Paravertebral Block Anesthesia for Inguinal Hernia Repair

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Abstract. Choice of anesthesia for inguinal hernia repair remains a controversial topic. Local anesthesia has been described in the literature as the optimal technique, however general and spinal anesthesia are commonly used in practice despite well-known complications and side effects. The regional technique of paravertebral block has been successfully used at our institution for the operative treatment of breast cancer. Its attributes are prolonged sensory block with minimization of postoperative pain, reduction of nausea and vomiting, shortened hospital stay, patient satisfaction, and rapid return to normal activities. These features are desirable in the practice of ambulatory hernia surgery; hence we initiated the use of thoracic/lumbar paravertebral block for that surgical procedure. Paravertebral block anesthesia was performed on 30 consecutive patients. Block placement took an average of 12.3 minutes, in six cases repeat injection at one or two spinal levels was required due to incomplete blockade. Paravertebral block achieved effective anesthesia in 28 of 30 cases; conversion to general anesthesia was performed for two failed blocks. We are reporting postoperative data on the 28 completed blocks. Supplementation of intravenous sedation or injection of local anesthesia successfully treated transient intraoperative pain in 10 cases. Epidural extension of anesthesia resulting in lower limb numbness and motor weakness delayed the discharge of two patients. There were no other complications of anesthesia and no cases of urinary retention. Time to onset of pain averaged 15 hours, while duration of sensory block was 13 hours. Patients were prescribed a standing order of naproxen 500 mg b.i.d. for 4 days regardless of pain; supplemental oral narcotic use during the 48 hours following surgery averaged 3.5 tablets, with 6 patients not requiring any narcotic. Ninety-six percent of patients scheduled for ambulatory surgery were discharged from the postanesthesia care unit, with an average stay of 2.5 hours. Employed patients returned to work on day 5.5 (range 3–10 days); patients who were not employed returned to regular activities in 5.8 days (range 1–14 days). Eighty-two percent of patients reported being "very satisfied" with the anesthetic technique.

Controversy characterizes the practice of inguinal herniorrhaphy, including the issues of repair technique, laparoscopic versus open approach, and choice of anesthesia. With regard to the latter, local anesthesia has been described as the preferred technique for open hernia repair. It is safe in patients with comorbidities; it facilitates ambulatory status; it provides postoperative analgesia; and it challenges the surgeon's abilities [1–6]. Local anesthesia, however, is used less in practice than promoted in the literature [7–10]. Widespread use of both general and spinal anesthesia persists despite

reports of side effects and complications including nausea and vomiting, urinary retention, failed blocks, spinal headache, and unplanned hospitalization for the treatment of these conditions. The advent of laparoscopic herniorrhaphy in the 1990s has further confounded the issue of anesthetic choice. Local and regional anesthesia have been investigated with varying success for laparoscopic hernia repairs performed with nitrous oxide insufflation [11, 12], using the abdominal wall-lifting technique [13], and when general anesthesia was medically contraindicated [14, 15]. However, laparoscopic herniorrhaphy typically employs general anesthesia, and this anesthetic requirement is repeatedly cited as a significant disadvantage because of associated postoperative nausea and vomiting, urinary retention, inability to control postoperative pain, and secondary unplanned hospitalization [1–3, 6, 8–10, 16–20].

Paravertebral block is a regional technique involving the injection of local anesthesia immediately lateral to the vertebral column, into the space where the spinal cord emerges from the intervertebral foramina and bifurcates into the dorsal and ventral rami. This technique provides unilateral motor, sympathetic, and prolonged sensory blockade. Historically, paravertebral block has been used for the diagnosis and treatment of chronic somatic pain. In April 1994 the practice of thoracic paravertebral block for operative treatment of breast cancer was initiated at Duke University. Our experience with this technique has been notable for anesthetic safety and efficacy, reduction of postoperative nausea and vomiting, and prolonged sensory block resulting in reduced postoperative pain levels and narcotic requirement [21, 22]. Ninety-six percent of patients undergoing major breast cancer operations were discharged within a 24-hour interval. In the past, these procedures were performed at our institution under general anesthesia, and were followed on average by a three-day hospitalization, usually for provision of parenteral narcotic and treatment of nausea and vomiting. Patients undergoing breast surgery with paravertebral block report a high degree of satisfaction and enthusiastically describe their operative, anesthetic, and recovery experiences as better tolerated than anticipated or previously experienced with general anesthesia.

