



# Pediatric Feeding and Dysphagia

Dear Fellow Feeders,  
 Welcome to issue 2 of our 10th season! Here we have a detailed article on the AEIOU approach to feeding disorders and a summary of pediatric research from DRS. As usual, we include current research, an editorial, and a challenging case. Enjoy, Krisi



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## AEIOU: An Integrated Approach to Pediatric Feeding By Nina Ayd Johanson, M.S., CCC-SLP, CEIM

Feeding "mismanagement" has been identified in the literature as contributing to the exacerbation of feeding problems and maladaptive behaviors in children, even when the underlying causes of the feeding disorders may be biomedical. The variability of biomedical and enviro-behavioral factors that influence the maintenance of feeding problems in young children is such that an integrated approach to management is needed. Determining treatment success should include not only quantitative gains (e.g., increasing total grams consumed per meal, decreasing percentage of inappropriate behaviors), but also qualitative improvements (e.g., child's enjoyment of mealtime, child's intrinsic motivation to eat, quality of mealtime interaction, parent report of positive family mealtimes) as well. Problem behaviors have been described as emerging from a background of exclusion, segregation, lack of personal control and impoverished lifestyles. Our goal should not only be to reduce or eliminate problem behaviors, but also to improve quality of life.

Feeding serves several purposes in infancy and early childhood. It is foremost a biologic skill. Feeding provides a mode of interpersonal relationship between the infant and primary caregiver, which forms the basis for bonding and attachment. Feeding is one of the first modalities by which children begin to learn about and explore their environment. Lastly, feeding provides a means for social and

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cultural participation that continues throughout the child's lifetime. Intervention should improve all aspects of feeding and mealtime participation.

### The AEIOU Approach

In devising individualized treatment plans, the AEIOU approach to pediatric feeding integrates five factors: *acceptance*, *exposure*, *independence*, *observation*, and *understanding*. Aspects of feeding and mealtime that increase the quality of the child's participation within his/her family unit are addressed in the context of family-centered care.

***Acceptance:*** Sensory, medical, and/or environmental influences that affect the child's motivation and willingness to eat are carefully evaluated. The caregiver's acceptance of the child's diagnosis and stage of development as well as caregiver acceptance of and readiness for intervention are also considered. Strategies for effective coaching are used to engage parents and empower them as the first expert in the care of their children. Management of acceptance issues can include establishing environmental supports such as resources and counseling; addressing biologic/sensory/environmental stress; sensory desensitization techniques; and medical management of underlying issues such as reflux, food allergies, and respiratory problems, to name just a few.

***Exposure:*** The diet that the child is exposed to in addition to environmental influences on mealtime (including parent's knowledge of feeding practices and cultural influences) is assessed. Children are dependent on their caregivers for providing an adequate and varied diet. Many parents restrict exposure to a variety of food tastes and textures, and lack routine and structure around mealtime. They may engage in coercive feeding practices and employ a myriad of strategies such as distractions and rewards in hopes of improving their child's eating. Management can include normalizing the mealtime structure, routine, and schedule; limiting grazing between meals/snacks; eating all meals and snacks at the table in a social context; increasing exposure at every meal and snack to at least 3 different foods and 3 different textures; eliminating distractions at mealtimes; and eliminating coercive and suggestive feeding practices. Feeding plans for home include making mealtime fun and interactive as well as educational. Children benefit from direct teaching experiences about the "physics" of food.

***Independence:*** Once elements affecting the child's motivation to eat (acceptance) and the actual diet (exposure) are assessed, the child's level of independence and autonomy with eating are evaluated. Children should be given autonomy to explore activities related to feeding. Active, independent movement is critical for sensory processing and motor planning. When children are given autonomy, they are more willing to explore. Management factors for positioning, postural stability, and/or oral-motor competence are considered in addition to accommodations that may be necessary for the child's neurological or developmental status. The

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caregiver/child interaction is observed to determine if there are issues of interference or imbalance of autonomy and control. Management can include strategies for addressing physical competence (modifications of the food, equipment, or environment), targeting specific skill deficits (e.g., direct teaching of chewing), and allowing autonomy and independence with self-feeding.



**Observation:** Children learn through comparison and observation. The social context of eating has been described as one of four determining factors in deciding that food is "positive." The extent to which the child participates in and benefits from shared mealtime experiences is determined. Are there opportunities for the child to observe others eating, preferably the same food expected to be eaten by the child? Is someone modeling and demonstrating, actively engaging the child in the learning process of how to eat and accept a wide variety of tastes and textures? Management often includes direct modeling of targeted behaviors by the feeding specialist and parents. Parents are taught to implement feeding plans at home that include social mealtimes. Children are rarely "fed" by others unless their physical competence or developmental age requires such support.

