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Upper esophageal sphincter dysfunction

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Cricoopharinga dysfunction occurs when the muscle at the top of the esophagus, sometimes known as the upper esophageal sphincter (UES), does not relax to allow food to enter the esophagus or relax in an uncoordinated way. This can cause dysphagia or difficulty to swallow. Children with cricoopharinga dysfunction can also experience symptoms such as aspiration, suffocation, noisy and regurgitated breathing when trying to eat or drink. What are the symptoms of cricoopharinga dysfunction? Croicofaringa dysfunction can cause a number of symptoms in children and children. These include: What causes cricoopharinga dysfunction? Cricoofaringa dysfunction occurs when the UES does not relax correctly. How is cricoopharinga dysfunction diagnosed? Medical typically diagnoses cricoopharinga dysfunction using high resolution manometry with impedance. How is cricoopharinga dysfunction treated? Depending on the unique situation of the child, the doctor will probably recommend less-invasive approaches to treat cricoopharinga dysfunction. These approaches can include: expansion injections of botulinum toxin (botox) to help relax the UES as we are interested in cricoopharinga dysfunction, expert climics in the aerodigest center in Boston Children's Hospital are lived in the diagnosing and treatment of children with a series of aerodigest concerns, including cricalpharinga dysfunction. Using high resolution esophageal manometry with impedance, we are able to accurately determine the relationship between the relaxation of sphincter and food and liquid movement in the esophagus. As a single aerodigest center with motion specialists as an integral part of the team, we are able to diagnose and treat patients with this disruption dysfunction. The Upper Esophageal SFHINCTER (UES) is a high-pressure region located in the joint between the pharynx and the esophagus. The UES is a goalkeeper who prevents the air from breathing from the esophagus and in the guards against the aspiration of gastric reflux. The UES high-pressure zone must also relax and the lumen must open to allow an unmarried unchanged obstacles passage. Neural inputs to swallowing muscles that influence pressure relaxation and luminal opening are controlled by central circuits and these are modulated by sensory information. The activation of these neural inputs causes a complex sequence of changes in striated muscles. These changes could see the muscle contract or relaxation, which in turn influences intraluminal pressures and diameters that eventually determine the enlarged food propulsion. Most of the relevant UES are the intrinsic muscle of cricopharynings and the extructive overdensy muscles that are mechanically coupled to the EU. Changes in the EU mechanical states, such as opening failed, can cause dysphagia. Diagnosis of the opening dysfunction of the UES is demanding but critical because the accurate diagnosis is predictive for therapeutic results. The reliable interpretation of the UES engine models is mostly based on the measurement of pressure (manometry), however, the determination of the normal or abnormal of the opening of the user interface requires considerable interpretative experience (HILA et al., 2001 ; Bhatia and shah, 2013). This because the typical flowers of the ues flow resistance (ie, failed or incomplete inauguration), are the residual pressure and intrabolo pressure, and these are quotas on a pressure generation from above the UES through sequential lingual propulsion and The contraction of pharyngi constrictors (Ali et al., 1997; Williams et al., 2002; PAL et al., 2003). As such, the residual pressure of the UES and the instrumental pressure gradient are less In patients with neuromuscular conditions due to the low-cost control of the bolus bolus and to the decling contractile weakness (Cook et al., 1989; Williams et al., 2002). Added to the difficulties in diagnosing UES dysfunction, most of the conditions that influence the swallowing of orophothynte occur in the elderly population where neuromuscular neuromuscular And weakness is more prevalent (Cook, 2009). To further complicate things, there is a clear distinction between manometricly measured UES Ã ¢ â,¬ Å "Relaxation" and observed radiologically ues Ã ¢ â,¬ å "ons ... (Cook et al., 1989). Il Manometrically determined relaxation is not equivalent to the reach of the UES opening during the flow. To Ã ¢ â,¬ Å "non-relaxing" suggests the failure of the termination of the excitement of the cricoopharynect muscle (CP) by the spinal motorcups, however The degree to which this type of dysfunction can limit the opening of the UES depends on the fact that it is the front of the pharyngeal contractor, the driving bolus the top propulsion is stored or fragmented, as well as the external traction forces Applied by the above-hydolic muscles to open the UES are strong and appropriately chronometrous (Williams et al., 2002). In healthy subjects and in patients with an intact fringen swallow, the volume of the bolus is pushed is also an important contribution to the timing and extension of the opening of the UES (Kahrilas et al., 