Wire-guided Endobronchial Blockade: An Alternative Means For Achieving One-lung Ventilation

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Abstract

The goal of this presentation is to introduce a new method of one-lung ventilation using a wire guided endobronchial blocker. Ten key points in using this device are described.

INTRODUCTION

Separation of the lungs for one-lung ventilation (OLV) can be achieved using a number of different devices: conventional double-lumen endotracheal tubes, univent endotracheal tubes and balloon tip catheters for endobronchial blockade.([1,2,3,4,5]) These techniques all have applications and are used for one-lung ventilation.

A new means of achieving one-lung ventilation is using a wire-guided endobronchial blocker (WEB).([6]) This is a balloon-tipped catheter placed with a pediatric fiberoptic bronchoscope for endobronchial blockade. The endobronchial blocker incorporates a guide-wire mechanism to couple it to the pediatric bronchoscope. The WEB is placed through a conventional endotracheal tube. It is optimally placed through an 8.0 internal diameter (ID) endotracheal tube; however, may be placed through a 6.5 ID endotracheal tube. The WEB system consists of the following components: the WEB and a special bronchoscopy port (SBP). The SBP allows simultaneous ventilation, fiberoptic bronchoscopy, and instrumentation of the airway and WEB placement.

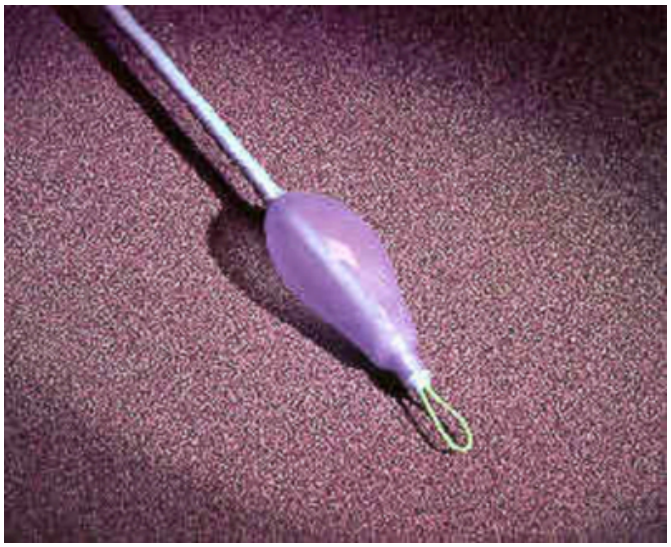
Figure 1

Figure 1: The Arndt Endobronchial Blocker (WEB)

The WEB catheter is a 9 French double-lumen catheter. The catheter has a 6 mm diameter, adjustable guide-wire loop at the catheter's distal end. The catheter also incorporates an elliptical balloon to allow optimal contact area with the bronchial wall. A 0.4 mm inflation lumen connected to a standard pilot balloon allows balloon inflation. The guide-wire is encased in a 1.4 mm guide-wire lumen. It is possible to partially remove the guide-wire to adjust the distal loop size or be entirely removed for oxygen insufflation or removal of gas from the blocked lung section.

