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Clinical Study

Optic disc drusen demonstrate a hyperechogenic artifact in B mode ultrasound

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ABSTRACT

We describe a new, specific, hyperechogenic artifact spot in B-mode ultrasound (US) in patients diagnosed with optic nerve drusen (OND). This is a retrospective chart review of 34 consecutive patients with OND using B-scan US. The patients underwent full ophthalmic evaluation and neuro-ophthalmic examination. In all cases, a typical hyperechogenic spot was seen within the acoustic shadows on medium or high gain settings. The length between the US probe and the OND, and the distance between the OND and the artifact were recorded for each patient. In all cases, a typical hyperechogenic spot was seen within the acoustic shadows on medium or high gain settings. Sonograms showed a hyperechogenic focus in all eyes. The average ratio between the cornea–OND distance (25.5 mm) and the OND–hyperechogenic spot (32.1 mm) distance was 1.26. The size of the hyperechogenic spot was proportional to the size of the deposit on the disc, with the most marked attenuation of the beam seen in the largest lesions. B-scan US is a very sensitive and reliable detector of both superficial and buried OND. The described hyperechogenic artifact spot may be an additional mode to support diagnosis of OND. This finding might be helpful for making a differential diagnosis between OND and papilledema.

1. Introduction

Optic nerve head drusen (OND) are acellular, calcified deposits that were first described by Müller in 1858 [1]. Histologically, they are defined as hyaline bodies that result from calcification of intracellular axonal mitochondria located in the prelaminar portion of optic nerve. The term druse, the singular form of drusen, describes a crystalline, hollow space in a rock, widely used in the mining industry in the 16th century [2].

Predisposing factors may include a narrow scleral canal, abnormal intraocular vasculature, family history, and being Caucasian. Most cases are bilateral. OND are associated with significant ocular morbidity. Patients are generally asymptomatic on presentation. With increasing age, eyes with OND may develop visual field defects which are commonly detected as early as the second decade of life and occur most often with large, superficial drusen [3].

OND are a common cause of pseudo-papilledema and represent an important differential diagnosis of optic disc swelling. Therefore, several diagnostic methods have been used, including preinjection control photography for detection of autofluorescence, B-scan ultrasonography (US), CT scanning and optical coherence tomography (OCT) [2,4].

B-scan US was described to verify the presence of drusen of the optic disc in the mid-1970s [5]. It is considered the most sensitive and most reliable detector of both superficial and buried disc drusen [3], even in uncooperative children [6]. A positive scan shows an echo of hyper-reflectivity at the nerve head, with acoustic shadowing in the medium gain setting. A posterior cone of shadowing is considered pathognomonic when seen [3]. We noticed a hyperacoustic spot in patients who were diagnosed with OND. The aim of this paper is to describe this new finding in patients with superficial and hidden OND diagnosed using B-scan US. A search of PubMed, ophthalmic and ultrasound literature did not find such a description [7,8].

2. Methods

A retrospective chart review of consecutive patients with OND diagnosed by a single neuro-ophthalmologist (Y.A.) using B-scan US (I Cubed, Ellex Medical Lasers, Adelaide, SA, Australia) was performed (years 2002–2011). The patients were referred for a neuro-ophthalmic examination for the following reasons: incidental finding of swollen discs, blurred vision, temporary loss of peripheral vision or flickering or graying out of their vision,

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Table 1
The average ratio between the corneal–optic nerve head drusen (OND) distance and the OND–hyperechogenic spot distance

Distances	Median (mm)	Maximum (mm)	Minimum (mm)	Average (mm)
Cornea–OND	26	35	15	25.5
OND–hyperechogenic spot	32.1	40	20	32.1

OND = optic nerve head drusen.

and headaches. The patients underwent a complete evaluation, which included visual acuity testing, visual field studies (Humphrey Systems, Dublin, CA, USA) and slit lamp and neuro-ophthalmic examinations.

The optic disc was investigated for the presence of the following features: visible drusen, blurred edges, raised disc and altered papillary color, altered form, absence of optic disc cupping (masking of the physiological excavation), no venous pulse, anomalous vascular branching (trifurcation of the arterioles within or adjacent to the optic disc), cilioretinal vessels, hemorrhage (papillary and peripapillary) and peripapillary atrophy.

In all cases, a typical hyperechogenic spot was seen within the acoustic shadows on medium or high gain settings. B-scan US measurements were performed on each patient and all were referred for a visual field study. In order to define the artifact position, we measured the length between the US probe and the OND, and the distance between the OND and the artifact in each patient.

The study was approved by the Institutional Review Board, and conducted according to the principles of the Declaration of Helsinki. Informed consent was obtained from all patients.

