

**The American Academy of Otolaryngology—
Head and Neck Surgery Foundation
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Chapter 11: Maxillofacial Trauma

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Print: First Edition 2001, Second Edition 2004

eBook Format: Second Edition, 2005

ISBN 978-1-56772-093-8



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Working for the Best Ear, Nose, and Throat Care
One Prince Street | Alexandria, VA 22314-3357 | 1-703-836-4444 | Fax: 1-703-684-4288

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Chapter 11: Maxillofacial Trauma

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Dr. Gregory Staffel first authored this short introduction to otolaryngology for medical students at the University of Texas School for the Health Sciences in San Antonio in 1996. Written in conversational style, peppered with hints for learning (such as "read an hour a day"), and short enough to digest in one or two evenings, the book was a "hit" with medical students.

Dr. Staffel graciously donated his book to the American Academy of Otolaryngology—Head and Neck Surgery Foundation to be used as a basis for this primer. It has been revised, edited and is now in the second printing. This edition has undergone an extensive review, revision and updating. We believe that you, the reader, will find this book enjoyable and informative. We anticipate that it will whet your appetite for further learning in the discipline that we love and have found most intriguing. It should start your journey into otolaryngology, the field of Head and Neck Surgery.

Enjoy!

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When you are treating maxillofacial trauma, obviously, the basic (ABC) tenets of trauma management hold:

1. You must secure an **A**irway.
2. You must make sure the patient is **B**reathing and ventilating adequately.
3. You must ensure adequate **C**irculation by stopping bleeding and providing fluid replacement.
4. You must ensure that no **C**-spine fracture is present.

First, the airway. Health care professionals always wonder whether a patient should have a cricothyrotomy or intubation. This is, indeed, sometimes a judgment call. One way of thinking about this is to go down a checklist of ways to secure the airway.

Don't forget that the most common cause of airway obstruction in a patient with an altered level of consciousness is the tongue falling back into the throat. This can be treated by a **jaw lift maneuver**, an **oral airway**, or a **long nasal airway**. Don't forget the possibility of a foreign body (dentures in adults; balloons, small toys, food, etc., in children) obstructing the airway. If the cause of airway obstruction isn't so simple, however, the quickest and easiest method of securing the airway is **endotracheal intubation** through the mouth. This requires placing a laryngoscope down through the mouth to the larynx (**direct laryngoscopy**) and lifting



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up. The **vocal cords** are seen and then the tube is placed into the trachea. But this technique may not work for two reasons. The first reason is if the patient has a broken neck. Direct laryngoscopy requires movement of the neck, and if the neck is broken, it can possibly move during the procedure and compress the spinal cord, causing paraplegia, quadriplegia, or death. Therefore, oral endotracheal intubation is not to be performed if a patient has either a known C-spine fracture or the possibility of having a C-spine fracture that hasn't been ruled out by a lateral neck film. The second reason you might not be able to perform oral intubation is massive trauma with distortion of landmarks and bleeding. The patient might actually have had a lateral C-spine film

**Figure 11.1.**

Nasal fracture. Note that the bony nasal pyramid has been shifted toward the patient's left. This is the most common direction because patients who suffer from this injury are most likely to have been struck by a right-handed individual! Repair is straightforward but should be completed within 5-7 days to ensure optimal outcome.



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that showed no C-spine fracture; however, at direct laryngoscopy, all you can see is blood and torn tissue. This patient will obviously need a surgical airway. You would perform a cricothyrotomy unless there is concern over a **fractured larynx (widened thyroid cartilage, subcutaneous air [crepitus], neck bruising, hoarseness, coughing up blood)**, in which case, a tracheotomy is the procedure of choice. Remember: Normal lateral C-spine film doesn't completely rule out a C-spine fracture. Intubation in a trauma situation requires that **in-line cervical traction** be applied to the head by someone other than the intubating doctor at the time of intubation.

Next on the checklist, if you can't perform an oral intubation, you can sometimes perform a **fiberoptic nasotracheal intubation**. In this case, an endotracheal tube is passed through the nose down into the **hypopharynx**, guided by a fiberoptic endoscope placed through the endotracheal tube. With the endoscope, you can see when the tube approaches the larynx, and immediately after an expiration, the scope is advanced into the larynx. You must wait until just after an expiration because the vocal cords open when the patient takes a breath in, and this is an ideal time to push the endoscope through. Once the endoscope is in the trachea, the tube is passed over it and the endoscope is removed. The advantage of the fiberoptic nasotracheal intubation technique is that the



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neck isn't manipulated at all, so if a C-spine fracture hasn't been ruled out, it is still a viable option. However, this technique isn't feasible if visualization is obscured by secretions, blood, or swelling. Also, if there is a **severe midface injury** with possible **cribriform plate fracture**, then passage of a nasogastric or blind nasotracheal tube is contraindicated because the tube may pass into the brain.

You now come to the 3rd option in airway management. You've gone through your checklist as above and determined that the patient's tongue isn't the problem, you can't perform



Figure 11.2.

Lateral C-spine x-ray of a patient who suffered a facial injury. The black dot marks vertebra C7. Care must be taken to ensure that all 7 cervical vertebrae are visible. Head and neck stabilization is required in all serious head and neck injuries until there is radiographic evidence that the C-spine is uninjured.



