

Sub-Tenon's local anaesthesia: the effect of hyaluronidase

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Abstract

Aims—A prospective, randomised, double blind study was used to investigate the effect of hyaluronidase on the quality of block achieved with sub-Tenon's local anaesthesia.

Methods—150 patients scheduled for elective cataract surgery were randomly allocated to either sub-Tenon's block with 3 ml lignocaine 2%/adrenaline 1:200 000 alone or with the addition of 30 IU/ml of hyaluronidase. The blocks were assessed for degree of akinesia and reduction of eyelid movement, and also post-injection and postoperative pain scores.

Results—Akinesia and reduction of eyelid movement measured 10 minutes after injection were significantly better in the group with hyaluronidase added to the anaesthetic solution. Postoperative pain scores were not significantly different between the two groups but the post-injection pain score was greater (marginally significant) in the group with hyaluronidase added.

Conclusion—The addition of hyaluronidase significantly improves the quality of the motor blockade achieved with sub-Tenon's local anaesthesia, but has no effect on the sensory blockade.

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The single quadrant technique for sub-Tenon's local anaesthesia was popularised by Stevens¹ in 1992 as a safe and effective method for ophthalmic anaesthesia, avoiding the risks of sharp needle techniques. Delivery of the local anaesthetic solution to the posterior sub-Tenon's space is followed by diffusion of the solution through Tenon's capsule and into the retrobulbar compartment where the anaesthetic exerts its effect.^{1,2} Hyaluronidase is an enzyme which catalyses the depolymerisation of hyaluronic acid to a tetrasaccharide and potentially increases diffusion of local anaesthetic through tissue planes. The use of hyaluronidase in retrobulbar anaesthesia has been shown to be of benefit^{3,4} in terms of speed of onset and quality of block, but the results with peribulbar techniques are more conflicting.⁵⁻⁷

To ascertain whether hyaluronidase had any effect on the quality of block with the sub-Tenon's technique, we conducted a randomised double blind study.

Patients and methods

Ethics committee approval for the study was obtained and informed consent given by 150 patients scheduled to undergo elective cataract

surgery under local anaesthetic. Exclusion criteria were patients with learning difficulties, profound deafness, dementia, high anxiety scores, and those with a known adverse reaction to lignocaine or hyaluronidase.

Using random number tables, each of the patients was randomly allocated to one of two groups. The control group received 3 ml lignocaine 2%/adrenaline 1:200 000 (Xylocaine, Astra Pharmaceuticals Ltd) alone whereas the hyaluronidase group received 3 ml lignocaine 2%/adrenaline 1:200 000 with the addition of 30 IU/ml of hyaluronidase (Hyalase, CP Pharmaceuticals Ltd). The syringes were prepared at the start of the list by an independent assistant who took no further part in either administering or assessing the block. The ophthalmologist administering the block, the operative surgeon, and the nursing staff were unaware of the contents of the syringe. The blocks were performed by one of three ophthalmologists (SAR, JH, RDF) using the technique described by Stevens¹ but using a Visitec 19 gauge sub-Tenon's cannula (5176) and only injecting 0.5 ml of anaesthetic at the equator. A McIntyre intraocular pressure reducer was applied over the eye for 10 minutes.

Pain experienced during administration of block was measured immediately after injection and pain experienced peroperatively was measured immediately after surgery. The pain assessments were made by a trained ophthalmic theatre nurse without the investigator being present, using a visual pain analogue 10 cm in length (0 being no pain and 10 excruciating pain). Questions, phrasing, and intonation were as standardised as possible to avoid any bias. Akinesia and eyelid movement was assessed by the ophthalmologist administering the block 10 minutes after administration. The degree of akinesia was measured using a four point scale:

0 = complete movement remaining
1 = moderate movement
2 = slight movement (<3 mm in any direction)
3 = no movement.

Eyelid movement was assessed using a three point scale:

0 = normal movement
1 = reduced movement
2 = absent movement.

