Case report

Emergency endovascular repair for traumatic injury of the inferior vena cava

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Abstract

Conventional open repair of the traumatic injuries of the inferior vena cava still represents a surgical challenge, since it carries high morbidity and mortality rates close to 100% in emergency setting. Surgical techniques required the total mobilization of the liver in the former case and the anatomic exposure of the aorto-iliac bifurcation in the latter. We report a case of uncontrolled hemorrhage from the inferior vena cava, managed by endovascular technique. A 65-year-old woman underwent endovascular stent-grafting for traumatic injury of the inferior vena cava. We performed the endovascular approach as we similarly did for aortic repair using a simple groin access through the common femoral vein; no additional dissection of the inferior vena cava or adjacent structures was needed using endovascular approach, thus avoiding additional operative trauma, and time with the stent-graft procedure was 9 min. Inferior vena cava stent-grafting without laparotomy and retroperitoneal dissection is feasible and could be a very attractive alternative to open surgery for rupture of the vena cava.

Keywords: Inferior vena cava; Endovascular repair; Stent-graft; Intraoperative injury; Blunt trauma

1. Introduction

Emergency surgical repair of traumatic injuries of the suprarenal inferior vena cava (IVC) or of the ilio-caval bifurcation is still considered a technical challenge with high morbidity and mortality rates (50—100%) [1,2]. Conventional surgical techniques required the total mobilization of the liver in the former case and the anatomic exposure of the aorto-iliac bifurcation in the latter [3]. In this setting an endovascular approach might be a feasible alternative: we present a case of endovascular exclusion of IVC traumatic injuries managed by stent-graft (SG).

2. Case report

A 65-year-old woman was involved in a rollover motor vehicle crash during a road traffic accident. At admission to the Emergency Department resuscitation therapies according to advanced trauma life support (ATLS) were carried out. She presented with paraplegia. Blood tests revealed Hb level was 11.4 g/dL, blood pressure was 110/65 mmHg, and heart rate was 96. X-rays showed the explosion of the first lumbar vertebra and multiple fractures of the acetabulum and the right femur. Total body spiral computed tomography (CT) revealed the presence of sub-aracnoideal hemorrhage and retroperitoneal hematoma surrounding the first lumbar vertebra without signs of active bleeding from the large vessels were not detected. Four hours later blood pressure fell to 65/40 mmHg, heart rate increased to 121 beats per minute, and the Hb level fell to 6.3 g/dL, despite the prolonged resuscitation with 12 units of packed red blood cells. In order to re-evaluate a potential lesion of the large vessels, we performed a CT-angiography (CT-A) that revealed a leaking injury of the IVC at the level of the ilio-caval bifurcation. Therefore, the patient was suddenly taken to the theatre to perform a preliminary cavogram through a percutaneous right transfemoral approach that confirmed the bleeding injury at the level of the ilio-caval bifurcation (Fig. 1). The left common femoral vein was surgically exposed immediately, and a 20 Fr sheath was inserted under fluoroscopic control using a mobile intensifier C-arm (Isocentric-Siemens, Munich, Germany), in order to deploy the main trunk of the SG [Excluder-W.L.Gore, Flagstaff, AZ, USA (31 mm × 14 mm × 150 mm)]. The contralateral leg was positioned through a percutaneous right transfemoral access. The final angiogram confirmed the complete exclusion of the injury and the absence of bleeding (Fig. 2). The duration of endovascular procedure was 9 min. The patient was admitted...
to the intensive care unit (ICU). She died 2 days after the procedure because of the consequence of the brain injury.

3. Discussion

To date, few data exist concerning the management of injuries involving low-pressure and high-flow venous systems in difficult anatomic locations, such as pelvic, retrohepatic inferior vena cava, and portal venous regions which could be devastating and associated with a high mortality rate, up to 92% [1,2]. Previous studies have shown that abdominal vascular injuries are among the most challenging and lethal injuries sustained by trauma patients. Frequently, these patients arrive at trauma centers in profound shock or present in cardiopulmonary arrest and could necessitate emergency thoracotomy, aortic cross-clamping, and open resuscitation to maximize any chance of reaching an operation room alive; exsanguinations account for the vast majority of deaths [2]. This paper describes the use of SG to treat intra-abdominal uncontrolled hemorrhage after traumatic injury of the IVC.

Interventional vascular techniques became an important alternative approach in the armamentarium of trauma and vascular surgeons for the treatment of many different vessel districts [3]. It has been described that the key to successful management of abdominal vascular injuries lies in the immediate control of the hemorrhaging vessel [2]: the main advantages of the endovascular approach include the relative ease and speed with which they can be performed combined with minimal additional tissue trauma, that is particularly attractive in terms of bleeding control following injuries at the level of the suprarenal vena cava or at the level of the ilio-caval bifurcation, where hemostasis requires extensive dissection, worsening both the injury and bleeding, which could lead to a potential fatal coagulopathy after prolonged resuscitation [4,5]. In fact, mortality has been directly associated with the severity of bleeding and its physiologic consequences [1,6]. Moreover, no additional dissection of the IVC or adjacent structures was needed using endovascular approach; in the present case, duration of the SG procedure was 9 min, and it allowed to avoid additional operative trauma and time consumption. However, mortality has been reported higher in patients with massive hemorrhage, hypothermia, acidosis, and hypotension; unfortunately, as we experienced in our patient, despite prolonged resuscitation, prompt and technically successful endovascular exclusion of the IVC bleeding tear, IVC injuries are still associated with fatal hemorrhage.

We believe there are several concerns before starting with SG repair of traumatic injury of the IVC such as the question of durability and the strategy of postoperative anticoagulation therapy; in fact, the stent is highly thrombogenic in the first month, until neo-endothelium covers the endovascular surfaces. We believe that anticoagulation could be advocated in this period. Although most of the reported studies suggested postoperative anticoagulation, to date any relative controlled clinical trial has not been carried out to determine whether anticoagulant treatment is needed or not and its duration [2,5]. The main shortcoming of this paper is the absence of follow-up examination; however, only two cases previously reported in literature showed good immediate outcome and durable results. Moreover, despite our patient died postoperatively, the cause of death was not procedure-related; in fact, autopsy confirmed the successful sealing of the injury.

4. Conclusion

In our experience, SG for IVC injury proved to be technically feasible. The aim of this report is not to redefine surgical management for IVC injury but to describe an intriguing potential alternative for these high-risk patients amenable to intervention.

References
