

Perforated appendix! An experience of a public teaching hospital

Naqqash Adnan¹, Ahmed Mujtaba Malik², Gohar Rasheed³, Maryam Iftikhar⁴,
Maariah Asif⁵, Jahangir Sarwar Khan⁶

¹ Ex Post Graduate Trainee, Surgery (unit-1), Holy Family Hospital / Rawalpindi Medical University, Rawalpindi

^{2,4} Post Graduate Trainee, Surgery (unit-1), Holy Family Hospital / Rawalpindi Medical University, Rawalpindi

³ Assistant Professor, Surgery (unit-1), Holy Family Hospital / Rawalpindi Medical University, Rawalpindi

⁵ Post Graduate Trainee, Pediatrics, Fauji Foundation Hospital, Rawalpindi

⁶ Professor, Head of Department, Department of Surgery, Holy Family Hospital, Rawalpindi

Author's Contribution

¹ Conception of study

² Experimentation/Study conduction

³ Analysis/Interpretation/Discussion

⁵ Manuscript Writing

⁶ Critical Review

⁴ Facilitation and Material analysis

Corresponding Author

Dr. Ahmed Mujtaba Malik

Post Graduate Trainee, Surgery (unit-1)

Holy Family Hospital / Rawalpindi Medical University, Rawalpindi

Email: draahmedmujtabamalik@gmail.com

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Introduction

The most common cause of non-traumatic acute abdominal pain as well as, the most common, acute abdominal condition, presenting to Surgical Emergency, is none other than Acute Appendicitis hence it becomes the most common entity undergoing surgery in Emergencies all over the world. The lifetime risk for someone to develop acute appendicitis is 8.6% and 6.7% for males and females respectively, with 90% found in children and young adults and 10% in patients over 60 years of age.¹

Increasing age or in other words decreasing immunity does affect the incidence of perforated appendix as we see the perforation rate in acute appendicitis is approximately 20~30% but as the age goes beyond 60 years it inclines to 32-72%.² Delay in the diagnosis caused by indefinite history and physical examination

tends to contribute to higher incidence of perforated appendix as reported by Siripong et al.

In another study, the risk factors that were found to be associated with perforated appendicitis were male sex, fever $\geq 38^{\circ}\text{C}$, anorexia, and duration of pain in the pre-admission period.³ In one of the study pre-hospital delays were exceeding related to perforation as compared to in-hospital delays which were explainable because of a linear relationship present among the pathological grade to hospital interval ratio, thus leading to increased risk of perforation.⁴ As far as the blood work was concerned, an increase in Total Leucocyte count with majority being polymorphonuclear leukocytes (PMN), and raised C-reactive protein (CRP) levels were found to be responsible for substantial increment in the risk and gravity of complications in appendicitis. Presence of

comorbid diseases didn't show any significant effect on perforation rate.⁵

Objectives

- a) To analyze the clinicopathological profile and outcomes in patients presenting with suspected acute appendicitis.
- b) To determine factors influencing the risk of perforation of an appendix in patients presenting with acute appendicitis.
- c) To determine the postoperative complications in patients operated on for perforated appendicitis.

Our study is unique of its kind as no such study has been conducted before from this area. Although we are presenting our institution-based data, which has some limitations, it will help in enhancing our clinical grasp of the factors, leading to perforated appendix and reduction of its incidence If possible.

Material and Methods

After getting approval from the medical ethics board at Rawalpindi Medical University the medical records of all patients who underwent an appendectomy at Surgical Unit 1 of Holy Family Hospital from 1st August 2016 to 1st August 2017 were retrospectively reviewed. Data was collected through the computerized system and manual entry register of patients at Holy Family Hospital.

100 patients who underwent an emergency appendectomy in the above-mentioned study period, were identified. All the patients with normal or incidental appendectomies and with incomplete medical records were excluded. The data collected included the patient's characteristics (computer record number, age, gender, education, residence, socioeconomic status), symptoms (abdominal pain, migrating pain, vomiting, fever, anorexia, and diarrhea), physical examination (tenderness, rebound tenderness, guarding), laboratory investigations (complete blood picture, Urine R/E), and radiological findings. In addition to these variables included were co-morbid, pre-hospital delay, patient delay, mode of transport, the type of operation, per operative findings, shifting of a patient, and length of hospital stay, discharge status, and presence of complications. The appendix was labeled as being perforated if it was mentioned so in operation notes or being confirmed by

histopathology report. Patient delay was defined as the time interval, being coded in hours, from the time of onset of symptoms to the registration of patients in the emergency department. Hospital delay was defined as the time during which diagnosis was being made and patiently waited for surgery.

