



OPHTHALMIC VISCO-ELASTIC DEVICES

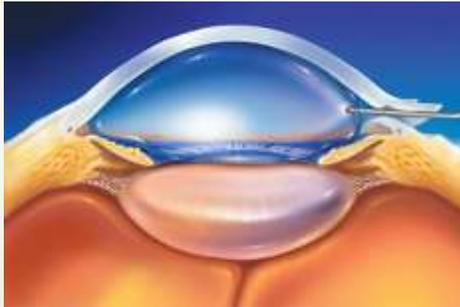
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The author declares that there is no conflict of interest regarding the publication of this presentation

History

Since the 1970's.

- Air and autologous serum had been tried before.

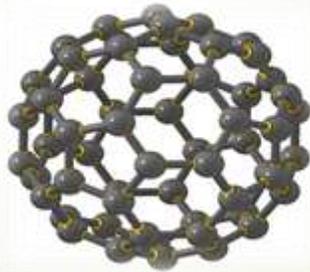


What is the Ideal Viscoelastic?

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.

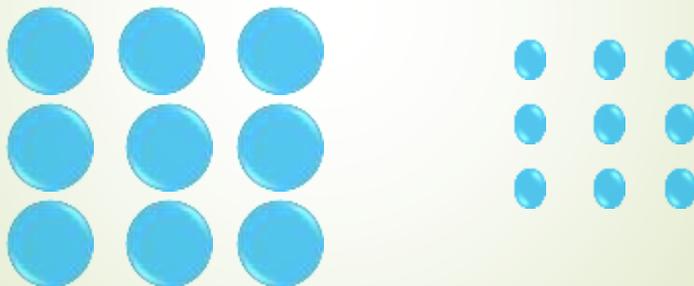


Cohesion:

Tendency for similar molecules to stay together.

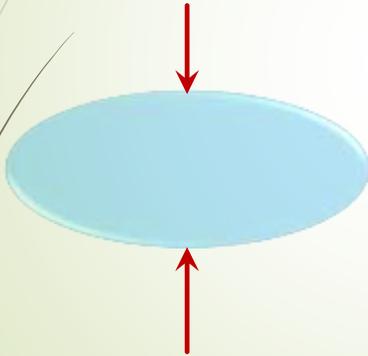
↑ in long chain (large) molecule solutions → *COHESIVE*

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



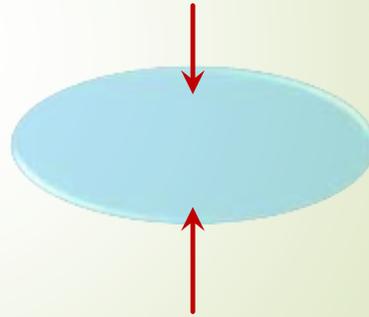
•Viscosity:

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.

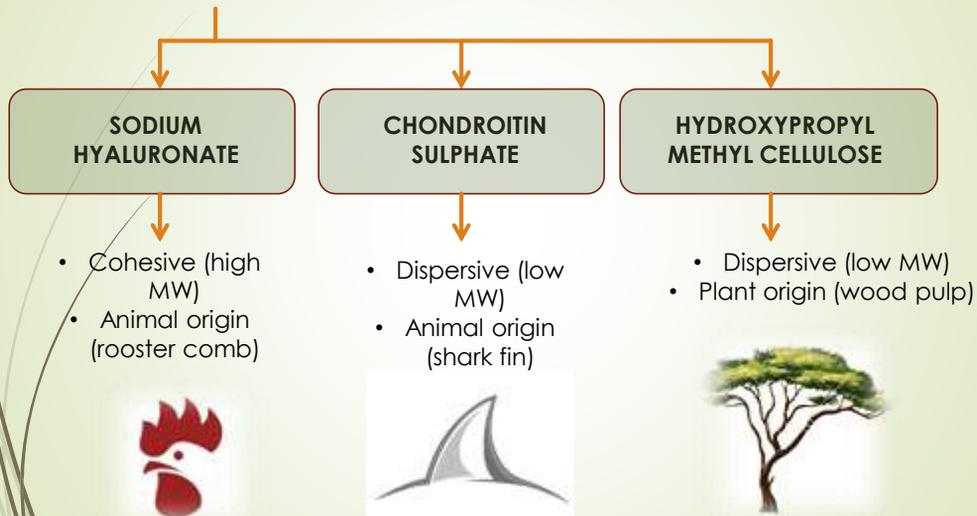


•Pseudo-plasticity:

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.