**Understanding:** Both the child's and the caregiver's level of communicative understanding and reciprocal engagement are assessed. Intervention addresses the timeliness and contingency of interactions and responses, and may include screening of the caregiver's mental health status. Additional management factors might include use of mealtime placemats or storybooks to improve communication, teaching parents how to interpret their child's cues and behaviors, as well as intervention to address bonding and attachment.

### Case Study

Mia (child's name has been changed) is a 14-month old girl born with visual impairment and craniofacial anomalies. She experienced extended hospitalization after birth for medical management and re-hospitalization on 5 occasions for surgeries between 2 and 6 months of age. She was an oral feeder shortly after birth and gained weight appropriately until the time of her last surgery when she began to refuse the bottle. Her parents struggled with oral feeding, eventually abandoning the bottle for a medicine dropper while also introducing solid foods. At 13 months of age when services were initiated, Mia was struggling with weight gain and hydration, and her parents reported significant stress and frustration with mealtime. They worried at every meal that she was not eating or drinking enough. They were employing strategies to get her to eat (distractions with toys, music, singing) such that they would never consider feeding her in public. They carefully timed all of their numerous medical and follow-up appointments around feeding so that they could be home. Mia was taking 3-5 feedings a day of whole milk by dropper (varied from 4-8 ounces), and her parents attempted oral feeding of solids for

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3 meals per day. She would only accept smooth puree textures, gagging or vomiting on any irregularities in the texture. She was also able to eat small crackers such as Goldfish or Teddy Grahams. She refused to touch any foods and would not make any attempts to feed herself.

*Acceptance:* Mia demonstrated significant sensory issues and aversions related both to her visual impairment as well as trauma and stress of multiple surgeries, hospitalizations, and lack of personal control. Her parents were keenly aware of her level of development and understood the impact of previous intervention on her feeding skills. They also expressed frustration with the methods they were using to feed Mia, hoping that intervention would help them normalize the process.

*Exposure:* Mia's parents exposed her to a wide variety of tastes. They ground and pureed a wide variety of table foods that they ate and always encouraged her to smell foods as a compensatory strategy for her visual impairment. At mealtimes they only gave one puree. They used frequent coercive and suggestive methods, frequently wiping her face during the meal, and using toys and distractions throughout the meal. Meals and dropper feedings were not evenly spaced throughout the day.

*Independence:* Mia used to engage in some self-feeding of crackers at snack time, but stopped feeding herself. She did not hold the cup when it was offered. She was given a spoon to hold which she often dropped on the floor. She did not touch any foods and was easily distressed if she accidentally did so. She demonstrated adequate postural support and motor skills for self-feeding. She was beginning to ambulate independently. Regarding her vision, she was able to see her parents' faces and imitate some oral-motor and fine motor movements. She sat in a booster seat, but began refusing placement of the tray because previous intervention in the booster with tray had included hand-over-hand activities that Mia strongly protested. As a result, her parents pulled her booster up to the regular table, where she was not able to see her food over the rim of the dishes.

*Observation:* Due to the methods they were using to feed Mia, her parents were unable to eat at the same time. All the focus and attention was on Mia and getting her to eat. They sometimes included her in one "family" style meal per day. They frequently described the foods that they were feeding her but they did not give her opportunities for independent exploration. Mia's parents also reported that Mia refused to watch them when they ate, often crossing her arms.

*Understanding:* There was significant difficulty with communication at mealtimes. Mia's parents reported that although she had started using her first words and was otherwise a good non-verbal communicator in other contexts, Mia did not give reliable cues at mealtime. She previously would indicate when she did not want to keep eating, and they were now unsure of when they should stop feeding her. With the exception of describing and naming foods that

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they were feeding her, most communicative interaction surrounded the distractions they used to feed her.

