MTE28 Meet the Expert

Lessons from the past – What I would not do again in diagnostic and therapeutic IP

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Never regret anything that has happened in your life.
It cannot be changed, undone, or forgotten.
Take it as a lesson learned and move on.
Daily Vibes

Outline

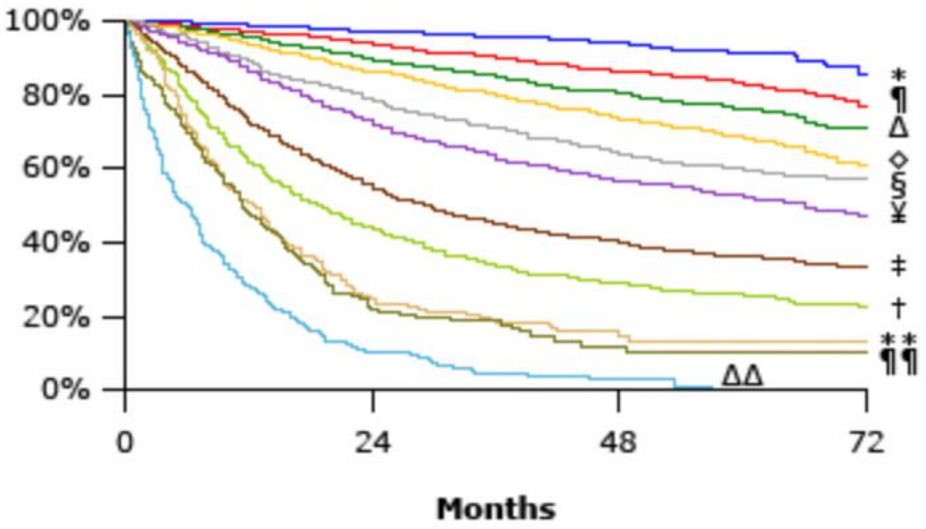
- EBUS
- Compare to mediastinoscopy
- Practical issues in starting an EBUS program
- Complicated cases

Historical perspective

- Wang developed TBNA (transbronchial needle aspiration) for the flexible bronchoscope and published in 1983.
- EBUS TBNA was developed in 2002. The first paper was published in 2002 by Herth et al.

- Transbronchial needle aspiration in the diagnosis and staging of bronchogenic carcinoma. Wang KP, Terry PB. Am Rev Respir Dis. 1983 Mar; 127(3):344-7.
- Endobronchial ultrasound (EBUS)--assessment of a new diagnostic tool in bronchoscopy for staging of lung cancer. Herth F, Becker HD, Manegold C, Drings P. Onkologie. 2001 Apr;24(2):151-4.

NSCLC Survival by Clinical Stage



8th edition	Events / N	MST	24 month	60 month
* IA1	68 / 781	NR	97%	92%
¶ IA2	505 / 3105	NR	94%	83%
Δ IA3	546 / 2417	NR	90%	77%
◇ IB	560 / 1928	NR	87%	68%
§ IIA	215 / 585	NR	79%	60%
¥ IIB	605 / 1453	66.0	72%	53%
‡ IIIA	2052 / 3200	29.3	55%	36%
† IIIB	1551 / 2140	19.0	44%	26%
** IIIC	831 / 986	12.6	24%	13%
¶¶ IVA	336 / 484	11.5	23%	10%
ΔΔ IVB	328 / 398	6.0	10%	0%

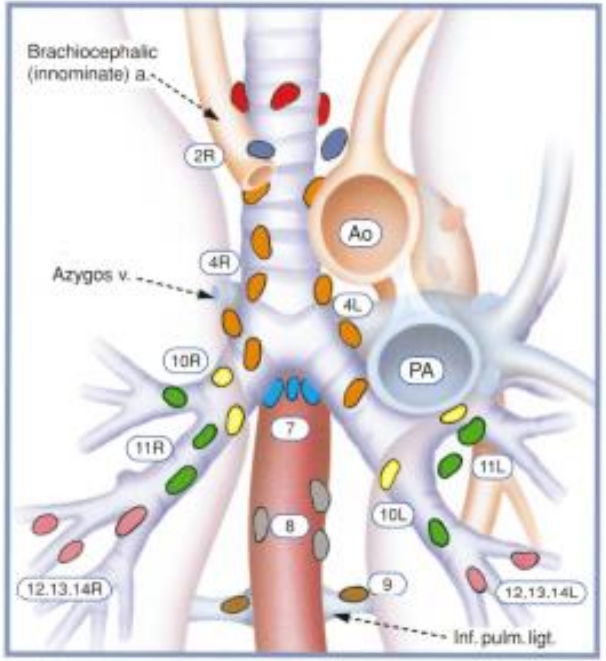
IASLC 8th Edition. J Thorac Oncol. 2016;11:39-51.

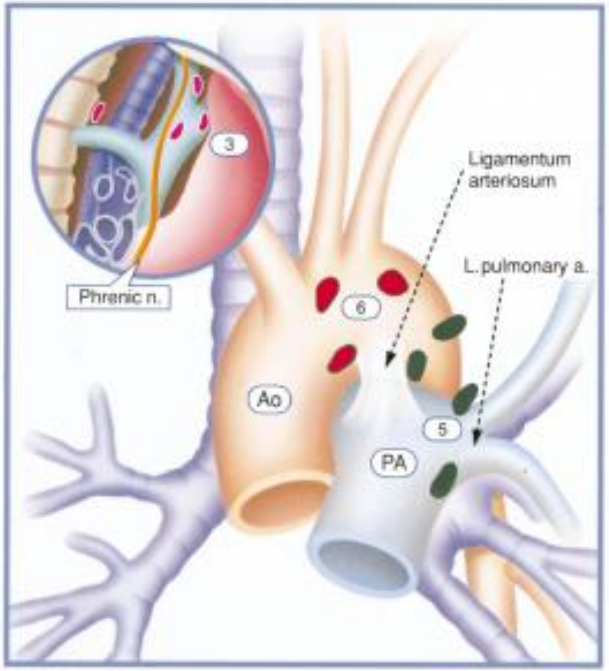
N Stage

- N0 – No regional lymph node involvement.
- N1 – Involvement of ipsilateral intrapulmonary, peribronchial, or hilar lymph nodes.
- N2 – Involvement of ipsilateral mediastinal or subcarinal lymph nodes.
- N3 – Involvement of contralateral mediastinal or hilar lymph nodes. Alternatively, involvement of either ipsilateral or contralateral scalene or supraclavicular lymph nodes.

IASLC 8th Edition. J Thorac Oncol. 2016;11:39-51.

