

Massive Subcutaneous Emphysema with Pneumoscrotum Following Penetrating Chest Trauma Successfully Managed with Improvised Foley Catheter Thoracostomy Drainage in a Resource-Limited Setting: A Case Report

Chiwendu Uchechukwu ISIAKPONA

chiwendu.isiakpona@bowen.edu.ng

Bowen University Teaching Hospital

Imri Goodness Adefokun

Bowen University Teaching Hospital

Temitomi Jane Oyedele

Bowen University Teaching Hospital

Adewumi Ojeniyi Durodola

Bowen University Teaching Hospital

Isaac Olusayo Amole

Bowen University Teaching Hospital

Stephen Adesope Adesina

Bowen University Teaching Hospital

Elugwaraonu Augustine Agbakwuru

Bowen University Teaching Hospital

Samuel Uwale Eyesan

Bowen University Teaching Hospital

Case Report

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Abstract

Background

Massive subcutaneous emphysema with pneumoscrotum following penetrating chest trauma is uncommon and may indicate significant underlying thoracic injury.

Case Presentation:

A 35-year-old man presented two days after a stab wound to the left chest with progressive swelling involving the neck, chest wall, left upper limb, and scrotum. Examination demonstrated extensive crepitus. Chest radiography showed a left pneumohemothorax, atelectasis, and extensive subcutaneous emphysema.

Management and Outcome:

Because a standard chest drainage system was unavailable, an improvised thoracostomy drainage system using a 22-French Foley catheter connected to a urinary drainage bag was inserted. Progressive resolution of the subcutaneous emphysema occurred, and the drain was removed after seven days. The patient made a complete recovery.

Conclusion

This case highlights the rare occurrence of pneumoscrotum following penetrating chest trauma and demonstrates that carefully improvised thoracostomy drainage using a Foley catheter may provide effective pleural decompression when standard equipment is unavailable in resource-limited settings.

INTRODUCTION

Subcutaneous emphysema (SCE) refers to the entrapment of air in the subcutaneous layer, i.e., beneath the dermal layers of the skin. Subcutaneous emphysema can result from traumatic, infectious, spontaneous, or iatrogenic aetiologies. (1, 3) Subcutaneous emphysema may result from a variety of causes, including trauma to the thoracic cavity, sinus cavities, or facial bones, rupture of pulmonary blebs, and bowel perforation. Among these, penetrating chest trauma is a well-recognised cause and may be associated with pneumothorax, haemothorax, and other intrathoracic injuries. (2, 4, 6) Chest trauma remains a significant cause of morbidity worldwide, and penetrating thoracic injuries continue to contribute substantially to emergency surgical presentations, including in Nigeria. (7, 8) SCE commonly occurs on the neck and chest wall, but it can also extend to other parts of the body. (2) Subcutaneous emphysema is often benign and self-limiting; however, in cases of severe subcutaneous emphysema, various complications (such as compartment syndrome, restricted chest wall expansion, and even

tracheal compression) can occur, resulting in cardiovascular and respiratory compromise. Without immediate intervention, it can prove fatal. (3)

We present the case of a young adult who developed severe subcutaneous emphysema extending to the scrotum following a stab wound to the chest; the patient had no cardiopulmonary sequelae after treatment. This is a rare case of massive post-traumatic subcutaneous emphysema with pneumoscrotum successfully managed using an improvised Foley catheter thoracostomy drainage system in a resource-limited setting.

CASE REPORT

A 35-year-old man presented to the emergency unit of a private hospital in a rural community in southwestern Nigeria at 6:00 pm with extensive swelling involving the chest, neck, left upper limb, and scrotum. He had sustained a stab wound to the left upper chest during an assault two days earlier.

On presentation, his vital signs (temperature, blood pressure, heart rate, respiratory rate, and oxygen saturation) were recorded (37.1°C, 126/111 mm Hg, 101 bpm, 22 bpm, and 92% in room air, respectively), and a general physical examination was performed. He was found to be conscious and well oriented, with equal and reactive pupils. The mobility of his limbs was not impaired. He was also found to have extensive subcutaneous swelling extending from the chest to the neck, including the upper left limb, and descending to the scrotum (Figs. 1 and 2). There was positive crepitus on palpation of the swelling. His respiratory examination revealed decreased breath sounds on the left hemithorax in the lower lung zones.