### Current Status

Mia has made significant progress in therapy. Observation of Mia and her parents during mealtime, coaching of her parents as they fed and interacted with Mia, and parent training regarding appropriate feeding practices were used in therapy rather than direct treatment of Mia by the feeding specialist. Her parents immediately eliminated all use of distractions. They were worried that doing so would result in the complete refusal to eat and were surprised to find that after 2 days of inconsistent eating, Mia responded very well and began to interact more. They stopped wiping her face after each spoonful, and reserved clean up for the end of the meal away from the table. Mia's parents were coached to observe Mia's subtle cues of distress and other communicative signs, and to respond in a timely and contingent manner (e.g., if Mia turned her head away as the spoon approached, her parents would say "You're turning your head away. I'll wait until you're ready for the next bite"). They implemented a routine feeding schedule, whereby Mia was offered food at the table 5 times per day at 2 hour intervals. The booster tray was reintroduced to offer better placement of Mia's food and utensils. This allowed her parents to better visually orient Mia to her food before spoonfuls were offered. Mia increased her visual inspecting of foods and started to touch her dishes and utensils more. Her parents started to offer 2 different foods at each meal, and after 3 weeks, increased the offerings to 3 different foods of 3 different textures at each meal. Mia demonstrated interest in the variety and started to increase her intake of a variety of tastes and textures. During treatment sessions, the feeding specialist coached Mia's parents about how to model and demonstrate interaction with new foods. Mia now shows interest and watches intently as her parents eat, and has even asked for foods that they eat.

After 7 treatment sessions over a 2-month period, Mia exceeded her target weight gain and is now in the 30-35<sup>th</sup> percentile for weight. Mia now asks to eat and demonstrates hunger as her next scheduled mealtime approaches. She is more communicative during meals, indicating her desire for more as well as indicating when she is all-done. She is eating a variety of food textures, including smooth purees, ground table food, chopped table foods, soft table foods such as breads, pasta, and scrambled eggs, and is continuing to eat meltable crackers. Gagging is very infrequent (once every couple of weeks) and does not cause Mia distress. She is able to manage the food and continue eating. Although she still takes 2-3 servings of milk per day by dropper, she drinks water and juice in a regular cup at meals and snacks.

Mia's parents report significant satisfaction with the mealtime process. Mia now holds the spoon, brings it to her mouth, and sometimes dips it into her foods. They all eat at the same time, and they are sharing the same family foods. They even fed Mia while out in the

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community for a follow-up doctor visit!

Intervention will continue to improve Mia's independence with eating and interactions with foods, and to help Mia advance to cup drinking for all liquids.

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## Editorial: Thoughts on medical management...

The longer I work in this field the more I feel that many feeding problems are also medical problems. And many of the underlying medical problems and concurrent symptoms are getting missed, under treated or ignored by treating professionals. These medical issues include diagnoses such as constipation, gastroesophageal reflux, abdominal pain (heightened awareness of pain), and allergies/intolerances. There is serious lack of training for therapists in this area.

As feeding therapists, we are trained to look for oral motor issues, dysphagia, and sensory aversions. We rely on physicians to diagnose and treat underlying medical problems. However, many physicians do not receive adequate education on feeding issues and are not aware of the impact of the GI tract on oral function. Some children can't see specialists often enough for efficient intervention. But as therapists, we do see our clients on a regular basis so it is our job to work closely with the medical team. Attentive therapists can observe for medical issues that may be interfering with feeding success, assist with observation of changes after treatment options have been put in place and help the medical team understand the relationship between these issues and feeding problems.

I have seen many children greatly improve with the right medical management. This does not diminish the need for oral motor/dysphagia therapy in the least. If the child feels better, it can make the therapist's job much easier which means success for the child and better outcomes overall!

# DRS Summary

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The 2010 International Dysphagia Research Society (DRS) Meeting is the premier conference for the clinician who wants to hear the latest evidence based research in the field of dysphagia. This year over 30 countries were represented in attendance, participation, and presentations. The participants, speakers, and meeting managers range from physicians (including but not limited to ENT, GI, Physiatry, Neurology, and Dentistry) research scientists, speech pathologists, dieticians, and students. Over the course of the four-day conference, speakers presented on research projects on topics covering a variety of issues relating to dysphagia categories. The most interesting (and I think informative) aspect is the 10 minute question and answer period following each presentation where audience members have the opportunity to ask questions regarding the speakers research process. While DRS has predominantly been an “adult” based conference in the past, many people in our field have worked diligently to change this conference to include information and research relating infants to older adults. The following are summaries of selected research quoted by authors and presented.

