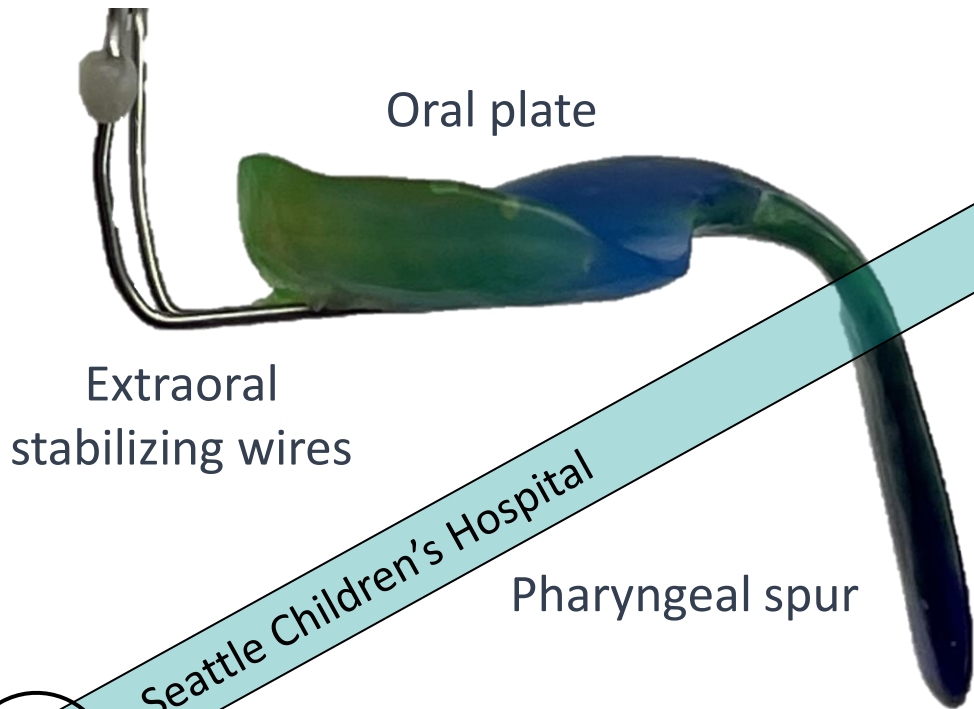


Seattle Children's OAP Job Aid

How the Orthodontic Airway Plate (OAP) Works

OAP components



- The precise fitting plate adheres to the hard palate and upper gum with adhesive denture cream
- The spur extension (pharyngeal component) brings the tongue forward thereby opening up the airway and relieving airway obstruction
- The wires and tape help lift the tongue and maintain the position of the plate

OAP in place with wires and tape



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Pre-OAP Workup and Checklist

Consults:

- ✓ Craniofacial medicine
- ✓ Orthodontist
- ✓ Otolaryngology
- ✓ Infant Feeding therapy
- ✓ Infant developmental therapy
- ✓ Nutrition
- ✓ Social work

Provider Huddle + Caregiver Discussion:

- ✓ Re: Treatment Options
- ✓ Craniofacial medicine, Orthodontist, Otolaryngology, OMFS/Plastics
- ✓ OAP Core Team

Agreement to Proceed with OAP?

- ✓ If not already in the NICU:
Transfer to NICU for OAP
- ✓ NICU RT notified of OAP plans/procedures
- ✓ Airway Emergency Signage at bedside
- ✓ Communication Plan with NICU in place:
defined by Orthodontist and Otolaryngologist

