

Early CT detection of Petersen's Hernias in Antecolic Roux-en-Y Gastric Bypass patients with Surgical Correlation.

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Learning objectives

The aim of the exhibit is to describe an original pattern of three signs found on abdominal CT examinations in patients with surgically proven Petersen's hernias after prior antecolic Roux-en-Y gastric bypass (RYGB). These are early signs that can be seen prior to the presence of later complications such as a bowel obstruction.

Background

Gastric bypass surgery has many indications and is becoming more utilised as a definitive method for weight loss when other forms of medical therapy have not been successful.

There are 4 types of internal hernias that have been described after laparoscopic Roux-en-Y reconstruction[1,2]:

1. Petersen's defect: Mesenteric defect posterior to the Roux jejunal limb
2. Meso-jejunal mesenteric window: Mesenteric defect at the jejuno-jejunal anastomosis
3. Mesocolic window: Mesenteric defect through the transverse mesocolon with a retrocolic Roux limb
4. Abnormal aperture secondary to an adhesive peritoneal band

A Petersen's hernia is an internal hernia that arises after any type of gastrojejunostomy (most frequently after Roux-en-Y anastomosis) into Petersen's space, which is bounded by the transverse mesocolon, the retroperitoneum, and the Roux limb mesentery.

Internal hernias, including Petersen's hernias, are often considered in patients post Roux-en-Y gastric bypass but are poorly recognised in radiology until they become complicated by a bowel obstruction or demonstrate associated acute inflammatory changes. The majority of the literature written about internal hernias are descriptions of their late complications [2-5].

Findings and procedure details

Our study included 10 patients with laparoscopically proven Petersen's hernias who also had a preoperative abdominal CT examination, most commonly for investigation of

nonspecific abdominal pain. The CT scans were retrospectively reviewed to determine common signs that could act as a guide for early diagnosis.

Our control group included 7 patients with laparoscopy that was negative for internal hernia following a preoperative CT abdomen examination, most commonly for assessment of nonspecific abdominal pain.

The time interval between the preoperative abdominal CT scans and the date of surgery ranged from 0 days to 2 years and 7 months, with a median of 7 days.

The majority of the patients did not have any evidence of bowel obstruction or dilatation. Among the Petersen's hernia group, 3 of the 10 patients (30%) had bowel dilatation - 1 had an intermediate grade small bowel obstruction due to a Petersen's hernia resulting in a caecal volvulus and the other 2 had localised, mildly dilated small bowel loops in the left side of the abdomen. In comparison, 1 of the 7 control group patients (14.3%) had small bowel dilatation. There was no statistically significant difference between the two groups ($p = 0.603$).

Superior Mesenteric Vein (SMV) Abnormalities

SMV compression in association with an SMV twist was a recurring pattern found in most patients with Petersen's hernias. We defined the SMV twist as a twisting course of the vessel, similar to the CT whirl sign found in a malrotation or volvulus, but in close proximity to the uncinate process [1, 6-9].

Figure 1. shows the normal appearance of the SMV (Thick arrow) and SMA (Thin arrow)

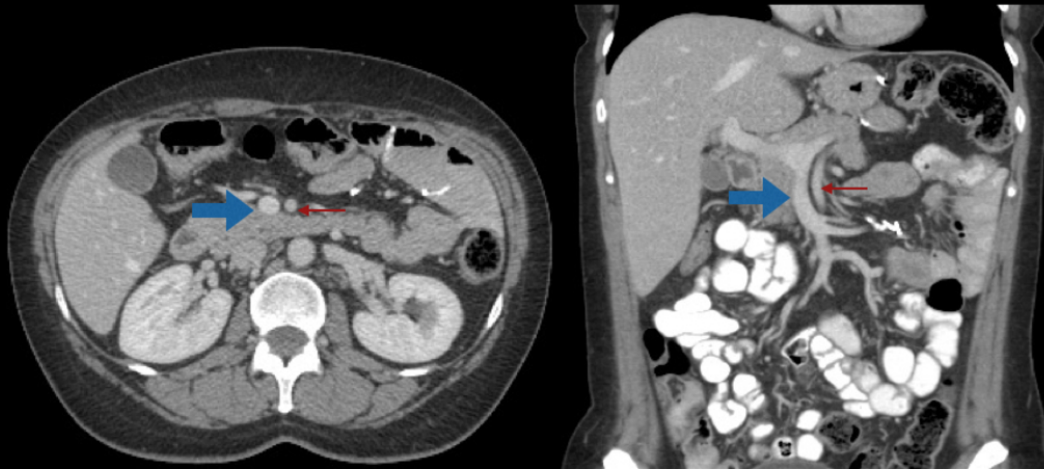


Fig. 1: Normal SMV and SMA orientation

References: Diagnostic Imaging, McMaster University, St Joseph's Healthcare Hamilton - Hamilton/CA

