Total transverse rupture of the duodenum after blunt abdominal trauma

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AIM: Complete transverse rupture of the duodenum as an isolated lesion in blunt trauma can be considered as exceptional. The aim of this report is to discuss diagnostic procedures and surgical options in such an infrequent presentation.

CASE EXPERIENCE: We report on a 37 year old man who had a total transverse rupture of the duodenum after blunt abdominal trauma. Diagnosis was suspected after contrast enhanced CT scan and confirmed at laparotomy; duodenal rupture was repaired by an end to end duodenal-duodenal anastomosis, after Kocher maneuver. The patient had fast and complete recovery.

DISCUSSION: A high index of suspicion is necessary for timely diagnosis. Multi detector contrast enhanced CT scan is the gold standard for that aim. Surgical management must be tailored on an individual basis, since many techniques are available for both reconstruction and duodenum decompression. Kocher maneuver is essential for complete inspection of the pancreatic duodenal block and for appropriate reconstruction.

CONCLUSIONS: Management of isolated duodenal rupture can be difficult. Contrast enhanced TC scans is essential for timely diagnosis. Primary repair can be achieved by an end to end duodenum anastomosis after Kocher maneuver, although alternative techniques are available for tailored solutions. Complex duodenum decompression techniques are not mandatory.

KEY WORDS: Duodenal injury, Trauma

Introduction

Blunt abdominal injuries, as the result of a direct blow to the epigastrium, account for 25% of all duodenum traumas, while the remaining 75% are due to penetrating trauma 1-3.

Considering its deep and relatively protected anatomical site, when a blunt trauma is able to determine an injury to the duodenum, lesions of other abdominal or thoracic organs are commonly associated, because of high energy involved. Such traumas are usually due to motor vehicle accidents, especially in unrestrained drivers 4. Therefore, if a traumatic lesion of the duodenum is detected, injuries to other structures, including major vessels, have to be ruled out 1-5. If isolated blunt injuries of the pancreatic duodenal block are rare, a complete transverse rupture of duodenum as an isolated blunt lesion must be considered as exceptional 6-8.

Our aim is to discuss diagnostic procedures and surgical options in such an infrequent presentation.
Case Report

A healthy 37-year-old man was admitted to our hospital after affray. At admission he was plastered, with Glasgow coma score of 12; ventilation and saturation were within normal values. He was normotensive and had a pulse rate of 90 beats per minute. Physical examination on admission showed nasal and eyebrow contusions, a shoe shaped ecchymosis in right upper abdomen and abdominal tenderness with defense. Due to alcohol abuse and language barrier (the patient is Polish and doesn’t speak any other language) it was impossible to achieve complete anamnesis.

Blood analysis showed a haemoglobin concentration of 15 gr/dl and a white blood cell count of 14.76 x 10⁹/l. Serum amylase level was more then doubled (177 U/L; reference range: 13-53 U/L), suggesting acute pancreatitis. Electrolytes, urea and other routine analysis were all within normal values.

The patient underwent an abdominal ultrasonography and computed tomography (CT) with intravenous contrast, which showed: two contusive areas of 2 cm and 1.7 cm at IV-III hepatic segments; millimetric air bubbles in abdomen, particularly in the retropancreatic and right anterior sub-diaphragm spaces; distended gallbladder with normal VB; a pancreatic head contusion of 3.5 cm; a small intraperitoneal fluid collection (Figg. 1, 2, 3).

Surgical open approach was decided. Laparotomy revealed a total transverse rupture of the second part of the duodenum (Fig. 4) and a laceration of the head of pancreas but no visible lesions of the pancreatic duct.
The gallbladder was dilated. The complete exploration of the abdomen showed no other associated lesions; no bleeding hepatic lesions were found. There was intra-abdominal haematic and gastric-enteric fluid. A wide Kocher maneuver \textsuperscript{9,10} was performed in order to fully visualize the posterior aspect of duodenum and pancreas. In our opinion, Kocher maneuver is of paramount importance to achieve a complete evaluation of the lesion and to perform an appropriate and safe reconstruction. The edges of the duodenal rupture were debrided and repaired with an end to end duodenum reconstruction by an interrupted manual polyglactin suture. A cholecystectomy was performed and a T-tube was placed in the common bile duct after small choledochotomy. A nasogastric tube and an abdominal drain were placed.

Enteral feeding was started on postoperative day three and oral assumption was allowed on postoperative day seven. Serum amylase level went down to normal values in few days. The post-operative course was uneventful. Particularly, neither pancreatic, biliar nor gastric-enteric fluid came out from abdominal drain.

The patient was discharged on postoperative day fourteen. One month later, a TC scan and an EGDS confirmed the complete healing of the pancreaticoduodenal lesions. One year after surgery the patient is well, without any long-term complications.

**Discussion**

Diagnosis is difficult unless a high index of suspicion is maintained, in so an infrequent lesion, misdiagnosis or diagnostic delay is common: in case of small duodenal wound, initial physical examination is generally negative \textsuperscript{9}. When the lesion is small or at retroperitoneal site, signs of peritonitis usually develop after duodenal contents pour out in the peritoneal cavity; and this process can require several hours \textsuperscript{9,12}. In case of alcohol abuse, such as in the reported one, clinical signs can be misleading, owing to consciousness alteration. Ultrasound scans can be performed to rule out severe or bleeding injuries, as in FAST\textsuperscript{9} approach, but in most cases are inadequate to detect lesions of the pancreaticoduodenal block \textsuperscript{4}. CT scan with either oral or intravenous contrast medium is of paramount importance \textsuperscript{13-15}; by this way, the extravasation of oral or intravenous contrast medium, as well as the presence of air in retroperitoneal tissues, lesser sac or peritoneal cavity, can be detected even in the presence of a small laceration. The development of multidetector CT has improved the ability to examine and detect duodenal injuries. However, in some cases even CT scan can be considered as negative at admission; in some instances, subtle CT findings such as small amount of unexplained fluid and unusual bowel morphology, may be underestimated \textsuperscript{13-15}. Also in the presence of extended duodenal lesions, as in the present case, CT findings may not be glaring. Therefore, subtle findings on abdominal CT should be an indication for laparotomy or explorative laparoscopy whenever there is a clinical suspect.