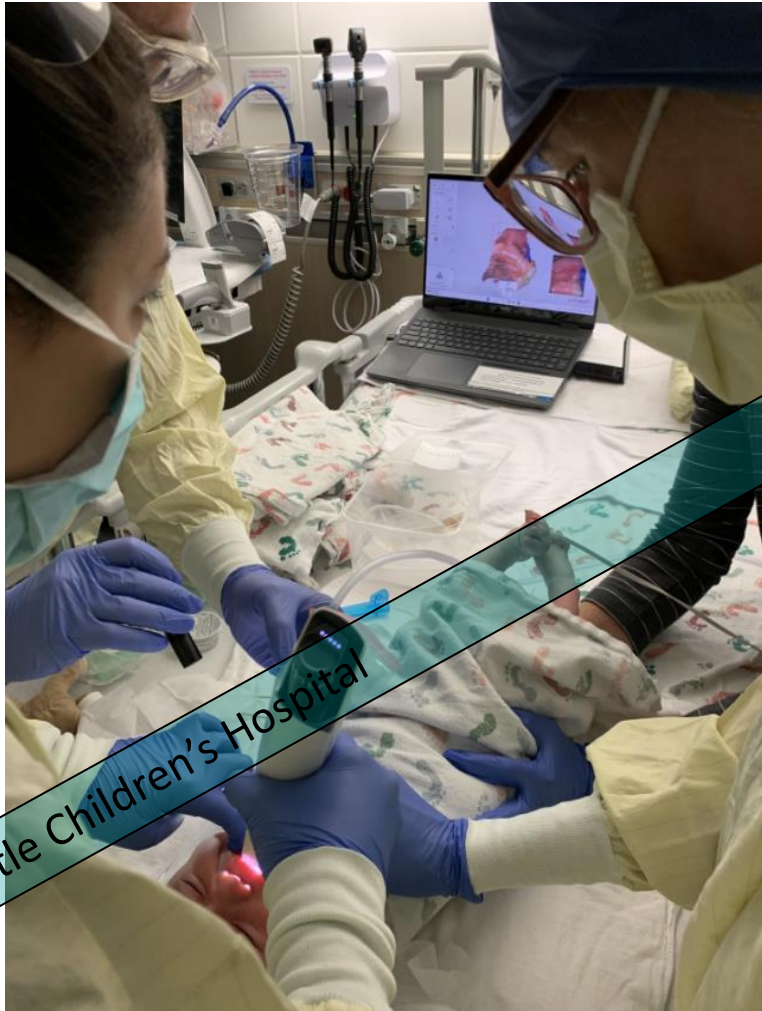
Studies/Imaging:

- ✓ Bedside flexible laryngoscopy by Otolaryngology
- ✓ Baseline Overnight Sleep Study
- ✓ CT maxillofacial wo IV contrast + 3D + Dynamic Airway; *OAP team present for CT*

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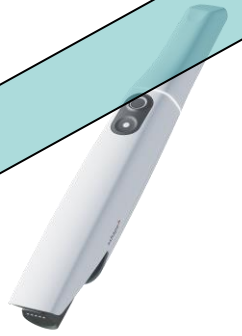
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Oral Scan by Orthodontist



At Bedside

- Pre-procedure huddle: Pediatrician, Orthodontist, Bedside RN, additional support as requested, and parents.
- Oral suction and BlowBy oxygen available
- Gauzes and long Q-tips needed
- No sedation, pacifier and sweeties available if deemed safe
- Baby swaddled and stabilized
- Procedure takes ~ 3-4 minutes of scanning, with breaks as needed



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Maxillary Impression by Orthodontist



Example of maxillary impression trays used for procedure



In Procedure Room or Main OR

- Dental cart with high vac suction, Impression supplies
- Pre-procedure huddle: Anesthesiologist, Orthodontist, Dental Assistant, additional support as requested
- Baby swaddled and stabilized
- Typically light sedation
- Procedure takes ~ 2 minutes

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Orthodontic Airway Plate (OAP) Care: NICU

1. **Maxillary impression** by Orthodontist in OR Procedure Room (with anesthesiologist)
2. **OAP creation** in Orthodontic Lab using the maxillary impression and CT
3. **Infant Support:** swaddle, soothing, option for side/prone position in between OAP modifications and endoscopies, O2 via nasal canula/BBO2, nasal + oral suction
4. **OAP Try-In** at Bedside with airway endoscopy (Orthodontist, Otolaryngologist, RN, RT, NICU provider), followed by modifications as needed, OAP modifications may occur at the bedside or orthodontic lab
5. **OAP Delivery/Insertion** at Bedside with airway endoscopy (Orthodontist, Otolaryngologist, RN, RT, NICU provider)
6. Assess daily for need for OAP modification. **Endoscopy by Otolaryngology at bedside as needed** to evaluate efficacy of device in the airway post-modification, minimize endoscopy frequency and time
7. **Pre-OAP placement:** Clean/Dry the palate/alveolar ridges pre-delivery with gauze
8. **Post-OAP Placement:** Vertical pressure on OAP/ anterior gumline while denture cream sets: Approx 6-8 min by orthodontist, longer as deemed by orthodontist. Side lying position only for 2-3 days. Limit pacifier and bottle x 24 hours after 1st insertion, or per orthodontist
9. **Daily mouth/gum checks** with Oral Care Kit out by orthodontist
10. **Orthodontist education** for bedside team + caregivers on: How to remove the OAP if respiratory distress, mouth/gum checks
11. **Daily NICU rounds** to include updates from Craniofacial, Otolaryngology, Orthodontist
12. **Monitoring:** Observation of exam, attention for stertor, snoring, stridor, work of breathing, secretions, cough, oral suction needs; Continuous oximetry; Trending CO2 levels, daily weights
13. **Sleep study** with OAP when in room air, supine: NICU or Medical Unit

Ready for Transfer to Acute care (Craniofacial) when:

- OAP is therapeutic
- total CO2 < 30, stable or downward trending
- No O2 desaturations requiring intervention
- Suction frequency reasonable for the floor
- Emergency Airway signage up to date at bedside



Orthodontic Airway Plate (OAP) Care: Medical Unit

1. *Once stable, and criteria met, OK for transfer to Medical Unit*
2. **Daily rounding** bedside craniofacial team, nursing, caregivers, daily communication with Otolaryngologist and Orthodontist
3. **Medical Team**
 - Assess daily: mouth/gums, breathing, any need for modification of the OAP
 - Daily plan/orders for backup plan if the OAP is dislodged
 - Assessments and modifications of OAP with endoscopies by Otolaryngology done as needed to guide and assess treatment
4. **Nursing**
 - Assess every shift and with cares: OAP in place, retention tapes secure
 - Notify primary team if any concerns about OAP
5. **Orthodontist**
 - Education for bedside team + caregivers on: Daily mouth/gum checks, how to remove/clean/replace the plate
 - Modifications to the OAP plate and spur: at the bedside or in the orthodontic lab
 - Addition of a wire to the spur when close to home-going and no spur adjustments anticipated
6. **Monitoring:**
 - Observation: attention for stertor, snoring, stridor, work of breathing, secretions, cough, oral suction needs
 - Continuous oximetry
 - Trending CO2 level
 - Daily weights
7. **Position:** Supine (as tolerated) with OAP in place, side/prone when OAP is out; Developmental therapist working on mobility, holding, exercises
8. **Feeding:** Feeding therapist assessing readiness for oral skills work and feeds
9. **Sleep study** with OAP in place, on room air, and prior to discharge home

Steps to remove the OAP

post at the bedside

any member of the team can remove OAP in case of emergency

1. Cut the tapes above the rubber bands or Unhook rubber bands from the OAP wires
2. While holding at the base of the external wires, apply gentle downward pressure to the plate to break seal with the maxilla
3. Tilt the plate downward and forward, twist to remove
4. Ensure entire OAP is removed
5. Place the infant side or prone, follow difficult airway guidance
6. With gauze, wipe away denture adhesive on gums + roof of mouth

Orthodontic Airway Plate (OAP) Communication Plan

post at the bedside

CALL FORS

Otolaryngologist on call for OAP:

- Airway worsening
- Respiratory distress

Orthodontist on call for OAP:

- Device dislodgement and unable to be replaced by caregivers
- Device malfunction (plate, spur, wires)
- Soft tissue irritation or ulceration
- Wire bent or irritating skin

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Rare Risks of OAP



Strategies to minimize

- Airway event during plate placement
- Dislodgement of plate
- Lip and Intraoral irritation or ulceration
- Facial skin irritation from taping
- Airway ulceration or granuloma
- Device breaking, spur fracture
- **highest risk in the 1st week**

- Back up O₂ and suction
- NICU for initial OAP delivery
- Adjustments to spur with ENT/endoscopy visualization
- Backup airway plan if plate dislodged or removed
- Gentle handling of plate, inspect for cracks whenever removed
- Daily soft tissue mouth checks
- **Communication**

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Daily OAP Care

The OAP needs to be removed and cleaned at least once daily, timing and frequency per the Orthodontist or if the patient's OAP accidentally dislodges.

In NICU, the orthodontist attends OAP daily care until a caregiver has been trained.

The steristrip retention tapes should be replaced when beginning to peel/come loose.

You will need the following supplies:

- REMOVAL: 2x2s, cotton tipped applicators, penlight
- CLEANING: 2x2s, toothbrush, soap, water
- REPLACEMENT of OAP: 2x2s, denture adhesive (from the patient refrigerator)
- REPLACEMENT of retention tapes: Detachol (adhesive remover), skin prep, steristrips attached to elastics, scissors

Daily OAP Care: *Removal*

REMOVAL:

1. Unhook the rubber bands from the external OAP wire, leaving tape attached to forehead (Fig. 1)
2. Use a finger and thumb to break the seal between the front of the plate and the maxilla, apply gentle downward pressure to the plate to break seal with the maxilla (Fig. 2)
3. Rotate the plate downward and forward, removing from the mouth (Fig. 3)
4. Using denture brushes, wipe away residual denture adhesive from the infant's palate. The plate should have some denture adhesive (Fig. 4).