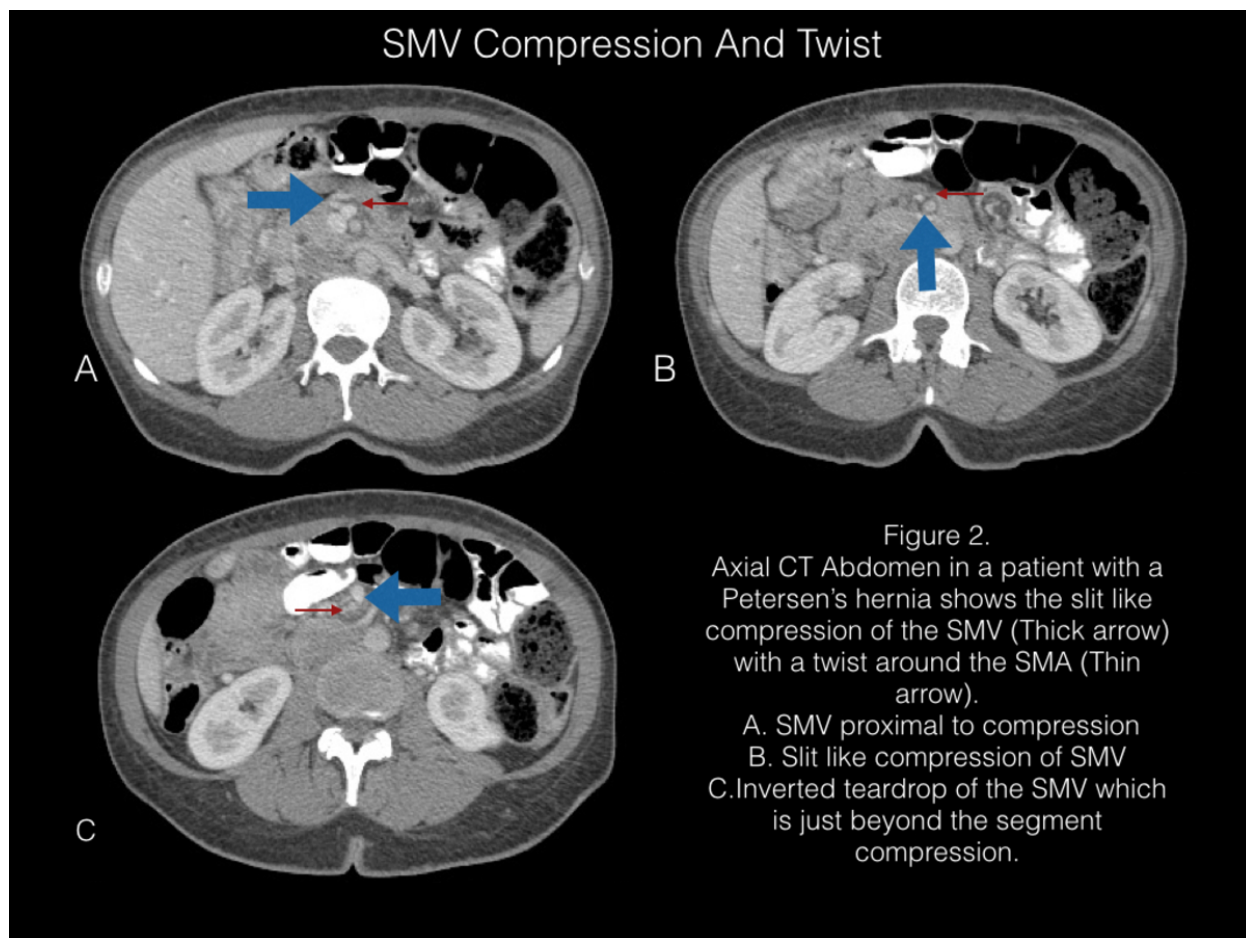


Fig. 2: SMV compression and twist in a patient with a Petersen's hernia

References: Diagnostic Imaging, McMaster University, St Joseph's Healthcare Hamilton - Hamilton/CA

SMV compression was present in 80% of the patients with a Petersen's hernia, in comparison with none of the patients in the control group ($p=0.002$).

A swirl or twist of the SMV or an SMV tributary was present in 80% of the Petersen's hernia patients and none of the control group patients ($p=0.002$). It was noted that the swirl was often associated with horizontal orientation of the SMV.



Fig. 3: SMV compression and twist in a patient with a Petersen's hernia

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Duodeno-jejunal (DJ) Flexure

DJ flexure malrotation is a known pathology in paediatrics. The DJ flexure is normally located to the left of midline at the level of the L1 vertebral body.

