esophageal circular smooth muscle tissue constructs were bioengineered using collagen hydrogel. (2) The muscle constructs were placed around a 2.5cm long hollow chitosan tube. (3) Biodegradable surgical glue was applied between the smooth muscle constructs and along their circumference. The constructs were maintained around the scaffold in culture. (4) Semi-solid material was pipetted through the lumen of the tube to check for flow, leakage and muscle integrity. (5) The constructs were taken off and tested for the ability to contract in response to Acetylcholine (Ach) and relax in response to vasoactive intestinal peptide (VIP). Results: (1) The bioengineered 2cm-long esophageal tube construct, maintained its luminal patency and its structural integrity in vitro >1 month. One end of the scaffold was clamped while the other was left intact. The scaffold, with the tissue constructs around it, expanded while pipetting a semi-solid solution through their lumen. The construct was able to restore its original dimensions once the solution was cleared through. No signs of leakage were observed and the tissue constructs did not disrupt due to pressure applied from the semi-solid bolus. (2) Real time force generation was studied on the tissue constructs after being taken off the scaffold. Ach caused a contraction of 45μN and VIP caused a relaxation of -35μN. Summary: We show the production of an esophageal tissue using a tubular biodegradable scaffold and esophageal smooth muscle cells. The construct was able to withstand the pressure of a semi-solid material pushed through its lumen. Conclusion: We successfully bioengineered a continuous esophageal tube using primary isolated circular smooth muscle cells. The semi-solid material mimicked the texture of a food bolus. This construct could be suitable for esophageal reconstruction. This work was supported by NIH/NIDDK RO1 DK042876.

Su1875

Esophageal Biofeedback Using Balloon Distension of the Esophagus and Swallowing-Related Visual, Olfactory, and Gustatory Stimuli in the Treatment of Severe Dysphagia With Tube Feeding

Richard A. Awad, Santiago Camacho, Diego A. Manjarrez, Alfredo Serrano, Marisol Galvez

INTRODUCTION: It is reported that tactile, gustatory, and visual biofeedback stimuli modulate neural substrates of deglutition (1). And that sacral nerve stimulation initially activates a region of the frontal cortex, which is normally active during focused attention, while subsequent stimuli activate the caudate nucleus, which is involved in learning and reward processing (2). The purpose of this pilot study was to modulate the altered neuronal substrate of swallowing through the stimulation of tensoreceptors with esophageal balloon distention combined with visual, olfactory, and gustatory stimuli in patients with severe dysphagia and feeding tube. METHODS: Seventeen patients (43±13 years) with severe dysphagia (Castell dysphagia severity scale = 6±2; 1= no dysphagia at any time, 7= unable to eat by mouth) after unsuccessful prior therapies were studied [clinical assessment, dysphagia severity, radiology, endoscopy, and esophageal manometry (MMS, Netherlands)] and compared with 12 healthy subjects for manometry studies. Biofeedback: 1) Slight inflation of the balloon in the mid esophagus was performed three times in a single session. 2) The patients received a graphic and precise description of how a normal person swallowing mechanism functions. 3) On waking, they rinsed out their mouths with water. 4) Patients were asked to look at, smell, chew and then discharge the food. 5) Then they were asked to try and swallow food while bearing in mind the working of the swallowing system that had been explained to them. Steps 3-4-5 were followed at home, every morning until healing. Mean±SD, binominal 95% confidence interval, and nonpaired Student two-tailed t test with alpha=0.05. RESULTS: All patients recovered completely the mechanism of swallowing in 36.9±25 (CI: 24-49) days. The 3 patients who were initially feeding tube dependent progressed to total oral intake after 13±10.5 (CI: -1.6-27.6) days of treatment. Patients with dysphagia compared with healthy subjects showed impaired peristalsis (p=0.008), lesser esophageal medial amplitude [47±21 (CI: 35-59) Vs. 88±54 (CI: 57-119) mmHg, respectively; p=0.022), and lesser esophageal upper duration [3±0.7 (CI: 2.5-3.4) Vs. 3.6±0.5 (CI: 3.3-3.9) s, respectively; p= 0.034). Lower esophageal sphincter pressure was not different between patients with dysphagia (14±6 (CI: 10.2-17.7) mmHg and healthy subjects (20.8±11.2 (CI: 14.4-27.2) mmHg, p=0.082. CONCLUSION: This successful outcome with our innovative Dysphagia Therapy Program suggests that the stimulation of esophageal tensoreceptors combined with visual, olfactory, and gustatory biofeedback stimuli, can modulate the neural substrates of swallowing reprogramming the physiological mechanism of swallowing in patients with severe dysphagia. REFERENCES: (1) Humbert IA et al. Neuroimage 2012;59:1485-90. (2) Lundby L et al. Dis Colon Rectum 2011;54:318-323.

