

# The management of primary adenocarcinoma of the vermiform appendix

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**EDITORIAL SYNOPSIS** Primary adenocarcinoma of the appendix is not of low grade malignancy as has been previously supposed and a right hemicolectomy is the proper procedure, offering a much better prognosis than simple appendicectomy.

Primary adenocarcinoma of the appendix is rare and likely to pass unrecognized. The diagnosis is usually made by a histologist, unless at operation the disease is so advanced that its nature is unquestioned. It is the purpose of this paper to describe several new cases and to examine past experiences of this tumour as a guide to treatment and prognosis.

Tumours of the appendix constitute only 0.3 to 0.4% of all intestinal growths and during the last century were regarded as metastases although Merling (1838) and Rokitansky (1867) both described primary tumours of the appendix. Kelly and Hurdon (1905) in their large text on the appendix offered a classification of these tumours. Their illustrations show three typical argentaffin tumours, one adenocarcinoma, and one probable sarcoma. Collins (1955) surveyed 50,000 human appendices mostly removed for appendicitis. His series embraces almost 100 disease classifications including 18 malignant conditions.

Many estimates of the incidence of this carcinoma are found in the literature, varying from 0.5% to 3.0% of appendicectomies. None of these estimates is based on large series and they must vary with local histological classification. Two extensive series are available, both from the United States. Norment (1932) in a survey of 45,000 appendices reported 67 'carcinomas'. Two of these are grouped apart as 'atypical' columnar-celled growths and were probably adenocarcinomas. The histological description of the remaining 65 leaves little doubt that they were argentaffin tumours. Collins (1955) found 0.08% in 50,000 cases; this possibly represents the incidence.

In 1955 in England and Wales it is estimated that 117,000 persons had their appendix removed and if the figures in Hammersmith Hospital are any guide

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**TABLE I**  
NUMBER OF APPENDICECTOMIES PERFORMED DURING 10 YEARS IN DEPARTMENT OF SURGERY, HAMMERSMITH HOSPITAL

Year	'Primary' Operations	'Incidental' Operations	Total
1949	280	27	307
1950	260	40	300
1951	240	40	280
1952	230	30	260
1953	255	20	275
1954	310	21	331
1955	240	10	250
1956	220	43	263
1957	270	86	356
1958	220	65	285
Total	2,525	382	2,907

(Table I) this number is fairly constant each year. In the United Kingdom only 12 cases of adenocarcinoma of the appendix which fulfil strict criteria have been reported in the 30 years before this paper. In this department over the past ten years 2,525 'primary' appendicectomies have been performed and to these must be added 382 'incidental' operations done during the course of gynaecological or other abdominal procedures. During this period one case of adenocarcinoma has arisen (case 1).

Previous writers have commented on the confused state of the literature concerning this tumour. In 1906 Rolleston and Jones produced the first extensive account and collected a series of cases including that of Beyer (1882) who described what has come to be regarded as the first authentic case. They also included cases by men famous in the history of the appendix—Battle and McBurney. However, no clear histological classification emerges from this and none of these cases is included here partly due to lack of histological evidence, and also because the treatment

and prognosis of acute, uncomplicated appendicitis has altered so much in the past half century as to minimize the value of these early cases.

Frauenthal and Grausman (1933), describing a case, mentioned 360 previous accounts, a figure far in excess of anything subsequently accepted. At the other extreme, Young and Wyman (1942) questioned all but four earlier reports, two from the United States and two from Germany. In 1943 Uihlein and McDonald re-assessed histologically 144 cases seen over a 30-year period at the Mayo Clinic, confirming only five.

The earliest case report quoted here is 1929 but most of the others have been in the last five years. The older accounts are less easy to evaluate properly and follow-up reports impossible to obtain.

Notwithstanding the publications that have appeared, as recently as 1953 Clarke and Simonds commented that little was known regarding the frequency, route, and extent of metastases, or of the prognosis of carcinoma of the appendix and the best surgical procedures for dealing with it.

#### HISTOLOGICAL CLASSIFICATION

Difficulty arises with the histology of the adenocarcinoma and the confusion with the argentaffin carcinoma commonly known as the 'carcinoid'. In their paper of 1943 Uihlein and McDonald produced the following classification which has provided a standard for several subsequent authors: 1 Carcinoid type, 2 cystic type, and 3 colonic type.

**1 CARCINOID TYPE** Willis (1948) prefers to call these argentaffin carcinomas 'lest we disguise their inherent malignant nature'. They were shown in 1914 to have the property of reducing ammoniacal silver salts to silver and are now well recognized as a distinct entity. Masson (1928) gave a classical description of these tumours. Their golden-yellow colour is almost constant and they tend to be multicentric in origin. The cells may be biochemically active, secreting 5-hydroxytryptamine and causing a clearly defined syndrome.

**2 CYSTIC TYPE** Cystic type or mucocele of the appendix was first recognized by Rokitansky in 1842. Although included in their classification by Uihlein and McDonald, it is not clear that this is a distinct entity and there is certainly no evidence that it is always of a malignant nature. Willis says that to produce a mucocele one does not require a neoplastic process and Aird does not regard the mucocele as necessarily malignant.

Woodruff and McDonald (1940) had discussed this. From 43,000 appendices removed over a 24-

year period at the Mayo Clinic they abstracted 146 cases of mucocele: 136 of these were simple and in 10 were due to early neoplastic hyperplasia of the mucosa similar to that seen in McCollum's cases (V.I.). It could be suggested that in these cases the overgrowth of the mucosa provides a mechanical factor which leads to the production of a mucocele. The condition may be produced experimentally by mechanical means.

**3 COLONIC TYPES** The colonic type or adenocarcinoma behaves similarly to other colonic carcinomas being either polypoid or ulcerative.

