

An Analysis of the Pathological Features of the Vermiform Appendix Removed for Acute Appendicitis in a Tertiary Health Centre in Nigeria

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Abstract

Aim: To analyze the gross and microscopic features of acute appendicitis as seen in the histopathology department of a Nigerian tertiary health institution.

Methods: The appendices of patients histologically diagnosed as acute appendicitis were used for this study. The diameter of the appendix, gross serosal features and the luminal contents were assessed. The presence or absence of mucosal microabscesses and periappendicitis were also assessed. These were all analyzed for differences in proportion using Chi square by SPSS version 16 (p is significant at <0.05).

Results: Acute appendicitis accounted for 76.2% of all appendicectomy specimens received. The mean age was 25.3 years while the age range was between 4 and 67 years and the male to female ratio was 1.3:1. The highest frequency of cases was in the 21-30 year age group. The diameter of the appendix was greater than 0.8cm in about 88.2% of cases. The association between the diameter of the appendix and the diagnosis of acute appendicitis was, however, not statistically significant. The most frequent luminal finding were faecaliths (55.6%) although a large proportion of lumina were empty (33.6%). No helminths were seen. The serosa of the appendix was shiny, dull and fibrinous/purulent in 14.7%, 39.0% and 46.3% of cases respectively. A statistically significant association was noted between these serosal appearances and the occurrence of periappendicitis. Periappendicitis was noted in 76.1% of cases where mucosal microabscesses were observed. This association was also statistically significant.

Conclusion: Although acute appendicitis is still the most common disorder of the appendix, there has been a shift in the peak age of occurrence at our centre from adolescence to early adulthood. A statistically significant association exists between the occurrence of peritonitis and the gross appearance of the serosa as well as with the presence of mucosal microabscesses but not with the diameter of the appendix.

Keywords: Acute appendicitis, Serosa, Diameter, Microabscesses, Periappendicitis

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Introduction

Acute appendicitis remains the most commonly diagnosed lesion of the appendix, even in Africa, where it was once thought to be rare^{1,2}. It is, however, more common among Caucasians than in any other racial groups³. Over the years, many studies done in Africa have revealed an increasing incidence of acute appendicitis to the extent that it is now the most common cause of emergency abdominal surgery^{4,5,6}.

Acute appendicitis occurs more frequently during adolescence and early adulthood. In one series, it was found to be most common between ages 10 and 29 years⁷.

It is more common in males than in females with a ratio of up to 1.7:1^{4,8}. The clinical diagnosis of acute appendicitis is based primarily on the history and physical examination, with additional assistance radiographic examinations^{9, 10, 11, 12}. Nevertheless, histologic diagnosis is required in all cases with neutrophil infiltration of the muscularis propria being the ultimate diagnostic feature¹⁴.

Various factors have been implicated in the aetiology of acute appendicitis¹³. It is widely accepted, however, that the inciting event in most instances is the obstruction of the appendiceal lumen which leads to organ distension with mucus and eventual bacterial overgrowth with all the attendant consequences².

A close correlation has been observed between the gross and microscopic features of acute appendicitis². Grossly, the external appearances range from a dull, granular serosa at the earliest stages to complete gangrene in the final stages^{14,14}.

The cut surface may show the cause of the obstruction, if any, within the lumen of the appendix. Microscopically, the changes range

from minimal focal inflammation in the earliest stages to total necrosis of the appendiceal wall with the degree of abnormalities being partially dependent on the interval between the onset of symptoms and surgical intervention^{2,15}.

Materials and Methods

The surgical materials of patients diagnosed with acute appendicitis in the histopathology laboratory of the Department of Morbid Anatomy and Forensic Medicine of the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Nigeria between January, 2001 and December, 2007 were used for this study.

The patients' original request cards were reviewed and the demographic data extracted. The surgical pathology reports were also studied for details of the gross and microscopic characteristics of the specimens. Only specimens with reports indicating the diameter of the appendicectomy specimen, the gross description of its serosa and lumen were included in the study.

The gross diameters of the appendix specimens were categorized into three groups: less than 0.7cm; 0.8 - 1.0cm; and greater than 1.0cm. The gross appearance of the serosa was categorized into shiny (when it was described as smooth, transparent and/or glistening), dull (when it was described as such) and fibrinopurulent (when it was described as having fibrinous or purulent exudates and/or necrotic debris on its surface). The luminal appearance was classified into 6 variables namely: empty; faecalith; mucus; purulent; stenosed; and presence of helminthes.

