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Case Report

Percutaneous endoscopy-guided gallbladder lumen-apposing metal stent retrieval, lithotripsy, and cholecystoduodenal stenting in a patient with acute cholecystitis☆,☆☆

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ABSTRACT

Endoscopic ultrasound-guided gallbladder drainage (EUS-GBD) with lumen apposing metal stent (LAMS) has emerged as an effective alternative to percutaneous cholecystostomy in managing acute cholecystitis patients with contraindications to open or laparoscopic cholecystectomy. Herein, the authors describe a case of a 69-year-old male who presented to interventional radiology with sepsis due to acute calculous cholecystitis and LAMS migration into the gallbladder. After stabilizing the patient with percutaneous cholecystostomy, percutaneous cholecysto-lithotripsy/lithectomy, cholecystoduodenal stenting, and LAMS retrieval were performed. This report highlights the potential complications associated with EUS-GBD with LAMS insertion and contributes to the limited literature on percutaneous management of migrated LAMS.

Introduction

Laparoscopic cholecystectomy (LC) is the gold standard treatment for acute calculous cholecystitis (ACC) [1]. However, a considerable number of patients have high surgical risk due to various underlying comorbidities [2–4]. Current guidelines recommend percutaneous cholecystostomy (PC) as the preferred initial modality for these patients [5]. Although PC is effective in temporarily stabilizing these patients, long-term management in patients who continue to have surgical contradictions is associated with a high adverse event rate. This includes catheter dislodgement/occlusion leading to leakage and frequent re-interventions (25%-60%) [3,6,7].

Endoscopic ultrasound-guided gallbladder drainage (EUS-GBD) has emerged as an effective alternative to PC. Initially described in 2007, this technique involves needle puncture access directly into the gallbladder through the stomach

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(cholecystogastrostomy) or duodenum (cholecystoduodenostomy) followed by dilatation and stent placement [8]. Traditional pigtail plastic stents were used as the stent of choice; however, they were replaced by covered self-expandable metal stents (SEMS) due to the increased bile leakage risk associated with plastic stents [9]. Recently, lumen-apposing metal stents (LAMS) have become the preferred choice and are Food and Drug Administration (FDA) approved for EUS-GBD. The commercially available LAMS has several advantages: (a) cautery-enhanced deployment mechanism allowing for 1-step insertion, (b) decreased risk of bile leakage due to its protective covering and dumbbell-shaped design, (c) decreased risk of migration due to shorter length and large external flanges, (d) endoscopic interventions, such as gallstone lithotripsy and removal, through the stent owing to its wider lumen [10,11].

Several studies have demonstrated the efficacy and safety of EUS-GBD with LAMS [12–15]. Nevertheless, a recent meta-analysis reported a 12.7% adverse event rate associated with LAMS, including migration, bile leakage, gallbladder perforation, recurrent cholecystitis, etc. [16]. The migration risk is associated with prolonged dwelling time; however, early migration has also been documented in the literature [16,17]. Stent migration into the gallbladder may lead to recurrent cholecystitis requiring emergent intervention. Management options include peroral endoscopic retrieval with stent replacement or fistula closure without re-stenting [10,17]. Another option is emergent cholecystectomy with repair of the duodenal wall defect [17]. Emergent surgery may have morbidity risks given the patients' poor surgical fitness. On the other hand, the peroral endoscopic approach, requiring high expertise, may not be readily available at most centers.

Herein, the authors report a case of percutaneous management of recurrent cholecystitis caused by LAMS migration into the gallbladder. The patient was managed by interventional radiology (IR) by initial PC placement, followed by planned percutaneous cholecysto-lithectomy/lithotripsy (PCL), cholecystoduodenal stenting (CDS), and LAMS removal.

