APPENDIX 1 : LARYNGEAL STRUCTURE AND FUNCTION pdf

1: The Larynx - Cartilages - Muscles - TeachMeAnatomy

structure that warms, moistens, and filters air as it enters the respiratory tract; also houses the olfactory receptors for the sense of smell Epiglottis A flap of tissue that seals off the windpipe and prevents food from entering.

See Article History Alternative Title: It is not clear whether the appendix serves any useful purpose in humans. Suspected functions include housing and cultivating beneficial gut flora that can repopulate the digestive system following an illness that wipes out normal populations of these flora; providing a site for the production of endocrine cells in the fetus that produce molecules important in regulating homeostasis; and serving a possible role in immune function during the first three decades of life by exposing leukocytes white blood cells to antigens in the gastrointestinal tract , thereby stimulating antibody production that may help modulate immune reactions in the gut. While the specific functions of the human appendix remain unclear, there is general agreement among scientists that the appendix is gradually disappearing from the human species over evolutionary time. Blockage of the appendix can lead to appendicitis , a painful and potentially dangerous inflammation. The appendix is a hollow tube that is closed at one end and is attached at the other end to the cecum at the beginning of the large intestine. The appendix is usually 8 to 10 cm 3 to 4 inches long and less than 1. The cavity of the appendix is much narrower where it joins the cecum than it is at its closed end. The appendix has muscular walls that are ordinarily capable of expelling into the cecum the mucous secretions of the appendiceal walls or any of the intestinal contents that have worked their way into the structure. If anything blocks the opening of the appendix or prevents it from expelling its contents into the cecum, appendicitis may occur. The most common obstruction in the opening is a fecalith, a hardened piece of fecal matter. Swelling of the lining of the appendiceal walls themselves can also block the opening. When the appendix is prevented from emptying itself, a series of events occurs. Fluids and its own mucous secretions collect in the appendix, leading to edema , swelling, and the distention of the organ. As the distention increases, the blood vessels of the appendix become closed off, which causes the necrosis death of appendiceal tissue. Meanwhile, the bacteria normally found in this part of the intestine begin to propagate in the closed-off pocket, worsening the inflammation. The appendix, weakened by necrosis and subject to increasing pressure from within by the distention, may burst, spilling its contents into the abdominal cavity and infecting the membranes that line the cavity and cover the abdominal organs see peritonitis. Fortunately, peritonitis is usually prevented by the protective mechanisms of the body. The omentum , a sheet of fatty tissue , often wraps itself around the inflamed appendix, and an exudate that normally develops in the areas of inflammation behaves like glue and seals off the appendix from the surrounding peritoneal cavity. A person experiencing an attack of appendicitis may feel pain all over the abdomen , only in the upper abdomen, or about the navel. This pain is usually not very severe. After one to six hours or more the pain may become localized to the right lower abdomen. Nausea and vomiting may develop sometime after the onset of the pain. Fever is usually present but is seldom high in the early phases of the attack. In a person with a normally sited appendix, the pain of appendicitis is situated at a point between the navel and the front edge of the right hipbone. But many people have the appendix lying in an abnormal position and may feel the pain of an appendicitis attack in a different or misleading location, which makes their symptoms difficult to distinguish from the abdominal pain caused by a variety of other diseases. Ultrasound or computed tomography CT scanning may also be useful in the diagnosis of appendicitis. The basic treatment of appendicitis is the surgical removal of the appendix in a minor operation called an appendectomy. The operation itself requires little more than a half hour under anesthesia and produces relatively little postoperative discomfort. This wait does slightly increase the risk that the appendix will rupture and peritonitis set in, so the patient is kept under careful medical surveillance at this time. Learn More in these related Britannica articles:

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2: The Structure of Singing: System and Art in Vocal Technique - Richard Miller - Google Books

Laryngeal structure and function ; Appendix 2. The structure and mechanics of the breath apparatus ; Appendix 3. The physiology of the vocal tract resonator system ; Appendix 4. The physical factors of vocal registration ; Appendix 5. Influences of various voiced and unvoices consonants on resonator adjustment ; Appendix 6.