In 7 out of the 10 patients (70%) with a Petersen's hernia, the DJ flexure was malrotated, in comparison with none of the control group patients ($p=0.010$).

Figure 4. shows the malrotation of the DJ flexure (arrow). This was found in 70% of patients with Petersen's hernias.

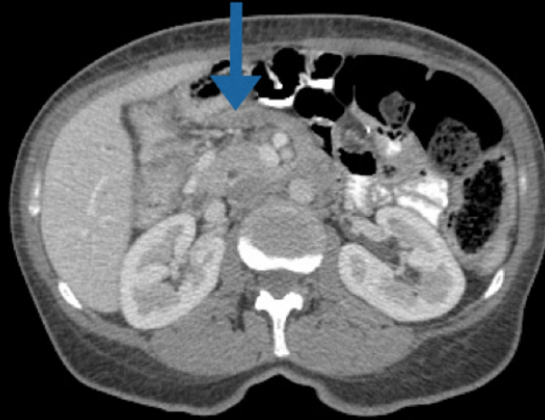


Fig. 4: Malrotation of the DJ flexure. This was found in 70% of patients with Petersen's hernias.

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Of the 3 patients with a Petersen's hernia but without malrotation of the DJ flexure, 1 demonstrated anterior displacement of the 1st jejunal loop with interposition of other bowel loops. The other two had either a normal DJ position with no anterior displacement or an indeterminate position of the DJ flexure.

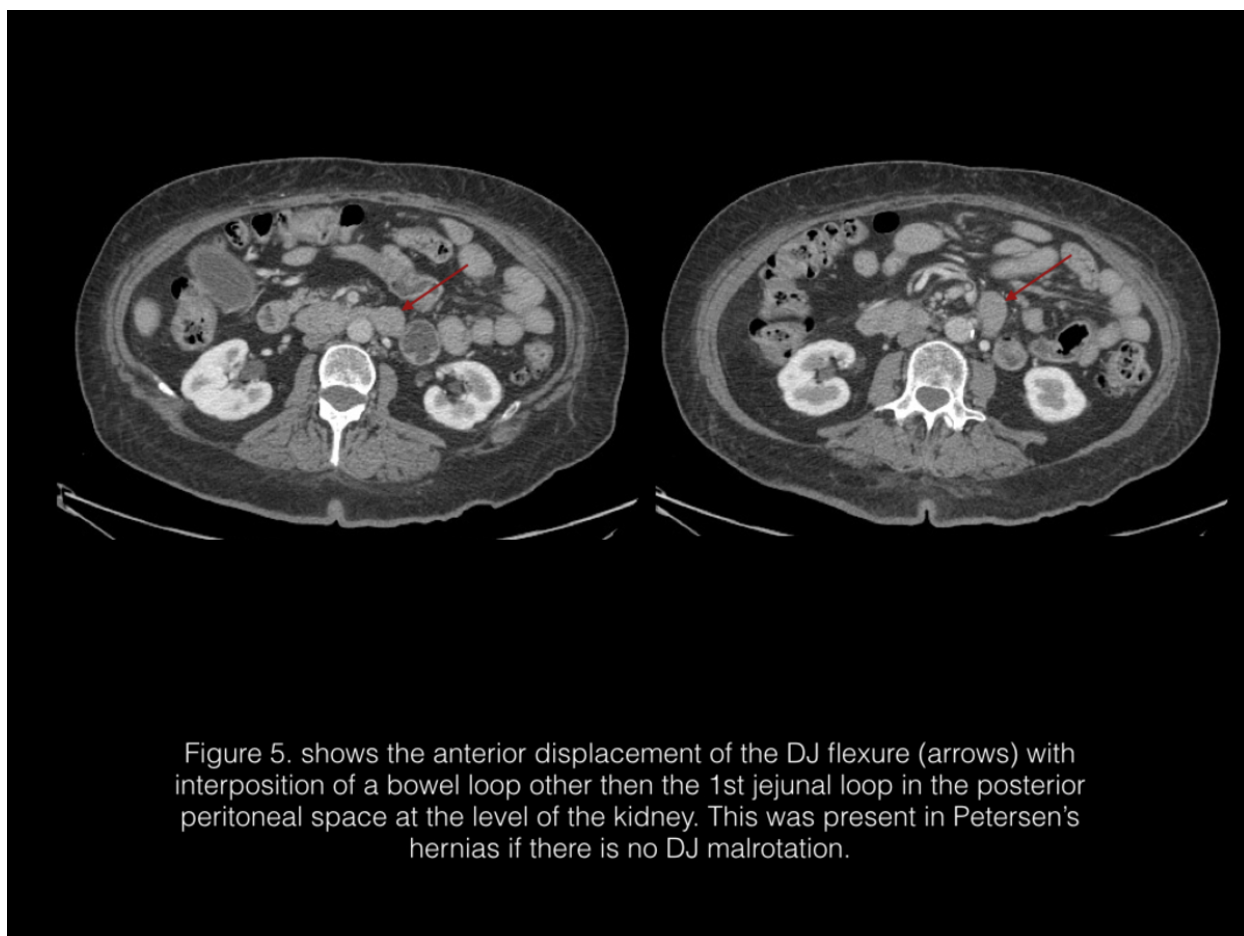


Fig. 5: Anterior displacement of the DJ flexure with interposition of a bowel loop other than the 1st jejunal loop. This was sometimes present in patients with Petersen's hernias who did not demonstrate DJ malrotation.