1988; Cook et al., 1989; Williams et al., 2002). In summary, manometry alone gives an incomplete description of the UES function during swallowing. Although radiological studies have been carried out with manometry and attempts to establish the biomechanics of the opening and the failure of the opening (Williams et al., 2002; PAL et al., 2003), these studies have not led to simple procedures that allow the Reliable analysis and diagnosis of ues engine dysfunctions. To improve our capacity to detect physiological differences in the UES and sickness function, we must be able to detect subtle changes in the opening and closing of the UES. In this document we will describe a new technique, adapted by Ex Vivo Studies based on Gut Peristalsis laboratory (Costa et al., 2013), which allows the evaluation of the main components of the related UES function related to real-time changes in the diameter diameter Diameter of the diameter of the Lumen diameter with the corresponding changes in the intraluminal pressure recorded in the same position and time. Through the definition of this relationship between changes in diameter and pressure, we can define the mechanical state of the muscle (refer to the box 1). Box 1. Concept of UES mechanical states. The changes to the pressure that occur within the high-pressure area of the EUS during the swallowing of a bolus material can be measured with a IndyFling catheter and the changes in the diameter of the Lumen UES can be measured using video phluoroscopy imaging of the Bolo material containing barium. Pressure pressure is mainly generated by my eyelash muscle (CP) and, during normal swallowing, the measurement pressure that the pressure floats in concert with neural activation and deactivation of the CP. The HYOID bone (as shown figure 1) is an anatomical structure mechanically coupled to the EU. The UES opens previously due to the mediated neuriate contraction of the above-hydous muscles that are attached to the Idol bone. Figure 1. The typical model of pressure and diameter change that the UES suffers during normal swallowing. Videofluoroscopy images show the different stages of swallow. The position of the lower edge of the jaw, the HYOID bone and the proximal margin of the ESES are outlined in yellow in each frame. The white arrows show the movement of the relevant anatomical structures relating to their position from the previous frame (shown as a black shadow). A typical UES pressure profile is displayed with arrows indicating periods when the pressure is static (Ã ¢ ¢ â €), decreasing (Ã ¢ â € ") or increasing (Ã ¢ â €"). A typical diameter profile is shown with arrows that Periods When the diameter is static (Ã ¢ â €), increasing (Ã ¢ â €) or decreasing (Ã ¢ â € ". When the pressure and diameter data is interpreted together, different states can be defined Mechanics based on the direction of the pressure exchange and in relation to the fact that the lumen is open, closed or changing in diameter. The report of the diameter against pressure over time can also be displayed through a plot Ã ¢ â,¬ Å "Orbit ". The mechanical states numbered 1 - 6 tie the IL Contracting sequence of the ues opentivities € and opening during downs. Note: The nomenclature describes that the States indicated are provided in Figure 2. Examining the reports that exist between changes in diameter and the corresponding pressure changes, recorded at the same point as space and time, the mechanical states of the Muscle (Costa et al., 2013). These mechanical states provide when muscle actively contravised or relaxing during periods of occlusion or luminal distension. During a human swallow these diameter changes and pressure can be seen in figure 1. The relationship between diameter and pressure over time can also be displayed through a plot Ã ¢ â,¬ Å "Orbit" (Figure 1). The nomenclature that Describes the UES mechanical states has been supplied in Figure 2 (refer to the box 2 relating to the specific terminology applied in the nomenclature). Previous studies examine ex vivo peristalsis in the lower intestine defined 12 possible mechanical states (8 active and 4 passive) (Costa et al., 2013; Wiklendt et al., 2013; Dinning et al., 2014) And these were detailed in box 2, Figure 2. in the human user, at least six of these mechanical states can be used To deactivate the normal UES contractility sequence and opening of the user interface during the swallow (see the colored arrows in Figure 1). Based on the current understanding of the Relaxing mechanisms NTO and opening of relaxation and putative mechanisms, it is possible to suggest a putative meaning for the different mechanical states (box 2, Figure 2). Each State is the net result of passive elasticity or muscle conformity, active contractual states of the muscle (driven by neurogenic paths) and extrinseca traction forces. Figure 2. Nomenclature and definition properties of 12 possible UES mechanical states previously described in relation to the propulsive peristalsis of the lower image (Costa et al., 2013). The functional pointative meaning if applied to the ESUs is also provided. We have tried to apply this new method to in vivo relaxation recordings and opening during bolus swallowing. The muscles of the swallowing of the