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Daily OAP Care: *Checking for Intraoral Sores*

MOUTH CHECK:

1. Check intraorally for any remaining denture adhesive. If present, remove with a 2x2 or cotton tipped swab (Fig. 1)
2. While the plate is out, check intraorally for sores in the mouth. The most common spots for irritation, a sore or an ulcer are along the gums in the front and along the gums towards the back of the palate (Fig. 2)



Daily OAP Care: *Cleaning*

CLEANING:

1. Remove residual denture adhesive from OAP using 2x2, toothbrush, or gloved finger
2. Rinse with water
3. Wash with hand soap
4. Rinse thoroughly



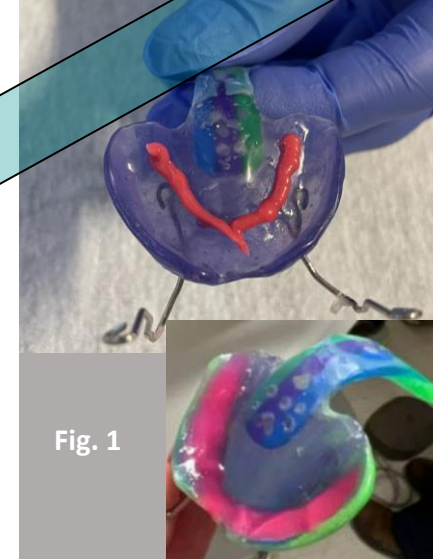
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Daily OAP Care: *Replacement*

REPLACEMENT:

1. Dry the plate with a 2x2
2. Apply single bead of denture adhesive in “U” shape, terminating before distal/back edges (Fig. 1)
3. Suction the mouth if needed
4. Dry the roof of the mouth (especially upper gumline) with dry 2x2s until surface is dry (Fig. 2)
5. Encourage infant to open mouth (gentle downward pressure on chin). Helpful to have a second person gently hold the head to prevent movement.
6. Insert spur over tongue first rotating down and back into place, ensure upper lip is clear, then seat onto alveolar ridge with upward pressure (Fig. 3). **check for the tip of tongue**
Hold in place with vertical pressure on the anterior hard palate or button for 6-8 minutes (Fig. 4). While maintaining pressure, loop the rubber bands back on the external wires



Daily OAP Care: *Taping*

TAPING:

1. Gently remove steristrips using adhesive remover (detachol)
2. Apply barrier film (sureprep rapid dry)
3. Hold upward pressure on plate to avoid dislodgment (pinky finger works well), then latch elastic onto retention wire (Fig. 1)
4. Apply moderate tension to elastic, then attach steristrip to contralateral side (Fig. 2). Adequate tension will induce a wrinkle (frown face) above the brow.
5. Trim excess steristrip to avoid hair and attach excess perpendicularly (Fig. 3), or use replicare (Fig. 4)



Fig. 1



Fig. 2



Fig. 3

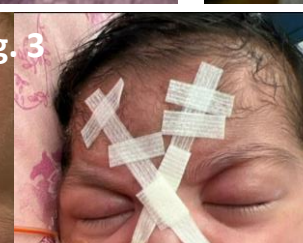
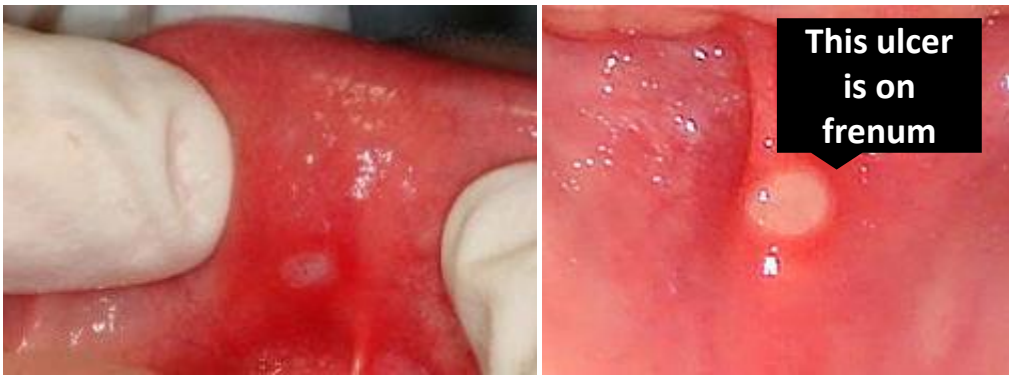


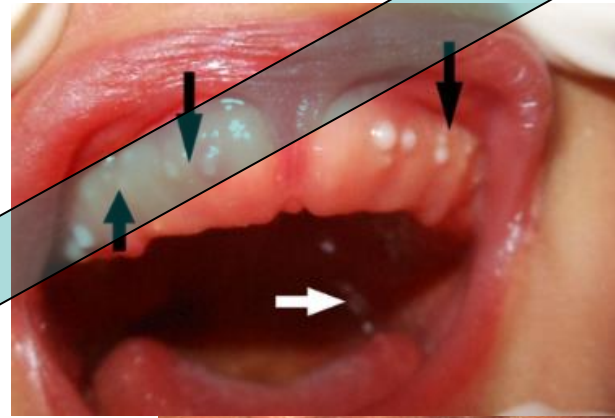
Fig. 4



This ulcer is on frenum

Oral Exam: Tips for Caregivers

Ulceration - white center and red edges
From trauma, friction or unknown reason, also called a canker sore/aphthous ulcer



Bohn nodules - front and back side of dental ridge

Epstein's Pearls - at midline of palate

Gingival cyst of newborn - at crest of dental ridge

These nodules are all NORMAL: appear as small, raised, white or gray, and resolve spontaneously.