The patient initially presented to a rural government secondary-level hospital in southwestern Nigeria, The facility lacked specialist trauma services and standard thoracostomy drainage equipment. The nearest tertiary referral centre capable of providing definitive care was located several hours away by road. Referral was further complicated by prolonged transport times, financial limitations, and regional security concerns, making immediate transfer impractical. The chest wound was sutured, and the patient was advised to seek higher-level care. Over the following two days, he developed progressive swelling of the chest, neck, upper limb, and scrotum. Because of worsening symptoms, he subsequently presented to a nearby private hospital, where further clinical evaluation and emergency management were undertaken.

Table 1
Timeline of Clinical Events

Day	Clinical Event
Day 0	Stab wound to the left upper chest during an assault.
Day 0	Initial treatment at a rural secondary-level hospital; the wound was sutured.
Day 1–2	Progressive neck, chest wall, upper limb, and scrotal swelling developed.
Day 2	Presentation to a nearby private hospital
Day 2	A chest radiograph was performed.
Day 2	Pneumo-haemothorax and extensive subcutaneous emphysema were diagnosed.
Day 2	A 22 French Foley catheter was used as an improvised chest drain.
Day 9	The chest drain was removed.
Day 10	Discharged home in stable condition.
Day 23	Follow-up review; complete symptom resolution

RADIOLOGICAL FINDINGS

A chest X-ray showed a homogeneous opacity with an air-fluid level on the left side of the chest, obliterating the costophrenic and cardiophrenic angles. There was gross subcutaneous emphysema on the left side of the chest wall (Fig. 3). An assessment of atelectasis of the left lung, pneumo-haemothorax, and gross subcutaneous emphysema was made.

Computed tomography would have provided a more detailed assessment of associated thoracic injuries and possible pneumomediastinum. However, advanced imaging was not immediately available at presentation, so management decisions were based on clinical findings and plain chest radiography (4, 5).

INTERVENTION

At the private hospital, clinical examination and chest radiography confirmed a left-sided pneumo-haemothorax with extensive subcutaneous emphysema (Fig. 3). In view of worsening respiratory symptoms and the extent of the emphysema, urgent pleural decompression was performed by the reporting clinician, a first-year surgical resident covering the facility at the time.

After aseptic skin preparation and sterile draping, local anaesthesia was infiltrated at the insertion site. A small skin incision was made at the 5th intercostal space along the mid-axillary line, and blunt dissection was carried through the subcutaneous tissue into the pleural cavity. A size 22-French Foley catheter was

fenestrated at two points along its shaft and advanced into the pleural space (Fig. 4). The catheter was secured with 2 – 0 nylon sutures to prevent displacement.

Initially, the catheter was connected directly to a urinary drainage bag, with the anti-reflux valve serving as a temporary one-way drainage mechanism to permit egress of air and fluid while minimising retrograde air entry into the pleural cavity. As the patient's condition stabilised, a more definitive improvised underwater seal drainage system was assembled using a 1.5-litre plastic bottle partially filled with clean water, with the drainage tubing submerged to create a water seal. This improvised closed drainage system allowed the continued evacuation of air and blood while preventing retrograde air entry into the pleural cavity. Approximately 200 mL of blood was drained immediately after insertion, followed by progressive clinical improvement and gradual resolution of the subcutaneous emphysema.

He received postoperative analgesics and prophylactic broad-spectrum antibiotics because of the penetrating nature of the chest wound and the risk of wound contamination and pleural infection, and was closely monitored with regular clinical assessments, including serial evaluation of vital signs, respiratory status, chest tube function, and progression of the subcutaneous emphysema, to facilitate early detection and prevention of complications. Appropriate chest tube care and aseptic wound management were maintained throughout admission. The subcutaneous emphysema gradually resolved during the hospital stay. The chest drain was removed after seven days following sustained clinical improvement, including resolution of respiratory symptoms, absence of an ongoing air leak, and near-complete resolution of the subcutaneous emphysema. Although repeat chest radiography before tube removal would have been desirable, this was not performed because of the patient's financial constraints, and the decision was therefore based on clinical assessment. His vital signs remained within normal limits, and he reported no respiratory or cardiovascular distress during serial ward reviews.

