

Safety and Efficacy of Subtenon Anesthesia in Anterior Segment Surgeries

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Pak J Ophthalmol 2011, Vol. 27 No. 3

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Submission of paper
November' 2010

Acceptance for publication
August' 2011
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Purpose: The objective of the study was to evaluate the complications of subtenon anesthesia in patients undergoing anterior segment surgeries

Materials and Methods: The study was conducted in the department of ophthalmology, Abbasi Shaheed Hospital, from January 2009 to June 2010. 150 Patients were selected amongst those presenting in outpatient department for anterior segment surgery using non-probability consecutive sampling technique. Patients were scheduled for elective ophthalmic procedures with an expected duration of less than 60 min. Patients with clotting abnormalities, impaired mental status, uncontrolled glaucoma, were excluded from the study. 2 ml of 2% xylocaine with adrenaline (plain xylocaine where adrenaline was contraindicated) was injected using a subtenon cannula in supratemporal quadrant of the eye ball. We recorded complications including patient discomfort, inadequate anesthesia, conjunctival chemosis, subconjunctival haemorrhage, reterobulbar haemorrhage.

Results: A total of 150 patients were operated under subtenon anesthesia. Majority of the procedures performed were extra capsular cataract extraction (55.3%) followed by trabeculectomy (24%). Most common complication in our study was subconjunctival haemorrhage (48%) followed by conjunctival chemosis (37%). Other complications like inadequate anesthesia were seen in 12 (8%) patients and inadequate akinesia in 18 (12%) patients. A second injection was required in 12 (8%) patients. Simultaneous use of topical anesthetic was recorded in 18 (12%) patients. Reterobulbar haemorrhage occurred in a small percentage (2%) of patients in our study. In addition pupillary constriction after delivering the nucleus 45 (30%) patients and positive vitreous pressure leading to raised intra ocular pressure and iris prolapse 3 (2%) patients were also recorded. 58(39%) patients complained of pain and discomfort during the injection.

Conclusion: Majority of complications encountered in this study were minor like subconjunctival haemorrhage, conjunctival chemosis, inadequate anesthesia and akinesia. Major complications like reterobulbar haemorrhage and positive vitreous pressure leading to raised intraocular pressure during the surgery were uncommon but present. Subtenon anesthesia though safe is not devoid of complications.

There are substantial international variations in the care and provision of ophthalmic regional anesthesia¹⁻⁵. In 1884 Herman Knapp was the first to describe the reterobulbar block⁶. The

complications related to needle block, such as retrobulbar haemorrhage, globe perforation, retinal vascular obstruction, cardio-respiratory arrest and even death, although rare, have been reported^{7,8}.

In 1970s peribulbar block was developed for clinical use⁹. Further techniques like topical and subtenon anesthesia¹⁰ were developed in an attempt to minimize potentially serious complications with retero bulbar and peribulbar anesthesia¹¹⁻¹³.

Sub-Tenon's block is a simple alternative¹⁴ to a sharp needle block. Subtenon space is a potential space between the tenon capsule and sclera with capacity of about 1.5 ml. It extends from corneoscleral limbus anteriorly to the optic nerve posteriorly. It is an ideal space where local anesthetic can diffuse to secure complete anesthesia of the globe as all the sensory nerves from the eye cross this space. Additionally the local anesthetic percolates through the thin area of the tenon capsule around the optic nerve and has anesthetic effects in the orbit.

The exact frequency of the use of this technique is not known. It is commonly practiced in certain parts of the world^{15, 16} but only 7% of ophthalmic departments in the UK practiced this block in 1997^{4,5}. Its use now appears to have increased¹⁷. The technique was first described by Turnbull in 1884¹⁸ and later by Swan in 1956¹⁹.

Although it is a very safe and effective procedure and common complications of sub-Tenon's block are mainly minor, although rare major complications have also been reported. We conducted this study to evaluate this procedure.

