

Thoracic Surgery Handbook

**A Guide For Postoperative Care
And Management**

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

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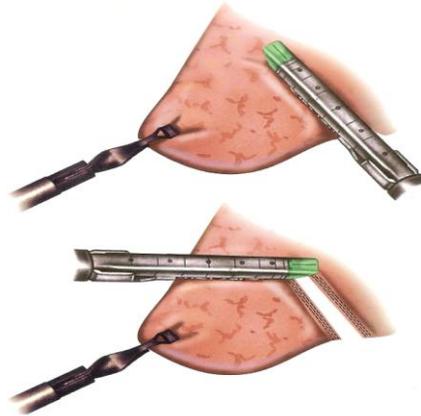
HOW TO USE THIS HANDBOOK

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

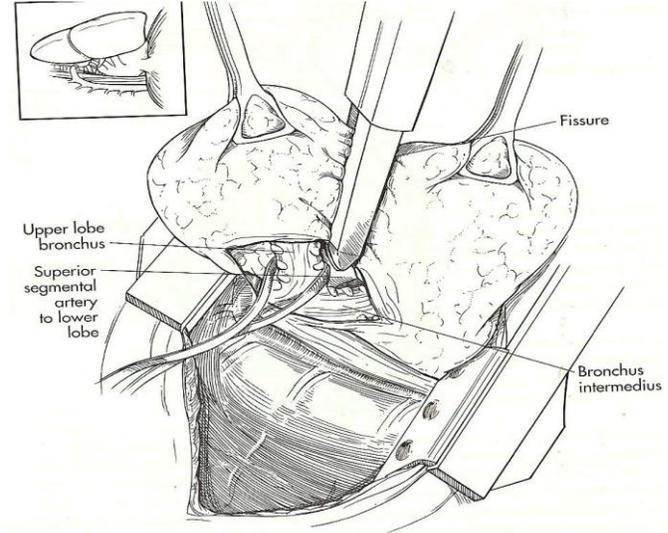
General criteria for tube removal:
No leak
Output less than 200 cc/24 days.
Ancef for all tubes for 24 hours.

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 (<i>HOLD 24 hrs prior to epidural removal</i>)
	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

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 (<i>HOLD 24 hrs prior to epidural removal</i>)
	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	

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 reequilibrating 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 (<i>HOLD 24 hrs prior to epidural removal</i>)
	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	

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 thoroscopically (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 (<i>HOLD 24 hrs prior to epidural removal</i>)
	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, Pepcid
	Genitourinary	Heplock; Often initially require fluids/albumin/blood on DOS as ooze into space.
	Hematology	SQ Heparin TID or Lovenox daily (<i>HOLD 24 hrs prior to epidural removal</i>)
	Infectious Disease	Ancef/Levofloxacin/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

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

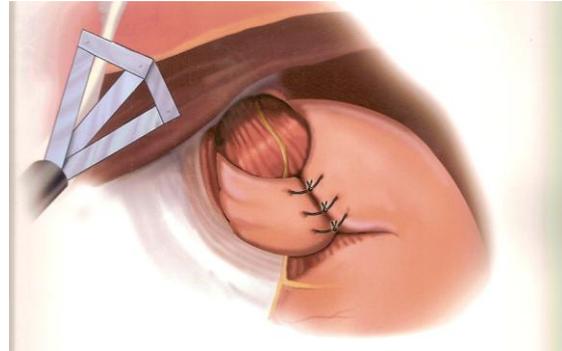
(The tube is placed in the anastomosis in the neck for pulmonary toilet.)

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.

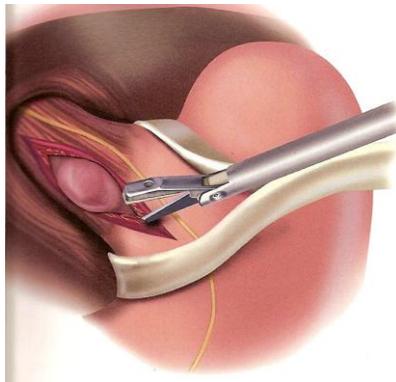
Laparoscopic Nissen/Paraesophageal Hernia Reduction

Nissen funduplications 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 laparoscopically.



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 laparoscopically 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 achalasia. It involves breaking the muscular esophageal fibers near the GE junction. It too can be performed laparoscopically 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

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

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

1. Thoracic Surgery Handbook adapted from the *Brigham and Women's Hospital Thoracic Surgery Handbook* for surgical housestaff.
2. Diagrams for "Thoracoscopic/VATS Wedge for Nodule" and "Laparoscopic Nissen/Paraesophageal Hernia Reduction/Myotomy" from: *Atlas of Minimally Invasive Surgery*, DB Jones et al, Cine-Med Inc, 2006.
3. Diagram for "Lobectomy/Open Wedge" from: *Atlas of General Thoracic Surgery*, LR Kaiser, Mosby Year Book Inc, 1997.