



## Therapeutic use of Presoaked Hydrophilic Contact Lens in Acute Angle Closure Glaucoma

Authors

**Neeta Bajaj<sup>1</sup>, Priyanka Singh<sup>2</sup>, Sakshi Lalwani<sup>3</sup>**

<sup>1</sup>M.S Ophthalmology, Associate Professor and Unit Head, Dept of Ophthalmology,

Grant Government Medical College and Sir J.J Group of Hospital, Mumbai, Maharashtra

Email: <sup>1</sup>[neeta.bajaj980@gmail.com](mailto:neeta.bajaj980@gmail.com), <sup>2</sup>[priyanka.singh6687@gmail.com](mailto:priyanka.singh6687@gmail.com) <sup>3</sup>[slalwani297@gmail.com](mailto:slalwani297@gmail.com)

### ABSTRACT

*Soft contact lenses presoaked in pilocarpine 2% for 12 hours and placed over cornea in cases of acute angle closure glaucoma are definitely useful in reducing the intra ocular pressure and is a better method as compared to conventional method of drug delivery.*

**Keywords-**soft contact lens, drug delivery, pilocarpine 2%.

### INTRODUCTION

Soft contact lenses were initially used for drug delivery by Sedlavec in 1965 in Czechoslovakia. The hydrogel lenses by virtue of their high water content and large intermolecular pore size, absorb water soluble drugs with some correlation with molecular weight releasing them initially in a high pulse and then gradually complying by first order of kinetics.

Anterior segment inflammations, infections/allergies and acute angle glaucoma are few important clinical conditions that require a high concentration of drugs<sup>1</sup>.

The drugs that can be delivered conveniently are water soluble antibiotics, steroids pilocarpine<sup>2</sup> atropine and homatropine.

Acute angle closure glaucoma is a medical emergency leading to painful blindness. There is progressive loss of visual field by infarction of nerve fibre bundles at the disc due to raised intraocular pressure. It usually develops in an eye

with abnormal anatomic configuration having shallow anterior chamber with increased curvature of anterior lens surface. The angle may be blocked by crowding with peripheral iris by iris bombe consequent upon pupil block, by a swollen lens pushing the iris diaphragm forwards or by combination of these factors.

The intraocular pressure should be lowered by medical means, traditionally with systemic administration of acetazolamide and miotic pilocarpine. The hyperosmotic agents like urea, mannitol, glycerol, isosorbide or alcohol have a severe effect on renal and cardiovascular systems and are usually reserved for patients with persisting high pressure or who have failed response to initial therapy.

The instillation of drops containing pilocarpine for the treatment of glaucoma has certain local disadvantages. If the action of the drug depends upon its concentration in the aqueous there are likely to have large fluctuations between

administration of the drops<sup>3</sup>. It is even likely that from time to time no pilocarpine will be present. To obviate this a high concentration of drug can be used or the length of time between administrations is reduced. The ideal method of ensuring a constant pilocarpine concentration in anterior chamber will be simple flow by diffusion over the cornea.

## MATERIALS AND METHODS

50 eyes with acute angle closure glaucoma were treated by means of a sterile hydrophilic contact lens which had been presoaked in 2 percent pilocarpine for 12 hours and applied for 4 hours on the patient following which intra ocular pressure was measured using air puff tonometer<sup>4</sup>. The contact lens was removed prior to measuring the intra ocular pressure and reapplied to the eye after an interval of 6 hours.

Materials used was soft contact lens having water content of 44 % made up of hydroxyl ethyl methacrylate. Other materials used are HEMA – VP (with vinyl pyrrolidone) MMA –PVD which contains hydrophilic polymer PVP, monomer VP. Diameter of lens used varied between 12-14 mm , curvature used was between 0.7 to 0.75mm and thickness between 0.25 to 0.35 mm.

The lenses were soaked in sterile isotonic saline for a minimum of 12 hours duration to remove any monomer residues and then transferred to 25 ml bottles of preservative free 2 % pilocarpine hydrochloride. The bottles were sealed and sterilised by keeping bottles in boiling water for 15 minutes. The lenses were soaked in this sterile form until use and were not used for 3 days to ensure complete equilibration of pilocarpine between aqueous solution and the lens.<sup>4</sup>

After the use the lenses were sterilised by autoclaving again in isotonic saline as soon as possible to prevent bacterial fungal contamination within the lens.

Ocular condition	No.of cases	Investigation	Treatment	Duration for which presoaked lens was used
Acute angle closure glaucoma	50	Intra ocular pressure	Soft contact lenses soaked in 2% pilocarpine for 12 hours and applied for 4 hours	2-3 days

## RESULTS

**Table 1:** Mean IOP after 4 and 8 hours of usage of presoaked contact lens.

S.no	Mean IOP before contact lens insertion	Mean IOP after 4 hours of presoaked contact lens usage	Mean IOP after 8 hours of presoaked contact lens usage
1	40	24	18

## DISCUSSIONS

Drugs penetrate hydrophilic contact lenses at a rate which depends upon the pore size between the cross linkage of the three dimensional lattice structure of the lens upon the concentration of the drug in soaking solution and upon the molecular size of the drug.

Because of tear flow topically instilled drugs have a limited life span in the conjunctival sac and only a fraction of their mass penetrates the eyeball across the epithelial barrier of the cornea. The resistance of the corneal epithelium to ions is about 2000 times that of the total stroma .The relative thickness of epithelium stroma and endothelium is 0.1:10:0.01 and diffusion of electrolytes by these structures is 2000:1.0:10.0.<sup>5</sup>This results in drug penetration in many cases in quantities which is below the optimum required for treatment<sup>6</sup>.

However much better penetrations can be achieved by prolonging <sup>7</sup>the contact time of the drug in the eye. Hydrophilic lens as an adjuvant to drug delivery has given positive results thus impressing upon their definite use as a drug delivery system.

Most workers have adopted a technique of a few minutes soak in pilocarpine immediately before

presenting the lens to the eye..The technique describes above allows the lens to be prepared and made available at stores in sterile form for use in cases of acute angle closure wherein efficient and quick intra ocular pressure lowering is the key to visual prognosis.<sup>8</sup>

During this period pilocarpine diffuses in from the soaking solution producing a concentration gradient within the lens the greater concentration being at the surface from which it later diffuses to the conjunctival sac.

A prolonged soak allows equilibration throughout the lens so that when the pilocarpine diffuses out from the surface layers it is replenished from the deep part of the lens acts as a reservoir producing a more sustained high yield<sup>6</sup>. A prolonged soaked lens offers benefit over short duration presoaked lens due to the concentration gradient created. Higher drug penetration than subconjunctival therapy

Need of much smaller amount of drug to produce desired therapeutic level. Being a non invasive procedure thus less chances of infection. The disadvantages of this procedure are that the drug release from hydrophilic contact lenses is pulsatile this may necessitate repeated application of drug soaked lenses in cases where consistent high drug penetration is needed.

## CONCLUSION

Hydrogel contact lens delivery system may be an effective method of treatment in acute angle closure glaucoma. The sustained drug elution helps not only in reducing the amount of drug used per patient but also aids in achieving better IOP control over longer duration of time.

The benefits of usage of soft contact lens outweighs their side effects. We can definitely conclude from above study that presoaked soft contact lens, in pilocarpine, works as an excellent means of drug delivery in cases of acute angle closure glaucoma.

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