Figure 2

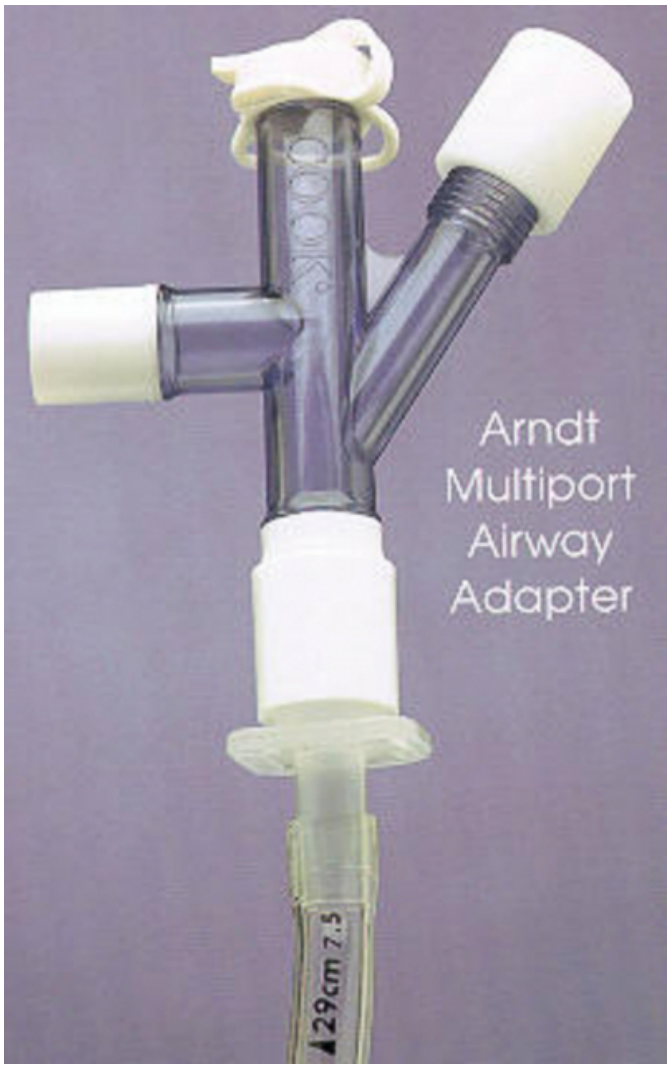
Figure 2: Endobronchial blocker with wire-loop



The special bronchoscopy port (SBP) allows simultaneous ventilation, endobronchial blockade and bronchoscopy. The SBP body incorporates a port for accepting the WEB, connection to a conventional anesthesia machine or mechanical ventilator, connection to an endotracheal tube and a standard bronchoscopy port with a sealable cap. The WEB port is unique, incorporating a Tuohy-Borst-type fitting. This contains a compressible diaphragmatic valve that allows the blocker to be advanced easily and form an airtight seal when positioned correctly. The amount of compression is adjustable by screwing or unscrewing the Tuohy-Borst cap.

Figure 3

Figure 3: Special bronchoscopy port (SBP)



The WEB is placed in the following fashion. The WEB is advanced through the WEB port of the SBP and then connected to a correctly placed endotracheal tube; 100% oxygen should be used during placement. The guide-wire loop will be in the endotracheal tube. A pediatric fiberoptic bronchoscope is advanced through the bronchoscopy port and, under direct vision, advanced through the WEB guide-wire loop. The pediatric fiberoptic bronchoscope is then advanced to the area requiring endobronchial blockade. The WEB is then advanced until it exits the end of the fiberoptic scope into the right or left mainstem bronchus. The guide-wire loop couples the endobronchial blocker to the fiberoptic bronchoscope. The fiberoptic bronchoscope thus acts as a guide making endobronchial blockade timely and precise. The WEB system requires generous application of silicone lubricant to the fiberoptic bronchoscope, the endotracheal tube lumen and the WEB guide-wire. Following initial

placement, the fiberoptic bronchoscope is retracted to view the endobronchial blocker within the bronchial lumen. The WEB should then be advanced distally and the patient positioned for surgery. Following positioning, the endobronchial blocker should be inspected and adjusted so the inflated balloon fills the bronchial lumen without herniation into the trachea. The balloon inflation volume should also be noted.

