from 2–24 hours so the turnaround time is prolonged and it is a relatively expensive process.

Sterilisation by irradiation is an industrial process and particularly suited to the sterilisation of large batches of products. Irradiation can cause serious deterioration of materials and is therefore not a suitable method for the resterilisation of equipment items.

**Summary of Decontamination Procedures**

**Respiratory equipment.** Sterilisation is unnecessary since spore-bearing organisms are not a cause of respiratory infection. Infection hazards can be reduced by lowering the amount of condensation in a circuit by means of heat-moisture exchangers, moisture traps and by the regular cleaning and drying of valves and circuits.

Many hospitals do not have access to disposable ventilator circuits and therefore with mechanical ventilators the internal circuit can often be autoclaved. The external (or patient) circuit and humidifiers may be disinfected in a washing machine at a temperature of at least 71°C for 3 minutes. The external circuit should be changed every 48hr or between patients. Heated water humidifiers should be cleaned, dried and refilled with sterile water every 48–72hr. If nebulisers are used they should be rinsed in alcohol after cleaning every 48 hours.

Anaesthetic face masks should be washed and cleaned after each use.

Laryngoscope blades should be washed after use and disinfected either chemically by soaking in 70% alcohol for 10 minutes, or by thermal means such as boiling in water at 100°C for 5 mins.

Endotracheal tubes intended for single use can be re-used if they are cleaned and disinfected. Thermal methods are likely to cause material damage but following cleaning, chemical disinfection can be provided by immersing tubes in a solution of 70% alcohol for 10min. The tubes should then be allowed to dry before use. 2% glutaraldehyde is not suitable as it may be absorbed by the plastic and is too irritant.

Suction catheters are not easy to clean but provided they are free of visible soiling they may be disinfected using 70% alcohol as described earlier and allowed to dry before use.

**Instruments**

Needles and cannulae (including spinal and epidural needles).

After thorough cleaning these must be sterilised. In many situations autoclaving is the most practical technique.

**Further Reading:**

Ayliffe GAJ, Coates D, Hoffman PN Chemical Disinfection in Hospitals. PHLS 1993.

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**OESOPHAGEAL DETECTOR DEVICES**

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**INTRODUCTION**

Oesophageal intubation may occur with a difficult laryngoscopy, inexperience, an emergency situation, accidental extubation with movement of the patient’s head, or distraction of the person intubating. An unrecognized oesophageal intubation may result in gastric distension, regurgitation, and hypoxic damage to the brain. Early detection of oesophageal intubation will prevent or reduce the morbidity and mortality of this life threatening situation. There are both clinical and technical tests that can be used to assess tracheal tube position \(^1\). Occasionally clinical tests prove unreliable and confirmation of the correct placement of the endotracheal tube by technical means is useful. One of the simplest and most reliable methods involves the use of an oesophageal detector device (ODD), the best alternative to capnography in differentiating oesophageal from tracheal intubation.

Although usually referred to as an ODD, both oesophageal and tracheal intubations are detected and due to its method of operation it has also been termed the negative pressure device.
Oesophageal detector devices (ODD) are designed to aspirate air via the endotracheal tube and depend on the structural differences between the trachea and oesophagus to indicate ETT position. The ability to aspirate air easily when connected to an ETT indicates tracheal intubation as the trachea and main bronchi have a rigid structure and do not collapse when a negative pressure is applied. Failure to aspirate air indicates oesophageal intubation as the oesophagus collapses around the end of the ETT.

**Types of oesophageal detector devices**

There are two major types of ODD (Figure 1). The first ODD was described in 1980(2), but Wee (1988) was the first to use the term oesophageal detector device, and also the first to publish a study on it(3). The ODD is made by connecting a 60 ml catheter-tip syringe to a right-angled endotracheal tube connector by a short length of rubber tubing (Figure 1). The device is attached to an ETT and the syringe aspirated. If resistance is encountered when the syringe is aspirated i.e. with an oesophageal intubation, when the plunger is released it usually rebounds to its original position. O’Leary(4) regarded the aspiration of 30mls of air as indicating tracheal intubation.

Nunn described an adaptation using an Ellick’s evacuator (a rubber bulb) and a connector (5). The bulb is squeezed and attached to the ETT. Passive re-inflation indicates a tracheal intubation, while a failure to reinflate occurs with an oesophageal intubation. The bulb from a disposable bulb syringe may also be used.

The advantages of the ODD are listed in table 1.

1. ODDs can be easily assembled using inexpensive and readily available equipment. They are easy to use (even by non-anaesthetists), portable, non-electronic, and provide a highly reliable assessment of ETT position. They are ideal for use in countries where capnography is not routinely available. They may also be useful for intubations performed outside the operating room (e.g., in the recovery room, emergency room, intensive care unit, and out in the field).

2. ODDs provide a rapid assessment of ETT position. In Wee’s original study(3), the average time to perform the test was 6.9 seconds (range 5 - 16 seconds). Nunn(5) obtained a result with the Ellick’s bulb in 3 - 5 seconds. When the bulb from a disposable bulb syringe was used, full re-inflation of the bulb took up to 30 seconds in only 6% of tracheal intubations(6). The result of the ODD test is obtained more rapidly than that from capno-graphy, and relies solely on observation.

3. ODDs are useful in patients in cardiac arrest as the test result does not depend on carbon dioxide being present in exhaled gas.

4. ODDs are useful when a Combitube (an emergency device that can be inserted into the airway blindly and used to ventilate patients) has
been used. They can indicate whether the Combitube is positioned in the trachea or oesophagus, and whether or not the airway is patent.

