CASE REPORT

An appraisal on emergency tracheostomy

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Introduction

The requirement for an emergency tracheostomy after trauma to the face and upper neck is very rare. A case of severe blunt trauma to the face and upper neck with injuries to the maxilla, mandible, tongue, hyoid bone and thyroid cartilage, is presented. The critical airway was secured with an emergency open tracheostomy in the emergency room. Tracheostomy is generally not recommended outside the operating theatre and without an endotracheal tube in situ because of the inevitable difficulties encountered in settings with limited logistic and technical facilities. The case is a paradigm of all the indications for emergency tracheostomy in blunt trauma to the face and neck.

Case report

A 63-year-old man was brought to the emergency room (ER) after having been extricated from a motor vehicle crash where he was found bent forwards with his face against the dashboard. At the scene, the patient had a Glasgow Coma Scale (GCS) score of 3/15 with pupils equally sized and reactive bilaterally, and an endotracheal tube (ETT) was inserted reportedly without the need of facilitating drugs. He arrived in the ER on a long spinal board with a rigid neck collar and two peripheral iv lines running 2 l of Ringer’s lactate, intubated and manually ventilated on 100% oxygen at high frequency rates. The collar was immediately removed on arrival to allow anterior neck and cervical spine examination. The neck was maintained manually stabilised during the subsequent assessment and management until the cervical spine (CS) was cleared of obvious injuries. The patient had obvious severe unstable mandibular and maxillary complex fractures, a swollen lacerated tongue and an anatomically deranged oral cavity full of blood and oedematous lacerated tissues. There were audible gurgling noises and the endotracheal tube was flinging unstably such that its upper end could be lifted forwards and moved as to trace an imaginary circle due to the lack of surrounding solid support. Bleeding from the mouth was continuous and required repeated gauze packing. The neck was swollen in its upper half and hard on palpation. No usual anatomical landmark could be felt; however an abnormally floating and displaceable transverse structure of bony consistency, eventually interpreted as fractured hyoid bone, was palpated half way up the upper end of the neck. No crepitus was elicited. No carotid artery bruit was heard and no thrill could be palpated. On the lower half of the neck the trachea was palpable between thumb and index fingers, was displaceable upwards and superficially and was felt intact in its anatomical longitudinal axis. Breath sounds were decreased bilaterally more on the right side. Heart sounds
were clearly audible with a normal and regular pattern. The oxygen saturation (\(\text{SaO}_2\)) was not recordable on the pulse oximeter, which displayed a tachycardia of 120 bpm. The blood pressure was not recordable manually, though the automatic manometer displayed a systolic of 59 mmHg. A rapid decision to perform an emergency open tracheostomy was made. This was done without neck/head positioning via a vertical incision 3—4 cm long, keeping as lower landmark an imaginary point 2 cm above the jugular fossa. No anaesthetic was used after ascertaining the status of unconsciousness of the patient. The procedure took about 1.5 min and diathermy was not used. Traction stitches were not applied due to the urgency of getting airway ingress for oxygen. No endotracheal tube tip or cuff was noted inside the trachea. The arterial blood gases taken immediately after the initial oximeter reading in the manually hyperventilated patient on 100% oxygen meanwhile showed hypoxaemia (\(\text{PaO}_2\) of 137 mmHg) plus severe combined metabolic and respiratory acidosis. After obtaining the surgical airway the \(\text{SaO}_2\) became finally recordable as 98—100% within the minute, and in the matter of a few minutes the heart rate came down first to 100 eventually to 90 bpm. Due to the initial fluid load and Bair hugger effects the systolic blood pressure became recordable first at 75 mmHg and then 99 mmHg. The arterial blood gases had meanwhile showed hypoxaemia (\(\text{PaO}_2\) of 137 mmHg) plus severe combined metabolic and respiratory acidosis. After the patient was stabilised, he was taken to radiology for a range of further investigations. The face and neck CT scans displayed multiple injuries to all the anterior bony-cartilaginous structures, namely Rt orbit, nose, Rt temporal bone, maxilla, mandible, hyoid bone (HB), thyroid cartilage (TC), cricoid cartilage (CC) (Figs. 1—3). The oral bleeding eventually stopped.

Figure 1  Delayed tridimensional reconstruction of the CT scan of the facial bones showing fractures of the lateral, inferior and medial walls of Rt orbit; displaced/comminuted fractures of the maxilla body and orbital process; displaced fractures Rt nasal bones; diastasis of Rt fronto-zygomatic suture; fracture of the zygomatic process of Rt temporal bone; comminuted three point fracture of the mandible at perisymphseal area and body bilaterally.

Figure 2  CT scan section of the hyoid bone showing fracture of Lt lateral body.

Figure 3  CT scan section of the thyroid cartilage showing fractures of body and Rt lamina.
only after a head-to-mandible bandage was added to the nasal and intraoral packings. The patient received four units of blood, regained consciousness and was operated for his facial injuries within 24 hours from admission. Post-traumatic anterograde amnesia related to the accident with no other neurological deficit or abnormality was reported at 2-month follow up in the maxillofacial clinic.

