

Complete small-bowel examination by oral single-balloon enteroscopy using the water-exchange method

Large volumes of either air or carbon dioxide need to be insufflated for good visualization during enteroscopy. This leads to significant distension of the small bowel and makes further intubation technically challenging because of the formation of loops and acute angulations [1]. The rate of complete examination is only $12.4 \pm 9.8\%$ for single-balloon enteroscopy (SBE) [2]. It is even more difficult, if not impossible, to achieve complete small-bowel examination using only the antegrade route for SBE. A device equipped with a decompression side tube seems promising with

regard to extending the intubation depth during enteroscopy by air desufflation. However, the clinical outcomes of this method are awaited [3]. Herein, we report a case in which complete examination of entire small bowel was performed using only antegrade SBE with the water-exchange method.

A 65-year-old woman was admitted with recurrent hematochezia. She had no abdominal pain, distension, vomiting, or fever, and her hemoglobin level was 11.3 g/dL. Neither colonoscopy nor esophagogastroduodenoscopy (EGD) re-

vealed a bleeding source. Computed tomography of enteroclysis (CTE) revealed segmental diffuse thickening and localized stenosis of the ileum in the pelvic cavity (● Fig. 1).

Oral SBE was performed with the patient under a general anesthetic. The single-balloon enteroscope was first advanced beyond the ligament of Treitz using carbon dioxide insufflation. In order to improve the intubation depth, the water-exchange method was then used, as has been previously described in colonoscopy [4]. Any residual air in the lumen was suctioned, and water at 37°C was infused through the biopsy channel using a peristaltic pump (Olympus) to obtain lumen visualization (● Fig. 2). Turbid luminal water caused by residual feces was suctioned and replaced by clean water until the small-bowel lumen was clearly visualized again.

