

CASE REPORT

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Genital burns caused by cell phone combustion following a motorcycle accident: a case report

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Abstract

Background Thermal injuries are common in emergency departments, but rarely involve isolated genital burns. However, burns caused by electronic devices, particularly cell phones, represent an emerging concern.

Case presentation A 47-year-old man presented with third-degree burns to the left anterior thigh, penis, and scrotum, covering 2% of the total body surface area, accompanied by facial fractures. These injuries had been sustained in a collision. A burned cell phone was discovered in clothing adjacent to the perineum, leading to the suspicion that it had ignited in his trouser pocket, causing burns in addition to trauma from the collision. He underwent surgical debridement and split-thickness skin grafting on hospital day 14. Despite the severity of the injury, the patient achieved complete epithelialization and recovered pre-injury urological and sexual function by the 3-month follow-up. To our knowledge, this represents the first report of deep dermal and full-thickness genital burns caused by cell phone combustion.

Conclusions This case highlights the potential for severe thermal injuries from cell phones, possibly exacerbated by trauma, and underscores the importance of patient education regarding the safe handling and storage of cell phones, particularly during activities like cycling or motorcycling.

Keywords Cell phone, Genital burns, Deep dermal burn, Full-thickness (third-degree) burn

Background

Thermal injuries are a common cause for emergency department presentations, frequently resulting from contact with hot liquids, flames, chemicals, and electrical sources. Burn injuries typically account for approximately 3–5% of all trauma-related ER admissions [1]. While less common, burns caused by electronic devices, particularly cell phones, are an emerging concern due to their widespread use and close proximity to the body [2–4]. Such incidents typically relate to battery malfunction or overheating [2–4].

Isolated genital burns are rare, likely reflecting the relatively protected location of the genitalia from common burn insults [5]. We report a unique case of severe genital

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Fig. 1 **A)** Clinical photograph on arrival at the emergency department, showing deep dermal and full-thickness (third-degree) burns, estimated to cover 2% of the total body surface area, involving the left anterior thigh and extending to the penis and scrotum. **B, C)** The burnt cell phone found in the left pocket of the trousers. The cell phone is completely adherent to the trousers

burns resulting from cell phone combustion during a traffic accident, affecting an area with significant functional and psychological implications.

Case presentation

A 47-year-old man presented to the emergency department approximately 30 min after being involved in a motorcycle accident. He reported sustaining injuries when his motorcycle, traveling at approximately 40 km/h, collided with a parked car due to inattentive riding. He called an ambulance after experiencing bilateral epistaxis and upper limb pain. He further reported that his cell phone (brand and model unknown, but described as a smartphone less than 1 year old) had suddenly ignited while in the left front pocket of his trousers. He

immediately felt intense heat and pain in his groin area. Upon removing the trousers, he observed flames and smoke emanating from the phone and a developing burn on his skin, which was extinguished spontaneously (Fig. 1A–C).

Upon arrival, vital signs were as follows: temperature, 36.6 °C; heart rate, 65 beats/min with regular rhythm; respiratory rate, 18 breaths/min; blood pressure, 141/99 mmHg; and oxygen saturation, 100% on room air. Glasgow Coma Scale (GCS) score on arrival was 15 (E4V5M6).

Physical examination revealed active bilateral epistaxis (Fig. 2A). Deep dermal burns and full-thickness (third-degree) burns were estimated to cover 2% of the total body surface area (TBSA), involving the left anterior thigh and extending to the penis and scrotum (Fig. 1A–C). The affected skin was charred, with loss of sensation to light touch, and demonstrated coagulative necrosis. No active bleeding or blistering was observed on the burn area at the time of presentation. The patient did not report pain related to his facial injuries or the perineal burn. The remainder of the physical examination was unremarkable, except for right elbow pain upon bending. The patient reported no significant past medical history or allergies.