Attempts have been made to subdivide the adenocarcinomas into several grades; this is unrealistic in small series and produces statistically insignificant figures.

It has been written that the site of the lesion gives a clue to its nature: that the adenocarcinoma is to be found in the proximal third and that the distal thirds are the province of the argentaffin tumour. In a high proportion of reports here the site of the tumour is not reported. This prevents any conclusion but 22 (23%) cases of adenocarcinoma are recorded in the proximal third and 38 (34%) in the distal thirds. Thirty-five (37%) were not recorded. When the tumour is found at the proximal extreme of the appendix it is a matter of opinion whether it arises in the appendix or the caecum: one or two doubtful cases of this category have been discarded.

There are certain anatomical features of the appendix which affect the progress of the disease. The narrow lumen is soon occluded by even a small growth, which may precipitate an acute obstructive appendicitis. This is the usual picture and may cause a number of carcinomas to be removed at an early stage, and to go unnoticed. The appendix is also covered by peritoneum and extensive soiling of the peritoneal cavity easily occurs if the appendix perforates; this is the commonest site for metastases.

The material for this series has been collected from the reports mostly in the British, Canadian, and United States literature with the addition of a few others. A total of 95 cases has been selected for analysis (Table II). Many, especially those described in the earlier papers, have been discarded as not fulfilling the conditions of the present enquiry which has been limited to invasive tumours, reasonably believed to be adenocarcinomata and penetrating beyond the submucosa. To these have been added the new cases described. There are several reports of the tumour confined to the mucosa but it is difficult to draw a line between a simple hyperplasia and this very early form of malignancy when reading some of the reports.

Those workers who had not already recorded the

TABLE II

Age	Sex	Presentation	Initial Operation	DETAILS OF INDIVIDUAL CASES					Known Survival	Remarks
				Which Thrd of Appendix	Later Right Hemicolectomy	How Long Afterwards	Site of Known Secondary Deposits			
73	F	Secondary deposits	—	D	—	—	Peritoneum	Died soon after		
73	F	Cholelithiasis (incidental operation)	Appendectomy	D	No	—	—	5 years	Still alive and well	
72	M	Appendix abscess	Appendectomy	P	Yes	2 weeks	—	—	No available follow-up	
55	M	Acute appendicitis	Appendectomy	D	No	—	No	(14 years) <sup>1</sup>	Alive and well at that time	
34	F	Acute appendicitis	Appendectomy	D	No	—	No	No known follow-up		
43	F	Appendix abscess	Drainage only	—	Yes	3 weeks	Ovary	5 years	Died of metastases	
48	F	Appendix abscess	Appendectomy	P	No	—	—	—	No available follow-up	
83	F	Appendix abscess	R. hemicolectomy	P	—	—	—	—	No available follow-up	
89	F	Appendix abscess	R. hemicolectomy	P	—	—	Locally	—	No available follow-up	
?	F	Acute appendicitis	Appendectomy	D	Yes	3 years	Locally	—	No available follow-up	
36	F	Acute appendicitis	Appendectomy	All	Yes	2 weeks	—	(3 years)	Still alive and well then	
69	F	Pain and mass in R. lower quadrant	Appendectomy	P	No	—	No	(9 months)	Still alive and well then	
48	M	Acute appendicitis	Appendectomy	—	Yes	2 weeks	—	6 years	Still alive and well	
80	F	Acute appendicitis	Appendectomy	M	Refused	—	Locally peritoneum, abdominal wall	1 year	No available follow-up, probably died soon afterwards	
56	M	Acute appendicitis	Appendectomy	—	Refused	—	—	(1 year)	Alive and well at that time, no further available follow-up	
71	M	Acute appendicitis	Appendectomy	D	Yes	2 weeks	Local node, peritoneum wound	5 years	Died of metastases	
49	F	Secondary ovarian deposits	Appendectomy, panhysterectomy	D	No	—	Ovary and peritoneum	No available follow-up, presumed dead shortly afterwards		
53	M	Acute appendicitis	Appendectomy	D	Refused	—	—	No available follow-up		
62	M	Acute appendicitis	Appendectomy	—	No	—	—	(2½ years)	Alive and well at that time, no further available follow-up	
55	F	Acute appendicitis	Appendectomy	—	Refused	—	—	6 months	Died	
41	M	Acute appendicitis	Appendectomy	—	Advised	—	—	Did not return for hemicolectomy. No further trace		
72	M	Appendix abscess	Appendectomy	D	No	—	—	2 years	Died	
43	M	Acute appendicitis	Appendectomy	P	Yes	2 weeks	—	5 years	Still alive and well	
57	M	Acute appendicitis	Appendectomy	P	Yes	Not known	—	—	Still alive and well	
53	M	Acute appendicitis	Appendectomy	D	Yes	Not known	—	9½ years	Still alive and well	
70	M	Acute appendicitis	Appendectomy	P	No	—	—	(4 years)	Still alive and well 1951 at age 74	
60	F	Carcinoma caecum	R. hemicolectomy	—	—	—	—	9 years	Still alive and well	
64	F	Acute appendicitis	Appendectomy	D	No	—	—	8½ years	Still alive and well	
53	M	Acute appendicitis	Appendectomy	—	—	—	Locally	4 years	Died	
52	F	Chronic appendicitis	Appendectomy	—	No	—	Peritoneum	2½ years	Died of metastases	
51	F	? Acute cholecystitis	Appendectomy	D	No, poor heart	—	—	5½ years	Still alive and well	
55	F	Gynaecological case (incidental operation)	Appendectomy	M	Inoperable at	4 weeks	Peritoneum	—	No available follow-up, presumed dead soon afterwards	
34	M	Acute appendicitis	Appendectomy	D	Yes	3 months	—	7 years	Still alive and well	
54	F	Cholelithiasis (incidental operation)	Appendectomy	—	Yes	4 weeks	—	3 years	Still alive and well	
52	F	Gynaecological (incidental operation)	Appendectomy	—	Yes	3 weeks	—	8 years	Still alive and well	
62	M	Strangulated right femoral hernia	Appendectomy	D	Refused	—	—	13 years	Died of heart disease	
36	F	Pain in right lower quadrant 6 months	Appendectomy	M	No	—	No	(10 years)	Still alive and well then, no available follow-up	
60	M	'Chronic appendicitis'	Ileo-transverse colostomy	P	Yes	3 weeks	No	(3½ years)	Still alive and well then, no available follow-up	
50	F	Cholelithiasis (incidental operation)	Appendectomy	D	No	—	No	(4 years)	Still alive and well then, no available follow-up	
65	M	Acute appendicitis	R. hemicolectomy	P	—	—	—	5 years	Still alive and well	
46	M	Duodenal ulcer (incidental operation)	Appendectomy	M	No	—	No	(1 year)	Still alive and well then, no available follow-up	
36	M	Acute appendicitis	Appendectomy	D	Yes	3 weeks	No	19 years	Still alive and well	
40	M	'Chronic appendicitis'	Appendectomy	M	No	—	—	—	No available follow-up	
22	F	Gynaecological case (incidental operation)	Appendectomy	M	No	—	—	—	No available follow-up	
65	M	Acute appendicitis	Appendectomy	P	Yes	3 weeks	—	—	No available follow-up	
58	F	Appendix abscess	Appendectomy	M	No	—	Wound locally 1 year	(2½ years)	Still alive then, no available follow-up	
60	M	Acute appendicitis	Appendectomy	D	Refused	—	—	(8 months)	Still alive then, no available follow-up	