Su1876

Determination of Normal Esophageal Pressure Responses to a Rapid Multiple Swallow Challenge Test. Results of a Multicenter Study in Healthy Volunteers

Ingrid Marin, Daniel Cisternas, Luiz Abrahao, Claudio R. Bilder, Ramiro Coello Jaramillo, Andres Ditaranto, Albis Hani, Ana Maria Leguizamo, Eponina Maria de Oliveira Lemme, Arturo Meixueiro, Jose Remes-Troche, Miguel Angel Zavala, Jordi Serra

Recent studies have suggested that a rapid multiple swallow challenge test can detect motor abnormalities not detected during conventional high resolution esophageal manometry (Marin et al. Gut 2012;61:A424). However, data of normal manometric values using this test is scarce. AIM: To determine normal values of a rapid multiple swallow challenge test performed in sitting position in healthy volunteers using high-resolution esophageal manometry. METHODS: 57 healthy volunteers (28 female, 29 male, age range 18-68 yrs) were recruited from seven centers from Europe and America. In each subject we evaluated the responses to rapid drink of 200 ml of water with a straw in sitting position, performed immediately after the standard protocol of high resolution esophageal manometry. In each subject we evaluated the time and the number of pharyngeal swallows required to drink 200 ml of water, , lower esophageal sphincter (LES) pressure and esophageal body pressure during and after swallow, and esophagogastric pressure gradient during swallow. Perception of esophageal symptoms was assessed by a 1-4 questionnaire. Results are expressed as mean±SD RESULTS: Subjects needed 14.0±5.5 pharyngeal swallows during 25.4±10.8 seconds to drink 200 ml of water. During that period, there was a general inhibition of esophageal pressures, both LES (mean IRP -1.4±3.0 mmHg) and esophageal body pressures (Only 5 % of healthy subjects had two or more brief pressure episodes >20 mmHg, longer than 3 cm, duration 1.3±0.7 sec) resulting in a low esophagogastric pressure gradient (-2.07±3.22 mmHg). 2.0±3.4 sec after the last swallow 23 % of subjects had a normal peristaltic contraction, whereas 75 % had no contraction and 2 % had a simultaneous contraction LES pressure returned to pre-swallow levels (-1.0±12.0 mmHg greater than pre-swallow; p= 0.535) immediately after swallow cessation. Only 13 % of subjects reported mild symptoms (score 1.8±1.5), mainly dysphagia 25 % and chest pain 75 % CONCLUSION: Rapid multiple swallow of 200 ml of water in sitting position may be a well tolerated, easy to perform challenge test of esophageal function. It is characterized by inhibition of esophageal LES and body pressures during swallow, and either no contractile post-swallow activity, or a normal post-swallow peristaltic contraction.

Su1877

Chicago Classification Normal Reference Range Significantly Altered When Patients Over Age 50 Included

Kee Wook Jung, Segyeong Joo, Hwoon-Yong Jung, Seung-Jae Myung, In Ja Yoon, So Young Seo, Hyun Sook Koo, Kee Don Choi, Ho June Song, Gin Hyug Lee, Joseph A. Murray, Yvonne Romero, Jin-Ho Kim

