SURGERY FOR GIANT BULLOUS EMPHYSEMA

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OVERVIEW

• Introduction
• Classification
• Patient selection
• Indications for surgery
• Operative procedures
• Case review
• Bullous emphysema
  • Presence of emphysematous areas with a complete destruction of lung tissue > 1 cm
  • Outer surface = visceral pleura, Inner layer = fibrous tissue from destroyed lung
• Careful to differentiate
  • Lung cysts
  • Blebs
Overall, progressive enlargement of bulla results from continued inflation and intrinsic destruction of pulmonary tissue.

Threefold mechanism:

- Progressive enlargement is caused by bronchus entering bullous airspace via “ball-valve” mechanism
- Enlarging cystic space causes destruction of adjacent normal pulmonary tissue
- Inflammation of smaller airways causes further enlargement of bulla
Can be associated with cocaine smoking, pulmonary sarcoidosis, alpha-1-antitrypsin deficiency, antichymotrypsin deficiency, Marfan’s syndrome, Ehlers-Danlos syndrome, inhaled fiberglass exposure
CLASSIFICATION

- **Group 1**
  - Single large bulla with underlying normal lung

- **Group 2**
  - Multiple bullae

- **Group 3**
  - Multiple bullae with underlying lung diffusely emphysematous

- **Group 4**
  - Underlying lung affected with other disease process

Group 1

Group 3
PATIENT SELECTION

• Classification of bullae useful to evaluate patients as candidates for surgery and to predict potential functional outcome.
• Group 1 and 2 patients are ideal candidates for surgery with predictable good results.
• Group 3 and 4 patients need careful selection.
INDICATIONS FOR SURGERY

• To treat complications
  • Pneumothorax, true infection, hemoptysis, cancer and pain

• To modify functional status of underlying lung by
  • Relieving restrictive changes
  • Increasing compliance and airway caliber
  • Improving V/Q ratio
  • Decreasing physiologic dead space
• When bullous disease may cause pneumothorax in patients with risk occupations, regardless of bulla diameter or state of underlying lung.
• Asymptomatic patients with moderate sized bullae
  » Natural history of these patients is unknown
• Bulla increasing in size or bulla occupying >1/3 of hemithorax
PATIENT SELECTION

- Dyspneic patients with bullae and diffuse emphysema present a challenge.
  - Must evaluate actual role of the bulla and the function of underlying non-bullous emphysematous lung.
  - Selection for surgery is difficult
  - If bullectomy is considered it should be interpreted as LVRS and improvement is mainly due to modifications in pulmonary mechanics.
Better results are anticipated for

- Younger patients with no rapidly progressing dyspnea
- Normal or slightly decreased FVC
- FEV1 > 40% predicted
- Normal DLCO and ABGs
- Large and well localized bullae with evidence of vascular crowding and normal lung density and architecture around the bullae
- Well localized matching V/Q defect
• VATS
  • Ideal for unilateral or bilateral disease
  • Bulla can be incised and deflated to facilitate manipulation
  • “spaghetti twist” to identify base
  • Reinforced staple-line in emphysematous lung
  • Surgical sealants to seal obvious air leaks
Plication or Brompton Procedure
- Roll or fold and plicate over itself placing a stapler at its base (originally described a sequential purse strings).
- Better done open, allows reinforce staple line with bulla itself.
- Disadvantage
  - 36 times higher risk of lung cancer in bullae versus normal lung parenchyma

Monaldi procedure
- Overlying rib resected, pleura opened revealing bulla
- 2 concentric purse-string sutures placed, bulla incised
- Talc insufflated, 32-Fr Foley inserted, 30 – 40 cc of air
- Talc insufflated into pleural space
- Wound closed around the Foley and secured under traction
- Chest tubes out in 48 hours and Foley out in 8 – 10 days
CASE REVIEW

- 42 year old male with COPD presents to ER with increasing SOB and respiratory distress
- On home oxygen (2 L via NP), multiple hospital visits (3 in last 3 months), intubated 1 year ago x 1 week
- PMHx childhood asthma, polysubstance abuse, hepatitis B and C, 45 pack-year smoking, currently 5 – 10 cigarettes/day
CASE REVIEW

- SaO2 70% on 4 L NP
- ABGs 7.20/126/37/40
- In obvious distress RR= 40, HR=120
- Afebrile, BP stable
- CXR shows pneumothorax (?)
• Intubated
• ABGs 2 hours later 7.39/83/160/35
• PSV vs VCV, no PEEP
• CT scan done
• Clinically improved and extubated in am
• PFTs FEV1 0.39 L (9% pred), FVC 0.8 L (16% pred, no DLCO available
• Patient returned to baseline respiratory status in 48 hours
• Points to discuss
  – COPD exacerbation *versus* symptomatic bullous disease
  – Therapeutic options for this patient
• Bullectomy via right thoracotomy
• Diffuse emphysematous changes noted
• Reinforced staple line
• 2 months post op on intermittent home oxygen
Above all, we care.