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by Dr Jean Chai

Time and tide wait for no man, and nowhere is this truer than in ophthalmology, where innovation and technology progresses at a rapid-fire pace. One of the hottest topics in 2013 was femtosecond laser cataract surgery – a quick PubMed Search will reveal that at least 266 articles on this topic have been published on this since 2012, of which 26 were in the first 2 months of this year alone – and in this issue we highlight the various platforms available in the market today, and the initial SNEC experience with femtosecond laser-assisted cataract surgery.

We also cover other interesting and pertinent topics in this first issue of 2014. Medico-legal issues, while a dreaded topic, are forming part of a reality that ophthalmologists (and indeed, all clinicians) have to be cognizant of in their clinical practice. Being aware of how medical complaints are handled in the Singapore system, and how they may arise, would give us better understanding in how to handle and avoid them. In addition, we look at the management and rehabilitation of the anophthalmic socket with its complications, as well as the ocular and non-ocular causes of torticollis in the paediatric patient.

As always, we hope that the contents of the newsletter are informative to all our readers, and look forward to bringing more relevant and useful updates in the issues ahead.

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**FEMTOSECOND LASER-ASSISTED CATARACT SURGERY: A REVIEW AND EARLY RESULTS 2012**

*Presented by Dr Ti Seng Ei on 17 October 2012 • Written by Dr Melissa Wong*

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**Key Points**

- Femtosecond lasers can be used to perform several steps of cataract surgery including capsulotomy, nuclear fragmentation, astigmatic relaxing incisions and cataract surgery corneal incisions.

- The evidence suggests that FLACS can create more consistent capsulorrhexis, better intraocular lens centration, better wound configuration and reduced ultrasound energy.

- Our early experience with FLACS shows that it has a short learning curve with promising short term results.

- However, patient-related factors may limit its use, along with questions on true benefit, costs and long term efficacy.

Femtosecond laser (10-15 seconds) cuts tissue via photodisruption with minimal collateral damage. It can focus at precise depths in the anterior segment. The smaller the spot size and shorter the pulse, the less energy required for photodisruption (due to smaller cavitation and air bubble).

**Review of available systems:**

The use of Femtosecond (fs) lasers in cataract surgery allows for automation of certain less predictable manual steps like capsulotomy, nuclear fragmentation, relaxing incisions and cataract wound incisions. Each of these systems consists of a docking platform, an imaging system and a laser delivery system.

To date there are several femtosecond laser systems available such as LensAR™ (LENSAR, Winterpark, FL), LenSX® (Alcon, Fortworth, TX), Catalys (Optimedica®, Santa Clara, CA), and Victus™ (Bausch & Lomb Technolas).

<table>
<thead>
<tr>
<th>Machine (Manufacturer)</th>
<th>Laser delivery</th>
<th>Docking</th>
<th>Imaging System</th>
<th>Comments</th>
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<tbody>
<tr>
<td>LENSAR™ (LENSAR, Winterpark, FL, USA)</td>
<td>Picosecond laser source</td>
<td>2 piece docking system; Fluid-filled interface (balanced salt solution), no direct corneal appplanation.</td>
<td>Uses confocal illumination and Scheimpflug principle to create high resolution 3-D images of the anterior segment.</td>
<td>Compact system</td>
</tr>
<tr>
<td>LenSX® (Alcon, Fortworth, TX, USA)</td>
<td>600-800 fs, 33KHz laser source</td>
<td>Direct corneal appplanation with suction ring. Greater IOP rise during docking.</td>
<td>OCT imaging system displays the image after scanning.</td>
<td>Cuts are pre-positioned, can be adjusted by user.</td>
</tr>
<tr>
<td>Catalys (Optimedica®, Santa Clara, CA, USA)</td>
<td>600fs, 60 kHz laser source</td>
<td>Fluid-filled docking system, no direct corneal appplanation. Small rise in IOP</td>
<td>Spectral domain imaging technology</td>
<td>Able to pre-divide the nucleus into multiple, small grid-like fragments</td>
</tr>
<tr>
<td>Victus™ (Bausch &amp; Lomb Technolas, Munich, Germany)</td>
<td>80KHz femtosecond laser</td>
<td>2-piece soft docking system: suction ring at limbus and fluid corneal interface. IOP rise is minimal.</td>
<td>Real time OCT imaging technology</td>
<td>Latest machine to be FDA approved; faster than other systems. Nuclear fragmentation into 4-6 segments.</td>
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</table>

The LensAR™ is a compact system which uses a picosecond laser source and has a 2 piece docking system. Balanced salt solution is used as an interface so that no corneal appplanation occurs. It also uses confocal illumination and the Scheimpflug principle to create high resolution 3-D images of the anterior segment.
The Optimedica® uses a 600fs, 60 kHz laser source and a fluid-filled docking system. There is no direct corneal applanation and the rise in intraocular pressure during docking is small. The Optimedia uses spectral domain imaging technology and has an added advantage of pre-dividing the nucleus into multiple, small grid like fragments.

