Gazi Tıp Dergisi / Gazi Medical Journal

ARAŞTIRMA YAZISI - RESEARCH ARTICLE

2005: Cilt 16: Sayı 4: 176-179

COMPARISON OF SPINAL ANESTHESIA WITH ISOBARIC 0.5% BUPIVACAINE IN THE PRONE OR JACKKNIFE POSITION WITH HYPERBARIC 0.5% BUPIVACAINE IN THE SITTING POSITION FOR ANORECTAL SURGERY

Pavel BADALOV[1], Hulya CELEBI[2], Bulent MENTEŞ[1]

Purpose: This study was designed to compare the anesthetic behavior, and hemodynamic consequences in spinal anesthesia performed with isobaric bupivacaine 0.5% 10 mg in the prone or jackknife position with those of spinal anesthesia performed with hyperbaric bupivacaine 0.5% 10 mg in the sitting/moved prone position in patients undergoing anorectal surgery.

Methods: Sixty patients were allocated into three groups to receive spinal anesthesia in the sitting (Group I), prone (Group II), or jackknife (Group III) position. The subarachnoid puncture was performed using a standard midline approach with a 25-gauge pencil-point spinal needle at L4-5 and hyperbaric or isobaric 0.5% bupivacaine 10 mg was injected according to the position.

Results: Onset of anesthesia was significantly faster in Group I, with the highest level at L1 and median L2 in 10 min. The highest anesthesia level was at L1 in the other groups as well. The final median anesthesia level was L3 and L2 in Groups II and III, respectively, in 15 min. This segmental analgesia remained stable until 90, 105 and 75 min in Groups I, II and III, respectively. Two segment regression times were 106.40±9, 109.65±6 and 107.95±7 min in Groups I, II and III, respectively. Motor block reached 3 in all groups and returned to 2 within 105 min in Groups II and III and within 120 min in Group I.

Conclusion: Spinal anesthesia can be performed successfully in the three different positions. Isobaric or hyperbaric bupivacaine 0.5% 10 mg produced similar anesthesia at L2 or L3 levels, which were suitable for pilonidal cyst excision in the prone position. However, isobaric bupivacaine 0.5% 10 mg was not favorable for ambulatory anorectal surgery in the jackknife position because of higher segmental anesthesia than predicted and long-lasting motor blockade.

Key Words: Anesthesia; Spinal Position; prone, jackknife, sitting Surgery; anorectal

ANOREKTAL CERRAHİDE PRON VEYA JACKKNIFE POZİSYONDA İZOBARİK %0.5 BUPİVAKAİNLE YAPILAN SPİNAL ANESTEZİNİN OTURUR POZİSYONDA HİPERBARİK %0.5 BUPİVAKAİNLE YAPILANLA KARŞILAŞTIRILMASI

Amaç: Bu çalışma anorektal cerrahi geçiren hastalarda pron veya jackknife pozisyonda %0.5 10 mg izobarik bupivakainle yapılan spinal anestezinin, %0.5 10 mg hiperbarik bupivakainle yapılana gore anestezik ve hemodinamik etki açısından karşılaştırılması amacıyla planlandı. Metod: Oturur (Grup I), pron (Grup II) ve jackknife (Grup III) pozisyonlarda spinal anestezi yapılmak üzere 60 hasta üç gruba ayrıldı. Subaraknoid ponksiyon standart orta hat yaklaşımıyla L4-5 aralığından, 25-gauge kalem uçlu spinal iğneyle yapıldı ve hiperbarik ya da izobarik %0.5 10 mg bupivakain pozisyona göre enjekte edildi.

Bulgular: Grup I'de anestezi başlangıcı en hızlı olup, en yüksek seviye L1 ve ortanca değeri 10. dakikada L2 seviyesine ulaştı. En yüksek anestezi seviyesi diğer gruplarda da L1 idi. En son ulaşılan anestezi seviyesinin ortanca değeri 15. dakaikada Grup II'de L3, Grup III'te L2 idi. Bu seviyeler Groups I, II and III de sırasıyla 90, 105 ve 75 dakikaya kadar stabil kaldı. İki segment gerileme zamanları Grup I, II ve III'te sırasıyla 106.40±9, 109.65±6 ve 107.95±7 dk idi. Motor blok derecesi tüm gruplarda 3 olup, Grup II ve III'te 105 dk.da, Grup I'de ise 120 dk.da 2.dereceye döndü ($p<0.05$).

