# Post-herniorrhaphy pain in outpatients after pre-incision ilioinguinal-hypogastric nerve block during monitored anaesthesia care

Yifeng Ding MD, Paul F. White PhD MD FFARACS

*The objective of this study was to evaluate the effect of an ilioinguinal-hypogastric nerve block (IHNB) with bupivacaine 0.25% on the postoperative analgesic requirement and recovery profile in outpatients undergoing inguinal herniorrhaphy with local anaesthetic infiltration. Thirty consenting healthy men undergoing elective unilateral inguinal herniorrhaphy procedures were randomly assigned to receive an IHNB with either saline or bupivacaine according to a double-blind, IRB-approved protocol. All patients received midazolam, 2 mg iv, and fentanyl 25 μg iv, prior to injection of 30 ml of either bupivacaine 0.25% or saline through the oblique muscle approximately 1.5 cm medial to the anterior superior iliac spine. Subsequently, the surgeon infiltrated the incision site with a lidocaine 1% solution. Sedation was maintained during the operation with a variable-rate propofol infusion, 25–140 $\mu g \cdot kg^{-1} \cdot min^{-1}$. No significant differences were noted in the intraoperative doses of lidocaine, propofol and fentanyl in the two treatment groups. However, the pain visual analogue score at 30 min after entering the PACU was lower in the bupivacaine (versus saline) group ($P < 0.05$). Although the times to ambulation (86 ± 18 vs 99 ± 27 min) and being judged "fit for discharge" (112 ± 49 vs 126 ± 30 min) were similar in the two groups, the bupivacaine-treated (vs saline) patients required less oral analgesic medication after discharge (46% vs 85%). We concluded that the use of an ilioinguinal-hypogastric nerve block with bupivacaine 0.25% as an adjuvant during inguinal herniorrhaphy under monitored anaesthesia care decreased pain in the PACU and oral analgesic requirements after discharge from the day-surgery unit.*

**Key words**

ANAESTHESIA: outpatient;
ANAESTHETIC TECHNIQUE: monitored anaesthesia care, regional, ilioinguinal-hypogastric nerve block;
ANAESTHETICS, LOCAL: bupivacaine.

From the Department of Anesthesiology and Pain Management, University of Texas Southwestern Medical Center at Dallas.

*Address correspondence to*: Dr. Paul F. White, Professor & McDermott Chair, Department of Anesthesiology and Pain Management, University of Texas Southwestern Medical Center, 5323 Harry Hines Boulevard, Dallas, Texas 75235-9068.

*Accepted for publication 13th August, 1994.*

*Cette étude vise à évaluer les répercussions du bloc ilioinguinal et hypogastrique (IIHB) à la bupivacaïne, 0,25% sur les besoins analgésiques et le profil de récupération postopératoires de patients opérés pour une herniorrhaphie inguinale sous infiltration locale d'anesthésique. Trente adultes consentants et bien portants soumis à une herniorrhaphie unilatérale programmée sont répartis au hasard pour recevoir un IIHB soit avec du soluté physiologique soit de la bupivacaïne suivant un protocole approuvé par notre comité d'éthique. Tous les patients reçoivent du midazolam 2 mg iv et du fentanyl 25 μg iv avant l'injection de 30 ml de la bupivacaïne 0,25% ou du soluté physiologique à travers le muscle oblique à un point situé à 1,5 cm à l'intérieur de l'épine iliaque antéro-supérieure. Par la suite, le chirurgien infiltre la ligne d'incision avec de la lidocaïne 1%. La sédation est maintenue pendant l'intervention avec une perfusion adaptée de propofol de 25 à 140 $\mu g \ kg^{-1} \cdot min^{-1}$ On ne trouve pas de différence posologique peropératoire de lidocaïne, de propofol et de fentanyl entre les deux groupes. Cependant le score de l'échelle visuelles analogue (EVA) de la douleur à trente min après l'arrivée en salle de réveil est plus bas dans le groupe bupivacaïne ($P < 0,05$). Bien que le moment de l'aptitude à l'ambulation (86 ± 18 vs 99 ± 27 min) et l'autorisation de quitter l'hôpital (112 ± 49 vs 126 ± 30 min) soient les mêmes pour les deux groupes, le groupe bupivacaïne a moins besoin d'analgésiques oraux après le congé hospitalier (46% vs 85%). Nous concluons que l'utilisation de bloc ilioinguinal et hypogastrique à la bupivacaïne 0,25% comme adjuvant pendant la herniorrhaphie inguinale sous anesthésie monitorée diminue la douleur en salle de réveil et les besoins d'analgésiques oraux après le départ de l'unité de chirurgie ambulatoire.*

