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A healthy 28 year old male participated in a mixed martial arts competition. He is 66 inches and 150 pounds. He received maxillofacial fractures (LeFort fracture III) and became unconscious. EMS arrived on scene and determined his Glasgow Coma Scale was 12 at 1900. He was estimated to have a 10% blood loss originating from his face. The patient had a CT scan upon arrival, and the test revealed a minor subdural hematoma. His vital signs: heart rate 95, blood pressure 111/74, respiratory rate 18, and SpO2 90%. He has no known drug allergies. The patient was transported to the OR for facial reconstruction surgery.

The population that commonly presents with maxillofacial trauma is patients in their mid 20's. The patient should be thoroughly examined for neuronal and secondary damage from the trauma. These include systemic factors like hypoxemia, hypercapnia, hypotension, formation and expansion of an epidural, subdural, or intracerebral hematoma, and sustained intracranial hypertension. The Glasgow Coma scale score positively correlates the severity of the injury with the patient's level of recovery. Any GCS score less than 8 on admission to the hospital holds a 35% mortality rate.

Based upon the presented patient information, the anesthesia team needs to address the five keys to trauma anesthesia prior to the patient's arrival to the OR. These include airway, IV access, hemodynamic resuscitation, avoiding the lethal triad (hypothermia, acidosis, coagulopathy), and supplying 100% oxygen.

Facial Trauma Reconstruction

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Case Study:

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He will likely tolerate anesthesia and surgery well as opposed to an older patient with comorbidities. Upon examination, he has general face trauma and needs repairs to his teeth, upper jaw, nose, cheekbones, and orbitals. The type of facial fracture that the patient presents is a Le Fort III fracture. There are three types of Le Fort facial fractures which are divided as Le Fort I, II, and III. Le Fort III is a transverse fracture seen in the upper maxilla which includes the cheekbones, nose, and orbitals.

The plastic surgeon will be working on his soft tissue injuries, reconstructing his face, mending his fractures, and performing a rhinoplasty.

Soft tissue injuries are common in maxillofacial traumas and it is best to correct up to 24 hours post-injury. Since soft tissues have rich blood supply, they can be salvaged, especially with soft tissues of the face.

The vigorous perfusion of facial soft tissues gives it the resilience against infection. Full-thickness skin grafts can be taken from other areas of the body like the ear, clavicle, or neck; preferably from an area that matches color, thickness and texture to achieve a more natural look. In our case, the patient needs reconstruction of his cheeks and the surgeon can construct skin flaps from the sides of the face or neck to be transposed. Due to the patient's facial trauma, there is a chance that he may have facial nerve injury. It is prudent to identify the distal ends of the facial nerve with a nerve stimulator to tag it. If they are not identified and become lacerated, the patient will lose function in his face. Another common facial injury is the parotid duct and is commonly caused by trauma to the cheek. One way to identify damage is to inject a methylene blue dye to see if there is any extravasation of the dye. If extravasation is present, then there is parotid duct laceration. The surgeon will have to put a stent in place to avoid complications postoperatively.

For his maxillofacial trauma, titanium plates and bone grafting are techniques used to reduce fractures and provide rigid bone fixation. It is important to perform reconstruction as soon as possible after a trauma; otherwise, shrinkage or tightening of facial soft tissues will result. Fractures of the upper midface include zygoma, naso-orbitoethmoid and orbital fractures. Mandibular fractures are treated with open

reduction and internal fixation. However, fixation can be a complicated task if permanent teeth are present in the maxilla and mandible due to damage by fixation hardware. Luckily, our patient only received upper jaw damage and will not need an ORIF. The physicalities that plastic surgeons plan to achieve when reconstructing the face are facial height and projection. Our patient will also need a rhinoplasty as he received a broken nose from the fight and incurred injuries to the nasofrontal ducts that drain the frontal sinuses into the nose. A rhinoplasty is done to restore the caliber of the nasal airway and is a complicated procedure involving a number of anatomical structures.

