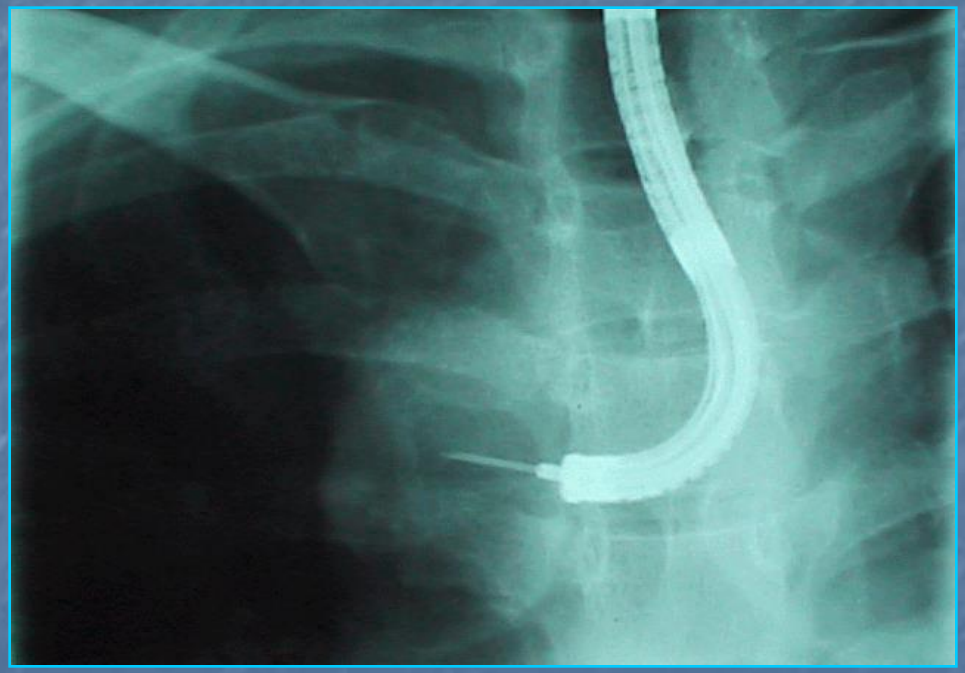
Part 5A: Transbronchial needle aspiration biopsy (TBNA) VOLUME 1

Strategy and Planning

Execution



Bronchoscopy International

History

TBNA

- Originally described in Argentina by SCHIEPPATI E. "La punction mediastinal traves del espolon traquel" in Rev As Med Argent 1949, 663: 497-499
- Expanded upon using flexible bronchoscopy in the 1970s
  - A new needle for transfiberoptic bronchoscope use. Oho K, Kato H, Ogawa I, Hayashi N, Hayata Y Chest 1979; 76: 492 (letter to the Editor).

TBNA today

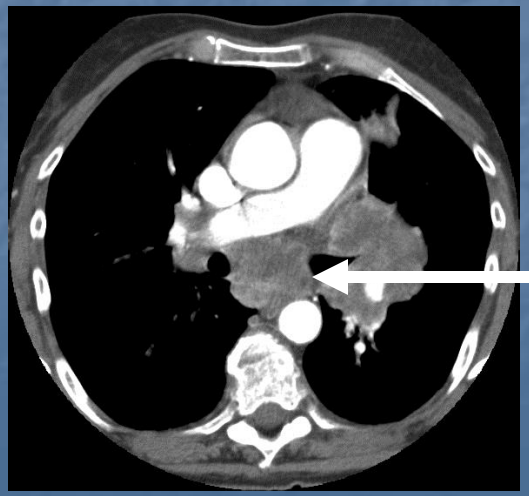
- Easily performed as outpatient procedure in a bronchoscopy suite.
- Ideally performed using conscious sedation and topical anesthetic.
- Rapid on site examination (histology or cytology) increases diagnostic yield.

Training is essential in order to

- Learn proper techniques and indications
- Avoid procedure-related complications.
- Learn to protect the equipment and avoid breaking the bronchoscope
  - avoid forced passage of the needle through the scope at ANY time, especially if the scope is flexed
  - Avoid needle manipulation while it is inside the working channel of the bronchoscope.

