

Chapter 1

Hiccups

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- I. Definition: An involuntary, intermittent, spasmodic contraction of the diaphragm and intercostal muscles (de Hoyos, Esparza, & Cervantes-Sodi, 2010; Lembo, 2012)
 - A. Bout: Episode persisting as long as 48 hours
 - B. Persistent: Episode persisting longer than 48 hours but less than one month
 - C. Intractable: Episode lasting longer than one month

- II. Physiology/Pathophysiology
 - A. Normal: Glottis pertains to the area of the vocal cords. Diaphragm separates the abdomen from the thoracic cavity. Intercostal muscles (external and internal) are located on the outer layer and between the ribs.
 - B. Pathophysiology (Becker, 2010; de Hoyos et al., 2010; Lembo, 2012; Suh & Krishnan, 2009; Woelk, 2011)
 1. Synchronous clonic spasm of the intercostal muscles and diaphragm causes sudden inspiration followed by prompt closure of the glottis, causing the hiccup sound and inhibiting respirations.
 2. Hiccups are a reflex arc traveling an afferent pathway over vagal sympathetic and sensory fibers of the phrenic nerve. It is thought that the central connection for hiccups involves an interaction among the medulla oblongata and reticular formation of the brain stem, phrenic nerve nuclei, and the hypothalamus.
 - a) Afferent pathway of hiccup reflex encompasses the phrenic and vagus nerves and the sympathetic chain arising from thoracic (T) segments T6 to T12.
 - b) Primary efferent reflex branch is the phrenic nerve; however, the glottis and accessory muscles of the respiratory nerves have been suggested as the efferent pathway.
 3. Hiccups most often occur during inspiration and are inhibited by elevations in carbon dioxide.

- III. Clinical features: Hiccups are a transient, innocuous symptom, but they can become exhausting and disabling (e.g., respiratory insufficiency) if they persist. They are clas-

sified as psychogenic, organic, and idiopathic. Hiccups occur more frequently in men, and they serve no known physiologic function. Hiccups tend to occur with a frequency of 4–60 per minute (Becker, 2010; Lembo, 2012; Marinella, 2009; Woelk, 2011).

A. Etiology (Lee et al., 2010; Woelk, 2011)

1. Vagus and phrenic nerve irritation
 - a) Esophagitis
 - b) Intraoperative manipulation
 - c) Intubation
 - d) Pharyngitis
 - e) Laryngitis
 - f) Mediastinal mass
 - g) Goiter
 - h) Tumors of the neck that stimulate the laryngeal nerve
2. Central nervous system (CNS) disorder
 - a) Head trauma
 - b) Multiple sclerosis
 - c) Encephalitis
 - d) Meningitis
 - e) Hydrocephalus
3. Metabolic
 - a) Uremia
 - b) Alcohol intoxication
 - c) Anesthesia
 - d) Drug-induced such as corticosteroids, benzodiazepines, hydrocodone
 - e) Chemotherapy-induced such as cisplatin, carboplatin, etoposide, irinotecan, docetaxel, paclitaxel, gemcitabine, vinorelbine
 - f) Hypokalemia
 - g) Hypocalcemia
 - h) Hyperventilation
4. Gastrointestinal
 - a) Distention from overeating or fluid buildup such as ascites
 - b) Gastroesophageal reflux disease (GERD)
 - c) *Helicobacter pylori* infection
 - d) Gastric cancer
 - e) Abdominal abscesses
 - f) Gallbladder disease
 - g) Pancreatitis
 - h) Pancreatic cancer
 - i) Inflammatory bowel disease
 - j) Hepatitis
5. Cardiac disorders: MI, pericarditis
6. Thoracic disorders
 - a) Lymphadenopathy secondary to infection or neoplasm
 - b) Pneumonia
 - c) Empyema

3. Thyroid studies to evaluate for thyroid disorder
 4. Complete metabolic panel to evaluate for electrolyte imbalances, hyperglycemia, liver function tests, amylase, and lipase to evaluate for GI causes
 5. Uric acid to evaluate for uremia
- B. Radiology
1. Chest x-ray to evaluate for pulmonary, mediastinal, or cardiac abnormalities capable of irritating the phrenic nerve, vagal nerve, or diaphragm
 2. CT scan
 - a) Abdominal CT to evaluate for abnormalities of the subdiaphragmatic region
 - b) Head CT to evaluate for lesions or bleeds
 3. MRI of the head to evaluate for lesions or bleeds
- C. Other
1. Electrocardiogram (ECG) to evaluate for heart block and/or bradyarrhythmia
 2. Lumbar puncture to evaluate for CNS infection or malignancy
- V. Differential diagnosis
- A. Structural defect
1. Pericarditis (see Chapter 48)
 2. Malignancy
 3. Subdiaphragmatic abscess
 4. Hiatal hernia
 5. MI (see Chapter 47)
 6. Peritonitis
 7. Pancreatitis (see Chapter 74)
 8. Biliary tract disease
 9. Feeding tube
- B. Metabolic disturbances
1. Uremia
 2. Diabetes mellitus (see Chapter 148)
 3. Alcoholism
 4. Goiter (see Chapters 154 and 155)
 5. Electrolyte imbalances (see Chapters 149–153)
- C. CNS disorders: Infection or multiple sclerosis
- D. Thorax-related
1. Ulcer
 2. Abscess
 3. Aneurysm
 4. Pleuritis
 5. Pneumonia (see Chapter 30)
- E. Drug-induced
1. Corticosteroids (e.g., dexamethasone, methylprednisolone)
 2. Benzodiazepines (e.g., midazolam, chlordiazepoxide)
 3. Anesthesia

