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Short Communication

# Hyperbaric Bupivacaine for Spinal Anaesthesia in Adults Patients: Comparison of Isobaric Bupivacaine 0.5% in 80mg/Ml and 40 Mg/Ml Glucose Solutions

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**Abstract**

**Background:** The Baricity of bupivacaine is one of the most important factors to influence the characteristics of distribution of the local anaesthetic and spread of the blockade. Bupivacaine is rendered hyperbaric by adding glucose. The effect of differing degrees of hyperbaricity remains to be evaluated in term of spinal anesthesia blockade.

**Methods:** Hundred patients who underwent lower abdominal, hips, and lower extremity surgeries were randomized into two groups in a double-blind, randomised, parallel group, prospective study. Group I received 0.5% isobaric bupivacaine with 80 mg/ml of glucose, while Group II received 0.5% isobaric bupivacaine with 40 mg/ml of glucose. Injection was made intrathecally in midline position at L3-4 and L4-L5 interspace in sitting position. The measured sensory blockade and motor blockade are the onset and duration. Duration of sensory block was the time measured from the time of the highest block for the regression to the S2 dermatome.

**Results:** Success rate, spread and duration of sensory block were similar in both groups. The highest median level of sensory block was T3 (T2-T7) (median (10th/90th percentiles)) in both groups. Time to reach T10 did not differ between the groups. Power analysis suggested that a total number of 100 adults were required in both groups for a 90% chance at the 0.05 level of significance of detecting a10% difference in success between groups. Categorical data were tested using the chi square test. For continuous data the Mann–Whitney test was used. Results are presented as median (10–90$^{th}$ percentiles), number (%) of cases, the significance was set as $P<0.05$.

**Conclusion:** These results demonstrate that bupivacaine in 80mg/ml glucose provides reliable spinal anaesthesia of shorter duration and with less hypotension than bupivacaine in 40 mg/ml glucose. The recovery profile for ropivacaine may be of interest given that more surgery is being performed in the day-case setting.

## Introduction

The Baricity of bupivacaine is one of the most important factors to influence the characteristics of distribution of the local anaesthetic and spread of the blockade [1]. Bupivacaine is rendered hyperbaric by adding glucose. The effect of differing degrees of hyperbaricity remains to be evaluated in term of spinal anesthesia blockade. The measured sensory blockade and motor blockade are the onset and duration. Duration of sensory block was the time measured from the time of the highest block for the regression to the S2 dermatome. The aim of this prospective, randomized, double-blinded study was to make a direct comparison between 0.5% isobaric bupivacaine in 80 mg/ml and 40 mg/ml of glucose in term of spinal anesthesia blockade and that the recovery profile for bupivacaine may be of interest given that more surgery is being performed in the day case setting [2]. Spinal anaesthesia is popular in both small children and elderly people. Spinal anaesthesia produces rapid onset, profound and uniformly distributed analgesia with good neuromuscular block. The amide local anaesthetics (bupivacaine) is used regularly, and spinal anaesthesia allows the use of a small dose with a low risk of systemic toxicity. Baricity (weight of anaesthetic solution in relation to weight of Cerebrospinal Fluid (CSF)) is one of the most important factors claimed to influence distribution of local anaesthetic solutions in CSF. Solutions administered most frequently are hyperbaric as they produce more predictable block in both adults and children [3]. Studies in adults have found that addition of a small amount of glucose to increase the baricity of bupivacaine solution just into the hyperbaric range improved predictability of spinal block [4]. Two different hyperbaric bupivacaine solutions (80mg/ml glucose and 40mg/ml glucose) were compared.

