



A Successful Damage Control Surgery in a 20-Years-old Male with Penetrating Abdominal Trauma: A Case Report

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Abstract

Introduction: Damage Control Laparotomy (DCL) is an appropriate technique in approaching patients with critical injuries.

Case Presentation: We report a case of road traffic injury in a 20-years-old male presented with penetrating abdominal trauma caused by a metal tube. The DCL was performed and the patient was stabilized. Re-exploration was carried out and the patient was discharged on the 33rd day with peroneal nerve palsy and no other associated complications.

Conclusion: Three main causes of mortality in severely injured patients are coagulopathy, hypothermia, and metabolic acidosis. These factors make a vicious cycle that leads to metabolic status disruptions and a high rate of mortality. The DCL consists of an initial laparotomy that is limited to the control of hemorrhage and contamination, followed by intra-abdominal packing. Minimizing the first operation to vital tasks can save lives that may be lost otherwise.

Keywords: Damage control, Laparotomy, Trauma

1. Introduction

Damage Control Laparotomy (DCL) is a life-saving procedure used in patients with critical injuries. Over recent years, damage control techniques have gained increasing popularity for the management of severe trauma (1). The DCL includes performing an abridged laparotomy and stabilizing the patient, and once the patient's condition is optimized, a second laparotomy would be performed. The initial laparotomy can be performed in the operating room or even Intensive Care Units (ICUs). The main goal in this approach is hemorrhage control, which is achieved by packing, ligation, or balloon tamponade. The temporary closure of damaged bowel by applying tapes, staplers, or running sutures is of great importance in the prevention of further peritoneal contamination (2). Here, we report a damage control laparotomy in a 20-year-old patient who was catastrophically injured with a metal tube in a road traffic trauma.

2. Case Presentation

A severely injured 20-year-old man was transferred by Emergency Medical Services (EMS) to our level 1 trauma center after a road traffic accident. On the primary survey, the patient was hemodynamically unstable. He had a systolic blood pressure of 60 mmHg, pulse rate of 120 beats per minute, and O₂ saturation of 97%. He was hypothermic with a body temperature of 36.5°C. His Glasgow Coma Scale (GSC) was 14/15, and

his medical history was not significant. A metal tube pierced the posteromedial region of the right thigh passing under the inguinal ligament, entering the abdominal cavity, and finally exiting from the left side of the back (figures 1,2). The patient had severe hemorrhage around the tube.

Two peripheral vein cut downs were performed in the emergency department. Resuscitation was started with warm crystalloids and blood transfusion. A total of seven units of packed cells and seven units of Fresh Frozen Plasma (FFP) were administered. Airways were intact and there was no chest trauma. The patient was immediately transferred to the operating room. A midline laparotomy was performed under general anesthesia and the aorta



Figure 1. Displaying a metal tube penetrating lower back of the patient and hemorrhage around the tube



Figure 2. Showing a metal tube penetrating right thigh and abdomen and exiting from lower back.

was clamped at the subdiaphragmatic region. The tube was extracted by pressure in an anteroposterior direction; consequently, massive venous hemorrhage started through the presacral region.

The pelvic cavity was packed with seven laparotomy pads. The aortic clamp was released after ruling out major arterial injuries in the distal aorta and its bifurcation. Solid and hollow organs were rapidly evaluated, and lacerations of the small intestine and extensive devascularization of the rectum were detected. Therefore, to prevent further contamination, the proximal and distal ends of the injured rectum and small intestine were clamped. The abdominal wall was closed with towel clamps and the patient was transferred to the surgical ICU while intubated. The resuscitation process, including core-warming, as well as the correction of coagulopathy and acidosis, was continued. Fracture and penetration of the sacrum were detected in x-rays.

Repairing the sacral injury with a flap was not possible and it was repaired with granulation tissue. After 36 h, the normal physiologic state was restored with normal hemodynamics, body temperature, and coagulation panels. He was scheduled for re-exploration laparotomy in the operating room. The pelvic pack was removed. Detailed inspection revealed partial laceration of the left common iliac vein, and lateral repair was carried out with 4-0 non-absorbable sutures. No injury of the ureter or urinary bladder was found. The injured small intestine was repaired. Hartmann's procedure was performed due to rectosigmoid injury, and a colostomy was formed. The permanent closure of the abdomen was performed, and the patient was sent back to the ICU.

After recovery, neurological examination revealed peroneal nerve palsy and foot drop in the left leg. Urinary incontinence was observed due to sacral nerve injuries. The patient had a weight loss of 12 kg, and dehiscence of fascia was detected and treated

accordingly. The patient was discharged from the hospital after 33 days. Three months later, the colostomy was repaired successfully. Due to financial problems, the patient did not accept treatment for nerve injury, and only complete peroneal nerve deficit and foot drop remained during a 4-year follow-up in surgery clinics.

3. Discussion

Road traffic injuries are a global health challenge, though the burden of disease caused by this problem is higher in low and middle-income countries, compared to that in developed countries (3). The DCL is an appropriate technique in approaching patients with abdominal injuries. The idea of damage control surgery was introduced on the realization of three main causes of mortality in severely injured patients: coagulopathy, hypothermia, and metabolic acidosis (a lethal triad known as the "Three Dark Angels"). These factors altogether make a vicious cycle that leads to metabolic status disruptions, and subsequently, a high rate of mortality as a result of any type of surgery the patient undergoes (4,5). Therefore, patients with injuries should immediately undergo surgery in order to improve the metabolic state and minimize the complications rather than to restore the patient's anatomic integrity.

The factors affecting patient's favorable outcome in our case included the absence of any medical comorbidities, being young and fit, and more importantly prompt decisions on the primary resuscitation, transfer of the patient to the operating room, performing DCL immediately, and temporary closure of abdomen which allows for a second look for any neglected injuries and repairing them. The DCL is indicated when a patient has an estimated blood loss of more than 4 liters, body temperature $\leq 35^{\circ}\text{C}$, pH <7.30 , and >10 units of blood transfusions. Furthermore, it is of utmost importance to stabilize the patient in an ICU setting by ventilator support, coagulopathy correction, normalization of body temperature, and exploration of further injuries (1). If core body temperature is $<36^{\circ}\text{C}$ for more than 4 h, hypothermia is significant clinically (4).

A second planned surgery should take place after the patient is hemodynamically stable, and coagulopathy, hypothermia, and acidosis are corrected to re-explore the injury site. In order to reduce the subsequent complications, such as abscess formation, fistula formation, and further infections, the second operation should be performed 24-48 h following the first operation. A complete survey to find primarily missed injuries and their repairing is made in the second procedure. Furthermore, some patients may develop conditions, such as ongoing hemorrhage with more than four units of blood transfusion, abdominal hypertension, or contamination, and will need an early operation (6).

4. Conclusion

The DCL consists of an initial laparotomy that is limited to the control of hemorrhage and contamination, followed by intra-abdominal packing. The use of this approach reduces the death rate in the selected trauma patients. The prolongation of the initial operation without considering patients' conditions may bring about disastrous outcomes. Minimizing the first operation to vital tasks, correction of physiologic state, and postponing definitive operation can save lives which may be lost otherwise.

Footnotes

Conflicts of interest: The authors declare that they have no conflict of interest regarding the publication of this article.

Ethical Considerations: Written informed consent

was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review on request.

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