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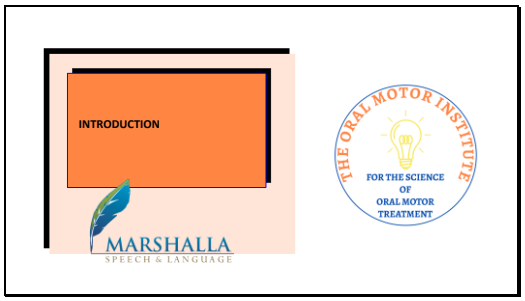

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OUR FOUNDER PAM MARSHALLA

Pam founded the Oral Motor Institute in 2007. She was a strong advocate of correct oral placement and how to achieve it which explains why her techniques were so successful.

Slide 4

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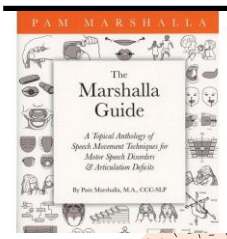

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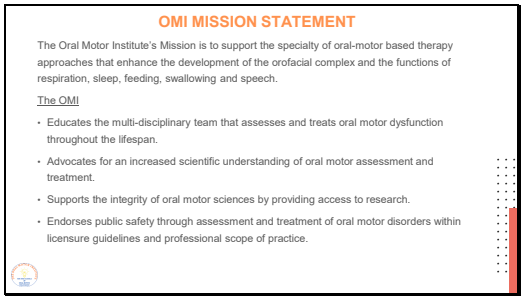

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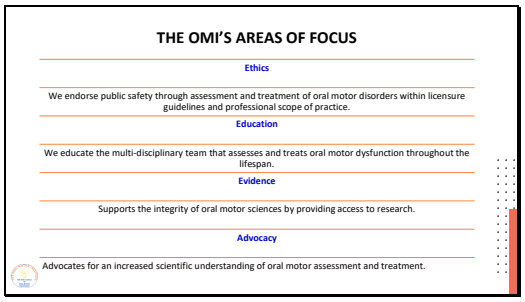

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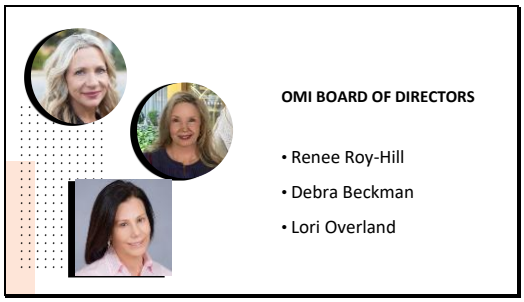

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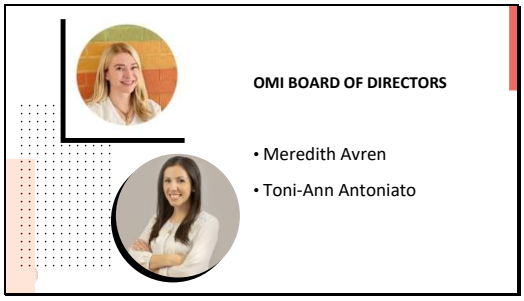

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DEBRA BECKMAN
FINANCIAL DISCLOSURES

The presenter receives revenue from products and professional activities related to the Beckman Oral Motor Approach. This includes the development and sale of the following products: Beckman Tri-Chew, Beckman E-Z Spoon, and Beckman Professional Oral Probe. The presenter also developed the Beckman Oral Motor Assessment and Intervention Approach and provides training to therapists regarding Beckman Oral Motor Techniques

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NON-FINANCIAL DISCLOSURES

Life Member of the American Speech Language Hearing Association
Member Florida Speech Language Hearing Association
Board Member Oral Motor Institute
Board Member Learn Autism

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LEARNER OBJECTIVES

1. **Describe** the developmental role of infant oral reflexes in organizing feeding, swallowing, and early neuromotor control.
2. **Differentiate** typical reflex integration patterns from clinically concerning persistence or incoordination that may impact feeding development.
3. **Apply** oral reflex observations to inform feeding assessment, referral decisions, and interdisciplinary collaboration within professional scope of practice.

