Case report
Transfontanellae ultrasonography in infantile bacterial meningitis:
a case report

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Abstract:
Transfontanelle Ultrasonography was used in the management of a case that presented with bacterial meningitis. It is a rapidly executed and non-invasive technique that is useful in the diagnosis and monitoring of the progress of disease and response to treatment.

Keywords: Transfontanelle Ultrasonography, Bacterial Meningitis.

Resume
L'ultrasonographie transfontanella fut utilisee dans le traitement d'un cas de meningite bactereienne. C'est une technique rapidement executee et non-invahissante qui est utile dans le diagnostic et le controle des progres de maladie et la reaction au traitement.

Introduction:
The incidence of meningitis is considerably increasing in the neonates and infants, and up until recently its diagnosis and management has been mainly by bacteriological assessment of blood and cerebrospinal fluid and also at autopsy. The importance of ultrasound in demonstrating the brain has been recognized for some years and reported in the literature. More cases were then reported by using both the static and real time equipment.

The purpose of this report is to highlight the characteristic of ultrasonic features of the brain in a case of Bacterial Meningitis seen at the University College Hospital Ibadan, Nigeria and review of the literature.

Case Report
R.S. is a 5-month old female child referred from a private hospital to the children emergency unit of the University College Hospital Ibadan, with three weeks history of fever, refusal of feeds, convulsion and failure to respond to antibiotic therapy. The pregnancy and delivery were uneventful. There was no history of antecedent trauma.

On examination she was found to be small for age, mildly dehydrated and covered with scaly skin. There was mild pallor of the conjunctiva, with a body temperature of 40.9°C and the body was in sustained spasm of tonic and clonic type. There was associated neck stiffness and spastic rigidity in both upper and lower limbs. The anterior fontanelle was bulging under tension. A diagnosis of post meningitis brain damage and encephalitis was made.

At lumbar puncture the cerebrospinal fluid showed no organism but had 6 cell/cu mm and slightly traumatic. The subsequent ventricular tap cerebrospinal fluid, however, showed a pale yellowish fluid, 15 cells/cu mm, lymphocyte of 90%, polymorphs 10%, protein of 140mg%, but no organisms were seen. She was then started on chloramphenicol.

Transfontanelle ultrasonography revealed asymmetry of the lateral ventricles in the coronal scan. The left lateral ventricle, third and fourth ventricles were dilated. The lateral aspect of the body and the frontal portion of the right lateral ventricle were displaced medially by a poorly defined hyperechoic mass suggesting fluid collection in the sagittal scan (Fig. 1A&B). An ultrasonic diagnosis of hydrocephalus with a right fronto-parietal subdural collection was made. A subsequent right fronto-parietal subdural tap revealed straw colored fluid with some blood. Cytology of the tap showed zanthocromic fluid with a white blood count of 70/cu mm. This tap did not suggest subdural collection, but appears to be an inadvertent ventricular tap.

Patient was reviewed by the ophthalmologist, on request, two weeks following admission, who diagnosed bilateral blindness secondary to post meningitis optic atrophy. Patient has had two followup repeated transfontanelle ultrasonography examinations, which revealed...
progressive increase in dilatation of the ventricles and the subdural collection.

Discussion

Bacterial meningitis is responsible for 4% of neonatal deaths. The common organisms responsible for meningitis in children is Haemophilus Influenza, Group B, and Beta Hemolytic streptococcal infections, but the organism encountered most frequently in neonates are E. Coli and Group B streptococci. This case did not yield any bacteria, most likely due to the previous antibiotic therapy.

Males are affected more frequently than females (ratio 1.7:1) and predominantly under 4 years age group. Diagnosis is usually made by the presence of (i) purulent cerebrospinal fluid, (ii) isolation of bacteria, and (iii) the finding of gross or microscopic evidence of meningical inflammation at autopsy.

The introduction of Transfontanelle Ultrasonography has added further impetus to the diagnosis of meningitis in infancy and the monitoring of response to therapy. The important areas of interest in brain ultrasonography are (i) the brain parenchyma, (ii) the ventricles, and (iii) the subdural space. The examination is best carried out in the first 7 months of life when the fontanelle width usually varies from 20-40mm. At this time the common sequel of meningitis such as hydrocephalus and subdural effusion can be recognized.

Attempts at describing normal anatomical landmarks in anterior fontanelle ultrasonography by other workers were made by both Dewbury and Cremin. They both used a real time scanner with a transducer frequency of 5MHz. The brain was visualised in the two main sections, that is Coronal and Sagittal sections.

The usual abnormalities seen on brain ultrasound in meningitis have been well described. They are: (i) dilatation of the ventricles. This is the most common abnormality and it is usually caused by adhesion at the base of the brain. The standard for ventricular dilatation remains subjective, and dilatation can be asymmetrical in its early stage. This is best seen in the coronal section. But early dilatations are recognized in the sagittal sections. Also, the dilatations may involve all the ventricles depending on the extent of the adhesions. Our case showed dilatations of all the ventricles (Fig 1A). Strands, membranes and debris may be present in the ventricular cavity as septa. Periventricular echogenicity indicating ventriculitis is a common complication of meningitis, (ii) subdural effusion is also a common complication of meningitis in haemophilus influenzae variety. They appear as echolucent crescents between the brain surface and the skull. This effusion may spread to the interhemispheric fissure. The effusion usually causes displacement of mid-line structures if it is unilateral. This case had an echolucent structure in the right fronto-parietal region causing a medial shift of the right lateral ventricle, (iii) Parenchymal changes that occur here include oedema which causes effacement of the sulci and gyri, causing distortion and loss of the uniform mid-echo patterns of the brain tissue. Severe oedema may compress and obliterate the ventricles, (iv) Abscess and infarction, if present usually appear as focal areas of increased echogenicity. The terminal pathological cerebral changes of necrosis and liquefaction may occur and this appears as focal echolucent areas, which may disrupt the normal ventricular relationships: these are called Porencephalic cysts.

This present case did not show signs of necrosis or liquefaction, but there was a progressive increase in ventricular dilatation and subdural collection.

The progress of the disease and response to medical and surgical treatment can be monitored by ultrasonography. Transfontanelle ultrasonography must be used to complement the existing forms of diagnosis of meningitis, and not to totally replace them.

References

3. Medicken W.M. Diagnostic Ultrasound. Prin-
ciples and use of Instruments, 2nd edn. Crosby Lockwood Staples, 1983


Figure 1A: Sagittal Transfontanelle scan in a female infant aged 5 months with bacterial meningitis. Note the crescent-line sonolucency of the dilated left lateral ventricle. The diminished echogenicity of a right fronto-parietal collection is also demonstrated. Subdural collection.

Figure 1B: Diagrammatic representation of Fig. 1A in a female neonate aged 5 months.