

Full Length Research Paper

Surgical pathologic review of appendectomy at a sub-urban tropical tertiary hospital in Africa

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Acute appendicitis is a popular cause of acute surgical abdomen worldwide. This study is further aimed at discovering any unusual pathology of the appendix that was not entertained clinically. To determine the clinical and histological characteristics of all the appendectomy samples received in the Department of Morbid Anatomy and Histopathology of Olabisi Onabanjo University Teaching Hospital, Sagamu, South West Nigeria. A review of the medical and pathological records including slides of appendectomy samples received between January 2002 and December 2010 was done. Routine haematoxylin and eosin (H&E) staining were carried out. A total number of 163 appendectomy specimens were received. The mean age of the patients was 26.7 years, modal age was 35 years (range - 9months to 80years). Male to female ratio was 1.2: 1. Fourteen cases had normal histologic findings, giving a negative appendectomy rate of 8.6%. Of the 149 appendices with pathology, only 130 cases (87.2%) showed histologic evidence of acute appendicitis with an average annual frequency of 14.4, 4 (2.7%) cases were chronic appendicitis, 10 (6.7%) cases showed reactive lymphoid hyperplasia; while 5 cases (3.4%) had submucosal fibrosis. Thirty seven cases (22.7%) had both gross and histological evidences of perforation. Fifty - nine cases (36.2%) had histological evidence of peritonitis. Although, incidence of acute appendicitis is low in Sagamu, South West Nigeria, patients however, presented lately with fairly high rates of perforation and post appendectomy wound infections.

Keywords: Appendicitis, Gross description, Histological description, Perforation, Appendectomy, Africa

INTRODUCTION

Acute appendicitis is the most common cause of acute surgical abdomen requiring emergency surgery both in developed and developing countries (Ojo et al., 1991; Singhal and Jadhav, 2007; Muthuphei and Morwamoche, 1998; Søreide, 1984; Abdulkareem and Awelimobor, 2009; Chamisa, 2009; Fashina et al., 2009; Gerst, 1981).

The incidence of acute appendicitis varies according to geographical locations. The highest rates are reported in whites compared to nonwhites. (Charles and Francis, 1996)

In USA, about 250,000 new cases of acute

appendicitis are reported annually while another similar study recorded an overall incidence of acute appendicitis to be approximately 11 cases per 10,000 population per year in Norfolk, Virginia. (Addiss et al., 1990; Charles and Francis, 1996).

However, in Nigeria, incidence of acute appendicitis is relatively low with varying reports of average annual frequencies ranging from 22.1 to 49.8 new cases (Abdulkareem and Awelimobor, 2009; Oguntola et al., 2010; Ojo et al., 1991) whereas in other parts of Africa, relatively higher annual frequencies ranging from 22.9 to 129 new cases were recorded (Ohene-Yeboah and Togbe, 2006; Madiba et al., 1998; Chavda et al, 2005; Muthuphei and Morwamoche, 1998).

Reported histopathological studies of the appendix

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Table 1: showing age and sex distribution of patients that had appendectomy

Age (years)	males numbers of cases	females	subtotal	percentage (%)
0-10	15	7	22	13.5
11-20	18	17	35	21.5
21-30	27	22	49	30.1
31-40	18	13	31	19.0
41-50	7	10	17	10.4
51-60	2	2	4	2.5
61-70	1	2	3	1.8
71-80	2	-	2	1.2
Total	90	73	163	100.0

conducted in the African population are few. The objective of this study was to determine the clinical and histological characteristics of all the appendectomy samples received in the Department of Morbid Anatomy & Histopathology of Olabisi Onabanjo University Teaching Hospital, Sagamu, South West Nigeria.