All OAP edges may cause ulcers

White film doesn't wipe off



Oral Thrush - fungus infection



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Retention tapes for the Orthodontic Airway Plate

Supplies

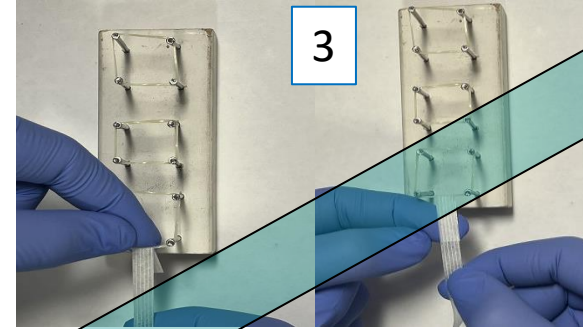
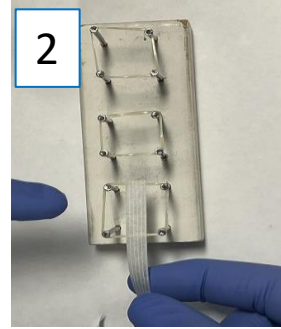
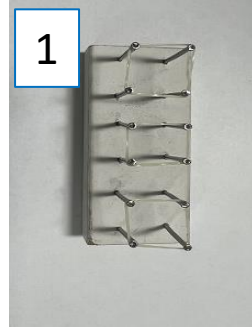
1. Board with nails
2. Steri-strips: 2 sizes
3. Package of orthodontic elastics ("Bummer")



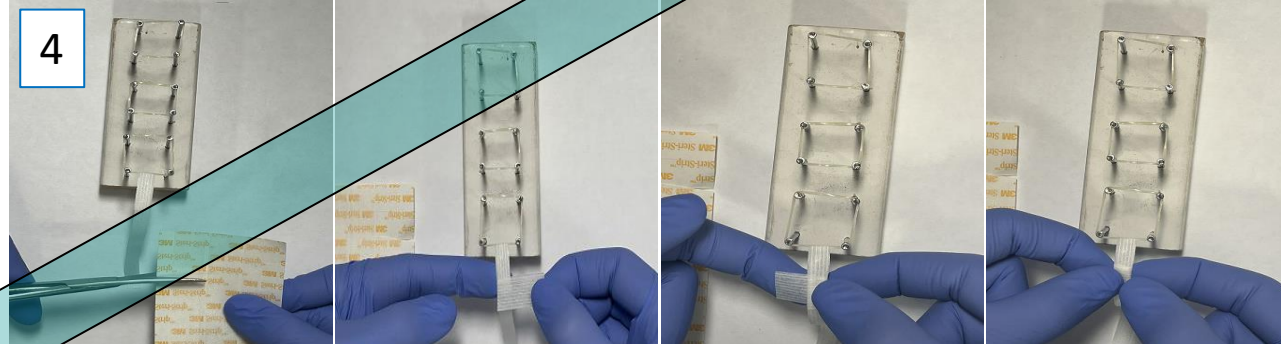
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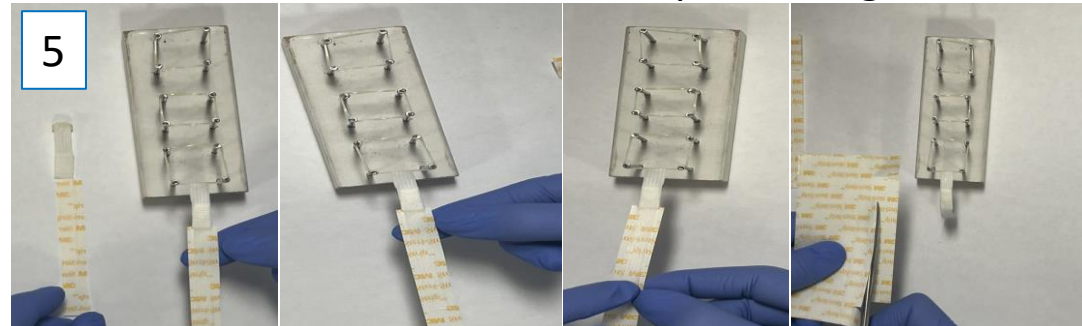
1. Place a single elastic around 4 nails to make a square shape.
2. From the package with 10 narrow steristrips, take one out strip
3. Loop ½ inch around one side of elastic square and attach onto the long part of the steri strip.



