

Research Article

A Comparison of Spinal and Epidural Anesthesia in Pilonidal Sinus Surgery: A Prospective Randomized Single-Center Clinical Study

Turgut Donmez,¹ Adnan Hut,² Vuslat Muslu Erdem,³ Duygu Ayfer Erdem,³ Dogan Yildirim,² Sinan Uzman,⁴ Oguzhan Sunamak,⁵ Muzaffer Akinci,² Ibrahim Halil Ozata¹

¹Department of General Surgery, Lutfiye Nuri Burat State Hospital, Istanbul, Turkey

²Department of General Surgery, Haseki Training and Research Hospital, Istanbul, Turkey

³Department of Anesthesiology and Reanimation, Lutfiye Nuri Burat State Hospital, Istanbul, Turkey

⁴Department of Anesthesiology and Reanimation, Haseki Training and Research Hospital, Istanbul, Turkey

⁵Department of General Surgery, Haydarpasa Numune Training and Research Hospital, Istanbul, Turkey

Abstract

Objectives: Regional anesthesia techniques may be preferred to general anesthesia for pilonidal sinus surgery due to difficulties related to the prone position under general anesthesia. The aim of this study was to compare spinal anesthesia (SA) and epidural anesthesia (EA) with respect to perioperative and postoperative side effects and postoperative pain.

Methods: A total of 100 American Society of Anesthesiologist class I or II patients underwent pilonidal sinus surgery. The patients were randomly divided into 2 groups of SA (n=50) or EA (n=50). The perioperative and postoperative side effects related to anesthesia and postoperative pain level were compared between the groups.

Results: There was a significant difference with respect to the maximal sensorial height of block (EA: L1-L3; SA: T7-T11; p<0.001). The duration of the sensorial block was significantly longer in the EA group (290±23 minutes) compared with the SA group (215±6 minutes). No patient in the EA group developed motor block. There was no significant difference between the groups in the side effects related to anesthesia. The postoperative pain level was evaluated with the Visual Analogue Scale in the postoperative recovery room and at 6, 12, and 24 hours after surgery. None of the patients in either group required analgesic treatment for first 6 hours after the surgery. There was significantly less postoperative pain in the EA group compared with the SA group, except at the sixth hour, but the clinical difference was small.

Conclusion: EA may be preferred to SA due to better postoperative pain control and the absence of a motor block.

Keywords: Epidural anesthesia, pilonidal sinus surgery, spinal anesthesia

Pilonidal sinus disease (PSD) is a common surgical condition, consisting of a hair-containing sinus or abscess occurring in the natal cleft of the sacrococcygeal region, and it usually occurs in young males.^[1] The incidence can be as high as 6.6% to 8.8% among Turkish students and soldiers.^[2,3]

Pilonidal sinus surgery is almost always performed in a prone position.^[4] Traditionally, general anesthesia is induced in the supine position, and after tracheal intubation, the patient is turned to the prone position.^[5] Patients in the prone position under general anesthesia may experi-

Address for correspondence: Sinan Uzman, MD. Haseki Egitim ve Arastirma Hastanesi, Istanbul, Turkey

Phone: +90 212 529 44 00 - 22 96 **E-mail:** drsinanuzman@yahoo.com

Submitted Date: October 10, 2017 **Accepted Date:** October 26, 2017 **Available Online Date:** November 07, 2017

©Copyright 2017 by Eurasian Journal of Medicine and Oncology - Available online at www.ejmo.org



ence various complications, such as limb, ophthalmic, and pressure injuries.^[6, 7] Moreover the change from supine to prone position can lead to endotracheal tube disposition and accidental extubation.^[6-8] It has been reported that spinal anesthesia (SA) was superior to total intravenous anesthesia for PSD surgery due to early recovery, less postoperative nausea and vomiting, and reduced analgesic consumption after the surgery.^[9]

Therefore, regional anesthesia may be preferred to general anesthesia for PSD surgery, and the most commonly used technique is SA, due to rapid onset and ease of application.^[10] SA-induced adverse events, such as hypotension, bradycardia, post-dural puncture headache, and urinary retention, are similar to those of EA, but these events may be more common and more severe with SA.^[11] There are few studies examining the use of EA in PSD surgery.^[12]

This study is a comparison of SA and EA in PSD surgery with respect to perioperative and postoperative side effects and postoperative pain intensity.

