Spectral Domain oct Patterns Of Macular Edema Associated With Branch Retinal Vein Occlusion In Indian Eyes

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Abstract : **Aim :** To study the spectral domain optical coherence tomography (sd-oct) characteristics of macular edema in branch retinal vein occlusion. **Methods :** 39 patients with branch retinal vein occlusion were studied with sd-oct . Characteristics analyzed were - integrity of inner segment outer segment junction, integrity of external limiting membrane, central retinal thickness and presence or absence of serous macular detachment. **Results :** 30 patients had disrupted photoreceptor Inner Segment-Outer Segment integrity. (76.9 %). External Limiting Membrane was disrupted in 64.2 % patients (n=25). Serous macular detachment was present in 20. 5% patients. Average central retinal thickness was 363.84 microns. **Conclusions :** Spectral domain oct characteristics can help to predict the visual outcome in patients with macular edema due to branch retinal vein occlusion. [Aggarwal S et al NJIRM 2013; 4(6) : 102-106]

Key Words: Is-os junction, macular edema, spectral-domain oct.

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Introduction: S Branch retinal vein occlusion (BRVO) is a common cause of retinal vascular diseases occurring most frequently between 60-70 years of age.[1] Occlusion occurs most frequently at a retinal arterio-venous crossing. Common risk factors are systemic hypertension, diabetes mellitus, hyperlipidemia, glaucoma, smoking and age related atherosclerosis. Macular edema is a common cause of vision loss in patients with BRVO.[2] Till the last decade grid laser photocoagulation was considered the gold standard for treatment of macular edema not resolving till three months. In last decade anti-vegf (anti- vascular endothelial growth factors) emerged as a major treatment modality.

Optical coherence tomography provides information regarding retinal tomography. It is like an in-vivo optical biopsy wherein we can see the histopathology of the retina. Spectral domain Oct (SD-OCT) has axial resolution of 6-7 microns which can provide better visualization of tissue pathology.[3]

In various clinical trials decrease in central macular thickness on OCT is considered an important secondary endpoint.[4] But it has been found that some patients achieve only poor or limited improvement in visual acuity despite complete resolution of the macular edema. Integrity of the foveal photoreceptor layer might explain the difference in final visual acuity after resolution of macular edema.The aim of this study was to identify the characteristics of macular edema on spectral – domain OCT which can help to predict the visual outcomes.

Methods: As it was a retrograde data analysis study, the permission of institute director was taken to carry out the study.

Spectral domain OCT records of 39 patients with macular edema in BRVO diagnosed at M & J Institute of Ophthalmology during May 2011 to April 2012 were studied. All patients were evaluated using the TOPCON 3D-OCT 2000 VERSION 1.4 X.

Imaging protocols used were the line scan and the 3D macula scan. The following characteristics were analyzed:

1. Inner segment- outer segment (IS-OS) junction was studied for possible morphological alterations like thickening, absence, deformation and disruptions. (Fig 4, 5)
2. Integrity of external limiting membrane (ELM). It is more resilient than IS-OS junction and can be seen when the later has disappeared. Cystoid spaces are seen on the inside of the ELM and are in contact with it.(Fig 1, 2)
3. Central retinal thickness.
4. Presence or absence of serous macular detachment. Serous retinal detachment can present alone or in conjunction with Cystoid macular edema. (Fig 3)

The defining criteria for above parameters were
1. The inner segment outer segment junction (IS-OS) normally presents as a hyper reflective line parallel to the retinal pigment epithelium .It can be detected more readily on grayscale mode.
.2. A thin hyper reflective line above the IS-OS junction is the External limiting membrane.(ELM)
3. The spectral domain OCT (SD-OCT) measures the retinal thickness from the RPE to the ILM.
4. An area of hypo reflectivity in the sub foveal region is consistent with serous macular detachment.

Results: Gender :Males were involved in 58.97% of cases (n=23). Females were involved in 41.02% of cases. (n= 16)

Age:The patients were in the age range of 31-83 years. 7 patients in the age range of 40-49 years, 12 in the range of 50-59, 19 >60 years.1 patient was <40 years.

