

## Case Report

# **Pneumomediastinum and subcutaneous emphysema due to blunt neck injury: A case report and review of the literature**

Ozgur Sogut,<sup>1</sup> Muazzez Cevik,<sup>2</sup> Mehmet Emin Boleken,<sup>3</sup> Halil Kaya,<sup>4</sup> Mehmet Akif Dokuzoglu<sup>5</sup>  
Department of Emergency Medicine,<sup>1,4,5</sup> Department of Pediatric Surgery,<sup>2,3</sup> Medical Faculty, Harran University, Sanliurfa, Turkey.

### **Abstract**

Minor blunt neck injury from childhood trauma is a relatively common condition which can be potentially life-threatening in only rare circumstances. Pneumomediastinum may develop in up to 10% patients who have sustained blunt cervical or thoracic trauma and may be a significant cause of morbidity and mortality in affected individuals because of the associated damage to the oesophagus, larynx or trachea. Management of this condition varies from conservative approach with close observation and antibiotherapy to surgical interventions, depending on the extent and severity of aerodigestive injuries.

We present a paediatric blunt neck trauma accompanied by subcutaneous emphysema and pneumomediastinum secondary to a bicycle accident (neck striking the handlebar). Its radiologic appearance, clinical presentation, and the options for initial management in the emergency department (ED) are reviewed.

**Keywords:** Blunt neck trauma, Bicycle accident, Child, Pneumomediastinum subcutaneous emphysema.

### **Introduction**

Blunt trauma to the neck typically results from motor vehicle crashes (dashboard syndrome) in childhood, but also occurs with bicycle accidents (neck striking the handlebars), falls (neck striking an object) and sports-related injuries (eg, minibike, snowmobile, water jet ski, clothesline tackle).<sup>1</sup> Impact to the exposed anterior aspect of the neck may crush the larynx or the trachea, particularly at the cricoid ring, and compress the esophagus against the posterior spinal column. The air ascends along the mediastinum toward the subcutaneous space of the neck, causing cervicofacial subcutaneous emphysema.<sup>2</sup> Pneumomediastinum following cervicofacial emphysema has a benign etiology, caused by extension of a pneumothorax through a pleural tear, air dissection around the bronchovascular sheath (the Macklin effect), or microperforations that are not clinically apparent.<sup>3</sup>

Cervicofacial emphysema and pneumomediastinum are rarely observed and have been reported in relation to dental surgical procedures, sequelae of surgical intervention in the upper aerodigestive tract, or orofacial trauma.<sup>4-6</sup> They may cause a potentially life-threatening condition but the

majority of cases are self-limiting and benign. Symptoms include chest pain, neck pain, dyspnoea and pain with swallowing (odynophagia).<sup>5</sup> Management of this condition varies from conservative approach with close observation in the intensive care unit (ICU) and antibiotherapy to laryngotracheal or esophageal reconstruction, depending on the patient's haemodynamic status, the clinical evidences and severity of aerodigestive injuries.<sup>7,8</sup>

A case with subcutaneous emphysema and pneumomediastinum occurring after bicycle accident (neck striking the handlebar) in a 6-year-old child is presented. This report highlights this unusual condition and its radiologic appearance, clinical presentation, and the options for initial management in the emergency department (ED).

### **Case Report**

A 6-year-old male was brought to our ED by paramedics with the complaints of neck pain and odynophagia after accidentally falling onto his bicycle. He had reported having struck the anterior upper neck by the handlebars of the bicycle. There were no additional episodes of chest pain or odynophagia before arrival to the ED. No



Figure-1: Anterior aspect of the patient's neck with ecchymosis and cervicofacial swelling are present.

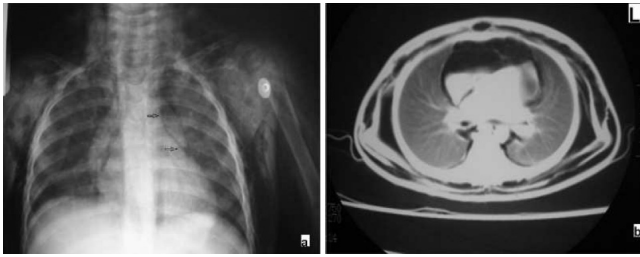


Figure-2: (a) Posteroanterior chest radiograph. Extensive cervical and bilateral axillary subcutaneous emphysema are seen. The radiolucent lines beside the aorta indicate the mediastinal emphysema (black arrows). (b) Thorax computed tomography showing massive subcutaneous emphysema with pneumomediastinum.

history of current illnesses or surgery were reported.