STATISTICAL METHODS

The power calculation was based upon the findings of a pilot study of pain scores in sub-Tenon's block without hyaluronidase; a standard deviation of 3.0 was achieved. We considered the smallest clinically significant difference to be a reduction in pain score of 1.5 on the analogue scale. Choosing a 5% significance

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Table 1 Patient demographics and proportions of blocks given by each investigator to the study

| | Hyaluronidase (n=76) | No hyaluronidase (n=74) | |
|-----------------------------------|-------------------------|----------------------------|----|
| Age range (years) | 37-96 | 52-93 | |
| Mean age | 77.14 | 76.51 | NS |
| Male:female ratio | 22:54 | 31:43 | NS |
| Blocks given by each investigator | | | |
| SAR | 57 | 48 | |
| JEH | 8 | 14 | NS |
| RDF | 11 | 12 | |

Table 2 Akinesia, eyelid movement, and pain scores

| | Hyaluronidase (n=76) | No hyaluronidase (n=74) | |
|---------------------------|-------------------------|----------------------------|-------------------------|
| Akinesia score | 2.32 | 1.43 | Significant (p<0.01) |
| Eyelid movement score | 1.37 | 0.50 | Significant (p<0.01) |
| Post-injection pain score | 2.26 | 1.95 | NS |
| Postoperative pain score | 1.04 | 1.03 | NS |

level, Altman's nomogram gives a power of 90% with a sample number of 150. Results were analysed using χ^2 test, χ^2 test for trend, *t* test, or Mann-Whitney U test as appropriate.

Results

There were 76 patients in the "with hyaluronidase" group and 74 patients in the control group and the two groups were similar in terms of age, sex distribution, and also proportion of blocks administered by each investigator (Table 1).

The degree of akinesia and reduction of eyelid movement, measured 10 minutes after administration of the anaesthetic, was significantly better (p<0.01) in the hyaluronidase group (Table 2) and indeed complete akinesia was achieved in 40 cases in the hyaluronidase group compared with only 10 in the control group. The mean post-injection and postoperative pain scores were higher in the hyaluronidase group (Table 2) but these were not statistically significant.

There was one case of posterior capsule rupture requiring anterior vitrectomy in each group and in four cases (two in each group) a 7 mm PMMA intraocular lens was inserted into the sulcus because of incomplete capsulorhexis. In none of these cases did the operating surgeon feel that the complication was due to the quality of the block.

Discussion

Although the use of topical anaesthesia alone is becoming more widespread in cataract surgery, there are patients for whom topical anaesthesia is not appropriate, perhaps because of poor patient cooperation, and where iris manipulation is required. In these cases, sub-Tenon's local anaesthesia provides a safe and effective

block avoiding the risks of sharp needle techniques.

This study has shown that at 10 minutes after injection, the group with 30 IU/ml of hyaluronidase added to the anaesthetic solution had significantly better akinesia and reduced eyelid movement compared with those who did not. There was no improvement in sensory blockade with the addition of hyaluronidase but in both groups the quality of the block was excellent. This supports the findings of a recent study by Guise and Laurent⁸ who showed significantly better akinesia after 9 minutes in the "with hyaluronidase" group compared with the control group. When they compared the quality of block at 13 minutes, however, they found no significant difference between the two groups. During a busy cataract list with average operating time of 15-20 minutes, this improvement in rate of onset of akinesia is clearly advantageous in terms of list efficiency.

We used 30 IU/ml of hyaluronidase as it reflected our day to day practice, did not deviate too far from the manufacturer's recommended 15 IU/ml, and was a similar concentration to those used in previous peribulbar studies.⁵⁻⁹ Our use of adrenaline in the anaesthetic solution again reflected our current practice and the potential risks of adrenaline in anaesthetic solutions are by no means proved.¹⁰⁻¹²

In conclusion, hyaluronidase has a beneficial effect in improving the quality of motor blockade achieved with sub-Tenon's local anaesthesia but has no effect on the sensory blockade.

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