Methods

This was a prospective, randomized, single-center clinical study to compare SA and EA in PSD surgery. Following receipt of the approval of the Haseki Training and Research Hospital Ethics Committee (September 2; no.: 105/244) and obtaining the written, informed consent of the patients, the study was conducted according to the Declaration of Helsinki.

Between October 2015 and March 2016, all patients older than 18 years of age with American Society of Anesthesiologists (ASA) physical status class I or II scheduled to undergo an elective PSD operation in the prone position were included in the study. Exclusion criteria were ASA \geq III, contraindications for SA or EA, such as coagulation disorders, infection at the injection site, or mental disorders, and a history of allergy to local anesthetics.

Patients were allocated to the SA group and EA group using a simple, computer-generated randomization. The day before surgery, all of the patients met with the anesthesiologist at the routine preoperative visit for regional anesthesia techniques.

No premedication was used. After the intravenous line was established with an 18-G intravenous catheter, all of the patients received 10 mL/kg of Ringer's lactate solution for volume loading 20 minutes before the regional anesthesia. SA and EA were performed in the sitting position using a standard midline approach under strict sterile conditions. Two mL of 2% lidocaine was injected intradermally to provide local anesthesia. SA was administered using a 26-G Whitacre pencil point spinal needle in the L3-L4 intervertebral space.

Following the observation of free flow of cerebrospinal fluid, 1.5 mL mg 0.5% hyperbaric bupivacaine (7.5 mg) was injected into the subarachnoid space. In the EA group, an 18-G Tuohy needle was inserted into the L3-L4 intervertebral space and the epidural space was identified the using loss of resistance to saline technique. The aperture of the needle tip was directed caudally. After negative aspiration of blood or cerebrospinal fluid, 2 mL of lidocaine 2% was administered as a test dose. Three minutes later, 15 mL 0.5% hyperbaric bupivacaine (75 mg) was injected for EA. An epidural catheter was not applied.

Following the spinal or epidural injection of local anesthetic, the patients were placed in the prone position. At 1-minute intervals, the sensorial block level was evaluated with the pinprick test and motor block was assessed using the modified Bromage scale (0=no motor block; 1=unable to raise extended legs, but able to flex knees and ankles; 2=unable to flex hips and knees, but able flex to ankles; 3=unable to move hip, knee or ankle). When the sensorial block reached the L2 dermatomal level, the patient was turned over to the prone position.

Standard anesthesia monitoring, including continuous electrocardiography, noninvasive arterial blood pressure, heart rate, and peripheral oxygen saturation, was provided throughout. All of these monitoring parameters were recorded immediately before volume loading, at 1-minute intervals for 15 minutes after the anesthesia procedure, at 5-minute intervals until the patient was returned to the ward, and every 30 minutes until the 24th hour after the surgery. The demographic profile details of the patient and surgery time (the time from the first incision until the last suture) were recorded. The maximal sensorial block height, the onset time of analgesia (the time from the injection of the local anesthetic to reaching L2 sensorial block), the onset time of motor block, and the duration of sensorial and motor block were also recorded. In addition, any anesthesia-related perioperative and postoperative adverse events of hypotension (30% decrease in baseline mean arterial pressure or systolic arterial pressure <90 mmHg), bradycardia (heart rate <50 beats/minute), hypoxemia (SpO₂ <90%), nausea/vomiting, headache, or urinary retention were recorded. The Visual Analogue Scale (VAS; 0=no pain, 10=severe pain) was used to assess surgical field pain. A VAS pain score was first recorded in the recovery room (VAS0), and 6 (VAS6), 12 (VAS12), and 24 (VAS24) hours after the surgery. A researcher/anesthesiologist who was blinded to the group allocation recorded all of the data.

The SPSS Statistics for Windows, Version 17.0 software package (SPSS Inc., Chicago, IL, USA) was used for the statistical analysis of the study. Quantitative variables were

expressed as mean \pm SD and/or median (min-max) analyzed with the Kolmogorov-Smirnov test. The Student's t-test or the Mann-Whitney U test was used to compare variables with normal distribution and variables without normal distribution, respectively. Categorical variables were expressed as patient numbers and percentage. A chi-square test and Fisher's exact test were used to compare categorical variables. A $p < 0.05$ value was considered statistically significant.

The sample size of the study was calculated based on the postoperative pain level. In a previous study, the average pain after PSD surgery under general anesthesia as evaluated by VAS was 3.10 ± 1.51 . Power analysis with $\alpha = 0.05$ and $\beta = 0.2$ to determine the 20% reduction on VAS value with SA or EA revealed that each group required a minimum of 47 patients.^[13] A $p < 0.05$ was considered statistically significant.

