

ANTIPERSONNEL IMPROVISED EXPLOSIVE DEVICE (AP-IED) BLAST AT MUZAFFARABAD, AJK: ORTHOPAEDIC INJURY PROFILE OF VICTIMS

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ABSTRACT

Objective: To describe orthopaedic injury profile in mass casualties due to anti-personnel improvised explosive device (AP-IED) blast at Muzaffarabad, Azad Jammu & Kashmir.

Study Design: Retrospective descriptive case study of a single incident.

Place and Duration of Study: The orthopaedic injury profile suffered by victims of anti-personnel improvised explosive device blast in 9th Muharram religious procession on 27th December, 2009 just in front of main gate of H.H. Sheikh Khalifa Bin Zayed Hospital, also called CMH Muzaffarabad.

Methodology: A total of 82 mass casualties were evacuated to the Accident and Emergency Department. There were 9 fatalities. Seven were found dead on triage, whereas 2 died during resuscitation. Seventy three injured victims were included in this study.

Results: Seventy three injured victims (51 males: 22 females) survived this anti-personnel improvised explosive device blast. Thirty nine victims were admitted and 2 died within 72 hours due to complications of polytrauma, making overall mortality to be 13.4%. Twenty eight emergency surgical procedures were done in 24 patients (32.8%). Limb fractures were present in 53.4% victims. Lower limb fractures in 56.75%, upper limb fractures in 29.73%. Most common upper limb fracture involved humerus (18.92%). Traumatic amputations were present in 7 (9.59%) victims.

Conclusion: The effects of anti-personnel improvised explosive device blast are both physically and psychologically devastating. Extremity injuries are prevalent in victims, by far. By appreciating associated injury profile, the treating physicians and surgeons are primed to deal with life and limb threatening injuries of unfortunate victims.

Keywords: Antipersonnel Improvised explosive device, Blast, Orthopaedic injury profile.

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INTRODUCTION

Antipersonnel Improvised Explosive Devices (AP-IED) defined by US Department of Defence are devices placed or fabricated in an improvised manner incorporating destructive, lethal, noxious, pyrotechnic or incendiary chemicals designed to destroy, disfigure, distract or harass. It consists of a container, a power switch, an initiator, a switch, a charger. This description encompasses a wide spectrum of devices ranging from simple home-made explosives to sophisticated weapon systems containing high grade explosives. Within this broad definition, IEDs

can be categorized as roadside explosives and blast mines^{1,2}. Additional materials such as nails, ball bearings and glass are commonly added to increase the number and severity of injuries. Over the years the devices have become more sophisticated and deadlier. The addition of large number of shrapnel intensifies the effects of penetrating trauma³⁻⁶.

AP-IEDs are frequently used as a terrorism tool worldwide now a days. The severity of injury inflicted depends on the energy transferred by explosions. Most common injuries encountered in blast victims are musculoskeletal. Bone being more rigid organ as compared to skin and muscles results in greater energy transfer causing fractures. Extremities and pelvic injuries related to orthopaedics may occur by any of the blast

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effects, i.e., a) direct blast wave b) penetrating projectiles c) body strike to fixed objects after tumbling and d) burns and crush effects causing neurovascular compromise^{4,5}.

Overall reported lethality of blast injures in open air is about 7.8%⁷. Primary blast injury leading to traumatic amputation is associated with dismal prognosis due to extreme over pressure exposure^{8,9}. Percentage of traumatic amputation serves as marker of multisystem trauma severity and subsequent high mortality. Extremities are commonly affected by IEDs. Studies from UK and US joint theatre trauma registries have shown 70% incidence of extremity injuries¹⁰. Many local studies have also reported similar findings¹¹⁻¹⁴.

The objective of this study was to circumscribe the orthopaedic injury profile suffered by the targets of AP-IEDs used in this part of the world. We retrospectively analysed the data of all casualties from roadside planted AP-IED blast carried out in a 9th Muharram religious procession. The incidence took place on December 27, 2009 at 17:45 hrs just as the procession was marching to nearby Imam Bargah on the road in front of main gate of H.H. Sheikh Khalifa bin Zayed Al-Nahyan Hospital also known as Combined Military Hospital (CMH) Muzaffarabad.

