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Short communication

"Post-cut": An endoscopic technique for managing impacted biliary stone within an entrapped extraction basket

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ABSTRACT

Background and study aims: Ampullary impaction of an entrapped stone-basket complex is not an infrequent yet challenging event during endoscopic retrograde cholangiopancreatography (ERCP). The aim of this study is to evaluate the feasibility, safety, and efficacy of "post-cut" for the management of such scenarios.

Patients and methods: Patients with impacted biliary stone with an entrapped basket during ERCP at West China Hospital, Chengdu, China, from October 2004 to August 2014 were included in this retrospective study. Adequate biliary sphincterotomy was performed in all cases before attempted stone basket removal. Using free hand needle knife techniques, the authors extended the sphincterotomy along the long axis of the distal common bile duct to manage the biliary stone-basket impaction. In comparison with "pre-cut", the authors coined the term "post-cut" referring to this technique. The feasibility, safety, and potential complications of post-cut were analysed.

Results: "Post-cut" was performed in consecutive 10 cases of impacted biliary stone within an entrapped extraction basket. The size of the removed stone ranged from 6 mm to 13 mm. The length of post-cut is 2 mm to 4 mm. The impacted basket was easily retrieved in all patients without complications, including bleeding, perforation, and pancreatitis.

Conclusion: "Post-cut" is a feasible, effective, and safe endoscopic technique when impaction of a biliary stone with an entrapped extraction basket develops.

Introduction

Ampullary impaction of an entrapped biliary extraction basket with a stone occurs not infrequently during endoscopic retrograde cholangiopancreatography (ERCP), with an estimated incidence between 0.8% and 5.9% [1–4]. The existing endoscopic techniques and options include emergency mechanical lithotripsy after cutting the basket cable using a Soehendra mechanical lithotriptor, extracorporeal shock-wave lithotripsy (ESWL), endoscopic laser lithotripsy, large-balloon dilation of the biliary orifice, and surgery [4–9]. However, these options usually significantly prolong the procedural time and costs, subject the patients to additional endoscopy even operation. In this study, the authors describe and report a "post-cut" technique for the retrieval of impacted stones and entrapped baskets. In contrast to "pre-cut", which is performed to gain biliary access [10], the authors coined the term "post-cut" after an adequate biliary sphincterotomy has been performed, before attempted stone removal or subsequent endoscopic interventions. The aim of the study is to evaluate the feasibility, safety and efficacy of post-cut in for the treatment of 10 cases of impacted biliary stones within an entrapped extraction basket.

Patients and methods

Patients

From October 2004 to August 2014, 3540 ERCPs were performed in 2655 patients with choledocholithiasis at the West China Hospital, Chengdu, China. The included study patients met the following criteria: ERCP was performed with a therapeutic duodenoscope (TJF240, Olympus, Tokyo, Japan) and a stone entrapped

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basket with a stone impacted in the ampulla treated with "post-cut". Retrospective analysis was conducted in 10 included patients (7 men, 3 women; median age 64 years; range 35–80) (Table 1, 2), and the feasibility, safety and efficacy of "post-cut" were evaluated in this study. The study protocol was approved by the ethics committee of the West China Hospital.

Endoscopic techniques

All ERCP procedures and post-cut were performed by one senior endoscopist (HB) using a standard therapeutic duodenoscope (TJF240) and signed informed consent was obtained from all patients. During ERCP, these patients received conscious sedation in a semi-prone position. The conscious sedation used for the procedure consisted of a combination of meperidine 50 mg and diazepam 5 mg along with anisodamine 10 mg. Balloon dilation (8–12 mm in diameter) after an adequate sphincterotomy was performed in 4 patients prior to attempted stone extraction. The size of the stones on cholangiograms and distal common bile duct diameters on these patients are shown in Table 2. A distal stricture was not shown on initial cholangiograms. Mechanical lithotripsy was performed and then the trapezoid RxLithotriptor basket was exchanged for a stone extraction basket (FG-22Q-1, Olympus) when the stone was thought to had been crushed. If the stone extraction basket was impacted and could not be disengaged, stone-basket impaction was thought to have occurred. A needle knife (KD-10Q-1, Olympus) was then introduced next to the basket catheter and wires. During post-cut, under endoscopic view, the needle-knife was gently inserted into the papillary orifice and the extended incision was made superiorly toward the position over the basket wire along the long axis of the distal common bile duct. This upward motion of the needle-knife was directed through manipulation of the elevator, large wheel, or by applying upward torque on the shaft of the endoscope during post-cut. The size of post-cut depended on the biliary opening after prior sphincterotomy and balloon dilatation, and the ampullary anatomy of to avoid the complication of perforation. Following post-cut procedures, traction of the basket was applied aiming to release of the impacted stone-basket. All the procedures were performed by step-wise post-cut and traction or tension of the basket cable should be applied to so that the impacted stone-basket becomes more prominent guiding the post-cut (Fig. 2).