The safety, efficacy, and patient acceptance of paravertebral block as demonstrated in the breast surgery experience are anesthesia attributes that are also desirable in the practice of hernia

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repair. For these reasons, the practice of paravertebral block, now performed at the lower thoracic and lumbar level, has been applied to inguinal hernia repair [23, 24].

Materials and Methods

All patients undergoing preoperative evaluation prior to unilateral inguinal hernia repair were presented with the option of having surgery with paravertebral block anesthesia and being followed prospectively. We are reporting on 30 consecutive paravertebral blocks performed on 29 patients over a 15-month interval; 22 of these patients were described previously [23]. All patients except one were men. Average age was 54 years and ranged from 28 years to 79 years. All patients underwent unilateral hernia repair; one patient underwent right-sided hernia repair 7 months after repair of a left inguinal hernia, both with paravertebral block. Two of the 30 hernias were recurrent. All patients presented to the hospital on the day of surgery. Two patients were scheduled for postoperative hospitalization for (1) heparin infusion and reestablishment of therapeutic coumadin levels in a 79-year-old man with a prosthetic aortic valve and (2) 23-hour postoperative observation in a 79-year-old man with coronary artery disease. The remaining patients were scheduled for ambulatory discharge.

Paravertebral blocks were placed while patients were in the preoperative holding area. Patients are in a sitting position and sedated with intravenous midazolam and fentanyl, titrated to effect (range, midazolam: 1–5 mg, fentanyl: 50–300 mcg). Pulse, blood pressure, and pulsoximetry readings were monitored during placement of the block. Paravertebral block was performed using the technique described by Moore and Katz [25, 26]. The superior aspect of the spinous processes of levels T10 to L2 was identified by palpation, and a mark was made approximately 3 cm lateral to that point. Following sterile prep and infiltration of the skin with 2% lidocaine, a 22-gauge, 3.5-inch Quincke spinal needle with centimeter markings attached to a syringe with extension tubing was introduced at the marked site and advanced perpendicular to the back until the transverse process was contacted. The needle was then "walked" approximately 2 cm caudad off the transverse process into the paravertebral space. Following aspiration to avoid intravascular injection, 5 ml of bupivicaine 0.5% with 1:400,000 epinephrine was injected. Blocks were placed at five levels, and a total of 25 ml of bupivicaine was used.

Testing of dermatomal distribution was performed using skin sensation within 10 minutes of completing the block. Repeat block using the identical technique as used for initial placement was performed at levels found to be deficient. After placement and testing of the block, patients were brought to the operating room. Sedation using intravenous diprivan and fentanyl was given intraoperatively; prophylactic antiemetics were not administered. Hernia repairs were performed by nine attending surgeons assisted by surgical residents in their first through third year of training. The types of hernia repairs are summarized in Table 1.

After completion of surgery, patients were transported to the ambulatory surgery recovery area. Their immediate postoperative pain was evaluated and treated as needed with narcotic analgesia. Patients were discharged after they had urinated and demonstrated ability to tolerate oral diet. Naproxen (500 mg twice daily) was prescribed for all patients regardless of pain level for the first 4 postoperative days; acetaminophen with codeine (tylenol #3) or perco-

Table 1. Characteristics of hernia repair.

