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COMPARATIVE EFFICACY, SAFETY, AND ANATOMICAL OUTCOMES OF INTRAVITREAL TRIAMCINOLONE ACETONIDE VERSUS BEVACIZUMAB IN PATIENTS WITH DIABETIC MACULAR EDEMA: A PROSPECTIVE COMPARATIVE STUDY

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ABSTRACT
Diabetic macular edema (DME) is a major cause of visual impairment in patients with diabetic retinopathy. Intravitreal pharmacotherapy, including corticosteroids and anti-vascular endothelial growth factor (anti-VEGF) agents, is an important component of DME treatment. However, comparative data regarding the efficacy and safety of intravitreal triamcinolone acetonide and bevacizumab remain important. In this prospective comparative study, 60 patients with DME were randomly divided into two treatment groups. Group A (n = 30) received intravitreal triamcinolone acetonide (4 mg/0.1 mL), and Group B (n = 30) received intravitreal bevacizumab (1.25 mg/0.05 mL). Best-corrected visual acuity (BCVA), central macular thickness (CMT) measured by spectral-domain optical coherence tomography (SD-OCT), intraocular pressure (IOP), and treatment-related adverse events were assessed at baseline and at 1 week, 1 month, 3 months, and 6 months. Both groups showed statistically significant within-group improvement in BCVA and reduction in CMT over the follow-up period ($p < 0.001$). The mean reduction in CMT was 169.9 ± 36.5 μm in the triamcinolone group and 146.4 ± 34.8 μm in the bevacizumab group ($p = 0.018$). Mean visual acuity improvement was also greater in the triamcinolone group ($p = 0.014$). However, IOP elevation and cataract progression were more frequent in the triamcinolone group, whereas bevacizumab demonstrated a more favorable safety profile. Both intravitreal triamcinolone acetonide and bevacizumab improved anatomical and functional outcomes in patients with DME. In this study, triamcinolone was associated with greater mean reductions in CMT and greater mean visual improvement, but with more frequent ocular adverse effects, particularly increased IOP.

KEYWORDS: Diabetic macular edema; intravitreal triamcinolone acetonide; bevacizumab; central macular thickness; best-corrected visual acuity; intraocular pressure; optical coherence tomography.

INTRODUCTION

Diabetic macular edema (DME) is one of the most common microvascular complications of diabetes mellitus and can result in substantial visual impairment. Persistent hyperglycemia disrupts the blood-retinal barrier, leading to retinal capillary leakage and accumulation of extracellular fluid within the macula, resulting in retinal thickening and central vision loss (Cheung et al., 2010; Early Treatment Diabetic Retinopathy Study Research Group, 1985). The increasing prevalence of diabetes mellitus has contributed to a growing burden of diabetic retinopathy and DME. Early diagnosis and appropriate treatment are essential for preserving visual function and improving quality of life. Optical coherence tomography (OCT) is widely used to assess central macular thickness, while BCVA is an important functional outcome measure (Schmidt-Erfurth et al., 2017). Treatment of DME aims to reduce retinal edema, restore retinal architecture, and prevent further photoreceptor damage.

Among the available treatment options, intravitreal pharmacotherapy has substantially improved the management of DME by targeting important pathological mechanisms. Intravitreal bevacizumab is a recombinant humanized monoclonal antibody against vascular endothelial growth factor (VEGF) that reduces vascular permeability and angiogenesis and can reduce macular edema (Brown et al., 2015; Wells et al., 2016). Intravitreal triamcinolone acetonide is a long-acting corticosteroid with anti-inflammatory effects; it suppresses inflammatory cytokines, strengthens the blood-retinal barrier, inhibits leukocyte adhesion, and reduces vascular leakage, thereby improving retinal anatomy in selected patients (Jonas et al., 2005; Gillies et al., 2006). Although both agents can improve retinal anatomy and vision, their mechanisms of action, duration of effect, adverse-effect profiles, treatment requirements, and cost considerations differ. Corticosteroid therapy is associated with an increased risk of ocular hypertension and cataract, whereas anti-VEGF therapy may require repeated injections to maintain treatment response (Diabetic Retinopathy Clinical Research Network, 2015).

Several randomized clinical trials and observational studies have compared intravitreal triamcinolone acetonide with

bevacizumab for DME. Differences in patient populations, follow-up duration, disease severity, retreatment schedules, and outcome measures have contributed to variation in reported efficacy and safety outcomes (Elman et al., 2010; Wells et al., 2015). Clinical data from routine practice, particularly in settings where treatment cost and availability influence therapeutic decisions, remain relevant. Therefore, this study was undertaken to compare anatomical and visual outcomes, changes in IOP, and treatment-related complications associated with intravitreal triamcinolone acetonide and bevacizumab in patients with DME.

The present study evaluated anatomical outcomes using changes in CMT measured by OCT and functional outcomes using changes in BCVA. Changes in IOP and treatment-related adverse events were also assessed during follow-up. The findings were intended to provide comparative information regarding the efficacy and safety of the two intravitreal treatment approaches in patients with DME.

