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Head Injury due to Cracker Blast

إصابة في الرأس بسبب انفجار الألعاب النارية (المفرقات) CrossMark

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Abstract

المستخلص

Death arising from fireworks is not an uncommon phenomenon in India. Deaths commonly arise during the manufacturing process and improper handling of chemicals for fireworks.

Here, we would like to highlight a rare case in which a 12-year-old child sustained a head injury due to a cracker blast, which resulted in a depressed fracture over the vault of her skull. In this paper, we tried to emulate the same pattern of fracture on a human skull bone experimentally using the same type of cracker which caused the injury.

This was done to give us an insight as to whether the cracker was powerful enough to produce a fracture and to rule out suspicion of blunt force trauma due to a weapon on the head. The subsequent explosion caused by the blast produced a distinctly similar pattern of fracture in comparison to the fracture observed in our case.

The study also highlights the dangers of country-made crackers handled by children.

إن الموت الناشئ عن الألعاب النارية ليس بظاهرة غير شائعة في الهند، حيث تحدث الوفيات عادة أثناء عملية التصنيع والتعامل غير السليم مع المواد الكيميائية للألعاب النارية. ونود أن نلقي الضوء في هذه الورقة على حالة نادرة أصيبت فيها طفلة في الثانية عشرة من عمرها بإصابة في الرأس بسبب انفجار المفرقات، ما أسفر عن كسر منخفض في قاع جمجمتها. وأجريت محاولة محاكاة للنمط نفسه من الكسر على عظام جمجمة بشرية تجريبياً باستخدام نفس النوع من الألعاب النارية الذي تسبب في الإصابة. وتم ذلك لإعطاء فكرة عما إذا كانت انفجار الألعاب النارية قوي بما يكفي لإنتاج كسر واستبعاد شكوك نشوء الإصابة بسبب ضربة قوية من سلاح على رأسها. ولقد أنتج الانفجار الناجم عن تجربة المحاكاة نمطاً مشابهاً للكسر مقارنةً بالكسر الذي لوحظ في الحالة المدروسة. كما تسلط الورقة الضوء على مخاطر المفرقات المصنعة محلياً من قبل الأطفال.

Keywords: Forensic Science, Fireworks, Head Injury, Skull, Children.

الكلمات المفتاحية: علوم الأدلة الجنائية، الألعاب النارية، إصابات الرأس، الجمجمة، الأطفال.



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1. Introduction

Firecrackers have been known to mankind for centuries and are used in various celebrations and festivals. Crackers are the most fascinating items and sources of enjoyment for children when they use them safely, but a potential danger when handled incorrectly.

Firecrackers are extensively used in India during various festivals, ceremonies and social events, like in other parts of the world [1].

While a number of papers have dealt with firecracker injuries, very few case series on this subject exist in the literature [2]. Death arising from firecrackers totalled around 150 cases in 2014, according to the National Crime Records Bureau [3]. However, most of these deaths commonly occur in cracker manufacturing industries, mainly due to improper handling of the chemical mixtures. Generally, accidental injuries are prone to occur when firecrackers explode, and are commonly seen over the hands, eyes and face. Such injuries are treated conservatively and few cases by minor surgical procedures.

Death arising while bursting crackers is an unusual phenomenon. Here we would like to highlight an isolated fatal case following head injury due to cracker use and provide recommendations to prevent such injuries.

2. Case Presentation

A 12-year-old female was bursting country-made sound crackers (garland type) during a local festival. Garland type fireworks are individual cracker pieces tied sequentially so that when lit once all of them burst out simultaneously. While bursting the loosely tied crackers, one of the crackers flew in her direction, hit a tree and bounced back, bursting when coming in contact with her head. The distance between the victim and cracker burst site was around 10 to 15 feet. She fell unconscious and died within 4 hours of the incident. On autopsy, a stellate shaped sutured wound measuring 6cm x 6cm x bone depth was present over the vertex

of the scalp. On examining the scalp underlying the above mentioned external injury, a depressed fracture 6cms in diameter was observed over the vertex involving the parietal bones and the right temporal bone. On removing the skull vault, sub-dural and sub-arachnoid hemorrhage was present over the cerebral hemispheres and base of the occipital lobe. A laceration measuring 5cm x 2.5cm x parenchymal depth was present over the parietal lobes. The remaining organs were intact and congested. The cause of death was determined to be cranio-cerebral.

