Editorial IV

## **Editorial IV**

## Local anaesthesia for eye surgery—no room for complacency

A recent article by Vohra and colleagues<sup>1</sup> reminds us that while regional anaesthesia for eye surgery is safe and reliable and complications are uncommon, there are a number of risk factors that predispose the globe to needle penetration during retrobulbar (RBA) and peribulbar (PBA) injections. The presence of a long eye, staphyloma or enophthalmos, the use of a faulty technique, a lack of appreciation of risk factors, an uncooperative patient and the use of an unnecessarily long needle are some of the contributory causes.<sup>2</sup> Patients presenting with axial myopia have a 30 times greater risk of globe puncture compared with patients with normal axial length.<sup>2</sup> A risk rate of one perforation for every 140 peribulbar blocks in eyes with an axial length greater than 26 mm has been calculated.<sup>2</sup>

Interestingly, an increase in axial length is associated with only a marginal increase in equatorial width.<sup>1</sup> Vohra and colleagues<sup>1</sup> have suggested that in patients with axial length greater than 26 mm, the medial canthal route for PBA injection might be safer than the inferotemporal route as the inferotemporal quadrant of the globe is the commonest reported site of perforation after RBA and traditional PBA blocks. This is not surprising as the majority of blocks are performed using the inferotemporal route. From their survey,<sup>3</sup> and by extrapolation of data from the National Cataract Surgery Survey,<sup>4</sup> Gillow and colleagues estimate that the overall incidence of ocular perforation during cataract surgery under local anaesthesia is about 0.114%. A much lower ocular perforation incidence of 1:16 224 PBA blocks was reported by Davis and Mandel.<sup>5</sup> Nicoll<sup>6</sup> reported a series of 6000 RBA injections. Sixteen patients (1 in 375) had complications that suggested direct spread of the anaesthetic agent via the dural cuff into the central nervous system. Other serious complications reported with RBA block include damage to the optic nerve and retrobulbar haemorrhage. These reports have resulted in a search for safer methods of local anaesthesia. Descriptions of PBA block,<sup>7</sup> simplified and safer PBA block,<sup>8</sup> sub-Tenon's block,<sup>9</sup> subconjunctival injection<sup>10</sup> and topical anaesthesia<sup>11</sup> have all appeared in the literature.

Ten years ago, very few anaesthetists in the UK were performing local anaesthetic blocks for eye surgery. At that time, anaesthetists did not feel confident placing needles deep in the orbit because of the potential complications. Most operations were performed under general anaesthesia. On the rare occasions where a local anaesthetic was indicated, the surgeons did the RBA injection themselves, and often demanded a degree of sedation indistinguishable from a general anaesthetic, surely the worst choice for poor risk patients. The surgeons' RBA block involved injecting a small volume of local anaesthetic often through a relatively wide bore (up to 21 g) and very long (up to 5 cm) needle. This meant that the injection was made inside the extraocular muscle cone and close to the orbital apex where most of the vital structures are situated.

By 1990, there was increasing interest among anaesthetists in promoting the change to local anaesthesia, especially for cataract surgery.<sup>12</sup> Peribulbar block had been described<sup>7</sup> and much shorter needles 2.5-3 cm were being used so that local anaesthetic was deposited outside the muscle cone and often no deeper than the globe equator. This was believed to be much safer, reducing the incidence of most of the complications of the traditional RBA block.<sup>5</sup> Anaesthesia, akinesia and operating conditions were said to be adequate provided enough time was allowed for the larger volume of local anaesthetic to diffuse from the site of injection into the muscle cone where most of the sensory and motor nerves and the ciliary ganglion are situated. Anaesthetists embarked on this technique either using the Davis and Mandel<sup>7</sup> description or a modification of it. Often anaesthetists were supervised initially by surgeons who

themselves had limited experience of the techniques and were fearful of the consequences of this invasion of their territory by specialists who understood veins and airways but might have limited knowledge of orbital anatomy.<sup>13</sup> There was a definite learning curve, the first attempts often leading to very long onset times of at least 20 min, and inadequate or even failed blocks. Repeated supplementary injections in the inferotemporal, nasal or superotemporal regions were often necessary to achieve success. The nasal compartment block<sup>14</sup> was adopted widely and was found to supplement the quality of the inferotemporal block, and by filling the lids and blocking the terminal branches of the facial nerve made the classical facial nerve block obsolete.

Progressively as more experience was gained, the PBA block seemed to work quicker, the quality of the block was better and the success rate was higher. The question, of course, was whether this inferotemporal block was in fact still a PBA block or something else. The needles, while still only 2.5 cm long, were, after passing the equator, moving upwards and inwards. A wide range of local anaesthetic injection techniques were used, some of which may be described as retrobulbar by one clinician and peribulbar by another.<sup>15</sup> New names, such as posterior bulbar, or anterior and shallow retrobulbar block, were appearing. It seemed that the rapid onset and improved block quality excluded an extraconal injection, and in spite of the shorter needle length the needle tip had to be intraconal. If larger volumes were used, a second injection might not be required, increasing safety. The increasing use of PBA block over the last decade or so is attributable to its reputation for a reduced risk of serious complications compared to RBA block. But if the new PBA is an intraconal injection it may have the potential for all the complications reported with the traditional RBA approach. So what are the alternatives available to the anaesthetist?

To avoid injections deep into the orbit, topical anaesthesia and subconjunctival anaesthesia have been advocated, the latter involving a subconjunctival injection of anaesthetic at the 12 o'clock position.<sup>10</sup> Neither of these techniques reduce globe movement. Topical anaesthesia is particularly popular in the USA where it was used in 30% of all cataract operations in 1998.<sup>16</sup> Advances in surgical techniques, such as small incision phaeco-emulsification, which have lessened the need for akinesia during surgery, may account for its popularity. However, topical anaesthesia results in significantly higher pain scores compared with sub-Tenon's anaesthesia so that surgery is more stressful for both patient and surgeon.<sup>17</sup> Chittenden<sup>17</sup> found that with topical anaesthesia application of cautery to scleral vessels was particularly painful. Topical anaesthesia may, therefore, be more appropriate when cataract surgery is done through a clear corneal incision. With experienced surgeons, short, uncomplicated procedures and carefully selected patients, topical anaesthesia is very effective with no tissue invasion and therefore no local complications. It saves time, wears off rapidly so that eye padding is not

required and the visual result is immediately apparent. However, it requires more patient co-operation to keep the eve relatively still, or the use of two instruments in the eve at 90° to each other to immobilize it. Moreover, only the front of the eye is anaesthetized and the patient will experience pain if the iris or the ciliary body is touched. In the USA topical anaesthesia is often combined with i.v. sedation.<sup>18</sup> In the UK the use of sedation is rare, most patients being managed by verbal interaction, explanation and reassurance. Increasing use of sedation would counterbalance the increased safety attributed to topical anaesthesia. No increase in the use of sedation was found in the National Survey published in 1999.<sup>15</sup> But surgeons are reluctant to operate without adequate ocular akinesia. There are thus many occasions when for various reasons, either an alternative local anaesthetic technique providing good akinesia or even general anaesthesia is indicated.

Sub-Tenon's block offers such an alternative. Access to the sub-Tenon's space may be obtained through different approaches. The inferior nasal quadrant approach<sup>9</sup> is popular in the UK. Anatomically, this approach is less likely to cause complications compared to the inferotemporal approach.<sup>9</sup> Four quadrant techniques have been used especially for vitreoretinal surgery.<sup>19</sup>

Sub-Tenon's block was reported to be completely painless by 99.1% of patients.<sup>20</sup> Thus, the sharp rises in arterial pressure and associated dysrrhythmias reported with painful procedures do not occur with the sub-Tenon's block.<sup>21</sup> In the same study, 97.3% patients did not have any pain during surgery. This block has been found to be effective for cataract surgery, pan-photocoagulation,<sup>22</sup> vitreo-retinal surgery,<sup>19</sup> and strabismus surgery.<sup>23</sup> But the degree of akinesia varies. Differences in the choice of local anaesthetic, the volume injected and the time allowed for it to take effect can explain this variation. Limited akinesia was reported using 1.5 ml of 2% lidocaine solution while complete akinesia was achieved at 15 min using up to 4 ml of a 50:50 mixture of 2% lidocaine and 0.5% bupivacaine.<sup>21</sup> Because of the smaller volumes of local anaesthetic used, akinesia of the orbicularis oculi is not always achieved. Thus, it has the advantage of producing moderate to good akinesia, excellent anaesthesia and by using a blunt cannula rather than a sharp needle reduces the chance of needle related complications. Indeed, in a study of 3000 sub-Tenon's blocks<sup>24</sup> no systemic or orbital complications were reported. It may be reinforced at any time during surgery, although this is rarely required if a local anaesthetic of suitable duration is used. Among the complications of the technique, chemosis is common but the solution disperses quickly and does not interfere with surgery. Similarly, subconjunctival haemorrhage is frequently caused from fine vessels, which may be severed on making the small conjunctival incision.

What about patients on anticoagulants? A case could be made for general anaesthesia as subconjunctival haemorrhage is common with the sub-Tenon's block. On the other hand, the bleeding is from conjunctival or episcleral vessels and can be controlled with pressure and patience. There is a risk of damage to a vortex vein, which might lead to considerable bleeding.<sup>8</sup> If a local anaesthetic technique is chosen, a sub-Tenon's block with a blunt cannula should be safer than a sharp needle local anaesthetic technique.

Opinions regarding pre-operative preparation of patients for surgery under local anaesthesia have changed over the last decade. Traditionally, presumably because the incidence of complications with the RBA was significant, patients were prepared similarly to those for general anaesthesia. In 1990 Rubin wrote, 'patients should be fasted, investigated and prepared as fully as for a general anaesthetic'.<sup>12</sup> Most centres these days do not starve their patients and routine investigations are omitted before surgery under local anaesthesia. Intravenous access and monitoring including electrocardiogram, non-invasive arterial pressure measurement and pulse oximetry should always be used. This requires the presence of someone able to interpret the measurements, and seek help when necessary.

In their report in 1992, the Joint College of Ophthalmologists and The Royal College of Anaesthetists Working Party<sup>25</sup> recommended that an anaesthetist should be present during ocular surgery under local anaesthesia. At that point they were acutely aware of the potential complications with the RBA block. Nearly 10 yr later with the incidence of serious complications much reduced, with wide experience of PBA, and with the excellent safety record of the sub-Tenon's block, which is fast growing in popularity, is the presence of an anaesthetist still appropriate? By the time this editorial is published the second report of the joint Royal College of Ophthalmologists and The Roval College of Anaesthetists Working Party, due early in 2001, will have answered this question for us, advising that an anaesthetist is only essential if PBA or RBA is used or sedation is given.

In conclusion, PBA or shallow RBA blocks are very safe unless there are risk factors. When risk factors are present, topical anaesthesia or sub-Tenon's blocks might be safer. Each of the different local anaesthetic blocks for eye surgery has its indications. At times, general anaesthesia is the best choice. Patients should have the benefit of the most appropriate technique administered by properly trained personnel.

G. S. Thind Department of Anaesthesia University Hospital Aintree Liverpool L9 7AL UK A. P. Rubin London NW2 3RH UK

## References

- I Vohra SB, Good PA. Altered globe dimensions of axial myopia as risk factors for penetrating ocular injury during peribulbar anaesthesia. Br J Anaesth 2000; **85**: 242–5
- 2 Duker JS, Belmont JB, Benson WE, et al. Inadvertent globe perforation during retrobulbar and peribulbar anaesthesia. Ophthalmology 1991; 98: 519–26
- 3 Gillow JT, Aggarwal RK, Kirkby GR. A survey of ocular perforation during ophthalmic local anaesthesia in the United Kingdom. Eye 1996; 10: 537–8
- 4 Courtney P. The National Cataract Surgery Survey. Method and descriptive features. Eye 1992; 6: 487–92
- 5 Davis DB, Mandel DM. Efficacy and complication rate of 16,224 consecutive peribulbar blocks. J Cataract Refract Surg 1994; 20: 327–37
- 6 Nicoll JMV, Acharya PA, Ahlen K, et al. Central nervous system complications after 6000 retrobulbar blocks. Anesth Analg 1987;
  66: 1298–302
- 7 Davis DB, Mandel DM. Posterior peribulbar anaesthesia: An alternative to retrobulbar anaesthesia. J Cataract Refract Surg 1986; 12: 182–4
- 8 Lebuisson DA. Simplified and safer peribulbar anaesthesia. Eur J Implant Ref Surg 1990; 2: 123–4
- 9 Stevens J. A new local anaesthesia technique for cataract extraction by one quadrant sub-Tenons infiltration. Br J Ophthalmol 1992; 76: 670–4
- 10 Petersen W, Yanoff M. Subconjunctival anaesthesia: An alternative to retrobulbar and peribulbar techniques. Ophthalmic Surg 1991; 22: 199–201
- II Kershner RM. Topical anaesthesia for small incision self sealing cataract surgery. J Cataract Refract Surg 1993; 19: 290-2
- 12 Rubin AP. Anaesthesia for cataract surgery—time for a change? Anaesthesia 1990; 45: 717–8
- 13 Boase DL. Local anaesthesia revisited. Eye 1996; 10: 531-2
- 14 Hustead RF, Hamilton RC, Loken RG. Periocular local

anaesthesia: Medial orbital as an alternative to superior nasal injection. J Cataract Refract Surg 1994; 20: 197–201

- 15 Eke T, Thompson JR. The National Survey of Local Anaesthesia for ocular Surgery II: Safety profiles of local anaesthetic techniques. Eye 1999; 13: 196–204
- 16 Learning DV. Practice styles and preferences of ASCRS members—1998 survey. J Cataract Refract Surg 1999; 25: 851–9
- 17 Chittenden HB, Meacock WR, Govan JA. Topical anaesthesia with oxybuprocaine versus sub-tenons infiltration with 2% lignocaine for small incision cataract surgery. Br J Ophthalmol 1997; 81: 288–90
- 18 Patel BCK, Clinch TE, Burns TA, Shomaker ST, Jessen R, Crandall AS. Prospective evaluation of topical versus retrobulbar anaesthesia. J Cataract Refract Surg 1998; 24: 853–86
- 19 Mein CE, Woodcock MG. Local anaesthesia for vitreoretinal surgery. Retina 1990; 10: 47–9
- 20 Roman SJ, Sit DAC, Boureau CM, Auclin FX, Ullern MM. Sub-Tenons anaesthesia: An efficient and safe technique. Br J Ophthalmol 1997; 81: 673–6
- 21 Tsuneoka H, Ohki O, Osamu T, Kenji K. Tenons capsule anaesthesia for cataract surgery with IOL Implantation. Eur J Implant Ref Surg 1993; 5: 29–34
- 22 Friedberg MA, Palmer RM. A new technique of local anaesthesia for panretinal photocoagulation. Ophthalmic Surg 1991; 22: 619–21
- 23 Steele MA, LaVrich JB, Nelson LB, Koller HP. Sub-Tenons infusion of local anaesthetic for strabismus surgery. *Ophthalmic* Surg 1992; 23: 40–3
- 24 Fukasaku H, Marron JA. Sub-Tenon pinpoint anaesthesia. J Cataract Refract Surg 1994; 20: 673
- 25 Report of the Joint Working Party on anaesthesia in ophthalmic surgery. Royal College of Anaesthetists and College of Ophthalmologists, March 1993. (Available from either of the Colleges)