# Impact of Food on Hepatic Clearance of Patients After Endoscopic Sphincterotomy

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**Background:** The recurrence rate of common bile duct stones (CBDS) is around 3–21% after treatment by endoscopic sphincterotomy (ES). Fatty meal has been shown to improve hepatic clearance in both patients with intact gallbladder and post-cholecystectomy after ES. This study tested the effects of different kinds of food on hepatic clearance by using quantitative cholescintigraphy (QC) in patients after ES.

**Methods:** Forty-seven patients after ES with abnormal QC were enrolled in our study. Complete ablation of sphincter function was confirmed by sphincter of Oddi manometry. Fasting QC was done in every patient shortly after normalization of liver function, and then followed with low-fat and fatty-meal QC. Each of the 47 subjects was observed for the effect on hepatic clearance at 3 different levels of treatments (diets and fasting). Additionally, possible factors responsible for recurrent CBDS were investigated by means of logistic regression.

**Results:** Both fatty and low-fat meals could significantly improve hepatic clearance compared with fasting in most patients after ES. But the response to food types was individualized. All patients tolerated the meals well. There was no significant relationship between the recurrence of CBDS and sex, age, intact gallbladder and presence of juxtapapillary diverticulum, CBD size, and improvement in hepatic clearance (≥5%) by food.

**Conclusion:** Both fatty and low-fat meals improved hepatic clearance in most of the patients with CBDS after ES, but the response to meals was individualized. Therefore, there is no need to restrict the amount of fat intake for patients who have undergone ES. [*J Chin Med Assoc* 2009;72(1):10–14]

**Key Words:** endoscopic sphincterotomy, food, hepatic clearance

## Introduction

A large ultrasound-based study from Europe revealed that the overall rate of gallstone disease was 18.8% in women and 9.5% in men.[1] More than 20 million people have gallbladder disease in the United States.[2] The introduction of endoscopic retrograde cholangiopancreatography and endoscopic sphincterotomy (ES) in the 1970s has virtually supplanted surgery for the treatment of common bile duct stones (CBDS).[2,3] However, the recurrence rate of CBDS is around 3–21% after ES and as high as 80% after the first recurrence.[4–10] Gallbladder left *in situ* and large bile duct size (≥15 mm) are associated with the relapse of biliary symptoms in patients after ES, while bile duct size and a large juxtapapillary diverticulum (JPD) are associated with recurrent bile duct stones (RBDS).[11,12] However, elective cholecystectomy after ES does not significantly reduce the incidence of recurrent biliary complications and is not always necessary.[13,14] Large bile duct and JPD may result in bile stasis or impairment of hepatic clearance.[15,16] Delayed biliary emptying or hepatic clearance occurred commonly in patients with a history of choledocholithiasis, even after complete ES.[12,17]

Quantitative cholescintigraphy (QC) is an ideal noninvasive test for evaluating hepatic clearance and predicting the occurrence of RBDS,[18–21] but there is still no effective method for preventing this complication.

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Some drugs such as ursodeoxycholic acid and aspirin have been employed to prevent gallstone formation in patients on a very low-calorie diet, but their effects on RBDS are unknown.[22–24] Fatty meal has been shown to reduce the risk of cholecystectomy and also to improve hepatic clearance in patients with intact gallbladder and post-cholecystectomy after ES.[25,26] It is questionable as to whether or not other kinds of food have a similar impact on hepatic clearance. In the present study, we compared the effects of fatty and low-fat meals on QC in patients with abnormal hepatic clearance after ES and tested the possible factors affecting the recurrence of CBDS.

## Methods

Between April 1999 and October 2003, 139 patients with choledocholithiasis after ES and complete biliary clearance received QC to evaluate their hepatic clearance after normalization of liver function. Forty-seven patients with abnormal QC (45-minute clearance of radioisotope < 57%) were enrolled in our study. Complete ablation of sphincter function in these 47 patients was confirmed by sphincter of Oddi manometry. Sphincter of Oddi manometry was performed as previously described,[16] and the complete ablation of sphincter function was defined as wide opening of the papilla and the basal pressure of the sphincter being < 10 mmHg.

