Case Report

A Rare Case of Orofacial Blast Injuries Caused by Explosion of Dry Cell Batteries in a 12-year-old Nigerian

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ABSTRACT

BACKGROUND: Severe isolated facial injuries arising from the explosion of dry cell battery in children is extremely rare. The management of the resultant tissue devastation in a scarce resource economy can be quite challenging.

METHOD: We report a case of 12 year old boy who sustained extensive oral and facial blast injuries caused by shattering of a locally assembled fan as result of an explosion of four 1.5 Volts dry cell batteries. He had multiple lacerations and avulsion of facial soft tissues as well avulsion and fractures of the mandible and maxilla. There was associated oronasal communication and avulsion of the anterior teeth in the upper and lower jaws.

RESULTS: Serial debridement and minimal repair of soft tissue injuries as well as splinting of the mandible was done under local anaeasthesia. Fourteen months after the injuries there was complete healing of mandibular fracture and closure of the oronasal communication. However patient had perioral hypertrophic scar, microstomia and edentulism.

CONCLUSION: Extensive life threatening injuries can be caused by a simple device such as a 1.5v dry cell battery. Early surgical intervention offers the best hope for full recovery.

KEYWORDS: Blast injuries, dry cell battery, facial reconstruction.

INTRODUCTION

Maxillofacial injuries in children are not common compared to adults[1-4] and when they occur, they usually result from falls, road traffic accidents or sports[1,5]. Most facial blast injuries when they occur are due to firecrackers, bombs and gunshots. Isolated blast injuries of the face due to low voltage electrical sources are extremely rare[6-7].

Dry cell batteries, usually 1.5 Volts, are frequently used household items; as they are used in torches, cameras, wall clocks, MP3 player etc. They are presently in high demand in this era of electronics, information and communication technology. They contain a large amount of energy and can set off a huge explosion when misused and may cause varying degree of tissue devastation depending on the proximity of the victim to the blast as well as the sophistication of the device[8]. The patterns of injuries in the pediatric population are different from those of adults. Generally there are extensive tissue destructions. Bleeding however, is usually minimal except when major vessels are breeched[9].

A number of factors must be considered when formulating a treatment plan for pediatric patient with maxillofacial trauma. These include the age of the patient, the anatomic site involved, the complexity of the injury and the time of presentation to the hospital[2]. In all, the basic principle of management involves maintenance of airway, serial debridement and reconstruction of the resultant facial defect.

We report an extensive facial injury caused by an explosion from four 1.5volts batteries coupled with a locally made fan by an adventurous teenager.

CASE REPORT

A 12 year old indigent primary school pupil presented at the Children Emergency unit of the OAUTHC Ile-Ife on August 8th, 2009 on account of 12-hour history of extensive injuries to the face and oral cavity caused by the shattering of a locally assembled fan as a result of an explosion of four 1.5 Volts dry cell batteries connected to a rotor.

On examination, the patient was fully conscious, pale and not in any obvious respiratory distress. There was mild bleeding from the extensive wounds, avulsive facial injuries involving the lower 2/3rd of the upper lip, middle 2/3rd of the lower lip. There was associated paramedian avulsion of the hard and soft palate resulting in oro-nasal communication as well as laceration of the dorsum of the tongue. The tissues were devitalized and necrotic with extensive comminution and avulsion of the anterior maxilla and mandible. There was fracture en-masse of the crowns of all the maxillary and mandibular incisors and cuspids. The wound surfaces were dirty and grossly contaminated with scattered fragments of dry cell battery casing.

Antitetanus prophylaxis was given and patient was commenced on the following drugs: intravenous genticin 40mg 8 hourly, ampiclox 500mg 6 hourly, metronidazole 250mg 8hrly for one week; drugamol 300mg 8 hourly for 5 days and syrup astymin 10mls daily x 2weeks. The patient was worked up for

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Fig 1. Patient on presentation about 12hours after the injury

Plain radiograph of the jaws revealed comminuted parasymphyseal and left body fractures of the mandible as well as bony avulsion of about 1cm in the right parasymphyseal region. The PCV on admission was 21%. Serum potassium (4.9 mmol/L) and urea (8.8mmol/L) were elevated while sodium and bicarbonate ions were within normal ranges (136mmol/L and 20 mol/L respectively).

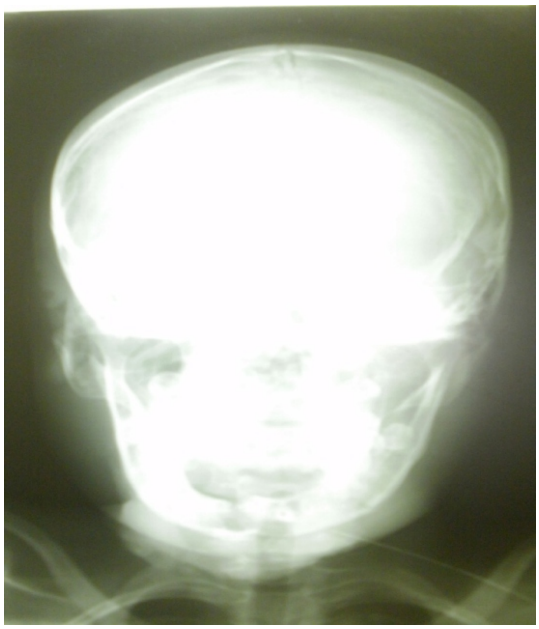
Fig.2: P.A view of the skull showing discontinuity and avulsion of parasymphyseal region of the mandible.