References: Diagnostic Imaging, McMaster University, St Joseph's Healthcare Hamilton - Hamilton/CA

6 out of 7 (85.7%) control group patients had a normal DJ flexure position with no displacement of the first jejunal loop. The remaining patient was noted to have anterior displacement of the first jejunal loop with an interposed loop of redundant sigmoid colon.

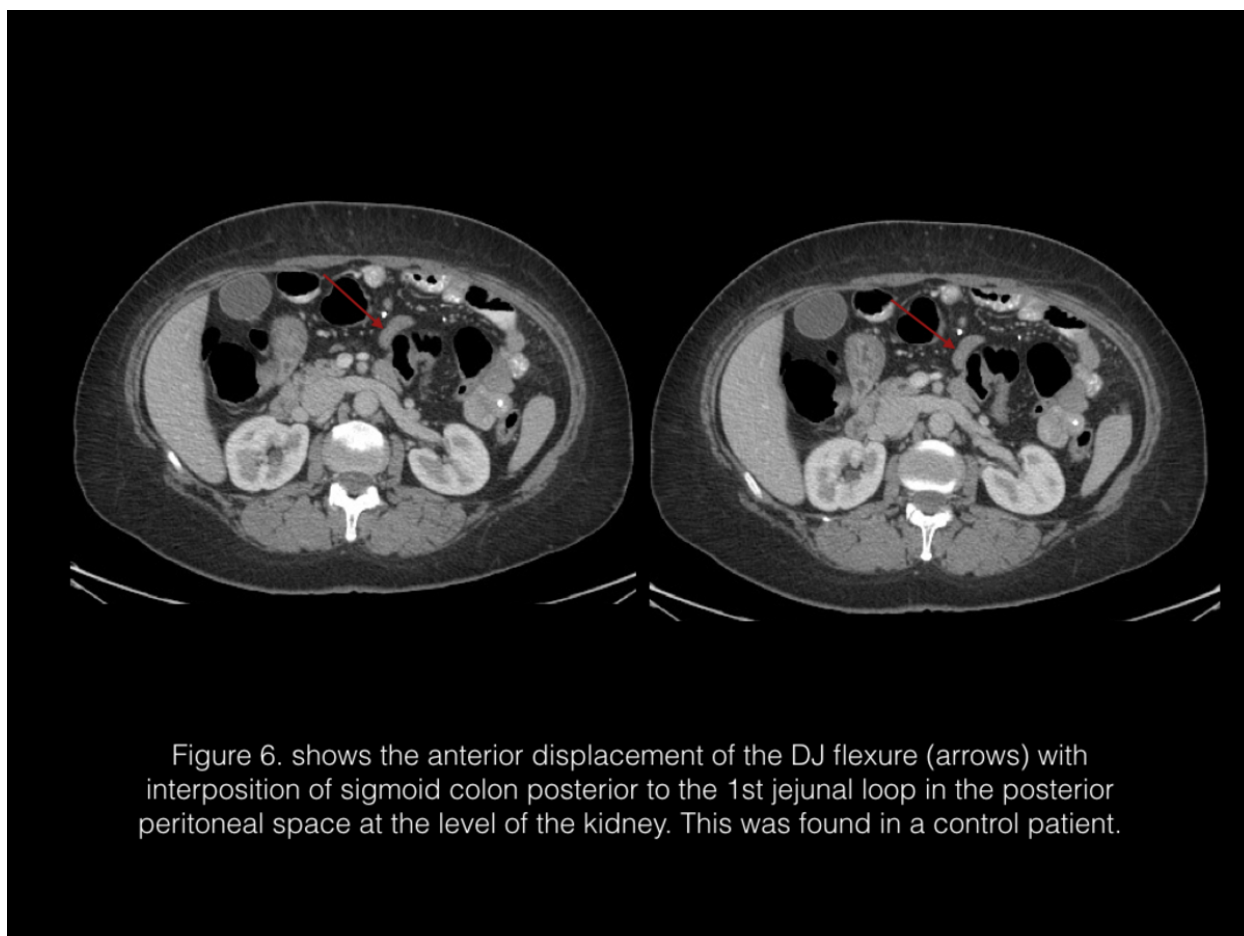


Fig. 6: Anterior displacement of the DJ flexure with interposition of sigmoid colon, seen in a control patient.

