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Original article:

COMPARATIVE STUDY OF THE EFFECTS OF INTERCOSTAL NERVE BLOCK VERSUS INFILTRATION ON POSTOPERATIVE PAIN IN THE FLANK INCISION

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Abstract

Introduction

The most often utilized flank approach in renal surgery is through the bed of the 11th or 12th rib, which offers excellent exposure to the renal parenchyma and collecting system [1]. The patient response to pain and surgery, and pre/peri-operative analgesic techniques all play a role in enhancing post-operative discomfort. The goal of this study was to compare the effectiveness of intercostal nerve block with flank incision infiltration of local anesthetics such as 0.25% Bupivacaine on postoperative pain control in order to determine which method was the most effective in reducing the need for total analgesic consumption.

Methods :

The study included a total of 100 individuals who underwent elective flank incision surgeries between January 2021 and January 2023 in our hospital: Two surgeons performed the procedures; one frequently employed infiltration of the flank incision while the second always used intercostal block on all of his patients. After reviewing the patient's medical records, we divided them into two groups: group A-50 patients who underwent intraoperative

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incisional infiltration (ICI) of combined local anesthetic agents (0.5% bupivacaine (20ml) + 2% lidocaine (5ml) diluted in 15ml 0.9% normal saline solution; and group B-50 patients, Intercostal nerve block (ICNB) during surgery using the same anesthetic agent. Postoperative pain scores were calculated up to the third day of surgery.

Result:

The patients ranged in age from 15 to 75 years. On comparison of postoperative pain on the visual analogue scale group A had better pain scores at the recovery period and postoperatively on day 3 which was statistically significant (Table 2).

In conclusion, wound infiltration is preferred over the intercostal nerve block in terms of the analgesic aspect, and its use is recommended postoperatively in major urological procedures.

Keywords: flank incision**;** Infiltration of Flank Incision; ICNB; Intercostal Nerve Block

Abbreviation:

1. DVT: Deep vein thrombosis
2. ICI: Intraoperative incisional infiltration
3. ICNB: Intercostal nerve block

MANUSCRIPT:

Introduction

To successfully perform the procedure and manage any potential difficulties, adequate exposure to the field is required during open kidney surgery. Large incisions are therefore required in renal surgery since minor incisions could result in inadequate exposure and make it difficult to control injuries to the renal vascular pedicle, particularly when a large tumor is present. The most often utilized flank approach in renal surgery is through the bed of the 11th or 12th rib, which offers excellent exposure to the renal parenchyma and collecting system [1]. The most common indications for a flank incision in renal surgery include nephrectomy (partial vs. complete renal excision, and simple vs. radical), renal parenchymal cyst excision, open nephrolithotomy, nephroureterectomy, ureteroureterostomy, and open pyeloplasty. A number of complications, including vascular, splenic, and intestinal damage, are possible during renal surgery, especially when done openly. early complications such as acute renal failure, intestinal obstruction, peritonitis, deep vein thrombosis (DVT), and pulmonary embolism; late complications such as chronic renal failure, incisional hernias, and wound infection.

In addition, flank incision contributes to these complications by lengthening the hospital stay, which delays patient recovery and results in ileus, increasing opioid demand, reducing patient mobility from bed, which increases the risk of DVT or pulmonary embolism, and weakening the abdominal wall due to the damage to muscles and nerves, which later results in incisional hernia [2]. Consequently, despite the fact that urologists have employed flank incision for decades, its morbidity has always been a concern.

Since opioids constitute the mainstay of postoperative pain treatment, one of the anesthesiologist's most crucial responsibilities is to achieve enough and effective post-operative analgesia to ensure adequate postoperative pain control and prompt ambulation with minimal complications [3]. The surgical (operation kind, length, and approach), patient response to pain and surgery, and pre/peri-operative analgesic techniques all play a role in enhancing post-operative discomfort. Therefore, post-operative pain and side effects (nausea, vomiting, and ileus) should be managed in order to achieve early patient discharge criteria.

