



Management of Acute Appendicitis in Adult

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Abstract

The aim of our work was to evaluate the results of the management of acute appendicitis.

Materials and Methods: This was a retrospective study over 6 years which included patients aged at least 15 years treated in the general surgery department of Pikine hospital, for simple or complicated acute appendicitis. The epidemiological, diagnostic, therapeutic and prognostic aspects were studied.

Results: We collected 583 cases representing 28.5% of surgical emergencies. The average age was 26.73 years and the sex ratio was 1.81. The abdominal pain was constant. Hyperleukocytosis was present in 75.65% of neutrophil-predominant cases. Ultrasound was performed in 94.17% of cases and was contributory in 76.7%. Acute appendicitis was simple in 61.4% of cases. We had 121 cases (20.75%) of appendicular abscesses, 89 cases (15.27%) of peritonitis and 15 cases (2.57%) of appendicular plastrons. All patients were operated on hot and this within 48 hours in more than half of the patients (76.49%). Overall morbidity was 6% (n = 35) and was dominated by surgical site infections. Mortality was 0.9% (n = 5) and hospitalization was 5.90 days on average.

Conclusion: Appendicitis remains a frequent surgical emergency. A non-contributory abdominal ultrasound should not delay treatment given the sensitivity of the clinical picture. Early surgery guarantees a good prognosis.

Keywords: Acute Appendicitis; Peritonitis; Appendiceal Abscess; Appendicular Plastron; Appendectomy

Introduction

Acute appendicitis is inflammation of the ileocecal appendix. It is a common surgical emergency representing more than 25% of digestive emergencies [1,2]. It can occur at any age, but rare before 5 years [3,4]. It remains a serious condition, which has not ended up being problematic because of its unpredictable evolution, which

can expose the patient to serious complications and thus endanger life [3]. The aim of our work was to evaluate the results of acute appendicitis management in a hospital located in the Dakar suburb of Senegal. Our specific objectives were to describe the diagnostic aspects and acute adult appendicitis in a suburban hospital in Dakar.

Methods and Patients

This was a retrospective, cross-sectional and descriptive study conducted in the national hospital of Pikine, a level 3 hospital located in the suburbs of Dakar, the capital of Senegal. It took place over a period of 06 years from 1 January 2015 to 31 December 2020. It affected all patients who were treated in the surgery department for simple or complicated acute appendicitis. The parameters studied were age, sex, duration of symptomatology, symptoms, physical examination data, leukocyte level, Alvarado score, radiological examinations, final diagnosis, antibiotic therapy used, the first surgical procedures and movements as well as the evolution within 30 days of postoperative. Variables are calculated and graphs obtained with the Excel software. The Chi2 test was used in bi variate analyses with a significant p value if <0,05 using the R software. The Alvarado score was calculated only for patients with a suspicion of simple appendicitis based on clinical examination and biological assessment data before surgery or radiological evaluation. The results were divided into 3 intervals: <3, between 3 and 6 and >6. A correlation was made between a score >= 6 and the rate of correction of per-operative diagnosis.

Results

Our study covered 583 cases. This represented 28.5% of abdominal surgical emergencies during this period. Uncomplicated acute appendicitis predominated in 358 cases (61.4%), followed by appendicular abscesses in 121 cases (20.8%). We had 89 cases (15.27%) of appendicular peritonitis and 15 cases (2.57%) of appendicular plastrons. The average age was 26.73 years. Males predominated in 376 cases or 64.5% with a sex ratio of 1.81. The age range from 15 to 30 years was predominant with 45% of cases as shown in Figure 1. The average consultation time was 3.97 days and ranged from 1 to 22 days. The majority of patients (59.2%) visited between 2 and 5 days after the onset of symptoms. Symptoms were dominated by abdominal pain observed in all patients, followed by transit disorders in 512 cases (87.8%) and constipation in 476 cases (81.6%). The pain was located in the right iliac fossa in 83.53% of cases. Appendicular syndrome combining pain and defense to the right iliac fossa and lateralized pain to the rectal touch, was present in 504 cases (86%) while the defense was absent in 79 cases. Fever was present in 457 cases (79%).

