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Esophagus

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1. States the pressures in the esophagus at rest and variation during respiration.
    a. UES: +50 mmHg
    b. Esophagus: -5 mmHg
    c. LES: +25 mmHg
    d. Stomach: +5 mmHg
    e. During respiration, the upper esophagus pressures are similar to intrathoracic pressures and the fundus has pressures similar to the intrabdominal pressure
2. Describes the function of the upper esophageal sphincter and lower esophageal sphincter.
    a. UES: upon swallowing UES relaxes and then contracts, contraction is followed by contraction of body of esophagus; mostly anatomical
    b. LES and fundus relax before peristaltic contraction arrival to allow passage into stomach. LES also prevents backflow from stomach into esophagus.
        i. Regulated by intrinsic properties of smooth muscle, nerves and hormones.
        ii. Basal tone is myogenic, but increased by ACh and gastrin
        iii. Transient relaxation mediated by inhibitory neurons that use VIP or NO as a NT
        iv. Sphincter tone lacking in newborns and decreased during pregnancy
3. States the stimulus which initiates the swallowing sequence.
    a. Tongue pushes soft palate up to seal of nasal pharynx
    b. Tongues pushes food backwards and in
    c. Superior pharyngeal muscles contract above bolus forcing it down into the pharyngeal channel. Glottis moves up and epiglottis closes off trachea to prevent food from entering airways.
    d. After passage of food, pharyngeal muscles relax and return to resting position.
    e. Moves food at 2-4 cm/sec; secondary waves can be initiated by distension in absence of swallowing; peristalsis can occur in absence of CNS and is mediated by ENS
4. Describes the different pattern of innervation of the upper and lower esophagus.
    a. Upper 1/3 esophagus is skeletal muscle and is directly innervated by vagus efferents
    b. Lower 2/3 made of smooth muscle, vagal preganglionic fibers synapse on ganglion cells which innervate smooth muscles
    c. Mediates peristaltic wave w/ contraction behind and relaxation in front of bolus of food
5. Describes the pressure changes that occur in the esophagus as a bolus of food moves from the pharynx to the stomach.
    a. There is a wave of high pressure above the bolus that forces the bolus forward
    b. Low pressure below bolus
6. States when the UES and LES are normally closed and open during the course of a swallow.
    a. UES opens upon swallowing and then contracts
    b. LES and fundus relax before peristaltic contraction to allow passage into stomach
7. Describes primary and secondary peristalsis.
    a. Primary peristalsis is the normal peristalsis
    b. Secondary peristalsis occurs when food gets stuck and distends the esophagus
8. States the mechanisms that normally prevent reflux from stomach to esophagus.
    a. LES is usually closed and prevents reflux into the esophagus
    b. Babies LES not fully developed --> reflux
9. States the immediate cause of heartburn.
    a. Failure of LES to function as a sphincter
    b. GERD
10. States the defect causing achalasia.
    a. Failure of LES to relax
    b. Leads to dilation of esophagus