PATIENTS AND METHODS

A retrospective study was undertaken to review the histopathology reports of all appendectomy specimens submitted at the department of Morbid Anatomy and Histopathology of Olabisi Onabanjo University Teaching Hospital, Sagamu, South West Nigeria between January 2002 and December 2010. It is a referral centre for other government and private hospitals in and around the Ogun State, South-west Nigeria. It has 300-beds (with 33 general surgical beds inclusive). Sagamu has a total population figure of 253,421 people (2006 census) and the catchment population of our hospital is estimated at 1.5 millions. Necessary patient biodata, clinical signs and symptoms were recorded. Routine haematoxylin and eosin (H&E) staining and where necessary histochemical studies were carried out. These data were analysed in terms of frequency, age, sex distribution, nature of clinical signs and symptoms as well as histologic characteristics of pathologic lesions using Microsoft Excel software, and Epidemiological Information (Epi info) software version 7. The data for these patients were presented in tables and photomicrographs.

RESULTS

A total number of 163 appendectomy specimens were received over a period of 9 years. Annual incidence rate of acute appendicitis was 5.7 per 100,000 populations.

Age and Sex Distribution

The age of these patients ranged from 9 months to 80 years with a mean age of 26.66years and modal age of 35 years. The peak age incidence was in the 21-30 years age group (Table 1). There were 90 males and 73 females giving a male to female ratio of 1.2: 1.

Clinical Characteristics of Patients

Abdominal pain was the most common symptom (93.0%) with its anatomic location extending from the umbilicus (42.8%) through the right iliac fossa (37.7%) to become generalized (29.6%). Vomiting followed closely in 78.6% of patients. Fever and anorexia were other symptoms observed in 71.8% and 46.5% of patients respectively. The mean duration of symptoms was 4.01days.

Right iliac fossa tenderness was present in 114 patients (69.9 %). Thirty seven cases (22.7%) of the appendices were perforated at operation.

Histological characteristics of appendiceal lesions

Of these, 14 cases had normal histologic findings, which accounted for negative appendectomy rate of 8.6%. Of the 149 appendices with pathology, only 130 (87.2%) cases showed histologic evidence of acute appendicitis with an average annual frequency of 14.4, there were 4 (2.7%) cases of chronic appendicitis, 1 of which was tuberculosis (Table 2).

Ten patients (6.7%) with reactive lymphoid had a mean age of 16.4years and a peak incidence in the 10 – 20 years age group. Female to male ratio was 4:1 (Table 3).

Five patients (3.4%) with submucosal fibrosis had a mean age of 22.4 years and bimodal peak age

Table 2: showing histologic diagnosis of appendiceal lesions

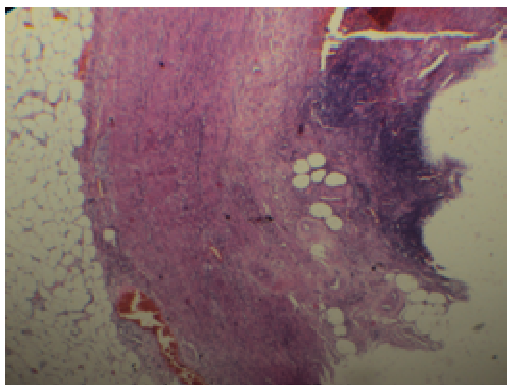
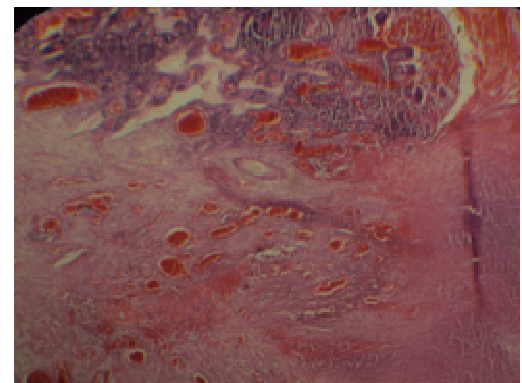
Histologic diagnosis	number of cases	percentage (%)
Acute appendicitis	45	30.2
Acute suppurative appendicitis	63	42.3
Early acute appendicitis	4	2.7
Acute ulcerative appendicitis	7	4.7
Acute necrotizing appendicitis	11	7.4
Chronic appendicitis	4	2.7
Lymphoid hyperplasia	10	6.7
Submucosal fibrosis	5	3.4
Total	149	100.0%

Table 3: showing age and sex distribution of patients with reactive lymphoid hyperplasia of appendix

