VISUAL OUTCOME OF SURGICAL MANAGEMENT OF EYES WITH MACULA INVOLVING OR MACULA THREATENING TRACTIONAL RETINAL DETACHMENT

QUNDEEL ZAHRA, HUSSAIN AHMAD KHAQAN, HADIA JABEEN, FARRUKH JAMEEL
Department of Ophthalmology, Lahore General Hospital/PGMI, Lahore.
Correspondence: Dr Hussain Ahmad Khaqan, Department of Ophthalmology, Lahore General Hospital/PGMI, Lahore. drkhaqan@hotmail.com, Postal Address: House No.87,Eden Canal Villas, Canal Bank Road, Thokar Niaz Baig, Lahore, Pakistan. Tel.+92-42-37498314, Cell.+92-300-4270233, Fax:+92-42-7223039

ABSTRACT
Objectives: To assess and analyze the visual outcome of surgical management in consecutive series of eyes with macula involving or macula threatening tractional retinal detachment
Material and Methods: Sixty five cases of diabetic retinopathy were included who fulfilled the inclusion and exclusion criteria.
Results: The mean ± SD age was 50.97±8.03. The mean duration of diabetes mellitus was 14.68±7.02. Preoperative visual acuity was 6/18, 2(3.1%), 6/24, 6(9.2%), 6/36, 5 (7.6%), 6/60, 11 (16.9%), CF visual acuity was 23 (35.4%) patients, HM was 10, (15.4%) patients and PLPR 8 (12.3%) patients respectively. While postoperative visual acuity after 6 months was 6/12, 2(3.1%), 6/18, 7 (10.8%), HM 4 (6.2%), PLPR 6 (9.2%) and 2 (3.1%) patients had NPL which is statistically significant ($p < 0.02$).
Conclusion: Major complications are rare after vitrectomy for advanced proliferative diabetic retinopathy, and >70% of eyes regain vision of 6/60 or better.

Keywords: Diabetes mellitus, Visual acuity and Vitrectomy.

INTRODUCTION
Diabetes Mellitus is a common metabolic disorder characterized by sustained hyperglycemia of variable severity secondary to absolute or relative deficiency of endogenous insulin. Diabetes may be insulin dependent (type 1) or non-insulin dependent (type 2). Diabetic retinopathy is the most common cause of legal blindness between ages of 25 and 65 years. [1]

The diabetes mellitus is one of the major causes of blindness in the world. It is the leading cause in USA and UK. According to WHO estimates in 1995 4.3 million people in Pakistan had diabetes mellitus. It will swell upto 11.6 million by the year 2025.[2]

According to Pakistan National Survey overall prevalence of diabetes mellitus is 11.47% and of impaired glucose tolerance is 9.39%.[3]

The advanced age, positive family history and obesity were associated risk factors. Diabetes mellitus causes 10% of new cases of blindness in UK each year. The diabetic retinopathy is classified as non-proliferative diabetic retinopathy (NPDR), proliferative diabetic retinopathy (PDR), and clinically significant macular edema (CSME).[4]

Duration of diabetes is most important risk factor in diabetic retinopathy. However 27% of those who have had diabetes 5-10 years and 71-90 % of those who had diabetes for longer than 10 year had diabetic retinopathy.[1,5] The National Health Survey of Pakistan records the prevalence of diabetes among population at or above 25 years as 4.2%.[6,7]

Diabetic retinopathy is a complication of diabetes that affects blood vessels of retina and leads to blindness.[8] Background non-proliferative (BDR) in which pathology remains intraretinal and proliferative diabetic retinopathy (PDR) in which pathology extends on to or beyond the retinal surface. Pre-proliferative diabetic has features of imminent proliferative disease.

There is proliferation of new vessels in proliferative diabetic retinopathy. Vessels usually arise from venous end of the circulation. Those on or within one disc diameter of the optic disc are referred to as neo-vascularization on disc (NCD) and those further than

one disc diameter are called new-vascularization elsewhere (NEV).

OBJECTIVES

The objective of this study is to assess and analyze the visual outcome of surgical management in consecutive series of eyes with macula involving or macula threatening traction retinal detachment.

MATERIAL AND METHODS

Study design was interventional experimental study.

This study was conducted in the Department of Ophthalmology, Lahore General Hospital, Lahore

The calculated sample size with 57% prevalence rate and with 10% margin of error is 65 cases of retinopathy diabetes. Non probability purposive sampling was done.

