IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 16, Issue 11 Ver. IX (Nov. 2017), PP 22-25
www.iosrjournals.org

A Study Role of OCT in the evaluation of clinically significant macular edema in diabetic retinopathy

*Dr.P.Rajasekhar[1] M.S., Dr.M.Parnikumar[2] M.S., Dr.K.Saketa[3] PG
[123]*Dr.P.Rajasekhar M.S Assistant professor of ophthalmology, GMC, Guntur*
Corresponding author: Dr.M.Parnikumar M.S.

.

Date of Submission: 07 -11-2017 Date of acceptance: 28-11-2017

I. Introduction

Diminision of visual acuity in association with diabetic retinopathy most commonly results fromdiabeticmacular oedema. Traditional method of assessing DME include 78D/90D slit lamp biomicroscopy, indirectophthalmoscopy, fundus flouorescein angiography and fundus stereophotography. The efficacy of these methods to quantify DME is limited. OCT is an objective method of evaluation of DME with effectiveness in both quality and quantity. Retinal vascular diseases, in particular diabetic retinopathy and retinal venous occlusive disorders, are important causes of visual loss and blindness. Other important retinal vascular diseases which can affect visual function include arterial occlusive disease, parafoveal telangiectasis, Coat's disease, vasculitides, macroaneurysms, and hypertensive retinopathy.

Despite the various etiologies and underlying pathogenic processes, the mechanisms of visual loss are frequently similar among these diseases. One such common final pathway is the development of occlusions of the microcirculation (capillaries) with attendant retinal ischemia. The most frequent sequela, however, is a compromise in retinal vascular permeability leading to leakage and exudation with accumulation of fluid, lipid, and proteins within the retina or in the subretinal space. Structural alterations are also a frequent outcome of retinal vascular disease. These changes include the development of cystoid spaces in the retina and vitreomacular traction.

1.1 Clinically significant macular oedema (CSMO) was defined in the ETDRS:

- Retinal thickening within 500 µm of the centre of the macula
- tes within 500 µm of the centre of the macula, if associated with retinal thickening (which may be outside) µm
- Retinal thickening one disc area (1500 µm) or larger, any part of which is within one disc diameter of the centre of the macula

OCT is based on the principle of low coherence interferometry akin to B-scan ultrasonography, OCT uses differences in the reflection of light, instead of sound echoes, to render two dimensional images (tomograms) of the retina. Various light sources, typically superluminescent diodes or lasers with very short pulses (i.e., femtosecond lasers), are used to generate broad bandwidth
light. The depth or axial resolution of OCT is based on the bandwidth of these sources, and the lateral resolution is determined by the diameter of the focused probe beam.

1.2 Essentials of OCT

- Provides both cross-sectional visualization and clinically relevant quantitative measurements
- Based on low-coherence interferometry
- Measures reflectivity of tissue interfaces with axial resolution less than 10 µm
- Good reproducibility in patients with macular diseases.

The light is split into two different paths: a reference beam projected inside the instrument and a sample beam focused on the tissue of interest. In time domain OCT, differences in the time of flight for these two light paths are measured using a Michelson-type interferometer. In Fourier domain OCT,
these differences are characterized with a spectrometer and Fourier-based mathematical calculations. Differences in the optical characteristics of ocular
tissues result in the different reflectivity intensities that are measured by OCT.

A single point of light reflected off the retina forms an *A-scan*, which contains information about the axial location of these tissue interfaces. These single points of light can be laterally aligned to form *B-scan*

images, which often use a false-color display to depict interface intensities: highly reflective interfaces are rendered in white and red, medium level reflections are shown as yellow and green, and features with low reflectivity are depicted in blue. OCT data can be viewed en face as a *C-scan* or in dense three-dimensional cubes (3D OCT) by capturing B-scans in rapid succession. Whereas the axial resolution of clinical ophthalmic echography is limited to greater than 100 μm, differences less than 10 μm can be discerned with conventional OCT instruments. Newer instruments, potentially coupled with adaptive optics devices, can resolve structures that are separated by less than 2 μm in the axial
direction.

Scan acquisition is painless for the subject, but requires cooperation and steady fixation. Due to inherent speed limitations in conventional time domain OCT technology, a radial pattern of scan line capture is often used as a compromise between acquisition time and imaging density. Even with this compromise, time-domain OCT instruments require the subject to maintain steady fixation for many seconds at a time, which may be difficult for patients with macular disease. Therefore, use of an external fixation light for the fellow eye has been advocated when the acuity of the eye being examined is less than 20/300. Investigators using OCT as the gold-standard definition of DME have found that diffuse thickening, thickening between 200 and 300 μm, and absence of hard exudates in the central macula are all predictors for the failed detection of CSME by slit-lamp biomicroscopy. Since more than half of the errors in the diagnosis of DME may be on the conservative side, some clinicians advocate the use of OCT if macular edema is not detected using standard clinical methods. However, Browning also found a substantial percentage of patients undergoing focal laser therapy for CSME who did not have a single OCT zone thickened beyond normal ranges.

