



# OPHTHALMIC VISCO- ELASTIC DEVICES

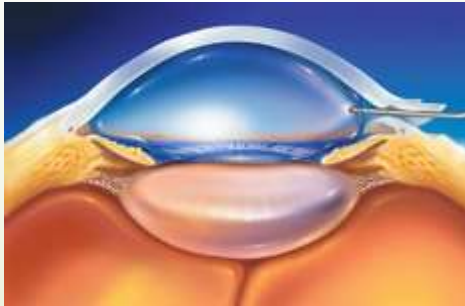
By  
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The author declares that there is  
no conflict of interest regarding the  
publication of this presentation

## History

Since the 1970's.

- Air and autologous serum had been tried before.

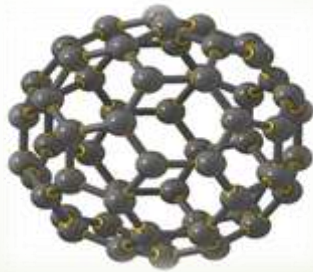


## What is the Ideal Viscoelastic?

1. Easy infusion
2. Optically clear
3. Retention during rhexis & phaco
4. Coats & protects corneal endothelium
5. Easy removal at the end of surgery
6. Non-toxic

## Physical properties

"Rheology" is the study of deformation & flow of fluids in response to applied forces.

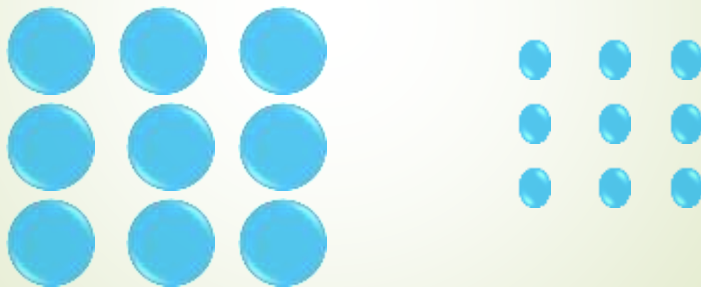


### Cohesion:

Tendency for similar molecules to stay together.

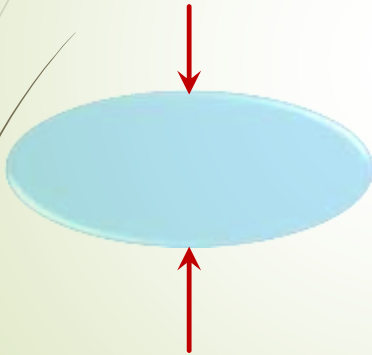
↑ in long chain (large) molecule solutions → *COHESIVE*

↓ in short chain (small) molecule solutions → *DISPERSIVE*



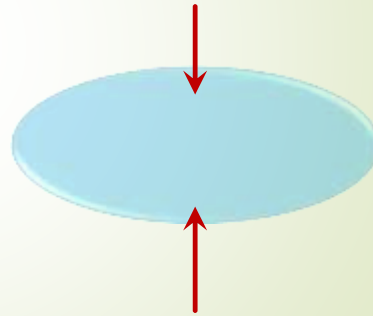
### •Viscosity:

It is a substance that resists deformation under pressure & maintains its original form.  
Measured in centipoise



### •Elasticity:

It is a substance that deforms its shape under pressure, but when pressure is released, it regains its original form.

