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ANATOMICAL AND FUNCTIONAL OUTCOMES OF INTRAVITREAL BEVACIZUMAB IN MACULAR EDEMA ASSOCIATED RETINAL VEIN OCCLUSION: A SINGLE-CENTER EXPERIENCE AT PRINCE RASHID BIN AL-HASSAN MILITARY HOSPITAL

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ABSTRACT

Aim: To assess the anatomical and functional outcomes of intravitreal Bevacizumab injections in patients with Diabetic Macular Edema treated at Prince Rashid Bin Al-Hassan Military Hospital over a one-year period. **Methods:** This is a retrospective conducted at the ophthalmology clinic in Prince Rashid Bin Al-Hassan Military Hospital between January 2023 and December 2025. All patients diagnosed with macular edema of more than 325 µm secondary to either BRVO or CRVO at the ophthalmology clinic in Prince Rashid Bin Al-Hassan Military Hospital and received a three loading doses of intra vitreal bevacizumab injections were included in the study. Data regarding patient age and gender were recorded, best-corrected visual acuity (BCVA), and central macular thickness (CMT) measured by optical coherence tomography (OCT) were recorded before treatment and at one month after treatment. **Results:** 100 patients (100 eyes) with a mean age of 66.2 years were included in this study. Male accounted for (61.3%) of Patients. 56.0% of them had BRVO and remaining had CRVO. The mean baseline best-corrected visual acuity (BCVA) was 0.15 Snellen, and the mean central macular thickness (CMT) was 489.3 µm. Significant improvement in BCVA was found after completing the loading doses when compared to baseline ($p = 0.001$). The mean visual improvement after one month of treatment was (0.32), further improvement occurred at 3 months (0.56). Significant number of eyes (42%) showed a gain of ≥ 10 ETDRS letters, 21.0% of those eyes gained ≥ 15 letters. Stable vision (± 4 letters) was found in 20% of eyes. only 8.0% of eyes experienced loss of ≥ 5 letters, and 4% of eyes showed a loss of ≥ 15 letters. All of eyes which showed deterioration of vision after treatment had CRVO not BCRVA. At baseline, the mean CMT was 41489.3µm, after giving the loading doses of intravitreal bevacizumab injections, marked and significant improvement in CMT was noted at follow-up visits ($p < 0.001$) when compared with baseline levels. The improvement strted after 1 month (-147.1 µm) and continued at 2 months (-198.8 µm) and the greatest mean reduction occurred at month 3 (-228.4 µm). Complete anatomical resolution of DME was obtained in 51.0% of eyes at 2 months and 70.0% at 3months. **Conclusions:** Intravitreal bevacizumab loading doses demonstrated marked improvement in macular edema resulting from retinal vein occlusion, with an excellent safety profile.

KEYWORDS: Bevacizumab, macular edema, Retinal vein occlusion.

INTRODUCTION

Retinal vein occlusion (RVO) is a very common retinal blood vessel disorder. It results in retinal bleeding and macular edema which is considered the most common cause of visual impairment. Early detection and treatment of macular edema may greatly prevent visual loss.

It is estimated that approximately 16.4 million adults are diagnosed with RVO. RVO can be either branch retinal vein occlusion (BRVO) in which the blockage occurs

only for a branch of the veins or central retinal vein occlusion (CRVO) in blockage in the central retinal vein.[1] Global studies reported that the prevalence of BRVO is 4.4 per 1,000 people. On the other hand, the prevalence of CRVO is 0.8 per 1,000 people. Unfortunately, the exact prevalence of RVO in Jordan is still known and studies about RVO are extremely limited. However, available studies confirm that RVO is common and it considerably led to vision loss in Jordan. For example, Al-Nawaiseh et al found that the average age for CRVO patients was 67.4 years, and for BRVO patients was 61.4 years, Hypertension and smoking were the major risk factors in patients with BRVO while glaucoma and blood disorders were mostly found among patients with CRVO.[2]

Before the introduction of anti-vascular endothelial growth factor (Anti VEGF) treatment of macular edema caused by RVO was extremely difficult.[3] Since vascular endothelial growth factor (VEGF) plays a major rule in the development of macular edema, anti VEGF was effectively used in the treatment of this condition.[4] A lot of studies demonstrated the role of bevacizumab in the treatment of RVO associated macular edema.[5] In an Indian study, the macular edema improved from 568 µm to 309 µm in eyes with CRVO, and about 86.5% of eyes showed significant improvement in vision.[3] Furthermore, in Turkey found no significant differences in effectiveness after using bevacizumab, ranibizumab, and aflibercept for patients with BRVO after three monthly loading doses.[6]

Since data regarding the effectiveness of bevacizumab on RVO associated macular edema is very limited in Jordan, this study was performed to evaluate the efficacy of intravitreal bevacizumab (Avastin) injections in patients with macular edema secondary to retinal vein occlusion in relation to central macular thickness (CMT) and best corrected visual acuity.

