A COMPARISON OF FIXED WEIGHT AND DIGITAL MASSAGE TECHNIQUES FOR INTRAOCULAR PRESSURE REDUCTION AFTER PERIBULBAR ANAESTHESIA

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SUMMARY

Objective: To compare the rate of intraocular pressure reduction using two methods of external compression – digital massage and fixed weight – after a peribulbar anaesthetic injection prior to cataract surgery.

Methods: 70 eyes of 70 patients for elective cataract surgery were studied. There were two groups of equal numbers. All received an equal volume of 2% xylocaine injection mixed with 1:1000 Adrenaline (at a dilution of 1:100,000) by the peribulbar method. Both groups received post injection external ocular compression for ten minutes. Pressure reduction was achieved in group A through external digital massage, and group B by application of the McIntyre bag of mercury pressure reducer.

Results: Pressure reduction was faster in group A than in group B. The mean pre-injection IOP was 11.26mmHg (±3.51) in group A and 11.49mmHg (±3.61) in group B. The mean IOP by 5 minutes of compression was 6.57mmHg (±4.37) (range 1-14mmHg) and 11.06mmHg (±5.40)(range 3-26mmHg) for groups A and B respectively. Over 40% of the subjects in group A had an IOP between 0-5mmHg, while only 11% of those in group B had an IOP in this range. After 10 minutes the mean IOP was 3.37 mmHg (±3.12)(range 0-10mmHg) in group A and 8.86mmHg(3.34) (range 1-26mmHg) in group B; 77% of the subjects in group A compared to 29% of those in group B had an IOP in the range of 0-5mmHg.

Conclusion: Pressure reduction in group A was faster and seemed adequate for over 40% of subjects by 5 minutes of compression, further compression till 10 minutes ensures adequate pressure reduction for both groups but more so for digital massage.

Keywords: cataract surgery, peribulbar injection, intraocular pressure, digital massage, standardized compression

INTRODUCTION

The use of peribulbar anaesthesia for cataract extraction is still a popular practice in developing countries including Nigeria.[1,2] The peribulbar procedure involves the injection of the anaesthetic agent into a fixed extraconal space bounded by a rigid orbital wall, which allows a demonstrable intraocular pressure rise.[3-5]

Peribulbar anaesthesia was developed to avoid some of the complications associated with retrobulbar anaesthesia in which the agent is deposited in the intraconal space. Pekka Ruusuvara et al. [6] gave a list of complications following retrobulbar anaesthesia which have been reported by various authors. These include retrobulbar haemorrhage, central retinal artery occlusion, optic neuropathy, bilateral amaurosis, toxic reaction after intravascular injection, brain stem

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anaesthesia (with unconsciousness and ad apnoea) and cardiopulmonary arrest. Peribulbar anaesthesia has been proven as an alternative to the retrobulbar technique.[2] It carries low risk of complications though it is not completely free.[7,8]

Knowledge of the pressure changes that occur in the eye following the injection of a local anaesthetic agent into the orbit is important since raised intraocular pressure (IOP) in open eye surgery can result in unpleasant sequelae. These include bulging forward of the iris-lens diaphragm, vitreous presentation, vitreous loss and expulsive choroidal haemorrhage, which all have adverse effects on postoperative visual outcome.[9] To minimize the occurrence of these events it is desirable to reduce intraocular pressure and have a soft eye before cataract extraction is done. External ocular compression after peribulbar injection tends to neutralize not only the volume-induced rise in intraocular pressure, but also offers the advantage of a faster spread of the agent. This gives smoother anaesthesia and akinesia. The compression can be achieved either by digital massage or by standardized compression using various methods such as Honan's balloon,[5,6] Buy's mercury bag,[1] and pneumatic auto pressor.[10] These standardized instruments exert an external pressure of between 25 and 30mmHg on the globe. These devices are not readily available in operating theatres in many developing countries due to the added cost required to procure them when compared to digital massage which is free of charge. However, it is often wondered if digital massage is as effective as standardized pressure compression in controlling post-anaesthetic injection intraocular pressure (IOP) rise.

