Accidental hand grenade blast injuries in the Transkei region of South Africa: A case report

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Abstract

During the apartheid era in South Africa explosive blasts were common. Transkei was the lynchpin of the government's homeland policy, and a major centre for the struggle against apartheid. Weapons and ammunition were stolen from the South African factories and army warehouses and were stored in safe places in Transkei.

This is a report on a group of children who were herding cattle in a field and found an M26 hand grenade. They were playing with it when it accidentally detonated. Six of the eight children died instantly, while the other two sustained minor injuries. The M26 hand grenade had been designed to harm by expelling high-velocity fragments. The result is extensive mutilation of the body, particularly to those close to the blast. In this report the nature and severity of injuries are described. The mechanisms of injury and possible criteria used to predict injuries caused by explosions are discussed and preventive measures are suggested.

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Introduction

Bomb attacks on the civilian and non-civilian population were not uncommon during the time of apartheid. Different types of explosive devices were used by freedom fighters against the state. The South African police in turn used devices to decimate bodies by attaching them to their opponents. There were 21 civilian fatalities (13 children and 5 adults) from 13 hand grenade explosions, mostly from South African-made M26 type hand grenades (Figure 1) during the 10-year period between 1998 and 2007 in the Transkei region[1] (Table I).

Table I: Hand grenade incidents in Transkei area of South Africa (1998-2007)

S.N.	Date of incident	Child deaths	Adult deaths	Type of grenade
1	03.01.1998 (Daily Dispatch)	2	0	M26
2	01.06.1998 (Daily Dispatch)	6	0	M26
3	28.12.1998 (Daily Dispatch)	1	1	Unknown
4	02.07.1999 (daily Dispatch)	3	0	M26
5	28.11.2000 (Daily Dispatch)	0	0	M26
6	28.11.2000 (Daily Dispatch)	0	0	RGD5
7	02.02.2001 (Daily Dispatch)	1	1	M26
8	12.11.2004 (Daily Dispatch)	0	3	M26
9	13.04.2005 (Mail & Guardian)	0	0	Unknown
10	23.08.2006 (SABC News)	2	0	M26
11	18.07.2007 (Herald)	0	0	M26
12	04.09.2007 (Daily Dispatch)	1	0	M26

Figure 1: M26 hand grenade used

M26 hand grenades were designed to produce casualties through the high-velocity projection of fragments. The grenade is 113 mm in length with a diameter of 60 mm, and is filled with 160 g of high-energy composition B charge. The grenade, with a total weight of 465 g, produces approximately 1 000 small fragments weighing about 200 mg each. It has a 50% casualty radius of 15 m; however, the fragments can disperse to 230 m. The grenade can be identified by its olive drab body with a single yellow band at the top with yellow markings that are indicative of the high-explosive filler.[2]

There is some evidence that a substantial number of small arms and hand grenades remain unaccounted for after the elections of 1994.[3] With the integration of the Transkei Defence Force into the South African National Defence Force in 1994, 715 firearms were not returned.[3] Presumably, in this process hand grenades were also not accounted for and a commission of inquiry into politically motivated violence, led by Judge Richard Goldstone, found that the Transkei government had supplied weapons to the Azanian People's Liberation Army.[4]

The purpose of this case report is to make the public aware of these explosive devices scattered throughout the country and to suggest some methods to get rid of them. In addition, if injury mechanisms and criteria used to predict injuries caused by specific explosive events can be adequately understood, this could aid medical personnel in providing the best possible care for victims of these events.

Case history

On 30 May 1998 there was a hand grenade explosion in the outskirts of Mthatha involving eight boys aged between 9 and 16 years. They were herding cattle grazing on the pastures when they found an object that looked liked a rugby ball and played with it. Unfortunately, the safety device was dislodged while they were playing, which triggered the explosion. Six of them died instantly but the other two escaped with minor injuries. The police identified the device as an M26 hand grenade of South African origin. The parents of these children, who were all from the same village, suspected foul play. They suspected that a horseman had knowingly left this grenade to kill these children.

At autopsy, all children had their ventral aspects mutilated or greatly lacerated. A bluish green substance was deposited all over their abdomens and chests. The abdomen and chest of the boy closest to the blast were mutilated (Figure 2), while those who were a little distance away had deep lacerations (Figure 3). The boys who were a considerable distance from the blast escaped with minor injuries. The lungs and intestines were diffusely contused in three boys who were a small distance from the explosion.

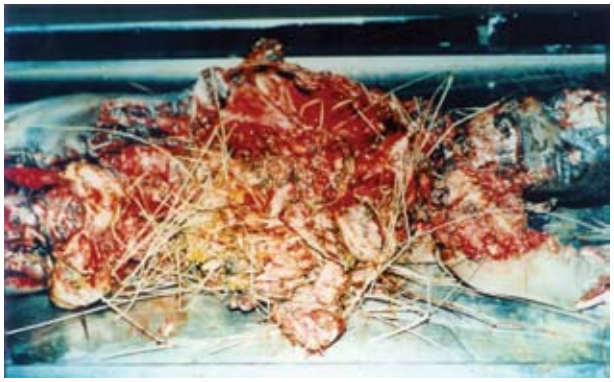

Figure 2: Victim who was in central ring at the time of explosion

Figure 3: Victim who was in outer ring at the time of explosion

Discussion

Transkei, the first black homeland to be granted "independence" by apartheid South Africa, was a big reservoir of freedom fighters in the liberation movements. Men were encouraged to fight the security apparatus of the apartheid regime while women managed the households. Those who joined the liberation movements received training in firearms both within and outside the country. Weapons were kept in hiding places in households and in homesteads. These weapons are still in circulation and are now used in committing crime.