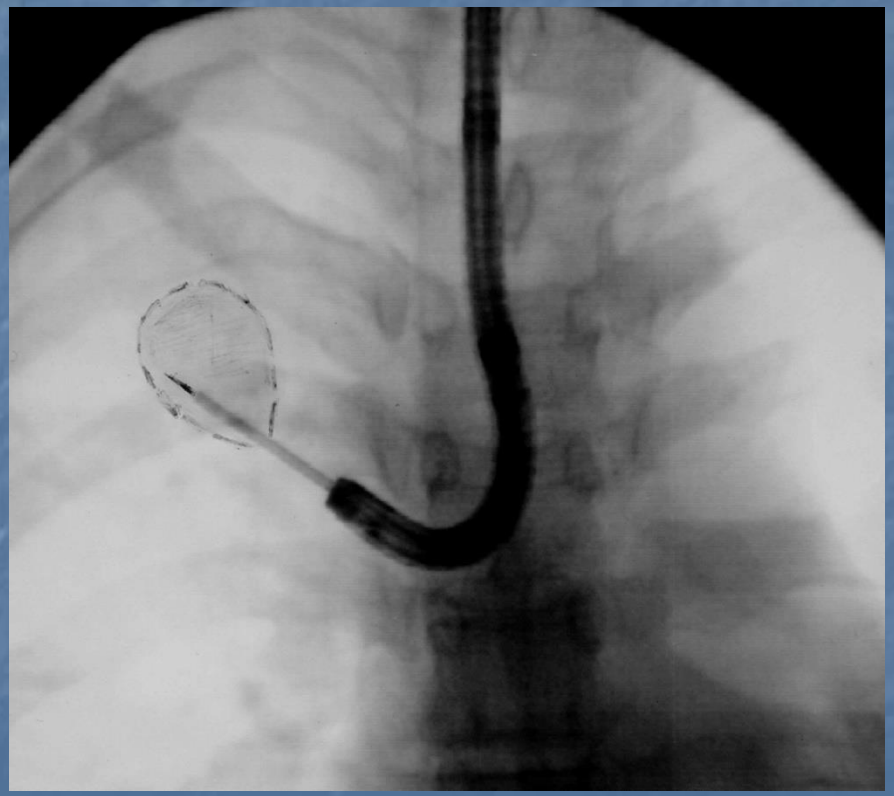
When to perform TBNA

- Mediastinal staging for suspected carcinoma
- Mediastinal tumors of unclear origin
- Submucosal needles for diagnosis of endobronchial disease
- Endobronchial needle aspiration can also be performed of airway lesions.
- To evaluate posterior subcarinal and aorto-pulmonary window lymph nodes not easily accessible by conventional mediastinoscopy.



TBNA of Subcarinal mass

TBNA can also be used to sample peripheral lung nodules



Courtesy P. Lee, Singapore

Contraindications to TBNA

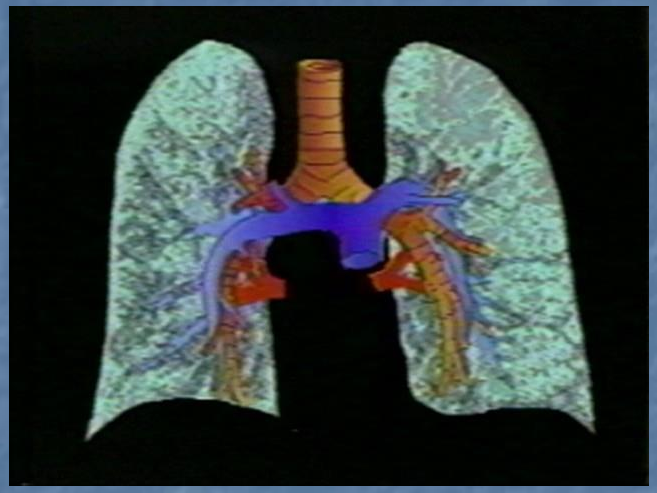
- Unable to tolerate bronchoscopy
- Careful consideration should be given to patients with bleeding disorders.

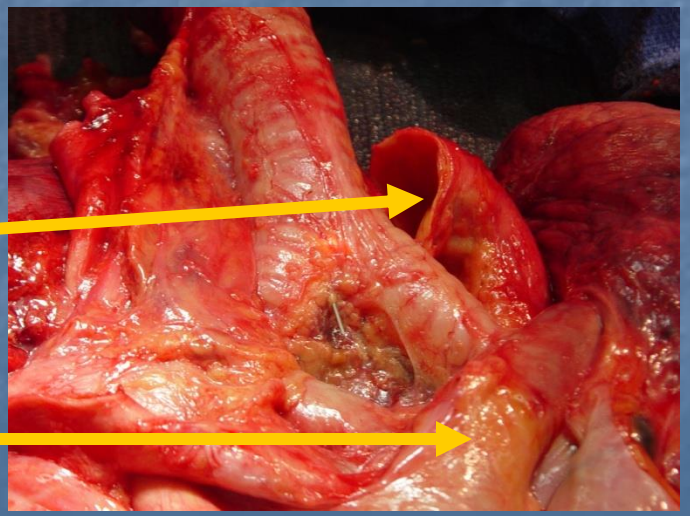
Presumed dangers of TBNA

- Perforation of great vessels
- Pneumomediastinum
- Air embolus
- Airway bleeding
- Pneumothorax

