의학석사 학위논문

담낭 절제술에 적합하지 않은 환자에서 내시경 초음파 유도 담낭 배액술과 경피적 담낭 배액술의 장기 결과 : 무엇이 더 우수한가?

Long-term outcome of EUS-guided gallbladder drainage vs. percutaneous gallbladder drainage in patients who are unfit for cholecystectomy: which is better?

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조석정

Long-term outcome of EUS-guided gallbladder drainage vs. percutaneous gallbladder drainage in patients who are unfit for cholecystectomy: which is better?

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이 논문을 의학석사 학위 논문으로 제출함

2017 년 11 월

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국문요약

배경/목표

내시경 초음파 유도 담낭 배액술 (EUS-GBD)은 급성 담낭염 환자에서 수술에 적합하지 않은 환자를 치료하는 데 점점 더 많이 사용되고 있다. 그러나 내시경 초음파 유도 담낭 배액술과 기존의 경피적 담낭 배액술 (P-GBD)의 장기 결과를 비교하는 연구결과는 많지 않다. 따라서 급성 담낭염 환자에서 내시경 초음파 유도 담낭 배액술의 효능과 안전성을 비교하기 위한 후향적 연구를 시행 하였다.

방법

2010 년 2 월부터 2015 년 11 월까지의 급성 담낭염으로 담낭 배액술이 필요한 182 명을 조사하였다. 내시경 초음파 유도 담낭 배액술 및 경피적 담낭 배액술 사이의 모든 공변량의 차이 (연령, 성별, 동반 질환, 이전 약물)를 조정하는 성향 점수 가중치를 사용하여 초기 및 후기 부작용과 재시술의 필요성을 비교했다.

결과

본 연구에서는 총 182 명의 환자 (내시경 초음파 유도 담낭 배액술 군 75 명, 경피적 담낭 배액술 군 107 명)를 대상으로 하였다. 기술적 / 임상적 성공률은 EUS-GBD 에서는 98.6%/100% (74/75, 74/74), 경피적 담낭 배액술 군에서는 99.1%/97.1% (106/107, 103/106) 였다 inverse-probability-of-treatment-weighted method 로 조정한 뒤 초기 부작용 두 군간에 통계적으로 유의한 차이가 없었다. 그러나 스텐트의 이동이나 배액관의 이탈, 스텐트 또는 관 폐색, 경피적 관 주위의 염증, 담즙 누출 및 담낭염의 재발을 포함하여 후기 부작용의 경우 내시경 초음파 유도 담낭 배액술 과 비교하여 경피적 담낭 배액술의 교차비가 훨씬 높았다 [교차비 3.39 (95% CI 1.09 to 10.55)]. 경피적 담낭 배액술은 또한 내시경 초음파 유도 담낭 배액술에 비해 재시술의 위험이 더 높았다 [교차비 3.60 (95% CI 1.26 to 10.32)]. 또한 로지스틱 회귀 분석 결과 경피적 담낭 배액술은 재시술과 유의한 관련이 있었다 (교차비 3.68, 95% CI 1.43 to 9.47, P value=0.007).

결론

내시경 초음파 유도 담낭 배액술과 경피적 담낭 배액술은 모두 담낭 배액에 효과적인

수단이었다. 그러나 담낭 절제술이 적합하지 않은 급성 담낭염 환자에서 내시경 초음파 유도 담낭 배액술은 장기 예후에 있어서 경피적 담낭 배액술보다 유익하고 안전 할 수 있다.

