



CASE REPORT

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Combined surgical and intraoperative endoscopic rescue of a biliary incarcerated balloon dilator: a successful rescue in a fortunate patient

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Abstract

Background: Endoscopic papillary balloon dilatation (EPBD) is the second proposed maneuver for the endoscopic retrieval of common bile duct stones after endoscopic sphincterotomy (EST). Being less traumatic, EPBD is acknowledged for fewer procedure-related complications compared to (EST).

Case presentation: We present a 55-year-old lady, who was referred to the pancreato-biliary division, Gastrointestinal Endoscopy Unit, National Liver Institute, Menoufia University, for endoscopic management of a high likelihood of choledocholithiasis. Unfortunately, during the procedure, the balloon dilator was incarcerated inside the common bile duct (CBD) with failure of all endoscopic extraction trials. Because of the resultant cholangio-pancreatitis, the incarcerated inflated balloon had to be removed immediately. Open surgical rescue of the case in conjunction with the intraoperative endoscopic biliary stent deployment had made it possible to save the patient.

Conclusion: This case is one of the few reports of incarcerated balloon dilator during EPBD and failure of endoscopic retrieval, with subsequent acute pancreatitis/hepato-cholangitis, and gall bladder mucocele. Despite being a critical surgical candidate and owing to the attentive timely surgical intervention collaborated with the intra-operative endoscopic management, the case was fortunate.

Keywords: Incarcerated balloon, Sphincterotomy, Endoscopic, Papillary balloon dilatation

Background

The revolutionary progress in clinical imaging has introduced a lot of knowledge, recognition, and diagnostic accuracy of common bile duct stones (CBD) stones. Furthermore, the preference for laparoscopic cholecystectomy over open surgery has augmented endo-biliary endoscopic management of CBD stones. In accord, endoscopic retrograde cholangiopancreatography (ERCP) acquired a central position in the management of CBD stones [1]. Endoscopic sphincterotomy (EST) and

Endoscopic papillary balloon dilatation (EPBD) are the two principal approaches for the removal of CBD stones [2]. It has been reported that either EST or EPBD combined with stone extraction using a basket and/or balloon catheter is successful in managing 90% of CBD stones [3].

EST was first described in 1974, and since then, it has become the daily endoscopic practice for the removal of CBD stones [4]. EST starts by deep insertion of a cannula into the bile duct through the papillary orifice followed by electrocautery to incise the sphincter of Oddi [5]. This disruption of the sphincter of Oddi and the associated instrumentation have been implicated in immediate and late EST related complications [5]. The reported short-term complications include bleeding, pancreatitis,

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cholangitis, and perforation while dysfunction of the sphincter of Oddi is a late adverse event [6].

EPBD was then introduced in 1983 and gained a lot of interest as a less traumatic substitute to EST [7]. EPBD starts by selective deep cannulation, then, introducing the balloon catheter across the papillary orifice, inflation of the balloon with diluted contrast till 8 to 12 atmospheric pressure when the waist of the balloon begins to disappear in the fluoroscopic image. The balloon is kept inflated in position for up to two minutes then deflated and the procedure can be repeated several times [7]. The process of EPBD does not involve an incision of the sphincter of Oddi; a great privilege in terms of avoiding bleeding complications especially in patients having coagulopathy, and additionally preserving the function of the sphincter of Oddi [8]. Animal studies showed that EPBD does not damage the smooth muscle layer, thus conserving the papillary architecture [9].

However, many reports had mentioned post-ERCP pancreatitis (PEP) as being the anxiety mostly associating with EPBD [10]. Papillary edema and possibly damage induced by the dilatation are the potential contributors of post-EPBD pancreatitis [11]. Based on this theory, the European Society for Gastrointestinal Endoscopy (ESGE) guidelines recommended the use of pancreatic stent as

a safeguard against PEP when EPBD is performed [12]. Some studies speculated that endoscopic naso-biliary drainage (ENBD) can attenuate the chances of PEP occurrence by preventing pancreatic juice blockage by papillary edema or the possible residual stones [13].

