Late Small Bowel Perforation from a Migrated Double Plastic Biliary Stent: A Case Report and a Review of Literature of 85 Cases from 2000 to 2022

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Running head: Late small bowel perforation from migrated double plastic biliary stent

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Abstract

Endo-biliary stent displacement is rare but can cause intestinal perforation. An 85-year-old woman with a history of ERCPs and biliary stents experienced stomach pain and vomiting. She was diagnosed with

small bowel perforation from migrated stents and underwent emergency laparotomy, bowel resection, and tension-free stapled anastomosis.

Keywords : Biliary stent; Biliary stent migration; Small bowel perforation; Endoscopic retrograde cholangiopancreatography

Key Clinical Message

This case highlights the importance of considering stent migration as a possible cause of intestinal perforation and the need for prompt surgical intervention.

Informed Consent

A written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy.

Introduction

internal biliary drainage, endoscopic biliary stents are frequently utilized during endoscopic retrograde cholangiopancreatography (ERCP). It has been used for benign or malignant illnesses and temporary or long-term biliary system decompression. Based on their material, biliary stents can be classified as either plastic or metallic, with the former being less expensive and simpler to remove or replace[1]. Stent occlusion from clogging, which may lead to cholecystitis or cholangitis, pancreatitis from duct manipulation, bleeding, stent fracture, and stent migration are complications of biliary stent placement[2,3]. There are sporadic cases of endo-biliary stent displacement and sliding from the common bile duct (CBD)[3]. Although it has a low incidence of less than 1%, intestinal perforation is a serious potential consequence of stent migration and can happen in any section of the small or large bowel[4]. A tiny percentage of migrating stents may cause perforation and peritonitis, necessitating an emergency laparotomy, even if most pass silently in the stool or can be removed using endoscopy and fluoroscopy[5]. This article describes a case of an 85-year-old patient who displayed acute abdominal signs and symptoms. A distal small intestinal perforation caused by stent penetration was discovered following an emergency laparotomy. A side-to-side tension-free stapled anastomosis was used to repair the damaged colon.

Case Presentation

Chief complaint:

Diffuse abdominal pain

History of present illness:

The emergency room at King Abdullah University Hospital had a visit from an 85-year-old non-smoking female patient who is free of any medical conditions and complaining of abrupt diffuse stomach pain and several episodes of non-bloody and non-bilious vomiting for three days.

She described the discomfort as being in the lower abdomen, cramping continuously, and not radiating. It was linked to abdominal bloating. The patient didn't report having a fever, jaundice, itching, or a change in the color of their urine or feces.

History of past illness:

She has a history of three admissions as a case of obstructive jaundice for which ERCP was performed four times, including one unsuccessful and three successful ERCPs with the placement of two plastic biliary stents in the last seven months, as the following:

On August 4, 2020, she first showed up with hyperbilirubinemia and obstructive jaundice symptoms. After two days, an ultrasound taken at the time revealed a dilated common bile duct measuring 1.2 mm. Her first diagnostic ERCP was unsuccessful since it could not cannulate through the orifice and the precut incision because of respiration and peristalsis that hyoscine butyl bromide, glucagon, or sedatives could not stop.

Still, it did reveal a protruding major duodenal papilla. Three days later, she underwent a second repeated diagnostic ERCP on August 9, and it was discovered that the CBD end had a benign stricture. On August 16, a plastic stent with a 6 cm 10 French (Fr) external (figure 1) and a single internal flap was implanted following a third ERCP. A 4th ERCP was required to diagnose the issue because obstructive jaundice continued and recurred for months after that 3rd ERCP was performed. At that point, choledocholithiasis was discovered and believed to cause jaundice, with a dilated CBD reaching 14 mm and a smooth tapering end. As a result, a new double big tail plastic stent (10 Fr 6cm in length) was inserted (figure 2). She also had a C.T. scan of her abdomen and pelvis, which revealed signs of migrating stents. She was hospitalized for an urgent laparotomy in April 2021.

Past and surgical history:

She had an open cholecystectomy 40 years ago, an open hysterectomy because of an unusual vaginal hemorrhage 35 years ago, and adhesiolysis because of a tiny intestine obstruction 30 years ago. These previous surgical procedures were substantial.

