

Modified HIDA scintigraphy for demonstrating bile reflux in Mini Gastric Bypass patients

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INTRODUCTION

Morbid obesity is the second leading cause of preventable death in the United States and a major cause of morbidity worldwide. Mini Gastric Bypass (MGB) bariatric surgery is gaining popularity in recent years (see figure 1). One of its predominant complications is symptomatic biliary reflux esophagitis, which may be complicated with Barrett's esophagus and esophageal cancer.

There is no diagnostic gold standard for detecting bile reflux. Hepatobiliary scintigraphy (HIDA scan) is a non-invasive test with good sensitivity, patient-tolerability and reproducibility. HIDA is concentrated rapidly in bile after injection, and can demonstrate bile production, secretion and excretion to the gallbladder and bowel. There are insufficient published studies regarding the use of HIDA scan for detection of bile reflux after MGB, and a tailored HIDA scintigraphy protocol is yet to be established.

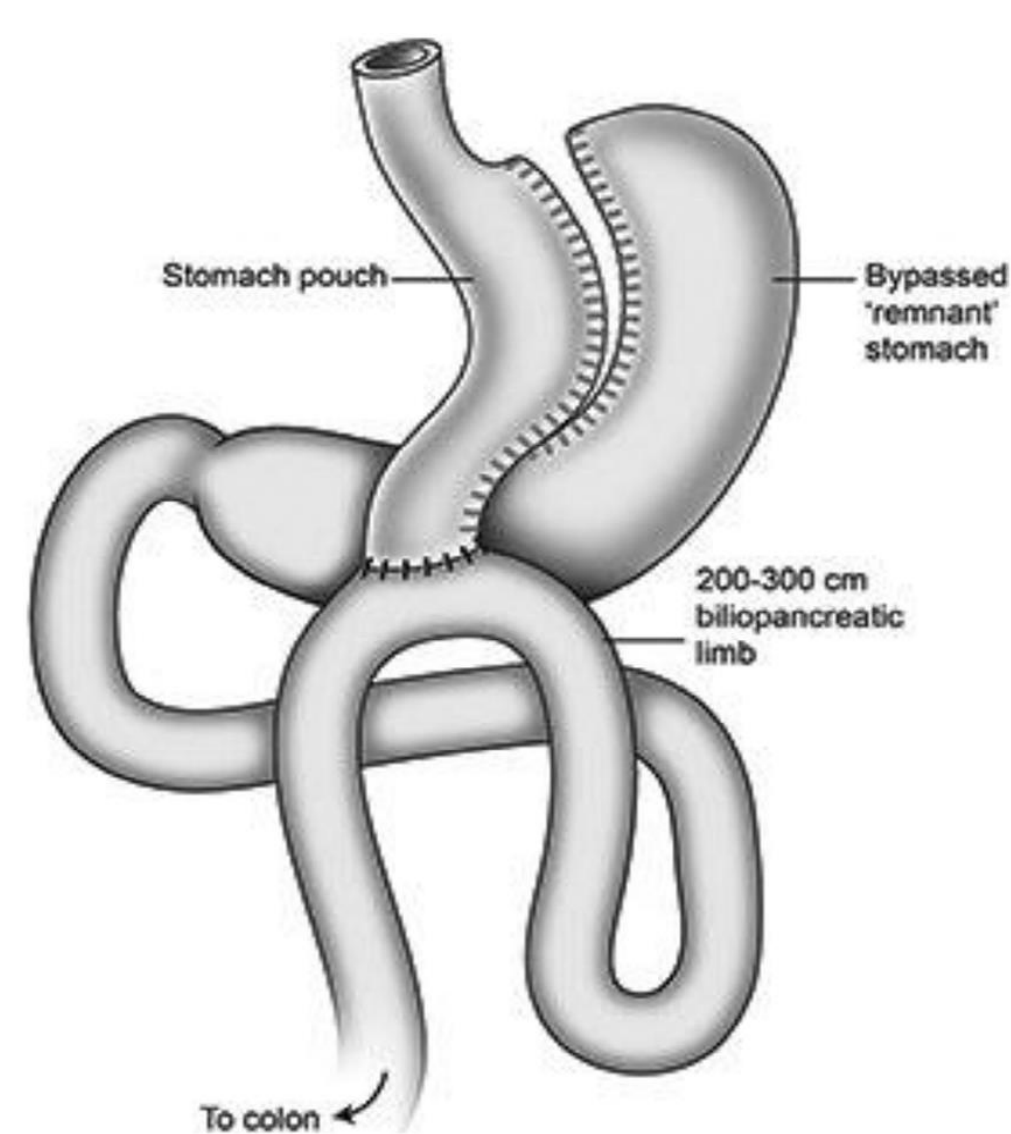


Figure 1
Mini Gastric Bypass operation

OBJECTIVE

Our aim was to define a HIDA scan protocol optimized for demonstrating bile reflux in patients after MGB and to study the prevalence and severity of bile reflux in these patients.

METHODS

Patients after MGB with complaints suggestive of bile reflux were prospectively enrolled. All patients underwent a HIDA scan with a protocol tailored for this study (see figure 2). Additions to the standard scan protocol included ingestion of a fatty meal to induce bile excretion, maneuvers intended to promote gastro-esophageal reflux (including Valsalva, knee bending to stomach and prone position) and Single-photon emission computed tomography (SPECT-CT) for greater sensitivity and anatomic localization of the bile.

Detection of bile in the stomach pouch or the esophagus during the scan was defined as bile reflux. The time of appearance, location and severity of bile reflux was documented for each patient.

