

## A Simple Approach to traumatic Pneumomediastinum in an Emergency Situation

### Travmatik Pnömomediastinuma Acil Durumda Uygulanan Basit ve Etkin Bir Yaklaşım

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#### ABSTRACT:

Pneumomediastinum is an important and a life-threatening complication of blunt thorax traumas. A 2-year-old male patient was admitted to our local emergency department after a domestic accident. He had breathing difficulty and severesubcutaneous emphysema in the neck and trunk region bilaterally. Supine chest radiograph and thorax CT revealed extensive subcutaneous and mediastinal air. The patient was tried to referral to a tertiary center due to lack of chest surgery team and pediatric intensive care unit in our local hospital. Unfortunately, referral was not succeeded because of a terrible snowstorm. The patient's blood oxygen saturation started to decrease just after the imaging tests. A needle subcutaneous drainage with an underwater seal was performed on the sternum in this critical situation. The patient's breathing difficulty and subcutaneous emphysema in the neck started to resolve after this procedure. The conservative vital sign monitoring and close follow-up were performed until the snowstorm ends. The patient hasn't had any breathing difficulty or shortness of breath after this procedure and subcutaneous emphysema has been completely resolved within a few hours. We present here a simple and life-saving approach to pneumomediastinum and subcutaneous emphysema in an emergency situation. This procedure can save time for reconsideration and transfer to a referral center in emergent situations.

**Keywords:** Trauma, pneumomediastinum, subcutaneous emphysema, needle drainage

#### ÖZET:

Pnömomediastinum, küntorakstravmaları sonrası görülebilen önemli ve hayatı tehdit eden komplikasyonlardandır. Hastanemiz acil servisine ev kazası sonrası gelişen, boyunda şişlik ve solunum sıkıntısı nedeni ile başvuran 2 yaşında hasta sunulmaktadır. Hastanın ilk değerlendirilmesinde boyunda ve toraks ön duvarında krepitasyon veren cilt altı amfizemi ve solunum sıkıntısı mevcuttu. Direkt grafi ve Toraks BT incelemeleri; cilt-altı amfizem ve mediastende serbest hava ile uyumlu olarak değerlendirildi. İlçe hastanemizde göğüs cerrahisi ekibi ve çocuk yoğun bakım ünitelerinin bulunmaması nedeni ile bir üst merkeze sevki planlandı. Ancak şiddetli fırtına nedeni ile ilçe yolları kapalıydı ve transfer işlemi gerçekleştirilemedi. Görüntüleme tetkiklerinin hemen ardından hastanın kan oksijensaturasyonu düşmeye başladı ve solunum gücü belirginleşti. Sternum anteriorundan intrakret yardımı ile ponksiyon yapıldı ve hazırlanan su-altı drenaj ünitesine bağlandı. İşlem sonrası hastanın cilt altı amfizemi geriledi ve kan oksijen saturasyonu yükselmeye başladı. Hastanın yakın konservatif takibi ve vital bulgu monitorizasyonu yapılmaya başlandı. İşlemden birkaç saat sonra cilt altı amfizemi tamamen geriledi ve hastanın solunum sıkıntısı kalmadı. Bu yazıda, pnömomediastinum ve cilt altı amfizeme acil durumlarda uygulanabilecek etkin ve basit bir yöntem sunulmaktadır. Bu yöntemin uygulanması ile hastanın transferi için zaman kazanılabilecek ve yeniden değerlendirme şansı bulunacaktır.

**Anahtar Kelimeler:** Travma, pnömomediastinum, cilt-altı amfizem, iğne drenaj

## INTRODUCTION:

Thorax traumas are very important and life threatening situations in emergency departments (1). Breathing difficulty and great vessel injuries are devastating complications of thorax traumas. Lung or pleural injuries, tracheobronchial tree damages or any kind of chest wall injury can be a cause of breathing difficulty (2). Traumatic pneumomediastinum (PM) may be the cause of severe breathing problems and serious complications in pediatric cases. The major clinical findings of PM are chest pain, subcutaneous emphysema, dyspnea, and Hamman's sign (3). Chest radiography and CT imaging are very useful for the diagnosis and etiopathogenesis. Treatment choices depend on the vital signs varying between conservative vital sign monitoring to emergency thoracotomy (2).

