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Anatomy and Physiology of Feeding and Swallowing: Normal and Abnormal 691
Koichiro Matsuo and Jeffrey B. Palmer

Eating and swallowing are complex behaviors involving volitional and reflexive activities of more than 30 nerves and muscles. They have two crucial biologic features: food passage from the oral cavity to stomach and airway protection. The swallowing process is commonly divided into oral, pharyngeal, and esophageal stages, according to the location of the bolus. The movement of the food in the oral cavity and to the oropharynx differs depending on the type of food (eating solid food versus drinking liquid). Dysphagia can result from a wide variety of functional or structural deficits of the oral cavity, pharynx, larynx, or esophagus. The goal of dysphagia rehabilitation is to identify and treat abnormalities of feeding and swallowing while maintaining safe and efficient alimentation and hydration.

Neural Control of Feeding and Swallowing 709
Satish Mistry and Shaheen Hamdy

Eating and drinking are basic pleasures in life that most of us take for granted, yet the ease with which we perform these tasks belies their complex neurologic system of control. Recent studies of human swallowing have begun to unravel some of these complexities,

evolving our understanding and thus ultimately helping to generate novel therapies for the treatment of swallowing problems after cerebral injury, such as stroke. This article provides a general overview of current knowledge of the neural control mechanisms that underlie the coordination of mastication, oral transport, swallowing, and respiration in humans.

Esophageal Dysphagia **729**
Adeyemi Lawal and Reza Shaker

Esophageal dysphagia can arise from a variety of causes such as motility disorders, mechanical and inflammatory diseases. Adequate management includes a detailed history, evaluation with upper endoscopy, barium radiography and manometry. Treatment is usually tailored to the underlying disease process and in some cases, as in inoperable cancer, palliative management may be necessary.

The Bedside Examination in Dysphagia **747**
Giselle Carnaby-Mann and Kerry Lenius

The evaluation of swallowing disorders currently uses a variety of methods. The most common dichotomy is between instrumental and noninstrumental or clinical examinations. The clinical bedside assessment often is considered the mainstay of dysphagia management. As the first line of assessment, it frequently defines the process and requisites of the task. This article reviews the available methods of noninstrumental bedside swallowing assessment and considers the issues surrounding the use of these approaches today.

The Videofluorographic Swallowing Study **769**
Bonnie Martin-Harris and Bronwyn Jones

This article describes the evidence for the physiologic foundation and interpretation of the videofluorographic swallowing study (VFSS). The purpose and clinical efficacy of VFSS are explained. Standardization of the VFSS procedure, protocol, interpretation, and reporting is highlighted as a critical step in future clinical practice and research. Individualized evidenced-based rehabilitation strategies are presented as key components that are systematically applied during the VFSS procedure and integrated into the swallowing management plan. A new tool that has been developed and tested for the quantification of swallowing impairment is introduced.

Fiberoptic Endoscopic Evaluation of Swallowing **787**
Steven B. Leder and Joseph T. Murray

Fiberoptic endoscopic evaluation of swallowing is a technique that allows for the assessment of pharyngeal dysphagia and the

implementation of rehabilitation interventions with the goal of promoting safe and efficient swallowing. An overview of the equipment needed for the laryngoscopic evaluation, how to conduct the examination, what can be visualized endoscopically, diagnostic parameters, the implementation of therapeutic strategies, and suggestions for future research are discussed herein.

Treatment of Oral and Pharyngeal Dysphagia 803
Jeri A. Logemann

Research on treatment of oropharyngeal dysphagia has supported several treatment approaches. Treatment can include postural changes, heightening preswallow sensory input, voluntary swallow maneuvers, and exercises. Evidence to support the efficacy of these procedures is variable. An instrumental study of a patient's oropharyngeal swallow forms the basis for treatment selection.

Surgical Treatment of Dysphagia 817
Liat Shama, Nadine P. Connor, Michelle R. Ciucci, and Timothy M. McCulloch

The role of surgery in the management of dysphagia is clear in some areas and controversial in others. Evaluation for the causes of dysphagia can elucidate conditions in which surgery can improve safety, quality of life, or both. Surgical therapy, when indicated, is safe and effective for many causes of dysphagia. This article includes a general overview of the causes of dysphagia that can be addressed successfully with surgery as well as a discussion of why surgery may be less appropriate for other conditions associated with dysphagia.

Pediatric Dysphagia 837
Maureen A. Lefton-Greif

Feeding and swallowing disorders during childhood are on the increase and typically occur in conjunction with multiple and complex medical, health, and developmental conditions. A multidisciplinary approach is essential for the evaluation of these disorders and the prompt initiation of appropriate treatment. Following a brief description of the terms feeding and swallowing, this article provides an overview of the available epidemiologic data on dysphagia and its common diagnostic conditions, impact, evaluation, and management in the pediatric population.

Dysphagia in the Elderly 853
Ianessa A. Humbert and JoAnne Robbins

The capacity to swallow or eat is a basic human need and can be a great pleasure. Older adults look forward to sharing mealtimes and participating in social interactions. The loss of capacity to swallow

and dine can have far-reaching implications. With age, the ability to swallow undergoes changes that increase the risk for disordered swallowing, with devastating health implications for older adults. With the growth in the aging population, dysphagia is becoming a national health care burden and concern. Upward of 40% of people in institutionalized settings are dysphagic. There is a need to address dysphagia in ambulatory, acute care, and long-term care settings.

Dysphagia in Stroke and Neurologic Disease 867
Marlís González-Fernández and Stephanie K. Daniels

Dysphagia is a common problem in neurologic disease. The authors describe rates of dysphagia in selected neurologic diseases, and the evaluation and treatment of dysphagia in this population. Applicable physiology and aspects of neural control are reviewed. The decision-making process to determine oral feeding versus alternative means of alimentation is examined.

Rehabilitation of Dysphagia Following Head and Neck Cancer 889
Barbara R. Pauloski

Patients who have cancers of the oral cavity, pharynx, or larynx may be treated with surgery, radiotherapy, chemotherapy, or a combination of these modalities. Each treatment type may have a negative impact on posttreatment swallowing function; these effects are presented in this article. A number of rehabilitative procedures are available to the clinician to reduce or eliminate swallowing disorders in patients treated for cancer of the head and neck. The various procedures—including postures, maneuvers, modifications to bolus volume and viscosity, range-of-motion exercises, and strengthening exercises—and their efficacy in patients treated for head and neck cancer are discussed.

Dysphagia Rehabilitation in Japan 929
Mikoto Baba, Eiichi Saitoh, and Sumiko Okada

This article describes the features of Japanese dysphagia rehabilitation, particularly where it differs from that in the United States. Many kinds of professionals participate in dysphagia rehabilitation; nurses and dental associates take important roles, and the Japanese insurance system covers that. Videofluorography and videoendoscopy are common and are sometimes done by dentists. Intermittent catheterization is applied to nutrition control in some cases. The balloon expansion method is applied to reduce pharyngeal residue after swallowing. If long-term rehabilitation does not work effectively in dysphagia due to brainstem disorder, the authors consider reconstructive surgery to improve function.

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