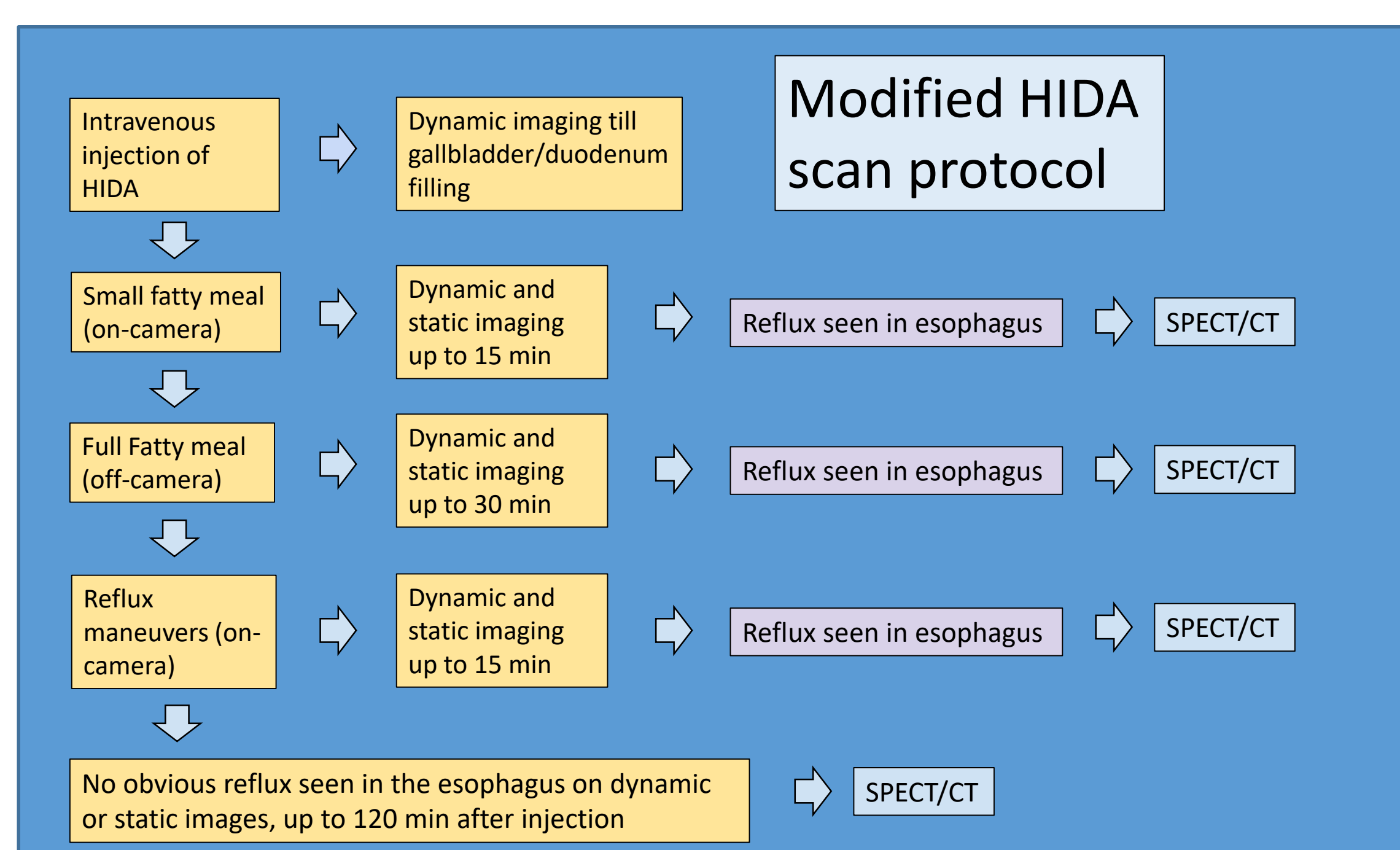


Figure 2
Tailored HIDA scan protocol

RESULTS

Nineteen patients were included. The mean time from surgery to the scan was 22.4 months. Bile reflux into the gastric pouch was documented in 11 patients (53%). In 3 patients reflux to the stomach pouch was severe (27%), in 2 patients moderate (18%) and in six patients mild (55%). Bile reflux into the esophagus was documented in 4 patients (21%). In 1 patient the reflux was severe (25%) and in the rest mild (75%). Representative cases of HIDA scans are presented in figures 3-5.

Comparison was conducted between the 11 patients who had bile reflux (group A) as compared to the 8 patients who didn't have (group B). Group A had a significantly higher rate of vomiting and heartburn or regurgitation (63.6% and 100%, $P=0.02$) as compared to group B (12.5% and 62.5%, $P=0.04$), respectively. Moreover, group A had a higher rate of esophagitis (40%), as compared to group B (0), $P=0.02$. On regression analysis to elucidate whether hiatal hernia or resected gallbladder represented risk factors for bile acid reflux, we showed no association with either hiatal hernia (OR 1.28, 95% CI 0.16-10.45, $P=0.81$) and resected gallbladder (OR 0.57, 95% CI 0.09- 3.64, $P=0.55$).

Figure 3
HIDA scan in a patient without reflux.

Planar images 60 minutes (a) and 90 minutes (b) after injection and axial CT (c), SPECT (d), fused SPECT-CT (e) and 3D SPECT image (f) demonstrate bile in the gallbladder (yellow arrow) and in the bypassed remnant stomach (black arrow), but no bile in the stomach pouch (white arrow) or the esophagus.

