

ACUTE APPENDICITIS: PATHOLOGY OF 1,000 CASES

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SUMMARY

A retrospective study of the pathology seen in 1,000 consecutive appendectomy specimens with a pre-operative diagnosis of acute appendicitis, was made in an attempt to find common factors which might throw light on the aetiology of the disease. Acute inflammation was seen in 775 cases. In 225 cases where no inflammation was seen, 168 appendices were associated with other pathology, i.e., lymphoid hyperplasia, fibrosis and tumour. In 57 cases the appendix was not inflamed. Acute inflammation was seen more in males and in patients aged below 30 years, while normal appendices were more commonly seen in females of reproductive age.

INTRODUCTION

The aetiology of acute appendicitis, the most common surgical emergency still remains obscure and is probably multifactorial. One thousand appendices removed from cases where a pre-operative clinical diagnosis of acute appendicitis was made were examined in the Histopathology Laboratory, General Hospital, Kuala Lumpur, in an attempt to find common factors which

might throw light on the aetiology of the disease. Appendices removed incidentally during the course of other surgical procedures and appendices from cases of elective appendectomy were excluded from this study. All the patients were seen between September 1982 and May 1983.

MATERIAL AND METHODS

The appendices for histopathological examination were received fixed in 10% Formalin. From the request form, the patient's age, sex, ethnic origin, the clinical history and findings were recorded.

The specimens were examined macroscopically for the presence of exudate, haemorrhage, perforation and faecoliths. The length was recorded. The appendix was bisected and one representative longitudinal section to include the tip and one or more cross sections of each appendix were processed into paraffin blocks. Haematoxylin and Eosin-stained sections were examined microscopically; in selected cases, special stains were done. The author personally reviewed all histopathology slides of these cases.

Inflamed appendices were divided into three categories according to macroscopic and microscopic findings. Category 1 — acute suppurative appendicitis with peritonitis, where the diagnosis was obvious at macroscopic examination; the organ being swollen, congested, freely covered with fibrin or pus and in many cases obviously

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perforated and gangrenous. Microscopy showed ulceration of the mucosa and an intraluminal and intramural infiltrate of acute inflammatory cells which extended into the periappendicular tissue.

Category 2 – early appendicitis where the organ appears normal on macroscopic examination but on microscopic examination, an infiltrate of polymorphs is seen in the lumen or mucosa but not extending to the serosa. The architecture of the appendix is also well preserved with minimal mucosal ulceration.

Category 3 – periappendicitis where, on macroscopic examination, the organ appears normal or only congestion of the serosal vessels is seen. On microscopic examination there is an infiltrate of polymorphs confined mainly to the serosa but which may extend into the wall.

RESULTS

Table I details the sex and race incidence of cases. There was a slight male preponderance of cases, i.e. 558 males to 442 females. Four hundred and fifty-three (81.2%) appendices in males showed inflammation compared to 321 (72.6%) in females (Table II). On correction of the race incidence for hospital admissions according to race for the period of study, no racial preponderance was noted.

TABLE I
APPENDICECTOMY : SEX AND RACE
INCIDENCE OF CASES

| Race | Number of Cases | | | (%) |
|---------|-----------------|--------|-------|------|
| | Male | Female | Total | |
| Malay | 227 | 183 | 410 | 41.0 |
| Chinese | 193 | 145 | 338 | 33.8 |
| Indians | 133 | 111 | 244 | 24.4 |
| Others | 5 | 3 | 8 | 0.8 |
| Total | 558 | 442 | 1,000 | 100 |

TABLE II
SEX INCIDENCE OF INFLAMED APPENDICES

| | Number of Cases | | | (%) |
|--------------|-----------------|--------|-------|-------|
| | Male | Female | Total | |
| Inflamed | 453 | 321 | 774 | 77.4 |
| Non-Inflamed | 105 | 121 | 226 | 22.6 |
| Total | 558 | 442 | 1,000 | 100.0 |

Table III shows the age incidence of cases. Seven hundred and ninety-nine cases were below 30-years of age. The oldest patient was 82-years-old while the youngest was four-years. In both these cases the appendices were acutely inflamed. As for the length, the longest appendix measured 11.5 cm, while the shortest appendix was 3.5 cm.

Pathology

The histological findings are presented in Table III.

In 775 cases, the appendix was acutely inflamed. In 544 cases, there was suppuration with peritonitis while in 217 cases, early inflammation was seen. Periappendicitis was seen in 14 cases. 75.5% of cases with acute conditions were below 30-years. In 74 cases, acute inflammation was associated with other pathology (Table IV). In most of the specimens with suppuration, the morphology of the appendix was so greatly altered that it was not possible to assess the presence of faecolith or lymphoid hyperplasia.