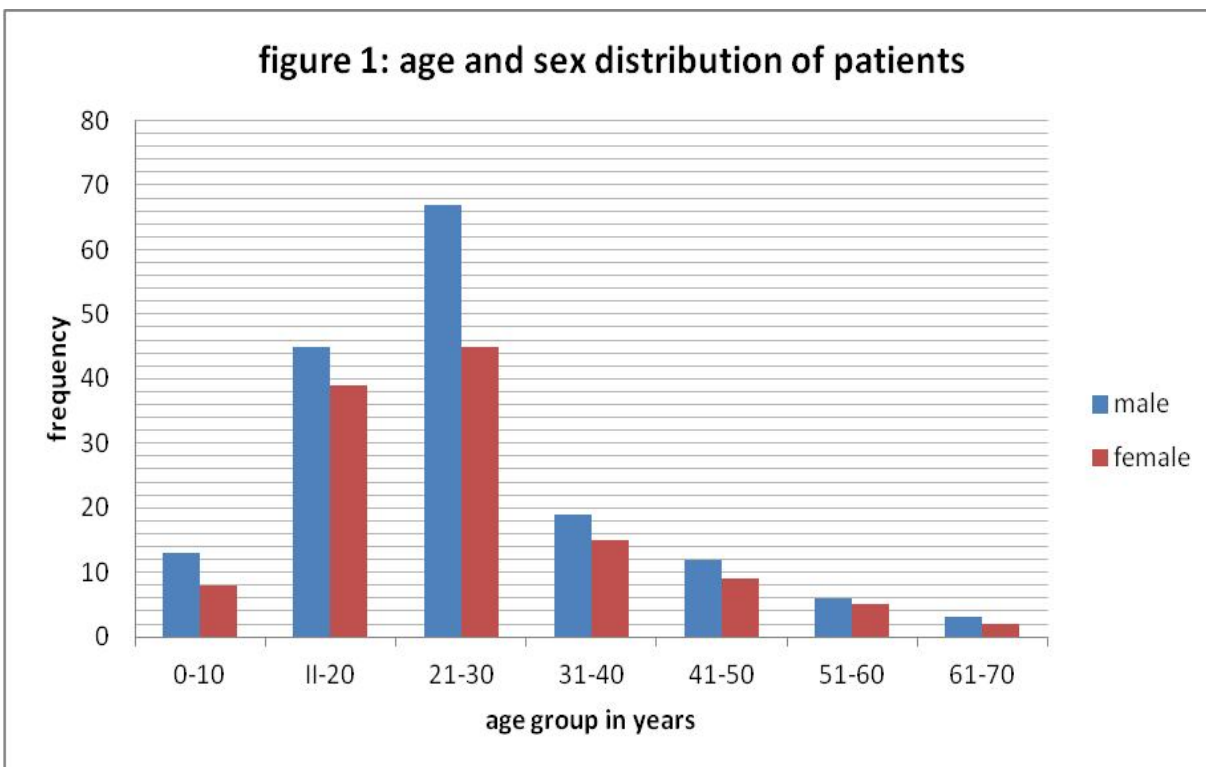
Acute appendicitis was diagnosed when there was infiltration of the muscularis propria by neutrophils. Other important microscopic features such as microabscesses and periappendicitis were also noted.

Statistical analysis of the results was performed for differences in proportion using Chi square (p is significant at <0.05) by SPSS version 16. The mean was also calculated where applicable.

Results

Figure 1 shows the age and gender distribution of the patients. Acute appendicitis was diagnosed in 288 (76.2%) of the 378 cases received in the department within the study

As seen in table 1, the diameter of the appendix as measured in 211 cases was less than 0.7cm in 25 cases (11.8%), between 0.8 and 1.0cm in 69 cases (32.7%) and more than 1.0cm in 117 cases (55.5%). Within the same period, however, there were 19 cases of histologically normal appendices removed upon a presumptive clinical diagnosis of acute appendicitis. About 11(57.9%) of these were less than 0.7cm in diameter while 6(31.6%) had diameters between 0.8-1.0cm and 2(10.5%)



period. There were 165 (57.3%) males and 123 (42.7%) females giving a ratio of 1.3:1. This male preponderance was recorded in all the age groups. The age range was from 4 to 67 years. The mean age was 25.3 years and the peak frequency was in the 21 – 30 years age group with 112 cases (38.9%). Childhood cases (0-10 years) constituted 7.3% of cases. The least number of cases was seen in the 61-70 years age group with 5 cases (1.7%). However, about 68.1% of the cases were clustered between ages 11 and 30 years. Data on patients’ age was not available in 9 cases.

