1. Theme & goals of Course:
   The course is designed to assist attendees in understanding:
   1.1. How far we have come in learning how to characterize ophthalmic viscosurgical devices, in a manner that relates directly to our uses of them in surgery.
   1.2. How the rheological characterization of OVDs leads directly to classification, which permits us to study the similarities and differences among available OVDs.
   1.3. How the classification of a given OVD can help us understand how to use it best in different situations.
   1.4. How phaco is rheology, and how understanding OVD rheology helps us perform better phaco surgery.
   1.5. How rheologic information helps us design newer better OVDs.

2. The roles of OVDs in surgery
   2.1. To create and preserve surgical spaces – viscosity / elasticity.
   - best achieved with most viscous-cohesive OVD
   2.2. To partition spaces – including endothelial protection
   - best achieved with lower viscosity dispersives.
   2.3. To provide a low viscosity space to perform surgery.
   - best achieved in a BSS space.

3. Historic and Current Classification of OVDs.
   3.1. Differences between dispersion and pseudo-dispersion.
   - viscoadaptives, at high shear are pseudispersive.

4. Zero-shear Viscosity and Cohesion, & how to measure them.
   4.1. Pseudoplasticity curves, Cohesion - Dispersion Index (CDI)

### New Classification of OVDs, 2005, modified and updated to 2013

<table>
<thead>
<tr>
<th>V₀ (zero-shear viscosity) range (mPa.s)</th>
<th>Cohesive OVDs CDI ≥ 30 (% asp / mm Hg)</th>
<th>Dispersive OVDs CDI &lt; 30 (% asp / mm Hg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 - 18 x 10⁸ (ten millions)</td>
<td>I. Viscoadaptives</td>
<td>II. Higher viscosity dispersives</td>
</tr>
<tr>
<td></td>
<td>*Healon GV™</td>
<td>A. Super viscous dispersives</td>
</tr>
<tr>
<td></td>
<td><em>iVisc</em>* (MicroVisc***)</td>
<td>none</td>
</tr>
<tr>
<td></td>
<td>*Phaco BD MultiVisc#</td>
<td>B. Viscous dispersives</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>DiCotVisc</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Amvisc Plus</em></td>
</tr>
<tr>
<td>1 - 5 x 10⁷ (millions)</td>
<td>II. Higher viscosity cohesives</td>
<td>A. Super viscous cohesives</td>
</tr>
<tr>
<td></td>
<td><em>Healon</em></td>
<td>none</td>
</tr>
<tr>
<td></td>
<td><em>iVisc</em>* (MicroVisc***)</td>
<td>B. Viscous cohesives</td>
</tr>
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</tr>
<tr>
<td></td>
<td></td>
<td><em>Amvisc Plus</em></td>
</tr>
<tr>
<td>10⁷ - 10⁸ (hundred thousands)</td>
<td>III. Lower viscosity cohesives</td>
<td>A. Medium viscosity cohesives</td>
</tr>
<tr>
<td></td>
<td></td>
<td>none</td>
</tr>
<tr>
<td>10⁸ - 10⁹ (ten thousands)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10⁹ - 10¹ (ten thousands)</td>
<td>III. Lower viscosity cohesives</td>
<td>B. Very low viscosity cohesives</td>
</tr>
<tr>
<td></td>
<td></td>
<td>none</td>
</tr>
<tr>
<td>10¹ - 10² (thousands)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Legend:
- * Abbot Medical Optics, ** iMed Pharma, *** Bohus Biotech, # Bectin Dickinson, ## Carl Zeiss Meditec,
  ††† Biotechnology Technology General, **# Rayner, † Shishiledo Co., ‡‡ Sekagaku Corporation - Santen,
  ‡‡‡ Croma Pharma, † Alcon laboratories, ** Bausch & Lomb
  HPMC = hydroxypropylmethylcellulose,* Available in USA

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STEVE ARSHINOFF, MD. FRCSC
Comprehensive Ophthalmology, Anterior Segment, Cataract, and Refractive Surgery of the Eye
5. Surgical OVD Techniques leading to Tri-Soft Shell Technique

5.1. Soft Shell Technique (SST).
Viscoat (low viscosity dispersive) injected first onto the surface of the lens, followed by a viscous cohesive, which pushes the dispersive up into a smooth layer against the endothelium, providing a protective layer, with a smooth fracture boundary separating the two OVDs.
5.1.1. Routine Cases
5.1.2. Fuchs’ Dystrophy
5.1.3. Broken Zonule cases (with CTR)
5.1.4. Small holes in posterior capsule
5.1.5. Isolating Frayed Iris

5.2. Achieve clean posterior capsules with BSS irrigating jet.

5.3. Healon5 & Ultimate Soft Shell Technique (USST)
- uses viscoadaptive and BSS (instead of dispersive).
- makes all cases much easier, and more stable.
5.3.1. Viscoadaptive rheology – how its different
5.3.2. Routine cases
5.3.3. Capsular Dye cases
5.3.4. USST for IOL injector cartridges
5.3.5. Adding BSS under all OVDs in all cases

5.4. SST-USST combinations ➔ Tri-Soft Shell Techniques.
- use layers of dispersive against the cornea, viscous cohesive centrally to establish stability, and BSS (or XYLO-PHE) on the lenticular surface (for a low-viscosity surgical space). Optimizes pupil dilation and makes cases easier.
5.4.1. General use
5.4.2. Fuchs Dystrophy – low endothelial cell counts
5.4.3. Flomax IFIS Soft Shell Bridge (SSB) technique
5.4.4. Worst case scenario TSST cases

5.5. Special circumstances
5.5.1. Can 1 OVD do it all – DisCoVisc?
5.5.2. Natural lens present – phakic IOLs
5.5.3. Exposed vitreous face – Secondary IOLs, no capsule.

6. OVDs & IOP
6.1. Do some OVDs cause worse IOP spikes than others?
6.2. Do post op IOP spikes suggest undiagnosed glaucoma?
6.3. Most effective drugs to prevent and treat IOP spikes?
6.4. Organized IOP spike management plan.
6.5. Preventing IOP spikes: OVD removal techniques
6.5.1. Rock & Roll Technique
6.5.2. Two Compartment Technique
6.5.3. USST removal of OVDs

7. The science of OVDs
7.1. Measuring cohesion-dispersion indices
7.2. Healon5 lies on the boundary of fluids and solids.
7.3. Designing new OVDs
References: