Perforated appendicitis
Study of the affecting factors

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Summary:

Objective:
To study the factors affecting the rate of perforation in patients with acute appendicitis with view of adding to local data and comparing our results with other local and international studies.

Patients and Methods:
A prospective study carried out on 135 pts. treated by emergency appendicectomy at Al-Sadar Teaching Hospital from June 2003 – 2004, they were divided according to their operative findings, into tow groups, those with acutely inflamed non perforated appendix (109 pts.) and those with perforated appendix (26 pts.). All the data collected were analyzed using Z-test.

Results:
The highest incidence of acute appendicitis (non perforated and perforated) was in the age group 21-30 years (52 pts.; 38.5%), while the lowest incidence was in the age group below 10 years (8 pts.; 5.9%) and above 60 years (6 pts.; 4.4%), in addition ,the highest incidence of perforation was in the age group over 60 years (3 pts.; 50%) and below 10 years (3 pts.; 37.5%),while, the lowest incidence was in the age group 21-30 years (5 pts.; 9.6%),however, the overall incidence of perforated appendicitis was 19.3% (26pts.). The mean time of delay from the onset of the abdominal pain to the operating room was 23 hours and 41 hours in the non perforated and perforated groups respectively with pre admission and post admission delay were 16 and 5.40 hours respectively in the non perforated group in contrast to 35 and 5.54 hours respectively in the perforated group.
More than 65% of both groups reached the operating room within 6hours from their admission to hospital.

Conclusion:
Differences in the length of the pre hospitalization phase of the disease play an important role in increasing the rate of perforation in patients with acute appendicitis in addition to other patient's related factors particularly age.
Variation of few hours in the timing of surgical operation after admission appears to be less contributory factor to perforation and lastly, a second opinion from senior colleague is warranted for diagnosing an equivocal case.

Introduction:

Acute appendicitis is undoubtedly, the most common surgical emergency, approximately 7% of the population will suffer from acute appendicitis during their life time [1] .A decline from 100 cases per 100000 population to 52 cases per 100000 population demonstrated over a study period from 1975 to 1991 [2].

Failure to make an early diagnosis is a primary reason for persistence rate of perforation [3]. Perforation rate ranging from 4% up to 45% in adult and from 30% up to 60% in children was reported in literature [3, 4].

Morbidity rate parallel mortality rates, being increased by rupture of the appendix and to lesser extent, by old age [2,5]. Most of the serious complications is sepsis (abscesses and wound infection) [4] .

Appendicitis in its classical form is easily diagnosed, but it is not always an easy diagnosis to make and it can baffle the best especially in early stages of the disease [6].

Patients and Methods:

A prospective study carried out from June 2003 to 2004 on 135 pts. treated by emergency appedicectomy at Al-Sadar Teaching Hospital, Basrah, Iraq. The patients were divided into two groups, those with acutely inflamed non-perforated appendices (109pts.) and those with perforated appendices (26 pts.), according to their operative findings (macroscopic perforation or pus in the peritoneal cavity).

The data collected for age, time of initial abdominal pain, duration (in hours) from the onset of the abdominal pain to the operating room with pre admission and post admission times, previous visit to the physician before hospitalization, time of operation and operative findings.

All these data were statistically analyzed with a probability of <0.05 considered to be significant by using Z- test.

Results:

The age distribution ranged from 7-65 years with a median age was 23 years, however, the highest incidence of acute appendicitis (non perforated and perforated) was in the age group 21-30 years (52 pts.; 38.5%), while the lowest incidence was in the age group below 10 years (8 pts.; 5.9%) and above 60 years (6 pts.; 4.4%) as shown in Table (l.).

The highest incidence of perforated appendicitis was in the age group over 60 years (3 pts.; 50%) and below 10 years (3 pts.; 37.5%), while the lowest incidence was in the age group 21-30 years (5 pts.; 9.6%). In addition, the overall incidence of perforated appendicitis was 19.3% (26pts.) Table (l.).

The mean time of delay from the onset of the abdominal pain to the operating room was 23 hours (range 7-92 hours) in the acutely inflamed group and 41 hours (range 12-128 hours) in the perforated group ($p<0.05$),(Table ll.).

The mean time of pre admission delay was 16 hours (range 4-74 hours) in the acutely inflamed group and 35 hours (range 10 - 102 hours) in the perforated group ($p<0.001$) and the majority of patients in the inflamed group (81pts; 74.3%) were in the hospital by 24 hours after the onset of abdominal pain in contrast to 4 pts. (15.3 %) in the perforated group ($p<0.05$) table (lll.)

More than 76% (83pts.) of the acutely inflamed group reached the operating room within 6 hours from their admission to hospital and 65.4 %(17 pts.) of the perforated group Table (lV.).

In addition, the maximum delay after admission to hospital occurred when the patient admitted between 2.00 - 8.00 AM and the minimum in patient admitted between 4.00 - 12.00 PM, on the other hand, there was significant post admission delay in the weekend and holidays.

Discussion:

The mortality from acute appendicitis has fallen below 1% in most recent studies [2,7], this mortality is almost exclusively among those with perforated appendicitis, which also carries a much more higher morbidity than acutely inflamed non perforated appendicitis [2,5]. The perforation rate in this study was 19.3%, which is within the range that reported in the literature [2,4].

The highest incidence of perforation in our study was found in the age group above 60 years (50%) and this can be explained by the fact that in the elderly, there are a number of anatomical changes occur in the appendix like narrowing of the lumen, mucosal thinning, and fibrosis and fatty infiltration of the wall as well as atherosclerosis, these changes together with omental atrophy, makes the progression of the disease faster and liability for perforation more [8]. In addition, the variability of presentations in the elderly patients make the diagnosis of acute appendicitis difficult [8].