Patient age above 30 years, patients of either sex, eyes having fibrovascular proliferation secondary to diabetes, causing or threatening the detachment of the macula, eyes suitable for vitrectomy and segmentation, and patients fit for surgery under local or general anesthesia were included in the study.

Patients with rhegmatogenous retinal detachment, blind eye, inflamed eyes and eyes with ocular comorbidity other than cataracts were excluded from the study.

The data was entered by SPSS version 16 computer software. Qualitative variables, numerical variables such as age, duration of diabetes, duration of visual loss were presents as mean ± standard deviation. Qualitative variables, categorical variables such as visual acuity pre and post op was presented as frequencies and percentages. The variable of interest which is visual acuity before and after vitrectomy and surgical segmentation was compared using Chi-square with p value ≤ 0.05.

RESULTS

This study was carried out on 65 cases. Only those cases were included in this study that fulfilled the selection criteria, as already mentioned and completed their required follow up of 6 months post-operatively.

Seventeen (17%) patients were in the age range of 31-40 years, 29 (45) patients were 41-50 years of and 14 (21%) patients in the age range of 51-60 years rest of 5 (8%) patients were in the range of > 60 years. The youngest age patient was of 41-50 years with mean ± SD age 50.97± 8.03 (Table 1).

There were 36 (55%) male patients and 29 (45%) female patients in the study showing slight male pre-dominance with male to female ratio 1.24:1 (Table 2).

Table 3 shows the duration of diabetes mellitus. 29 (45%) patients were 4-13 years, 28 (43%) patients were 13-24 years of diabetes and only 8 (12%) patients were in the duration of 25-35 years. Mean duration ± SD was 14.68±7.02

The duration of visual loss was 37 (57%) patients from 1-2 years, 11 (17%) patients were 3-4 years of visual loss and remaining 17(26%) patients from 5-7 years duration of visual loss with mean ±SD was 2.82± 1.96 (Table 4).

Preoperative visual acuity was 6/18, 2 (3.1%) patients 6/24, 6 (9.2%) patients, 6/36, 5 (7.6%) patients, 6/60, 11 (16.9%) patients, CF visual acuity was 23 (35.4%) patients, HM was 10, (15.4%) patients and PLPR 8 (12.3%) patients respectively (Table 5).

The post-operative visual acuity one week after surgery was 6/18, 5 (7.7%) patients, 6/24 in 6 (9.2%) patients, 6/36 in 5 (7.7%) patients, 6/60 in 16 (24.6%) patients, CF in 14 (21.6%) patients, HM in 9 (13.8%) patients and PLPR in 10 (15.4%) patients respectively (Table 6).

The post-operative visual acuity one month after surgery was 6/18 in 7 (10.8%) patients, 6/24 in 7 (10.8%) patients, 6/36 in 9(13.7%) patients, 6/60 in 13 (20%) patients, HM in 13 (20%) patients and PLPR 8 (12.3%) patients respectively (Table 7).

Table 8 shows the post-operative visual acuity 3 months after surgery was 6/18 in 7 (10.8%) patients, 9 (13.8%) patients had 6/24 visual acuity, 6/36 in 12 (18.5%) patients, 6/60 in 12 (18.5%) patients, CF in 11 (16.9%) patients, HM in 4(6.2%) patients and PLPR in 10 (15.4%) patients respectively.

Six months after operation visual acuity was 6/12 in 2 (3.1%) patients, 6/18 in 7(10.8%) patients, 6/24 in 5 (7.7%) patients, 6/36 in 14 (21.5%) patients, 6/60 in 18 (27.7%) patients, CF in 7 (10.8%) patients, HM in 4 (6.2%) patients, PLPR in 6 (9.2%) patients and only 2 (3.1%) patients had NPL (Table 9).

Comparison of pre and one week post-operative visual acuity

Pre-operative visual acuity was 6/18 in 2 (3.1%), 6/24 in 6 (9.2%), 6/36 in 5 (7.7%), 6/60 in 11(16.9%), CF in 23 (35.4%), HM in 10(15.4%), and PLPR in 8 (12.3%) respectively. While post-operative visual acuity after one week was 6/18 in 5 (7.6%) patients, 6/24 in 6 (9.2%) patients, 6/36 in 5 (7.6%) patients, 6/60 in 16 (24.6%) patients, CF in 14 (21.6%) patients, HM in 9 (13.8%) patients and PLPR in 10 (15.4%) patients respectively which is statistically significant ($p < 0.05$) (Table 10).

