Critical analysis of crisis management in anaesthesia:

A case study of laryngospasm

Laryngospasm is a common and distinct form of airway obstruction; cases of which many anaesthetists and anaesthetic technicians will see several times in their career. However if poorly managed, this anaesthetic emergency can cause significant morbidity and mortality, the threat of which impels its critical analysis.
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Introduction:

Critiquing the way in which anaesthetic emergencies are managed, both from an individual perspective and the equipment and resources available, provide an invaluable diagnostic tool in ensuring an appropriate management plan is followed, or the correct interventions are implemented, so that a successful outcome can be achieved (Visvanathan, T. et al 2005). A particular crisis of significant interest is that of laryngospasm, which is described as a reflexive closure of the glottis, mediated by the superior laryngeal branch of the vagus that provides a protective mechanism of foreign materials entering the larynx. As the epiglottic body, false cords and extrinsic muscles of the larynx come together forming a tight seal, air can no longer move through the larynx, causing symptoms of varying severity ranging from mild desaturation and stridor to complete airway obstruction, and if not managed effectively, even death (Calder, I. & Pearce, A. 2011)(Greenberg, M.I. 2005). Laryngospasm occurs as a result of irritants in the airway such as gases, food, vomit, blood or foreign bodies. It occurs particularly in patients in light planes of anaesthesia, and those undergoing ENT or maxillofacial surgery, where the airway may come in to contact with surgical debris (Calder, I. & Pearce, A. 2011). Although laryngospasm is a form of airway obstruction that is both common and generally well recognised, it can also be associated with significant morbidity and mortality if poorly managed. Consequently, although the case study reflected below had a successful outcome with no adverse events, it is important to understand and critique these events so any improvements, if necessary, can be made for future practice. (Visvanathan, T. et al 2005).

Before describing the case study below, it is important to note that all identifying features of this patient have been removed in order to maintain anonymity. Discussing in length with the anaesthetist who was present at the time of these events the desire to write a case study on this patient, the anaesthetist instructed me to contact the patient to ask his permission. Speaking with the patient, he gave his full permission, but declined the need for a copy of the paper once complete.
Case presentation:

The case in question surrounds a 56 year old male undergoing a L3/4 discectomy to remove a herniated disc from his spinal canal. During the pre-operative check-in, the patient reported a small residual cough present after an episode of the flu he had experienced approximately two weeks prior to surgery. The anaesthetist was alerted and no further concern was made. Intubation was performed relatively easily with a size 8 endotracheal tube, size 3 Macintosh laryngoscope blade and a small amount of backwards upwards rightwards pressure to enable better visualisation of the vocal cords. The patient was positioned prone and the surgery proceeded uneventfully. At the end of the surgery, the patient was positioned supine, all monitoring was left on and the anaesthetist and I waited for the patient to awake sufficiently that they were in control of their own airway. As the patient began to rouse, reaching for their own airway, the anaesthetist instructed me to deflate the cuff of the endotracheal tube. At the same time, the anaesthetist suctioned inside the patient’s mouth, removing the tube and replacing it with a face mask around the patients mouth, connected to the breathing circuit of the anaesthetic machine with 100% oxygen flowing. However, at this time, the patient let out a very mucous-filled cough and began to show signs of stridor, with increased inspiratory efforts and slowly developing cyanosis. Something was wrong.

Management and Outcome:

In management of this crisis, the mnemonic ‘COVER ABCD – A SWIFT CHECK’ and its related mnemonic ‘SCARE’ was used to quickly and efficiently identify the crisis and manage it appropriately. Through scanning the theatre environment, it was noticed that the patient’s Airway and Breathing was in some way obstructed. As extubation had not gone as planned, the intensity level of our mnemonic was raised to a ‘Check’ and further to an ‘Alert/Ready’ status as we actively began to check the patient’s Circulation, Capnograph and Colour (saturation). The patient’s pulse was easily felt, however, we were getting no carbon dioxide trace on the capnograph, as the patient continued to make a wheezing sound as they tried to breathe in. The pulse oximeter read at its lowest 82% and the patient became cyanosed. Moving to Oxygen supply and Oxygen analyser, we increased the oxygen supply, ensuring that we had a good seal around the patient’s mouth with a face mask, with a gentle chin
lift/jaw thrust instigated to improve oxygenation. As the anaesthetist and I realised that we would require assistance quickly, I communicated with the nursing team that we were having issues with the airway, and to go next door and get the senior technician who I knew was free. She came swiftly, bringing another student technician with her. While this occurred, I was instructed by the anaesthetist to draw up another ampule of propofol and administer 100mg (10mL) to the patient immediately. I relayed this information back to the anaesthetist to confirm his instructions and confirmed with him when the task was completed. While this was done, the anaesthetist attempted continuous positive airway pressure to the patient through the facemask. The other technician in theatre with me was instructed to draw up suxamethonium whilst I made sure I had sufficient equipment available to re-intubate the patient; checking an appropriately sized endotracheal tube, bougie for aiding in intubation, Magill’s forceps to hold the tongue out of the way, a range of LMA’s both classic and supreme, as well as suction and suction catheters. By this time, all theatre staff were ready and available to receive instructions to help with this crisis. As the anaesthetist made the call to push the emergency button, whilst instructing the senior technician to administer the suxamethonium as well as some more propofol, the patient let out another large cough, followed by a wheezing sound, but more importantly, began to breathe on his own, with a capnography trace now showing on the patient monitor. Although the emergency bell had been activated, administration of suxamethonium had been stopped just in time. The patient’s saturations began to improve, while the anaesthetist suctioned in the patient’s mouth. Reviewing our mnemonic at this time, the patient’s Circulation appeared normal, with a radial pulse clearly felt, and the oximeter reading a saturation of 94% and improving. The patient’s Colour had returned, although still slightly red from coughing. Oxygen was still being administered at 100% through the facemask, and Ventilation was not necessary as the anaesthetist was satisfied the patient was now in control of their own airway. Eliminating the dangers of a relapse en-route to recovery, I confirmed the presence of an oxygen cylinder and Hudson mask to oxygenate the patient once the anaesthetic facemask had been removed. Reviewing our monitors one last time, saturations were now at 96%, blood pressure was within normal range and the patient was normocardiac. The anaesthetist kept the patient in theatre longer to ensure the propofol had worn off and that the patient was no longer coughing. Post-operatively, the anaesthetist re-confirmed a clear airway, opening the patient’s mouth and listening to the
patient’s breath sounds through a stethoscope, with no reported crackling or wheezing. The anaesthetist explained to the patient what had happened, but the patient reported no awareness, just a sore jaw which was most likely caused from the jaw thrust performed during CPAP. The patient’s saturations returned to normal, and the anaesthetist was satisfied no further damage was caused (Australia Patient Safety Foundation 2006).

**Discussion:**

In analysing the management of this crisis, there are several points of interest to be addressed. First and foremost is how a “crisis point” was reached, both in the events leading up to it and the decision to declare these events as an emergency. Defined as a sudden change in disease course, toward either improvement or deterioration, crises are by in large a fact of anaesthesia practice (Australia Patient Safety Foundation, 2006). Anaesthesia by profession involves several opportunities for crises, through a combination of the complexity of tasks required, their intensity, the uncertainty and associated risk of these tasks, the time pressure with which they must be performed and their dynamism. Anaesthesia crises can be caused through patient factors, anaesthetic factors, surgical factors or a combination of all three. Because these events occur with little or no warning, they must be detected, diagnosed and remedied in the quickest and most effective method (Gaba, D.M. et al 1994). It was noted in the above crisis that the patient reported a small residual cough present after an episode of the flu he had experienced approximately two weeks prior to surgery. A debrief with my team leader after the crisis helped answer my concerns that irritants in the patient’s airway from this cough was likely the cause of his laryngospasm upon extubation. However, other factors that could have also contributed to this, including airway hypereactivity simply from placement of the endotracheal tube, as well as the patient being in a light plane of anaesthesia and therefore more sensitive to any airway intervention, were explored in depth (Hagberg, C. 2013).