pharyngo-esophageal segment are streaked and therefore only contract via input from spinal engine neurons. To record this neural input traditionally involves EMG recordings. However, these recordings are usually limited to a single site. For in vivo human recordings, the light manometry offers greater spatial resolution and is simpler and easier to apply from EMG. Therefore, the manometry offers a distinct advantage over the IMG, provided that the information collected on the Motilità of the ESUs can provide similar insights. By applying the methodology used to calculate the mechanical states that we can determine theoretically in real time when the muscle actually contravers or relaxing in response to neural inputs (Costa et al., 2013). The calculation of the mechanical states also requires an accurate measurement of the diameter. To approximate changes in diameter in a real-time situation and in vivo we used intraluminal impedance, which is recorded in parallel with the manometry. In the former Vivo (Costa et al., 2013) and in in vivo recordings (Woman et al., 2012; Kim et al., 2014) has been shown that the impedance can be used to estimate the diameter changes in Association with the movement of the bolus, thus canceling the need for radiology. In this document we provide further validation of this technique. Hypothesis we hypothesize that the quantification of the different mechanical states of the EU and the mechanical properties that define them, ie the change of pressure and the change in diameter, can allow the characterization of the mechanisms that regulate the timing and extension of the Relaxation and the opening of the UES during the normal and disordered swallowing. To face our hypothesis we performed surveys both by validating the methodology and to apply it to a scenario of the patient of Disfagia "of the MondoReal". Our study has had four goals. First of all, we aimed to use the combined videofelloroscopy and the UES manometry to characterize the mechanical mechanical status profile Within the UES region based on the inter-reports of the diameter of the EUS (recorded by X-rays) and change of pressure over time. Secondly, we aimed to determine whether the UES mechanical states can also be provided using the measurement of the intraluminal impedance to estimate the change in the diameter instead of video phluoroscopy. To obtain what we have tried to characterize the relationship between diameter and intraluminal impedance, therefore allowing the non-radiological application of the technique. Thirdly, we aimed to define a model based on pressure impedance that will also host the upper movement of the UES high-pressure area during the swallow. Finally, after completing the validation studies above, we aimed at applying the optimized pressure impedance model to a previously acquired studies database. Specifically, we examined changes in the UES mechanical states in relation to the volume of the bolus, normal aging and patients with symptoms of dysphagia due to the motoneurone disease. Materials and methods Validation studies Study procedure The diameter, impedance and pressure relationships have been determined for the UES by using a continuous video phluoroscopy imaging in combination with intraluminal impedance and pressure measurement using an IndyFelling catheter Located through the UES. In combination simultaneous videofluoroscopy and impedance studies of pharyngeal swallow pressure from five healthy controls (3 male, 24 years "45 years, average 38) were analyzed. Each subject has been intubated with a solid state pressure pressure at 3 , 2 mm in diameter and impedance catheter that incorporates 25 pressure sensors spaced from 1 cm and 12 adjacent impedance segments, each of 2 cm long (Unisensor USA INC, Portsmouth, NH). The subjects were intubated after the Topical anesthesia (Lignocaine spray) and the catheter was placed with sensors riding the entire Faringe-esophageal segment (veil-pharynx to proximal esophagus). Following catheter accommodation, a brief fluoroscopy shield assured the most proximal sensor of the 'Pressure impedance array was in sight. With the subject sitting in a vertical position and in the head of the neural position, three swallows of 10 ml of contrasting material of liquid barium (Micropaq UEH â ¢ containing 1% NACL to make the conductive bolus) were captured simultaneously by continuous video (25 frames) and the pressure-impestation of the acquisition system (data sampling at 20 Hz, solar system, MMS, Netherlands). The measurement of the diameter of the UES diameter during swallowing our initial analysis and the forecast of the EUs mechanical states were based on pressure records and measurements of the diameter within a region of 2 cm located along the catheter pressure matrix and identified by a single impedance segment located optimally has been observed on video phluoroscopy to stay within the EU region during the swallow. Pressure measurements were performed based on the pressure sensor located in the central point of the segment, which we called the reference impedance segment because it was subsequently used to establish the report of the diameter with impedance (see below). Diameter was measured at three points along the reference