US evaluation of infantile hypertrophic pyloric stenosis before and after pyloromyotomy

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Section: Paediatric radiology
Area of Interest: Abdomen Stomach (incl. Oesophagus)
Procedure: Diagnostic procedure
Imaging Technique: Ultrasound
Special Focus: Dysplasias Eating disorders Case Type: Anatomy and Functional Imaging
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Patient: 2 months, male

Clinical History:
An infant was admitted to the hospital with multiple episodes of projectile and nonbilous vomiting for the last 3 days. An “olive shaped” mass was palpated in the lower inner aspect of the right upper quadrant. The infant was referred for ultrasound.

Imaging Findings:
Ultrasound revealed thickening of the pyloric muscle. The pyloric diameter (PD) was 12.7 mm. The pyloric muscle thickness (PMT) was 6.3 mm and the length of the elongated pylorus (PL) was 24.7 mm. (Fig. 1a-d) The patient underwent surgery. 3 days after the operation, the anterior part of the pylorus’s PMT was reduced to 2.2 mm and the posterior part’s PMT to 5.2 mm. 1 month after the operation, the anterior part of the pylorus had a PMT of 1.9 mm. The posterior part of the pylorus was also further reduced.

Discussion:
The incidence of infantile hypertrophic pyloric stenosis (IHPS) in Europe is 0.2%. IHPS affects predominantly boys (ratio 4.2:1) and its exact cause is still poorly understood.
IHPS refers to the gastric outlet obstruction and is the most common surgical cause of vomiting in infants. A palpable “olive-shaped” mass and visible abdominal peristaltic waves constitute the main clinical findings. [1, 2]

Ultrasound of the antropyloric region has been used in the diagnosis of IHPS since the first reports. It is actually the examination of choice with sensitivity ranging from 76 to 100% and specificity from 85-100% thus having replaced barium studies. [1, 3]

The main ultrasound parameters include PMT, PD and PL. The diagnosis is posed when PMT >3mm, PD >10mm and PL >16mm although the numeric values for these parameters have varied in the literature. Dynamic evaluation of pylorus with passage of the gastric content excludes IHPS. Colour Doppler ultrasound reveals increased blood flow in a hypertrophic pyloric muscle. [4, 5, 6, 7]

Pyloromyotomy is the treatment of choice, with mortality lower than 2% and minimal complication rates (duodenal perforation, incomplete pyloromyotomy, wound infection, dehiscence or incisional hernia). [8]
conservative treatment approaches have been undertaken with various success rates. [1, 4]
In cases requiring surgery, PMT, PD and PL are ultrasonographically evaluated before and after surgery. The thickness of the pyloric muscle increases 1 week after pyloromyotomy whereas it significantly decreases 1 month postoperatively and it reaches the normal values 8 months after surgery. Accordingly, the PD slightly increases the first week after surgery and then gradually decreases to reach its normal value one year postoperatively. The anterior part of the pyloric muscle usually normalizes first, measuring less than 3mm after 3 months. The posterior part normalizes later, usually after 5 months. At this point, the pylorus can be again depicted as an elongated ring. The PL value decreases faster and in many cases becomes normal after 4 months. Unlike ultrasonographic measurements which need time to normalize, clinical improvement is seen immediately after the surgery. Post treatment ultrasound of the pylorus may be requested if vomiting persists. [5, 9, 10]
The incision of the pyloric muscle is ultrasonographically visible as a wedge, 3 days after the operation. The pylorus gradually resembles to a flat tire (days 7-14) and eventually takes the shape of an elongated ring. [11]

**Differential Diagnosis List:** Infantile hypertrophic pyloric stenosis before and after successful surgery., Infantile hypertrophic pyloric stenosis, Non obstructive pyloric hypertrophy, Pylorospasm, Reflux, Hiatal hernia

**Final Diagnosis:** Infantile hypertrophic pyloric stenosis before and after successful surgery.

**References:**


Description: Short axis scan of the pylorus shows the “target sign”. The anteroposterior PD is 13 mm.
Origin: Radiology Department, General Hospital « GENNIMATAS » of Thessaloniki, Thessaloniki, Greece.
**Description:** Long axis scan of the pylorus shows the “cervix sign” with a PL of 24.7 mm. The maximum PMT is 6.3 mm. **Origin:** Radiology Department, General Hospital « GENNIMATAS » of Thessaloniki, Thessaloniki, Greece.
Description: Long axis scan of the pylorus depicts the “double line” and “nipple sign”. Origin: Radiology Department, General Hospital « GENNIMATAS » of Thessaloniki, Thessaloniki, Greece.
Description: Long axis scan of the pylorus depicts bidirectional increased blood flow signals with e-FLOW. Origin: Radiology Department, General Hospital « GENNIMATAS » of Thessaloniki, Thessaloniki, Greece.
Description: We can see a wedge at the site of the incision of pylorus 3 days after pyloromyotomy. Diagram showing the wedge in the anterior part of the pyloric muscle which corresponds to the incision.

Origin: Radiology Department, General Hospital « GENNIMATAS » of Thessaloniki, Thessaloniki, Greece.
Description: Short axis scan of the pylorus shows the “flat tire” morphology of the pylorus, 7 days after pyloromyotomy. Diagram of the “flat tire” morphology of the pylorus. Origin: Radiology Department, General Hospital «GENNIMATAS» of Thessaloniki, Thessaloniki, Greece.
Description: Short axis scan of the pylorus shows passage of the stomach fluids. The anterior part of the muscle was decreased to 1.9 mm. A diagram is also shown, describing the “elongated ring” morphology of the pylorus. Origin: Radiology Department, General Hospital « GENNIMATAS » of Thessaloniki, Thessaloniki, Greece.
Description: Long axis scan of the pylorus shows unobstructed passage of the stomach fluids. Origin: Radiology Department, General Hospital « GENNIMATAS » of Thessaloniki, Thessaloniki,