Tips on truth
Self-reflect to reap rewards in your everyday work

Game-changing IOLs
Presbyopia-correcting devices are providing new astigmatism options

ISSUE FEATURE
Securing grafts without sutures
Technique maintains static glaucoma drainage device placement, reduces risks

A. Posterior placement of the plate (about 10 to 12 mm behind the limbus). B. After diluting the sealant, it is applied to the suture islet holes to ensure the plate remains static. C. The sclera is thoroughly dried for sealant application to the sclera and tutoplast. D. The wound is successfully closed and anterior chamber is formed. (Images and video courtesy of Dr Inder Paul Singh)
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A big challenge for ophthalmologists, especially in refractive surgery, is to define ourselves (in professional terms) and set goals. To avoid the trap of repeating ingrained actions relating to goals that no longer represent our aspirations, it is important to implement a strategic plan and periodically analyse whether we are heading in the right direction. Are we being true both to ourselves and to our patients?

The examples below illustrate the ways in which truth comes into play for two professional types of ophthalmologists.

**Case 1**
As a conservative ophthalmologist, you may be adverse to risk and/or a late adopter of new technologies. Something worth examining is whether you are doing everything you can, to the extent of your knowledge, to serve your patients. For example, are you able to admit to a patient that his or her illness might be better managed with a more specialised consultation? This means accepting that you are not the best in every aspect of your profession and thus being true to yourself. Elements of laziness and/or greed can lead to a patient being dismissed with a ‘one size fits all’ approach. Or you could become so absorbed in your professional tasks that you forget the real reason for running a business. Thus, it is beneficial, from time to time, to reflect on the balance between your private life and profession.

**Case 2**
Let’s say you are a refractive, private healthcare-oriented surgeon, offering and promoting elective surgery. You see yourself as a passionate early-adopter of new technology. However, perhaps it is difficult to position yourself at the forefront of technological innovation without huge financial resources or high-volume surgery.

It might be tempting to enlarge the indications, neglect contraindications, or minimise side effects in order to enrol more patients. Or you might dive into new surgery without thorough training or despite knowing that your practice lacks appropriate diagnostic equipment.

As with the conservative type, you must first accept the truth to yourself, before revealing the situation to your patient. After all, it is the quality of your work that will define you to your community and, more importantly, to yourself.

**Being the first patient**
Another tricky issue is revealing to patients that they will be the first to receive a new type of surgery.

Consider this conversation at Dr Karl Oppenheirs’ ‘20/20 vision surgical centre’:

Dr Oppenheirs: “So, Mr Jones, you are looking for a solution for your disabling presbyopia. I see your far vision is perfect. Good for you, since you are a professional driver. I can offer you a brand new surgical procedure that seems to promise very useful near vision without affecting far vision. It involves the implantation of a recently developed device. I have read the research papers and no serious complications have been reported. Having said that, I cannot give you 100% assurance that you will not see any change in your far vision.”

“How many cases have you done?”

“None. You could be the proud first patient in your country to be operated on with this new exciting procedure. My experience with other kinds of surgeries should lead my hand with this new one.”

Another doctor enters the room: “Karl, who are you talking to? There’s nobody here but you!”

Dr Oppenheirs: “No one – I was just practising.”

As a final thought, will Dr Oppenheirs adopt this honest approach with his next, first patient? Will you, when faced with a similar situation?
contemporary glaucoma strategies

Securing grafts without sutures

Technique maintains static glaucoma drainage device placement, reduces risks

By Dr Inder Paul Singh

Glaucoma drainage devices aid in controlling IOP by redirecting aqueous from the anterior chamber to an external reservoir to regulate flow. They are typically used for patients who have failed previous surgeries or who have a high likelihood of failing procedures, such as trabeculectomy.\(^1\)\(^{-}\)\(^7\) While effective, they are traditionally anchored through the use of sutures, which is both time-intensive and may cause complications.

Sutures are needed in several areas to secure the plate and tube to the sclera, to anchor the patch graft, and finally to close the wound. Typically, when suturing, I will use a 9-0 nylon, non-absorbable suture that remains in the eye post-surgery. While this does not generally cause issues it can theoretically cause bleeding, which could lead to fibrosis on the rare occasion that a blood vessel is punctured while placing the sutures.

There is also the rare possibility that while the suture needle is puncturing through the sclera, the retina could be pierced. Other possible complications include substantial patient discomfort, and in some cases, absorbable sutures may cause inflammation and fibrosis scarring.\(^8\) Permanent non-absorbable sutures may cause tissue erosion, buttonholes, or tears.

**Posterior device placement**

Perhaps most significantly, suturing the conjunctiva can be tedious and difficult depending on the plate position. Placing the plate further forward reduces the difficulty with suturing as it provides easier access and visibility.

However, it is always better, from both a cosmetic as well as a fibrosis-scarring perspective, to place the device as posterior as possible, about 10 to 12 mm behind the limbus.

A proximity too close to the limbus can cause patient discomfort and may cause other issues, such as a larger cystic bleb and fibrosis. The main drawback to this placement is that when the plate is placed further back it becomes extremely difficult to suture as both accessibility and visibility are reduced.

As a result, it is more common to place the plate further forward, only 8 to 9 mm behind the limbus.

A more posterior placement aids in reducing or eliminating the need for sutures. Due to the natural curvature of the plate, placing it further back toward the equator allows it to suction to the sclera, fitting snugly and reducing the chances of migration. Additionally, once the conjunctiva is closed, there is enough pressure on the plate to keep it in place.

Using an ocular sealant (ReSure, Ocular Therapeutix) in place of the sutures further ensures the plate will remain static. We have not seen any migration since implementing the use of the sealant.

In terms of safety, it has been shown to be safe to use on corneal wounds.\(^9\) It is likewise as safe for use on the sclera and with the patch graft. It is very rare for patch grafts to shift. Therefore, adding another suture to secure them not only adds time, but also increases the chance of fibrosis, which can occur quickly.

A small amount of sealant in place of a suture is more than adequate to ensure the graft remains in place. Overall, the use of a sealant results in less time in the operating room, less equipment in terms of sutures and all the accompanying paraphernalia, greatly increased efficiency for the

‘I have found the use of a sealant to comfortably, quickly and more efficiently secure a plate.’

— Dr Inder Paul Singh

By Dr Inder Paul Singh

IN SHORT

- Posterior placement of a glaucoma drainage plate allows for a plate-securing technique, which obviates the need for sutures. Dr Inder Paul Singh explains how a sealant is used and has not been associated with any cases of plate migration.
procedure as a whole, and greater comfort for patients.

Applying the sealant
During the procedure, I place the plate about 11 to 12 mm behind the limbus and then apply the sealant over the suture islet holes with the included applicator. It takes only seconds to set and then I firmly tug on the plate to test its stability and ensure the sealant is still over the suture holes.

After the tube is in place, I dry the sclera and apply sealant to the area in order to secure the patch graft over the tube. It can be difficult to keep the area dry. Cellulose sponges (WECK-CEL, Beaver-Vistec International) can be used to assist in drying the conjunctiva and sclera and in absorbing any blood from vessels that may have been injected. I also position the sponges to the sides of where the sealant will be placed to keep the conjunctiva tented above so it does not touch the sclera while I dry any residual amounts of fluid that might present. Those will remain in position while the sealant is applied. Then, I place the sealant on the sclera and tutoplast or amniotic membrane and close the wound.

The biggest concern when transitioning from a permanent suture to an absorbable sealant seems to be the possibility of the plate shifting. If the conjunctiva is especially thin, any movement may cause erosion.

While there is no way to measure how long the sealant lasts once it is under the conjunctiva, it typically lasts between 1 and 3 days in other applications. However, it is possible to determine within seconds of application if the sealant is holding and I have not had any instances of migration. I have found the use of a sealant to comfortably, quickly and more efficiently secure these plates in an ideal location without the need for sutures is significantly advantageous to both surgeon and patient.

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For 20 years, I have effectively employed endoscopic cyclophotocoagulation (ECP) as a primary or secondary line of glaucoma treatment. ECP is a minimally invasive glaucoma surgical (MIGS) option capable of reducing IOP in the majority of patients and can potentially eliminate the need for drainage surgery, including trabeculectomy (trab) and glaucoma drainage devices (GDDs).

With few sight-threatening complications, this is an attractive option to patients facing higher-risk, invasive procedures, or it can serve as a supplemental tool that complements and enhances the effects of other procedures.

ECP combines light and endoscopy to produce a precise, visualised laser application. The endoscope allows for viewing the ciliary body from the anterior or posterior segment in real time. Ciliary processes are easily identified and treated with laser ablation, thus minimising trauma to adjacent healthy ciliary and other tissues.

Quick, sutureless and ocular surface-friendly, ECP shows destruction of the non-pigmented epithelium with little effect outside of the ciliary processes. Scanning electron microscopy displays shrinkage and effacement of the process without gross architectural destruction or collateral damage.

In contrast, eyes treated with traditional cyclophotocoagulation (CPC) demonstrate destruction of the pigmented and non-pigmented epithelium, pigment clumping, coagulative necrosis and destruction of the deeper ciliary stroma.

Visibility (not just probability)

ECP allows direct visualisation of the treatment endpoint with localised shrinkage of ciliary processes. This is particularly important in large eyes and eyes that have undergone previous surgery. In both of these groups of patients, the position of the ciliary body may be atypical, leading to poor results and increased complications with transcleral CPC.

The laser and endoscopic system (Endo Optiks/Beaver Visitec) provides the benefit of real-time visibility of the anatomy. There is no need to guess the location of the ciliary processes and thus collateral damage to the surrounding tissues may be minimised.

Outflow (not just inflow)

Critical to the success of ECP is consideration of aqueous dynamics, both inflow and outflow. The decision should not be based solely on the plan to reduce inflow.

ECP is highly effective, but in my opinion, it is best used on patients with reasonable outflow, or surgeons risk failure. It is an obvious and helpful adjunct to cataract surgery in eyes with visually significant cataracts and mild to moderate glaucoma.

### IN SHORT

- Employing endoscopic cyclophotocoagulation effectively reduces IOP when used early in the glaucoma treatment paradigm.
However, in eyes with moderate to advanced glaucoma, there is usually severely restricted outflow and typically also low inflow, leaving little ‘wiggle room’ to modulate treatment via reduction of inflow. So for patients with severe disease, I first perform a procedure to establish outflow (be it MIGS, trab, or GDD).