Case presentation

A 55-year-old lady presented to the pancreato-biliary unit, National Liver Institute, Menoufia University, for endoscopic management of the strong likelihood of choledocholithiasis accompanying calculi gall bladder. The pre-ERCP assessment revealed an average body-built lady with prominent jaundice, epigastric pain, and tenderness. She was feverish but reported no vomiting or respiratory system related symptoms. Her immediate abdominal ultrasound showed dilated common bile duct (CBD = 8 mm) with dilated intrahepatic biliary channels and multiple gall bladder stones. The laboratory findings were marked by raised cholestatic and inflammatory parameters (Table 1).

After proper sedation, selective cannulation of the CBD needed several trials due to the abnormal anatomic position of the papilla (left duodenal wall positioned papilla). Then, cholangiography confirmed the presence

Table 1 Serial laboratory data of the case

Variables		Pre-ERCP	Post-ERCP	Pre-operative	Post-operative D ¹	Post-operative D ²
CBC	Hb (g/dL)	13.3	11.6	11.9	11.3	11
	WBC (10 ³ /μL)	8.9	8.8	9.6	10.5	8
	Platelets (10 ³ /μL)	246	212	290	281	280
Liver profile	Albumin (g/dl)	3.7	3.6	3.5	3.4	3.7
	Bilirubin (mg/dL)	8	8.4	8.8	2.4	1
	PT (%)	100	100	96	100	100
	INR	0.9	1	1.1	1	1
	AST (U/L)	100	360	454	98	30
	ALT (U/L)	110	460	480	21	20
	ALP (U/L)	687	662	765	190	122
	GGT (U/L)	400	491	2800	120	56
Renal profile	Urea (mg/dL)	40	41	40	44	32
	Creatinine (mg/dL)	0.5	0.74	0.9	1.1	0.7
	Sodium (mmol/L)	145	142	143	144	145
	Potassium (mmol/L)	4.1	3.75	3.6	3.5	4
Others	Amylase (U/L)	–	953	1838	62	30
	Lipase (U/L)	–	3855	4221	183	25
	D dimer (mg/dl)	–	3.38	4.56	3.5	1.2
	Ferritin (μg/L)	–	1100	1800	1000	122
	CRP (mg/l)	–	13.3	28.7	8.1	1.1

CBC complete blood picture, HB hemoglobin, WBCs white blood cells, PT prothrombin concentration, INR international normalized ratio, AST aspartate transaminase, ALT alanine transaminase, ALP alkaline phosphatase, GGT gamma glutamyl transference, CRP C-reactive protein



Fig. 1 Selective CBD cannulation with cholangiogram revealing dilated CBD and proximal biliary radicles with small distal stricture

of multiple small CBD stones, markedly dilated CBD, and small distal CBD stricture (3 mm) (Fig. 1).

Limited papillotomy was successfully undertaken, and an extractor balloon was inserted into the papillary orifice, but repeated clearance trials were unsuccessful, possibly due to the relatively small papillary orifice (Fig. 2a, b). Afterward, the decision was to perform EPBD. Before the procedure, and to ensure proper function, the dilatation balloon was inflated and deflated, then, the dilatation balloon catheter was slid over the guidewire till arrived at the biliary sphincter. While inflating, unexpectedly, the balloon escaped proximally and neither deflation nor backward traction was successful in deflating, and/or

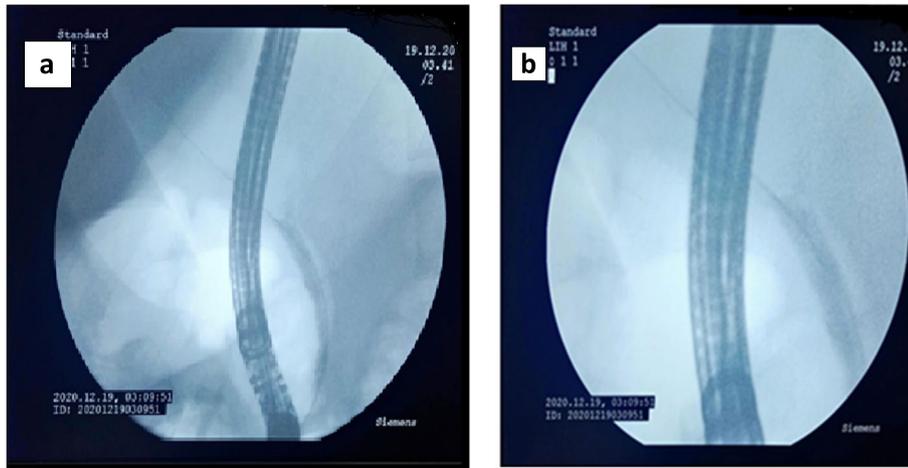


Fig. 2 a Limited papillotomy was done followed by Initial inflated balloon. b The inflated balloon within the CBD