Tailoring Your Diagnostic Technique To The Anatomy





NODAL BASSIN	EBUS	EUS	CM	AM	VATS
1 – Highest Mediastinal	✓				
2 – Upper Paratracheal	✓	✓	✓		✓
3 – Pre-Vascular Retrotracheal	✓	✓			✓
4 – Lower Paratracheal	✓	✓	✓		✓
5 – Subaortic (AP Window)		✓		✓	✓
6 – Para-Aortic				✓	✓
7 – Subcarinal	✓	✓	✓		✓
8 – Paraesophageal		✓			✓
9 – Pulmonary Ligament		✓			✓
10 – Hilar	✓		✓		✓
11 – Interlobar	✓				✓

Guidelines

- ACCP
- ERS
- ESTS (European Society of Thoracic Surgeons)
- NICE (National Institute for Health and Care Excellence)
- ESGE (European Society of Gastrointestinal Endoscopy

EBUS should be the initial staging procedure for NSCLC

ACCP Guidelines

- Invasive versus Minimally-Invasive Mediastinal Staging
- EUS and EBUS

CHEST Supplement
DIAGNOSIS AND MANAGEMENT OF LUNG CANCER, 3RD ED: ACCP GUIDELINES

Methods for Staging Non-small Cell Lung Cancer

Diagnosis and Management of Lung Cancer, 3rd ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines

Gerard A. Silvestri, MD, FCCP; Anne V. Gonzalez, MD; Michael A. Jantz, MD, FCCP; Mitchell L. Margolis, MD, FCCP; Michael K. Gould, MD, FCCP; Lynn T. Tanoue, MD, FCCP; Loren J. Harris, MD, FCCP; and Frank C. Detterbeck, MD, FCCP

Chest. 2013;143(5):e211S-e250S

4.4.4.3. In patients with high suspicion of N2,3 involvement, either by discrete mediastinal lymph node enlargement or PET uptake (and no distant metastases), a needle technique (endobronchial ultrasound [EBUS]-needle aspiration [NA], EUS-NA or combined EBUS/EUS-NA) is recommended over surgical staging as a best first test (Grade 1B).

Remark: This recommendation is based on the availability of these technologies (EBUS-NA, EUS-NA or combined EBUS/EUS-NA) and the appropriate experience and skill of the operator.

Remark: In cases where the clinical suspicion of mediastinal node involvement remains high after a negative result using a needle technique, surgical staging (eg, mediastinoscopy, video-assisted thoracic surgery [VATS], etc) should be performed.

4.4.6.2. In patients with an intermediate suspicion of N2,3 involvement, ie, a radiographically normal mediastinum (by CT and PET) and a central tumor or N1 lymph node enlargement (and no distant metastases), a needle technique (EBUS-NA, EUS-NA or combined EBUS/EUS-NA) is suggested over surgical staging as a best first test (Grade 2B).

TASK FORCE REPORT ESGE/ERS/ESTS GUIDELINE

Combined endobronchial and oesophageal endosonography for the diagnosis and staging of lung cancer

European Society of Gastrointestinal Endoscopy (ESGE) Guideline, in cooperation with the European Respiratory Society (ERS) and the European Society of Thoracic Surgeons (ESTS)

For mediastinal nodal staging in patients with suspected or proven non-small cell lung cancer (NSCLC) with abnormal mediastinal and/or hilar nodes at computed tomography (CT) and/or positron emission tomography (PET), ***endosonography is recommended over surgical staging*** as the initial procedure (recommendation grade A).

Eur Respir J 2015; 46: 40–60.

Accuracy of CT for Staging Mediastinum in NSCLC

First Author	Year	No.	Tech	Prev	Sens	Spec	PPV	NPV
Eggeling[137]	2002	73	CE	70	82	50	79	55
Wallace[143]	2001	121	CE	69	87	35	75	54
Marom[88]	1999	79	CE	56	59	86	84	63
Vansteenkiste[150]	1998	56	CE	50	86	79	80	85
Aaby[156]	1995	57	…	44	72	91	86	81
Schillaci[136]	2003	83	CE	42	69	75	67	77
Vansteenkiste[151]	1998	68	CE	41	75	63	58	78
Primack[157]	1994	159	CE	38	63	86	73	79
Turkmen[130]	2007	59	CE	36	43	66	41	68
Laudanski[141]	2001	92	CE	33	60	73	51	79
Yokoi1[58]	1994	113	CE	33	62	80	61	81
Gdeedo[153]	1997	100	CE	32	63	57	41	76
Bury[155]	1996	53	CE	32	71	81	63	85
McLoud[139]	1992	143	CE	31	64	62	44	79
Pieterman[90]	2000	102	CE	31	75	66	50	85
Yen[127]	2008	96	CE	31	47	80	52	77
Osada[146]	2001	335	CE	30	56	93	77	83
Jolly[160]	1991	336	CE	30	71	86	69	87
Subedi[97]	2009	91	CE	29	50	86	59	81
Buccheri[154]	1996	80	CE	28	64	74	48	84
Pozo-Rodriguez[24]	2004	132	CE	27	86	67	49	93
Kiernan[138]	2002	92	CE	27	64	94	80	88
Reed[19]	2003	302	CE	25	37	91	58	81
Nosotti[139]	2002	87	CE	25	64	88	64	88
Dunagan[144]	2001	72	CE	25	50	87	56	84
Kimura[135]	2003	203	CE	24	63	97	88	89
Yi1[29]	2007	143	CE	24	65	89	65	89
Suzuki[149]	1999	440	CE	23	33	92	56	82
Bury[152]	1997	64	CE	22	79	84	58	93
De Wever[44]	2007	50	CE	22	91	72	48	97
Webb[162]	1991	154	CE	21	52	69	31	84
Cole[161]	1993	150	…	21	26	81	26	81
Takamochi[132]	2005	71	CE	21	20	89	33	81
Kamiyoshihara[145]	2001	546	CE	20	33	90	46	84
Takamochi[147]	2000	401	CE	20	30	82	30	83
Lee[126]	2009	182	CE	20	36	79	30	83
Yang[128]	2008	122	CE	20	52	73	33	86
Kelly[134]	2004	69	CE	19	46	86	(43)[a]	87
Saunders[148]	1999	84	…	18	20	90	(30)[a]	84
Nomori[133]	2004	80	…	18	50	95	(70)[a]	90
Ebihara[131]	2006	205	CE	15	32	83	(26)[a]	87
Poncelet[142]	2001	62	CE	15	56	68	(23)[a]	90
Von Haag[140]	2002	52	CE	12	50	65	(16)[a]	91
Median: prevalence > 30					**67**	**74**	**62**	**79**
Median: prevalence 21-30					**63**	**87**	**58**	**84**
Median: prevalence ≤ 20								
Summary: Median		**7,368**			**55**	**81**	**58**	**83**

Inclusion criteria: studies reporting test characteristics of chest

Chest 2013;143(5)
e211s-e250s

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Accuracy of PET-CT for Staging Mediastinum in NSCLC

