



Stent migration necessitating surgical intervention

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Received: 22 July 2002/Accepted: 27 March 2003/Online publication: 29 September 2003

Abstract

Background: Internal drainage with transhepatically or endoscopically placed endoprosthesis has been used for many years as a temporary or definitive treatment for biliary tract obstruction. As a late complication, stent migration may occur.

Methods: We reviewed our records to identify patients who were operated on for a migrated endoprosthesis that was causing complications. In all, five such patients were identified.

Results: One patient had a large bowel perforation. Bowel penetration led to an interenteric fistula in one patient and to a biliocolic fistula formation in another. Small bowel distension was found in two patients. Surgical treatment consisted of local excision in three patients, segmental resection in one patient, and a bypass operation in the patient with biliocolic fistula. Postoperatively, four patients recovered without problems, but one patient died during a complicated postoperative course.

Conclusion: If a stent becomes stuck in the gastrointestinal tract and is not accessible for endoscopic removal, early operative revision is mandatory to prevent further complications.

Key words: Endoprosthesis — Stent — Migration — Dislocation — Biliary obstruction — Bowel perforation

Interventional internal drainage of the biliary tract has become an established procedure for both the temporary and definitive treatment of biliary obstruction due to malignant or benign disease. The complication rate is reported to be low, so, if feasible, this technique is preferred over a surgical drainage procedure, especially in critically ill patients [1]. For benign stenosis, plastic stents remain the standard [4, 6, 12]. In malignant dis-

ease, metal stent implantation can be performed for palliative purposes [5].

Dislocation and migration is a late complication after endoscopic or transhepatic biliary endoprosthesis placement; it has been reported to occur in about 7% (0–40%) of cases [1, 4–6]. Proximal migration, the further advancing of the stent into the biliary duct, may lead to biliary obstruction [12]. Its correction is technically challenging, but it can usually be achieved endoscopically by forceps, snare, or balloon and rarely necessitates operative intervention [4, 11, 15, 25]. In the early stages of distal migration, the stent can be replaced endoscopically [12]. Endoscopic treatment is limited to early and endoscopically accessible cases [7, 23]. In most other cases, the stent passes naturally due to the contractions and distensibility of the intestinal wall. Under rare circumstances, excretion does not occur spontaneously [2, 14, 20, 23, 26]. Sometimes the stent gets stuck, leading to further complications. Complications due to distal migration other than the recurrence of biliary obstruction have only been reported anecdotally [2, 14, 19, 20, 22, 26]. Thus, close observation and clinical control, in combination with digestion-inducing means, is the primary therapy [24]. With distal migration, bowel obstruction or perforation may occur, requiring surgical intervention [2, 19].

We report five cases of stent migration, that necessitated surgical intervention.

Materials and methods

We reviewed all patients that had been operated on at our institution from 1995 to 2001 for a dislocated biliary stent. Data collected included patient demographics, diagnosis, indications for stent placement, type of stent, operative procedure, and intraoperative findings. Outcome criteria included survival data, need for further treatment, and postoperative outcome.

Results

In the reported period, we placed 987 plastic endoprosthesis endoscopically; for those patients, we ob-

Table 1. Patient data

	Case 1	Case 2	Case 3	Case 4	Case 5
Material of stent	Polyurethane	Teflon	Polyurethane	Metal mesh	Metal mesh
Size of stent	12-F	7-F	14-F	10-mm	10-mm
Length of stent	12-cm	10-cm	12-cm	7-cm	7-cm
Stenosis at the time of dislocation	No	No	No	Yes	Yes
Interval from implantation to onset of symptoms	9 mo	1 mo	1 mo	6 mo	12 h
Interval from onset of symptoms to therapeutic intervention	10 d	1 wk	2–3 wk	1 wk	? h

served a migration rate of 3.7%. In most of these cases, endoscopic correction or exchange was performed or the stent passed naturally. In the same period, 20 biliary metal stents were placed endoscopically and ~180 were placed percutaneously for malignant biliary obstruction.

Five patients had to be operated on for a migrated biliary stent (see Table 1). The diagnosis was biliary obstruction in four of these cases; in the remaining case, a stent had been implanted prophylactically in a patient undergoing liver transplantation. The causes of the biliary stenosis were acute pancreatitis, stenosis of the papilla, pancreatic head carcinoma, and bile duct carcinoma, respectively. Patient histories are detailed below. The clinical signs that led to the diagnosis of stent dislocation were as follows: local pain that was provoked or that increased on palpation, with no signs of inflammation or bowel obstruction at the onset of symptoms. Conservative approaches for stent removal (high-fiber diet, bowel stimulation, colonoscopy, and enteroscopy) failed.

