# Optimizing Anesthetic Care in Corrective Jaw Surgery

Protocols, challenges, and strategies

Tarandeep Singh
Oral Maxillofacial Surgery


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20

# Facial Cosmetic Surgery Training

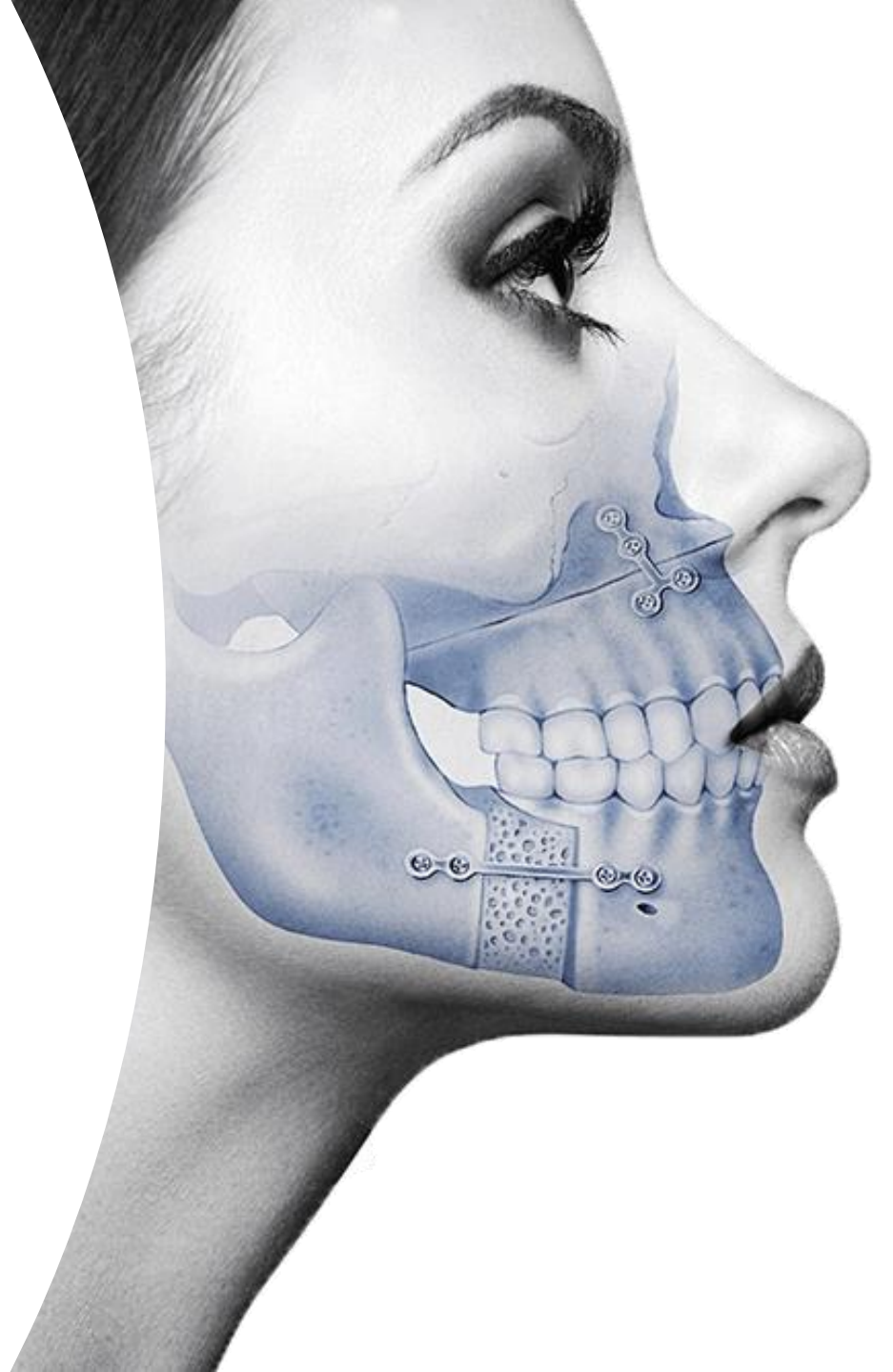
Acknowledge **Dr. Manolis Manolakakis** for his mentorship.

Guided me in understanding both the artistry and technical precision involved in facial surgery.

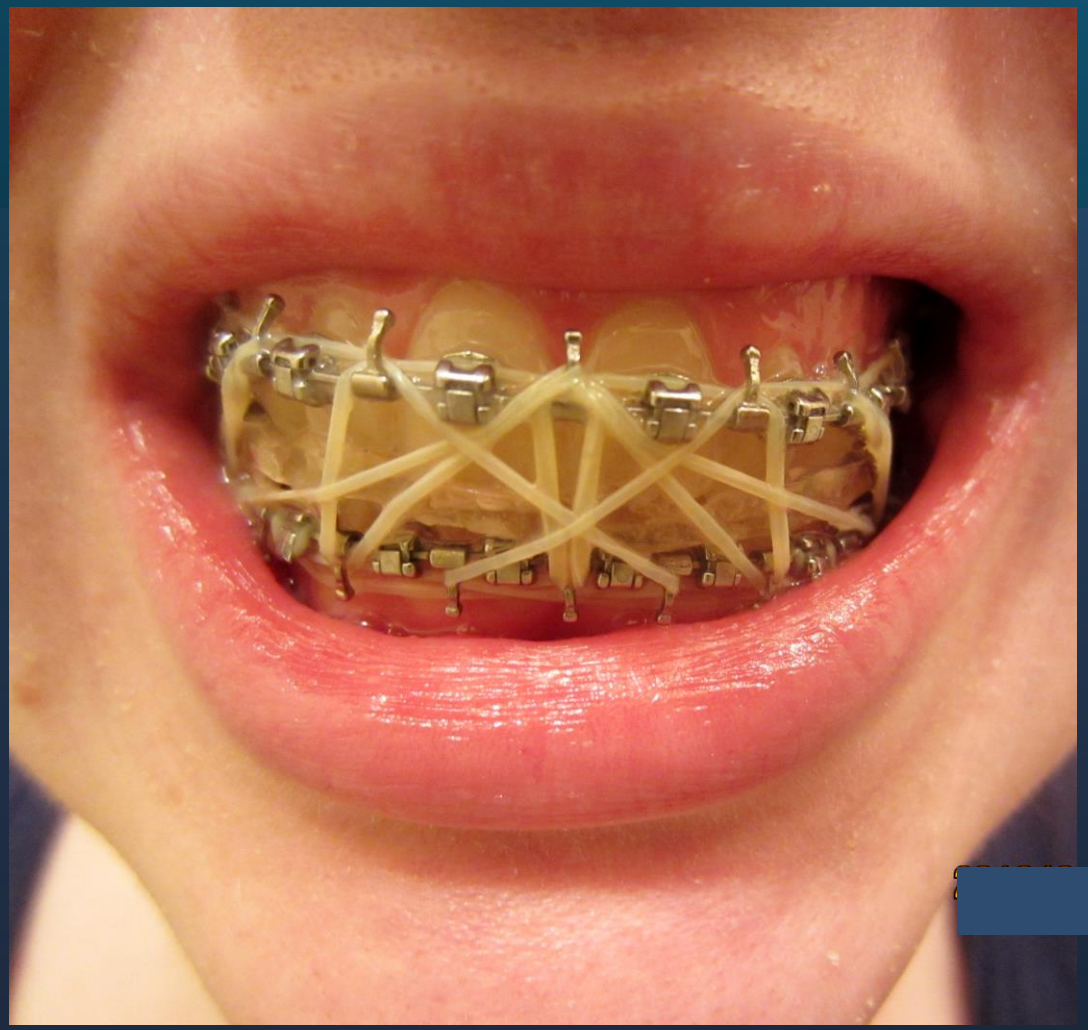
Procedures such as facelifts, neck lifts, rhinoplasties, brow lifts, and jaw surgery were a pivotal part of this learning journey.

# Corrective Jaw Surgery

The most **powerful** surgery for the face.




CardinalHealth



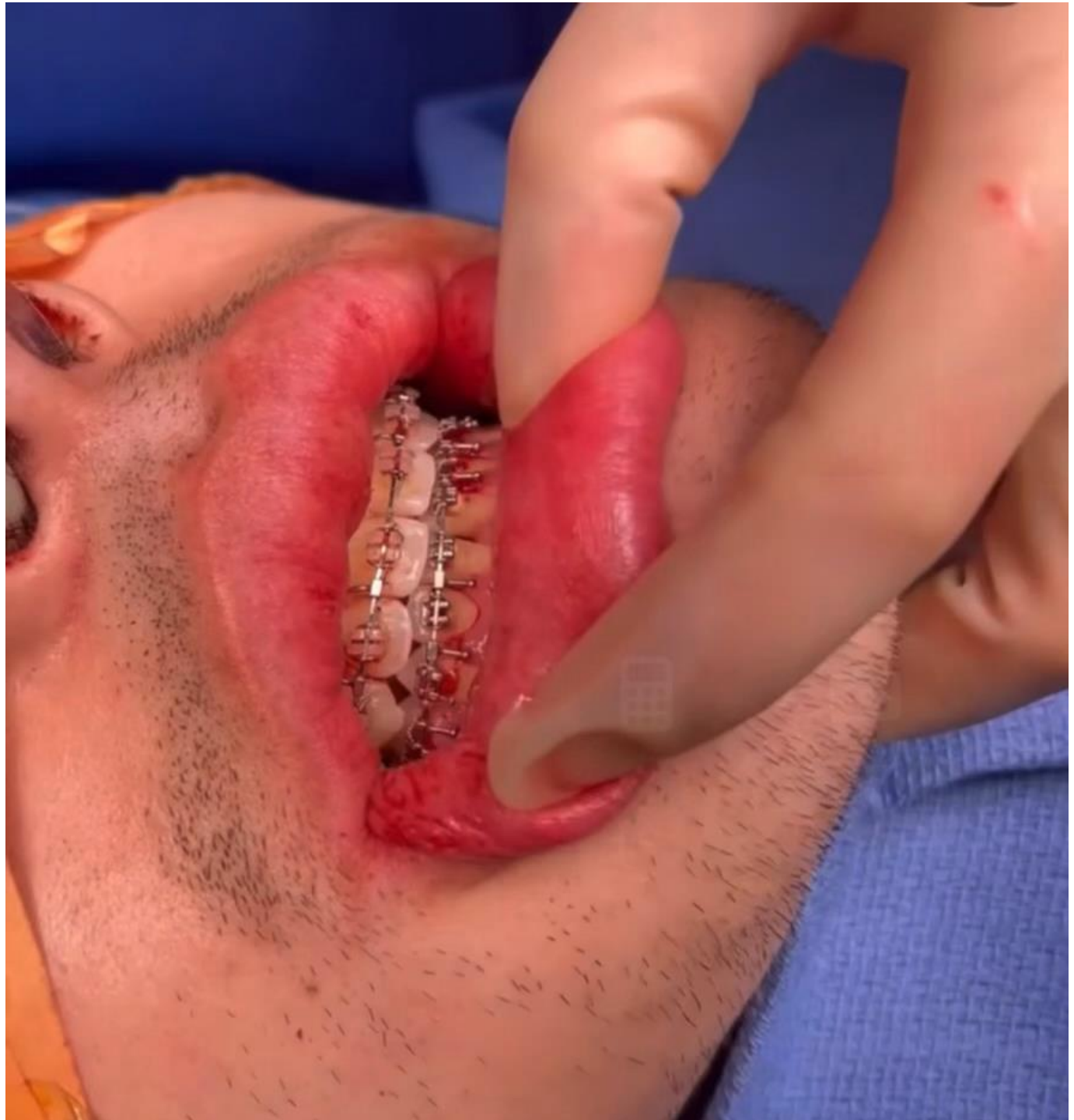
# Objectives

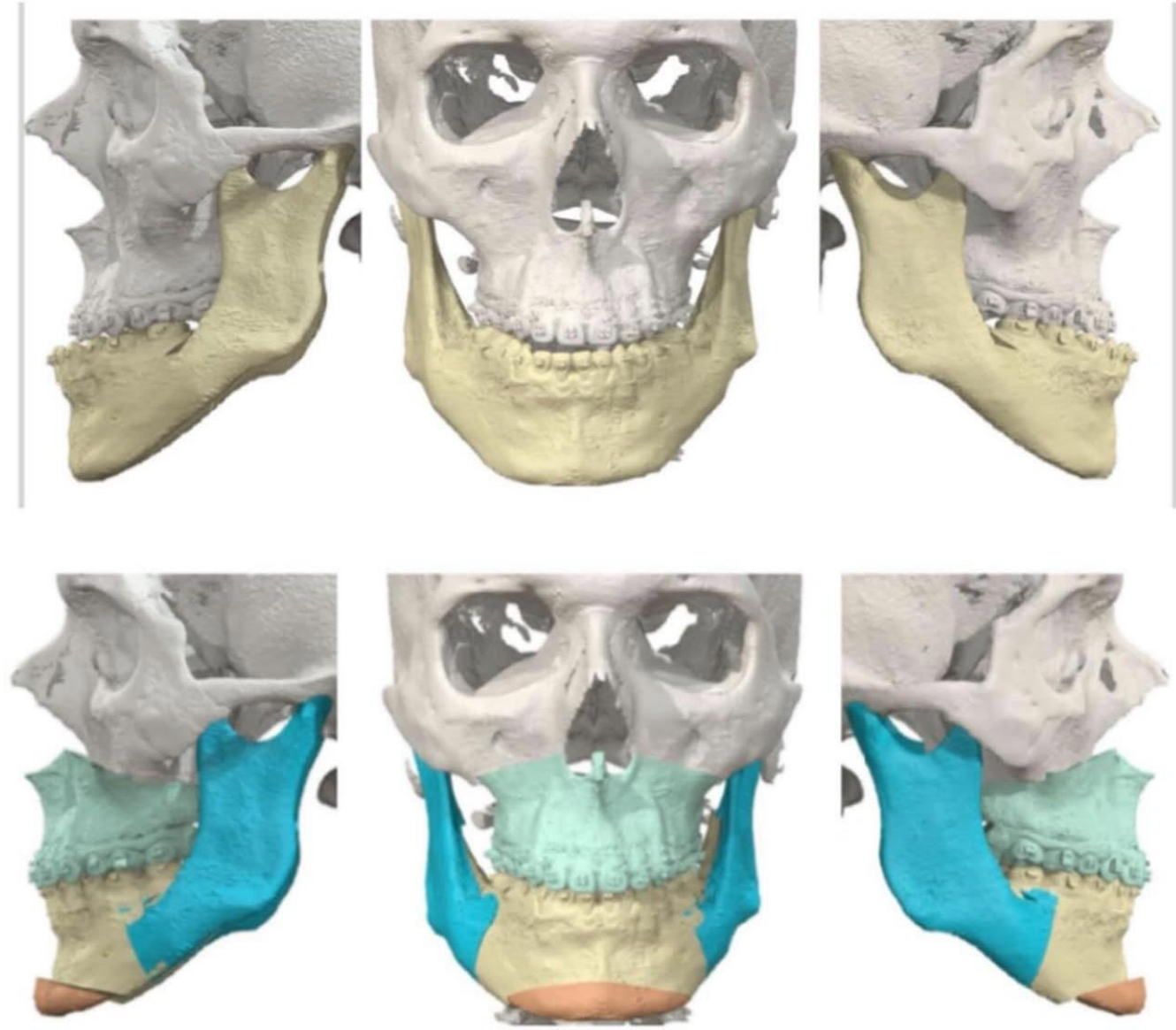
| | |
|---|---|
| Recognize | • Recognize indications for Corrective Jaw Surgery |
| Identify | • Identify Pre-operative risk factors and airway challenges in patients with congenital craniofacial deformities |
| Discuss | • Discuss strategies for intraoperative anesthetic management including airway control, blood loss reduction, analgesia |
| Anticipate and manage | • Anticipate and manage key postoperative concerns including extubation, airway safety, and PACU protocols |

