Valsalva-type maneuver induced cervicofacial subcutaneous emphysema: A case report

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A B S T R A C T

Subcutaneous emphysema may occur as a result of surgery, trauma or infectious process, air is forced beneath the tissue and spread along the fascial planes. Conditions that increase intra-thoracic pressure such as excessive coughing, vomiting, sneezing or prolonged Valsalva maneuver may result in volutrauma, with subsequent subcutaneous emphysema. Due to its unclear presentation, diagnosis of subcutaneous emphysema may be delayed or even missed. In this report, a case of subcutaneous emphysema, after stress shouting and prolonged bout of coughing, is presented. Imaging studies were consistent with a diagnosis of subcutaneous emphysema. The patient responded positively to conservative treatment and discharged uneventfully. The clinical manifestations, pathogenesis and management of subcutaneous emphysema are discussed together with review of literature.

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1. Introduction

Cervico-facial subcutaneous emphysema is defined as the abnormal introduction of air or gas in the subcutaneous tissues of the head and neck. When gas/air is forced in the mediastinum the condition is called pneumo-mediastinum [1]. Subcutaneous emphysema (SCE) of the head, neck and mediastinum may arise secondary to a variety of etiologies, e.g. gas-forming germs, head and neck surgical procedures, oro-maxillofacial trauma [2,3]. Subcutaneous emphysema may complicate different dental procedures, where air is pressed into soft tissues via the air-driven handpieces [4]. Other SCE inciting factors include: incorrect wound suturing [5], Valsalva maneuver and Valsalva-type maneuvers e.g. coughing, sneezing, difficult defecation, childbirth, nausea, and vomiting [6,7]. We report uncommon case of cervicofacial and mediastinal emphysema after history of a stress shouting and vigorous coughing. The patient mainly required close vital signs and airway observation, together with antibiotic therapy. Early recognition of this unusual problem is essential in preventing life-threatening complications such as airway obstruction, mediastinitis and deep neck infection. Origin, presentation, diagnostic and therapeutic recommendations with literature review are included.

2. Case report

A 42-year old previously healthy male patient presented to Mubarak Alkabeer Hospital casualty-Kuwait with generalized tiredness and sensation of swelling in his face, neck and upper thorax. He had reported vigorous shouting and severe coughing few hours back. On presentation, he was afebrile conscious, breathing normally with respiratory rate of 18 breaths/minute and SpO2 of 98%. The patient was responsive but agitated. Electrocardiogram produced normal rhythm, with pulse rate of 100 beats/min and blood pressure of 150/80 mmHg. Routine laboratory tests were within normal limits. Patient was given 5mg diazepam intravenously for agitation. His blood pressure and tachycardia improved, after agitation came down. Physical examination revealed discomfort sensation, palpable significant swelling with characteristic crepitus around the eyes, over the cheeks and along the neck -more pronounced on the left side- and anterior chest wall, (Fig. 1).

However, there was no evidence of infection nor serious breathing problem. The patient denied a pre-existing trauma nor surgery. The rest of the physical examination didn’t reveal any clinical significant point. Plain skull and chest x-ray and computed
tomography (CT) of the head, neck and chest demonstrated significant air accumulation in the mediastinum, and soft tissue spaces of face and neck, confirming the clinical findings, (Figs. 2–7).

Patient was hospitalized and conservative management was instituted, consisting of parenteral nutrition, analgesics, antitussive and empirical antibiotic regime of Ceftriaxone 1 gm/day and Metronidazole 250mg/8h with close cardiac and respiratory monitoring. Daily observations revealed gradual resolution of the emphysema and the patient was discharged from the hospital after five days, with excellent outcome.

3. Discussion

Subcutaneous emphysema is characterized by a pathologic accumulation of air/gas in the soft tissues. It may occur spontaneously following conditions that lead to increase in intra-thoracic pressure such as bronchial asthma, severe coughing, severe vomiting, defecation, vaginal delivery, habitual Valsalva maneuver, and inhalational drug abuse like Heroin, Marijuana and Cocaine. The sudden increase in intra-thoracic pressure is a risk factor of alveolar over stretch and rupture with consequent tracking of air into the pulmonary interstitium. The air dissects the path of least resistance into the mediastinum and the fascial planes of the neck causing emphysema [6,7]. It could be developed by iatrogenic injury during dental and surgical therapies, mechanical ventilation, and invasive procedures such as bronchoscopy [4,8].

Fig. 1. Photograph of the patient showing swollen left side of face and neck, due to emphysema, "arrows".

Fig. 2. Posteroanterior radiograph of head and neck showing subcutaneous emphysema of face and neck, "arrows".

Fig. 3. Lateral radiograph of head & neck showing neck emphysema, "arrow".

Fig. 4. Lateral chest radiograph showing subcutaneous emphysema, where air is entrapped in the mediastinum, "arrow".

Fig. 5. Axial CT image showing emphysema of face, "arrow".
Subcutaneous emphysema associated with dental procedures, in the following order: dentoalveolar surgery, restorative dentistry, root canal therapy, and periodontal treatment, have been reported [4]. It is said that air is pressed into soft tissues via the high-speed air-driven handpieces, especially in procedures involving molar teeth. The roots of molar teeth are connected with the submandibular space, which communicates with the retropharyngeal space and mediastinum [3].

Subcutaneous emphysema could be precipitated by Boerhaave’s syndrome, and gas-forming infections [7]. Incorrect suturing of the wound may induce SCE due to improper positioning of the tissues to be sutured [5].

The differential diagnosis of rapid facial or neck swelling includes allergic reactions, cellulitis, angioneurotic edema and Melkerson-Rosenthal syndrome. Crepitus is pathognomonic sign of SCE. The absence of tactile crepitus may lead to some diagnostic difficulty.

Plain x-ray is helpful to establish/confirm diagnosis. Computed tomography is highly recommended to rule out any underlying disease and to identify air/gas extension. In our patient, x-ray and CT scan showed that free air was mainly dissecting the soft tissues of the face, neck and chest.

As emphysema is likely self-limiting and resolve fully within 7–10 days -depending on the initial amount of entrapped air [9], treatment is basically symptomatic and may be limited to reassurance of the patient, close observation and supplemental oxygen. Patients should be encouraged to discontinue smoking and habitual Valsalva maneuver.

The initial administration of 100% oxygen via a non rebreather mask hastens the resolution of the emphysema because the oxygen, which replaces air, is more readily absorbed [10].

Intravenous fluids, sedation, analgesia, steroids, antitussive, laxative, decongestant and/or antihistaminic need to be individualized for each patient, based on the underlying cause.

Surgical intervention is necessary in some cases, the need for exploratory surgery, emergency tracheotomy, and the placement of chest tubes have been reported [5,11].

Empirical antibiotics coverage against the risk of secondary infection is recommended especially if air enters the body through a contaminated route or in dental-related cases, since the introduction of air most likely include oral flora microorganisms [10].

4. Conclusion

Although SCE is relatively benign with rapid recovery once the cause is known and treated, tragic life-threatening complications –as airway obstruction, air embolism and mediastinitis–may arise from systemic spread of air, so astute examination, prompt diagnosis and effective management are crucial to reduce the incidence of its progression. It is worth mentioning that our patient did not experience any major complication.

References

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