METHODOLOGY

This was a descriptive single incident case study. A total of 82 mass casualties were brought to the Accident and Emergency of H.H. Sheikh Khalifa bin Zayed Al-Nahyan Hospital, Muzaffarabad. The data of all these blast victims, retrieved from personal database was analysed bringing out injury pattern/profile with special focus on orthopaedic injuries.

All patients were received in Accident and Emergency and START (Simple Triage and Treatment) protocol was initiated. Simple Triage was done using R-P-M (respiration, pulse, mental state) by team including medical officers and paramedics. Patients were resuscitated and evaluated by the trauma team. They were individualized and colour coded as dead (black),

stable (Green) and unstable (Red and Yellow). The red-coded were taken straight away to Operation Theatres, whereas Yellow were kept in Surgical ICU and Orthopaedic Wards for stabilization followed by required intervention on emergency basis or elective, as deemed appropriate. All patients did receive tetanus prophylaxis and appropriate antibiotic coverage.

RESULTS

There were 82 casualties from the AP-IED explosion. The patients were labelled by triage into five categories as shown in fig-1. The number of casualties falling into each category are shown in table-I.

Most of the injured, i.e. 25 (34.25%) victims belonged to 31-40 age group, followed by 15 (20.55%) in 41-50 and 14 (19.18 %) in 21-30 age

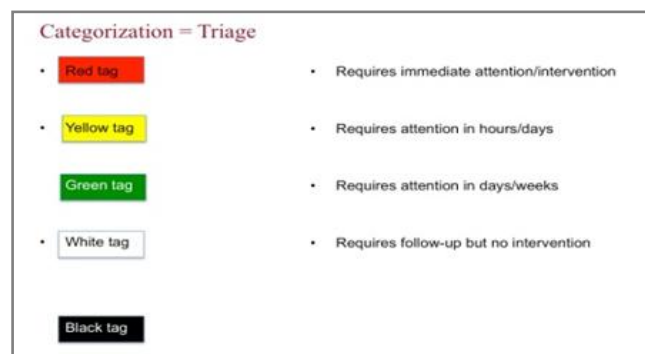


Figure-1: Triage categories.

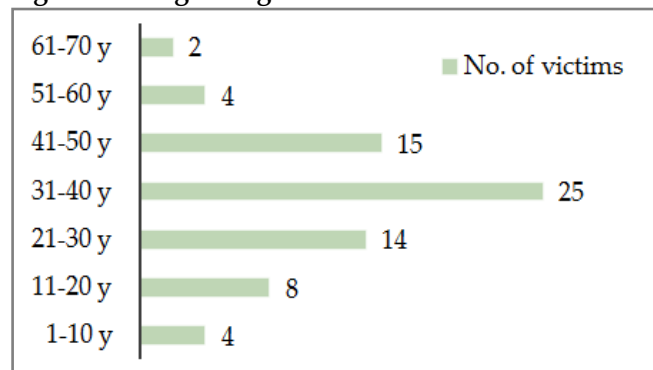


Figure-2: Demographics of victims (n=73).

group (fig-2).

Out of 73 injured victims, 51 (69.86%) were males and 22 (30.14%) females.

Thirty four victims labelled Green/White had sustained minor and superficial injuries

requiring stitching/ antiseptic dressings and were discharged with follow-up advice. Thirty nine victims labelled Red/Yellow were admitted. A total of 28 procedures were performed emergently in 24 patients (32.8%). External fixators of limbs were applied in 8 patients (10.9%), Laparo-

Table-I: Triage results.

Red	Yellow	Green/White	Black
8 (9.75%)	31 (37.8%)	34 (41.47%)	9 (10.98%)

Table-II: Breakdown of emergency surgery (n=73).

Procedure	Number	Percentage
Chest intubation	3	4.1
Thoracotomy	2	2.7
Laprotomy	5	6.8
Pelvic Ex-Fix	1	1.3
Ex-Fix Limbs	8	10.9
Vascular repair limbs	2	2.7
Debridement/stumps in traumatic amputations	7	9.5

tomies were carried out in 5 patients (6.8%). There were 3 chest tube intubations (4.1%), 2 thoracotomies (2.7 %), 2 vascular repairs (2.7%) and 1 external fixator of pelvis (1.3%) (table-II & fig-3). Out of these 39 polytrauma victims, 2 expired within 72 hrs raising the overall mortality of this AP-IED blast to 13.4% (11 deaths).

