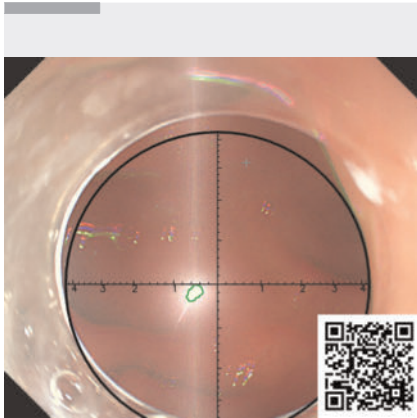


## Use of an endoscopic virtual ruler based on the fiber laser principle and artificial intelligence technology

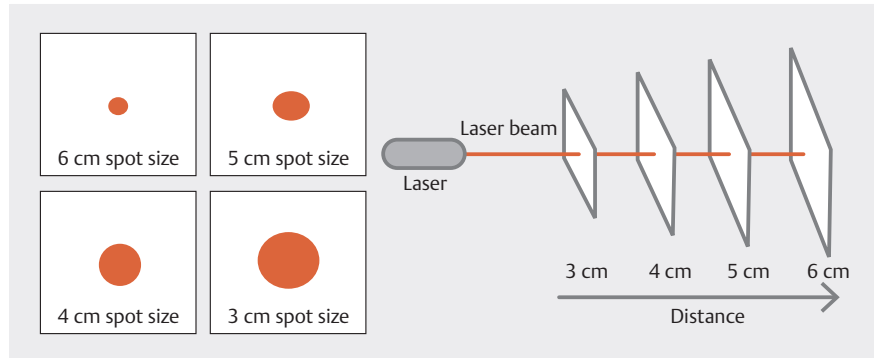
OPEN  
ACCESS



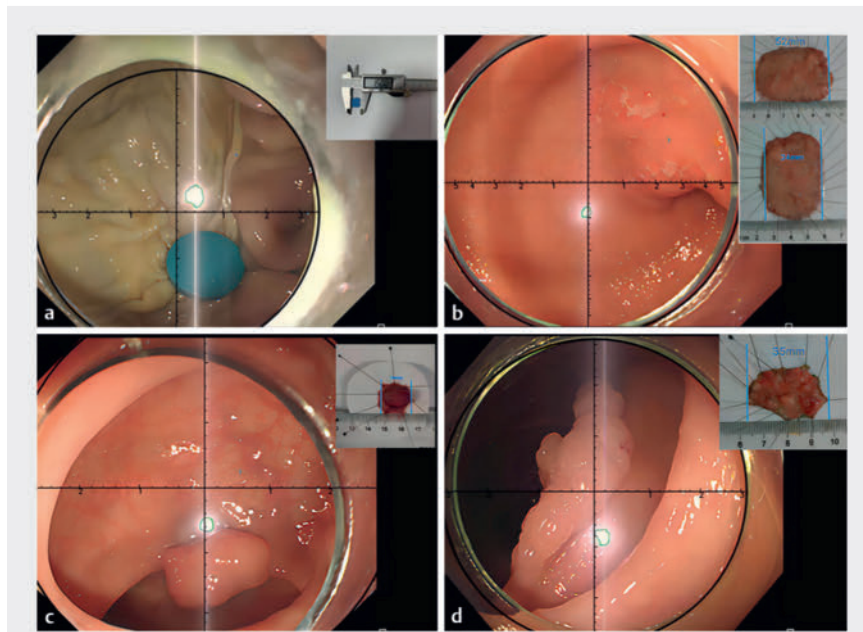
▶ **Video 1** An introduction to the endoscopic virtual ruler, including its demonstration on an ex vivo pig stomach and three different lesions in patients.

The accurate measurement of lesion size during endoscopic procedures is of paramount importance. It not only informs the assessment of disease risk, but also guides the selection of appropriate surgical interventions and provides a foundation for effective treatment monitoring [1]. Current endoscopic measurement techniques, such as visual inspection, the tension clamp method, and the implantable instrument ruler, still exhibit certain limitations [2]. To address this challenge, researchers have explored the development of an endoscopic virtual ruler based on fiber laser principles and artificial intelligence (AI) technology, which aims to enable simple and precise real-time measurement of various types of lesions.

In this innovative model, a laser-based approach is employed to precisely measure the size and distance of targets [3]. Leveraging a medical endoscope, fiber-coupled laser, laser collimator, and an advanced AI algorithm, the system generates laser spots that appear at varying size at different distances (▶ Fig. 1). By analyzing the spot area in the captured image and correlating it with the known



▶ **Fig. 1** Schematic diagram of the endoscopic virtual ruler construction.



▶ **Fig. 2** Examples of measurements made using the virtual ruler for: **a** a round foreign body in an ex vivo pig stomach; **b** an early antral cancer; **c** a sigmoid colon polyp; **d** a laterally spreading polyp in the ascending colon.

scale bar, the system is able to accurately estimate the distance to the object and calculate its actual size. This end-to-end solution streamlines the measurement process during medical procedures, enabling healthcare professionals to make informed decisions based on reliable data-driven insights. The integration of cutting-edge laser technology and intel-

ligent software algorithms underscores the continuous advancements in medical imaging and diagnostics.

▶ **Video 1** shows the novel model being used to accurately size a large raised polyp, a laterally spreading polyp, and an early gastric cancer (▶ Fig. 2).

Endoscopy\_UCTN\_Code\_TTT\_1AQ\_2AI

## Funding Information

2022 Key Research and Development Plan  
Project of the Science and Technology  
Department of Anhui Province  
2022e07020048

## Clinical trial

Chinese Clinical Trial Registry  
ChiCTR2400085998

## Conflict of Interest

The authors declare that they have no  
conflict of interest.

## The authors

**Yaxian Kuai<sup>1</sup>, Shiwei Zhou<sup>2</sup>, Bin Sun<sup>1</sup>, Xu  
Wang<sup>1</sup>, Youwei Xiao<sup>3</sup>, Aijiu Wu<sup>3</sup>, Derun  
Kong<sup>1</sup>**

- 1 Department of Gastroenterology, The First  
Affiliated Hospital of Anhui Medical  
University, Hefei, China
- 2 School of Software, University of Science and  
Technology of China School of Software  
Engineering, Hefei, China
- 3 Research and Development Department,  
Hefei Zhongna Medical Instrument Co. Ltd,  
Hefei, China

## Corresponding author

**Derun Kong, MD**  
Department of Gastroenterology, The First  
Affiliated Hospital of Anhui Medical, No. 81  
Jixi Road, Shushan District, Hefei City,  
230031, Anhui Province, China  
kongderun168@163.com

## Citation Format

Endoscopy 2024; 56: E795–E796.  
doi: 10.1055/a-2409-0070.

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Endoscopy 2025; 57: 86–87  
DOI 10.1055/a-2438-0202  
ISSN 0013-726X  
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