Feeding and Speech Interventions for Young Children With Cleft Lip and Palate

Maia Braden, MS, CCC-SLP
UW Madison Voice and Swallow Clinics, American Family Children’s Hospital

Disclosures

• Financial:
  – Financial compensation from ASHA for this presentation
  – Salary from UW Medical Foundation

• Nonfinancial:
  – None
Learning Objectives

• Describe how cleft palate impacts breast and bottle feeding, and describe what is needed in a feeding system for a child with this birth anomaly
• Explain how speech sound acquisition prior to palate repair may differ from typical speech sound development
• Identify two ways to support speech development in toddlers post-palate repair

“Anna”

• Born full-term, no complications
• Breast feeding 45 minutes every 1.5 hours
• Not gaining weight
• Frequently fussy
“Anna”

- 3 weeks of age, sees SLP
- Identifies cleft of soft palate...

“Thomas”

- Adopted from China at age 18 months
- Cleft lip and palate repaired in China
- Age 2 years, 2 mos.
- Babbling; only m, n, vowels
- Parents say his comprehension is good, but he only has a handful of words – referred for speech evaluation through 0-3...
Overview of Cleft Lip and Palate

Prevalence

- Cleft lip and/or palate is the 4th most common birth anomaly in infants – 1 in 600 live births (Cleft Palate Foundation, 2011)
- Higher/lower in some populations
  - Native American: 1 in 300
  - Asian: 1 in 500
  - African descent: 1 in 2000
Factors That Influence Clefting

- Chromosomal
- Mechanical: Pierre Robin
- Environmental: Drugs/medications, Alcohol, Lead, Viruses
- Maternal nutrition deficiencies: Folate, B6
- Advanced parental age

Syndromes Associated With Clefting

- 22q11.2 deletion
- Fetal alcohol syndrome
- Trisomy 13
- CHARGE syndrome
- Diabetic embryopathy
- Opitz syndrome
- Stickler syndrome
- Kabuki syndrome
- Van der Woude syndrome
- Wolf-Hirschhorn syndrome
Feeding and Speech Interventions for Young Children With Cleft Lip and Palate

Embryology/Development

- Migration of neural crest cells in embryo to form skull/facial structures
- If delayed, it impacts formation of facial/cranial structures
- Lip/alveolus
  - 6-7 weeks gestation
  - Fusion starts at incisive foramen and fuses anteriorly

Palatal Fusion

- Begins at 8-9 weeks gestation, complete by 12 weeks
- Begins at incisive foramen and fuses posteriorly
- Tongue starts out high in posterior nasal cavity
- Palatal shelves vertical, on each side of the tongue
- Tongue has to move down in the mouth for the palate to fuse
- Palatal shelves move in, fusing along median palatine suture line
- Vomer moves downward, completes hard palate
- Velum fuses at midline
- Last, uvula forms

(Gray, 1918)
Oral View

Velopharyngeal Function
Cleft Types

Veau I

Veau II

Veau III

Veau IV

Surgical Timeline
Surgeries in Childhood

Lip repair (2-6 months)
Palate repair (10-12 months)
Lip/nose revision if needed (by kindergarten)
Alveolar bone graft (8-9 years)
Secondary surgery if needed

Lip Repair

- 10 weeks old or later
- Often later if nasal-alveolar molding is used
Palate Repair

- 10-12 months old
  - Prelinguistic
  - Optimal growth
- Surgery MUST realign muscle
  - Straight line with intravelar veloplasty
  - Furlow z-plasty

Feeding an Infant With Cleft Lip/Palate
Elements of Successful Infant Feeding

- State regulation
- Hunger drive
- Airway protection
- Coordinated suck/swallow/breathe
- Stable vitals
- Intact anatomy
- Intact underlying supportive systems

Successful Feeding

- Positive feeding experiences
  - Bonding, comfort, learning
- Adequate intake
  - Amount, caloric density
- Safe and efficient feeding
  - Airway protection, not excessive duration
- Growth and development
  - Follow weight on growth chart, ensure nutrition for physical and neurologic growth
Expectations – Cleft Lip Only