The LenSX® uses a 600-800 fs laser at 33KHz. The docking system involves direct applanation of the cornea with a suction ring, resulting in higher IOP rise and possible suction-related complications. Its OCT imaging system displays the image after scanning. The cuts are prepositioned and adjusted later by the user.

The Victus™ is the latest machine to be FDA-approved for LASIK and anterior capsulotomy use. It uses a 80kHz femtosecond laser which is faster than the previous systems and has an added advantage of using real time OCT imaging technology. It has a 2-piece soft docking system which includes a suction ring at the limbus and a fluid cornea interface, hence IOP rise is minimal. Unlike the Optimedia, nuclear fragmentation occurs in about 4-6 segments.

The evidence supporting Femtosecond laser assisted cataract surgery (FLACS) is as follows:

1) FLACS results in better centration, regularity and completeness of the continuous curvilinear casulorrhesis (CCC)
   - Position of the CCC has direct relation to the effective lens position, which is the biggest source of errors in IOL calculations.
   - Laser capsulotomy allows for more precise (in terms of circularity and intended diameter size) capsular opening, better lens implant centration with resulting less significant lens aberrations and optical quality.

2) FLACS allows for better nuclear fragmentation
   - This reduces the amount of ultrasound energy used by 43%, effective ultrasound time by 51% and the potential to reduce the risk of cornea injuries.

3) Better wound configuration with resulting less wound leakage
   - Femtosecond incisions show decreased leakage and are more reproducible and stable. They also show fewer features of damage and faster healing.
   - Femtosecond incisions are found to be one way, self-sealing and under conditions of normal intraocular pressure (IOP).

Our Initial experience with the Victus™ in SNEC

Problems encountered

1) Difficulty docking and maintaining suction in eyes with small palpebral aperture and patients who have strong Bell’s reflex.
   - A finger can be placed over the suction ring to prevent loss of suction.

2) Incompletely cut capsulorrhexis
   - This can be easily completed with a Kawai forceps, with forces being directed towards the centre. Incomplete cuts can lead to dog-ear tears that require rounding off to prevent an anterior capsular rip and its extension

3) Subconjunctival hemorrhage

Our early results:

FLACS has a short learning curve and our first 100 cases showed encouraging results.

Contraindications include small pupil size (<5mm), anterior chamber shallower than 2mm, significant cornea scars, advanced glaucoma, very tight palpebral aperture and uncooperative patients.

While there are advantages of FLACS over manual cataract surgery, there are still issues to explore with regards to long term efficacy, impact of femtosecond incision related endophthalmitis rates, and the true benefit of femtosecond fragmentation in reducing ultrasound energy. Cost versus reimbursement issues have to considered as well.

References:
ANOPHTHALMIC SOCKET

Presented by A/Prof Seah Lay Leng and Dr Teoh Khim Hean on 20 February 2013 • Written by Dr Deborah Tan

Key Points
• Porous orbital implants such as hydroxyapatite and Medpor® are commonly used in SNEC to replace orbital volume after enucleation.
• Complications associated with anophthalmic socket include post-enucleation socket syndrome, implant migration and socket contracture.
• Socket contracture can cause poor prosthesis retention, and would involve release of adhesions, increasing conjunctival surface via a variety of mucosal grafts and deepening of the fornices with sutures and stent, or a conformer shell.

An anophthalmic socket occurs after partial or complete removal of a globe. The aim of socket rehabilitation is to create an adequate socket with stable fornix of adequate depth, adequate conjunctival lined surface area, adequate volume restoration and good retention of an ophthalmic prosthesis. The normal volume of a globe in an adult is 8ml. Generally, we would aim to replace 70-80% of the orbital volume with an orbital implant, and the remaining 20-30% with an ocular prosthesis.