Comparison of pre and after one month post-operative visual acuity

Pre-operative visual acuity was 6/18 in 2(3.1%) patients, 6/24 in 6 (9.2%) patients, 6/36 in 5 (7.7%) patients, 6/60 in 11 (16.9%) patients, CF in 23 (35.4%) patients, HM in 10 (15.4%) patients, and PLPR in 8 (12.3%) patients respectively. While post-operative visual acuity after one month was 6/18 in 7(10.8%) patients, 6/24 in 7 (10.8%) patients, 6/36 in 9 (13.7%) patients, 6/60 in 13 (20%) patients, CF in 8 (12.3%) patients, HM in 13 (20%) patients, and PLPR in 8 (12.3%) patients respectively which is statistically significant ($p<0.05$) (Table 11).

Table 1: Age distribution of patients (n=65)

Age in years	No. of Patients	Percentages
30-40	17	26.0
41-50	29	45.0
51-60	14	21.0
>60	5	8.0
Total	**65**	**100.0**

Mean ± SD = 48.03 ± 9.55
Keyword
SD = Standard deviation

Table 2: Sex distribution of patients

Sex	No. of Patients	Percentages
Male	36	55.0
Female	29	45.0

M:F ratio = 1.24:1

Table 3: Duration of Diabetes Mellitus of Patients

Duration in years	No. of Patients	Percentages
4-13	29	45.0
13-24	28	43.0
25-35	8	12.0

Mean ± SD = 14.68 ± 7.02
Keyword
SD = Standard deviation

Table 4: Duration of Visual Loss in years of Patients

Duration of visual loss	No. of Patients	Percentages
1-2	37	57.0
3-4	11	17.0
5-7	17	26.0

Mean ± SD = 2.82 ± 1.96
Keyword
SD = Standard deviation

Table 5: Frequency of Pre-operative Visual Acuity of Patients

Visual acuity	No. of Patients	Percentages
6/18	2	3.1
6/24	6	9.2
6/36	5	7.6
6/60	11	16.9
CF	23	35.4
HM	10	15.4
PLPR	8	12.3

Table 6: Frequency of First Week Post-operative Visual Acuity of Patients

Visual acuity	No. of Patients	Percentages
6/18	5	7.7
6/24	6	9.2
6/36	5	7.6
6/60	16	24.6
CF	14	21.6
HM	9	13.8
PLPR	10	15.4

Table 7: Frequency of First Month Post-operative Visual Acuity of Patients

Visual acuity	No. of Patients	Percentages
6/18	7	10.8
6/24	7	10.8
6/36	9	13.7
6/60	13	20.0
CF	8	12.3
HM	13	20.0
PLPR	8	12.3

Table 8: Frequency of Third Month Post-operative Visual Acuity of Patients

Visual acuity	No. of Patients	Percentages
6/18	7	10.8
6/24	9	13.8
6/36	12	18.5
6/60	12	18.5
CF	11	16.9
HM	4	6.2
PLPR	10	15.4

Table 9: Frequency of Six Month Post-operative Visual Acuity of Patients

Visual acuity	No. of Patients	Percentages
6/18	2	3.1
6/24	7	10.8
6/36	5	7.7
6/60	14	21.5
CF	7	10.8
HM	4	6.2
PLPR	6	9.2
NPL	2	3.1

Comparison of pre and after 3 months post-operative visual acuity

Pre-operative visual acuity was 6/18 in 2 (3.1%) patients, 6/24 in 6 (9.2%) patients, 6/36 in 5 (7.7%) patients, 6/60 in 11 (16.9%) patients, CF in 23 (35.4%) patients, HM in 10 (15.4%) patients, and PLPR in 8 (12.3%) patients respectively. While post-operative visual acuity after three months was 6/18 in 7(10.8%) patients, 6/24 in 9 (13.8%) patients, 6/36 in 12 (18.5%) patients, 6/60 in 12 (18.5%) patients, CF in 11 (16.9%) patients, HM in 4 (6.2%) patients, and PLPR in 10 (15.4%) patients respectively which is statistically significant ($p<0.05$) (Table 12).