First Author	Year	No.	Prev	Sens	Spec	PPV	NPV
Cerfolio[200]	2004	40	100	75	…	…	…
Plathow[204]	2008	52	73	100	100	100	100
Fischer[361]	2011	79	33	85	100	100	93
Lee[202]	2009	41	32	38	89	63	76
Yi[209]	2008	150	30	62	94	82	85
Maziak[29]	2009	167	29	48	93	74	82
Subedi[47]	2009	91	26	92	85	69	97
Yi[129]	2007	143	24	56	100	100	88
Carnochan[76]	2009	194	23	42	87	50	83
Lee[40]	2007	126	22	86	81	56	95
De Wever[44]	2007	50	22	73	82	53	91
Lee[126]	2009	182	20	81	73	42	94
Yang[128]	2008	122	20	52	73	33	86
Perigaud[203]	2009	51	20	40	85	40	85
Billé[199]	2009	159	19	48	93	(63)[a]	88
Toba[207]	2010	42	19	100	88	(67)[a]	100
Usuda[208]	2011	63	17	36	92	(50)[a]	87
Sanli[205]	2009	78	14	82	90	(56)[a]	97
Shin[206]	2008	184	13				
Summary: median		**2,014**		**62**	**90**	**63**	**90**

Inclusion criteria: studies reporting test characteristics of integrated PET-CT scanning to identify benign or malignant mediastinal nodes in patients with lung cancer, involving ≥20 patients from 2000 to 2011. See Figure 6 for expansion of abbreviations.

[a]Because PPV is increasingly affected by prevalence as prevalence is <20% these values are excluded from summary calculations.

Chest 2013;143(5) e211s-e250s

Accuracy of EBUS in Staging NSCLC

Study	Year	No.	Stage	Thoro	Prev	Sens	Spec[a]	PPV[a]	NPV
Fielding[341]	2009	68	cN1-3	Sel	87	95	(100)[a]	(100)[a]	(67)[b]
Steinfort[334]	2011	117	cN1-3	Sys	80	97	(100)[a]	(100)[a]	87
Cetinkaya[332]	2011	52	cN2-3	Sys	80	95	(100)[a]	(100)[a]	83
Rintoul[344]	2009	109	cN1-3	Sys	77	91	(100)[a]	(100)[a]	60
Gilbert[339]	2009	67	cN1-3	Sel	70	93	(100)[a]	(100)[a]	83
Yasufuku[349]	2005	108	cN1-3	Sys	69	95	(100)[a]	(100)[a]	90
Yasafuku[350]	2004	70	cN1-3	Sys	67	96	(100)[a]	(100)[a]	92
Szlubowski[343]	2009	226	cN0-3	Sys	64	89	(100)[a]	(100)[a]	84
Ye[333]	2011	101	cN1-3	Sel	63	95	(100)[a]	(100)[a]	93
Cerfolio[336]	2010	92	cN2	Sys	63	57	(100)[a]	(100)[a]	79
Lee BE[329]	2012	73	cN0-3	Sys	62	95	(100)[a]	(100)[a]	94
Bauwens[345]	2008	106	cN1-3	Sys	58	95	(100)[a]	(100)[a]	91
Sun[337]	2010	49	cN1-3	Sys	53	85	96	96	85
Herth[307]	2010	139	cN1-3	Sel	52	91	(100)[a]	(100)[a]	92
Memoli[331]	2011	100	cN1-3	Sys	47	87	(100)[a]	(100)[a]	89
Omark Petersen[340]	2009	151	cN2-3	Lim	43	85	(100)[a]	(100)[a]	89
Yasufuku[330]	2011	153	cN0-3	Sys	35	81	(100)[a]	(100)[a]	91
Hwangbo[335]	2010	150	cN2-3	Sys	31	84	(100)[a]	(100)[a]	93
Wallace[296]	2008	138	cN2-3	Sys	30	69	(100)[a]	(100)[a]	88
Lee HS[346]	2008	102	cN2-3	Sys	30	94	(100)[a]	(100)[a]	97
Hwangbo[342]	2009	117	cN2-3	Sys	26	90	(100)[a]	(100)[a]	97
Yasufuku[348]	2006	102	cN1-3	Sys	25	92	(100)[a]	(100)[a]	97
Szlubowski[343]	2010	120	cN0	Sel	22	46	99	93	86
Herth[211]	2006	100	cN0	Sys	21	92	(100)[a]	(100)[a]	96
Nakajima[338]	2010	49	cN1-3	Sys	18	67	(100)[a]	(100)[a,c]	93
Herth[210]	2008	97	cN0	Sys	10	89	(100)[a]	(100)[a,c]	99
Median: Prevalence ≥ 80						**96**			**83**
Median: Prevalence 60-79						**91**			**83**
Median: Prevalence 40-59						**87**			**89**
Median: Prevalence 20-39						**87**			**95**
Median: Prevalence < 20						**78**			**96**
Median: cN1-3									
Median: cN0									
Summary: median		**2,756**				**89**	**(100)[a]**	**(100)[a]**	**91**

Inclusion criteria: studies reporting test characteristics of EBUS-
ing ≥ 20 patients from 1980 to 2011. EBUS-TBNA = endobronchial ultrasound and transbronchial needle

Chest 2013;143(5)
e211s-e250s

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Does EBUS replace mediastinoscopy

Advantages of EBUS

- Diagnostic yield
  - Improved compared to blind TBNA
  - Equivalent to mediastinoscopy
- Improves time to diagnosis
- Costs
  - Decreases futile surgeries

EBUS vs. mediastinoscopy

- Equivalent to mediastinosopcy in yield
  - Superior for 4L and subcarinal LN
- Cost saving
- Safer

A prospective controlled trial of endobronchial ultrasound-guided transbronchial needle aspiration compared with mediastinoscopy for mediastinal lymph node staging of lung cancer

- NSCLC requiring Mediastinoscopy
- EBUS + MED
- 153 patients
- N2/N3 prevalence = 35%

	EBUS	MED
Sensitivity	81%	79%
NPV	91%	90%
Accuracy	93%	93%

Yasufuku et al. *J Thorac Cardiovac Surg.* 2011;142:1393-400.

EBUS TBNA and time to diagnosis

- 2 small studies looking at time to diagnosis of SCLC and lung cancer.
- Both studies revealed shorter time to diagnosis when EBUS was first diagnostic procedure.

- Ozturk A et al. EBUS may arise as an initial time saving procedure in patients who are suspected to have small cell lung cancer. The Clinical Respiratory Journal. 2016; DOI: 10.1111/crj.12556
- Verma A et al. Timeliness of diagnosing lung cancer: Number of procedures and time needed to establish diagnosis: Being right the first time. Medicine. 2015;94:e1216.

