

The Pierced Colon: When Biliary Stents Go the Wrong Way

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ABSTRACT

Bowel perforation of biliary stents is a rare complication of biliary stenting. We report the successful endoscopic treatment of a 78-year-old man with a straight biliary plastic stent perforating the ascending colon without underlying structural abnormality in the affected segment. Perforation was detected incidentally during computed tomography; the patient had been under continued antibiotic therapy for liver abscess. Stent extraction was performed by using an endoscopic snare; the site of perforation was closed with through-the-scope clips. The patient remained asymptomatic. In addition, we reviewed published cases of perforated biliary stents and outlined that most perforations are caused by straight plastic stents.

KEYWORDS: biliary stent; perforation; endoscopic treatment

INTRODUCTION

Biliary stenting is a common procedure to treat a variety of benign and malignant conditions, most notably common bile duct stones, acute cholangitis, and benign or malignant strictures of the common bile duct. Stent migration occurs in 3%–21%^{1–5} of patients, the rate being highly dependent on the etiology of the stricture, stent type used, and length of follow-up. Although stent migration is not uncommon, serious complications due to this are rare. Duodenal perforation vis-à-vis of the papilla by straight biliary stents ranges from 1 in 2,293⁶ to 2.1%.⁷ The majority was managed with endoscopic removal and closure, with however high mortality (3 of 11⁶ vs 4 of 13 cases⁷). While migration to unusual sites, such as the pericardium,^{8–10} bronchial system,¹¹ and perforation of small bowel,^{12,13} is limited to few case reports, colonic perforation has been reported in 32 cases since 2000 (Table 1), with only 5 cases outside the rectosigmoid colon, in which most perforations occurred because of impaction in thin-walled diverticula.

CASE REPORT

A 78-year-old man underwent scheduled abdominal computed tomography during a follow-up of liver abscess diagnosed 1 month earlier. Colon perforation due to a migrated stent in the ascending colon was suspected with the stent protruding 3 cm beyond the colonic lumen and surrounding fat imbibition while no free air was detected (Figure 1). The patient was without symptoms and afebrile, and the abdominal examination was without tenderness or localized resistance. His laboratory results showed no leukocytosis, but mild C-reactive protein elevation (19.7 mg/L, reference: <10).

One month before colonic perforation, the patient underwent urgent endoscopic retrograde cholangiography with endoscopic papillotomy and placing of a straight biliary stent because of ascending cholangitis with worsening sepsis complicated by polymicrobial liver abscess and severe pancreatitis with disseminated intravascular coagulation and portal vein thrombosis. Cholelithiasis was neither present on magnetic resonance imaging conducted 3 days earlier nor noted during endoscopic retrograde cholangiopancreatography. After stent placement, fever resolved within 3 days; jaundice had not been present. His course was complicated by vancomycin-associated acute kidney injury. He was discharged after de-escalation of antibiotic therapy 16 days after stent placement. At the time of colonic perforation, he was still on antibiotic therapy with linezolid and amoxicillin/clavulanic acid as the ongoing treatment of liver abscess; he had remained asymptomatic since discharge.