Type of hernia	
Indirect	15
Direct	10
Pantaloon	2
Other	3[a]
Type of repair	
Lichtenstein	18
Bassini	9
Shouldice	1
Other	2

[a] 2 Hydroceles, 1 not specified.

cet was prescribed to supplement the naproxen as needed for pain. Patients were interviewed while in the recovery room or inpatient ward, and then contacted at home by telephone 2, 6, 12, 18, 24, and 48 hours after surgery and questioned regarding the duration of sensory block (as measured by sensory perception of an alcohol pad), timing of onset of pain at the operative site, degree of pain on a 1–10 verbal rating scale, oral narcotic use, and incidence of nausea or vomiting. Question methodology was the same regardless of inpatient or outpatient status. Patient interviews were not held during sleeping hours; this resulted in missing data for 1 patient at the 2-hour interval, 2 patients at the 6-hour interval, 8 patients at the 12-hour interval, 19 patients at the 18-hour interval, and no patients at the 24- or 48-hour intervals. Patients were subsequently asked by telephone to rate their experience with paravertebral block for hernia surgery as "very satisfactory," "satisfactory," or "unsatisfactory," and were asked to report the timing of return to normal activities and work. Patients were seen for postoperative care within 4 weeks of surgery.

Results

Time for placement of paravertebral block averaged 12.3 minutes and did not exceed 35 minutes. Testing revealed incomplete blockade in six patients at levels ranging from T11 to L2; each of these patients underwent repeat block at the deficient level. Time to full onset of the block averaged 17.2 minutes, with a range of 5 to 50 minutes. There were no episodes of needle aspiration of blood, cerebral spinal fluid, air, or other immediate complications of the paravertebral block placement. Average operative time from skin incision to wound closure was 76.0 minutes and ranged from 37 to 130 minutes.

Two operations were converted to general anesthesia because of failed paravertebral block manifest in both cases as significant pain with skin incision. In one of these patients two spinal levels had been found to be deficient and were reinjected; in the other patient the block was deemed adequate at the time of skin testing. Intraoperative and postoperative data are reported for the 28 patients whose surgery was completed under paravertebral anesthesia. Ten patients experienced transient intraoperative pain; no patient experienced more than one such episode. This occurred at the time of skin incision (4 patients), while traction was placed on the hernia sac (5 patients), or during spermatic cord manipulation (1 patient). These episodes of pain did not require intervention in four cases. In three cases, pain was treated with infusion of additional intravenous sedation; in two cases, local anesthetic was injected; and in one case, both local anesthetic and an increased level of sedation

Table 2. Pain outcome in patients undergoing hernia repair with paravertebral block.

	Average ± SD	Range
Duration of sensory block (hours from completion of surgery)	13.3 ± 6.9	1–28
Time to onset of pain[a] (hours from completion of surgery)	14.9 ± 9.4	0.5–31
Oral narcotic use within 48 hours (number of tablets—Percocet or Tylenol #3)	3.5 ± 3.8	0–12
Patients not taking oral narcotic in PACU	26	
Patients not taking oral narcotic at home	6	
Pain score (range 1–10)		
Arrival in recovery	0.36 ± 0.90	
2 hours postoperatively	1.43 ± 1.69	
6 hours postoperatively	1.76 ± 2.14	
12 hours postoperatively	2.21 ± 1.81	
18 hours postoperatively	2.00 ± 1.51	
24 hours postoperatively	2.00 ± 1.54	
48 hours postoperatively	1.07 ± 1.38	

PACU: postanesthesia care unit.

[a]Responses limited to patients experiencing pain within 48-hour interval. Data not given for five patients: two reported no pain within 48 hours; for three patients, data are not available.

were required. No patients complained of nausea or experienced vomiting intraoperatively.

There were no intraoperative complications. In all but one case, patients scheduled for ambulatory status were discharged home as planned on the day of surgery. Average time to discharge for these patients was 2.5 hours. There were two cases of epidural spread of anesthetic resulting in prolonged numbness and paralysis of the lower limbs, and therefore delay in discharge. A 79-year-old patient was temporarily admitted because the epidural effect persisted beyond outpatient recovery room hours. He subsequently regained normal sensation and strength and was discharged home on the evening of surgery. A 72-year-old man required overnight hospitalization for lower limb weakness, also resulting from epidural spread of the anesthetic; this was the only patient who required unplanned hospital admission. There were no cases of urinary retention, hemodynamic instability, or other anesthetic complications, including in the two patients affected by epidural spread.