<sup>1</sup>Survival times shown in parentheses are those patients known to have lived for that period but are not up to date (1959)

TABLE II *continued*

Age	Sex	Presentation	Initial Operation	DETAILS OF INDIVIDUAL CASES					Known Survival	Remarks
				Which Third of Appendix	Later Right Hemicolectomy	How Long Afterwards	Site of Known Secondary Deposits			
56	M	Appendix abscess	Appendectomy	P	Yes	5 weeks	Wound at 3 years	4 years	Died	
42	F	Gynaecological case (incidental appendectomy)	Appendectomy	P	Yes	8 weeks	—	7½ years	Still alive and well	
54	F	Appendix abscess	R. hemicolectomy	—	—	—	Peritoneum	2 years	Died	
41	F	1½ years pain in right lower quadrant	Appendectomy	P	No	—	Ovaries	2½ years	Died	
51	M	Secondary deposits	—	P	No	—	Peritoneum	—	Died shortly afterwards	
57	M	Carcinoma caecum	R. hemicolectomy	D	—	—	Peritoneum	3 years	Died	
40	F	Intestinal obstruction	R. hemicolectomy	D	—	—	Local nodes (excised)	8 years	Still alive and well	
49	F	Gynaecological case (incidental operation)	Appendectomy	—	No	—	Ovary	10 months	Died	
64	M	Acute appendicitis	Appendectomy	D	No	—	Wound and peritoneum	1½ years	Believed dead	
72	M	Acute appendicitis	Appendectomy	P	No	—	—	7 weeks	Died from abdominal abscess	
26	F	Acute appendicitis	Appendectomy	M	Yes	8 weeks	—	8½ years	Still alive and well	
67	F	Acute appendicitis	R. hemicolectomy	M	—	—	—	8 years	Still alive and well	
43	F	Gynaecological case (incidental operation)	Appendectomy	D	No	—	—	25 years	Still alive and well	
61	M	Secondary deposits	—	—	—	—	Glands, lungs pleura, and peritoneum	—	Died soon after	
79	M	Acute appendicitis	Appendectomy	M	Refused	—	—	2 years	Died of C.V.A.	
51	F	Acute appendicitis	Appendectomy	—	—	—	—	3 days	Died ? renal failure	
56	F	Intestinal obstruction	Appendectomy	D	No	—	Glands and peritoneum	6 months	Died	
46	M	Secondary deposits	—	—	—	—	Peritoneum	—	Died soon after	
72	F	Acute appendicitis	Appendectomy	D	—	—	—	—	No available follow-up	
—		Acute appendicitis	Appendectomy	D	Yes	Not stated	Glands, colon, wound	—	No available follow-up	
42	M	Carcinoma of caecum	R. hemicolectomy	P	—	—	Nodes, lungs, liver, peritoneum	10 months	Died	
46	M	Acute appendicitis	Appendectomy	P	No	—	Peritoneum	4 months	Died	
47	M	Mass in right lower quadrant	R. hemicolectomy	P	—	—	Peritoneum	6 months	Died	
59	M	Cholelithiasis (incidental operation)	Appendectomy	D	No	—	—	7 months	Died despite deep x-ray therapy	
63	M	Acute appendicitis	Appendectomy	All thirds	No	—	Omentum, peritoneum	3 months	Died	
65	M	Acute appendicitis	Appendectomy	M	No	—	Peritoneum	10 months	Died	
65	M	Right lower quadrant pain for 6 months	Appendectomy	P	No	—	No	2½ months	Died other causes	
58	M	Acute appendicitis	Appendectomy	—	—	—	—	6 weeks	Died after laparotomy ? no obvious cause	
51	F	Right lower quadrant pain for 3 weeks	Appendectomy	D	Yes	10 days	—	6 years	Still alive and well	
44	F	Acute appendicitis	Appendectomy	—	No	—	—	3 days	Died peritonitis	
49	F	Acute appendicitis	Appendectomy	—	No	—	Generalized	2 years	Died	
61	F	Acute appendicitis	Appendectomy	D	Yes	4 weeks	No	2 years	Still alive and well	
67	F	Acute appendicitis	Appendectomy	—	No	—	—	—	Died of peritonitis	
43	M	Appendix abscess	Appendectomy	—	Inoperable	4 weeks	Peritoneum	3 months	Died	
61	F	Acute appendicitis	Appendectomy	—	Yes	2 weeks	Local nodes (excised)	2 weeks	Died C.V.A.	
68	F	Secondary deposits	—	—	—	—	Glands and peritoneum	—	Died soon afterwards	
47	F	Appendix abscess	R. hemicolectomy	—	—	—	—	5 years	Died	
41	M	Acute appendicitis	Appendectomy	—	No	—	—	—	No available follow-up	
60	M	Acute appendicitis	Appendectomy	D	No	—	'Generalized deposits'	1½ years	Died	
39	M	Acute appendicitis	Appendectomy	—	No	—	—	—	No available follow-up	
51	M	Acute appendicitis	Appendectomy	—	Yes	9 weeks later	—	5 years	Still alive and well	
51	F	Mass in right iliac fossa	R. hemicolectomy	P	—	—	—	10 years	Still alive and well	
17	F	Six months pain in right iliac fossa	Appendectomy	D	Yes	8 weeks later	—	—	Still alive and well	
63	F	Secondary ovarian deposits	Biopsy	—	—	—	Ovary and peritoneum	—	Died shortly afterwards	
42	M	Pain in right iliac fossa	Appendectomy	—	Yes	2 weeks later	Locally, peritoneum	6 months	Died despite deep x-ray therapy	
72	F	Appendix abscess	R. hemicolectomy	—	—	—	—	8 years	Still alive and well	
?	F	Acute appendicitis	Appendectomy	—	No, due to poor condition	—	Locally	8 months	Died suddenly ? coronary	
54	F	Acute appendicitis	R. hemicolectomy	—	—	—	Locally	3 years	Died of secondary deposits	