Fasting (routine) QC was performed following intravenous administration of 8 mCi (296 MBq) of technetium-99m disofenin (Hepatolite; CIS-US, Bedford, MA, USA) to patients after overnight fasting. Imaging was carried out using a large-field gamma camera with low energy, all-purpose collimator (Siemens Orbiter 75, Chicago, IL, USA) connected to a computer (Microdelta, Chicago, IL, USA). Data were recorded with patients in supine position under the gamma camera. A continuous series of 60 frames of 1-minute duration each was stored on the computer disk for later analysis. Static views at 1, 2, 4 and 6 hours were also recorded. A rectangular region of interest was identified and outlined over the right hepatic lobe, and a time-activity curve was created. The time to reach maximal count ($T_{max}$), half time for hepatic clearance from $T_{max}$ ($T_{1/2}$) and hepatic clearance percentage of the maximal counts at 45 minutes and 60 minutes (E45′, E60′) were calculated for comparison. The reference values of positive limit were $T_{max}$ = 13 minutes; $T_{1/2}$ = 30 minutes; E45′ = 57%; and E60′ = 72%.[20]

The mean time lag between low-fat meal QC performed after fasting QC was 1.4 ± 0.9 months and between fatty and low-fat meal QC was 1.5 ± 1.4 months. The low-fat meal consisted of 2 pieces of toast, 250 mL of low-fat milk and 250 mL of fruit juice (fat, 0.3 g; protein, 13 g; carbohydrate, 77 g; total, 363 kcal), while the fatty meal consisted of 2 fried eggs, 250 mL of full-fat milk and 250 mL of fruit juice (fat, 28 g; protein, 22 g; carbohydrate, 12 g; total, 388 kcal). Meals were taken 30 minutes before isotope injection and the rest of the procedure was the same as for fasting QC.

The Department of Medical Research and Education of Kaohsiung Veterans General Hospital approved this study, and informed consent was obtained from each patient.

This was a repeated measures study with a balanced design in which each of the 47 subjects was observed at 3 different levels of treatments, namely: fasting (treatment 1); low-fat meal (treatment 2); and fatty meal (treatment 3). General linear model of ANOVA was used to test the differences in hepatic clearance among the 3 levels of the factor (diet), and Tukey's honestly significant difference (HSD) was used as a multiple comparison test. Furthermore, the possible factors (age, sex, CBD diameter, intact gallbladder, presence of juxtapapillary diverticulum, improvement in hepatic clearance ≥ 5% at 45 minutes or 60 minutes after meals) affecting the recurrence of CBDS were analyzed by logistic regression. A $p$ value of < 0.05 was considered to be significant.

## Results

Patients' characteristics are shown in Table 1. The mean age of all the patients was 67 ± 11 years; 32 patients (68%) were male. Twenty-two patients (47%) had JPD, and 21 patients (44.7%) had an intact gallbladder. Twenty-seven (57%) patients had bile duct size ≥ 15 mm. There was no significant difference in fasting E45′ with regard to the differences in sex, age, gallbladder status, presence of JPD and bile duct size (Table 2). The mean follow-up period was 62 ± 34

**Table 1.** Patients' characteristics

| | Patients | |
|---|---|---|
| | *n* | % |
| Male/female | 32/15 | 68/32 |
| Age > 65 yr *vs.* ≤ 65 yr | 28/19 | 60/40 |
| Juxtapapillary diverticulum (yes/no) | 22/25 | 47/53 |
| Intact gallbladder (yes/no) | 21/26 | 45/55 |
| Bile duct size ≥ 15 mm *vs.* < 15 mm | 27/20 | 57/43 |
| Recurrent bile duct stones (yes/no) | 12/35 | 26/74 |