Utility of single balloon enteroscopy (SBE) for difficult cases of total colonoscopy

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Abbreviations: BE, balloon enteroscopy; SBE, single balloon enteroscopy; CT, computed tomography

Balloon enteroscopy (BE) was originally developed for observation of the deep small intestine, and has recently been utilized for difficult cases of total colonoscopy due to reasons such as adhesions and elongation. In this report, we present our experience with single balloon enteroscopy (SBE) to facilitate successful colonoscopy when standard techniques failed. In two cases, early colon cancers were detected in the cecum by SBE and were removed endoscopically or surgically. A third case is discussed in which SBE was attempted but was ultimately not successful. In that case, total colonoscopy was not performed because of looping in the sigmoid and transverse colon. A fourth case in which SBE was performed in order to remove colonic gas in a patient with megacolon. In that case, total colonoscopy could not be completed because the SBE balloon could not “grab” the dilated colon and therefore could not advance. SBE is a useful adjunct to standard colonoscopy in challenging cases, but has limitations and does not always ensure success.

Introduction

Colonoscopy is an established technique for the diagnosis and treatment of many large bowel disorders. However, in some cases, visualization of the entire colon may be impossible due to intestinal elongation, adhesions or complicated flexures.

The small intestine was said to be a “dark continent” before balloon enteroscopy (BE) was invented. Since the introduction of BE in 2001¹, numerous diagnostic and treatment options for diseases of the small intestine evolved. By “grabbing” the bowel and enabling loop reduction, BE has the ability to visualize long segments of the small intestine despite its natural tortuosity. Since frequent loop reduction is also a hallmark of good colonoscopic technique, it is not surprising that BE would be used to help with difficult colonoscopy^{2,3}. In the present report, four cases are described in which total colonoscopy could not be achieved successfully using standard technique. In two of the four cases, SBE enabled completion of the required procedure, while in the other two cases, SBE failed.

Case reports

Case 1

A 73-year-old female was admitted to our hospital for surveillance colonoscopy after polypectomy. Four years earlier, polyps of the

ascending and transverse colon were removed with endoscopic snare polypectomy at another center. While we were unable to reach the cecum with a standard colonoscope, SBE was employed and total colonoscopy was completed in approximately 10 min. A 35-mm advanced colonic cancer with ulceration was found in the cecum, and moderately differentiated adenocarcinoma was diagnosed from a biopsy. Surgical laparoscopic right hemicolectomy was performed.

Case 2

A 78-year-old male underwent computed tomography (CT) colonoscopy, and a protruding lesion was noted in the cecum. Colonoscopic examination was attempted at another center, but total colonoscopy could not be completed due to elongation of the transverse and sigmoid colon. He was referred to our hospital for total colonoscopy which was completed with SBE assistance in approximately 10 min. A 15-mm laterally spreading tumor corresponds with the CT abnormality was found in the cecum. It was successfully removed with standard endoscopic mucosal resection and histology revealed early stage adenocarcinoma of the colon.

Case 3

A 49-year-old female complained of intractable constipation and was admitted to an outside hospital. Colonoscopic examination was performed but the cecum could not be reached. She was referred to our hospital for total colonoscopy, where SBE was employed. However, the sigmoid colon formed double loops, and linearization was not possible due to severe abdominal pain. The transverse colon formed a gamma-shaped loop that also could not

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Figure 1. SBE only reached the hepatic flexure due to looping in the sigmoid and transverse colon in case 3.

Figure 2. Abdominal x-ray shows marked colon gas in case 4.

be straightened. The hepatic flexure was the deepest insertion point (**Fig. 1**) of the SBE. For complete colon examination, a barium enema procedure was performed and no lesions were detected in the proximal colon.

Case 4

A 48-year-old male with a previous diagnosis of cryptogenic megacolon at 30 years of age and with repeated hospitalizations for ileus was admitted to our hospital with a chief complaint of severe abdominal distention. Upon admission, both standard radiological and CT scans of the abdomen showed marked colon gas upstream of the rectosigmoid area (**Fig. 2** and **Fig. 3**). Conservative treatment was provided, but the ileus did not improve. Definitive surgical colectomy was decided on, and preoperative SBE was performed to remove as much colon gas as possible (**Fig. 4a** and **Fig. 4b**). However, due to marked colon dilatation the balloon was unable to grasp the colon walls, and we reached only the transverse colon. Surgical laparoscopic total colectomy was then performed.

Discussion

Colonoscopy examination is a widely performed procedure, and observation of the entire large intestine can be achieved in almost all cases. However, there are some cases in which total colonoscopy cannot be completed for reasons such as colon elongation, adhesions, or complicated flexures. Since approximately 20% of colorectal cancer exists in the right colon, total colonoscopy is very important, even though it sometimes cannot be completed

Figure 3. Abdominal CT shows marked colon gas in case 4, as seen with the abdominal x-ray.

successfully.