MATERIALS AND METHODS

A total of 150 patients were recruited using non probability consecutive sampling technique from patients presenting in outpatient department who were planned for anterior segment surgery from January 2009 to June 2010. After recruitment written informed consent was taken and patients were admitted and prepared for surgery.

Patients undergoing procedures having less than 60 minutes duration were included in the study. The patients with clotting abnormalities, impaired mental status, uncontrolled glaucoma, recent surgical procedure on the same eye were excluded.

Topical proparcaine 0.5% was instilled thrice with one minute interval five minutes before subtenon anesthesia for all patients.

Subtenon space was opened using Westcott scissors to expose white sclera in the supro temporal quadrant of the eye ball. 2 ml of 2% xylocaine with adrenaline (plain xylocaine where adrenaline was

contraindicated) was injected using a subtenon cannula mounted onto a 5 ml syringe.

We recorded complications including patient discomfort, inadequate anesthesia, conjunctival chemosis, subconjunctival haemorrhage and retrobulbar haemorrhage both preoperatively and postoperatively.

RESULTS

A total of 150 patients were operated under subtenon anesthesia. 56% patients were male and 44% were female. (Table 1) Majority of the patients (45%) were between 50 and 60 years, whereas, 27.3% were between 40 to 50 years of age. (Table 2)

Majority of the procedures performed were extra capsular cataract extraction (55.3%) followed by trabeculectomy 24% (Table 3). Common complications we encountered were subconjunctival haemorrhage 48% followed by conjunctival chemosis 37%. Other complications like inadequate anesthesia were seen in 12 (8%) patients and inadequate akinesia in 18 (12%) patients, repeat injections in 12 (8%) patients were also recorded. Simultaneous use of topical anesthetic was recorded in 18 (12%) patients. Reterobulbar heamorrhage occurred in a small percentage (2%) of patients in our study. In addition pupillary constriction after delivery of the nucleus occurred in 45 (30%) patients and positive vitreous pressure leading to raised intra ocular pressure and iris prolapse occurred in 3 (2%) patients. 58 (39%) patients complained of pain and discomfort during the injection.

DISCUSSION

We conducted this study to assess the complications secondary to subtenon anesthesia. The complications encountered with this method were minor and easily manageable but occasional major complications were also encountered.

Most common complication encountered in our study was sub-conjunctival haemorrhage (48%). The incidence of haemorrhage has been reported to vary from 20 to 100% in other studies and may depend on the type of cannula used²⁰. Conjunctival haemorrhage may be caused by conjunctival dissection. This can be minimized by careful conjunctival dissection, application of cautery and use of topical epinephrine. Patients should be warned of the possibility of this complication preoperatively. 39% patients complained

of discomfort and pain during the injection. Pain experienced during various ophthalmic blocks depends on multiple factors.

Table 1: Gender distribution

Sex	No. of Patients n (%)
Male	82 (56)
Female	68 (44)

Table 2: Age distribution

Age in Years	No. of Patients n (%)
20-30	2 (1.3)
30-40	2 (1.3)
40-50	51 (34)
50-60	60 (40)
60-70	35 (23.3)

Table 3: Surgical procedures performed under subtenon anesthesia

Procedure	No. of Patients n (%)
Trabeculectomy	36 (24)
ECCE with IOL	83 (55.3)
Phaco with IOL	31 (20.7)

The incidence of pain during sub-Tenon injection reported in various studies can be up to 44%^{14,20}. Premedication or sedation of patients during sub-Tenon injection did not help to prevent pain in these studies. Preoperative explanation of the procedure, good surface anesthesia, gentle technique, slow injection of warm local anesthetic agent and reassurance are considered good practice and may reduce the discomfort and anxiety during the injection²².

