Nature Reviews Gastroenterology & Hepatology **8**, 357 (2011); doi:10.1038/nrgastro.2011.100

DYSPHAGIA

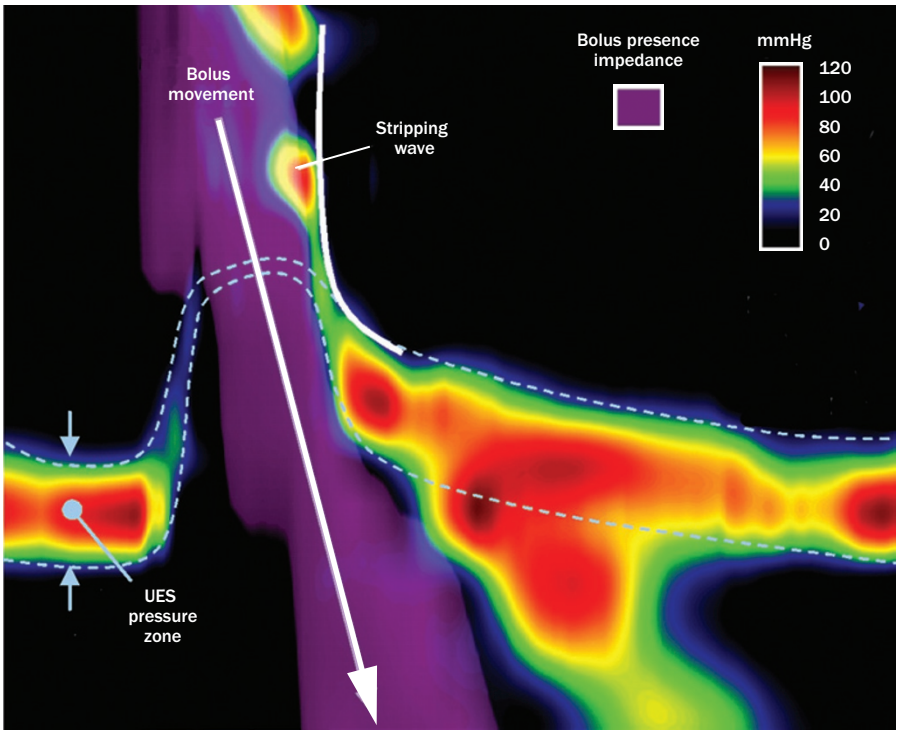
Validation of a new nonradiological method for the prediction of ineffective swallowing

Ineffective pharyngeal swallowing can now be predicted in an objective, automated and nonradiological way that could eliminate the need for fluoroscopy, the tool standardly used to evaluate swallowing.

To make this possible, Taher Omari and colleagues have combined high-resolution solid-state manometry with intraluminal impedance. "In the past, we have used these two measurement modalities separately—manometry to measure the strength (pressure) of the swallow and impedance to measure bolus flow," explains Omari. "By combining the two modalities, we have developed a simple to perform diagnostic test with high sensitivity and specificity for swallowing dysfunction."

In this validation study, 23 adult and pediatric patients with dysphagia who were referred to a swallowing clinic for videofluoroscopy also underwent combined manometry and impedance. Prior medical histories ranged from unknown etiologies to motility disorders, cardiovascular disease and postcervical surgery, but most (16) had a neurological history. 10 healthy adults with no history of difficulty swallowing or symptoms indicative of a motility disorder also underwent videofluoroscopy and combined manometry and impedance.

The catheter used for the combined recordings incorporated 25 pressure sensors and 12 impedance sensors; it was placed to allow complete coverage of the pharyngoesophageal segment. Patients and controls were given an oral injection of semisolid test bolus and video fluoroscopy images were obtained. The combined recordings were matched to the fluoroscopic images and the data analyzed. Four pharyngeal pressure-flow variables were generated—pressure at nadir impedance, peak pressure, time delay from nadir impedance to peak pressure, and flow interval. Upper esophageal sphincter (UES) relaxation variables—relaxation interval, nadir relaxation pressure, median intrabolus pressure, and resistance—were also measured and a swallow risk index (SRI) was developed.



Combined manometry and impedance plot of a pharyngeal swallow. Changes in pressure (colors blue through red) occur with the pharyngeal stripping wave and relaxation and movement of the upper esophageal sphincter (UES) pressure zone. The conductivity of the bolus swallowed is detected by impedance (purple shading). Courtesy of T. I. Omari.

115 swallows were analyzed: 76 from patients (35 with residue) and 39 from controls (12 with residue). Residue was associated with a longer flow interval in patients and controls, but the pressure at nadir impedance was increased only in controls with residue. UES nadir relaxation pressure, intrabolus pressure and resistance were all increased in controls with residue compared with patients with residue, who had a prolonged UES relaxation interval. In patients and controls, residue was associated with an elevated SRI. An average SRI of 9 predicted residue with 75% sensitivity and 80% specificity.

"The most significant finding is that the methodology can detect levels of dysfunction of swallowing that predispose to ineffective swallowing and to aspiration," says Omari. The methodology is now being validated in different patient groups, particularly in those who have a physical obstruction of the UES and in pediatric patients.

So, how do the researchers envisage the methodology being used in the clinical setting? "We believe that this methodology may have a role as an early screening test in patients [who suffer a] stroke or to assess swallowing function over time in a range of degenerative muscle and nerve diseases," concludes Omari.

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Original article Omari, T. I. *et al.* A novel method for nonradiological assessment of ineffective swallowing. *Am. J. Gastroenterol.* doi:10.1038/ajg.2011.143