There are many types of implant materials, which can broadly divided into:-
• Smooth synthetic implants: Silicone, polymethylmethacrylate (Figure 1)
• Porous implants: Hydroxyapatite (Coralline or synthetic), porous polyethylene (Medpor®), bioceramic (Al2O3) (Figure 2)

The commonly used implants in SNEC are hydroxyapatite and Medpor®:-
• Hydroxyapatite: It is consists of uniform interconnecting porous architecture that acts as framework for host fibrovascular ingrowth. This prevents implant migration, reduces risk of extrusion and allows for attachment of EOM with better implant motility and cosmesis. It needs to be wrapped to allow for attachment of EOM and to facilitate implantation. Commonly used wraps are:
  1) Cadaveric sclera / fascia
  2) Bovine pericardium
  3) Autogenous tempolaris fascia / fascia lata
  4) Synthetic polyglactin/vicryl mesh
There are also implants that are pre-wrapped.

- Medpor®: It is made of ultra-high density material that allows for greater tissue stability. The implant surface is smooth and softer, and sutures can be placed directly on the implant or on the scleral cover.

Steps of implant insertion involve the following:

1) Windows are cut/bored on the implant wrap to facilitate vascularisation (Figures 3 & 4)
2) The implant is slid deep into the orbit and placed posterior to the Tenon’s capsule
3) EOM are sutured anteriorly to provide stability and reduce tension on the Tenon's capsule

The complications associated with anophthalmic socket are:

- Post enucleation socket syndrome (Figure 5)
- Presenting as deep upper lid sulcus, enophthalmos, upper lid ptosis and lower lid malposition.
- This occurs as a result of retraction of the superior muscle complex and upward displacement of the inferior rectus effectuating a rotary displacement of the orbital content with redistribution of orbital fat.
- Implant migration (Figure 6)
- Socket contracture (Figure 7)

- Due to loss of conjunctival surface, deep cicatrix formation, fornix contraction and atrophy of orbital fat.
- It causes poor retention of prosthesis.

Management of socket contracture:

- Release conjunctival adhesions
- Increase conjunctival surface with mucosal grafts (oral, nasal, hard palate, dermis fat, or cultivated ocular mucosal epithelium)
  - Dermis fat grafts serve as an alternative for volume augmentation and as a primary or secondary orbital implant. It provides structural support for ingrowth of conjunctiva over graft and preserves conjunctival surface area. It can be harvested from the gluteal or subumbilical region.
  - Cultivated Ocular Mucosal Epithelium (COME) is an Oral Mucosal Epithelial Cell Equivalent and consists of 10-12 layers of epithelial cells that is able to withstand shearing stresses from surgical manipulation better than conjunctial equivalent of 3-4 layers of epithelial cells.
- Fornix deepening with sutures and post-operative stent or conformer shell
  - Conformer shells help maintain the socket fornices and reduce socket contraction during the early post-operative period. It is available in different sizes, shapes and materials and has holes for drainage. A customized conformer is preferred for contracted socket requiring reconstruction, as a standard one may not fit the socket well. There are clear and customized aesthetic options.
A LEGAL INSIGHT OF MEDICAL OVERSIGHT IN HINDSIGHT

Presented by Mr Eric Tin on 10 April 2013 • Written by Dr Clarissa Cheng

Mr Eric Tin, Head of the Medico-legal Practice Group of Donaldson and Burkinshaw (Singapore), gave a talk on the medico-legal aspects of Ophthalmic practice in Singapore. In his address, he highlighted two case studies arising from Civil Claims and Singapore Medical Council (SMC) Complaint Cases.

Civil claims

Civil claims deal with apportioning compensation, usually monetary or otherwise, commensurate with the extent of damages suffered by the affected party. In the context of a Doctor-Patient relationship, civil claims usually arise from Negligence or Tort of Battery (i.e. trespass to person – e.g. when a procedure has been performed without informed consent). In proving the former, one has to demonstrate that

i) A Duty exists between Doctor and Patient,

ii) a Breach in the Standard of Care, based on the Bolam-Bolitho Test, has occurred, and

iii) any Damage sustained is directly caused by this breach in care. In contrast, Tort of Battery does not require proof of any Damage.

What is the Bolam-Bolitho test?

The Bolam-Bolitho test itself requires the fulfilment of 2 further conditions. The first being the medical practitioner has exercised reasonable skill and care in treating his patient. This is assessed on the basis of the standard of those with a similar level of training and qualification, and not necessarily that of the most expert in the field. Secondly, the medical practitioner must have acted in accordance with practices that are regarded as acceptable by a responsible body of medical professionals, as supported by logic and evidence, regardless of any other bodies of opinion with a differing view.