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Reflex Development

MARSHALLA SPEECH & LANGUAGE

THE ORAL MOTOR INSTITUTE FOR THE SCIENCE OF ORAL MOTOR TREATMENT

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Introduction

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Case Study - Noah

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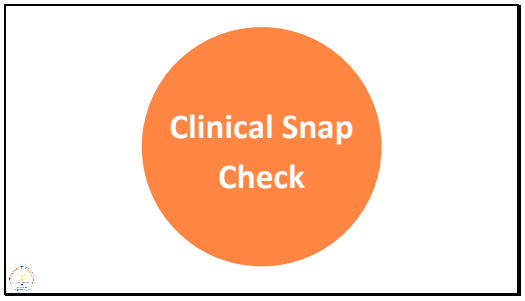

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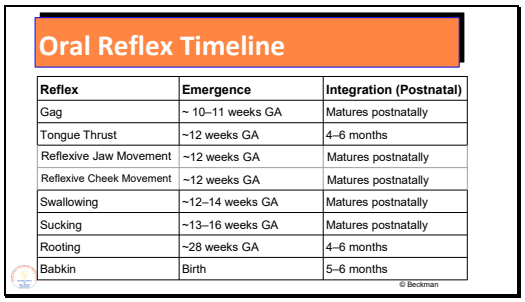

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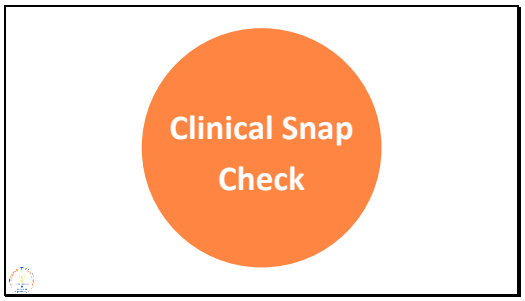

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Oral Reflexes as Developmental Organizers

FEEDING	REGULATION	EARLY COMMUNICATION
Gag	Gag	
Tongue Thrust		Tongue Thrust
Reflexive Jaw Movement	Reflexive Jaw Movement	Reflexive Jaw Movement
Reflexive Cheek Movement		Reflexive Cheek Movement
Swallowing		
Sucking	Sucking	
Rooting	Rooting	
Babkin	Babkin	Babkin

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Tongue Thrust Reflex

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Tongue Thrust Reflex

- **What it is:** The tongue thrust (extrusion) reflex is a **primitive infant reflex** present at birth
- **Timing:** Typically **integrates by 4–6 months of age**
- **Functional significance:** Integration coincides with the transition from **reflexive suckling** to **voluntary, coordinated feeding patterns**

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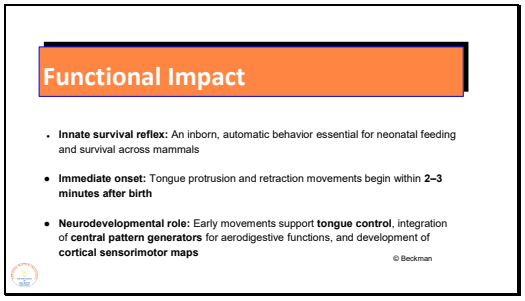

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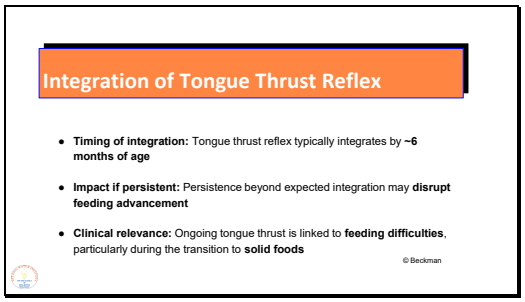

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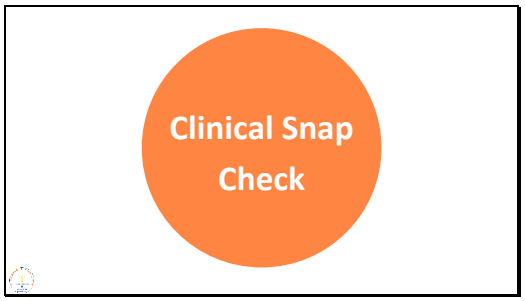