I then titrate the degree of additional ECP treatment (which can vary from 90° to 360°) based on the severity of the disease and risk assessment of factors including ‘target’ IOP, pharmacologic resistance, past procedures and the very rare risk of hypotony.

**Efficacy (not just safety)**

ECP is largely successful in reducing ciliary body aqueous production. However, now that ophthalmologists are aiming for ever-lower target pressures after surgery, the extent of treatment efficacy may be the main issue. The effect of an ECP procedure is based on controlled tissue damage.

However, as it is a gentle, titratable and repeatable procedure, safety is not as overly concerning now as it had been in the past with previous more aggressive modalities of cyclo-ablation (for ECP, I prefer the term ‘cyclo-modulation’ rather than cyclo-destruction). The bigger question is whether the treatments lower pressure enough after surgery.

Think of it as an ‘untrabitional’ surgical procedure for patients with glaucoma. It is a mild process allowing for re-treatment if necessary, and patients are subject to reduced probability of sight-threatening risks associated with invasive procedures, such as trab or GDD surgery.

**Cataract, glaucoma perfect pair for ECP**

As an adjunct to small-incision cataract surgery, ECP is an ideal way to address moderately controlled glaucoma and cataracts in one procedure. Although cataract surgery alone may temporarily reduce IOP, targeting and ablating ciliary processes frequently enables patients to experience long-term IOP reduction comparable to the more invasive GDD procedures, but without the added risk of sight-threatening complications.

The process adds about 10 minutes to the overall surgery time and can prevent patients from needing additional glaucoma surgery. In cases where IOP is not lowered enough, I will supplement with a second ECP treatment. If IOP still remains high, I will often proceed to a trab or GDD.

Finally, if this does not produce results, I will try ECP again (perhaps via a posterior approach). In my experience, ECP helps outflow operations to work better when performed either before or after glaucoma outflow surgery.

For patients who are no longer responsive to or have an aversion to pharmacological treatments, ECP typically lowers IOP sufficiently to make it possible for them to discontinue one or two glaucoma medications and still maintain control.
Performing ECP sooner rather than later

My clinical experience has shown that utilising ECP earlier in the treatment paradigm is prudent practice. Patients experience more success when the procedure is performed in the early to moderate stages of glaucoma, while outflow facility is only minimally reduced and outflow resistance is rising but still functional.

The desired endpoint of treatment is whitening and shrinkage of the entire ciliary process.

Waiting to perform ECP in patients who have never received any other treatment, or until the disease is severe with very high outflow resistance, and often combined with already reduced inflow and little or no outflow facility, is unlikely to be a great success. Once the disease progresses to this stage, surgeons simply cannot reduce the inflow sufficiently to lower IOP in a patient with minimal or no outflow. Furthermore, this situation is brittle and may lead to hypotony if the already-reduced inflow is quickly reduced.

However, as in inflow procedure, ECP can play a role in augmenting previous outflow of other treatments in complicated glaucoma, particularly in patients who have already had a failed trabeculectomy or tube and are facing even more invasive surgery, such as a second tube operation.

Technique

My practice is usually to use ECP as a primary treatment when performed in conjunction with phacoemulsification and as a secondary treatment when treating glaucoma alone. There are four skills required to perform ECP:
- watching a video monitor;
- accessing ciliary processes once given the approach and lens status;
- inflating the ciliary sulcus; and
- controlling the long duration, invisible wavelength laser.

I initially perform ECP with phacoemulsification as an additive procedure. Phacoemulsification and IOL insertion are performed as normal. I remove the viscoelastic and then re-inject it to inflate the sulcus and perform ECP. It is simple to treat the facing 180° of the ciliary body with ECP through the normal phaco incision.

If further treatment is planned (as is usual), I enlarge my normal two side-port incisions to 1.5 to 2 mm, which is slightly larger than the 21 gauge probe and permits horizontal movement in the wound and eliminates corneal torque. I treat the visible surface of the whole process as well as the area between the processes. Once the process shrinks upon treatment, it is not uncommon for new processes to be revealed behind the first row of them.

Phased approach

I utilise a phased treatment approach and typically start with ECP and then progress to ‘ECP plus’ (re-treatment with scleral indentation to expose untreated areas on previously treated processes and new posterior-sited processes) in refractory glaucoma cases.

With few exceptions, I treat the full 360°. Overtreatment is an inconsequential risk. There is a huge amount of ciliary epithelium and ECP is a gentle procedure. For a complicated eye, or the rare case when the eye is at increased risk for hypotony, I opt for 180° or 270° of treatment.

What to expect

The desired endpoint of treatment is whitening and shrinkage of the entire ciliary process.

However, inflammation is an inevitable consequence of any intraocular procedure, including endoscopic treatment. When managed properly, inflammation is self-limiting and does not pose a problem.

To manage inflammation, I pre-treat patients with topical steroids and inject intracameral steroids at the end of the procedure. Inflammation should not be a deterrent to performing ECP. One should expect inflammation and treat it prophylactically to avoid surprises or complications.

Conclusion

ECP is a low-risk, minimally invasive surgical method offering IOP control and some liberation from the plethora of medications required for glaucoma patients. Using ECP earlier in the treatment paradigm to stem inflow when the outflow mechanisms are still functioning enables the greatest margin of success.

Used as a primary treatment for glaucoma in conjunction with cataract surgery, ophthalmologists can effectively reduce IOP without adding risk to the extraordinarily safe cataract surgery procedure. Consider the ‘untrabitional’ approach. Patients (and their eyes) will be happy.

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contemporary glaucoma strategies

Laser trabeculoplasty opening doors for open-angle glaucoma patients

A low-energy form of the procedure has helped to address safety concerns

Prostaglandin-based topical therapy has been the ‘go-to treatment’ for open-angle glaucoma for decades. In contrast, laser trabeculoplasty has conventionally remained reserved for patients unresponsive or unable to adhere to medication-based therapy.

Recent years, however, have brought the level of technologic advancement needed to move laser trabeculoplasty into the limelight as an effective open-angle glaucoma treatment.

However, with argon laser trabeculoplasty (ALT)—the original laser therapy for glaucoma—requiring a hot, high-energy laser that carries a notable risk of collateral damage to surrounding tissue, safety concerns are a key disadvantage.

Fortunately, the subsequent development of a cool, low-energy form of the procedure, called selective laser trabeculoplasty (SLT), has helped to ameliorate safety concerns.

By using a low-energy, Q-switched, frequency-doubled Nd:YAG laser with a short exposure time of up to 5 ns, the SLT laser is primed to specifically target pigmented trabecular meshwork cells without damaging surrounding tissue.1 And studies show that SLT is just as effective as ALT at lowering IOP in glaucoma patients.1,2

Spurred by encouraging reports about the efficacy of SLT laser systems, I have spent recent months using the OptoYAG and SLT laser system (Optotek d.o.o, Slovenia) in my clinic in Ivano-Frankovsk, Ukraine. While doing so, I have been pleasantly surprised at how easy it has been to integrate an advanced piece on technology within my practice, and I have also become more aware of the realities of using laser technology to treat a condition that is classically managed with eye drops.

Seeing the advantage

The system is a combined unit that consists of two lasers—a ND:YAG and SLT laser—used for different applications. As the ND:YAG laser has penetrative properties, it is best utilised in the treatment of diseases in which there is a need to create a hole or incision in tissue.

For example, the laser is used during iridotomy and in the treatment of secondary cataract or limited regional haemorrhages. For the latter, the creation of a small hole allows blood to move into the vitreous humour, where it can be absorbed without detriment to ocular health.

In contrast, the SLT laser stimulates tissue rather than cutting through it. As such, when applied to an eye with open-angle glaucoma, the laser stimulates the pigmented trabecular cells and macrophages responsible for filtering and draining the aqueous humour, thus triggering a clearance process in the trabecular meshwork, which, in turn, lowers the elevated IOP seen in open-angle glaucoma.

An important observation I have made while working with the SLT laser is that the results achievable are strongly influenced by disease. Patients at stages 1 and 2 of the disease seem to achieve better outcomes than those at later stages. Specifically, mean IOP reductions of 5.9 and 5.7 mm Hg were achieved among my patients with stage 1 and 2 glaucoma, respectively.

Of note, these levels of reduction were seen in more than 80% of patients. In comparison, SLT therapy was effective in no more than 50% of my stage 3 patients, resulting in a mean IOP reduction of only 4.7 mm Hg among this group at 1 to 3 months post-SLT.

Published literature, including a 2016 study by Schlote et al., support my observation that SLT outcomes are worse with advanced open angle glaucoma.4 This suggests that while such technology

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IN SHORT

SLT therapy provides a safe and efficacious first-line treatment option for open-angle glaucoma patients who have had little success after taking conventional topical therapy.
is exciting and offers favourable outcomes for glaucoma patients, it is important to recognise that such outcomes are not universal for all patients. Thus, it is vital that the treating physician selects patients for treatment appropriately.

In addition to disease stage, other factors, such as angle width and pigmentation level, influence both the outcomes obtainable with SLT and the technical settings that must be used when treating patients with the laser.

For example, in eyes with a higher degree of pigmentation, it is better to use a relatively low energy beam or apply treatment in several stages to minimise the risk of burns. In eyes with low levels of pigmentation, SLT is not really worthwhile as its ability to lower IOP in such eyes is minimal. Similarly, this treatment is typically ineffective in patients with pseudoxefoliation glaucoma.

As with any therapeutic intervention, while SLT laser offers great benefits and outcomes, it does carry a risk, albeit a low one, of side effects. My experience with the laser revealed just one case of IOP increase among a treatment group with more than 100 patients.

In this case, IOP rose to 35 mm Hg after SLT treatment. However, it dropped back to normal levels within two weeks (during which hypotensive eye drops were used to maintain IOP at acceptable levels). But as transient IOP rise has been widely reported after laser procedures, this is an observation that is not too unexpected.

Rectifying misconceptions

It is often believed by physicians and patients that laser therapy is a very expensive treatment that the average person simply cannot afford. In reality, however, the cost of laser-based glaucoma treatment is comparable with the cost of a 5-month supply of eye drops. Given the longer lasting outcomes achieved with SLT and the one-time investment, it is actually more cost effective to have laser therapy than continue on long-term topical therapy. This misconception highlights a need for improved education on this treatment modality among physicians and patients, to ensure that patients who stand to benefit both financially and physically from opting for laser therapy over medication are presented with all their options at an early-disease stage, when good outcomes are still achievable.

