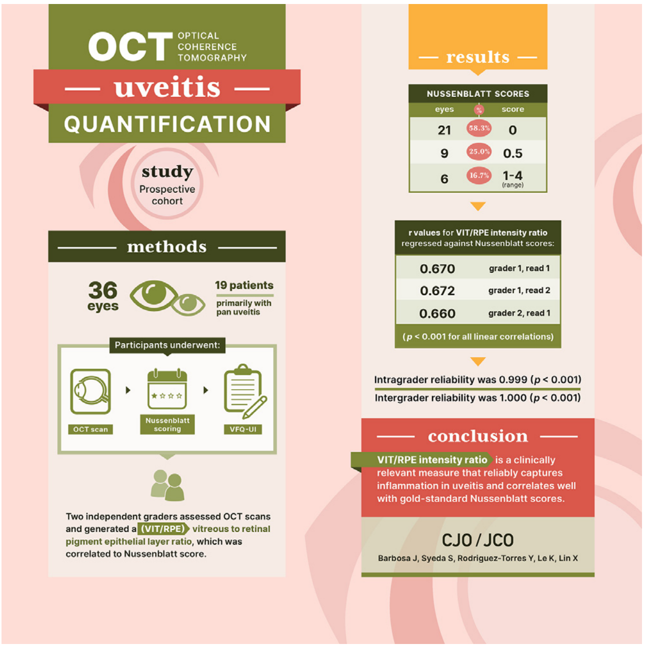

Resident Perspective: Utilizing an OCT-based approach to quantify vitreous inflammation

Establishing objective and reproducible means to assess disease is paramount when treating patients in the clinic and when conducting clinical trials. For example, comparison of a primary endpoint between treatment groups in a study evaluating drug efficacy is inherently limited by how reliable and valid the endpoint measure is. Furthermore, in clinical trials that include patients with intermediate or posterior uveitis, significant heterogeneity exists in the outcome measures used.[1] This lack of consensus ultimately limits both the ability to compare results between studies and the ability to draw conclusions in patients with uveitis. Currently, one of the more recognized measures of posterior segment disease activity in uveitis patients uses the Nussenblatt vitreous haze scale. This scale grades the degree of vitreous haze from 0 to 4 according to the visibility of posterior pole features using an indirect ophthalmoscope.[2] Recent studies have used optical coherence tomography (OCT) imaging, despite its moderate reliability, to quantify vitreous inflammation more objectively.[3]

In this issue, Barbosa and colleagues discuss their use of OCT imaging and software processing to quantify vitreous inflammation in a cohort of patients with uveitis.[4] Two independent graders determined the intensity of the vitreous (VIT) in ImageJ using a defined pixel area above the foveal internal limiting membrane. This value was divided by the mean intensity of the retinal pigment epithelium (RPE) to generate a VIT/RPE intensity score for each patient. This ratio controlled for corneal and lenticular changes that may have affected OCT image quality. The VIT/RPE scores were found to correlate with the Nussenblatt vitreous haze grades clinically determined by a separate observer. In addition, there was strong inter- and intra-observer reliability with VIT/RPE measurements.

This study provides further evidence to support the role of OCT in the objective assessment of inflammation in uveitis. As the authors mention, vitreous haze may be a more reliable indicator of disease activity than vitreous cells, especially in cases such as pars planitis, where vitreous cells may persist despite disease quiescence.[4] In addition, OCT imaging has been used in deep learning applications for diseases ranging from diabetic retinopathy to glaucoma.[5] If VIT/RPE intensity scores are validated in future studies, it might even be possible to generate a machine-learning algorithm for assessing the presence and severity of vitreous inflammation in patients with uveitis.