The second highest incidence of perforation was found in the age group below10 years (37.5%) and it is well recognized that any inflammatory process is not well isolated and walled of in children as in adult and may progress rapidly to perforation [2, 3, 9]. Therefore, age has strong effect on the rate of perforation which is not explained by the differences in the time of operation, so it is a factor which is not amenable to modify by changing in the surgical approach.

Delay is the major factor that result in perforation [6]. Our results confirm that the incidence of perforation increased with increasing duration of symptoms as shown in Table (ll.)in which only 23% of patients with perforation had symptoms for less than 24 hours and 77% for more than 24 hours. In our study also we found that most of the patients with perforated appendices (84.7%) had symptoms for more than 24 hours before admission to hospital which is significantly higher than patients with acutely inflamed group (25.7%) ($p<0.05$), as shown in table (lll.). These findings are similar to that reported by other studies [6,10-12]. This long pre hospitalization symptoms in patients with perforated appendices may indicate that most of perforation occurred before admission to hospital and this pre admission delay can be explained by many patients related factors like refusal of the patients to go to the physician, failure of certain patients (especially children and elderly) to communicate adequately with the doctors, poor financial condition of certain families and also because of the poor security conditions that play major role in preventing the patients from referring to the hospital in the late hours of the night and early hours of the morning.

It is well known that patients with perforated appendicitis need to be reached the operating room more quickly, after the admission to hospital, than patients with non perforated appendix, that is why, it was disappointing to find that only 65.4% of patients with perforation reached the operating room within 6 hours which is much more less than those with acutely inflamed non perforated appendix (76.1%), and this can be explained by the following:

Because most of the cases of acute appendicitis were diagnosed in the emergency room by junior doctors who may lack the experience in the differentiation between non perforated and perforated appendicitis, this makes the initial accuracy in the diagnosis of these cases nearly the same. In addition perforation was more likely occurred in those patients who had previous visit to the physician before hospitalization and they were receive treatment for wrongly diagnosed illness which makes their signs of perforation occult and difficult to be diagnosed, 23% (6 pts.) and 11% (11 pts.) of perforated and non perforated group respectively had visit to the physician which is statistically significant ($p<0.05$).

Another factor that affect post admission delay was the time and the day of arrival to the hospital those patients arriving between 2.00 AM and 12.00 AM wait significantly longer than those arriving outside these hours as the waiting surgical registrar either taking rest or may be busy elsewhere during these hours or on the assumption that those arriving at late night they can wait till the morning.

Table (l). Age distribution of the patients.

Age groups	Pathological state of the appendix				Total	
	Acutely inflamed		perforated			
	No.	%	No.	%	No.	%
1 – 10	5	62.5	3	37.5	8	5.9
11 – 20	27	87.1	4	12.9	31	22.9
21 – 30	47	90.4	5	9.6	52	38.5
31 – 40	11	73.3	4	26.7	15	11.1
41 – 50	9	69.2	4	30.8	13	9.6
51 – 60	7	70	3	30	10	7.4
>60	3	50	3	50	6	4.4
Total	109	80.7	26	19.3	135	100

Table (ll.): Total delay from onset of abdominal pain to operating room.

Total delay (hours)	Pathological state of the appendix			
	Acutely inflamed		perforated	
	No.	%	No.	%
1-8	7	6.4	-	-
9-16	31	28.4	2	7.7
17-24	41	37.6	4	15.4
25-48	23	21.2	2	7.7
49-72	5	4.6	8	30.8
73-96	2	1.8	7	26.9
>96	-	-	3	11.5
Mean time	23 hours		41 hours	
Range	7 – 92 hours		12 – 128 hours	
Total	109	100	26	100

Table (lll.): Pre admission delay to hospital.

Pre admission delay (hours)	Pathological state of the appendix			
	Acutely inflamed		Perforated	
	No.	%	No.	%
1 - 8	8	7.3	-	-
9 -16	34	31.2	1	3.8
17 – 24	39	35.8	3	11.5
25 – 48	17	15.6	2	7.7
49 – 72	9	8.3	11	42.4
73 – 96	2	1.8	9	26.9
>96	-	-	2	7.7
Mean time	16 hours		35 hours	
Range	4 – 74 hours		10 - 102	
Total	109	100	26	100

Table (lV.): Post admission delay to operating room.

Post admission delay (hours	Pathological state of the appendix			
	Acutely inflamed		perforated	
	No.	%	No.	%
1 - 2	_	-	-	-
3 - 4	52	47.7	6	23.1
5 - 6	31	28.4	11	42.3
7 - 8	12	11	4	15.5
9 - 10	9	8.3	2	7.7
11 - 12	3	2.8	1	3.8
>12	2	1.8	2	7.7
Mean time	5.4 hours		5.54 hours	
Range	1 - 13 hours		1 - 10	
Total	109	100	26	100

Table (V): Comparison between median pre admission and post admission delay in different studies.

Authors	Country	Year	Mean pre admission delay		Mean post admission delay	
			Acutely inflamed	Perforated	Acutely inflamed	Perforated
Moss [12]	U.K	1985	14	30	4	3.50
Korner [10]	Norway	1997	17	32	6.8	5
Alazzawi [13]	Iraq	2001	15	36	5	3
Our study	Iraq	2004	16	35	5.40	5.54

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