FOLLOW- UP

The patient was reviewed two weeks following discharge. Clinical examination demonstrated complete resolution of the cervical, thoracic and scrotal emphysema. Respiratory symptoms had resolved completely. Breath sounds were equal bilaterally, and oxygen saturation was 98% in room air. The patient had resumed normal daily activities and reported no residual symptoms. There was no recurrence of respiratory symptoms or subcutaneous emphysema, and no further intervention was required.

DISCUSSION

Severe subcutaneous emphysema with pneumoscrotum following penetrating chest trauma is rarely reported in the literature. Although pneumoscrotum has been described in association with spontaneous pneumothorax, thoracic interventions, abdominal visceral perforation, and blunt thoracic trauma, its occurrence after penetrating chest injury remains uncommon. (10–12, 15) In the present case, penetrating chest trauma resulted in a pneumo-haemothorax with extensive subcutaneous emphysema extending from the thorax to the scrotum. Prompt pleural decompression was required to relieve

symptoms, facilitate lung re-expansion, and prevent further deterioration (4). A further distinguishing feature of this case is the successful use of an improvised thoracostomy drainage system using a Foley catheter in the absence of standard chest drainage equipment.

Reports describing improvised thoracostomy drainage in resource-constrained settings remain uncommon. Nevertheless, successful temporary pleural drainage using Foley catheters, improvised thoracostomy drainage systems, and locally assembled drainage devices has been reported in selected low-resource and humanitarian settings, where shortages of standard thoracostomy equipment may delay definitive treatment. (23, 24) These reports support the concept of carefully planned improvisation as a temporary bridge rather than a substitute for conventional chest tube drainage. (23, 24) To our knowledge, this is among the few reported cases of massive post-traumatic subcutaneous emphysema with pneumoscrotum successfully managed using an improvised Foley catheter thoracostomy drainage system in a resource-limited setting.

Subcutaneous emphysema is usually a benign clinical finding but may indicate significant underlying thoracic injury, including pneumothorax, haemothorax, diaphragmatic rupture, oesophageal injury, or necrotising infections. (9) The term pneumoscrotum refers to the presence of air within the scrotum, which may present as either scrotal emphysema or pneumatocele. (12) The exact mechanism by which pneumoscrotum develops following chest trauma remains uncertain. Three anatomical pathways have been proposed: direct extension of air through the continuous superficial fascial planes from the thorax to Scarpa's fascia, Colles's fascia, and the dartos fascia of the scrotum; spread of mediastinal air through the retroperitoneum and inguinal canal; and tracking of air following alveolar rupture through the mediastinum and abdomen into a patent processus vaginalis. (15–20) In the present patient, direct extension through the superficial fascial planes is the most plausible explanation, as the widespread thoracic, cervical, and scrotal emphysema closely follows this anatomical continuity (Fig. 5). The progression of the swelling over two days also supports the gradual propagation of air through these tissue planes before becoming clinically apparent. The rapid improvement following drainage supports that the patient's symptoms were primarily driven by the untreated pneumo-haemothorax rather than the subcutaneous emphysema itself.

The cornerstone of management for severe subcutaneous emphysema is the correction of the underlying pathology. In selected patients with persistent respiratory compromise despite definitive treatment, adjunctive decompressive techniques such as subcutaneous drain placement have been described to facilitate more rapid resolution of the emphysema. (13, 14, 21) In this patient, evacuation of the associated pneumo-haemothorax was achieved using a fenestrated 22-French Foley catheter connected to a urinary drainage bag, as standard thoracostomy equipment was unavailable. The relatively large bore of the catheter permitted temporary drainage of both air and approximately 200 mL of blood, allowing lung re-expansion and gradual resolution of the subcutaneous emphysema. No procedure-related complications, including catheter blockage, dislodgement, or recurrent pneumothorax, were encountered.

In resource-limited settings, chest radiography remains an accessible and valuable first-line investigation for detecting traumatic thoracic injuries and guiding early management. (4, 5)

Previous reports and observational studies have shown that improvised thoracostomy drainage systems constructed from readily available materials, including Foley catheters, urinary drainage tubing, and locally assembled underwater-seal devices, can provide effective temporary pleural decompression when standard commercial systems are unavailable, with a reported pleural resolution rate of 74.3% in a recent Nigerian observational study. (23, 24) Although direct comparative data remain limited, conventional small-bore pleural catheters and chest tubes have reported success rates of 79–86% in selected series. (23) In the present case, the improvised Foley catheter system achieved effective evacuation of both air and blood, resulting in complete clinical resolution without procedure-related complications, further supporting its role as a practical temporising measure in resource-limited emergency settings.

