Spinal anaesthesia for transurethral surgery: comparison of 2 % lignocaine with hyperbaric 0.5 % bupivacaine

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Summary
We have compared 2 % lignocaine 3.5 ml with 0.5 % hyperbaric bupivacaine 3 ml in a randomized, double-blind study in 30 patients undergoing subarachnoid anaesthesia for transurethral surgery. A sensory level of T10 was produced more quickly \( (P = 0.0001) \) and maximum height reached sooner \( (P = 0.0002) \) with lignocaine, although there was a greater reduction in systolic arterial pressure \( (P = 0.03) \) and a trend towards slower heart rates \( (P = 0.056) \). Return of full sensory and motor function occurred earlier with lignocaine \( (P = 0.0005 \) and \( P = 0.02) \). (Br. J. Anaesth. 1995; 75: 9–11)

Key words

Spinal anaesthesia is a well established technique for transurethral surgery, and indeed is considered by some as the technique of choice. Both bupivacaine and lignocaine have been shown to provide adequate anaesthesia. This study was undertaken to compare 2 % plain lignocaine with 0.5 % hyperbaric bupivacaine for transurethral surgery to see if one agent had clinically significant benefits in terms of speed of onset, time to maximum height, duration of block, cardiovascular stability or complications.

Patients and methods
We studied male patients, ASA I–III, presenting to one urological surgeon for transurethral surgery (bladder tumour, bladder neck or prostatic resection) with no contraindications to spinal anaesthesia and no objection to regional block. All gave written informed consent to the study which was approved by the Hospital Ethics Committee. Cardiovascular diseases or medications acting on the cardiovascular system were not considered a contraindication to spinal anaesthesia unless there was a fixed cardiac output state or the patient was receiving anticoagulants. Low-dose aspirin therapy was discontinued at least 2 weeks before surgery.

The solutions used were 2 % lignocaine (Xylocaine 2 %, Astra, specific gravity (SG) 1.0047 at 20 °C) and 0.5 % hyperbaric bupivacaine (Marcain heavy, Astra, SG 1.026 at 20 °C). Treatment was randomized to two groups using random number tables. Patients with even numbers were given 2 % lignocaine 3.5 ml (lignocaine group) and odd numbers 0.5 % hyperbaric bupivacaine 3 ml (bupivacaine group). Details of the selected agent were concealed in a sealed envelope and sequential envelopes opened as the patient arrived in the anaesthetic room. All subarachnoid blocks were performed by one consultant, and the data collected by two registrars who were blinded to the solution used.

Patients were unpremedicated. On arrival in the anaesthetic room automatic non-invasive arterial pressure (AP) and electrocardiograph (ECG) monitoring were commenced and 500 ml of Hartmann’s solution given i.v. An additional 500 ml of this solution was infused during surgery. Spinal injection was performed at the L3–4 or L2–3 interspace via a midline approach, with the patient in a sitting position, using a 24-gauge Sprotte needle. The solutions were injected over 60 s, aspirating once to check free flow of cerebrospinal fluid. Patients were placed supine with one pillow, after completion of subarachnoid injection.

Baseline AP and heart rate (HR) were recorded and the time of injection of local anaesthetic noted. The sensory level was assessed bilaterally using ethyl chloride spray. If the levels differed, the mean of the two sides was recorded. Motor block was assessed using the Bromage scale: 0 = no block, 1 = inability to raise the extended leg, 2 = inability to flex the knee, 3 = inability to flex the ankle joint or first digit of the foot.

Systolic arterial pressure (SAP), HR, sensory and motor levels were recorded at 3-min intervals during onset of the block, 5-min intervals during surgery and then at 15-min intervals until resolution.

When the sensory level reached T10, patients were placed in the lithotomy position for surgery. Oxygen was administered via a Hudson mask. Midazolam 1 mg was given i.v. if the patient requested sedation and this was repeated once if required. General anaesthesia was administered if the sensory block failed to reach T10 or if the patient complained of pain during surgery.

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HR less than 50 beat min⁻¹ was treated with atropine 0.3 mg i.v. A 30 % or greater decrease in baseline SAP was treated with rapid infusion of fluid and i.v. boluses of ephedrine 3 mg. Reductions in AP occurring after the maximum height of block was reached were treated with i.v. colloid or blood transfusion, as indicated by blood loss.

