

ORIGINAL

PROF-1422

DAMAGE CONTROL SURGERY; A SAFE APPROACH FOR EXSANGUINATING TRAUMA PATIENTS.

DR. MUHAMMAD ATEEQ

Assistant Professor of Surgery
Rawalpindi Medical College,
Rawalpindi

DR. SHAZIA JAHAN

Senior Registrar Surgery

DR. M. HANIF

Associate Professor of Surgery

Article Citation:

Muhammad Ateeq, Shazia Jahan, M. Hanif. Damage control surgery; a safe approach for exsanguinating patients of trauma. Professional Med J Mar 2009; 16(1): 12-16.

ABSTRACT... Objective: To analyze the role of damage control in surgery in severely injured and polytrauma patients. **Design:** Descriptive study. **Setting:** Surgical unit of District Headquarter (teaching) Hospital, Rawalpindi. **Period:** January 2000 to December 2007. **Patients and methods:** This study included 28 severely injured patients who presented in the accident and emergency department of District Headquarters (teaching) Hospital, Rawalpindi. These patients were unstable because of life threatening hemorrhage following some blunt or penetrating trauma. After immediate shifting to operation theater, resuscitation and operative intervention was done simultaneously. Different procedures of damage control surgery like abdominal packing for hepatic and pelvic trauma, major vascular ligation for vascular injuries of neck and extremities were adopted in phase I. In phase II patients were managed in ITC for coagulopathy and hypothermia. Definitive treatment was done in Phase III after 24-72 hours once patients got stable. **Results:** Total 28 patients included in the study. In 18 patients abdominal packing for hepatic injury (n=11) and pelvic fractures (n=7) was done. Major vascular ligations in n=11 and temporary intestinal clamping in n=1 patient. Planned re-exploration after 24-72 hours in n=16 and unplanned re-exploration within 24 hours in n=5 patients was done. Complications included ongoing hemorrhage (n=5), coagulopathy (n=2), controlled biliary fistula (n=1), abdominal compartment syndrome (n=1), cerebral ischemia (n=1) and gangrene of abdominal wall (n=1). Two patients died.

Key words: Damage control surgery; polytrauma; abdominal packing; coagulopathy; hypothermia.

INTRODUCTION

In the seventh and eighth decades of the last century, huge developments in science and technology were also reflected in the operation theatre and intensive care units. There was better understanding of body physiology supported by excellent equipment for intra operative and post operative monitoring of the patient along with adequate blood banks. Surgeons at that time took up the challenge of trauma surgery more aggressively for complete repair of complex injuries at the first chance. The patients could survive the initial surgery but soon they succumbed to a new kind of clinical situation¹.

Trauma surgeons tried to find out an alternative approach of this hugely expensive and frustrating exercise. It was

found that the cause of death in these trauma victims was not due to failure to complete the initial operation, the patients died because of the metabolic derangement or physiological alteration in the body following severe exsanguinating polytrauma, characterized as the trauma triad of death. These were hypothermia, coagulopathy and acidosis^{2,3,4}.

Article received on: 14/10/2008

Accepted for Publication: 14/01/2009

Received after proof reading: 01/02/2009

Correspondence Address:

Dr. Muhammad Ateeq

mateeq95@yahoo.com

Surgical Department of District Headquarter (teaching) Hospital,
Rawalpindi.

A new surgical approach to patients with devastating trauma has emerged in the form of modified operative sequence using rapid life saving techniques, definitive resections and reconstructions are delayed until the patient can be adequately resuscitated and stabilized in surgical ICU^{5,6}.

Damage control is currently the most common term to describe the staged surgery or staged laparotomy. Although most stems from experience with abdomen but it has also applicability to a wide range of other traumatic and non traumatic surgical encounters in thorax, gynecological, vascular and orthopedic procedures. This innovative new surgical strategy reveals inter disciplinary collaboration and understanding of the process of Damage control surgical care and possible complications. This study reviews the experience of Damage control surgery and it's outcome in terms of care and complications.

MATERIALS AND METHODS

This study was conducted in surgical unit District Head Quarter's Teaching Hospital Rawalpindi. The DHQ hospital is a tertiary care hospital affiliated with Rawalpindi Medical College Rawalpindi. This study included 28 seriously injured patients who presented in Accident and Emergency Department during January, 2000 to December 2007.

INCLUSION CRITERIA

- ▶ Exsanguinating trauma patients.
- ▶ Haemodynamically unstable patients.
- ▶ Inability to control bleeding with direct haemostatic measures.

