THE USE OF ABDOMINAL ULTRASOUND AS A SCREENING METHOD IN THE NEONATAL AND INFANT PERIOD – IS IT USEFUL?

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Abstract

Introduction: In recent years' abdominal ultrasound has become a very useful and accessible method for exploring the pediatric gastrointestinal pathology. Study objective: Assessing the need to perform an abdominal ultrasound in the neonate and infant, as a screening procedure, in order to find evidence of malformative or tumoral pathology. Methods: Abdominal ultrasounds were performed on 769 patients hospitalized in our clinic during July 2013 - March 2015. The patients were aged between 0-1 years, with an average of 3 ± 2.5 months. Of these, 450 patients (58.51%) received a routine abdominal ultrasound without any clinical evidence to justify this investigation. Results: The most common pathology was that of the reno-urinary tract: renal malformations – 1 case (cystic renal dysplasia), Ist and IInd degree hydronephrosis – 75 cases (16.67%), IIIrd and IVth degree hydronephrosis – 18 cases (4%); other findings consisted in ovary cysts – 39 patients (8.6%), vascular portal malformations – 5 cases (1.1%), digestive malformations (midgut cyst) – 2 cases (0.04%), tumoral pathology – 10 cases (2.2%), congenital spleen cyst – 1 case. Discussions: The relatively high prevalence of abdominal pathology (75 cases, 28%) detected accidentally by performing routine abdominal echography in these patients has not changed the therapeutical approach in 92% of cases. 6 cases were subject to surgical referrals. 2 cases required immediate surgery (neuroblastoma and nephroblastoma), while other 2 cases would undergo surgery at a later stage. Conclusions: Abdominal ultrasound during the neonatal period and infancy is important in order to establish a complete diagnosis and subsequent monitoring of these cases.

Keywords: abdominal ultrasound, screening, newborn, infant

Introduction –

The purpose of the paper The most common pathology was that of the reno-urinary tract: renal malformations – 1 case (cystic renal dysplasia) (Figure 1), Ist and IInd degree hydronephrosis – 75 cases (16.67%), IIIrd and IVth degree hydronephrosis – 18 cases (4%); other findings consisted in ovary cysts – 39 patients (8.6%) (Figure 2), vascular portal malformations – 5 cases (1.1%), digestive malformations (midgut cyst) – 2 cases (0.04%) (Figure 3), tumoral pathology – 10 cases (2.2%), congenital spleen cyst – 1 case (Table 1).

Infection diseases represent a matter of highest Ultrasound scanning is a painless, safe, radiation and side-effect free examination. It is the most commonly used diagnostic imaging method. Abdominal ultrasound is increasingly used as part of the initial patient evaluation, without a specific indication. However, such an indiscriminate use of abdominal ultrasound is still controversial. The primary screening examination of asymptomatic persons leads to clinically relevant findings in less than 0.5% of cases (1).

The aim of the present study is to evaluate the benefit of routinely performing abdominal scans on newborns and infants with a view to detecting possible abnormalities. The scans applied to children who had not beneficiated of antenatal ultrasounds, but also to patients monitored during pregnancy, to find malformations which may have been missed ante-natally.

Material and method

Abdominal ultrasounds were performed on 769 patients hospitalized in our clinic during July 2013 - March 2015. The patients were aged between 0-1 years, with an average of 3 ± 2.5 months. Of these, 450 patients (58.51%) received a routine abdominal ultrasound without any clinical evidence to justify this investigation.

The scans were performed using a portable ultrasound scan (USS) (General Electrics – Logique e) machine with Doppler facilities. Multiple views of the abdomen were acquired to visualize all the abdominal organs. If neonatal hydronephrosis was present, the Society for Fetal Urology, America (SFU) grading was used. Neonates with abnormal USS findings had follow-up scans (2).

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Table 1. Abnormal USS findings at initial scans.

