

APPENDICITIS—STILL A CONSIDERABLE PROBLEM*

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Acute appendicitis is a disease of progressively decreasing mortality and a low but still significant morbidity. There has been a tendency, therefore, to minimize the importance of the condition and to delegate responsibility for its management to some junior and less experienced member of the surgical team. There is, however, agreement among surgeons that pre-operative diagnostic difficulties are all too frequent and that accuracy in diagnosis leaves much to be desired.

A review of our own cases may lead to a recognition of some of the difficulties, and at the same time allow identification of those factors which would more consistently enable a correct diagnosis to be made. It was also hoped to gain some data on the problem of 'chronic appendicitis', a condition which has proved previously to give rise to much loose surgical talking.

CASES AND METHODS

During a 20-month period from January 1966 to August 1967, 414 appendices were removed at Johannesburg Hospital. A random group 215 cases was selected from the total number for retrospective analysis, the distribution of appendicectomies being shown in Table I.

TABLE I. DISTRIBUTION OF APPENDICECTOMIES

Type of case	Number
Actual/suspected acute appendicitis	192
Elective:	
Previous abscess	4
Recurrent RIF pain	3
Incidental:	
Surgical	4
Gynaecological	12
Total	215

The cases of 'acute appendicitis' were drawn from 3 surgical units, in 2 of which they were seen on admission by the resident staff (house surgeon and registrar). In the

third unit most of the cases were seen in addition by a more senior member of staff.

RESULTS

It can be seen from Table I that 192 patients were operated on for a diagnosis of acute appendicitis or suspected acute appendicitis, and this group forms the basis of this study. It consists of 90 males and 102 females.

The age distribution (Fig. 1) is notable for the maxi-

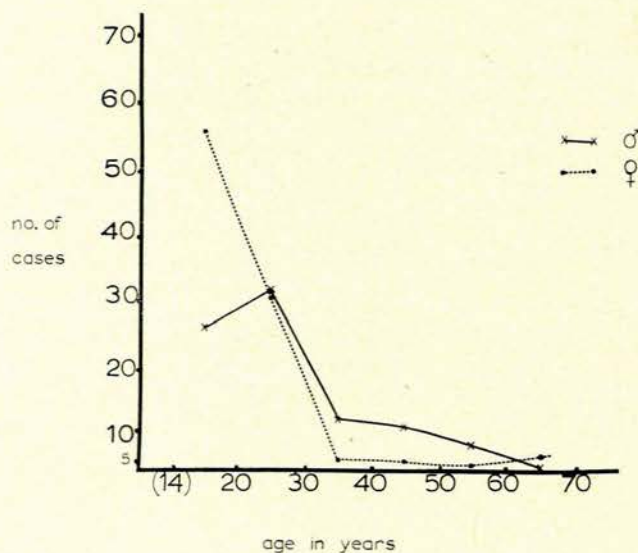


Fig. 1. Age distribution of emergency appendicectomies (192).

imum incidence in the second decade in females and third decade in males, and also for the important group occurring over the age of 60 years.

Perforated appendices were found in 8.8% of the emergency appendicectomies.

*Date received: 18 July 1968.

The criterion for diagnosing acute appendicitis was the presence of acute inflammatory cells within one or more layers of the wall of the appendix, and several cases containing only polymorphonuclear cells within the lumen were not included as positives. When the inflammation appeared to start from the serosal surface, as with an associated salpingitis, these cases were likewise excluded.

Only 55.3% of cases were thus histologically positive. The high diagnostic error in each sex is clearly shown for each age-group in Fig. 2.

