



Original article

## Spontaneous passage of bile duct stones: frequency of occurrence and relation to clinical presentation

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**Background:** Little is known about the spontaneous passage of bile duct stones. The aim of this study was to determine the rate of spontaneous stone passage and relate it to the clinical presentation of the bile duct stone.

**Patients and Methods:** Prospectively collected data were studied on a total of 1000 consecutive patients undergoing laparoscopic cholecystectomy with or without laparoscopic common duct exploration. Comparisons were made between 142 patients with common bile duct stones (CBDS), 468 patients who had no previous or current evidence of duct stones, and 390 patients who had good evidence of previous duct stones but none at the time of cholecystectomy. The evidence used for previous duct stones included a good history of jaundice or pancreatitis. In patients with biliary colic or cholecystitis, abnormal pre-operative liver function tests and/or a dilated common bile duct were taken as evidence of bile duct stones.

**Results:** Of the 1000 patients studied, 532 had evidence of stones in the common bile duct at some time prior to cholecystectomy. At the time of operation, only 142 patients had bile duct stones. By implication, 80%, 84%, 93% and 55% of patients presenting with pancreatitis, colic, cholecystitis and jaundice (73% overall) had passed their bile duct stones spontaneously. All 4 patients with cholangitis had duct stones at the time of operation.

**Conclusions:** It is likely that most bile duct stones (3 in 4) pass spontaneously, especially after pancreatitis, biliary colic and cholecystitis but less commonly after jaundice. Cholangitis appears to be always associated with the presence of duct stones at the time of operation.

**Key words:** Bile duct stones – Spontaneous passage – Pancreatitis – Biliary colic – Cholecystitis – Cholangitis

It is a frequent experience in clinical practice that common bile duct stones (CBDS) pass spontaneously. There is, however, little published data describing the clinical circumstances and frequency with which this happens. A knowledge of the rate at which ductal stones will pass spontaneously may be of importance when considering their

management, and may avoid both unnecessary intervention and missed stones. The aim of this study was to estimate the rate of spontaneous bile duct stone passage and relate it to the various clinical presentations of the ductal stone. It would be helpful if parameters could be identified which predicted the likelihood of spontaneous stone passage.

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**Patients and Methods**

Prospectively collected data were studied from 1000 consecutive patients undergoing cholecystectomy with or without common bile duct exploration over a 7-year period. All patients had symptomatic gallstones. Every patient in the study had a measurement of common bile duct diameter by abdominal ultrasonography and serum samples taken for bilirubin, alkaline phosphatase and alanine transaminase measurements in the week before operation. These data and the clinical presentation of the patient were recorded prospectively and transferred onto a computer database. The presence or absence of ductal stones at the time of operation was determined by the immediate pre-operative measurement of bile duct diameter by ultrasonography and liver function tests in combination with operative cholangiography according to our previously described protocol.<sup>1</sup> Operative cholangiography is only undertaken if the pre-operative study is abnormal as normal results are associated with a 98% negative predictive value for duct stones. In addition, the last 367 patients had their bile ducts scanned intra-operatively by ultrasonography.<sup>2</sup> The presence of duct stones was confirmed by removal at the time of operation. Patients with no ductal stones at the time of cholecystectomy were divided into two groups (A and B). First, patients who had no historical or investigative indications of ductal stones at any time were assumed never to have had any (group A). Patients who had a good history of jaundice or pancreatitis who had previously abnormal liver function tests or a dilated common bile duct, were assumed to have passed their ductal stones spontaneously (group B). A third group of patients had ductal stones at the time of operation, determined by cholangiography or ultrasonography (group C). Statistical analysis was performed using Student's *t*-test.