Complications of TBNA

- Patient-related
  - Fever
  - Transient bacteremia
  - Pneumomediastinum
  - Pneumothorax
  - Bleeding
  - Inadvertent puncture of mediastinal structures





Complications of TBNA

- Equipment-related
  - Puncture of bronchoscope
  - Tear of working channel of bronchoscope
  - Broken needles
    - Do not retract or advance
- Staff-related
  - Needle stick injury

Indications for TBNA

- Focal or diffuse endobronchial mucosal or submucosal infiltration suggestive of
  - Infection
  - Carcinoma or lymphoma
- Pulmonary nodules and masses
- Mediastinal adenopathy or masses
- Endobronchial lesions, especially in cases of substantial neovascularization where biopsy may cause bleeding, or necrotic lesions where a core, rather than surface biopsy is warranted.

Yield of TBNA

- Sensitivity generally reported to be >70 % for malignancy
- Specificity generally reported to be > 90% for malignancy
- Positive predictive value 100%,and negative predictive value 70% for malignancy.
  - Negative TBNA warrants confirmation by mediastinal exploration results.

Diagnostic yield depends on

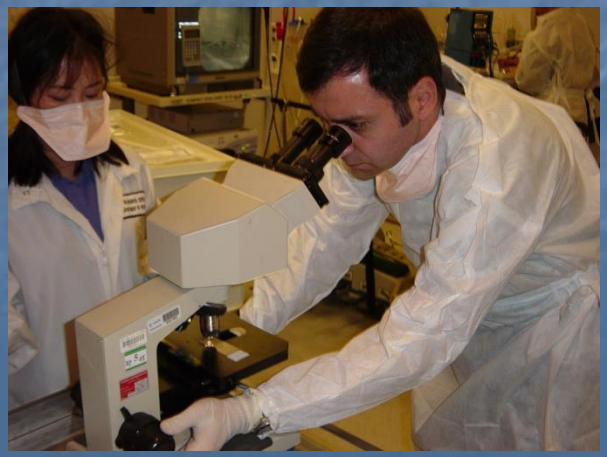
- Bronchoscopist’s experience
- Cytopathologist's experience
- Use of Rapid On-site examination
- Location of abnormality being sampled (yield is highest for subcarina and right paratracheal nodes)
- Needles used (cytology and histology)
- Use of Endobronchial Ultrasound
- Nodule size
- Lymph node size
- Cell type (usually higher for small cell carcinoma than for nonsmall cell carcinoma)

Rapid on-site examination

Rapid On-Site Examination (ROSE) by cyto-pathologist has been shown to improve diagnostic yield.

