Mini Review

iMedPub Journals
http://www.imedpub.com

Trauma & Acute Care
ISSN 2476-2105

2020
Vol. 6 No. 1: 88

A Mini Review on Damage Control Surgery

Abdulrahman Aljuraisi*

Department of Medical Education, College of Medicine, King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia

*Corresponding author: Aljuraisi A, Department of Medical Education, College of Medicine, King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia, E-mail: am.juraisi@gmail.com

Citation: Aljuraisi A (2020) A Mini Review on Damage Control Surgery. Trauma Acute Care Vol.6 No.1: 88

Abstract

Damage Control Surgery (DCS) is a concept of abbreviated laparotomy, designed to prioritize short-term physiological recovery over anatomical reconstruction in the seriously injured and compromised patient. Over the last 10 years, a new addition to the damage control paradigm has emerged, referred to as Damage Control Resuscitation (DCR). This focuses on initial hypotensive resuscitation and early use of blood products to prevent the lethal triad of acidosis, coagulopathy, and hypothermia. This review aims to present the evidence behind DCR and its current application, and also to present a strategy of overall damage control to include DCR and DCS in conjunction. The use of DCR and DCS have been associated with improved outcomes for the severely injured and wider adoption of these principles where appropriate may allow this trend of improved survival to continue. In particular, DCR may allow borderline patients, who would previously have required DCS, to undergo early definitive surgery as their physiological derangement is corrected earlier.

Keywords: Damage control surgery; Damage control resuscitation; Rapid-sequence induction; Damage control strategies

Received: November 19, 2020; **Accepted:** December 03, 2020; **Published:** December 10, 2020

Highlights

- Damage control strategies prioritize physiological and biochemical stabilization over the full anatomical repair of all injuries.
- Damage control strategies are useful for a subset of trauma patients and are not appropriate in all cases.
- Selection criteria for damage control management include the mechanism of injury and the degree of physiological derangement.

Introduction

Over the last two decades, public health measures and better pre-hospital care have led to an increasing number of seriously injured patients surviving their initial accident and arriving in hospital [1]. These injured patients often have injuries to multiple body cavities, massive hemorrhage, and near exhausted physiological reserve. Management of these cases has changed significantly in the last decade with the emergence of a new paradigm termed damage control.

A combination of acidosis, hypothermia, and coagulopathy (the so-called lethal triad) may preclude definitive surgical repair of all injuries in one setting and it is in this subset of patients that 'Damage Control Surgery' (DCS) is advocated. DCS is a treatment strategy of temporization, prioritizing physiological recovery over anatomical repair. Its use is associated with dramatically increased survival of the most seriously injured patients [2]. Damage Control Resuscitation (DCR) is a newer development within the damage control paradigm, and describes novel resuscitation strategies aimed to limit the physiological derangement of trauma patients. This review will discuss the principles and application of DCS in the current era of DCR.

Damage Control

Stone and colleagues were the first to describe a technique of 'truncated laparotomy' for patients with clinically evident coagulopathy and retrospectively reviewed its efficacy in 1983 [3]. A decade later, Rotondo and colleagues popularized the term 'damage control laparotomy', retrospectively reviewing the management of patients undergoing laparotomy for exsanguinating penetrating injuries [requiring urgent transfusion of >10 units of Packed Red Blood Cells (PRBC). They identified a subset of maximally injured patients (major vascular injury

with two or more visceral injuries) in which survival was markedly improved in the DCS group [2]. DCS limits the goals of the initial operation to control of hemorrhage and limitation of contamination rather than definitive repair of all injuries, prioritizing physiology over anatomy.

In modern trauma practice, it is inconceivable that DCS should be practiced separately from DCR; the two strategies are integral to each other and DCS should be the endpoint of DCR with surgical control of hemorrhage. DCS was originally described by Rotondo and colleagues in 1993 as a three-phase technique. This was later modified by Johnson and Schwab [4] to include a fourth, pre-theatre phase:

• Part zero (DC 0) emphasizes injury pattern recognition for potential damage control beneficiaries and manifests in truncated scene times for the emergency services and abbreviated emergency department DCR by the trauma team. Rapid-Sequence Induction (RSI) of anesthesia and intubation, early rewarming, and expedient transport to the operating theatre are the key elements.

• Part one (DC I) occurs once the patient has arrived in theatre. DC I consists of immediate exploratory laparotomy with rapid control of bleeding and contamination, abdominal packing, and temporary wound closure.