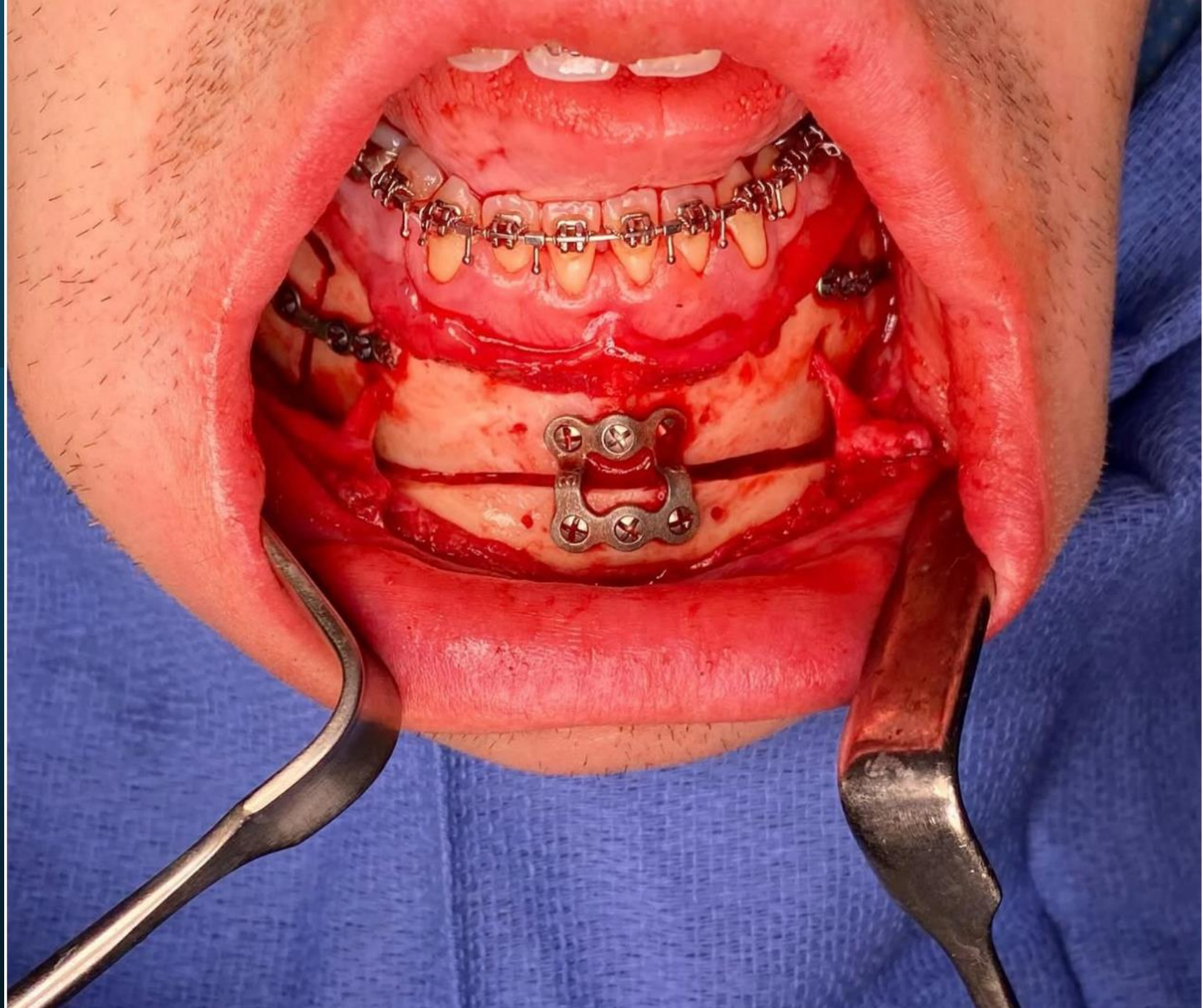
# Corrective Jaw Surgery

The most **powerful** surgery for the face.

*Let’s look at a facial transformation.*



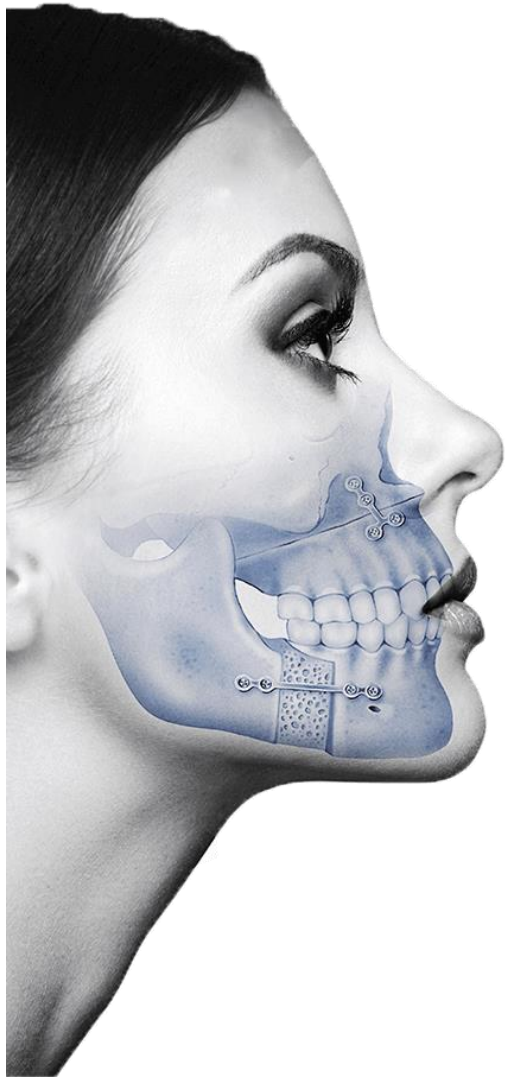




# Orthognathic Surgery / Corrective Jaw Surgery

Greek words "orthos" (straight) and "gnathos" (jaw)

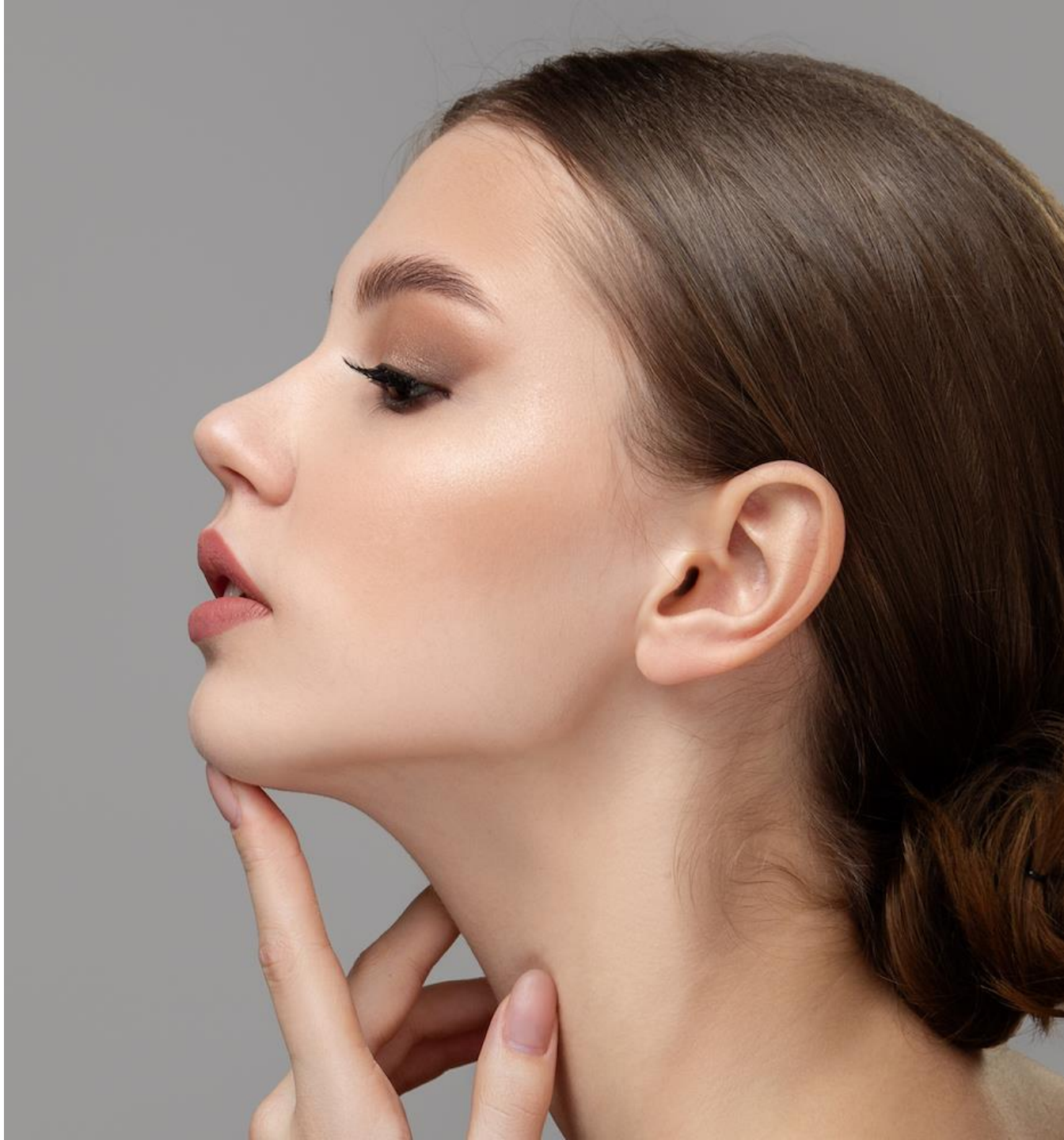
Surgical correction of skeletal irregularities and jaw misalignment secondary to craniofacial deformities or facial trauma.



Corrective Jaw Surgery involves repositioning and fixation of the upper and lower jaws.

Purpose & Indications

- Align jaws to correct malocclusion
- Balance facial appearance and harmony
- Improve function – chewing, speaking, breathing*
- Eliminate airway obstruction in sleep apnea



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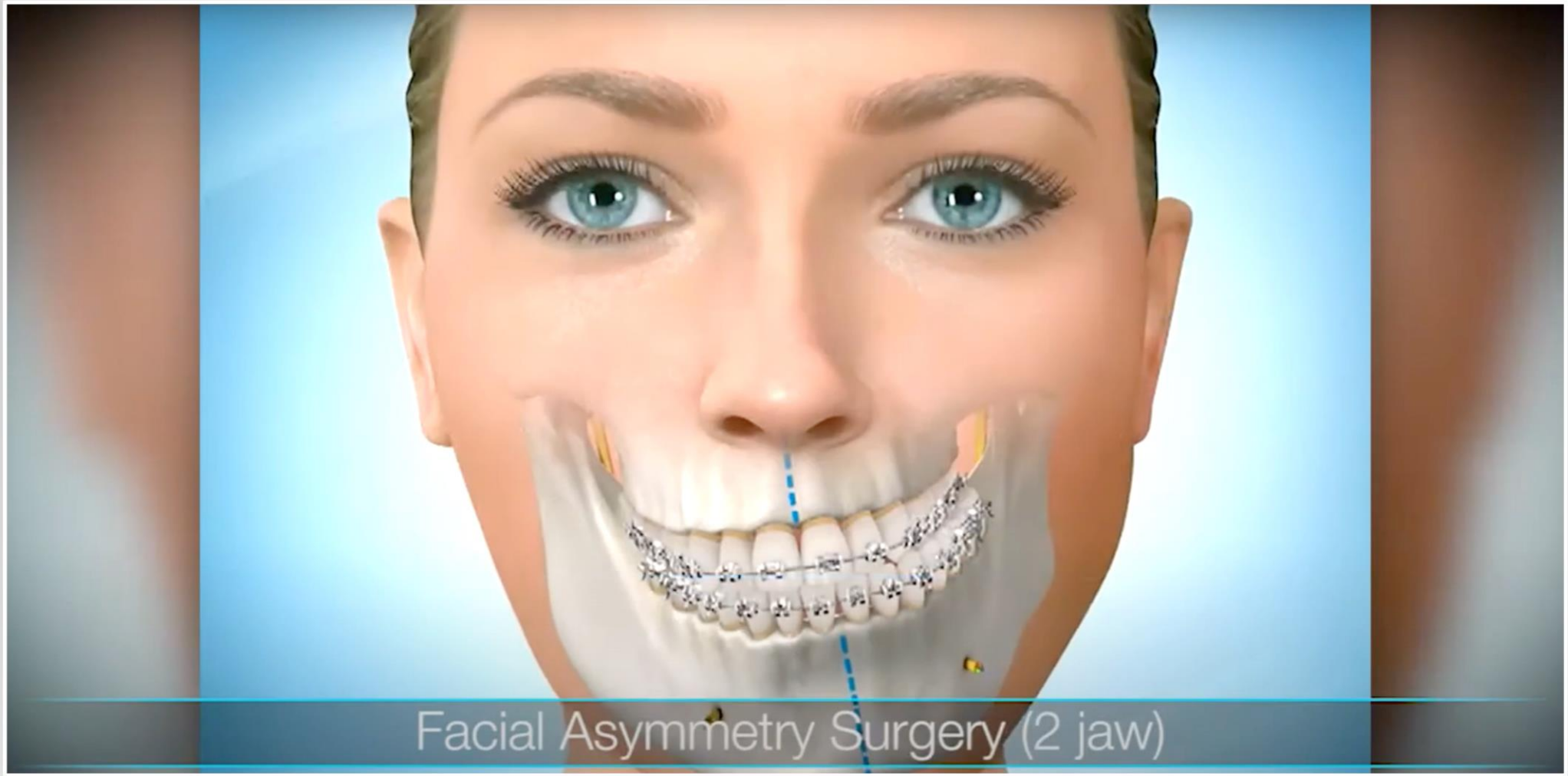
Facial Asymmetry Surgery (2 jaw)

**Upper Jaw Osteotomy**

Significantly receded or protruding upper jaw

Crossbite

Too much or too little of the teeth showing

Open bite

Reduced facial growth of the middle of the face (midfacial hypoplasia)

