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# Sonographic Assessment of Optic Disc Cupping in Glaucoma, Overview

[1]Mashael Abdulateef Mustafa, [2]Alajmi Refan Naji D,
[3]Mohammed Foad Ahmed Basehi, [4]Mahroos Mohammed Essam A,
[5]Otaif Wael Ali Mohammed, [6]Ebtihal Hadi Ahmad Tairan,
[7]Muath Hassan Ibrahim Najmi, [8]Ahmed Abdullah Ahmed Hakami,
[9]Khalid Haji Mohammad Amin, [10]Maryam Mohammed Alkhaldi

***Abstract:*** **Glaucoma is a disease where the pressure of eye ends up being high damaging the nerve fibers of the optic nerve. In some patients even regular or low eye pressure can cause damage to the nerve. This study aimed to solve the clinical problem of diagnosing and following up glaucoma patients when they have opacities in ocular media obscuring visualization of optic disc and preventing the visual fields analysis. we conducted this overview to summarized the evidence based on this sonography uses in case of Glaucoma to evaluate the optic cupping disc, we performed an electronic search through specific databases such, PubMed (MEDLINE) and Ovid EMBASE, up to November 2016, we limited our search on English language published studies, and all studies discussing any kind of sonography assessment in optic disc cupping in case of Glaucoma. Optic disc cupping (ODC) is a consequence of glocoma. Cupping can be seen with neurological processes, including benign growths, which are treatable. Patient histories, and sonographic assessment, are the key to diagnosis of glaucomatous versus nonglaucomatous ODC. Ultrasonography revealed a considerable discrepancy in between the results of the approaches of ODC evaluation in Glaucoma condition.**

***Keywords:*** **Glaucoma, glaucomatous versus nonglaucomatous ODC, MEDLINE.**

## 1. INTRODUCTION

Glaucoma is a disease where the pressure of eye ends up being high damaging the nerve fibers of the optic nerve. In some patients even regular or low eye pressure can cause damage to the nerve. Slow damage to optic nerve causes slow loss of field of vision lastly causing blindness. Glaucoma is a typical reason for irreversible blindness across the world. The main problem in picking up this Silent Disease is that mainly it does not have signs. An extensively accepted view is that in glaucoma, the site of preliminary damage to the ganglion-cell axons is at the level of the lamina cribrosa in the optic nerve head (ONH) [(1,2,3,4)]. Optic-disc cupping is most often triggered by glaucoma, however may be seen in numerous less-common neuroophthalmic conditions [(5)].

The evaluation of optic disc cupping is important in the diagnosis and follow-up of glaucoma [(6)]. Many patients with glaucoma will have progressive cupping even though the intraocular pressure remains within the typical range [(6,7)]. New tools established for more precise assessment of optic disc and nerve fiber layer in glaucoma patients, such as optical coherence tomography, Heidelberg retinal tomography, and GDx scanning laser polarimetry, require clear ocular media. Sonography stays a functional tool with which to examine the posterior section, consisting of the optic cup, in patients with nontransparent ocular media preventing optical exposure of the posterior section [(6,7,8)]. The diagnostic potential of orbital optic nerve measurements in glaucoma has been limited by the bad dealing with power of B-scan ultrasound in the retrobulbar area in most of cases [(9)].

Few studies have attempted to test the ability of sonography in assessment and diagnosis of optic disc cupping. Therefore, this study aimed to solve the clinical problem of diagnosing and following up glaucoma patients when they have opacities in ocular media obscuring visualization of optic disc and preventing the visual fields analysis.

## 2. METHODOLOGY

Due to the limitation of recent studies evaluating the sonography in the diagnosis of optic disc cupping in glaucoma, we conducted this overview to summarized the evidence based on this sonography uses in case of Glaucoma to evaluate the optic cupping disc, we performed an electronic search through specific databases such, PubMed (MEDLINE) and Ovid EMBASE, up to November 2016, we limited our search on English language published studies, and all studies discussing any kind of sonography assessment in optic disc cupping in case of Glaucoma. Also references concerning the same topic was extracted from chosen studies for further board search to collect as strong evidence as we can.

## 3. RESULTS AND DISCUSSION

An increased interest has grown around the possibilities of detection and evaluation of glaucomatous cupping of the optic disc by means of ultrasonography [10,11]. Some studies have attempted to test the capability of modern-day B-scanners to precisely find disc cupping [10,11,12] and a few specifications such as vertical and horizontal cup diameters. 4 Results from these research studies demonstrate a great agreement between ultrasonographic (US) measurements and ophthalmoscopic or laser scanning tomographic evaluation of disc cupping [13]. On the other hand, ultrasonography measurements of elevated optic nerve head have actually been suggested for usage primarily in eyes with nontransparent media [14].

We have actually determined a number of research studies that stressed the significance of ultrasonography on examining transverse optic nerve diameter measurements to approximate the degree of intracranial hypertension in patients with papilledema, [15,16,17] and a correlation was found between these readings and perimetric losses in patients with Glaucoma (**Figure1**) [17]. In the raised disc (**Figure1**) the first gate was found on the leftmost edge echo signal of the swollen neuroretinal tissue protruding in the vitreous cavity and the 2nd one on the leftmost edge of the highly reflective echo line representing the lamina cribrosa, which is easily recognized as a highly reflective and wide echogenic line located deeper in the disc [17,18,19].

