Cystoid macular oedema with trypan blue use

We present a large comparative series of trypan blue use in cataract surgery. This series of trypan blue used in all eyes regardless of cataract severity may be unique. We found an apparent increased rate of cystoid macular oedema (CMO) associated with trypan blue use. Méelles et al’s report on the use of trypan blue in cataract extraction in 1999 combined with Apple et al’s series on dye enhanced cataract surgery facilitated widespread acceptance of this technique. The dye has been shown to stain basement membrane of lens capsule. Trypan blue is now widely used to assist in cataract extraction when visualisation of the anterior capsule is poor because of loss of red reflex. Trypan blue has also been used to improve contrast during cataract extraction in eyes with corneal opacities and to stain internal limiting membrane and epiretinal membrane during vitreoretinal surgery. The safety profile of trypan blue appears good with no adverse effects reported in several large series.

Patients and methods

In this retrospective, comparative study we identified a consecutive series of 75 patients (group A) in whom trypan blue had been used “routinely” regardless of cataract type or density. A consecutive series of 94 patients (group B) who had routine phacoemulsification by the same surgeon were used as a control group.

Apart from the use of trypan blue to facilitate capsulorhexis, standard phacoemulsification techniques were used in both groups.

The data from the two cohorts were compared using mean and standard deviations for continuous variables such as age, and proportions for categorical variables such as sex. For acuity a numeric ordinal score was created from 1 to 10 by placing all the recorded acuities in order. This numeric ordinal score allowed us to plot the data using box plots, and to analyse the data using non-parametric methods to produce p values where necessary.

Table 1 Age and sex distribution and co-morbidity

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group A (n = 75)</th>
<th>Group B (n = 94)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (SD)</td>
<td>79.4 (9.8)</td>
<td>78.4 (8.5)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>25 (33%)</td>
<td>31 (33%)</td>
</tr>
<tr>
<td>Female</td>
<td>50 (66.7%)</td>
<td>63 (67%)</td>
</tr>
<tr>
<td>ARMD</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>CVA</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>ERM</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
| ARMD, age related macular degeneration; CVA, cerebrovascular accident; ERM, epiretinal membrane.
The preoperative best corrected acuity was decreased in the group in which trypan blue was used. This suggests that the cataracts in this group were of greater density, possibly requiring more energy to remove using phacoemulsification. The energy used during surgery however was not recorded. The CMO may therefore be a reflection of higher energy used in denser cataracts.

A prospective trial with matched cohorts is required to prove the suggested higher incidence of CMO with trypan blue use. OCT scanning of the maculas in both groups would give non-invasive objective evidence of CMO.

We suggest the following steps to limit the apparent complication of CMO with trypan blue use:

- Use the smallest amount and lowest concentration of trypan blue possible (trypan blue in concentrations as low as 0.0125% has been shown to effectively stain the anterior capsule).
- Increase postoperative steroid or anti-inflammatory drops prophylactically.
- Use only in appropriate cases—that is, with poor visualisation of the anterior capsule.

References


Familial intraocular cysts in association with anisometropia

Vitreous cysts are rare. Their origin is postulated to be a congenital remnant of the primary hyaloidal system or ciliary body pigment epithelium. Although most vitreal cysts are asymptomatic, some may cause obstruction of visual field defects. Treatment is seldom indicated, though laser photocoagulation or vitrectomy have been suggested. Iris cysts include iris pigment epithelial cysts and stromal cysts. The former may get dislodged into either the anterior chamber or into the vitreous space. They become symptomatic when they enlarge and occlude the visual axis. Treatment includes aspiration or surgical excision of the cyst.

Both vitreous and iris cysts have been previously reported as sporadic findings. In this report, we present the clinical and echographic manifestations of intraocular cysts in two siblings.

Case report

Two sisters, 11 and 3 years old, were referred for evaluation because of intraocular cysts and amblyopic fellow eyes. They were the products of a full term normal pregnancy with an uneventful perinatal history. Their parents were not relatives. Past medical history was unremarkable. The children in the family were reportedly healthy with no ocular pathology but were inaccessible for examination.

The older sister was known to have worn glasses since the age of 7 years. She complained of intermittent obscuration of vision in her right eye. Her vision was 6/12, J1 right eye and counting fingers at 1 metre with J14 left eye. By indirect ophthalmoscopy of her right eye, a round pigmented, cystic structure was observed in the vitreous cavity (fig 1).

