Scandinavian Journal of Urology

ISSN: 2168-1805 (Print) 2168-1813 (Online) Journal homepage: http://www.tandfonline.com/loi/isju20

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To cite this article: Ahmed Hammady, Wesam Abdelgalil, Elnesr Rashed & Mohamed S. Elbadry (2015) Upper urinary tract retroperitoneoscopic surgery under epidural anesthesia: Shifting towards outpatient treatment, Scandinavian Journal of Urology, 49:2, 181-184

To link to this article: http://dx.doi.org/10.3109/21681805.2014.971426

Published online: 30 Oct 2014.

SCANDINAVIAN JOURNAL OF UROLOGY

http://informahealthcare.com/sju
ISSN: 2168-1805 (print), 2168-1813 (electronic)

Scand J Urol, 2014; 49(2): 181–184
 DOI: 10.3109/21681805.2014.971426

informa healthcare

ORIGINAL ARTICLE

Upper urinary tract retroperitoneoscopic surgery under epidural anesthesia: Shifting towards outpatient treatment

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Abstract

Objective. Laparoscopy for urological surgery is usually carried out under general anesthesia. However, laparoscopy under epidural anesthesia has been reported to be successful for laparoscopic cholecystectomy, hernia repair, gynecological procedures, renal biopsy and renal cyst unroofing. *Materials and methods.* From August 2011 to July 2013, 46 patients (26 male, 20 female) with a mean age of 35 years underwent retroperitoneoscopic surgery (15 nephrectomy, 21 ureterolithotomy, 10 renal cyst excision) under epidural anesthesia, performed by the same surgeon. Inclusion criteria were patients with benign upper urinary tract pathology, no history of flank operation, American Society of Anesthesiologists score I–II and body mass index less than 25. Pulse oximetry, electrocardiography, non-invasive arterial blood pressure and respiratory rate were monitored intraoperatively. The partial pressure of carbon dioxide in arterial blood and pain assessment via a visual analogue scale were assessed every 30 min. The serum cortisol level was measured to evaluate the surgical stress under epidural anesthesia. *Results.* All operations were completed laparoscopically with no conversion to open surgery. Hypotension was observed in six patients (13%) and 16 (34.7%) experienced shoulder pain. The mean operative time was 90 min. No postoperative analgesia was given. All patients could ambulate 4 h after the operation and were discharged on the same day; the mean hospital stay was 6.5 h. *Conclusions.* Retroperitoneoscopy for benign upper tract pathology combined with epidural anesthesia is a feasible and an attractive method for both surgeon and patient. No postoperative pain and early recovery are the most beneficial results of this technique. Further studies, applying this technique in patients with cardiopulmonary problems, should be conducted.

Keywords:

Epidural anesthesia, outpatient surgery, retroperitoneoscopy

History

Received 3 April 2014
Revised 16 August 2014
Accepted 25 September 2014

Introduction

Minimally invasive surgery has replaced open surgery as the first line of treatment in the management of many urological diseases. Besides endourological techniques, laparoscopy is a powerful tool offered by several centers around the world to perform various ablative and reconstructive procedures [1]. Surprisingly, in the era of minimally invasive medicine, regional anesthesia has not gained popularity and has not been routinely used as a sole method of anesthesia in laparoscopic procedures. In a prospective study, Azurin et al. proved that endoscopic preperitoneal herniorrhaphy can be carried out on an outpatient basis effectively under epidural anesthesia, obviating the need for general anesthesia [2]. Johnson [3] noted that all laparoscopic procedures merely involve a change in access and still require general anesthesia; hence, the difference from conventional surgery is likely to be small. This statement is predominantly based on the assumption that laparoscopy necessitates endotracheal intubation to prevent aspiration and respiratory difficulties secondary to the induction of carbon dioxide (CO_2) pneumoperitoneum, which is not well tolerated in a patient who is awake during the procedure [4–6].

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The objective of this study was to evaluate the possibility of performing retroperitoneoscopy under epidural anesthesia, by recording the results, outcome and postoperative pain from the procedure.