Examination:

Upon assessment, she displays a low-grade temperature, slight tachycardia, normal oxygen saturation, and normal pressure. There were three stars: a Pfannenstiel scar, a midline laparotomy scar, and a right subcostal scar. In addition, her abdomen was swollen, painful, tympanic to percussion, showing indications of peritonitis, and she could not urinate. A little hernia of the umbilicus that contains omental fat was also observed.

Laboratory examinations:

From laboratory evaluation, the patient had WBC 12.3 k/μL and total bilirubin 10.3 mg/dL.

Imaging examinations:

Computed tomography (C.T.) scan of the abdomen and pelvis with intravenous contrast provided multiple serial axial, reformatted sagittal, and coronal images (figure 3). Evidence of at least two migrated biliary stents was found in the proximal and mid-ileal loops, with one of them protruding into the intraperitoneal cavity and causing a localized perforation with small bowel ileus and peritonitis along with a few small foci of pneumoperitoneum, thickening of the circumferential wall surrounding it and dilatation of the adjacent bowel loop, fat stranding, and high attenuation interloop free fluid.

Small amounts of free fluid and generalized mesenteric fat stranding were present in the pelvis and abdomen, consistent with peritonitis. Moreover, a simple diverticulum was seen in the sigmoid colon, and Phaleboliths were visible in the pelvis.

There was evidence of pneumobilia, intra- and extrahepatic biliary dilatation, and left-sidedness of the hepatic ducts and CBD. In addition, the non-visualization of the gallbladder is consistent with the patient's history of cholecystectomy. The liver, pancreas, and adrenal glands, which had normal attenuation, size, and enhancement, showed no obvious localized pathology. Bilaterally, there were a few small renal cortical cysts; the largest one was in the left kidney's lower pole and measured about 0.8 x 1 cm. Other than that, there was no evidence of hydronephrosis, and both kidneys seemed to improve after intravenous contrast. Additionally, cystocele (the prolapse of the bladder into the vagina) and microcalcifications in the urinary bladder wall were seen. The patient's surgical history of bilateral salpingo-oophorectomy and hysterectomy was compatible with the absence of the uterus and both ovaries.

There are prominent lymph nodes in the gastrohepatic, porta hepatic, paraaortic, paracaval, common iliac, external and internal iliac, and mesenteric regions. The largest lymph node measures about 6mm in its short axis in the right common iliac region. Additionally, atherosclerotic changes can be seen in the abdominal aorta and its major branches.

BMD measurements show a decline in the investigated bone's bone density. Hemangiomas and multilayer anterior/posterior osteophyte complexes among the degenerative changes in the examined spine.

Regarding chest imaging, the region of the lung bases that could be seen had bi-basal atelectatic changes, and both lung bases exhibit a mosaic attenuation pattern. In addition, small pleural-based lung nodules were present in both lungs; the largest is atelectatic and measures about 3 millimeters. Finally, a sizable sliding hiatal hernia was compressing the IVC and heart.

Treatment:

A doubly migrated biliary stent was the cause of the final diagnosis, which was distal small bowel perforation. The surgical team decided on an emergency laparotomy after consulting with the patient, and it was carried out to reveal extensive adhesion between the small bowel and abdominal wall, perforation of the distal small bowel brought on by the penetration of the plastic stent, along with hypertrophic changes and necrotic tissue at the site of perforation. The proximal and mid-ileal loops' stents were both removed. Due to the severe inflammation, it was decided to remove the portion of the bowel with the perforation. As a result, the affected bowel was resected using a tension-free stapled anastomosis from side to side. (figure 4)

Outcome & Follow-Up

Following surgery, everything went smoothly, and nothing complicated happened. The patient was treated in the I.C.U. for 24 hours before being moved to the floor and sent home on the 6^{th}postoperative day.

Discussion

A significant scientific development of contemporary medicine is the endoscopic implantation of stents in the common bile duct or pancreatic duct, a regularly used technique to treat benign or malignant biliary or pancreatic tract stenosis or obstruction. It was first introduced in 1980 as a replacement to surgical choledochoduodenostomy for high-risk or inoperable cases to relieve the biliary system[6]. Since the initial description of endoscopic biliary stent implantation, the entire procedure and the available stents have been greatly improved. This technique's popularity is steadily rising because it is a less invasive treatment than surgery. However, serious problems can occur during or after endoscopic treatments like upper endoscopy and biliary tract cannulation, despite their obvious benefits and the major advancements in this field [3]. Applying a biliary stent can create issues, including stent occlusion from clogging, which may lead to cholecystitis or cholangitis, pancreatitis from duct manipulation, bleeding, stent fracture, and stent migration. Since various institutes have varying levels of experience, varied equipment is accessible, and different etiologic grounds for the intervention, the overall rate of biliary stent problems differs among them[7].