- Can often breastfeed or take a typical bottle
- May need positioning changes
- Some will have difficulty with this due to difficulty forming lip seal, but most don’t

Expectations – Cleft Palate

- Generally cannot get adequate nutrition from breast or standard bottle
- Need specialty bottle
- With appropriate modifications, should have intact pharyngeal swallow, should be able to grow and gain weight
- IF THEY DO NOT: Look at other causes
Feeding and Speech Interventions for Young Children With Cleft Lip and Palate

Typical Infant Feeding

• Oral phase
  – Suckling (up to about 6 months)
    • Rhythmic backward and forward motion of tongue, combined with up and down jaw movement
    • Nipple compressed between tongue and alveolar ridge, releases some liquid
  – Sucking (from 6 months on)
    • Up and down motion of tongue against alveolar ridge
    • Forward-backward motion of tongue pulls liquid from nipple
    • Tongue moves backward, jaw drops, velum seals off nasal from oral cavity, negative pressure generated – suction and expression of most of the liquid

• Pharyngeal phase
  – Initiated once fluid bolus enters pharynx
  – Tongue base, velum, and posterior pharyngeal wall provide driving pressure
  – Velum elevates, seals off nasopharynx
  – Negative pressure and suction generated to propel bolus into pharynx
  – Bolus diverts around epiglottis, pharynx fills and contracts
  – Vocal folds adduct
  – Epiglottis retroflexes over larynx
  – Infant continues nasal breathing (but ceases briefly at initiation of swallow)
Typical Infant Feeding

- **Esophageal phase**
  - UES opens
  - Bolus travels through esophagus (peristalsis)
  - LES opens

Feeding in Children With Cleft Lip and Palate

- **Oral preparatory phase**
  - Rooting reflex
  - Latching on nipple (lips and tongue form a seal) – can be impacted by cleft lip

- **Oral phase**
  - Suckling or sucking tongue compresses nipple against alveolar ridge, releases some liquid
  - Forward-backward motion of tongue pulls liquid from nipple
  - Tongue moves backward, jaw drops, velum seals off nasal from oral cavity, negative pressure generated – suction and expression of most of the liquid – with cleft palate, cannot seal off nasal from oral cavity or generate adequate negative pressure
    - Inadequate volume
    - Backflow into nasal cavity
### Feeding in Children With Cleft Lip and Palate

**Pharyngeal phase**
- Tongue base, velum, and posterior pharyngeal wall provide driving pressure
- Velum elevates, seals off nasopharynx
- Negative pressure and suction propel bolus into pharynx
- Bolus diverts around epiglottis, pharynx fills and contracts
- Vocal folds adduct
- Epiglottis retroflexes over larynx
- Infant continues nasal breathing (but ceases briefly at initiation of swallow)

### Feeding in Children With Cleft Lip and Palate

**Esophageal phase**
- UES opens
- Bolus travels through esophagus, peristalsis
- LES opens
Differences in Feeding

- Louder nasal breathing
- “Suck” is really compression
- Shorter sucking bursts
- Nasal regurgitation can occur

Feeding Problems Related to Cleft

- **Nonsyndromic**
  - Intact sucking and swallowing reflexes
  - Normal pharyngeal swallow
  - Normal tongue position, function, movement

- **Syndromic**
  - Higher risk for more complicated feeding and swallowing disorders
  - Upper airway obstruction
  - Neurologic impairment
    - Incoordination of SSB
    - Hyper- or hypotonicity

(Brogan et al., 1987; Clarren et al., 1987; Dinwiddie, 2004; Hartzell & Kilpatrick, 2014; Masarei, 2007; Reid et al., 2006)
Feeding Problems Related to Cleft