차 례

국문요약 ····· 1
표 목차 ····· 4
Introduction ····· 5
Materials and methods ····· 5
Results ····· 9
1. Patient characteristics ····· 9
2. Procedural outcomes ····· 10
3. Early adverse events ····· 12
4. Long-term outcomes ····· 14
Discussion ····· 14
References ····· 17
English abstract ····· 20

표 목차

Table 1. Baseline characteristic of patients ····· 10
Table 2. Outcomes of EUS-GBD vs P-GBD ····· 11
Table 3. Comparison of outcomes by IPTW analysis ····· 12
Table 4. Risk factors for late adverse event needs unplanned admission or reintervention, analyzed by logistric regression analysis····· 13

Figure 1. Partially covered self-expandable tubular metal stent with antimigrating flare ····· 12

Introduction

Laparoscopic cholecystectomy (LC) has been regarded as a definitive treatment of acute cholecystitis for most patients [1-4]. However, laparoscopic cholecystectomy is often difficult to perform in high risk-surgical patients who are extreme elderly or have multiple comorbidities. In these patients, nonsurgical drainage might be needed when patients couldn't get better with conservative treatment. Percutaneous transhepatic gallbladder drainage (P-GBD) has long been used for the treatment of these patients and it's clinical response rates have been reported to range from 56% to 100%. [5-8]. Despite its simple procedure and high efficacy of P-GBD, patents' discomfort, drainage catheter-related adverse and recurrence of cholecystitis after P-GBD removal is the disadvantage of this treatment [9, 10].

Endoscopic ultrasound-guided gallbladder drainage (EUS-GBD) was introduced as an alternative for the patients with acute cholecystitis who are unfit for surgery and have shown high efficacy and safety in previous studies [11, 12]. Moreover, EUS-GBD using self-expandable metal stent (SEMS) offers more simple, effective and durable drainage to inflamed gallbladder [13]. A recent study comparing EUS-GBS and P-GBD have shown lower 30-day adverse event rate in EUS-GBD group [14]. Although short-term efficacy and safety of EUS-GBD has been well documented, there is a lack of study on long-term results compared with P-GBD. We therefore performed this study to compare the long-term efficacy and safety of EUS-GBD and P-GBD in patients with acute cholecystitis.

Materials and methods

This retrospective study was conducted on major referral center.

Study population

We identified 182 patients who are unfit for surgery and underwent gallbladder drainage for acute cholecystitis from February 2010 to November 2015 through the extensive review of

EUS database and electrical medical chart of our institute. Acute cholecystitis was defined as diagnosed according to the Tokyo guidelines (TG) [15]. The patients were regarded as unfit for cholecystectomy when American Society of Anesthesiologists (ASA) class ≥ 3 or having advanced malignancies. The anesthesiologists and surgeons made the treatment decisions together with gastroenterologists. The patients with ASA class V were excluded because EUS-GBS was difficult to perform or might not be helpful for those patients.

EUS-GBD with metal stent

All patients were sedated using intravenous administration of midazolam, or (occasionally) propofol, and meperidine. Endoscopic ultrasound guided gallbladder stenting (EUS-GBS) was performed using a linear-array echoendoscope (GF-UCT 240 or 260-AL 10; Olympus Optical Co., LTD., Tokyo, Japan) with fluoroscopic guidance. Either the prepyloric antrum of the stomach or the bulb of the duodenum was chosen as the puncture point for accessing the gallbladder body or neck and avoiding any intervening blood vessels. A 19-gauge needle (EUSN-19-T; Cook Endoscopy, Winston-Salem, North Carolina, USA) was used to puncture the gallbladder through the gastric or duodenal wall. After the stylet was removed, bile fluid was aspirated for microbacterial culture, and contrast was injected into the gallbladder under fluoroscopic guidance to confirm access.

A 0.035-inch guidewire (Jagwire; Boston Scientific, Natick, Massachusetts, USA) was passed through the EUS needle and then coiled in the gallbladder. The needle was then withdrawn, and a 6-Fr or 7-Fr bougie (Soehendra Biliary Dilatation Catheter; Cook Endoscopy) was inserted and then removed in order to dilate the tract. If there was resistance to advancing the 6-Fr bougie, a triple-lumen needle-knife (Microtome; Boston Scientific) with a 7-Fr shaft diameter was used as a rescue method to dilate the tract using a brief burst of pure cutting current. If resistance was felt during stent advancement, a 4-mm biliary balloon dilator (Hurricane, Boston Scientific) was occasionally used for sufficient dilation of

the tract to facilitate the advance of the stent.