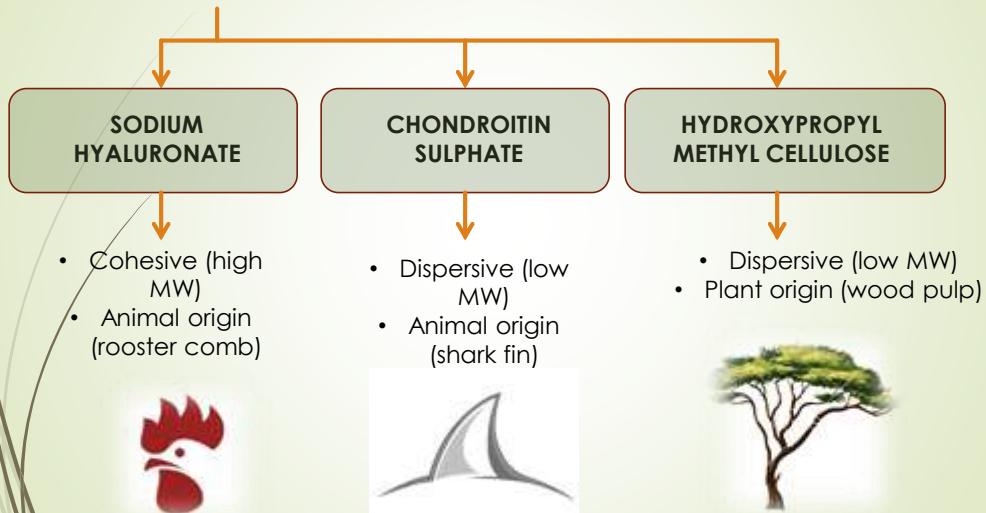


### •Pseudo-plasticity:

A substance that while at rest (= zero shear rate) behaves in a highly viscous manner & maintains its form, but when subjected to pressure (= high shear rate) it becomes highly elastic & fluidy & deforms with ease.



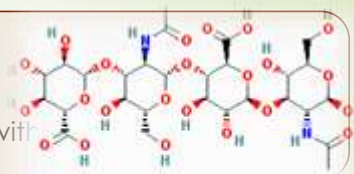
## Composition



## Types of OVDs

According to Healon, Healon GV, Provisc

- High molecular weight, long-chained Na hyaluronate (1,000,000-7,000,000 Daltons)
- Long chains interlock & entangle → behave as with a cohesive unit.

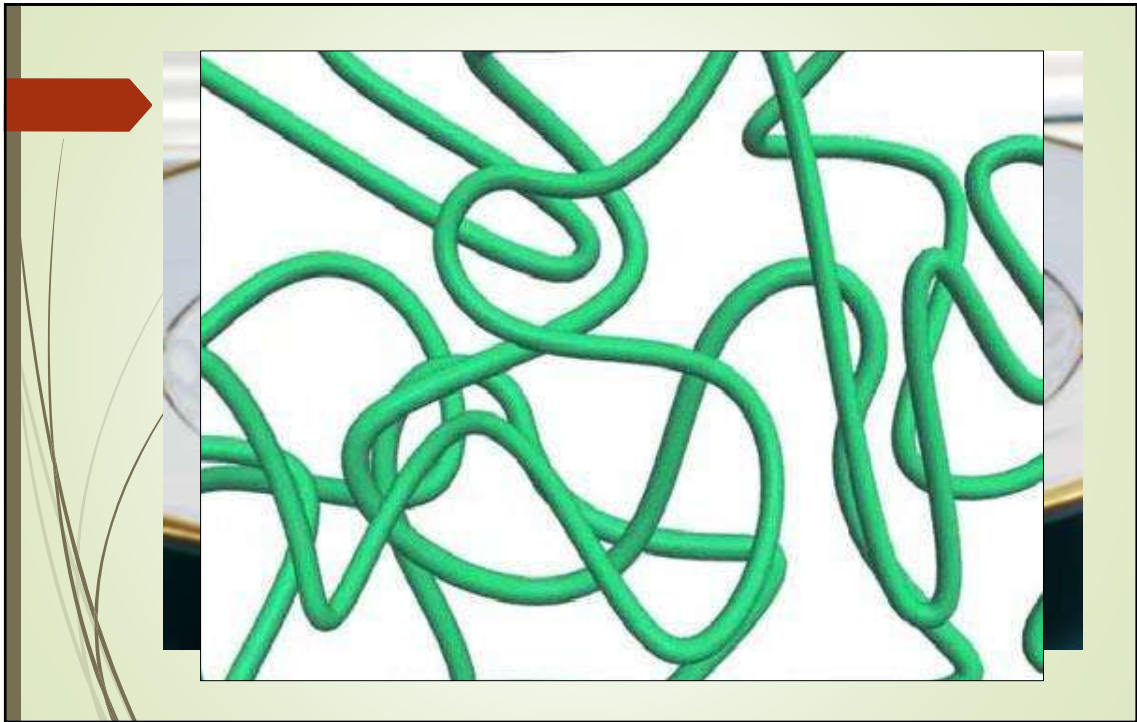


### COHESIVE

- **During zero shear:**  
Scaffolding effect → maintain space effectively

### DISPERSIVE

- **Under high shear:**  
Leave the eye as a bolus → easier to remove, but less protective



## DISPERSIVE

Eg: Healon D, Viscoat, methyl cellulose

Low molecular weight, short chained OVDs (~500,000 Daltons).

