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Original Research Article

To compare peribulbar and subtenon anaesthesia in patients undergoing cataract surgery

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ABSTRACT

Purpose: To compare peribulbar and subtenon anaesthesia in patients undergoing cataract surgery.
Materials and Methods: In a hospital based randomised comparative interventional study, patients who underwent cataract surgery were randomised into two groups, one receiving peribulbar and the other subtenon anaesthesia. Pain during administration, pain during surgery, chemosis, subconjunctival haemorrhage globe akinesia were noted and compared in the two groups. Any other complications which occur also noted.
Result: The pain during administration was significantly lesser in subtenon injection as compared to peribulbar anaesthesia. Pain during surgery was comparable in the two groups. Incidence of subconjunctival haemorrhage and chemosis was more in subtenon injection as compared to peribulbar anaesthesia. Globe akinesia was achieved more effectively in subtenon injection as compared to peribulbar injection.
Conclusion: The subtenon anaesthesia is comparable to peribulbar anaesthesia with few additional advantages and is recommended as safe and effective alternative to peribulbar anaesthesia for cataract surgery.

1. Introduction

Cataract is the major cause of treatable blindness after the age of 50 yrs in India and also in the world. No preventive or therapeutic treatment for cataract is available. Hence surgical treatment remains the only viable option. An uneventful cataract surgery is the aim as it is the most commonly performed surgery in ophthalmology and a perfectly performed operation may bless a person with good sight or a complicated one may render him in trouble. To accomplish this successfully, in addition to other conditions being ideal for cataract surgery, a good anaesthesia is required for such an event. As most of the cataract surgery is done is elderly population who can experience many complications of general anaesthesia, eye surgery in these patients is mostly performed under local anaesthesia.

Local anaesthesia involves infiltration of the area around a nerve with an anaesthetic agent for providing blockage of the nerve.[1]

The recent advances in anaesthetic agents and surgical instruments such as blunt subtenons canula along with modification in routes and techniques of administration have led to increase in use of local anaesthesia in cataract surgery. The high rate of success and wide margin of safety has popularised regional anaesthesia in ophthalmic surgery.[2]

Day care surgeries are possible because of quicker recovery of patients thereby reducing the cost of surgery.[3] Cataract patients being elderly usually have multiple co-morbidities and multiple drug use.[4] So to ensure patient safety and comfort, various anaesthetic techniques have been focussed by researchers.[5]

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In earlier times, retrobulbar anaesthesia was the mainstay for cataract surgeries.[6] The onset of effect is fast and requires only a small volume of anaesthetic agent. But it can have some vision threatening complications like globe perforation, retrobulbar haemorrhage and brainstem anaesthesia.[7,8]

Peribulbar anaesthesia is safer alternative but has the disadvantage of use of greater quantity of anaesthetic agent sometimes in the form of supplementation and the rate of onset of akinesia is also slower.[9–13]

A new technique was introduced of injecting local anaesthetic directly in subtenons space in the inferonasal quadrant using blunt 19 gauge cannula in cataract surgery and was reported as simple reliable technique offering excellent anaesthesia and avoiding use of sharp instruments into the orbit.[14]

Susruta in 600 BC practiced couching, the earliest surgical technique in which lens was displaced into vitreous cavity. It is interesting that Hindus practiced a safer method of couching than Greeks. In the Hindu method of couching the sclera was pierced with the help of a sharp lancet and then a blunt instrument was introduced into the anterior chamber, the side of which could be used to depress the lens into vitreous cavity while Greeks used one sharp instrument because of which the capsule was often ruptured and complications subsequently developed.

Daviel J in 1745 was the first to perform a planned extraction of cataract from its natural position by means of a limbal incision. He first performed an incision at the lower limbus with a triangular knife and this was enlarged on either side with the help of curved scissors. A spatula was then placed between the iris and the lens to loosen the lens and the cataract was expressed by gentle pressure.

