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## LASIK TECHNIQUE: A HOLISTIC APPROACH

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### ABSTRACT

LASIK has justly claimed its place of prominence in the pantheon of refractive surgical procedures. To achieve a good surgical result, repetition of fixed surgical steps in sequence is essential. Each stage of the surgery has its own nuances and variations. Those surgeons wishing to master LASIK need to learn the cornerstones of safe surgical technique. They may then develop variations thereof to suit their own patient populations and requirements unique to their practice and location. The aim of surgery is achievement of the best visual result within the parameters of least surgical risk.

### LASIK TECHNIQUE – A HOLISTIC APPROACH.

LASIK has, over the past five years, become the predominant refractive surgery practiced by surgeons the world over. It offers the surgeon a versatile procedure for correcting virtually any refractive disorder. It offers the patient a virtually painless and quick restoration of vision. To achieve uniformly excellent results, meticulous attention to detail is needed. Repetition of the surgical steps in sequence, without compromise, will achieve the desired outcome. To that end, this article will provide information on the basic principles of LASIK together with various pointers on achieving surgical excellence with least risk.

Preoperative counseling, selection and evaluation.

Careful patient selection and counseling is key to a happy post op result.

Beware the extremely fastidious patient with very high expectations and one who can instantly discern between a 0.25 Diopter variation in prescription during the pre operative refraction. Such a patient is unlikely to be fully satisfied post operatively irrespective of a good result. Myopes (especially high myopes) have certain character traits that bear watching. They are usually introverted, lack self-

confidence and dwell on the negative. Counseling should be positive and confidence boosting, tempered with mention of the risks. It is unwise to dwell on the risks of surgery for too long, as this will throw such a personality into a deeper quandary. An irony, as these are the very patients who would benefit most from LASIK. LASIK changes these people's lives forever and the transformation in personality and outlook to life is very gratifying for all concerned. Counseling should always emphasize that LASIK is a means of reducing dependency on glasses or contact lenses and not a method of eliminating them altogether. Patients are counseled that they will always have a residual correction after LASIK – but that the same will not be necessary for the majority of their working day. Always mention that there is a possibility of wearing a thin pair of glasses for certain activities such as driving a car at night. It is important that the patient leaves the counselor with a positive and upbeat feeling about the procedure. An accurate refraction is a must pre operatively. Documentation of both corrected and uncorrected vision is recorded. Cycloplegic and manifest refraction are done. Remember that patients live in the "manifest" world hence we usually base our preoperative spectacle refraction on the manifest refraction. The only exception being, if the manifest and cycloplegic refraction vary by more than .75 D in which case we would veer towards the cycloplegic refraction values. As a rule of thumb, go with the manifest value of the sphere and the cycloplegic value of the cylinder.

Remember that we are dealing with high myopes here and these eyes are sometimes amblyopic (especially if it is a unilateral myope). Look carefully for the presence of a cataract. Nuclear sclerosis early in life is not uncommon in this patient population. Apart from regression postoperatively, the initial refraction might be erroneous due to the myopic shift already caused by the sclerosis. Careful evaluation of the lids for blepharitis and ptosis should be done. Any blepharitis should be treated prior to surgery. Ptosis should be recorded and brought to the patient's attention lest it be

attributed to the postoperative effect of the surgery. Similarly any ocular deviation (latent or manifest) should be noted and mentioned to the patient. After surgery, when the masking effects of spectacles have disappeared, patients (and friends) are prone to noticing the slightest abnormality of the shape or orientation of the eyes.

Careful binocular examination of the disc, macula and periphery is mandatory and any holes or degenerations that require attention are treated before LASIK is attempted.

Notation of pupil size is important in counseling about the possibility of nighttime glare. Especially if myopia is high and the optical zone diameter is likely to be small. This is more of a concern for the light-eyed Caucasian pupils rather than the darker brown coloured irises.

#### Preoperative preparation

Antibiotic eye drops are given a day pre operatively. Ofloxacin eye drops, three times daily for a day prior to surgery. Immediately before surgery one drop of Proparacaine hydrochloride is placed in both eyes. Apart from giving good anesthesia, it does not sting like Xylocaine. The eyes are then washed with a stream of BSS hooked upto an I.V. line. This removes all the mybomian secretions and mucous floating on the surface of the tear film. (5 cc of Betadine solution is added to the bottle of BSS). The lids and lashes are then cleaned with a non-linting sponge dipped in Betadine solution and are wiped dry. Care is taken to remove mucous plugs from the caruncle and any residual make up on the lid margins of lady patients. A surgeons cap is placed on the patient's head. Two eye pads are stuck two inches below the lateral canthii of each eye. This prevents fluid entering the patients ear during the procedure. Both ears are stuffed with cotton wool. This reduces the sensation of hustle and bustle to the patient, and further prevents the patient hearing questions put to the surgeon by colleagues under training. Patients tend to be disturbed by indiscreet questions such as "so if you don't put in this plate you could perforate the eye ball?"

