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Transomental hernias: Multi-detector row computed tomography findings in 15 clinical cases

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Abstract

Introduction: Transomental hernia (TOH), a type of intra-abdominal hernia formed as a result of incarceration through abdominal greater omental hiatus, is a rare disease that lacks specific physical features, which makes its preoperative diagnosis difficult. This study aims the clinical characteristics and radiological findings of 15 cases of TOH.

Methods: From 2009 to 2021, we encountered 15 cases of TOH in which multi-detector row computed tomography (MD-CT) with multiplanar reconstruction (MPR) was helpful for the preoperative diagnosis. We performed a clinical study of patients with TOH.

Results: The average age of the 15 patients (male, n=9; female, n=6) was 73 years (range, 58-91 years). The preoperative diagnosis, based on MD-CT, was TOH in 11 patients and internal hernia in 4 patients. The preoperative diagnosis of TOH was confirmed in 11 of 15 patients (73%). MD-CT showed dilatation of the small intestine on the ventral side of the ascending colon and the descending colon through the omental hiatus, closed loop, and the convergence of the mesentery or small intestine.

Conclusion: The possibility of TOH should be considered when treating patients with obstruction who have no history of laparotomy. MD-CT with MPR is useful for the preoperative diagnosis of TOH.

Introduction

Meyers et al. (1) have defined an internal hernia as a protrusion of abdominal viscera through an opening within the confines of the peritoneal cavity, although not all internal hernias are strictly intraperitoneal. Internal hernia is defined as the acute or chronic protrusion of the small bowel through a mesenteric or peritoneal orifice. They are relatively uncommon clinical conditions that involve small bowel loops and occur through either congenital or acquired defects of attachment of various peritoneal folds. Recently, multi-detector row computed tomography (MD-CT) is the first-line imaging technique for internal hernias. Thin-section axial images and high-quality multiplanar reconstruction (MPR) allow improved visualization of normal anatomic structures and pathologic conditions, leading to greater diagnostic accuracy. Furthermore, three-dimensional images such as volume-rendered images aid in the understanding of pathologic conditions and contribute to optimal surgical planning. Transomental hernia (TOH) is defined as bowel invagination into an abnormal hiatus of the omentum. Most TOH are congenital; however, they are also rarely traumatic or iatrogenic (2,3). Yamaguchi classified TOHs as follows: type A (peritoneal cavity →peritoneal cavity), type B (peritoneal cavity →omental bursa→ peritoneal cavity), and type C (peritoneal cavity →omental bursa). Type A is the most common type of TOH (4). Recently, the number of reported cases has increased with the improvement of diagnostic imaging techniques (5,6). In this study, we describe the clinical characteristics and radiological findings of 15 cases of TOH that we experienced at our hospital, with some discussion of the relevant literature.

Materials and methods

Patients

Patients who underwent emergency surgery for strangulated bowel obstruction after a preoperative MD-CT at our hospital and who were diagnosed with TOH on intraoperative findings were included in the study. The study population included 15 patients with TOH who underwent emergency surgery in our department between 2009 and 2021. Our institution is the core general hospital in the town of Kanonji, Kagawa, Japan, with a population of about 80,000.

Methods

The clinical characteristics, MD-CT (Canon Aquilion-One 320 detector) findings, preoperative diagnosis, intraoperative findings, surgical technique, and postoperative course of the patients were reviewed. All procedures were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the 1964 Declaration of Helsinki and later versions. This study was approved by the ethics committee of Mitoyo General Hospital (approval number: 22-CR01-247; approval date, December 5, 2022).

Results

The study population included 15 patients (male n=9, female n=6; mean age 73 years [range: 58-91 years]). The chief complaints were abdominal pain and vomiting due to bowel obstruction. The mean time from the onset to surgery was 15.3 hours (range 6 to 32 hours). Only two patients (13.3%) had previous abdominal surgery. The most common comorbidities were cardiovascular diseases such as hypertension and atrial fibrillation (Table 1).