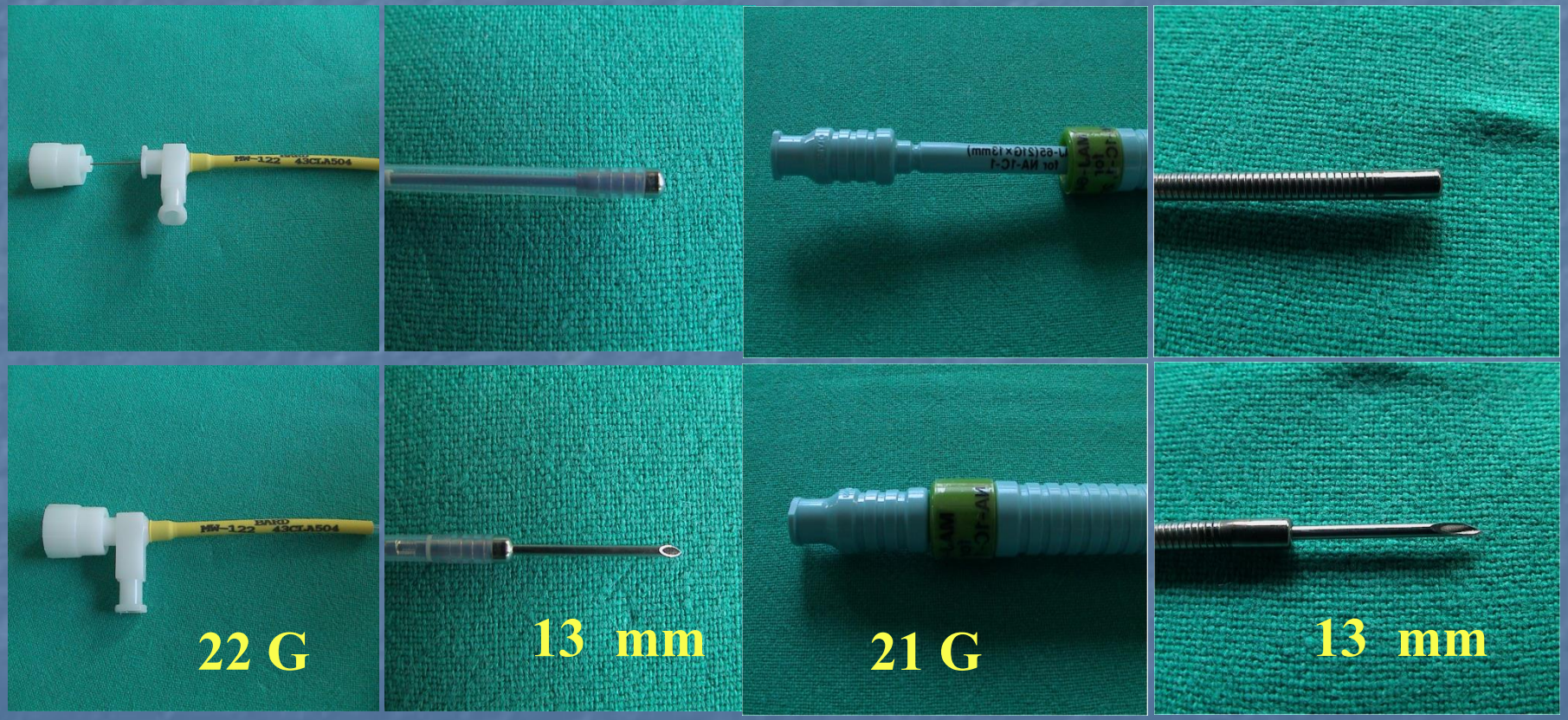
Number of specimens needed

- Even one pass may be enough
  - If on site examination provides diagnosis
- Best to obtain several specimens
- Process specimens according to protocol developed in partnership with cytopathology department.
- Obtain sample for cell block



ROSE shortens duration of procedure, increases diagnostic yield, accelerates patient management decisions, and enhances chances for rapid treatment

Examples of Needles Cytology



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Examples of Needles Histology

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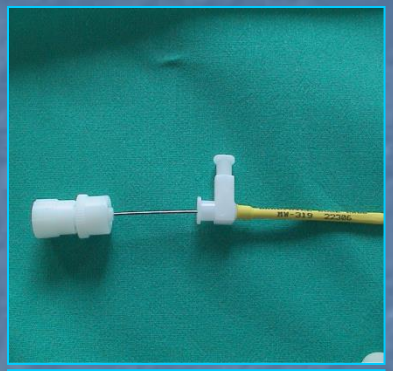
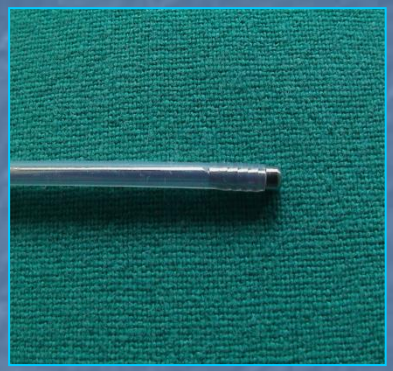
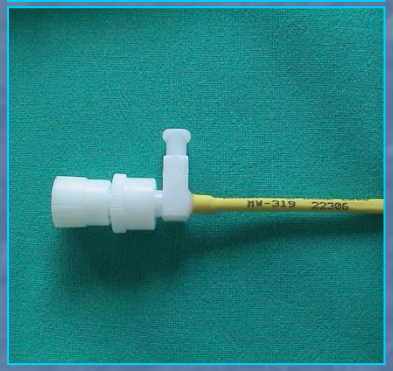





