

Case Report

Subcutaneous emphysema or necrotizing fasciitis after insect bite?

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ARTICLE INFO

Keywords:

Subcutaneous emphysema

Necrotizing fasciitis

Insect bite

LNIREC

ABSTRACT

Background: The rapid form of subcutaneous emphysema after an insect bite is hard to distinguish from necrotizing fasciitis.

Case presentation: Here we report a case of benign subcutaneous emphysema after an insect bite on the hand of an 18-year-old Caucasian man. The puncture area in the first web space of his hand was erythematous and swollen. After 4 h, he began to hear crackling sounds in the hand. Although conservative management was provided, he experienced gradually increasing pain and rapid progression in swelling and crepitation. The symptoms regressed after fasciotomy.

Conclusion: This is the fourth reported case of benign subcutaneous emphysema after an insect bite in the literature. Although benign emphysema has a good prognosis after treatment, it is similar to necrotizing fasciitis. Proper diagnosis can only be established with histological and microbiological investigations, but in cases where early histological and microbiological investigations cannot be performed, biochemistry and radiological test should be used.

Introduction

Subcutaneous emphysema is defined as the presence of air in the subcutaneous tissues [1]. This phenomenon has numerous causes, including blunt and penetrating trauma, soft tissue infection, and surgical instrumentation [2]. Emphysema is thought to be due to the pumping effect of limb movement [3]. Subcutaneous emphysema is usually benign and does not necessitate major surgical intervention. Emphysema of soft tissues, including subcutaneous tissue, is more often of infectious origin. Moreover, benign subcutaneous emphysema after an insect bite is extremely rare [2]. Necrotizing fasciitis is a life-threatening condition that affects deeper tissues. In fact, crepitus associated with severe pain on palpation and systemic inflammatory signs are characteristic features of necrotizing soft tissue infections. In our patient, the clinical presentation was similar to that of necrotizing infection [4]. Necrotizing fasciitis necessitates major surgical intervention immediately because of its aggressive nature [5].

Case report

An 18-year-old male farmer suffered an insect bite to the thenar side of the left hand while he was feeding pigeons (Fig. 1). Four hours after the insect bite, he began to hear crackling sounds in his hand. He visited our emergency department 1 day after the insect bite because the pain was worsening despite the use of painkillers (Fig. 1).

The patient had no medical conditions such as systemic disease or a major surgery, but his father had type 2 diabetes mellitus. The emergency department specialist's findings were swelling and crepitation on the thenar side of his left hand and extending to the

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Accepted 14 August 2020

Available online 15 August 2020

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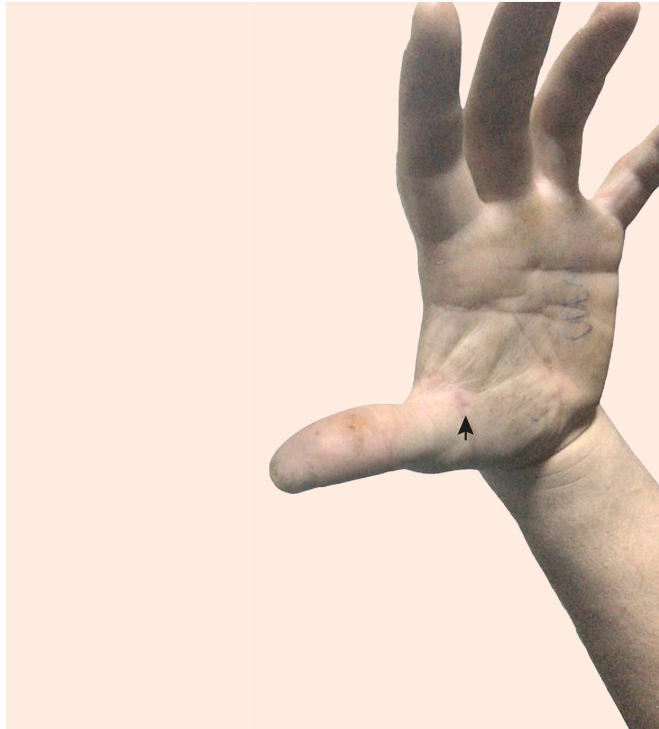


Fig. 1. Black arrow showing the puncture side.

distal wrist. Wrist range of motion was limited because of pain. Neurovascular examination yielded normal findings. The emergency department specialist administered nonsteroidal anti-inflammatory drug treatment, elevated the hand, and applied a cold pack. After 4 h of this treatment, the crepitation and swelling had extended to his elbow, and orthopedic and trauma specialists were consulted. Subfebrile temperature and tachycardia were then noted. Radiographs were taken after consultation and revealed gas formation in the subcutaneous and intramuscular areas from his left hand to the elbow (Fig. 2). Despite these findings, his blood tests revealed no significant inflammatory process (white blood cell count, 8200 cells per microliter of blood; C-reactive protein level, 22 mg/dL; hemoglobin, 15.1 g/dL; serum sodium, 139 mmol/L; serum creatinine, 0.9 mg/dL; serum glucose, 120 mg/dL). He had no other infectious condition, and chest radiographs appeared normal. He was administered cefuroxime, metronidazole, and gentamicin preoperatively because we could not distinguish the condition from necrotizing fasciitis; swelling and crepitation were extended to elbow in just 4 h and pain got worse despite painkillers. Fasciotomy was performed through three incisions in the hand (two dorsal and one volar), two incisions in the forearm (one dorsal and one volar), and a forearm volar incision that extended to the upper arm. The subcutaneous and intermuscular fascial plane was observed to be edematous. Discoloration and necrosis were not observed in the extensor tendon mechanism and first dorsal interosseous muscle in the hand and forearm muscles. All muscles were contractile with the provocative test. Associated thrombosed and thickened blood vessels were not observed (Fig. 3).