Age (years)	males	females	subtotal
0-10	-	1	1
11-20	1	4	5
21-30	1	1	2
31-40	-	2	2
TOTAL	2	8	10

Table 4: showing age and sex distribution of patients with ruptured appendicitis

Age (years)	males	females	subtotal	percentage (%)
0-10	3	3	6	16.2
11-20	3	3	6	16.2
21-30	8	1	9	24.3
31-40	4	4	8	21.6
41-50	4	2	6	16.2
51-60	-	2	2	5.4
TOTAL	22	15	37	100.0

**Photomicrograph 1:** showing acute suppurative appendicitis with peritonitis, h & e x 10**Photomicrograph 2:** showing necrotizing appendicitis, h & e x 40

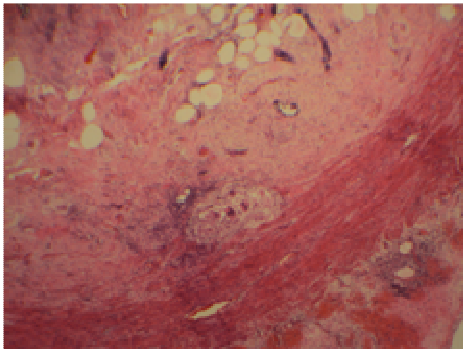
incidences of 0 – 10 years and 31-40 years respectively. All cases were seen in females.

Faecoliths were found in the appendiceal lumen in 14 (8.6%) cases.

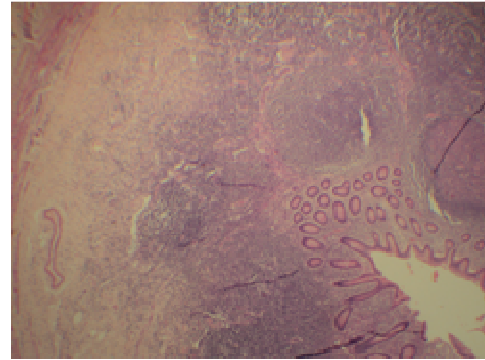
Thirty seven patients (22.7%) with histological

evidence of perforation had a mean age of 30.3 years and peak incidence in the 21 – 40 years age group. Female to male ratio was 1.5:1 (table 4).

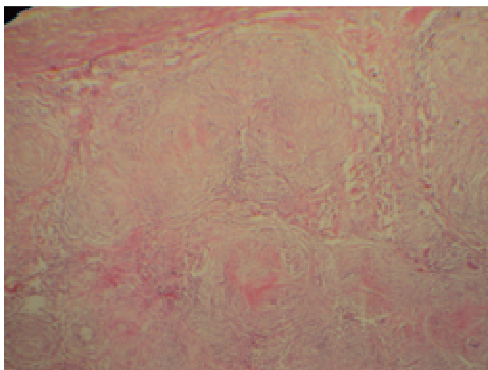
Fifty - nine cases (36.2%) of the removed appendices had histological evidence of peritonitis. Neither carcinoid



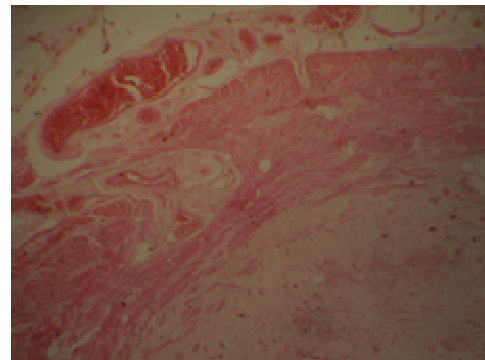
Photomicrograph 3: showing tuberculous appendicitis, h & e x 10



Photomicrograph 5: showing appendix with lymphoid hyperplasia, h & e x 40



Photomicrograph 4: showing tuberculous appendicitis with peritonitis, h & e x 40



Photomicrograph 6: showing appendix with submucosal fibrosis, h & e x 40

tumour nor adenocarcinoma was seen.

