Fundamentals of Femtosecond Laser Assisted Cataract Surgery (FLACS)

The femtosecond laser performs three main functions: Incisions, Capsulorhexis (CCC) and Nuclear fragmentation.

Docking & Lasering

The major FLACS platforms use different docking systems. Whichever system is used, the surgeon should endeavour to get a nice planar dock without tilt of the nucleus to ensure as clean a femto CCC as possible and safe nuclear fragmentation. The posterior limit of nuclear fragmentation ranges from 500-800 microns and the surgeon can choose this. If an air bubble gets in between the patient interface and the cornea, a redock should be done. Most of the lasers allow variation in incision position, size and shape, CCC size and position and fragmentation pattern and depth.

Incisions

1. Imperforate Incisions. Depending on which platform is used, some femtosecond lasered incisions cannot be opened. It is useful to have a purpose designed femtoincision spatula to open these incisions. Incisions should not be located outside clear cornea in the limbus, areas of dense arcus senilis or pterygia as they will not be patent.

2. Occasionally incisions are created which are too central; different laser platforms position their incisions differently and the surgeon needs to be familiar with his femtosecond laser platform to know where to place the incision.

3. After the phaco portion of surgery, the incisions can get more hydrated than we are used to seeing in standard phaco incisions. This is probably because the inner incision is flared excessively wide.

Femto CCC

The femto CCC is the main reason why we do FLACS. When faced with the eye under the microscope after the femto step, the surgeon should observe the cut edge of the CCC critically
and watch out for any uncut areas. Special care should be taken during phaco and I/A near these uncut areas in case a hidden tag is lurking. The free anterior capsular cap should be removed. If the edge of the CCC is ragged, I/A of subincisional cortex should be done most carefully to avoid creating a radial tear. Another option is to do bimanual I/A.

Hydrodissection/gas management

The femtolaser creates gas bubbles when the nucleus is fragmented. These gas bubbles increase the intralenticular volume making hydrodissection potentially hazardous as hydorupture of the posterior capsule may occur. It is therefore of paramount importance that gas bubbles are burped out from behind the nucleus by depressing the nucleus gently prior to hydrodissection. As some element of pneumodissection is usually present, only minimal hydrodissection is required.

Nucleus management

All femtofragmentation patterns leave a posterior offset of 500-800 microns resulting in an uncut posterior nuclear plate. It is therefore imperative to complete the separation of the nuclear segments, be they 4, 6, 8 or more. Grid or matrix patterns soften the nuclei and make for easier emulsification. A useful instrument to facilitate nuclear separation is the femto prechopper which is easily inserted into the femtofragmented nuclear groove.

Irrigation/Aspiration (I/A)

It is often said that I/A after FLACS is more difficult. It is slightly different but not really difficult. Lens cortex is more adherent to the back of the anterior capsular rim so I/A should be done on the under surface of this anterior capsular rim, ideally a little beyond the very edge of the CCC to avoid aspirating any hidden tags.

Complex cases

FLACS is eminently suited to more challenging cataracts. These include posterior polar cataracts, dense cataracts, subluxated cataracts, white cataracts and cataracts with fibrotic anterior capsules.

Complications

Complications can occur at any point of the procedure. A good, symmetrical dock usually leads to precise femtolaser delivery and good incisions, CCCs and nuclear division. Loss of suction is a rare occurrence. Earlier generations of FLACS machines had some issues with incomplete CCCs but the latest machines give almost 100% complete CCCs.