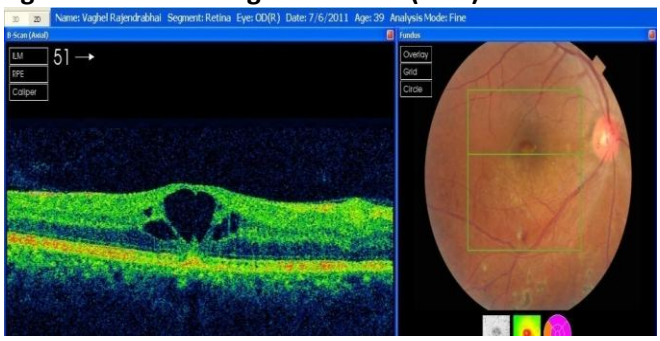
Laterality: Right eye was involved in 20 patients, left eye in 19 patients.

SD-OCT characteristics: 30 /39 patients had disrupted photoreceptor inner segment outer segment junction. (76.9%). ELM was disrupted in 64.2% patients (25/39). In 5 patients with disrupted IS-OS junction the ELM was intact. Serous retinal detachment was present in 20.5% patients. All patients with serous retinal detachments had disruptions of IS-OS junction. The central retinal thickness ranged from 174 to 736 microns with an average of 363.84 microns.

Discussion: In recent times spectral domain Oct (SD-OCT) characteristics have become an important secondary end point after visual acuity in various clinical trials as a response to treatment. Changes occurring in the photoreceptor layer are considered an important entity in predicting visual outcomes after resolution of macular edema.

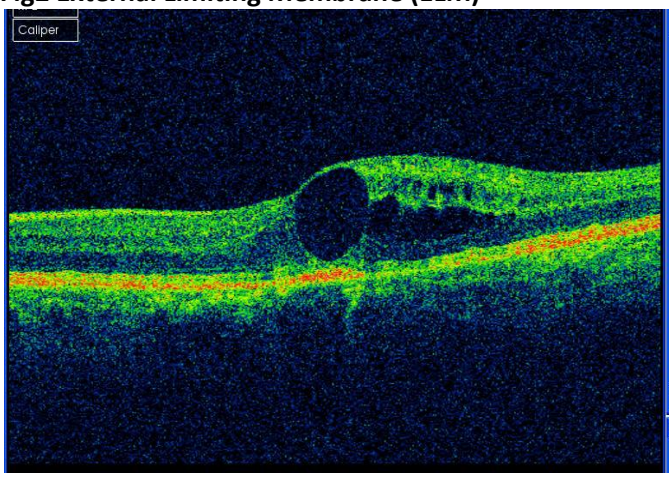
A number of recent OCT studies have identified that continuity of the photoreceptor inner segment/outer segment (IS/OS) junction line in the fovea is a hallmark of foveal photoreceptor integrity, which is critical to visual outcome in eyes with

Fig 1External Limiting Membrane (ELM)



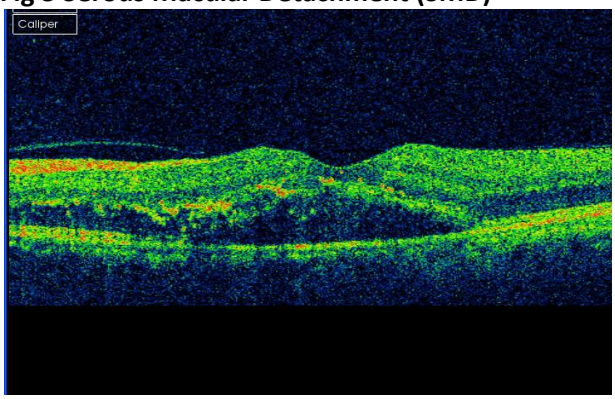
ELM- thin hyper reflective line above the IS-OS junction

Fig2 External Limiting Membrane (ELM)



Cystoid spaces are seen on the inside of the ELM .

Fig 3 Serous Macular Detachment (SMD)



An area of hypo reflectivity in the sub foveal region is consistent with serous macular detachment

Fig 4 IS-OS Disruptions

Fig 5 IS-OS Disruptions

Branch retinal vein occlusion (BRVO): Coscas G et all[5] studied the SD-OCT patterns of retinal venous occlusion with macular edema treated with sustained release dexamethasone implant (Ozurdex) in 9 patients.SD-OCT demonstrated the presence of external limiting membrane and integrity of IS-OS junction in 6/9 patients at end of three months. They concluded that final visual acuity in eyes with still interrupted or thickened IS-OS junction was poorer than those with intact IS-OS line.