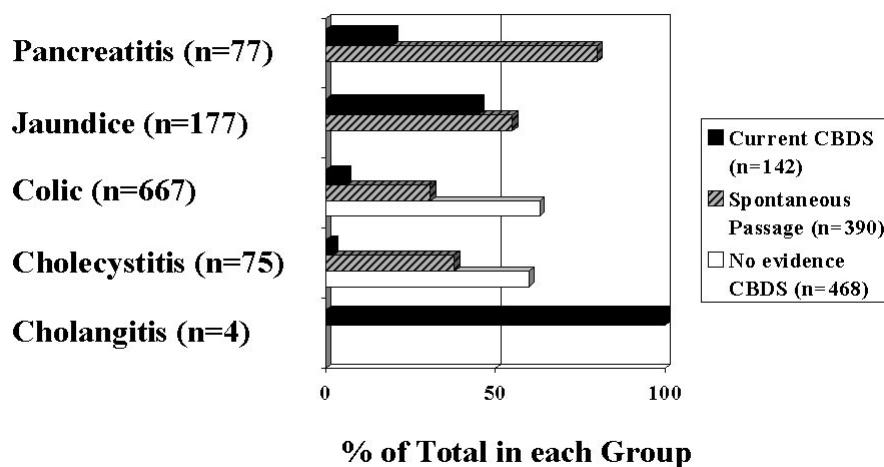
All data, including the nature of the clinical presentation, were recorded by the surgical team at the time of the operation. The diameter of bile duct stones was measured using operative cholangiography or callipers on the ultrasound machine.

**Results**

Of the 1000 patients studied (male:female ratio, 1:2.6), 468 (47%) had no past or present evidence of CBDS and no ductal stones were found at the time of operation (group A) and 532 (53%) patients had previous or current evidence of ductal stones (groups B & C). Of these latter patients, 390 were judged to have passed their stones spontaneously prior to their operation (group B) and 142 patients had common duct stones at the time of operation (group C). Thus, 73% of patients with previous or current evidence of ductal stones passed their stones spontaneously.

The relationship between spontaneous stone passage and clinical presentation of the patients is shown in Figure 1. Of patients presenting with biliary colic, a third had evidence of ductal stones, of whom 84% underwent spontaneous passage. Of patients presenting with pancreatitis, 80% also underwent spontaneous passage of their ductal stones. Of patients presenting with cholecystitis, 40% had evidence of ductal stones and 93% of these passed their stones spontaneously. In contrast, patients who had jaundice as the presenting symptom spontaneously passed only 55% of their ductal stones. All 4 patients presenting with cholangitis had bile duct stones at the time of operation.

Table 1 illustrates the peri-operative measurements made in the 3 groups of patients. Patients presenting with cholecystitis or cholangitis were significantly older than



**Figure 1** Clinical presentation and ductal stone status.

Table 1 A comparison of clinical presentation and mean pre-operative biochemical studies and ultrasound CBD diameter measurements in the three groups

(A) Patients with no evidence of ductal stones

Clinical presentation	Total	Age (years)	M:F	Bilirubin	ALP	ALT	PUS	LUS
Colic	423	49	1:6	9.4	70	23	4.1	5
Cholecystitis	45	60	1:1.8	9.4	80	21	4.5	5

(B) Patients who previously passed their ductal stones spontaneously

Clinical presentation	Total	Age (years)	M:F	Bilirubin	ALP	ALT	PUS	LUS
Colic	204	50	1:5.4	11	90*	34*	5.7*	5*
Cholecystitis	28	60	1:2.8	10.5	95	35	5.7*	6*
Pancreatitis	61	51	1:2.1	11.6	107*	50*	5.8*	7.2*
Jaundice	97	52	1:1.5	20*	109*	63*	6.1*	6.4*

(C) Patients with current evidence of ductal stones

Clinical presentation	Total	Age (years)	M:F	Bilirubin	ALP	ALT	PUS	LUS
Colic	41	55	1:1.1	17.3	172*	122*	8.1*	10.5*
Cholecystitis	2	71	1:1	10	109	51	7.2*	12*
Pancreatitis	15	56	1:3	11.6	154*	120*	7.6*	11.4*
Jaundice	80	52	1:2.2	97*	333*	163*	10.8*	12.3*
Cholangitis	4	69	1:1	35	270	167	11	10

Bilirubin (g/dl); ALP, alkaline phosphatase (g/dl); ALT, alanine transferase (g/dl) measured within a week pre-operatively; PUS, pre-operative ultrasound; LUS, laparoscopic ultrasound measurements of CBD diameter (mm).