What do civil claims pertain to?

The range of Civil Claims that can occur in Ophthalmology are varied. Commonly seen scenarios include:

1) Pre-operative stages: missed or delayed diagnoses, lack of informed consent.

2) Intra-operative stage: choice of surgical methods and tools, incomplete removal of heavy fluids or cortical vitreous, failure of inducement of posterior vitreous detachment and failure to check for wound leaks after wound closure.

3) Post-operative stage: delays in patient review, failure to monitor for complications.

SMC Complaint Cases

SMC Complaint Cases generally deal with punishment and rehabilitation of the offending medical practitioner, as well as deterrence of such future offence from the individual and the wider body of professionals alike. The type of complaints that may be raised against a practitioner include:

a) A defect in character as implied by a prior conviction (e.g. in military, civil or criminal courts)

b) Professional Misconduct, where there has been an intentional departure from professional standards or serious negligence, which portrays abuse of professional privileges

Key Points

• Civil claims and SMC complaint cases against ophthalmologists can arise in the course of practice, and pertain to any stage of care.

• Ensure that medical insurance is current and seek assistance early in the event of a claim.

• Majority of complaints and claims arise from lack of communication, and treating patients with due consideration may help avoid problems.

• Maintaining adequate documentation, timely and appropriate specialty referral, compliance with guidelines and proper conduct are also important.
c) Disreputable Misconduct, which cover behaviour outside of professional capacity with potential for bringing disrepute to the medical profession.

SMC Complaint Cases are heard before a Complaints Committee (CC), chaired by 2 doctors and 1 lay person. Possible outcomes following a CC hearing can include unanimous dismissal of the complaint, mediation or a formal inquiry. In the latter scenario, the case may then be escalated to a Disciplinary Tribunal (DT) chaired by 1 lawyer and up to 3 doctors. In such an instance, parties will be required to make representations, attend pre-inquiry conferences before the formal hearing itself. It will be during the formal hearing itself where the defendant then has the choice of pleading guilty or claim trial.

**What to do in an event of claim or SMC complaint?**

In managing one’s claims, Mr Tin advised practitioners to possess sufficient and up to date medical insurance coverage, as it would go a long way in defraying the eventual costs of the claim. When one is faced with a claim, he should seek assistance at the earliest possible opportunity. This will allow for prompt legal attention so that witnesses, documentary evidence and appropriate expert advisors can be identified early to facilitate in the case. The practitioner should also have his own insight into the case, and be upfront with his legal advisors about this. If indeed one answers “Yes” to the question “Would I have done it differently?”, it would be best that the practitioner tells his legal advisors sooner rather than later. Last but not least, practitioners should always be mindful of their physical and emotional wellbeing during the course of managing the claim, and not to let the stress of the situation overwhelm them.

**How to avoid claims and complaints?**

Mr Tin wrapped up his talk by giving the audience invaluable tips on avoiding claims and complaints. His top pointer was for practitioners to show consideration, respect and compassion to their patients as majority of claims stem from communication problems. Practitioners were also reminded to keep adequate documentation of case notes; this means documentation is based on the subject matter being recorded, and should allow for prompt recognition and comprehension by any third party reading it. Thirdly, practitioners should always consult with their seniors or colleagues from relevant specialties when in doubt. Fourthly, one should be keep abreast of and comply with existing hospital protocols and MOH guidelines. Last, but not least, practitioners were reminded to always maintain proper and lawful conduct both during and outside of work, especially with the advent of Social Media and its attendant pitfalls.
THE MANY FACES OF TORTICOLLIS

Presented by Dr Linda Dagi on 18 July 2013 • Written by Dr Melissa Tien

Key Points

• Torticollis can be non-ocular or ocular in aetiology
• Ocular torticollis can be secondary to strabismus, nystagmus or ptosis. It is essential to exclude intracranial tumours in cases of 6th cranial nerve palsies.
• Treatment of ocular torticollis is directed at the underlying cause; however, if binocular fusion is present, a watch-and-wait approach can be adopted.

Torticollis which manifests as an abnormal head posture, can occur in the paediatric age group and be considered to be ocular or non-ocular in aetiology.

