Swallowing Disorders

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Risk

- Neuromuscular disorder or mechanical obstruction can cause difficulty in swallowing (dysphagia).
- Dysphagia can be classified into distinct types: Oropharyngeal dysphagia due to malfunction of the tongue, pharynx, larynx and/or upper esophageal sphincter and esophageal dysphagia due to malfunction of the esophagus.
- Dysphagia is often a symptom of a systemic disease (impaired consciousness, sarcopenia, dyspnea).
- Effects of dysphagia can go undetected until more serious medical complications—such as respiratory disorders, sepsis, and/or profound weakness and cachexia—are identified.
- According to AHRQ, approximately 300,000–600,000 people each year are affected by dysphagia and around 51,000 of these cases stem from neurologic disorders other than stroke.
- Aspiration pneumonia is one of the leading causes of death among the elderly.
- Not all pts with swallowing disorders will develop an aspiration pneumonia but the majority are at risk for dehydration and malnourishment.

Perioperative Risks

- Subclinical dysphagia often becomes symptomatic periop with increased volume of airway secretions; effects of sedatives, opioids, and neuromuscular blocking agents; and inflammation.
- Increased risk of aspiration when consciousness is impaired (decreased sensorium, impaired breathing-swallowing coordination).

Worry About

- Impaired breathing-swallowing interplay in pts with dyspnea and impaired mental status.
- Full stomach/impaired gastric emptying.
- Mask ventilation: Gastric inflation may increase the risk of life-threatening regurgitation and pulm aspiration.
- Underlying malnourishment/frailty/sarcopenia: Poor periop outcome.
- Risk of extubation failure: Deconditioned pt (weakness, anemia, renal failure).
- Aspiration in pts with severe muscle weakness.

Overview

- Dysphagia is defined as any difficulty that can affect the swallowing mechanism or safe transference of food, liquid, and secretions anywhere through and along the digestive tract.
- Only 40– 60% of institutionalized elderly have overt signs and symptoms of oropharyngeal dysphagia.
- About 50% of hospitalized pts with recurrent respiratory failure leading to reintubation have swallowing disorders and silent aspiration.
- Oropharyngeal dysphagia in the hospitalized elderly is an indicator of poor prognosis for pts with pneumonia; however, this is dependent on their functional capacity prehospitalization and any functional decline that occurs during hospitalization.
- Pts with overt signs or symptoms of aspiration often have poor functional status, a higher prevalence of neurologic comorbidities, and greater exposure to paralytics or sedative drugs that might affect level of consciousness, swallow efficiency, and coordination.
- Adequate screening methods to identify pts at risk for aspiration help to prevent adverse outcomes (aspiration, inadequate hydration, poor nutrition).
- Muscle weakness is an independent predictor of aspiration in critically ill pts.
- Complete evaluation of swallowing disorders to diagnose and treat dysphagia and determine aspiration risk requires a multidisciplinary team and is not limited to bedside clinical evaluation. It might include a combination of instrumental tests such as FEES, VSS, and/or BaS.
- Hospitals that implement a swallowing screening do have a lower rate of aspiration pneumonia, reduced rate of readmission, decreased length of stay, increased staff and patient satisfaction, and reduced admission cost.
- An aspiration risk screening tool can be used in pts who are considered to be at risk for swallowing disorders.
- Evaluation:
  - Clinical bedside evaluation: Aims to determine risk and presence and severity of swallowing disorder and aspiration risk. It includes reviewing history and identifying risk factors for swallowing disorders, observing pt's level of arousal and alertness, oral sensory motor evaluation, observation for any signs or motor speech or voice abnormalities, observation of food and liquid administration, and saliva management.
  - FEES: Allows structural laryngeal evaluation and functional evaluation of swallowing efficiency and safety. Assessment of aspiration before, during, and after swallowing. During the moment of swallow is the view is obliterated, so microaspiration might go undetected.
  - Video swallowing study: Considered the gold standard. Allows functional evaluation of swallowing efficiency and safety from oral cavity to stomach. Uses barium in different consistencies. Not only detects prandial aspiration but also determines the cause, and all efforts are made to eliminate aspiration and improve efficiency of swallowing during examination. Requires hemodynamic stability and travel off the floor and involves radiation exposure.
  - BaS: Evaluates esophageal function and clearance. Might detect aspiration but does not eliminate and or seek to understand causes of aspiration aside from esophageal retroflow or reflux. Larger volumes of barium are ingested, and pts may be prone during procedure if they are unable to stand up. Pts at risk for prandial aspiration are not considered safe to participate on a BaS.
  - Swallow screening: Pass/fail procedure to determine overt risk of aspiration, safety to feed, and likelihood of need for further swallow assessment. There are many tools available but few have been validated. The Massachusetts General Hospital Swallow Screening test is a two-step exam:
    - Part 1: The pt is essentially assessed for readiness. The screener looks at wakefulness, breathing, posture, and cleanliness of the mouth. If any of these items are missing, the patient fails, is kept NPO, and rescreening is performed as appropriate.
    - Part 2: This includes the five elements most sensitive to determining risk of aspiration. Four of the elements have a 1-point value (tongue movement, volitional cough, vocal quality, and pharyngeal sensation). Note that pharyngeal sensation must be intact on both sides to receive a score of 1. The ability to swallow water without a cough, throat clear, wet or congested quality of voice, or shortness of breath is assigned 2 points because this is the best indicator of aspiration risk.
    - A score of 5 or 6 is needed to pass. A score of 4 or less results in a fail. If at any time during the screening there is concern for aspiration, the pt fails based on clinical judgment.
    - This screening instrument requires appropriate training to assure valid and reliable assessment. It was created to detect aspiration and has been validated on neurologic population. For more information and training, go to https://www2.massgeneral.org/stopstroke/swallowScreen.
    - Pts with known history of dysphagia or medical diagnosis that frequently causes swallowing disorders (stroke, head and neck cancer, neuromuscular disorder) who have signs or symptoms of dysphagia (coughing/choking) or aspiration (recurrent pneumonias, recurrent fever of unknown cause) should be referred to a bedside clinical swallow evaluation to determine need of further instrumental evaluation.

