

Short Research Article

A Safe, Efficacious and Cost Effective Way of Delivering Subtenons Anaesthesia
During Cataract Surgery.

Abstract

Introduction

There are considerable pressures in various health economies at present to reduce costs whilst maintaining patient safety and clinical efficacy. We report a new simplified regime for the administration of Sub-Tenon's anaesthesia offering a cost saving of up to 95% over the more prevalent combination regime of 2% Bupivacaine + 2% Lignocaine + Hyaluronidase whilst maintaining total safety and efficacy.

Methods

Following topical anaesthesia with 3 drops of Proxymetacaine 0.5% drops instilled one minute apart and subsequent administration of a drop of 5% Povidone Iodine aqueous solution into the conjunctival sac, 2ml of 2% Lignocaine with 1:200000 adrenaline was administered as a Sub-Tenon's injection to 100 eyes of consecutive patients undergoing phacoemulsification. Pain levels during the administration of the injection and during surgery were monitored by measuring Visual Analogue Pain (VAP) scores via a prospective questionnaire immediately after the operation.

Results

There were 100 eyes of patients undergoing cataract surgery included in this study. No patient required top up anaesthesia during the surgery and no serious anaesthetic

related intra or post-operative complication was noted in any of the patients. The mean VAP score during delivery of anaesthetic and for the duration of surgery were both 0.

Conclusions

Our results show that this regime for administration of Sub-Tenon's anaesthesia meets the standards required in terms of both safety and efficacy whilst delivering considerable cost savings. We recommend its routine use for the reasons cited above.

41 **Introduction**

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43 Local anaesthesia for cataract surgery has been shown to be a safe and efficient mode
 44 of anaesthesia for routine daycase cataract surgery^{1,2} and there is some evidence to
 45 suggest that it is preferred by patients.³ According to a Cochrane review meta-
 46 analysis by Davison et al, it is still the anaesthesia of choice with regards to
 47 minimising overall pain perception and intraoperative complications.⁴

48

49 A variety of local anaesthetic agents are employed in the administration of sub-
 50 tenon's block. The hitherto prevalent regime in our department has been utilising 5 cc
 51 of a combination of 0.5% Bupivacaine, 2% Lignocaine and Hyalase for the
 52 subtenon's block. Our simplified regime consists of using 2ml of 2% Xylocaine (2%
 53 Lignocaine with 1: 200,000 adrenaline).

54

55 Our reasons for choosing this preparation were based on our experience that it was
 56 an effective and safe method of pain control during surgery and secondly the marked
 57 cost advantage over the prevailing regime which amounted to a 95% cost saving per
 58 patient. This is highly relevant in the context of a National Health Service that faces
 59 considerable pressures to innovate in order to reduce costs whilst maintaining patient
 60 safety and clinical efficacy. Cataract surgery is one area in which the high turnover of
 61 patients allows for small savings made per person to translate into larger financial gains. Our

aim was to assess the effectiveness of our practice in terms of safety, efficacy and meeting the standards required for pain free cataract surgery.

The Royal College of Anaesthesia and Royal College of Ophthalmologists published guidelines in their 2012 paper ⁵ regarding the administration of local anaesthesia in cataract surgery. In this, the goal of anaesthesia for intraocular surgery is:

- To provide pain-free surgery and to minimise the risk of systemic complications
- To facilitate the surgical procedure
- To reduce the risk of surgical complications

Visual analogue pain (VAP) scores have been used in a number of studies to assess pain following sub-tenon's anaesthesia.^{2,6-9} Stevens, was the first to describe a series of 50 patients undergoing sub-tenon's anaesthesia and measured pain during both surgery and administration of anaesthesia using a VAP scale.⁶ The mean scores were found to be 1 for both of these measurements.

Our aim was to determine if our current practice of administration of sub-tenon's local anaesthesia for day case cataract surgery meets the accepted standards required in anaesthesia.

82

83 We evaluated the level of pain experienced by the patient during both anaesthesia
84 and surgery. Our standards are:

85 1. To achieve minimal or no pain during delivery of the sub-tenon's block (i.e. VAP
86 score of <2)

87 2. To achieve pain free surgery (i.e. VAP score of 0)

88 3. No systemic or serious local adverse effects of anaesthesia

89

90 **Materials and Methods**

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92 This was a prospective longitudinal questionnaire based study where 100 consecutive
93 eyes of all patients undergoing routine cataract surgery as a day-case procedure were
94 included. Exclusion criteria included patients with profound deafness, dementia,
95 learning difficulties, high anxiety or an allergy to any of the compounds being used.

96

97 Patient monitoring of blood pressure, pulse oximetry and heart rate was performed
98 throughout the procedure by a suitable trained individual as per Royal College
99 recommendations. In all cases 2ml of Lignocaine and adrenaline 1:200000 was used
100 for injection from a single 20ml bottle. Sterility was maintained by drawing up

101 syringes of anaesthetic for each patient on the list and appropriately labelling them
102 with “anaesthetic” prior to the start of the list.

