Can cataract surgery control glaucoma?

For less-severe cases, phaco alone may be enough; for more-severe cases, multiple combined surgery options are emerging

Howard Larkin
in San Francisco

WHEN Richard B Packard MD, FRCS, FRCOphth was appointed consultant surgeon in Windsor, UK, in 1982, he was doing at least two filtering surgeries a week as a comprehensive ophthalmologist. "Now I probably do four or five a year," Dr Packard told a session of the 2009 ASCRS Glaucoma Day. Yet he estimates about 10 per cent of the 800 cataract patients he operates on annually have glaucoma.

This drop in combined cataract-glaucoma surgeries is an international phenomenon, said Reay H Brown MD, Atlanta, US. Nonetheless, a 2005 study showed that 64 per cent of trabeculectomies in the US were still performed in conjunction with cataract procedures despite sharply reduced volume, he said.

"Combined surgery is well-loved by cataract surgeons."

Dr Brown believes the volume drop is related to differing indications for combined procedures compared with filtering surgery alone – and the shifting balance of effort and risk vs reward for combined surgery.

In most combined cases, the decision to go to surgery is driven primarily by the presence of a cataract, with the trabeculectomy added to reduce medications for controlling intraocular pressure, Dr Brown said. For filtering surgery alone, on the other hand, continuing optical neuropathy or visual field loss despite medical intervention, or patient intolerance of medication are the primary indications with no cataract present.

In the 1990s, when cataract surgery was commonly done through a superior scleral incision, trabeculectomy was a relatively easy add-on, Dr Brown noted. He believes that the switch to clear corneal incisions is a significant, but rarely discussed, factor in combined surgery's decline. It requires adding a scleral incision, which increases the complexity, risk and operating time. Combined surgery may regain popularity if it can be done temporally in a short time, perhaps 20 minutes or less, he believes.

A more commonly discussed reason is improved medical control. Increasingly powerful pharmaceutical agents combined with early detection and better follow-up often result in better IOP control with fewer drugs, Dr Packard noted. If the patient remains stable and tolerates medical treatment well, surgery may never be required.

Still, the current low volume of combined procedures raises many issues, not the least of which is whether cataract surgeons can maintain adequate skill performing filtering procedures so infrequently, Dr Packard said. "Should non-glaucoma specialists be doing glaucoma surgery at all?" he asked.

The decision to do combined surgery is further complicated by the advent of multiple alternatives to trabeculectomy. Among them are deep sclerotomy, canaloplasty, trabeculotomy, trabecular bypass, and aqueous drainage devices. While many of these procedures have lower complication rates than trabeculectomy, they vary in the degree and duration of their IOP lowering effect, and their technical difficulty. Long-term research to date suggests that trabeculectomy with mitomycin-C still yields the lowest IOP, Dr Packard said.

And then there's phacoemulsification alone. For some patients it may be enough to control ocular hypertension and reduce reliance on glaucoma medications.

So how does a cataract surgeon decide which is best for a given patient with ocular hypertension or glaucoma? When is cataract surgery with possible future medical or surgical therapy enough? When does the benefit of reduced complications from an alternative surgery outweigh the risk of additional visual field loss that it might present because it may not reduce IOP as much as a trabeculectomy?

Unfortunately, randomised, long-term trials provide limited hard evidence on which to base these decisions, Dr Packard said. However, recent research does support some guidelines, he added. In general, patients with well-tolerated medical glaucoma control should have phacoemulsification alone while those with poor control and/or continuing visual field loss may need a combined approach. The surgery of choice may be surgeon-dependent, but trabeculectomy with mitomycin-C seems to give the lowest pressure, albeit with higher morbidity. The patient's condition also is a major factor. Whether patients have ocular hypertension alone or also glaucoma signs and symptoms, and the type of glaucoma all influence how well combined and individual therapies work.

Phacoemulsification as glaucoma surgery

The IOP-lowering effect of phacoemulsification in clear cornea incisions was first reported in 1996 by Debra Tennen MD and Samuel Masket MD, noted Bradford Shingleton MD, Boston, US. That seminal study found IOP significantly reduced in non-glaucoma eyes one year post-surgery.

"We found a trend toward lower IOP that, if permanent, raises serious implications about the necessity of combined procedures in patients with both glaucoma and cataract," the study concluded.