Some physicians may also hold the belief that a combined system will be more complicated than a conventional YAG laser or traditional ALT. With features such as fine-energy setting buttons located next to the joystick included in the device for ease of use, there is no significant learning curve with this device compared with standard YAG lasers.

Physicians used to using ALT in open-angle glaucoma will notice increased treatment precision on making the switch to SLT. This is because the SLT’s 400 μm laser beam diameter covers the full size of the trabeculae, thus eliminating a need for extremely accurate aiming.

In contrast, the laser beam used in ALT has a diameter of 50 μm, which will always require greater aiming precision to deliver the best treatment outcome possible—no matter how skilled the surgeon. Furthermore, when the ALT laser is used, there is a risk of rebound increase in IOP 6 months after treatment that is not seen with SLT.

Conclusion

SLT therapy provides a safe treatment option for open-angle glaucoma patients who have had little success after taking conventional topical therapy for several years. With the added benefit of proven efficacy and safety as a first-line treatment in these patients, it seems the adoption of SLT in glaucoma treatment is likely to grow in coming years.

As a procedure that produces similar outcomes to those achieved with eyedrops, SLT offers the added advantage of eliminating the compliance problem that is often seen with patients on long-term eyedrop therapy (that is, with their eye drops and follow-up appointments).

Cost savings from a single laser treatment versus years of multiple eye drop regimes are also worth noting. This further adds to my confidence in the future of SLT in open-angle glaucoma treatment.

However, a key factor that is likely to make or break the uptake of this procedure by eye care practices worldwide is proper education of both patients and ophthalmologists. This will be vital in ensuring that only the most appropriate patients (early-stage glaucoma patients) are selected for treatment. By doing so, this promising technology can consistently be used to its full advantage and deliver the exemplary results for which it is capable.

REFERENCES


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Elevated intraocular pressure (IOP) has long been recognised to play a role in glaucoma, and data from population-based studies demonstrate that blood pressure, possibly through an effect on ocular perfusion pressure, may influence open-angle glaucoma risk.

Recently, evidence has been accumulating to support the theory that cerebrospinal fluid pressure (CSFp) is also important in primary open-angle glaucoma (POAG) and normal-tension glaucoma (NTG), and the relationship has potential implications for clinical practice, said Dr R Rand Allingham, Richard and Kit Barkhouser Distinguished Professor, Duke University Eye Center, Durham, NC, and principal clinician scientist, National University of Singapore.

“We will need a noninvasive method to measure CSFp. With that information, we will be able to assess the role of CSFp in its contribution to the transmural pressure gradient (the difference between IOP and CSFp) and begin considering this as a new therapeutic target,” said Dr Allingham.

Mounting evidence

The idea that CSFp is important in glaucoma is reasonable from an anatomic perspective recognising that the lamina cribosa is the structure that separates the cerebrospinal fluid space from another pressurised fluid compartment, the aqueous humour, within the eye. Increasing evidence suggests there is normally a physiological balance between CSFp and IOP.

Evidence of a role of CSFp in glaucoma also comes from comparative studies measuring CSFp in patients with glaucoma compared with CSFp measured in unaffected controls. In a retrospective case-control study, Berdahl et al. found that CSFp was significantly lower in eyes with normal-tension glaucoma (NTG).

“Interestingly, eyes with ocular hypertension that have no evidence of glaucoma had a higher CSFp than the control group with normal IOP. This finding suggests higher CSFp may be protective for glaucoma in people with ocular hypertension,” he noted.

Growing evidence suggests there is normally a physiological balance between CSFp and IOP.

Increasing evidence

Growing evidence supports the notion that the cerebrospinal fluid pressure (CSFp) level may affect risk for developing primary open angle glaucoma (POAG).

Supporting data

Consistent with these findings, results of a prospective study by Ren and co-workers showed that the transmural pressure gradient was significantly greater in eyes with either POAG and NTG compared with controls without glaucoma. In addition, the latter investigators noted a significant positive correlation between CSFp and both IOP and blood pressure in normal controls, but not in POAG patients.

“The latter findings suggest that dysregulation of several physiologic pressures, including eye pressure, CSF pressure and blood pressure, may play a role in the pathogenesis of glaucoma,” Dr Allingham said.
Further support for a role of CSFp in glaucoma is provided by information on relationships between glaucoma and factors that alter CSFp, such as body mass index (BMI). Pasquale and colleagues found that a higher BMI was protective for glaucoma in women. Asrani and colleagues found that BMI was significantly lower in NTG patients compared with OAG patients.

In a study that examined the clinical data for over 4000 patients, Dr Allingham and colleagues analysed the relationship between CSFp and BMI and reported a positive, linear association between BMI and CSFp.

**Age-related effect**

In another study Fleischman and colleagues looked at the effect of age on CSFp in more than 13,000 patients without glaucoma seen at the Mayo Clinic and found CSFp began to progressively drop after age 50. In total, the mean CSFp reduction was over 30% by age 90.

“Interestingly, the prevalence of POAG begins its rise at about the same age that CSFp begins to decrease, while most population-based studies show that mean eye pressure remains constant throughout life,” Dr Allingham said.

**Exploring clinical relevance**

Several developments, such as electronic medical records, have played a major role in the study of CSFp in glaucoma and will impact future studies like this one, said Dr Allingham.

“Since electronic medical records give rapid access to vast volumes of data, researchers will be better able to investigate the relationship between CSFp and other factors, known and unknown, that may play a role in glaucoma risk. In addition, there has been progress in developing methods to measure CSFp noninvasively,” he explained.

Dr Allingham added that Dr John Berdahl is investigating the idea of using goggles to modulate the translaminar pressure gradient as a possible therapeutic intervention.

“We are also looking at the role of genetic contributions to the regulation of CSF dynamics that may suggest novel therapeutic targets,” Dr Allingham said.
Toric IOL’s transitional conic design enhances tolerance to misalignment

Device is pupil-independent making it ideal option for patients with large pupils

By Cheryl Guttman Krader; Reviewed by Dr José L Güell

A new aberration-free, transitional conic toric IOL (Precizon, Ophtec) with good rotational stability and tolerance to misalignment is providing excellent visual and refractive outcomes for patients with pre-existing regular corneal astigmatism undergoing cataract surgery in Europe.

“As little as 0.5 D of astigmatism can have a significant effect on the quality of vision after cataract surgery,” said Dr José L Güell. “Toric IOLs are an option for accurate correction of pre-existing astigmatism.”

The results depend in part on precise IOL alignment because there is a 3.3% loss of cylindrical power correction for every degree that the IOL is off-axis.

“Although newer techniques have improved the accuracy of intraoperative alignment to the intended meridian and newer toric IOLs demonstrate good rotational stability, it would also be advantageous if an IOL has a high tolerance of misalignment in case there is postoperative rotation,” explained Dr Güell, associate professor, ophthalmology, Autonoma University; director of Cornea and Refractive Surgery, Instituto Microcirugía Ocular (IMO), Barcelona, Spain.

“Because of its unique transitional conic toric surface, the Precizon IOL has a broader toric meridian that might be more tolerant to misalignment,” he added. “Clinical experience indicates that the refractive outcome is not significantly affected by minimal misalignment (< 5°).”

IOL’s design

The transitional conic toric IOL is a single-piece hydrophilic acrylic lens with C-loop haptics that measures 12.5 mm in overall length. It is available in a wide dioptric range and in cylinder powers of +1.00 to +10.00 D in 0.5 D increments.

It has a 6 mm biconvex optic with a 360° square edge. The toricity correction is on the anterior surface, which has neutral asphericity, and the posterior surface is spherical.

The hallmark of the IOL is its transitional conic surface that is designed to confer pupil independence and enhanced tolerance to misalignment. Evidence of success in achieving these goals is available from a bench study by Kim et al. that evaluated four toric IOLs [J Cataract Refract Surg. 2015;41(10):2274-2282].

“At 6 months after surgery, mean binocular distance UCVA had improved from 0.32 D preoperatively to 0.77 D.

“These investigators reported that the transitional conic implant and another aberration-free toric IOL provided better image quality across different pupil diameters and despite decentration compared with two negative aspheric models,” said Dr Güell. “Of the four IOLs, however, the transitional conic toric IOL also had the greatest tolerance to rotation-induced loss of contrast.

“The excellent pupil-independent behaviour of this IOL makes it an ideal choice for younger patients who tend to have larger pupils,” he added.

IN SHORT

A novel toric IOL features an aberration-free, transitional conic anterior optic surface shows pupil independence and improved tolerance to misalignment in bench testing and excellent clinical outcomes.
Tolerance to misalignment was also demonstrated in a clinical study reported by Dr Erik Mertens, director and ophthalmic surgeon, Antwerp Eye Centre, Belgium. Dr Mertens used intraoperative aberrometry to measure refraction in patients receiving the transitional toric IOL when the implant was properly aligned and when it was rotated off-axis by 5° and 10°.

**Personal experience**

Dr Güell evaluated the clinical performance of the transitional conic toric IOL for correcting regular corneal astigmatism > -0.75 D in a prospective, non-randomised case series of 165 eyes of 144 patients who underwent uncomplicated cataract surgery and were followed for a minimum of 6 months. Biometrical data for IOL power calculation were obtained using optical coherence biometry (IOLMaster 500, Carl Zeiss Meditec) and IOL power calculations were performed using Ophtec’s software.

Preoperatively, eyes were marked with a manual marker (Robomarker, Surgilum). In some cases, a computer-guided visualisation system was used to assist with intraoperative alignment of the toric IOL (TrueGuide, TrueVision 3D Surgical). In most patients, a blended micromonovision approach was used to improve both near and distance uncorrected visual acuity (UCVA).

Preoperatively, axial length averaged about 24 mm, but about one-fourth of eyes had an axial length > 25 mm and 4% were < 21 mm. Mean SE was -0.59 ± 3.84 D and mean refractive cylinder was -1.61 ± 1.38 D. Thirteen eyes had a history of LASIK, seven eyes had a phakic IOL, and three eyes had undergone penetrating keratoplasty.

There were no intraoperative complications, and Dr Güell highlighted the user-friendliness of the manufacturer’s disposable injector and cartridge system (DualTec Kit, Ophtec) and implantation.

“Loading the IOL into the cartridge is easy,” Dr Güell said. “The delivery can be done by pushing on the plunger with one hand or—in what is my favourite technique—with a twisting motion using two hands. Once released into the capsular bag, the IOL can be gently manipulated and rotated until reading its correct position.”