## Patients and Methods

The study was approved by our Ethics Committee. All patients gave informed consent. We studied 100 patients, ASA I–II, aged 20-60 yr, undergoing day-case surgery below the umbilicus lower abdominal, hips, and lower extremity surgeries )were randomized into




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**Table 1:** Characteristics of the spinal puncture and the success rate of spinal anesthesia in the two groups (number %).

| | Bupivacaine in 80mg/ml glucose N=55 | Bupivacaine in 40 mg/ml glucose N=52 |
|---|---|---|
| Interspace used for spinal puncture: L3-L4 | 20 | 17 |
| L4-L5 | 35 | 35 |
| Time to complete (s) | 30 | 60 |
| Sensory block complete | 52 | 51 |
| Motor block complete | 53 | 52 |

**Table 2:** Characteristics of sensory block in the two groups (median (10-90$^{th}$ percentile)). Times are after spinal puncture.

| | Bupivacaine 0.5% with glucose 80 mg/ml N=55 | Bupivacaine 0.55 with glucose 40 mg/ml N=55 |
|---|---|---|
| Height of sensory block (dermatome) | T4(T1-T7) | T4(T1-T5) |
| Regression of block by two segments (min) | 63 | 85 |
| Regression of block to T7 (min) | 80 | 103 |
| Time to discharge from hospital (min) | 237 | 340 |

two groups in a double-blind, randomised, parallel group, prospective study. Group I received 0.5% isobaric bupivacaine with 80 mg/ml of glucose, while Group II received 0.5% isobaric bupivacaine with 40 mg/ml of glucose. Patients with a known contraindication to spinal puncture, such as increased intracranial pressure, haemorrhagic diathesis or infection at block or allergy to bupivacaine were excluded. Data were collected between July 2021 and June 2022. We used a double-blind, randomized, parallel group, prospective study design. Patients were allocated randomly (computer-generated) to receive spinal anaesthesia. Intraoperative monitoring consisted of non-invasive arterial pressure measurements every 5 min, continuous ECG, ventilatory frequency, peripheral arterial oxygen saturation and end-tidal carbon dioxide concentration. Appropriate treatment was given if systolic arterial pressure or heart rate decreased to less than 75% of baseline. All adverse effects were recorded. All patients were administered oxygen and monitored closely by the anaesthetist or anaesthetic nurse. Lumbar puncture was performed in the sitting position using a midline approach at the L3–4 or L4–5 interspace. Standard 27-gauge, 90-mm long spinal needles (Pencan). Correct placement was verified by free aspiration of CSF. After injection of local anaesthetic, free aspiration of CSF was verified again and the patient was placed in the supine, horizontal position. During spinal puncture the following variables were recorded: interspace used ; and time to complete the block. The highest median level of sensory block was T3 (T2-T7) (median (10th/90th percentiles)) in both groups. Time to reach T10 did not differ between the groups. A pinprick testing was used to evaluate the width of the analgesic area, 15 min after injection of the anaesthetic. A movement in a rostral direction along the surface of the trunk was used until the patient reported mild pain, indicating the upper border of the analgesic area. The procedure was repeated until the level of the first painful segment was confirmed. Motor block was assessed using a modified Bromage scale recording the patient's ability to flex the ankle, knee and hip (0=no motor block, 3=complete motor block of the legs and feet). After operation, patients were transferred to the Post Anaesthesia Care Unit (PACU) for continuous monitoring of vital signs and regression of block. Regression of sensory block by two segments was tested every 5 min and the time recorded. Patients were discharged when they were awake, able to walk unaided, had stable vital signs for at least 1 h had no pain or only mild pain, had no nausea, or vomiting, and were able to tolerate clear fluids. Time to discharge was measured from spinal puncture to actual discharge from the hospital/PACU. Power analysis suggested that a total number of 100 adults were required in both groups, 50 patients were required in each group for a 90% chance at the0.05 level of significance of detecting a 10% difference in success between groups. Categorical data were tested using the chi square test. For continuous data the Mann–Whitney test was used. Results are presented as median (10–90th percentiles), number (%) of cases, the significance was set as $P<0.05$.