Viscoat has additional chondroitin sulfate (~25,000 Daltons)

**Zero shear:**

Tend to slide over one another and create a puddle → less effective at maintaining space

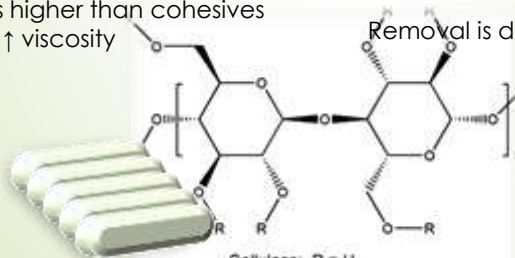
Concentrations higher than cohesives

→ ↑ viscosity

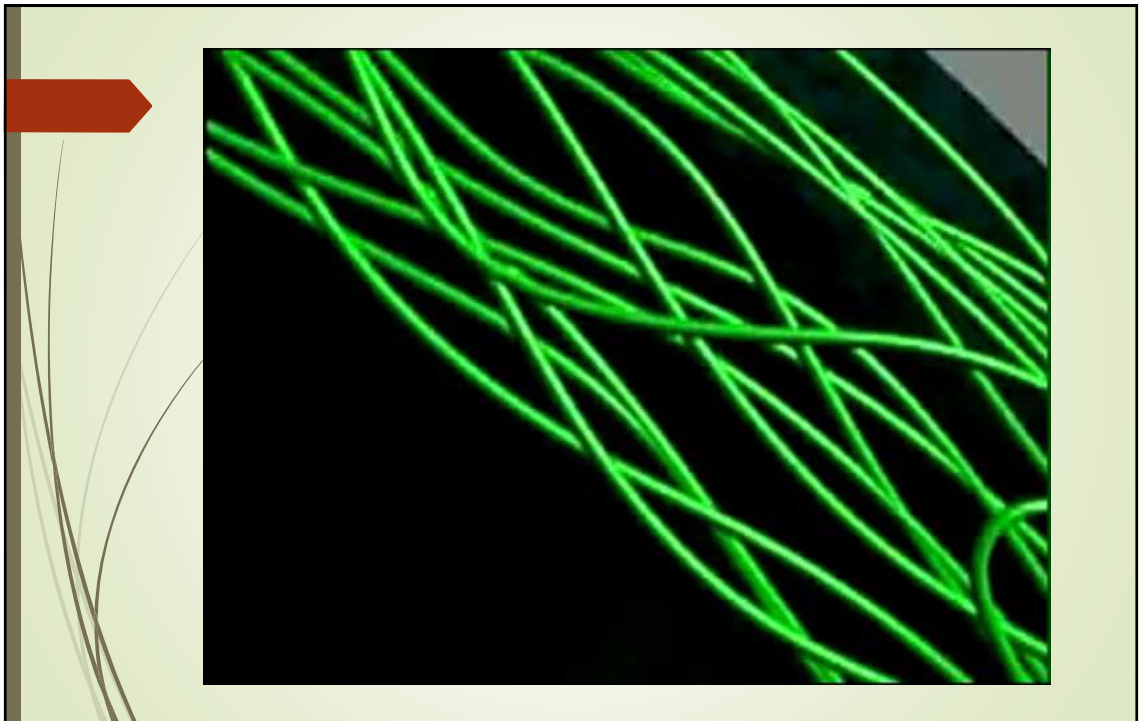
**High shear:**

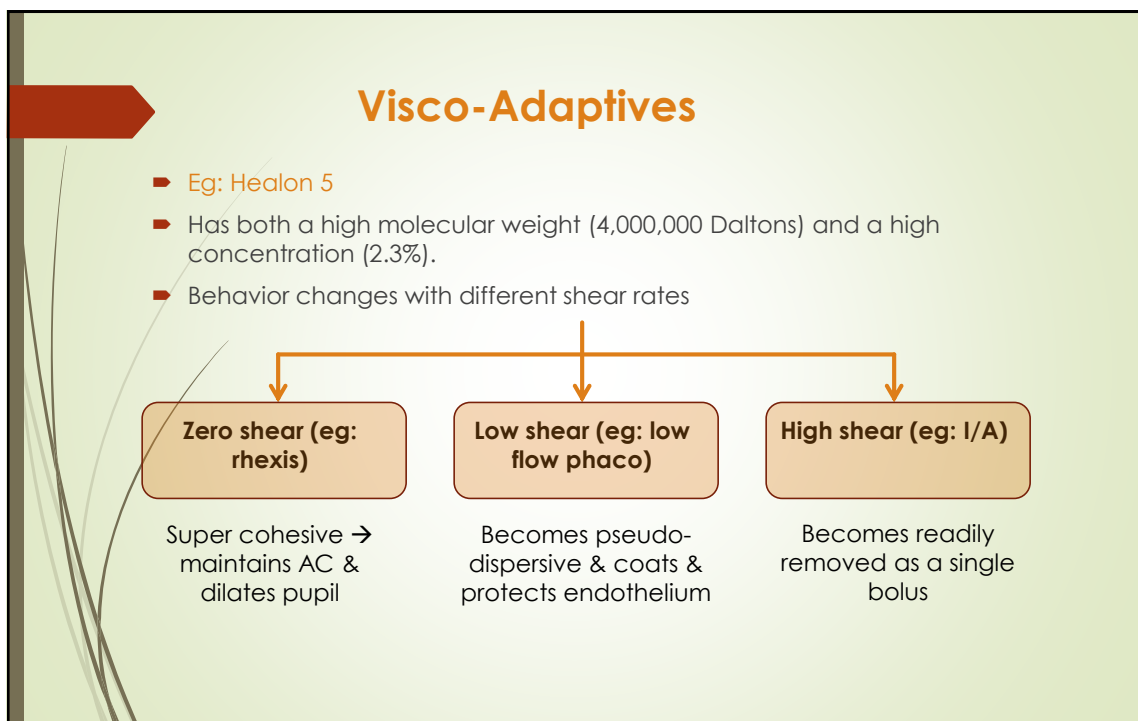
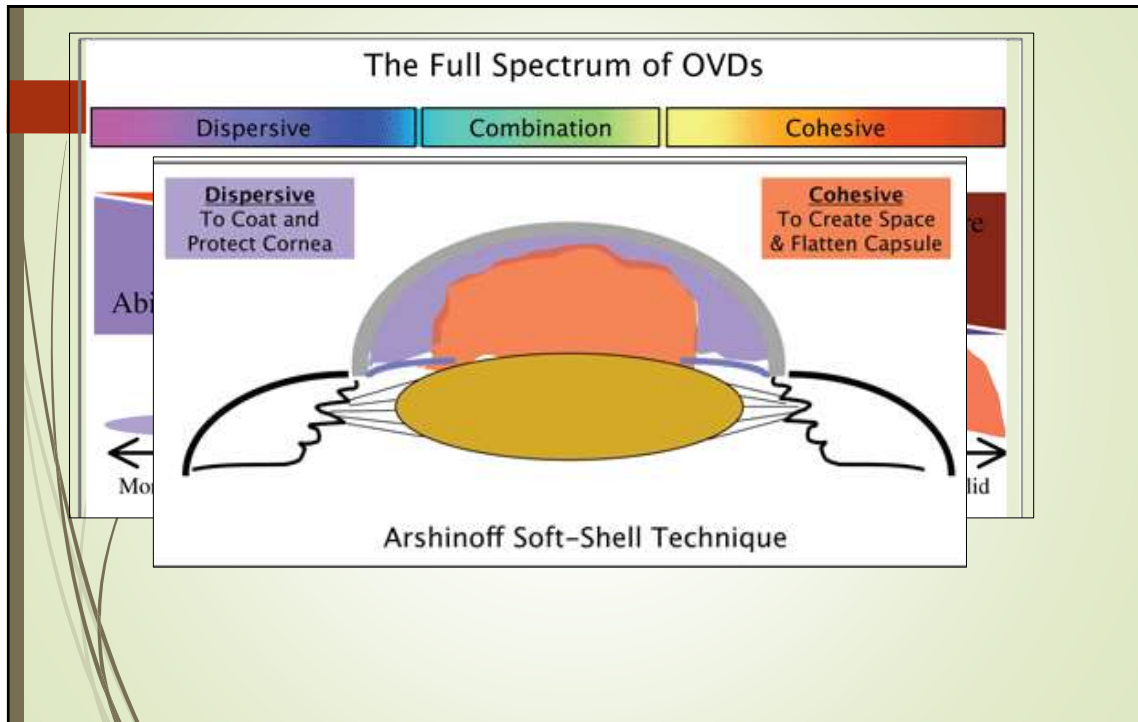
Molecules slide over themselves and don't entangle → coat & protect intraocular structures + stay in the AC during phaco