Case presentation

A 69-year-old male with type 2 diabetes, oxygen-dependent chronic obstructive pulmonary disease, urothelial carcinoma status post right nephrectomy, and body mass of index of 47 kg/m^2 presented to the emergency department with hypoxia unresponsive to home oxygen, fever (103.8°F), and abnormal labs (white blood cells: 38.4 × 10^3/uL; lactic acid: 5 mmol/L). The patient was transferred to the intensive care unit and managed with intravenous fluids, vasopressors, and antibiotics (Piperacillin/tazobactam and vancomycin every 8-12 hours for 5 days). Further review revealed a previous history of ACC and gallstone pancreatitis, treated with LAMS (Axios, Boston Scientific, Marlborough, MA) EUS-GBD 1 year ago given the high risk of cholecystectomy.

Investigations

After stabilizing the patient, an abdomen/pelvis computed tomography (CT) scan was ordered which revealed cholelithiasis and pericholecystic edema, highly suggestive of recurrent ACC. The patient was referred to IR for further management. A transcholecystic cholangiogram was performed, which demonstrated multiple filling defects within the gallbladder and a moderate filling defect within the proximal cystic duct, consistent with cholelithiasis and choledocholithiasis. A 10 French (Fr) PC drain was placed in the gallbladder, and the patient was advised to follow up after 4-6 weeks for possible exchange and further management. On follow-up, the drain was upsized to 12 Fr, and the patient was scheduled for PCL and cholecystoduodenal stenting as a definitive treatment, given the patient's continued risk for surgery. Fig. 1 shows the migrated LAMS and PC drain.

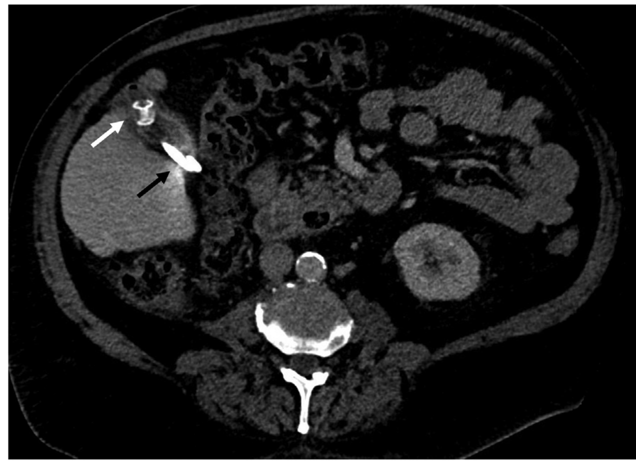

Fig. 1 – Follow-up axial CT scan after percutaneous cholecystostomy demonstrating LAMS migrated into the gallbladder (white arrow) and percutaneous cholecystostomy drain (black arrow).

Treatment

The procedure was performed under general anesthesia after anesthesiology evaluated the candidacy. Prophylactic antibiotics were administered per the guidelines of the Society of Interventional Radiology (SIR) [18]. Of note, Ringer's lactate (as the maintenance fluid) and rectal indomethacin were administered to mitigate the pancreatitis risk [19,20].

The existing drain was cut and exchanged over a wire for an 8 Fr Brite Tip sheath (Cordis, Miami Lakes, FL) (Fig. 2A). Through the sheath, the cystic duct was cannulated using a Kumpe catheter (Cook Medical, Bloomington, IN). Small bowel access was obtained using a combination of a 2.4 Fr Maestro microcatheter (Merit Medical, South Jordan, UT) and a 0.016-inch fathom wire. The Kumpe catheter was then exchanged for a Glidewire Advantage (Terumo Medical Corporation, Somerset, NJ) (Fig. 2B). The gallbladder access was serially dilated, and a 12 Fr sheath was placed. Cholecystoscopy was performed through the peel-away sheath using the Spyglass Discover (Boston Scientific, Marlborough, MA), revealing numerous pigmented gallstones and a foreign body, which was identified as the previously placed LAMS. Fig. 2C shows a fluoroscopic image of the cholecystoscope probe inside the LAMS.

