Emergency Presentations of Meckel's Diverticulum

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In

General Surgery

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INTRODUCTION

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Meckel's diverticulum is the most common congenital anomalies that occur in the digestive system ***(Evers, 2004).***

Meckel's diverticulum is the remain of prenatal yolkstalk (vitello intestinal duct). The yolk sac of the developing embryo is connected to the primitive gut by vitelline duct, this structure normally regress between the fifth and seventh weeks of life. If this regression fails, various anomalies occur such as Meckel's diverticulum ***(Evers, 2004).***

Meckel's diverticulum was first described by Fabricuis Hildanus in 1598. The name of Meckel's diverticulum derives from the german anatomist, Johann Friedrich Meckel who described the embryological and pathological feature in 1809 ***(Raymond, 2007).***

Meckel's diverticulum is a true diverticulum because its wall contains all layers found in normal small intestine. It affects 2% of general population ***(Yahchouchy et al., 2001)***.

Its location varies among individuals but it is usually found in the ileum within 100 cm of ileocecal valve (***Yahchouchy et al., 2001)***.

The majority of the Meckel's diverticulae remain silent and are diagnosed incidentally during small bowel contrast study , laparoscopy or laparotomy done for unrelated condition or until complication arise from the diverticulum such as, gastrointestinal bleeding, intussusceptions, diverticulitis, intestinal obstruction ***(Mortensen NJ and Jones O, 2004).***

The surgical treatment of symptomatic Meckel's diverticula should consist of diverticulectomy with removal of associated bands connecting the diverticulum to the abdominal wall or intestinal mesentery. If the indication for diverticulectomy is bleeding, segmental resection of ileum that includes both the diverticulum and the adjacent ileal peptic ulcer should be performed. Segmental ileal resection may also be necessary if the diverticulum contains a tumor, or if the base of the diverticulum is inflamed or perforated ***(Yahchouchy et al., 2001)***.

AIM OF WORK

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The current work attempts to highlight the various life threatening complications of Meckel's diverticulum and to present the surgical strategies used in the emergency conditions.

CHAPTER (1) ANATOMY OF MECKEL'S DIVERTICULUM

MECKEL'S DIVERTICULUM

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Meckel’s diverticulum was named after Johann Friedrich Meckel, who described its anatomy and embryology in 1809 ***(Opitz et al., 2006).***

Meckel’s diverticulum is a remnant of the omphalomesenteric or vitelline duct, which connects the yolk sac to the midgut through the umbilical cord. This duct is typically obliterated by the 5th–8th week of gestation. Failure of duct closure results in diverticulum (90% of cases), omphalomesenteric fistula, enterocyst, or a fibrous band. ***(Elsayes et al., 2007).***

Meckel’s diverticulum arises from the antimesenteric border of the distal small bowel, typically 40–100 cm from the ileocecal valve, with a typical length of up to 5 cm and diameter of up to 2 cm. Blood supply to this diverticulum typically comes from the omphalomesenteric artery (a remnant of the primitive vitelline artery arising from an ileal branch of the superior mesenteric artery). ***(Elsayes et al., 2007).***

Meckel’s diverticula are lined with heterotopic mucosa in up to 60% of cases in the following manner: gastric mucosa, 62%; pancreatic, 6%; both gastric and pancreatic, 5%, jejunal, 2%; Brunner’s glands, 2%; and gastric and duodenal, 2% ***(Matsagas et al., 1995).***

The ileal diverticulum (of Meckel) exists in 3% of adults: it represents the remnant of the proximal part of the intestino-vitelline duct. It projects from the antimesenteric border of the terminal ileum and is commonly located between 50 and 100 cm from the ileocaecal valve. It has a median length of c.5 cm and often possesses a short 'mesentery' of adipose tissue that extends from the ileal mesentery up to the base. ***(Borley , 2005).***

The lumen of the diverticulum is usually wide, with a calibre similar to that of the ileum. The tip is usually free but occasionally may be connected to the anterior abdominal wall near the umbilicus by a fibrous band. The mucosa is ileal in type but small areas may be lined by gastric body type epithelium, which occasionally gives rise to bleeding in the adjacent normal ileal mucosa. ***((Borley , 2005).***

Heterotopic areas of pancreatic, colonic or other tissues may occur in its wall. Inflammation may mimic acute appendicitis: Meckel's diverticulum is derived from midgut

structures, and so pain is referred to the periumbilical region as it is in early appendicitis. ***(Borley , 2005).***

The midgut enlarges rapidly during the first 5 weeks of gestation and becomes too large for the abdominal cavity; subsequently, it is herniated into the umbilical cord. The apex of the herniated midgut is continuous with the vitellointestinal duct and the yolk sac. The axis of the herniated midgut is formed by the superior mesenteric artery. At approximately the 10th week of gestation, the midgut begins its return into the abdominal cavity. This return occurs by a highly complex developmental process, and as a result, numerous anomalies of the bowel may ensue. These include bowel atresias and stenoses, abnormalities of the vitellointestinal duct, failure of ceacal descent, malrotation, malfixation, reversed bowel rotation and exomphalos. ***(Mohite et al., 2007).***