Ladies and men are asked to release any pony tails/ hair buns or bunching of hair at the nape of the neck or occiput that could act as a pivot for rotation of the head during surgery. Tight collars are unbuttoned and the patient is asked to get as comfortable as possible.

Whilst lying under the laser, the patient is explained the procedure with special reference to the pressure of the suction ring, the vision dimming, the noise the

laser will make and the smells that will occur. It is also important to further reassure them at this stage, that there will be no pain. Someone holding the patient's hand during the procedure is a great source of comfort to the patient.

#### Exposure

Good exposure of the globe is a pre requisite to surgeon comfort. To this end have several specula at hand including a pediatric sized speculum. A good idea of the level of ocular anesthesia can be gauged by the patient's reaction to the speculum. If the patient shows signs of discomfort at this stage, it is well worth removing the speculum and placing a drop of anaesthetic in both upper and lower fornixes. Sometimes the palpebral aperture is too small and deep set to accommodate both speculum and suction ring. A technique recommended to experienced surgeons is to insinuate the suction ring onto the globe without a speculum and activate suction once the ring has been positioned appropriately beneath the lids (positioning is critical as there is a real danger of gross decentration of the ring during this maneuver). Next, tyre lever the lids around the suction ring such that the ring now lies above the plane of the lids. Then engage the head of the keratome on the ring to make the keratectomy. After the ring and head are removed, gently place the speculum on the lids and carry on with the surgery as usual.

#### Corneal Marking

The cornea is marked with a marker (Banaji Corneal marker - Rhein Medical - USA). Whilst marking the cornea ensure that ink does not intrude upon the pupillary area and the cornea is slightly tacky. Marking the cornea is essential to ensure perfect apposition of the flap on its bed. In the rare case of a free cap, it will help distinguish between the epithelial and stromal sides of the cap.

Faint marks from the ink can often be discerned on the epithelium for a few days after the procedure. This might interfere with post op vision (especially if the ink has intruded upon the pupillary area) but its effect is transient.

#### Placement of the suction ring

Press down gently with the thumb or index finger on that part of the ring opposite the handle. This will ensure that the ring settles down evenly on the eye. Before placing the suction ring on the eye, remove any torque in the suction tubing such that the ring settles in place without any inherent twist. With the Chiron ACS it is advisable to decenter the ring 1mm

nasally to put as much distance as possible between the hinge and pupil.

### **Pseudo suction and the "Red Spot Sign".**

Pseudo suction occurs when conjunctiva or plastic drape is sucked up into the aspirating port of the suction ring, registering appropriate pressure at the console, but inadequate pressure in the globe. Thus the aplanation reading will show pressure less than 60 mm Hg and the console will show the maximum pressure achievable. When pseudo suction occurs, stop suction immediately. Lift off the ring. A bright red spot (of sub conjunctival haemorrhage) will invariably be seen in the position just vacated by the suction port. When applying the ring again, rotate it such that the suction port lies over "virgin " conjunctiva. Like iris buzzed by a Phaco tip, this red spot will have a special affinity for the suction port. If appropriate suction is not feasible then proceed to the fellow eye (in bilateral cases) or make the patient wait in the lounge till the end of the session. The conjunctival edema and ridge takes approximately 12 minutes to totally flatten out. One can return to the eye and complete the case in the same session.

### **Applanation Tonometry**

Applanation of the cornea will inform the surgeon whether the intraocular pressure is 60mm Hg or less. If appropriate pressure has been achieved, the patient will mention that the fixation light has disappeared, and the pupil usually dilates (more so in blue irises than brown). These clues are however not a substitute for applanating the cornea. It has been the author's experience (on several occasions) when the patient mentioned the fixation light going out, only to find that the applanation showed borderline IOP. To proceed with the keratectomy in these cases is dangerous. A small thin flap with a narrow hinge is a certainty, but manageable. However, loss of suction mid pass with a bifurcated flap or free cap is a sobering possibility too. During enhancement surgery, the applanated area will look unnaturally large and approximate the circle of inscription on the tonometer. This is due to the flatness of the previously ablated cornea. A case of pseudo pseudo suction!

