General anesthesia plus ilioinguinal nerve block versus spinal anesthesia for ambulatory inguinal herniorrhapy

Lucía Vizcaíno-Martínez, Manuel Ángel Gómez-Ríos, Beatriz López-Calviño

Department of Anesthesia and Perioperative Medicine, Complejo Hospitalario Universitario de A Coruña, A Coruña, Galicia, Spain

ABSTRACT

Objective: The aim was to evaluate general anesthesia (GA) plus ilioinguinal nerve block (IIB) versus spinal anesthesia (SA) in patients scheduled for ambulatory inguinal hernia repair regarding pain management, anesthesia recovery and reducing potential complications. **Materials and Methods:** A double-blind, prospective, randomized, controlled study in patients American Society of Anesthesiologists I-III randomized into two groups: GA plus IIB group, induction of anesthesia with propofol, maintenance with sevoflurane, airway management with laryngeal mask allowing spontaneous ventilation and ultrasound-guided IIB; SA group, patients who underwent spinal block with 2% mepivacaine. The study variables were pain intensity, assessed by visual analog scale, analgesic requirements until hospital discharge, time to ambulation and discharge, postoperative complications-related to both techniques and satisfaction experienced. **Results:** Thirty-two patients were enrolled; 16 patients in each group. The differences regarding pain were statistically significant at 2 h of admission ($P < 0.001$) and at discharge ($P < 0.001$) in favor of the GA plus ilioinguinal block group. In addition in this group, analgesic requirements were lower than SA group ($P < 0.001$), with times of ambulation and discharge significantly shorter. The SA group had a higher tendency to develop complications and less satisfaction. **Conclusion:** General anesthesia plus IIB is better than SA regarding postoperative analgesia, time to mobilization and discharge, side-effect profile and satisfaction experienced by the patients.

Address for correspondence:
Dr. Manuel Ángel Gómez-Ríos, As Xubias, 15006 A Coruña, Spain.
E-mail: magoris@hotmail.com

Key words: *Ambulatory surgical procedures, analgesia, general anesthesia, inguinal hernia, nerve block, pain management, spinal anesthesia*

INTRODUCTION

Inguinal hernia repair is one of the world's most common surgical procedures with over one million surgeries accomplished per year in Europe and the United States, mainly as an out-patient regime.[1] Postoperative pain is localized at the territory innervated by the ilioinguinal nerve, being moderate-severe[2,3] and causing an increase in morbidity, extended hospital stay and unexpected hospitalization with consequently increasing expenses.[4,5] Similarly, inadequate perioperative pain control is an important factor for persistent pain,[6] resulting in chronic pain in 10-50% of the patients and limitation for daily activities in almost a third of them.[7,8]

Access this article online	
Quick Response Code:	Website: www.saudija.org
	DOI: 10.4103/1658-354X.140883

The election of an adequate anesthetic technique may avoid or minimize the grade of peripheral and central sensitization due to surgical trauma, minimizing the undesirable consequences. In addition to this, the choice depends on other factors such as the patients, surgeon and anesthesiologist's preference and the technical viability in each patient and type of hernia.[9] General anesthesia (GA) and regional anesthesia (RA) or local anesthesia (LA) (normally associated with sedation) are the different choices for hernia repair.[9-12] The PROSPECT guidelines (http://www.postoppain.org) recommend LA techniques with infiltration and/or peripheral blocks alone or plus sedation, due to the reduction of postoperative pain and the additional benefits in the recovery in comparison with spinal anesthesia (SA) or GA. Evidence for these recommendations is supported by studies held in

centers which are specialized in inguinal hernia repair, with reduced surgical times and use of long-acting local anesthetics for spinal anesthesia. Recent clinical studies[13-15] have evaluated short-acting and medium-acting local anesthetics for this purpose with better outcome. A renovated interest for SA in ambulatory surgery has surfaced as a result.[16]

The purpose of this study was to evaluate GA plus ilioinguinal nerve block (IIB) versus SA with pain control, early ambulation and decrease of potential complications as study variables.