Structure and Function Page 2 of 3 Intrinsic Muscles of the Larynx The muscles of the larynx consist mainly of muscles that change the opening of the glottis , as well as the tenseness of the vocal folds, thereby keeping the glottis open during respiration or more closed during vocalization. The extrinsic muscles connect the thyroid, cricoid, and arytenoid cartilages to other structures of the head and neck, while the smaller muscles within the structure of the larynx, the intrinsic muscles, move the vocal folds in reference to each other. The intrinsic muscles of the larynx abduct move apart , adduct bring together , alter vocal fold shape or change the longitudinal tension of the folds. The cricothyroid muscle lengthens and stretches the vocal folds. It lies anterior and external to the larynx, and is part of the muscular triangle of the neck. It arises from the cricoid cartilage and attaches to the inferior horn and lower margin of the thyroid cartilage. When it contracts, it pulls the thyroid cartilage forward around the axis through the cricothyroid joint, increasing the distance between the thyroid and arytenoid cartilages and stretching and tensing the vocal fold. The action of the cricothyroid tilts the thyroid cartilage down, increasing the front-to-back distance of the larynx, and thus placing the vocal folds under increased tension. Unlike all the other muscles of the larynx, which are innervated by the recurrent laryngeal nerve branch of the vagus , the cricothyroid muscle is the only muscle that is supplied by the external laryngeal branch of the vagus superior laryngeal nerve. The cricothyroid ligament is the larger part of the laryngeal membrane, continuing inferiorly as a median or anterior part and twin lateral ligaments. The median cricothyroid ligament is a flat band of white tissue joining the cricoid and thyroid cartilages, while the lateral cricothyroid ligament also known as the cricothyroid membrane keeps the cricoid and thyroid from traveling too far. The lateral cricoarytenoid muscle arises from the upper border of the cricoid cartilage and inserts into the muscular process of the arytenoid cartilages. The lateral cricoarytenoid muscles adduct and internally rotate the arytenoid cartilages to close the rima glottides glottis. The posterior cricoarytenoid muscles arise from the expanse of the cricoid lamina and insert into the muscular process of the arytenoid cartilages. These muscles adduct and externally or laterally rotate the arytenoid cartilages, causing the vocal folds to separate from one another, thus opening the rima glottidis. These are the only muscles that are capable of opening the space between abducting the vocal folds to allow for normal breathing. If this muscle is incapacitated on both sides, as in a bilateral injury to the recurrent laryngeal nerve, the inability to pull the vocal folds apart will cause difficulty in breathing. The transverse arytenoid muscle is a single muscle that arises from the posterior surface and lateral border of one arytenoid cartilage and is inserted into the corresponding parts of the opposite arytenoid cartilage, and fills up the posterior concave surfaces of the arytenoid cartilages. The transverse arytenoid muscle pulls the arytenoids toward each other when they contract, which results in adducted vocal folds. This action closes the rima glottides the opening of the glottis , especially at its back part, to eliminate the posterior commissure - the point, angle, or surface where two parts join or connect - of the vocal folds. The aryepiglottic fold or aryepiglottis is a fold of mucous membrane, enclosing ligamentous and muscular fibres, that extends from the side of the epiglottis to the apex of the arytenoid cartilage, forming the borders of the opening of the larynx. Located in the upper part of the aryepiglottic fold is the aryepiglottic muscle aryepiglotticus or recurrent laryngeal nerve of the vagus. It is attached to the lateral border of the epiglottis and becomes the oblique arytenoid muscle, which then attaches into the arytenoid cartilage. This muscle works as a sort of purse string to close the opening of the larynx when swallowing, protecting the larynx. The oblique arytenoids narrow the laryngeal inlet by constricting the distance between the arytenoid cartilages and the epiglottis. When the aryepiglottis contracts, it causes the arytenoids to appose each other - it closes the laryngeal aditus by bringing the aryepiglottic folds together - and draws the epiglottis down to bring its lower half into contact with the arytenoids, thus closing the aditus. The thyroarytenoid muscle is a broad, thin muscle that lies parallel with and lateral to the vocal fold and