This year there were two lengthy infant and pediatric sessions: “Facilitating Oral Feeding: NICU and Beyond” (included research by Sudarshan Jadhlerla MD, Joan Arvedson PhD, and Pamela Dodrill PhD) and “Tube Feeding: Decisions and Processes for Weaning” (Richard Noel MD, Midge Kirby M.S. R.D, and Amy Delaney M.S. CCC-SLP). In addition, physicians from various children’s hospitals presented a panel focused on “Eosinophilic Esophagitis” (Dana Thompson MD, Richard Noel MD, and Michael Rutter MD). These researchers/clinicians summarized all the latest research for this population to date. Discussion from some of the panel experts included facts such as: a) 40% of pre-term infants have feeding difficulty and the lower the birthweight the more probability of cognitive disabilities, b) Pre-term infants had lower growth and weight gain in comparison to full term infants, c) Is the feeding problem an oral motor issue or an oral sensory issue?, d) in 325 patients with EE, 53% had an allergic component to “other” allergies, e) scarring of the esophagus can develop, 57% of EE patients achieve a fibrotic esophagus if undiagnosed, f) subglottic edema resolves with EE treatment, g) chronic hoarseness, recurrent croup without vocal cord abuse may have EE, h) children have more food allergies and adults have more aero allergies when diagnosed with EE, h) Symptoms such as feeding issues, vomiting, pain, dysphagia, and food impaction appears on a continuum from 0-20 years of age, i) aero allergies, food allergies drives the EE disease.

### ***Non-nutritive sucking for promoting physiologic stability and nutrition in preterm infants.***

**Background:** Non-nutritive sucking is used during gavage feeding and in the transition from gavage to breast/bottle feeding in preterm infants. The rationale for this intervention is that non-nutritive sucking facilitates the development of sucking behavior and improves digestion of enteral feedings. Non-nutritive sucking has been considered to be a benign intervention, although it has the potential to have a negative effect on breastfeeding or on the incidence of later oral aversion. **Objectives:** To determine whether non-nutritive sucking (NNS) in preterm infants influences: a) weight gain, b) energy intake, c) heart rate, d) oxygen saturation, e) length of hospital stay, f) intestinal transit time, g) age at full oral feeds or h) any other clinically relevant outcomes. **Selection criteria:** All trials utilizing experimental or quasi-experimental designs in which non-nutritive sucking in preterm infants was compared to no provision of non-nutritive sucking. Articles that met relevance criteria were then assessed for methodologic quality based on predetermined set of criteria. **Conclusions:** This review found a significant decrease in length of stay in the preterm infants receiving a NNS intervention. The review did not reveal a consistent benefit of NNS with respect to other major clinical variables (weight gain, energy intake, heart rate, oxygen saturation, intestinal transit time, age at full oral



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feeds, and behavioral state). The review identified other positive clinical outcomes of NNS: transition from tube to bottle feeds and better bottle feeding performance. No negative outcomes were reported in any of the studies. There were also a number of limitations of the presently available evidence related to the design of the studies, outcome variability, and lack of long-term data. Based on the available evidence, NNS in preterm infants would appear to have some clinical benefit. It does not appear to have any short term negative effects. *J Pinelli, A Symington, The Cochrane Collaboration, Wiley Publishers, Issue 1 2009.*

**Attainment of Early Feeding Milestones in Preterm Neonates: Objective:** This study aimed to document the ages at which preterm neonates commence suckle-feeds and attain exclusive suckle-feeding, as well as the time taken to transition from commencement of suckle-feeds to exclusive suckle-feeding. It was hypothesized that gestational age (GA) at birth and degree of neonatal morbidity would influence the timing of these early feeding milestones. **Design:** A chart review was conducted for all neonates born <37.0 weeks GA admitted to a tertiary level perinatal facility over a 12 month period (n=735). Complete data relating to attainment of feeding milestones were available on 472 neonates. **Results:** Correlation analysis indicated that both a low GA at birth and a high neonatal morbidity rating were statistically significantly correlated with an increased transition time from commencement of suckle-feeds to exclusive suckle-feeding. Cox regression indicated that both of these variables were statistically significant risk factors for a delayed GA at attainment of exclusive suckle-feeding. **Conclusion:** Preterm neonates who were less mature at birth and /or who displayed a greater degree of neonatal morbidity took longer to transition from starting suckle-feeds to achieving independent suckle-feeding, and were more mature at attainment of independent suckle-feeding. *P Dodrill, T Donovan, G Cleghorn et al., Journal of Perinatology (2008) 28, 549-555.*

