Reminder of important clinical lesson

Right thoracoabdominal stab injury penetrating the liver and gallbladder: case report and lessons in penetrating knife wounds to the chest and abdomen

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Summary

The authors report a patient who suffered a penetrating knife injury to the right thoracoabdominal region which penetrated through the liver and both sides of the gallbladder. This injury was treated successfully by laparotomy and cholecystectomy.

BACKGROUND

Traumatic injuries to the gallbladder are rare and are most commonly due to blunt abdominal trauma. We report a patient who suffered a penetrating knife injury to the right thoracoabdominal region which penetrated through the liver and both sides of the gallbladder. This injury was treated by laparotomy and cholecystectomy. This problem may become more common as the number of recorded knife injuries resulting in hospital admission in England is increasing. Although non-operative treatment of right-upper-quadrant thoracoabdominal knife injuries is becoming increasingly common, continued vigilance is required to detect a potential injury to the gallbladder, biliary tree or hollow viscus (stomach, duodenum or transverse colon). In this article we review the management of penetrating thoracoabdominal trauma and traumatic injuries to the gallbladder.

CASE PRESENTATION

A 44-year-old man was brought in by an emergency ambulance in the early hours of the morning. He had multiple knife-stab injuries to both sides of his chest, right shoulder and left arm. He was treated by the on-call trauma team in the main resuscitation bay. His airway was intact. His oxygen saturations were 100% on oxygen, and his respiratory rate was 20 breaths/min. He had bilateral good air-entry. His pulse was 80 and blood pressure 130/80. His abdomen was tender in the right upper quadrant, but with no peritonism or guarding.

His specific injuries were a 4-cm anterior stab wound in the right seventh intercostal space (ICS), 6 cm lateral to the sternum in line with his right nipple. He had a left 2-cm stab wound in the sixth ICS, 6 cm lateral to the sternum. His other knife injuries were a deep wound to his left hand, an incised wound to the left elbow and a stab wound to the right-shoulder region. His Glasgow coma scale was 14/15, and he appeared intoxicated with alcohol or drugs.

He was treated according to advanced trauma life-support guidelines with large bore intravenous access, urinary catheterisation and routine bloods and crossmatch.

Supine chest x-ray showed no signs of a pneumothorax or free intra-abdominal gas. The lower right chest had a hazy appearance, but no definite haemothorax. Because there was no indication for emergency surgery a contrast CT scan of his chest and abdomen was performed.

CT scan showed minor amounts of right pleural blood, but no pneumothorax. There was blood surrounding the liver, spleen and pelvis. There was no obvious stab injury visualised in the liver parenchyma. No free abdominal gas was observed.

His superficial wounds were sutured in the emergency department. He was admitted for close observation on the high-dependency unit (HDU). The next day he complained of worsening right upper abdominal discomfort and had become tachycardic with a pulse of 120. He had right-upper-quadrant peritonism on examination. On the basis of these features, he was taken to theatre for emergency laparotomy and right chest drain insertion.

Under general anaesthesia, a right-sided intercostal drain (28 French) was inserted using a blunt technique and 500 ml of old blood was drained. A right subcostal incision was performed to open the abdomen. There was approximately 500 ml of blood and some bile-stained fluid in the abdomen. On direct inspection, the stab wound penetrated the diaphragm, liver and both sides of the gallbladder (figure 1). The duodenum, pancreas, transverse colon and inferior vena cava were inspected and found to be free of any injuries. An open cholecystectomy was performed to deal with the penetrating injury to the gallbladder. The diaphragmatic injury was closed with 0-Vicryl interrupted sutures. The anterior surface of the liver was bleeding and was sutured with interrupted 0-Vicryl liver sutures. The abdomen was washed with 0.9% saline and a 24F drain placed in the sub-hepatic space. The abdomen was closed with a mass closure and skin stapled.

Postoperatively he was observed on the HDU. Bile drained initially from the abdominal drain but this dried up in 48 h without any specific treatment. The chest drain was removed after 3 days.

Figure 1 (A) This shows the penetrating injury on the anterior surface of the liver. (B) The stab wound penetrated through the liver and gallbladder fossa, and there was a puncture wound visible on the under surface of the gallbladder. (C) The cholecystectomy specimen showing the posterior gallbladder stab injury and protruding haematoma. (D) Photograph of the wound closure showing chest drain, stab injury, right subcostal incision and abdominal drain.

INVESTIGATIONS

Included in case presentation.

TREATMENT

Included in case presentation.

OUTCOME AND FOLLOW-UP

He was fit for discharge 15 days after the initial injury. He was readmitted 3 days after discharge with abdominal pain, features of sepsis (high white cell count and fever) and cellulitis of his wound and pussy discharge from the drain site. He was treated with intravenous fluids and antibiotics. Repeat CT of the abdomen showed a subcapsular liver collection and collection in the gallbladder fossa area. Both were small and did not require radiologically guided percutaneous drainage. He was treated conservatively and discharged after a further 5 days.