measured more than 1.0cm in diameter. The association between the diameter of the

Table1: Relationship of the gross diameter of the appendix to the presence or absence of acute appendicitis

Diagnosis	Diameter of Appendix			Total
	<0.7cm	0.8-1.0cm	>1.0cm	
Acute appendicitis	25(11.8)	69(32.7)	117(55.5)	211(100.0)
Normal appendix	11(57.9)	6(31.6)	2(10.5)	19(100.0)

appendix and the diagnosis of acute appendicitis was, however, not statistically significant ($p>0.05$).

The most frequent luminal finding in the 277 cases so reported was faecalith with 157 cases (55.6%). The lumen was empty in 93 cases (33.6%), stenosed in 21 cases (7.6%) and purulent material was seen within it in 8 cases (2.9%) while mucus was seen in 1 case (0.4%). No helminthes were seen in the lumen.

The gross appearance of the serosa was described in 272 cases (table 2). The serosa was shiny in 40 cases (14.7%), dull in 106 cases (39.0%) and fibrinous/purulent in 126 cases (46.3%). About 103 (81.7%) of the 126 cases

Discussion

Acute appendicitis is the most commonly diagnosed lesion of the appendix the world over¹. A histopathologic diagnosis of acute appendicitis was made in 78.6% of appendicectomy specimens received in our laboratory during the review period. This finding is in keeping with previous work done in the same centre by Ojo et al in 1991¹. This is also corroborated by reports from other parts of Nigeria and Africa^{4,8,10,11,13}. This is not surprising as infectious diseases constitute the major health burden in our environment. Our study also confirms that acute appendicitis occurs more commonly in males^{4,5,6,7,8}. The reasons for this slight male preponderance cannot readily be explained.

Table 2: Relationship of serosal appearance and mucosal microabscesses to periappendicitis

Periappendicitis	Serosal Appearance			Mucosal Microabscesses	
	Fibrinous/Purulent	Dull	Shiny	Present	Absent
Present	103(81.7)	67(63.2)	12(30.0)	162(76.1)	31(41.4)
Absent	23(18.3)	39(36.8)	28(70.0)	51(23.9)	44(58.6)
TOTAL	126(100.0)	106(100.0)	40(100.0)	213(100.0)	75(100.0)

with a fibrinous/purulent serosa, 67 (63.3%) of those with a dull serosa and 12 (30%) of the 40 cases described as shiny were associated with a periappendicitis. The association between the gross appearance of the serosa and the presence of periappendicitis was statistically significant ($p<0.0001$). From table 2, mucosal microabscesses were seen in 213 cases (74.0%) of the 288 cases reviewed and absent in 75 cases (26.0%). Periappendicitis was also observed in 162 (76.1%) of the 213 cases with microabscesses. Ironically, periappendicitis was also observed in 31 (41.4%) of 75 cases where microabscesses were absent. The association between the presence of periappendicitis and that of mucosal microabscesses was also found to be statistically significant ($p<0.0001$).

Our study also demonstrates that acute appendicitis can occur in all age groups even though the frequency decreases after the third decade of life. The highest frequency of cases in our study was seen between 21 and 30 years of age in contrast to findings by Ojo *et al* in 1991 who found the majority of cases between 11 and 20 years of age while working in the same centre¹. Childhood acute appendicitis also accounted for a smaller proportion of our cases (7.1%) than that reported by Ojo *et al* (11.3%). In both studies, however, the vast majority of cases still occurred in the 2nd and 3rd decades of life. The reasons for these disparities may be related to specific changes in dietary preferences in these groups of

individuals over the course of time as a result of changing economic situations in Nigeria during the period involved.

A close relationship has long been noted by various workers to exist between the gross and microscopic features of acute appendicitis^{2,1}. While some have alluded to their pathogenetic significance others have used these features as prognostic indices of severity². Our study showed a statistically significant association between the presence of typical macroscopic features of appendicitis and the occurrence of peritonitis. According to our study an appendix with a dull serosa or fibrinopurulent exudates on its surface was more likely to be associated with histological evidence of peritonitis when compared with one with a shiny surface ($p < 0.0001$). Moreover, the presence of micromucosal abscesses, according to our study, should also prompt a search for microscopic evidence of peritonitis since we found a positive correlation between these two microscopic features ($p < 0.0001$). The fact that majority of our cases were associated with peritonitis suggests, however, that there is a marked delay between the onset of disease and surgical intervention at our centre.