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an oral intubation (perhaps because the lateral C-spine film shows a broken neck), and you can't perform a naso-tracheal intubation (perhaps because the patient has profuse oral bleeding). You then realize that the only option is a surgical airway. The method of choice is a tracheotomy or a cricothyrotomy. In an emergency, cricothyrotomy may be chosen over tracheotomy because it's quicker and is accomplished through the relatively thin cricothyroid membrane. You should learn to palpate and recognize the cricoid cartilage. Try it on yourself. The membrane is just above the cricoid cartilage, below the thyroid cartilage (the Adam's apple). The choice of which procedure to perform may depend on the level of expertise available.

Other Aspects of Maxillofacial Trauma Management:

Any person who has sustained enough trauma to break a facial bone should be assumed to have a C-spine fracture until this is ruled out. Rule #1 in maxillofacial trauma management is secure the **A**irway, **B**reathing, and **C**irculation. Rule #2 is rule out a C-spine fracture if it hasn't already been done. Rule #3 is evaluate the patient completely. Look in the ears for hemotympanum, which can signify a temporal bone fracture. Check that the facial nerve works on both sides, since a complication of temporal bone fracture may be facial nerve paralysis. Any temporal bone fracture is something for which an otolaryngologist should be consulted. Next, palpate the orbital rims to ascertain



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whether or not a **malar (tripod) fracture** has occurred. Make sure the patient isn't experiencing double vision, which can occur when an **orbital blowout fracture** happens and the **inferior rectus** or **medial rectus** can become entrapped. Make sure that there is no **infraorbital nerve hypesthesia**, which can also occur with a blowout fracture or a tripod fracture.



Figure 11.3.

Bilateral periorbital ecchymoses and subconjunctival hemorrhages. This may be due to soft tissue trauma only, or it may be a manifestation of underlying fracture.

Next, evaluate the nose.

In general, isolated nasal fractures can be reduced up to 14 days

after the fracture, if they cause a cosmetic deformity or airway obstruction. It is easier to do when there is less swelling and, usually, the swelling goes down by 5-7 days.

If the septum has been broken, you must rule out a **septal hematoma**, the formation of a blood clot between the **perichondrium** and cartilage that disrupts the nourishment of



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the cartilage. This can result in **septal necrosis**, with subsequent perforation due to either a loss of nutrition from the perichondrium or a secondary infection of the hematoma, generally with *Staphylococcus aureus*. These are treated by incision and drainage and packing to ensure that they don't re-accumulate. Remember: Radiographs aren't particularly helpful in cases of a broken nose, because old fractures can't be distinguished from acute ones.

Generally, inspection and palpation are the best ways to diagnose a broken nose. Uncomplicated nasal fractures are treated with antibiotics, pain medicine, a decongestant nasal spray, and a referral for reduction within 3-5 days.

Continuing with the exam, evaluate the stability of the maxilla by grasping the maxilla area just above the front teeth and applying a gentle rocking motion. If the maxilla is unstable, you will feel it move separately from the face. This is a **LeFort fracture** and will require **surgical plating**. A complete bilateral LeFort III fracture is rare and involves massive trauma, usually with spinal fluid leakage. The procedure involves disarticulating the face from the skull. The remaining soft tissue attachments consist largely of the optic nerves, thus the *gentle* rocking. A CT scan will elucidate the situation if you are unsure.

Check the patient for **cerebrospinal fluid (CSF)** rhinorrhea, since a basal skull fracture or temporal bone fracture can leak first into the middle ear, which drains down



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into the Eustachian tube and out the nose. Alternatively, the site of leak may be just above the cribriform plate. Remember that CSF mixed with blood produces a ring sign on the sheets or on

filter paper and also that CSF has a measurable glucose concentration, and mere nasal secretions do not. Beta-transferrin is a protein only found in CSF. So a positive test is diagnostic of a CSF leak.

Evaluate the mandible. Examine the patient's occlusion and ask if his or her teeth fit together like they always have. Mandibular fractures are generally treated with a combination of intermaxillary fixation and the surgical application of plates.



Figure 11.4.

Coronal CT scan demonstrating a blowout fracture of the right orbit. This fracture often results in entrapment of the inferior rectus muscle and limitation of upward gaze.



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Trauma to the neck may injure the larynx or trachea. For example, blunt trauma from a steering wheel or garrote can cause fracture of the thyroid cartilage, cricoid, or both. A complete crush isn't compatible with life unless someone handy with a knife is waiting to do an immediate cricothyrotomy—lesser injury generally results in progressive hoarseness and **stridor**. The only initial physical finding may be **cervical ecchymosis**. Check for loss of cartilaginous landmarks and feel for subcutaneous air (**subcutaneous emphysema**). Any positive finding is an indication for further evaluation with laryngoscopy, possible CT, and observation. Penetrating wounds to the neck may also indicate injury to the vascular structures or airway. Immediate expert evaluation will determine if surgery is required.



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Questions, Section #11

1. The first priority in management of maxillofacial trauma is securing the _____
2. In an unconscious patient, the most common cause of airway obstruction is _____
3. Two reasons that oral endotracheal intubation may be contraindicated are _____ and _____
4. A contraindication to blind nasotracheal or nasogastric intubation is _____
5. The nerve that is commonly not evaluated upon initial presentation, but whose management depends greatly on the examination at the initial time of presentation is the _____ nerve.
6. A fractured nose can be reduced in up to 14 days without complications; however, a _____ must be ruled out at the time of the initial fracture.

Answers

1. Airway
2. Prolapse of the tongue posteriorly
3. A broken neck, massive trauma with distortion of landmarks and bleeding
4. Cribriform plate fracture
5. Facial
6. Septal hematoma



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