Orthopaedic Injuries Profile: (n=37)

Limb injuries amounting to fractures were present in 39 victims (53.4%). Two out of these

treated for these injuries. Lower limb fractures were present in 21 (56.76%) and upper limb fractures in 11 (29.73%) while 5 (13.52 %) patients had both.

Since 11 patients had only upper limb fractures, whereas 5 had both upper and lower limb fractures, overall upper limb fractures were present in 16 patients, i.e. 43.24%. There were 7 (18.92%) fractures of radius/ulna, 3 (8.11%) of humerus, 2 (5.41%) of hand fractures and 4 (10.81%) patients of multiple upper limb fractures.

Twenty one victims had only lower limb, whereas 5 had both upper and lower limb fractures. Therefore, overall lower limb fractures were present in 26 (70.27%). There were 14 (37.84%) fractures of tibia/fibula, 5(13.51%) cases of fractured femur, 4 (10.81%) cases of fractured foot bones and 3 (8.11%) victims with multiple lower limb fractures.

DISCUSSION

Unfortunately, terrorism is a growing global problem that knows no borders and doesn't discriminate. AP-IEDs have now become an established tool of destruction in terrorism worldwide. The injuries caused by IEDs may be divided into primary, secondary, tertiary and quaternary injuries. Primary injuries are due to

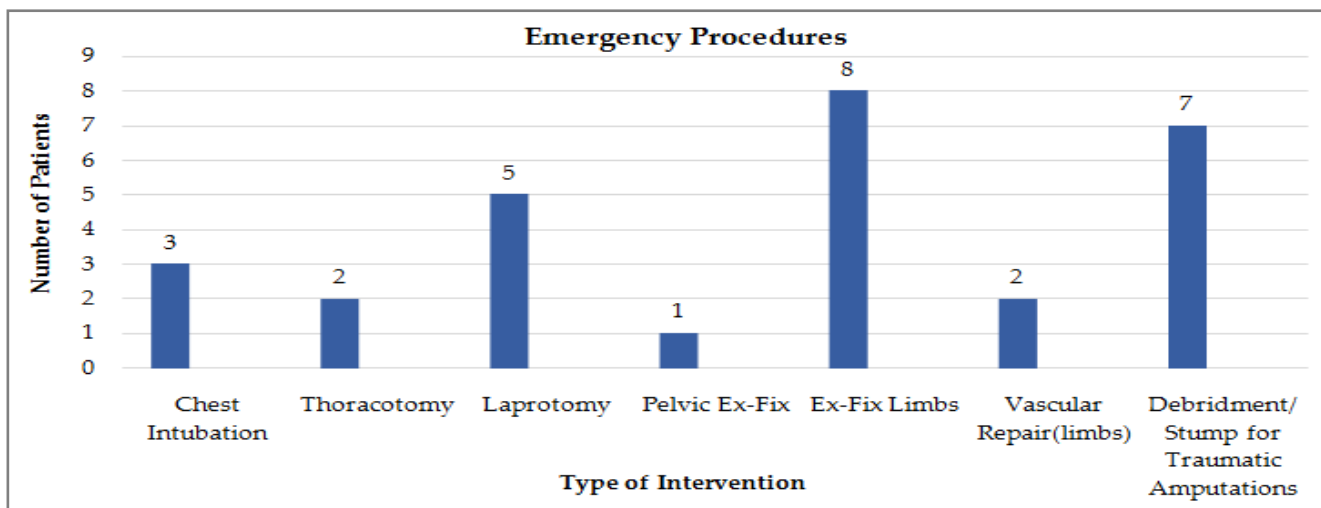


Figure-3: Emergency procedures carried out.

expired within 72 hours due to complications of polytrauma and hence 37 were subsequently

high pressure blast waves that cause compression and shearing of tissues as the waves pass through

the body resulting in injuries in gas filled structures like ear, lungs, and bowel¹⁰. Secondary injuries are due to materials thrown out from the bomb casing and the debris. Tertiary injuries occur as a result of victim displacement by the blast wind or by structural collapse. Quaternary injuries include inhalation of toxins and dust or by burns or radiations^{10,15-18}. The fractures and traumatic amputations may result from the combination of primary secondary and tertiary blast injuries, however mostly they are caused by secondary blast injuries¹⁹.

