

Management of Explosions and Blast Injuries after Gërdec Tragedy, Albania

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Abstract

Background: In the last decade, the risk of terrorist attacks has increased largely almost worldwide. In this setting, disaster response personnel must understand the unique physiopathology of injuries associated with explosions and must be prepared to assess and treat the people injured in such tragedies. The ammunition explosion in Gërdec, Vora, just 13 miles from the capital of Albania, Tirana, confronted our country with a real human tragedy with severe casualties. The striking force of the two consecutive explosions resulted in two consecutive earthquakes with respectively an amplitude of 9.2 and 2.5 on the Richter scale.

Objective: To explain the classification of explosives and in connection with it to identify the major types of explosive and blast injuries, and the management options in the cases of explosions and blast injuries.

Material & Methods: Efforts to dismantle Albania’s stockpiles of obsolete munitions took a catastrophic turn on March 15th, when a series of explosions occurred as crews were clearing out a storage depot in Gërdec, on 15th of March 2008, at 12:15 AM hours. Gërdec is located 10 km northwest of the capital of Albania, Tirana; near the national highway Tirana-Durres and at a distance of 3-4 km in air line from National Airport. Data presented here were collected from the patients’ files in our Trauma UHC and from the official reports from the different governmental offices.

Conclusion: The explosive and blast injuries now present a true modern epidemic disease that threaten the very survival of the free world. A thorough understanding of detonation and blast dynamics by the treating teams is required to better correlate the injury patterns presented. This is also critical for revision of current multiple casualty protocols. It is up to the medical establishment to prepare suitable protocols, coordinate manpower and secure medical resources to successfully handle such events.

Keywords: *BLI (Blast Lung Injury); CT (Computerized Tomography); DPL (Diagnostic Peritoneal Lavage); FAST (focused abdominal ultrasound); IED (Improvised Explosive Device)*

Introduction

Blast injuries result from explosions that have the capability to cause multisystem, life-threatening injuries in single or multiple victims simultaneously. These types of events may constitute a rather complex triage, and a real diagnostic and management challenge for the health care providers.

Blast injuries are generally categorized from primary to quaternary injuries.[1,2,3] Primary injuries are caused by the effect of transmitted blast waves on gas-containing structures; secondary injuries are due to the impact of airborne debris; while tertiary injuries are caused by the transposition of the entire body due to the blast wind or structural collapse; and quaternary injuries constitute injuries inflicted by all other forces. A patient may be injured by more than one of these mechanisms.[1,2,3] As the risk of terrorist attacks increases in the world, disaster response personnel must understand the unique physiopathology of injuries associated with explosions and must be prepared to assess and treat the people injured in such occasions.

A major impact factor to the scale of injury is the proximity of the person to the explosion in a primary blast injury. [3] For example, a person in a 3m (10ft) distance from the explosion experiences 9 times more overpressure than a person situated 6 m (20ft) away (double the distance) at the moment of the event. In addition, other factors are to be taken in consideration. Blast waves are reflected by solid surfaces; thus, a person standing next to a wall may suffer increased primary blast injury. [3]

The explosions at the army depot in Gërdec village, around 10km north of the capital of Albania, Tirana, were overheard in a distance more than 50 km (30 miles) away. Albanian newspapers described the blast as “Albania’s Hiroshima” and an “Apocalyptic tragedy”.

Efforts to dismantle Albania’s stockpiles of obsolete munitions took a catastrophic turn on March 15th, when a series of explosions occurred as crews were clearing out a storage depot in the outskirts of Tirana. The explosions lasted nearly 14 hours, and resulted in 26 deaths and more than 300 injured, while thousands of people were left home-

less, resulting in a total economic damage of 16.6 mil Euro worth, including the catastrophic damage to hundreds of homes and other civilian structures within a 2.5 kilometers (1 1/2 miles) radius from the dismantling facility. Several officials of the Ministry of Defense and managers and directors of the private company disposing of the ammunition were arrested on charges of negligence. About 100,000 tons of excess ammunition, mostly Russian and Chinese artillery shells produced in the ‘60s or earlier, are stored in former army depots across Albania. The country pledged to dispose of the ammunition by 2010, with assistance from the US, Canada and other NATO countries. It appeared that most of the injured were caught by the blast, which was traced up to 200 kilometers away in the Macedonian capital of Skopje and which was also registered as an earthquake by the seismographs as far as in Strasbourg. The initial explosion was followed by a series of blasts, and ammunition continued to detonate for hours. Attempts to fly rescuers into the area by helicopters were thwarted by the continuing explosions, and armored vehicles were used to ferry rescue units into the area. Injured people were taken to nearby hospitals. Local media reported the injuries included burns, concussions, broken limbs, and cuts from flying glass and shrapnel.