All patients were visited on the day after surgery. Postoperative opioid administration, episodes of clot retention and any complications were noted. Patients were asked specifically if they had been distressed by numbness.

Data were analysed with SPSS V4.0 software package. Comparisons between groups were performed using Wilcoxon rank sum tests. Categorical data were analysed using chi-square test with Yates’ correction or Fischer’s exact test for smaller frequencies. \( P < 0.05 \) was considered statistically significant. Data are presented as mean (SE) or median (95 % confidence intervals (CI)).

**Results**

We studied 30 patients; 17 received 2 % lignocaine 3.5 ml and 13 received 0.5 % hyperbaric bupivacaine 3 ml. Both groups were similar in age, weight and duration of surgery (table 1).

Prostatic resection was carried out in 13 patients in the lignocaine group and seven in the bupivacaine group; bladder neck incision in two and four patients, respectively, and tumour resection in two patients in each group. Mean weights of prostate resected were 32 (5) g and 26 (7) g for the lignocaine and bupivacaine groups, respectively. Five patients required general anaesthesia because of failure to establish an adequate level of sensory block; two patients in the lignocaine group and three patients in the bupivacaine group.

For the 15 patients in the lignocaine group whose block reached T10, the median onset time was 3 (3–3–3) min compared with 9 (4.5–13) min for the 10 patients in the bupivacaine group (\( P = 0.0001 \)). The median maximum height of block was T4 (T2.5–T5) for lignocaine and T5 (T3–T7.5) for bupivacaine (\( P = 0.56 \)). The median time to maximum height of block for lignocaine was 15 (8–20) min and 35 (27–47) min for bupivacaine (\( P = 0.0002 \)).

SAP decreased in both groups with a median reduction of 38.5 % (30–45 %) in the lignocaine group compared with 25 % (16–45 %) in the bupivacaine group (\( P = 0.026 \)) (table 2). The time to lowest AP for lignocaine was 35 (27–47) min and 20 (6–30) min, respectively (\( P > 0.05 \)). HR decreased in the lignocaine group by a median of 17.5 % (4–24 %) and increased in the bupivacaine group by 2 % (+23 to −17 %) (\( P = 0.056 \)).

Four patients in the lignocaine group required atropine 0.3 mg i.v. to treat HR < 50 beat min⁻¹, but none in the bupivacaine group (\( P = 0.14 \)). Five patients (29 %) in the lignocaine group and two (15 %) in the bupivacaine group required ephedrine. The maximum dose of ephedrine administered to any one patient was 6 mg. Four patients in the lignocaine group and two in the bupivacaine group received colloid or blood transfusion; all had prostatic resections.

Motor block lasted a median of 104 (75–123) min in the lignocaine group and 182 (140–240) min in the bupivacaine group (\( P = 0.02 \)). Sensory block lasted a median of 135 (115–183) min for lignocaine and 295 (200–390) min for bupivacaine (\( P = 0.0005 \)) (table 2).

Five of the 13 patients (39 %) in the lignocaine group who had prostatic resection compared with two of seven (29 %) in the bupivacaine group received opioids in the postoperative period (\( P = 1.05 \)).

Only one patient in the study (lignocaine group) developed clot retention. One patient in each group was distressed by the numbness associated with sensory block. No patient in the study developed post-spinal headache, and there were no neurological complications.

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**Table 1** Patient characteristics (mean (range or SE))

<table>
<thead>
<tr>
<th></th>
<th>Lignocaine (n = 17)</th>
<th>Bupivacaine (n = 13)</th>
</tr>
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<tbody>
<tr>
<td>Age (yr)</td>
<td>72 (60–86)</td>
<td>74.6 (65–88)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>77.4 (3.1)</td>
<td>72.4 (4.2)</td>
</tr>
<tr>
<td>Duration of surgery (min)</td>
<td>32 (5)</td>
<td>26 (7)</td>
</tr>
</tbody>
</table>

**Table 2** Summary of onset time, maximum height and time to maximum height, changes in systolic arterial pressure (SAP) and duration of sensory and motor block (median (95 % CI))