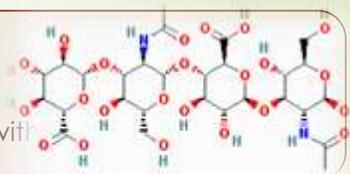
Composition



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.

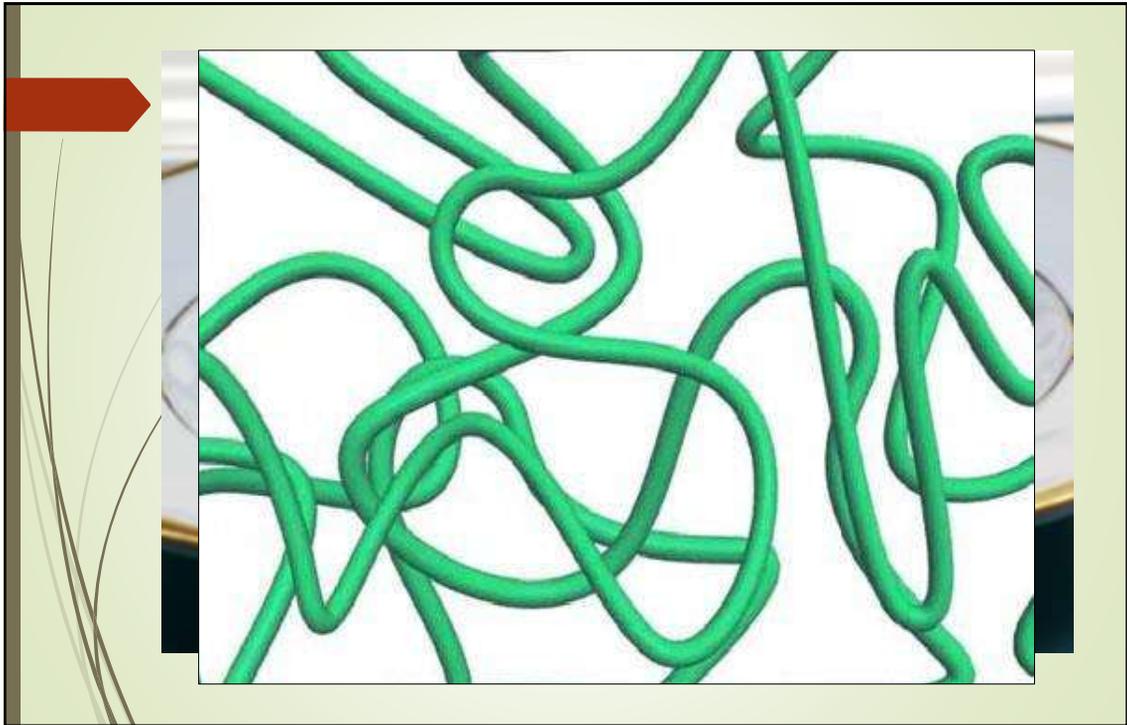


COHESIVE

- **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:

High shear:

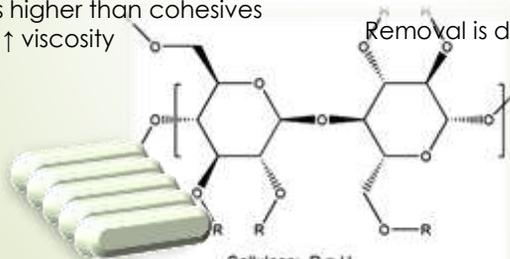
Tend to slide over one another and create a puddle → less effective at maintaining space