The left fundus showed myopic choriotinal changes with a tilted optic disc. Retinoscopy showed marked myopic anisometropia of +1.00 –1.25 x75˚ right eye and –10.50 –2.00 x95˚ left eye. Ultrasonography disclosed a 3.05 mm cystic, round, hypoechogenic vitreal structure (fig 1). It was partially mobile with vitreal after-movements and was tethered to fine vitreal strands. Its walls showed internal reflectivity of 60%, whereas its contents had very low (<5%) reflectivity. The younger sister was fitted with spectacles at the age of 7 months because of anisometropia myopia. Her visual acuity (picture cube) was 0.03 right eye with unsteady fixation and 0.2 left eye. In her left eye a cystic, pigmented lesion was attached to the posterior iris surface and extended into the anterior vitreous (fig 2). It was located in the superotemporal quadrant causing adjacent lenticillar cortical opacities. Indirect ophthalmoscopy revealed bilateral mild retinal myopic changes. High frequency echography of the iris lesion disclosed a cyst with hypoechogenic content measuring 3.68 mm in diameter (fig 2). Cycloplegic refraction showed anisometropia myopia of –7.5 –1.00 x90° right eye and –0.3 –3.50 x80° left eye.

Figure 1 (A) Homogeneously pigmented vitreous cyst. (B) B-scan echography that demonstrates a round, echolucent vitreous cyst bound by fine vitreal strands.
with anisometropic amblyopia look normal to the family, leading to delay in detection and treatment.

The physical characteristics of the vitreous cyst we described, including its confinement to the region of Croquet’s canal, are similar to those reported by others. This suggests that the cysts may be remnants of the persistent fetal vasculature, though this manifestation was not included in Goldberg’s description of this disease. However, since no surgical excision was performed, we may postulate regarding their cellular origin. Nork and Millechia suggested after histological studies, that the cyst origin was pigment epithelial-type cells. In our study, indirect evidence that the cysts originated from pigment epithelium include their homogenous brown pigmentation, medium reflectivity, and continuation of iris cyst with the posterior iris surface. The cellular origin of the vitreal cyst is less obvious. It can either be a primary congenital hyaloidal remnant or a cyst that detached from the iris during childhood. Only few have reported on vitreous cysts jarring loose from the ciliary body pigment epithelium.

The poor vision in the fellow eye (without cyst) was attributed to the high anisometropia present in both sisters. They were prescribed glasses with anti-amblyopic therapy by patching. No invasive therapy of the cysts in the eye with better vision was recommended.

Comment

This reports the unusual association between vitreous and iris cysts found in two siblings. The familial clustering of pigmented intraocular cysts suggests a hereditary aetiology in these sisters. Sallo et al reported on the occurrence of primary marginal pigment epithelial iris cysts in four members of one family, thus postulating an autosomal dominant heredity pattern. Nork and Millechia reported an association between vitreous cyst in a patient and corneal dermoid in her son. A familial association between vitreous cyst and iris cyst was not previously reported. Our study, in accordance with previous reports, emphasises the need for examination of family members once an intraocular cyst has been diagnosed in a young child.

The second unusual association described in these siblings is the deeply amblyopic fellow eye with high anisometropic myopic astigmatism. It is not clear whether axial myopia developed because of the amblyopia or whether the amblyopia is secondary to anisometropia. Amblyopia in anisometropia results from the suppression of cortical vision centres that receive inputs from the chronically defocused eye. Also, the eyes of a child

Figure 2 (A) Cystic structure extending from the posterior layer of the iris in the superotemporal quadrant. (B) High frequency echography that shows a cystic structure attached to the posterior iris.

The physical characteristics of the vitreous cyst we described, including its confinement to the region of Croquet’s canal, are similar to those reported by others. This suggests that the cysts may be remnants of the persistent fetal vasculature, though this manifestation was not included in Goldberg’s description of this disease. However, since no surgical excision was performed, we may postulate regarding their cellular origin. Nork and Millechia suggested after histological studies, that the cyst origin was pigment epithelial-type cells. In our study, indirect evidence that the cysts originated from pigment epithelium include their homogenous brown pigmentation, medium reflectivity, and continuation of iris cyst with the posterior iris surface. The cellular origin of the vitreal cyst is less obvious. It can either be a primary congenital hyaloidal remnant or a cyst that detached from the iris during childhood. Only few have reported on vitreous cysts jarring loose from the ciliary body pigment epithelium.

R Amer, I Anteby
Department of Ophthalmology, Hadassah University Hospital, Jerusalem, Israel

Correspondence to: Radgonda Amer, MD, Department of Ophthalmology, Hadassah University Hospital, POB 12000, Jerusalem 91120, Israel; radgonda@hotmail.com
doi: 10.1136/bjo.2003.041277
Accepted for publication 29 February 2004

Proprietary interest: none.