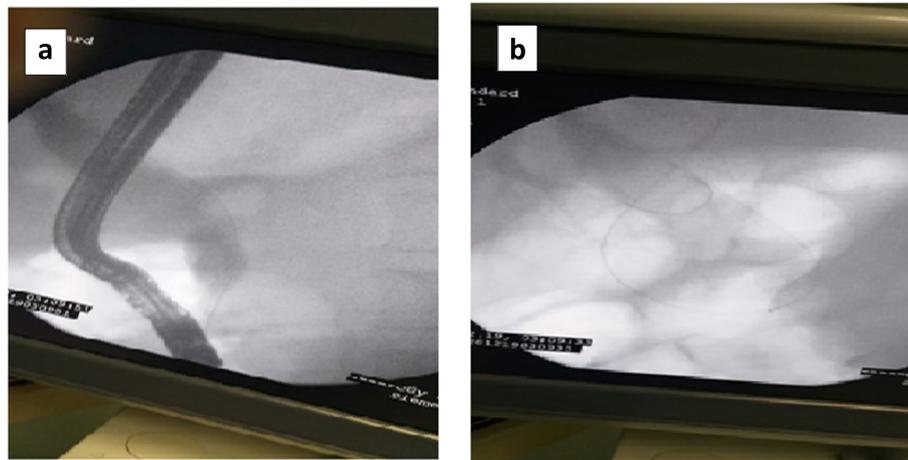


Fig. 3 a The migrated up inflated balloon in the CBD. b The migrated up balloon in the CBD after removal of endoscopy

removing the balloon catheter (Fig. 3a, b). The endoscopy was removed and introduced again along with vainly trials using rescue extraction forceps to grasp the catheter and trying to remove the balloon. Then, a new trial to introduce a cannulotome to remove the balloon using an extraction basket was also unsuccessful. Desperately, the ERCP session was terminated and both radiological and surgical consultations were decided.

Immediate interventional radiological consultation planning for percutaneously puncturing the balloon aiming to ease its endoscopic retrieval was the first rescue consultation. However, the radiologists reported a difficult situation due to the proximity with the portal vein and the significant risk of puncturing it (Fig. 4).

In respect to the critical medical condition and the expected hepato-biliary and pancreatic tissue edema, open surgery was the preferred undertaken approach.

Intraoperatively, because of the markedly edematous CBD and gall bladder mucocele, the surgeon neglected to do CBD exploration. The surgeon made an incision in the first part of the duodenum and manually pulled the EBD catheter with its balloon out of the duodenal opening and without any damage to the papillary sphincter. The same endoscopist attended the operation, he re-cannulated the papilla through the duodenal opening and the following cholangiogram revealed multiple small stones which were easily removed by balloon extractor through the dilated distal CBD end under the effect of incarcerated inflated balloon. The cholangiogram confirmed the absence of any CBD injury. Then, a CBD plastic stent 10 cm × 10 French was deployed along the in-kept guidewire. The role of the deployed CBD stent is to keep the duct open in face of tissue edema and to safeguard against any possible leak.

The post-operative period was uneventful with regression of both cholangio-hepatitis and pancreatitis

on oral feeding, parenteral fluids, broad-spectrum antibiotics, and vasopressors. The patient was transferred to the ward on the 5th postoperative day and was managed to start oral intake along with the removal of the abdominal drains. On the 10th postoperative day, the patient was sent home to be followed up in pancreatobiliary clinic, planning for removal of the biliary stent 1 month later.

Discussion

Although EST had been considered for a long as the standard technical approach for endoscopic removal of CBD stones, the subsequently introduced EPBD had acquired its reputation as an equally effective alternative but with minimized complications [10]. However, EPBD has its shortcomings, basically, due to the small rather than widened papillary orifice as in EST [14].

