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Case Series

Clinical Courses and Outcome in Patients with Blast Injuries: An Observational Case Series Study

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ABSTRACT

Background: Blast injuries are similar to any other burn injuries. Emphasis is given to safety measures as the treatment of burns is a painful and prolonged process that involves a loss of limb or sensory organs with a lot of expenditure. **Aim:** To evaluate the patient with their outcomes and management who sustained blast injuries. **Patients and Methods:** All patients who had blast injuries with different kinds and mechanisms were prospectively studied and clinical presentation, management and outcomes were reviewed. **Results:** 6 patients were studied with different age groups and different mechanisms of blast injuries of which one was female who sustained thermal injuries associated with AC Blast, two patients sustained explosive blast, and others were involved in methanol cylinder blast, improvised explosive device and mixing fertilizer as a chemical form of blast injuries respectively. All were managed and the outcome was satisfactory for 2 individuals, 3 sustained amputations and 1 sustained mortality. **Conclusion:** The high energy wave produced during blasts are strong enough to produce fatal injuries that will lead to high morbidity and mortality. Civilians should be aware and personal protective equipment should be worn by those who are indulged in this hazardous occupation.

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1. Introduction

Blast injury explosions are very devastating injuries which affect various systems and increase morbidity and mortality similar to any other traumatic injuries. Explosions can occur due to chemical reactions and generate more intense energy and cause damage, it can be in various forms like primary, secondary, tertiary and quaternary. The pattern of injuries following blasts is a product of the composition and amount of the chemical or material used, the surrounding area, the delivery method, the distance between the source and the victim, and any intervening protective barriers or environmental hazards. Explosions are relatively infrequent but very devastating, many of them are associated with head injury, thermal burn injuries, extremities injury and sometimes mortality can occur. Blast-related injuries can present unique triage, diagnostic,

and management challenges to provide emergency care [1-4]. According to triage patients are managed accordingly.

2. Case Series

All patients who had blast injuries with different kinds and mechanism were prospectively studied and clinical presentation, management and outcomes were reviewed. Six patients were studied with different age groups and different mechanisms of blast injuries out of which one patient was female who sustained thermal burn injuries associated with AC Blast, two sustained explosive blasts, one each with methanol cylinder blast, improvised explosive device and mixing fertilizer as a chemical form of blast injuries respectively. Clinical course and outcome of patients shown in (Figure 7).

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FIGURE 1: Case 1



FIGURE 2: Case 2: IED while making explosives.



FIGURE 3: Case 3: Methanol cylinder blast.



FIGURE 4: Case 4: Explosion in farm.



FIGURE 5: Case 5: Explosion in farm.



FIGURE 6: Case 6: AC blast scene.

Serial no.	1	2	3	4	5	6
Age/sex	36Y/M	32Y/M	38Y/M	50Y/M	45Y/M	35Y/M
TIME TO REACH HOSPITAL	2DAYS 5 HRS	15HRS	18HRS	10HRS	10HRS	18HRS
MECHANISM OF INJURY	Chemical blast while mixing of fertilizers (<u>neela thotha</u> and <u>gandhak</u> potash alum	IED(improved explosive device) explosion while making 9 sacks of explosives	Methanol cylinder blast at station	Explosion in farm	Explosion in farm	Air conditioner blast
THERMAL ASSOCIATION	NO	NO	YES (30%)	NO	NO	YES (<u>90%</u>)
AREA INVOLVED	Right U/L and L/L with fibula fracture	Multiple small lacerations over chin, neck, shoulder, tongue with upper airway <u>oedema</u> .	Face, U/L, Chest, Abdomen, Right L/L	Right Hand Traumatic amputation with crush injury with multiple abrasions over left thigh and abdomen	Mangled Bilateral hands at wrist joint level.	Thermal Burn Injury involving almost all body except bilateral legs.
TM RUPTURE	+	+	+	+	-	-
MANAGEMENT(CONSERVATIVE/OPERATIVE)	Right Thumb amputation and suturing of l/w with slab application right fibula with medial gastrocnemius flap cover	Tracheostomy + suturing and ICU Management	ICU Conservative Management	Debridement + Stump closure.	Debridement + Stump closure.	ICU Management + Tracheostomy
OUTCOME	Discharged with amputated right thumb	Discharged	Discharged satisfactorily	Discharged satisfactorily	Discharged with amputated right forearm	Patient expired due to MODS
HOSPITAL STAY	31 DAYS	24 DAYS	5 DAYS	5 DAYS	5 DAYS	4 DAYS

FIGURE 7

3. Discussion

Blast injuries are more dangerous because when explosion occurs, high energy produce and causes much more damage than other injuries and

affects on multisystem of body. If blast injury occur in enclosed space it increase morbidity and mortality [5-7]. In blast various manner of injuries occur and classified into four types primary, secondary, tertiary, and quaternary (Figure 8).