4. From the package with 6 wider steristrips, cut across strip about ¾ inch from edge, attach cut piece to cover the edge of the doubled up narrow steri strip as below



5. Cut long piece of the non stick printed paper and attach over the long free end of the narrow steri strip. Remove from nail board and store in plastic bag until needed.



Making OAP Retention Tapes

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Endoscopy: Pre-endoscopy Precautions

Verify

- High Flow Nasal Cannula (HFNC) in use?
- If no HFNC, have Blowby oxygen present
- **Feeds held at least 30 minutes**, and for some patients ideally would not have received a feed within 2 hours prior to try-in and delivery
- Have **suction ready: 8 or 10-french** catheter and oral tip
- Need for RT and/or Neonatologist for support

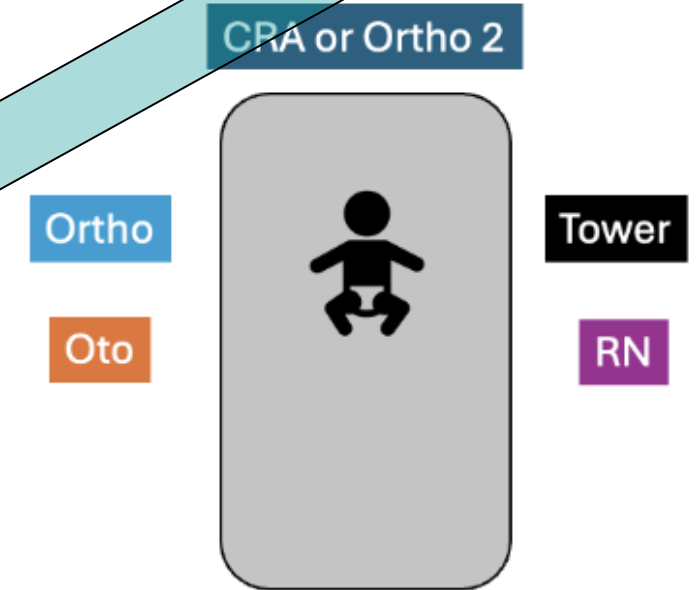
Equipment

- *2.7 mm pediatric distal chip scope is recommended*
- *Assessment should include nasal cavity (assess cleft for any tongue protrusion), tongue base (ensure indication and evaluate level of obstruction), supraglottis (evaluate epiglottis position), lateral tongue base/pyriforms (ensure no contact or concerns)*

Time-out

- Discuss the order of procedure (**scope first and OAP second**)
- Discuss provider positions – have a senior orthodontist in direct vision of the screen and next to Otolaryngology resident / APP for guidance

Prior to starting, suction mouth + deeper pharyngeal suction thoroughly



Division of roles:

- Pediatrician, Orthodontist, Otolaryngologist, RN
 - Ensure monitoring of vitals (oxygen and heart rate) by the pediatrician or RN. If in NICU, Neonatologist may be needed.
 - If RT needed, ensure delivery of Blowby oxygen or adjustment of FIO2 for procedure.
 - Ensure visualization of extraoral OAP wires (especially during initial delivery try-in).

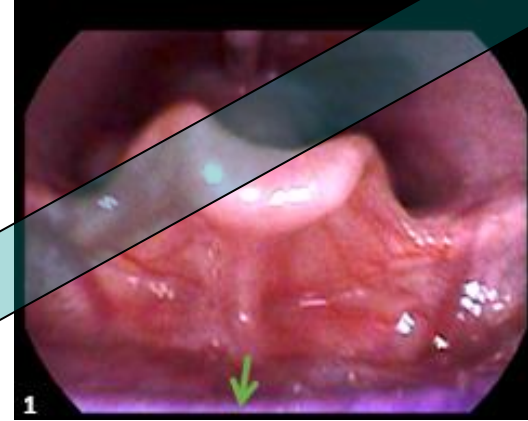
Endoscopy: Inspection Levels

- Anterio-posterior distance of spur from posterior wall of pharynx



Looking for visualization of the “perky” epiglottis, with a generous distance between the spur and posterior wall of pharynx (open airway). At rest, ensure that the epiglottis is brought forward away from the posterior pharyngeal wall. If epiglottis collapses backwards, further anterior push might be needed.

- Vertical distance of spur from vallecula



Approximate 1.5-2 mm vertical distance from vallecula, with an equal amount of bulging of the tongue under the spur (Picture 2). This prevents the end of the spur from contacting the tip of the epiglottis during active glottic movement, which could lead to gagging and/or coughing.

