

Trick or Treat: paediatric plastic surgery at Halloween

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Abstract

Aims

The aim of this study was to describe a snapshot experience of firework-related injuries during a single Halloween at the national paediatric burns unit.

Methods

This was a retrospective review of paediatric patients referred to the plastic surgery service in the week of Halloween 2024. Baseline characteristics in addition to date of injury, mechanism of injury, intervention, and patient outcomes were collected. Data was collected using theatre logbooks, hospital in-patient enquiry, and plastic surgery dressing clinic logbooks.

Results

In total, 10 referrals were made to the service for management of firework-related injuries over the 7-day period. All patients referred were male, with an average age of 12.1 years. Three patients required admission; two were taken to theatre for management of hand fractures under general anaesthetic, with one patient also sustaining an injury to his eye, resulting in permanent loss of vision. One patient underwent exploration of his hand under a local anaesthetic. Average length of stay for the 3 patients who required admission was 2.6 days.

Discussion

In addition to being prepared to manage a surge in these injuries at Halloween, healthcare professionals have a role in raising public awareness in an effort to mitigate these potentially devastating injuries.

Introduction

Increased volume of trauma has been reported during public holidays including New Year's Eve and Halloween¹. Firework-related hand injuries have been reported as increasing in

incidence during public holidays and burns and fireworks represent a significant proportion of paediatric ocular injuries^{2,3}.

Legislation regarding the use of fireworks is inconsistent internationally⁴. The efficacy of legislation and public safety awareness campaigns with regard to fireworks and injuries sustained from their exposure remains unclear^{5,6}.

In Ireland, the use of fireworks is heavily restricted, with severe penalties for violations. The Criminal Justice Act 2006 amended the Explosives Act 1875 to address the sale, supply, and use of fireworks, making it illegal to import, possess, sell, or use fireworks without a license⁷. Specifically, it is illegal to light fireworks, throw them at people or property, or possess them with the intent to sell or supply without a license. In 2004, Jones et al. evaluated the number of presentations related to fireworks in the paediatric and adult populations over the Halloween period⁴. Over twenty years later and in the context of significant legal restrictions, the aim of this study was to describe a snapshot experience of firework-related injuries over a single Halloween period at the national paediatric burns unit.

Methods

This was a retrospective series. Patients referred to the paediatric plastic service from local and regional units between 25/10/24–08/11/24 were included for review. Theatre logbooks, hospital in-patient enquiry (HIPE), dressing clinic logbooks and patient charts were examined.

Baseline characteristics including sex, age, mechanism of injury, intervention, follow-up and outcomes were collected. Descriptive analysis was carried out for nominal and ordinal data collected using SPSS 26.0 software package.

Results

Nine patients were referred to the service for management of firework-related injuries (Table 1). One patient was referred twice for separate firework injuries, totalling 10 referrals across the study period. All patients referred were male, with an average age of 12.1 years (± 2.6). Three patients required admission for injuries sustained.

Date of Injury

The most common date of injury was Halloween night itself (4/10), with two patients sustaining injuries the 1/11/24. The 6/11/24 was the most delayed injury seen with the use of fireworks around the Halloween period.

Injury details

All patients presented with burn injuries, with the average total body surface area (TBSA) involved being 1.67% (± 1.4). The most common site of burn injury was the hands (7/10), with the face (3/10) and chest (2/10) also reported. One patient was admitted for mechanical debridement under general anaesthetic of a 5% TBSA burn to bilateral hands, face, chest, and abdomen. Wounds were dressed with Silvercel (3M, Ireland) or Polysporin (Neosporin, Canada) based on site of injury.

Two patients who sustained hand burns also required surgical intervention for concomitant hand fractures. Of these, one patient (11 year-old male) fractured the proximal phalanx of his non-dominant hand, which was reduced under general anaesthetic and managed with splinting. The second patient (15 year-old male) sustained a fracture dislocation of his non-dominant thumb metacarpophalangeal joint, as well as a traumatic partial amputation to the level of his proximal inter-phalangeal joint of his non-dominant index finger which required Kirschner-wire fixation and formal terminalisation respectively. A third patient underwent exploration of a laceration in association with a hand burn under a local anaesthetic in minors theatre. No deficits identified and the wound was allowed to heal by secondary intention.

The ocular injury sustained from firework shrapnel resulted in a penetrating eye injury leading to a ruptured globe for which the patient underwent a repair to resume patency of the globe and mitigate risk of sympathetic ophthalmia.

Outcomes

The average length of stay for the three patients who required admission was 2.6 days. Patient care continued in the outpatient dressing clinic until healed. Average number of dressing clinic appointments for the patient cohort was 2.4 (± 1.1). Two patients did not attend for planned dressing clinic appointments and were lost to follow up.

Average time to re-epithelialisation for patients with burns was 16.38 days (± 6.2). Both patients with hand fractures had follow up with the occupational therapists for hand therapy. The patient with K-wire fixation underwent a second general anaesthetic to have wires removed at six weeks postoperatively. The patient with ocular injury has permanent vision loss in the injured eye.

Discussion

Nine male children, with a mean age of 12 years, were treated in the national paediatric burns unit for injuries related to firework use around the Halloween period in 2024. Three of these were polytrauma cases, with traumatic injuries that required surgical intervention for injuries other than thermal burns. Three children required a general anaesthetic and one a local anaesthetic procedure. Paediatric emergency medicine and specialty on-call services were required over the Halloween period to evaluate these injuries. A cumulative inpatient stay of eight days was required for this patient cohort. Twenty-two plastic surgery dressing clinic and/or outpatient appointments were required, as well as hand therapy sessions for those with hand injuries.

