

Subcutaneous emphysema, pneumo-orbita and pneumomediastinum following a facial trauma caused by a high-pressure car washer

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ABSTRACT

Pneumomediastinum is air leakage to mediastinal space from various potential sites, including lung, esophagus, trachea, and neck. It is a rare condition that develops either spontaneously with increased intraalveolar or intrabronchial pressure, or due to trauma. Although cases where face or neck trauma with subcutaneous emphysema that extended to mediastinal cavity via anatomical connections in face and neck have been reported, orbital traumas leading to pneumomediastinum are very rare occurrences that have seldom been reported. This paper documents a 17-year-old male who presented with diffuse subcutaneous emphysema involving paraorbital facial areas, which extended to neck and mediastinal cavity.

Key words: Facial trauma; pneumomediastinum; subcutaneous emphysema.

INTRODUCTION

Pneumomediastinum (PM) is presence of air in mediastinum. It is either spontaneous or traumatic. Although posttraumatic facial subcutaneous emphysema is a well-known complication of facial injuries, diffusion of gas into the mediastinum is uncommon. As such, only a few cases of pneumomediastinum (PM) following an isolated facial trauma have been reported.^[1]

The patient documented is a young male who presented with pneumo-orbita, subcutaneous emphysema, and pneumomediastinum after his left eye was hit by a high-pressure car washer.

CASE REPORT

A 17-year-old male presented to the emergency department with the inability to open his left eye because of severe left hemifacial pain and swelling that developed after his left eye was hit by a high-pressure car washer. He was hemodynamically stable, alert, and fully oriented. He had no loss of consciousness, visual disturbances, chest pain, or shortness of breath. His O₂ saturation was 98%. He had no heart or lung disease.

Physical examination revealed a widespread swelling and subcutaneous crepitation extending from scalp superiorly to 10th rib inferiorly, which involved left eye margin, zygomatic arch, left preauricular region, mandible, and neck (Figure 1). Breath sounds were normal and there was no evidence of airway obstruction or respiratory distress.

With an initial diagnosis of facial and cervical fracture with orbital and facial subcutaneous emphysema, pneumothorax, and pneumomediastinum, computed tomographies (CT) of head, neck, and chest were obtained. Head CT demonstrated no intracranial pathology or facial fractures. Axial section of the facial CT showed a hypodense appearance consistent with air between subcutaneous tissue planes in left temporal,

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Figure 1. The gross view of the patient's face. A marked left peri-orbital and hemifacial swelling is apparent. A small pinhole at the medial canthus is also seen, which is probably the entry point of high-pressure water from car washer.

bilateral paraseptal, bilateral intraorbital, and left retrobulbar areas. The coronal section of the neck CT demonstrated a diffuse hypodense appearance consistent with air that began from the mastoid portion of the temporal lobe and extended between the muscle planes caudally to thoracic inlet. Axial section of the neck CT showed a diffuse hypodense appearance consistent with air between the subcutaneous muscle planes and around the vascular structures at both sides of the neck (cervical subcutaneous emphysema). Axial section of the thorax CT showed diffuse hypodense appearance consistent with air in prevascular, paratracheal, and paraesophageal areas of mediastinum (pneumomediastinum). There was no pneumopericardium or pneumothorax. There was no sign of great vessel compression, either (Figure 2a-d). Based on these findings, the patient was diagnosed with pneumo-orbita, subcutaneous emphysema of face and neck, and pneumomediastinum. Ophthalmology and otorhinolaryngology consultations were requested. Ocular examination demonstrated a small, non-repairable laceration on the left lower medial canthus.

The patient was hospitalized and a conservative treatment including bed rest, intravenous antibiotic therapy, and cessation of oral feeding was begun. His subsequent course was uneventful, and he was discharged the fifth day upon resolution of pneumomediastinum in control chest X-ray and improvement of subcutaneous emphysema involving neck, face,

and left eyelid. The patient was examined weekly for the next three weeks and no long-term complications occurred.

