DISCLOSURES:

Dr. Luis Escaf is a consultant for ALCON, receives royalties from the ultrasonic blade (UltraChopper®) and travel expense reimbursement from ALCON.

Dr. Luz Melo has travel expense reimbursement from PROCAPS.

We will participate with the topic of phaco prechop by ultrasound.

Currently accepted concepts are:

- Phacoemulsification is the best technique to remove the cataract.
- The division and emulsification of the nucleus affects the endothelial damage.
- Nucleus prefracture decreases the use of ultrasound.
Actually the techniques for nucleus fragmentation are, among others:

- Divide and conquer
- Chip and flip
- Stop and chop
- Nagahara’s Chopper
- Akahoshi’s Prechopper
- Escaf’s UltraChopper®
- Femtosecond (incomplete fragmentation)

For academic purposes the choppers can be included in generations:

**First generation:** Nagahara’s chopper
**Second generation:** Akahoshi’s prechopper

These two generations use mechanical energy, prechop by hand.

The **third generation**: Escaf’s UltraChopper®, prechop by ultrasound.
And the **fourth generation** would be the Femtosecond, prechop by laser.

We will move on into our topic: prechop by ultrasound.

The UltraChopper® is an ultrasonic blade designed to divide the nucleus in various fragments using ultrasound before its emulsification.

It is a flattened phaco tip with two lateral openings and with an angulation to avoid cutting the iris. It has 2.5 mm in its length, 1 mm of height, and the edge goes from 60 μ to 110 μ.
Here you can see the dimensions in relation to the lens, you can observe the safety of the device.

It has a sleeve and the handpiece connects to the phaco machine.

The UltraChopper® is very safe since it does not reaches the bottom of the lens. There is no way than you can rupture the posterior capsule thanks to the measures with which it is manufactured.

The UltraChopper® platform: is mounted in the ALCON machines, since they own the patent, and it also includes other instruments such as the divisor, the sustainer, the manipulator and the Escaf’s prechopper.
And now, the question that follows would be:

*In which types of Cataracts can you use the UltraChopper®?*

Cataracts 3+ and more (LOCS III)
Mature white
Nigrans
Brunescents
Phacomorphic
Posterior Polar
Argentinian Flag
Pseudoexfoliation
Corneas guttata
IFIS
Luxated Cataracts
Morganians Small pupil Antiblockage surgery

The new Infiniti has a port where the ultrachopper is connected directly, so there's no need to change the tip.

The ASCRS’ 2011 award winning video made by Dr. Alan Crandall using the Miyaki system, shows how the UltraChopper® moves and how it cuts in a very accurate way without stressing the zonule. (Video will be presented).

The assembly of the UltraChopper® is very simple. It is attached on the handpiece, screwed and a sleeve is placed. It can be used with incisions from 2.2 to 2.65.

Up to here we have described the concept of this method, now we will continue with its applications in the procedures.

So now the question would be:
How is it used?

It can be used in many ways:

**DIVIDE AND CONQUER TECHNIQUE:**

Using the nucleus divisor in the left hand and/or a designed prechopper to complete the division with Akahoshi’s or Escaf’s prechopper.

This is recommended for a cataract 3+ (video will be presented)

**HORIZONTAL ULTRACHOP TECHNIQUE:**

Used in harder nucleus. For this technique we use a sustainer in the left hand to lift the nucleus and the ultrachopper in the right hand. Using it in this way, less CDE is used, but more experience of the surgeon is needed in order to use it. (video will be presented)

**SPECIAL CASES HANDLED WITH ULTRACHOPPER:**

As we mentioned earlier, prechop by ultrasound is not just for the hard cataracts, in our experience we use it in 95% of our cases. Our unit makes around 4000 cases a year. Currently we have operated more than 15,000 cataracts with the ultrachopper in the last six years. These surgeries have been performed by the cataract unit surgeons and fellows in training.
Talking about special cases we can mention its use in:

**BRUNESCENT CATARACT 5+ or 6+**

This is a very hard one, in our sunny region we do have many of this (more than 30 or 40%). So for this ultrahard we recommend to first make a small pit in the center of the nucleus with the Akahoshi’s Wobble tip or with the Kelman 45° tip in order to weaken it. We then introduce the sustainer and we place it around the nucleus in order to hold it, we lift the nucleus and we fracture it in as many parts as we want. This technique enables us to fracture very hard cataracts into 6 or more pieces using very low amounts of energy.

