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Original Research Article

Preoperative pain associated with peribulbar injection for cataract surgery

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ABSTRACT

Background: Patients admitted for cataract surgery have a fear of worst pain due to peribulbar injection for anaesthesia rather than surgery itself. The aim of this study is to find out the threshold of pain associated with the anaesthetic peribulbar injection for cataract surgery.
Methods: This prospective randomised study was carried out at Ophthalmology department of Maharishi Markandeshwar University from 10 January 2017 to 22 March 2017. 100 patients undergoing elective cataract surgery were administered a peribulbar block. Before injection all patients were briefed about the procedure and counselled regarding the degree of pain that they may experience. Patients were asked to grade the pain of peribulbar anaesthetic injection, using a Visual Analogue Scale (VAS).
Results: Focus of the study was on the degree of pain associated with anaesthetic peribulbar injection for cataract surgery. 100 patients (60 males and 40 females) were included in the study. 90 (90%) patients were having their first surgery, they were more apprehensive especially about the injection associated pain. 10 (10%) patients with history of previous cataract surgery were calm, confident and claimed that they felt no pain at all. 92 (92%) patients had just needle prick lead to heaviness or mild pain. Only small percentage of patients i.e. 8 (8%) had injection associated moderate to severe pain.
Conclusions: The study revealed that the peribulbar anaesthesia for cataract surgery is safe and highly effective. The degree of pain associated with peribulbar injection is much less than what the patients actually have in their mind and fear of. The study also shows 'pain threshold' and anxiety level as major factors for pain perception.

Keywords: Pain threshold, Peribulbar anesthesia, Visual Analogue scale

INTRODUCTION

Cataract surgery is almost exclusively performed in local anaesthesia. Regional anaesthesia for eye surgery has traditionally consisted of retro bulbar block, peribulbar block, a facial nerve block and intravenous sedation. Various local anesthetic techniques have evolved since then including both akinetic (needle-/cannula-based technique) and non-akinetic (topical anaesthesia) techniques.[1-3] It should, however, be taken into account that topical anaesthesia does have its own limitations. As a process, it lays a high emphasis on patient co-operation in addition to the surgeon's skills on the table; studies also indicate that patients have a preference to the akinetic technique.[4] General anaesthesia with endotracheal intubation is likely to be associated with postoperative nausea. Both the techniques achieve akinesia of the eye quite well. The effectiveness of regional block for cataract surgery has traditionally been assessed by describing the completeness and adequacy of globe akinesia (prevention of eye movement) and pain control. Advantages of the peribulbar technique include minimum

risk of globe, optic nerve and artery penetration, and less pain on injection. The pain often experienced during peribulbar injection for local anaesthesia is partly related to the needle prick and partly to the solution injected and it's PH (true for solutions with adrenaline). The Visual Analogue Scale (VAS) was used to grade the intensity of pain or how much pain the patient was feeling. VAS is a straight line marked from 0 to 10, with the left end of the line '0' representing no pain and the right end of the line '10' representing the worst pain. Patients are asked to mark on the line where they think their pain is.[5]

Objectives of anesthesia in intraocular surgery

- Akinesia of globe and lids
- Anaesthesia of globe and lids
- Control of intraocular pressure
- Control of systemic blood pressure
- Relaxation of patient
- Smooth emergence
- Adequate post operative analgesia

Relevant anatomy

Orbit

The orbit is an irregular four-sided pyramid. The medial wall of each orbit lies parallel to the contralateral medial orbital wall. The lateral wall of each orbit forms a 90° angle with the contralateral lateral orbital wall. The medial wall is separated from the ethmoid sinus by a very thin portion of the ethmoidal bone called the lamina papyracea. Perforation of the medial wall by a needle may result in orbital cellulitis or abscess.