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Sucking

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Sucking Reflex

- **Reflex type:** Sucking reflex is a **centrally mediated primitive reflex** controlled by brainstem pattern-generating circuitry
- **Developmental transition:** Becomes a **voluntary response by ~4 months of age**
- **Clinical significance:** Essential for neonatal feeding and an important **indicator of neurological integrity**

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Developmental Context

- **Prenatal emergence:** Sucking movements begin **in utero (~13 weeks' gestation)** and become functionally organized in **late fetal life**
- **Phased development:** Aerodigestive skills develop in two stages—early orofacial movements → **postnatal mastery of suckling by ~4 months**, then preparation for **chewing and swallowing solids**
- **Neural control:** Sucking is generated by **brainstem central pattern generators (CPGs)** that integrate sensory input from perioral and intraoral tissues to shape jaw and tongue motor patterns

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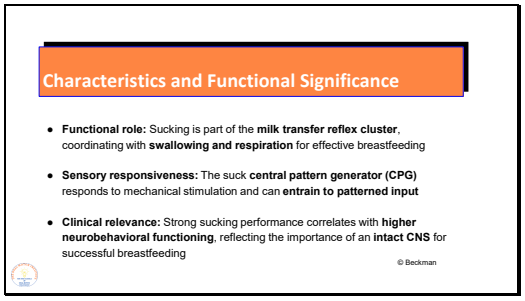

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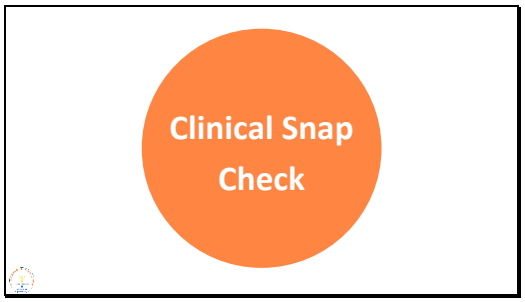

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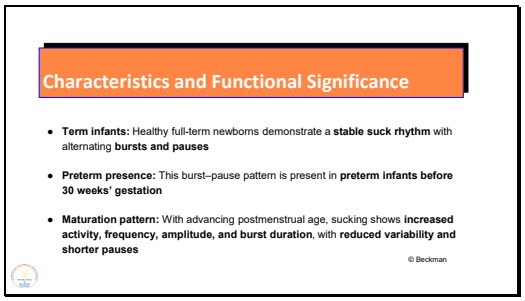

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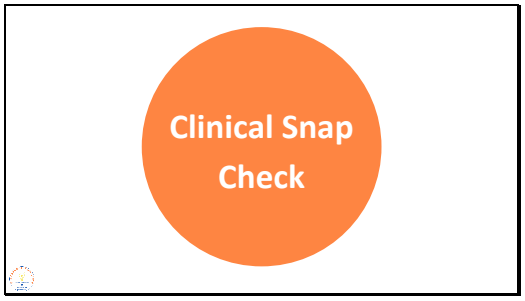

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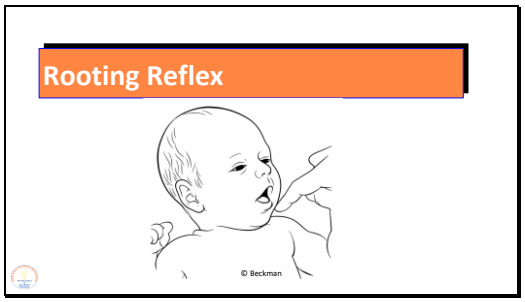

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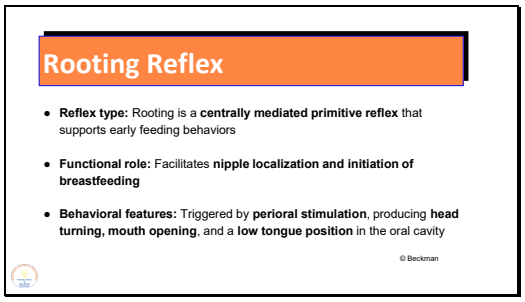

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Characteristics and Elicitation:

- **Coordinated behavior:** Rooting involves a **sequence of responses** to cheek or perioral stimulation
- **Motor features:** During rooting, the **tongue rests low in the oral cavity**, with **licking movements** often occurring before and after in alert infants
- **Developmental course:** The rooting reflex typically **integrates between 3–6 months** as cortical maturation supports **voluntary control**

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Clinical Snap Check

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Function as a feeding cue:

- **Hunger signal:** Rooting is an **empirically validated hunger cue**, occurring more frequently before feedings than non-feeding reflexes (e.g., palmar grasp)
- **Timing and intensity:** Rooting duration **decreases with increasing neonatal age** and **increases with greater postnatal weight loss**
- **Physiologic significance:** These patterns suggest rooting is regulated by **mechanisms involved in food intake control**

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Relevance to Breastfeeding:

- **Functional role:** Rooting is part of the **finding/latching reflex cluster** essential for successful breastfeeding
- **Postural influence: More rooting and other primitive reflexes** are elicited in **inclined sidelying position**, supporting feeding initiation
- **Sensory enhancement: Maternal breast odor** enhances rooting by promoting early **head orientation toward the nipple**, beginning within minutes after birth

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Clinical Implications:

- **Handling matters: Forcing the infant to the breast** may suppress the rooting reflex and **disrupt tongue positioning**
- **Feeding impact:** Interference with rooting can **contribute to breastfeeding difficulties**
- **Neurobehavioral link:** Strong rooting and feeding behaviors correlate with **higher neurobehavioral functioning**, highlighting the role of an **intact CNS**

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Clinical Snap Check

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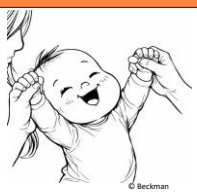
Babkin Reflex



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Babkin Reflex

- **Reflex description:** The **Babkin (hand–mouth) reflex** is a primitive reflex triggered by **bilateral palm stimulation**
- **Behavioral response:** Produces **mouth opening** with associated **arm flexion**
- **Developmental course:** Present at birth, **progressively inhibited with maturation**, and typically **integrates by ~5 months of age**

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Clinical Snap Check

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Clinical Significance

- **Abnormal patterns:** A **strong response at 4–5 months** or **persistence beyond 5 months** is generally considered **abnormal**
- **Clinical interpretation:** Persistent abnormal responses warrant **neurologic monitoring**, while **absence in early infancy may still be normal**

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Clinical Snap Check

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Neural Mechanism

- **Neural mediation:** The Babkin reflex is likely mediated by the **brainstem reticular formation**, receiving input from **nonprimary motor cortices**
- **Hierarchical maturation:** As cortical control increases, the reflex is **progressively inhibited**, giving rise to more **adaptive hand–mouth movements**
- **Functional outcome:** This progression supports the transition to **voluntary eye–hand–mouth coordination**, serving as a **precursor to self-feeding behaviors**

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Gag Reflex

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Gag Reflex

- **Fetal onset:** Gag reflex and swallowing develop early in fetal life (**≈ 10–11 weeks' gestation**)
- **Protective purpose:** Laryngeal protective reflexes form to prevent aspiration of amniotic fluid
- **Key mechanism (LCR):**
  - Triggered by liquid contact with laryngeal epithelium
  - Produces laryngeal closure, apnea, and other airway-protective responses
  - Primary airway defense in the fluid-filled intrauterine environment

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Slide 50

Integration and Impact on Function

Developmental transition: The gag reflex evolves from fetal to adult life as part of a broader system of pharyngeal and laryngeal protective reflexes

Early control: In fetuses and newborns, gag and airway protective responses are primarily **involuntary reflexes**

Clinical relevance: Postnatal maturation improves coordination and efficiency; **delayed development** may contribute to swallowing dysfunction in **premature or neurologically compromised** infants

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Clinical Snap Check

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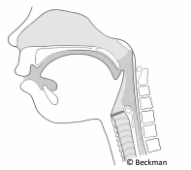
Swallowing



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Swallowing

- **Early onset: Fetal swallowing** begins as early as **~12 weeks' gestation**
- **Developmental progression:** Swallowing **increases in frequency and coordination** across pregnancy
- **Physiologic role:** Essential for **amniotic fluid regulation** and **gastrointestinal tract development**