<sup>1</sup>Survival times shown in parentheses are those patients known to have lived for that period but are not up to date (1959).

death of a patient have all been circularized to bring the follow-up figures up to date.

#### DIAGNOSIS

The diagnosis has never been established before operation and it will be seen that this condition most commonly presents as an acute obstructive appendicitis. Forty-two (44%) of the cases here presented as acute appendicitis, a further 13 (14%) as appendix abscesses, and 8 (11%) as 'chronic appendicitis'. These together comprise 66% of all cases. Eight cases (11%) presented in a terminal phase with widespread metastases.

As many as 13 (14%) patients had an 'incidental' appendectomy with subsequent histological discovery of an adenocarcinoma. A pre-operative diagnosis of cholelithiasis or a gynaecological disorder had without exception been made and sustained at operation. No attempt has been made to classify these cases separately.

#### AGE AND SEX INCIDENCE

The age incidence and range is shown graphically (Fig. 1). The youngest subject is 17 years old. The age group 40-65 years is most commonly affected but no age group appears immune.

There is no sex predominance of any significance, there being 49 female patients and 45 males.

#### TREATMENT

When we come to treatment, we found in this Unit

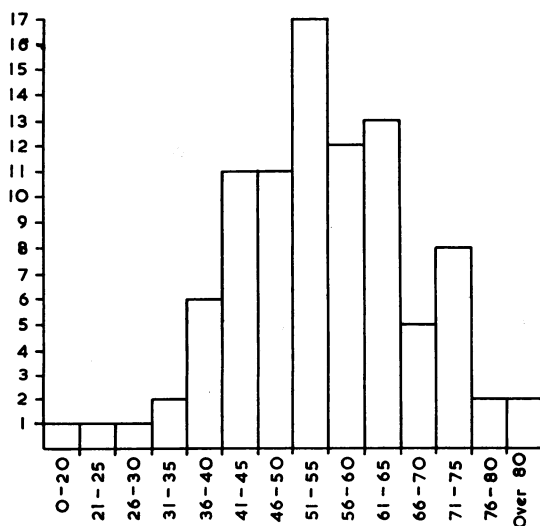


FIG. 1. Histogram of age incidence and range.

that no one had first-hand experience of this disease and faced with such a growth found by appendectomy (case 1) the decision to do a formal right hemicolectomy was originally founded on basic principles. A brief survey of some of the literature at that time did little to help. Authors were divided as to the proper measures to adopt. This more extensive analysis has attempted to show that the proportion of cases in which a hemicolectomy has been done has risen appreciably in the last few years. One could infer from this that the more radical operation is becoming accepted as a proper form of treatment. There still remains the problem of direct 'seeding' of the peritoneal cavity but it would seem that this is unavoidable.

The treatment at the moment is essentially surgical. Only two patients were given radiotherapy, one in the United States and case 2 reported in the United Kingdom. The first was dead of the disease in seven months and in the other instance only a short palliative course was given because of intestinal obstruction and rapid deterioration. Deep x-ray therapy has probably no more obvious application in cases of adenocarcinoma of the appendix than in carcinomas of the colon.

From the point of view of treatment let us consider a total of 87 cases, omitting those eight presenting in a terminal stage.

Of these 87, 15 (17%) had a right hemicolectomy as a primary procedure when the nature of the disease was recognized at the initial operation. Twenty-five (28%) had a hemicolectomy as a secondary procedure a week or so after. This would allow proper preparation of the patient. For 12 patients (14%) a further resection was proposed but was not carried out either because of the patient's condition or because consent to operation was refused. Radical surgery was thus proposed in 60% of the cases and carried out in 46%. Those remaining had an appendectomy only. Two of these also had a local resection of the caecum.