EXCELON


All 19 Gauge

HISTOLOGY NEEDLES

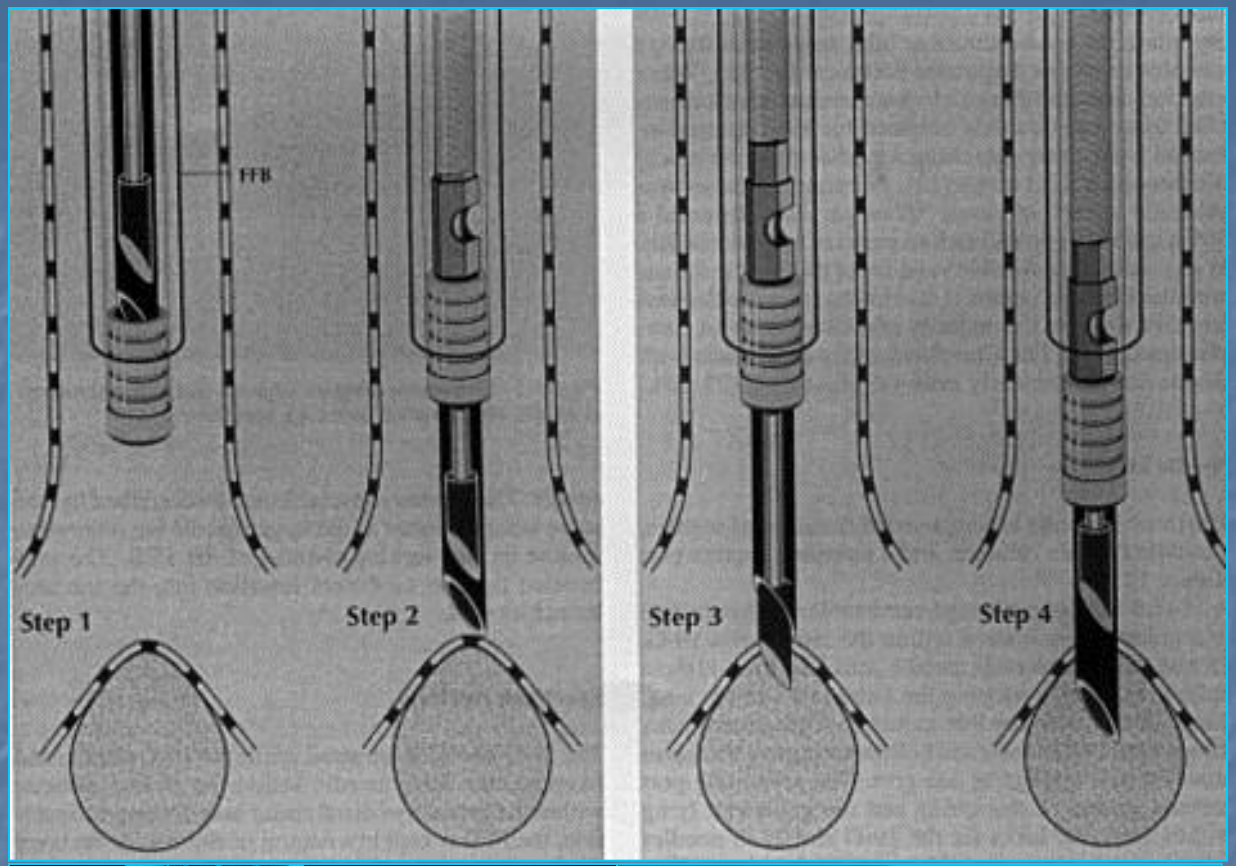


Photo courtesy A. Mehta

Core specimens can be obtained

Courtesy S. Gasparini

Manipulating the Bronchoscope during TBNA

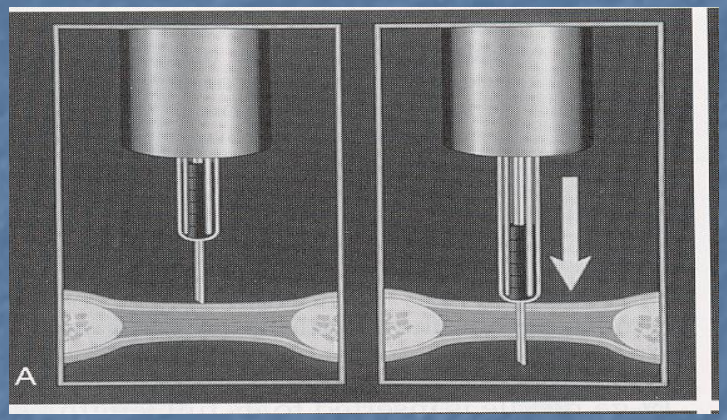
- Control flexion-extension.
- Avoid advancing needle through fully flexed scope.
- Caution if resistance is felt while advancing needle-catheter through working channel.
- Never withdraw needle catheter without first assuring that needle has been retracted into the catheter.
- Straighten scope during needle withdrawal

