A DOUBLE-LUMEN ENDOBRONCHIAL TUBE

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Endobronchial intubation is a well-established practice in anaesthesia for thoracic surgery, and since the introduction of the original technique described by Gale and Waters (1932), many ingenious tubes and blockers have been devised. These have had two objects in mind: either to render existing methods more efficient (Stuetzbecher, 1953; Vellacott, 1954; Green and Gordon, 1957) or to simplify, and thus place a method at the disposal of those who make no claim to being expert thoracic anaesthetists (Macintosh and Leatherdale, 1955).

These technical advances do not, however, overcome the principal disadvantage of one-lung anaesthesia—the shunt of blood through a non-aerating lung. Although the function of the lower lung may be increased by the gravitational flow of blood in the lateral position (Rothstein, Landis, and Narodick, 1950), this may be inadequate compensation for many patients. It is in such circumstances that the double lumen catheter may prove its worth. Independent control of the lungs not only provides the safeguards offered by simple endobronchial intubation, but at the same time permits a more efficient ventilation to be carried out. Moreover, the movement and degree of distension of the lung on the side of operation can be adjusted to suit the surgical needs in a way that would be impossible with endotracheal intubation and with the use of endobronchial blockers. The Carlens tube, which has these advantages, was described in 1949 and its use in anaesthesia and bronchoprimetry has been recorded in a number of instances (Bjork, Carlens and Friberg, 1953; Middleton, 1957).

Such a tube has the added attraction of being made so that its shape conforms to the angle made by the left bronchus to the trachea, a feature emphasized also in the construction of the Macintosh-Leatherdale tube and blocker. In this way the stability of the tube is increased and the risk of displacement of the terminal cuff reduced to a minimum.

The tube described here is a modification of the Carlens catheter, the principles of which are retained, but there is no carinal hook, as this often causes considerable difficulty in the introduction of the tube and is probably unnecessary. It is made in a manner similar to that of the Macintosh-Leatherdale tube, being formed by single extrusion process which has the merits of cheapness and a smooth uniform surface of compounded rubber which is more durable than a moulded tube over-dipped in latex.

The tube has a double lumen for the greater part of its length, but it continues for 2\(\frac{1}{4}\) inches (7 cm) as a single tube which is curved both posteriorly and to the left. This section bears a cuff at the distal end which when inflated lies in the left main stem bronchus proximal to the upper lobe orifice. The other channel of the catheter terminates just above the carina, and an airtight fit is made in the trachea by means of a second cuff (fig. 1).

The proximal end of the catheter has an anterior curve so that it lies easily in the oropharynx. It terminates as two separate tubes into which connectors may be fitted. These tubes are of equal size and are designated by the diameter of each tube in millimetres. Three differently sized tubes are made, the smallest being 6 mm in diameter (roughly equivalent to two Magill No. 4 tubes), the next 6.5 mm and the largest 7 mm.

The resistance of these catheters is dependent on their diameter and length, but the difference in resistance between the two channels of each is negligible. For comparison with an endotracheal tube, the resistance in a 7 mm double lumen catheter (both channels simultaneously) is about the same as in that of a No. 10 Magill tube of equivalent length (about 36 cm) at continuous flow rates up to 40 litres per minute.

The length of the double-lumen catheter is slightly greater than in the Macintosh-Leather-
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METHOD OF INSERTION

As with the Macintosh-Leatherdale tube, the double-lumen catheter is inserted through the cords under direct vision. The laryngoscope is then discarded and the catheter advanced blindly. Because of its shape, the terminal portion will tend to enter the left main stem bronchus and will be halted when the double-lumen section reaches the carina. The bronchial and tracheal cuffs may now be inflated and the correct siting of the tube confirmed by auscultation.

On two occasions, the tube has proved life-saving by preventing soiling of the left lung with gross haemorrhage. On the first occasion the tube was introduced to provide urgent independent control of the lungs in a patient with a ruptured right lower bronchus. On the second occasion it had been used fortuitously for a right pneumonectomy for carcinoma of bronchus. After the bronchus had been divided and left open, the pulmonary artery tore, causing a haemorrhage of about 5 pints.

This double-lumen catheter is particularly suitable for all operations on the right lung and for left lobectomy. To satisfy the requirements of left pneumonectomy, a "right-sided" tube with a Green-Gordon type of cuff on its endobronchial section is undergoing trials.

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REFERENCES