Preemptive analgesia in patients undergoing appendectomy at Debaratana Nakhon Ratchasima Hospital, Thailand

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Abstract

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Preemptive analgesia through infiltration of anaesthetics into surgical wounds before the incision is effective in various elective surgeries. Although this application can decrease postoperative pain, it is not known whether it is effective in surgery with acute pain. This study, therefore, evaluated whether the application of a preincisional local anaesthetic decreased the postoperative pain in patients undergoing an appendectomy for acute appendicitis.

The sample was seventy-five consecutive patients admitted to Debaratana Nakhon Ratchasima Hospital with a tentative diagnosis of acute appendicitis. Patients were randomly divided into two groups. For group 1, the study group of thirty-five cases, 2% lidocaine with adrenaline (epinephrine) 1:200,000 was injected to the planned incision site cutaneously, subcutaneously under the fascia of the external oblique muscle. Group 2, the control group of forty cases received the same volume of saline injection to the anatomical site. One milligram per kilogram meperidine was administered intravenously to both groups for postoperative analgesia. If required, a further 0.5 mg/kg of meperidine was administered. Postoperative pain was assessed by a visual analog scale during the first 24 hr. The analgesic and the doses required were recorded. All data were stored using SPSS 11.0 for Windows. The Mann-Whitney U-test was used to compare data between the two groups when the data were in a non-normal distribution.

No statistically significant difference was found between the pain scores of the two groups, the number of patients who needed analgesic and the amount and number of doses administered. Preincisional local anaesthetic infiltration did not decrease the need for postoperative analgesic use in patients with acute pain.

Keywords: Anaesthesia, preemptive analgesia, appendicitis
การระงับความเจ็บปวดในผู้ป่วยที่เข้ารับการผ่าตัดสิ่งในโรงพยาบาลเทพรัตนนครราชสีมา ประเทศไทย

สาธิต บัวคล้าย

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บทคัดย่อ

การระงับความเจ็บปวดในผู้ป่วยที่เข้ารับการผ่าตัดสิ่งในโรงพยาบาลเทพรัตนนครราชสีมา ประเทศไทย ว.สาธารณสุขและการพัฒนา.2559;14(1):67-76

การระงับความเจ็บปวดโดยวิธีการฉีดยาชาเข้าไปในแผลผ่าตัดก่อนที่จะทำการผ่าตัดนั้นมีการวิจัยแสดงให้เห็นว่ามีประสิทธิภาพช่วยลดความเจ็บปวดหลังการผ่าตัดได้ การศึกานี้ต้องการจะประเมินว่าการฉีดยาชาเข้าไปในแผลก่อนที่จะทำการผ่าตัดผู้ป่วยให้ได้ผลอัธยาบายสามารถลดความเจ็บปวดของแผลผ่าตัดภายหลังการผ่าตัดได้ดีกว่าไม่ได้

การศึกษาเป็นการศึกษาแบบไปข้างหน้า ในจำนวนผู้ป่วยทั้งหมด 75 ราย ที่เข้ารับการรักษาในโรงพยาบาลเทพรัตนนครราชสีมาที่มีการวินิจฉัยเบื้องต้นว่าเป็นปัญหาปวด ได้แบ่งออกเป็นสองกลุ่ม กลุ่มที่ 1 (กลุ่มศึกษา) จำนวนสามสิบห้าราย ทำการฉีดยาชาเฉพาะที่ 2% lidocaine และ 0.25% bupivacaine ลงบนแผลที่จะทำการผ่าตัดบริเวณผิวหนัง, ใต้ผิวหนัง และภายใต้พังผืดของกล้ามเนื้อผู้ป่วย ในกลุ่มที่ 2 (กลุ่มควบคุม) จำนวนสี่สิบราย ได้รับน้ำเกลือในปริมาณเท่ากัน ในตำแหน่งเดียวกัน โดยทั้งสองกลุ่มผู้ป่วยจะได้รับยากระมือตามหลักคัด ถ้ามีความจำเป็น 1 mg/kg meperidine เป็นยาฉีดเข้าทางหลอดเลือดดำ ในช่วง 24 ชั่วโมงและจะทำการบันทึกไว้ และจะทำการวิเคราะห์ข้อมูลโดยโปรแกรมทางสถิติ

ผลของการวิจัยแสดงให้เห็นว่า ความเจ็บปวดของแผลจากหลังการผ่าตัดไม่ได้ต่างกัน ของผู้ป่วยทั้งสองกลุ่ม ในไม่มีความแตกต่างของมีนัยสำคัญทางสถิติ ผู้ป่วยยังคงมีความเจ็บปวดบริเวณที่ผ่าตัดและเจ็บเป็นค่อนข้างอย่างน้อยโดยรวมของผู้ป่วยที่มีอาการปวด เนื่องด้วยการใช้ยาแก้ปวด

