International Journal on Recent Researches In Science, Engineering & Technology
(Division of Computer Science Engineering)
A Journal Established in early 2000 as National journal and upgraded to International journal in 2013 and is in existence for the last 10 years. It is run by Retired Professors from NIT, Trichy.
It is an absolutely free (No processing charges, No publishing charges etc) Journal Indexed in JIR, DIIF and SJIF.
Research Paper Available online at: www.jrrset.com

ISSN (Print) : 2347-6729
ISSN (Online) : 2348-3105

Volume 5, Issue 10, October 2017

JIR IF : 2.54
DIIF IF :1.46
SJIF IF: 4.338

A Vigorous Investigation in the identification of glaucoma by facilitating Ophthalmology inhabitants

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ABSTRACT

The Evaluation of shading circle photo (S-CP) is influenced by picture quality, which reduces the probability to identify glaucoma. High-Dynamic-Extend (HDR) imaging gives a more noteworthy scope of radiance. Thusly, the target of this examination was to assess the ability of ophthalmology inhabitants to distinguish glaucoma utilizing HDR-idea circle photography (HDR-DP) compared to C-DP Outline Cross-sectional investigation. Techniques Twenty subjects were ordered by 3 glaucoma pros as either glaucoma, glaucoma suspect, or control. All C-DPs were changed over to HDR-DPs and haphazardly exhibited and surveyed by 10 to begin with year ophthalmology occupants. Affectability and specificity of glaucoma identification were looked at Results. The mean ± SD of found the middle value of retinal nerve fiber layer (RNFL) thickness was 74.0 ± 6.1 µm, 100.2 ± 9.6 µm, and 105.8 ± 17.2 µm for glaucoma,glaucoma suspect, and controls, separately. The analytic affectability of HDR-DP was higher than that of C-DP (87% versus 68%, mean contrast: 19.0, 95% CI: 4.91 to 33.1; p = 0 014). With respect to specificity, HDR-DP and C-DP yielded 46% and 75% (mean contrast: 29.0, 95% CI: 13.4 to 44.6; p = 0 002) Conclusions. HDR-DP measurably expanded analytic affectability yet not specificity. HDR-DP might be a screening instrument for non-expert ophthalmologists

INTRODUCTION

Glaucoma is a chronic progressive optic neuropathy that is characterized by loss of retinal nerve tissue and field of vision. Due to the asymptomatic nature of the disease, most patients are not aware that they have glaucoma until the late stage of the disease. Currently, more than 8.4 million people worldwide are bilaterally blind from glaucoma [1]. It has been estimated that worldwide prevalence of glaucoma will rise to 111.8 million by 2040, with a high proportion in Asia and Africa [2, 3]. However, the actual prevalence of glaucoma may be higher than this estimation, because more than half of glaucoma patients are under diagnosed [4–6]. Early diagnosis and treatment is the key to preventing blindness from glaucoma. One of the highest sensitivity methods for monitoring early glaucomatous change is detection of retinal nerve fiber layer (RNFL) defect [7–9]. Color optic disc photography (C-DP) is a standard tool for RNFL evaluation due to its convenient, low-cost, and noninvasive technique. However, the ability to detect glaucoma, especially by clinicians lacking expertise in glaucoma, has been hindered by the poor quality of C-DP images (e.g., light exposure, poor contrast, and color tone), which are frequently found in media opacity and tigroid fundus cases [10]. Highdynamic- range (HDR) imaging is a computerized technique that was developed to produce a greater dynamic range of luminosity, compensate for loss of detail by adapting different exposure levels, and integrate those exposure levels to reproduce a new image with broader tonal range [11, 12]. Capability of ophthalmology residents to detect glaucoma and peripapillary RNFL defect using HDR optic disc photography (HDR-DP), as compared to detection using C-DP.

MATERIALS AND METHODS

This cross-sectional investigation was led at the Department of Ophthalmology, King Chulalongkorn Memorial Hospital (Bangkok, Thailand) and was affirmed by the Institutional Survey Board of the Faculty of Medicine, Chulalongkorn College. This investigation was directed as per the Declaration of Helsinki and the greater part of its consequent changes. There were 3 gatherings of members in this investigation, counting glaucoma patients, glaucoma speculate patients, also, solid volunteers. Shading optic circle photos were taken from the eyes of members in each of the 3 subgroups. Evaluators comprised of 10 first-year ophthalmology inhabitants.

