OCULAR INSERTS

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Ophthalmic Inserts

- Ocular insert (Ocusert) are sterile preparation that prolong residence time of drug with a controlled release manner and negligible or less affected by nasolacrimal drainage.
- It shows diffusion controlled release.
- It consists of a central reservoir of drug enclosed in specially designed microporous membrane allowing drug to diffuse from reservoir at precisely predetermined rate.
- Inserts are available in different varieties depending upon their composition and applications.

OCULAR INSERTS

CLASSIFICATION :

1 .NON ERODIBLE INSERTS

i. Ocusert
ii. Contact lens

2 .ERODIBLE INSERTS

i. Lacriserts
ii. SODI
iii. Mindisc

OPTHALMIC INSERTS

- ***Ophthalmic inserts*** are defined as sterile solid or semisolid preparations, with a thin, flexible and multilayered structure, for insertion in the conjunctival sac.
- Recently ophthalmic inserts impregnated with drug, have been developed to provide for the continuous release of the drug. The insert unit is designed to provide for the release of medication at predetermined & predictable rates permitting the elimination of frequent dosing by the patient, ensuring night-time medication & providing a better means of patient compliance.

- The insert is flexible & is a multilayered structure consisting of a drug containing core surrounded on each side by a layer of copolymer membranes through which the drug diffuses at a constant rate. The rate of diffusion is controlled by the polymer composition, the membrane thickness & the solubility of the drug. The devices (inserts) are sterile & do not contain preservatives.

