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Safety and Usefulness of Percutaneous Transhepatic Cholecystoscopic Examination (PTCCS) in High-Risk Surgical Patients Manifesting Acute Cholecystitis

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= 국문초록 =

수술이 위험한 급성 담낭염 환자에서 경피 경간적 담낭경 검사의 안전성 및 유용성

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연구배경 및 목적: 수술이 위험한 급성 담낭염 환자에서 경피 경간적 담낭 배액술은 급성 증상의 완화를 위한 유용한 방법으로 알려져 있다. 본 조사에서는 이들에서 담낭 배액술 후 병적 담낭의 진단 및 치료를 위해 시행한 담낭경 검사의 안전성과 유용성에 관해 조사하였다. **대상 및 방법**: 1992년 1월부터 1998년 6월까지 급성 담낭염으로 서울중앙병원을 방문하여 경피 경간적 담낭 배액술을 시행한 268명의 환자 중 수술이 위험하여 경피 경간적 담낭경 치료를 시행한 33명(남/여; 20/13, 평균연령 67±2세)의 환자를 대상으로 하였다. **결과**: 경피 경간적 담낭 배액술 및 담낭경 검사는 모든 환자에서 성공하였다. 시술동안 경증의 합병증이 5예에서 발생하였다(전기수압 쇄석시 발생한 경도의 출혈 2예, 담낭 배액관의 이탈 2예, 복강내로의 담즙 유출). 경피 경간적 담낭경 검사상 급성 담낭염과 관련된 담낭의 병변으로 26예의 담낭 담석, 3예의 담낭내 담즙 찌꺼기, 3예의 담낭암, 1예의 간 흡충이 있었는데 담낭암의 경우 모두 이전의 방사선학적 검사로 예측되지 않았었다. 26예의 담낭 담석에 대해 경피 경간적 담낭경 검사를 통한 담석제거를 시행하였으며 1~4회 (평균 2.2회)후에 모든 환자에서 성공적 담석 제거가 이루어 졌다. 12~60개월 (평균 7개월)의 추적 관찰 기간 동안 담낭 담석의 재발은 3/22 (14%)예에서 발생하였으나, 증상의 재발은 없었다. **결론**: 경피경간적 담낭경 검사는 수술이 위험한 급성 담낭염 환자의 진단 및 치료에 유용하고 안전하게 사용될 수 있을 것으로 사료된다.

핵심 단어: 급성 담낭염, 경피 경간적 담낭경 검사

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INTRODUCTION

Surgical intervention for acute cholecystitis is reported to have mortality rates of 3.5% to 4%.[1] This figure, however, may exceed 10% in high surgical risk patients.[2] Percutaneous transhepatic cholecystostomy (PC) is a well-known, safe and effective alternative therapeutic option in those patients.[3~5] In acalculous cholecystitis, PC itself may be sometimes curative.[6] In calculous chololecystitis, PC is often followed by radiological intervention for the removal of gallstone.[7~9]

Cholecystoscopic stone removal through the percutaneous transhepatic cholecystostomy tract was recently introduced as a new modality for treating gallstones.[10~12] However, this method has not been widely applied yet because of the concern for bleeding or parenchymal disruption which might occur during dilatation of percutaneous access route used for percutaneous transhepatic cholecystoscopic examination (PTCCS). At present, percutaneous transhepatic cholangioscopic examination (PTCS) is generally recommended for the bile duct evaluation due to few procedure-related complications. PTCCS and PTCS are made by very similar techniques.[13,14] On the basis of our accumulated experiences of PTCS, therefore, we have performed PTCCS for patients who presented acute cholecystitis and inevitably underwent percutaneous cholecystostomy due to the poor surgical condition.

The aim of the present study is to identify the diagnostic and therapeutic usefulness of PTCCS in high-risk surgical patients manifesting acute cholecystitis.