Partially covered self-expandable tubular metal stent (SEMS) with antimigrating flare (Bona-AL stent, Standard SciTech, Seoul, Korea) was then placed over the guidewire. The length of the stent was determined by the thickness of the interposed tissue, with extra length (10–15mm) in order to secure a length of the proximal stent in the gallbladder (about 15mm). When needed (the presence of thick pus or particles of lithiasis), a nasogallbladder drainage tube (ENBD-5; Cook Endoscopy) was occasionally inserted through the stent lumen for continuous irrigation. Daily or twice-daily irrigation with 10mL of saline solution through the nasocystic tube was attempted for 24–48 hours in order to flush out thick bile content.

Figure 1. Partially covered self-expandable tubular metal stent with antimigrating flare

P-GBD

P-GBD was performed by trained interventional radiologists in the interventional suite under aseptic conditions, using local anesthesia. A transhepatic route was used in all patients to decrease bile leakage. The gallbladder was punctured using an 18-gauge needle (Cook Medical, Bloomington, Indiana, USA) under direct ultrasound visualization. Confirmation of correct needle tip position within the gallbladder lumen was ascertained by aspiration of bile and opacification by injecting small amounts of contras medium under fluoroscopy. A 0.035-

inch guidewire was inserted through the needle and securely coiled inside the gallbladder lumen. After adequate dilatation, an 8.5F pigtail drainage catheter (Cool Medical, Bloomington, Indiana, USA) was inserted into the gallbladder lumen over the guidewire.

Definition of events

The main outcomes evaluated in the study were: 1) technical success, 2) clinical success, 3) procedural adverse events, 4) late adverse events related to stent, and 5) stent patency.

Technical success was defined as successful placement of the stent or catheter into the gallbladder endoscopically and percutaneously, along with the adequate flow of the radiocontrast and bile through the stent. ***Clinical success*** was defined as complete resolution of clinical symptoms with laboratory tests returning to normal. Adverse events were classified according to consensus guidelines [16]. ***Early adverse events*** were defined as any procedure-related adverse events that occurred within 2 weeks, and these included bleeding, bile peritonitis, pneumoperitoneum, and perforation. ***Late adverse events*** were defined as any stent-related adverse events, including stent migration, occlusion, inflammation or recurrence of acute cholecystitis that occurred later than 2 weeks after stent placement.

Recurrence of acute cholecystitis was defined as the recurrence of typical symptoms with characteristic imaging findings. Re-intervention was defined as any type of endoscopic, percutaneous, or surgical procedure that was required to improve gallbladder drainage or treat adverse event after EUS-GBS/P-GBD. ***The stent patency*** was calculated by the interval (days) between the time of stent placement and the time of stent occlusion, stent migration, or patient death. If a patient demonstrated no clinical symptoms related to stent malfunction, the duration of stent patency was regarded as equal to the survival time. Survival was calculated as the time from stent placement to death or to the end of observation if the patient was alive at the end of the study.

Statistical analysis

Comparisons were performed using the Student *t* test for continuous variables and the chi-

squared or Fisher exact test for categorized variables. Logistic regression analysis was used to identify factors associated with the late adverse event that needs unplanned admission or re-intervention. To avoid selection bias and potential confounding factors that might influence the chance of being treated with specific procedures, we performed a weighted propensity score analysis using the inverse probability of treatment weights (IPTW). Propensity score estimated with two treatments as the dependent variable by logistic regression analysis. A full nonparsimonious model was developed that included all the variables in Table 1. With this technique, weights for patients receiving EUS-GBS were the inverse of propensity score, and weights for patients not receiving EUS-GBS were the inverse of (1-propensity score). The absolute standardized differences were used to diagnose the balance after propensity analysis. All absolute standardized differences after IPTW were less than 0.1 except WBC (ASD=0.111). In addition, Cox model was created with IPTW as the weights and WBC as the adjusted covariate. $P < 0.05$ was considered statistically significant. All analyses were performed using SAS 9.4 statistical software (SAS Institue, Cary, NC).

