

복부 둔상 후에 발생한 광범위한 하대정맥 손상: 증례보고

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- Abstract -

Extensive Inferior Vena Cava Injury Following Blunt Abdominal Trauma: A Case Report

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Traumatic injuries of the inferior vena cava (IVC) are the most challenging lesions in abdominal vascular injuries and are associated with a high mortality rate. Although endovascular treatment has been addressed in the management of vascular trauma, surgery is the mainstay in the treatment for IVC injury as an endovascular technique for the venous system has not been developed. We report a case of successful surgical repair of an extensive IVC laceration following a fall. [J Trauma Inj 2014; 27: 219-23]

Key Words: Inferior vena cava, Blunt trauma, Surgical repair

I. Introduction

Traumatic injuries of inferior vena cava (IVC) account for approximately 25~40% of abdominal vascular injuries and are the most challenging and lethal lesions sustained by trauma patients.(1-3) Although its overall incidence is rare, it is reported that up to 1% of patients with blunt trauma sustain injuries to the IVC.(3) Blunt trauma is responsible

for about 10% of IVC injuries.

Despite the progress in the surgical and interventional techniques, mortality rate remains high between 40~60% with little improvement.(4-6) Due to high mortality in the field, the data on IVC are probably under-reported in the literature and the results are not well updated.

Although endovascular treatment has been addressed in the management of vascular trauma,

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surgery is the mainstay in the treatment for IVC injury as endovascular technique for venous system has not developed widely.(7) We report a case of successful surgical repair of extensive IVC laceration following falling-down.

II. Case

A 31-year-old woman was brought in our emergency department (ED) following falling down injury from a height of seventh floor 30 minutes ago. On physical examination, there were multiple contusions on abdomen and extremities. Initial blood pressure in ED was 60/40 mmHg with pulse rate 120/min, for which she was resuscitated and simple x-ray and computed tomography (CT) was checked after being stable state. Initial trauma radiographs

revealed multiple fractures on extremity and pelvic. CT scan showed no signs of hollow viscus organ injury but huge retroperitoneal hematoma and active bleeding around the infrarenal IVC was seen (Fig. 1). Her initial hemoglobin (Hb) level was 12.5 g/dl and dropped to 9.1 g/dl after an hour. Suddenly her blood pressure dropped to 80/60 mmHg with stuporous mentation. The patient was immediately taken to the operating theatre for exploration.

Access was gained into the peritoneal cavity through midline incision. At laparotomy, there was no hollow viscus perforation and solid organ injury. However, a large expanding hematoma behind the right colon was observed. For proximal and distal vascular control, a medial visceral rotation from the right side was carried out for exposure of IVC and both iliac veins .Rommel tourniquets were applied at