Fourteen cases of periappendicitis were noted. Of these, 12 (85.7%) were below 30-years old and 11 (78.6%) were female. In all these cases the cause of periappendicitis was not identified at surgery.

Non-inflamed appendices were observed in 255 cases in this study. Of these, only 57 were normal appendices. One hundred and sixty-eight appendices were associated with other entities

TABLE III
APPENDICECTOMY : PATHOLOGY AND AGE INCIDENCE OF CASES

| Decades (years) | Pathology | | | | Total |
|--------------------|--------------------|---|------------------|-----------------|-------|
| | Early appendicitis | Appendicitis with suppuration and peritonitis | Periappendicitis | No inflammation | |
| 0 – 10 | 13 | 71 | 0 | 22 | 106 |
| 11 – 20 | 78 | 169 | 3 | 95 | 345 |
| 21 – 30 | 78 | 164 | 9 | 77 | 328 |
| 31 – 40 | 26 | 86 | 1 | 16 | 129 |
| 41 – 50 | 16 | 30 | 1 | 10 | 57 |
| 51 – 60 | 4 | 16 | 0 | 5 | 25 |
| 61 – 70 | 2 | 5 | 0 | 0 | 7 |
| 71 – 80 | 0 | 2 | 0 | 2 | 2 |
| 81 – 90 | 0 | 1 | 0 | 1 | 1 |
| Total | 217 | 544 | 14 | 225 | 1,000 |

TABLE IV
ADDITIONAL PATHOLOGY FOUND IN APPENDICES REMOVED

| | Inflamed appendix | Non-inflamed appendix | Total |
|---------------------------------------|----------------------|--------------------------|-------|
| Worm infestation | 33 | 41 | 74 |
| Faecolith | 16 | 74 | 92 |
| Lymphoid hyperplasia | 9 | 18 | 27 |
| Faecolith and lymphoid hyperplasia | 8 | 25 | 33 |
| Entamoeba histolytica | 1 | 5 | 6 |
| Adenomatous hyperplasia | 1 | 0 | 1 |
| Diverticulum | 2 | 0 | 2 |
| Bacteria | 1 | 0 | 1 |
| Fibrosis | 1 | 2 | 3 |
| Carcinoid tumour | 1 | 1 | 2 |
| Second non-inflamed appendix | 1 | 0 | 1 |
| Calcified nodule | 0 | 1 | 1 |
| Total | 74 | 168 | 242 |

TABLE V
CASES WITH NORMAL APPENDIX

| Age groups (yrs) | 0 – 10 | | 11 – 20 | | 21 – 30 | | 31 – 40 | | 41 – 50 | | 51 – 60 | | Total |
|------------------|--------|---|---------|----|---------|----|---------|---|---------|---|---------|---|-------|
| | M | F | M | F | M | F | M | F | M | F | M | F | |
| Race: Malay | 1 | 0 | 5 | 5 | 2 | 7 | 1 | 0 | 0 | 0 | 0 | 0 | 21 |
| Chinese | 0 | 0 | 3 | 3 | 1 | 5 | 2 | 0 | 1 | 3 | 0 | 1 | 19 |
| Indian | 1 | 0 | 2 | 8 | 2 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 17 |
| Total | 2 | 0 | 10 | 16 | 5 | 13 | 3 | 1 | 2 | 3 | 1 | 1 | 57 |

*M = male; F = female.

(Table IV). 80.7% of cases, where a normal appendix was diagnosed on histology, were in patients below 30 years and 59.6% were female.

Normal appendices were seen more often in Indians than in the Chinese or Malays, on correction of the race incidence for hospital admission (Table V).

Other entities found in the appendices removed

Faecolith. This was seen in 125 cases (Table IV). In 74 cases, no other pathology was seen, while 25 were associated with lymphoid hyperplasia, 16 with inflammation and eight with lymphoid hyperplasia and inflammation.

Worm Infestation. In 74 cases, adult nematode or ova was seen in the lumen. In 41 cases, there was no other pathology and in 33, there was inflammation as well. *Enterobius vermicularis* was the most common nematode encountered (Fig. 1); the others being *Ascaris lumbricoides* and *Trichuris trichiura*. The adult *Trichuris* was not seen in any sections in this study.

Lymphoid Hyperplasia. In 18 cases, this was the sole finding while it was associated with faecoliths in 33 cases and acute inflammation in nine cases.

Entamoeba histolytica. In six specimens, *E. histolytica* trophozoite was seen in the lumen

of the appendix. The Periodic Acid Schiff stain was done to demonstrate and support the diagnosis. In one case, inflammation of the appendix was seen as well. Invasion of fissure was not demonstrated.

Tumours. Two cases of carcinoid of the appendix was seen. Both cases were males, aged 27 years and 36 years. The tumour was confined to the appendix. The packeting arrangement of cells was characteristic (Fig. 2). Argyrophilic granules in the cytoplasm were demonstrated using the Grimelius stain.

