Interventional Radiology:

Percutaneous Approach for Removal of a Migrated Cystogastric Stent from a Pancreatic Pseudocyst: A Case Report and Review of the Literature

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Percutaneous Approach for Removal of a Migrated Cystogastric Stent from a Pancreatic Pseudocyst: A Case Report and Review of the Literature

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ABSTRACT

Stent migration into pancreatic pseudocysts during endosonographic (EUS) cystogastrostomy is a relatively rare complication. The migrated stent may induce, if it remains within the body, infection and perforation. Therefore, retrieval and/or re-stenting is necessary. Endoscopic retrieval is commonly attempted first. However, it is technically challenging and largely dependent on the skill of the endoscopists; if retrieval is unsuccessful, surgery is usually carried out. We report a case of stent migration into a pancreatic pseudocyst that was retrieved with a percutaneous approach under imaging guidance using a simple technique with available devices. A technique that enhances the role of interventional radiology in the management of this rare complication.

CASE REPORT

CASE REPORT

A 68-year-old man without any history of any medical disease was diagnosed with a pancreatic pseudocyst of unknown cause 4 weeks prior to presentation to our hospital and was admitted electively with no symptoms and sent to the gastroenterology department for further examination.

The patient's vital signs, physical examination, and laboratory data were within normal limits. Transabdominal ultrasound revealed a well-circumscribed, smooth-walled, unilocular mass with internal echoes, fluid-sedimentation level, and posterior acoustic enhancement in the upper region of the abdomen with no vascularity on color Doppler (Curvilinear 5 MHz probe, Philips; Fig. 1 a,b). Computed tomography (CT) examination revealed a well-defined, 10 cm × 14 cm, hypodense, near water density pancreatic pseudocyst, with internal sedimentation, that displaced the stomach anteriorly (Fig. 1 c,d). In addition, T2-weighted magnetic resonance imaging (MRI; Siemens 1.5T, TR/TE 1500/171, thickness 6 mm, matrix 416 × 512) indicated a large, retrogastric, smooth,

well-defined, low-signal intensity wall and a pseudocyst with internal fluid signal intensity and no enhancement postcontrast, but mild enhancement at the wall (Fig. 1 e,f). A diagnosis of non-complicated pancreatic pseudocyst was thus confirmed. The healthcare team scheduled the patient for drainage with a cystogastric double-pigtail stent (7 French/10 cm) under endosonographic (EUS) guidance. However, unfortunately, upon deployment, the stent accidentally migrated into the pseudocyst. Owing to a lack of experience with retrieval, the staff left the stent inside the patient. On the same day, CT scanning confirmed migration of the stent into the pseudocyst (Fig. 2a, b, c).

A few days later, the patient experienced severe abdominal pain and tenderness. Blood tests showed elevated parameters indicative of infection. A CT scan showed multiple air bubbles within the cyst cavity; however, owing to the patient's clinical condition, a superimposed infection was considered the most appropriate diagnosis, even though the postintervention measures may have caused this finding (Fig. 2d, e, f). Antibiotic therapy was initiated for 1 week, but no

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significant improvement was observed. Attempts to remove the stent using endoscopic approaches were unsuccessful. The patient's condition became critical, such that it progressed to septic shock developed, requiring immediate intervention. The interventional radiology team was consulted and scheduled for retrieval of the migrated stent via a percutaneous approach.

The patient was prepared and draped in the standard sterile fashion. Upon reviewing the most recent CT scan, a safe trajectory pathway was determined away from interfering vessels, spleen, and bowel loops (Fig. 3). The patient was administered 10 mL of 1% lidocaine as a local anesthetic. Subsequently, using ultrasound guidance for real-time visualization, the pseudocyst was targeted with an 18-gauge needle (One-Step centesis catheter, Merit Medical, South Jordan, UT, USA). After puncture, 10 mL of pus was aspirated and sent for further diagnostic investigation. A 0.035-inch stiff guide wire with a flexible tip (Amplatz Super Stiff J Guidewire, Boston Scientific Corporation, Marlborough, MA, USA) was advanced followed by removal of the needle. Over the guidewire, a 12 French × 23 cm introducer sheath (BRITE TIP sheath introducer, Cordis, Miami, FL, USA) was advanced inside the pseudocyst cavity after using sequential dilators. Under fluoroscopic guidance, a 15-mm three-loop snare device (En Snare, Merit Medical, South Jordan, Utah, USA) was advanced through the sheath and manipulated in order to achieve close access to the stent. One end of the stent was caught and pulled back out via the introducer sheath (Fig. 3). Finally, the snare device was removed and the stiff guidewire was advanced via the sheath followed by exchanging the sheath with an external closed-loop pigtail drainage 12 French catheter (Bioteq, Taipei, Taiwan) without any complications.

