Esophageal bougination: a novel ex vivo endoscopic training model correlated with clinical data.

Abstract:
Esophageal bougination is a worldwide standard endoscopic procedure. Clinical methods and recommendations are based on clinical experiences only. Mechanical properties have never been described. Aim of the study was to establish a realistic ex vivo training model. Therefore, detailed assessment of relevant mechanical features of esophageal bougination should be evaluated ex vivo and in patient setting and correlated against. A three-step concept was used to evaluate mechanical properties at stenosis level. First, insertion forces were evaluated in an ex vivo linear single stenosis model during steady mechanical insertion. Second, adding friction and properties of the pharynx and upper esophagus, the model was integrated in an artificial endoscopic training model (ELITE training model). Third, in vivo measurements were taken to correlate ex vivo data with parameters of a realistic patient setting. With the presented setup, we were able to assess insertion force and pressure levels in an artificial stricture using different sizes of commercially available standard bougies. In all models, there was a relevant increase in insertion force with higher stricture pressure levels. Insertion force levels in the ELITE model show higher levels compared to the linear stenosis model. Having regard to the maximum forces in patients, there is also a constant increase in mean insertion force.
according to higher bougie sizes, but lower forces were measured as in the ELITE model. The applied models are suitable to appraise mechanical properties of esophageal bougination in an ex vivo model and patient setting. Forces could be constituted reliable, significant increase was documented according to stenosis level and results were comparable to patient data. This was comparable to patient data. Further clinical evaluation in different kinds of stenosis is necessary.