

Spontaneous Passage of Gallbladder Calculi-Facilitation by Endoscopic Sphincterotomy

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After Endoscopic sphincterotomy (ES) gallbladder motility increases leading to expulsion of crystals and stones. But this is not a universal phenomenon. We evaluated cholangiographic findings in patients emptying their gallbladder after ES for common bile duct (CBD) stones. Cholangiographic features of twenty patients expelling gallbladder calculi after ES were studied. Controls included 20 age and sex matched patients with gallstones and CBD stones, who did not expel gallstones after ES. Of 20 cases in study group, 9 recovered more than 20 stones each in the stool within 7 days of ES. Repeat ERCP showed empty gallbladder in all, whereas CBD was full of stones in 11 of the 20 cases. In the study group, low insertion of the cystic duct was more common (10 vs 0, $p < 0.04$), the cystic duct made a narrow angle ($20 \pm 5^\circ$ vs $50 \pm 10^\circ$, $p < 0.04$) with CBD before insertion and cystic duct diameter was higher (5 mm vs 2.5 mm, $p < 0.04$) as compared to controls. We conclude that in patients undergoing ES with intact gallbladder and small gallbladder calculi, spontaneous emptying of gallbladder calculi occurs, if cystic duct is wider, has low insertion and makes narrow angle with CBD before insertion.

Keywords: Cholelithiasis, choledocholithiasis, cholangitis, papillotomy, cystic duct, cholangiogram

INTRODUCTION

Endoscopic sphincterotomy (ES) is an established mode of treatment for retained or recurrent stones in the common bile duct after cholecystectomy. With increasing experience, the indications for ES have expanded to include patients with gallstones and common bile duct stones with poor operative risks. In some centres ES is performed in patients with an intact gallbladder, who present with cholestasis, cholangitis and gallstone pancreatitis regardless of surgical risk [2]. It has been reported both in experimental and clinical studies that ablation of the papillary sphincter enhances gallbladder emptying. After ES gallbladder motility increases and expels crystals and stones [3–9]. But this phenomena is not a universal finding. Only in a few patients has it been found on routine check ERCP that, following ES, the gallbladder becomes empty and stones come to lie in the common bile duct. Though gallbladder motility increases after ES in

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all patients, only a few empty their gallbladder and this fact tempted us to make a detailed evaluation of cholangiographic findings in 20 of our patients, exhibiting this phenomena.

PATIENTS AND METHODS

Of 120 patients who had undergone ES with the gallbladder in situ, 20 patients cleared their gallbladder of stones. Endoscopic procedure was performed using a JFIT 10 or TJF 10 sideviewing duodenoscope ES(1–2 cm) was done using a standard sphincterotome. Dormia extraction was tried in every patient. The check ERCP was done in every patient at an interval of 7 to 30 days, after the first procedure. All the patients were requested to check their stools for stones after ES. Cholangiographic findings were studied in patients expelling calculi from gallbladder after ES with special reference to number and size of gallbladder calculi, common bile duct diameter, number and size of common bile duct calculi, cystic duct diameter, level of cystic duct insertion and angle cystic duct makes with common bile duct before insertion. Measurement of common bile duct and cystic duct were taken at the site of their maximum diameter. Cystic duct was considered to run parallel to common duct, if the course of the two ducts was closely adherent for at least 1 cm. For determining the location of the junction along the length of extrahepatic biliary tree, the distance from ampulla to bifurcation of the duct was divided into three equal parts and ex-

pressed a proximal, middle and distal one-third. Cystic duct joining common duct in distal one-third was considered as low insertion of cystic duct [10]. The cholangiographic findings were compared with 20 age and sex matched controls, having multiple small gallstones with common bile duct stones and functioning gallbladder. They had undergone ES for common bile duct stones, had clear common bile duct on check ERCP but did not expel gallbladder stones after ES. In controls also the check ERCP was performed at intervals ranging from 7–30 days.

RESULTS

Patients included 8 men and 12 women with a mean age of 42 years (range 30 to 60 years). All the patients has cholelithiasis with choledocholithiasis and 6 patients has associated cholangitis. Liver function tests were as shown in Table I. In all of the 20 patients cholangiograms revealed 1 to 5 common duct stones, which were actively extracted after doing ES and the common bile duct was cleared in every patient. Of 20 patients, 9 recovered more than 20 stones in the stool within 7 days of ES. Repeat ERCP done at intervals of 7 to 30 days, showed an empty gallbladder in all, whereas the common bile duct was full of small stones (4 to 6 mm) in 11 out of 20 patients.

On cholangiographic evaluation (Tab. II), the gallbladder was opacified in all the cases and revealed multiple (10 to 35) calculi of 4 to 6 mm.