In the wake of accepting consent to get to and recover pictures, shading plate photos of glaucoma and glaucoma suspect patients were selected from our healing facility's imaging database. Composed educated assent was acquired from sound volunteers preceding their interest in the examination. All subjects were over 18 years of age and had a circular refractive blunder between −6 diopters and +6 diopters and astigmatism of under 3 diopters. Prohibition criteria were history of intraocular injury, retinal infection, neurological sickness,
also, uncooperative subject. All glaucoma and glaucoma suspect subjects had experienced C-DP (KOWA Company Ltd., Nagoya, Aichi, Japan), optical lucidness tomography (OCT) (Cirrus-HD OCT; Carl Zeiss Meditec, Dublin, CA,
USA), and standard computerized perimetry (SAP) (Carl Zeiss Meditec, Dublin, CA, USA) inside a half year before the begin of the investigation. All C-DPs from the glaucoma and glaucoma suspect gatherings were performed in enlarged condition by a solitary experienced picture taker at measurements and settings
of 1600 × 1216 pixels and RGB shading space in JPEG design. Just qualified pictures were selected. Glaucoma quiet was characterized as vertical glass to-plate proportion more noteworthy than 97.5th percentile of ordinary populace with nearness of RNFL deformity in OCT or plate photo that related with visual
field deformity in SAP. Nearness of vertical container to-plate proportion in the vicinity of 97.5th and 99.5th percentiles of ordinary populace without RNFL deformity or practical visual field misfortune and IOP of under 21mmHg were named glaucoma suspect subjects. Sound volunteers who took an interest in this examination had visual field tests and pictures taken after the same process by a similar single picture taker. Solid members had a vertical container to-circle proportion of under 97.5th percentile with a typical dependable SAP result. Nonqualifying pictures, OCT, and visual fields incorporated the accompanying: (1) pictures with poor perception of retinal veins; (2) OCT checks with wrong ONH identification, topsy turvy ONH, movement ancient rarities, wrong division, or flag quality under 6; and (3) questionable SAP with obsession misfortune, false-positive or false-negative reactions more prominent than 20%. Pictures from 10 glaucoma patients, 5 glaucoma suspect patients, and 5 sound volunteers were taken, recorded, also, incorporated into the examination. An aggregate of 20 C-DPs from all subjects were enrolled from April to October 2014. Three glaucoma experts (VT, AM, and SC) assessed C-DP, OCT, and SAP to affirm the finding and to distinguish the number and influenced zones of peripapillary RNFL

deformity in six quadrants (nasal, superonasal, superotemporal, fleeting, inferotemporal, and inferonasal) (Figure 1). The conclusions come to by the 3 experts were set apart as references for facilitate assessment by the ophthalmology occupants. All enlisted C-DPs were then prepared into HDR photographs by altering the light introduction as overexposed, regularly uncovered, or underexposed (Figure 2). Picture altering was performed utilizing review program for Macintosh OS X variant 8.0. Three diverse introduction pictures were at that point consolidated utilizing the accompanying settings: quality −4.4, brilliance 0.4, neighborhood differentiate 8.4, white Clip 1.0, dark Clip 0, midtone 0, and shading immersion −1.5 (Figure 3). From that point onward, the ten first-year ophthalmology occupants who volunteered to join the investigation gave composed educated agree to take part as evaluators. All evaluators were prepared in how to analyze glaucoma and distinguish RNFL deformity. Evaluators were blinded to quiet clinical data furthermore, finding. The ophthalmology inhabitant evaluators freely surveyed an arrangement of 40 haphazardly sequenced circle photos comprising of 20 C-DPs and 20 HDR-DPs. Pictures were anticipated onto a projector screen at a determination of 1280 × 800 pixels with 32-bit shading in a dim room, what not of the evaluators surveyed the picture inside a time of 30 seconds. The inhabitants were made a request to answer 2 inquiries inside 30 seconds, as takes after: decide if the showing picture is glaucoma or not and distinguish the number and area of RNFL deformity.

