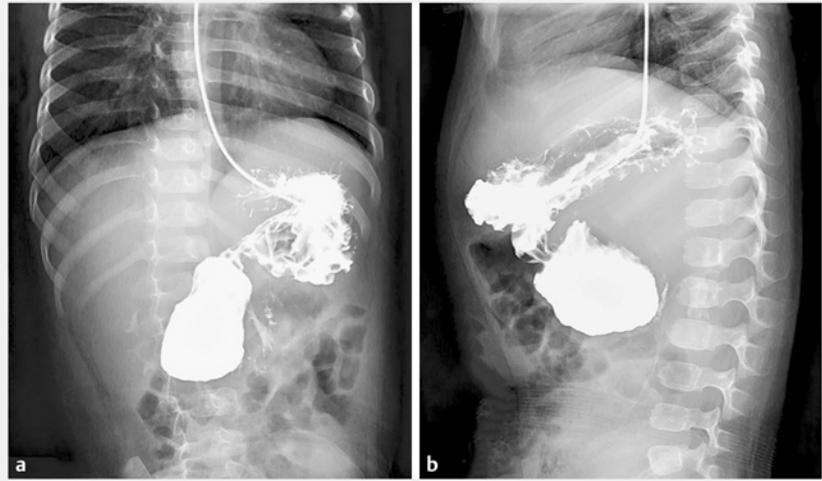


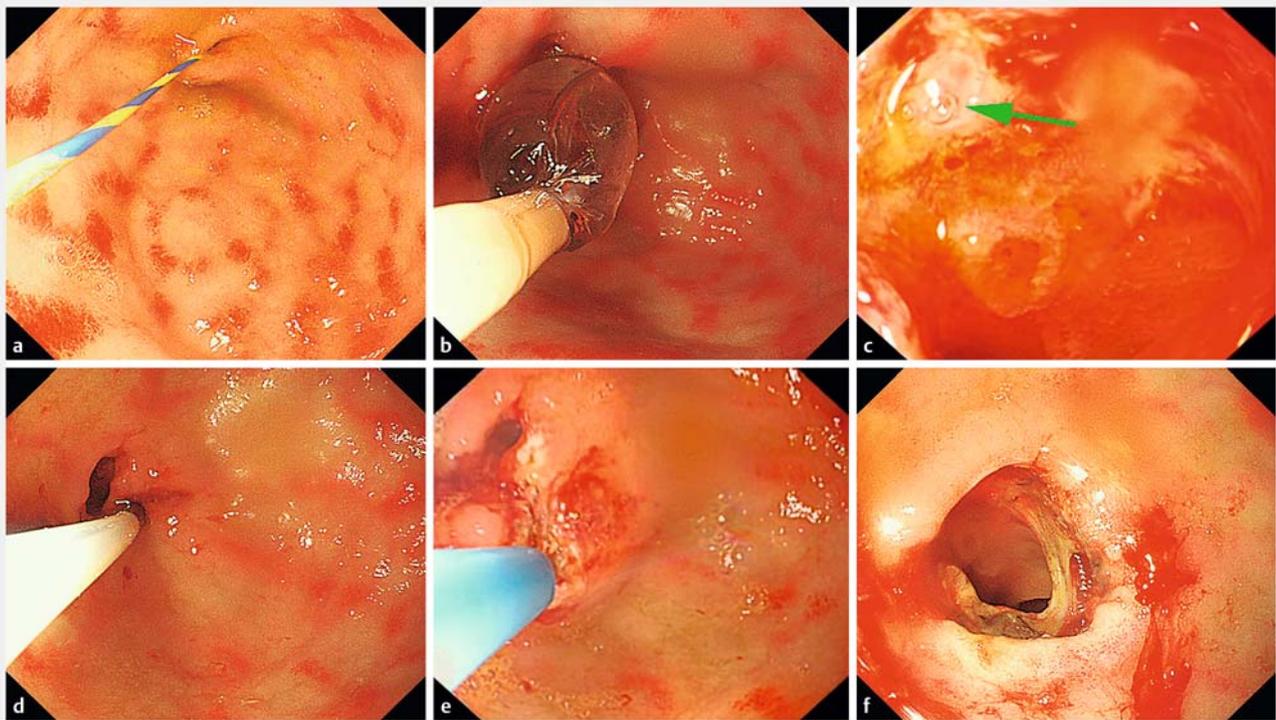
## Successful management of membranous duodenal stenosis by endoscopic balloon dilation and membrane resection with an insulated-tip knife

A 14-month-old girl was admitted to our department because of repeated nonbilious vomiting for >3 months and malnutrition. Upper gastrointestinal radiography showed partial obstruction of the duodenum (▶ **Fig. 1**). Gastroscopy confirmed a membranous duodenal stenosis with an opening of about 3 mm in diameter, and no view of the duodenal papilla above the membrane (▶ **Fig. 2a**). We performed both balloon dilation and membrane resection (▶ **Video 1**).

