

# Management of wound infection after appendectomy: are parenteral antibiotics useful?

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هل تُفيد المضادات الحيوية المعطاة حقناً في معالجة عدوى الجروح التالية لاستئصال الزائدة؟  
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**الخلاصة:** في هذه الدراسة تم استقصاء فعالية المضادات الحيوية في معالجة عدوى الجروح التالية لاستئصال الزائدة. وتمت دراسة 72 مريضاً مصابين بعدوى في جرح استئصال الزائدة في مستشفى عام في منطقة صحية في الأردن. وتلقى جميع المرضى تضميداً يومياً بمطهر البوفيدون اليودي 10٪ في الكحول. وتم تقسيم المرضى عشوائياً في تجربة مفردة التعمية إما لتلقي المضادين الحيويين مترونيدازول وسيفوكسيتين بالحقن، وإما دون تلقي أي مضادات على الإطلاق. ولم يظهر أي تأثير يُعتدُّ به لاستعمال المضادات الحيوية لدى المرضى المصابين بالتهاب مبكر أو وخيم للزائدة. أما المرضى المصابون بالتهاب الزائدة الثاقب فقد انخفضت الفترة المتوسطة لمكوناتهم في المستشفى وانخفض متوسط تواتر تغيير الضمادات انخفاضاً ملموساً. وتستنتج الدراسة أن المضادات الحيوية ليست فعالة في عدوى جروح استئصال الزائدة، ما عدا حالات الزائدة المثقوبة.

**ABSTRACT** This study investigated the use of antibiotics in the treatment of wound infections after appendectomy. The subjects were 72 patients with post-operative wound infections at a district general hospital in Jordan. All patients received daily antiseptic dressings with povidone-iodine 10% in alcohol. The patients were randomized in a single-blind trial to receive either no antibiotics or parenteral antibiotics metronidazole and cefoxitin. There was no significant effect of antibiotic use in patients with early inflamed or severely inflamed appendicitis. However, for patients with perforated appendicitis the mean length of hospital stay and the mean frequency of change of dressings were significantly reduced. We conclude that antibiotics do not offer any advantage in post-appendectomy wound infections except for cases of perforated appendix.

**Prise en charge de l'infection des plaies après une appendicectomie : les antibiotiques par voie parentérale sont-ils utiles ?**

**RESUME** Cette étude a examiné l'utilisation des antibiotiques dans le traitement des infections des plaies après une appendicectomie. Les sujets étaient 72 patients ayant des infections de plaies postopératoires dans un hôpital général de district en Jordanie. Des pansements antiseptiques imprégnés de povidone iodée à 10 % dans de l'alcool ont été appliqués quotidiennement à tous les patients. Les patients ont été randomisés dans un essai à simple insu pour recevoir soit aucun antibiotique soit des antibiotiques par voie parentérale (métronidazole et céfoxitine). Il n'y avait aucun effet significatif de l'utilisation d'antibiotiques chez les patients ayant une inflammation légère ou grave de l'appendice. Toutefois, la durée moyenne du séjour hospitalier et la fréquence moyenne de changement du pansement étaient significativement réduites pour les patients ayant un appendice perforé. Nous concluons que les antibiotiques ne présentent pas d'avantages pour les infections des plaies après appendicectomie sauf en cas de perforation de l'appendice.

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## Introduction

Appendectomy is one of the most commonly performed operations in general surgery in the world. Nevertheless, a proportion of patients suffer post-operative wound infection; reported rates of wound infection vary from 3% to as high as 60% [1-3], depending on the pathology. The problem of wound infections following abdominal surgery and especially after appendectomy is a source not only of distress to patients but also of pressure on hospital beds and financial resources [4-6].

The management of these infected wounds varies considerably according to the personal opinion of medical staff, often based on anecdotal evidence alone. There are ample citations in the literature advocating one treatment over another, sometimes with contradicting results about the choice of treatment or combination of antibiotics [2-5].

The aim of this study was to investigate the efficacy of the two most common ways of managing wound infection after appendectomy: antiseptic dressings alone or antiseptic dressings plus antibiotics.

## Methods

The study was conducted over a two-year period from August 2000 to June 2001. Ethical approval was given by the Department of Surgery at King Hussein Medical Centre. All patients with wound infections after appendectomy at a district general hospital in the Royal Medical Services (RMS) in Jordan were recruited to the study. Patients with a normal appendix at operation were excluded from the study as were patients already receiving antibiotics for other reasons. Patients received metronidazole 500 mg at induction of anaesthe-

sia, but no further antibiotics until they had been randomized to different treatment regimens.

All patients were given daily antiseptic dressings with povidone-iodine (10% in alcohol) followed by normal saline (0.89%). The patients were randomized in a single-blind method to receive either no antibiotics or parenteral antibiotics, metronidazole 500 mg three times daily and cefoxitin 1 g three times daily. Antibiotics were continued until the infection had cleared.

The criteria for assessing the success of antibiotic treatment were the length of stay in hospital (that is, the number of days until the infection had cleared enough for the patient to be discharged from hospital) and the frequency of changing dressings per day. The frequency of change of dressings ranged from 1 to 7 times per day and was decided by the medical and nursing staff according to the level of wound discharge.

The length of stay, number of dressings and other clinical data were collected from the medical and nursing records.

Patients were followed up until they had been discharged from the hospital and had been seen at the outpatient clinic (an average of 42 days).

