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Gastroscopic treatment of membranous duodenal stenosis in infants and children: Report of 6 cases ☆

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ABSTRACT

Objective: To investigate the efficacy of gastroscopic treatment in the treatment of membranous duodenal stenosis.
Methods: We performed a retrospective study of 6 patients with membranous duodenal stenosis, aging from 7 days to 37 months, who underwent gastroscopic balloon dilatation in a children's hospital between January 2012 and December 2013. All surgical procedures of balloon dilatation were performed under direct gastroscopic vision. The balloon dilators with diameter 8 mm and 10 mm for neonates and children aged over one month, respectively, were placed through the foramen of the membranous stenosis. The septum in the membranous stenosis was gradually extended by increasing diameter of the balloon dilator. The residual septum was removed by gastroscopic electrocauterization.
Results: The membranous stenosis in duodenum of all children was successfully expanded by gastroscopic balloon dilatation, and only one case with residual septum received gastroscopic electrocauterization. No complications such as bleeding, intestinal perforation, etc., were observed. Postoperative radiography using iodine-based contrast media showed that the gastrointestinal tract was unobstructed. During a follow-up period ranging from 3 to 24 months, all patients ate normally without vomiting and abdominal distension and grew normally.
Conclusion: Gastroscopic balloon dilatation is an effective method in the treatment of membranous duodenal stenosis in children. For the patients with residual septum, they can be cured by using gastroscopic electrocauterization.

Membranous duodenal stenosis is one of the common pediatric gastrointestinal abnormalities with an incidence of 1:10000–40000. Patients are mostly premature or low birth weight infants and often present with bile-stained vomiting and upper abdominal distension. This condition is usually associated with other anomalies in the gastrointestinal tract, cardiovascular system and genitourinary system. Upper gastrointestinal tract radiography using iodine-based contrast media can be helpful for diagnosing this anomaly. The traditional treatment method of this condition is to open the duodenum resect the duodenal septum and/or perform a duodenoduodenostomy which may result in postoperative anastomotic leakage and intestinal adhesions. With the development of minimally invasive surgery, a few reports describing laparoscopic treatment of this condition have appeared in the literature [1]. Recently, some scholars successfully treated membranous duodenal stenosis endoscopically. Herein we describe six patients with membranous duodenal stenosis that underwent gastroscopic balloon dilatation in a children's hospital between January 2012 and December 2013.

1. Data and methods

1.1. Clinical data

Between January 2012 and December 2013, six patients including 2 males and 4 females with membranous duodenal stenosis were managed with gastroscopic balloon dilatation. Four patients showed occasional bilious vomiting in the first month after birth, but their parents delayed bringing them to hospital. Patients 1, 2, and 5 were diagnosed with membranous duodenal stenosis by prenatal ultrasound screening, and the other three patients were not diagnosed before hospitalization because of lack of availability of prenatal ultrasound screening in remote areas where they were born. Upper gastrointestinal tract radiography using iodine-based contrast media was performed for each patient to verify the presence of an incomplete duodenal obstruction. General information on the patients is shown in Table 1.

1.2. Preoperative preparation

Preoperative physical examinations were performed after admission, the patients were kept without oral intake and continuous gastrointestinal decompression and rehydration was carried out. Nutritional support was carried out for patients with poor nutrition. Informed consent was obtained from the patients' parents before the surgical operation. All patients were given gastric lavage 2 h before the operation; the

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Table 1
General information on patients upon admission.

Case no.	Sex	Age (month)	Birth weight (kg)	Admission weight (kg)	Bilious vomiting	Abdominal distension	Congenital diseases
1	Male	7	2.5	6.5	Yes	Yes	Bilateral oblique inguinal hernias
2	Female	4	2.6	5.5	Yes	No	No
3	Male	34	2.8	10	No	Yes	PDA, 21-trisomy syndrome
4	Female	37	3.2	12.5	Yes	Yes	No
5	Female	7/30	2.8	2.7	Yes	No	No
6	Female	2	3.5	4.0	Yes	No	No

8–16 mm balloon dilators and electrocauterization devices specially designed for gastroscopic procedure were prepared.

1.3. Gastroscopic procedure

The gastroscope used in the current study had 9.2 mm outer diameter with a 2.8 mm instrument channel. After induction of anesthesia, routine gastroscopic examination was carried out and any gastric residue was washed out. When the endoscope reached the duodenal stenosis (Fig. 1a), the balloon dilators were placed through the instrument channel, the dilators were inserted through the small duodenal foramen (Fig. 1b), and balloon dilatation was performed under direct vision to expand the stenotic foramen within the duodenum. The balloon dilators with diameters of 8 mm and 10 mm for neonates and children aged over one month respectively were placed through the duodenal stenosis. The septum in the membranous stenosis was extended completely by increasing diameter of the balloon dilator (Fig. 1c). The residual septum was removed by gastroscopic electrocauterization (Fig. 2). After dilatation, the gastroscope could be observed and smoothly entered the distal segment of intestine and carefully evaluated for possible bleeding or intestinal perforation. No procedural complications were observed.