There are, however, a few limitations of the current study that are worth mentioning. First, the exclusion criteria are somewhat restrictive and may impact the study's generalizability. Second, the approach for quantifying vitreous inflammation above the fovea would be satisfactory in the majority of diseases with diffuse vitritis but may be less revealing in disorders such as toxoplasmosis, which often present with a more focal vitritis. Finally, a minority of patients in this study had Nussenblatt grades of 1 or higher. Future studies that enroll patients with more advanced vitritis may be helpful in assessing the utility of this OCT method across wider ranges of vitreous inflammation.

In summary, Barbosa and colleagues have eloquently described the validity, reliability, and objectivity of an OCT-based measure of vitreous inflammation in patients with uveitis. Studies such as this are important to facilitate the development of more objective and reproduceable means of assessing disease severity. These measures will benefit patients in the clinic and create more robust endpoints for clinical trials.

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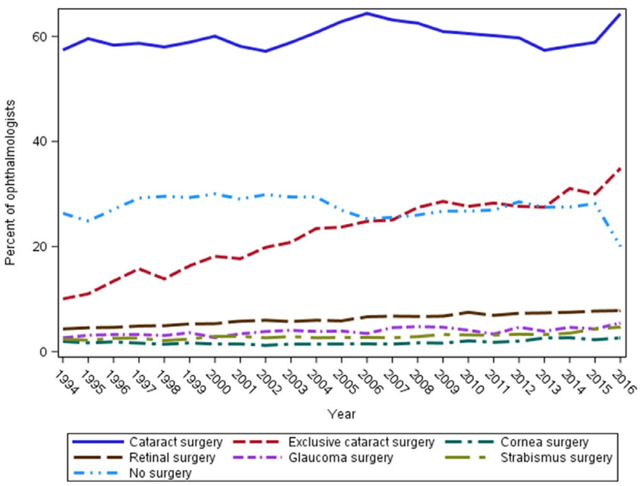

Resident Perspective: Exclusive cataract surgical focus among ophthalmologists

The practice of medicine has become increasingly specialized over the last century. In fact, ophthalmology was the first discipline in North America to have its own certification board.[1] Today, subspecialty training is offered in no fewer than 10 subspecialties within ophthalmology. One concern that has been raised over excessive subspecialization in medicine is that it narrows the scope of practice of generalist physicians.[1]

In this issue, Campbell and colleagues compare trends in the scope of surgical practice among generalist and subspecialist ophthalmologists in Ontario.[2] They found that the proportion of ophthalmologists performing exclusively cataract surgery increased from 1-in-10 to 1-in-3 between 1994 and 2016, whereas the proportion of ophthalmologists providing various subspecialty surgical care, or no surgical care, remained relatively stable. The median annual number of cataract surgeries performed by exclusive cataract surgeons increased from 138 to 529 between 1994 and 2009, before plateauing.

These findings may well evidence a narrowing in the scope of surgical practice of general ophthalmologists as a consequence of excessive subspecialization within the field. Alternatively, they may be but another manifestation of subspecialization. Modern cataract surgery is highly specialized, with increasing attention being paid to the management of refractive errors and presbyopia. In this light, many "exclusive cataract surgeons" may view themselves as subspecialists.

A natural question is whether this trend is beneficial or detrimental to patients—both in terms of access to care and surgical outcomes. Though not a clear-cut issue, there is evidence suggesting subspecialization improves surgical outcomes. A small study of penetrating keratoplasty, for example, found that grafts performed by a subspecialist were less likely to fail than those performed by general ophthalmologists.[3] Additionally, higher case volumes, as might be expected in a subspecialty practice, have been found to be associated with lower intra-operative complication rates for trabeculectomy[4] and phacoemulsification.[5] On the other hand, fragmentation of patient care across numerous subspecialists may increase barriers to access, particularly for patients in remote geographic areas.

As noted by Campbell and colleagues, this is an important area for further investigation because of its relevance to standards for professional certification and training program accreditation and to policies related to human resources in health.