On physical examination, the anterior aspect of the neck was tender with ecchymosis, facial swelling and crepitus (Figure-1), extending along the neck and anterior chest wall, down to the abdomen and scrotum. There was no bleeding or signs of trauma to the mouth or oropharynx. Also, he had no difficulty in breathing, chest pain, or voice change. The lungs were clear to auscultation, and there was good air movement. The heart rhythm was regular; heart sounds were normal; and there was no murmur. The anterior chest wall was tender with crepitus. No abnormalities were seen in the neurological examination. Her initial vital signs revealed a heart rate of 102 beats per minute, blood pressure of 105/74 mm Hg mm Hg, respiratory rate of 20 breaths per minute, temperature of 36.7°C, and a pulse oximetry of 97% on a nonrebreather mask. The initial chest radiograph showed subcutaneous emphysema in the cervicofacial, thoracic, and bilateral axillary regions with no evidence of rib fracture (Figure-2a). The computed tomography (CT) scan without intravenous contrast of the chest demonstrated extensive pneumomediastinum and subcutaneous emphysema but no pneumothorax (Figure-2b). The patient was transferred to the paediatric surgery for close observation in paediatric surgery ICU. Antibiotic therapy was administered to prevent mediastinitis. Acetaminophen 15 mg/kg was given intravenously every 4-6 hours as needed for neck pain. During the following days in the ICU, the patient's clinical condition had improved notably with progressive decrease of the cervicofacial emphysema and neck pain. On the fifth hospital day, total resolution of the cervical emphysema and pneumomediastinum was detected in the control radiographs. He was discharged home later that day. Medications included orally 400/57 mg amoxicillin/clavulanic acid twice a day for 7 days and orally 15 mg/kg acetaminophen every 6 hours for 5 days. At follow-up 2 weeks later, the patient had no complaints of neck pain or odynophagia.

## Discussion

Serious anterior neck injuries from childhood trauma are rare. The high position of the larynx, the relatively larger

mandible, and the shorter neck of a child protect the larynx and trachea airway.<sup>1</sup> Also the mobility and the pliability of the paediatric airway structures make it less prone to fractures and thus reduce injury severity.<sup>9</sup> Blunt trauma to the neck can result in a wide range of injuries to the larynx, trachea, or both. Injuries to other structures in the neck include the cervical spine, oesophagus, vascular, and nerve.<sup>1,9</sup> Tracheobronchial injury, a rare but potentially fatal condition, results from blunt or penetrating chest or neck trauma and has different clinical signs.<sup>2</sup> These include signs of soft tissue injury (e.g., redness, ecchymosis, swelling, tenderness) to the anterior neck, subcutaneous emphysema, pneumomediastinum or deformity to the cartilaginous landmarks.<sup>2,9</sup>

Despite the fact that pneumomediastinum and subcutaneous emphysema following severe blunt thoracic or cervical trauma is often considered an indicator of serious aerodigestive injury, a major aerodigestive tract injury is seen in approximately 7% of patients with blunt trauma pneumomediastinum.<sup>8</sup> Radiographic and endoscopic studies are recommended to evaluate patients for the aerodigestive injuries.<sup>9</sup> Posteroanterior and lateral radiographs are usually helpful for diagnosis of pneumomediastinum, as posteroanterior chest radiographs typically demonstrate a radiolucent line between the left heart border and the mediastinal pleura.<sup>10</sup> However, radiographic imaging may not be as accurate in assessment of the severity and extent of injury. CT scan is great accessibility in identifying patients with a high likelihood of serious aerodigestive tract injury, also in visualizing the level of rupture and its consequences with respect to the pulmonary parenchyma.<sup>4,7</sup>

In the present case, the initial physical examination showed important cervicofacial and thoracic subcutaneous emphysema. The chest radiograph and thoracic CT confirmed these clinical findings and revealed the presence of pneumomediastinum. Complementary diagnostic procedures hence recommend (microlaryngoscopy, bronchoscopy, esophagoscopy) are often performed for the evaluation of all pneumomediastinum patients to exclude a major aerodigestive tract injury.<sup>8,10</sup> However, the efficacy of such testing in otherwise stable children with pneumomediastinum is controversial.<sup>10</sup> It has been hypothesized that pneumomediastinum after blunt trauma in clinically stable children is rarely associated with significant underlying injury.<sup>8</sup> The clinical significance of isolated pneumomediastinum in the stable blunt trauma patient remains unclear. This leads to significant challenges in the management of the following patients: in certain cases, pneumomediastinum may represent a harbinger of severe thoracic injury in children, although in other instances, there may actually be no aerodigestive injury present.<sup>8,10</sup> In the present case, there was no clinical evidence of aerodigestive

injury (e.g, dyspnoea, chest pain, shortness of breath), so further diagnostic testing was not necessary for determining the presence of aerodigestive injury. The extent and severity of aerodigestive injuries determine the definitive management of pneumomediastinum resulting from blunt trauma in patients. Conservative management consisting of intensive care unit observation, humidified oxygen and antibiotic has been suggested in these patients who are haemodynamically stable and have no clinical signs of aerodigestive tract injury.<sup>8</sup> It has been stated that pneumomediastinum without pneumothorax often can be treated conservatively; however, the onset of massive pneumomediastinum and pneumothorax may necessitate both tracheotomy and tube thoracostomy as initial treatment.<sup>10</sup> Pneumomediastinum with the presence of clinical findings regarding tracheobronchial injuries confirmed by diagnostic testing may require tracheostomy or primary repair of the injury with possible stenting.<sup>1,8,10</sup>

### Conclusion

In conclusion, as illustrated in our case, haemodynamically stable children with pneumomediastinum after blunt neck injury with no other identifiable injuries can be observed alone in ICU without invasive testing or repeat imaging. The goals of such management would be to limit unnecessary tests, while ensuring that significant

aerodigestive injuries are not overlooked. CT scan is of great value in determining patients who can be safely observed, and those who require further evaluation for pneumomediastinum.

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