Subsequently, the patient's clinical condition improved significantly and the pain subsided. A follow-up CT scan showed that the size of the pseudocyst reduced (Fig.4). The patient was discharged from the hospital 2 weeks after therapy and received follow-up care at the outpatient clinic of the gastroenterology department.

DISCUSSION

Pancreatic pseudocysts are a common complication of acute or chronic pancreatitis. They may develop in up to 10% of patients with pancreatitis, and represent about 20% of all cystic lesions of the pancreas [1].

A pancreatic pseudocyst is defined as an encapsulated collection of fluid with a well-defined inflammatory wall usually outside the pancreas with minimal or no necrosis. They usually occur more than 4 weeks after the onset of acute pancreatitis [2]. The inflammatory response induces formation of a distinct non–epithelized wall composed of granulation, organizes with connective tissue and fibrosis.

Approximately 41% of patients with pancreatic pseudocysts may experience complications such as rupture, abscess, jaundice, bowel obstruction, and hemorrhage if no treatment is administered [3]. Nevertheless, a watchful waiting

plan is justified by the knowledge that small pseudocysts (<5 cm) and those located in the pancreatic tail are likely to resolve spontaneouly in up to 56% of cases [4]. However, the indications for intervention and drainage of a pancreatic fluid collection are driven by the patient's symptoms, characteristics, and location of the fluid collection, and whether complications such as pseudoaneurysm or infection have been developed. The drainage intervention management for pseudocysts includes the least invasive procedures such as percutaneous image-guided or endoscopic drainage and the invasive surgical option.

Endoscopic ultrasound-guided drainage is a widely used treatment for pancreatic pseudocysts that is performed by establishing communication between the pseudocyst and stomach or small intestine; however, it involves complications that may be related directly to the procedure or can occur in relation to the stent placement. Procedure-related complications may include bleeding, perforation, pancreatitis, and infection (bacteremia, sepsis, abscess formation). Stent-related complications generally involve migration and clogging with subsequent infection [5].

Etiology & Demographics:
The occurrence of stent migration into pancreatic pseudocysts during endoscopic cystogastrostomy is a relatively rare complication (0.67%) [5]. There is no known age ratio or sex predilection [6]. There is no adequate data in the literature about the causes of migration.

Clinical & Imaging findings:
A migrated stent may cause poor drainage, which leads to secondary complications, if left within the body, such as infection, perforation, and obstruction, and becomes a foreign object in the body, making retrieval or re-stenting necessary [6].

The diagnosis can be established immediately during endoscopy; however, migration might occur later. Stent migration is difficult to diagnose on plain film radiographs and ultrasound images. On radiography, residual contrast can occasionally be observed within the pseudocyst lumen; after endoscopy, the contrast may appear to outline the cavity and thus indicates the location of the migrated stent. On ultrasound, the stent appears as hyperechoic parallel lines separated by a thin anechoic space with distal shadowing and pigtail loops at the end. CT, the gold standard, would demonstrate the stent inside the pseudocyst (Fig. 2); however, the most important observation is to make sure that both ends of the stent are identified and no concurrent complications are present, as described above.