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Developmental Progression of Swallowing

- **Early emergence:** Swallowing appears by **12–14 weeks' gestation** and becomes more **organized with advancing gestational age**
- **Motor maturation:** Swallowing is linked to oral–facial activity, with **jaw, lip, and tongue movements** progressing from simple motions to **coordinated patterns** required for effective swallowing
- **Increasing demand: Swallowing frequency and volume increase across gestation**, likely reflecting adaptation to **rising amniotic fluid volume**

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Clinical Significance

- **Physiologic role:** Swallowing is essential for **amniotic fluid homeostasis** and **fetal gastrointestinal development**
- **Gastric function: Gastric emptying** follows swallowing, is present by the **early second trimester**, and increases markedly with advancing gestation
- **Motor maturation: Gastric peristalsis** appears by **~14 weeks** and consolidates into organized, clustered patterns by **24–25 weeks' gestation**, a key developmental milestone

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Clinical Significance

- **Regulatory control:** Fetal swallowing is governed by **intact central and systemic dipsogenic mechanisms** in the **last third of gestation**
- **Physiologic modulation:** Swallowing frequency varies with **neurobehavioral state** and is influenced by **hypoxia, hypotension, and plasma osmolality**
- **Clinical assessment: Sonographic evaluation** of fetal sucking and swallowing shows **high intra- and interobserver reliability**, supporting clinical use

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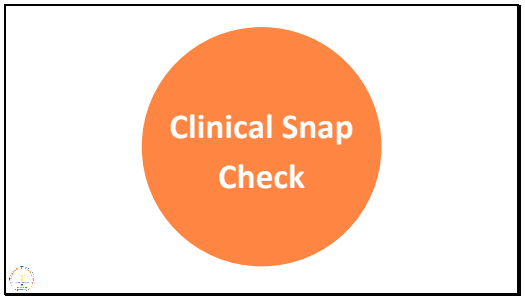

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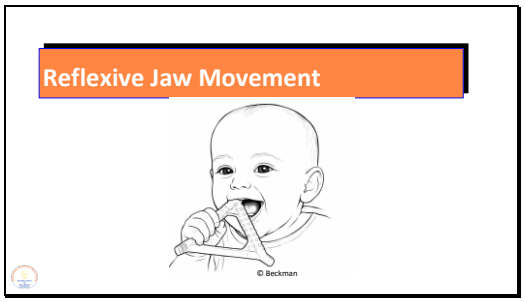

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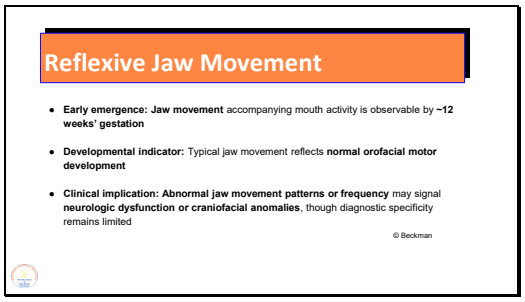

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Neurological Significance

- **Neurodevelopmental marker: Jaw movement patterns** reflect the integrity of **central nervous system development**
- **Progressive integration:** Jaw movements mature from **simple mouth opening** to **repetitive open–close patterns**, indicating increasing **neural integration**
- **Critical periods: Regular mouthing movements (RMMs)** increase at **32–33 weeks** and **36–37 weeks' gestation**; deviations from these patterns may suggest **neurologic impairment**

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Neurological Significance

- **Predictive value: Fetal neurobehavioral assessment** that includes jaw movements can help **predict postnatal neurological outcomes**
- **KANET findings: Abnormal mouth/jaw movements** significantly differentiate **high-risk vs. low-risk fetuses**, with abnormal KANET scores correlating with **postnatal abnormalities**
- **Behavioral states:** Jaw movement patterns differ between **eye movement (EM)** and **non-eye movement (NEM)** states, with distinctions emerging by **24–27 weeks' gestation**, aiding identification of **disrupted neurobehavioral development**