References: Diagnostic Imaging, McMaster University, St Joseph's Healthcare Hamilton - Hamilton/CA

In total, 8 out of the 10 Petersen's hernia group patients (80%) demonstrated either malrotation or anterior displacement of the DJ flexure, in comparison with 1 out of the 7 control group patients (14.3%), a statistically significant difference ($p=0.015$).

Jejunum-jejunostomy (JJ) Anastomosis displacement

80% of the Petersen's hernia patients had the JJ anastomosis at the level of the mid pole of the left kidney or below while 20% demonstrated a JJ anastomosis that was displaced into the right side of the abdomen. In the control group, 85.7% of the patients had the JJ anastomosis on the left. There was no statistically significant difference between the groups ($p=0.435$) and this sign was not found to be helpful in the identification of Petersen's hernias.

Figure 7. shows part of the staple line (arrows) in the normal position of the JJ anastomosis.

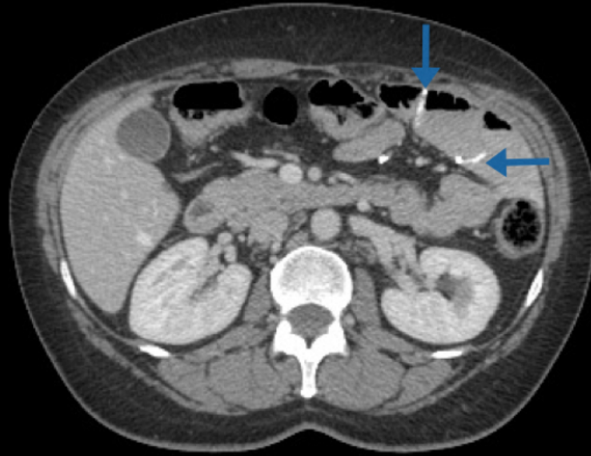


Fig. 7: Normal position of the staple line of the JJ anastomosis.

References: Diagnostic Imaging, McMaster University, St Joseph's Healthcare Hamilton - Hamilton/CA

Figure 8. shows abnormal displacement of the JJ anastomosis to the right side of the abdomen.

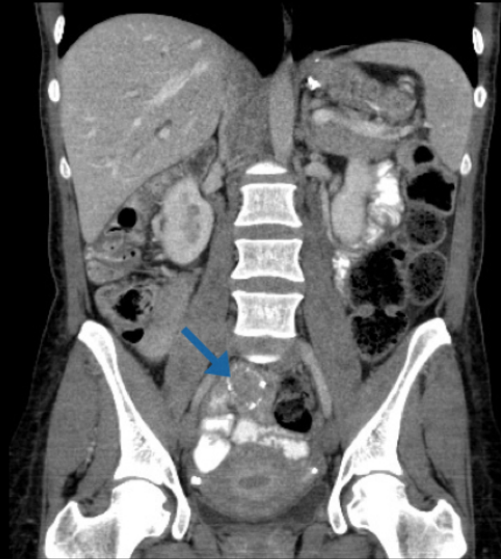


Fig. 8: Abnormal displacement of the JJ anastomosis to the right side of the abdomen.

References: Diagnostic Imaging, McMaster University, St Joseph's Healthcare Hamilton - Hamilton/CA

Images for this section:

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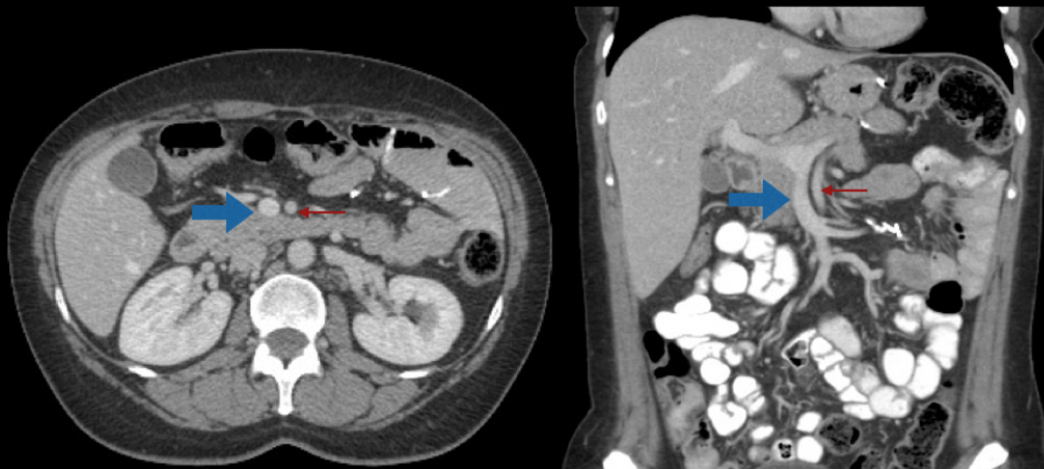