MATERIALS AND METHODS

Study design

After obtaining the approval of our Institution's Ethics Committee and getting the informed consent signed, double-blind, prospective, randomized, controlled study was held with out-patients scheduled for inguinal hernia repair. 32 American Society of Anesthesiologists I-II patients were enrolled, aged between 30 and 70, all of them able to understand the analgesic protocol as well as the different postoperative evaluation scales. Patients with history of allergies to any of the drugs used, undergoing bilateral inguinal hernia repair and reoperations, those with expected or documented difficult airway and patients with chronic opioid use were excluded.

In the operation theater, all patients were monitored with electrocardiography, noninvasive arterial pressure, peripheral oxygen saturation, and expired CO_2 ($EtCO_2$) and bispectral index (BIS). Patients were given intravenous (i.v.) 2 mg of midazolam and i.v. 50 mg of ranitidine.

Upon arrival at the surgical block patients were randomized into two groups with simple 1:1 randomization following a list generated by the Epidat program (3.1, Xunta de Galicia, Galicia, Spain).

In the GA plus IIB group, group gastrointestinal (GI), anesthesia was induced with propofol (2 mg/kg i.v.) followed by airway control with Supreme Laryngeal Mask™ (The Laryngeal Mask Company Limited, Mahé, Seychelles) and maintained with sevoflurane (4-5%) with oxygen/air mixture (FiO_2 50%) adjusted to a BIS of around 50, maintaining spontaneous breathing. Afterwards, we proceeded to an ultrasound-guided IIB.

In the SA group, group S, a spinal block was performed, puncture level L3-L4 with a 25 G needle, in sitting position, giving 60 mg of mepivacaine 2% (Braun Medical S.A., Barcelona, Spain) aiming to achieve a T9-T10 thermoalgesia.

In both groups, patients were given 1 g of paracetamol i.v. after induction and infusion of remifentanil 0.1-0.15 μg/kg/min until the end of the procedure and after suturing, infiltration of the surgical wound with 50 mg of levobupivacaine 0.5% was made by the surgeon. All patients were sent to the postanesthesia care unit (PACU). Analgesia was achieved with paracetamol 1 g/8 h i.v. metamizol (2 g/8 h), dexketoprofen (50 mg/8 h) and fentanyl (bolus of 25 μg/15 min i.v.) were given gradually on demand as rescue analgesia when visual analog scale (VAS) ≥3 until pain control (VAS <3).

Discharge was given after beginning ambulation and achieving a score ≥9 on the Postanesthetic Discharge Scoring System. In the 24 h after the procedure, as part of the continuous out-patient assistance quality improving program, a nurse contacted all patients by phone giving advice on postoperative care and answering doubts if needed.

Ilioinguinal nerve block

The peripheral nerve block was performed using ultrasound-guided (M Turbo, Sonosite, Bothell, USA). With the patient in the supine position and the lower abdomen, iliac crest and groin exposed, the skin was prepared with chlorhexidine 2% before locating a 10-12 MHz probe obliquely to an imaginary line between the anterior-superior iliac spine and the umbilicus, localizing the ilioinguinal and iliohipogastric nerves along this line internally and superior to the anterior superior iliac spine between the extern oblique and transversus abdominis muscles [Figure 1]. After identifying these structures and visualizing the fascia, a 21 G, 8 cm long needle (Locoplex, Vygon, Ecouen, France) is inserted parallel to the probe and the ultrasound beam checking the right placement injecting a small amount of saline, producing a hypoechoic expansion of the area between the fascia of the transversus abdominis and internal oblique nerve. At this point, 100 mg

