

Injury, Fatal and Nonfatal: Explosive Injuries

A Edirisinghe, University of Kelaniya, Ragama, Sri Lanka

A Samarasekera, South Asian Institute of Technology and Medicine, Malabe, Sri Lanka

© 2016 Elsevier Ltd. All rights reserved.

This article is a revision of the previous edition article by J. Crane, volume 3, pp 98–110, © 2005, Elsevier Ltd.

Abstract

Injuries and effects on the human body due to explosions in general, and in modern warfare in particular, have certain patterns which can be identified and classified depending on their causation, properties of the explosive material and device used, motive, and the target. Predetermined action plans together with disaster preparedness and response are important for proper and effective medicolegal management of dead bodies and survivors after an explosion, and the key to success is a coordinated multidisciplinary and humanitarian approach.

Introduction

Various types of explosions, including bombs, land mines, hand grenades, industrial fuel eruptions, mine explosions, and explosion of fireworks, result in injuries. The effects of explosions on humans lead to multi-system, life-threatening injuries in single or multiple persons simultaneously. The injury patterns seen in an individual or individuals involved in the explosion of a firecracker (Witsaman *et al.*, 2006) or an explosion in a chemical plant (Pavelites *et al.*, 2011) differ from those due to explosions during to war or terrorist attacks (Golan *et al.* 2014; Lerner *et al.*, 2007).

The original descriptive work on the pathology of bombing and explosion-related injuries was derived from studies by Marshall, Crane, and Mason (Marshall 1976, 1977, 1988; Hull *et al.*, 1994; Lucas and Crane, 2008; Mason, 1965). Since then, particularly in the last few years, the body of knowledge has improved with the

increase in terrorist bombings and armed conflicts all over the world (Patel *et al.*, 2012; Bala *et al.*, 2010; Kluger *et al.*, 2007; Ramasamy *et al.*, 2009).

Explosions and Their Effects

An explosion refers to a rapid increase in volume and release of energy in an extreme manner, usually with the generation of high temperatures and release of gases. Supersonic explosions created by high-order explosives (HOE) are known as detonations; they travel via supersonic shock wave/blast wave, whereas subsonic explosions created by low-order explosives (LOE) involve a slow burning process known as deflagration. The mechanisms of causation of damage in explosions include blast, fragmentation, crater formation, shaped charged penetration, and incendiary effect. The explosive pressure decays very rapidly (Figure 1), and the damage closer to

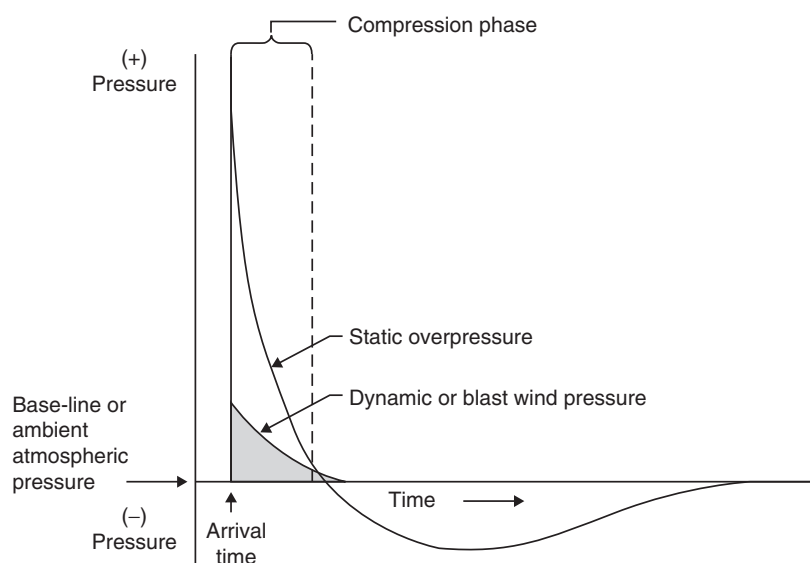


Figure 1 Variations of overpressure and dynamic pressure with time.