

Cataract surgery

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R P Wormald, A Foster

The times they are a changing

Are our cataract surgical outcomes as good as they can get? If the answer is that there is still room for improvement, then how?

The outcome of cataract surgery is determined by the patient, the technique, and the surgeon: the patient where there is coexisting morbidity; modern techniques (most notably the implantation of an intraocular lens and probably small incision methods) have transformed the quality of visual rehabilitation; and—dare we say—the “better” the surgeon the “better” the results. There is often little we can do to influence comorbidity. As for technique, we have countless papers, posters, presentations, and videos promoting new techniques claiming excellent results (but rarely of sufficient study design quality to justify the claims). But what of the surgeon? Can the surgeon improve and if so how?

Habib *et al's* paper in this issue of *BJO* (p 643) describes the association between higher volume and lower complication rates which has been noted in other spheres of surgery but not so far in ophthalmology. The message is—the more you do, the fewer the complications. This is just an association, and one cannot tell from this kind of study which way the cause and effect works. It could be that “better” surgeons do more surgery because they have fewer complications or is it, as the old adage states, “practice makes perfect” and that doing more makes you better?

If, as seems plausible, practice does make perfect and increasing one's surgical experience improves results, then what is the optimum number of cataract surgeries per week? Habib *et al* suggest that the complication rate is lower in those who perform more than 400 operations per year (8–10 per week) than in those who perform fewer. Given there are not a limitless number of cataracts to be extracted each year, what is the optimum number of cataract surgeons for the population operating at an optimum rate? We know that in the Americas and western Europe there are too many ophthalmologists for most of them to perform regular cataract surgery. So are more cataract surgeons actually required in the United Kingdom to reduce time on the waiting lists?

The cataract surgical rate (CSR, cataract operations per million population per year) in the United Kingdom is probably between 4000 and 4500. This is about 100 operations per working week per million population. If a rate of 8–10 cataract operations per week is associated with a lower complication rate then 10–12 “cataract surgeons” are needed per million population. (Of course it may be that doing 12–14 per week gives even lower complication rates.) At present the United Kingdom has approximately 14 ophthalmologists per million population (all specialties). Australia has a CSR of around 6500, or 150 cataract operations per week per million population. If the United Kingdom wish to have a CSR like Australia (currently the highest worldwide) then it would require 75% of UK ophthalmologists performing 14 cataracts per week (approximately 7 hours operating), 44 weeks per year. It would therefore seem that the number of “cataract surgeons” is not the main limiting factor in reducing cataract waiting times, and one could argue that if too many people are performing cataract surgery, the complication rate may be more than optimal.

Change in the way cataract services are provided may be difficult to accept but, if well planned, could become a rewarding challenge for the profession with significant societal benefits

In order to reduce time on waiting lists there is a need to increase volume (CSR); a point made in an editorial several years ago in response to Minassian *et al's* modelling of cataract backlog in the United Kingdom.^{1,2} The government, in order to reduce cataract waiting time, has introduced “treatment centres” as they are now termed. This move has not been welcomed by many consultants and there is a concern about training the next generation of eye surgeons. The use of surgical teams from outside the United Kingdom has further aggravated the situation and does not provide the basis for a sustainable cataract service for the United Kingdom which can meet the growing needs of an ageing population.

On the other hand, successful implementation of high quality, high volume units within the NHS can be achieved and be a positive experience. Some exemplary units, including the one reporting in this issue, were used as examples of best practice to form policies in the “Action on cataract” document. These units show that despite many barriers, progress can and has been made within the National Health Service. It is puzzling why more effort has not been made to disseminate and implement these examples of best practice.

There is a separate point to consider from Habib and colleagues' article. The authors were able to review complication rates from a database of nearly 17 000 cases. Over time the complication rates fell for those performing fewer than 400 operations per year as well as for those performing more than 400. Yorston *et al* have shown that prospective monitoring of complications and visual outcome leads to an improvement in results over time.³ This strategy of routine monitoring every 100 cases is now being encouraged as part of the “Vision 2020—right to sight” strategy to improve the results of cataract surgery worldwide. High volume, high quality, and low cost units have been pioneered in many parts of south Asia and are now emerging in Africa. Increasingly, these centres are monitoring the visual outcome in order to give objective real time feedback of the results to the surgeon. This is not to compare one surgeon with another, but rather for each surgeon to monitor his own results over time.