### **The Keratectomy**

Moisten the surface of the cornea with a soaking merocell sponge. This will prevent any epithelial abrasions caused by the keratome head moving over dry cornea. Check if the keratome head is engaged in the tracks. The pathway of keratome traverse should be clear of lashes, drape or lax eyelid skin.

Once the keratectomy has been made, suction is released and the keratome and suction ring are removed off the eye. Inspect the cornea. If a free cap has been created, the corneal markings will suddenly look one-third their length. A flat curved spatula (Banaji LASIK Spatula - Rhein Medical - USA) is then inserted under the flap at its temporal edge taking care not to infold the margins, and is lifted and repositioned nasally.

At this point the superior and inferior margins of the flap closest to the hinge will curl in on themselves. They should be straightened. Do not stretch the flap tight nasally, as it will wrinkle with horizontal striae. Corneas flatter than 41 D and steeper than 45 D should be noted preoperatively. Flat corneas will render small thin flaps with narrow hinges. Use a 180-micron gap plate for a flat cornea. Steeper corneas run the risk of getting buttonholed.

### **Protection of the hinge and flap.**

Paramount to accurate correction and a good post-operative result is protection of the hinge and stromal side of the flap from ablation. Ablation of the hinge can lead to irregular astigmatism and even scarring. This is especially true of Hypermetropic correction. A LASIK shield (Banaji LASIK shield Becton Dickinson USA) is used to protect the flap and hinge from unwanted ablation. The shield is soaked in a solution of BSS and Ofloxacin, then placed on a non-linting instrument wipe. Just after the flap has been reflected, the shield is placed on the surface of the reflected flap with its straight edge approximating the straight edge of the hinge. Though moist, the shield should not be soaking wet. Apart from its protective function, the shield prevents the retracted flap from desiccating and it is possible that the antibiotic present in the shield is absorbed by the stromal surface of the flap acting as a slow release vehicle during the first 24 hours post operatively. Any fluid collecting near the hinge during ablation can be wicked up by gently pressing on the straight edge of the shield. Further, placing the shield on the hinge allows the surgeon to have both hands free for any surgical maneuver.

### **Laser Ablation**

Once the laser starts, it is important to bolster the patient's confidence with words of encouragement and praise. Keep on talking to the patient even if an unexpected complication such as a keratome jam occurs. Ask the patient to keep both eyes open and to breathe normally. Patients tend to hold their breath during the procedure. Chins, which have been nervously tucked into the chest, are gently raised.

Small saccadic movements of the eye are acceptable, but stop the laser if the eye starts drifting away from fixation. Eye trackers are certainly very helpful, but are not essential.

#### Cleaning and repositioning the flap

Wet the bed with a soaking merocell sponge. Pay particular attention to the area of the hinge, which is cleaned with several swipes of the sponge in a direction parallel to the straight edge of the hinge. The flap is then rolled onto the bed with another wet sponge. An irrigating canula (Banaji LASIK canula - Katena Instruments USA) which is attached to a 3 cc luer lock syringe is then insinuated under the flap and a full 3 cc (sometimes more) of BSS is irrigated under the flap. (Ofloxacin eye drops are added into the irrigating liquid in the syringe). The sand blasted surface of the canula and 6 omni directional ports flush out interface debris as well as dislodging stubbornly attached foreign body particulate matter such as lint. Extensive irrigation will lead to hydration of the flap. A gap between the edge of the hydrated flap and the corneal bed might thus give the rapidly regenerating epithelial cells free ingress under the flap before it has fully settled into place. This could increase the possible incidence of epithelial ingrowth. Apposition of the flap on its bed is re checked by seeing that all marking lines on flap and bed are aligned. After checking for adherence with the striae test, the speculum is gently removed whilst asking the patient to stare at the fixation light. The patient is asked to blink and squeeze the eyes and the flap position is checked again.

The patient is immediately examined on the slit lamp. The interface is examined for debris. The flap is examined for infolding of the edges, displacement, and alignment of the markers. If the flap (nasal hinge) is displaced inferiorly, there will always be a gutter superiorly of equal width to the degree of inferior displacement. Further, if there is an inferior displacement, the corner of the hinge opposite to the direction of displacement (the superior corner of a nasal hinge) will have radiating micro striae (the finger print sign) in the shape of a V with the apex pointing to this corner of the hinge. If there is a uniform gutter of .5mm or more all around the flap then it has been over hydrated. If there is an irregular gutter all around, then the flap has been partially

over hydrated. It is quite easy for the beginner to mistake a partially hydrated flap for a displaced flap. Attempts to re float an over hydrated flap will further hydrate it, compounding the problem.