Since OCT was developed after the completion of the Early Treatment Diabetic Retinopathy Study, we do not have robust evidence for its use as an adjunct or replacement for slit-lamp biomicroscopy, nor do we have guidance on treatment recommendations for subclinical or OCT-evident macular edema. Nevertheless, even in the absence of proof from robust clinical trials, OCT is still becoming a standard of clinical practice for the evaluation of macular diseases, and will likely become a permanent feature in treatment and management decisions for diabetic macular edema. The OCT provides quantitative measurement of macular edema. The OCT images correlate well with fundus biomicroscopy and fluorescein angiography. Three types of macular edema are described; they are sponge-like, cystoid, and subfoveal serous detachment. Sponge-like macular edema is confined to the outer retinal layers due to backscattering from intraretinal fluid accumulation. Cystoid macular edema shows large cystoid spaces with intervening septae. Subfoveal serous detachment in association with macular edema appears as an area of hypo reflective area bounded by a hyper reflective area under the fovea. Currently photocoagulation, intravitreal injection of triamcinolone acetonide, and vitrectomy are advised for treatment of different types of macular edema. The OCT images also can be used to titrate photocoagulation in eyes where it is recommended.

5 distinct patterns recognised on OCT:

- Type 1 – focal macular thickening
- Type 2 – diffuse thickening without cysts
- Type 3 – diffuse thickening with cystoid macular oedema
- Type 4 – tractional macular edema

4a – posterior hyaloid traction
4b – epiretinal membrane
4c – combination of posterior traction & ERM

- Type 5 – DME of any of the above type associated with macular serous retinal detachment

Patients and methodology:

- In this study OCT scans were performed in about 100 patients with diabetic retinopathy.

Inclusion criteria:

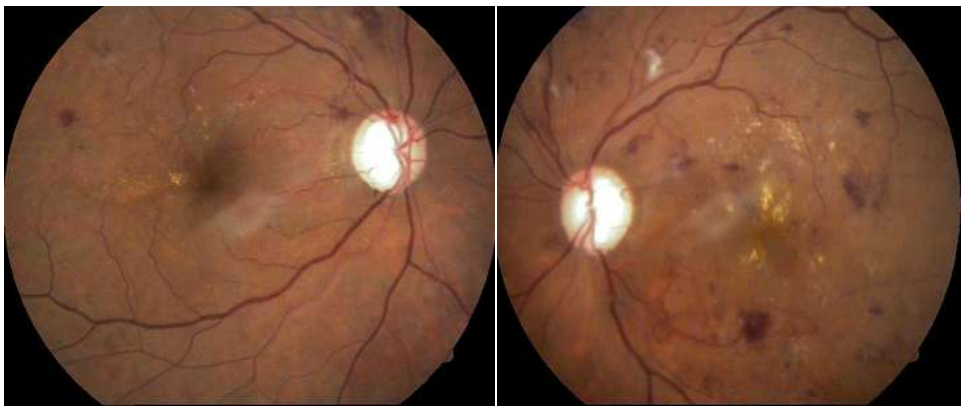
- Pts diagnosed as having diabetic retinopathy with CSME on slit lamp examination and direct/indirect ophthalmoscopy.

Exclusion criteria:

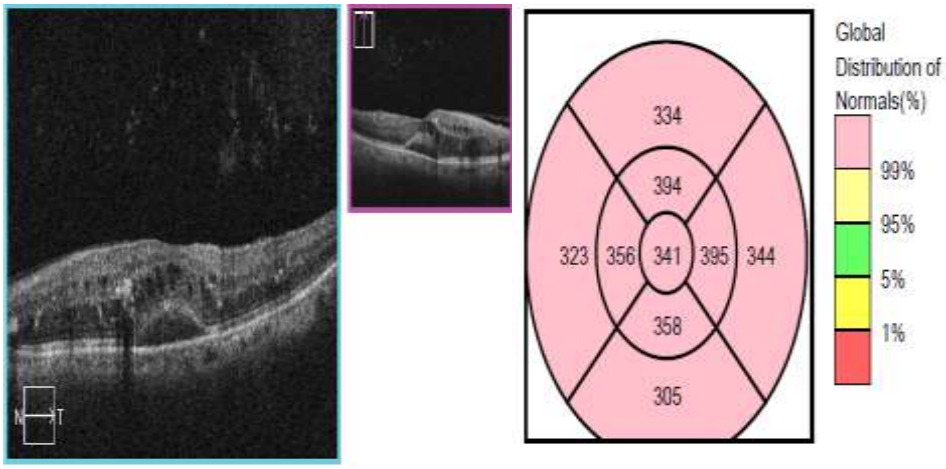
- Significant media opacities like cataract that can result poor OCT signal.
- Pts with other causes of macular edema like retinal vein occlusions, ARMD, CSCR etc.