2.1. Statistical analysis

Nominal data are shown as number and percentage and as mean ± standard deviation for continuous variables. We used both parametric (paired *t*-test) and non-parametric tests (Wilcoxon test) for differences between methods. A p value <0.05 was considered statistically significant. All analyses were performed using the Statistical Package for the Social Sciences version 21 (IBM, Armonk, NY, USA).

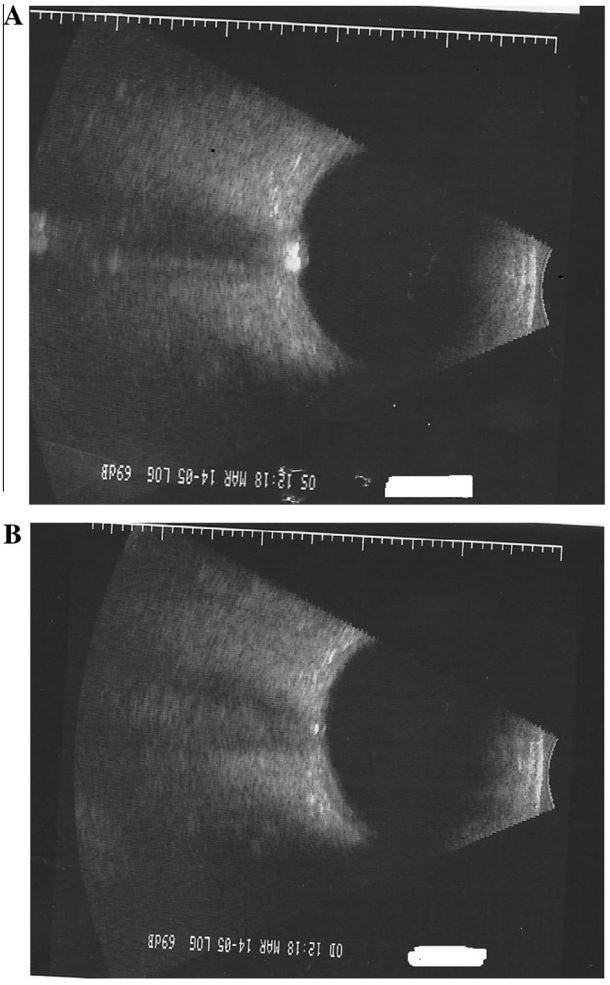

Fig. 2. (A) A healthy, 15-year-old patient presented to the emergency room with a sudden lower left visual field loss that was diagnosed as left anterior ischemic optic neuropathy. Clinical examination showed optic disc drusen which was confirmed with ultrasonography. The hyperechogenic artifact is seen clearly in B mode ultrasound. (B) There are no drusen on the right side.

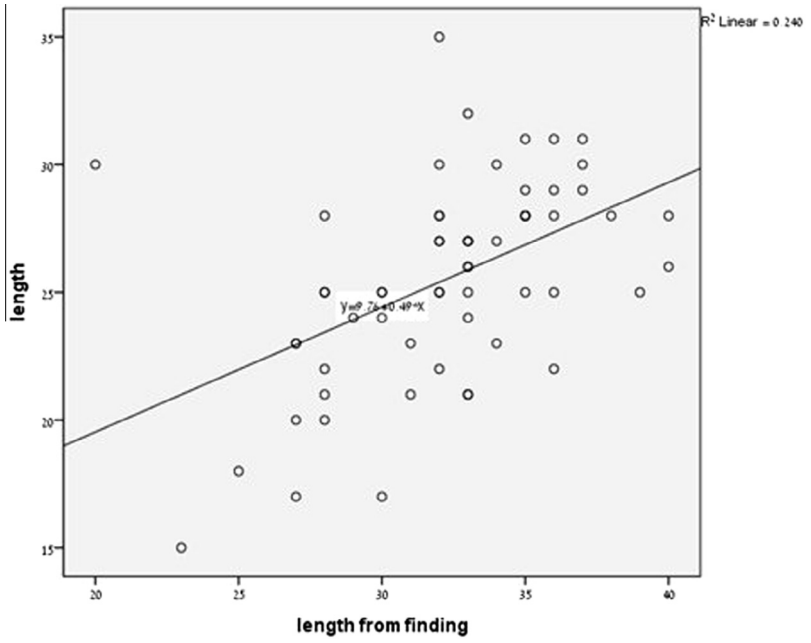

Fig. 1. Scatterplot showing the association between the cornea–optic nerve drusen (OND) distance and the OND–hyperechogenic spot distance ($R = 0.49$; $p < 0.0001$).