Peritoneal Cultures and Antibiotic Treatment in Patients with Perforated Appendicitis

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Abstract
Objective: When we sending material for microbiological examination during appendicectomy for perforated appendixes. Design: prospective study. Setting: Al-Shifaa private hospital, Iraq, Diyala governorate. Subjects: 40 patients who had their perforated appendixes removed. Interventions: Appendicectomy and antibiotic treatment. Main outcome measure: Whether a changes in antibiotic regimen was required after bacteriological identification of bacteria isolated during the operation. Results: In 19 of the cultures (48%) taken during the operation were mainly found Escherichia coli. In 29 patients (72.5%) there was no need to change the previously initiated antibiotic regimen, and in 8 (20%) it was changed on clinical grounds. In 3 patients (7.5%) was the change the consequence of microbiological culture result, as the organisms identied of the cultures (98%) were sensitive to at least one of the antibiotics that had already been given. Conclusion: The practice of culturing samples taken from a ruptured appendix is not need, because the antibiotic that has already been initiated is effective in most of the patients and the decision to modify the therapeutic regimen is dependent by clinical considerations.
Keywords: appendicectomy, antibiotics, perforated appendix, bacteriological culture.

Introduction

Since the organism of appendicitis was established, the practice of sending routine intraoperative intraperitoneal cultures of patients with acute appendicitis has been used by many surgeons (1). It also must know the nature and the antibiotic sensitivity of these bacteria is important for the management of patients with perforated appendicitis.
Because the nature of the intestinal organism is wellknown, most surgeons initiate broad spectrum antibiotics before obtaining the laboratory results, and base it on their experience. This practice raises the question of whether it is necessary to take microbiological samples during operation in patients with perforated appendicitis. Economic considerations are important in the management of patients, and the effect of this routine practice on patient outcome must be evaluated.

Patients and Methods

40 patients with perforated appendicitis who had had their appendixes removed , from February 2015 to February 2021. The surgeon responsible for the management of the antibiotic treatment. The data were used to confirm the diagnosis of perforated appendicitis; to obtain details of the patients; and to chart the information about the number of cultures taken during operation, their microbiological identification, the antibiotic sensitivity of the microorganisms, and the therapeutic antibiotic regimen used and its duration. Subsequent changes of the initial antibiotic treatment were noted and correlated with the results of the microbiological examinations. The duration of hospital stay, morbidity and mortality were also evaluated.

Results

The study included 40 patients, 15 women and 25 men, median age 30 years (range 16–40). All patients had perforated appendicitis confirmed by histopathological examination, and their hospital stay ranged from 3 to 10 days.
A combination of broad-spectrum antibiotics that included ampicillin, gentamicin, and metronidazole was given intravenously to most patients and was started one hour preoperatively.

Table I. Number (%) of microorganisms cultivated from peritoneal cultures in 43 perforated appendixes

Type	patient
Escherichia coli	22 (55)
Pseudomonas aeruginosa	4 (10)
Streptococcus sp.	2 (5)
Salmonella	1 (2)
Proteus mirabilis	3 (7)
Citrobacter	1 (2)

Intraperitoneal cultures were taken from all patients using swabs, and in 7 more than one sample was obtained. Bacterial growth, both as monocultures or mixed organism, was obtained in 19 patients (48%), not counting anaerobic cultures. Escherichia coli was encountered in most cultures, followed by Pseudomonas aeruginosa and streptococci (Table I). In (98%) of cultures, the microorganisms were sensitive to at least one of the antibiotics that had already been given.

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The mean duration of the given antibiotic regimen was 5 days (range 2–8), and it was replaced with oral antibiotics in 22 patients (56%) (Table II). The first choice of antibiotics was change in 11 patients (27.5%). Almost all these changes were based on clinical assessment such as fever, pain, or lack of physical improvement, and not on the results of cultures, except for one that was change as result of the sensitivity testing of the intraoperative peritoneal sampling.

Table II. Oral antibiotics prescribed

Antibiotic	Patients
Amoxycillin/clavulanate	15
Gentamicin	14
Metronidazole	2
Amoxycillin	2
Cefuroxime	1
Ofloxacin	1
Ciprofloxacin	1
Ceftazidime	1
Vancomycin	1
Cephalexin	1
Chloramphenicol	1

The initial antibiotic regimen was modified in 12 (29%), purely on clinical considerations.