Ophthalmology has pioneered and embraced many changes in technology—cataract extraction is just one example. A growing elderly population with a greater expectation of good vision, means that high volume, high quality cataract services are required. Change in the way cataract services are provided may be difficult to accept, but, if well planned, could become a rewarding challenge for the profession with significant societal benefits. Efficient use of an ophthalmologist's time making best use of surgical skills in a way which optimises those skills seems a sensible part of planning a sustainable cataract service for the NHS.

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Opticin

Shedding light on a new eye protein

J V Forrester

Opticin is a proteoglycan of the small leucine rich repeat family located in the extracellular matrix

It is reassuring to realise that there are still new molecules to be discovered using classic biochemical methods rather than the blockbuster genomic approach. Opticin is an eye specific molecule discovered by Reardon and colleagues in 2000¹ using a 4 M guanidine hydrochloride extract from bovine vitreous collagen fibrils to prepare peptides as a starting point for molecular cloning. Almost simultaneously, a separate group of researchers discovered an iris specific molecule which they termed oculoglycan² and was later found to be identical with opticin. In this issue of the *BJO* (p 697), Ramesh *et al* describe more fully the distribution of opticin in the human eye. Opticin was found to be present in significant quantities in several ocular tissues, particularly the ciliary body, the iris, and the anterior vitreous close to the pars plana. It is a proteoglycan of the small leucine rich repeat (LRR) family located in the extracellular matrix.

The role of opticin is not clear. In the vitreous gel, Bishop has suggested a function in maintaining gel stability and structure.³ The vitreous body is a virtually acellular connective tissue with a high content of water, and composed predominantly of a type II collagen scaffold filled with a matrix of hyaluronan. Several other collagens are also present in smaller quantities such as V, XI, VI, and IX, which act either as crosslinking proteins or directly as proteoglycans, binding together the structural but thin type II collagen fibrils with the hyaluronan filler via other proteoglycan associated glycosaminoglycans (GAGs). Other non-collagenous proteoglycans and proteins such as versican and fibulin may also be involved in stabilisation of this delicate structural lattice (for review see Bishop³).

In fact, although non-collagenous proteins form a very small percentage of the total molecular composition of the vitreous gel they are believed to have

important structural roles. In addition to versican and fibulin mentioned already, fibrillin containing microfibrils are an important component although without their usual partner elastin. Other minor proteins are present instead such as microfibril associated glycoprotein-1 (MAGP-1). Opticin is present in significant amounts in vitreous and it is surprising that it has not been identified previously. It binds to heterotypic vitreous collagen fibrils and appears to be the only member of the LRR family of proteins present in the vitreous. One of the proposed functions of this family of proteins is the prevention of lateral association, or aggregation, of collagen fibrils, and its abundance in the vitreous may be relevant to the determination of appropriate short range spacing of the thin collagen fibrils of the vitreous required to permit light transmission. In this sense then, these proteins are regulators of supramolecular organisation of tissues and include other well known proteins such as decorin and lumican. These have relevance to spacing of other critical collagenous matrices such as the corneal stroma (lumican knockout mice have opaque corneas) and skin matrix. Opticin is unusual in that it is substituted with a preponderance of O-sialylated oligosaccharides instead of GAG disaccharide chains, thereby reducing the level of GAG heterogeneity in the vitreous.

Matrix molecules such as opticin may have a role in ensuring a sufficient supply of growth hormone for ocular vasculogenesis

Coating of vitreous collagen fibrils with molecules such as opticin and type IX collagen through its chondroitin sulphate chains may thus have a dual purpose: on the one hand they permit structural integrity of the vitreous gel by

providing linkage to form a contiguous collagen network; on the other hand, these molecules also might prevent aggregation of the vitreous fibrils which would destabilise the gel. During ageing or disease, particularly after cellular infiltration of the gel, these molecules are likely to be damaged or degraded and thus lead to collagen fibril aggregation, lacunae formation, and gel condensation, clinically known as vitreous syneresis.

