



Management of a transbronchial cryobiopsy using the i-gel[®] airway and the Arndt endobronchial blocker

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To the Editor,

The practice of anesthesiology is moving beyond the operating room and increasingly into the venue of various interventional medical specialties, including cardiology, radiology, gastroenterology, and pulmonology. Interventional pulmonologists are frequently performing transbronchial cryobiopsy procedures that often require various degrees of sedation or general anesthesia. Initially, this procedure was mainly used in the treatment and excision of endobronchial lesions, particularly in cases of bronchial obstruction. Nevertheless, it is now an emerging technique performed by pulmonologists to diagnose focal and diffuse lung diseases, including neoplastic and interstitial lung diseases as well as pulmonary infections and lung rejection following transplantation.¹

The use of the cryotherapy probe allows sampling of well-preserved tissue that tends to be superior quality to that obtained through traditional forceps biopsy via a flexible bronchoscope. For example, the tissue is often devoid of the crush artifact commonly seen with a

traditional forceps technique. Cryobiopsy offers additional advantages as it may reduce operative time, improve diagnostic yields, and potentially decrease complications. Additionally, the cryotherapy probe may facilitate the sampling of airway lesions positioned tangentially to the bronchoscope.^{2,3} The disadvantage of cryobiopsy is that tracheal intubation is often recommended because the samples attached to the cryoprobe cannot be retracted through the bronchoscope and thus requires removal of both cryoprobe and bronchoscope as a single unit. For that reason, it is important to have a secure airway in place to facilitate rapid control of any potential bleeding. Absolute contraindications to cryobiopsy include severe hypoxia, status asthmaticus, poor patient cooperation, massive hemoptysis, and uncorrectable bleeding diathesis.

In our institution, we carry out cryobiopsy under general anesthesia. This facilitates better conditions for performing the technique, including an optimized field of view in a non-combative patient. In addition, it allows for better control of the airway in case of a bleeding emergency.

For these procedures, we use standard intraoperative monitors as well as the bispectral index (BIS).⁴ Anesthesia induction is performed with propofol 2.5–3 mg·kg⁻¹ and remifentanyl 1 µg·kg⁻¹, both administered slowly over one minute. Once an adequate depth of anesthesia has been achieved, an i-gel[®] supraglottic airway (Intersurgical Ltd, Berkshire, UK) is inserted according to the manufacturer's instructions. Next, an Arndt endobronchial blocker with spherical balloon (C-AEBS-9.0-78-SPH-AS; Cook Medical Inc, Bloomington, IN, USA) is advanced through the blocker port of the Arndt Multiport Adapter[®], and a 6.0-mm diameter fiberoptic bronchoscope (with a 3.0-mm operating channel), which had been introduced through the fiberoptic port, is passed

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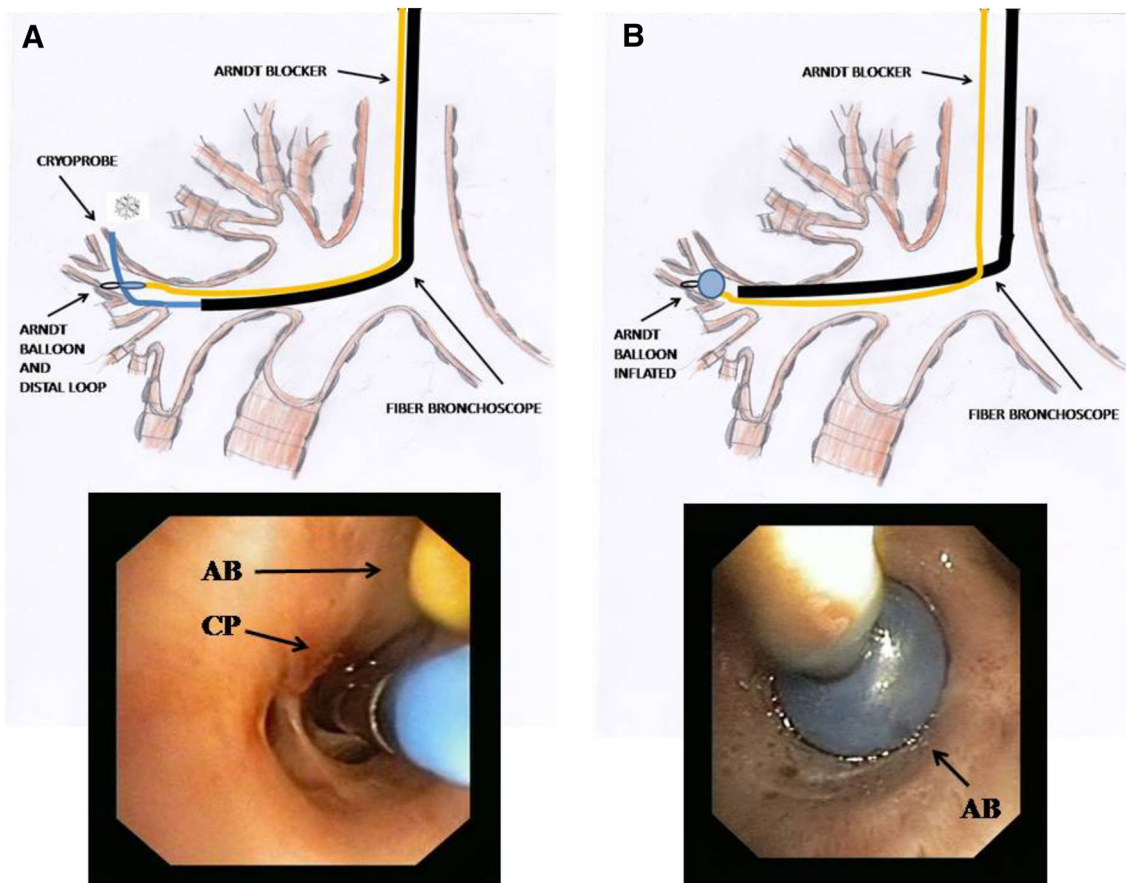