Procedural Techniques and Results

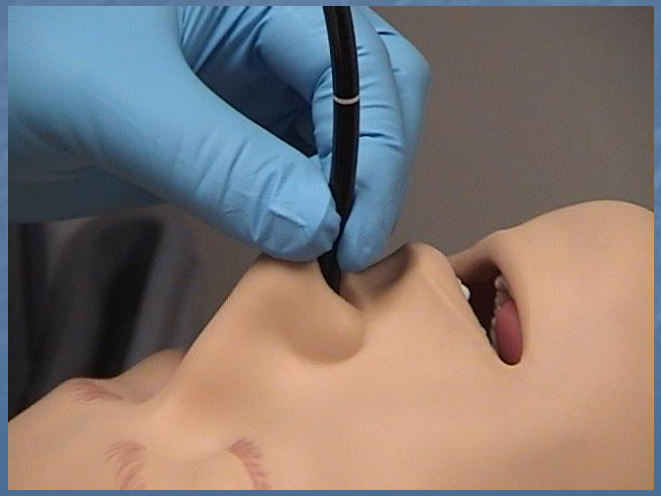
- Techniques and instrumentation
  - Either one of the 3 techniques of TBNA can be applied.
  - TBNA will be performed after the complete airway examination, but before any other diagnostic bronchoscopic procedures so that contamination of specimens is avoided.
  - For the same reasons, suction should be minimized during scope insertion, and the site of TBNA can be rinsed with saline bolus prior to needle insertion.
  - Release suction before withdrawing the needle from the airway wall.
  - Procedure can be started using a 21 gauge cytology needle, and a 19 gauge histology needle should be available.
  - Provide on-site cytology if available (ROSE: Rapid On-Site Examination).
  - Biopsy of the upper lobe bronchial abnormalities can be avoided so that bleeding is avoided in this patient with comorbidities. In addition, TBNA provides both diagnosis and mediastinal staging in case of nonsmall cell carcinoma.

TBNA Techniques

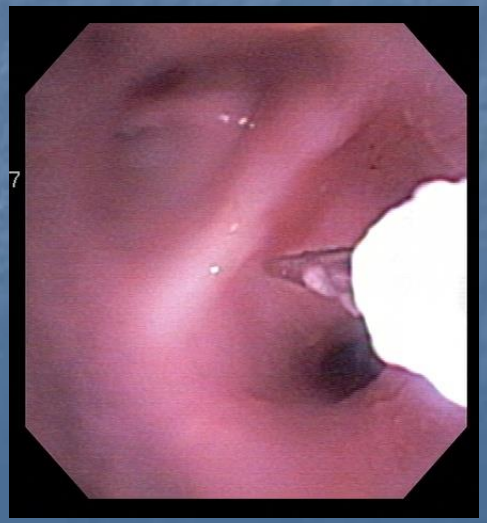
Image from Uptodate 2007



- Jabbing
  - Needle out.
  - Hold scope firmly at the mouth or nostril and push the needle through the tissues.

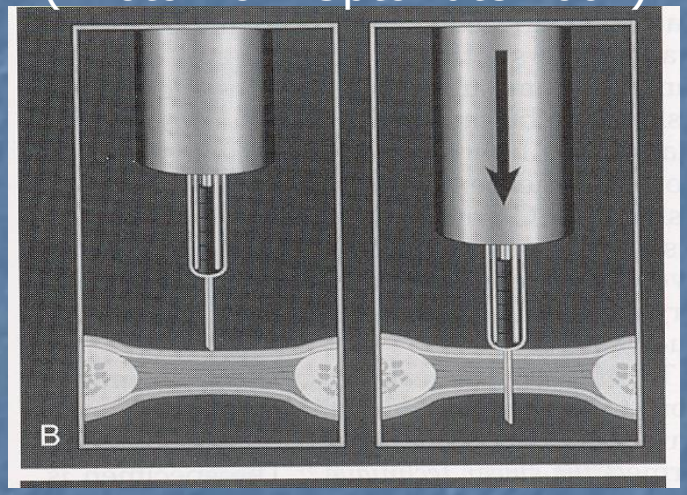


Courtesy H. Colt, UCIMC



TBNA Techniques

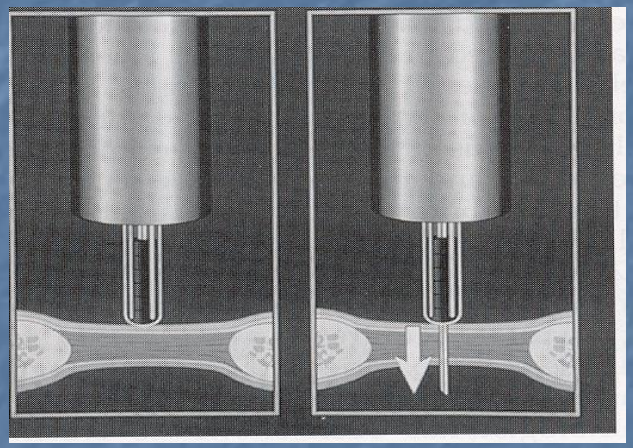
(Photo from UptoDate 2007)