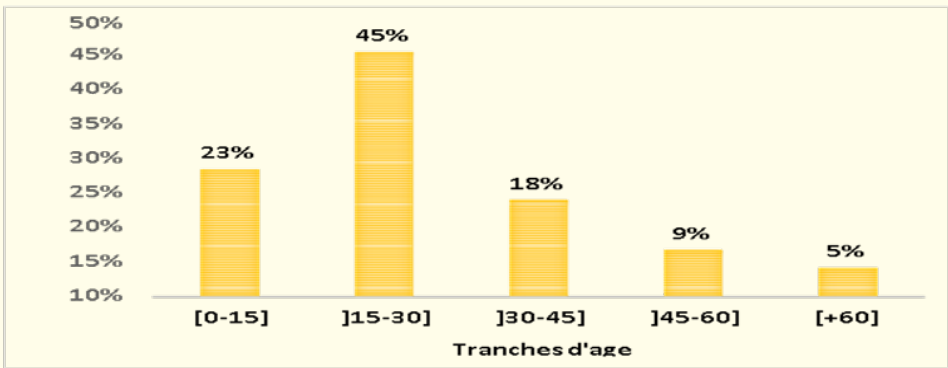


Figure 1: Distribution of our patients by age.

There was a correlation between temperature >38.5° and a complicated form of appendicitis with p = 0.032 (Table I). The blood count and blood count (NFS) was carried out in all our patients and objectified a hyperleukocytosis in 441 cases (75.65%) with an average rate of 13507.55 white blood cells/mm³. The CRP performed in 6% of patients was positive in all cases. There is an association between a leukocyte count >15000/mm³ and the presence of a complicated form of appendicitis with p = 0.021 (Figure 2).

Ultrasound was performed in 94.17% of patients and was contributive in 76.17% of cases. It had a sensitivity of 76.7% and a specificity of 57.14%. The abdominal scan was performed in 34

patients (5.83%) and returned in favor of the diagnosis in 28 patients, a rate of 82.4% (Table II). Unprepared abdominal radiography (ASP) was performed in 9.09% of patients and was not helpful in the diagnosis of acute appendicitis. Antibiotics were given to all of our patients prior to the procedure. The most used were amoxicillin-clavulanic acid, associated with metronidazole in bitherapy (90.74%) and ceftriaxone associated with gentamicine metronidazole in tritherapy (5.15%). All of our patients underwent surgery. Three-quarters (3/4) of our patients (76.49%) were operated within 20 hours of admission with an average delay of 16.33 hours.

The first surgical route was the Mac Burney route (68.78%) followed by median laparotomy in 16.12%. Fifteen (15) patients

Pathologies	Normal Temperature		Fever >38,5°	
	Number	Percentage	Number	Percentage
Appendicular peritonitis	13	15%	76	85% p = 0.032
Appendicular lump	3	20%	12	80% p = 0.032
Acute simple appendicitis	75	21%	283	79% p = 0.85
Appendicular abscess	35	29%	86	71% p = 0.032
TOTAL	126	21%	457	79%

Table I: Correlation between fever and pathologies.