Removal is difficult at the end of surgery



Cellulose: R = H  
Methyl cellulose: R = CH<sub>3</sub> (40-90%) or H





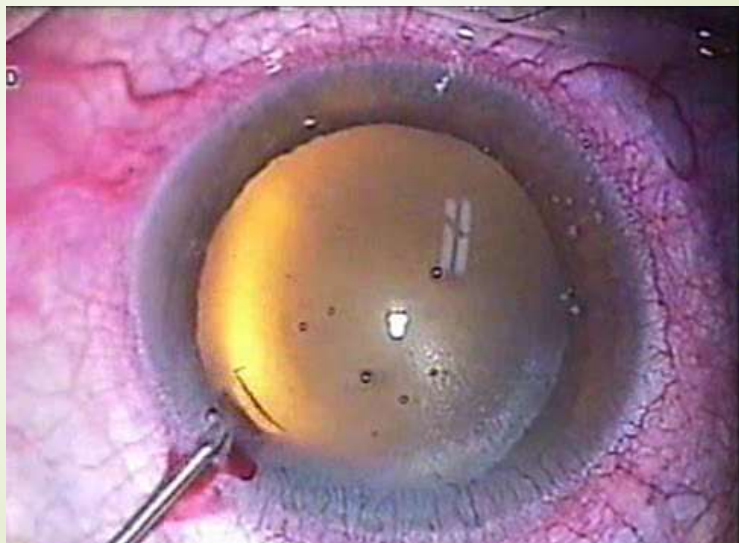


## Uses of OVD's

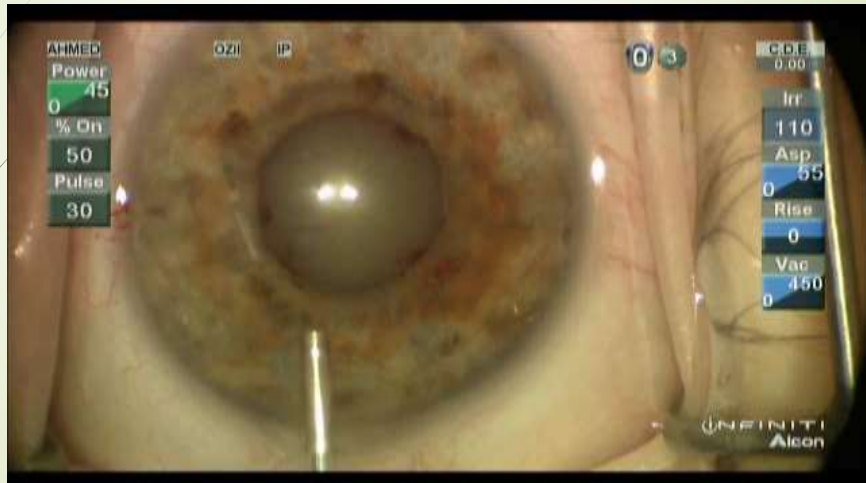
Intra-ocular	Extra-ocular
<ol style="list-style-type: none"> <li>1. Coating &amp; protecting corneal endothelium.</li> <li>2. Pupillary dilation</li> <li>3. Maintaining &amp; forming space:               <ol style="list-style-type: none"> <li>a) During capsulorrhexis.</li> <li>b) During phaco-probe insertion.</li> <li>c) During IOL implantation.</li> </ol> </li> <li>4. Compartmentalization (eg: during vitreous loss).</li> <li>5. Visco-dissection &amp; visco-expression.</li> </ol>	<ol style="list-style-type: none"> <li>1. Coating corneal epithelium.</li> <li>2. To fill dead space in IOL injector.</li> </ol>

