Evaluation of the Greenbaum sub-Tenon’s block

C. M. Kumar* and C. Dodds

James Cook University Hospital, Marton Road, Middlesbrough TS4 3BW, UK

*Corresponding author

A prospective, randomized blind study was conducted in 40 patients undergoing phacoemulsification and posterior chamber intraocular lens implantation. They received anaesthetic infiltration of 2% lidocaine with 1:200 000 epinephrine and hyaluronidase 150 U ml\(^{-1}\) in a volume of 2, 3, 4 or 5 ml into the sub-Tenon’s fascial space through a Greenbaum cannula after a conjunctival incision. Reduction of ocular movements, anaesthesia, pain on injection and any incidental complications were recorded. Akinesia and anaesthesia occurred within 5 min with 4 and 5 ml of local anaesthetic, and no supplementary injections were required. There were marked reductions in the frequency of forced eyelid movements with these volumes. Chemosis and conjunctival haemorrhage were noted in the majority of patients but caused no intraoperative problems. Approximately 10–15% of patients reported slight discomfort at the time of injection. Four to 5 ml of 2% lidocaine with 1:200 000 epinephrine and 150 U ml\(^{-1}\) of hyaluronidase is the optimum volume to achieve adequate akinesia, anaesthesia and reduction of lid movements during the Greenbaum sub-Tenon’s block.

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Regional anaesthesia is widely used for ophthalmic surgical procedures and blocks are most commonly evaluated in patients undergoing cataract surgery. There is substantial international variation in the provision of ophthalmic regional anaesthesia for cataract surgery, both akinetic and non-akinetic techniques being used. At present, there is no technique that can be described as ideal. There is no standard method of formal assessment of anaesthesia and any inadequacy is often only apparent during surgery. The assessment of the extent of anaesthesia is particularly difficult when topical agents are used to produce surface anaesthesia, leading most investigators to rely on the development of akinesia as a marker of sensory, as well as motor, blockade.

This study was designed to evaluate and assess the Greenbaum technique and the optimum volume of local anaesthetic required to achieve maximum akinesia.

**Methods and results**

After having obtained Local Hospital Research Ethics Committee approval, we recruited 40 consecutive patients undergoing phacoemulsification cataract surgery into a prospective randomized blind study. Exclusion criteria were previous intraocular surgery, apparent ocular pathology other than age-related cataract and inability to communicate during surgery. After they had given informed consent, the patients were randomized to receive 2, 3, 4 or 5 ml of 2% lidocaine with epinephrine 1:200 000 and hyaluronidase 150 U ml⁻¹ into the sub-Tenon’s fascial space using Greenbaum’s cannula.

An independent observer, who was unaware of the volume used, assessed the quality of block. The patients were assessed for residual ocular movements in the superior, inferior, medial and lateral directions (movement scores: maximum, 3; moderate, 2; minor, 1; no movement, 0; range of 0–12 for each assessment) and forced lid opening and closure before the block and 2, 5 and 10 min after injections. If the akinesia score was >4 or judged inadequate for surgery at 10 min, a repeat injection consisting of a further 2 ml was given. Pain during the injection of local anaesthetic was assessed using a verbal rating score (no pain, 0; worst imaginable pain, 10). The surgeons were asked to note any discomfort or other complication that occurred during surgery. No sedation was used. Data were analysed using analysis of variance for repeated measures, Student’s t-test, the χ² test and the Mann–Whitney U-test as appropriate. Values of P<0.05 were considered statistically significant.

Patient data were comparable in all groups with respect to age, weight and axial length. The onset of akinesia was directly related to the volume of local anaesthetic injected (Fig. 1). None of the patients who received 2 ml had an akinesia score of <4 at 10 min. Twenty and 60 per cent of patients receiving 3 ml had an akinesia score of <4 at 5 and 10 min respectively. All patients receiving 4 or 5 ml had an akinesia score of <4 at 5 min, and this was statistically significant (P<0.05).

Lid opening and closing were both present in all patients receiving 2 ml of local anaesthetic but were markedly reduced or abolished in the other groups within 10 min and the onset was faster as the volume increased. All patients receiving 2 ml of local anaesthetic required a repeat injection but the requirement for repeat injections fell as the volume of local anaesthetic increased. None of the patients who received 4 or 5 ml of local anaesthetic required supplementary injection. None of the patients who had complete akinesia felt any pain or discomfort during surgery. Chemosis increased in incidence as the amount of local anaesthetic injected increased but did not cause any problem with surgery. A minor degree of conjunctival haemorrhage was observed in all cases, but the operating surgeons did not find this to be a problem. Fifteen per cent of the patients reported a minor degree of discomfort during the injection but their score was never >3 on the verbal rating score.

**Comment**

The original Greenbaum technique used diathermy and did not lead to akinesia. Small volumes of local anaesthetic were used without hyaluronidase. The technique appears to be simple, safe and effective but anaesthetists may be reluctant to use diathermy and the non-akinetic nature of the block leads to concern about the assessment of anaesthesia.
before the start of surgery. The assessment of anaesthesia is particularly difficult when topical agents are used to produce surface anaesthesia, so most investigators rely on the development of akinesia. The usual commercially available cannulae for sub-Tenon’s injection are made of metal and they are longer than the Greenbaum cannula, which is short, flexible, plastic and non-traumatic.

Inferonasal quadrant access is the method described most commonly in the literature because the dissection is away from the cataract incision area. In our experience of the use of this technique in 40 patients, it was easy to learn and perform. Injection of 4 or 5 ml of local anaesthetic produced effective anaesthesia and nearly complete akinesia within 5 min in all patients. We encountered no serious problems and the post-operative period was uncomplicated.

However, this technique has limitations. The injection site was slightly larger than the cannula size, although perhaps the use of diathermy would have limited the widening of the incision area, which increased as a result of traction during the injection. This also led to loss of local anaesthetic solution during the injection. Minor conjunctival haemorrhage was present in all patients, which is more frequent than the 56% reported in other papers. Chemosis was another common feature of this technique. The incidence and extent of chemosis increased as the volume of the local anaesthetic increased. The length of the cannula may have contributed to this phenomenon. We agree with Greenbaum that the use of diathermy may be worthwhile in attempting to reduce the incidence of conjunctival haemorrhage and chemosis. However, it is expensive and we believe that most anaesthetists would not use it.

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References