Postoperative pain can delay the patient's return to a normal level of physical activity even after minor ambulatory surgical procedures.[1] Although opioid analgesics are highly effective in decreasing pain in the early postoperative period, their use may be associated with unwanted side effects (e.g., itching, nausea and vomiting).[2] Local anaesthetics are popular adjuvants during outpatient procedures because they can provide perioperative analgesia without opioid-related side effects.

The ilioinguinal-hypogastric nerve block procedure is a widely used local anaesthetic technique for decreasing pain after inguinal hernia repair,[3] especially for children undergoing this procedure.[4,5] Although a variety of local anaesthetic techniques has been used to provide postoperative analgesia for outpatients undergoing inguinal hernia repair, these studies have all evaluated local anaesthetics when used as part of a regional or general anaesthetic technique.[6-10]

We assessed the effect of an ilioinguinal-hypogastric nerve block with bupivacaine 0.25% (versus saline) on postoperative pain and recovery times in outpatients undergoing inguinal hernia repair using a monitored anaesthesia care (MAC) technique.

## Methods

Thirty healthy, consenting male outpatients scheduled to undergo unilateral, elective inguinal herniorrhaphy under MAC were randomly assigned to one of two treatment groups according to a double-blind, institutional review board approved protocol. Patients with a history of hypersensitivity to local anaesthetic agents and those with a history of chronic use of analgesic drugs were excluded from participation in this study. All patients were fasted for at least six hours before the operation. In the preoperative holding area, patients completed a series of 100 mm visual analogue scales (VAS) to assess baseline levels of pain, sleepiness (sedation) and nausea, with scores of 0 = none to 100 = maximum effect.

Intraoperative monitors included an ECG, noninvasive blood pressure device, pulse oximeter, and capnograph (for measurement of end-tidal $CO_2$ ($P_{ET}CO_2$) and respiratory rate (RR)). Mean arterial pressure (MAP), heart rate (HR), and oxygen saturation ($SpO_2$) were recorded on arrival in the operating room and at 3–5 min intervals during the operation. All patients were administered oxygen, 3 $L \cdot min^{-1}$ via nasal prongs with a $CO_2$ sampling port (Salter Labs, No. 4707, Arvin, CA). Each patient received midazolam 2 mg *iv*, and fentanyl 25 μg *iv*, prior to the start of a propofol infusion, 75 $\mu g \cdot kg^{-1} \cdot min^{-1}$ (using a Bard InfusO.R.™ pump). The ilioinguinal-hypogastric nerve block was performed by the attending anaesthetist (PFW) 5–10 min prior to initiating the surgical procedure by injecting 30 ml of either saline (Group 1) or bupivacaine 0.25% (Group 2) through the oblique muscles in the area 1.5 cm medial to the anterior superior iliac spine using a 23 ga, 2.5 cm, short bevel needle. The study medication (30 ml of either saline or bupivacaine 0.25%) was prepared by the hospital pharmacy in a numbered (unlabeled) syringe. The anaesthetist, surgeon, and patient were all unaware of the treatment administered.