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Prior to the start of the case, the anesthesia technologist will perform a FDA checkout on the anesthesia machine to ensure it is safe to use. Standard ASA monitors will be placed on the patient (pulse oximeter, 5 lead EKG, blood pressure cuff, EtCO₂, and temperature probe). On standby,

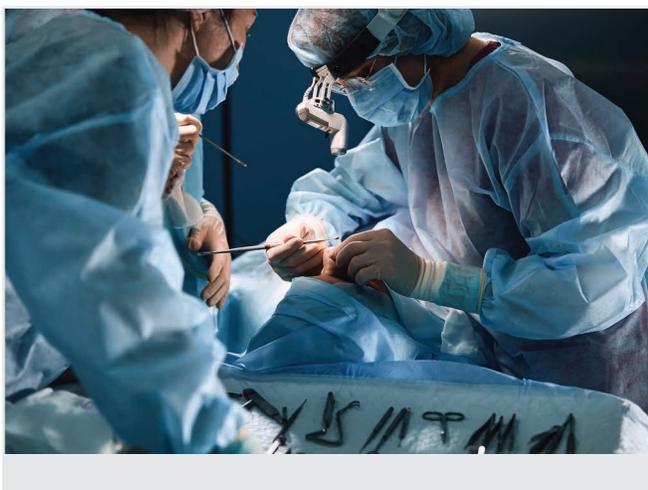
the difficult airway cart, a hotline and arterial line with an ultrasound is placed in the room. Standard emergency drugs such as vasopressors, beta blockers, anticholinergics and crystalloids will be on top of the cart. A long circuit and a flex connector are provided for the 90-180 degree table turn. The patient has an upper body bair hugger for temperature maintenance. Two units of typed and screened blood should be on hold if the provider suspects significant blood loss. Antibiotics are generally used to prevent infection and to avoid complications post-operatively with sepsis. In preparation for trauma cases, rapid sequence induction is necessary.

For positioning, the patient will be supine in a slight head-up to minimize bleeding and have his pressure points padded. The patient will be preoxygenated with 100% O₂ for about 3-5 minutes via blow-by. This is because the patient lacks adequate facial structure and will result in a poor seal for masking. A rapid sequence induction will be performed with a muscle relaxant and induction agent, rocuronium and etomidate simultaneously, with the application of cricoid pressure. Rocuronium is a nondepolarizing muscle relaxant which will not cause an increase in intracranial and intraocular pressures compared to succinylcholine. Succinylcholine is a depolarizing muscle relaxant and

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contraindicated for this patient due to its negative side effects and has no reversal drugs for it. Etomidate will not drop blood pressure significantly because of its clean cardiac profile when compared to propofol. Cricoid pressure will be used during the induction and intubation phases; suction must always be available. Jaw opening, mask fit, neck mobility, micrognathia, retrognathia, maxillary protrusion, macroglossia, dental pathology, nasal patency, and intraoral lesions or debris will determine how the provider will intubate the patient. An oropharyngeal pack is placed to minimize the amount of blood and other debris reaching the larynx and trachea. For this procedure, an oral RAE tube will be used because it is south facing and will enable the surgeon to work on the LeFort III fractures. Size 7.0 and 7.5 oral RAE tubes will be set up with a GlideScope or McGrath.

After intubation, the anesthesia provider will protect the patient's eyes with ophthalmic ointment and lightly tape them shut to prevent corneal abrasion. Transcranial Doppler sonography will be placed on the patient's head and is a noninvasive continuous measure of the velocity of blood flow in the major blood vessels in the "Circle of Willis" within the brain. As a precaution for increased intracranial pressure, the patient should be treated with moderate hyperventilation, mannitol, or pentobarbital for his intracranial hypertension due to his subdural hematoma. The arterial line will give the provider a real-time blood pressure and allow viewing of the closure of the aortic valve via the dicrotic notch. A secondary IV is ideal to allow rapid infusion if necessary. Additional equipment



Sevoflurane will be used and has a low blood:gas solubility which means it has a fast on and offset.

for point-of-care testing will be needed and may include a glucometer, i-STAT, HemoCue, blood gas analyzer, or whole blood microcoagulation system.