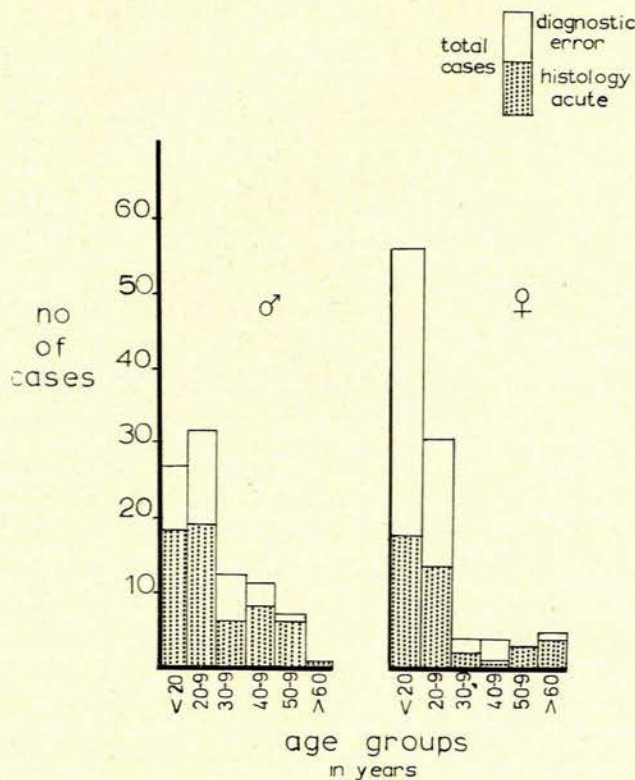


Fig. 2. Incidence of positive diagnosis by age and sex.

The over-all histological findings are summarized in Table II.

TABLE II. OVER-ALL HISTOLOGICAL FINDINGS

Histology	No. of cases
Acute	98
Acute-on-chronic (included above)	12
Chronic	42
Lymphoid hyperplasia	21
Normal	16
Total	177

} 54 chronic

On the basis of the degree rather than the extent of inflammation within the wall of the appendix, there were 81.6% of severe and 18.4% of mild cases within the histologically positive group.

The history and physical findings of the histologically acute group were further analysed, and the results are summarized in Figs. 3 and 4 and Tables III - V.

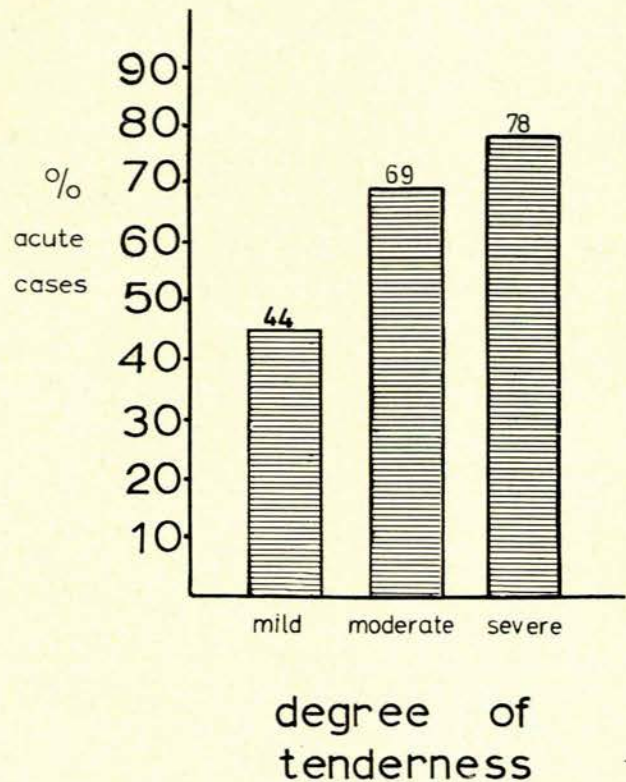


Fig. 3. Incidence of acute appendicitis according to the degree of tenderness.

