# Table of Contents

- **HOW TO USE THIS HANDBOOK**  
  2
- **THORACOSCOPIC/VATS WEDGE FOR NODULE**  
  3
- **LOBECTOMY/OPEN WEDGE**  
  4
- **PNEUMONECTOMY**  
  5
- **THORACOSCOPIC LUNG VOLUME REDUCTION SURGERY**  
  6
- **DECORTICATION**  
  7
- **ESOPHAGECTOMY**  
  8
- **LAPAROSCOPIC NISSEN/PARAESOPHAGEAL HERNIA REDUCTION**  
  10
- **REFERENCES / ACKNOWLEDGEMENTS**  
  12
Thoracic Surgery Handbook

A Guide For Postoperative Care And Management

HOW TO USE THIS HANDBOOK

This handbook is intended to be used as a reference and general guide. It is adapted from a handbook created for surgical housestaff on the Thoracic Surgery Service at the Brigham and Women's Hospital. It is not meant to be used as a clinical pathway order set. My hope is that the handbook will provide a foundation of which procedures we commonly employ, their indications, and what the expected postoperative course should be. If a patient falls off the expected timetable, it should serve as a red flag to investigate why and then take steps to intervene to get them back on course. Also, the handbook should highlight some important postoperative points specific to the care of thoracic patients. For example, holding lovenox prior to epidural removal, ambulating patients on postoperative day 1, fluid restriction, and prophylactic beta blockers to name a few. I hope you find this handbook helpful and educational.

Samer Kanaan, M.D.
Thoracoscopic/VATS Wedge for Nodule

Thoracoscopic wedges are performed for biopsy of nodules, typically in the periphery, for diagnosis and often for treatment. They are performed through two or three 2-3 cm port incisions.

Postoperative Care

General criteria for tube removal:
- No leak
- Output less than 200 cc/24 days.
- Ancef for all tubes for 24 hours.

Typical Postoperative Course

DOS:
- Neurological: Epidural for pain control, minimize sedation
- Cardiovascular: Lopressor (Hold if HR<55, SBP<100 mm Hg)
- Respiratory: Chest tubes to -20 suction, Nebulizers
- Gastrointestinal: NPO, Pepcid
- Genitourinary: Heplock
- Hematology: SQ Heparin TID or Lovenox daily
  (HOLD 24 hrs prior to epidural removal)
- Infectious Disease: Ancef x 24 hours then stop
- Lines: Peripheral Lines
- Endocrine: Insulin Protocol

POD1:
- Sips of clears and advance diet as tolerated (1500cc fluid restriction)
- Chest tubes to water seal
- Diuresis later in day
- Ambulate with assistance

POD2:
- Oral Medication
- Chest tubes can start to be removed
- Diuresis if indicated
- Ambulate with assistance

POD3:
- Remaining chest tubes are removed
- Epidural stopped and removed after chest tubes removed
- D/C Foley 4 hours after epidural removed
- Ambulate with assistance
- Diuresis if indicated
- Reconcile medications with preoperative medications

POD4-POD5: Discharge
Lobectomy/Open Wedge

Lobectomies are performed typically for masses that are biopsy proven (or intraoperatively proven) lung cancer and occasionally for metastatic disease or severe bronchiectasis. Open wedges through thoracotomies are performed for large masses not accessible through VATS or masses located near the hilum.

Postoperative Care

General criteria for tube removal:
- No air leak
- Output < 200 cc/24 hrs
Ancef for all tubes for 24 hours

Typical Postoperative Course

<table>
<thead>
<tr>
<th>DOS:</th>
<th>Neurological</th>
<th>Epidural for pain control, minimize sedation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular</td>
<td>Lopressor (Hold if HR&lt;55, SBP&lt;100 mm Hg)</td>
<td></td>
</tr>
<tr>
<td>Respiratory</td>
<td>Chest tubes to -20 suction, Nebulizers</td>
<td></td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>NPO, Pepcid</td>
<td></td>
</tr>
<tr>
<td>Genitourinary</td>
<td>Heplock</td>
<td></td>
</tr>
<tr>
<td>Hematology</td>
<td>SQ Heparin TID or Lovenox daily</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(HOLD 24 hrs prior to epidural removal)</td>
<td></td>
</tr>
<tr>
<td>Infectious Disease</td>
<td>Ancef x 24 hours then stop</td>
<td></td>
</tr>
<tr>
<td>Lines</td>
<td>Peripheral Lines</td>
<td></td>
</tr>
<tr>
<td>Endocrine</td>
<td>Insulin Protocol</td>
<td></td>
</tr>
</tbody>
</table>

