A coroner's report into an airway related death in Scotland

The intention of this review is to highlight possible system failures leading to a patient's death, not to criticise individuals. Indeed, this case is an example of common clinical management strategies that occur in many hospitals throughout Australia and the world. Examination of this event will hopefully lead to an improvement in our standard of care.

The patient died at the Victoria Infirmary, Glasgow, in May 2006. An inquiry was held under the Fatal Accidents and Sudden Deaths (Scotland) Act 1976 and the sheriff/coroner released her determination in April 2010.

The following is a brief summary of the events leading up to the patient's death.

A 51-year-old Glaswegian man presented for elective open reduction and internal fixation of a fractured distal phalanx of his right little finger. Six weeks previously he had undergone uneventful emergency surgery on the same fracture in a different hospital. K wires had been inserted at the first procedure and anaesthesia was uneventful. However, the orthopaedic treatment was unsuccessful and the patient had a deformity with loss of function. Prior to the second procedure, the patient was offered two options: no further treatment or revision of surgical correction. The patient opted for the latter.

A preoperative assessment was performed on the ward by the consultant anaesthetist and included a thorough airway assessment. It was noted that there had been no airway issues with the previous anaesthetic. The patient was 124kgs with a BMI of over 40. The anaesthetist was concerned about the risk of aspiration and preoperative ranitidine was ordered. The patient requested to be asleep for the operation and a rapid sequence induction after pre-oxygenation was planned.

Anaesthetic induction was 100ug fentanyl, 500mg thiopentone and 100mg suxamethonium. Cricoid pressure was applied and a No. 3 Macintosh blade was used for direct laryngoscopy. The larynx could not be viewed and intubation was not attempted.

Although the anaesthetist was concerned that the cricoid pressure may be the cause of the failed laryngoscopy, she instructed that it should continue and a Polio blade was requested. This was obtained along with the difficult airway trolley. Unfortunately the Polio blade did not provide a better view. In accordance with the difficult airway protocol senior colleagues were called for assistance.

A No. 4 laryngeal mask was inserted and effective ventilation achieved with jaw thrust. Oxygen saturation was 97 per cent but the decision was made to insert an intubating laryngeal mask (iLMA). Oxygen saturations fell to 80 per cent during this change. It was considered that the thiopentone was wearing off and sevoflurane was administered to maintain anaesthesia. An experienced anaesthetist and senior registrar arrived to help.

A size 8 endotracheal tube (ETT) was inserted through the iLMA but could not be fully advanced. During this phase, the patient's heart rate rose to 136bpm, BP 214/136 and SaO2 fell to 51 per cent. The patient started to cough. Alfentanyl 1mg was administered. A size 7 ETT was then passed without difficulty and capnography confirmed placement in the airway. Successful ventilation was achieved.

Oropharyngeal bleeding continued and the anaesthetist felt that the source of bleeding needed to be investigated. The iLMA was to be removed. However, the 50mm connector was difficult to remove and required forceps. This resulted in enlargement of the top of the ETT and thus the interface between the stabilising rod (pusher) and ETT was “loose”.

The anaesthetic fellow suggested using a Cook airway exchange catheter to “stabilise” the ETT as the iLMA was removed over it. The consultant had no previous experience with the catheter but felt it could be used to administer oxygen as required. The Cook catheter was inserted until there was resistance, thought to be the carina. The iLMA was then removed but the ETT’s pilot balloon sheared off creating a large leak. The oxygen saturation fell from 99 to 69 per cent.

The iLMA and ETT were removed. An attempt was made to railroad a size 9 ETT over the Cook catheter. Resistance occurred at the vocal cords. Oxygen saturations started to fall and the iLMA was reinserted. SaO2 rose to 92 per cent and the catheter remained in place.

It was decided to use a fibreoptic bronchoscope through the iLMA and another size 7 ETT to intubate the patient after 25mg rocuronium. As oxygen was to be delivered through the Cook catheter during this intubation, the assistant connected the catheter to a freestanding oxygen cylinder and administered 15 l/min. An initial view of the cords was obtained but the ETT could not be manipulated. A second fibreoptic bronchoscopy was attempted but revealed oropharyngeal swelling with no recognisable structures. This was followed by rapid brawny swelling of the face, neck, arms and chest and a “cherry-red” appearance. A diagnosis of rocuronium-induced anaphylaxis was made and 10mls of 1/10,000 adrenaline and 2x10mg chloropheniramine were administered. Midazolam was administered to avoid awareness.

No improvement occurred with this management and hand ventilation via the iLMA was difficult. Oxygen saturations fell to 40 per cent and the HR 42bpm. Needle cricothyroidotomy was unsuccessful. There was no effective airway and no cardiac output. CPR was commenced and continued for 50 minutes. A loud crack was heard coming from the lower abdomen. It was then realised that the crack was due to air rupturing of the scrotum and the swelling was due to surgical emphysema. Emergency needle thoracotomies were performed followed by insertion of chest drains.

Extensive cardiac resuscitation continued but the patient was pronounced dead. Post-mortem showed the Cook catheter had perforated the right middle lobe and entered the chest wall.

The coroner found that the cause of death was perforation of right lung with an airway exchange catheter while undergoing airway management following induction of anaesthesia. High-flow oxygen insufflation through the catheter caused widespread surgical emphysema, barotrauma, hypoxia and death.

Concerns raised by the coroner:

1. *(1) Failure to consider waking the patient. The focus was on overcoming individual problems as they arose rather than a consideration of the whole clinical picture. There were three opportunities to wake the patient and none of the three experienced anaesthetists considered doing so.*
2. *(2) Matters concerning the use of the Cook catheter:*

None of the anaesthetists were experienced in its use. There was breakdown of communication among the anaesthetic team as to the experience of those present.
Failure to follow clear operating instructions for the use of the catheter. These instructions include a caution to avoid barotrauma by ensuring (for example, by marking) that the tip of the catheter always remains above the carina and that oxygen insufflation through the catheter is limited to 2l/min.

(3) *Matters concerning the difficult airway trolley.*
A device that is rarely used was readily available on a general emergency airway trolley.
The trolley had become overloaded with a "miscellany of equipment".
Individual clinicians have a professional responsibility to use only equipment with which they have familiarity and competence.

(4) *Equipment failure of the intubating laryngeal mask was concerning.*

(5) *Other factors such as failed fibreoptic intubation and misdiagnosis of anaphylaxis late in the management were unlikely to have had a direct impact on the outcome but were nevertheless concerning.*

One element that is not clear from the report is the reason for the initial failed direct laryngoscopy and the subsequent problems with airway management. One possibility is that the patient was not placed in the "ramped position"[1,2] prior to induction of anaesthesia for the second operation.

Dr Keith Greenland

Note: The author has attempted to provide a brief summary of some salient points within the report. The full report is available at: www.scotcourts.gov.uk/opinions/2010FAI15.html.

References:

1. Collins J, Lemmens H, Brodsky J, Brock-Utne J, Levitan R. Laryngoscopy and Morbid Obesity: a Comparison of the "Sniff" and "Ramped" Positions. Obes Surg 2004;14:1171-5.
2. Greenland KB, Edwards MJ, Hutton NJ. External auditory meatus–sternal notch relationship in adults in the sniffing position: a magnetic resonance imaging study Br J Anaesth 2010;104:268-9.