PATIENTS AND METHODS

Between Jan 1992 and Jun 1998, among 268 patients who underwent decompressive PC as a temporizing procedure for the acute cholecystitis, 33 consecutive patients for whom surgery is prohibitory risky, and therefore PC followed by PTCCS were performed were enrolled. Twenty were men, and thirteen were women. Their mean age was 67 ± 2.

Accompanying diseases related to great motility and mortality risk included serious cardiovascular diseases (n=14), pulmonary diseases (n=5), terminal stage of malignancy (n=4), advanced liver cirrhosis (n=5), renal diseases (n=2), and old age over 75 years with multi-systemic complications (n=3). Detailed definitions of the high-surgical risk group for the individual diseases were based on an Anesthesiology textbook.[15] As the serious cardiovascular diseases, recent onset-AMI, cerebrovascular accident within 3 months and CHF with severity of NYHA (New York Heart Association) functional class IV were included. For the pulmonary diseases, patients with COPD or asthma demonstrating preoperative pulmonary function of FEV_1 less than 1 L and MBC (maximal breathing capacity) of less than 50% predicted were considered to be a high-surgical risk group. Patients with advanced liver cirrhosis and renal diseases were all in the critical care setting. The old age patients over 75 were all over score III of American Society of Anesthesiologists (ASA) physical status classification.[15]

They were diagnosed to have an acute cholecystitis (24 calculous, 9 acalculous) from clinical findings such as right upper quadrant pain, fever and leucocytosis ($WBC > 10,000/mm^3$), and radiological findings including gallbladder wall thickening, gallbladder distension and the sonographic Murphy's sign on ultrasonography. The patients with concomitant common bile duct or intrahepatic duct lesion were excluded in this study.

Emergent PC was performed using 8. 5 Fr pigtail drainage catheter (Cook, USA) at the seventh or eighth intercostal space under the combination of

sonographic and fluoroscopic guidance. The sinus tract was dilated and was placed by a 16 Fr or 18 Fr catheter in one session three days after PC. In our experience, three days were enough for allowing relieve of pain at puncture site and observation of occurrence of complication related to the PC. To control pain during the tract dilatation, subcutaneous injection and intercostal nerve block with Lidocain were done as a local anesthesia. PTCCS was performed 10 days after tract dilatation, when the patients were clinically stabilized and their sinus tracts were matured. Broad-spectrum antibiotics were prophylactically used. All PTCCS were made with instillation of normal saline using a conventional cholangioscope of 5mm outer diameter (Olympus, Tokyo, Japan) under the intravenous sedation with Demerol.

During PTCCS, abnormal gallbladder mucosal lesions were carefully examined and biopsy was performed wherever necessary. If gallstones were present, they were removed by Dormia basket (Olympus, Q22, Japan). Stones larger than 10mm were fragmented by crushing with forceps or by using electrohydraulic lithotripsy (EHL), (Lithtron EJ220, Olympus, Japan). EHL probe was passed through the biopsy channel of the cholecystoscope and fragmentation of calculi was accomplished with direct visualization. Stone fragments were removed by basket. If stones were not cleared by one session, the subsequent stone removal was repeated with 2 or 3-day interval. The procedure was terminated when complete clearance of stone by cholecystoscopic inspection of gallbladder and patency of cystic duct by cholecystogram were confirmed. Draining catheter of gallbladder was removed when the clinical status of the patients whose external drainage tube had been clamped was stable for 3 days.

Adjunctive therapy of ursodeoxycholic acid (10 mg/kg) during follow-up period was administered in all the patients after discharge. Follow-up included clinical assessment and sonographic examinations at 3rd, 6th, 12th months and then annually thereafter. The clinical outcomes, complications and follow-up results of PTCCS were retrospectively analyzed.

All the patients were offered two options, surgical treatment and cholecystoscopic treatment. They chose PC followed by PTCCS. Written consents were obtained.

RESULTS

1. Clinical outcomes of PTCCS

PC was successfully accomplished in all of the 33 patients. Abdominal pain and fever were improved within two days after decompression of gallbladder and drainage of bile for all of them.