- CL/CLP
  - Larger/more extensive cleft \( \rightarrow \) increased difficulty
  - Impaired suction and compression
  - Anterior fluid loss
  - Decreased volume extraction per suck
  - Piecemeal posterior transfer
  - Piecemeal delivery of bolus to pharynx
  - Nasopharyngeal regurgitation
  - Excessive air intake
  - Incomplete clearance
    - Mouth
    - Nasopharynx
  - Loud, wet-sounding breathing

- Can lead to...
  - Impaired SSB coordination
  - Poor feeding efficiency
  - Increased feeding time
  - Inadequate intake
  - Poor weight gain

(Arvedson & Brodsky, 2002; Bessell et al., 2011; Brine et al., 1994; Carlisle, 1998; Dailey, 2013; Masarei et al., 2007; Miller, 2016; Reid, 2006, 2007)

Reid et al. (2007)

- Measured suction and compression in children with and without cleft palate
- Non-compressible bottle
- Special device to measure suction/pressure
- With cleft lip only, could generate positive and negative pressure
- With cleft palate, reduced or absent negative pressure
- Cleft palate and cleft lip had least efficient suck
- Conclusion: Smaller cleft results in better feeding
Masarei et al. (2007)

• Compared feeding in babies with cleft palate and without cleft palate
• Babies with cleft palate had:
  • Faster suck rates
  • Shorter suck bursts
  • Shorter suck duration
  • Higher suck/swallow ratio
• Conclusion: Infants with cleft palate had more inefficient feeding

Submucous Cleft

• Mucosa forms in presence of incomplete muscle closure
• Range of severity
• Oral signs may include
  – Bifid uvula
  – Zona pellucida
  – Notching of hard palate
• Feeding difficulties
  – Reduced or absent negative pressure
  – Difficulty with breast or standard bottle
  – Prolonged feeding times
  – Poor weight gain
Feeding and Speech Interventions for Young Children With Cleft Lip and Palate

**Interventions**

- **Behavioral**
  - Specialty bottle
  - Positioning
  - Frequent burping
- **Surgical**
  - Usually at 10-12 months

**Cochrane review**

- Found very limited evidence for any interventions
- Squeezable bottle was more usable than hard bottles, but no difference in weight gain

**Bessell et al. 2011**
Feeding and Speech Interventions for Young Children With Cleft Lip and Palate

Available Evidence: Case Series, Cohort, Expert Opinion

Specialty/modified bottle
• One-way valve
• Cross cut nipple
• Compressible bottle

Positioning strategies
• Head support
• Trunk in midline
• Flexion
• Semi-upright

Assisted feeding
• Squeezing nipple or bottle

Feeding facilitation strategies
• Proprioceptive assist with nipple on tongue
• Positioning of nipple
• Pacing

What Bottle to Use?

Ideal system

- Allows adequate volumes
- Doesn’t require negative pressure
- Safe
- Baby-controlled
- Manageable for parents
- Allows baby to develop oral feeding skills
- Manageable for parents

ASHA 19005
Feeding Strategies

- General guidelines – use your clinical judgement as individual cases vary!
  - Place nipple as close to midline as possible
  - DO NOT place nipple in cleft line
  - Feed in slightly upright position
  - Burp frequently
  - Co-regulated pacing as needed
  - Sometimes a faster flow rate
Starting Solids

- Babies with cleft can start solids at the typical time
- Usually no restrictions
- Nasal saline can help with food in the nose
- There are often restrictions around the time of surgeries, varies by surgeon

Supporting Speech and Language Development
Cleft Palate and Speech

- Velum closes off nasal cavity from oral cavity
- Full VP closure needed for high pressure consonant sounds
  - /p, b, t, d, k, g, s, z, j, z, s, f, v, tʃ, dʒ, θ, ð/
- Full VP closure NOT needed for nasals and glides
  - /m, n, ŋ, w, j/
Cleft Palate and Speech

