Postextubation dysphagia

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Postextubation dysphagia (PED) is a common problem in critically ill patients with recent intubation. Although several risk factors have been identified, most of them are nonmodifiable preexisting or concurrent conditions. Early extubation, small endotracheal tube size, and small bore of nasogastric tube potentially decrease the risk of PED. The majority of patients receive treatment based on only bedside swallow evaluations, which has an uncertain diagnostic accuracy as opposed to gold standard instrumental tests. Therefore, the treatment decision for patients may not be appropriately directed for each individual. Current treatments are mainly focused on dietary modifications and postural changes/compensatory maneuvers rather than interventions, but recent studies have shown limited proven benefits. Direct therapies in oromotor control, such as therapeutic exercises and neuromuscular stimulations, should be considered as potential effective treatments.

Postextubation dysphagia (PED) is defined as the difficulty or inability to effectively and safely transfer food and liquid from the mouth to the stomach after extubation. It is commonly seen in trauma and critical care patients requiring endotracheal intubation for mechanical ventilation, especially after cardiac surgery (1, 2). PED may result in aspiration and its ensuing complications, such as aspiration pneumonia, chemical pneumonitis, transient hypoxemia, bronchospasm, or mechanical obstruction with atelectasis. As a result, malnutrition, prolonged hospital stays, financial burden, and increased mortality occur (3, 4). Understanding the treatment modalities and screening tests is essential to minimize complications, improve quality of treatment, and develop standard screening guidelines.

INCIDENCE

Of 220,000 survivors of acute respiratory failure requiring mechanical ventilation each year in the US (5), 3% to 62% develop PED. The wide range of incidence could be explained by the differences in the population studied, differences in the sensitivity of diagnostic methods and the timing of the assessment, and the duration of intubation. The patients who required prolonged intubation from all diagnosis subtypes were found to have a higher incidence of PED compared to postoperative patients with a shorter duration of intubation (6).

MECHANISMS

The mechanisms of PED are multifactorial and include mechanical causes, cognitive disturbances, and residual effects of narcotics and anxiolytic medications (7). Mechanical causes are directly related to the duration of intubation and endotracheal tube size, since these tubes cause mucosal inflammation leading to loss of architecture, oropharyngeal muscle atrophy from disuse during intubation, diminished proprioception, decreased laryngeal sensation, and laryngeal injury (edema, granuloma, and vocal cord paralysis) (6). Traumatic brain injury or critical illness may also cause PED by damaging peripheral and bulbar nerves, altering cognition, or causing the dysregulation of the swallowing reflex (8).

RISK FACTORS

Preexisting neurological conditions, such as stroke and neuromuscular disease (2), low Glasgow Coma Scale scores (1), advanced age (9–11), prolonged mechanical ventilation (1, 2, 9, 10), preexisting congestive heart failure, forced supine position, the presence of tracheostomy, nasogastric tube placement (12–16), head and neck cancer, and recent transesophageal echocardiography (17) have been associated with a higher risk of developing PED. A study in trauma patients found that number of ventilator days and an age ≥55 years were independent risk factors. Each day of intubation increased the risk of PED by 14%, and patients older than 55 had a 37% increased risk of dysphagia compared with younger patients (9).

PED is clearly linked to preexisting neurological disorders that cause swallowing abnormalities, such as stroke, neuromuscular diseases, and low Glasgow Coma Scale scores. The increased prevalence of neurological disease in elderly patients is one of the risk factors that places elderly patients at a higher risk of PED and a poor functional status prior to admission (11).

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The incidence of PED is increased in the presence of risk factors that cause laryngeal irritation and inflammation, including prolonged mechanical ventilation (>50% of patients with PED were intubated for >48 hours) (1, 2), the presence of tracheostomy, nasogastric tubes, or a recent transesophageal echocardiography study. A large-bore nasogastric tube is more likely than a small-bore nasogastric tube to be associated with the development of PED (18).

SCREENING AND EARLY DETECTION

Since PED can potentially cause life-threatening consequences, including aspiration pneumonia, malnutrition, prolonged hospital stays, massive financial costs, and increased mortality (3, 4, 19), early detection of PED is essential to reduce complication rates. However, there is no well-established standard screening protocol across institutions in the US. Most diagnostic tests are performed 18 to 24 hours after extubation (18).