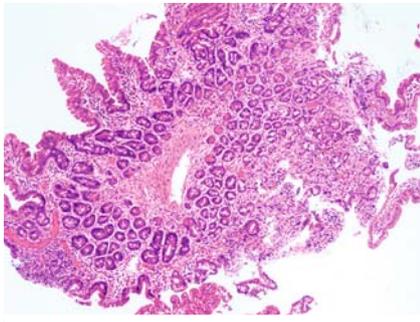
First, endoscopic balloon dilation was carried out to locate the duodenal papilla (▶ **Fig. 2b**), which was in the 10 o'clock position and 1 cm below the membrane (▶ **Fig. 2c**). Then, following submucosal injection of diluted epinephrine (1:10 000), a circumferential incision was performed contralaterally to



▶ **Fig. 1** Upper gastrointestinal radiography showed partial obstruction of the duodenum. **a** Frontal view. **b** Lateral view.



▶ **Fig. 2** Endoscopic images. **a** Membranous duodenal stenosis with an opening of about 3 mm in diameter. **b** Balloon dilation of the membrane. **c** Location of the duodenal papilla (green arrow), showing bubbles that escaped when the right upper abdomen was pressed gently. **d** Submucosal injection of diluted epinephrine. **e** Membrane resection with an insulated-tip knife. **f** The opening of the membrane was increased so that the endoscope could pass through without resistance.



► **Fig. 3** Pathological examination showed that muscle tissue was present in the resected membrane (hematoxylin and eosin staining, ×40).



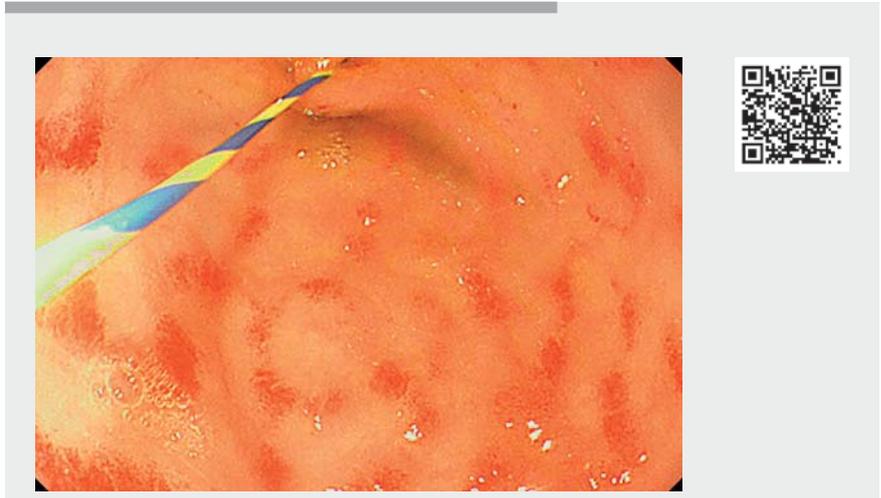
► **Fig. 4** Follow-up upper gastrointestinal radiography at 6 months post-procedure showed that the duodenal obstruction had disappeared.

the duodenal papilla using an insulated-tip knife (► **Fig. 2 d, e**). The resected membrane was removed and the opening was increased to 12 mm in diameter (► **Fig. 2 f**). A nasojejunal tube was inserted through the opening.

The girl recovered uneventfully after endoscopic treatment, and symptoms of vomiting gradually disappeared. Pathological examination showed that muscle tissue was present in the resected membrane (► **Fig. 3**).

At the 6-month follow-up visit, her body weight had increased by 3.0 kg, and upper gastrointestinal radiography showed that the duodenal obstruction had disappeared (► **Fig. 4**).

Membranous duodenal stenosis is a common pediatric gastrointestinal abnormality, with an incidence of 1:10 000–40 000



► **Video 1** Management of membranous duodenal stenosis by endoscopic balloon dilation and membrane resection with an insulated-tip knife.

[1], which has traditionally been managed either via laparotomy or laparoscopic surgery. Endoscopic treatment of sporadic cases has been reported [2–4]. However, balloon dilation alone, without membranectomy, may result in stricture recurrence, whereas membranectomy cutting techniques cannot completely avoid possible injury to the duodenal papilla or even perforation, especially if the duodenal papilla is below the membrane. Given the limited space and thinner duodenal wall in children, submucosal injection prior to membrane resection would help to avoid cutting too deeply and ensure safe removal of the lesion.

Endoscopy\_UCTN\_Code\_CCL\_1AB\_2AZ\_3AZ

### Acknowledgments

The authors thank Shanghai Municipal Population and Family Planning Commission (China) (201840341) for their support.

### Funding

Shanghai Municipal Population and Family Planning Commission,  
<http://dx.doi.org/10.13039/501100008410>  
 201840341

### Competing interests

The authors declare that they have no conflict of interest.

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*Endoscopy* 2022; 54: E256–E258

**DOI** 10.1055/a-1506-2785

**ISSN** 0013-726X

**published online** 8.6.2021

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Georg Thieme Verlag KG, Rüdigerstraße 14,  
70469 Stuttgart, Germany

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