References

Central retinal artery occlusion and ophthalmpoplegia following spinal surgery

Visual loss and ophthalmpoplegia are very infrequent complications after spinal surgery. Visual loss may be caused by ischaemic optic neuropathy, central retinal artery or vein occlusion, or occipital stroke. Previous reports have attributed this complication to patient positioning, intraoperative blood loss, and controlled hypotension or shock. Associated risk factors include anaemia, prolonged surgical time, bradycardia, hypoxia, diabetes, smoking, vascular disease, and increased blood viscosity. Ophthalmpoplegia after spinal surgery is even more unusual than visual loss, and only few reports exist in the literature. Moreover, magnetic resonance image (MRI) studies to differentiate between cavernous sinus thrombosis and direct compression of orbital contents have not been previously described. We therefore report two patients who developed this unusual combination of ophthalmpoplegia and central retinal artery occlusion (CRAO) after spinal surgery.

Case 1

A 62 year old male ex-smoker underwent a T2–T3 posterior spinal decompression and segmental instrumentation for lumbar scoliosis, in prone position with ocular protection (gauze swab and tape). The surgery lasted 2 hours and 45 minutes. Before the procedure blood pressure was 140/60 mm Hg and during operation it was maintained at 90/60 mm Hg. Just after surgery he complained of visual loss and left ocular and nasal pain. Examination revealed left palpebral oedema, local erythema, blinding, and total ophthalmpoplegia of the left eye. Left pupil was dilated and fixed. The fundoscopic examination showed retinal oedema, a central cherry-red spot at the macula, and attenuated arteries. The rest of his neurological examination was normal. The haemocrit dropped from 43% to 34%. The brain MRI was normal and the orbit MRI revealed enlargement and hyperintensity of left ocular muscles in T2 weighted images sparing their tendons (fig 1). Ocular motility recovered in 4 weeks but visual loss persisted until the last follow up at 7 months.

Case 2

A 23 year old man with a history of tobacco abuse and asthma underwent a prolonged cervical arthrodesis in prone position caused by C7 vertebral collapse with spinal contusion. Immediately after surgery he complained of left visual loss and he was referred to our hospital. Details of duration of surgery, ocular protection, intraoperative blood pressure, and haemocrit were unavailable. Upon examination he showed blindness of the left eye with palpebral oedema, orbital pain, and total external ophthalmpoplegia. The fundoscopic examination revealed a pale retina with a macular cherry-red spot. The pupil was dilated and fixed. The MRI studies showed a normal brain, but swelling of the left extraocular muscles; MRI angiography and ophthalmic echo Doppler were normal. After 3 months

Figure 1 MRI of the orbit. T2 weighed image shows proptosis and oedema of extraocular muscles in the left eye, sparing their tendons.
Table 1  Reported patients with postoperative CRAO, ophthalmoplegia, or both

<table>
<thead>
<tr>
<th>Author</th>
<th>Sex/age</th>
<th>Surgery</th>
<th>Position</th>
<th>Instrumentation</th>
<th>Operating time (minutes)</th>
<th>Blood pressure (mm Hg)</th>
<th>CRAO</th>
<th>Ophthalmoplegia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slocum 1948*</td>
<td>F/55</td>
<td>Neurosurgical</td>
<td>Prone</td>
<td>No</td>
<td>180</td>
<td>80/60</td>
<td>Right</td>
<td>No</td>
</tr>
<tr>
<td>Givner 1950*</td>
<td>M/late 50s</td>
<td>Abdominal</td>
<td>Supine</td>
<td>No</td>
<td>265</td>
<td>Shock</td>
<td>Right</td>
<td>No</td>
</tr>
<tr>
<td>F/33</td>
<td>Abdominal Supine</td>
<td>No</td>
<td>85</td>
<td>Mild shock</td>
<td>Right</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F/37</td>
<td>Abdominal Supine</td>
<td>No</td>
<td>90</td>
<td>Shock</td>
<td>Left</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F/40</td>
<td>Abdominal Supine</td>
<td>No</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Right</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gillan 1953*</td>
<td>M/26</td>
<td>Abdominal</td>
<td>Supine</td>
<td>No</td>
<td>At least 100</td>
<td>Systolic 70</td>
<td>Left</td>
<td>No</td>
</tr>
<tr>
<td>F/48</td>
<td>Abdominal Supine</td>
<td>No</td>
<td>At least 140</td>
<td>Systolic 55</td>
<td>Left</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hollenhorst 1954*</td>
<td>M/48</td>
<td>Spine</td>
<td>Prone</td>
<td>No</td>
<td>120</td>
<td>Normal</td>
<td>Left</td>
<td>No</td>
</tr>
<tr>
<td>M/29</td>
<td>Neurosurgical Sitting</td>
<td>No</td>
<td>120</td>
<td>Normal</td>
<td>Left</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M/65</td>
<td>Spine</td>
<td>Prone</td>
<td>No</td>
<td>120</td>
<td>Normal</td>
<td>Left</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>M/50</td>
<td>Spine</td>
<td>Prone</td>
<td>No</td>
<td>180</td>
<td>Normal</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M/39</td>
<td>Spine</td>
<td>Prone</td>
<td>No</td>
<td>180</td>
<td>Normal</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F/36</td>
<td>Neurosurgical</td>
<td>Prone</td>
<td>No</td>
<td>240</td>
<td>Normal</td>
<td>Right</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>M/50</td>
<td>Spine</td>
<td>Prone</td>
<td>No</td>
<td>240</td>
<td>Normal</td>
<td>Right</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>M/29</td>
<td>Neurosurgical</td>
<td>Prone</td>
<td>No</td>
<td>260</td>
<td>Normal</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bradish 1987*</td>
<td>F/12</td>
<td>Spine</td>
<td>Prone</td>
<td>Yes</td>
<td>180</td>
<td>Systolic 70</td>
<td>Right</td>
<td>No</td>
</tr>
<tr>
<td>West 1990*</td>
<td>F/50</td>
<td>Spine</td>
<td>Prone</td>
<td>Yes</td>
<td>270</td>
<td>Systolic 70</td>
<td>Left</td>
<td>No</td>
</tr>
<tr>
<td>Wolfe 1992*</td>
<td>F/28</td>
<td>Spine</td>
<td>Prone</td>
<td>Yes</td>
<td>135</td>
<td>90/60</td>
<td>Right</td>
<td>No</td>
</tr>
<tr>
<td>Hamilton 1993*</td>
<td>F/12</td>
<td>Spine</td>
<td>Prone</td>
<td>Yes</td>
<td>360</td>
<td>Mean 70–80</td>
<td>Right</td>
<td>No</td>
</tr>
<tr>
<td>Halton 2004</td>
<td>M/62</td>
<td>Spine</td>
<td>Prone</td>
<td>Yes</td>
<td>165</td>
<td>140/60–90/60</td>
<td>Left</td>
<td>No</td>
</tr>
<tr>
<td>M/23</td>
<td>Spine</td>
<td>Prone</td>
<td>Yes</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Left</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