The most common complication was wound infection, found in 8 patients (19%), and it was treated by local drainage. Bacterial growth was found in 26 of them (65%), consisting mostly of *E coli* (82%).

Bacteria were sensitive to the initial empirical antibiotic used in all cases, but the clinical assessment is important changing the antibiotic in eight patients, regardless of the confirmed bacterial sensitivity. The bacteria isolates from the wound were coagulase-positive *Staphylococcus* and *Klebsiella*; the antibiotic regimen was changed accordingly, and the patient was discharged after 5 days.

The second most common complication was the development of intraperitoneal abscesses in 3 patients (7.5%). Two drained surgically, and one were drained treated conservatively with antibiotics. Bacterial growth, predominantly *E coli*, was found in 25 (62%), and without exception was sensitive to the first antibiotics. However, the antibiotic regimen had to be modified in seven of these patients (43%). In three the change of antibiotic was based on the clinical assessment, in one patient gentamicin was discontinued because of raised serum creatinine concentration, one patient was switched to Augomentin (amoxicillin and clavulanate) only because his strain of *E coli* had developed resistance to the initial combination, and the third patient had pseudomembranous enterocolitis. In only one patient did the antibiotic sensitivity testing of intraoperative samples lead to the substitution of the initial intravenous triple drug regimen by Augumentin.

Discussion

Perforation of the appendix causes the spillage of aerobic and anaerobic microflora into the peritoneum, so obtaining intraperitoneal cultures of patients with perforated appendicitis during operation is regarded as necessary by most surgeons, as they recognise that secondary bacterial peritonitis can be caused by the autochthon microflora of the diseased organ (8).

Studies of the intestinal microflora have shown a complex ecosystem that may contain up to 20 different bacterial species (15), yet only a small number of these are found in established infections, and the pathogens that escape host defences are either aerobes, such as *E coli*, or anaerobes, such as *Bacteroides fragilis* (6, 7).

It was therefore it was not surprising that the pathogenic microorganisms that grew in the intraoperative cultures came from only a few species. Bacterial growth was obtained in 48% of the patients, considerably less than the 88% reported elsewhere (12), perhaps as the result of giving antibiotics immediately before operation.

The importance of antibiotics given preoperatively has been established (2, 3, 10, 11) and it is widely accepted that comprehensive antibiotic treatment should be continued in patients with perforated appendicitis (4, 9), so triple-drug treatment was initiated in all the patients. Most of them were treated by a combination of broad-spectrum antibiotics given intravenously, namely ampicillin, gentamicin, and anaerobe-specific drugs such as metronidazole. Two patients who were allergic to penicillin were given gentamicin and metronidazole only. The choice of these particular antibiotics was also justified on economic grounds, but second or third generation cephalosporins can also be considered. Because of the effectiveness of this approach, the practice of obtaining routine peritoneal cultures has been challenged here and by others (5, 13, 14 and Matlow A, Bohnen J. Are intra-operative cultures useful in abdominal surgery? Paper presented at the 24th Interscience Conference on Antimicrobial Agents and Chemotherapy, Washington DC, 1984). The sensitivity of the pathogens to the empirically chosen antibiotics, 98% of isolates in our series, illustrates the validity of this approach. In only a few patients did the microbiological findings cause modification of the therapeutic regimen. Most surgeons rely on clinical judgement rather than on microbiological data when considering a postoperative change in antibiotic. The decision to switch from intravenous to oral antibiotics is also based predominantly on the patient's clinical state. Because no strict guidelines for the duration of treatment are accepted we surmise that surgeons rely more on their clinical experience than on laboratory results.

Peritoneal culturing is further challenged by the practice of adjusting the treatment according to the sensitivity of pathogens recovered from drained postoperative wound infections (12).

Conclusion

peritoneal cultures taken from patients with perforated appendicitis have little influence on antibiotic treatment or the management of patients, so the routine practice of obtaining such cultures in these patients is neither medically nor economically justified, and should be reconsidered.

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