We present a simple approach to PM with breathing difficulty in an emergency situation.

## CASE REPORT:

A 2 year-old boy sustained a blunt trauma following by a bookcase fall onto his chest and was admitted to our emergency department an hour later with a complaint of breathing difficulty and swelling in the neck bilaterally. His first physical examination revealed with a subcutaneous emphysema and crepitation on the neck and trunk region bilaterally. Breath sounds were short and deeper. A crunching sound synchronous with heartbeats was detected on auscultation. The patient was afebrile with a respiratory rate of 35. His blood oxygen content was stable at about 90-92 % on room air. A posteroanterior chest radiograph showed air collections surrounding the mediastinal structures

and marked subcutaneous emphysema in the neck region and left chest wall (Figure 1).

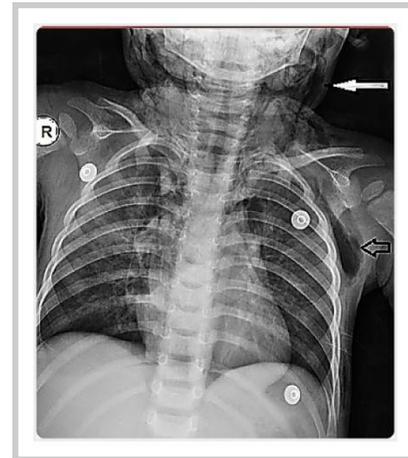


Figure 1. Posteroanterior chest radiograph reveals air collections surrounding the mediastinal structures and marked subcutaneous emphysema in the neck region and left chest wall (black and white arrows). A minimal extrapleural air is also noted adjacent to the fourth lateral rib.

A minimal extra-pleural air was also noted adjacent to the fourth lateral rib. Chest CT confirmed radiographic findings and also revealed the presence of contusion and laceration in the right upper lobe (Figure 2a).

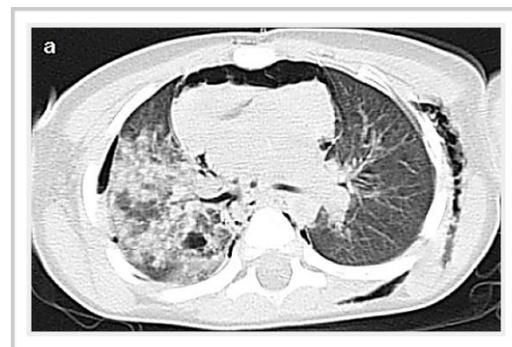


Figure 2a. Pneumomediastinum and minimal extra pleural air collections, extensive patchy areas of air space consolidations consistent with contusion and a bleb as a result of laceration in the right upper lobe are seen on axial chest CT (lung window).

Cervical CT also showed extensive subcutaneous emphysema (Figure 2b).

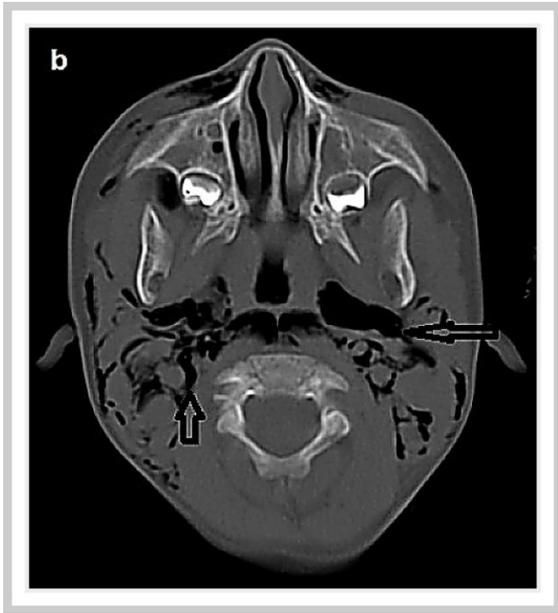


Figure 2b. Massive subcutaneous emphysema dissecting along the layers of cervical fascia is seen on axial cervical CT (black arrows).

