

Blast Injury to Hand after Mobile Battery Explosion in an Adolescent Boy

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Abstract

Mobile phone battery blast injury was a rare thing in the past, however with technological advancement it's on the rise. It usually involves the hand, face, eyes though can involve others too. The manifestation of hand injuries due to cellphone battery explosion commonly occurs with thenar muscle injury, 1st web split, dislocation of CMC joint of thumb and amputations of other digits.

Keywords: Thermal runaway • CMC joint • Thenar muscle

Introduction

Blast injury due to mobile phone battery explosion has been a rare thing in the past but it is now on the rise. In 2016, around 100 of the 2.5 million-phone cell units have been recorded to have exploded. It was attributed to low-quality items, user irresponsibility, and the use of phones while charging [1]. These cell phones and devices most commonly contain Lithium-ion batteries. Overheating of these batteries during charging results in "thermal runaway" (uncontrolled increase in internal battery temperature). Because, these batteries are loaded with flammable electrolytes, there is a high chance of catching fire when heated [2]. The battery explosion could result in an injury which can include a combination of mechanical (battery fragments), thermal and chemical injuries. Injuries such as lacerations, avulsion, amputation, burns, vascular injury, compartment syndrome, fractures, physal plate injury and soft tissue defect could occur [2].

A first web space split with varying degrees of thenar muscle injury, dorsal dislocation of the CMC joint of the thumb, which was occasionally coupled with 2nd and 3rd metacarpal injuries, was the most prevalent pattern of injury. Amputations of sections of the second and third fingers were common in many cases [3].

Case Report

A 15 years old boy was referred to our center from a province hospital with history of mobile phone battery explosion since 6 hours ago. According to his father, his son was playing a game over a phone with charging on. He sustained superficial burns over the face with lithium stains and a laceration over his left hand. On presentation at our center, he was hemodynamically stable. On examination: large laceration 7 × 5 cm involving over the volar and dorsal aspect of the left hand along with superficial burns of palmar skin, split

1st web space and closed dorsal dislocation of Metacarpophalangeal (MCP) joint. His wound was thoroughly irrigated and intravenous antibiotics were already started from the province hospital.

After the basic laboratory and radiological investigations, he was taken to operation theatre for emergency wound debridement. Surgery was done under the general anesthesia. Ophthalmology team was activated to rule out any ocular injury and dressings of his facial burns were done. Intraoperative findings: large avulsion wound over the 1st web space with complete laceration of adductor pollicis of left thumb. Systematic debridement was done along with repair of muscle and wound closure. The dislocation of the MCP joint of index finger was reduced. No fractures were noted.

Daily dressing and IV antibiotics were given for 5 day. Passive range of motion was started on the 3rd day and active by the 7th day (Figures 1-3). His wound healed without any problems and he could return to his normal range of motion of thumb and other digits by 10th day (Figures 2 and 3).



Figure 1. Showing laceration wound caused by phone battery explosion.



Figure 2. Wound after one week. Demonstrates the active extension and abduction of digits.

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Figure 3. Demonstrating the achievement of active opposition and flexion of digits at one week after surgery.

Discussion and Conclusion

There are several studies describing blast injuries to the hand from explosives, fire crackers, etc. However there is paucity of studies on the blast injuries to the hand from the mobile battery explosion.

A Study of paediatric hand blast injury in Indonesia found that laceration of the first interdigital web area with variable degrees of thenar muscle injuries, dislocation of the thumb, and injuries to the 2nd–3rd metacarpals were the most prevalent blast injuries. This study also demonstrated when compared to the ulnar region, the damage mostly occurred in the radial area. The index finger was the most affected digit. The laceration injuries usually occur in the radial digits and center of the palm.

According to the pathomechanics of blast injuries to the hand, the thumb and index finger provide the major movement for holding an item like a bomb, with the ulnar fingers providing support and the long finger stabilizing the grip [3]. As a result, when an explosion happens with an object held in the hand

or in close contact with the hand, numerous injury vectors act in a centrifugal direction radiating from the thenar eminence, which is the principal site of contact with the hand [4]. This takes the majority of the damage from injury vectors, resulting in an initial web split.

As mentioned in few studies, the patient in our case also sustained a large laceration over the radial side of the hand with 1st web space split and involvement of the MCP of the index finger.

Early systematic debridement with intravenous antibiotics coverage is crucial to prevent further complications. A timely hand physiotherapist intervention is an important component in such injuries to prevent secondary contractures and joint stiffness. Therefore, timely presentation and proper management is vital to salvage the hand and its functions.

These cases are necessary to raise public awareness about the possible dangers of cellphone usage, to encourage people to follow manufacturers' guidelines for safe cellphone use, and to avoid counterfeit devices and other mishaps [3].

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