Serum amylase level might be helpful, since persistently increased or rising level can indicate a lesion in the duodenal pancreatic complex. In such cases, CT abdominal scan must be considered as mandatory \textsuperscript{9,13}. Approximately 80\% of duodenal injuries can be safely primarily repaired, while the remaining usually requires more complex procedures, such as pyloric exclusion, duodenoduodenostomy, and duodenojejunostomy \textsuperscript{2,4,9,10,16}. Duodenal reconstruction with pedicled ileal loop may be considered in major lesion. Pancreaticoduodenectomy is rarely required and it might be performed in case of massive disruption of the duodenopancreatic complex \textsuperscript{17}.

Such area should be always adequately explored at laparotomy, through a wide Kocher maneuver and exposing all the duodenal portions. Unfavorable prognostic factors are the involvement of common bile and/or pancreatic duct, blunt trauma, and an involvement of more than 75\% of the duodenal circumference. Additional factors are represented by delay of treatment after the first 24 hours from the trauma, and lesions located in the first and second portions of the duodenum \textsuperscript{4,9}.

Protection of a primary duodenal repair is important to decrease the risk of duodenal suture dehiscence. Several liters of salivary, gastric, biliary, pancreatic and duodenal secretions pass daily through the duodenum. The proteolytic enzymes content and the great volume by itself may lead to a breakdown of suture lines, with subsequent fistula, which can lead to peritonitis and sepsis \textsuperscript{12}. So far many methods have been suggested in order to achieve diversion of gastric-duodenal flow associated with the primary closure of the duodenal wound: duodenal diverticulization, antrectomy and vagotomy and end-to-side gastrojejunoscopy \textsuperscript{4}. Pyloric exclusion without antrectomy, plus vagotomy and biliary diversion has been also proposed \textsuperscript{8,10}. A more common alternative to such techniques is the triple-tube decompression, with nasogastric tube or gastrostomy, retrograde and antegrade tubes for both duodenal decompression and feeding jejunostomy, respectively \textsuperscript{4,9,10}. An additional T-tube in the common bile duct can be placed, obtaining a "quadruple tube" decompression \textsuperscript{18}. After decompression, a lower incidence of duodenal leaks has been reported, even if there is no prospective randomized study, comparing decompression versus other techniques \textsuperscript{5,10,12}.

In the reported case, clinical suspicion was strong (abdominal defense together with CT findings and high amylases serum level) and laparotomy could be performed on time. There was no indication for duodenopancreatectomy, since the pancreatic tear didn't
affect pancreatic duct. The edges of duodenal rupture where quite neat and allowed direct end to end anastomosis. Cholecystectomy and T-tube drainage of cholecoccus seemed to be advisable in view of the incoming post traumatic pancreatitis and bile flow obstacle by pancreatic swelling or hematoma. Other kinds of gastrointestinal drainage, except a nasogastric tube, seemed not to be necessary. The favorable outcome seems to confirm our surgical options but, of course, there are no evidences against the effectiveness of other surgical procedures.

Conclusions

The diagnosis of an isolated duodenal injury can be difficult, owing to its very rare occurrence, anatomical location of the duodenum and possible lack of peritoneal signs. A high degree of suspicion must always be maintained for early diagnosis and CT scan should be performed in case of all significant epigastric traumas. Primary repair can be achieved by an end to end duodenum anastomosis after Kocher maneuver, although alternative techniques are available for tailored solutions. Duodenal decompression via triple or quadruple tube technique is not mandatory in most cases.

Riassunto

INTRODUZIONE: Le lesioni del duodeno secondarie a trauma chiuso non sono frequenti; poiché corrono in traumatismi a elevata energia, sono generalmente associate a lesioni multiple. È da ritenere del tutto eccezionale il caso di una lesione isolata del blocco duodenopancreatico, con transezione completa del duodeno in un traumatismo chiuso. Obiettivi del presente lavoro è discutere il processo diagnostico e la tecnica chirurgica alla luce di questa esperienza.

CASO CLINICO: Riportiamo il caso di un uomo di 37 anni, con un trauma addominale da percosse, che presentava una lesione duodenopancreatica con sezione completa trasversale del duodeno. Una TC dell’addome mostrava la presenza di piccole bolle aeree intraperitoneali, confermando l’indicazione all’esplorazione chirurgica d’urgenza. Alla laparotomia si è evidenziata la sezione trasversale completa della seconda porzione del duodeno, associata a una lacerazione del parenchima cefalo-pancreatico, con integrità del dotto pancreatico. È stata eseguita un’ampia manovra di Kocher per consentire la completa valutazione del danno ed un’agevole riparazione. Nella nostra esperienza, la sutura termino-terminale, quando possibile, si è dimostrata efficace e sicura. Tecniche complesse di decompressione duodenale non sono sempre necessarie.

References

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