REVIEW ARTICLE

Disc hemorrhage: what do we know?

Dexter Y. L. Leung, FRCS, FCOphth(HK), Noel Chan, MBChB, MRCS, Clement C. Y. Tham, MA, FRCS, Dennis S. C. Lam, MD, FRCOphth
Department of Ophthalmology & Visual Sciences, The Chinese University of Hong Kong, Hong Kong Eye Hospital, Hong Kong.

Correspondence and reprint requests:
Dr. Dexter Y.L. Leung, Department of Ophthalmology & Visual Sciences, The Chinese University of Hong Kong, 2/F., Hong Kong Eye Hospital, 147K Argyle Street, Kowloon, Hong Kong. Email: dexleung@alumni.cuhk.net

Abstract

This is part 2 of a review of normal tension glaucoma and will discuss a specific entity in normal tension glaucoma: disc hemorrhage. This review highlights the management issues of patients with disc hemorrhage.

Key words: Eye hemorrhage; Glaucoma; Optic disk; Retinal hemorrhage

Definition of glaucomatous disc hemorrhage

Before further evaluation of the importance of disc hemorrhage (DH) to glaucoma, it is important to define a glaucomatous DH. DH considered typical of glaucoma is usually flame or splinter shaped, often with feathered ends, and is radially oriented and perpendicular to the disc margin. DH characteristically extends from within the optic nerve head to the adjacent retina, crossing any peripapillary zone of absent or disrupted retinal pigment epithelium, but does not necessarily occupy the entire length of this typical position.[1] The most common site of DH is the inferotemporal quadrant[2] for both single and recurrent types.[3]

Importantly, DH should not be considered to be related to glaucoma if the disc is swollen or otherwise abnormal from non-glaucomatous optic neuropathy such as anterior ischemic optic neuropathy. Similarly, a hemorrhage within the optic disc in the presence of diabetic retinopathy, vein occlusion, or other retinal vascular abnormality should not be mistaken as glaucomatous.

Course of disc hemorrhage and its prevalence

The prevalence of DH in the general population varies in different studies. In a retrospective study by an Australia group, the prevalence was noted to be 1.4%.[3] The prevalence of one or more DHs increases in patients with open angle glaucoma, particularly normal tension glaucoma (NTG),[4] to 13.8 to 28.0%.[4,5] In a longitudinal study involving 1123 patients, DH was present in none of the 661 healthy eyes (0%), 6 of 1377 glaucoma-suspect eyes (0.44%), and 3 of 123 glaucomatous eyes (2.44%). The prevalence of DH in glaucomatous eyes was significantly higher than in healthy or glaucoma-suspect eyes.[5] Despite this strong association, most DH (70%) are found in patients without definite signs of glaucoma.[4]

Studies show that DH is more common in patients with advanced glaucoma than in patients with early glaucoma. It has been observed that the frequency of DH increased from an early stage of glaucoma to a medium/advanced stage and decreased again towards the pre-final stage of glaucoma.[6] In eyes with absolute glaucoma, DH was not detected.[6]

Before a florid DH occurs, optic disc characteristics—including peripapillary atrophy, superior-inferior asymmetry in the neuroretinal rim, and thin sloping of the rim—have been noted to antedate its appearance.[7] The normal time for a DH to disappear is approximately 2 months.[8]

Recurrent DH has been reported to occur in 12 to 73% of patients with DH.[2,7-14] The broad variance is largely attributable to the variances in follow-up period, diagnostic parameters, and study populations in different studies. In the study by Siegner and Netland,[9] 22% of the eyes with DH had recurrent hemorrhage at a mean interval of 21.5 months (standard deviation, 2.9 months). For patients with DH, recurrence was observed in 67% of patients with NTG, 29% of those with primary open angle glaucoma (POAG), and 54% of glaucoma suspects.[14]

The transient appearance and recurrence of DH imposes difficulties in determining the true prevalence of this optic disc change, and limits the evaluation of predictive factors for its development.