Cost Savings

- Retrospective cohort study
- 77 pts had EBUS for mediastinal staging
- 51% revealed metastases – mediastinoscopy was avoided
- "Conclusion: Mediastinoscopy can be avoided in more that 50% of lung cancer patients when EBUS-TBNA is used as initial staging modality for mediastinal staging, leading to a significant reduction of health care costs."

- Claessens N et al. Diagnostic yield, clinical impact and cost aspect of EBUS-TBNA in mediastinal staging in lung cancer. European Respiratory Society Annual Congress. 2012;40:P4403.

Morbidity

- **MEDIASTINOSCOPY**
- 2,145 patients
- 23 complications (1.07%)
  - Bleeding – 7
  - Vocal Cord Dysfunction – 12
  - Tracheal Injury – 2
  - Pneumothorax – 2
  - Death – 1
  - PA Injury

Lemaire A, et al. Ann Thorac Surg 2006;82:1185-1190.

- **EBUS**
- 100 patients
  - 0 complications

Chest 2004;125:322-325.

- 1,174 patients
  - 0 major complications
  - 5.5% transient atrial tachycardia

Eur Resp J 2002;20:118-121.

- 50 lung biopsies
  - 1 pneumothorax

Eur Resp J 2002;20:972-974.

Lessons from the past

- Learning a new skill (ie EBUS)
- Starting a program (implementing a new procedure)
- EBUS - similar to standard bronchoscopy
- EBUS – also different from standard bronchoscopy

Lessons from the past

- Additional resources required:
  - Multiple technicians (2-3)
  - Nurse
  - Increased sedation
  - Longer procedure
  - ROSE (rapid on site evaluation)

ROSE

- Rapid On-Site Evaluation by cytopathologist or cytotechnologist

PURPOSE OF ROSE

1. To evaluate sampling adequacy of mediastinal LNs as evidenced by the presence of representative normal tissue (lymphoid tissue or anthracotic pigment-laden macrophages) and/or other lesional material (eg, granulomatous inflammation, malignancy).
2. To evaluate the diagnostic yield for neoplastic or nonneoplastic disease.
3. To ensure sampling of adequate material for appropriate triage of the sample for ancillary studies, including immunohistochemistry, microbiology studies, flow cytometry analysis, and molecular assays.
4. To provide a preliminary diagnosis to direct immediate patient care, akin to a frozen section evaluation

- D. Jain et al. Rapid On-Site Evaluation of Endobronchial Ultrasound–Guided Transbronchial Needle Aspirations for the Diagnosis of Lung Cancer: A Perspective From Members of the Pulmonary Pathology Society. Archives of Pathology & Laboratory Medicine: February 2018, Vol. 142, No. 2, pp. 253-262.

Advantages	Limitations
Adequacy assessment of the specimen	Needs an experienced cytopathologist or a dedicated trained cytotechnician
Improved diagnostic yield	Cost may not be reimbursed
Reduction of additional procedures	Time-consuming process (35–56 min)[67]
Obtain additional passes for molecular testing, microbiology cultures, and flow cytometry	At present, no statistically significant results for ROSE and increased diagnostic yield, fewer aspirations, decreased procedure time, and reduced rate of complications
Better use of laboratory resources and reduced laboratory effort because of the lower number of total slides	
Improved patient care	

- Rapid On-Site Evaluation of Endobronchial Ultrasound–Guided Transbronchial Needle Aspirations for the Diagnosis of Lung Cancer: A Perspective From Members of the Pulmonary Pathology Society. D. Jain et al. Archives of Pathology & Laboratory Medicine: February 2018, Vol. 142, No. 2, pp. 253-262.

Lessons from the past

- Additional resources required:
  - Multiple technicians (2-3)
  - Nurse
  - Increased sedation
  - Longer procedure
  - ROSE (rapid on site evaluation)
  - Post procedure recovery
  - $$$ (equipment and needles)

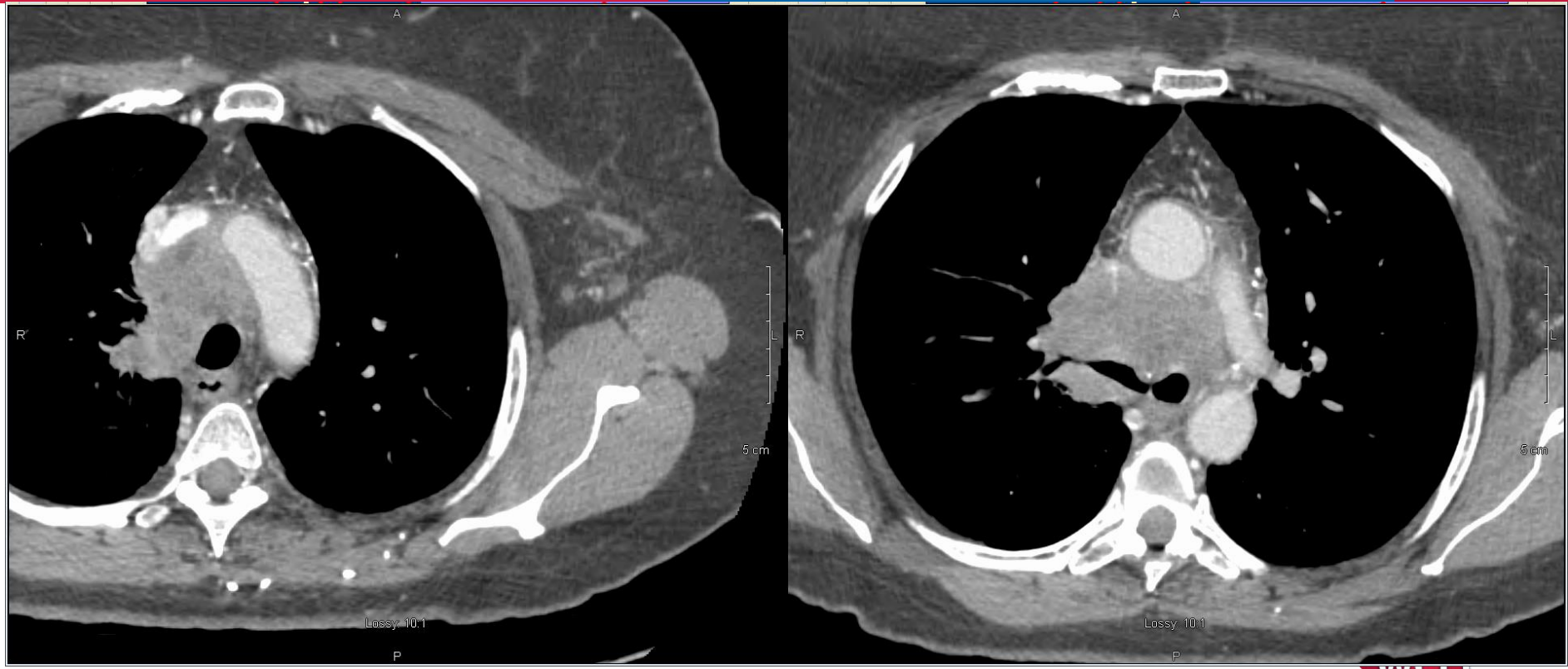
Complicated cases: Demonstrating that non-invasive testing is not always successful