It is important within a crisis to appreciate that although these events often occur at a speed exceeding an individual’s capacity to keep pace, they do not occur at random. Therefore, early recognition and quick decision making is key. Central to this is the necessity to call for help at the earliest stage necessary (St. Pierre, M. et al 2011). Use of the mnemonic, second nature to the anaesthetist, helped prevent fixation errors so that a diagnosis and
subsequent cure could be addressed. However, the situation reached crisis point when the patient’s saturations began to fall dangerously low and the need to reintubate was imminent. The anaesthetist realised extra help would be required in case intubation proved difficult and a “can’t intubate, can’t ventilate” emergency ensued. Although the emergency alarm was activated quite late, and subsequently the crisis ended soon after, there were several individuals in theatre available to help with clearing the area surrounding the patient so we could get access to him as soon as possible. The first difficulty I faced in management of this crisis was my sheer lack of experience. Being only in my first year of training, my exposure to emergency situations was very limited. Working also primarily with consultant anaesthetists, their reaction to crises is much different to that of a house officer or a registrar. Therefore, I did not realise the seriousness of the situation until much later. However, I did appreciate that the most important piece of equipment I needed was an extra set of hands, knowing a qualified senior technician was available next door in case I came in to difficulty. Bringing this individual in to theatre had an added benefit of providing comfort to the anaesthetist as he knew this technician’s skill level and had worked with them many times before, making him more relaxed.

Traditional anaesthesia training has placed significant emphasis on the mastering of technical skills. However, within an anaesthetic crisis, it is often the non-technical skills – the skills not necessarily acquired through clinical experience but rather have to be taught – that prove the most valuable in emergency management. Central to this is adaptability; recognising that no two emergencies are the same, regardless of if all factors seem similar (Yee, B. et al 2005). Within the operating room, although thought of as a collective “team”, in actual fact include several individual teams, including the surgical, nursing, anaesthetic team etc. each with their own structure and goals. Teamwork is an inherent feature of healthcare, recognising the desire to achieve a common goal or outcome, in this case the overall optimal health and well-being of the patient, regardless of the role each team member holds. Within this is the need for a leader, who can guide each team member in achieving this goal or outcome in the most effective method possible. In the above situation, the anaesthetist became the natural leader, delegating tasks to myself, and once extra hands were available, to the other technicians also. My role within this crisis was to follow every order of the anaesthetist, which primarily involved reading aloud the patient’s
vital signs to the anaesthetist and checking the availability of airway equipment had we needed to intubate again. There are many personal features of the anaesthetist that contributed to the successful management of this crisis, including his familiarity of the theatre environment and the team with which he found himself, minus myself. However, at no point did he fail to communicate with me his requests for resources, distributing the workload quickly and efficiently with closed-loop communication (Gaba, D.M. et al 1994).

Although crises are naturally stressful, each team member worked collectively to ensure quick and efficient management, discussing all events and actions after the crisis was over to see where improvements, if any, could be made. I felt well supported during this crisis, recognising my responsibility as a member of this team as well as the actions expected from me for this. Although relatively well managed, with the anaesthetist satisfied with his level of assistance, this crisis made me realise I needed a lost more education on appropriate management of this situation in case help was not as readily available (Gaba, D.M. et al 1994).

**Conclusion:**

Laryngospasm, although relatively common, can cause significant morbidity and mortality if managed poorly. Although the above case study was the first I had experienced in my first year of training, I have since – fortunately or unfortunately – been present at several different episodes of laryngospasm, each situation distinctly dynamic from the rest. With each new event comes new insight into the causes of anaesthetic crises and the factors that contribute to their successful management. Within this is the ability to critique every aspect of the anaesthetic crisis, from patient factors, anaesthetic factors and surgical factors to ensure an appropriate management plan is followed and correct interventions are implemented (Calder, I. & Pearce, A. 2011)(Greenberg, M.I. 2005). The case study described above taught me the importance of understanding my own strengths and weaknesses and the importance of my role within the operating team. The overall well-being and optimal health of this patient was all team members’ priority and responsibility, responding to developing events with precision and professionalism. Although a positive outcome was achieved, there was much for me to learn from this situation so I would better be able to help the anaesthetist should it occur in the future, which it has. Conclusively, the ability to
critique particular anaesthetic events can have important positive implications on future practice, the likes of which should be highly encouraged (Gaba, D.M. et al 1994). “Success does not consist in never making mistakes, but in never making the same one a second time” (Shaw, G.B., 1937).
References:


