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**Broncho-Alveolar Lavage (BAL) & Mini-BAL standardised procedure guideline**

**Clinical suspicion of VAP**

**OR**

**CAP, where a deep specimen is thought to be of benefit by the treating senior clinician**

YES

**Any** of below present

* Pre-treatment with antibiotics
* FiO2 >0.6 or PEEP >10
* Unstable patient

**Consider risk benefits of BAL**

YES

NO

Mini-BAL

**Appropriate for BAL/Mini-BAL**

Mini-BAL

BAL

NO

Is re-useable bronchoscope available for use or will be available in reasonable timeframe?

Use Large disposable AMBU aScope 4 with aView screen

YES

Significant cross contamination risk?

(e.g. *MDR-TB, VHF, MDR-GNB, Prion disease)*

YES

NO

Use large diameter re-useable bronchoscope and stack

**Introduction – BAL for VAP**

Ventilator acquired pneumonia (VAP) is a common condition in ICU1 with high morbidity2 3 but there is often diagnostic uncertainty. The consequences of inappropriate or delayed antibiotic therapy can be significant4 5, whilst overuse of, and failure to de-escalate, antibiotic therapy can result in selection of multi-drug resistant bacteria6 and significant morbidity such as Clostridium difficile infection7.

There is evidence that Broncho-Alveolar Lavage (BAL) has superior specificity compared to Endo-Tracheal Aspiration (ETA) for the diagnosis of ventilator acquired pneumonia8 9, with culture growth from ETA more likely to represent upper airway colonisation. Use of BAL results in a lower incidence of microbiologically confirmed pneumonia10, more antibiotic free days10. BAL should therefore be considered the gold standard investigation. There is less evidence directly comparing BAL and mini-BAL – if the patient is too unstable or there will be a significant delay in performing BAL (e.g. experienced bronchoscopist not available) then it may be appropriate to perform a mini-BAL.

**Indications for BAL in VAP from ECDC HAI-Net ICU protocol v2.2**

A screenshot of a cell phone

Description automatically generated

**Relative contraindications**

Pre-treatment with antibiotics

FiO2 >0.6 or PEEP >10

Unstable patient (eg, high dose vasopressors/inotropes, arrhythmias, etc)

**Procedural guidelines - BAL**

Selection of bronchoscope (will depend on unit working within & availability)

1. Re-usable large diameter bronchoscope with appropriate stack

Once removed from cabinet must be used within 1 hour or re-sterilized

**Or if unavailable/emergency**

1. Single use AMBU aScope 4 (ensure selected large size) with portable monitor

Preparation

* Review CXR and choose segment to be lavaged as below:
  1. Segment involved on CXR
  2. If 1. difficult to predict, then choose segment where pus seen at bronchoscopy
  3. If pus not seen then lavage posterior segment of RLL
* Ensure adequate ongoing anaesthesia and neuro-muscular blockade
* Volume controlled ventilation mode (consider adjusting pressure alarms/disabling autoflow)
* Pre-oxygenate and ensure FiO2 1.0 with PIFR <60L/min
* Change to a sterile catheter mount
* Trolley with sterile field containing:
  + Sterile traysin – decant sterile saline from 1L bottle
  + 20ml syringes x 8
  + At least two large sterile suction traps
* New suction tubing connected to bedside suction

Procedure

* Don appropriate PPE (consider Jupiter hood/FFP3 mask), scrub, gown, and glove
* Do not use local anaesthetic – *it is bactericidal*
* Attach sterile suction trap to bronchoscope and suction tubing
* Maintaining sterility, pass scope down ETT to desired area of lung avoiding use of suction
* Wedge the scope in a sub-segment and apply gentle suction – visualised lung should collapse
* Inject 20ml sterile saline, aspirate and discard this sample
* Keeping scope wedged in same position, change suction trap
* Inject 20ml aliquots of saline to a maximum total of 120mls (stop if resistance to injection or falling SpO2)
* Allow sample to rest for 10-20 seconds
* Keeping suction trap upright, gently suction BAL fluid into trap (NB/ average return is <20% - cadence suctioning can help improve return)
* Remove trap and seal with sterile top
* Visualise the rest of bronchial tree and perform further sampling if appropriate (note published evidence supports a single sample as described above)
* Document procedure in notes

**Procedural guidelines – Mini-BAL**

Preparation

* Review CXR and choose side to be lavaged
* Ensure adequate ongoing anaesthesia and neuro-muscular blockade
* Volume controlled ventilation mode (consider adjusting pressure alarms/disabling autoflow)
* Pre-oxygenate and ensure FiO2 1.0 with PIFR <60L/min
* Change to a sterile catheter mount
* Trolley with sterile field containing:
  + Sterile traysin – decant sterile saline from 1L bottle
  + 20ml syringes x 5
  + At least two large sterile suction traps
* New suction tubing connected to bedside suction

Procedure

* Don appropriate PPE (consider Jupiter hood/FFP3 mask), scrub, gown, and glove
* Do not use local anaesthetic – *it is bactericidal*
* Open dressing pack and drape
* Remove BAL catheter
* Remove protective cover from tip of BAL catheter
* Attach 20 ml syringe, with saline to 3-way tap
* Flush catheter deadspace with 4-5 ml saline
* Attach connector between catheter, sputum trap & suction apparatus
* Insert BAL catheter into catheter mount approximately 2-4cm
* Position the catheter for right or left side (O2 port on same side)
* Advance BAL catheter maintaining correct direction to just beyond tracheal tube (cm. markings match)
* Advance 3-5cm, flush tip with 2 ml saline
* Advance inner catheter into wedge position (slight resistance)
* Lock catheter position by sliding blue mechanism
* Instill Saline in 20 ml aliquots down catheter to maximum of 120ml (stop if resistance to injection or falling SpO2)
* Gently suck lavage fluid into sputum trap
* Unlock the catheter by sliding blue mechanism
* Remove BAL catheter, withdraw inner catheter first followed by both together
* **Clearly label as ‘mini-BAL sample’**
* Document procedure in notes
* **Interpret culture results with a 103 CFU /ml cut-off for positivity (normal BAL is ≥ 104 CFU)**

**Sending samples & consideration of antimicrobials**

* Refer to HAP/VAP protocol and anti-microbial guidelines
* Separate the sample in a sterile fashion into
  + Gram stain and quantitative culture (C&S)
  + Virology
  + Mycology
  + Acid fast bacilli culture/staining
  + Cytology (if indicated) [NB/ must also complete a paper cytology request form and include with sample]
* Print two sets of labels and stick second set on green micro sheet in patient folder / Document samples sent as micro TRAK entry
* **Send BAL fluid urgently via porter (cannot be sent via pneumatic tube “pod” system)**
* **Warn the labs that specimens are coming (micro technician via switchboard).** Inform the Biomedical Scientist on X26021 (or bleep 2900 between 2000-0800). Request urgent quantitative culture set up and assistance to triage for other tests.

**Results**

* Document results (including gram stain) as TRAK micro entry
* Quantitative culture is significant if >104 colony forming units (cfu)/ml of fluid are present (>103 colony forming units (cfu)/ml if Mini-Bal is used)
* Antimicrobials should be reviewed on the basis of results
* A negative culture should prompt consideration of cessation of antimicrobials

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