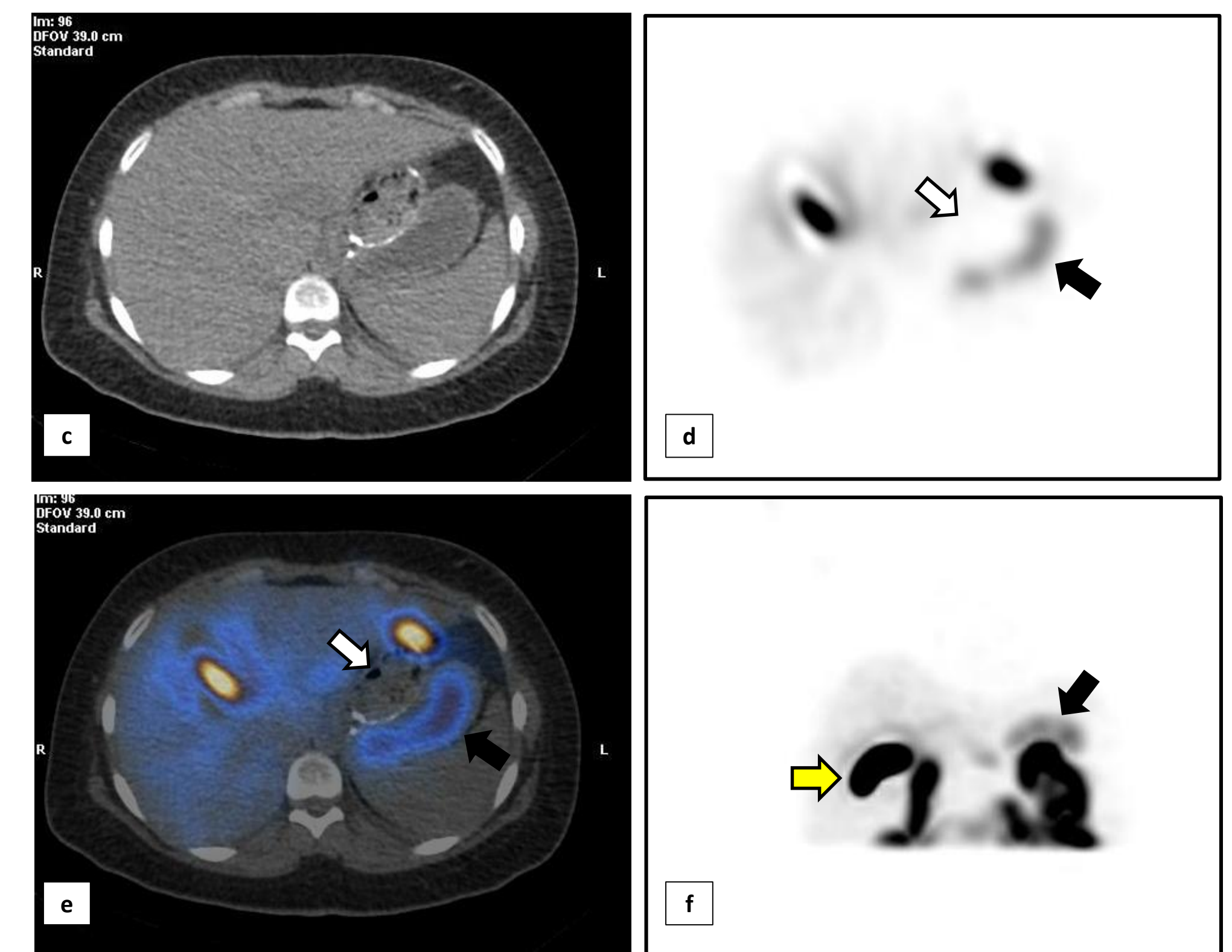
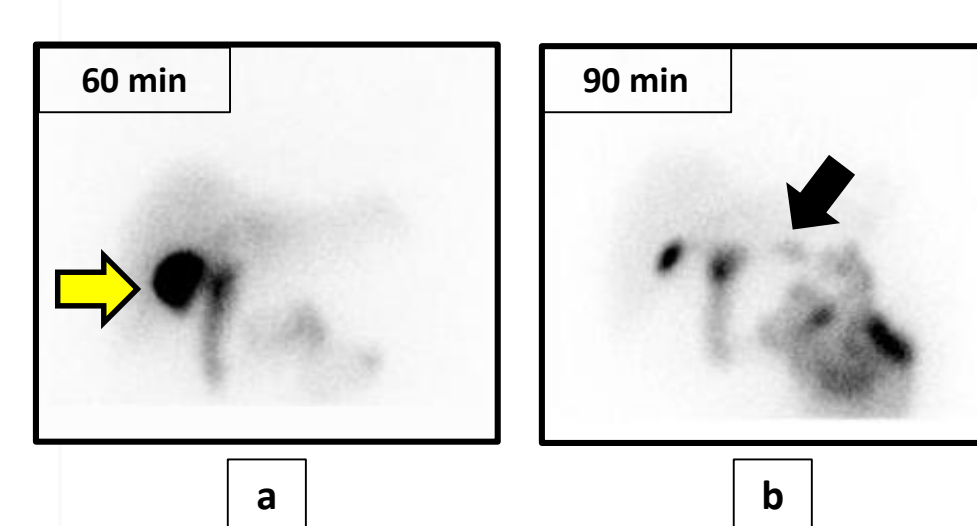


Figure 4
HIDA scan in a patient with reflux to the stomach pouch.

