2 years experience with LenSx, what we learned?

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Financial Interest

- Speaker for Alcon
- no direct financial interest in this presentation
General Order of Pattern Positioning

1. Docking / PI Suction
2. Limbus Centration
3. Primary / Secondary incision alignment
4. Capsule / lens positioning alignment
5. Capsule depth adjustment
6. Lens depth adjustment
7. Corneal thickness measurements
8. Arcuate incision angle and diameter
LenSx – Challenges / pearls

- Docking
- Arcuate Incisions
- Corneal Incisions
- Capsulotomy
- Retrolenticular bubble formation
- Hydrodissection
- Fragmentation
Lensx docking

- Docking is a crucial step for a well centered treatment
- Head and chin position
- Sunken orbits, small eyes, large nose are a challenge
- Signs for centered docking are:
  - Flat anterior capsule and a flat posterior capsule
  - No tilt as seen in the line scan OCT image
Arcuate incisions

- mark the 0-180 degrees before the surgery
- rotate the limbus image to be aligned with the mark, so the arcuates are in excellent position
- Verion will do it automatically
Corneal incisions

• Program the incisions slightly larger (0.1mm larger) than manual incision

• Open the Paracentesis first then viscoelastics before opening the primary incision to avoid AC collapse.

• Recommended Trapezoid offset with larger internal ie….2.5mm / 2.6mm

Corneal incisions

• 3 Plane incisions recommended

• Lane Spatula, Slade Spatula

• Start at the corner of the incision, far posterior – bury tapered spatula 1/3 depth and use the incision stroma wall as a fulcrum. Next slide the spatula over to break “unzip“ the tissue bridge
what we learned with capsulorhexis

- Anterior chamber collapse during CCC can lead to a radial tear
- Never let the AC collapse
- Open the paracentesis first
- Stabilize the AC with OVD
- Open the primary incision
- Complete the capsulotomy-if needed

Type 1
- Microadhesions

Type 2
- Area of no treatment

Type 3
- Complete pattern but not continuous
circumferential pattern

what we learned about the Hydrodissection
Fragmentation Surgical Pearl

- LenSx allows chop, cylinder, or a combination of both (++) air
- The central cylinder cut allows the apex portions of each quadrant to be freed up.
- Femtosecond technology working best through clear media (less effect in denser, more opaque white or brunescent cataracts)
thanks!

FLACS evaluation
check list

• EFFICACY
• COST EFFECTIVENESS
• SAFETY
★ compare to gold standard (phaco)
★ Limited Clinical Data
Safety check list

- damage from the laser to the internal Eye structures
- endothelial cell loss
- macular thickening
- Anterior capsule rents
- Post Capsule Rent, retained lens fragments

Is FS laser safe for surrounding structures in the Eye?
• 1053nm wavelength is in the near-infrared spectrum which is not absorbed by optically clear tissues at lower densities
• unaffected by corneal magnification
• ultrafast pulse time allows smaller amounts of energy to be used with sparing the adjacent tissues from collateral damage

Is FS laser safe for surrounding structures in the Eye?  

YES
is FS laser safe for the Endothelium?

Toward zero effective phacoemulsification time using femtosecond laser pretreatment

- Prospective, consecutive, single-surgeon case-control study comparing FLACS to Phaco
- 201 eyes with no significant differences in demographics or cataract grade

### Reduction in FLACS compared to Phaco

<table>
<thead>
<tr>
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<th>Reduction</th>
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<tbody>
<tr>
<td>Effective Phaco time</td>
<td>29%</td>
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<tr>
<td>Endothelial cell loss</td>
<td>36%</td>
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### Reduction in FLACS compared to Phaco in LenSx multicenter study

- Prospective multicenter study
- Matched groups of 64 phaco vs 37 FLACS

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<thead>
<tr>
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<th>Reduction</th>
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<tr>
<td>Effective Phaco power</td>
<td>54%</td>
</tr>
<tr>
<td>Endothelial cell loss</td>
<td>60%</td>
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Is FS laser safe for the Endothelium?

Yes

Is FS laser safe for the Macula?
Femtosecond laser-induced macular changes and anterior segment inflammation in cataract surgery


- 202 eyes randomized to FLACS vss Phaco
- OCT used to measure the Macular thickness; preop and at 2 hrs, 4 days, 1 month, 3 months and 6 months
- results were similar between both groups
- conclusion: FLACS did not influence the incidence of post operative macular edema

is FS laser safe for the Macula?

YES
How is FS laser compare to Phaco in capsule complications?