Results

Patient characteristics

A total of 182 patients (75 in EUS-GBD group and 107 in PTGBD group) were enrolled in this study. Their baseline demographic and clinical characteristics of the 2 groups are shown in Table 1. All patients were ASA class III or IV, and 89 patients (35 in EUS-GBD group, 54 in P-GBD group) had advanced malignancies. There were no significant differences in the background demographic details between the two groups of patients, except for the gender and cause of cholecystitis.

Table 1. Baseline characteristic of patients (N=182)

	EUS-GBD (n=75)	P-GBD (n=107)	p-value	Stddiff	Weighted Stddiff
Median age (range), years	71.3 (65-79)	71 (59-79)	0.155	0.292	0.080
Male:Female	35/40	66/41	0.045	0.305	0.012
Cause of cholecystitis, n (%)					
Calculous	34 (45.33)	55 (51.4)	0.037	0.395	0.025
acalculous	9 (12)	24 (22.43)			
Malignant obstruction	32 (42.67)	28 (26.17)			
ASA classification, n (%)					
III	19 (25.33)	21 (19.63)	0.657	0.137	0.096
IV	21 (28)	32 (29.91)			
advanced malignancy	35 (46.67)	54 (50.47)			
Use of antiplatelet (aspirin), n (%)					
none	60 (80)	84 (78.5)	0.807	0.037	0.072
yes	15 (20)	23 (21.5)			
Use of antiplatelet (plavix), n (%)					
none	69 (92)	98 (91.59)	0.921	0.015	0.020
yes	6 (8)	9 (8.41)			
Use of anticoagulant (warfarin), n (%)					
none	70 (93.33)	103 (96.26)	0.491	0.132	0.055
yes	5 (6.67)	4 (3.74)			
WBC count ($X10^3$ /uL), mean (SD)	11.14 (5.93)	13.47 (10.25)	0.304	0.278	0.111
Platelet count ($X10^3$ /mm^3), mean (SD)	226.8 (107.08)	221.21 (147.98)	0.487	0.043	0.035
PT (INR), mean (SD)	1.21(0.64)	1.25 (0.34)	0.003	0.074	0.035
BUN (mg/dL), mean (SD)	16.25 (10.23)	21.47 (14.32)	0.005	0.419	0.003
Cr (mg/dL), mean (SD)	0.89 (0.48)	1.14 (1.01)	0.272	0.316	0.048
Albumin (g/dL), mean (SD)	2.99 (0.57)	2.72 (0.56)	0.002	0.471	0.087
CRP (mg/dL), mean (SD)	12.05 (8.64)	14.32 (9.91)	0.115	0.245	0.005
Underlying disease, n (%)					
Neurologic disease	19 (25.33)	30 (28.04)	0.686	0.061	0.042
Pulmonary disease	15 (20)	15 (14.02)	0.284	0.160	0.022
Cardiovascular disease	23 (30.67)	30 (28.04)	0.701	0.058	0.091
Cancer	40 (53.33)	65 (60.75)	0.319	0.150	0.085
DM	26 (34.67)	26 (24.3)	0.128	0.229	0.011
ESRD	2 (2.67)	4 (3.74)	1.000	0.061	0.030
Liver cirrhosis	3 (4)	11 (10.28)	0.118	0.246	0.065

Stddiff: Standardized difference Weighted Stddiff: Standardized difference using the inverse-probability-of-treatment weighting

Table 2. Outcomes of EUS-GBD vs P-GBD

	EUS-GBD (n=75)	P-GBD (n=107)	*p*-value
Follow up period, median (range), days	388 (74-862)	219 (81-666)	0.367
Technical success	74/75 (98.6%)	106/107 (99.1%)	1.000
Clinical success	74/74 (100%)	103/106 (97.1%)	0.270
Early adverse event	5 (6.8%)	16 (15.0%)	0.103
bile peritonitis	2	0	
stent or tube occlusion	1	4	
pneumoperitoneum	2	0	
migration	0	5	
bleeding	0	4	
bile leakage	0	1	
perforation	0	1	
tract inflammation around tube	0	1	
Late adverse event	5 (6.8%)	21 (19.6%)	0.017
migration or dislodgement	3	5	
stent or tube occlusion	2	4	
tract inflammation around percutaneous	0	5	
bile leakage	0	2	
recurrence after percutaneous tube removal	0	7†	
Patients who need 1 ≥ reintervention	7/74 (9.5%)	23/106 (21.7%)	0.041
P-GBD indwelling duration, median (range) days		20.0 (14.0-45.2)	
Patency duration, median (95% CI), days	208.0 (126.4-289.5)		

