ORIGINAL ARTICLE

SEVERITY OF DIABETIC RETINOPATHY AND SUBFOVEAL SEROUS RETINAL DETACHMENT

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ABSTRACT: PURPOSE: To determine the Prevalence of subfoveal serous retinal detachment in diabetic Macular oedema among Indians, ascertain the relationship between serous retinal detachment (SRD) and severity of diabetic retinopathy and to study the demographic profile of these patients. **MATERIALS AND METHODS:** Retrospective single centre analysis of all patients with Diabetic macular oedema who received intravitreal Bevacizumab for diabetic macular oedema at the retina clinic between January 2013 to June 2014. **RESULTS:** The overall prevalence of serous retinal detachment in diabetic retinopathy was 40%. The average central macular thickness of patients having subfoveal SRD was 586.2 microns. Statistically significant higher mean CMT was found in patient with PDR having SRD (p value 0.018) over those with NPDR. Higher prevalence of SRD was noted among men (p value 0.036). **CONCLUSION:** Higher prevalence of serous retinal detachment (SRD) was seen in proliferative diabetic retinopathy with a higher prevalence among Indian population with male preponderance.
KEYWORDS: Serous Rd, Diabetic Macular Oedema.

INTRODUCTION: Diabetic retinopathy (DR), a major microvascular complication of diabetes, has a significant impact on the world's health systems. It is projected that number of people with DR worldwide will grow from 126.6 million in 2010 to 191.0 million by 2030, and the number with vision-threatening diabetic retinopathy (VTDR) is expected to increase from 37.3 million to 56.3 million.[1]

According to the latest World Health Organization (WHO) report, India has 31.7 million diabetic subjects, and the number is expected to increase to 79.4 million by 2030.[2]

A recent systematic review of 35 population-based studies showed that the prevalence of DR, proliferative diabetic retinopathy (PDR), diabetic macular edema (DME), and VTDR among individuals with diabetes is 34.6%, 7.0%, 6.8%, and 10.2%, respectively.[3]

During OCT examination of patients with diabetic CME, Kang et al found that the prevalence of serous macular detachment was much higher than in patients who did not show serous macular detachment on Ophthalmoscopic examination and fluorescein angiography. CME prevents the detection of serous macular detachment by clinical examination and fluorescein angiography. Because of its improved resolution and image quality, OCT allows an in vivo cross-sectional observation of even subtle serous macular detachment that is difficult to diagnose at the slit-lamp or by fluorescein angiography in patients with diabetic CME.[4]

Using OCT, we intend to know the prevalence of serous macular detachment (FIGURE 1) in diabetic CME in Indian scenario, and its correlation to severity of diabetic retinopathy.

AIMS and OBJECTIVES: This is a single centre retrospective observational case study was intended to examine if presence of sub retinal fluid is associated with severity of retinopathy.

To study the demographic profile of patients with diabetic macular oedema having SRD on OCT.

To assess the central macular thickness in these patients on Time domain OCT.

To determine the Prevalence of serous macular detachment in diabetic CME among Indians

MATERIALS and METHODS: A retrospective analysis of case records of all patients between January 2013 and June 2014 who received intravitreal Bevacizumab injection for diabetic macular oedema having subretinal fluid demonstrated on Time domain OCT were analyzed in detail. The authors of the study adhered to the tenets of the Declaration of Helsinki.

INCLUSION CRITERIA:

- All patients with diabetes having diabetic retinopathy,
- The presence of clinically significant macular oedema in the fundus examination,
- The presence of angiographically confirmed diabetic macular oedema,
- The presence of CME and serous macular detachment documented by OCT type 3A as described by Kang.

EXCLUSION CRITERIA:

- Non diabetics with macular oedema.
- Patients having undergone vitreo retinal surgery in past.
- Central serous retinopathy.
- Wet ARMD.
- Eyes that had received previous grid laser photocoagulation.
- The presence of epiretinal membrane or vitreo-macular traction documented by OCT,
- The presence of dense media opacity or pre-retinal haemorrhage that might prevent OCT examination.
- Eyes with previous intraocular surgery or vitreo-retinal pathology other than diabetic retinopathy.

METHODOLOGY: A retrospective analysis of case records of all patients who received intravitreal Bevacizumab for diabetic macular oedema at the Retina clinic between January 2013 to June 2014 was analysed. A detailed ophthalmic evaluation including visual acuity, slit lamp biomicroscopy and indirect ophthalmoscopy were done. Time domain OCT was performed using the Stratus OCT version 4.0.7. Patients having subretinal fluid demonstrated on OCT were included in the study and results tabulated.

The grading of diabetic retinopathy was done based on modified klein classification as mild, moderate and severe nonproliferative diabetic retinopathy and proliferative diabetic retinopathy. The modification was proposed as a standardized alternative to the more detailed Early Treatment Diabetic Retinopathy Study (ETDRS) system.[5]

DEFINITION OF CME ON OCT: The OCT examination showing CME was the presence of hyporeflective intraretinal cavities radiating from the centre of the macula in cross-sectional scans included. Serous macular detachment was thought to be present if the posterior surface of the retina was elevated over a non-reflective cavity with minimal shadowing of the underlying tissues. All records of the patients including age, sex, diagnosis at presentation etc were tabulated.
Macular oedema on OCT will be defined by the following (Kang et al)[6]:

- type 1 is shown by thickening of the fovea with homogeneous optical reflectivity throughout the whole layer of the retina;
- type 2 is shown by thickening of the fovea with markedly decreased optical reflectivity in the outer retinal layers, and
- type 3 is shown by thickening of the fovea with subfoveal fluid accumulation and the distinct outer border of a detached retina, and comprises
  - Type 3A, without foveal traction, and
  - Type 3B, with apparent vitreo-foveal traction.

