

Case Report

Air vs. Blood: Navigating the Diagnostic Challenge of Traumatic Subcutaneous Emphysema and Hematoma – A case report

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ABSTRACT:

Subcutaneous emphysema (SE), resulting from the infiltration of air into adjacent subcutaneous tissue planes, is often characterized by crepitus on palpation. Other clinical features may include swelling, erythema, pain, infection, and occasionally hematoma. Subcutaneous hematoma, though rare, can occur due to the shearing of subcutaneous blood vessels under tissue tension. This case report presents a middle-aged man with a history of facial trauma and sudden swelling on the left side of his face. Computed tomography (CT) imaging findings and the management protocol are detailed, providing insights into the clinical approach. Additionally, this report highlights the diagnostic protocols for subcutaneous emphysema and discusses key differentiating features between emphysema and hematoma, aiding in accurate diagnosis and treatment planning.

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INTRODUCTION

Subcutaneous emphysema (SE) of the head and neck occurs when air is introduced into the fascial planes of connective tissue. Due to the loose nature of this tissue and its highly distensible walls, air can accumulate, expanding these spaces significantly.[1] Common causes of SE include facial trauma, ventilation with endotracheal intubation during general anesthesia, punch biopsies, soft tissue lacerations during dental procedures, and endodontic treatments. [2] Additional triggers include air-generating dental instruments, orthognathic surgeries, scaling and root planing therapy, vigorous sneezing, nose blowing, mouth rinsing, and even playing wind instruments.[3] The de novo development of air infiltration within the subcutaneous layer of the skin, can involve both superficial and deeper tissues. While localized subcutaneous air dissemination is typically less concerning clinically, its occurrence may signal the presence of air in deeper, less visible regions of the body.[4] Conditions such as pneumothorax, pneumoperitoneum, pneumomediastinum, and

pneumoretroperitoneum may arise from air extravasation into various body cavities. [5] Air movement follows fascial and anatomical planes, driven by pressure gradients between the intra-alveolar space and the perivascular interstitium, allowing it to travel to the head, neck, chest, and abdomen.[6]

Traumatic subcutaneous emphysema (TSE) of the face can arise from fractures involving the maxillary, ethmoidal, or frontal sinuses. Such injuries create a pathway for air to infiltrate the facial tissue spaces, particularly in the periorbital region.[7]Maxillofacial subcutaneous emphysema, though rare, is a potentially concerning presentation often associated with trauma or fractures involving facial bones, particularly the sinuses. We present a case highlighting the diagnostic challenge of distinguishing between emphysema and hematoma associated frontal sinus hairline fracture, which was successfully managed.

CASE REPORT

A 38-year-old male presented to the dental outpatient department with a chief complaint of swelling in the upper left cheek region for the past week. The patient reported being asymptomatic until a road traffic accident occurred one week prior, associated with mild pain. Extraoral examination of the head and neck revealed significant left periorbital swelling, accompanied by a single, diffuse swelling in the left cheek and maxillary region, measuring approximately 3×3 cm. In the left periorbital region evidence of mild hematoma is noted with mild hemorrhage in the left

conjunctiva. Laceration is noted in the forehead and upper lip region. On palpation, the swelling is soft in consistency with mild crepitus and tenderness. On intraoral examination, evidence of mild soft tissue swelling involving the left buccal mucosal region which is soft in consistency and tenderness. The hard tissue findings revealed Ellis class II fracture in 12,11,21 and 22. Patient has fair oral hygiene. To rule out fractures, patient was advised for orthopantomogram which confirmed the tooth Ellis class II fracture and normal anatomical structures in maxilla and mandible.



Figure 1 Initial presentation of Extraoral frontal appearance and Left lateral appearance revealing left facial swelling



Figure 2 Intraoral examination of the patient which revealed mild swelling involving the buccal mucosa and vestibular region



Figure 3 Orthopantomogram of the patient which revealed normal trabecular bone pattern in maxilla and mandible



Figure 4 CT image showing **A**: Hairline fracture involving the posterior wall of frontal sinus. **B** : coronal section showing diffuse hypodensity involving the left maxillary and infraorbital fascial planes. **C** : Axial section showing subcutaneous edematous changes.

A provisional diagnosis of traumatic subcutaneous emphysema was made, with hematoma considered as a differential diagnosis. The patient was advised to undergo a head and neck CT scan, which revealed a hairline fracture in the anterior wall of the right frontal sinus. The scan also identified a hypodense area involving the left maxillary and periorbital fascial spaces, consistent with subcutaneous emphysema. The paranasal sinuses, cranial fossa, and its contents appeared normal, with no evidence of intracranial or extracranial hemorrhage. Based on these findings, a final diagnosis of traumatic subcutaneous emphysema was established. Management included oral antibiotics—Amoxicillin 500 mg with clavulanic acid 125 mg twice daily and Metronidazole 400 mg three times daily—along with a combination of Aceclofenac and Paracetamol for pain relief. The patient was reassured and instructed to avoid activities that could increase intraoral air pressure, such as blowing balloons, drinking through straws, or