Procedural outcomes

The procedural success and adverse events are summarized in Table 2. The technical success rates of EUS-GBD (74 of 75; 98.6%) and P-GBD (106 of 107; 99.1%) were similar (*P*=1.00). One patient in the EUS-GBD group and 1 patient in the P-GBD group failed the procedure. In the former, accidental loss of guidewire access during stent deployment was occurred. After removal of the mispositioned stent, an endoscopic closure was performed using hemoclips, immediately upon recognition of the iatrogenic duodenal perforation. The patient's overall condition eventually improved after EUS-guided gallbladder aspiration and

conservative treatment, and there was no evidence of clinical peritonitis. The patient who failed the P-GBD was drained of ascites by free wall puncture. She was a patient with advanced pancreatic cancer and was transferred without further action. The clinical success rates of EUS-GBD (74 of 74; 100%) and P-GBD (103 of 106; 97.1%) were also similar (*P*=0.270).

Early adverse events

The rate of early adverse event rate was higher in the P-GBD group but the difference was not statistically significant [5(6.8%) in EUS-GBD group vs. 16(15%) in P-GBD group; *P*=0.103]. Table 3 summarizes the odds ratio of adverse outcomes in patients receiving either EUS-GBD versus P-GBD using unadjusted and adjusted multivariate analyses. The P-GBD group showed a high odds ratio for early adverse events before and after adjustment, but there was no statistical significance.

Table 3. Comparison of outcomes by IPTW analysis (N=180, 74 vs 106)

			Crude				IPTW			
	group	Event	Odds ratio	95% CI		P-value	Odds ratio	95% CI		P-value
Early adverse event	EUS-GBD	5	1				1			
	P-GBD	16	2.453	0.857	7.025	0.095	2.894	0.917	9.137	0.070
Late adverse event	EUS-GBD	5	1				1			
	P-GBD	21	3.409	1.222	9.509	0.019	3.385	1.086	10.549	0.035
Re-intervention	EUS-GBD	6	1				1			
	P-GBD	26	3.683	1.432	9.474	0.007	3.602	1.257	10.322	0.017

Table 4. Risk factors for late adverse event needs unplanned admission or reintervention, analyzed by logistic regression analysis (N=180, Event=33)

	Univariate				Multivariate*			
	Odds ratio	95% CI		P-value	Odds ratio	95% CI		P-value
Group								
EUS-GBD	1							
P-GBD	3.683	1.432	9.474	0.007	3.536	1.333	9.375	0.011
Age	0.996	0.968	1.026	0.801				
Sex	0.725	0.331	1.591	0.423				
Cause of cholecystitis								
Calculous	1							
Acalculous	0.648	0.221	1.907	0.431				
Malignant obstruction	0.654	0.273	1.564	0.340				
ASA classification								
III	1							
IV	2.275	0.737	7.020	0.153				
advanced malignancy	1.342	0.448	4.024	0.599				
Use of antiplatelet (aspirin)	2.815	1.226	6.466	0.015	2.601	1.032	6.554	0.043
Use of antiplatelet (plavix)	0.692	0.148	3.231	0.640				
Use of anticoagulant (warfarin)	Infinite			1.000				
WBC count (X103 /uL)	1.011	0.971	1.052	0.601				
Platelet count (X103 /mm3)	0.996	0.992	0.999	0.022	0.996	0.993	1.000	0.051
PT (INR)	0.886	0.363	2.161	0.790				
BUN (mg/dL)	1.016	0.989	1.043	0.239				
Cr (mg/dL)	1.377	0.941	2.016	0.100	1.053	0.686	1.615	0.814
Albumin (g/dL)	0.724	0.368	1.425	0.350				
CRP (mg/dL)	1.006	0.967	1.047	0.751				
Neurologic disease	0.870	0.362	2.092	0.756				
Pulmonary disease	1.254	0.465	3.385	0.655				
CV disease	1.566	0.703	3.489	0.273				
Cancer	0.817	0.379	1.760	0.606				
DM	1.414	0.626	3.194	0.404				
ESRD	2.400	0.420	13.706	0.325				
LC	1.971	0.577	6.736	0.279				