Table 1. Reported colonic perforations of biliary stents from 2000

Year	Author	Indication for ERCP	Stent	Location	Manifestation	Treatment	Outcome
2000 ¹⁴	Størkson	Malignant stenosis	Straight	Ileum	Pain/abscess	Laparotomy	Died after surgery
2000 ¹⁴	Størkson	CBD stone/cholangitis	Straight	Sigmoid	Pain/free perforation	Surgical primary closure	Uneventful
2001 ¹⁴	Figueiras	Benign stricture	Straight	Left flexure	Cutaneous fistula	Removal through colocolocutaneous fistula	Uneventful
2001 ¹⁴	Klein	CBD stone	Straight	Sigmoid	Pain/peritonitis	Surgery	Uneventful
2003 ¹⁴	Elliott	CBD stone/cholangitis	Straight	Sigmoid	Pain/ileus	Hartmann procedure	Uneventful
2003 ¹⁴	Diller	Benign stricture	Straight	Sigmoid	Asymptomatic	Endoscopic removal and sigmoidectomy	Perforation after endoscopic removal
2003 ¹⁴	Wilhelm	CBD stone	Straight	Sigmoid	Pneumaturia/enterovesical fistula	Sigmoidectomy	Uneventful
2003 ¹⁵	Cerisoli	Postoperative bile leakage	Straight	Cecum	Pain/serosa not perforated	Cecotomy	Uneventful
2004 ¹⁶	Blake	CBD stone	Straight	Sigmoid	Colovaginal fistula	Low anterior resection	Uneventful
2007 ¹⁴	Anderson	CBD stone	Straight	Sigmoid	Pain/abscess	Endoscopic removal	Uneventful
2007 ¹⁴	Namdar	Postoperative bile leakage	Straight	Rectum	Pain/peritonitis	Rectal resection	Uneventful
2009 ¹⁷	Brinkley	Malignant stenosis	Straight	Right flexure	Fever/abscess	Percutaneous removal	Uneventful
2011 ¹⁴	Jafferbhoy	Postoperative bile leakage	Straight	Sigmoid	Pain w/o peritonitis	Endoscopic removal and clip closure	Uneventful
2011 ¹⁴	Lankisch	Malignant stenosis	Straight	Sigmoid	Pain/abscess	Surgery	Uneventful
2011 ¹⁴	Malgras	Malignant stenosis	Straight	Sigmoid	Pain/peritonitis	Hartmann procedure	N/A
2012 ¹⁴	Alcaide	CBD stone/stricture	Straight	Sigmoid	Pain/peritonitis	Endoscopic removal and clip closure	Abscess (day 5, treated with antibiotics)
2012 ¹⁸	Depuydt	Post-LT bile duct stricture	Straight	Rectum	Fever/minimal perirectal inflammation	Peranal stent removal	Uneventful
2013 ¹⁴	Jones	Benign stricture	Straight	Cecum	Pain/no peritonitis	Endoscopic removal	Uneventful
2016 ¹⁴	Chittleborough	CBD stone/cholangitis	Straight	Sigmoid	Sepsis/peritonitis	Hartmann procedure	Prolonged ileus, discharged after 18 d
2017 ^{14,19}	Siaperas	Postoperative CBD stricture	Straight	Sigmoid	Pain/peritonitis	Hartmann procedure with colostomy	Uneventful
2018 ¹⁹	Cano-Hoz	CBD stone/stricture	Straight	Sigmoid	Fever/hydronephrosis	Endoscopic removal and clip closure	Uneventful
2019 ¹⁴	Riccardi	CBD stone	Straight	Sigmoid	Pain/peritonitis	Hartmann procedure with colostomy	Perioperative NSTEMI
2019 ²⁰	Ramani	CBD stone	Straight	Sigmoid	Pain/impaction in sacral foramen	Endoscopic removal	Uneventful
2020 ¹⁴	Marcos	CBD stone	Straight	Sigmoid	Asymptomatic	Surgical primary closure	N/A
2021 ¹⁴	Pengermä	Benign stricture	Straight	Appendix	Pain/appendicitis	Appendectomy	Abscess (day 10, treated with antibiotics)
2021 ¹⁴	Tao	CBD stone/cholangitis	Straight	Sigmoid	Pain/free perforation	Sigmoidectomy + colostomy	Uneventful
2021 ¹⁴	Park	CBD stone/cholangitis	Straight	Left colon	Pain/localized peritonitis	Right hemicolectomy	Uneventful
2011 ¹⁴	Wagemakers	CBD stone	N/A	Sigmoid	Urinary tract infection/enterovesical fistula	Sigmoidectomy	Uneventful
2015 ¹⁴	Mady	Malignant stenosis	N/A	Sigmoid	Sepsis/abscess	Hartmann procedure	Died from MOF
2015 ¹⁴	Virgilio	CBD stone	N/A	Sigmoid	Pain/covered perforation	Endoscopic removal	N/A
2015 ¹⁴	Virgilio	CBD stone	N/A	Sigmoid	Pain/free perforation	Hartmann procedure	N/A
2017 ¹⁴	Chou	CBD stone	N/A	Sigmoid	Asymptomatic	Endoscopic removal and clip closure	Uneventful
2010 ¹⁴	Bagul	Benign stricture	Pigtail	Sigmoid	Pain and groin abscess	Abscess exploration and stent removal	Uneventful

CBD, common bile duct; ERCP, endoscopic retrograde cholangiopancreatography; LT, liver transplantation; MOF, multiple organ failure; N/A, not available; NSTEMI, non-ST segment elevation myocardial infarction; op, operation.