Many facilities have developed screening tools for PED. A dysphagia clinical evaluation typically includes the following:

- Questions about history/risk factors
- Observation of the patient's behavioral characteristics, such as level of alertness, cooperation, and motivation
- Observation of signs of motor speech and/or voice abnormalities
- Observation of oral motor structure, sensation, and function
- Observation of signs of oral and pharyngeal dysphagia

Swallow screening evaluation is used to determine the need for further instrumental assessment. A clinical examination to evaluate the pharyngeal phase has a good correlation with fiberoptic endoscopy in swallowing evaluation and is adequate to start oral nutrition (20). About 60% of PED evaluations use only bedside swallow evaluations (18).

DIAGNOSTIC PROCEDURES

Various instrumental tests used for evaluation of PED include videofluoroscopic swallow study (VFSS) (21), fiberoptic endoscopic evaluation of swallowing (FEES) (22), ultrasonography (23), pH-manometry (24), and scintigraphy (25). Many factors, such as the presence of established screening guidelines, hospital size, type of academic affiliation, and availability of diagnostic tests, have a significant influence on the pattern of formal evaluation in PED in the US. The gold standard evaluation of oropharyngeal dysphagia is VFSS or FEES, which allows real-time imaging of all stages during swallowing.

VFSS is sometimes called a modified barium swallow exam or swallow study. It incorporates a set of modifications in various consistencies and textures, ranging from thin barium to barium-coated cookies, patient positioning, and radiographic focus, to facilitate optimum visualization of the oral-pharyngeal-laryngeal structures and their function during swallowing. The effects of compensatory maneuvers, diet modification, and bolus transport during all stages of swallowing can be studied fluoroscopically in a real-time manner to determine a safe-for-swallow diet and to maximize efficiency of the swallow.

An FEES allows a direct observation of the pharyngeal and laryngeal structures during swallowing via a fiberoptic nasopharyngolaryngoscope to evaluate the pharyngeal swallow. Detailed information regarding swallowing function and relevant functions of nearby structures within the upper aerodigestive tract are evaluated. Also, compensatory positions and therapeutic maneuvers can be attempted to determine a safe diet and to maximize the efficiency of the swallow. The advantages of FEES include its ability to be done at the bedside and its ability to assess tissue quality, such as strictures from fibrosis. It also can reduce the exposure to radiation (26).

Both VFSS and FEES are mainly used when the diagnosis is uncertain after bedside swallow evaluations, and both tests are more likely to be available at university-based hospitals than community-based hospitals (18). Other criteria for obtaining an instrumental examination include suspicion for silent aspiration, recurrent pneumonia, or right lower lobe pneumonia and the need for treatment strategy evaluation (18).

TREATMENT

Dysphagia treatment is focused on nutritional status, hydration, and reducing morbidity from pneumonia. However, treatment modalities have been relatively underappreciated. Based on most studies, there are three major therapeutic options for PED: dietary texture modifications, postural changes/compensatory maneuvers, and interventions to improve swallow function, therapeutic exercises, and neuromuscular stimulation.

The American Dietetic Association has classified diet level according to textural properties and anchor foods to four levels of semisolid/solid foods (27):

I. National Dysphagia Diet Level 1: Dysphagia-pureed (homogenous, very cohesive, pudding-like, requiring very little chewing ability)
II. National Dysphagia Diet Level 2: Dysphagia-mechanical altered (cohesive, moist, semisolid foods, requiring some chewing)
III. National Dysphagia Diet Level 3: Dysphagia-advanced (soft foods that require more chewing ability)
IV. Regular (all foods allowed)

The level of liquid viscosity is labeled based on correlating viscosity ranges:

I. Thin: 1–50 centiPoise (cP)
II. Nectar-like: 51–350 cP
III. Honey-like: 351–1750 cP
IV. Spoon-thick: >1750 cP

The patients will receive treatment based on the level of severity and the pattern of dysphagia after swallowing function assessment.

Without changing swallowing function, postural techniques such as 90° upright, 45° reclining sitting posture, and chin down position, and swallowing maneuvers, such as a small amount of intake per swallow and multiple swallows, are used to change the patients' environment to overcome anatomical and physiological deficiencies. Postural methods can reduce airway aspiration by changing the passage and speed of ingested food.

Therapeutic exercises and neuromuscular stimulation are focused on improving swallowing function. A speech pathologist can prescribe an oral-pharyngeal regimen to improve oromotor

control and to decrease the risk of aspiration (26). More recent interventions, such as neuromuscular electrical stimulation, cricopharyngeal botulinum toxin injection, and surface electromyography biofeedback, have also shown benefits in alleviating underlying neuromuscular disorders in dysphagia (28, 29).

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