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# A Study On The Role Of Optical Coherence Tomography(Oct) In The Detection of Degenerative Changes In Pathological Myopia

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***Purpose:*** *To assess the role of optical coherence tomography (OCT) in evaluation of the retinal changes in pathological myopia.To study foveal,macular and vitreous changes with the help of OCT.*
***Methods:*** *A cross-sectional study was conducted. 30 patients with pathological myopia were studied with regard to their visual acuity, amount of myopia with streak retinoscopy and posterior segment changes with dilated fundus examination and OCT.*
***Results :****out of 60 eyes , 40% of eyes had refractive error between 6-8 D ,50% of eyes had refractive error between 9-12 D and 10% had > 12D. Various OCT changes in pathological myopia are as follows,Myopic configuration of ONH in 48.9% eye, PVD in 20%, Myopic retinal degeneration in 15.4% , Peripapillary detachment 3.1%, Lacquer cracks 5.1%, Posterior staphyloma in 22% , Foveoschisis 4.8% , Macular hole 4.2% , Macular CNV 7.6%, Myopic traction maculopathy 3.8%*
***Conclusion :****Precise and early diagnosis of CNV and posterior staphyloma is very much possible with only OCT, which facilitates its early management ,and can prevent further visual loss.*
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## I. Introduction

Pathological or high myopia is defined as a refractive error of > -6.00 D and axial length >26.5mm[1]. Pathological myopia is more prevalent in Asian population. Prevalence varies from 1 to 4% of general population[2]. It is the leading cause of blindness in Asian countries mostly in china and japan. The frequency of Degenerative Myopia ranges from 27% to 33.2% of myopic population which corresponds to rates of 1.7-2.1% for the general population[3].

Female gender, younger age, early onset of myopia & family history are all risk factors for Pathological Myopia. It is twice as common in females than in males[4].

Increased standards of living and recent changes in the lifestyle of younger generation, lead to spending more time on near work like online classes, reading, usage of electronic gadgets like mobile phones, tabs which probably resulted in increased prevalence of Myopia.

The early stages of Myopic Retinal changes can often be underestimated by Biomicroscopy, Angiography or U/S. Recently OCT, with its high resolution cross sectional imaging, was found to make it possible to identify various vision threatening complications of Pathological myopia earlier and facilitated their better management.

OCT is a non invasive imaging tool which has allowed us to visualize the retinal structure in vivo,using 820nm light,SD-OCT has 8-10 microns resolution. It performs 26,000 A-scans/sec.

**PATHOGENESIS & CLINICAL FEATURES**

Pathological Myopia occurs when progressive increase in axial length causes excessive thinning of the sclera, choroid, RPE and retina, resulting in varying degrees of visual disability[5].

It is a multifactorial disorder with genetic, environmental and socioeconomic etiologies. Defective collagen fibrin formation results in biomechanically weak sclera, leading to progressive elongation of the eye and associated thinning and degeneration of retina, RPE, choroid, & prevalence and severity of these abnormalities correlate directly with the magnitude of Myopia[6].

Fundus manifestations of pathological myopia may include tilting of the Optic disc with Peripapillary atrophy and Tessellated or Tigroid fundus.

**Lacquer cracks** – spontaneous rupture of elastic lamina of the Bruch's membrane that appear as yellow white, irregular, subretinal lines in the posterior pole. They may cause spontaneous subretinal haze, which may produce acute photopsia, metamorphopsia or scotoma. Later complication of Lacquer cracks is CNV.Numerous complications such as PVD, Retinal detachment, Posterior Staphyloma, Macular hole and Subretinal haze leading to visual disability occur at an early age.

**CNV**- The most common vision threatening complication of Pathological myopia is CNV and accounts for 5-10% in high myopic eyes. Genetic, structural and hemodynamic mechanisms are involved in the development of Myopic CNV[3].Excessive elongation of globe may cause mechanical stress, with retinal damage and imbalance of proangiogenic and antiangiogenic factors, resulting in CNV[7].