Etiology

- Leading causes of dysphagia include stroke, neurodegenerative diseases, brain tumors, and traumatic head or cervical spine injuries.
- Other common mechanisms of dysphagia include local cancer of head, neck, and esophagus; respiratory diseases (acute hypoxia and/or hypercarbia); congenital structural defects (cleft palate, tracheoesophageal fistula, laryngeal cleft, esophageal atresia); frailty; sarcopenia; and poor nutritional status.
- Airway devices: Large tracheal cannulas and nasogastric tubes, cervical collars.

Usual Treatment

- Aspiration prevention: Rapid sequence induction; 30 degrees elevated body position; conscious use/reversal of sedatives, opioids, and neuromuscular blocking agents; screening for high aspiration risk prior to oral feeding
- Implementation of preventive and compensatory measurements such diet texture and consistency; modifications to improve the safety and efficiency of swallowing and prevent further malnourishment, dehydration, or recurrent respiratory infections due to aspiration pneumonia.
- Implementation of swallowing maneuvers by changing head posture to change the direction and control of bolus flow.
- Neuromuscular swallowing exercises (head lift, tongue pressing, Mendelsohn maneuver)
- Oral hygiene.
- Implementation of airway clearance techniques to reduce effects of aspiration.

Assessment Points

Systems	Effects	Assessment by Hx	PE	Test
HEENT	Aspiration	Coughing, choking, speech and voice changes	Oral motor sensory exam, saliva management, food and liquid administration	Clinical bedside swallow exam, VSS, or FEES
CV	Dehydration	Skin, orthostatic vital signs	UO	
RESP	Pneumonia	Cough, sputum production	Fever	CXR, clinical bedside swallow exam, video swallow exam
GI	Dysphagia	Recurrent pneumonia, weight loss Heartburn, food impaction, regurgitation of food, odynophagia	Hoarseness (reflux), frequent throat clearing, laryngeal exam for signs of laryngo-esophageal reflux	Swallow screening, BaS, endoscopy, esophageal manometry, pH monitoring
CNS	Cranial nerves dysfunction and mental status changes	Hoarseness, motor speech, voice changes, decreased arousal	Oral motor sensory exam, level of arousal	Swallow screen
MS	Sarcopenia,cachexia	Weight loss, fatigue	Proximal muscle strength	VSS, FEES

Key References: Mirzakhani H, Williams J-N, Mello J, et al.: Muscle weakness predicts pharyngeal dysfunction and symptomatic aspiration in long-term ventilated patients, *Anesthesiology* 119(2):389–397, 2013; D'Angelo OM, Diaz-Gil D, Nunn D, et al.: Anesthesia and increased hypercarbic drive impair the coordination between breathing and swallowing, *Anesthesiology* 121(6):1175–1183, 2014.

Perioperative Implications

Preoperative Preparation

- Consider performing an aspiration risk screening tool or more comprehensive swallowing evaluation if there are any concerns for dysphagia, as detailed in the Assessment Points table.

Monitoring

- Assess dyspnea and desaturation.
- Closely monitor ventilatory drive (hypercapnia decreases hypopharyngeal pressure) because of increased risk of pathologic swallowing (swallowing on inhalation).

Airway

- Consider upper body elevation to decrease aspiration risk.

Induction

- Anesthesia disrupts the physiologic coordination between breathing and swallowing.
- Gentle (or absence of) mask ventilation helps avoid gastric insufflation.

Maintenance

- Ensure airway is clear of secretions due to the decreased frequency of swallowing.