For the maintenance of general anesthesia, the anesthesia provider will use volatile agents, analgesics, muscle relaxants, and antibiotics. Sevoflurane will be used and has a low blood:gas solubility which means it has a fast on and offset. In terms of pain control, the anesthesia provider can use a nonsteroidal anti-inflammatory drug such as Ketorolac. Ketorolac's analgesic effects can last up to 6-8 hours and will not cause respiratory depression or

nausea and vomiting like with opioids. Rocuronium is used for maintenance; its onset is similar to succinylcholine. Cephalosporin is typically used in surgery and is an effective antimicrobial.

For emergence, extubation should only be performed on the awake patient who has regained control of protective

reflexes. The use of intravenous lidocaine may help reduce coughing prior to extubation and prevent bleeding in the postoperative period. Although our patient is young and his level of consciousness prior to surgery was moderate, his subdural hematoma is a factor to keep the oral RAE in postoperatively. The treatment of nausea and vomiting via Zofran, Reglan, Versed or Valium is important in preventing aspiration and keeps surgical wounds from reopening.

The anesthesia technologist must anticipate potential risks during induction, maintenance and emergence. Airway is the most critical aspect of anesthesia. Once the oral RAE is placed, the tube can become dislodged, kinked, disconnected, or perforated throughout surgery. This poses a problem because the anesthesiologist is no longer present at the head of the patient. In the induction phase, if the glidescope or McGrath is unsuccessful, a fiberoptic or tracheostomy can be attempted. A blind nasal intubation is contraindicated in the presence of a basilar skull fracture, ecchymosis of periorbital tissues, "raccoon eyes," or if present behind the ear, "battle's sign."

Due to the nature of the injury and length of the procedure, there are potential complications that can occur, for instance, a maxillofacial trauma may accompany a pneumothorax,

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cervical spine injury, subdural hematoma, and intra-abdominal bleeding. Hypotension may also occur after induction, causing vasodilation and hypovolemia; treatment includes an alpha adrenergic agonist such as phenylephrine and volume infusion with crystalloids or colloids. Hypotension prevention includes a slight head-up position and an epinephrine infiltration.

Hypertension, on the other hand, is an anticipated event the provider and anesthesia technologist should be prepared for; this can stem from surgical stimulation or occur from elevated intracranial pressure. This can be treated by giving additional doses of the induction agent or by increasing anesthetic inhalation agents or vasodilators. A beta antagonist medication like esmolol can control high blood pressure and tachycardia. It should be noted that vasodilators should be avoided until the dura is opened if evacuation of the subdural hematoma should be elected.

Bradycardia can result when the surgeon starts working near the eyes and is a result of the oculocardiac reflex being triggered. When the surgeon applies pressure on the eyes or manipulates the eyes, it will affect the trigeminal nerve and vagal nerve pathways. The anesthesia provider will have the surgeon stop stimulation to the eyes, provide adequate oxygenation and ventilation and administer an anticholinergic like atropine as needed. A lidocaine injection can also be done to reduce the oculocardiac reflex.

Disseminated intravascular coagulation (DIC) is another event to keep a close eye on as this can cause an unanticipated event during maintenance. Release of thromboplastin from a brain injury can cause clots to form in the brain or throughout the body. DIC may also lead to acute respiratory distress syndrome; however, positive end expiratory pressure (PEEP) is applied on the ventilator to maintain adequate cerebral perfusion pressure (CPP).

If postoperative airway edema is observed upon extubation, the patient should be carefully observed or left intubated. Airway obstruction and laryngospasms are major postoperative concerns due to tissue edema or foreign bodies such as teeth, blood clots, or bone fragments. Emergency equipment such as a bag valve mask, airway adjuncts, and a difficult airway cart with emergency medications should be on standby to regain airway access.

The setup and anticipation we presented during each phase of anesthesia showcases the critical role we play in caring for the safety of the patient. As the profession evolves, new technology and continuing education are instrumental. 