Miscellaneous Entities: Fibrosis – In two of the three cases seen, there was complete loss of the mucosa and the lumen due to fibrosis. Focal fat infiltration was also seen.

Diverticulitis. Two cases were noted and in both, the diverticular wall was of mucosa only.

Duplication. In a case, a second non-inflamed caecal appendix was seen and removed.

DISCUSSION

This study reaffirms Boyce's statement¹ that acute appendicitis is a disease of the young. 79.9% of cases in this study occurred in the first three decades while only 1% occurred in patients more than 60 years of age. It also supports Morson and Dawson's statement² that acute appendicitis is more common in males. 58.5% of cases were in

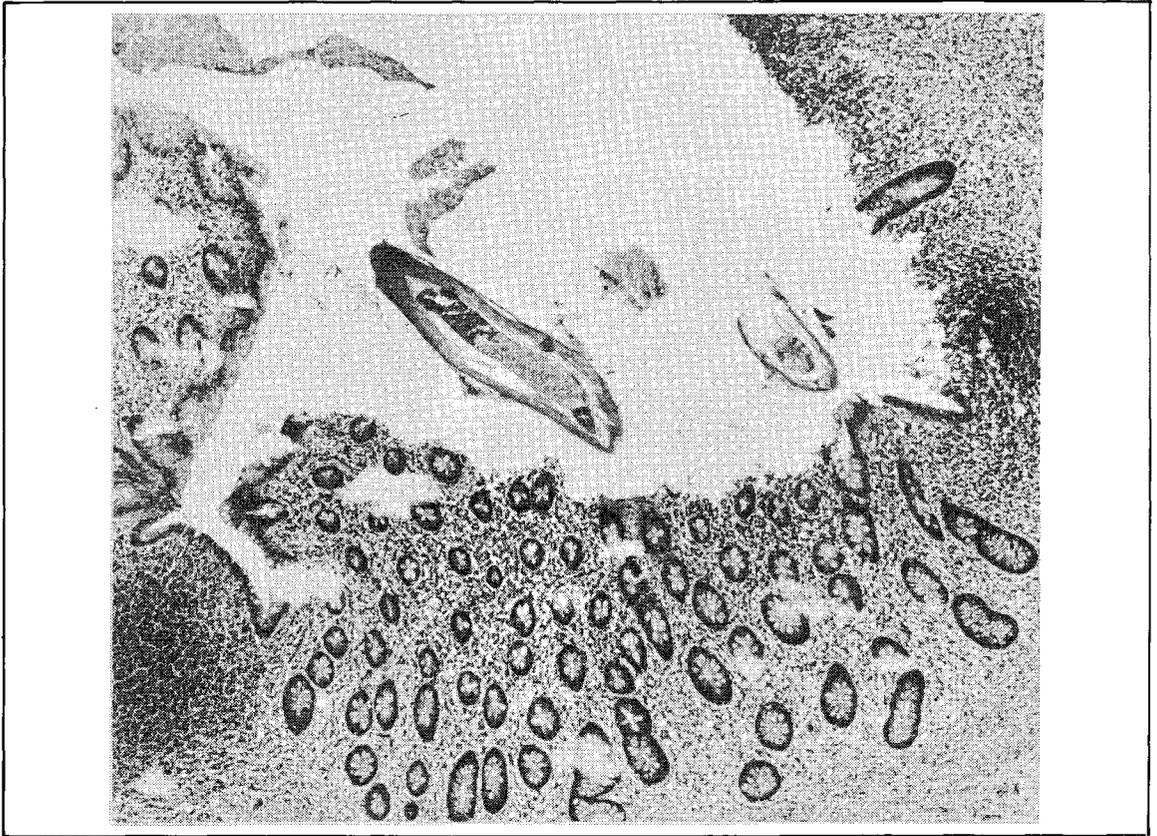


Fig. 1 Section of *Enterobius vermicularis* in lumen of appendix (x 40).

males, compared to 41.5% in females. No racial preponderance is seen in this study but a previous study⁶ showed a higher incidence in the Chinese.

In 5.7% of appendices examined, no inflammation or other pathology was seen. This is comparable to other series (Chang³ – 18%; Boerema *et. al.*,⁴ – 23.2%; Kannan Kutty and Balasegeram⁵ – 12.9%). In a previous study of 292 cases of acute appendicitis at the Seremban General Hospital,⁶ 4.8% of cases were found to have normal appendices at operation. No mention is made of histological confirmation of diagnosis in this study.

Normal appendices are commonly removed in females in the first three decades. A possible explanation is the frequent occurrence of pain

associated with gynaecological disorders in women during the reproductive period. But this does not explain the 10% of cases occurring in the first decade.

