Does wound infiltration of tramadol reduce postoperative pain in laparoscopic or open herniorrhaphy?

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Abstract

Introduction: The laparoscopic approach may be associated with more postoperative pain initially. The aim of this study was to evaluate the effects of administered tramadol at wound closure on postoperative pain and analgesic requirements under spinal anesthesia in laparoscopic inguinal herniorrhaphy (LH) or tension free open inguinal herniorrhaphy (TFOH).

Methods: Twenty patients were randomly divided into two groups (n= 10 in each) as LH or TFOH. Patients received infiltration of 200 mg tramadol with 40 mL of 0.9% saline solution at wound closure procedure. Postoperative pain was assessed with a Visual Analog Scale (VAS) at 3, 6, 12, and 24 hours postoperatively. Additional requirements of tramadol for postoperative pain relief were registered.

Results: VAS scores at postoperative 12 and 24 hours were significantly higher according to 3rd hour VAS scores in both groups. The VAS scores at 12 hours after operation significantly lower in LH group than in TFOH group (1.5 ± 0.97 vs 5.1 ± 0.99). Additional requirements of tramadol for postoperative pain relief were significantly lower in LH group.

Conclusion: We conclude that wound infiltration of 200 mg tramadol reduce postoperative pain in LH group.

Keywords: laparoscopy herniorrhaphy, postoperative pain, tramadol

Introduction

Pain after laparoscopic surgery may vary in quality and localization and is reported in several studies to be incisional, intraabdominal, or referred (1). The etiology is complex, including damage to abdominal wall structures, the induction of visceral trauma and inflammation and peritoneal irritation because of CO2 entrapment beneath the hemidiaphragms. Pain after laparoscopic procedure is significantly less and shorter than that caused by the same surgical procedure made possible by open surgery (2). Compared with open procedures, laparoscopic surgery, a minimally invasive technique, is associated with reduced surgical trauma (3). Anti-inflammatory drugs decrease postoperative pain as local anesthetics and opioids when administered at the surgical site at time of wound closure. Tramadol is a centrally acting synthetic analgesic with μ-opioid receptor agonist activity. Infiltiration of tramadol into the surgical wound reduces postoperative pain with very few side effects (4). Patients benefit from laparoscopic extraperitoneal hernia repair because this allows earlier mobilization than the more classical open surgical approach (5). Laparoscopic inguinal herniorrhaphy (LH) provides distinct advantages over open herniorrhaphy and it is the treatment of choice for many patients. LH is associated with less pain and disability without increasing mortality or overall morbidity (6-8). Although the effect of wound infiltration of tramadol following LH provides better postoperative analgesia than open herni-
orhaphy, this issue is not well documented yet. The aim of this study was to evaluate postopera-
tive pain relief effects and analgesic requirements of locally administered trama-
dol after LH and tension free open herni-
orrhaphy (TFOH) under spinal anesthesia.

Methods
Twenty ASA physical status I or II patients were
randomized for elective unilateral either LH or
TFOH (n=10 in each). Informed consent was
obtained from each patient. Patients were evalu-
ated as primary inguinal hernia type II-a,b and
III-a according to Nyhus Classification. Patients
with renal disease, active peptic ulceration, a his-
tory of drug or alcohol abuse, chronic pain states,
or daily intake of non-steroidal anti-inflamma-
tory drugs or opioids were excluded from the
study. Any kind of complications were explained
to all of the patients and informed consent was
provided. All patients were instructed preopera-
tively about the use of a visual analog pain scale
(VAS) (0= no pain to 10= excruciating pain).
The patients didn't receive any analgesic pre-
medication. Age (year), height (cm) and weights
(kg) were recorded and all patients had received
IV saline infusion (0.09% NaCl, 10 mL kg⁻¹) in
the operating room about 20 min before spinal
anesthesia. Standard monitors were included an
electrocardiogram, non-invasive blood pressure
device, and pulse oxymetry. Oxygen was admin-
istered to all patients via nasal catheters at rate 2
mL/min. Spinal anesthesia was made with a 26 G
Quincke point needle in the lateral position at the
L4-L5 interspaces. After clear, free flow of cerebro-
spinal fluid was obtained, 3 mL heavy 0.5% bupi-
vacaine (*Marcaine heavy, Astra Zeneca, England)
was administered intratecally. Patients were then
placed with a supine horizontal position until the
end of the study. Any decrease or increase in base-
line systolic blood pressure of more than 20% was
treated and excluded from the study. When a bra-
dycardia or tachycardia occurs then atropine 0.5
mg was given. Data were recorded on a chart re-
corder. No opioids were given during the operation.
The extra peritoneal laparoscopic hernia repairs
were performed by the same surgeon. A subum-
bilical incision was made and the rectus sheath
was retracted to create a plane between the pos-
terior aspect of the rectus muscle and the perito-
neum. A space-maker balloon trochar apparatus
was then introduced and inflated with isotonic
sodium chloride solution (1000 mL) before de-
flation. The dissection exposed the hernial defect
and allowed placement of the mesh. At the end of
surgical procedure, Tramadol 200 mg in 40 mL of
0.9% saline was injected to the wound locally by
the surgeon. The patients were placed in a 30o sit-
ting position to keep the injected volume in the
ilioinguinal dependent area of the fascial plane.