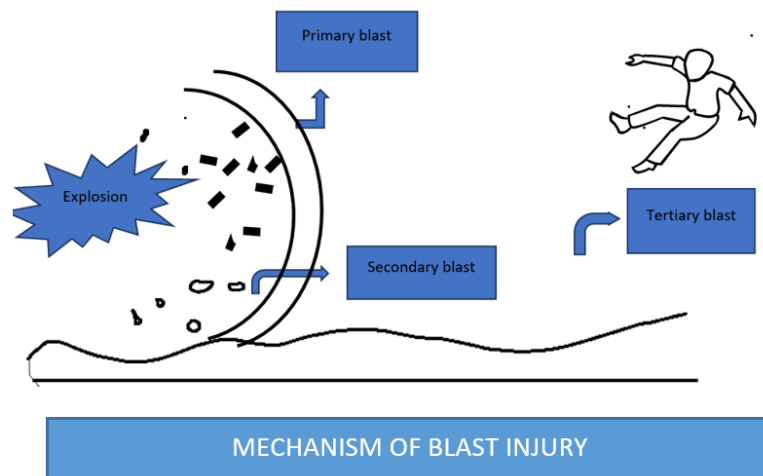


FIGURE 8

3.1. Primary

It occurs due to direct effect of explosion and effects various vital organs like eye, ear, nose, abdomen, extremities, lung, heart and brain. Perforation and vision loss can occur in eyes, tympanic membrane

perforation, hearing loss can occur in ear, internal haemorrhage and compartment syndrome can occur in the abdomen, bleeding can occur in the nose, amputation can occur in both extremities, barotrauma can occur in lungs, cardiac tamponade can occur in heart, parenchymal damage can occur in the brain.

3.2. Secondary

Secondary damage can occur due to the production of debris after an explosion. It causes lacerations over the face, neck, extremities and various parts of the body.

3.3. Tertiary

It occurs due to a displaced object via air and colloids to other objects and causes fatal injury and may cause death.

3.4. Quaternary

It includes all types of injuries which are not included in primary, secondary and tertiary. It occurs in various manners if an explosion and

fire occur in an enclosed space it causes thermal burn and inhalational injury. If inhalation injury occurs in COPD and asthma patients it increases morbidity and mortality. Some toxins are also produced after an explosion and cause toxemia. In myocardial ischemic patients, blast injury precipitates cardiac events like arrhythmia, MI, heart failure etc.

A blast is a high-energy explosion, it occurs due to any cylinder blast, chemical explosion, bomb blast and etc. If the patient survives after a blast injury its effects long term like disability, phantom limb pain, depression, vision loss, sleep disorder, anxiety, psychological disturbances and overall decreased quality of life. In blast injury, patients manage accordingly to protocol (Figure 9).

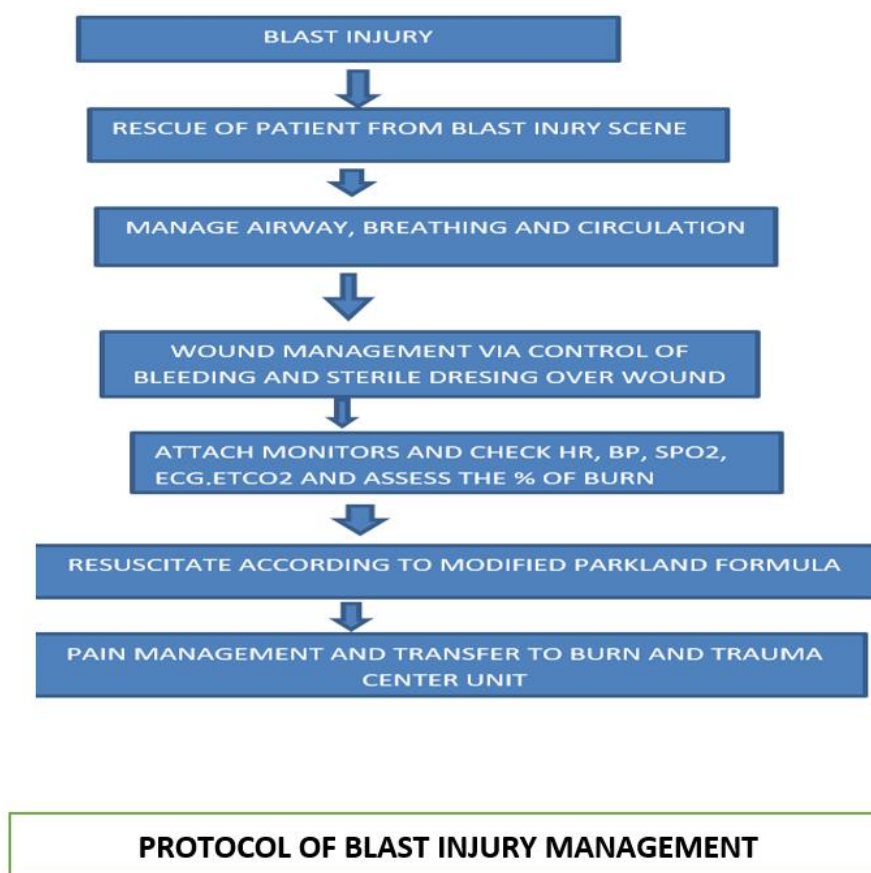


FIGURE 9

On arrival to burn and trauma unit, take proper history of deafness, vision loss, hemoptysis, abdominal distension, guarding and rigidity, tinnitus, any bleeding from nose and ear, nausea, cough, any respiratory distress do chest x ray, ABG, abdominal x ray or CT scan, ophthalmology consultation and managed accordingly.

4. Conclusion

The high energy wave produced during blasts are strong enough to produce fatal injuries that will increase morbidity and mortality. People

should be aware and personal protective equipment should be worn by those who are indulged in this hazardous occupation.

Funding

None.

Conflicts of Interest

None.

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