The objective of this study was to compare the efficacy of lowering intraocular pressure using standardized method of external compression with that of digital massage after a peribulbar block prior to cataract extraction.

PATIENTS AND METHODS

The study was conducted in the ophthalmic theatres of two hospitals in Oyo State, Nigeria – University College Hospital (UCH), Ibadan and Our Lady's Catholic Hospital, Iseyin. Approval was obtained from the ethical committee of UCH before the commencement of the study. Eighty-nine patients admitted for cataract extraction under local anaesthesia, irrespective of their age, were screened for the study, but only 70 qualified. Before the screening exercise, informed consent was obtained along with the routine consent for cataract surgery. Patients who had other problems with their eyes were excluded from the study. Eight of the patients had co-existing glaucoma, 3 had previous ocular surgery (trabeculectomy), and 4 had secondary cataract (post-uveitic and traumatic). Those who developed peribulbar haemorrhage (2) as well as two patients who refused to participate (for fear of damage to their eyes) were also excluded (see table 1).

The patients were consecutively allocated to two groups (A and B); the first group (A) were assigned to have digital massage, while the other group (B) was for McIntyre standardized compression. Peribulbar anaesthesia using 5ml of 2% lignocaine mixed with adrenaline (1: 100,000 dilution) was administered to all the patients with a 30mm long 23G needle. Each patient was instructed to look away from the injection site and 3ml of the agent was delivered into the lower outer quadrant, 2ml was delivered into the inner upper quadrant. The landmark for the first site was above the junction of the middle and lateral third of the inferior orbital margin. The second was at the junction of the nasal and middle third of the superior orbital margin. The injections were given through the skin. Facial block was achieved by the injection of 5ml of the agent using the O' Brien method.

Table 1. Patient selection

Category of eye	Number
Total number of eyes screened	89
Co-existing glaucoma	8
Previous ocular surgery	3
Secondary cataract	4
Peribulbar haemorrhage	2
Refusal to participate	2
Total number excluded	19
Total number selected	70

One half of the patients (group B) then received external standardized compression using the McIntyre mercury bag, well positioned over the closed eye, secured in place with the headband, and left for ten minutes. The mercury bag exerts an external pressure of 25-30mmHg. For the second group of 35 patients (group A), the eye was massaged with the middle and index fingers of both hands, the index fingers resting directly over the cornea with the eyelids closed. Firm pressure was applied for two seconds and released for 2 seconds. This action was repeated for 10 minutes. At the 5th and 10thminutes, the intraocular pressure was measured. An assistant kept the time. The intraocular pressure was measured using the handheld Perkin's applannation tonometer immediately before and after administering the blocks. After 5 and 10 minutes of compression, the intraocular pressure was again measured.

The results obtained were analysed using both the student's T- test and simple proportions.

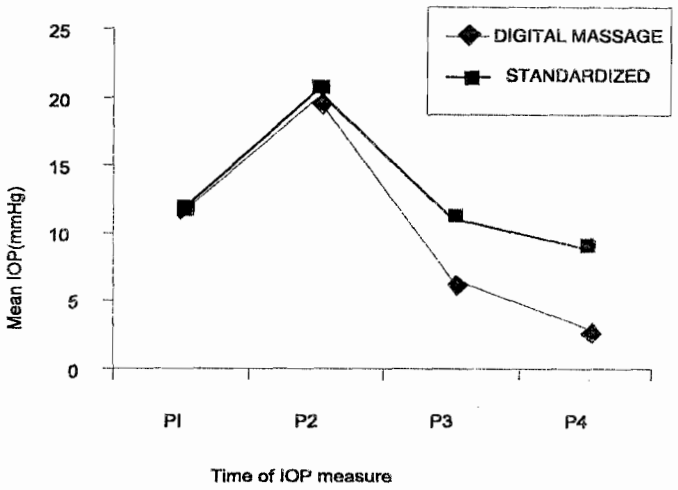
RESULTS

A total of 70 eyes of 70 patients were studied. Of these patients, 37 (52.9%) were men and 33 (47.1%) were women. The modal age group was 70 years and above (44.2%). There was a near even distribution of subjects by age and sex in the 2 groups, with 19 men in Group A and 18 in group B, while there were 16 women in group A and 17 in group B.