Planar images (a,b) and axial CT (c), SPECT (d), fused SPECT-CT (e) and 3D SPECT image (f) demonstrate bile in the stomach pouch (white arrow) 90 minutes after injection. No bile is seen in the esophagus.

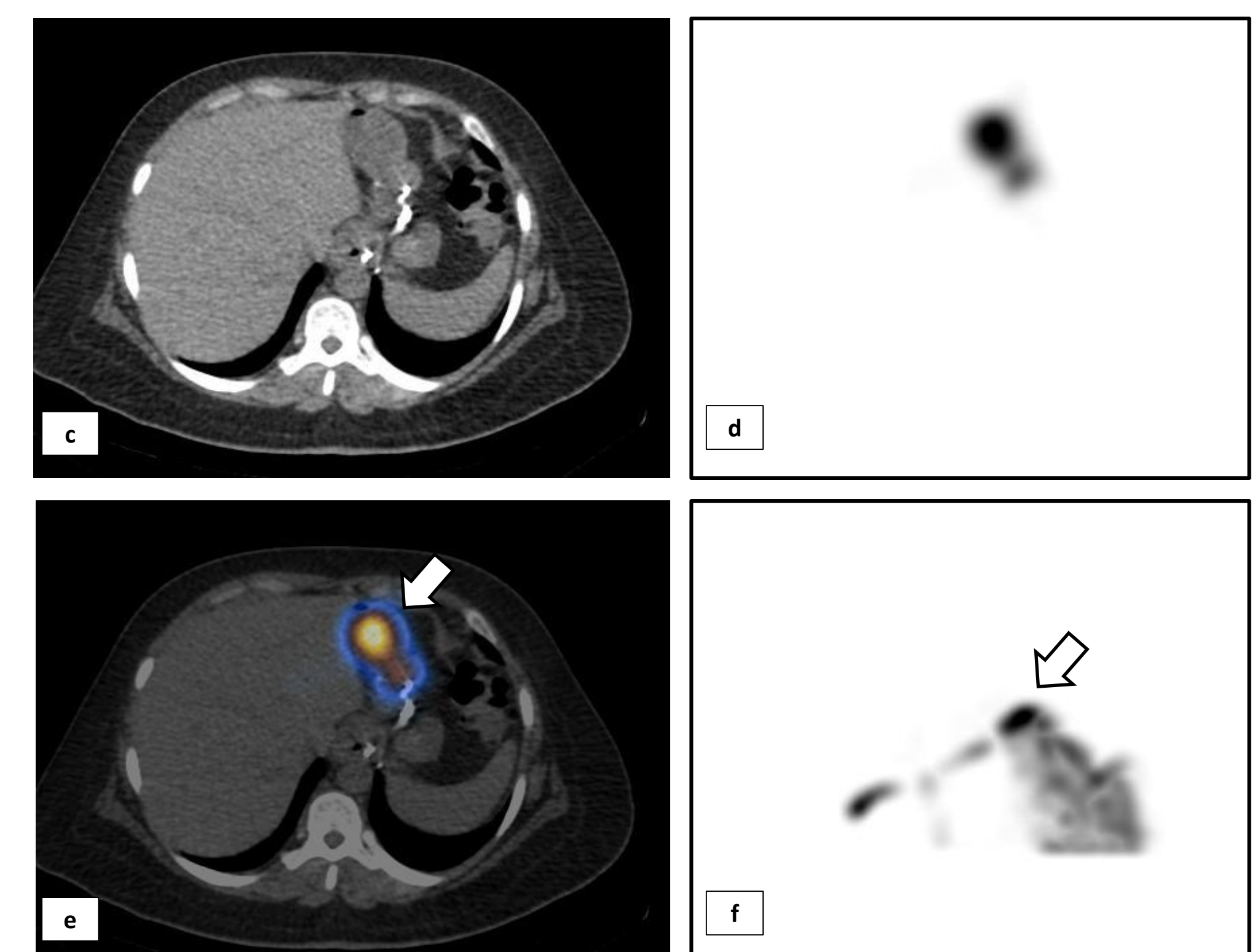
