Selective Spinal Anesthesia versus Intravenous Propofol in Transrectal Ultrasound-Guided Prostate Biopsy

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Background: *Selective spinal anesthesia (SSA) focuses on the use of minimal doses of intrathecal agents with greater precision and selectivity so that return of function occurs rapidly.*
Objective: *The authors compared the efficacy of 1.25 mg of hyperbaric bupivacaine intrathecally with propofol anesthesia in terms of hemodynamic stability, surgical conditions and ability to bypass the post anesthetic care unit (PACU).*
Material and Method: *Seventy male patients, 45-85 years old, ASA physical status I-III, were randomly allocated into two groups. Group 1 (n = 35) received intrathecal 1.25 mg hyperbaric bupivacaine plus patient's cerebrospinal fluid 0.75 ml. Group 2 (n = 35) received propofol 1-1.5 mg/kg IV bolus dose and 6-10 mg/kg/hr infusion to maintain surgical anesthesia.*
Results: *The patients in group 1 had adequate anesthesia and were able to walk and bypass the PACU (100%). The need of supplemental oxygen and airway maneuver, the incidence of hypotension and bradycardia were found only in group 2. The surgical conditions were rated as excellent 100% in group 1 and 57.1% in group 2.*
Conclusion: *SSA is superior to propofol anesthesia in terms of hemodynamic stability, surgical conditions and recovery profiles. Even elderly patients were able to walk out from the operating theatre immediately after the procedure.*

Keywords: *Selective spinal anesthesia (SSA), Ambulatory anesthesia, prostate biopsy*

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About 65% to 90% of men reported discomfort during transrectal ultrasound (TRUS)-guided prostate biopsy[1]. The pain is a result of transrectal probe insertion and penetration of the prostate capsule by the biopsy needle[2]. Various techniques of anesthesia delivery such as propofol anesthesia, neuraxial anesthesia, and periprostatic block have been evaluated to increase acceptance of the procedure. However, many patients are elderly and have coexisting medical conditions. Therefore, there are increased risks for hemodynamic variations and postoperative complications[3]. Some recent publications have suggested that pain may be controlled by periprostatic block[2,4-6] but some have shown no benefit[7]. Machado et al[2] reported that 38.5% of patients had more discomfort due to probe manipulation. So the unpleasant experience still remains.

Spinal anesthesia (SA) can currently compete with the newer general anesthetic agents that allow shortened discharge times[8]. Selective spinal anesthesia (SSA) focuses on the use of minimal doses of intrathecal agents. The main aim is to provide SA with greater precision and selectivity so that return of function occurs rapidly[9-12].

In the present study, the authors compared the efficacy of 1.25 mg of hyperbaric bupivacaine intrathecally with propofol anesthesia in terms of hemodynamic stability, surgical conditions and ability to bypass the post anesthetic care unit (PACU).

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Material and Method

The present study was approved by our institutional ethics committee and the written informed consent was obtained. Seventy male patients, 45-85 years old, ASA physical status I-III, scheduled for outpatient TRUS-guided prostate biopsy obtaining a minimum of ten cores were enrolled in this prospective randomized controlled trial. The patients who were unable to walk and had contraindication to SA were excluded. The patients were randomly allocated into two groups according to a random number table. In the operating room, routine monitors were applied (eletrocardio-graphy, automatic blood pressure, and pulse oximeter). All patients received midazolam 1 mg intravenously and 300 ml of Ringer's lactate solution preloading within 15 minutes before conducting of the anesthetic. The intravenous fluid was maintained at 5 ml/kg/hr during the intra-operative period. Group 1 (n = 35) received 1.25 mg hyperbaric bupivacaine plus patient's cerebrospinal fluid 0.75 ml (total volume = 1 ml). A 27-gauge spinal needle was inserted at L3-4 in the lateral decubitus position. The solution was injected over 10 seconds after free flow of cerebrospinal fluid was verified. Subsequently, the patient was placed in the supine position for 5 minutes before being placed in the lithotomy. The level of sensory block was defined by using a pinprick test and the degree of motor block was rated with a modified Bromage scale[11] before the procedure. If a patient complained about discomfort or pain, fentanyl 1 mcg/kg would be given intravenously at 10-min intervals. Group 2 (n = 35) received propofol 1-1.5 mg/kg bolus dose and 6-10 mg/kg/hr IV infusion to maintain surgical anesthesia. The heart rate, blood pressure and pulse oximetry were recorded at 3-min intervals. Hypotension, defined as systolic blood pressure which decreased 20% from baseline, was treated with 5 mg of ephedrine intravenously.