Figure 4

Figure 4: Endoscopic view of carina and left mainstem bronchus

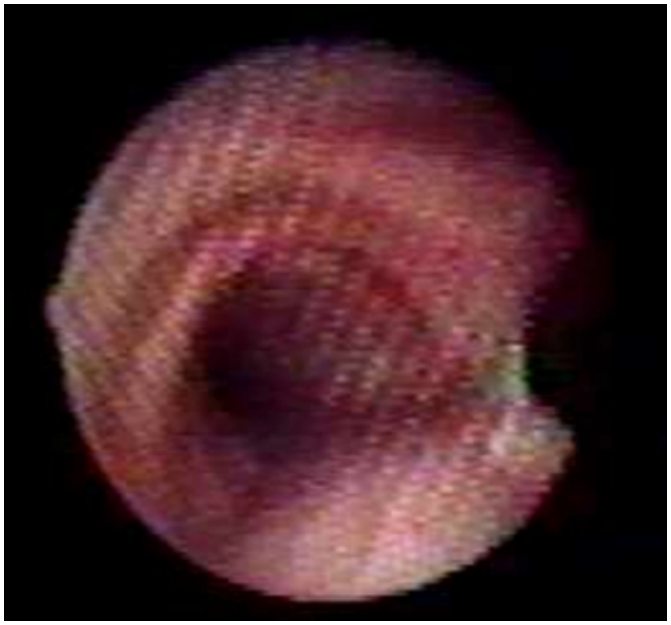


Figure 5

Figure 5: Endobronchial blocker deep in left mainstem bronchus

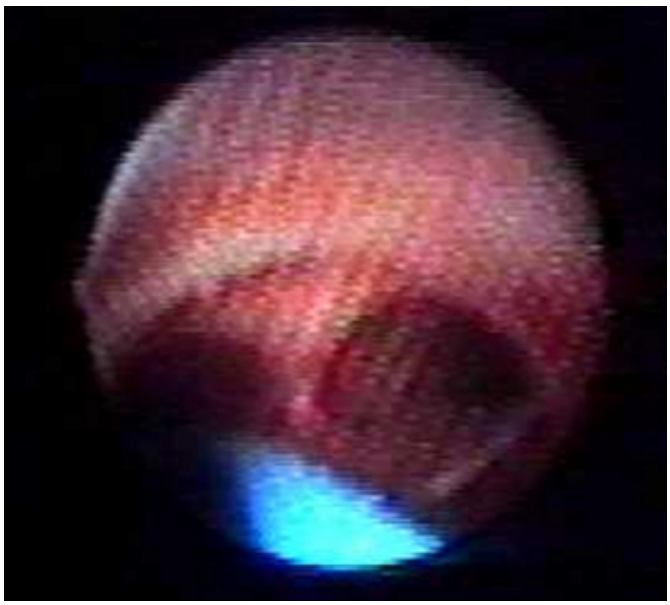


Figure 6

Figure 6: Endobronchial blocker in good position (still deflated) in left mainstem bronchus

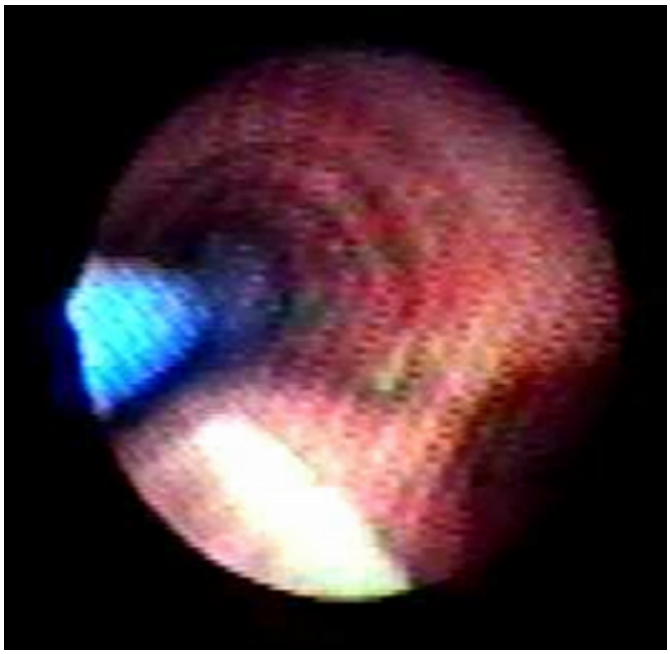


Figure 8

http://www.cookgroup.com/cook_critical_care/blocker.html

The WEB system allows one-lung ventilation with a conventional endotracheal tube. This can be advantageous in the critically ill patient requiring OLV when placing a double-lumen tube could be dangerous. The WEB allows OLV in-patients with the difficult airway by placing a conventional endotracheal tube with a fiberoptic bronchoscope and then placing the WEB through the correctly placed endotracheal tube. The WEB allows OLV where use of the double-lumen tube is inappropriate, such as patients having major vascular surgery such as repair of thoracic aneurysms when the airway is compromised by swelling and edema. Following the OLV, there is no need to reintubate the patient.

