



COMPARATIVE ANALYSIS OF DAMAGE CONTROL SURGERY VERSUS DEFINITIVE SURGERY IN TRAUMA CARE

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Abstract

Introduction: Effective management of traumatic injuries often determines patient outcomes, with timely and appropriate surgical intervention being paramount.

Objective: The main objective of the study is to find the comparative analysis of damage control surgery versus definitive surgery in trauma care.

Methodology of the study: This comparative study was conducted at Surgical Department Lady Reading hospital Peshawar during April 2022 to April 2024. Data were collected from 220 patients with age >18 years. Demographic and clinical data, including age, sex, mechanism of injury, and initial physiological parameters, blood pressure, heart rate, Glasgow Coma Scale were extracted from the EMRs and trauma registry.

Results: Data were collected from 220 patients. The average age was 35.6 ± 12.4 years in the DCS group and 34.8 ± 11.9 years in the DS group. Both groups had a similar male predominance, with 70% in the DCS group and 68% in the DS group. In terms of surgical procedures, 85% of the DCS group underwent hemorrhage control compared to 50% in the DS group. Temporary abdominal closure was performed in 75% of DCS patients, while no such procedures were needed in the DS group. Contamination control was necessary for 65% of the DCS group.

Conclusion: Damage Control Surgery (DCS) is essential for stabilizing critically injured patients with severe physiological instability, Definitive Surgery (DS) yields better overall outcomes, including fewer complications, shorter hospital stays, and improved functional recovery

Introduction

Trauma care is a critical aspect of emergency medicine, dealing with injuries that range from minor to life-threatening. Effective management of traumatic injuries often determines patient outcomes, with timely and appropriate surgical intervention being paramount. In the realm of trauma surgery, two primary approaches have emerged: Damage Control Surgery (DCS) and Definitive Surgery (DS) [1]. Hospitals and casualty departments frequently seen, discuss and treat trauma cases of patients of all ages. Major abdominal trauma has what is referred to as the lethal triad which may include; coagulation disorders, metabolic acidosis, and hypothermia among the patients [2]. It is one of the

many diseases that pose a serious threat to life and adds to morbidity and mortality. To avoid this lethal triad, the doctors require to stop the bleeding as well as avoid further heat loss [3]. Most forms of significant abdominal injury of removed are managed by surgery that joins the severed organs or the abdominal wall. The patient who has been diagnosed to have one or multiple trauma may also be in an unstable condition due to lose and this makes it rather risky to opt for immediate surgery. Damage control surgery (DCS) is an option recommended in such cases [4]. Hearing the concerns to help the patient involves the following: Initially, a complete other major incision is closed and the patient is kept in the Intensive Care Unit [5]. When the patient has become stable, specific laparoscopic surgeries are done to fix any of the small-sized rents that were left. In the case of the DCS approach, the benefit lies in the fact that surgeons perform the more rigorous and, naturally, the longer operation only after patient stabilization; thus the possibility of an unfavourable outcome, such as death due to severe blood loss, may be lower [6]. DCS was introduced as an idea less than three decades ago and the approach is now recognised extensively. The concept behind DCS is that massive operation in trauma patients with severe pathophysiologic disturbances and multisystem injuries should be, and that is avoided. Instead it should be a short operation that controls hemorrhage and contamination [7]. Thus, once this is done, physiology on the patient needs to be attacked furiously, and only after that, the temporized injuries can be dealt with properly. What needs to be stressed is that the concept of DCS applies to the majority of trauma patients does not necessarily mean that the patient does not need DCS, and that they should still receive definitive surgery [8]. Hence, determination of when this technology is necessary in managing labor requires clinical wisdom. In principle, there are only two parameters that need to be regarded, namely the anatomic lesion as well as the pathophysiologic change. In most sets of guidelines, a decision regarding the need for DCS has been conditioned by using the physiologic benchmarks [9]. Damage Control Surgery is an approach focused on rapid intervention to control hemorrhage and contamination, stabilizing the patient physiologically before undertaking more extensive repairs [10]. This method is often employed in patients who are too unstable to withstand prolonged procedures, aiming to prevent the "lethal triad" of hypothermia, acidosis, and coagulopathy. On the other hand, Definitive Surgery involves completing all necessary surgical repairs in one go, provided the patient's condition allows for it. This approach aims to restore normal anatomy and function immediately, assuming the patient can tolerate the duration and extent of the surgery [11].