คำสำคัญ: ยากระมือ, การระงับความเจ็บปวด, ให้ผลอัธยาบาย
Introduction

Postoperative pain control is a topic of current interest. Opioids provide good pain relief particularly of severe pain. However, their use is restricted because of potential side effects. Effective postoperative pain control leads to lower narcotic analgesic consumption, more rapid discharge of patients from hospital and also hastens return to normal activities. The administration of local anaesthetics into the wound before the incision (preemptive analgesia) has been shown to reduce postoperative pain in many kinds of elective surgery such as inguinal herniorrhaphy, tonsillectomy, diagnostic laparoscopic procedures, gynecological procedures and some orthopedic procedures.

The concept of preemptive analgesia is based on the hypothesis that the most effective way to eliminate or reduce postoperative pain is to prevent nociceptive input from afferent stimuli to the central nervous system so that central nervous system hyperexcitability does not occur. The most common agent used for this purpose is parenteral pethidine (Aldolan [pethidine hydrochloride], meperidine etc.). The opioid use for the treatment of postoperative pain causes some side effects. Although decreasing the dose of the analgesic can help to decrease these side effects, this reduces the effectiveness of the analgesic. Respiratory and gastrointestinal side effects can be prevented by using local anaesthetics.

Appendectomy is one of the most common emergency surgical procedures. In 1894, McBurney described a new technique for the management of acute appendicitis; this method is still used when an open approach is required. McBurney’s procedure represented the gold-standard for acute appendicitis until 1981, when Semm performed the first laparoscopic appendectomy in Germany. This revolutionary method was a culture shock in general surgery. The number of laparoscopic appendectomies has progressively increased since it has been demonstrated to be a safe procedure, with excellent cosmetic results and also allows a shorter hospitalisation with a quicker and less painful postoperative recovery.

An appendectomy is the surgical removal of the appendix. It is performed to treat appendicitis when the appendix becomes inflamed. However, few randomised clinical studies have determined the efficacy of preemptive analgesia on postoperative pain relief after appendectomy and the results remain controversial. Preemptive intraperitoneal local anaesthesia in laparoscopy surgery is a safe, non-invasive procedure that can benefit patients by reducing the immediate postoperative pain intensity and metabolic stress response of the body.

In the last decade, knowledge regarding the mechanisms of acute pain has increased and treatment protocols more logical and specific to the causes of development of the pain have now replaced empiric treatments. Preemptive analgesia is one of these new treatment protocols. Most postoperative pain is caused by surgical tissue injury. Preincisional bupivacaine infiltration prevents nociceptive impulses from reaching the central nervous system.

Preemptive analgesia decreases the postoperative pain by preventing the intense nociceptive bombardment of the central nervous system due to surgery. The term preemptive here means to decrease the postoperative pain by applying preoperative therapies. The application time or method of the treatment is not that important. Regardless of the time and
A random sampling method was selected by patient hospital ID number. Those ending with an even number were placed in the study group and those ending with an odd number were selected for the control group. Group 1 (study group) patients received preemptive analgesia with 2% lidocaine with adrenaline (epinephrine) 1:200,000. Group 2 (control group) patients received normal saline solution infiltration.

Non-depolarising muscle relaxant (vecuronium 0.1 mg/kg), opioid (phentanile 1-2 µg/kg), and thiopental 5 mg/kg were used to induce anaesthesia. After endotracheal intubation, anaesthesia was maintained with 3 l/kg oxygen + 3 l/kg nitrous oxide + 1-2% isoflurane and vecuronium 0.02-0.03 mg/kg intravenously (IV). Ten milliliters of 2% lidocaine with adrenaline (epinephrine) 1:200,000 was infiltrated into the planned incision site cutaneously, subcutaneously (Figure 1) under the fascia of the external oblique muscle (Figure 2) of the patients in the study group. The patients in the control group were injected with the same volume of saline to the same anatomical site.

Materials and Methods

The study was designed in a prospective randomised manner. The subjects selected were consecutive patients with a tentative diagnosis of appendicitis who presented to the Emergency Department at Debaratana Nakhon Ratchasima Hospital between January and September 2014. Seventy-five consecutive patients were enrolled into the study. Approval was gained from the Academy Ethical Committee and patients were given informed consent which appraised them of the nature of the procedure, reasonable alternatives to the proposed intervention, relevant risks and benefits. Patients were consecutively randomised into two groups on admittance to the hospital.