McCollum *et al.* (1957), in considering those tumours confined entirely to the mucosa (V.S.), were of the opinion that appendectomy would suffice. Growths of this type have not been considered here but the anatomical structure of the organ raises grave doubts whether a distinction can be drawn in their treatment. The muscular layers of the appendix are often deficient at several points where the submucosa becomes adjacent to the serosa.

Adenocarcinoma of the appendix has been referred to previously as one of low-grade malignancy but the cases reviewed suggest that it behaves as aggressively as any other colonic cancer although it differs in some respects. Transcoelomic spread occurs readily and produces peritoneal and ovarian secondary de-

posits. By their nature these multiply rapidly and appear to be lethal before extensive hepatic metastases are established. Few references are found to secondary deposits in the liver. Adjacent lymph nodes are commonly involved and serve as a strong motive for radical surgery. Local recurrence is also quite common both intraperitoneally and in the wound. This has occurred despite hemicolectomy and sometimes several years after operation.

PROGNOSIS

In assessing the prognosis, the 18 patients known to have died of intercurrent disease, and those presenting with secondary deposits or dying within three months of operation have been excluded. The remainder of the patients has been divided into two groups, those in whom a simple appendicectomy was performed and those who had a right hemicolectomy. Two expressions of the prognosis have been used. First, 5 and 10-year survivals for each group are given, and

secondly the 'median survival time' is given for each group, *i.e.*, the time at which 50% of the patients remain alive; these are plotted with the times at which 75% and 25% remain alive, and give a much better idea of the pattern of survival and enable better comparison of techniques (Fig. 2).

From Fig. 2 it will be seen that the survival curve for the cases submitted to more radical surgery is shifted well to the right and is much less steep. It should be remembered also that this improved prognosis is underemphasized by this graph as two-thirds of the patients are still alive. Nineteen cases where only appendicectomy was performed have been followed up to date (Fig. 3); of these 14 (75%) died of the disease. There are four survivors (20%) reaching or exceeding five years. The other group comprises 31 cases in which right hemicolectomy was undertaken and for which current follow-up reports are available (Fig. 4). Ten deaths (33%) are reported. Nineteen (63%) patients survived for five years or

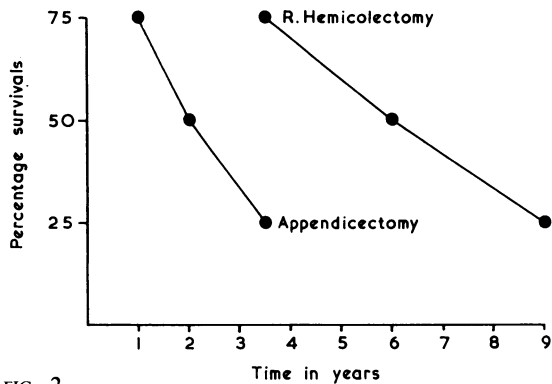


FIG. 2.

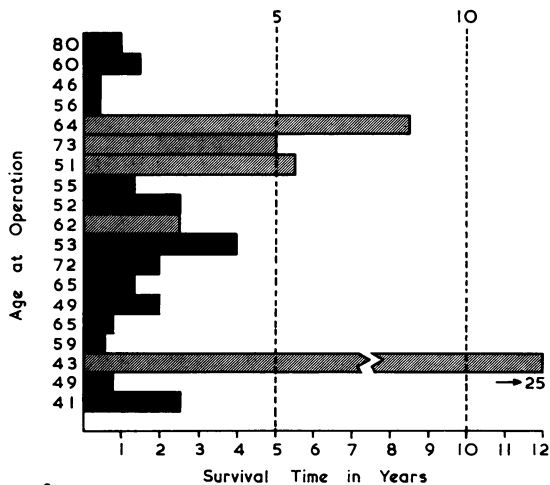


FIG. 3.

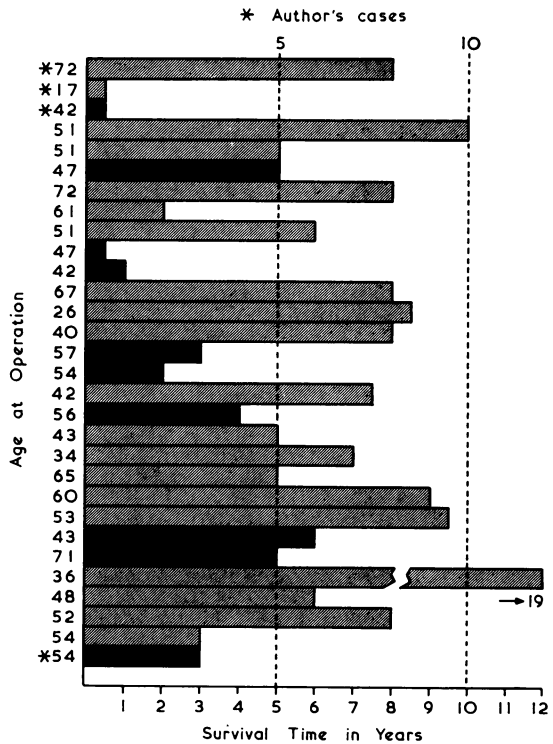


FIG. 4.

FIG. 2. Survival times for patients subjected to appendicectomy and to right hemicolectomy.

FIGS. 3 and 4. Survival times of five years and over for both groups followed up to date.

more including two (8%) exceeding 10 years. In both groups all but one of the deaths which have occurred have been in the first five-year period.

