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Military Medicine

Combat surgery: Status of tactical abbreviated surgical control

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ARTICLE INFO

Article history:

Received 30 November 2016

Accepted 5 May 2017

Available online 25 July 2017

Keywords:

Tactical abbreviated surgical control

Damage control surgery

Combat surgery

ABSTRACT

Traditionally injury care meant definitive repair following surgical exploration. However the outcome is poor because of deranged physiology in severely injured. Damage control surgery (DCS) is abbreviated initial procedure with subsequent correction of physiological imbalance, followed by definite repair.

Tactical abbreviated surgical control (TASC) is application of principles of DCS techniques in the tactical environment. TASC is applied because of patient related factors (classic damage control) and limitations due to tactical reasons. Non-patient related factors only seen in tactical setting are, large numbers of patients arriving in short span, mobility of forward medical units, limitation of resources, and hostile environment. TASC involves only phase one of classical DCS. Complete correction of physiological imbalances and definitive surgery is carried out at a better equipped static hospital. TASC has shown to improve survival, extends benefit to greater number and helps to conserve precious resources. However TASC has its own limitations.

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Introduction

Restoration of anatomy was the primary goal of treating injuries traditionally. Definitive surgery for the injured was done in one sitting with the premise that first repair is the best repair. With better understanding it became apparent that there is loss of physiological reserve following massive trauma. Such patients are incapable of sustaining a prolonged surgical insult. Prolonged surgery with an attempt to provide a single definitive procedure in these patients leads to more blood loss, resulting in coagulopathy, further increasing bleeding,

hypothermia, decreased tissue perfusion, acidosis, shock and multiple organ failure. Quick and rapid abbreviated initial procedure to control bleeding and contamination, followed by correction of physiological derangement in the intensive care unit and then definitive repair at later stage improves survival rates. In 1993, Rotondo and Schwab coined the term 'damage control surgery' (DCS) to this approach and in their landmark paper showing a seven-fold improvement (11–77%) in mortality figures in patients with its application.¹ In civilian practise DCS has now been very well defined. However, because of various reasons, DCS in totality cannot be adapted in battlefield settings for treatment of casualties. Modified military version of DCS

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has now evolved to treat combat casualties in tactical zone and is coming to be known as tactical abbreviated surgical control (TASC). TASC not just incorporates the physiologic reasons for performing abbreviated surgery but also takes into consideration the needs of tactical environment. It is needless to say that TASC is associated with a few pitfalls and challenges.² The aim of this article is to highlight how TASC differs from DCS and enumerate the merits and demerits.

Damage control surgery

Damage control surgery is based on a Navy term and process used to 'ensure the capacity of a ship to absorb damage and maintain mission integrity'. When a Navy ship has taken hostile fire, the sailors, at all costs, immediately put out all fires and stop any flooding. The definitive repair is done later when things are under control. The surgical analogy of this in massive trauma, is stopping all bleeding and contamination as fast as possible by abbreviated surgery, then correction of deranged physiology, followed by definitive repair when the patient is stable. The initial need for speed is to avoid the patient going into the vicious cycle of lethal triad of hypothermia, acidosis, and coagulopathy. Hypothermia occurs because of exsanguination along with loss of intrinsic thermoregulation. Acidosis is due to hypovolemic shock and inadequate tissue perfusion. Hypothermia, acidosis, consumption of clotting factors/platelets, and blood loss in combination leads to coagulopathy. Coagulopathy in turn causes more haemorrhage, which exacerbates acidosis and hypothermia propelling the vicious cycle which often leads to fatal outcome.^{1,2} This phased management approach of the severely injured has shown to prevent this from occurring. So the Phase I involves rapid stopping of further derangement of physiology by controlling bleeding and contamination. Phase II is correction of all deranged physiological and metabolic parameters. In Phase III restoration of anatomy with definitive injury management is done. This principle of DCS is now well established standard of care for severely injured patients in civilian setting. There are now definitive guidelines for considering DCS based on critical physiological parameters, associated injury complexes and patient conditions like physiological reserves, age and co-morbidities.^{1,2}

Tactical abbreviated surgical control

Though as early as 1942, Watts recognized that "the war surgeon must evacuate the wounded with all possible speed, both to clear the unit and restore its mobility... that he must wherever possible, avoid procedures that will prevent the early evacuation of the patient" abbreviated procedures were not uniformly applied to manage casualties in the battle field till very recent times.³ This was even after DCS was recognized in civilian trauma centres. The delay in adaption could be multifactorial including certain peculiarities of war casualties. Few aspects unique to management of combat casualties are:

1. Large numbers of patients can arrive simultaneously with high casualty rates.

2. Mobility of forward medical units required because of tactical situation.
3. Austere conditions with lack of diagnostic/monitoring facility, equipment, supplies and material.
4. Types of wounds seen are those due to high energy/high velocity projectiles and burns.
5. Hostile and harsh environment like desert/HAA/extreme heat/cold/snow with lack of cleanliness/sterility.
6. Recurrent need of casualty evacuation and transfer to a higher-level care facility.
7. Need to deal with moral of medical personnel, fatigue and fear.
8. Pre hospital time/care not under full control.