Table 1

Patient background

Case	Age	Sex	Symptoms	Time from the symptom onset to surgery (hour)	History of abdominal surgery	Comorbidity
1	88	M	Abdominal pain	24	None	Hypertension
2	91	M	〃	9	〃	Atrial fibrillation
3	83	F	Abdominal pain, Vomiting	7	〃	Atrial fibrillation, Hypertension
4	74	M	Abdominal pain	20	〃	Cognitive disorder
5	89	F	〃	18	〃	Hypertension
6	74	M	〃	8	〃	〃
7	79	F	〃	24	Total hysterectomy	〃
8	66	F	〃	24	None	None
9	61	M	Abdominal pain, Vomiting	7	〃	Hypertension, Diabetes
10	83	M	Abdominal pain	18	〃	Hypertension
11	62	M	〃	7	〃	None
12	69	M	Abdominal pain, Vomiting	16	〃	Hypertension
13	58	M	Abdominal pain	32	〃	None
14	59	F	Abdominal pain, Vomiting	9	〃	〃
15	59	F	〃	6	Ovarian tubal ligation	Hypertension

All patients had the same abdominal MD-CT findings: dilated small intestine on the ventral side, convergence of the small intestine, and closed loop. In cases 1-11, in which TOH was preoperatively diagnosed, the diagnosis was confirmed by the presence of a dilated small intestine prolapsing ventral to the ascending or descending colon from the hernia orifice (Figs. 1-3). TOH and internal hernia were diagnosed in 11 and 4 patients, respectively. The preoperative diagnosis of TOH was confirmed in 11 of 15 patients (73%). Twelve cases involved the ileum and three cases involved the jejunum. The mean length of the hiatal hernia was 68.3 cm (range: 20 to 160 cm). All patients had type A intussusception (Yamaguchi classification) (Table 2).

Table 2

MD-CT findings and the preoperative diagnosis

Case	MD-CT Findings	Preoperative Diagnosis
1	Dilatation of the small intestine ventral to ascending colon on a convergent mesenteric image and a closed-loop image	Transomental hernia
2	〃	〃
3	〃	〃
4	Dilatation of the small intestine ventral to descending colon on a convergent mesenteric image and a closed-loop image	〃
5	Dilatation of the small intestine ventral to ascending colon on a convergent mesenteric image and a closed-loop image	〃
6	Dilatation of the small intestine ventral to ascending and descending colon on a convergent mesenteric image and a closed-loop image	〃
7	Dilatation of the small intestine ventral to ascending colon on a convergent mesenteric image and a closed-loop image	〃
8	〃	〃
9	Dilation of the small intestine ventral to the transverse colon on a converging mesenteric images and a closed-loop images	〃
10	Dilatation of the small intestine ventral to ascending colon on a convergent mesenteric image and a closed-loop image	〃
11	〃	〃
12	〃	Internal hernia
13	〃	〃
14	Dilation and wall thickening of the small intestine ventral to the lower abdomen on convergent and closed-loop images of the intestinal tract	〃
15	Dilation of the small intestine ventral to the ascending colon. Convergent image shows the intestine and mesentery. In the closed-loop image, the intestinal wall shows the poor contrast effect	〃