- EBUS or EUS non diagnostic
- Required mediastinocopy

Case 1

- 54 female
- No significant PMHx
- >45 p-y smoker
- Presented to ER with 2 wks of facial swelling, dyspnea, 5 lb wt loss

- CT neck/chest - Large irregular right hilar and mediastinal mass causing severe compression and near complete occlusion of the right upper lobe bronchus…
- PET scan - Intensely hypermetabolic primary mediastinal and right hilar malignancy with multifocal lymph node and bone metastases.


A
R
L
5 cm
Lossy 10:1
P
A
R
L
5 cm
Lossy 10:1
P

1. Bronchoscopy revealed narrowed right mainstem with near complete obstruction of RUL.
   - TBNA (carina and RUL) was non-diagnostic
2. EUS of subcarina was non-diagnostic

Mediastinoscopy

DIAGNOSIS

LEVEL 7, SUBCARINAL LYMPH NODE:
- POORLY DIFFERENTIATED NON-SMALL CELL CARCINOMA IN FIBROUS TISSUE.

LEVEL 4R, RIGHT LOWER PARATRACHEAL LYMPH NODE (SPECIMENS B AND C):
- LYMPH NODE WITH MINUTE SUBCAPSULAR FOCUS OF METASTATIC CARCINOMA.

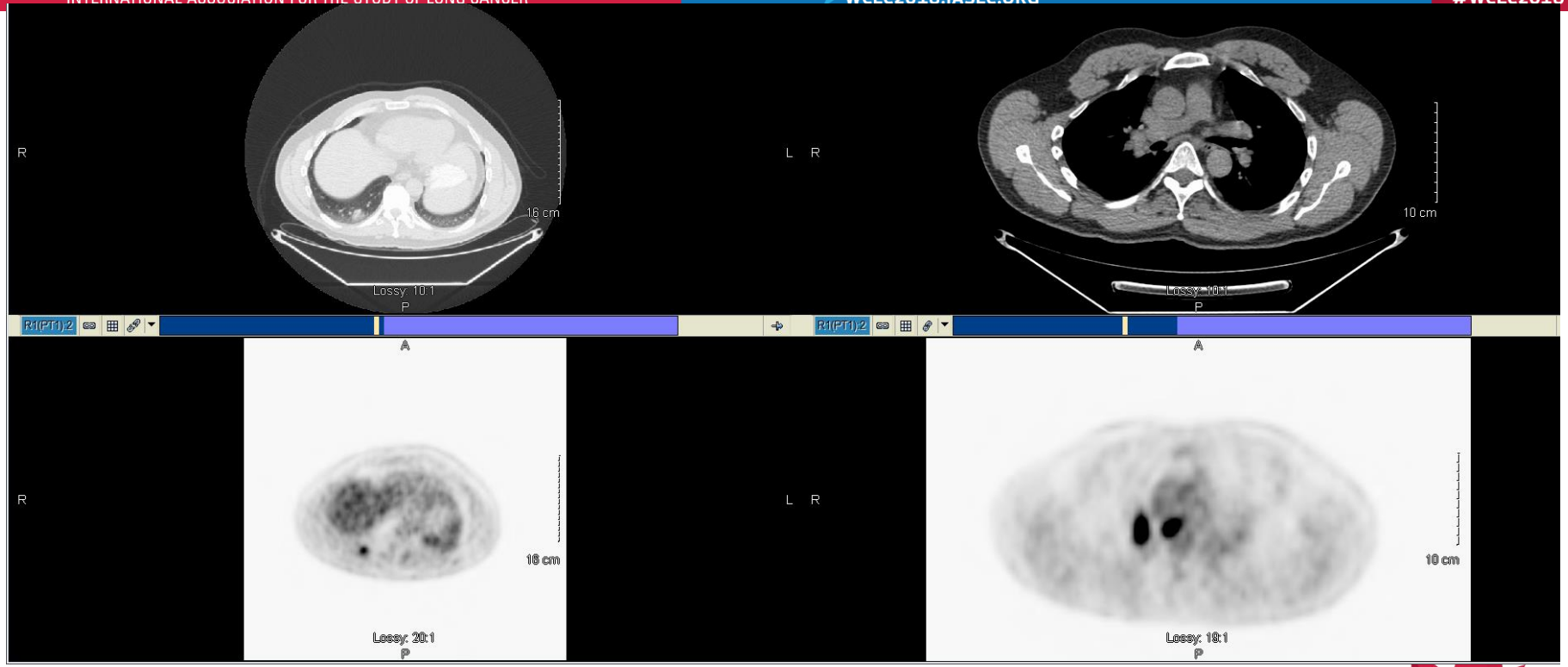
COMMENT: Immunohistochemical study shows positive reactions for TTF1 (extensive), CK7 (extensive), CEA (extensive) and CK 20 (focal), and negative ones for mamaglobin, S100 and NapsinA. This profile is suggestive of pulmonary adenocarcinoma. Material sent for molecular study (results to be reported separately).

Case 2

- 50 year old male with PMHx of GERD
- Non smoker
- Presented to ER with fever and RUQ pain of 5 days duration
- Also complained of some difficulty swallowing
- Strong family hx of lung cancer (mother, father, and sister)

Imaging

- CT abdomen - In the posterior right lower lobe, there is a 1.3 x 2 x 1.9 cm mildly irregular nodule with nearby granuloma.
- PET - There is a 1.9 cm nodule at the right base, hypermetabolic, (SUV 4.6). There is an intensely hypermetabolic mass in the right hilum, (SUV 11.6). Multiple right-sided hypermetabolic nodes are identified in the mediastinum from the subcarinal region to the thoracic inlet: 1-2 cm in diameter with max SUV of 14.4. There is a hypermetabolic level III right axillary, along the right subclavian vascular bundle, node 0.7 cm short axis, (SUV 3.5). On axial 98 there is a mildly hypermetabolic RUL GGO, could represent to early new metastasis.
    - IMPRESSION: Possible right hilar primary with metastatic disease in the mediastinum as described above and probable lung metastasis. Most amenable to biopsy would likely be the supraclavicular/thoracic inlet node which is right lateral to the esophagus


R
16 cm
Lossy: 10:1
P
L R
10 cm
Lossy: 10:1
P
R1(PT1):2
A
R
16 cm
Lossy: 20:1
P
L R
A
10 cm
Lossy: 19:1
P

Final Pathology Report

Intraoperative Consultation: 3R lymph node (smear x 2):

- Lymphoid tissue with epithelioid granuloma, no necrosis.