• Part two (DC II) is the intensive care unit (ICU) resuscitative phase where physiological and biochemical stabilization is achieved, and a thorough tertiary examination is performed to identify all injuries.

• Part three (DC III) occurs once physiology has normalized and consists of re-exploration in theatre to perform definitive repair of all injuries. This may require several separate visits to theatre if multiple systems are injured and require operative treatment.

Indications for Damage Control

Appropriate patient selection for DCS is critical. Attempts at primary definitive surgical management in patients with severe physiological compromise will almost inevitably lead to poor outcome or unplanned abbreviation of the procedure. In contrast, excessively liberal use of DCS may deny patients with adequate physiological reserve the benefits of effective early management and condemn them to unnecessary extra procedures with attendant morbidity and potential for mortality. There are published data to guide patient selection [5], but no single 'physiological threshold' has been defined. Over liberal application of DCS has significant resource implications for theatres and ICU and may increase the risk of intra-abdominal infection, fistula formation and abdominal wall hernias [6-8].

If not identified before operation by mechanism or injury pattern, indications to change to a damage control strategy are primarily those of physiological derangement; significant bleeding requiring massive transfusion (>10 units PRBC); severe metabolic acidosis (pH<7.30); hypothermia (temperature <35°C); operative time >90 min; coagulopathy either on laboratory results or seen as 'non-surgical' bleeding; or lactate >5 mmol litre-1 [9-13].

Overall, it is estimated that ~10% of major trauma patients might benefit from DCS but there is no single factor that predicts who these patients are. However, the later that the decision to damage control is made, the less successful the outcome is likely to be.

Conclusion

DCS and resuscitation have been associated with improvements in survival for the severely injured trauma patient. An abbreviated operation to attain control of hemorrhage and enteral contamination and aggressive resuscitation allows one to improve the patients' physiology, albeit at the expense of anatomical repair in the short term.

DCR used during the initial phases of damage control has further been associated with improved mortality rates and reduced incidence of complications in major trauma patients. It may reduce the requirement for DCS as patients' better physiological condition after DCR allow them to better withstand early definitive surgery.

Competing Interests

None declared.

References

1. Stewart RM, Myers JG, Dent DL, Ermis P, Gray GA, et al. (2003) Seven hundred fifty-three consecutive deaths in a level I trauma center: The argument for injury prevention. J Trauma 54: 66-70.
2. Rotondo MF, Schwab CW, McGonigal MD, Phillips GR , Fruchterman TM, et al. (1993) 'Damage control': An approach for improved survival in exsanguinating penetrating abdominal injury. J Trauma 35: 375-82.
3. Stone HH, Strom PR, Mullins RJ (1983) Management of the major coagulopathy with onset during laparotomy. Ann Surg 197:532-5.
4. Johnson JW, Gracias VH, Schwab CW, Reilly PM, Kauder DR, et al. (2001) Evolution in damage control for exsanguinating penetrating abdominal injury. J Trauma 51:261-9, 2690-71
5. Rotondo MF, Zonies DH (1997) The damage control sequence and underlying logic. Surg Clin North Am. 77: 761-77.
6. Miller RS, Morris JA, Diaz JJ, Herring MB, May AK (2005) Complications after 344 damage-control open celiotomies. J Trauma 59:1365-71.
7. Sutton E, Bochicchio GV, Bochicchio K, Rodriguez ED, Henry S, et al. (2006) Long term impact of damage control surgery: A preliminary prospective study. J Trauma 61: 831-4.
8. Brenner M, Bochicchio G, Bochicchio K, Ilahi O, Rodriguez E, et al. (2011) Long-term impact of damage control laparotomy: A prospective study. Arch Surg 146: 395-9.
9. Shapiro MB, Jenkins DH, Schwab CW, Rotondo MF (2000) Damage control: Collective review. J Trauma 49: 969-78
10. Asensio JA, McDuffie L, Petrone P, Roldań G, Forno W, et al. (2001) Reliable variables in the exsanguinated patient which

indicate damage control and predict outcome. Am J Surg 182: 743-51.

11. Asensio JA, Petrone P, Roldán G, Kuncir E, Ramicone E, et al. (2004) Has evolution in awareness of guidelines for institution of damage control improved outcome in the management of the posttraumatic open abdomen? Arch Surg 139: 209-14.

12. Beuran M, Iordache FM (2008) Damage control surgery-physiopathological benchmarks. J Med Life 1: 96-100

13. Midwinter MJ (2009) Damage control surgery in the era of damage control resuscitation. J R Army Med Corps 155: 323-6.