

## Short Communication

# Ventilatory monitoring during microlaryngeal surgery using jet insufflation anaesthesia

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### Abstract

We describe a method for continuous measurement of end-tidal carbon dioxide concentration during jet insufflation anaesthesia for microlaryngeal surgery. This increases the safety of the technique by allowing closer monitoring of inspired and expired gases during anaesthesia.

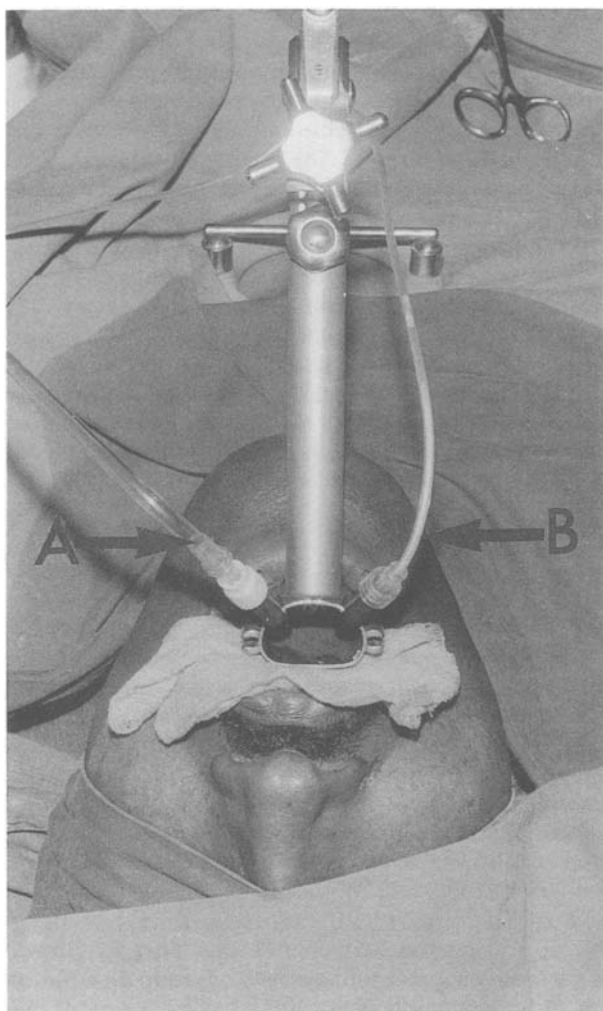


FIG. 1

### Introduction

Jet insufflation anaesthesia is a well described and commonly used technique for microlaryngeal surgery with few complications (Norton *et al.*, 1976; Crockett *et al.*, 1987; Shikowitz *et al.*, 1991). It provides the surgeon with a clear view of the larynx as the vocal cords remaining stationary during expiration, and the laser can be used with safety (Gussack *et al.*, 1987).

Currently used methods of monitoring the patient include clinical observations (*e.g.* patients colour, chest wall movement, palpation of the pulse, and auscultation of heart and breath sounds), continuous monitoring (*e.g.* pulse oximetry and electrocardiography) and intermittent non-invasive monitoring of blood pressure.

We describe an additional technique for continuous monitoring of end-tidal carbon dioxide (CO<sub>2</sub>) concentration during jet insufflation anaesthesia.

### Method

The patient is anaesthetized using propofol and is paralyzed using vecuronium (a non-depolarizing neuromuscular blocker). Lignocaine is sprayed on to the larynx, and the patient is hand ventilated using 100 per cent oxygen with a mask and oral airway until a Negus rigid laryngoscope is inserted by the surgeon and held using suspension apparatus. Two Venturi needles, 7 cm long 14 SWG (Downs Surgical LN-236-02-Y), are attached to the laryngoscope, their tips lying approximately 8–10 cm proximal to the beak of the laryngoscope depending on its size.

