

Blunt trauma to the extrahepatic biliary tract

A multicenter study



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Emmanouil Pikoulis*, Panayiotis Daskalakis, Efthimios D Avgerinos, Evangelia Gougoudi, Ioannis Karavokyros*, Ari Leppäniemi**, Emmanouil Pavlakis, Dimitrios K. Filippou, Nikolaos Psalidas, Nicolas Condilis, Panayiotis Tsatsoulis

Second Department of Surgery, General Hospital "ASCLEPEION" Voulas, Athens, Greece, *First Department of Surgery, Medical School, University of Athens, Athens, Greece, **Department of Surgery, Meilahti Hospital, University of Helsinki, Finland..

Blunt trauma to the extrahepatic biliary tract. Multicenter study

BACKGROUND/AIMS: *Blunt trauma to the extrahepatic biliary tract is a rare and challenging injury. The purpose of this paper is to review our experience of these injuries, with special reference to their clinical presentation.*

PATIENTS AND METHODS: *In a retrospective multicenter study of the records of a trauma-admitting in three hospitals, seven patients with blunt extrahepatic biliary tract trauma were identified, one with combined gallbladder and common bile duct injuries and six with a ruptured gallbladder.*

RESULTS: *Except for the patient with the common bile duct injury developing peritoneal signs during observation and being operated 24 hours post-admission, all other patients underwent early laparotomy for shock, peritonitis or positive diagnostic peritoneal lavage (DPL) caused by associated injuries. The common bile duct injury was treated with suture repair over a T tube and the gallbladder injuries with cholecystectomy, except for two cases in which a cholecystostomy was performed.*

CONCLUSIONS: *In patients with blunt trauma, especially to the right upper quadrant, a high index of suspicion and liberal use of diagnostic studies to exclude an isolated extrahepatic biliary tract injury is recommended.*

KEY WORDS: Blunt trauma, Car accident, Motor vehicle accidents, Perforation of biliary tract.

Introduction

Injuries of the extrahepatic biliary tract caused by blunt trauma are very rare. Especially, injuries of the extrahepatic biliary ducts excluding the gallbladder are seldom encountered with only 125 cases reported in the English literature by 1989¹. They can pose challenging diagnostic problems, especially when not associated with other abdominal injuries prompting early laparotomy, as well as require expert management to reduce early and late morbidity associated with stricture formation in the repaired bile ducts. The purpose of this paper is to report the collective experience of one trauma-admitting hospital in managing extrahepatic biliary tract injuries with special emphasis on their clinical presentation.

Patients and methods

In a retrospective review of hospital records of three

Hospital from the years 1994-2002, seven patients with blunt extrahepatic biliary tract injuries – one with common bile duct and gallbladder trauma and six with a ruptured gallbladder – were identified. The clinical data of these patients is summarized in Table I. All of the patients had associated abdominal organ injuries including the liver in all cases, the spleen, the duodenum and even the portal vein in one case. Associated extra-abdominal injuries included rib fractures and haemo-pneumothorax, pelvic and lumbar vertebral fractures, a femoral fracture and a head injury.

Ultrasonography was performed in two cases (no. 1 & no. 3 of Table I). In case no. 1, it was negative for fluid in spite of the presence of associated liver and duodenal injuries. Whenever diagnostic peritoneal lavage (DPL) was used it proved positive for blood in all cases, but in one case only positive for bile.

Results

Six patients (nos. 2-7) underwent early laparotomy for hemodynamic instability and/or generalized peritonitis and/or positive DPL result. The ruptured gallbladder was managed with a cholecystectomy in four of them (nos.

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For correspondence: Efthimios D Avgerinos, MD, 2nd Department of Surgery, General Hospital "ASCLEPEION" Voulas, V. Pavlou 1, 16673 Voula Attikis, Athens, Greece (e-mail: eavgerinos@medscape.com).

TABLE I. – Clinical data of seven patients with blunt extrahepatic biliary tract injury

Patient no	1	2	3	4	5	6	7
Age (years)	30	80	25	28	30	20	21
Sex	Female	Male	Male	Female	Male	Male	Female
Trauma mechanism	Fall (3m)	MVA*	MVA	Fall (10m)	MVA	Crush Syndrome	MVA
Shock O/A**	+	+	-	+	-	+	+
Abdominal tenderness O/A	-	+	+	+	+	+	-
Local/generalized peritonitis	+/-	+/-	+/+	+/+	+/-	+/+	+/-
DPL for blood	Not done	+	Not done	+	+	+	+
DPL for bile	-	-	-	-	+	-	-
Biliary Trauma	CBD & GB***	GB	GB	GB	GB	GB	GB
Associated abdominal injuries	Liver, duodenum	Liver	Liver	Liver, spleen	Liver	Liver	Liver,
portal vein	-	-	-	-	-	-	-
Associated extra-abdominal injuries	-	Femur fracture	-	-	Pelvic	-	-
& lumbar fractures	Head Injury	Rib fractures	-	-	-	-	-
& haemo-	-	-	-	-	-	-	-
pneumothorax	-	-	-	-	-	-	-

