

Multidetector CT Findings of Retroarterial Reversed Intestinal Rotation in an Adult: A Case Report¹

Jin-kyeong Sung, M.D., Young Mi Ku, M.D., Hiun-Suk Chae, M.D.²,
In Yong Whang, M.D., Su Lim Lee, M.D.

Intestinal malrotation is an uncommon cause of abdominal pain in adults. More so, reversed intestinal rotation is one of the least common malrotation anomalies. A few cases of reversed intestinal rotation have been reported only in surgical and internal medicine literatures. To the best of our knowledge, MDCT findings concerning reversed intestinal rotation had never been reported. We present a 38-year-old man with retroarterial reversed intestinal rotation with MDCT findings.

Index words : Rotation
Colon
Tomography, X-Ray Computed

Reversed intestinal rotation is one of the least common intestinal developmental anomalies, and accounts for 4% of all malrotation cases (1). In 1923, Dott et al. (2) proposed that in reversed rotation, the normal 270° counterclockwise rotation is replaced by a 90° counterclockwise rotation followed by a 180° clockwise rotation, resulting in a net 90° clockwise rotation. Intestinal malrotation is usually diagnosed during infancy and childhood as a result of acute symptoms induced by complications including intestinal obstruction or volvulus. Adults with rotational anomalies are asymptomatic and are usually founded incidentally during an imaging evaluation or laparotomy for coincidental disease (3).

Only a few cases of reversed intestinal rotation have been reported in surgical and internal medicine literatures. To the best of our knowledge, there are no reports of MDCT findings concerning reversed intestinal rota-

tion (4-6). We report a case of reversed rotation in a 38-year-old man, focusing on the first MDCT findings alongside a literature review.

Case Report

A 38-year-old man visited the outpatient department of our hospital with complaints of nausea, intermittent vomiting, recurrent dyspepsia, and abdominal discomfort. Upon physical examination, his abdomen was not distended, and he had normal bowel sounds. After undergoing endoscopy, he was initially diagnosed with gastritis and gastroesophageal reflux and had been treated. However, his recurrent dyspepsia and abdominal discomfort had not been completely relieved.

Using a 128-row detector MDCT scanner (definition AS+, Siemens Medical Solutions, Forchheim, Germany), CT scans of the abdomen and pelvis were obtained in the arterial and portal venous phases after the intravenous injection of contrast agent (Ultravist 300, Bayer Schering Pharma, Berlin, Germany) and optimal colon distension. Colon distension with carbon dioxide was achieved using an automated insufflator and a small rectal catheter with a retention balloon

Departments of ¹Radiology and ²Internal Medicine, Uijeongbu St. Mary's Hospital, College of Medicine, The Catholic University of Korea

Received December 15, 2010 ; Accepted January 18, 2011

Address reprint requests to : Su Lim Lee, M.D., Department of Radiology, Uijeongbu St. Mary's Hospital, College of Medicine, The Catholic University of Korea, 65-1 Geumo-dong, Uijeongbu-si, Gyeonggi-do 480-717, Korea.

Tel. 82-31-820-3148 Fax. 82-31-846-3080

E-mail: radlsl@catholic.ac.kr

(PROTOCO₂L; E-Z-Em, Westbury, NY, USA). We obtained 4-mm-thick axial, coronal, and sagittal reformat images. The findings of axial image revealed that the superior mesenteric vein (SMV) was located to the left of the superior mesenteric artery (SMA) and wrapped clockwise around the SMA (Figs. 1A–D). The abnormal position of the bowel loops related to the SMA and SMV were depicted. The mid-portion of the transverse colon was interpositioned between the superior mesenteric vessels and the aorta, which resulted in focal luminal narrowing. The duodenum crossed from right to left anterior to the SMA and SMV. Additional reformat image (Fig. 1E) and tissue transition projection from CT colonoscopy (Fig. 1F) more clearly demonstrated the re-

lationship between the superior mesenteric vessels and transverse colon, as well as the focal narrowing in the mid-portion of the transverse colon. A double contrast barium enema (Fig. 1G) showed focal luminal narrowing at the mid-portion of the transverse colon and the cecum located in the right upper quadrant of the abdomen. All of these findings were consistent with retroarterial reversed rotation of the intestine with an extrinsic compression of the transverse colon by the superior mesenteric vessels.