Now a modified version suited for combat zone has evolved to treat war casualties based on the principles of DCS called TASC. TASC thus is application of these damage control techniques in the tactical environment taking into consideration these peculiarities of war at the forward most surgical centre. Noted difference of TASC as compared to DCS is that this technique is applied to almost all received casualties who cannot go back to battlefield after treatment reporting to forward surgical centre. The criteria of applying is not limited to only those with derangement of critical physiological parameters and injury complexes but to others with less severe injuries as well, who may not need DCS in non-tactical scenario, because limitations exist beyond the patient's need. Triage of course will be done as before and TASC applied only those casualties expected to survive. The second difference is TASC involves only Phase I of DCS and marks the end of the role to be played at forward surgical centre. The forward surgical centre will not keep the casualties after completion of Phase I. Complete restoration of physiological reserve and definitive surgery (phase II & III) is always done next echelon.^{4,5} To reiterate the initial surgery though abbreviated is focused and deliberate to rapidly control haemorrhage and contamination.

The surgeon at the forward most surgical unit must strictly apply TASC to all the casualties and resist the temptation of exceeding the set mandate however competent he/she may be. It is only when this is done as protocol; TASC will yield results, improve survival, extend benefit to greater number and help to conserve precious resources, such as time, operating table space, and blood in forward surgical centre.^{4,5} The extent of focused and abbreviated surgery to be done as part of TASC is as enumerated below.

Abdominal injuries

It involves 4 distinct steps:

1. Extent of injury: To determine extent of injury, give long midline incision and do a resuscitative four quadrant packing. Clean the abdomen of blood/contamination. Mobilize the right colon or left colon if required. Identify the source of bleeding or site causing contamination.
2. Control of haemorrhage: Ligate any obvious visible bleeding vessel. Casualties with bleeding liver injuries, pelvic fracture with active bleeding and retroperitoneal bleeding are to be treated by packing and packing alone if abdomen is

opened. If major vessels are damaged they are to be repaired if easily possible or shunted. Splenectomy for splenic injury forms part of TASC.

3. Control of contamination: Resect out all non-viable gut, as a rule no primary anastomosis bring out the gut as stoma or if multiple resections are required just close the ends by suturing or stapling and leave them inside the abdomen to be tackled later. In case of small gastrotomies or enterotomies they are to be closed primarily. If there is pancreatoduodenal Injury the procedure to be used is drainage and/or packing.
4. Closure: All TASC patients undergoing a laparotomy must have the abdominal fascia left open to avoid the complications of unobserved abdominal compartment syndrome. If there is slightest of doubt of tight closure of skin, Bogotá bag closure to be done.

Thoracic injuries

Thoracic injuries rarely require thoracotomy, 90% of chest injuries can be treatable with chest tube alone; indications for thoracotomy are life threatening massive air leak, continuous haemorrhage, and large vessel injury. If thoracotomy is done repair cardiovascular injuries and carry out stapled pulmonary resection.

Extremity injuries

The dictum in extremity injury is debride, pack, splint and ship. Fasciotomy is extremely important in limb injury because the patient will not be continuously observed during transport and is performed therapeutically as well as prophylactically. So timely fasciotomy in selected patients is advocated.

Limitations and concerns of TASC

It goes without saying that for TASC to succeed uninterrupted evacuation route and well equipped transport facility is mandatory. For this there has to be control of air space and major roadways. Well trained staff with facility to monitor and carry out good supportive care during transport is important requirement. The role of deploying state of art, cutting edge technology will add on the benefit.

There are few questions that commanders would be concerned when briefed about TASC. They would want to

know whether TASC would over burden traditional evacuation routes? Will sicker patients get care first, delaying evacuation and care of traditionally salvageable patients? Will it really result in fewer deaths and less limb loss? Has TASC been tested? The answer to all these are that the US army has applied this in their Iraq and Afghan war. More than 90% of their casualties survived once they reached the forward surgical centre. They came with the conclusion that applying TASC is one of the main ways to decrease the mortality of combat wounded personnel arriving at a combat surgical facility in the near future.^{6,7} If it has worked for the US will it work for us? This question can only be answered by testing it in our setting during combat exercises, simulations and actual operations. The challenges in our country with varied terrain and environmental condition are going to be even more.

Conclusion

TASC philosophy is “damage control in field hospital and definitive surgical care at the next echelon” to all casualties who cannot be send back to battlefield. This is shown to improve survival and also conserve scarce resources and time in battle field. The safe evacuation route, well equipped transport and trained manpower are mandatory components.

Conflicts of interest

The authors have none to declare.

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