Needle Biopsy in the Thorax
EVIDENCE TABLE

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Strength of Evidence
1. American Lung Association. Lung Disease Data: 2008. www.lungusa.org. Accessed January, 2008.	15	N/A	Lung disease data.	N/A	N/A
2. Ries LAG, Eisner MP, Kosary CL, et al. SEER Cancer Statistics Review, 1975-2003, National Cancer Institute. Bethesda, MD. http://seer.cancer.gov/csr/1975_2003/, based on November 2005 SEER data submission, posted to the SEER web site, 2006.	15	N/A	Cancer statistics. Review incidence, mortality, prevalence, and survival data.	N/A	N/A
3. van Geel AN, Pastorino U, Jauch KW, et al. Surgical treatment of lung metastases: The European Organization for Research and Treatment of Cancer-Soft Tissue and Bone Sarcoma Group study of 255 patients. *Cancer* 1996; 77(4):675-682.	13	255	Retrospective study to analyze prognostic factors in selecting patients for resection of pulmonary metastases from soft tissue sarcomas.	• Surgical excision of metastases from soft-tissue sarcomas should be used as first-line of treatment if preoperative evaluation reveals possibility of clearance of the metastases. • Additional inquiry is needed before recommending chemotherapy.	1
4. Klein JS, Zarka MA. Transthoracic needle biopsy: an overview. *J Thorac Imaging* 1997; 12(4):232-249.	12	N/A	Review transthoracic needle biopsy (TTNB).	CT has become the guidance modality of choice for performing TTNB.	4
5. Cardella JF, Bakal CW, Bertino RE, et al. Quality improvement guidelines for image-guided percutaneous biopsy in adults. *J Vasc Interv Radiol* 2003; 14(9 Pt 2):S227-230.	15	N/A	Guidelines.	N/A	N/A
6. Erasmus JJ, Connolly JE, McAdams HP, Roggli VL. Solitary pulmonary nodules: Part I. Morphologic evaluation for differentiation of benign and malignant lesions. *Radiographics* 2000; 20(1):43-58.	12	N/A	Review to evaluate morphologic features of solitary pulmonary nodule (SPN) to differentiate benign from malignant nodule.	Presence and pattern of calcification can help differentiate benign from malignant nodules. CT is 10-20 times more sensitive than standard radiography and allows objective, quantitative assessment of calcification.	4
7. Henschke CI, Yankelevitz DF, Mirtcheva R, McGuinness G, McCauley D, Miettinen OS. CT screening for lung cancer: frequency and significance of part-solid and nonsolid nodules. *AJR* 2002; 178(5):1053-1057.	13	233	To report frequency and significance of part-solid and nonsolid nodules in comparison with solid nodules.	For CT, the detected nodule is either only part-solid or nonsolid, but such a nodule is more likely to be malignant than a solid one.	2
8. Jeong YJ, Yi CA, Lee KS. Solitary pulmonary nodules: detection, characterization, and guidance for further diagnostic workup and treatment. *AJR* 2007; 188(1):57-68.	12	N/A	Study to improve understanding of clinical issues involved in making a diagnosis and to guide further diagnostic workup and treatment of SPN.	PET/CT is more sensitive at detecting malignancy than dynamic helical CT.	4

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9. Chandan VS, Zimmerman K, Baker P, Scalzetti E, Khurana KK. Usefulness of core roll preparations in immediate assessment of neoplastic lung lesions: comparison to conventional CT scan-guided lung fine-needle aspiration cytology. *Chest* 2004; 126(3):739-743.	9	25	To compare core roll preparations with aspirate smears and determine whether core roll preparations led to alteration of the histopathology of the core biopsy.	The core roll preparations complement the CT scan-guided lung FNA procedure in the immediate assessment of neoplastic lung lesions without altering the histopathology of core biopsy specimens.	3
10. Diacon AH, Schuurmans MM, Theron J, et al. Transbronchial needle aspirates: comparison of two preparation methods. *Chest* 2005; 127(6):2015-2018.	9	86 patients 282 pairs of samples	Prospective comparison of two preparation methods for transbronchial needle aspirates.	The direct technique is superior to the fluid technique for the preparation of transbronchial needle aspirates.	2
11. Kucuk CU, Yilmaz A, Yilmaz A, Akkaya E. Computed tomography-guided transthoracic fine-needle aspiration in diagnosis of lung cancer: a comparison of single-pass needle and multiple-pass coaxial needle systems and the value of immediate cytological assessment. *Respirology* 2004; 9(3):392-396.	9	143	To compare single-pass needle and multiple-pass coaxial needle systems and to evaluate the value of immediate cytological assessment during the procedure in the diagnosis of lung cancer with CT-guided transthoracic FNA.	Single-pass needle technique in transthoracic FNA is preferred.	1
12. Mazza E, Maddau C, Ricciardi A, Falchini M, Matucci M, Ciarpallini T. On-site evaluation of percutaneous CT-guided fine needle aspiration of pulmonary lesions. A study of 321 cases. *Radiol Med (Torino)* 2005; 110(3):141-148.	10	312	To determine the importance of having a cytopathologist present during percutaneous CT-guided FNA of pulmonary lesions.	CT guided aspiration cytology can be a safe and fast procedure for lung nodule characterization.	1
13. Yamagami T, Iida S, Kato T, Tanaka O, Nishimura T. Combining fine-needle aspiration and core biopsy under CT fluoroscopy guidance: a better way to treat patients with lung nodules? *AJR* 2003; 180(3):811-815.	9	138 samples	To evaluate the value of the combined use of FNA and tissue core biopsy under real-time CT fluoroscopy guidance.	Combined use of FNA and core biopsy improves the diagnostic ability of CT fluoroscopy-guided lung biopsy.	1
14. Ko JP, Shepard JO, Drucker EA, et al. Factors influencing pneumothorax rate at lung biopsy: are dwell time and angle of pleural puncture contributing factors? *Radiology* 2001; 218(2):491-496.	13	159	To study factors (needle dwell time and plural puncture) influencing pneumothorax and chest tube placement rate.	• Longer dwell times do not correlate with pneumothorax and should not influence the decision to obtain more biopsy samples. • A shallow pleural puncture angle may increase the pneumothorax rate.	2
15. Fraser RS. Transthoracic needle aspiration. The benign diagnosis. *Arch Pathol Lab Med* 1991; 115(8):751-761.	12	N/A	Review benign diagnosis in a transthoracic needle aspiration.	Although sensitivity for malignancy is high in transthoracic needle aspiration, a benign diagnosis is obtained in 5%-25% of all cases.	4

