Pneumoscrotum: Value as an early diagnostic sign of tension pneumothorax in blunt thoracic trauma

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ABSTRACT

Pneumoscrotum is a rare complication that can result from various etiologies and can be essential in the diagnosis of those causative factors, especially life-threatening ones such as infection or trauma. We present here a case of a patient who presented in posttraumatic cardiac arrest and an extensive, grossly obvious, and rapidly expanding pneumoscrotum. Based on our patient’s clinical presentation and a history of a high-speed mechanism with obvious torso trauma, a diagnosis of tension pneumothorax was quickly made resulting in immediate treatment. We review the existing literature and highlight the importance of pneumoscrotum in aiding with differential diagnosis. The presence of pneumoscrotum is often benign; however, in the right clinical setting, it can be an extremely important and useful clinical tool for the early identification and timely treatment of life-threatening diagnoses, such as tension pneumothorax.

Key Words: Blunt thoracic trauma, pneumoscrotum, tension pneumothorax

INTRODUCTION

Pneumoscrotum is a condition that is defined by air within the scrotal sac. It comprises two presentations: scrotal emphysema and pneumatocele. The condition is not a primary entity, but rather secondary to other causes. Clinically, it is generally a painless condition and presents as a swelling of the scrotum and crepitus on palpation.

In some etiologies such as a scrotal infection in Fournier’s gangrene, the air originates directly within the scrotal sac. However, in rare cases, the origin of the air may be extrascrotal and may track from the chest or abdomen. The proposed mechanism of extrascrotal spread is via a patent processus vaginalis which can be present in up to 15%-30% of adults or through dissection through the pneumomediastinum, Scarpa’s fascia in the abdominal wall, or retroperitoneal tissue down to the scrotal sac. This extrascrotal air is iatrogenic in 50% of cases from invasive procedures such as colonoscopies or secondary to either blunt or penetrating thoracoabdominal trauma. Consideration of the differential diagnosis of an enlarging scrotum is therefore particularly important as pneumoscrotum can arise from extra-genital anatomic locations and misdiagnosis of these conditions can be potentially fatal.

The first incidence of pneumoscrotum was reported in 1912 following a nephrostomy, and in the following century, few cases have been reported in the literature with only 59 incidences documented between 1972 and 2013, with a variety of etiologies described including introduction of air within the pleural or abdominal cavities and local infections such as with Fournier’s gangrene.

Of these etiologies, the true incidence of pneumoscrotum secondary to blunt thoracic trauma and tension pneumothorax is unknown due to the scarcity of literature on the specific topic, and on our review, there are only a handful of reported cases of pneumoscrotum.
overall in the English literature.[1-16] Given the precedence for this pathophysiology and the life-threatening etiologies, such as pneumoperitoneum or pneumothorax, the importance of finding a cause for a pneumoscrotum in the setting of trauma should not be overlooked. As we witnessed, this finding can lead to earlier diagnosis, but more importantly, timely, life-saving intervention. We present here a case that highlights this point for a trauma patient at our Level 1 trauma center with pulseless electrical activity cardiac arrest of unknown etiology with a tension pneumothorax diagnosed and treated solely on the presence of pneumoscrotum.

**CASE REPORT**

The patient is a 37-year-old male who arrived at our institution as Level 1 trauma activation after an unwitnessed motorcycle collision. The Emergency medical squad (EMS) unit that responded to the scene found the patient several feet from the motorcycle in asystole. Advanced cardiac life support (ACLS) was initiated at the scene, but the patient remained in asystole on arrival to the trauma bay despite 10 min of ACLS during prehospital transport. The ACLS protocol was continued and advanced trauma life support (ATLS) was initiated. The airway was secured with an oral endotracheal (ET) tube immediately upon arrival for airway protection, given the patient was unresponsive Glasgow coma scale (GCS) was 3. Auscultation of the lungs revealed bilateral breath sounds in the anterior lung fields with pulse oximetry readings of > 92%. Of note, there were moderate difficulty and increased resistance during bag-mask ventilation despite confirmation of correct ET tube placement. There were no palpable carotid pulses or femoral pulses appreciated. There was no jugular venous distention (JVD) noted. Exposure of the patient revealed large abrasions on the chest and abdomen, but no palpable chest crepitus or broken ribs were observed. Pupils were equal, round, and reactive bilaterally. The patient remained asystolic on cardiac monitoring during the initial pausing of chest compressions for re-evaluation.

