

# Patient preference and pain-reported outcomes for topical versus subtenon anesthetic for cataract surgery

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## Abstract:

**PURPOSE:** Cataract extraction and lens implantation is the most common surgical procedure performed worldwide, with surgeons opting for either a topical or a subtenon anesthetic in majority of cases. While complication rates and pain scores have been previously examined in a bid to determine which modality was better, patients who have had both eyes operated upon under different techniques have never previously been asked which method they prefer. We undertook this study to fill in this crucial gap in our knowledge.

**METHODS:** This is a retrospective study of patients who have undergone bilateral cataract surgery with one eye operated on with topical anesthesia and the other eye with subtenon anesthesia. Patients were identified who had had surgery undertaken in the previous 6 months at Singleton Hospital, Swansea, where both eyes had been operated upon using different anesthetic techniques. Telephone interviews with these patients were performed and their pain scores recorded on a scale from 0 (no pain) to 10 (severe pain) for both eyes, with the patients then being asked which the method of anesthetic they preferred. Statistical analysis of pain scores was compared using Wilcoxon rank-sum testing.

**RESULTS:** One hundred and fifty-two patients in total were identified. One hundred and forty-one of the applicable patients participated in the study. Of these, 78 patients received topical anesthesia for their first operation and 63 had subtenon block for their first operation. The mean pain scores reported for surgery with topical anesthesia and subtenon block were 2.30 and 1.38, respectively. The pain data were analyzed using a Wilcoxon signed-rank test, returning a  $z$ -score of 4.038. This result therefore suggests that patients experience statistically significantly less pain from cataract surgery when given a subtenon block. Patients expressed a preference for subtenon anesthesia, with 70% preferring subtenon block, 23% preferring topical anesthesia, and 7% having no preference.

**CONCLUSIONS:** Patients report less pain with subtenon anesthesia compared with topical anesthesia in cataract surgery, where both eyes were operated upon with different anesthetic techniques. This is the first study in which patients who have had both anesthetic techniques performed independently for cataract surgery have had their pain scores reported and statistically analyzed.

## Keywords:

Anesthesia, cataract, phacoemulsification, subtenon

## INTRODUCTION

Cataract is the leading cause of impaired vision and blindness worldwide, with over 400,000 surgical procedures being performed each year in the United Kingdom alone.<sup>[1,2]</sup> Being the most commonly performed surgical procedure in the National Health Service, there are significant cost advantages to be gained by using less invasive and more efficient methods of anesthesia.<sup>[3]</sup>

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As there have been significant advances in cataract extraction techniques over the years, there have also been major changes in anesthetic practice for cataract surgery since the first guidelines produced by the Royal College of Ophthalmologists and the Royal College of Anaesthetists in 1993.<sup>[4,5]</sup> The vast majority of cataract procedures are performed under regional anesthesia as opposed to general anesthesia, with the majority of these composed of either topical or subtenon anesthesia.<sup>[2,6,7]</sup> Historically, retrobulbar

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blocks were favored, delivered by the surgeon, sometimes without an anesthetist present.<sup>[8]</sup> As phacoemulsification has become more widespread, the requirement for total akinesia and low intraocular pressures has diminished.<sup>[9]</sup> Similarly, the complications arising from conventional retrobulbar blocks have also been widely described, necessitating greater safety requirements with eye blocks.<sup>[8]</sup>