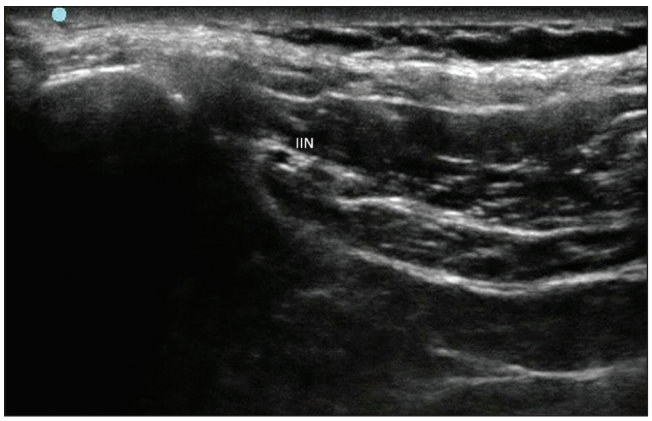

Figure 1: Ultrasonographic image show the ilioinguinal nerve between the internal oblique and transversus abdominis muscles

of levobupivacaine 0.5% are injected, checking that all the nervous structures are surrounded by local anesthetic.

Postoperative variables

During the study period, the intensity of acute postoperative pain, need for rescue analgesia, the time elapsed from admission to ambulation, from ambulation to discharge and total time as well as the incidence of anesthetic technique-related complications and degree of satisfaction with the anesthetic-analgesic regime were explored. Such variables were collected in all cases by a single independent anesthesiologist, alien to the randomizing process, during the hospital stay and by the nurses responsible for the phone control.

Pain was evaluated on arrival (rest pain), 2 h after the procedure and before discharge (pain on moving) using the VAS from 0 (lack of pain) to 10 (worst pain imaginable) and after 24 h by phone using the verbal numerical scale from 0 (lack of pain) to 10 (worst pain imaginable).

The need of analgesic drugs during immediate postoperative time was quantified (1 = 1 nonsteroidal antiinflammatory drugs (NSAID), 2 = 2 NSAID, 3 = fentanyl) until discharge.

The presence of undesirable side-effects (postoperative nausea and vomiting [PONV], headache and urinary retention) was registered during the stay on the PACU and after discharge by the phone control in the following 24 h. PONV was evaluated with a numerical scale from 0 to 3 (0: Lack of nausea; 1: Mild nausea; 2: Severe nausea and/or vomiting in spite of treatment). Ondasetrone (4 mg i.v.) was used as rescue treatment.

Furthermore, on the 24 h control phone call, a patient satisfaction survey was carried using a verbal scale from 0 (unsatisfied) to 100 (entirely satisfied). The anesthetic technique was evaluated by a direct questionnaire using qualifiers such as excellent, very good, good, acceptable or bad.

Statistical analysis

Statistical analysis was performed using the SPSS version 20 statistics program (SPSS Inc., Chicago, IL, USA). Categorical variables are shown as number of patients and/or percentage of cases. Continuous qualitative variables, once analyzed with the Kolmogorov–Smirnov test, are described as median and interquartile range for the nonnormally distributed and as media and standard deviation for the normally distributed. Mann–Whitney or Student's *t*-test were used to compare continuous variables and the Chi-square test for categorical. For sample size calculation, a decrease of at least 1.5 points of the VAS after 2 h was considered as clinically significant. A sample size of 34 patients allows to determine a difference of 1.5 ± 1.7 points on the EVA scale after 2 h, with 90% statistic power and 95% reliability, assuming a 5% loss and considering $P < 0.05$ as statistically significant.

RESULTS

A total of 34 patients were enrolled; 17 patients on group S and rest 17 on group GI. One patient from each group was excluded for noncompliance with the protocol. Figure 2 shows the flow diagram of the study.

There were no significant differences with respect to demographic characteristics [Table 1].

With regard to pain evaluation there were no differences between both groups on arrival to PACU ($P = 0.4$) and at the 24 h phone call ($P = 0.1$), but were statistically significant 2 h after admission and before discharge ($P < 0.001$) [Figure 3].