Figure 1. Subdermic infiltration

Figure 2. Injection under the fascia of the external oblique muscle
The surgeon selected open abdominal surgery for the appendectomy (surgical removal of the vermiform appendix) and made one incision in the right-lower-quadrant side of the abdomen (pioneered by McBurney’s point and the Lanz incision). After the appendectomy was complete the skin was closed with interrupted nylon sutures or subcuticular absorbable sutures such as Vicryl®. The length of the wound was 3-5 cm (Figure 3).

**Figure 3.** Appendectomy

All patients received the standard incision on the right bottom quadrant. The patients were classified as normal, suppurative, gangrenous and perforated appendicitis by the surgeons. At the end of the surgery, inhalation of the anaesthetics ceased and the patients received 0.06 mg/kg neostigmine + 0.02 mg/kg atropine IV for decurarisation. Patients with sufficient spontaneous respiration were taken to the recovery room and monitored for blood pressure, respiration rate and peripheral oxygen saturation.

When the patients somnolence score was pain (Blog Post 1) the patients rated their pain experiences against the scale. The pain scores during the first 6, 12, 24 and 48 hr after operation were similar in both groups and in sitting position, day 1-2.

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**Blog Post 1: Analog to Digital**
On a scale from one to ten: 1-no pain, 2-low, 3-minor, 4-slightly, 5-moderate, 6-slightly bearable, 7-high, 8-higher, 9-very painful and 10-worst pain. The faces show expressions which correspond to the level of pain.

Postoperative Course for Appendix Removal. Uncomplicated appendicitis – the procedure is performed through a relatively small right lower incision. Recovery is usually rapid with patients starting oral feeds and being discharged from the hospital in 2-3 days. If the incision is a larger right lower quadrant incision or a midline incision, recovery is delayed and the hospital course is lengthened by several days.

All data were prepared and compiled using the SPSS/PC computer program. Means and standard deviations were assessed. Independent t-test was used to compare data between the two groups when the data were in a normal distribution pattern. The Mann-Whitney U-test was used to compare data between the two groups when the data were in a non-normal distribution. A p-value < 0.05 was considered statistically significant.

Results

The 75 patients (32 males and 43 females) were randomly divided into two groups with ages ranging from 15 to 84 years. The study group consisted of 35 patients (16 males) (preemptive analgesia with bupivacaine) and the control group contained 40 patients (16 males) (saline solution). The demographic data of the subjects included age, gender, weight, height and body mass index (BMI). These values for the two groups were not statistically different (Table 1).

The average duration of disease, operative time and wound length between the two study groups were also not statistically different (Table 2).

One patient (1.33%) in the control group did not receive a primary wound closure because of disease contamination.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Demographic data of all patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Preemptive group (n = 35)</td>
</tr>
<tr>
<td>Male : Female</td>
<td>16:19</td>
</tr>
<tr>
<td>Age (years)</td>
<td>35.57 ± 15.33</td>
</tr>
<tr>
<td>Body weight (kg)</td>
<td>62.88 ± 13.37</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>162.11 ± 8.62</td>
</tr>
<tr>
<td>Body mass index</td>
<td>24.00 ± 5.31</td>
</tr>
</tbody>
</table>
The pain scores during the first 6, 12, 24 and 48 hr after operation were similar in both groups. During the first 24 hr postoperative period the average pain scores were not statistically significant. However, the average pain score while sitting was higher than in the supine position. To the level of pain scale most cases, the pain scores of the patients in the middle average 4-6.

During the first 24 hr postoperative period the average total number of pethidine injections (mg/case) was not statistically different between the study (27.85 ± 20.19) and the control (17.62 ± 19.83) (Table 3). The dose of pethidine was 25 mg/time intravenously when the patient experienced moderate to severe postoperative pain.

The average length of hospital stay was two to three days for patients in both groups.