Anatomical Diagnosis:

Mediastinal (3R) lymph node, FNAB (EUS):

- Satisfactory for evaluation.

- Negative for malignant cells.

- Lymphoid tissue with rare epithelioid microgranulomas. See note.

Note: the epithelioid microgranulomas are rare and are present essentially on the smears where there is no associated necrosis. On the corresponding Cellblocks, there is very scant granular eosinophilic material (most likely fibrin) that raises the possibility of necrosis.The differential diagnosis includes mostly mycobacterial infection, sarcoidosis, and non specific granulomatous reaction associated with tumors. Special stains (AFB and PAS) performed on the Cellblock are negative. Clinico-radiological correlation is advised.

Final Pathology Report

Clinical History: 50 year-old male with RLL growing lesion and hypermetabolic mediastinal adenopathies. Needs

biopsy. #1. R4 sent fresh @ 15h10, #2. R4 sent fresh @ 15h25, #3. Neck lipoma. FS 2 not performed according to the pathologist because of the (diag) result of the fir FS (IOC).

Intraoperative Consultation:

Frozen section: Necrotizing granulomatous lymphadenitis (rule out TB R/O other infectious process).

Anatomical Diagnosis:

 # 1 and 2. Lymph node, 4R (mediastinoscopic biopsy):

- Florid necrotizing granulomas (see note).

 # 3. Neck soft tissue (resection):

- Benign thymic tissue.

Note: The special stain for GMS reveals degenerated small microorganisms, suspicious for *Histoplasma Capsulatum*. Other differentials include *Pneumocytis jiroveci* etc. Special stain for AFB is negative for acid-fast bacilli. Clinical correlation with microbiology result is recommended.

Microbiology Results

Fungal Deep Mycosis Culture - FINAL 18/06/06 11:52 OUGM1

ORGANISM 02 Histoplasma capsulatum

Diagnosis:

DISSEMINATED PULMONARY AND MEDIASTINAL HISTOPLASMOSIS

Followed by ID and treated with Itraconazole

Conclusion

- EBUS is a necessary tool
- EBUS is recommended as an initial diagnostic tool for lung cancer staging
- EBUS has significantly decreased the need for mediastinoscopies

- Significant amount of resources are required to start an EBUS program
- Still may have complicated cases where non invasive testing is negative, thus requiring mediastinoscopy or surgical biopsy

Lessons from the Past: What I Would Not Do Again in Diagnostic and Therapeutic IP

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The growing armamentarium

- **Flexible bronchoscopy**
  - Endobronchial biopsy (EBB)
  - Transbronchial lung biopsy (TBLB)
  - Conventional-TBNA
- **Endobronchial ultrasound (EBUS)**
  - Convex probe EBUS
  - Radial probe EBUS
- **Medical thoracoscopy**
  - Flexi-rigid **OR** Rigid

- **Rigid bronchoscopy**
  - Mechanical coring
  - Stent placement
  - Argon plasma coagulation
  - Electrocautery
  - Laser
  - Cryotherapy

Roles of procedures – Diagnostic vs. Therapeutic

- **Flexible bronchoscopy**
  - Endobronchial biopsy (EBB) — Diagnosis
  - Transbronchial lung biopsy (TBLB) — Diagnosis
  - Conventional-TBNA — Diagnosis, Staging
- **Endobronchial ultrasound (EBUS)**
  - Convex probe EBUS — Staging, Diagnosis
  - Radial probe EBUS — Diagnosis
- **Medical thoracoscopy**
  - Flexi-rigid **OR** Rigid — Diagnosis, Palliation

Roles of procedures – Diagnostic vs. Therapeutic

- **Rigid bronchoscopy**
  - Mechanical coring — Palliation, Diagnosis
  - Stent Placement — Palliation
  - Argon Plasma Coagulation — Palliation
  - Electrocautery — Palliation
  - Laser — Palliation
  - Cryotherapy — Palliation

Endobronchial Biopsy (EBBx)

- Most frequently performed bronchoscopic procedure for LC Dx
- Relatively safe with a high diagnostic yield (76%-97%)
- Airway bleeding one of the commonly encountered problems
- Learning points for EBBx:
  1. **Hot (electrocautery enabled) biopsy from vascular lesions → Does NOT affect tissue quality of diagnostic yield**
  2. **Avoid biopsy from cavity**
  3. **Avoid biopsy from an excavating ulcer with vascular supply**
  4. **Avoid biopsy from tracheal tumor or tumor at carina**

Endobronchial Biopsy (EBBx)

Respiration

Interventional Pulmonology

Respiration 2011;81:129–133
DOI: 10.1159/000320262

Received: April 5, 2010
Accepted after revision: August 10, 2010
Published online: October 29, 2010

A Randomized Controlled Trial of Electrocoagulation-Enabled Biopsy versus Conventional Biopsy in the Diagnosis of Endobronchial Lesions

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Departments of [a]Pulmonary Medicine and [b]Histopathology, Postgraduate Institute of Medical Education and Research, Chandigarh, India

Biopsy with electrocautery enabled forceps did not affect the tissue quality or the diagnostic yield

Transbronchial Lung Biopsy (TBLB)

- TBLB may be needed for diagnosing diffuse infiltrative lung disease in the setting of lung cancer e.g. lymphangitis, drug-induced ILD, radiation pneumonitis and secondary infection.
- Pneumothorax, bleeding & crush artefacts common problems
- Important learning point: **Do not use cup forceps for doing TBLB (Alligator forceps is preferred)**
  - Cup cuts through blood vessels (alligator crushes b.v.) → higher bleeding.
  - Cup has smaller diameter (4 mm vs. 7 mm with alligator) in open position → reaches lung segments more distally → higher risk of pneumothorax

Transbronchial Lung Biopsy (TBLB)

A Prospective Randomized Controlled Trial Comparing the Efficacy and Safety of Cup vs Alligator Forceps for Performing Transbronchial Lung Biopsy in Patients With Sarcoidosis

- 150 patients with sarcoidosis
- Use of cup forceps was associated with significantly higher complication rate (21.4% vs. 8.5%; p=0.03)
- All four pneumothorax occurrences were with use of cup forceps

Sehgal IS, et al. Chest 2016;149:1584-1586

Bronchoscopy for lung cancer diagnosis and staging

Bronchoscopic
- **Conventional TBNA**
- **EBUS-TBNA**

Non-bronchoscopic
- **Mediastinoscopy**
- **CT-guided FNAC**

Bronchoscopy for lung cancer diagnosis and staging

Lung cancer diagnosis and staging with endobronchial ultrasound-guided transbronchial needle aspiration compared with conventional approaches: an open-label, pragmatic, randomised controlled trial

Navani N, et al.
Lancet Respir Med
2015;3:282–89

Use of EBUS-TBNA results in significantly shorter time to treatment decision compared to conventional techniques

Medical Thoracoscopy

A Randomized Trial Comparing the Diagnostic Yield of Rigid and Semirigid Thoracoscopy in Undiagnosed Pleural Effusions

Sahajal Dhooria MD DM, Navneet Singh MD DM, Ashutosh N Aggarwal MD DM, Dheeraj Gupta MD DM, and Ritesh Agarwal MD DM

Most patients present late at our center with extensive pleural adhesions and fibrosis. In such cases, flexi-rigid thoracoscopy has a lower yield in such cases (73% vs. 98%).