Sonuç: Spinal anestezi üç farklı pozisyonda başarıyla uygulandı. %0.5 10 mg izobarik ve hiperbarik bupivakain L2 ya da L3 seviyelerinde benzer anestezi oluşturdu. Pron pozisyonda pilonidal kist cerrahisi için yöntem uygun bulundu. Ancak %0.5 10 mg izobarik bupivakain, öngörülenden daha yüksek segmental anestezi ve geç sonlanan motor blok oluşturması nedeniyle jackknife pozisyonda uygulanan spinal anestezi ambulatuar anorektal cerrahi için uygun bulunmadı.

Anahtar Kelimeler: Anestezi: spiral pozisyon, pron, jacknife, oturur cerrahi; arorektal

Departments of Anesthesiology[1] and General Surgery2, Faculty of Medicine, Gazi University, Ankara - Turkey

Spinal anesthesia is most frequently performed in the lateral decubitus or sitting position and is rarely performed in the prone or jackknife position by anesthetists today (1,2). Spinal anesthesia in the prone or jackknife position has been described for procedures such as anorectal and lower lumbar disc surgery and emergency procedures (3-7). The standard approach was to perform spinal anesthesia in the sitting position before placing the patient into the position for surgical intervention and the preferred local anesthetic was mostly hyperbaric bupivacaine 0.5%. Therefore, we wanted to perform spinal anesthesia in the prone and jackknife positions to find out the best method.

This study was designed to compare the anesthetic behavior, and hemodynamic consequences in spinal anesthesia performed with isobaric bupivacaine 0.5% 10 mg in the prone or jackknife position with those of spinal anesthesia performed with hyperbaric bupivacaine 0.5% 10 mg in the sitting/moved prone position in patients undergoing anorectal surgery.

METHODS

The study was approved by the Hospital Ethics Committee, and informed consent was obtained from each patient. Sixty patients with ASA (American Society of Anesthesiologists) physical status I-II scheduled for elective anorectal surgery were included. Patients older than 50 years, those morbid obese, those using anticoagulants or salisilates, and those having coagulation abnormalities, or neurological or psychiatric problems were excluded from the study. No premedications were administered. Electrocardiographic monitoring, non-invasive blood pressure measurements and pulse oximetry (Physiogard SM 785 nt/07, France) were used in all patients. On arrival in the operating room, a standard iv infusion of 0.9% NaCl solution 7 mL kg-1 was given before and after spinal anesthesia, which was performed by the same senior resident under the supervision of the same consultant. Spinal anesthesia was performed in the sitting (Group I, n= 20), prone (Group II, n=20), or jackknife (Group III, n=20) position.

Preparation of spinal anesthesia:

The lumbo-sacral area was prepared, and infiltration anesthesia from the skin to the ligamentum flavum was performed with 2 mL prilocaine at a level corresponding to the L4-5 interspace. Subarachnoid puncture was performed using a standard midline approach with a 25-gauge (G) pencil-point spinal needle (Pencan®) with introducer. The spinal needle aperture was directed caudally during insertion and injection of the local anesthetic solution. When the spontaneous flow of cerebrospinal fluid (CSF) was observed or confirmed by aspiration of 0.2 mL CSF, hyperbaric or isobaric 0.5% bupivacaine 10 mg at room temperature was injected intrathecally over 20 seconds.

In Group I, hyperbaric 0.5% bupivacaine 10 mg was given in the sitting position. The patients were kept in the same position for 5 min after the beginning of the injection. Then they were moved to the prone position with a pillow under the iliac crests in the 20

Table 1. Demographic properties and duration of operation [Mean±SEM].

	Group I (n=20)	Group II (n=20)	Group III (n=20)
Age (year)	32.15±4.36	33.55±5.58	34.10±6.10
Weight (kg)	75.90±7.35	73.65±8.59	72.65±7.70
Height (cm)	174.80±7.34	176.40± 8.24	172.00± 4.15
Duration of operation (min)	57.60±13.08	54.40±14.65	18.15±1.57* #

*:P<0.05 vs. Group I
#:P<0.05 vs. Group II

degrees head-down position. In Groups II and III, the patients were placed in the prone or jackknife position (20 and 30 degrees head-down, respectively) before the dural puncture. They were administered isobaric 0.5% bupivacaine 10 mg and they stayed in the same positions during the operation.