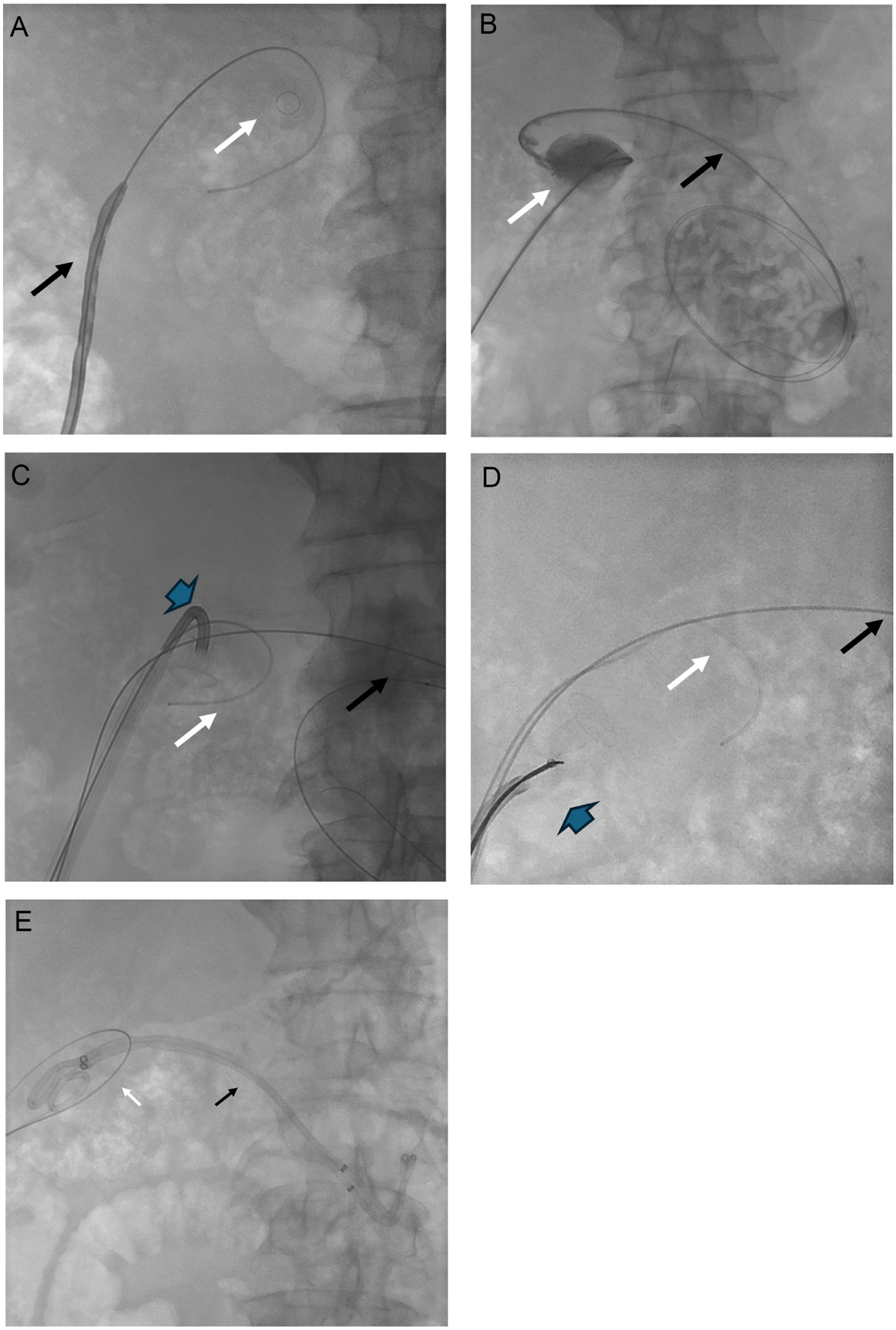

Fig. 2 – Intraprocedural fluoroscopic images. (A) The white arrow shows the LAMS migrated into the gallbladder, and the black arrow demonstrates the percutaneous cholecystostomy drain being removed over a wire. (B) Contrast filling the gallbladder (white arrow) and wire crossing the cystic/common bile ducts into the duodenum (black arrow). (C) Wire coiled into the gallbladder (white arrow), wire crossing the cystic/common bile ducts into the duodenum (black arrow), and the cholecystoscope probe in the LAMS (blue arrow). (D) Wire coiled into the gallbladder (white arrow), wire crossing the cystic/common bile ducts into the duodenum (black arrow), and LAMS being snared and pulled out (blue arrow). (E) Contrast filling the gallbladder (white arrow) and dual cholecystoduodenal stents placed (black arrow).

There were stones within the lumen of the LAMS and these were removed to facilitate folding of the stent for retrieval. Following cholangiography, electrohydraulic lithotripsy (EHL) was performed using a 1.9 Fr Autolith EHL probe (Boston Scientific, Marlborough, MA), and gallstone fragments were retrieved using a 12 mm SpyGlass retrieval basket (Boston Scientific; Marlborough, MA). The 10 mm Amplatz gooseneck snare (Medtronic, Minneapolis, MN) was advanced through the working channel of the SpyGlass Discover but could not snare the LAMS. Hence, after additional sequential dilation of the gallbladder access, an 18 Fr peel-away sheath was advanced over the wire. Under fluoroscopic and cholecystoscopic guidance, the LAMS was removed with a 20 mm Amplatz gooseneck snare (Medtronic, Minneapolis, MN) (Fig. 2D), inserted parallel to the scope (not through the working channel). Additional EHL was performed until the cholelithiasis burden was relieved with minimal residual debris.

Following lithotripsy, a second Glidewire Advantage was placed through the cystic duct and into the small bowel. CDS stenting was performed over these guidewires using two 8.5 Fr by 12 centimeters double-pigtail plastic stents, with pigtails coiled in the gallbladder and small bowel (Fig. 2E). The positioning of the stents was confirmed under fluoroscopy. Fig. 3 shows the retrieved gallstone fragments and LAMS (saddle length: 8mm, flange diameter: 17mm, lumen diameter: 8mm).

