

:
 : 8 9 , 8 CT , 3 11
 CT
 : 8 가 , 2 10
 가 , 1 가 . 11
 . 8 가
 CT (6/8), (4/8), (8/8), (3/7),
 CT (1/5) . 1 가
 CT . 2 가
 CT 가
 : CT

(retroanastomotic hernia)

가 (stomal edema), 8 11
 (dumping syndrome), 가 10 가 32-73 59
 , (strangulation) (1-6). (antecolic) , 2 6 (retrocolic)
 (1, 2), 가 3
 가 가 2 . 9
 가 가 6 17
 , 2 , 4 1 ,
 5 17 . 4
 , 2 , 2

1
 2003 5 7 2003 7 31
 189

1, 2, 270

1
5.0 - MHz convex (Squoia; Acuson, (twisting), (crowding), (displacement),
Mountain view, Ca, U.S.A.) (stretching), , CT

2.5 -
cm

(Emotion and Somatom Plus - 4, respectively;
Siemens, Erlangen, Germany)

(Ultravist 300; Schering, Korea) 150 cc
(model OP 100; Medrad, Pittsburgh, Pa, U.S.A.) 가

3cc 70 7 mm collimation 1:1.5
pitch 7 mm 가

9 8 11
3 가 , 2 가
8 가 1 10 가
CT 가 8

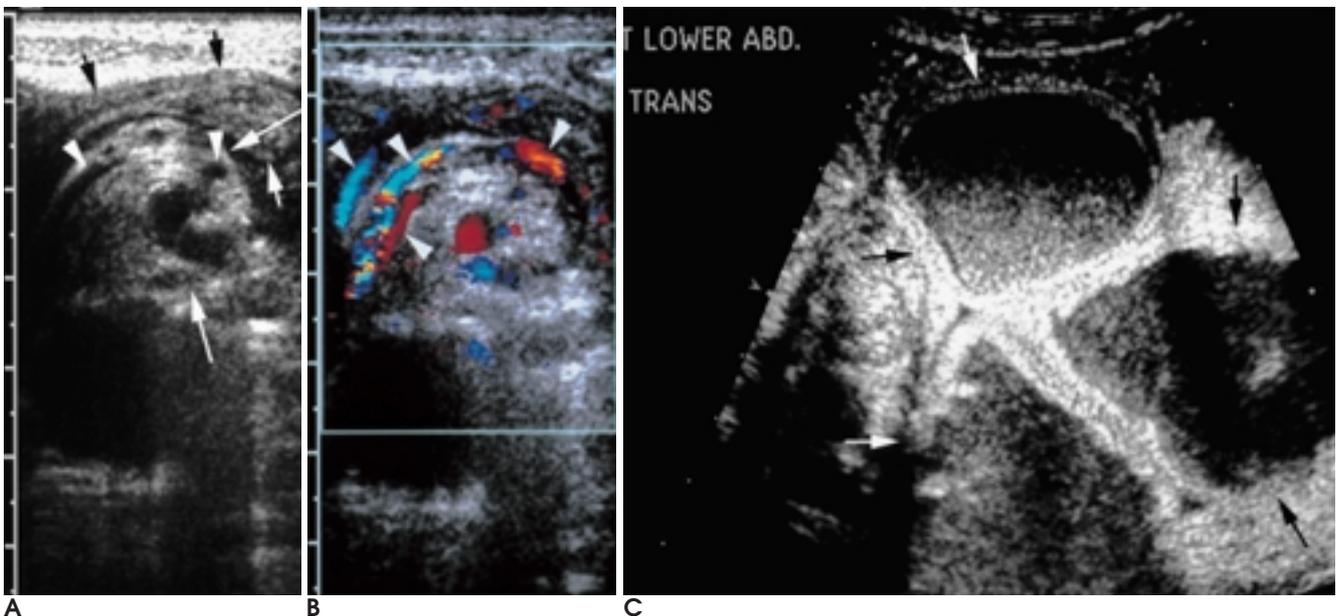


Fig. 1. Retroanastomotic hernia with efferent loop herniation in a 64-year-old man undergone subtotal gastrectomy with gastrojejunostomy for gastric ulcer perforation 17 years earlier.
A. Transverse gray-scale US image shows the whirling of mesenteric vessels (arrowheads), jejunal loops (short arrows), and mesentery (long arrows) in the superior periumbilical abdomen.
B. Transverse color Doppler US image shows the whirling of mesenteric vessels with alternating different colors (arrowheads). Duplex US images showed arterial waveform and venous waveform within sample volume of rotating vessels (not shown).
C. Transverse gray-scale US image in the right lower abdomen shows dilatation of small bowel loops with mural thickening (arrows).