At 6 months after surgery, mean binocular distance UCVA had improved from 0.32 D preoperatively to 0.77 D. Distance UCVA was 20/40 or better in 89.4% of eyes, and mean binocular near UCVA improved from 0.41 D preoperatively to 0.66 D.

Mean binocular distance BCVA also improved significantly from 0.73 D preoperatively to 0.86 D. No eyes lost BCVA, almost 60% gained one or more lines, and 95% achieved 20/40 or better distance BCVA.

Both the overall refractive and cylinder results showed good accuracy. Attempted mean spherical equivalent (SE) was -0.46 D and was -0.57 D at 6 months. The SE results were stable over time with minimal change between 3 and 6 months.

Refractive cylinder was reduced from an average of -1.05 D at 3 months to -0.87 D at 6 months. The relatively high residual astigmatism in this series was accounted for by suture placement and removal in eyes that underwent phakic IOL explantation.

“The explantation procedure requires a 5 mm incision that needs to be sutured,” Dr Güell explained. “Until the suture is removed, there is a significant amount of induced astigmatism.”

Postoperatively, no IOL rotated more than 3°, but three (1.7%) IOLs required realignment due to intraoperative positioning error. In all three eyes, intraoperative alignment was guided by the preoperative manual markings.

“Perhaps routine use of the computer-guided surgical system will reduce alignment errors,” said Dr Güell. “As with other toric IOLs, there may be greater potential for rotation of the Precizon in longer eyes that have larger capsular bags. Implantation with an intracapsular tension ring may provide improved stability.”

Twelve (7%) eyes with a residual spherical defect underwent LASIK enhancement and were corrected to achieve the targeted micromonovision.

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This article was adapted from a presentation given by Dr Güell at the 2016 American Society of Cataract and Refractive Surgery meeting. He is a consultant to Ophtec.
It's Time to make a Move

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The availability of toric presbyopia-correcting IOLs has changed what refractive cataract surgeons can offer to patients with astigmatism, making preoperative patient education considerably easier.

Surgeons now have several toric presbyopia-correcting IOLs, each of which is quite different in design and function. Trulign (Bausch + Lomb) is a toric version of the Crystalens platform. Both the Tecnis Symfony Toric (Johnson & Johnson Vision/Abbott) and the AcrySof ReStor Multifocal (Alcon Laboratories) are toric versions of the single-piece IOLs of the same names. The ReStor toric is available as a + 2.5 D and a + 3.0 D-add multifocal IOL, while the Symfony is an extended-depth-of-focus (EDOF) lens which elongates the focal range from mid-near to distance.

**One-step correction**

Regardless of preference among these lenses, the big change is that surgeons can offer patients with significant astigmatism a much easier, one-step correction of presbyopia. In the past, if patients were interested in presbyopic correction I would offer a low-add multifocal with laser astigmatic keratotomy (AK) incisions to those who had < 1.75 D of astigmatism.

However, had I not been trying to give them near vision, I would have preferred the predictability of a toric IOL, as I do for most patients with ≥ 1 D of astigmatism.

Decision-making and patient counselling was trickiest for those with ≥ 1.75 D of astigmatism because it would mean the patient would have to be a good candidate for both the multifocal implant and for a corneal ablation, and be willing to accept a two-stage procedure.

Dry eye or thin corneas could rule out laser vision correction and leave us without an option for spectacle independence, or we could simply lose the patient because it all sounded complicated.

I no longer have to go through all these caveats. If the patient wants presbyopia correction and has ≥ 1 D of astigmatism, they will now typically get a toric EDOF lens. This allows me to focus on the patient’s visual goals of spectacle independence rather than the limitations of a particular technology for a patient with astigmatism.

**Presbyopic-correcting IOLs changing game for astigmatic patients**

New options change conversation but need for precision, careful planning
Careful still counts

While patient counselling has been simplified by the new IOLs, my approach to preoperative measurements and surgery really has not changed. If anything, new information about the impact of posterior corneal astigmatism means there are now extra steps (and extra stakes) in the determination of the best IOL power.

I rely on corneal topography to confirm the astigmatism is regular, verify the axis of astigmatism and then use that axis to evaluate the keratometry measurements from other devices. It is a good idea to get multiple measurements of the magnitude and axis of astigmatism.

I look for consistency among the measurements and agreement with the axis. I also rely on an anterior eye segment tomography system (Pentacam, Oculus) to incorporate data on the posterior cornea and its contribution to the overall magnitude and axis of astigmatism.

Surgical outcomes can offer patients with significant astigmatism a much easier, one-step correction of presbyopia.

Toric IOL calculations based on anterior corneal measurements can result in overcorrection in eyes that have with-the-rule astigmatism and undercorrection in eyes that have against-the-rule astigmatism, so it is important to choose a method for adjusting for posterior corneal astigmatism (PCA) power and orientation in one’s IOL calculations.

Reitblat and colleagues provide an overview of different methods for adjusting for PCA. They compared five methods, including anterior corneal astigmatism with optical low-coherence reflectometry (Lenstar, Haag-Streit), the Baylor nomogram, a combination of anterior keratometry with posterior tomography using vector analysis, and two different measures available on the anterior eye segment tomography system, the true net power and total corneal refractive power (Figure 1).

The authors found that using a PCA adjustment method resulted in a change in the toric IOL calculation in 62 to 81% of cases, depending on the method used, and reduced the residual refractive error in up to 62% of eyes. Although vector analysis performed the best, any of these methods is better than ignoring PCA.

I personally incorporate the true net power (Figure 2 on Page 20) into my calculations and then plug the resulting magnitude into the
One of the features about the Tecnis toric calculator is that it has the ability to change the prediction of toricity power based on effective lens position (ELP). Some calculators underestimate the toric power needed at the lens plane in long eyes.

Although I do not use intraoperative aberrometry in every case, I do find it helpful in very long or short axial length cases or eyes with inconsistent keratometry measures, and it is incredibly reliable at improving predictions in post-refractive eyes.

Surgically induced astigmatism (SIA) remains a concern in perfecting IOL power choices. Although my average SIA for a 2.4-mm incision is 0.3 D, the SIA in any individual case could be as high as 0.8 D or even 1 D. Corneal biomechanics are possibly responsible for these outliers, but it is nevertheless important to be aware that SIA can lead to a postoperative surprise, no matter how low one’s average.

Care must also be taken intraoperatively not to do anything that could compromise lens fixation, position, or stability. There are no toric presbyopia-correcting IOL options for the sulcus, so an inadvertent capsular bag tear can mean a major change of plans.

In summary, achieving good refractive outcomes with toric presbyopia-correcting IOLs requires meticulous preoperative measurements and careful surgical technique.

Although there are data to suggest toric EDOF lenses are tolerant of some residual sphere or cylinder, it is still best to aim for highly precise biometry and power calculation, given there continue to be some factors, such as individual wound healing response and ELP, that are beyond the surgeon’s control.

REFERENCES


While participating in an ORBIS Flying Eye Hospital programme in Trujillo, Peru, and operating on an elderly patient with a dense cataract under peribulbar anaesthesia, Dr James Lehmann encountered iris prolapse as soon as he made the paracentesis.

With 30 local ophthalmologists watching via closed circuit television in the front of the aeroplane, Dr Lehmann proceeded to go through his usual algorithm of strategies to relieve the underlying posterior pressure and keep the prolapsed iris inside the eye. These included decompression of the anterior chamber, sweeping the iris back into the eye and moving the phacoemulsification incision site.

After none of his options worked, he decided to place a pupil ring (Malyugin Ring, MicroSurgical Technology), thinking it would hold back the iris and allow him to proceed with phacoemulsification. As he was maneuvering the device into place, however, the anterior capsule split, creating an “Argentinean” flag in Northern Peru!

Dr Lehmann, who works in private practice in San Antonio, Texas, US, said his next thought was, “What else can go wrong?” Fortunately, the answer was “nothing,” and the case was successfully completed when he converted to small incision extracapsular cataract surgery.

After suturing the phaco incision, creating a scleral tunnel incision and performing a capsulotomy, he removed the iris retention device, prolapsed the nucleus into the anterior chamber and expressed it manually with a lens loop.

**Case resolved**

Fortunately, the anterior capsule tear had not extended to involve the posterior capsule. After repairing the damaged iris, Dr Lehmann implanted a one-piece polymethylmethacrylate (PMMA) lens in the sulcus. Almost an hour after he started, Dr Lehmann sutured the scleral tunnel incision closed and he learned weeks later that the patient achieved 20/40 BCVA.

“In retrospect, prolapse of the iris as soon as I made the paracentesis should have been a clue there was profound posterior pressure,” he said.

“Hindsight is 20/20, but better preoperative planning would have probably spared me some extra gray hairs.” — Dr James Lehmann

Suggestions for case management included pre-operative placement of a Honan balloon,
administration of intravenous mannitol and intraoperative limited vitrectomy through a pars plana incision.

Reviewing these options, Dr Lehman noted that a Honan balloon and intravenous mannitol were not available to him.

“Of course, hindsight is 20/20, but better preoperative planning would probably have spared me some extra gray hairs,” he said.

**Best option**

Dr Lehmann said performing a pars plana vitrectomy would have been the best solution, although he acknowledged he has a lower level of comfort performing that technique because it is something he seldom uses.

Had he needed to operate on the second eye of this patient, he said he would have used retrobulbar anaesthesia, placed a Honan balloon for 15 minutes preoperatively and been prepared to do a vitreous tap through a pars plana incision. In addition, he would have used iris hooks instead of a pupil expansion ring because placement of the hooks would involve less manipulation and could be done with greater ease and safety in the shallow anterior chamber.

Dr Lehmann said that when he is operating at his usual medical centre, Focal Point Vision in San Antonio, most cases of iris prolapse occur during hydrodissection of the nucleus.

His usual protocol for handling the event, which he used in his initial attempts to manage the case he reported, is to decompress the anterior chamber, sweep the iris back into the eye and place some dispersive viscoelastic at the base of the incision to keep the iris back.

If that does not work, he sutures the incision, creates a new entry site at a different location and places an iris retention device.
Retinal disease during pregnancy

Patient segment requires special care, surveillance of retinal disorders

By Lynda Charters;
Reviewed by Dr Mark W Johnson and Dr Julie M Rosenthal

Advancing pregnancy induces obvious physical changes for women over time. However, numerous not-so-obvious physiologic, hormonal and metabolic changes also occur during pregnancy for which ophthalmologists should make themselves aware.