POD1: Sips of clears and advance diet as tolerated (1500cc fluid restriction)
Chest tubes to water seal
Diuresis later in day
Ambulate with assistance

POD2: Oral Medication
Chest tubes can start to be removed
Diuresis if indicated
Ambulate with assistance

POD3: Remaining chest tubes are removed
Epidural stopped and removed after chest tubes removed
D/C Foley 4 hours after epidural removed
Ambulate with assistance
Diuresis if indicated
Reconcile medications with preoperative medications

POD4-POD5: Discharge
Pneumonectomy

A pneumonectomy performed typically for masses that are biopsy proven (or intraoperatively proven) lung cancer that either involves the hilum or the bronchial tree such that a sleeve lobectomy is not possible. In general, a Robnell catheter is placed in the OR for a pneumonectomy and often taken out on POD1 after CXR if mediastinum is in good position.

Intraoperative Care

Air or fluid must be withdrawn from the cavity to equilibrate the mediastinum while in the operating room as follows:

Right pneumonectomy -- withdraw 750 cc of air in females, 1000 cc of air in males
Left pneumonectomy -- withdraw 500 cc of air in females, 750 cc of air in males

This may cause significant hypotension, which can be prevented by opening the Robnell to air and requilibrating the space with atmospheric pressure.

Typical Postoperative Course

DOS:  Neurological  Epidural for pain control, minimize sedation
       Cardiovascular  Lopressor (Hold if HR<55, SBP<100 mm Hg)
       Respiratory  Robnell Capped, Nebulizers
       Gastrointestinal  NPO, NGT, Pepcid
       Genitourinary  Heplock; Often initially require fluids/albumin/blood on DOS as ooze into space.
       Hematology  SQ Heparin TID or Lovenox 40mg daily
                   (HOLD 24 hrs prior to epidural removal)
       Infectious Disease  Ancef x 24 hours or until Robnell Out
       Lines  Central Line
       Endocrine  Insulin Protocol

POD1:  D/C NGT
       Clear sips to clears
       Remove Robnell
       Diuresis if indicated
       Ambulate with assistance

POD2:  Start clears and advance diet as tolerated (1000cc fluid restriction)
       Oral Medication
       Diuresis if indicated
       Ambulate with assistance

POD3:  Epidural stopped and removed after chest tubes removed
       D/C Foley 4 hours after epidural removed
       Ambulate with assistance
       Diuresis if indicated
       Reconcile medications with preoperative medications

POD4-POD5:  Discharge
Thoracic Surgery Handbook

Thoracoscopic Lung Volume Reduction Surgery

LVRS is typically performed for those with end-stage COPD with predominantly upper lobe disease. There are exceptions. LVRS can be performed through a median sternotomy (bilateral), through a thoracotomy, or thorascopically (through two or three 2-3 cm port incisions using a Gore-Seam Guard to prevent air leaks).

Postoperative Care

In general, these patients have large air leaks and often multiple chest tubes and Blake drains are left in place to control the leak. The hospital course of each of these patients vary. However, there are several key points to postoperative management.

- These patients need to AMBULATE at least 3x/day.
- Diuresis and keep these patients dry. They have no margin for fluid on board.
- They often have COPD flares postoperatively and need to be placed on steroids.

In general, chest tubes and Blake drains can be placed to water seal on POD1 but often these patients are unable to tolerate the pneumothorax and need to be placed back on suction.

Patients often go home with at least one tube for an air leak.