Bradycardia, defined as heart rate which decreased 20% from baseline, was treated with atropine 0.3 mg intravenously. Supplementary oxygen was administered via oxygen mask, flow 6 L/min, only if the SpO_2 was < 95%. The need for additional airway maneuver (SpO_2 < 90%) and other adverse effects, including nausea, vomiting and pain of propofol injection were recorded. The surgical conditions were graded by the surgeon according to the number of any movement as poor 8-10, fair 5-7, good 2-4, and excellent 0-1. The anesthetic time was recorded as the time from midazolam injection until transfer to PACU.

At the end of surgery, the motor block was assessed as to whether they were able to walk out independently from the surgical table and the ability to bypass PACU using a modified Aldrete score $\geq$ 9 by the PACU nurses. Those who could not, were assessed at 15 min-intervals (0,15,30,45,60 min). The need for therapeutic interventions (*e.g.*, supplement oxygen, analgesia, or antiemetic medications) was recorded. The patients in group 1 were questioned about pain intensity during the procedure as a study end point, using a verbal rating score (VRS 0-10), with 0 denoting no pain and 10 equaling the worst pain imaginable. The patients in group 2 were questioned about pain of injection. Patients were allowed to take acetaminophen tablets, 500 mg *p.o.*, following surgery for pain relief. The incidence of postoperative side effects, time to void (time from anesthesia induction to voiding), and the duration of stay in the PACU and Phase 2 unit were also recorded. The actual discharge time (time to achieve Modified Post Anesthesia Discharge Scoring System (PADSS) score $\leq$ 9 plus voiding) were recorded. Post-discharge follow-up by telephone was done at 24-48 hr. to assess post dural puncture headache (PDPH), backache, transient neurological syndrome (TNS), and patient's satisfaction. The patient's satisfaction was graded as poor, satisfactory, and good.

Statistical analysis was completed using unpaired Student's t tests for continuous data and Fisher's exact test for categorical data as appropriate. Nishikawa et al[13] reported the incidence of hypotension was lower in SA with small-dose lidocaine compared to general anesthesia (GA) with fentanyl and propofol (5% vs. 47.5%). A sample size was calculated based on this, with $\alpha = 0.05$ and $\beta = 0.2$. Thirty-five patients were required in each group in order to have a power of 80%. Data are presented as mean $\pm$ standard deviation unless specified otherwise. The comparisons are considered statistically significant at $p \leq 0.05$. All analyses were performed using SPSS program.

Results

Patients' demographic data, anesthesia time are listed in Table 1. There was no difference between the two groups.

There was a remarkable cardiovascular stability in group 1. Hypotension and bradycardia, however, were found in group 2. The anesthesia was comparable in both groups. The patients in group I required neither supplemental analgesia nor conversion to GA. Supplemental oxygen and airway maneuver were needed only in group 2. All patients in group 1

Table 1. Demographic characteristics and anesthetic time

Variable	Group I SSA (n = 35)	Group II Propofol (n = 35)
Age (yr)	64.8 ± 9.1	65.9 ± 6.6
Weight (kg)	61.7 ± 9.4	64.2 ± 9.6
ASA (I:II:III)	1:26:7	3:24:8
SBP (mmHg)	144.6 ± 17.4	145.3 ± 18.2
DBP (mmHg)	90.0 ± 16.5	72.4 ± 16.4
MAP (mmHg)	108.2 ± 14.6	96.7 ± 11.4
HR (bpm)	72.0 ± 8.8	72.3 ± 14.9
Anesthetic time (min)	32.7 ± 3.5	32.2 ± 3.2

