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Preparation of Shnehika Aschyotana (Eyedrops) and its Pharmacokinetic importance w.s.r to Shunthyadi Aschyotana

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ABSTRACT:-

Eyes are the only organ in the body which receives separate treatment modality as a Bahir Parimarjana Chikitsa. Acharya Vagbhatta has quoted Aschyotana as the foremost procedure for treatment of all ocular ailments and it is safe as well as most economical procedure. Shunthyadi Aschyotana(Eyedrops) is prepared with Ghrita paka method, as mentioned in literature. Sunthi and Saindhava lavana were made into kalka form by adding sufficient water.In Aschyotana medicine is applied in the Kaninika Sandhi, which is highly vascularised area via which medicine is absorbed through the vessels and via circulatory system reaches the vessels of the head region.The medicine instilled in the form of Swarasa, Kashaya, Hima, Arka and Ghrita comes in contact with the conjunctiva and the cornea. As different layers of the conjunctiva and the cornea have different permeability property, medicine is absorbed based on hydrophilic and lipophilic properties.Eye drops are the most popular and convenient method of topical drug administration. The pharmacology of Eye drops can be explained on the following principles like Route of drug administration, Solubility and Bioavailability, Absorbing surface, Physical state of the drug and Excretion or disposal.

Keywords:- Shunthyadi Aschyotana, Eyedrop,

INTRODUCTION:-

Eyes are the only organ in the body which receives separate treatment modality as a Bahir Parimarjana Chikitsa. Acharya Vagbhatta has quoted Aschyotana as the foremost procedure for treatment of all ocular ailments and it is safe as well as most economical procedure. Acharyas have described different types of the Aschyotana on the basis of Dosha pre-dominancy in disease. All Acharyas are in same opinion regarding time to perform Aschyotana in Ahoratra on the basis of Dosha involvement in particular disease but there are some variations in the dose of the Aschyotana.

Etymology of Aschyotana:-

- **Vyutpatti:** Aa + Shchyu + Ta + Lyu Pratyaya

It denotes as Samyak Ksharana Sheela property of Aschyotana. Ksharana word implies meanings that capacity of Aschyotana to eliminate Dosha trickling/ dropping/ flowing[1].

- **Nirukti:** Netra Sechana or Chakshu Poorana[2].

It means trickled, dripped, and sprinkling application to the lids.

So, in Aschyotana, medicine is instilled drop by drop in Kaninika Sandhi (Inner canthus area) from two fingers height.

Method of preparation of Shunthyadi Aschyotana (Eye drops)(Anubhoota):

Shunthyadi Aschyotana(Eyedrops) is prepared with Ghrita paka method, as mentioned in literature. Sunthi and Saindhava lavana were made into kalka form by adding sufficient water. This kalka was added to Ghrita and to this mixture water was added. The ratio of Kalka: Sneha: Drava Dravya is 1/4: 1: 4.

1) **Pattern of heating :**Throughout the procedure the temperature of heating source was maintained so as to generate only bubble in the mixture.

2) **Observation of Sneha Siddhi Lakhsana**: The heating was continued till observation of following:

- Vartivata sneha kalka
- Sabdohino agni nikshipta
- Acchitava

Above mention tests were observed sequentially, Sabdohino agni nikshipta test was observed to be positive in residual Kalka.

3) **Filtration and Packaging:** After cooling, the mixture is filtered through four fold fine cotton

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cloth two times and packed into sterile jar. The procedure in brief is as given below-

• Filtration by 2.0 microns glass filter followed by 0.2 microns nylon filter.
• Filtered solution was filled in 5 ml sterile plastic bottles under Laminar Air Flow in aseptic conditions.
• Plugging and capping was also done in aseptic area.

Pharmacokinetics of Eye drops:

Eye drops are the most popular and convenient method of topical drug administration. The pharmacology of Eye drops can be explained on the following principles of modern pharmacology. [3,4]

Route of drug administration:

Drugs are applied to the conjunctival sac as drops and ointment which is a thin disc of gelatin as in Aschyotana, Seka, and Anjana. The systemic route has limitations because of the blood-aqueous barrier. Large-sized molecules cannot cross this barrier and do not enter the eye. Many collyria contain large-sized molecules that are administered topically. This proves the awareness of ancient Acharyas about the blood-aqueous barrier. Few drugs rapidly penetrate the intact skin. The absorption of these drugs is proportional to their lipid solubility since the epidermis behaves as a lipid barrier.