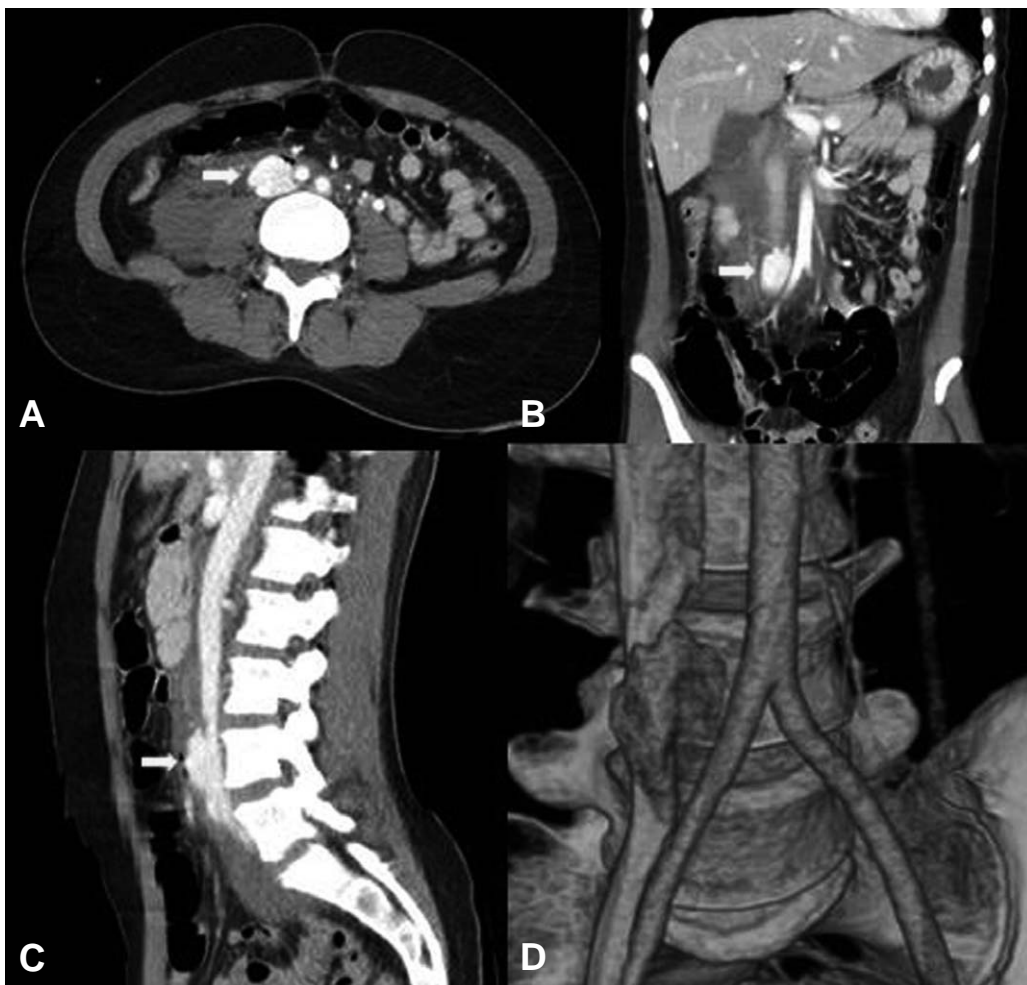


Fig. 1. Computed tomography showed laceration of infrarenal IVC with active bleeding (arrow).
(A) Axial view (B) Coronal view (C) Sagittal view (D) Reconstructed angiogram

suprarenal IVC and both common iliac vein. When hematoma around IVC was carefully unroofed, active bleeding from injured IVC took place. Temporary control of active bleeding was gained by digitally compressing the IVC against the spine above and below the injury. Even though proximal and distal vessels were controlled, hemorrhage from lumbar

veins were not controlled well and continued. A laceration of anterior wall in length of 4 cm from infrarenal IVC to iliac bifurcation was identified. Although we attempted to control bleeding applying a side-biting Satinsky clamp, it was difficult to clamp the entire circumference of the laceration due to the large area of laceration. Using several sponge sticks and suctions, laceration was visualized and closed with a continuous 5-0 Prolene suture from the lower edge to the upper edge of the laceration (Fig. 2). A total of 16 packs of RBCs and 18 packs of FFP were transfused during the operation.

The patient was recovered uneventfully and several elective operations were performed to treat the multiple fractures. Although CT scan after one month showed focal stenosis of IVC, the lumen was patent and there was no flow-limiting lesion (Fig. 3). Low molecular weight heparin was administered after IVC repair, but no oral anticoagulant was prescribed. The patient was discharged without complication such as deep vein thrombosis or leg edema, and was still well without complications at the follow-up visit 8 months after the operation.



Fig. 2. Intraoperative photography showing repaired laceration of IVC in length of 4 cm with prolene 5-0 (black arrow).

III. Discussion

The injury of inferior vena cava continues to challenge trauma surgeons. Although improvements in prehospital medical services and rapid transportation to emergency room enable more patients to