A complete ophthalmological examination was performed to all pts including the BCVA, slit lamp biomicroscopy fundus examination, and stereophotography. A spectral domain OCT scan was performed through a dilated pupil. Macula was scanned in horizontal and vertical meridians. Foveal thickness was assessed by automated method. Diabetic macular edema is considered to be significant when the foveal thickness is more than 252+/-23micrometres and extra foveal thickness more than 252+/- 20 micrometres

Severity of diabetic retinopathy is graded as per the ETDRS classification Non proliferative diabetic retinopathy/ proliferative diabetic retinopathy with or without clinically significant macular edema will have prognostic significance on the visual outcome . And the treatment plan for DR like laser photocoagulation, intravitreal anti-VEGFs, is largely dependent on the presence of macular edema



Fundus picture of both eyes moderate NPDR with clinically significant macular edema.



OCT picture of diabetic macular edema with diffuse thickening with cysts and subretinal fluid.

II. Results

- Out of 100 pts male pts were 54 & female pts were 46

Total no.of pts	No. of males	No.of females
100	54	46

III. Age distribution:

The age of the patients in the study ranged from 39-68yrs. Mean age of our study is 56.8yrs. majority of the pts falling under the age group of 50-60yrs (around 47%).

Distribution of cases as per the ETDRS grading:

ETDRS grade	No. of pts	Percentage
• Mild NPDR with DME	30	30%
• Moderate NPDR with DME	43	43%
• Severe NPDR with DME	19	19%
• PDR with DME	08	08%

IV. Macular Edema On OCT

200 eyes of 100 patients with diabetic retinopathy were examined. 57 pts (57%) showed the bilateral involvement with macular edema on OCT scan and 43 pts (43%) showed the unilateral involvement. A total of 157 eyes (78.5%) out of 200 examined eyes showed Diabetic Macular Edema. 43 eyes (21.5%) with diabetic retinopathy showed no macular edema.

Type of thickening:

Type of thickening	No.of eyes	Percentage
• Focal thickening	49	31.21%
• Diffuse thicekning without cysts	36	22.92%
• Diffuse thickening with cysts	72	45.85%

Amoung the paitents with diffuse thickening, tractional macular edema was found in 11 pts (7.06%) with epiretinal membrane alone in 7 pts (4.45%) and combined posterior hyaloid traction with epiretinal membrane in 4pts (2.54%). Subretinal fluid with Macular Serous Retinal Detachment was reported in 3 pts (1.91%). Mean macular thickness of the study was 292.51 microns

V. Summary

In the present study 100 pts presented with clinically significant macular edema in association with diabetic retinopathy. OCT was performed to confirm the presence and severity of macular edema. Diffuse thickening of the macula with cysts found out to be predominant i.e; in 46% of pts which is consistent with the literature.

VI. Conclusion

OCT is a new tool in the armamentarium of the posterior segment diagnostics for evaluation of macular and retinal diseases. It helps in assessing the macular diseases more effectively. Hence we have taken up this study to assess CSME in diabetic retinopathy.

References

[1]. Retinal Vascular Disease A.M.Joussen·T.W.Gardner·B.Kirchhof· S.J. Ryan (Eds.)
[2]. Optical coherence tomography in macular diseases and glaucoma, 1st edition, pg no 83
[3]. The Diagnostic Function of OCT in Diabetic Maculopathy - Bartosz L. Sikorski,1 Grazyna Malukiewicz,1 Joanna Stafiej,1 Hanna Lesiewska-Junk,1 and Dorota Raczynska2
[4]. Macular Edema in Diabetes Treatment & Management - Emmanouil Mavrikakis, MD, PhD; Chief Editor:
[5]. Ampton roy , sr, Md Phd,more…

* Dr.M.Parnikumar M.S. "A Study Role of OCT in the evaluation of clinically significant macular edema in diabetic retinopathy." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) 16.11 (2017): 22-25