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ANJANA -THE DEFOGGER IN AGEING LENS

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ABSTRACT

Ayurveda the science of life aims both preventing and curing the diseases. Among the many contributions of *Ayurveda* in drug delivery system – "*Kriyakalpa,"* plays an important role as it is tissue targeted, simple and an effective method of drug administration to eyes including the posterior segment disorders. *Kriya kalpa* means specific formulation used for therapy in *Netra chikitsa* which includes *Bidalaka, Ascyothana, Anjana, Seka, Pindi, Tarpana and Putapaka*. Among them *Anjana* plays prime importance in treating degenerative conditions and age related changes. As people in the world live longer the number of people with cataract is anticipated to grow. According to the latest assessment, cataract is responsible for 51%of world blindness, which represents about 20 million people. Cataract is the loss of transparency of the lens in the eye which develops as a result of altered physical and chemical properties in lens. Although cataract can be surgically removed, in many countries barriers exists that prevent patients to access surgery. However due to its high cost, post-operative complications, it necessitates researchers to find out other modalities of treatments for cataract, to breakdown patho- physiology of cataract. *Anjana* application expels the*kapha dosa* and does *lekhana karma*, which have longer tissue contact time than any other topical ocular administration. Eye diseases can be prevented and normal vision can be restored for longer time by following *dinacharya* and *Anjana* is one among the *dinacharya* mentioned by our *acharyas* also. *Anjana* types, indications, probable mode of action, and its importance in cataract will be discussed here.

KEYWORDS: Kriyakalpa, Lens, Timira, Cataract, Dinacharya.

INTRODUCTION

"The eyes are the windows to the soul"- an expression often used not only reveals the importance of eyes in connection towards ones soul but also elicits how important eyes are for manhood. Thereby all possible measures have to be taken inorder to protect the eyes. Among all the treatment modalities explained for eyes *Kriyakalpa* holds prime importance wherein it is a *Bahirparimarjana chikitsa* and has several advantages over oral administration.*Anjana* is one among the *kriyakalpas* which even on daily application is said to provide*sookshma darshana* (clarity in vision) and it is *hita* (pleasant for eyes) providing *susnigda pakshmana* (unctous lashes) as per *Acharya* Vagbata.[1] So in the context of *dinacharya* he explains *Souveeranjana* to be applied daily. The Eye is such an organ which can easily get afflicted by kapha dosha even though it is *tejomayam.* ie. predominant with tejomahabhuta.[2] This is the basicreason behind indicating *Anjana* atleast once in seven days (*rasanjana*) which thereby acts as a preventive measure for many eye disorders.[3]

Kriyakalpa – The Pillar of Shalakya Tantra

Kriyakalpa is the unique branch of medicine which deals with the specialized topical occular procedures /methods of preparation for the management of different diseases of eye and its adnexa.

Charaka samhitha has explained local treatment of eye in the form of *Bidalaka, Aschyothana* and *Anjana* while *Susrutha samhitha* has enumerated five in total which includes Tarpana, Putapaka, Seka, Ascyotana, Anjana. Acharya Sharangadara has enumerated seven out of which P*indi* and *Bidalaka* are the additional procedures and he had entitled them as *Netra prasadanakarmas. Kriyakalpa* should be done after deha *shodhana* and it is done depending upon the *dosha dusthi.* Based on the doshic involvement and the condition of the disease, each *kriyakalpa* is done on the basis of certain *matrakala* as explained by Acharya Sarangadhara.[4]

It is assumed that every *kriyakalpa* procedure done possess the potency to combat the targeted tissues involved in pathology and some have the ability to cross the barriers.Furthermore it is mainly aimed at improving functional efficacy of Eye, (Netra bala vardhana).[5]

Anjana and Types

The word *Anjana*is derived from the root '*Anuj*' added with *'lyut' pratyaya* and as per Vachaspathy '*Anakthi anena ithi anjana*' which means that which spreads all over the eye '*Anjanam kriyathe yenaa taddravyam anjanam smritham'* which states that drug which is used as eye application.