Table 2  Intraoperative variables

<table>
<thead>
<tr>
<th>Intraoperative variables</th>
<th>Preemptive group (n = 35)</th>
<th>Non-preemptive group (n = 40)</th>
<th>p-value (t-test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of disease (hr)</td>
<td>27.94 ± 19.90</td>
<td>19.12 ± 12.58</td>
<td>0.017</td>
</tr>
<tr>
<td>Operative time (min)</td>
<td>29.71 ± 10.91</td>
<td>34.00 ± 12.91</td>
<td>0.370</td>
</tr>
<tr>
<td>Wound length (cm)</td>
<td>4.22 ± 0.91</td>
<td>4.27 ± 1.26</td>
<td>0.625</td>
</tr>
<tr>
<td>Rupture</td>
<td>3 (8.57%)</td>
<td>4 (10.00%)</td>
<td>0.676</td>
</tr>
</tbody>
</table>

Table 3  Postoperative pain score

<table>
<thead>
<tr>
<th>Average pain score</th>
<th>Preemptive group (n = 35)</th>
<th>Non-preemptive group (n = 40)</th>
<th>p-value (t-test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 hr after operation</td>
<td>4.30 ± 2.06</td>
<td>4.30 ± 2.01</td>
<td>0.054</td>
</tr>
<tr>
<td>12 hr after operation</td>
<td>4.17 ± 2.06</td>
<td>4.15 ± 1.96</td>
<td>0.518</td>
</tr>
<tr>
<td>24 hr after operation</td>
<td>4.14 ± 2.06</td>
<td>4.15 ± 1.96</td>
<td>0.575</td>
</tr>
<tr>
<td>48 hr after operation</td>
<td>4.02 ± 2.12</td>
<td>3.95 ± 1.69</td>
<td>0.162</td>
</tr>
<tr>
<td>In sitting position, day 1</td>
<td>5.85 ± 2.34</td>
<td>5.30 ± 2.80</td>
<td>0.136</td>
</tr>
<tr>
<td>In sitting position, day 2</td>
<td>5.62 ± 2.48</td>
<td>5.00 ± 2.50</td>
<td>0.855</td>
</tr>
<tr>
<td>Total dose of pethidine per body (mg/case)</td>
<td>27.85 ± 20.19</td>
<td>17.62 ± 19.83</td>
<td>0.946</td>
</tr>
</tbody>
</table>
There was no difference between the systolic and diastolic arterial pressures, heart rate and peripheral oxygen saturation values of the two groups.

**Discussion**

Preincisional local anaesthetic infiltration did not decrease the need of postoperative analgesic after an appendectomy in acutely painful cases. The average postoperative pain scores during the first 6, 12, 24 and 48 hr in sitting position day 1 and in sitting position day 2 were not significantly lower with preemptive analgesia. This may be due to the more inflammatory visceral conditions requiring an appendectomy.

The most effective method was the combination of preincisional and postincisional infiltration. This observation correlated with the hypothesis of two different phases of the pain, the first as incisional and the second resulting from the inflammatory response of the traumatised tissue.

Willard et al. evaluated the effect of a combination of 1% lidocaine mixed with 0.25% bupivacaine and 1:400,000 epinephrine in equal volumes before incision compared to a control group which received normal saline. They concluded that the use of preincisional local anaesthetic did not reduce pain in patients after an appendectomy. A similar experiment was conducted by Ko et al. in California. They compared patients who received preemptive analgesia with a combination of lidocaine hydrochloride and bupivacaine hydrochloride, preemptive analgesia with saline infiltration and no analgesia treatment. Results showed that preemptive analgesia did not reduce postoperative pain, reduce analgesic requirements or shorten the length of hospital stay. Cosar et al. found that a preincisional local anaesthetic did not decrease the postoperative pain in patients undergoing an appendectomy for acute appendicitis. The author observed similar results to these studies. Ejlersen E et al. stated that the application of infiltration both in pre and postoperative periods was helpful. Postoperative infiltration may reduce the second phase of the pain, however, this may not be sufficient because of central sensitisation.

Preemptive analgesia prevents or limits spinal neuron excitability before perceiving the afferent stimuli, therefore, it may not be helpful in patients with intense preoperative pain. The reason because 2% lidocaine with Adrenaline have during the two minute's power, acting for half-life 1-4 hr, this study process is to assess the pain of surgery immediately it may be that 6 hr after of operative time patients had back pain surgery. Anwar M et al. compared the effects of analgesia with local infiltration of bupivacaine in postoperative wounds. In the study group, 0.25% bupivacaine was infiltrated in the wound margins before applying skin stitches and postoperative analgesic demand was delayed for 5.3 hr as compared to 2.7 hr in the control group with no infiltration. Wound infiltration with a local anaesthetic is a simple, safe and effective method to provide early postoperative wound analgesia.

**Conclusion**

Results determined that preincisional local anaesthetic infiltration did not decrease the need for postoperative analgesics use in patients with acute pain after an appendectomy. This may be due to the variables of the study as age and gender which reported the pain of the wound as different. Future studies should, therefore, select only samples of one
gender and age group to reduce the control variables for better assessment of pain after surgery.

References


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