**Lower Jaw Osteotomy**

Receding lower jaw

Protruding lower jaw

Recessed ‘weak’ chin

Protruding chin

Reshape the chin for aesthetic reasons
*Facial feminization surgery*

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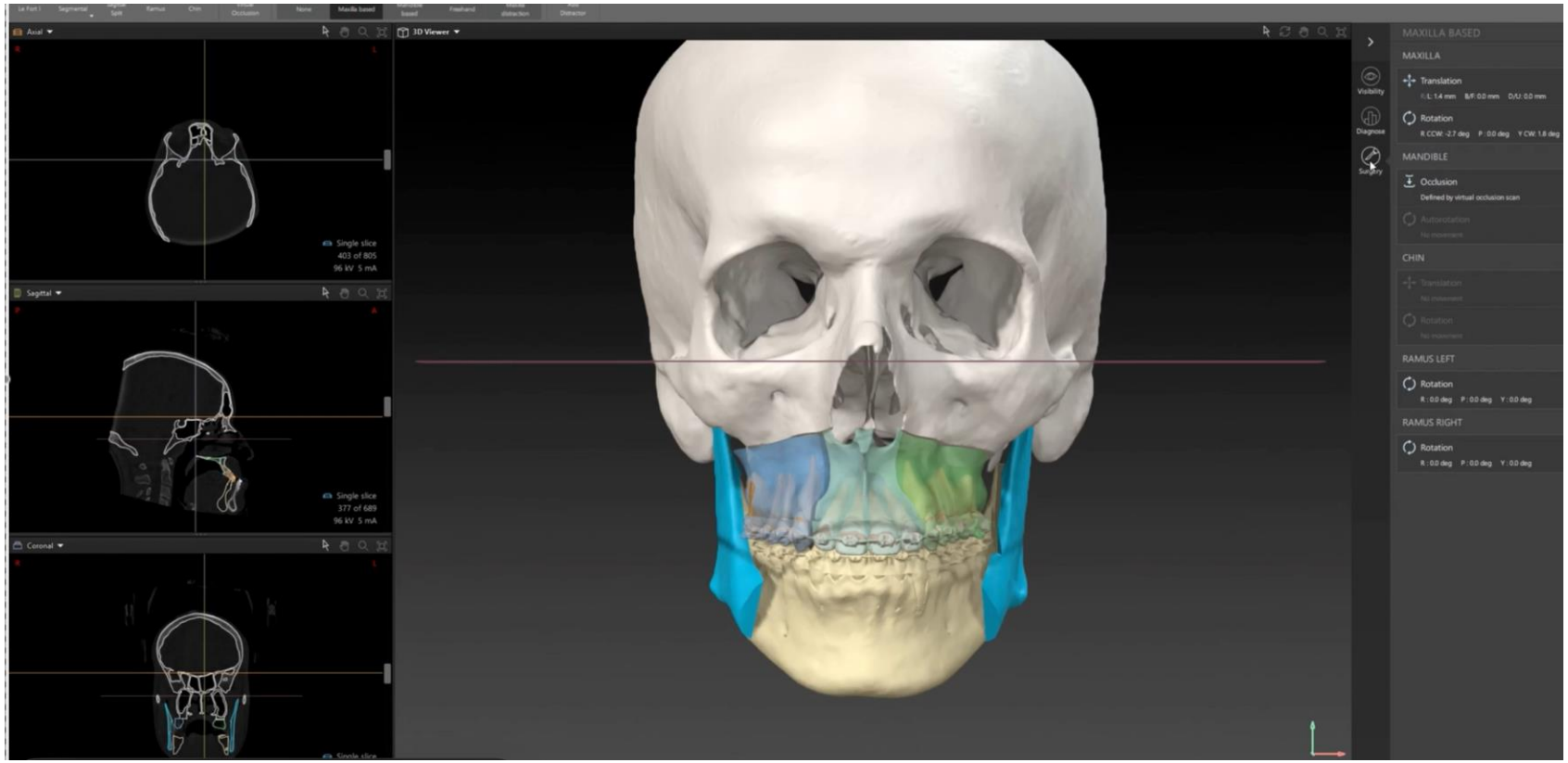

Axial
Single slice
403 of 805
96 kV 5 mA
Sagittal
Single slice
377 of 689
96 kV 5 mA
Coronal
3D Viewer
Visibility
Diagnose
Surgery
MAXILLA BASED
MAXILLA
Translation
Rotation
MANDIBLE
Occlusion
Defined by virtual occlusion scan
Autorotation
CHIN
Translation
Rotation
RAMUS LEFT
Rotation
RAMUS RIGHT
Rotation

# Surgical candidates

Majority of patients are young.

Surgery performed upon completion of facial skeletal growth.

There is growing literature to support the use of orthognathic surgery to treat moderate and severe obstructive sleep apnea with maxillomandibular advancement (MMA).

This patient population may be older with comorbidities which presents anesthetic challenges.

Giralt-Hernando M, Valls-Ontañón A, Guijarro-Martínez R, Masià-Gridilla J, Hernández-Alfaro F. Impact of surgical maxillomandibular advancement upon pharyngeal airway volume and the apnoea-hypopnoea index in the treatment of obstructive sleep apnoea: systematic review and meta-analysis. BMJ Open Respir Res. 2019 Oct 9;6(1):e000402. doi: 10.1136/bmjresp-2019-000402.

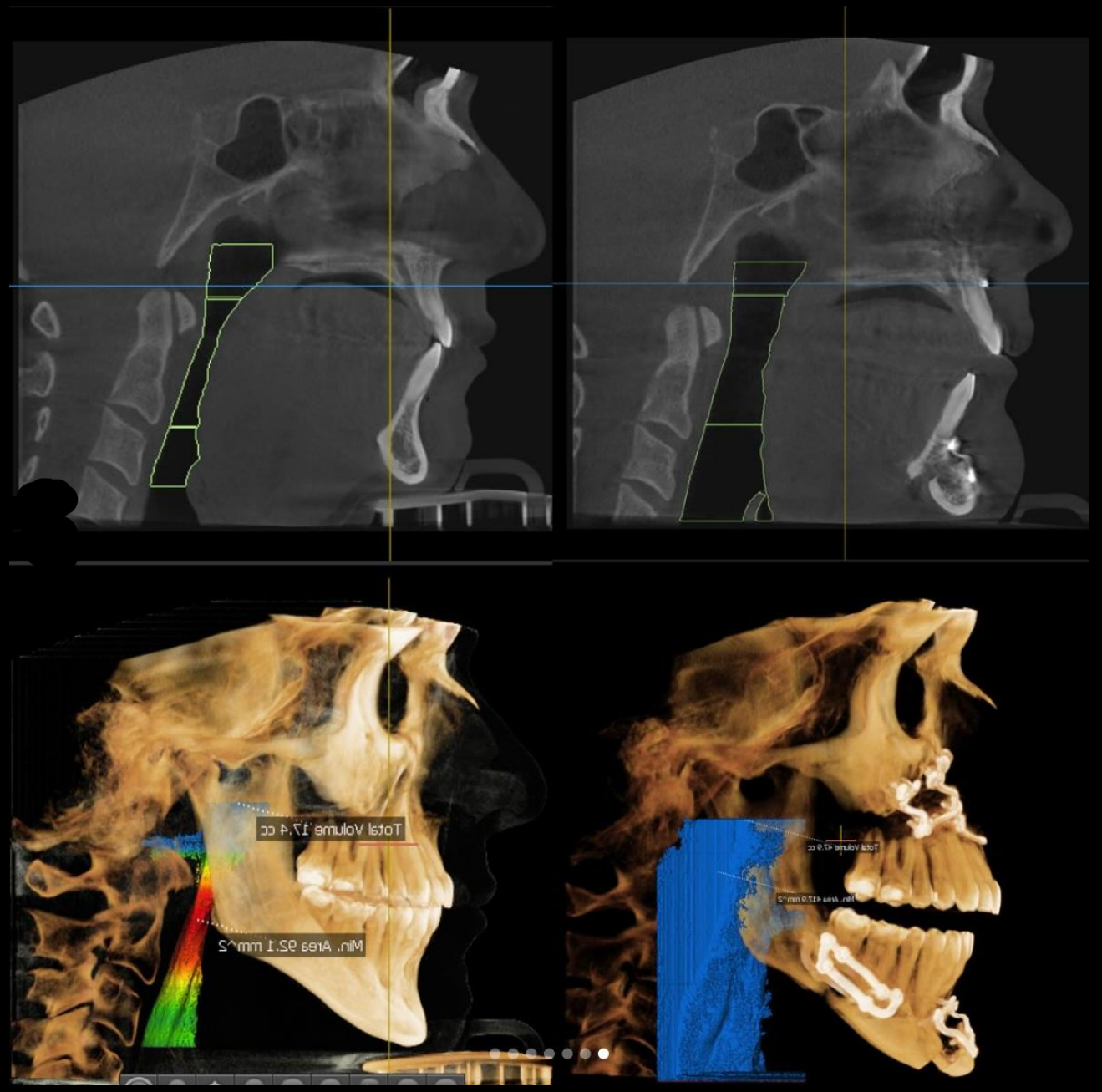
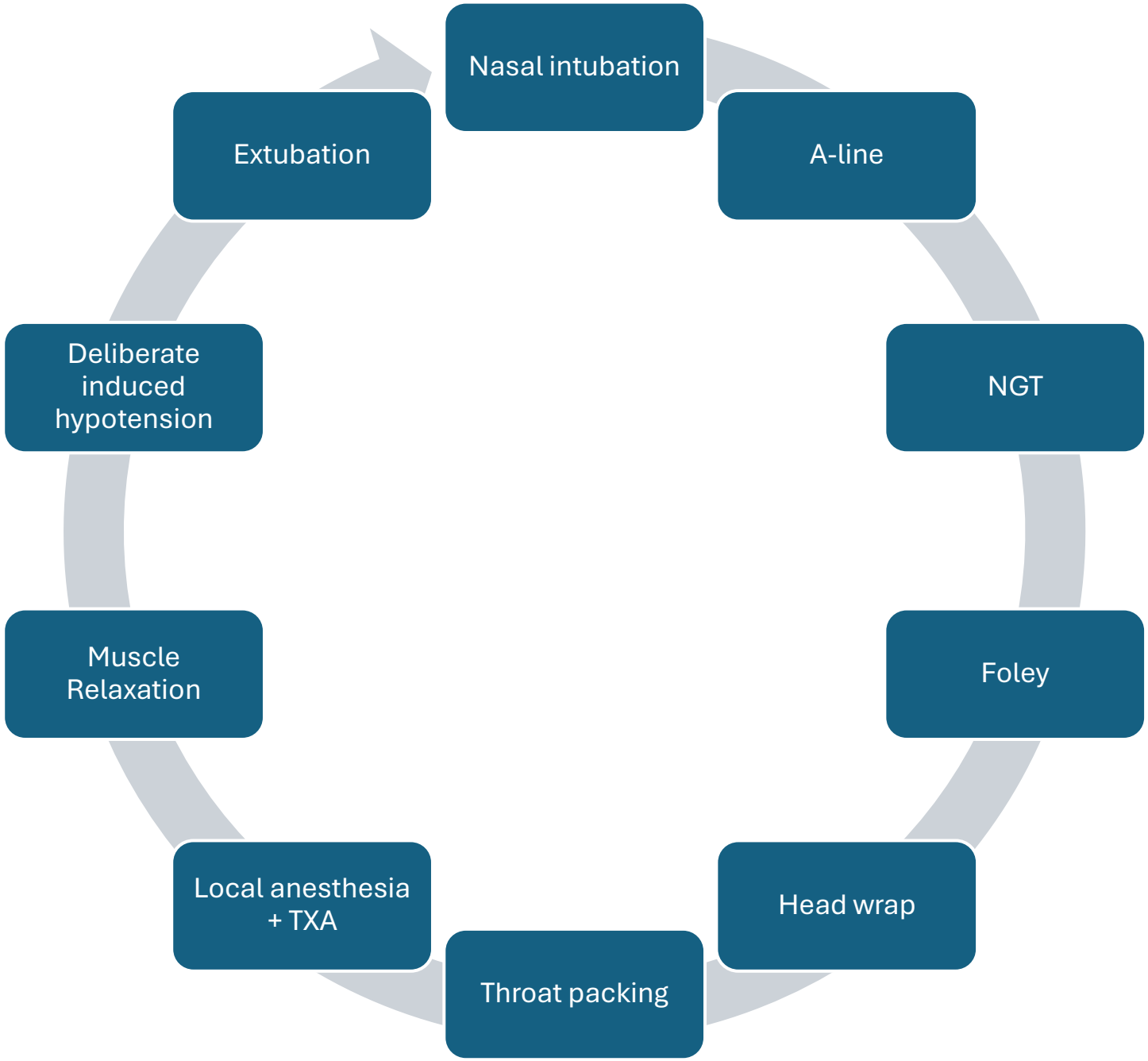