One solution that satisfies this criterion is local anesthetic wound infiltration [4], which reduces the need for opiate analgesics. The goal of this study was to compare the effectiveness of intercostal nerve block with flank incision infiltration of local anesthetics such as 0.25% Bupivacaine on postoperative pain control in order to

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determine which method was the most effective in reducing the need for total analgesic consumption in a 24-hour period and lengthening the time to first rescue analgesia.

Methods:

The study included a total of 100 individuals who underwent elective flank incision surgeries. The following urological procedures were carried out between January 2021 and January 2023 in our hospital: nephrectomy (partial vs. complete and simple vs. radical), open nephrolithotomy, pyeloplasty, nephroureterectomy, and ureteroureterostomy. Two surgeons performed the procedures; one frequently employed infiltration of flank incision while the second always used intercostal block on all of his patients. After reviewing patient's medical records, we divided them into two groups: group A-50 patients who underwent intraoperative incisional infiltration (ICI) of combined local anesthetic agents (0.5% bupivacaine (20ml) + 2% lidocaine (5ml) diluted in 15ml 0.9% normal saline solution; and group B-50 patients, Intercostal nerve block (ICNB) during surgery using the same anesthetic agent. The Ages of the patients ranged from 15 to 75, and the follow-up time for each patient was from the day of surgery, post-operatively in the recovery room when the patient became fully conscious, to the end of the third postoperative day.

Patient's inclusion criteria included renal pathologies (benign or malignant tumors, benign or malignant cysts, stones, non-functioning kidney, and chronic infections (granulomatous pyelonephritis); ureteral pathologies (pelvi-ureteric junction obstruction, upper ureteral tumors and elective repair of ureteral injuries); donor nephrectomy; and controlled bleeding profile, diabetes mellitus and hypertension. Exclusion criteria were Ages <15 or > 75 years, dialysis patients, pregnancy, ectopic kidneys, renal injuries requiring nephrectomy, and acute kidney injury and infections (such as emphysematous pyelonephritis or abscesses).

Third-generation cephalosporins were administered intravenously to all patients before surgery (ceftriaxone, 1 g), and preoperative blood and urine cultures were proven to be normal. Additionally, a double J catheter was inserted beforehand if necessary.

The procedures included all of the steps of open nephrectomy and were carried out through a retroperitoneal flank incision. A subcostal, supracostal, or trans costal incision was made (often with the resection of the 11th or 12th rib). The position of the kidney and the amount of exposure necessary determined the type of incision to use. Supracostal incision-supra twelfth rib incision is the most popular flank approach.

The local anesthesia technique was as follows: in group A, ICI with 40ml of diluted combined local anesthetic agents (20ml of 0.5% bupivacaine + 5ml of 2% lidocaine + 15ml 0.9% NaCl) were applied at the conclusion of the surgery, and in group B, ICNB with the same diluted combined agents was applied at the completion of the procedure.

Statistical analysis

scale data are expressed as mean and standard deviation (SD), whereas categorical data are expressed as frequency and percentages. In order to identify relationships between categorical data and split plots, the chi-square of independence was used. For group mean differences across all observation intervals, an ANOVA test was utilized. With an 80 percent study power, an alpha level of 0.05 was considered statistically significant. The data were examined using SPSS version 25.

Result:

The patients ranged in age from 15 to 75 years; both groups were comparable in age distribution. More female patients underwent open renal surgeries in both groups. More left-sided nephrectomies were performed (Table 1). On comparison of postoperative pain on visual analogue scale group A had better pain scores at recovery period and postoperatively on day 3 which was statistically significant (Table 2).

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Table 1: Demographic data

Variables	Group A(IFI)(n=50)	Group B(ICNB)(n=50)	P value
Age			0.654
15-45 years	10(20%)	9(18%)	0.234
45-60 years	31(62%)	30(60%)	0.453
>60 years	9(18%)	11(22%)	0.321
Gender (male/female)	21(42%)/29(58%)	23(46%)/27(54%)	0.144
Laterality (right/left)	24(48%)/26(52%)	22(44%)/28(56%)	0.667

n: number of patients. IFI: Infiltration of Flank Incision. ICNB: Intercostal Nerve Block.