Figure A) The cryoprobe (CP) (blue line) is inserted more distally than the Arndt blocker (AB) (yellow line) to obtain the lung sample. B) After removal of the bronchoscope with the cryoprobe and the

lung tissue, the Arndt blocker (AB) is inflated to minimize any bleeding. The bronchoscope is inserted to perform endoscopic control of bleeding

through the wire loop. The bronchoscope is then advanced into the desired bronchus; the Arndt blocker is placed into position, and placement is confirmed using fluoroscopic guidance.

A flexible 90-cm long, 2.4-mm diameter cryoprobe (Erbokryo[®] CA; ERBE, Tuebingen, Germany) is introduced through the working channel of the bronchoscope. Once brought into position pressing against the tissue to be biopsied, the probe is cooled to decrease the temperature of the probe tip to -89°C within several seconds. After four seconds of freezing, the bronchoscope is removed en bloc with the frozen lung tissue attached to the probe tip. The balloon of the Arndt blocker is then inflated for two minutes to minimize any bleeding from the biopsied bronchus (Figure). Usually, three to four biopsies are taken from each patient depending on the suspected pathology.

Anesthesia is maintained during surgery with a propofol infusion adjusted by the BIS and with remifentanyl $0.1\text{--}1.0\ \mu\text{g}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$. Most patients do not experience coughing, but if this does occur, we occasionally administer intratracheal 2% lidocaine 1-2 mL or a bolus

of rocuronium bromide $0.3\ \text{mg}\cdot\text{kg}^{-1}$. In the latter case, sugammadex is administered at the end of the procedure prior to removal of the i-gel airway.

All patients undergo positive pressure ventilation (PPV) through the i-gel airway using a lung protective ventilatory strategy (inspiratory plateau pressure $< 20\ \text{cm H}_2\text{O}$; tidal volume of $6\text{--}8\ \text{mL}\cdot\text{kg}^{-1}$; $5\ \text{cm H}_2\text{O}$ positive end-expiratory pressure; minimal $\text{F}_{\text{I}}\text{O}_2$ that maintains an oxygen saturation $> 92\%$).

At the end of the procedure, anesthetics are discontinued and the i-gel airway is removed when the patient is awake. Within two hours of the procedure's conclusion, a chest x-ray is performed to exclude pneumothorax.

Although some authors recommend cryobiopsy under spontaneous ventilation, we think our PPV technique offers several advantages. First, the performance of the technique under general anesthesia permits reduced breathing movements, making for an easier and efficient biopsy technique. Secondly, PPV may reduce the risk of coughing. Accordingly, the risk of pneumothorax may be reduced by avoiding the high intrathoracic pressures developed with the glottic closure of a cough (as high as 300 mmHg, far

exceeding the pressures during PPV). Importantly, the large internal diameter of the i-gel airway allows for the introduction and passage of all the required devices for the technique without interfering significantly with the patient's ventilation. The usual diameters of endotracheal tubes do not allow for easy passage of the large diameter of a bronchoscope alongside an endobronchial blocker.

In conclusion, the use of the i-gel airway allows an optimum conduit for performing the cryobiopsy technique and facilitates endoscopic control of bleeding complications when used in conjunction with the Arndt blocker.

Conflicts of interest None declared.

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