Results

In all, 117 patients who underwent elective PSD surgery were enrolled in the study. Seventeen patients who didn't fulfill the inclusion criteria or did not want to participate in the study were excluded. Ultimately, 50 patients in each group were evaluated (Figure 1). All surgical and anesthesia procedures were performed with the same anesthesiologist and the same surgeon, and were completed successfully. Desired anesthesia was achieved on the first attempt in all cases.

There was no significant difference between the groups with regard to demographic characteristics, ASA physiological score, surgery time, or hospitalization days (Table 1). The

level of maximal sensorial block was significantly higher in the SA group than in the EA group (EA: L1-L2; SA: L1-T8; $p < 0.001$). The onset time of analgesia was 4.14 ± 0.99 minutes in the SA group and 6.62 ± 1.03 minutes in the EA group ($p < 0.001$). The duration of the sensorial block was significantly shorter in the SA group compared with the EA group ($p < 0.001$). No patient in the EA group developed motor block. The duration of motor block was 156 ± 6 minutes in the SA group. There was no significant difference between the groups in the side effects observed (Table 2).

Urinary retention was the most common side effect related to regional anesthesia after the surgery (4 EA patients; 7 SA patients; $p = 0.338$). No patient in the EA group developed a headache, but 4 patients suffered from a headache in the SA group ($p = 0.059$). Hypotension was observed in 2 patients in the EA group and 1 patient in the SA group ($p = 0.500$). Bradycardia and postoperative nausea/vomiting (PONV) were not observed in any patients ($p > 0.999$) (Table 3).

All patients received 1 L Ringer's lactate and 1 L isotonic saline for fluid replacement within 24 hours after the surgery. The postoperative pain scores were significantly lower in the EA group compared with the SA group, with the exception of the sixth hour, but the clinical difference was small (Table 4). If VAS ≥ 4 , tramadol 50 mg in 100 mL physiological saline was administered within 30 minutes for surgical field pain. None of the patients in either group required analgesic treatment for the first 6 hours after the surgery. All of the patients in both groups except for 1 patient in the SA group needed analgesic treatment at the sixth hour ($p > 0.999$). In all, 35 patients in the SA group and 27 patients in the EA group received a tramadol infusion to relieve pain

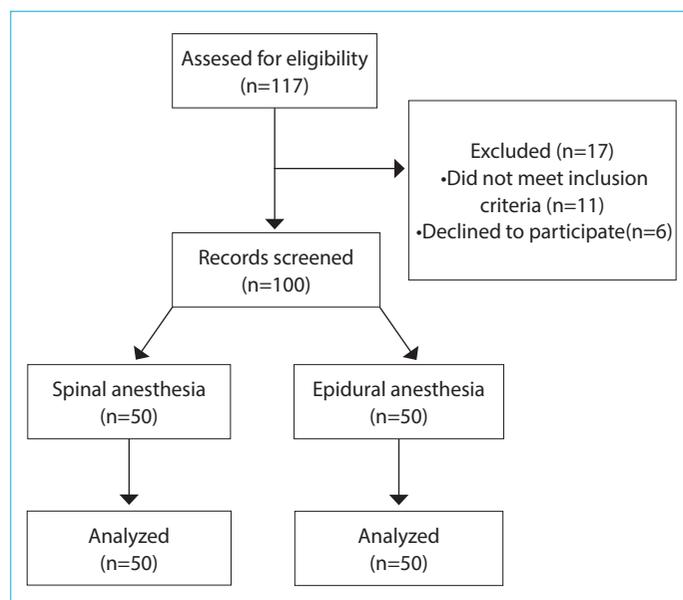


Figure 1. Flowchart diagram of the study.

Table 1. Characteristics of the patients

	SA group	EA group	p
Age (years) ^a	25 (18-60)	25 (18-58)	0.890
Sex (M/F) (n)	13/37	15/35	0.824
Weight (kg)	72 \pm 10	76 \pm 14	0.091
Height (cm)	171 \pm 7	172 \pm 8	0.339
BMI (kg/m ²)	24.4 \pm 2.7	25.4 \pm 3.5	0.121
ASA I/II (n)	48/2	48/2	>0.999
Surgery time (min)	40 \pm 7	40 \pm 8	0.945
Hospital stay (days) ^a	1 (1-2)	1 (1-2)	0.728

^aMedian (min-max). ASA: American Society of Anesthesiologists; BMI: Body mass index; EA: Epidural anesthesia; SA: Spinal anesthesia.

