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case report

Carcinoid tumor in Meckel’s diverticulum: laparoscopic treatment and review of the literature

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Meckel’s diverticulum is a common anomaly of the small intestine that occurs in approximately 2% of the population, often found incidentally at the time of abdominal exploration. Carcinoid tumors in a Meckel’s diverticulum have been reported in only 111 cases. The author describes a patient who presented for elective cholecystectomy and who during laparoscopy was found to have an abnormal-appearing ileal diverticulum. The resected specimen contained a carcinoid tumor. The decision-making process in treating these patients is reviewed along with a discussion of the laparoscopic treatment of intra-abdominal pathologic conditions found incidentally at the time of elective surgery.

(Key words: Meckel’s diverticulum, carcinoid tumor, laparoscopy)

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Meckel’s diverticulum is found in approximately 2% of the population and represents the most common true diverticulum of the gastrointestinal tract. Embryologically, it results from incomplete closure of the omphalomesenteric duct and generally is seen arising from the antimesenteric border of the distal ileum, from 45 to 60 cm proximal to the ileocecal valve. The vast majority are asymptomatic and found incidentally during surgical exploration or radiographic study of the small intestine. Although these diverticula may result in persistent fistula or fibrous band formations, most are benign broad-based lesions of little clinical concern. A small portion of them may contain heterotopic gastric or pancreatic mucosa, and some of these lesions may produce symptoms resulting from inflammation or bleeding. Most symptomatic presentations occur in childhood and are occasionally complicated by small bowel obstruction or perforation. Diagnosis may be difficult, but lesions containing gastric mucosa may be identified with isotope scanning of the abdomen after injection of technetium.

Surgical treatment of a Meckel’s diverticulum generally consists of diverticulectomy without small bowel resection. Although most authorities agree that asymptomatic diverticula found in children during abdominal exploration should be resected in the absence of absolute contraindications, agreement is not universal in the decision tree for these diverticula in adult patients. In an overall review of the statistical probability of complications of Meckel’s diverticulum, Soltero and Bill presented data indicating a 2% or less risk in adults of complications of these diverticula and an estimated 12% risk of surgical morbidity resulting from the elective treatment of asymptomatic diverticula. This study provided a solid background for the surgical philosophy of not removing normal-appearing diverticula in adults. However, in a more recent review, Cullen and associates reported a lifetime risk of 6.4% rate of complications of Meckel’s diverticulum and an estimated 2% or less risk of surgical morbidity from resection. These data suggested that in adults younger than 80 years of age, incidental resection was appropriate. Abnormal-appearing Meckel’s diverticula are generally resected in all age groups, with emphasis on lengthy narrow-based lesions and those with nodularity, obvious mass effect, or serosal indurations and thickenings.

With the widespread availability and use of videolaparoscopic techniques during the past 10 years, general surgeons have increasingly used this modality in the diagnosis and treatment of intra-abdominal disease. Laparoscopic cholecystectomy has been extensively described and is currently one of the most common laparoscopic procedures performed. Minimally invasive surgical techniques have expanded to virtually every area of gastrointestinal pathology, and most surgeons include a thorough exploration of the abdominal cavity in their routine elective laparoscopic evaluations. Laparoscopic treatment of appendicitis has become commonplace, and a recent study confirmed the efficacy of Meckel’s diverticulectomy with laparoscopic techniques in infants and children. In a 1996 report, Fansler reviewed the laparoscopic management of Meckel’s diverticulum in adults along with operative decisions and laparoscopic options. The author of this report has used this approach in a number of adults with asymptomatic Meckel’s diverticula found incidentally during laparoscopy.

Report of case

A 62-year-old man was evaluated in the surgical clinic for complaints of epigastric and right upper quadrant abdominal pain associated with a food-pain pattern, fatty food intolerance, profuse eructations, and episodic nausea. Gastrointestinal history was otherwise unremarkable. He had had hypertension and coronary artery disease and had undergone coronary bypass surgery 3 years earlier. His pulmonary review indicated a 50-pack-year smoking history with a mild nonproductive cough. The remainder of his system review data was noncontributory. Medications included atenolol, aspirin, and...
vitamins. Physical examination revealed an alert and cooperative adult man. His height was 190 cm, and he weighed 70 kg. Blood pressure was 104/50 mm Hg; pulse, 58 beats/min; respirations, 16/min; and temperature, 37°C by mouth. Findings of examination of the head, eyes, ears, nose, and throat were unremarkable. His heart was normal, and lung sounds were clear in all fields. Abdominal examination revealed only mild right upper quadrant tenderness without mass, guarding, or rebound tenderness. Bowel sounds were active, no hernia was present, no bruits were noted, and surgical scars from chest tubes were well healed. Findings of examination of the groin, genitalia, and rectum were unremarkable, and the extremities were normal.