Globe

The globe is situated in the anterior part of the orbital cavity closer to the roof than the floor and nearer the lateral wall than the medial wall. Axial length of 26 mm or more denotes a myopic eye and they carry risk of one perforation for every 140 needle blocks performed.[6]

Extraocular muscles

Globe movements are controlled by the rectus muscles (inferior, lateral, medial and superior) and the oblique muscles (superior and inferior). The rectus muscles arise from the annulus of Zinn near the apex of the orbit and insert anterior to the equator of the globe, forming an incomplete cone (Figure 1).

Nerve supply

Within the muscle cone lie the optic nerve (II), oculomotor nerve (III), abducens nerve (VI nerve), nasociliary nerve (a branch of V nerve), ciliary ganglion and blood vessels. The oculomotor nerve supplies the levator palpebrae muscle, inferior oblique, superior, inferior and medial rectus. The abducens nerve supplies the lateral rectus. The trochlear nerve (IV nerve) supplies the superior oblique muscle. This muscle is frequently not paralyzed as anaesthetic agents often fail to block IV nerve, which lie outside the muscle cone. Corneal and perilimbal conjunctival and superonasal quadrant of the peripheral conjunctival sensations are mediated through the nasociliary nerve. The remainder of the peripheral conjunctival sensation is supplied through the lacrimal, frontal and infraorbital nerves coursing outside the muscle cone.

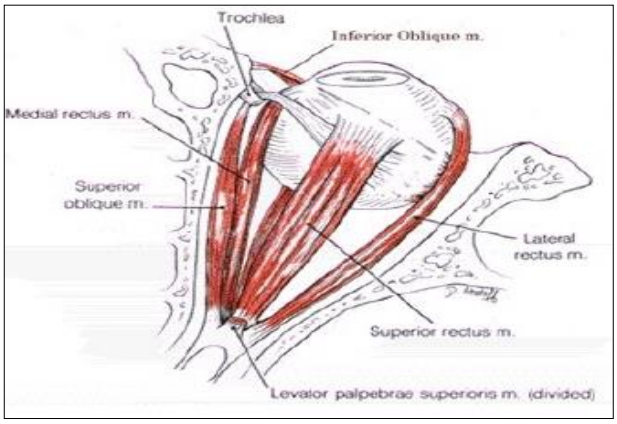

Figure 1: Relevant anatomy of extraocular muscles of eye.

Techniques of peribulbar block

- The peribulbar block is performed with the patient supine and looking directly ahead. After topical anaesthesia of conjunctiva an inferotemporal injection is given half way between the lateral canthus and the lateral limbus.
- The needle is advanced under the globe parallel to the orbital floor and when it passes the equator of the eye it is directed slightly medial (20 degree) and cephalad (10 degree), injecting 5ml local anaesthetic solution (Figure 2).
- In peribulbar block the needle does not penetrate the cone formed by extra-ocular muscles, as in retro bulbar block.

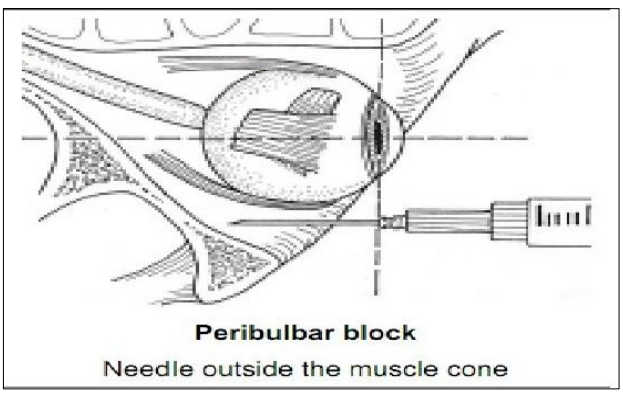

Figure 2: Techniques of peribulbar block.

Guiding of needle

The needle should be slowly advanced, stopping immediately

- If there is tugging movement of the globe which indicates snagging of needle on sclera or extra ocular muscle.
- If there is severe pain or resistance to injection either of which indicates injection to globe.