Table 2. Characteristics of neuroaxial block

Block characteristic	SA group	EA group	p
Sensorial block height ^a	T10 (L1-T8)	L2 (L1-L2)	<0.001
Onset time of analgesia	4.14 \pm 0.99	6.62 \pm 1.03	<0.001
Duration of sensorial block ^a	214 (211-219)	294 (288-302)	<0.001
Onset time of motor block	7.22 \pm 1.20	NA	NA
Duration of motor block	156 \pm 6	NA	NA

^aMedian (25p-75p). EA: Epidural anesthesia; SA: Spinal anesthesia; NA: Not available.

Table 3. Perioperative and postoperative side effects

Side effects	SA group	EA group	p
Urinary retention ¹	7 (14%)	4 (8%)	0.338
Headache ¹	4 (8%)	0 (0%)	0.059
Hypotension ²	1 (2%)	2 (4%)	0.500
Bradycardia ²	0 (0%)	0 (0%)	>0.999
PONV ¹	0 (0%)	0 (0%)	>0.999

¹Postoperative; ²Perioperative. EA: Epidural anesthesia; PONV: Postoperative nausea and vomiting; SA: Spinal anesthesia.

Table 4. Postoperative pain evaluation

VAS	SA group	EA group	p
VAS-0h	0.5 (0-3)	0 (0-1)	<0.001
VAS-6h	5 (3-8)	6 (5-8)	0.091
VAS-12h	4 (2-6)	4 (2-5)	0.043
VAS-24h	2 (1-5)	2 (1-4)	0.016

Values were presented as median (25p-75p). EA: Epidural anesthesia; SA: Spinal anesthesia; VAS: Visual Analog Scale.

at the 12th hour ($p=0.099$). No patient needed analgesic treatment 24 hours after the surgery.

Discussion

To the best of our knowledge, this is the first study to compare SA and EA in PSD surgery. In the present study, we found that patients in the EA group had lower postoperative pain scores compared with those in the SA group. This might be due to the quantity of preemptive analgesia, or a pharmacological blockade of the nociceptive pathways before the surgical incision.^[14,15] It has been demonstrated that the segmental regression of analgesia was much faster for SA compared with EA postoperatively.^[16] However, we confirmed that EA may lead to a greater reduction in the pain response compared than SA.

Both SA and EA provided a long, painless period at the operation site due to the continuous analgesic effect of the local anesthetic and opioid. There were no patients who needed analgesic treatment for 6 hours after the surgery. We found that the number of patients who required pain relief at 6 and 12 hours after the surgery were not significantly different between groups. Our results reinforced the small number of previous studies examining the use of SA and EA in PSD surgery.^[9,12]

In a study comparing SA and total intravenous anesthesia (TIVA) with endotracheal intubation for PSD surgery, Schmittner et al.^[9] reported that none of the patients required analgesic treatment in the recovery room after SA, while 6 patients did after TIVA. There was no difference between SA and TIVA with regard to an additional need for analgesics 24 hours after the surgery. Unlike that study, 24 hours after the operation, we found that no patient needed analgesia, due to a larger dose of local anesthetic.

Luedi et al.^[4] found that a primary midline closure was associated with less postoperative pain compared with other surgical techniques, and reported no difference in postoperative pain in a comparison of SA and general anesthesia. Although we used the same technique, these results contradict those of our study because of the methodological limitation related to the retrospective nature of Luedi's data.

The comparison of sensorial block time between SA and EA in PSD surgery indicated that the onset time of analgesia was faster and that the duration of the sensorial block was significantly shorter for SA compared with EA (median [25p-75p]: 214 minutes [range: 211-219 minutes] vs 294 minutes [range: 288-302 minutes]). These results are consistent with the results of previous studies.^[17-19] It has been shown that EA is associated with the lack of a complete motor block.^[12,17-20] We observed that all of the patients in the SA group had a complete motor blockade of the lower limbs, whereas no patient developed motor block in the EA group.