CT (Fig. 1, 2), 6 (Fig. 1C, 2D), 4 (Fig. 1C) 3 CT 1 (internal hernia) 가 2 CT 가 1 (5, 6). CT 가 1 (Fig. 3A, (8) 3C, D) (Fig. 3B, C). 3 , 3 가 1 가 8 가 2 가 6 , 가 2 ,

가 1 , 1 (Table 1).

(internal hernia) , (5, 6). 1 (8) (9-11).

가

1897 Buddee Petersen (3, 4). (volvulus) (6). 1900 “Petersen hernia” 30%

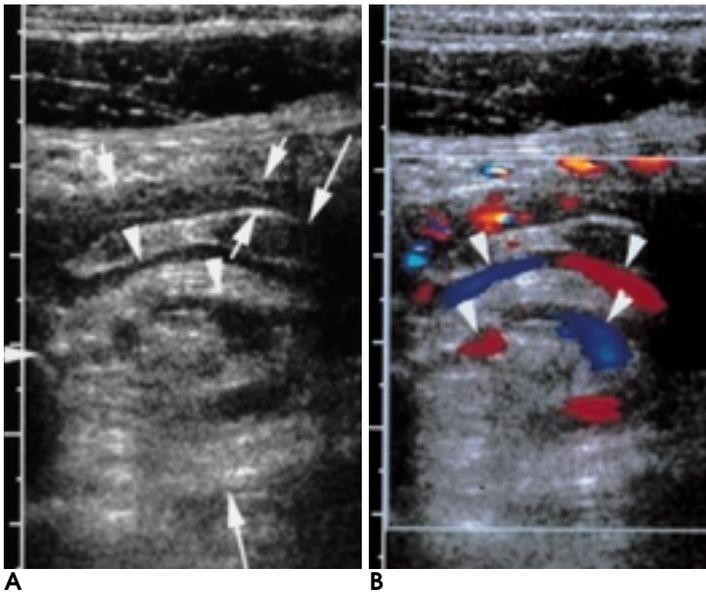


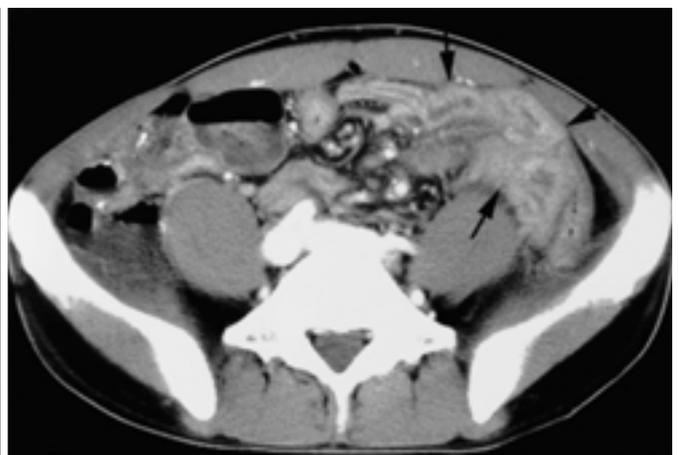
Fig. 2. Retroanastomotic hernia with efferent loop herniation in a 32-year-old man undergone subtotal gastrectomy with antecolic gastrojejunostomy for stomach cancer 6 days earlier.

A. Transverse gray-scale US image shows the whirling of mesenteric vessels (arrowheads), jejunal loops (short arrows), and mesentery (long arrows) in the left periumbilical abdomen.

B. Transverse color Doppler US image shows the whirling of mesenteric vessels with alternating different colors (arrowheads).

C. Contrast-enhanced abdominal CT image shows the whirling of jejunal loops (arrows) and mesenteric vessels (arrowheads) in the left periumbilical abdomen.

D. Contrast-enhanced abdominal CT image obtained caudal to **C.** shows mural thickening and collapse of herniated efferent loops (arrows).



