have a poor prognosis and should perhaps receive little attention during extended training.

We are grateful for the help of West Yorkshire metropolitan ambulance service and the many health service staff who participate in extended training.

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Lesson of the Week

Dangers of neonatal intubation with the Cole tube

M D Mitchell, C M Bailey

To avoid neonatal subglottic stenosis a Cole tube should not be used for ventilation

Tracheal intubation is an accepted part of modern neonatal intensive care. Although basically a safe procedure, it is not without complications.¹ Subglottic stenosis is the most serious of these with a reported incidence in one series of 2.6% in long term survivors of tracheal intubation.² Reports have repeatedly drawn attention to the high incidence of subglottic stenosis after tracheal intubation with a Cole pattern shouldered tracheal tube.^{3,4} Despite these reports this tube is still widely used, particularly by non-anaesthetists.⁵

Case report

A 14 day old male infant was referred to this hospital because of repeated failures at extubation at the referring hospital. The infant, weighing 1400 g at birth, had been delivered by emergency caesarean section at 37 weeks' gestation because of intrauterine growth retardation and a suspected diaphragmatic hernia. He needed resuscitation, and tracheal intubation had been performed one minute after delivery; he had then been transferred to the intensive care unit for further resuscitation and ventilation. A chest radiograph had not shown a diaphragmatic hernia. He had recovered and had been extubated when he was 26 hours old. Three hours subsequently, however, he had collapsed and had been reintubated and resuscitated. During the next 11 days three further trials of extubation had been attempted, dexamethasone being given on the last attempt to reduce glottic oedema. On each occasion he had collapsed, but between trials of extubation he had breathed well and maintained good arterial oxygen tensions. A Cole pattern tracheal tube had been used for each intubation.

Microlaryngoscopy and bronchoscopy were performed on the day after admission to this hospital. After induction of anaesthesia the child was reintubated. Slight posterior displacement of the larynx allowed the glottis to be seen clearly at laryngoscopy, and the shoulder of the oral Cole tube (size 3.0 mm) was seen to be well through the glottis. This tube was removed to permit inspection of the glottis and was replaced with a 2.5 mm parallel sided nasotracheal tube. After completing the preparations for surgery the new tube was removed to permit microlaryngoscopy and bronchoscopy with a 2.5 mm Storz bronchoscope with assisted ventilation. The upper gum was severely

ulcerated and grooved at the site of the shouldered tracheal tube, the vocal cords were barely identifiable, and there was severe glottic and subglottic damage with circumferential ulceration in the shape of the tube. The child subsequently needed an elective tracheostomy and may eventually require laryngo-tracheal reconstruction for established subglottic stenosis.

Discussion

This case illustrates the severe laryngeal damage that may follow the use of a Cole pattern shouldered tracheal tube. Cole introduced the shouldered tube to reduce resistance to airflow by restricting the narrowing to a short intratracheal portion.⁶ The shoulder, however, causes an abrupt transition from laminar to turbulent air flow and therefore actually increases resistance to air flow, thus removing the proposed advantage of its design.⁷ Its shape and relative stiffness make it easy to use and hence it enjoys considerable popularity and is commonly used by paediatricians for resuscitating newborn infants. If, however, a Cole tube is left in position for longer term airway management its wide shoulder may advance through the vocal cords to impact in the non-expansile cricoid region. Necroscopic findings and animal research have confirmed that ulceration and necrosis of the mucosa may then occur within hours, leading to the onset of subglottic stenosis.²

These changes may also occur with parallel sided tracheal tubes, but damage may be minimised and possibly avoided altogether by paying careful attention to detail when selecting and using tracheal tubes. The correct sized tube must be chosen.⁸ Strong and Passay showed that half the tracheal tubes used in a series of patients in their unit were too large.¹ There should be a leak around the tube, as first suggested by Stocks, when pressure of 25 cm H₂O is applied to the breathing circuit.⁹ The tube must be the correct length, which should be calculated before intubation and confirmed afterwards by chest radiography.⁸ The intubation must be performed as smoothly as possible to avoid trauma to the mucosa. Adequately secure fixation must be achieved, the only way of ensuring this being to pass the tube nasotracheally and to attach it to the forehead using a Tunstall type connector. Orotracheal intubation

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is suitable only for initial resuscitation. In the smallest premature babies nasotracheal intubation may not be possible and secure fixation then becomes major importance. Repeated intubations are a definite factor in the development of subglottic stenosis and are more likely the longer the infant is intubated.² The duration of intubation, however, is not in itself directly related to the onset of subglottic stenosis.¹

At this hospital tracheal tubes are meticulously assessed for size, length, and leak before they are securely fixed. If the leak resolves the tube is changed to a smaller size. Many neonates who have not needed resuscitating at the referring hospital are sent to this hospital in the first few hours of life and are subsequently intubated for the first time with parallel sided tracheal tubes. No cases of subglottic stenosis have occurred in neonates receiving their first intubation at this hospital for at least 10 years.

