[Original Research]

CHEST

Impact of Rapid On-Site Cytological Evaluation (ROSE) on the Diagnostic Yield of Transbronchial Needle Aspiration During Mediastinal Lymph Node Sampling

Systematic Review and Meta-Analysis

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BACKGROUND: Whether the use of rapid on-site cytologic evaluation (ROSE) increases the diagnostic yield of transbronchial needle aspiration (TBNA) remains unclear. This article is a systematic review of studies describing the utility of ROSE in subjects undergoing TBNA.

METHODS: The study included a systematic review of the PubMed, Embase, and Scopus databases for randomized controlled trials investigating the diagnostic yield of conventional transbronchial needle aspiration (c-TBNA) or endobronchial ultrasound (EBUS)-TBNA, with or without ROSE, in subjects with mediastinal lymphadenopathy.

RESULTS: Five studies (618 subjects; two EBUS-TBNA, two c-TBNA, and one both) were identified. Overall, the studies were of good quality. The pooled risk difference (95% CI) of the diagnostic yield of EBUS-TBNA and c-TBNA was 0.04 (−0.01 to 0.09) and 0.12 (−0.08 to 0.33), respectively, suggesting no added benefit with ROSE. The use of ROSE during EBUS-TBNA (but not c-TBNA) resulted in significantly fewer needle passes (mean difference [95% CI], −1.1 [−2.2 to −0.005]; $P < .001$). There was no difference in the procedure time during EBUS-TBNA. The complication rate was significantly lower (OR [95% CI], 0.26 [0.10 to 0.71]; $P = .009$) when ROSE was used during c-TBNA due to fewer additional procedures required to make a diagnosis. There was evidence of heterogeneity in the studies involving c-TBNA but not EBUS-TBNA. There was no publication bias.

CONCLUSIONS: The use of ROSE neither improved the diagnostic yield nor reduced the procedure time during TBNA. However, the use of ROSE was associated with fewer number of needle passes during EBUS-TBNA and overall lower requirement for additional bronchoscopy procedures during TBNA to make a final diagnosis.

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ABBREVIATIONS: c-TBNA = conventional transbronchial needle aspiration; EBUS = endobronchial ultrasound; ROSE = rapid on-site cytologic evaluation; TBNA = transbronchial needle aspiration

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Transbronchial needle aspiration (TBNA) is a routine procedure for sampling mediastinal lymph nodes. Conventionally, TBNA is performed by using a flexible bronchoscope and, recently, with the help of endobronchial ultrasound (EBUS). The yield of conventional transbronchial needle aspiration (c-TBNA) and EBUS-TBNA depends on several factors, including the etiology (benign or malignant), lymph node size (< 1 or > 1 cm), type of sedation used (conscious sedation or general anesthesia), number of passes per lymph node station (≥ 3 or < 3), and the lymph node station being sampled (station 4R, 7, or others).[1-3] Another factor that can potentially increase the diagnostic yield of TBNA is rapid on-site cytologic evaluation (ROSE).

ROSE provides immediate feedback regarding the adequacy of the specimens obtained and can thus increase the diagnostic yield.[4-7] In case of an inadequate sample, ROSE may guide the operator to modify the technique of TBNA by changing the lymph node, the puncture site, the depth and angle of puncture, and the use of suction.[4,8] Intuitively, the use of ROSE during TBNA has the potential to reduce the number of needle passes and thus the procedure time. Furthermore, it can reduce the need for additional procedures. Despite a sound logic, ROSE is not widely used, and its utility remains unclear.[9,10] Several observational studies have shown that ROSE increases the yield of TBNA.[11,12] However, most of these studies have been small and retrospective, in which ROSE was performed in nonconsecutive subjects based on the physician's discretion, the underlying diagnosis, and the size of lymph nodes (choosing smaller lymph nodes). All these factors can introduce a selection bias, wherein the real benefit of ROSE remains unclear. We conducted a systematic review and meta-analysis of randomized controlled trials investigating the diagnostic yield of c-TBNA or EBUS-TBNA with or without ROSE in the evaluation of patients with mediastinal lymphadenopathy.

Materials and Methods

This review was conducted in accordance with guidelines of Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement.[13] An ethics committee approval was not required because this study was a systematic review of published data.

PICO Question

P, patients with mediastinal lymphadenopathy undergoing EBUS-TBNA or conventional TBNA; I, ROSE; C, no ROSE; and O, diagnostic yield.

Search Strategy

The PubMed, Embase, and Scopus databases (from inception until March 31, 2017) were searched by using the following free text terms: (ebus OR eus OR endosono* OR "endobronchial ultrasound" OR "endoscopic ultrasound" OR "ebus-tbna" OR "eus-fna") AND ("transbronchial needle aspiration" OR "tbna " OR "needle aspiration") AND ("rapid onsite evaluation" OR "rose" OR "rapid onsite cytological evaluation"). The reference list of all the included articles and previous review articles were searched. In addition, we searched our personal files.

Inclusion Criteria

Studies meeting the following criteria were included: (1) randomized controlled trials in which the subjects underwent mediastinal lymph node sampling using either c-TBNA or EBUS-TBNA, with or without ROSE; and (2) studies providing outcome of the procedures with or without ROSE, thereby allowing calculation of diagnostic yield from the study observations.

The following type of studies were excluded: (1) observational studies; (2) case reports, abstracts, comments, editorials, and reviews; (3) studies not providing the diagnostic yield of procedures performed by using ROSE separately; (4) studies describing the use of ROSE in sampling peripheral lung lesions; and (5) studies describing the use of ROSE in transthoracic sampling of thoracic lesions.

Initial Review of Studies

The electronic searches were assimilated in a reference manager package, and all duplicate citations were discarded. Two authors (I. S. S. and R. A.) screened the citations by review of the title and abstract to identify the relevant studies. Any disagreement was resolved by consensus between the authors. This database was then scrutinized again to include only primary articles. The full text of each of these studies was obtained and reviewed in detail.

Study Selection and Data Abstraction

Two authors (I. S. S. and R. A.) independently extracted the data into a standard data extraction form. The following information was retrieved: (1) publication details (authors, year of publication, and country where the study was conducted); (2) number of patients, inclusion criteria, and demographic profile of patients; (3) the type of sedation or anesthesia used; (4) lymph node stations sampled by c-TBNA or EBUS-TBNA; (5) diameter of conventional and EBUS needle, number of passes made through conventional and EBUS-TBNA, with or without ROSE; (6) the adequacy (preponderance of lymphocytes) and diagnostic yield (detection of malignant cells or granuloma or abnormality in the lymph nodes resulting in a specific diagnosis) of c-TBNA and EBUS-TBNA; (7) reagent used for rapid staining of the cytology specimens; (8) duration of procedure; and (9) complications associated with the procedures. Any differences in the data extraction process were resolved by discussion.

Assessment of Study Quality

The quality of each included study was independently evaluated by two authors (I. S. S. and R. A.) using the Cochrane risk of bias tool.[14] This tool assesses the risk of bias and applicability judgment based on randomization sequence generation, allocation concealment and blinding of participants and personnel, attrition of participants, selective reporting of results, and other sources of bias. Each item is rated as low, high, or unclear risk of bias.

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