Sutureless Cataract Extraction:
Complications, Management and Learning Curves

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A key issue in converting to sutureless cataract surgery is training. This article first describes the main surgical steps and complications of sutureless cataract extraction and their management. The second part reports on the training of 11 surgeons in sutureless cataract extraction at Sagarmatha Choudhary Eye Hospital, Lahan. The stepwise, supervised training is described and the learning curves of 11 surgeons analysed.

Surgical Steps and Intra-operative Complications

a. Construction of a self-sealing wound

A stable, self-sealing wound of appropriate size is the precondition for sutureless cataract extraction. To create a valve-like incision, the tunnel has to be prepared 1 to 2 mm into clear cornea before the anterior chamber (AC) is entered. The required tunnel size can be anticipated by the appearance of the cataract and patient age. Deep brown nuclei in older patients will need very large tunnels, whereas cataracts in younger patients may require incisions just as large as the IOL. Use of sharp instruments and good catching forceps (Paufique or Pierce type) for scleral fixation help to achieve the desired results. In deep set eyes, where the operating field is difficult to access, the tunnel should be prepared temporally or supero-temporally rather than superiorly.

Complications	*Management*
Premature entry: Dissection of the sclera is too deep and the AC is entered in the AC angle. The iris will easily prolapse and the wound will leak.	A more shallow dissection can be started at the other end of the tunnel. Suturing of the wound is required at the end of the surgery.
Button hole formation: The dissection of the sclera is too superficial.	Usually, this can be corrected by making a deeper frown-incision and dissecting the tunnel in a deeper plane, starting at the opposite side of the button hole.
Descemet's membrane injury or stripping. The keratome tip may be blunt or the angle at which the AC is entered may be too shallow.	Injection of an air bubble at the end of surgery usually results in reattachment of Descemet's membrane. Accidental removal of Descemet's membrane and overlying endothelium will result in irreversible corneal decompensation.

b. Opening of the anterior capsule

The anterior capsule can be opened either by capsulotomy or capsulorhexis. Capsulotomies are easy to perform. A capsulorhexis is more difficult, but will guarantee long term IOL centration.

Complications	*Management*
Linear capsulotomy: Rarely, an incomplete or oblique capsular tear will result, which makes mobilisation of the nucleus difficult.	Extension of the capsulotomy with scissors solves the problem.
Capsulorhexis: Peripheral extension of a capsulorhexis is the most common complication.	Anterior capsule staining and the use of capsule forceps (Utrata type) can reduce this risk. For a controlled rhexis, sufficient visco-elastic has to be injected to deepen the AC. The capsule flap should be gripped close to the advancing tear while pulling it centrally and slightly upwards. A failed capsulorhexis can be converted to a can-opener capsulotomy.

c. Hydrodissection

Hydrodissection separates lens cortex with nucleus from the capsule. In conditions such as posterior polar, traumatic or hypermature cataracts with risk of pre-existing posterior capsular dehiscence, hydrodissection should be avoided.

Complications	*Management*
Incomplete hydrodissection	Hydrodissection is most effective if the fluid is injected directly under the capsule.

d. Nucleus delivery

A variety of techniques can be used for nucleus delivery (see previous articles in this issue). However, similar complications may be encountered with all these techniques, especially when large nuclei have to be extracted.

Complications	*Management*
Small capsulorhexis: The nucleus cannot be tilted or prolapsed out of the capsular bag.	The rhexis has to be enlarged by radial relaxing incisions.
Small tunnel: Inadequate size of the tunnel will create unnecessary trauma during nucleus delivery.	After mobilisation of a big nucleus, it is wise to re-check the size of the inner tunnel opening. If the wound seems to be small compared to the nucleus size, it should be enlarged before nucleus removal is attempted.

Endothelial damage

Complications

Iris trauma: Excessive manipulations may result in iris damage, prolapse or iridodialysis.

Zonular dialysis: Risk of zonular dialysis is high after trauma, in hypermature cataracts and in pseudoexfoliation syndrome.

Management

In techniques where the nucleus is prolapsed into the AC before delivery, sufficient visco-elastic has to be injected above the nucleus to prevent endothelial touch.

Small, rigid pupils should be enlarged surgically by stretching, iris retractors or a sector iridectomy, before nucleus delivery is started.