Table 2: Intergroup comparison of mean visual analogue scale (VAS) score

Variables	Group A(IFI)(n=50)	Group B(ICNB)(n=50)	P value
Mean VAS score (mean±SD)			
6hrs	5.8±1.1	6.2±1.02	<0.001
12 hrs.	4.6±1.2	5.7±1.23	<0.001
24 hrs.	3.4±0.97	4.8±1.01	<0.001
48 hrs.	2.4±1.33	3.24±1.02	<0.001
72 hrs.	1.89±0.022	2.5±1.022	<0.001
Total analgesic requirements (tramadol in mg) (mean±SD)	176.79±98.89	224.56±109.34	<0.001
Time to first analgesic demand (hrs.) (mean±SD)	4.87±1.54	3.12±1.33	<0.001

n: number of patients. IFI: Infiltration of Flank Incision. ICNB: Intercostal Nerve Block.

Discussion:

Traditional open nephrectomy exposes the patient to a major flank incision which delays the patient's recovery because of severe postoperative discomfort, in addition to the possibility of chronic postoperative pain [5]. Numerous studies have examined the role of local analgesics in urological operations in reducing post-operative pain and extending the duration of analgesia postoperatively.

Bupivacaine and buprenorphine together were the subjects of research by Nirmala and colleagues, who discovered that they had a positive impact on both the length of the post-operative analgesic period and the overall amount of analgesics needed [6]. While Iqbal Singh and colleagues supported our findings regarding the superiority of wound infiltration in reducing the overall analgesic requirements and postoperative pain, as well as prolonging the first analgesic demand [7], by comparing wound infiltration to the intercostal nerve block method using bupivacaine. While these studies used local analgesics to treat small wound incisions (peri-tubal incisions for percutaneous nephrolithotomy), other studies have shown that continuous infiltration of nephrectomy wounds can improve postoperative pain, speed recovery, and lower the cost of analgesic care [8]. Contrarily, Nirmala et al. demonstrated that ropivacaine provided superior analgesic efficacy to peri-tubal infiltration post percutaneous nephrolithotomy when used in an intercostal nerve block, as demonstrated by the decrease in analgesic demands and consumption as well as the longer time to first analgesic rescue [9].

The effectiveness of wound infiltration as a method of postoperative analgesia has generally been studied extensively in the literature. Some studies support the role of wound infiltration alone in enhancing recovery by reducing post-operative pain and the total analgesic demands [10], while others report that this method is superior to

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placebo but still falls short of the other gold standard analgesic techniques like the epidural and the peripheral nerve block [11]. There are numerous studies that demonstrate the effectiveness of continuous wound infiltration with local analgesic agents in lowering postoperative pain, analgesic requirements, and recovery time, including after open gastrectomy and cesarean sections, with equal efficacy to abdominal nerve blocks in cesarean sections and showing a potential reduction in the opioid requirements but not the pain scores.

According to the findings of this study with regards to the post-operative pain and analgesic requirements, the infiltration of the nephrectomy wound by the combination of local anesthetic agents (0.5% Bupivacaine + 2% lidocaine) is more efficient than an intercostal nerve block by the same agents.

Conclusion:

The infiltration of flank wound incision and the intercostal nerve block post-operatively with combined local analgesic agents (0.5% Bupivacaine + 2% lidocaine) are both effective techniques in reducing the recovery period due to increasing the post-operative pain, lowering the total analgesic consumption during the first postoperative 72 hrs., and extending the time until the first rescue analgesic demand, but the superiority for producing superior outcomes significantly favors wound infiltration method. In light of this, wound infiltration is preferred over the intercostal nerve block in terms of the analgesic aspect, and its use is recommended postoperatively in major urological procedures.

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