A formal definition of difficult colonoscopy is not yet agreed upon; in many cases total colonoscopy is not completed due to colon elongation and adhesions. There have been many case reports describing the utility of BE for completion of colonoscopy after an incomplete examination with a conventional

Figure 4. A markedly dilated transverse colon with feces was observed with SBE in case 4 (A). The SBE balloon could not be used effectively to grab the colonic walls in the dilated colon, and total colonoscopy could not be completed (B).

Table 1. Reported cases of incomplete colonoscopy with balloon enteroscopy

Case No.	Year of report	Reported by	Age	Gender	Endoscope	Location of failure	Reason of failure
1 ⁸⁾	2006	T. Kaltenbach	76	Male	DBE	sigmoid colon	adhesion
2 ⁷⁾	2007	G. Gay	unknown	unknown	DBE	splenic flexure	too smooth a thin endoscope to be held
3 ⁵⁾	2010	Christopher W	unknown	unknown	SBE	hepatic flexure	poorly prepared colon
4 ⁶⁾	2011	Rajesh N	unknown	unknown	SBE	unknown	poorly prepared colon
5	2011	Our Case	49	Female	SBE	hepatic flexure	looping
6	2011	Our Case	48	Male	SBE	transverse colon	megacolon

BE, balloon enteroscopy; SBE, single balloon enteroscopy; DBE, double balloon enteroscopy.

colonoscope⁵⁻⁸. BE is useful because it can hold and shorten a complicated and elongated bowel segment, and therefore can be used in patients with difficult colonoscopies. Furthermore, histopathological diagnosis and treatment are sometimes possible when BE is employed, which is not the case with barium enemas or CT colonography.

In case 1, the patient was admitted for follow-up examination after polypectomy, and visualization of the entire large intestine was essential. In case 2, a lesion had already been noted by CT colonography. Utilizing SBE, successful intubation of the cecum was successful in both patients.

Nevertheless, BE does not always enable successful visualization of the entire colon (Table 1). In the present report, SBE did not result in complete colonoscopy in two of the four cases due to elongation, adhesions and complicated flexures. In cases of a poorly prepared colon, deep insertion might be difficult due to accumulation of solid colonic debris, potentially making smooth movement of the endoscope within the overtube and deeper insertion impossible^{5,6}.

SBE was originally developed for the purpose of observation of the small intestine, but due to its insertion flexibility, it has utility for various kinds of endoscopic procedures. In certain cases, SBE allows complete colonoscopy when standard technique fails.

Experienced practitioners should consider utilizing SBE in that setting when appropriate.

References

1. Yamamoto H, Sekine Y, Sato Y, Higashizawa T, Miyata T, Iino S, et al. Total enteroscopy with a nonsurgical steerable double-balloon method. *Gastrointest Endosc* 2001; 53:216-20.
2. Kawamura T, Yasuda K, Tanaka K, Uno K, Ueda M, Sanada K, et al. Clinical evaluation of newly developed single-balloon enteroscope. *Gastrointest Endosc* 2008; 68:1112-6.
3. Tomoyuki T, Yasuharu S, Shigeki B, Masaya S, Akira A, Yoshihide F, et al. The usefulness of single-balloon enteroscope for patients with difficult colonoscopic evaluation. *Intestine* 2010; 14:277-81. (in Japanese)
4. Kotake K, Honjo S, Sugihara K, Kato T, Kodaira S, Takahashi T, et al. Changes in colorectal cancer during a 20 year period: an extended report from the multi institutional registry of large bowel cancer, Japan. *Dis Colon Rectum* 2003; 46:S32-43.
5. Teshima CW, Aktas H, Haringsma J, Kuipers EJ, Mensink PB. Single-balloon-assisted colonoscopy in patients with previously failed colonoscopy. *Gastrointest Endosc* 2010; 71:1319-23.
6. Rajesh N, Keswani, MD. Single-balloon colonoscopy versus repeat standard colonoscopy for previous incomplete colonoscopy: a randomized, controlled trial. *Gastrointest Endosc* 2011; 73:507-11.
7. Gay G, Delvaux M. Double-balloon colonoscopy after failed conventional colonoscopy: a pilot series with a new instrument. *Endoscopy* 2007; 39:788-92.
8. Kaltenbach T, Soetikno R, Friedland S. Use of a double balloon enteroscope facilitates caecal intubation after incomplete colonoscopy with a standard colonoscope. *Dig Liver Dis* 2006; 38:921-5.