*MVA=motor vehicle accident

**O/A=on admission

***CBD and GB= Common Bile Duct and Gallbladder

2-5). Patient no. 2, died due to multiple organ failure 10 days postoperatively. Patients nos. 3-5 survived without major complications, except for one wound infection (patient no. 5) and were discharged 13, 20 and 15 days postoperatively, respectively. Patients nos. 6-7 were treated with a cholecystostomy. On the 8th postoperative day a cholangiogram was performed and showed normal biliary flow. On both patients the cholecystostomy tubes were removed after one month. They were discharged 29 and 18 days postoperatively, respectively. No late complications have been detected during the 5-year follow up.

Patient no. 1, though in shock on admission, was resuscitated and observed expectantly. However, he gradually developed generalized peritoneal irritation and was operated 24 hours post-admission. Among other injuries, a longitudinal, non-circumferential common bile duct laceration of 2 cm length, with no tissue loss and a ruptured gallbladder were discovered. A cholecystectomy was performed and the common bile duct laceration was treated with suture repair over a T tube. T tube cholangiogram on the 8th postoperative day was satisfactory, the patient recovered without complications, and he was discharged on the 25th postoperative day. The T tube was left in place for 6 weeks. During a 5-year follow up, no late complications have emerged.

Discussion

The majority of patients with blunt extrahepatic biliary tract injuries have suffered a blunt or crushing trauma to the right upper quadrant of the abdomen. Several theories have been proposed to explain the mechanism of injury to the bile duct and the consistent location of

the ductal injury. The short and rigid nature of the ductal system makes the bile duct vulnerable to injuries. Other causes include shearing forces with disruption of the duct at points of fixation, "blow out" of the distended duct and compression against the vertebral column²⁻⁶. The "blow out" hypothesis was confirmed experimentally by Fletcher⁴ after inducing intraductal pressures of 750 pounds per square inch in goats.

There appears to be two levels at which blunt rupture of the bile duct is most likely to occur: 1) at the hilum of the liver where one or both hepatic ducts may be avulsed⁷, and 2) at the level of the superior border of the pancreas^{8,9}. In our case, the level of injury was located in the distal part of the bile duct and extended longitudinally.

Because of the relatively benign initial course, the diagnosis of extrahepatic biliary duct injuries is difficult in the absence of associated injuries¹⁰, and is undoubtedly related to the modest toxicity of bile in the peritoneum and reabsorption of bile through the peritoneum^{2,10,11}. Long-term bile loss into the peritoneal cavity, however, is not well tolerated and leads to death. It is evident that early detection of biliary duct disruption due to blunt trauma is dependent upon a high index of suspicion based upon the nature of the injury and the detection of vague abdominal symptoms. The presence of jaundice and unexplained fever in addition should prompt investigation of the integrity of the bile ducts^{1,12}. Bourque et al.¹ reported that the delay between clinical presentation and surgical intervention averaged 18 days with a range from several hours to 60 days. In our series, the longest delay in diagnosis was 24 hours post-admission.

Even abdominal CT with contrast does not necessarily reveal bile duct injuries¹³. Diagnostic peritoneal lavage

in haemodynamically stable patients is useful even though bile, which is pathognomic, is rarely found^{6,14,15}. In addition, in some cases bile leakage may occur into the retroperitoneum or lesser sac and would not be detected in the lavage fluid^{6,8}. In one of our cases with a ruptured gallbladder, the DPL return was positive for bile.

It is not uncommon for a patient who has sustained blunt abdominal trauma to be discharged and return days later with jaundice, nausea, vomiting, recurrent abdominal pain and low-grade fever. Ultrasonography and computed tomography (CT) are useful to demonstrate free intraperitoneal fluid collections followed by a diagnostic peritoneal lavage^{1,12,16}. The point of leakage can be demonstrated by HIDA scan^{6,13,17} or ERCP^{6,13,18}. In patients with suspected haemobilia, angiography is indicated to exclude vascular damage which may be managed by embolization¹⁹. In our series, the clinical findings along with the DPL or ultrasonography results led to an exploratory laparotomy and to the subsequent diagnosis of biliary tract injuries in all cases. However, in one case, a false negative ultrasonography delayed our therapeutical intervention for 24 hours.