Lastly, a 12 Fr PC drain was placed within the gallbladder as a safety drain and secured with sutures. There were no immediate procedural complications, and the patient was discharged after a 1-night observation.

Outcome and follow-up

The patient presented to IR for follow-up after 2 weeks. The PC drain was removed 2 weeks postprocedure after transcholecystic cholangiogram demonstrated no filling defects within the gallbladder and patent cholecystoduodenal stents. The dual cholecystoduodenal stents were not removed as placing double stents creates 4 lumens within the cystic and bile ducts. This approach maintains adequate bile flow without requiring stent exchange [21].

The patient was followed up clinically and remained asymptomatic till the last known follow-up (4 months postprocedure).

Fig. 3 – Postprocedure images. (A) Retrieved pigment gallstone fragments (B) Retrieved LAMS.

Discussion

There is limited data on the optimal time for LAMS removal. The cholecystoenteric tract takes almost 4 weeks to mature after which LAMS can be removed safely. However, some studies recommend leaving the LAMS for 90 days postplacement to prevent ACC recurrence and bile leakage [22]. The cholecystoenteric fistula usually closes spontaneously after the LAMS retrieval; however, recurrent cholecystitis can occur unless the cystic duct is patent. Conversely, increased dwell time is associated with an increased risk of migration, bleeding, and gallbladder/duodenal perforation [23]. Current literature, however, favors longer LAMS indwell times, reporting no significant increase in adverse event rate [24,25]. Nevertheless, stent migration remains a concern, especially if the migration is associated with ACC recurrence as presented in this case report.

Emergent cholecystectomy with fistula closure has been reported in the literature as a treatment option for migrated LAMS [17]. However, this approach may not be suitable for critically ill patients due to the increased risk of morbidity and mortality. Alternatively, peroral endoscopic retrieval of migrated LAMS can be performed, but it requires a high level of expertise, limiting its availability [10]. As a result, these patients are often managed with percutaneous cholecystostomy (PC) placement until a definitive treatment can be pursued.

