Supplementary

Partial questionnaire administered to radiologists who participated in the survey.

Asterisked questions (*Q) are for radiologists with five or more years of transthoracic needle biopsy (TNB) experience only (n = number of respondents who answered a particular question).

Q1. Name of respondent

Q2. Affiliation

Q3. How long have you been working as a thoracic radiologist? (n = 60)
      A. Less than a year (n = 1, 1.7%)
      B. 1–5 years (n = 17, 28.3%)
      C. 5–10 years (n = 15, 25%)
      D. Over 10 years (n = 27, 45%)

Q3-1. Do you have five or more years of TNB experience?
      A. Yes (n = 42, 70%)
      B. No (n = 18, 30%)

Q4. Do you perform TNB in inpatient or outpatient settings? (n = 60)
      A. Exclusively in inpatient setting (n = 54, 90%)
      B. Mainly in inpatient setting with occasional outpatient-setting procedures (n = 4, 6.7%)
      C. Mainly in outpatient setting with occasional inpatient-setting procedures (n = 1, 1.7%)
      D. Exclusively in outpatient setting (n = 0)
      E. Others (n = 1, 1.7%)

Q5. How do you receive a biopsy request? (n = 60)
      A. Via electronic medical record (EMR) (n = 48, 80%)
      B. Via internet or intranet outside EMR (n = 4, 6.7%)
      C. By phone (n = 2, 3.3%)
      D. Personal visit (n = 6, 10%)
      E. Others (n = 0)

Q6. What percentage of requested TNBs do you actually perform? (n = 60)
      A. 100% (n = 1, 1.7%)
      B. 95–100% (n = 22, 36.7%)
      C. 90–95% (n = 20, 33.3%)
      D. 85–90 % (n = 10, 16.7%)
      E. 80–85% (n=7, 11.7%)

Q7. Of Thoracic radiology and intervention, which section is in charge of TNB at your hospital? (n = 60)
      A. Thoracic radiology (n = 59, 98.3%)
      B. Intervention (n = 1, 1.7%)

Q8. Do you keep a separate TNB records? (n = 60)
      A. No (n = 21, 35%)
      B. With paper reports (n = 7, 11.7%)
      C. In offline electronic spreadsheet (i.e., MS-Excel) (n = 27, 45%)
      D. In online electronic spreadsheet (i.e., Google Doc) (n = 5, 8.3%)

Q9. Do you regularly audit TNB results?

    A. Yes (n = 53, 88.3%)

    B. No (n = 7, 11.7%)

Q10. For tissue diagnosis of a focal lung lesion with a high probability of resectable-stage lung cancer, which do you think is the most frequent practice at your hospital? (n = 60)

    A. Direct surgery (n = 1, 1.7%)

    B. Bronchoscopy followed by surgery (n = 4, 6.7%)

    C. Bronchoscopy (inconclusive results) followed by TNB (n = 7, 11.7%)

    D. TNB followed by bronchoscopy (n = 4, 6.7%)

    E. Both TNB and bronchoscopy (n = 38, 63.3%)

    F. Not sure (n = 1, 1.7%)

    G. Others (n = 5, 8.3%)

*Q11. As a tissue diagnosis method for a focal lung lesion with a high probability of resectable-stage lung cancer, do you think that the proportion of direct surgery has increased over the past five years? (n = 41)

    A. Increased (n = 16, 39%)

    B. Decreased (n = 5, 12.2%)

    C. Same as before (n = 19, 46.3%)

    D. Others (n = 1, 2.4%)

Q12. When requested to do TNB for a part-solid nodule or a pure ground-glass nodule, what do you do? (n = 54)

    A. Always reject (n = 19, 35.2%)

    B. Occasionally perform (n = 17, 31.5%)

    C. Often perform (n = 17, 31.5%)

    D. Others (n = 1, 1.9%)

Q13. How often do you reject TNB when it is requested for a patient who has (according to your assessment) a high risk of procedure-related complications? (n = 60)

    A. Always reject (n = 3, 5%)

    B. Occasionally perform (n = 27, 45%)

    C. Often perform (n = 11, 18.3%)

    D. Always perform (n = 2, 3.3%)

    E. Decide case by case (n = 17, 28.3%)

*Q14. Do you think that the number of rebiopsy (TNB in a patient with confirmed lung cancer) has increased over the past 5 years? (n = 41)