Comparison of pre and after 6 months post-operative visual acuity

Pre-operative visual acuity was 6/12 in 0 (0%) patients, 6/18 in 2 (3.1%) patients, 6/24 in 6 (9.2%) patients, 6/36 in 5 (7.6%) patients, 6/60 in 11 (16.9%) patients, CF in 23 (35.4%) patients, HM in 10 (15.4%) patients, and PLPR in 8 (12.3%) patients and no patient in NPL. While post-operative visual acuity after 6 months was 6/12 in 2(3.1%) patients, 6/18 in 7(10.8%) patients, 6/24 in 5 (7.7%) patients, 6/36 in 14 (21.5%) patients, 6/60 in 18 (27.7%) patients, CF in 7 (10.8%) patients, HM in 4 (6.2%) patients, and PLPR in 6 (9.2%) patients and 2 (3.1%) patients had NPL which is statistically significant ($p<0.05$) (Table 13).

Table 10: Comparison of Pre-operative and after 1 week Post-operative Visual Acuity

Visual acuity	Pre-operative Visual Acuity		After 1 month Post-operative Visual Acuity	
	No. of Patients	Percentages	No. of Patients	Percentages
6/18	2	3.1	5	7.6
6/24	6	9.2	6	9.2
6/36	5	7.6	5	7.6
6/60	11	16.9	16	24.6
CF	23	35.4	14	21.6
HM	10	15.4	9	13.8
PLPR	8	12.3	10	15.4

Table 11: Comparison of Pre-operative and after 1 month Post-operative Visual Acuity

Visual acuity	Pre-operative Visual Acuity		After 1 month Post-operative Visual Acuity	
	No. of Patients	Percentages	No. of Patients	Percentages
6/18	2	3.1	7	10.8
6/24	6	9.2	7	10.8
6/36	5	7.6	9	13.7
6/60	11	16.9	13	20.0
CF	23	35.4	8	12.3
HM	10	15.4	13	20.0
PLPR	8	12.3	8	12.3

Chi-square 4.29 P value <0.05

Table 12: Comparison of Pre-operative and after 3 months Post-operative Visual Acuity

Visual acuity	Pre-operative Visual Acuity		After 3 months Post-operative Visual Acuity	
	No. of Patients	Percentages	No. of Patients	Percentages
6/18	2	3.1	7	10.8
6/24	6	9.2	9	13.8
6/36	5	7.6	12	18.5
6/60	11	16.9	12	18.5
CF	23	35.4	11	16.9
HM	10	15.4	4	6.2
PLPR	8	12.3	10	15.4

Chi-square 4.10 P value <0.05

Table 13: Comparison of Pre-operative and after 6 months Post-operative Visual Acuity

Visual acuity	Pre-operative Visual Acuity		After 6 months Post-operative Visual Acuity	
	No. of Patients	Percentages	No. of Patients	Percentages
6/12	0	0	2	3.1
6/18	2	3.1	7	10.8
6/24	6	9.2	5	7.7
6/36	5	7.6	14	21.5
6/60	11	16.9	18	27.6
CF	23	35.4	7	10.8
HM	10	15.4	4	6.2
PLPR	8	12.3	6	9.2
NPL	0	0	2	3.1

Chi-square 5.21 P value <0.05

DISCUSSION

Sixty five patients were included in this study and it was carried out at Lahore General Hospital, Lahore in the Ophthalmology department.

Contemporary vitrectomy techniques provide means of removing vitreous haemorrhage in a relative safe and effective fashion. Most systems employ three small (20-25gauge) entry "ports" into the eye. Both proliferative and non-proliferative diabetic retinopathy with macular edema is indications for vitrectomy and segmentation. Cataract surgery can be combined with vitrectomy if the lens opacity prevents an optimal view and in other selected cases to improve vision.

In our study, age range was 30-65 years with their mean ± SD 48.03 ± 9.55 years and in sex distribution male to female ratio was 1.24:1. In our study 42 patients had underwent phacoemulsification with IOL per operatively or during the six months follow up period. Sixteen patients needed internal temponade with silicon oil, only 6 patients had post-operative detached retina in which 2 patients ended up with no perception of light. The prevalence of blindness is influenced by duration of diabetes, blood glucose and pressure control or absence of screening and preventive laser and timely (Vitrectomy + segmentation) surgery, and also due to delay in seeking medical attention. In our patients vision was checked at every post-op visit and the final outcome is the best corrected vision after vitrectomy and segmentation combined with laser photocoagulation and cataract surgery. Refraction was done in every patient.

A study was done by Siddiqui [11] in which mean age patients was 52 years. In another study carried out by Farrukh[17] the mean age was 59.52±8.34. Another study from Italy by Grassi [18] the age group involved in this study was 22-75 years. In our study, age range was 30-65 years with their mean±SD 48.03±9.55 years which is lower than that in study by Farrukh.[17] Majority of our patients 29 (44.6%) were in the age group between 41-50 years of age.