Objective

The main objective of the study is to find the comparative analysis of damage control surgery versus definitive surgery in trauma care.

Methodology of the study

This comparative study was conducted at Surgical Department Lady Reading hospital Peshawar during April 2022 to April 2024. Data were collected from 220 patients with age >18 years. Demographic and clinical data, including age, sex, mechanism of injury, and initial physiological parameters, blood pressure, heart rate, Glasgow Coma Scale were extracted from the EMRs and trauma registry. Regarding injury-related characteristics, the part-of-body injured and the nature and severity of injuries were documented in detail, and data referring to the first Assessment Scores including the ISS and the RTS as well as intra-operative findings were also collected thoroughly. For DCS and DS the type of the surgical intervention was collected from surgical reports and specifics of the procedures performed. Procedures analyzed for the DCS group included the outcomes on complications, infections, organ dysfunction, redo operations, the time in the ICU and the hospital, and the time to definitive intervention. The findings at the time of discharge were also recorded – the place where the patient was discharged to, as well as the 30-day post-surgery mortality rates. Additional data were also collected to evaluate patients' functional status after discharge, including whether they were able to return to work and perform activities of daily living, besides revisiting the issue of complications and readmissions. Data were analyzed using SPSS v29. P-value<0.05 were considered as significant.

Results

Data were collected from 220 patients. The average age was 35.6 ± 12.4 years in the DCS group and 34.8 ± 11.9 years in the DS group. Both groups had a similar male predominance, with 70% in the DCS group and 68% in the DS group. The distribution of injury types was also comparable, with blunt trauma constituting 60% and 58%, and penetrating trauma 40% and 42%, in the DCS and DS groups, respectively.

Table 1: Patient Demographics and Injury Characteristics

Characteristic	DCS Group (n = 110)	DS Group (n = 110)
Mean Age (years)	35.6 ± 12.4	34.8 ± 11.9
Male (%)	77 (70%)	75 (68%)
Blunt Trauma (%)	66 (60%)	64 (58%)
Penetrating Trauma (%)	44 (40%)	46 (42%)

Initial physiological parameters revealed that patients in the DCS group had a mean systolic blood pressure of 90 ± 15 mmHg, a mean heart rate of 120 ± 20 bpm, and a mean Glasgow Coma Scale (GCS) score of 10 ± 3 . In contrast, the DS group had a mean systolic blood pressure of 110 ± 14 mmHg, a mean heart rate of 100 ± 18 bpm, and a mean GCS score of 12 ± 2 , indicating that patients in the DCS group presented with more severe physiological instability upon admission.

Table 2: Initial Physiological Parameters

Parameter	DCS Group (n = 110)	DS Group (n = 110)
Mean Systolic Blood Pressure (mmHg)	90 ± 15	110 ± 14
Mean Heart Rate (bpm)	120 ± 20	100 ± 18
Mean GCS Score	10 ± 3	12 ± 2

In terms of surgical procedures, 85% of the DCS group underwent hemorrhage control compared to 50% in the DS group. Temporary abdominal closure was performed in 75% of DCS patients, while no such procedures were needed in the DS group. Contamination control was necessary for 65% of the DCS group. Conversely, the DS group had a higher prevalence of definitive repairs, with 80% undergoing vascular repairs, 70% receiving solid organ repairs, and 60% requiring orthopedic fixation, reflecting the comprehensive nature of the definitive surgery approach.