Our study also suggests that a diagnosis of acute appendicitis was more likely when the diameter of the appendix was more than 0.8cm as opposed to a diameter less than 0.7cm. This is not surprising as luminal obstruction and hence distention of the appendix is the main pathogenetic pathway to the development of acute appendicitis. Nevertheless, the association between the diameter of the appendix and the diagnosis of acute appendicitis was not statistically significant. This may be explained by the marked variation in the diameter of the normal appendix. A significant pathogenetic role may also be attributable to specific dietary preferences as faecaliths were found to be the commonest causes of luminal obstruction. This finding is similar to that by Uba *et al* in Jos, Nigeria³. The relatively high proportion of empty appendiceal lumina, however, seems to suggest a plausible role for other pathogenetic

mechanisms or perhaps it may be due to poor handling of the appendix either at surgery or at cut-up. No helminthes were seen in any of the cases we reviewed. This contrasts with the findings by Ojo *et al* who found helminthes in 13 of the 316 appendices examined in 1991¹. This could be attributed to the mass anti-helminthic chemotherapeutic interventions instituted in the two decades preceding this study.

References

1. Ojo OS, Udeh SC and Odesanmi WO. Review of the histopathological findings in appendices removed for acute appendicitis in Nigerians. *J R Coll Surg Edinb*; 1991; 36(4): 245-248.
2. Rosai J (Ed.) *Ackerman's Surgical Pathology*. 8thed. Mosby. New York 1996.
3. Luckmann R and Davis P. The epidemiology of acute appendicitis in California. Racial, gender, and seasonal variation. *Epidemiology*. 1991; 2: 323-330.
4. Mungadi IA, Jabo BA and Agwu NP. A review of appendectomy in Sokoto, North-western Nigeria. *Niger J Med*; 2004; 13(3): 240-243.
5. Adesunkanmi AR. Acute appendicitis: a prospective study of 54 cases. *West Afr J Med*; 1993; 12(4): 197-200.
6. Onuigbo WI. Acute appendicitis in Nigerian Igbos—review of 182 cases. *Am J Proctol Gastroenterol Colon Rectal Surg*; 1981; 32(6): 6-7.
7. Thomas JO, Acute appendicitis in Buraidah, Saudi Arabia. *Cent Afr J Med*; 1998; 44(7): 176-178.
8. Mbembati NA, Lema LE, Mwakyoma HA, and Ussiri EV. Appendicitis in Dar es Salam, Histopathologic pattern. *Cent. Afr. J Med*; 1996; 42: 68-70.
9. Andersson RE, Hugander A, Ravn H, Offenbartl K, Ghazi SH, Nystrom PO *et al*. Repeated clinical and laboratory examinations in patients with an equivocal diagnosis of appendicitis.

- World Journal of Surgery; 2000; 24(4):479-485.
10. Vasavada P. Ultrasound evaluation of acute abdominal emergencies in infants and children. *Radiologic Clinics of North America*; 2004; 42(2):445-456.
 11. Macari M and Balthazar EJ. The acute right lower quadrant: CT evaluation. *Radiologic Clinics of North America*; 2003; 41(6): 1117-1136.
 12. Lee SL, Ho HS. Ultrasonography and computed tomography in suspected acute appendicitis. *Seminars in Ultrasound, CT & MR*; 2003; 24(2):69-73.
 13. Rain AJH, Ritchie DH, Editors. *Bailey & Love's Short Practice of Surgery*. 19th ed. London: H.K. Lewis; 1984.
 14. Liu C and Crawford JM. The Gastrointestinal Tract. In: Robbins and Cotran *Pathologic Basis of Disease*. 7th ed. Kumar V, Abbas AK, Fausto N (Eds). Elsevier. Pennsylvania. 2005; 870-872.
 15. Tsuji M, Puri P and Reen DJ: Characterization of the local inflammatory response in appendicitis. *J Pediatr Gastroenterol Nutr*; 1993; 16: 43-48.
 16. Therkelsen F. On histologic diagnosis of appendicitis. *Acta Chir Scand* 1948; 94(Suppl 108): 1-48.
 17. Butler C. Surgical pathology of acute appendicitis. *Hum Pathol* 1981; 12(10): 870-878.
 18. Uba AF, Lohfa LB and Ayuba MD. Childhood acute appendicitis: Is routine appendectomy advised? *J Indian Assoc Paediatr Surg*. 2006; 11(1): 27-30