In the present study, 36 (55.4%) patients were male and 29 (44.6%) were female with male to female ratio was 1.24:1. In a study by Siddiqui [11] male to female ratio was 4:1. Farrukh[17] placed the male to female ratio

at 1:1.7. Prevalence of diabetic retinopathy was significantly higher among males (62.5%) as compared to females (37.5%). The male preponderance has also been reported by Kayani and her colleagues in their study carried out in a teaching hospital of Lahore. The report mentioned higher ratio among males (42.8%) as compared to females (27.9%).[78]

Pre-operative visual acuity 6/18 in 2 (3.1%), 6/24 in 6(9.2%), 6/36 in 5 (7.6%), 6/60 in 11 (16.9%), CF in 23(35.4%), HM in 10 (15.4%) and PLPR in 8 (12.3%) patients respectively while post-operative visual acuity after 1 week of operation was acuity 6/18 in 5 (17.6%), 6/24 in 6(9.2%), 6/36 in 5 (7.6%), 6/60 in 16 (24.6%), CF in 14 (21.6%), HM in 9 (13.8%) and PLPR in 10 (15.4%) patients.

This visual acuity improved after surgery. The difference between pre-operative visual acuity and that after 1 week of vitrectomy and segmentation surgery is statistically significant. Similarly the difference of visual acuity is better than pre-operative visual acuity ($p<0.05$).

Similarly the results of pre-operative visual acuity was 6/18 in 2(3.1%) patients, 6/24 in 6 (9.2%) patients, 6/36 in 5 (7.7%) patients, 6/60 in 11 (16.9%) patients, CF in 23 (35.4%) patients, HM in 10 (15.4%) patients, and PLPR in 8 (12.3%) patients respectively. While post-operative visual acuity after one month was 6/18 in 7(10.8%) patients, 6/24 in 7 (10.8%) patients, 6/36 in 9 (13.7%) patients, 6/60 in 13 (20%) patients, CF in 8 (12.3%) patients, HM in 13 (20%) patients, and PLPR in 8 (12.3%) patients respectively. As compared to pre-operative visual acuity versus post-operative visual acuity after 1 month of surgery was better than pre-operative visual acuity which is statistically significant ($p<0.05$).

In comparison of pre-operative visual acuity and after 3 months of visual acuity patients as: Pre-operative visual acuity was 6/18 in 2 (3.1%) patients, 6/24 in 6 (9.2%) patients, 6/36 in 5 (7.7%) patients, 6/60 in 11 (16.9%) patients, CF in 23 (35.4%) patients, HM in 10 (15.4%) patients, and PLPR in 8 (12.3%) patients respectively. While post-operative visual acuity after three months was 6/18 in 7(10.8%) patients, 6/24 in 9 (13.8%) patients, 6/36 in 12 (18.5%) patients, 6/60 in 12 (18.5%) patients, CF in 11 (16.9%) patients, HM in 4 (6.2%) patients, and PLPR in 10 (15.4%) patients respectively. As compare to pre-operatively visual acuity versus post-operative visual acuity after 3 months of surgery was better than pre-operative visual acuity which is statistically significant ($p<0.05$).

In comparison of pre-operative visual acuity and after 6 months of visual acuity patients as: Pre-operative visual acuity was 6/12 in 0 (0%) patients, 6/18 in 2 (3.1%) patients, 6/24 in 6 (9.2%) patients, 6/36 in 5 (7.6%) patients, 6/60 in 11 (16.9%) patients, CF in 23 (35.4%) patients, HM in 10 (15.4%) patients, and PLPR in 8 (12.3%) patients and no patient in NPL. While post-operative visual acuity after 6 months was 6/12 in 2(3.1%) patients, 6/18 in 7(10.8%) patients, 6/24 in 5 (7.7%) patients, 6/36 in 14 (21.5%) patients, 6/60 in 18 (27.7%) patients, CF in 7 (10.8%) patients, HM in 4 (6.2%) patients, and PLPR in 6 (9.2%) patients and 2 (3.1%) patients had NPL respectively which is statistically significant ($p<0.02$) as compared to pre-operative visual acuity.

