

‘Do as you would be done by’: the ethics of using outdated equipment in medical charity

Editor—Charity in medicine offers treatment to sick people that would not normally be within their reach. Medical charities provide expertise and equipment to recipients in the developing world; however, the safety standards of the donor agency are often very different from those in the recipient country. We present an incident of an endotracheal tube (ET tube) patency failure that might have turned fatal had one not been vigilant, and this incident occurred during major cardiac surgery in the developing world as part of a charity programme in a teaching hospital.

A 63-yr-old male was accepted for aortic valve replacement and on the day of surgery, the patient was anaesthetized and intubated with an 8.5 mm ET tube. Mechanical ventilation was commenced with satisfactory $\text{ETCO}_2$, oxygenation, and airway pressures. A transoesophageal echocardiography (TOE) probe was inserted into his oesophagus to assess the aortic valve replacement perioperatively. Soon after the TOE probe insertion, the anaesthetic machine recorded raised airway pressures. A transoesophageal echocardiography (TOE) probe, solving the problem and re-establishing airway patency.

In our case, being a charity mission, post-expiry-dated equipment were used, provided there was no danger to the patient. The portex ET tube used in our patient was manufactured in 1985. Older ET tubes may wane in their texture over a period of time becoming soft, but there is no way to discern this from simply inspecting the ET tube or the pack. In addition, this process may be accelerated in temperate countries where ambient temperatures can reach body temperature and beyond. Furthermore, this problem was compounded by the TOE probe pressing on the ET tube from behind. In our patient, when no obvious cause was found, we tried buying more time to rectify the situation by requesting that the surgeon go on cardiopulmonary bypass (CPB) in order to oxygenate the patient through the CPB pump. However, prudence and luck were on our side that we decided to pull out the TOE probe, solving the problem and re-establishing airway patency.

Old ET tubes should ideally be avoided. Newer ET tube packs do have expiry dates; however, the shelf life may be shortened at excessively high temperatures, and may pose danger to life. All equipment, charitable or not, should comply with appropriate patient safety checks and should be discarded if confirmed otherwise. The problem lies in deciding the level of safety checks in respect of donor or recipient organizations or in between. Wherever the line is drawn, one should bear in mind that charities are promoted to save and not pose a threat to life. Charitable organizations must comply with legal and ethical issues and balance the risks of using suboptimal equipment against the benefits of saving lives, which might otherwise be lost.

Declaration of interest

None declared.

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Arterial blood gases from central venous lines: a sign for malformation

Editor—A 58-yr-old female patient presented for elective minimal-invasive aortic valve replacement for a symptomatic aortic valve stenosis. No other comorbidities were known.

Standard anaesthesia care was provided, including a three-lumen central venous catheter (CVC), inserted in the right internal jugular vein. Arterial blood gas analysis (BGA) under mechanical ventilation with 50% oxygen showed oxygen partial pressure ($P_{O_2}$) of 17.5 kPa and an arterial carbon dioxide partial pressure ($P_{CO_2}$) of 4.9 kPa. In contrast, BGA obtained from the distal line of the three-lumen CVC showed a $P_{O_2}$ of 34 kPa and a $P_{CO_2}$ of 3.8 kPa. Central venous pressure measurement revealed a venous pressure curve with a mean pressure of 14 mm Hg, and a BGA obtained from the proximal lumen of the CVC showed a $P_{O_2}$ of 5.0 kPa. Hence, we suspected an anatomic malformation with a left-to-right shunt, and therefore, immediate transoesophageal echocardiography (TOE) was performed. Surprisingly,
injection of agitated saline solution as contrast dye to the distal lumen of the CVC showed bubbles in the left atrium (Fig. 1B) and ventricle only. In addition, the coronary sinus was enlarged (diameter 2.5 cm, Fig. 1A), raising suspicion of a persistent left superior vena cava (PLSVC).

During surgery, the PLSVC was confirmed (Fig. 1D), leading to the coronary sinus, and a small right superior vena cava (RSVC) was identified, ending in the left atrium near the right pulmonary veins (Fig. 1A). No shunting between the right and left atrium and no intrathoracic bridging vein was observed. Standard replacement of the aortic valve was performed. Furthermore, switching of the RSVC from the left atrium to the auricle of the right atrium was performed, using an autologous pericardium-patch. After operation, we injected contrast dye to the distal line of the CVC and TOE showed contrast only in the right atrium and ventricle, without any right-to-left shunt (Fig. 1C). Further surgical and anaesthetic management was uneventful.