EXCLUSION CRITERIA

1. Age 70 years and more.
2. Fatal head injury patients.
3. Pre hospital cardiac arrest.

As soon as any patient meeting the criteria stated above arrived in emergency department, immediate arrangements for shifting to Operation Theater and surgical intervention were made. Resuscitation and surgical intervention were started simultaneously on the

operation table. Abdominal packing for pelvic injury and hepatic trauma were done in cases of abdominal trauma, major vascular ligation were also considered in case of limbs, neck vascular injuries and whenever required in abdominal trauma victims. The choice of temporary closure techniques was left to surgeon's preference. Different methods like towel clips closure, simple closure with tension sutures were adopted in case of abdominal trauma. Patients then shifted to surgical ICU for continued resuscitation, frequent assessment for the prevention of onset of trauma triad of death i.e. hypothermia, coagulopathy and acidosis. In surgical ICU re-warming, correction of coagulopathy, acidosis and optimization of the pulmonary functioning were performed. Once patient got stable planned return to Operation Theater was made for review of injuries, removal of packs, debridement of ischemic necrotic tissues, assessment of viability of the tissues, definitive treatment of other injuries previously left untreated and proper abdominal closure.

Medical records were maintained and later on reviewed for degree and pattern of injury, transfusion requirement for preoperative and post operative phases, resuscitation and operative time, pH and bicarbonates, complications after definitive treatment and mortality.

RESULTS

Mean age of the patients was 20 years, and male to female ratio was 5:2. Majority were injured due to firearm injuries (14 patients, followed by blunt trauma abdomen, 08 patients, and stab wounds 06 patients).

Average time interval between presentation in emergency department and surgical intervention was 15 minutes, and average operating time was 45 minutes. In 21 patients staged exploratory laparotomy was performed while 03 patients underwent emergency neck exploration and 04 patients was explored for vascular injury in the thigh.

Injuries to various structures and surgical intervention done are shown in table I.

Table-I. Structures Injured and type of intervention.

| Organ Injured | Number | Intervention |
|-------------------------|--------|--------------------------------------|
| Liver | 11 | Peri hepatic packing |
| Pelvic fracture | 07 | Pelvic packing |
| Femoral artery | 04 | Ligation |
| External carotid artery | 02 | Ligation |
| Inferior vena cava | 02 | Ligation |
| Avulsed mesentery | 01 | Gut resection and temporary clamping |
| Common carotid artery | 01 | Ligation |
| Internal jugular vein | 01 | Ligation |

Abdominal packing for Hepatic injury and pelvic fracture was done 18 patients. Major vascular ligation was done in 11 patients. Temporary intestinal clamping was performed in 01 patient. Planned re-exploration / staged laprotomy after 48 to 72 hours was done in 16 patients for review of injuries, removal of packs, debridement of ischemic tissues, peritoneal wash and intestinal reconstructions. In 05 patients un planned re-exploration was done for control of ongoing bleeding with in 6 hours of first surgery. The various complications are shown in table II.

Table-II. Complications.

| Complication | No. Of cases |
|-----------------------------|--------------|
| Ongoing hemorrhage | 02 |
| Coagulopathy | 02 |
| Cerebral ischemia | 01 |
| Amputation | 02 |
| Gangrene of abdominal wall | 01 |
| Controlled billiary fistula | 01 |

Two patients were died in surgical ICU during resuscitative phase due to coagulopathy and hypothermia in spite of all resuscitative measures.

DISCUSSION

Rapid progress in trauma care occurs when the results of translational research are promptly integrated into clinical practice. Experience with high volume of severely injured casualties expedites the process. Historically these conditions have converged during times of conflict, improving the care of combat casualties and subsequently that of civilian trauma patients.

The conventional sequence of the management of trauma surgery was to bring the patient to the operating room after initial resuscitation and then to operate for complete repair of the injuries. Even patients with multiple complex injuries were operated more aggressively over a prolonged period of time for definitive primary repair¹. Subsequently, these patients were sent to the intensive care unit where a good number of the patients succumbed due to metabolic derangement of the body^{2,3}.

In the most severely injured casualties, we know that when the lethal triad of hypothermia, acidosis, and coagulopathy is present, death is imminent. Current teaching is to avoid reaching these conditions by using damage control surgery. However conventional resuscitation practice for damage control focuses on rapid reversal of acidosis and prevention of hypothermia, and surgical techniques focus on controlling hemorrhage and contamination. Direct treatment of coagulopathy has been relatively neglected, viewed as a byproduct of resuscitation, hemodilution, and hypothermia, and delayed by banking logistics^{4,7}. Damage control resuscitation addresses the entire lethal triad immediately upon admission in hospital and as a structured intervention begins immediately after rapid initial assessment in the emergency department and progresses through or into ICU^{8,9,10}.