    A. Increased (n = 25, 61%)

    B. Decreased (n = 2, 4.9%)

    C. Same as before (n = 11, 26.8%)

    D. Others (n = 3, 7.3%)

*Q15. What is the most common reason for rebiopsy? (n = 39)

    A. Confirmation of histopathologic results (n = 5, 12.8%)

    B. Molecular analysis for an established target therapy (n = 17, 43.6%)

    C. Clinical trial for a new drug (n = 11, 28.2%)

    D. Suspicion of synchronous cancer (n = 6, 15.4%)

*Q16. Which of the following reasons for rebiopsy saw the biggest increase in the last 5 years? (n = 38)
  A. Confirmation of histopathologic results (n = 2, 5.3%)
  B. Molecular analysis for an established target therapy (n = 19, 50%)
  C. Clinical trial for a new drug (n = 14, 36.8%)
  D. Suspicion of synchronous cancer (n = 3, 7.9%)

Q17. Which needle type do you prefer for TNB? (n = 60)
  A. Aspiration needle (fine needle aspiration) (n = 6, 10%)
  B. Cutting needle (non-coaxial) (n = 19, 31.7%)
  C. Coaxial needle (n = 33, 55%)
  D. Others (n = 2, 3.3%)

Q18. [Subjective question] Which diameter of needle do you frequently use? (n = 60)
  A. 18 Gauge (n = 21, 35%)
  B. 19 Gauge (n = 1, 1.7%)
  C. 20 Gauge (n = 34, 56.7%)
  D. 21 Gauge (n = 2, 3.3%)
  E. 22 Gauge (n = 2, 3.3%)

Q19. How many pleural passes do you usually make? (n = 60)
  A. One pleural pass, one needle pass (non-coaxial) (n = 24, 40%)
  B. One pleural pass, multiple needle pass (coaxial) (n = 27, 45%)
  C. Two pleural passes (n = 7, 11.7%)
  D. Three or more pleural passes (n = 0, 0%)
  E. Others (n = 2, 3.3%)

Q20. Have you ever changed your biopsy needle in the past 5 years? (n = 59)
  A. Yes (n = 10, 16.9%)
  B. No (n = 43, 72.9%)
  C. Not sure (n = 6, 10.2%)

Q21. Do you think needle diameter has a significant influence on the accuracy for histopathologic diagnostic and/or molecular analysis? (n = 59)
  A. I cannot answer because I have used only one diameter of needle (n = 23, 39%)
  B. No–No (n = 16, 27.1%)
  C. Yes–No (n = 5, 8.5%)
  D. No–Yes (n = 3, 5.1%)
  E. Yes–Yes (n = 12, 20.3%)

Q22. [Multiple answers allowed] What type of imaging modality do you use for TNB guidance? (n = 60)
  A. Conventional CT (n = 34, 56.7%)
  B. CT fluoroscopy (n = 5, 8.3%)
  C. Fluoroscopy without cone-beam CT (CBCT) (n = 18, 30%)
  D. CBCT (n = 15, 25%)
  E. Ultrasound (n = 1, 1.7%)

Q23. During CT fluoroscopy, have you ever put a hand within the gantry opening while X-ray was on? (n = 57)
    A. Yes (for pushing the needle to the target) (n = 10, 17.5%)
    B. Yes (for biopsy) (n = 3, 5.3%)
    C. Yes (for both pushing the needle to the target and biopsy) (n = 3, 5.3%)
    D. No, since I use intermittent mode only (n = 4, 7%)
    E. No experience in CT fluoroscopy (n = 37, 64.9%)

Q24. Supposing that a robotic arm becomes available to you in the near future, which of the following imaging modality would you choose for TNB guidance? (n = 56)
    A. CBCT (n = 11, 19.6%)
    B. CT fluoroscopy (n = 36, 64.3%)
    C. USG (n = 0, 0%)
    D. Fluoroscopy (n = 0, 0%)
    E. CT (n = 8, 14.3%)
    F. Other (n = 1, 1.8%)

Q25. Do you let a TNB needle travel across the interlobar fissure if that makes biopsy more feasible? (n = 59)
    A. Never (n = 9, 15.3%)
    B. Only in an inoperable patient (n = 12, 20.3%)
    C. Occasionally, regardless of operability (n = 26, 44.1%)
    D. Often, regardless of operability (n = 12, 20.3%)

