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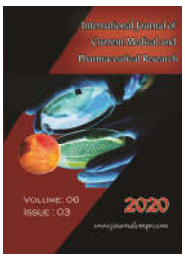

Research Article

THE TRANSFONTANELLAR ULTRASOUND IN A MOROCCAN NEONATOLOGY SERVICE

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ABSTRACT

Transfontanellar ultra sound is an easy and accessible exam for brain exploration in the newborn. The aim of studyis to evaluate its role in neonatology. We collected retrospectively 447 newborns at term and premature infants hospitalized in neonatology between the first of September 2010 and 31December 2017in which Transfontanellar ultra sound was indicated. The lesions were dominated by hyperechogenicity of thalami in 62 cases (44%), ventricular dilatation in 50 cases (35%) and diffuse cerebral edema in 37 cases (26%). Ultrasonography transfontanellar has an essential value in the initial diagnosis and monitoring of brain damage in the newborn and premature.

INTRODUCTION

The transfontanellar ultra sound represents the initial exploration technique in the brain of the newborn. It is easily, accessible and reproducible regardless of the patient's condition. It represents an essential tool for screening for various brain injuries in neonatology and the monitoring of their evolution [1]. Indeed, this is a very sensitive examination for hemorrhagic and ischemic lesions which also proved effective in infectious diseases and malformations.

Our study aimis to evaluate the role of thetransfontanellar ultrasound in neonatology, the description of different brain damage depending neonatal pathologies while discussing our main difficulties encountered in daily practice.

MATERIALS AND METHODS

This is a retrospective study of 447 infants hospitalized in neonatal unit of the University Hospital Mohammed VI Marrakech between the first September 2010 and 31 December 2017. It was premature newborns at term and post-mature. Were included all newborns in whom the exam was performed. It was indicated to neonatal suffering, premature birth, as part of a malformation balance sheet, a suspected infection in cerebral localization and to neonatal convulsions.
Data collection was conducted from clinical records with the help of farm return for the collection of results. A statistical study was performed according to the discoveries lesions, bleeding lesions, ischemic injury, ventricular dilatation, infections cerebral localization and malformations anomalies.

RESULTS

This is a serie of 447 newborns, of which 269 were male (60%) and 178 female (40%).In the 200 premature (45%) of our serie, the ETF was performed as part of the systematic review and revealed in 90 cases (45%) normal ETF and in 110 cases (55%) abnormal ETF distributed as follows, intraventricular hemorrhage in 90 cases (82%), periventricular leukomalacia in 17 cases (15%), ventricular dilatation in 2 cases (2%) and diffuse cerebral edema in 1 case (1%).

Among the 247 newborns born at term (55%), the ETF was performed in perinatal asphyxia in 135 cases and neonatal seizures in 81 cases and in 53 cases in neonatal infections (tobe reported an association of the ETF's lesions).ETF were normal in 107 cases (43%) and abnormal in 140 cases (57%), the abnormalities were distributed as follows: hyperechogenicity of thalami in 62 cases (44%), ventricular dilatation in 50 cases (35%), diffuse cerebral edema in 37 cases (26%), ventriculitis in 5 cases (3%), agenesis of the corpus callosum in 5cases (3%), intra-parenchymal hematoma in 2 cases (2%), cerebral ischemia in 2% of cases and cerebral thrombophlebitis in 1 case (1%) (an association of the lesions was noted).

DISCUSSION

The transfontanellar ultra sound represents the initial assessment of brain exploration in neonatology. It is characterized by its safety, its simplicity and low cost

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compared to other brain imaging methods [1, 2]. However, it has some limitations such as the size of the fontanelle, the seat of the lesion that sits outside the windows used and the operator-dependent nature. [1]

According to guidelines from the American Academy of Neurology, the transfontanellar ultrasound should be conducted in premature and in newborn term infants exhibiting signs of encephalopathy without perinatal asphyxia in two, between the seventh and the fourteenth day to view hemorrhagic or ischemic initial lesions that are often clinically silent, which could optimize their care. At this stage, the transfontanellar ultrasound could also identify birth defects in neonates with clinical signs of encephalopathy. The examination should be repeated between 36 and 40 weeks to identify cystic lesions in the white matter and ventricular dilatation with an impact on long-term neurological development [3].

In daily practice, the exploration is carried out through the anterior fontanelle, which explores the main brain structures. But this route is not adequate to visualize structures in tentorielles, accessible by alternative acoustic windows as the posterior Fontanelle, temporal or mastoid [1, 3]. This difficulty was also reported by our sonographers.

