THORACIC ANESTHESIA

This is a handout for the residents rotating through the Thoracic Anesthesia service for one month during their CA-2 year and senior residents doing their advanced clinical electives and rotating through the thoracic anesthesia service.

This text is not meant as a substitute for your clinical textbooks and reference material, but as a guideline for your conduct during the rotation, and also explains the degree of clinical competence expected with thoracic procedures at the end of the rotation. During the rotation, you will be assigned primarily to the thoracic rooms and all the case-load of the interventional pulmonary service. At anytime during the month you will share this case load with two to three other residents and the days when you are not assigned to a thoracic case, you will be expected to be in the general OR pool. You will also be performing all your call duties as usual, and this may involve overnight call, and heart and liver call.

The thoracic rotation involves not only doing interventional pulmonary and other thoracic cases everyday in the operating rooms, but also attending thoracic surgery conferences, complex airway workshops and having a very close communication with the OR staff in the thoracic room as well.

During introduction of the thoracic anesthesia rotation, the following topics will be discussed in detail:

1. Preoperative evaluation.
2. Introduction to the thoracic room set up.
3. Fiberoptic bronchoscope set up.
4. Epidurals and pain service communication.
7. Interesting Cases/Challenging cases.

**Preoperative evaluation:**
The general history (sex, age, obesity, nutrition) can yield information that can have impact on the outcome and specific risks associated with the procedure. For example, women survive thoracotomy for lung cancer far longer than men, (with all other factors being equal i.e. Cell type), possibly due to hormonal factors. Age more than sixty years has been shown to be an independent predictor of post operative complications. Post-operative atelectasis is more common in patients who are obese. History of smoking, or smoking cessation is also very important. A history of infection, fevers, increase in amount or color of sputum or any aggravation of chronic symptoms may entail an acute flare or infection. This may mean that the patient may need to be optimized prior to a high-risk elective surgery. Chest should be auscultated and degree of bronchospasm noted which may be helped by bronchodilators.

Patients undergoing thoracic surgery are generally very challenging cases. In addition to their respiratory problems, many have numerous other co-morbidities, which may include, but are not limited to cardiac and renal problems, airway issues. Many of these patients may be inpatients and in the Intensive care units.
This entails that each patient should be evaluated in detail and a thorough pre operative evaluation be performed.

Of special significance is the evaluation of the pulmonary function tests. These tests are generally performed on patients undergoing lung resections. Spirometry is performed and patients are identified who undergo more specialized testing. However, some patients who are in otherwise excellent health may not undergo any respiratory function testing. This decision is made by the surgical team and is generally made on the basis of the exercise tolerance. It is extremely important for the anesthesia team to be aware of the respiratory status of the patient, the results of any specialized testing and the nature and extent of surgery planned. A detailed description of the Pulmonary Function Tests (PFT’s) will be done later in the course of the handout.

Similarly, patients undergoing mediastinal explorations may have severely compromised airway. It is important for the anesthesia team to be aware of the pulmonary functional status and the nature of investigations performed. Chest radiographs should be looked at to assess any tracheal deviation, narrowing, mediastinal masses, pleural effusions, pneumothorax and cardiac size and pulmonary structure.

The majority of patients getting lung resections through a standard thoracotomy get thoracic epidural unless it is otherwise contraindicated. It is very important to rule out any contraindications to placement of an epidural catheter. Some patients may have been on chronic anticoagulant therapy, such as coumadin. Coumadin is generally stopped by the surgical team at least five days prior to surgery. However, this fact needs to be confirmed and PT/INR may need to be re-drawn immediately prior to placement of an epidural to assure return to normalcy. Generally, healthy patients with no history of bleeding problems or any specific drug intake do not require any coagulation tests.

Last but not the least, is the evaluation of the airway. It is especially important to very critically assess the airway as many of these patients would require placement of a double lumen tube (DLT), which can sometimes be a very challenging undertaking. Patients with history of difficult intubations, or those who seem to fulfill criteria of a possible difficult intubation should be very carefully assessed and a complete plan chalked out in regards to securing the airway. The surgical team should be informed of the possibility, and a plan devised for intubation and eventually lung isolation. Close communication with the surgical team is of paramount importance and always helps in a better and a more optimal intra operative management plan.