Table 3: Intraoperative Findings and Procedures

Procedure	DCS Group (n = 110)	DS Group (n = 110)
Hemorrhage Control (%)	94 (85%)	55 (50%)
Temporary Abdominal Closure (%)	83 (75%)	-
Contamination Control (%)	72 (65%)	-
Definitive Vascular Repairs (%)	-	88 (80%)
Solid Organ Repairs (%)	-	77 (70%)
Orthopedic Fixation (%)	-	66 (60%)

The incidence of postoperative complications was higher in the DCS group, with 40% of patients experiencing complications compared to 25% in the DS group. Infections occurred in 20% of the DCS group versus 10% of the DS group. Organ failure was reported in 15% of DCS patients, compared to 8% in the DS group.

Table 4: Postoperative Complications

Complication	DCS Group (n = 110)	DS Group (n = 110)
Overall Complications (%)	44 (40%)	28 (25%)
Infections (%)	22 (20%)	11 (10%)
Organ Failure (%)	17 (15%)	9 (8%)
Reoperations (%)	11 (10%)	8 (7%)

The mean ICU stay for patients in the DCS group was 10.2 ± 5.4 days, compared to 7.1 ± 4.6 days for the DS group. The mean total hospital stay was longer for the DCS group at 22.3 ± 10.2 days, while the DS group averaged 18.4 ± 8.7 days. The 30-day mortality rate was higher in the DCS group at 18%, compared to 10% in the DS group.

Table 5: Length of Stay and Mortality

Measure	DCS Group (n = 110)	DS Group (n = 110)
Mean ICU Stay (days)	10.2 ± 5.4	7.1 ± 4.6
Mean Total Hospital Stay (days)	22.3 ± 10.2	18.4 ± 8.7
30-Day Mortality Rate (%)	20 (18%)	11 (10%)
Functional Outcome		
Return to Daily Activities (%)	66 (60%)	83 (75%)
Return to Work at 6 Months (%)	55 (50%)	72 (65%)

Discussion

The comparative analysis of Damage Control Surgery (DCS) versus Definitive Surgery (DS) in trauma care reveals critical insights into the efficacy, benefits, and limitations of these two surgical approaches. The findings have the following implications: There are potential overall differences between the groups, which inform the development of strategies for the treatment of severely traumatized patients [12]. The epidemiological and pathology profiles of the patient groups were comparable also, with no differences demonstrated in patients' age, gender, or the nature of the injuries between the DCS and DS groups [13].

This similarity reinforces the comparative analysis because it results in a higher probability that the differences in outcomes are due to the type of surgical intervention rather than the characteristics of the subjects or the mechanisms of the injuries they sustained. There were differences in the severity of physiological decompensation of patients in the DCS group with comparatively low systolic pressure, elevated heart rate and low GCS at admission [14]. These observations reflect the choice of DCS, which is commonly used with patients in severe physiological imbalance. It can be seen that an early and quick intervention which can save their lives is crucial for the patients in the DCS group as the normal physiological changes have led to the condition which progressed to irreversible shock and multi-organ dysfunction [15]. The intraoperative data indicate the difference between the objectives of DCS and DS. Temporary abdominal closure was found to be applied in about 50% of patients dominated by the three DCS principles, namely rapid hemorrhage and contamination control [16].

DS on the other hand anticipated full repair during index operation, and had a higher percentage of definitive vascular and solid organ repairs. These procedural differences speak to the individual specific interventions which are for use in DCS to secure the patient before other structural interventions can be undertaken safely [17]. One can state that the overall rates of postoperative emergency in the DCS group were higher and equal 40% while they constituted 25% in the DS group. Getting to the possible reasons for increased complications in the DCS group could be explained by the initial severity of injuries and the staged character of the surgical intervention in many patients, which can prolong the period of risk for such complications as infection and organ failure. These results advocate for optimal precautions and monitoring of the patients with DCS to ensure early detection of complications [18].

Conclusion

Damage Control Surgery (DCS) is essential for stabilizing critically injured patients with severe physiological instability, Definitive Surgery (DS) yields better overall outcomes, including fewer complications, shorter hospital stays, and improved functional recovery. Individualized patient

assessment and appropriate surgical strategy selection are crucial for optimizing trauma care outcomes.

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