In the present study, minimal cardiovascular changes were observed. Bradycardia was not seen in any patient. Intraoperative hypotension developed in 1 (2%) and 2 patients (4%) in the SA group and the EA group, respectively, and they were treated successfully with intravenous ephedrine. Regional anesthesia leads to a decrease in systemic vascular resistance and the venous return to the heart due to sympathetic blockage.^[21] It has been proven that the incidence and severity of hypotension is correlated with the sensorial block level.^[22] Schmittner et al.^[9] reported a hypotension incidence of 8% for SA in PSD surgery. In their case series, Cuvas et al.^[23] found no hypotension in SA due to a low dose of local anesthetic. Orhon et al.^[12] observed significant hypotension in only 1 patient due to a sensorial block that reached the T2 level.

Urinary retention and post-dural puncture headache are well-known side effects of regional anesthesia. Postoperative urinary retention may lead to a urinary tract infection due to urinary catheterization and may cause a delayed discharge.^[24] Although the incidence of urinary retention after spinal anesthesia has been reported as 19% for anal surgery, a few studies have demonstrated that no patient had urinary retention following PSD surgery.^[9, 12, 24, 25] We didn't observe spinal headache in the EA group as there was no dural puncture. In the present study, none of the patients experienced PONV.

In conclusion, SA and EA provide similar surgical conditions for PSD surgery. The lack of a motor block and post-dural puncture headache, and the longer duration of the sensorial block are benefits of EA compared with SA. On the other

hand, SA may be preferred to EA due to the rapid onset and ease of application.

Disclosures

The study was presented as an oral presentation at the XVIth National Colon and Rectum Surgery Congress, held May 16-20, 2017 in Antalya, Turkey.

Ethics Committee Approval: The study was approved by the Local Ethics Committee.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

Authorship contributions: Concept – T.D., A.H., V.M.E., D.A.E., D.Y., S.U., O.S., M.A., I.H.O.; Design – T.D., A.H., V.M.E., D.A.E., D.Y., S.U.; Supervision – T.D., A.H., V.M.E., D.A.E., D.Y., S.U.; Materials – T.D., A.H., V.M.E., D.A.E.; Data collection &/or processing – T.D., V.M.E., D.A.E.; Analysis and/or interpretation – T.D., A.H., V.M.E., D.A.E., D.Y., S.U., O.S., M.A., I.H.O.; Literature search – V.M.E., D.A.E., D.Y., S.U., O.S.; Writing – T.D., A.H., V.M.E., D.A.E., D.Y., S.U., O.S., M.A., I.H.O.; Critical review – T.D., S.U.