Among these changes are increased serum cortisol, increases in blood pressure during the third trimester, raised blood volume, insulin resistance with worsening glycaemic control and hypercoagulability, according to Dr Mark W Johnson and Dr Julie M Rosenthal.

Considering these complications, pregnancy might induce certain retinal and choroidal diseases—such as hypertensive retinopathy and choroidopathy, exudative retinal detachment and retinal vascular occlusive diseases—as well as exacerbate other diseases.

**Induced retinal/choroidal diseases**

Hypertensive retinopathies and choroidopathies that might develop are the pregnancy-induced hypertension (PIH) syndromes of preeclampsia and eclampsia. The former includes hypertension, peripheral oedema and proteinuria, and the latter is defined as pre-eclampsia plus seizures.

Fundus findings associated with PIH syndromes for which ophthalmologists should be alerted include arteriolar constriction; retinal haemorrhages; cotton-wool spots; retinal oedema and lipid exudates; the presence of subretinal fluid (choriocapillaris infarction); and optic disc oedema and/or ischaemia.

In patients with HELLP syndrome, exudative retinal detachments can develop bilaterally along with yellow-white subretinal deposits and vitreous haemorrhages.

**IN SHORT**

- Pregnant patients require special care and surveillance when retinal diseases are present.

**IN VIEW**

Dr Mark W Johnson suggested physicians follow the American Academy of Ophthalmology Preferred Practice Patterns in managing patients with diabetes. The guidelines cite maximisation of glycaemic control before conception and examination during the first trimester with follow-up determined based on the severity of the retinopathy.

(Photo courtesy of Dr Mark W Johnson)
Dr Johnson, professor of ophthalmology and visual science, W.K. Kellogg Eye Center, University of Michigan, Ann Arbor, United States, recounted the case of a 41-year-old woman who presented with a 3-day history of blurred vision, back pain and hypertension late in the third trimester.

Her visual acuity levels were 20/100 and 20/400 in the right and left eyes, respectively. After the patient underwent a C-section, the visual acuity levels and the fundus findings returned to normal.

Exudative retinal detachment

In pregnant patients who develop an exudative retinal detachment, physicians should consider the presence of the HELLP syndrome (Haemolysis, Elevated Liver enzymes, Low Platelets), which is a life-threatening liver disorder.

“The HELLP syndrome occurs in up to 15% of women with pre-eclampsia and is associated with infant mortality in as high as 25% of cases,” added Dr Rosenthal, clinical instructor, ophthalmology and visual Sciences, Kellogg Eye Center.

In patients with HELLP syndrome, exudative retinal detachments can develop bilaterally along with yellow-white subretinal deposits and vitreous haemorrhages. The only treatment is immediate delivery of the infant after the pregnant woman is stabilised.

Other disorders in pregnancy with which exudative retinal detachments can be associated are disseminated intravascular coagulation and thrombotic thrombocytopenic purpura.

Retinal vascular occlusive disease

Postpartum Purtscher-like retinopathy, an arterial occlusive disorder that can occur within 24 hours after infants are delivered, is associated with a complicated pregnancy. The patients often experience severe bilateral visual loss. Amniotic fluid embolism can also cause retinal arterial occlusions, but, while rare, is usually fatal, Dr Rosenthal said.

Retinal venous occlusions associated with pregnancy usually occur in the third trimester or during the postpartum period.

Exacerbated retinal/choroidal diseases

Pregnancy might exacerbate retinal/choroidal diseases, such as idiopathic central serous chorioretinopathy (ICSC) and diabetic retinopathy, Dr Johnson noted.

Pregnancy is a known trigger of active episodes of ICSC, which are related to elevated serum cortisol levels. In this setting, there is up to a 90% incidence of subretinal fibrin deposition.

Patients with ICSC may be managed with observation alone if they are close to delivery and no fibrin is present close to the fovea, since ICSC is expected to resolve after delivery, he noted.

However, in cases in which fibrin is present near the fovea, optical coherence tomography (OCT)-guided laser photocoagulation can be applied. Fluorescein angiography and photodynamic therapy (PDT) should be avoided if possible.

Dr Johnson described the case of a physician, an obstetrician/gynecologist, who had progressive fibrin deposits late in the second trimester with a visual acuity of 20/60. By 5 months after treatment with OCT-guided thermal laser photocoagulation, her vision had recovered to 20/20.

Diabetic retinopathy

In patients with diabetic retinopathy, the rate at which retinopathy progresses doubles in pregnant patients compared with those who are not pregnant. Dr Johnson explained that after adjusting for haemoglobin A1C values, pregnancy itself is associated with retinopathy progression.
In the Diabetes in Early Pregnancy Study, the investigators found that in 55% of patients with moderate, non-proliferative diabetic retinopathy (NPDR) at baseline, there was two-step Early Treatment Diabetic Retinopathy progression and 29% progressed to PDR.

The Diabetes Control and Complications Trial also reported that retinopathy in type 1 diabetes progresses faster during pregnancy and further found that the long-term risk of progression of early retinopathy was not increased by pregnancy.

When managing patients with diabetes, Dr Johnson suggested physicians follow the American Academy of Ophthalmology Preferred Practice Patterns. They involve maximisation of glycaemic control before conception and examination during the first trimester with follow-up determined based on the severity of the retinopathy.

Patients with no retinopathy or with mild-to-moderate NPDR should be examined every 3 to 6 months, and those with severe NPDR or worse every 1 to 3 months. Surveillance should continue during the first year postpartum.

Patients who develop gestational diabetes do not require an eye examination during pregnancy. Drs Johnson and Rosenthal recommended that for patients with PDR, panretinal photocoagulation should be performed at diagnosis and anti-vascular endothelial growth factor (VEGF) therapy should be avoided.

Patients with mild diabetic macular oedema can be observed as the disease might resolve after delivery. If treatment is needed, focal laser or intravitreal triamcinolone can be considered, but anti-VEGF treatments should be avoided.

**General recommendations**

Drs Johnson and Rosenthal offered several pearls for pregnant patients with retinal diseases.

For intravitreal injection, triamcinolone is safe in this patient population. Although small case series have reported that anti-VEGF agents had no harmful effects on the foetus, no large studies have addressed this issue and there is no available foetal safety data that compared anti-VEGF agents.

Anti-VEGF agents should be administered to pregnant women only if absolutely necessary, and pregnancy testing should be performed in women of child-bearing age, the doctors recommended.

When considering angiography, fluorescein dye crosses the placenta and is present in breast milk for 72 hours. No reports have documented any adverse effects on the foetus.

Indocyanine green dye, however, does not cross the placenta and is used in pregnant women for non-ophthalmic indications. It is advisable that OCT or OCT-angiography be used instead of invasive angiography wherever possible.

Regarding surgery, such as vitrectomy procedures, elective surgeries should be avoided during pregnancy. In cases in which surgery is necessary, the obstetrical team should be involved, and local rather than general anesthesia is preferred. Lidocaine is considered safe for use during pregnancy, whereas bupivacaine and mepivacaine should be avoided.

No data are available regarding gestational exposure to PDT with verteporfin. Whenever possible, thermal laser should be used instead of PDT.

Drs Johnson and Rosenthal emphasised that retinal specialists must be armed with knowledge about the changes in pregnancy and the manner in which retinal diseases affect these patients.
Multimodal imaging approach useful in treatment of patients with uveitis

Selective imaging technologies can offer identifying data, motivation for patients

Ste

vene

By Steve Lenier; Reviewed by Dr Glenn J Jaffe

Successful imaging for the group of diseases known as uveitis depends on the specific underlying etiology. Tailoring the imaging approach using a variety of imaging methods, which are often complementary, can yield the maximum amount of information. This approach is useful not only for diagnosis and management of patients, but increasingly in clinical trials.

**Fluorescein angiography**
Fluorescein angiography (FA) is a frequently used modality in the diagnosis of uveitis.

To diagnose cystoid macular oedema (ME), the finding of an early course perifoveal hyperfluorescence, along with a late petalloid leakage and optic nerve hyperfluorescence, can identify an inflammatory etiology for the ME as opposed to a non-leaking form.

In the white dot syndromes, it can be useful to differentiate multiple evanescent white dot syndrome (MEWDS), birdshot, multifocal choroiditis and panuveitis.

Patients with Vogt-Koyanagi-Harada disease (VKH), scleritis and sympathetic ophthalmia have a characteristic appearance of punctate hyperfluorescence, which then pools in the subretinal space in the late angiographic phase and which corresponds to subretinal fluid.

In placoid syphilitic uveitis, there is a characteristic appearance of a yellowish grey macular lesion on colour fundus photography and on fluorescein angiography, an early hypofluorescent appearance that fills in partially in the later frames.

Acute multifocal placoid pigment epitheliopathy (AMPPE) and serpiginous choroiditis, in the acute disease phase, have the classic “blocks early, stains late” appearance, meaning the lesions are hypofluorescent early in the angiogram, and those lesions then stain in the late phase angiogram.

In the late stages of AMPPE and serpiginous uveitis, there is staining of the lesions and a hyperfluorescent rim can be seen around the lesion, which is from the intact choriocapillaris.

In retinitis, it may be hard to distinguish an insult to the retina, which turns white from a vascular occlusion. The finding of the “block-early, stain-late” appearance is helpful to identify retinitis. In contrast, in an eye with ischaemic damage, there may be mild hypofluorescence, or no abnormality, without late hyperfluorescence.

OCT can be an excellent motivational tool in the clinic and in clinical trials, as patients like to see their images from one exam to the next.

Fluorescein angiography is also useful for identifying peripheral perfusion abnormalities and vasculitis.

Ultra-wide field imaging provides a look further into the periphery to see the peripheral neovascularisation.

**ICG angiography**
Indocyanine green (ICG) angiography is useful to identify the lesions in some of the white dot syndromes; the lesions are characteristically hypofluorescent. Often the hypofluorescence is more extensive than what is seen on clinical exams. MEWDS, birdshot, sarcoid, multifocal

**IN SHORT**

› To evaluate patients with uveitis, a tailored multimodal imaging approach can be very helpful both in the clinic and in clinical trials. With selective imaging, you can integrate and correlate the data from different images for a more conclusive diagnosis.
choroiditis, AMPPE and serpiginous will all present with hypofluorescent lesions on ICG.

