this had been to some extent alleviated, nasal block and discharge were reduced, though the actual situation at work had not altered.

Effect of Psychotherapy upon Nasal Symptoms

All the patients in series II were treated in the out-patient department by repeated interviews for periods ranging from 1 to 20 months. The sources of tension were explored and the patients were given help to deal with these. Dream analysis was utilized in six cases. The results of treatment were:

	Paroxysmal Rhinorrhoea	Chronic Nasal Oedema
Much improved or recovered	5	3
Improved	3	3
No change	2	1
Improvement in rhinitis, development of asthma	1	—

It will be seen that in response to treatment there was no significant difference between paroxysmal rhinorrhoea and chronic nasal oedema.

The best results were obtained in cases in which the relationship of the illness to stress was strongest, and six of the eight patients in group C were much improved.

These results suggest that sustained improvement in vasomotor rhinitis can be brought about by the diminution in emotional tension which follows psychotherapy—an improvement that does not depend on the use of antihistamine drugs.

Comment

A comparison of the grouping in series I and II shows that the principal difference is in group C (series I, 1; series II, 6). This suggests that the more that is known about the patient, and the better his reactions are understood, the more does the stress factor stand out. This conclusion is confirmed by the clinical findings in those patients who were investigated at greater length. The patient mentioned above (Case 1 of series II) could not, at his first interview, have told of his attack on his wife, since he was not at that time aware of it. The judgment that a particular disorder is not related to stress is a difficult one to make without a really thorough inquiry.

One of the patients in series II (Case 16), who was most anxious and hypochondriacal and suffered from abdominal discomfort, bodily pains, migraine, tension, and depression, had to consult a doctor about his other symptoms; another (Case 3) looked pale and ill, and was depressed and anxious. Both of these patients were manifestly anxious on examination, and their anxiety and its symptoms were severe enough to warrant their seeking medical advice. The other 16 patients did not seem to be very anxious or very depressed, and would not have asked for a psychiatric appraisal if it had not been offered to them. Few of the patients in either series were able, at their first attendance, to relate the symptoms of their rhinitis to stress, yet they were able to grasp this relationship readily enough when it was made clear to them by the anamnesis, and the more intelligent among them strove to make such modifications in their lives as were necessary to keep symptoms to a minimum.

No specific personality pattern emerged from the psychiatric examination of the patients in series II. Reactions of evasion and retreat (Cases 3 and 5) were represented among the patterns of illness, as well as reactions of combativeness and defiance (Cases 10 and 17). Symptoms of nasal dysfunction could appear in anticipation of stress (Case 13), during the stress itself (Case 7), and after it was over (Case 1).

Once the physical symptoms had appeared, utilization of them in order to gain some advantage was not a feature of the illness in any of these patients. In this respect the disorder resembles duodenal ulcer.

Summary

The results of treatment of chronic vasomotor rhinitis by physical and psychiatric methods are reviewed.

A few patients may be relieved of their symptoms by desensitization, and a few more are benefited by

zinc ionization. Obstruction of vascular origin, and that due to polypi, can be lessened by cautery and polypectomy. Antihistamine drugs are capable of suppressing the symptoms of paroxysmal rhinorrhoea, but only when they are being given continuously. They do not benefit the patient with chronic nasal oedema.

Some relationship between stress and the onset and course of vasomotor rhinitis has been demonstrated from a superficial psychiatric investigation. When the investigation is more prolonged and is carried to deeper levels a close relationship between nasal symptoms and stress can be shown in most patients. Such a relationship was found in 24 of this series of 31 patients. Recovery or sustained improvement followed psychotherapy in 14 of 18 patients treated at some length.

REFERENCES

- Lucas, H. A. (1952). *J. Laryng.*, **66**, 480.
O'Neill, D. (1952). *Practitioner*, **169**, 273.

COMPLICATIONS OF MECKEL'S DIVERTICULUM

WITH AN ANALYSIS OF 18 CASES

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Meckel's diverticulum has been the subject of many authoritative and stimulating papers in the past. It is not a rare congenital abnormality; the complications of this lesion are, however, of such gravity that the subject is always of importance in any consideration of acute abdominal emergencies. The cases reported here illustrate well some of its more serious complications, and it is by keeping such facts constantly in mind that we may hope to reduce the mortality of such lesions.

The first adequate description was published by J. F. Meckel in a series of three papers which appeared between 1808 and 1815. He was apparently the first to associate the diverticulum with the omphalomesenteric duct which connects the yolk sac with the intestine during the first few weeks of foetal life. Failure of obliteration of part or whole of the duct results in various anatomical types, ranging from complete patency to the outpouching of intestine, usually of the terminal ileum.

