

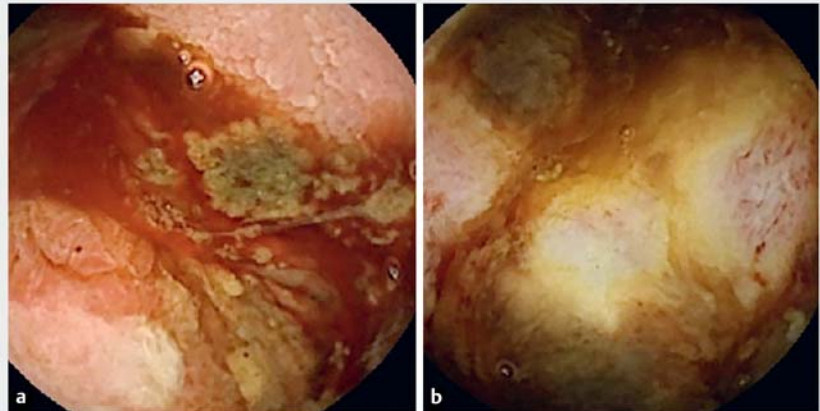
Fistula caused by cytomegalovirus enteritis hidden between swollen folds and detected by capsule endoscopy

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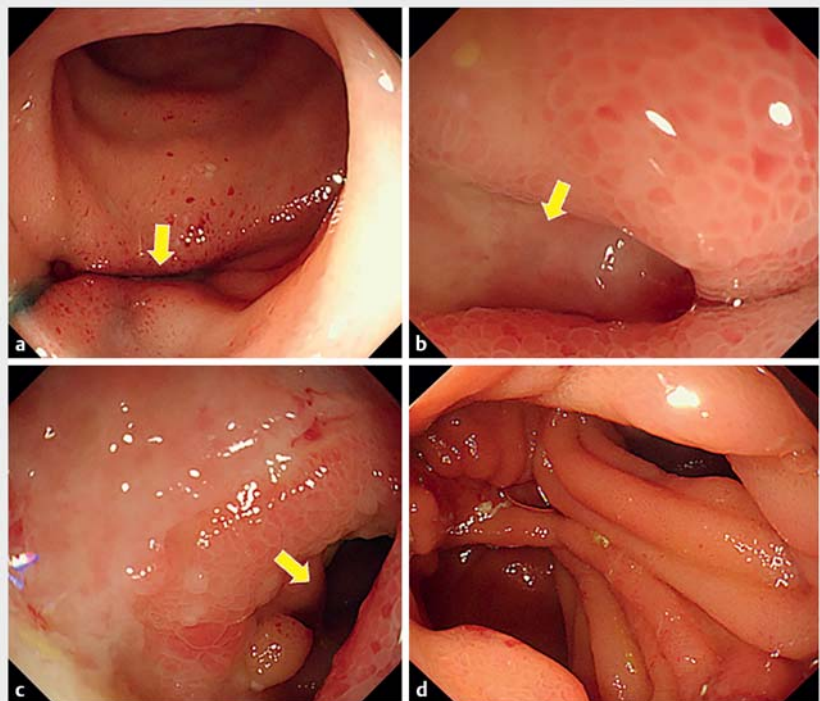
A 72-year-old man with type 2 diabetes mellitus and receiving dialysis presented with a 6-month history of anemia (hemoglobin 5.6 g/dL). Upper and lower gastrointestinal endoscopies and computed tomography (CT) failed to identify the cause of the anemia. Small-intestine capsule endoscopy showed multiple ulcers with adherent blood (► **Fig. 1**). After folds were separated during transanal enteroscopy, an ulcer was identified (► **Fig. 2a–c**). During an attempt to visualize the entire ulcer, another intestinal tract was discovered behind the ulcer (► **Fig. 2d**) (► **Video 1**). Biopsy of the ulcer showed giant inclusion bodies in the granulation tissue that were confirmed immunohistochemically as cytomegalovirus (CMV)-positive cells (► **Fig. 3**). The patient was diagnosed with CMV enteritis and treated with ganciclovir. At two months after treatment, his hemoglobin level had improved to 12.0 g/dL.

CMV can cause ulcerations anywhere in the gastrointestinal tract [1]. Ulcers sometimes cause perforation and in rare cases fistula may occur, [2] including arteriovenous, duodenocolic, or colovesical fistula. To the best of our knowledge, this is first report of an internal fistula between loops of small intestine.

