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Small bowel diverticula

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SMALL BOWEL DIVERTICULA

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The small bowel diverticula, excluding the Meckel's variety, have evolved from a rare necropsy curiosity of 75 years ago to a clinical entity of importance which is often being overlooked today. Due to the multiplicity of position, types, and complications, the diagnosis is often obscure. Most cases are asymptomatic, but a few cases will turn up with severe complaints and a distressing history. Therefore, each case should be evaluated on its own terms and not dismissed on the mere grounds of statistical values.

HISTORY

The diverticula, which are small pouches or pockets leading off from the main cavity, were first noted in the 1700's arising from the small bowel. These initial observations by Chomel in 1710, as reported by Maingot (38), were made at the autopsy of an eighty-year old woman who died of an apoplectic fit. There was a blind duodenal pouch which contained twenty-two gallstones. Maingot (38) also reported that the next account was in 1765 by Morgagni, and the third report was by Sommering in 1794. Then followed Voigtel in 1804.

The first report in the English literature was in

1844 by Sir Astley Cooper (15), who reported an incidence of an elderly man, with symptoms of partial obstructions, whom he had seen in 1804 in a London Hospital. On necropsy he was found to have multiple jejunal diverticula which were composed of mucosa and serosa without muscularis. These contained only flatus. He likened these to the known entity of bladder diverticula.

The next major account was by Osler (46) in 1881, who remarked about the morbid anatomy and reported eleven occurrences of which one case had fifty-six diverticula in the jejunum. The literature at the turn of the century continued to review the necropsy findings and substantiate the anatomic entity as in Baldwin's (5) report of fourteen instances in one-hundred and five necropsies done at Cornell.

Forsell and Key (24) in 1915, in the German literature, gave the first report of fluoroscopic examination and diagnosis, and the operative removal of a small bowel diverticula. This was on the second or descending portion of the duodenum.

The next major breakthrough came in 1920, when Case (13), in the American literature described the X-ray diagnosis of this entity, which he had made on five occasions, in 6,847 small bowel examinations for an incidence of 0.073 per cent.

The literature from the 1930's until now has pri-

marily been review articles and reports of cases with various complications. The recent literature has primarily brought to light the higher incidence of the entity than was originally suspected.

INCIDENCE

In 1934 Rankin and Martin (49) found this lesion in 0.31% of 956 consecutive small bowel series. As reports continued to appear in the literature, each varied in the reported incidence. Edwards, (20) in 1936, found an incidence of 0.086% on X-ray examination, while his gross autopsy findings placed the incidence at 0.31%. This figure, which matches that of Rankin and Martin's (49) roentgenographical experience, was obtained on routine examination in 2850 autopsies. In 881 autopsies, in which special attention was paid to the small bowel, an incidence of 0.57% was noted.

Many authors have reported single cases and a few have reported small series in the literature. One of the last big series, that of 2,161 roentgenographic barium meal studies, by Orr and Russel (45) in 1951, reported an incidence of 0.42%. Therefore, it seems to appear that this entity is not as rare as once thought and probably should be considered as a factor in the differential diagnosis in the acute or chronic abdomen in the patient over 50 years of age.

Of the small bowel diverticula, the most common

site is the duodenum; then the jejunem; and least often in the ileum. An interesting side note is the frequency with which this entity is seen in conjunction with colon diverticula. Like those seen in the colon, the small bowel diverticula has a preponderance for the 5th, 6th, and 7th decade. The incidence seems to increase with age. Caplan and Jacobson (12) found an average age of 60 with a spread of ages from 55 to the 70's; whereas Baskin and Mayo (6) in 1952 found the mean to be in the 60 to 69 year old bracket. This represented 33 of 76 patients with this entity seen at the Mayo Clinic during the eight years from 1943 to 1951. Fifty-four of the 76 were between ages 50 and 69. There does seem to be a slight predominance for this disease to appear in males. Orr and Russel (45) found the ratio between men and women to be about 2:1, which seems to agree with most reports.

ETIOLOGY

Numerous hypotheses have been presented on the pathogenesis of this entity. The one conclusion that most agree upon is that the true etiology is unknown. Whether this is a herniation through a weakened or attenuated layer of muscularis, the "locus minoris resistentiae", as described by Edward (20) in 1936, or secondary to chronic increased intraluminal pressure is unknown. It could be a combination of both of these

factors. Some may be due to a traction mechanism secondary to prolonged irritation or inflamation as with chronic duodenal ulcers.

Due to the age group in which small bowel diverticula are seen, degenerative diseases such as vascular sclerosis and senile atrophy are probably a major part of the pathological process.

PATHOLOGY

The diverticula, which are composed of serosa, sub mucosa, and mucosa without muscularis, are located primarily on the medial or mesenteric side of the bowel. They tend to arise at the site of an entering blood vessel and disect out through the muscularis within the peritoneal folds of the mesentery.

They range in size from several millimeters to 10 centimeters. The necks of the diverticula tend to be larger than those seen in the colon; therefore allowing an easier entrance and exit of the partially digested food material.

There is an entity, called intraluminal duodenal diverticulae, which have been reported frequently since 1947. These are probably a variant of the congenital duodenal diaphragm and composed entirely of mucosa and contained within the small bowel lumen. As this type of diverticula seems completely unrelated in structure, morphology and etiology, it is not discussed in this paper.

DISTRIBUTION

In general, the diverticula of the jejunum and ilium tend to be larger than those of the duodenum. Duodenal diverticula are about five times more prevalent than those of the jejunum according to Caplan and Jacobson (12). Those of the ileum are rarer yet. Although isolated single diverticulum do occur, multiple diverticula are the usual rule in the acquired or primary type.

CLASSIFICATION

The classification of small bowel diverticula has been frequently discussed with the resulting use of confusing terms of true and false, congenital and acquired, mesenteric and antimesenteric, to name a few. In the recent years, the authors seem to be settling on the terms of primary and secondary as used by Elstner and Waugh (23).

The secondary group contains those diverticula which are mostly found in the first part of the duodenum, and are usually a result of scarring and adhesions secondary to pathology such as peptic ulcer and gallbladder disease. These contain all the layers of the intestine and result from the scarring of adjacent inflammatory processes. As these differ in pathogenesis, distribution, and clinical course from the primary or idiopathic variety, they are not further discussed in

this paper.

The primary diverticula (excluding Meckel's) are usually located on the concave or mesenteric border of the bowel. These contain only serosa, sub-mucosa, mucosa, and no muscularis. Therefore they are quite thin-walled. The anatomy of these diverticula has been previously described.

CLINICAL MANIFESTATIONS

The clinical symptoms attributed to the small bowel diverticula are highly variable. Cooper in 1844 (15) described partial obstruction. Osler, (46) in 1881, reported a patient with colicky pains and borborygimi after eating.

The classification is probably best dealt with by Orr and Russel (45), who broke the patients into three groups as follows:

1). Asymptomatic
2). Mild to moderate symptoms
3). Acute abdomenal symptoms

They found that approximately 60% of the patients had no symptoms. These diverticula were diagnosed as an incidental finding on small bowel series. The high percentage of asymptomatics here as compared to the rate seen in the colon, is often attributed to the greater mobility of the small intestine, wider neck of the diverticula, lower bacteria concentration and more liquid state of the small bowel contents.

The 30% which composes the mild to moderate symptom group, vary from dyspepsia and mild pain, to diarrhea, loud peristaltic rushes, and nausea with anorexia. The symptoms seem to have no relation to bowel movements, exercise, or eating, and tend to be intermittent and quite variable. These signs and symptoms tend to be non-specific in nature and the diagnosis is usually made only after ruling out all other causes due to small bowel pathology.

The remaining 10% comprise the acute abdominal pain group of which one-half or 5% of all patients are considered to have an acute surgical abdomen.

An interesting fact pointed out by Altemeier (2) is that the degree of disability from the diverticula is often related to the multiplicity of the lesions. In his series 38% of those with multiple diverticula had marked recurrent symptoms or an acute abdomen, as opposed to approximately 10% of all patients with diverticula.

The variety of symptoms that this entity can present with, makes its clinical diagnosis quite challenging. Colicky pain, dyspepsia, diarrhea and weight loss have also been described.

In the approximately 5% of the diverticula that do become acute surgical complications, the classification or indications are quite simple. They are:

1). Hemorrhage
2). Inflamation

3). Obstruction
4). Rupture

The obstruction is the most common entity. McIlrath and Sterling (40) claim that a "low grade" obstruction in combination with inflamation is the most frequent cause of symptoms. The obstruction may be either mechanical, as due to volvulus, an intussuseption or an enterolith, or a motility disturbance secondary to an abscess, stricture, adhesions or even a full blown peritonitis following the perforation of a diverticulum.

Acute inflamation may occur, but certainly not as frequently as seen in the colon. Hemorrhage occurs rarely, but when it does occur, can be quite striking and massive amounts of blood can be lost quite rapidly. The etiology of the acute blood loss is usually rather hidden, but may be ulceration, trauma, heterotopic rests or foreign bodies. Often these are the site of silent hemorrhages, but are overlooked completely on the work-up as being a benign lesion of interest.

The rupture of the small bowel diverticula, is usually secondary to inflamation, which can be from multiple etiologic causes, or rarely, the rupture may be due to trauma.

The chronic symptomatology of this disease covers virtually all the abdominal organs. Patients may have an occasional episode of cramping or mild weight loss,

or they may have the triad of macrocytic anemia, steatorrhea and small bowel diverticula. This triad of smyptoms has often been overlooked as being an incidental finding in the gastrointestinal examination; however, recently it is being reported more and more. This is probably secondary to a condition much like the blind loop where an altered bacterial flora interferes with the normal B_{12} metabolism.

DIAGNOSIS

The diagnosis of the small bowel diverticula can be, and probably should be, more frequently suspected from the clinical history; however, the diagnosis can be established by only two methods. Indirectly it can be seen by X-ray or floroscopy, or it may be found at the time of celiotomy.

X-ray examination of the small bowel with the aid of a barium meal is the only clinical mode of evaluation. The use of recumbent X-rays of the abdomen are usually inconclusive, especially in the asymptomatic patient. Occasionally small air fluid levels are seen on the X-ray, but rarely does the diverticula attain a significant size to be seen as a soft tissue mass. Out pouchings from the small bowel are filled or partially filled with contrast media which tends to be retained after the lumen is clear. Floroscopic examination is often helpful, especially in any case with questionable or

abnormal motility disturbance.

The small bowel diverticula usually appear on X-ray as smooth globular, out pocketings, primarily on the mesenteric aspect, which lack mucosal pattern. They vary greatly in size and usually are multiple; however, they can be single. The diverticula are most common in the duodenum and decrease with distance down the jejunum, but in the ileum the most frequent involvement is in the terminal areas. However, according to McIlrath and Sterling (40) the diverticula of the duodenum is the most easily visualized, as those of the jejunum and ileum are easily obscured by other parts of the bowel.

The greatest problem in the diagnosis of small bowel diverticula is not in determining their presence, rather it is determining which lesions are symptomatic and which are asymptomatic. Unless there is a specific complication, this is often quite difficult due to the multitude of non-specific symptoms they present with.

McIlrath and Sterling (40) report an incidence of colon diverticula of over 30% in the patients with small bowel diverticula. They also state they have found 20% of their patients have been diagnosed as having a concomitant hiatal hernia, peptic ulcer or gallbladder disease.

The two most common radiological findings of symptomatic diverticula are (1) pain caused by pressure over

the area, and (2) large diverticula with rather narrowed necks.

TREATMENT

The treatment of small bowel diverticula can be considered best by breaking it into the classification of the entity. For the 60% of the diverticula that are asymptomatic, obviously no treatment is needed or recommended, but for the 30% which have mild to moderate symptoms, the therauptic approach is primarily a symptomatic medical treatment to avoid constipation, irritation, overdistention or increased intraluminal pressure. This is usually best accomplished by placing the patient on a bland, low residue diet with multiple small feedings and anti-spasmotic drugs, (for whatever this regimen is worth).

Of the 10% which develop an acute abdomen, approximately one half can be handled by medical or non-operative management. This includes the trial of therapy of the gastrointestinal hemorrhage by the non-operative mode, and the treatment of steatorrhea with macrocytic anemia by oral broad spectrum antibiotics. Some cases of perforation can be handled non-operatively, as the occurrence of an asymptomatic pneumoperitoneum secondary to perforation reported by Herrington (28).

Operative intervention, which is the only corrective mode of therapy available, is indicated in less than 5%

of all patients with this entity, but usually this is only after a failure of a trial of a nonsurgical regimen. The major indications for operation are:

1). Obstruction
2). Perforation
3). Hemorrhage

There are several basic principles which should be followed in the operative management of small bowel diverticula. The first being adequate exposure and sufficient dissection to free the lesion or lesions. In those patients with a single large diverticulum the simple ligation of the neck with transection and closure of the cuff is sufficient, however, Caplan and Jacobson (12) recommend that with multiple involvement, the procedure of choice is a regional or segmental resection with an end-to-end entero-enterostomy. In some cases, the intestinal involvement is so extensive that excision of the involved segment would remove too much bowel, therefore only the symptomatic area or segment harboring the complication should be resected.

The mortality for operative intervention runs somewhere between 10% to 40% according to various surveys, whereas the success of the operation, as measured by the alleviation of symptoms, results in improvement in 50% to 75% according to McIlrath (40). The mortality rate should be expected to be rather high, due to the technical difficulties involved, as well as the fact that

the patients are primarily of the sixth and seventh decades, in acute distress and poorly nourished. As the most prevalent location is on the mesenteric aspect of the duodenum, the operative dissection is into the head of the pancreas, which is an area for caution for both the neophyte and the accomplished surgeon. This anatomic consideration adds greatly to the morbidity and mortality of the operation.

DISCUSSION

The frequency of reported cases of the small bowel diverticula, excluding Meckel's, seems to be increasing in recent years. This can be attributed to more patients in the older age group where this is found, more upper gastrointestinal X-ray examinations, and more physicians becoming aware of this entity. The diagnosis of the diverticula's presence is only half the problem, as the physician must evaluate each case in view of the frequency of occurrence and the infrequency of complications.

The presentation of symptoms is so varied and nonspecific that the diagnosis of symptomatic small bowel diverticula is quite challenging. I feel that before this label can be affixed to any patients, all other possible causes must be ruled out; therefore, this diagnosis is primarily a process of elimination. However, in the patient in whom all other causes have been ruled

out, too often the diagnosis of symptomatic diverticula is not made as this is felt to be exceedingly rare. Before adequate therapy is instituted the diagnosis must be made.

The incidence of this entity, as I have stated earlier in this paper, is probably somewhere around 0.30% to 0.40% of the population over 50 years of age. Of these approximately 60% will be entirely asymptomatic, 30% will have some symptoms but only 10% will have severe or acute symptoms. This means, as a conservative estimate, that of the population over 50, about one out of every 275 people have small bowel diverticula, and that of these people with small bowel diverticula, one out of every ten will have acute symptoms. This must therefore be recognized as a very real pathological entity which must be thought of and not be dismissed on mere statistical evidence as a rare bird.

The treatment of choice in those that are asymptomatic is conscientious neglect, and in those that are symptomatic, primarily medical management is recommended. Because the mortality is high and results are not always satisfactory, a non-operative course of management is usually recommended. As these diverticula can present with life-threatening complications, surgical intervention is usually indicated in instances of hemorrhage, obstruction or perforation.

SUMMARY

The history and early literature of the small bowel diverticula (exclusive of Meckel's diverticula) has been reviewed. I have attempted to point out the relative frequency of this lesion, as well as the infrequency of complications. The diagnosis of symptomatic diverticula is often overlooked, but it must and can be made. The treatment is primarily the treatment of its complication, and in view of past results a conservative regimen is usually best except in certain acute surgical complications. Small bowel diverticula can and do become symptomatic and develop life-threatening complications.

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