Inferior vena cava injury repair, a successful outcome

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ABSTRACT

Inferior vena cava (IVC) injuries are very very infrequent; yet it still happens to be the most frequently injured retroperitoneal vascular structure. Fifty percent of the patients can't even make it to the hospital. Even when half of them manage to attend the hospital the mortality rates for the great vessel injury are still very high perhaps due to the low index of suspicion, delayed or inadequate volume resuscitation, difficulty in diagnosis and also due to some technical problems associated in its repair. We present a young male with an abdominal stab injury who had a near transected inferior vena cava at operation. Aggressive perioperative management and the correct judgement by our team at the right time possibly made the patient survive. The rarity of this condition and a review of the literature with some discussion are presented.

Keywords: Inferior vena cava injury, stab wound, survival factors

Though the incidence of tears of inferior vena cava (IVC) due to injury is relatively small, it still happens to be the most frequently injured retroperitoneal vascular structure[1]. Despite the improvements in preoperative care and operation techniques, mortality rates for inferior vena cava injuries are still high due to delayed or inadequate volume resuscitation, difficulty in diagnosis and technical problems in repair. We confronted a case of almost completely transected inferior vena cava, due to penetrating abdominal trauma. Aggressive, timely perioperative management and the correct judgement at the right time made the patient survive. The rarity of this condition and a good outcome encouraged us to present this report.

CASE REPORT

An adolescent male eighteen years of age, presented to the emergency with alleged history of physical assault, after half an hour of the incident. He had a stab wound of 2x2 cm over the anterior abdominal wall below and right to the umbilicus, associated with multiple cut injuries over the chin and the right armpit. On clinical examination, he looked severely pale and dehydrated. His femoral pulse rate was 140/minute and weak. His radial pulse was not palpable. The blood pressure was not recordable. He was in a state of altered sensorium. However, there were no focal neurological signs. Abdominal examination revealed penetrating wound over the right lower abdomen, which was bleeding profusely. Rapid intravenous fluids were administered and bladder catheterization done. After 1.5 litres of intravenous fluids, his radial pulse could be felt and the blood pressure of 90/60 mm of Hg was recorded.

Within half an hour of arrival at the emergency, a decision for exploratory laparotomy was made and he was taken to the operation theatre. Laparotomy revealed 2 litres of free blood and plenty of blood clots in the peritoneal cavity and a large expanding retroperitoneal haematoma. There was active bleeding from the defect in the posterior peritoneum overlying the haematoma and from the small intestine mesentery as well. The proximal and the distal control was achieved by applying direct pressure by the fingers of the assistants against the spine. We did not opt for a full right medial rotation and relied on this maneuver throughout the procedure since we could not waste time. The inferior venacava was found to be completely transected but at the extreme lateral ends (Fig. 1). The jejunum revealed three perforations around four feet distal to the duodenojejunal flexure. The venacaval injury was closed with a 4/0 non-absorbable continuous prolene suture (Fig. 2). The bleeding from the mesentery was controlled and the defect was repaired. Resection of the perforated jejunum and end-to-end anastomosis was done. Abdominal drain was positioned and the abdomen closed in single layer with no 1 polypropylene suture. The operative time was two and half hours and the patient received eight litres of crystalloid, one litre of colloid and three units of whole blood. There were no critical events during the intraoperative period.

The patient was transferred to the intensive care unit for mechanical ventilatory support and after twenty-four hours of postoperative management, intravenous heparin was started via infusion pump, which was later switched to low molecular weight heparin. He developed right sided spontaneous pneumothorax on the third