Medical Thoracoscopy

- Very useful procedure for both diagnosis of malignant pleural effusions as well as performing pleurodesis.
- The important learning point is:
- **Avoid using flexi-rigid thoracoscopy for diagnosis of malignant pleural effusions**

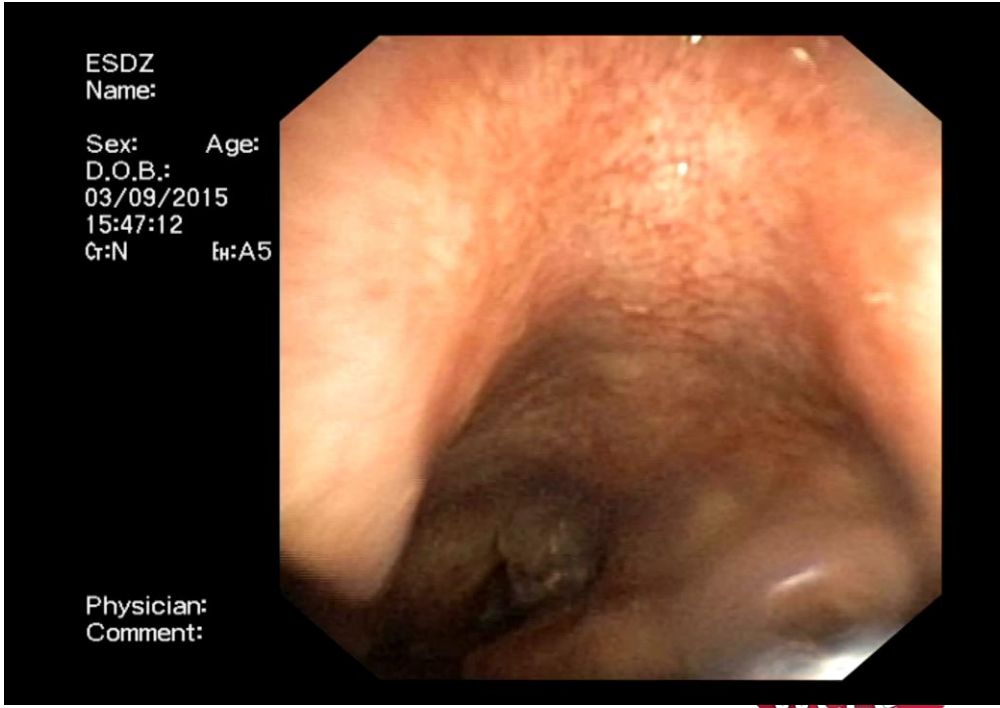
Airway intervention

What I will not do

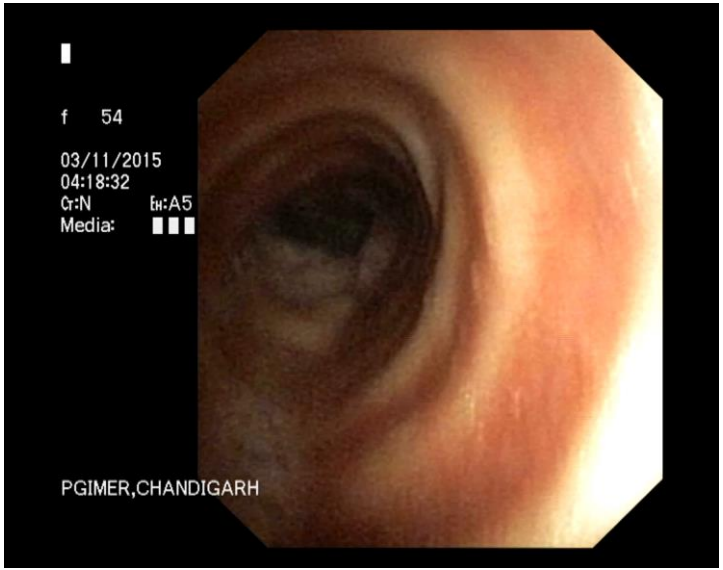
Avoid complex intervention procedures using flexible bronchoscope

Prefer doing them using a rigid bronchoscope

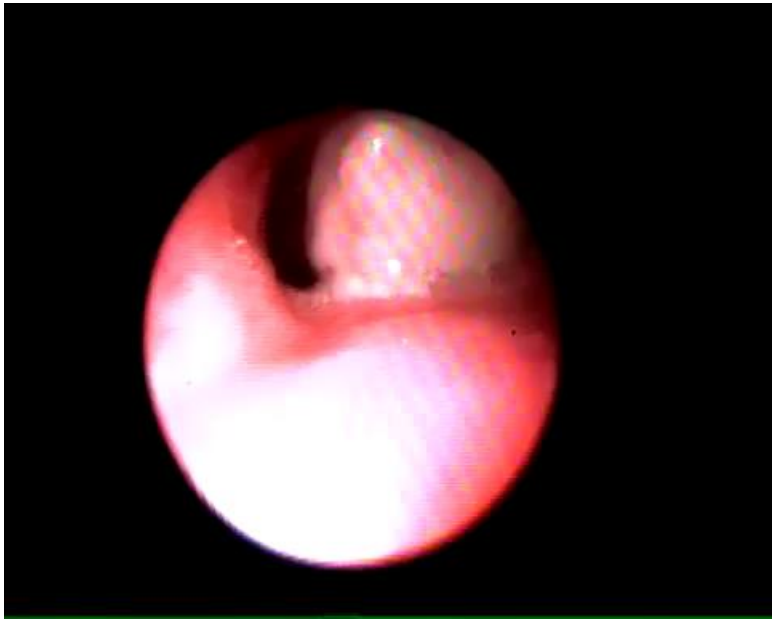
I will not biopsy these patients using FB

