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Original Research Article

A study on microbiology culture of acute appendicectomy specimen and its correlation with wound infection

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ABSTRACT

Background: Appendicitis is a common condition which frequently requires emergency surgery and has postoperative wound infection has been reported in few cases which can be influenced by many factors, the most important being surgical skill and technique and the criteria used to define the infection. Bacteria play an important role in appendicitis and the local application of antibiotics or antiseptics can reduce the incidence of wound infection. In this study, we analyse the microbiology culture of acute appendicectomy specimen and its correlation with wound infection.
Methods: This is a randomised control test study which was carried out 56 patients with appendicitis. The swab was taken from appendix lumen after appendicectomy and wound infection was sent to laboratory to carry out histology findings and infective organisms respectively. All patients were followed postoperatively for wound infection.
Results: Bacteria was isolated from 60% swabs taken from appendix lumen in which gram-negative bacilli isolated as commonest bacteria among which perforated appendicitis shows 66.7% isolation of bacteria. Wound infection among patients underwent appendicectomy was 21%. Gram-negative bacilli were isolated from almost all swabs (100%) taken from wound infection.
Conclusions: From this study and results, it shows gram negative bacilli was the commonest organisms isolated from the swabs taken from both appendix lumen and wound infection.

Keywords: Acute appendicectomy, Gram-negative bacilli, Wound infection

INTRODUCTION

Appendicitis is a common condition which requires emergency surgery in most of the times. Around 30% of cases has been reported as postoperative wound infection which can be influenced by many factors, the most important being surgical skill and technique and the criteria used to define the infection.[1] Bacteria plays a major role in causing appendicitis. The incidence of wound infection in postoperative period has been reduced by using local application of antibiotics or antiseptics.[2,3] Few workers has showed detailed description of bacteria which is associated, accounts for 90% of bacteria population of intestine. Bacterial flora of the peritoneal cavity surrounding appendix preoperatively relates to the degree of contamination in development of wound infection.

There is no agreement about the outcome of parenteral antibiotic treatment in acute appendicitis which might lead to emergence of resistant bacteria but a there is knowledge of use of specific prophylactic therapy might prevent postoperative sepsis.[5]

In this paper, results report the common organisms which are significantly associated with appendicitis and wound infection in patients undergoing emergency and elective appendicectomy.

METHODS

In all patients with a clinical diagnosis of appendicitis undergoing appendicectomy at Aarupadai Veedu Medical College and Hospital in the Department of General Surgery were included in study after obtaining consent. After getting detailed history, clinical examination and relevant investigations, patients were planned for appropriate surgery (open/laparoscopy, emergency/elective).

Exclusion criteria included patients with generalized peritonitis, abscess and phlegmom. Patients with suspected diagnosis of appendiceal abscess or phlegmom was confirmed by ultrasonography or laparotomy.

The swab was taken from the appendix lumen after appendicectomy and was sent to laboratory by placing in Robertson's meat broth. All bacteria which were isolated was identified by routine laboratory methods and antibiotic sensitivities were carried out. All patients were followed postoperatively and wound infections developing in patients in hospital were examined bacteriologically and culture was carried out.

A wound infection was defined as the discharge of pus or purulent fluid from the surgical site with associated inflammation of the skin edges and pain.

RESULTS

This study has been done between May 2016 to April 2017, in which 56 patients underwent appendicectomy in which 34 males and 22 females, emergency appendicectomy was carried out in 39 patients and elective appendicectomy in 17 patients, 31 patients carried out appendicectomy by laparoscopy and 25 patients by open.

Table 1: Results of culture of swabs from appendix lumen.

	All cultures	Pure growth
Gram negative		
Bacteroides	19 (55.9%)	7 (63.6%)
Klebsiella/Enterobacter spp[1]	5 (14.7%)	2 (18.2%)
Esch. Coli	4 (11.8%)	1 (9.1%)
Gram positive		
Strep. Faecalis	3 (8.8%)	1 (9%)
Anaerobic streptococci	2 (5.9%)	-
Staph. Aureus	1 (2.9%)	-
Total no. of swabs Bacteria isolated: 34 (60%) Pure growth:11(32%)	56	

[1]No distinction is made between Klebsiella and Enterobacter, both species being resistant to ampicillin.

Bacteria was isolated from 34 (60%) swabs taken from appendix lumen in which bacteroides species were found as commonest bacteria present in 19(55%) and Gram - negative bacilli isolated were *Klebsiella*, *Enterobacter species* and *Esch. coli*. Gram-positive cocci were found apparently less usually *Strept. faecalis*, anaerobic streptococci. A pure growth of bacteria strain was found in 7 (63%) of bacteroides species and overall 11 (32%) swabs isolated as pure growth (Table 1).

Table 2: Bacterial isolation compared with clinical and histological findings.

	Normal	Fibrosis	Lymphoid hyperplasia	Acute appendicitis	Perforated appendix
Total no. of patients	9	3	6	29	9
Bacteria isolated	3 (44%)	1 (33%)	2 (33%)	79 (24%)	7 (77.8%)
Bacteroides spp	2 (22%)	1 (33%)	2 (33%)	7 (24%)	6 (66%)
Klebsiella /Enterobacter	-	-	1 (16.7%)	2 (6.9%)	2 (22%)
Esch. Coli	1 (11%)	-	-	2 (6.9%)	2 (22%)
No growth	2 (22%)	-	-	-	-
Gram positive	1 (11%)	-	-	-	-

Bacteria was isolated more frequently in patients with perforated appendicitis in which 66.7% specimens isolated as bacteroides species. The isolation of other bacteria among other groups were relatively similar and 22% shows no growth (Table 2).

