

# Bronchoalveolar Lavage

# 7

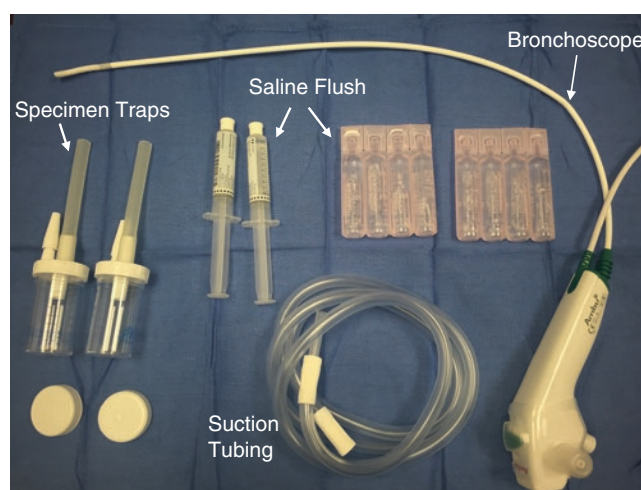
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## 7.1 General Principles

- Bronchoalveolar lavage (BAL) involves obtaining a specimen from the lower respiratory tract and therefore requires proficiency in bronchoscopy.
- Thoracic imaging modalities, such as chest radiography or CT scan, may be used to guide the location of specimen acquisition.
- Indications for BAL include:
  - Diagnosis of pulmonary infection
    - Bacterial, fungal, or viral isolation
    - Quantitative evaluation of the pathogen
    - Culture for speciation and sensitivity determination
  - Distinguishing ARDS from cardiogenic pulmonary edema
    - Evaluation of the protein and neutrophil content
- BAL cultures should be sent for both gram stain and quantitative culture analysis. Gram stain can be utilized to tailor early antibiotic therapy. The specimen is diagnostic of pneumonia if the quantitative culture demonstrates at least  $10^4$  CFU/mL.
- The accuracy of BAL is optimized if it is performed prior to the initiation of antibiotics.

## 7.2 Instruments (Fig. 7.1)

- Fiber-optic bronchoscope.
- Sterile collection trap(s).
- Sterile saline.
- Suction tubing and vacuum source.



**Fig. 7.1** BAL equipment

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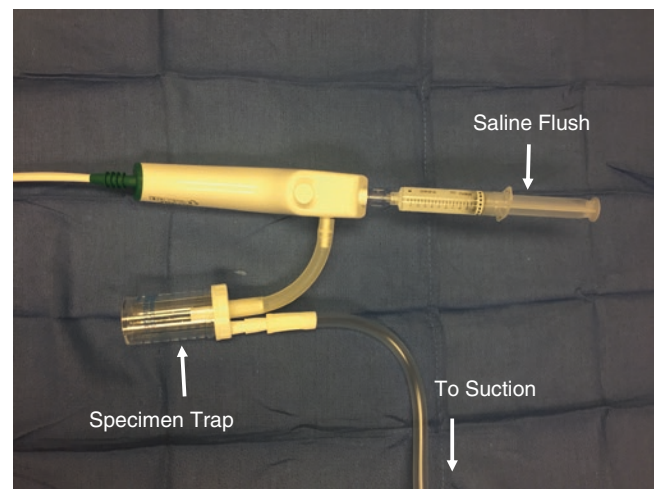
### 7.3 Positioning

- Refer to Chapter 6: Bronchoscopy in the ICU.

### 7.4 Technique

- Refer to Chapter 6: Bronchoscopy in the ICU.
- After evaluation of the tracheobronchial tree, a BAL specimen should be obtained in any segment with purulent secretions or in the segment(s) corresponding to the location of infiltrate appreciable on thoracic imaging.
- If any prior suctioning of the airway or endotracheal tube secretions has been performed, the bronchoscope should be irrigated with sterile saline prior to obtaining the BAL specimen to prevent contamination.
- The bronchoscope should be connected to the sterile collection trap, which is connected to suction. A sterile saline syringe should also be attached to the top of the bronchoscope (Fig. 7.2).
- The bronchoscope should be advanced distally into the desired tracheobronchial tree until gentle resistance is appreciable, appropriately wedging the bronchoscope in the area of concern.
- Sterile isotonic saline is then instilled for appropriate lavage.
  - Assure the saline irrigation is visible on bronchoscopic view during instillation.
  - Avoid suction until instillation of irrigation is complete, to assure adequate volume of sample is collected.
- Suction should then be applied to evacuate the irrigated segment into a sterile collection device, assuring the trap remains in a dependent position to prevent evacuation and loss of obtained specimen.

- Alternatively, if suction is unavailable, the specimen may be aspirated with a sterile syringe through the irrigation channel.
- Instillation and evacuation of fluid in 20 mL aliquots should be repeated until the segment is fully cleared, as this assures sampling of the distal alveoli, not only the distal bronchus.
- The collection device is then removed and labeled with appropriate identification information.
- If additional specimens are required, the bronchoscopy suction channel should be appropriately flushed to avoid contamination of subsequent cultures.
- At the conclusion of the procedure, the operator should ensure the entirety of visible saline irrigation has been evacuated completely.



**Fig. 7.2** Final setup for obtaining BAL specimen

## 7.5 Tips and Pitfalls

- Pulsations of suction, rather than continuous application, can be helpful to avoid collapse of the distal airways. This prevents de-recruitment of alveoli and hypoxemia.
- Suctioning during obstructed bronchoscopic view should be avoided to prevent mucosal injury.
- It is preferable to avoid suctioning endotracheal tube secretions or upper airway secretions prior to obtaining a BAL specimen to avoid the potential for contamination.