Similarly, analgesic drug demand was significantly bigger on group S ($P < 0.001$). Figure 4 shows the distribution of NSAID and fentanyl needs for both groups.

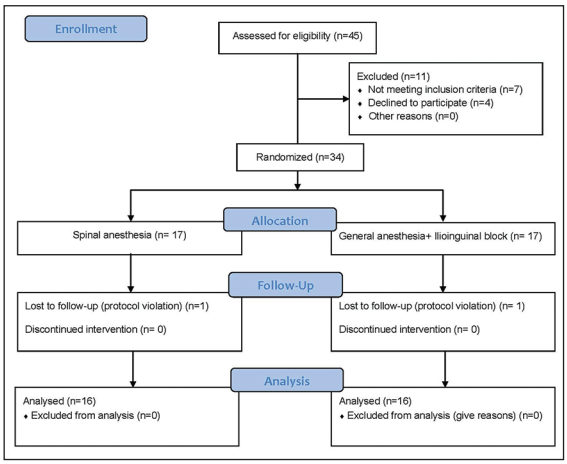

Figure 2: CONSORT flow diagram

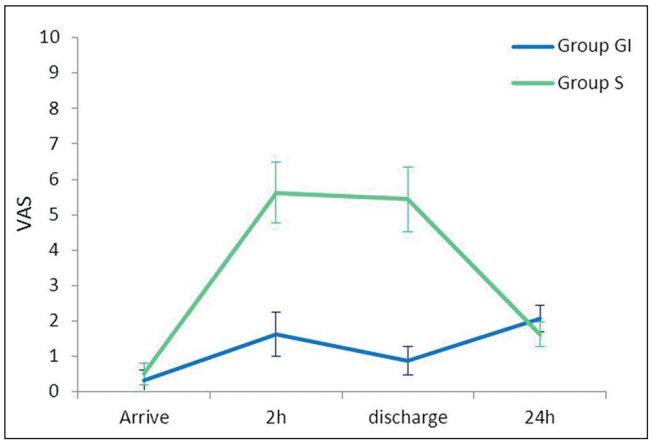

Figure 3: Pain assessment during the follow-up period

Ambulation and discharge occurred significantly earlier for group GI ($P < 0.001$), with no differences found for the period of time between ambulation and discharge. Figure 5 shows differences between group GI and group S regarding times until ambulation, discharge and total time.

There was an increased tendency to PONV, headache and urinary retention on group S. One patient from this group showed clinical symptoms compatible with transient radicular irritation syndrome reported at the 24 h phone call. None of the patients in group GI showed any complication or incidence [Table 2].

Regarding the degree of satisfaction, both groups qualified the anesthetic technique as very good and although there were no significant differences between them, patients showed a greater preference to GA plus IIB [Table 3].

DISCUSSION

The results obtained in this study suggest that the use of GA plus IIB has advantages over SA, being associated to less postoperative pain, a lower need for rescue analgesia, earlier ambulation and discharge and a lower complication incidence.

Patient's satisfaction and comfort, as well as a fast incorporation to normal daily activity are imperative in out-patient surgery. This has led that numerous studies to search for techniques, anesthetic drugs and right doses to achieve, on inguinal hernia repair postoperative period, quality analgesia with minimum side-effects and an early recovery with a granted successful outcome.