The majority of intracranial lesions are detectable at the transfontanellar ultrasound, especially hemorrhagic and ischemic. Nevertheless, it is less sensitive for lesions in the white matter or MRI finds it's stated [3, 4, 5]. According to a US study in 480 premature infants, it objectified as abnormal results of a late transfontanellar ultrasound and MRI were independently associated with impaired neurological development, or even death [2, 4]. Hencethe need to perform repeated examinations, often sufficient to detect these lesions if MRI is not available. [4] In our context, we resorted to repeated transfontanellar ultra sound, MRI is not a review of current practice because our patients are often low socio economic level.

Brain damage found in our study was quite variable. Indeed, intra-ventricular hemorrhage was the most sought pathology at thetransfontanellar ultrasound inpremature infants [5, 6]. Its frequency and intensity depend on the term and hemodynamic stability of the newborn. [7]

The occurrence of bleeding early, in 70% of cases in the second day of life in 90% of cases in the third day of life in very premature infants [3]. The data from our study showed a rate of intra-ventricular hemorrhage higher in term newborns or 21.8%, compared to 7.8% in premature infants. These results contrast with published data claiming that this lesion is the prerogative of prematurity [5, 6]. While in the new-born at term, intracerebral hemorrhages are the much less frequent, they are more related to a traumatic childbirth or a bleeding disorder. [7] This could be probably related to birthing methods in our communities.

The use of transfontanellar ultrasound in early hemorrhagic disease is amply justified by its high specificity and sensitivity [3, 5, 6]. It also allows the monitoring and detection of possible complications including hemorrhagic ventricular dilatation post-occurring days to weeks after the initial abundant hemorrhage [5] where the need for an early ultrasound examination especially in the first week of life in premature ventricular with taking measurements and then repeat it as much as is necessary in the context of monitoring [5].

The ischemic lesions visualized in our study are mainly peri-ventricular leukomalacia in preterm which is the second complication rate after intraventricular hemorrhage [6]. It concerns 5-10% of premature born before 33 weeks of gestation [8]. The ultrasound appearance corresponds to a hyper-intense echogenicity of the white substance ventricular perished whose evolution is towards cavitation in 2-3 weeks with a cystic appearance of images. Periventricular is exceptionally meet in the new-born at term, it appears later, in specific contexts of severe sepsis or chorioamnionitis, neonatal ischemic stroke [7], necrotizing enterocolitis of or viral infection [5].

The second is found ischemic anoxic ischemic encephalopathy (IAE), it affects the gray matter predilection newborn term [3]. The transfontanellar ultrasound e remains in this context a review of unscrambling because it is not contributory in detecting cortical lesions [3], it must be complemented by a brain MRI to describe more accurately, the extension of the lesions [3, 7]. In our study was detected in 2% newborns at term admitted for cerebral localization to infection. The diagnosis was made only on ultrasound data, based on clinical needs. IAE is generally considered a disease of the newborn at term; however it can affect preterm newborn too.

The cerebrovascular accident (CVA) is the third ischemic neonatal ischemic injury found; this is a common cause of neurological symptoms of the newborn term [3]. Convulsions or hypotonia are often the clinical signs of Appeal [3, 7, 9]. The transfontanellar ultrasound is often called insensitive in detecting ischemic lesions located or located in the posterior areas [3]. Note that early, the transfontanellar ultrasound may not detect these lesions, and it was not until the fourth day of life it allows the diagnosis in 87% of cases. It shows a hyperechoic cortico-subcortical triangular range erasure grooves systematized to a vascular territory usually MCA [3, 5, 9], sometimes with a pathological Doppler [9]. We emphasize the interest of repeat transfontanellar ultrasound even though the initial one is normal before any convulsion or hypotonia of the newborn.

Ventricular dilatation of any type was the most brain damage displayed by our transfontanellar ultra sound. She was associated with other lesions in 72% of cases and isolated in 28% of cases. Using a CT scan was needed for newborns with hydrocephalus isolated looking malformations escaped thetransfontanellar ultrasound. This expansion can be post infectious or Post hemorrhagic.

Hydrocephalus is an important complication of neonatal meningitis whose spontaneous evolution is marked by the occurrence of ventriculitis which ranks first and which may itself be complicated by hydrocephalus [10].

We emphasize the interest of thetransfontanellar ultrasound in the etiological diagnosis of positive expansion and monitoring of lesions.

