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The Efficacy of Focal Argon Laser on Visual Acuity and Foveal Thickness Outcome in Chronic Macular Oedema

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Abstract:-

➢ ***Purpose***

The aim of this study is to report 2-year visual acuity and anatomic changes from baseline to 24 months after conventional and modified focal macular photocoagulation in eyes with chronic vascular macular oedema1-3. Diabetes mellitus and retinal vein occlusion are the main causes of chronic macular oedema and those patients had no improvement of their visual outcome after treating by Anti-VEGF drugs4,5.

➢ ***Methods***

Follow up of 98 eyes (of 82 patients) with chronic diabetic and vein occlusion maculopathy who underwent conventional and modified focal macular photocoagulation guided by Fluorescein fundus angiography6. All those patients had received different types of Anti-VEGF drugs and had no improvement of their visual acuity.

➢ ***Results***

24 months follow -up there is a significant improvement in the mean visual acuity outcome by 12 letters in 45 from 98 eyes (45.91%).The median central subfield retinal thickness decreased by 82-95 microns ,median total macular volume decreases by 0.8mm3 and median Fluorescein leakage area with conventional and modified focal macular photocoagulation decreased by 1.1 disc areas.

38 eyes (84.44%) had stable improvement of visual outcome and 6(13.35%) eyes had deterioration of their baseline visual acuity and when repeated focal laser to this group, there was 2 from 6eyes (33.33%) eyes had Visual improvement.

➢ ***Conclusions***

More than 45.91% of eyes of patients had a significant and stable improvement of visual acuity outcome, OCT thickness, volume measurement and decreased fluorescein leakage area that underwent both conventional and modified focal macular laser.

More than 38 from 45 eyes (84.44%) of eyes had stable visual outcome after focal macular Laser treatment.

Keywords:- *Macula Oedema, Anti-VEGF Drugs, Focal Laser, Foveal Thickness.*

I. METHODS

A written informed consent was obtained from each patient.

Synopsis of study Design:

Conventional Focal Argon laser is targeted to localised leakage areas and C-pattern technique is applied around temporal macula based on FFA.

Follow –up visits were performed 3, 8, 12, 18 and 24 months.

BCVA, and OCT-Macula were carried each follow to measure Central Foveal thickness. The outcome was recording at each visit for 24 months.

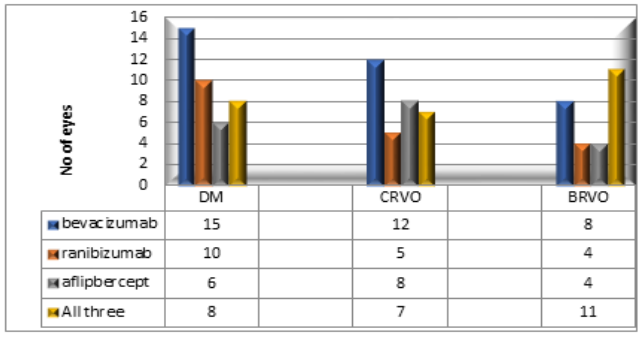

Figure 1: Types of Anti-VEGF drugs in chronic macular oedema

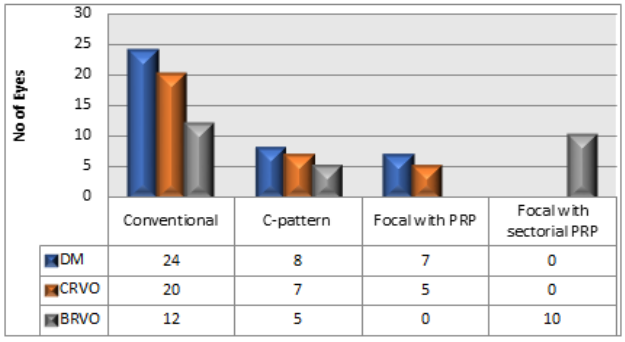

Figure 2: Types of focal Argon Laser in chronic macular oedema

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II. TREATMENT PROTOCOLS

Conventional focal laser

Laser applied to all areas with leakage or non-perfusion within area from 500 to 3000 microns and no burns are placed within 500 microns from macula centre guided by FFA Burn size is 50 microns, burn duration is 0.05 to 0.1 sec, barely visible.

C-pattern modified focal laser

Burn size is 50 microns; burn duration is 0.05 to 0.1 sec, barely visible) and 2 visible burn widths apart. It applied in C -shape around macula in diffuse macular oedema.

Resolution

Defined as Central subfield is less 250 and at least a 50 microns decrease, weighted inner zone thickness is less 285 microns and at least a 50 microns decrease, maximum retinal thickness is less 50 microns of thickening and at least 50 microns of thickening at baseline, or resolution defined as thickening within 2 standard deviations of normal in each subfield and volume decreased at least 0.5 mm3.

Examination procedures

At baseline and at each follow- up visit visual acuity was measured, following a standardized refraction, dilating fundus exam.

Before the retinal thickness measurements were performed, the eye was dilated to a minimum of 6 mm with drops of 2.5% phenylephrine hydrochloride and 1% tropicamide. The cornea was anaesthetised with one drop of proxymetacaine hydrochloride.

OCT images were obtained on each eye following pupil dilation by certified operator using the OCT 3 thought out the study of 82 subjects (98 eyes). Scans were 6 mm in length and included the 6 radial line pattern for quantitative measures.

16 microns, inner nasal =267± 17 microns, and inner inferior =271± 16 microns.

III. RESULTS

The study started with105 eyes (86 patients), but only 98 eyes completed 24-months follow up.

Among the 98 eyes had chronic macular oedema that had no improvement by previous different types of intravitreal injections of Anti-VEFG drugs.

Mean age 58 years ± 11, all the patients are white Europeans. 53 eyes (54.08%) are women and 45 eyes (45.91%) are men.

The visual acuity in study eyes was between 20/400 and 20/20 (74± 13 letters) and mean OCT central subfield retinal thickness was 350 ± 128 microns. Maximum retina thickening of central and inner subfields 163 ±122 microns and area of retinal thickening (in the inner Zone) 2.2 ± 1.4 disc area.

39 eyes (39.8%) eyes had diabetic macular oedema, 27 eyes (27.55%) eyes had macular oedema related to branch retinal vein occlusion, and 32 eyes (32.65%) eyes had macular oedema related to central retinal vein occlusion.

35 eyes (33.71%) had intravitreal injection of bevacizumab only more than 3 times, 19eyes (19.38%) had intravitreal injection of ranibizumab only more than 3 times, 18 eyes (18.36%) had intravitreal flipbercept only more than 3 times , and 26 eyes (26.53) had different intravitreal injections of bevacizumab, ranibizumab, and aflipbercept.

Central Foveal Thickening outcome

Central subfield thickening, weighted inner zone thickening, maximum retinal thickening, retinal volume and area of retina leakage all decreased at 3.5 months in 18 from 39 eyes (46.15%) having chronic diabetic macular oedema, 12 from 32 eyes (37.5%) having macula oedema related to CRVO and 15 from 27 eyes (55.56%) having chronic macular oedema related to BRVO.

Central subfield thickening decreased by an average of 88 microns in diabetic macular oedema, decreased by 82 microns in CRVO, and decreased by 95 microns in BRVO. Weighted inner zone thickening decreased by 42, 40, and 45 microns, respectively.

Maximum retinal thickening decreased by an average of 66 microns in diabetic eyes, 64 microns in CRVO, and 68 microns in BRVO. Retinal volume decreased by 0.8, 0.7, and 0.9 mm3, respectively.

On fundus photographs, at 3.5 months, the average diameter of the area of leakage in inner zone had decreased by 1.1DD in DME, 1 DD in CRVO, and 1.2 DD in BRVO.

IV. VISUAL ACUITY OUTCOME

At 3.5 months of among 39 from 98 eyes (39.79%) diabetic macular oedema, there are 18 eyes (46.15%) improved of their visual acuity.

There is ≥15 letters improvement in 9 eyes (23.7 %), 10 -14 letters in 5 eyes (12.82%), and 5-9 letters in 4 eyes (10.25%). 14 eyes (35.89%) have stable vision. However, 7 eyes (17.95) are worse.

Among 32 eyes (32.65%) of chronic macular oedema related to CRVO, there are 12 eyes (37.5 %) improved ≥ 15 letters improvement in 6 eyes (18.75%), 10 -14 letters in 4 eyes (12.5%), and 5-9 letters in 2 eyes (6.25%), and 16 eyes (50%) have same vision. While 4 eyes (12.5%) are deteriorating in their vision.