Given the introduction of percutaneous cholecystoscopy and in-vivo lithotripsy devices in IR, patients with an existing mature PC tract can be managed with PCL along with CDS as a definitive treatment option. Both PCL and CDS have been reported in the literature with favorable outcomes [21,26–30]. The PC drain can be safely removed once the cystic duct patency is ensured on the cholecystogram. Combining CDS with PCL minimizes the recurrence rates. Moreover, placing dual stents effectively creates 4 lumens, which prevents the occlusion of bile flow without requiring stent exchange.

While the popularity of EUS-GBD continues to grow, clinicians should be mindful of potential long-term adverse events associated with the procedure as described in this case. Some authors recommend exchanging the LAMS with double-pigtail plastic stents, which can be left indefinitely [9]. Nevertheless, the optimal time for LAMS removal needs to be evaluated in more detail. Additionally, the long-term surgical candidacy of patients undergoing EUS-GBD should be carefully assessed, as performing a cholecystectomy later may be challenging due to adhesion formation between the gallbladder and the duodenum or stomach. Therefore, the ideal candidates for EUS-GBD are those who are not expected to be surgical candidates in the future [31].

Conclusion

Combined PCL and CDS can be used as an effective treatment modality for managing ACC patients. Additionally, migrated LAMS into the gallbladder can also be retrieved using this approach as an alternative open surgery.

Learning points/take home message

- Migrated lumen apposing metal stent (LAMS) is a possible complication of endoscopic ultrasound-guided gallbladder drainage and can cause symptoms such as acute cholecystitis.
- Additional literature is necessary to evaluate the risk of stent migration caused by LAMS.
- Percutaneous cholecysto-lithotripsy/lithectomy and cholecystoduodenal stenting can be successfully combined to manage acute calculous cholecystitis.
- Immediate diagnosis and procedural interventions are key to relieving acute cholecystitis.

Patient consent

Written informed consent was obtained from the patient for their anonymized information to be published in this article (case report).