Causes of non-ocular torticollis include:

• Torticollis of infancy with or without sternocleidomastoid tightness
  - will not straighten in sleep
  - can offer physical therapy to keep neck supple
• Osseus abnormalities of cervical spine
• Neurological abnormalities of posterior fossa
• Pharmacological e.g. Phenothiazines
• Secondary to strabismus with a defined region of single binocular fusion
• Secondary to nystagmus with a null point:
  - Monocular occlusion/patching may well increase a latent nystagmus or extinguishes the null point, making the nystagmus more noticeable
• Secondary to ptosis:
  - If ptosis is bilateral, patching will not resolve torticollis
  - If ptosis is unilateral and patients maintain binocularity, torticollis usually resolves
  - If ptosis is related to myasthenia gravis, ptosis may worsen because patching increases fatigue.

Ocular torticollis secondary to strabismus:

1. Superior oblique (SO) palsies:

Useful tests:

• 3 step test
• Double Maddox rod:
  - Advantages: easy and quick to perform, gives quantitative measurement of subjective torsion
  - Disadvantages: only useful in primary gaze, torsion may localize to wrong eye
• Lancaster red-green:
  - Diagram of horizontal, vertical and torsional deviations in 9 positions of gaze
  - Shows incomitance if present
  - Demonstrates acute torsion well
  - If patient has chronic torsion, this is usually not seen on Lancaster red-green plotting.
• Check for anatomic torsion by fundal examination
• Perform a patch test
  - If patching resolves torticollis, surgical correction of strabismus will likely resolve the torticollis
• Fusional amplitudes measurements: to differentiate between congenital and acquired SO palsies
Surgical correction of superior oblique palsies:

1. SO tuck
2. Harada-Ito procedure
   - Enhances torsional effect of SO tendon
   - Extorts eye without changing vertical alignment

2. Partial 6th cranial nerve (CN VI) palsies:
   - Multiple causes including:
     - Demyelination
     - Ischaemia
     - Elevated intracranial pressure
     - Always exclude tumours in children
   - Surgical correction: lateral rectus (LR) resection with medial rectus (MR) recession

3. Transient torticollis secondary to acute CN VI palsy:
   - Transient CN VI palsies can occur in:
     - Gradenigo’s syndrome
     - Traction after spinal surgery
     - Acutely raised intracranial pressure
   - Always elucidate underlying cause of CN VI palsy before deciding on surgery
   - Watch and wait: torticollis will resolve when transient CN VI palsy resolves

4. Duane’s syndrome:
   - Preferred surgical correction: Superior rectus transposition to lateral rectus plus medial rectus recession on adjustable sutures.

5. Thyroid eye disease:
   - Always look for superior rectus (SR) involvement when considering recession of the inferior rectus (IR):
     - Possible to unleash SR tension after IR recession causing a large hypertropia after IR recession
   - Asymmetric IR involvement in Grave’s orbitopathy may result in motility that mimics a CN IV palsy

Ocular torticollis secondary to nystagmus:

Congenital motor nystagmus:
- Often will see reduction of torticollis at near as convergence dampens nystagmus
- Surgical correction: Kestenbaum procedure

Final pearls in the treatment of torticollis:

Excellent binocularity wins out over surgical overcorrection. The enemy of good is sometimes the pursuit of perfection.

Watching and waiting may be an option. If the child can maintain binocular fusion, waiting is preferable because if there is poor correction initially, patient may start to suppress vision.
A 3-month old baby presented with swelling over the left lower lid area. The swelling was evident since birth but had been enlarging in the past 3 weeks. There was no history of trauma.

Q1: List 4 differentials.
Ans: Capillary haemangioma, Lymphangioma, Varix, Rhabdomyosarcoma

Q2: What useful clues would you elicit in the clinical history?
Ans: Ask about any increase in proptosis on valsalva manoeuvre i.e when the baby is crying.

Q3: What specific feature is seen on image (C) and (D) which could point towards the diagnosis?
Ans: Flow voids.

Q4: The baby (F) was empirically treated with an oral medication for which she showed a dramatic response. What is this medication and what do you think is the diagnosis?
Ans: Propranolol, capillary haemangioma.

Q5: From the ophthalmic point of view, what do you need to monitor during this period of treatment?
Ans: The baby’s visual acuity.
PHOTOQUIZ 24

Q1: What will this patient complain of? Name 4.
Q2: What eye signs would you expect to find in this patient? Name 3.
Q3: What is a possible treatment?