Comparison of 1% ropivacaine with 0.75% bupivacaine and 2% lidocaine for peribulbar anaesthesia

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We have compared the efficacy of 1% ropivacaine with a mixture of 0.75% bupivacaine and 2% lidocaine for peribulbar anaesthesia in cataract surgery. We used the time to adequate block for surgery, and ocular and eyelid movement scores at 8 min after block as clinical end-points. Ninety patients were allocated randomly to receive 7–10 ml of a mixture of equal parts of 0.75% bupivacaine and 2% lidocaine or an equal volume of 1% ropivacaine alone. Hyaluronidase 15 iu ml–1 was added to both solutions. There were no differences between groups in clinical end-points. Median time at which the block was adequate to start surgery was 8 min (interquartile range 4–10 min) in each group. Median eyelid movement scores were similar in both groups, but the bupivacaine and lidocaine mixture produced a significantly decreased ocular movement score at 2, 4 and 6 min (P<0.05). There was no difference between groups in the incidence of minor complications. Based on clinical end-points, time to adequate block for surgery and median ocular and eyelid movement scores at 8 min, 1% ropivacaine as the sole agent for peribulbar anaesthesia was comparable with a mixture of 0.75% bupivacaine and 2% lidocaine.

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Regional anaesthesia with peribulbar block is the technique of choice for most patients undergoing cataract surgery. A mixture of bupivacaine and lidocaine is the most frequently used local anaesthetic, lidocaine providing a rapid onset and bupivacaine a long duration of action.

Ropivacaine is a new aminoamide local anaesthetic agent with a greater margin of safety than bupivacaine for cardiotoxicity and central nervous system toxicity. We have shown recently that 1% ropivacaine is an effective alternative to 0.75% bupivacaine when used with 2% lidocaine for peribulbar anaesthesia. We found that, although ocular movement scores were not significantly different between groups at 2, 4, 6 and 8 min, eyelid movement scores were significantly less in the ropivacaine group at 2, 6 and 8 min (P<0.05). The earliest time at which the block was considered adequate to start surgery was 8 min for each group.

However, if ropivacaine is used as a single agent for peribulbar anaesthesia, onset of block may be delayed. In this study, we have compared the rapidity of onset and efficacy of peribulbar block produced with 1% ropivacaine alone with the traditional mixture of equal volumes of 0.75% bupivacaine and 2% lidocaine; hyaluronidase was added to both solutions. The major clinical end-points were ocular and eyelid movement scores at 8 min, and time to adequate block for surgery.

Methods and results

After obtaining approval from the Local Research Ethics Committee and written informed consent, we studied 90 patients presenting for cataract surgery under local anaesthesia. This study had a 95% chance of detecting a statistically significant (P<0.05) difference of two points for the sums of the ocular movement scores. Patients were excluded if they were unwilling to take part, if there were communication problems or if there was a history of allergy to amide-type local anaesthetic agents. Patients were allocated randomly to one of two groups using sealed envelopes. Sealed unmarked envelopes that contained the name of the anaesthetic to be administered were randomized by shuffling. One group received a mixture of equal volumes of 2% lidocaine and 0.75% bupivacaine, with hyaluronidase 15 iu ml–1, while the other group received an equivalent volume of 1% ropivacaine to which hyaluronidase 15 iu ml–1 was added. The anaesthetic solution was warmed to
patients were not fasted and did not receive any premedication, perioperative sedation or supplementary oxygen. On arrival in the induction room, baseline eyelid and globe movements were assessed. Topical anaesthesia of the conjunctiva and cornea was achieved by administering 2–3 drops of 0.4% oxybuprocaine. Standard monitoring was started and i.v. access established. Peribulbar block was carried out by one of two consultant anaesthetists via a single inferolateral, transcutaneous or tranconjunctival injection using a 25-gauge, 25-mm needle. After test aspiration, 7–10 ml of the local anaesthetic mixture was injected over 30–40 s. Different volumes of local anaesthetic were used depending on the degree of filling of the orbit observed during injection and the rate of onset of ptosis. Manual compression and gentle massage of the eyeball were performed after which a Visitec intraocular pressure reducer inflated to 40 mm Hg was applied between scoring to facilitate spread of the anaesthetic solution and to lower intraocular pressure. Patients were assessed for eyelid and ocular movements at 2-min intervals using the scoring system of Brahma and colleagues. Scoring was carried out by a trained observer who was blinded to the local anaesthetic used.