***Rasavagbhata* had classified *anjana* as:** *Sauviranjana, Srotoanjana, Nilanjana, Pushpanjana and Rasanjana.*

Rasamadhava mentioned two varieties *Swetanjana (sauviranjana*) and *Krishnanjana (sroto anjana).*

Rasajalanidhi added one more variety called *Kulathanjana* to the five explained by *Rasa ratna samuchaya.*

All *anjana* drugs has to be purified by subjecting to *bhavana (*trituration*)* with either B*hringaraja swarasa* or *Triphala kwatha* as per *Ayurveda prakasha* before using as an Netra aushada.[6]

Classification of Anjana

Based on action *(Karma*)

Susrutha Samhitha	Astanga Hridaya	Astanga Sangraha	Sharangadhar Samhitha	Yoga Ratnakara	Bhava Prakasha
Lekhana	Lekhana	Lekhana	Lekhana	Lekhana	Lekhana
Ropana	Ropana	Ropana	Ropana	Ropana	Ropana
Prasadana	Drushti Prasadana	Snehana Prasadana	Snehana	Snehana	Snehana

Based on preparations (*kalpanas)* *anjana* is classified as *Gutika (tablet form), Rasakriya (Semi solid)* and *Choorna anjana*.

Anjana should be applied by means of *Anjana shalaka* which should be made up of *Tamra, Loha, Rajatha* or *Swarna* dependig upon the type of *anjana* to be applied.

Anjana matra: As per *acharyas* the standard *matra of anjana* is *harenu matra* and it varies accordingly depending on the type of anjana.[7]

Indications of Anjana

Anjana is indicated when doshas are fully manifested and are localized in the eye.

The pre requisites to apply *anjana* are

- Disease should be clearly manifested indicating *dohsadushti* and *adhistana.*
- The body should be free from *ama dosha lakshanas*.
- The features of *dosa dushti* are limited only to the eye.

Thus it is clearly stated as per *Astanga sangrahakara* that it should be done after the initial features of *doshas* are settled down, to be precise when there occurs complete absence of;

- *Gana paichilyatha* (thick and slimy exudates)
- *Kandudreka* (scratching)
- *Svayadhu* (swelling)
- *Mlanatha* (dullness)
- *Ragavicheda* (redness or congestion)

If *anjana* is applied in any of the above conditions it may lead to aggravation of symptoms, suppuration of eye ball and blurness of vision.

Contra Indications of Anjana

Anjana is contra indicated in the following conditions

- Shrama (Tiredness)
- Udavarta (Upward movement of flatus)
- Rudita (Grief)
- Madya (While drunk)
- Krodha (Anger)
- Bhaya (Fear)
- Jwara (Fever)
- Vega vinigraha (Suppression of natural urges)
- Shirodosa (Diseases of head).

Age Related Changes in Lens

There are three stages of age related changes in the crystalline lens; Developmental, Growth and Ageing[8]. Many changes will occur to the clear lens with increasing age. Changes can be grouped as

- Physical changes
- Metabolic changes
- Changes to crystallins
- Changes to plasma membranes and cytoskeleton.

Physical changes

- ***Lens weight and thickness*:** Increase steadily with age due to continued growth of the crystalline lens throughout life building up layers of new cells from the equator.
- ***Light transmission*:** Usually decreases due to increased light absorbance as age progresses.
- ***Light scattering*:** Increases with age because of change in refractive index.
- ***Fluoroscene property*:** Increase with age.
- ***Refractive index*:** Increases with age.

Metabolic changes

Most of the metabolic activities of lens decrease with age. The proliferative capacity of human lens epithelial cells decline during the shelf life Many enzyme activities decline in the whole lens with age and there will be increase in urea soluble proteins, from cortex to nucleus. The enzymes of glutathione metabolism, like glutathione peroxidase, glutathione S-transferase and reductase however does not decline but both glutathione and acsorbate levels decrease with age. Even the superoxide dismutase and glucose 6 phosphate dehydrogenase activity are lost with age but dentured enzyme protein remains.

Changes in Crystallins: Studies suggest that there occurs an age related loss of gamma crystains. It has been also reported that all crystalline fractions of human lens contain flurophor other thantryptophan. The non-tryptophan fluoroscene increases with age. (greater in nucleus than in cortex).Gamma crystallins fraction in particular shows an increase in disulphide bonds with age. However alpha crystallins have been reported to almost disappear from soluble extracts of nucleus and beta crystallins become more polydispersity.

Changes of plasma membrane and cytoskeleton: As age advances there will be loss of hexagonalcross section of fiber cells and of their interlocking devices and lack of cytoskeleton in lens nucleus have been reported tooccur. In lens sodium and calcium occur with age. Large membrane polypeptides decrease with age. Changes in membrane rigidity also occur with ageing. As these many changes occur in an aged lens there should be measures to protect it at any cost to prevent for further damage in terms of opacification. The opacification in the lens structure is called as cataract.

Cataract and Types

The word cataract was coined assuming that an abnormal humour developed and flowed in front of the lens and decreases the vision.In other words cataract refers to any opacification of lens or capsule. Opacification can occur due to opaque lens fibre formation instead of transparent and also occur due to opacification of normally formed transparent lens fibers.