CRAO, central retinal artery occlusion.

Comment

Our two patients developed complete ophthalmoplegia and CRAO after spinal surgery. Intraoperative ocular protection was used at least in the first patient. Common features included prone position and postoperative signs of orbital swelling. Imaging studies revealed signs of oedema in extraocular muscles sparing their tendons. To our knowledge, extraocular muscles abnormalities in MRI have not been previously reported. Ophthalmoplegia partially improved in one patient and fully recovered in the other within a few weeks, but visual loss persisted in both cases.

Acknowledgement

We thank Dr John Stewart for his critical reading of the manuscript.

References

8. Hollenhorst RW. Sven HJ, Benoit CF. Unilateral blindness occurring during anesthesia for
I read with great interest the article by Joussen et al.1 The authors deserve to be commended for their pioneering interest in childhood blindness. There are certain points that I would like to clarify and supplement with regard to their study.

(1) The authors have mentioned that only babies born vaginal delivery were studied, since the eyes of babies delivered by caesarean section were previously proved to be nearly always sterile. This would result in a gross underestimation of the incidence of ophthalmia neonatorum in this study, for the following reason.

By convention, ophthalmia neonatorum is defined as conjunctivitis arising within 1 month after birth. Hence, some of these conjunctival infections could originate from sources other than the maternal vaginal and cervical flora. In fact, some cases of ophthalmial neonatorum especially those caused by Staphylococcus aureus, could have originated at home, as previously reported by the authors themselves. In the same study, no significant difference in the frequency or type of infection was found among the infants delivered vaginally or by caesarean section.

Other authors, too have made similar observations. Krohn et al. have found some cases of ophthalmial neonatorum to have been caused in India by the infants’ nasogential passages or from their care givers after birth. Verma et al., in a prospective study from India, found no correlation between the microbiology of the conjunctival swabs of the infected eyes (Staph aureus was the commonest isolate) and the vaginal and cervical swabs of the mothers (Escherichia coli was the commonest isolate). They concluded that most of the cases of ophthalmia neonatorum were acquired postnatally. In the light of these previously reported studies, I feel that exclusion of cases that were delivered by caesarean section was not warranted and weakens the power of this study. The efficacy of the second drop of povidone-iodine was not tested on a significant proportion of the eyes of babies delivered by caesarean section. This source of ophthalmia neonatorum is the one that would be influenced by this study. Indeed, Dr Vendantham’s main intentions of the surgery were to place later on the day of birth. Infections postnatally that Dr Vendantham listed as arising, while technically still within the definition of “ophthalmia neonatorum,” would not be impacted by this second drop and therefore would not be directly affected by this study. Indeed, Dr Vendantham’s interest in neonatal dacryocystitis would also be influenced by this study. The fact that ophthalmia neonatorum in some countries seems to peak in certain seasons and not in others should cause increased vigilance for this disorder in those countries. Our study, however, encompassed more than one full year of births in Kikuyu, Kenya. Therefore, the study included both the peaks and troughs of the incidence of ophthalmia neonatorum.

We thank Dr Vendantham for his interest and hope that in many countries, including India, ophthalmia neonatorum prophylaxis will either continue unabated or be initiated preferentially with the use of povidone-iodine.

S J Isenberg, L Apt
UCLA School of Medicine, Harbor-UCLA Medical Center, 1000 W Carson Street, Box 6, Torrance, CA 90509, USA

Correspondence to: S J Isenberg, UCLA School of Medicine, Harbor-UCLA Medical Center, 1000 W Carson Street, Box 6, Torrance, CA 90509, USA; isenberg@ucla.edu

doi: 10.1136/bjo.2004.045096
Accepted for publication 19 February 2004

References

Authors’ reply

We greatly appreciate the inquiry of Dr Vendantham and are happy to reply to his questions.

While he is correct regarding the definition of ophthalmia neonatorum including all infections acquired by an infant during the first 30 days of life, for the purposes of our study,2 we were primarily interested in those cases resulting from neonatal exposure in the birth canal. This source of ophthalmia neonatorum is the one that would be influenced mainly by a second drop of povidone-iodine, placed later on the day of birth. Infections postnatally that Dr Vendantham listed as arising, while technically still within the definition of “ophthalmia neonatorum,” would not be impacted by this second drop and therefore would not be directly affected by this study. Indeed, Dr Vendantham’s interest in neonatal dacryocystitis would also fall within the same question since the reflux from the tear duct causing this infection generally does not arise until well after the first day of life.

The proportion of ophthalmia neonatorum neonatal cases acquired postnatally compared with those acquired during the birth process probably differs by country. In the predominant caesarean cases (Staphylococcus aureus and Enterococcus in the former; Staphylococcus aureus and gonococcus in the latter) probably reflects the length of the infection. Historically, in Kenya a high proportion of the infections probably arose from the birth process as reflected in the type of infecting organism. Thus, our Kenyan study, was primarily directed towards those infections acquired during birth.

The high incidence of complications in the study, however, has aroused our concern as only 15.9% of patients completed the study uneventfully. Further vitreoretinal surgeries were required in 47.7% because of retinal complications. Moreover, the incidence of hypotony, phthisis, and enucleation occurred in 25%, 20%, and 16% respectively, and these figures are higher compared with other treatments such as glaucoma implants and cycloioide. We have previously studied the use of the Ahmed valve implant for complicated glaucoma and hypotony, phthisis, and enucleation occurred in 10.8%, 3.1%, and 1.5%, respectively. A recent study on the management of refractory glaucoma by cycloioide similarly found a lower rate of hypotony, phthisis, and enucleation in 9.5%, 5.3%, and 1.8% respectively. The high complication rates in the study by Joussen et al may be because of the negative case selection with a high incidence of aphakic (30%) and infantile and juvenile glaucoma (7%). A further controlled study comparing retinectomy with other treatments may therefore be warranted.

We congratulate the authors for studying this innovative method for the management of refractory glaucoma with a long follow up of 5 years.

It was stated by the authors that the main intentions of the surgery were to relieve pain and to preserve the eye without discomfort. Unfortunately, these POEMS were not included in the final outcome measures. Instead, success was determined.
by “disease oriented evidence” (DOE) like intraocular pressure and retinal attachment, which are surrogate outcomes. These DOEs may correlate well with the patients’ symptoms and it would be valuable if the authors can include the level of pain and discomfort as other outcome measures for the study.

V Y Wong, T Y Lai, D C Lam
Kong Eye Hospital, 147K Argyle Street, Kowloon, Hong Kong

Correspondence to: Dr Timothy Y Lai, Kong Eye Hospital, 147K Argyle Street, Kowloon, Hong Kong; tyylai@netnavigator.com
doi: 10.1136/bjo.2004.042820
Accepted for publication 22 January 2004

References

Blue light and the circadian clock

Dr Mainster and Sparrow have provided an excellent perspective on the relative merits and difficulties of extending intraocular lens (IOL) absorption into the blue portion of the spectrum. However, they have not considered an unintentional consequence of blocking the blue portion of the spectrum—reducing the activity of intrinsically photosensitive retinal ganglion cells. These cells serve several non-visual ocular photoreceptive tasks, most prominently the entrainment of the circadian clock to external light-dark cycles. Pupillary light responses in mice are also at least partially controlled by this system, which appears to use a novel opsins (melanopsin) and possibly also a flavoprotein (cryptochrome) as photopigments. Experiments in mice have suggested that the action spectrum for these photopigments peak in the blue, at approximately 480 nm, but with substantial sensitivity to blue light to 430 nm. This system appears to be functional in humans as documented by the action spectrum for light suppression of the pineal hormone, melatonin.

The clinical importance of these photoreceptors is presently unknown, although it appears that loss of retinal ganglion cell predisposes children and young adults to disorders of sleep timing that outer retinal disease does not. While, as the authors note, there may be substantial benefit in blocking blue light phototoxicity, particularly for patients with pre-existing outer retinal degeneration, these lenses may have unintended consequences with respect to the timing of sleep and wakefulness or levels of certain neurohormones.

R N Van Gelder
Washington University Medical School, Campus Box 8096, 660 S Euclid Avenue, St Louis, MO 63110, USA; van gelder@vision.wustl.edu
doi: 10.1136/bjo.2004.042861
Accepted for publication 22 January 2004

References

Author’s reply

I appreciate Van Gelder’s thoughtful comments regarding the potential consequences of a ultraviolet + blue light absorbing intraocular lens (IOL) on circadian rhythmicity. I agree that the clinical importance of retinal ganglion photoreceptors is currently unknown and that decreasing the amount of blue light reaching them might affect their function. Conversely, if photosensitive ganglia respond to oradian changes in their blue light exposure rather than just the magnitude of that exposure, a ultraviolet + blue light absorbing IOL may not impair ganglion function.

Van Gelder re-emphasizes our finding that IOL chromophore selection balances the potential loss of useful visual function against a reduction in the risk of acute ultraviolet-blue phototoxicity. Our paper did not state, however, that ultraviolet + blue absorbing IOLs were desirable for people with outer retinal degeneration. Indeed, blue light is more important in scotopic than photopic vision. Individuals with age related macular degeneration have greater night-time visual problems than their peers without it, and these scotopic problems may be exacerbated if a significant amount of blue light is blocked by an IOL.

M A Mainster
University of Kansas Medical School, 3901 Rainbow Boulevard, MS3009, Kansas City, KS 66160-7379, USA; mmainstel@kumc.edu
doi: 10.1136/bjo.2004.045120
Accepted for publication 19 February 2004

Modification of classification of ocular chemical injuries

A recent paper by Kobayashi and co-workers on temporary amniotic membrane patching for acute chemical burns highlights the difficulty in the consistent classification of this type of injury. Roper-Hall’s classification of acute chemical injuries to the eye is based on the original classification of Ballen” and there is little difference between them. However, in neither classification is the grade based on the most severe sign. This immediately leads to the problem of trying to classify an eye having, for example, corneal signs of one grade and conjunctival signs of another. There is also difficulty in grading the conjunctival and limbal injuries.

Dua et al. recognized the problem of assessing limbal stem cell damage and proposed a quasi-analogue scale in order to indicate intergrade variations. They suggested using limbal fluorescein staining as a marker of limbal stem cell damage. However, their grading scheme is complex and departs significantly from that of Roper-Hall. Although fluorescein staining is a useful sign, it does not necessarily imply limbal stem cell damage or failure and has not been shown to be a better index of limbal damage than perilimbal ischaemia. Importantly, it is also becoming apparent that both the fornices and mucocutaneous junction of the conjunctiva are important for conjunctival regeneration. In fact, Roper-Hall stressed the importance of involvement of contiguous areas of the conjunctiva, which may lead to symblepharon formation. Although there are limitations with Roper-Hall’s classification, it is simple and remains popular. Rather than replace Roper-Hall’s and Ballen’s classification, I suggest a modification, which addresses some of the issues raised and makes the classification more robust.

One of the questions that needs to be answered is whether to base the grade of injury upon the most severe sign or on a combination of ocular surface signs. A combination of signs using three parameters (cornea, limbus, and conjunctiva), each with three levels requires 27 possible combinations to avoid crossover. To avoid this complexity and without evidence to indicate a difference in prognosis, it would seem reasonable therefore to base the grade of injury on the most severe sign.

Although limbal ischaemia does not necessarily imply limbal stem cell failure, it remains to be shown that it is less indicative than fluorescein limbal staining of limbal damage. We propose therefore to continue to use limbal ischaemia in the grading of injury.

With regard to conjunctival involvement, in order to be able to include the total area of involvement, we suggest calculating the conjunctival surface into bulbar and tarsal areas, as is natural. The bulbar and tarsal conjunctiva comprise approximately two thirds and

www.bjophthalmol.com
one third of the total conjunctival surface respectively. Using conjunctival fluorescein staining as an indicator of the extent of conjunctival damage, the area of involvement can be based on the fraction of the third involved, limiting any division into not less than sixths—that is, the tarsal surfaces together comprise a third of conjunctiva (see fig 1). This includes the issue that a vertical distribution of conjunctival injury is as important as a horizontal distribution.

Corneal involvement in terms of prognosis remains an area of difficulty. Although it may be assumed that limbal and conjunctival damage implies a worse prognosis than isolated corneal damage, this has yet to be shown. In addition, a severe chemical injury involving the cornea but not the limbus, or vice versa, would be expected to be an uncommon event. We therefore propose to retain the degree of corneal damage (as proposed by Roper-Hall and Ballen) in grading of the injury (see table 1).

Thus, grade I is identified by any isolated corneal epithelial injury. Grade II includes limbal or conjunctival involvement, but involves less than one third of the area involved. Grade III includes either a hazy cornea, defined as obscurity of the iris or pupil details (as per Roper-Hall’s and Ballen’s original descriptions), and/or greater than one third of limbal conjunctival involvement. With the advent of recent surgical techniques such as amniotic membrane transplants and limbal allografts, the prognosis of severe ocular chemical injuries previously classified as Roper-Hall grade IV have improved and no longer carry a uniformly poor prognosis. Therefore, we reason that these cases can be included in grade III of our proposed classification.

In conclusion, in the absence of good evidence for re-classifying ocular surface injuries, it would seem reasonable to keep to the Roper-Hall/Ballon classification and to move it forward by addressing the weaknesses of that system. We hope that the proposed grading system improves the consistency with which chemical injuries are reported in the literature, serves as a basis for controlled comparative evaluation of modern treatment, and stimulates further work in this area.

**Table 1 Modified classification of ocular chemical injuries**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Cornea</th>
<th>Limbal ischaemia</th>
<th>Conjunctival involvement</th>
<th>Prognosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Clear epithelial damage only</td>
<td>None</td>
<td>None</td>
<td>Good</td>
</tr>
<tr>
<td>II</td>
<td>Clear epithelial damage only &lt; 1/3</td>
<td>&lt; 1/3</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>Hazy cornea OR &gt; 1/3 OR &gt; 1/3</td>
<td>OR &gt; 1/3</td>
<td>Guarded</td>
<td></td>
</tr>
</tbody>
</table>

**References**


**Author’s response**

The response by Harun et al. is to be commended in so far as it highlights the problems with the current Roper-Hall classification system and the difficulties it poses in evaluating outcome and efficacy of treatments in ocular surface burns. As a proposed modification, however, it is a retrograde step.

The three major issues with the Roper-Hall classification were that it lumped all injuries with 50% or more of limbal involvement into one category, did not take into account conjunctival involvement in the actual classification, and placed undue emphasis on the degree of corneal damage.

The proposed modification by Harun et al. goes a step backwards by grouping all injuries with more than 33% limbal involvement into one category. The grading of a patient with all 12 clock hours of limbus involvement would then be the same as one with just over 6 clock hours of limbus involvement. This rationale is not always comparable to degree of limbal involvement. Yet limbal involvement without ischaemia, in the form of loss of stem cells, can have an equally important impact on prognosis. That is precisely why the Dua, King, and Joseph classification considers limbal involvement (to encompass ischaemia as well) rather than limbal ischaemia alone.

The point about conjunctival involvement is well made in the proposed modification. This does not differ significantly from the Dua, King, and Joseph classification. The latter was the first to take this aspect of burns into account in determining severity and prognosis. The authors mention the importance of conjunctival conjunctival involvement. This is a valid though often an impractical consideration. Associated swelling, indentation, thickening, shrinkage and the like, of the lids make tarsal conjunctival evaluation impractical if not impossible in some cases, in the immediate post-injury period. It was for this practical consideration that the Dua, King, and Joseph classification included only the extent of bulbar conjunctival involvement in determining the grade. It is interesting to note that the authors disregard limbal fluorescein staining as an indicator of limbal damage (as proposed in the Dua, King, and Joseph classification) but propose fluorescein staining as an indicator of conjunctival damage in evaluating extent of conjunctival damage. This implies that fluorescein staining is appropriate to evaluate both conjunctival epithelial damage and conjunctival ischaemia but not limbal epithelial damage and limbal ischaemia. There is no rationale for this.

Corneal haze can be an indicator of the offending chemical rather than the severity of the insult. It is not uncommon to find a clear and transparent cornea, which is totally denuded of its epithelium, immediately after a chemical injury. This can stay so for a few days before becoming rapidly hazy or opaque, or remain clear and become re-epithelialised. Corneal endothelial damage leading to corneal oedema and haze can occur later in the course of an acute chemical injury. Conversely, a hazy cornea with a resultant scar could do well following a corneal graft procedure if the limbal involvement is minimal. The proposed modification retains corneal haze as a grading parameter and includes a hazy cornea in grade 3 only. There are many chemical injuries, which involve 3–6 clock hours of the limbus (or 50%) with a clear cornea. These do not fall well in any grade in the proposed new classification and highlight the inherent
problem in the Roper-Hall classification and its proposed modification.

Most important of all, the proposed classification is purely theoretical and has not been validated. The Dua, King, and Joseph classification is based on several years of clinical experience of managing burns including more than 67 patients. It is simple and easy to use (clock hours of limbus involvement and percentage of conjunctival involvement), flexible, and allows for all combinations of different extents of involvement of the two structures. It is validated as a prognostic indicator and allows for accurate comparison of cases. The proposed new classification/modification fails on all these counts.

H S Dua
Division of Ophthalmology and Visual Sciences, B Floor, Eye ENT Centre, University Hospital, Queens Medical Centre, Derby Road, Nottingham NG7 2UH, UK; harminder.dua@nottingham.ac.uk
doi: 10.1136/bjo.2004.046797
Accepted 23 March 2004

Further communications regarding this subject can be found at eLetters on the BJ Ophthalmology website (www.bjophthalmol.com).

References

BOOK REVIEW

Complications in Ophthalmic Plastic Surgery

There is no doubt that complications in surgery are an inevitable fact.

Nevertheless, the unforeseen surgical outcomes always play a fundamental part in the self-improvement process. Certainly, the experience provides the safest way, for both the patient and the surgeon, to prevent harm and smooth the final result.

This book represents one of the most serious, and not very common, works focusing on the complications in ophthalmic plastic surgery. It is a considerably well-organised book, which apparently requires some basic knowledge of ocularplastics and facial aesthetic surgery. The format is based on three distinguished parts: cosmetic surgery, ptosis, and lower eyelid malposition.

very competent number of contributors cover the topics of their specific interest. In the first part the authors are dealing with the blepharoplasties, the laser resurfacing, and the forehead lift. The ptosis chapter is referred to the most common ptosis techniques but brow suspension is remarkably absent. The third part, although it is entitled “Lower eyelid malposition,” includes and some unrelated, though welcomed topics, like DCR, enucleation, and orbital fractures.

The necessity of the communication between the surgeon and the patient is vigorously emphasised and didactically analysed in every single chapter. Deep understanding of the patient’s expectations as well as detailed information about the pragmatic results is recommended throughout the chapters of the book. There is quite a sufficient reference to preoperative evaluation of the patient regarding measurements, anaesthesia, and surgical preparation.

Although the covered operations are extensively described, a countable number of other surgical techniques, and their possible complications, are not mentioned. The latter is probably related to the editor’s orientation to aesthetic oculoplastic surgery.

The anatomical and pathophysiological mechanisms of the most common complications are thoroughly explained. At the same time, the authors give many enlightening tips, based on their broad experience, for preventing the problems, and meticulously describe the management of the intraoperative and postoperative complications. The number of the illustrations do not adequately correspond to the addressed complications and the quality of the pictures varies, depending on the author’s collection. Additionally, the shortage of references in some of the most interesting chapters (ptosis, enucleation) should certainly not be overlooked, for the magnitude of such a book.

Every attempt to give precious advice about the frustrating and unavoidable surgical complications is always warmly welcomed. Brian Brazzo’s book is predominately a useful guide to the understanding, prevention, and management of the commonest problems in oculoplastic surgery. Despite the expected problems of every first edition this generally represents a meticulous work on specific issues and thus is recommended for the ophthalmic surgeon and especially for surgeons who are chiefly interested in oculoplastics and cosmetic surgery.

N Chalvatzi
Bristol Eye Hospital, Lower Maudlin Street, Bristol BS1 2LX, UK; nikochacha@hotmail.com

NOTICES

Childhood cataract
The latest issue of Community Eye Health (No 50) deals with the manitude, management, economics and impact of childhood cataract. For further information please contact: Journal of Community Eye Health, International Resource Centre, International Centre for Eye Health, Department of Infectious and Tropical Diseases, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, UK (tel: +44 (0)20 7612 7964; email: Anitta.Shah@lshtm.ac.uk; online edition: www.jceh.co.uk). Annual subscription (4 issues) UK £26/US$45. Free to developing country applicants.

Ophthalmic Anesthesia Society
The 18th annual meeting of the Ophthalmic Anesthesia Society will be held on 1–3 October 2004 in Chicago, USA. For further details: Ophthalmic Anesthesia Society (OAS), 793-A Foothill Blvd, PMB #119, San Luis Obispo, CA 93405, USA (tel: 001 805 534 0300; fax: 001 805 534 9030; email: info@eyeanesthesia.org; website: www.eyeanesthesia.org).

4th International Congress on Autoimmunity