#### CASE REPORTS

**CASE 1** This girl, aged 17, was first seen as an out-patient on 10 December 1958, complaining of abdominal pain. She stated that she had been quite well until six months previously when she began to have attacks of sharp, central abdominal pain, often radiating to the right lower quadrant, and lasting perhaps half an hour at a time. Until recently she had had approximately two attacks a week but for the past eight weeks she had had pain almost every day. During these last weeks also she had periods of diarrhoea every two or three days when she passed three or four loose stools a day with no blood or mucus. There was nothing untoward in her previous or family history, and clinical examination produced no abnormal physical signs (pulse 80, blood pressure 150/75 mm. Hg). A contrast enema at this time showed a free flow of barium around the colon, the terminal ileum also filled: no abnormality was shown. The urine was normal.

On 21 January 1959 she was admitted and the next day a normal-looking appendix was removed through a right Lanz incision. Nothing else was found at the time in the

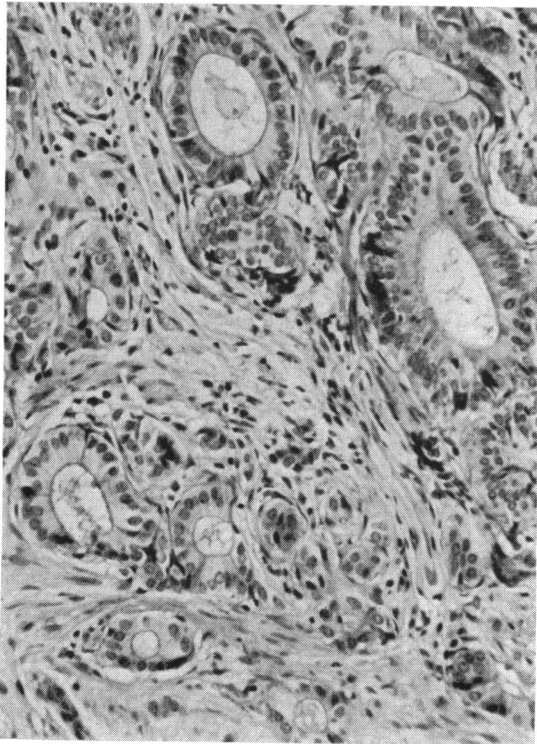


FIG. 5. *Case 1: A section showing invasion of the muscular layers of the appendix wall by the tumour ( $\times 240$ ).*

abdomen to account for her symptoms. A sigmoidoscopy was also done but nothing abnormal was seen. She made an uneventful recovery.

**Histology** 'An externally normal appendix 4.5 cm. long  $\times$  0.5 cm. diameter shows no evidence of acute or chronic inflammation. In the tip of the appendix is a tumour composed of columnar cells in well-formed tubules separated by a fibrous stroma, forming a nodule 2 mm. in diameter. Strands of tumour are invading the muscular coat. Occasional Paneth cells were seen in the tumour near the mucosa. Having failed to demonstrate the presence of argentaffin granules by either the silver or Diazo techniques and in the presence of many tubular acini, a diagnosis of an adenocarcinoma was made' (Fig. 5).

It was agreed that more radical surgery was necessary. At this stage it was difficult to correlate her marked symptoms with such a relatively small lesion but following appendicectomy they had all resolved.

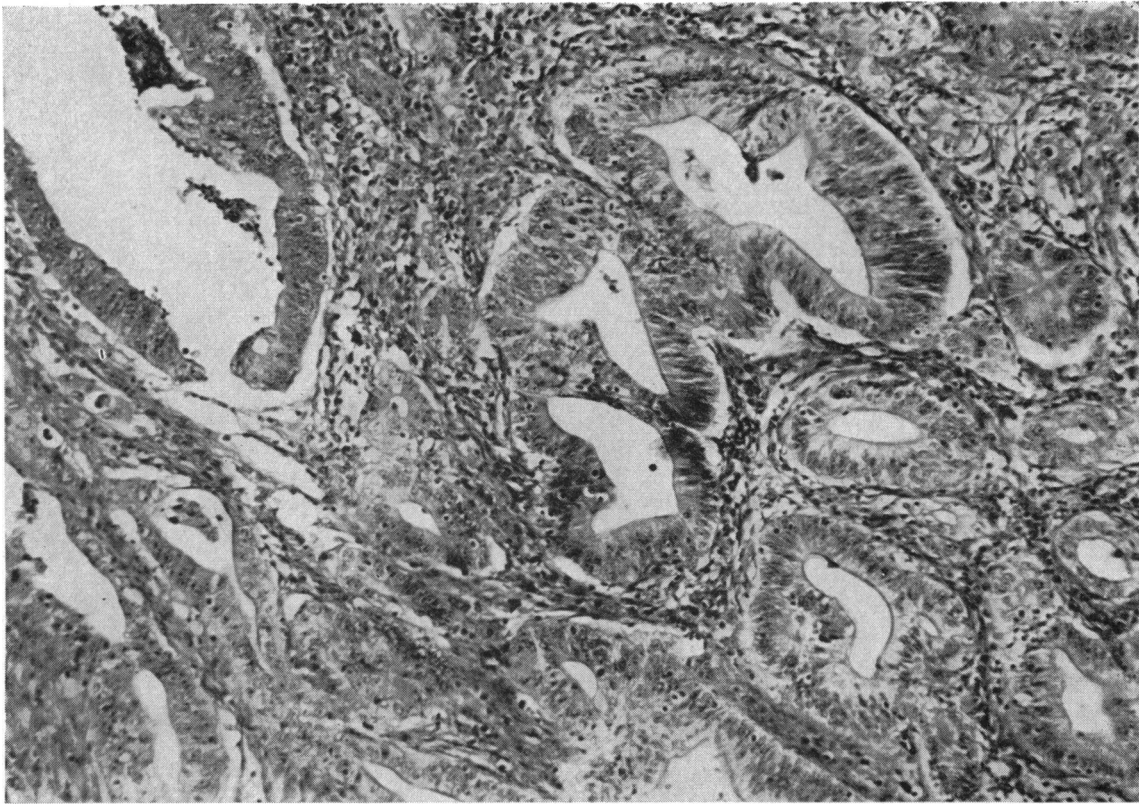
On 24 March 1959, through a right Rutherford Morison incision, the ascending colon was found to be freely mobile. There were a number of enlarged, soft nodes in the mesocolon. No obvious secondary deposits were found. The right colon was mobilized and removed together with the proximal third of the transverse colon and distal six inches of the ileum. An end-to-end anastomosis was performed between ileum and transverse colon and the mesenteric defect repaired. The wound was closed without drainage.