extends from the lower half of the back of the thyroid cartilage to the front side of the arytenoid cartilage, to the middle cricothyroid ligament. It is variously described as being divided into the thyroarytenoid and vocalis muscle or the thyromuscularis and the thyrovocalis , depending on the source. The thyroarytenoid muscle pulls the arytenoid cartilages forward toward the thyroid when it contracts, thereby loosening relaxing and shortening the vocal ligament see below. The fibres of the thyroarytenoid pass backward and lateralward, and are inserted into the base and anterior surface of the arytenoid cartilage. A considerable number of the fibres of the thyroarytenoid are prolonged into the aryepiglottic fold, where some of them become lost, while others are continued to the margin of the epiglottis. These fibres are called the thyreoepiglotticus or thyroepiglottic, and are sometimes described as a separate muscle. A few fibres extend along the wall of the ventricle from the lateral wall of the arytenoid cartilage to the side of the epiglottis and constitute the ventricularis muscle. The lower and deeper fibres - the fine and most medial fibres - of the thyroarytenoid muscle can be differentiated as a triangular band originating from the depression between the two laminae of the thyroid cartilage and inserted into the vocal process of the arytenoid cartilages as well as portions of the vocal ligament, and into the adjacent portion of its anterior surface. This band is termed the vocalis or vocalis muscle, which lies parallel with the vocal ligament to which it is adherent attached. The vocalis muscle, as the name implies, is an important muscle for speech and thus singing. The main function or action of the vocalis muscle is to adjust or alter the tension of small segments of the vocal folds in order to vary tonal qualities and pitches of the voice. It is a sphincter of vestibule that tightens the front part of the ligament near to the thyroid cartilage, thus narrowing the laryngeal inlet. It also supports the wall of the ventricle and its appendix. The vocalis muscle is innervated supplied by the recurrent laryngeal nerve. The vocal ligaments, or inferior thyroarytenoid thyroartenoideus internus , are two strong bands enclosed within the vocal folds. Each ligament consists of a band of yellow elastic tissue, attached in front to the angle of the thyroid cartilage, and behind to the vocal process of the arytenoid. They are constructed from epithelium a tissue composed of cells that line the cavities and surfaces of structures throughout the body , but they have a few muscle fibres in them, namely the vocalis muscle. Various parts of the larynx are closed by connective tissue membranes, which include the cricothyroid membrane, the thyrohyoid membrane and the quadrangular membrane. The cricothyroid membrane or conus elasticus extends from the upper margin of the cricoid cartilage and attaches to the back of the thyroid cartilage anteriorly and the arytenoid cartilage posteriorly. Its upper free margin is the vocal ligament true vocal fold. The thyrohyoid membrane is a tough, fibro-elastic ligament or membrane that connects the thyroid cartilage with the hyoid bone. It extends from the superior margin upper border of the thyroid cartilage below and the upper margin of the posterior surface of the body and greater cornua of the hyoid bone above. Essentially, it fills the gap between the hyoid bone and the thyroid cartilage. It is pierced by the internal laryngeal nerve and superior laryngeal artery. The quadrangular membrane is free at the top and bottom but attached posteriorly to the arytenoid cartilage and anteriorly to the side of the epiglottis. The lower free margin forms the vestibular fold false vocal fold. Extrinsic Muscles of the Larynx The extrinsic muscles are larger muscles, located outside the larynx, that position and support the larynx. They may move the cartilages, which in turn, stretch or compress the vocal folds. The thyrohyoid muscle is a small, quadrilateral muscle belonging to the infrahyoid muscles group that appears like an upward continuation of the sternothyroid muscle next paragraph. It originates at the oblique line on the lamina of the thyroid cartilage and inserts into the inferior lower border of body and greater cornu horn of the hyoid bone. It depresses the hyoid and elevates the larynx. The sternothyroid muscle is an infrahyoid muscle that originates from the posterior surface of the manubrium sterni or episternum and the first and sometimes second costal cartilages the elastic cartilages that connect the sternum - breastbone - and the ends of the ribs, and allow the chest to move during respiration , with insertion into the oblique line of the lamina of the thyroid cartilage. The manubrium sterni is the broad, upper part of the sternum that articulates with the clavicle - collar bone - and the first two ribs. This muscle is shorter and wider than the sternohyoid muscle paragraph below , beneath which it is situated. Its nerve supply comes from the upper cervical nerve through the cervical ansa. The sternothyroid muscle depresses the larynx and the thyroid cartilage for mastication chewing and swallowing. The sternohyoid muscle is a thin, narrow muscle that arises from the posterior border of the medial end of the clavicle, the posterior sternoclavicular ligament, and the

upper and posterior part of the manubrium sterni. Passing upward and medially, it is inserted by short tendinous fibres into the lower border of the body of the hyoid bone. The sternohyoid muscle attaches the hyoid bone to the sternum. It is one of the paired strap muscles of the infrahyoid muscles group, and it serves to depress the hyoid bone. Pharyngeal constrictors are muscles that serve to constrict the pharynx. When the bolus of food a ball of chewed food matter mixed with saliva reaches the pharynx, the elevator muscles relax, allowing the pharynx to descend. The constrictors then contract upon the bolus, and convey it downward into the esophagus the muscular tube through which food passes from the pharynx to the stomach. The pharyngeal constrictors include the superior pharyngeal constrictor muscle, the middle pharyngeal constrictor muscle which arises from the whole length of the upper border of the greater cornu of the hyoid bone , and the inferior constrictor muscle. The inferior pharyngeal constrictor is the thickest of the three pharyngeal constrictors. It arises from the thyroid cartilages from the oblique line on the side of the lamina from the surface behind this, nearly as far as the posterior border, and from the inferior cornu and the sides of the cricoid cartilage in the interval between the cricothyroid muscle in front and the articular facet of the inferior cornu of the thyroid cartilage behind. The first and more superior part arising from the thyroid cartilage is called the thyropharyngeal part, and the second part arising from the cricoid cartilage is called the cricopharyngeal part. From these origins, the fibres spread backward and medialward to be inserted with the muscle of the opposite side into the fibrous pharyngeal raphe - a continuous ridge of tissue that serves as the origin and insertion for several of the pharyngeal constrictors - in the posterior median line of the pharynx. The fibres then diverge from their origin, with the lower fibres descending beneath the inferior constrictor, the middle fibres passing transversely, and the upper fibres ascending and overlapping the superior constrictor. The inferior fibres are horizontal and continuous with the circular fibres of the esophagus. The rest of the fibres ascend, increasing in obliquity, and overlap the middle constrictor from the lesser cornu and from the stylohyoid ligament see below for definition. The pharyngeal constrictors are all innervated by branches from the pharyngeal plexus a network of nerve fibres innervating most of the palate, larynx and pharynx and by neuronal branches from the recurrent inferior laryngeal nerve a branch of the vagus nerve - tenth cranial nerve - that supplies motor function and sensation to the larynx. Other extrinsic muscles associated with the larynx are the digastric, stylohyoid, mylohyoid, geniohyoid and hyoglossus muscles. These supplemental muscles are known as the laryngeal elevators or the suprahyoid muscles because they raise the larynx in the neck or support it. Some of these muscles are visible in images of the tongue, as they are also extrinsic muscles of the tongue. The digastric is a small muscle located under the jaw and extending, in a curved form, from the mastoid process the smooth, pyramidal or cone-shaped bone projections at the base of the skull on each side of the head just below and behind the ears to the symphysis menti the midline symphysis between the two halves of the mandible, or jaw that acts to elevate the hyoid bone when it contracts. It consists of two fleshy bellies united by an intermediate rounded tendon. If the hyoid is being held in place by the infrahyoid muscles , it will tend to depress the mandible and thus open the mouth. The stylohyoid is a slender muscle lying anterior and superior to the posterior belly of the digastric muscle. It arises from the posterior and lateral surface of the styloid process of the temporal bone a slender, pointed piece of bone located just below the ear that projects down and forward from the inferior surface of the temporal bone, and serves as an anchor point for several muscles associated with the tongue and larynx , near the base. Passing inferiorly and anteriorly, it is inserted into the body of the hyoid bone, at its junction with the greater cornu, and just superior the omohyoid muscle an infrahyoid muscle located at the front of the neck, arising from the scapula and inserted into the body of the hyoid bone, that consists of inferior and superior bellies separated by an intermediate tendon, and acts to depress the hyoid bone during chewing and swallowing. The mylohyoid is a flat and triangular muscle situated immediately above the anterior belly of the digastric muscle, and running from the mandible lower jaw to the hyoid bone, forming the floor of the oral cavity. The geniohyoid is a narrow muscle situated superior to the medial border of the mylohyoid muscle, and is involved in driving food from the mouth into the pharynx and in depressing the mandible. The hyoglossus is a thin and quadrilateral muscle that arises from the side of the body and from the whole length of the greater cornu of the hyoid bone, and passes almost vertically upward to enter the side of the tongue, between the styloglossus a muscle with origin from the lower end of the styloid

process, with insertion into the side and undersurface of the tongue, with nerve supply from the hypoglossal nerve, and whose action retracts the tongue and longitudinalis inferior a narrow band situated on the under surface of the tongue between the genioglossus and the hyoglossus. It depresses and retracts the tongue, making its dorsum upper side more convex. It is important in singing.

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3: Singwise - Singwise - The Larynx: Structure and Function

Energizing system (mechanism of power): inhalatory-exhalatory system housed in the head and torso 2. Vibratory system: Laryngeal mechanism 3. Resonator system: series of cavaties in changing relationships with laryngeal tone 4.

Different views of the cricoid cartilage. Facets of Cricoid Cartilage The superior facets articulate with the arytenoid cartilages. The inferolateral facets articulate with the inferior cornu of thyroid cartilage. It has muscle fibers attached to it that allow the food bolus to pass from the pharynx to the esophagus. It also helps in production of speech or sounds [5, 6]. Clinical Significance Cricothyrotomy In the event that airway is not established by all other means, emergency cricothyrotomy may be done to gain access through the trachea and provide respiration. The thyroid and cricoid cartilages serve as a landmark to identify the cricothyroid membrane which will be incised during cricothyrotomy. Cricothyroid membrane is in between them, as depicted in Picture 7. Once identified, cricothyroid membrane is incised and a tube must be placed immediately for it to remain open. There are cases when a patient has pyramidal lobe that stems off the thyroid gland. This occludes the area for cricothyrotomy. When the pyramidal lobe is being cut, the patient will be at risk for haemorrhage [4]. Behind the cricoid cartilage is the esophagus. The thumb and the index finger are used to apply pressure on the cricoid cartilage in order to close off the esophagus. Proper visualization of the trachea is obscured when applying pressure to the cricoid cartilage. In some cases, airway obstruction was worsened when cricoid pressure was performed. Cricoid cartilage fracture may happen when too much pressure is applied. It was argued that Brian Sellick had a small sample and limited evidence when he proved that cricoid pressure is needed in performing endotracheal intubation and RSI. Well, its use is entirely up to the case. Fracture of Laryngeal Cartilages: The most commonly fractured laryngeal cartilages are thyroid and cricoid cartilages. Physical injury or trauma is usually the reason for having fracture on these parts. The patient develops laryngeal inflammation, swelling, or even hemorrhage. Possible complications are problems in speech and airway obstruction [1].

