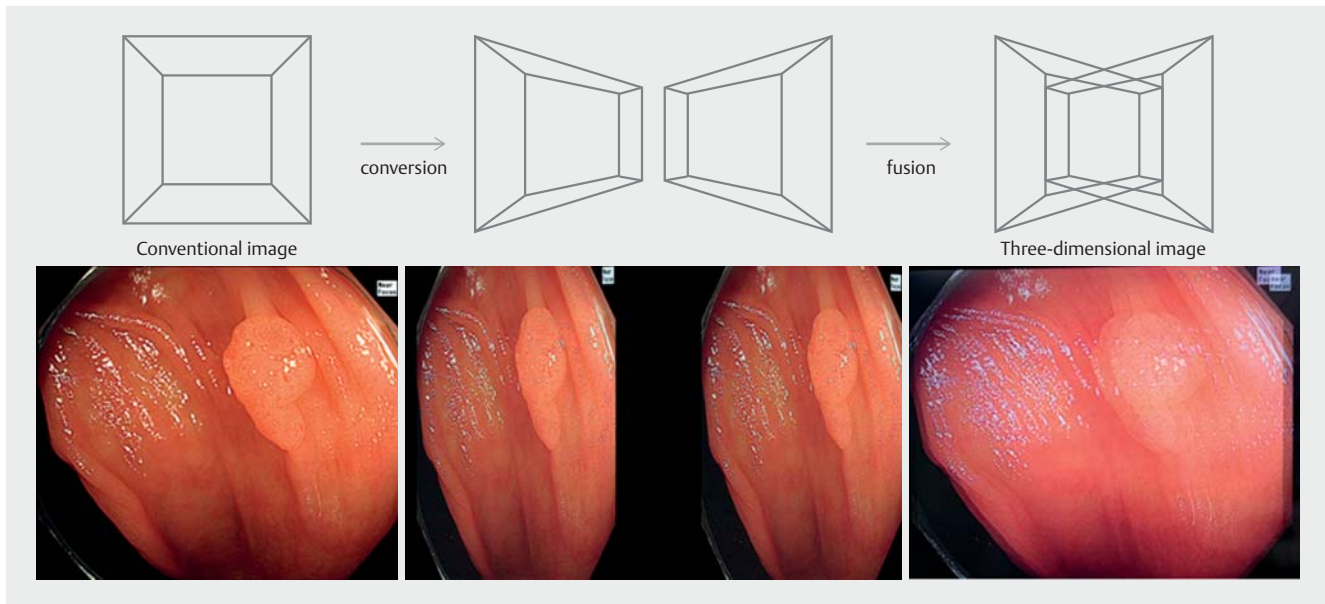


## Three-dimensional imaging system for colonoscopy



► **Fig. 1** Explanation of a 3D image system. The 2D endoscopic image can be converted to a 3D image in real time.

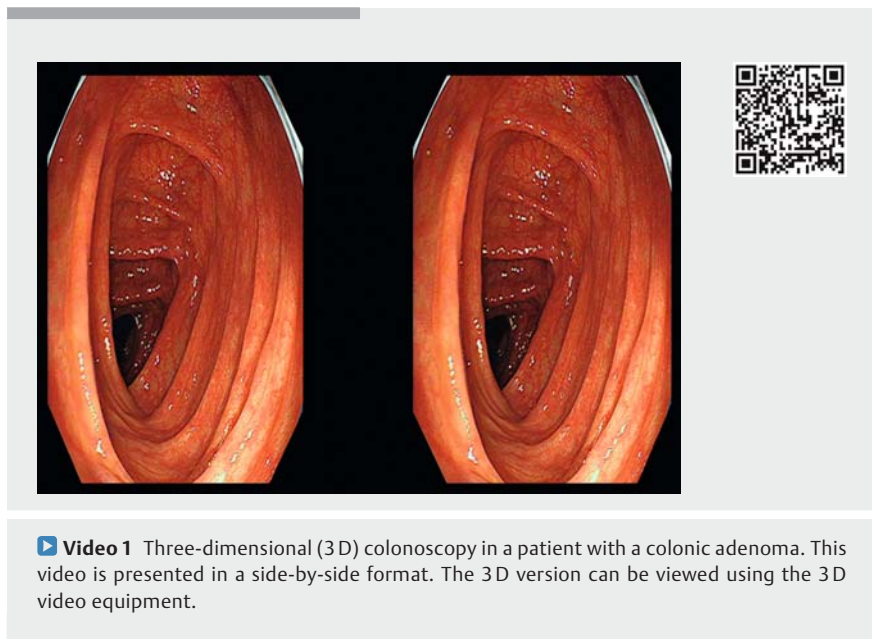
Three-dimensional (3D) imaging techniques have been developed in the medical field. In laparoscopic surgery, such techniques are widely used; they provide the surgeon with spatial information and increase the safety of surgical techniques [1–3]. In gastrointestinal endoscopy, Sakata et al. reported the efficacy of 3D imaging for improved detection of colonic lesions using simulated 3D colonoscopy [4]. However, to create a conventional 3D image, two optical axes are required.

A novel 3D imaging processor (HD-3D-A; Shinko Optical, Tokyo, Japan), which can create 3D virtual video images from conventional two-dimensional (2D) endoscopic video images, has been developed recently [5]. This imaging processor is connected to a monocular endoscopic system and converts conventional endoscopic images into a pair of images, as if they were obtained from two different points that match the operator's convergence angle [4] (► **Fig. 1**). This system can be used in combination with a conventional endoscope, and 3D images

can be easily viewed using 3D glasses and a 3D monitor.

Here for the first time, we report the use of this 3D system in gastrointestinal endoscopy. In gastrointestinal endoscopy,

the 3D image also provides the endoscopist with space perception, helping them to evaluate the status of the intestinal tract space (► **Video 1**). In addition, we can more precisely visualize the



► **Video 1** Three-dimensional (3D) colonoscopy in a patient with a colonic adenoma. This video is presented in a side-by-side format. The 3D version can be viewed using the 3D video equipment.

shape of a gastrointestinal tumor using a 3D image compared with a 2D image (► **Video 1**). During colonoscopy, 3D images provide visual cues to the next fold and aid in easy insertion to the cecum. Although further studies are required to demonstrate the efficacy of a 3D system in gastrointestinal endoscopies, we believe this system may have additional benefits compared with a conventional 2D endoscopy.

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### Competing interests

None

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### References

- [1] van Bergen P, Kunert W, Buess GF. Three-dimensional (3-D) video systems: bi-channel or single-channel optics? *Endoscopy* 1999; 31: 732–737
- [2] Votanopoulos K, Brunnicardi FC, Thornby J et al. Impact of three-dimensional vision in laparoscopic training. *World J Surg* 2008; 32: 110–118
- [3] Sakata S, Watson MO, Grove PM et al. The conflicting evidence of three-dimensional displays in laparoscopy: a review of systems old and new. *Ann Surg* 2016; 263: 234–239
- [4] Sakata S, Grove PM, Stevenson AR et al. The impact of three-dimensional imaging on polyp detection during colonoscopy: a proof of concept study. *Gut* 2016; 65: 730–731
- [5] Yoshida S, Kihara K, Fukuyo T et al. Novel three-dimensional image system for trans-urethral surgery. *Int J Urol* 2015; 22: 714–715

### Bibliography

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