Topical anesthesia was first used by Carl Koller for eye surgery in 1884 and later reintroduced by Fichman in 1992.<sup>[10,11]</sup> It is applied using drops or gel on the surface of the eye. It provides corneal analgesia affecting the afferent nerves of the cornea and conjunctiva, including the short, long, and nasociliary nerves.<sup>[9]</sup> While this is useful in eliminating the risk of complications associated with injectable anesthesia, it does not eliminate the pain sensitivity linked to the iris or the ciliary body.<sup>[4]</sup> Topical anesthesia is quick and pain-free to administer and useful when akinesia is not an absolute requirement.<sup>[4]</sup> Topical anesthesia also allows the patient to regain sight almost immediately after surgery without the need for an eye patch.<sup>[12,13]</sup> While topical anesthesia has an overall low rate of complication for cataract surgery, it may not provide complete analgesia and epithelial and endothelial toxicity has been reported with its use.<sup>[14,15]</sup> Comparative studies have shown patients experiencing less intraoperative pain with retrobulbar or subtenon block compared to topical anesthesia.<sup>[16-18]</sup> In some studies, topical anesthesia is equivalent to have no anesthesia at all.<sup>[19]</sup> Furthermore, the absence of akinesia and lack of intraocular pressure control may make the surgery more difficult.<sup>[8,18]</sup> A meta-analysis demonstrated that topical blocks are associated with a two-fold rise in the posterior capsule rupture when compared to subtenon anesthesia and was associated with higher rates of dropped nucleus.<sup>[12,20]</sup>

Subtenon anesthesia for cataract surgery was first described by Turnbull in 1884 and by Swan in 1956 and later revisited by Stevens in 1992.<sup>[21-24]</sup> With subtenon anesthesia, around 5 ml of anesthetic is injected directly into the subtenon space using a curved blunted needle. Larger volumes up to 11 ml can provide akinesia by spreading to the extraocular muscle sheaths.<sup>[25]</sup> Subtenon anesthesia is associated with lower risks of complications, such as subconjunctival or retrobulbar hemorrhage, chemosis, optic neuropathy, scleral perforation, and injury to the extraocular muscles compared to retrobulbar anesthesia.<sup>[4,25,26]</sup> Studies comparing subtenon block with topical blocks show that the former provides more analgesia and lower rate of posterior capsule rupture, resulted in higher patient satisfaction.<sup>[12,27]</sup> With increased demand for cataract surgery, however, and the pressure toward quicker anesthesia, it is critical to formerly compare the two modalities to offer our patients the best option or at least to have not available. We undertook this study to fill in this crucial gap in our knowledge.

## METHODS

At Singleton Hospital in Swansea, there is a pooled list of patients undergoing cataract surgery with some surgeons

using topical anesthesia as standard and some surgeons using subtenon anesthesia. There are therefore some patients who are assigned different surgeons who use different anesthetic modalities for both eye surgeries by random allocation. The surgical database was searched for patients who had undergone phacoemulsification with intraocular lens implant surgery with topical anesthesia for one eye and subtenon anesthesia for the other eye, with no emphasis placed on which technique was undertaken first. Patients undergoing planned sequential surgery within 3 months of each other were selected, and only those having undergone the most recent surgery within 6 months of the date of the phone assessment were eligible on the basis that valid recall would be impaired at longer intervals from surgery. All patients were adults (48–94 years) and inclusion criteria included all eligible patients who had enjoyed straightforward surgery without complication. We excluded any patient where the operation note had indicated dropped nucleus (1 patient) or posterior capsule rupture (2 patients). Duration of operation was not a limiting factor; however, of all eligible patients, no operation lasted longer than 21 min. Other exclusion criteria included expected inability to answer the questions reliably, including Alzheimer's disease and other cognitive disorders.

Telephone interviews were conducted with these patients who were then asked for their pain scores for each operation and which method they preferred. The pain scores were ranked from 0 to 10, with 0 being no pain and 10 being severe pain. Interviews were conducted by two medical students with no ophthalmic experience or bias toward one method or another. Statistical analysis was carried out on the pain scores using a Wilcoxon signed-rank test.

The primary outcome measures were the reported pain scores during surgery for each patient for each operation they underwent and the patient's opinion of which technique was preferred. Other collected data included the grade of surgeon operating and any significant comments that were made by the patient.

## RESULTS

Review of departmental records identified 152 patients who had undergone cataract surgery in both eyes using a different anesthetic approach for each operation. One hundred and forty-one of the applicable patients participated in the study, with the remaining 11 patients being uncontactable by phone (10) or deceased (1). Of these, 78 patients received topical anesthesia for their first operation and 63 had subtenon block for their first operation.