When the surgeon is confronted with traumatic injury to the biliary ducts the factors that must be considered include the hemodynamic stability of the patient, the location and extent of the injury, the size of the ducts and the management of associated injuries.

When a large through-and-through injury or transection is present in an unstable patient, an end-tube hepato- or choledochostomy creates a controlled external fistula and allows for late repair at the time of reoperation when the patient is stable^{6,13}.

Reported techniques for dealing with partial or incomplete injury to the bile duct include primary repair with T-tube^{10,20}, patch techniques with use of gallbladder wall^{6,21}, serosal surface of duodenum²², autologous vein²³, and PTFE²⁴. For clean lacerations, primary suture with T-tube stenting is usually satisfactory^{2,6,10,13,20}. It is best to bring the T-tube out through an area of normal bile duct and to have one limb of the tube acting as a stent and preventing bile leakage.

Even though there is no definite evidence that T-tube prevents bile leakage or stricture formation, it is recommended for subsequent radiologic evaluation of the repair. In our series, we used the above method of primary repair without postoperative leaks or stenosis of the injured bile duct. We believe that the clean laceration as well as the good blood supply of the repaired bile duct played a significant role for the successful postoperative course. Although, quite controversial in the surgical literature^{10,20,25}, we left the T-tube in place for a period of 6 weeks.

Complete transection of the extrahepatic ducts is a more severe injury with a high incidence of biliary fistulization and postoperative strictures. In collected series, about 55% of the transected ducts treated by end-to-

end anastomosis stenosed necessitating reoperation and biliary-enteric diversion⁵.

For gallbladder injuries most of the authors recommend cholecystectomy as the treatment of choice^{6,13,15,20}. The risk of bile leakage, perforation or late gallstone formation is higher if simple cholecystorrhaphy will be performed. However, when an hemodynamic instability or other emerging injuries preclude cholecystectomy, a cholecystostomy can be performed. In our study, we used cholecystectomy as a primary treatment for most of our patients. In two cases though, the massive hemorrhage from the liver in one case, from the portal vein in the other case and the overall intraoperative findings led us to proceed to a cholecystostomy.

The only death in our series was related to the associated injuries and the later development of sepsis and multiple organ failure.

Conclusion

In patients with blunt trauma especially to the right upper quadrant, a high index of suspicion and liberal use of diagnostic studies to exclude an isolated extrahepatic biliary tract injury is recommended.

Riassunto

INTRODUZIONE: La lesione traumatica delle vie biliari extraepatiche è piuttosto rara e problematica.

Lo scopo di questa pubblicazione è quella di fare una revisione della nostra esperienza riguardo questo tipo di lesione, facendo contemporaneamente riferimento particolare al quadro clinico di presentazione di questo tipo di lesione.

MATERIALE E METODO: In uno studio retrospettivo e multicentrico dei registri riferiti al trauma di tre grandi ospedali, abbiamo identificato sette pazienti affetti da trauma chiuso delle vie biliari extraepatiche, uno dei quali associava una lesione della colecisti a quella della via biliare principale, e gli altri sei pazienti la sola rottura della colecisti.

RISULTATI: Fatta eccezione per il paziente con lesioni combinate, che sviluppò i segni di irritazione peritoneale solo nel corso dell'osservazione iniziale, e venne pertanto sottoposto ad un intervento chirurgico dopo 24 ore dal suo ricovero, tutti gli altri pazienti vennero sottoposti precocemente ad intervento di laparotomia esplorativa perché in stato di shock, per evidenti segni di peritonite oppure per positività della presenza di bile al lavaggio peritoneale diagnostico (DPL), quadri tutti questi provocati dalla concomitanza di altre lesioni associate in relazione all'evento traumatico subito.

Le lesioni della via biliare comune extraepatica sono state trattate con una sutura di riparazione su tutor secondo Kehr (tubo a T); le lesioni della colecisti sono state

trattate con un intervento di colecistectomia, ad eccezione di due casi in cui per motivi tecnici è stato effettuato un intervento di colecistostomia .

CONCLUSIONI: Concludendo si potrebbe dire che in pazienti vittime di un trauma addominale chiuso, specie se localizzato in corrispondenza del quadrante addominale superiore destro, è altamente raccomandabile eseguire tutti i necessari esami diagnostici al fine di confermare od escludere precocemente una possibile lesione delle vie biliari extraepatiche.

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