Treatment of Advanced Lung Disease
Division of Thoracic Surgery
January 28th, 2016
LVRS Surgical Update

Evaluation and selection of LVRS patient

LVRS Surgery

Caring for the LVRS patient post-operatively

Quality metrics of LVRS
Patient Volume


2006: 11
2007: 8
2008: 11
2009: 9
2010: 5
2011: 8
2012: 5
2013: 4
2014: 12
2015: 18
2016: 1
The beginning

- **CHEST WALL**: Costochondrectomy under local totally disrupting integrity of thorax to expand the capacity of the lung (1905)

- **LUNG VOLUMES**: Thoracoplasty and phrenic denervation to reduce the volume of overdistended lung: patients with worsening dyspnea and unable to debate with the surgeon (1930-40)

- **DIAPHRAGM**: decrease flattening by way of abdominal belts or pneumoperitoneum (1934, 1950)
- If patient does not stop smoking → FEV1 annual decline 80-100 ml/year
- If patient does stop smoking → FEV1 annual decline 30 ml/year

5 yr survival 25% FEV1 0.75
NETT

- 1st multi-center trial to determine role, safety and effectiveness of bilateral lung volume reduction surgery (LVRS) in treatment of emphysema and 2nd objective was identifying patient population

- 1218 patients (608 surgery and 610 medical only)

- Mortality 7.9%

- Major pulmonary morbidity 29.8%

- Cardiovascular morbidity 20 %
Pulmonary Rehab

- Six weeks
- Pulmonary Boot Camp
- Physical Conditioning
- Counseling
LVRS Checklist

- Signed consent for screening
- Signed consent for pulmonary rehab
- Severe upper lobe emphysema; bilateral on HRCT
- BMI <31.1, 31.3 (women)
- FEV1 <45% (>15% if age>70)
- TLC >100% (total lung capacity)
- RV >150% (residual volume or air trapping)

- PCO2 < 60 mmHg
- P02 > 45 mmHg room air
- Post-rehab 6 MW > 140 m
- 3 min unloaded pedaling
- Approval by physician post rehab
- Non-smoking x 4 months prior to initial evaluation
- Plasma cotinine level < 13.7 ng/ml
Bronchoscopy

1. Main Carina
2. Critico LMB Main Carina
3. Abnormal
4. Left mainstem mass
5. Left Main Stem Bronchus
6. Left mainstem mass
7. left mainstem/main carina
Double Lumen Tube Intubation
Position

Lateral decubitus
Upper arm support
Table break
Thoracoscopy (VATS)
Severe Apical Emphysema
Adhesions
LVRS Case Where To Start?

- Joe is a 63 yo male with diagnosis of COPD for 8 years and progressively worse past 2. He is now on 2L supplemental oxygen at home and 4 L with activity. He needs help completing daily activities.

- **PFTs**
  - FEV1 0.84 (38%)
  - DLCO 28%
  - pCO2 45
  - pO2 52

- **Perfusion**
  - RUL 5.4, RML 18.5, RLL 16.4
  - LUL 15.0, LML 29.8, LLL 14.9
  - Right Total 40%
  - Left Total 60%
Determining Where to Start

- Most Importantly Perfusions
  - If 50/50 doesn’t matter
  - Dominant Lung 1\textsuperscript{st}

- 2\textsuperscript{nd} any pulmonary nodules needing Dx

- 3\textsuperscript{rd} CT findings of adhesions/effusions
OSUWMC Performance Measures
Joint Commission Certification

- Post-operative Complication Rate

- Mortality ninety (90) days post-procedure

- Post-operative length of stay

- Overall patient satisfaction at discharge

- Average quality of life score improvement
  - Pre-Rehab to 1 Year Post-op
LVRS: Post-operative Complications

90 day mortality: 7.9% (5.9-10.3)

Air-leak > 5 days: 57%

Pneumonia: 18%

Failure to wean: 5%
## Types of Complications

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Patient Satisfaction
Percent Rating Overall Satisfaction at 9 or 10 (on a 10-point Scale)


Satisfaction Response Rate

THE Ohio State University
WEXNER MEDICAL CENTER
Immediate Post-Operative Interventions

- Arterial Blood Gas STAT and then 6 hours post-recovery time
- Notify physician on call if pO2<60 or PCO2>55
- Goal: Extubate within 4 hours post-op
Ongoing post-operative Assessment

- Evaluation of patient
  - SQ EMPHYSEMA (more common finding), dyspnea with conversation (indication of hypoxia), confusion (indication of hypercapnea)

