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Research Article

Cutaneous Crepitus is not Equal to Gangrene. The Exceptional Case of Benign Subcutaneous Emphysema

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Abstract

Subcutaneous emphysema is the presence of air or gas within subcutaneous tissue plane of anybody region. Skin lesions associated to cutaneous crepitus on palpation and presence of subcutaneous air/gas on x-rays must suggests an infectious etiology. Diagnostic procedures have to promptly rule out life-threatening infections as gas gangrene (GG) or necrotizing fasciitis (NF). Not all subcutaneous emphysema is potentially lethal, and, in rare case, they can result from benign etiology, most commonly secondary to trauma, called Benign Subcutaneous Emphysema (BSE).

In literature, this benign uncommon clinical entity is poorly documented by only a small collection of case reports.

A cause of BSE involving an isolate upper limb resulting from an accidental close-range soft-air rifle shoot to the hand is reported and the importance of differential diagnosis between infectious and benign etiology of subcutaneous emphysema is highlighted.

Keywords: Subcutaneous Emphysema; Benign Emphysema; Crepitus; Gas Gangrene; Necrotising Fasciitis; Upper Limb; Soft-Air

Abbreviations

NF: Necrotizing Fasciitis; GG: Gas Gangrene; BSE: Benign Subcutaneous Emphysema

Introduction

Subcutaneous emphysema is the presence of gas or air within the hypodermis. There are many etiologies, most are usually serious and require admission, the most alarming being the necrotizing fasciitis (NF) and gas gangrene (GG). Despite this, there is also a little known pathology called benign subcutaneous emphysema (BSE) that can cause emphysema that is limited to the subcutaneous tissue, without systemic involvement and usually appears in the upper extremities. The BSE presents several causal factors, the main one is usually a traumatic antecedent [1,2]. This emphasizes the importance of differential diagnosis when faced with a patient with crepitus. In this article we present the case of a patient diagnosed with BSE who meets all the characteristics.

Materials and Methods

Patient of "49" years, with no history of interest or known allergies, who goes to the Emergency Department due to striking swelling of the right upper extremity of hours of evolution after an accidental close-range shooting injury to the hand with a soft-air rifle.

Powered by 88 grams of compressed CO_2 at 50 BAR pressure, this weapon type, classified as "low-power soft-air rifle", generates a force up to 7,5 Joules enough to fire a caliber 4,5mm metal pellets with velocities from 600 up to 1,000 feet per second (200 - 300 m/s).

After an initial assessment, the patient was under hemodynamic stability, eupneic, slightly anxious and normal conscious and oriented.

On physical examination, the patient presented an entry injury at the central region of on the palmar side of the hand (Figure 1). A 1-cm diameter "starry" shape wound crosses the subcutaneous plane, without secretion or signs of local infection and no blistering or necrosis.

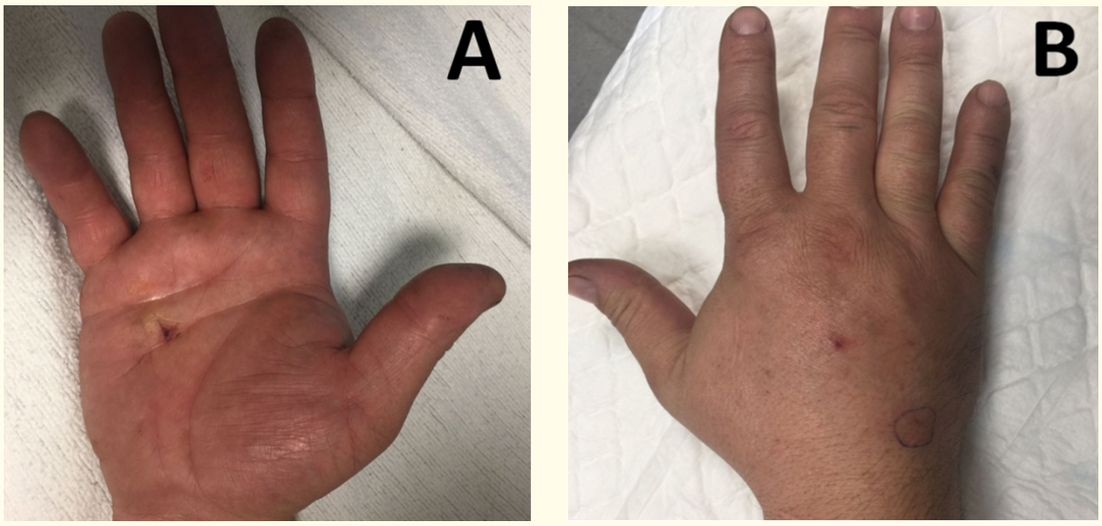

Figure 1: Hand injury: volar (A) and dorsal (B) side.

The involved limb presents a complete and painless joint balance, strength and sensitivity preserved and distal neurovascular exploration without alterations. The most striking was the crepitus of painless air bubbles, mainly at the level of the back of the hand and forearm. Various complementary tests were requested; all the analytical parameters, including acute phase reactants were within the limits of normality.

On the x-rays the metal pellet and no fractured bones were observed; diffuse subcutaneous emphysema that affected the limb up to the "arm" was also revealed (Figure 2).

