ORIGINAL ARTICLE
นิพนธ์ต้นฉบับ

Primary Subcuticular Appendectomy Wound Closure in Children: Results of a Prospective Clinical Trial

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Problem: The standard closure of appendectomy wound using interrupted mattress technique with non-absorbable suture in acute appendicitis and delayed primary closure in ruptured appendicitis seems to be unpractical in children. Such procedure results in unsight wound and may be an unpleasant experience for both patients and surgeons during stitching off the sutures and dressing of the wound.

Objective: To study the risk of wound infection after subcuticular wound closure primarily in children with appendicitis and compare with those who had standard closure.

Setting: Division of Pediatric Surgery, Department of Surgery, Chulalongkorn University Hospital, Bangkok, Thailand

Research design: Prospective clinical trial

Patients & Method: All children with the diagnosis of appendicitis between January 1991 and June 1997 were included in the study. Primary subcuticular suturing technique using absorbable suture was applied for both acute non-ruptured and ruptured appendicitis in group. Interrupted non-absorbable suturing was applied for acute non-ruptured and delayed primary closure was applied for ruptured appendicitis in another group as a controlled one.

Results: Of 915 patients with clinically diagnosed as appendicitis, 728 children were confirmed by clinical finding and pathological report as acute non-ruptured and 134 as ruptured appendicitis while 48 had normal appendix and 5 had other diagnosis. 587 patients underwent primary wound closure in subcuticular fashion with 5-0 Polyglactin suture while as 268 patients had interrupted 5-0 Nylon suture and 40 patients were managed by delayed primary wound closure. In the study group, postoperative wound infections occurred in 6 of 460 (1.30%) cases with acute non-ruptured appendicitis and 5 of 94 (5.32%) cases with ruptured appendicitis. In the controlled group, 4 in 268 (1.49%) of non-ruptured and 2 in 40 (5%) of ruptured appendicitis got wound infection.

Conclusion: There is no significant difference in the rate of wound infection in the group of acute non-perforated and perforated appendicitis using different wound closure. So, subcuticular appendectomy wound closure using absorbable suture is advised and should be accepted as a standard technique in children.

Index: Appendicitis, Wound infection, Skin closure.

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การเย็บปิดแผลผ่าตัดไส้ติ่งอักเสบในเด็ก แบบฝังไหมเย็บใต้ผิวหนังโดยใช้วัสดุเย็บชนิดละลายได้

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ปัญหาและข้อมูลเบื้องต้น : การเย็บปิดแผลผ่าตัดไส้ติ่งแบบมาตรฐานทั่วไปที่นิยมใช้คือ การเย็บเป็นคำ ๆ โดยใช้วัสดุเย็บชนิดไม่ละลายและตัดไหมเย็บภายหลังสำหรับไส้ติ่งอักเสบเฉียบพลันและการเปิดแผลไว้ก่อนเย็บปิดภายหลังสำหรับไส้ติ่งแตกทะลุ ก่อให้เกิดปัญหาในการดูแลแผล การตัดไหม การเย็บปิดแผลภายหลัง รวมถึงความสวยงามของแผลผ่าตัด โดยเฉพาะในเด็ก

วัตถุประสงค์ : เพื่อศึกษาอัตราการติดเชื้อของแผลผ่าตัดไส้ติ่งในผู้ป่วยเด็กทั้งชนิดเฉียบพลันและชนิดแตกทะลุ เมื่อได้รับการเย็บปิดแผลแบบฝังไหมเย็บใต้ผิวหนังโดยใช้วัสดุเย็บชนิดละลายได้ เปรียบเทียบกับอัตราการติดเชื้อของแผลผ่าตัดไส้ติ่งที่เย็บแบบเป็นคำ ๆ โดยใช้วัสดุชนิดไม่ละลายในไส้ติ่งอักเสบเฉียบพลัน และของการเปิดแผลไว้ร่วมกับเย็บปิดภายหลังในผู้ป่วยไส้ติ่งแตกทะลุ

รูปแบบ : เป็นการศึกษาแบบไปข้างหน้าทางคลินิกชนิด unmatched control

ข้อมูลและวิธีการศึกษา : ทำการศึกษาในผู้ป่วยเด็กที่ได้รับการผ่าตัดไส้ติ่งทั้งชนิดอักเสบเฉียบพลันและไส้ติ่งแตกทะลุระหว่างเดือนมกราคม 2534 ถึงเดือนมิถุนายน 2540 โดยแบ่งผู้ป่วยเป็น 2 กลุ่ม ตามความรับผิดชอบของแพทย์เจ้าของไข้ กลุ่มหนึ่งเย็บปิดแผลแบบฝังไหมเย็บใต้ผิวหนัง อีกกลุ่มหนึ่งเย็บปิดแผลเป็นคำๆ สำหรับไส้ติ่งอักเสบเฉียบพลันหรือเปิดแผลไว้สำหรับไส้ติ่งแตกทะล ทำการบันทึกปัญหาแทรกซ้อนด้านแผลผ่าตัดติดเชื้อและการติดเชื้อภายในช่องท้อง หรือช่องเชิงกรานของทั้ง 2 กลุ่ม และทำการเปรียบเทียบ