The patient is examined on the slit lamp after a wait of about 45 minutes in the patient lounge. After the position of the flap has been re checked, the patient leaves the center.

Three pearls for safe effective and predictable LASIK surgery

Amongst the dozens of small points that go towards achieving the perfect LASIK result, I would chose the following three as amongst the most important:

- A fully informed and confident patient.
- Corneal marking.
- Protection of the hinge and flap.

#### **LASIK and marriage in India.**

"Eye that new Market" was the headline of an article in a recent issue of the Economic Times (The Indian equivalent of The Wall Street Journal). It dealt solely with the LASIK procedure and "dowry."

Harking back hundreds of years, is a custom called "dowry". Legally banned but universally practiced, it has wide and often devastating socioeconomic fallout. Dowry is the amount of money the girl (and her family) have to pay the boy's family for the privilege of marrying him! This custom has led to the financial ruination of hundreds of thousands of families in India. Families can be in debt to local money lenders for several generations as a result of dowry. Most Indian marriages are "arranged marriages". That is, the *parents* of the couple get together first. After considering various factors including the two horoscopes in question and more importantly the dowry, the parents agree to the marriage. The boy and girl comply with their parent's wish. If the girl wears glasses, she stands to be rejected (if not ridiculed) by the boy's parents. The price her parents would have to pay to the groom's family in dowry would also increase commensurately. Enter LASIK. Before the "marriage season" there is a veritable deluge of anxious patients (and parents) waiting outside the doors of LASIK clinics. For the (relatively) modest LASIK fee a parent can save hundreds of thousands of Rupees in dowry and the bride can hold her head high once more!

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Quote of the quarter: We are each of us angels with only one wing, and we can only fly embracing each other.  
(Liciano De Crexenzo)

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Figure 1: Appropriate aplanation. Note that the aplanated area of the cornea falls within the tonometer circle

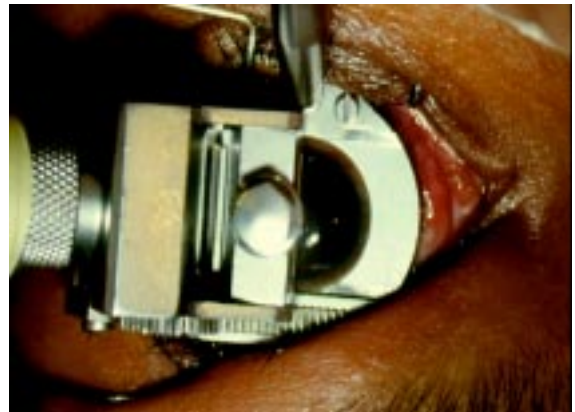


Figure 2: Keratotomy about to start. The skin fold across the suction ring tracks indicates the potential for keratome jamming midway through the pass.

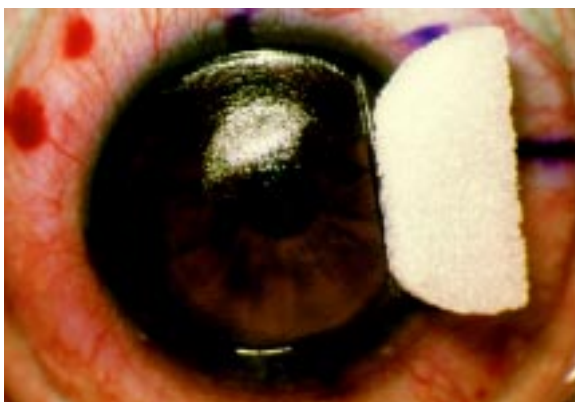


Figure 3: Lasik shield in place prior to excimer ablation

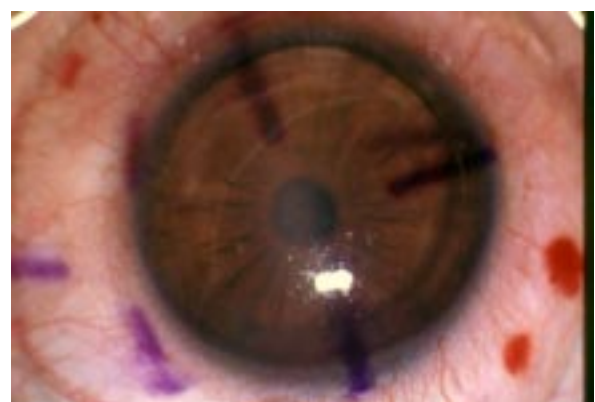


Figure 4: well aligned ink marks show that flap apposition is perfect