Associations of disc hemorrhage

Controversies exist about the risk factors associated with glaucomatous DH. Factors observed to have significance in the incidence of DH are shown in **Table 1**.[1,4,5,15]

Relationship with glaucoma

The relationship of DH to NTG has been evaluated from different aspects, including the chance of having the disease, its effect on the rate of disease progression, and the benefit of managing it therapeutically with regard to disease control. There are practical clinical implications in making the distinction of impact of DH on these different factors.

DH is one of the prime risk factors involved in the pathogenesis of untreated NTG.[2] This is not difficult to understand as DH is associated with localized retinal nerve fiber layer (RNFL) defects, neuroretinal rim notches, and circumscribed perimetric loss.[7,16-18] A significant relationship between the location of the DH and the area of the progression of visual field loss has also been demonstrated in 44.0 to 65.4% of patients with DH.[8,10]

Recent studies have shown a clear association of DH not only with NTG but also with its progression.[2,8-10] The cumulative probability of progression of visual field loss was noted to be significantly greater for glaucoma patients with DH than for patients without DH.[8] However, whether the presence of DH signifies progression for all patients with glaucoma remains controversial. In the study by Siegner and Netland[9] comparing eyes with DH and control eyes without DH, progression of visual field defects were noted to be significant in all groups of patients with POAG, NTG, and ocular hypertension (OHT). However, Rasker et al[10] suggested that DH was indicative of deterioration in patients with NTG only. In the same study of patients with POAG and OHT, progression did not differ between eyes with DH and the contralateral eyes without DH.[10]

Table 1. Factors observed to have possible association with the incidence of disc hemorrhage.

Increased age[1,4]
Diabetes[4,5]
Thinner central corneal thickness[1] (but refuted by another study[15])
Greater vertical cup-disc ratio[1]
Family history of glaucoma[1]
Smoking[1]
Greater pattern standard deviation index on perimetry[1]
Female sex[4]
Increased intraocular pressure[4]
Increased systolic blood pressure[4]
Pseudoexfoliation[4]
Aspirin use[5]

As the presence of DH may suggest an active disease progress, efforts have been made to delineate the association of glaucoma therapy and incidence of DH. One study has shown that glaucoma therapy may reduce the incidence rate of initial and recurrent DH in patients with high pressure glaucoma, but not in patients with NTG.[14] On the other hand, in a Japanese study, the incidence of DH in NTG was reduced after trabeculectomy.[19]

It has been postulated that splinter hemorrhages are a result of a different pathogenic factor that causes the hemorrhage and axon damage.[1] Hendrickx et al[14] proposed an explanation with the concept of 2 populations with NTG (1 with DH and 1 never having had DH) as therapy appeared to have no effect on the incidence rate of DH.

The next question is whether increased incidence of DH or recurrent hemorrhage is associated with more extensive glaucomatous changes. However, the clinical significance of recurrent DH is where the controversies lie.

Ishida et al[8] showed a significant progression of visual field defects in eyes that had at least 2 occurrences of DH compared with non-recurrent DH eyes. On the contrary, Siegner and Netland[9] reported no differences in the rate of progression of optic disc shape or visual field defects in patients with recurrent DH and single DH. Rasker et al[10] also reported no difference in the proportion of eyes progressing after single or recurrent DHs.

A more recent study by Kim and Park[20] demonstrated that patients with glaucoma (mostly NTG) who had recurrent DH have a higher probability of progressive optic disc deterioration and RNFL deterioration. These authors, however, failed to show any significant differences with regard to progressive visual field deterioration between the single and recurrent DH groups. As with other studies,[9,10] Kim and Park[20] pointed out clearly that their study was limited by the fact that their patients received glaucoma medication in contrast to the patients in the study of Ishida et al,[8] who did not. As glaucoma medications may delay the progression of visual field defects and mask the difference between the 2 groups, this may explain the failure in confirming the impact of recurrent DH on visual field deterioration.

Conclusions

Despite the fact that it is customary to take occurrence of DH as a sign of glaucoma and its progression, it is uncertain whether treatment will benefit these patients. A randomized clinical trial for effectiveness of treatment for DH is warranted.

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