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Laryngeal structure and function ; Appendix 2. The structure and mechanics of the breath apparatus ; Appendix 3. The physiology of the vocal tract resonator system ; Appendix 4.

This article has been cited by other articles in PMC. Abstract To investigate the inter-rater agreement for the clinical dysphagia scale CDS. Method Sixty-seven subjects scheduled to participate in a video-fluoroscopic swallowing study VFSS were pre-examined by two raters independently within a hour interval. Each item and the total score were compared between the raters. In addition, we investigated whether subtraction of items showing low agreement or modification of rating methods could enhance inter-rater agreement without significant compromise of validity. Results Inter-rater agreement was excellent for the total score intraclass correlation coefficient ICC: Four items lip sealing, chewing and mastication, laryngeal elevation, and reflex coughing did not show excellent agreement ICC: However, subtraction of each item either compromised validity, or did not improve agreement. Conclusion The clinical dysphagia scale is a reliable bedside swallowing test. The incidence of dyspahgia is quite high after stroke or head and neck cancer surgery. Dysphagia gives rise to pneumonia, which is one of its typical complications, and leads to death of the patients, thus resulting in substantial socioeconomic loss. The clinical dysphagia scale CDS is a dysphagia rating scale that can be used with ease at the bedside, 9 which is a required condition of screening tests. It predicts the aspiration of patients with more precision, and can quantify the severity of dysphagia. It showed excellent sensitivity and specificity, and correlated well with VFSS findings. This study aimed to investigate the inter-rater agreement of the CDS for the total score as well as each item score, and to explore possibilities of improving agreement by item modification if necessary. The same procedure is repeated just before the exam by another physician. Among the reviewed records, 67 studies that had complete information on both CDS scores of two different raters and VFSS result data were analyzed in the study. Thirty-seven were stroke patients whereas the others had dysphagia of different etiology e. The first rater was a medical doctor who performed the rating within a day before VFSS, and had the ability to perform basic neurological examination. The doctor who performed the second CDS rating just before VFSS was a physiatrist with more than 2 years experience treating dysphagic patients, and was instructed in a similar way. Thus, inter-rater agreement could be tested based on the collected data. The clinical dysphagia scale The CDS consisted of 8 rating items lesion location, tracheostomy, history of aspiration, lip sealing, chewing and mastication, tongue protrusion, laryngeal elevation, and reflex coughing. If the etiology of dysphagia was not stroke, then it was not rated. Whether the patient had tracheostomy or not was identified by inspection. The rater asked the patient or caregiver whether the patient had experienced aspiration during the past week and rated the history of the aspiration item. If the patient had not tried oral feeding for the previous week due to nasogastric tube feeding or total parenteral nutrition, the item was not rated. Integrity of lip sealing, chewing and mastication, tongue protrusion, and laryngeal elevation was assessed by physical examination. These were rated according to three choices intact, inadequate, and none. Reflex coughing was checked after allowing the patient to drink 3 ml of sterile water twice. In addition, we attempted various modifications of the CDS rating system in order to improve the inter-rater agreement without compromising the validity. If the patient showed aspiration on the videofluoroscope or any clinical symptoms of aspiration, they progressed to the next test diet. The VDS was composed of 14 items that represented oral lip closure, bolus formation, mastication, apraxia, premature bolus loss, and oral transit time and pharyngeal function pharyngeal triggering, vallecular and pyriform sinus residue, laryngeal elevation and epiglottic closure, pharyngeal coating, pharyngeal transit time, and aspiration observed in the VFSS. It was shown to have good correlation with the swallowing status of the patients. The ICC can be used in both scale and ordinal variables. Also, the meaning of ICC in ordinal variable is equivalent to that of weighted kappa. Table 1 Open in a separate window ICC: Percentage of agreement, NA: Subtracting the last item improved the agreement considerably, ICC: If the patient did not have stroke, we rated it as equivalent to stroke involving the brain stem. This modification showed similar inter-rater agreement and improved validity ICC: Combining the modifications showed additional increment in validity ICC: Table 3