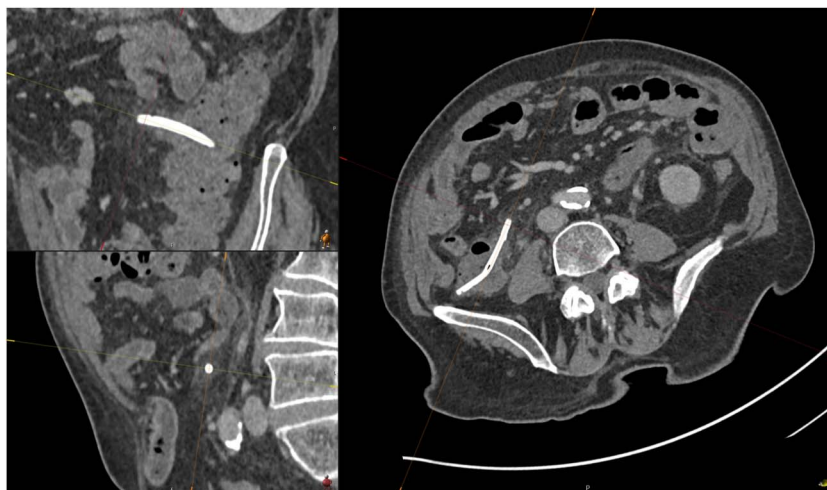


Figure 1. Computed tomography showing perforation of the ascending colon.

During colonoscopy, the stent was found to be lodged transversely in the ascending colon, penetrating the bowel wall with one end of the flap not visible; near the other end, a superficial, fibrin-covered ulceration was present (Figure 2). The stent was retrieved with a snare; the site of perforation showed only traces of purulent discharge and was closed with 3 through-the-scope metal clips. Antibiotic therapy was continued for 1 week after removal of the stent, and the patient remained asymptomatic on follow-up (Figures 3 and 4).

DISCUSSION

Our patient benefited from the incidental discovery of his asymptomatic colonic perforation and from being on broad-spectrum antibiotic therapy for his liver abscess. Owing to the

absence of clinical and radiographic signs of peritonitis, we deemed endoscopic removal to be the appropriate therapy, in accordance with previous reports that demonstrated successful endoscopic treatment in the absence of peritonitis or penetration of other organs, in which case surgery is required. To our knowledge, this case is the first reported colonic perforation of a biliary plastic stent outside anatomically predisposed sites, such as diverticula or colonic flexures, and shows feasibility of endoscopic removal and closure of the fistula in an asymptomatic patient.

Colonic perforation is a rare complication of biliary stenting. Reviewing reported cases of colonic perforations of biliary stents from 2000 to 2022 (Table 1), we found that unlike in duodenal perforation, which carries a high risk of mortality,^{6,7}