Materials and methods

This study was conducted at Sohag University Hospital, Egypt, from August 2011 to July 2013, during which time 46 patients (26 males and 20 females) underwent retroperitoneal laparoscopic surgery (15 simple nephrectomy, 21 ureterolithotomy and 10 simple renal cyst excision). All surgery was performed under epidural anesthesia by the same surgeon (AH). The inclusion criteria included patients with benign upper urinary tract pathology (e.g. simple renal cyst, non-functioning kidney, upper ureteral stone), no previous history of flank operation, American Society of Anesthesiologists score (ASA) physical status classification I–II and body mass index less than 25. The study was approved by the faculty ethics committee. Written informed consent was obtained from those who participated in this study. The exclusion criteria included severe cardiovascular diseases, history of previous retroperitoneal surgery, morbid obesity and contraindications for epidural catheterization (e.g. coagulopathy, INR > 1.5, platelet count < 50,000, sepsis or the presence of a skin infection at the site of catheter placement).

The primary endpoints of this study were a failure to achieve the desired level of epidural block from T5 to L2, and an intraoperative serum cortisol level greater than 450 mg/ml. The secondary endpoints were severe abdominal discomfort, severe shoulder pain not responding to rescue treatment and a visual analogue scale (VAS) score greater than 6.

Anesthetic protocol

On the day before surgery, all patients scheduled to participate in the study were given full details regarding the surgery in addition to the benefits and possible side-effects of lumbar epidural anesthesia. The steps in epidural anesthesia are listed in Table 1.

Surgical technique

(See Rassweiler et al. [7].)

The patient was placed in a lateral position while conscious. Initially, a 1.0 cm transverse incision was made at the Petit triangle and a small retroperitoneal cavity was created using the digit technique. Two standard trocars (5 mm and 10 mm) were then placed lateral to the incision site at the midaxillary line, and a blunt trocar was introduced into the initial incision for the telescope. Thereafter, capnoretroperitoneum was created by maintaining a CO_2 pressure of 8–10 mmHg, and retroperitoneoscopy was carried out. The patients were asked to rate the severity of pain on a VAS ranging from no pain (0) to worst possible pain (10) during and after the procedure.

Statistical analysis

Numerical data are expressed as mean ± SD or median (interquartile range), and categorical data as number (percent). SPSS version 15 was used for data analysis. Categorical variables were analyzed using the chi-squared test (or Fisher's exact test). The Mann–Whitney test was used for numerical variables. A p value less than 0.05 was considered statistically significant.

Results

The study included 46 patients, 26 (56.5%) male and 20 (43.5%) female. Demographic data and type of retroperitoneoscopic operations are shown in Table 2. The mean age was 35 years (range 25–44 years). All operations were completed laparoscopically with no conversion to open surgery. Intraoperative data were recorded and are shown in Table 3. Hypotension was observed in six patients (13%) during surgery; these patients were treated successfully with intravenous ephedrine. Sixteen patients (34.7%) experienced shoulder pain, which was moderate in six patients (13%) who needed an intravenous fentanyl injection at a dosage of 1 μg/kg for analgesia. The mean operative time was 90 min (range 65–130 min). The mean serum cortisol levels, measured preoperatively, 30 min after the beginning of the operation and postoperatively, were 75 ± 9 ng/ml, 150 ± 5 ng/ml and 93 ± 2.5 ng/ml, respectively. The median VAS score was 2 (range 0–6). No postoperative analgesia was needed and the patients did not experience sore throat, myalgia, hoarseness, nausea or vomiting, which are frequent postoperative complaints. All patients could ambulate 4 h after the operation and there were no complications or morbidity in the immediate postoperative period, except for two cases who had urinary retention and were managed by the insertion of a plastic catheter to relieve the retention. All the patients were discharged from the hospital on the same day, with a mean hospital stay of 6.5 h, and remained free of complications throughout the follow-up period (3 months) without the need for further interventions.