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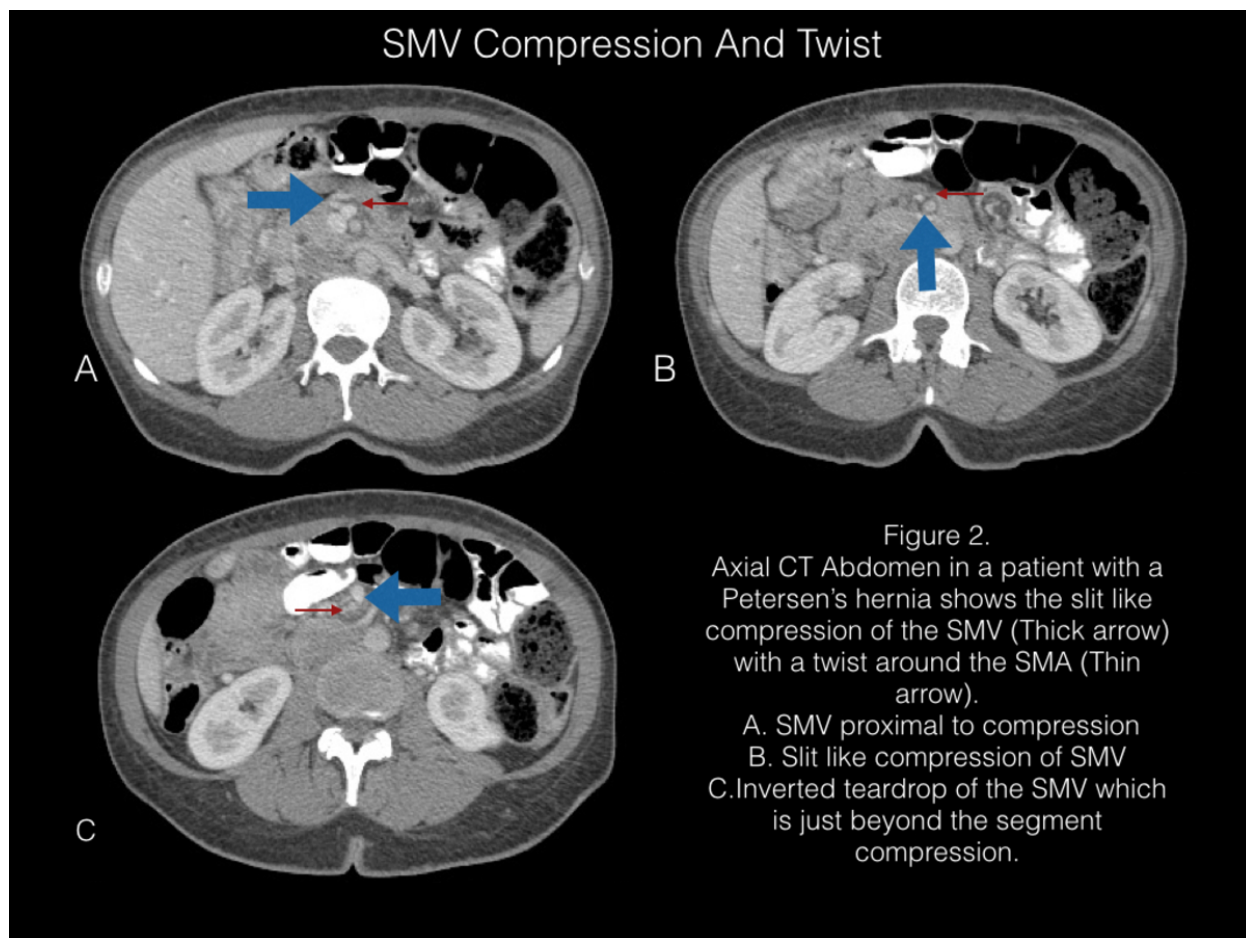


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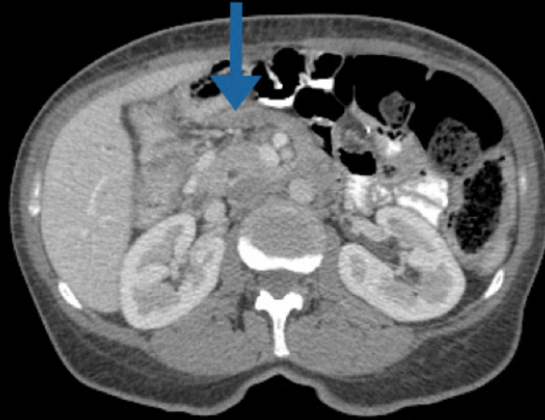