가 (1, 7).
 50% 1
 25% 1 , 25%
 (5).
 3 가 ,
 (postvagotomy atony)
 가 (closed loop obstruction)
 가
 (1). 가 (5, 6). 가
 가 10 - 15%

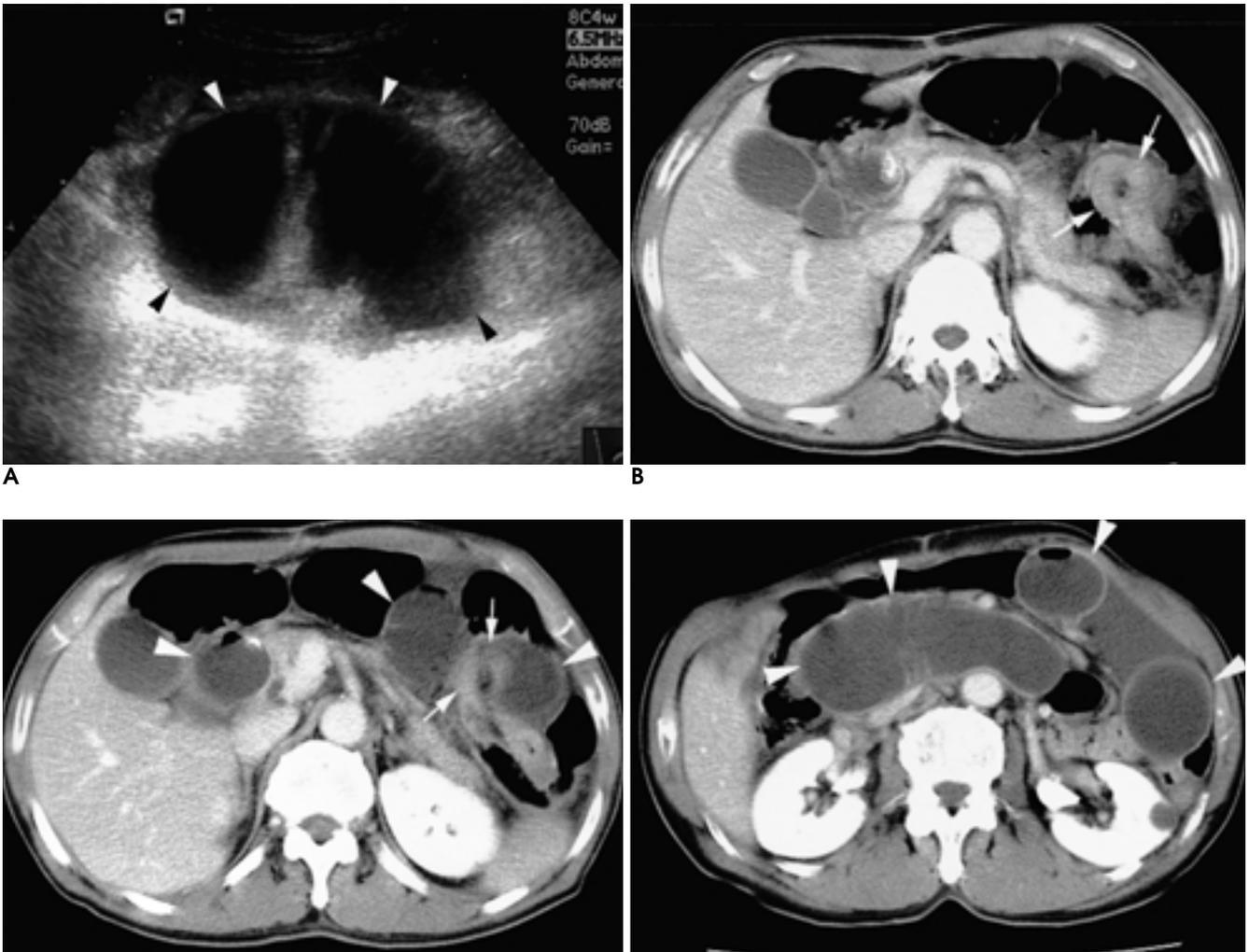


Fig. 3. Retroanastomotic hernia with afferent loop herniation in a 67-year-old man undergone subtotal gastrectomy with antecolic gastrojejunostomy for stomach cancer 40 days earlier.
A. Transverse gray-scale US image shows marked dilatation of second and third duodenum (afferent loop) (arrowheads) in the epigastric region.
B. Contrast-enhanced abdominal CT image shows the whirling of short segment of a long redundant afferent loop behind the anastomosis (arrows).
C. Contrast-enhanced abdominal CT image obtained 1.5 cm caudal to **B.** shows markedly dilated afferent loop (arrowheads) and the whirling afferent loop (arrows).
D. Contrast-enhanced abdominal CT image obtained caudal to **C.** shows markedly dilated afferent loop (arrowheads).