Management and outcome

The patient received immediate first aid, including insertion of a urinary catheter and application of sterile dressings. Computed tomography (CT) revealed multiple facial fractures, specifically involving the anterior wall of the frontal bone, the nasal bone, and a Le Fort I fracture (Fig. 2B). Intravenous fluid resuscitation was initiated and broad-spectrum antibiotics were administered to treat multiple facial fractures. Whole-body CT did

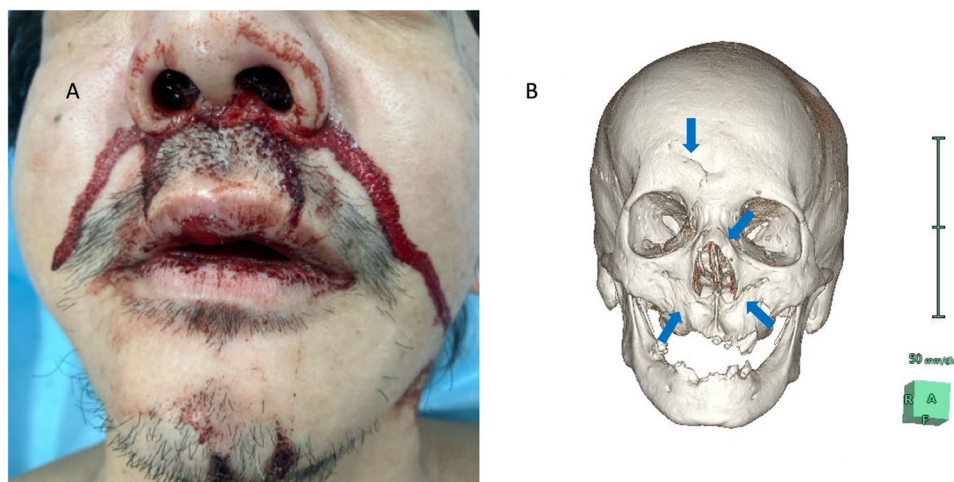


Fig. 2 **(A)** Clinical photograph showing active bilateral epistaxis upon arrival at the emergency department. **(B)** Three-dimensional computed tomography of the skull. Arrows indicate fractures of the skull



Fig. 3 Clinical photographs the day after the operation. **(A)** The demarcation became clear on day 7 post-admission with enzymatic debridement based on bromelain, at which point the graft was evaluated. Tangential excision was performed with a scalpel and curette on day 14 post-admission until bleeding was observed. A dermal substitute (PerNac®; Bear Medic Co., Tokyo, Japan) was secured to the left side of the scrotum to prevent adhesion. A split-thickness skin graft harvested from the left thigh was meticulously applied to the debrided areas of the scrotum and penis. **(B)** The penis was elevated and secured with a paper cup. The left thigh burns, being a minimal deep thermal injury, was amenable to primary closure. The wound was managed with direct suturing, and the epidermis was approximated using 5–0 Nylon sutures

not show any other traumatic changes. Due to the full-thickness nature of the burns and the involvement of a sensitive location, surgical debridement and skin grafting were deemed necessary. Topical bromelain ointment was initiated on the day following admission to facilitate enzymatic debridement of devitalized tissue, serving as an early intervention prior to surgical excision.

Under general anesthesia, necrotic tissue was excised on day 14 after admission. The thigh burn was amenable to primary closure. After undermining, the wound was approximated using 3–0 polydioxanone sutures for the subcutaneous tissue, 4–0 polydioxanone sutures for the dermis, and 5–0 Nylon for the epidermis. A split-thickness skin graft (STSG) was harvested from the left thigh and meticulously applied to the debrided areas of the scrotum and penis. For small thermal burn ulcers on the left side that did not require skin grafting, a dermal substitute was applied to promote epithelialization and suppress scar formation. After applying antiseptic gauze dressing, the penis and glans were surrounded with cotton, and the penis was elevated and secured with a paper cup. The same day, the facial fractures were also operated on with titanium plate fixation. Postoperatively, the patient received cefazolin and daily wound care. Pain was managed with opioid analgesics on the day of the operation, but the patient reported no pain the next day and did not require further analgesics (Fig. 3).