Discussion

In the early 1990s, the retroperitoneoscopic approach was less popular than the transperitoneal approach. In 1999, Keeley and Tolley [8] stated the main advantages of retroperitoneoscopy over transperitoneoscopy as being better exposure of the renal hilum, avoidance of intraperitoneal organ injury, avoidance of paralytic ileus, and confinement of postoperative hematoma and urinoma into the retroperitoneum, and the main disadvantage as being a relatively small working space. Nevertheless, all laparoscopic procedures were

Table 1. Anesthesia protocol.

Intravenous midazolam 0.1 mg/kg 1 h before surgery
IV Ringer's Lactate solution 10ml/Kg/hr starting 1 h before surgery and continued during the operation
Insertion of lumber epidural catheter (Perifix®) via 17 gauge tough needle at the level of L1–L2 and advanced about 8 cm to achieve a T5–L2 block
Injection of 20 ml of bupivacaine 0.25% 15 min before the operation
Intraoperative discomfort was treated with IV midazolam 0.1 mg/kg
Abdominal or referred shoulder pain was assessed using pain grading[6]
In case of moderate pain degree, incremental doses of Fentanyl 1 μg/kg was given intravenously
Intraoperative continuous monitoring of pulse oximetry, ECG, non-invasive arterial blood pressure and respiratory rate
PCO2 in arterial blood gas and pain assessment via VAS were assessed every half an hour
Hypotension (systole < 100 mmHg) was treated with incremental doses of IV Ephedrine hydrochloride 0.1 mg/kg
Serum cortisol level was measured preoperatively, 30 min after gas insufflation and immediately postoperative
In postoperative, single dose of 5 mg morphine sulphate through epidural catheter was given for postoperative analgesia

[a]Pain grading: 0 = none, 1 = mild (no additional analgesics needed), 2 = moderate (additional analgesics needed), 3 = severe (not controlled by analgesics) [6].
ECG = electrocardiography; $PaCO_2$ = partial pressure of arterial carbon dioxide; VAS = visual analogue scale.

Table 2. Demographic and perioperative data.

Patient criteria	
Gender (male/female)	26 (56.5)/20 (43.5)
Age (years)	35 ± 7.3
Body mass index (kg/m^2)	23.1 ± 0.2
Type of operation	
Nephrectomy	15 (32.6)
Ureterolithotomy	21 (45.6)
Renal cyst excision	10 (21.7)
Operative duration (min)	90 ± 30
Blood loss (ml)	95 ± 70
Hospital stay (h)	6.5 ± 2.3

Data are shown as *n* (%) or mean ± SD.

performed under general anesthesia and the use of epidural anesthesia in laparoscopic surgery was rare, with few reports justifying its use, and it was limited to patients who were unfit for general anesthesia. Since minimally invasive procedures result in less infection, quicker recovery time and shorter hospital stay, or allow outpatient treatment, the present study aimed to evaluate the feasibility of performing retroperitoneoscopic surgery for benign upper urinary tract pathology on an outpatient basis. Concerning the type of anesthesia, general anesthesia is usually used for laparoscopic surgery to control pain and respiratory condition [9]. Recently, epidural anesthesia has also been indicated for retroperitoneal laparoscopic renal biopsy and unroofing of renal cysts [10,11].

The major concerns about epidural anesthesia in laparoscopic or retroperitoneoscopic procedures are excessive CO_2 absorption, pain and respiratory or abdominal discomfort. In transperitoneoscopy, although pain control can be achieved by epidural anesthesia, respiratory disturbance and abdominal discomfort attributable to visceral distension may occur, leading to difficulty in carrying out lengthy procedures. In this study, under epidural anesthesia, the patient was able to control his or her own ventilation. Arterial CO_2 pressure was kept within the normal range under an insufflation pressure of 8–10 mmHg without any complaints (e.g. pain, vomiting or breathing difficulties). This finding compares well with the case of retroperitoneoscopic renal cyst unroofing reported by Yagisawa et al. [11]. The occurrence of intraoperative hypotension (explained by epidural sympathectomy) was managed by intravenous injection of ephedrine to increase peripheral vascular resistance. This finding also compares well with the study of Lee et al. [12], in which hypotension was encountered in most patients undergoing laparoscopic cholecystectomy under epidural anesthesia and was managed by intravenous ephedrine. In contrast, Yagisawa et al. [11] did not observe any hemodynamic changes in their case report of retroperitoneoscopic renal cyst unroofing.