**Secondary Airway Lesions in Infants with Laryngomalacia: Objective:** To determine the incidence of secondary airway lesions in infants with laryngomalacia and to compare the incidences of these concomitant airway lesions in infants with severe, moderate, and mild laryngomalacia; to determine whether infants with mild or moderate laryngomalacia have a higher incidence of surgical intervention with a secondary airway lesion is present; and to determine whether the incidence of gastroesophageal reflux disease (GERD) is affected by the presence of a secondary airway lesion. **Methods:** A retrospective review of a database consisting of 201 infants with a diagnosis of laryngomalacia treated at a pediatric tertiary referral center between June 1998 and June 2003. Data pertaining to demographic information, severity of laryngomalacia, presence of secondary airway lesions, and diagnosis of GERD were collected and analyzed. **Results:** Of the 201 infants, 104 (51.7%) were found to have a secondary airway lesion. Subglottic stenosis was found in 38.8%, and tracheomalacia in 37.8%. Of the infants with severe laryngomalacia, 30 (79%) had a diagnosis of a secondary lesion compared with 51 (61.5%) of those with moderate and 23 (28.8%) of those with mild disease. Among infants with mild or moderate disease, those with secondary airway lesions were more likely to require surgical intervention than were infants without secondary airway lesions (27% versus 5.6% p=0.0002). There was no difference in the rates of secondary airway lesions in infants managed with supraglottoplasty versus tracheotomy. The incidence of GERD in this patient population was 65.5%. Infants with a secondary airway lesion were more likely to have GERD than were those without a secondary airway lesion (84.6% versus 45.4%; p<0.0001). **Conclusions:** The incidence of secondary airway lesions in our population of infants with laryngomalacia was higher than those previously reported. The severity of disease correlated with the diagnosis of secondary airway lesion. Secondary airway lesions lead to an increased incidence of surgical intervention and

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GERD in infants with laryngomalacia. *J Dickson, G Richter, J Meizen-Derr, M Rutter, D Thompson, Annals of Otolaryngology, Rhinology & Laryngology 118 (1): 37-43, 2009.*

**Abnormal Sensorimotor Integrative Function of the Larynx in Congenital Laryngomalacia: A new Theory of Etiology: Objectives:** Laryngomalacia is an enigmatic disease in which laryngeal tone is weak, resulting in dynamic prolapse of tissue into the larynx. Sensorimotor integrative function of the brainstem and peripheral reflexes are responsible for laryngeal tone and airway patency. The goal of this study was to elucidate the etiology of decreased laryngeal tone through evaluating the sensorimotor integrative function of the larynx. The secondary goal was to evaluate factors and medical co-morbidities that contribute to the wide spectrum of symptoms and outcomes. **Design:** Prospective and retrospective collection of evaluate data on infants with congenital laryngomalacia at two tertiary care pediatric referral centers. **Methods:** Two hundred one infants with laryngomalacia were divided into three groups on the basis of disease severity (mild, moderate, severe). Patients were followed prospectively every 8-12 weeks until symptom resolution or loss to follow up. Sensorimotor integrative function of the larynx was evaluated in 134 infants by laryngopharyngeal sensory testing (LPST) of the laryngeal adductor reflex (LAR) by delivering a duration (50ms) and intensity (2.5-10mm Hg) controlled air pulse to the aryepiglottic fold to induce the LAR. Medical records were retrospectively reviewed for medical co-morbidities. **Results:** The initial LPST was higher ( $P<.001$ ) in infants with moderate (6.8 mm Hg) and severe disease (7.4 mm Hg) compared with those with mild disease (4.1 mm Hg). At 1, 3, and 6 months, infants with moderate and severe disease continued to have a higher LPST compared with those with mild disease. At 9 months, the LPST decreased in all subjects (3.1-3.5 mm Hg,  $P =.14$ ) which also correlated with symptom resolution. Neurologic, genetic, and cardiac diseases were more common in infants with severe disease ( $P < .001$ ). Gastroesophageal reflux disease (GERD) and feeding problems were more common in those with moderate and severe disease ( $P<.001$ ). Apgar scores were lower in those with severe disease ( $P<.001$ ). Most symptoms resolved within 12 months of presentation. Those with GERD benefited from treatment. Supraglottoplasty resulted in few complications. Multiple comorbidities ( $>3$ ) influenced the need for tracheotomy. **Conclusions:** Laryngeal tone and sensorimotor interactive function of the larynx is altered. The degree of alteration correlated with disease severity, indicating that factors that alter the peripheral and central reflexes of the LAR have a role in the etiology of signs and symptoms of laryngomalacia. GERD, neurologic disease, and low Apgar scores influenced disease severity and clinical course, explaining the spectrum of disease symptoms and outcomes. Sensorimotor integrative function improved as symptoms resolved. *D Thompson, The Laryngoscope 117: June 2007.*