### Intraocular uses:

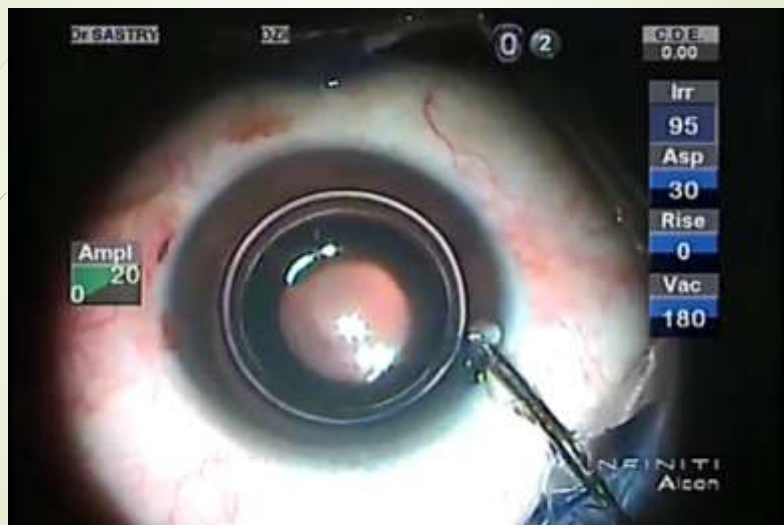
#### 1. Coating & protecting corneal endothelium:



Intraocular uses:  
2. Pupillary dilation:

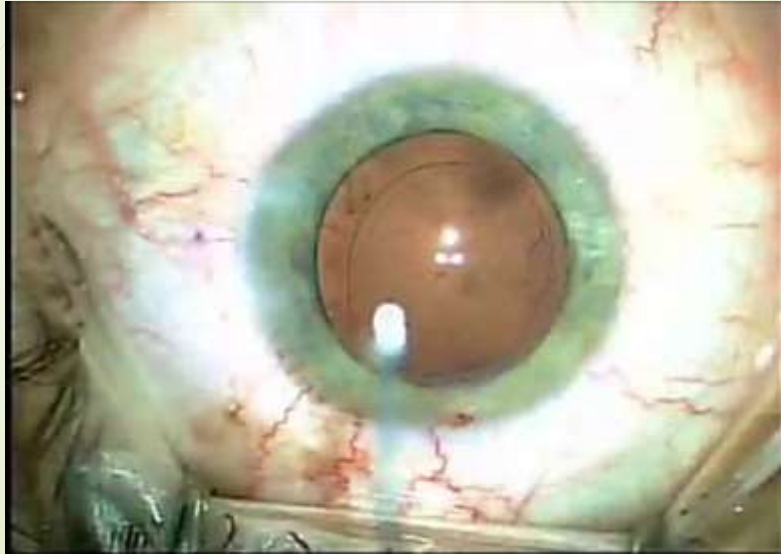


Intraocular uses:  
3. Maintaining & forming space (eg: during capsulorhexis):



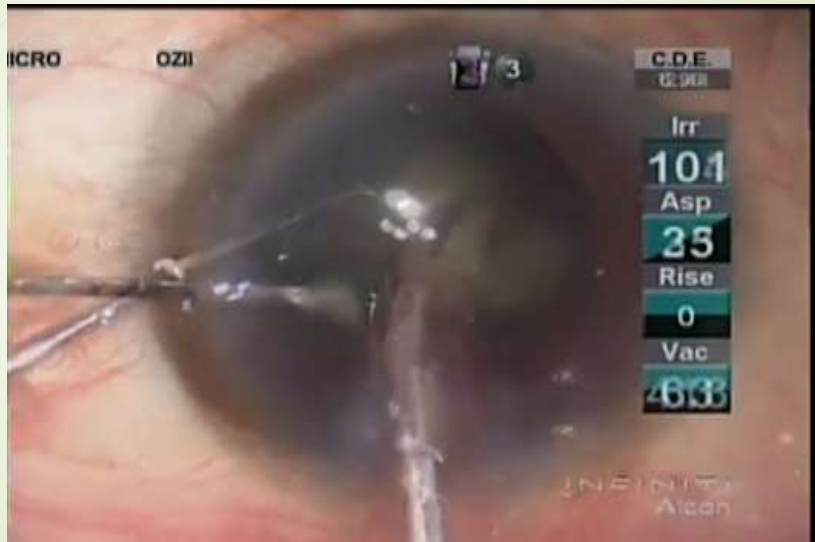
Intraocular uses:

3. Maintaining & forming space (eg: during IOL implantation):



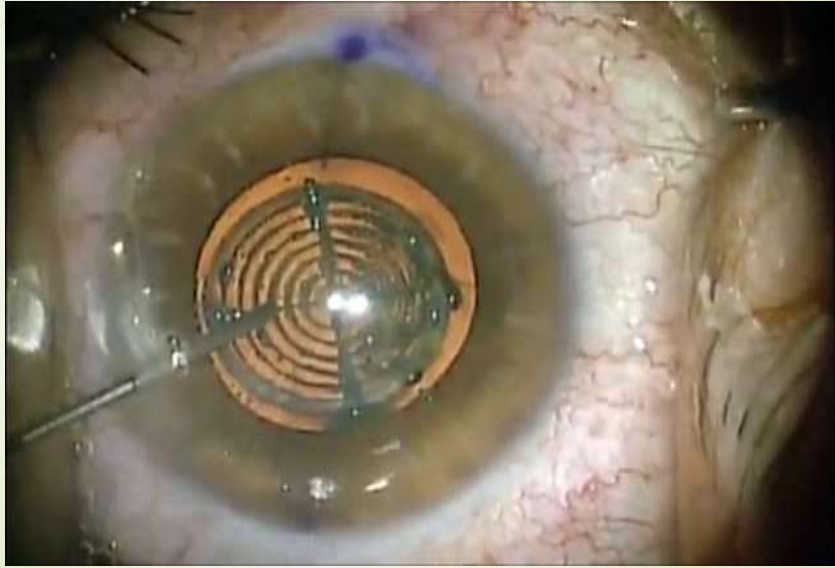
Intraocular uses:

4. Compartmentalization (eg: during vitreous loss):



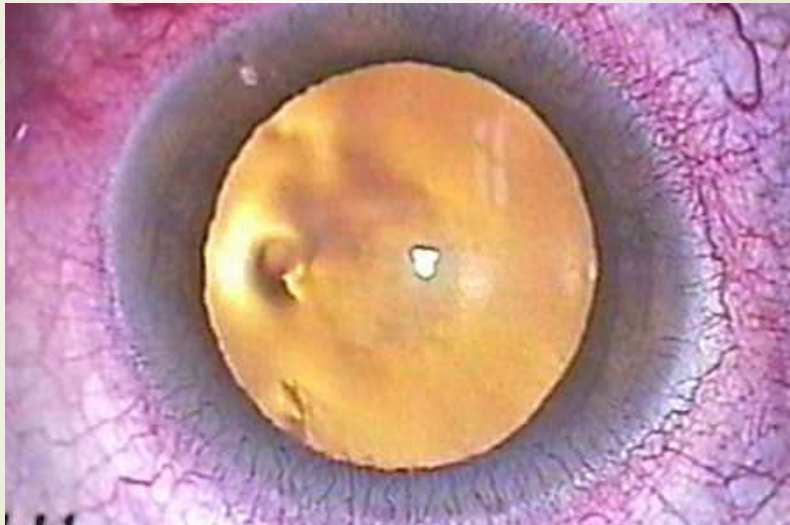
Intraocular uses:

5. Visco-dissection & visco-expression:



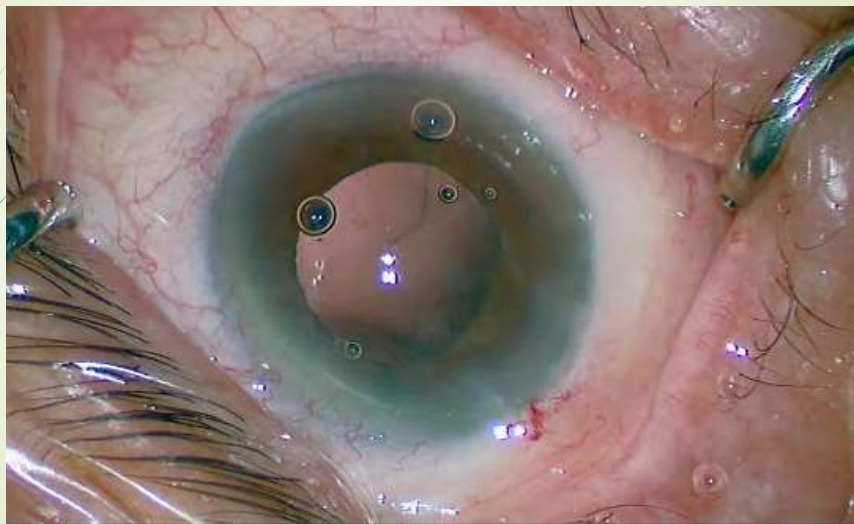
Extraocular uses:

1. Coating corneal epithelium:



Extraocular uses:

2. Filling the dead space of the IOL injector:



THANK YOU