No patients required parenteral narcotic while in the recovery room; three patients requested oral narcotic. Pain rating, duration of sensory block, time to onset of pain, and narcotic use during the 48 hours following surgery are summarized in Table 2. Nine patients (30%) experienced nausea during the 48-hour postoperative interval; one of these patients had nausea and vomiting. Four of these patients reported an episode of nausea while in the recovery room; three required treatment with an antiemetic agent. Three patients experienced two episodes of nausea, while the remaining six experienced only one episode.

Eighteen patients in this series were employed, seven in jobs requiring physical activity or standing during much of the day. Their average time to return to work was 5.5 days and ranged from 3 to 10 days. The remaining 10 patients were retired or not employed; they reported a return to daily nonexertional activities, including walking and working at home, in an average of 5.8 days. Twenty-three described their operative, anesthetic, and recovery experience as very satisfactory, five as satisfactory. No complications resulting from hernia repair were detected at postoperative visits.

Discussion

The inception of paravertebral block anesthesia for hernia repair at Duke University evolved from our experience with this regional technique for operative treatment of breast cancer [21, 22]. The breast surgery experience, in turn, represents a new clinical application of an obscure regional anesthetic technique that was used in the early twentieth century for the diagnosis and treatment of chronic pain, and later for surgical procedures of the shoulder and chest. The major attributes of paravertebral block as demonstrated in the breast surgery experience are prolonged sensory block with minimal postoperative pain and narcotic use, reduction of nausea and vomiting, avoidance of invasive monitoring in patients at high risk for general anesthesia, and shorter hospitalization. A regional anesthetic technique with these attributes is ideally suited to improving the quality of recovery after hernia repair—a procedure already established as ambulatory, but nevertheless associated with significant postoperative pain, delayed return to work, and unplanned hospitalization due in part to anesthetic considerations [27, 28]. This rationale fostered the investigation of paravertebral block for hernia repair.

Paravertebral block was effective in 93% of cases in this initial series; two cases required conversion to general anesthesia due to failed block that was suggested in one case at the time of skin testing and was apparent in both cases at the start of the operation. Ten patients experienced transient pain either with skin incision, traction of the spermatic cord, or manipulation of the hernia sac. Incisional pain represents failure to attain complete blockade at all spinal levels, whereas pain with manipulation of the hernia sac reflects the inability of paravertebral technique, a purely somatic block, to provide visceral anesthesia. In each of the 10 cases, including those involving division and ligation of large sacs, intraoperative pain was adequately treated with supplementation of intravenous sedation, injection of local anesthetic, or both. Contraindications to placing paravertebral block are coagulopathy and central neuropathy. Obesity renders the identification of anatomic landmarks more challenging, but does not preclude effective anesthesia as has been reported in the use of local anesthesia for hernia repair [5, 6]. Our experience with paravertebral block also compares favorably with reports of failed spinal blocks, which require conversion to general anesthesia in as many as 25% of cases [29]. Efficacy in our hernia experience to date, however, reflects the skills of two regional anesthesiologists with extensive experience in paravertebral block (R.G./S.K.).

Patient acceptance of an anesthetic technique is critical when considering whether its inherent attributes translate into widespread clinical use. Local anesthesia is widely considered optimal for open hernia surgery because of safety, efficacy, lack of side effects, and ease of recovery [3, 5]. When offered anesthetic choice, however, patients commonly elect or insist upon general or spinal anesthesia [1, 10]. Surgeons also express apprehension regarding use of local anesthesia, citing concerns over intraoperative pain, prolonged operative time, tissue distortion, and preference for muscle relaxation [1, 7, 8]. These perspectives are reflected in the ongoing widespread use of general and spinal anesthesia in hernia surgery practices [6, 8–10]. For example, of the 109 unilateral open inguinal hernia repairs performed during the year (1996) before the paravertebral block was introduced at our institution, general anesthesia was used in 39% of cases, spinal or epidural anesthesia was used in 36%, and local anesthesia with sedation was used in only 25% (unpublished data).