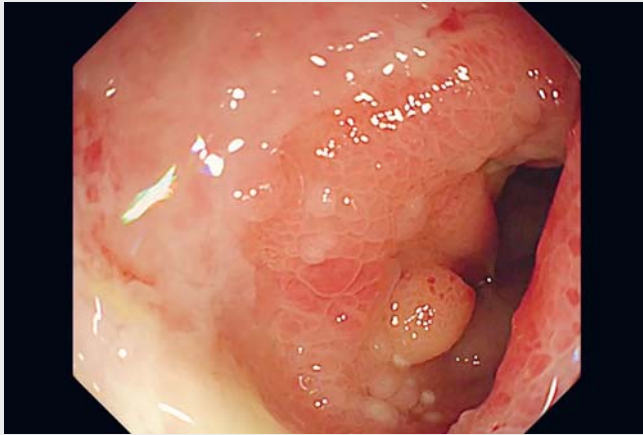
When perforation occurs, it is usually detected by computed tomography (CT) and requires emergent surgical intervention [3,4]. Fistula formation can be detected by upper or lower endoscopy as well as by CT. Formation of a fistula between loops of small intestine, however, is difficult to find by these modalities and requires examination of the small intestine by an alternative modality. A fistula that is hidden between folds can easily be overlooked in an initial lower endoscopy. Capsule endoscopy has a rotating characteristic, and as part of the capsule enters the space between folds, abnormalities can be observed in such locations. We present here a valuable movie of an



► **Fig. 1** Small-intestine capsule endoscopy in a patient with cytomegalovirus (CMV) enteritis: **a** active bleeding, **b** ulcers.



► **Fig. 2** Transanal enteroscopy in the same patient. **a** Enlarged folds are shown separated by a space (arrow) with the appearance of edematous change in the intestinal tract, about 2 cm from the ileocecal region. **b** After insertion of the scope, an ulcer is found (arrow). **c** A narrowed lumen is seen at the tip of the ulcer (arrow). **d** The intestinal tract is seen in two directions at the tip of the narrowed lumen.



► **Video 1** Capsule endoscopy of the small intestine in a patient with cytomegalovirus enteritis shows ulcers with bleeding, and space beyond one of the ulcers. Transanal endoscopy shows a fistula located beyond the ulcer and hidden between swollen folds.

extremely rare case of fistula formation between loops of small intestine that was captured by capsule endoscopy and enteroscopy.

Endoscopy_UCTN_Code_CCL_1AB_2AH_3AB

Competing interests

The authors declare that they have no conflict of interest.

The authors

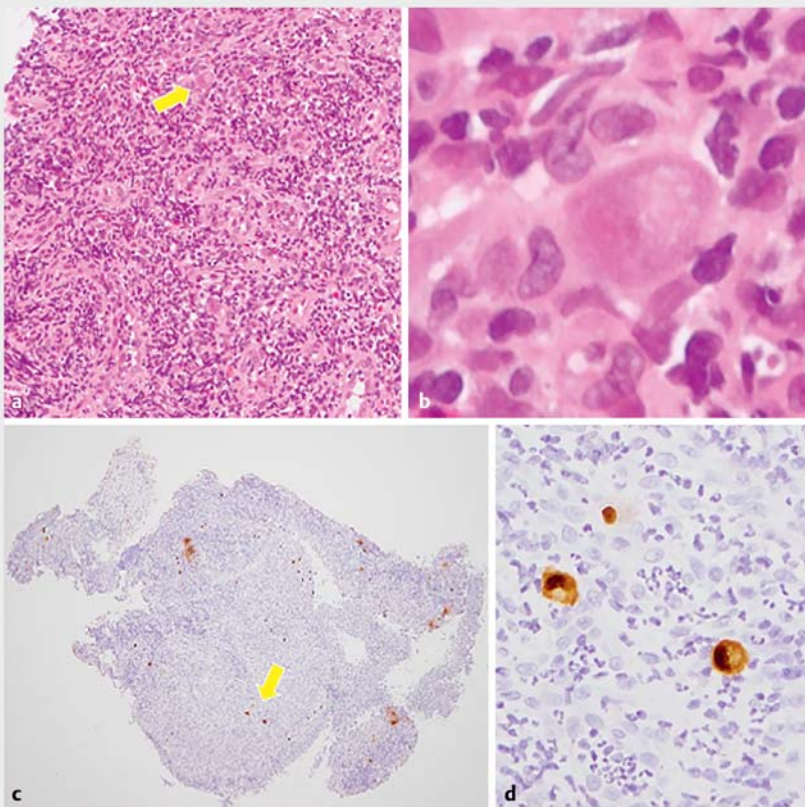
Satomi Shibata¹, **Toshiro Iizuka**¹, **Ryoko Shimizuguchi**¹, **Akinari Takao**¹, **Shin-Ichiro Horiguchi**²

- 1 Department of Gastroenterology, Tokyo Metropolitan Cancer and Infectious Diseases Center Komagome Hospital, Tokyo, Japan
- 2 Department of Pathology, Tokyo Metropolitan Cancer and Infectious Diseases Center Komagome Hospital, Tokyo, Japan

Corresponding author

Toshiro Iizuka, MD, PhD

Department of Gastroenterology, Tokyo Metropolitan Cancer and Infectious Diseases Center Komagome Hospital, 3-18-22 Honkomagome, Bunkyo-ku, Tokyo 113-8677, Japan
tiizukatora@gmail.com



► **Fig. 3** **a, b** Pathologically, the terminal ileum ulcer biopsy shows “owl’s-eye-like” intranuclear inclusion bodies (arrow) (H&E staining). **c, d** Immunohistochemical examination shows positive immune reactivity to the CMV antibody (arrow).

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