Background: High-resolution Manometry (HRM) based on spatiotemporal plots is increasingly replacing conventional manometry based on linear waves. Chicago classification based on its characteristic parameters including integrated relaxation pressure (IRP) and distal contractile integral (DCI) showed higher diagnostic value than the previously used conventional criteria. However, the current normal cut-off values used by the Chicago classification system are based on a limited sample of individuals from 19 to 48 years of age without considering the elderly. Therefore, we aimed to investigate the normal values for Chicago classification across a more diverse age spectrum from 20 to 67 years of age. Then, we compared the difference between the young and older age groups. Methods: From March to September 2012, 54 asymptomatic healthy people (M:F=27:27, age:20-67) were prospectively enrolled in this study based on their responses to the ROME III questionnaire. To evaluate the influence of age and sex on manometric profiles, we attempted to enroll the same number of subjects of each sex within each decade. A HRIM catheter with 32 circumferential pressure and 16 impedance sensors was used. The manometry profiles were analyzed by one investigator using Bioview software. Results: Fifty-four subjects with 10 swallows each constituted the final sample (a total of 540 swallows). Mean IRP and DCI were 2.98±2.33 mmHg and 1051.69±1002.16 mmHg•s•cm, respectively. Mean distal latency (DL) and contractile front velocity (CFV) were 7.00±0.81 sec and 4.14±1.01 cm/sec, respectively. Comparison of those ≤ 50 years (n=42, M:F=22:20, mean age=33±9 years old) and those > 50 years (n=12, M:F=5:7, age=57±5 years old) revealed a higher mean IRP (4.61±2.56 mmHg in >50 years vs. 2.52±2.06 mmHg in ≤ 50 years old, $P<0.01$) and DCI (1856.77±1530.60 mmHg•s•cm in > 50 years vs. 821.67±652.56 mmHg•s•cm in ≤ 50 years old, P=0.02) in the > 50 years old group. Moreover, DL showed a tendency to be longer in the ≤ 50 years old group (7.11±0.84 sec in > 50 years vs. 6.63±0.57 sec in ≤ 50 years old, P=0.06). However, there was no significant difference in CFV between the two groups. No significant difference was found between males and females. Conclusions: The key parameters determining the Chicago classification are affected by age, especially IRP and DCI. Larger prospective studies including the elderly are needed to provide age relevant normative values for the Chicago Classification system.

Su1878

Normal Values Determination for High Resolution Esophageal Manometry Using Sitting Viscous Solution Swallows. Results of a Multicenter Study in Healthy Volunteers

Daniel Cisternas, Ingrid Marin, Jordi Serra, Ramiro Coello Jaramillo, Jose Remes-Troche, Miguel Angel Zavala, Arturo Meixueiro, Albis Hani, Alberto Rodriguez, Ana Maria Leguizamo, Luiz Abrahao, Eponina Maria de Oliveira Lemme, Claudio R. Bilder, Andres Ditaranto

Introduction: It has been suggested that a more physiologic esophageal manometry study protocol, including non-liquid solutions and a sitting position, could improve the test performance. For the specificity determination of putative findings it is necessary to determine normal values Aim: To determine normal values for sitting viscous solution swallows in healthy volunteers using high-resolution esophageal manometry (HREM) Methods: Healthy volunteers were recruited from seven centers in Spain and America. Sitting swallows with an apple sauce-like standardized solution were analyzed using HREM. Analysis was performed as recommended by Bredenoord et al in the last Chicago classification revision (Neurogastroenetrology and Motility 2012;24(Suppl 1):57). Results: 59 volunteers (29 females (48.1%)) with a total of 468 swallows were analyzed. 132 of this swallows (in 18 volunteers) were analyzed using impedance and HREM. 47 volunteers had at least 7 evaluable swallows, so that the whole study could be diagnosed using the Chicago classification. Mean age was 34 years (18-68 years). Table 1 shows results for significant variables. None of them demonstrated any gender-related difference. Using the aforementioned Chicago classification for whole study, 26/47 (55.3%) were classified as normal, 7/47 (14.9%) as weak peristalsis with small defect, 7/47 (14.9%) as weak peristalsis with large defects, 5/47 (10.6%) as frequent failed peristalsis, 1/47 (2.1%) as EGJ outflow obstruction and 1/47 (2.1%) as rapid contractions with normal latency. 88/132 (66.6%) of swallows evaluated with impedance showed complete bolus transit. 13/18 (72.2%) volunteers showed at least one swallow with incomplete bolus transit. Using Chicago single swallow classification, 78/83 (93.9%) of normal, 4/11 (36.4%) of small break, 6/19 (31.6%) of large break and 0/19 of failed peristalsis showed complete bolus transit, respectively. There was a significant difference in bolus transit when comparing normal to non-normal swallows ($p<0.001$), but not when comparing small to large breaks (p=1). Conclusion: Normal values have been determined. Remarkably, upper limit of CVF and lower limit of DL are higher than normal values previously described for supine-water swallows. On the other hand, upper limit for DCI seems much lower. Impedance information suggests that even in a sitting position, normal peristalsis is still a significant predictor of bolus transit. Any functional relevance of the small and large breaks distinction could not be demonstrated.