**Thoracic Room set up:**
The majority of the thoracic cases are done in the Main OR 7, however, cases can be done in any of the operating rooms. Room seven is preferred as it has all the thoracic surgery equipment set up. From the anesthesia perspective, a case requiring lung isolation intra operatively, would require the following additional steps of preparation along with the preparation for any case done under general anesthesia,

1. A double lumen tube with all its connectors and suction catheters.
2. Size and side to be determined prior to opening of the package.
3. Single lumen tube, of appropriate size.
4. Fiberoptic bronchoscope, which has been checked and found to be functional(adequate light source white and color balanced, camera head positioned optimally).
5. Hurricane spray for bronchoscope lubrication.
6. Defogging solution.
7. Readily available CPAP circuit.
8. Any additional set up that may be required with any specific monitoring modality being used by the patient.
**Care of the Fiberoptic Bronchoscope**

A fiberoptic bronchoscope consists of coated glass fiber bundles that transmit light and images. One bundle (light source bundle) transmits light from the light source to the tip of the scope while the other bundle (image bundle) transmits a high resolution image.

There is another aspiration/suction channel, which provides limited availability of suction or oxygen insufflation. After use the aspiration channel is always thoroughly flushed as it can get quickly clogged and nonfunctional.

A water based lubricant is usually adequate for the scope to be passed through the DLT. The smaller the DLT, the more important it is to adequately lubricate the scope. The camera head adaptor is used to display the image on the monitor.


**Epidurals and Pain Service Communication**

Patients coming to hospital for thoracotomies and lung resections usually have significant pulmonary compromise and limited ventilatory reserve. It is very important for these patients to have adequate chest physical therapy post operatively, and to take vital capacity breaths without any significant pain. This prevents the occurrence of post operative respiratory complications, which are the source of greatest morbidity following lung resections.

Good pain control allows these patients to cough and expectorate respiratory secretions thus preventing atelectasis and pneumonia. Many of these patients also have ischemic heart disease, and it is also extremely beneficial to block the sympathetic response to pain, which may cause tachycardia and hypertension.

Planning for post operative pain control should start in the pre operative period and depends primarily upon the nature of the surgery. Unless otherwise contraindicated, our policy is to place high thoracic epidurals in all patients getting open thoracotomies for any surgery. However, this does not include the patients who have been booked for video assisted thoracotomies for surgeries as Video assisted wedge resection, talc pleurodesis, video assisted lung biopsy etc, as the incisions are very small and the patients generally do not need as much pain control. However, there are a number of patients who are booked for a mediastinoscopy/Video assisted wedge resection with a question of lobectomy after that. The mediastinoscopy is done to assess operability, if negative the procedure proceeds to a Video assisted resection and following a positive biopsy a formal thoracotomy is performed with a resection. Communication with the surgical team is extremely important, as they can inform the anesthesia team of the likelihood of a procedure ending up being an open thoracotomy, and hence an epidural catheter can be placed before the procedure begins.

All patients who get thoracic epidurals get Acute Pain Service(APS) consults post operatively, and the APS follows them post operatively until the time the catheter is removed. It is very important to inform the APS resident about the epidural, especially its site, catheter insertion and the drugs being used for the pain control. This helps the APS to keep track of the patient in the PACU and the epidural orders can be written expeditiously.

**Choice for pain control**

1. Short acting narcotics are generally used for short procedures as mediastinoscopy, VAWR and as temporizing measures while a nerve block is in effect.
2. Ketorolac is an extremely popular drug in thoracic patients. It is also very helpful in patients who have an epidural as it will help treat pain originating from nerves other than intercostals. It is also helpful in treating chest tube pain. It is contraindicated in patients with renal failure, GI bleeding and ulceration due to NSAIDS and any uncontrolled bleeding. Administration of Ketorolac should be discussed with the surgical team and the anesthesia staff.

3. Intercostal nerve blocks are placed by the surgical team during the course of the surgery towards the end. They are especially helpful if the patient does not have an epidural.

4. PCA is used by most patients who do not have an epidural. Sometimes the patients with epidurals also have a PCA, when the epidural solution contains only local anesthetic and narcotics are given via PCA.

5. Thoracic epidural is the procedure of choice for the majority of the thoracic surgery procedures including lobectomy, pneumonectomy, median sternotomy, lung volume reduction surgery, esophagectomy etc. They are particularly indicated for patients with poor lung functions. Contraindications for placing a thoracic epidural are the same as for placing epidural/spinal at any other level. However, the epidural does not cover pain that is being transmitted by vagus or the phrenic nerve. Pain due to a thoracoabdominal incision may not be covered by a thoracic epidural and hence the patient may need intravenous narcotics.