- Spur-tip bevel (difficult to visualize on endoscopy)

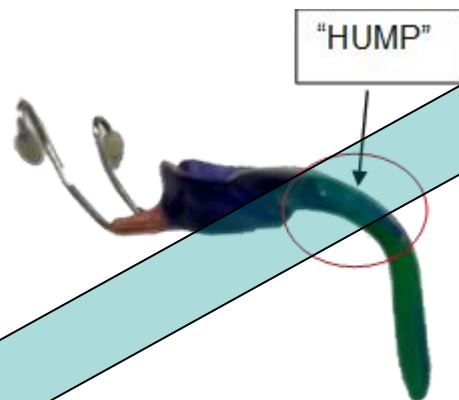
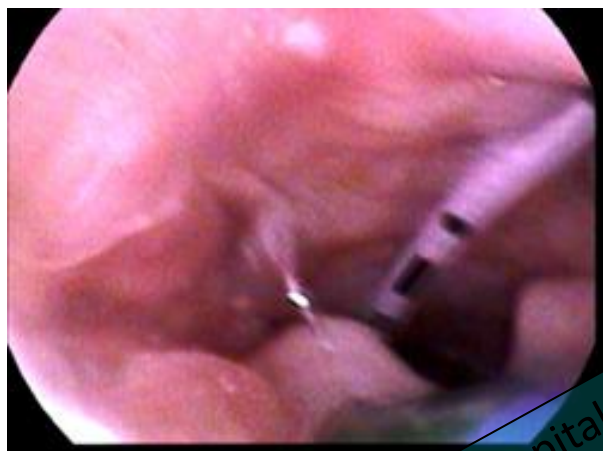


Portion of the tip of the pharyngeal spur where the posterior thickness is decreased by 0.25mm. In the picture, note how a blue hue is slightly visible. If fabricated correctly, it should disappear from view during endoscopy.

Endoscopy: Inspection Levels

- Horizontal curvature from end of oral plate to beginning of vertical spur (“hump”).

The scope should be pulled back into the nasopharynx with visualization of the posterior end of the cleft palate.



- Midline orientation relative to the epiglottis



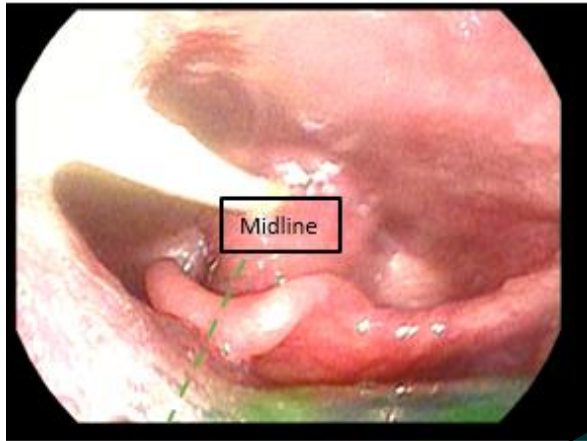
Looking for the midline position of pharyngeal spur to align with the epiglottis. During try-in, if aligned properly, typically the purple color stripe of the thermoplastic material should be at the middle position (Picture 1).

Looking for generous distance from “hump” to the posterior wall of pharynx. Note how horizontal curvature of OAP rests passively below clefted segments of the soft palate, away from the NG-tube. If fabricated correctly, it should not be easily visualized during endoscopy.

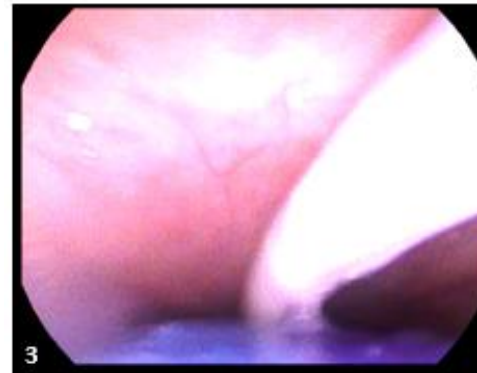
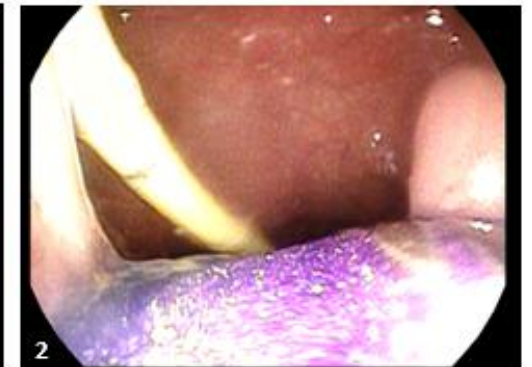
Endoscopy:

Examples of pharyngeal spurs needing adjustment

- Non-centered spur (deviated to patient's left)



- Excess horizontal curvature from end of oral plate to beginning of vertical spur ("hump" too posterior)



Note how the "hump" of the pharyngeal spur slightly displaces the clefted segments of the soft palate (Picture 1 – upwards / Picture 2 – laterally). Contact of spur with NG tube and diminished space between horizontal curvature and posterior wall of pharynx (airway space) are signs of an excessive initial curvature.