Four studies compared SA and GA,[17-20] three of which three showed a decrease in pain scores at the immediate postoperative period, although data were inconclusive.[17,19,20]

Table 1: Demographic characteristics

Variable	Group GI	Group S
Number (*n*)	16	16
Sex (male:female)	14:2	13:3
	Average±SD	Average±SD
Age (years)	55.2±4.4	52.9±4.0
Weight (kg)	65.1±4.8	67.4±3.2
Height (cm)	160.6±5.1	165.3±3.9
	n (%)	*n* (%)
ASA		
I	5 (31.2)	6 (37.5)
II	7 (43.7)	6 (37.5)
III	4 (25.0)	4 (25.0)
Duration of surgery (min)	83.2±15.2	91.7±8.5

SD: Standard deviation, ASA: American Society of Anesthesiologists, GI: Gastrointestinal

Table 2: Complications-related to the anesthetic technique

Variable	Group GI (%)	Group S (%)
Nausea and/or vomiting	0 (0.0)	1 (6.3)
Headache	0 (0.0)	1 (6.3)
Urinary retention	0 (0.0)	2 (12.5)
Others	0 (0.0)	1 (6.3)

GI: Gastrointestinal

Table 3: Experienced satisfaction and assessment of anesthetic techniques for the patients

Variable	Group GI	Group S
	Average±SD	Average±SD
Satisfaction	90.5±4.8	87.7±5.6
	***n* (%)**	***n* (%)**
Excellent	6 (37.5)	2 (12.5)
Very good	8 (50.0)	7 (43.7)
Good	2 (12.5)	5 (31.2)
Acceptable	0 (0.0)	2 (12.5)
Bad	0 (0.0)	0 (6.3)

SD: Standard deviation, GI: Gastrointestinal

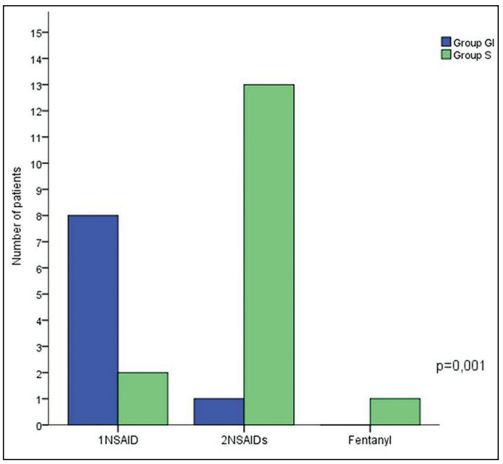

Figure 4: Analgesic requirements

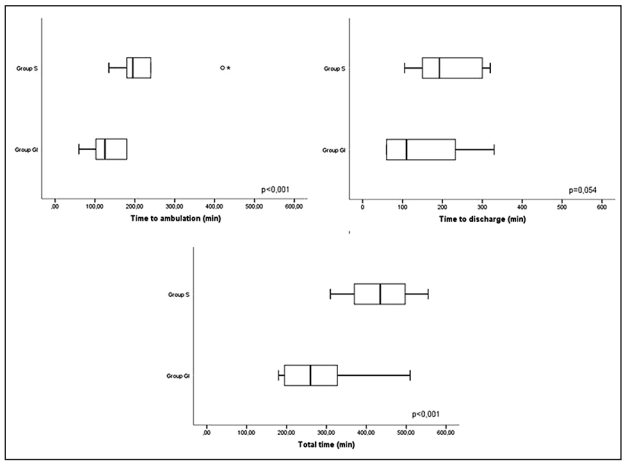

Figure 5: Times to ambulation, discharge and total postoperative stay

Two determined an increase of time until the first analgesia request with SA as compared with GA, even if needs for additional analgesia were equally inconclusive.[17,20] Opioid use at the postanesthesia recovery unit was significantly lower on group SA, whereas NSAID use was similar.[17] Discharging times were significantly shorter with GA.[17] There were no differences regarding side-effects before discharge, except nausea, and vomiting whose incidence was lower on group SA.[17] General satisfaction was similar on both groups.[18]

Four studies analyzed SA versus other regional anesthetics techniques (wound infiltration, ilioinguinal, iliohypogastric, and genitofemoral nerve block).[9,11,19,21] Two of them showed superiority versus SA in decreasing pain scores.[9,11] Analgesic request and postoperative complications incidences were similar, except for urinary retention, which was higher with SA. SA was also associated to a longer hospital stay.[9,11]