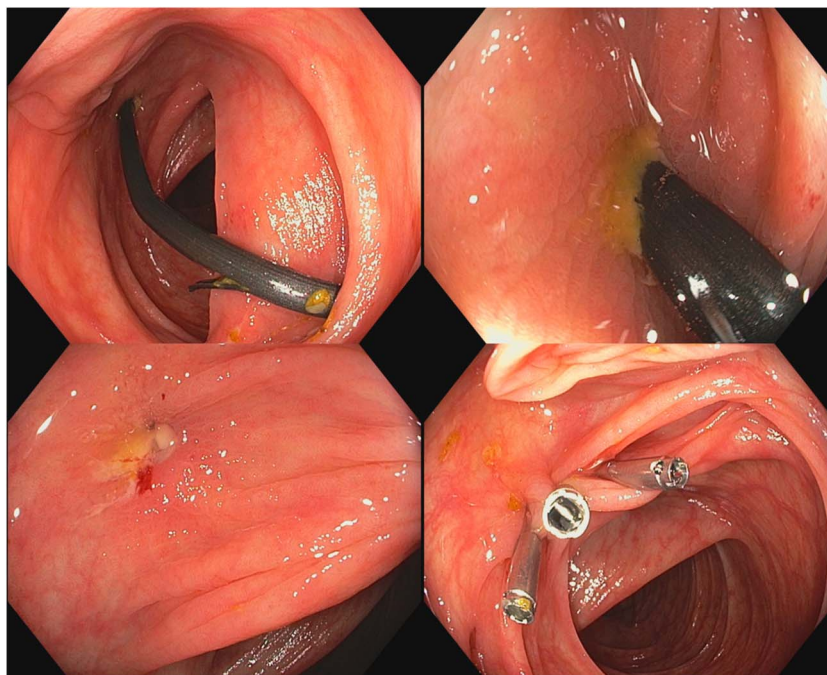


Figure 2. Endoscopic removal of the affected biliary stent.

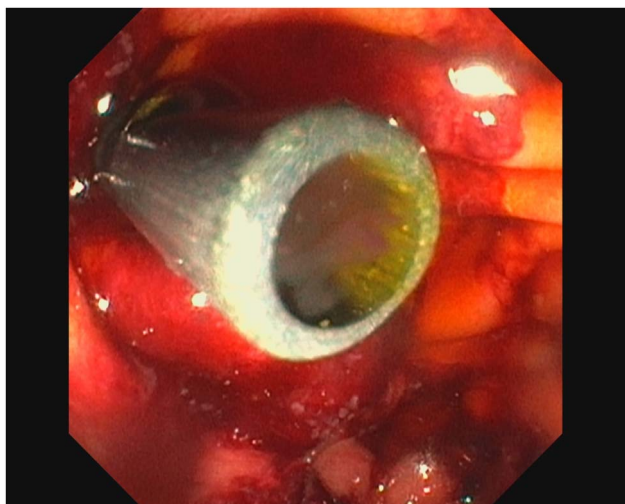


Figure 3. Duodenoscopic view of the biliary stent.

mortality in reported cases of colonic perforation is low (1 of 32). Of note, only 1 perforation was confirmed to be due to a pigtail stent while 31 of 32 perforations were caused by straight stents (25 of 32) or the type of stent was not mentioned (5 of 32). Nevertheless, colonic perforation was associated with additional interventions and hospital-prolonged hospital stay. Most cases were managed surgically (20 of 32), and endoscopic therapy was performed in 10 of 32 cases; 2 stents were removed through a colocolic fistula. Of those treated endoscopically, 1 patient developed a small abscess that was successfully treated conservatively and 1 patient had a colonic perforation after stent removal and required surgery. Mortality in colonic perforations seems to be low (1 of 32).

The almost exclusive causation of colonic and duodenal perforations by straight plastic stents should be kept in mind when choosing a biliary stent, and risk factors of stent migration should be considered. Whether reported higher rates of migration in pigtail stents³ is compensated for by less complications from perforation remains unclear. Consequent follow-up of implanted stents until their removal or excretion is documented should be assured by keeping records of implanted stents.

DISCLOSURES

Author contributions: F. Rybinski: endoscopy and care of the patient, drafting of the manuscript, and is the article guarantor. H. Heinrich: endoscopy supervision and drafting of the manuscript. M. Zimmerli: review of the literature and revision of the manuscript. S. Kahl: revision of the manuscript.

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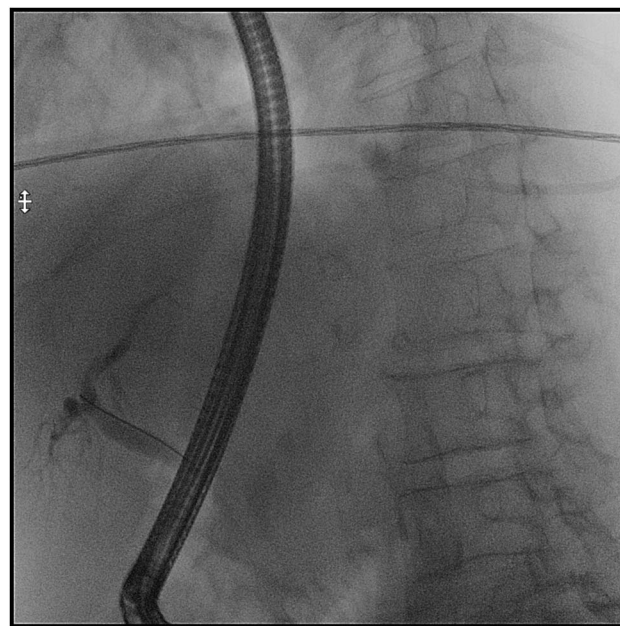


Figure 4. Cholangiogram during endoscopic retrograde cholangiopancreatography.