Treatment outcome

The treatment was appendectomy. The post - operative complication rate was 32.5%. Of these, wound infection (50.9%) was the most common, mainly following perforation in 32 (21.5%) patients. Fever and paralytic ileus were other complications seen in 41.5% and 7.6% of patients respectively. The average stay in hospital was 9.7 days. There was no mortality.

DISCUSSION

Acute appendicitis is indeed common but the incidence varies widely in Western countries when compared with Africa with a relatively higher incidence reported in the whites. (Addiss et al., 1990; Charles and Francis, 1996, Raahave et al., 2007; cureResearch.com, 2011) In this study, we recorded 130 cases of histologically confirmed acute appendicitis giving an annual incidence rate of 5.7 per 100,000 population which is lower than 18 to 77 per 100,000 population reported in other parts of Africa (Ohene-Yeboah and Abantanga, 2009; Zoguéréh et al.,

2001; Philipp et al., 1999). On the contrary, higher annual incidences of acute appendicitis ranging from 22.71 to 154 per 100,000 population were recorded in regions outside Africa including USA, Canada, Sweden, Norway and South-Korea (Addiss et al., 1990; Al Omran et al., 2003; Jung Hun et al., 2010; Andersson et al., 1994; Søreide, 1984). This is supported by the fiber hypothesis which stated that faecoliths develop more readily in people who consume a diet deficient in fiber with subsequent formation of more tenacious stool whereas diet rich in fiber speeds stool transit times, reduces faecal viscosity, and inhibits faecolith formation. In addition, regions with high fiber intake (Asia, India, and Africa) have less than one-tenth of the incidence of appendicitis in societies where fiber intake is lower (Europe, North America). (appendectomy.net, 2007)

From the foregoing, it is obvious that low incidence in our studies compared to other studies may be ascribed to underreporting as some ignorant patients have great desire to patronize traditional herbalists for treatment rather than visiting hospitals on a false claim of high cost of care in the hospitals owing to poor socio-economic status.

The age of these patients ranged from 9 months to 80 years with a mean age of 26.7years and a peak age

incidence in the 21-30 years age group. This finding concurs with findings from previous study conducted in Lagos, Nigeria but contrasts to those studies in Kano, Nigeria, South Africa, South Korea and Canada where patients between 10-19 years were commonly affected (Muthuphei and Morwamoche, 1998; Chamisa, 2009; Fashina et al., 2009; Al-Omran et al., 2003; Madiba et al., 1998; Edino et al., 2004; Jung Hun et al., 2010).

Acute appendicitis could affect all age groups but geographic factors such as climate change, altitude, and desertification may contribute to the varying peak age incidence in different countries. Appendicitis was common in children and young adults due to activeness of lymphoid follicle in appendix, but less common in elderly because atrophy of that system in appendix. Furthermore, higher prevalence of infections and allergens from pollens in the rainy season are likely climatic influences contributing to a higher incidence of appendicitis.

There was a slight male preponderance with a male to female ratio of 1.2: 1 which concurs with most previous studies where males were mostly affected with male to female ratios ranging from 1.1: 1 to 3.6:1 (Singhal and Jadhav, 2007; Muthuphei and Morwamoche, 1998; Søreide, 1984; Abdulkareem and Awelimobor, 2009; Chamisa, 2009; Fashina et al., 2009; Edino et al., 2004; Naaeder and Archampong, 1998; Ronchetto et al., 1990). This may probably be a coincidental finding.

Abdominal pain was the most common symptom (93.0%), followed by vomiting, fever, and anorexia in that order which concurs with reports from Durban, South Africa (Chamisa, 2009). Although, abdominal pain was the predominant symptom in Lagos, fever and anorexia however, slightly outnumbered vomiting whereas vomiting was the most common symptom in Kumasi, Ghana (Ohene-Yeboah and Togbe, 2006; Fashina et al in Lagos, 2009). In this study, the mean duration of symptoms was 4.01 days which lies within the widely reported range of 1 to 4.2 days, and this is predominantly above 3 days in about 60% of patients recorded in many studies (Zoguéréh et al, 2001; Chamisa, 2009; Willmore and Hill, 2001; Ohene-Yeboah and Togbe, 2006). Right iliac fossa tenderness was the most frequent elicited sign in 69.9% of patients, which did not differ from other similar studies. (Fashina et al, 2009; Ohene-Yeboah and Togbe, 2006; Madiba et al., 1998) In other words, acute appendicitis may present with various symptoms in varying proportions and durations. Late presentation may be attributed to failure of some patients to visit modern hospitals or partly from misdiagnoses by inexperienced medical personnels.