The appearance of VKH on ICG is different and diagnostically useful. A choriocapillaritis is seen, and so there is hyperfluorescence acutely with leakage, and then later on, so clinicians can see diffuse hyperfluorescence, which then resolves after treatment.

**Fundus photography**

It is often useful to obtain fundus photographs in eyes with uveitis to compare images from one exam to the next, rather than to rely on clinical notes or drawings. The macula can be viewed using a standard modified three-field imaging approach.

One can view more peripheral areas with seven-field, imaging pattern, but with ultra-wide field imaging, a view much further into the periphery can be obtained. If an ultra-wide field camera is not available, as a substitute, a standard camera can be used to obtain a nine-field pattern with 50° area images for each field.

**Ultrasonography**

Ultrasonography can be used to identify macular thickening and choroidal thickening, particularly when the media is opaque. In addition, it can used to help plan surgery, for example, to identify vitreous haemorrhage and retinal detachment in eyes with opaque ocular media.

One problem with all of the modalities is that there is no cross-sectional information except with ultrasound, which is a relatively low-resolution technique, and it may be difficult to quantify lesions. This problem can be overcome with the use of optical coherence tomography (OCT).

**Optical coherence tomography**

OCT can provide cross-sectional, topographic images and quantitative data. There are
There are also disadvantages to using OCT in eyes with uveitis. Images are often degraded because many of these patients have hazy media; the quality of the image depends on the technician or several advantages to this imaging modality. With OCT, it is possible to correlate foveal oedema, atrophy and/or vitreoretinal interface abnormalities with changes in visual acuity. Choroidal thickness can be assessed, cross-sectional morphologic data can be obtained, and, with OCT angiography (OCT-A), macular perfusion can be identified.

OCT also can be an excellent motivational tool in the clinic and in clinical trials, as patients like to see their images from one exam to the next, which motivates them to keep coming back to the clinic for evaluation.

There are also disadvantages to using OCT in eyes with uveitis. Images are often degraded because many of these patients have hazy media; the quality of the image depends on the technician or

(FIGURE 7) OCT angiography shows blood flow by obtaining sequential images at identical locations. (Courtesy of Kester Nahen)

(FIGURE 8) Example of Type-2 CNV imaged by FA, ICG, structural OCT and OCT-A. With OCT-A, the depth of the CNV lesion can be determined. (Images courtesy of Kester Nahen and Giovanni Staurenghi)
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OCT-A is also useful to identify Type-2 choroidal neovascularisation (CNV) typically found in patients with uveitis, and in which the CNV lesion is on top of the RPE. The indications are evolving to evaluate eyes with uveitis with OCT-A. The retinal vessels and choriocapillaris can be seen and it may be helpful in the white dot syndromes to evaluate vascular abnormalities.

OCT can be used to look for ME, subretinal fluid and vitreoretinal interface changes, such as epiretinal membrane and vitreomacular traction. It can be useful to view the retinal microstructure, to evaluate hyperreflective foci, choroidal neovascularisation and choroidal thickness. Anterior chamber cells can be quantified and the retinal and choroidal vasculature can be seen.

With OCT angiography, blood flow can be seen. Sequential images are obtained at the same point in time and a hyper-reflective flow signal is obtained. Specific layers can be identified, moving into the choroid, which can then be correlated with FA. With fluorescein the different layers cannot be differentiated, though the superficial and the deeper vascular plexus can be seen with OCT-A.

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This article was adapted from a presentation at the Uveitis Subspecialty Day before the 2016 American Academy of Ophthalmology meeting. Dr Jaffe consults for Johnson & Johnson Vision/IAMO, Alcon Laboratories, Heidelberg Engineering and Maunotech.
New biomarker may predict treatment response in DME

DRIL may predict visual acuity outcomes in patients with anti-VEGF therapy

By Steve Lenier; Reviewed by Dr Jennifer K Sun, MPH

In many patients, eyes treated with an anti-VEGF agent for diabetic macular oedema (DME) resolve the oedema and improve their vision. However, there are eyes in which the oedema resolves over the course of anti-VEGF therapy but the vision remains the same or even worsens and there are eyes that have persistent or even worsening oedema, with excellent visual acuity outcomes.

There is an inexact correlation between central subfield thickness and visual acuity, so researchers are looking into using biomarkers of vision, which might improve methods for evaluating potential new therapies.

Many parameters evaluated to this point (such as presence or absence of epiretinal membranes, presence and extent of intraretinal cysts, hyper-reflective foci, presence of microaneurysms, extent of subretinal fluid and measures of outer layer disruption, reflectivity or thickness) have not been shown to be strongly correlated with or predictive of vision.

Disorganisation of the retinal inner layers

Dr Jennifer K Sun, MPH and colleagues at the Joslin Diabetes Center, Boston, US, have identified a new biomarker called disorganisation of the retinal inner layers (DRIL). The researchers looked for DRIL within the central 1-mm foveal zone.

In eyes with no DRIL, researchers were able to segment the inner retinal layer boundaries, but in eyes with DRIL they were unable to segment these layers.

They found DRIL could be evaluated not just within the entire extent of the 1-mm zone, but also in terms of portions of the 1-mm zone being affected. DRIL can be present or absent in eyes with resolved as well as current DME.

Eyes with oedema that do not have disruption of the boundaries of the inner retinal layers often have good vision, even despite the presence of large intraretinal cysts. However, eyes with DRIL in either resolved or current oedema often have poor vision.

Researchers initially identified the DRIL parameter in an early cross-sectional study that looked at a number of parameters seen on spectral-domain optical coherence tomography (SD-OCT) in eyes with DME (80 eyes in 58 patients).

There is an inexact correlation between central subfield thickness and visual acuity, so researchers are looking into using biomarkers of vision.

In the study, the patients were split into groups of those with the expected relationships between retinal thickness and visual acuity and those with paradoxical, or unexpected, relationships between thickness and visual acuity.

“Both in the entire cohort when we looked and in an analysis evaluating just the groups of eyes with current oedema and good vision, versus those with resolved oedema, but unfortunately poor vision, we found that DRIL of all the SD-OCT parameters was the most robustly associated with visual acuity outcomes,” Dr Sun explained, “where the presence of DRIL affecting 50% or more of the retinal inner layers was associated with poor vision.”

IN SHORT

Researchers have identified a new biomarker they believe can be used as a predictor of vision change in patients with diabetic macular oedema, either during the natural history of the disease or after undergoing anti-VEGF therapy. The biomarker is disorganisation of the retinal inner layers (DRIL).
the central 1-mm zone was more likely to be seen in eyes with worse vision.”

The researchers then looked at longitudinal studies, examining DRIL and other SD-OCT parameters in terms of early change within 4 months. They looked to see how these correlated with visual acuity outcomes at 8 months.

They found even when adjusting for central retinal thickness and outer layer characteristics, DRIL was still the most robust SD-OCT parameter associated with visual acuity change over time. Early, 4-month change in DRIL was predictive of visual acuity outcomes at the 8-month time period.

Though DRIL can worsen and persist, it can also resolve and reverse. In the researchers’ study, 66% of eyes with baseline DRIL had DRIL improvement in the 8-month study. When DRIL decreased by 50 μm or more at 4 months, visual acuity was stable or increased in 97% of eyes.

In eyes where DRIL decreased by a larger threshold of 250 μm over 4 months, none had vision decline of a line or more, but 78% percent visual acuity increase of a line or more at 8 months.

“These data suggest that perhaps over time we might be successful in finding thresholds of DRIL that are highly correlated with percent chances of visual acuity gain or worsening over the long term,” Dr Sun said.

Though DRIL can worsen and persist, it can also resolve and reverse. In the researchers’ study, 66% of eyes with baseline DRIL had DRIL improvement.

The researchers went on to look at other aspects of visual function–retinal sensitivity as measured by microperimetry in the LUCIDATE study, which randomised 33 participants to ranibizumab or macular laser for treatment of DME.

They looked at the entire panel of SD-OCT parameters and again found that DRIL was highly correlated with improvements in central microperimetry over 0-12 and 0-24 weeks. In contrast, other SD-OCT measures, including central retinal thickness, were not correlated with microperimetry outcomes at any one of the time points in this 48-week study.

“DRIL change within the central foveal zone is a stronger predictive biomarker for both visual acuity and retinal sensitivity, than either retinal thickness, or outer layer changes,” Dr Sun said.

“Thresholds of early DRIL change may prove in the future to be useful for predicting functional improvement, or worsening, for an individual eye.”

For now, evaluation of DRIL and other SD-OCT variables is primarily a research tool in eyes with DME. There are studies ongoing to attempt to validate DRIL and these other parameters as predictors of vision.

WANT TO SUBMIT AN ARTICLE TO OPHTHALMOLOGY TIMES EUROPE?

The emphasis of every article should be practical and current. Articles describing techniques should include enough information so that readers can make independent judgments about how applicable the approach is for them. Articles usually contain 1,000 to 2,500 words, plus photos, graphs, charts, tables, diagrams or other appropriate graphics.

The typical time between an initial enquiry and a published magazine article is 1 to 3 months.

Articles must be original work that has not been published elsewhere. Articles are considered for publication with the understanding that they are not simultaneously under consideration for publication elsewhere.

Contact Caroline Richards, Editor, with questions at caroline.richards@ubm.com
New technology has been paired with the time-tested technique of direct ophthalmoscopy to create a portable, retinal imaging system (D-Eye, D-Eye S.r.l.) that utilises a small optical device magnetically attached to a smartphone.

High quality colour digital images and videos of the retina can be recorded, retained and shared conveniently and inexpensively, said Dr Andrea Russo, who developed the device. Dr Russo is an ophthalmologist in private practice and a PhD candidate researcher at the University of Brescia, Italy.

The imaging system taps into physicians’ widespread adoption of smartphones to produce a portable fundus camera to offer an alternative to conventional retinal imaging systems, according to Dr Russo, who also founded the company with offices in Padova, Italy, and Pasadena, California, United States.

The system’s external lens redirects the camera’s light to eliminate corneal glare, which can affect the quality of images obtained with a standard ophthalmoscope. The magnetic bumper aligns the device’s lens with the camera and the phone’s LED light source to record an examination.

When positioned 1 cm from the pupil to take direct images of the posterior pole, the field of view is slightly larger than that of an ophthalmoscope: 5 to 8º with a single undilated pupil image and 20º or greater with a single dilated pupil image.