The mean pain scores reported on a 10-point pain scale for surgery with a topical anesthesia and subtenon block were 2.30 and 1.38, respectively. The Shapiro–Wilk test returned *P* values for topical pain and subtenon pain of  $1.16 \times 10^{-10}$  and  $2.73 \times 10^{-14}$ , respectively, indicating that the pain scores are highly unlikely to be normally distributed. The pain data were analyzed using a Wilcoxon Signed rank test, returning a

*z*-score of 4.038. This result suggests that patients experience significantly less pain from cataract surgery when given a subtenon block. There was no difference in score in the group undergoing subtenon anesthetic first (63) and those undergoing topical anesthetic first (78).

Patients expressed a clear preference for subtenon anesthesia, with 70% preferring subtenon block and 23% preferring topical anesthesia along with 7% having no preference.

Patient pain was also analyzed by the grade of surgeon performing the operation. The total number of operations performed by each grade of surgeon was conducted by consultant ( $n = 170$ ), specialist registrar ( $n = 71$ ), and staff/middle grade ( $n = 41$ ). The mean pain scores for each grade of surgeons were consultant (1.81), specialist registrar (1.92), and staff grade (1.89). An ANOVA between the three grades of surgeon returned a *P* value of 0.938, suggesting that there was no significant difference in operative pain by grade of the surgeon.

## DISCUSSION

This retrospective study has suggested that subtenon anesthesia has a lower pain score compared to topical anesthesia, with a clear patient preference for subtenon anesthesia over topical anesthesia in cataract surgery. This is the only study to date that has measured patient preference in two different anesthetic techniques for cataract surgery in which the patients have all directly experienced both modalities of anesthesia.

Previously, although it was shown that patient satisfaction rates were higher with subtenon as opposed to topical anesthesia, the difference was significant but thought to be too small to be clinically relevant.<sup>[28-30]</sup> As demand for cataract surgery is predicted to rise by 25% over the next 10 years and by 50% over the next 20 years, it is crucial that patients are fully informed of the types of anesthesia available and undergo minimal discomfort.<sup>[31]</sup> The NICE guidelines on cataract surgery in the United Kingdom currently promote the use of either subtenon or topical anesthesia for routine cataract surgery without preference.<sup>[32]</sup> Several strategies for coping with the increased demand for cataract surgery have been implemented in the UK including the use of high volume cataract lists of more than 8 cases.

Topical and subtenon anesthesia are both commonly accepted methods of anesthesia for cataract surgery worldwide. Each technique has its own advantages with certain centers adopting one or the other technique for all cataract surgery. In particular, high-volume cataract centers often use topical anesthetic due to the time saved for administration of anesthesia. The authors performed this retrospective case analysis in a hospital which offered both types of anesthesia due to surgeon preference, in a pooled list environment. The advantages of topical anesthesia include a faster administration time and faster recovery time. These results suggest that patients experience significantly less pain from cataract surgery when given a subtenon block rather

than topical anesthesia. The result was statistically significant, though the absolute average difference in pain between the two approaches was only one out of ten. This is chiefly because both anesthetic approaches produce low levels of intraoperative pain and were both broadly acceptable to patients.

The same patients were asked to rate pain for both approaches, so patients are controlled against themselves. This is particularly valuable when gathering information on a subjective sensation such as pain, so evaluating the effectiveness of the anesthetic approach should not be complicated by patient factors, such as differing pain threshold or anxiety. There was also variation in which anesthetic approach was used for the first eye, which will control for compounding factors such as potential greater anxiety for the first operation or inflated expectations with the second surgery. A similar study comparing topical versus peribulbar anesthesia in the same patient demonstrated preference for peribulbar anesthesia, though peribulbar anesthesia is not a common modality for ocular anesthesia in the United Kingdom.<sup>[33]</sup> There have been no studies comparing peribulbar with subtenon though this would be useful in this context.