Conjunctival chemosis was seen in 37% of the patients. The incidence of chemosis varies from 25% to 60%^{14,20} with a posterior cannula and the incidence increases to 100% with shorter cannulae²¹. Chemosis occurs due to anterior injection of the anesthetic agent. This usually occurs if a large volume of local anesthetic is injected and if the Tenon's capsule is not dissected properly²¹. Chemosis may not be confined to

the site of injection and has been known to spread to other quadrants as well²¹. Chemosis usually resolve after the application of digital pressure, and no intra-operative problems have been reported secondary to it. Significant chemosis may compromise the surgical procedure for glaucoma.

Table 4: Complications of subtenon anesthesia

Complications	No. of Patients n (%)
Difficulty to reach subtenon space	18 (12)
Repeat injection	12 (8)
3. Inadequate anesthesia	12 (8)
Inadequate akinesia	18 (12)
Patient discomfort and pain during injection	58 (39)
Subconjunctival haemorrhage	72 (48)
Conjunctival chemosis	55 (37)
Reterobulbar haemorrhage	3 (2)
Positive vitreous pressure leading to raised intraocular pressure and iris prolapse	3 (2)
Pupillary constriction after delivering the nucleus	45 (30)
Simultaneous use of topical anesthetic	18 (12)

Anesthesia with sub tenon block was adequate in most of the cases, but 8% of the patients required augmentation with more injection.

In our study inadequate akinesia was seen in 12% of the patients. In other studies akinesia was variable and was not complete²³. Akinesia is volume dependent and if 4-5 ml local anesthetic agent is injected, a large proportion of patients develop akinesia²². Superior oblique muscle and lid movements may also remain active in a significant number of patients²².

We encountered difficulty in reaching sub-tenon space in 12% of the patients as compared to the study conducted at Larkana in which it was noticed in 10.8% of the patients. This difficulty was probably due to

improper patient selection and inadequate anesthesia. It was easily overcome by explaining the procedure to the patient and reassurance.

Positive vitreous pressure leading to raised intraocular pressure and iris prolapse were found in 2% patients. Similar results were (3.2%) were seen in a study from Larkana²⁴.

Complications like short term muscle paresis, globe perforation and cardio respiratory arrest due to central spread of local anesthetic have been reported but we did not encounter this complication in our study^{21, 25}.

Retrobulbar hemorrhage occurred in 3 (2%) patients in our study. This complication has also been reported in other studies²⁶⁻²⁸.

We selected supero-temporal quadrant for subtenon anesthesia in our study. Access from all quadrants has been reported, supero-temporal by Fukasaku and Marron, superonasal and infero-temporal by Roman and colleagues¹⁴ and the medial canthal side by Ripart and colleagues²⁴. It is not known how frequently these quadrants are used for access. We found supero-temporal quadrant anatomically safe and adequate. Moreover, this site is covered by the upper lid, hiding the subconjunctival hemorrhage and thus prevents anxiety on first post-op day.

CONCLUSION

In our study subtenon anesthesia was safe and effective method for anterior segment intraocular surgery but not devoid of complications. Though majority of complications were minor and easily manageable but some major complications like retrobulbar hemorrhage and positive vitreous pressure with iris prolapse may have adverse effects on the outcome of surgery.