When popularity of extracapsular cataract extraction became a commonly performed surgery, a new technique was introduced by Kelman CD called phacoemulsification for removing nucleus of the cataractous lens. Here the lens is emulsified by an ultrasonic titanium probe, after which the irrigation and aspiration done simultaneously through the same tip. It has its own limitations like the higher cost and difficulty in learning the technique.

Since 1989, Davis D.B II and Mandel MR have been performing peribulbar injection for all intraocular surgeries. They performed peribulbar anesthesia in over 4000 cases without complications. Their technique of peribulbar anesthesia had two parts, an initial superficial injection, and a deep peribulbar injection. The peribulbar injection is given at the junction of lateral 1/3rd and medial 2/3rd of the inferior orbital rim through skin. The volume of anaesthetic agent used is 6-10 ml. The injection is followed by application of super pinky ball for 10-30 minutes. The needle used was Thorton 23 or 25 gauge 7/8" needle. They observed that while learning the technique incomplete block may occur in 30-40% of cases and anaesthesia and akinesia typically appear after 8-15 minutes. Surgeon reported requirement for supplemental injection 2-30% of time and requirement for third injection in 5% of cases. In the study they reported that an incomplete anesthesia occurred in less than 10% of cases.

Tenon's capsule is a dense fibrous layer of connective tissue surrounding the globe and extraocular muscles. Local anaesthetic when given in the posterior aspect of this space spreads along extraocular muscles and diffuses into the retrobulbar space. This technique of subtenon anaesthesia uses a blunt probe (curved lacrimal cannula) to instill local anaesthetic into posterior subtenon's space hereby avoiding sharp needles blindly placed in the orbit or retrobulbar space. It is painless to perform and provides reliable anaesthesia with minimal risk of serious complications.

2. Materials and Methods

The study was conducted in the upgraded department of Ophthalmology, Govt. Medical College Jammu and MH Wellington on patients complaining of diminution of vision due to cataract between January 2019 to June 2020 after obtaining clearance from ethical committee of the institute in accordance with the ethical principles of the Declaration of Helsinki. Total of 200 cases were studied and divided into two groups of 100 each.

Group A: 100 patients undergoing cataract surgery under peribulbar anaesthesia.

Group B: 100 patients undergoing cataract surgery under subtenon anaesthesia.

The patients underwent either Phacoemulsification or small incision cataract surgery with intraocular lens implantation.

2.1. Study design

Prospective randomized clinical observational study.

2.2. Exclusion criteria

1. Age less than 30years and more than 90 years
2. Any history of allergy to lignocaine
3. Patient not willing to or unable to give informed consent
4. Patient who has undergone any other intraocular surgery
5. Previous history of intraocular inflammation or trauma
6. Associated other intraocular disease
7. Patient unable to understand the visual analogue pain scale.

Peribulbar anaesthesia: Four ml of 2% lignocaine mixed with hyaluronidase 150IU/ml was injected at the junction of middle and outer third of orbital margin with the needle directed towards the floor of orbit using 24 gauge sharp needle. A supplementary injection of four ml was given at

the supraorbital notch with needle directed towards orbital roof. The eyelid was closed and massaged for 5 minutes.

Subtenon anaesthesia: Proparacaine eye drop was put in the eye to be operated on. The periocular region and the eyelids were painted with povidone iodine 5%. After draping, a lid speculum was inserted for good exposure and the patient was told to look in upward and outward direction. Westcotts scissor was used to make a small conjunctival nick, 4mm from limbus. Through the nick, the scissors were skewed to do blunt dissection and create a path in the subtenons space. A 20 Gauge curved cannula attached to 5ml syringe was inserted and glided along the contour of the globe. One ml of 2% lignocaine mixed with 150 IU/mlof hyaluronidase was slowely injected in the subtenon space and if resistance encountered then the direction of the cannula was changed so that the anaesthetic could flow freely in the subtenons space

Visual analogue pain scale: The patients were asked to grade the pain they felt on a linear scale of 0-4. They were asked to grade the pain separately during administration of anaesthesia and pain during surgery.