Photo courtesy of Dr. David Al

# Pre-Operative Considerations for Shared Airway Surgery

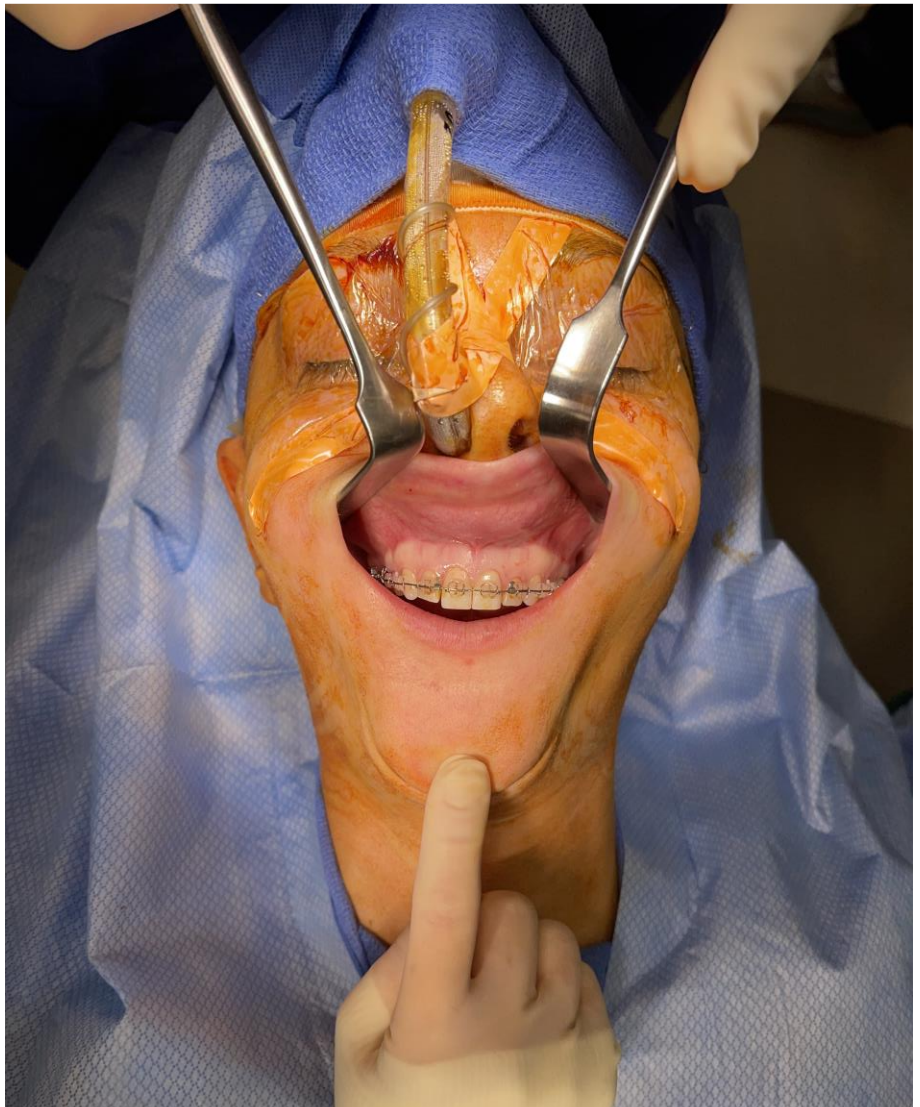
# Anesthesia & Surgical Synergy

Optimal Patient Outcomes



# Shared Airway Surgery

# Shared Airway Surgery



# Intubation Considerations

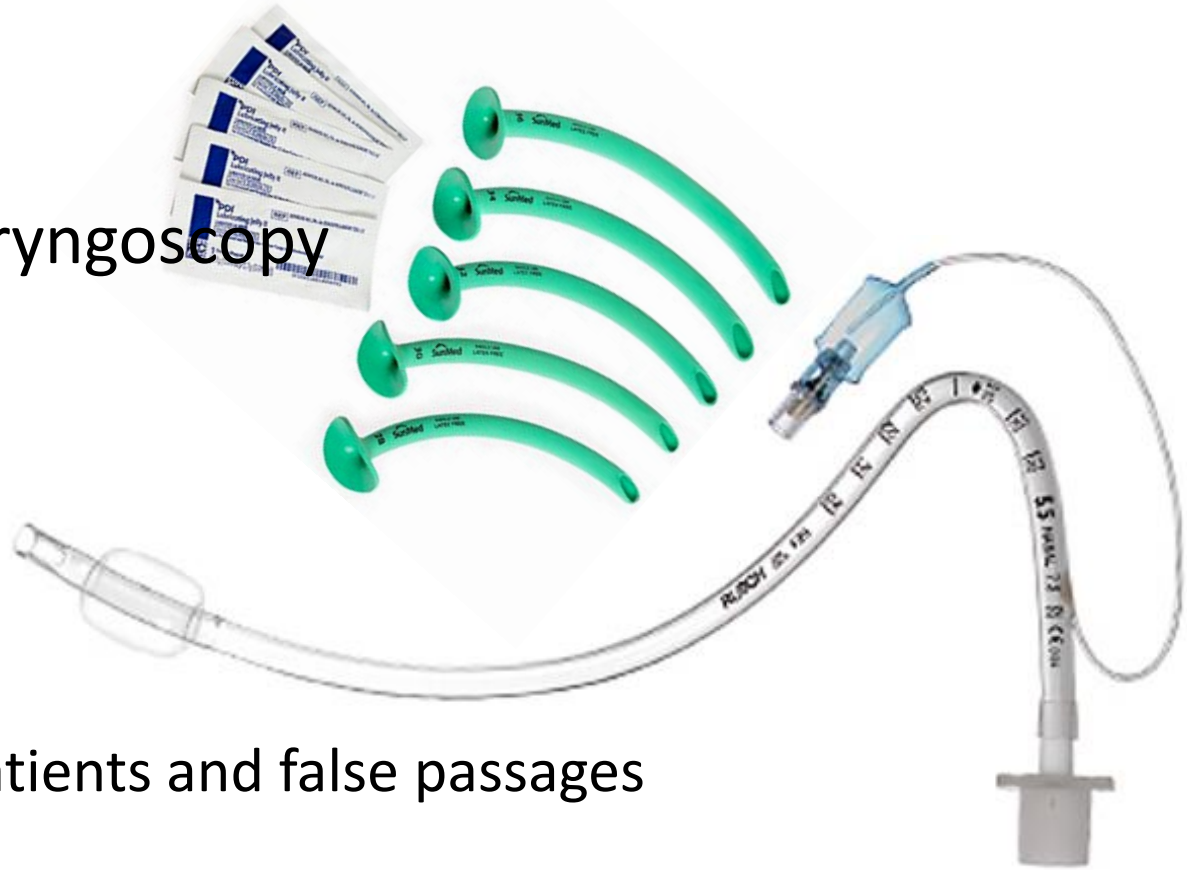
Nasal intubation is required to allow patient to be placed into their bite to set the jaws in the pre-determined ideal position.

Traditional nasal intubation – direct laryngoscopy

Video assisted laryngoscopy

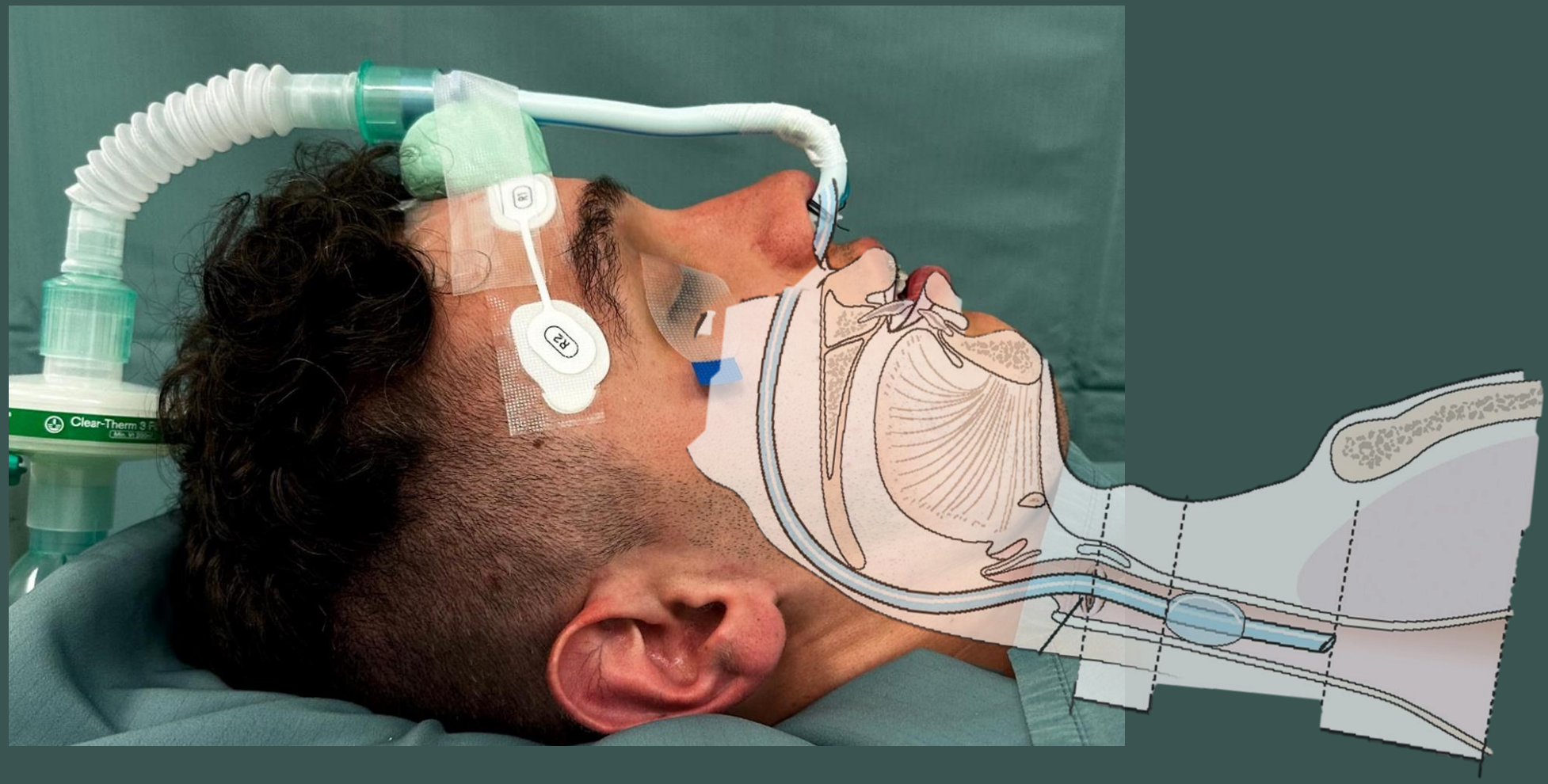
Fiberoptic Nasal Intubation

Awake Intubation

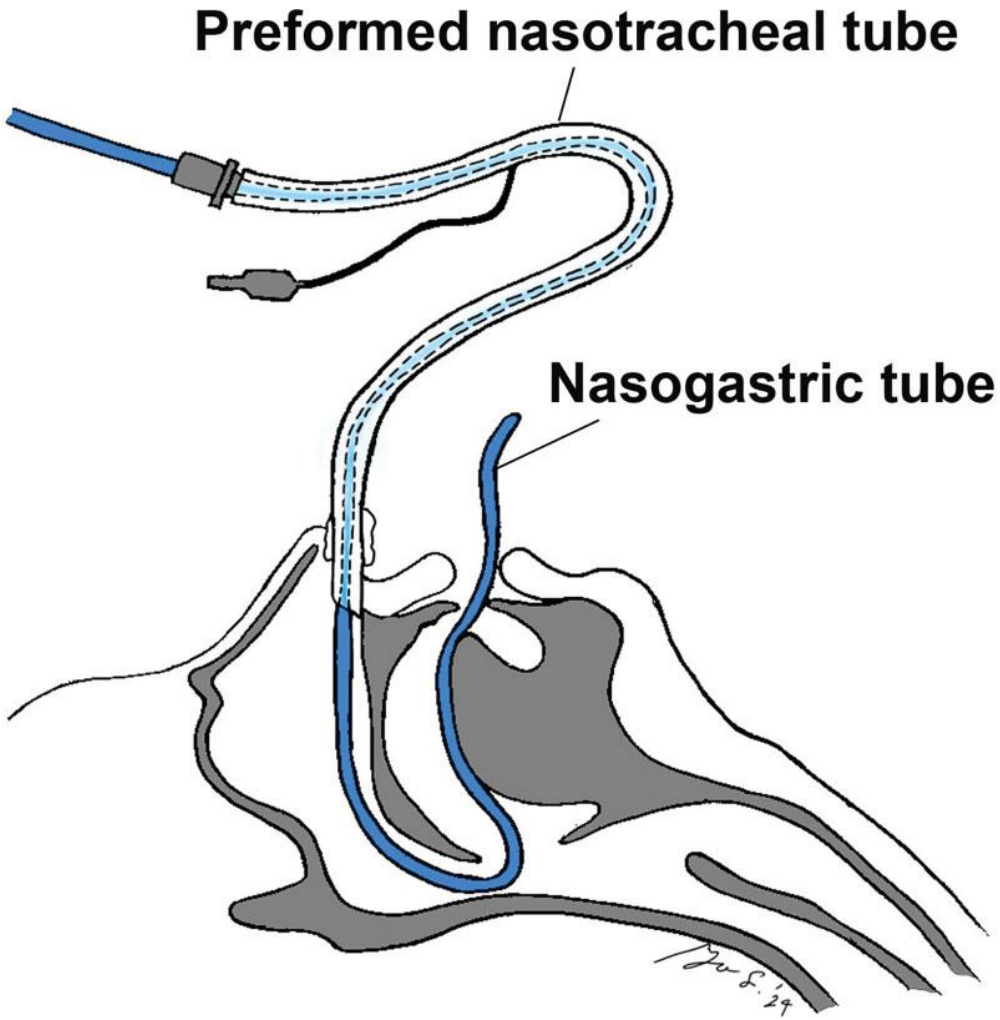


Special precautions for cleft lip and palate patients and false passages


Clear-Therm 3


Clear-Therm 3
R2


A
B



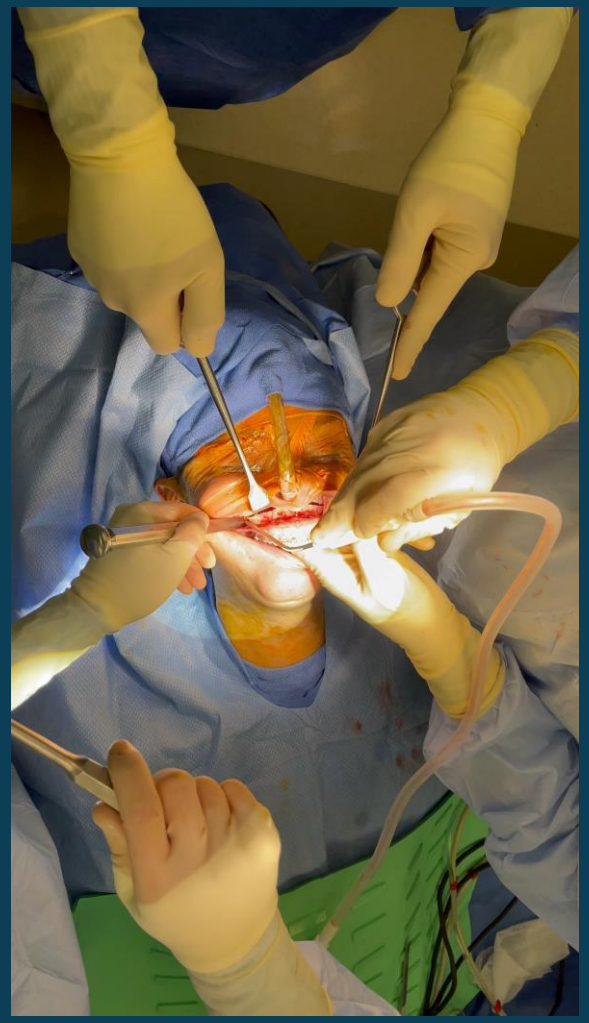

Sasaki R, Koyasunaga Y, Agawa K, Watanabe Y. Nasogastric Tube-guided Nasotracheal Intubation for Narrow Nasal Passage in Orthognathic Surgery. Plast Reconstr Surg Glob Open. 2024 Sep 6;12(9):e6130. doi: 10.1097/GOX.0000000000006130. PMID: 39247569; PMCID: PMC11379476.

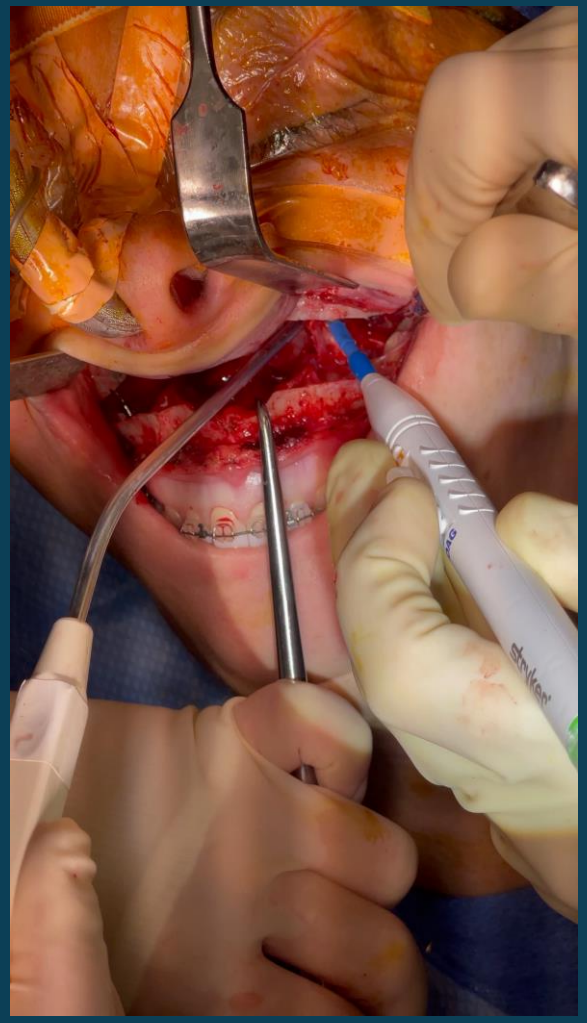
Anesthesia & Surgical

Optimal Patient Outcomes

Volatile agents
TIVA
Pain Control
Tranexamic Acid (TXA)*
Antibiotics
Steroids
Anti-emetics
PONV & Maxillomandibular fixation / rubber bands