Q26. Have you ever performed preoperative localization of a lung nodule? (n = 55)
    A. Yes (n = 48, 87.3%)
    B. No (n = 7, 12.7%)

Q27. [Multiple answers] If you answered yes for Q26, which of the following methods do you use most often? (n = 48)
    A. CT-guided dye injection (e.g., Methylene blue) (n = 14, 29.2%)
    B. CT- guided hook wire (n = 42, 87.5%)
    C. CT-guided radiopaque markers (barium, Lipiodol) (n = 18, 37.5%)
    D. CT-guided radioisotope (n = 2, 4.2%)
    E. Fluoroscopic-aided contrast medium (n = 1, 2.1%)
    F. Others (n = 3, 6.3%)

Q28. Have you ever placed a fiducial marker (gold pin) for the CyberKnife surgery of lung lesions? (n = 52)
    A. Yes (n = 7, 13.5%)
    B. No (n = 45, 86.5%)

Q29. Have you ever encountered an air embolism? (n = 60)
    A. Yes (n = 9, 15%) → go to Q30–Q34
    B. No (n = 51, 85%) → go to Q35

Q30–Q34: Asked to those who said yes to Q29

Q30. What was the needle type? (n = 9)
    A. Coaxial needle (n = 5, 55.6%)
    B. Non-coaxial needle (n = 4, 44.4%)

Q31. Did the patient have dyspnea prior to TNB? (n = 9)
  A. With dyspnea (n = 1, 11.1%)
  B. No dyspnea (n = 5, 55.6%)
  C. The patient had no dyspnea but had other symptom(s) (n = 3, 33.3%)

Q32. Where in the lung was the target located? (n = 9)
  A. Central lesion (n = 3, 33.3%)
  B. Peripheral lesion (n = 5, 55.6%)
  C. Others (n = 1, 11.1%)

Q33. How long did the needle traverse the aerated lung before reaching the target? (n = 9)
  A. Less than 2 cm (n = 2, 22.2%)
  B. About 2–5 cm (n = 4, 44.4%)
  C. Over than 5 cm (n = 3, 33.3%)

Q34. Did the needle cross a pulmonary vessel while approaching the target? (n = 9)
  A. The needle crossed no visible vessels (n = 6, 66.7%)
  B. The needle crossed a less-than-1 mm-sized vessel (n = 1, 11.1%)
  C. The needle crossed a 1–3 mm-sized vessel (n = 2, 22.2%)
  D. The needle crossed a more-than-3 mm-sized vessel (n = 0, 0%)

Q35. Have you encountered tension pneumothorax? (n = 60)
  A. Yes (n = 14, 23.3%) → go to Q36–Q39
  B. No (n = 46, 76.7%) → go to Q40

Q36–Q39: Asked to those who said yes to Q35

Q36. When did you know that it occurred? (n = 14)
  A. Before removal of needle (n = 2, 14.3%)
  B. Between needle removal and patient position change (n = 9, 64.3%)
  C. After patient position change (n = 3, 21.4%)

Q37. Why did you think that it was a tension pneumothorax rather than a non-tension pneumothorax? (n = 14)
  A. Sudden dyspnea (n = 7, 50%)
  B. Decreased blood pressure (n = 2, 14.3%)
  C. Increased amount of pneumothorax on CT (n = 4, 28.6%)
  D. Others (n = 1, 7.1%)

Q38. Do you think there was a risk factor for the tension pneumothorax that was encountered? (n = 14)
  A. Yes (n = 11, 78.6%)
  B. No (n = 3, 21.4%)

Q39. [Subjective question] If you said yes for Q38, what was the risk factor? (n = 11)
  Emphysema and chronic obstructive pulmonary disease (n = 11, 100%)

Q40. How do you place the patient if imaging shows airspace opacities that suggest procedure-related pulmonary hemorrhage? (n = 59)

    A. Always supine (n = 6, 10.2%)
    B. Biopsy side down decubitus position, only if hemoptysis (n = 25, 42.4%)
    C. Biopsy side down decubitus position, always (n = 27, 45.8%)
    D. Always sitting (n = 1, 1.7%)