

Biliary complications associated with laparoscopic cholecystectomy – an analysis of common misconceptions

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SUMMARY

Background

Several views are expressed by surgeons on biliary complications following laparoscopic cholecystectomy as follow: most are caused by trainees; complications occur in the presence of difficult anatomy/pathology; injuries occur more proximally than at open cholecystectomy; most injuries are recognised immediately and most can be managed non-operatively. The aim of our study was to determine if these views are substantiated in clinical practice.

Methods

The mode of presentation, management and outcome of thirty-two patients referred to a hepatobiliary unit over a seven year period were analysed.

Results

In 72% of cases the initial operator was a consultant. Five of the 32 complications (16%) occurred in the presence of difficult anatomy/pathology. Two patients had proximal biliary tree injuries, the only mortalities (two) occurring in this group. Only 41% of injuries were detected immediately; 87% required surgical intervention, hepaticojejunostomy being the most common procedure performed (75%).

Conclusion

Our study shows that the majority of bile duct injuries are not caused by trainees, do not occur because of unusual anatomy/pathology, do not occur in the proximal biliary tree and are not recognised at the time of operation. Most injuries ultimately require major reconstructive surgery for definitive management.

INTRODUCTION

Since the advent of laparoscopic cholecystectomy there have been a large number of publications discussing the problem of biliary complications, in particular the problem of bile duct injuries.¹⁻¹⁰ Despite this, there are a number of views that are often expressed on the subject have no support in the literature. These include the following:

- That after the initial 'learning curve' the incidence of biliary injuries is approximately the same as in the 'open' era²
- That the majority are caused by trainee surgeons^{11, 12}
- That injuries usually occur in the presence of unusual anatomy or difficult pathology³
- That biliary injuries are generally higher than those that occur with open cholecystectomy¹³

- That injuries are often recognised at the time of surgery^{4, 14}
- That most complications are easily managed, and that most can be managed non-operatively¹⁵

Based on our experience we felt that these are probable misconceptions; therefore we reviewed

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this series of patients referred to a specialist hepatobiliary unit.

PATIENTS AND METHODS

Northern Ireland is a well defined geographical area with a relatively stable population of 1.6 million. Over a seven-year period from 1992, thirty two patients were referred for management of biliary complications arising from laparoscopic cholecystectomy. In one case the initial laparoscopic cholecystectomy had been performed outside Northern Ireland. There were 5 male and 27 female patients with a median age of 58 years. Seven patients were referred at the time of initial surgery, nineteen were referred 'early' (within six weeks of initial surgery) and a further six were referred 'late' (after six weeks). Injuries were classified according to the method described by Strasberg *et al*¹ (summarised in Table 1). Eight patients had Type A injuries. In three of these a cystic duct leak occurred as a direct consequence of an unsuspected common bile duct stone. One patient had an injury to the segment V duct in the gallbladder bed and the remainder of the Type A injuries were due to cystic duct necrosis or to laceration with a clip. There was one Type B injury with the common bile duct partly occluded by a clip. Three patients had Type C injuries, one due to a transected right posterior sectoral duct and two due to a transected accessory duct. There were nine patients with Type D injuries, all with lacerations to the common bile or hepatic ducts. Ten patients were referred with Type E2 injuries. One of these occurred following conversion to an open procedure for dense adhesions. Eight of the E2 injuries were 'classical' laparoscopic injuries.⁸ One patient could not be included in this classification. She was referred three years after initial surgery with recurrent episodes of pain and jaundice due to stones in the cystic duct remnant and the common bile duct for which she had undergone repeated ERCP. At operation she was found still to have the distal portion of the gallbladder in-situ. Incomplete excision of the gallbladder causing these problems has previously been described.¹⁶

Where biliary reconstruction was required this was carried out using an 80 cm Roux-en-Y loop anastomosed to the bile duct confluence, with the anastomotic circumference increased by extending the opening along the horizontal portion of the left hepatic duct. The anastomotic technique used was that described by Blumgart.¹⁷ These

patients are all under long-term follow-up with regular measurement of liver enzymes.

RESULTS

Type A Injuries – Leak from minor duct (e.g. cystic duct stump) – 8 patients

None were recognised at the time of initial surgery. All presented in the early postoperative period with bile peritonitis and, in four cases, jaundice as well. Two were managed by ERCP and stone extraction with percutaneous drainage. One had ERCP following laparotomy and placement of drains. The rest had suture repair of the injury. All are alive and asymptomatic with normal liver function tests after follow-up ranging from 1 to 64 months.