- Pharyngeal spur too long



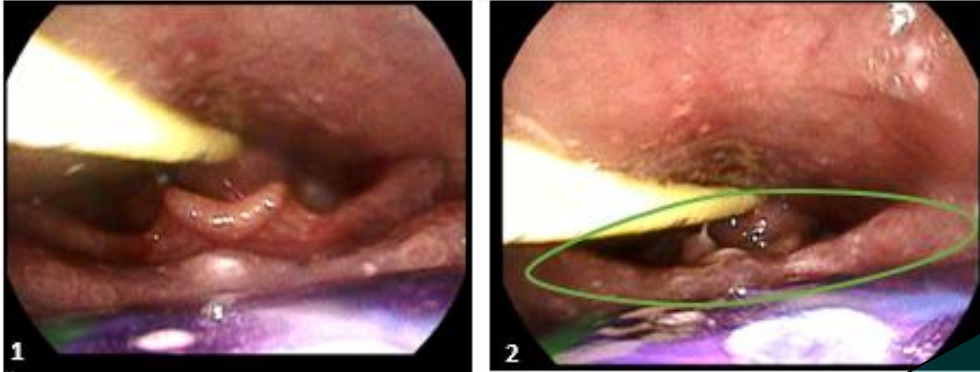
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Endoscopy:

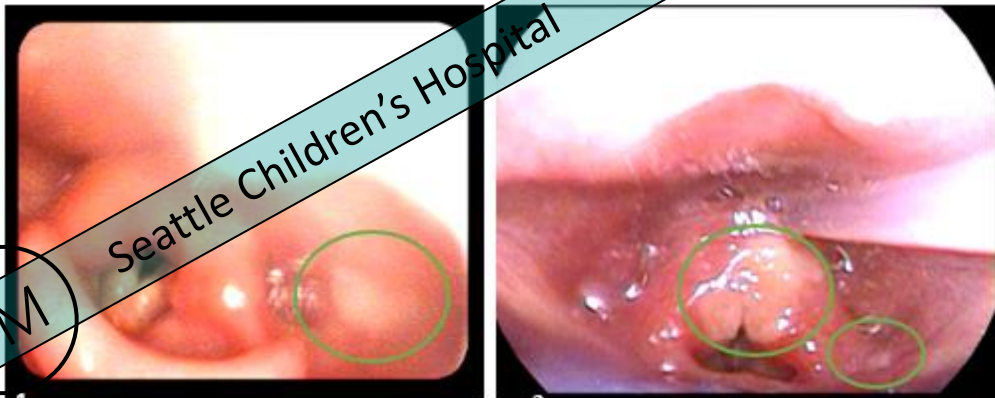
Examples of pharyngeal spurs needing adjustment

- Pharyngeal spur too short

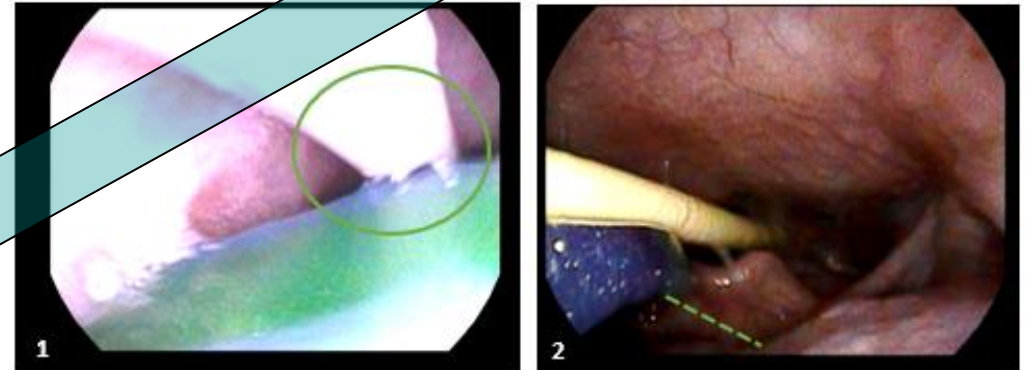


Note the excessive tongue bulging under the tip of the spur (Picture 1), displacing the epiglottis backwards (Picture 2).

- Pharyngeal sore



- Pharyngeal spur too posterior



Pharyngeal spur occupies excessive portion of the view, obstructing the airway. Note the contact between the pharyngeal spur and NG-tube (Picture 1), as well as from a lateral view (Picture 2), space between the anterior surface of the pharyngeal spur and the base of tongue is evident.

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