Most recently a further role for opticin has been suggested—namely, as a repository for growth factors.⁴ Binding of growth factors by matrix molecules is well recognised. For instance, vitreous type II collagen binds TGF- β and BMP-2.^{5,6} Fibroblast growth factor among many other factors is stored extracellularly in basement membranes bound to a heparan sulphate proteoglycan (syndecan).⁷ Now opticin appears to bind growth hormone.⁴ Growth hormone has been implicated in new vessel growth both directly and through its mediator insulin-like growth factor 1 (IGF-1), particularly during development, and matrix molecules such as opticin may have a role in ensuring a sufficient supply of growth hormone for ocular vasculogenesis. This may also apply to the retina and other ocular tissues since opticin appears to be widely distributed in the eye. Thus, it may have more functions besides promoting the development of the hyaloid vascular system during embryogenesis.

It is likely that further molecular functions for opticin will emerge. Opticin appears to be restricted to the eye and as such may come under the umbrella of sequestered ocular antigens and participate in immune privilege. It may thus also act as an autoantigen and induce immune mediated inflammation such as vitritis or pars planitis. So far there is no evidence for such a role but it seems attractive as a candidate autoantigen for disorders whose pathogenesis at present remains obscure.

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Dry eyes

The treatment of dry eyes

J P Whitcher

To know it is still not to love it

The dry eye is often referred to as a condition, a syndrome, or a disease; and it is likewise known by a variety of terms. Keratoconjunctivitis sicca (KCS), or more commonly keratitis sicca, refers to any eye with some degree of dryness either by history or by objective clinical findings. The literature is confusing on this subject and often blurs the difference between the symptoms of dryness and clinical findings based on objective criteria.¹ In similar fashion, the term dry eye syndrome is sometimes used interchangeably with dry eye symptoms, a lapse in descriptive terminology that unfortunately clouds the issue. Other descriptive terms for ocular dryness include xerophthalmia, which is used almost exclusively to describe the eye findings associated with vitamin A deficiency in children, and xerosis, which connotes the extreme ocular dryness and keratinisation that sometimes occurs after Stevens-Johnson syndrome, trachoma, and other causes of severe conjunctival cicatrization. And then there is Sjögren's syndrome, a generalised inflammatory disease that stands alone in its own category. Patients with Sjögren's syndrome usually have dry eyes or KCS but they also have or may not have an associated rheumatological disease depending on whether they have primary Sjögren's syndrome (without associated rheumatological findings) or secondary Sjögren's syndrome (with an associated rheumatological disease).² Having KCS does not necessarily imply that a patient has Sjögren's syndrome, but the reverse with few exceptions is usually true.

The truth of the matter is that dry eyes, for which we can interchangeably use the term KCS, is a neglected orphan. Even though it has been recognised for 70 years, since Sjögren first described the syndrome that bears his name in 1933,³ progress has been frustratingly slow in agreement on the diagnostic

criteria for Sjögren's syndrome as well as on treatment for all forms of KCS. This situation exists because KCS is in reality a condition that occurs in a family of orphan diseases. To be sure, Sjögren's syndrome sits at the head of the table, but the other orphans in the KCS family have a way of frequently showing up quite unexpectedly. After Sjögren's syndrome, there is a second group of diseases that has already been mentioned that can also produce severe KCS. These are the conjunctival cicatrization syndromes: Stevens-Johnson syndrome, trachoma, ocular pemphigoid, drug induced pseudopemphigoid, graft versus host disease, chemical burns, and conjunctival cicatrization that occurs after severe membranous conjunctivitis. A third group consists of those individuals who have signs of KCS because of a specific ocular disease: dacryoadenitis, congenital absence of the lacrimal gland, Riley-Day syndrome, cholinergic blockade due to drugs such as atropine, chronic blepharoconjunctivitis, senile atrophy of the lacrimal gland, and even the current epidemic of presumed KCS that occurs after refractive surgery. And the fourth group includes those atypical dry eye "orphans" that appear to have clinical KCS but who in reality have adequate tear production: trigeminal nerve paralysis with loss of corneal sensation, facial sensory nerve paralysis, exposure keratitis, and vitamin A deficiency resulting in xerophthalmia.⁴

The ultimate goal is to find curative solutions for this disparate family of diseases; keratoconjunctivitis sicca, in some forms, will always require ameliorative therapy

So we are presented with a family of orphan diseases, all complicated, many posing as diagnostic dilemmas,⁵ and

none that is easily treatable. Treatment is, indeed, the issue here. If we look at Sjögren's syndrome alone, there have been 70 frustrating years of having to rely on partially successful ameliorative therapy for both the xerostomia and the KCS components of the syndrome. We still cannot "cure" Sjögren's syndrome. We can only make patients more comfortable and, fortunately in the case of the eye component, we can usually prevent the complications related to microbial keratitis that led to blindness in some cases of KCS in the past. And yet our treatment is still ameliorative, not curative, and until we find a way to reverse the inflammatory component of Sjögren's syndrome, just to name one of the orphans, millions of individuals, mostly women, will suffer daily discomfort and disability.