Terrorist bombings result in high injury scores among other findings. Kluger, in an analysis of data from the Israel Centre for Disease



Figure-4: (a) (b) X-rays showing Bilateral Comminuted fractures of distal humerus and proximal radius ulna. Note the penetrated stainless-steel nails used in AP-IED visible around fractures (c) Stainless-steel nail and its fragment removed during surgery (d) Bilateral Elbow-spanning Ex-Fix applied after thorough debridement.

Control, found that bombing casualties had higher injury severity scores (ISS >16, 30% vs 10% for other trauma), increased immediate mortality (as high as 29% for closed space bombings), greater in hospital mortality rate (6.2% vs 3% for other trauma), more frequent need for surgical intervention - particularly orthopaedic, longer hospital stays, greater use of intensive care, and younger age groups²⁰.

The under study roadside AP-IED blast took place in front of H.H. Sheikh Khalifa bin Zayed Al-Nahyan Hospital (CMH Muzaffarabad) main gate at a passing by 9th Muharram religious

procession at 17:45 hrs. The mass casualties were immediately brought to Accident and Emergency of the hospital. Since this blast targeted the religious procession, demographics were slightly different than in bomb blasts at public places. Most of the patients belonged to the age group between 21 to 50 years (87%). There were only four patients (5.48%) below the age of 10 years. Fifty one (69.86%) of victims were males and 22 (30.14%) were females. Nairobi Embassy bomb blast 21 reported overall female predominance with 63.1% females and 36.9% males in contrast to our study. Similarly, there were more female victims during the world trade centre attack in New York²². Local studies, however report male pre-ponderance in open space blast victims, similar to our study. The reason essentially remains presence of males in public places/open spaces engaged in livelihood, while traditionally females mostly are involved in daily household chores^{11,13,14}.

The aim of this study was to delineate injury profile caused by such IEDs. The mortality rate was 10.97% as compared to 19% quoted by Smith *et al*²³. Significant Orthopaedic injuries amounting to Limb fractures were seen in 53.42% of the victims. In Oklahoma City bombing, 35% of the survivors had multiple fractures²⁴. In Madrid bombing the fractures constituted 18% of the musculoskeletal trauma²⁵.

Jacobs *et al* classified the limb injury pattern of 103 consecutive casualties of IEDs treated at a UK Role 3 facility in Helmand Province, Afghanistan. They found 76 (57.57%) victims suffered significant bilateral lower limb injuries, with 50 who required bilateral lower limb amputation. Thirty-three victims suffered genital or perineal injury, 9 sustained pelvic ring disruption and 40 (30.30%) sustained significant upper limb injury. Correspondingly in our study, lower limb fractures were seen in 70.27% of casualties with majority (37.84%) fractures of tibia and fibula. Likewise, injuries of upper extremities were seen in 29.6% with preponderance of forearm fractures in 18.92%. Associated limb vascular injuries were primarily repaired in 2 (9%)

patients. Traumatic amputations were present in 7 (9.59%) victims. In a similar local study from DHQ Hospital Miranshah, in North Waziristan Agency, KPK, 10% incidence of traumatic amputations and frequency of upper and lower limb fracture types reported was quite consistent to

steel nails were used which inflicted abysmal musculoskeletal damage (fig-4 & 5).

Finally, it is prudent to add that these events occur with no warning and create a real threat to personal safety and have potential to cause profound and lasting emotional impact. Responders