During the procedures, the patients were given nasal oxygen 4 L h-1 via a nasal catheter. Heart rate (HR), mean arterial pressure (MAP), and peripheral oxygen saturation (SpO2) were recorded before performing the dural puncture (B-baseline), immediately after delivering the local anesthetic solution into the subarachnoid space (0), and then at 2, 5, 10, 15, 20, 25, and 30 min. Sensory block was evaluated based on the patient's statement of being able to perceive a pin prick in any given dermatome 2, 5, 10, 15, 20, 25, 30, 45, 60, 75, 90, 105, and 120 min after the intrathecal injection. Motor block was evaluated using a modified Bromage scale (0 = no paresis, full movement; 1 = partial paresis, ability to flex knee; 2 = partial paralysis, ability to flex foot only; and 3 = full paralysis, no movement) and the degree of motor paralysis was recorded (8).

The patients were observed for 30 min in the recovery room; then they were transferred to the ward. Two segment regression time and recovery of motor function within 120 min were recorded.

Patients' satisfaction rate was assessed by asking whether they would prefer the same anesthesia protocol should they need to undergo a similar procedure in future. The patients were interviewed by telephone 72 hours after discharge from the hospital for the presence of headache, backache, paresthesia on the buttocks, incontinence, or any other complications.

Statistical Analysis

The data are presented as mean ± standard error of mean (SEM) or standard deviation (SD), median values (range) and numbers (n). The data were analyzed with SPSS 10.0 for Windows. Repeated measurements (HR, MAP, motor and sensory block) were analyzed by using repeated-measures analysis of variance (ANOVA). One-way ANOVA was used to compare other parametric data followed by post hoc comparisons with Bonferroni adjustment. Nominal data (ASA, gender) of the groups were compared using the chi-square or Fisher's exact test. P values less than 0.05 were considered significant.

RESULTS

The three study groups were similar with regard to demographic data (Table 1). The cases were pilonidal cyst excision in Groups I and II. The durations of surgery were similar in Group I (57.60±13.08 min) and Group II (54.40±14.65 min). Since the patients in Group III underwent minor surgical interventions for conditions such as perianal fistula, chronic anal fissure or hemoroidectomy, they had the shortest operation time (18.15±1.57 min).

SpO2 remained within normal values during the operation. There were no statistically significant differences in MAP at all time points within the groups. No significant differences were found within the groups at all time points. Although there were significant differences in MAP between the groups at some of the time points, they were within normal clinical limits. In Group III, MAP recorded at 0, 2, 10 and 20 min showed significant increases with respect to Group I (Figure 1).

Heart rate decreased significantly with respect to the baseline within all groups. There were significant differences between the groups, but they were in normal clinical limits as well. In Group III, HR recorded at 0, 10, 15, 20 and 30 min showed significant increases with respect to Group I. In Groups I and II, HR recorded at 0, 10, 20, 25 and 30 min showed significant decreases with respect to Group III (Fig. 1).

Successful dural puncture was performed at the first or second attempt with a 25 G spinal needle (Pencan®) in all groups. Sufficient surgical anesthesia for the anorectal region was achieved in all patients. None of the patients received any sedatives or analgesics peroperatively. The onset of anesthesia was significantly faster in Group I, with the highest level L1, and the median maximum block reached L2 in 10 min. Similarly, the highest segmental anesthesia level was L1 in the other groups, but the final median segmental anesthesia level was L3 and L2 in Groups II and III, respectively, in 15 min. This maximum sensorial blockade level did not change until 90 min in Group I, 105 min in Group II and 75 min in Group III ($p< 0.05$). Two segment regression time was 106.40±9 min, 109.65±6 min and 107.95±7 min in Groups I, II and III, respectively. Sensorial blockade levels are shown in Figure 2.

The degree of median motor blockade was 3 in Groups I and III within 10 min; whereas it was 3 in Group II within 20 min. Motor block returned to 2 within 105 min in Groups II and III, and within 120 min in Group I ($p< 0.05$) (Fig. 3).