Slide 62

Craniofacial Disorder Detection

- **Prenatal imaging: Ultrasound and fetal MRI** enable early detection of **mandibular abnormalities** (e.g., micrognathia, retrognathia)
- **Associated risk:** Jaw abnormalities are often linked to **genetic syndromes** and potential **airway compromise**
- **Functional insight:** Assessing **jaw structure and movement patterns** helps identify fetuses at risk for **feeding dysfunction**, with abnormal patterns seen in conditions such as **Arnold–Chiari** and **trisomy 18**

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Clinical Applications

- **Clinical utility: Fetal jaw movement assessment** can inform **postnatal feeding readiness** and care planning
- **Risk stratification:** Particularly valuable for **medically fragile neonates** with **craniofacial or neurologic abnormalities**
- **Care planning:** Findings may help anticipate the need for **feeding support** and **respiratory management** after birth

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Clinical Snap Check

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Reflexive Cheek Movement

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Reflexive Cheek Movement

- **Early markers: Fetal swallowing and sucking** emerge around **12–14 weeks' gestation**
- **Functional significance:** These behaviors act as **surrogate markers of posterior cheek function**, requiring coordinated **buccal muscle (buccinator) activity**
- **Assessment limitation: Direct visualization** of posterior cheek structures is limited, making **movement-based assessment** clinically valuable

Slide 67

Swallowing as a Surrogate Marker

- **Coordinated mechanism: Fetal swallowing** requires complex coordination of **oral–facial structures**, including active engagement of the **buccal musculature**
- **Motor sequence:** Swallowing consists of **suckling movements + wide mouth opening + tongue-driven bolus propulsion** into the hypopharynx, supported by **buccinator activity** for oral competence
- **Reliable assessment:** Swallowing can be **consistently observed from 12–14 weeks' gestation**, with **progressive coordination** documented via **gray-scale and color Doppler ultrasound**

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Sucking as a Functional Assessment

- **Functional indicator: Fetal sucking movements** provide indirect evidence of **buccinator (cheek) function**, which is essential for generating **negative intraoral pressure**
- **Assessment reliability: Sonographic evaluation** of fetal sucking shows **high intra- and interobserver repeatability**, supporting its clinical reliability
- **Developmental pattern:** While **sucking frequency remains stable** from **20–34 weeks' gestation**, **movement complexity and coordination increase** with advancing gestational age

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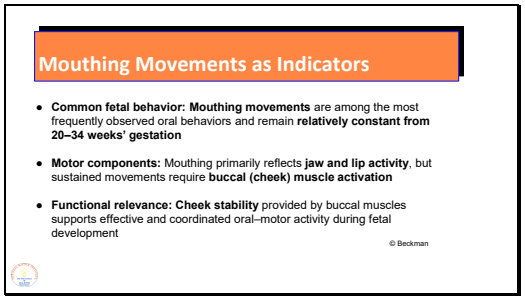

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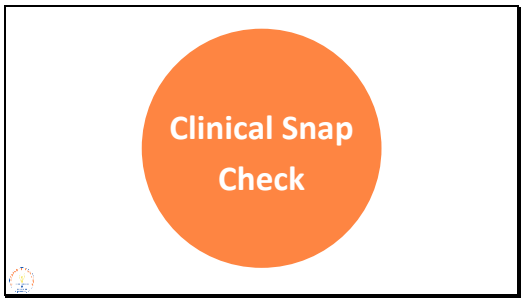

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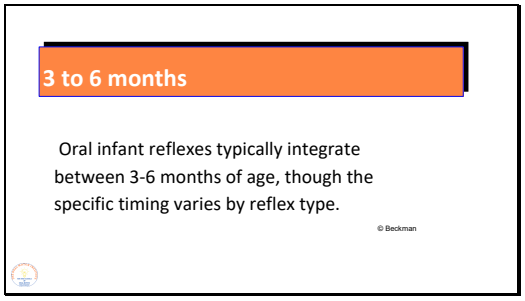

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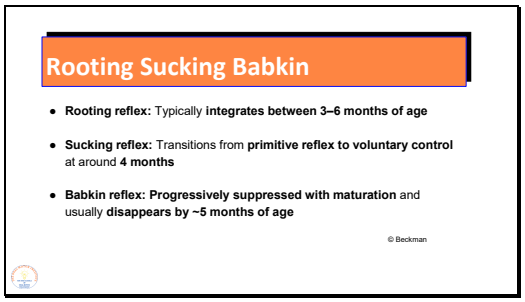