While we limited the duration between surgery and phone call assessment to 6 months, there is still a risk of recall bias potentially affecting the study. The study focused primarily on pain scores and other parameters such as time taken for surgery and phacoemulsification time and power were beyond the scope of the study. The patients were asked to recall their overall pain scores for the operation, and not specifically pain scores on administration of anesthesia, intraoperatively, or on day 1 postoperatively. This could be done in future studies to further subdivide pain scores. A more detailed prospective randomized controlled trial with patients having both anesthetic techniques is warranted for future research.

## CONCLUSIONS

Patients expressed a clear preference for subtenon anesthesia, and this should remain an important factor in making decisions on patient management. The results of this study show that both topical only and subtenon anesthesia are effective and acceptable to patients. The choice of anesthetic approach will be influenced by numerous factors including the operative needs of the surgeon, anesthetic availability, and patient preferences. Patient-reported outcomes are playing a greater role in shaping treatment and service delivery options. This study shows that with improved pain relief and greater patient preference, surgeons might be more inclined to consider a subtenon block in appropriate patients undergoing phacoemulsification surgery.

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## Conflicts of interest

There are no conflicts of interest.

## REFERENCES

- Behndig A, Montan P, Stenevi U, Kugelberg M, Lundström M. One million cataract surgeries: Swedish National Cataract Register 1992-2009. *J Cataract Refract Surg* 2011;37:1539-45.
- Leaming DV. Practice styles and preferences of ASCRS members. *Cataract Regis J Cataract Refract Surg* 2004;30:892-900.
- Hodge W, Horsley T, Albani D, Baryla J, Belliveau M, Buhrmann R, *et al.* The consequences of waiting for cataract surgery: A systematic review. *CMAJ* 2007;176:1285-90.
- Chandrasekhara Reddy S, Thevi T. Local anaesthesia in cataract surgery. *Int J Ophthalmic Res* 2017;3:204-10.
- Report of the Joint Working Party on Anaesthesia in Ophthalmic Surgery. Ashford and London: Royal College of Anaesthetists; 1993.
- Pick ZS, Leaming DV, Elder MJ. The fourth New Zealand cataract and refractive surgery survey: 2007. *Clin Exp Ophthalmol* 2008;36:604-19.
- El-Hindy N, Johnston RL, Jaycock P, Eke T, Braga AJ, Tole DM, *et al.* The Cataract National Dataset Electronic Multi-centre Audit of 55,567 operations: Anaesthetic techniques and complications. *Eye (Lond)* 2009;23:50-5.
- Nouvellon E, Cuvillon P, Ripart J, Viel EJ. Anaesthesia for cataract surgery. *Drugs Aging* 2010;27:21-38.
- Schutz J, Mavranakas N. What degree of anaesthesia is necessary for intraocular surgery? It depends on whether surgery is "open" or "closed". *Br J Ophthalmol* 2009;94:1400.
- Ocular Anesthesia – EyeWiki. Eyewiki.Aao.Org; 2019. Available from: [https://eyewiki.aao.org/Ocular\\_Anesthesia](https://eyewiki.aao.org/Ocular_Anesthesia). [Last accessed on 2019 May 26].
- Fichman RA. Use of topical anesthesia alone in cataract surgery. *J Cataract Refract Surg* 1996;22:612-4.
- Guay J, Sales K. Sub-Tenon's anaesthesia versus topical anaesthesia for cataract surgery. *Cochrane Database Syst Rev* 2015;(8):CD006291. doi: 10.1002/14651858.CD006291.
