Benign subcutaneous emphysema is a rare clinical entity, documented by only a small collection of case reports. The presence of crepitus on physical examination and subcutaneous gas on radiographs is concerning for necrotizing fasciitis. Necrotizing fasciitis is a dangerous and deadly infection accounting for 500 to 1000 cases annually in the United States, with mortality rates of up to 76%. Delay in surgical treatment is related to increased morbidity and mortality; therefore, a high clinical suspicion should be maintained in patients with subcutaneous emphysema and/or crepitus. It is critical to recognize that no laboratory result or radiologic finding should delay surgical intervention if a high clinical suspicion for necrotizing fasciitis exists. However, not all subcutaneous emphysema represents a life-threatening infection. This article presents a case of benign subcutaneous emphysema treated with close observation and prophylactic antibiotics. Patients with necrotizing fasciitis typically appear ill and have the triad of swelling, erythema, and disproportionate pain. Patients who are not systemically ill and have minimal pain, no significant inflammatory changes at the site of crepitus, and stable hemodynamic parameters can be treated conservatively, with the caveat that close clinical monitoring is essential to avoid the unnecessary morbidity and mortality that can result from delaying intervention in the case of necrotizing fasciitis.
Benign subcutaneous emphysema is a rare clinical entity, documented by only a small collection of case reports.\textsuperscript{1-5} The presence of crepitus on physical examination and subcutaneous gas on radiographs is concerning for necrotizing fasciitis.\textsuperscript{1} Benign (noninfec-
tious) subcutaneous emphysema has been described after elbow arthroscopy,\textsuperscript{1} injection of air into the soft tissues,\textsuperscript{7} blackthorn injury to the hand,\textsuperscript{4} and factitious disorder.\textsuperscript{2} In each case, despite the presence of subcutaneous emphysema, other common clinical indicators of infection, such as pain, fevers, and/or elevated laboratory values, were not present.

This article presents a case of benign subcutaneous emphysema treated with close observation and prophylactic antibiotics.

**CASE REPORT**

A 63-year-old, right-hand–dominant man presented to the emergency department reporting swelling in the forearm and increased tympani to light tapping. The patient had fallen the day before while ascending a flight of stairs, sustaining a 1-cm laceration just proximal to the right olecranon (Figure 1). He reported cleaning and bandaging the wound without issue. The next morning, he noted increased swelling in the proximal forearm and presented to the emergency department. He reported no pain in the arm, fevers, chills, or feeling ill. The patient was afebrile and normotensive, without tachycardia or tachypnea.

On physical examination, the patient had painless range of motion of the elbow, including full extension and flexion to 140\degree. No erythema and no tenderness to palpation were observed anywhere in the forearm or upper arm. Significant crepitus was felt over the extremity from the level of the mid-humerus to the wrist. Laboratory workup demonstrated a white blood cell count of 5300/µL and a C-reactive protein level of 0.4 mg/dL (normal value, less than 0.9 mg/dL). Radiographs demonstrated significant subcutaneous air within the soft tissues (Figure 2). Computed tomography scan demonstrated circumferential subcutaneous emphysema but no evidence of fascial thickening or fat stranding (Figure 3).

The patient was admitted, placed on intravenous antibiotics (ampicillin-sulbactam), given nothing by mouth, and monitored closely for any signs of increased pain in the arm, changes in vital signs, and changes in laboratory values. The patient was observed for 48 hours and showed no signs of worsening. The crepitus in the forearm improved significantly over this time, and the patient was discharged home on a 5-day course of cephalalexin, which he did not take. The patient was seen in the outpatient office 3 days after discharge and the crepitus had completely resolved. It is likely that the reason for the rapid improvement was based solely on the etiology of benign subcutaneous emphysema. However, elevation and compression wrapping may have also contributed to the resolution of symptoms.

**DISCUSSION**

Necrotizing fasciitis is a dangerous and deadly infection accounting for an estimated 500 to 1000 cases annually in...
the United States, with mortality rates of up to 76%.7 Delay in surgical treatment is related to increased morbidity and mortality; therefore, a high clinical suspicion should be maintained in patients with subcutaneous emphysema and/or crepitus.7 However, to prevent unnecessary surgical treatment, benign causes of subcutaneous emphysema should be considered in patients with subcutaneous emphysema and no signs of true infection. Patients with necrotizing fasciitis typically appear ill and have the triad of swelling, erythema, and disproportionate pain.7 Disproportionately severe pain is the most sensitive symptom, noted in nearly 100% of patients with necrotizing fasciitis.8 In contrast, the current patient reported no pain. A clinical tool developed to assist in the diagnosis of necrotizing fasciitis noted that negative inflammatory markers (white blood cell count, C-reactive protein) were negative predictors for necrotizing fasciitis.9 The current patient had normal white blood cell count and C-reactive protein levels.

In a prior report, the authors proposed a 1-way ball-valve mechanism that traps air within the subcutaneous tissues after an olecranon laceration.5 No proof of such a mechanism was offered, but the current patient had a similar injury and similar physical and radiologic findings.

The diagnosis of necrotizing fasciitis is primarily made based on clinical suspicion. It is critical to recognize that no laboratory result or radiologic finding should delay surgical intervention if a high clinical suspicion for necrotizing fasciitis exists.7 However, not all subcutaneous emphysema represents a life-threatening infection. Ozalay et al10 suggested that patients who are not systemically ill and have minimal pain, no significant inflammatory changes at the site of crepitus, and stable hemodynamic parameters can be treated conservatively. The current authors agree with this suggestion for the management of upper extremity subcutaneous emphysema, with the caveat that close clinical monitoring is essential to avoid the unnecessary morbidity and mortality that can result from delaying intervention in the case of necrotizing fasciitis.

REFERENCES