Complications

Peribulbar block is one of the regional anesthesia technique that used for providing anaesthesia and akinesia in ophthalmic surgery. With a local anaesthetic agent administered into the extraconal compartment of the eye, risk of optic nerve damage is avoided. Therefore, more anaesthetic agent is needed. Peribulbar block is frequently preferred for its low rate of complications before ophthalmic surgery despite its disadvantages such as requiring more than one injection and a larger volume of local anaesthetic agent.[7] Although peribulbar block is theoretically considered to be much safer and easier to apply, some cases of brainstem anaesthesia after peribulbar block have been reported in the literature.[8,9] The complications are as follows:

- Venous orbital Hemorrhage
- Arterial orbital hemorrhage
- Oculocardiac incidence
- Allergic reaction
- Ophthalmoplegia-direct damage to the extraocular muscle or its nerve
- Globe perforation
- Optic nerve damage

METHODS

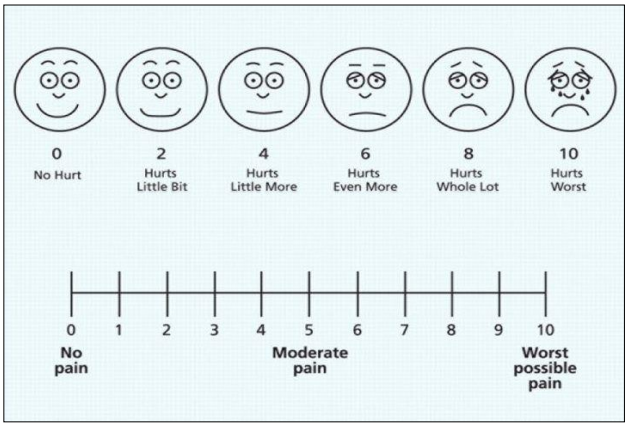

Figure 3: Visual Analogue scale.

This randomized study was carried out in Ophthalmology department in 100 patients (60 male and 40 female) between the ages of 40 to 85 years patients undergoing elective cataract surgery were administered a peribulbar block. It was given at the junction of middle and lateral third of lower lid using 5ml syringe having 23 gauge local anesthetic solution of 2.5ml 2% Lignocaine with adrenaline 1:1000 and 2.5ml 0.5% bupivacaine was used. Before injection all patients were briefed about the procedure and counseled regarding the degree of pain that they may experience. Patients were asked to grade the pain in a visual analogue scale (VAS) (Figure 3) and were given a questionnaire to evaluate their experience in terms of pain, surgical experience, and complications.

RESULTS

Patients were assessed on the basis of gender, including history of cataract surgery, pain level threshold using a Visual Analogue Scale (VAS).100 patients were included in the study, 60 (60%) male and 40 (40%) female (Table 1) out of which 10 patients (10%) had previous cataract surgery. They were more confident, calm and composed before their surgery. 90 (90%) patients undergoing surgery for the first time were more worried and anxious about the peribulbar injection and its associated pain rather than the surgery itself.

Table 1: Gender wise distribution of patients.

Gender	No of Patient	Percentage %
Male	60	60
Female	40	40
Total	100	100

Table 2: Frequency distribution of peribulbar injection pain in visual analogue scale.

Analogue Scale	No of patient	Percentage %
0.00	10	10
1.00	60	60
2.00	20	20
3.00	2	2
4.00	2	2
5.00	2	2
6.00	1	1
7.00	1	1
8.00	1	1
9.00	1	1
10.00	0	0
Total	100	100

Analogue scale reveals that 10 patients (10%) claimed that they had no pain at all and marked ‘0’ on visual analogue scale (VAS) because of previous experience of cataract surgery. 60 patients (60%) graded their pain ‘1’ on visual analogue scale (VAS), when they were asked to explain, they had just needle prick sensation. 20 patients (20%) felt heaviness and graded their pain ‘2’. 2 patients (2%) had mild pain so marked ’3’ on visual analogue scale (VAS). Only 8 patients (8%) had moderate to worst pain and graded their pain from ‘4’ to ‘9’ on visual analogue scale (VAS).