Typical Postoperative Course

DOS:

- Neurological: Epidural for pain control, minimize sedation
- Cardiovascular: Lopressor (Hold if HR<55, sBP<100 mm Hg)
- Respiratory: Chest tubes to -20 suction; Nebulizers
- Gastrointestinal: NPO, Pepcid
- Genitourinary: Heplock
- Hematology: SQ Heparin TID or Lovenox daily
  - (HOLD 24 hrs prior to epidural removal)
- Infectious Disease: Ancef x 24 hours
- Lines: Peripheral Lines
- Endocrine: Insulin Protocol

POD1:

- Sips of clears and advance diet as tolerated (1500cc fluid restriction)
- Chest tubes to water seal
- Diuresis later in day
- Ambulate with assistance

POD2:

- Oral Medication
- Chest tubes can start to be removed if ready
- Diuresis if indicated
- Ambulate with assistance

POD3:

- Remaining chest tubes are removed, some may need to stay longer
- Patient may even go home with pneumostat in place
- Epidural stopped and removed after chest tubes removed
- D/C Foley 4 hours after epidural removed
- Ambulate with assistance
- Diuresis if indicated
- Reconcile medications with preoperative medications

POD4-POD5:

- Discharge
Decortication

A decortication is performed to free the lung which has been encased in a fibrinous rind typically as a result of an empyema.

Postoperative Care

In general, there are three chest tubes to drain the air leak depending on whether or the degree of visceral pleurectomy performed (anterior chest tube is basilar tube; middle chest tube is apical and posterior; posterior chest tube is apical and anterior).

Typical Postoperative Course

| DOS: Neurological | Epidural vs PCA for pain control, minimize sedation |
| Cardiovascular | Lopressor (Hold if HR<55, SBP<100 mm Hg) |
| Respiratory | Possibly intubated overnight, chest tubes on -10 cm water suction or water seal depending upon degree of air leak, Nebulizers |
| Gastrointestinal | NPO, NGT, Pecid |
| Genitourinary | Heplock; Often initially require fluids/albumin/blood on DOS as ooze into space. |
| Hematology | SQ Heparin TID or Lovenox daily |
| Infectious Disease | Ancef/Levofoxacin/Flagyl x 5 days |
| Lines | Central Line |
| Endocrine | Insulin Protocol |
| CXR | Increase suction if space present. |

POD1: Extubate if not already done postoperatively  
D/C NGT.  
Chest tubes to water seal; back to suction if large space  
Diuresis if tolerated  
Bedrest  
Sips

POD2: Diuresis if tolerated  
Dangle and then Ambulate with assistance  
Clear diet, advance diet as tolerated

POD3: Ambulate with assistance, Diuresis  
Begin Oral Medications

POD4: Ambulate with assistance, Diuresis  
Begin Oral Medications  
Chest tubes left in as empyema tubes and can be placed to pneumostat unless drainage is >100 cc/day or large air leak

POD5: Cap epidural and d/c Foley  
Ambulate with assistance, Diuresis  
Reconcile medications with preoperative medications

POD6: Ambulate with assistance, Diuresis  
Chest tubes can be pulled back and secured at this stage

POD7-10: Discharge
# Esophagectomy

Esophagectomy is performed typically for esophageal cancer and rarely for end-stage achalasia or perforation. The 3-Hole is the preferred approach with incisions in the right chest, left neck, and abdomen. However, other approaches are occasionally used (transhiatal, left thoracoabdominal, Ivor-Lewis, etc).

## Typical Postoperative Course

<table>
<thead>
<tr>
<th>DOS:</th>
<th>Neurological</th>
<th>Epidural for pain control, minimize sedation (epidural rate should be turned down if patient hypotensive and in minimal or no pain)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular</td>
<td>Lopressor (Hold if HR&lt;55, SBP&lt;110 mm Hg), Please keep conduit perfused with SBP&gt;110 mm Hg</td>
<td></td>
</tr>
<tr>
<td>Respiratory</td>
<td>Usually keep intubated overnight, Nebulizers if extubated.</td>
<td></td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>NPO, NGT-- DO NOT MANIPULATE OR REPLACE, Pepcid</td>
<td></td>
</tr>
<tr>
<td>Genitourinary</td>
<td>IVF: D5LR or D51/2NS at 150 cc/hr</td>
<td></td>
</tr>
<tr>
<td>Hematology</td>
<td>SQ Heparin TID or Lovenox daily</td>
<td>(HOLD 24 hrs prior to epidural removal)</td>
</tr>
<tr>
<td>Infectious Disease</td>
<td>Ancef/Levofloxacin/Flagyl x 5 days</td>
<td></td>
</tr>
<tr>
<td>Lines</td>
<td>Central Line</td>
<td></td>
</tr>
<tr>
<td>Endocrine</td>
<td>Insulin Protocol</td>
<td></td>
</tr>
<tr>
<td>CXR</td>
<td>Watch out for dilated conduit</td>
<td></td>
</tr>
</tbody>
</table>