Graft viability was first assessed on postoperative day 5, in accordance with standard practice. Following confirmation of graft adherence, compressive dressing with



Fig. 4 **(A)** Clinical photograph at the 3-month follow-up. The skin graft on the penis and scrotum remains viable, and scarring is less noticeable. **(B)** The donor site on the left thigh is also less conspicuous. However, the primarily closed wound on the left thigh shows some scarring

cotton was reapplied and maintained for an additional two weeks. The urethral catheter was removed on day 22 post-admission. The patient was discharged on day 28 post-admission with instructions for continued wound care and follow-up. At the 3-month follow-up, the graft remained viable and the patient had regained full range of motion in the left hip. He reported no residual discomfort or altered sensation in the grafted area and was able to resume normal daily activities. Scarring was evident, but functional outcomes were good (Fig. 4). Urological and sexual function had recovered to pre-injury states. The patient did not attend the 7-month follow-up appointment.

Discussion

To our knowledge, this may represent the first report of deep dermal and full-thickness genital burns resulting from cell phone combustion. Cell phones are ubiquitous and indispensable devices in daily life, and cell phone-related injuries are thus increasing [2–4, 6]. Thermal injuries due to cell phone combustion may continue to rise, but genital burns specifically from this cause have not been reported previously. Fortunately, despite sustaining full-thickness (third-degree) burns to the genitals, the patient achieved recovery of urological and sexual functions to the pre-injury states.

Cell phones contain lithium-ion batteries that can accidentally overheat or explode. The injuries in this case might be attributed to ignition of the lithium battery in

the cell phone following physical damage in the motorcycle accident. While ignition might not have occurred without the accident, lithium-ion batteries comprise a cathode and anode separated by an insulating membrane known as a separator. If this separator is damaged due to significant mechanical impact, thermal runaway can occur, potentially leading to combustion [7]. Therefore, we recommend that cyclists or motorcyclists avoid placing their cell phones in their pockets while riding, and instead store them in a bag or another secure location to prevent potential injury.

The genitalia alone comprise about 1% of the TBSA, but this location is of immense functional, anatomical and psychological relevance [8]. Previous studies have revealed that genital and perineal burns can significantly impact patient morbidity, with potential long-term sequelae such as scar contracture and urethral stenosis [9, 10]. While genital burns are commonly associated with major burns, the exact incidence of isolated genital burns is unknown, but may be less than 5% of all genital burns [8]. A previously reported case of a right thigh burn due to a cell phone blast involved a second-degree deep burn that was managed with split-thickness skin grafting after two weeks [4]. In our case, the patient suffered from both genital and left thigh burns due to cell phone combustion following a motorcycle accident. Although the total burn area was at most 2%, most was a full-thickness (third-degree) burn, necessitating surgical intervention. Urethral catheterization is generally not recommended as a standard treatment for genital burns and remains a topic of much discussion, given the risks of urinary tract colonization and harm to the urethra and bowel [8, 11]. However, we continued urethral catheter management to stent the urethra. After removing the urethral catheter, the patient was able to urinate spontaneously and no longer required fluid management.

Generous conservative treatment is often employed for most cases of second-degree genital and perineal burns [11]. Conservative wound treatment after burn injury is frequently recommended for children, with surgical treatment and STSG reserved for severe burns, as children generally have better healing capacity than adults [11]. The treatment of deep dermal and full-thickness genital burns is much more challenging. In the present case, we waited for demarcation of the burn wound with enzymatic debridement based on bromelain, and tangential excision was performed with a scalpel and curette until bleeding was observed on day 14 post-admission. The post-surgical course was uneventful and the patient was able to resume normal daily activities.

Conclusions

We have presented a case of deep dermal and full-thickness genital burns resulting from cell phone combustion. The ignition of the lithium battery in the cell phone was likely attributable to the motorcycle accident. Given that cellular phones are currently a lithium battery-dependent technology, we recommend avoiding placing cell phones in pockets when engaging in strenuous activities to prevent potential burn injuries.

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Authors' contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work. Concept and design: KoO, Acquisition, analysis, or interpretation of data: KoO, SM, KaO, Drafting of the manuscript: KoO, SM, KO, Critical review of the manuscript for important intellectual content: KO, SM, KaO, AA, YY, AT, Supervision: AT, TN.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

not applicable.

Consent for publication

The patient provided written, informed consent for publication of the details of this case.

Competing interests

The authors declare no competing interests.

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