Biliary Complications after Hepatic Trauma in Children

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Abstract

Aim of the Study: In pediatric patients with liver trauma and hemodynamic stability, conservative treatment is acknowledged as the gold standard. Patients and Methods: We conducted a retrospective analysis of 116 consecutive pediatric patients (<14-year-old) observed at our institution for closed abdominal trauma from January 2010 to January 2016. Among these, 16 patients (13%) had hepatic trauma Grade II or more, according to Moore liver trauma injury score. Results: Only one patient underwent surgery for hemodynamic instability; all others children received conservative treatment according to the American Paediatric Surgical Association guidelines. Three patients had a biliary complication (2, 5%). two patients treated surgically by drainage insertion and one was managed conservatively. Conclusions: Biliary complications of liver trauma in children may require aggressive surgical approach in selective patients.

Keywords: Biliary complication, children, hepatic trauma

INTRODUCTION

Liver injury is the most common, potentially life-threatening intra-abdominal injury in children who sustain blunt trauma. Conservative treatment is established as the treatment of choice in these patients.1,2

After the accurate initial assessment, which includes achieving the hemodynamic stability and imaging (abdominal ultrasound and computed tomography [CT]-scan) to define the degree of trauma, patients are usually managed with nonoperative treatment (ultrasound plus CT-scan diagnosis, hemodynamic stability, initial bed rest, close observation, and continuous re-evaluation).

However, the risk of serious complication is described, and this may occur even several days past the trauma.

Potential biliary complications include the hepatic sub-capsular bilioma, the biliary peritonitis, the hemobilia and the gallbladder necrosis.

Although the actual trend is to implement minimally invasive treatments for the management of such complications, this may not always be a feasible solution considering the patient’s age, the patient’s general conditions, or the severity of the lesion.3

In alternative laparotomy permit, both the execution of intraoperative cholangiography with correct localization of a fistula and a proper control of the entire abdominal cavity with direct manipulation of the viscera.

By laparotomy moreover the surgeon can perform a liver resection if necessary, with biliodigestive anastomosis or cholecystectomy with possible Kehr’s T tube placement.

The indication for any treatment is indeed very variable depending on the case.

We report our experience in three particular cases of biliary complications after major hepatic trauma.

PATIENTS AND METHODS

We conducted a single-center retrospective study of 116 consecutive children who presented at our institution with a blunt abdominal traumatism with liver involvement, from January 2010 to January 2016.

Patient’s average age was 10-year-old (range: 6–14 years) and the mean hospital stay was 7 days (range: 5–20 days).

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Among those children, 16 patients had hepatic trauma from Grade II–IV, whereas in the majority of cases, liver trauma was of Grade II.

The lesions were predominantly intrahepatic or subcapsular hematomas, and liver parenchima contusion, with or without hemoperitoneum.

The diagnosis was in all cases made using abdominal CT-scan.

Ninety-five percent of children were managed conservatively.

All cases were initially managed conservatively with three patients developing a biliary complication.

Two patients presented an internal biliary fistula with bile peritonitis and were subjected to surgery (drains placement and hepatectomy) and one patient presented hemobilia managed conservatively.

We describe these 3 cases in detail:

**Case 1**

A 13-year-old female patient hospitalized on August 2015, transferred from another hospital for politraumatism caused by falling off a bike.

The abdominal and chest CT-scan showed an important liver injury [Moore III; Figure 1a].

She began broad-spectrum antibiotic therapy and pain relief plus bed rest according to the conservative treatment protocol.

Due to an increase in abdominal pain, abdominal ultrasound was performed: signs of liver structural alteration were present, predominantly involving the left lobe in the absence of dilatation of the bile ducts.

An abdominal CT-scan was immediately performed, and confirmed liver structural alteration involving the right lobe, with an increased peritoneal effusion [Figure 1b].

The next day, given that the abdominal pain persisted, an explorative laparoscopy was performed.

A diffuse coleperitoneum was highlighted, and abundant peritoneal lavage was performed with two drains left in place (sub-hepatic and in the Douglas space).

Due to the persistence of fever in the postoperative period, a cholangio-magnetic resonance imaging was obtained showing an alteration of the hepatic profile for a laceration of an intrahepatic biliary duct, with discrete bile leak [Figure 1c].

The persistence of the collection in the perihepatic space, indicated the necessity of a percutaneous insertion of a new abdominal drainage (a pig-tail type drain was placed with the aspiration of about 250 mL of bile).

During the procedure, the previously placed drains were removed.

However, the continuing fever and persistent abdominal pain conducted to perform a new abdominal ultrasound control and to add an additional drain.

The following day both the drains were removed, without complications.

The collection identified at the ultrasound has been monitored, with a further percutaneous paracentesis being performed 1 week after, because of a 8 cm perihepatic collection [Figure 1d].

The child was discharged 5 days after this maneuver in good condition and is in regular follow-up.

**Case 2**

A 8-year-old male patient hospitalized on April 2014 according to Moore III liver traumatism caused by falling off a bike [Figure 2a].

Conservative treatment was established with the good clinical response, and the patient was discharged home on day 8.

On day 11, he returned to the emergency department with hematemesis and melena.

At readmission, hemoglobin value was 8, serum glutamic oxaloacetic transaminase was 1017, alkaline phosphatase was 1293, and gamma-glutamyl transferase was 287.

The abdominal CT-scan demonstrated blood in the gallbladder [Figure 2b].
He was submitted to hemotransfusion, and Doppler measurements of portal vein flow and hepatic artery flow demonstrated no alterations.

