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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

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การระงับความเจ็บปวดในผู้ป่วยที่เข้ารับการผ่าตัดไส้ติ่งในโรงพยาบาลเทพรัตน์นครราชสีมา ประเทศไทย

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บทคัดย่อ

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การระงับความเจ็บปวดโดยวิธีการฉีดยาชาเข้าไปในแผลผ่าตัดก่อนที่จะทำการผ่าตัดนั้น มีการวิจัยแสดงให้เห็นว่ามีประสิทธิภาพช่วยลดความเจ็บปวดหลังการผ่าตัดได้ การศึกษานี้ต้องการที่จะประเมินว่าการฉีดยาชาเข้าไปในแผลก่อนที่จะทำการผ่าตัดผู้ป่วยไส้ติ่งอักเสบสามารถลดความเจ็บปวดของแผลผ่าตัดภายหลังการผ่าตัดไส้ติ่งอักเสบได้

การศึกษานี้เป็นการศึกษาแบบไปข้างหน้า ในจำนวนผู้ป่วยทั้งหมด 75 ราย ที่เข้ารับการรักษาในโรงพยาบาลเทพรัตน์นครราชสีมาที่มีการวินิจฉัยเบื้องต้นว่าไส้ติ่งอักเสบ โดยแบ่ง ออกเป็นสองกลุ่ม กลุ่มที่ 1 (กลุ่มศึกษา) จำนวนสามสิบห้าราย ทำการฉีดยาชาเฉพาะที่ 2% lidocaine และ 0.25% bupivacaine ลงบนแผลที่จะทำการผ่าตัดบริเวณผิวหนัง, ใต้ผิวหนัง และภายใต้พังผืดของกล้ามเนื้อผู้ป่วย ใน กลุ่มที่ 2 (กลุ่มควบคุม) จำนวนสี่สิบราย ได้รับการฉีดน้ำเกลือในปริมาณที่เท่ากัน ในตำแหน่งเดียวกัน โดยทั้งสองกลุ่มจะได้รับยาระงับปวดหลังผ่าตัดถ้ามีความจำเป็น 1 mg/kg meperidine เป็นยาฉีดเข้าทางหลอดเลือดดำ ในช่วง 24 ชั่วโมงและจะทำการบันทึกไว้และจะทำการวิเคราะห์ข้อมูลโดยโปรแกรมทางสถิติ

ผลของการวิจัยแสดงให้เห็นว่า ความเจ็บปวดของแผลภายหลังการผ่าตัดไส้ติ่ง ของผู้ป่วยทั้งสองกลุ่ม ไม่มีความแตกต่างอย่างมีนัยสำคัญทางสถิติ ผู้ป่วยยังคงมีความเจ็บปวดที่คล้ายกันและจำเป็นต้องใช้ ยาแก้ปวด โดยสรุป การใช้ยาชาเฉพาะที่ ไม่ได้ช่วยลดความปวดของแผลผ่าตัดในผู้ป่วยที่มีอาการปวด เฉียบพลันของไส้ติ่งอักเสบ

คำสำคัญ: ยาระงับความรู้สึก, การระงับความเจ็บปวด, ไส้ติ่งอักเสบ

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.[1] Effective postoperative pain control leads to lower narcotic analgesic consumption, more rapid discharge of patients from hospital[2,3] and also hastens return to normal activities.[4] 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,[5] tonsillectomy,[6] diagnostic laparoscopic procedures,[7] gynecological procedures[8] and some orthopedic procedures.[9]

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.[10,11] 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[12] 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[13] 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.[14]

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.[15]

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.[16] *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.[17] 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

method applied, preventing the central nervous system attaining a state of hyperstimulation is important.[16] To achieve this, the treatment must cover all the possible causes and the periods of this painful stimulus. This study aimed to determine the efficacy of preincisional lidocaine infiltration as preemptive analgesia in postoperative pain relief after an appendectomy.

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.

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.

Figure 1. Subdermic infiltration

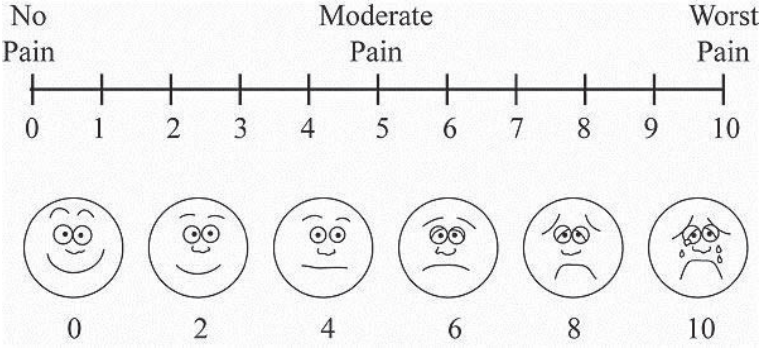
Figure 2. Injection under the fascia of the external oblique muscle

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 .