For diagnosis of meningitis in our context, it was focused on the clinical signs data lumbar puncture, often at the stage of complications revealed to thetransfontanellar ultrasound. The main complications can be ventriculitis of sub dural empyema and brain abscess. Among the hospitalized cases of meningitis in our training, half was complicated by progressive

hydrocephalus. Our results are consistent with the literature on the role of thetransfontanellar ultrasound in the surveillance of meningitis complications [3]. Our study islimited study duration and a limited number of casesa study of a larger case would be desirable.

CONCLUSION

Through this work, the transfontanellar ultrasound keeps up an essential place in the neonatal units as it allows visualizing the majority of the lesions described in the literature and their monitoring. Its indications are multiple and varied. The training of more medical staff in its use could improve the care of newborns and premature babies to term in our neonatal units.

Competing Interests

The authors declare no competing interest.

Authors' Contributions

All authors have read and agreed to the final version of this manuscript and have equally contributed to its content and to the management of the case.

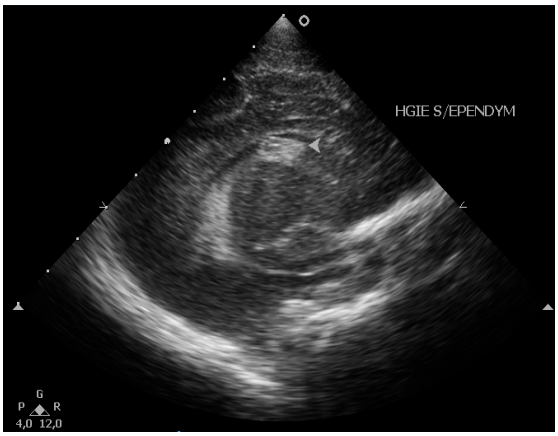

Figure 1 Aspect of sub ependymal hemorrhage.

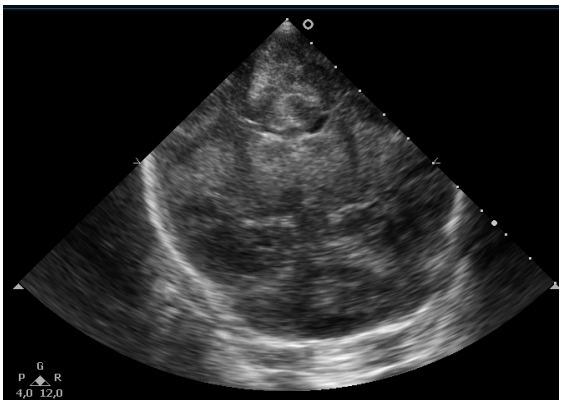

Figure 2 Aspect of cerebral edema following perinatal asphyxia.

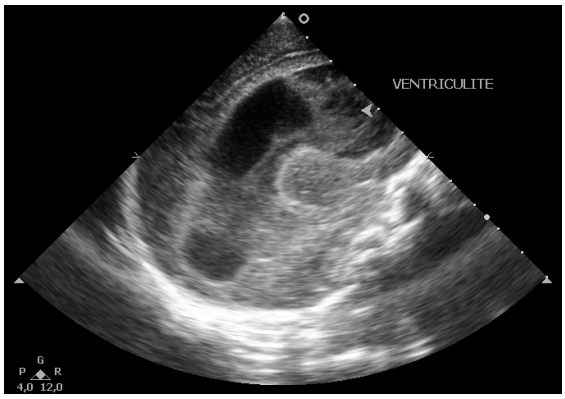

Figure 3 Aspect of ventriculitis.

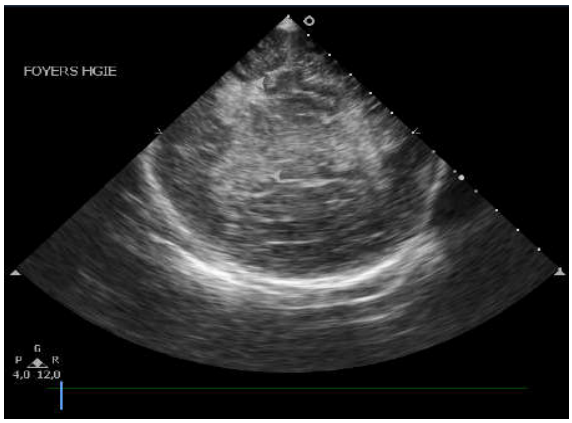

Figure 4 Aspect ofparenchymal hemorrhage (grade 4 of Papile).

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