ผลการศึกษา : ผู้ป่วยจำนวนรวมทั้งสิ้น 915 คน ได้รับการวินิจฉัยทางคลินิกว่าเป็นไส้ติ่งอักเสบ ในจำนวนนี้ได้รับการยืนยันทางพยาธิวิทยาว่าเป็นไส้ติ่งอักเสบเฉียบพลัน 728 คน ไส้ติ่งแตกทะลุ 134 คน ไส้ติ่งปกติ 48 คน วินิจฉัยว่าเป็นโรคอื่น 5 คน จากผู้ป่วยกลุ่มศึกษาที่เป็นโรคไส้ติ่งอักเสบเฉียบพลันไม่แตกทะลุจำนวน 460 คน พบปัญหาแผลติดเชื้อ 6 คน คิดเป็น 1.30% ซึ่งไม่แตกต่างจากอัตราแผลผ่าตัดติดเชื้อ 1.49% ในผู้ป่วย กลุ่มควบคุมจำนวน 268 คน อย่างมีนัยสำคัญ และอัตราแผลผ่าตัดติดเชื้อในกลุ่มศึกษาที่เป็นไส้ติ่งแตกทะลุและได้รับการเย็บปิดแผลแบบใต้ผิวหนัง 94 คน พบได้เท่ากับ 5.32 % ไม่แตกต่างไปจากกลุ่มควบคุมที่เปิดแผลไว้(อัตราแผลติดเชื้อ 5%) อย่างมีนัยสำคัญ

สรุป : การเย็บปิดแผลผ่าตัดไส้ติ่งอักเสบทั้งชนิดไม่แตกทะลุและแตกทะลุ เป็นวิธีการที่ปลอดภัย ไม่พบว่าทำให้แผลติดเชื้อเพิ่มมากขึ้นหรือทำให้วินิจฉัยภาวะแทรกซ้อนแผลติดเชื้อล่าช้าจนเกิดอันตราย วิธีนี้นอกจากจะทำให้แผลผ่าตัดสวยงามกว่าแล้ว ยังลดปัญหายุ่งยากระหว่างการตัดไหม การล้างแผลในเด็ก อีกทั้งแผลเป็นสวยงามกว่า และน่าจะยอมรับเป็นวิธีมาตรฐานสำหรับเด็กที่เป็นโรคนี้

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Introduction

Wound infection is a common complication following appendectomy. The morbidity records of this complication showed a range of 5-20 percent incidence. Interrupted mattress suturing technique with non-absorbable material is widely used and accepted as a standard procedure for appendectomy wound closure in acute nonruptured appendicitis. The stitches will be taken out 5-7 days postoperatively. It is believed that such technique provides easier detection and drainage of pus if wound infection occurs. In children, such appendectomy wound closure will leave an unsight wound and stitches-off in children seems to be more difficult for the non-cooperated ones. The accepted delayed primary closure of wound in perforated appendicitis is also unpractical in children. The daily wound dressing causes painful experience and delayed primary wound suturing with local anesthesia cannot easily be done.

The aims of this trial were to study the rate of wound infection in pediatric patients underwent appendectomy with primary subcuticular wound closure using absorbable suture either in acute non-ruptured or ruptured appendicitis and to compare to the infected wound rate in patients with interrupted sutures in acute nonruptured and ruptured appendicitis. Other intraabdominal and pelvic infections were also monitored.

Patients and methods

All children undergoing appendectomies at Chulalongkorn University Hospital were considered for entry. The period of study was between January 1991 and June 1997. The patients were randomized into 2 groups, study and control group according to the responsible attending surgeons and date of consultation. In the study group, all patients either with acute nonruptured or ruptured appendicitis were managed by primary subcuticular wound closure. Most patients who had presumptive diagnosis of acute nonruptured appendicitis did not receive any antibiotics while Gentamicin and Metronidazole were given intravenously in cases with ruptured appendicitis.

Access to the abdomen was through right lower quadrant transverse incision. No skin or wound barriers were used. The appendix was removed and the stump was either double ligated or buried with a purse-sting suture. No peritoneal irrigation was performed. The abdominal wall was closed layer by layer. Subcutaneous tissue was irrigated with povidone iodine. All patients in the study group underwent immediate primary wound closure in subcuticular fashion with 5-0 or 4/0 traumatic polyglactin suture and the closed wound was left open. All patients in the control group with acute nonruptured appendicitis underwent wound closure using silk or Nylon interrupted mattress manner. The wound closure in the patients with ruptured appendicitis in the controlled group were delayed. No drains were used in all cases. The wound was dressed with a simple gauze, which was removed on the second day after operation. Wound infection was defined as a wound with any discharge of serous or purulent material. Any evidence of intra-abdominal sepsis was also recorded. During hospital stay, wounds were examined daily for evidence of infection by an independent assessor throughout the study. All patients were followed up at 1-2 weeks postoperatively and the possible complication were assessed. Patients without complete follow-up were excluded from the study. All the wound, intraabdominal and pelvic infections were recorded and analysed using chi-square test for its relevant significant difference between both group.