According to Arhan et al. 2, the migration rate was 8.58% (proximal 4.58% and distal 4.00%). In benign biliary strictures, migration occurred more frequently than in malignant ones (13.7% versus 5.3%). When compared to patients with numerous stents (2.7%), the rate of stent migration in B.B.S. was higher in cases with one (19.3%) and two stents (20.9%). When compared to instances with one stent (3.0%) and those with multiple stents (0%) in M.B.S., migration happened more frequently (10.9%) in cases with two stents. Long stents migrated more commonly distally (73%) and short stents more frequently proximally (77%) in the B.B.S. In the B.B.S., migration was more frequently proximal (73.3%) than distal (76.9%) in cases of proximal stricture and distal (73.3%) in cases of distal stricture. The bigger diameter expansion of the biliary system concerning benign reasons and the quick reduction in inflammation following the stent explain the higher frequency of stent migration in benign disorders. However, it is stated that in malignant illnesses, the migration rate is low due to stent fixation brought on by tumor growth [4,8,9]. Malignant strictures and wide, short stents have been linked to proximal migration of the stent, whereas benign strictures and ampullary stenosis have been linked to distal migration of the stent[4]. Instead of using a single big stent, some writers advise using numerous smaller stents to limit the likelihood of stent migration[10]. Regular sphincterotomy during biliary stenting is not advised because the valves and sphincter of Oddi tonus may help to avoid distal migration. Proximal and distal migration of biliary stents is an additional classification. Distally migrating stents often traverse the intestine without any problems[1,11].

In our case, she underwent open cholecystectomy 40 years before, open hysterectomy due to an uncommon vaginal hemorrhage 35 years prior, and adhesion-lysis due to a small intestine obstruction 30 years prior. The bowel was less mobile due to the patient's condition. Therefore, there was a greater possibility that the stent would be damaged and fail to pass. Most institutions have policies to guarantee that all patients with stents are called back for stent removal[7].

The patient had conducted four ERCP, three of which were conducted in 2020 and the last performed in 2021. The first one showed a major bulging papilla; however, due to failure to cannulate the ampulla through the orifice and precut incision due to breathing and peristalsis, which could not be abolished with both hyoscine butyl bromide and glucagon and sedatives. Accordingly, an ERCP was conducted 3 days later. The new one showed a recent scar of the last needle incision in the major papilla, markedly dilated CBD, and dilated CHD and Intrahepatic Ducts. Accordingly, cannulation was performed through the orifice, a large sphincterotomy incision was done, and the above cholangiogram was obtained. Sweeping with balloon 13mm and then 16 mm was done with rapid clearance of the biliary tract, and no stones or sludge was seen. A week later, ERCP was conducted in which cannulation was performed through the previous sphincterotomy with balloon and occlusion cholangiogram performed, which showed the previous finding, sweeping with the balloon 13 and then 16 mm performed with the passage of clear bile, no stones, or sludge, as obstruction orifice is suspected at the orifice, a stent 6 cm by 10 Fr inserted with free bile flow noted. A year later, an ERCP was conducted, which showed dilation reaching about 14 mm with smooth tapering down regarding the major papilla. Additionally, cannulation was performed with a balloon and wire, and the occlusion cholangiogram showed no stents and the above feature in the biliary tract. Furthermore, sweeping was conducted with the removal of sludge; however, a stone was felt to be present inferiorly; accordingly, an extension of the orifice was performed with sphincterotomy, which resulted in the removal of stones around 8 mm with a large number of sludges, a double pigtail plastic stent 6 cm in length with 10 Fr inserted with free bile drainage.

A major complication from a migrated stent is intestinal perforation, which can happen anywhere in the small or large intestine. There are very few incidences of small bowel perforation, and most published cases of bowel perforation from migrating biliary stents involve either duodenal or large intestinal perforation. Most individuals with perforation will exhibit widespread peritonitis and septic symptoms at presentation 7. The level of infection in our case was high, and there was a sign of peritonitis.

