Glaucoma and Cataract surgery

In Lisbon 2005

One-site phacotrabeculectomy

Surgical intervention on a patient will be exposed to just one surgical session and there is less risk of IOP spikes just after surgery.

Robert Carassa MD

The surgeon first creates a fornix-based conjunctival flap in the superior quadrant, and then makes a groove 3.0-4.0mm deep, 2.0mm posterior to the limbus, followed by dissection of a scleral flap with a crescent knife 1.0mm anteriorly in clear corneal tissue. Following creation of a paracentesis, viscoelastic is injected into the anterior chamber and phacemulsification is performed through the tunnel opening. An injection of acrylicoll is used to dilate the pupil.

After cataract extraction and IOL implantation, the surgeon transforms the tunnel into an “L” or “U” shape with two lateral cuts at the edge of the flap, thereby exposing the internal end of the flap and allowing greater outflow of aqueous. The surgeon performs trabeculectomy using a blade trephine or punch and performs an iridectomy to prevent the iris from plugging the filtration. The procedure concludes with the closure of the scleral and conjunctival flap and aspiration of the viscoelastic.

“O ne-site phacotrabeculectomy is a completely different procedure when compared with standard phacemulsification or standard trabeculectomy,” Dr Carassa said. One ne-site combined procedures using non-penetrating surgery involve an additional level of complexity, he noted.

In such procedures, the surgeon will generally proceed with a normal non-penetrating technique until Schlemm’s canal is exposed, just before clearing the sclero-descemetic membrane. At this point the surgeon will make a tunnel between the internal and external flap and perform regular phacemulsification and then close the sclero-descemetic membrane and complete the glaucoma surgery as usual.

Evidence supports higher efficacy of two-site technique

Dr Carassa said that perhaps the only advantage of one-site techniques is that they are faster. He cited two studies that...
indicated that the two-site technique is more effective in reducing IOP than the one-site technique.

In one of the studies (Wyse T et al.: AJO, 1998), patients who underwent the two-site technique had a mean of IOP of 13.3 mmHg and required a mean of only 0.2 glaucoma medications. By comparison, patients who underwent one-site surgery had a mean IOP of 13.1 mmHg after the one-site technique, compared to 17.6 mmHg in the two-site group.

Two-site techniques also have numerous safety advantages over one-site techniques, he noted. They involve less manipulation of the conjunctiva and sclera, there is less risk of anti-metabolites entering the anterior chamber, and postoperative suture removal or adjustment will not affect the scleral incision.

“The major points affecting the overall outcome of our combined glaucoma and cataract surgery are the use of mitomycin-C, two-site technique, and the use of phacoemulsification instead of ECCE. By following all these recommendations we can get the best results with our combined procedures.”

The case for sequential surgery
Philippe Sourdille MD suggested that combined procedures should be used selectively in order to avoid the use of anti-metabolites.

“More and more phacotrabeculectomies are routinely performed with application of mitomycin-C and this makes them prone to complications such as hypotony, maculopathy, bleb leak, blebitis and even endophthalmitis with a final loss of visual acuity,” he said.

Indications for a sequential approach include glaucomatous eyes with incipient cataracts and those with close-angle glaucoma.

In eyes with incipient cataracts, where visual impairment is mild and cataract surgery is not urgent, he recommended the use of non-penetrating glaucoma surgery techniques because they are less cataractogenic than standard trabeculectomy.

“In the AGIS study, at five years an incidence of 87% of cataract was noted after trabeculectomy. In contrast, all the published literature indicates a rate less than 10% after non-penetrating surgery.”

In eyes with primary closed-angle glaucoma and cataract he recommended first removing the cataract and assessing the effect of the procedure on the IOP.

Influence of cataract surgery on IOP
When performing cataract surgery in eyes that have undergone previous filtration, surgeons should consider the effect the procedure will have on the eye's IOP, he said. Several studies have shown that cataract procedures increase IOP slightly in about half of eyes for a year or more.

