AN ENDO-OESOPHAGEAL STETHOSCOPE

BY

D. W. J. CULLINGFORD

East Birmingham Hospital Thoracic Unit, Birmingham, England

The use of an endo-oesophageal stethoscope for listening to the heart and breath sounds of unconscious patients is not new. The first piece of equipment was described in America in 1954 (Smith, 1954) and it has been modified and described subsequently (Cullingford and Varkey, 1963; Pryor, 1964). The commercial model described here is considered to be an improvement and has been found more satisfactory and durable.

The stethoscope (fig. 1) consists of an oesophageal tube with several holes at its lower end, over which a latex cuff is sealed to act as a diaphragm. When the cuff is placed in the oesophagus behind the heart, cardiac and pulmonary sounds can be heard at the other end of the oesophageal tube. When the cuff is higher in the oesophagus, the breath sounds predominate, whilst the heart sounds are better heard lower down. For most adults the tube is inserted between 35 and 37 cm from the lips. During anaesthesia, the stethoscope is conveniently inserted by direct vision prior to passing an endotracheal tube, although if it is subsequently passed blind into the pharynx, it enters the oesophagus fairly readily.

Briefly, the advantage of the oesophageal stethoscope is the ease with which the heart and breath sounds can be heard. This is so even in an obese emphysematous patient and any secretions in the tracheobronchial tree may be readily detected. In asthmatic patients during anaesthesia the progress of bronchospasm can be noted. It is almost impossible to use a precordial stethoscope during a thoracic operation without intruding on the surgical field and it may become dislodged.

![Fig. 1](image_url)

Endo-oesophageal stethoscope, extension tube earpiece and spare Luer mount.

524
from contact with the chest wall, but an oeso-
ophageal stethoscope can be secured as firmly as
an endotracheal tube. Continuous monitoring of
the heart and breath sounds with a reliable
stethoscope is valuable during neurosurgical
operations, for if they are performed in the sitting
position, air emboli are possible, whilst in pos-
terior fossa explorations changes in cardiac and
respiratory rate occur. During operations for
severe burns of the chest and arms, particularly
in children, the use of a conventional stethoscope
is impossible, a pulse may be difficult to feel, and
sounds from the oesophagus may be the only
reliable indication of changes in the patient’s
condition.

Anaesthesia for radiological procedures can be
hazardous both to the patient, particularly if it is
performed in the dark, and to the anaesthetist, who
is liable to sustain excessive doses of irradiation.
An external stethoscope obstructs the radiological
picture of the heart and chest, but the oesopha-
geal stethoscope, lacking metal parts, casts a
minimal X-ray shadow and with one or more
extensions of 125 cm, as described later, the
anaesthetist can be sufficiently distant to avoid
irradiation.

Vasoconstriction makes the palpation of a peri-
pheral pulse difficult or impossible, and this is
particularly so during hypothermic operations.
From inside the oesophagus, it is possible to hear
heart sounds to reassure oneself that the patient
is still alive. For this reason, this stethoscope is
also useful in the casualty department to prevent
a tragically incorrect assumption of death being
made.

Unconscious patients requiring prolonged pul-
monary ventilation present problems of monitor-
ing, particularly so if a tank respirator is in use.
Nursing staff can be trained to listen for the heart
sounds, detect the accumulation of secretions and
verify the efficacy of tracheobronchial toilet. (It
is pointed out that if intermittent positive pres-
sure ventilation with a cuffed tube is employed,
the cuff needs to be adequately inflated to avoid
the sound of air escaping past it.)

While a prototype transparent model was being
tested, the author noticed that a column of water
in the tube moved with each phase of respiration.
It is thought that if the tube were filled with fluid
and a suitable manometer attached, reading of
the intrathoracic pressure might be obtained. No
experiments in this field have yet been done.

The author does not claim that alterations in
cardiac murmurs during heart operations can be
detected reliably by this device, although Smith
(1954) states this to be so.

This stethoscope is marketed in three sizes.
The smallest comprises a 12 FG tube with a cuff
3 cm long, suitable for infants and small children.
For larger children and small adults, a medium
size of 16 FG with a cuff 6 cm long is recom-
mended. Normal adults accept the large size of
24 FG which also has a 6 cm long cuff. Insertion
of the larger, more rigid, tube is easier and, and
moreover, the low-pitched heart sounds are more
readily heard with the larger diameter cuff and
tube. It is recommended that one should listen
with a single earpiece, so as to be able to hear what
else is going on in the operating theatre (Roberts
and Thompson, 1963). A binaural earpiece can
equally well be used and a two-way tap can be
interposed so that the same earpiece is used for
this and blood pressure measurements (Weis and
Mason, 1958).

The stethoscope is 125 cm long and is calibrated
in centimetres from the cuff. At the other end is
a female Luer connector, into which an earpiece
on a male connector is normally plugged. To
allow the anaesthetist to listen farther away from
the patient, extension tubes of 125 cm length are
supplied, already provided with Luer male and
female connectors, so that one or more can be
immediately plugged into the stethoscope and the
earpiece transferred to the extension. However,
the sound is appreciably fainter if more than
one extension is used. A thorough wash is
normally adequate between patients but it is
suggested that the stethoscope should always be
sterilized when used on infants. If sterilization is
performed by immersion in boiling water, water
should not be allowed to enter the open end of
the tube. Once water obtains entry to the lumen
of the tube it blocks the passage of sound and its
removal is a time-consuming procedure. A Luer
syringe fits the connector for testing the cuff
or sucking water out and replacing it by air if
this should become necessary. Sounds cannot be
heard if the tube is kinked in the pharynx. The
original cuffs made for the author are still in use and their life, with reasonable care, is better than that of some cuffed endotracheal tubes, possibly because they are not distended when in use.

The stethoscope and its attachments are manufactured and sold by Messrs. William Warne and Company Limited, of Barking, Essex, and can be supplied in individual items or as a complete set consisting of one each of sizes 12 FG, 16 FG and 24 FG stethoscope tubes, one extension tube, two earpieces and one Luer mount.

REFERENCES

BOOK REVIEW


It is a pleasure to acknowledge a new edition of this classic, but it would be an invidious task, almost an affront, to attempt a comprehensive review. This third edition, so similar to the last, reemphasizes yet again with the clarity, stringency, and quality of its presentation. Sufficient then to mention some changes from the last edition (1958). The most obvious is an improved and enlarged final chapter (XXIV—Physical Data and Conversion Factors), accounting entirely for the small (five-page) increase in size. Additional points worth noting are the useful inclusion of halothane in the oft-consulted figure 67; mention of the "copper kettle" (an adaptable device too little appreciated in this country); and the reminders that 1 Torr (after Torricelli) represents 1 mm Hg and that "degree Celsius" officially replaced "degree Centigrade" in 1948; the reader is introduced to Poise (after Poiseuille), the absolute unit of viscosity; the index is enlarged slightly. The design of modern anaesthetic vaporizers is not covered comprehensively, whereas the subject of anaesthetic explosions is again considered rather generously (132 pages).

Physics for the Anaesthetist is now increased in price by 20 per cent, but this seems unlikely to deter intending purchasers. Further comment seems superfluous.

R. A. Millar

CONFERENCE ON ANAESTHESIA FOR OTORHINOLARYNGOLOGY

The Royal National Throat, Nose and Ear Hospital, Gray’s Inn Road, London, W.C.1, is holding a Conference for Consultant Anaesthetists on "Anaesthesia for Otorhinolaryngology" on December 3, 1964. The meeting will take the form of short papers and discussions.

For further particulars apply to Dr. H. A. Condon at the above address.