Patient and surgeon acceptance of paravertebral block for hernia surgery has been high. Block placement is rapid (average 12.3 minutes in the current series); hence the interval between operations is not prolonged. Because the block can be performed in a preoperative area, operating room occupancy and charges are not increased. Paravertebral block for herniorrhaphy has been described as "difficult and unpleasant" for patients due to the need for injection at several levels [30]. Our experience, both in the cervical/thoracic region for breast surgery and the thoracic/lumbar region for hernia surgery, has shown this to be unfounded. Placing blocks while patients receive midazolam and fentanyl sedation and anesthetizing the skin at the needle entry site has resulted in universal tolerance and subsequent amnesia of the event. Complications associated with paravertebral block are pneumothorax (less likely in the lower thoracic and lumbar position), epidural spread (lower risk of hemodynamic compromise in the lower thoracic and lumbar position), intravascular injection, dural puncture, and nerve injury [31]. In a series of 156 thoracic paravertebral blocks placed for breast cancer surgery, the overall complication rate of this technique was 2.6%, representing four cases [21]. There was one radiographically small pneumothorax manifest postoperatively as chest and shoulder pain. This was managed with overnight observation without chest tube placement. There were two cases of epidural extension. One patient had lower limb numbness that resolved during recovery room stay. The second patient had intraoperative arm paresthesia and dyspnea requiring intubation. One patient demonstrated hemodynamic evidence of epinephrine absorption that responded to labetolol administration. In this initial series of blocks placed for hernia repair, the only complication was epidural spread (2 cases) manifest as transient lower limb numbness and weakness. This complication prolonged time to discharge, but was otherwise not clinically significant or dangerous.

Reported causes of prolonged hospitalization after hernia repair commonly relate to anesthetic complications and deficiencies, including urinary retention, pain requiring parenteral narcotic, and nausea and vomiting [1, 30, 32]. Other bothersome anesthetic complications and side-effects are sore throat and somnolence after general anesthesia with endotracheal intubation [27], headache after arachnoid puncture in spinal and misplaced epidural blocks, and urinary tract infection resulting from catheterization performed for retention [1, 29, 32]. Urinary retention is avoided in paravertebral technique because sacral parasympathetic fibers that innervate autonomic bladder function are not blocked, as they can be with local anesthetics injected into the epidural or subarachnoid spaces. Postoperative pain and narcotic use, factors contributing to urinary retention, are also minimized with this technique. Nausea and vomiting remain a significant problem for surgical patients despite the avoidance of emesis-inducing anesthetic agents and the prophylactic and therapeutic use of new antiemetic medications [33]. The incidence is particularly high after procedures performed using general anesthesia, and nausea and vomiting have been cited as reason to avoid general anesthesia in the practice of outpatient hernia surgery [1, 31]. Reduction in the incidence and severity of postoperative nausea and vomiting has been a significant attribute of paravertebral block in patients undergoing surgery for breast cancer [21, 22]. In the current series, one third of patients undergoing herniorrhaphy with paravertebral block experienced one or two episodes of postoperative nausea or vomiting; in no case was it severe enough to require hospitalization. There were no cases of intraoperative nausea and vomiting. Nausea and vomiting, however, are not eliminated in the postoperative interval in patients undergoing paravertebral block anesthesia, and this can be attributed to infusion of fentanyl and other opioids and sedatives during paravertebral block placement and surgery, intraoperative manipulation of the cord and hernia sac, and postoperative use of oral narcotic [1, 33]. For example, of the six patients who had intraoperative pain with manipulation of the hernia sac or spermatic cord, three experienced nausea during the postoperative interval.

