

Visual acuity and pupillary reactions after peribulbar anaesthesia

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Abstract

The effect of peribulbar anaesthesia on optic nerve function in 20 patients, before and after cataract surgery, was measured. All the patients had decreased visual acuity. Five (25%) had no perception of light. Seventeen (85%) developed a relative afferent pupil defect (RAPD). No patients saw the operating instruments. Seven (35%) had improved visual acuity immediately postoperatively. Patients should be warned that they may lose vision completely on being given a peribulbar anaesthetic; however their vision will improve, but not necessarily immediately, postoperatively. Examination for an RAPD is a good method of providing reassurance that the operating instruments will not be seen.

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Peribulbar anaesthesia is a popular method of anaesthesia for cataract surgery.¹ It has been introduced as an alternative to retrobulbar anaesthesia as it is thought to be safer and as effective.²⁻⁴ The extraconal position of the injection and the use of a shorter needle means there is less chance of complications such as optic nerve damage or scleral perforation.^{5,6}

Visual acuity has been shown to be temporarily reduced with retrobulbar anaesthesia.^{7,8} The effect of retrobulbar anaesthesia compared with peribulbar anaesthesia on the optic nerve has been demonstrated by visual evoked potential studies which showed marked reductions of the visual evoked potential only with retrobulbar anaesthesia.⁹ This finding was also felt to suggest that peribulbar anaesthesia is safer than retrobulbar anaesthesia for the optic nerve. Despite the effect of retrobulbar anaesthesia on the optic nerve some function of the optic nerve is retained as shown in one study in which 73% of the patients could see the instruments during cataract surgery.¹⁰

In view of the above findings it would be expected that visual acuity should be less affected by peribulbar anaesthesia; so patients may be able to see more of what is happening during surgery, which could be a cause for anxiety both for the patient and surgeon. Retrobulbar anaesthesia can cause an afferent pupil defect; this was found in 31% of cases in one study.¹⁰ It would be expected to occur less often with peribulbar anaesthesia.

Patients and methods

Twenty patients with uncomplicated cataracts, who had not had previous ocular surgery and had normal pupil responses, were selected; they comprised 12 females and eight males, with an

average age of 76 years. The only coexisting ocular pathology was background diabetic retinopathy in three cases.

The eye to be operated on was dilated with phenylephrine 10% and cyclopentolate 1%. The patients' visual acuity was measured in the anaesthetic room with a standard Snellen chart at 1 metre, unaided and then with a pinhole. One metre was used so as to cause least disturbance to the patient lying on a trolley and also to aid use of a pinhole. A pinhole was used to overcome the effect of dilatation and absence of refractive correction. Although this method does not give a fully accurate visual acuity measure it does enable adequate comparison of visual acuity pre and post anaesthesia and postoperatively. An afferent pupil defect was examined for, using the reverse swinging Marcus Gunn test, with a bright pen torch.

A standard peribulbar anaesthetic was then given, by the same anaesthetist in each case, using a modified technique of that described by Hamilton *et al.*¹ The patients had given informed consent and no sedation was used. Topical oxybuprocaine 0.4% drops were applied. A mixture, of 5 ml bupivacaine 0.75% and 5 ml lignocaine 2% with adrenaline 1:200 000 and 75 units/ml of hyaluronidase, was made. Five ml of this solution were given inferolaterally to the globe, through the conjunctiva and 5 ml medial to the caruncle using a 25 gauge, 25 mm needle. Ten minutes of compression were applied at 30 mm Hg. The effectiveness of the anaesthetic was assessed by observing the degree of akinesia, degree of anaesthesia, and presence of ptosis. The visual acuity was then measured again and an afferent pupil defect looked for.

The operations were carried out without complication. Postoperatively the patient was transferred to the recovery room and the visual acuity measured and an afferent defect looked for. The patient was also asked what he had seen from the eye during the operation. A sterile dressing was then applied using an aseptic technique. An afferent pupil defect was looked for and the visual acuity recorded after refractive correction 8 weeks postoperatively.

Results

All patients had a reduction of visual acuity, including five patients (25%) who had no perception of light after the injection; 17 patients (85%) had an afferent pupil defect, 10 minutes after administration of the peribulbar anaesthetic (Table 1). Eighteen patients (90%) had absent ocular movements, two (10%) had slight torsional movements and all had complete ptosis with full analgesia. Postoperatively, on average 1 hour after the injection of the anaesthetic, nine

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Table 1 Visual acuity and the presence of an afferent pupil defect pre and post peribulbar anaesthetic and postoperatively