DISCUSSION

The number of recorded knife injuries resulting in hospital admission in England has increased by 30% over the period of 1997–2005.¹ Penetrating chest injuries contribute significantly to the trauma workload of a busy emergency department in the UK.² Stab injuries to the thoracoabdominal region (or the intrathoracic abdomen) pose specific and well-documented problems.³ Injuries in this region can affect both the thoracic and upper-abdominal organs and make assessment and management particularly challenging. Haemodynamically unstable patients may require thoracotomy, laparotomy or both approaches to

deal with underlying injuries. Patients with haemodynamic instability, peritonitis or intestinal evisceration require immediate surgery. Non-operative treatment of right-upper-quadrant thoracoabdominal knife injuries has become increasingly common in recent years.⁴ The rationale behind the change in management, which would previously warrant laparotomy, is that a significant percentage of injuries do not require surgical treatment and patients can be spared the morbidity of a non-therapeutic laparotomy. The key to non-operative management is patient selection.⁵ Relative contraindications to the non-operative management include free abdominal gas on plain radiography; omental protrusion via the stab wound; patients who need surgery for other injuries, for example, head injuries; and patients who cannot be closely observed. Patients without these contraindications, who are not shocked and who have minimal abdominal signs are suitable for non-operative management. With this approach, it is important to identify patients who may have suffered occult injuries and require further diagnostic evaluation or operative treatment. Patients treated non-operatively require regular clinical evaluation, preferably by the same team of experienced clinicians.

Another aspect of conservative treatment that must not be forgotten is that after the acute event, some patients may require laparoscopy to assess for diaphragmatic injury which may require laparoscopic or open surgical repair. Missed diaphragmatic injuries and subsequent hernia development are a major cause of late morbidity in thoracoabdominal stab wounds.³ This is particularly important in left-sided diaphragmatic injuries that will lack the buttressing effect of the liver.

Traumatic injuries to the gallbladder are rare. This is partly due to the anatomical protection that is provided by the liver, lower-right thoracic cage, surrounding omentum and intestines. Road-traffic accidents appear to be the commonest cause of gallbladder injuries in Westernised countries,⁶ especially in countries with low gun crime. Penetrating injuries from gunshot wounds are more reported in countries such as South Africa which has a high rate of gun violence. In one study of 1242 patients undergoing laparotomy for acute trauma in South Africa, there were 43 injuries (3.5%) to the gall bladder (37 from gunshot wounds, three knife wounds and three from blunt abdominal trauma).⁷ In this study, associated injuries of the liver, pancreas, biliary tree, major intra-abdominal vascular structures (such as inferior vena cava, portal vein or aorta), right kidney, transverse colon, duodenum and stomach were commonly associated with penetrating injuries, especially gunshot wounds. Often it is the severity of the associated injuries that govern subsequent outcome.⁸ Early diagnosis and treatment is crucial to avoid unnecessary morbidity and mortality.^{9–10}

Patients with gallbladder injury may present with a variety of features. Shock and haemoperitoneum can occur hours after injury from transection of the cystic artery or associated liver or other injuries. Later presentation may occur with right-upper-quadrant pain and biliary peritonitis. Isolated, penetrating gallbladder injuries may produce minimal symptoms initially. A rarer presentation is of blood within the gallbladder causing blockage of the cystic duct and features of acute cholecystitis ensue.¹¹ A high index of suspicion and appropriate selection of imaging studies may lead to early identification.

Management of gallbladder injury is often with open laparotomy. In the case of apparently isolated gallbladder injury, the surgeon should carefully examine for trauma to other nearby organs. The optimum surgical treatment for a gallbladder injury is cholecystectomy.^{7–8} Suture repair (cholecystorrhaphy) of penetrating injuries has been described, but there are risks associated with this procedure, such as repair breakdown and subsequent bile leakage. In addition, even absorbable sutures placed in the gallbladder wall carry the risk of forming a nidus for subsequent stone formation. Cholecystectomy eliminates these risks, and the procedure has a fairly low rate of morbidity. The placement of a closed suction drain in the gallbladder fossa is recommended after cholecystectomy to monitor and treat potential postoperative bile leaks. Cholecystostomy (closure of a perforation over a drain, such as a Foley catheter, and leaving the gallbladder in situ) is another potential treatment for gallbladder injury.⁶ However, this should be seen as only a damage-control option and should only be used in patients who are desperately ill and have other injuries which would mean that taking extra time to perform a cholecystectomy would be potentially dangerous.

Laparoscopic cholecystectomy has been described as the treatment for an isolated gallbladder perforation due to abdominal stab wound.¹² However, the laparoscopic approach has some limitations and is generally not recom-

mended in the situation of gallbladder trauma where other concomitant injuries need to be excluded. Although the laparoscope can give a good superficial view of the peritoneal cavity and provide excellent diaphragmatic views, inspection of the duodenum, pancreas and porta hepatitis is not sufficient in the hands of most general surgeons without advanced laparoscopic experience.

Learning points

- ▶ Clinical assessment of the patient with stab injuries may be clouded by other injuries or drug and alcohol intoxication.
- ▶ Absolute indications for laparotomy include haemodynamic instability and diffuse abdominal peritonitis (in particular, deep tenderness away from the site of injury).
- ▶ Selected patients with penetrating thoracoabdominal trauma can be treated conservatively, without surgery.
- ▶ Although penetrating injuries to the right-upper-quadrant/liver may be treated non-operatively, continued vigilance and observation is required so that associated injuries to the gallbladder, biliary tree, stomach, duodenum or transverse colon are not missed.

Competing interests None.

Patient consent Obtained.

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