- Infants with cleft begin babbling with the sounds they can make
- Cannot begin making other sounds until after repair
- Later development of consonant sounds, less practice
- Infants/toddlers attempt to approximate adult sounds
- Compensatory errors – glottal stops, pharyngeal fricatives, velar fricatives, nasal fricatives, nasal substitutions (e.g., O’Gara & Logemann, 1988; O’Gara et al., 1994; Chapman et al., 2001)

Cleft Palate and Language

- Children with cleft palate produce fewer words than same-age children without cleft at ages 14-30 mos. (Scherer & D’Antonio, 1995)
- Children with cleft palate have word acquisition about 3 months behind children without cleft (Broen et al., 1998)
- Children with cleft palate attempt more words beginning with sonorants (nasals, liquids, glides, vowels) than obstruents (stops) (Estrem & Broen, 1989; Willadsen, 2013; Hardin-Jones & Chapman, 2014)
Cleft Palate and Language

- Limited experience with consonant babbling
- Potential hearing loss/middle ear fluid
- Later ability to produce words
- Selection of lexicon that matches consonants
- Language development
- Syndromes contributing
- Less reinforcement from adults due to incorrect productions

Hardin-Jones & Chapman (2014)

- 62 toddlers with cleft palate
- 26 toddlers without cleft palate
- CDI and language samples at multiple time points
- Toddlers with and without cleft palate had similar lexicon at 13 months
- Toddlers with cleft had fewer words at 21 and 27 months than age-matched peers
- Toddlers with cleft palate had more words beginning with sonorants and fewer words beginning with obstruents
## Surgical Timing

- Usually palate repaired at age 10 mos. to 1 year
  - BEFORE most speech development
- Prelinguistic babbling is mostly nasal sounds
- First words are more often sonorants
- Once repaired, children start to babble with high pressure sounds, but words appear LATER

## Pre-Surgery

- Language stimulation
- Auditory bombardment
- Signs
- Encourage babbling with low pressure/nasal consonants
- Watch for signs of delay or disorder in prelinguistic communication
Post-Surgery

- Expect 2-3 months to pass before pressure sounds develop
- Encourage vocal play with /b/ /p/ /t/ /d/
- Use established EI intervention strategies – WITH special considerations for cleft palate (e.g., Scherer et al., 2007; Kaiser et al., 2017)
  - Enhanced milieu with phonological emphasis
  - Focused language stimulation
  - Parent coaching

Late Repairs

- Higher risk for compensatory errors
- More likely to need intervention
**Scherer et al. (2008)**

- Compared parent-implemented EI in children with and without cleft palate
- Participants: 10 mother-child pairs with and without cleft palate (<3 y/o)
- Mothers of children with cleft trained in focused language stimulation emphasizing words with stop consonants
- Intervention: Parents trained in modeling and expansions or repetitions of target words
- Results: Parents could be trained in focused language stimulation; children in both non-cleft and cleft groups showed improvement in expressive and receptive language

**Kaiser et al. (2016)**

- Examined effect of enhanced milieu with phonological emphasis on s/l outcomes of toddlers with cleft lip and palate
- Participants: 19 children 15-36 months old
- EMT + PE (48 sessions, 2x/wk.) or “business as usual”
- EMT + modeling, expanding, recasting
- Results: Children in EMT + PE group had larger gains in receptive language and expressive vocabulary
What Does This Look Like?

- Determine target sound(s)
- Establish core words containing those sounds
- Set up environment to elicit those words/sounds
  - Book, toys
- Model, teach parent to model – emphasizing target sound
- Respond to child’s production with recast if incorrect, expansion if correct
- Train parents to recast and expand

Speech Treatment for Cleft-Specific Errors

- What ARE cleft -specific errors?
  - ʔ - glottal stop
  - ā - nasalized vowel
  - ζ - pharyngeal fricative
  - h - pharyngeal fricative
  - χ - velar fricative
  - Δ - posterior nasal fricative
Obligatory