103

104 The sub- tenon's anaesthetic was delivered by 1 of 3 surgeons (SB, KJ or KT). Three
105 drops of proxymethacaine were instilled into the inferior fornix at 1 minute intervals.
106 Povidone iodine was given in the conjunctival sac and over the lashes. The patient
107 was asked to look upwards and outwards. The inferonasal bulbar conjunctiva was
108 grabbed using a Moorfields forceps and a small incision was made using curved
109 Wescott scissors. The sub- tenon's cannula was inserted along bare sclera and 2 ml of
110 the anaesthetic solution was injected slowly into the sub- tenon's space.

111

112 The patient was asked to mark their pain score on the visual analogue pain scale
113 immediately after surgery for 1) the delivery of anaesthetic and 2) the duration of
114 surgery.

115

*How severe is your pain today? Place a vertical mark on the line below to indicate
how bad you feel your pain is today.*

No pain | _____ | Very severe pain

116

We certify that all applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed during this research.

Results

There were 100 patients included in the study. No patient required top up anaesthesia during the surgery and there were no complications of anaesthesia. The mean VAP score for delivery of anaesthetic and duration of surgery was 0 in both cases. 100% of patients felt no pain during surgery. 98% of patients gave a VAP score of 0 and 2% a score of 1 for delivery of sub- tenon's anaesthesia (mean 0.02, or effectively 0).

Discussion

Our results meet the standards we had defined earlier. Furthermore our findings compare favourably with those in the literature where VAP scores have been used to determine pain during cataract surgery or delivery of anaesthetic.

Srinivasan et al⁹ report mean VAP scores of 2.42 taken immediately after cataract surgery with sub- tenon's anaesthesia in a randomised clinical trial comparing topical and subtenon's anaesthesia. Similarly Zafirakis et al⁷ report a mean VAP score of 1.53(SD0.63) for delivery of anaesthesia and 0.57(SD1.28) during surgery.

Of note is the study by Rowley et al⁸, in which they used a similar anaesthetic combination to ours, however their group of patients were subdivided into two depending on whether or not hyaluronidase was given. Hyaluronidase was found to improve akinesia however had no significant effect on pain scores. Akinesia was not measured in our study as many cataract surgeons will nowadays accept a small degree of ocular movement during surgery provided the patient is pain free and cooperative.

Although it has been argued that a limitation with VAP scores is their inter-observer variability, nevertheless as a guide to pain relief, an already subjective modality, they have proved useful in arbitrary comparisons and effectiveness of anaesthesia.

There were no complications from anaesthesia in our series of patients apart from the occasional localized conjunctival chemosis which is not deemed a significant complication of subtenonsanesthesia. Some surgeons may be wary of using adrenaline in the subtenon's space. The risks of using dilute adrenaline in sub-tenon's anaesthesia are by no means established. Our experience with this study and having used the same preparation in over 800 cases prior to this study has not yielded a single adverse effect of its use in the doses described above. Also, we could not find any reported cases in the English literature of central retinal artery occlusion secondary to the use of adrenaline in the sub-tenon's space

Experiments on rabbits whereby blood flow to ocular structures was analysed using colour Doppler techniques show a reduction in blood flow to certain ocular structures (iris, ciliary body) following retrobulbar injection of adrenaline.¹⁰ In this paper however 2% adrenaline was utilised, approximately 4000 fold more concentrated than our preparation. In addition, we argue that unlike the retrobulbar space, the sub-tenon's space is not in direct contact with the optic nerve sheath which is pierced by the ophthalmic artery and vein. Although some intraconal leakage of anaesthetic might occur, this is perhaps further limited by the relatively smaller volume of anaesthesia administered in our series (2ml) compared with the standard 3-5ml described with sub-tenon's techniques.

Krohn et al¹¹ report certain distinct advantages of retrobulbar anaesthesia with combined adrenaline in a study involving 75 patients. Compared to patients receiving anaesthetic alone, adrenaline appeared to have a mydriatic as well as an intraocular pressure lowering effect. In addition by virtue of its vasoconstrictor effect it helped increase both the duration of anaesthetic effect and postoperative analgesia by slowing down the absorption of the anaesthetic agent..

Pohjanpelto et al argue that introduction of epinephrine 5mg/ml into the anaesthetic solution made no difference to the intraocular blood supply over and above that caused by the retro bulbar block alone.¹²

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184 **Conclusion**

185 The results indicate that the prescribed criteria and standards were being met in terms
186 of providing pain free surgery, with minimal pain (VAP<2) for delivery of
187 anaesthesia. There were no complications arising as a result of this technique.

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189 The additional cost advantage in the setting of the modern financially constrained
190 NHS can also not be overlooked with the cost of delivery per anaesthetic cocktail per
191 patient being £9.11 per patient for the lignocaine-bupivacaine-hyalase combination
192 regime and only £0.17 per patient with our suggested regime.

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194 We conclude that the use of lignocaine 2% with adrenaline 1:200000 in our current
195 regime of delivery of sub- tenon's anaesthesia for cataract surgery is not only safe
196 and effective but also highly cost efficient.

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204 **References**

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