Clinical studies evaluating nonneuraxial RA techniques versus GA showed superiority in decreasing pain scores, nausea incidence, throat pain, urinary retention and hospital stay duration.[9,11,22-25] However, there is limited evidence regarding the association of GA with peripheral nerve blocks.[26]

Thus, the available evidence shows that LA techniques by infiltration and/or peripheral blocks are associated with bigger pain relief, less morbidity, less urinary retention incidence and better cost-effectiveness. If these techniques are not possible, GA is preferable to neuroaxial anesthesia. SA brings excellent anesthesia and analgesia during the postoperative period, but the possibility of urinary retention and ambulation delay may affect discharge after out-patient surgery. Bupivacaine, long-acting local anesthetic, has been the drug of choice in almost all studies. However, the incidence of side-effects was insignificant with short or intermediate-acting local anesthetics.[16] At university centers like ours, not exclusively specialized in specific interventions, extension of surgical times is expected. Consequently, we have selected GA plus IIB versus SA with an intermediate-acting local anesthetic for this study.

Our study has several limitations, being sample size one of them. Sample size is limited to make comparisons between both techniques regarding the incidence of side-effects and complications. In addition, the follow-up period was restricted to the immediate postoperative period.

CONCLUSION

As a conclusion, GA plus ilioinguinal block is superior to SA regarding postoperative analgesia, times until ambulation and discharge, side-effects profile and patient satisfaction. More studies and bigger sized studies are needed to define more accurately, which of these techniques is more suitable for out-patient inguinal repair.

REFERENCES

1. Rutkow IM. Demographic and socioeconomic aspects of hernia repair in the United States in 2003. Surg Clin North Am 2003;83:1045-51, v-vi.
2. Joshi GP. Multimodal analgesia techniques and postoperative rehabilitation. Anesthesiol Clin North America 2005; 23:185-202.
3. Pavlin DJ, Horvath KD, Pavlin EG, Sima K. Preincisional treatment to prevent pain after ambulatory hernia surgery. Anesth Analg 2003;97:1627-32.
4. Williams BA, Kentor ML, Vogt MT, Vogt WB, Coley KC, Williams JP, *et al*. Economics of nerve block pain management after anterior cruciate ligament reconstruction: Potential hospital cost savings via associated postanesthesia care unit bypass and same-day discharge. Anesthesiology 2004;100:697-706.
5. Williams BA. For outpatients, does regional anesthesia truly shorten the hospital stay, and how should we define postanesthesia care unit bypass eligibility? Anesthesiology 2004;101:3-6.
6. Aasvang EK, Gmaehle E, Hansen JB, Gmaehle B, Forman JL, Schwarz J, *et al*. Predictive risk factors for persistent postherniotomy pain. Anesthesiology 2010;112:957-69.
7. Nienhuijs S, Staal E, Strobbe L, Rosman C, Groenewoud H, Bleichrodt R. Chronic pain after mesh repair of inguinal hernia: A systematic review. Am J Surg 2007;194:394-400.
8. Poobalan AS, Bruce J, Smith WC, King PM, Krukowski ZH, Chambers WA. A review of chronic pain after inguinal herniorrhaphy. Clin J Pain 2003;19:48-54.
9. Song D, Greilich NB, White PF, Watcha MF, Tongier WK. Recovery profiles and costs of anesthesia for outpatient unilateral inguinal herniorrhaphy. Anesth Analg 2000;91:876-81.
10. Nordin P, Zetterström H, Carlsson P, Nilsson E. Cost-effectiveness analysis of local, regional and general anesthesia for inguinal hernia repair using data from a randomized clinical trial. Br J Surg 2007;94:500-5.
11. Nordin P, Zetterström H, Gunnarsson U, Nilsson E. Local, regional, or general anesthesia in groin hernia repair: Multicentre randomised trial. Lancet 2003;362:853-8.
12. Kehlet H, White PF. Optimizing anesthesia for inguinal herniorrhaphy: General, regional, or local anesthesia? Anesth Analg 2001;93:1367-9.
13. Kairaluoma P, Bachmann M, Kallio H, Rosenberg P, Pere P. Hyperbaric articaine with or without fentanyl in spinal anesthesia: Patient and observer blinded comparison. Acta Anaesthesiol Scand 2013;57:118-25.
14. Bachmann M, Pere P, Kairaluoma P, Rosenberg PH, Kallio H. Randomised comparison of hyperbaric articaine and hyperbaric low-dose bupivacaine along with fentanyl in spinal anesthesia for day-case inguinal herniorrhaphy. Eur J Anaesthesiol 2012;29:22-7.
15. O'Donnell D, Manickam B, Perlas A, Karkhanis R, Chan VW, Syed K, *et al*. Spinal mepivacaine with fentanyl for outpatient knee arthroscopy surgery: A randomized controlled trial. Can J Anaesth 2010;57:32-8.
16. Förster JG, Rosenberg PH. Revival of old local anesthetics for spinal anesthesia in ambulatory surgery. Curr Opin Anaesthesiol 2011;24:633-7.
17. Toivonen J, Permi J, Rosenberg PH. Analgesia and discharge following preincisional ilioinguinal and iliohypogastric nerve block combined with general or spinal anesthesia for inguinal herniorrhaphy. Acta Anaesthesiol Scand 2004;48:480-5.

