Can delayed primary wound closure decrease incidence of wound infection after appendectomy in patients with perforated appendicitis?

Acute appendicitis is a common indication for emergency abdominal surgery. An appendectomy with an open right lower quadrant incision is the "gold standard" of treatment for acute appendicitis. After an appendectomy procedure is completed, wound infection is the most common morbidity, and it may result in increased patient pain, longer hospital stay, poor cosmesis, and overall higher costs of treatment.

Two routinely used methods of wound management following an appendectomy are delayed primary closure (DPC), which involves packing an open wound for 4–5 days followed by wound closure, and primary closure (PC).¹ For patients with simple appendicitis, the incision was usually primarily closed, and the wound infection rate is usually below 5%.² However, some 20%–30% of appendicitis patients had appendiceal perforation upon admission.¹,³ Perforated appendicitis without a palpable mass can be treated during emergency surgery either laparoscopically or via an open incision. It is well accepted that, once appendiceal perforation occurs, complication rates increase with wound infection and can rise to 15%–25%.¹,³ Traditionally, in an effort to decrease the risk of infection at the surgical site, patient wounds associated with perforated appendicitis have been managed with DPC. However, no single large randomized trial proved the benefit of DPC in reducing the wound infection rate in patients following an appendectomy. By contrast, clinical trials in the 1990s reported low rates of infection using PC in patients with perforated appendicitis.⁴ Recent studies¹,³ employing meta-analyses indicated that PC does not increase the risk of wound infection after appendectomy for complicated appendicitis. Primary closure has the potential benefit of rapid wound healing associated with the elimination of painful and time-consuming dressing changes, as well as a reduction in overall hospital costs. Although controversy persisted concerning the optimal methods of wound management, recent studies tend to recommend that perforated appendicitis most often can be primarily closed without an increase in the wound infection rate as compared to DPC.¹

In the recent issue of the Journal, Chiang and colleagues⁵ reported the results of a prospective clinical trial addressing the question about the use of DPC to prevent wound infection after appendectomy for perforated appendicitis. In the entire series, no patient received laparoscopic appendectomy. Fifteen patients (21.4%) developed wound infection after DPC or PC. There was only one wound infection in the DPC group (1/34; 2.9%). In the PC group, there were 14 wound infections (38.9%). There was a significant association between wound infection and the type of skin closure (DPC 2.9% vs. PC 38.9%; p < 0.001). Analyzing the length of stay, there also was a noticeable difference in the duration of stay between both groups (DPC 6.3 ± 0.7 days vs. PC 8.4 ± 0.9 days; p = 0.038). This study provided valuable information about the possibility of DPC as a method to reduce the incidence of wound infection after appendectomy.

However, this study has several limitations due to study design and the detail of trial information. First, the study report lacked inclusion and exclusion criteria, and susceptibility bias may exist during patient enrollment. Second, wound infection was defined as the presence of gross purulent discharge at the incision site, with or without a positive bacterial culture. Such subjective assessment created a nonuniform outcome measurement. In this series, in which patients had already received adequate perioperative antibiotic therapy, the incidence of wound infection among the patients with PC (38.9%) represents a rate higher than expected from reports in the recent literature.⁶ It would be more convincing if wound assessment was objectively based on the additional treatment, the presence of Serous discharge, Erythema, Purulent exudate, and Separation of the deep tissues, the Isolation of bacteria, and the duration of inpatient Stay (ASEPSIS) criteria per the Centers for Disease Control and Prevention definition of nosocomial surgical site infection.⁷ Third, there was little mention of the management of other critical perioperative factors. Although the authors provided an analysis of their enrolled patients by pointing out potential risk factors for infection such as high body mass index, diabetes, malnutrition, and steroid use, they failed to mention the management of the factors in decreasing wound infection rates. Fourth, the experience level of the surgeon who closed the wounds was not reported, and it is unknown if the quality of care applied during wound closure was consistent within the study. Finally, long-term follow-up of wounds was not performed, and patient satisfaction with the procedure and follow-up are unknown.

In clinical practice, because so many factors besides wound management itself can affect surgical outcomes, prevention of...
wound complications should be achieved in optimizing preoperative, intraoperative, and postoperative risk factors. Many efforts have been advocated to decrease wound infections after appendectomy. These include using effective antibiotics prophylaxis, isolating the cecum and inflamed appendix with moist packs, providing adequate peritoneal lavage, placing closed suction drains in the abscess cavity, bringing out the drain through a stab wound separated from the main incision, preventing the abdominal wall from being in contact with both the perforated appendix and infected fluid during the procedure, adequate wound irrigation with copious warm saline before wound closure, and loose closure of the wound. In a prospective randomized clinical trial, Towfigh and colleagues indicated that simple daily wound probing of the PC wound could significantly reduce wound infection after an open appendectomy for perforated appendicitis. Recently, laparoscopic appendectomy has been shown to reduce wound infections compared with open appendectomy in patients with perforated appendicitis. This may be because laparoscopic appendectomy has less wound surface area exposed to contamination, the intra-abdominal infected fluid was aspirated early and thoroughly in the laparoscopic approach, and the perforated appendix usually was removed through an endoscopic bag.

Although the present study supports several advantages of DPC compared with PC, including lower wound infection rate, shorter hospital stay and no readmission, DPC has the potential disadvantages of wound cross-contamination before being closed, and patients may experience considerable discomfort during dressing and wound closure. In a clinical trial, Pettigrew and colleagues reported 17% patients of DPC group developed staphylococcal contamination of their open wound. In the present series, hospital length of stay was significantly shorter in the DPC group. This is in disagreement with other reports that DPC may increase hospital stay in some patients. This is likely attributable to the fact that no DPC patients could be discharged before the fifth postoperative day when closure was performed, which is in contrast to some patients in the PC group.

Wound management after appendectomy for patients with perforated appendicitis cannot be standardized. On the basis of the evidence of available data, we should conclude that DPC to reduce wound infection can be successful in a few selected cases and cannot be recommended as routine treatment. Apparently, DPC is not always necessary for every patient and agreed-upon criteria for using DPC should be defined in the future. This technique needs to be used selectively according to the condition of the patient (e.g., duration of symptoms, degree of contamination, operation time, and severity of preoperative comorbid condition). Hopefully, an optimal wound treatment strategy coupled with effective perioperative infection control may give patients the best chance to avoid wound infection after appendectomy.

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References