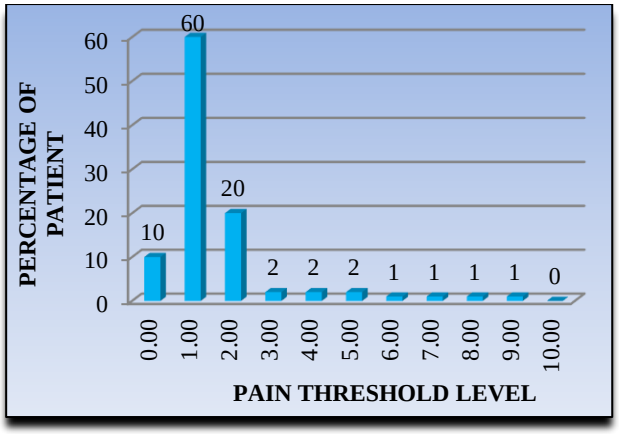

Figure 3: Pain threshold level of peribulbar injection pain.

Hence most of our patients i.e. 92 patients (92%) claimed (Table 2 and Figure 4) NO to mild pain i.e. '0'-'3' on visual analogue scale (VAS).

DISCUSSION

Cataract surgery is almost exclusively performed as an out-patient in local anaesthesia. The use of local anaesthesia has risen from around 20% in 1991 to over 75% in 1996 and 86% in 1997 and the use of sedation with local anaesthesia has fallen from 45% in 1991 to 6% in 1996.[10] The peribulbar block is performed with the patient supine and looking directly ahead. In peribulbar block the needle does not penetrate the cone formed by extra-ocular muscles, as in retro bulbar block. Both the techniques achieve akinesia of the eye quite well.

Advantages of the peribulbar technique include minimum risk of globe, optic nerve and artery penetration, and less pain on injection. Disadvantages include a slower onset and an increased likelihood of ecchymosis.[11]

Local anaesthetic used for nerve block must cross perineural sheath and nerve membrane. These structures are permeable to these agents only in non ionized form. Alkalinisation of anaesthetic agent also contributes to the reduction of pain in peribulbar injection due to many reasons. Firstly adjustment of pH towards 7.0-7.4 reduces direct tissue irritation caused by injection of acidic solution. Secondly, the increased relative concentration of non ionised form allows for a more rapid diffusion through tissues and results in immediate nerve blockade. Thirdly nocioceptor receptors may be less sensitive to non ionised form.

Regarding pain associated with administration of block, there was obvious evidence that peribulbar block was slightly less painful than retro-bulbar block and weak evidence that sedation or analgesia improves anxiety level, pain relief and patient satisfaction during cataract surgery and that one sedative or analgesic agent was superior to the other.[12]

The pain experienced during injection is also related to the temperature of Injectate and speed of delivery of the solution. Slow administration results in a lower incidence of satisfactory akinesia.

Alkalinisation of local anaesthetic agent with bicarbonate increases the amount of non ionised form, lipid solubility and despite ionised form being active in solution, penetrate the membrane and tissues faster.[13] However there is some evidence that adding preservative free sodium bicarbonate to the local anaesthetic solution reduces the discomfort on injection.[14,15]

CONCLUSION

In this study, Table 2 revealed that majority of the patients 60 (60%) had just needle prick sensation, i.e. '1' on visual analogue scale (VAS) and only few patients experienced severe pain '8' and'9'on visual analogue scale (VAS).The degree of pain associated with peribulbar injection is much less than what the patients actually have in their mind and fear or had a previous cataract surgery. The study also shows 'pain threshold' in visual analogue scale (VAS) which proves that it is safe and highly effective. Topical anesthesia is applied as drops or gels and may be if supplemented by intracameral injection by the surgeon for better intraoperative pain control.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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