Type B Injury – Occlusion of part of biliary tree by a clip – 1 patient

This patient was managed by ERCP and stenting. The stent was removed after six months and the patient remains asymptomatic at one year with normal liver function tests.










Type C Injuries – Leak from accessory duct – 3 patients

One patient had a transected right posterior sectoral duct which was recognised at the time of initial surgery. An immediate hepatobiliary referral was made and a primary repair carried out over a T-tube. The patient was asymptomatic with normal liver function after 30 months follow-up. The other two patients had leaks from accessory ducts and both presented in the early postoperative period with generalised biliary peritonitis. One patient initially underwent laparotomy at which time oversewing was carried out, and the patient was subsequently referred because of a continuing bile leak. This was managed by ERCP, sphincterotomy, percutaneous drainage and drainage of a pleural effusion. The patient settled and had normal liver function tests after 3 months follow-up. The other patient initially underwent ERCP with stenting and percutaneous drain insertion; however eventually a laparotomy was required with the insertion of a large bore drain for management of a bile collection.

Type D Injuries – Lateral injury to major bile ducts – 9 patients

Seven patients had the injury recognised at the time of initial surgery. One patient had a Mirizzi Syndrome and a tear occurred in the common hepatic duct due to excessive traction on the gallbladder fundus. This was referred immediately

TABLE I
STRASBERG CLASSIFICATION OF BILIARY INJURIES

A		Leak from Minor Duct (in continuity with CBD)	8	25%
B		Occlusion of Part of Biliary Tree	1	3.1%
C		Leak from Duct (not in continuity with CBD)	3	9.4%
D		Lateral Injury to Extra Hepatic Duct	9	28.1%
E1		Circumferential Injury >2cm from bifurcation	0	0%
E2		<2cm from bifurcation	10	31.2%
E3		at bifurcation	0	0%
E4		involving right and left ducts	0	0%
E5		involving other hepatic ducts	0	0%

and the patient had a primary hepaticojejunostomy carried out with no late complications. In the remaining six a primary sutured repair had been carried out with or without a T-tube. Two of these required no further treatment and were asymptomatic with normal liver function after six years and three months respectively. The remaining four developed strictures. One of these had an end to side hepaticojejunostomy performed in the same unit, before presenting later to this unit with cholangitis due to recurrent stricturing at the site of the anastomosis. This was treated by revision hepaticojejunostomy with revision of the entero-enterostomy to lengthen the Roux limb. This patient remained well with normal liver function after 4 years. Two patients presented with Bismuth type II strictures, one early and one late. These were treated by hepaticojejunostomy and both were asymptomatic with normal liver function after 4 and 5 years. One further patient developed a stricture but was not referred until 10 months after the injury by which stage he had developed a Bismuth type IV stricture and cirrhosis. Prior to referral, various inappropriate management options had been attempted, including endoscopic and percutaneous balloon dilatation. A hepaticojejunostomy was performed but the patient died in the postoperative period secondary to DIC and liver failure.

Two further patients with type D injuries presented in the early postoperative period with biliary peritonitis. One developed a late stricture requiring hepaticojejunostomy and was asymptomatic with normal liver function after 5 years follow-up. The other was referred early with a small puncture wound to the common hepatic duct. A sutured repair was carried out with no complications at 7 months.

Type E Injuries – Circumferential injury to major bile ducts – 10 patients

Of these, 5 were recognised at the time of surgery – one occurring after open conversion for dense adhesions. Three of these were referred immediately at the time of initial surgery and had a hepaticojejunostomy performed as a primary repair. All were well with normal liver function tests after between one and six months follow-up. Two had a sutured repair over a T-tube. One of these was referred early with a Bismuth type II stricture, had a hepaticojejunostomy and was well after 11 months follow-up. The other developed a Bismuth type II stricture after 2 years requiring a hepaticojejunostomy.

The remaining 5 patients with type E2 injuries presented in the early postoperative period with obstructive jaundice. All were referred early, one having had a laparotomy and T-tube insertion prior to referral and another having had a hepaticojejunostomy prior to referral. This patient developed a dehiscence of the anastomosis within a few days and was referred with biliary peritonitis. At the time of referral the patient was requiring ventilation, inotropic circulatory support and dialysis. A revision hepaticojejunostomy was performed to the left and right hepatic ducts. There was no further bile leak or deterioration in liver function, but the patient developed progressive multi-system organ failure and died. Hepaticojejunostomies were carried out on the remaining four patients and all were well with normal liver function at follow up ranging from 9 months to 6 years.