DISCUSSION

Pneumomediastinum is the presence of extraalveolar air in mediastinum, first described by Laennec in 1819.^[2] It either develops spontaneously or as a result of trauma. Spontaneous pneumomediastinum is usually seen in healthy young persons as a result of rupture of peripheral pulmonary alveoli due to a sudden increase of intraalveolar pressure after an exaggerated Valsalva maneuver.^[3] Similarly, acute asthma attack,^[4] strenuous cough,^[5] vomiting,^[6] rapid vaginal birth,^[7] barotrauma,^[8] and even cocaine and similar drugs^[9] have all been reported to cause pneumomediastinum and subcutaneous emphysema by leading to increased alveolar and intrabronchial pressures.^[3,10] Traumatic pneumomediastinum, on the other hand, develops as a consequence of external head, neck, and thoracic traumas as well as iatrogenically with invasive medical procedures such as esophagoscopy, bronchoscopy, endotracheal intubation, and tooth extraction.^[1,10-14] Pneumomediastinum following cervicofacial emphysema is very rare and has been reported after orofacial trauma, head and neck surgery, or dental surgical procedures.^[11-16] Orbital trauma leading to periorbital subcutaneous emphysema extending to neck and mediastinum is a very rare occurrence.^[17] During isolated facial trauma, air may be forcefully introduced into the parapharyngeal and retropharyngeal spaces, follow the potential space at the prevertebral and fascial planes, and can lead to emphysema in the neck and mediastinum.^[13,18,16] Air may pass to neck and mediastinum from the fascia of the the eye-socket rim, antero-superior pharynx, or sublingual and submental areas. Hence, no evidence of pneumothorax or tracheal and esophageal disruption was noted in the workup as an alternate explanation of pneumomediastinum. From a mechanistic viewpoint, laceration of the medial canthus may have provided a route for high-pressure water-air jet into the subcutaneous tissue in our patient. Generally, high pressure, high energy traumas are necessary to introduce air into subcutaneous tissues of face, neck, and down to mediastinum. Given that the commercial car washing companies use high-pressure car washer units with a water pressure of 3,000 - 6,900 PSI, the force our subject was subjected to was sufficient to drive air down to mediastinum.

Clinical presentation of such patients is quite variable, ranging from subtle symptoms to life-threatening acute respiratory distress syndrome (ARDS). Chest pain, odinophagy, subcutaneous emphysema, dyspnea proportional to mediastinal compression, cyanosis, and pneumothorax are usually the most common symptoms.^[7] Subcutaneous air often accompanies pneumomediastinum whereas pneumothorax is present in approximately 50% of cases.^[16]

Depending on presentation, initial diagnostic workup of pneumomediastinum may involve a chest X-ray which may

