EDITORIAL

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Standardization of endoscopic ultrasound shear wave elastography

Julio Iglesias-García, J. Enrique Domínguez-Muñoz

Department of Gastroenterology and Hepatology, Health Research Institute of Santiago de Compostela, University Hospital of Santiago de Compostela, University of Santiago de Compostela, Santiago de Compostela, Spain

See "Defining the optimal technique for endoscopic ultrasound shear wave elastography: a combined benchtop and animal model study with comparison to transabdominal shear wave elastography" by Thomas J. Wang and Marvin Ryou, Clin Endosc 2023;56:229–238.

Endoscopic ultrasound (EUS) represents an important step forward in the management of various diseases, and clear clinical indications for EUS have been established.[1] EUS has significantly changed the diagnostic and therapeutic approach to a relevant proportion of patients, mainly but not only those with biliopancreatic diseases.[2] Nevertheless, an accurate diagnosis cannot always be provided by conventional B-mode EUS imaging, and differential diagnosis between different diseases (e.g., different tumors) may be challenging. EUS-guided advanced imaging techniques, such as elastography and contrast enhancement, have emerged as new techniques that can increase the diagnostic capabilities of EUS. These techniques have been developed and have demonstrated adequate diagnostic accuracy in different clinical scenarios.[3]

Among these two techniques, EUS-guided elastography has demonstrated its usefulness and diagnostic yield in several studies, mostly for the differential diagnosis of solid pancreatic tumors and the evaluation of chronic pancreatitis, enlarged lymph nodes, or subepithelial lesions.[4,5] Elastography is an imaging modality that provides information on tissue stiffness. Different elastographic methods have been developed and evaluated, and two of them, strain elastography (Fig. 1) and shear wave elastography (Fig. 2), can be associated with EUS.

The basis of elastography is that different pathological processes, including inflammation, fibrosis, and cancer, induce different alterations in tissue stiffness. The first studies on EUS-guided elastography were performed using strain elastography.[6] This is a non-invasive technique that measures elasticity in real time by registering differences in the distortion of the EUS image after the application of slight pressure with the EUS probe. Strain elastography can be evaluated qualitatively (i.e., based on color map distribution) or quantitatively (i.e., by quantifying the strain ratio or strain histogram).[3] Several studies have demonstrated the high diagnostic yield of EUS-guided elastography, mostly in the context of biliopancreatic diseases.[3-5,7] However, one of the drawbacks of this method is the subjective selection of images for qualitative or quantitative color map analysis. Several recommendations have been published to address this issue.[8] Compared with strain ratio analysis, shear wave elastography may be able to provide a more objective measurement of the stiffness of the lesion or organ under evaluation.

EUS-guided shear wave elastography has been available since 2019.[9] This modality involves a doppler-like ultrasound tech-

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Correspondence: Julio Iglesias-García
Department of Gastroenterology and Hepatology, Health Research Institute of Santiago de Compostela, University Hospital of Santiago de Compostela, University of Santiago de Compostela, c/Choupana s/n, 15706-Santiago de Compostela, Spain
E-mail: julioiglesias.garcia@usc.ess

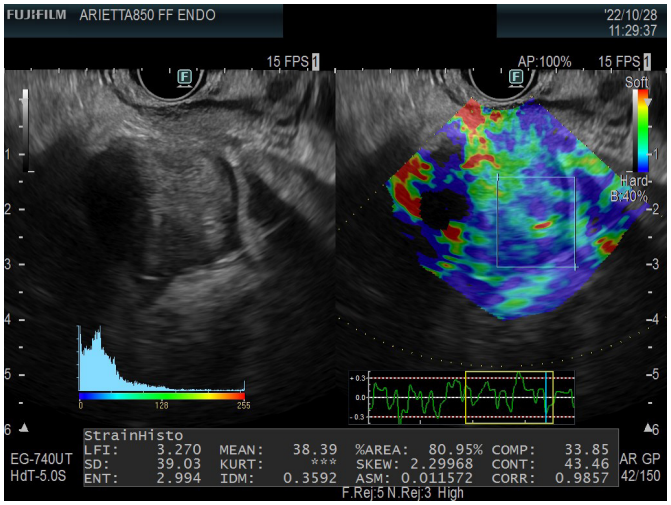

Fig. 1. Endoscopic ultrasound-guided strain elastography of a solid pancreatic mass, showing the typical heterogeneous blue predominant pattern, with a strain histogram of 38.39.