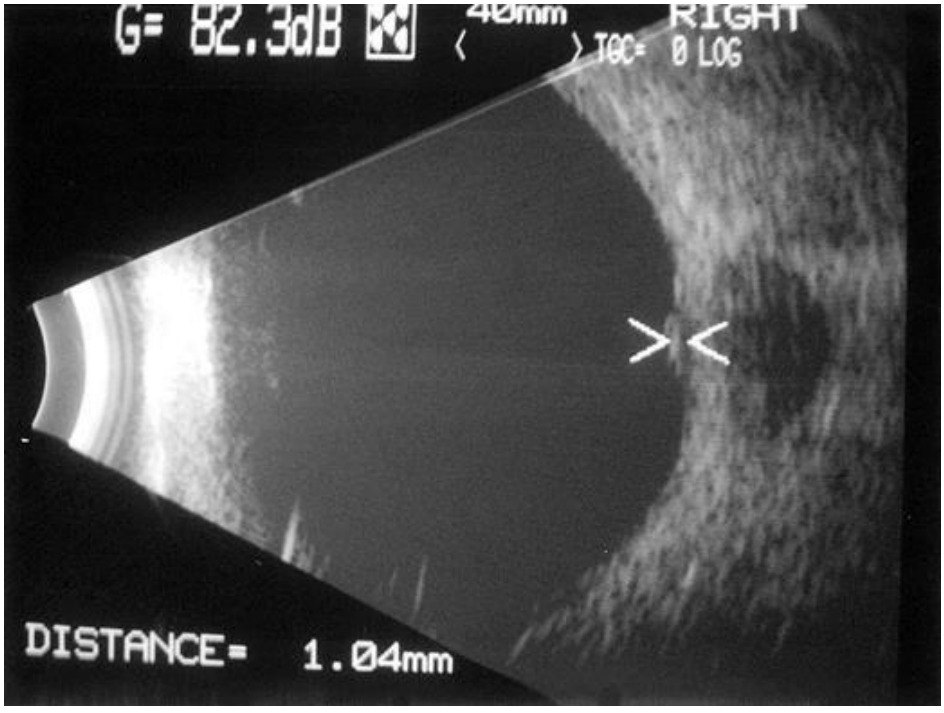


**Figure1: US transverse vertical scan of the swollen disc displaying the maximal elevation of the papilledema. Calipers are placed on top of the protruding swollen tissue (*left*) and on the strongly reflecting line corresponding to the lamina cribrosa (*right*).**

We also included one A prospective study [12] was conducted on 25 emmetropic topics (50 eyes) with discs and cups of various sizes, that aimed to examine the level of sensitivity of contemporary, eye-dedicated B-scanners in discovering optic disc cups and to associate the echographic measurements with an optical evaluation. This research study suggested that a high-resolution contact Bultrasound scanner can find vertical optic disc cups of 0.5 mm or bigger. In addition a high corelation was discovered between echographic measurements of optic disc cups and optical vertical cup diameters and C:

D ratios. 3 discs with C: D ratios of 0.7 or larger were determined as little on ultrasound as they were in small-diameter optic discs. And conclude that the B-scanner is measuring absolute cup size which describing the C: D ratio in ultrasound may be deceptive[12].

Other crucial identified research study [20] including randomly chosen eye of 22 patients with idiopathic intracranial hypertension (IIH) and a variable degree of optic disc swelling underwent 5 and three duplicated measurements of disc height using high-resolution ultrasonography. Was aimed To determine the accuracy and reproducibility of ultrasonographic (US) readings of optic disc elevations in patients with papilledema compared with confocal scanning laser ophthalmoscope (CSLO) measurements. This study showed that, ultrasonographic readings were positively correlated with HRT measurements in both inflamed ($r = 0.62$, $P = 0.002$) and excavated disc ($r = 0.84$, $P < 0.0002$). The 95% limitations of arrangement between the instruments were $0.24 \pm 0.59$ mm (mean ± 2 SD) and $0.05 \pm 0.3$ mm for swelling and cupping measurements, respectively. The coefficient of variation was 7.63% and 1.8% for swelling and 7.93% and 5.91% for cupping, with United States and HRT, respectively. was conducted on 25 emmetropic topics (50 eyes) with discs and cups of various sizes, that aimed to examine the level of sensitivity of contemporary, eye-dedicated B-scanners in discovering optic disc cups and to associate the echographic measurements with an optical evaluation. This research study suggested that a high-resolution contact Bultrasound scanner can find vertical optic disc cups of 0.5 mm or bigger. In addition a high corelation was discovered between echographic measurements of optic disc cups and optical vertical cup diameters and C: D ratios. 3 discs with C: D ratios of 0.7 or larger were determined as little on ultrasound as they were in small-diameter optic discs. And conclude that the B-scanner is measuring absolute cup size which describing the C: D ratio in ultrasound may be deceptive[20]

**Disadvantage of sonography assessment to optic disc cupping:**

2 research studies [15,16] revealed one disadvantage of ultrasonic optic cup assessment is that the disc edge cannot be determined by ultrasound, and therefore a cup/disc (C/D) ratio is not computed. A number of research studies investigating the connection between structural optic disc measurements and practical disability have failed to recognize the C/D ratio as a reliable predictor of field 10ss [15,16]. Discrim location and the 3rd central minute of the frequency circulation of the depth values for the optic disc structures have, nevertheless, been revealed to associate strongly with visual field deficit [15,16].

## 4. CONCLUSION

Optic disc cupping (ODC) is a consequence of glocoma. Cupping can be seen with neurological processes, including benign growths, which are treatable. Patient history, and sonographic assessment, are the key to diagnosis of glaucomatous versus nonglaucomatous ODC. Ultrasonography revealed a considerable discrepancy in between the results of the approaches of ODC evaluation in Glaucoma condition. The weak point of the agreement might be due in part to different reference planes. Further studies are needed to identify whether coupling in Glaucoma and sonographic assessment of disc elevation may be clinically useful in the management of patients with IIH and papilledema. Using United States might be suggested in those patients in ophthalmologic centers where the HRT is not offered and in presence of significant media opacities.

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