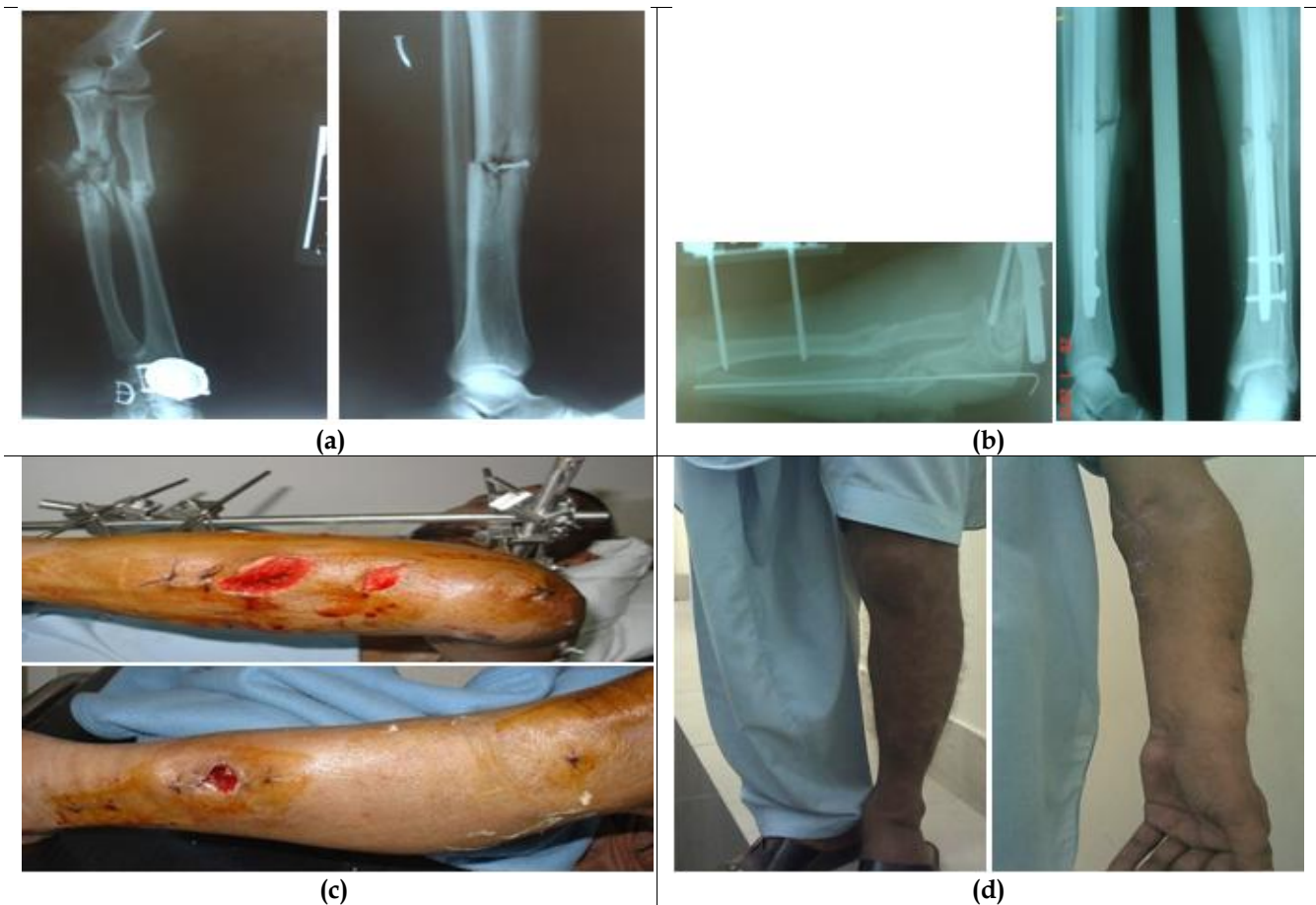


Figure-5: (a) X-rays showing badly comminuted Fractures of Radius Ulna and Tibia in a 45 years old policeman. Stainless-steel nails causing the damage are seen lodged around fractures (b) Post-operative x-rays of forearm and leg (c) Nicely healing wounds on forearm and leg after fixation and debridement (d) Healed forearm fractures and wounds at 20 weeks.

our study¹¹.

Orthopaedic care of these blast injuries is governed by several principles. Significant injuries can result from small entrance wounds and fragments may not travel simple straight lines. The use of materials such as nails, ball bearings and glass potentiate the local tissue damage to an alarming extent. In this blast, small stainless-

to bombing are encouraged to promote a sense of safety, calm, connectedness and hope.

CONCLUSION

The effects of anti-personnel improvised explosive device blast are both physically and psychologically devastating. Extremity injuries are prevalent in victims, by far. By appreciating associated injury profile, the treating physicians

and surgeons are primed to deal with life and limb threatening injuries of unfortunate victims.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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