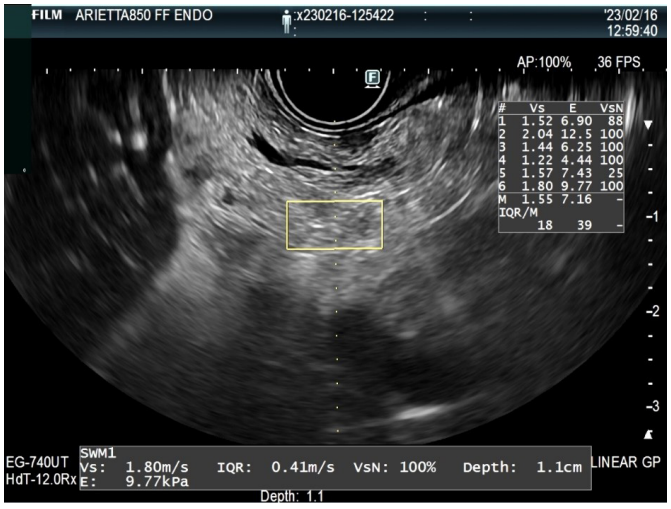

Fig. 2. Endoscopic ultrasound-guided shear wave elastographic evaluation of a patient with early changes of chronic pancreatitis. In the top of the screen the box is showing the mean velocity (Vs) (1.55) and Kpascales (Kpas) (7.16).

nique to monitor the shear-wave propagation and measure the velocity of the shear wave. Theoretically, greater tissue elasticity corresponds to faster shear-wave propagation. As an elastic module, shear-wave velocity is measured in a target lesion. Information is displayed in meters per second (m/s) or in kilopascals (kPa). The region of interest (ROI) is set close to the tissue or lesion to be evaluated, with attempts to avoid structures such as cystic components, blood vessels, and calcifications. Small respiratory fluctuations are required during the measurement to avoid breathing artifacts. Despite being a promising technique, shear wave elastography requires standardization, and evidence supporting its use in clinical practice is very limited.

The study by Wang and Ryou[10] aims to standardize the optimal technique for EUS-guided shear wave elastographic evaluation. The authors set up a system with EUS and a transabdominal route in a benchtop and in vivo porcine model. They were able to define the optimal ROI size (1–1.5 cm in length) with a depth of <2 cm for the EUS-guided approach. Importantly, the ROI orientation and pressure on the transducer did not cause any difference. In contrast to real-time elastography, in which the ROI can be adjusted to the size of the evaluated lesion, shear wave elastography cannot evaluate lesions larger than the specific size of the ROI for this method.

However, clinical experience with shear wave elastography is limited. In chronic pancreatitis, shear wave values appear to correlate better with EUS criteria than with strain elastography.[11] Shear wave elastography appears to be unstable for the evaluation of solid pancreatic lesions,[12] which is in line with the results reported by Wang and Ryou[10] regarding difficulties in adjusting the ROI size in this clinical scenario. The main reason for this instability is related to respiratory movements, which cannot be controlled during the EUS evaluation of solid pancreatic lesions. This also leads to problems in establishing an optimal ROI size.

In summary, EUS-guided shear wave elastography is a promising imaging technique. Standardization of the method, as reported by Wang and Ryou,[10] was the first essential step. Whether this new technology overcomes the better-known strain ratio elastography in terms of consistency of results, objectivity of the method, and diagnostic accuracy in different clinical scenarios requires further investigation.

Conflicts of Interest

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ORCID

Julio Iglesias-García https://orcid.org/0000-0002-3517-329X
J. Enrique Domínguez-Muñoz https://orcid.org/0000-0001-8283-3185

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