



A redundant loop of descending colon and right sided sigmoid colon

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Abstract

During routine dissection for undergraduate students in the Department of Anatomy, NRS Medical College, Kolkata, India, few rare variations in the disposition of large intestine and inferior mesenteric artery were noted in a 70-year-old male cadaver. Variations were as:

The caecum and appendix were present in right lumbar region and a short ascending colon (about 10 cm in length) extended from the caecum up to the first hepatic flexure. Usual transverse colon was present with mesocolon and splenic flexure with phrenico-colic ligament.

A redundant loop of descending colon crossed the great vessels of abdomen to form a second hepatic flexure. The descending and sigmoid colon were present on the right side of abdomen. Inferior mesenteric artery arose from the right side of the ventral surface of the abdominal aorta to supply the left one-third of transverse colon, splenic flexure, descending colon, sigmoid colon, etc. This was a rare case. © *Int J Anat Var (IJAV)*. 2012; 5: 11–13.

Key words [descending colon] [redundant colon] [sigmoid colon] [inferior mesenteric artery]

Introduction

Variations in the disposition and length of colon are developmental in origin. Interruption of typical locations may lead to a variety of acute and chronic pathological conditions [1].

The embryonic gut has three parts: foregut, midgut and the hindgut. The major portion of the large intestine develops from this hindgut loop [2, 3].

The large intestine extends from the distal end of ileum to the anus (about 1.5 meters in length). It has following divisions: caecum, appendix, ascending colon, transverse colon (extending from hepatic flexure to splenic flexure), descending colon, sigmoid colon, rectum and anal canal. Phrenico-colic ligament is attached to the splenic flexure [3, 4]. The retroperitoneal descending colon (about 25 cm long) descends through the left hypochondrium and lumbar regions, curves inferomedially to become the sigmoid colon. The descending colon and sigmoid colon are supplied by the inferior mesenteric artery [3].

A portion of the hindgut loop may be elongated abnormally giving rise to a redundant loop [5]. In Kantor's [6] definition the redundant colon is one which is too long to fit into the body of its owner without undergoing reduplication. Redundant colon refers to the extra bends in the colon by Kanagasuntheram et al. who classified redundant colon into four groups [5]:

Group I: Presence of complete ascending and descending mesocolon,

Group II: Presence of double hepatic flexure.

Group III: an extension of sigmoid colon into the abdominal cavity.

Group IV: Displacement of sigmoid colon towards the right side.

Case Report

Caecum and appendix were present in right lumbar region in the cadaver. A short ascending colon (about 10 cm) extended upwards from the caecum, ended at hepatic flexure. From the latter transverse colon passed to the left side up to splenic flexure. The phrenico-colic ligament was attached to this flexure. Here the first segment of descending colon, instead of going vertically downwards, curved downwards and medially (in front of the great vessels) and then vertically upwards on the right side of abdomen to form a second hepatic flexure, which was the redundant loop with a length of about 15 cm.

Then the second segment of descending colon (length was about 18 cm) ran vertically downwards on the right side to continue as the sigmoid colon in the right iliac fossa. The total length of the two segments of the descending colon was about 33 cm. The redundant loop (a retroperitoneal structure) was devoid of mesentery.

The inferior mesenteric artery arose from right side of ventral surface of abdominal aorta (opposite third lumbar vertebra). It descended retroperitoneally, along the right side of aorta for about 1.5 cm, gave two branches perpendicular to each other. The descending branch passed vertically downwards to continue as the superior rectal artery. The ascending branch supplied left one-third of transverse colon, splenic flexure, the redundant loop of descending colon, second hepatic flexure, the second segment of descending colon, sigmoid colon (partly) and ended by anastomosing with the a branch of superior mesenteric artery.

Discussion

During the first 4-5 weeks of gestation, the midgut loop forms the physiological umbilical hernia with 90° rotation (first stage).

The second stage (10th and 11th week of gestation) consists of a reduction of the umbilical hernia, with return of the jejunum, ileum, caecum and colon into the abdominal cavity with 180° rotation. As a result, caecum and appendix come to be situated in the subhepatic region in the right hypochondrium.

In the third stage (after 10th week of gestation) descent of caecum and appendix occurs to the right iliac fossa with the formation of the ascending colon and fixation of the mesenteries.