(1).
 가 . (4-6).
 가 (colicky pain) 가 (4). 가 3
 , , 3
 .
 (4). 1
 가 . 가
 가 (7, 12).
 가 .
 가

Table 1. US, CT, and Small Bowel Follow-through Examination Findings of Retroanastomotic Hernia (N = 11)

Patient No./Age (y)/Sex	Type of anastomosis/ Interval between GJS and RH	Location of whirl	Findings at US (n = 9)	Findings at CT (n = 8)	Findings at SMFT (n = 3)	Findings at surgery (n = 11)
1/62/M	Antecolic/3y11m periumbilical	Left and Ms	Whirling of EL, MV, MV, and Ms	Whirling of EL, barium-filled EL	Stasis of	Herniation of most EL
2/45/M	Retrocolic/6m periumbilical	Left and Ms	Whirling of EL, MV, Dilatation of herniated EL	of barium-filled EL	Stasis and dilatation length of EL	Herniation of 100-cm length of EL
3/64/M	Undescribed/17y periumbilical	Superior and Ms	Whirling of EL, MV, Dilatation and thickening of herniated EL Decrease of peristalsis		Herniation of 150-cm length of EL Ischemia of EL	
4/62/M	Retrocolic/2m periumbilical	Right and Ms	Whirling of EL, MV, and Ms Dilatation of AL Thickening of herniated EL	Whirling of EL, MV, Dilatation of AL Thickening of herniated EL	length of EL and 5-cm length of AL	Herniation of 100-cm length of AL
5/67/M	Antecolic/1m10d abdominal	Left upper	Dilatation of AL Whirling of small portion of a long redundant AL	Dilatation of AL	length of AL	Herniation of 5-cm
6/71/M	Undescribed/8y	Umbilical	Dilatation and thickening of herniated EL	Whirling of EL, MV, and Ms		Herniation of most EL
7/71/F	Undescribed/8y1m periumbilical	Left	Thickening of herniated EL Marked dilatation of AL	Whirling of EL, MV, and Ms	length of EL and 5-cm length of AL	Herniation of 180-cm length of EL
8/73/M	Antecolic/7d periumbilical	Left	Whirling of EL, MV, and Ms Thickening of herniated EL Decrease of peristalsis herniated EL	Whirling of EL, MV, and Ms Thickening of herniated EL Decreased enhancement of	Good passage through barium-filled EL	Herniation of most EL Ischemia of EL
9/56/M	Antecolic/3y7m periumbilical	Superior	Whirling of EL, MV, and Ms Dilatation and thickening of herniated EL Decrease of peristalsis			Herniation of most EL Ischemia of EL
10/32/M	Antecolic/6d periumbilical	Left	Whirling of EL, MV, and Ms Thickening of herniated EL	Whirling of EL, MV, and Ms Thickening of herniated EL		Herniation of 100-cm length of EL
11/51/M	Antecolic/4m periumbilical	Left	Whirling of EL, MV, and Ms Thickening of herniated EL	Whirling of EL, MV, and Ms Thickening of herniated EL		Herniation of 100-cm length of EL

AL: afferent loop, CT: computed tomography, d: day, EL: efferent loop, F: female, GJS: Gastrojejunostomy, M: Male, m: month, Ms: mesentery, MV: mesenteric vessel, N: total number, n = number, RH: retroanastomotic hernia, SMFT: small bowel follow-through, US: ultrasound, y: year.

1 (7).

CT

CT

가

가

CT

(7, 13 - 15).

(entering limb)가

가 (return -

ing limb)가

가

CT

(7, 12),

가

(12),

(6, 7, 12).

가

가

가

가

(whirl sign)

(midgut

volvulus),

(16).