The ease of use of the Cole tube has led the joint working party of the Royal College of Obstetricians and Gynaecologists to advocate its use for resuscitating newborn infants.¹⁰ What is not emphasised, however, is that the Cole tube should be used only for resuscitation and not for longer term airway management, as is the case in many special care baby units across the country (M D Mitchell, unpublished data). The manufacturers of the Cole pattern tube (Portex, Hythe, Kent, England) produce a "resuscitation set" (infant resuscitation kit part number 100/420; Cole neonatal tube part number 100/430) that is specifically for neonatal resuscitation. It has a T piece end and cannot

be attached to the tubing of a ventilator. There is a separate Cole tube with a standard 15 mm mount for routine use. The resuscitation set is the type recommended by the working party. If used, it should be removed or replaced by a parallel sided tracheal tube as soon as the baby's condition permits.

Intubation is a safe procedure for the intensive care and resuscitation of the neonate providing care is taken in the selection and use of tracheal tubes. The only Cole pattern tube that we would recommend for use is that produced specifically for neonatal resuscitation and, if used, it should be replaced as soon as possible with a parallel sided nasotracheal tube.

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ANY QUESTIONS

Termination of early pregnancy by suction is occasionally followed by bleeding despite apparently complete evacuation of the uterine contents. What treatment is advised?

The termination of early pregnancy by suction is an efficient method of evacuating the uterus. Nevertheless, in the same way as curettage removes only a sample of the endometrium suction evacuation of the uterus would almost certainly in most cases leave behind a small amount of products of conception and in particular decidua. A further consideration is that, although long term follow up of patients who undergo termination of pregnancy is undertaken by those conducting clinical trials, there is little information on patients who are not included in trials and who for obvious reasons are likely to seek medical advice only if they start bleeding heavily or are appreciably ill. There are also obvious difficulties in studying vaginal bleeding in terms of how blood loss is estimated and what is regarded as normal. Beric *et al* estimated that the incidence of secondary haemorrhage greater than 200 ml was 3.4%.¹ In one trial vaginal bleeding after abortion stopped within two weeks in 83% of the 77 patients given placebo.²

There are four possible mechanisms for bleeding that continues after complete evacuation of the uterine contents.

(1) Retained products of conception. There may be only a small amount, which may lead to a minor bleeding which settles after seven to 10 days.

(2) Minor infection leading to endometritis, which again may resolve spontaneously or possibly require antibiotic treatment.

(3) Shedding of the decidua. If a careful history is taken after termination of pregnancy many women will describe bleeding for two or three days after the termination. Two or three days with no bleeding may then ensue, and thereafter bleeding may occur for two or three days. The mechanism for this is probably shedding of any decidua that remains only after the progesterone concentration has fallen. This is well recognised after an ectopic pregnancy and may also occur to a lesser extent for any decidua that remains after suction termination of pregnancy. This type of bleeding is usually self limiting but commonly leads to the patient presenting with so called secondary haemorrhage about a week after the termination; investigation by a further evacuation of the uterus usually leads to little in the way of retained products of conception.

(4) Dysfunctional uterine bleeding associated with the hormonal changes that occur after termination of pregnancy. Again this is self limiting but if troublesome can be treated with progestones.

Provided there is no significant amount of retained products or significant infection bleeding after termination of pregnancy is usually self

limiting and can be treated with reassurance. The mechanism depends on the timing of the bleeding in relation to the termination and for how long it continues. In some cases patients are subjected to avoidable and unnecessary repeat evacuations. — P B TERRY, *consultant in obstetrics and gynaecology, Aberdeen*

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Would vasectomy, which should render the seminal fluid cell free, be of any value in checking the spread of HIV, an intracellular virus?

The exact location and origin of the HIV found in semen are not known. Inflammation, such as that occurring with gonorrhoea or with other sexually transmitted diseases, results in an increase in the number of CD4 lymphocytes and macrophages found in semen.¹ Both of these cell types may be infected by HIV, and in fact HIV itself has been recovered from the mononuclear cells of semen.^{2,3} Unfortunately, vasectomy does not render seminal fluid free of cells but only free of sperm.

Furthermore, it is now apparent that HIV is not exclusively an intracellular virus, and recent reports have shown an association between the levels of cell free virus in plasma and advanced disease.⁴ HIV has also been recovered from the cell free portions of semen obtained by differential sucrose centrifugation.⁵ Even in the unlikely event that a vasectomy could eliminate HIV from semen such a measure could not, of course, alter the spread of HIV by non-sexual means such as injections by drug users or mother to child transmission. It would also have no effect on heterosexual transmission of HIV.

Thus vasectomy is unlikely significantly to alter the dynamics of the HIV epidemic. — R P BRETTE, *consultant physician, London*

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