The device also takes advantage of smartphones’ autofocus capabilities to compensate from -10 to +5 D and produce clear images. The device can obtain views of the optic disc with pupils as small as 2 mm.

By using a phone’s video function to expand the field of view, an acquisition protocol can be taken starting at the posterior pole and moving to the upper, nasal, inferior and temporal peripheral retina to the equator.

Recorded images and videos can be saved to the company’s HIPAA-compliant, cloud-based patient record system with a subscription service available in the United States.

Multiple applications
Applications for the imaging system include routine eye examinations and retinal screenings; optic nerve head examinations conducted without...
Ophthalmology Times Europe

retina

dilation for detecting glaucoma and other nerve-related pathologies; screening for and grading of later-stage diabetic retinopathy and age-related macular degeneration (with dilation); detection of neurological disorders, haemorrhages, arteriolar constriction and blood vessel abnormalities; and screening of other conditions.

Due to its portability, the system can be used during hospital rounds, emergency department evaluations, out-of-office visits and home eye testing. It could be convenient for conducting examinations in infants and young children, said Dr Russo, pointing out that while these young patients are attracted—or distracted—by the phone’s light, the clinician can proceed with the examination.

Being that young children are familiar with mobile phones in their environment, they may be more at ease than if examined with another type of device, he said.

Patients undergoing screening with the portable system may be more comfortable than when screened with an ophthalmoscope, Dr Russo suggested.

“With this system, you can just relax and put your hand toward the patient,” he added. “You don’t need to lean your face very close.”

Beneficial for medical students

The portable imaging system may also be an advantage for medical students, most of whom have smartphones and are adept at using them, since they can study ocular anatomy and eye diseases without access to conventional imaging devices located only in hospitals or large clinics, Dr Russo said.

“We don’t want to replace the standard, high-end cameras found in hospitals,” Dr Russo said. “Those are the gold standard. This is something in between that puts a bridge between the screening population and the hospital.”

Based on the initial images from the device, clinicians may recommend patients undergo additional screening with the sophisticated technology.

Although the external device lens has been available for several smartphone makes and models, the company is focusing on iPhones because of the quality of the camera and the ability to control the focus and compensate for refractive error, Dr Russo said.

The device lens and downloadable app work with the iPhone 5, 5s, 6, 6s, 6Plus, 6sPlus and 7.

Clinical trials

The company continues to conduct clinical trials to compare the performance of the smartphone ophthalmoscope with more traditional screening and diagnostic technologies. The various studies, either ongoing or completed, include evaluating the use of the imaging system for ocular fundus photography in hypertensive emergencies and comparing it with slit lamp biomicroscopy for grading vertical cup-to-disc ratio. In the latter application, a recently published study found smartphone ophthalmoscopy showed substantial agreement with slit-lamp ophthalmoscopy in a prospective comparative instrument study carried out in 110 patients with ocular hypertension or primary open-angle glaucoma (J Glaucoma. 2016 Sep;25(9):e777-81.)

In another published study, considerable agreement was shown between smartphone ophthalmoscopy and slit-lamp retinal biomicroscopy for grading of diabetic retinopathy (Am J Ophthalmol. 2015;159: 360–364.)

The device received FDA Class II 510 (K) exempt listing in December 2014 and is a registered CE Class I device.

A. The imaging device redirects the camera light to eliminate corneal glare which affects the quality of the images. The magnetic bumper aligns the lens with the camera and the phone’s LED light source to record an eye examination. B. The lens device simply covers the camera aperture.

(Images courtesy of D-Eye S.r.l)

DR ANDREA RUSSO, MD
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Dr Russo is founder and medical advisor of D-Eye.
DALK ruptures repairable if surgeons adhere to five rules

While there is steep learning curve to procedure, these cases are not difficult

By Fred Gebhart, Reviewed by Dr Enrica Sarnicola

Worried about rupture during a deep anterior lamellar keratoplasty (DALK)? You may be overreacting. While rupture is the most common complication of DALK, its repair is not as difficult as commonly thought.

A retrospective study of more than 1,000 eyes with descemet membrane (DM) ruptures during DALK found 91 ruptures. All of the ruptures were successfully repaired and there were no conversions to penetrating keratoplasty (PK).

“There is a very difficult and steep learning curve when a surgeon begins to perform DALK,” explained Dr Enrica Sarnicola, international fellow in cornea, Cincinnati Eye Institute, Cincinnati, Ohio, United States, from the Università degli Studi di Siena, Italy. “In the very beginning, it is nice to know that conversion to PK can be used as a safety net. But as soon as a surgeon becomes comfortable with DALK, he should start repairing ruptures.

“Saving the host endothelium is the key to avoid endothelial rejection, provide a good and stable endothelial cell count and allow for a long-term graft survival,” she added. “Ruptures happen to even the most experienced surgeons and we have seen very consistently that when they happen, repair should be the first choice.”

DALK study

Dr Sarnicola discussed the results from a retrospective study of DALK, conducted by DALK surgeon Dr Vincenzo Sarnicola, Clinica degli Occhi Sarnicola, Grosseto, Italy, on 1,084 eyes of 908 patients.

Not only were all of the DM ruptures repaired, but the rupture rate was quite low, 8.4%. DM rupture rates reported in the recent literature range from 4 to 39% and PK conversion from 0 to 60%. Surgeon experience appears to be the best predictor of rupture risk and conversion into PK.

Most ruptures are small micro perforations, tears in the DM that occur when the surgeon goes just a little too deep during a manual dissection. Macro perforations, ruptures larger than 2 mm, occur during the removal of residual peripheral stroma in big bubble cases.

Of the 1,084 DALK procedures in the study, 889 were descemetic DALK (dDALK) procedures and 195 were manual DALK. There were 91 DM ruptures (8.4%) in the entire study population, of which 62 (7%) were in dDALK and 29 (15%) in manual DALK.

Most of the ruptures (79%) were micro perforations and 21% were macro perforations. Micro ruptures were more common in both dDALK and manual DALK procedures (76% and 86%, respectively) compared with macro ruptures. Of the macro ruptures, 24% occurred in dDALK and 14% in manual DALK.

Ruptures in manual DALK

Manual DALK is prone to rupture, with 15% of the manual procedures resulting in rupture compared with 7% of dDALK procedures. The majority of the ruptures, 87 (96.6%), were peripheral.

Of the peripheral ruptures, 39 (44.8%) were lateral, 32 (36.8%) were superior and 16 (18.4%) were inferior. Only four (4.4%) ruptures were central or paracentral—all of them in the manual DALK group.

Whatever the site and size of the rupture, five general rules can help assure successful repair. Always complete the stromectomy before beginning repair, Dr Sarnicola said. Completing the stromectomy avoids the formation of any stromal steps between donor and recipient tissue.

IN SHORT

» A retrospective study of deep anterior lamellar keratoplasty (DALK) on over a thousand eyes showed 100% repair rates, with low rupture rate. Surgeon experience appears to be the best predictor of rupture risk and conversion into PK.
These steps can prevent good host-donor attachment and can keep the rupture open.

Rather than immediately injecting air into the anterior chamber, first suture the donor graft in place. Once the donor tissue is firmly placed, then inject air into the anterior chamber.

The next step is to move the eye to remove interface fluids that may have collected. The most important step is proper head positioning for the patient.

The air bubble must be left in the anterior chamber for several hours after surgery so that the rupture is sealed. Patients with a lateral rupture should be on their sides. Patients with a superior rupture should be lying back with the head straight back and the chin hyperextended.

Patients with an inferior rupture should be lying the back with the head straight back and the chin hyperextended.

The main concern in repairing ruptures is convincing patients to keep their head in the correct position—even if it does not feel comfortable.

Dr Sarnicola advised a patient discussion about the possibility of rupture before surgery and explain that it can be repaired. If it happens, the patient will not be surprised. The surgeon then has another opportunity to discuss the importance of proper head positioning.

“Rupture during DALK is the most common complication,” Dr Sarnicola said. “Residents and fellows and newer DALK surgeons will have more ruptures, but it happens to even the most experienced surgeon. We should always at least try to fix the rupture, keeping in mind the repairing rules and the advantages of preserved a self-endothelium.”

A preoperative (left) and postoperative photo (right) of a DALK case. The case of keratoglobus became complicated with a descemet membrane (DM) rupture and was then repaired. These cases can be successful with proper management. (Photos courtesy of Dr Enrica Sarnicola)
Eye-to-Eye
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Severe complications occur very rarely after corneal crosslinking (CXL) for progressive keratoconus, but surgeons should recognise the cornea is most vulnerable during the re-epithelialisation period, said Dr Theo Seiler, PhD, professor of ophthalmology, University of Zurich, and chairman, IROC Zurich, Zurich, Switzerland.

“In a PubMed search for articles about complications of crosslinking, more than 150 citations were found,” he added. “Most of the reports are anecdotal case series. Fortunately, the rate of severe complications is less than 1%, but management may require keratoplasty.”

Dr Seiler and colleagues analysed their complication rates in a prospective study that included 117 eyes, of which approximately 90% had follow-up to 12 months [J Cataract Refract Surg. 2009;35:1358-1362]. They found the incidence of delayed epithelial healing was 1.9%.

To accelerate healing and prevent related complications, Dr Seiler’s surgical protocol includes ofloxacin 0.3% ointment instilled onto the ocular surface at the end of the procedure followed by a bandage contact lens application.

“This technique enables epithelial healing in an environment that is antimicrobial and non-toxic when ofloxacin is used,” Dr Seiler said.

Amniotic membrane may also facilitate healing by providing a scaffold for epithelial regrowth.

Sterile infiltrates are the most common complication after CXL. The incidence in Dr Seiler’s study was 7.6%. They are well tolerated if developed in the periphery and may respond to topical corticosteroids, but in some cases they present an indication for keratoplasty.

Rare events
Central stromal scars have also been recorded in 2.8% of Dr Seiler’s series. A clue to their presence is absence of complaints about blur and glare at the 1 month follow-up visit, he said.

Patients with an uncomplicated postprocedural course typically report these symptoms and are associated with resolving anterior stromal haze.

The good news, Dr Seiler said, is that eyes with stromal scars had a strong flattening effect and improvement in uncorrected distance visual acuity.

Although not disappearing entirely, scars faded during continued follow-up with a corresponding regression of the corneal flattening.

Other rare events include late onset scars that mimic post-LASIK toxic diffuse lamellar keratitis in appearance. These scars fade with time.