Results

Emergency appendectomy was performed in 910 children over the 5.5 year period in which the protocol was prospectively followed. Seven hundred and twenty-light children were confirmed by pathological report as acute nonruptured appendicitis, 134 children as ruptured appendicitis, and 48 children had normal appendix with no signs of inflammation. Age of the children with acute appendicitis ranges from 4 to 14 years.

Table 1 Final diagnosis of the children presumely diagnosed as appendicitis

	Number of patients	Percent
Acute appendicitis	728	79.6
Ruptured appendicitis	134	14.6
Normal appendix	48	5.2
Miscellaneous	5*	0.6
Total	915	100.00

*Twisted ovarian cyst (1), Ruptured corpus luteum (2), Chronic appendicitis (1) and periappendicitis(1)

Table 2 Number of patients and wound infection.

		Total cases	Infection	No infection	Infected rate (%)
Study gr.	Nonruptured	460	6	454	1.30 *
	Ruptured	94	5	89	5.32 **
	Normal	33	0	33	0
Control gr.	Nonruptured	268	4	262	1.49 *
	Ruptured	40	2	38	5.0 **
	Normal	15	0	15	0

* No significant difference in nonruptured appendicitis between study and control gr. (x^2, $p < 0.01$)

** No significant difference in ruptured appendicitis between study and control gr. (x^2, $p < 0.01$)

Misdiagnosis of appendicitis arose in 5.8% (53/910) of children. There were 48 normal appendix and other 5 patients had definite pathological diagnosis accounting for the clinical presentation, twisted ovarian cyst (1), ruptured corpus luteum (2), chronic appendicitis (1) and periappendicitis (1). Most of the children with acute nonruptured appendicitis were discharged from the hospital on third day post appendectomy. There was no mortality in this study.

In the study group, postoperative wound infections occurred in 6 of 460 (1.30%) children with acute non-ruptured appendicitis. Wound infection was detected on the fourth day after appendectomy in two children while they were in the hospital, both children required opening of the wound for daily dressing and closing later. The other four children came back to the hospital and wound infections were detected after discharge. None of these children received intravenous antibiotics and all healed their wounds without further complication. Wound infection occurred in 5 of 94 patients with perforation (5.32%) in this study group.

In the controlled group, the incidences of wound infection in the non-ruptured and ruptured appendicitis were 1.49% and 5% respectively.

The incidence of wound infection in the pediatric patients with non-ruptured appendicitis who had difference suturing technique (1.30% - subcuticular suture, 1.49% - interrupted mattress suture) is not significantly different (x^2 , $p<0.01$). The incidence of wound infection in ruptured appendicitis who had primary subcuticular wound closure (5.32%) is also not significantly different from the ones who had delayed primary closure (5%) according to chi-square test ($p<0.01$).

In all patients, wound infections ran a benign condition. The overall incidence of wound infection in children with acute non-ruptured appendicitis was 1.37% and 5% in ruptured appendicitis. No children required reoperation for drainage or debridement. There were no cases of systemic sepsis, necrotizing fasciitis, or other synergistic infection. There were no deaths in the series.

Discussion

Acute appendicitis is the most common indication for abdominal surgery in children. The usual rupture rate is 10-30%[1]. Most recent series use protocols of early appendectomy, preoperative antibiotics with aerobic and anaerobic coverage, measures to minimize operative contamination, avoidance of peritoneal drainage except for appendiceal abscess, and continuation of antibiotics postoperatively for complicated appendicitis[2,3]. There are somewhat controversy in skin closure technique of acute non-ruptured appendicitis. The interrupted mattress suturing led to unsatisfactory cosmetic results and fears concerning suture removal is still used as a traditional procedure though there were several reports about the usefulness of subcuticular suturing method.[4-5]

Appendectomy wound for acute non-ruptured appendicitis was defined as clean contaminated wound in which the rate of wound infection is 2-5%[6]. In the past, it had been assumed that primary closure with absorbable subcuticular sutures might increase infectious inoculum, then the use of interrupted mattress sutures had been accepted for years[7]. With better antiseptics and minimally reactive synthetic suture, the technique of skin closure in subcuticular fashion is now more favorite. Standard interrupted mattress suture involve tissue strangulation, leading to ugly, lasting cross hatches and a scar that tends to stretch with time. The results of several recent studies and ours show that subcuticular skin closure in children with acute appendicitis do not increase the rate of wound infection when compare with conventional interrupted mattress suture[4,8-12]. Subcuticular sutures, on the other hand, give perfect skin approximation and result in a fine, narrow scar. Fearful anticipation during removal of interrupted mattress sutures was consistently expressed by the children, so both the children and their parents expressed their amazement, relief, and gratitude at the absence of skin sutures.

In conclusion, it is true that many pediatric surgeons today commonly use subcuticular skin closure for hernias and most abdominal wounds when the risk of infection is low. Along with our study and some

literatures, it is apparent that subcuticular skin closure should be particularly suited for children who undergo appendectomy for both acute non-ruptured and ruptured appendicitis because of the low risk in wound infection.

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