

Anaesthesia for facial trauma

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Abstract

Facial trauma is common and can produce both physical and psychological problems for patients. Managing patients in both the emergency setting and elective theatre environment can be extremely challenging, so airway interventions should be carefully planned so the safest and most effective technique can be chosen. This may mean that direct laryngoscopy may not be the safest or most straightforward option and awake fiberoptic intubation, videolaryngoscopy, submental intubation or awake tracheostomy may be a better choice in a given set of circumstances. An understanding of common mechanisms of injury and pathologies and the likely difficulties that will be present are essential. Senior anaesthetic input and effective teamwork are required to provide excellent levels of care for these patients.

Keywords Airway; anaesthesia; facial trauma; intubation; maxillofacial

Royal College of Anaesthetists CPD Matrix: 1B02, 1C01, 1C02, 2A01, 2A02, 3A01, 3A10

Background

Facial trauma can significantly affect patients in both the short and long term, producing aesthetic, functional and psychological problems. Functionally, it can affect mastication, eyesight, sense of smell, taste, swallowing, and breathing depending on the site of injury. Facial trauma may be associated with concurrent polytrauma and/or vascular complications. It is possible that these factors in combination with aesthetic complications may have a profound psychological impact on a person's life.

Patients may present with injuries requiring immediate medical treatment in the emergency department, commonly due to either haemorrhage or airway compromise,¹ or may present in a more stable situation allowing more time to assess injuries and formulate treatment plans.

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Learning objectives

After reading this article you should be able to:

- identify likely causes and patterns of facial trauma injuries
- select appropriate airway management techniques in the emergency setting
- perform airway management for specific maxillofacial injuries in the stable patient
- formulate anaesthetic management plans for patients with facial trauma

Aetiology

Patients present with isolated facial trauma or facial trauma in combination with other significant injuries. Individuals with a single facial fracture have been shown to have an incidence of cervical fracture at 5–8% and head injury 20–80%, and those with at least two facial fractures have a 7–10% incidence of cervical fracture and a 65–89% incidence of head injury.² Between 55% and 70% of patients presenting with facial trauma have been shown to have other significant injuries.^{3,4} Polytrauma is likely to be a combination of both penetrating and blunt force trauma.

The two most common causes of facial trauma are assault and road traffic accidents, with blunt trauma more common than penetrating trauma.¹ Other causes include sports injuries (most often football, rugby, hockey, boxing and cycling), falls, accidents, dog bites and gunshot injuries. Improved road safety measures including seat belts, airbags and a reduction in people driving under the influence of alcohol have reduced the trauma association with road traffic accidents over the past 30 years.¹ The use of helmets by bicyclists reduces the risk of head, brain and severe brain injury by 63–88%, providing equal protection for crashes involving motor vehicles (69%) and crashes from all other causes (68%). Additionally, injuries to the upper and mid-facial areas are reduced by 65%.⁵

Prevention of injuries caused by violent assaults is also clearly important and local initiatives may help in this regard. Examples of such initiatives exist throughout the UK. One example in Scotland is the 'Medics against violence' programme. This organization was started by healthcare professionals in Scotland and is supported by the Scottish Government. It consists of a school education programme consisting of anti-violence lessons to pupils about 13 years of age, and a domestic abuse training programme.⁶

Anatomical considerations

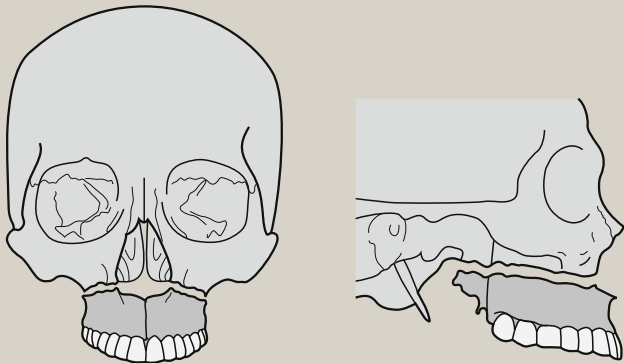
Anaesthetic management of facial trauma requires understanding of maxillofacial anatomy. The human skull is divided in two major parts, the cranial skeleton which contains and protects the brain and the facial skeleton, which can be subdivided into three parts:

- the upper face: frontal bone and fronto-zygomatic processes
- mid-face: orbits, nasal bone, ethmoid, zygoma and maxilla
- lower face: mandible.

