



Case report

A cause of severe thigh injury: Battery explosion



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H I G H L I G H T S

- All type of batteries may explode regardless of size and power.
- Battery explosion can cause deep tissue and fascia defects in lower extremity.
- Children should not be allowed to play with battery.
- Protector mask and clothing should be used especially short-circuit risk is present.

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Introduction: In parallel with technological improvements, humankind encounter with equipments/devices transforming chemical energy to electrical energy. Especially automobile batteries, watch and mobile phone batteries are the most encountered ones. In the literature, there are mainly facial burn cases due to mobile phone battery explosion. On the other hand very few examples of serious lower limb injury is present.

Presentation of case: 12-year-old female patient referred to emergency room with skin and soft tissue injuries on bilateral anteromedial thigh area as a result of battery explosion. The widest axis of skin defect was approximately 16 × 8 cm on the right side, and 17 × 4 cm on the left side. In addition, there were tattooing caused by chemical injury and multiple pin-point like lesions extending to dermal level on anterior region of thigh. Chemically dirty and necrotized dermal and subdermal tissues were debrided and foreign materials were removed from regions with multiple tattooing. Left thigh was closed primarily. In order to close the defect on right anterior thigh, skin flap from right medial thigh is advanced in Y–V fashion.

Discussion: Battery explosion causing lower extremity tissue defect is a type of injury that is rarely seen in the literature. Regardless of battery size and energy level, they should be considered as potential explosive material and protector masks, clothing should be worn during contact with this type of material.

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1. Introduction

In parallel with technological improvements, humankind encounter with equipments/devices transforming chemical energy to electrical energy. The batteries take their place in every part of our daily social life. Especially automobile batteries, watch and mobile phone batteries are the most encountered ones. In the

literature there is limited information about injuries caused by battery explosions. The scale of this type of injury is quite wide and explosions causing death are reported. In the literature, mainly facial burn cases that cause corneal and orofacial soft tissue injuries, some facial bone fractures, neck, upper trunk and upper extremity injuries, facial nerve palsies due to mobile phone battery explosion are seen [1–8]. The case we present is about a patient who was referred to our emergency room with a skin and soft tissue defect on bilateral thigh caused by battery explosion. In literature, there are very few reported cases about an explosion causing deep and wide tissue defects accompanied by chemical burn in lower extremity as seen in our case.

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Fig. 1. Views of defects during the emergency procedure.

2. Case

12-year-old female patient referred to our emergency room as a result of battery explosion caused by short circuit seen in homework designed by her with 3 batteries (each 1.5 V, AA). On physical examination, there were chemically dirty wounds extending to muscle fascias on bilateral anteromedial thigh. The widest axis of wounds was approximately 16×8 cm on the right side and, 17×4 cm on the left side (approximately 8% of total body surface area). In addition, there were tattooing caused by chemical injury and multiple pin-point like lesions extending to dermal level on anterior region of thigh (Fig. 1). Her other system examinations were normal. She was cooperated, oriented and conscious. Vitals of the patient were stable and no pathological findings were seen in routine work-up. Emergency resuscitation was not required. She was operated under general anesthesia. Chemically dirty and necrotized dermal and subdermal tissues were debrided and foreign materials were removed from regions with multiple tattooing. Left thigh was closed primarily. In order to close the defect on right anterior thigh, skin flap from right medial thigh is advanced in Y–V fashion. We avoided intradermal sutures due to the risk of deep tissue infections, and we closed bilateral thigh with staplers (Fig. 2A). In postoperative 2 years follow-up, normal wound healing process were seen without any complication.

3. Discussion

The battery explosion damages tissues by 3 components: heat, acid and battery pieces. In the literature, lots of eye injury cases were reported [9], according to this we can say that eye is the main region which should be saved during work on battery. Devices like mobile phones can cause injuries due to the battery systems they contain [8]. Although 1.5-volt-batteries seem safe due to their small sizes, they can cause severe damages when explode [5].

Davidorf FH., reported car battery explosion case causing injury to face and cornea of 30-year-old woman [1]. Zieker AW et al., reported a case about corneal injury due to watch battery explosion [2]. Akinbade AO et al., reported orofacial soft tissue injury and mandible-maxilla fractures due to dry cell battery explosion [3].

Fadeyibi IO et al., reported a lethal case about battery explosion which causes burn injuries to the face, upper arms, trunk, and thighs of a 10-year-old primary schoolgirl. Inhalation injuries were also present and she was deceased approximately 5 days after admission [5].

There are very few examples of lower extremity damage caused by battery explosion as seen in our case. Especially to debride disseminated tattooing and tissue dust due to heavy metals that battery contain is very important in order to prevent foreign body reactions and infections. Beyond all these, mercury and other heavy metals in tissue can cause intoxications that are difficultly diagnosed [10]. However, when the debridement is not enough, we should avoid closure of the skin in order to prevent foreign body reactions, infections and intoxication. Extensive debridement was applied to this rare case with dirty wound. When we were satisfied with debridement, the left thigh was closed primarily; the right thigh was repaired with dissection of Y–V skin flap. However due to the shape of the defect area after debridement Y–V flap was cut out for this wound. Solidified chemicals in the area of tattooing were removed individually by sterile injector. In postoperative follow-up, no detachment or infections were seen and we removed staplers at second week. In the second year postoperatively control, there was no problem other than expected scar tissue. Therefore, we planned scar revision with tissue expander (Figure 2B).

Battery explosion causing lower extremity tissue defect is a type of injury rarely seen in the literature, because of the working positions of patients on battery or using positions of devices which include battery. Regardless of battery size and energy level, they should be considered as potential explosive material and protector masks, clothings should be worn during contact with this type of material. As seen in our case, the work with batteries especially in children should be managed with the supervision of their parents and safety precautions should be taken.

4. Conclusion

It is important to remember that, all kind and size of batteries can explode. In battery explosion cases the main targets of surgical treatment are:

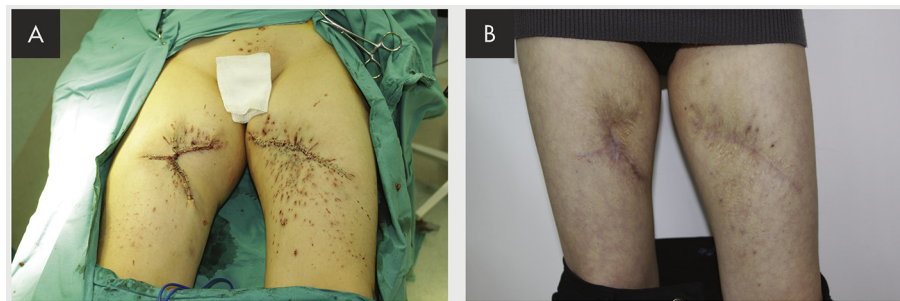


Fig. 2. Appearance following the operation (A) and after 2 years (B).

- 1) Aggressive debridement is the most important part to avoid intoxication and infection.
- 2) If it is believed that debridement is not enough, reconstruction should be postponed to the end of the serial debridements.
- 3) Surgical closure should aim to decrease morbidities not to improve aesthetic results.

Ethical approval

Consent form was signed by the family of patient.

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Author contribution

First author: primary surgeon of the patient and collected all data.

Conflicts of interest

The author declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

Guarantor

Author is the guarantor.

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