If the cataract is not so hard you can skip the pit. (Video will be presented)

**WHITE CATARACTS:**

White cataracts are a surprise: some are very hard and ruby, some are hard but chalky.

This cataract is a dense, hard nucleus, no cortex. Since the prechop by ultrasound is so effective, friendly and easy to use, you can fragmentate this nucleus in as many pieces as the surgeon wants making the emulsification safe, easy and saving time. (Video will be presented)

**NIGRANS CATARACTS:**

These are really hard stones to grind, which in the majority of cases the surgeons prefer an extracapsular technique. Considering the fracture we absolutely recommend first to make the pit with Akahoshi’s Wobble tip or Kellman 45° tip to “make it tremble” and then fragmentate it with the ultrachopper to “knock it out”. (video will be presented)
**ANTIBLOCKAGE TECHNIQUE:**

The capsular blockage during the hydrodissection is a latent complication and sometimes is overlooked and is described in the literature.

Making things easier for the beginner phaco surgeon, we proposed what we called the ANTIBLOCKAGE TECHNIQUE.

It consists in making a groove in the center of the nucleus with the ultrasonic blade and divide the cataract into two halves prior the hydrodissection.

This helps the beginner surgeon to work with a more stable lens and also it allows that the fluid used in the hydrodissection flows through this space preventing the capsular blockage thus adding more safety to the procedure.

It is also really helpful even for an experienced surgeon in cases of small pupils, small capsulorrhexis, narrow chambers, posterior polar cataracts, and pseudoexfoliation among others. (Video will be presented)
**NARROW CHAMBERS:**

These are tough also. In these cases the capsular blockage is more frequent since the capacity of the anterior chamber decreases and the antiblockage technique allows us a safer procedure. (Video will be presented)

**LUXATED CATARACT:**

We can handle cataracts with zonular dyalisis up to 180 with the ultrachopper, since it does not produce stress to the zonule while cutting, as we mentioned earlier. (Video will be presented)

**ARGENTINIAN FLAG, PHACOLITIC, PHACOMORPHIC, MORGANIAN CATARACTS.** (Video will be presented).

We can summarize that with the ultrachopper system we han handle successfully challenging cataracts.

In this chart we compare the various techniques of prechop: by hand, by ultrasound and by laser just considering the fracture of the nucleus. We are not talking about incisions, capsulorrhexis, just the nucleus fracture.
# Fracture of the Nucleus

<table>
<thead>
<tr>
<th></th>
<th>Prechop by hand</th>
<th>Prechop by ultrasound</th>
<th>Prechop by Laser Femtosecond</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgeons experience</td>
<td>+++</td>
<td>Lo hace la máquina</td>
<td></td>
</tr>
<tr>
<td>Costs</td>
<td>Low (US 850)</td>
<td>Low (US 100)</td>
<td>Ver high (US 900 mil)</td>
</tr>
<tr>
<td>Cost effective</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>Reproducibility</td>
<td>High</td>
<td>High</td>
<td>Very high</td>
</tr>
<tr>
<td>Visualization</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Endothelial damage</td>
<td>No</td>
<td>No</td>
<td>???</td>
</tr>
<tr>
<td>Narrow chambers</td>
<td>+/-</td>
<td>Yes</td>
<td>??</td>
</tr>
<tr>
<td>Discontinuos capsulorhexis</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Small CCC</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Small pupil</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Antiblockage technique</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Zonular dialysis</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Complete fracture</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Cataracts 5+6+</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Pseudoexfoliation</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Morganian cataract</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Posterior polar cataract</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Cortex aspiration</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>PCR possibility</td>
<td>No</td>
<td>No</td>
<td>Si</td>
</tr>
<tr>
<td>Duration of the fracture</td>
<td>5&quot; 10&quot;</td>
<td>5-10&quot;</td>
<td>7777</td>
</tr>
<tr>
<td>CDE</td>
<td>No</td>
<td>2-10</td>
<td>??</td>
</tr>
</tbody>
</table>

In our experience, we consider that the best case to use the prechop by ultrasound are all the cataracts except the ones that are 2+ or less. We have found the ultrachopper to be very safe, effective, versatile, and easy to use.
At our institution we recently performed the study of Ultrachopper: Phaco metrics and Endothelial cell loss with three different techniques. We include the abstract.