	Preoperative corrected VA	Pre-anaesthetic VA		Post-anaesthetic VA			Time (minutes)	Postoperative VA			Final VA (best corrected)
		Unaided	Pinhole	Unaided	Pinhole	RAPD		Unaided	Pinhole	RAPD	
1	CF	HM	1/60	NPL	NPL	Yes	60	1/36	1/24	Yes	6/6
2	6/36	1/24	1/24	NPL	NPL	Yes	70	CF	1/36	Yes	6/9
3	6/36	1/24	1/18	NPL	NPL	Yes	87	1/36	1/36	Yes	6/6
4	6/60	1/12	1/9	NPL	NPL	Yes	70	1/24	1/24	Yes	6/6
5	6/24	1/9	1/6	NPL	NPL	Yes	48	CF	CF	Yes	6/6
6	HM	HM	HM	PL	PL	Yes	57	1/24	1/24	Yes	6/6
7	HM	HM	HM	PL	PL	Yes	60	1/36	1/12	No	6/4
8	HM	HM	CF	HM	HM	Yes	62	1/60	1/60	Yes	6/5
9	6/36	1/36	1/24	HM	HM	Yes	60	1/12	1/9	No	6/5
10	6/24	1/9	1/9	HM	HM	Yes	57	1/24	1/18	Yes	6/6
11	CF	1/60	1/12	CF	CF	Yes	70	1/18	1/12	No	6/5
12	CF	1/36	1/36	CF	CF	Yes	60	1/24	1/24	No	6/9
13	6/36	1/9	1/6	CF	CF	Yes	60	1/12	1/12	No	6/5
14	CF	1/24	1/24	1/60	1/60	Yes	58	1/18	1/18	No	6/9
15	6/36	1/18	1/6	1/60	1/36	Yes	50	1/18	1/12	No	6/6
16	6/24	1/24	1/24	1/36	1/36	Yes	60	1/18	1/24	Yes	6/9
17	6/18	1/9	1/5	1/36	1/36	Yes	63	1/12	1/12	No	6/5
18	6/24	1/24	1/24	1/36	1/36	No	50	1/36	1/36	No	6/9
19	CF	1/18	1/12	1/36	1/24	No	50	1/18	1/12	No	6/6
20	6/36	1/9	1/6	1/18	1/18	No	52	1/9	1/6	No	6/6

CF=counting fingers; HM=hand movements; PL=perception of light; NPL=no perception of light; VA=visual acuity; RAPD=relative afferent pupillary defect.

patients (45%) still had an afferent defect but seven (35%) could already notice an improvement in visual acuity. On refraction, 8 weeks later, they all had good acuity and none had an afferent pupil defect.

Peroperatively no patients reported seeing the operating instruments, although four saw visual images described as 'colours' or 'floating liquid' or 'circles of light'; these included the three patients who did not develop an afferent pupil defect.

Discussion

This study has shown a marked effect on the optic nerve, in terms of visual acuity and afferent defect, which is contrary to the results from previous studies showing less of an effect on the optic nerve with peribulbar compared with retrobulbar anaesthesia. The main difference between this study and previous studies was the amount of local anaesthetic solution used. In our study 10 ml were given compared with the study by Levin and O'Connor¹⁰ in which 4 ml of anaesthetic solution were given retrobulbarly and 73% of the patients observed the operating instruments. Ropo *et al*⁹ looked at the effect on the visual evoked potential of retrobulbar and peribulbar anaesthetics using 4 ml of local anaesthetic solution, although in other studies they have used nearer 10 ml of anaesthetic.¹¹ They found marked reductions of the visual evoked potential only with retrobulbar anaesthesia. The method of peribulbar anaesthesia used in our study and the administration of around 10 ml is a technique that produces a very good anaesthetic result as assessed by the absence of ocular movements and good analgesia.¹² Our results suggest that the effect on the optic nerve during retrobulbar or peribulbar anaesthesia is just as dependent on the volume of the anaesthetic used as the exact position of injection. This fits with other work using contrast media and local anaesthesia under computed tomography which showed rapid diffusion of contrast media around the optic nerve within 2 minutes of injection.¹³ It is likely the main effect on the optic nerve is due

to anaesthesia of the nerve but it is possible that part of the effect is due to compression of the nerve by the use of 10 ml of anaesthetic solution. In addition a compressive balloon was applied, but only at a pressure of 30 mm Hg.

No patients saw the operating instruments, which is reassuring for the patient and surgeon, but the three who did not develop an afferent defect had increased visual awareness. Immediately postoperatively seven patients (35%) already had improved visual acuity. This measurement is obviously affected by many factors, such as bleaching of the retina by the operating microscope light, but the effect of the peribulbar anaesthetic is important. Patients who are left unpadding with a clear shield in the postoperative period should be warned that they may not see clearly immediately.

Peribulbar anaesthesia, using a relatively large volume of local anaesthetic solution, produces a significant effect on optic nerve function as detected by visual acuity and afferent pupil defect. This is probably desirable for the patient and surgeon as the patient does not see the operating instruments. Examining for a relative afferent pupil defect appears to be a useful method for predicting which patients may be likely to see through the operated eye peroperatively. Patients should be warned that they may temporarily lose vision completely after peribulbar anaesthesia but they can be reassured that the effect on optic nerve function wears off relatively quickly.

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