Antro-Pyloric Abnormalities

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Introduction

In pediatrics, a great number of disorders, in addition to idiopathic hypertrophic pyloric stenosis of the infant, affect the antro-pyloric region. Ultrasound (US), using high-frequency transducers operating between 6 mHz and 12 mHz, has proven its accuracy in demonstrating the antral and pyloric wall. With the patient in supine position, the probe is positioned transversely in the epigastric area, slightly to the right of midline, and rotated slowly to visualize the long axis of the distal stomach (Fig. 3.1). In the rare situations where the antrum and pylorus cannot be found, they are easily shown by having the patient drink water or by instilling fluid through a nasogastric tube.

Fig. 3.1. Axial transverse scan. The pylorus (arrow) is found anterior to the pancreas and mesenteric root, left to the gallbladder. 1 spine, 2 right kidney, 3 gallbladder, 4 aorta, 5 inferior vena cava, 6 superior mesenteric vein, 7 superior mesenteric artery

3.1 The Antro-Pyloric Region: Normal Aspect

Sonography of the normal gastric wall (Stringer et al. 1986) delineates five distinct layers (Fig. 3.2), from the luminal side:
  ● A first hyperechoic layer representing the interface between gastric fluid and the epithelial surface (Lim and Jeong 1994)
  ● A second hypoechic layer representing the deep mucosa and muscularis mucosae

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A third hyperechoic layer representing the submucosa
A fourth hypoechoic layer representing the muscularis propria
A fifth hyperechoic layer representing the serosa

The aspect of gastric fundus and antrum changes with the amount of gastric content: the increased thickness and multinodular appearance of the two first inner layers when the stomach is empty (Fig. 3.3, Fig. 3.4) disappear with gastric filling. In contrast, the pyloric canal keeps same aspect (Fig. 3.3).

Several measurements have been proposed to define the normal pyloric pattern: the pyloric length (PL), pyloric diameter (PD), muscle thickness (MT), and pyloric volume \[PV = \pi \times (PD/2) \times PL\]. In 97 asymptomatic patients, Rohrschneider et al. (1998) determined normal values: \(PL = 9.8\pm2.0\) (range 3-15), \(PD = 8.4\pm1.7\) (range 5.5-14), \(MT = 1.8\pm0.5\) (range 0.8-2.9) and \(PV = 0.6\pm0.3\) (range 0.2-2.2). The more reliable criteria was reported to be the muscle thickness, which was most precisely measured and always less than 3 mm. O’Keeffe et al. (1991) found an antro-pyloric muscle thickness equal or less than 2 mm in 98% of a population of 99 normal infants. Finally, it increases linearly with gestational age, as demonstrated by Argyropoulou et al. (1998), and rises from 1.05±0.09 in 26- to 28-week old pre-term babies to 1.76±0.24 in full-term neonates.

At the level of gastric antrum or fundus, detection of a wall thickening requires that the stomach is filled enough.

Finally, real-time sonography enables evaluating antral contractility, pyloric channel opening (Figs. 3.5, Fig. 3.6), and gastric emptying.

**Fig. 3.2.** Longitudinal axis of the distal stomach. Fluid-filled lumen (lu). Multilayered aspect of the antro-pyloric wall: 1st (mucus and superficial mucosa) hyperechogenic (1), 2nd (deep mucosa) hypoechogenic (2), 3rd (submucosa) hyperechogenic (3), 4th (muscularis propria) hypoechogenic (4), 5th (serosa) hyperechogenic (5). P pancreas, MV superior mesenteric vein, MA superior mesenteric artery

**Fig. 3.3a,b.** Full-term neonate before feeding. The wall of the fundus and body of stomach (a) is multilobulated (curved arrow), contrasting with a linear aspect (b) at the antrum and pylorus (arrowhead). Gastric lumen (thin arrows). DB duodenal bulb, DJA gas-filled duodeno-jejunal angle