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Neovascular glaucoma

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Abstract

Neovascular glaucoma (NVG) is a severely blinding, intractable disease. The objective of this review is to provide detailed information on its basic and clinical aspects, to enable us to manage it logically. Therefore, its causes, pathogenesis and pathology, methods of early diagnosis and management are discussed. To prevent or reduce the extent of visual loss caused by NVG, the first essential is to have a high index of suspicion of its development. The most common diseases responsible for development of NVG are ischemic central retinal vein occlusion (CRVO), diabetic retinopathy and ocular ischemic syndrome. In the management strategy, the first priority should be to try to prevent its development by appropriate management of the causative diseases. If NVG develops, early diagnosis is crucial to reduce the extent of visual loss. Management of NVG primarily consists of controlling the high IOP by medical and/or surgical means to minimize the visual loss. Currently, we still do not have a satisfactory means of treating NVG and preventing visual loss in the majority, in spite of multiple modes of medical and surgical options advocated over the years and claims made. This review discusses the pros and cons for the various advocated treatments.

Keywords: Angle neovascularization; Carbonic anhydrase drugs; Central retinal vein occlusion; Cyclophotocoagulation; Diabetic retinopathy; Intraocular pressure; Iris neovascularization; Neovascular glaucoma; Ocular ischemic syndrome; Trabeculectomy; Glaucoma implants

Contents

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1. Introduction

Neovascular glaucoma (NVG) is a blinding, intractable disease, difficult to manage and often resulting in disastrous visual loss. For a logical understanding and scientific rationale for management of any disease, one first has to know the basic issues involved and the scientifically valid information available on the disease. To prevent or reduce the visual loss caused by NVG, the first essential is to have a high index of suspicion of its development, i.e. to be aware of the various ocular diseases in which it can develop. Once it develops, early diagnosis and rational management are important to minimize the visual loss. Therefore, the objective of this review on NVG is to discuss its causes, pathogenesis and pathology, methods of early diagnosis and finally management.

2. Causes of NVG

These can be divided into two categories: (a) the most common causes and (b) uncommon causes.

2.1. Most common ocular causes of NVG

Diabetic retinopathy, ischemic central retinal vein occlusion (CRVO) and ocular ischemic syndrome are by far the most common causes of NVG. There is little controversy about NVG in diabetic retinopathy. However, many of the concepts about NVG in various types of retinal vascular occlusive diseases and ocular ischemic syndrome are controversial. In the Ocular Vascular Clinic of the University of Iowa Hospitals and Clinics, we have systematically investigated the various retinal vascular occlusive diseases as well as ocular ischemic syndrome in detail in longitudinal prospective studies since 1973; these studies have provided new information, contradicting much of the conventional wisdom on these disorders. Those require detailed discussion in the interest of clarifying the confusion and controversies on these important disorders (see below).

2.1.1. Diabetic retinopathy

Association of NVG with diabetic retinopathy is a well-established clinical entity and a huge volume of literature has accumulated on this subject. NVG is an advanced manifestation of diabetic retinopathy. NVG may occur without retinal or optic disk neovascularization (NV); however, it is more commonly seen in association with proliferative diabetic retinopathy.

2.1.2. Retinal vascular occlusive diseases

NVG may occur in the setting of ischemic CRVO or more rarely following ischemic hemi-CRVO, simultaneous multiple-branch retinal vein occlusion involving large areas of the retina, or when venous occlusions are superimposed upon a background of non-proliferative diabetic retinopathy. There are many unfounded theories regarding NVG and vein occlusions. These have spawned controversy and some confusion on the etiology, natural course and management of NVG in such patients. I have discussed the various misconceptions elsewhere (Hayreh, 2005). I have included here an abbreviated discussion of some of the most common misunderstandings relevant to NVG in retinal vascular occlusive diseases.

2.1.2.1. Retinal vascular occlusive diseases associated with NVG

2.1.2.1.1. Central retinal vein occlusion (CRVO). There is a common notion among ophthalmologists that every eye with CRVO is at risk of developing NVG. It is well established now that CRVO is of two distinct types—non-ischemic and ischemic CRVO, with very different clinical findings, complications, course, prognoses and managements (Hayreh, 1965, 1976, 1983, 1994, 2003, 2005; Hayreh et al., 1983, 1990a). *NVG is a complication only of ischemic CRVO* (Hayreh et al., 1983). Eyes with non-ischemic CRVO do not develop ocular NV or NVG (Hayreh et al., 1983), unless there is associated diabetic retinopathy or ocular ischemic syndrome—the latter two associated conditions being the sole cause of ocular NV in those eyes, which may wrongly be attributed to non-ischemic CRVO.