Statistical analysis

Because the small size data was not normally distributed, univariable analysis was performed using the Mann-Whitney test for continuous variables. A 2-tailed $p < 0.05$ was deemed statistically significant. All statistical analysis was conducted using IBM SPSS Statistics 19.0.

Results

From October 2004 to August 2014, the authors performed ERCP in 2655 patients with choledocholithiasis at West China Hospital, and 21 patients developed stone-basket impaction during ERCP. In 10 patients (7 men, 3 women; median age 64 years; range 35–80) with stone-basket impaction, (Table 1, 2; Fig. 1) ERCP was performed using a therapeutic duodenoscope with a large working channel (4.2 mm in diameter). Post-cut was carried out in all 10 patients. Of these patients who received post-cut, the estimated

Table 1
Characteristics of the patients.

Characteristics	Post-cut group (n = 10	Emergency mechanical lithotripter group (n = 11)	p value
Age, median, years (range)	64 (35–80)	56 (42–67)	>0.05
Female/Male	3/7	6/5	–
Endoscopy type, n (%)	TJF240, 10 (100%)	JF-260 V, 6 (54.5%)	–
Periampullary diverticulum, n (%)	0	4 (36.4%)	–
Lower common bile duct strictures, n (%)	0	1 (9.1%)	–
CBD size (mm), median (range)	9.5 (8–15)	10 (9–15)	>0.05
Stone size (mm), median (range)	7.5 (6–13)	9 (7–14)	>0.05
Stone number, median (range)	2.5 (1–3)	2 (1–3)	–
EST size (mm), median (range)	4 (3–5)	4 (3–5)	>0.05
Mechanical lithotripsy, n (%)	2 (20%)	4 (36.3%)	–
Balloon dilatation, n (%)	4 (40%)	11 (100%)	–
Impacted stone-basket removal median time, minutes (range)	9 (8–12)	27 (24–30)	<0.001
Extra fluoroscopic radiation exposure dose, mGy (range)	3499 (2765–4367)	335640 (304726–385120)	<0.001
Complications	0	0	–

The Mann-Whitney test was used to compare the 2 groups. Complications include pancreatitis, pain, bleeding, perforation, cholangitis, and cholecystitis. CBD: common bile duct; EST: endoscopic sphincterotomy.

Table 2
Patient, ampullary, peri-ampullary, ductal anatomy and procedural characteristics in patients who underwent post-cut in this study cohort.

Patient	Sex (male/female)/age (years)	Balloon dilatation size prior to post-cut	Stone size	Distal CBD size	Periampullary diverticulum	ML performed	EST size	Post-cut length
1	Female/53	–	7 mm	10 mm	Yes	–	4 mm	3 mm
2	Female/80	8 mm	10 mm	12 mm	Yes	–	4 mm	3 mm
3	Male/64	–	6 mm	8 mm	–	–	5 mm	2 mm
4	Male/67	–	8 mm	9 mm	–	–	5 mm	3 mm
5	Male/58	–	7 mm	8 mm	Yes	–	3 mm	3 mm
6	Male/64	12 mm	13 mm	15 mm	–	Yes	4 mm	3 mm
7	Male/47	10 mm	11 mm	10 mm	Yes	Yes	5 mm	3 mm
8	Female/35	8 mm	10 mm	12 mm	–	–	3 mm	4 mm
9	Male/68	–	6 mm	8 mm	Yes	–	4 mm	2 mm
10	Male/70	–	7 mm	9 mm	Yes	–	4 mm	2 mm

CBD: common bile duct; *ML*: mechanical lithotripsy; *EST*: endoscopic sphincterotomy.

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