Solubility and Bioavailability:

Absorption depends on the solubility of drugs and local conditions at the site of absorption. It depends on many factors like absorbing surface, dosages form, absorption, drug vehicles, tissue contact time, compliance, disposal, etc. Route of drug administration, solubility, and bio-availability of drugs, absorbing surface whether it is skin, conjunctiva, cornea, nasolacrimal duct or oral mucosa or all together, vascularity of the absorbing surface, the physical state of drug, patient compliance, excretion of the drug -influence the action of ocular administration. Drugs to be absorbed through the mucous membrane should be water and lipid-soluble. The main forms of drugs instilled into the eyes are aqueous solutions (Medicated solution), aqueous suspensions (Medicated ghee and oils), ocular inserts, and ointments (Different Anjana preparations). Each has a different influence on drug bioavailability. In solution, the drug is dissolved but tissue contact time is short as in Aschyotan and Seka. Ointment increases the bioavailability of the drug by increasing the tissue contact time and by preventing dilution and drainage of active ingredients as in different collyria. In suspension, the drug is present as small particles kept suspended in an aqueous medium by a dispersing agent (Medicated Ghee and oils). Particles do not leave the eye as quickly as the solutions which increase the tissue contact time as in Snehana Aschyotana, Tarpana, and Putapaka.

Absorbing surface:

Conjunctiva and cornea are the main absorbing surfaces. The conjunctival membrane readily absorbs the drug. Absorption through the cornea involves the transformation of drugs through its different layers. The corneal epithelium and endothelium have 100 times more lipid contents than in the stroma and fat-soluble drugs readily penetrate the epithelium and endothelium. An instilled drug penetrates the eye by absorption across the cornea from the precorneal telefilm.[5,6,7] The precorneal tear film is a stagnant fluid layer that is spread over the corneal epithelium by a coacervate of mucin and is stabilized by the superficial oily layer formed by meibomian gland secretion.[8] Therefore mixing of the drug with the marginal tear fluid after drugs are instilled takes place only by blink movements, which at the same time carry the instilled drug away from the cul-de-sac. Thus the mixing and kinetic behavior of drugs in the tears has a direct bearing on the efficiency of drug absorption by the eye.

However, only water-soluble drugs can penetrate the stroma; therefore a drug should be amphipathic i.e have both lipophilic and hydrophilic characters to penetrates all the layers of the cornea. The drug contact time affects the absorption and penetration of drugs. So specific duration of contact time has been mentioned by our Acharyas for specific diseases e.g. Snehana Aschyotana and Tarpana in Vata predominant diseases are done for a longer duration as compared to Pittaja and Kaphaja predominant diseases.

Vascularity of the absorbing surface:

Water-soluble drugs are easily absorbed through the vessel wall i.e. permeability and vascularity. Some diseases where blood vessels especially the external eye is not involved, in that disease medicines in the watery form are better. Therefore, modes of application modulated watery preparations are Aschyotana and Seka. Especially in the anterior segment of the eye Aschyotana and Seka are the procedures for medications. Fat-soluble factors easily get absorbed through the cornea. So in Vata Pitta predominant diseases, Ghrita is perfect for Tarpana and Aschyotan. Honey has both vascular as well as corneal

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absorption and Kapha Shamaka so used in Kapha predominant diseases.

The physical state of the drug:

According to Richardson, a substance with a molecular weight less than 100 can pass readily through cell membranes and those of more than 500 do not. To overcome this limitation in molecular size, some ophthalmic drugs are prepared in high concentrations. So that by the law of mass action, a small percentage will reach the anterior chamber and an effect will be obtained. In Aschyotana, Tarpana, and Putapaka the medicated Ghee or oil is used in the eye, and absorption of the drug is based on the law of mass action. Herbal compounds given in the form of infusion and decoctions contain varying amounts of saponins which increase the permeability of epithelium by reducing the surface tension.

Compliance:

The peak serum level time of the drug is the criteria of its dosage schedule which should be maintained by repeating the drug at that interval. Noncompliance with this dosage schedule leads to drug resistance by the causative organisms. So to avoid noncompliance certain dosage intervals are mentioned by Acharyas in each Aschyotana.

Excretion or disposal:

Topically applied solutions or eye drops, as in Aschyotana mostly overflows and also get excreted through the nasolacrimal duct. Whatever is absorbed entered the blood circulation and excreted through the main route of excretion. The cell membrane is a lipid globular protein mosaic with a lipid-soluble portion or non-polar group towards the interior of the membrane.

Ionic water-soluble or polar groups are oriented at the two surfaces of membranes embedded within these phospholipids are globular proteins which are the hydrophilic portion of the membrane; therefore, the cell membrane has some sites for water-soluble drugs.

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