Data collected that included to time intervals
(minute) duration of spinal anesthesia (bupiva-
cain injection to loss of sensorial level of L2) and
duration of surgery (incision to end of surgery).
Patients were transferred to the recovery room and
observed by nursing staff and have not received
any other analgesics during the study. Postopera-
tive pain was assessed by using a VAS during un-
assisted mobilization at 3, 6, 12 and 24 hour after
operation. When VAS value was ≥ 3, tramadol was
given intramuscularly for postoperative analgesia
and total amount of tramadol were documented
for each patient. Postoperative complications
included nausea and vomiting were also noted.

Statistical analysis
The results were expressed as mean values ± stan-
dard deviation. Mann-Whitney-U was used to
compare VAS scores and total amounts of trama-
dol as additional analgesic postoperatively
for each patient between two groups. Friedman
test and Wilcoxon test were used for repeated
and related measures. P values less than 0.05 was
considered as statistically significant. The study
was conducted in accordance with the ethical
standards of the Helsinki Declaration of 1975.

Results
Age, height, weight, duration of anesthesia and
surgery were similar in two groups (Table 1).
VAS scores on postoperative periods in the groups
and levels of statistical significance changes ac-
cording to 3th hour VAS scores were shown in
Table 2. VAS scores at postoperative 12 and 24
hours were significantly higher in both groups.
The significant is greater in TFOH group. The
VAS scores were reduced significantly in LH
group than in TFOH group at 12 hours after
operation (1.5 ± 0.97 and 5.1 ± 0.99) (Table 2). Fifteen patients received additional tramadol postoperatively. There was statistically significant difference between groups for the time to the first request for tramadol between LH group and TFOH group; the patients in the TFOH groups needed additional tramadol earlier than the patients in the LH group. Tramadol requirements were significantly lower in LH group while 5 patients never received and 5 patients received only once after operation (Table 3). The highest frequency of postoperative nausea and vomiting (PONV) coincided in early postoperative period. There were not statistically significant differences between groups in means of PONV (Table 4).

**Discussion**

Laparoscopic surgery, compared with open procedures, may be associated with diminished surgical trauma response and shortened recovery time; early postoperative pain after laparoscopic procedure which is a frequent complaint (9). Saff et al showed that laparoscopic extraperitoneal hernia repair with bupivacaine resulted in a lack of pain-relieving efficacy (5). There are different reasons for pain in extraperitoneal laparoscopic hernia repair based on the afferent source of pain signals. There is a significant contribution of visceral pain fibers that are more diffuse in distribution and innervation (5). These fibers are more refractory to blockade with local anesthetics and nonsteroidal anti-inflammatory drugs than somatic fibers (2,10). The latter are related to stimulation of neuronal serotonin release and inhibition of presynaptic reuptake of norepinephrine and serotonin (11). Tramadol is a synthetic and centrally acting analgesic. It has both opioid and non-opioid properties. Tramadol has been shown to have a similar potent effect on pain as morphin (12). In clinical trials, tramadol has not displayed the serious side effects typically seen with the use of opioid analgesics or non-steroidal anti-inflammatory drugs (13-15). Direct infiltration into the wound is a common form of postoperative analgesia in the surgery because of reduced side effects of the drugs on cardiovascular and central nervous system (16). Relieving pain in patients with herniorrhaphy can be problematic. Inadequate analgesia may delay discharge or pro-

**TABLE 1.** Patients demographic data and duration of anesthesia and surgery in two groups

<table>
<thead>
<tr>
<th></th>
<th>LH (n=10)</th>
<th>TFOH (n=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>49.3 ± 9.8</td>
<td>49.6 ± 8.3</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>168.9 ± 7.0</td>
<td>169.1 ± 3.8</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>71.2 ± 5.2</td>
<td>75.7 ± 4.9</td>
</tr>
<tr>
<td>Duration of anesthesia (min)</td>
<td>80.7 ± 9.1</td>
<td>78.6 ± 9.5</td>
</tr>
<tr>
<td>Duration of surgery (min)</td>
<td>64.4 ± 8.2</td>
<td>62.6 ± 8.2</td>
</tr>
</tbody>
</table>

LH; laparoscopic herniorrhaphy group, TFOH; tension free open herniorrhaphy group

**TABLE 2.** Visual analog scale (VAS) scores on postoperative periods in two groups and levels of statistical significance changes according to 3rd hour VAS scores.

