Speech and Resonance Disorders: Ann W. Kummer

1. Speech and Resonance Disorders associated with Clefts and Other Structural Anomalies: Evaluation and Treatment
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2. Financial Disclosures
   • Employment:
     – Cincinnati Children’s Hospital Medical Center
   • Royalties
     – Author of the text called *Cleft Palate and Craniofacial Anomalies: The Effects on Speech and Resonance*, Delmar Cengage, 2008.
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3. Non-Financial Disclosure
   • Author of the SNAP test for nasometry
   • Serve on committees for the American Cleft Palate-Craniofacial Association
   • Serve on various advisory boards

4. Seminar Outline
   5. Cleft Lip and Palate
      • Normal structure and function
      • Cleft lip and palate (CLP)
      • Effects of CLP (and other structural anomalies) on speech

6. Resonance Disorders and Velopharyngeal Dysfunction
   • Normal resonance
   • Resonance disorders
   • Normal velopharyngeal function
   • Velopharyngeal dysfunction (VPD)
     o Velopharyngeal insufficiency (VPI)
     o Velopharyngeal incompetence (VPI)
     o Velopharyngeal mislearning
   o Effects of CLP/VPI on speech and resonance

7. Evaluation and Treatment
   • Evaluation
     o Perceptual evaluation
     o Intra-oral evaluation
     o Instrumental evaluation
   • Treatment of VPI
     o Surgical procedures
     o Prosthetic devices
   • Speech therapy
   • Referrals

8. Normal Structure and Function
9. Normal Face
10. Normal Palate
11. Cleft Lip and Palate
12. Types of Cleft Lip
13. Unilateral Incomplete Cleft Lip
14. Bilateral Incomplete Cleft Lip
16 Unilateral Complete Cleft Lip
17 Unilateral Complete Cleft Lip (Syndromic)
18 Bilateral Mixed (Incomplete and Complete)
19 Bilateral Complete Cleft Lip
20 Bilateral Complete Cleft Lip
21 Bilateral Complete Cleft Lip
22 Lip Surgery Before/After
23 Bilateral Facial Cleft
24 Types of Cleft Palate
25 Bilateral Complete Cleft Lip/Palate
26 Cleft Palate Only
   Pierre Robin Sequence
27 Sequence of Palatal Closure
   • Mandible grows forward
   • Tongue drops down and goes forward
   • Palatal shelves move from vertical to horizontal and begin to close
28 Pierre Robin Sequence (Pronounced Robann)
   • Micrognathia is the underlying cause:
     – Can be due to mechanical forces in utero
     – Can be part of a syndrome
   • Sequence:
     – Micrognathia (small jaw) which causes...
     – Glossoptosis (posterior tongue) which causes..
     – Wide bell-shaped cleft palate
29 Submucous Cleft
   Some or all of the following:
   • Bifid or hypoplastic uvula
   • Zona pellucida (bluish area)
   • Notch in the posterior border of the hard palate
   • Abnormal insertion of muscles, causing an upside-down V-shape with phonation
30 Cleft and Muscles
31 Submucous Cleft:
   Classic stigmata
32 Submucous Clefts:
   Typical, but not “classic”
33 Occult Submucous Cleft:
   Only seen on the nasal surface
34 Basic Cleft Classification
   Primary Palate

Secondary Palate
35 Primary Palate:
   Cleft Lip (CL)
   • Anterior to incisive foramen
   • Includes lip and alveolus
   Clefts include:
   • Complete or incomplete
   • Unilateral or bilateral
36 Secondary Palate:
Cleft Palate (CP)
- Posterior to incisive foramen
- Includes hard and soft palate
Clefts include:
- Complete or incomplete

Embryology
- Primary Palate (lip & alveolus): 7 weeks
- Secondary Palate (hard & soft palate): 9 weeks
- Development is independent

Embryological Development

Embryological Sequence
- Closure begins at incisive foramen and “zips” toward the lip and then the uvula
- If it stops, there is a cleft from that point on
- Clefting goes from out to the incisive foramen
  - Right side of lip may close first (left sided clefts most common)
  - Oral surface of velum closes first (submucous cleft if not complete)