Ocular movements were scored for each direction of gaze in the superior, inferior, medial and lateral directions with a maximum score for each direction of 3 points and a possible total maximum score of 12 points. Ocular and eyelid movements were assessed at 2, 4, 6, 8 and 10 min until the block was considered adequate for surgery (eyelid movement score = 0 and ocular movement score ≤ 2). If after 10 min block was inadequate, supplementary anaesthesia was provided with another injection of up to 5 ml of the test solution using the same technique. Time to adequate surgical anaesthesia was noted in addition to the need for supplementary anaesthesia. It was assumed that, when motor block had been achieved, adequate sensory block was already present as this usually precedes motor block. Complications during or after injection were recorded and patients were questioned specifically about pain during insertion of the block or during surgery.

The main outcome criteria were difference in median ocular and eyelid movement scores at 8 min and time needed to obtain adequate block to start surgery. Differences between groups were analysed using the Wilcoxon rank sum test. The number of patients who reached an ocular movement score of ≤ 1, need for further injections, delay to the start of surgery and occurrence of complications were compared using the chi-square or Fisher’s exact test, as appropriate. Statistical analysis was carried out using SPSS for Windows version 8.

There were 45 patients in each group and all patient data were included in the statistical analysis. Mean age in the bupivacaine group was 75 (range 51–92) yr and 73 (41–98) yr in the ropivacaine group. The male:female ratio was 19:26 in the bupivacaine group and 15:30 in the ropivacaine group.

Table 1 Median (interquartile range) ocular and eyelid movement scores and number of patients who required supplementary anaesthesia or developed complications in the two groups. *P < 0.05 between groups.

<table>
<thead>
<tr>
<th>Complications</th>
<th>Bupivacaine 0.75% and 2% lidocaine (n = 45)</th>
<th>Ropivacaine 1% (n = 45)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8 min: 2 [0–4]</td>
<td>2 [1–5]</td>
</tr>
<tr>
<td>Eyelid movement scores</td>
<td>2 min: 1 [1–2]</td>
<td>1 [1–2]</td>
</tr>
<tr>
<td></td>
<td>4 min: 1 [0–2]</td>
<td>1 [0–2]</td>
</tr>
<tr>
<td></td>
<td>6 min: 0 [0–2]</td>
<td>1 [0–2]</td>
</tr>
<tr>
<td></td>
<td>8 min: 0 [0–1]</td>
<td>0 [0–1]</td>
</tr>
<tr>
<td>Supplementary anaesthesia</td>
<td>9</td>
<td>14</td>
</tr>
</tbody>
</table>

We have shown that 1% ropivacaine alone is an effective alternative to 0.75% bupivacaine and 2% lidocaine for peribulbar anaesthesia. Although the bupivacaine and lidocaine mixture resulted in significantly lower ocular movement scores at 2, 4 and 6 min, at 8 min both anaesthetic solutions provided similar anaesthesia. The faster onset in the bupivacaine and lidocaine group was probably the effect of lidocaine.
We were unable to assess the duration of motor block as patients’ eyes were bandaged and covered after operation and they were discharged home 1–2 h after surgery. If a shorter duration of motor block occurs with ropivacaine, this could be advantageous as prolonged paralysis from local anaesthesia leaves the eye vulnerable to drying and trauma.7

Peribulbar anaesthesia requires relatively large volumes of local anaesthetic and concerns have been expressed about the potential for systemic toxicity. The incidence of peribulbar blocks requiring supplementary anaesthesia has been reported to be as high as 54%.8 Huha and colleagues recently compared the clinical efficacy of 1% ropivacaine alone with 0.75% bupivacaine and found no difference in perioperative analgesia or duration of akinesia.9 Those patients who received 1% ropivacaine had higher maximum serum concentrations of local anaesthetic compared with the group who received 0.75% bupivacaine. However, no drug-related adverse effects were observed in either group. Ropivacaine is less toxic to the myocardium and central nervous system, which is a theoretical advantage in elderly patients who frequently have co-existing cardiac disease.

Acknowledgement
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References
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