Data was entered and analyzed using Statistical Package for the Social Sciences (SPSS 16). While comparing variables, P-Value < 0.05 was considered statistically significant. A Student t-test, Pearson chi-square, linear by linear association analysis was done.

Result

We retrospectively evaluated 100 patients with biopsy-proven acute appendicitis during tenure from August 2016 to August 2017. Sex distribution results showed male dominance with 58 males and 42 females with a mean age of 35.4 ± 2.7 years and diversity in the range (ranging from 18-95 years). Sixteen (16%) patients were in their 18-29 years of age, 33 (33%) in the age group of 30-39, 33 (33%) patients in their 40-49 years, 14 (14%) patients in their 50-59 years and only 4 (4%) patients were above 60 years old. Perforated appendicitis was found in a total of 40 patients (40%) with again male predominance, 24 (57.1%) males, and 16 (38.1%) females.

Of all patients, there were 54 (54%) patients who had co-morbid; Diabetes Mellitus 27(50%), hypertension 17 (31.5%), chronic kidney diseases 6 (11.1%), and chronic obstructive airway disease 4 (7.4%). Statistically, insignificant relation was seen between co-morbid conditions and the risk of perforation.

The prehospital time delay was significantly longer in patients in the perforated group as compared to those in the non-perforated group with p-value <0.001. No statistically significant difference could be established between the two groups in regard to the in-hospital delay (p-value 0.8623).

Regarding the findings on taking the history, all patients gave the history of pain in abdomen but only around half of the patients had the classical migratory pain that is 53 (53%) patients, 36 (60%) patients in the non-perforated group and 16 (40%) in the perforated group. Nausea and vomiting were found in 53% of all patients and were found to be significant in the non-perforated group. Anorexia, reported in 75% of patients, did not show any difference between the two groups.

Clinical examination showed 46% of all the patients were running a fever (>38°C) at the time of presentation to the hospitals and was observed more

in the perforated group of patients (51%). Tenderness and rebound tenderness in right Iliac fossa being very important clinical parameters were present in 84% and 75% patients respectively. Tenderness in right iliac fossa was 93% in the non-perforated and 73% in the perforated group while Rebound tenderness had no specific difference between the perforated and non-perforated groups.

Regarding laboratory investigations, increased TLC (Total leucocyte count) > 109/L, was seen in 62 (62%) of all patients at the time of presentation. High TLC count was present in 28 (70%) patients, in the perforated group, with 92% showing left shift while 35 (58%) patients in the non-perforated group had high TLC count with 62% demonstrating a Left shift.

Clinical Assessment, laboratory investigations, and ultrasonography were used for the diagnosis of all patients. Diagnosed mainly on clinical findings and laboratory studies were 73% of patients. Ultrasound helped in the rest 27%. There was no intention to measure the sensitivity and specificity of the diagnostic tests as we only evaluated the positive cases.

Postoperative complications occurred in 13 (32.5%) patients in the perforated group and in 7 (11.6%) patients in the non-perforated group ($p < 0.001$). Significant complications were surgical wound infection ($p=0.001$) and intra-abdominal sepsis and collections ($p= 0.046$). Two patients developed wound dehiscence both of which were in the perforated group. Patients who developed surgical site infections were managed by antimicrobial treatment and dressings with the majority showing a good response. Chest infection was noted in both groups.

Hospital stay in the perforation group was 7 days (3-46 days) which was longer than that of patients in the non-perforated group that is 3 days (2-23 days), and this was found to be statistically significant ($p < 0.001$). Of the 40 patients in the perforated appendicitis group, there were 38 (95%) patients who were discharged on complete recovery while two (5%) mortalities were reported in that group where one patient died due to sepsis, and the other one died from congestive heart failure. No mortality was reported in patients in the non-perforated group.