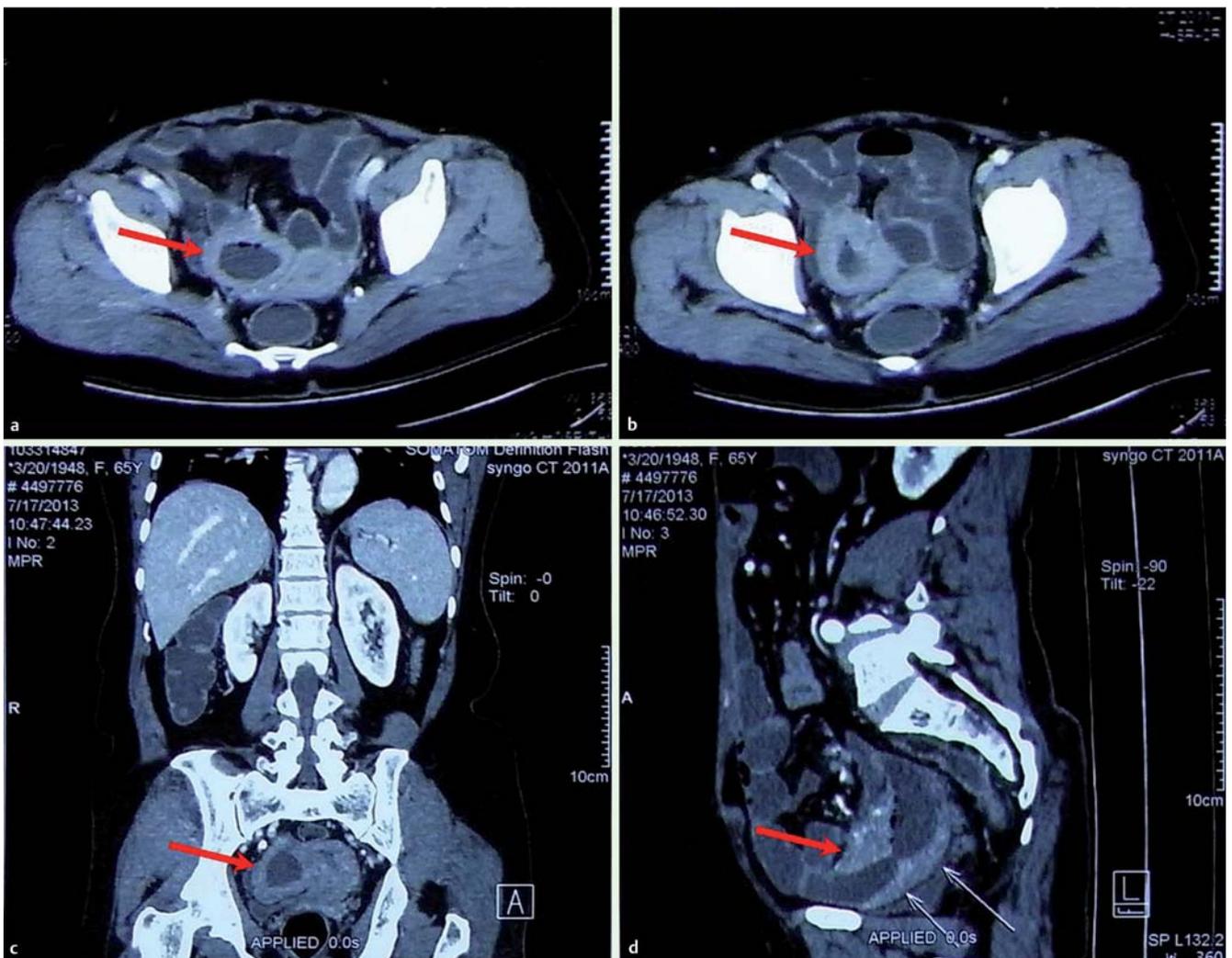


Fig. 1 Computed tomography of enteroclysis (CTE) scan in a 65-year-old woman with recurrent hematochezia showing segmental diffuse thickening and localized stenosis of the ileum in the pelvic cavity (red arrows) in: **a, b** axial view; **c** coronal view; and **d** sagittal view.