The mean pre-injection IOP was 11.26mmHg(±3.51) in group A and 11.49mmHg (±3.61) in group B. The immediate post-injection mean IOP was 19.94mmHg (±7.93) for group A and 20.54mmHg (±9.58) for group B. The IOP recorded after 5 minutes of compression ranged from 1-14mmHg in group A (mean 6.57 mmHg), 15 eyes (42.9%) already had pressure less than 6mmHg compared to only 4 eyes (11.43%) in group B (mean, 11.06 mmHg and range 3-26mmHg). The difference in the mean pressure between these two groups after 5 minutes of compression was statistically significant (P= 0.0003). Table 2 shows the intraocular pressure changes of the studied eyes over time, following ocular compression.

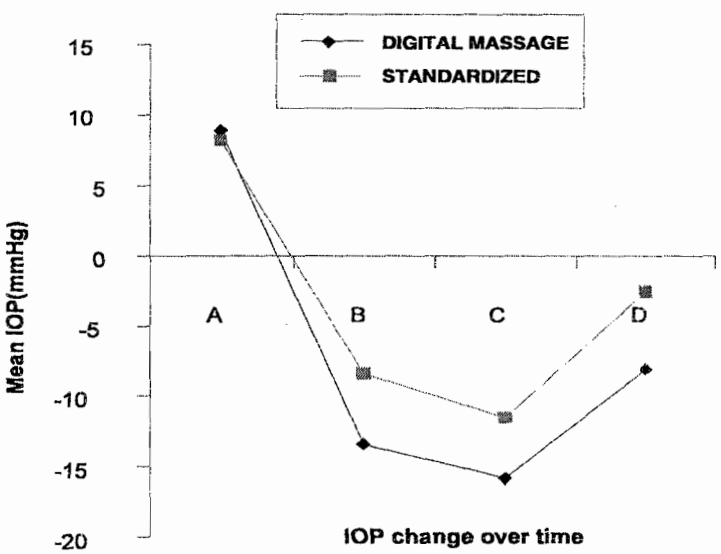
After 10 minutes of external compression, the IOP recorded in group A ranged from 0mmHg to 10 mmHg (mean 3.09mmHg in table (±3.12). This was a drop of 16.57 mmHg from the immediate post-injection mean IOP of 19.94mmHg. More than half (77%) of the eyes that received digital massage were also observed to be in the 0-5mmHg pressure range while only 10 (29%) eyes were in 0-5mmHg range in group B. The IOP range in group B at this time was from 1 to 26 mmHg, with a mean of 8.86mmHg, representing a drop of 11.68 mmHg from the immediate post-injection mean pressure of 20.54 mmHg. The difference in the mean IOP of the two groups after 10 mins of compression was significant (P = 0.000). The IOP recorded over time and the mean changes are shown in figures 1 and 2 respectively.

It must be mentioned that 5 eyes had rather poor akinesia after the block; they had full extraocular muscle movement. Interestingly, these eyes had no rise whatsoever in their IOP following the injection. They had to be given additional injections for adequate anaesthesia.



P1 = Pre-injection
P2 = Post-injection
P3 = After 5 mins of compression
P4 = After 10 mins of compression

Figure 1. Mean IOP (mmHg) recorded at various intervals in both groups



A = Mean rise following injection
B = Mean fall following 5mins of compression from post-injection pressure
C = Mean fall following 10mins of compression from post-injection pressure
D = Mean fall from pre-injection at 10mins

Figure 2. Mean IOP (mmHg) change over time

DISCUSSION

Hypotony is desirable before cataract extraction to minimize the chances of vitreous loss and the resultant effects, as well as other undesirable sequels of high intraoperative IOP. External compression using various methods, including the use of digital eye massage, has been demonstrated to be capable of achieving this.[11] This study has demonstrated that there is a mean rise in IOP immediately after peribulbar injection.[4] Both methods of external compression used in this study brought about an appreciable and significant reduction in the intraocular pressure. The mean fall was, however,

higher in the patients who received digital massage (group A) compared to the patients (group B) who received external compression with a fixed standard weight (see table 3).