Reference:

Thoracic Surgical Conference
Thoracic Surgical conference is held every Friday at seven am on the third floor in the clinical center on the west campus. It is held in the one of the radiology reading rooms. The conference is attended by majority of the thoracic surgeons, especially who have case for the following week, the pulmonary service and the thoracic surgical coordinator, and a representative of the anesthesia department. It is an important conference, as all the cases to be done in the following week are discussed. Issues pertaining to pre operative pulmonary, cardiac or any other relevant consults are brought up as well as post operative pain management is discussed. Similarly, any specific intra operative management issues are also discussed with the anesthesia team, such as any specific procedure requiring DLT, or SLT followed by DLT, epidural placement etc. Generally, it is attended by one of the attending anesthesiologists, on the thoracic service, who takes notes of any specific requests for any patient and then sends e-mail to all the residents and fellows as well as the Attending anesthesiologists on the service. With the start of the formal thoracic rotation, senior residents rotating through the service may be asked to attend the conference. If you are assigned to do this, it will be done a day before the conference, and then you need to show up early and be done with your room set up by 7 AM, so that you may have enough time to attend the conference, which lasts for about twenty minutes.

The scheduled case will be sent out in an e-mail to the residents and fellows with the relevant information discussed in the conference. The e-mail should be sent preferably the same day or on the following weekend by the latest.
Complex Airway Conference
The complex airway conference is a multi disciplinary conference held on the first Thursday of every month, in the Shapiro Clinical Center, on the fourth floor in the radiology conference room from 5PM to 7:30 PM. It is attended by pulmonologists, otolaryngologists, thoracic surgeons, intensivists and anesthesiologists. Every month a guest speaker is invited for a presentation, which is followed by a series of interesting cases and discussion. It is an accredited conference and CME credits can be earned by attending the conference. All residents and fellows are encouraged to attend, but the residents rotating through the thoracic service must attend the conference. You are encouraged to make a presentation of an interesting case, difficult airway or any case relevant to the conference.

Thoracic Morbidity and Mortality conference
We will be holding a thoracic morbidity and a mortality conference on the last Wednesday of every month. The conference will be held in collaboration with thoracic surgical, interventional pulmonary and the thoracic anesthesia division. Interesting cases and complications will be presented. Although not mandatory for the anesthesia residents, they are strongly encouraged to attend and present interesting cases. The conference is held towards the end of the month so that the residents are familiar with the cases being presented. It also important that you must discuss the case you want to present with your attending anesthesiologist on record for that case prior to putting it on the list. A brief and a relevant review of literature must accompany the case and the cases that are presented by the anesthesia teams will be kept in the thoracic case log.

STARTING THORACIC CASES
Generally the thoracic cases are scheduled in OR 7 on the west campus. However, emergency cases and add on cases for the day can be done in any room. Unless the patient in house, patients for thoracic surgery will show up around 6:30 am in the holding area. The majority of the times, they have had a thorough pre operative evaluation in the PAT, but sometimes, for any number of reasons, it is waived, and hence, it has to be done in the holding area.

This makes it very important that the room set up be complete by 6:30am so that you are ready to start you pre operative evaluation between 6:30 and 6:45am. These are very challenging cases, which require invasive monitoring lines and thoracic epidural placement. You should have adequate time to place these lines and have enough time for placement of DLT and fiberoptic bronchoscopy.

Similarly, if the patient is in house, you should ensure that the patient has been placed on call by the front desk, so that there is no unnecessary delay because of transport issues.

Soon after establishing intravenous access, unless contraindicated, the patient should be positioned and thoracic epidural performed. This is because, a difficult epidural is the most common reason a case will be delayed and it is good to have it placed ahead of the arterial line, which in most cases can even be placed after induction of general anesthesia.

Prior to administration of sedatives, it should be ensured that all documentation such as surgical/anesthesia consents are in order. Similarly, majority of these patients require a type and screen specimen sent to the blood bank. You will generally find a T &C green slip and pink tube in front of the chart of the patients who require a blood bank specimen. But even if you do not find the tube and the slip, the availability of the specimen should always be double checked with the blood bank.
After having checked with the nurses in the operating room, you should generally be ready to take the patient back to the OR, by 7:30 am. These patients require DLT placement, fiberoptic bronchoscopy, and positioning for the surgical procedure. If all goes well, this requires between 15-20 minutes and then some time for positioning. Going in the room early will ensure that you have adequate time to place and position a DLT and perform a FOB.