Clinical caveats unique to this system are the need to lubricate the system. Meticulous inspection of the WEB when it is initially placed and inflated is required. The balloon inflation volume should be noted. If the WEB does not advance easily, the WEB can be removed and the guide-wire diameter decreased to approximate it closer to the fiberoptic bronchoscope. The WEB should not be inflated blindly. If it is, however, and the obstruction is noted, the WEB balloon should be deflated immediately and a fiberoptic bronchoscope advanced to note the WEB position. The WEB location may be partially in the main trachea and should be repositioned.

TEN WIRE GUIDED ENDOBRONCHIAL BLOCKER CAVERTS

1. Generously lubricate with medical grade silicone spray, the

- Bronchoscope
- Shaft of the blocker
- Inside of the ET tube
- Adapter

2. Evacuate the balloon before placement.

3. Use the largest ET tube possible and tape to side to be blocked. 8.0 mm ID is recommended

4. Use smallest bronchoscope possible. A 3.5 mm fiberoptic scope or smaller.

5. Adjust guide loop to fit snugly to the bronchoscope.

6. Place the blocker and inspect with patient supine.

7. Reconfirm blocker placement with patient in final position.

8. Initially inflate the balloon and under direct vision, note inflation volume, usually 5 - 10 ccs. The balloon should fill the bronchus

9. Immediately deflate blocker balloon if signs of obstruction occur.

10. The guide loop assembly can be removed following placement to deflate the lung or administer oxygen.

SUMMARY

Wire-guided endobronchial blockade is the alternative method to allow one-lung ventilation. The advantage of this system is that it allows one-lung ventilation with a conventional endotracheal tube. Following the need for one-lung ventilation, there is no need to reintubate the patient. The WEB guide-wire mechanism allows timely and quick placement using a fiberoptic bronchoscope as a guide mechanism.

{image:8}

References

1. Smith GB, Hirsch NP, Ehrenwerth J. Placement of double-lumen endobronchial tubes. Br J Anaesth 1986; 58:1317-20.
2. Benumof J. The position of a double-lumen tube should be routinely determined by fiberoptic bronchoscopy. J Cardiothorac Vasc Anesth 1993; 7:513-14.
3. Zilberstein M, Katz RI, Levy A, Reyes R, Poppers PJ. An improved method for introducing an endobronchial blocker. J Cardiothorac Anesth 1990; 4:481-3.
4. Larson CE. A device for endobronchial blocker placement during one-lung anesthesia. Anesth Analg 1990; 71:311-12.
5. Ginsberg RJ. New technique for one-lung anesthesia using an endobronchial blocker. J Thorac Cardiovasc Surg 1981; 82:542-6.
6. Arndt GA, DeLessio S, Kranner P. A new method to achieve one-lung ventilation using a fiberoptically directable endobronchial blocker. Acta Anaesth Scan 1997; 41(S110):188.
7. Arndt, GA, Kranner PW, Lorenz DC. Co-axial placement of an endobronchial blocker. Can J Anaesth, 1994; 41:1126-1127
8. Arndt GA, DeLessio S, Kranner PW, Orzepowski W,

Ceranski B, Valtysson B. One-lung ventilation when intubation is difficult - presentation of a new endobronchial blocker, Acta Anaesth Scand 1999; 43: 356-358
9. Arndt GA, Buchika S, Kranner PW, DeLessio S. Wire-guided endobronchial blockage in a patient with limited mouth opening. Can J Anesth 1999; 46(1): 87-89
10. Arndt GA, Kranner PW, Rusy DA, Love R. Single lunge ventilation in a critically ill patient using a fibreoptically wire guided endobronchial blocker. Anesthesiology 1999; 90: 1484-6
11. Arndt GA, Valtysson B. An air contrast cricothyrotomy catheter. European J of Anaesth 1998; 15: 802-5

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