior segment. The eye being a very vital and sensitive part was of main focus while designing *kriyakalpas*– which include -*seka, aschyotana, pindi and bidalaka*. *Tarpana, putapaka*are usually lipid medicaments to enable easy, faster and far penetrating effect into the posterior segment of eyes. These *kriyakalpas*are not sophisticated drug delivery systems, but are deployed in novel methods to keep medications intact to specifically targeted parts of the eye through a medium that can control the administration and achieve marvellous results. With this view an attempt was made to discover the scientific facts which can ascertain the ayurvedic concepts. After a critical review of various researches, scientific texts and ayurvedic classics it is concluded that *tarpana* acts on the principle of *bahyasnehana*. It can successfully cross the defensive barriers present in eye for absorption and nourishes the ocular and periocular structures, strengthens the sphincters & brings about changes in dioptric power and visual acuity.

INTRODUCTION

Ayurvedic ocular therapies are regarded as *Netrakriyakalpas*. Acharya *Susruta* explains five *kriyakalpas* which includes *sekam*, *aschyotana*, *anjanam, tarpanam and putapakam* but Acharya *Sarngadhara* explains two extra types of *netrakriyakalpas* which includes *pindi* and *vidalaka*[1]. *Kriyakalpas* can be invariably used in different types of *dosha* vitiation related to *netra*. The drugs used for the procedure makes it more specific to particular *dosha*. e.g. *seka* can be performed in *vata* predominant eye disease but it should be *snigdha* and *koshna* in nature, in *pitta rakta* predominant condition but it should be with *sheeta*, *tiktha*, *kashayadravyas* and in kaphavikaras it should be made of *katu*, *tiktha*, *kashayadravyas*. *Seka*, *aschyotana*, *vidalaka* and *pindi* can be advised in the *amavastha* or early stage of a diseases process. *Tarpana*, *putapaka* and *anjana* are preferred in the *pakvavastha* or later stage of a disease[2].

Tarpanam and *putapakam* are considered as the supreme treatments among the *kriyakalpas* in posterior segment disorders of the eyes. *Akshitarpana* literary means to give nourishment to the eye through *snehadravyas* like *ghruta* [ghee], *ghrutamanda*, medicated *ghruta*, *vasa*, *majja*, *ksheera* [milk] etc. *AcharyaSusrutha* mentions *akshitarpanam* as one among the 24 *snehapravicharanam*. *Ghruta* is used primarly for *akshitarpanam*. It is effective in subsiding *pittaja* and *vatajavikaras*, it improves *dhatus* and boosts the *ojus*. *Ghruta* has the quality of *yogavahitva* and reaches every minutest channels of the body. *Ghruta*due to its *samskaranuvartan* property easily imbibes the properties of other drugs processed with it without leaving its own properties.

*Ghruta*is having *sheethaveerya* property, hence eye being the site of *alochaka pitta* can be effectively managed by using ghee in its various forms for *akshitarpanam*. Properties like *balya*, *brimhana* and *rasayana* can also be attributed to *ghruta*, hence provides strength to overall tissues of eyeball as well as to nervous tissues of ocular system. [3]

Method of Application of Akshitarpanam

Tarpana should be carried out in *poorvanha* (Fore Noon) on an auspicious day after the food taken by the patients is properly digested, after subjecting to *poorvakarmas* such as *snehana*, *swedana* according to *roga* and *rogibala*. The patient should be made to lie down in supine position in a chamber free from dust, sun rise and wind.

The *adhara* (compact circles) should be made of powder and paste of *Masha* (*kalka*) around orbital fossa (*NetraKosha*) which should be filled with melted *ghruta,* up to the level of reaching the tips of eye lashes. Then patient is made to blink the eyes for the specific period of time depending upon the *roga*.[4]

After stipulated period, the eyes should be cleaned. The *ghruta* should be let out through a small hole made at *apangasandhi*. Then, the *kapha* which has already been stimulated by potency of *ghruta* should be eliminated by *dhoomapana* by *varti* made out of *kaphaharadravyas*. Immediately after *tarpanakarma* exposure to excessive light and dust must be avoided.[5]

Mode of Action of Tarpanam

Tarpana can also be considered as a route of ocular drug delivery through topical administration. Layers of the cornea, conjunctiva, sclera, and the other tissues of the anterior segment such as the iris and ciliary body usually acts as the site of action for most of the topically applied drugs. Bioavailability of topical formulations gets negatively affected by precorneal factors and anatomical barriers upon its administration. Solution drainage, blinking, tear film, tear turn over and induced lacrimation can be considered as pre-corneal factors.

Tear film offers the first resistance due to its high turnover rate. Mucin present in the tear film plays a protective role by forming a hydrophilic layer that moves over the glycocalyx of the ocular surface and clears debris and pathogens. Human tear volume is estimated to be 7 µl, and the cul-de-sac can transiently contain around 30 µl of the administered ocular drug. However, tear film displays a rapid restoration time of 2–3 min, and most of the topically administered solutions are washed away within just 15–30 s after instillation. Considering all the precorneal factors, contact time with the absorptive membranes is lower, which is considered to be the primary reason for less than 5% of the applied dose reaching the intraocular tissues. In case of *tarpana* the volume of drug retained over ocular surface is much higher in comparison to the eye drops thus mucin itself may get diluted by the *ghruta* or any other *tarpana* drug removing the hydrophilic layer barrier and provides more drug available for absorption.