At the first phase of damage control strategy, only abbreviated laparotomy was done for lifesaving measures, and then the patient was sent to the surgical intensive care unit (SICU) for the correction of the metabolic disorder. Following satisfactory correction the patient was once again taken to the operation room for definitive repair and sent back to SICU for further

convalescence.

Staged surgical procedures including staged laparotomy represent an important development in the historical spectrum of trauma resuscitation^{10,11}. Damage control procedures are becoming more common as are more physiological. Successful damage control operations are currently best to save life in experienced hands. Management of these complex patients requires an effort from all members of a multidisciplinary trauma team. Rotondo MF along with his team proved twice in his studies the role of damage control surgery and its logic and concluded that damage control is a safe approach for increased survival in exsanguinating patients with major vascular and multiple visceral penetrating abdominal injuries^{5,6}. We also have seen in our study that despite limited facilities in our hospital this approach has made us able to save even the severely injured patients of poly trauma.

Hemorrhage from extremity wounds is a leading cause of death. Optimal management involves rapid homeostasis and reversal of metabolic derangements utilizing damage control principles. The traditional concept of damage control surgery favors a life over limb approach and discourages elaborate, prolonged vascular reconstruction. However limb preservation could be successful when the control approach is combined with advanced resuscitative strategies and vascular techniques. Gillespie DL and his team suggested that aggressive damage control resuscitation maneuvers in critically injured casualties successfully permitted prolonged, complex extremity revascularization with excellent limb salvage and graft patency. Recombinant VIIa, fresh frozen plasma, fresh whole blood, platelets and cryoprecipitate, while minimizing crystalloids allowed limb salvage and did not result in early graft failures¹². But as in our setup, we don't have enough facilities except whole blood and crystalloid, and when patient is so unstable, we cannot afford prolong revascularization surgery. So we favor a life over limb approach. Moreover these lacking facilities were the main cause of mortality due to coagulopathy seen in our study. Over all results obtained from this study are broadly consistent with the other studies published to-date, i.e. reducing morbidity

and mortality, and improving outcome.

CONCLUSION

Damage control surgery represents an important landmark in the historical spectrum of trauma resuscitation. In trauma surgery, prolonging the initial operation can lead to disastrous results. Curtailing the operation does not mean abandoning but it gives a chance to survive in an otherwise hopeless situation. It is difficult to learn when to stop and can be learned only from experience. The results obtained from the present study are broadly consistent with the other studies published to date i.e. reducing mortality and morbidity and improved outcome. The management of this complex problem requires a multidisciplinary team approach with patient counseling and communication with the family.

Copyright© 14Jan, 2009

REFERENCES

1. Mattox K. **Introduction, background, and future projections of damage control surgery.** Surg Clin North Am 1997;77:753-9.
2. Slotman G, Jed F, Burchard K. **Adverse effects of hypothermia in postoperative patients.** Am J Surg 1985; 149:495.
3. Frank SM, Beattie C, Christopherson R, Norris EJ, Peraler BA, Williams GM, et al. **Unintentional hypothermia is associated with post operative myocardial ischaemia.** Anaesthesiology 1992; 78:468-76.
4. Gubler KD, Gentilello LM, Hassantash SA, Maier RV. **The impact of hypothermia on dilutional coagulopathy.** J trauma 1994; 36:847-55.
5. Gubler KD, Gentilello LM, Hassantash SA, Maier RV. **The impact of hypothermia on dilutional coagulopathy.** J trauma 1994; 36:847-55.
6. Rotondo MF, Zonies DH. **Damage control sequence and underlying logic.** Surg Clin North Am 1997; 77:761-77.
7. Michenfelder JD, Uihlein A, Daw EF, Theye RA. **Moderate hypothermia in man: Haemodynamic and metabolic effects.** Br J Anaesth 1965; 37:738-45.
8. Abramson D, Scalea TM, Hitchcock R, Trooskin SZ, Henry SM, Greenspan J. **Lactic clearance and survival**

- following injury.** J trauma 1993; 35:584-9.
9. Brohi K. **Damage control surgery.** Trauma Org 2000; 5:6.
10. Asensio JA, Petrone P, Roldan G, Kuncir E, Ramicone E, Chan Linda. **Has evolution in awareness of guidelines for institution of damage control improved outcome in the management of posttraumatic open abdomen?** Arch Surg 2004; 139:209-14.
11. Feliciano DV, Moore EE, Mattox KL. **Damage control and alternative wound closures in abdominal trauma.** In: Feliciano TDV, Moore EE, Mattox KL, editors. Trauma 3rd Ed. - Appleton & Lange; 1996. p. 717-32.
12. Gillespie DL, Cox ED, Kragh JF JR, Mehta SG, Salinas J, Holcomb JB. **Damage control resuscitation for vascular surgery in a combat support hospital.** J Trauma 2008; 63(1): 1-9.