# Why Induced Hypotension?





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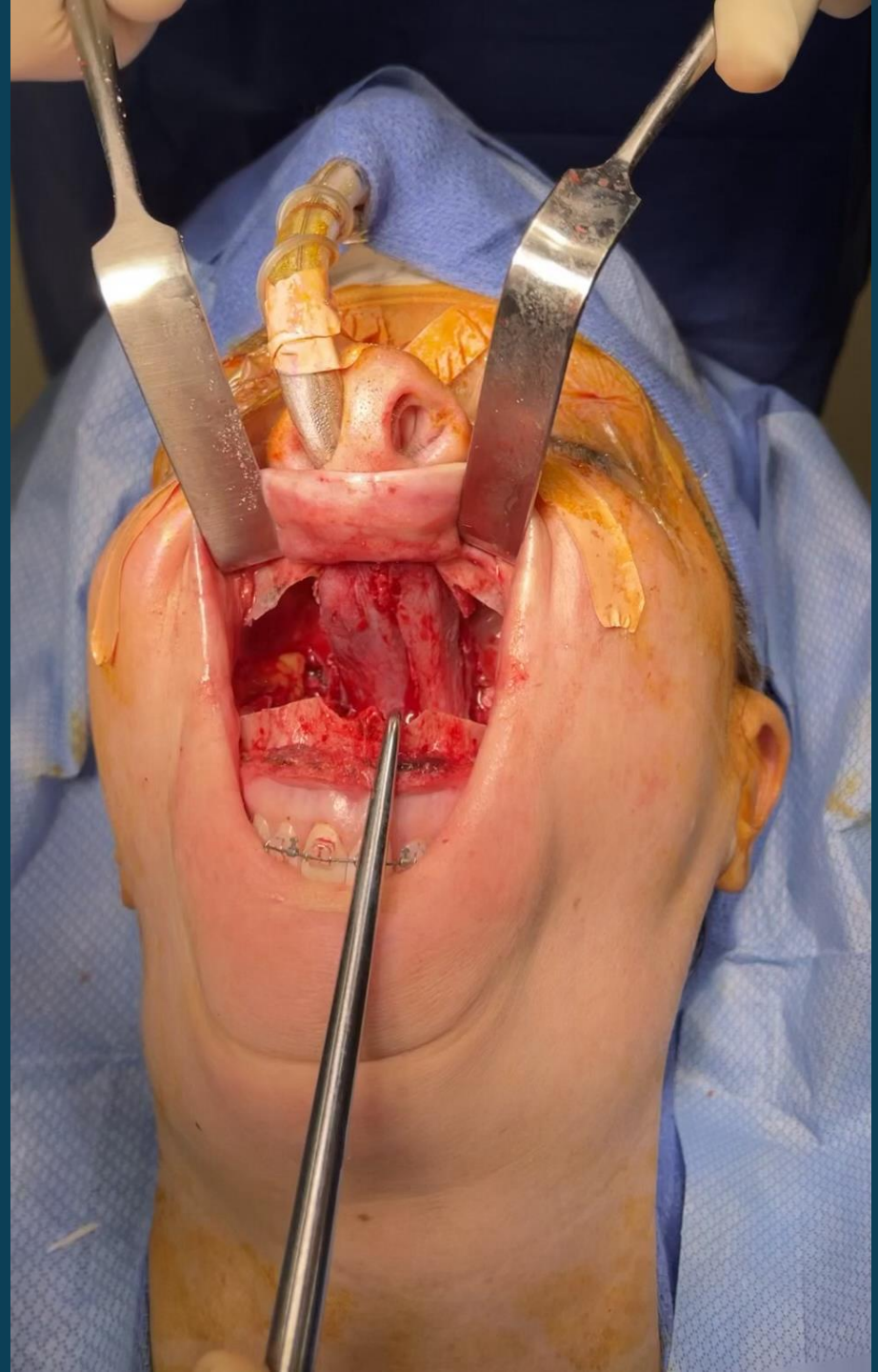
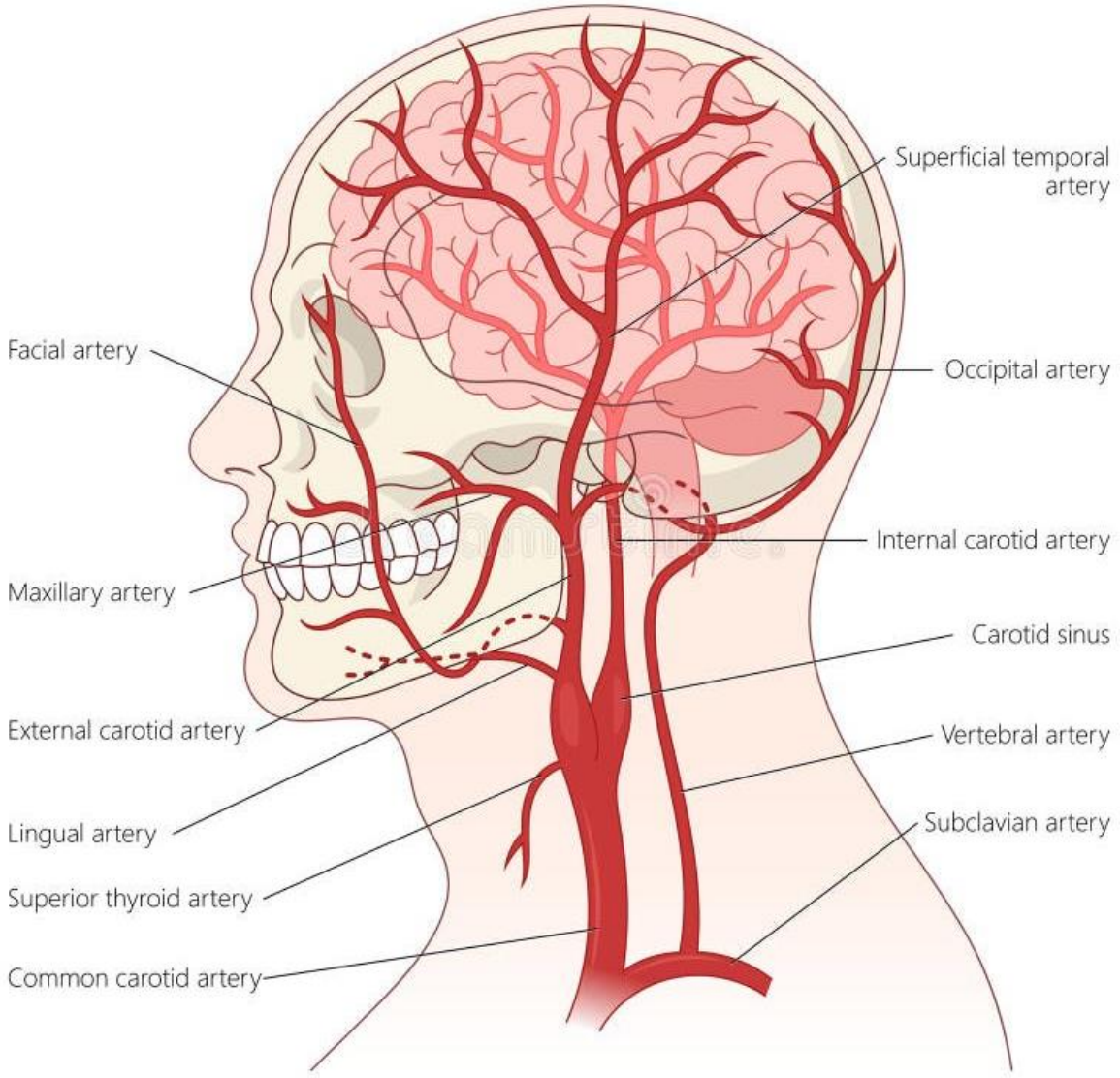
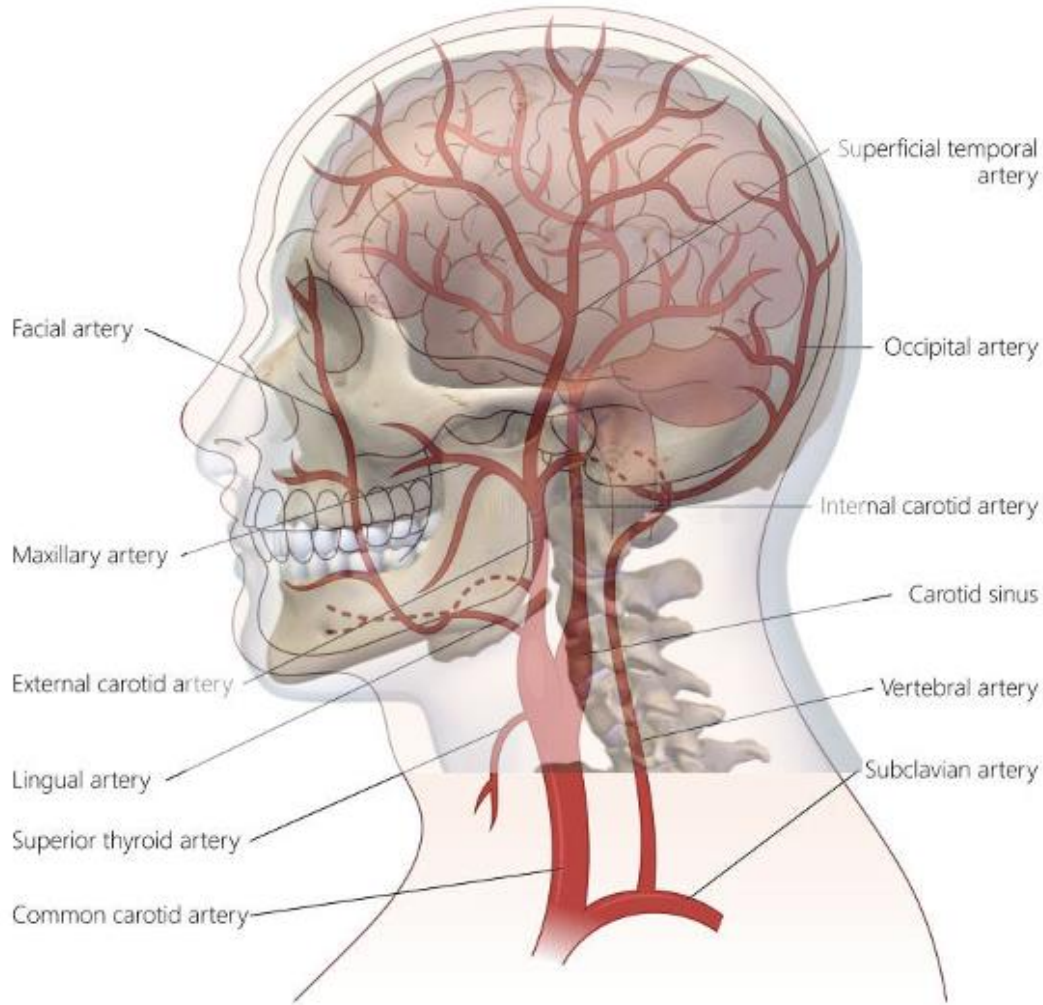



Superficial temporal artery
Facial artery
Occipital artery
Internal carotid artery
Maxillary artery
Carotid sinus
External carotid artery
Vertebral artery
Lingual artery
Subclavian artery
Superior thyroid artery
Common carotid artery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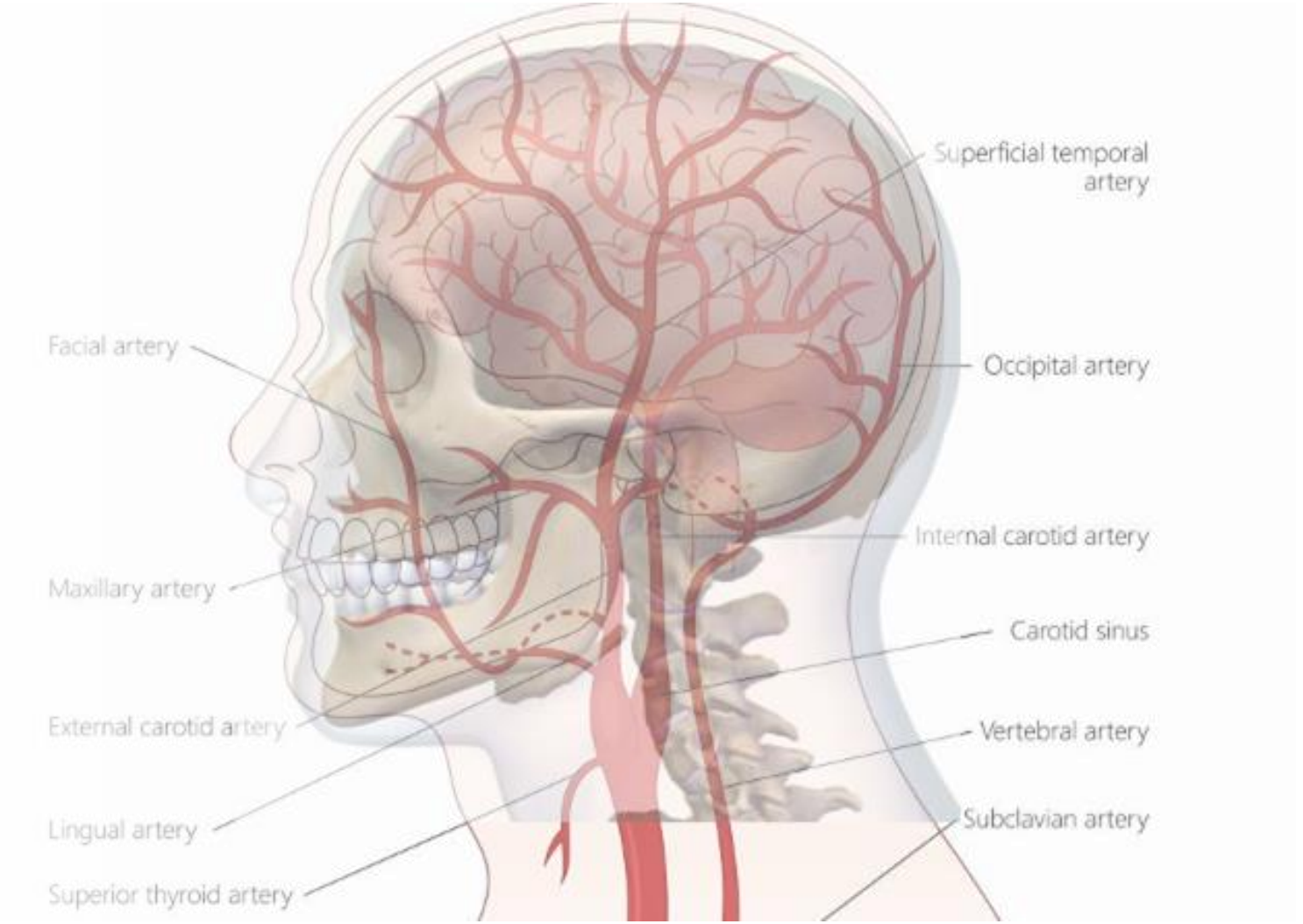
# Game Changer

Administration of tranexamic acid during orthognathic surgery significantly reduces blood loss and improves the quality of the surgical field.

Studies have shown a reduction of intra-operative blood loss by **30%** with a single dose of 10–20 mg/kg of tranexamic acid given intra-operatively.




Dammling CW, Weber TM Jr, Taylor KJ, et al. Does Tranexamic Acid Reduce the Need for Hypotensive Anesthesia Within Orthognathic Surgery? A Retrospective Study. J Maxillofac Oral Surg 2024;23:229-34.

Olsen JJ, Skov J, Ingerslev J, et al. Prevention of Bleeding in Orthognathic Surgery--A Systematic Review and Meta-Analysis of Randomized Controlled Trials. J Oral Maxillofac Surg 2016;74:139-50.

# Induced Hypotension

The degree of induced hypotension at any one time must therefore be **tailored to the stage of surgery** and **communication between surgeon and anesthetist** is vital.

Goal MAPs ~60

Mean arterial pressure should be reduced by no more than 30% of the patient's normal with an absolute lower limit of 55 mm Hg (in ASA I patients).

Invasive arterial pressure monitoring

Organ hypoperfusion

Choi WS, Samman N. Risks and benefits of deliberate hypotension in anaesthesia: a systematic review. Int J Oral Maxillofac Surg 2008; 37: 687–703

# Techniques for lowering arterial pressure

Deepen anesthesia with a volatile agent.