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REFERENCE

1. Norregaard JC, Schein OD, Bellan L et al. International variation in anesthesia care during cataract surgery: results from the International Cataract Surgery Outcomes Study. Arch Ophthalmol. 1997; 115: 1304-8.
2. Hansen TE. Current trends in cataract surgery in Denmark - 1998 survey. Acta Ophthalmol Scand. 1999; 77: 685-9.
3. Eke T, Thompson JR. The national survey of local anaesthesia for ocular surgery. I. Survey methodology and current practice. Eye 1999; 13: 189-95.
4. Eke T, Thompson JR. The national survey of local anaesthesia for ocular surgery. II. Safety profiles of local anaesthesia techniques. Eye 1999; 13: 196-204.
5. Leaming DV. Practice styles and preferences of ASCRS members - 2003 survey. J Cataract Refract Surg. 2004; 30: 892-900.
6. Altman A J, Albert DM, Fournier GA. Cocaine's use in Ophthalmology: Our 100 year heritage, Surv Ophthalmol. 1985; 29: 300-6.
7. Rubin AP. Complications of local anaesthesia for ophthalmic surgery. Br J Anaesth. 1995; 75: 93-6.
8. Hamilton RC. Complications of ophthalmic anaesthesia. Ophthalmol Clin North Am. 1998; 11: 99-114.
9. Davis DB, Mandel MR. Posterior Peribulbar anesthesia :an alternative to retrobulbar anesthesia J Cataract Refract Surg: 1986; 12: 182-4.
10. Rous SM. Simplified subtenon anesthesia: miniblock with maxiblock effect. J Cataract Refract Surg. 1999; 25: 10-5.
11. Haider SA. Survey of the practice of cataract surgery under local anesthesia in England and Wales. Pak J Ophthalmol. 1998; 14; 104-7.
12. Tatum PL, Defalque RJ. Subarachnoid injection during retrobulbar block: A case report Aana J. 1994; 62; 49-52.

13. **Mount AM, Seward HC.** Scleral perforation during peribulbar anesthesia. *Eye*. 1993; 7: 766-7.
14. **Roman SJ, Chong Sit DA, Boureau CM.** Sub-Tenon's anaesthesia: an efficient and safe technique. *Br J Ophthalmol*. 1997; 81: 673-6.
15. **Elder M, Leaming D.** The New Zealand cataract and refractive surgery survey 2001. *Clin Exp Ophthalmol*. 2003; 31: 114-20.
16. **Hansen TE.** Current trends in cataract surgery in Denmark - 1998 survey. *Acta Ophthalmol Scand*. 1999; 77: 685-9.
17. **Eke T, Thompson JR.** Safety of local anaesthesia for cataract surgery: why we should look again. *Eye* 2003; 17: 127-8.
18. **Turnbull CS.** The hydrochlorate of cocaine, a judicious opinion of its merits. *Med Surg Rep*. 1884; 29: 628-9.
19. **Swan KC.** New drugs and techniques for ocular anesthesia. *Trans Am Acad Ophthalmol Otolaryngol*. 1956; 60: 368.
20. **Verghese I, Sivraj P, Lai YK.** The effectiveness of sub-Tenon's infiltration of local anaesthesia for cataract surgery. *Aust New Zeal J Ophthalmol*. 1996; 24: 117-20.
21. **Kumar CM, Dodds C.** Evaluation of Greenbaum sub-Tenon's block. *Br J Anaesth*. 2001; 87: 631-3.
22. **Kumar CM, Williamson S, Manickam B.** A review of sub-Tenon's block: current practice and recent development. *European Journal of Anaesthesiology*. 2005; 22: 567-77.
23. **Guise PA.** Sub-Tenon anesthesia: a prospective study of 6,000 blocks. *Anesthesiology*. 2003; 98: 964-8.
24. **Shah AIS, Siddiqui JS, Deepar DM, et al.** Subtenon Anesthesia in Anterior Segment Surgery. *Pak J Ophthalmol*. 2006; 22: 186-8.
25. **Mount AM, Seward HC.** Scleral Perforations during peribulbar anesthesia. *Eye* 1993; 7: 766-7.
26. **Ripart J, Jean J, Bassoul B, et al.** Ophthalmic Regional Anesthesia Medial Canthal Episcleral (subtenon) single injection block. *Anesthesiology*. 2004; 100: 370-4.
27. **Olitsky SE, Juneja RG.** Orbital haemorrhage after the administration of sub-Tenon's infusion anaesthesia. *Ophthalmic Surg Lasers*. 1997; 28: 145-6.
28. **Rahman I, Ataulah S.** Retrobulbar haemorrhage after sub-Tenon's anesthesia. *J Cataract Refract Surg*. 2004; 30: 2636-7.