## Results

A total of 481 appendectomies were performed, of which 243 were for early inflamed appendix, 172 for severely inflamed appendix and 66 for perforated appendix. Out of these, 72 had post-operative wound infections: an infection rate of 15.0%. The infection rate was 2.9% among the cases of early inflamed appendix, 18.0% for cases of severely inflamed appendix and 51.5% for cases of perforated appendix (Table 1).

**Table 1 Rate of wound infection and patients' allocation to treatment according to type of appendix**

Type of appendix	Total no. of patients	No. (%) with infected wounds	No. of patients receiving:	
			Dressings only	Dressings + antibiotics
Early inflamed	243	7 (2.9)	3	4
Severely inflamed	172	31 (18.0)	15	16
Perforated	66	34 (51.5)	17	17
Total	481	72 (15.0)	35	37

Because of the small number of wound infections in the early inflamed cases it was decided to group them with the severely inflamed group for analysis: that is, all patients with a non-perforated appendix. Table 2 shows the mean length of hospital stay and frequency of change of dressings for the perforated and non-perforated groups according to treatment. In the non-perforated group there was no significant effect of antibiotic treatment on the mean length of stay in hospital or the mean frequency of change of dressings ( $P > 0.05$ ).

In the perforated group, however, the mean hospital stay was 8.5 days for the antibiotic-treated patients compared with 11.5 days for the group without antibiotics ( $P < 0.05$ ). Similarly the mean frequency of change of dressings was significantly lower in the antibiotic-treated group (3.9 per day) than the non-treated group (4.8 per day) ( $P < 0.05$ ).

Of the antibiotic-treated patients, 7 developed diarrhoea, one bloody, and a further 3 patients developed a maculopapular rash on the torso and the lower extremities.

**Table 2 Length of hospital stay and frequency of change of dressings for patients with and without antibiotic treatment**

Type of appendix and treatment	No. of patients	Mean hospital stay (days)	Mean frequency of change of dressings (no. per day)	P-value
<i>Non-perforated</i>				
Dressings only	18	6.1	3.2	> 0.05
Dressings + antibiotics	20	5.8	3.0	
<i>Perforated</i>				
Dressings only	17	11.5	4.8	< 0.05
Dressings + antibiotics	17	8.5	3.8	

However, only one patient had to cease antibiotic treatment before the wound had cleared. One patient had a lengthy period of stay in hospital before discharge and was later diagnosed as having a fistula that was treated conservatively with success.

## Discussion

The aim of this study was to investigate whether antibiotic use is a significant factor in the treatment of wound infection after appendectomy. Our study demonstrates a beneficial effect of parenteral metronidazole and cefoxitin in cases of perforated appendicitis only. Many papers in the literature have looked at the issue of prophylactic antibiotics and there is almost universal acceptance that these have a role in contaminated wounds [1–7]. Few studies, however, have looked at the issue of antibiotics once wound infection has started.

We did not investigate different regimens of antibiotics but elected to study the one most commonly used at our hospital: parenteral metronidazole and cefoxitin. There is strong evidence in the literature that the combination of a cephalosporin with metronidazole is a better regimen than other combinations including an aminoglycoside or quinolone with a cephalosporin [8,9]. There is almost universal acceptance that metronidazole is the antibiotic of choice in cases of perforated appendix [1,2,5,10–12] and one study has shown equal efficacy between oral and parenteral metronidazole [13].

Our rate of wound infections, 2.9% in early inflamed cases and 51.5% in perforated cases, is similar to other studies, which found complications occurring in 3% of non-perforated cases [1] and a 20%–60% infection rate in perforated cases [2–5].

Other aspects of the management of appendectomy patients deserve consideration. The question of whether to leave the wound open or closed has received interest in the literature. Lemieur and colleagues [14] found that patients with primary closure following appendectomy for perforated appendix had a four-fold increase in readmission rate, a five-fold increase in surgical wound infection and twice the length of hospital stay compared with patients with non-perforated appendices. They recommended that for perforated appendix the wound should be left open and this conclusion has been reached by other workers [15,16]. In contrast, other authors have concluded that wounds should be closed in cases of perforated appendicitis, based on a cost–utility assessment [17,18].

There have been ample publications in the literature comparing open versus laparoscopic appendectomy [7,19–29]. Our study did not include laparoscopic appendectomy in the figures because it is not done routinely at our hospital. While the majority of research has shown no significant difference between the two methods in terms of wound infection rate [7,19–29], some studies have demonstrated a slight decrease in wound infection rate with the laparoscopic method in adults [30–33] and in children [28,34].

There have been citations in the literature of other ways to reduce the rate of wound infection after appendectomy. For example, syringe pressure irrigation of the subdermic tissue [34] has been claimed to reduce the wound infection rate in complicated cases, and infiltration of the incision tissue with 0.915 g of metronidazole has shown a highly significant reduction in the wound infection rate from 11.6% to 0.8% [11].

## Conclusion

This study has shown that the use of antibiotics for managing wound infection after surgery for perforated appendicitis is associated with a reduction in the frequency of change of dressings and length of hospital stay. However, this was not the case for

patients with non-perforated appendicitis. Other ways that have been shown in the literature to decrease the rate of wound infection, such as the infiltration of metronidazole to the incision tissue, should perhaps be adopted more widely.

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