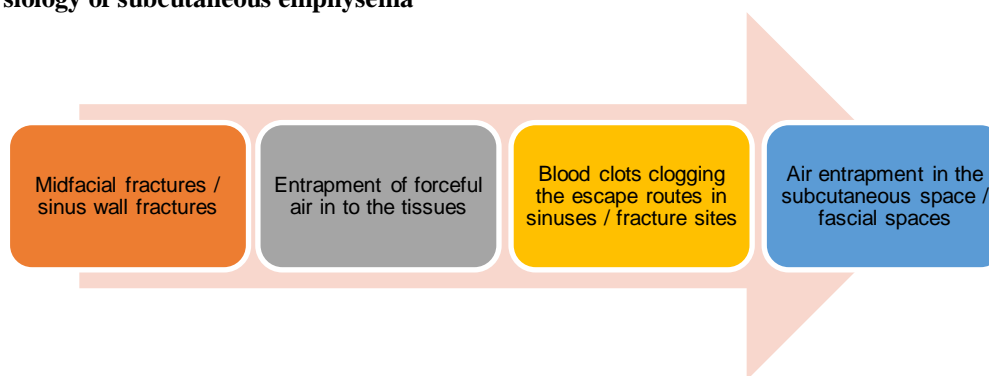
sneezing. A follow-up was scheduled for three days later.

At the three-day review, the swelling remained unresolved, prompting surgical exploration through a buccal vestibular incision. Hematoma-like changes were identified and drained by the surgical procedure. The patient was advised to continue the same medications and return for a follow-up after five days. At the second follow-up, the patient reported no further symptoms or complications, indicating successful resolution.

DISCUSSION

Facial skeleton fractures are considered the most likely cause of subcutaneous emphysema (SE) in the head and neck region. While relatively uncommon, SE often arises from direct trauma to the maxillary sinus, fractures of the zygomaticomaxillary complex involving the lateral wall of the maxillary sinus, or injuries to the naso-orbital ethmoidal complex.[8]

Pathophysiology of subcutaneous emphysema



Clinically, SE typically presents with the sudden onset of facial swelling, accompanied by a sensation of facial fullness and closure of the eyelids on the affected side. Other features may include crepitation, pain, tenderness, and, in some cases, subconjunctival ecchymosis. Crepitation, which is almost pathognomonic for SE, can be detected with a stethoscope or by gently rolling two fingers over the affected tissue, producing a characteristic crackling sensation.[9]

The paranasal sinuses play a significant role in the spread of air into facial tissues, often leading to

emphysema secondary to trauma involving the frontal, naso-ethmoidal, or maxillary sinuses. Fractures of the sinus walls, coupled with tearing of the lining mucosa, allow air to escape into the surrounding facial soft tissues. [10] This is particularly noticeable in the periorbital region, where loose areolar tissue facilitates air accumulation. Among the paranasal sinuses, ethmoidal sinus fractures are the most frequently reported in the literature and are associated with a higher likelihood of edema in the periorbital region.[11]

Males are disproportionately affected due to their higher involvement in road traffic accidents and physical assaults. Fractures in these areas enable communication between the orbit, subcutaneous tissues of the face, and eyelids with air passageways. Most cases of periorbital SE result from defects in the medial orbital wall connected to the ethmoidal sinuses and, less commonly, from the maxillary sinus or retroseptal regions.[2]

However, this case report describes a rare presentation of SE localized to the maxillary region without significant fractures. Instead, only a hairline fracture of the frontal sinus was identified, an unusual finding compared to the typical patterns of SE reported in the literature.

Diagnostic and prognostic challenges

Radiographs serve as the primary diagnostic tool for cases of subcutaneous emphysema (SE). On radiographic imaging, SE typically appears as multilocular radiolucency, indicating the presence of air and often revealing displacement of anatomical structures. [12] Differential diagnoses for SE should include conditions such as allergic reactions, hematomas, angioedema, esophageal rupture, infections, and necrotizing fasciitis. [13] Aspiration of the affected area is contraindicated in suspected cases of SE or hematoma, as it can exacerbate the condition. Therefore, radiography remains the definitive diagnostic modality.

Management of SE is predominantly supportive, as the air within the tissues is usually reabsorbed naturally over 2 to 14 days. In most cases, no specific intervention is required beyond prophylactic antibiotic coverage, as the air introduced into the soft tissues is often contaminated. [14] Additional measures, such as asphyxia management, antihistamines may be prescribed to prevent further air infiltration. In severe cases, hospitalization may be necessary for close monitoring, along with serial follow-up radiographs to assess progression. [15]

Although SE is generally self-limiting and resolves without significant intervention, it can sometimes lead to serious local and systemic complications. Severe outcomes due to the displacement of anatomical structures by accumulated air may include vision loss, cranial nerve dysfunction, pneumothorax, and pneumomediastinum. [16,17,18,19] Additionally, the spread of contaminated air can result in infections such as cellulitis or deep space infections, potentially causing life-threatening complications.[17]

CONCLUSION

Subcutaneous emphysema (SE) associated with maxillary and anterior frontal sinus fractures, though uncommon, is a clinically significant condition requiring prompt recognition and management. The presence of SE indicates air infiltration into soft tissues, often originating from fractures involving the paranasal sinuses, nasal cavity, or oral cavity. In this

case, the combination of anterior frontal sinus and maxillary fractures resulted in SE, presenting with facial swelling, pain, and the potential for severe complications if left untreated.

Early identification, accurate imaging, and timely intervention are critical for managing such injuries effectively. Treatment primarily aims to alleviate symptoms, monitor for complications such as airway obstruction, and address the underlying fractures. While conservative management is sufficient in most cases, surgical intervention may be necessary for extensive fractures or the development of complications. In severe instances, aspiration or drainage of trapped air may also be required.

This case underscores the importance of considering SE in patients with facial trauma, particularly those with fractures involving the frontal sinus and maxilla. Prompt diagnosis and appropriate management are essential to prevent complications and improve patient outcomes.

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