Given the persistent asystole, our differential was broad including cardiac tamponade, pulmonary thromboemboli, hemorrhage, and tension pneumothorax. Given the continuous compressions being delivered, the decision was made to forego a chest X-ray, and instead, multiple cardiac views were obtained with a bedside ultrasound during the pulse check. These revealed no cardiac activity or signs of cardiac tamponade. Repeat physical examination revealed no JVD and equal breath sounds. As ACLS continued for 10 min with two total rounds of epinephrine, given the patient began to desaturate on pulse oximetry, and it was noted that there was significant and rapid scrotal enlargement. Based on the trauma attending’s clinical experience and knowledge of traumatic pneumoscrotum to be associated with thoracic pathology and pneumothorax in a pneumothorax with rapidly progressing tension physiology was suspected. Bilateral needle decompression was performed with 14-gauge needles in the second intercostal space of the mid-clavicular line noting a rush of air immediately from the left hemithorax, confirming our clinical suspicion. A 32-Fr chest tube was placed subsequently, and on entering the thoracic cavity with the Kelly forceps, additional evacuation of air was noted resulting in a significant decrease in resistance of bag-mask ventilation. However, despite the early identification and treatment of occult tension pneumothorax and appropriate ACLS and ATLS efforts for approximately 20 min, return of spontaneous circulation was not achieved and the patient was pronounced.

**DISCUSSION**

In terms of chest pathology as the primary etiology for pneumoscrotum, there have been cases reported due to procedural etiologies, including chest tube insertion, tracheal intubation, and pulmonary resection. Of these, 12 cases reported in the existing literature have been secondary to pneumothorax with six specifically reported to have blunt thoracic trauma as the inciting incident.[6-14] Diagnosis of pneumoscrotum was made in four of these cases during the initial trauma assessment and before the diagnosis of a pneumothorax via physical examination or imaging including chest X-rays or computed tomographic scans, while the remaining two cases noted the presence of pneumoscrotum incidentally on imaging that captured the scrotal sac or on tertiary surely. However, none of these previous case reports describe the use of a rapidly expanding pneumoscrotum as a diagnostic sign of an acute tension pneumothorax and its potential usefulness and application during the initial resuscitative phase of trauma care such as ours.

Given the presence of pneumoscrotum in the setting of pneumothoraces in the previous reports and the findings from our case report, we believe that further diagnostic maneuvers should be performed or intervention should be considered to relieve potential acute pulmonary pathology. This may be done on the basis of a physical examination finding in the absence of other findings other than a rapidly expanding pneumoscrotum during a trauma survey such as in our case or when confirmed with diagnosis with imaging or other clinical symptoms if the patient is stable. In a trauma setting, confirmatory imaging studies may be more time-consuming and can interrupt essential resuscitative efforts that can be the difference between survival and death. It should be noted that the absence of a pneumoscrotum does not rule out a
pneumothorax, though with a history of blunt thoracic trauma, the presence of pneumoscrotum should increase clinical suspicion.

In our case, the patient was in critical condition with an already high likelihood of mortality on arrival with low GCS and in cardiopulmonary arrest, requiring significant intervention and support. During a routine trauma survey, a diagnostic chest X-ray would be performed rapidly after the primary survey and likely revealed the pneumothorax. However, the patient had continued requirements for chest compressions and thus prevented the time-consuming positioning of the machine and patient, as well as the imaging. Had an X-ray been performed, earlier intervention may have been possible, and the cause of asystole may have been relieved. In addition, the usual diagnostic signs including lack of breath sounds on the affected side, JVD, and tachycardia were not present on our survey, which limited our suspicion until the pneumoscrotum developed approximately 10 min after arrival to the hospital, and total 20 min after ACLS was initiated in the field. The significant time interval to development may have been the time for the air to track through the fascia from the thoracic cavity to the scrotum. As shown in the literature, pneumoscrotum did not immediately develop in iatrogenic or traumatic causes and was only noted after various time points. In our patient case, the continuous chest compressions likely exacerbated the air tracking, leading to the more rapid development compared to the literature cases.

It is important to note here that the pneumoscrotum itself is not a condition that requires treatment and will resolve spontaneously over time in most cases without significant consequences. Rather, it is the etiology of this complication that should be sought after and treated, though initial diagnosis may be difficult without appropriate workup of all potential etiologies. In the case of traumatic chest pathology resulting in conditions such as pneumothoraces, chest tubes should be placed to evacuate additional air from the thoracic cavity. If the patient is not in critical condition, thoracic CT or imaging with a chest X‑ray can help confirm the diagnosis. Prompt recognition in the trauma setting may lead to expedited therapy and reduction of morbidity and mortality.

CONCLUSION

In the setting of acute blunt thoracic trauma and an asystolic patient with no other defined cause, the finding of a rapidly expanding pneumoscrotum should be considered as a diagnostic sign of a potential tension pneumothorax, leading to immediate and appropriate treatment. If the patient is not in critical condition, further diagnostic maneuvers to identify clinical signs or imaging with a chest X‑ray can help confirm the diagnosis. Prompt recognition in the trauma setting may lead to expedited therapy and reduction of morbidity and mortality.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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