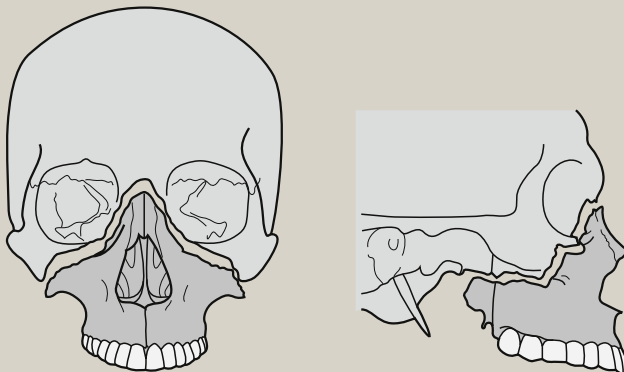
The facial skeleton has natural points of weakness and strong dense bones called buttresses, and in the context of trauma, acts as a crumple zone to protect the brain. Fractures occur in

Le Fort fracture lines

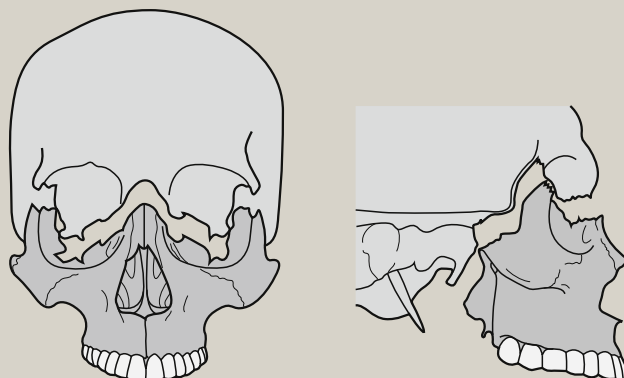
a Le Fort 1 fracture



b Le Fort 2 fracture



c Le Fort 3 fracture



a The Le Fort 1 fracture line passes through the inferior wall of the antrum and allows the tooth-bearing segments of the upper jaw to move in relation to the nose. **b** In a Le Fort 2 fracture the maxilla and nose can move as a block in relation to the frontal bone and zygoma. **c** In a Le Fort 3 fracture the facial bones are able to move separately from the base of the skull. Le Fort 2 and 3 fractures may be associated with a dural tear resulting from fracture of the cribriform plate of the ethmoid bones. In Le Fort 3 fracture the base of skull bones (sphenoid and/or temporal) are involved.

characteristic points where the bone is weak, and may be unilateral or bilateral. Comminuted fractures imply high-energy transfer. High-impact force will cause trauma to the supraorbital rim, frontal bone, maxilla and mandible, whereas the nasal bones and zygoma can be damaged even in low impact trauma.

The rich blood supply to the face can lead to bleeding during trauma. But in the context of hypovolaemic shock in a trauma patient other causes of haemorrhage should be sought. Rarely, a major bleed from facial trauma can occur from end branches of the maxillary artery or from epistaxis.

Classification

Maxillofacial trauma can be classified as:

- soft tissue injury with no underlying bone trauma
- bony skeleton fractures, upper, middle and lower; middle facial fractures are further classified as LeFort I, II, III
- laryngeal and tracheal trauma.

Soft tissue facial injury

Extensive soft tissue injury around the nose and face can lead to difficult face mask ventilation.

Facial fractures

Upper facial fractures

Fractures involve the frontal bone, sinuses and orbit. Anterior skull base fracture can occur with cerebrospinal fluid (CSF) leak and risk of infection. Although not absolute contraindication, care with nasal intubation, nasogastric tube and temperature probe is required.

Middle facial fractures

Fractures of the mid-face are classified as LeFort I, II and III (Figure 1). LeFort fractures can commonly involve fractures of the mandible.

- LeFort I horizontal fracture separates the teeth and the lower maxillary part from the upper facial structures. The patient will have facial oedema and mobility of hard palate and teeth.
- LeFort II triangular fracture that separates the maxilla from the zygoma. The maxilla may be displaced backwards in the facial skeleton and free floating. The patient will have facial oedema, epistaxis requiring packing and possible CSF leak.
- LeFort III complete dissociation of facial skeleton from cranial skeleton. The patient may present with significant facial oedema, flat dish face deformity, epistaxis and CSF leak with associated base of skull fracture. If the maxilla is displaced posteriorly it may act to close off the posterior airway.

In middle facial fractures, epistaxis may lead to significant blood loss and need to be controlled with packing, which may make bag/valve/mask ventilation difficult. Due care with NG tubes and temperature probes is required if base of skull fracture is suspected. CNS infection if CSF leak is present should be considered. Nasal intubation may be contraindicated which is discussed in more detail later.

Figure 1 LeFort classification of middle facial fractures. (Reproduced from: Joy E Curran. Anaesthesia for facial trauma. *Anaesthesia and Intensive Care Medicine* 2014).

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