Data are mean ± SD
SSA = selective spinal anesthesia; ASA = American Society of Anesthesiologists

Table 2. Intraoperative outcomes

Variable	Group 1 SSA n (%)	Group 2 Propofol n (%)
Hypotension	0	14 (40)
Bradycardia	0	2 (5.7)
O_2 supplement	0	35 (100)
Airway maneuver	0	33 (94.3)
PACU bypass	35 (100)	0

Data are presented as numbers (%)
SSA = selective spinal anesthesia

were able to walk and bypass PACU while those in group 2 required the PACU care. The surgical conditions were rated as excellent 100% in group 1 and 57.1% in group 2. The statistic difference showed the SSA superiority when compared to propofol anesthesia as in Table 3.

In group 1, the median level of the upper sensory block was T9-10. All patients were able to perform a deep knee bend at five minutes testing and at the end of surgery. All patients reported no pain (VRS = 0) but two patients felt some touching during the procedure and only reassurance was needed. The patients had neither PDPH nor TNS. Two patients had backache due to soreness at the site of injection.

In group 2, 75% of patients complained about pain of propofol injection and all of them required oxygen supplement at PACU. Three patients in each group had urinary catheterization due to voiding difficulty. Actual time to discharge was significantly earlier in group 1 than in group 2. Patient's satisfaction was rated as good 94.28% in group 1 and 91.42% in group 2, as satisfactory 5.71% in group 1 and 8.57% in group 2 respectively.

Discussion

The ideal anesthetic would be a technique that is easily performed, has a fast onset, good surgical conditions, hemodynamic stable with a rapid recovery and minimal side effects[14]. Intra-operatively, optimal surgical conditions must be balanced with maintaining a stable physiologic state. In an ambulatory setting, where patients have significant co-morbidities that make GA undesirable, SA offers several advantages over procedures performed using GA, including the maintenance of alertness and cognitive function, hemodynamic stability, and immediate return to normal oral intake. Furthermore, SA can facilitate fast tracking, allowing early mobilization[15]. Regarding the use of SA in outpatients, some other concerns include the possibility of urinary retention, delayed recovery of motor function and the development of TNS[15,16].

In an effort to make it successfully selective and optimally efficient for ambulatory surgery,

Table 3. Postoperative outcomes

Variable	Group 1 SSA n (%)	Group 2 Propofol n (%)	p-value
O_2 supplement	0	35 (100)	<0.001*
PACU stay (min)	0	67.4 ± 19.2	<0.001*
Time to void (min)	102.5 ± 40.2	105.5 ± 30.0	0.74
Actual discharge time (min)	104.7 ± 30.5	131.7 ± 18.6	0.07
Patient's satisfaction as good	33 (94.3)	32 (91.4)	0.65

Data are mean ± SD or numbers (%)
SSA = selective spinal anesthesia

mini-doses of local anesthetics are used. As the dose of local anesthesia is progressively reduced, there are beneficial effects in terms of a more stable hemodynamic profile and modalities such as light touch, proprioception, motor and sympathetic functions are essentially preserved. SSA tends to preserve muscle tone and power in the legs and facilitates rapid ambulation[17]. Nishikawa et al reported the use of SA with 10 mg hyperbaric lidocaine in prostate biopsy. They found 5% incidence of hypotension, but they did not state the motor power in the legs[13]. Hyperbaric lidocaine has been abandoned in many countries due to the risk TNS. Therefore, the authors chose to use bupivacaine, because it is associated with less motor blockade and very low incidence of TNS (1%)[16]. The authors found that bupivacaine in a very small dose (1.25 mg) provided completely satisfactory anesthesia for this procedure. A drawback of regional anesthesia (RA) techniques is that they require additional preparation time. However, performance of SA is simple, rapid and has high reliability. There is no time difference in administration of the SA or in waiting for an emergence from propofol anesthesia (Table 1). Voiding before discharge is required in the present study because of concern about bladder dysfunction especially in high risk patients such as greater than age 70, having urologic surgery and with a history of voiding difficulty[17]. A large volume preload may not be desirable in ambulatory patients due to the risk of perioperative bladder distension[18]. In the present study, there is no statistical difference between groups in time and ability to void.