**POD1:**
- Extubate if not extubated
- Continue NGT
- Heplock later in day (may need additional fluids if SBP < 110 mm Hg to maintain conduit perfusion and avoid ischemia)
- Ambulate with assistance

**POD2:**
- Continue NGT
- Diuresis if tolerated
- Ambulate with assistance
- Start tube feeds ½ FAA at 10cc/hr if flatus otherwise wait

**POD3-POD6:**
- Ambulate with assistance
- Diuresis as needed
- Increase tube feeds to goal or start tube feeds if bowel activity.
- Start medications through J-tube if bowel activity and tube feeds tolerated
- Reconcile medications with preoperative medications

**POD7:**
- Swallow study to rule out leak
- Chest Tube DC’d if Swallowing Study negative
- Remove drains as listed below

**POD8-10:**
- Cap epidural and d/c Foley if chest tube is out and J-tube medications tolerated
- Discharge
Esophagectomy Patient Drain Management

Chest tubes

In general, chest tubes for esophagectomy are kept in and removed after swallow study and eating.

General criteria for chest tube removal:
- No leak
- Output less than 200 cc/24 days
Ancef for 24 hours.

NGT

NGT tubes are pulled after the swallow if it is negative for a leak with good motility of the conduit and gastric emptying.
(The tube is placed in the anastomosis in the neck for pulmonary toilet.)

Neck drains

Neck drains are kept in until patient has had colored drink day after swallow test and drain quality shows no evidence of leak.
Laparascopic Nissen/Paraesophageal Hernia Reduction

Nissen fundoplications are performed for those patients who have medically intractable reflux. The procedure involves wrapping the stomach around the lower esophageal sphincter. The procedure can now be done laparascopically.

Paraesophageal hernia involves the herniation of the stomach into the chest in various manners. They are treated when strangulated or cause symptomatic pain or reflux. The reduction procedure can be done laparascopically often with an esophageal lengthening procedure where the stomach is divided to lengthen the esophagus (Collis gastroplasty) and a Nissen is also often included for the reflux.

An esophageal myotomy is typically performed for achalsia. It involves breaking the muscular esophageal fibers near the GE junction. It too can be performed laparascopically and often a Nissen or Dor wrap is also included for reflux or to protect the myotomy.

These procedures are grouped together as their postoperative management can be loosely grouped together with the more complex procedures often needed additional tests.
# Typical Postoperative Course

<table>
<thead>
<tr>
<th>DOS:</th>
<th>Neurological</th>
<th>Minimize sedation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular</td>
<td>Lopressor (Hold if HR&lt;60, SBP&lt;110 mm Hg)</td>
<td></td>
</tr>
<tr>
<td>Respiratory</td>
<td>Nebulizers</td>
<td></td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>NPO, NGT – <em>DO NOT MANIPULATE OR REPLACE</em></td>
<td></td>
</tr>
<tr>
<td>Genitourinary</td>
<td>IVF: D5LR or D51/2NS at 125 cc/hr</td>
<td></td>
</tr>
<tr>
<td>Hematology</td>
<td>SQ Heparin TID or Lovenox daily</td>
<td></td>
</tr>
<tr>
<td>Infectious Disease</td>
<td>Ancef x 24 hours</td>
<td></td>
</tr>
</tbody>
</table>

**POD1:**
- **Nissen without Collis, no intraoperative problems:**
  - D/C NGT, start sips
- **Nissen with Collis, no intraoperative problems:**
  - Swallow study prior to d/c NGT
- **Paraesophageal hernia repair w/ Collis, no intraoperative problems:**
  - D/C NGT, start sips
- **Paraesophageal hernia repair with Collis, no intraoperative problems:**
  - Swallow study prior to d/c NGT
- **Myotomy, no intraoperative problems:**
  - Swallow study prior to d/c NGT
  - Heplock later in day
  - Ambulate with assistance

**POD2:**
- Clears if tolerated
- Ambulate with assistance

**POD3-5:**
- Full Liquids
- Reconcile preoperative medications and give crushed or only if fairly small pill (0.5 cm length or smaller)
- Discharge on Full Liquids or Clear Liquids Only
References / Acknowledgements