References

- McCallum IJ, King PM, Bruce J. Healing by primary closure versus open healing after surgery for pilonidal sinus: systematic review and meta-analysis. *BMJ* 2008;336:868–71. [CrossRef]
- Duman K, Girgin M, Harlak A. Prevalence of sacrococcygeal pilonidal disease in Turkey. *Asian J Surg* 2017;40:434–7.
- Akinci OF, Bozer M, Uzunköy A, Düzgün SA, Coşkun A. Incidence and aetiological factors in pilonidal sinus among Turkish soldiers. *Eur J Surg* 1999;165:339–42. [CrossRef]
- Luedi MM, Kauf P, Evers T, Sievert H, Doll D. Impact of spinal versus general anesthesia on postoperative pain and long term recurrence after surgery for pilonidal disease. *J Clin Anesth* 2016;33:236–42. [CrossRef]
- Ellard L, Wong DT. Should we induce general anesthesia in the prone position? *Curr Opin Anaesthesiol* 2014;27:635–42.
- Bund M, Heine J, Jaeger K. Complications due to patient positioning: anaesthesiological considerations. *Anesthesiol Intensivmed Notfallmed Schmerzther* 2005;40:329–39. [CrossRef]
- Edgcombe H, Carter K, Yarrow S. Anaesthesia in the prone position. *Br J Anaesth* 2008;100:165–83. [CrossRef]
- Minonishi T, Kinoshita H, Hirayama M, Kawahito S, Azma T, Hatakeyama N, et al. The supine-to-prone position change induces modification of endotracheal tube cuff pressure accompanied by tube displacement. *J Clin Anesth* 2013;25:28–31.
- Schmittner MD, Dieterich S, Gebhardt V, Weiss C, Burmeister MA, Bussen DG, et al. Randomised clinical trial of pilonidal sinus operations performed in the prone position under spinal anaesthesia with hyperbaric bupivacaine 0.5 % versus total intravenous anaesthesia. *Int J Colorectal Dis* 2013;28:873–80.
- Nandanwar AS, Patil Y, Wagaskar VG, Baheti VH, Tanwar HV, Patwardhan SK. A Comparison of Efficacy of Segmental Epidural Block versus Spinal Anaesthesia for Percutaneous Nephrolithotomy. *J Clin Diagn Res* 2015;9:UC01–4. [CrossRef]
- Tarkkila P. Complications Associated with Spinal Anesthesia. In: Finucane BT, editor. *Complications of regional anesthesia*. 2nd ed. New York: Springer; 2007. p. 149–66. [CrossRef]
- Orhon ZN, Koltka EN, Devrim S, Tüfekçi S, Doğru S, Çelik M. Epidural anesthesia for pilonidal sinus surgery: ropivacaine versus levobupivacaine. *Korean J Anesthesiol* 2015;68:141–7.
- Rahmani N, Gholipour Baradari A, Heydari Yazdi SM, Firouzian A, Hashemi SA, Fazli M, et al. Pilonidal Sinus Operations Performed Under Local Anesthesia versus the General Anesthesia: Clinical Trial Study. *Glob J Health Sci* 2016;8:53531. [CrossRef]
- Kahveci K, Doger C, Ornek D, Gokcinar D, Aydemir S, Ozay R. Perioperative outcome and cost-effectiveness of spinal versus general anesthesia for lumbar spine surgery. *Neurol Neurochir Pol* 2014;48:167–73. [CrossRef]
- Ross SB, Mangar D, Karlinski R, Camporesi E, Downes K, Luberice K, et al. Laparo-endoscopic single-site (LESS) cholecystectomy with epidural vs. general anesthesia. *Surg Endosc* 2013;27:1810–9. [CrossRef]
- Helbo-Hansen S, Bang U, Garcia RS, Olesen AS, Kjeldsen L. Subarachnoid versus epidural bupivacaine 0.5% for caesarean section. *Acta Anaesthesiol Scand* 1988;32:473–6. [CrossRef]
- Nandanwar AS, Patil Y, Wagaskar VG, Baheti VH, Tanwar HV, Patwardhan SK. A Comparison of Efficacy of Segmental Epidural Block versus Spinal Anaesthesia for Percutaneous Nephrolithotomy. *J Clin Diagn Res* 2015;9:UC01–4. [CrossRef]
- Schewe JC, Komusin A, Zinserling J, Nadstawek J, Hoefl A, Hering R. Effects of spinal anaesthesia versus epidural anaesthesia for caesarean section on postoperative analgesic consumption and postoperative pain. *Eur J Anaesthesiol* 2009;26:52–9. [CrossRef]
- Gupta A, Kaur S, Khetarpal R, Kaur H. Evaluation of spinal and epidural anaesthesia for day care surgery in lower limb and inguinoscrotal region. *J Anaesthesiol Clin Pharmacol* 2011;27:62–6.
- Ulker B, Erbay RH, Serin S, Sungurtekin H. Comparison of spinal, low-dose spinal and epidural anesthesia with ropivacaine plus fentanyl for transurethral surgical procedures. *Kaohsiung J Med Sci* 2010;26:167–74. [CrossRef]
- Brull R, Macfarlane AJ, Chan WV. Spinal, epidural and caudal anesthesia. In: Miller RD, Cohen NH, Eriksson LI, Fleisher LA, Wiener-Kronish JP, Young WL, editors. *Miller's Anesthesia*. 8th ed. Philadelphia: Elsevier Saunders; 2015. p. 1684–720.
- Hartmann B, Junger A, Klasen J, Benson M, Jost A, Banzhaf A, et al. The incidence and risk factors for hypotension after spinal anesthesia induction: an analysis with automated data collection. *Anesth Analg* 2002;94:1521–9. [CrossRef]
- Cuvas O, Gulec H, Karaaslan M, Basar H. The use of low dose plain solutions of local anaesthetic agents for spinal anaesthesia in the prone position: bupivacaine compared with levobupivacaine. *Anaesthesia* 2009;64:14–8. [CrossRef]
- Sinha R, Gurwara AK, Gupta SC. Laparoscopic cholecystectomy under spinal anesthesia: a study of 3492 patients. *J Laparoendosc Adv Surg Tech A* 2009;19:323–7. [CrossRef]
- Borges LA, da Cunha Leal P, Rey Moura EC, Sakata RK. Randomized clinical study on the analgesic effect of local infiltration versus spinal block for hemorrhoidectomy. *Sao Paulo Med J* 2017;135:247–52. [CrossRef]