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# EVALUATION OF TRAUMA MANAGEMENT SKILL IN SURGEONS WORKING IN HOSTILE CONFLICT ZONE

Surgery

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## ABSTRACT

With modern surgical concept & surgeons of newer generation are trained to practice in super specialties & multidisciplinary teams like urology, orthopedics, neurosurgery, maxillofacial, reconstructive, vascular, gastrointestinal, thoracic etc. In austere scenario, at Hostile conflict condition surgeon should be competent enough for life & limb saving surgery with knowledge of all relevant subspecialty & superspeciality. These wounds have minimal resources & varied working conditions. Various improvisation & compromises are required for management decision. In such areas different echelons of care are provided by different surgeon's, constraints of tactical situation, mass casualty management with principles of triage, wound pathology by bullets, bombs & blast, terrain specific catastrophe like frost bite, trench foot in snow or heat stroke in desert.

## KEYWORDS

Hostile Conflict zone, mandatory surgical skill , Injuries

**Introduction -**

This study emphasizes the mandatory surgical skill required by deployed surgeons in hostile conflict zone in order to modify the future training curriculum for such surgeons (1) .Multimodality injuries are seen like bullet, explosives, bombs, fragments, blasts, crushed wound leading to complex tissue injury in Hostile conflict zone with austere scenario. Basic treatment of the wound is same. Primarily wounds have to be treated by Surgeons and not weapons. Adhere to basic ATLS. Assess C- ABC, treat life threatening condition, stop bleeding assess wound (2).

Multiple injuries casualties are very difficult to treat because of synergistic effects of pathophysiological disturbances for more than one organ system, increased frequency & severity of shock & competing priorities for immediate care of various injuries. These casualties are managed by damage control to prevent fatality. (3)

Unique challenge for surgeons while deployed they serve as a "jack-of-all-trades" in austere environment, once they go back home they have to meet expectation & have to compete with the standards of civilian surgical care, which has become highly dependent on minimally invasive technology & subspecialized (2)

Modern civilian trauma centers cannot train Wartime surgeons with specific skills obtained by practice, "War surgery requires aggressive operative intervention, with staged procedures and often in an austere environment with no access to basic X-ray and lab capability and no local subspecialty support."

**AIM**

To delineate & specify the multispecialty & subspecialty mandatory skill and technical competency required by surgeons working in austere scenario.

**METHOD**

Study design was Retrospective observational study conducted at hospitals in hostile area for five years from June 1998 to June 2000 & April 2009 to June 2010 at places where full spectrum of operations offensive, defensive, low intensity conflict operation, with varied terrain like mountains, plains, valley, dense jungles, ridges, high altitude area with snow bound dessert. All casualties were personnel evacuated from forward echelon by road or air.

In this study total 2351 cases studied with injuries for stipulated 5 years in Hostile conflict zone. Analysis of skill and technical competency required by surgeons for management of varying type of wounds done. Combat injuries workload was seen with exposure to surgical pathology in civilian surgical training concept in order to identify a possible curriculum modification for the future surgeons. Full spectrum of surgery by anatomical location & mechanism of war injuries including terrain specific catastrophe was seen.

Exclusion criteria were cases with medical illness and diseases in hostile zone, road traffic accidents with small contusions & abrasions, self-inflicted or suicidal injuries & non-combatant patients.

Casualty management was started as per medical tactical doctrine at the site to injury and must be continued throughout the chain of evacuation" maintain health of forces, conserve its fighting strength. It aims at rearward transfer by echelon based evacuation system depending on clinical condition of patient. After initial management by buddy care, Medical officer, paramedics, all patients presented to surgical center with varied mechanism & spectrum of injuries. Primary option in all cases was adhere to basic surgical principle. Assess airway, breathing, circulation, catastrophic bleeding was managed as emergency damage control philosophy. Abbreviated resuscitative surgery with transfer to higher echelon was done in 60% patient. In wounded polytrauma patient physiology has to be managed before anatomy. Concept of resuscitation is restoration of oxygen delivery to vital organs, address acidosis by keeping hemoglobin more than 6 gram. Address hypothermia by infusion of warm fluids. Limit crystalloid, permissive hypotensive resuscitation with warm fluids & short time on operating table. Keep surgery short, pack & stop. Surgical intervention for hemostasis is done before stabilization; patient was transferred to higher echelon once stabilized.

Various types of weapon injury were encountered causing maximum fragment injuries, followed by gunshot wound, land mine, IED blast & hand grenade. All patients were males between 18 to 45 years of age.

Trauma involving various types of organ system management

**1) Limb injury** with soft tissue or bony injury managed by wound debridement & excision, free bone pieces, bullets, shell etc. should be removed. Major blood vessels were ligated, shunted or repaired. Nerves & tendon tagged. All compartments should be decompressed, irrigate wound with hydrogen peroxide, saline & povidine iodine, keep wound open, immobilize bone, delayed primary closure of wound after 5 days.