The PLSVC is a rare abnormality, affecting 0.3–0.5% of individuals. In 80–90% of cases, a PLSVC coexists with an RSVC, in 10–20% of cases with a PLSVC, an RSVC does not exist. Normally, the RSVC leads to the right atrium. In 25–30% of patients with a PLSVC and an RSVC, a left innominate vein is present, which allows some cross flow between the two superior vena cava drainage territories.

So far, only few cases have been described, in which a double superior vena cava exists with the RSVC leading to the left atrium. In contrast to the presented case, in some patients, the malformation was diagnosed after neurological complications such as cerebral abscess and syncope.

The malposition of the central venous line would have been missed without BGA. In a routine chest X-ray, the central venous line would have been found in right mediastinal position, easily misinterpreted as regular position. ATOE should be performed to gain more information about the respective anatomy. The injection of agitated saline as contrast dye from both arms allows to visualize a venous drainage through the coronary sinus in the case of a PLSVC. A central venous line ending in the left atrium should be removed, as the risk of embolic events is high. However, if the venous drainage of

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**Fig 1** (A) Preoperative TOE, modified mid-oesophageal four-chamber view: enlarged sulcus coronarius (SC). LA, left atrium; MV, mitral valve; LV, left ventricle. (B) Preoperative TOE, modified mid-oesophageal bicaval view. Contrast in the left atrium (LA) after injection to the CVC. Right atrium (RA) without contrast. (C) Postoperative TOE, modified mid-oesophageal bicaval view: contrast in the right atrium (RA) after injection to the CVC. Left atrium (LA) now without contrast. (D) Operative findings: 1, PLSVC; 2, aortic cannula; 3, left atrium. (E) Operative findings: 2, aortic cannula; 4, cannula in the RSVC; 5, cannula in the inferior vena cava; 6, right atrium.
the right arm leads to the left atrium, a peripheral venous line in this area should be removed for the same reasons. This case report emphasizes the importance of a BGA after central venous catheterization.

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**Preoperative evaluation of Montgomery tube: a stitch in time saves nine**

Editor—A Montgomery tube (MT) is a silicone tube that is used to stent the airway open after laryngeal–tracheal stenosis.1 Owing to its infrequent use, working knowledge of the present-day anaesthesiologists is extremely limited. The scarcely available literature just sums up possible methods of securing airway in these patients for intraoperative positive pressure ventilation.2 3 However, like any other airway devices [tracheal tube (TT) or tracheostomy tube], its preoperative evaluation is critical. The lack of first-hand experience and available literature often leads to underestimation of possible complications and thus preoperative planning fails to foresee associated hazards. We present a child with an MT who underwent general anaesthesia and was subject to significant preventable morbidity as a result of undiagnosed obstruction in the upper limb of the MT.

A 4-yr-old male child developed tracheal stenosis 6 months ago for which an MT was inserted to alleviate the stridor in order to stent the subglottic tracheal narrowing. Presently, bronchoscopic assessment of the upper airway was planned under general anaesthesia. During pre-anaesthesia workup, the child/parents reported no complication related to the MT or any breathing difficulty. An i.v. line was secured on the dorsum of the hand using a eutectic mixture of local anaesthetics (EMLA) in parental presence in the preoperative area. Midazolam 0.5 mg i.v. was given and the child was transferred to the operating theatre where routine monitoring was attached. A flexometallic TT was kept at hand to replace the MT after induction of anaesthesia. To pre-oxygenate, oxygen tubing from the auxiliary oxygen source from anaesthesia machine was connected to the external limb of the MT. However, the child resisted the connection (which was assumed due to anxiety), small aliquots of propofol were given to sedate the child. During the process, oxygen-connecting tubing from the MT ‘popped off’ seeming like a high pressure build up leading to disconnection. The child started to desaturate, so mask ventilation on occlusion of the anterior limb of MT was tried. However, no ventilation/chest rise could be achieved. The pulse oximeter saturation continued to decrease till 20% and heart rate began to decrease.

The skin over the anterior limb was scarred and fibrosed removing the MT and inserting a tracheostomy/flexometallic TT required surgical incision on the scar tissue. The surgeon was asked to rapidly assist in emergency removal of the MT.

Fig 1 Removed MT with completely occluded upper/superior end.