2. Results

2.1. Treatment outcomes

Dilatation of duodenum proximal to the obstruction was observed in all patients. Duodenal stenosis was successfully manage by balloon dilatation alone in five patients with only one case (patient #4) requiring endoscopic cauterization of the obstructing membrane. The results of gastroscopic treatment are shown in Table 2. The ampulla of Vater was clearly recognized in four of our cases.

Since patient 1 was diagnosed with an inguinal hernia before the endoscopic procedure, after successful gastroscopic balloon dilatation, laparoscopic bilateral hernia repair was then accomplished. In patient 3, watermelon seeds and cores of jujube were observed in the intestine proximal to the duodenal stenosis, and were removed via the gastroscope prior to balloon dilatation. All patients tolerated feedings on the 1st postoperative day and were discharged on the 4th postoperative day following upper gastrointestinal radiography showing that the gastrointestinal tract was unobstructed.

2.2. Postoperative follow-up

During a follow-up period ranging from 3 to 24 months, all patients ate normally without vomiting and abdominal distension, and had normal growth. Upper gastrointestinal radiography using iodine-based contrast media was performed 1, 3, 6, and 12 months after surgery, which showed that the duodenum was unobstructed without evidence of a stenosis.

3. Discussion

Membranous duodenal stenosis is a common cause of congenital duodenal obstruction whose symptoms may appear in neonates, infants and occasionally in older children. Diagnostic delay may lead to malnutrition, weight loss, anemia and growth. Conventional operative management has included open or laparoscopic duodenal incision,

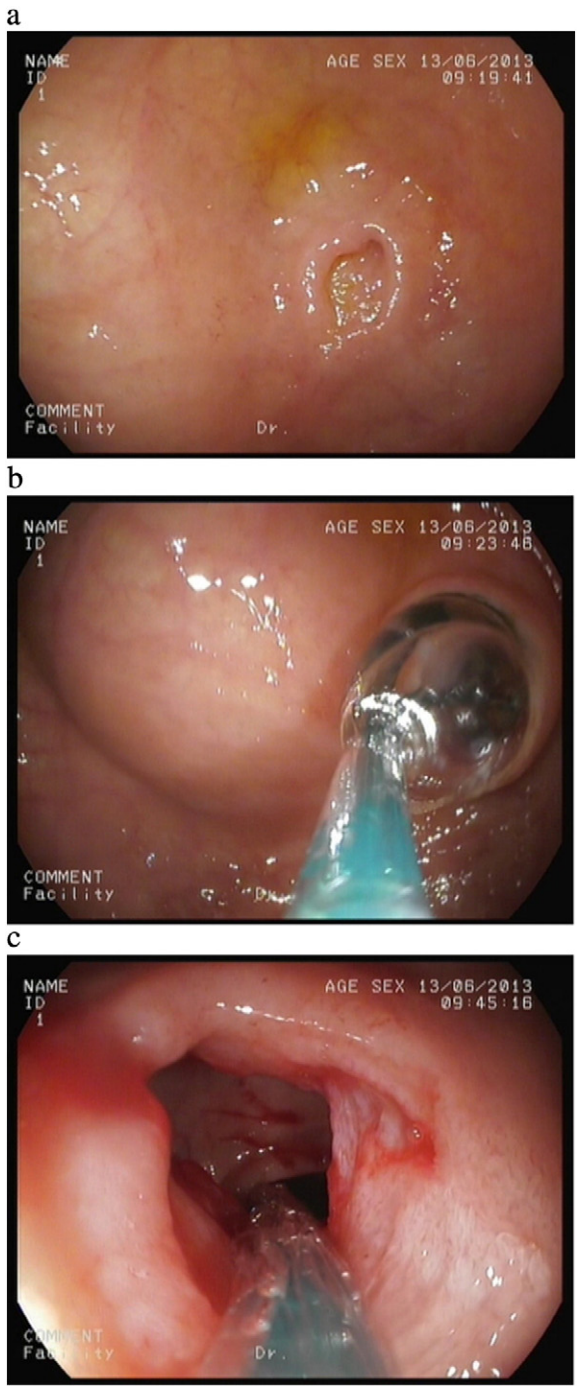

Fig. 1. (a) A penetrated web seen in the duodenum under endoscopy. (b) Balloon dilatation was performed under direct endoscopic vision. (c) The web expanded after balloon dilatation.