Case 1

A 27-year-old woman had experienced biliary necrotizing pancreatitis. After 6 weeks, she developed a pancreatic pseudocyst measuring 17 × 20 cm. The cyst was drained externally operatively but caused further biliary obstruction. A 12-F, 12-cm endoprosthesis was inserted endoscopically and had to be changed once due to occlusion. After the patient had recovered from pancreatitis, a cholecystectomy was performed. Endoprosthesis removal was planned for 6 weeks after cholecystectomy, but the patient did not show up. Nine months later, she presented with unspecific abdominal pain in the middle abdomen that increased on palpation. Endoscopic retrograde cholangiopancreatography (ERCP) showed a dissolution of the biliary obstruction but also revealed a dislocated stent. Further examination revealed a partial involution of the pseudocyst, which was now 10 × 13 cm in size. The endoprosthesis had moved into the small bowel. Because her pain was increasing, the patient underwent operation. The cyst was externally drained — its content was clear, with no signs of infection — and the stent was removed by jejunotomy. The jejunal loop was distended and fixed by adhesions. Postoperatively, the patient's recovery was uneventful. The pancreatic drain was removed after 3 weeks.

Case 2

A 58-year-old man underwent a liver transplant for irresectable multifocal hepatocellular carcinoma. Intra-

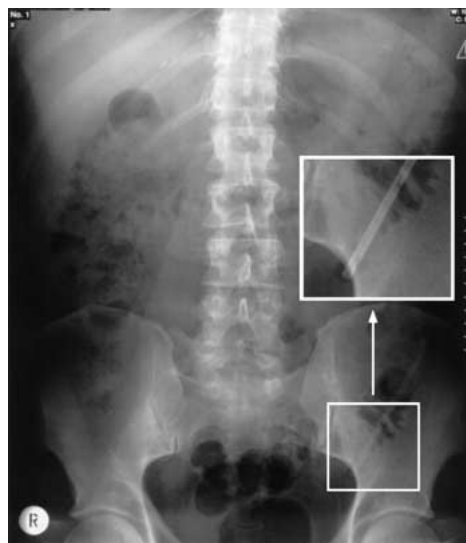


Fig. 1. Case 2. Radiograph showing the stent stuck in the sigmoid colon. The inset shows a magnification of the distal tip of the stent in a diverticulum.

operatively, because the bile duct was rather small and an anastomotic stricture was expected, a 7-F, 10-cm straight endoprosthesis was inserted prophylactically. One month later, stent dislocation was observed, but there were no signs of biliary obstruction. As seen on control radiographs over 1 week, the endoprosthesis had advanced to the sigmoid colon, which was twisted and showing diverticula (Fig. 1). The stent had gotten stuck in a sigmoid diverticulum 50 cm above the dentate line. It was removed by colonoscopy. In the course of events, the patient developed a diverticular perforation and required an emergency laparotomy with sigmoid resection. The patient's recovery was uneventful.

Case 3

A 60-year-old woman with coronary heart disease and a history of two myocardial infarctions had already undergone a sigmoid resection for diverticular disease and a right-sided nephrectomy for pyelonephritis. She then underwent cholecystectomy for biliary pancreatitis. Postoperatively, she was found to have recurrent bile duct stones and received an endoprosthesis (14-F) at another institution because of a papillary stenosis after bile duct clearance of the stones. After 2 months, she presented with recurrent abdominal pain that increased over time and was aggravated by food intake and local pressure. Stent dislocation was diagnosed radiographi-

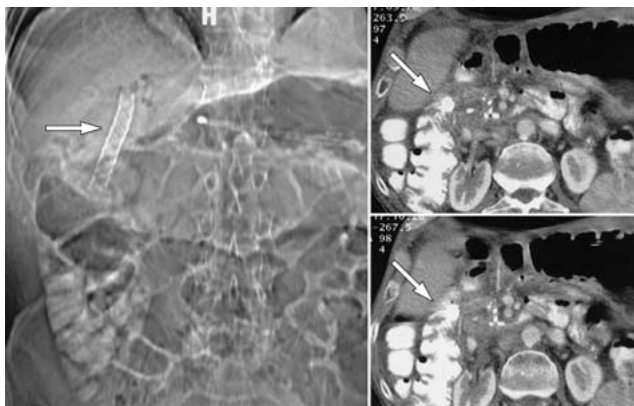


Fig. 2. CT scan of the Wallstent penetrating into the ascending colon. The arrows indicate the stent.

cally. Conservative treatment esp. bowel stimulation led to an increase in abdominal pain. On radiologic controls, it was observed that the stent had become stuck in a jejunal loop. At the time of operation, extensive adhesiolysis was necessary. As a cause of the abdominal pain, we found that the endoprosthesis had penetrated the jejunal wall into the neighboring jejunal loop. Treatment consisted of local excision and closure of the penetrated regions. Postoperatively, the patient recovered without further complications.