- Errors that are due to abnormal structure
  - Hypernasality due to incomplete VP closure or fistula
  - /s/ distortions due to irregular dentition
  - Child is using correct placement, attempting VP closure, and otherwise doing things correctly, but the sound is not right

TREATMENT WILL NOT HELP

Compensatory/Maladaptive Errors

- Using compensations to approximate normal sound in the presence of abnormal structure
- Often persist after repair
  - Glottal stop substitutions
  - Pharyngeal fricatives
  - Nasal fricatives

If structure has been repaired, treatment can help
If surgery has to be delayed, treatment can help with placement
Feeding and Speech Interventions for Young Children With Cleft Lip and Palate

Mislearning

- Phoneme-specific nasal emissions or substitutions
- Repaired structure, function is not yet normal
- Stimulable for improvement

Treatment can help

Common Errors in Preschoolers

- Glottal stop substitution
- Pharyngeal fricative
Choose Your Target

- Initial position usually easiest, but some do best with final (e.g., “hop”)
- Choose targets that are most stimulable first
- Choose targets that have the most impact on intelligibility
- Usually early developing (/p//b/), easily visible
- Sometimes /h/ first to identify oral airflow
- Usually choose unvoiced before voiced cognate
- Sometimes not in developmental order
  - E.g., it’s OK to target /s/ in a 3-year-old if they are producing a nasal fricative instead of /s/

Hierarchy

- As with articulation
- Discrimination
- Production in isolation
- Syllable (CV or VC)
- VCV or CVC
- Word
- Carrier phrase
- Sentence
- Conversation
- Work on self-monitoring throughout
- Have them correct your errors
- Train parents’ ears
Principles of Treatment

- Motor learning principles
- Task specificity
- Massed practice early, distributed practice later
- Maximize correct productions
- Immediate, constant feedback initially, fade to intermittent and delayed feedback
- Use speech to work on speech
- NSOMEs do not work
- Might need to start with a very basic level of speech sound
- As many correct productions as possible in a treatment session
- Reduce complexity if they are failing

Ideas for Young Children

- “Pop bubbles”
- “Ball please”
- Building a tower and knocking down: “Up, up, up, boom!”
- Cars crashing: “Boom!”
- Peek a boo!
- Tea party (“cup,” “tea,” “please,” “hot”)
- Making food (“apple,” “pear,” “pie,” etc.)
A Word on Nonspeech Oral Motor

• NOT effective in treatment of speech sound errors related to cleft palate
  — Strength needed for speech tasks is relatively low — strength isn’t the issue
  — Even if it were, no evidence that NSOMEs strengthen
  — Task specificity!!
  — Different neural control for speech than blowing/sucking
  — Doesn’t follow exercise principles of frequency and increasing resistance

• Might use nonspeech tasks briefly to lead up to the speech task
  • E.g., “blowing” a cotton ball to identify oral airflow
  • BUT often this can be done with /h/ or /puh/
  • AND should be very few trials, only until speech sounds can be targeted
Feeding and Speech Interventions for Young Children With Cleft Lip and Palate

Working With the Cleft/Craniofacial Team

• Find your resources!
  – https://cleftline.org/find-a-team/
• Establish communication
  – Ask questions
  – Let them know when you think it’s not going right
• Work in partnership

“Anna”

• Once cleft was identified, she was given a cleft bottle
• Began taking adequate volumes, had coordinated feeding
• Gained weight, had palate repaired at 11 months
“Thomas”

- Had four sessions of speech intervention – SLP noted that he was hypernasal and was not stimulable for high pressure articulation sounds
- Referred to cleft team – nasendoscopy revealed incomplete realignment of the muscle, limited elevation, no velopharyngeal closure
- Underwent revision of palate repair, followed by weekly intervention

Additional Resources

- American Cleft Palate–Craniofacial Association: [https://acpa-cpf.org/](https://acpa-cpf.org/)
- Golding-Kushner, K. (2010). *Therapy Techniques for Cleft Palate Speech and Related Disorders* (Cengage)
References