segment based on videoOfluoroscopy images acquired simultaneously. As we recognize that UES moves regardless of the catheter, the use of a fixed place for these initial validation studies has allowed us to avoid the need to correct for these complex movements. For each of the 100 sequences of captured swallow, the times of the first higher movement The bone was used to mark the times of swallowed. The position of the proximal EU has been identified by the Air Tracheal column display. The video was then advanced frame-by-frame to observe the upper and front laryngeal movement until the time precedes the penetration of the user interface immediately for liquid contrast (Figure 3a). The impedance segment positioned more optimally (the pair of 2 cm spaced rawn electrodes) was therefore determined as the segment that was more closely adjacent to the EU, but also lower lower To the air-fabric interface ensure that no part of the impedance segment was in the pharyngeal airspace. The video was then photogramma for Advanced frame (0.04 s steps) and the diameter of the measured barium column for each frame in three positions along the reference segment. These were the proximal electrode ring, the pressure sensor at the middle point of the segment and the distal electrode ring (figure 3b). Images Figure 3. Videofluoroscopy show as a luminal diameter was measured precisely over time. For this example 10 ml liquid swallow The approximate position of the UES is identified by displaying the tracheal air column (TAC). (A) Immediately Previous Image UES Penetration of Liquid Contrast. The most optimal reference impedance segment (RIS) is adjacent to the TAC. (B) Image showing the column of barium to the maximum diameter and surrounds the RIS. Diameter was measured at the axial center (D2) and both proximal and distal ring electrodes (D1, D3) which delimit the margins of the reference impedance segment. Sequential measurements have been performed from entrance to the tollbooth of the entire barium inside the RIS. Sequential diameter measurements have been performed until all the bariums had passed through the reference impedance segment (figure 4a). The catheter electrode rings produced a discernible radiological shadow. Therefore, even if the lumen contained contrast and there was the inevitable decoupling of the axial positions of the tracheal air column and the reference segment due to a further higher laryngeal movement, we have however succeeded in accurately measuring the diameters in very points Precise along the catheter pressure - Impedency at any time (figure 4a). All measurements are calibrated by magnification with the known distance between visible adjacent electrodes. Diameters were expressed net of the width of the catheter (~ 3 mm) so that the lumen completely closed on the catheter has been defined as having a diameter of 0 mm (rather than 3 mm). The three separate diameter measures (D1A D3 Figure 3b) detected consecutive video frames were averaged for each point of time to produce a single diameter value for the reference segment over time. The diameter data set was then smoothed by 25 to 40 Hz using a hermite cubic interpolation method. The corresponding average point pressure data and the impedance data for the reference segment were then exported from the acquisition system in text file format separated from commas. This data has been sanded by interpolation to match the data set diameter as described above. Figure 4. An example of 10 ml liquid swallow that shows the temporal correlation of the luminal diameter and intraluminal admittance at the level of the reference impedance segment (RIS). (A) Sequential pictures of swallow onset (elevation larynx) Shows barium passing through the res. Dotted lines Table trajectory of the tracheal air column movement (TAC, white line) and RIS (yellow dotted line). Note decoupling of the TAC and proximal margin of the RIS at times 0.72 and 1.16 s after swallow onset. (B) Diameter of the contrast column Bario and admittance measured at RIS level over time by swallow onset. Individual diameter curves are shown for shooting D1a D3 (Figure 3) and the average diameter. Correlation (c) Diameter and input time with colors indicating if the samples correspond to when the lumen increased (yellow) or decrease (blue) in diameter. Refer to Figure 2 and the box 2 as regards our use of the specific terminology to describe UES mechanical states. Box 2. An explanation of the terminology used to describe UES mechanical states. As UES is composed of Striped, physiology governs smooth muscle intestinal peristals is not directly comparable. Furthermore, UES relaxation is physiologically and biomechanically distinguished by the UES opening. However, we considered that previously described 12 12 States characterized in relation to Peristalsi (Costa et al., 2013) should also be observable during the transit of a bolus swallowed through the UES (Figure 2). For this pilot survey, and the first description of the methodology in relation to the EU, we deliberately maintained the descriptive terminology of the mechanical states applied in our previous colonic Studio Peristalsis ex Vivo (Costa et al., 2013; Wiklendt et al., 2013 ; Dinning et al., 2014). We recognize