There is no therapeutic panacea for dry eyes. As a clinician taking care of dry eye patients on a daily basis, I find the treatments often frustrating and unrewarding. There are no "quick fixes," and to know the various treatment options that are available for our patients is definitely not to love the choices. To be sure, we have learned a few important lessons in the supportive treatment of KCS over the past few years. For instance, we have become vigilant about recognising and controlling secondary infections. However, probably the most important lesson we have learned is that dry eye patients usually do not tolerate artificial tears on a long term basis, especially those that have preservatives in them. The dryer the patient's eyes and the more frequently they need eye drops, the more important becomes the issue of preservatives. Before the current preservative free artificial tears became commercially available, many of us used 1.25% or 0.625% preservative free gum cellulose as a drop of last resort. The solution frequently became contaminated with opportunistic pathogens and some patients developed microbial keratitis. Dry eye patients with chronic epithelial keratitis were particularly susceptible to corneal infections, so the development of commercial preservative free artificial tears in individually packaged disposable containers was a godsend. However, development of the ideal solution that mimics human tears with all of their complicated constituents has remained elusive. One has only to look at a short list of artificial tear

preparations that have been tried in the recent past to realise that there is no ideal solution. Exotic tear substitutes, including human serum albumin, fibronectin, vitamin A drops, and sodium hyaluronase, to name but a few, all purport to contain certain factors and antiproteases that mimic human tears, but all have proved disappointing. They are either too difficult to manufacture on a commercial basis or they are too expensive. Other topical medications based on their anti-inflammatory effects, such as corticosteroids⁶ and cyclosporine,⁷ are of questionable benefit especially in cases of severe ocular dryness.

Those of us who take care of patients with severe KCS have known for several decades that there are some individuals who cannot use any artificial tears, even preservative free, on a sustained long term basis without developing an allergic reaction or toxicity to the drops. We have also found anecdotally that the one tear substitute these patients can almost always tolerate is their own serum. There has been renewed interest recently in the use of autologous serum for the treatment of KCS⁸ and persistent corneal epithelial defects,⁹ but the study in this issue of the *BJO* (p 647) by Noble

et al, is the first to prove conclusively that 50% autologous serum is superior to conventional artificial tears for the treatment of KCS caused by a variety of conditions. The authors are to be congratulated for a beautifully designed and executed study. Even though the number of patients in this randomised, prospective, crossover clinical trial is small, the authors were scrupulous in the objective criteria they used to document improvement in the patients, and their statistical analysis of the data was flawless. I look forward to further studies of this quality involving even larger patient populations. Although the ultimate goal is to find curative solutions for this disparate family of orphan diseases, KCS in some forms will always require ameliorative therapy. This aspect of treatment should not be neglected. With more information from studies like this one, we may one day be able to approach the clinical management of KCS with greater confidence, secure in the knowledge that our treatments are safe, effective, and predictable in their ultimate benefits for the individual patient.

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Series editor: David Taylor

Give me a good reference

D Taylor

It is the duty of the referee to be honest, regardless of whether the candidate will see the reference or not

A young and rather inexperienced ophthalmologist was asked to provide a hospital, where he had applied for a 40 month registrar/senior registrar training post, with two references, one confidential and another open. As luck would have it, an administrative slip-up led to the open reference, which was glowing, being used as the definitive, confidential, reference that contributed to the appointment of the unlikely candidate. He was shocked to read the returned reference that was the confidential one, which was by the same author as the open one: it began “I cannot in all honesty say that Mr X is the most enthusiastic trainee that I have had, but...” and went downhill from there. The incident shows how luck is important in a career, and how little attention is usually paid to open references. It emphasises the value of

different types of references and with the changes in human resources management in recent years it should suggest to us that we might do well to better understand the uses of references today.

