

Hemorrhagic Complications of Transthoracic Needle Biopsy of the Lung in Patients with Pulmonary Hypertension: A Systematic Review and Meta-Analysis

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ADMINISTRATIVE INFORMATION**Support** - None.**Review Stage at time of this submission** - Completed but not published.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY2023100074**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 21 October 2023 and was last updated on 21 October 2023.**INTRODUCTION**

Review question / Objective Does TTNB in patients with PH compared to patients without PH have a greater risk of complications such as pulmonary hemorrhage or hemoptysis?

Rationale Transthoracic needle biopsy (TTNB) is an important diagnostic tool in the evaluation of lung lesions. With an aging patient population, advancements in molecular testing, earlier detection of pulmonary nodules, and the availability of non-surgical treatment options for lung cancer, there has been an increasing utilization of this and other minimally invasive biopsy techniques. According to one estimate, TTNB accounted for 52.7% of all lung biopsies performed in patients diagnosed with lung cancer in 2013-2015.

In evaluating a patient for TTNB, it is recommended that one takes into consideration

the presence or absence of pulmonary hypertension (PH). Due to a theoretically increased likelihood of or worsened consequences from injuring vascular structures, PH has consistently been cited as at least a relative contraindication to TTNB.

PH, however, was estimated to have a global prevalence as high as 1% of all people. Patients with certain forms of PH, such as group 3 PH related to COPD, may share underlying risk factors for lung cancer. Furthermore, a recent study by Roderburg et al demonstrates that PH itself is associated with an increased incidence of cancer, especially of respiratory organs. Therefore, patients with the combination of PH and an indication for TTNB are not uncommon in clinical practice. Multidisciplinary discussion is recommended in this situation to weigh whether the procedure is more likely to benefit or harm the patient, but there is little cited data to inform this discussion. We thus performed a systematic review and meta-analysis to assess the evidence for an association

between PH and hemorrhagic complications of TTNB.

Condition being studied Hemorrhagic complications of transthoracic needle biopsy of the lung in patients with pulmonary hypertension.

METHODS

Search strategy We searched PubMed, Embase, CINAHL, and Cochrane Library databases through May 22, 2022. Reference lists of studies identified through the database search were also examined for potentially relevant articles.

Participant or population Patients undergoing transthoracic needle biopsy of the lung with assessment of pulmonary arterial pressure by CT, echocardiography, or right heart catheterization.

Intervention Pulmonary hypertension (does not fit traditional PICO structure).

Comparator No pulmonary hypertension (does not fit traditional PICO structure).

Study designs to be included Retrospective, prospective, case-control, cohort, reviews.

Eligibility criteria Inclusion criteria: all studies reporting frequency of complications of CT-guided lung biopsy in adult patients with evidence of PH compared to patients undergoing the procedure without evidence of PH. This included studies with case-control, prospective, or retrospective study designs. Exclusion criteria: case reports, case series, review studies lacking quantitative data, studies that excluded patients with PH, and studies in which PH status of participants was not assessed.

Information sources Electronic databases, citation review, contact with authors.

Main outcome(s) Study outcomes of interest were frequency of pulmonary hemorrhage, hemoptysis, hospitalization, and mortality following TTNB in patients with PH compared to patients without PH. Definitions and gradings of PH, pulmonary hemorrhage, and hemoptysis used in each study were recorded. This included methods of defining PH (e.g. CT, echocardiography, right heart catheterization) and methods of assessing complications. Results were sought for all outcomes reported at all time points specified in the study.

Data management Data from selected studies were extracted independently and in duplicate by two reviewers using a common data form (spreadsheet).

Quality assessment / Risk of bias analysis Two reviewers working independently assessed each study for risk of bias using criteria adapted from the Agency for Healthcare Research and Quality⁹ (Supplement). Accordingly, potential sources of bias were investigated for 5 domains (selection, performance, attrition, detection, and reporting), and each study was categorized as having high, unclear, or low risk of bias. These assessments were then compared, and differences were resolved by consensus.

Strategy of data synthesis A table outlining the modalities used to define PH and the complications reported in each study was used to decide which studies were eligible for each synthesis. Some studies separated their complications according to grades of severity, reporting more than one set of results. In these cases, the grade that most closely matched the criteria set by other studies was chosen. Results of individual studies were summarized in tables created using Microsoft Excel. Forest and funnel plots were generated on Review Manager 5. Studies were grouped based on the complications reported and modalities used to define PH. For each group, pooled odds ratios were obtained using an inverse-variance random-effects method. Heterogeneity was assessed by calculating the I² for each group. All statistical analysis was performed using Review Manager 5.

Subgroup analysis None.

Sensitivity analysis None.

Country(ies) involved United States.

Keywords Hypertension, Pulmonary; Imaging, Diagnostic; Biopsy, Needle; Lung Neoplasms.

Contributions of each author

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