

Letters

■ The Editor:

Ghai A, Wadbera R. Accidental removal of laryngeal foreign body along with the tracheal tube. SAJAA 2007;13(5):6-7

It is with great concern that I have read the letter in the September/October issue of SAJAA 2007.

I have a few problems with the management of the patient. Aphonia implies something has happened to the larynx! The fact that they missed the foreign body is understandable considering the "mucosal" colour!

But the use of muscle relaxants in this situation is unforgiveable in my book. Yes, many do paralyse for foreign bodies but this particular one must have been in the larynx - aphonia was the clue! Maybe the authors would like to comment on "paralyse or not to paralyse that is the question"! The "slings and arrows" may follow!

What would have happened if the FB had been dislodged either during either the bronchoscopy or subsequent intubation and it could not be removed. If the anaesthetist had chosen any other size tube it would still have been missed. As they say in the paper, careful laryngoscopy is what was needed particularly in view of the aphonia. The FB was missed on two occasions because they were looking deeper and not focusing on the clinical clues.

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Case report: Gunshot facial injury: a multi-disciplinary management

■ The Editor:

ABSTRACT

Gunshot facial injury may be frightening and overwhelming. We present a case report of a male employee who was shot in the face during an armed robbery attack on a bank. He sustained severe injuries to the eyes, as well as fractures involving the orbital, maxillary and mandibular bones, with impending airway compromise. He bled profusely and was resuscitated and stabilized. Anaesthesia management included initial local anaesthesia for emergency tracheostomy and then a general anaesthetic for emergency ophthalmology and maxillofacial surgeries in a one-staged operation all on the same day lasting six hours.

INTRODUCTION

Gunshot injuries to the face are very serious and can be associated with high morbidity and mortality if not treated urgently. Typical injuries involve serious disruption of the soft tissue, and the bony and cartilaginous components of the upper airway, often with little initial external evidence of the magnitude of deformation. The airway is at risk, as increasing oedema may result in total airway occlusion.^{1,2} Tracheostomy and multidisciplinary definitive surgery have been associated with a good outcome.^{3,4} Resuscitation must be immediate and on-going, while maintenance of haemodynamic stability must be ensured for a successful outcome. This case presentation illustrates early subspecialty involvement and anaesthesia for a one-staged multidisciplinary emergency operation.

CASE REPORT

A 29-year-old, well built, male bank worker was brought to the accident and emergency (A&E) unit by a co-worker, one hour after being shot in the face by armed robbers. He was conscious, but still bleeding from the ear, nose and mouth. Cervical

immobilization was performed, and intravenous (iv) fluid resuscitation was commenced with 1 litre of normal saline, administered over 10 minutes using an 18-G peripheral cannula. Thereafter 1 litre was titrated against vital signs, whilst a secondary survey was performed. His baseline blood pressure was 98/55 mmHg and the pulse rate was 120 beats/minute. Venous blood was taken and sent for packed cell volume (PCV), electrolyte and urea estimation, as well as blood grouping, screening and cross matching. Two units of blood were ordered, and the ophthalmologists, Ear Nose & Throat (ENT) and maxillofacial surgeons, and anaesthesiologists were invited to participate.

Within thirty minutes of presentation, facial oedema and periorbital swelling were noticed to have increased in size. After the initial fluid resuscitation, radial pulse rate and blood pressure became 72 beats/minute and 120/70 mmHg respectively. His respiratory rate was 24 breaths/min. Breathing was not laboured and his chest was clinically clear. He had a retro-positioned, deformed and mobile maxillary segment. Radiological investigations were ordered which included specialized views of the face and neck.

He was started on treatment with iv chymotrypsin 5000 iu 12-hourly, iv metronidazole 500 mg eight-hourly, and iv ampicillin and cloxacillin (combined) 500 mg six-hourly. A decision was made for immediate multidisciplinary surgical intervention, which included an awake tracheostomy, ophthalmic examination under anaesthesia, and exploration and reduction of facial fractures.

Preoperatively, he remained calm but was unable to talk or open his mouth. He had mild pallor, and was well hydrated. The cardiovascular signs remained stable. He was not in respiratory distress. The respiratory rate was 28 breaths/minute. There was good air entry in both lung fields and no crepitations. However, he had transmitted breath sounds. Mallampati assessment of the airway was not possible. The results of blood investigations were not yet available. The requested X-rays taken in the radiology department en route to the theatre were negative for cervical spine injury. He was classified as ASA 3E. Within three hours after arrival at the hospital, he was taken to the operating theatre. Monitors comprising non-invasive blood pressure (NIBP) cuff, ECG leads and precordial stethoscope were attached. An anaesthetic chart was started, and the baseline vital signs recorded were a pulse rate of 116 beats/minute and a blood pressure of 130/70 mmHg. A urinary catheter was inserted and attached to a urine bag.