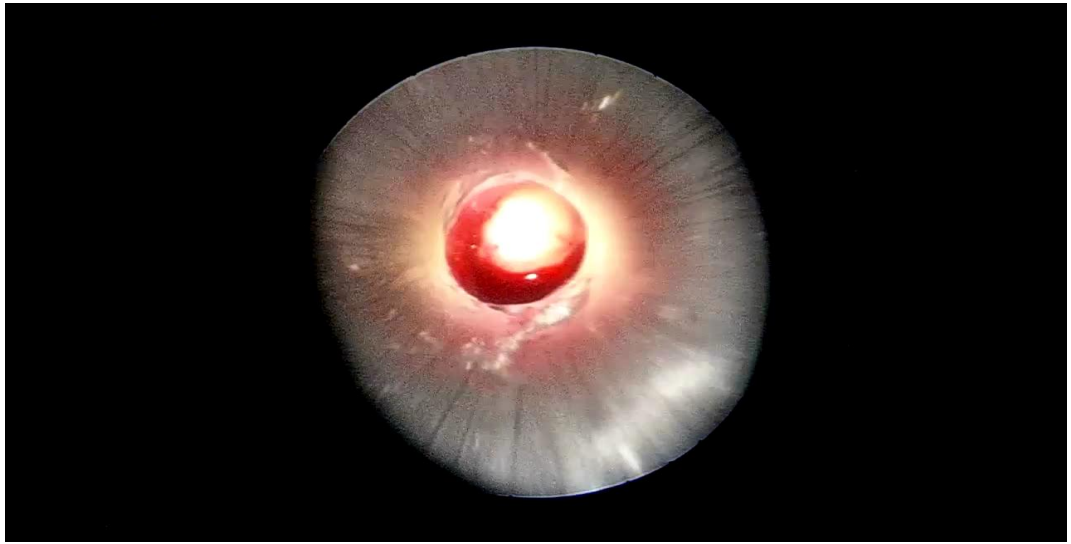


I will not biopsy and not place a straight stent



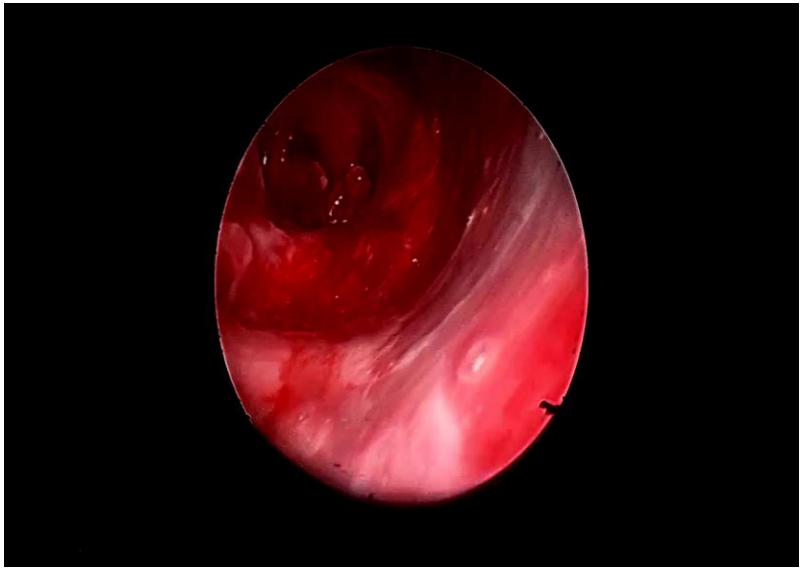
I will not treat with chemotherapy or using FB





Use of Cryotherapy, APC, Laser will be futile

Distal airway involvement precludes stent placement



Avoid placing stents when distal airways are involved

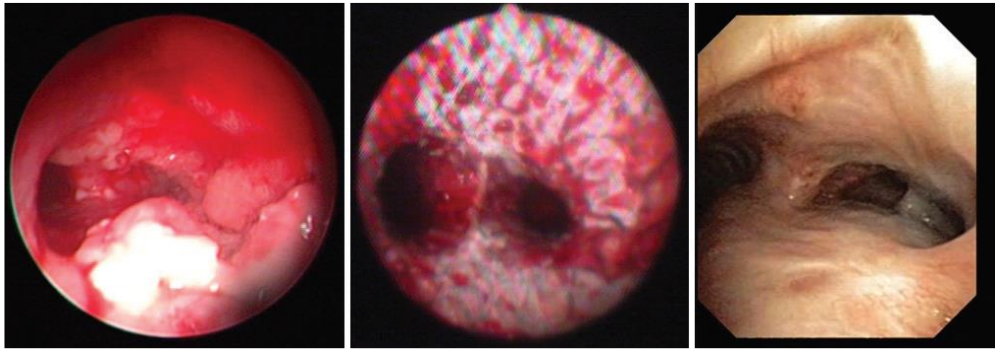
Successful procedure but patient died after 1 week

When in doubt place a silicon stent

- Easy to extract
- Work even in malignant disorders
- Can always be replaced by metallic stent
- Never place uncovered metallic stent for malignant disorders

Removal of an inadvertently deployed self-expanding metallic Y stent

What appears malignant may not be so



Turned out to be endobronchial TB

Muthu V, et al. Lung India. 2017;34:567–568

A Multicenter Experience With the Placement of Self-Expanding Metallic Tracheobronchial Y Stents

Karan Madan, MD, DM, Sahajal Dhooria, MD, DM,† Inderpaul Singh Sehgal, MD, DM,† Anant Mohan, MD,* Ravindra Mehta, MD,‡ Vallandramam Pattabhiraman, MD,§ Rajiv Goyal, MD, MRCP,‖ and Ritesh Agarwal, MD, DM†*

Do not place metallic Y-stents using flexible bronchoscopy:

- Criss-cross of guidewires
- Loss of airway control (immediate conversion to rigid bronchoscopy)
- Need for fluoroscopic guidance

Madan K, et al. J Bronchology Interv Pulmonol. 2016;23:29-38

Placement of tracheobronchial silicone Y-stents: Multicenter experience and systematic review of the literature

Inderpaul Singh Sehgal, Sahajal Dhooria, Karan Madan[1], Vallandramam Pattabhiraman[2], Ravindra Mehta[3], Rajiv Goyal[4], Jayachandra Akkaraju[5], Ritesh Agarwal

Do not place silicone stents using flexible bronchoscopy

Sehgal IS, et al. Lung India 2017;34:311-7

Take home message

- The most important is *Primum non nocere* **(first do no harm)**
- Each bronchoscopic procedure has inherent risks and potential for unintended complications → each procedures teaches us something
- Avoid biopsy in tracheal tumors with airway obstruction during flexible bronchoscopy
- Use EBUS for diagnosing and staging carcinoma lung
- All complex interventions should be done with a rigid bronchoscope
- Avoid placing stents with distal airway involvement