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Informed consent was obtained for this case report.

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REFERENCES

- Arhan M, Odemiş B, Parlak E, et al. Migration of biliary plastic stents: Experience of a tertiary center. *Surg Endosc.* 2009;23:769–75.
- Emara MH, Ahmed MH, Mohammed AS, et al. Biliary stent migration: Why, how, and what? *Eur J Gastroenterol Hepatol.* 2021;33:967–73.
- Paspatis GA, Papastergiou V, Mpitouli A, et al. Distal biliary stent migration in patients with irretrievable bile duct stones: Long-term comparison between straight and double-pigtail stents. *Dig Dis Sci.* 2022;67:4557–64.
- Taj MA, Ghazanfar S, Qureshi S, et al. Plastic stent migration in ERCP; a tertiary care experience. *J Pak Med Assoc.* 2019;69:1099–102.
- Katsinelos P, Kountouras J, Paroutoglou G, et al. Migration of plastic biliary stents and endoscopic retrieval: An experience of three referral centers. *Surg Laparosc Endosc Percutan Tech.* 2009;19:217–21.
- Gromski MA, Bick BL, Vega D, et al. A rare complication of ERCP: Duodenal perforation due to biliary stent migration. *Endosc Int Open.* 2020;8:E1530–6.
- Stassen PMC, Jong DMde, Poley J-W, et al. Prevalence of and risk factors for stent migration-induced duodenal perforation. *Endosc Int Open.* 2021;9:E461–9.
- Lee V, Woldman S, Meier P. Biliary stent migration as a cause of cardiac tamponade. *J Cardiovasc Med (Hagerstown).* 2013;14:750–2.
- Simeon K, Wright A, Browne V. Cardiac tamponade and septic pericarditis caused by biliary stent migration. *Am J Emerg Med.* 2022;63:181.e1–3.
- Chao HY, Li CH, Chen SY. Bacterial pericarditis caused by penetration of a migrated biliary stent from the lateral segment of the liver: A case report. *Medicina (Kaunas).* 2022;58:132.
- Queirós T, Castro B, Ferreira A, et al. Bronchobiliary fistula after stenting of biliary duct as the management of iatrogenic bile duct injury during elective cholecystectomy. *Acta Chir Belg.* 2022;2022:1–6.
- Barranco Castro D, Aparcero López R, Domínguez Amodeo A, et al. Biliary stent migration as a rare cause of ileal perforation. *Rev Esp Enferm Dig.* 2022;13:54–5.
- Zorbas KA, Ashmeade S, Lois W, et al. Small bowel perforation from a migrated biliary stent: A case report and review of literature. *World J Gastrointest Endosc.* 2021;13:543–54.

14. Park TY, Hong SW, Oh H-C, et al. Colonic diverticular perforation by a migrated biliary stent: A case report with literature review. *Medicine (Baltimore)*. 2021;100:e28392.
15. Cerisoli C, Diez J, Giménez M, et al. Implantation of migrated biliary stents in the digestive tract. *HPB (Oxford)*. 2003;5:180–2.
16. Blake A-M, Monga N, Dunn EM. Biliary stent causing colovaginal fistula: Case report. *JSLs*. 2004;8:73–5.
17. Brinkley M, Wible BC, Hong K, et al. Colonic perforation by a percutaneously displaced biliary stent: Report of a case and a review of current practice. *J Vasc Interv Radiol*. 2009;20:680–3.
18. Depuydt P, Aerts R, van Steenberghe W, et al. An unusual case of rectal perforation after liver transplantation. *Acta Chir Belg*. 2012;112:232–3.
19. Cano-Hoz M, Carrascosa MF, Pérez AD, et al. Migrated biliary stent. *Lancet Gastroenterol Hepatol*. 2018;3:288.
20. Ramani AS, Mandrekar S, Samant D, et al. An unusual case of biliary stent migration in sacrum. *Niger J Surg*. 2019;25:104–6.

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