Total	Normal USS	HNI/II	HN III/IV	Ovary cysts	Tumors	Vascular abnormalities	Digestive malformation	Spleen cyst
450	299(66.4%)	75 (16.67%)	18 (4%)	39 (8.7%)	10 (2.2%)	5 (1.1%)	2 (0.4%)	1 (0.2%)

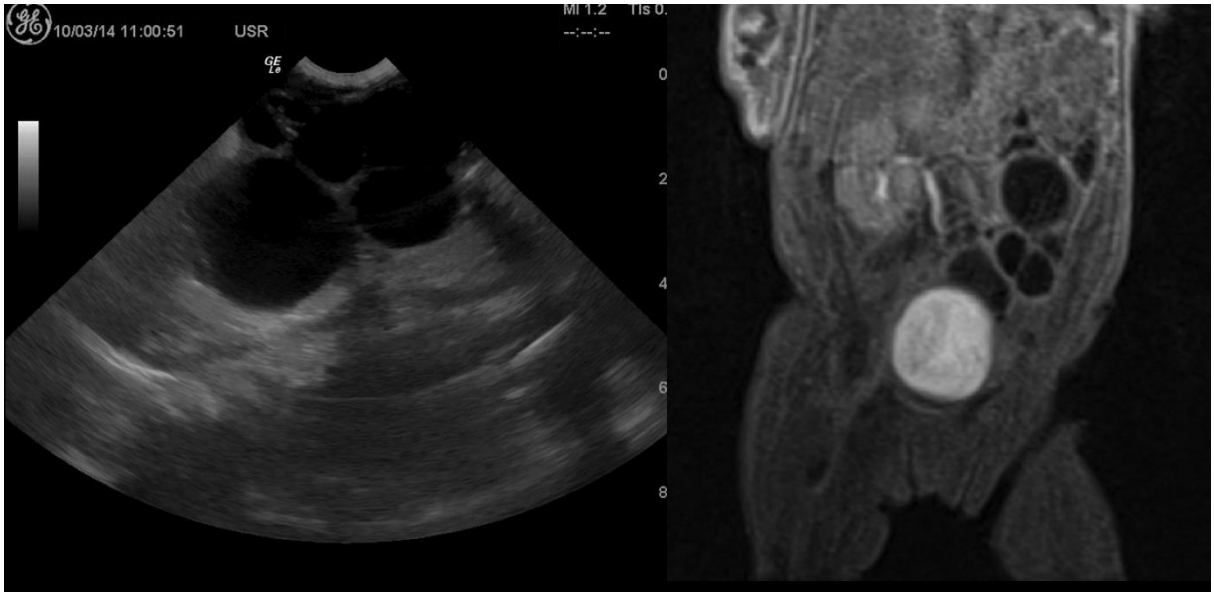
HN-hydronephrosis, USS-ultrasound scan

Results

The most common pathology was that of the reno-urinary tract: renal malformations – 1 case (cystic renal dysplasia) (Figure 1), Ist and IInd degree hydronephrosis – 75 cases (16.67%), IIIrd and IVth degree hydronephrosis – 18 cases (4%); other findings consisted in ovary cysts – 39 patients (8.6%) (Figure 2), vascular portal malformations – 5 cases (1.1%), digestive malformations (midgut cyst) – 2 cases (0.04%) (Figure 3), tumoral pathology – 10 cases (2.2%), congenital spleen cyst – 1 case (Table 1).

The tumoral pathologies detected were: one hemangioendothelioma, one intrahepatic calcification without any evident clinical or biological sign of an infectious disease (Figure 4), one neuroblastoma in an 8 month old infant addmited for fever, one 3 mm nephroblastoma in a 10 month old infant addmited for bronchiolitis (Figure 5), one pancreatic lesion in a 10 month old girl with a suspicion of tuberous sclerosis (Figure 6), 4 cases of hemangiomas, one ectopic intraabdominal testicle.

The vascular abnormalities found were 3 cases of portal cavernoma, one case in an 7 month old boy with hydronephrosis grade III on the restant kidney after nephrectomy who developed 2 months later portal cavernoma (Figure 7 a, b). Another vascular abnormality (heterotaxic syndrome) was discover in a 1 month old girl with polisplenia (Figure 8 a, b).