Obstruction of the appendicular lumen is thought to play an important part in the pathogenesis of appendicitis.⁷ The obstruction can be by lymphoid hyperplasia and/or faecoliths,^{4,7,8} and by nematodes.⁵

Of 725 cases of acute appendicitis, faecolith, lymphoid hyperplasia or nematode was only seen in 66 cases. In most of the specimens where suppuration was seen, the morphology was so much altered that it was not possible to assess the presence of faecolith or lymphoid hyperplasia.

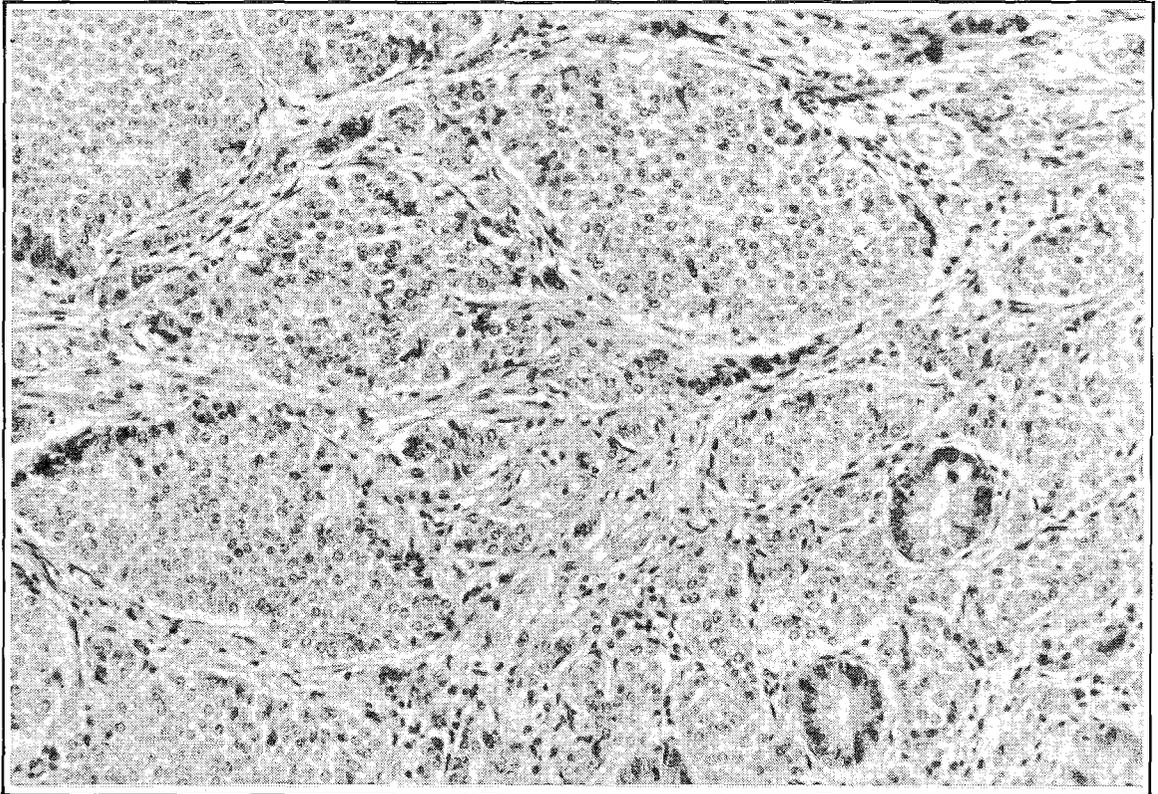


Fig. 2 Characteristic 'packetting' arrangement of cells of carcinoid tumour of appendix (x 40).

This study does not substantiate the claim that obstruction by faecolith and/or hyperplastic lymphoid tissue is of importance in the pathogenesis of acute appendicitis. Lymphoid hyperplasia and faecolith as the only pathological finding was seen in 18 cases and 74 cases respectively. It would be interesting to accord symptoms of acute appendicitis to this.

In cases where nematode adults or ova were seen, the numbers were not large enough to cause obstruction. Gut nematode as the only finding was seen in 41 appendices. Perhaps these parasites can cause symptoms of acute appendicitis by other mechanisms i.e. by toxic or traumatic effects as postulated by a previous study from this department.⁵

Neoplastic disease of the appendix was not a common finding (2% of cases). In contrast

to previous studies, the female preponderance of carcinoid tumours is not borne out by this study. As with previous studies it is seen in the third and fourth decades. In both cases there was no evidence of metastasis.

CONCLUSION

This study does not establish any definite aetiology or pathogenesis of acute appendicitis but it does show that in the majority of cases the histological findings is in agreement with the clinical diagnosis.

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