that, in some cases, our use of terms like Ã ¢ â,¬ Å "Relaxation", Ã ¢ â,¬ "Ã ¢ â,¬ Ã ¢ â,¬ Ã ¢ â,¬ Ã ¢ â,¬ Ã ¢ â,¬ Ã Ã ¢ â,¬ Ã ¢ â,¬ is, Ã, Ã, Ã, Ã, Ã, Ã â â â â â â â â â â â â â â â â,¬ and Ã ¢ â,¬ å "quescenza" cannot be considered a functional appropriate if used In conjunction with the physiological the mechanisms that govern the mechanical events we are trying to measure. An example is the definition of "Quieseschence Doflused" which is applied when the UES is closed and the pressure is nor increasing nor decreasing . According to basal conditions, it was demonstrated that pressure pressure is generated by meogenic and neurogenic mechanisms and combined with force due to the light of the surrounding tissues (Levitt et al., 1965; ASHOH and Goyal, 1978; Lang et al., 1991; Medda et al., 1997). It could therefore argue that this state can be defined as a separate isometric state. Another example is the use of the term Ã ¢ â,¬ å "Relaxation ¢ Â , ¬ in relation to AG Mechanical states when the UES is opening and Ã ¢ â,¬ Ã ¢ â,¬ Ã ¢ â,¬ Å "contraction" when you are closing. You can claim that the opposite terminology should be used because the UES opens when the front traction is applied by contraction of the above-hydous muscles. However, since the approach is both new and complex, we have decided to maintain the original generic terminology and will take more functionally appropriate terms in future studies. Using the diameter and diameter of the diameter and pressure synchronized temporally, the samples for each of the 15 liquid swallows were consecutively assigned a mechanical status based on the direction of contraction or relaxation and in relation to the fact that the lumen was in an occluded state or Drawing. The 12 possible mechanical states, as defined in Figure 2, were determined using the derivatives - diameter and pressure derivatives compared to time. A minimum diameter of Ã ¢ â € 1 mm defined an occluded state and a diameter rate varies the change higher than ± 2 mm / s defined if the diameter increased or decreasing. Based on a separate analysis of the normal ues rest pressure fluctuations compared to the time, the criteria of +250 mmHg / so Ã,20 mmHg / s defined the thresholds that determined whether the pressure was considered increasing or decreasing Above below the level of basic activity. Correlation of the Time of the diameter of the UES diameter and impedance of the UES as described above We measured diameter and impedance in a single reference impedance segment of 2 cm located in an optimal position within the EU region. To take into account the non-linearity note of the report of the impedance diameter (Kim et al., 2014) Impedance values were converted into the inverse product of the impedance (1 / impedance) called Ã ¢ â,¬ Ã ¢ Â, ¬ Å "Admittance" and expressed in Siemens (S) or Millisiemenens (MS). The extension of the temporal correlation between the diameter of the UES and the UES admission was therefore determined for each single swallowing (Figures 4B, C) and Mediated for all swallows. Definition of UES mechanical states: admission pressure method refers to Figure 2 and to the box 2 Regarding our use of the specific terminology to describe the mechanical states of the UES. Use of simultaneous admission data and pressure recorded for the reference segment (as described above) samples for Of the 15 liquid swallows has consecutively been assigned a mechanical state based on the direction of contraction or relaxation and in connection if the Lumen was in an occluded or a relaxed state. The 12 mechanical states, as defined in Figure 2, were determined using the derivatives â € 20 s towards the mouth through a syringe and subjects they asked to swallow the command (ie the Voting swallowing). Patients have been subjected to A video phluoroscopic study of their swallowing. However, this was not performed simultaneously with the manometric procedure. Two of patients in this cohort have had a pulmonary aspiration open to swallowing liquids during videoflucopics of swallow studies, while the rest had no evidence of lung suction. Six patients had evidence of significant pharyngeal residues (> 50% of residues Vallecular / pyriformed sinuses). Radiology has not been performed in controls. In addition to the UES UES mechanical states It has also been analyzed every bolus swallowing to determine the maximum pressure of maximum pre- and post-relaxation, the pressure of the UES NADIR during the relaxation and pressure of the relaxation integrated by 0.2 s ues (Weijenborg et al., 2014). The regression of the R2 statistical analysis was used to evaluate the strength of the temporal correlation between diameter and admission. The volume averages were calculated for each subject and then compared between control groups and patients. These data are not normally distributed and then presented as median [interquartile interval]. The comparisons were performed using the Wilcoxon signed rank test for coupled data; Analysis of Kruskal-Wallis One Way Variaz analysis on ranks with the Dunn method used for multiple torque comparisons within grouped data and spearman-rank correlation. The prognostic value has been evaluated using the area under the receiver operator curve (AUC). A P