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“You may consider that 2.0mm in IOP elevation would not be significant, but should the IOP already be above the target pressure at the time of cataract surgery this 2.0mm rise can be deleterious to the visual field.”

Dr Sourdille recommended carefully watching the influence of infusion on the bleb height during surgery. In this way it is possible to assess whether to consider additional steps such as bleb revision, anti-metabolite injection, scleral flap revision or re-operation at a later time.

“IOP elevation will be dangerous for the optic nerve and hypotony can be deleterious to the filtration so we should be very careful to ensure the postoperative tightness of the wound and remove all of the viscoelastic and monitor postoperative IOP and inflammation.”

Dr Sourdille noted that most of the published literature suggests better IOP control can be achieved with trabeculectomy than with phacoemulsification, whether or not anti-metabolites are used. However, he noted that some investigators have reported results equivalent to those of trabeculectomy alone in combined procedures involving deep sclerectomy.

“Routine phacoemulsification does not apply to all cases of coexisting cataract and glaucoma. Sequential procedures should be considered in glaucomatous eyes with incipient cataract and in such cases non-cataractogenic glaucoma surgery should be the procedure of choice” he added.

Management of the miotic pupil
Turning to some of the specific challenges faced by surgeons dealing with cataracts in glaucoma patients, I Howard Fine MD addressed the issue of miotic pupils.

“One of the problems with cataract surgery in glaucoma patients is the frequent incidence of small pupil, which can often be intractable.”

He described his own approach in such eyes, which he said involves proceeding from the least invasive to the more invasive approaches until the pupil can be dilated sufficiently for phacoemulsification.

In such eyes, he commences his procedures as he would in an eye with a normal pupil. Under the upper eyelid he places a surgical sponge dripped in a solution containing a local anaesthetic (Maracaine-MFP 0.75%, 12.5cc), mydriatics (Homacryl 1%, 2.5cc), anti-inflammatories (Flurbiprofen 0.03%, 2.5cc) and antibiotics (Vigamox 0.5cc, Alcon). The sponge is left under the eyelid, which he tapers closed for 15 minutes. If the pupil does not seem to dilate adequately he adds additional mydriatic drops.

In patients prone to floppy iris syndrome because they are receiving the agent tamulosin (Flomax, Boerhinger Ingelheim), patients are prescribed atropine 1% one week before surgery.

“In these cases I believe that binuar microincision phaco is an added advantage because although the iris will still come to the incision it doesn’t extrude and because of the ability to separate infusion from the phaco tip we can have the fluid circulating above the iris.”

Lester hooks
If the pupil still remains inadequately dilated, Dr Fine then begins a series of additional steps, starting with the use of two Lester hooks. Injection of viscoelastic can also aid in pupil dilation.

“It is important to stretch the pupil slowly because it is easy to damage the iris. It’s important also to stay in a horizontal plane so as not to damage the zonules. I try to avoid going into the incision location with stretching because we tend to get ruptures in the sphincter, which tend to be a little bit floppy. We also get less chance of extrusion if we stretch it in meridians that are not in the meridian of the incision or the sitedepot.”

If this manoeuvre is insufficient Dr Fine said that he will then proceed to use a Bheeiler pupil dilator. The device comes in two forms, one with three prongs, which fits through 2.5mm and another with three prongs, which requires a 3.0mm incision. Both have a hook at the base of the cannula, which allow the surgeon to reflect the subincisional portion of the pupil.

“The prongs will essentially stretch the pupil closer to the dimension of the circumference of the base of the iris rather than just the diameter of the pupil. Slow stretching is very important and the use of viscoelastics following the stretching of the pupil adds to the increased size of the pupil and very often it allows you to perform surgery in the usual manner in an intractable pupil.”

Hydro-express the cataract
An additional technique is to hydro-express the cataract into the plane of the pupil so it is vertical rather than horizontal. The bulk of the cataract will hold the pupil open throughout the case. Using bevel down phacoemulsification at this point prevents fluid from going under the iris.

“In situations like this, you don’t disassemble the nucleus by chopping or cracking. We just try to phaco it from inside out with a gradual diminution of the size of the cataract. It is another benefit is that all the energy goes toward the cataract and none toward the corneal endothelium or toward the trabecular meshwork.”