- Vital Signs
  - Hypercapnea, hypoxemia

- Daily labs
  - CBC, Chem 7

- CXR
  - Pneumothorax, pneumonia

- Chest tube evaluation
  - Air leak (very common due to extremely damaged lungs, connection to suction, drainage amount and consistency)
Chest Tube Assessment
SQ Emphysema (Crepitus)
SQ Emphysema on CXR
SQ Emphysema on Chest CT
Post-Operative Consults

- Pulmonology
- Pulmonary Rehabilitation
- Respiratory Therapy
- Physical/Occupational Therapy
- Infectious Disease, if necessary
Post-Operative Medications

- Pain Management (epidural)
- VTE Prophylaxis
- MIV- Heplock IVF once tolerating oral diet
- 2 doses post-operative antibiotics (Cefazolin or Clindamycin)
- Anti-emetic, if necessary
- Stool softeners, if necessary
- Resume important home medications (i.e. antihypertensive, antiarrhythmics)
Ongoing Post-Operative Care

- Wean supplemental oxygen as tolerated to maintain PaO2 saturations >88% at rest
- Encourage use of incentive spirometry and cough/deep breathing exercises hourly while awake
- Advance diet as tolerated
  - assess for nausea/vomiting/aspiration
Post-op LVRS Assessment Checklist

- **Evaluation of patient**
  - Vital Signs (continuous pulse oximeter, continuous telemetry)
  - Daily labs including Chem 7 and CBC (electrolyte abnormalities, infection, anemia)
  - Degree of dyspnea (improving vs. declining)
  - Chest tube output (amount, color, consistency)
  - Chest tube function (connected to -20cm mmH20)
  - Air leak grading (0-+7 air leak)
  - SQ emphysema
  - Pain Management
  - I&O (Q1H x4 hours, Q4H x6 hours, Q8H ongoing)
Post-operative Activity
POD#0

- If patient extubated post-operatively, RN should get patient out of bed to chair within 4 hours
- If patient remains intubated post-operatively, be sure physical therapy is consulted
Post-operative Activity

POD#1

- Removal of foley if meets criteria (allows for easier ambulation)
- Patient should be out of bed to chair throughout day as much as tolerated
- Patient should ambulate in the hallway or on treadmill with pulmonary rehab staff or RN at least 4 times
  - First walk should be evaluated by pulmonary rehab
- Each walk should be a minimum of 3-10 minutes
Ongoing Post-operative Activity

- Increase time and frequency of ambulation
- Increase pace at which they are walking (importance of treadmills)
- Increase amount of time out of bed throughout day
Upon Discharge

- Expect a 6-10 day hospitalization post LVRS
- Goal at discharge is to meet pre-op oxygen requirement or better
- Goal at discharge is to not be dependent on walker
- Complete the final 2-4 weeks of Pulmonary Rehabilitation
  - First session after surgery will be at OSU with our pulmonary rehab department
- F/U with thoracic surgery in 2 weeks with CXR prior to appointment
- F/U with pulmonary medicine
- Maintenance Rehab (funds at MMH if necessary)
Upon Discharge

- Arrange for Oxygen at home if O2 saturation is <88% at rest or with exertion
- If discharged with a chest tube, arrangements for home health care should be made
- Good idea to have someone stay with you at your home for the first week or two for support- Important to have in place prior to surgery
Mechanical Goals of LVRS

- Reduce the size mismatching between damaged lungs and the chest cavity
  - *Increases elastic recoil*
- The function of the diaphragm and intercostal muscles improve
  - *Decreases the amount of air left in the lungs after exhalation*
- Decrease respiratory drive and ventilation response to increased amounts of CO2
  - *Decreases the sensation of dyspnea*
- Decreases intrathoracic pressure due to the decreased amount of air in the lungs
  - *Improves left ventricular filling and cardiac index*
Patient Goals of LVRS

▪ Improved Quality of Life
▪ Decreased rate of mortality
▪ Improved exercise capacity
Shortness of Breath Questionnaire

- 24 questions rating SOB from 0-5
  - How short of breath are you?
  - How much do these limit your daily life?

- How Short of breath are you while....
  - At rest
  - Walking at your own pace
  - Walking at others pace
  - Walking up stairs
  - Standing up from a chair
  - Showering/bathing
  - Brushing your teeth
  - Dressing
  - Doing dishes
The University of California, San Diego Shortness of Breath Questionnaire (SOBQ)
Mortality Rate ≤ 90 Days

- 2006: 9%
- 2007: 13%
- 2008: 0%
- 2009: 0%
- 2010: 0%
- 2011: 13%
- 2012: 0%
- 2013: 0%
- 2014: 0%
- 2015: 0%

YTD