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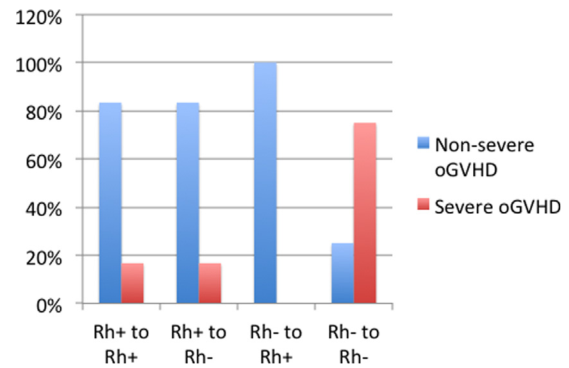

Resident Perspective: Who's at risk for ocular GVHD?

Dry eye disease in ocular GVHD is a multifactorial process that involves destruction and fibrosis of lacrimal glands and conjunctiva, leading to tear film deficiency and instability. It is a common ocular manifestation of chronic ocular graft-versus-host disease (GVHD), ocular discomfort, decreased quality of life, and vision loss. Conjunctival involvement early in the disease process is also a prognostic factor for a higher mortality rate.[1] An increased understanding of the risk factors for severe dry eye will help physicians identify candidates for early treatment to prevent vision-threatening complications of allogenic hematopoietic stem cell transplant.

In this issue, Chieh Wang and colleagues describe a number of risk factors to identify patients at higher risk of developing debilitating ocular GVHD.[2] Seventy-eight patients with diagnosed ocular GVHD-related dry eye syndrome were enrolled and followed for over 31 months. Majority of patients had at least grade 2 dry eye syndrome according to the National Institutes of Health (NIH) criteria. Severe overall chronic GVHD, worsening lung involvement, gastrointestinal (GI) involvement, worsening Schirmer test score, and male recipients of female donors have been identified as risk factors associated with severe GVHD-related dry eye syndrome. It was previously hypothesized that blood typing is also associated with severe ocular GVHD. This is the first study to show that donor transplants received from group-AB blood type or Rh-negative recipient who received a Rh-negative donor graft tend to have more severe ocular GVHD[2].

According to the National Institutes of Health (NIH)[3] Diagnosis and Staging Working group, ocular findings such as new-onset dry or painful eyes, cicatricial conjunctivitis and keratoconjunctivitis sicca are manifestations of chronic GVHD[3]. However, there are no diagnostic criteria to accurately assess the severity of the ocular disease. Using the Schirmer's score as the only objective criterion for the diagnosis of chronic ocular GVHD would produce a high false positive and negative rate of diagnosis[4]. Tear film dynamic and reflex tearing from environmental stimulants may also be potential confounders of this test. Although a more robust definition criteria set by the International Chronic Ocular GVHD Consensus Group criteria exists, the importance of a comprehensive ocular evaluation and assessment of systemic risk factors has been stressed.

Patients with systemic GVHD including severe GI and lung disease, as highlighted in this issue, have also been shown to be associated with severe GVHD-related dry eye syndrome in literature[4]. One limitation of this report is that inflammation of the skin was not included. A study of 172 patients with ocular GVHD post-allogenic stem cell transplant showed that prior acute skin GVHD (odds ratio 2.57) is another independent risk factor that has shown a similar likelihood of developing ocular GVHD as donor-recipient gender disparity (odds ratio: 2.57)[4]. The activated T cells are thought to migrate from secondary lymphoid organs to target mucosal membranes of the skin and gastrointestinal tract, and carry out cytotoxic activity via Fas-Fas ligand and the perforin/granzyme pathways[5]. It has been hypothesized that the conjunctiva mimics systemic mucosal membranes like the lung, intestines and mouth.[6]

Given the multifactorial nature of the disease and variability between different criteria used to evaluate patients with GVHD, it can be difficult to understand which risk factors contribute directly to severe dry eye syndrome. The results of the current study taken together with the literature evidence highlight a few intrinsic and graft-related characteristics that can help physicians identify patients at greater risk. Early identification and aggressive management of these patients can minimize debilitating ocular GVHD.