Case 4

A 64-year-old man with a diagnosis of irresectable pancreatic head cystadenocarcinoma had had a pancreaticocysto-jejunostomy 5 years previously. He had received irradiation and chemotherapy for the tumor 4 years earlier. He then presented with obstructive jaundice. Endoscopy revealed a tumorous infiltration of the duodenum, so that the papilla of Vater could not be reached with the duodenoscope. Therefore, a Wallstent (Boston Scientific) (10-mm) was placed percutaneously transhepatically. After 6 months, he presented with duodenal obstruction and abdominal pain. The control CT scan showed a large tumor mass with duodenal infiltration (Fig. 2). The stent was dislocated, with its distal tip in the colon, thus creating a biliocolic fistula. Because he presented with a near total stop of food passage and signs of infection, operative revision was undertaken. The stent-carrying colonic segment was excluded from the colonic passage and connected to the jejunal loop of the cystojejunostomy. The remaining colon was reanastomosed and a gastrojejunostomy performed. The postoperative course was complicated due to perfusion disturbance of the colon. This resulted in anastomotic insufficiency, leading to peritonitis, which necessitated operative revision twice. Finally, the patient developed pulmonary insufficiency and died.

Case 5

A 65-year-old man had undergone subtotal gastrectomy with Roux-en-Y-reconstruction for signet ring carcino-

ma 10 years previously. Eight years later, a biliodigestive anastomosis had been performed because of obstructive jaundice. During this operation, no definite diagnosis of the underlying disease could be made. He then presented with recurrent jaundice. Endoscopic retrograde cholangiography (ERC) was not possible due to the preceding gastric resection. CT scan revealed a tumorous lesion in the region of the pancreatic head and liver hilum. Percutaneous puncture of that process did not yield a clear histological diagnosis. An external percutaneous transhepatic cholangiodrainage was established. Later, explorative laparotomy was performed. It showed a diffuse infiltration of the hepatoduodenal ligament with a poorly differentiated cholangiocellular carcinoma and a subhepatic abscess. Due to the local extent of the disease, the tumor was not resectable. Histologic examination confirmed the diagnosis of a poorly differentiated cholangiocellular carcinoma. In the further course, the external drain was replaced with a 10-mm Wallstent. Unfortunately this metal stent dislocated into the jejunal loop of the biliodigestive anastomosis. Because of abdominal pain, operative revision was indicated. The stent was removed by local jejunotomy. The postoperative course was uneventful. The patient died 6 months later due to progression of his tumor.

Discussion

Interventional internal bilioenteric drainage using a stent is a minimally invasive procedure that maintains intact enterohepatic circulation. Endoscopic stenting procedures of the biliary system for malignant and benign lesions are well established and increasing in number. If stenting is performed for benign lesions, late complications should also be taken into consideration.

In addition to stent occlusion, the migration of a stent is a late complication that occurs with varying frequency and may cause further problems. Also, once the stent is removed from the bile duct, it may not be possible to retrieve it, leaving the stent to migrate spontaneously [23].

Especially in benign strictures, the dislocation of an endoprosthesis may not even be noticed because the biliary stenosis has resolved [9, 10, 12], as was the case in patients 1 and 3. In patients with intraabdominal adhesions, diverticular disease, or any other cause of fixation of the bowel, spontaneous stent passage may not be possible. The longer and more rigid the migrated stent is, the higher the risk of it becoming stuck [24]. Because the concrete symptoms result from the shifting of the stent and the organ thereby afflicted and do not relate to the underlying disease, the correct diagnosis may sometimes be delayed [18].

The observed frequency of stent migration varies greatly, from 0% to 40%; in average 5–10% for plastic endoprostheses [1, 5, 12, 21]. The migration of self-expandable metal mesh stents occurs less frequently (0–8%); the actual rate is probably <1% because the surrounding tissue grows through the struts, thus fixing them and sometimes even leading to occlusion [4, 5, 10, 21]. After the placement of self-expanding stents mi-