The children must have been within 0.2 m of the explosion (Figure 4). They had perhaps been bending on one knee at the time of the explosion. This is suggested by the other knee being spared. The brunt of the blast was taken by thoraco-abdominal walls because the heads were relatively spared (Figure 4). The child in Figure 3 could also have been within 0.2 m of the blast. His hands had been spared, suggesting that he may not have

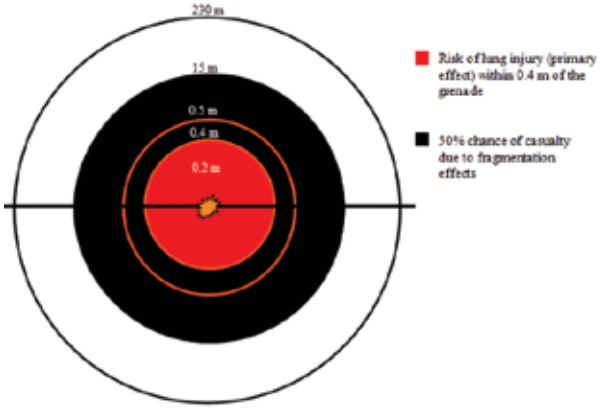

Figure 4: Area within which injuries due to primary and secondary injuries caused by an M26 hand greanade may be expected

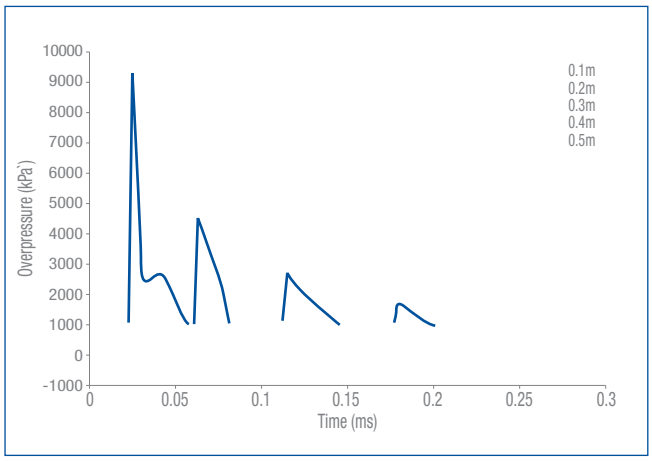

Figure 5: Simulated overpressure predictions at various distances from the grenade

been handling the device. Both children in the inner circle had 100% lethality and would have exceeded the threshold for lung damage (using Bowen, Fletcher and Richmond's criterion) due to the primary effects of the explosive event.[5]

The impact of injuries is directly related to two factors: the magnitude of the explosion and the site of its occurrence (i.e. whether it occurred in open air or closed space).[5] These injuries occurred in an open space. M26 hand grenades are powerful, and can cause a 50% casualty within a radius of 15 m. Body fragments can disperse over an area of 230 m. The two children who survived were probably within 15 m of the explosion and hence survived with minor injuries.

At autopsy, the lungs and intestines of the three children who were closest to the blast presented haemorrhages. Such haemorrhaging is indicative of shock wave injuries to air-containing organs and is a result of a sudden increase of environmental air pressure caused by the hand grenade blast. The dry grass on the bodies was due to the sudden compression and decompression around the blast carrying light objects along the shock wave. The simulated graph shows the effect of shock waves in relation to time (Figure 5).

The explosive content of the grenade is definitely significant, as shown by the injury curves, and is due to the pressure rise and fall caused by the explosive detonation. The dominant injury mechanism of an M26 hand grenade is shrapnel wounds. These are significantly observed in all the victims of M26 hand grenade blasts. These kinds of injuries are not frequently seen in accident and emergency departments of hospitals these days. However, staff should have a basic knowledge of bomb blast injuries. The blue-black discoloration could be the paint of the grenade itself or flash burns due to a fireball effect. It is also accepted that longer positive-phase overpressure durations cause more severe injuries than do shorter.[6] Studies have been conducted on mammals and risk curves have been produced to predict human injuries for various peak overpressures and positive-phase durations of blast waves.[7] The simulated peak overpressure and positive-phase durations are shown in Figure 5. These can predict overpressure injuries at various distances from the explosion. The overpressure injuries closer to the grenade could be much more severe due to the dramatic increase in peak overpressure values as the distance to the grenade decreases. However, this is speculation, and further work needs to be conducted to understand the injury mechanisms when the body is exposed to excessive peak overpressures with very short positive-phase durations.

Bomb blast injuries are becoming a public health problem, and knowledge of the type of injuries, mechanisms of causation and their management should be imparted to all medical personnel. A concerted effort must be made to collect firearms and explosive material from the general population.

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