Ammunition explosion in *Gërdec, Vora, just 13 miles* from the capital city of Albania, resulted in large numbers of severe casualties in the country. The striking force caused by to consecutive blasts, resulted in two consecutive earthquakes with an amplitude of respectively *9.2 and 2.5 on the Richter scale*.

Explosion of collected munitions occurred on 15th of March, 2008, at 12:15 AM, in an extermination facility located in Gërdec, close to Tirana-Durres national highway, northwest of Tirana, and at an air-line distance of 3-4 km from National Airport.

Within a timespan of thirty minutes, this explosion constituted the greatest tragedy that ever happened in my country. According to the Defense Ministry and witnesses who worked in the department, most of the ammunition comprised high caliber shells and the gunpowder used for their weapons, which were being removed and

separated.

The economic impact was calculated as *36.7 million euro, with some 3390 buildings* damaged by the blast, including homes, local businesses and factories. So, *407 houses* were completely destroyed and *250 different businesses* were damaged after the blast. Most of these businesses were located in immediate proximity to Gërdec village, along the Tirana-Durres highway. [3]

A medical facility suffered blast damage from warehouses in Gërdec. The only health center established in this area was damaged, in addition to *eight schools*. According to the assessment team, the schools were not completely destroyed. *5000 of the shells* collected in an area of 900–hectares resulted as harmless by the expert military inspection while *690 collected shells* were considered dangerous. Damages were also registered in another *1112 buildings* in the surrounding areas of Gërdec.

In a few minutes the blast made a huge hit on the health of the people involved directly or indirectly in the region. *It required* the primary rescue of damaged lives and wounded people, provision of first aid, stabilization and final treatment. First aid for the injured was performed instantly by ordinary nearby citizens. Within a few minutes the police intervened and were immediately followed by special army units that were nearby.

The Ministry of Health carried out rescue operations in all the areas affected by the tragedy of Gërdec.

Twelve helicopters from the Medical Transport Unit contributed to the tragedy in Gërdec. This is the total number of medical helicopters owned by the center at the time, which was directly under the Ministry of Health in dependency level, while *thirty ambulances* on the disaster area were put into service to transport the injured from Gërdec, from which thirteen were provided by the Ministry of Defense and the rest by the Ministry of Health and the Ministry of Interior Affairs.

A thousand was the number of military forces engaged on mission in Gërdec. All units, such as civil emergencies, units of Engineer troupes and special teams were involved in the operation to save as many lives as possible and to demine the area.

Fifty doctors from the Military Hospital were called in and were available for the entire day to provide both first aid and specialized treatment to all the injured. With the special order of the Ministry of Health *fifty doctors and two hundred nurses* worked at the Military Hospital without stop throughout the day of the event, while special shifts were organized for the following days.

After the event, the government ordered the establishment of three emergency staff offices:

The first was established in Vora, Tirana, right by the scene. *The second* was established in the operating units in the Central Military University Hospital Center (CMUHC). *The third* was established at “Mother Theresa” UHC, in Tirana and in the regional hospital in Durres, with the goal to give first aid, help in *stabilizing the patients and provide final treatment to them*.

In addition, a *health center* was established Near the Explosion Field through the health personnel of the area, mainly responsible for the evacuation of the injured, etc.

The total count was 300 injured by the event. This country has actually testified a large number of children injured from limited weapon depot explosion previous to this event.

Twenty one resulted dead from the tragedy of Gërdec. Corpses found at the scene reduced the number of missing, thus raising and confirming the number of deaths. *Four were reported missing* from the explosion of weapons warehouses in Gërdec. All four were employees of the ammunition dismantling facility. Mortality rates in other similar accidental or terroristic explosions vary widely between incidents. An analysis of 29 large terrorist bombing events between 1966 and 2002 showed 8,364 casualties, including 903 immediate deaths and 7,461 immediately surviving injured. [4]

Methods and Materials

A thorough review of all the patients' files hospitalized from the event was performed and the data was than calculated and are presented below in correlation with the age-groups, gender and type of injury, etc. in both absolute and percentage value.