Esophago-gastro-duodenoscopy was negative for mucosal lesions, but blood was present in the second duodenal portion, and blood emission from the papilla was noticed, so hemobilia was suspected.

We decided not to contact the gastrointestinal endoscopists believing that any sphincterotomy would reduce the pressure on the level of the bile duct and potentially cause bleeding.

Instead, we alerted the interventional radiologist for eventual vascular embolization. After achieving hemodynamic stability, the patient had no more need for blood transfusions due to progressive normalization of cholestasis indices.

He was discharged home on posthospitalization day 26 and is in regular follow-up.

Ursodeoxycholic acid was administered for 6 months following the discharge from hospital for the presence of biliary sludge. However, last ultrasound no longer visualized any sludge.

**Case 3**

A 14-year-old female, hospitalized on May 2010 after politraumatism due to a bike accident.

Initially admitted to the intensive care unit with hepatic laceration (Moore IV), splenic fracture and right pneumothorax [Figure 3], she needed a blood transfusion in the first 24 h and after reaching progressive hemodynamic stabilization. She was transferred into the ward on day 5.

On day 11, she manifested sudden anemia and worsening of general conditions.

On day 12, hyperpyrexia (39°C) appeared, with the elevation of serum C-reactive protein, clinical signs of acute abdomen and bilirubin level up to 3 mg/dL.

At the abdominal CT-scan bile peritonitis was demonstrated.

Given the rapid and progressive deterioration of the general conditions, she was submitted to emergency laparotomy with intraoperative cholangiography, which showed a complete section of the posterior right bile duct.

It was chosen not to only drain the bile duct due to the biliary major injury, but also to perform a right heptectomy plus drain tube placement.

The postoperative course was complicated by low-output biliary fistula, which resolved spontaneously.

She was discharged home on the postoperative day 20.

After 5 years of follow-up, she maintained a good general condition.

**Discussion**

Major liver trauma remains a potentially life-threatening disease with mortality rates in adults at or above 10%.

The growing experience with less extensive surgical procedures and the highly performant diagnostic tools, ensure that about 80% of patients with liver injuries can be treated by simple measures or conservatively.[4]

The finding of free blood in the abdominal cavity is not an absolute indication for surgery; the only alarm sign is the circulatory instability.

Facilities for diagnosis, observation and follow-up are required in the hospital for safe treatment.

Abdominal CT has been proven to be sensitive and specific for the diagnosis of a parenchymal organ injury and ultrasonography is a suitable measure for a rapid diagnosis and moreover for the follow-up studies.

If nonoperative treatment is chosen, close observation and continued re-evaluation are mandatory.

Initial bed rest is advised for 24–48 h after which the patients are mobilized.[5]

The first report of conservative treatment in blunt liver trauma was reported in the early seventies, where four children with subcapsular hematomas of the liver without signs of capsular tears were followed with gradual resolutions of the lesions.

During recent years, numerous reports describe successful conservative management in liver trauma in a great number of patients, conveying great optimism on this approach.

As in adults, the hemodynamic status of the child is the primary indicator of the type of management required for hepatic injuries.

Children with intractable bleeding despite aggressive fluid and blood transfusion (>20 mL/kg of packed red blood cells) need emergent laparotomy if hemodynamically unstable.

Despite careful monitoring, a percentage of initially stable children with hepatic trauma are at risk of sudden
exsanguinations and such should be managed under surgical supervision with bed rest, serial abdominal evaluation and serial hemoglobin monitoring.

The success rate of conservative treatment of pediatric liver injuries varies from 85% to 90% depending on the series.

Debated questions remain the length of hospitalization and the return to activity recommendations.

About the length of hospitalization, Stylianos for liver injury Grade I–III recommend a total hospitalization equaling 1 day plus the level of injury; for Grade IV injury, they recommend 1 day of intensive care unit monitoring and retaining the formula for overall hospital stay.[6]

The authors recommend the return to a normal age-appropriate activity level was the organ laceration grade plus 2 weeks.

Bile leaks can conduct to significant morbidity after liver trauma.

The passage of bile into the hematoma could increase the intralesional pressure, with the consequent liver tissue necrosis and possible creation of a bilioma.[5]

Overall, the incidence of biliary complications after blunt abdominal trauma varies from 3% to 10%.

The bilioma is usually the most frequent complication that can occur.[7]

In literature, about 17% of bile injuries in Moore IV to VI liver traumatism, require surgery.[8]

Bile peritonitis can be managed by minimally invasive surgery with a combination of laparoscopic lavage plus drain placement.[9]

Follow-up imaging is essential to evaluate the development of biliary complications.

**Conclusions**

Children with liver trauma are at risk of significant morbidity and mortality.

With conservative treatment, success rate is near to 95%, but biliary complications after this approach is up to 4% of cases, and increase to 11%–13% of patients presenting severe lesions (Moore III, IV, V, VI), with the onset being usually late, about from 8th to 10th day.

The management of this complication can be nonsurgical, but should be surely multidisciplinary and should involve an interventional radiologist (for Percutaneous transhepatic cholangiography/drainage/embolization), an endoscopist (for endoscopic retrograde cholangio-pancreatography), and a surgeon (for laparotomy/laparoscopy, hepatic resection).

In all cases, identification of an abdominal injury can be challenging and failure to detect injury can lead to preventable complications.

Clinicians should maintain a high index of suspicion.

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**Conflicts of interest**

There are no conflicts of interest.

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