**Remifentanil** provides blunting of the hemodynamic response to surgery and decreases sympathetic tone and heart rate.

Rapid and predictable onset and offset → Gaining popularity.

**Table 2** Strategies for achieving hypotensive anaesthesia

| Strategy | Mechanism | Drugs |
|---|---|---|
| Reduce cardiac output | Reduce cardiac contractility | Beta-blockers—esmolol, labetalol |
| | Reduce heart rate | Opioid—remifentanil |
| Reduce systemic vascular resistance | Relax vascular smooth muscle (vasodilators) | Alpha-blockers—phentolamine, labetalol |
| | Block autonomic ganglia | Calcium channel blockers—nicardipine |
| | | Inhalational agents—sevoflurane, isoflurane, desflurane |
| | | Nitrates—sodium nitroprusside, nitroglycerin, GTN |
| | | Direct acting—hydralazine, magnesium sulphate |
| | | Centrally acting—clonidine, dexmedetomidine |

BP = CO × SVR. GTN, glyceryl trinitrate; BP, blood pressure; CO, cardiac output; SVR, systemic vascular resistance.

# Emergence & Extubation

Induced hypotension should be ceased before the completion of surgery.

Removal of the throat pack must never be forgotten.

Prior to extubation, careful and thorough suctioning of the oral cavity is important to remove any blood, airway secretions and clots in the post-nasal space which may cause airway obstruction.

This should be carried out while the patient is in a deep plane of anesthesia to avoid coughing.

# Emergence & Extubation

Suctioning and jaw manipulation after surgery should be done gently.

Limited pressure on the jaw is important to avoid any disruption screws or plates used in the osteotomy fixation.

Ensure hemostasis and clear secretions prior to placement of inter-maxillary fixation (IMF)

# Emergence

A smooth controlled emergence is important for this surgery and this can be achieved with a remifentanil or dexmedetomidine infusion.

# Emergence & Extubation

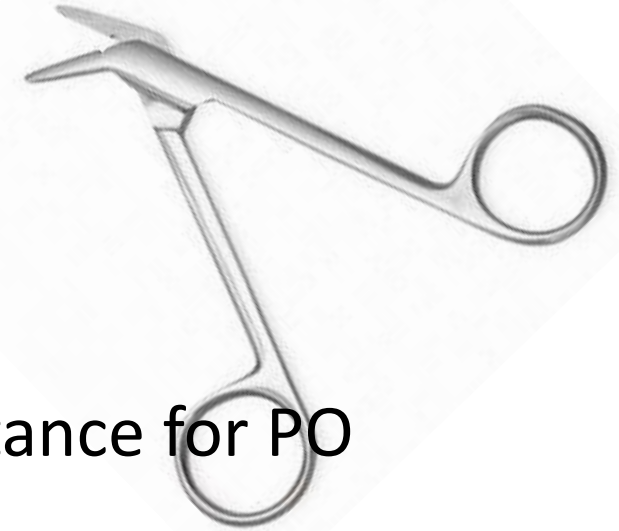
Removal of the nasal tube after Le Fort I osteotomy should be done gently because the sectioned nasal septum may easily be displaced at this stage.

Confirm cuff is fully down.

# PACU Protocols

- Airway protection.
- Soft tissue swelling or hematoma formation → airway obstruction.
- Nasal bleeding after LeFort I osteotomy may require nasal packing.
- PONV

# PACU Protocols



Jaw fixation and vomiting don’t mix well.

Water in, water out.

Clear liquid diet until the next morning.

Nausea/vomiting can prolong hospital course due to reluctance for PO diet.

Scissors or wire-cutters bedside.

# PACU Protocols

Techniques to reduce PONV include use of TIVA, administration of multiple anti-emetics and using multimodal, opioid-sparing analgesia.

The placement of throat packs to prevent swallowing of blood, and use of nasogastric (NG) tubes to aspirate stomach content.

Prior to floor transfer: NGT, A-Line, Foley come out.

# Post op Pain Management

Pain after orthognathic surgery is often not severe, and this is contributed to by the generous intra-operative use of local anesthesia and exposure of sensory nerves during surgery.

Common complaints from patient: *sore throat, nasal congestion, chapped lips.*

# Practice Pearls

During orthognathic surgery nasal intubation is generally required to allow the teeth to be brought into occlusion to set the bite and fixate upper and lower jaws in new position.

Remifentanil is becoming popular. It may be titrated to the surgical stimulus and contributes usefully to deliberate hypotension.

Steroids and anti-emetics are important adjuncts to anesthesia for orthognathic surgery.

The requirements for blood transfusion and postoperative critical care are largely historical.

# Anesthesia & Maxillofacial Trauma

# Maxillofacial Trauma

Jaw Surgery is controlled deliberate maxillofacial trauma

Similar anesthesia guidelines

Midface fractures / nasal intubation

Submental intubation

# Maxillofacial Trauma

**Special Considerations**

Mouth opening

Fracture stability and fracture displacement

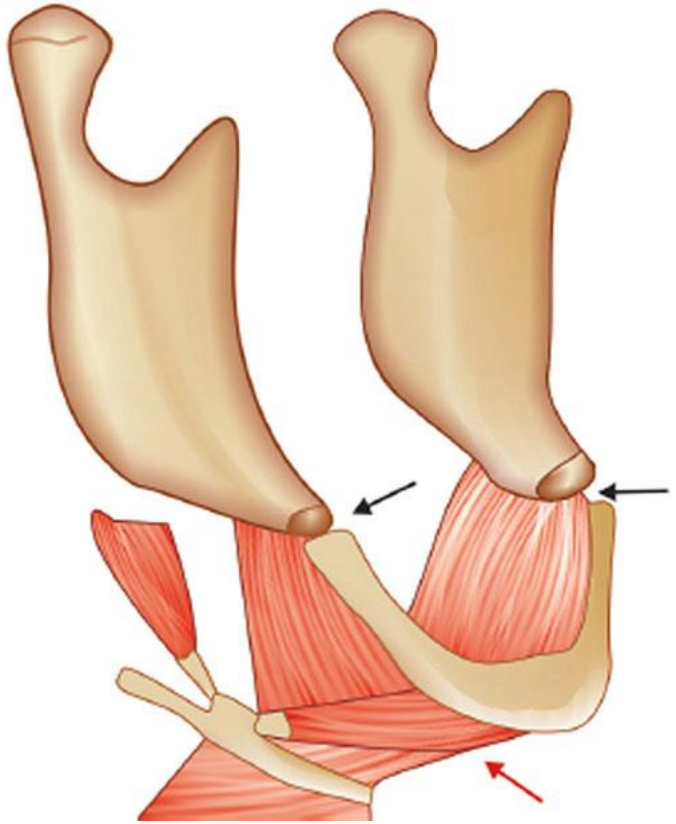
Hematoma

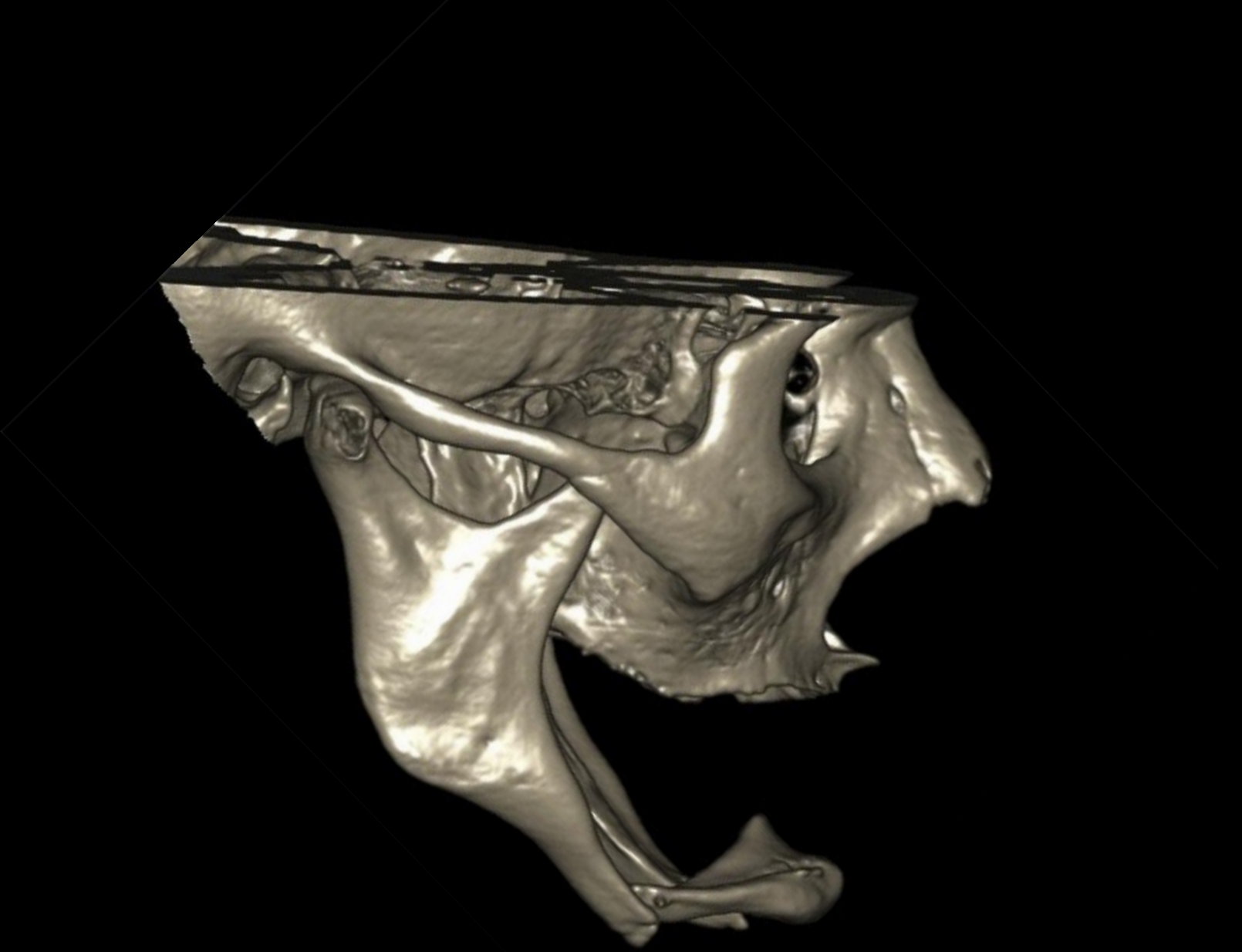
Nasal patency

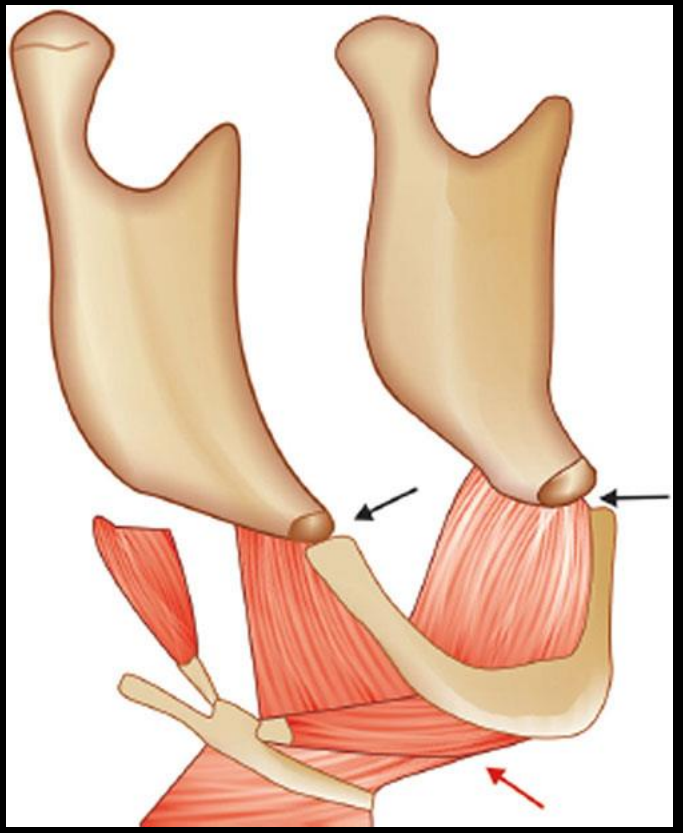
Loose dentition and foreign bodies

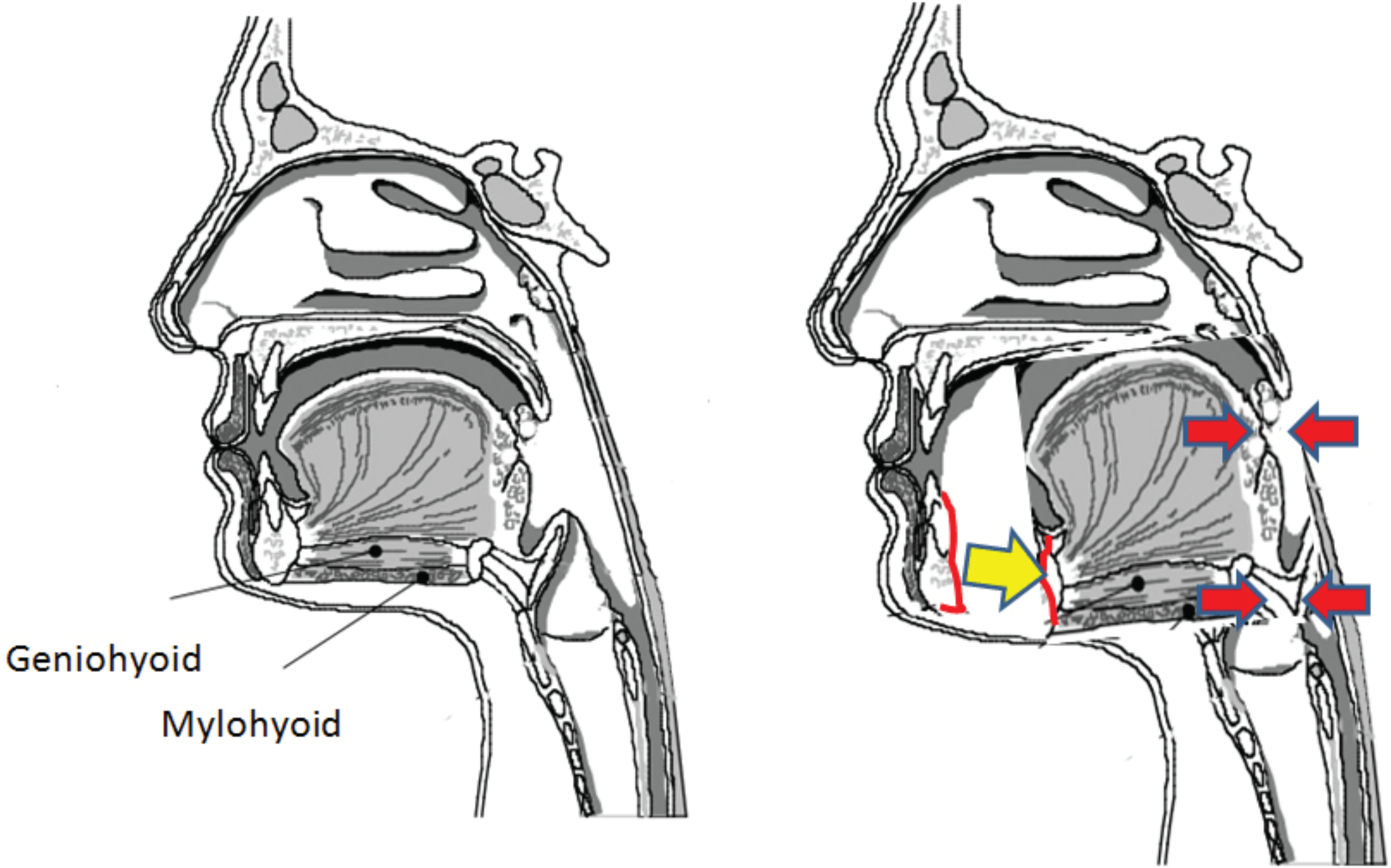
Radiological investigations of head and cervical spine to ascertain the extent of injury

