



## Application of linked color imaging for detecting a previously bleeding colonic diverticulum

Hirosato Tamari, MD, Taiki Aoyama, MD, PhD, Akira Fukumoto, MD, PhD, Shinichi Mukai, MD, PhD, Shinji Nagata, MD, PhD

Colonic diverticular bleeding is common, but we often encounter difficulties in diagnosing the bleeding site because the bleeding is intermittent. Endoscopic identification of a nonbleeding visible vessel, which is critical evidence of colonic diverticular bleeding, may be technically difficult after spontaneous cessation of bleeding. The slightly reddened lesion may be easily missed among similar-colored mucosa.

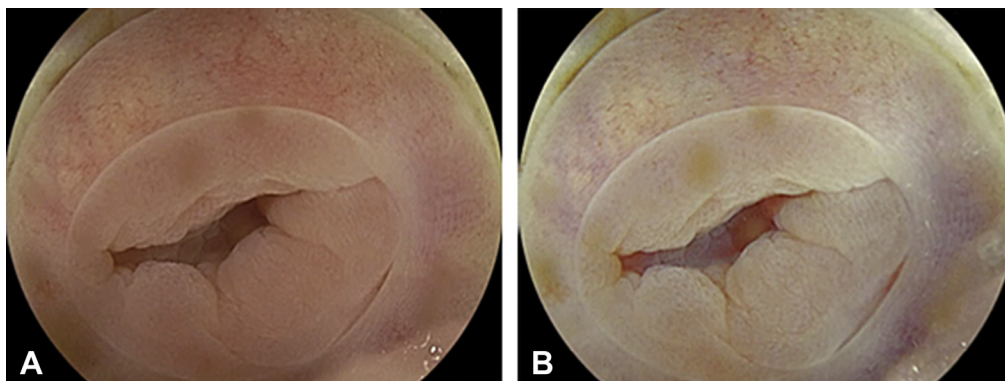
Linked color imaging (LCI) is a newly developed endoscopic technique that enhances color contrast. LCI uses narrow-band short-wavelength light. In detail, LCI causes the expansion and reduction of color information simultaneously so that red colors appear redder and white colors appear whiter (Fig. 1). The usefulness of LCI for the detection of neoplastic lesions has been reported.<sup>1,2</sup> We report a case in which LCI was useful for the identification of the culprit diverticulum in an effort to detect nonbleeding visible vessels (Video 1, available online at [www.VideoGIE.org](http://www.VideoGIE.org)).

A 67-year-old man presented with hematochezia. Contrast-enhanced CT showed extravasation from one of the numerous diverticula in the ascending colon (Fig. 2). After antegrade bowel preparation with 2 liters of polyethylene glycol, colonoscopic examination with EC-L600ZP (Fujifilm Corporation, Tokyo, Japan) combined with water-jet was conducted. Colonoscopic examination found no active bleeding

or clot. Poor background preparation hindered observation. We searched for the responsible diverticulum using water immersion observation, instead of air insufflation, to eliminate residual stool and dilate the orifice of the diverticula,<sup>3</sup> combining this approach with LCI observation to gain a clearer perspective of the inside of the diverticula. Subsequently (~3 minutes later), we found the responsible diverticulum by identifying a remarkable reddish lesion in it. The nonbleeding visible vessel was located at the lip of the diverticulum. Following this, we evaluated the most effective light for detecting the lesion.

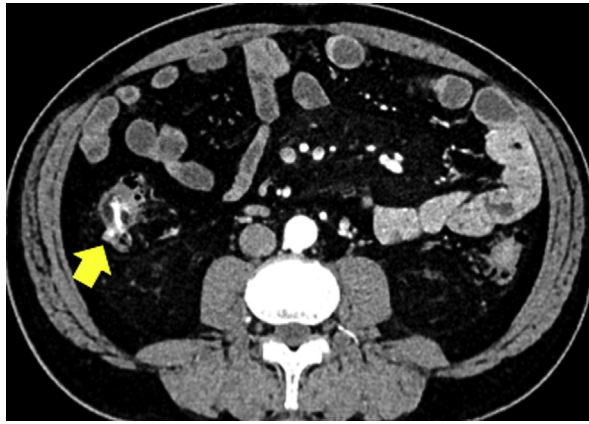
Detection of a culprit lesion may depend on exceptional visibility. In other words, we have to identify only a reddish lesion in the white surrounding mucosa using LCI in cases of colonic diverticular bleeding. Furthermore, we evaluated whether LCI was indeed practical for the detection of the responsible diverticulum (Fig. 3).