Among 27 eyes (27.55%) of chronic macular oedema related to BRVO, 15 eyes (55.56%) improved. ≥ 15 letters

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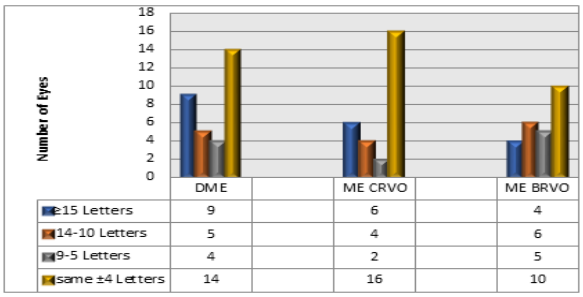
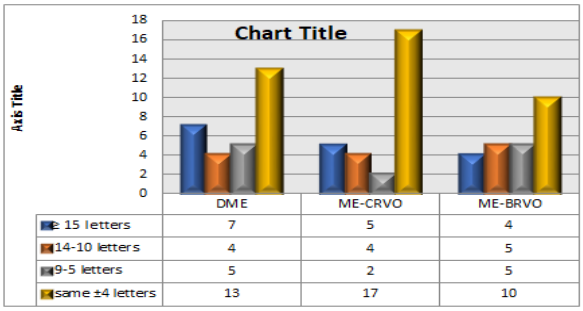
improvement in 4 eyes (14.81%), 10-14 letters 6 eyes (22.22%), 5-9 letters in 5 eyes (18.52%) and 10 eyes (37.03%) are stable.



	DME	ME CRVO	ME BRVO
≥15 Letters	9	6	4
14-10 Letters	5	4	6
9-5 Letters	4	2	5
same ±4 Letters	14	16	10

Figure 3: Effect of focal Argon Laser on visual acuity at 3 months



	DME	ME-CRVO	ME-BRVO
≥ 15 letters	7	5	4
14-10 letters	4	4	5
9-5 letters	5	2	5
same ±4 letters	13	17	10

Figure 4: Visual outcome of focal Argon Laser at 24 months

Visual field outcome

There are only two cases of DME and one case of CRVO has an insignificant Para central scotoma after C-pattern of focal laser treatment.

V. DISCUSSION

At present, despite the enthusiasm for evaluation of several novel treatments for macular oedema including Intravitreal therapies (e.g., anti-VEGF drugs and corticosteroids), Laser photocoagulation remains the current standard of care and the only treatment with proven efficacy in clinical trial for this condition. In this study, we investigated the change in retinal thickness and visual acuity after focal laser photocoagulation treatment in chronic macular oedema related to diabetes mellitus and vein occlusion and they received previously Anti-VEGF drugs and there is no improvement.

We found that retinal thickness decreased in 45.91% and remained unchanged in 54.09% and the mean visual outcome is improved lines 12 letters at 3.5 months after focal laser treatment.

The primary outcome measure of the study was change in retinal thickening as a surrogate for longer-term change in visual acuity.

Functional and anatomical improvement of the retina after both conventional and C- pattern focal laser treatment was significant during the first 3.5 months. At the fovea, the high correlation between foveal thickness before and after treatment indicated strong success of therapy, at 3.5 months, on the pre-treatment thickening.39 from 98 eyes (86.67%) had stable visual outcome over 24 months follow-up.

No side effects were present after focal laser and in two cases are complaining of insignificant Para central scotoma.

These results demonstrate that focal laser treatment has golden role in reducing retinal thickness and consequently improves long-term visual outcome in the patients have chronic macular oedema related to DM, CRVO, and BRVO.

VI. CONCLUSION

Despite potential advantages of different of Anti-VEGF drugs for Vascular macular oedema treatment, focal macular laser treatment still has substantial clinical benefits over Anti –vascular endothelial growth factors drugs.

More than 45 from 98 eyes (45.91 %) had a significant improvement of visual acuity outcome, OCT thickness, and decreased fluorescein leakage area that underwent both Conventional and modified focal macular laser.

More than 86.44%of eyes had stable visual outcome after focal macular Laser treatment.

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