TABLE I Liver function tests before and after ES, *n* = 20

	Before ES	After 7 days
	Mean \pm SD (range)	Mean \pm SD (range)
1. Total bilirubin (mg/dL)	5.5 \pm 4.4 (0.6–14.3)	1.1 \pm 0.6 (0.4–1.6)
2. Direct bilirubin (mg/dL)	4.1 \pm 4.0 (0.1–12)	0.3 \pm 0.1 (0.2–0.4)
3. Alkaline phashatase (IU/L)	381.7 \pm 281 (132–810)	126 \pm 26 (98–130)
4. AST (IU/L)	99.2 \pm 88.1 (48–290)	38.6 \pm 14.7 (22–50)
5. ALT (IU/L)	105 \pm 87.7 (31–317)	32.6 \pm 11.3 (20–42)
6. Albumin (g/dL)	3.8 \pm 0.4 (3.1–4.5)	3.2 \pm 0.4 (2.9–3.5)

TABLE II Cholangiographic features

	Patients <i>n</i> = 20	Controls <i>n</i> = 20	<i>P</i> value
A. Gall bladder calculi			
Size	4–6 mm	4–6 mm	NS
Number	multiple	multiple	
B. Common bile duct			
Diameter	10 mm (7–20 mm)	10 mm (6–20 mm)	NS
Calculi	multiple	multiple	
C. Cystic duct			
Diameter	5 mm (4–6 mm)	2.5 mm (2–3 mm)	< 0.04
Insertion			
Normal	10 cases	20 cases	< 0.04
Low	10 cases	0	
Angle	20 ± 5°	50 ± 10°	< 0.04

Cystic duct had insertion in lower part of common bile duct in 10 patients. In 6 patients it was running parallel to common bile duct before insertion. In all 20 patients the cystic duct made on acute and narrow angle ($20 \pm 6^\circ$, range $10-30^\circ$) with common bile duct before insertion. In controls gallbladder calculi were multiple and varied from 4 to 6 mm in size. Cystic duct insertion was in middle portion of common bile duct in all patients and at insertion cystic duct made angle of $50 \pm 10^\circ$ (range $40-60^\circ$) with common bile duct.

DISCUSSION

ES is an established mode of treatment for choledocholithiasis for last 20 years with complications rate of 8% to 10% and mortality of 1% to 2% [7]. Nowadays ES is widely used for treating common bile duct stones in patients with an intact gallbladder. These are the patients who are elderly, frail and a poor risk for surgery or patients with acute biliary disease and gall stone pancreatitis. The fate of the gallbladder in such patients depends on whether the gallbladder harbors calculi or not. The incidence of acute cholecystitis in patients with acalculous gallbladder is 0 to 1% even after long term followup for 7 to 9 years [8]. In patients with gallstones, the incidence of acute cholecystitis is reported to be 16%[9]. After ES in patients with gallbladder

in situ, biliary symptoms occur more frequently in patients with gallbladder calculi as compared to patients with acalculous gallbladder [11]. In earlier studies, there are scattered case reports, where gallbladder calculi are cleared after ES [4, 3, 6]. This is an important finding as the gallbladder in such cases will behave like those with acalculous gallbladder in term of developing acute cholecystitis. Such patients with acalculous gallbladder may not require routine cholecystectomy after ES as recommended by some workers. This phenomenon of facilitation of spontaneous passage of gallbladder calculi can be explained by enhanced gallbladder emptying after ES. Hutton et al studied spontaneous passage of glass beads from gallbladder after ES in dogs [3]. One month after bead implantation, dogs with intact sphincter passed 52%, 26%, 22%, 10%, 0% and 0% of beads with diameters of 2, 3, 4, 5, 6 and 8 mm respectively. For the same respective bead diameters, dogs with sphincterotomy passed 90%, 90%, 88%, 75%, 75% and 42% of beads. In a separate set of dogs, cholescintigraphic study performed after sphincterotomy revealed increased gallbladder ejection fraction from 0.46 to 0.76. In addition sphincterotomy also lowered resting and cholecystokinin stimulated gallbladder volume. Similar results have been reported in other experimental studies. In human studies, ES was found to lower resting gallbladder volume and caerulein stimulated residual gallbladder

volume. ES also significantly increased ejection fraction and rate constant for gallbladder emptying [12, 13].

Spontaneous passage of gallbladder calculi after ES occurs only in some patients, so apart from alteration in mechanical functions of gallbladder after ES, others factors: cystic duct length, diameter and insertion and common bile duct diameter are thought to be important. After critical evaluation of cholangiographic findings, we could identify certain distinct features. In all the patients when expelled their the gallbladder has multiple small stones, broader cystic duct, low insertion of cystic duct and the cystic duct made narrow angle with common bile duct in all the cases whereas in normal cases it was found to vary from 40° to 60°.

Based on these findings we consider that apart from enhanced gallbladder motility normal cholangiographic variations to also play a role in determining whether patients will expel gall bladder calculi after ES or not. However a prospective larger study is needed to draw further definite conclusions. In patients undergoing ES with intact gallbladder and small sized gallbladder claculi, if these cholangiographic features are present, the chances of spontaneous passage of gallbladder calculi are there. Unless there is a pressing need such cases can be followed up the with hope of spontaneous emptying of gallbladder. However if stones are large and cystic duct diameter is small then cystic duct occlusion may occur leading to complications like mucocoele and empyema.

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