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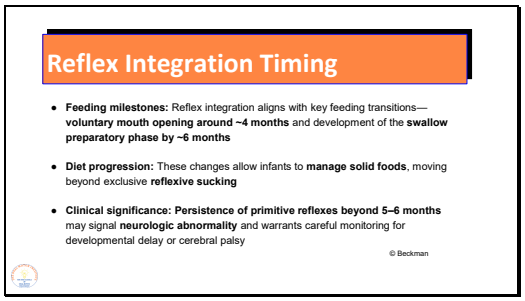

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Reflex Integration Timing

If oral motor skills do not develop, primitive oral reflexes are **maintained** for protection

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Why Do Fetal and Post Natal Oral Reflexes Matter?

MARSHALLA SPEECH & LANGUAGE

THE ORAL MOTOR INSTITUTE
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Predictive of Feeding Problems

- **Predictive value: Prenatal oral–motor abnormalities** are associated with **postnatal feeding difficulties**
- **Comparative findings:** At-risk fetuses show significant **differences in ingestive form and function** compared with gestational age–matched controls
- **Clinical application: Prenatal aerodigestive markers** may help guide **postnatal feeding readiness and care planning**

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Pre Term Infants

- **Predictive validity: Postnatal oral–motor assessment** strongly predicts **later neurodevelopmental outcomes**
- **Specific risk marker: Abnormal sucking patterns**, particularly **suck–swallow–respiration incoordination**, significantly increase risk for adverse outcomes in moderately and late preterm infants
- **Longer-term correlation: Neonatal feeding performance** correlates with neurodevelopmental status at **6 to 18 months**, reinforcing feeding as an early neurologic indicator

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Term Infants

- **Predictive assessment: Neurobehavioral findings at term-equivalent age** predict **feeding impairment at 12 months**
- **Key risk indicators: Suboptimal reflexes, abnormal tone, and abnormal general movements** significantly increase risk for later oromotor feeding difficulties
- **Growth marker: Smaller biparietal diameter** is also associated with increased risk, linking **brain growth** to feeding outcomes

Slide 80

Hindbrain Development

- **Neuroanatomic basis: Altered hindbrain development** can disrupt **craniofacial formation** and the **motor–sensory circuits** required for feeding and swallowing
- **Shared mechanism:** This disruption represents a **common pathogenic pathway** underlying feeding difficulties across **multiple neurodevelopmental disorders**
- **Clinical implication:** Feeding and swallowing problems may serve as **early functional indicators** of broader **neurodevelopmental impairment**

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Multifactoral

- **Multifactorial etiology:** Early feeding problems arise from multiple concerns including: **oral reflex impairment, increased orofacial muscle tone**, delayed motor development, and **sensory hypersensitivity**, with **prematurity** as a key risk factor
- **Motor control delays: Delayed head control and tongue movement** compromise feeding efficiency and safety
- **Swallowing contributors:** Immature **palatal function, gag reflex, and laryngeal sensation** contribute to **poor swallow coordination**

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Red Flags for Referral

- Uncoordinated or absent oral reflexes
- Frequent coughing/choking during feeds
- Excessive spillage
- Prolonged feeding times, fatigue
- Tongue protrusion, lip retraction, poor oral seal
- Delayed solid food readiness past 6–8 months

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Clinical Snap Check

Slide 84

Case Study - Noah

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Clinical Snap Check

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Core References

Assessment and Treatment of Oral Skills

Beckman, D. A. (2024)
Beckman oral motor assessment and intervention (Rev. ed.)
Provides a structured framework for assessing and supporting oral motor skills across the lifespan.