REFERENCES

[1] Gallaher JR, Charles A. Acute cholecystitis: a review. JAMA 2022;327(10):965. doi:10.1001/jama.2022.2350.
[2] Endo I, Takada T, Hwang TL, et al. Optimal treatment strategy for acute cholecystitis based on predictive factors: Japan-Taiwan multicenter cohort study. J Hepato-Biliary-Pancreat Sci 2017;24(6):346–61. doi:10.1002/jhbp.456.
[3] Loozen CS, van Ramshorst B, van Santvoort HC, Boerma D. Early cholecystectomy for acute cholecystitis in the elderly population: a systematic review and meta-analysis. Dig Surg 2017;34(5):371–9. doi:10.1159/000455241.
[4] Yokoe M, Takada T, Hwang TL, et al. Validation of TG13 severity grading in acute cholecystitis: Japan-Taiwan collaborative study for acute cholecystitis. J Hepato-Biliary-Pancreat Sci 2017;24(6):338–45. doi:10.1002/jhbp.457.
[5] Okamoto K, Suzuki K, Takada T, et al. Tokyo Guidelines 2018: flowchart for the management of acute cholecystitis. J Hepato-Biliary-Pancreat Sci 2018;25(1):55–72. doi:10.1002/jhbp.516.
[6] McKay A, Abulfaraj M, Lipschitz J. Short- and long-term outcomes following percutaneous cholecystostomy for acute cholecystitis in high-risk patients. Surg Endosc 2012;26(5):1343–51. doi:10.1007/s00464-011-2035-0.
[7] Baron TH, Grimm IS, Swanstrom LL. Interventional approaches to gallbladder disease. N Engl J Med 2015;373(4):357–65. doi:10.1056/NEJMra1411372.
[8] Baron TH, Topazian MD. Endoscopic transduodenal drainage of the gallbladder: implications for endoluminal treatment of gallbladder disease. Gastrointest Endosc 2007;65(4):735–7. doi:10.1016/j.gie.2006.07.041.
[9] Manudhane AP, Leupold MD, Shah HW, et al. A review on endoscopic management of acute cholecystitis: endoscopic ultrasound-guided gallbladder drainage and endoscopic transpapillary gallbladder drainage. Medicina (Mex) 2024;60(2):212. doi:10.3390/medicina60020212.
[10] Dollhopf M, Larghi A, Will U, et al. EUS-guided gallbladder drainage in patients with acute cholecystitis and high surgical risk using an electrocautery-enhanced lumen-apposing metal stent device. Gastrointest Endosc 2017;86(4):636–43. doi:10.1016/j.gie.2017.02.027.
[11] Pisano M, Allievi N, Gurusamy K, et al. World Society of Emergency Surgery updated guidelines for the diagnosis and treatment of acute calculus cholecystitis. World J Emerg Surg WJES 2020;15(1):61. doi:10.1186/s13017-020-00336-x.
[12] Itoi T, Takada T, Hwang TL, et al. Percutaneous and endoscopic gallbladder drainage for acute cholecystitis: international multicenter comparative study using propensity score-matched analysis. J Hepato-Biliary-Pancreat Sci 2017;24(6):362–8. doi:10.1002/jhbp.454.
[13] Luk SWY, Irani S, Krishnamoorthi R, Wong Lau JY, Wai Ng EK, Teoh AYB. Endoscopic ultrasound-guided gallbladder drainage versus percutaneous cholecystostomy for high risk surgical patients with acute cholecystitis: a systematic review and meta-analysis. Endoscopy 2019;51(8):722–32. doi:10.1055/a-0929-6603.
[14] Siddiqui A, Kunda R, Tyberg A, et al. Three-way comparative study of endoscopic ultrasound-guided transmural gallbladder drainage using lumen-apposing metal stents versus endoscopic transpapillary drainage versus percutaneous cholecystostomy for gallbladder drainage in high-risk surgical patients with acute cholecystitis: clinical outcomes and success in an international, Multicenter study. Surg Endosc 2019;33(4):1260–70. doi:10.1007/s00464-018-6406-7.
[15] Krishnamoorthi R, Jayaraj M, Thoguluva Chandrasekar V, et al. EUS-guided versus endoscopic transpapillary gallbladder drainage in high-risk surgical patients with acute cholecystitis: a systematic review and meta-analysis. Surg Endosc 2020;34(5):1904–13. doi:10.1007/s00464-020-07409-7.
[16] Mohan BP, Asokkumar R, Shakhatreh M, et al. Adverse events with lumen-apposing metal stents in endoscopic gallbladder drainage: a systematic review and meta-analysis. Endosc Ultrasound 2019;8(4):241–8. doi:10.4103/eus.eus_63_18.
[17] Binda C, Anderloni A, Forti E, et al. EUS-guided gallbladder drainage using a lumen-apposing metal stent for acute cholecystitis: results of a nationwide study with long-term follow-up. Diagnostics 2024;14(4):413. doi:10.3390/diagnostics14040413.