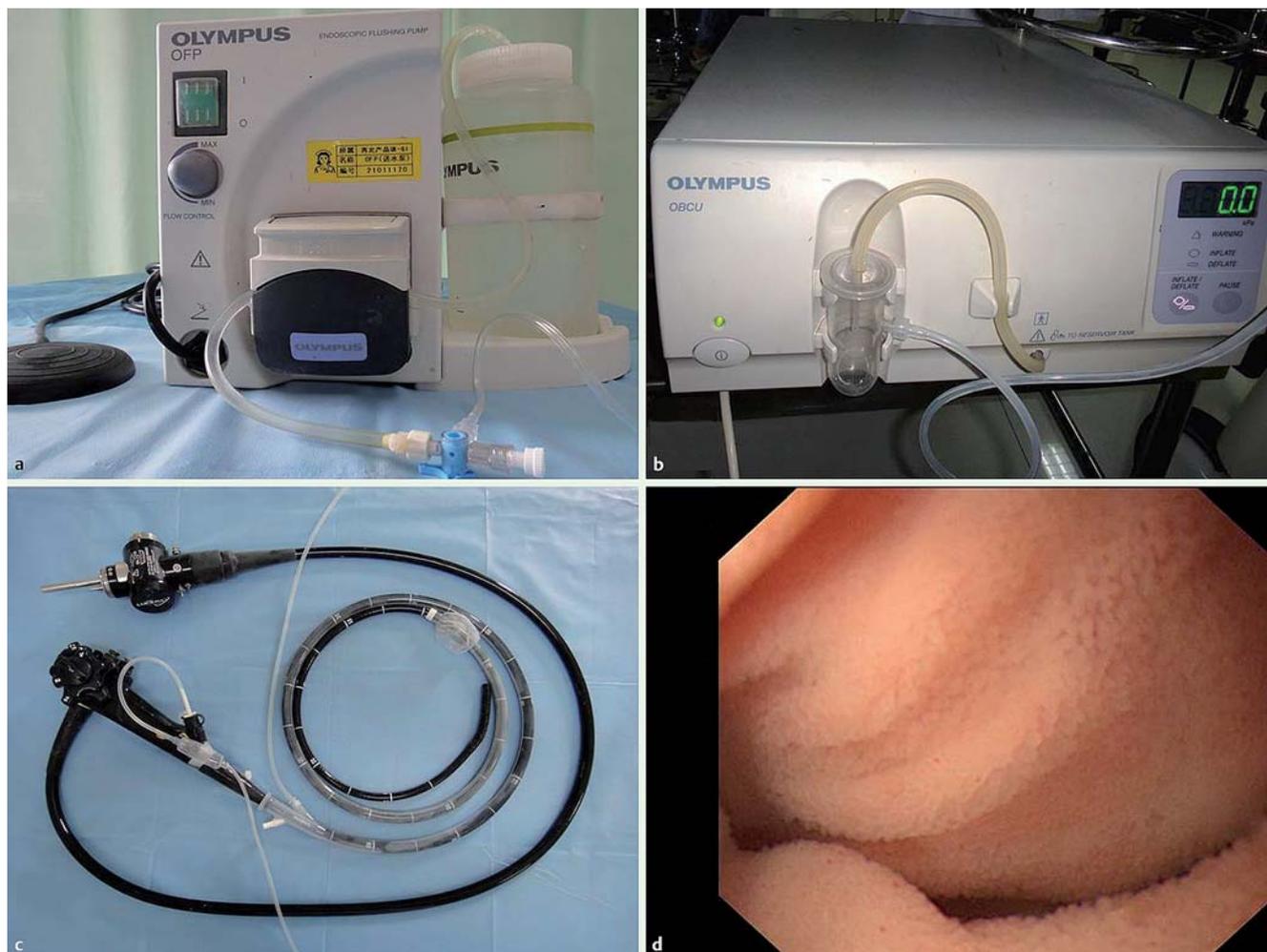


Fig. 2 The devices and procedure used to perform water-exchange single-balloon enteroscopy (SBE). **a** A peristaltic pump is used to infuse warm water into the intestinal lumen through the biopsy channel. **b, c** The overtube balloon and the overtube balloon control unit (OBCU) are used in the same way as for SBE by the conventional method. **d** As a result of the process of water exchange, with turbid luminal water being replaced by clean water, the small-bowel lumen can be clearly visualized.

After 2 hours of insertion, the cecum was reached and the opening of the appendix was observed (▶ Fig. 3 a). Carbon dioxide was then insufflated again during scope withdrawal for observation to be carried out. A 4-cm long annular mass was found in the mid-ileum (▶ Fig. 3 b, c) and a biopsy was obtained. The histological diagnosis was mucosa-associated lymphoid tissue (MALT) lymphoma (▶ Fig. 3 d). After the SBE, the patient had no discomfort and she later went on to receive chemotherapy for her lymphoma.

To our knowledge, this is the first report of the entire small bowel being examined by

water-exchange SBE via only the ante-grade route. As shown in colonoscopy [4], the water-exchange method without air insufflation during SBE may facilitate scope insertion by avoiding excessive lengthening of the small bowel and the formation of acute angulations. A prospective study needs to be designed to investigate whether water-exchange SBE is better than the conventional method.