In small zonular dialysis, a PC IOL can still be implanted into the capsular bag or ciliary sulcus. However, in large dialysis, involving more than 6 clock hours, the capsule should be removed and an AC IOL implanted.

e. Posterior capsule rupture (PCR)

Complications

PCR may occur during hydrodissection, nucleus delivery or cleaning of cortex.

Management

Once a PCR is noticed, irrigation should be stopped and vitreous integrity should be checked. If the anterior vitreous face is not disturbed, remaining lens cortex can be aspirated, using as little irrigation as possible. In case of any vitreous disturbance, anterior vitrectomy has to be done. In settings with limited resources, a simple, battery operated vitrectomy machine can be used for managing PCR (Figure 1). If the cutter is immediately flushed with water and air after use, it can be re-sterilised and used many times.

Post-operative Complications

a. Hyphaema

Complication

Bleeding may originate from the tunnel, from the AC angle or from the iris.

Management

If bleeding is detected during surgery, it can usually be stopped, if the eye is left hypertensive at the end of surgery or filled with an air bubble. Small post-operative hyphaema with the iris still being visible can be treated conservatively. However, dense hyphaema and blood clots will need removal. We usually wash the AC through a newly made clear corneal incision and do not touch the original wound in such cases.

b. Corneal oedema

Complication

Corneal oedema may be due to endothelial damage, high intraocular pressure (IOP) or both.

Management

A good surgical technique and use of sufficient visco-elastic can reduce the risk of endothelial damage during nucleus delivery. With the 'fishhook' technique, the nucleus can be extracted directly out of the capsular bag, which makes endothelial damage less likely. Incomplete removal of visco-elastic is the most common reason for increased IOP post-operatively.

Learning Curves

Learning sutureless cataract surgery is demanding and should be taught formally. Surgeons should have consistently good, self-evaluated results with conventional cataract extraction before starting sutureless surgery.

We analysed the first 100 operations of 11 ophthalmologists, trained in sutureless cataract surgery with the 'fishhook' technique at Sagarmatha Choudhary Eye Hospital, Lahan. Seven surgeons had previously done a minimum of 800 sutured ECCE/PC IOL procedures, four had performed at least 400 phacoemulsifications. First day uncorrected visual acuity (VA) and rate of complications were recorded. Reasons for VA below 6/60 were analysed (Table 1).

Surgery was divided into three steps:

Step one: Self-sealing incision and linear capsulotomy.
Step two: Hydrodissection and nucleus extraction.
Step three: Irrigation/aspiration and IOL implantation.

At the beginning, only step three was taught, and the teaching surgeon did steps one and two. Once step three was mastered, the trainees sequentially learned steps two and one, while the supervisor did less and less of the operation. In case of a complication, the supervising surgeon took over and completed the surgery. The reason for learning the last step first was so that the trainees were always operating in a good situation – i.e., they had a good tunnel and the nucleus had been extracted by the trainer before they started to do the irrigation/aspiration.*

ECCE surgeons needed a median of 58 operations, whereas phaco-surgeons needed a median of 30 surgeries until they had completed the first operation independently. This was mainly because the latter group already knew how to prepare the tunnel incision. There were no statistically significant differences between the surgeons

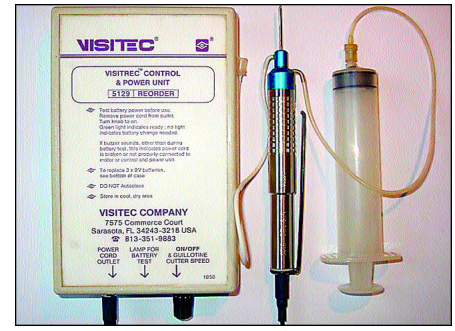

Fig.1: Portable, battery operated vitrectomy machine:tipandhandlecanbere-sterilised.