**Altered Laryngeal Sensation: A Potential Cause of Apnea of Infancy:** Delayed maturation of respiratory control of breathing and the laryngeal adductor reflex (LAR) are commonly implicated in infant apnea. A swallow response occurs to remove the stimulus from the pharynx to prevent aspiration once the glottis reopens. Induction of apnea by poorly cleared endogenous upper airway secretions has been postulated to be a potential cause of infant apnea. Our purpose was to determine whether alteration in the LAR, an indicator of laryngeal sensation, and the presence of secretions influenced the responsiveness of the LAR in infants with apnea. The LAR was induced in 20 infants with apnea (median gestational age, 36.5 weeks) by application of air pulses of controlled duration (50ms) and intensity (2.5-10 mm Hg) to the aryepiglottic fold. Twenty infants evaluated for upper respiratory tract anomalies were used as a comparison group (median gestational age, 39 weeks).

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The infants with apnea required higher-intensity stimuli ( $p < .001$ ) to induce the LAR (6.2 +/- 1.6 mm Hg) than did the comparison adjusted for postconceptional age at the time of the test ( $p = .007$ ). The findings of this study suggest that decreased laryngeal sensitivity results in poor endogenous secretion clearance and that it may induce a prolonged glottis closure event to prevent aspiration. This closure may play a role in infant apnea. *D Thompson, M Rutter, C Rudolph, J Willging, R Cotton, Ann Otology Rhinology Laryngology 114: 258-263, 2005.*

**Preliminary Ultrasound Observation of Lingual Movement Patterns during Nutritive versus Non-Nutritive Sucking in a Premature Infant. Abstract:** Term neonates must suck, swallow, and respire in a coordinated manner during successful oral feeding. When infants are born prematurely, these skills may not be fully mature. To stimulate sucking responses, premature infants are offered pacifiers under the premise that non-nutritive sucking experiences facilitate oral feeding readiness. This care reported examined the lingual-hyoid mechanics of non-nutritive suck (NNS) patterns with a pacifier versus nutritive suck (NS) during a bottle feed in a premature infant using a noninvasive ultrasound imaging technique as a pilot to discern aspects of oral feeding candidacy. Lingual patterns during NS resulted in significantly greater displacements and excursions than NNS ( $p < 0.0001$ ) in both anterior and posterior regions of the tongue ( $p < 0.0001$ ). In addition, the angle of hyoid movement during NNS was significantly smaller ( $p < 0.05$ ) than the angle recorded during NS tasks. Unlike an expected neonatal sucking pattern of horizontal anterior-posterior movements of the tongue body, vertical tongue body excursions occurred as described in the literature of representing a 6-9 month developmental skill level. Through the integration of semiautomatic computerized analysis of tongue surface configurations and hyoid activity, these data may enhance knowledge of oral swallowing function in developing preterm neonates. *J Miller, S Kang, Dysphagia Vol 22, Number 2, 150-160, 2007.*

**Review Article: The Pathogenesis and management of Eosinophilic Oesophagitis. Background:** Eosinophilic oesophagitis is a clinicopathological disease affecting both children and adults that is characterized by symptoms of gastro-oesophageal reflux disease (feeding refusal, vomiting, heartburn, dysphagia, and food impaction) and dense oesophageal eosinophilia both of which are unresponsive to proton pump inhibition. **Aim/Method:** To present a review of the recent literature examining the pathogenesis and treatments of Eosinophilic oesophagitis. Translational and basic studies suggest that this disease is sparked by food or by aeroallergens. To date, effective treatments include system topical corticosteroids, specific food elimination or an elemental diet. While several studies identified oesophageal strictures as potential complications of unbridled eosinophilia, the natural history of the disease is still not certain. Recent studies suggest a role of interleukin-5 and eotaxin-3 in the pathogenesis of Eosinophilic oesophagitis and suggest an impact of future targeted therapeutic agents. **Conclusions:** Eosinophilic oesophagitis represents an immune-mediated disease of undetermined pathogenesis. While many patients develop clinicopathological findings following ingestion of foods, others do not. Natural history studies will be critical to defining future treatment paradigms. *G Furuta, A Straumann, Alimentary Pharmacology & Therapeutics, 24, 173-182, 2006.*

**Retching and vomiting in neurologically impaired children after fundoplication:** Predictive preoperative factors. **Background:** In neurologically impaired children, retching and recurrent vomiting are common after Nissen fundoplication. The aim of this study was to identify whether there