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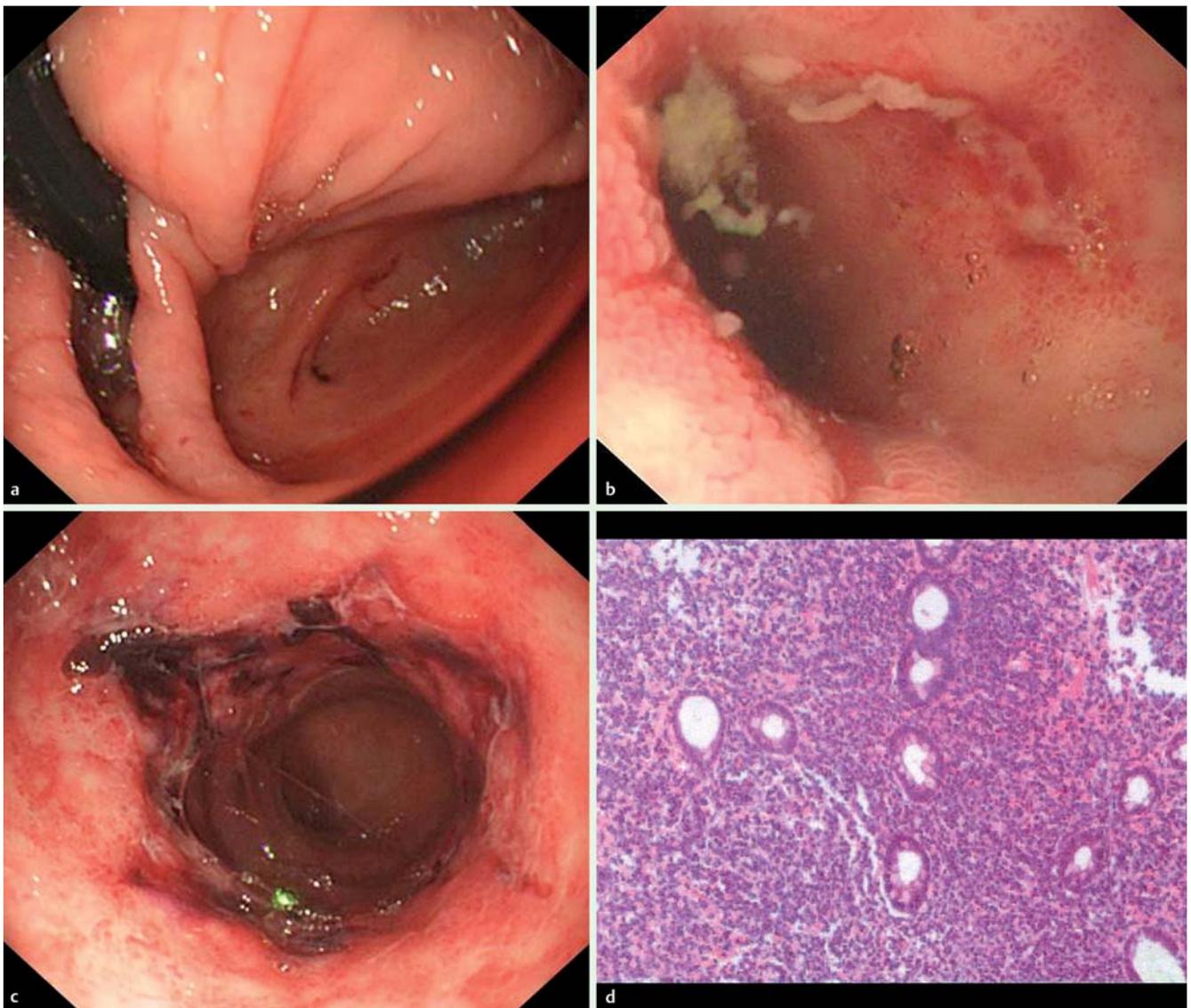


Fig. 3 Images from the procedure showing: **a** the ileocecal valve and opening of the appendix during antegrade insertion of the enteroscope; **b** the lesion in the mid-ileum observed under water during insertion of the enteroscope; **c** the lesion after distension by carbon dioxide during enteroscope withdrawal. **d** Subsequent histopathological analysis revealed mucosal lymphoid tissue hyperplasia.

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