a. USS examination b. MRI examination

Fig. 1. Cystic renal dysplasia in a 20 day old girl

Fig. 2. Ovary cyst

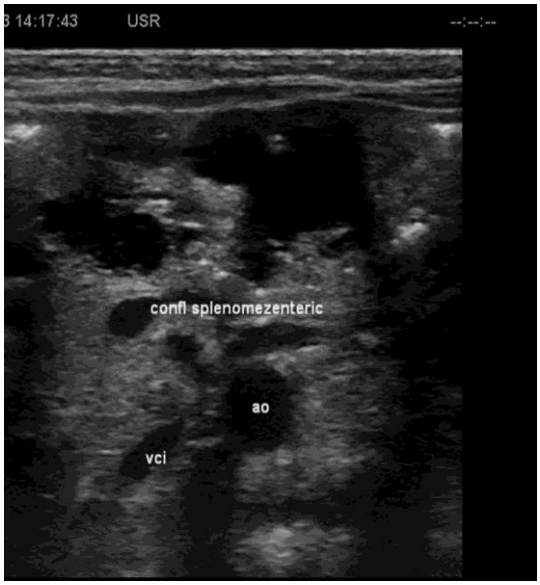


Fig. 3. Midgut cyst in a 7 day old boy

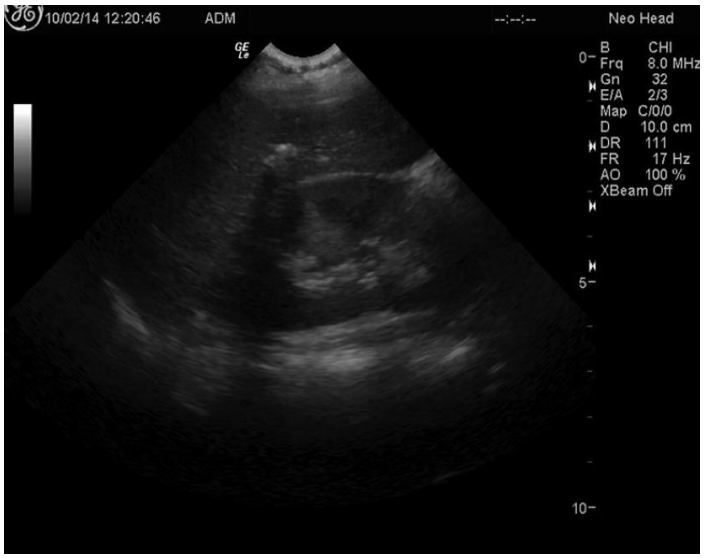
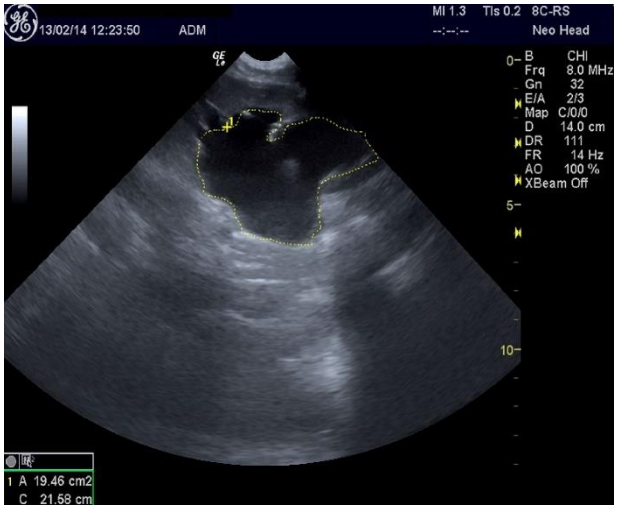


