

Tension Pneumothorax Complicating Routine Pediatric Adenoid Surgery: A Case Report

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Adenoid surgery (adenoidectomy) is one of the most common pediatric surgical procedures. Complications of this surgery include anesthetic issues, bleeding, pain, dysphagia, and velopharyngeal insufficiency. The intraoperative complications are usually the most urgent and therefore require prompt identification and resolution. Tension pneumothorax (TPX) is a rare intraoperative complication. We present the first case in the English literature, to the best of our knowledge, of TPX during adenoid/tonsil surgery.

PATIENT DESCRIPTION

A healthy 4-year-old child with symptoms suggestive of obstructive sleep disorder presented to the pediatric otolaryngology unit at the Galilee Medical center, Israel. Physical examination showed small palatine tonsils and a large adenoid obstructing the post-nasal space. A trial of medical therapy using montelukast was not successful, and the patient was planned for elective adenoid surgery. During anesthetic induction, the patient exhibited a significant bronchospasm and was treated accordingly. The patient's situation improved. High ventilation pressures were needed for a short time to improve oxygenation. At the end of a 10-minute surgery, the patient's situation suddenly and rapidly deteriorated with loss of oxy-

gen saturation, pulse, and blood pressure. Cardiopulmonary resuscitation was immediately started on the surgical table and the working diagnosis given was TPX [Figure 1A]. Chest auscultation suggested bilateral diminished air entry, and urgent bilateral needle applications were performed and followed by quick hemodynamic improvement with return of pulse and low blood pressure. Bilateral chest tubes were quickly inserted, and the child was transferred intubated to the pediatric intensive care unit [Figure 1B]. The first left chest drain was small caliber so did not properly drain the pneumothorax and was subsequent-

ly replaced with a larger diameter tube before transfer to the pediatric intensive care unit. It took one week in the intensive care unit until the chest tubes were no longer draining air before their successful removal. Ten days after surgery the child was discharged home in excellent clinical condition with no residual morbidity.

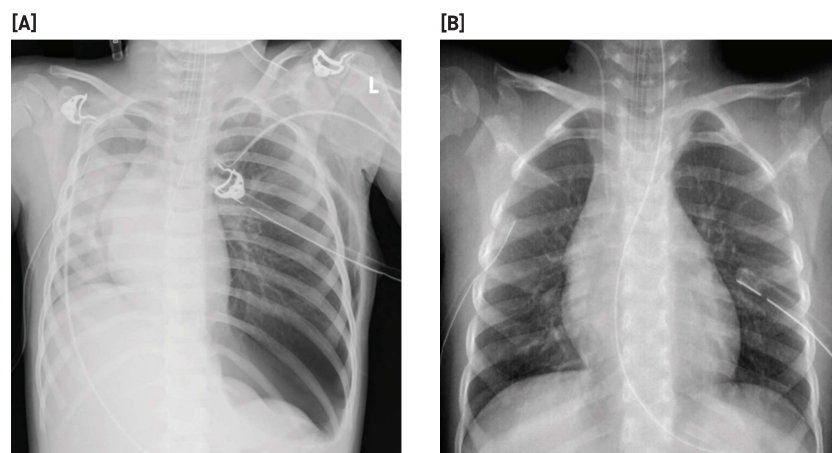
COMMENT

Tension pneumothorax (TPX) presents a very rare complication of routine adenoid surgery, and to the best of our knowledge, this is the first report of this

Figure 1. Intraoperative AP chest X-ray before and after decompression of a tension pneumothorax

[A] Intraoperative AP chest X-ray demonstrates complete right lung collapse with increased intercostal space and depression of the hemidiaphragm on the left side, increased lucency on the same side and shift of the mediastinum to the right. A chest tube is also present. This initial drain was small in caliber and did not drain air properly, and was quickly replaced by a larger diameter tube.

[B] Chest X-ray imaging after insertion and good placement of bilateral chest tubes. The mediastinum is central in its normal anatomical state, the diaphragm is not depressed, and normal density of lung parenchyma can be seen on both sides.



complication in the English medical literature. Non-tension pneumothorax during routine otolaryngology procedures is also uncommon, with only a few cases described in the literature [1-3] during the last 50 years.

TPX is known for its high mortality rate and is defined by the accumulation of air in the pleural space causing pressure on nearby organs with a final common pathway of hemodynamic collapse. Immediate identification and appropriate intervention are needed. Misdiagnosis or wrong treatment of the situation can lead to cardiovascular collapse and death [4].

The pathogenesis by which air gains entry to the pleural and mediastinal spaces during adenoidectomy, tonsillectomy, or dental operations is a matter of hypothesis.

One of the proposed mechanisms for air penetration is damage to the tracheo-bronchial tree or lung parenchyma as a result of ventilation under positive pressure during the surgery [5]. In those cases, air leaks into the pleural space directly from the lung, which may cause pneumothorax or TPX without cervical emphysema. Patients with active upper respiratory tract infections are at risk. Bronchospasm and laryngospasm events are common during anesthesia of these patients and sometimes require high-pressure ventilation, which increases the risk of TPX. Therefore, it is essential to evaluate pre-

operatively and to identify cases at risk for this type of complication.

Another mechanism is the penetration of air into deep tissues through the surgical bed as the mucosal integrity is breached secondary to the surgical procedure [5]. Once the air gains the pharyngeal space, it can track through to the deep spaces and cause pneumomediastinum and pneumothorax. In these cases, the clinical presentation is usually subacute and not urgent and cervical emphysema will appear with the pneumomediastinum and possibly pneumothorax [1,3,5]. In the case of TPX, the clinical manifestation is usually urgent, with rapid loss of oxygen saturation, pulse, and blood pressure. Chest auscultation will indicate diminished air entry on the affected side. Emergency identification and intervention are needed. Once the condition is identified, it is necessary to drain the pleural space. Needle applications can be performed as an immediate intervention and as a bridge until the definitive treatment, which is insertion of a chest tube [Figure 1B]. Findings suggestive of TPX on chest X-ray include increased lucency, increased rib spacing, depression of the diaphragm and displacement of the mediastinum to the contralateral side of the chest [Figure 1A]. Hemodynamic collapse develops quickly during TPX, so there is no time to perform a chest X-ray prior to starting emergent treatment.

CONCLUSIONS

TPX is a rare, life-threatening complication that may complicate routine surgical procedures, including common pediatric otolaryngology surgeries. High suspicion threshold and awareness of this potential complication are pivotal for quick diagnosis and proper treatment. Timely identification of this very stressful condition may save a patient's life and avoid morbidity and mortality.

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Capsule

Protective parasites

Parasitic helminths generate a type 2 immune response that can persist even after clearance of an infection. Using a mouse model of roundworm infection, **Oyesola** and colleagues found that prior exposure to lung-migrating helminths protects transgenic K18-hACE2 mice against SARS-CoV-2 infection. Pulmonary macrophages from roundworm-infected mice adopted a type 2 transcriptional and epigenetic signature that persisted after parasite clearance and at least 45 days after infection. SARS-

CoV-2-specific CD8+ T cell responses were driven by alveolar macrophages and were required for helminth-mediated protection. These results demonstrate that lung-migrating helminths reprogram lung immune homeostasis, leading to enhanced protection against subsequent SARS-CoV-2 infection.

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