TABLE III. CORRELATED TEMPERATURE AND PULSE — ACUTE CASES

Pulse/min.	Temperature °F			
	<98.4°F	98.4-99.8°F	100.0-101.0°F	>101.0°F
<72	6	1	1	0
72 - 90	22	21	10	0
92 - 110	6	16	5	8
>110	2	4	2	3

TABLE IV. LEUCOCYTOSIS IN ACUTE APPENDICITIS

WBC	Acute	Perforated
<10,000/cu.mm.	25.6%	25%
10 - 15,000/cu.mm.	42.7%	37.5%
15 - 20,000/cu.mm.	24.3%	21.2%
>20,000/cu.mm.	7.4%	16.3%

TABLE V. HISTOLOGY IN RELATION TO RECURRENT PAIN

Histology	No. of cases
Acute	24
Acute-on-chronic	5
Chronic	17
Follicular hyperplasia/normal	21*
Report not available	10
Total	77

*See text.

Pre- and postoperative antibiotics were used in 43.7% of the over-all study group, including all cases with perforations.

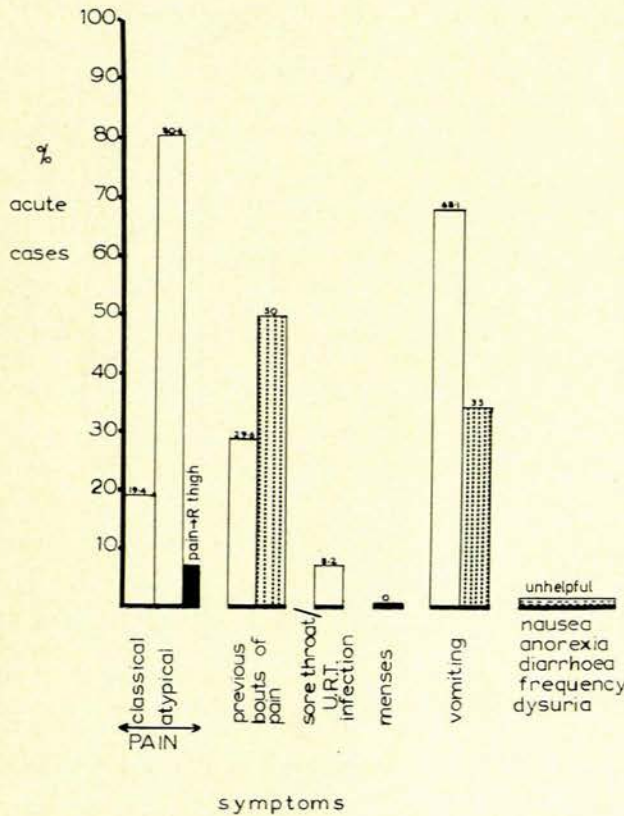


Fig. 4. History in acute appendicitis. Shaded columns indicate the non-acute group for comparison.

No deaths occurred in this series in cases having emergency appendicectomy. Reference to Table VI shows

TABLE VI. MORBIDITY AFTER EMERGENCY APPENDICETOMIES

Type	No. of cases	Comment
Pulmonary complications	16	Major in 6 cases
Wound sepsis	17	Perforated appendix 6
Pelvic abscess	2	1 early—on Dindevan; 1 late
Subphrenic cellulitis	1	
Jaundice	2	Transient
Prolonged ileus	1	
Pyrexia of unknown origin	1	
Intestinal obstruction: Early	3	
Late	unavailable for this series*	

*Just over 20% of obstructions admitted to one unit of Johannesburg Hospital during 12 consecutive months of the period under review were due to adhesions where appendicectomy had been the only previous operation.

that there was considerable morbidity. Of particular interest is the incidence of intestinal obstruction, both the early variety and, for comparison, late obstruction (i.e. after 6 months) as analysed for a single unit at the same hospital during 13 months of the period under review.

DISCUSSION

These results show quite clearly that there is no room for complacency in the over-all management of appendicitis.

It is obvious that the group at greatest risk of having an appendicectomy is females under the age of 20 years. In the third, fourth and fifth decades, males are more frequently subjected to surgery, while over the age of 60 years females again predominate. This latter peak may be explicable merely on the greater normal life expectancy of females, but perhaps a true higher incidence does occur at this time. If the present trend of appendicetomies continues, we shall produce within the next few decades a female population reaching middle age without their appendices, so that the second peak should then disappear.

