Pneumothorax Resulting from Costal Osteochondroma

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**Introduction**

Pneumothorax is considered an urgent medical situation that should be treated quickly (Zarogoulidis et al., 2014). It is defined as the presence of air in the plural space (Figure 1). In large pneumothoraces, breath sounds may be decreased or absent, and hyperresonance, tachypnea, tachycardia, and cyanosis can occur (Noppen, 2010). Decreased or absent breath sounds in the auscultation area are consistent with pneumothorax (Assefa, 2016). The diagnosis of pneumothorax is based on the presence of air in the interstitial space with a bony spur pointing inward toward the pleural cavity.

**A Case Study**

A 16-year-old male reported to the hospital with complaints of right-side pleuritic chest pain with no recent history of trauma. His medical history included a diagnosis of multiple exostoses. This diagnosis also was present in both of his immediate family members.

A chest x-ray showed a right pleural effusion accompanied by a mass from the seventh to eighth ribs. Further examination by computed tomography (CT) indicated exostoses in the same ribs with a bony spur pointing inward toward the pleural cavity.

The chest tube placement was performed to drain the pneumothorax. Costal resection surgery was performed by video-assisted thoracoscopic surgery. Thickening of the visceral pleura was noted near the eighth rib. Resection of the rib containing the inward projecting exostosis was performed. The pathological specimen revealed tissue consistent with exostosis but was non-malignant (Imai et al., 2012).

For example of CT imaging of costal exostosis and resulting pneumothorax see Figure 2 below.

**Signs and Symptoms**

**Pneumothorax**
- **Shortness of Breath**
- **Diminished or absent breath sounds on affected side**
- **Tachypnea**
- **Tachycardia**
- **Diminished or absent breath sounds**

**Pathophysiology**

While most costal tumors are asymptomatic, advanced practice nurses should be aware of the potential for fatal complications associated with these abnormal growths. Previously asymptomatic growths may develop malignant transformation. One to two percent of osteochondromas may become malignant, but that number rises to twenty-five percent in hereditary multiple exostoses (Marlowe et al., 2011). Therefore, close surveillance is important. Prevention, early detection, and quick treatment of benign osteochondroma that develop into a costal osteochondromas should be the priority of the advanced practice nurse in this at-risk patient.

**Significance of Pathophysiology**

In normal physiology, the plural membrane is present on each side of the thoracic cavity that covers the lung and chest wall surfaces. Between the two layers is a fluid medium, the pleural space, that allows lungs to expand and contract during respiration without friction. The loss of the negative intrapleural pressure can cause partial or total lung collapse, also known as pneumothorax (Emergency Nurses Association [ENA], 2014). Figure 1 shows a diagram of pneumothorax pathophysiology.

**Underlying Pathophysiology**

**Costal Osteochondroma/exostosis**

**Costal osteochondroma** is also known as exostoses, can be solitary events. This can include a spontaneous event or can be secondary to trauma. This type of occurrence can be seen in adults or children.

In addition, hereditary multiple exostoses (HME) can cause abnormal bone growth with resulting skeletal abnormalities in bones that have cartilaginous stages (Figure 1). HME is an autosomal-dominant disorder with an early onset gene family mutation. Exostoses resulting from HME typically occur before puberty (Marlowe et al., 2011; Zariogulids et al., 2014; Vemula et al., 2012).

**Osteochondroma**
- **Shortening of the rib**
- **Hyper-resonant chest percussion**

**Normal Chest Wall Physiology**

Pneumothorax is the most common complication of the bone. Two percent of those tumors grow in the chest wall, and can cause severe complications such as pneumothorax. Costal exostoses can cause traumatic pneumothorax through puncture, laceration, or friction from chest wall movement during breathing (Assefa et al., 2011; Iyoda et al., 2014). The consequent change in intrapleural pressure and possible lung collapse is an anatomic condition (ENA, 2014) that the advanced practice nurse should diagnose and treat quickly.

**Implications for Nursing Care**

The majority of patients presenting with costal osteochondromas are asymptomatic, and the tumors are seen as incidental findings on chest radiographs (Vemula et al., 2012; Assefa et al., 2011). However, in patients with HME, costal exostoses are more common and should be monitored. Some complications are severe, and life-threatening pneumothorax can occur with solitary osteochondromas (Assefa et al., 2011; Iyoda et al., 2014).

Patients with suspicion for costal exostoses or osteochondroma should be examined with chest radiographs to determine involvement of the growth with the intercostal muscles (Kadu et al., 2015). Some studies propose only close follow-up as treatment, especially if the patient’s appearance is asymptomatic (Assefa et al., 2013; Vemula et al., 2012). Others propose surgical treatment depending on the probability of lung trauma resulting in pneumothorax (Vemula et al., 2012; Zarogoulidis et al., 2014; Jhunjhunwala & Bergman, 2011).

The damage to the chest wall and lung allows air from the atmosphere to enter the plural space (Zarogoulidis et al., 2014), causing a subsequent loss of negative intrapleural pressure. The loss of the negative intrapleural pressure can cause partial or total lung collapse, also known as pneumothorax (Emergency Nurses Association [ENA], 2014). Figure 1 shows a diagram of pneumothorax pathophysiology.

**References**