

Eye 2019: The sensitivity of optic nerve CT scan combined with OCT in diagnosis of Idiopathic intracranial hypertension

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Abstract

Introduction:

Idiopathic Intracranial Hypertension (IIH), also referred to as benign intracranial hypertension, is a disorder generally affecting overweight women of childbearing age. Idiopathic intracranial hypertension has been considered an analysis of exclusion, particularly if no cranial neuropathies or papilloedema have been noticed. Measurement of the Optic Nerve Sheath Diameter (ONSD) using a CT scan can run a solution for this condition, as it has been used as a non-invasive way of ICP monitoring since the mid-1990s. Another rapid non-invasive method for the evaluation of patients with IIH is Optical Coherence Tomography (OCT). Spectral-domain OCT offers reliable thickness and measurements of the optic nerve head and retina and can constantly demonstrate structural variations due to papilloedema. This study included 40 patients (aged ≥ 18 years) presented with headache and fulfilled modified Dandy criteria for IIH. Idiopathic intracranial hypertension (IIH) is defined -according to modified Dandy criteria- as the presence of clinical signs and symptoms of increased intracranial pressure including headache, nausea, vomiting, transient visual disturbances like mild visual loss, papilloedema, and unilateral or bilateral 6th cranial nerve paresis and is generally affecting overweight women in the childbearing period.

Normal neuroimaging is important for diagnosis excepting for empty sella turcica. Idiopathic intracranial hypertension is measured as a diagnosis of exclusion, particularly when no cranial neuropathies or papilloedema have been determined. If a patient is complaining of only persistent severe headache, then the diagnosis is delayed as in such cases lumbar puncture and a head CT scan for these patients is regularly negative, putting the clinicians in a diagnostic challenge. Measurement of the optic nerve sheath diameter (ONSD) using orbit CT scan can provide a solution in this case, as It is considered as a non-invasive method of intracranial pressure (ICP) based on that the presence of enlarged ONSD specifies the elevated ICP.

Aim of the work: is to evaluate the usage of optic nerve sheath diameter (ONSD) measured by computed tomography and Spectral-domain OCT for the detection of elevated intracranial pressure (ICP) in patients with IIH as an alternative to lumbar puncture.

Methods:

We collected and analyzed data on the following variables: ONSD in the middle third of the intraorbital path (the point where the ophthalmic artery crosses the optic nerve served as an anatomical landmark); Our patients underwent spectral-domain OCT (SD-OCT) scanning dual-beam Spectralis laser tracking tomography Spectralis, using a commercially available device (3D OCT-1000; Topcon Corp., Tokyo, Japan). The scanning protocol involved the acquisition of a 6x6 mm cube scan of the Optic Nerve Head (ONH) and macula with a scan density of 512x128 pixels. Ethical statement this prospective study was conducted according to international guidelines approved by the Research Ethics Committee. Informed consent was obtained from all patients prior to the study. We followed the ethical principles of the Declaration of Helsinki during the preparation of this study.

Study population: This study included 40 female patients (aged ≥ 18 years) presented with headache and fulfilled modified Dandy criteria for IIH. Patients were recruited from the Neurology Outpatient Clinic and Neurology inpatients ward of Zagazig University Hospitals. During history taking, complaints that were usual for raised ICP (headache, nausea, vomiting, etc.) were detected and all patients were generally and neurologically examined. Routine lab and plain chest X-rays were done to exclude patients with end-organ failure. Also, patients with known ophthalmological disorders such as glaucoma, hypertensive or diabetic retinopathy, patients with migraine, or those having contraindications for IV contrast-enhanced CT were excluded. All patients underwent an initial non-contrast head CT scan. All patients with suspected IIH were examined by an ophthalmologist, even if they did not report any visual symptoms. Patients who complained of headaches associated with tinnitus and dizziness were also examined.

Results:

Our study involved 40 female patients with a clinical-radiological analysis of IIH with their age range from 22 to 42 years, their main complaints were visual complaints as blurred vision and transient visual obscurations in 16 patients (40%), and headache in 15 patients (37.5%), while 9 patients (22.5%) had both complaints. The ONSD was nearly in the same range in both eyes (4-10 mm for right and 4- 11 mm for left) when measured by CT with contrast at the crossing point of the ophthalmic artery. More than 82% (33) of patients diagnosed by OCT have papilloedema while 17% (7) of patients not. There was a statistically significant relationship between the ONSD by OCT in both right and left sides with the diagnosis of IIH ($P = 0.003$ for right, $P = 0.001$ for left) while there was no significant relation between pseudotumor cerebri (PTC) and patient's age ($P = 0.921$). The estimated statistical cut-off value of ONSD was 5.5 mm with a sensitivity of 84.4% and specificity to diagnose optic nerve thickening by 100% on the left side and 85.7% in the right side.

Discussion:

The diagnosis of IIH is mainly made by the measurement of raised intracranial pressure (ICP). This is considered critical as the early diagnosis and treatment of the increased pressure can protect against optic nerve damage. Lumbar puncture, as a diagnostic tool for the detection of IIH, is considered accurate but its performance is limited in patients with obesity, thrombocytopenia, bleeding tendencies or those on regular anticoagulants and also considered as an invasive procedure that carries the risk of post-spinal tap headache, nerve root irritation, spinal subdural hematoma, and infection.

Conclusion:

The addition of OCT to ONSD by CT+C can increase its diagnostic ability for the cases with IIH, which may reduce the need for invasive diagnostic techniques like LP.

This work is partly presented at [World Eye and Vision Congress on December 09-10, 2019](#)