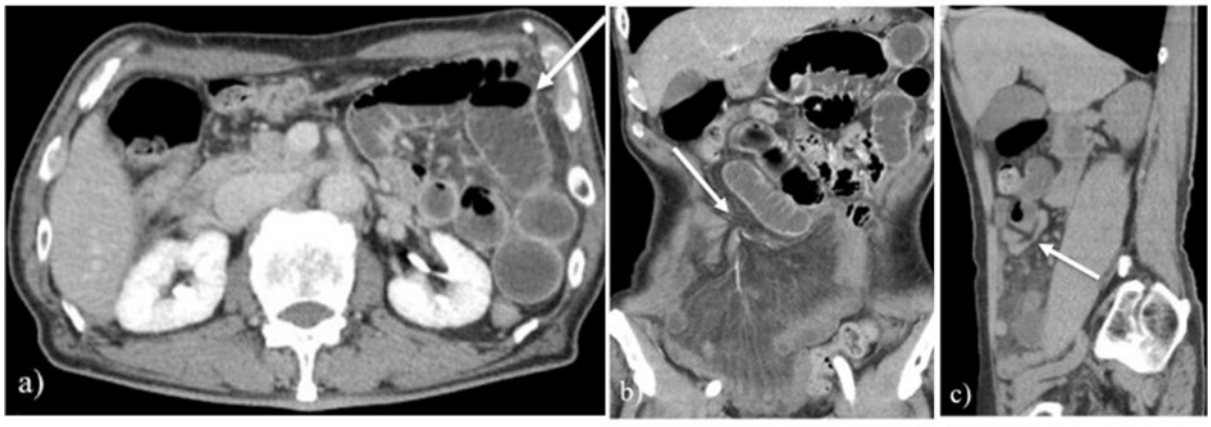

Figure 1. MD-CT findings in a case with a preoperative diagnosis of transomental hernia (case 4) a) A dilated small intestine is seen on the ventral side of the descending colon (arrow) (horizontal section). b) A dilated small intestine with congested mesentery is seen prolapsing from the hernia orifice. Hernia orifice (arrow) (coronal section). c) A dilated small intestine prolapsing ventrally from the hernia orifice is seen. Hernia orifice (arrow) (sagittal section).

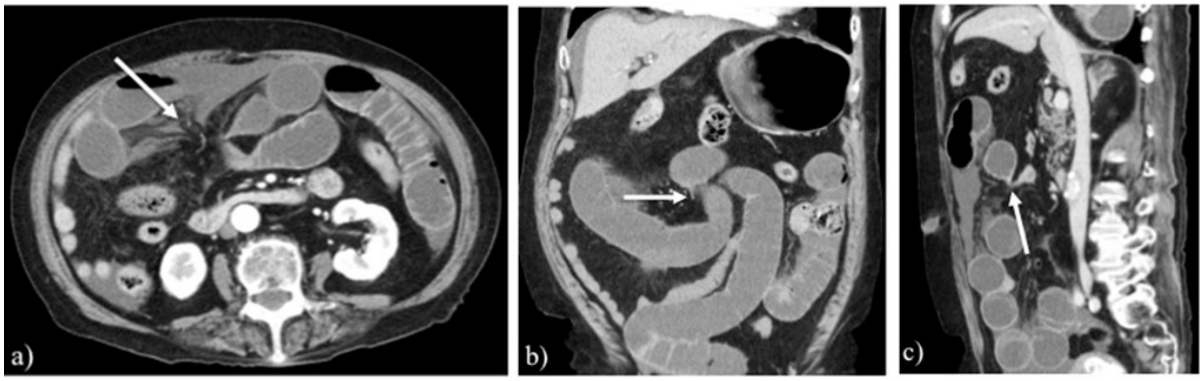

Figure 2. MD-CT findings in a case with a preoperative diagnosis of transomental hernia (cases 5) a) The dilated small intestine is seen on the ventral side. The arrow indicates the hernia orifice (horizontal section). b) The dilated small intestine prolapsing from the hiatal hernia. The arrow indicates the hernia orifice (coronal section). c) The dilated small intestine is prolapsing ventrally from the hernia orifice. The arrow indicates the hernia orifice (sagittal section).

