Singapore Med J 2015; 56(5): 237-247
doi: 10.11622/smedj.2015071

Advances in the management of diabetic macular oedema based on evidence from the Diabetic Retinopathy Clinical Research Network

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ABSTRACT The Diabetic Retinopathy Clinical Research Network (DRCR.net) performs studies on new treatments for diabetic retinopathy. This review aims to summarise recent findings from DRCR.net studies on the treatment of diabetic macular oedema. We performed a PubMed search of articles from the DRCR.net, which included all studies pertaining to the treatment of diabetic maculopathy. The main outcome measures were retinal thickening as assessed by central subfield thickness on optical coherence tomography and improvement of visual acuity on the Early Treatment Diabetic Retinopathy Study (ETDRS) chart. Findings from each study were divided into modalities of treatment, namely photocoagulation, bevacizumab, triamcinolone, ranibizumab and vitrectomy. While modified ETDRS focal/grid laser remains the standard of care, intravitreal corticosteroids or anti-vascular endothelial growth factor agents have also proven to be effective, although they come with associated side effects. The choice of treatment modality for diabetic macular oedema is a clinical judgement call, and depends on the patient's clinical history and assessment.

Keywords: diabetic macular oedema, DRCR.net review, treatment

INTRODUCTION

The Diabetic Retinopathy Clinical Research Network (DRCR.net) performs multicentre clinical research studies on diabetic retinopathy. It is funded by the National Eye Institute and consists of almost 200 clinical sites distributed throughout the United States. The network, which represents a powerful resource to rapidly assess new treatments, has completed a number of studies that have dramatically enhanced the management of diabetic retinopathy. Secondary manuscripts from assorted DRCR.net studies have also provided useful information on both patient care and study design. A complete list of publications is available from the DRCR.net website.

Diabetic retinopathy is a major cause of blindness in the working-age group (i.e. 25–65 years). Clinically significant diabetic macular oedema (DMO) is the commonest cause of moderate visual loss. Wild et al estimated the worldwide prevalence of diabetes mellitus to be 2.8%.[1] The Wisconsin Epidemiologic Study of Diabetic Retinopathy (WESDR), a population-based study in southern Wisconsin, estimated that the prevalence of DMO after 20 years of known diabetes mellitus was about 28% in both type 1 and type 2 diabetes mellitus.[2] The incidence over a ten-year period was reported to be 20.1% in the younger-onset group (before age 30 years), 25.4% in the older-onset group taking insulin and 13.9% in the older-onset group not taking insulin.[3] The 25-year cumulative incidence in type 1 diabetes mellitus was found to be 29% and 17% for macular oedema and clinically significant macular oedema, respectively.[4]

DMO is defined by the Early Treatment Diabetic Retinopathy Study (ETDRS) as the presence of: (a) retinal thickening at or within 500 µm of the centre of the macula; or b) hard exudates that are associated with adjacent retinal thickening at or within 500 µm of the centre of the macula; or (c) zone(s) of retinal thickening of one-disc area or larger, any part of which is within the one-disc diameter of the centre of the macula.[5] Traditionally, DMO is further classified as focal or diffuse based on the leakage pattern on fundus fluorescein angiography (FFA). The DRCR.net studied this classification using time domain optical coherence tomography (OCT) (Stratus OCT-3; Carl Zeiss, Jena, Germany). Browning et al's classification of DMO into focal or diffuse did not explain the variations in visual acuity (VA) or responses to treatment, and there are also inconsistencies in clinical examination, colour fundus photography, FFA and OCT, which were further complicated by hybrid definitions.[6] The hybrid definitions have been used to define diffuse DMO, but not focal DMO. These definitions can be categorised into subgroups based on: (a) clinical examination and FFA criteria; and (b) clinical examination, FFA and OCT criteria.

Extending the concept of focal and diffuse by assessing the number of thickened subfields on OCT showed only modest correlation with baseline acuity but no correlation with subsequent changes in acuity, although OCT has a greater likelihood of detecting cystoid abnormalities compared to FFA.[7,8] OCT and fundus photograph both provide complementary information and have moderate correlation in assessing retinal thickening in DMO. However, this cannot be a surrogate for VA,[9] as there is a wide range of acuity for a given degree of retinal oedema even following laser treatment.[9,10]

This review aims to summarise recent findings from DRCR.net studies on the treatment of DMO. The primary outcomes are

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