- Piggyback
  - Needle out.
  - Hold catheter against insertion channel using fingers.
  - Advance scope and catheter together in order to penetrate airway wall with needle. Hub against wall

TBNA Techniques

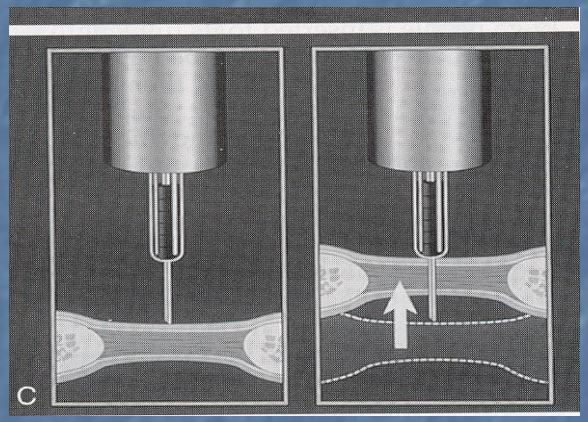
(Photo from UptoDate 2007)



- Hub against wall
  - Needle in.
  - Push catheter hub against airway wall.
  - Hold catheter against airway wall
  - Needle out so that it penetrates into the target.

Photo courtesy H. Colt, UCIMC

TBNA Techniques

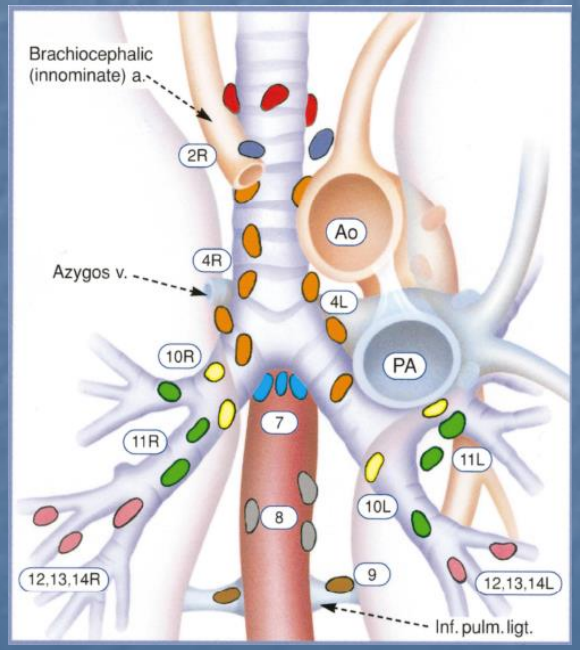


Cough prompts carina to move proximally (Photo from UptoDate 2007)

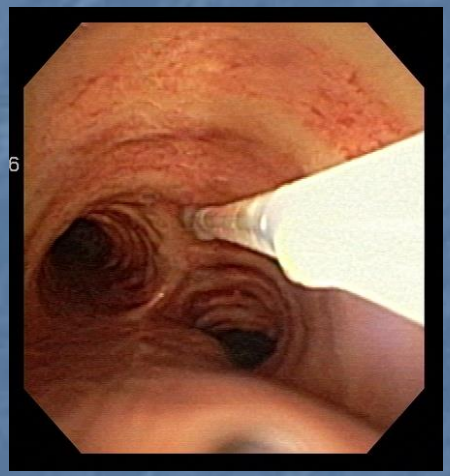
- For any of the three techniques, the patient can be asked to cough in order to create greater force with which the needle penetrates through the airway wall.

