Image-enhanced capsule endoscopy based on the diagnosis of vascularity when using a new type of capsule

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Background: Small-bowel lesions responsible for obscure GI bleeding are often accompanied by vascular abnormalities. Image-enhanced capsule endoscopy could be advantageous in detecting these abnormalities.

Objective: To evaluate the image representation performance of the contrast capsule.

Design: Feasibility study.

Setting: University hospital.

Patients and Interventions: Consecutive patients with obscure GI bleeding swallowed the contrast capsule.

Main Outcome Measurements: Image representation performance of the contrast capsule and the appearance of small-bowel lesions in image-enhanced capsule endoscopy.

Results: Twenty patients (16 males and 4 females) underwent capsule endoscopy during the study period. Small-bowel abnormality was detected, including 5 cases of multiple erosions or ulcers, 1 case of Peutz-Jeghers syndrome, and 1 case of angiectasia. The contrast capsule visualized the lesions with high vascularity in a dark green color with a strong color contrast compared with the surrounding normal mucosa, which appeared as a brownish color.

Limitations: Small, single-center, nonrandomized study.

Conclusion: This feasibility study demonstrated the image representation characteristics of the contrast capsule. The diagnostic yield of this technology should be investigated in a future randomized trial.

Although capsule endoscopy (CE) is currently a well-established screening modality for obscure GI bleeding (OGIB),[1,2] the rebleeding rates after negative findings on a CE study are reported to be 6% to 11%.[3,4] The application of image enhancement technology to CE could significantly improve the diagnostic yields of CE. Most small-bowel lesions that induce small-bowel bleeding, including angioectasia, ulcers, and tumors, are associated with vascular engorgement, inflammation, or neoangiogenesis.

Recently, a capsule with illumination characteristics, called the contrast capsule, was developed for use in image-enhanced capsule endoscopy (IECE). The aim of this feasibility study was to evaluate the image representation performance of the contrast capsule.

Abbreviations: CE, capsule endoscopy; FICE, Fujinon Intelligent Color Enhancement; IECE, image-enhanced capsule endoscopy; OGIB, obscure gastrointestinal bleeding; WL, white light; WL-LED, white-light light-emitting diode.

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PATIENTS AND METHODS

Patients and CE procedure

Consecutive patients with OGIB who visited our hospital during the study period were enrolled in this study. Twelve hours before CE, bowel preparation was performed by using 1 L of polyethylene glycol. Two experienced endoscopists interpreted the CE images, and a consensus interpretation was reached.

Contrast capsule

The contrast capsule is the same type and size (26 × 11 mm) as a conventional capsule, EC type 1 (Olympus Medical Systems, Tokyo, Japan), except that it is equipped with a white-light light-emitting diode (WL-LED). The WL-LED was selected to give increased illumination intensity in the blue light wavelength range, which is appropriate for the visualization of hemoglobin accumulation (Fig. 1).

Take-home Message

- The contrast capsule visualizes small-bowel lesions with high vascularity in a dark green color with a strong color contrast compared with the surrounding normal mucosa, which was visualized in a brownish color.

Contrast image creation

White-light (WL) images were generated by using all the R, G, and B data obtained from a charge-coupled device in a conventional manner (Fig. 2A), whereas the contrast images were generated by extracting only the G and B data from WL images (Fig. 2B).

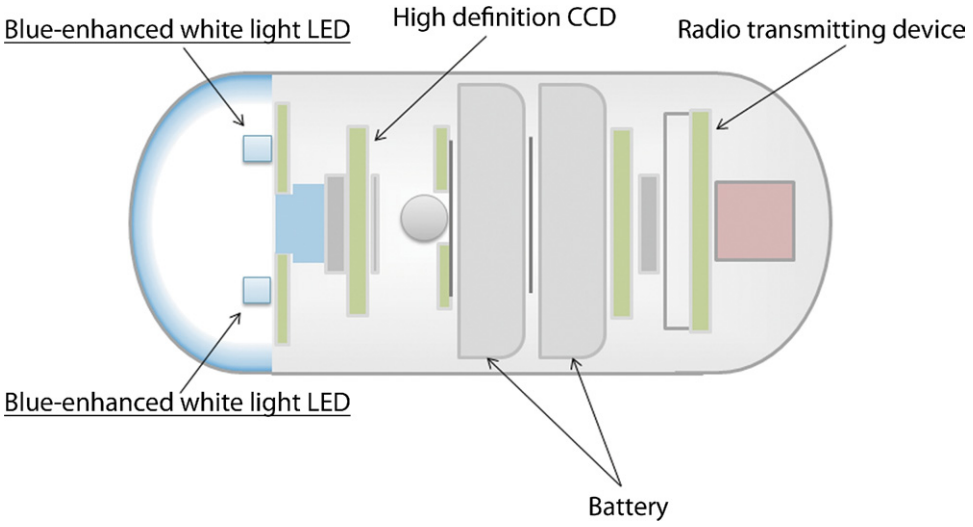

Figure 1. Internal configuration of the contrast capsule, which is equipped with a selected blue-enhanced WL-LED.

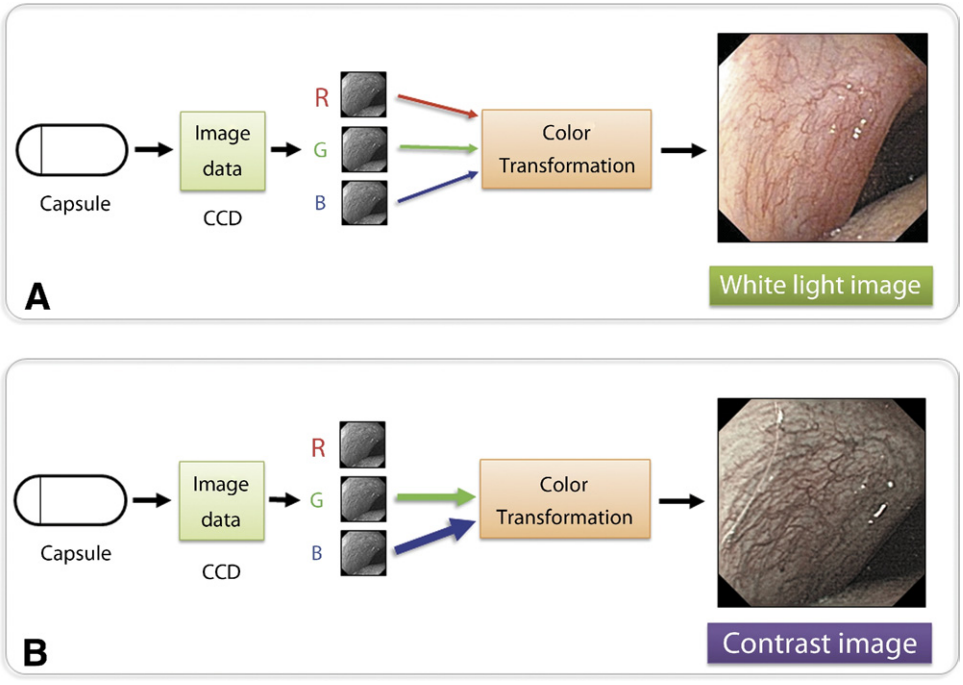

Figure 2. Algorithm of image generation in 2 modes. In the WL mode (**A,**) images are created by using all the R, G and B data obtained from the charge-coupled device (CCD). The contrast images (**B**) are created by extracting only the G and B data from WL images.