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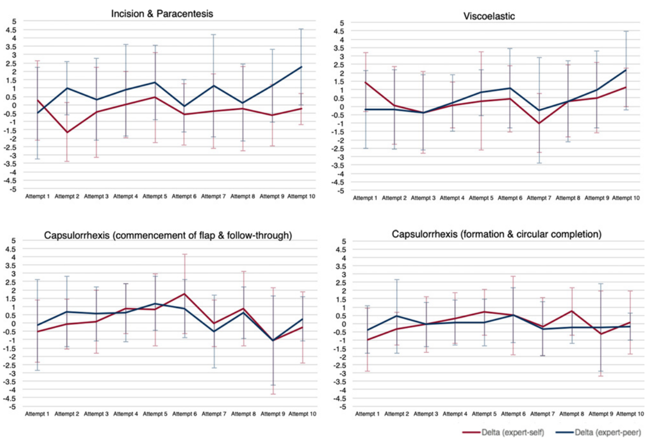

Resident Perspective: Ophthalmology residents' self- and peer-assessment in video-recorded simulated cataract surgery

With the adoption of Competency Based Medical Education (CBME), there is a shift towards a more outcomes-based approach to medical education and an emphasis on observational and directive feedback for learners. Once in practice, directly observed encounters and assessments are more limited. Clinicians must therefore have the ability to accurately assess their own knowledge and skills and identify and address any gaps or weaknesses.[1,2] However, there are inconsistencies in physician self-assessment when compared to external measures.[3,4]

In this issue, Cheon et al. investigate the accuracy of ophthalmology self- and peer-assessments of surgical skills.[5] A cataract surgery assessment tool was created based on the International Council of Ophthalmology's Ophthalmology Surgical Competency Assessment Rubric: Phacoemulsification (ICO-OSCAR: Phaco) and expert feedback. This was then used to assess 8 novice ophthalmology residents who each performed 10 cataract surgery simulations. Each simulation recording was evaluated by a cataract surgery expert and peer resident (masked assessments) and by the participant (unmasked self-assessment).

Mean expert, self, and peer scores across all attempts were 3.90 ± 0.43, 3.86 ± 0.47, and 3.54 ± 0.29, respectively. While mean scores were comparable between raters, inter-rater reliability varied. Inter-rater reliability was excellent between the 2 expert scores, poor between expert and self-score, and fair to excellent between expert and peer scores. The discrepancy between the latter 2 inter-rater reliabilities indicates that participants have the ability to accurately assess surgical skills but are not able to demonstrate this during self-assessment. Participants tended to over-score themselves and were overly critical of peers when compared to expert scores. Perhaps the masked versus unmasked assessment of others versus self introduced bias. It thus is imperative to recognize this tendency as a resident learner when striving for assessment accuracy.

Mean scores by attempt number improved between the first and tenth attempt but did not reach statistical significance and did not necessarily translate into skill proficiency by the tenth attempt. Expert feedback was not provided between attempts, so it is likely that the participants, novices to cataract surgery, lacked the necessary knowledge to identify all areas of improvement to achieve competency.

The key takeaway from this study—especially as a junior ophthalmology resident—is that the ability to accurately assess oneself is a skill that must be developed in a deliberate manner. During residency, the availability of feedback from experts and teachers should be utilized and compared to self-assessments to hone these skills. While there are typically fewer opportunities for such feedback once in independent practice, explicit feedback should be sought from colleagues, patients, and others to continually guide and inform self-assessment for lifelong learning. This is especially important considering medicine is a self-regulating profession,[6] and as physicians, we have obligations to our patients and to society to maintain competency throughout our professional careers.