PTCCS revealed 26 cases of gallstones, 3 of sludge ball, 3 of gallbladder carcinoma and 1 of Clonorchiasis as associated gallbladder lesions with acute cholecystitis. Among 26 patients of calculous cholecystitis, three patients initially misdiagnosed to have acalculous cholecystitis eventually were diagnosed to have multiple small stones by PTCCS. Most gallstones were identified in the gallbladder lumen, but impacted cystic duct stones were documented in 5 patients. The size of stone was 3～25 mm (mean 10.6 mm), and the number of stones was 1～7 (mean 3.4).

Among three patients with the gallbladder cancer, one patient was demonstrated to have the concomitant fundal cancer with multiple gallstones. Cancer was not predicted by radiological study before PTCCS. He refused further treatment and died due to the hepatic metastasis of the gallbladder cancer 7 months after PTCCS. In another two patients with cancers, whose imaging study could not reveal a stone or a cancer, a minute mucosal nodularity with sludge was demonstrated (Fig. 1). The mucosal lesion was at the neck portion of gallbladder, interrupting bile drainage. It was confirmed as cancer by targeted cholecystoscopic biopsy. They underwent endoscopic ultrasono-

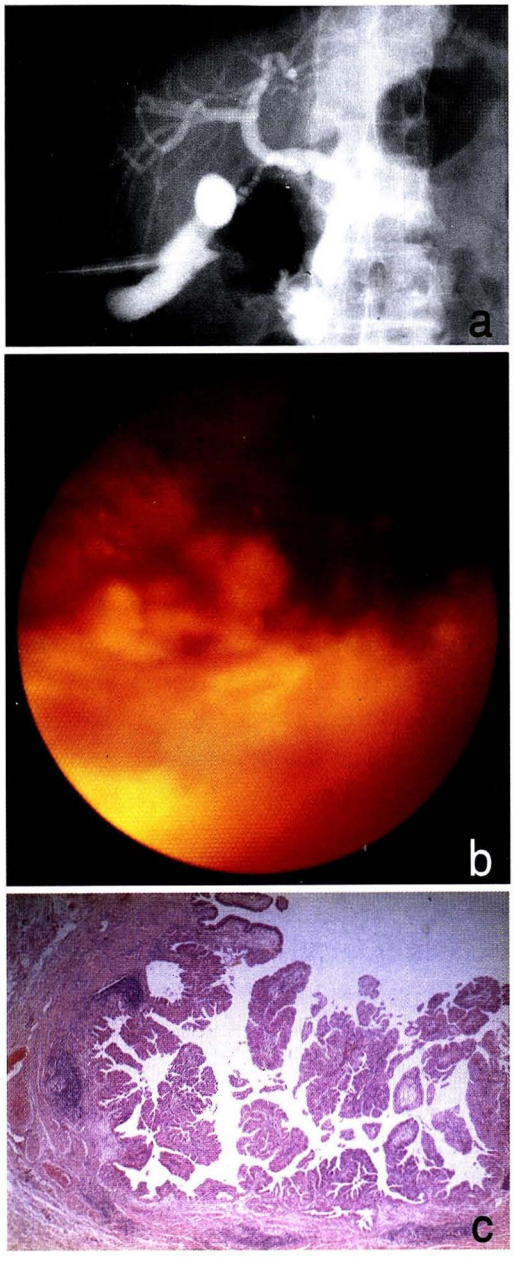

Fig. 1. a; Percutaneous cholecystogram shows no definitive mucosal lesions. b; Subtle mucosal irregularity is found at the neck portion of the gallbladder during PTCCS. c; Well-defferentiated adenocarcinoma confined to mucosal layer is observed in the surgical specimen (H&E, ×40).