METHODS

This is a retrospective conducted at the ophthalmology clinic in Prince Rashid Bin Al-Hassan Military Hospital between January 2023 and December 2025. All patients diagnosed with macular edema of more than 325 µm secondary to either BRVO or CRVO at the ophthalmology clinic in Prince Rashid Bin Al-Hassan Military Hospital and received a three loading doses of intra vitreal bevacizumab injections were included in the study. Data regarding patient age and gender were recorded, best-corrected visual acuity (BCVA), and central macular thickness (CMT) measured by optical coherence tomography (OCT) were recorded before treatment and at one month after treatment. Patients with Previous treatment with anti-VEGF agents or steroids, or laser were excluded from the study. Patients with diabetes or any other pathology affecting the macula were excluded as well.

RESULTS

100 patients (100 eyes) with a mean age of 66.2 years were included in this study. Male accounted for (61.3%) of Patients. 56.0% of them had BRVO and remaining had CRVO. The mean baseline best-corrected visual acuity (BCVA) was 0.15 Snellen, and the mean central macular thickness (CMT) was 489.3 µm.

Significant improvement in BCVA was found after completing the loading doses when compared to baseline ($p = 0.001$). The mean visual improvement after one month of treatment was (0.32), further improvement occurred at 3 months (0.56). more than two thirds of eyes achieved improvement of BCVA at 3 months after treatment. The results are summarized in table 1.

Table 1: Best-Corrected Visual Acuity (ETDRS Letters) Over 3 Months.

Time	BCVA (letters)	Visual improvement	P value	Proportion with BCVA improvement of at least 2 lines
Baseline	0.15 ± 0.1	------	-------	-------
1 month	0.32 ± 0.3	0.17	<0.001	32.0% (32/100)
2 months	0.41 ± 0.9	0.26	<0.001	50.0% (50/100)
3 months	0.56 ± 0.5	0.41	<0.001	68.0% (68/100)

Significant number of eyes (42%) showed a gain of ≥ 10 ETDRS letters, 21.0% of those eyes gained ≥ 15 letters. Stable vision (± 4 letters) was found in 20% of eyes. only 8.0% of eyes experienced loss of ≥ 5 letters, and 4% of eyes showed a loss of ≥ 15 letters. All of eyes which showed deterioration of vision after treatment had CRVO not BCRVA.

Table 2: Distribution of Visual Acuity Gain at 3 Months.

Changes in BCVA (ETRDS letters)	Number of eyes	percentages
Gain of ≥ 15 letters (≥ 3 lines)	21	21.0%
Gain of 10–14 letters (2–3 lines)	31	31.0%
Gain of 5–9 letters (1–2 lines)	16	16.0%
Stable (± 4 letters)	20	20.0%
Loss of 5–14 letters (1–3 lines)	8	8.0%
Loss of ≥ 15 letters (≥ 3 lines)	4	4.0%

At baseline, the mean CMT was 41489.3µm, after giving the loading doses of intravitreal bevacizumab injections, marked and significant improvement in CMT was noted at follow-up visits ($p < 0.001$) when compared with baseline levels. The improvement strted after 1 month (-147.1 µm) and continued at 2 months (-198.8 µm) and the greatest mean reduction occurred at month 3 (-228.4 µm). Complete anatomical resolution of DME was obtained in 51.0% of eyes at 2 months and 70.0% at 3months. The results are summarized in table3.

Table 3: Central Macular Thickness Over 3 Months.

Time	Mean CMT (µm) ± SD	Mean Reduction from Baseline (µm)	P value	Proportion with complete fluid resolution (%)
Baseline	489.3 ± 82.1	------	-------	-------
1 month	315.2 ± 73.2	-147.1	<0.001	30.0% (30/100)
2 months	290.5 ± 55.2	-198.8	<0.001	51.0% (51/100)
3 months	260.9 ± 63.4	-228.4	<0.001	70.0% (70/100)

From safety wise, serious complications like endophthalmitis, vitreous hemorrhage, or sterile inflammation were encountered. Subconjunctival hemorrhage was recorded in 10 eyes (10.0%). In addition, no serious systemic complications were recorded including, sudden death, stroke and myocardial infarction.