Table 2. Review of the literature 2001–03

Reference	Stent	Migration direction	Complication	Therapeutic procedure	Outcome
Basile et al. (2003) [2]	10-F, 15-cm, amsterdam	Distal	Duodenoscrotal fistula	1. Endoscopic and conservative 2. Operative	Fatal
Wilhelm et al. (2003) [26]	Straight	Distal	Colovesicular fistula	Operative	Uneventful
Levey (2002) [14]	8.5-F, 7-cm, Cotton-Leung	Distal	Intestinal perforation in parastomal hernia	Operative	Uneventful
Fiori et al. (2002) [9]	12-F, plastic	Distal	Enterocutaneous fistula	Operative and endoscopic	Uneventful
Figueiras et al. (2001) [8]	10-F, 10-cm, polyethylene, straight	Distal	Colocutaneous fistula, cholestasis	Operative	Prolonged recovery
Jendresen and Svendsen (2001) [11]	Straight endoprosthesis	Proximal	Penetration into liver and pancreas	Endoscopic	Uneventful
Klein et al. (2001) [13]	Tannenbaumstent	Distal	Sigmoid diverticular perforation	Operative	Uneventful
Liebich-Barthorlain et al. (2001) [15]	7-F, 10-cm, polyethylene	Proximal	Biliary pneumonitis	Operative	Prolonged recovery
Mistry et al. (2001) [19]	11.5-F, 12 cm, straight	Distal	Small bowel perforation and obstruction	Operative	Uneventful
Pathak and de Souza (2001) [22]	10-F, Teflon, straight	Distal	Duodenocolic fistula	Endoscopic	Uneventful
Distefano et al. (2001) [7]	10-F, 12-cm, straight, plastic	Distal	Duodenal perforation	Endoscopic	Uneventful

gration may occur, due to the shortening during their expansion as was observed in patient 5 [16].

In patient 4, the proximal end of the Wallstent impacted into the bile duct wall and its lack of flexibility, together with the sharp wire at its end, may have provided a base for the development of a duodenocolic fistula; thereafter, the scarring and contraction of the duodenal wall following radio chemotherapy completed it. Due to the stent's rigidity, local erosions of neighboring vessels or the neighboring bowel wall may occur [4].

There is an increased risk of proximal stent migration with large-diameter or short stents [12]. Their migration can lead to symptoms of biliary obstruction if it is apparent at all [4, 12, 21]. It may be symptomatic with biliary obstruction or often not display any symptoms at all. Longer stents in the bile duct are less likely to migrate because a longer section is fixed in the common bile duct, thus limiting proximal movement [12].

The only risk factors for distal migration that have been identified are papillary stenosis [12] and — in a smaller number of cases — the omission of sphincterotomy [17]. Stenting is complicated relatively more frequently by distal migration in benign strictures, than in malignant ones [4, 12]. One possible explanation for this phenomenon is that the benign stenoses are not as tight, possibly due to regression of the inflammatory component. In malignant strictures, tumor growth may help to anchor the stent, thus preventing its migration.

Migration may lead to impaction in the distal gut. The common denominator of an impacted stent is the extrinsic fixation of the bowel wall, impeding the passage of the stent through the bowel lumen [14, 19, 23]. On very rare occasions, a perforation occurs without any obvious associated bowel pathology [20].

Complications after stent migration can be classified into penetration, perforation, and obstruction of the

intestine. Rarely, other organs—such as the pleura or pancreas—can be affected [11, 15]. Penetration requires adherence between the perforated organ and another organ. It does not lead to diffuse peritonitis or intra-abdominal contamination, but eventually causes the development of a fistula (e.g., duodenocolic) [22]. Penetration of the intestinal wall can lead to an abscess, which may resolve after stent extraction and conservative treatment [23]. Cases of stent migration leading to complications that have been published in the last 2 years are summarized in Table 2.

Intestinal wall lesions due to a migrated stent are observed relatively frequently in the duodenum [2, 7, 22]. In these cases, the stent is too rigid and the duodenal wall is fixed in the retroperitoneal space. Perforation can occur in diverticular sacs of the colon because the walls of the diverticula are extremely thin [13, 23]. Because stents move naturally along the lumen of the intestine, the therapeutic approach to stent migration is primarily conservative. If they become impacted and they are endoscopically accessible, endoscopic removal is the therapy of choice. Endoscopy may even be sufficient in cases of local wall penetration [7, 23]; however, an operation is mandatory in cases of perforation and peritonitis [2, 13, 24].

A review of the literature shows that the overwhelming majority of complications with bowel perforation were caused by a straight stent [2, 13, 15, 18–20].

Because stent migration can entail concomitant risks — especially in patients with adhesions, diverticular disease, or a hernia — the insertion of a straight plastic stent should be undertaken cautiously. Close follow-up is mandatory in this group.

For liver transplantation, we no longer use prophylactic stenting. The use of stents can even result in a higher incidence of stenosis, not to mention further possible complications from T-tubes or endoprosthesis [3].

For the treatment of biliary obstruction, short-term stenting is a simple and useful procedure that obviates the need for surgical intervention. However, in patients requiring long-term therapy, stent migration has to be considered as a relevant complication that may eventually lead to a life-threatening situation. Therefore, the retrieval of migrated stents should be attempted in all cases. A migrated stent that has become symptomatic should be removed within 24 h. If conservative and endoscopic approaches fail, early operation is mandatory.

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