Histological examination of the excised bowel, including 17 lymph nodes, disclosed no tumour. She made an uneventful recovery and when last seen in the follow-up clinic was quite well.

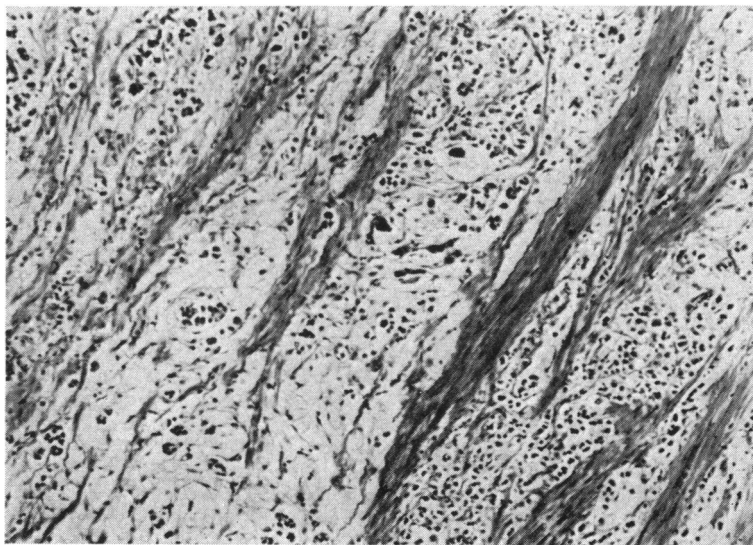
**CASE 2** This man, aged 42, gave a history of three attacks of pain during the previous six years which had been diagnosed as appendicitis but treated conservatively. Following the last attack he was advised to have his appendix removed and this was done on 5 December 1955. Histological examination showed the epithelium to be replaced by a well-differentiated adenocarcinoma and the wall was extensively invaded through to the serosa by much less differentiated adenocarcinoma (Figs. 6 and 7).

On 16 December 1955 a right hemicolectomy was performed and this specimen when submitted to section showed poorly differentiated adenocarcinoma with numerous mitoses situated in the muscular layers of the caecum with an intact mucosa over it (Fig. 8). A lymph node also showed secondary deposits of adenocarcinoma (Fig. 9.)

Two months later he was found to have a local recurrence of the tumour. He was referred for radiotherapy but had had only one treatment when he developed intestinal obstruction. At laparotomy a large carcinomatous mass was found, some 12 cm. across, in the right lower quadrant, with small masses scattered throughout the peritoneal cavity; one of these was involving and obstructing the small bowel. Masses were also found in the liver. After operation he was given a short palliative dose of irradiation with little change in the size of the mass. On his return home he died three weeks later—only seven months after the appendicectomy.



**FIG. 6.** *Case 2: The typical appearance of the adenocarcinoma seen here in a section from the wall of the appendix. This section shows marked glandular formation, numerous mitoses, reduplication of the 'mucosal' layers, and an overall irregular pattern ( $\times 160$ ).*



**FIG. 7.** *Case 2: Showing the spread of tumour in the mesoappendix ( $\times 80$ ).*



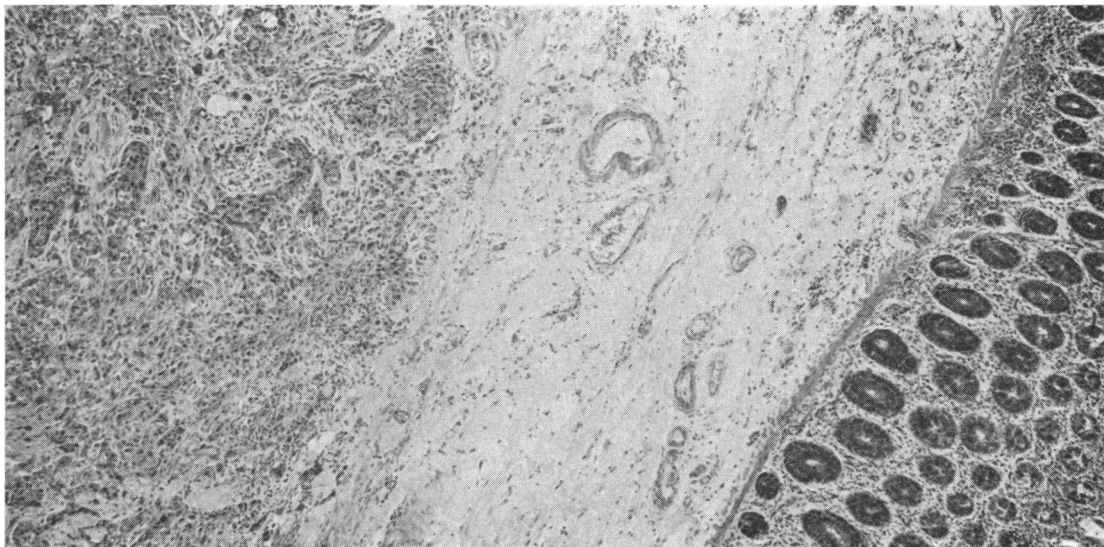


FIG. 8. *Case 2: Metastatic deposits of adenocarcinoma in the wall of the caecum with intact caecal mucosa. This is taken from the hemicolectomy specimen ( $\times 60$ ).*