The surgeon infiltrated the incision site with lidocaine 1%. In both groups, the propofol infusion rate was varied between 25 and 140 $\mu g \cdot kg^{-1} \cdot min^{-1}$ to maintain a level of sedation during the operation whereby the patient was resting comfortably when unstimulated, but readily responded to verbal or "light" tactile stimulation. Additional fentanyl, 25 μg *iv* boluses, were administered to manage discomfort not responding to supplemental local anaesthetic (lidocaine) infiltration. Upon completion of the operation, the propofol infusion was discontinued. Total intraoperative doses of propofol and fentanyl were recorded. The times from the end of anaesthesia until ambulation (i.e., when the patient was able to walk unassisted) and to being judged "fit for discharge"[11] were recorded by a "blinded" observer.

In the postanaesthesia care unit (PACU), pain was treated with fentanyl, 25 μg *iv* boluses. The patient's postoperative requirements for analgesic and antiemetic medications were recorded. In addition, the patient's assessment of postoperative pain, sedation, and nausea were determined using 100 mm VAS upon arrival in the PACU and at 30 min intervals until discharge. All patients were given a standardized prescription for oral analgesic medication (i.e., acetaminophen 500 mg with codeine 30 mg) at the time of discharge. The patients were contacted on the first postoperative day by a research nurse who inquired about their use of oral analgesic medication and side effects during the first 24 hr following discharge from the outpatient surgery unit.

Data are expressed as mean values ± standard deviation (±SD). Continuous variables were analyzed using analysis of variance (ANOVA), and descriptive variables were analyzed with Chi square and Fisher's exact tests when appropriate. Changes in the postoperative pain VAS values over time were evaluated using repeated measures of ANOVA. In all cases, $P$-values $< 0.05$ were considered statistically significant.

## Results

The two treatment groups were comparable with respect to age, weight, ASA physical status, duration of the procedure, and duration of sedation (Table I). Two patients in each treatment group required supplementation with nitrous oxide 67% in oxygen because of inadequate local anaesthesia. Therefore, these patients' data were not

TABLE I Demographic characteristics of the two analgesic treatment groups*

| *Variables* | *Saline* | *Bupivacaine* |
|---|---|---|
| Number (*n*) | 15 | 15 |
| Age (yr) | 53 ± 20 | 49 ± 23 |
| Weight (kg) | 78 ± 11 | 78 ± 9 |
| ASA (I/II) | 6/9 | 7/8 |
| Operation time (min) | 50 ± 15 | 53 ± 18 |
| Sedation time (min) | 61 ± 17 | 63 ± 21 |
| Total propofol (mg) | 421 ± 193 | 395 ± 156 |
| Total fentanyl (μg) | 85 ± 26 | 69 ± 22 |
| Total lidocaine dose (ml) | 28 ± 7 | 29 ± 9 |

*Values are mean ± SD (or number).

included in the statistical analysis. Although patients in the saline (control) group required slightly higher propofol and fentanyl dosages, there were no differences in the intraoperative dosages of these two drugs. In addition, both groups of patients had similar amounts of lidocaine 1% infiltrated by the surgeons during the operation (Table I).

There were no differences between the two groups with regard to their preoperative (baseline) pain VAS scores. Postoperative requirements for both oral and parenteral analgesics are summarized in Table II. A similar percentage of patients in the two treatment groups required parenteral opioid analgesic medication in the early postoperative period. However, the average postoperative VAS pain score during the first 30 min after arriving in the PACU was lower in the bupivacaine-treated patients (Figure). Although the times to ambulation and being judged "fit for discharge" tended to be shorter in the bupivacaine group, these differences did not achieve statistical significance (Table II).

When contacted by telephone the following day, fewer patients in the bupivacaine treated group required oral analgesics for pain control after discharge from the day-surgery unit (Table II). Nausea occurred in only one patient in the saline group. No nausea or vomiting was reported in patients in the bupivacaine group. Finally, there were no differences between the two treatment groups with respect to the patients' postoperative sedation or nausea VAS scores (unreported data).