Prolonged sensory block enabling prolonged analgesia is the most significant attribute of the paravertebral technique. This results from the relative avascularity of the paravertebral space and hence the slow uptake of local anesthetic. Sensory block in this experience lasted an average of 13 hours; and patients described onset of pain or discomfort at the operative site in 15 hours. Of equal importance, patients described their surgical pain after resolution of the block as mild, typically characterized by a dull, stiff sensation. The precise qualitative nature of postoperative pain was not studied in this series. It is reflected, however, in the low use of narcotic needed to supplement the standing order of naproxen, low pain rating scores, and a high degree of patient satisfaction. These results contrast sharply with a recently reported survey of patients undergoing outpatient inguinal hernia repair under general anesthesia, in which 81% of patients reported wound pain, 43% described this pain as "almost unbearable," and 70% required oral analgesia [34]. Pain reduction is also a critical factor in determining time to return to work. While issues including specific disability policies and patient expectations affect when an individual returns to work, this trial's average of 5.5 days, and return to daily activities of 5.8 days, is nonetheless shorter than the reported literature [35, 36]. Based on this preliminary experience, we consider paravertebral block a safe and effective anesthetic for open herniorrhaphy.

Résumé. Le choix d'anesthésie pour la réparation d'une hernie inguinale reste un sujet de débat. On décrit comme optimale dans la littérature l'anesthésie locale, cependant, les techniques les plus utilisées malgré leurs complications et leurs effets secondaires bien connus sont l'anesthésie générale et la rachianesthésie. La technique d'anesthésie régionale par bloc paravertébral a été utilisée avec succès dans notre institution pour le traitement opératoire du cancer du sein. Ses avantages comprennent un bloc sensitif prolongé avec minimisation de la douleur postopératoire, la réduction de la nausée et des vomissements, une durée de séjour hospitalier plus courte, une meilleure satisfaction des patients, et un retour plus rapide aux activités normales. Ces caractéristiques sont désirables pour la pratique de la chirurgie ambulatoire de la hernie; ainsi nous avons entrepris l'utilisation du bloc paravertébral thoracolombaire pour cette indication. Un bloc anesthésique paravertébral a été réalisé chez 30 patients consécutifs. La durée nécessaire pour le bloc a été de 12.3 minutes en moyenne, et dans six cas, il a fallu répéter l'injection à un ou deux niveaux différents pour compléter le bloc. Le bloc paravertébral a été efficace dans 28 des 30 cas; une conversion à l'anesthésie générale a été nécessaire dans deux cas d'échec. Nous rapportons ici nos résultats sur 28 cas de bloc complets. Un supplément de sédation par voie intraveineuse ou par injection d'anesthésie locale a été nécessaire pour traiter avec succès la douleur peropératoire survenue dans 10 cas. Une extension péridurale de l'anesthésie, provoquant une anesthésie et une faiblesse musculaire des membres inférieurs a retardé la sortie chez deux patients. Il n'y avait aucune autre complication anesthésique et aucun cas de rétention urinaire. Le délai avant l'apparition de la douleur a été de 15 heures en moyenne, alors que la durée du bloc sensitif a été de 13 heures. Les patients disposaient, en cas de besoin, d'une prescription de naproxène, 500 mg deux fois par jour, pendant quatre jours, même en dehors de la douleur. En moyenne, un supplément de 3.5 comprimés de narcotiques par voie orale pendant 48 heures après chirurgie a été nécessaire: six patients ne nécessitaient aucune narcoanalgésie. Quatre-vingt seize pour cent des patients prévus pour chirurgie ambulatoire ont pu quitter la salle de réveil après une moyenne de 2.5 heures. Les patients employés pouvaient

regagner leur travail 5.5 (en moyen) (extrêmes 3–10) jours après; les patients qui ne travaillaient pas ont pu reprendre leurs activités habituelles 5.8 (extrêmes 1–14) jours après. Quatre-vingt deux pour cent des patients ont dit qu'ils étaient «très satisfaits» de la technique d'anesthésie.