Table 3. Intraoperative data.

*P*aO_2 (mmHg), mean ± SD (range)	97.6 ± 2.5 (96–99)
Hypotension (systole < 100 mmHg), no. of patients (%)	6 (13)
Respiratory rate (breaths/min), mean ± SD (range)	17.3 ± 1.4 (16–20)
*P*aCO_2 (mmHg), mean ± SD (range)	46 ± 3 (34–50)
Referred pain, no. of patients (%)	
0	30 (65.2)
1	10 (21.7)
2	6 (13)
3	0
Serum cortisol level (ng/ml), mean ± SD	
Preoperatively	75 ± 9
After 30 min	134 ± 5
Postoperatively	93 ± 2.5
VAS score, median (range)	2 (0–6)

*P*aO_2 = partial pressure of arterial oxygen; *P*aCO_2 = partial pressure of arterial carbon dioxide; VAS = visual analogue scale.

In transperitoneal laparoscopic surgery under regional anesthesia, shoulder pain due to diaphragmatic irritation by CO_2 could occur, although this problem is theoretically less prominent in retroperitoneal procedures. In this study the insufflation pressure was not increased above 10 mmHg; nevertheless, shoulder pain was encountered in 16 patients, in six of whom it was moderate, necessitating intravenous fentanyl 1 μg/kg as a rescue medicine, while the other patients had mild shoulder pain with no need for treatment. This finding compares well with the work of Lee et al. [12] on the use of epidural anesthesia during laparoscopic cholecystectomy, in which 11 out of 12 patients experienced right shoulder pain and six patients needed an intravenous fentanyl injection owing to severe pain. In the present study, intraoperative pain control was sufficiently good, as demonstrated by VAS assessment (median = 2), and the rise in serum cortisol level was twice the baseline measurement (mean = 150 ng/ml). This finding agrees with the study by Aggo et al. [13], comparing the impact of general and epidural anesthesia on cortisol levels, in which the mean plasma cortisol level was 361.6 ng/ml in the general anesthesia group and 147.45 ng/ml in the epidural anesthesia group, a statistically significant difference.

In this study, the mean operative time was 90 min. This is comparable with Rassweiler and colleagues' [7] experience with 200 cases under general anesthesia, which indicated that operative time was not affected by the type of anesthesia. In the present study, no patient required postoperative pain medication. This concurs with the findings of Pursnani et al. [4], who studied the performance of laparoscopic cholecystectomy under epidural anesthesia in patients with chronic respiratory disease. The lack of postoperative pain and the early ambulation of patients may be the main advantages of retroperitoneoscopy under epidural anesthesia, owing to reduction of the surgical stress response. This reduction may be achieved by two techniques: minimally invasive surgery to reduce the degree of tissue trauma and thereby the injury response, and the less stressful anesthesia technique to provide effective pain relief.

The findings of the present study are related to the use of low CO_2 pressure, an experienced surgeon, cooperative patients and short operative time. Nevertheless, epidural anesthesia is not free from complications, and therefore a well-trained anesthesiologist, well-equipped operating theatre and good monitoring are essential for this technique.

The small sample could be considered a shortcoming in this study, so the authors recommend the use of epidural anesthesia with retroperitoneoscopy in a larger number of patients and the involvement of patients with cardiopulmonary problems for future studies.

In conclusion, retroperitoneoscopy for benign upper tract pathology combined with epidural anesthesia is a feasible and an attractive method for both surgeon and patient. No postoperative pain and early recovery are the most beneficial results of this technique. Further studies, applying this technique in a larger number of patients and involving patients with cardiopulmonary problems, should be conducted.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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