Ophthalmology is a bit special where career assessment and references are concerned because it is where doctors need a combination of surgical and medical skills that is not seen to the same extent elsewhere. It is also very difficult for a potential employer at interview to judge whether or not a trainee is potentially a good surgeon, or for that a matter a good physician, except by the reference.

There are three main types of references: verbal, open, and confidential. Verbal references are usually given over the telephone or when people meet, and should only be used as a means of

obtaining information quickly and should be followed up in writing. Often they are given because the human resources office does not appreciate how long it takes to receive the invitation to give a reference and how long it takes in many hospitals to get the reference prepared as an extra duty in an already crowded week. To assume a verbal reference is safe and offer a job on the merit of that reference alone is dangerous: often a written reference (which may be written by someone else) will not correspond to the verbal reference. It used to be quite acceptable to canvas by telephone on behalf of a candidate: the “old boy network” seemed to work well but it was unfair, bred inequality, and is not adequate now in most circumstances.

Open references are quite common in some countries and many visitors or fellows from overseas ask for an open reference. Realistically, it is difficult for referees to be completely honest when writing open references and often they are not considered worth the paper they are written on. None the less, it is still the duty of the referee to be honest, regardless of whether the candidate will see the reference or not. Open references may confine themselves to specific statements about the nature of the work carried out, how long the candidate had worked for the organisation, the department or unit the candidate had worked

in, and tangible comments as to their capabilities.

A confidential reference can only be given adequately if it is focused on the position for which the candidate is applying. For job references, the author should be provided with the job description and the person specification and must consider the ways in which the candidate fits the job or otherwise for which s/he is applying. Under the Freedom of Information and Data Protection acts, the candidate has a legal right to see a confidential reference, although many health authorities have destroyed confidential references once considered at the committee meeting following conclusion of the recruitment process. They should therefore only contain factual statements that can, if required, be backed up with evidence, especially if the statements may be detrimental to a candidate. However, if there are known problems with a candidate's performance or if there are negative perceptions about their performance, true or false, they must be dealt with honestly. They must be clear and concise, not contain innuendoes, tittle tattle, or second hand information. The confidential reference should never be disclosed outside the interviewing panel or its value is negated. Many employers abide by the rule that a reference should not be used to form an opinion but to confirm a decision, so references are not read until the decision to appoint is all but made.

Organisations have a duty to each other and to their employees to demonstrate good performance management but all too often it is seen as the easy option to provide a good reference and let the employee move on, sometimes with disastrous consequences.

No one is all good or all bad and if there are negative things to be brought

out, they must firstly have been made known to the candidate and should have been addressed within the performance management process set down by the previous organisation. It is unfair and illegal to provide a reference based on previous performance issues that were not addressed with the individual during their employment and to which they did not have the opportunity to put right during their employment.

The following may be a helpful checklist for both questions on a reference request and considerations in the interviewing process:

- Is the candidate appropriately qualified for the job? Qualifications do not just refer to diplomas, higher degrees, or fellowships of colleges, etc. Experience in the required field is as valuable.
- Has the reference writer appraised him/herself of the job description and person specification?
- Is his/her personality appropriate for the job?
- Is s/he a team player (if, of course, the skill is required)?
- Does s/he display appropriate collegiality?
- Does s/he have an appropriate emotional intelligence/maturity?
- Does s/he have a good sense of fairness?
- Even temperedness?
- Does s/he demonstrate an ability to work with staff at all levels and are they appropriately affable.
- Does s/he show innovative skills?
- Does the candidate show common sense?
- Does the candidate show honesty to other staff members and patients?

- Does the candidate have a criminal record? If so, you must consider the implications of the crime and if its relevance to the working environment. Those with a criminal record must not be discriminated against.
- Does the candidate have a good health/sickness record? It is important to follow up previous reasons and periods for absence. A candidate should not be penalised for what may be perceived as an unacceptable record.
- Does the candidate have good communication skills?
- Does s/he have good medical skills, including basic knowledge, diagnostic skill, and medical common sense?
- Is the candidate self motivated?
- Is the candidate a potential leader (should the skill be required)?
- Does s/he have any difficulties in taking or giving orders or leadership?

It is important to remember that all the above are only guidelines and no one factor should determine the fate of an individual's career. Completion of any application form, format and content of the curriculum vitae, the interview, any psychological/ability testing, and references form the process and must be considered in totality, not in isolation.

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