Long-term outcomes

Late adverse event rate was higher in P-GBD group [5(6.8%) in EUS-GBD group vs. 21(19.6%) in P-GBD group; *P* =0.017]. P-GBD also showed significantly higher odds ratio compared to EUS-GBD [odd ratio 3.39 (95% CI 1.09 to 10.55)]

Seven patients in the P-GBD group experienced the recurrence of cholecystitis after tube removal. One patient visited the emergency room with tube malfunction and the tube migration was noted. The tube was removed and the cholecystitis recurred. The patient recovered after the endoscopic transpapillary gallbladder drainage. The remaining 6 patients removed the tube after confirming the patency of the cystic duct, but the cholecystitis recurred. Five of the patients underwent P-GBD and one patient improved after US-guided percutaneous aspiration.

Re-intervention rate was also higher in PTGBD group [7(9.5%) in EUS-GBD group vs. 23(21.7%) in P-GBD group; *P*=0.041]. After adjustment of IPTW method, P-GBD showed a higher risk of the additional intervention compared to EUS-GBD [odd ratio 3.60 (95% CI 1.26 to 10.32)]. Moreover, logistic regression analysis showed that P-GBD was significantly associated with re-intervention [Table 3, odds ratio 3.68, 95% CI 1.43 to 9.47, P value=0.007].

Discussion

In this comparative cohort study, late adverse event and need for re-intervention were less common in EUS-GBD group compared to P-GBD group at long-term follow-up. By conventional multivariate logistic regression analysis, P-GBD was the most significant risk factor for the late adverse event that needs unplanned admission or re-intervention among these cohorts. Moreover, these results remained similar in the IPTW-based analysis to reduce selection bias and potential confounding factors that might influence the chance of being treated with specific procedures. To the best our knowledge, this is the first study comparing

long-term outcomes between EUS-GBD and P-GBD in relatively large-cohort of patients with acute cholecystitis who were unfit for surgery.

In the TG 13 indications and techniques for gallbladder drainage in acute cholecystitis, P-GBD is considered a standard alternative to early cholecystectomy, especially in surgically high-risk patients with acute cholecystitis [17]. They stated EUS-GBD is still required to be validated and should be performed in high-volume institutes by skilled endoscopists. In the previous study comparing EUS-GBD with nasobiliary drainage tube and P-GBD [12], technical and clinical success rates were similar in EUS-GBD and P-GBD. Complication rate within 1 week of the procedure was also similar in that study (7% in EUS-GBD and 3% in P-GBD; P =0.492). Recently SEMS has been used in EUS-GBD. Long-term outcomes after EUS-GBD with SEMS was once evaluated by Choi et al. and late adverse event rate was 7.1% [95% CI 5.7-8.4%] and re-intervention rate was 3.6% in their study [13] Moreover, lumen apposing metal stent also introduced in EUS-GBD and one cohort study comparing EUS-GBD and P-GBD showed that 30 day adverse event rates were similar between two groups (17 [28.8%] vs. 10[16.9%]; P=0.13) [14].

Based on these findings, the recently published TG 18 guideline stated EUS-GBD could be considered in high-volume institutes [18].