Fig. 4. Intrahepatic calcification of unkown ethiology

Fig. 5. Nephroblastoma

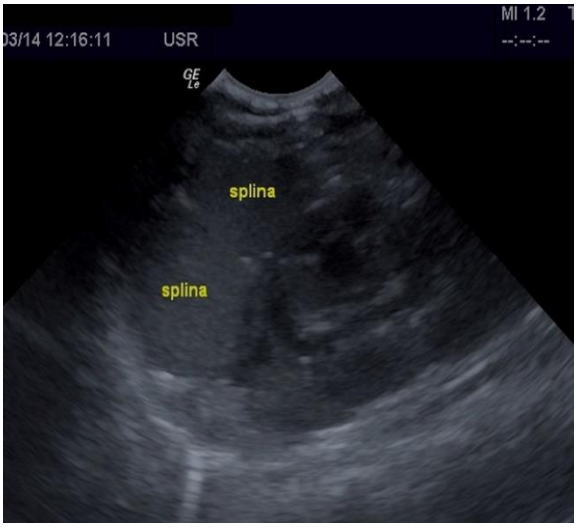
Fig. 6. Pancreatic lesion

a. Portal cavernoma in an 9 month old boy

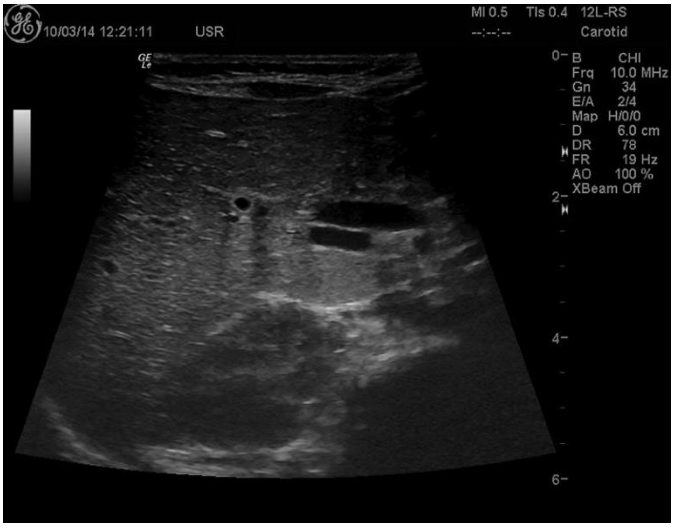


b. Grade III hydronephrosis on the restant kidney in the same 9 month old boy

Fig. 7.



a. Polisplenia



b. Visualisation of azygos vein posterior to portal vein, anterior and on right side of the aorta

Fig. 8. Heterotaxic syndrome

Discussion

The relatively high prevalence of abdominal pathologies (151 cases, 33.5%) detected accidentally by performing routine abdominal echographies in these patients has not changed the therapeutical approach in 92% of cases; they remained on a follow-up schedule.

In a study performed by Tato and Zoller (1) approximately 50% of the persons examined had abnormal findings without clinical relevance. The authors of this study concluded that this high frequency of abnormal findings may cause high costs due to unnecessary follow-up examinations.

Ovarian cysts are seen more frequently than expected in the neonatal period. In our study, they were incidentally discovered in 8.8% of cases. Ovarian cysts are the rule, not the exception in newborn infants. Nowadays, the routine use of ultrasound allows the detection of ovary cysts during the neonatal period. Ovary cysts with a diameter exceeding 4 cm are considered pathological. The incidence of ovarian cysts has been estimated at more than 30% (this estimate is based on an investigation of stillborns or infants who died within 28 days of birth) (2). The correlation of the diameter with the clinical symptoms and ultrasound appearance allows an optimal therapeutic approach (3). Their presence is attributed to immaturity of the hypothalamic–pituitary–ovarian axis (“gonadostat”) (4).

On prenatal ultrasound, the fetal abnormalities most frequently detected are those of the urinary system. Of these, hydronephrosis is the most common, seen in about 50% of such cases (5), and it most often occurs in males (6). For cases of hydronephrosis not diagnosed in utero, the role of postnatal abdominal ultrasound will be to determine the cases due to obstruction, which can lead to renal damage and therefore require surgical intervention or long term follow-up of renal function. Up to 60% of antenatally detected cases of hydronephrosis resolve spontaneously (7, 8) and the threshold for spontaneous resolution of fetal or neonatal hydronephrosis has been established at renal pelvis diameter between 5 - 20 mm and SFU grade I to II by several authors (9, 10). This corroborates with findings in this study where persistent hydronephrosis was only seen in cases with SFU grades III and IV up to four months of age. It is however generally agreed that conservative management options should initially be considered for most patients. In our study hydronephrosis was the most frequent abnormality detected on USS. Grade I and II were detected in 16.67% of cases, with a good outcome on follow up.

Out of the 450 patients screened, only 6 (1.3%) were subject to surgical referrals. Two cases required immediate surgery (one case of neuroblastoma with poor outcome and one case of nephroblastoma discovered in stage 1 with very good prognosis). Other two cases would undergo surgery at a later stage (one case of renal dysplasia and one case of grade III hydronephrosis associated with portal cavernoma). The two cases of midgut cyst without any digestive symptomatology required USS follow up.

Conclusions

Abdominal ultrasound in the neonatal period and infancy is important in order to establish a complete diagnosis and subsequent monitoring. It can be extremely useful in the detection of serious birth defects or tumoral pathology in a subclinical phase, is non-invasive, affordable, with a low cost/efficiency ratio. However, it is time consuming, therefore its use remains at the discretion of each physician. A sonographic screening of asymptomatic patients may nonetheless be useful for specific indications in preselected individuals.

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