One needle is connected via tubing to a 400 kPa oxygen source on the anaesthetic machine ('A' Figs. 1 & 2) and the patient's lungs are ventilated using a Penlon 200 ventilator (Intermed). The other needle is connected to capnograph tubing ('B' Figs. 1 & 2) aspirating continuously at 150–300 ml/min.

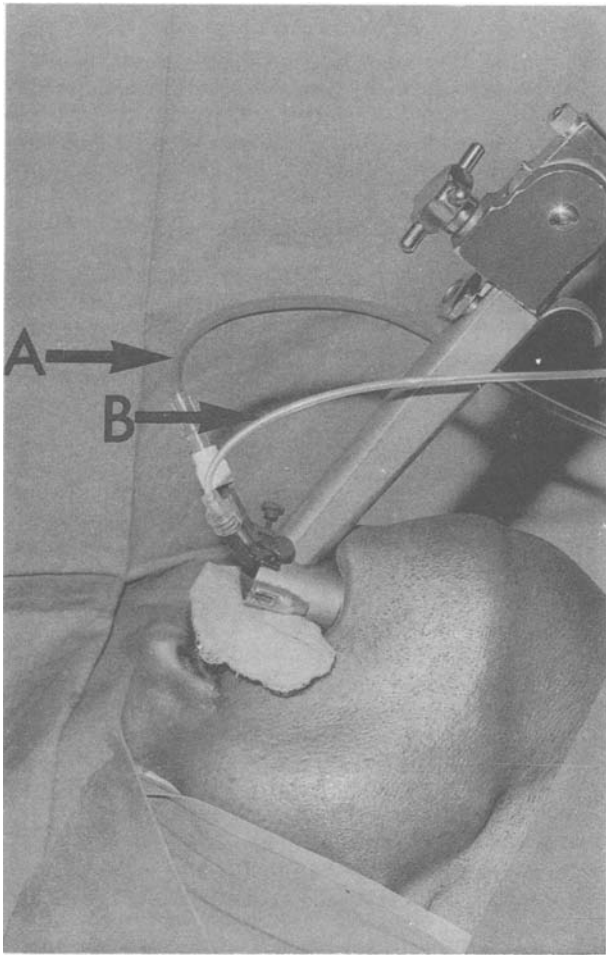


FIG. 2

The capnograph displays continuous waveform, together with the end-tidal CO<sub>2</sub> concentration, from which alveolar, and hence arterial partial pressures, are inferred.

The patient is also monitored using electrocardiography, pulse oximetry, non-invasive blood pressure measurement, and a peripheral nerve stimulator. Anaesthesia is maintained by a propofol infusion, and at the end of the procedure residual neuromuscular blockade is reversed with neostigmine and glycopyrrolate.

#### Discussion

Continuous monitoring of expired gases, in the form of capnography is strongly recommended by both the Association of Anaesthetists of Great Britain and Ireland, (Association of Anaesthetists of Great Britain and Ireland, 1988) and the Harvard Medical School (Eichorn *et al.*, 1986)—later adopted by the American Society of Anesthesiologists (American Society of

Anesthesiologists 1986) as an indicator of the adequacy of ventilation.

Although pulse oximetry is useful it only detects changes in arterial saturation after a significant delay, and gives no information about CO<sub>2</sub> levels and ventilatory adequacy. During insufflation with 100 per cent oxygen it will be a very poor marker of ventilation, and end-tidal CO<sub>2</sub> levels will reflect ventilatory adequacy much more closely.

The measurement of end-tidal CO<sub>2</sub> concentration, through a conventional circuit, has been used after the venturi technique to aid reversal in anaesthesia (Gussack *et al.*, 1987). Needle sampling of inspired and expired gases has also been used after microlaryngeal laser surgery in children to investigate the effectiveness of jet ventilation (Scamman and McCabe, 1986). The continuous measurement of end-tidal CO<sub>2</sub> concentration during jet insufflation anaesthesia is a useful adjunct for monitoring the patient, which has not been described before. We recommend this method and believe it contributes to the safety of the procedure.

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