DISCUSSION

This study clearly showed that intravitreal injections of bevacizumab loading doses led to marked improvement in patients with RVO associated macular edema. The mean age of the study population was 66.2 years, and males constituted 61.3% of the sample. These results are comparable to that of other studies showing that RVO mainly affects elderly individuals with systemic risk factors particularly hypertension. In addition, this study demonstrated that (BRVO) occurs more frequently than central retinal vein occlusion (CRVO). In other global studies, BRVO formed 70–80% of all RVO cases, which is comparable to the ratio found in our study, where BRVO accounted for 56% of cases.[7,8]

A statistically significant improvement in visual acuity was noted following three consecutive loading doses of intravitreal bevacizumab with 4 weeks interval. Mean BCVA improved from 0.15 Snellen at baseline to 0.56 at three months, this corresponds to four Snellen lines gain. In addition, 68% of eyes showed an improvement of two or more Snellen lines. These results were consistent with the BRAVO and CRUISE trials, in which ranibizumab effeteness was evaluated in BRVO and CRVO, respectively. Campochiaro et al. found 18.3 ETDRS letters gain in BRVO and 14.9 letters gain in CRVO at six months, with approximately 55–61% of eyes showed gains of ≥15 letters. Although the present study had a shorter follow-up period and included both BRVO and CRVO eyes, the overall visual improvement was comparable to these landmark studies.

Similarly, the SCORE2 study demonstrated that bevacizumab was noninferior to aflibercept in patients with macular edema secondary to CRVO or hemiretinal vein occlusion, with both groups achieving mean gains of approximately 18–19 ETDRS letters after six months.[5] These findings support the use of bevacizumab as an effective and economical first-line treatment for RVO-associated macular edema.

Analysis of visual outcomes revealed that 52% of eyes gained at least 10 ETDRS letters and 21% achieved gains of ≥15 letters, while only 12% experienced visual deterioration. Interestingly, all eyes showing significant visual loss belonged to the CRVO subgroup. This observation is consistent with previous reports demonstrating poorer visual prognosis in CRVO compared with BRVO because of greater retinal ischemia and more extensive vascular compromise.[7] Real-world studies have also shown that BRVO eyes generally achieve better visual outcomes than CRVO eyes following anti-VEGF therapy.[8]

Marked anatomical improvement was also observed in this study. Mean central macular thickness decreased from 489.3 µm at baseline to 260.9 µm at month three, representing a mean reduction of 228.4 µm. These results are comparable to those reported in the BRAVO and CRUISE studies, where reductions in retinal thickness of approximately 345 µm and 452 µm, respectively, were observed after six months of treatment.[7,8,9,10,11] Similarly, Epstein et al. demonstrated marked reductions in macular thickness after treatment with intravitreal bevacizumab in CRVO patients, accompanied by sustained visual improvement over one year.[12]

Furthermore, this A study reported a 70% overall increase in eyes achieving complete resolution of macular edema by the third month. This finding confirms both the effectiveness of the loading doses and the importance of adherence to an initial treatment regimen for achieving good outcomes. Other studies also reported similar findings with the use of intravenous bevacizumab in the treatment of RVO and associated macular edema.[13]

Safety data for patients receiving intravitreal bevacizumab therapy have shown the drug to be well tolerated. No cases of endophthalmitis, vitreous hemorrhage, retinal detachment or intraocular inflammation have been reported. Non-serious adverse

events occurred infrequently; 10% of eyes had subconjunctival hemorrhage. Furthermore, there were no systemic adverse events such as stroke, myocardial infarction or sudden death associated with treatment. These results are congruent with previously published excellent safety profiles for intravitreal bevacizumab in other clinical studies conducted around the world.[14]

The overall findings of this study are consistent with the findings of other international studies, illustrating the importance of intravitreal bevacizumab as an effective treatment for management of RVO related macular edema and an acceptable safety profile.[15,16] These findings further support the role of bevacizumab as a low cost, efficacious therapeutic option in developing countries where financial barriers will likely negatively impact patient access to needed healthcare services.

Limitations of the study

The relatively short follow-up period, the retrospective nature of the study and lack of separation between the results of BRVO and CRVO were the major limitations of the present study. Future prospective studies with longer follow-up periods are needed to explore the safety and effectivity of bevacizumab in RVO related macular edema.

CONCLUSION

Intravitreal bevacizumab loading doses showed significant functional and anatomical improvement in patients with macular edema secondary to retinal vein occlusion. Immediate improvement was noted after the 1st dose and was maintained after three months. Adverse events were rarely encountered and all of them were not serious.

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