Discussion

When orotracheal intubation (OTI) fails or is impossible, the laryngeal mask airway (LMA) is a useful adjunct to utilize for manually ventilating unconscious patients with an incomplete airway obstruction. Obvious drawbacks are the possibility of exacerbating existing injuries and the lack of protection from aspiration in the airways. Its main advantage is that it buys time before a definitive surgical airway is established. If LMA fails to ventilate the patient, an emergency surgical airway is immediately required.

The *imromptu* decision to perform a tracheostomy was instinctive and dictated by the rapid correlation of critical factors in the clinical scenario: (i) the simultaneous presence of gurgling noises and hypoxaemia; (ii) the endotracheal tube apparently in situ but not secured; (iii) the mouth/mandibular complex severely injured (bleeding and likely obstructing the airways mechanically); (iv) the swollen neck with impalpable anterior landmarks possibly disguising underlying laryngeal complex injuries. Quoting Trunkey: "*In the evaluation and treatment of actual life-threatening conditions, algorithms do not help in decision-making. Humans do not think in a binary fashion. Instead they use cluster analysis*."12 Gurgling noises or stridor after trauma to the face and neck or in presence of hypoxaemia are cardinal signs of impending airway obstruction. Cricothyroidotomy (CTY), which can be performed within half a minute, is a temporary surgical airway technique used when endotracheal intubation is unsuccessful (anatomical difficulties) or impossible (trismus and not negotiable upper airways obstruction) and an LMA cannot ventilate the patient. It is the technique of choice in a situation of impending or actual respiratory-cardiac arrest by hypoxia from upper airways obstruction as for its rapid and easy accomplishment. The technique remains contraindicated in anterior soft tissue neck swelling with loss of landmarks, in presence of obvious thyroid/cricoid cartilages damage and in pre-pubertal children.

Open standard tracheostomy (OST) allows quick, fast and easy management of critical intraoperative complications, i.e. peritracheal and intratracheal bleeding, cannula malposition/dislodgement, tracheal damage, airway loss with sudden fall of airways pressures and hypoxia (Table 1). As for the palpable trachea, a closed or percutaneous tracheostomy (PCT) with 1—1.5 cm skin incision, or a semipenetrating tracheostomy (SOT) with 2—3 cm skin incision down to visualize the pretracheal fascia followed by a percutaneous method, would also have permitted rapid oxygenation: but both the PCT and SOT tracheostomy techniques were not considered safe in this case because of potential intraoperative and perioperative complications, worsening the existing hypoxia and causing hypoxic or vagal-reflex mediated cardiac arrest. The vertical skin incision would have given more space for manoeuvring and is known to make the procedure safer, easier and faster. OST, by the very nature of the procedure, allows the tracheotomy to be easily targeted in the most optimal site on the membrane between the second and third tracheal rings without unduly damage to the adjacent cartilaginous rings and to be fashioned for a perfectly

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<th>Table 1 Complications of tracheostomy (modified from Refs. 2,4,10)</th>
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<td>Early (intraoperative or perioperative)</td>
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<td>Delayed (postoperative)</td>
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matching cannula. The site and the centrality of the initial needle puncture/tracheotomy are crucial in avoiding complications: a plane of dissection not strictly on the midline, a high/very high tracheotomy for its proximity to the larynx, a low tracheotomy for life-threatening CTY and PCT intraoperative complications.

The classical two indications for emergency tracheostomy (laryngeal injury and failure to secure the airway with orotracheal intubation or cricothyroidotomy) are too generic and encompass a broad spectrum of possibilities. In principle they are unquestioned, in practice they are of difficult application and not helpful in deciding whom exactly and, most importantly, when a patient should have an emergency tracheostomy as a life-saving bedside procedure. As a matter of fact the two groups of indications are not sensitive, not specific, and not accurate. The most important drawback is that their practical application is operator’s experience/skills dependant. Specific indications for emergency tracheostomy are scattered in literature but are biased, partially comprehensive, not clearly described or homogeneously gathered. A list of the indications is proposed with emphasis on semiotics and semantics (Table 2).

Acknowledgement

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References


Table 2 Indications for emergency tracheostomy in blunt face/neck trauma

(i) Disruption of the midface i.e. multiple unstable (comminuted or displaced) fractures of: (a) at least two out of three between the two zygomatic-maxillary complexes (comprising also the zygomatic process of the temporal bone and the lateral and inferior walls of the orbit) and the naso-orbital-ethmoid complex (comprising also the medial wall of the orbit) or (b) unstable fracture of the superior dentoalveolar arcade/external nose complex with inability to lay a face mask effectively, to ventilate the patient or to fix an ETT

(ii) Disruption of the lower face, i.e. unstable (comminuted or displaced) three point fracture of the mandible (persymphysial + bilateral body or ramus or angle or condyle) with inability to lay a face mask effectively, to ventilate the patient or to secure an ETT

(iii) Impeding or actual upper airways (oro-pharynx and laryngopharynx) obstruction with any known oedema, foreign body, haemorrhage, haemathoma, palpable anterior neck landmarks deformity (HB, TC, CC) or compressing cervical spine injury not treatable or worsened by ETT

(iv) Impeding or actual upper airways obstruction + loss of palpable thyroid or cricoid cartilages landmarks with consequent inability to rule out underlying laryngeal injuries and preclusion to a CTY