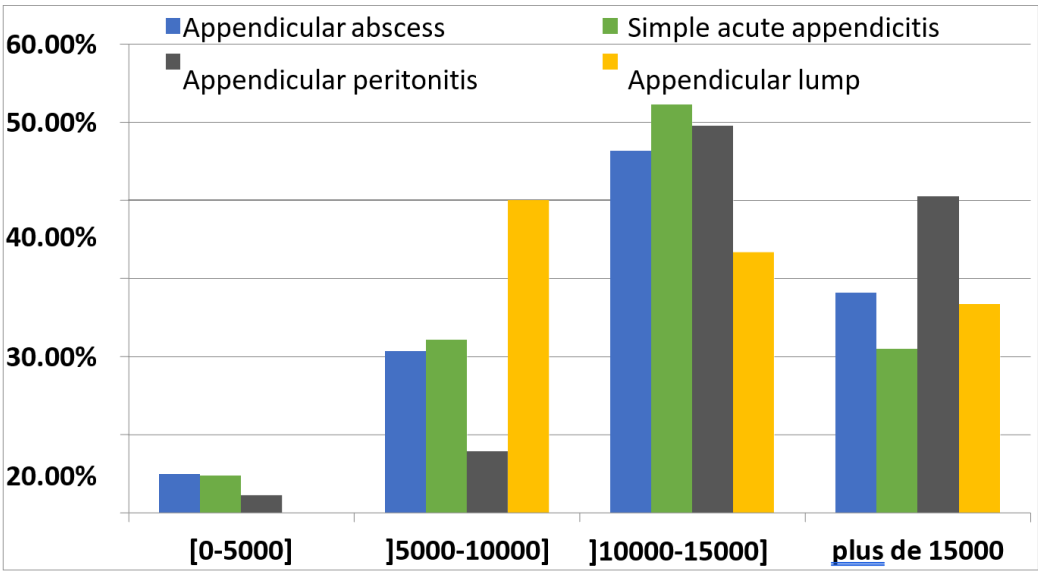


Figure 2: Distribution of patients according to leukocyte level by pathologies.

Us/CT scan	Results Us/CT scan						
	Positive predictive value		Negative predictive value		Normal	Total	
	Freq.	Percent	Freq.	Percent	Freq.	Percent	
CT scan	28	82.35%	3	8.82%	3	8.82%	34
Us	421	76.68%	66	12.02%	62	11.29%	549
Total	449	77.02%	69	11.84%	65	11.15%	583

Table II: Contribution of ultrasound and abdominal CT to the diagnosis of acute +/- complicated appendicitis.

had undergone an appendectomy by laparoscopy, a rate of 2.57%. At the surgical examination, the appendix was mainly in laterocecal position (80.79%) and gangrenous in 30.87% of cases. The majority per-operative diagnosis was simple acute appendicitis (n = 357, 61.41%), followed by appendicular abscess (n = 121 or 20.8%), appendicular peritonitis (n = 89 or 15.27%) and appendicular plastron (n = 15 or 2.57%). There was a discrepancy between the preoperative and postoperative diagnosis in 77 cases (13.2%). These were the 15 cases of appendicular plastrons that were diagnosed as simple appendicitis at radiology; 40 cases of acute generalized peritonitis with an initial diagnosis of appendi-

cular abscess and 22 cases of simple acute appendicitis initially diagnosed as appendicular abscess. The Alvarado score was calculated in 358 cases. The average score was 7.73 with extremes of 03 and 09. Scores between 6 and 9 were majority with a rate of 80%. There was an association between an Alvarado score of >or equal to 6/10 and a complicated form of appendicitis with p = 0.0032.

Appendectomy was the main surgical procedure performed in all our patients. The 15 cases of appendicular plastrons had received prior antibiotic therapy. Thirty-nine decimal four percent

(39.4% or n = 230) of the patients had benefited from an abdominal toilet and 25.7% (n = 149) of a drainage. The delay between admission and surgery ranged from 1 hour to 96 hours with an average of 16.33 hours. In our study, 3/4 of patients (76.49%) were operated within 20 hours of admission.

The morbidity rate was 6% (n = 35). It was dominated by infections of the surgical site in 68.5% (n = 24), followed by postoperative ileus in 14% (n = 5). Two cases of flange OIA were also recorded. Overall mortality was 0.9% (n = 5). All deaths were recorded in the complicated forms group, namely 4 cases of peritonitis and 1 case of appendicular abscess. It was a decompensation of tare in 3 cases and infectious complications in 2 cases with persistent peritonitis. An admission delay >7 days was significantly associated with a fatal outcome with p = 0.046. There was no causal link between a surgical delay of >24 h and the occurrence of complications in uncomplicated forms.

The length of hospitalization varied from 03 days to 27 days with an average of 5.90 days. The average length of hospitalization was 5.9 days for all patients with extremes of 3 and 27 days. For simple acute appendicitis, the average length of hospitalization was 4 days. It ranged from 1 to 7 days. For the Appendicular abscess, it was 5.83 days on average with a minimum of 1 day and a maximum of 16 days hospitalization. For appendicular peritonitis, the average length of hospitalization was 6 days with extremes of 0 and 27 days. For the appendicular plastron: hospitalization ranged between 2 and 23 days with an average of 5.8 days.