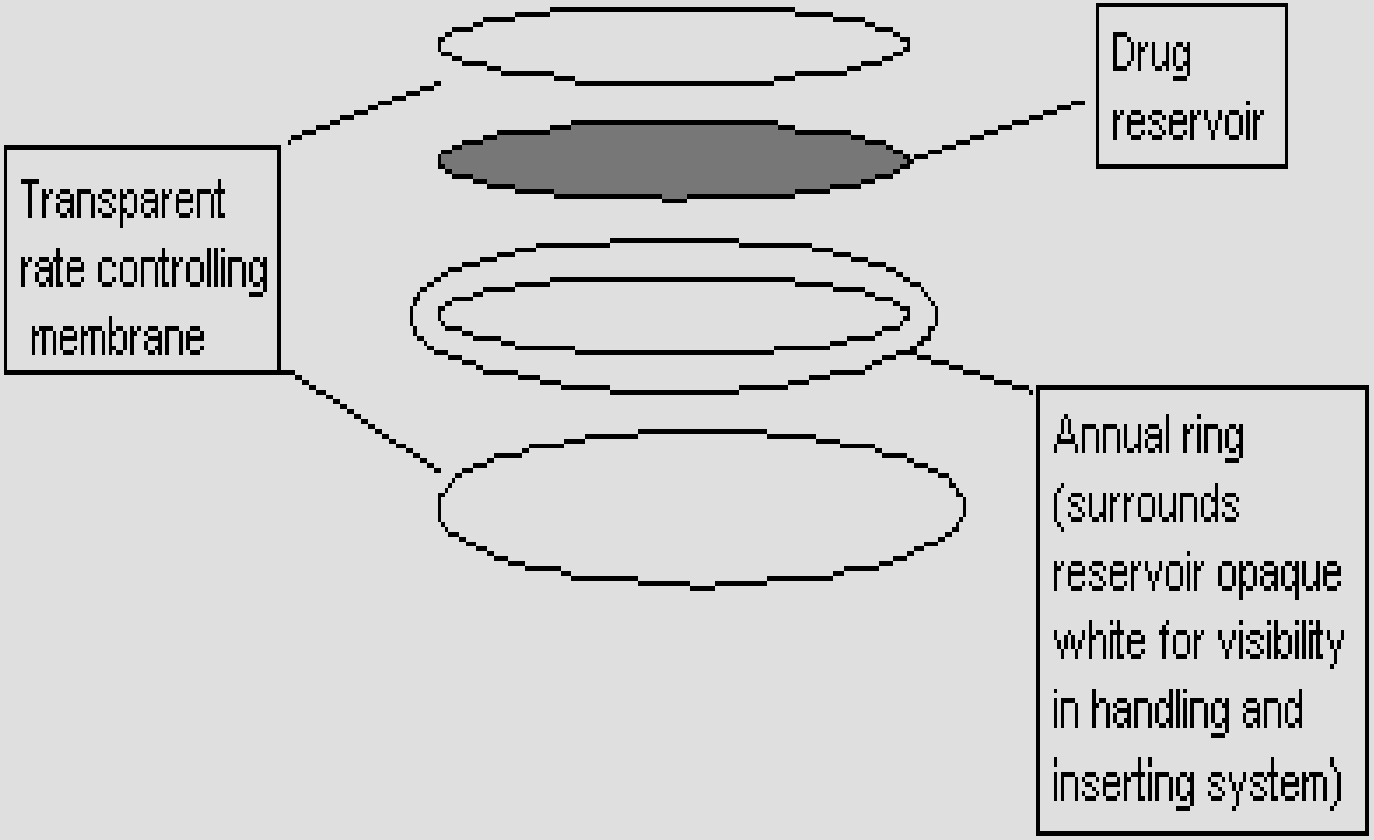


Fig. 1. Schemetic diagram of ophthalmic insert

- ***Advantages:***
- Increasing contact time and improving bioavailability.
- Providing a prolong drug release and thus a better efficacy.
- Reduction of adverse effects.
- Reduction of the number administrations and thus better patient compliance.

Insoluble / Non erodible inserts

- ***Insoluble insert*** is a multilayered structure consisting of a drug containing core surrounded on each side by a layer of copolymer membranes through which the drug diffuses at a constant rate.

- **The rate of drug diffusion is controlled by:**

- The polymer composition
- The membrane thickness
- The solubility of the drug

- OCUSERT: 1ST Ocusert by " ALZA Corporation" – Pilocarpine delivery

* The Ocusert therapeutic system is a flat, flexible, elliptical device designed to be placed in the inferior cul-de-sac between the sclera and the eyelid and to release Pilocarpine continuously at a steady rate for 7 days.

It consists of (a) a drug reservoir, pilocarpine (free base), and a carrier material, alginic acid: (b) a rate controller ethylene vinyl acetate (EVA) copolymer membrane.

* The device consists of 3 layers…..

1. Outer layer:Ethylene vinyl acetate copolymer layer. (Rate Controlling Membrane)

2. Inner Core - Pilocarpine gelled with alginate main polymer.

3. A retaining ring - of EVA impregnated with titanium dioxide

: Annular ring surrounds reservoir and opaque white.

e.g. *The* ***Ocusert® Pilo-20 and Pilo-40 Ocular system***

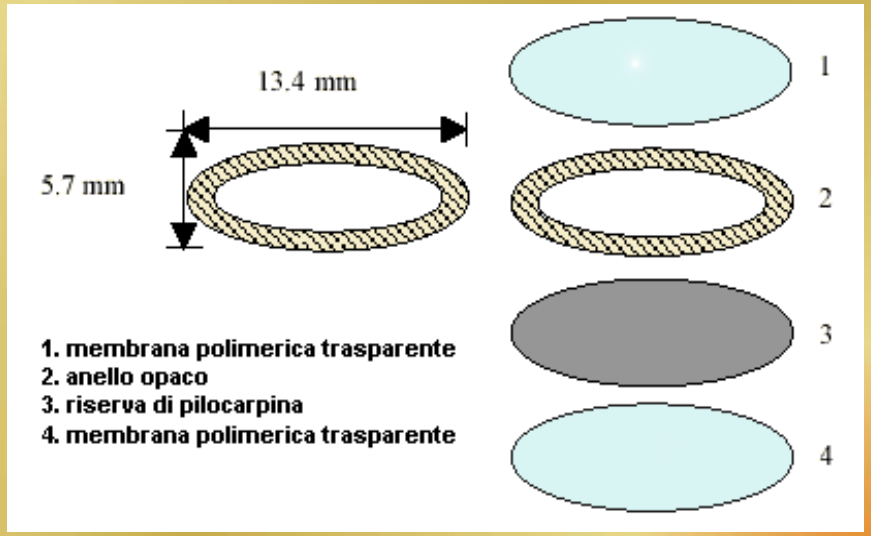
-Designed to be placed in the inferior cul-de-sac between the sclera and the eyelid and to release pilocarpine continuously at a steady rate for 7 days for treatment of glucoma.

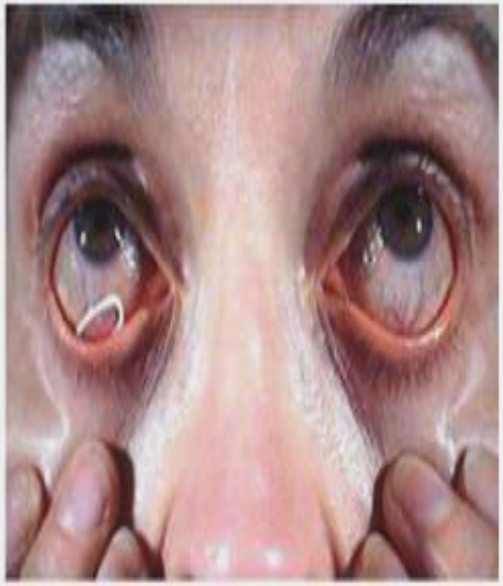
Pilo - 20 :- 20 µg /hr for 7 days

Pilo 20 dimensions- L:13.4 mm T: 0.3

Pilo - 40 :- 40 µg /hr for 7 days

Pilo 40- higher rel rate- RC memb thinner, Use of 90 mg of di(2- ethylhexyl) phthalate as flux enhancer