As our local hospital team didn't have a thoracic surgery team and pediatric intensive care unit, we decided to transfer the patient to a tertiary referral center but the transferring process was not possible due to the snowstorm. The respiratory difficulty and blood oxygen content started to get worse within one hour despite nasal oxygen therapy. The patient was settled to supine position and land-markers were marked (Figure 3).

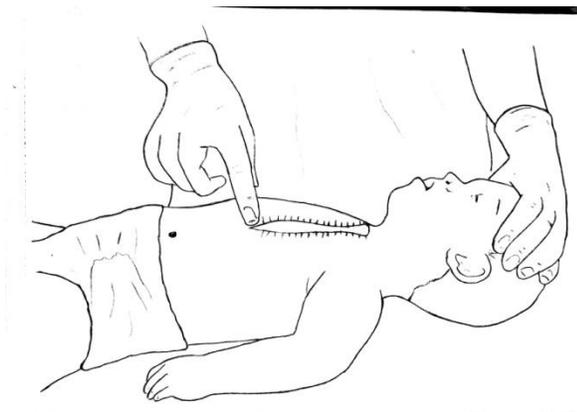


Figure 3: Examining the operation area.

A 16-gauge IV cannula (Grey) was inserted into the subcutaneous space on the sternum at a 30 degree angle. The needle was removed and the intracath was redirected to the horizontal plane for full insertion. The intracath was connected to an underwater seal drain with an intravenous infusion line cable (Figure 4).



Figure 4: Illustration of the patient at the end of the procedure.

Air evacuation was observed after setting up this closed system. A soft compressive massage was applied by nurses towards the draining angiocath every thirty minutes. The patient's symptoms started to improve after this simple procedure. Blood oxygen content started to increase and reached 96 % two hours later. The patient was transferred to a tertiary referral center the next day when the snowstorm stopped.

The patient was closely observed in a university hospital and discharged five days later. He had no complaints at postprocedural second month.

#### DISCUSSION:

Blunt chest trauma may lead to a rupture of marginally situated alveoli into the pulmonary interstitial space, with tracking of air along the bronchovascular connective tissue planes towards the hilum and mediastinum (4). The presence of air inside the mediastinum is named as

'pneumomediastinum' (5). Subcutaneous emphysema may coexist when the air escapes from the mediastinum into the subcutaneous and deep tissues of the neck. The clinical symptoms of pneumomediastinum include chest pain, dyspnea, dysphagia, dysphonia, cough, palpitation, anxiety, sore and hemoptysis. A cracking sound over the cardiac apex which was first described by Hamman in 1939 can be heard on auscultation (6).

On posteroanterior and lateral chest radiographs, subcutaneous emphysema and radiolucent streaks of air that outlines the mediastinal structures are seen and there are several radiological signs depending on the depiction of normal anatomic structures. CT of the chest can be used when the diagnosis is unclear or when there is a clinical suspicion of another pathology (7,8).

The treatment of PM depends on vital sign monitoring and close observation. Breathing with high flow oxygen may improve clinical symptoms. Emergency surgeries and thoracotomy may sometimes be necessary in persistent cardiorespiratory failure. The vital sign monitoring is more important in pediatric cases due to immature compensation ability. The stability of cardiorespiratory findings in pediatric cases is very critical and delicate. The minimally invasive methods are more important in pediatric cases to save time for transfer.

Numerous techniques have been reported to treat PM that include placing chest tubes, infraclavicular blow holes, tracheotomy, subcutaneous pig-tail, bore drains and/or large-bore drains (9). The utility and efficiency of many techniques are controversial. These invasive techniques need surgical experience and advanced equipment. The IV angiocath drainage is an alternative and effective way to treat PM in emergency situations and doesn't need surgical

expertise (10). The required instruments are very simple and widely available in each emergency room and ambulances. The technique is relatively safe, very effective, painless and easy to perform at bedside. It can save time for reconsideration and transfer to a referral center in urgent situations like earthquake, snowstorm and accidents.

In conclusion, we observed that this minimally invasive procedure was simple and very effective in our patient. We propose that this technique may be the first line therapy for symptomatic pediatric cases in an emergency situation.

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