Radiography of the chest and abdomen revealed postoperative cardiac surgery changes. Electrocardiographic findings were unchanged from prior studies. Survey abdominal ultrasound was unremarkable, and there was no evidence of cholelithiasis. Results of hematologic, liver, and pancreatic biochemical panels were all within normal limits. The patient's renal function and coagulation screening test results were normal, as were the urinalysis and electrolyte results. A nuclear medicine (lidofenin) biliary study with cholecystokinin challenge revealed gallbladder ejection obstruction with reproduction of the patient's clinical symptoms, including pain, nausea, and vomiting. The clinical diagnosis was chronic acalculous cholecystitis, and the patient was offered elective outpatient laparoscopic surgical treatment of his gallbladder disease.

At the time of surgical intervention, laparoscopic abdominal exploration revealed a Meckel's diverticulum with an irregular and somewhat indurated serosal region on one side (Figure 1). Diver- ticulectomy was elected, and a stapled resection was performed (Ethicon Endopath Endoscopic Linear Cutter TSW35). Postoperative small bowel inspection revealed no lumenal compromise (Figure 2). No evidence of lymphadenopathy, intra-abdominal tumor, small or large bowel pathologic features, ascites, or liver disease was found; the findings of the remainder of the examination were unremarkable except for a densely adhesed gallbladder. Laparoscopic cholecystectomy was performed, and the patient had an uncomplicated recovery. Pathologic evaluation of the diverticulum revealed normal histologic features (Figure 3), but in one region, a zone less than 1 cm revealed typical changes of carcinoid tumor (Figure 4) extending to the serosa. The patient has remained asymptomatic in postoperative follow-up, and 24-hour urine 5-hydroxyindoleacetic acid results were normal.

Discussion

Carcinoid tumors have widespread distribution and have been reported in virtually every anatomic region. Most commonly found in the appendix, they are an incidental finding in 0.3% to 0.7% of routine appendectomy specimens. In a 1988 review of the literature, Silk and colleagues found only 52 reported cases of carcinoid tumor in Meckel's diverticulum; a more recent study identified 111 cases. The extreme rarity of this lesion makes the clinical behavior and outcome somewhat difficult to predict. Statistical data support the expectation that single carcinoids smaller than 1 cm rarely metastasize and are usually surgically cured, whereas multiple lesions or those larger than 2 cm metastasize in nearly 90% of cases. Appendiceal and colorectal localized carcinoids typically follow a more indolent and benign clinical course, whereas small bowel and bronchial carcinoids are the most virulent lesions.

Moyana studied the immunophenotype of several carcinoids of the Meckel’s diverticulum and compared them to appendiceal and jejunookal tumors. He found that the Meckel’s lesions more closely resembled the jejunoileal carcinoid in immunohistochemical profile and thus may be predicted to behave more aggressively. In a review of 104 Meckel’s cases of carcinoid tumor, Nies and coworkers found an incidence 2.5 times
greater in males, a 70% location in the tip of the diverticulum, and behavior similar to that of ileal carcinoids. The average patient age was 56 years. Carcinoid syndrome, most frequently associated with massive hepatic metastases, has been rarely associated with carcinoid tumors of the Meckel’s diverticulum smaller than 2 cm.

Surgical treatment of carcinoid tumors is generally based on extent and size of the primary lesion. For asymptomatic, solitary lesions smaller than 1 cm without mesenteric lymphadenopathy, segmental resection is considered adequate.\(^1\) For larger or multiple lesions, wide excision of bowel and mesentery is recommended. For incidentally found small carcinoids arising in a Meckel’s diverticulum, a localized stage would therefore likely be adequately treated by diverticulectomy. For larger or higher-stage lesions, wide resection of the ileal segment and its mesentery would seem appropriate. The decision on whether to return a patient to surgery for more extensive resection for a carcinoid found incidentally would probably be similar to the treatment followed for appendiceal carcinoids, and that would be based on size, proximity to the margin of resection, and extension through the serosa.

Prognosis has been evaluated and seems to be similar to that described for small intestinal carcinoids. In a review of reported cases through 1989, Weber and McFadden\(^12\) confirmed this finding, with incidence of symptoms, percentage of syndrome cases, and metastases similar to the ileal carcinoids. Patients with locally staged carcinoids of the small bowel have been reported to have an overall survival rate of 75%,\(^1\) and this likely approximates the prognosis for carcinoid tumors found in Meckel’s diverticulum. The 5-year survival rate for patients with tumors with lymph node involvement is approximately 50%, and about 20% for patients with liver metastases.\(^13\)

Current studies support surgical resection of asymptomatic Meckel’s diverticula found incidentally at laparotomy, and the case reported here demonstrates the potential benefit of this approach. The extension of this surgical philosophy to laparoscopic interventions would seem valid.

**References**