Extubation

- Goal is an awake pt with no residual paralysis, as this will affect swallowing stability and ability to protect airway.
- Closely monitor ventilatory drive because hypercapnia increases the incidence of pathologic swallows

Adjuvants

- Consider clinical bedside evaluation after extubation if pt failed swallowing screening.

Postoperative Period

- Monitor changes in pulm function closely.
- Ensure ability to maintain enteral nutrition.
- Monitor for changes in mental status to ensure swallow stability across time.

Anticipated Problems/Concerns

- Residual paralysis and sedation
- Inability to manage own secretions

Syndrome of Inappropriate Antidiuretic Hormone Secretion

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Risk

- Elderly pts
- Nursing home residents
- Planned major operations, especially neurosurgical procedures
- Pts receiving exogenous hormone therapy, especially desmopressin
- CNS disorders including psychiatric diseases
- Cancer, especially small-cell lung cancer
- Lung disease

Perioperative Risks

- Hyponatremia
- Cerebral edema causing altered mentation, seizures, and coma
- Acute water intoxication and fluid overload

Worry About

- Other causes of hyponatremia, such as heart failure, liver failure, renal failure, or pseudohyponatremia (e.g., hyperglycemia) (see Hyponatremia).
- Acuity and magnitude of hyponatremia influences the risk of CNS complications.
- Osmotic demyelination syndrome is caused by rapid correction of hyponatremia.

Overview

- Hyponatremia is the most common electrolyte disorder in hospitalized pts (affects 15%), and SIADH is the most frequent cause of hyponatremia, but other causes of hyponatremia should be excluded before making a Dx of SIADH.
- Normally, increased serum osmolarity, hypovolemia, or hypotension triggers thirst and ADH release. ADH increases aquaporin-2 channels on the luminal surface of the distal tubules and collecting duct and acts to promote free water reabsorption. Thirst, free water intake, or hypotonic fluid administration combined with ADH-induced free water retention causes hyponatremia.
- Dx of SIADH: Symptoms include serum osmolarity less than 275 mOsm/L, urine osmolarity >100 mOsm/L, urine sodium >40 mEq/L, euvolemia, normal thyroid and adrenal function, and absence of diuretic therapy.
- SIADH can be classified as follows: Type A is unregulated secretion of ADH, type B is elevated basal secretion, type C is reset osmostat, and type D is undetectable ADH.

Etiology

- Malignant diseases causing ectopic ADH secretion: Lung cancer (especially small-cell and mesothelioma), brain tumors, cancer of the duodenum, pancreas, head and neck, GU tract, lymphoma, and sarcomas.
- Pulm disorders: Infections, asthma, cystic fibrosis.
- CNS disorders: Infection, masses, head trauma, intracranial bleed, MS, Guillain-Barré syndrome, Shy-Drager syndrome, delirium tremens, and acute intermittent porphyria.
- Immune compromised states like HIV with associated pulm infections or malignancies.
- Drugs include, but are not limited to, chlorpropamide, carbamazepine, cyclophosphamide, SSRIs, TCAs, clofibrate, nicotine, NSAIDs, antipsychotics, narcotics, arginine vasopressin analogues (DDAVP, oxytocin, and vasopressin).
- Major surgery: Pain, stress, general anesthesia, PPV, neurosurgery.
- SIADH may be hereditary, with a mutation of gene for renal vasopressin-2 receptor and a mutation for gene affecting osmolarity sensing in the hypothalamus.

Usual Treatment

- The decision to treat depends on acuity and severity of hyponatremia or the presence of symptoms.
- Treat underlying causes for SIADH when possible.
- Water should be restricted to 500–1000 mL per day for asymptomatic or chronic SIADH.
- Normal saline (0.9%, 154 mEq/L) infusion and furosemide (20 mg) for hyponatremia of unknown duration or moderate CNS symptoms. The goal is to increase Na^+ by 8–10 mEq/L in first 24 h. Measure Na^+ every 4 h.
- Hypertonic saline (3%, 513 mEq/L) at 1–2 mL/kg per h infusion and furosemide (20 mg) for acute hyponatremia associated with coma or seizures. The goal is to increase Na^+ by 2 mEq/L per h until symptoms improve. Measure Na^+ every 2 h.
- Demeclocycline 300–600 mg PO bid to diminish responsiveness of collecting tubule to ADH for persistent hyponatremia unresponsive to other therapy.
- Vasopressin-receptor antagonist such as conivaptan (20–40 mg IV qd) or tolvaptan (15–60 mg PO qd) as an adjunct to increase free water clearance and Na^+.
- Urea, 15-30 mg tid or qid to enhance water excretion in chronic SIADH.
- Infusion rate (mL/hr) = $[TBW \times (Na_{target} - Na_{current})/(Na_{infusion})] \times (1000\ mL/L) \times (1/t)$, where TBW = total body water (0.6 × body weight); Na_{target} = target Na^+; Nacurrent = current Na+; Nainfusion = Na+ of saline infusion; t = time to achieve target Na+ in h.