Negative appendectomy rate was 8.6% in this study which compares favourably with most studies which reported negative appendectomy rates ranging from 8.8% to 35.8% (Ojo et al., 1991; Singhal and Jadhav, 2007; Muthuphei and Morwamoche, 1998; Abdulkareem and Awelimobor, 2009; Chamisa, 2009; Fashina et al.,

2009; Madiba et al., 1998; Babekir and Devi, 1990; Sitara and Junaid, 2001). Negative appendectomy is an indication for measures such as repeated clinical evaluation, and investigations to exclude a diagnosis of acute appendicitis. Laparoscopic examination may help to rule out pelvic inflammatory disease and ovarian cysts mimicking acute appendicitis in female patients of reproductive age (Charles and Francis, 1996; Singhal and Jadhav, 2007; Chamisa, 2009).

One hundred and thirty (87.2%) appendices showed histologic evidence of acute appendicitis. This is contrary to studies conducted in Ile – Ife and Lagos, Nigeria where 69.9% and 70.3% of appendices showed acute inflammation respectively. (Ojo et al., 1991; Abdulkareem and Awelimobor, 2009) Several studies conducted outside Nigeria did not differ greatly from our study as they recorded frequency of acute appendicitis to be between 45.7% and 82.5 % (Singhal and Jadhav, 2007; Muthuphei and Morwamoche, 1998; Chamisa, 2009; Chang, 1981; Babekir and Devi, 1990).

Nineteen cases had other histological subtypes. There were 4 (2.7%) cases of chronic appendicitis, 1 (0.7%) of which was tuberculous. This finding compares relatively with a study conducted in Ile-Ife, Nigeria where four of the 25 cases of chronic appendicitis were granulomatous, only one of which was tuberculous appendicitis (0.32%) but differ from a study in Allahabad, India which recorded an evidence of tuberculosis in 2.3% of appendices (Ojo et al., 1991; Gupta et al., 1989).

Ten patients (6.7%) with reactive lymphoid hyperplasia had a mean age of 16.4 years and a slight peak incidence in the 10–20 years age group which agrees with most general studies (Charles and Francis, 1996; Babekir and Devi, 1990). Female to male ratio is 4:1 which compares relatively with a study conducted in Hereford, UK where they also reported a lower frequency of reactive lymphoid hyperplasia (2.1%) (Singhal and Jadhav, 2007). On the contrary, studies from Lagos, Nigeria, and Al-Fujairah, United Arab Emirates reported higher frequency of reactive lymphoid hyperplasia to be 19% and 25% respectively (Abdulkareem and Awelimobor, 2009; Babekir and Devi, 1990). The presence of reactive lymphoid hyperplasia in appendix in varying percentages supports the theory that obstruction by lymphoid hyperplasia is important in the pathogenesis of acute appendicitis especially in children from the age of 10 years to young adults (Charles and Francis, 1996; Babekir and Devi, 1990).

The initiating event in acute appendicitis is luminal obstruction from a variety of mechanisms such as primary lymphoid hyperplasia or secondary hyperplasia resulting from upper respiratory infections, mononucleosis, gastroenteritis, Crohn's disease, or parasitic infections has been described (Charles and Francis, 1996). The relatively high reported cases of appendiceal luminal obstruction with unknown or rare aetiologies may be attributed to histologically undetected bacteria (e.g

Yersinia species, actinomycosis), viruses (adenovirus, cytomegalovirus), parasites (e.g pinworms, Strongyloides stercoralis), foreign materials (e.g, shotgun pellet, tongue stud, activated charcoal), and tuberculosis, in which one case was seen (Charles and Francis, 1996; Ronchetto et al., 1990).