3. Discussion

Crackers are very popular in India and extensively used during celebrations and festivals. Along with cracker use comes the danger of injury to children. Among children, the maximum number of injuries (35%) was seen in the age group 5–14 years [4]. The most commonly injured body sites include: hands (62%), face (32%) and eyes (10%) [5–7]. However, we note one epidemiological overview study from Australia conducted between July 1987 and June 1996 which stated that the head is the commonest anatomical site involved in firework injuries [8]. Even low risk sparklers can burn at very high temperature and cause severe dermal burns [9]. Burns are also a common type of injury in accidental firework work related deaths followed by amputation and severe facial injuries [10]. Fatal head injury due to accidental cracker blast is uncommon [11].

In this case, we had to rule out any suspicion of the fact that it was not caused by blunt force trauma due to a weapon and to correlate the history with the findings. Hence, we decided to experimentally recreate the fracture pattern observed on the skull. A prototype of the cracker which caused the injury was used in our experiment (Figure-1). The cracker was placed over a human skull bone and ignited. The subsequent explosion caused by the blast produced a distinctly similar pattern of fracture in comparison to the fracture observed in our case (Figure-2). However,





Figure 1- *Prototype of the cracker with experimental recreation.*

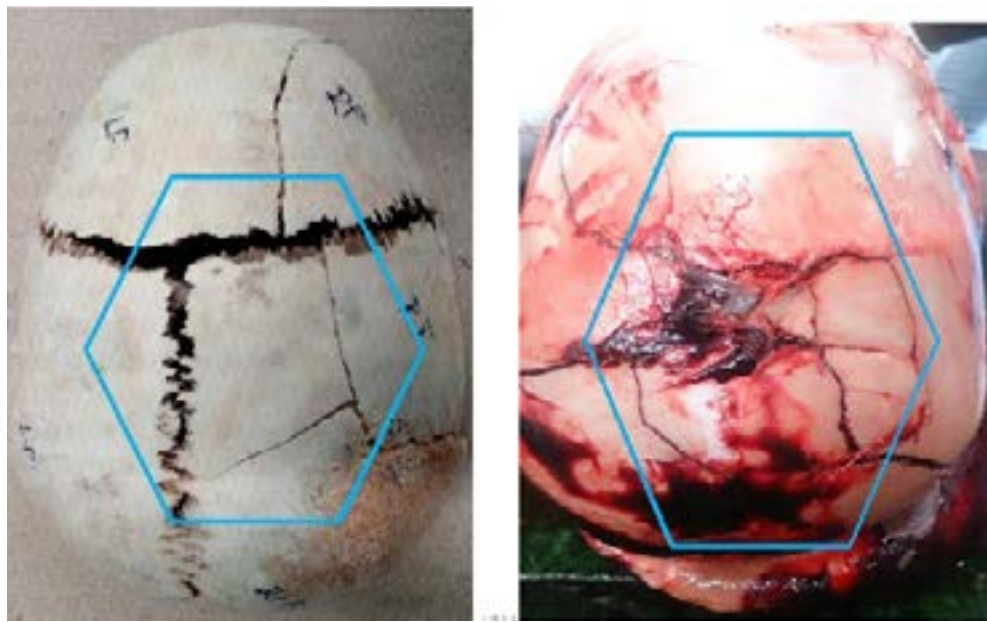


Figure 2- *Similarity between the pattern of injury over the skull of the deceased and the experimental recreation.*

one potential limitation of this experiment is that the exact biomechanics could not be replicated exactly. The cracker was just placed over the skull; thus the protective effect of hair, scalp and other biological factors could not be assessed in depth.

Ultimately, we ruled out any suspicion of blunt force trauma. Our study highlights the lethal nature of country-made crackers and the potential hazards they pose to children.

Recommendations

1. The government should take steps to control the

sale of country-made crackers as there is no regulation on manufacturing and sales.

2. The chemical composition and blast powers should be tested before being sold on the market.
3. Parents should supervise and monitor their children while handling crackers to ensure their safety.
4. A safe distance of 15 meters should be maintained between the firework and the person after lighting it.

4. Conclusion

It must be understood that crackers are not toys that can be handled by children; even a seemingly harmless sparkler burns at very high temperature and can cause severe burns.

The spectrum of injuries ranging from simple burns to fatal head injury and amputation of limbs must be anticipated while treating firework related injuries. Experimental recreation of events gives clarity to the investigating officer and forensic pathologist to solve such cases.

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