Treatment & Prognosis:
The migrated stent causes drainage dysfunction, and if it remains within the body, infection and perforation may occur. Therefore, retrieval and/or re-stenting is necessary [6]. Previous studies have described methods by which stent migration was treated. Henriksen reported three cases of stents that had migrated into the pseudocysts that were treated with immediate surgery [7]. Mahnken et al. reported a case of transgastric repositioning of the stent with a fluoroscopically guided snaring technique, and Varadarajulu reported a case of

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repositioning of the stent with rat-tooth forceps using a gastroscope [8-9]. A few studies have also reported using an endoscopic approach for retrieval [10-12]. Chung et al. reported a case of endoscopically guided removal of a stent through a pancreatic duodenal fistula tract [13]. Randall J et al. reported a stent had migrated into the retroperitoneum and then been retrieved laparoscopically [14].

The endoscopic retrieval approach is technically challenging, requires the use of multiple endoscopic accessories, and is largely dependent on the skill of the endoscopists. In practice, endoscopic expertise is scarce in many centers, and if retrieval is unsuccessful, surgery will be carried out. In our case, the procedure was performed percutaneously under imaging guidance using a simple technique with available devices. The percutaneous approach provides a valuable option for stent removal upon migration; furthermore, the access can be utilized for percutaneous external drainage and would thus prevent surgery. However, interventionists should exercise caution in terms of being aware of the presence of an overlying bowel when attempting draining of a large pseudocyst, as the bowel loops may be compressed and invisible on ultrasound owing to the larger pseudocysts.

Differential Diagnosis:

Differential diagnosis of cystic pancreatic masses includes pancreatic pseudocyst, mucinous cystic neoplasm, pancreatic serous cystadenoma, and pancreatic intraductal papillary mucinous tumor. Although the majority of cystic lesions of the pancreas are postinflammatory pseudocysts, it is important to differentiate them from other pancreatic cystic masses. By combining imaging features with clinical history, a reasonable differential diagnosis can be offered. Unless patient has a clear history of pancreatitis, all cystic masses should be considered potential neoplasms. However, small lesions in elderly or ill patients may require no additional evaluation or treatment [15-16].

Pancreatic pseudocyst is the most common etiology for a symptomatic cystic mass, usually involving a known history of pancreatitis or alcoholism with imaging stigmata of chronic pancreatitis (pancreatic calcifications, ductal beading) [15-16]. Contrast-enhanced CT would show encapsulated homogeneous cysts with near-water density, sometimes with high attenuation, which indicates blood, and gas bubbles, which indicate infection. CT may also show enhancement of the fibrous capsule, peripheral calcification, and occasionally, internal debris. MRI typically demonstrates non-enhanced fluid signal content with layering or dependent debris and mild early capsule enhancement, which progressively becomes more intense.

Mucinous cystic neoplasm is the most common cystic neoplasm, and usually occurs in women aged 40–50 years ("mother lesion") in the body-tail segment of the pancreas. Mucinous cystic neoplasms are composed of relatively large cysts (>2 cm) and may have peripheral calcification. Serous cystadenomas occur in women aged 50–70 years ("grandmother lesion") and are commonly located in the pancreatic head. Serous cystadenomas are composed of

innumerable cysts (<2 cm in diameter) that demonstrate a honeycomb appearance and with occasional calcification in the center of the mass. Unilocular variants with thin walls also exist; this form is difficult to distinguish from mucinous cystic neoplasms [15-16]. Intraductal papillary mucinous neoplasms are classified as main duct, branch duct (side-branch), or mixed intraductal papillary mucinous tumors. Cystic lesions are contiguous with dilated main pancreatic ducts, sometimes indistinguishable from pseudocysts. The main duct type causes gross dilatation of the main pancreatic duct with/without cystic spaces. The side branch type usually occurs in the pancreatic head and is uncinated, resembling a cluster of grapes or small tubular cysts [15-16].

TEACHING POINT

Complete migration of a cystogastric stent into the pancreatic pseudocyst is a potentially life-threatening condition. The percutaneous approach, for removal, is simple and should be considered in the management of unsuccessful attempts or a lack of endoscopic retrieval options, which is technically challenging and requires experienced gastroenterologists. Furthermore, this approach could prevent surgery.