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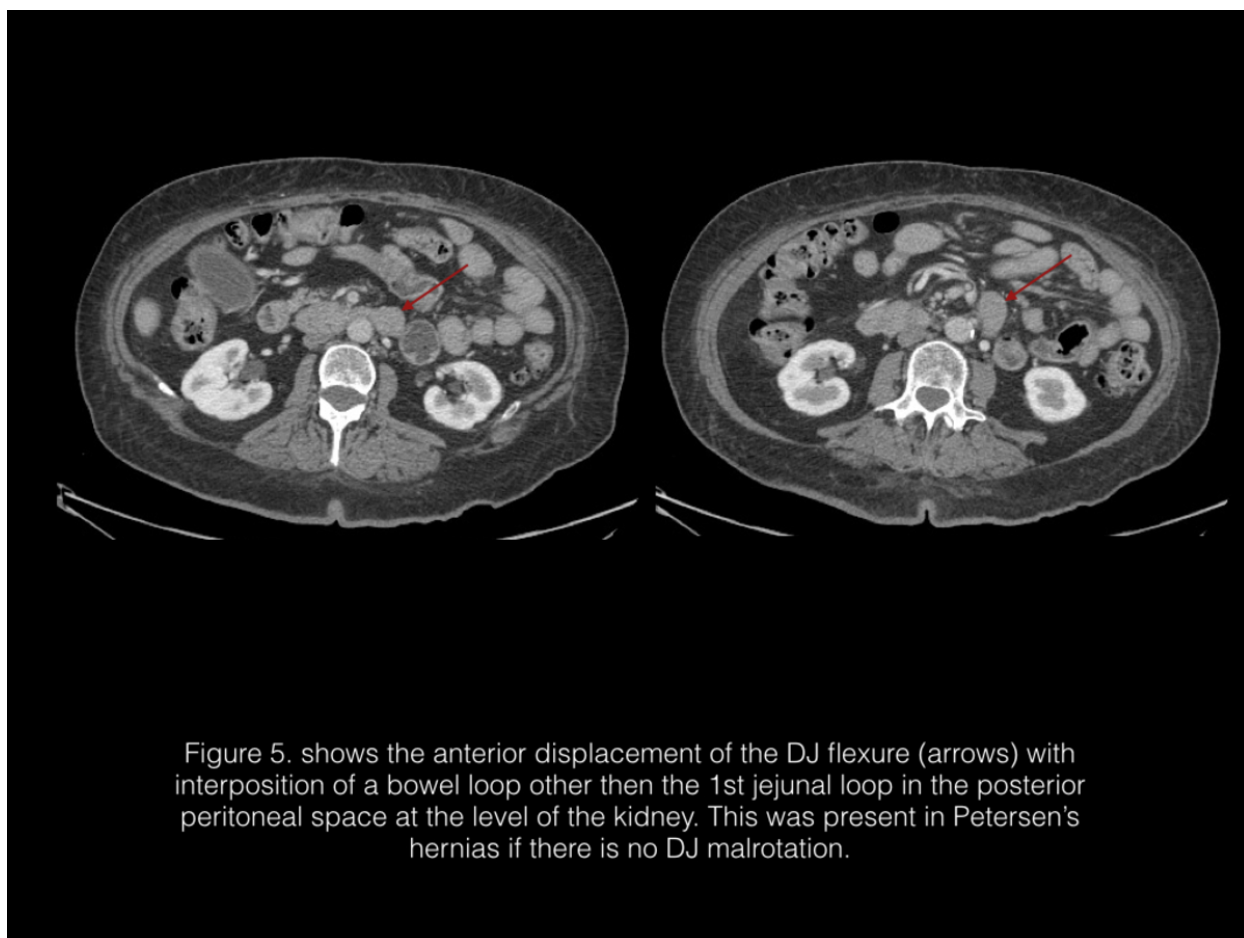


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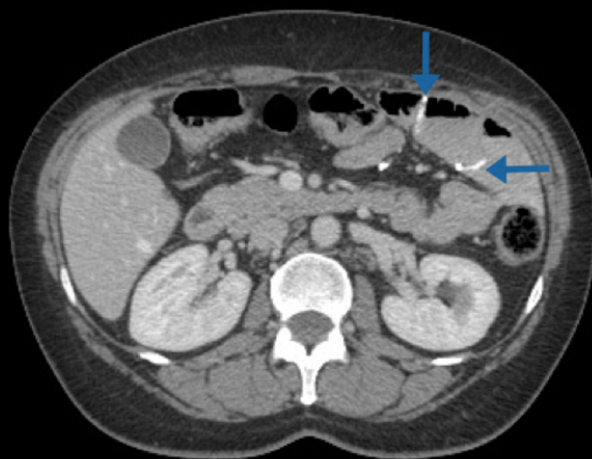