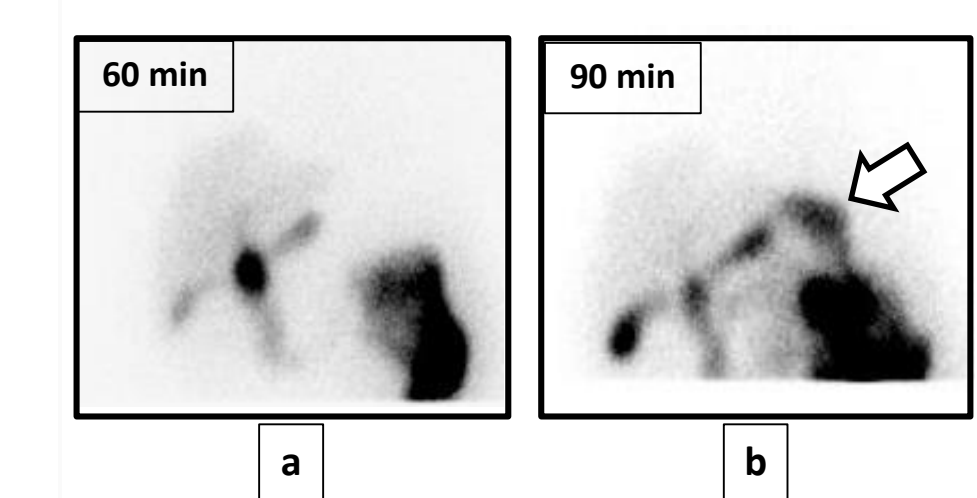
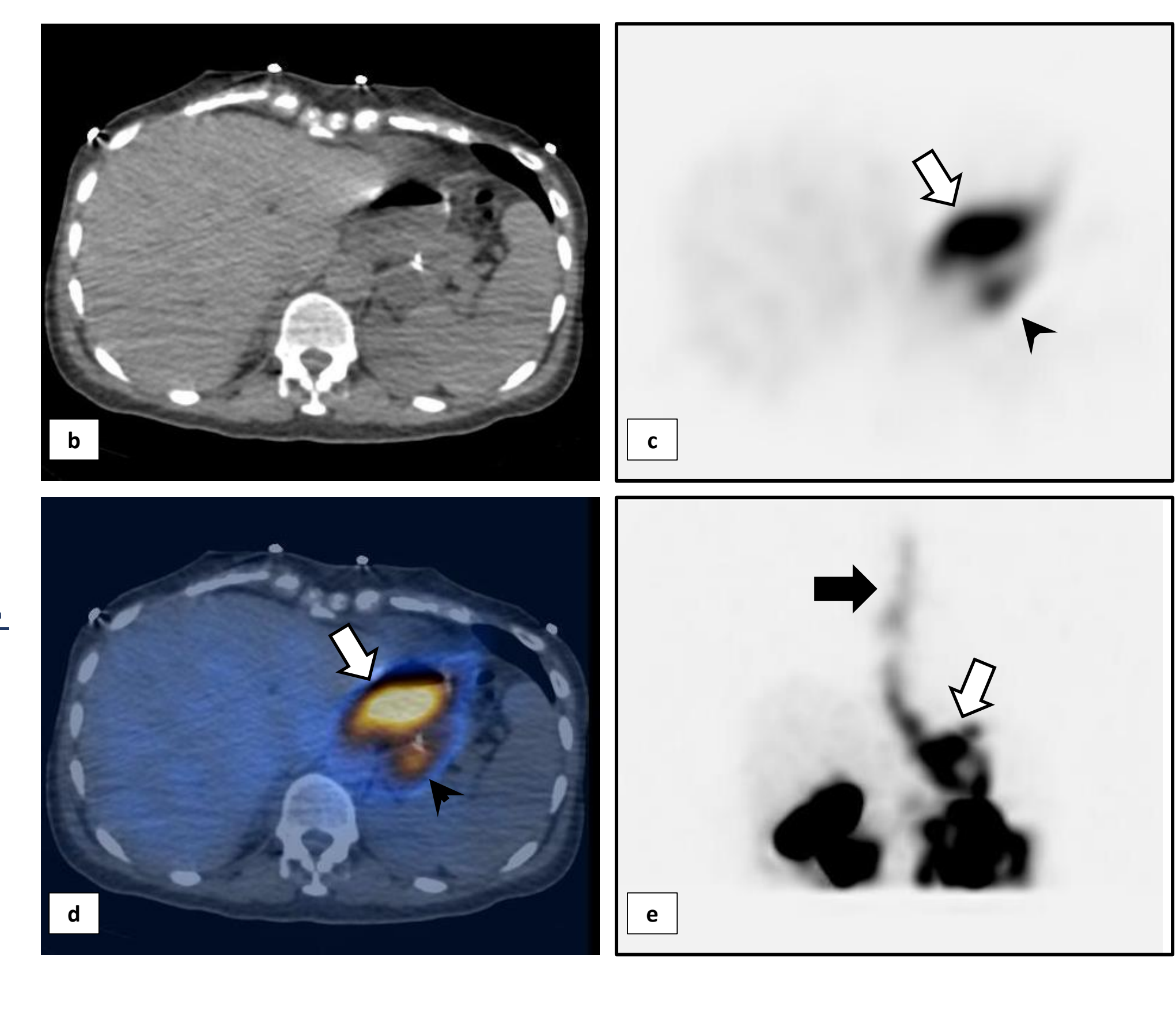
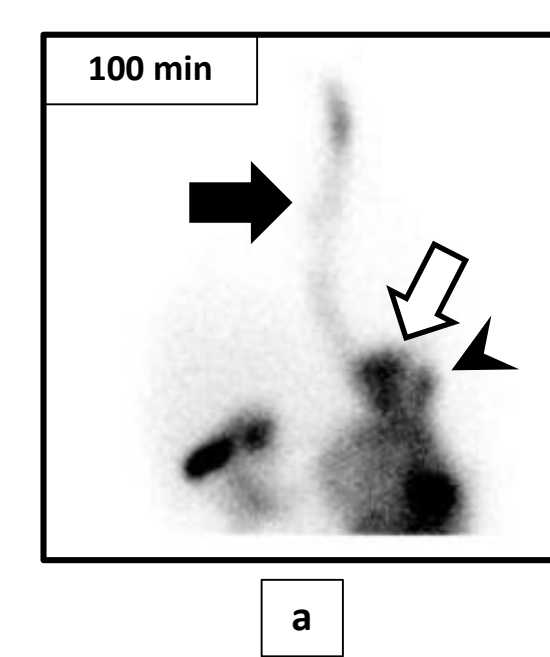