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Open in a separate window ICC: Thus, we can promptly decide on how to provide nutrition without increasing the risk of aspiration pneumonia or causing unnecessary discomfort of nasogastric tube feeding. Therefore, many screening tests for dysphagia have carried out for a long time. However, the outcome measure was not a direct confirmation of aspiration such as aspiration ascertained in VFSS. Due to the limitations of these previous studies, new dysphagia screening tests were introduced. However, the recently introduced tests tend to show low specificity. The CDS was developed from a group of 59 stroke patients with an average age of 63 years. It was developed to predict aspiration ascertained by VFSS. The eight items were selected among various clinical findings using a polychotomous linear logistic regression model using aspiration as a criterion factor and various clinical findings as predictor factors. Eight clinical findings with statistical significance were selected as CDS items. Each item was given weight based on the odds ratio so that the total score would be points, higher score indicating higher probability of aspiration. Although inter-rater agreement of some individual items was low, a sum CDS showed an excellent level of agreement. All items that failed to show good inter-rater agreement lip sealing, chewing and mastication, and laryngeal elevation were those that were rated by physical examination. This is inevitable when two raters of different experience examine a patient. Moreover, the two exams of different raters lacked temporal synchronicity, although the time lapse was just about 24 hours. More thorough education and training rather than brief one-hour instruction may improve inter-rater agreement. However, this will make the CDS less applicable in a clinical environment, which takes away a major strength of the CDS rating system. Considering that reflex coughing is an obvious sign, its low ICC value may seem peculiar. The wet voice criterion may have affected the consistency. Many patients who were referred to undertake VFSS had poor lung condition. Therefore, wet voice due to excessive sputum and poor expectoration might have confounded the examination. Examination after complete throat clearing or removal of wet voice would improve inter-rater agreement. Subtraction of each item was done to improve inter-rater agreement. It failed each time except for reflex coughing. However, validity was compromised when it was subtracted. Reflex cough is a direct sign of aspiration. Therefore, it is obvious that this item closely correlates with VDS, which contains an aspiration item. Concerns have been raised over the vagueness of the rating method on some items. There has been no clear guideline on the items that cannot be rated. Therefore, we modified the rating method of two items under the judgment that the established method lacks logical foundation. Nasogastric tube feeding or total parenteral nutrition were indicated when a patient was in various acute medical conditions or had severe difficulty in swallowing. In the acute care setting, the clinician looks for any sign of aspiration and if the patient shows any, oral nutrition is usually forbidden. This attempt improved the validity as well as the agreement. Therefore, dysphagia is sustained or progresses in many cases. Having dysphagia with etiology other than stroke was considered equivalent to stroke involving the brain stem. The same tendency of improvement was observed in both validity and inter-rater agreement. The CDS was originally designed for stroke patients. Therefore, it is quite obvious that CDS shows better correlation with VFSS findings in stroke patients compared to non-stroke patients. This would be due to the different mechanism of dysphagia. In stroke patients, the reason for aspiration is impaired sensory input, paresis, and incoordination of swallowing muscles. On the contrary, in non-stroke patients the pathomechanism of dysphagia can be very different. For example, a patient may have partial laryngectomy and develop dysphagia despite good oral function and laryngeal elevation. There is no item that can assess this in the current CDS rating system. Although some items do not show as much agreement, such as the total score, the CDS is a reliable rating system. To sum up, CDS is an adequate screening tool that can be easily learned and applied by physicians even without rich experience in dysphagia treatment for reliable detection of dysphagia, and for the selection of patients who should undertake VFSS. Modification of some of the items improved the agreement and validity. Accordingly, we suggest a revised version of CDS with short instruction Appendix 1. If the etiology of dysphagia is other than stroke, rate 5 points. Timing of videofluoroscopic, manometric events, and bolus transit during the oral and pharyngeal phases of swallowing. Electromyographic activity from human laryngeal, pharyngeal, and submental muscles during swallowing. Risk factors for pneumonia in the elderly. The cost of treating community-acquired pneumonia. Dysphagia bedside screening for acute-stroke patients: Management of Adult Stroke Rehabilitation Care: The clinical functional scale for dysphagia in stroke

patients. Validation of clinical dysphagia scale: J Korean Acad Rehabil Med. The prediction of persistent dysphagia beyond six months after stroke.

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5: Cricoid Cartilage - Definition, Location, Function, Problems

ii The Thesis Committee for Derek A. Palmer certifies that this is the approved version of the following thesis: LARYNGEAL STRUCTURE AND FUNCTION IN MALE-TO-FEMALE.