There is a growing body of knowledge on this subject, and many therapeutic modalities have been suggested. A case series of stent migration requiring surgical intervention was reported by Diller et al. [12] in 2003. The stents ranged in size from 7 to 14 Fr, with lengths between 7 and 12 cm. Three patients received stents: two received polyurethane, one had a Teflon stent, and the other received metallic stents. Four patients had an acute pancreatitis diagnosis, and the fifth patient underwent liver transplantation and was given a preventive stent. From surgical respiratory failure, one of those five patients passed away. In this study, 987 individuals had a stent migration rate of 3.7%. In their literature analysis with 12 instances total, including 7 cases from 2000, Namdar et al. 1 described a rectal perforation caused by a migrated biliary stent. According to several studies, downstream migration occurs more frequently in benign biliary illness than in malignant biliary disease; this may be because the stenosis resolves when the inflammation subsides[1]. In addition, they advise that regardless of the patient's clinical condition, any biliary stent that has shifted should be removed right away[1]. Most of the early increasing corpus of research on endoscopic procedures for treating bowel perforation caused by migrating stents focuses on the duodenal or distal large intestine perforation. Recently, Bureau et al. [13] published a case series of six patients with over-the-scope clip treatment for lateral duodenal wall perforation caused by shifted plastic biliary stent. The endoscopic method could have been more practical since the bowel hole was in the middle of the jejunal loop. Additionally, Axial images of the abdomen and pelvic X-ray were conducted with oral and intravenous contrast, which showed at least three migrated stents seen in the proximal and mild ileal loops, one of them seen in the left lower quadrant protruding into the intraperitoneal cavity-causing localized perforation associated with bowel loop, fat, stranding and high attenuation interloop free fluid, finding concerning for biliary stent migration causing localized small bowel perforation with small bowel ileus and peritonitis.

Which made us worry that an endoscopic mucosal repair might not be durable. As a result, we went straight to surgery.

In a systematic analysis of the literature from 2000 to October 2022, we identified 85 cases of intestinal perforation caused by migrating biliary stents (Table (Table1).1). The following search algorithm was used to find the appropriate articles in the MEDLINE bibliographical database (latest search: October 3, 2022) , it was adapted from Konstantinos A Zorbas et al[7] algorithm used in their recently published paper and a continuation of their work to update the literature : ((”intestinal perforation”[MeSH Terms] OR (”intestinal”[All Fields] AND ”perforation”[All Fields]) OR ”intestinal perforation”[All Fields] OR (”bowel”[All Fields] AND ”perforation”[All Fields]) OR ”bowel perforation”[All Fields]) AND (”migrate”[All Fields] OR ”migrated”[All Fields] OR ”migrates”[All Fields] OR ”migrating”[All Fields] OR ”migration”[All Fields] OR ”migrational”[All Fields] OR ”migrations”[All Fields] OR ”migrator”[All Fields] OR ”migrators”[All Fields]) AND ”biliary”[All Fields] AND (”stent s”[All Fields] OR ”stentings”[All Fields] OR ”stents”[MeSH Terms] OR ”stents”[All Fields] OR ”stent”[All Fields] OR ”stented”[All Fields] OR ”stenting”[All Fields])) AND (2000:2022[pdat])[3]. The references of relevant articles were further searched, and publications connected to our topic were included. E-Videos, E-pictures, and manuscripts in languages other than English were not included. Manuscripts with full text readily available online were used. Additionally, cases were disregarded if the whole text was not accessible online.

Table1.

No	Year	Age, yr	Gender	Type of stent1	Site of perforation	Treatment	Country	Mortality	Stent length	Stent size
1	2000	81	M	P	SB	ST	Norway	Y	6.5	10 Fr
2	2000	86	M	P	LB	ST	Norway	N	5	7 Fr
3	2000	74	M	P	DU	ET	Spain	N	15	10 Fr
4	2001	58	M	P	DU	ET	Italy	N	12	10 Fr
5	2001	43	F	P	DU	ET	India	N	NA	10 Fr
6	2001	N .A.	N.A.	P	SB	ST	United States	N	12	11.5 Fr
7	2001	88	F	P	DU	ST	Germany	N	10	7 Fr
9	2001	31	F	NA	BD	ST	Denmark	N	NA	NA
10	2001	47	M	P	LB	ST	Spain	N	10	10 Fr
11	2002	72	F	P	SB	ST	Italy	N	NA	12 Fr
12	2002	N .A.	N.A.	P	SB	ST	United States	N	7	8.5 Fr
13	2003	85	F	P	LB	ST	Germany	N	NA	NA
14	2003	86	M	P	DU	ET	Italy	Y	15	10 Fr
15	2003	27	F	P	SB	ST	Germany	N	12	12 Fr
16	2003	58	M	P	LB	ET-ST	Germany	N	10	7 Fr
17	2003	60	F	P	SB	ST	Germany	N	12	14 Fr
18	2003	64	M	M	LB	ST	Germany	Y	7	10 Fr
19	2003	65	M	M	NA	ST	Germany	N	7	10 Fr
20	2003	62	F	P	LB	ST	Argentina	N	NA	8 Fr
21	2003	62	F	P	SB	ST	Argentina	N	NA	5.5/10 Fr
22	2003	80	F	P	LB	ST	Australia	N	10	10 Fr