On the basis of the National Bureau of Standards (NBS) unit,<sup>4</sup> a system for naming colors, the color contrast between the vessel and adjacent mucosa in the diverticulum was evaluated. LCI had higher color contrast (43.3 units) than white light (22.8 units), blue laser imaging (BLI) (18.3 units), and BLI-bligh (26.5 units). A value greater than 12.0 units is considered

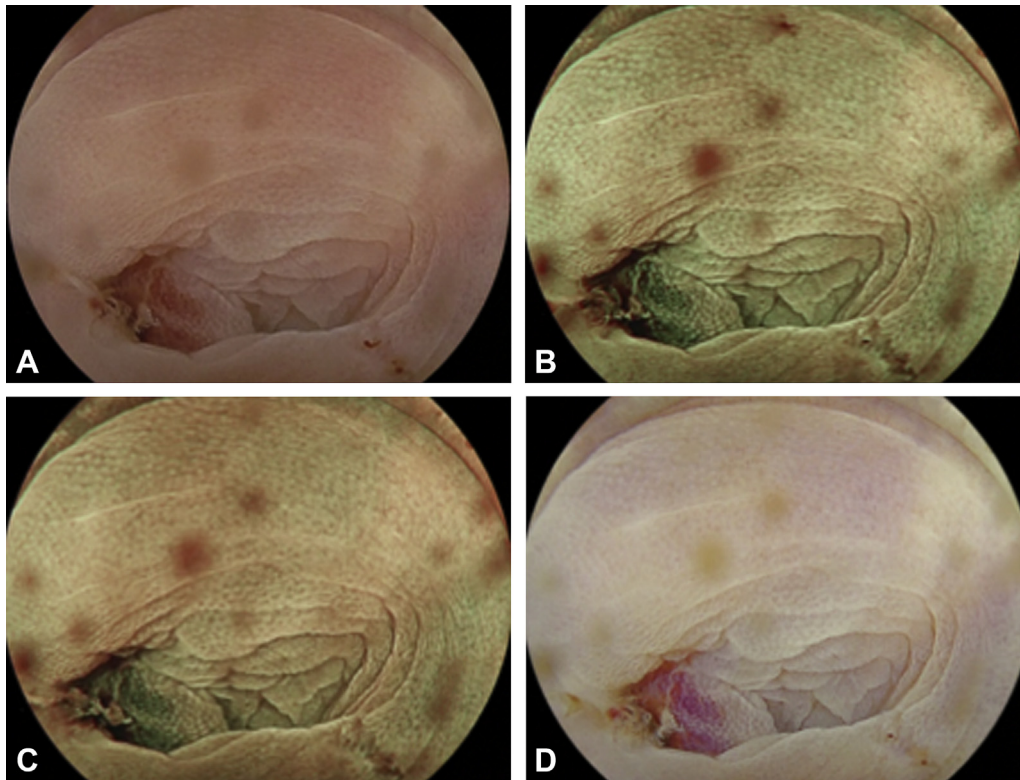


**Figure 1.** Observation of the colon diverticulum using linked color imaging. **A**, White light. **B**, Linked color imaging.

Written transcript of the video audio is available online at [www.VideoGIE.org](http://www.VideoGIE.org).



**Figure 2.** Extravasation from a dorsal diverticulum in the ascending colon depicted using contrast-enhanced CT at hospitalization (*yellow arrow*).



**Figure 3.** Identification of the nonbleeding visible vessel in the culprit diverticulum. **A**, White light imaging. **B**, Blue laser imaging. Color-enhanced stool on the lens hinders observation. **C**, Blue laser imaging-blight. Color-enhanced stool on the lens hinders observation. **D**, Linked color imaging, which provides higher color contrast between the nonbleeding visible vessel and adjacent mucosa. The color-enhanced culprit lesion was easy to identify. Stool on the lens almost completely disappears and does not hinder observation.

“very much” contrast according to the NBS criteria.<sup>4</sup> Although white light, BLI, and BLI-blight showed “very much” contrast in this case, LCI provided a higher color contrast, with 43.3 NBS units. Moreover, stool on the lens almost disappeared and did not hinder observation in LCI. We successfully treated the lesion with endoscopic band ligation. The exposed vessel on the ligated

diverticulum verified that this was the responsible lesion.

In conclusion, LCI is indeed practical for detecting the responsible diverticulum in cases of colonic diverticular bleeding, and a color-enhanced culprit lesion is easy to locate when information from the surrounding obstacles is suppressed.

## DISCLOSURE

*All authors disclosed no financial relationships relevant to this publication.*

Abbreviations: *BLI*, blue laser imaging; *LCI*, linked color imaging; *NBS*, National Bureau of Standards.

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Department of Gastroenterology, Hiroshima City Asa Citizens Hospital, Hiroshima, Japan.

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<https://doi.org/10.1016/j.vgje.2018.07.007>

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