The midgut loop rotates on the axis of the superior mesenteric vessels through 270° as a whole from its original plane [2].

Abdominal aorta gives three ventral splanchnic arteries to the digestive tube: the coeliac trunk, the superior and inferior mesenteric arteries. In the fetus as the viscera supplied descend into the abdomen, the origins of these arteries migrate caudally. So the origin of the inferior mesenteric artery is transferred from the 12th thoracic vertebra to the 3rd lumbar vertebra and it runs to the left side [3]. This theory

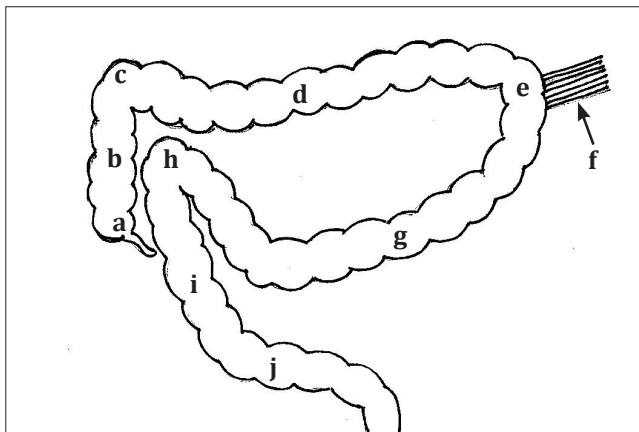


Figure 1. The illustration shows the variations of colon. (*a: caecum and appendix; b: ascending colon; c: first hepatic flexure; d: transverse colon; e: splenic flexure; f: phrenico-colic ligament; g: redundant descending colon; h: second hepatic flexure; i: right sided descending colon; j: right sided sigmoid colon*)

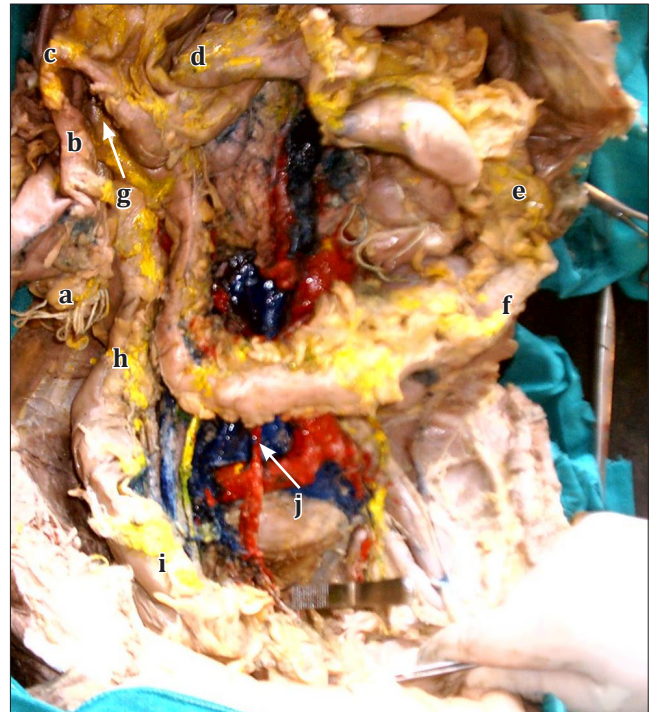


Figure 2. Disposition of the major portion of large intestine with the redundant loop of descending colon. (*a: caecum and appendix; b: ascending colon; c: first hepatic flexure; d: transverse colon with mesocolon; e: splenic flexure with phrenico-colic ligament; f: redundant descending colon; g: second hepatic flexure; h: right sided descending colon; i: right sided sigmoid colon; j: inferior mesenteric artery*)

can explain the right-sided course of the inferior mesenteric artery to supply the right sided descending and sigmoid colon in the present case.

Some fetuses appear to show an excessive elongation of the sigmoid colon and it is possible that persistence of this condition will give rise to the similar elongation of the colon in the adult life [5]. Such a concept is in accord with the variations occurring elsewhere in the gastrointestinal system [7]. These statements can explain the redundant loop of colon of the present case.