Courtesy of Robert Noecker MD

Endoscopic view of Ciliary processes during laser ablation

These words proved prophetic. Subsequent research by Dr Shingleton and others shows that phaco alone is an effective treatment for ocular hypertension and glaucoma in many patients.

"Phacoemulsification is the most commonly performed glaucoma surgery in the world. Whether it is the procedure of choice is another matter," Dr Shingleton said.

Among the research findings are that the mean reduction in all eyes is modest – about 1.0 mmHg to 3.0 mmHg. In normal and open angle glaucoma suspect eyes the reduction persists for at least five years. More important, in symptomatic open angle glaucoma eyes, phaco alone not only reduces IOP, it cuts the mean number of medications required to control IOP by half, though medications needed to maintain IOP trend up toward pre-surgery levels over time, Dr Shingleton added.

Moreover, greater IOP reductions are associated with higher pre-surgery IOP. Reductions ranging up to 10 mmHg have been reported in eyes with preoperative IOP of 25 mmHg to 30 mmHg. Greater IOP reductions are also associated with narrow angles.

The thickening of the crystalline lens with age may explain why cataract extraction reduces pressure more in open angle and narrow angle patients with higher preoperative pressures, said Thomas Samuelson MD, Minneapolis, US. After age 24, the size of the eye remains stable, but the lens enlarges significantly. Magnetic resonance imaging studies show that the growing lens pushes the iris forward and the anterior chamber shallows. The ciliary body, trabecular meshwork and Schlemm's canal are compressed, and angles narrow.

This could impede aqueous outflow, Dr Samuelson said. Removing the lens and replacing it with a thinner artificial implant relieves the compression, which may restore outflow, he theorised. Because higher pressures are caused by greater outflow resistance, when the compression is relieved in these patients their outflow improves more than for patients with less compression, explaining their greater pressure drops.

"I believe that phacomorphic open angle glaucoma exists. It makes sense that if the lens itself is compromising outflow, if you take it out you will increase outflow," Dr Samuelson said.

These conclusions appear to be supported by a study of narrow angle and chronic angle closure glaucoma by Dr Brown. Eyes with preoperative pressures of over 20 mmHg showed a mean reduction of 5.2 mmHg, or 23 per cent, compared with 3.28 mmHg, or 19 per cent, for all eyes, a statistically significant finding. In addition, higher preoperative IOP also was linked with shallower anterior chambers and shorter axial lengths.

"If the eye is too short, the lens takes up too much space. We cannot lengthen the eye, but we can create space by removing the lens," Dr Brown said.

His results were statistically significant enough to satisfy FDA guidelines for medications, Dr Brown said.

"If cataract surgery came in a bottle,


Richard Packard


Robert Noecker


Howard Barnebey

the FDA would approve it for glaucoma treatment," he quipped.

In a study Dr Shingleton reported involving 1,122 patients with pseudoexfoliation and pseudoexfoliation with glaucoma he found that phaco alone lowered IOP by 1.0 mmHg to 2.0 mmHg for seven years in all patients, though the reduction was not significant after the first year for patients with glaucoma symptoms. However, the active glaucoma cases did require fewer medications to control pressure, though pressure trended upward to pre-surgery levels in later years.

Dr Shingleton also noted that the need for follow-up treatment after phaco was small. Only 2.7 per cent of the pseudoexfoliation-only patients required additional treatment, defined as a need for medications to control IOP. The rate was slightly higher for the group that also had glaucoma symptoms, where 3.7 per cent required additional treatment, defined as the need for laser or glaucoma surgery.

"There is something about phacoemulsification that is truly beneficial in pseudoexfoliation eyes," Dr Shingleton said.

These findings have prompted Dr Shingleton to shift his own practice preferences.

"Multiple factors should go into determining the best surgical choice for patients with cataracts and glaucoma. But in my hands, phaco alone is taking a much broader stance in my armamentarium."

Combined surgery alternatives

While cataract extraction alone may be the most appropriate procedure for patients with controlled or modestly uncontrolled glaucoma, the disease can be aggressive, Dr Samuelson noted. The benefits of a combined approach may outweigh the risk for patients who are not compliant with medication regimens, strongly want off medications, require chronic steroid medication, have progressive disease that threatens fixation or those with very low target IOPs, he said.