\*Group B versus group C (Student's *t*-test, *P* < 0.001).

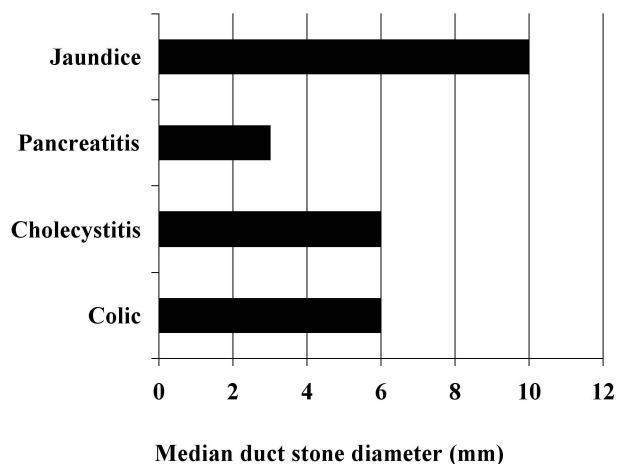


Figure 2 Median bile duct stone diameter according to clinical presentation.

patients presenting with other symptoms. No other significant age differences were found between the groups. The ratio of male to female patients is similar in each of the three study groups. Females were more likely to present with biliary colic, whereas men were more predisposed to the complications of gallstones.

A median of one stone was removed from the common bile duct in all patients with ductal stones regardless of clinical presentation (jaundice, pancreatitis, colic or cholecystitis). The median size of the bile duct stones was significantly greater in the presence of jaundice compared to patients presenting with pancreatitis (10 mm *versus* 3 mm; *P* < 0.001). Patients presenting with colic and cholecystitis both had a median ductal stone diameter of 6 mm (Fig. 2).

Discussion

Although practicing clinicians are familiar with spontaneous passage of bile duct stones, this study has quantified the phenomenon across the spectrum of differing clinical presentation. Previous studies have made similar observations in the case of pancreatitis and the results are very similar to our own with approximately 80% of bile duct stones being passed spontaneously.<sup>3-10</sup> In contrast, patients presenting with cholecystitis or biliary colic had a spontaneous stone passage rate of 93% and 84%, respectively, whilst we found only half of patients presenting with jaundice appeared to pass their bile duct stones spontaneously.

Patients who spontaneously passed their ductal stones were the same age as those who had no remaining stones.

Stone size may be relevant, as the patients with jaundice who retained stones had larger ductal stones than those with pancreatitis. Patients with biliary colic or cholecystitis also had larger stones than patients with pancreatitis, but passed them more frequently. These stones, of course, were those that were retained – no measurement is possible of those which were passed. The contents of the gallbladder may or may not be a guide, but is outside the scope of this study. Patients with colic or cholecystitis may simply have undergone their cholecystectomy later than those with jaundice or pancreatitis, allowing more time for spontaneous passage to take place.

Our conclusions are drawn from prospectively collected information, which inherently contain uncertainties. Nevertheless, only a good history of jaundice, pancreatitis or measured abnormalities allowed a patient to be included in the group regarded as having passed stones spontaneously. It is unlikely that an overestimate has been made: more probably, we have underestimated the number of stones passing spontaneously.

Whilst we have been able to quantify approximately the rate of spontaneous stone passage, it would be very useful to predict which patients will pass their stones spontaneously. We have not been able to identify a particular characteristic of patients who have failed to pass their stones spontaneously other than jaundice. Patients with jaundice may harbour the ductal stone or stones more often. The explanation may be that they are treated more quickly than other patients, allowing less time for spontaneous passage. It might be expected that

larger stones are less likely to pass spontaneously: we have found some evidence to support this supposition. The evidence is not sufficiently robust to allow assumptions for clinical management.

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