CLEFT LIP / CLEFT PALATE

Surgical Specialty:	Plastic Surgery
Authors:	Rebecca E Lee, MD, Mount Sinai Hospital, New York, New York Natalie Barnett, MD, Medical University of South Carolina, Charleston, South Carolina

Background:

- General Considerations
    - Orofacial clefts (isolated cleft lip, isolated cleft palate, or cleft lip + palate) are the most common craniofacial abnormality worldwide[1,3]
    - Goals for repair: improved speech and feeding, dental health, hearing benefits, improved appearance, and psychological health
    - Primary cleft lip repair is typically performed at 3-6 months of age, and cleft palate repair is typically performed at 9-12 months of age.
    - While uncommon, some institutions may perform a combined lip and palate repair between 6-12 months.[4]
    - Additional surgeries may be performed later in childhood or as teenagers – such as pharyngoplasty for velopalatal insufficiency, rhinoplasty, maxillary osteotomy, dental rehabilitation, etc.
    - These patients should be extubated awake as they are at high risk for acute postoperative airway obstruction.
- Patient Considerations
    - Frequent upper respiratory infections or chronic ear infections can increase anesthetic risk. It is important to differentiate between baseline chronic condition vs. an acute infection.
    - Difficult airway risk factors include associated syndrome, presence of both cleft lip and palate, micrognathia, and age < 6 months.[2]
    - Approximately 30% of orofacial clefts are associated with a syndrome, most commonly:
        - Pierre Robin sequence
        - Velocardiofacial (DiGeorge) syndrome
        - Trisomy 21
        - Hemifacial microsomia (Goldenhar) syndrome
        - Treacher Collins syndrome
        - Klippel-Feil syndrome
        - Stickler syndrome
        - Fetal alcohol syndrome

Anesthetic Planning:

- Pre-Anesthetic Evaluation
  - Evaluate per routine paying special attention to any syndromic co-morbidities and presence of a difficult airway.
  - Respiratory illnesses – these patients are at high risk for post-operative airway obstruction/reactivity which can worsen in presence of acute upper respiratory infection.
- Specific or Unique Room Set-Up Requirements
  - Airway
    - The head of the bed will likely be turned 90-180 degrees away from the anesthesia workstation
    - Oral Endotracheal tube
      - Oral RAE (Ring-Adair-Elwyn or Right-Angle-Endotracheal): most commonly utilized tube with a preformed bend to secure midline onto the chin. Need to carefully select tube size as the set length past the bend associated with each tube size may result in endobronchial intubation or accidental extubation. If the appropriate tube size is too long, consider padding with gauze between the tube and chin to prevent endobronchial intubation upon insertion of the Dingman retractor.
    - Dingman retractor: tongue and cheek retractor used by the surgeon that allows for visibility of anterior palate and alveolus. Insertion of the retractor may cause accidental endobronchial intubation and/or tube compression or kinking. Manipulation or removal of the retractor may cause inadvertent extubation. Ensure the tongue is also free of excessive pressure from the retractor.
  - Drugs
    - Dexamethasone: minimizes the potential for airway edema (0.5-1.0 mg/kg – max 20 mg)
    - Local anesthetic: common for either the anesthesiologist or plastic surgeon to administer blocks (i.e. infraorbital and/or suprazygomatic maxillary nerve blocks) for intraoperative and postoperative analgesia
      - Lidocaine with epinephrine is commonly used by surgeons
      - Calculate the maximum toxic dose of any local anesthetic used and if the patient < 6 mos, decrease the maximum local anesthetic dose by 1/3.
  - Monitors – standard American Society of Anesthesiologists monitors
  - Blood Availability – typically not necessary
  - PICU Bed Availability – consider a PICU bed if needed for associated comorbidities, a history of difficult airway, or the need for additional airway or respiratory monitoring.

Intraoperative Considerations:

- Premedication – per routine
- Induction
  - Per routine – inhalational or intravenous
  - Special attention to:

        - difficult mask ventilation in the presence of a large cleft (i.e. tongue or oral airways may lodge in the cleft, causing airway obstruction).
        - risk of laryngospasm from frequent or chronic respiratory infections
        - potential for difficult airway.
- Positioning – Supine with shoulder roll
    - Head of bed rotate 90-180 degrees away from anesthesia work station – use a straight adaptor
    - The Dingman retractor may rest on the patient's chest along with the circuit – pad as needed
- Maintenance – Per routine although TIVA with propofol may have a smoother emergence and fewer respiratory events post-operatively[10]
    - Multimodal analgesia – consider acetaminophen and/or ibuprofen/ketorolac (discuss with the surgeon) along with regional blocks[11]
        - Link to infraorbital nerve block and suprazygomatic maxillary nerve block[6-9]:
- Hemodynamic/Physiologic goals – maintain appropriate blood pressure and heart rate for age
- Surgical Considerations
    - Duration of surgery: prolonged surgery may result in extended use of the retractor which can cause tongue ischemia or edema – consider intermittent relaxation of the Dingman retractor.
    - Confirm the maximum allowable local anesthetic dose before injection by the surgeon.
- Emergence/Disposition
    - Awake extubation.
        - High risk for acute postoperative airway obstruction due to smaller intraoral space post palate repair, airway edema with airway narrowing, lingual edema, blood, and residual anesthetic.
        - The goal is to avoid post-emergence obstruction and emergent need for oral airway or mask ventilation (which can disrupt repair).
    - Confirm removal of throat packs and have the surgeon place an orogastric tube under direct visualization to suction any blood in the stomach.
    - Removal of the Dingman retractor can displace the endotracheal tube—monitor closely for inadvertent extubation.
- Post-op Care
    - Depending on the degree of cleft palate and repair, the patient may have various instruments in place postoperatively to help relieve obstruction
        - Tongue stitch: allows forward displacement of the tongue if the patient is obstructing and cannot be relieved with position changes.
        - Nasopharyngeal airway: may be inserted and left in place postoperatively to prevent obstruction but may also be a source of obstruction if clogged with clot or if the incorrect length of airway is used.
    - The patient may require arm immobilizers to prevent elbow flexion and thumb sucking which may disrupt sutures
    - The patient will be admitted for 24-48 hours post-operatively for airway monitoring, pain control, and to ensure adequate oral intake