  All data was compiled and tabulated.

RESULTS: The prevalence of serous detachment in diabetics was 40%, present in 31 of the 77 patients. [Graph 1]

A total of 77 patients were studied of which 63 were males and 14 were females. Males accounted for 82% of patients and females were 18%. Sub foveal serous detachment was seen in 31 of the 77 patients amounting to 40% of the study group. 38% of the patients with subfoveal SRD were males and 3% were females which were found to be statistically significant with a higher prevalence amongst males (p value 0.036).

The average age of male patients in this group was 55.58 years age group varied from 40- 72 years and in females was 56.64 years with a range of 45- 69 years.

46% and 14% of the male and female population included in the study had SRD.

The central macular thickness of patients having subfoveal SRD was 586.2 microns and those without was 445.84 micron in males. The average macular thickness in females was 422.86 microns. [Graph 2]

SRD was prevalent in 19% with moderate NPDR (6 of 31), 26% with severe NPDR (8 of 31) and 55% with PDR (17 of 31). [Graph 3]

Statistically significant higher mean CMT (566 microns) was found in patients with PDR having SRD (p value 0.018) than those with NPDR.

DISCUSSION: Diabetic retinopathy causes vascular complications of retina causing blindness. Macular edema is the crucial cause of visual impairment and may occur at any stage of diabetic retinopathy. OCT enables precise measurement of macular thickness and facilitates detecting macular oedema which is the main pathologic feature of diabetic maculopathy. This is defined as any detectable retinal thickening due to fluid accumulation. The oedema may be symmetrical or involve only a sector of the macular area. The main characteristics of macular oedema in OCT, apart from increased retinal thickness, include intraretinal spaces of reduced reflectivity, disintegration of the layered retinal structure, and usually also flattening of the central foveal

depression, fluid under the neurosensory retina. Yohannan et al. demonstrated that disruption of IS/OS junction correlates well with a significant decrease in point sensitivity in eyes with DME.

Logistic regression analysis done by Mohan et al showed that for every 5-year increase in the duration of diabetes, the risk for DR increased 1.89-fold. For every 2% elevation of glycated hemoglobin (HbA1c), the risk for DR increased by a factor of 1.7.[7]

OCT has demonstrated serous macular detachment with macular edema in 7% to 15% of patients with diabetic macular edema.[8]

Marmor reported the development of retinal detachment depended on the osmotic or oncotic pressure of intraocular fluids.[9] In eyes with DME, vascular hyperpermeability might increase such pressures, resulting in SRD. High-resolution OCT has enabled observation of the cystoid spaces in the OPL that sometimes rupture toward the SRD, suggesting that extravasated blood components pour directly into the SRD.[10] No association was found between VA and foveal thickness in eyes with foveal SRD,[11] whereas these eyes often have a poor prognosis after treatment.[12] OCT often delineates hyperreflective foci in subretinal fluids. According to ETDRS study subfoveal hard exudates develop after resolution of the macular edema (ME) that correspond to the confluent hyperreflective foci along with impaired visual function.[12,13,14]

Detachment of the sensory retina occurs when fluid from the retinal or choroidal circulation leaks into the subretinal space and the compensatory mechanism for fluid removal is exceeded. Weinberg et al suggested that the pathogenesis of serous retinal detachment is due to leakage from retinal or choroidal circulation into the subretinal space exceeds when it exceeds its drainage capacity. Ravalico & Battaglia opined it is linked to the limitations of the draining vascular system and in the function of the retinal pigment epithelium. Kang et al reported that in diabetic eyes the incidence of CME and serous macular detachment increases with the existence of retinal vascular hyperpermeability. The external limiting membrane is permeable to fluid and albumin, with the disruption of the inner blood–retinal barrier, the excess fluid reaches the subretinal space in large amounts, fails to be removed by the retinal pigment epithelium resulting in subfoveal detachment.

According to a study by Otani et al, OCT showed three patterns of diabetic macular oedema: retinal swelling, cystoid macular oedema and serous retinal detachment. Among the 59 eyes included in the study, only nine eyes (15%) showed serous retinal detachment (six eyes with retinal swelling and three eyes with both retinal swelling and cystoid macular oedema) (Otani et al. 1999). In our study all the 77 patients had cystoid macular oedema and 31 had serous detachment.

The presence of Neuro Sensory Detachment adversely affects the prognosis of DME,and can significantly limit effective laser treatment of the macula.[15] Poor visual prognosis after vitrectomy has been reported in the presence of NSD in DME.[16] To our knowledge, in available literature ours is probably the first study among Indian population where a comparison is made between the severity of DR and subfoveal SRD in diabetics.

Our study which included South Indian population showed the overall prevalence of SRD to be about 40% which was comparable to 31% in a study published by Ozdemir et al.[17] We found a higher prevalence of serous RD in patients with worsening of diabetic retinopathy with maximum number of patients having PDR.

The overall central macular thickness was highest among patients with PDR.

Among the various patterns of DME, NSD under the fovea has been reported in 3–31% of patients in various studies but our study shows a relatively higher value. Indian study by Gupta et al has reported the presence of systemic hypertension as a significant and independent risk factor for NSD in DME, but we are emphasising the association of NSD with the severity of diabetic retinopathy.[18]

CONCLUSION: There is a higher prevalence of subfoveal serous retinal detachment among Indian population. The presence of SRD varies with the severity of diabetic retinopathy may adversely affect the visual prognosis in patients with diabetes. There is increase in serous RD with worsening of diabetic retinopathy. This study gives an insight in to need for a larger prospective population based study, to know the possibility of neuro sensory detachment affecting the final visual prognosis and treatment of vision threatening diabetic retinopathy depending upon the severity of retinopathy.

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