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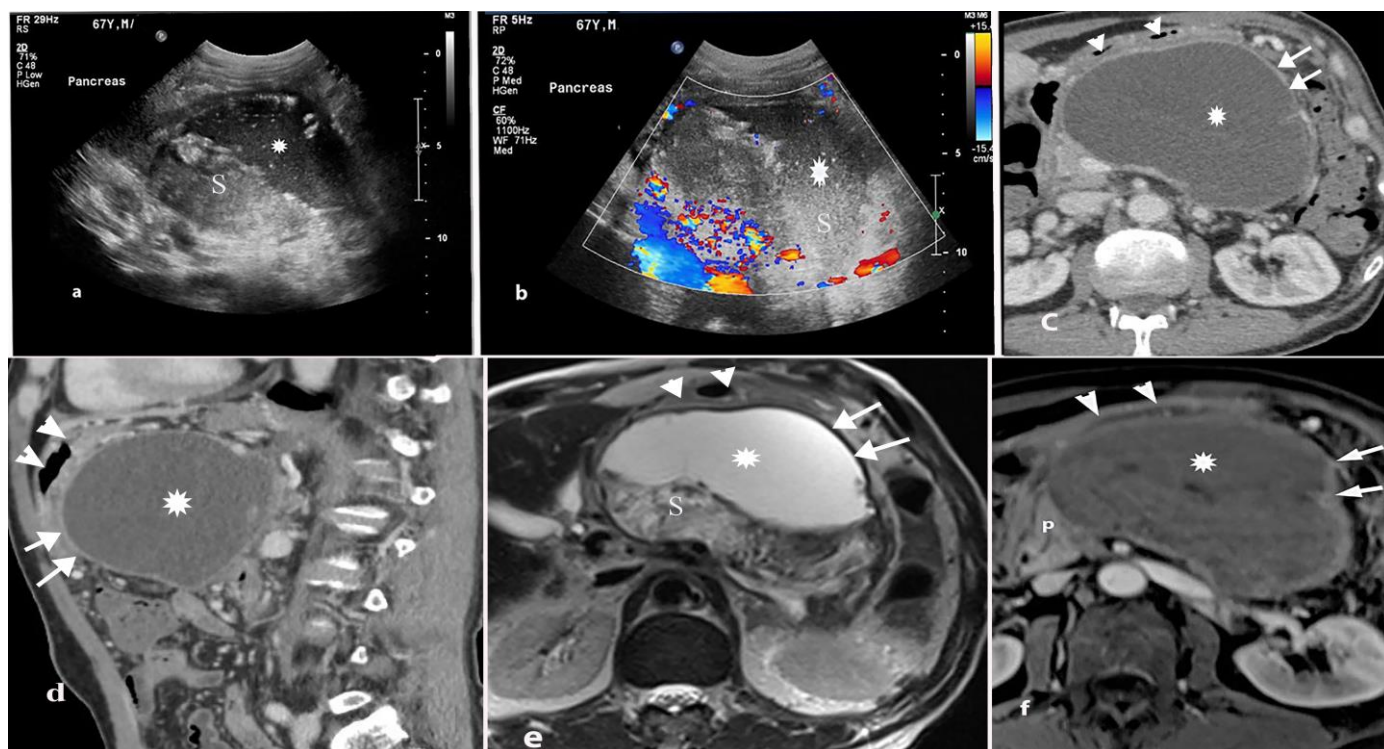
FIGURES

Figure 1: Imaging findings prior to stent placement for the pancreatic pseudocyst drainage in a 68-year-old man with stent migration into the pancreatic pseudocyst.