Case-Specific Complications/Pitfalls

- Airway obstruction: Common pre- and post-repair. During induction tongue or oral airway may lodge in the cleft creating an obstruction and possible difficult mask ventilation. Post repair, intraoral space is reduced along with mucosal edema. A stable post-operative respiratory status is the paramount anesthetic goal. Their post-operative destination should be appropriate for their respiratory status.
- Laryngospasm: increased risk during extubation due to secretions and blood in the oropharynx.
- Dingman retractor concerns: Accidental endobronchial intubation, extubation or endotracheal tube kinking can occur with Dingman retractor manipulation. Monitor tidal volumes, peak pressures, and bilateral breath sounds as needed especially with any manipulation. In addition, prolonged use of the retractor can lead to tongue ischemia or edema.
- Post operative analgesia
  - Minimize use of opioids due to concern for post-operative apnea and obstruction
  - Multimodal analgesia and regional blocks beneficial for this patients[9,11]
    - Link to regional blocks: https://www.nysora.com/techniques/head-and-neck-blocks/nerve-blocks-face/
  - Have a frank discussion with parents about the need to balance analgesia while avoiding apnea or obstruction

References

1) Strickler, P., Fladjoe, J., & Lerman, J. (2019). Plastic and Reconstructive Surgery. In *A Practice of Anesthesia for Infants and Children* (6th ed., pp. 804-806). Philadelphia, PA: Elsevier
2) Xue FS, Zhang GH, Li P, et al. The clinical observation of difficult laryngoscopy and difficult intubation in infants with cleft lip and palate. *Paediatr Anaesth*. 2006;16(3):283-289. doi:10.1111/j.1460-9592.2005.01762.x
3) Hammoudeh JA, Imahiyerobo TA, Liang F, et al. Early Cleft Lip Repair Revisited: A Safe and Effective Approach Utilizing a Multidisciplinary Protocol. *Plast Reconstr Surg Glob Open*. 2017;5(6):e1340. Published 2017 Jun 26. doi:10.1097/GOX.0000000000001340
4) Davila AA, Holzmer SW, Kubiak J, Martin MC. Anesthetic Exposure in Staged Versus Single-Stage Cleft Lip and Palate Repair: Can We Reduce Risk of Anesthesia-Induced Developmental Neurotoxicity?. *J Craniofac Surg*. 2021;32(2):521-524. doi:10.1097/SCS.0000000000007156
5) Denning S, Ng E, Wong Riff KWY. Anaesthesia for cleft lip and palate surgery. *BJA Educ*. 2021;21(10):384-389. doi:10.1016/j.bjae.2021.06.002
6) Flack, S. & Lang, R. (2019). Regional Anesthesia. In *A Practice of Anesthesia for Infants and Children* (6th ed., pp. 477-478). Philadelphia, PA: Elsevier
7) Chiono J, Raux O, Bringuier S, et al. Bilateral suprazygomatic maxillary nerve block for cleft palate repair in children: a prospective, randomized, double-blind study versus placebo. *Anesthesiology*. 2014;120(6):1362-1369. doi:10.1097/ALN.0000000000000171
8) Sola C, Raux O, Savath L, Macq C, Capdevila X, Dadure C. Ultrasound guidance characteristics and efficiency of suprazygomatic maxillary nerve blocks in infants: a descriptive prospective study. *Paediatr Anaesth*. 2012;22(9):841-846. doi:10.1111/j.1460-9592.2012.03861.x
9) Sola C, Dadure C, Choquet O, Capdevila X. Nerve Blocks of the Face. Accessed November 27, 2022. https://www.nysora.com/techniques/head-and-neck-blocks/nerve-blocks-face/
10) Karam C, Zeeni C, Yazbeck-Karam V, et al. Respiratory Adverse Events After LMA® Mask Removal in Children: A Randomized Trial Comparing Propofol to Sevoflurane [published online ahead of print, 2022 Feb 25]. *Anesth Analg*. 2022;10.1213/ANE.0000000000005945. doi:10.1213/ANE.0000000000005945
11) Esfahanian M, Marcott SC, Hopkins E, et al. Enhanced recovery after cleft palate repair: A quality improvement project. *Paediatr Anaesth*. 2022;32(10):1104-1112. doi:10.1111/pan.14541

Reviewed by:

Reviewer #1: Jennifer Lau, M.D., Children’s Hospital- Los Angelas

Reviewer #2: Anita Akbar Ali, MD, Arkansas Children’s Hospital

Reviewer #3: Kamie Yang, M.D., University of Michigan

Created: August 12, 2022; Last revised: November 27, 2022