Statistical Analysis

All statistical analyses were performed using SPSS version 17.0 (SPSS Inc., Chicago, IL, USA). Paired t-test was used to test statistical differences of sensitivity and specificity between C-DP and HDR-DP, as evaluated by the residents when using the glaucoma specialists' references. The primary outcomes were mean difference ±SD of sensitivity and specificity of the test. p values less than 0.05 were considered statistically significant.

RESULTS AND DISCUSSIONS

All subjects had best-corrected visual acuity better than 20/30. Distribution of sensitivity and specificity of glaucoma diagnosis using C-DP and HDR-DP by the 10 ophthalmology residents is shown in

Figure 4. The scatter plot graph shows high level of distribution for sensitivity in HDR-DP, compared to medium level of distribution for specificity. The average sensitivity of glaucoma detection in HDR-DP was better than that in C-DP (87% ± 13.4% and 68% ± 19.3%,resp.). The mean difference of sensitivity was 19.0 ± 19.7 (95% CI: 4.91 to 33.1). The average specificity of glaucoma detection in HDR-DP and C-DP was 46% ± 28.8% and 75% ± 17.2%, respectively. The mean difference in specificity was 29.0 ± 21.8 (95% CI: 13.4 to 44.6) (Table 2).

Figure 1: Locations of peripapillary retinal nerve fiber layer. N: nasal; SN: superonasal; ST: superotemporal; T: worldly; IT: inferotemporal; IN: inferonasal.

(a)

(b)

(c)

(d)

Figure 2: High-dynamic-go picture handling of shading plate photography with three distinctive introduction levels. (an) Underexposed picture; (b) ordinarily uncovered picture; (c) overexposed picture.

The normal affectability of RNFL imperfection recognition between C-DP and HDR-DP in every quadrant of the glaucoma gathering was examined, yet no measurable huge contrast was watched (Table 3).

Interobserver understanding in our investigation was 0.33 (95% CI: 0.21 to 0.45) and 0.43 (95% CI: 0.31 to 0.56) for HDR-DP and C-DP, separately.

In this investigation, we connected the HDR procedure and assessed demonstrative exactness contrasted and unique C-DP in nonexperienced learners. We found that HDR-DP had higher affectability for distinguishing glaucoma than C-DP, however specificity for recognition of glaucoma utilizing HDR-DP was lower than that utilizing C-DP. RNFL imperfection discovery was comparative between the two methods. Shading plate photo is the spine indicative strategy for glaucoma analysis and is generally utilized as a part of clinical rehearse. To enhance the representation of optic circle qualities, stereoscopic circle photo for three-dimensional assessment is ordinarily suggested.

CONCLUSION

There were a few constraints in our examination. To begin with, low specificity was found because of overestimation of RNFL imperfection in the HDR-DP gathering. The RNFL design in HDR-DP of typical also, glaucoma presume patients mirrored opening RNFL deformity furthermore, may have actuated false-positive outcomes. Change in HDR program parameters may enhance general specificity what's more, increment affectability of RNFL imperfection, when contrasted with

C-DP. Furthermore, we played out the investigation utilizing first-year inhabitants that had just 3 months of clinical ophthalmology preparing. Despite the fact that we had quickly prepared them on the most proficient method to assess optic circle photo in glaucoma, their absence of encounter remained the overwhelming downside. Moreover, the occupants may have had included trouble with HDR translation, since this was the first run through HDR idea was connected to plate photo. These variables brought about the high interobserver varieties found in

our investigation. Further consider is required utilizing evaluators with various levels of encounter. In addition, we didn't investigate other particular qualities of the optic plate that effect or may influence glaucoma discovery. These optic plate attributes ought to likewise be additionally explored. In rundown, HDR-DP gave better affectability to glaucoma recognition than C-DP, yet specificity was definitely not progressed. HDR-DP may be a viable option glaucoma screening apparatus for general specialists, nonexpert ophthalmologists, and learners.

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