If the pupil should constrict after removal of the nucleus there can be some difficulty in visualising the cortex. Injection of Healon 5 (AMO) will usually re-dilate the pupil adequately. The cortex can then be stripped circumferentially following the margins of the capsulorhexis. However, it is important to disallow closure of occlusion to avoid aspiration of the viscoelastic, he said.

Stripping the pupillary membrane is another technique that some surgeons find useful, he said. A fibrotic membrane is often the cause of the pupil’s miosis. Another technique is to make mini-sphincterotomies with Rapapoz scissors, making incisions that are halfway through the thickness of the sphincter but are full thickness in the anterior and posterior dimension.

“After making these mini-sphincterotomies we stretch these areas where we cut. This leaves a peripheral rim of muscular tissue in the pupillary sphincter, which allows for normal function postoperatively. I always reduce the pupil mechanically to reduce adhesions between pupil and capsule physiologically functional and cosmetically acceptable.”

Dr Fine said that, as a final resort, he will use a pupillary expander ring implanted with either two forceps or with an injector. By providing a broad area of contact against the iris, the rings can safely and efficiently dilate very weak and most miotic pupils without damaging the iris.
**Enhanced viscocanalostomy**

Robert Stegmann MD concluded the symposium with a description of his new enhanced viscocanalostomy technique. While glaucomas represent a very heterogeneous group of conditions, one factor they all have in common is that they involve a collapsed, dysfunctional Schlemm's canal, Dr Stegmann noted. Trabeculectomy, along with most of the non-penetrating techniques, are fistulising procedures, which direct the aqueous fluid to the conjunctiva where a filtering bleb is formed. In contrast, viscocanalostomy provides a channel for aqueous through the Descemet's window into a scleral lake, from which the fluid drains out through Schlemm's canal as it does in the normal healthy eye. Up to now the problem with viscocanalostomy has been that it has not been possible to open Schlemm's canal throughout its complete circumference. However, a new microcatheter has made it possible to not only expand the canal completely but also to draw a suture through the canal to insure its long-term patency. The new microcatheter is produced by iScience and has a diameter of 200 microns and an atraumatic soft tip. A helium-neon light source shone through an optical fibre illuminates the catheter tip, which also contains a polyamide lumen for the injection of sodium hyaluronate. In addition, a new high-resolution ultrasound system, also produced by iScience provides accurate localisation of Schlemm's canal and can also provide confirmation of the success of the procedure.

**Microcatheter technique**

When using the microcatheter, Dr Stegmann commences as he would with a conventional viscocanalostomy procedure. He first dissects a parabolic flap in the sclera to a depth of 250 to 300 microns and then dissects a further 300 or 400 microns down to a level that is just superficial to the choroid to create a scleral lake. He then dissects forward to reveal the canal of Schlemm and creates a Descemet's window. He then gently insufflates the surgically created ostia with a viscoelastic, which serves as a lubricant to allow the safe insertion of the microcatheter. As he passes the microcatheter through the canal of Schlemm he uses a micrometer syringe to deliver 0.02ml of viscoelastic per 1/8 turn on the micrometer screw. Once he has passed the microcatheter 360 degrees through Schlemm's canal and it emerges at the operative site he attaches two 10-0 prolene sutures to the catheter, which he then draws back through the canal. After withdrawing the catheter, he ties off the ends of the sutures with a special slipknot to create 20 grams of tension. "This opens the canal internally so that the ostia you have created will not close postoperatively," he said. He noted that the high success rate in his African glaucoma patients, among whom the mean pre-operative IO P is 47-49 mmHg, suggests it should be even more effective in Caucasian glaucoma patients, among whom the mean IO P is 24-25 mmHg. Dr Stegmann said that he has had a success rate of about 79% in his African population, while his associates in America are reporting success rates of around 92%.

"What is most encouraging is that with a maximum follow-up of 11 months, 92% of cases have reached episcleral venous pressure."