CASE REPORT

Damage Control Surgery in a <1kg Neonate: A Brief Report

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Damage control surgery is a feasible and successful approach for the management of unstable neonates with intra-abdominal catastrophes, including liver injuries. We report the case of a premature infant with a liver injury secondary to the placement of an umbilical vein catheter who was successfully managed using damage control surgery techniques.

INTRODUCTION

Damage control or abbreviated laparotomy is the current alternative treatment for exsanguinating patients who have developed the triad of hypothermia, coagulopathy, and acidosis [1-4]. Although this staged approach previously has been used in pediatric patients with blunt abdominal injuries [5], this method also can be used safely for other traumatic and non-traumatic causes of intra-abdominal bleeding [6]. The use of umbilical catheters has become a common procedure in neonatal intensive care units around the world [7]. However, these catheters have associated complications, including vascular and liver injuries [7-9]. Although rare, these injuries carry a significant rate of morbidity and mortality due to significant blood loss [10]. We present a newborn patient with hepatic laceration and intra-abdominal hemorrhage secondary to an umbilical catheter-related injury.

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†Abbreviations: UAC, umbilical artery catheter; UVC, umbilical vein catheter; Hct, hematocrit; NBSCU, newborn special care unit; POD, post-operative day.

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CASE PRESENTATION

This is a 4-day-old girl weighing 900 grams who was one of triplets born at 28-weeks gestation. Immediately after birth, an umbilical artery catheter (UAC) and umbilical vein catheter (UVC) were placed. The UVC had to be repositioned after an initial unsuccessful attempt at placement. On day-of-life 3, she developed hyperbilirubinemia, requiring an exchange transfusion. During the course of her exchange transfusion, she became pale, and her hematocrit (Hct) was dropped from 38 percent to 31 percent. After the transfusion was stopped, the patient became hemodynamically unstable. A repeat Hct was 10 percent, and an ultrasound confirmed the presence of a hepatic hematoma as well as a large amount of free fluid. The patient was resuscitated, the UVC was removed, and the patient was transferred to our institution, where the pediatric surgery team was consulted.

On physical examination, her abdomen was extremely distended and bluish in color. Despite several transfusions, the Hct was only 20 percent. The patient was taken emergently to the operating room for evidence of ongoing intra-abdominal hemorrhage. The abdomen was explored through an upper abdominal transverse incision. Upon entry into the abdomen, massive hemoperitoneum was found. Initial exploration of the upper abdomen revealed a two-centimeter tear in the liver capsule located at the dome of the right lobe. Associated with this capsular tear was an underlying cavity with dark debris and fibrinous material within it, suggestive of ruptured subcapsular hematoma. Pressure was held at the site with a surgical sponge, and the remainder of the abdomen was inspected. The hemoperitoneum was evacuated (approximately 50 ml of blood), and the abdomen irrigated. No other injuries were found. The liver was again inspected, and ongoing bleeding was noted. At this time, the patient had a rectal temperature of 35.8°C and was severely acidotic (arterial pH: 7.15, PCO2: 23). Therefore, the area of the laceration was packed with Surgicel® (ETHICON, INC., West Somerville, NJ) and surgical sponges, and the decision was made to terminate the surgery. A piece of silastic sheeting was inserted below the abdominal fascia. The wound was packed open with sponges, a drain was placed over the sponges, and the entire wound was covered by an occlusive dressing. The patient was taken back to the newborn special care unit (NBSCU) for aggressive resuscitation with the plan to return to the operating room for re-exploration after correction of the patient’s acidosis, coagulopathy and hypothermia. On post-operative day (POD) 2, the patient was taken for re-exploration. The packing was removed, and the abdomen was copiously irrigated and inspected for hemostasis. A small amount of oozing from the dome of the liver was noted and was packed with new Surgicel®. After observing for several minutes, no new bleeding occurred and the abdomen was closed. The patient did well post-operatively, without further hepatic bleeding. Due to her prematurity, she remained hospitalized but was ultimately discharged home on POD 101.

DISCUSSION

Damage control surgery for severe intra-abdominal hemorrhage has been proven to be a safe alternative for adult and pediatric patients with exsanguinating hemorrhage with the triad of hypothermia, coagulopathy, and acidosis [1,3,4,6]. The goal of the initial approach is to control bleeding by tamponade in order to have time to correct this lethal triad. After replacement of clotting factors, rewarming, and correction of the acidosis, a second look procedure is performed to remove packing and address any ongoing bleeding. The decision for a staged operative strategy for unstable patients requires a thorough understanding of the pathophysiologic consequences of this triad.

To our knowledge, this is the first report of successful use of damage control surgery in a premature infant. The etiology of the bleeding, an umbilical catheter-related injury, may be unique to this population, but
the techniques employed should be included in the surgeon’s armamentarium for any hemodynamically unstable patient with intra-abdominal hemorrhage regardless of age or size. We conclude that damage control surgery is a feasible technique in patients as small as premature infants, and it should be considered for the management of intra-abdominal exsanguinating hemorrhage regardless of the etiology.

CONCLUSION

Damage control surgery is a feasible and successful approach for the management of unstable neonates with intra-abdominal catastrophes including liver injuries, regardless of age and weight of the patient.

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