The demographic characteristics of male sex and age in early adolescence are in keeping with other studies, with de Faber et al. describing similar findings⁸. Authors of that study reviewed firework-related ocular injuries over the new year period across 20 years in Finland and the Netherlands, outlining that, of the paediatric cohort, the majority were males between 10 and 15 years⁸. A relatively high proportion of firework-related injuries has been attributed to adolescence, with male sex identified as a separate risk factor^{9,10}. Naseripour et al. implemented educational programs for male youths to prevent high-risk behaviours in this population¹⁰. Despite a multitude of interventions, including distribution of safety information, evidence of potential damage derived from firework use, and communication to parents, no change in behaviour was seen¹⁰.

Jones et al. reviewed firework injuries referred to the Irish national burns services in 2001, including both adult and paediatric patients⁴. Findings were similar to ours, with 10 paediatric cases over a 3- week period, the majority being male and aged 5-14 years. Similar findings were described in a large epidemiological study from the United States, which described injuries over a 13-year period up to 2006¹¹. Although rare, firework-related mortality has also been reported in the UK⁶ and the USA¹².

An epidemiological trend of increasing number of firework injuries presenting to emergency departments in clustered populations during peak holiday periods has been described¹³, highlighting the potential need for increased staffing during these times to account for the burden of care these patients represent to emergency services. As regards specialty services, de Faber et al. outlined the impact of firework-related injuries on ophthalmology services in both Finland and the Netherlands⁸. This finding is mirrored in other ophthalmology services internationally in both paediatric and adult populations¹⁴. Similar findings have been reported by ENT¹⁵ and paediatric hand services¹⁶. Werz et al. describe a 16-year period of otorhinolaryngology injuries related to firework use at New Year's Eve, with injuries including hearing damage and facial fractures¹⁵. Moore et al. outlined the severity of paediatric hand injuries sustained from fireworks, highlighting 19 finger amputations over 10 years at a single

centre¹⁶. Findings reported from trauma centres internationally reported a common finding of injuries predominantly affecting hands, eyes, face, or burn-related injuries¹⁶.

No mandatory reporting is required on an international platform. In an effort to capture the impact of such injuries, reporting measures are in place on a state-wide basis within the USA to state agencies including fire marshals, or the US Consumer Product Safety Commission (CPSC). An EU directive on the sale and marketing of pyrotechnics, which was outlined in 2007 and further updated in 2013, was enacted in Ireland in 2015¹⁷. The aim of this directive was to classify and regulate the sale and use of fireworks across the EU. Category F1 fireworks, which comprise low hazard fireworks including party poppers, are legal for the general population in the Republic of Ireland but cannot be sold to those under 12 years of age, while categories F2-4 require a professional licence for use¹⁸. Having compared our experience to that published in advance of the introduction of this regulation, it would appear that its impact has been limited.

Studies from the UK, the Netherlands, and Finland have demonstrated a significant impact of legislation, particularly when associated with targeted public safety campaigns^{6,8}. Edwin et al. outlined the impact that limiting firework sales and restricting firework types has had on presentation of firework injuries⁶. De Faber et al. demonstrated the efficacy of public safety announcements (PSAs), delivered in conjunction with “firework-friendly hours” and restricted firework types in decreasing number of total eye injuries recorded⁸. Cardin et al. reported a significant reduction in presentations of firework-related injuries to the hand following release of a targeted PSA in Florida, USA on the topic³.

The current study suggests that prevalence of firework injuries in the paediatric population remains unchanged in the Halloween period despite the introduction of legislation to improve safety and regulatory sales of dangerous fireworks in Ireland. Internationally, the use PSAs has been demonstrated to improve incidence of firework-related injuries around public holidays. The introduction of PSAs in the weeks leading up to the Halloween period may have the most impact on mitigating these devastating paediatric injuries. Consideration of mandatory reporting of such injuries to capture the impact on these injuries on the population on a national basis may help to improve regulation and monitoring use of such devices.

Declarations of Conflicts of Interest:

None declared.

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Appendix:

Table 1. Patient Characteristics					
Patient	Age	Sex	DOI	Injury	Intervention
1	15	M	02/11/2024	Flame burn to bilateral hands 2%	Dressed with silvercell
2	11	M	01/11/2024	Bilateral hand burns 2.5% Fracture left 1 st metacarpal	Theatre for fracture reduction
3	10	M	03/11/2024	Bilateral hand burns, face, chest, abdomen 5%	Theatre for mechanical debridement
4	14	M	06/11/2024	Burn to face 0.5%	Dressed with silvercell
5	12	M	31/10/2024	Burn to face and ear 0.5%	Dressed with silvercell
6	8	M	30/10/2024	Contact burn 0.5% right hand	Dressed with silvercell
7	9	M	31/10/2024	Contact burn 1% neck and chest	Dressed with silvercell
8	15	M	01/11/2024	Bilateral hand burns Webpace laceration	Local anaesthetic exploration
9	12	M	31/10/2024	Bilateral hand burns 2%	Dressed with silvercell
10	15	M	31/10/2024	Partially amputated finger Fracture dislocation left 1 st metacarpal Ocular injury	GA Theatre for terminalisation + fracture fixation + repair of globe