Table 1: Baseline Characteristics

Baseline Characteristics	Non-perforated appendix (n=60)	Perforated appendix (n=40)
Age Group (years)		
15-25	22 (36.6%)	14 (35%)

26-50	32 (53.4%)	22(55%)
51-75	6 (10%)	4(10%)
Gender		
Male	37(61.6%)	24(60%)
Female	23(38.4%)	16(40%)
Socioeconomic status		
Upper class	5(8.4%)	2(5%)
Middle class	32(53.3%)	21(52.5%)
Lower class	23(38.3%)	17(42.5%)
Education		
No formal education	19(31.8%)	12(30%)
Primary level	21(35%)	16(40%)
Secondary level	13(21.6%)	7(17.5%)
Residence		
Rural	37(61.6%)	26(65%)
Urban	23(38.4%)	14(35%)
Co-morbidities		
No comorbidities	34(57%)	28(30%)
Diabetes	9(15%)	18(45%)
Hypertension	10(16.6%)	7(17.5%)
Chronic kidney disease	3(5%)	3(7.5%)
COPD	4(6.4%)	0(0%)
Pre-hospital delay (hours)		
<12	16(26.6%)	4(10%)
12-24	32(53.4%)	5(12.5%)
>24	12(20%)	31(77.5%)
In-hospital delay (hours)		
<6	21(35%)	6(15%)
6-12	24(40%)	23(57.5%)
>12	15(25%)	11(27.5%)
Shifted to		
Ward	60(100%)	38(95%)
ICU	0(0%)	2(5%)
Discharge status		
Complete recovery	60(100%)	38(95%)
Mortality	0(0%)	2(5%)
Postoperative complications (n=20)	7(11.6%)	13(32.5%)

Table 2: Causes of delayed presentation in patients with a perforated appendix

Causes	Frequency (%)
Missed diagnosis by a physician	11(28%)
Managed by non-doctors	15(37%)
Misperception about the gravity of the illness	5(12%)
Financial problems	7(17%)
Lack of support from the family	2(2%)

Discussion

Acute appendicitis is the most common cause of surgical abdomen in emergencies is managed with overall good results but when it progresses to perforation, it often leads to difficult convalescence and can even lead to death.⁷

In our study, a perforated appendix was found in 40 patients (40%) which lies within the range reported by many other authors.^{8,9,10,11} This high rate was also observed by some of the other authors as well and the factors contributing to it included atypical and delayed presentations, missed diagnosis, pre-hospital delay, in-hospital delay and presence of co-morbid.^{12,13,14}

Barrett et al.¹⁵ studied the trends in the rate of perforation over a period of 10 years from 2001 to 2010, the distribution of these cases with respect to age showed that 55.6% of them were under 45 years of age while 15.7% patients were above 65 years while what we observed in our study was different and the percentages came out to be 66% and 4% for under 45 and above 65 years respectively showing slight fewer numbers in the above 65 years group, however, having the same trends. When risk factors were looked upon, our study showed that the male gender was related significantly to perforation, which is in accordance with previous studies.^{16, 17} A possible explanation for this as reported by Sheu et al.¹⁸, is the reluctance of males to seek healthcare services. Middle socioeconomic status and living in rural areas were considered as risk factors, in our study with the possible explanations that low income, large family size and lack of approachable health care services are the reasons behind it. The same was also observed by Sirikkurnpiboon and Amornpornchareon in their study.¹⁹

Co-morbid tend to affect the clinical outcomes in surgical cases and we had a huge number that is 54 (54%) of all patients with co-morbid conditions at presentation, yet no statistically significant association could be established between co-morbid and risk of perforation. Storm Dickerson et al also couldn't establish a significant association in their study as well.⁹

In several previous studies pre-hospital and in-hospital delay in appendectomies has been reported to be linked with poor outcomes.^{20,21,22} In a study conducted by Busch et al.²³ an increased risk of perforation was seen with a delay of more than 12 hours. Giraud et al.²⁴ concluded that a delay of more than 24 hours from the onset is strongly associated with the risk of complications. In contrast, some of the

authors have shown that delaying has no association with perforation in acute appendicitis. In a study conducted by Teixeira²⁵ delay in appendectomy was not shown to be linked with an increased risk of perforation however it did show an increase in the surgical site infection in the postoperative days. Likewise, Abou-Nukta et al.²⁶ also concluded that a 12 to 24 hours delay is not associated with the risk of perforation. In our study, a statistically significant association was established between pre-hospital delay and risk of perforation while no association could be established between in-hospital delay and perforation risk. Ideal timing for appendectomy, however, still remains debatable. Some of the factors that can be controlled include creating awareness among the people regarding early presentation to well-equipped hospitals as soon as the symptoms appear.

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