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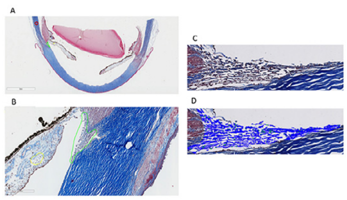

Resident Perspective: Histopathological changes among eyes with anterior and posterior chamber intraocular lenses

Cataract surgery with posterior chamber intraocular lens implantation (PCIOL) has been shown to have a modest, long lasting decrease in intraocular pressure (IOP) in patients with primary open angle glaucoma and ocular hypertension.[1] Although, the literature has suggested that there is a sustained decrease in the intraocular pressure after cataract surgery, the mechanism of this decrease is not well understood. Previous histopathological studies have looked at the changes in the trabecular meshwork (TM) following PCIOL implantation. These studies have shown an increase in the distance between scleral spur and the anterior limit of the uveal TM in pseudophakic compared with phakic eyes.[2] In addition, TM histopathological studies have shown an increased in the ciliary body fibrosis.[2]

In this issue, Mastromonaco and colleagues discuss trabecular meshwork changes caused by both PCIOL and ACIOL implantation.[3] The authors examined 40 formalin-fixed post-mortem donor eyes from the Minnesota Lions Eye Bank of Canada between 2015 to 2019. The eyes were sectioned in the coronal axis at the midpoint between the cornea and the posterior pole. Slides were fixed in paraffin and then stained with Masson's trichrome to analyze fibrosis and immunostained with CD31 antibody to stain for vascular endothelial cells. Using objective software, the TM was demarcated, trabecular area, trabecular space, trabecular lamellae area, and the intensity of the blue staining in the Masson's trichrome slides for fibrosis were quantified. CD31 stained slides were used to demarcate the corneal endothelial cells which were counted within 1mm measurements in the central and peripheral cornea. CD31 slides were used to evaluate and demarcate the Schlemm's canal endothelium as well.

Of the 40 eyes included in the study, 5 were phakic, 5 had ACIOL and 30 had PCIOL. Comparing the phakic, PCIOL and ACIOL groups, the authors found that TM area was not significantly different between all three groups. However, the ACIOL & PCIOL groups showed a significantly lower TM cellular components compared with the phakic eyes. Subgroup analysis comparing PCIOL lens design (1-piece haptic with square edge versus 3-piece haptic with optic edge design) did not show any significant differences in TM cellular components. TM and ciliary process fibrosis did not show any significant differences between the three groups. Thus, the authors suggest that cataract surgery with any IOL implantation may lead to lower TM cellular components.

When comparing the impact of IOL type on the endothelial cell counts, the authors found that there was a significant difference in the endothelial cells between the three groups, with ACIOL having lower endothelial cell count compared with phakic eyes. However, PCIOL donor eyes did not have a significantly lower endothelial cell count compared with phakic eyes, suggesting that the lower endothelial cell count noted in the ACIOL eyes is likely related to the lens type rather than cataract surgery itself. In terms of confounding variables, the authors found that lower endothelial cell counts and increased ciliary process fibrosis were significantly associated with the age of the patient. It is important to note that the PCIOL group had 4 glaucoma patients and the ACIOL group had one glaucoma patient. In addition, given the anonymity of the donor tissue, the authors note that they did not have access to other potential surgeries, lasers, or medications that were given to the included patients. Reassuringly, the authors note that the glaucoma patients in both groups were not outliers. Despite the study's limitations of small sample size and limited availability of other ocular diagnoses, it provides us with further understanding of the histological changes that occur at the angle and corneal endothelium with the placement of ACIOL and PCIOL.

Bottom Line: Cataract surgery with both ACIOL and PCIOL results in loss of cellular components in the trabecular meshwork. In addition, higher amounts of corneal endothelial cell loss occur in patients with ACIOL compared with PCIOL and phakic eyes. Understanding the histopathological changes that occur with different intraocular lenses during cataract surgery will allow us to better understand the impact of lens choices on our patients.

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