Photo: Bernd Shroeder

Table 1: Outcome and Reasons for 1st day Uncorrected VA < 6/60 for 11 Trainee Surgeons

Operations	1–50	51–100
Total number of operations analysed:	550	550
Outcome (uncorrected VA) on 1st day		
Good (6/6 – 6/18)	31.1%	25.3%
Borderline (6/24–6/60)	64.9%	67.8%
Poor (< 6/60)	4.0%	6.9%
Reasons for 'poor' outcome on 1st day		
Pre-existing pathology	1.5%	1.1%
Surgical (corneal oedema, hyphaema)	2.0%	5.0%
Refractive error	0.5%	0.9%

Table 2: Intra- and 1st Day Post-operative Complications

Operations	1–50	51–100
Total number of operations analysed:	550	550
Intra-operative complications		
Posterior capsule rupture	2.9%	4.5%
Zonular dialysis	1.1%	1.6%
Iridodialysis	0.9%	0.7%
Poor tunnel construction (premature entry, leak)	0.7%	1.5%
Descemet's stripping	0.5%	0.7%
1st day post-operative complications		
Residual lens cortex	3.0%	3.0%
Decentred IOL	0.5%	1.3%
Corneal oedema, Descemet's folds	3.6%	6.0%
Hyphaema	0.5%	1.0%

concerning first day VA and complication rate.

Complication rates were acceptably low, especially during the first 50 surgeries, where the supervising surgeon was still doing some steps of the operation (Table 2). However, complications while learning sutureless cataract surgery will be much more frequent if supervision and stepwise training are not available.

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***Editor's note:** This method of 'Reverse Training' is also described in Issue 42, 2002, page 20.

Tanzanian Distribution of the Journal

Tanzanian readers have received this issue of the Journal from the Kilimanjaro Centre for Community Ophthalmology (KCCO). KCCO will continue to distribute *Community Eye Health* to Tanzanian readers.

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What is Evidence–based Ophthalmology? Introducing the Cochrane Eyes and Vision Group

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An evidence-based approach to health care delivery is not new. Research has informed clinical practice for centuries, but within the last decade a growing body of enthusiasts are advocating a more structured approach to the use of evidence in practice. There are many influences on our work; most important perhaps is what and how we were taught. The traditional approach of medical training is to learn and memorise lists of facts. The modern approach is to teach doctors how to ask questions and challenge established values. What is the evidence that one treatment is better than another? How precise is a test in separating people affected by a condition from those who are not?

In answering these questions, it is no longer sufficient to resort to the well thumbed text book; today, it is likely to be out of date and often the evidence underlying the authority of the text is not given. The growth of research and the publication of its findings in medical literature are so rapid that it becomes impossible for any clinician to keep abreast of the latest developments. It is especially challenging for people working in areas where access to well stocked libraries can be difficult, if not impossible.

Those involved with evidence-based medicine are committed to breaking down the old structures of knowledge where the best wisdom was stored in inaccessible centres of excellence, and to ensuring that all practitioners, however remote or distant they are from centres of learning, have access to it.

Where health care resources are scarce, it is especially important that limited funds are used on interventions and services based on sound evidence. Furthermore, poorer countries may be exposed to influences which do more harm than good: exploitation by richer economies is not unusual; pharmaceutical companies may have greater freedom to behave less than ethically where they find themselves without competition – inflating prices or trading obsolete or harmful remedies rejected elsewhere. Sometimes the zeal 'to do good' in poorer countries misfires when enthusiasm overlooks the lack of evidence of benefit or indeed the possibility that an intervention may be harmful. Such was the case for diethylcarbamazine in the treatment of River Blindness, which caused, rather than prevented, blindness.

The International Cochrane Collaboration is a network of individuals in all specialities of medicine dedicated to preparing, maintaining and promoting access to systematic reviews of the best evidence of the benefits and risks of health care interventions. Cochrane systematic reviews are intended to help people (health professionals, policy makers and consumers) make practical decisions. **The Cochrane Eyes and Vision Group (CEVG)** exists to do this for eye care internationally and is committed to support the efforts of VISION 2020 by providing the evidence-base for practice and policies to eliminate avoidable blindness.

Beginning with this short introduction, we propose to launch a series on evidence-based ophthalmology starting with the basics and continuing to promote an understanding of its relevance to eye care. The next issue will include an article about the nature of evidence and evidence hierarchies with more on what evidence-based medicine actually involves. The CEVG is delighted that *Community Eye Health* will provide a means for disseminating the findings of its reviews and hopes that it will become a means of recruiting contributors from its readership. More information about CEVG can be found at the website www.cochraneeyes.org and about the Cochrane Collaboration as a whole at www.cochrane.org ❐

A l'attention des lecteurs de langue fran aise

A special French issue of selected articles from *Community Eye Health* is planned for June 2004. If you would like to receive it, please send details of your name, occupation and address to Anita Shah at the address on page 63.