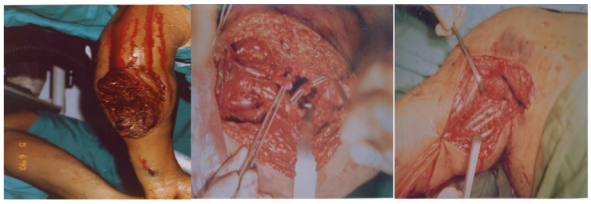


**Fig 1: SOFT TISSUE INJURY Fig 2 & 3 : VASCULAR REPAIR**

**2)In Neurotrauma** our focus was to prevent secondary brain injury. Blast injury behaves as blunt trauma. Prehospital hypoxia & hypotension should be avoided. Medical management involves raising

head end to 45 degree to lower ICP; cool to normothermia hypothermia causes coagulopathy & sepsis, hypertonic saline, mannitol for cerebral decongestion. Surgical management in the form of decompressive craniectomy or craniotomy was done as indicated by the condition of the patient. Anti-seizure prophylaxis for 7 days in depressed #, EDH, SDH.

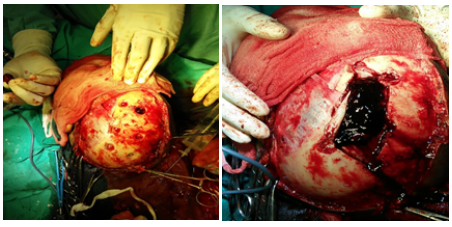


**FIG No 4 & 5 : DECOMPRESSIVE CRANIECTOMY**

Field guidance to craniotomy if mydiasis & GCS less than or equal to 9 decompressive craniotomy or trauma craniectomy is done as shown in fig 4 & 5.

**3) Mine blast :** Wide spread use of antipersonnel mines has resulted in humanitarian challenge, produces 3 pattern of injury penetrating, fragmentation & blast, required level of amputation is higher than is apparent to eye due to umbrella effect. Leave the stump open for delayed primary closure. Improvised explosive device & unexploded ordinance also produces same effect.

**4) Torso injuries** are a challenge comprises chest, abdomen, pelvis & buttocks. It can involve more than one body cavity. Chest tube should be inserted before anesthesia. Surgeon must be mentally prepared to open chest and abdomen interrupting one procedure to deal with second source of bleeding. Access to abdomen should never be attempted through diaphragm perforation during thoracotomy. Whenever there are clinical signs of massive haemothorax or tension pneumothorax treatment precedes X-rays. If more than 1500 ml blood loss immediately or 500ml 1st hour & 200 to 300 ml for 2 to 3 hours proceed for thoracotomy.

**5) Spinal injuries** wound management & nursing care, meticulous skin bladder bowel care should be done.

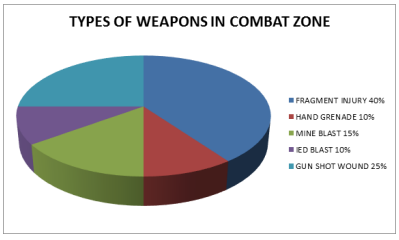
**6) Terrain specific catastrophe** is managed symptomatically or definitively.

So in resource poor setting all variety of cases were managed by deployed surgeons but technique described are not those of latest development as performed by specialist sitting in academic civil setting but definitely scientifically valid & varied dynamic daring procedures beyond the scope, exposure & preview of civilian surgeon.

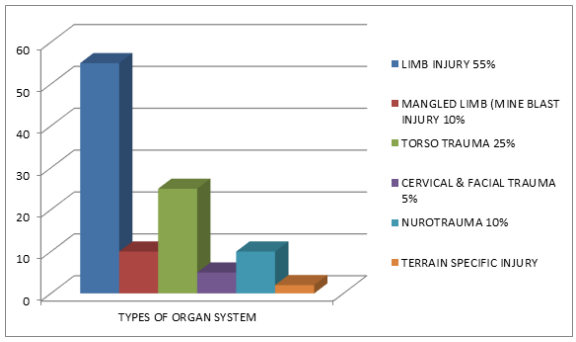
## RESULTS

A retrospective analysis of casualties admitted to peripheral remote hospitals during mentioned 5-year period from June 1998 to June 2000 & April 2008 to June 2010. Study delineates the mandatory skill required by surgeons deployed in Hostile conflict zone. Analysis of skill & technical competency required for management of different types of wound created by various weapons used in hostile conflict zone.

Total number of casualties managed in 5 yrs. were 2351 out of which maximum were fragment injury due to artillery or motor shells 940 cases i.e. 40%, gunshot wounds due to semi or fully jacketed bullet 587 cases about 25%, land mine injury 352 cases i.e. 15%, improvised explosive device blast 10% ie 235 cases, hand grenade injuries 10% cases, terrain specific injuries like frost bite & trench foot about 2% i.e. 47 cases.