Five patients (3.4%) with submucosal fibrosis had a mean age of 22.4 years and bimodal peak age incidences of 0 – 10 years and 31-40 years respectively. All cases were seen in females. This finding compares relatively with similar study conducted in Hereford, UK (Singhal and Jadhav, 2007). In addition, Andreou et al reported that fibrosis and faecoliths were more common in the older autopsy group than in the younger surgically resected group (Andreou et al., 1990). The findings of fibro-obliterative changes in appendix buttress the theory that previous inflammation usually precedes fibrosis which is important in the pathogenesis of acute appendicitis (Charles and Francis, 1996; Singhal and Jadhav, 2007; Andreou et al., 1990).

Submucosal fibrosis described a condition characterized by increased deposition of fibrous connective tissue beneath the mucosa, usually the submucosa. This condition is preceded by previous or repeated acute inflammation which fails to resolve completely, thus leaving scar tissue behind (Charles and Francis, 1996; Carr, 2000). The accumulating fibrous connective tissue progressively obliterate the lumen of appendix and this time, initiate transmural inflammation of the appendix which may extend to the serosa, parietal peritoneum, and adjacent organs. (Charles and Francis, 1996; Juan, 1999, Carr, 2000) Furthermore, submucosal fibrosis may be a consequence of post-schistosomal appendicitis or interval appendectomy (Meshikhes et al, 1999; Ojo et al., 1991; Zoguéréh, 2001).

Thirty seven cases (22.7%) of the appendices had both gross and histological evidences of perforation which is comparable to most previous studies where the perforation rate with acute appendicitis ranged from 23.2% to 43% (Al-Omran et al., 2003; Chamisa, 2009; Edino et al., 2004; Muthuphei and Morwamoche, 1998; Madiba et al., 1998) Actually, this is also a fairly high rate when compare with most of series right now and further brought to fore the need to create more awareness and educate people about the mode of presentation of acute appendicitis as well as the need for them to report to the hospital promptly whenever they notice any strange complaint in their abdomen.

Fifty - nine cases (36.2%) of the removed appendices had histological evidence of peritonitis which is not quite different from findings in similar previous studies (Ojo et al., 1991; Abdulkareem and Awelimobor, 2009; Chamisa, 2009; Madiba et al., 1998).

The post - operative complication rate was 32.5%, mainly due to wound infection (50.9%) following perforation. Fever and paralytic ileus were other complications seen. The average stay in hospital was 9.7

days and there was no mortality recorded.

Although, most studies recorded wound infection as the most predominant post-operative complication with its rate ranging from 13.5% to 25.3% with associated long hospital stay between 7 and 10.7days, this is however less than the wound infection rate reported in our study (Ronchetto et al., 1990; Chamisa, 2009; Willmore and Hill, 2001; Edino et al., 2004; Fashina et al., 2009; Yeboah and Togbe, 2006; Madiba et al., 1998; Zoguéréh, 2001). In addition, a similar comparative study in Durban, South Africa recorded fever, prolonged ileus, peritonitis and chest infection in varying proportions as other post-operative complications (Chamisa, 2009).

Perforation usually results from pre-hospital delay, in-hospital delay or both. In our environment, where basic infrastructures are deficient and access to health care is difficult, patients try alternative therapy, using the government hospitals as a last resort. In addition, patients pay directly for their treatment as health insurance is available to only a minority of the population. These high user fees contribute significantly to in-hospital delays. Septicemia, fibrous adhesions, infertility in females and even death may complicate perforation. Improvement in all aspects of health care delivery is required to cut down on the perforation rate which was found in about one-third of cases of appendicitis. From the foregoing, it is obvious that perforation and peritonitis are likely complications to be watched out for in cases with acute appendicitis to prevent further devastating clinical complications.

CONCLUSION

Although, incidence of acute appendicitis is low in Sagamu, South West Nigeria, patients however, presented lately with fairly high rates of perforation and post appendectomy wound infection. The male preponderance and the peak age incidence of 21 -30 years age group of acute appendicitis are similar to that observed in other reports.

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