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16. Greif J, Marmor S, Schwarz Y, Staroselsky AN. Percutaneous core needle biopsy vs. fine needle aspiration in diagnosing benign lung lesions. *Acta Cytol* 1999; 43(5):756-760.	9	60 cases	Retrospective review to determine the diagnostic value of percutaneous core needle biopsy in comparison with FNA in patients with benign pulmonary lesions.	Histologic analysis by percutaneous core needle biopsy can greatly increase the diagnostic accuracy in benign pulmonary diseases as compared with the yield of FNA.	3
17. Covey AM, Gandhi R, Brody LA, Getrajdman G, Thaler HT, Brown KT. Factors associated with pneumothorax and pneumothorax requiring treatment after percutaneous lung biopsy in 443 consecutive patients. *J Vasc Interv Radiol* 2004; 15(5):479-483.	13	443	Prospective study to describe patient- and procedure-related factors associated with post-biopsy pneumothorax and those that require intervention.	Prior surgery and prone positioning during biopsy seem to provide a "protective effect" against clinically significant post-biopsy pneumothorax.	1
18. Dennie CJ, Matzinger FR, Marriner JR, Maziak DE. Transthoracic needle biopsy of the lung: results of early discharge in 506 outpatients. *Radiology* 2001; 219(1):247-251.	13	506	Prospective study to determine the safety of early discharge after TTNB of the lung.	Early discharge after outpatient TTNB of the lung is associated with little morbidity and no mortality.	1
19. Yamagami T, Nakamura T, Iida S, Kato T, Nishimura T. Management of pneumothorax after percutaneous CT-guided lung biopsy. *Chest* 2002; 121(4):1159-1164.	13	82 lesions in 34 patients	• To examine the characteristics of lung tumors for which radiofrequency (RF) ablation therapy is effective. • To determine what RF ablation parameters are effective for obtaining complete coagulation of the entire ablation zone with a single RF ablation session.	• A long duration of RF ablation is desirable for large lung tumors. • RF ablation treatment is most effective for lesions <2.5 cm.	3
20. Engeler CE, Hunter DW, Castaneda-Zuniga W, Tashjian JH, Yedlicka JW, Amplatz K. Pneumothorax after lung biopsy: prevention with transpleural placement of compressed collagen foam plugs. *Radiology* 1992; 184(3):787-789.	1	50	Prospective, comparative study to evaluate the effectiveness of pleural sealing with a compressed collagen foam plug.	Transpleural collagen foam plug placement may be an effective supplement for transthoracic needle biopsies.	3
21. Lang EK, Ghavami R, Schreiner VC, Archibald S, Ramirez J. Autologous blood clot seal to prevent pneumothorax at CT-guided lung biopsy. *Radiology* 2000; 216(1):93-96.	1	100	Evaluate patients to determine whether the use of autologous blood clot seal after biopsy of lung lesions can reduce or prevent pneumothorax.	Plugging of biopsy tracks with autologous blood clot seal reduced the frequency of pneumothorax.	1
22. Petsas T, Siamblis D, Giannakenas C, et al. Fibrin glue for sealing the needle track in fine-needle percutaneous lung biopsy using a coaxial system: Part II--Clinical study. *Cardiovasc Intervent Radiol* 1995; 18(6):378-382.	1	26 group A 32 group B	Comparative study to determine the effectiveness of fibrin glue as a sealant.	Fibrin glue is a safe sealing material for percutaneous lung biopsy and serves to decrease the frequency.	3