Tokoro outlined 3 stages of Myopic CNV-1)Active : Patients have sudden vision loss with central scotoma. On fundus examination, slightly elevated greyish zone in the subfoveal region is seen.2)Scar: Hyperpigmented areas known as Fuch's spots form around the prior lesion. Transient improvement in visual acuity may be seen.3)Atrophic: Poor long term visual outcome. Patchy or diffuse atrophy at the macula.

**Differential diagnosis**: OCT helps to differentiate CNV from – Posterior Staphyloma, Retinoschisis, thinned choroid, PVD, Macular atrophy, Macular haze, VMT, Macular hole and inflammation like Multifocal choroiditis &Panuveitis. OCTA has definite role in the diagnosis of Myopic CNV non invasively. Active CNV appear as typical lacy wheel pattern, numerous tiny capillaries, widely anastomosed network and perilesional hypointense halo. Queiscent CNV appear as long filamentous, linear, large, mature looking vessels, rare anastomosis and a dead tree appearance[2].

**POSTERIOR STAPHYLOMA –** is pathognomonic of degenerative myopia. Its frequency is clinically underestimated (10%), compared to histopathologically (35%), and OCT is very much useful in detecting this[3].

**MYOPIC MACULAR RETINOSCHISIS –** is a schisis like thickening of neurosensory retina into a thicker inner layer and a thinner outer layer at the macula in highly myopic eyes with a posterior staphyloma. It is also described as MTM, it includes VMT, Macular hole formation and foveal detachment[2].

Pathogenesis of MTM – splitting of retina overtime due to relative tautness and non compliance of the inner retina compared with outer retina within the posterior staphyloma, at the level of ELM.Patients may complain of blurring or distortion of vision (metamorphopsia), vision loss occurs due to lamellar hole or fovealdetachment. Early stages are easily missed by biomicroscopic examination.

The diagnosis is confirmed by OCT.

OCT based progression of myopic foveal retinoschisis to RD – Shimada et al and also Fang et al - Stage 1- Focal irregularity of thickness of external retinal layer, Stage 2- Outer lamellar hole, Stage 3- Vertical enlargement of hole, Stage 4- Retinal Detachment

Myopic retinopathy includes PVD and RD. PVD leads to – Retinal traction and break (Rhegmatogenous retinal detachment).

**PVD**- high myopic eyes are characterized by premature PVD. It correlates with increased axial length, age and degree of myopia compared to controls. Acute PVD may produce photopsia and a symptomatic floater.PVD may also cause acute VH, retinal traction, retinal break and RRD.

**RRD**- It is the most common surgical complication of high myopia. RRD may result from retinal tear, retinal dialysis, macular hole or acute PVD, and it may develop after cataract surgery also. And also due to lattice degeneration, abnormal vitreo retinal interface caused by increased axial length.

**Patients and methods:** This cross-sectional study was done in the Department of Ophthalmology, Guntur medical college,Guntur, AP from January 2020 to may 2020. A total of 30 patients within the age group of 10-40 years attending outpatient department,with pathological myopia were selected.All patients underwent a complete ocular examination including visual acuity, slit lamp biomicroscopy , streak retinoscopy,subjective refraction and Dilated fundus examination by Indirect Ophthalmoscope followed by OCT examination by using SD OCT . Certain pathological changes are studied using ultrasound B-scan.An Informed consent was obtained from the patients/parents before investigations.