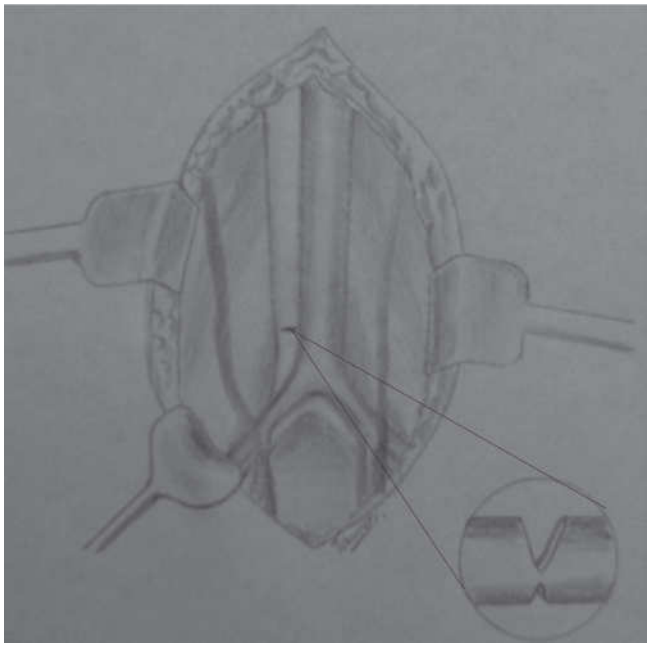

Fig. 1. Sketch showing the site of injury

postoperative day that was managed with intercostal tube drainage. On the fifth postoperative day he was extubated and inotropic support was stopped. He was discharged on the tenth postoperative day with an advice to continue low molecular weight heparin for two more weeks. Ultrasound (Fig. 3) that was done after two weeks showed a normal calibre inferior vena cava with no evidence of intraluminal thrombus.. On further follow up visits, there were no swelling in the lower limbs and he remained absolutely symptom free at the end of one year.

DISCUSSION

Injury to the inferior vena cava carries a very high mortality, ranging from 57 to 95% as reported by Kudos and colleagues.[2] Injury to the inferior vena cava results from trauma or during operative procedures in the vicinity.[3,4] If recognised early and repaired the prognosis is particularly good, especially in cases of peri-operative damage to the inferior vena cava. Nearly 36% of patients with traumatic rupture or tear of the vena cava die before reaching hospital.[4] In the remaining 67%, the mortality is reported to be as high as 50%, despite active resuscitation and an early operation.[4] The usual cause of death in such cases is oligaemic shock or ensuing renal failure. Survival can be correlated with the time of admission, blood pressure and its response to fluid resuscitation. In our patient presentation within half an hour after the injury, appropriate and timely preoperative management of hypovolaemic shock prevented exsanguination and subsequent renal failure. Immediate intervention and repair of the injury prevented further bleeding.

Mortality is lowest if the injury is restricted to infrarenal or suprarenal area [4]. Other factors positively associated with survival were stab wound, presentation as retroperitoneal haematoma, low Abdominal Trauma Index score and small peripoperative blood loss[5]. We observed stab wound, presentation as retroperitoneal haematoma, infrarenal injury to be the positive factors in our patient as had also been inferred by Leppaniemi et al, for a successful outcome. Concomitant injury to the abdominal aorta, liver or kidney worsened the prognosis in the report published by Leppaniemi *et al*.[5] However, our patient made quite rapid and a remarkable recovery, though he had sustained multiple perforations of the small bowel as well.

The crucial factor in the management of inferior vena caval injuries is rapid and effective control of bleeding, whether from the caval or associated injuries.[5] Delivery of severely injured patients to trauma centres where resuscitation teams are available round the clock decreases the mortality and morbidity.[6] Although some wounds of the vena cava, especially those of the retrohepatic vena cava, are best left unexplored, most injuries inferior to this level can be exposed and repaired by lateral suture technique. [7] In our patient, we were able

Fig. 2. Shows repaired IVC

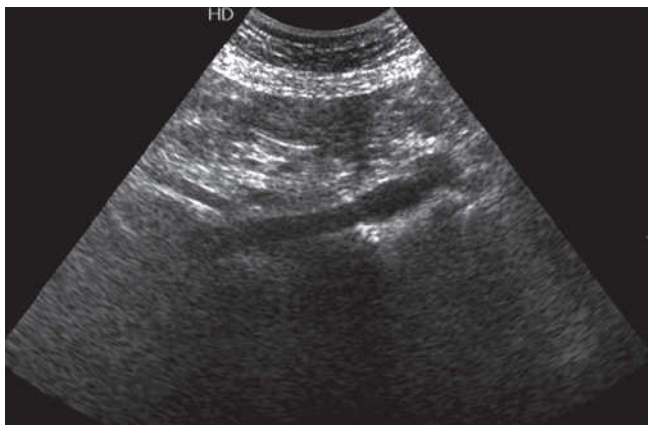

Fig. 3. Post repair US scan of the IVC

to repair the defect using polypropylene suture without any tension. Preservation of a lumen of at least 25% of normal is probably important in the suprarenal vena cava but is of no value inferior to the renal veins. No evidence supports the need to expose and repair vena caval wounds that have spontaneously stopped bleeding. Such wounds, especially in the retrohepatic area, may be managed expectantly provided there is no strong suspicion of an associated injury to a major artery or hollow viscus.[7] Prosthetic reconstruction using polytetrafluroethylene (PTFE) patch represents an acceptable alternative to the venacaval injury repair.[8]

The traumatic inferior vena cava injury can be managed successfully. Early presentation, high index of suspicion, a technically good repair supplemented by a good postoperative support determines a good outcome. Rapid restoration of blood volume and control of haemorrhage is the most crucial factor.

Similarly, stab wound, presentation as retroperitoneal haematoma, supra or infrarenal venacaval injury and low Abdominal Trauma Index score are the other key factors to improve the salvage rate.

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