Photograph of patient with Ocusert (pilocarpine) in place in lower cul-de-sac of right eye

Advantages of pilocarpine ocuserts over drops :

- The ocusert exposes the patient to a lower amount of the drug leading to reduced side effects .The ocusert provide a continuous control of the intra-ocular pressure
  The ocusert is administered only once per week & this will improve patient compliance .The ocusert contain no preservative so they will be suitable for patients sensitive to preservatives in opthalmic solutions

Disadvantages of pilocarpine ocuserts

- They are more expensive than drops
  It may be inconvenient for the patient to retain the ocusert in the eye for the full 7 days.
- The ocusert must be checked periodically by the patient to see that the unit is still in place

ADVANTAGES:

Controlled rate

Reduced local side effects and toxicity.

Around the clock control of IOP.

Improved compliance.

DISADVANTAGES:

Retention in the eye for the full 7 days.

Periodical check of unit.

Replacement of contaminated unit

Expensive.

Patient discomfort- placement and removal – loss of system from eye.

OBSERVATNS:

Inserts are functns of size and shape.

Smaller- better retained than larger.Rod- better retained than oval.

Non erodible osmotic inserts : Single reservoir of drug with or without additional osmotic solute dispersed thro out polymeric matrix.

CONTACT LENSES:

- These are circular shaped structures.
- Therap contact lenses- by presoaking them in drug solution.
- Drug incorporation depends on whether their structure is hydrophilic or hydrophobic.

Drug release depends upon : Amount of drug

Soaking time ,Drug concentration in soaking solution.

Alternative: Drugs may be added during polymerization

ADVANTAGES: Possibility of vision correction simultaneously with release of drug.

DISADVANTAGES: Handling and cleaning, Expensive

Classfication: Rigid, semirigid, elastomeric, soft hydrophilic biopolymeric.

Rigid- not suitable for prolonged delivery to eye- reasons

Soft hydrophilic preferred as better tolerance, easy to fit- for corneal ulcers (HEMMA copolymerized with PVP or EGDM)

ERODIBLE INSERTS

*The solid inserts absorb the aqueous tear fluid and gradually erode or disintegrate. The drug is slowly leached from the hydrophilic matrix.

*They quickly lose their solid integrity and are squeezed out of the eye with eye movement and blinking.

* They do not have to be removed at the end of their use.

Three types :

1. LACRISERTS

2. SODI

3. MINIDISC

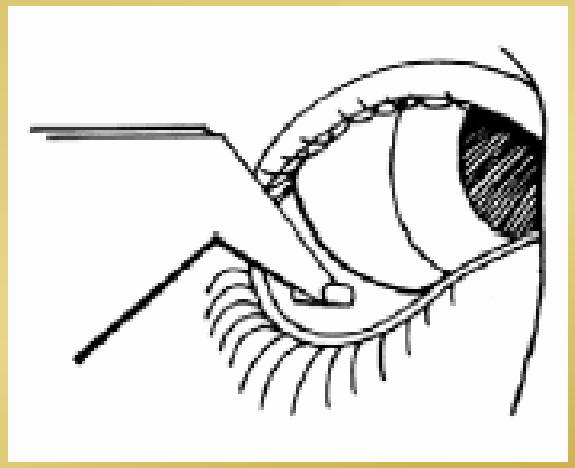
LACRISERTS:

-Sterile rod shaped device made up of hydroxyl propyl cellulose without any preservative.

-Used for the treatment of dry eye syndromes

-weighs 5 mg and measures 1.27 mm in diameter with a length of 3.5 mm.

-It is inserted into the inferior fornix.



SODI (Soluble ocular drug inserts)

-Small oval wafer

-Sterile thin film of oval shape

-Weighs 15-16 mg and Used in glaucoma treatment

-Advantage – Single application

MINIDISC:

-Countered disc with a convex front and a concave back surface

-Diameter – 4 to 5 mm

Composition:

-Silicone based prepolymer-alpha-w-dis (4-methacryloxy)-butyl poly di methyl siloxane. (M2DX)

M-Methyl a cryloxy butyl functionalities.

D – Di methyl siloxane functionalities.

X-Pilocarpine, chloramphenicol

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Images adapted from internet-

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