GLAUCOMA SURGERY INNOVATIONS
Breakthroughs may flow from exchange of ideas, industry support
by Howard Larkin in San Diego

During his 30 years in practice, glaucoma surgery hasn’t advanced much, says Reay H Brown MD, Atlanta, US. But it’s not for lack of new ideas so much as insufficient support for realising them. He believes that’s about to change.

“Glaucoma is becoming a surgical disease. The question is ‘why now?’” Dr Brown asked attendees of the 2011 ASCRS Glaucoma Day Stephens A Obstaun Honourdale. He gave two reasons.

First, ageing populations are exponentially increasing demand. Second, major industry players are finally making serious investments in glaucoma surgery to offset their revenue losses as Xalatan and other big-money prostaglandins go off patent.

“That’s going to take $500m (about €350m) out of glaucoma therapy. Meanwhile, the glaucoma device market may be $1bn,” Dr Brown said.

Dr Brown also believes that glaucoma and ophthalmic specialty societies have a major role to play in fostering glaucoma surgery innovation by creating forums for information exchange. These should include “virtual coffeehouses” supported by social media and online services such as Eytetube, but also a greater focus on surgery by existing glaucoma societies, and formation of societies dedicated to glaucoma surgery.

“There are plenty of ideas; what we need is an exchange of ideas, so the half-an-idea will always find the other half.”

The ‘adjacent possible’

Dr Brown suggested the concept of the “adjacent possible”, formulated by biologist Stuart Kauffman, well describes surgical innovation. Each advance creates opportunities for new advances that didn’t exist before. In his book, Where Good Ideas Come From, author Steven Johnson likens the process to standing in a room with four doors. Behind each door is another room with four doors, but to reach the third room, one must pass through the second. Each door represents a different set of “adjacent possible” developments.

Modern cataract surgery is a good example, Dr Brown pointed out. It took years after the invention of phacoemulsification by Charles Kelman before supporting inventions, including foldable lenses, viscoelastics and the capsulorhexis resulted in the elegant, reliable, and less invasive and very safe procedure we know today.

To an extent, this was a result of serendipity. But mostly it was the rich exchange of ideas, one inspiring and making it possible to apply the next, and all driven by the principles of minimalism and simplification, Dr Brown said.

But simplification is not simple, he pointed out. The tools of modern cataract surgery, including phaco machines, microscopes and diagnostic devices are anything but simple. And with femtosecond laser applications on the horizon, the complexity of cataract surgery technology may again increase by an order of magnitude.

Rather, simplification means increased efficiency and improves outcomes, Dr Brown said.

“Perhaps the best definition of ‘simple’ is when the patient says ‘thanks, doctor. That was easy.’”

Simplifying glaucoma surgery

By contrast, trabeculectomy, still the gold standard glaucoma procedure, is performed with manual tools that haven’t changed much in decades. The result can be anything but easy for patients.

“If your patient asks whether it’s normal for vision to be worse after surgery and you say ‘yes; if you prefer to keep a patient on four drops with a red eye rather than operate, you might have what it takes to be a glaucoma surgeon,” Dr Brown quipped.

But with adequate financial support and a robust exchange of ideas, glaucoma surgery will take advantage of adjacent possibilities and progress much as has cataract surgery. The principle of minimalism is an even greater factor favouring glaucoma surgery because it potentially takes the issues of medication cost and compliance off the table.

“I don’t want glaucoma surgery to be a joke. I don’t accept that it is not compatible with good vision or should only be used as a last resort. We need innovation,” Dr Brown said.

Yet the history of glaucoma surgery innovation has been spotty. For example, in the early 1980s, Dr Brown and colleagues adapted emerging vitrectomy technology to create the automated mechanical trephine, known as the trabecuphine. This allowed iridectomy and sclerotomy to be performed through a 19-gauge incision, sidestepping the conjunctival incision and related failures due to surgical trauma and bleb scarring.

“This was the adjacent possible. The instrument was the door to the next room.”

However, the trabecuphine failed, in part because of difficulty controlling outflow.

“If the hole was too open we got hypotony. If it closed up, the procedure failed,” Dr Brown said.

Ironically, at about the same time Robert Ritch MD invented the “Ritch rivet” device for holding open a scleral flap, Dr Brown cited the trabecuphine in his patent – but never contacted Dr Brown, who sees the situation as a lost opportunity to exploit the “adjacent possible.” Similarly, he believes his early attempts at a corneal valve to regulate aqueous pressure and the理想的 trabecular bypass tube, which went all the way to a phase III trial, failed due to insufficient supporting research.

But the possibilities these inventions created are still being investigated, and with renewed vigour, Dr Brown says. He sees three promising areas of advance: trabecular bypass using canuloplasty, iStents, Hydrus and the Trabectome; external drainage using devices such as Express and Aquasys; and suprachoroidal drainage. The glaucoma tack corneal valve is also under development to find the right materials and fixation technique. Tube shunts are also an area ripe for development, particularly given the reduced failure rates demonstrated in the trab versus tube trial, he said.

While Dr Brown suspects that surgery will not be sufficient in many cases, he envisions most patients being managed with one drop as better surgical options are developed.

“There are just too many ideas out there not to be optimistic.”