Discussion

A fetal midgut loop is divided into two segments;

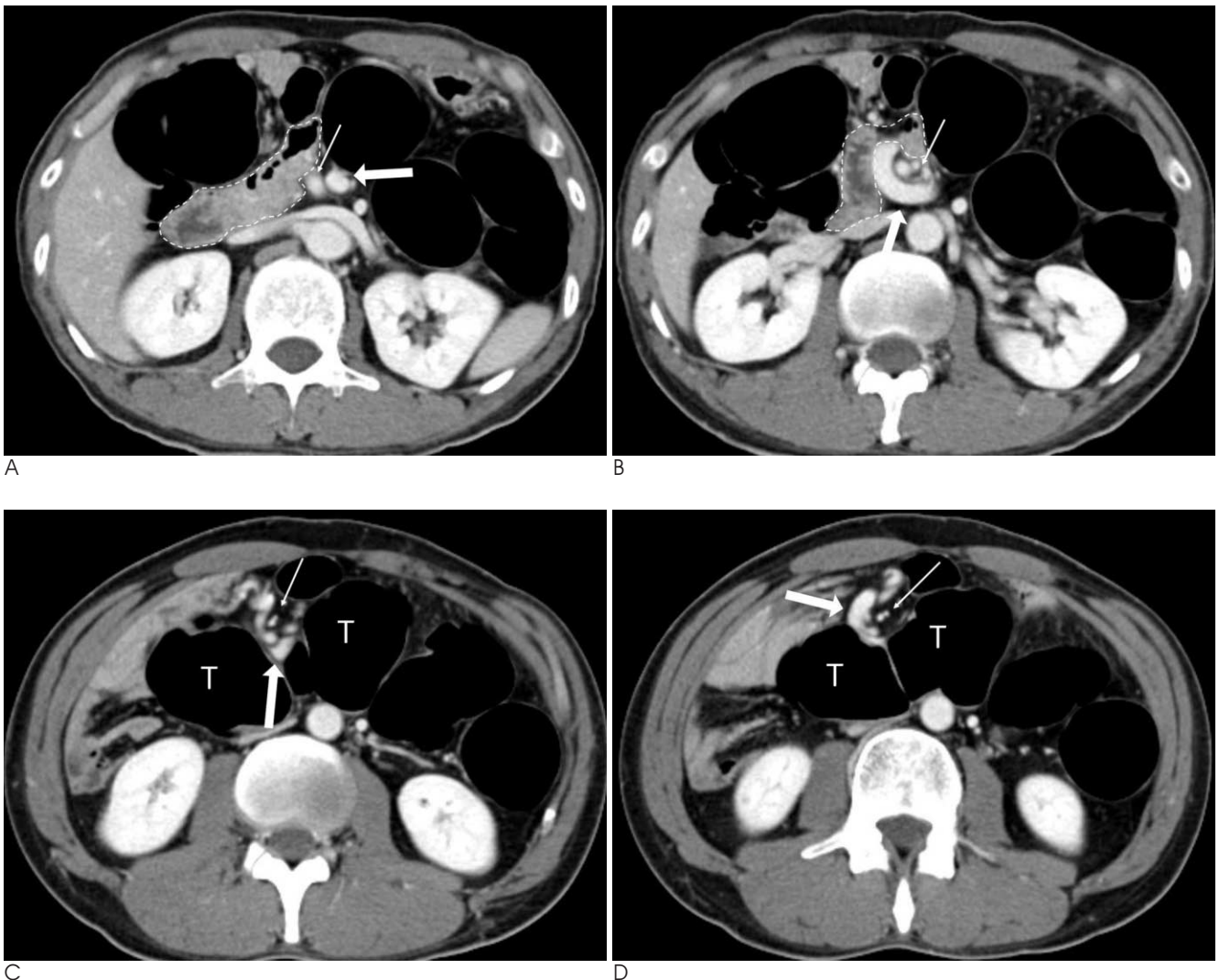


Fig. 1. A-D. Serial axial images of a contrast-enhanced CT of a 38-year-old man with reversed rotation. SMV (thick arrow) lies to the left of SMA (thin arrow) in the first image (A), and SMV wraps around SMA clockwise on consecutive images (B-D). It is noted that the duodenum (dotted lines in A and B) cross from the right to left anterior to SMA and SMV. Images at the level of lower pole of the kidneys (C and D) demonstrate that the distended transverse colon (T) is sandwiched between the superior mesenteric vessels and the aorta.