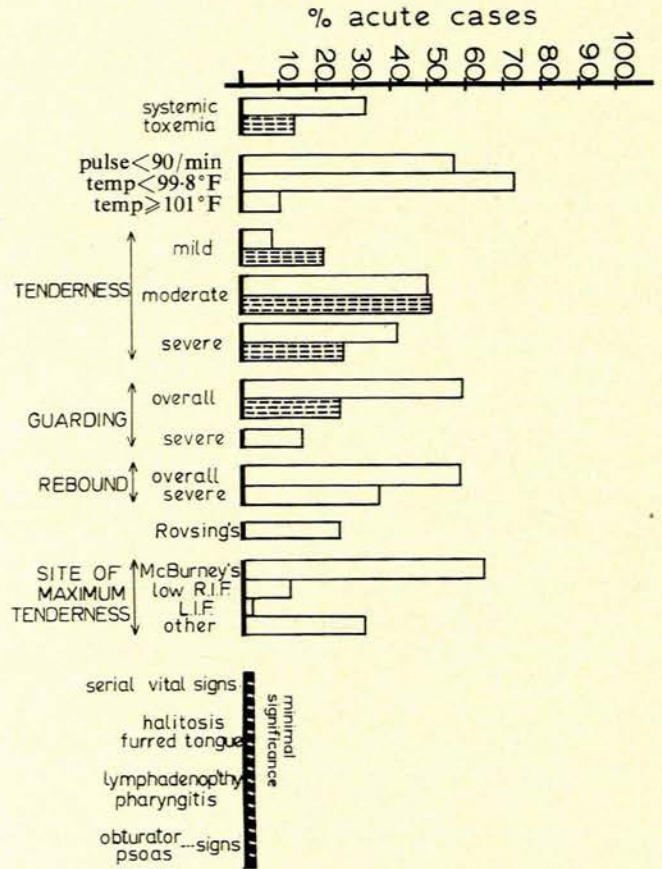


Fig. 5. Physical findings in acute appendicitis. Shaded columns indicate the non-acute group for comparison.

The most striking feature of this series has been the very high over-all diagnostic error of 44.7%. For the individual groups the error was highest (69.6%) in the very patients at greatest risk of having an appendicectomy, namely females under 20 years, while males and females in the third decade had diagnostic errors of 40.6% and 57% respectively. It is notable that Silber¹ reported a diagnostic error of 43.9% in his series of cases diagnosed pre-operatively as acute appendicitis. He also found that diagnostic errors were almost twice as common in females as in males in the second and third decades. It is salutary, therefore, that so little progress has been made in the interval between Silber's report and this series, considering the declining status accorded the ap-

pendix, to which reference has been made. Hobson and Rosenman,² discussing 801 patients with pre-operative diagnoses of acute appendicitis, reported 72% of positives, while 21% had normal appendices removed at the time of operation. I feel that 20% constitutes the acceptable upper limit of normal appendices removed as emergencies, in spite of suggestions by various authors that this figure could well be increased in view of the existing high rate of perforated appendices.

This series shows a perforation rate of 8.8% without mortality. This latter fact in a group including, as it did, several elderly patients, was attributed simply to the very adequate postoperative care which they received, and must not be allowed to breed complacency, particularly as the associated morbidity was considerable. It should be apparent that the surgeon has to choose between too frequent and perhaps unnecessary operations on the one hand, and too few and perhaps unduly delayed operations on the other, the latter course obviously inviting a higher incidence of perforated appendicitis.