<table>
<thead>
<tr>
<th></th>
<th>Lignocaine</th>
<th>Bupivacaine</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to T10 (min)</td>
<td>3 (&lt;3–3)</td>
<td>9 (4.5–13)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Maximum height of block</td>
<td>T4 (T2.5–T5)</td>
<td>T5 (T3–T7.5)</td>
<td>0.56</td>
</tr>
<tr>
<td>Time to maximum height (min)</td>
<td>15 (8–20)</td>
<td>35 (27–47)</td>
<td>0.0002</td>
</tr>
<tr>
<td>Maximum decrease in SAP (%)</td>
<td>38.5 (30–45)</td>
<td>25 (16–45)</td>
<td>0.026</td>
</tr>
<tr>
<td>Time to maximum decrease in SAP (min)</td>
<td>32.5 (12–59)</td>
<td>25 (6–62)</td>
<td>0.52</td>
</tr>
<tr>
<td>Duration of sensory block (min)</td>
<td>135 (115–183)</td>
<td>295 (200–390)</td>
<td>0.00005</td>
</tr>
<tr>
<td>Duration of motor block (min)</td>
<td>104 (75–123)</td>
<td>182 (140–240)</td>
<td>0.02</td>
</tr>
</tbody>
</table>
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Discussion

In this study 2 % lignocaine 3.5 ml or 0.5 % hyperbaric bupivacaine 3 ml provided adequate anaesthesia for 25 patients undergoing transurethral surgery. In five cases the level of sensory block was inadequate for surgery and this high failure rate was thought to be related to inexperience with the use of Sprotte needles. Both hyperbaric and isobaric bupivacaine 0.5 % solutions have been shown previously to provide adequate anaesthesia for prostatic surgery [1–4], but anaesthesia is often prolonged [2] and may last for several hours after the patient has returned to the ward, during which time cardiovascular instability may be a problem [5]. In our patients sensory block produced by bupivacaine was prolonged (range 187–540 min) but, in all patients, the maximum changes in SAP occurred within 75 min, that is while the patients were still in theatre or the recovery ward. It has been suggested that patients dislike the prolonged numbness associated with intrathecal bupivacaine [3, 6] but only two patients in this study complained of numbness. However, this may be an underestimate as the patients in this study had the reassuring presence of an anaesthetist at 15 min intervals until the effects of anaesthesia had terminated.

The proposed benefits of prolonged block include reduced requirement for postoperative analgesia and the ability to deal with clot retention should it occur [3]. In our study, clot retention occurred in only one patient, 19 h after surgery; sensory block wore off at 3.5 h. Lignocaine 2 % has been used as an alternative agent for subarachnoid anaesthesia because of rapid onset, rapid attainment of maximum height and shorter duration of block [7]. It has been suggested that fewer unexpected hypotensive episodes occur during onset of anaesthesia and that there is greater cardiovascular stability on return to the ward [5, 6]. In this study we observed rapid onset of anaesthesia which allowed the patient to be positioned for surgery almost immediately if desired. We also confirmed earlier attainment of maximum height of block. However, hypotension was significantly greater in the lignocaine group and there was a trend towards slower heart rates. There was no significant difference in the number of late episodes of hypotension and no apparent association with prostatic resection, although the numbers involved are too small to draw conclusions. The median height of block in both groups was higher than that required for this type of surgery. This was surprising as the local anaesthetic solutions had been injected in the sitting position and the Trendelenburg position used in only four patients (three in the bupivacaine group with sensory levels of T2, T5 and L1 and one in the lignocaine group with a level of T4.5). The dose of lignocaine used was based on a study by Kristensen and colleagues [8] who found that 2 % lignocaine 3–4 ml was required to provide adequate anaesthesia for transurethral surgery. Hyperbaric bupivacaine 0.5 % (3 ml) was used for comparison as this was the dose most commonly used for spinal anaesthesia by colleagues in our department, although a smaller dose has been shown to be sufficient [4].

References

2. Ryan DW, Pridie AK, Copeland PJ. Plain bupivacaine 0.5 %: a preliminary evaluation as a spinal anaesthetic agent. Annals of the Royal College of Surgeons of England 1983; 65: 40–43.