No	Year	Age, yr	Gender	Type of stent1	Site of per-fora-tion	Treatment	Country	Mortality	Stent length	Stent size
23	2004	65	F	P	LB	ST	United States	N	NA	NA
24	2005	69	M	M	DU	ST	United States	N	NA	NA
25	2006	55	M	P	DU	ET	Greece	Y	NA	NA
26	2006	74	M	P	DU	ST	India	NA	10	7 Fr
27	2006	54	F	P	SB	ST	United Kingdom	N	7	10 Fr
28	2006	85	M	P	DU	ST	Italy	N	10	9 Fr
29	2007	65	F	P	LB	ST	Germany	N	10	12 Fr
30	2008	75	M	P	DU	ST	Taiwan	N	NA	NA
31	2008	52	F	P	DU	ST	Turkey	N	10	8.5 Fr
32	2008	67	M	P	DU	ST	Australia	Y	NA	5/10 Fr
33	2008	43	M	P	DU	ET	Belgium	N	NA	NA
34	2008	71	F	P	SB	ST	Belgium	N	NA	NA
35	2009	77	M	P	LB	PI	United States	N	12	10 Fr
36	2009	76	F	P	SB	PI	United States	N	NA	10 Fr
37	2009	59	F	P	SB	ST	Turkey	N	7	11 Fr
38	2011	58	M	P	DU	PI	United Kingdom	N	10	8.5 Fr
39	2011	65	F	P	LB	ST	Germany	N	10	10 F Fr
40	2011	73	N.A.	P	LB	ST	France	N	5	10 Fr
41	2011	75	M	P	SB	ST	United Kingdom	N	NA	NA
42	2011	70	M	P	DU	ET	China	N	NA	8.5 Fr
43	2011	82	F	P	LB	ET	United Kingdom	N	7	7 Fr
44	2012	55	M	P	DU	ET	South Korea	N	7/5	5 Fr
45	2012	27	F	P	DU	ST	United Kingdom	N	12	7 Fr
46	2012	87	F	P	DU	ET	United States	N	15	8.5 Fr
47	2012	73	M	P	LB	ET	Spain	N	12	10 Fr
48	2012	50	N.A.	P	LB	ET	Belgium	N	NA	NA
49	2013	51	M	P	DU	ST	S. Arabia	N	10	10 Fr
50	2013	66	M	P	LB	ET	United Kingdom	N	NA	NA
51	2013	50	M	M	SB	ST	India	N	NA	NA
52	2014	67	M	P	DU	ST	United States	Y	12	10 Fr