Cause of Clefts
Multifactorial
- Genetic factors (endogenous)
- Environmental teratogens (exogenous)

Genetic Factors
- Causes a predisposition
- Usually a 3-5% recurrence risk
- Risk depends on racial background
  1. American Indians- highest risk
  2. Asians
  3. Caucasians
  4. Africans- lowest risk

Environmental Teratogens
- Nutritional deficiencies (i.e., folic acid)
- Infections (rubella, CMV)
- Drugs (valium, dilantin)
- Environmental toxins
- Radiation

Effects of Cleft Lip/Palate (CLP) (and other structural anomalies) on Speech

Basic Principles
Whenever there are abnormalities on the outside of the head (face and/or skull)...
always look for corresponding structural abnormalities on the inside of the head.

Basic Principles
Whenever there are abnormalities on the inside of the head (face and/or skull)...
always look for corresponding functional abnormalities.

Basic Principles
- Outside anomalies: Typical affect appearance and aesthetics
- Inside anomalies: Typically affect function (cognition, language, speech, resonance, hearing, feeding, swallowing, etc.)

Basic Principles
Structural anomalies can affect speech by causing:
- Obligatory distortions
- Compensatory errors
- Treatment for each is different
• Obligatory distortions:
  – Function (articulation placement) is normal
  – Speech distortion is due to abnormal structure only
  – Treatment: Correct structure
• Examples:
  – Lateral lisp due to interference of maxillary teeth
  – Hypermnasality due to velopharyngeal insufficiency

49 Basic Principles
• Compensatory errors:
  – Function (articulation placement) is abnormal
  – Articulation placement is altered in response to structural abnormality
  – Treatment: Correct structure and then speech therapy to correct function
• Examples:
  – Lateral lisp to avoid interference of maxillary teeth
  – Pharyngeal fricatives to compensate for VPI

50 Causes of Abnormal Speech with CLP
• Primary Palate
  – Lip deformities
  – Nose and nasal cavity deformities
  – Dental and occlusal abnormalities
• Secondary Palate
  – Hearing loss
  – Velopharyngeal dysfunction (VPD)

51 Lip Deformities
52 Short Upper Lip
• Due to dysmorphology and/or repair

53 Short Upper Lip
• Relative shortening due to protruding premaxilla

54 Short Upper Lip
• Can cause difficulty with bilabial competence at rest
• Can affect bilabial competence during speech for production of bilabial sounds (p, b, m)

55 Nose and Nasal Cavity Deformities
56 Nasal or Nasal Cavity Abnormalities
  – Deviated septum, esp. with unilateral CLP
  – Nasal cavity blockage or restriction
  – Stenotic naris due to scarring
  – Maxillary retrusion

57 Maxillary Retrusion
58 Maxillary Retrusion
• Causes midface deficiency
• Restricts pharyngeal and nasal airway
• Can cause hyponasality or cul de sac resonance

59 Nasal Deformities
• Nasal deformities usually cause nasal obstruction
• Can cause hyponasality or cul de sac resonance

60 Dental and Occlusal Abnormalities

61 Basic Facts
• Tongue rests in mandible
• Tongue tip needs to:
  – be under the alveolar ridge
– move during speech without obstruction
– Sibilants or “teeth sounds” (s, z, sh, zh, ch, j) are not really produced by the teeth

62 Basic Facts
• Most consonants are produced in the anterior portion of the oral cavity
• Abnormalities of the anterior dental arch can interfere with movement of the tongue tip and lips
• Narrow maxillary arch can cause oral cavity crowding and distorted speech and resonance

63 Dental/Occlusal Abnormalities
May cause:
• Obligatory distortions
• Compensatory errors

64 Dental Abnormalities
• Ectopic tooth
• Supernumerary teeth
• Missing teeth and open bite

65 Ectopic Tooth
(note tongue flap)

66 Supernumerary Teeth

67 Missing Teeth or Open Bite
• Only an issue if there is small oral cavity size or crowding due to:
  – a low, flat or narrow palatal arch
  – maxillary retrusion
  – macroglossia
• Oral cavity crowding causes the tongue to seek an opening...
  – either by using an existing one, or creating one by opening the teeth