Results

The data have been presented in both absolute value and percentage value.

The distribution of trauma cases *by gender* was as follows: 89 (51%) females and 87 (49%) males.

The distribution *based on the age* was: a) 0–14 years old — 27 (15%); b) 14–30 years old — 44 (25%); c) > 30 years old — 105 (60%) of cases.

When we compare our data with the literature data we find similarities and differences. In a study of firework-related injuries treated in EDs in the United States from 2000 to 2010, the higher rates were noted in children, with the highest rates being observed in 10–19 year olds (7.28 per 100,000 persons) and 0–9 year olds (5.45 per 100,000 persons). The injury rate was nearly 3 times higher for males than for females (4.48 vs. 1.57 per 100,000 persons). [6, 7]

In relation to the type of injuries, the patients with *superficial VLC* constituted 75 (41.9%) of the injured; patients with different fractures constituted 20 (11.3%) of the overall cases; while 43 patients (24%) were diagnosed with *body & head* damages and 24 (13.4%) with tympanic membrane perforation (TMP), while 13 (7%) were diagnosed with combustion in the different stages.

66 (37%) of the overall trauma patients were hospitalized for prolonged treatment, and 11 (16%) were transferred in medical centers abroad.

The most common injuries were burns (26.7%) of the wrist, hand, and finger, followed by contusion or superficial injuries to the eye (10.3%); while open wounds of the wrist, hand, and finger were third in row (6.5%). [6, 7]

From a literature review, unique patterns of injury are found in all bombing types. Injury is caused both by the direct blast overpressure (primary

blast injury) and by a variety of associated factors. Enclosed-space explosions, including those occurring in buses, and in-water explosions produce more primary blast injury. Blasts in ultra-confined spaces such as buses have the highest associated mortality. [5]

In a study of the relationship between tympanic membrane perforation (TMP) and severity of blast injury, TMP was more prevalent in patients with moderate and severe injuries than in mildly injured patients (53.3% vs. 13.6%). Patients with TMP more often needed surgery, ICU hospitalization, and transfer to a level I trauma center. [9]

Similarly, in a review of 167 patients who underwent blast exposure in Iraq, TM perforation was noted to be poorly sensitive as a biomarker for more serious primary blast injury. [8]

A health center was established Near Field Blast through the area health personnel helping in evacuation.

Military Medical Research Institute, in collaboration with the Institute of Public Health (IPH), made available doses of 600 ATV and enabled the application in the field hospital facilities contingents, which directly took part in search-rescue and in the clean-up of the area.

Destruction of dead animals: An important element, which, constitutes a danger to the troops and the population—is the finding and disposing of dead animals. In a short period, 233 dead animals were found, disinfected and buried (19 cattle, four fowl, three pigs, four perissodactyls and 203 birds).

Blood donation: The blood need was covered by a great influx of solidarity and voluntary donors from all Albanian territories.

No.	Data	Age Groups (in years)			Gender		TOTAL	%	
		0-14	14-30	>30	M	F			
1	TOTAL CASES	27	44	105	87	89	176	100	
2	<i>Superficial V.L.C.</i>						75	41.9	
3	<i>TMP</i>						24	13.4	
4	<i>Extremity fractures</i>						20	11.3	
5	<i>Comotions & Contusions of the Head</i>						43	24.4	
6	<i>Extremities Amputation</i>	1				1	1	0.5	
7	<i>Combustion of different grades</i>						13	7.3	
8	TOTAL (2+7)						176	100	
9	HOSPITALIZED						66	100	
10	TRANSFERRED ABROAD	GREECE						6	9
		ITALY						4	6
		TURKEY						1	1
		TOTAL						11	16.6

VLC – Vulnus Lacero Contusum; TMP - tympanic membrane perforation

Table 1: Distribution of data per injured patient.

Conclusion

Explosive and blast injuries represent a true modern epidemic that threaten the very survival of the free world. A thorough understanding of detonation and blast dynamics by the treating teams is required to better correlate the injury patterns presented. Such an understanding and

these experiences are also critical for revision of current multiple casualty protocols. It is up to the medical establishment to prepare suitable protocols, coordinate manpower and secure medical resources, which are key to successfully handle such events.

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