No	Year	Age, yr	Gender	Type of stent1	Site of per-fora-tion	Treatment	Country	Mortality	Stent length	Stent size
53	2014	73	M	P	LB	ST	Australia	N	5	10 Fr
54	2014	66	F	P	DU	ET	The Netherlands	N	15	NA
55	2015	48	M	P	DU	ET	United States	N	NA	NA
56	2015	N.A.	F	P	LB	ST	Italy	N	12	12 Fr
57	2015	N.A.	F	P	LB	ET	Italy	N	12	12 Fr
58	2015	52	F	P	SB	ST	Turkey	N	NA	NA
59	2015	N.A.	M	P	LB	ST	United Kingdom	Y	NA	NA
60	2016	85	F	P	S .B.	N.A.	Turkey	Y	NA	NA
61	2017	75	F	P	LB	ST	Greece	N	NA	NA
62	2018	57	M	P	DU	ET	United States	N	15	8.5 Fr
63	2018	79	F	P	DU	ET	United States	N	12+15	7+10 Fr
64	2018	87	M	P	DU	ST	Greece	N	15	10Fr
65	2018	20	M	P	SB	ST	Turkey	N	NA	NA
66	2019	71	M	P	DU	ET	France	N	12	8.5 Fr
67	2019	50	M	P	DU	ET	South Korea	N	10	10F
68	2019	78	M	P	DU	ET	South Korea	N	10	7 Fr
69	2019	72	M	P	DU	ET	South Korea	N	12	10 Fr
70	2019	84	F	P	DU	ET	South Korea	N	12	10 Fr
71	2019	73	F	P	DU	ET	South Korea	N	15	10 Fr
72	2019	63	F	P	DU	ST	Jordan	N	10	10 Fr
73	2019	65	F	P	LB	ST	Portugal	N	5	10 Fr
74	2019	79	F	P	LB	ST	United States	N	10	7+10 Fr
75	2020	90	F	P	SB	ST	Australia	N	9	10 Fr
76	2020	84	F	P	SB	ST	Australia	N	7	10 Fr
77	2020	72	M	P	DU	ET	China	N	9	8.5 Fr
78	2020	84	M	P	DU	ET	China	N	12	7 Fr
79	2020	52	M	P	DU	ET	China	N	9	8.5 Fr
80	2021	80	F	P	J .U.	S.T.	Australia	N	NA	10 Fr
81	2021	74	M	P	LB	ST	Republic of Korea	N	7	10 Fr
82	2018	66	F	P	AP	ST	Finland	N	5	10 Fr
83	2020	54	F	P	IL + JU	ST	United States	N	7 + 7	7 Fr + 8.5 Fr

No	Year	Age, yr	Gender	Type of stent1	Site of perforation	Treatment	Country	Mortality	Stent length	Stent size
84	2020	54	M	P	LB	ST	China	N	NA	NA
85	2022	33	M	P	DU	ST	Nepal	N	NA	NA

[1]Time interval from stent placement to complication in days.

P: Plastic; M: Metallic; B.D.: Bile duct; D.U.: Duodenum; S.B.: Small bowel; L.B.: Large bowel; J.U.: Jejunum; I.L.; Ileum; A.P.; Appendix; S.T.: Surgical treatment; E.T.: Endoscopic treatment; P.I.: Percutaneous intervention; NA: Not available.

Our literature review found that 85 patients had similar cases in which the mean age was (65.63 ± 15.63), 50.0% were male patients, 45.2% were female, and the rest were missing data. 94.0% of the cases were plastic stents, whereas the rest were metallic, 4.8%, and one missing data. Regarding the stent length, it had a range of 10 (15-5) cm, and most patients had either a 10 or 12-cm stent (50.8%). On the other hand, regarding the stent size, it had a range of 9 (14-5) Fr. Moreover, Duodenum was the most site to get perforated in the reported cases, 36 (42.4%). Then, large bowels, 25 (29.4%), and small bowels, 18 (21.2%). Surgical treatment was used more in the previous cases 53 (63.1%) than Endoscopic treatment 28 (33.3%). Finally, regarding mortality, only 8 people (9.5%) died, while 75 (89.3%) survived.

Conclusions

The duodenum is the most frequently perforated organ, and plastic stents are the most frequently migrating stent types linked to bowel perforation. The most common type of treatment is surgical stent removal; however, an expanding body of data suggests that endoscopic removal and mucosal healing may also be options in certain situations. Even though the middle of the gut has not yet been discovered, this area might be the subject of further study and development. The endoscopic implantation of biliary stents is a practical and efficient technique for transient biliary system decompression. As mentioned in the literature, we suggest that the main reason for perforation is extensive adhesion. In the case of long-term therapy, stent-migration-related issues that may result in life-threatening situations must be considered as a differential diagnosis. Because there aren't any typical symptoms, making a good diagnosis can sometimes be difficult.

Declarations

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Conflicts of interest

All authors declared no conflict of interest.

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Credit contribution

AMA, OSH, JFS, MAJ, AJN: Writing – original draft and Writing – review & editing

All authors read and approved the final manuscript

Availability of data and material

All data generated or analyzed during this study are included in this published article.

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Figures

Figure 1: Plastic stent 6 cm in length with 10 fr

Figure 2: Double pig tail plastic stent 6 cm in length with 10 fr

Figure 3: Computed tomography scan; a multiple serial axial and reformatted sagittal images showing the findings.

Figure 4: Intra-operative images demonstrating biliary stents perforation.