immediate wound debridement, soft tissue repair and temporary stabilization of the mandible under general anaesthesia. Unfortunately, patient's relatives could not afford necessary preoperative investigations, neither could they get donors for blood transfusion nor pay for the procedure. Due to this, serial 12-hourly wound debridement under local anaesthesia with sedation was then commenced. About 48hours after the injury minimal soft tissue repair and splinting of the mandible with a lower arch bar was subsequently done. The procedure was poorly tolerated and the patient was exceptionally uncooperative and difficult. 4.3% dextrose in 0.18 saline 2 liters daily was given the first 5 days of admission and patient was fed with protein rich fluid diet via nasogastric tube. Topical honey dressing was applied daily on the upper lip wound and meticulous oral toileting with warm saline was instituted.

Patient's general condition progressively improved; upper lip and palatal wounds were granulating well and oral feeding was commenced 18 days after the injury. The Patient was subsequently discharged 3 weeks after admission and was planned for secondary mandibular reconstruction and soft tissue repair but the patient could not afford the cost of any treatment. Two months postoperative review of the patient showed healing of the upper and lower lip wounds, closure of the oronasal communication and immobility of the fractured mandibular segements. Plain radiographs 2 months after the injuries also showed evidence of considerable healing of the mandibular fracture and some degree of bone regeneration of the avulsed anterior region of the mandible.

Fig 3. Patient's 2 months postoperative facial appearance.

Patient was recalled 14 months after the injury and clinical examination showed radial perioral hypertrophic scar, with moderate microstomia and edentulism. However, there was complete healing of the mandibular fractures.

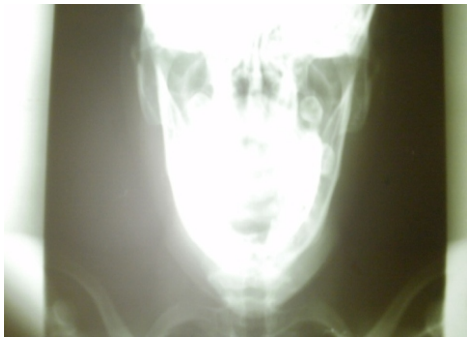
Fig. 4 postoperative P.A view of the jaws 2 months after injury

DISCUSSION

Severe isolated facial injuries arising from the explosion of 1.5 Volts dry cell battery, is extremely rare[7,8]. The most extensive and devastating pediatric soft tissue injuries reported in literatures was found to occur from animal bites, commonly from dogs[2]. A search through English literature showed only two previous reports of orofacial injuries from low voltage dry cell battery explosion till date[6,7.] Singh reported extensive facial damage in a 9-year-old boy, caused by a blast injury arising from a 6 Volts lead accumulator. The resultant injuries- avulsion of the lips at the commissure, multiple deep perioral lacerations and comminuted mandibular fracture were similar to the present case. The second reported case was that of an 18-year-old boy who suffered extensive tissue loss involving the lower half of the face due to blasting of low voltage battery used in a flash light. Fadeyibi et al[12] also reported a fatal domestic accident in a 10-year-old Nigerian girl from 1.5 Volt dry cell battery explosion. The patient was pouring water in a lighted charcoal pot containing used batteries. The batteries exploded and set her clothes ablaze. She sustained 53% burns to the face, upper arms trunk and thighs as well as inhalational injury which contributed to her death[12].

An electrical battery is one or more electrochemical cells that convert stored chemical energy to electrical energy[11]. Low voltage batteries like the ones assembled by the patient in the present study contain tremendous amount of energy and their low internal resistance, when short circuited permits the flow of heavy current. When the two terminals of the battery are short circuited, a heavy current passes instantly through the wire and this could lead to the vaporization of the wire at a point where the contact had been bridged[7]. This is similar to what happens when a fuse blows. The severity of soft tissue and bony injuries seen in our patient is comparable to close range gunshot wound and this poses a reconstructive challenge especially in a child patient. Treatment of this patient was severely hampered by inability of the parent to afford the least of investigations and surgical repair of the injuries under general anaesthesia. Various mode of reconstruction have been described in the literatures for reconstructing facial soft tissue and bony defects ranging from local flaps and regional flaps to free flaps. In the present report, only local flaps were used for the minimal soft tissue repair done under local anaesthesia. A modest result was obtained. It was also remarkable that monomandibular fixation by means of lower arch bar produced a considerable bone healing after 2 months. This could be explained by the high osteogenic potential in children and preservation of the periosteum. The greatest concern when treating the pediatric patient is the effect of injury or treatment on growth and development which is both anatomically and psychologically important[2].

CONCLUSION

It is quite common for young people to do maneuvers in ignorance which can prove dangerous and may produce grievous injury. A small lapse in precaution can lead to physical and psychological trauma as seen in the present report. It is therefore imperative to educate the general public on the proper and safe handling of low voltage electric appliances in order to prevent the potential danger inherent in their careless handling. Early and decisive surgical intervention offers the best hope for full recovery.

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