Cataract can be classified in many ways but considering to the opacity formation it can be grouped as: LOCS (Lens opacities classification)[9]

LOCS1

Grade 0 – Absence of lens opacity

Grade 1 _ Presence of early opacification which can be subdividedinto category 1a includes minor, clinically insignificant opacification and category 1b early cortical cataract.

Grade 2 _ Implies includes definite cataract.

LOCS2: it differentiates among various degrees of cortical, subcapsular and nuclear opacification.

LOCS3: Based on standardized photographs, nuclear opalescence, nuclear colour, cortical cataract and posterior sub capsular cataract are graded

Action of Anjana

The reference of administration of *Anjana* even in unconscious condition is available in classics. In *sarpa visha chikitsa*, the significance of the procedure to penetrate into deeper structures and its quick action can be assessed. As described in *paribhasha*, "*anakti anena ithi anjanam*" meant for the spreading and propagation of *anjana*. The topical instillations such as *anjana* in *netra roga*s hasto pass through many barriers to reach their target in the ocular tissue.[10]

1. Corneal barrier: The factors which decide the penetration of drug through cornea are

a) Lipid and Water solubility of the drug: Topically instilled medications largely penetrate intraocularly through the cornea. Thecorneal epithelium and endothelium being lipophilic are crossed readily by the nonpolar (lipid soluble) drug. The stroma being hydrophilic is easily crossed by polar (water soluble) compounds. Therefore a drug should be amphipathic ie with both lipidand water solubility to readily penetrate across the cornea.

b) Molecular size, weight and concentration of the drug: The lipid soluble molecules can cross the corneal epithelium easily irrespective oftheir molecular size, while water soluble molecules with the molecular size less than4A0 only can cross cornea.

c) Ionic form of drug: The drug intended for the topical use in eye must have the capacity to exist in bothionized and non-ionized form for penetration through cornea. Only non-ionised drugscan penetrate through corneal epithelium and ionized drugs can penetrate throughstroma.

d) pH of the solution: The pH of the solution may be varied from 4 to 10 without affecting thepermeability of the epithelium but solution outside this range increases thepermeability.

e) Tonicity of the solution: Hypotonic solutions increase the permeability of the epithelium considerably.

2. Blood-aqueous barrier: It is formed by tight junctions between the cells of the inner non-pigmentedepithelium of the ciliary body and the non-fenestrated endothelium of the iriscapillaries.

3. Blood vitreous barrier: It is the functional term describing the inability of vitreous constituents toequilibrate with blood and surrounding fluids. This barrier restricts the inflow ofserum protein and when this barrier is broken down as in trauma or inflammation) there occurs an inflow of proteins consequently decrease in the vitreoustransparency.

4. Blood-retinal barrier: It consists of two parts- the inner and outer. The inner blood retinal barrier iscomposed of the tight junction of retinal capillaries, endothelial cells and the outerblood-retinal barrier consists of tight junction complexes which are locatedbetween adjascent retinal pigment epithelial cells.So for an easy corneal penetration;

- Drug should be soluble both in water and fats.
- Prodrug form should be lipophilic and after absorption through epithelium is converted to proper form which can penetrate through stroma.
- Drug must contain agents that reduce surface tension so that corneal wetting will be enhanced and thereby delivers drug efficiently.

The drugs used in the preparation of *Anjana* also possess the properties of oil and usually used in the form of semi-solid which fulfills the lipid and water solubility thereby crossing the cornea.

The peculiarity of drugs used in *Anjana* preparation is that it can cross all the barriers, prevents the opacification and most importantly arrests the further opacification if already occurred.

Anjana as A Preventive and Curative Aspect

Anjana, the application of collyrium is advisable both in *Swastha (Healthy)* and in A*atura (Diseased)*. In *Swastha* as a part of *Dinacharya* and in case of *aatura* there is a broad rangeof indications such as *Timira, Abhishyanda, Adhimantha, Arma, Shuklagata roga*sand *Krishnagatarogas*. There are different types of *anjana* depending on their mode of action. The basic aim of *anjana prayoga* is that eye being an organ which is "*tejomayam*" i.e., one which is predominant with *tejomahabhuta* (Fiery element) can easily get afflicted by *kapha dosha* and by *anjana prayoga* as a daily regimen the accumulated*Kapha* can be combated.