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23. Zwischenberger JB, Savage C, Alpard SK, Anderson CM, Marroquin S, Goodacre BW. Mediastinal transthoracic needle and core lymph node biopsy: should it replace mediastinoscopy? *Chest* 2002; 121(4):1165-1170.	10	89	Retrospective study to assess mediastinal lymph nodes for staging lung cancer by transthoracic needle with or without core biopsy.	Transthoracic FNA with or without core biopsy is diagnostic in 78% of cases with mediastinal adenopathy.	2
24. Shah PL, Singh S, Bower M, Livni N, Padley S, Nicholson AG. The role of transbronchial fine needle aspiration in an integrated care pathway for the assessment of patients with suspected lung cancer. *J Thorac Oncol* 2006; 1(4):324-327.	10	129	Prospective study to evaluate the value of transbronchial fine needle aspiration (TBNA) for the assessment of patients with suspected lung cancer.	TBNA improves the diagnostic yield and staging of patients with lung cancer.	1
25. Annema JT, Versteegh MI, Veselic M, Voigt P, Rabe KF. Endoscopic ultrasound-guided fine-needle aspiration in the diagnosis and staging of lung cancer and its impact on surgical staging. *J Clin Oncol* 2005; 23(33):8357-8361.	10	242	To assess the extent endoscopic ultrasound guided fine-needle aspiration (EUS-FNA) could prevent surgical interventions.	• Sensitivity, specificity, and accuracy for EUS in mediastinal analysis were 91%, 100% and 93%, respectively. • EUS-FNA qualifies as the initial staging procedure.	1
26. Cerfolio RJ, Bryant AS, Eloubeidi MA. Routine mediastinoscopy and esophageal ultrasound fine-needle aspiration in patients with non-small cell lung cancer who are clinically N2 negative: a prospective study. *Chest* 2006; 130(6):1791-1795.	10	153	A prospective study to determine the necessity of routine mediastinoscopy and/or EUS-FNA in patients with non-small cell lung cancer who are clinically N2 negative.	Routine mediastinoscopy or EUS-FNA is not recommended in patients who are clinically staged as N0 but may be considered in patients clinically staged as N1 and/or in those with adenocarcinoma, upper-lobe tumors, or tumors with a max SUV ≥10.	1
27. Herth FJ, Ernst A, Eberhardt R, Vilmann P, Dienemann H, Krasnik M. Endobronchial ultrasound-guided transbronchial needle aspiration of lymph nodes in the radiologically normal mediastinum. *Eur Respir J* 2006; 28(5):910-914.	10	100	To determine the accuracy of endobronchial US-guided transbronchial needle aspiration (EBUS-TBNA) in sampling nodes ≤1 cm in diameter.	EBUS-TBNA can accurately sample small mediastinal nodes.	2
28. Singh P, Camazine B, Jadhav Y, et al. Endoscopic ultrasound as a first test for diagnosis and staging of lung cancer: a prospective study. *Am J Respir Crit Care Med* 2007; 175(4):345-354.	9	113	Prospective study to evaluate EUS-FNA as a single test for diagnosing and staging of lung cancer.	EUS-FNA has a high diagnostic yield and accuracy for detecting lung cancer.	1
29. Herth FJ, Becker HD, Ernst A. Ultrasound-guided transbronchial needle aspiration: an experience in 242 patients. *Chest* 2003; 123(2):604-607.	10	242	Prospective study to examine the possibility of EBUS in providing imaging support for TBNA.	EBUS affords an excellent yield independent of lymph node location.	1

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30. Chang AC, Yee J, Orringer MB, Iannettoni MD. Diagnostic thoracoscopic lung biopsy: an outpatient experience. *Ann Thorac Surg* 2002; 74(6):1942-1946; discussion 1946-1947.	10	62	Study to demonstrate the safety and efficacy of patients undergoing outpatient thoracoscopic lung biopsy.	Outpatient thoracoscopic lung biopsy is safe and effective.	2

Evidence Table Key

Study Type Key

Numbers 1-7 are for studies of therapies while numbers 8-15 are used to describe studies of diagnostics.

1. Randomized Controlled Trial — Treatment
2. Controlled Trial
3. Observation Study
    a. Cohort
    b. Cross-sectional
    c. Case-control
4. Clinical Series
5. Case reviews
6. Anecdotes
7. Reviews
8. Randomized Controlled Trial — Diagnostic
9. Comparative Assessment
10. Clinical Assessment
11. Quantitative Review
12. Qualitative Review
13. Descriptive Study
14. Case Report
15. Other (Described in text)

Strength of Evidence Key

- Category 1 - The conclusions of the study are valid and strongly supported by study design, analysis and results.
- Category 2 - The conclusions of the study are likely valid, but study design does not permit certainty.
- Category 3 - The conclusions of the study may be valid but the evidence supporting the conclusions is inconclusive or equivocal.
- Category 4 - The conclusions of the study may not be valid because the evidence may not be reliable given the study design or analysis.