## II. Results

**Table 1 :ANALYSIS BASING ON THE AMOUNT OF MYOPIA**

| Refractive error (myopia/spherical equivalent) | No of eyes | Percentage |
|---|---|---|
| 6-8D | 24 | 40% |
| 9-12D | 30 | 50% |
| >12D | 06 | 10% |

**Table 2 : PERCENTAGE OF VARIOUS OCT CHANGES IN PATHOLOGICAL MYOPIA**

| OCT changes | % percentage | Number of eyes |
|---|---|---|
| Myopic configuration of ONH | 48.9% | 29 |
| PVD | 20% | 12 |
| Myopic retinal degeneration | 15.4% | 09 |
| Peripapillary detachment | 3.1% | 01 |
| Lacquer cracks | 5.1% | 03 |
| Posterior staphyloma | 22% | 13 |
| Foveoschisis | 4.8% | 02 |
| Macular hole | 4.2% | 02 |
| Macular CNV | 7.6% | 04 |
| Myopic traction maculopathy | 3.8% | 02 |

## III. Discussion:

In our study, myopic configuration of ONH is seen in 48.9% patients. It is somewhat high when compared to other studies which was 37.7% according to Adrienne W.Scott and Sharon Fekrat.

We found vitreous degeneration with PVD in 20% of cases only. Because we have taken patients only below 40 years of age. In the study by David perez,Shulamit Schwartz, and Anat Loewenstein[7], it was 60%, as they have taken patients upto 60 years of age. In their study,it was 6-7% below 30 years of age.In another study by HirorakaItakura,ShojiKishi;DanjieLi;KeisukeNitta,Hideo Akiyama[8], it was 50% and they have taken patients of age group 20-79 years.

In our study myopic retinal degeneration is seen in 15.4% of patients, which is almost consistent with11.4% in Grossniklaus, HE and Green study[9].

Peripapillary detachment is seen in 3.1% of cases in the present study , which is similar to the study by Shimada N,Ohno-Matsui K,Yoshida T et al[11].

Lacquer cracks are seen in 5.1% of cases in our study, when compared to 4.2% in the study by Curtin BJ and Karlin[13]

We are able to find out posterior staphyloma in 22% of cases in our study, with the help of OCT. in the study by in Grossniklaus, HE and Green study[9],it was 35.4% in histopathology specimens and clinically it was only 10%.

Foveoschisis is seen in 4.8% of cases in our study, it is less when compared to 9.3% of cases in the study by Gohil R,SivaprasadS,HanLT,Mathew R et al[12], because we have taken patients only upto 40 years of age, they have taken patients upto 79 years of age.

Macular hole has been found to be in 4.2% of cases compared to 6.3% in the study by RipandelliG,ParisiV,Coppe AM et al [10]RRD as a result of macular hole is more likely in pathologic myopia.

Macular CNV found to be 7.6% in this study, it is consistent with the study of Grossniklaus, HE and Green study[9] and kumarA.ChawlaR,KumawatD,Pillay G[2]which showed the percentage between 5-10%.

## IV. Conclusion

Pathologic myopia is particularly visually devastating, as it is irreversible, often bilateral, and affects individuals at younger ages.OCTA has been found to successfully detectupto 94.1% of myopic CNV [8]CNV was not detected by FFA in 36% of the patients. 50% of new vessels grow into foveola in a 5 year follow up period.50% of these people will have worse visual prognosis.

Precise visualization of the posterior vitreous was not possible before the improvement of OCT.OCT also aids in the differential diagnosis of myopic CNV with ARMD. In myopic CNV, it measures <1000 microns, no sub RPE fluid or exudates. In ARMD, drusen are present and fluid and exudates may be present.In our study, We found OCT as a very helpful diagnostic aid in high myopia.

Precise and early diagnosis of CNV will prevent the further advancement, by treating it with anti VEGF(ranibizumab), which may clear with 1 or 2 injections permanently, unlike in other conditions. So, early diagnosis and treatment have much value in myopic CNV.

Early diagnosis of posterior staphyloma is very much possible with only OCT, which facilitates its management by posterior scleral reinforcement.

Finally as prevention is better than cure,as of now the only prevention of high myopia is by accurate prescription and insisting on wearing of glasses and playing,spending more time outdoors, which must be encouraged in children.

The ultimate goal is to prevent myopia progression and posterior staphyloma with its associated visual loss, but currently no method exists by which to accomplish this.

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