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

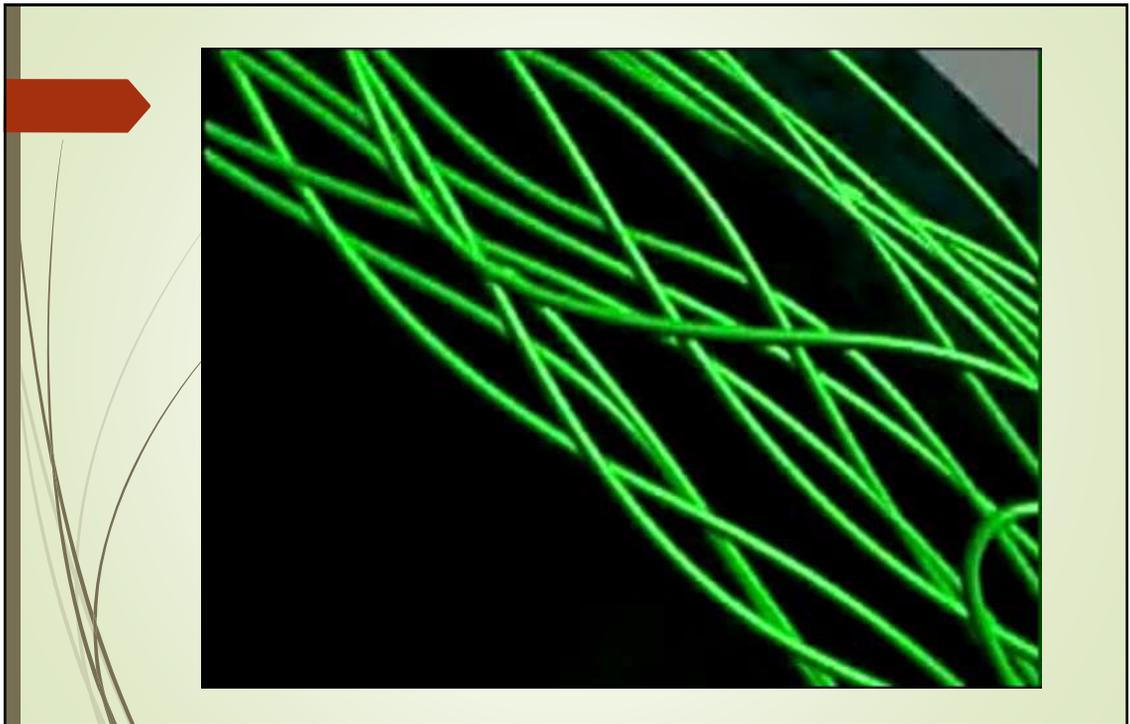
Concentrations higher than cohesives

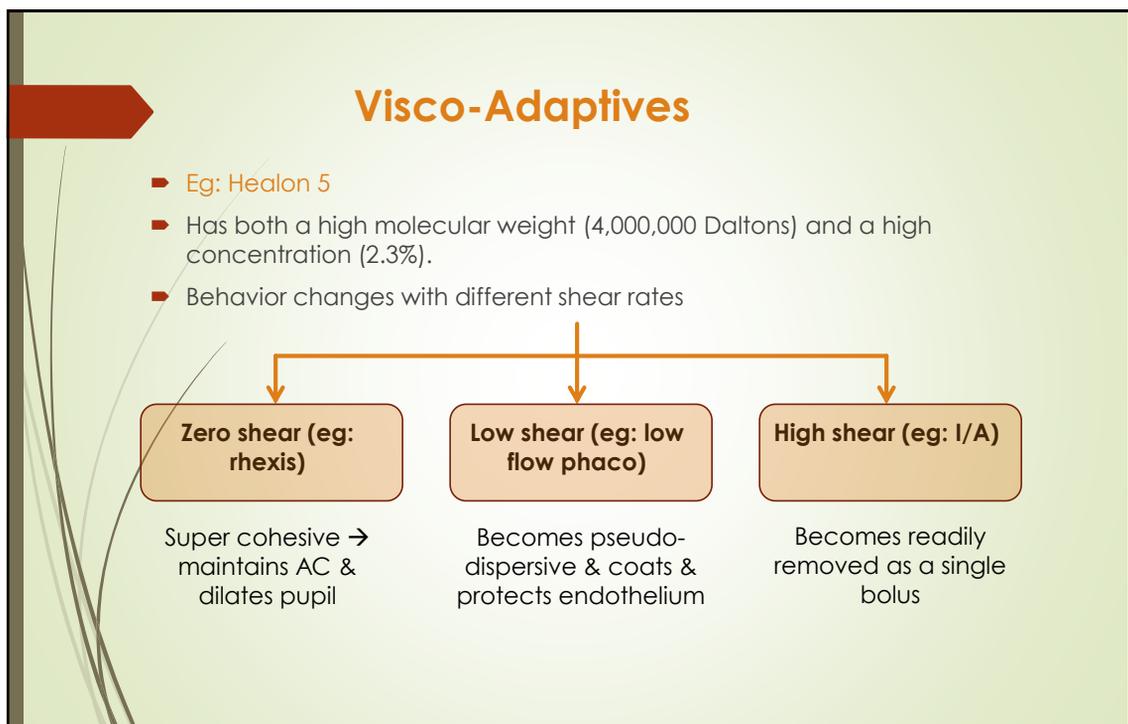
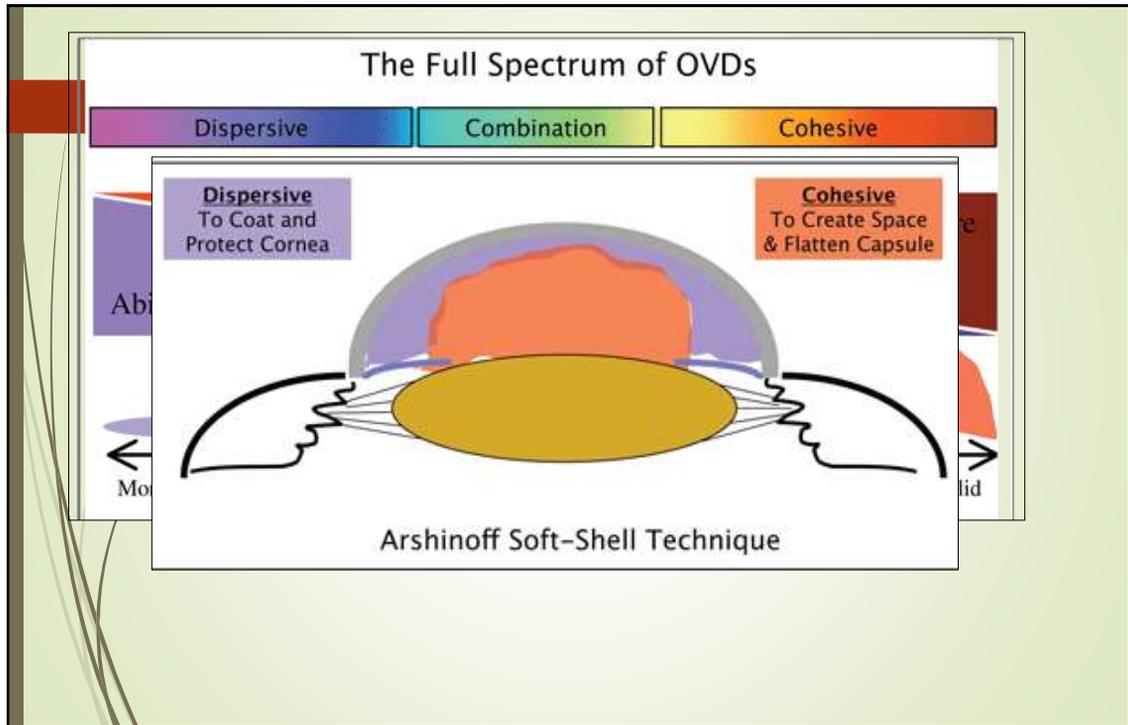
