Pneumatocele

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Injury/Disease Demographics

- Pneumatoceles can be divided into infectious and non-infectious etiologies.
- The majority of pneumatoceles are infectious, arising as a complication of bacterial pneumonia, most commonly *staphylococcus aureus.*
- Non-infectious pneumatoceles occur following blunt or penetrating trauma and mechanical ventilation, and are more commonly occur in children.
- Pneumatoceles due to trauma result from rapid compression followed by decompression from negative pressure leading to a pulmonary laceration, and subsequent healing with formation of a thin walled cystic lesion.
- Pneumatoceles due to infection result from bronchial obstruction causing bronchial wall rupture and subsequent formation of a thin walled cystic lesion.

Clinical Presentation

- Most pneumatoceles are diagnosed on radiographic imaging as an asymptomatic finding.
- Symptomatic patients most often present with hemoptysis.
- Pneumatoceles may progress to a tension pneumatocele, pneumothorax, or secondarily infected pneumatocele; these require rapid diagnosis and treatment. In these cases, physical exam may have evidence of tracheal deviation, absent breath sounds, and potential hemodynamic instability.

Evaluation/Diagnostics/Imaging

- For pneumatoceles secondary to bacterial pneumonia, initial exam may be similar to any patient with pneumonia; blood cultures and plain chest radiographs should be obtained.
- Chest computed tomography (CT) is usually performed to determine the extent of pneumatocele and to differentiate it from a hematoma and/or abscess.

Role of Conservative Management and Associated Considerations

- Most traumatic pneumatoceles require only observation and will spontaneously resolve.
- Serial imaging is not routinely advocated for asymptomatic lesions.
- In patients that develop primarily/secondarily infected pneumatoceles, antibiotic therapy is required and should be based on clinical resolution of infection.

Indications for Operative Intervention

- Operation or percutaneous drainage should be considered in patients that develop:
    - tension pneumatoceles
    - multi-cystic pneumatoceles with severe atelectasis

- infected pneumatoceles that do not respond to antibiotics
- pneumatoceles that develop a bronchial pulmonary fistula

Pre-operative Preparation/Impact of Associated Injuries

- Need for single lung ventilation should be anticipated, and thus placement of a double lumen endotracheal tube or bronchial blocker should be placed.
- Associated spine fractures should be determined prior to operation, and may limit positioning of the patient.
- Rib fractures usually complicate trauma related pneumatoceles; rib fixation should be considered if multiple bicortical rib fractures are present and if there is no active infection.

Operative Techniques/Intraoperative Considerations

- Patients that present with cardiopulmonary collapse should be treated with tube thoracostomy, or anterolateral thoracotomy if unsuccessful.
- Ideal positioning in the majority of patients is lateral decubitus; with either a video assisted thoracoscopy (VATS) or open posterolateral thoracotomy approach.
- For small peripheral pneumatoceles, non-anatomic wedge resection can be performed with a stapler.
- For large central or multi-cystic pneumatoceles, formal anatomic lobectomy or pneumonectomy is required.
- If the pneumatocele is not resectable due to patient condition or scarring, then drainage either percutaneous, video assisted or open can be performed with high incidence of bronchopleural fistula development.

Postoperative Management/Complications

- Chest tubes should remain in place until any air leaks have resolved, and drainage is minimal.
- Antibiotics for infected pneumatocele should be continued as indicated for treatment of pneumonia or abscess if present.
- Although complications are rare, both abscess formation and bronchopleural fistula formation may develop requiring re-operation.

Considerations for Special Populations

- Pneumatoceles that develop secondarily to bacterial pneumonia occur most frequently in children, especially those under the age of 3.
- Pulmonary function worsens with age, and can complicate recovery of geriatric patients requiring long term mechanical ventilation.

Suggested Reading

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