68 Missing Teeth
69 Open Bite
70 Open Bite
71 Malocclusion
• Class II malocclusion
• Anterior or lateral crossbite
• Class III malocclusion

72 Class II Malocclusion
73 Anterior Crossbite
74 Anterior Crossbite
75 Anterior and Lateral Crossbite
76 Class III Malocclusion
  (with maxillary retrusion and open bite)
77 Class III Malocclusion
78 Class III Malocclusion
79 Palatal-Dorsal Production
  (used for anterior sounds)

80 Dental/Occlusal Abnormalities
• Particularly affect:
  – sibilants (s, z, sh, ch, j)
• Can affect:
  – labio-dentals (f, v)
  – lingual-alveolars (t, d, n, l)
  – bilabials (p, b, m)

81 Treatment of Abnormal Speech
due to Dental/Occlusal Abnormalities
• Orthodontics
• Surgery—usually after facial growth is complete
• Speech therapy for compensatory errors

82  Palatal Expanders
• Cross bites—anterior and lateral
• Maxillary retrusion

83  Arch Appliance
84  Quad Helix Appliance
85  Rapid Palatal Expander
86  Tongue Irritation from Rapid Expander

87  Effect of Fistula
   Depends on:
   • Size: Larger are more symptomatic
   • Location: Above tongue tip will be symptomatic for tongue-tip sounds

88  Fistula (alveolar or labial)
   • “Intentional” fistula

89  Palatal (Oronasal) Fistulas
90  Palatal (Oronasal) Fistula
91  Palatal (Oronasal) Fistula
92  Palatal (Oronasal) Fistula
   If large enough, can cause:
   • Nasal emission
   • Hypernasality
   • Compensatory articulation

93  Ankyloglossia
94  Ankyloglossia
   • Congenital anomaly—noted at birth
   • Complete: total fusion between tongue and floor of mouth (rare)
   • Partial: lingual frenulum is short or has an anterior attachment near the tongue tip

95  Functional Characteristics
   • With mouth open, patient can’t touch roof of mouth with tongue tip

96  Functional Characteristics
   • Patient can’t protrude tongue past the mandibular teeth or incisal edge of the lower gingiva

97  Functional Characteristics
   • Limits normal lingual movements
   • With protrusion attempts, tongue becomes heart-shaped or shows a ”notch” in midline

98  Ankyloglossia
99  Ankyloglossia

100  Causes of Tongue Tie
   • Unknown
   • Very common
   • Often not symptomatic
   • Changes with growth and time

101  Effect of Tongue Tie
   • Restricts tongue tip mobility
   • Can affect feeding
     – Can affect latching on to a nipple
     – Restricts movement of a bolus and clearing of food from sulci and molars

102  Common Belief
   • Tongue tip cannot move well... therefore, this will affect speech

103  Speech
   • No evidence in literature that ankyloglossia causes speech defects
• Our experience: Ankyloglossia is highly unlikely to cause speech defects

Speech
Common sense approach:
• Need for elevation: /l/
• Need for protrusion: /th/
• These sounds can usually be produced, even with significant tongue tip restriction
• May affect lingual trills (i.e., Spanish /r/)

Speech Problems and Ankyloglossia
• Both are common
• May be a co-occurrence, not a cause-effect relationship
• Consider other causes of speech defect:
  – speech sound disorder
  – oral-motor dysfunction

Cosmetic Effect
• “It looks funny.”
• Has been described as a forked or “serpent tongue”

Other Effect
• French kissing

Frenulectomy
• Usually not warranted for speech
• More likely to be warranted for early feeding, bolus manipulation, dental or cosmetic concerns

Hearing Loss
Normal Middle Ear Function
• At rest, Eustachian tube is closed
• During swallowing, tensor veli palatini muscle opens the Eustachian tube
  – releases negative pressure
  – allows fluids to drain

With History of Cleft Palate
• Tensor veli palatini muscle is abnormal, so tube doesn’t open
• Negative pressure builds
• Fluids can’t drain out
• Causes temporary (conductive) hearing loss
• Can affect articulation and language development in the short term

Treatment of Middle Ear Disease
• Insertion of PE (pressure equalizing) tubes
• Regular otologic (ear) care

Velopharyngeal Dysfunction (VPD)
• Coming up next...