<table>
<thead>
<tr>
<th>Hours</th>
<th>VAS</th>
<th>p†</th>
<th>VAS</th>
<th>p†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>LH (n=10)</td>
<td>TFOH(n=10)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0.8 ± 0.78 (1 [0-2])</td>
<td>1.0 ± 0.94 (1 [0-3])</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>1.0 ± 0.81 (1 [0-2])</td>
<td>0.317 ± 1.3 ± 0.67 (1 [0-2])</td>
<td>0.429</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>1.5 ± 0.97 (2 [0-3])</td>
<td>0.020 ± 5.1 ± 0.99 (5 [4-7])</td>
<td>0.005</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>5 ± 1.33 (4.5 [3-6])</td>
<td>0.005 ± 6.4 ± 1.34 (6 [5-9])</td>
<td>0.005</td>
<td></td>
</tr>
</tbody>
</table>

Data was shown as median [min - max] ± standard deviation. p†: levels of statistical significance changes according to 3th hour (Wilcoxon signed ranks).

**TABLE 3.** Tramadol requirements in two groups

<table>
<thead>
<tr>
<th></th>
<th>LH</th>
<th>TFOH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tramadol use</td>
<td>n</td>
<td>n</td>
</tr>
<tr>
<td>None</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>1 time</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>2 time</td>
<td>0</td>
<td>7</td>
</tr>
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</table>

p = 0.001 62.6 ± 8.2

LH; laparoscopic herniorrhaphy group, TFOH; tension free open herniorrhaphy group

**TABLE 4.** Nausea and vomiting

<table>
<thead>
<tr>
<th></th>
<th>LH</th>
<th>TFOH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Nausea</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Vomiting</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

p = 0.218 62.6 ± 8.2

LH; laparoscopic herniorrhaphy group, TFOH; tension free open herniorrhaphy group
long hospital stay (6). Concerns over the safety of analgesics often lead physicians to use small doses of these drugs with consequent sacrifices in efficacy; the respiratory depression, together with the prevalent nausea and vomiting, caused by opioids. There is no available literature concerning the magnitude of pain in LH and TFOH after wound infiltration of tramadol postoperatively. It is a general belief that most surgeons thought that LH causes less postoperative pain than TFOH (2). We have found that VAS scores at postoperative 12 and 24 hours were significantly higher according to 3th hour VAS scores in both groups. The VAS scores were reduced significantly in LH group than in TFOH group at 12 hours after operation (1.5 ± 0.97 and 5.1 ± 0.99). Pain and postoperative tramadol requirements decreased in group LH. This difference is significant; it also may bias the results toward less pain and need for analgesics in LH group. Fifteen patients received tramadol postoperatively. There was statistically significant difference between groups for the time to the first request for tramadol between LH group and TFOH group; the patients in the TFOH groups needed additional tramadol earlier than the patients in the LH group. Tramadol requirements were significantly lower in LH group while 5 patients never received and 5 patients received only once after operation. The recommended systemic dose of tramadol for postoperative pain is 50 mg intramuscular injection. Morphine produces a prolonged postoperative analgesia, but is associated with major side effects such as postoperative nausea and vomiting, in particular the potential of delayed respiratory depression (15). Clonidine, an alpha 2 adrenergic agonist, has been shown to potentiate postoperative analgesia. Although, clonidine improved the efficacy of analgesia, it was associated with prolonged sedation. Of all the agents used, wound infiltration of tramadol seems to show promise because of the absence of the side effects (18). Inadequate pain treatment causes discomfort, prevents sleep and thereby contributes to postoperative fatigue, delays discharge, and limits activity, prolong recovery period, and may induce nausea and vomiting. There were not statistically significant differences between groups in means of PONV in this study also. Yndgaard S. et al., have been shown that analgesic effect of subfascial infiltration with local analgesic was observed on postoperative pain after herniorrhaphy. Therefore, using tramadol may provide better effect is the postoperative pain and less side effects (19). The results of the VAS score indicate a negligible effect with a significant level for long-lasting period postoperatively when wound infiltration of tramadol was used in LH group. The effect of tramadol is clear: it lasts for a longer period and is evident during the mobilization. At postoperative 12 and 24 hour, the median VAS score in LH group decreased than TFOH group. Most of the patients in the group had not needed analgesic requirements but only a few patients was given analgesic drug for pain and with low VAS scores remained in the group. The nausea, vomiting and sedation, which are frequently associated with the administration of parenteral opioids and similar drugs such as tramadol. But, wound infiltration of these drugs has been found more suitable for use in a day care setting and postoperative analgesia (20).

**Conclusion**

We conclude that wound infiltration of 200 mg tramadol provides more long lasting effect for pain management in LH group without respiratory depression, PONV or other side effects

**Conflict of interest**

Authors declare no conflict of interest.

**Acknowledgements**

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References