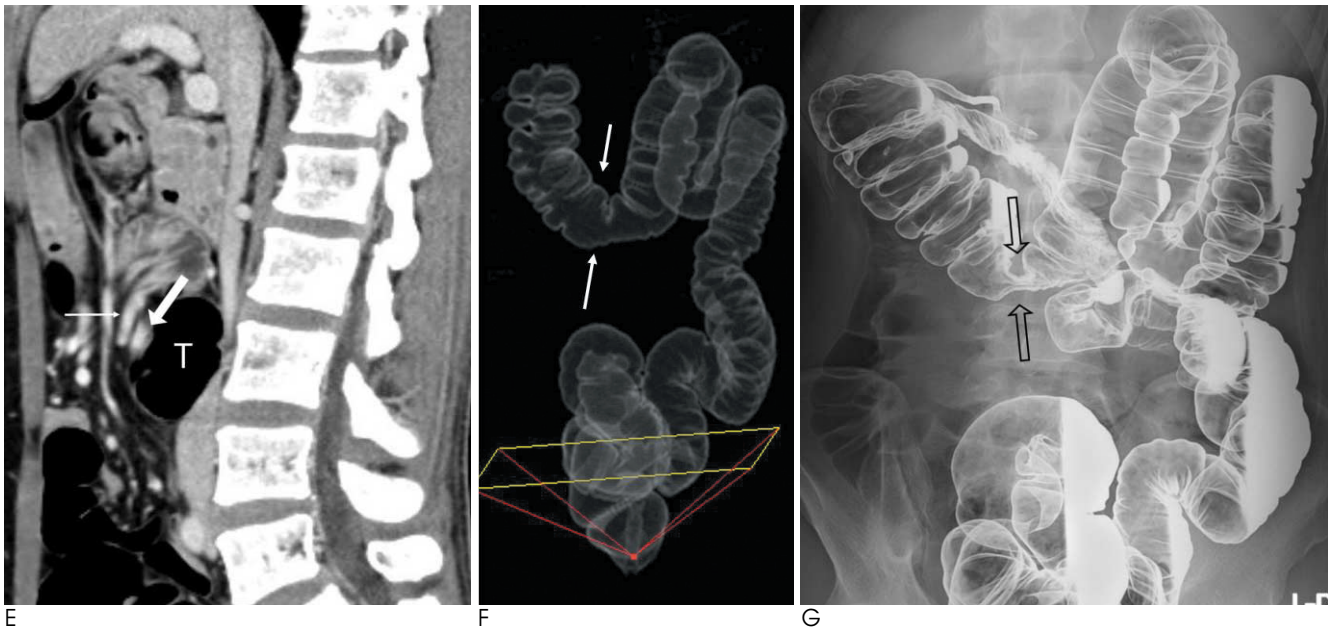


Fig. 1. E-G. The sagittal (F) reformatted image more clearly depicted the relationship between the superior mesenteric vessels (thin and thick arrows) and the transverse colon (T). A tissue transition projection (F) from CT colonoscopy discloses focal narrowing of transverse colon (open arrows) and the abnormal location of the cecum. The overhead image after double-contrast barium enema (G) is exactly coincidental with the image of CT colonoscopy, which shows focal extrinsic compression of the transverse colon and resultant narrowing of the involved segment (open arrows). The cecum, appendix, and ileocecal valve are located in the right upper quadrant of the abdomen.

prearterial and postarterial. These two segments are separated by the superior mesenteric vessels. The midgut loop is herniated out of the abdominal cavity and reduced. In this stage, the prearterial segment first returns to the abdomen, followed by the postarterial segment (4). Anomalies during this stage are related to the abnormal rotation of midgut and classified as non-rotation, malrotation, or reversed rotation (5).

Reversed rotation is the rarest developmental intestinal rotation anomaly. As described earlier, reversed rotation is defined as net 90° clockwise rotation of midgut. Estrada et al further classified reversed rotation into two subtypes; retroarterial and prearterial (6). The more common retroarterial subtype was thought to occur when the postarterial bowel segment first reduced into the abdomen. As a result, the transverse colon was located behind both the duodenum and the SMA. In the less common prearterial subtype, the prearterial segment is reduced first into the abdomen and is located in the left abdominal region anterior to the SMA. The postarterial segment ends up in the right abdomen (6, 7). In our case, the transverse colon was located behind the superior mesenteric vessels and the cecum and duodenum were positioned in the right supramesocolic compartment of the abdominal cavity. The intraperitoneal

location of bowel loops and the relationship between the bowel loops and adjacent mesenteric vessels are clearly delineated on reformatted and 3D rendered images of MDCT, with the findings consistent with retroarterial reversed midgut rotation.