가

가 가

1. Rutledge RH. Retroanastomotic hernias after gastrojejunal anastomoses. *Ann Surg* 1973;177:547-553
2. Morton CB, Alrich EM, Hill LD. Internal hernia after gastrectomy. *Ann Surg* 1955;141:759-764
3. Sebesta DG, Robson MC. Petersen 's retroanastomotic hernia. *Am J Surg* 1968;116:450-453
4. Johnson JM, Wood M, Lawson J, Hale HW Jr. Retroanastomotic hernia. *Arch Surg* 1974;108:363-365
5. Meyers MA. Internal abdominal hernia. In: Meyers MA, ed. *Dynamic Radiology of the abdomen*. 5th ed. New York, NY: Springer, 2000;711-748
6. Ghahremani GG. Abdominal and pelvic hernias. In: Gore RM, Levine MS, eds. *Textbook of gastrointestinal radiology*. 2nd ed. Philadelphia, Pa: Saunders, 2002;1993-2009
7. Ogata M, Ishikawa T. Acute afferent loop obstruction caused by retroanastomotic hernia. *J Ultrasound Med* 1993;12:697-699
8. Wachsberg RH, Helinek TG, Merton DA. Internal abdominal hernia: diagnosis with ultrasonography. *Can Assoc Radiol J* 1994;45:223-224
9. Blachar A, Federle MP, Brancatelli G, Peterson MS, Oliver JH 3rd, Li W. Radiologist performance in the diagnosis of internal hernia by using specific CT findings with emphasis on transmesenteric hernia. *Radiology* 2001;221:422-428
10. Blachar A, Federle MP, Dodson SF. Internal hernia: clinical and imaging findings in 17 patients with emphasis on CT criteria. *Radiology* 2001;218:68-74
11. Blachar A, Federle MP. Bowel obstruction following liver transplantation: clinical and CT findings in 48 cases with emphasis on internal hernia. *Radiology* 2001;218:384-388
12. Wise SW. Case 24: Afferent loop syndrome. *Radiology* 2000;216:142-145
13. Wills JS. Closed-loop and strangulating obstruction of the small intestine: a new twist. *Radiology* 1992;185:635-636
14. Balthazar EJ, Birnbaum BA, Megibow AJ, Gordon RB, Whelan CA, Hulnick DH. Closed-loop and strangulating intestinal obstruction: CT signs. *Radiology* 1992;185:769-775
15. Schmutz GR, Benko A, Fournier L, Peron JM, Morel E, Chiche L. Small bowel obstruction: role and contribution of sonography. *Eur J Radiol* 1997;7:1054-1058
16. Blake MP, Mendelson RM. The whirl sign: a non-specific finding of mesenteric rotation. *Australas Radiol* 1996;40:136-139

US and CT Findings of Retroanastomotic Hernia after Gastrojejunostomy¹

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Purpose: To review the radiologic findings of retroanastomotic hernia and to derive useful US and CT criteria to assist in the diagnosis of the condition in patients who have undergone gastrojejunostomy.

Materials and Methods: During a recent eight-year period, we encountered 11 consecutive cases of retroanastomotic hernia. Of the patients involved, nine underwent ultrasound (US), eight underwent computed tomography (CT), and in three, small bowel follow-through imaging was performed. The US and CT scans were reviewed to determine abnormal findings; surgical proof was available in all cases.

Results: The efferent loop was herniated through the defect created behind the anastomosis in eight cases, both the efferent and afferent loop in two cases, and the afferent loop in one case. Retroanastomotic hernia was prospectively diagnosed in ten of these eleven cases. Among the eight cases of efferent loop herniation, US and CT signs of retroanastomotic hernia included whirling of mesenteric vessels, jejunal loops and mesentery in the periumbilical abdomen (8/8); mural thickening of herniated bowel loops (6/8); dilatation of herniated bowel loops (4/8); (at US) decreased peristalsis of herniated bowel loops (3/7); and (at CT) decreased contrast enhancement of herniated bowel loops (1/5). In one case, US and CT signs of retroanastomotic hernia of the afferent loop included its dilatation and whirling of a short length behind the anastomosis. In two cases, US and CT signs of retroanastomotic hernia of both the afferent and efferent loop included findings of both afferent and efferent loop herniation.

Conclusion: Retroanastomotic hernia is an important and underdiagnosed condition, and the US and CT findings we have described may permit its accurate diagnosis.

Index words : Hernia

Intestines, CT

Intestines, hernia

Intestines, stenosis or obstruction

Intestines, US

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