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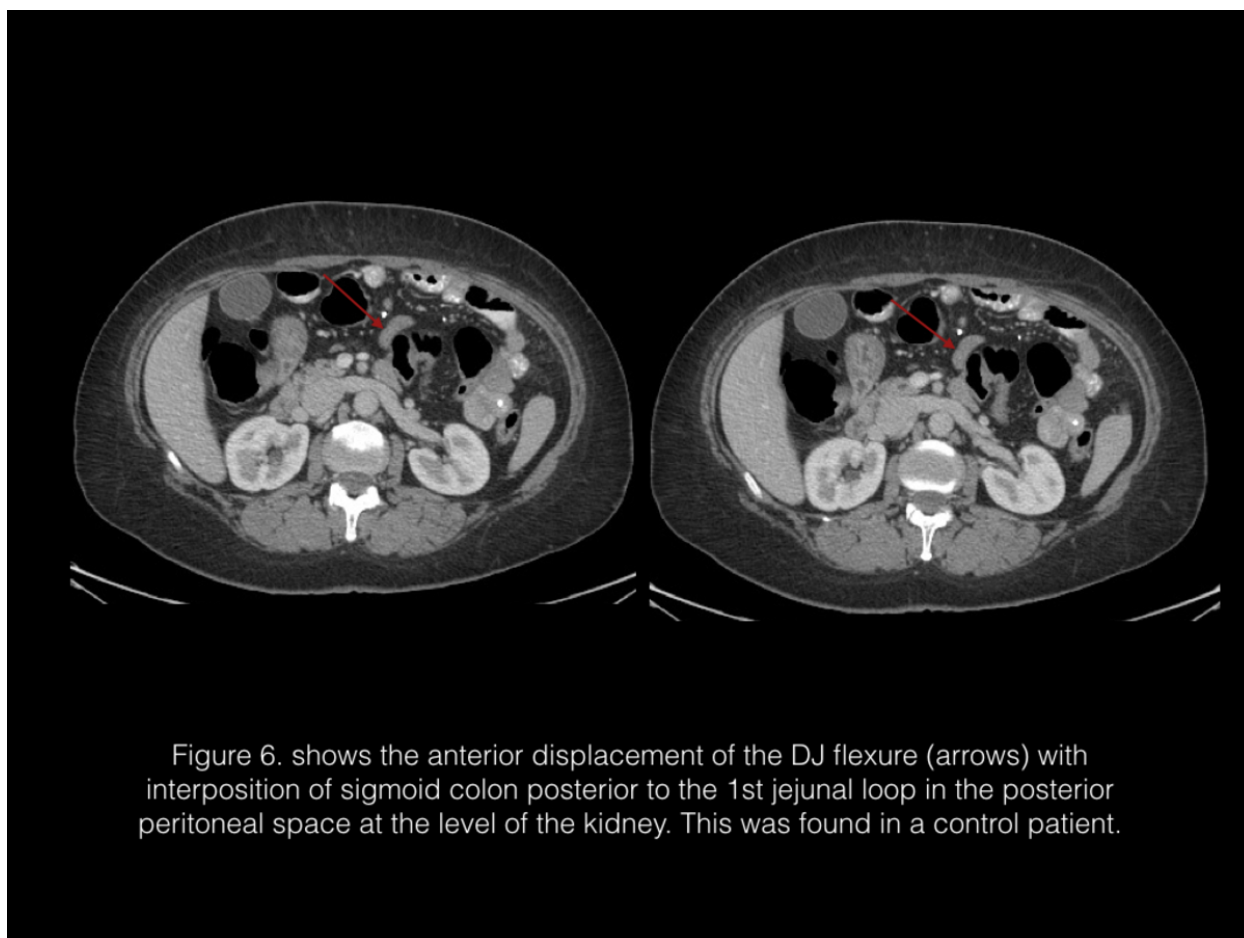


Fig. 6: Anterior displacement of the DJ flexure with interposition of sigmoid colon, seen in a control patient.

Conclusion

CT scans are helpful in the diagnosis of internal hernias in RYGB. Currently, imaging findings of Petersen's hernias are not well described. In our case series of 10 surgically proven cases, we found that the most sensitive indicators of Petersen's hernias were the compression of the SMV and the twisting of the SMV around the SMA axis. The additional sign of malrotation of the DJ #exure or anterior displacement of the DJ #exure, with the interposition of a bowel loop other than the first jejunal loop in the posterior peritoneal space, was also specific and present in 80% of the positive cases. In contrast, displacement of the JJ anastomosis was not found to be helpful.

By describing these original radiological patterns of Petersen's hernias on CT, we hope to increase the radiologist's confidence in making this diagnosis.

Personal information

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