# Mandible Fracture Airway Compromise



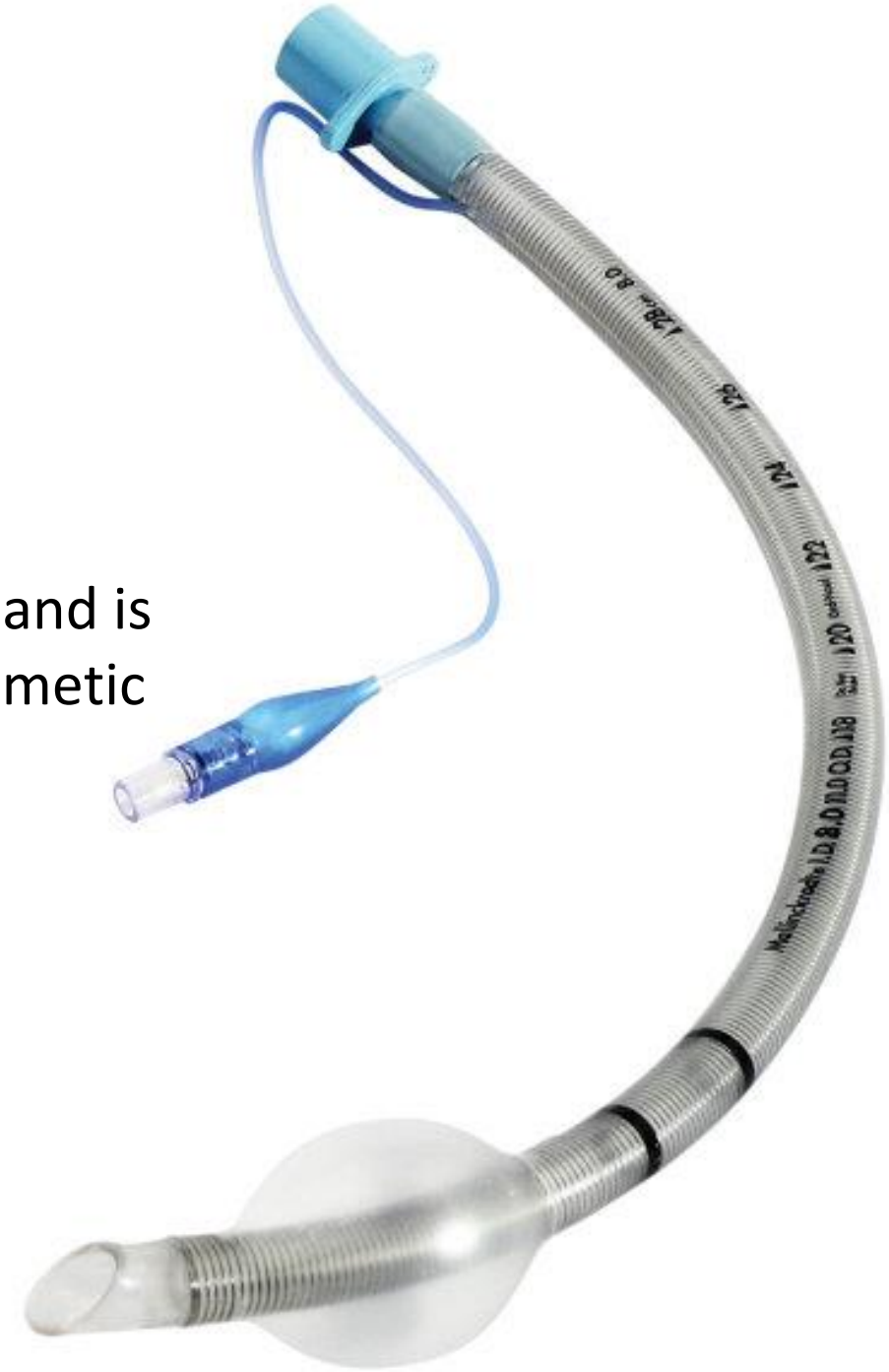





Geniohyoid
Mylohyoid

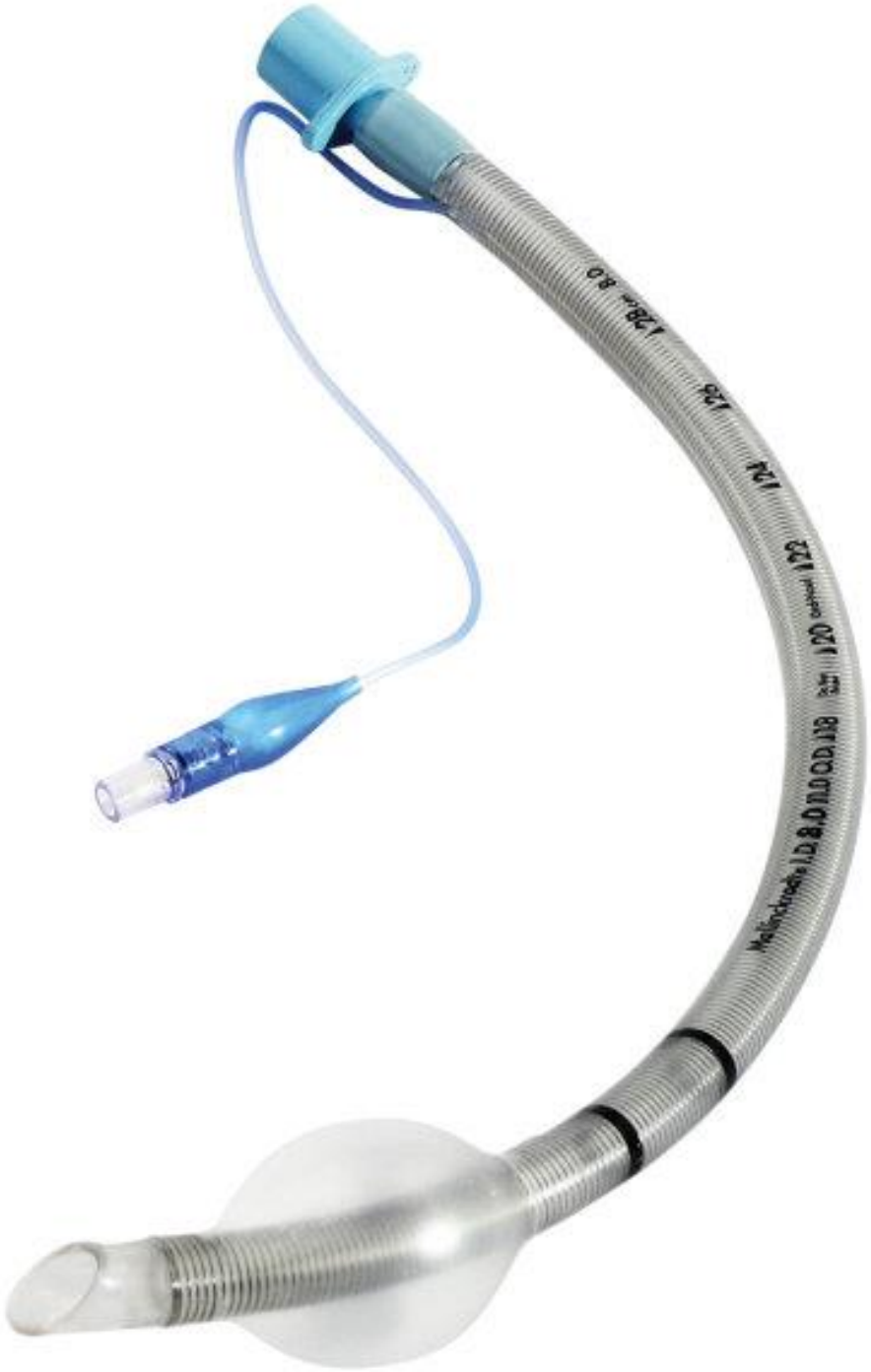
# Submental Intubation

This procedure carries fewer risks than a tracheostomy, and is associated with reduced scarring, providing a better cosmetic result for patients.



# Submental Intubation

Before intubation, always **‘break the seal’** at the blue circuit connection*



# Submental Intubation

62-year-old male presented to ED after being involved in a motor vehicle accident.

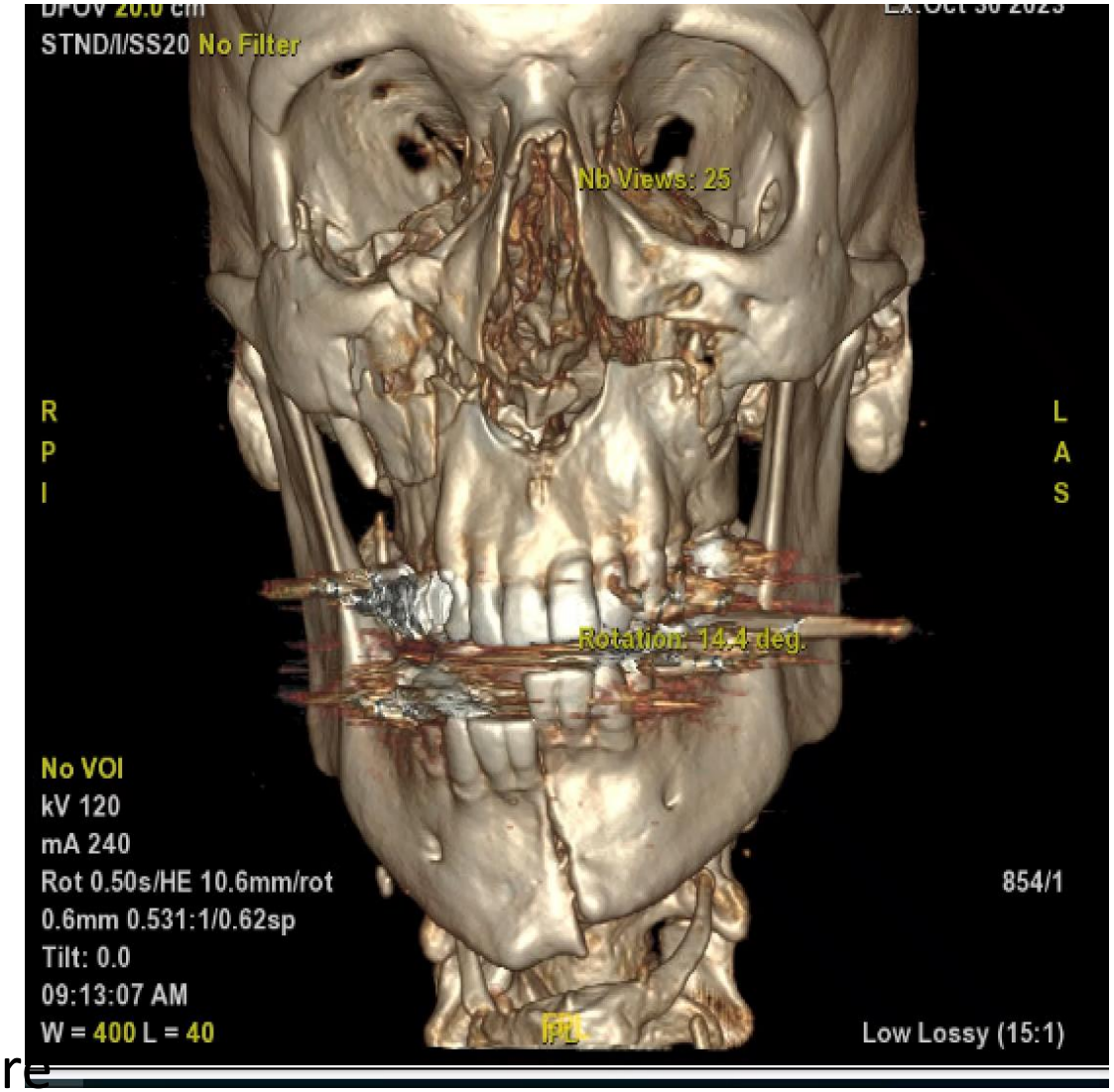
**Diagnosis**

Nasal Bone Fractures

Segmental Lefort fracture
- Right sided Maxillary Lefort III pattern
- Left Lefort I pattern