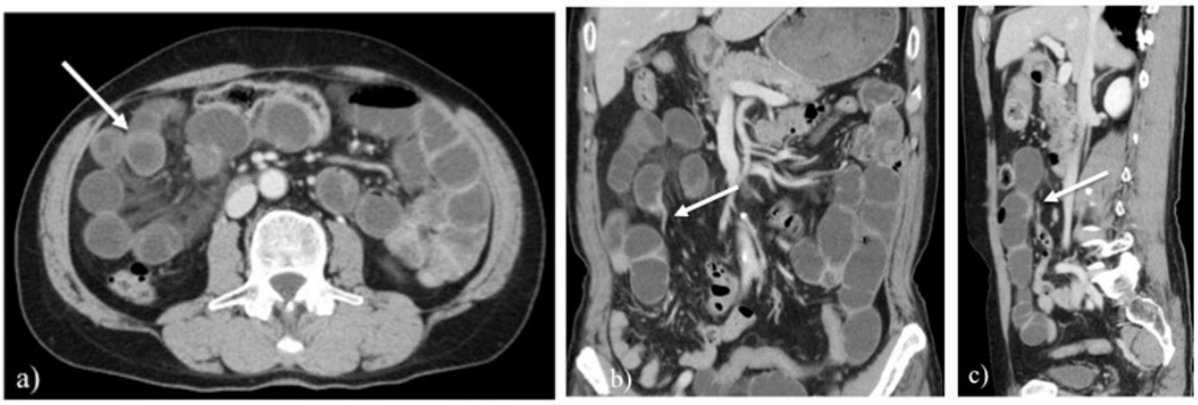

Figure 3. MD-CT findings of transomental hernia with the preoperative diagnosis (case 6) a) The dilated small intestine with thickened wall is seen on the ventral side of the ascending and descending colon, which prolapsed ventrally from the hernia orifice. (arrow) (horizontal section). b) The dilated small intestine with thickened wall is seen protruding from the hernia orifice. The arrow indicates the hernia orifice (coronal section). c) The dilated small intestine with thickened wall is seen prolapsing ventrally from the hernia portal. The arrow indicates the hernia orifice (sagittal section).

Fourteen patients underwent hiatus release, and one patient underwent partial resection of the small intestine. The mean hospitalization time was 10.9 days (range: 6 to 17 days); no patients had postoperative complications (Table 3).

Table 3. The surgical findings, surgical procedure, and postoperative course

Case	Site of Herniation	Length of Incarcerated Intestine	Yamaguchi Classification	Surgical Procedure	Postoperative Complication	Postoperative Hospitalization Period (day)
1	100 cm from the end of the ileum	70cm	A	Hiatus release	None	17
2	90 cm from the end of the ileum	130cm	〃	〃	〃	12
3	40 cm from Treitz	160cm	〃	〃	〃	12
4	150 cm from the end of the ileum	70cm	〃	〃	〃	8
5	170 cm from Treitz	50cm	〃	〃	〃	14
6	170 cm from the end of the ileum	40cm	〃	〃	〃	10
7	10 cm from the end of the ileum	65cm	〃	〃	〃	16
8	80 cm from the end of the ileum	60cm	〃	〃	〃	11
9	90 cm from the end of the ileum	60cm	〃	〃	〃	8
10	40 cm from the end of the ileum	40cm	〃	〃	〃	11
11	100 cm from the end of the ileum	70cm	〃	〃	〃	6
12	20 cm from the end of the ileum	50cm	〃	〃	〃	6
13	140 cm from the end of the ileum	70cm	〃	〃	〃	9
14	50 cm from the end of the ileum	40cm	〃	〃	〃	9
15	150 cm from Treitz	50cm	〃	Partial resection of small intestine	〃	14

Discussion

The openings of internal hernias can be normal (foramen of Winslow), paranormal (paraduodenal, ileocecal, supravesical fossa) or abnormal (transomental defect) with respect to the routine anatomy of the abdominal cavity (7). The pathogenesis of TOH involves the development of a congenital defect of the greater omentum and omental fragility caused by emaciation or atrophy of the greater omentum secondary to aging, oral steroids, trauma, surgery, or inflammation (2, 3). Martin LC et al. (8) reported that TOH accounts for approximately 1% of all internal hernias.

Kimura et al. (9) reported 203 cases in Japan. In their study, the incidence was slightly increased in males, with a male-to-female ratio of 114:89, and the age of the patients was widely distributed from 4 to 95 years (mean age: 56.2 years). In this study, the mean age was 73 years, and there were 9 males and 6 females. TOH is classified into Yamaguchi types, A to C, according to the mode of intestinal insertion. In their study population, Kimura et al. (9) reported that there were no cases of type B, 120 cases of type A, and 72 cases of type C. The age of Type A patients was higher than that of Type C patients. The small intestine was the most frequently incarcerated bowel tract in 186 cases (92%), and the colon was

incarcerated in 6 cases. In this study, all cases were type A, and in all cases the small intestine was the incarcerated bowel tract.

The preoperative diagnosis of TOH is difficult. Clinical manifestations are not specific and are similar to acute obstructive bowel syndrome, including abdominal pain, nausea, vomiting, and distended abdomen. Many cases are diagnosed only as strangulated ileus due to internal hernia, and surgery is performed without a definitive diagnosis. Kimura et al. (9) reported that the preoperative diagnosis rate was only 9% of 203 TOH cases. In the present study, we were able to preoperatively diagnose TOH in 11 of 15 patients (73%).