A study of our perforated cases showed that none of them had progressed from an uncomplicated inflammation while under observation in our wards. They were all received in the wards with a diagnosis of perforation being made on early initial examination. The culpable factors, however, appeared to be delay at the patient, practitioner or transport levels. It is interesting to note that Boyce³ stated, 'it is literally true that the fate of all patients with acute appendicitis lies first in their own hands and secondly in the hands of the doctors whom they first consult'. Lie⁴ stated that 'the gospel of seeking early medical advice *without* any self-medication such as purgation should still be shouted from the house-tops'. Perhaps over-zealousness in guarding against perforation in our cases was in fact responsible for a higher proportion of unnecessary operations. This zeal might more usefully be employed in a lengthier period of careful observation which would undoubtedly separate a number of true cases of appendicitis from cases of mesenteric adenitis, spastic colon, *mittelschmerz* or other tubo-ovarian lesions causing pain. Another benefit from such a policy of careful observation would be to clarify those instances in which other surgical conditions such as leaking duodenal ulcer, Meckel's diverticulitis and mesenteric vascular occlusion occur and need operation anyhow, but in which better management could be achieved by more pre-operative knowledge of the pathology. Such a group did not occur in our series, but Hobson and Rosenman noted that 7% of their cases operated on for acute appendicitis had some other surgical lesion.²

We cannot rely on the classical history of pain, as this was present in less than one-fifth of acute cases. The atypical histories included radiation of pain down the right thigh in 8% of acute cases, of which over half were in males, so that this feature does not negate the diagnosis of acute appendicitis. The mechanism of this pain is not clear but it is obviously not always ovarian in origin. Lie stressed the point of an unreliable history and quoted the series of Campbell and McPhail who found the typical pain described in only 39% of their cases.⁵

Previous bouts of abdominal pain similar to the current

episode occurred in 29.6% of the acute cases, suggesting that many cases of early appendicitis do settle down spontaneously if left alone. This point is supported by the finding that 12.8% of the acute cases showed histological evidence of acute-on-chronic inflammation (Table II), indicating previous involvement which had either produced symptoms or occurred subclinically. A history of one or more previous attacks of pain has also been noted in other series^{5,6} to occur in from one-third to one-half of cases with acute appendicitis. The mechanism of such pain may possibly be related to previous acute attacks which subsequently resolved completely, or to the finding of lymphoid hyperplasia and fibrosis with kinking and obstruction of the lumen. These latter findings are frequent on histological examination.

Of the group of cases marked with an asterisk in Table V, two-thirds had no extra-appendicular lesion which might have accounted for pain. It was felt that recognition of these cases would be important and might constitute one group in which operations could definitely be avoided. However, detailed analysis failed to reveal any features setting these patients apart from the rest. In the series of Hobson and Rosenman half of the cases with normal appendices had no anatomical abnormality to account for pain, i.e. 10% of all cases operated on for acute appendicitis.

The significance of follicular hyperplasia alone is not clear; it may represent the early phase of acute appendicitis, or it may be part of the lymphoid response in mesenteric adenitis. When present with intramural fibrosis, it probably indicates previous inflammation. Howie⁷ regards it as an almost universal finding in adult appendices and attaches no particular significance to it.

It has long been taught that patients with uncomplicated acute appendicitis vomit infrequently or not at all, but this was not the case in our series. Fig. 2 shows that while two-thirds of the cases vomited, one-third did so on 3 or more occasions. It was also noted that not all patients who vomited frequently were in the group with severe appendicitis.

The simultaneous occurrence of menstruation and acute appendicitis was rare in this series. Does the increased vascularity of pelvic viscera at the time of menstruation assist in the early resolution of appendicular inflammation? This problem remains to be solved.

Systemic toxæmia was present twice as frequently in the positive group as in the group without acute appendicitis, but vital signs such as pulse rates and temperatures were of little value for the individual case. Many acute cases had normal temperatures and pulse rates. Accessory signs such as halitosis and furring of the tongue have not been useful diagnostic features, although Mason-Brown⁸ has indicated their usefulness in children. Campbell and McPhail suggested that these signs indicated spread of inflammation beyond the appendix.

Lymphadenopathy and pharyngitis were noted so infrequently that, together with the paucity of history of sore throats or upper respiratory tract infections, one feels that the myth of their usefulness in the diagnosis of right iliac fossa pain should be exploded.