Removal is difficult at the end of surgery

→ ↑ viscosity



Cellulose: R = H
Methyl cellulose: R = CH₃ (40-90%) or H



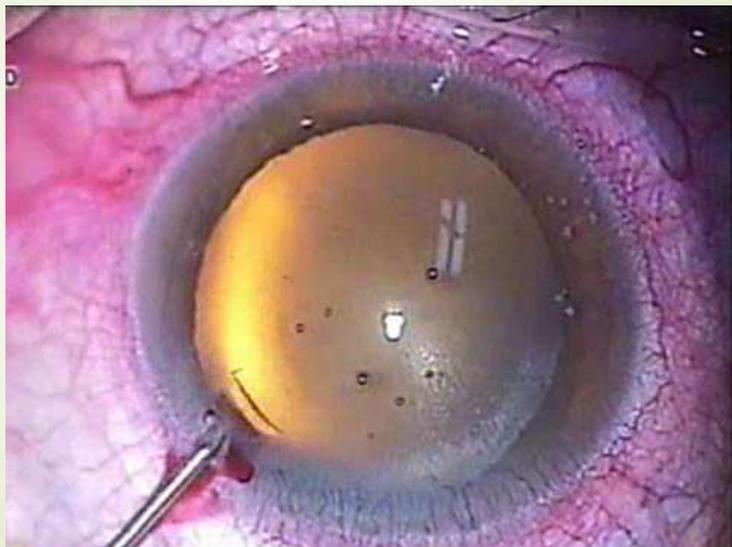


Uses of OVD's

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

Intraocular uses:

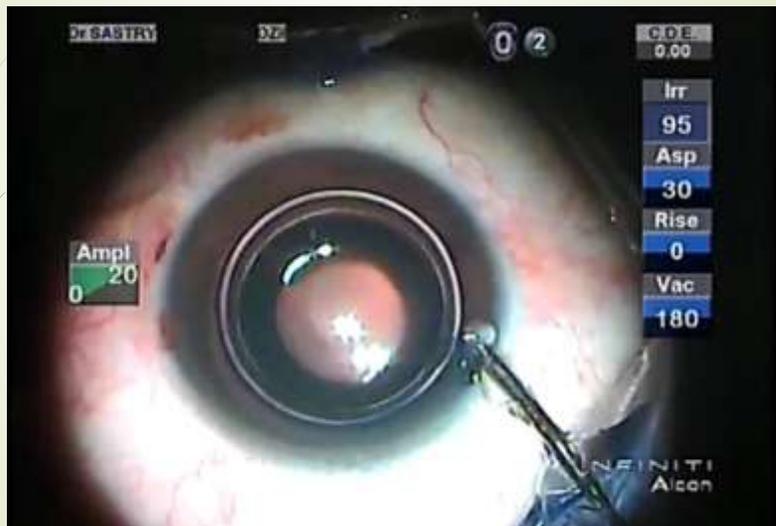
1. Coating & protecting corneal endothelium:



Intraocular uses:
2. Pupillary dilation:

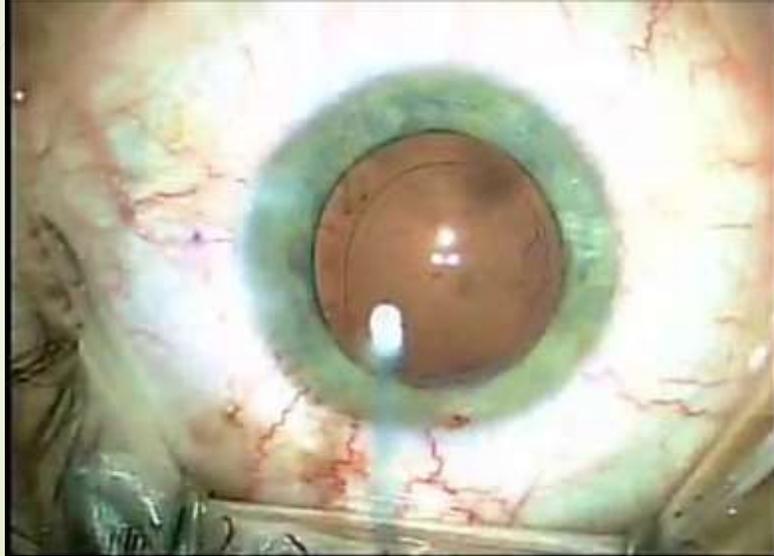


Intraocular uses:
3. Maintaining & forming space (eg: during capsulorhexis):



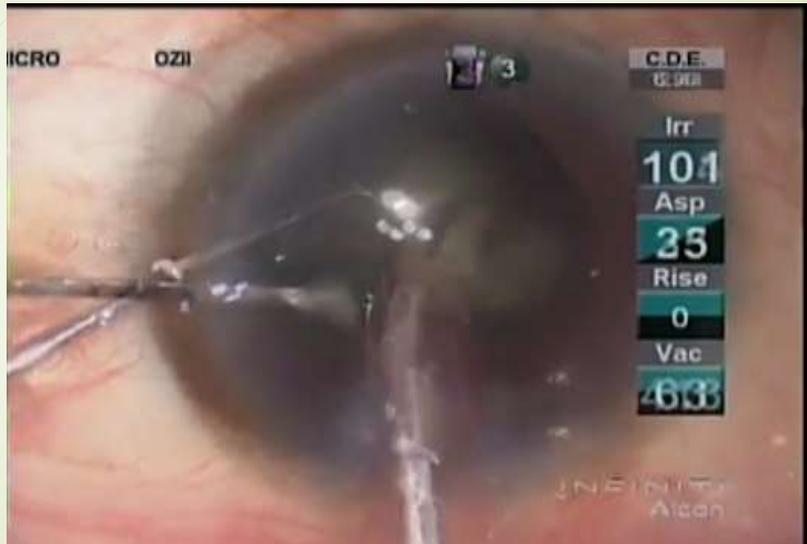
Intraocular uses:

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



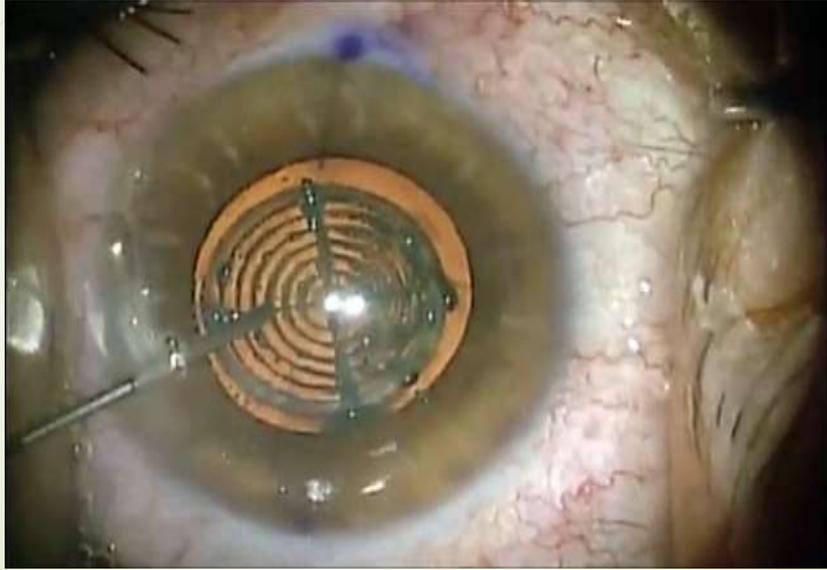
Intraocular uses:

4. Compartmentalization (eg: during vitreous loss):



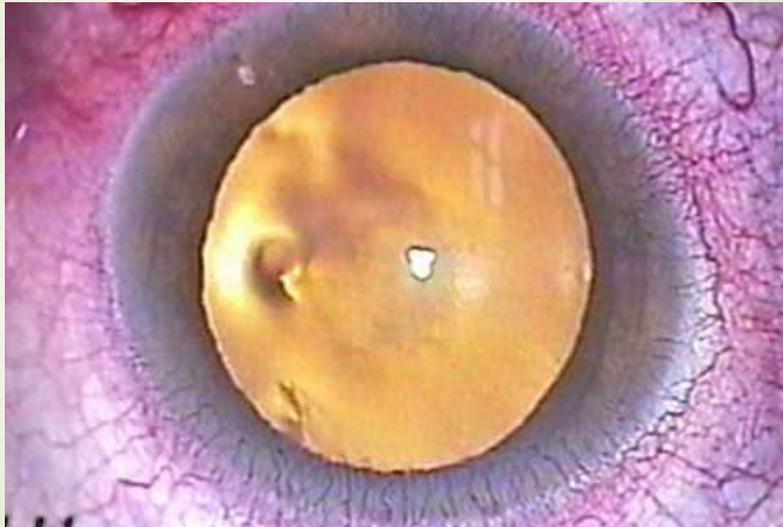
Intraocular uses:

5. Visco-dissection & visco-expression:

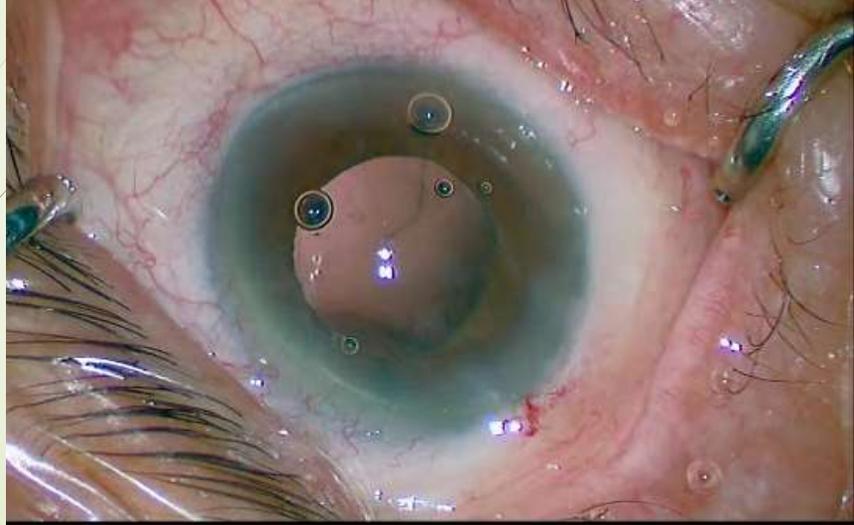


Extraocular uses:

1. Coating corneal epithelium:



Extraocular uses:
2. Filling the dead space of the IOL injector:



THANK YOU