Since patients stated that they would prefer the same anesthesia protocol should they need to undergo a similar procedure in future, the overall satisfaction rate was considered high. No per/postoperative complications were seen. The patients were allowed to leave the hospital the day after surgery without any

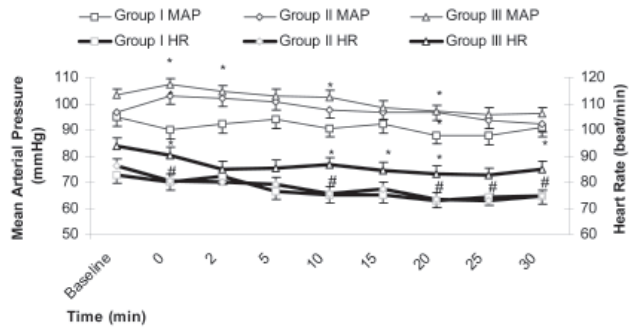

Figure 1: Mean arterial pressure and heart rate (mean ± SEM).

* :P<0.05 vs. Group I and #:P<0.05 vs. Group III

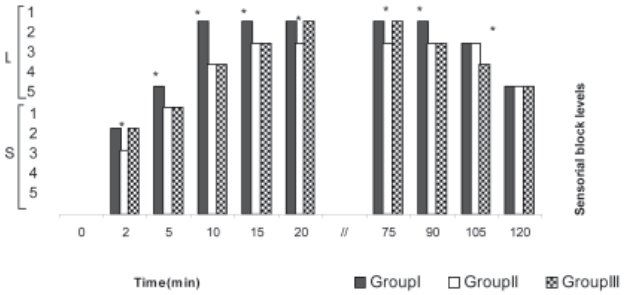

Figure 2: Segmental distribution of sensorial block levels (median).

* :P<0.05 vs. other groups

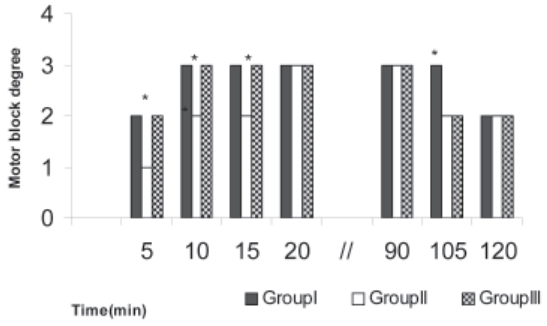

Figure 3: Segmental distribution of motor block levels (median).

* :P<0.05 vs. other groups

complications. When they were contacted by telephone 72 hours after discharge from hospital, they did not complain of any headache, backache, incontinence or any other problem related to anesthesia.

DISCUSSION

We gained experience in the induction of spinal anesthesia in the prone or jackknife position, which was an ideal approach when patients were required to be in these positions during surgery. The two approaches, prone and jackknife, were carried out for the first time in our clinic. The new methods were found to be satisfactory and were preferred by the surgery team.

Larsen (7) reported spinal anesthesia with 4 mL of isobaric bupivacaine 5 mg.mL-1 in the prone position for a patient who had positioned himself face-down on the table because of the pain. The patient was placed in the supine position after 10 min without any change in blood pressure or heart rate. The approach in the prone position is necessary for patients who cannot be positioned in the sitting or lateral decubitus, and so the anesthetist should be experienced in this method. Jellis et al. (9) performed spinal anesthesia with hyperbaric 0.75% bupivacaine in the right lateral decubitus position/moved supine. After achieving a stable segmental anesthesia level in approximately 10 min, the patients were rolled over into the prone position for lumbar disc and laminectomy surgery. However, Rugh et al. (5) injected isobaric 0.5% bupivacaine 10 mg in the prone position for patients undergoing single-level disc surgery. They recommended this method because of its many advantages, such as more time-efficient and more reliable block, besides the lower incidence of hypotension. Laakso et al. (6) performed spinal anesthesia in the prone knee-chest position for lumbar disc surgery. Maroof et al. (3) studied the anesthetic properties of 5 mg hypobaric bupivacaine 0.1%, administered in the prone-jackknife position for anorectal surgery. While motor blockade was absent, they recorded the highest sensory blockade at T10. The prone position was generally preferred for spinal surgery and the jackknife position for anorectal surgery according to the above studies. In this study, while pilonidal cyst excision was performed in the prone position, the jackknife position was preferred by the surgeon for anal operations.

In the present study, hemodynamic stability was anticipated, especially for the prone and jackknife positions, but even in Group I MAP and HR remained within normal clinical limits.