[18] Chehab MA, Thakor AS, Tulin-Silver S, et al. Adult and pediatric antibiotic prophylaxis during vascular and IR procedures: a society of interventional radiology practice parameter update endorsed by the Cardiovascular and Interventional Radiological Society of Europe and the Canadian Association for Interventional Radiology. J Vasc Interv Radiol 2018;29(11):1483–1501.e2. doi:10.1016/j.jvir.2018.06.007.
[19] Luo H, Zhao L, Leung J, et al. Routine pre-procedural rectal indometacin versus selective post-procedural rectal indometacin to prevent pancreatitis in patients undergoing endoscopic retrograde cholangiopancreatography: a multicentre, single-blinded, randomised controlled trial. Lancet Lond Engl 2016;387(10035):2293–301. doi:10.1016/S0140-6736(16)30310-5.
[20] Boal Carvalho P, Magalhães J, Dias de Castro F, et al. NSAIDs are not enough - a double blinded randomized controlled trial on the impact of intensive hydration for the prevention of post-endoscopic retrograde cholangiopancreatography pancreatitis. Eur J Gastroenterol Hepatol 2022;34(7):751–6. doi:10.1097/MEG.0000000000002380.
[21] Sperry C, Malik A, Reiland A, et al. Percutaneous cystic duct interventions and drain internalization for calculous cholecystitis in patients ineligible for surgery. J Vasc Interv Radiol JVIR 2023;34(4):669–76. doi:10.1016/j.jvir.2022.12.468.
[22] Walter D, Teoh AY, Itoi T, et al. EUS-guided gall bladder drainage with a lumen-apposing metal stent: a prospective long-term evaluation. Gut 2016;65(1):6–8. doi:10.1136/gutjnl-2015-309925.
[23] Goldman I, Ji K, Scheinfeld MH, Hajifathalian K, Morgan M, Yang J. A stent of strength: use of lumen-apposing metal stents (LAMS) for biliary pathologies and other novel applications. Abdom Radiol N Y 2024 ahead of print. doi:10.1007/s00261-024-04561-9.
[24] Bazaga S, García-Alonso FJ, Aparicio Tormo JR, et al. Endoscopic ultrasound-guided gallbladder drainage with long-term lumen-apposing metal stent indwell: 1-year results from a prospective nationwide observational study. J Gastroenterol Hepatol 2024;39(2):360–8. doi:10.1111/jgh.16392.
[25] Martinez-Moreno B, López-Roldán G, Martínez-Sempere J, de-Madaria E, Jover R, Aparicio JR. Long-term results after EUS gallbladder drainage in high-surgical-risk patients with acute cholecystitis: a 3-year follow-up registry. Endosc Int Open 2023;11(11):E1063–8. doi:10.1055/a-2180-9817.
[26] Stirrat J, Patel NR, Stella SF, Mafeld S, Ho CS, Shlomovitz E. Safety and efficacy of percutaneous gallstone extraction in high-risk patients: an alternative to cholecystectomy or long-term drainage? J Am Coll Surg 2021;232(2):195–201. doi:10.1016/j.jamcollsurg.2020.09.019.
[27] Patel N, Chick JFB, Gemmete JJ, et al. Interventional radiology-operated cholecystoscopy for the management of symptomatic cholelithiasis: approach, technical success, safety, and clinical outcomes. AJR Am J Roentgenol 2018;210(5):1164–71. doi:10.2214/AJR.17.18690.
[28] Kim SK, Mani NB, Darcy MD, Picus DD. Percutaneous cholecystolithotomy using cholecystoscopy. Tech Vasc Interv Radiol 2019;22(3):139–48. doi:10.1053/j.tvir.2019.04.006.
[29] Hersey N, Goode SD, Peck RJ, Lee F. Stenting of the cystic duct in benign disease: a definitive treatment for the elderly and unwell. Cardiovasc Intervent Radiol 2015;38(4):964–70. doi:10.1007/s00270-014-1014-y.
[30] Lee TY, Kim JW, Shim DJ, Kim D, Yoon YC, Lee EW. Percutaneous cholecystoduodenal stent as a definite treatment for acute cholecystitis in elderly or comorbid patients: a bicentric retrospective study. Diagn Interv Radiol Ank Turk 2023;29(2):367–72. doi:10.4274/dir.2023.222003.
[31] Podboy A, Yuan J, Stave CD, Chan SM, Hwang JH, Teoh AYB. Comparison of EUS-guided endoscopic transpapillary and percutaneous gallbladder drainage for acute cholecystitis: a systematic review with network meta-analysis. Gastrointest Endosc 2021;93(4):797–804.e1. doi:10.1016/j.gie.2020.09.040.