Diagnosis and staging of lung cancer using transesophageal ultrasound: Training and assessment

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CLINICAL BACKGROUND

Lung cancer is the leading cause of cancer mortality.[1] Tumor tissue sampling is mandatory in the allocation of correct treatment and to enhance outcomes.[2] Diagnosing and staging of patients is comprised of imaging and invasive techniques. The latter includes endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) and transesophageal EUS-FNA. Endoscopic staging has replaced operative interventions as mediastinoscopy, as endoscopic staging has a higher sensitivity in lymph node staging,[3] is less invasive with a lower complication rate,[4] and is recommended by current international guidelines as the first test in mediastinal testing in lung cancer patients.[4-6] EUS and EBUS complement each other. The diagnostic value of combining EBUS with EUS by using echo-bronchoscope (EUS-B) is superior to either performing EBUS or EUS-B alone, and reduces the need for surgical staging procedures.[7,8]

EUS is excellent for the left and lower paraesophageal structures and structures under the diaphragm,[9] while EBUS provides access to structures close to the large airways on both sides. EUS-FNA can be performed with either conventional gastrointestinal EUS or EUS-B in the esophagus.[10] A single-scope approach (EBUS-TBNA and EUS-B-FNA) has also obvious logistical, practical, and economic advantages compared to a dual-scope approach (EBUS-TBNA and EUS-FNA).

Only a few pulmonologists perform EUS-FNA since it conventionally lies in the hands of gastroenterologists or gastric surgeons. EUS-B-FNA is a relatively new technique. Thus, there is a huge need for education and assessment of competencies in the procedure. Training requirements for EBUS-TBNA have been published by the European, American, and British Respiratory Society,[11-13] whereas no specific requirements have been defined for EUS-FNA for mediastinal staging of lung cancer.

We will briefly describe the current status for theoretical education, practical education, and validation of competency in EUS-B with suggestions to a training program.

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HOW TO LEARN TRANSESOPHAGEAL ULTRASOUND

Miller described a four-layered pyramid for acquiring competence.[14] The two first steps ("knows" and "knows how") relate to the theoretical knowledge that should establish a base for practical training and performance. Step 3 ("shows how") is a performance in a simulated environment, and step 4 ("does") is the supervised performance on patients. A systematic training program in transesophageal ultrasound should be based on the same steps: theoretical knowledge, simulation-based training, and supervised performance on patients. For the assessment of theoretical knowledge, a validated theoretical examination based on multiple-choice questions have been developed.[15] Unfortunately, evidence-based training requirements for transesophageal ultrasound for the diagnosis and staging of lung cancer do not exist.

We recommend for the development of a systematic and stepwise approach, learned through simulation-based training, where skill assessment relies on tests with a pass/fail criteria.

SYSTEMATIC AND STEPWISE APPROACH

When comparing a systematic approach to a targeted in EBUS, the former resulted in a higher diagnostic yield.[16] For bronchoscopy, a systematic approach is also correlated with inspection of more segments and a lower procedure time.[17] Therefore, we recommend using a stepwise and systematic approach when learning and performing the procedure. First, the trainee should learn to recognize the six anatomical landmarks in the following order by observing the procedure performed by an experienced colleague. (1) the left liver lobe, (2) the abdominal aorta with the celiac trunk and the superior mesenteric artery, (3) the left adrenal gland, (4) lymph node station 7, (5) lymph node station 4 L, and (6) lymph node station 4R.[18,19] Similarly, six landmarks for learning EBUS-TBNA have been described.[19] The second and next step is to learn how to handle the endoscope, i.e., to insert it and to find the landmarks. The third step is to learn how to take biopsies.

APPRENTICESHIP-BASED LEARNING

Early guidelines for gastrointestinal EUS recommended a minimum of 150 total supervised procedures. Studies on learning curves showed "substantial variability in achieving competency and a consistent need for more supervision than current recommendations."[20,21] Another study exploring learning curves for EUS for lung cancer staging found that 20 procedures were not enough to ensure basic competency.[22] Similar results were found for trainees performing 50 EBUS-TBNA procedures.[23,24] Procedural experience is a surrogate marker for competence, as trainees learn at different paces.[25] Skill acquisition should rely on mastery learning where the trainee practices until proficiency targets are met,[26] and thereby relies on assessment tools, that can determine if the desired level of competence is achieved.[27] Measurement of competency can be based on a validated video-based tool (the EUSAT tool) for assessing technical abilities in EUS-FNA.[28] The assessment tool has a high intra- and inter-rater reliability and can discriminate between trainees and experienced physicians.

SIMULATION BASED LEARNING

Operators should train to perform EBUS and EUS-B at the same time to enable complete endoscopic staging in one session.[29] It is no longer acceptable to put the burden of initial training on the patients. In general, beginners should practice endoscopic procedures on rubber models, animal organs, live anesthetized animals, and virtual-reality simulators. However, no animal presents an anatomy suitable for learning the relevant human anatomy for the transesophageal ultrasound. It is surprising that no rubber models or virtual reality simulators for EUS-FNA and EUS-B-FNA for pulmonology exist, while there are several EBUS simulators on the market with validated tests.[30] Simulation-based learning is a cornerstone in the European Respiratory Society's educational program in EBUS-TBNA[31] and can replace apprenticeship-based learning in the initial part of the learning curve.[32] However, not all aspects can be practiced on simulators or phantoms. Even after passing a simulation-based test, the trainee should perform the initial procedures under supervision, and reach as high a procedure volume as possible, as dedicated interventional pulmonologists are more likely to perform procedures properly than general pulmonologists who do not perform the procedure regularly.[33]

FINAL REMARKS

There is a huge need to develop simulation-based training programs for EUS-B-FNA with validated

tests to assess user competency and spare patients from the initial part of novices learning curves, in the same way, it has successfully been done for EBUS-TBNA.

Conflicts of interest

There are no conflicts of interest.

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