In another study by Zou et all,[6] comprising of 41 patients, the thickness of foveal neurosensory retina and photoreceptor layer that was beneath the foveal Cystoid spaces, and the transverse length and height of foveal Cystoid spaces were measured on SD-OCT. The status of the junction between inner and outer segments of the photoreceptors (IS-OS) in the fovea was also assessed. The correlations between the parameters above and visual acuity were analyzed. The average foveal neurosensory thickness was (484.71 ± 131.86) μm, the photoreceptor layer thickness was (92.04 ± 45.53) μm and the size of foveal cavity was 772.59 μm × 362.17 μm.Cases were classified as three groups according to the status of IS-OS layer: continuous group (8 cases), discontinuous group (19 cases) and interrupted group (14 cases).They concluded that in patients with persistent Cystoid macular edema associated with BRVO, the thickness of the foveal photoreceptor layer are positively associated with visual acuity, and the eyes without IS-OS layer have worse visual acuity than eyes with IS-OS layer.

In another study by Masafumi Ota et [7]all they studied the foveal photoreceptor layer in eyes with Cystoid macular edema in branch retinal vein occlusion. Of the 42 eyes, 15 showed a continuous IS/OS line in the fovea. Visual acuity in the eyes with a continuous IS/OS line in the fovea was significantly better than that in eyes with a discontinuous or interrupted IS/OS line ($P < .0001$).
In a study by Kang et al [8]of 59 patients, 31 patients had disrupted photoreceptor integrity.23 patients had disruption of ELM .They concluded that the strongest predictor of final best corrected visual acuity were photoreceptor IS-OS integrity followed by ELM status followed by baseline visual acuity.
In our study 76.9% (30/39) patients had IS-OS junction disruption.

In their study of 20 eyes with branch retinal vein occlusion on 3D OCT, Yamaike N et [9] al found that ELM was not seen clearly in 2 eyes. ELM was disrupted in 64.2% patients (25/39) in our study.

In 5 patients with disrupted IS-OS junction the ELM was intact suggesting that it is more resilient than IS-OS junction.

In a study by Spaide et al [10] to evaluate the incidence of serous retinal detachment secondary to BRVO, it was found in 4/14 eyes (42.9%)(Table 1)

In a large study by Yamaguchi et al [11] comprising 109 patients (70 major BRVO and 39 macular BRVO). Serous detachment was present in 63% patients with major brvo and in 21% eyes with macular brvo. In our study the serous retinal detachment was present in 20.5% patients.

Limitations of our study are small sample size and retrospective nature. Our findings suggest that spectral domain Oct characteristics like disruptions of IS-OS junction and ELM and presence of serous detachment can help predict the visual outcome in patients with macular edema. (Table 2)

Table 1:Percentage wise Comparison of IS-OS and ELM Disruption with other studies:

Characteristics	Coscas g et al.	Zou et al	Masafumi ota et al.	Kang HM et al	Our study
No of patients	9	41	42	59	39
Is-os disruption	6 (66.6%)	33 (80.48%)	27 (64.28%)	31 (52.54%)	30 (76.92%)
Elm disruption	6 (66.6%)	-		23 (38.98%)	25 (64.10%)

Table 2:Percentage wise comparison of serous retinal detachment with other studies.

Characteristics	Spaide et al	Yamaguchi et al	Takahashi k et al.	Our study
No of patients	14	109	111	39
Serous retinal detachment	4 (28.57 %)	52 (47.70%)	22 (19.81%)	8 (20.51%)

Conclusion:-SD-OCT has brought into focus important aspects of disease previously unknown. Limitations of our study are small sample size and retrospective nature. Our findings suggest that spectral domain Oct characteristics like disruptions of IS-OS junction and ELM and presence of serous detachment can help predict the visual outcome in patients with macular edema.Further studies are needed to study in detail its role in predicting the visual outcome in patients with macular edema in Branch retinal vein occlusion.

Abbreviations:

BRVO- branch retinal vein occlusion
SD-OCT-spectral domain optical coherence tomography
IS-OS – inner segment outer segment junction.
ELM- external limiting membrane.

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