Dr Samuelson said options fall into three categories; complete trabeculo-cannicular bypass, such as trabeculectomy, aqueous drainage devices, or suprachoroidal stents, such as the Solx shunt; Schlemm's enhancement procedures, including 360 degree canaloplasty with prolene suture, Trabectome procedures, or trabecular bypasses such as the iStent; and endoscopic cyclophotocoagulation, which reduces aqueous production rather than facilitating outflow.

Trabeculectomy remains the gold standard for combined procedures in large part because its pressure reducing potential is compelling, said Patrick Riedel MD, Minneapolis, US. The procedure is relatively predictable, quickly performed, and can be used in many forms of glaucoma. Success rates are improving thanks to greater attention to bleb morphology, specifically directing subconjunctival aqueous flow to a broader and more posterior location with the goal of creating a low-lying, diffuse slightly avascular conjunctival bleb. While small incision techniques and foldable IOLs now allow combined procedures through a single scleral incision, he believes that separate site surgery may be best because it allows surgeons to perform their usual clear corneal cataract surgery and reduces complication risks for the trabeculectomy.

Steven R Sarkisian Jr MD, Oklahoma City, US, described the Ex-Press Mini Glaucoma shunt. He reported a recent published case series of 345 eyes demonstrating a success rate of 95 per cent with three years' follow-up in getting an IOP as low as is seen with trabeculectomy; however, the surgeon uses a 26-gauge needle under a small scleral flap rather than a large 1-2mm scleral incision, said Dr Sarkisian. No iridectomy is required, and the implant can easily be inserted superiorly in combination with a temporal phaco procedure. Dr Sarkisian compared the advance of the Ex-Press from trabeculectomy to advances in cataract surgery in which we have evolved from a large 10-13mm incision to a 2.2mm incision.

The Trabectome makes possible an internal approach trabeculotomy through a temporal corneal incision, said Brian Francis MD, Los Angeles, US. The hand piece is advanced to the nasal angle under gonioscopic viewing and the tip is compressed through the trabecular meshwork into Schlemm's canal. The TM and inner wall of Schlemm's canal is ablated, exposing the outer wall of Schlemm's canal and collector channels unobstructed by any meshwork debris. When combined with phaco, success rates, defined as 20 per cent or greater reduction in IOP or decreased medications and no additional glaucoma surgery, exceed 90 per cent at three years, Dr Francis said. The procedure can be used with many types of glaucoma except neovascular glaucoma, or in patients where the angle structures cannot be properly visualised.

Canaloplasty is a viable choice for patients with uncontrolled open angle glaucoma as well as situations where a trabeculectomy might fail or cannot be tolerated due to lifestyle or occupational considerations, said Howard Barnebey MD, Seattle, US. The procedure is non-invasive, does not create a bleb, offers fewer complications and has comparable IOP lowering to trabeculectomy, he said. Drawbacks include technical difficulty and longer operative time however, the adoption proves well worth the effort and similar to the learning curve associated with learning phaco. Canaloplasty is not indicated for angle closure, plateau iris or neovascular glaucoma.

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Bradford Shingleton MD

The iStent offers the advantage of fewer and less severe complications, said Carlo E Traverso MD of the University of Genova, Italy. The device is essentially a miniature snorkel with one end open protruding into the anterior chamber and the other end inserted into Schlemm's canal to allow aqueous fluid to bypass blocked trabecular meshwork. The device is implanted through a 1.5mm corneal incision with no sutures and is held in place by three ridges on the long arm of the stent that is inserted into Schlemm's canal. However, the need for additional treatment to control IOP may be higher than for some alternatives. Some studies suggest that two iStents work better than one.

Endoscopic cyclophotocoagulation reduces IOP by slowing the inflow of aqueous by ablating the ciliary processes that produce it, said Robert Noecker MD, Pittsburgh, US. Typically 270 to 360 degrees are ablated. IOP drops for several days after the procedure, with the ultimate post-op pressure reached somewhere between the second and eighth week. Combining the procedure with phaco results in prolonged IOP reduction medications required, whereas pressure tends to trend toward pre-op levels when it is performed alone.

As these newer, less risky procedures establish a track record over time, combined surgery could make a comeback for less severe cases, Dr Samuelson said. Each holds the potential to reduce or eliminate dependence on medications without the risks of managing a bleb. However, "the new procedures must prove their mettle to be combined with cataract extraction for early or controlled disease," he added.

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