**Purpose:** To evaluate the different Ultrachopper techniques, comparing phaco metrics (Cumulative Dissipated Energy (CDE), Balanced Saline Solution (BSS), Surgical Time) with endothelial cell loss.

Since phacoemulsification invention in 1967, cataract pre-fracture techniques are becoming popular among cataract surgeons since they aim to decrease the ultrasound energy and reduce ocular tissue impact, specially endothelial count. Phaco chop and prechop techniques are of great help in rather soft cataracts, allowing a proper nucleus fracture for its later phacoemulsification. However, because of their relatively long learning curve and their lower efficiency in hard voluminous cataracts, the dissemination of this techniques has not been the expected with just 24% of cataract surgeons using them.

**Setting/Venue:** With the arrival of the Ultrachopper this disadvantages have been solved allowing surgeons to successfully address in an easier way the different cases they deal with. Currently, in our institution, Clínica Oftalmológica del Caribe, located in Barranquilla Colombia, 100% of our cataract cases are performed with the Ultrachopper technology using three different techniques called: Horizontal Ultrachopper, Vertical Ultrachopper and Central pit. This study wants to evaluate the different Ultrachopper techniques comparing phaco metrics (Cumulative Dissipated Energy (CDE), Balanced Saline Solution (BSS), Surgical Time) and endothelial cell loss between them.

A prospective observational study was made of 256 cases of cataract surgeries performed at the Clínica Oftalmológica del Caribe in Barranquilla Colombia, from May thru August 2013. All cases were performed by experienced cataract surgeons, using the Ultrachopper device and the Infiniti® phaco system (Alcon-Novartis Fort Worth Texas). Cataract classification (LOCS III), Ultrachopper technique, CDE (fracture, fragments emulsification, total), BSS and surgical time were assessed. In 55 cases, a specular microscopy was made before and 4 months after surgery for endothelial cell loss evaluation. The information was processed with Epi Info Software using Kruskal Wallis test.

**Methods:**

The total time of the CDE technique ultrachopper vertically (vertical Ultrachopper 12.71 ± 7.80, 13.72 ± 7.66 Ultrachopper horizontally; 26.15 ± 4.93 Central pit) and volumes of SSB (vertical ultrachopper 90.04 ± 19.47, 98.50 ± 21.90 horizontal ultrachopper; 116.6 ± 10.81 Central pit) and surgical time employees (vertical ultrachopper 8.41 ± 2.30, 10.19 ± 3.51 horizontal ultrachopper; central pit 13.30 ± 3.57).

**Results:**
The mean pre-operative and post-operative cell density was 2480 ± 394 and 2228 ± 453 cells/mm² endothelial demonstrating 10.2% loss. No statistically significant difference (P = 0.994) was found in endothelial loss of the three techniques compared (vertical ultrachopper 10.1%, 9.7% horizontal ultrachopper; central pit 10.9%).

The Ultrachopper device allows an effective and efficient nuclear fracture in any degree of cataract hardness or opalescence. The final phaco metrics including (Cumulative Dissipated Energy (CDE), Balanced Saline Solution (BSS), Surgical Time) using Ultrachopper are very low compared to other phaco techniques currently used, especially in hard cataract cases. It is also a very safe instrument for the corneal endothelium with a cell loss count in the order of the lowest accepted ranges for ultrasound using techniques. The Vertical Ultrachopper shows to be the more efficient of all techniques, resulting in the lowest metrics used during surgery, especially for nuclear fracture. The later can explain the surgeons obvious preference for this technique.

**Conclusions:**

**RECOMMENDATIONS:**

- Read the instructions before using it:  [www.ultrachopper.com](http://www.ultrachopper.com)
- Watch videos
- Let it flow, use the logic
- Be aware of the parameters: usually power between 30 and 50, longitudinal phaco, pulsed.
- Height of the bottle: between 90-115
- Flow: around 30
- Aspiration: 100 – 150
- Use the proper sleeve according to the incision.
- As any phaco tip, if you do not use it properly you can burn the incision.