On axial CT images of our patients, there is a clockwise whirling of the SMV around the SMA. It has been demonstrated that a clockwise wrapping of the SMV and the mesentery around the SMA, is suggestive of a midgut volvulus (8). On the other hand, a counterclockwise whirling pattern is usually the result of normal embryologic rotation and is not associated with the volvulus or malrotation (9). As our patient had both the midgut and the hindgut rotated in the opposite direction, the clockwise whirling of the SMV around the SMA is presumed a normal finding of reversed rotation, a counterpart of clockwise rotation in the normal midgut rotation.

During infancy and childhood, the most common clinical manifestation of midgut malrotation is vomiting and abdominal distension, which results from the intestinal obstruction or volvulus. Occasionally, malabsorption and chronic diarrhea are present due to intermittent volvulus (3). On the contrary, rotational anomalies constitute less than 1% of bowel obstructions in adults (3).

Most adults with midgut rotational anomalies in adult patients are asymptomatic and are incidentally revealed during imaging evaluation or laparotomy for coincidental diseases. Vague symptoms of malrotation in adult patients may delay the exact diagnosis, as occurred in our patient. MDCT is suitable for further evaluation of these enigmatic patients with ambiguous symptoms. MDCT can make an accurate diagnosis of the reversed rotation since it discloses the position of the small and large bowels and the relationship between the bowel loops and adjacent structures such as mesenteric vessels. Also, additional coronal or sagittal reformatted images and 3D-rendered images provide even more detailed depiction, as in our case.

Although reversed rotation is the rarest type of malrotation, it emphasizes the importance of considering rotational abnormalities in adolescents and adults who present with chronic abdominal pain or recurrent obstructive symptoms. Based on this study, MDCT is a more useful diagnostic tool for depicting reversed rotation than conventional diagnostic methods such as a barium enema and conventional CT.

References

1. Aldridge RT. Intestinal malrotation in the adult. *N Z Med J* 1996;60:420-423
2. O'Connell P, Lynch G. Reversed intestinal rotation associated with anomalous mesenteric venous drainage. *Dis Colon Rectum* 1990;33:883-885
3. Berardi RS. Anomalies of midgut rotation in the adult. *Surg Gynecol Obstet* 1980;151:113-124
4. Lilleyman A, Levy RD, Sillar R. Reversed intestinal rotation: report of two cases and review of the published reports. *ANZ J Surg* 2006;76:947-949
5. Cunningham T, Hartman G, Bulas DI. CT findings in prearterial reversed midgut rotation. *Pediatr Radiol* 1994;24:537-538
6. Estrada RL, Gurd FN. Surgical correction of reversed rotation of the midgut loop. *Surg Gynecol Obstet* 1962;114:707-711
7. Nehra D, Zeineh M, Rodriguez F, Dutta S. Double reverse intestinal malrotation: a novel rotational anomaly and its surgical correction. *J Pediatr Surg* 2007;42:578-581
8. Shimanuki Y, Aihara T, Takano H, Moritani T, Oguma E, Kuroki H, et al. Clockwise whirlpool sign at color Doppler US: an objective and definite sign of midgut volvulus. *Radiology* 1996;199:261-264
9. Clark P, Ruess L. Counterclockwise barber-pole sign on CT: SMA/SMV variance without midgut malrotation. *Pediatr Radiol* 2005;35:1125-1127

대한영상의학회지 2011 : 64 : 365-368

성인에서 발견한 후동맥역회전이상의 MDCT 소견: 증례 보고¹

¹가톨릭대학교 의정부성모병원 영상의학과

²가톨릭대학교 의정부성모병원 소화기내과

성진경 · 구영미 · 채현석² · 황인용 · 이수림

성인 환자에서 장회전이상은 복통의 드문 원인이며 역회전이상은 선천성 회전이상의 가장 드문 종류이다. 이 질환은 몇 예만이 내, 외과 문헌에 보고되었을 뿐이며 영상의학소견 특히 MDCT소견은 보고된 적이 없다. 저자들은 후동맥역회전이상을 가진 38세 남자 환자 1예를 보고한다.