Surgical outcomes and safety of femtosecond laser cataract surgery: a prospective study of 1500 consecutive cases


• comparing safety results of FLACS in the first 200 eyes to the subsequent 1300 eyes done by same group of surgeons
% of eyes with complications

- Ant cap tear
- P. cap tear
- P. lens dislocation
- Ant cap tags

First 200:
- Ant cap tear: 4%
- P. cap tear: 3.5%
- P. lens dislocation: 2%
- Ant cap tags: 1.6%

Subsequent 1300:
- Ant cap tear: 0.31%
- P. cap tear: 0.31%
- P. lens dislocation: 0%
- Ant cap tags: 1.9%

% of eyes with complications

FLACS
- Singapore
- UK
Capsular block syndrome associated with femtosecond laser-assisted cataract surgery

Timothy V. Roberts, MB BS, MMed, FRANZCO, FRACS,
Gerard Sutton, MB BS, MD, FRANZCO, FRACS,
Michael A. Lawless, MB BS, FRANZCO, FRACS, FRCOphth,
Shiveta Jindal-Ball, MB BS, MD, Chris Hodge, BAppSc(Orth)

We report intraoperative capsular block syndrome occurring during the first 50 femtosecond laser-assisted cataract surgeries performed in our facility. Two patients had uneventful combined laser fragmentation, capsulotomy, and corneal incision procedures. In both cases, following transfer to the operating room and manual removal of the laser-cut capsulotomy, posterior capsule rupture was noted during hydrodissection, resulting in posterior dislocation of the lens. Pars plana vitrectomy, removal of the crystalline lens, and sulcus implantation of an intraocular lens were performed in both patients with good visual outcomes. Femtosecond laser-assisted cataract surgery changes the intraoperative environment with the generation of intracapsular gas and laser-induced changes in the cortex. With awareness of the changed intracapsular environment following laser lens fragmentation and capsulotomy and a modification of the surgical technique, no additional cases of intraoperative CBS have been seen in more than 600 laser-assisted cataract surgery procedures performed at our facility.

Financial Disclosure: No author has a financial or proprietary interest in any material or method mentioned. Additional disclosure is found in the footnotes.


1. Normal intracapsular gas bubble pattern following laser fragmentation and capsulotomy.

Figure 2. Residual gas bubble within the dislocated cataract.
- capsular block syndrome was reported as 2 cases in the first 50 cases
- then zero in the following 3500 cases
- good example of learning curve as this was the first group users
- data before softfit upgrade
• Small, Universal 19.8mm PI
• Eliminates corneal compression in nearly all cases
• Free floating capsulotomy
• Lowers IOP – 16mmHg increase
• Improves docking and centration
• Fixates cornea, not the head
• Efficient surgical performance
  • 66% reduction in laser energy
  • 33% reduction in laser time

1 Data on File

2.13 Software
2.20 Software
Femtosecond laser capsulotomy.
Anterior capsulotomy integrity after femtosecond laser-assisted cataract surgery.

Abell RG1, Davies PE2, Phelan DJ, Seemann K4, McPherson ZE2, Vote BJ5.

Author information

Abstract

OBJECTIVE:
To compare the incidence of anterior capsular tears after femtosecond laser-assisted cataract surgery (FLACS) versus phacoemulsification cataract surgery (PCS) and to assess the ultrastructural features of anterior capsulotomy specimens (FLACS and PCS) using electron microscopy.

DESIGN:
Prospective, multicenter, comparative cohort case series.

PARTICIPANTS:
Consecutive patients undergoing FLACS or PCS.

METHODS:
A prospective cohort study of all patients (n = 1626) undergoing FLACS or PCS by 2 surgeons from centers A and B was undertaken to compare the incidence of anterior capsule tears. Anterior lens capsules were collected by 4 surgeons from centers A, B, C, and D using 3 different commercially available femtosecond platforms, each with latest version upgrades. Lens capsule tissue was prepared for scanning electron microscopy (SEM) using a total of 10 samples for patients undergoing PCS, and 40 samples for patients undergoing FLACS.

MAIN OUTCOME MEASURES:
Incidence of anterior capsule tear and comparative ultrastructural features of capsular samples from both PCS and FLACS cases.

RESULTS:
There was a significantly increased rate of anterior capsule tears in the FLACS group (15/804 [1.87%]) when compared with the PCS group (1/822 [0.12%]; P = 0.0002, Fisher exact test). In 7 cases, the anterior capsule tear extended to the posterior capsule. Because all cases had occurred in complete capsulotomy, the integrity of the anterior capsule was questioned in the FLACS group. Subsequent SEM sampling showed irregularity at the capsule margin, as well as multiple apparently misplaced laser pits in normal parts of the tissue. Aberrant pits were approximately 2 to 4 μm apart and occurred at a range of 10 to 100 μm radially from the capsule edge.

CONCLUSIONS:
Laser anterior capsulotomy integrity seems to be compromised by postage-stamp perforations and additional aberrant pulses, possibly because of fixational eye movements. This can lead to an increased rate of anterior capsule tears, and extra care should be taken during surgery after femtosecond laser pretreatment has been performed. A learning curve may account for some of the increased complication rate with FLACS. However, the SEM features raise safety concerns for capsular integrity after FLACS and warrant further investigation.
% of eyes with complications

- FLACS
- UK
- Singapore
- others

**take home messages**

- FLACS is passing through stage of better learning curve (machine & technique)
- available data suggest FLACS to be at least as safe as phaco
In porcine studies with the LenSx system, lens fragmentation allowed the surgeon to reduce ultrasound power by 43%, and phacoemulsification time by 51%. The authors of this study employed a ‘divide and conquer’ technique for manual phacoemulsification. Whether such significant contrasts in ultrasound power and phaco time exist with other techniques (eg ‘phaco chop’) remains to be elucidated.

Palanker et al’s randomised case-controlled study of 59 human eyes in vivo found that phacoemulsification energy was reduced by 39% in eyes treated with FLACS compared with standard cataract surgery. However, the technique used for manual surgery was not specified in this study.