In addition, less favorable, early recovery profile of propofol is associated with a high incidence of intra-operative hypotension, airway manipulation and an increased need for therapeutic interventions both intrao-peratively and postoperatively. A fixed dose used in SSA may make surgical conditions and blood pressure states better than an adjusted dose as used in propofol anesthesia. SSA avoids the need for airway manipulation, eliminates complications of GA such as hypotension, cardiac arrhythmia, hypoxemia and hypoventilation. Immediate return to normal oral intake and early ambulation establishes satisfactory conditions for fast-tracking concepts[19].

Conclusion

This study demonstrates that SSA is superior to propofol anesthesia in terms of hemodynamic stability, operating conditions and recovery profiles. Even elderly patients are able to bypass the PACU and walk out from the operating theatre immediately after the procedure.

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การฉีดยาชาทางช่องไขสันหลังแบบเลือกได้ (selective spinal anesthesia, SSA) ในการตัดชิ้นเนื้อต่อมลูกหมากผ่านทางทวารหนักโดยใช้เครื่องอัลตราซาวด์

เพชรา สุนทรฐิติ, โฉมชบา สิรินันท์, รัฐพล แสงรุ้ง, จิตติยา วัชโรทยางกูร, วรรณิภา สิทธิ์ธรรมวิไล

วัตถุประสงค์*: เปรียบเทียบประสิทธิภาพของ hyperbaric bupivacaine ขนาด 1.25 มิลลิกรัมฉีดทางช่องไขสันหลังกับการให้ยา propofol ฉีดทางหลอดเลือดดำ โดยวัดผลจาก การเปลี่ยนแปลงของระบบไหลเวียนเลือด, ความราบรื่นของการผ่าตัด และความสามารถในการฟื้นตัวเร็วในระดับที่ไม่ต้องอยู่ห้องพักฟื้น*

วัสดุและวิธีการ*: การศึกษาในผู้ป่วยชาย 70 คน, ASA I-III ที่มารับการตัดชิ้นเนื้อต่อมลูกหมากผ่านทางทวารหนัก แบ่งผู้ป่วยออกเป็น 2 กลุ่ม กลุ่มที่ 1 ได้รับยา hyperbaric bupivacaine ขนาด 1.25 มิลลิกรัม ฉีดทางช่องไขสันหลัง กลุ่มที่ 2 ได้รับยา propofol ขนาด 1-1.5 มิลลิกรัม/กิโลกรัม และให้อย่างต่อเนื่องอีก ขนาด 6-10 มิลลิกรัม/กิโลกรัม/ชั่วโมง*

ผลการศึกษา*: ในผู้ป่วยกลุ่มที่ 1 พบว่าระดับการชาเพียงพอต่อการผ่าตัด และสามารถฟื้นตัวเร็วในระดับที่ไม่ต้องอยู่ห้องพักฟื้นได้ทุกคน พบภาวะความดันเลือดต่ำ และภาวะหัวใจเต้นช้า เฉพาะในผู้ป่วยกลุ่มที่ 2 ความราบรื่นของการผ่าตัดดีเยี่ยม พบได้ 100% ในผู้ป่วยกลุ่มที่ 1 และ 57.1% ในผู้ป่วยกลุ่มที่ 2*

สรุป*: SSA มีประสิทธิภาพเหนือกว่า propofol ฉีดทางหลอดเลือดดำในเรื่องความมั่นคงของระบบไหลเวียนเลือด, ความราบรื่นของการผ่าตัด และการฟื้นตัวได้รวดเร็ว แม้ว่าผู้ป่วยสูงอายุยังสามารถเดินได้ทันทีหลังผ่าตัด*