(a) Sagittal grey-scale transabdominal ultrasound image showing a well-circumscribed, smooth-walled, unilocular mass (star) with internal echoes, fluid-sedimentation level, and posterior acoustic enhancement at the upper abdomen. (b) Color Doppler image showing no vascularity (Curvilinear 5 MHz probe, Philips). (c) Enhanced axial and (d) sagittal reformat venous phase computed tomography images of the abdomen showing a 10 cm × 14 cm well-circumscribed, homogenous, hypodense lesion with fluid density (star) and a thin enhanced capsule (arrow) that displaced the stomach anteriorly (arrowhead; GE light speed VCT kV = 120; mA = 189; slice thickness = 2.5 mm; contrast agent: Iobitridol (Xentix-300 mg I/mL) 100 mL). (e) Axial T2 magnetic resonace imaging using the half-Fourier single shot turbo spin echo sequence showing a large retrogastric smooth well-defined low-signal intensity wall (arrow) and high-signal fluid intensity pseudocyst (star) that displaced the stomach anteriorly (arrowheads). (f) Axial T1 postcontrast magnetic resonance image showing no internal enhancement but mild enhancement of the wall (Siemens 1.5T T1 weighted VIBE fat saturated axial sequence, TR 5, TE 2, venous post contrast 12 s contrast: OmniScan). S: sedimentation; VCT = Volume computed tomography

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Figure 2: Imaging findings after stent placement in a 68-year-old man with stent migration into the pancreatic pseudocyst

(a): Enhanced axial venous phase, (b) sagittal, and (c) coronal reformat abdominal computed tomography images showing the stent completely migrated (arrow) into the pancreatic pseudocyst. (Contrast inside the pancreatic pseudocyst was administered during endoscopy intervention; GE light speed VCT kV = 120; mA = 152; slice thickness = 5 mm; contrast: Iobitridol (Xentix-300 mg I/mL) 100 mL).

(d) Non-enhanced axial, (e) sagittal, and (f) coronal reformat computed tomography images of the abdomen with oral contrast obtained a few days after endoscopy during septicemia showing the stent migrated into the pancreatic pseudocyst with multiple air bubbles, likely indicating infected pseudocyst collection (GE light speed VCT kV = 120; mA = 152; slice thickness = 5 mm; widows/ level 342/56).
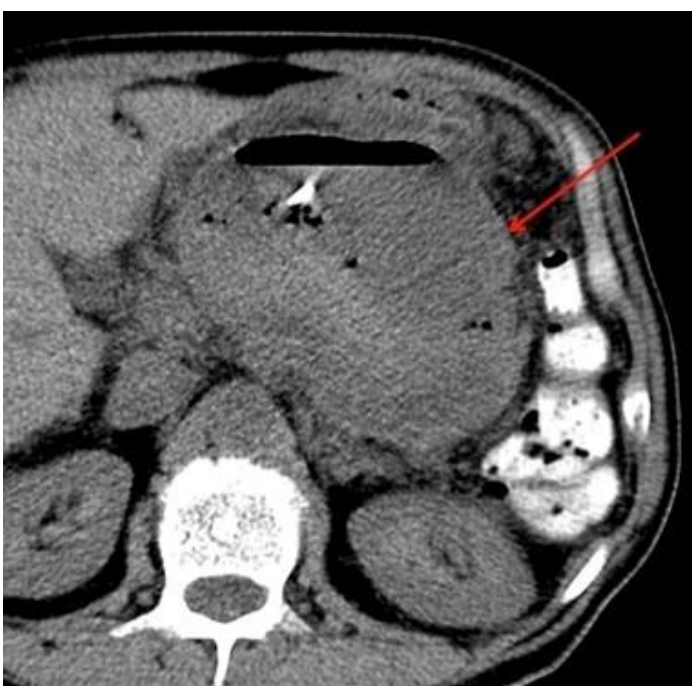
VCT = Volume computed tomography

Figure 3: Computed tomography imaging for stent retrieval in a 68-year-old man with stent migration into the pancreatic pseudocyst