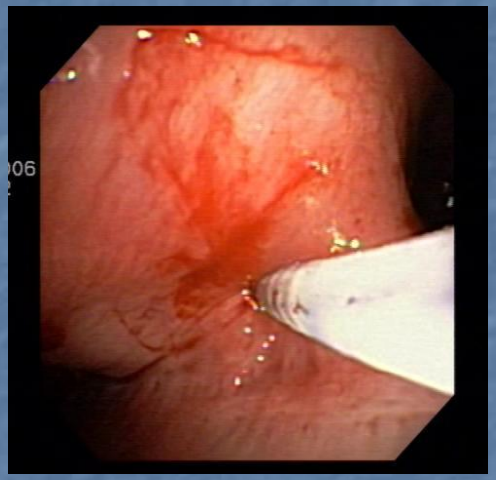
Procedural Techniques and Results

- Subcarina
  - 3-10 mm below the carina, insert needle inferior-medially.
  - Although needle insertion through the carina may sample precarinal and subcarinal nodes as well



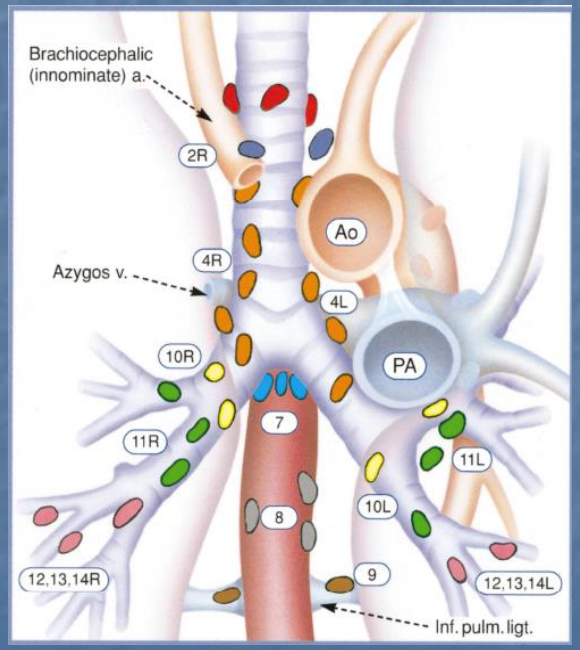
From Mountain CF et al, Chest 1997





Procedural Techniques and Results

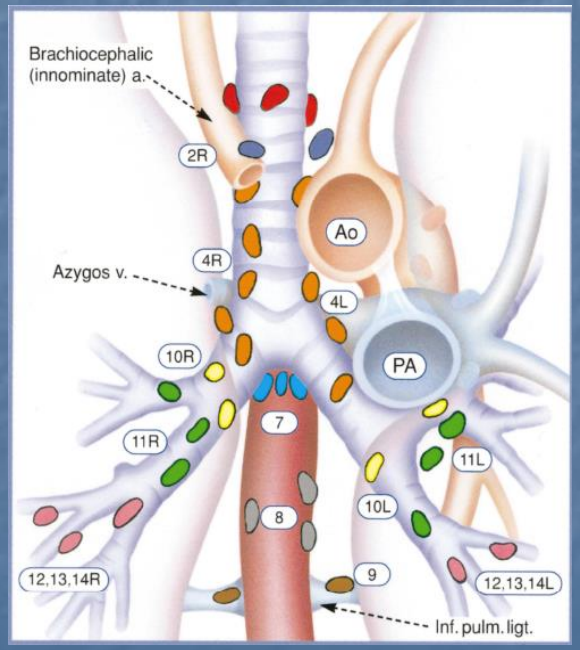
- Right paratracheal nodes
  - 2 cm above the carina, insert needle antero-laterally at the 1-2 0'clock position.



From Mountain CF et al, Chest 1997

Procedural Techniques and Results

- Left paratracheal and aortopulmonary window nodes
  - At the level of the origin of the left main bronchus and the main carina, insert the needle laterally at the 9 o'clock position.



From Mountain CF et al, Chest 1997

Techniques and results : endobronchial lesions

- Needles can also be used to sample endobronchial lesions

Helpful hints for performing TBNA

- Inform the patient that "there are no nerve endings in the airway, so the needle insertion itself will not hurt".
- Use conscious sedation to improve patient comfort.
- Carefully examine airway-computed tomography correlations to plan the procedure.
- Inform bronchoscopy assistants of procedure plan.
- Use instructions such as "needle out", "needle in" , "remove catheter", "hold scope at nose" to communicate with assistants.
- Send copies of bronchoscopy report to assisting cytopathologists.

TBNA More Helpful hints

- Start sampling the nodal station with the worst prognosis (n3 followed by n2 followed by n1).
- Cytology samples should be processed in the bronchoscopy suite using smear techniques.
- Core tissues should be submitted in 10% formaldehyde.
- Histology needles (19 gauge) can be flushed with normal saline to obtain a cytology sample and potentially increase diagnostic yield.
- Samples are acceptable when there is a predominance of lymphocytes and few or no respiratory epithelial cells.

This presentation is part of a comprehensive curriculum for Flexible Bronchoscopy. Our goals are to help health care workers become better at what they do, and to decrease the burden of procedure-related training on patients.

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Thank you