## Discussion

With the continued growth in ambulatory surgery, postoperative pain management has assumed an increasingly important role in providing for a smooth transition from the outpatient unit to the home environment. The traditional use of opioid analgesics for providing perioperative pain relief can be associated with an increased incidence of gastrointestinal side effects, in particular nausea and vomiting.[12] The ability of these uncomfortable side effects to delay recovery after ambulatory surgery has stimulated the search for alternative methods of providing pain relief. Local anaesthetics are increasingly popular adjuvants during outpatient anaesthesia,[13] and their efficacy in minimizing pain after inguinal herniorrhaphy has been investigated using ilioinguinal-hypogastric nerve blockade (IHNB),[7] inguinal field blocks,[8] and wound infiltration techniques.[9] Most published studies involving IHNB procedures have not been conducted in a double-blinded, placebo-controlled fashion, and are usually employed as a part of a regional or general anaesthetic technique.[5-10] Therefore, we designed a double-blinded, placebo-controlled study to determine if the performance of a IHNB with bupivacaine 0.25% provided additional benefit to outpatients undergoing inguinal hernia repair when using a MAC local infiltration technique.

Previous studies involving IHNB techniques with bupivacaine 0.25% have been reported to provide prolonged postoperative analgesia in adults and paediatric patients undergoing inguinal herniorrhaphy.[7,14] It has been suggested that IHNB following the induction of general anaesthesia and prior to skin incision can decrease the inhaled anaesthetic requirement and provide for a pain-

TABLE II Postoperative recovery times and analgesic requirements of the two treatment groups*

| | *Saline* | *Bupivacaine* |
|---|---|---|
| Number of patients analyzed (*n*) | 13 | 13 |
| Time to unassisted ambulation (min) | 99 ± 27 | 86 ± 18 |
| Time to be "fit for discharge" (min) | 126 ± 30 | 112 ± 49 |
| Required postoperative fentanyl (%) | 23 | 31 |
| Total fentanyl dose at PACU (μg) | 32 ± 37 | 20 ± 31 |
| Oral analgesic taken at home (%) | 85 | 46† |

*Values are mean ± SD or percentages.
†Significantly different from the saline group, $P < 0.05$.

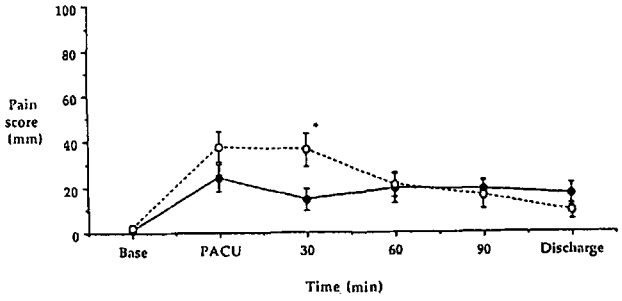


FIGURE Pain visual analogue scales before (Base), on arrival in the PACU, and at 30, 60, and 90 min intervals until the time of discharge (Discharge) in the two treatment groups ( — ● — , bupivacaine 0.25%; — O — , saline). Data are mean values ± SEM. Asterisk indicates difference between the two treatment groups, $P < 0.05$.

free stay in the recovery room. However, in our study the intraoperative requirements for propofol and supplemental fentanyl were similar in the two treatment groups. Furthermore, the administration of bupivacaine 0.25% (75 mg) did not decrease the requirement for postoperative opioid medication in the PACU. Since both treatment groups received lidocaine 1% for local infiltration, this may have "minimized" the opioid-sparing effects of bupivacaine 0.25% in the early recovery period. In fact, it has been suggested that preincisional local anaesthetic infiltration with lidocaine 1% can prevent nociceptive impulses from entering the central nervous system (i.e., preemptive analgesia),[15] thereby suppressing formation of the sustained hyperexcitable state in the spinal cord that is alleged to contribute to the maintenance of postoperative pain.

The use of a higher concentration of bupivacaine (i.e., 0.5%) might have provided more effective and longer lasting postoperative analgesia. However, in a recently published study involving preincisional IHNB and wound infiltration, bupivacaine 0.5% failed to produce an analgesic effect beyond the first six hours after elective hernia repair.[16] Although complications of an IHNB procedure are extremely rare, transient quadriceps paresis, haematoma formation, bowel perforation, and intravascular injection are all possible complications. The use of a small gauge short-bevel needle will minimize the risk of complications associated with this superficial nerve block procedure.