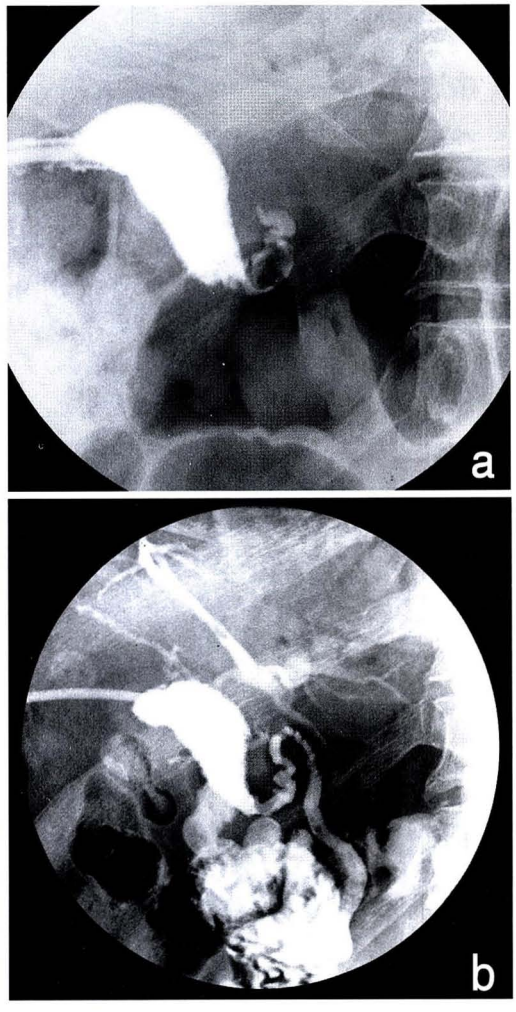

Fig. 2. a; A gallstone is impacted at cystic duct. b; After removal of stone, cholecystography shows patent cystic duct free of stone.

graphy for the evaluation of depth of invasion and were treated with open cholecystectomy after resolution of acute stage of myocardial infarction. On histology, malignant cells were confined to mucosal layer. These two patients are still alive and well with no evidence of recurrence for 13 and 21 months, each.

For the evaluation of diffuse gallbladder wall thickening mimicking cancer on ultrasonography or CT scan, PTCCS was performed for three patients.

Cholecystoscopic findings of hyperemic and proliferating mucosa with tiny multiple stones were compatible with those of acute calculous cholecystitis. Histologic examination revealed acute inflammations with no atypical cell. They were followed-up for at least 2 years after removal of stones and are still asymptomatic with no change of radiological findings.

For 26 patients with gallstones, PTCCS and subsequent stone removal were successfully carried out in one to four consecutive sessions (mean 2.2 sessions). In 17 patients, gallbladder was simply cleared by expelling stone through the percutaneous tract with Dormia basket. In nine patients whose stones were too large to be extracted through the dilated percutaneous tract, stones were fragmented using EHL. Removals of impacted cystic duct stones in five patients were also successfully accomplished (Fig. 2). Complete clearance of stones was achieved in all (100%) patients.

One patient was found to have a large number of Clonorchis parasites, regarded as a cause of acute cholecystitis, within the distended gallbladder during PTCCS. He was treated by Praziquantel. The hyperechoic shadow of parasites disappeared on the follow-up ultrasonogram.

2. Complications of PTCCS

Tract dilatation was well tolerated and was successfully terminated without significant morbidity and mortality in all the patients. During PTCCS, minor complications (2 of minor bleeding during EHL, 2 of tube dislodgement and 1 of bile leakage to peritoneum) occurred in five patients. These complications were medically controllable and there was no death related to the procedure.

3. Follow-up after PTCCS and stone removal

Of the 26 patients whose gallstones were successfully removed, 22 patients were followed-up for 12 months to 5 years (mean: 27 months). During this period, two patients have died due to the unrelated problem with gallstones, one from pancreatic cancer and one from acute myocardial infarction. Another two patients were lost to follow up.

Gallstones recurred in three (3/22, 14%) patients during the follow-up period, but they remain asymptomatic. Nineteen of stone-free patients were also asymptomatic. No symptomatic recurrence was found in patients with acalculous cholecystitis.

