

Sputum Induction

Indication

It is widely used to assess the following:

1. Airway inflammation in asthma - Curschmann's Spirals and Charcot Leyden crystals are popularly used to diagnose bronchial asthma.
2. Airway inflammation in chronic obstructive pulmonary disease (COPD).
3. It can be used as a complementary tool to BAL both in research and in clinical monitoring of patients with interstitial lung disease (ILD).
4. The cells, recovered from spontaneous coughing can be used to study lung cancer,
5. Respiratory infections
6. Diagnosis of pneumocystis carinii pneumonia in patients infected with human immunodeficiency virus.
7. In developing countries having high prevalence of pulmonary tuberculosis, sputum induction (SI) can increase the diagnostic yield, resulting in better categorization of patients for treatment purposes.
8. Others - Cough due to gastroesophageal reflux disease (GRD) has shown increased macrophages laden with lipid in induced sputum.

Contraindications and Precautions

- As hypertonic saline causes bronchoconstriction, the procedure should only be performed in children with asthma.

- As the procedure induces severe coughing the procedure should not be performed in patients in whom severe coughing may be harmful
- Relative contraindications include patients with :
 - haemoptysis of unknown origin
 - acute respiratory distress
 - unstable cardiovascular status, (arrhythmias, angina)
 - thoracic, abdominal or cerebral aneurysms
 - hypoxia (SaO₂ less than 90% on room air)
 - lung function impairment
 - pneumothorax
 - pulmonary emboli
 - fractured ribs or other chest trauma
 - recent eye surgery

Infection Control

Induction of sputum should only be conducted in a single room with a ventilation system that allows for the total exhausting of air from the room to the external environment. The minimum requirement is a single room with door closed and air exhausted to the outside of the building without recirculation.

Gloves will be worn when handling specimens.

Staff must ideally wear the recommended TB respiratory protection (P2 mask) while in the room and disposable gloves when handling sputum specimen(s).

Pre - procedure

- Minimal fasting period of 2-3 hours is mandatory.
- Assess the patient.
- Consent to be taken.
- Explain procedure to patient

Procedure

- Before bringing the patient to the area in which the sputum induction is to be performed, assemble and check the equipment .
- Salbutamol Inhaler (100 Microgram) 2-4 puffs to be given via MDI with Spacer and a well fitted face mask /via Nebulisation with equivalent doses .
- Load 5 ml of the 3% hypertonic saline solution into nebulising chamber.
- Instruct the patient to thoroughly clean/rinse the mouth.
- Seat them comfortably in an upright position.
- Explain the procedure and possible side effects to the patient (e.g., coughing, dry mouth, chest tightness, nausea and excess salivation)
- Instruct the patient to:
 - inhale and exhale through the mouthpiece only
 - expectorate saliva in the container provided.
 - expectorate sputum coughed up into the sterile jar.
- Shut all doors and windows.
- Turn the machine on (a fine mist should appear above the level of the hypertonic solutions) and ensure connection to a pressurised O₂ /air circuit.

- Allow the patient to inhale the hypertonic mist for approximately 5-10 minutes
Then instruct them to take several deep breaths off the nebuliser. If the patient does not initiate coughing spontaneously, ask them to attempt a forced cough.
- Gentle chest physiotherapy can be used e.g., vibration and percussion to bring the secretions from the peripheral to central airways.
- The ideal specimen size is 5 to 10 mL. The absolute minimum specimen size is 2 mL.
- In younger children, nasopharyngeal suction with a mucous trap may be used if expectorated sample inadequate or child uncooperative.
- Patient must be observed closely at all times during the procedure: Pulse Oximetry to be done before during and after the procedure.
- The procedure should be stopped when:
 - the patient has produced 1-2 ml of sputum for each specimen
 - 15 minutes of nebulisation is reached.
- Terminate the procedure if unsuccessful after 15 minutes, or if the patient is showing signs of respiratory distress or is light headed or feels nauseated.
- Assess the patient's condition post procedure, and take appropriate action if required.