The pharynx and larynx Pharynx The word throat is used for the parts of the neck anterior to the vertebral column, especially the pharynx and the larynx. The pharynx is the part of the digestive system situated posterior to the nasal and oral cavities and posterior to the larynx. It is therefore divisible into nasal, oral, and laryngeal parts: The pharynx extends from the base of the skull down to the inferior border of the cricoid cartilage around the C6 vertebral level , where it becomes continuous with the esophagus. Its superior aspect is related to the sphenoid and occipital bones and the posterior aspect to the prevertebral fascia and muscles as well as the upper six cervical vertebrae. The pharynx is the common channel for deglutition swallowing and respiration, and the food and air pathways cross each other in the pharynx. In the anesthetized patient, the passage of air through the pharynx is facilitated by extension of the neck. The nasopharynx, at least in its anterior part, may be regarded as the posterior portion of the nasal cavity, with which it has a common function as part of the respiratory system. The nasopharynx communicates with the oropharynx through the pharyngeal isthmus, which is bounded by the soft palate, the palatopharyngeal arches, and the posterior wall of the pharynx. The isthmus is closed by muscular action during swallowing. The choanae are the junction between nasopharynx and the nasal cavity proper. A mass of lymphoid tissue, the naso pharyngeal tonsil is embedded in the mucous membrane of the posterior wall of the nasopharynx. Enlarged naso pharyngeal tonsils are termed "adenoids" and may cause respiratory obstruction. Higher up, a minute pharyngeal hypophysis resembling the adenohypophysis may be found see fig. Each lateral wall of the nasopharynx has the pharyngeal opening of the auditory tube, located about 1 to 1. The auditory tube can be catheterized through a nostril. The opening is limited on the superior side by a tubal elevation tubal torus , from which mucosal folds descend to the palate and side wall of the pharynx. The part of the pharyngeal cavity posterior to the tubal elevation is termed the pharyngeal recess. Nearby lymphoid tissue is referred to as the tubal tonsil. The auditory tube is pharyngotympanic; i. Hence, infections may spread along this route. The tube equalizes the pressure of the external air and that in the tympanic cavity. The auditory tube, about 3 to 4 cm in length, extends posteriorly, laterally, and superiorly. It consists of 1 a cartilaginous part, the anteromedial two thirds, which is a diverticulum of the pharynx, and 2 an osseous part, the posterolateral third, which is an anteromedial prolongation of the tympanic cavity. The cartilaginous part lies on the inferior aspect of the skull, in a groove between the greater wing of the sphenoid bone and the petrous part of the temporal bone see fig. The cartilaginous part of the auditory tube remains closed except on swallowing or yawning, when its opening prevents excessive pressure in the middle ear. The osseous part of the tube is within the petrous part of the temporal bone. The oropharynx extends inferiorward from the soft palate to the superior border of the epiglottis. It communicates anteriorly with the oral cavity by the faucial oropharyngeal isthmus, which is bounded superiorly by the soft palate, laterally by the palatoglossal arches, and inferiorly by the tongue see fig. This area is characterized by a lymphatic ring composed of the nasopharyngeal, tubal, palatine, and lingual tonsils. The mucous membrane of the epiglottis is reflected onto the base of the tongue and onto the lateral wall of the pharynx. The space on each side of the median glosso-epiglottic fold is termed the epiglottic vallecula. Each lateral wall of the oropharynx has the diverging palatoglossal and palatopharyngeal arches, which are produced by the similarly named muscles and are often called the anterior and posterior pillars of the fauces, respectively. The triangular recess tonsillar fossa between the two arches lodges the palatine tonsil, which is often referred to as merely "the tonsil" see fig. A tonsil is a mass of lympoid tissue containing reaction or germinal centers and related to an epithelial surface in the pharynx. The medial surface of the tonsil usually has an intratonsillar cleft commonly but inaccurately called the "supratonsillar fossa" and a number of crypts fig. The lateral surface is covered by a fibrous capsule and is related to fascia, the paratonsillar vein the chief source of hemorrhage after tonsillectomy , and pharyngeal musculature. The tonsil is supplied by the tonsillar branch of the facial artery, and it drains into the facial vein. Involution of the tonsil begins at puberty.