Resumen. Sigue estando controvertida la modalidad anestésica para el tratamiento quirúrgico de la hernia inguinal. En la bibliografía se describe, que la anestesia local es la más idónea, pero se siguen utilizando, con mucha frecuencia, la anestesia general y la raquianestesia, cuyas complicaciones y efectos secundarios son bien conocidos. En nuestro Hospital la anestesia regional mediante bloqueo paravertebral se utiliza con resultados muy satisfactorios para las intervenciones de cáncer de mama. Dicha técnica produce un bloqueo sensitivo prolongado, minimizando el dolor postoperatorio, disminuye las náuseas y vómitos, acorta la estancia hospitalaria, satisface al paciente y propicia una rápida reincorporación a sus actividades normales. Todas estas características son idóneas para el tratamiento quirúrgico ambulatorio de las hernias. De ahí, que empezásemos a utilizar en el tratamiento quirúrgico de las hernias el bloqueo anestésico paravertebral toraco-lumbar. El bloqueo anestésico paravertebral se realizó en 30 pacientes. El bloqueo se obtuvo por termino medio en 12.3 minutos y sólo en 6 casos hubo que repetir la inyección en 1 ó 2 niveles vertebrales por no haberse conseguido, de entrada, un bloqueo completo. El bloqueo paravertebral proporcionó una anestesia eficaz en 28 de los 30 casos. Sólo en dos pacientes hubo de recurrirse a la anestesia general. Exponemos el curso postoperatorio de estos 28 bloqueos paravertebrales. En 10 casos el dolor transitorio intraoperatorio requirió una sedación i.v. o infiltración anestésica local. En 2 pacientes el agente anestésico se difundió al espacio epidural provocando parestesias e inestabilidad motora que prolongaron la estancia hospitalaria. No hubo otras complicaciones; ningún caso de retención urinaria. Para tratar el dolor se prescribió a los pacientes 500 mg BID durante 4 días. El suplemento analgésico medio durante las 48 primeras horas del postoperatorio fue de 3.5 comprimidos. 6 pacientes no precisaron analgésico alguno. El 96% de los pacientes en régimen de cirugía ambulatoria estuvieron ingresados 2.05 horas. Los empleados volvieron al trabajo a los 5.5 días (rango 3–10 días) y los sin empleo retornaron a sus actividades normales a los 5.8 días (rango 1–14 días). El 82% de los pacientes se mostraron muy satisfechos con esta técnica anestésica.