Tracheostomy was performed under local anaesthetic infiltration, using 10mls of 1% lidocaine with epinephrine. A cuffed, size 7mm plastic tracheostomy tube was inserted, and connected to a Mapleson A circuit of the anaesthetic machine. The patient was allowed to breathe 50% oxygen in nitrous oxide spontaneously, while securing the tracheostomy tube. Following this, iv propofol 140 mg and atracurium 35 mg were administered, after which he was manually ventilated with 0.5-1% halothane and equal volumes of O₂ and N₂O at a flow rate of 6 litres/minute, using a closed circuit with carbon dioxide absorber. One hundred (100) mg of iv tramadol was administered, followed by two supplemental doses of 50 mg each. Pancuronium was also used in 1-2 mg iv boluses intermittently, in order to maintain muscle relaxation.

His vital signs were recorded at intervals of 10 minutes and the anaesthetic agents titrated as required. The duration of general anaesthesia was 5 hours 30 minutes. The patient's heart rate remained above 100 beats/minute during the first 3.5 hours of the operation, with the highest recording seen during tracheostomy and ophthalmic manipulation, whilst in the last 2 hours it was between 90-100 beats/minute. The blood pressure was relatively stable, particularly during the last 2.5 hours. The lowest recorded blood pressure was noticed whilst there was no surgical stimulation. He had a total of 9 mg of pancuronium, 200 mg of tramadol, 4 litres of warmed normal saline infusion and 1 unit of blood transfusion. The blood loss was estimated to be 1500 mls. The urine output at the end of operation was 2000 mls.

Ophthalmologic examination under general anaesthesia revealed the following: severe chemosis, corneal laceration and uveal prolapse in the right eye; periorbital oedema, enophthalmos, conjunctival hyphaema, corneal oedema, deep anterior chamber and a small pupil in the left eye. These injuries necessitated enucleation of the left eye.

The maxillofacial findings were Le Fort 2 & 3 fractures, a fracture of the mandible, and a grossly mobile middle half of the mandible. The zygomatic/intraorbital bones and the orbital floor were shattered. However, the patient had a full complement of dentition. A maxillofacial reconstruction was performed. The intraoral middle half fracture was disimpacted and arch bars

were put in place. Inter-maxillary fixation was done, the site was sutured extra-orally and the wound was dressed.

The patient was reversed with a mixture of 2.5mg neostigmine and 1.25mg of atropine administered iv, following which 100% of oxygen was administered for 10 minutes. His blood pressure remained relatively stable with a postoperative recording of 125/72 mmHg and a heart rate of 104 beats/minute. Tetanus prophylaxis (0.5mls of tetanus toxoid and 1500 units of anti-tetanus serum IM) was prescribed. He did not require mechanical ventilation. He had an uneventful course in the intensive care unit (ICU) for 10 days, and was discharged to the ward thereafter.

DISCUSSION

Airway compromise is the most frequent and most life-threatening early problem encountered in gunshot facial injuries.^{1,2} A baseline airway assessment must be followed quickly by trauma resuscitation, which should include the control of ongoing haemorrhage and definitive repair of the injury.^{3,4} Unnecessary delays and unwanted complications can be avoided by early involvement of a team skilled in trauma management, whilst the anaesthetist provides access to the airway and anaesthesia for emergency surgical intervention.

Most patients are found to be reasonably stable for the first one hour after injury, with their vital organs well perfused, if resuscitation is instituted during this phase of physiological compensation ("the golden hour"). After this time, decompensation and organ failure is progressively more common. Facial fractures are not an immediate treatment priority, unless there is heavy bleeding, airway compromise or uncontrollable secretions. Mandibular fractures, however, are more likely to be associated with soft tissue injury that may cause respiratory obstruction or distress.

Specialized radiographic views are invaluable, and give precise localization of injury site when reviewed by an experienced radiologist⁵. Four to five percent (4-5%) of facial fractures (other than mandible fractures) have associated cranial injuries, and 1-5% of facial fractures have associated cervical spine (C-spine) fractures⁶. Although radiographic studies may detect 80-90% of fractures, CT (computerized tomographic) scan remains the most useful method in the evaluation of gunshot facial injury¹. CT scan was not performed in this patient, because in the presence of increasing facial oedema, further delay may have compromised the airway significantly.