Tenderness was the single most useful diagnostic sign in this series (Table III). As would be expected, the percentage of acute appendices in each group rose as the degree of tenderness increased (Fig. 2). Severe tenderness, especially when guarding was also present and severe, was strongly suggestive of appendicitis rather than other pain-producing lesions, while salpingitis was most readily diagnosed after vaginal examination had revealed severe cervical excitation pain and tenderness. It was very rare to find such a degree of cervical pain with other varieties of pelvic peritonitis and this is presumably related to the presence or absence of inflammation within the broad ligament.

It is suggested that in those cases with only mild to moderate tenderness and no guarding, a period of careful observation in hospital is indicated. Many of these undoubtedly settle down completely, but perhaps some resolve incompletely and progress to the chronic inflammatory state, which may or may not be clinically evident.

Indirect signs such as psoas, obturator, or Rovsing's signs were unhelpful, only the last-named being present with any frequency (26%). In his review, Lie found very little importance attached to these signs in recent literature.

The possible relationship of right iliac fossa pain and a positive psoas sign should be remembered, especially in children, as pointed out by Cywes and Dall,⁹ who drew attention to the condition of primary intra-psoas abscess presenting as appendicitis, where, of course, negative findings at appendectomy are inevitable.

A striking aspect of this series was the lack of uniformity in histological reporting, suggesting that different pathologists adopt different criteria for the diagnosis of acute appendicitis. Such lack of unanimity was not unique to this series, as Howie has also recorded similar difficulties in his series of 460 cases.⁷ One feels that a first step towards a clearer understanding of the right iliac fossa pain syndrome should be to standardize histological reporting. A prospective study and correlation with various histological groupings would undoubtedly yield useful information.

Antibiotics were given to 43.7% of the cases operated on as emergencies, of whom only 8.8% had perforated appendices. It appeared at first that antibiotics were being used on minimal indications, but it became evident that even cases with the tensely swollen pregangrenous appendix, but without frank perforation, were not being treated thus as a routine, except in the elderly or frail. It would appear to be rational, when the meso-appendix is oedematous and friable, to treat this with antibiotics. Du Plessis,¹⁰ however, maintains that this lymphangitis is present in all acute cases and advises routine antibiotic cover for these patients. It must be stressed that antibiotics are not used to cover defects in surgical technique, and in this series frank wound sepsis occurred in 17 cases, of whom 12 were on antibiotic cover.

The mortality was nil in this series, in keeping with the very low mortality quoted by others. Morbidity was significant. The occurrence of intestinal obstruction should be stressed. It is this aspect more than any other which has

led to the more cautious attitude towards the doubtful case in the hope that less unnecessary operations will be performed, with correspondingly less adhesions to produce obstruction. Lie has summarized the opposing viewpoint by stating that 'it is far better to subject a moderate number of patients to a theoretically unnecessary operation, than to let one person suffer perforation with 100 times the likelihood of dying'. Our own figures show that by intensive and conscientious supportive therapy, the mortality from perforated appendicitis can be very low indeed. Earlier admission to hospital and thus earlier surgery would no doubt reduce this mortality even further.

The Problem of Chronic Appendicitis

Much has been argued about this condition. The existence of a chronic, non-specific, inflammatory state as a pathological entity is beyond doubt. The criteria for its histological diagnosis were:

1. Non-granular cell infiltrate into one or more layers of the wall.
2. Variable degrees of submucosal or intermuscular fibrosis.
3. Associated lymphoid hyperplasia.

Clearly this describes a non-specific inflammatory state without any of the specific diseases such as bilharzia, tuberculosis or regional enteritis, which occasionally affect the organ. This chronic state may result from poorly resolved acute inflammation which may or may not have been clinically apparent, or from a low grade process *de novo*. Table II shows that 54 cases had chronic inflammation, representing 30.5% of acutely removed appendices, while 43.8% of incidentally removed appendices showed these histological features.