The mean IOP at 5 minutes and at 10 minutes of compression showed statistically significant differences between the two groups. Over 40% of the eyes massaged, compared to 11% of the eyes that had standardized weight compression, had IOP less than 6mmHg and were optimally hypotonic after 5 minutes of compression. The proportion of eyes that had IOP less than 5mmHg after 10 minutes compression was 77% for the massage group compared to 29% for the standard weight group. It would therefore appear that 10 minutes of digital massage is ideal, while this duration may not be sufficient for some patients exposed to fixed weight compression. The advantage of digital massage over the standardized method is its ready availability and accessibility. It is also easy to administer, however, assistance would be required from an anaesthetist or trained assistants to administer the blocks and apply the digital massage. The disadvantage here is the tying down of the hands that could have been engaged in some other activity. With appropriate division of labour however, this may not pose too much of a problem.

The reason for the difference in the IOP-lowering effect of the two methods probably has to do with the difference in the amount of pressure exerted. Digital massage is not standardized and most likely has a higher pressure effect. Unfortunately, it was not possible

Table 2. Distribution of IOP at different stages of anaesthetic injection and external compression

IOP (mmHg)	Number of eyes							
	P1		P2		P3		P4	
	GPA	GPB	GPA	GPB	GPA	GPB	GPA	GPB
0-5	1	0	0	0	15	4	27	10
6-10	15	20	3	1	15	16	8	15
11-15	15	9	8	11	4	9	0	6
16-20	4	6	9	12	1	4	0	3
21-25	0	0	6	5	0	1	0	1
26-30	0	0	4	3	0	1	0	1
>30	0	0	5	3	0	0	0	0
Total	35	35	35	35	35	35	35	35

P1=Pre-injection pressure; P2= Post-injection pressure; P3=Pressure after 5 mins of compression; P4=Pressure after 10 mins of compression; GPA=Group A who received digital massage.; GPB=Group B who received standardized compression

Table 3. Comparing mean IOP and P values in both groups

Variable	Group A		Group B		P-value
	IOP	SD	IOP	SD	
(A) Pre-injection IOP	11.26	3.51	11.49	3.61	0.77
(B) Post-injection IOP	19.94	7.93	20.54	9.58	0.77
(C) IOP after 5 minutes of external compression	6.57	4.37	11.06	5.40	0.0003
(D) IOP after 10 minutes of external compression	3.09	3.12	8.86	3.34	0.0000
(B-A) change in IOP	8.68	7.57	8.08	8.92	0.08
(C-B) change in IOP	-13.37	6.70	-8.48	7.40	0.000
(D-B) change in IOP following	-15.85	6.61	-11.58	7.01	0.003
(D-A) change in IOP	-8.17	4.09	-2.63	5.45	0.00006

to measure the amount of pressure applied digitally in this study. Digital pressure applied may also vary greatly between administering individuals and may thus be near impossible to standardize.

This presumably high pressure by digital massage may be enough to induce retinal vascular occlusion, however, the intermittent release employed in this study would most likely prevent this by re-establishing circulation adequately and promptly in between compression periods, thus preventing permanent occlusion and damage. It would however, be expedient to find a way of regulating the amount of pressure exerted through the use of a pressure gauge connected to the eyes to measure the pressure exerted as the globe is massaged. This gadget would ensure that the pressure applied is not excessive, and would thus prevent possible complications such as lens dislocation.

CONCLUSION

Digital ocular massage compared to fixed volume weight is more effective and acts faster in lowering intraocular pressure prior to cataract extraction after peribulbar block. It appears to be ideal and should be recommended for centres that handle large numbers of cataract extraction, especially in low-income economies, since no extra cost is required for pressure-lowering devices.

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