Identification of the correct position of the needle tip in the prone or jackknife position can be performed with the patient positioned head up during needle placement and then moved head down during the injection of local anesthetic solution (10) or aspiration of CSF 0.2-0.3 mL through the needle before injecting the local anesthetic (6). We preferred the latter because a position change was avoided.

Pencil-point needles, such as 25 G, have a low incidence of postdural puncture headache (PDPH) because they separate the longitudinal dural fibers instead of cutting them, and thus dural trauma and leakage of CSF are reduced (11-13). None of our patients suffered from PDPH.

Another advantage of this needle is the lateral location of the ejection port, which is proximal to the tip, facilitating caudal pooling of local anesthetic solutions. Therefore, the spinal needle aperture was directed caudally during insertion and during the injection of the local anesthetic solutions. We expected only the sacral dermatomes to be affected, but we observed that most of the lumbar segments in addition to sacral dermatomes were blocked in all groups. Bupivacaine (0.5%) 10 mg seemed to exceed the actual required dose.

Both hyperbaric and isobaric lidocaine have been reported to cause transient neurological symptoms (TNS) (14,15). The incidence of TNS varies from 0% to 3% with bupivacaine (13). Because of low TNS incidence, we used bupivacaine despite its long duration. None of our patients complained of TNS after 72 hours. The patients were obliged to stay one night in hospital because of the long recovery characteristics of both heavy and isobaric bupivacaine. Therefore, 10 mg of both bupivacaine formulations cannot be recommended for outpatient surgery.

Isobaric bupivacaine acts hypobarically at body temperature (16-18). Blomqvist and Nilsson (19) confirmed the hypobaric behaviors of isobaric bupivacaine 0.5% administered intrathecally in patients positioned laterally. Therefore, we preferred to use isobaric bupivacaine requiring the prone and jackknife positions for anorectal surgical procedures to achieve block towards the caudal. While isobaric bupivacaine spreads to a higher level in the erect patient, hyperbaric solutions flow downward by gravity in the CSF in the sitting position (20). In the present study, the median height of anesthesia at L2 in the sitting/moved prone position was 10-90 min and in the jackknife position 15-75 min, and at L3 in the prone position 15-105 min. The highest levels of blockade (L1) were similar in all groups. Two segment regression times were 106.40±9, 109.65±6 and 107.95±7 min in Groups I, II and III, respectively ($p>0.05$). Motor block reached 3, which occurred earlier in Groups I and III (10 min) than in Group II (20 min), and returned to 3 and 2 in 105 min in Groups II and III, but in 120 min in Group I. Motor blockade was more intense in patients kept sitting regardless of the solution used (21). In contrast, Malinovsky et al. (22) demonstrated that hyperbaric solutions induced shorter anesthesia and motor blockade than with an isobaric solution. We preferred isobaric bupivacaine because of its hypobaric behavior in CSF. Although we used a higher dose (10 mg) than did Maroof et al. (3), who used hypobaric 5 mg bupivacaine in the jackknife position, sensorial blockade was lower in the present study (L2 versus T10). Motor blockade did not develop in their study, whereas the motor blockade was dense and long lasting in our study. There was no problem in either the sensorial or motor blockade observed in the pilonidal cyst operations because those patients were hospitalized, but motor blockade was disadvantageous for short anal surgeries in ambulatory basis. Therefore, we concluded that both approaches for spinal anesthesia were suitable for pilonidal cyst surgery. The jackknife position was ideal for anal surgery, but isobaric bupivacaine 0.5%, 10 mg was not favorable for ambulatory surgery.

In conclusion, spinal anesthesia can be achieved safely with 0.5% isobaric bupivacaine in patients requiring the prone or jackknife position for surgery, but 10 mg of both solutions was not favorable for ambulatory anorectal surgery because of the unnecessary higher segmental anesthesia and long-lasting motor blockade. Therefore, further studies with smaller doses are required.

ACKNOWLEDGMENT

We would to thank Dr. Mustafa Arslan for his help with the statistical analysis of the study and technical contribution to the manuscript.