Nevertheless, Foley catheters have important limitations compared with conventional chest tubes, including a smaller drainage lumen, an increased risk of kinking or obstruction, the absence of a standardized pleural drainage design, and potentially less effective evacuation of large-volume haemothorax or persistent air leaks. Consequently, this technique should be regarded as a temporary alternative when conventional thoracostomy systems are unavailable rather than a replacement for standard chest drainage. (23, 24)

A limitation of this case is that repeat chest radiography prior to thoracostomy drain removal and serial radiographic follow-up were not performed because of the patient's financial limitations. Consequently, decisions regarding drain removal and subsequent follow-up relied primarily on clinical assessment. Despite this limitation, the patient demonstrated sustained clinical improvement, complete resolution of subcutaneous emphysema and respiratory symptoms, and remained well at follow-up.

This case also illustrates the challenges of trauma care in resource-limited settings. Limited access to specialist services, prolonged transport times, and shortages of essential equipment may delay definitive management, making carefully considered improvisation necessary in selected emergency situations. (25) Although standard thoracostomy systems remain the treatment of choice, this case demonstrated that appropriately selected improvised alternatives may provide effective life-saving pleural decompression until definitive care is available. The delayed progression of symptoms in this patient illustrates the evolving nature of post-traumatic thoracic injuries and emphasises the need for serial clinical assessment, as initially occult injuries may become clinically apparent over time despite an initially reassuring presentation. (22) In low-resource settings, clinicians should maintain a high index of suspicion for occult thoracic injuries in patients with worsening subcutaneous emphysema. Where standard equipment is unavailable, prompt clinical decision-making and the judicious use of available resources can provide life-saving temporizing measures while definitive treatment is being arranged.

CONCLUSION

Massive subcutaneous emphysema with pneumoscutum following penetrating chest trauma is rare and may signal significant underlying thoracic injury. Early recognition, careful reassessment, and prompt intervention are essential to prevent progression and complications. In resource-limited settings, adaptive emergency measures may provide life-saving temporary management when standard thoracostomy systems are unavailable.

LEARNING POINTS

An extensive pneumoscutum may originate from thoracic injury.

1. Delayed progression of subcutaneous emphysema after penetrating chest trauma does not exclude significant underlying pleural injury and warrants repeated clinical assessment.
2. Progressive subcutaneous emphysema following chest trauma warrants urgent evaluation for pneumothorax and haemothorax.
3. Early pleural decompression remains the cornerstone of management.
4. Resource-appropriate improvisation may be life-saving when standard equipment is unavailable.

Declarations

Ethics Approval:

Approved by the Bowen University Teaching Hospital Research Ethics Committee (BUTH/REC-27574). Conducted in accordance with the Declaration of Helsinki.

Consent for publication:

Written informed consent was obtained from the patient for the publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Competing interests:

None declared.

Large Language Model (LLM) Disclosure

Large Language Models (including ChatGPT, OpenAI) were used during manuscript preparation to assist with language editing, improving grammar and clarity, and formatting. All scientific content, data analysis, interpretation, and final editorial decisions were performed and verified by the authors, who accept full responsibility for the accuracy and integrity of the manuscript.

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Author Contribution

Conceptualisation— CUI, AOD. Methodology— CUI, IGA, JTO, IOA. Data curation— CUI. Investigation— CUI. Resources— AOD. Supervision— AEA, SUE, AOD. Visualisation— CUI. Writing—original draft— CUI. Writing—review & editing— CUI, IGA, JTO, AOD, IOA, SAA, AEA, SUE. All authors contributed to the manuscript, critically revised it, approved the final version for publication, and agree to be accountable for all aspects of the work.

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Data availability:

Data are available upon reasonable request from the corresponding author.