# DRS Summary

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are preoperative factors that predict their occurrence. **Methods:** twenty neurologically impaired children (8 boys, 12 girls: age range, 3 months to 8 years) were studied prospectively by taking a detailed history of behaviours and symptoms associated with feeding before and after Nissen fundoplication for gastroesophageal reflux. **Results:** Preoperatively, children in group A had symptoms suggestive of only gastroesophageal reflux (effortless “vomiting” or regurgitation), whereas children in group B exhibited one or more features associated with activation of the emetic reflex (pallor, sweating, retching, forceful vomiting). Postoperatively 0 of 8 in group A retched compared with 8 of 12 group B ( $p < 0.005$ ). **Conclusions:** Children at high risk of retching, and ultimately vomiting, after antireflux surgery may be identified clinically preoperatively. They have symptoms that are specifically caused by activation of the emetic reflex rather than to gastroesophageal reflux. In these cases, antireflux surgery could be considered inappropriate and hence be avoided. C Richards, P Milla, L Andrews, L Spitz, *J Pediatric Surgery* 36: 1401-1404. 2001

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## On the Research Front:

**Ibrahim SH, Voigt RG, Katusic SK, Weaver AL, Barbaresi WJ. Incidence of gastrointestinal symptoms in children with autism: a population-based study. *Pediatrics*. 2009 Aug;124(2):680-6. Epub 2009 Jul 27. PMID: 19651585**

The author's objective was to determine whether children with autism have an increased incidence of gastrointestinal symptoms compared with matched control subjects in a population-based sample. 124 children and two matched control subjects for each child were identified for each case subject. Gastrointestinal diagnoses before 21 years of age were grouped into 5 categories: (1) constipation; (2) diarrhea; (3) abdominal bloating, discomfort, or irritability; (4) gastroesophageal reflux or vomiting; and (5) feeding issues or food selectivity. Results indicated that significant differences between autism case and control subjects were identified in the cumulative incidence of constipation (33.9% vs 17.6%) and feeding issues/food selectivity (24.5% vs 16.1%). No significant associations were found between autism case status and overall incidence of gastrointestinal symptoms or any other gastrointestinal symptom category. The authors concluded that as constipation and feeding issues/food selectivity often have a behavioral etiology, data suggest that a neurobehavioral rather than a primary organic gastrointestinal etiology may account for the higher incidence of these gastrointestinal symptoms in children with autism.

## On the Research Front:

**Van Wijk MP, Benninga MA, Davidson GP, Haslam R, Omari TI. Small volumes of feed can trigger transient lower esophageal sphincter relaxation and gastroesophageal reflux in the right lateral position in infants. J Pediatr. 2010 May;156(5):744-8, 748.e1. Epub 2010 Jan 25. PMID: 20097362**

The objective was to investigate the threshold amount of constantly infused feed needed to trigger lower esophageal sphincter relaxation (TLESR) in the right lateral position (RLP) and left lateral position (LLP). Eight healthy infants were studied using an esophageal impedance-manometry catheter. After tube placement, infants were randomly positioned in RLP or LLP. They were then tube-fed their normal feed. Recordings were made during the feed and 15 minutes thereafter. The study was repeated with the infant in the opposite position. Results indicated more TLESRs were triggered in the RLP compared with LLP. First TLESR occurred at a significantly lower infused volume in RLP compared with LLP. The percentage of feed infused at time of first TLESR was significantly lower in RLP compared with LLP. The authors concluded that in the RLP, TLESRs and gastroesophageal reflux are triggered at volumes unlikely to induce gastric distension.

**Kirby M, Danner E. Nutritional deficiencies in children on restricted diets. Pediatr Clin North Am. 2009 Oct;56(5):1085-103. Review. PMID: 19931065**

Pediatric nutritional deficiencies are associated not only with poverty and developing countries, but also in children in the developed world who adhere to restricted diets. At times, these diets are medically necessary, such as the gluten-free diet for management of celiac disease or exclusion diets in children with food allergies. At other times, the diets are self-selected by children with behavioral disorders, or parent-selected because of nutrition misinformation, cultural preferences, alternative nutrition therapies, or misconceptions regarding food tolerance. Health care providers must be vigilant in monitoring both growth and feeding patterns to identify inappropriate dietary changes that may result in nutritional deficiencies.