There are increasing reports that abdominal CT is useful in the preoperative diagnosis of TOH (5,6). With the recent spread of multi-detector row computed tomography (MD-CT), it has become possible to quickly create arbitrary reconstructed images, such as coronal and sagittal sections, by performing MPR. In comparison to conventional single-helical CT, MPR provides more detailed information. We previously reported the radiological features in the preoperative diagnosis of TOH using MD-CT (10). The greater omentum, which is the hernia orifice, is difficult to distinguish from the intra-abdominal fatty tissue, making it difficult to directly visualize. This represents an anomalous positional relationship due to the prolapse of the intestinal tract from the dorsal to the ventral side of the colon via the hiatus of the greater omentum, which is the hernia orifice. In Type A, the small intestine - originally located on the dorsal side of the large mesenchyme - is located on the ventral or lateral side of the ascending or transverse colon, and the converging images of the mesentery and intestinal tract and the closed-loop formation of the intestinal tract are noted. An image of the intestinal tract located on the dorsal surface of the stomach is considered diagnostic.

The most important distinction between a TOH and a transverse mesenteric hernia is the location of the hernia portal and the transverse colon (11). This is because the transverse colon is located cephalad and dorsal to the omentum, dorsal to the gastrointestinal mesentery, and ventral to the transverse mesentery. A TOH is diagnosed when the transverse colon is located cephalad of the hernia orifice, and a transverse mesenteric hernia is diagnosed when the transverse colon is located anterolaterally of the hernia orifice (12). Sagittal section images provide a clear view of the anteroposterior relationship of the mesenteric structures of the upper abdomen, including the hepatogastric mesentery, gastrointestinal mesentery, and transverse colonic mesentery, which support the liver, stomach, and pancreas (13). MDCT findings of a TOH are often identical to those of a transmesenteric hernia. However, a closed-loop intestine without a saclike appearance, located in the most anterior portion of the peritoneal cavity, is a characteristic feature because the direction of a TOH is usually posterior to anterior. Omental branches of the left and right gastro-omental vessels are landmarks that run inside the apron like greater omentum. Therefore, once the hernia orifice is directed, omental vessels that run vertically around the hernia orifice contribute to the diagnosis of the TOH at MDCT (14).

In this study, by combining horizontal sectioning with MPR coronal and sagittal sectioning, we were able to preoperatively diagnose TOH in 11 patients and internal hernia in 4 patients based on the observation of the dilated small intestine located ventral to the ascending and descending colon, which had prolapsed from the hernia orifice, convergence of the intestinal tract and mesentery toward the hernia orifice, and closed loop (Figs. 1-3). Emergency surgery was performed in all cases. In the four cases in which internal hernia was preoperatively diagnosed, a preoperative diagnosis of TOH was possible after a detailed retrospective examination. Four of the cases diagnosed as internal hernias were diagnosed between 2009 and 2013, when there was a lack of awareness of the diagnosis of TOH in our department. In the 11 subsequent cases, we were able to make a preoperative diagnosis of TOH in all cases. In case 15, we were able to prepare for partial resection of the small intestine and perform the operation because contrast-enhanced CT showed no contrast at all in a part of the small intestinal wall, and we diagnosed necrosis of the small intestine. We expect that the number of cases in which a preoperative diagnosis is possible will increase with the use of MPR in the future.

Although the prognosis of TOH is considered relatively good, intestinal necrosis has been reported to occur within a short period of time, leading to death. In case 15, the time from the onset to surgery was only 6 hours, but the intestinal tract was necrotic at the time of surgery. It is important to recognize that necrosis may occur in a short period of time depending on the degree of strangulation. To avoid unnecessary resection of the intestine due to TOH, it is essential to promptly diagnose the patient with MD-CT and to release the strangulation.

Conclusion

The possibility of TOH should be considered when treating patients with obstruction who have no history of laparotomy. MD-CT with MPR is useful for the preoperative diagnosis of TOH.

Statements and Declarations

All procedures were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the 1964 Declaration of Helsinki and later versions.

Competing Interest: All authors declare that there are no conflicts of interest.

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