According to a study done by Grassi[18], the visual outcome visual acuity remained same in most of the patients i.e. (49.5%) and was improved in (30%) and deteriorated in (20.5%). While treatment options of severe non proliferative and proliferative forms of diabetic retinopathy are limited to laser photocoagulation, photocoagulation has proven efficacy in slowing down the progression of diabetic retinopathy.[9] The diabetic retinopathy and vitrectomy study DRVS indicated that patients should be closely observed so that vitrectomy when indicated can be undertaken promptly.

CONCLUSION

Conclusions I found in my study

1. Advanced diabetic retinopathy was more frequently seen in males.
2. Vision improves in most patients after vitrectomy and segmentation.
3. Major complications are rare after vitrectomy for advanced proliferative diabetic retinopathy, and >70% of eyes regain vision of 6/60 or better.
4. Patients with taut posterior hyaloids are more likely to have visual improvement and reduction in oedema as compared to patients with posterior vitreoschiasis. The removing of internal limiting membrane over macula is beneficial in visual improvement.
5. Segmentation techniques are useful when combination of relatively mature epiretinal tissue and atrophic retina results in a significant increase in risk of retinal breaks associated with complete epiretinal membrane dissection or when vascular membrane are located anteriorly and are difficult to remove safely.

REFERENCES

1. Kanski JJ, Clinical Ophthalmology 5th ed. Woburn, MA: Butterworth Heinemann 2003; 439-45.
2. Ahmed MM. Diabetes mellitus. Editorial: Pak J Ophthalmol 2002; 1 90/

3. Shera AS, Rafiq G, Ahmed Kl. Prevalence of glucose intolerance and associated factors in Baluchistan Province. Diabetic research and clinical practice 1999; 44: 49-58.
4. Jann ED, Noorily SW, Pico WP. Retinovascular diseases: diabetic retinopathy: In textbook of Ophthalmology by Kenneth W. Wright 1st edition. Williams & Wilkins 1997; 845.
5. Klein R, Klein BE, Moss SE, Ruickshanks KJ. The Wiskonsin epidemiologic study of diabetic retinopathy, XIV, ten year incidence and progression of diabetic retinopathy. Arch Ophthalmol 1994; 112: 1217-28.
6. Pakistan Medical Research Council. National health survey of Pakistan, Islamabad. Pak Med Res Council 1997; 54.
7. Huma K, Rehan N, Naeemullah. Frequency of retinopathy among diabetics admitted in a teaching hospital of Lahore. J Ayb Med Coll Abbottabad 2003; 15: 53-6.
8. Grigorian RA, Castellarin A, Fegan R, Seery C, Del Priore LV. Von Hagen S, Zarbin MA. Epiretinal membrane removal in diabetic eyes; comparison of viscodissection with conventional methods of membrane peeling. Br J Ophthalmol 2003; 87: 737-41.
9. Klein R, Klein BEK, Moss SE. The visconsin epidemiological study of diabetic retinopathy III. Prevalence and risk of diabetic retinopathy when age at diagnosis is 30 or more years. Arch Ophthalmol 1984; 102: 52.
10. Khan HA, Hiller R. Blindness caused by diabetic retinopathy. Am J Ophthalmol 1974; 78: 58.
11. Siddiqui SJ, Shah SIA, Shaikh AQ, Depar MY, Abbasi SA. Study of 189 Cases of Diabetic Retinopathy at CMC Larkana. Pak J Ophthalmol 2007; 23: 92-96.
12. Kanski JJ, Clinical Ophthalmology 6th ed. Woburn, MA: Butterworth Heinemann 2007; 567-84.
13. Klein R, Moss SE, Klein BEK. The Wisconsin epidemiologic study of diabetic retinopathy. The NEI-VFQ-25 in people with long-term type 1 diabetes mellitus. Arch Ophthalmol 2001; 119: 733-40.
14. Mohamed Q, Gillies MC, Wong TY; Management of diabetic retinopathy: a systematic review. JAMA 2007; 298: 902-16.
15. Arevalo JF, Garcia-Amaris RA. Intravitreal bevacizumab for diabetic retinopathy. Curr Diabetes Rev 2009; 5: 39-46.
16. Wong T, LIEW G, Tapp RJ. Relation between fasting glucose and retinopathy for diagnosis of diabetes: three Lancet 2008; 371: 736-43.
17. Farrukh I. The effect of ketorolac tromethamine 0.5% and diclofenac sodium 0.1% on inhibition of miosis during phacoemulsification in diabeteics [Thesis] Lahore, University of Punjab 2009.
18. Grassi G. Diabetic Retinopathy. In Minerva Med. 2003; 94: 419-35.