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The laryngopharynx extends from the superior border of the epiglottis to the inferior border of the cricoid cartilage, where it becomes continuous with the esophagus. Its anterior aspect has the inlet of the larynx and the posterior aspects of the arytenoid and cricoid cartilages. The piriform recess, in which foreign bodies may become lodged, is the part of the cavity of the laryngopharynx situated on each side of the inlet of the larynx see fig. Muscles The pharynx consists of four coats of muscles, from within outward: The wall of the pharynx is composed mainly of two layers of skeletal muscles. The external, circular layer comprises three constrictors fig. The internal, chiefly longitudinal layer consists of two levators: The constrictors of the pharynx have their fixed points in the anterior larynx, where they are attached to bones or cartilages, whereas they expand posteriorly, overlap one another from inferior to superior, and end in a median tendinous raphe in the posterior midline. Their overlapping has been compared with that of three flower pots placed one inside another. The inferior constrictor arises from the cricoid and thyroid cartilages. The cricopharyngeal fibers are horizontal in orientation and continuous with the circular fibers of the esophagus. These fibers act as a sphincter and prevent air from entering the esophagus. A pharyngeal diverticulum may form posterior to the larynx through the fibers of the inferior constrictor. The middle constrictor arises from the hyoid bone, whereas the superior constrictor arises from the mandible and sphenoid bone. The palatopharyngeus muscle arises from the palate, forms the palatopharyngeal fold, and is inserted into the thyroid cartilage and the side of the pharynx. The stylopharyngeus muscle arises from the styloid process, passes between the superior and middle constrictors, and is inserted with the palatopharyngeus. The stylopharyngeus is supplied by the glossopharyngeal nerve, whereas the palatopharyngeus and the constrictor muscles are innervated by the pharyngeal branch of the vagus nerve probably fibers from the accessory nerve through the pharyngeal plexus that is located on the middle constrictor. The chief action in which the muscles of the pharynx combine is deglutition or swallowing , a complicated, neuromuscular act whereby food is transferred from 1 the mouth through 2 the pharynx and 3 the esophagus to the stomach. The pharyngeal stage is the most rapid and most complex phase of deglutition. During swallowing, the nasopharynx and vestibule of the larynx are sealed but the epiglottis adopts a variable position. Food is usually deviated laterally by the epiglottis and ary-epiglottic folds into the piriform recesses of the laryngopharynx, lateral to the larynx. The pharyngeal ridge is an elevation or bar on the posterior wall of the pharynx inferior to the level of the soft palate; it is produced during swallowing by transverse muscle fibers. Innervation and blood supply The motor and most of the sensory supply to the pharynx is by way of the pharyngeal plexus, which, situated chiefly on the middle constrictor, is formed by the pharyngeal branches of the vagus and glossopharyngeal nerves and also by sympathetic nerve fibers. The motor fibers in the plexus are carried by the vagus although they likely represent cranial accessory nerve components and supply all the muscles of the pharynx and soft palate except the stylopharyngeus supplied by cranial nerve IX and tensor veli palatini supplied by cranial nerve V. The sensory fibers in the plexus are from the glossopharyngeal nerve, and they supply the greater portion of all three parts of the pharynx. The pharynx is supplied by branches of the external carotid ascending pharyngeal and subclavian inferior thyroid arteries. Larynx The larynx is the organ that connects the lower part of the pharynx with the trachea. It serves 1 as a valve to guard the air passages, especially during swallowing, 2 for the maintenance of a patent airway, and 3 for vocalization. The anterior aspect of the larynx is quite superficial fig. Laterally, the larynx is related to the carotid sheath, infrahyoid muscles, sternomastoid muscle, and the thyroid gland. The larynx is elevated particularly by the palatopharyngeus muscle during extension of the head and during deglutition. The larynx can be examined in vivo by means of a mirror indirect laryngoscopy or a fiber optic instrument direct laryngoscopy see figs. The thyroid, cricoid, and arytenoid cartilages are composed of hyaline cartilage and may undergo calcification, endochondral ossification, or both, thereby becoming visible radiographically. The other cartilages are elastic in type. The thyroid cartilage fig. The posterior border of each lamina is prolonged superiorly and inferiorly as cornua, or horns. The superior horn is anchored to the tip of the greater horn of the hyoid bone. The inferior horn articulates medially with the cricoid cartilage. The lateral surface of each lamina is crossed by an oblique line for the attachment of muscles. The cricoid cartilage fig. It comprises a posterior plate, called the lamina, and a narrow, anterior part, the arch. The lamina articulates superolaterally with the arytenoid cartilages. The cricoid cartilage is at the level of the C6 vertebra, and its arch is palpable. The inferior border of the cricoid

cartilage marks the end of the pharynx and larynx and hence the commencement of the esophagus and trachea. The arytenoid cartilages fig. Each has a superiorly-positioned apex which supports the corniculate cartilage and a base that comprises its inferior part. The base sends a vocal process anteriorward for attachment to the vocal ligament and a lateral, muscular process for muscular attachments. The corniculate and inconstant cuneiform cartilages are nodules in the aryepiglottic folds figs. The epiglottic cartilage see fig. The epiglottis is situated posterior to the root of the tongue and the body of the hyoid bone and anterior to the inlet of the larynx. The inferior end, or stalk, of the leaf-shaped cartilage is anchored to the posterior aspect of the thyroid cartilage. Taste buds are present in the posterior surface of the epiglottis. The cricothyroid joint, between the lateral aspect of the cricoid cartilage and the inferior horn of the thyroid cartilage, allows mainly rotation of the thyroid cartilage around a horizontal axis through the joints of the two sides. This produces a tipping motion where the anterior part of the thyroid cartilage moves anterior and inferior. The cricoarytenoid joint, between the superior border of the lamina of the cricoid cartilage and the base of the arytenoid cartilages, allows gliding and rotation of the arytenoid cartilages. Ligaments The thyrohyoid membrane connects the thyroid cartilage with the superior border of the hyoid bone see fig. The median part is thickened to form a ligament. The membrane is pierced on each side by the internal laryngeal nerve and the superior laryngeal vessels. The cricothyroid ligament see fig. The term conus elasticus fig.

6: Chapter THE PHARYNX AND LARYNX

Cartilaginous Structure of the Larynx Larynx is situated at the top of the trachea Located somewhat central in respiratory tract (nose and lips to the bronchioles in the lungs) Larynx consists of 9 cartilages: three single (unimpaired) and paired cartilages of lesser dimension.

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Structure and function of oral, facial, pharyngeal, respiratory, and gastrointestinal systems Other conditions that could affect the child's tolerance and stamina (such as cardiac conditions) Observation of interaction patterns between the child and caregiver.

9: Laryngeal Ligaments and Folds - Vocal - Vestibular - TeachMeAnatomy

laryngeal exam that permits a speech-language pathologist or otolaryngologist to assess specific vocal fold vibratory parameters in addition to assessing the gross structure and function of the larynx.

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