Large and bizarre shaped CBD stones are difficult to be removed by EPBD [15], also, the large number of small stones would take a lengthy time [10]. In purpose to overcome such shortcomings, Ersoz et al. had introduced the concept of combining EST with EPBD [7].

A sequential EST followed by EPBD has been explored and demonstrated both safety and efficacy [16]. In addition to the prevention of post-procedural pancreatitis, prior sphincterotomy can help to control the choledochal direction with successful cannulation during EBD [16]. Hence, such a 2-step approach was the selected technique for the present case.

Limited EST has shown to reduce the chances of procedure-related hemorrhage compared to generous sphincterotomy [7]. Additionally, with marked papillary edema, follow up of the dilatation status can be carefully managed by the attending endoscopist; hence, perforation can be avoidable [7]. Therefore, limited papillotomy was done preferably for the present case. Also, the presence of only 2 small stones in the CBD had encouraged the endoscopist to be more conservative in the EST technique.

In this case, the incarceration of the balloon during ERCP can be owed to the distal narrow short CBD segment. Also, based on financial constraints, the repeated use of ERCP-related accessories can reduce their efficiency with inevitable difficulties during work.

Even though the experienced hands, the undertaken endoscopic rescue of the incarcerated balloon was not successful.

Open cholecystectomy as a rescue surgery was the single-shot intervention of choice in this case [17]; it has allowed punctual treatment of both the impacted balloon and the calcular GB and meanwhile the intraoperative re-ERCP for deploying a prophylactic CBD plastic stent.

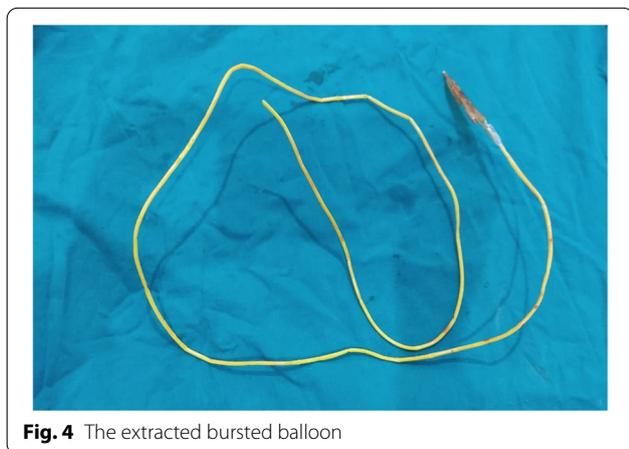


Fig. 4 The extracted bursted balloon

Conclusion

Therapeutic ERCP has become the intervention of choice for the removal of CBD stones. Although rates of endoscopic CBD clearance are substantial, the potential for serious adverse events is also discernible. The present report identifies an unusual case of incarcerated biliary balloon dilator during EPBD-ERCP management of CBD stones. Prompt sequential open surgery to remove the incarcerated balloon along with cholecystectomy, then, intraoperative re-ERCP and prophylactic stenting of the CBD have shown ultimate results in the management of this case.

Abbreviations

CBD: Common bile duct; ERCP: Endoscopic retrograde cholangiopancreatography; EPBD: Endoscopic papillary balloon dilatation; EST: Endoscopic sphincterotomy; MRC: Magnetic resonance cholangiography; PEP: Post-ERCP pancreatitis; ESGE: European Society for Gastrointestinal Endoscopy.

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Authors' contributions

EO analyzed and interpreted the patient data and was a major contributor in writing the manuscript. EM helped in revising the manuscript. HO analyzed and interpreted the patient data regarding the hematological disease KA performed the endoscopic intervention. EH helped in case analysis. MT revised the rationalities of the case, and data interpretation, along with manuscript final revision. All authors read and approved the final manuscript.

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Availability of data and materials

All the data is available in the manuscript.

Declarations

Ethics approval and consent to participate

The case was written after the consent of the ethical committee of National Liver Institute Menoufia University

Consent for publication

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Competing interests

All authors declare that they have no competing interests.