Crepitation stopped expanding after surgery. The patient required no further analgesic after postoperative day 1. All antibiotics were discontinued on the postoperative second day after histological and microbiological investigations showed no necrotizing fasciitis. All fasciotomies were closed on the postoperative second day. No tissue graft was needed. One month later, the patient showed good recovery with a volar sided mild keloid scar (Fig. 4).

Discussion

Subcutaneous emphysema is defined as the presence of free air in the subcutaneous tissues [6]. It is important to distinguish subcutaneous emphysema from gas-forming infection because neglect of necrotizing fasciitis can be fatal [7,8]. Subcutaneous emphysema has predisposing factors, such as immunosuppressive conditions; however, our patient did not have any chronic disorders [9].

Necrotizing fasciitis is a rapidly progressive, often fatal soft tissue infection that results most commonly from polymicrobial infection. It is a medical emergency; reported mortality rates are as high as 80% [7,8]. Imaging findings are nonspecific, and clinicopathologic correlations must be sought. Therefore, necrotizing fasciitis should be diagnosed from the wound biopsy and the diagnosis should be supported with clinical and laboratory tests [10].

Insect bites can cause various types of infections such as impetigo, folliculitis, cellulitis, erythema, papule or papulo-vesicle hemorrhagic bulla and lymphangitis. Although rare, insect bites can cause benign subcutaneous emphysema and necrotizing fasciitis



Fig. 2. AP forearm radiograph with black arrows showing the gas formation in the subcutaneous and the intermuscular planes.



Fig. 3. Intraoperative image of the patient showing no discoloration and necrosis.

[11]. However, affected patients should be firstly evaluated for necrotizing fasciitis after insect bites because necrotizing fasciitis is fatal. Our patient had the fourth known case in the literature with subcutaneous emphysema after insect bite [12,13].

Subcutaneous emphysema, mostly affects the respiratory system. In the literature with subcutaneous emphysema after insect bite is clinically observed within 12 h to 3 days. In these cases the patients had mild pain but the patient's vital signs and laboratory findings were normal [12–14]. Our patient started to hear crackling sound in only 4 h after the bite, and one day later he applied the emergency department, a rapid clinical progression was observed within 4 h despite of medical treatment. In our patient the clinic



Fig. 4. a: Lateral picture of left elbow and forearm; b: AP view of forearms and wrists demonstrating a full range of motion.**Table 1**
The Laboratory Risk Indicator for Necrotizing Fasciitis.

CRP (mg/dl)	< 150	0
	≥ 150	4
WBC (per mm ³)	< 15	0
	15–25	1
	> 25	2
Hemoglobin (g/dl)	> 13.5	0
	11–13.5	1
	< 11	2
Sodium (mEq/L)	≥ 135	0
	< 135	2
Creatinine (mg/dl)	≤ 1.6	0
	> 1.6	2
Glucose (mg/dl)	≤ 180	0
	> 180	1

was different from the other subcutaneous emphysema cases in the literature because he exhibited rapid progression, exaggerated pain, and noninvolvement of respiratory symptoms.

In our case, the clinic with rapid progression and exaggerated pain made us consider early necrotizing fasciitis. A biopsy with a frozen section can rapidly confirm the diagnosis of necrotizing fasciitis. If the biopsy is performed in the operating room, and the results are positive, then radical debridement must be performed immediately [15,16]. In our situation, no pathologist was available as a consultant in our hospital to diagnose necrotizing fasciitis. In cases when a biopsy with a frozen section cannot be performed, the Laboratory Risk Indicator for Necrotizing Fasciitis (LRINEC) score is another method of diagnosing early cases of necrotizing fasciitis and distinguishing it from other soft tissue infections (Table 1) [17]. LRINEC score sensitivity was shown to be between 71% and 80% [18,19]. In our patient, the LRINEC score was 0. However, there is a case in the literature that necrotizing fasciitis was confirmed at surgery where LRINEC score was zero [20]. So the clinical diagnoses was hard to us to distinguish from necrotizing fasciitis.

Diagnostic radiological studies are of importance as well. In cases of subcutaneous emphysema, the gas shadow is limited to the subcutaneous plane. Despite all this, radiological studies can not confirm the diagnosis of necrotizing fasciitis alone. [10]. In our case, X ray evaluation revealed the gas formation in the subcutaneous plane as well as in the intermuscular plane (Fig. 3).

In our case, we did not observed any necrotizing fasciitis finding in intraoperative examination but to make a definitive diagnosis we performed fully fasciotomy and take samples for histopathological and microbiological investigations. Postoperative second day, the histological and microbiological investigations showed no signs of necrotising fasciitis and infection. Pain was relieved on the first postoperative day. In the light of this findings the patient got the diagnosis of subcutaneous emphysema.

Although this case was hard to distinguish from necrotizing fasciitis, our treatment could be find aggressive. Less aggressive methods such as minimally invasive procedures could be performed primarily. We did not choose a minimal invasive method because we did not the chance of intraoperative pathological and microbiological evaluation. In necrotising fasciitis definitive diagnosis can only histological and microbiological investigations [21,22].

Conclusion

Although benign emphysema has a good prognosis after treatment, it could be very similar to necrotizing fasciitis. In exaggerated clinical situations, proper diagnosis can only be made with histological and microbiological investigations. In cases where early histological and microbiological investigations cannot be performed, biochemistry and radiological test should be used. Closed monetization should be performed before aggressive treatment.

Declaration of competing interest

The author, their immediate family, and any research foundation with which they are affiliated have not received any financial payments or other benefits from any commercial entity related to the subject of this article and no funding was received related to the subject of this article. We have no conflict of interest to declare.

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