

Clinical Communications: Adults

MANAGEMENT OF SIGNIFICANT AND WIDESPREAD, ACUTE SUBCUTANEOUS EMPHYSEMA: SHOULD WE MANAGE SURGICALLY OR CONSERVATIVELY?

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Abstract—Background: Subcutaneous emphysema of a limb after acute injury is classically associated with gas gangrene. Delayed management can result in amputation and death. Typically caused by a clostridial infection, patients are unwell, with rapidly spreading clinical signs, abnormal laboratory results, and cultures positive. There are reports of widespread subcutaneous emphysema of a limb in well-appearing patients, with blood parameters within normal limits; however, the optimum management of this type of case is unclear. **Objective:** Our objectives were to present 4 new cases of acute subcutaneous emphysema in well-appearing patients managed with early surgery, review the literature, and discuss the management decisions in cases of acute subcutaneous emphysema in clinically well patients. **Case reports:** Here we present a case series of 4 patients, all with penetrating injuries to the upper limb resulting in widespread subcutaneous emphysema within 24 h of injury. Mean age was 33 years. All were fit and well, with the exception of one with type 1 diabetes, no cardiorespiratory compromise, and no significant derangement of laboratory investigations. X-ray studies showed widespread gas within the soft tissues. All were treated aggressively with immediate surgical fasciotomy of the upper limb, thorough debridement, and washout as required. Gram stains revealed pus cells (polymorphonuclear leucocytes) in all, but organisms in only one case (Gram-positive cocci and bacilli). Prolonged culture grew organisms in all. All patients had a second washout and closure plus 6 weeks of antibiotics. All survived and had fully functioning limbs.

Why should an emergency physician be aware of this? We recommend having a low threshold for rapid referral to an appropriate surgical speciality, allowing prompt and radical surgical management of this type of presentation, even in the presence of a well patient. © 2014 Elsevier Inc.

Keywords—surgical emphysema; subcutaneous emphysema; fasciotomy; debridement; soft tissue infection; necrotizing fasciitis

INTRODUCTION

Any patient presenting with widespread subcutaneous emphysema of a limb raises significant concern about the cause, specifically, *Clostridia perfringens* and gas gangrene or group A *streptococcus* and necrotizing fasciitis. Management of such an infection is immediate resuscitation, followed by aggressive limb debridement with or without amputation, if necessary. This is limb-saving and often life-saving management. The decision to operate in these circumstances is rarely debated.

The majority of patients that have infective subcutaneous emphysema are unwell, shocked, and demonstrate rapidly progressing pain and soft-tissue changes (crepitation, swelling, erythema, blistering) of the affected limb. When a patient presents with widespread rapidly

progressing subcutaneous emphysema of a limb after an injury, but is well and shows no other significant signs of infective process, their management becomes less clear.

Here we present four cases with such a clinical presentation. All were treated aggressively with surgical debridement and all had successful outcomes (Table 1). We consider the available literature on this subject and discuss the dilemma of whether an aggressive surgical or conservative approach offers the most successful outcomes.

CASE REPORT

Case 1

A 30-year-old male was bitten on his right wrist by a dog at 11 AM. He developed increasing pain around the wrist, where 4 puncture wounds were present when he presented to the emergency department (ED) at 1:00 PM. He had no other medical conditions. On examination, he was afebrile and hemodynamically stable. Subcutaneous emphysema was felt on volar wrist and forearm. X-ray studies confirmed gas in the subcutaneous tissues of the wrist and distal forearm (Figure 1). Routine blood tests revealed a white cell count (WCC) of $< 10 \times 10^9/L$ and C-reactive protein (CRP) of 2 mg/L. Following urgent advice from the duty microbiologist, he was commenced on i.v. metronidazole and co-amoxiclav. The decision was made to formally wash out and debride his wounds. At 7 PM, he underwent emergency fasciotomy of both volar and extensor compartments from wrist to elbow. Gas was found in the subcutaneous tissues and planes outside of the fascia. All muscles looked healthy and viable. Multiple superficial and deep tissue samples from areas beyond the initial dog bite were taken for culture and processed the same evening. Initial Gram stain demonstrated minimal pus cells and no organisms, but the samples later grew *Pasteurella multocida*, group G *Pyogenic streptococcus*, and *Streptococcus anginosus* on culture. Despite prolonged anaerobic culture, neither *Clostridium* sp. nor other anaerobes were isolated, although he had received antibiotics active against anaerobes before the operation. Wounds were left open and a second look was performed at 48 h with closure. Antibiotics were continued for 6 weeks. The patient suffered no long-term deficit or complications.

Case 2

A 33-year-old female butcher slipped and cut her elbow on the floor at around 9 AM. She had type 1 diabetes. Pain developed around her elbow and she presented to the ED at 2:00 PM. Clinically she was well, afebrile, and hemodynamically stable. She had crepitation

Table 1. Summary of Cases

Age (y)	Injury	Medical History	Time from Injury to Surgery (h)	WCC ($\times 10^9/L$)	CRP (mg/L)	Gram Stain	Outcomes from Prolonged Culture
30	Dog bite to wrist	Nil	8	< 10	2	Pus cells No organisms	<i>Pasteurella multocida</i> , group G <i>pyogenic strep. Streptococcus anginosus</i> <i>Escherichia coli</i>
33	Cut elbow on floor	Type 1 DM	8	< 10	6	Pus cells Gram-positive cocci	
23	Axillary impalement	Nil	6	< 10	28	Gram-positive bacilli Pus cells	<i>Corynebacterium</i> <i>Proteus</i>
46	Cut elbow on restaurant floor	Nil	24	< 10	8	No organisms Pus cells	<i>Staphylococcus capitis</i> , <i>Bacillus</i> and <i>Staphylococcus epidermidis</i>

CRP = C-reactive protein; DM = diabetes mellitus; WCC = white cell count.

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