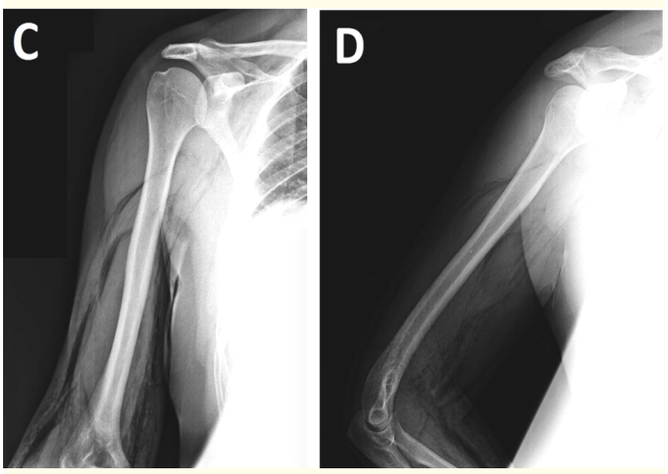

Figure 2: Metal pellet and subcutaneous emphysema on x-rays: antero-posterior (A, C) and lateral (B, D) view.

A tetanus vaccine was applied for immunization and 1st-generation cephalosporin (cefazoline) was administered intravenously. In the operating room, a local incision was performed with local anesthesia and a tourniquet. The metal pellet was removed (Figure 3) and local irrigation and tissue debridement were realized.

The patient was admitted for follow-up and administration of antibiotics "during-hours". After 24-hours observation, the patient was discharged. After 10 days, an outpatient evaluation was performed with a complete remission of manifestations.

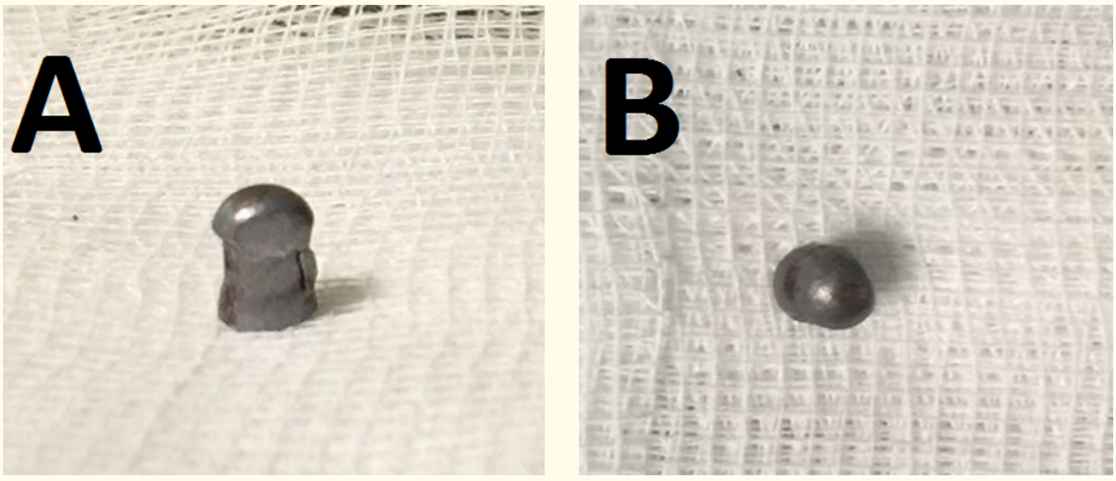

Figure 3: Metal pellet: longitudinal (A) and axial (B) view.

Results and Discussion

When reviewing the literature on this subject, we can affirm that the documented cases of BSE are few and all are case reports [1-9].

Based on the source of the air entering the subcutaneous space, emphysema can be divided into three different categories: gas produced de novo, gas arising internally, and gas introduced externally. The first is the consequence of gas producing infection, as NF or GG. The second is the result of perforation of the pulmonary, digestive tracts or other hollow visceral organs. The third is the effect of a penetrating trauma, post-surgical procedure, post-percutaneous treatment or irrigation of wounds with hydrogen peroxide [8]. Trauma is the most common cause, sometimes is the result of large air amounts introduces in the soft tissues through small skin wounds with ball-valve mechanism [6,8].

In case of subcutaneous emphysema, NF and GG must always be ruled out. It is important to differentiate these life-threatening conditions from benign entities because treatment and outcome differ considerably [7]. GG and NF are both pathologies produced by gas-producing microorganisms usually develop emphysema after 12-18 h [4,7]. Both GG and NF are a skin infection that rapidly spreads to deep tissue and may present up to 76% mortality [6]. Swelling, erythema, and disproportionate pain complete the typical triad of these infectious pathologies. Its main treatment is a nearly surgical intervention for the debridement of affected tissues, exponentially increasing the morbidity and mortality associated with the time elapsed since the infection [5]. An isolated limb involvement by subcutaneous emphysema is an extremely rare condition [4].

The diagnosis of BSE is made by exclusion; even so it presents a series of characteristics such as: appearance of emphysema limited to subcutaneous tissue (hypodermis) in the 6-8 hours after a trauma with a skin wound without signs of local infection, good general condition and stable hemodynamic parameters without objective or subjective data of infection [4,7]. A close observation and prophylactic antibiotics are both necessary, since in the majority of cases it is self-limited, but a small percentage of the cases may require a surgical treatment [1-3,5].

Conclusion

Benign noninfectious subcutaneous emphysema is a rare pathology, whose differential diagnosis is essential to avoid complications and iatrogenic sequelae, secondary to unnecessary treatments.

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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