Twelve (21%) patients developed wound infection among patients underwent appendicectomy inspite of giving local application antibiotics and antiseptics, in which incidence in males relatively higher than females. The development of wound infection shows 9 (23%) done as emergency appendicectomy and 3 (17) % as elective. Open appendicectomy accounts for 10 (40%) incidence of wound infection and laparoscopic for 2 (6.4%). Among twelve 83% of infected swabs showed bacterial growth and this incidence was 20% where there is no bacterial growth among infected swabs.

The development of wound infection was related to clinical appearance of appendix and histological findings. Perforated appendicitis has got high incidence of wound infection (41%). Open wound management has previously been considered as the standard of care for most cases of acute appendicitis, particularly cases of perforated appendicitis. These methods have been developed in response to the high rates of wound infections (Table 3).[6]

Table 3: wound infection and clinical and histological findings.

Clinical / histological findings	No.	Wound infection
Normal	6	2(16.6%)
Fibrosis	3	-
Lymphoid hyperplasia	6	1(8.3%)
Acute appendicitis	29	4(33%)
Perforated appendix	9	5(41%)

Table 4: Infective organisms in wound infection.

Bacteria	Pure culture	Mixed culture
Bacteroides	4 (80%)	4 (100%)
Esch. Coli	1	3
Strept. Faecalis	-	2
Klebsiella/Enterobacter	-	3
Streptococcus spp.	-	1
Staph. Aureus	-	2
Total number of patients	6	4

Perforated appendix showed high incidence of wound infection rate (41%) in which four patients took prophylactic antibiotic therapy with wound infection rate 25% and lowest incidence in fibrosis and lymphoid hyperplasia. Many wound infections were developed at home after discharging Patients soon after appendicectomy.

Table 5: Summary of overall bacterial growth in appendix lumen.

	Overall bacteria		Gram + ve		Gram - ve	
	Growth positive	**Growth negative**	**Positive**	**Negative**	**Positive**	**Negative**
Diseased	27	20	7	4	26	21
Normal appendix	7	2	1	8	6	3
Sensitivity	57.4%		14.9%		55.32%	
Specificity	22.2%		88.9%		33.3%	
Positive predictive value	79.4%		87.5%		81.25%	
Negative predictive value	9%		16.7%		12.5%	
Disease prevalence	83.9%		83.9%		83.9%	

Table 6: Summary of overall bacterial growth in wound infection.

	Overall patients		Patients with Gram +		Patients with Gram -	
	Growth positive	**Growth negative**	**Positive**	**Negative**	**Positive**	**Negative**
Wound infection in diseased	10	37	4	6	9	1
Wound infected in normal appendix	2	7	1	1	1	1
Sensitivity	21.3%		40%		90%	
Specificity	77.8%		50%		50%	
Positive predictive value	83.3%		80%		90%	
Negative predictive value	15.9%		14.3%		50%	
Disease prevalence	83.9%		83.3%		83%	

Among swabs taken from wound infection, bacteria were isolated from 10 infections and in which single strain was found in 6. Bacteroides species were cultured from 8 (80%) of the swabs. No bacterial growth was cultured from two patients wound infection probably due to concurrent antibiotic therapy (Table 4).

DISCUSSION

The development of wound infection after appendicectomy is related to the severity of the appendicitis and it is most common in perforation. Therefore, it is important to compare the incidence of

infection with the histological and clinical findings. In this group, the incidence of wound infection was 21.4% among 56 patients, where 41% occurred in perforation (Table 3), the outcome of perforated appendicitis will rest on potential postoperative factors like analgesia, length of hospital stay, return to regular activity and complications rate.[7] The relative incidence of wound infection in normal appendix is probably due to contamination of peritoneum and wound during operation which shows to take care even for minor resection of intestine is necessary. Many workers showed reduction in the incidence of wound infection by using local application of antibiotic, antiseptics and povidone iodine which showed 21% wound infection in this study. Overall bacterial growth in appendix lumen shows sensitivity and specificity as 57.4% and 22.2% respectively and overall bacterial growth in wound infection 21.3% and 77.8% respectively. Patients with Gram-negative in wound infection shows 90% and 50% respectively (Table 5, 6).

Drainage of the peritoneal cavity was associated with a greatly increased incidence of infection, but in contrast to other reports the use of early parenteral antibiotic therapy did appear to prevent the development of wound infection especially in patients with a perforated appendix.[8,9]

Postoperative surgical wound infections are mostly caused by bacteroides and appropriate antibiotics as per culture and sensitivity will give good results.

CONCLUSION

This study shows that anaerobes acts as the commonest organism to be involved in both appendicitis and postoperative wound infection. So, it should be kept in mind that a standard protocol of prophylactic antibiotic for appendicectomy should have antibiotic coverage for anaerobes. This study also implies that presence of anaerobes has highest incidence of having complicated appendicitis. The study also proves that uncomplicated appendicitis has less chances of wound infection compared to cases with complications such as perforation appendicitis.

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