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References

- Sharma A, Dahiya P, Khullar R, Soni V, Bajjal M, Chowbey PK (2012) Management of common bile duct stones in the laparoscopic era. *Indian J Surg*. 74(3):264–269

- Williams E, Beckingham I, El Sayed G, Gurusamy K, Sturgess R, Webster G et al (2017) Updated guideline on the management of common bile duct stones (CBDs). *Gut*. 66(5):765–782
- Ekmektzoglou K, Apostolopoulos P, Dimopoulos K, Tsibouris P, Kalantzis C, Vlachou E, et al. Basket versus balloon extraction for choledocholithiasis: a single center prospective single-blind randomized study. *Acta Gastroenterologica Belgica*, 01 2020, 83(4):577-84
- Kawai K, Akasaka Y, Murakami K, Tada M, Koli Y (1974) Endoscopic sphincterotomy of the ampulla of Vater. *Gastrointest Endosc*. 20:148–151
- Meseeha M, Attia M. Endoscopic retrograde cholangiopancreatography. [Updated 2020 Aug 11]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK493160/>
- Köksal AŞ, Eminler AT, Parlak E (2018) Biliary endoscopic sphincterotomy: Techniques and complications. *World J Clin Cases*. 6(16):1073–1086
- Ersoz G, Tekesin O, Ozutemiz AO, Gunsar F (2003 Feb) Biliary sphincterotomy plus dilation with a large balloon for bile duct stones that are difficult to extract. *Gastrointest Endosc*. 57(2):156–159
- Yasuda I, Tomita E, Enya M, Kato T, Moriwaki H (2001 Nov) Can endoscopic papillary balloon dilation really preserve sphincter of Oddi function? *Gut*. 49(5):686–691
- de Nucci G, Petrone MC, Imperatore N, Forti E, Grassia R, Giovanelli S et al (2019) High accuracy of transduodenal endoscopic fine needle biopsy using a 19 g flexible needle: a retrospective multicenter study. *Endoscopy* 51(04):21–21
- Chou C-K, Lee K-C, Luo J-C, Chen T-S, Perng C-L, Huang Y-H et al (2020) Endoscopic papillary balloon dilatation less than three minutes for biliary stone removal increases the risk of post-ERCP pancreatitis. *PLoS ONE* 15(5):e0233388
- Fujisawa T, Kagawa K, Hisatomi K, Kubota K, Nakajima A, Matsushashi N (2016) Is endoscopic papillary balloon dilatation really a risk factor for post-ERCP pancreatitis? *World J Gastroenterol*. 22(26):5909–5916
- Dumoncaeu JM, Kapral C, Aabakken L, Papanikolaou IS, Tringali A, Vanbiervliet G et al (2020) ERCP-related adverse events: European Society of Gastrointestinal Endoscopy (ESGE) Guideline. *Endoscopy* 52:127–149
- Huang Q, Shao F, Wang C, Qi W, Qiu LJ, Liu Z (2018) Naso-biliary drainage can reduce the incidence of post-ERCP pancreatitis after papillary large balloon dilation plus endoscopic biliary sphincterotomy: a randomized controlled trial. *Scand J Gastroenterol*. 53(1):114–119
- Afifi M, Abd Elmoniem S, Soliman G, Abd Elhameed H, Elgendy A (2017) Comparison of endoscopic papillary large balloon dilatation and endoscopic sphincterotomy for retrieval of choledocholithiasis. *The Egyptian Journal of Hospital Medicine* 67(2):742–748
- Elkeleny MR, Kandel MM, Sultan MH, Ellakany AI, El-Sayes I (2020) Endoscopic sphincterotomy with balloon dilatation versus sphincterotomy alone for common bile duct stones removal. *Journal of Gastroenterology and Hepatology Research* 9(3):3223–3227
- Ding J, Li F, Zhu HY, Zhang XW (2015) Endoscopic treatment of difficult extrahepatic bile duct stones, EPBD or EST: an anatomic view. *World J Gastrointest Endosc* 7:274–277
- , Koji M., and Sasaki H. Surgical procedure for unexpected balloon burst complication during endoscopic balloon dilatation in a patient with common bile duct stones. *Surgical Case Reports*. 2020; 6(1) p. NA. Accessed 15 Feb. 2021.

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