FIG. 9. *Case 2: Metastatic deposits of adenocarcinoma in a lymph node removed at hemicolectomy ( $\times 160$ ).*

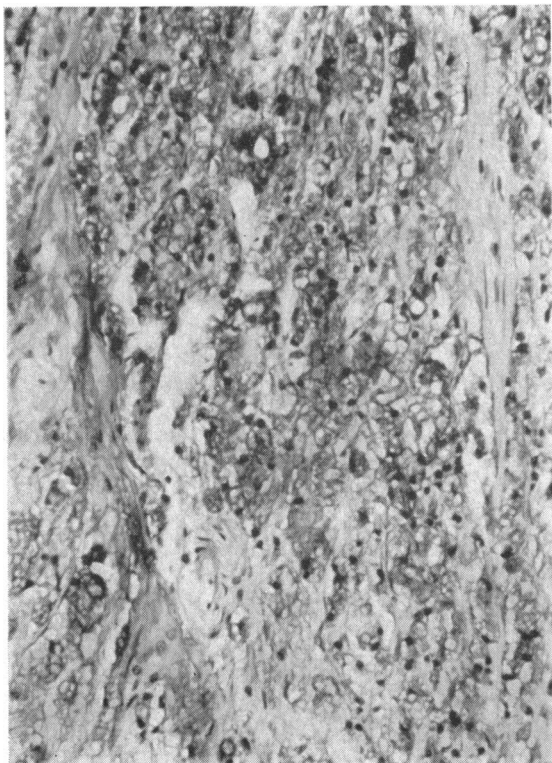


FIG. 10. Case 3: A section of ovary showing deposits of adenocarcinoma ( $\times 80$ ).

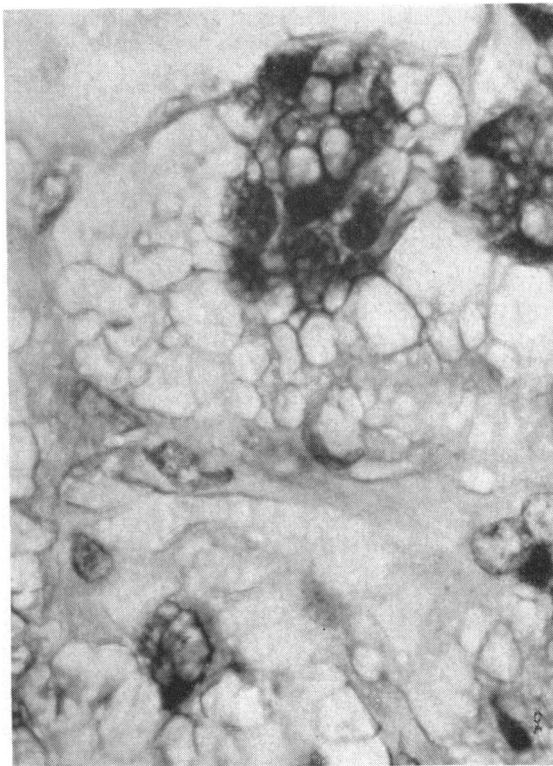


FIG. 11. Case 3: A high-powered view of the ovarian metastasis shown in Fig. 10 ( $\times 1,000$ ).

**CASE 3** This woman, aged 64, presented in November 1944, complaining of abdominal enlargement and pain for the previous six weeks together with loss of appetite and loss of weight. She was found to have bilateral, firm abdominal masses arising from the pelvis, and at subsequent laparotomy one week later these were found to be inoperable ovarian tumours. A biopsy was taken which was reported as a secondary deposit of degenerate mucoid carcinoma (Figs. 10 and 11), probably from a primary centre in the colon or stomach.

A year later she was readmitted in a moribund condition and died two days later. Necropsy revealed a primary adenocarcinoma of the appendix with massive secondary deposits in both ovaries and peritoneum.

**CASE 4** This woman, aged 72, presented in October 1951, and pre-operatively a diagnosis of chronic appendicitis with resolving abscess was made. The malignant nature of her condition was appreciated at operation and a right hemicolectomy was performed as a primary procedure. From this she made an uneventful recovery and she is still alive and well.

Histological examination of the tumour showed an adenocarcinoma of the appendix.

**CASE 5** This woman (age not recorded) presented in 1954 with acute appendicitis for which her appendix was

removed; this was shown to contain an adenocarcinoma. No further operation or treatment was instituted in view of her poor general condition and mental instability, for which she had previously had a pre-frontal leucotomy some years before.

This patient survived eight months with a gradually increasing mass in the right lower quadrant: she died suddenly and it was thought that she had a coronary thrombosis. No necropsy was made.

**CASE 6** This woman, aged 54, was operated upon in 1954 for acute appendicitis and at operation a carcinoma of the appendix was found. A right hemicolectomy was performed as a primary procedure and she remained well for 18 months when her abdomen was re-explored because of intestinal obstruction. This was found to be due to a stenosis of the anastomosis and she appeared quite free of tumour at that time. However, a year later she again had an obstruction and a palpable mass in the right lower quadrant; she refused operation and settled after conservative treatment. She died six months later. No necropsy was performed.

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