Until the advent of the ultrasonographic investigation of the gastroesophageal reflux (GER) proposed by Naik and Moore in 1984 and many others after Wright et al. (1988), imaging of the esophago-gastric junction (EGJ) required some invasive methods, such as the conventional irradiating barium upper gastrointestinal tract opacification or endoscopic investigation that required sedation. It has been clearly demonstrated that the upper gastrointestinal conventional barium exploration has a poor sensitivity against reflux disease (43%), and, for this reason, many authors suggest starting with an endoscopic investigation or 24-h pH monitoring. Barium examination can sometimes still be reserved for some patients under 1 year of age, for those undergoing surgery and, finally, for those with negative pH monitoring but who are strongly suspected of suffering from a pathological reflux (Al-Khawari et al. 2002). Ultrasound has a better sensitivity than barium studies in detecting small hernia. In addition, functional data can also be acquired by this technique. The aim of any imaging procedures in the field of gastroesophageal reflux disease (GERD) is to search for a permanent or a transient sliding gastric hernia, because an anatomic abnormality of the EGJ may be a factor for persistent symptoms and difficulties in treating the GERD (Gomes and Menanteau 1991; Halkiewicz et al. 2000).

Among the anatomic factors that contribute to preventing a GERD, such as the esophago-diaphragmatic membrane and the lower esophageal sphincter, the length of the abdominal esophagus seems to be crucial. There is a relationship between endoscopically proven esophagitis and the esophageal abdominal segment length (Antunes et al. 1998). In 560 endoscopic examinations performed on infants with severe vomiting, no esophagitis was found without endoscopic herniation of the EGJ (Gomes et al. 1993). But an accurate assessment of the length of the sub-diaphragmatic esophagus by sonography requires a careful measurement under strictly defined conditions (Gomes et al. 1993). To prove a GER due to a sliding hernia, sonographic imaging of the EGJ represents an efficient non-irradiating diagnostic tool that does not require sedation. Compared with more invasive and technically demanding methods, such as 24-h intraesophageal pH monitoring, sonography is a cheap, rapid and innocuous method; sonography is capable of easily imaging the stomach, the pylorus, the duodenum, the superior mesenteric vessels and the first intestinal loops simultaneously. Using the now available...
high-frequency ultrasonic probes (particularly for small infants), the visualization of more and more tiny details of the different layers of the abdominal esophagus and the surrounding structures, such as the right crus of the diaphragm, is now feasible. Even though the 24-h intra-esophageal pH monitoring is still the gold standard, sonography may be considered as an alternative first imaging method, as opposed to other more sophisticated investigations.

After a learning period, it seems now essential to assess by ultrasound not only the anatomy of the EGJ but also the emptying delay of the stomach rather than the reflux itself. Except for the rare occurrence of the occult clinical reflux, it is actually more useful to detect any anatomic anomaly than to detect the reflux itself, which may be purely accidental during a short period of examination. However, the diagnostic value of the frequency of the reflux is questionable, because it is known that as many as 40 refluxes during 24 h (1.6 reflux per hour) may be physiological. Thus, from a statistical point of view, a 10-min sonographic examination can probably fail to show a pathologically frequent reflux.

2.1 Clinical Findings

Regurgitation, choking, irritability, failure to thrive, apparent life-threatening event or wheezing and recurrent upper airway infections represent the most current and classical symptoms related to GERD. The majority of infants with a GERD resolve their symptoms within 3-6 months after the initiating treatment ([Tolia 2003]. With older children, recurrent abdominal pain and heartburn may be an indication for esophageal investigation. However, the definition of the GERD is still controversial. The day-to-day variability of the spectrum of GERD is obvious, and there is no definitive clinical or imaging finding that can be used by the caregivers. For example, although the 24-h esophageal pH monitoring should be accepted as the gold standard, in the course of the GERD, many infants, despite a negative pH test, need to be treated until the symptoms have improved ([Tolia et al. 2003].

An endoscopically proven esophageal inflammation during the natural course of a GERD in children ([Ashorn et al. 2002]) surprisingly occurs in a relatively low proportion of cases: 29%. Moreover, control endoscopy shows no progression of the histological lesions. The majority of the refluxing children do not present severe esophagitis during the course of their disease.

2.2 Technique

To avoid the current physiological post-prandial reflux and to assess the gastric emptying delay, the examination is done 1 h after the last meal. The patient is asked to lie down on his back, and the sonographic transducer is placed over his epigastrium just below the xiphisternum to the left side from the median line. A slight left tilting of the ultrasonic field in the sagittal plane images the subdiaphragmatic portion of the esophagus and the GER through the left lobe of the liver. In the first year of an infant’s life, the image of the EGJ can be tremendously increased using a high-frequency ultrasonic transducer (Fig. 2.1). An axial image of the EGJ shows the right crus of the diaphragm, shows the esophageal hiatus and allows for a more precise measurement of the transverse diameter of the esophagus than the longitudinal view (Fig. 2.3). A slight moving of the probe down in the same axis easily images the gastric cavity, the pylorus, the duodenum and the superior mesenteric vessels to find any other gastrointestinal malformation that would eventually be an etiological factor.

Sometimes it may be useful to image the EGJ during a swallowing through the lower thoracic esophagus.