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Figures

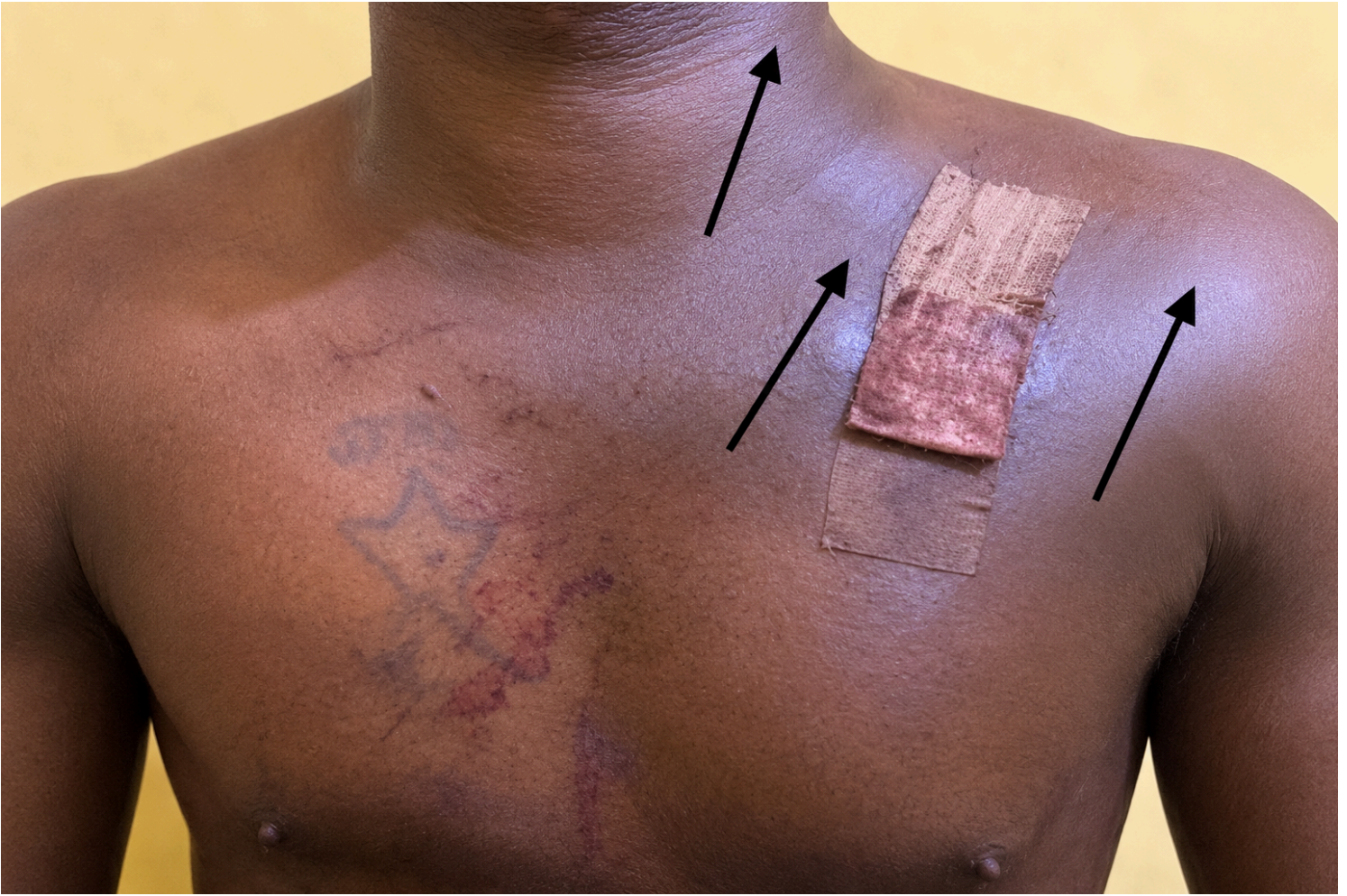


Figure 1

A clinical photograph showing subcutaneous swelling in the left chest and neck; the arrows point to the region of the swelling. The dressing over the stab wound is from where the patient had previously received care.



Figure 2

A clinical photograph showing extensive scrotal swelling in the index patient; the arrows point to the region of the swelling.



Figure 3

A plain radiograph of the index patient showing homogeneous opacity with air-fluid levels on the left side of the chest, obliterating the costophrenic and cardiophrenic angles on the left. There is gross subcutaneous emphysema on the left side of the chest wall.