- Barequet IS, Sachs D, Priel A, Wasserzug Y, Martinowitz U, Moisseiev J, *et al.* Phacoemulsification of cataract in patients receiving Coumadin therapy: Ocular and hematologic risk assessment. *Am J Ophthalmol* 2007;144:719-23.
- Shaw AD, Ang GS, Eke T. Phacoemulsification complication rates. *Ophthalmology* 2007;114:2101-2.
- Shah R. Anesthesia for cataract surgery: Recent trends. *Oman J Ophthalmol* 2010;3:107-8.
- Boezaart A, Berry R, Nell M. Topical anesthesia versus retrobulbar block for cataract surgery: The patients' perspective. *J Clin Anesth* 2000;12:58-60.
- Zafirakis P, Voudouri A, Rowe S, Livir-Rallatos G, Livir-Rallatos C, Canakis C, *et al.* Topical versus sub-Tenon's anesthesia without sedation in cataract surgery. *J Cataract Refract Surg* 2001;27:873-9.
- Gombos K, Jakubovits E, Kolos A, Salacz G, N lacz J. Cataract surgery anaesthesia: Is topical anaesthesia really better than retrobulbar? *Acta Ophthalmol Scand* 2007;85:309-16.
- Pandey SK, Werner L, Apple DJ, Agarwal A, Agarwal A, Agarwal S. No-anesthesia clear corneal phacoemulsification versus topical and topical plus intracameral anesthesia. Randomized clinical trial. *J Cataract Refract Surg* 2001;27:1643-50.
- Mahmood S, von Lany H, Cole MD, Charles SJ, James CR, Foot B, *et al.* Displacement of nuclear fragments into the vitreous complicating phacoemulsification surgery in the UK: Incidence and risk factors. *Br J Ophthalmol* 2008;92:488-92.
- Turnbull CS. The hydrochlorate of cocaine, a judicious opinion of its merits. *Med Surg Rep* 1884;29:628-9.
- Swan KC. New drugs and techniques for ocular anesthesia. *Trans Am Acad Ophthalmol Otolaryngol* 1956;60:368-75.
- Stevens JD. A new local anesthesia technique for cataract extraction by one quadrant sub-Tenon's infiltration. *Br J Ophthalmol* 1992;76:670-4.
- Ripart J, Prat-Pradal D, Vivien B, Charavel P, Eledjam JJ. Medial canthus episcleral (sub-Tenon) anesthesia imaging. *Clin Anat* 1998;11:390-5.
- Nouvellon E, L'Hermite J, Chaumeron A, Mahamat A, Mainemer M, Charavel P, *et al.* Ophthalmic regional anesthesia: Medial canthus episcleral (sub-Tenon's) single injection block. *Anesthesiology* 2004;100:370-4.
- Guisse P. Sub-Tenon's anesthesia: An update. *Local Reg Anesth* 2012;5:35-46.
- Ruschen H, Celaschi D, Bunce C, Carr C. Randomised controlled trial of sub-Tenon's block versus topical anaesthesia for cataract surgery: A comparison of patient satisfaction. *Br J Ophthalmol* 2005;89:291-3.
- Omulecki W, Laudanska-Olszewska I, Synder A. Factors affecting patient cooperation and level of pain perception during phacoemulsification in topical and intracameral anesthesia. *Eur J Ophthalmol* 2009;19:977-83.
- Hou CH, Lee JS, Chen KJ, Lin KK. The sources of pain during phacoemulsification using topical anesthesia. *Eye (Lond)* 2012;26:749-50.
- Ula F, Balbaba M, Ç İbab S. Effect of prophylactic intraocular pressure-lowering medication on pain during cataract surgery. *J Ocul Pharmacol Ther* 2013;29:658-62.
- RCOphth steering group. *The Way Forward: Cataract*. led by Prof C McEwen: The Royal College of Ophthalmologists; 2018.
- NICE Guidance Cataracts in Adults: Management. National Institute of Health and Care Excellence, London: 2017.
- Ahmad N, Zahoor A, Motowa SA, Jastaneiah S, Riad W. Satisfaction level with topical versus peribulbar anesthesia experienced by same patient for phacoemulsification. *Saudi J Anaesth* 2012;6:363-6.