5. ODDs can be re-used after cleaning or sterilisation.

The disadvantages of the ODD include:
1. Some false results may occur (Table 2). However, the incidence of this is low.
2. Regurgitation of gastric air, distension of the oesophagus with air, or an ODD that is not airtight may give a false impression of tracheal intubation when the tube is in fact in the oesophagus.
3. Thick secretions may occlude a tracheal tube and give a false impression of oesophageal intubation. Occlusion of the bevel of a reinforced ETT by the wall of the trachea has been described to cause failure of bulb refill. Bronchial intubation, bronchospasm, tracheal compression, obesity, chronic obstructive pulmonary disease, may also cause resistance to aspiration or delayed refill of the bulb-type ODD.
4. Wee (3) had no problem in identifying tracheal intubation in two patients with moderate bronchospasm (peak airway pressures of 3.0 - 4.2kPa). However, delayed refill of the bulb-type ODD has been observed in an asthmatic patient. The slow re-inflation of the bulb seen in the presence of bronchospasm represents the slow exhalation that is characteristic of acute asthma.

**Conclusions: role of the ODD**
The ODD is a simple device, and its underlying principle is easy to explain, even to non-anaesthetists. Wee stated that instruction on the use of his device took five minutes. The ODDs have been reliably used by paramedics and by doctors not trained in anaesthesia.

ODDs are inexpensive, easily assembled, and generally very reliable. Although the required components may be found in many operating rooms it will take several minutes, at the very least, to collect and assemble them. The ODD should, therefore, be preassembled.

ODDs are ideal for use where capnography is unavailable. They are useful in hospitals which have capnography in the operating theatres, but not in the recovery rooms, wards and emergency rooms, and in hospitals where capnography is not yet available or affordable. It must be stressed that ODDs do not replace capnography, but they are the best alternative method to capnography in differentiating oesophageal from tracheal intubation. The ODDs must not be used on their own, but always in conjunction with clinical methods to assess endotracheal tube position.

**Table 1**

<table>
<thead>
<tr>
<th>Advantages of the Oesophageal Detector Devices</th>
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<tbody>
<tr>
<td>1. Easy to use: Can be reliably used by paramedical staff and doctors not trained in anaesthesia.</td>
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<td>2. Short instruction period required.</td>
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<td>3. Can be assembled with readily available equipment.</td>
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<td>4. Inexpensive.</td>
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<td>5. Portable.</td>
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<td>6. Non-electronic: No electricity supply is required.</td>
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<td>7. The test result is rapidly obtained.</td>
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<td>8. Highly reliable.</td>
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<td>9. Reliable during cardiac arrests.</td>
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<td>10. Reusable.</td>
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**Table 2**

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<tr>
<th>Causes of False Results with the Oesophageal Detector Devices</th>
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<tbody>
<tr>
<td><strong>False positive result (a)</strong></td>
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<tr>
<td>1. Regurgitation of gas from the stomach.</td>
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<tr>
<td>2. Oesophageal distension with gas.</td>
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<tr>
<td>3. Oesophageal detector device not airtight.</td>
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<tr>
<td><strong>False negative result (b)</strong></td>
</tr>
<tr>
<td>1. Thick secretions occluding the ETT.</td>
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<td>2. Occlusion of the end of an ETT (with no Murphy eye) by the tracheal wall.</td>
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<td>5. Tracheal compression.</td>
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<td>6. Obese patient.</td>
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<td>7. Chronic obstructive pulmonary disease.</td>
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</tbody>
</table>

**ETT** = endotracheal tube.
(a) ETT in oesophagus, and able to aspirate air with the syringe or the bulb refills (suggesting tracheal intubation).
(b) ETT in trachea, and unable to aspirate air with the syringe, or the bulb does not refill (suggesting oesophageal intubation).
A copy of this article with a full set of references can be obtained by writing or sending e-mail to Dr. R.P. Haridas:

References:


LETTERS TO THE EDITOR

Spinal Anaesthesia for Caesarean Section

Sir,

I read with interest D. Wilkinson’s letter “Low Spinal Anaesthesia for Caesarean Section” and although I agree with some of his points I have some queries about others.

Although not specified, one may guess that the heavy bupivacaine used is the common 0.5% solution. This should be mentioned as higher concentrations of 0.75% are used in some countries. I share the view that 1.5ml of anaesthetic solution (7.5mg) provides adequate levels of anaesthesia. The same amount is used successfully in Durban. This is in contrast with other South African data of a standard dose of 2.5ml (12.5mg). The latter amount is widely used in developed countries, where it is considered by some that volumes of 2ml or less of heavy bupivacaine 0.5% are followed by an excessive number of inadequate blocks.

It would have been interesting to know the levels of upper sensory block in Wilkinson’s experience. Working in similar conditions and with the same population of Zulu women, and using the same amount of anaesthetic solution, our average level of sensory blockade was T4.6 (±3.2; median: T4; range: C5-T8, using Keegan and Garrett’s non-overlapping dermatome map).

In contrast with Wilkinson, I did not keep the patients sitting after the subarachnoid injection, since other studies have reported no effects of posture on the spread of hyperbaric as opposed to plain solutions. Since the main thrust of the letter was a “low” spinal obtained by keeping the patients sitting for 5 minutes, it would have been interesting to report the level of blockade to substantiate the relevance of the method. It is also not stated whether the patients were in labour or not. It is generally considered that hypotension is more prevalent and of greater magnitude in elective cases. Only 59 patients had a systolic blood pressure fall by an average of 16%, which is not hypotension by international criteria. Only 5% had a decrease of >39mmHg. This is surprising and exceptional! In a mixed population of 175 cases (20% elective cases; 14% hypertensive disease of pregnancy) I experienced hypotension <30% or more from baseline and (<90mm Hg) in 37.7%.

References:


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