Bronchoscopic techniques in interstitial lung diseases. Obtaining and preserving specimens for investigation.

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Bronchoscopy in ILDs

• Bronchoscopy is a useful diagnostic tool in some ILDs, particularly sarcoidosis, hypersensitivity pneumonitis and organizing pneumonia

• Bronchoscopic methods in ILDs:
  – Bronchoalveolar lavage
  – Endobronchial biopsy
  – Transbronchial biopsy
  – Transbronchial needle aspiration of mediastinal lymph nodes under EBUS control
Sedation and local anesthesia

Sedation

- Intravenous midazolam is the preferred drug for sedation; it has a rapid onset of action and is titrable.
- Dosage: no more than 5 mg midazolam (strength 1 mg/mL) should be drawn into a syringe prior to bronchoscopy for patients under the age of 70 (2 mg midazolam for patients over 70).
- Combination opioid and midazolam sedation should be considered in patients to improve bronchoscopic tolerance.
- When opioids are used, short-acting agents (such as fentanyl or alfentanil) should be used to minimize post-procedural sedation.

Sedation and local anesthesia

Local anesthesia

- **Nasal topical anaesthesia**
  - lidocaine gel

- **Laryngeal and tracheobronchial topical anaesthesia** - 1% lidocaine solution:
  - **Application of lidocain spray** to anesthetize tongue, and larynx followed by application of lidocain (tetracain), by special bore laryngeal needle inserted through vocal chords
  - **“Spray-as-you-go” delivery**, in which lidocaine is applied via the bronchoscope working channel. Repeated application allows lidocaine delivery to the entire airway
  - **Direct injection into the upper trachea** using a needle passed through the cricothyroid membrane, allowing lidocaine delivery to the larynx and trachea prior to bronchoscope insertion - not frequently used
  - **Additional lidocaine doses** to the bronchial tree can be administered as required via the bronchoscope
  - **Use of nebulized 4% lidocaine** – increases the risk of doubling the total dose of lidocaine, and is not recommended

General anesthesia

- Administered and guided by anesthesiologist
- **Indications:**
  - Medical indication - patients undergoing combined bronchoscopic procedure with longer durations, e.g. EBUS+BAL+TBLB
  - Allergic patients - In patients who have an allergy to local anesthetics
  - Patient request – for patients who do not want to have bronchoscopy using only local anesthesia + sedation
- **Artificial ventilation:**
  - **Classical volume or pressure ventilation** – suitable for patients intubated using an endotracheal tube
  - **High-frequency jet ventilation** – suitable for patients intubated using a rigid bronchoscope
General anesthesia with jet ventilation

• HF Jet ventilation
  – Small volumes (2 to 3 ml/kg)
  – High frequency gas exchange (100-200/min)
  – High pressure (100-500 kPa)
  – Gas is pushed in pulse-mode via a thin catheter (14-18 Gauge catheter or side-port of bronchoscope)
Bronchial and transbronchial biopsy

- **To increase diagnostic yield:**
  - **Bronchial biopsy (BB)** and **transbronchial biopsy (TBLB)** should be combined in sarcoidosis with **transbronchial needle aspiration** of lymph nodes (TBNA) and **bronchoalveolar lavage (BAL)**
  - TBLB should be combined with BAL in other ILDs
  - **Multiple specimens** should be taken during one procedure (optimally at least 5)
  - Preservation of specimens: specimens are fixed in formol making quick transport to a histopathologic lab unnecessary
    - Shorr AF et al. Chest 2001
    - Navani N et al. Respirology 2011
Bronchial biopsy

• **BB is indicated in diseases with pathological changes in airway mucosa**, mainly in diseases with airway involvement, mainly sarcoidosis

• Diagnostic and differential diagnostic yield

• **Technical workup**: forceps biopsy of bronchial mucosa, optimally at the bronchial carinae of different lobes and segments
  
  – *Shorr AF et al. Chest 2001*
Bronchial biopsy in asthma with ABPA and sarcoidosis

Allergic bronchopulmonary aspergillosis

Sarcoidosis
Transbronchial lung biopsy - TBLB

- TBLB is indicated in diffuse lung diseases and in the diagnosis of solid (tumorous) lesions
- In general, it increases diagnostic yield of bronchoscopy by 30%
- In ILDs diagnostic yield of TBLB has been shown mainly in sarcoidosis, and to a lesser extent in hypersensitivity pneumonitis and smoking-related ILDs, dif dg versus disseminated tumors
- In its classic form TBLB is not suitable for diagnosis of most fibrosing ILDs
  - Descombes E. et al. Monaldi Arch Chest Dis 1997
TBLB complications

- Pneumothorax
- Bleeding
- Incidence of complications: 6%; mostly pneumothorax (5.8%, 3.8% requiring intercostal drainage)
TBLB diagnostic yield in ILDs

- **Diagnosis of sarcoidosis**-is up to 70% and almost 100% when combined with TBNA and BAL
- In other ILDs the diagnostic yield is low – rarely useful in hypersensitivity pneumonitis or SRIF
- **Substantially increased diagnostic yield when a cryobiopsy is performed**
TBLB- granuloma in sarcoidosis
Transbronchial cryobiopsy - TBLC

- Transbronchial cryobiopsy: a new tool for lung biopsies. 
  Babiak A et al. Respiration 2009

- Method: flexible cryoprobe connected to source of CO2 - temperature at the tip of probe −75 °C- duration of cooling 5 - 6s, fluoroscopic control
Diagnostic yield from TBLC

Casoni et al. Plos One 2013
Transbronchial needle aspiration – TBNA - EBUS

- TBNA - EBUS mainly valuable in diagnosis of sarcoidosis
- Combination of BAL, TBLB (TBLC) and TBNA-EBUS increases probability of obtaining a diagnosis to ≈ 100%
- Differential diagnosis of tumorous involvement of mediastinal lymph nodes
- TBNA is suitable not only for cytologic evaluation but also for histologic - part of tissue or cytoblock
- Preservation of samples – saline is best, plus quick transport for further histopathologic processing
  – Navani N et al. Respirology 2011
EBUS- TBNA cytoblock and slices from cylinder of tissue retained in needle
EBUS- TBNA- low magnification
EBUS- TBNA- cartilage
EBUS-TBNA SCLC
EBUS- TBNA SCLC CD20 EMA
EBUS- TBNA sarcoid granuloma
EBUS-TBNA normal lymph node
Conclusions

• Bronchoscopy has a substantial role in the diagnosis and differential diagnosis of ILDs
• Better diagnostic yield is obtained by combining the methods; i.e. BAL, TBLB, TBLC, EBUS-TBNA
• The samples obtained are suitable for cytologic and in most cases for histopathologic evaluation (preserved as native or fixed in formol)
• Combining bronchoscopic methods and introduction of new ones (TBLC) allows patients to avoid surgical lung biopsies
Thank you for your kind attention