Grade 0: No pain

Grade 1: Mild pain

Grade 2: Moderate pain

Grade 3: Severe pain

Grade 4: Maximum pain imaginable.

Chemosis: The chemosis was graded as follows

Grade 0: No chemosis

Grade 1: Chemosis involving one quadrant

Grade 2: Chemosis involving two quadrants

Grade 3: Chemosis involving three quadrants

Grade 4: Chemosis involving four quadrants

Subconjuctival haemorrhage: It was graded as follows

Grade 1: Subconjuctival haemorrhage involving one quadrant

Grade 2: Subconjuctival haemorrhage involving two quadrants

Grade 3: Subconjuctival haemorrhage involving three quadrants

Grade 4: Subconjuctival haemorrhage involving four quadrants

Ocular movements (Akinesia): Measurement was performed by independent assessors who were unaware of the technique of anaesthesia given to the patient. The ocular movements were measured in all four quadrants using a transparent ruler with reference point of the limbus of the respective quadrant, zero of the ruler was aligned and the patient was asked to look in that direction and extent of movement was noted.

Score 0: No movement

Score 1: Mild movement (Upto 2 mm)

Score 2: Moderate movement (Upto 4mm)

Score 3: Severe movement (More than 4mm)

This was checked in all four quadrants so the least possible score was 0 and the maximum possible score was 4x3=12.

2.3. Statistical analysis

In order to test association between different variable the chi-square and student t-test were taken into account and $p<0.05\%$ was considered statistically significant.

3. Results

Two hundred eyes comprising of 100 right eyes and 100 left eyes were studied. There was no statistical significant difference either in the eye operated (P=0.96) or in the gender affected (P=0.56).

3.1. Pain during anaesthesia

In group A, pain grade-0 was seen in 36(36%) patients, grade-1 in 54(54%) patients. In group B, pain grade-0 was seen in 78(78%) patients, grade-1 in 18(18%) patients. Chi square test shows significant difference between both groups for grade 0 and 1 ($p<0.0001$).

Pain during surgery was comparable in both groups. No significant difference was found ($p>0.05$).

Chemosis was found more in the group of patients receiving subtenon anaesthesia. The p value was 0.021 hence significant.

Subconjuctival haemorrhage was found more frequently in the cases receiving subtenon anaesthesia as compared to the peribulbar anaesthesia. The p value was 0.0415 hence significant.

Akinesia was found statistically significant ($p<0.001$) better with subtenon anaesthesia as compared to the peribulbar anaesthesia.

4. Discussion

In the present study the patients who received peribulbar anaesthesia had grade 0 pain in 36(36%) of patients and the ones receiving subtenon anaesthesia had 78(78%) patients with grade 0 pain. Chi square test shows significant difference between both groups as for the pain during administration for grade 0 and grade 1 ($p<0.0001$), for grade 2($p=0.009$) and for grade 3 ($p=2$) by figure exact test. There being statistically significant difference for grade 0 and 1. Study by Briggs et al,[15] in the united kingdom showed that pain during administration is more in peribulbar anaesthesia in comparison to subtenon anaesthesia($p<0.05$). Parkar T et al. compared the two and reported 35.2% of peribulbar anaesthesia and 77.5% of subtenon injection group experienced no pain during administration of anaesthesia.

In this study pain during surgery was grade 0 in 88(88%) of patients receiving peribulbar injection and 90 (90)%

Table 1:

Grade of pain during anaesthesia	No. of cases of group A	%age	No. of cases of group B	% age	Total No. of cases	% age
Grade-0 (No pain)	36	36%	78	78%	114	57%
Grade-1 (Mild pain)	54	54%	18	18%	72	36%
Grade-2 (Moderate pain)	6	6%	2	2%	8	4%
Grade-3 (Severe pain)	2	2%	2	2%	4	2%
Grade-4 (Maximum pain)	2	2%	0	0%	2	1%

Table 2:

Grade of pain during surgery	No. of patients in Group A	%age of patients in Group A	No.of patients in Group B	%age of patients in Group B	Total no. of cases	%age
Grade 0	88	88	90	90	178	89
Grade 1	10	10	10	10	20	10
Grade 2	0	0	0	0	0	0
Grade 3	2	2	0	0	2	1
Grade 4	0	0	0	0	0	0
Total	100	100	100	100	200	100

Table 3:

Grade of Chemosis	No. of patients in Group A	%age of patients in Group A	No. of patients in Group B	%age of patients in Group B	Total no. of cases	%age
Grade 0	22	22	66	66	88	44
Grade 1	18	18	30	30	48	24
Grade 2	20	20	4	4	24	12
Grade 3	24	24	0	0	24	12
Grade 4	16	16	0	0	16	8
Total	100	100	100	100	200	100

Table 4:

Grade of subconjunctival hemorrhage	No. of patients in Group A	%age of patients in Group A	No. of patients in Group B	%age of patients in Group B	Total no. of cases	%age
Grade 0	32	32	66	66	98	49
Grade 1	28	28	24	24	52	26
Grade 2	18	18	10	10	28	10
Grade 3	16	16	0	0	16	8
Grade 4	6	6	0	0	6	3
Total	100	100	100	100	200	100

Table 5:

Grade of Akinesia	No. of patients in Group A	%age of patients in Group A	No. of patients in Group B	%age of patients in Group B	Total no. of cases	%age
Grade 0	0	0	64	64	64	32
Grade 2	0	0	18	18	18	9
Grade 4	8	8	16	16	24	12
Grade 6	10	10	2	2	12	6
Grade 8	38	38	0	0	38	19
Grade 10	42	42	0	0	42	21
Grade 12	2	2	0	0	4	1
Total	100	100	100	100	200	100

of patients receiving subtenon anaesthesia. It was not statistically significant. There have been similar studies done by Azmon et al[16] from Israel, Budd et al[17] from United kingdom, Parker et al.[18] from India and Al Yousuf[19] from Bahrain showing that patients experienced similar level of pain intraoperatively.

In the present study, statistically significant chemosis (P=0.005) was found in subtenon injection in comparison to peribulbar injection. Budd et al.[17] also concluded in his study that chemosis was more commonly found in subtenon injection as compared to peribulbar injection.

In this study subconjunctival haemorrhage after anaesthesia was more common in subtenon injection as compared to peribulbar injection as shown by Budd et al.[17] and Parker et al.[18] This can be explained on the basis that during dissection of subtenonspace there can be severance of the subconjunctival blood vessels. These complications however did not cause any problem in the surgery.

Akinesia of the globe was achieved in a statistically significant proportion in subtenon injection as compared to peribulbar injection as shown by some authors.[19–21] Some authors[16–18] reported that globe akinesia was comparable in the two techniques. This may be explained due to the different quantities of anaesthetics used in different studies. But, in the study conducted by Al-Yousuf[19] of Bahrain, who used equal quantities of both anaesthetics in two groups concluded that better akinesia was achieved by subtenon anaesthesia when compared with peribulbar anaesthesia.

No cases of sight threatening complication like perforation of globe, optic nerve injuries, brainstem anaesthesia, retrobulbar haemorrhage or central retinal arterial or vein occlusion were there. Also no incidence of life threatening complications were present as found in other studies.[16–22]

5. Conclusion

This study shows that the subtenon injection was more comfortable to the patient during administration. It also reduced time interval between administration of anaesthesia and surgery with no compromise of quality. Also lesser amount of anaesthetic was used in subtenon injection compared to peribulbar injection. Hence reducing the cost burden in a large hospital or community eye centre. But chemosis and subconjunctival haemorrhage were found more commonly in subtenon injection in comparison to peribulbar injection which did not cause any hindrance in surgery.

So subtenon anaesthesia is comparable to peribulbar anaesthesia with few additional advantages and is recommended as safe and effective alternative to peribulbar anaesthesia for cataract surgery.

6. Source of Funding

None.

7. Conflict of Interest

The authors declare that there is no conflict of interest.

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