Other structures which play an important role in drug permeation are, layers of the cornea, conjunctiva, and sclera. The anterior most layer of the eye, the cornea is a mechanical barrier which limits the entry of exogenous substances into the eye and protects the ocular tissues. Main layers of cornea include epithelium, stroma, and endothelium. Each layer offers a different polarity and a potential rate-limiting structure for drug permeation. The corneal epithelium is lipoidal in nature which contains 90% of the total cells in the cornea and poses a significant resistance for permeation of topically administered hydrophilic drugs. Furthermore, superficial corneal epithelial cells are joined to one another by desmosomes and are surrounded by ribbon-like tight junctional complexes (zonula occludens). Presence of these tight junctional complexes retards paracellular drug permeation from the tear film into intercellular spaces of the epithelium as well as inner layers of the cornea.

Lipophilic drugs in the form of *ghruta*, *vasa*etc is used mainly for *tarpana*. Thus, it can be well absorbed through lipoidal membrane and also it can nourish this membrane so that its function gets improved. Moreover, *tarpana* is done in lukewarm form that may dilate the tight junctional complexes thus allowing paracellular drug permeation. The stroma, which comprises 90% of the corneal thickness, is made up of an extracellular matrix and consists of a lamellar arrangement of collagen fibrils. The highly-hydrated structure of the stroma poses a significant barrier to permeation of lipophilic drug molecules. Endothelium is the innermost monolayer of hexagonal-shaped cells. Even though endothelium is a separating barrier between the stroma and aqueous humor, it helps maintain the aqueous humor and corneal transparency due to its selective carrier-mediated transport and secretory function. Furthermore, the corneal endothelial junctions are leaky and facilitate the passage of macromolecules between the aqueous humor and stroma. Thus, corneal layers, particularly the epithelium and stroma, are considered as major barriers for ocular drug delivery. It is vital to understand that the permeant should have an amphipathic nature in order to permeate through these layers. Certain drugs used for *tarpana* like *SiddhaKshira* are of this nature.

Compared to cornea, conjunctival drug absorption is considered to be non-productive due to the presence of conjunctival blood capillaries and lymphatics, which can cause significant drug loss into the systemic circulation thereby lowering ocular bioavailability. Conjunctival epithelial tight junctions can further retard passive movement of hydrophilic molecules. However, in *tarpana* the drug used is significantly in high dose that can give enough bioavailability even after the loss in systemic circulation or in other words it can act both locally and systemically. The sclera, which is continuous with the cornea originates from the limbus and extends posteriorly throughout the remainder of the globe. The sclera mainly consists of collagen fibres and proteoglycans embedded in an extracellular matrix. Permeability through the sclera is considered to be comparable to that of the corneal stroma. Recent reports indicate that the permeability of drug molecules across the sclera is inversely proportional to the molecular radius. *Tarpana* when did with *SiddhaGhruta*, it contains more small chain fatty acids having small molecular radius than the long chain fatty acids. Thus, they may get readily absorbed. [6]

Table 1 Duration of *Tarpanam* in Different Disorders

Condition	Ashtangahridayam	Susruthasamhita	Sarnghadharasamhita
Vartmaroga / eye lid disorders	100 matra	100 matra	100 matra
Sandhi roga	300 matra	300 matra	500 matra
Sitaroga / diseases of conjunctiva and sclera	500 matra	500 matra	600 matra
Krishna roga/ diseases of cornea, iris etc	700 matra	700 matra	700 matra
Drishti roga / diseases of vitreous, retina etc	800 matra	800 matra	800 matra
Adhimantham	1000 matra	-------	1000 matra
Vatajanetraroga	1000 matra	1000matra	1000 matra
Pittajanetraroga	600 matra	800 matra	---------
Kaphajanetraroga	500 matra	600 matra	500 matra
Swastha / healthy individual	600 matra	500 matra	------
Sarvakshiroga	--------	1000matra	--------

Conclusion

Ophthalmic therapeutic either in the form of local therapy i.e.*kriyakalpas*or in the form of systemic use i.e. oral *chakshushyadravyas* can be applied. Attainment of an effective

concentration at the site of action for a sufficient period of time to elicit the response is the main aim of any pharmaco therapeutics. In practice, therapeutic effect is found in all types of *kriyakalpa*. It is up to the science to correlate the observations with their scientific explanation. Here in present review article, it is tried to correlate the *ayurvedic* ocular therapeutic i.e. *kriyakalpa* on the basis of modern pharmaco-therapeutic. Various drugs can be selected according to the stage and types of the disease and can be used in various *kriyakalp* procedures according to need. In the light of above fundamentals of modern pharmacology, all the *ayurvedic* ocular therapeutic procedures are relevant as such. Today current methods of drug delivery exhibit specific problems that scientists are attempting to address.

Present conventional system of medicine has topical and systemic administration of drugs to the eye which are highly inefficient and there is a need for controlled, sustained release, particularly for conditions that affect the posterior segment. Various non-implantable and implantable drug delivery devices have been developed which are far from satisfactory and result in more adverse effects which is driving scientists to research more and more into safe, effective drug delivery methods for all parts of the eyes.

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