References

- Butterworth, J.F., Mackey, D. C., & Wasnick, J. D. (2013). *Morgan & Mikhail's Clinical Anesthesiology* (5th ed.). New York, NY: The McGraw-Hill Companies, Inc. Pgs. 286, 601-604, 781-784
- Castillo, O., Cer. A.T.T. (2018). AVPU and Glasgow Coma Scale. Lecture. Retrieved from Kaiser Permanente School of Anesthesia Technology, *Advanced Principles of Anesthesia Technology*.
- Friedberg, Barry L. (2007) *Anesthesia in Cosmetic Surgery*. Cambridge, New York: Cambridge University Press. Pg. 162
- Heiner, J., CRNA. (2018). Trauma Anesthesia. Lecture. Retrieved from Kaiser Permanente School of Anesthesia Technology, *Advanced Principles of Anesthesia Technology*.
- Nagelhout, J. J., and Plaus K. L. (2010) *Handbook of Nurse Anesthesia (4th ed.)* St. Louis, MO: Saunders Elsevier. Pg. 313-314, 327-329, 331-332, 334-335, 339-340, 345-347
- Nagelhout, J. J., and Plaus K. L. (2014) *Nurse Anesthesia (5th ed.)* St. Louis, MO: Elsevier Health Sciences. Pg. 971
- Non Surgical Rhinoplasty- Tips and tricks. (2016, October 11). Retrieved July 11, 2018, from <http://www.healioswoundsolutions.com/dermatology/non-surgical-rhinoplasty-tips-tricks/>
- Sandberg, W. S., MD PhD, Urman, R. D., MD MBA, & Ehrenfeld, J. M., MD MPH. (2011). *The MGH Textbook of Anesthetic Equipment (1st ed.)*. Philadelphia, PA: Saunders Elsevier.
- Townsend, C. M., Beauchamp, R. D., Evers, B. M., & Mattox, K. L. (2017). *Sabiston Textbook of Surgery: The Biological Basis of Modern Surgical Practice (20th ed.)*. Philadelphia: Elsevier. Pgs. 1949-1952

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QUIZ
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Continuing Education Quiz

To test your knowledge on this issue's article, provide correct answers to the following questions on the form below. Follow the instructions carefully.

1. What are the five keys to trauma anesthesia?

- a) Airway, IV access, hemodynamic resuscitation, avoid the lethal triad, oxygen
- b) Airway, IV access, EKG, pulse ox, blood pressure cuff, inhalation agent
- c) Airway, hemodynamic resuscitation, oxygen, rapid sequence induction, succinylcholine
- d) Airway, EKG, pulse ox, blood pressure cuff, EtCO2

2. Who is responsible for the all-around care of the patient?

- a) Charge Nurse
- b) Certified Nurse Anesthetist
- c) Anesthesia Provider
- d) Anesthesia Technologist

3. What fractures are involved in LeFort III?

- a) Popliteal, mandible, cheekbones, orbitals
- b) Nasal, cheekbones, orbitals, maxilla
- c) Orbital, LeFort II, lower jaw, upper jaw
- d) Maxilla, mandible, upper jaw, lower jaw

4. What are complications of the surgeon working at the head?

- a) Tube can be dislodged
- b) Tube can be kinked
- c) Tube can be perforated
- d) All of the above

5. The arterial blood pressure transducer should be zeroed at what level of the patient to determine cerebral perfusion pressure?

- a) Level when patient is in the prone position
- b) Phlebostatic axis
- c) Level in trendelenberg
- d) The anesthesiologist determines where to zero the transducer

6. What is typically ordered for patients suspected to having subarachnoid hemorrhage in traumas upon arrival to the ER?

- a) CT (computerized tomography)
- b) MRI (magnetic resonance imaging)
- c) H/H (hemoglobin and hematocrit)
- d) Arterial blood gas

7. Which muscle relaxant is avoided in trauma cases?

- a) Rocuronium
- b) Succinylcholine
- c) Cisatracurium
- d) Atracurium

8. Which airway equipment is NOT indicated in trauma cases?

- a) Endotracheal tube
- b) LMA
- c) Cricothyrotomy kit
- d) Tracheostomy kit

9. What type of patient would you NOT want to perform RSI (rapid sequence induction)?

- a) Obstetric
- b) Bariatric
- c) Trauma
- d) Expired

10. Why is it important for a rhinoplasty patient to avoid coughing postoperatively?

- a) Bleeding
- b) Seizure
- c) Embolus
- d) Hypertension

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- 5: A B C D

- 6: A B C D
- 7: A B C D
- 8: A B C D
- 9: A B C D
- 10: A B C D

Quiz 2 of 2

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