

PAPER DETAILS

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MEASURING THE OPTIC NERVE SHEATH DIAMETER BY USING ULTRASONOGRAPHY IN DIAGNOSIS AND FOLLOW-UP OF PSEUDO-TUMOR CEREBRI: A CASE REPORT

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Abstract

Objective: The pseudo-tumor cerebri (PTC) is defined as the idiopathic or benign intracranial hypertension (IH), complaints of which cannot be explained in a different way. PTC is an exclusion diagnosis, in which the neuroophthalmopathy of IH cannot be determined. The patients with PTC may have complaints such as headache, nausea, vomiting, temporary blurred vision, and mild-level vision loss or unilateral or bilateral abducens nerve paralysis may develop. The radiological examination of patients yields normal results. In case that IH develops due to any reason, the enlargement is seen in optic nerve sheath diameter (ONSD) in the acute period.

Case Report: 14 year-old patient, who has been diagnosed for PTC in our unit, optic nerve sheath diameter (ONSD) measurement and follow-up of pressure change of whom have been performed by using ultrasonography (USG) method, is presented in order to discuss the contribution of this non-invasive method to diagnosis, treatment, and observation processes.

Conclusion: USG and ONSD measurement in PTC cases may be effective and reliable monitoring method as much as invasive methods.

Keywords: Pseudo-tumor Cerebri, Optic Nerve Sheath Diameter Measurement, Ultrasonography

Introduction

The pseudo-tumor cerebri (PTC) is an IH, which develops due to various reasons and neuroophthalmopathy of which cannot be found (1). The optic nerve is surrounded by three meninx membranes and the cerebrospinal fluid freely flows in subarachnoid distance. The change of intracranial subarachnoid fluid pressure directly reflects on the intraorbital subarachnoid zone. For this reason, the enlargement of ONSD is seen as an early and first indicator of brain edema, before the development of papillary stasis (2). In addition to the known diagnosis and follow-up methods, the 14 year-old girl case undergone optic nerve sheath diameter measurement using USG is presented here upon the verbal approval of her family.

Case Report

Firstly, Authors have permission from patient's parent as written.

14 year-old patient, who had the complaints of headache and blurred vision, was brought to our emergency service. It was determined that her

headache intermittently continued for last 2 months, that her headache didn't wake her up from the sleep, and that she had blurred vision in recent days.

The physical examination findings were as follows: body temperature: 36.6°C, respiratory rate: 16/min., heart rate: 84/min., blood pressure: 100/60 mmHg, oxygen saturation (at room environment): 96%. She was conscious and cooperating, and the results of her system examination were normal, except for the right abducens nerve paralysis. In fundoscopic examination, she was found to have papillary edema. Blood leucocyte: 17.02x10³/μL, Hb: 12.8 gr/dl, thrombocyte: 240x10³/μL, and BMI: 32.

ONSD measurement was performed using high-frequency prop by pediatric emergency sub-specialist, who had bedside focused ultrasonography training, and the ONSD was found to be 5.4 mm (Figure 1). In brain CT (computed tomography) and magnetic resonance (MR) imaging of patient, it was determined that there was no mass and the ventricles were seen to be normal. The right optic disc was seen to be mildly bulbous. The

results of MR venography were normal. The lumbar puncture was applied to the case, who we thought to have PTC. The pressure of cerebrospinal fluid was 50 cmH₂O. In microscopic analysis of cerebrospinal fluid, the glucose and protein values were found to be at normal levels.

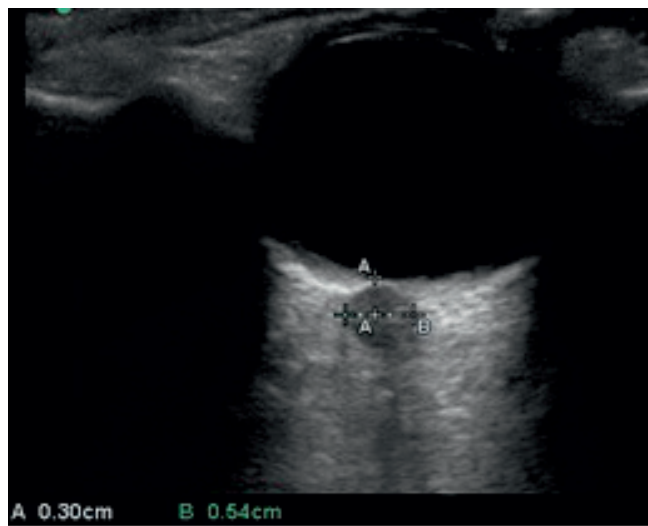


FIGURE 1. Enlarged optic nerve sheath diameter

The transorbital ultrasonography was applied to the patient at supine position by using 6-13 MHz planar probe before the lumbar puncture. The measurements were performed in transverse and sagittal cross-sections and the average value was calculated. The PCT diagnosis was made according to Dandy criteria (3) and the patient was hospitalized in pediatric neurology service. The acetazolamide therapy was started. She was taken into diet program.



FIGURE 2. Normal-width optic nerve sheath diameter

It was determined that the complaints and symptoms have regressed. In the examination performed a week later, it was determined that the ONSD reduced to 3.8 mm (Figure 2). In second lumbar puncture, the pressure of cerebrospinal fluid was found to be 18 cmH₂O.

Discussion

PTC is an IH, in which the neuroophthalmopathology cannot be detected. Even though it was related to the obesity, toxins, medications, hypo- and hyper-vitaminosis, collagen tissue diseases, intracranial venous sinus thrombosis, and empty sella syndrome, the etiology of this clinical condition is not clear yet (1). In pediatric emergency services, because of the possible complications, the non-invasive methods are preferred as long as possible. In this study, it is emphasized that the non-invasive monitorization significantly contributes to diagnosis, treatment, and follow-up.

The optic nerve is surrounded by three meninx membranes. The pressures of cerebrospinal fluid flowing in intracranial and intraorbital subarachnoid distance were the same, and the change of pressure directly reflects. For this reason, as an early and first indicator of brain edema, the enlargement of ONSD is seen before the development of papillary stasis. This enlargement is at most remarkable level at 3mm behind the globe. Although there is no standard cut-off value yet, the ONSD values higher than 4.5mm for children and 5mm for adults are considered to be compliant to an increase in intracranial pressure (1) (2) (4).

In literature, it can be seen that ONSD measurement is reliable enough (2) (4). In study of Singleton et al., it was reported that ONSD measurement reflected the dynamic changes in an IH case undergone therapeutic lumbar puncture (5). In the present case, it was observed that the ONSD enlarged before the lumbar puncture and then reduced to normal levels after the therapy.

ONSD measurement can be applied to PTC cases during the admission, and it may contribute to immediately starting the appropriate treatment (1).

Conclusion

This case study is an example indicating that the measurement of ONSD by using USG method is a reliable and effective monitorization method, which is compatible with invasive methods, in PTC cases. On this subject, the comprehensive studies should be carried

out in future on enough number of subjects.

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Abbreviations

- PTC: Pseudo-tumor Cerebri
- IH: Intracranial Hypertension
- USG: Ultrasonography
- ONSD: Optic Nerve Sheath Diameter
- BCT: Brain Computed Tomography
- MR: Magnetic Resonance