**Bingham PM, Ashikaga T, Abbasi S. Prospective study of non-nutritive sucking and feeding skills in premature infants. Arch Dis Child Fetal Neonatal Ed. 2010 May;95(3):F194-200. Epub 2009 Nov 29. PMID: 19948525**

The aim of this study was to assess the value of non-nutritive sucking (NNS) measures as predictors of oral feeding performance in comparison to other putative predictors of feeding skills: respiratory support, post-menstrual age (PMA) at birth and the neonatal oral motor assessment score (NOMAS). 51 premature infants born between 25 and 34 weeks' PMA, birth weight 1512.3+/-499.4 g, were included in this study. Interventions were measurement of NNS, standardized feeding advance schedule, performance of NOMAS, and standardized, permissive, oral feeding advance schedule. MAIN OUTCOME MEASURES: were transition time from first to full oral feeding (FOF) and gestational age at FOF. Results indicated that higher NNS organization scores predicted shorter transition to FOF: infants with a more organized suck pattern reached independent oral feeding 3 days earlier (16 vs 13 day transition) than infants with more chaotic patterns of suck bursts. Consistency of the suck waves also corresponded with feeding milestones: infants with more regular suck wave pressure deflections became competent oral feeders approximately 3 days earlier than those with irregular suck pressure waves. PMA at birth was inversely associated with PMA at FOF. NOMAS measures were not associated with outcome measures. In conclusion, measures of NNS organization and suck consistency constitute useful candidate predictors of feeding performance by premature infants. The results accord with previous findings linking PMA at birth with age at independent feeding.

# Case by Case: *an interesting case.....*

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Back ground: Jack started in therapy at 5 1/2 year's old. He has no known medical history and is typically developing in all aspects except for feeding. He was referred by an outside therapist for poor chewing and lack of self feeding. When he started therapy, he was in kindergarten and ate only pureed foods which his mother fed him and also went to his school daily to feed him lunch. His parent's were extremely frustrated with his inability to chew. When asked how this had happened, his parent's response was that "they were both working when he was a toddler and his babysitters did not offer chewables." In fact, his father felt his son was just being "lazy." Jack was also allergic to eggs and fish.

Initial evaluation: Jack was an extremely friendly and compliant 5 year old. Oral motor exam revealed normal structures but delayed function. He showed a decreased ability to lateralize his tongue. Observation of a meal revealed Jack's mom feeding him textured purees (rice and yogurt, applesauce, oatmeal). Jack used an immature oral pattern (sucking) to transfer purees with good bolus control. There were no signs of swallowing dysfunction but through out the meal, Jack showed facial grimacing, coughing, and hard swallows. When Jack was asked to take a piece of cracker, he began gagging after tasting the small piece and became very upset.

## Intervention :

1. Treat signs and symptoms of gastroesophageal reflux: Jack had coughing, grimacing, hard swallows, and texture refusal while eating. All of these can be related to reflux. When this was discussed with Jack's parent's, they revealed that he occasionally complained of stomach pain and that reflux ran in the family. Intervention: Jack's pediatrician put him on 15 mg of Prevacid. Symptoms of improved by about 60%. Our pediatric GI team doubled the dose and symptoms completely resolved.
2. Treat oral motor delay: Jack was put on a home program for chewing which included using the chewy tube to work on motor patterns for biting and jaw strength, lateral placement of purees, and practice biting meltable solids. Intervention: After 6 months of practice, Jack was able to use a vertical chewing pattern which allowed him to move to table foods. He was also able to self feed purees and soft solids.
3. Further evaluate upper airway patency: As Jack became a more proficient chewer, it became apparent that he often needed to mouth breathe during chewing. Intervention: Referral to an ENT to evaluate his upper airway. His ENT reported that everything structural appeared fine.
4. Further evaluate allergies: Jack had known food allergies. A few months into therapy, Jack's parent's reported that he had an allergic reaction to lentils. He had swelling and had to be rushed to the emergency room. Intervention: Referral to an allergist. The ENT ran a RAST test (blood allergy test) which revealed class 3 and 4 reactions to rice, oats, corn, soy, wheat, shell fish, and tree nuts. (noted there is a lot of room for interpretation with RAST tests which evaluates for IgE mediated allergy). Based on these results, a referral to a pediatric allergist was made as well as plans for GI to scope to rule out eosinophilic esophagitis (EE). EE can cause many reflux like symptoms including coughing, dysphagia, pain and food impaction.

Outcome: Jack is able to eat regular table food with a rotary chewing pattern. Medical management of allergies and pending scope are in progress to determine a root cause for Jack's feeding issue.