Our Acharyas have explained different types of anjanas in many conditions having many properties. Most of the *anjana* preparations explained in the context of *Timira* possess *teekshna guna* as the pathology of *Timira* itself says – *adhika kledatva*. The anjana prepared for timira will be possesing lekhana guna In case of cataract, the *lekhana anjana* is helpful because thelens is hydrated and has become hard due to denaturated fibres. So on application of lekhana anjana it will help in the *samprarthi vigatana* of the *timira*.

Drugs Used In Preparing Lekhana Anjana Which Posess Anti-Cataractous Activity

- *Kshara dravyas* like *Yava kshara*
- *Tikshna dravyas* like *Marica, Pippali, Saindhava*
- *Amla dravyas* like *Amlika, Matulunga*
- *Triphala*
- *Yashtimadhu*
- *Lodhra*
- *Haridra*
- *Madhu* and
- *Ghritha*

As per *Astanga Sangraha*, all rasas except *madhura rasa* is used for preparation of *lekhana anjana*.

Common Anjana Yogas

- *Sukha Vati Varti (Cha. Sa. Chi 26 /253)*
- *Drishtiprada Varti (Cha. Sa. Chi 26/255)*
- *Saindhavadi Varti (Cha. Sa. Chi26/242)*
- *Chandrodaya Varti (Sha. Sa. Uth/ Netrarogadhikara).*
- *Chandraprabha Varti (Sha. Sa. Uth/Netrarogadhikara).*
- *Krishnadi varti (Va. Sa/ Netrarogadhikara).*
- *Vimala Varti (Sahasrayoga/ Netrarogadhikara).*

Efficacy of Anjana

Lekhana anjana has *teekshna properties* and thus it can help to eliminate *doshas* from *varthma siras* and *eye*, related tissues *srotas* and *sringataka marma*.

Once applied *anjana* act as an occular foreign body and hence eye gets reflex secretion in response to foreign particles. Thereby a part gets washed away by weeping and another part drained to the Naso lacrimal duct.In case of *Gutika* and *choorna anjana*, due to the micro particles deposited in the cul-de-sac the bioavailability of drug is enhanced and thus occular absorption is excelled. When ultimately the drug reaches the targeted tissue, the potency of drugs come into action further fulfilling thecriteria of arresting the opacification of lens. Considering all these factors *Anjana* procedure is higly efficient in the eye in presence of anatomical, biological and physiological barriers. *Acharya Charaka* opines that how gold ornaments are cleaned by different methods the same way by the application of *anjana*, eyes become bright like '*nabasi induvat'* (the moon in clear sky).

DISCUSSION

Among all the *kriyakalpas* owing to the factors like easy administration, bio availability and affordable price, *Anjana* can be the best option especially when a long term effect is demanded. In addition to its qualities in curing especially the posterior segment disorders, it can be adopted as a daily regimen to protect eyes from disorders and to maintain the equilibrium of *doshas* inside eye.

Many of the drugs used for *anjana* preparations contains arsenic and antimony compounds. While considering their molecular size it is clear that it is very high for these compounds. So in administering them orally and systemically doesn't serve the purpose of crossing the barriers of Eye. Hence topical application is done and thereby bioavailability is enhanced. In the drug delivery system of eye, there should be a controlled and sustained release and *anjana* easily serves this purpose.

Cataract remains the single largest cause of blindness, an estimated rate upto 17.6 million people are blind due to worldwide though it is curable cataract. So all possible measures should be taken to prevent such blindness. Public awareness about blindness and eye health through Ayurveda should be raised by NPCB programs and should encourage people to adopt Ayurvedic methods for same. Adopting *anjana* as a daily regimen is one such measure to prevent the early occurrence of catarat Since cataract is as an opacified lens, there occurs hydration and hardening of lens, thus anjana can help in competing this *athika kledatwa* as *lekhana anjana* is prepared out of drugs possesing such *teekshna* and *lekhana* properties. Owing to all these factors *anjana* can be considered as the best among all other *kriyakalpa* procedures not only in treating an aged lens but also to prevent early ageing of lens.

CONCLUSION

The main aim of *ayurveda* is '*swasthasya swaasthya rakshanam' and 'aathurasyavikaraprashamanam'*, considering this aspect anjana is the one procedure which have its utility in both preventive and curative aspect.

Most of the modern popular ocular preparations fail to reach the posterior segment. *Anjana* is a therapy which is efficient and most simple therapy which has been practiced since 5000 years that is useful both in anterior and posterior segment disorders. Apart from these considering other treatment modalities, *kriyakalpa* procedures are non-surgical, non-invasive, cost effective and efficient in treating both anterior and posterior segment disorders.

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