References

1. Amado WJ. Anesthesia for hernia surgery. Surg. Clin. North Am. 1993; 73:427–438
2. Amid RK, Shulman AG, Lichtenstein IL. An analytic comparison of laparoscopic hernia repair with open "tension-free" hernioplasty. Int. Surg. 1995;80:9–17
3. Bendavid R. Complications of groin hernia surgery. Surg. Clin. North Am. 1998;78:1089–1103
4. Tverskoy M, Cozacov C, Ayache M, et al. Postoperative pain after inguinal herniorrhaphy with different types of anesthesia. Anesth. Analg. 1990;70:29–35
5. Wantz GE. Ambulatory hernia surgery. Br. J. Surg. 1989;76:1228–1229
6. Maddern GJ, Rudkin G, Bessell JR, et al. A comparison of laparoscopic and open hernia repair as a day surgical procedure. Surg. Endosc. 1994;8:1404–1408
7. Bowen JR, Thompson WR, Dorman BA, et al. Change in the management of adult groin hernia. Am. J. Surg. 1978;135:564–569
8. Condon RE. letter to editor, commenting on Geis WP, Crafton WB, Novak MJ, et al. Laparoscopic herniorrhaphy: results and technical aspects in 450 consecutive procedures. Surgery 1993;114:765–774
9. Toy FK, Smoot RT. Laparoscopic hernioplasty update. J. Laparoendosc. Surg. 1992;2:197–205
10. Vogt DM, Curet MJ, Pitcher DE, et al. Preliminary results of a prospective randomized trial of laparoscopic onlay versus conventional inguinal herniorrhaphy. Am. J. Surg. 1995;169:84–90
11. Pendurthi TK, DeMaria EJ, Kellum JM. Laparoscopic bilateral inguinal hernia repair under local anesthesia. Surg. Endosc. 1995;9:197–199
12. Spivak H, Nudelman I, Fuco V, et al. Laparoscopic extraperitoneal inguinal hernia repair with spinal anesthesia and nitrous oxide insufflation. Surg. Endosc. 1999;13:1026–1029
13. Tagaya N, Kita J, Kogure H. Laparoscopic transabdominal preperitoneal herniorrhaphy using abdominal wall-lifting method under regional anesthesia: a preliminary report. J. Laparoendosc. Surg. 1995;5:215–220
14. Fierro G, Sanfilippo M, D'Andrea V, et al. Transabdominal preperitoneal laparoscopic inguinal herniorrhaphy (TPLIH) under regional anaesthesia. Int. Surg. 1997;82:205–207
15. Schmidt J, Carbajo MA, Lampert R, et al. Laparoscopic intraperitoneal onlay polytetrafluoroethylene mesh repair (IPOM) for inguinal hernia during spinal anesthesia in patients with severe medical conditions. Surg. Laparosc. Endosc. Percutan. Tech. 2001;11:34–37
16. Brooks DC. A prospective comparison of laparoscopic and tension-free open herniorrhaphy. Arch. Surg. 1994;129:361–366
17. Kozol R, Lange PM, Kosir M, et al. A prospective, randomized study of open vs laparoscopic inguinal hernia repair: an assessment of postoperative pain. Arch. Surg. 1997;132:292–295
18. McKernan JB, Laws HL. Laparoscopic repair of inguinal hernias using a totally extraperitoneal prosthetic approach. Surg. Endosc. 1993;7:26–28
19. Rudkin GE, Maddern GJ. Peri-operative outcome for day-case laparoscopic and open inguinal hernia repair. Anaesthesia 1995;50:586–589
20. Rutkow IM. Laparoscopic hernia repair: the socioeconomic tyranny of surgical technology. Arch. Surg. 1992;127:1271
21. Coveney E, Weltz CR, Greengrass R, et al. Use of paravertebral block anesthesia in the surgical management of breast cancer—experience in 156 cases. Ann. Surg. 1998;227:496–501
22. Weltz CR, Greengrass RA, Lyerly HK. Ambulatory surgical management of breast carcinoma using paravertebral block. Ann. Surg. 1995; 222:19–26
23. Klein SM, Greengrass RA, Weltz CR, et al. Paravertebral somatic nerve block for outpatient inguinal herniorrhaphy. Reg. Anesth. 1998; 23:306–310
24. Wassef MR, Randazzo T, Ward W. The paravertebral nerve root block for inguinal herniorrhaphy—a comparison with the field block approach. Reg. Anesth. 1998;23:451–456
25. Katz J. Atlas of regional anesthesia, 2nd edition, Norwalk, CT, Appleton & Lange, 1994
26. Moore D. Regional block. A handbook for use in the clinical practice of medicine and surgery, 4th edition, Springfield, IL, Charles C Thomas, 1965
27. Callesen T, Kehlet H. Postherniorrhaphy pain. Anesthesiology 1997; 87:1219–1230
28. Swanstrom LL. Laparoscopic herniorrhaphy. Surg. Clin. North Am. 1996;76:483–491
29. Young DV. Comparison of local, spinal, and general anesthesia for inguinal herniorrhaphy. Am. J. Surg. 1987;153:560–563
30. Winnie AP, Rosenquist RW. Anesthesia for herniorrhaphy. In Nyhus LM, Condon RE, editors: Hernia, Philadelphia, J.B. Lippincott, 1995, pp. 501–514
31. Lonnqvist P-A, Naja Z. Somatic paravertebral nerve blockade: incidnece of failed block and complications. Anaesthesia 2001;56:1181–1187
32. Ryan JA, Adye BA, Jolly PC, et al. Outpatient inguinal herniorrhaphy with both regional and local anesthesia. Am. J. Surg. 1984;148:313–316
33. Watcha MF, White PF. Postoperative nausea and vomiting: its etiology, treatment, and prevention. Anesthesiology 1992;77:162–184
34. Salet GAM, Go PMN. Patient survey after inguinal hernia repair in ambulatory surgery. Ambulatory Surg. 1993;1:194–196
35. The MRC Laparoscopic Groin Hernia Trial Group. Laparoscopic versus open repair of groin hernia: a randomized comparison. Lancet 1999;354:185–190
36. Callesen T, Kehlet H. Postherniorrhaphy pain. Anesthesiology 1997; 87:1219–1230