4. Chemotherapy-induced
- F. Psychogenic disease
1. Hysteria
 2. Anorexia nervosa
 3. Anxiety (see Chapter 159)
- VI. Treatment: Overall goal is to relieve the patient of discomfort (de Hoyos et al., 2010; Lembo, 2012; Woelk, 2011).
- A. Nonpharmacologic measures (many without scientifically proven efficacy)
1. Hold breath or breathe into a paper bag.
 2. Swallow a teaspoonful of granulated sugar.
 3. Stimulate the gag reflex.
 4. Lift uvula with a spoon.
 5. Gargle with or sip ice water.
 6. Bite a lemon wedge.
 7. Interrupt vagal stimulation by
 - a) Valsalva maneuver
 - b) Carotid massage
 - c) Supraorbital pressure
 - d) Irritation of tympanic membrane
 - e) Digital rectal massage
 8. Disrupt phrenic nerve transmission.
 - a) Rhythmically tap over fifth cervical vertebra.
 - b) Apply ice to skin over phrenic nerve.
 - c) Apply electric stimulation over phrenic nerve.
 - d) Stimulate phrenic nerve.
 9. Counterirritation of the diaphragm
 - a) Pull knees to chest.
 - b) Lean forward to compress chest.
 - c) Apply pressure at points of diaphragmatic insertion.
 10. Induce vomiting if cause is gastric distention.
 11. Hypnosis
 12. Peppermint facilitates belching by relaxing the lower esophageal sphincter.
 13. Acupuncture has been found to improve intractable hiccups (Ge, Ryan, Giaccone, Hughes, & Pavletic, 2010).
 - a) Most acupoints for hiccups are located near dermatomes (see Appendix 3) related to afferent and efferent pathways. Secondary synapses or nuclei are involved in the hiccup reflex arc.
 - b) Acupuncture may modulate any portion of the hiccup reflex arc locally by changing blood perfusion, activating the autonomic nervous system, regulating inflammatory mediators, or altering axonal excitability.
- B. Pharmacologic measures: To interrupt afferent and efferent pathways (Becker, 2010; Lee et al., 2010; Lembo, 2012; Renes, van Geffen, Rettig, Gielen, & Scheffer, 2010; Seker et al., 2011)
1. Antipsychotics act centrally by dopamine antagonism in the hypothalamus.

- a) Chlorpromazine: 25–50 mg PO initially with maintenance therapy of 25 mg QID
 - b) Haloperidol: 2–5 mg IM initially with maintenance of 1–4 mg PO TID
2. Anticonvulsants for intractable hiccups
- a) Valproic acid 250 mg PO/day in divided doses for two weeks; no long-term use because of potential hepatotoxicity; thought to block hiccup stimulus
 - b) Phenytoin 200 mg IV initially, followed by maintenance dose of 300 mg PO every day
 - c) Gabapentin 300 mg every day to TID
3. Miscellaneous
- a) Metoclopramide 10 mg PO TID after large-dose IV (2 mg/kg) may reduce esophageal contraction. Large doses are associated with tardive dyskinesia.
 - b) Baclofen 10 mg PO QID is thought to block the hiccup stimulus arc.
 - c) Proton pump inhibitor for GERD such as omeprazole 20–40 mg PO daily
 - d) Sertraline 50 mg daily may inhibit the hiccup reflex arc by affecting 5-HT₃ (serotonin) receptors in GI tract. Ironically, hiccups can be an adverse reaction to sertraline.
 - e) Simethicone to relieve gastric distention
 - f) Benzonatate 100 mg every 4 hours, not to exceed 600 mg in 24 hours
- C. Surgical infiltration of the phrenic nerve: When other measures have not been successful
- 1. Injection of long-acting anesthetic or alcohol
 - 2. Crushing or cutting the phrenic nerve
- D. General anesthesia for intractable hiccups as a last resort
- VII. Follow-up: Dependent upon etiology and occurrence of hiccups
- A. For persistent and intractable hiccups, see patient daily until interventions have been successful and maintenance dose is managed.
 - B. If patient is taking anticonvulsant or antipsychotic drugs, monitor serum levels every two weeks or monthly, as well as liver function tests if indicated.
 - C. Hospitalization may be warranted to aggressively manage symptom if patient has persistent or intractable hiccups.

VIII. Referrals

- A. Surgeon: If invasive procedure is necessary
- B. Anesthesiologist: For phrenic nerve block or general anesthesia

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