Rare complications that have been reported in the literature include corneal melt, herpes keratitis reactivation and endothelial decompensation. Reactivation of herpes can be avoided by obtaining a good history and initiating systemic antiviral therapy as appropriate for prophylaxis.

Cases of endothelial decompensation occurred in patients who were not appropriate candidates for CXL because the cornea was too thin (<400 μm), Dr Seiler said.

IN SHORT

Severe complications are rare (<1%) after corneal crosslinking for progressive keratoconus. Some are preventable, some are manageable, but some may lead to a need for corneal transplantation.
Adalimumab promising in treating JIA-associated uveitis, study finds

Use of laser flare photometry can help clinicians assess treatment outcomes earlier

By Michelle Dalton, ELS

Adalimumab can be an effective treatment in children with juvenile idiopathic arthritis (JIA)-associated uveitis.

JIA-associated uveitis “is one of the most challenging inflammatory conditions in the paediatric population,” reported Dr Bahram Bodaghi, PhD, as there is little evidence-based data on therapeutic options, and glaucoma and cataract are the predominant complications (due to steroid treatment).

“There is an inconstant efficacy of methotrexate,” said Dr Bodaghi, professor of ophthalmology, University of Pierre and Marie Curie, Paris. “We had promising results with the adalimumab and the infliximab in a case series and in our open-label trials when the study was designed in 2009."

An earlier study found a relationship between laser flare values and complications of uveitis, with more than half of the patients reporting some complication during the follow-up period.

“In a paediatric population, using the Standardisation of Uveitis Nomenclature (SUN) criteria has not yet been validated,” Dr Bodaghi said. This led to a multicenter, randomised, investigator-initiated, placebo-controlled phase III trial comparing adalimumab with placebo at 16 sites in France, which enrolled 31 children.

ADJUVITE study details

The primary endpoint was the efficacy of adalimumab versus placebo at 2 months, based on laser flare values.

There was flare reduction of 30% (evaluated by laser flare photometry [LFP]) compared with baseline and no worsening of flare and cells at slit-lamp, Dr Bodaghi said. Further, efficacy was shown through tapering from months 2 until 12.

Researchers analysed the transcriptomics on the blood of the enrolled children. Primary inclusion criteria included active uveitis associated with JIA, which could include polyarticular, LFP values > 30 photons perms for a normal below 7; resistance or intolerance to topical corticosteroids; resistance to systemic methotrexate used for at least 3 months; possible evaluation of anterior chamber flare by LFP; and 4-year-olds weighing at least 15 kg.

Primary exclusion factors included any previous treatment with anti-tumour necrosis factor (TNF); contraindication to systemic immunosuppressants or biologics; and some ocular contraindications—such as chronic blood-ocular barrier rupture, impossible monitoring of flare by laser flare, uncontrolled glaucoma or any major ocular complications.

‘Adalimumab was effective and safe in reducing ocular inflammation within 2 months and well tolerated over 12 months’

— Dr Bodaghi

The researchers considered responders those who showed a 30% reduction of flare values at month 2, with no worsening of inflammation based on the SUN criteria, Dr Bodaghi said.

The study itself had two phases. During the initial 2 months, the patients were randomised to either placebo (n = 15) or adalimumab (n = 16) and then all patients received adalimumab 40 mg every 2 weeks for 1 year. The second phase was open-label.

IN SHORT

➢ JIA-associated uveitis is a challenging inflammatory condition in the paediatric population. Adalimumab was found to be effective and safe in reducing ocular inflammation within 2 months and well tolerated over 12 months in JIA-associated uveitis.
Almost all the patients were female, (n = 15 in the adalimumab group, n = 13 in the placebo group), and both groups averaged about the same age (10 years), with each group having a duration of uveitis of about 4 years.

“The mean laser flare values were about 99 in the adalimumab group and 70 in the placebo group,” Dr Bodaghi said. “The disease was bilateral in 63% of the adalimumab group and 93% in placebo group.”

There were seven patients on oral steroids in the adalimumab group, compared with three patients in the placebo group.

**Intent-to-treat analysis**

The intent-to-treat analysis showed significant results in the adalimumab group compared with placebo group, with nine out of 16 responders at 2 months compared with three out of 15 in the placebo group.

“When there was a failure, the baseline flare values were very low, < 30 photons per ms,” Dr Bodaghi said.

Although there were six serious adverse events in five patients, none were related to the study treatment. “Overall, we found adalimumab was effective and safe in reducing ocular inflammation within 2 months and well tolerated over 12 months in patients with JIA-associated chronic uveitis and inadequate response to topical steroids and methotrexate,” Dr Bodaghi said.

**Results similar in UK**

Results were similar to trial outcomes in the United Kingdom, “but separation was obtained earlier due to the use of LFP, which is a valuable tool to assess earlier improvement,” he added.

Dr Bodaghi explained the group used the highest dosage possible before performing LFP to determine if the patient was still active.

“Below 30 photons per ms, it was very difficult to see the difference,” Dr Bodaghi said. “We don’t know which patients might be methotrexate-resistant, as they were responding but did not have a complete response. In my opinion, every one of these children needed to go to biologics.”

Similarly, in some children with very active and severe ocular inflammation, the flare is “quite high” and even the use of aggressive corticosteroids will not decrease flare.

“It’s a chronic blood-ocular barrier that already has more damage than can be repaired,” Dr Bodaghi said.

In France, methotrexate is still considered the primary first-line treatment, but the approval and use of adalimumab and anti-TNF agents alters the disease parameters, Dr Bodaghi pointed out.

Patients are developing cataracts later in the course of the disease, but inflammation is better controlled. Time will tell if biologics will become embraced as readily as the first-line option.

**DR BAHRAM BODAGHI, MD, PHD**

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This article was adapted from a presentation Dr Bodaghi delivered at the 2016 American Academy of Ophthalmology meeting. Dr Bodaghi is a consultant to AbbVie, Allergan, Bayer Healthcare, Novartis, Santen Pharmaceutical and TiCell.
Rayner marks 10 years of monofocal IOLs in the USA

Rayner has announced its plans to mark the 10-year anniversary of the FDA approval of its monofocal IOL (C-flex 570C).

Dr James A Davison at the Wolfe Clinic, Marshalltown, Iowa, United States, implanted the first US patient with a C-flex IOL on 24th October 2003, as part of an international, multi-site clinical study.

“It was a great privilege to be part of the study for the Rayner foldable acrylic IOL and I join in celebrating its 10-year anniversary,” Dr Davison said. “This lens has a unique and extremely stable three-dimensional haptic structure and beautifully clear optic. It is easy to implant and centres very predictably. I really enjoy seeing it in my patients today.”

The monofocal IOL has closed C-loop haptics and is implantable through a 2.2 mm incision. Research shows that anti-vaulting haptic technology provides refractive outcomes and stable centration, and, because the IOL is manufactured from Rayacryl, the material used is free from vacuoles and glistenings, and has been seen to provide uveal biocompatibility and low inflammatory responses, according to the company.

Another lens feature is the Amon-Apple square edge, which is thought to create an optimum barrier to reduce epithelial cell migration, but shows no general increase in glare from previous models. The overall lens design has been seen to reduce dysphotopsia, said the company in a prepared statement.

For more information, go to www.rayner.com

Optovue unveils high-density OCT angiography for ophthalmology

Optovue has released a high-density OCT angiography (OCTA) imager that it says provides improved resolution and peripheral visualisation of vasculature in the eye.

Optovue states its technology (AngioVueHD Imaging) provides OCTA scans with 73% more sampling points and improves image resolution by around 33% over existing field-of-view, enabling physicians to more closely assess the fine vasculature in the eye for changes that could indicate ocular disease.

“The improved density of [the product] provides the high-resolution resembling that of 3x3 mm scans—the size we previously used to obtain the highest image quality—yet in a larger, 6x6 mm format,” said Dr Nadia Waheed, MPH, associate professor of ophthalmology at Tufts Medical School and director of the Boston Image Reading Center. “As a result, we have much greater image resolution for the 6x6 mm field-of-view, allowing for better assessment of pathologies characterised by large or oblique lesions.”

One of the major challenges of OCTA imaging is the limited region of the eye that can be visualised for assessing fine microvasculature. Currently, the standard field-of-view for the best image quality measures 3x3 mm, according to the company.

The feedback from early clinical evaluators of the technology enhancements suggests the new 6x6 mm OCTA scan enables the improved likelihood of detecting abnormalities and assessing fine microvasculature details that would typically extend beyond the central 3x3 mm region, said the company.

For more information, go to www.optovue.com
Alcon launches two vitreoretinal surgical probes at 2017 FLOREtina

Alcon Laboratories introduced two surgical vitreoretinal products during the recent, second edition of the FLOREtina Retina Meeting.

One probe (Advanced Ultravit Beveled High Speed Probe) is designed to offer surgical versatility, bevel tip precision and added control in micro-incision vitrectomy surgery, while the second (Vektor Articulating Illuminated Laser Probe) aims to expand the possibilities for reaching and treating the anterior periphery of the retina.

These new technologies are designed to help surgeons deliver a higher level of precision and efficiency during vitreoretinal surgery, especially as both will be available in all small gauges of 23 Ga, 25+ Ga and 27+ Ga.

Alcon’s educational program is centred on the future of three-dimensional visualisation in ophthalmology, with live surgeries and symposium featuring its visualisation platform (NGENUITY).

For more information, go to www.uk.alcon.com

Ophtec bv receives CE Mark for aspheric presbyopia-correcting IOL

Ophtec bv announced it received a CE Mark for a new aspheric presbyopia correcting IOL (Precizon Presbyopic) with an innovative patent pending, continuous transitional Focus (CTF) optical design.

The firm’s CTF optic seems to offer a safer surgical approach than traditional multifocal technologies available on the market, and addresses the fact that nature is not an optical bench and IOL seating is important for good performance, according to the company.

The technology offers a full range of vision and, due to the CTF’s transitional zones, a smooth, continuous transition from near vision to infinity is achieved.

The product appears to be able to forgive larger degrees of lens tilt and decentration. This misalignment tolerance reduces photic phenomena, thereby helping patients to adapt more naturally to their new vision. The CTF optic is also designed to be less dependent on pupil size under all lighting conditions, said the company.

Precizon Presbyopic will be commercially launched in October 2017 during the European Society of Cataract and Refractive Surgeons in Lisbon, Portugal. The product will initially be available in the European Union and a few selected markets.

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