

EDITORIAL

Balloon-assisted enteroscopy for symptomatic Meckel's diverticulum: High diagnostic accuracy and possible endoscopic intervention

Meckel's diverticulum (MD) is the most common congenital anomaly of the gastrointestinal tract, with reported prevalence of 1% to 3% and male predominance. As MD is usually asymptomatic and discovered incidentally, the true prevalence and characteristics are still unclear. Most MD patients are identified with the onset of complications, including bleeding, intussusception, diverticulitis, or bowel obstruction. Bleeding is the most common complication.¹ MD is also the most common cause of obscure gastrointestinal bleeding in children and young adults. Diagnosis is challenging because no standardized diagnostic criteria are available. Before the introduction of balloon-assisted enteroscopy (BAE), the diagnostic accuracy of conventional modalities (computed tomography, small-bowel follow-through, angiography, or Technetium-99 m pertechnetate scintigraphy) was limited. Technetium-99 m pertechnetate scintigraphy (Meckel's scan) is a well-established tool for the diagnosis of MD, with high accuracy in children.^{2,3} However, accuracy is not as high (less than 50%) in adults,⁴ because some MD patients may have little or no ectopic gastric tissue within the diverticulum. Capsule endoscopy is recommended as a first-line diagnostic tool for suspected small bowel bleeding in patients without bowel stenosis, but it has a limited role in MD because the bowel lumen cannot be inflated and good visibility of the distal small bowel is required.⁵

The development of BAE (including single-balloon and double-balloon enteroscopy) has provided a new diagnostic tool with high accuracy for MD.⁶ BAE also provides the possibility of treatment. Selected MD patients have reportedly been treated with endoscopic intervention.⁷⁻⁹

One recent study showed that BAE has the highest accuracy for diagnosis of a bleeding MD in adults, with diagnostic accuracy higher than that of a Meckel's scan (85.0% vs 21.4%, $P < 0.001$).⁵ When MD is suspected but conventional modalities provide no definite conclusion, retrograde BAE could be an alternative tool for confirmation of the diagnosis with high accuracy. Although the accuracy of BAE in patients with MD is high, some challenges persist in clinical

practice. First, BAE is an invasive procedure and requires bowel preparation. Second, MD may be overlooked when the orifice is small or hidden by a mucosal-fold. To date, reports of BAE for MD have mostly employed double-balloon enteroscopy, while single-balloon enteroscopy has rarely been reported.^{10,11} In this issue of the journal, Wei et al reported the clinical experience with single-balloon enteroscopy for diagnosis of adult MD in a single medical center in Taiwan. Compared to double-balloon enteroscopy, single-balloon enteroscopy is easier to perform and less time-consuming, and a previous meta-analysis found that the diagnostic rate is similar in patients with small bowel diseases.¹² This technique could be considered as a first-line diagnostic tool in selected cases with strongly suspected MD. However, a conventional noninvasive modality (especially a Meckel's scan) should be performed first in children and young adults because retrograde BAE is a technical and invasive procedure and not available at some medical institutions.

For symptomatic MD, surgical intervention is the standard method of treatment, and can prevent recurrent complications. BAE can be used for endoscopic intervention in selected patients with MD. Some cases with inverted MD were successfully resected with BAE.^{7,8} As inverted MD can resemble a pedunculated polyp, careful manipulation during endoscopic intervention is necessary to prevent complications.¹¹ Wei et al reported that some cases did not have recurrent bleeding on follow-up after endoscopic hemoclipping, but the possibility still exists because of the retained MD. Close follow-up is recommended. In conclusion, retrograde BAE could provide a reliable and useful modality with high diagnostic accuracy and the possibility of endoscopic intervention in selected patients with MD.

CONFLICTS OF INTEREST

The author declares no conflict of interest. The author transfers all copyright ownership of the above manuscript to the journal in the event the work is published.

Tien-Yu Huang^{1,2}

¹*Division of Gastroenterology, Department of Internal Medicine,
Tri-Service General Hospital, National Defense Medical Center, Taipei,
Taiwan*

²*Taiwan Association for the Study of Small Intestinal Diseases, Taoyuan,
Taiwan*

Email: tienyu27@gmail.com

REFERENCES

1. Park JJ, Wolff BG, Tollefson MK, Walsh EE, Larson DR. Meckel diverticulum: The Mayo Clinic experience with 1476 patients (1950-2002). *Ann Surg.* 2005;241:529-533.
2. Kiratli PO, Aksoy T, Bozkurt MF, Orhan D. Detection of ectopic gastric mucosa using ^{99m}Tc pertechnetate: Review of the literature. *Ann Nucl Med.* 2009;23:97-105.
3. Soltero MJ, Bill AH. The natural history of Meckel's diverticulum and its relation to incidental removal. A study of 202 cases of diseased Meckel's diverticulum found in King County, Washington, over a fifteen year period. *Am J Surg.* 1976; 132:168-173.
4. Spottswood SE, Pfluger T, Bartold SP, et al. SNMMI and EANM practice guideline for Meckel diverticulum scintigraphy 2.0. *J Nucl Med Technol.* 2014;42: 163-169.
5. Hong SN, Jang HJ, Ye BD, et al. Diagnosis of bleeding Meckel's diverticulum in adults. *PLoS One.* 2016;11:e0162615.
6. He Q, Zhang YL, Xiao B, Jiang B, Bai Y, Zhi FC. Double-balloon enteroscopy for diagnosis of Meckel's diverticulum: Comparison with operative findings and capsule endoscopy. *Surgery.* 2013;153: 549-554.
7. Konomatsu K, Kuwai T, Yamaguchi T, et al. Endoscopic full-thickness resection for inverted Meckel's diverticulum using double-balloon enteroscopy. *Endoscopy.* 2017;49:E66-E67.
8. Fukushima M, Suga Y, Kawanami C. Successful endoscopic resection of inverted Meckel's diverticulum by double-balloon enteroscopy. *Clin Gastroenterol Hepatol.* 2013;11:e35.
9. Fukushima M, Kawanami C, Inoue S, Okada A, Imai Y, Inokuma T. A case series of Meckel's diverticulum: Usefulness of double-balloon enteroscopy for diagnosis. *BMC Gastroenterol.* 2014;14:155.
10. Sato Y, Tanaka S, Ko Y, et al. Adenocarcinoma of Meckel's diverticulum diagnosed by capsule endoscopy and single-balloon enteroscopy. *Clin J Gastroenterol.* 2009;2:388-393.
11. Huang TY, Liu YC, Lee HS, et al. Inverted Meckel's diverticulum mimicking an ulcerated pedunculated polyp: Detection by single-balloon enteroscopy. *Endoscopy.* 2011;43:E244-E245.
12. Lipka S, Rabbanifard R, Kumar A, Brady P. Single versus double balloon enteroscopy for small bowel diagnostics: A systematic review and meta-analysis. *J Clin Gastroenterol.* 2015;49:177-184.