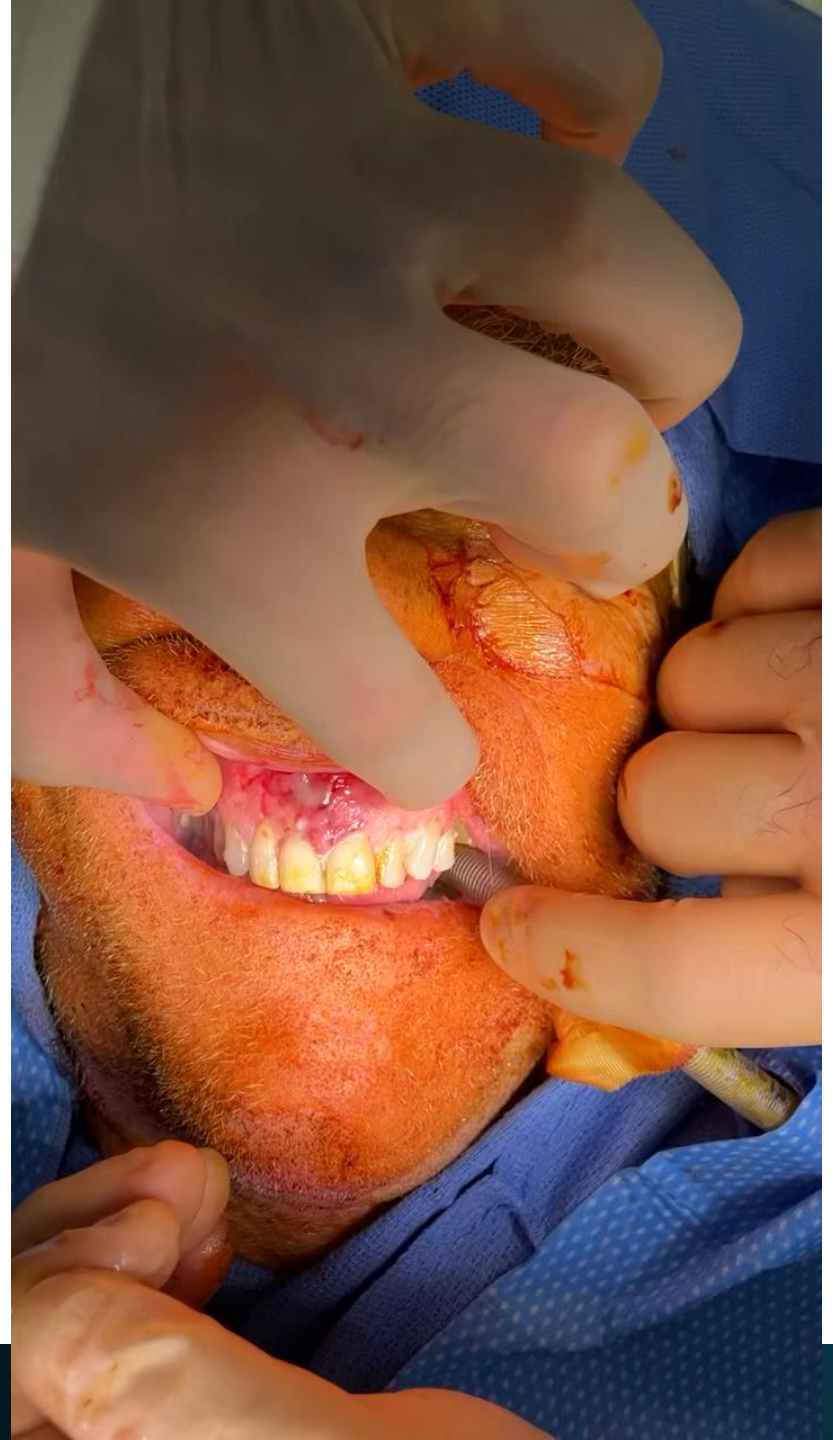
Mandibular Symphysis fracture

Right non-displaced high condylar neck fracture



# Maxillofacial Trauma

Submental Intubation



# Maxillofacial Trauma

Submental Intubation

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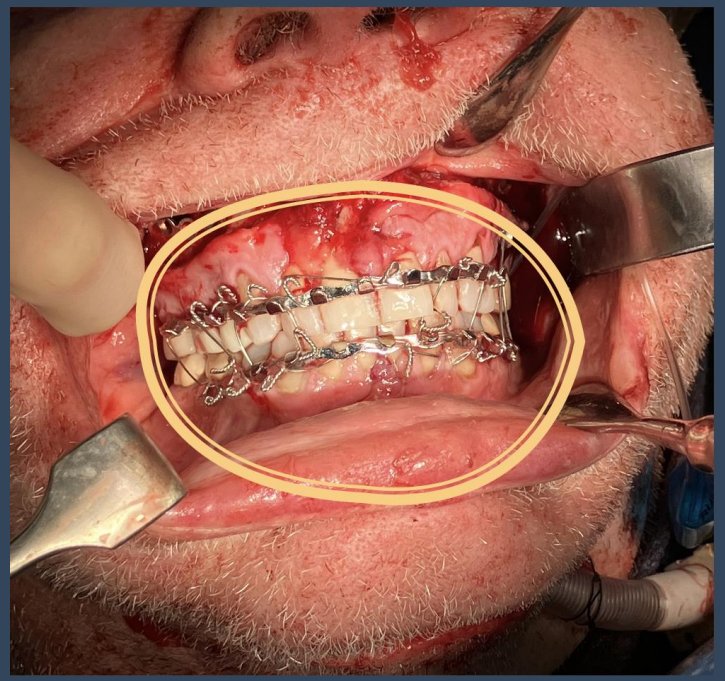
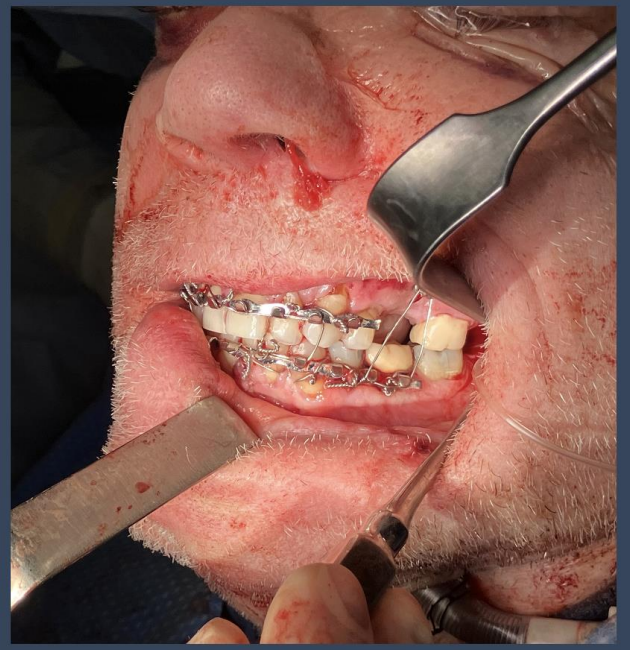
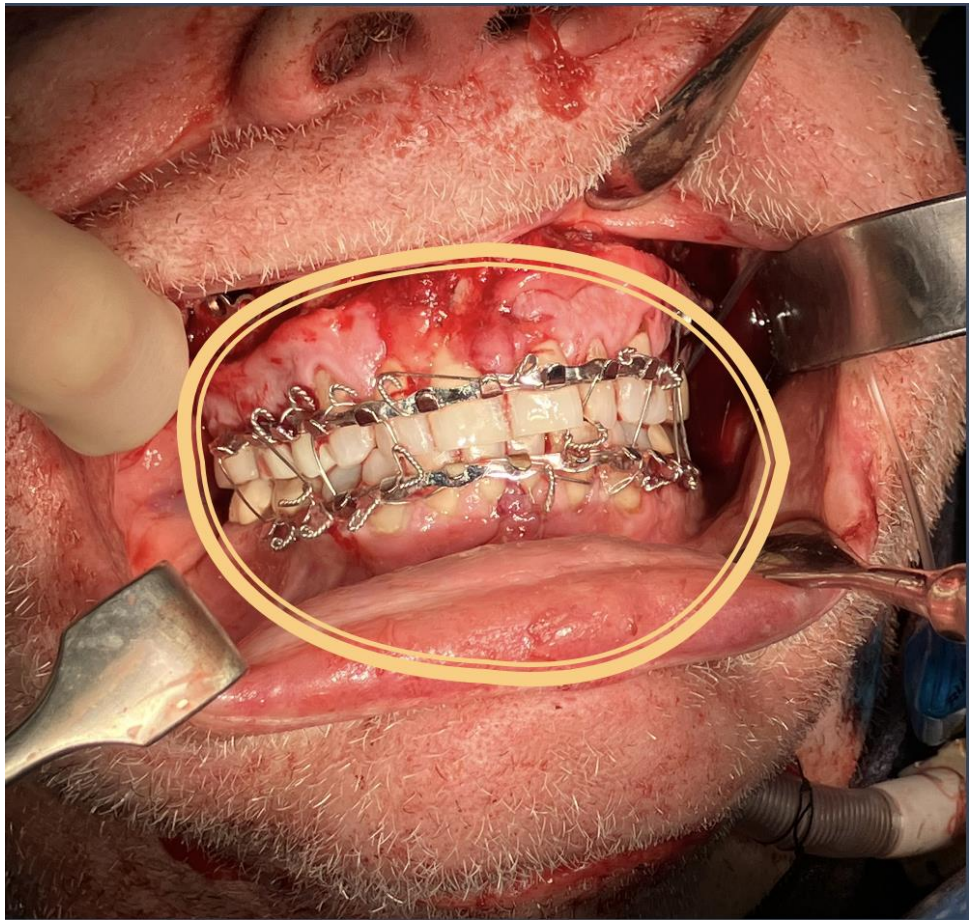
## Submental Intubation



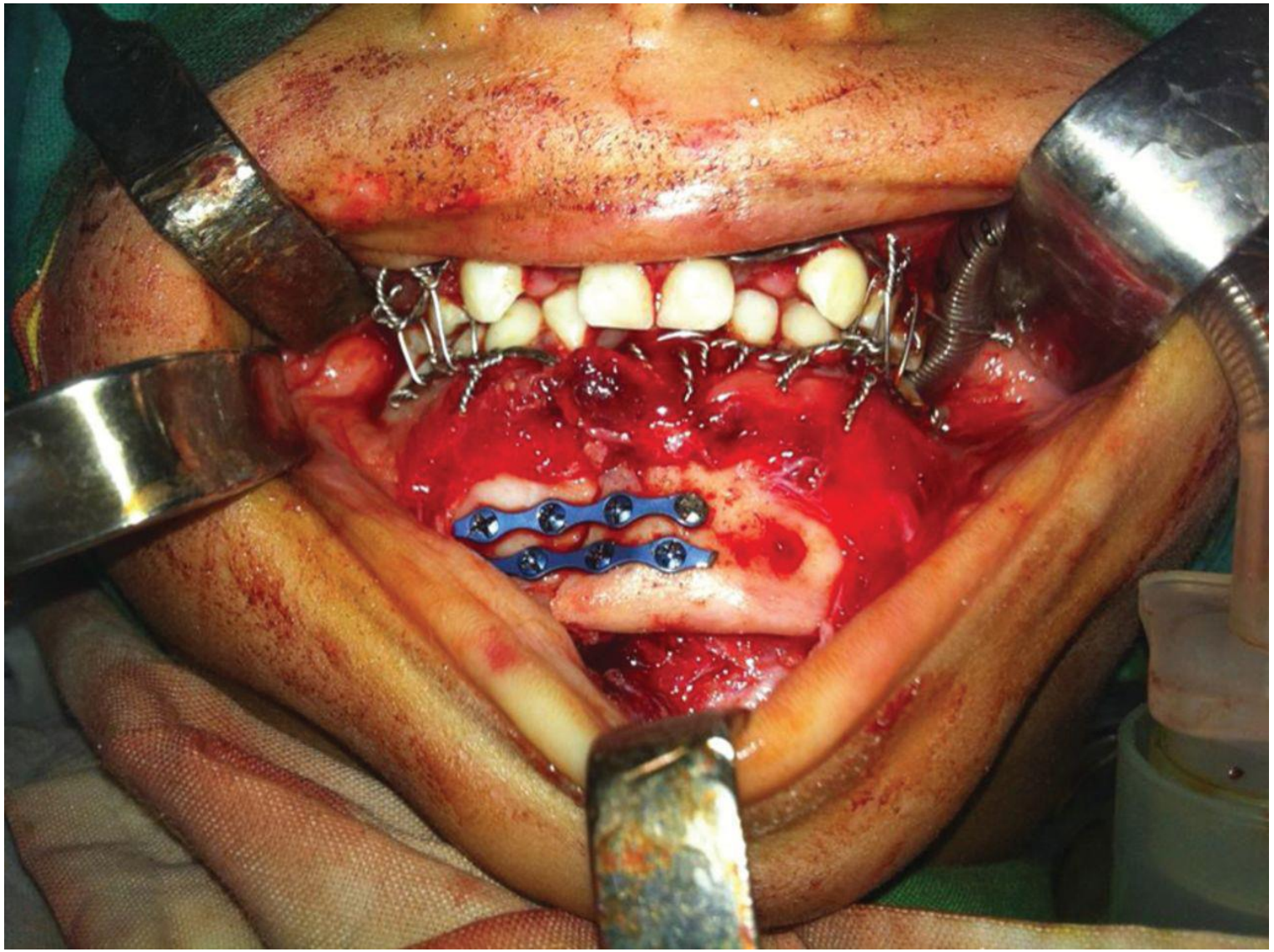


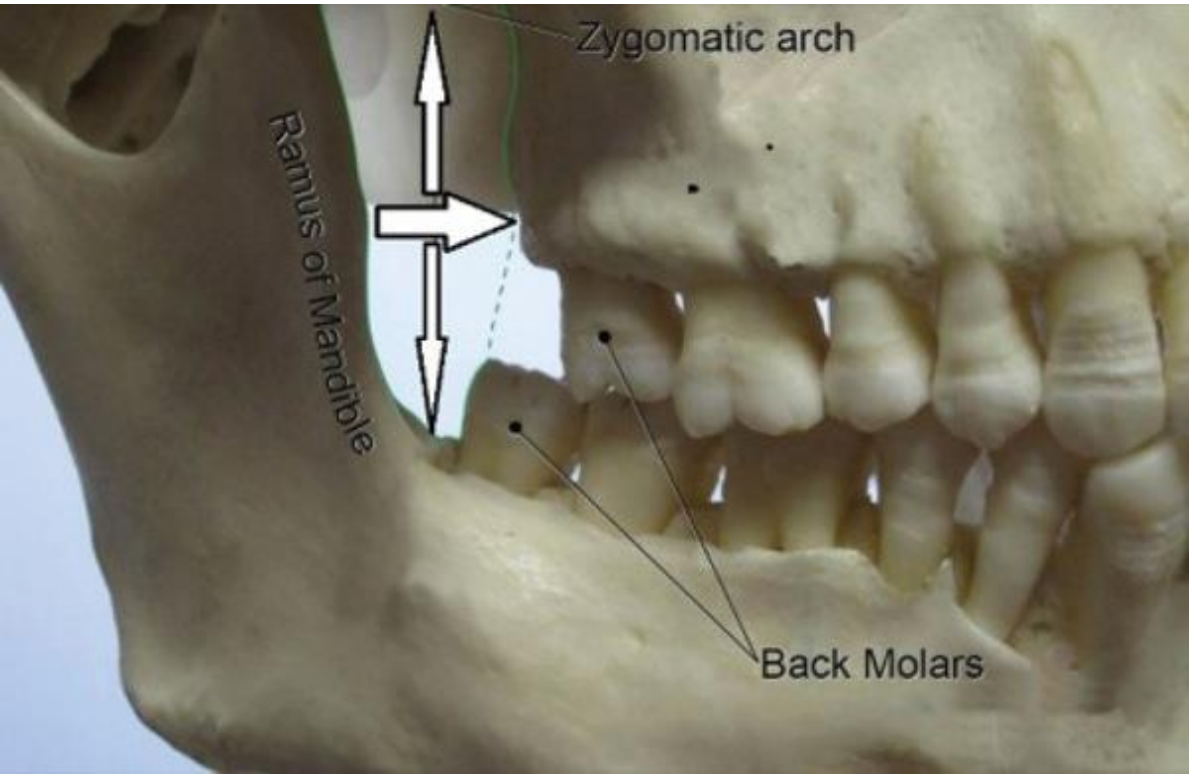
# Maxillofacial Trauma

## Submental Intubation



# Retromolar Intubation




Zygomatic arch
Ramus of Mandible
Back Molars

Optimal surgical outcomes of Corrective Jaw Surgery and Trauma Reconstruction require orchestration and coordination between the surgical team and anesthesia team.

Special considerations of airway management, minimizing blood loss, utilizing effective anti-emetic techniques and vigilant post operative airway monitoring.

# Corrective Jaw Surgery

The most **powerful** surgery for the face.

# Surgeon & Anesthesia Synergy

The most **powerful** care for the patient.

SINGH_SURG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Maxillofacial Surgery
Center *for* Excellence

# References


Giralt-Hernando M, Valls-Ontañón A, Guijarro-Martínez R, Masià-Gridilla J, Hernández-Alfaro F. Impact of surgical maxillomandibular advancement upon pharyngeal airway volume and the apnoea-hypopnoea index in the treatment of obstructive sleep apnoea: systematic review and meta-analysis. BMJ Open Respir Res. 2019 Oct 9;6(1):e000402. doi: 10.1136/bmjresp-2019-000402.

Haq, A., Winterbottom, T., & Ong, J. (2024). Anaesthesia for orthognathic surgery—a narrative review. *Journal Of Oral And Maxillofacial Anesthesia, 3*. doi:10.21037/joma-24-18

James I. Beck, Kevin D. Johnston, Anaesthesia for cosmetic and functional maxillofacial surgery, *Continuing Education in Anaesthesia Critical Care & Pain*, Volume 14, Issue 1, February 2014, Pages 38–42, https://doi.org/10.1093/bjaceaccp/mkt027

Rodrigo C. Anesthetic considerations for orthognathic surgery with evaluation of difficult intubation and technique for hypotensive anesthesia. Anesth Prog. 2000 Winter;47(4):151-6. PMID: 11432182; PMCID: PMC2149032.

Saini S, Singhal S, Prakash S. Airway management in maxillofacial trauma. J Anaesthesiol Clin Pharmacol. 2021 Jul-Sep;37(3):319-327. doi: 10.4103/joacp.JOACP_315_19. Epub 2021 Oct 12. PMID: 34759538; PMCID: PMC8562439.