Figure 5
HIDA scan in a patient with severe reflux to the stomach pouch and the esophagus.

Planar image (a) and axial CT (b), SPECT (c), fused SPECT-CT (d) and 3D SPECT image (e) demonstrate a significant amount of bile in the stomach pouch (white arrow) and the esophagus (black arrow). Bile is also present in bypassed remnant stomach (arrow head). Differentiating between the stomach pouch and remnant stomach is impossible without SPECT-CT.



CONCLUSIONS

Patients with bile reflux on the HIDA scan were more symptomatic and had a significantly higher prevalence of esophagitis when compared to the non-reflux patients.

The tailored HIDA scan protocol used for this study detected bile reflux in more than half of the post MGB patients included. The prevalence found in our study group was higher than previously published studies that used HIDA scan for this purpose (range of 3-17%)^{1,2}. We believe that the changes introduced to the protocol increase the scan's sensitivity while being technically easy to reproduce with good patient tolerability.

REFERENCES

- Eldredge TA, Bills M, Myers JC, Bartholomusz D, Kiroff GK, Shenfine J. HIDA and Seek: Challenges of Scintigraphy to Diagnose Bile Reflux Post-Bariatric Surgery. *Obes Surg.* 2020;30(5):2038-2045.
- Saarinén T, Pietiläinen KH, Loimaala A, et al. Bile Reflux is a Common Finding in the Gastric Pouch After One Anastomosis Gastric Bypass. *Obes Surg.* 2020;30(3):875-881.