Meckel's diverticulum usually arises from the antemesenteric border of the ileum, about 20 in. (50 cm.) proximal to the ileo-caecal valve, the distance being less as the age approaches infancy. The diverticulum is usually composed of the same three layers which make up the ileum, but at times contains heterotopic tissues; the incidence varies between 15 and 25% of cases. It takes the form of gastric, duodenal, jejunal, and colonic mucosa, as well as pancreatic tissue. The most common type of heterotopic tissue is gastric mucosa, occurring in 16.6% of all cases of Meckel's diverticulum. When present, the heterotopic tissue usually lines the greater portion of the diverticulum, often involving the neck of the sac.

Complications

Meckel's diverticulum attracts the attention of the surgeon as a rule only when one of the several complications of this anomaly develop. These include:

1. *Diverticulitis With or Without Perforation.*—Meckel's diverticulum is subject to inflammatory changes giving rise to symptoms and signs similar to those of appendicitis. It is impossible to distinguish between the two conditions with

any degree of confidence, unless the patient has had his appendix removed at a previous operation. Perforation with peritonitis may occur, the latter being more lethal than that seen with a perforated appendix, owing to less efficient "walling off" and to greater volume and fluidity of intestinal contents.

2. *Ulceration or Haemorrhage or Both from Heterotopic Gastric Tissue.*—Peptic ulcer with haemorrhage or perforation or both is a common complication of Meckel's diverti-

Summary of Cases

Case No.	Age	Sex	Clinical Features on Admission	Pre-operative Diagnosis	Post-operative Diagnosis	Treatment and End-result
1	21	M	Recurrent severe attacks of melaena extending over period of 10 months requiring transfusion. Barium meal and gastroscopy: N.A.D. History of mild ulcer dyspepsia	? Bleeding duodenal ulcer. ? Bleeding ulcer of Meckel's diverticulum	Bleeding ulcer of Meckel's diverticulum	Simple excision of diverticulum, which appeared to be fibrosed at apex. End-result satisfactory
2	9	M	Admitted with 48-hours history of abdominal pain and vomiting. T. 100.8° F. (38.2° C.). Examination revealed tenderness and rigidity of lower abdomen. Per rectum: tender on right side anteriorly	Acute appendicitis	Gangrenous Meckel's diverticulitis	Simple excision of diverticulum. End-result satisfactory
3	39	F	History of colicky abdominal pain and vomiting of 4 hours' duration. T. 99° F. (37.2° C.). Tenderness and guarding high in right iliac fossa and right hypochondrium. Previous but less severe attacks of abdominal pain	Acute appendicitis	Meckel's diverticulitis	Simple excision of diverticulum. End-result satisfactory
4	55	F	Recurrent attacks of melaena associated with vague attacks of upper abdominal pain. Barium meal, barium enema, and gastroscopy normal	Bleeding duodenal ulcer	Bleeding ulcer of Meckel's diverticulum	Simple excision of diverticulum with invagination of the stump. Histology: no heterotopic gastric mucosa
5	33	F	Lower right abdominal pain associated with vomiting for 3 days. T. 98.4° F. (36.9° C.). Also previous attacks of colicky right lower abdominal pain with vomiting for 3 years	Acute appendicitis	Meckel's diverticulitis	Simple excision of diverticulum. Discharged well 2 weeks after operation. Histology suggests heterotopic gastric mucosa
6	9	M	Severe recurrent attacks of melaena necessitating blood transfusion. Barium meal: N.A.D.	Bleeding ulcer of Meckel's diverticulum	Bleeding ulcer of Meckel's diverticulum	Simple excision of diverticulum. Discharged well 7 weeks after operation
7	54	F	Lower abdominal pain and vomiting for 3 days. Rheumatic heart disease associated with fibrillation. On examination there was evidence of slight abdominal distension	Intestinal obstruction	Intestinal obstruction	Patient died from toxæmia without any operative intervention. Necropsy showed gangrenous Meckel's diverticulum causing intestinal obstruction
8	38	M	Colicky lower abdominal pain and vomiting	Intestinal obstruction	Meckel's diverticulitis causing intestinal obstruction	Simple excision of diverticulum. As the diverticulum was kinking small intestine and causing marked obstruction, temporary ileostomy was performed. Discharged well about 7 weeks after operation
9	10 12	M	Colicky abdominal pain and vomiting, associated with bleeding per rectum. T. 100° F. (37.8° C.). ? Mass felt in right hypochondrium	Intussusception	Intussusception caused by Meckel's diverticulum	Simple excision of diverticulum. Discharged well 8 days after operation
10	17	M	4 months' history of vague dyspepsia with recent severe attack of melaena requiring blood transfusion	? Bleeding peptic ulcer of Meckel's diverticulum. ? Bleeding D.U.	Bleeding ulcer of Meckel's diverticulum	Simple excision of Meckel's diverticulum. Histology showed heterotopic gastric mucosa. Discharged well 12 days after operation
11	38	M	Intermittent mild abdominal pain for 9 days. Much more severe 24 hours before admission, associated with vomiting. Examination showed tenderness and guarding in right iliac fossa	Acute appendicitis	Gangrenous Meckel's diverticulitis	Excision of diverticulum, plus adjacent portion of small bowel. Discharged well about 4 weeks after operation
12	10/12	M	Painless melaena for one day. Irritability, especially after feeds for a few days. No abnormality found on examination of abdomen	? Intussusception. ? Bleeding ulcer of Meckel's diverticulum	Bleeding ulcer of Meckel's diverticulum	Excision of diverticulum. Discharged well 8 days after operation
13	29	M	2 days' history of colicky mid-abdominal pain. Examination revealed tenderness and guarding in right iliac fossa. T. 102° F. (38.9° C.)	Acute appendicitis. ? Meckel's diverticulitis	Meckel's diverticulitis	Simple diverticulectomy. Discharged well 11 days after admission
14	50	M	5 days' history of abdominal pain and vomiting. On examination no definite distension seen but obstructive sounds heard on auscultation	Intestinal obstruction	Meckel's diverticulum causing obstruction of small bowel	Excision of diverticulum plus adjacent portion of small intestine
15	33	F	20 years' history of pain 1-hour after meals with recent attacks of colicky abdominal pain. One attack of right-sided abdominal pain diagnosed as appendicitis; appendicectomy performed but appendix normal. Meckel's diverticulum was not looked for. Barium meal and gastroscopy negative. Occult blood positive on several occasions	? Ulcer of Meckel's diverticulum	Meckel's diverticulum with ulcer on adjacent portion of small bowel	Excision of diverticulum plus portion of small intestine on each side. The ulcer in this case was in the ileum, 1 cm. proximal to stoma of Meckel's diverticulum. The ulcer had caused ring stricture of small intestine, producing marked intestinal obstruction
16	45	M	2 days' history of generalized abdominal pain and vomiting; pain more marked in right iliac fossa on day of admission. On examination marked tenderness and guarding in right iliac fossa	Acute appendicitis	Gangrenous Meckel's diverticulitis and sub-acute appendicitis	Simple excision of diverticulum. The diverticulum was divided into two portions by a constriction in its wall, and the larger pouch contained a number of hard stones
17	18	M	2 years' history of occasional dyspepsia. Recurrent attacks of fairly severe melaena extending over a period of 8 months. On examination tender to right of umbilicus. Barium meal normal	? Meckel's diverticulum. ? Duodenal ulcer	Meckel's diverticulum	Simple excision of diverticulum. Post-operative progress satisfactory
18	63	F	24 hours' history of acute abdominal pain. Pulse 150, T. 101° F. (38.3° C.). On examination tenderness and rigidity of whole lower abdomen, more marked to right of midline	? Perforated appendicitis. ? Perforated diverticulitis of colon	Gangrenous Meckel's diverticulitis with peritonitis	Simple excision of diverticulum, with satisfactory result

culum. It is more often seen in infancy and childhood, and is the only complication of Meckel's diverticulum other than umbilical lesions which can be diagnosed pre-operatively. The cardinal symptoms and signs are: (a) history of massive intestinal haemorrhage, (b) an average age of from 10 to 15 years, and (c) abdominal pain. Usually the patient gives a history of previous massive intestinal haemorrhage followed by a period of months, or even years, before recurrence. The haemorrhage is usually massive, although in some cases there may be a history of small and recurrent melaenas. Other conditions giving rise to rectal bleeding are Henoch's purpura, bleeding peptic ulcer, rectal polyp, ruptured rectal varicosities, and early congenital intestinal telangiectasis. In adults, benign and malignant tumours of the gastro-intestinal tract must also be considered. With careful examination it is usually possible to eliminate most of the conditions mentioned. The bleeding gastric or duodenal ulcer may, however, cause difficulty in the diagnosis, because some cases of diverticular ulcer do have a definite pain-food relation (see Case 15). Regardless of other symptoms, a history of massive haemorrhage from the rectum followed by recovery and then recurrence of haemorrhage after the lapse of weeks or months is almost pathognomonic of peptic ulcer of Meckel's diverticulum.

3. *Intestinal Obstruction.*—Meckel's diverticulum may be the cause of intestinal obstruction. The fibrous band connecting the diverticulum to the parietes or other adjacent organs may act as an axis about which the bowel may rotate to form a volvulus. At other times the diverticulum itself may be the leading point of an intussusception, particularly in the broad-based diverticulum. There is no characteristic feature to distinguish it from small-bowel obstruction due to other causes, but this condition must be borne in mind when confronted with a case of intestinal obstruction in infants and children.

4. *Umbilical Fistula and Associated Lesions.*—Lesions of the umbilicus associated with incomplete obliteration of the omphalo-mesenteric duct also occur, and are relatively easy to diagnose.

5. *Neoplasms.*—Tumours, both benign and malignant, have also been reported in Meckel's diverticulum, but are of rare occurrence.

6. *Foreign Bodies.*—Calculi and various foreign bodies have been encountered, giving rise in some instances to inflammation, perforation, and obstruction (see Case 18).

Treatment

It is generally agreed that silent diverticula found incidentally at laparotomy require no special treatment. It is only when a complication supervenes that the surgical treatment becomes a matter of urgency. The detail of operative procedure used must of necessity vary with the findings in the individual case. When intestinal obstruction is found, it is usually due to either a band or an intussusception. The band must be divided and the intussusception should be reduced, and, provided the general condition of the patient is satisfactory and there is no gross distension of bowel, the diverticulum may be resected at the same time. The method of excision, however, varies with different surgeons; some advise excision with closure of the defect by two rows of sutures, or by the same technique as used for appendicectomy, while others believe in resecting the diverticulum plus a portion of adjacent bowel, with subsequent anastomosis. With the former method particular care must be taken to avoid undue narrowing of the lumen. Ladd and Gross (1941) recommend that clamps should be placed at an angle of 45 degrees to the long axis of the bowel to reduce the risk of this complication. In cases of perforation or haemorrhage from an ulcer there is the possibility of heterotopic gastric mucosa extending up to the adjacent portion of the bowel, and it is therefore important to include it in the resection.

Cases of umbilical fistula or adenoma require formal laparotomy, as these conditions are commonly associated

with incomplete obliteration of the omphalo-mesenteric duct, which should be remedied at the same time. In cases of diverticulitis with or without perforation, the general and local condition must be taken into account in deciding the advisability of resection of adjacent portions of the intestine. Diverticula which are sites of tumour formation should be excised, with a few inches of small intestine on each side, including a wedge of the mesentery.

The patients whose cases are reported in the Table were operated upon at Central Middlesex Hospital between 1936 and 1953. They illustrate well some of the more important complications of Meckel's diverticulum.

In seven of the cases the possibility of Meckel's diverticulum as the causative factor was considered, but in only three was the diagnosis made with some degree of confidence. The greater incidence of the condition in males in this series agrees with the findings generally recorded by other writers. There was one death in this series, giving a mortality of 5.5%. This occurred in a patient who was too ill for operation. Heterotopic gastric mucosa was found in two cases; some of the specimens were not submitted to histology, while in others there was no evidence of heterotopic tissue. However, without making several sections from each specimen, such tissue might readily be missed.

The complications of Meckel's diverticulum in childhood have been stressed by many writers, and, while such studies are entirely appropriate, the importance of these complications in adults must also be remembered. This is well shown in the Table, in which two-thirds of the cases were found in adults over the age of 21. In fact, in any acute abdominal emergency, unexplained bleeding from the gastro-intestinal tract, and vague intra-abdominal complaints the possibility of Meckel's diverticulum as the cause must be considered.

Summary and Conclusions

An account is given of the common complications of Meckel's diverticulum, together with a short note on treatment.

Eighteen cases, with one death, are reported and subjected to analysis.

The importance of Meckel's diverticulum as a cause of acute abdominal emergency, unexplained intestinal haemorrhage, or vague abdominal symptoms is stressed.

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BIBLIOGRAPHY

- Dragstedt, L. R. (1933). *J. Amer. med. Ass.*, **101**, 20.
Ladd, W. E., and Gross, R. E. (1941). *Abdominal Surgery of Infancy and Childhood*. Saunders, Philadelphia.
Meckel, J. F. (1812). Quoted by Wilson (1942).
Thompson, J. E. (1937). *Ann. Surg.*, **105**, 44.
Wilson, H. (1942). *Amer. J. Surg.*, **56**, 614.
Wolfson, W. L., and Clurman, M. J. (1930). *Ann. Surg.*, **92**, 388.

The annual report of Yale Medical Library for the year ending June 30, 1953, includes some interesting information on the relative use made of medical periodicals. The library receives 1,140 serial publications of all types, and a rearrangement in the reading-room made it necessary to reduce the number of journals housed there. An analysis was therefore made of the recorded use of these journals, and it was noticed that the "current use" of a journal appears to continue for about five years, with the second year after publication being the time of heaviest use. It is shown that the availability of such periodicals is greatly increased if binding is delayed for five years. As much use was made of the two most popular journals together as was made of the 158 least popular on the list combined. Forty journals accounted for nearly half of the total use made of periodicals.