Discussion

Acute appendicitis accounted for 28.5% of abdominal surgical emergencies in our study. Harouna., *et al.* in Niger report that this pathology occupied the 2nd rank of abdominal surgical emergencies with a rate of 26.93% while Coulibaly., *et al.* in Mali reported a rate of 37.4% [1,2]. In France, acute appendicular syndrome is the leading cause of abdominal surgical emergencies [4]. Acute appendicitis is one of the most common abdominal surgical emergencies in the world. The mean age in our study was 26.92 years with a predominance of the 15 to 30 years old age group. This predominance of young age in our study is widely reported in the literature (table III). The majority of our patients (59.18%) had consulted between 2 and 5 days.

The mean duration of signs was 3.97 days and ranged from 1 to 22 days. Our rate is similar to that of Hafid., *et al.* where the consultation time was 3.5 days on average with extremes of 1 and 6 days [5]. It is higher than in the studies of Diarra (Mali) and Dilai (Morocco), which had 2 and 2.6 days on average respectively but lower than that of Diagne (Senegal) which found 4.7 days [4,5]. We note

Table III: Average age of patients with acute appendicitis in the literature.

Authors	Number	Average Age
Ndoye A, 2019 Senegal [110]	146	22
Yong IL, 2006 Chine [111]	97	34
Maiga IE, 2009 Mali [112]	104	27
Our study	583	26.92

that few of our patients have consulted from day 1 (less than 30%). This delay could be explained by the tendency to self-medicate before emergency room consultation. Abdominal pain was present in 83.53% of the FID. This is in line with the results of Harouna in Niger and Coulibaly in Mali, which are respectively 79.3% and 82.7% [1,2]. The majority of authors report that any acute pain in FID is acute appendicitis until proven otherwise [1,2,6]. Constipation and diarrhea were observed in 18.09% and 6.66% of our patients, respectively. Some authors report normal transit in 50% of cases. However, the presence or absence of these transit disorders is not of great interest in the diagnosis of acute appendicitis [5]. Diarrhea is a dangerous trap, because when combined with fever and vomiting it can lead to the misdiagnosis of acute parasitic or bacterial gastroenteritis even before clinical examination [5].

In our study, fever was present in 79% of cases. This fever was more common in patients with acute complicated appendicitis with respective levels of 85% and 80% in peritonitis and plastron appendixes. This does not differ statistically from results found in other series [7,8]. Normal temperature may be accompanied by severe anatomical damage in acute appendicitis. This reflects the absence of anatomical parallelism. On the other hand, the presence of a fever >38.5° must make us fear a complicated form of acute appendicitis with a p = 0.032 in our series [4]. The absence of defence is not sufficient to rule out acute appendicitis. In our series, it was observed in 86% of cases. Several authors report that the abdominal defense was present in 68% to 85% of cases and pain caused in 95% to 100% of cases [4,9].

In our study, 75.65% of our patients had hyperleukocytosis with a clear predominance of neutrophils. This result is similar to those of most authors where hyperleucocytosis is present in more than 80% of cases [4,6,9]. A leukocyte level of more than 15000/mm3 was strongly correlated with the presence of a complicated form of acute appendicitis with p = 0.021. Most authors report a CRP sensitivity of 98%, more significant than leukocytosis. We had an absence of leukocytosis in 142 patients while the per-operative and anatomopathological diagnosis was acute appendicitis. The absence of hyperleukocytosis could not be sufficient to rule out

appendicitis. Some authors explain it by a self-medication not to confess by patients and others by the precocity of diagnosis within 48 hours after the onset of symptoms [4,9]. In our series, the ultrasound was non-contributive in 12% of cases while Ndoye (Senegal) and Inssaf (Morocco) reported a rate of 6.18% and 7.74% of non-contributivity of the abdominal ultrasound [2,8]. Thus, this examination alone could not be sufficient to rule out acute appendicitis. Abdominal CT is the gold standard for appendicitis diagnosis. It provides the same information as ultrasound but with more precision. It has a sensitivity and specificity of 94% to 100% [10].