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 1 Demographic data of all patients

	Preemptive group (n = 35)	**Non-preemptive group (n = 40)**	***p*-value (t-test)**
Male : Female	16:19	16:24	0.371
Age (years)	35.57 ± 15.33	35.40 ± 15.47	0.565
Body weight (kg)	62.88 ± 13.37	60.12 ± 8.01	0.002
Height (cm)	162.11 ± 8.62	161.10 ± 7.43	0.232
Body mass index	24.00 ± 5.31	23.67 ± 3.71	0.013

Table 2 Intraoperative variables

	Preemptive group (n = 35)	Non-preemptive group (n = 40)	*p*-value (t-test)
Duration of disease (hr)	27.94 ± 19.90	19.12 ± 12.58	0.017
Operative time (min)	29.71 ± 10.91	34.00 ± 12.91	0.370
Wound length (cm)	4.22 ± 0.91	4.27 ± 1.26	0.625
rupture	3 (8.57%)	4 (10.00%)	0.676

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 3 Postoperative pain score

Average pain score	Preemptive group (n = 35)	Non-preemptive group (n = 40)	*p*-value (t-test)
6 hr after operation	4.30 ± 2.06	4.30 ± 2.01	0.054
12 hr after operation	4.17 ± 2.06	4.15 ± 1.96	0.518
24 hr after operation	4.14 ± 2.06	4.15 ± 1.96	0.575
48 hr after operation	4.02 ± 2.12	3.95 ± 1.69	0.162
In sitting position, day 1	5.85 ± 2.34	5.30 ± 2.80	0.136
In sitting position, day 2	5.62 ± 2.48	5.00 ± 2.50	0.855
Total dose of pethidine per body (mg/case)	27.85 ± 20.19	17.62 ± 19.83	0.946

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.[18] 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.[19] 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.[20] 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.[21] 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.[18] 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.[22] 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

1. Shafer A, White PF, Urquhart ML, Doze VA. Outpatient premedication: use of midazolam and opioid analgesics. Anesthesiology. 1989 Oct;71(4):495–501.
2. Mixter CG, Hackett TR. Preemptive analgesia in the laparoscopic patient. Surg Endosc. 1997 Apr;11(4):351–3.
3. Hession MC. Factors influencing successful discharge after outpatient laparoscopic cholecystectomy. J Perianesthesia Nurs Off J Am Soc PeriAnesthesia Nurses Am Soc PeriAnesthesia Nurses. 1998 Feb;13(1):11–5.
4. Ke RW, Portera SG, Bagous W, Lincoln SR. A randomized, double-blinded trial of preemptive analgesia in laparoscopy. Obstet Gynecol. 1998 Dec;92(6):972–5.
5. Tverskoy M, Cozacov C, Ayache M, Bradley EL, Kissin I. Postoperative pain after inguinal herniorrhaphy with different types of anesthesia. Anesth Analg. 1990 Jan;70(1):29–35.
6. Jebeles JA, Reilly JS, Gutierrez JF, Bradley EL, Kissin I. The effect of pre-incisional infiltration of tonsils with bupivacaine on the pain following tonsillectomy under general anesthesia. Pain. 1991 Dec;47(3):305–8.
7. Kato J, Ogawa S, Katz J, Nagai H, Kashiwazaki M, Saeki H, et al. Effects of presurgical local infiltration of bupivacaine in the surgical field on postsurgical wound pain in laparoscopic gynecologic examinations: a possible preemptive analgesic effect. Clin J Pain. 2000 Mar;16(1):12–7.
8. Hannibal K, Galatius H, Hansen A, Obel E, Ejlersen E. Preoperative wound infiltration with bupivacaine reduces early and late opioid requirement after hysterectomy. Anesth Analg. 1996 Aug;83(2):376–81.
9. McQuay HJ, Carroll D, Moore RA. Postoperative orthopaedic pain--the effect of opiate premedication and local anaesthetic blocks. Pain. 1988 Jun;33(3):291–5.
10. Woolf CJ. Generation of acute pain: central mechanisms. Br Med Bull. 1991 Jul;47(3):523–33.
11. Raymond S. Sinatra, Oscar A. de Leon-Casasola, Brian Ginsberg, Eugene R. Viscusi, Henry McQuay. Acute Pain: Mechanisms & Management. Vol. 2009. Cambridge University Press; 21-32 p.
12. McBurney C. IV. The Incision Made in the Abdominal Wall in Cases of Appendicitis, with a Description of a New Method of Operating. Ann Surg. 1894 Jul;20(1):38–43.
13. Semm K. Endoscopic appendectomy. Endoscopy. 1983 Mar;15(2):59–64.
14. Ruffolo C, Fiorot A, Pagura G, Antoniutti M, Massani M, Caratozzolo E, et al. Acute appendicitis: what is the gold standard of treatment? World J Gastroenterol. 2013 Dec 21;19(47):8799–807.
15. Thanapal MR, Tata MD, Tan AJ, Subramaniam T, Tong JMG, Palayan K, et al. Pre-emptive intraperitoneal local anaesthesia: an effective method in immediate post-operative pain management and metabolic stress response in laparoscopic appendicectomy, a randomized, double-blinded, placebo-controlled study. ANZ J Surg. 2014 Feb;84(1–2):47–51.
16. Woolf CJ, Chong MS. Preemptive analgesia--treating postoperative pain by preventing the

establishment of central sensitization. Anesth Analg. 1993 Aug;77(2):362–79.

17. Kissin I. Preemptive analgesia: terminology and clinical relevance. Anesth Analg. 1994 Oct;79(4):809–10.
18. Ejlersen E, Andersen HB, Eliasen K, Mogensen T. A comparison between preincisional and postincisional lidocaine infiltration and postoperative pain. Anesth Analg. 1992 Apr;74(4):495–8.
19. Willard PT, Blair NP. Is wound infiltration with anesthetic effective as pre-emptive analgesia? A clinical trial in appendectomy patients. Can J Surg J Can Chir. 1997 Jun;40(3):213–7.
20. Ko CY, Thompson JE, Alcantara A, Hiyama D. Preemptive analgesia in patients undergoing appendectomy. Arch Surg Chic Ill 1960. 1997 Aug; 132(8):874-7; discussion 877-8
21. Cosar A, Yagci G, Orhan EM, Sizlan A. Preemptive analgesia application in acute appendicitis. Indian J Surg. 2005 Apr;67(2):90–3
22. Muhammad A, Owais H, Munawar F, Mansoorul H, Muhammad A.B. Local anesthetics infiltration in wounds. Professional Med J. 2005 Jan;12(1):69–73.