Nonenhanced axial abdominal computed tomography image showing the trajectory pathway used for stent retrieval (red arrow).
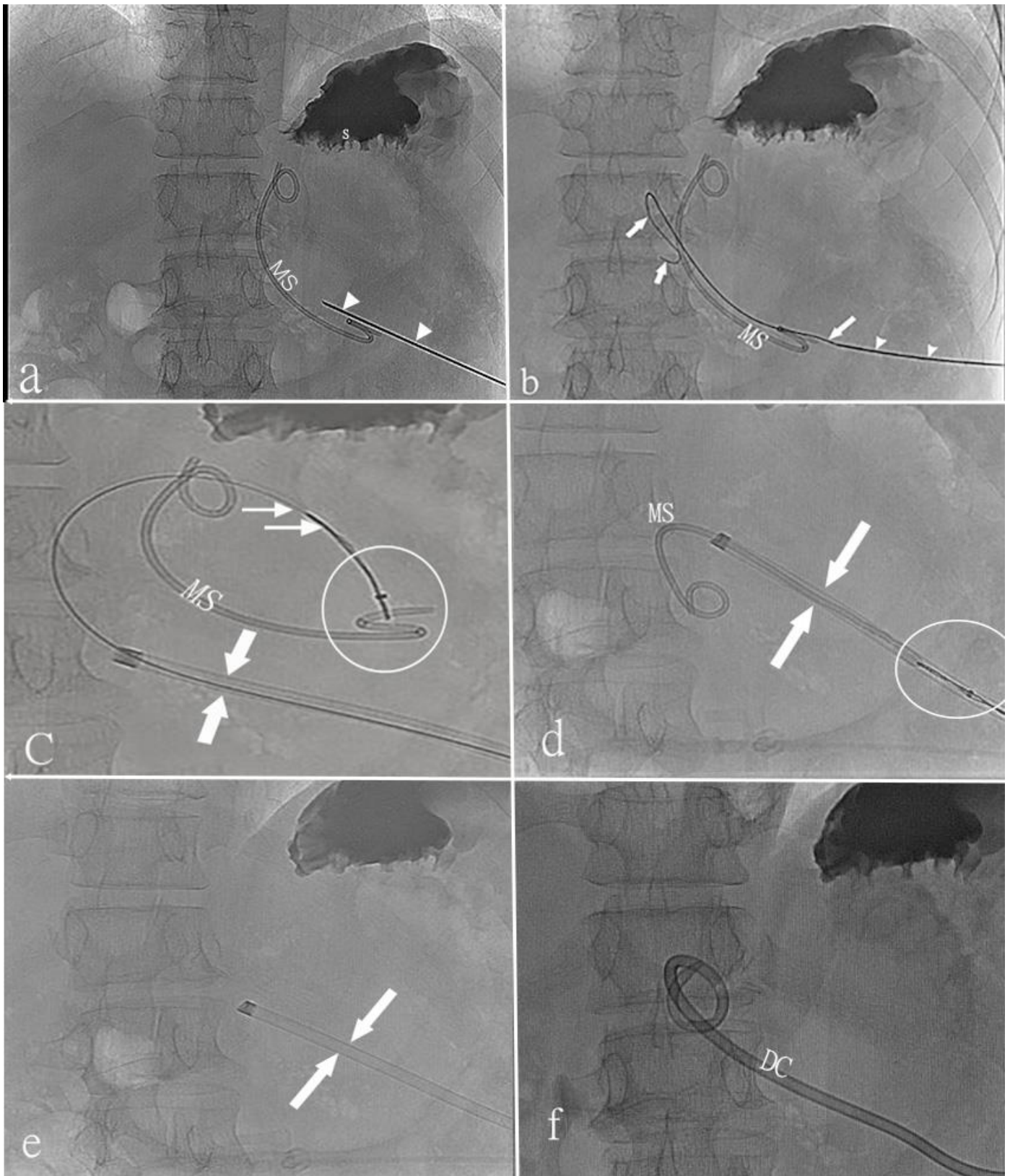
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Figure 4: Procedure for stent retrieval in a 68-year-old man with stent migration into the pancreatic pseudocyst
(a): Initial access into the pseudocyst was established using an 18-gauge × 15 cm needle (arrowheads); (b): A 0.035" J-wire (arrows) was advanced through the needle (arrowheads); (c,d,f) a 12 French × 23 cm introducer sheath (wide arrows) was placed through which a 15-mm snare was advanced into the pseudocyst (small arrows) and successfully caught one end of the MS (white cursor) that was pulled inside the introducer sheath (wide arrows). (f): A new 12 French drainage tube was left inside. Note the presence of contrast to outline the stomach was administered prior to the procedure. Technique: Spot fluoroscopic images were obtained after administering 50 mL orally Iobitridol (Xentix-300 mg I/mL) in the supine position. MS: migrated stent. S: stomach. DC: pigtail drainage catheter.