In 2 to 4% of people, a small portion of the vitelline duct persists, forming an outpocketing of the ileum, Meckel's diverticulum or ileal diverticulum **(Fig. 1.A).**

In the adult, this diverticulum, approximately 40 to 60 cm from the ileocecal valve on the antimesenteric border of the ileum, does not usually cause any symptoms. However, when it contains heterotopic pancreatic tissue or gastric mucosa, it may cause ulceration, bleeding, or even perforation. Sometimes both

ends of the vitelline duct transform into fibrous cords, and the middle portion forms a large cyst, an enterocystoma, or vitelline cyst **(Fig. 1.B).**

Since the fibrous cords traverse the peritoneal cavity, intestinal loops may twist around the fibrous strands and become obstructed, causing strangulation or volvulus. In another variation the vitelline duct remains patent over its entire length, forming a direct communication between the umbilicus and the intestinal tract. This abnormality is known as an umbilical fistula, or vitelline fistula **(Fig. 1.C).** A fecal discharge may then be found at the umbilicus.(***Sadler, 2006).***

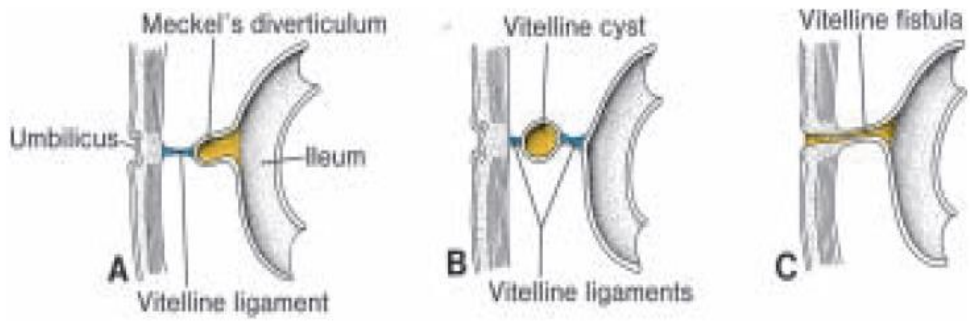

Figure 1. Remnants of the vitelline duct.
A. Meckel's, or ileal, diverticulum combined with fibrous cord (vitelline ligament).

B. Vitelline cyst attached to the umbilicus and wall of the ileum by vitelline ligaments.

C. Vitelline fistula connecting the lumen of the ileum with the umbilicus.
(**Quoted from : Sadlar T.W - Langman's Medical Embryology 9th Edition (2006). Lippincot and Williams, New York. Chapter 13;312,313.)**

Considering that Meckel's diverticulum is an abnormality of the ileum, it is appropriate to describe the anatomy of the ileum (Blood supply, Lymphatic drainage).

VASCULAR SUPPLY AND LYMPHATIC DRAINAGE

ARTERIES

The arterial supply to the jejunum and ileum arises from the superior mesenteric artery. Branches divide as they approach the mesenteric border and extend between the serosal and muscular layers. From these, numerous branches traverse the muscle, supplying it and forming an intricate submucosal plexus from which minute vessels pass to the glands and villi. Although there is a profuse anastomotic network of arteries within the mesentery, anastomoses between the terminal branches close to the intestinal wall are few, and alternate vessels are often distributed to opposite sides of the jejunum/ileum . ***(Borley , 2005).***

SUPERIOR MESENTERIC ARTERY

The superior mesenteric artery originates from the aorta 1cm below the coeliac trunk, at the level of the intervertebral disk between the first and second lumbar vertebrae. It runs inferiorly and anteriorly, anterior to the uncinate process of the pancreas and the third part of the duodenum, and posterior to the splenic vein and the body of the pancreas. The left renal vein lies behind it and separates it from the aorta.(***Borley , 2005).***

As it descends in the root of the small bowel mesentery, the artery crosses anterior to the inferior vena cava, right ureter and right psoas major. The calibre of the vessel steadily decreases as successive branches are given off to the loops of jejunum and ileum: it ends in a terminal branch which anastomoses with the ileocolic artery. The superior mesenteric artery gives off the middle colic, right colic, ileocolic, jejunal and ileal branches. A fibrous strand from the region of the last ileal branch may be present in the mesentery and represents the vestige of the embryonic artery that originally connected it to the yolk sac. The superior mesenteric artery may be the source of the common hepatic, gastroduodenal, accessory right hepatic, accessory pancreatic or splenic arteries. It may arise from a common coeliac-mesenteric trunk. ***(Borley , 2005).***

Ileal branches

Ileal branches arise from the left and anterior aspects of the superior mesenteric artery. They are more numerous than the jejunal branches but smaller in calibre. The length of the mesentery is greater in the ileum and the branches form three, four or sometimes five tiers of arcs within the mesentery before giving rise to multiple straight vessels that run directly towards the ileal wall. As with the jejunal branches, these run parallel in the mesentery and are distributed to alternate aspects of the ileum. They are longer and smaller than similar jejunal vessels,