Grossly various types of organ system involved like limb injuries 55% i.e. 1293 cases, ischemic mangled limbs due to mine blast 10% i.e. 235 cases, torso wounds 25% i.e. 587 cases, Neurotrauma about 352 cases ie 15%, cervical spine & fasciomaxillary injury requiring secure airway about 5% i.e. 117 cases.




We have executed damage control philosophy with abbreviated resuscitative staged surgery in 60% cases 1410 cases were transferred to higher echelon for definitive reconstructive & orthopaedic management.

## Discussion

In austere environment surgeons encounter multiple injured patients with high energy transfer fragment, projectile & blast wounds that require an application of damage control & definitive operative expertise. So surgeons need to be equipped to treat the complex casualties they can encounter during operation conducted in hostile environement & properly trained for management of blast and penetrating injuries, damage control surgery & triage. Need of hour is to formalize dedicated fellowship & curriculum for optimal training for surgeons (4).

Although in common procedures like Laparotomies, debridement & initial fracture stabilization broad training is imparted in the curriculum but very limited exposure is achieved towards injuries involving thoracotomy, craniotomy, nephrectomy & IVC repair.

Surgical skill declines in all surgeon working in peripheral areas where numbers of cases are very low (5). Lack of operative activity is the biggest hurdle we have to overcome. We fall significantly below our civilian counterparts in both overall case numbers and in case complexity at certain places. Deployment must be short to prevent a decline in surgical skill. Required surgical skill should not be compromised Hostile conflict operation rarely follow set pattern; situation can change (6). Surgical training is heavy knowledge based on apprenticeship & examination consists of written paper, clinical examination & viva, all does not test technical skill. On the basis of experience alone operative competence no longer is assured. Surgical knowledge is best assessed by examination and surgical skills are best assessed in work place (7).

There is no formalised standardized surgical training programme for surgeon working in hostile region, numerous studies describe operative case load & injury pattern seen in both Iraq & Afghanistan by coalition partners Honcamp R.Idenburg FJ. Hamming JF.

Following training is required to be included in curriculum of surgeon working in periphery in hostile conflict region as under:

1. Mandatory ATLS (advance trauma life support course) for all deployed surgeons.
2. Short basic surgical skill course required specially damage control surgical skill as following.

**(a) Vascular procedures:**

(i) Aortic cross clamping during resuscitative laparotomy thoracic & abdominal
(ii) Ligation of major arterial or venous tear
(b) Abdominal procedures
(i) Liver packing
(ii) Colonic injury control
(iii) Removal of spleen & kidney
(iv) Bladder rupture repair & drainage
(v) Pancreatic leak with multiple drain

(vi) Abdomen rapid & temporary closure

**C Extremity**

(i) Stabilizing fracture pelvis with pelvic ring binding or external fixation with pelvic packing.
(ii) Decision & performance of rapid amputation.
(iii) Soft tissue management & rapid debridement.
(iv) Compartment syndrome prevention.
(d) Neurotrauma
(i) Craniotomy by burr hole technique
(ii) Craniotomy & evacuation of hematoma
(iii) Elevation of depressed fracture
(iv) Removal of superficial bone & metal fragment
(e) Surgical airways technique
(I) Tracheostomy
(ii) Cricothyroidectomy

"Old lessons for new surgeons" best antibiotic is good surgery, good diagnosis, good clinical decision when to or when not to operate, antibiotic cannot replace poor surgery. Tetanus prophylaxis is must whatever the immunization status. Keep high index of suspicion for gas gangrene, early & adequate surgery can prevent it. (8, 9, 10)

This concept of forward surgery requires a solid foundation in general surgery which is no longer provided by the current surgical programs due to an early super specialization of the residents. Obviously a specific training is needed in war trauma due to the special pathology and practice.

## CONCLUSION

This article highlights the surgeon operating in emergency arena of warfare with importance of training in life saving technique & treatment developed through clinical research. We need to upgrade new alternate technology & training methodologies like using animals, simulators and various lifesavings training technique.

US army has developed courses like "Tactical Hostile conflict casualty course" which consist of didactic sessions, interactive human surgical stimulators, triage scenarios, use of animal tissue etc. so we can formulate customize approach for trauma care training to operate in austere environment with limited resources.

Three level of surgical education & skill training for surgeons to sustain surgical skill.

1) Core surgical competence the basic skill & training that are usually obtained through graduate medical education & garrison surgical care that forms the foundation for readiness skill.
2) Basic and advanced medical Hostile conflict readiness skills, the basic essential medical skills required for all medical personal deploying to hostile zone & advance surgical readiness skill that allows members of surgical teams to deploy and optimally perform in this assigned roles.
3) Mission specific medical readiness skill that required skills to perform a specific deployed surgical mission. Further research focused on field first aid, resuscitation fluids & coagulation agents is the need of the hour. Expansion of such research for establishment of units to restore the army medical corps tradition of integrated casualty care research within the theatre of operation should be done. Continuation of such research will ensure ongoing surgical progress & further help in improving in outcome of both military & civilian casualties.

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