In this case the observations simulate the type II variety of the redundant colon to some extent and type IV variety [5], because here the elongated loop of descending colon formed the second hepatic flexure and there was right-sided sigmoid colon.

Elongation and displacement of the sigmoid colon to the right side was noted in radiological studies by Kantor [6]. Pyrtek et al. also reported a case of right-sided sigmoid colon revealed with a Barium meal X-ray [1].

Komiyama et al. in 1991 reported a 50-year-old Japanese male with excessively long distal part of the colon including the right-sided sigmoid colon [8]. The inferior mesenteric artery gave off four branches towards the distal three-fourths of this segment of colon and the superior rectal artery to the upper

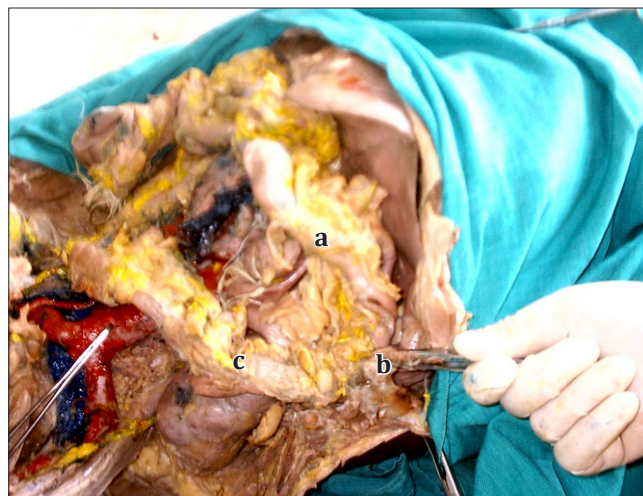


Figure 3. Phrenicocolic ligament and the redundant loop of the descending colon. (a: transverse colon; b: phrenico-colic ligament; c: redundant and fixed loop of descending colon)

part of the rectum. The proximal half of the variant loop was descending colon (devoid of mesentery) and the distal half was the sigmoid colon. This case had close similarity with the present case.

The symptoms that may arise from this condition are generally pronounced constipation, indefinite discomfort over the colon, indigestion, loss of weight, insomnia, pain and tenderness in the right iliac fossa [6, 9]. Pain is caused by spasm proximal to the point of redundancy [6]. The symptoms may suggest gastric ulcer, heart disease, chronic obstruction of bowel in addition to appendicitis [6]. In diagnosing these conditions the possibility of a redundant colon should be kept in mind [5].

Volvulus of the large bowel, which is a surgical emergency, usually occurs in the caecum or sigmoid colon, but may involve

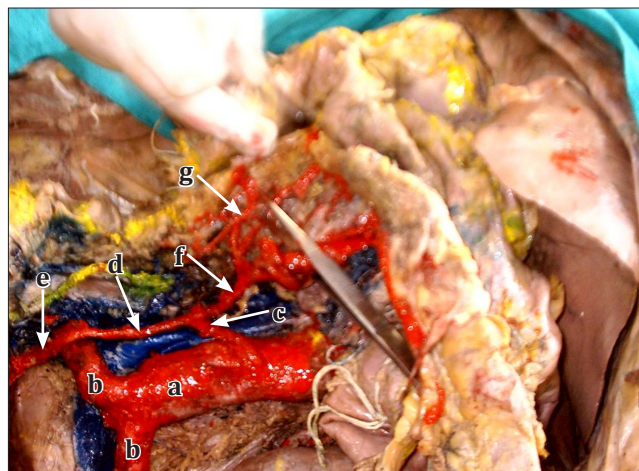


Figure 4. Right sided inferior mesenteric artery and its anastomosis. (a: abdominal aorta; b: two common iliac arteries; c: inferior mesenteric artery on the right side; d: descending branch of c; e: superior rectal artery; f: ascending branch of c; g: arterial anastomosis of f)

any segment of the colon, including the redundant loop. Volvulus can be diagnosed via an abdominal CT scan [5, 10].

Conclusion

This case will help to enhance our knowledge in embryology, gross anatomy and clinical anatomy. It may be helpful to make the radiologists and surgeons conscious about this type of variation of large gut while undertaking an investigative or surgical procedure.

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