ULTRASOUND DIAGNOSIS OF DUODENAL OBSTRUCTION – KEY POINTS AND PITFALLS

C.M. Badiu, G. Lupu, Laura Stroică, T. Marinescu, Al.T. Ispas
“Carol Davila” University of Medicine and Pharmacy
Department of Anatomy

ULTRASOUND DIAGNOSIS OF DUODENAL OBSTRUCTION – KEY POINTS AND PITFALLS (Abstract): Prenatal ultrasound is able to detect a wide range of abnormalities of the gastrointestinal tract. Diagnostic suspicion of such anomalies should be regarded with caution, because there is a great amount of normal ultrasound images of the segments of the digestive system, some of them being easily confused with pathological aspects. Duodenal atresia and stenosis are between the most common causes of fetal bowel obstruction. The prevalence of duodenal atresia is 1:5000 to 1:10000 live births. It is associated in 30% of cases with Down syndrome, but also with other bowel atresias, cardiac malformations and VACTERL syndrome. Prenatal ultrasound diagnosis of duodenal stenosis and atresia is based on identification of the polyhydramnios associated with the image of the “double bubble” in the upper abdomen of the fetus. For the correct use of the term “double bubble” the connection between the two structures containing liquid must be proven. If this connection cannot be viewed, other possible diagnoses must be taken into consideration. Key-words: DOUBLE BUBBLE, PRENATAL, ULTRASOUND, DUODENAL ATRESIA, STENOSIS

INTRODUCTION
Prenatal ultrasound is able to detect a wide range of abnormalities of the gastrointestinal tract. Diagnostic suspicion of such anomalies should be regarded with caution, because there is a great amount of normal ultrasound images of the segments of the digestive system, some of them being easily confused with pathological aspects. Likewise, pathological processes of other organs may present at ultrasonographic examination similar images as the dilated bowel (1,2).

ETIOLOGY AND EPIDEMIOLOGY
Duodenal atresia and stenosis are between the most common causes of fetal bowel obstruction. In the first 24 hours after birth, usually after the first feeding, the newborn presents bilious or nonbilious vomiting. Prenatal ultrasound can make the diagnosis, but if this wasn’t possible, it can be also diagnosed with plain Xray examination immediately after birth (3).
Duodenal atresia and stenosis are usually located distally to ampulla of Vater. Fail of recanalization of duodenal lumen during 8 to 10 weeks of gestational age may lead to these two conditions. A rare cause can be a duodenal web which creates the classical image of a “windsock” deformity (4). The stenosis means incomplete obstruction, and atresia complete obstruction of duodenal lumen. The prevalence of duodenal atresia is 1:5000 to 1:10000 live births. It is associated in 30% of cases with Down syndrome, but also with other bowel atresias, cardiac malformations and VACTERL syndrome (3, 5).

ULTRASOUND DIAGNOSIS
Prenatal ultrasound diagnosis of duodenal stenosis is based on identification of the polyhydramnios (present in 50% of cases after 24 weeks) (3) associated with the image of the “double bubble” in the upper abdomen of the fetus. (fig. 1). The “double bubble” image is due to a dilated stomach filled with fluid in the upper left quadrant (first bubble), accompanied by a duodenal bulb also dilated, located at the right of the stomach (second bubble, often cir-
cular and blind ended) (fig. 2). A small amount of gas can be detected distally to the site of obstruction (on X-ray images after birth) (3,6).

This image corresponds to “double bubble” gaseous content viewable on the postnatal radiological images in newborns with duodenal atresia. The presence of two “bubbles” filled with fluid in the upper portion of the fetal abdomen do not necessarily indicate the existence of a duodenal atresia (fig. 3). To strengthen the suspicion of this diagnosis, the second “bubble” must be placed in the position of the duodenal bulb, usually immediately to the right of the midline. If the second “bubble” is not located in the classic position of the duodenal bulb, the term “double bubble” should not be used, because it presupposes the existence of a duodenal obstruction. Differential diagnosis in this case depends on the appearance and location of the second “bubble”. For example, although a cyst on the left side of the fetal abdomen, visualized in the same plane as the stomach, can give the impression of “double bubble”, the second bubble is rather a renal cyst, splenic cyst or gastric duplication (7). Even if the second “bubble” is located in the right upper quadrant, in approximate position of the duodenal bulb, for there to be the image of the “double bubble” the connection between the two structures containing liquid must be proven. If this connection cannot be viewed, other possible diagnoses must be taken into consideration.

The most common diagnosis of a cystic formations in right upper quadrant is coledocian cyst, although the doctor may take into account other differential diagnoses such as renal, hepatic, ovarian or omental cysts (8). Although a cystic renal mass can be confused with a di-
lated stomach and duodenum, the dilated renal mass is closer to the spine than the stomach. One of the pitfalls of diagnosis that must be taken into account before confirming the diagnosis of duodenal atresia, is that some images may capture two sections of an otherwise normal stomach, creating the false appearance of “double bubble” (9). This error can be surmounted if the examination is done in the transverse plane and the typical appearance of pyloric antrum can be visualised.

The “double bubble” sign in patients with Down syndrome is highly predictive for duodenal atresia or stenosis, because the prevalence of these anomalies in this group of patients is higher than in the general population (fig. 4). Usually, no other examinations are necessary to confirm the diagnosis before surgery.

The simple presence of the “double bubble” image is not only caused by duodenal atresia, but also by any duodenal obstruction, including volvulus, Ladd bands, annular pancreas or obstruction caused by intestinal duplication.

**CONCLUSIONS**

Survival rate after surgical intervention in cases with duodenal atresia not associated with other anomalies is greater than 95%. The management of such cases is better to be done by a multidisciplinary team, including the obstetrician, the pediatrician, the pediatric surgeon, the geneticist. The prenatal diagnosis is not easy, but is very useful for the patient’s outcome, so the knowledge of the various aspects of stomach and duodenum fetal ultrasound is mandatory for a correct management.

**REFERENCES**


*Corresponding author*

Al.T. Ispas
e-mail: doruispas@yahoo.com