In view of the potential problems in anaesthetizing this patient (i.e. difficult mouth opening, facial oedema, and the inability to determine the extent of damage), together with the possibility of a full stomach, an awake tracheostomy performed under local anaesthetic infiltration provides the safest option in securing the airway. Tracheostomy also allows the surgeons to operate without the fear of inadvertent premature extubation, or damage to the endotracheal tube. A tracheostomy tube also ensures the maintenance of the airway in the postoperative period, and can be better cared for by the nursing staff. An attempt at nasotracheal intubation in this situation is dangerous and futile. When fracture of the base of the skull is present, there is a possibility of introducing the tube through the fracture line and into the subarachnoid space, with disastrous consequences.⁷

The choice of propofol for intravenous induction was made to prevent worsening tachycardia and a further increase in systolic blood pressure following awake tracheostomy. Propofol does not have a hangover effect, and it causes a decrease in systemic blood pressure, with relaxation of vascular smooth muscle. The persistence of a high normal blood pressure, even with the

addition of halothane, may be as a result of an established stress response to trauma and injury.⁸ There are also changes in the levels of acute phase reactants, which take part in the local inflammatory response, but which also have systemic consequences.

In patients undergoing surgery under general anaesthesia, the stress response is diminished by anaesthetic drugs, airway control and fluid infusion, while it may be completely controlled by regional anaesthesia.⁹ If the patient is not sufficiently haemodynamically and metabolically resuscitated (i.e. maintain normovolaemia, normocarbida and normoxia), attenuation of the response will lead to loss of homeostatic mechanisms, with resulting hypo-perfusion, cellular hypoxia and cellular dysfunction. The goal of the anaesthetist is to make the patient metabolically and haemodynamically stable. Circulatory volume was adequately restored in this patient with urinary output of 2000 mls in 6 hours (>3mls/kg/hour). Tramadol was used, (together with nitrous oxide), as the analgesic in this patient, because of less potential for addiction and respiratory depression, when compared with morphine. More potent opioids such as fentanyl, sufentanil and alfentanil would probably provide better analgesia and modify the stress response, but were not available to us.

Maxillofacial reconstruction may evoke the trigeminocardiac reflex (TCR), whilst surgery on the eye may evoke the oculocardiac reflex (OCR). The OCR is commonly seen during eye muscle surgery, repair of detached retina, enucleation, and whenever extensive eyeball traction or rotation is required during surgery. Although these reflexes are commonly associated with bradycardia, practically any dysrhythmia, including ventricular tachycardia and asystole, may be seen.¹⁰ The possibility of these reflexes calls for continuous ECG monitoring. However, where ECG monitoring is not available, TCR and OCR can be detected by vigilant monitoring with a precordial stethoscope, and prevented by good anaesthesia, gentle surgical manipulations, and the use of anticholinergic agents when indicated. The use of pancuronium, which has an indirect sympathomimetic effect, helped with maintenance of the heart rate in this patient.

Crystalloids remain the preferred solution in an emergency in our working environment, because they are readily available and inexpensive. Crystalloids can provide rapid volume replacement with balanced electrolyte solutions; they are not allergenic, immunogenic, or toxic; they quickly restore urine output, keep blood viscosity low, and present less danger of overload because they can be rapidly diuresed.^{11,12} Although infusions of normal saline with or without Ringer's lactate have been associated with hyperchloraemic acidosis, this is more common with large infusions of 20mls/kg/hour.¹³ A study by Waters et al revealed little difference in the outcomes when both fluids were compared.¹⁴ Acidosis, contrary to traditional concepts, may have a protective effect by attenuating the inflammatory process, as well as reducing cellular respiration and oxygen consumption.¹⁵ Moreover, any associated peripheral and pulmonary oedema can be easily managed with iv furosemide in the recovery room. Because crystalloids do not carry oxygen, it was necessary to transfuse this patient with whole blood. The use of warm fluids ensures normothermia, thus maintaining acid-base balance, preventing coagulopathies and preserving myocardial function. It also maintains normal oxygen-haemoglobin curve, and the metabolism of anaesthetic drugs.

Automated monitors such as the pulse oximeter, continuous ECG, capnograph and automated blood pressure apparatus are the standard in monitoring. The use of electronic record systems are encouraged and recommended, and it is likely that their use will become routine.¹⁶ Nevertheless, the "high touch low tech"

monitoring by a vigilant anaesthetist, typical of most developing countries, (although difficult in prolonged and multidisciplinary operations), can be successfully employed in the absence of standard recommended monitoring. Tetanus prophylaxis must be administered, even where priority is on the airway, breathing and circulation.

In conclusion, teamwork, quick intervention and repair before oedema, distortion and inflammation of the soft tissues occur, are advantageous in cases of facial injury. Rapid decision-making and timely institution of tracheostomy is ideal when airway patency is threatened. Institution of tracheostomy ensures continuous airway maintenance and care postoperatively. The avoidance of the oculo- and trigeminocardiac reflexes, maintenance of organ perfusion and the prevention of the detrimental effect of the stress response, using appropriate anaesthetic drugs and technique are important.

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