Review: Transthoracic needle aspiration biopsy is accurate for diagnosing malignant and specific benign pulmonary lesions

QUESTION

What is the accuracy of transthoracic needle aspiration biopsy (TNAB) for the diagnosis of solitary or multiple localized pulmonary lesions?

DATA SOURCES

English-language studies were identified by searching MEDLINE (1966 to 1996) using the terms lung neoplasms, needle biopsy, and coin lesion/diagnosis; by searching *Index Medicus* (1963 to 1965); and by reviewing bibliographies of relevant papers.

STUDY SELECTION

Studies were selected if they assessed consecutive patients with parenchymal pulmonary solitary or multiple localized lesions; if they reported on aspiration, small-gauge biopsy, or cutting needles; if they used an appropriate diagnostic standard; if ≥ 90% of patients had their TNAB result verified by the diagnostic standard; and if sufficient data were available to compute operating characteristics of TNAB.

DATA EXTRACTION

Data were extracted on the distribution of diagnoses in patients with malignant and benign disease; the size and location of the lesion; the type of lesion; the type of radio-logic assistance; whether a cytopathologist was consulted; the diagnostic standard and number of patients given a final diagnosis; the type and number of complications; and the results. Studies were assessed for methodologic quality.

MAIN RESULTS

48 studies were included in the analysis. 5 meta-analyses were done using a random-effects model: malignant diagnosis compared with all other categories (48 studies); malignant or suspicious diagnosis compared with all other categories (48 studies); suspicious diagnosis compared with all other categories, excluding malignant (21 studies); benign diagnosis compared with all other categories (35 studies); and specific benign diagnosis compared with all other categories (20 studies). The results are summarized in the Table. Complications related to TNAB were pneumothorax (39 studies, pooled incidence rate 25%, 95% CI 21% to 28%) and pneumothorax requiring chest tube drainage (39 studies, pooled incidence rate 7%, CI 6% to 8%).

CONCLUSION

Transthoracic needle aspiration biopsy is accurate for diagnosing malignant and specific benign solitary or multiple localized pulmonary lesions.

Operating characteristics of transthoracic needle aspiration biopsy for diagnosis of pulmonary lesions*

Comparison†	Pooled sensitivity (95% CI)	Pooled specificity (CI)	+LR	−LR
Malignant	86% (84 to 88)	99% (98 to 99)	72	—
Malignant or suspicious	88% (86 to 90)	98% (98 to 99)	49	—
Suspicious	26% (18 to 33)	98% (98 to 99)	15	—
Benign	95% (93 to 96)	81% (75 to 87)	—	0.07
Benign specific	99.8% (99.6 to 100)	44% (31 to 57)	—	0.005

*LRs defined in Glossary.
†Diagnosis compared with all other categories, except for "suspicious" diagnosis, which is compared with all other categories except "malignant."

COMMENTARY

TNAB is commonly done to determine the malignant or benign nature of a resectable solitary lung nodule, to establish a tissue diagnosis of a metastatic or otherwise unresectable malignant tumor, or to obtain material for microbiologic staining and culture. Some controversy persists about the accuracy and application of TNAB in evaluating solitary pulmonary nodules.

The meta-analysis by Lacasse and colleagues offers assurance on this point. TNAB has suboptimal sensitivity (84% to 88%) and excellent specificity (98% to 99%) for diagnosing a malignant pulmonary nodule. TNAB is generally less useful for making a diagnosis of anything other than malignant disease, but that issue is of less practical importance. We are usually interested only in knowing that a solitary nodule is not malignant to avoid surgery, and this area is where TNAB has some limitations.

TNAB can be helpful in determining malignant conditions, but only for selected patients. The critical factor is the pretest likelihood of malignancy, which depends principally on age, smoking history, nodule size, and radiologic features (1, 2). For example, in a patient with a pretest likelihood of 90%, TNAB (with a sensitivity of 84% to 88%) will yield as many false-negative as true-negative results. So whether the test result is positive or negative, the patient will probably have surgery. Nothing has been gained from doing an expensive test that places the patient at some risk. On the other hand, as shown by the authors' example, a negative TNAB result in a patient with a pretest likelihood of ≤ 50% reduces the post-test likelihood of malignancy to ≤ 5%. A likelihood of 5% may be sufficiently low to recommend watchful waiting in preference to immediate surgery.

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References

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2. **Swensen SJ, Silverstein MD, Ilstrup DM, Schleck CD, Edell ES.** The probability of malignancy in solitary pulmonary nodules. Application to small radiologically indeterminate nodules. Arch Intern Med. 1997;157:849-55.