Figure 4

A clinical photograph showing a 22-French, 2-way Foley catheter inserted in the 5th intercostal space, anterior axillary line, of the left hemithorax. The catheter was connected to a urine bag to drain blood from the left hemithorax.

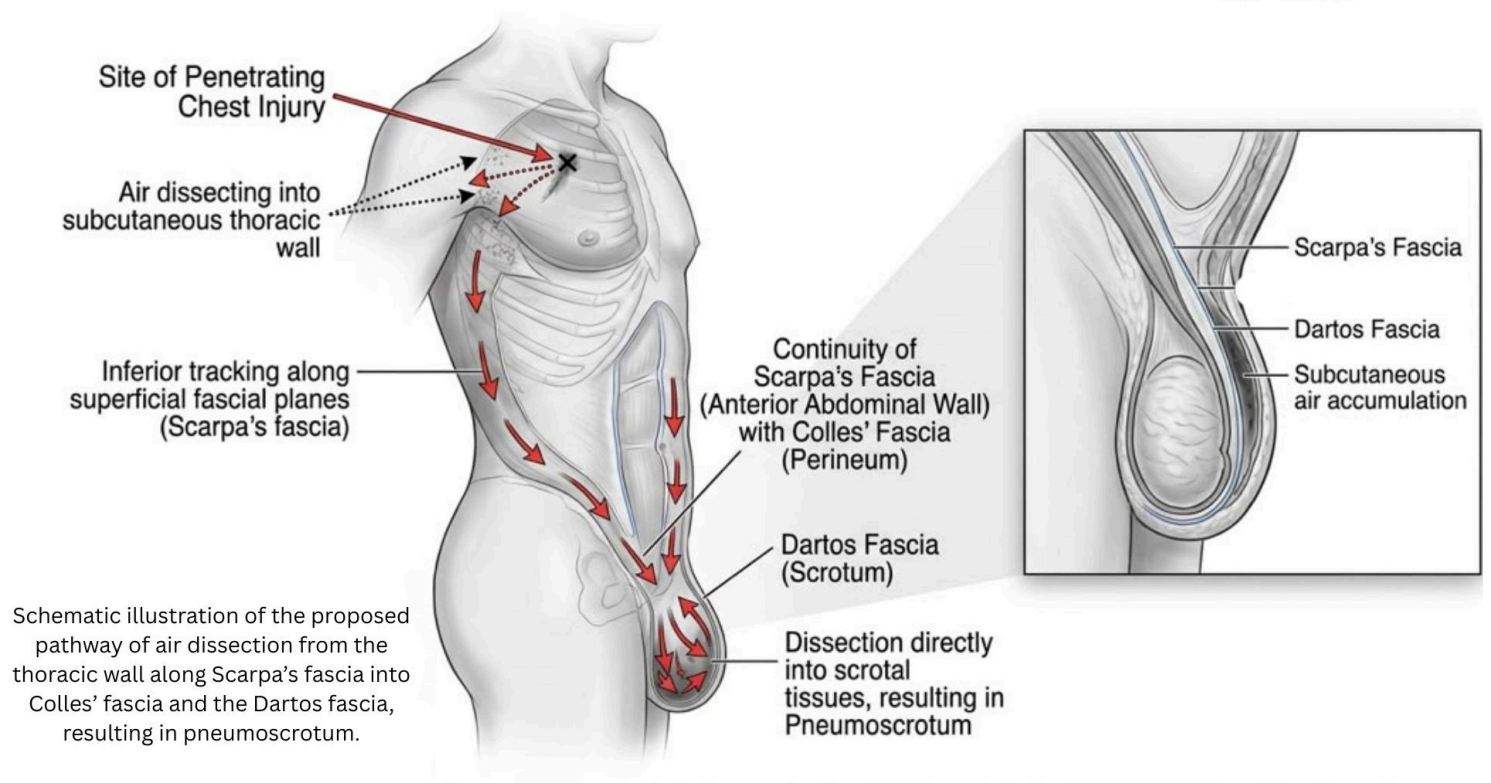


Figure 5

Proposed pathophysiology of pneumoscrotum via direct extension through the continuous superficial fascia planes.

Supplementary Files

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