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Figure 5 (left): Computed tomography findings after stent retrieval in a 68-year-old man with stent migration into the pancreatic pseudocyst

Enhanced axial venous phase abdominal computed tomography image showing reduced pseudocyst size 1 week after stent retrieval.

Etiology	Migration of the stent used for drainage into the pancreatic pseudocyst.
Incidence	Relatively rare.
Age and Sex Predilection	None described.
Risk Factors	No adequate data in the literature regarding the causes of migration.
Complications	Poor drainage, which leads to secondary complications such as infection, perforation, and obstruction, and becomes a foreign object in the body.
Treatment	Retrieval or re-stenting.
Imaging Findings	• *Radiography:* occasional residual contrast within the pseudocyst lumen; after endoscopy, the contrast may outline the cavity and could indicate the location of the migrated stent. • *Ultrasound:* the stent appears as hyperechoic parallel lines separated by a thin anechoic space with distal shadowing and pigtail loops on the end inside the cavity. • *Computed tomography:* the gold standard, would demonstrate the stent inside the pseudocyst; however, the most important observation is to make sure that both ends of the stent are identified and no concurrent complications are present.
Prevention	During deployment, care to avoid placement errors at the point of releasing the stent. Using a pigtail stent.

Table 1: Summary table of stent migration into a pancreatic pseudocyst.

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Disorder	Ultrasound	CT	MRI	Clinical
Pancreatic Pseudocyst	• Usually solitary, unilocular, peripancreatic cystic mass. • Fluid-debris level and internal echoes due to autolysis (blood clot or cellular debris)	• Encapsulated, homogeneous, hypodense lesion with near-water density ("mature "pseudocyst). • High attenuation indicates blood and gas bubbles indicate infection. • May show enhancement of fibrous capsule.	• T1WI: Hypointense; possibly hyperintense (With hemorrhage). • T2WI: Hyperintense (fluid); mixed intensity (fluid + debris). • T1WI C+: May show enhancement of fibrous capsule.	• Usually known history of pancreatitis or alcoholism ± imaging stigmata of chronic pancreatitis (pancreatic calcifications, ductal beading).
Pancreatic Serous Cystadenoma	• Inhomogeneous hypoechoic mass with lobulated contour.	• Unilocular pattern. Single or few cysts. • Honeycomb or sponge pattern (<2 cm).	• Cysts are of fluid signal intensity and hypointense on T2 imaging with fibrous components/central scar. • No communication with the main pancreatic duct.	• Women 50–70 years ("grandmother lesion")
Mucinous Cystic Neoplasm	• Mass with smooth contours; usually hypoechoic cysts exceeding 2 cm in diameter.	• Unilocular or multilocular encapsulated cyst in pancreatic body/tail with frequent internal septations of simple fluid attenuation.	• Simple fluid signal may be slightly less hyperintense T2 imaging owing to mucin content. • No communication with the main pancreatic duct.	• More common in women 40–50 years old ("mother lesion")
Intraductal Papillary Mucinous Neoplasm	• Dilated ducts, which appear hypoechoic. • Mural nodules and mucin globules may appear hyperechoic.	*Side branch:* • Grape-like clusters or tubes and arcs, or tubular in pancreatic head/uncinated. *Main duct:* • Markedly dilated, tortuous MPD without distal obstructing mass and with "bulging" ampulla. *Mixed:* • Shares imaging features of the main duct and side branch in IPMN.	• Communication between cysts and pancreatic duct is key to diagnosis. • Presence of dilated adjacent main pancreatic duct.	• Majority of patients are asymptomatic (incidental finding).

Table 2: Top differential diagnoses for cystic pancreatic mass.

ABBREVIATIONS

CT: Computed Tomography
EUS: Endosonographic
IPMN: Intraductal papillary mucinous tumor
MPD: Main pancreatic duct
MRI: Magnetic Resonance Imaging

KEYWORDS

Migrated Stent; Endoscopic ultrasound; Snaring; Removal; Pancreas; Pseudocyst; Drain; Percutaneous

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