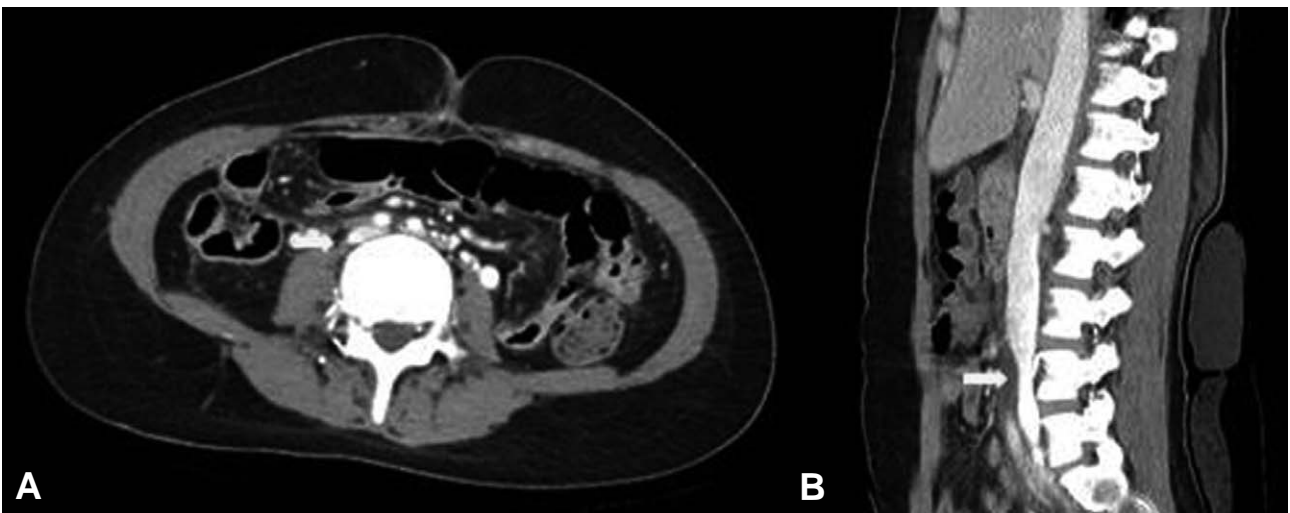


Fig. 3. In follow-up CT scan 1 month after operation, focal stenosis without flow-limitation was identified and there was no deep vein thrombosis of venous system. (A) Axial view (B) Sagittal view

reach the hospital alive, 10~20% patient die before surgical operation or completion of repair.(8)

Several clinical factors have been previously known to be predictive of survival, particularly anatomic location of injury, initial severity of shock and associated vascular injury.(8,9) Because the infrarenal IVC is surgically accessible, which simplifies exposure and facilitates vascular control of hemorrhage and repair of the injury, survival is highest in patients with infrarenal IVC injury, and mortality is highest in patients with retrohepatic injuries.

However, there are no definitive indications of surgical repair in case of IVC injury. It is difficult to decide whether to repair the injury of IVC or to observe, due to a real risk of making things much worse by unroofing the injury and releasing the tamponade. A stable, small hematoma may be treated without further exploration or repaired in carefully selected patients. However, sudden fatal hemorrhage in an uncontrolled situation resulting in exsanguination is possible.

A number of techniques were introduced to the trauma surgeons to control hemorrhage.(10) Direct pressure with finger or sponge stick is effective until exposure is complete. The larger Satinsky clamp placed under the smaller one to contain the entire laceration is also effective. However, blind application of vascular clamp should be avoided to prevent further laceration and avulsion of lumbar veins or IVC itself. Instead of vascular clamp, Rommel tourniquets are useful to achieve proximal and distal vascular control.

Extensive disruption of IVC like in our case is the most difficult to repair, requiring significant mobilization and extended surgical exposure. Primary repair remains the procedure of choice in hemodynamic stable patients with noncomplex injuries.(11) Anterior perforation of IVC should be repaired in a transverse fashion as far as possible to prevent narrowing of IVC. When significant longitudinal perforation is present, surgical repair can be performed in a longitudinal fashion just like our case. However, because the narrowing may lead to postoperative stenosis or occlusion of IVC, autogenous vein patch, PTFE patch and interposition graft

should be considered depending on the patient's hemodynamic status. In case of our patient, there were no complications such as IVC occlusion or deep vein thrombosis in clinical follow-up.

Ligation of IVC may be life-saving procedure in otherwise exsanguinating injuries and should be considered early in the management of complex injuries.(6,12) However, because ligation of IVC as a bailout solution remains associated with high mortality, certain precautions such as bilateral four-compartment fasciotomies and continuous elastic compression and leg elevation is generally required.

The exact incidence of venous thromboembolism (VTE) after IVC injury is poorly defined. Recently, in a large statewide database, the overall incidence of VTE was reported as 2.3% (5/308).(13) Although the use of VTE prophylaxis was undefined, it was surprisingly low rate of VTE after operative management, which was similar for patient undergoing ligation and repair (4.2% versus 1.7%, $p>0.99$). Accordingly, the question remains whether the VTE prophylaxis and use of screening modality is necessary.

In summary, we report a case of extensive IVC injury in the setting of blunt trauma, which was treated by surgical repair. In case of extensive IVC injury, surgical repair is technically demanding procedure and careful surgical strategy should be planned.

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