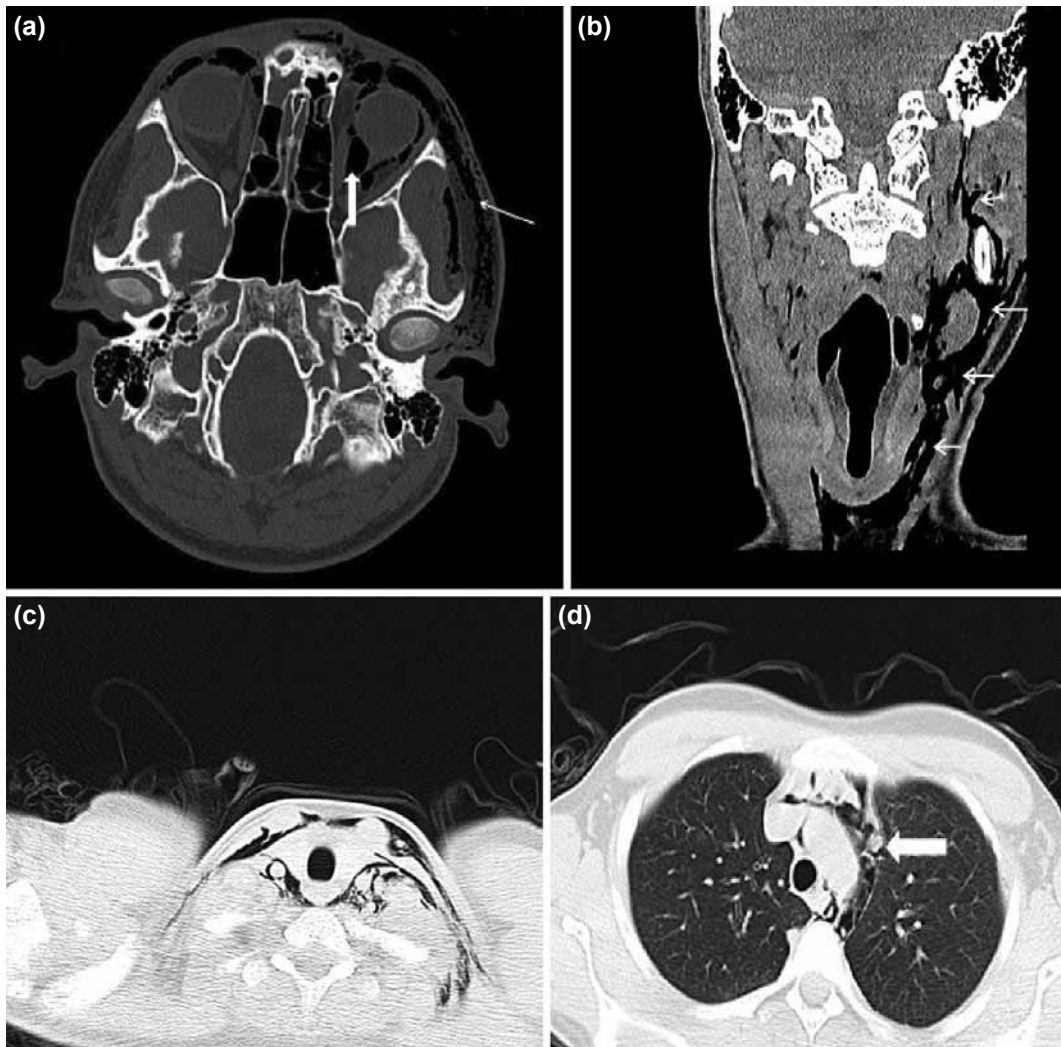


Figure 2. (a) Axial section of the facial CT shows a hypodense appearance consistent with air (white arrow) between subcutaneous tissue planes in left temporal (thin arrow), bilateral paraseptal, bilateral intraorbital and left retrobulbar (thick arrow) areas. (b) Coronal section of the neck CT shows a diffuse hypodense appearance consistent with air (white arrows) that begins from the mastoid portion of the temporal lobe and extends between the muscle planes caudally to thoracic inlet. (c) Axial section of the neck CT shows a diffuse hypodense appearance consistent with air between the subcutaneous muscle planes and around the vascular structures at both sides of the neck (cervical subcutaneous emphysema). (d) Axial section of the thorax CT shows diffuse hypodense appearance consistent with air (white arrow) in prevascular, paratracheal, and paraesophageal areas of mediastinum (pneumomediastinum).

show an air column between left heart and the mediastinal pleura.^[19] However, CT is more sensitive in diagnosis.^[16] We proceeded directly to CT due to massive subcutaneous emphysema extending to thoracic region, which raised the possibility of pneumomediastinum, pneumothorax or pneumopericardium, conditions severe enough to warrant rapid diagnosis.

In most cases the pneumomediastinum is a self-limiting condition that improves with conservative treatment,^[1] as in our patient. The treatment approach usually consists of conservative management (bed rest, painkillers, antibiotics, and avoiding valsalva maneuver) if no tracheal or esophageal injury or

a source of air leakage such as a large bulla or a bleb is present. Caution should be exercised with noninvasive or invasive positive pressure ventilation.^[1] Complications of pneumomediastinum are rare and mostly temporary. However, large volumes of air may lead to a condition called tension mediastinal emphysema characterized by compression of great vessels, diminished venous return, and hypotension, and requires mediastinotomy.^[1] Severe cases can be managed with mediastinal needle aspiration, cervical mediastinotomy, tracheostomy, or urgent thoracotomy.^[20]

In conclusion, pneumomediastinum is a condition with high morbidity and mortality. It may develop as a result of blunt

neck, face, and eye traumas even with no concurrent tracheal or esophageal injuries, and pneumothorax may accompany it.

Conflict of interest: None declared.

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OLGU SUNUMU - ÖZET

Yüksek basınçlı oto yıkama sonucu oluşan yüz travması sonrası gelişen cilt altı amfizemi, pneumo-orbita ve pnömomediastinum

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Pnömomediastinum akciğer, özefagus, trakea ve boyun olmak üzere çeşitli potansiyel bölgelerden mediastinal boşluğa hava sızıntısının olmasıdır. İntraalveolar veya intrabronşial basınç artışı sonucu kendiliğinden veya travma sonucu gelişen nadir bir durumdur. Yüz veya boyun travması sonucu meydana gelen cilt altı amfizemin yüz ve boyunun anatomik bağlantıları yoluyla mediastinal boşluğa yayılımı bildirilmiş olmasına rağmen, Orbita travması sonucu meydana gelen pnömomediastinum çok nadir bir durumdur ve sadece birkaç raporda bildirilmiştir. Bu olguda 17 yaşında erkek hastada paraorbital ve yüz alanlarındaki yaygın cilt altı amfizemin boyuna ve mediastinal boşluğa yayılımı sunuldu.

Anahtar sözcükler: Cilt altı amfizemi; pnömomediastinum; yüz travması.

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