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International Journal of Clinical Case Reports and Reviews
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Case Report

Facial Injury Caused by Punctiform Impact from High Pressure Gas

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Received Date: January 22, 2025 | **Accepted Date:** February 12, 2025 | **Published Date:** February 21, 2025

Citation: Li Wang, Lian Duan, Liuming Hang, Gang Liu, Lu Peng, et al, (2025), Facial Injury Caused by Punctiform Impact from High Pressure Gas, *International Journal of Clinical Case Reports and Reviews*, 23(4); **DOI:10.31579/2690-4861/691**

Abstract:

This case report is about a 12-year-old boy, his face, mouth and nose was damaged by gases from a high pressure gas gun (which can eject compressed gases with a pressure of 6-10 kpa from an air compression pump). Redness and swollen with small area of ulceration in the right cheek was earliest observed. Rapid deterioration from broken skin to extensive nose damage.

Key words: high pressure; redness; facial injury; malocclusion

Introduction

With the advent of high pressure compressed air in industrial work, the risk of associated pneumatic injuries from its improper use is becoming evident. These injuries usually happen through careless use and practical jokes, although rare but can be fatal. Previous reports are mainly about colorectal injury by compressed air passing through the anus, direct impact of high-pressure compressed air on human face is an unusual emergency presentation [1-5]. This report describes the case of facial injury caused by punctiform impact from high pressure gas.

Case Report

The face, mouth and nose of a boy aged 12 was damaged by gases from a high-pressure gas gun (which can eject compressed gases with a pressure of 6-10 kpa from an air compression pump). Redness and swollen with small area of ulceration in the right cheek was earliest observed. During the subsequent week, the skin ulceration and necrosis was progressively aggravated, and the nose and throat were gradually affected. The child was transferred to our hospital on the 12th day after injury to prevent further aggravation of facial ulceration.

Physical examinations at hospital admission found a 5 cm × 8 cm ulcer with parotid fistula in the right cheek and a 3 cm × 7 cm ulcer in the right preauricular area. A large number of necrotic tissues and purulent secretions were observed on the ulcer (Figure 1). The normal shape of nose disappeared with necrosis from biliteral nasal wings to nasal root. Nasal dorsum cartilage and nasal wing cartilage were necrosis and deficiency, with necrosis of anterior nasal septum cartilage and partial deficiency of the nasal columella. The bony structures of anterior segment of inferior nasal concha, nasal septum and turbinate were visible (Figure 2). The oral cavity was malodorous and the gingiva was dark-colored. The gingival laceration was present from upper right 5th to 7th teeth with bone exposure and a large number of secretions. The upper left first tooth was completely detached. The upper left 2th to 6th teeth suffered from mobility of grade II or III. The dentition was irregular with malocclusion. Slight mobility was present from the upper left 6th tooth to the left upper maxillary joint. The mucous membrane of the hard palate was dark black; A 2 cm × 1.5 cm perforation was present at the junction of soft palate and hard palate. Part of the soft palate was ulcerated (Figure 3). Cranial CT scanning was urgently performed and showed that necrosis was not diffused within the sinus and skull.

Figure 1: Right facial wounds

Figure 2: Nasal wounds

Figure 3: Injuries in the mouth

After continuous facial debridement for a week after hospital admission, the pediatric patient's condition was stabilized without continuous expansion of festered wound surface, and the child could be fed through a nasogastric tube. During the next 9 months, the necrotic part of the maxilla along the nasal and facial midline and necrotic tissues on the face detached gradually, scarring healing of the facial wounds was achieved (Figure 4). Reconstructive procedure was started after the stabilization of the wound surface. Firstly, surgical repair was performed but failed to close the parotid fistula, which was gradually healed after 6 times of local radiotherapy. Bone deficiencies along the nasal and facial midline including the cover of the palate, alveolar processes and superior teeth were repaired with prostheses after CT three dimensional reconstructions (Figure 5). The total nasal reconstruction was performed by staging operations using expanded forehead flaps.

Figure 4: Scarring healing of the facial wounds was achieved, the soft palate disappeared with the oral cavity connected with outside space via opened nasal cavity.

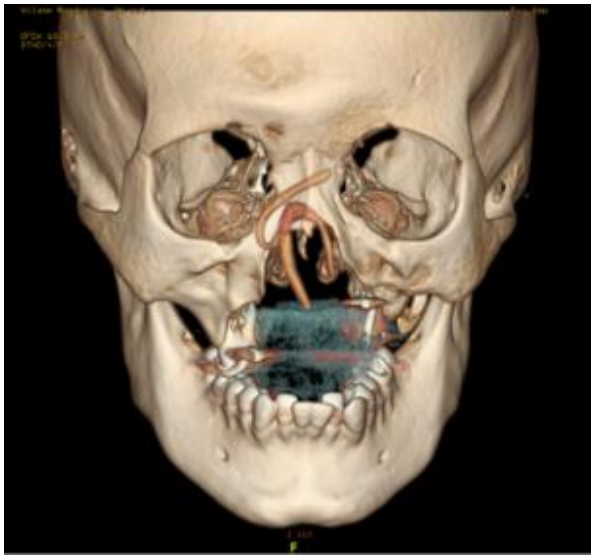

Figure 5: CT three dimensional reconstructions

Discussion

Injuries caused by high-pressure gas is an unusual emergency presentation. Its clinical manifestation and pathological changes are different from those caused by traditional shock wave, direct punctiform impact on the skins from high-pressure gas produce impact forces far greater than the traditional strength of blast injuries [6-11]. There have been sporadic reports of pneumatic injury, most of which focus on pneumatic colon injury. At present, literatures about direct punctiform blast from high pressure gases on the skins of face or other parts were rare, and chronic persistent necrosis after injuries described in this case were also not reported previously.

In the course of treating this child with high-pressure compressed air blast injury, we found that his facial injury was different from that caused by other shock waves and blast injuries: he presented a concentric circle ulceration centered on the impact point, and the development of the injury was lagging behind, which was easily neglected in the early stage. The characteristics of this case were concluded as follows: firstly, late onset of symptoms: the facial skin tissues remained structurally intact during the initial stage after direct blast from the high-pressure gas, and the ulceration and necrosis occurred gradually. So, the skin redness, swollen and ulceration appeared in the early stage of disease were ignored, causing delay of related treatments. Secondly, rapid deterioration: there was only an interval of one week from skin rupture to large area necrosis of the nose. Such rapid aggravations of skin injuries without underlying diseases were rarely reported. Finally, slow healing: The facial and nasal damage achieved scarring healing more than half a year. The injuries of nasal bone and maxillary bone became basically stable after a longer time due to the osteolytic necroses.

In this case, we found that compared to the traditional shock wave, the impacted forces by high-pressure gases is greater and the duration is longer, the injury of skin will be worse.

Conclusion

The direct high-pressure gas blast injury is a kind of closed laceration with concussion injury. In this type of injury, the skin lesions appear relatively late, but the wound deteriorates more rapidly and more seriously with a longer healing time. Since these conditions are rarely observed in clinical practice and easily to be ignored, they may lead to serious consequences. In later stage of treatments, enhancing wound care to promote wound healing is the key point for successful treatments.

Conflicts of interest: None of the authors have conflicts of interest to disclose.

Financial disclosure: None of the authors have financial relationships relevant to this article to disclose.

Author Contributions: LW, LD, and ZF wrote the report. LW, LP and YS searched the literature and analysed the results. ZF, LD, LH and GL cared for the patient. LD provided the images. All authors critically revised the report. Written consent for publication was obtained from the patient.

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DOI:10.31579/2690-4861/691