18. Burney RE, Prabhu MA, Greenfield ML, Shanks A, O'Reilly M. Comparison of spinal vs general anesthesia via laryngeal mask airway in inguinal hernia repair. Arch Surg 2004;139:183-7.
19. Ozgün H, Kurt MN, Kurt I, Cevikel MH. Comparison of local, spinal, and general anesthesia for inguinal herniorrhaphy. Eur J Surg 2002;168:455-9.
20. Tverskoy M, Cozacov C, Ayache M, Bradley EL Jr, Kissin I. Postoperative pain after inguinal herniorrhaphy with different types of anesthesia. Anesth Analg 1990;70:29-35.
21. Gultekin FA, Kurukahvecioglu O, Karamercan A, Ege B, Ersoy E, Tatlicioglu E. A prospective comparison of local and spinal anesthesia for inguinal hernia repair. Hernia 2007;11:153-6.
22. O'Dwyer PJ, Serpell MG, Millar K, Paterson C, Young D, Hair A, *et al*. Local or general anesthesia for open hernia repair: A randomized trial. Ann Surg 2003;237:574-9.
23. Gönüllü NN, Cubukçu A, Alponat A. Comparison of local and general anesthesia in tension-free (Lichtenstein) hernioplasty: A prospective randomized trial. Hernia 2002;6:29-32.
24. Aasbø V, Thuen A, Raeder J. Improved long-lasting postoperative analgesia, recovery function and patient satisfaction after inguinal hernia repair with inguinal field block compared with general anesthesia. Acta Anaesthesiol Scand 2002;46:674-8.
25. Teasdale C, McCrum AM, Williams NB, Horton RE. A randomised controlled trial to compare local with general anesthesia for short-stay inguinal hernia repair. Ann R Coll Surg Engl 1982;64:238-42.
26. Joshi GP, Rawal N, Kehlet H, PROSPECT collaboration, Bonnet F, Camu F, *et al*. Evidence-based management of postoperative pain in adults undergoing open inguinal hernia surgery. Br J Surg 2012;99:168-85.

How to cite this article: Vizcaíno-Martínez L, Gómez-Ríos M, López-Calviño B. General anesthesia plus ilioinguinal nerve block versus spinal anesthesia for ambulatory inguinal herniorrhapy. Saudi J Anaesth 2014;8:523-8.
Source of Support: Nil, **Conflict of Interest:** None declared.