EUS-GBD has inherent technical difficulties and risk of adverse events compared to P-GBD. However, recent studies on EUS-GBD report a high degree of technical success rate and low adverse event rate as the experience of the procedure has accumulated [14, 19-21]. In the current study, the technical success rate was similar to previous reports. The early adverse event occurred 5 (6.8%) in EUS-GBD group and a case of stent occlusion in EUS-GBD group occurred 8 days after the procedure. The patient was treated endoscopically by addition of plastic stent through the metal stent, after which stent occlusion did not recur. Stent migration did not occurred at all in EUS-GBD group. In the late adverse event, 2 cases of stent occlusion by food material developed in EUS-GBD group. Recently, Kim et al

pointed out this type of adverse event in their report and expressed concerns about EUS-GBD [22]. However, unlike their concerns, our study showed that these adverse events occurred in relatively small numbers despite long-term follow-up and could be treated endoscopically by adding plastic stent or metal stent.

In the P-GBD group, 16 early adverse events and 21 late adverse events were occurred during follow up period and most of them were stent occlusion and dislodgement. When these complications occurred, most patients had to visit the emergency room and had to undergo additional procedure such as tube change or re-insertion (23/106, 21.7%). Late adverse event and need for re-intervention were significantly more common in P-GBD group than EUS-GBD group.

Of course, when interpreting these results, selection bias and confounding factor should be taken into consideration, and our study shows that these results are still valid after adjustment through IPTW method.

The current study has several limitations. First, since this was a retrospective study, it cannot be free from selection bias even though IPTW method was applied. Second, the study is limited by its single-center design. It may not be valid to extrapolate the results to other centers where endoscopists may have varying levels of expertise in EUS-GBD.

Until now, most studies comparing efficacy and safety of EUS-GBD and P-GBD focused on the short-term outcomes such as technical/clinical success rate and early adverse events. However, the majority of patients with acute cholecystitis survive for long periods of time after being well treated for the episode of acute inflammation. Also, given that the technical success and the clinical success are close to 100%, it is now time to look at the long-term performance of EUS-GBD and P-GBD in these patients. Our study findings suggest that EUS-GBD could be beneficial as a long-term treatment strategy for acute cholecystitis in surgically high-risk patients.

In conclusion, EUS-GBD and P-GBD were both safe and effective for the acute phase

treatment of acute cholecystitis of high-surgical risk patients. However, considering long-term follow-up and risk of recurrence, EUS-GBD may be more helpful to the patients who couldn't undergo surgery.

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English Abstract

Background and aims: EUS guided gall-bladder drainage (EUS-GBD) has become increasingly used to treat patients with acute cholecystitis who are not eligible for surgery. However, there are limited data comparing long-term outcomes of EUS-GBD and conventional percutaneous cholecystostomy (P-GBD). We therefore performed a retrospective study to compare the efficacy and safety of EUS-GBD and P-GBD in patients with acute cholecystitis.

Method: We studied 182 patients who required gallbladder drainage for acute cholecystitis from February 2010 to November 2015. We used propensity-score weighting to adjust for differences in all covariates (age, sex, comorbid diseases, previous drugs) between EUS-GBD and P-GBD groups, and compared early, late adverse events and need for re-intervention in each group.

Result: A total of 182 patients (75 in EUS-GBD group and 107 in P-GBD group) were enrolled in this study. The technical/clinical success rate was 98.6%/100% (74/75, 74/74) in EUS-GBD and 99.1%/97.1% (106/107, 103/106) in P-GBD group respectively. After adjustment of inverse-probability-of-treatment-weighted method, early adverse event rate was no statistical difference between two groups. However, for late adverse events including migration of stent or dislodgement of drainage tube, stent or tube occlusion, tract inflammation around percutaneous tube, bile leakage and recurrence of cholecystitis it is shown P-GBD significantly higher odds ratio compared to EUS-GBD [odd ratio 3.39 (95% CI 1.09 to 10.55)]. P-GBD also showed a higher risk of additional intervention compared to EUS-GBD [odd ratio 3.60 (95% CI 1.26 to 10.32)]. Moreover, logistic regression analysis showed that P-GBD was significantly associated with re-intervention [odds ratio 3.68, 95% CI 1.43 to 9.47, P value=0.007].

Conclusion: EUS-GBD and P-GBD were both effective means of achieving gallbladder

drainage. However, EUS-GBD might be beneficial than P-GBD in long term management for the patients with acute cholecystitis who are not suitable for cholecystectomy.