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Core Articles

Feeding as a Developmental Organizer

Miller et al., 2003
Emergence of oropharyngeal, laryngeal and swallowing activity in the developing fetal upper aerodigestive tract
Establishes early feeding-related motor organization in utero

Ross & Nijland, 1997
Fetal swallowing and amniotic fluid regulation
Shows feeding-related reflexes as regulatory, not isolated skills

Maynard et al., 2020
Suckling, feeding, and swallowing: Behaviors, circuits, and targets for neurodevelopmental pathology
High-level neurodevelopmental synthesis (excellent anchor article)

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Core Articles

Neurodevelopment & Brainstem Organization

Keven & Akins, 2017
Neonatal imitation and sensorimotor development
Supports skill-driven refinement of early motor patterns

Finan & Barlow, 1998
Mechanosensory modulation of non-nutritive sucking
Central pattern generators + experience-dependent organization

LaMantia et al., 2016
Hard to swallow: Developmental biological insights into pediatric dysphagia
Links hindbrain development, feeding, and later dysfunction

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Core Articles

Clinical Prediction & Outcomes

Zhang et al., 2017
Predictive value of early oral motor assessments
Early feeding skills predict later neurodevelopment

Mizuno & Ueda, 2005
Neonatal feeding performance and developmental outcome
Feeding as a neurodevelopmental indicator

Sanchez et al., 2017 / 2023
Neuropredictors of oromotor feeding impairment
Reflex + tone patterns predict feeding outcomes

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Core Articles

Reflex-Specific, Developmentally Relevant

Futagi et al., 2013 / 2017
Babkin reflex and neural mechanisms
Clear example of skill-driven reflex suppression and integration

Widström et al., 1992 / 1993
Rooting, tongue position, and early feeding behavior
Supports your rooting + feeding organization argument

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Core Articles

Regulation

Hafström & Kjellmer, 2000
Non-nutritive sucking in preterm infants
Feeding rhythm and regulation link

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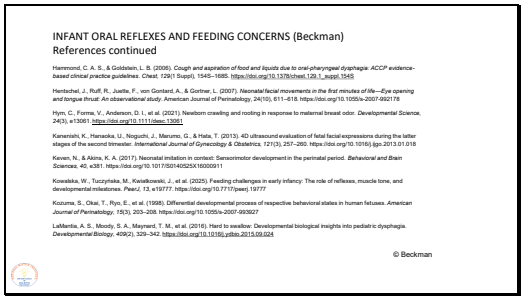

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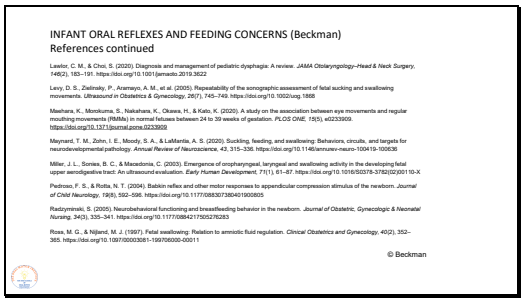

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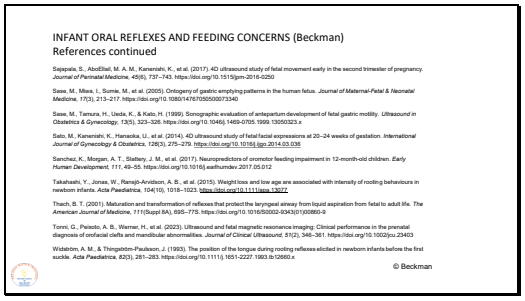

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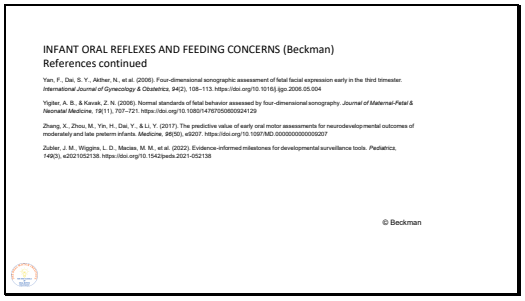

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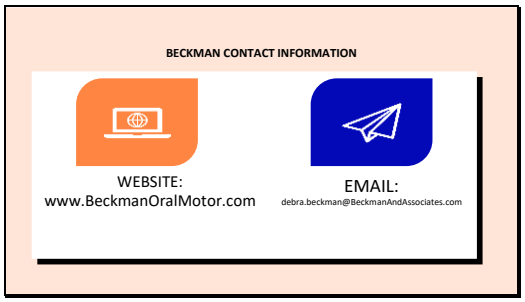

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