We conclude that in adult outpatients undergoing inguinal hernia repair with local anaesthetic infiltration, use of an ilioinguinal-hypogastric nerve block with bupivacaine will contribute to a decrease in postoperative pain and reduce the requirement for oral analgesic medication after discharge from the day-surgery unit. Future studies should compare this peripheral nerve block technique with simple wound infiltration (or instillation) techniques prior to skin closure in adults undergoing this procedure on an ambulatory basis.

## References


1 *Fraser RA, Hotz SB, Hurtig JB, Hodges SN, Moher D.* The prevalence and impact of pain after day-care tubal ligation surgery. Pain 1989; 39: 189–201.

2 *Bosek V, Smith DB, Cox C.* Ketorolac or fentanyl to supplement local anesthesia? J Clin Anesth 1992; 4: 480–3.

3 *Flanagan L Jr, Bascom JU.* Herniorrhaphies performed upon outpatients under local anesthesia. Surg Gynecol Obstet 1981; 153: 557–60.

4 *Reid MF, Harris R, Phillips PD, Barker I, Pereira NH, Bennett NR.* Day-case herniotomy in children. A comparison of ilio-inguinal nerve block and wound infiltration for postoperative analgesia. Anaesthesia 1987; 42: 658–61.

5 *Casey WF, Rice LJ, Hannallah RS, Broadman L, Norden JM, Guzzetta P.* A comparison between bupivacaine instillation *versus* ilioinguinal/iliohypogastric nerve block for postoperative analgesia following inguinal herniorrhaphy in children. Anesthesiology 1990; 72: 637–9.

6 *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.

7 *Bugedo GJ, Carcamo CR, Mertens RA, Dagnino JA, Munoz HR.* Preoperative percutaneous ilioinguinal and iliohypogastric nerve block with 0.5% bupivacaine for postherniorrhaphy pain management in adults. Reg Anesth 1990; 15: 130–3.

8 *Dierking GW, Dahl JB, Kanstrup J, Dahl A, Kehlet H.* Effect of pre- vs postoperative inguinal field block on postoperative pain under herniorrhaphy. Br J Anaesth 1992; 68: 344–8.

9 *Bays RA, Barry L, Vasilenko P.* The use of bupivacaine in elective inguinal herniorrhaphy as a fast and safe technique for relief of postoperative pain. Surg Gynecol Obstet 1991; 173: 433–7.

10 *Hannallah RS, Broadman LM, Belman AB, Abramowitz MD, Epstein BS.* Comparison of caudal and ilioinguinal/iliohypogastric nerve blocks for control of post-orchiopexy pain in pediatric ambulatory surgery. Anesthesiology 1987; 66: 832–4.

11 *Smith I, Van Hemelrijck J, White PF.* Effects of local anesthesia on recovery after outpatient arthroscopy. Anesth Analg 1991; 73: 563–9.

12 *White PF, Shafer A.* Nausea and vomiting: cause and prophylaxis. Seminars in Anesthesia 1987; 6: 300–8.

13 *White PF.* Pain management after day-case surgery. Current Opinion in Anaesthesia 1988; 1: 70–5.

14 *Shandling B, Steward DJ.* Regional analgesia for postoperative pain in pediatric outpatient surgery. J Pediatric Surg 1980; 15: 477–80.

15 *Woolf CJ, Chong MS.* Preemptive analgesia – treating postoperative pain by preventing the establishment of central sensitization. Anesth Analg 1993; 77: 362–79.

16 *Harrison CA, Morris S, Harvey JS.* Effect of ilioinguinal and iliohypogastric nerve block and wound infiltration with 0.5% bupivacaine on postoperative pain after hernia repair. Br J Anaesth 1994; 72: 691–3.