DISCUSSION

The aim of this paper was to examine some commonly expressed views on laparoscopic cholecystectomy to determine if they are supported by our data. These will be examined in turn.

Complications are no more common than in open cholecystectomy:

Our data do not directly address this issue. However, because of the static nature of the population in Northern Ireland and the fact that there are rarely any referrals in to or out of the region, it is possible to form a strong impression. A previous paper from the same region reported 30 patients referred over a 21 year period during the era of open cholecystectomy.¹⁸ Our paper reports 32 patients referred over a 7 year period. Whilst the number of cholecystectomies performed may have increased since the advent of laparoscopic cholecystectomy, it is very unlikely that this can explain the apparent increase in referrals and much more likely that there has been a real and significant increase in the incidence of biliary complications.

The majority of complications are caused by trainee surgeons:

In this series the initial operator was a consultant in 23 cases (72%). Clearly, even if the procedure is carried out by a trained surgeon, the risk of complications persists.

Complications mostly occur in the presence of difficult pathology or anatomy:

It is difficult to precisely quantify these issues. However referring surgeons were asked why they thought the complication had occurred. Only one cited an anatomical variation as the cause and only five described difficult pathology (e.g significant inflammation). A further three complications were due to unsuspected common bile duct stones. The vast majority of complications (84%) arose, therefore, in the absence of any unusually difficult anatomy or pathology.

Biliary injuries occur more proximally in the biliary tree than at open cholecystectomy:

In this series there were no patients who had received type D or E injuries at or proximal to the bile duct confluence, although two patients later developed E4 type injuries. One presented very late after persistent inappropriate attempts at management by stenting, and one patient had already undergone hepaticojejunostomy prior to referral. Thus, in our experience there is nothing to suggest that bile duct injuries are occurring at a higher level than in the open era. There were, however, no patients in our series with associated vascular injuries. Other authors have noted a significant number of cases with concomitant arterial injury and have felt that this may contribute to more proximal biliary injury.¹⁹

Most complications are recognised at the time of surgery:

In this series 13 patients (41%) had their injury recognised at the time of initial surgery. Of the 19 patients with the more serious type D and E injuries, seven patients (78%) with type D injuries, but only five patients (50%) with type E injuries had them recognised immediately. Overall these data indicate that the majority of complications do not become apparent until the post-operative period.

Most complications are easily managed non-operatively:

In this series only four patients (13%) were managed without open surgery. Of 18 patients who had a laparotomy prior to referral, 10 (56%) required a further procedure. Five patients with type D injuries (56%) and all patients with type E injuries required a hepaticojejunostomy. Two patients required revision of a previous hepaticojejunostomy. The two deaths in the series resulted from inappropriate early management and a delay in referral.

One of these deaths further illustrates the hazards of attempting a definitive repair in a patient acutely ill in the early postoperative period when a period of external biliary drainage would have been more appropriate. Presumably some patients, particularly those with a localised bile leak were managed locally by ERCP and stenting, with or without percutaneous drainage, and our percentage of patients requiring open surgical management may be falsely high. Nonetheless, these data indicate that the assumption that most complications are easily managed non-operatively is false.

Based on our experience and informal discussion with the surgeons concerned, it would appear that many of these complications were avoidable, given that eight of the injuries were 'classical'. A careful review of the anatomy prior to dividing any duct is an essential step of laparoscopic cholecystectomy. Earlier conversion to open surgery in the face of difficult dissection, unexpected findings or suspected biliary injury would probably have prevented or minimised many of the complications discussed. This is despite the fact that one bile duct injury in this series occurred after conversion.

It is therefore important to remember that even after conversion, the factor making the procedure risky or difficult may still be present and the surgeon must maintain a high level of caution and safety. We could not recommend a 'no-conversion policy' as advocated by some.²⁰ The role of routine cholangiography remains unclear and there are no appropriate prospective randomised trials of its effectiveness, although one recent retrospective study suggested that it did significantly reduce the risk of injury.²¹ Only one patient in our series had a cholangiogram and this did not prevent a major injury from occurring. It is possible that cholangiography may have allowed earlier identification of biliary injuries, and may have prevented the three complications in this series that occurred due to unsuspected common bile duct stones.

In conclusion, an analysis of our experience has proved useful in addressing a number of common misconceptions regarding the occurrence of biliary complications following laparoscopic cholecystectomy. In addition we have shown that, with prompt referral, a successful outcome can be obtained for the majority of patients. Delay in referral and persistent attempts at inappropriate management can be catastrophic.

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