Pyloric reconstruction for refractory dumping syndrome after Nissen fundoplication and pyloroplasty in an infant: A case report

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A B S T R A C T

Dumping syndrome (DS) is common after gastrectomy or gastric bypass surgery, but DS in children has been described almost exclusively as a complication of Nissen fundoplication. DS resolves spontaneously in most patients; however, some patients require dietary modification or medications, and surgical treatment is reserved for medically intractable cases. We herein describe an unusual case of DS in a neurologically impaired infant that developed after Nissen fundoplication and pyloroplasty and was treated by reversal of the pyloroplasty. A 12-month-old male infant was referred for medically intractable DS. He suffered from cerebral palsy-related quadriplegia and gastroesophageal reflux, and underwent open Nissen fundoplication, gastrostomy tube placement, truncal vagotomy, and pyloroplasty two months before referral. Gastric emptying scintigraphy confirmed rapid gastric emptying, which was consistent with early DS. On laparotomy, a pyloroplasty scar was identified and opened along the scar. The pyloric ring was identified, reapproached, and the incision was closed longitudinally. Postoperative gastric emptying scan showed normalized gastric emptying, and the half-emptying time was measured as 110 min. Pyloric reconstruction is a technically easy and less destructive surgery and should be considered as a therapeutic option in medically refractory DS following fundoplication and pyloroplasty.

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Dumping syndrome (DS) is infrequently reported but known to occur after Nissen fundoplication with or without pyloroplasty. The therapeutic approach includes cornstarch, pectin, octreotide, and dietary modification, but refractory patients ultimately require surgical treatment [1,2]. We herein report a case of medically refractory DS after Nissen fundoplication, truncal vagotomy, and pyloroplasty that was successfully treated by pyloric reconstruction.

1. Case report

A 12-month-old male infant was referred for medically intractable DS. He suffered from cerebral palsy-related quadriplegia and gastroesophageal reflux and underwent open Nissen fundoplication, gastrostomy tube placement, truncal vagotomy, and pyloroplasty two months before referral. Five days after the anti-reflux surgery, tube feeding was started but he developed severe post-prandial lethargy, sweating, and watery diarrhea, symptoms that suggested early DS. Over a period of two months following surgery, his body weight fell from 8 kg to 6 kg, representing a 20% loss. A carbohydrate-modified diet with starch as the only carbohydrate failed to improve his symptoms, and he was dependent on a strict diet, parenteral nutrition, and frequent, small volumes of complex carbohydrates. Gastric emptying scintigraphy revealed very rapid emptying, making consideration of a linear or exponential fitting impossible (Fig. 1A). Pyloric reconstruction was planned for the presumptive diagnosis of medically uncorrectable DS. Techniques in pyloric reconstruction surgery have already been described in detail [3]. In brief, the patient’s previous pyloroplasty scar was identified and stay sutures (1, 2; at either end of the scar; 3, 4; in the middle of the incision scar) were placed. By even traction of the stay sutures 3 and 4, the incision scar was completely opened along its course. The posterior pyloric ring was identified and reapproached so that stay sutures 1 and 2 meet. The pyloric incision was then closed longitudinally with interrupted stitches. Gastric emptying scintigraphy performed five days after the pyloric reconstruction showed normalized gastric emptying, and the half-emptying time was measured as 110 min by linear fitting (Fig. 1B). Tube feeding was resumed, and full feeds (120 cc of formula every 3 h) were achieved seven days after pyloric reconstruction. The postoperative course was uneventful, without recurrence of DS, and the patient regained his body weight three months after pyloric reconstruction.

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Fig. 1. Gastric emptying scintigraphy. (A) Before pyloric reconstruction, the gastric emptying time was unmeasurable either by linear or exponential fitting. (B) After pyloric reconstruction, the half-emptying time was measured as 110 min by linear fitting.
2. Discussion

Since the first description of childhood DS by Villet in 1978 [4], DS has been recognized as a major complication of Nissen fundoplication in young children [5]. Symptoms can be divided into early dumping, which occurs in the first 30 min after a meal, and late dumping 90–180 min after a meal. The exact pathological mechanisms underlying early DS after Nissen fundoplication remain unknown in most cases but can be explained in several ways. Physiologically relaxation of the fundus after ingestion of food is interrupted by fundoplication, and therefore intragastric pressure rises after food ingestion [6]. Increased intragastric pressure results in accelerated gastric emptying, especially when pyloroplasty is added to fundoplication [7]. Rapid delivery of undigested, hyperosmolar contents induces fluid shift into the bowel and increases intestinal blood flow, resulting in decreased circulating blood volume [8]. These mechanisms provide a clear understanding of the development of vasomotor symptoms in early DS. The patient herein described underwent pyloroplasty and showed rapid gastric emptying, provoking early DS. Although early or late DS have also been observed after Nissen fundoplication without pyloroplasty [5], the patient’s symptoms greatly improved after pyloric reconstruction, and DS might have been avoided if pyloroplasty had not been attempted in this patient.

There have been conflicting results on the usefulness of drainage procedures, such as pyloroplasty, after Nissen fundoplication [9]. Recent research advocates additional vagotomy and pyloroplasty after Nissen fundoplication in neurologically impaired children to avoid repeat surgery [10]. Due to these results, we performed vagotomy and pyloroplasty in our patient with cerebral palsy and associated quadriplegia. Although our patient experienced an adverse effect after pyloroplasty, we also advocate additional vagotomy and pyloroplasty after Nissen fundoplication in neurologically impaired children given the risk of repeat surgery and possibility of pyloric reconstruction after pyloroplasty.

DS are treated by dietary modification and time as the patients adapt to the condition. However, some patients will require medications, and in about 1–5% of cases, the symptoms are refractory to dietary modification and medications and eventually require surgical intervention [11,12]. Pyloric reconstruction was first attempted by Regan et al. in 1972 [13], and several studies have reported favorable outcome in adult patients [14,15]. This is the first case report of pyloric reconstruction successfully performed in an infant. To achieve successful pyloric reconstruction, Regan emphasized the importance of creation of a wide pyloric ring, which is wide enough to accommodate an index finger [13]. Also, Cheadle et al. emphasized the importance of restoration of alignment of the pyloric ring [3]. As there were no references regarding pyloric reconstruction in infants, we aligned and reapproximated the pyloric ring and confirmed the passage of a 28-Fr rubber catheter. This size could be a reference to reconstruct the pylorus after pyloroplasty in infants.

3. Conclusions

In summary, we treated refractory early DS that developed after Nissen fundoplication and pyloroplasty with pyloric reconstruction in an infant. Pyloric reconstruction is technically easy and fundamentally corrects the mechanical cause of early DS. Linear alignment of the pyloric ring is of paramount importance, and passage of a 28-Fr catheter through the reconstructed pyloric ring may be enough to prevent the recurrence of DS in infants.

References