Correspondence Address:
Prof. Hulya Celebi
Department of Anesthesiology
Gazi University, Faculty of Medicine
06500 Besevler-Ankara TURKEY
Telephone: 90 312 2025311
E-mail: hcelebi@gazi.edu.tr or sertcelebi@hotmail.com

REFERENCES

1. Kennedy FW. Techniques of neural blockade. In. Cousins MJ, Bridenbaugh PO (eds): Neural Blockade in Clinical Anesthesia and Management of Pain. Philadelphia: JB Lippincott; 1980. p. 164-165.
2. Kleinman W. Regional anesthesia & pain management. In. Morgan GE, Mikhail MS, Murray MJ, Larson CP (eds): Clinical Anesthesiology. 3rd ed. New York: McGraw-Hill Company; 2002. p. 263-264.
3. Maroof M, Khan RM, Siddique M, Tariq M. Hypobaric spinal anaesthesia with bupivacaine (0.1%) gives selective sensory block for ano-rectal surgery. Can J Anaesth 1995; 42: 691-694.
4. Alley EA, Pollock JE. Transient neurologic syndrome in a patient receiving hypobaric lidocaine in the prone jack-knife position. Anesth Analg 2002; 95: 757-759.
5. Rung GW, Williams D, Gelb DE, Grubb M, Jellish WS, Shea J, Thalji Z. Isobaric spinal anesthesia for lumbar disk surgery. Anesth Analg 1997; 84: 1165-1166.
6. Laakso E, Pitkänen M, Kyttä J, Rosenberg PH. Knee-chest vs horizontal side position during induction of spinal anaesthesia in patients undergoing lumbar disc surgery. Br J Anaesth 1997; 79: 609-611.
7. Larsen JR. Emergency spinal anaesthesia in the prone position. Acta Anaesthesiol Scand 1997; 41: 790-791.
8. Vincent RD, Chestnut DH. Analgesia during labor and delivery. In. Brown DL (ed): Regional Anesthesia and Analgesia. Philadelphia: WB Saunders; 1996. p. 587-608.
9. Jellish WS, Thalji Z, Stevenson K, Shea J. A prospective randomized study comparing short- and intermediate-term perioperative outcome variables after spinal or general anesthesia for lumbar disc and laminectomy surgery. Anesth Analg 1996; 83: 559-564.
10. Hodgson PS, Liu SS. Spinal anesthesia for day surgery. Tech Reg Anesth Pain Med 2000; 4: 3-9.
11. Hodgson PS, Liu SS. New developments in spinal anesthesia. Anesthesiol Clin North Am 2000; 18: 235-247.
12. Sharma SK, Gambling DR, Joshi GP, Sidawi JE, Herrera ER. Comparison of 26-gauge Atraucan® and 25-gauge Whitacre needles: insertion characteristics and complications. Can J Anaesth 1995; 42: 706-710.
13. Faccenda KA, Finucane BT. Complications of regional anaesthesia. Drug Safety 2001; 24: 413-442.
14. Pollock JE, Liu SS, Neal JM, Stephenson CA. Dilution of spinal lidocaine does not alter the incidence of transient neurologic symptoms. Anesthesiology 1999; 90: 445-450.
15. Flaatten H, Raeder J. Spinal anaesthesia for outpatient surgery. Anaesthesia 1985; 40: 1108-1111.
16. Greene NM. Distribution of local anesthetic solutions within the subarachnoid space. Anesth Analg 1985; 64: 715-730.
17. Tuominen M. Bupivacaine spinal anaesthesia. Acta Anaesthesiol Scand 1991; 35: 1-10.
18. Horlocker TT, Wedel DY. Density, specific gravity and baricity of spinal anesthetic solution at body temperature. Anesth Analg 1993; 76: 1015-1108.
19. Blomqvist H, Nilsson A. Is glucose-free bupivacaine isobaric or hypobaric? Reg Anesth 1989; 14: 195-198.
20. Tuominen M, Kalso E, Rosenberg PH. Effects of posture on the spread of spinal anaesthesia with isobaric 0.75% or 0.5% bupivacaine. Br J Anaesth 1982; 54: 313-318.
21. Stienstra R, Poorten F. Plain or hyperbaric bupivacaine for spinal anesthesia. Anesth Analg 1987; 66: 171-176.
22. Malinovsky JM, Renaud G, Corre P, Charles F, Lepage JY, Malinge M, Cozian A, Bouchot O, Pinaud M. Intrathecal bupivacaine in humans. Anesthesiology 1999; 91: 1260-1266.