DISCUSSION

To date, cholecystectomy is the best therapeutic modality for acute cholecystitis. In cases of patients with severe coexisting diseases or elderly patients, however, less invasive PC may be more beneficial than cholecystectomy because of its low morbidity and mortality.[1~5] Most patients of acute cholecystitis is induced by gallstone. There have been many reports on the interventional cholecystolithotomy through the percutaneous tract such as radiological extraction with basket or contact dissolution with methyl tert-butyl ether (MTBE).[7~9] After introduction of PTCCS in 1981, PTCCS has been applied for the treatment of gallbladder stones.[10]

As shown in the present study, PTCCS and the stone removal can provide several advantages over radiological intervention. First advantage is its high success rate in stone removal. In our study, the success rate was 100 % which was superior to 80~90% of the radiological intervention.[7,8] This good result may be attributable to the fact that the procedure is performed under the direct visualization. Grasping and trapping of stone are more readily accomplishable under the direct visualization. Even tiny residual stones, which may be a future nidus of recurrent stones, can be completely removed. Furthermore, application of EHL may improve the clearance

rate of large stones.

Another advantage is that mucosal evaluation is possible during PTCCS. The gallbladder cancer has been incidentally identified in 1~2% of cholecystectomy specimens.[16] Detection of early gallbladder carcinoma is the best policy for the treatment of the gallbladder cancer. Despite of the improvement of ultrasound technology and an increased awareness of the ultrasonic feature of the gallbladder cancer, detection of an early gallbladder cancer is a still perplexing problem. According to Nakawaza's report[17] on the characteristics of the early gallbladder cancer, a flat type cancer was more common than polypoid or papillary type. In addition, 80~90% of early gallbladder cancers coexisted with stones and were found incidentally during cholecystectomy for the stone-bearing gallbladder.[18] These characteristics of the early gallbladder cancer are thought to be responsible for the low preoperative detection rate.

In our study, the gallbladder cancers were detected in 3 of 33 patients with acute cholecystitis. The incidence seems to be high compared to that of general population. Our study population, however, is limited to the patients manifesting acute cholecystitis and direct comparison between two groups is not feasible. In addition, PTCCS can elicit radiologically unrecognizable lesions of the gallbladder by the meticulous mucosal evaluation. Actually, cancers in our study were all early gallbladder cancer and an appropriate management was eventually provided after resolution of critically ill condition.

Meanwhile, PTCCS may also provide useful information for differentiation of benign gallbladder wall thickenings from cancers. Direct mucosal evaluation and concomitant histological confirmation may lead to avoiding risky surgical treatments.

In spite of diagnostic and therapeutic advantage of PTCCS, however, it can be argued whether patients having acute cholecystitis should routinely undergo PTCCS or not, due to the concern on its invasiveness.[19] In our study, therefore, we limited PTCCS employment only to the patients who presented acute cholecystitis and inevitably needed percutaneous cholecystostomy to avoid high surgical mortality. In those patients, dilatation of percutaneous tract which was accomplished at one stage under the adequate local anesthetics coverage was well tolerated and no severe complication occurred. In addition, the time needed for tract maturation after PC is not thought to be a time-waste, but is a requisite for resolution of acute inflammation by the bile drainage.

In patients with gallbladder stones, however, any treatment that leaves the gallbladder *in situ* has an accompanying risk of the stone recurrence. In our study, recurrence rate was 14% (3/22). None of the patients with recurrent gallstones experienced biliary pain or acute cholecystitis during the follow-up period. This low recurrence rate of gallstones and good clinical outcomes may be explained by the complete clearance of even tiny stones and the long-term administration of ursodeoxycholic acid (UDCA). Particularly, UDCA administration was reported to reduce the emergence of biliary pain and acute cholecystitis by the dissolution of cholesterol crystal and the anti-inflammatory effect of UDCA.[20]

In conclusion, PTCCS may be justified in the management of acute cholecystitis in selected patients of high surgical risk. PTCCS is regarded as a valuable tool for diagnosing and treating acute cholecystits in high-risk surgical patients.

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