

# Foot Protective System : A Boon to Demining Soldiers

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## Abstract

**Background:** A significant number of soldiers suffer serious injuries or die in the process of demining and a protective device is necessary in such operations.

**Methods:** All the patients involved in demining operations using the foot protection devices in last one year were analysed.

**Results :** We received 35 patients, of which only five had limb injuries and 30 had eye injuries. Of the five, three had closed calcaneal fractures and two contusion of foot. No fatality, amputation or compound fracture occurred.

**Conclusion:** Early results after the use of this device during demining operations are encouraging.

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**Key Words :** Mine blast injury; Demining; Spider boot

## Introduction

Many demining soldiers become victims of accidental mine detonations, resulting in serious physical injury, loss of limb and even death [1]. When the foot of the victim is directly on top of the exploding mine, the blast force exceeds the structural integrity threshold of the majority of wearable foot materials. If the deminer does not have adequate foot protection, there is a high probability of amputation. We share the experience of using a foot protective device (Spider Boot) by our soldiers, which has reduced the incidence and magnitude of the mine blast injuries drastically in our sector.

## Material and Methods

The spider boot (Fig 1) consists of a binding system on a platform mounted above a deflector shell. It is mounted on two forward and two rear protruding legs, each terminating with a rubber pod. The deminer wears the spider boot with regular footwear. The deflector shell, legs and pods provide the necessary standoff distance by raising the platform to a nominal height of 144 millimeter (mm) above the ground. This configuration is designed to maximize protection while remaining wearable. All patients in 2003-2004, who used the foot protection devices were analysed. Due to recent introduction and paucity, the spider boot was provided to officers and personnel of engineers only.

## Results

The demining operations by troops of two brigades was carried out in the northern part of the country. We received 35(0.70% of troops engaged) patients of mine related injuries at our centre in one year. Of these, only five (14.29%) were limb injuries and rest 30 (85.71%) were eye injuries. The number of eye injuries also reduced in the later half of the

year, due to the use of improvised helmets and visors. Out of the five feet injuries, three (60%) had closed calcaneal fractures (Fig. 2) and two (40%) contusion of foot. There was no traumatic amputation due to blast injury during demining operations.

## Discussion

The protection afforded to feet and legs depends on the explosive content and the relative location of the mine. The Spider Mine Boot Protection System prevents



Fig. 1 : The Spider Boot

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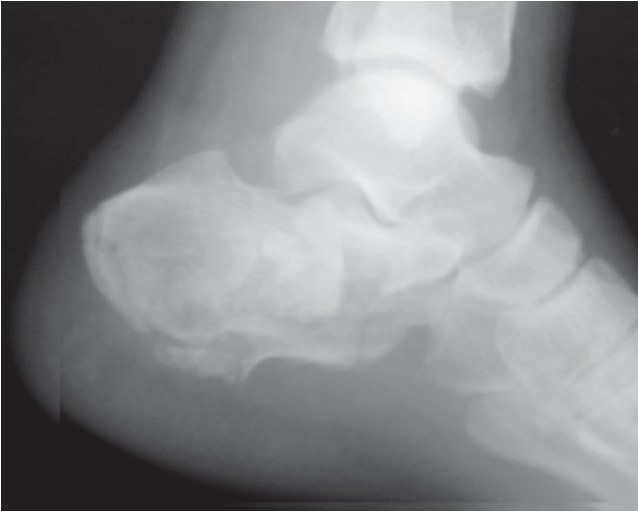


Fig. 2 : Radiograph of the foot showing fracture of the calcaneum after antipersonnel mine blast. There was no open wound or traumatic amputation

or minimises injury to the feet and legs, when the user steps over or is near a blast-type antipersonnel mine. It consists of a platform (to which the user's combat boot is secured) supported by four pods. The spider boot keeps the foot 144 mm from the source of the blast [2]. The pods and elevation of the boot allow the energy and fragments produced by the blast to be dispersed and deflected away from the foot and leg. The shell of the boot absorbs any residual fragments and blast energy. The spider boot is meant to be used with appropriate full-body protective equipment. While the spider boot may not give complete protection, especially against larger anti personnel mines, the injury and its treatment are simplified as compared to a conventional mine boot [2].

In conventional boots the sole was thickened. The drawback of this type of footwear is that the direct

contact increases the shock transmission into the sole and the kinetic energy of mine explosion is directly absorbed by the foot and lower leg. We managed 27 patients of mine blast injuries sustained during mining operation in a tactical move in 2002. They were either not wearing any protective boots or using old pattern boots at that time and all of them sustained severe injuries. Fourteen patients underwent Below Knee amputation while four required Through Knee amputations (66.67%). Of the three (11.11%) eye injuries two underwent evisceration and one had repair of cornea [3]. As compared to these injuries, there were no traumatic amputations during demining with the use of modern spider boot. These are early results but definitely encouraging.

The incidence of eye and facial injuries decreased after the introduction of visors [4]. The modified fixed visors in the helmets reduced the extent of eye injuries in later half of our study. In conclusion the use of spider boot greatly reduces the extent of injury and its treatment as compared to the conventional mine-protected footwear or a standard combat boot.

#### Conflicts of Interest

None identified

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