In our study, 5.83% of patients had an abdominal scan. The majority of African series report low completion rates for this re-

view [2,10]. This is probably due to the fact that abdominal CT is rarely available as an emergency in our contexts. In addition, it is an expensive and often not necessary examination to diagnose acute appendicitis. In our study, abdominal CT was requested either as a complement to non-contributory PSA radiography or as an alternative to abdominal ultrasound. Thus, 16 patients had to benefit from these 2 examinations simultaneously with a contributive scan in 10 cases. In our study, acute uncomplicated appendicitis was the most frequent diagnosis (n = 358 or 61.41%), followed by apendial abscesses (n = 121 or 20.75%) and then generalized acute peritonitis (n = 89 or 15.27%). These results can be superimposed on those in the literature (Table IV).

Authors	Acute appendicitis	Abscess appendicular	App peritonitis	Appendicular lump
Poudiougou B. (Mali) [153]	90.28%	6.94%	0%	2.80%
Dilai (Maroc) [125]	62%	21.6%	9%	2.8%
Saadia ED DYB (Maroc) [80]	69.51%	9.74%	14.40%	6.35%
Diarra B. (Mali) [154]	91%	3.6%	3%	2.4%
Our study	61.41%	20.75 %	15.27 %	2.57%

Table IV: Prevalence of acute appendicitis and its complications in the literature.

All of our patients have received hot surgical treatment. Diawara., *et al.* in Mali report that 88.0% of its patients had received emergency surgery while Harouna., *et al.* in Niger reported a 100% rate of surgery [1,11]. In France, emergency surgery was performed in 98.3% of cases [4]. With a view to reducing the very high rate of white appendectomies and the cost of management, some authors concluded that antibiotic therapy alone is feasible as an alternative to surgery in the management of uncomplicated acute appendicitis, in patients with no known defects. The same reasoning was used in patients with high surgical risk. These studies have shown its effectiveness with success rates ranging from 68 to 95% [11-13]. Relapse rates reported over a year range from 3 to 25 to 37% [12,13]. At present there is no universal consensus on the modalities of conservative treatment. However, conservative treatment is always questioned due to the methodological limitations of studies on the issue and the significant risk of recurrence. Thus, surgery remains the treatment of choice for acute appendicitis. More than half (76.49%) of patients were operated within 24 hours after admission.

The postoperative evolution was favorable in 93.1% of cases. The overall morbidity in our series concerned 35 patients or 6%. This morbidity is superposed to that of the series of Fall, Wu and Garg [14]. It is lower than that of the Diagne series where the morbidity rate was 9.1% [1,8]. In developed countries, it is between

0.1 and 0.25% [14]. Parietal suppurations are more frequent during appendectomies by laparotomy where they can reach 30%. These are rare complications that occur in 2 to 3% of laparoscopic appendectomies [14,15]. They are due, among other things, to defective hygiene conditions, the urgency of the intervention, the fact that appendicitis itself is a disease at risk of sepsis, and the contact of the appendix with the abdominal wall during its extraction. It is well established that late diagnosis is the main cause of death in acute appendicitis because it leads to complications. The latter have a higher morbidity. Our mortality rate was relatively low (n = 5 or 0.9%). It is higher than those of Podda., *et al.* and Al Faouri., *et al.* which had 0.6% and 0.5% respectively [15,16]. Mortality is significantly higher in the underdeveloped and developing countries where rates between 0.9 and 4% have been found, mainly related to complicated forms [1,4,16]. In 2009, Maïga in Mali reported a mortality rate of 2.9%, much higher than ours [17]. The average length of hospitalization in our study was 5.4 days. This rate is superposable to that of most authors. This duration is still acceptable and seems to be reasonable and more beneficial for our patients than a medical treatment with a much longer and more expensive follow-up.

Conclusion

The diagnosis of appendicitis remains essentially clinical. The absence of hyperleucocytosis and abdominal defence would not be

sufficient to rule it out. Surgical treatment remains a standard in our contexts with good results. Early surgery within 48 hours of admission seems to improve the prognosis.

Conflicts of Interest

No conflict of interest.

Contributions from Authors

All authors have read and approved this work.

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