## Results

Patient data and the characteristics of spinal punctures were comparable between groups. The success rate of spinal block was high in both groups with no differences between groups (Table 1). These results demonstrate that bupivacaine in 80mg/ml glucose provides reliable spinal anaesthesia of shorter duration and with less hypotension than bupivacaine in 40 mg/ml glucose. The recovery profile for bupivacaine may be of interest given that more surgery is being performed in the day case setting. 100 patients were randomized into two groups in a double blind, randomized, parallel group, prospective study. Both groups had similar characteristics for spinal puncture (median 10-90$^{th}$ percentile) with L3-L4 and L4-L5 level used for spinal puncture with the dose of isobaric bupivacaine 0.5% of 10 mg and the time for complete block was 30 sec in bupivacaine 0.5% with 80 mg/ml glucose and 60 sec in bupivacaine 0.5% with 40 mg/ml group. The characteristics of sensory block in the two groups were as follow, the height of sensory block was at T4 in both groups and the regression of block by two segments, the regression of block to T7 and the time to discharge from hospital was shorter in bupivacaine 0.5% with glucose 80mg/ml group compared to bupivacaine 0.5% with 40mg/ml glucose group (Table 2). The regression of block by two segments was 63 min in group I and 85 min in group II. The regression of block to T7 was 80 min in group I and 103 min in group II.

Time to discharge from hospital was 237 min in group I and 340 min in group II.

There were no differences between groups in the incidence of adverse effects.

## Discussion

We have compared the anesthetic effects of isobaric bupivacaine 0.5% in 80mg/ml and 40 mg/ml of glucose solutions. Thus baricity was the main factor responsible for differences in spinal block. In agreement with the studies observed previously, a slightly hyperbaric bupivacaine solution produced a predictable sensory block but the spread of the block did not show the narrow range observed in adults [5]. In this study, the success rate of spinal with bupivacaine 0.5% in glucose 80 mg/ml was high to complete surgery [6]. We measured the analgesic area using pinprick testing for assessment of height and duration of anesthesia and analgesia. The results of our study confirm our earlier findings that the characteristics of sensory block in the

two groups, the height of sensory block, the regression of block by two segments and regression to T7 plus the time to discharge from hospital was shorter in bupivacaine 0.5% with glucose 80 mg/ml group compared to bupivacaine 0.5% with glucose 40 mg/ml group.

Mild hypotension was reported in 15 patients and 20 patients reported shivering which was a normal physiological response during spinal anesthesia. In summary, these results demonstrate that bupivacaine in 80mg/ml glucose provides reliable spinal anaesthesia of shorter duration and with less hypotension than bupivacaine in 40mg/ml glucose. The recovery profile for ropivacaine may be of interest given that more surgery is being performed in the day-case setting.

## References

1. H Kokki, H Hendolin. No difference between bupivacaine in 0.9% and 8% glucose for spinal anaesthesia in small children. Acta Anaesthesiol Scand. 2000; 44: 548-51.
2. JB Whiteside, D Burke, JAW Wildsmith. Comparison of ropivacaine 0.5% (in glucose 5%) with bupivacaine 0.5% (in glucose 8%) for spinal anaesthesia for elective surgery. Br J Anaesth. 2003; 90: 304-8.
3. Fettes PDW, Hocking G, Peterson MK, Luck JF, Wildsmith JAW. Comparison of plain and hyperbaric solutions of ropivacaine for spinal anaesthesia. REGIONAL ANAESTHESIA. 2005; 94: P107-111.
4. Uppal V, Retter S, Shanthanna H, Prabhakar C, McKeen DM. Hyperbaric Versus Isobaric Bupivacaine for Spinal Anesthesia: Systematic Review and Meta-analysis for Adult Patients Undergoing Noncesarean Delivery Surgery. Anesth Analg. 2017; 125: 1627-1637.
5. Tang WX, Li JJ, Bu HM, Fu ZJ. Spinal anaesthesia with low-dose bupivacaine in marginally hyperbaric solutions for caesarean section: A randomised controlled trial. Eur J Anaesthesiol. 2015; 32: 493-8.
6. Kokki H, Tuovinen K, Hendolin H. Spinal anaesthesia for paediatric day-case surgery: a double-blind, randomized, parallel group, prospective comparison of isobaric and hyperbaric bupivacaine. Br J Anaesth. 1998; 81: 502-6.