Is this condition symptomatic? Of the 54 cases referred to above, 46.6% gave a history of previous attacks of similar pain, while 25.4% were found at operation to have significant mesenteric adenitis and no other pathology. Assuming this latter to be a recurring condition and therefore a possible cause of the previous pains, there remains a group of 21.2% of cases with chronic inflammation and without other extra-appendicular lesions to account for their symptoms. A further analysis of the group of cases with mesenteric adenitis showed that while 50% had previous bouts of pain, 66% had histologically chronically-inflamed appendices, demonstrating a small group (16%) of cases who develop subclinical chronic appendicitis. It is probable that some cases in the group with symptomatic chronic appendicitis are in reality suffering from the irritable colon syndrome, and appendectomy in these cases may merely be the start of a long series of surgical procedures.

Thus, it does appear that there is a small group in whom chronic appendicitis may give rise to pain, while the condition probably develops insidiously in most other cases, and there would appear to be little justification for the removal of the appendix for chronic right iliac fossa pain, at least until some more definite method is found of establishing that the organ is diseased. A possible argument, however, in favour of removing the 'grumbling' appendix is that this elective operation carries a negligible

risk, while if acute appendicitis supervenes with the possibility of perforation, the risk is significantly increased. There is not adequate evidence to suggest that chronic inflammation predisposes to acute appendicitis, as less than 6% of our acute cases had associated chronic inflammation.

Incidental Appendectomy

Many surgeons remove the appendix whenever they perform laparotomy for other reasons. We have not practised this, but the gynaecologists at our hospital have done this for some time. Of the 16 elective appendectomies in this series, 43.8% showed a chronic inflammatory state, but there was no instance of an acutely inflamed appendix being removed incidentally during the performance of other elective or emergency procedures. Harkins,¹¹ however, has had several such instances especially during gastric resections, and he has advocated appendectomy during laparotomy and even during a right-sided inguinal hernia repair. He stated that such practice obviates the distressing occurrence of acute appendicitis during early postoperative convalescence. There was no such case in our series, although Hobson and Rosenman noted 19 cases of acute appendicitis when this organ was removed during operations for other conditions in their series of 820 appendectomies under review.²

A reasonable compromise seems to be an appendectomy during other operations only if the appendix is readily accessible and can be removed with minimal dissection and mobilization.

SUMMARY

A series of 192 cases operated on for a pre-operative diagnosis of acute or suspected acute appendicitis in a large teaching hospital has been reviewed. It has been shown that this operation is most frequently undertaken in females below the age of 20 years, and that this group of patients is also the one with the highest diagnostic error. The misdiagnosis was also considerable in other patient groups, and compares well

with previously reported series.

The lack of a uniform clinical history is stressed, while those symptoms most frequently encountered have been tabulated. The frequent occurrence of vomiting was not an unusual feature, and should not be taken to indicate non-appendicular disease as has previously been stated. The most helpful clinical signs were tenderness, especially when severe and when some guarding was also present, and rebound tenderness, especially when this was located at the site of maximum tenderness. Accessory signs were of little help and vital signs did not assist the diagnosis of the individual case.

It is suggested that in cases which do not show much tenderness, a period of careful observation in the ward should be undertaken. Some of the benefits of such a policy are stated, and the risks of an increased perforation rate should be minimal if proper assessment is made.

Morbidity in this series was significant, and the problem of intestinal obstruction following appendectomy has been noted. This problem is of more importance when viewed against the background of the high incidence of wrong diagnosis in young patients.

The condition of chronically inflamed appendices certainly exists, and a small proportion of these probably do give rise to symptoms. The difficulty is to ascertain which appendices are diseased and which are symptomatic. There does not seem to be sufficient justification for routine 'incidental' appendectomy on the grounds that by removing chronically inflamed appendices the occurrence of acute appendicitis will be reduced.

I should like to thank Dr H. van Wyk, Medical Superintendent of Johannesburg Hospital, for permission to publish.

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