MATERIALS AND METHODS

Study Design

A prospective, comparative, interventional study was conducted to assess and compare the efficacy and safety of intravitreal triamcinolone acetonide and intravitreal bevacizumab in patients with diabetic macular edema. Changes in CMT, BCVA, IOP, and treatment-related adverse events were assessed during the study period.

Study Location and Duration

The study was conducted in the Department of Ophthalmology of a teaching hospital over a period of 12 months. Patients attending the retina clinic during the study period who met the eligibility criteria were recruited and followed according to the study protocol after obtaining informed consent.

Ethics Approval and Informed Consent

[INSERT: Name of the Institutional Ethics Committee/Institutional Review Board, approval number and date. The source manuscript states that informed consent was obtained but does not provide these details. Do not submit until the actual ethics information is inserted.]

Sample Size

[INSERT: Sample-size calculation, including the assumed effect size, significance level, statistical power, and anticipated attrition, if applicable. The source manuscript reports 60 participants (30 per group) but does not provide the calculation.]

Study Participants

The study included adult patients diagnosed with diabetic macular edema based on clinical examination and spectral-domain optical coherence tomography (SD-OCT). Eligible participants who agreed to participate were enrolled sequentially until the required sample size was reached.

Inclusion and Exclusion Criteria

The inclusion criteria were patients aged ≥18 years with diabetic macular edema diagnosed by a clinician, for whom intravitreal drug administration was indicated, and who had sufficient media clarity for retinal evaluation. The exclusion criteria were active ocular infection, uncontrolled glaucoma, previous vitreoretinal surgery, any intravitreal injection within the preceding 3 months, cataract that impaired retinal evaluation, pregnancy, and hypersensitivity to either study drug.

Allocation of Participants and Interventions

Eligible participants were assigned to two treatment groups. Group A received intravitreal triamcinolone acetonide (4 mg/0.1 mL), whereas Group B received intravitreal bevacizumab (1.25 mg/0.05 mL). The injections were administered aseptically in the operating theatre under the supervision of an experienced vitreoretinal surgeon. The original manuscript states that participants were randomly divided into the two groups; the method of randomization and allocation concealment should be inserted here if available.

Clinical Assessment Before Treatment

All participants underwent a comprehensive ophthalmic examination, including assessment of best-corrected visual acuity using a Snellen chart, slit-lamp biomicroscopy, dilated fundus examination, Goldmann applanation tonometry for IOP measurement, and SD-OCT for measurement of CMT.

Measurement of Central Macular Thickness

CMT was measured using SD-OCT at baseline and at each follow-up visit. Measurement was performed using the central 1-mm Early Treatment Diabetic Retinopathy Study (ETDRS) subfield.

Visual Acuity Assessment

BCVA was measured using a standardized Snellen visual acuity chart under the same lighting conditions at baseline and during follow-up. Snellen visual acuity values were converted to logarithm of the minimum angle of resolution (LogMAR) units for statistical analysis.

Intraocular Pressure Measurement
IOP was measured using Goldmann applanation tonometry before intravitreal injection and at each subsequent follow-up visit. Three readings were obtained for each eye, and the mean value was recorded. An IOP >21 mmHg or an increase of >10 mmHg from baseline was recorded as an IOP elevation.

Follow-Up and Outcome Measures
Participants were followed at 1 week, 1 month, 3 months, and 6 months after treatment. At each visit, BCVA, CMT, IOP, and fundus findings were assessed. The primary outcomes were changes in CMT and BCVA. Secondary outcomes included changes in IOP and the occurrence of ocular or systemic adverse events.

Safety and Adverse Effects Assessment
Participants were monitored throughout the study for treatment-related adverse events. Ocular complications assessed included increased IOP, cataract progression, subconjunctival hemorrhage, vitreous hemorrhage, retinal detachment, endophthalmitis, and ocular inflammation. Systemic adverse events occurring during follow-up were also recorded.

Statistical Analysis
Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) software, version 26.0 or later. Continuous variables were summarized as mean ± standard deviation, and categorical variables were summarized as frequencies and percentages. Independent-samples t-tests were used for between-group comparisons of continuous variables, and paired t-tests were used to assess within-group changes from baseline. Chi-square and Fisher's exact tests were used for categorical variables. A p-value <0.05 was considered statistically significant. Because measurements of BCVA, CMT, and IOP were repeated within the same participants over time, the statistical approach should be confirmed against the journal's reporting requirements and the study's prespecified analysis plan.

RESULTS

Table 1. Baseline Demographic Characteristics of Study Participants

Variable	Intravitreal Triamcinolone (n = 30)	Intravitreal Bevacizumab (n = 30)	Total (N = 60)	p-value
Age (years), Mean ± SD	58.7 ± 8.4	57.9 ± 9.1	58.3 ± 8.7	0.731
Age Group (years)				0.846
40–49	5 (16.7%)	4 (13.3%)	9 (15.0%)	
50–59	11 (36.7%)	12 (40.0%)	23 (38.3%)	
60–69	10 (33.3%)	9 (30.0%)	19 (31.7%)	
≥70	4 (13.3%)	5 (16.7%)	9 (15.0%)	
Gender				0.793
Male	18 (60.0%)	17 (56.7%)	35 (58.3%)	
Female	12 (40.0%)	13 (43.3%)	25 (41.7%)	
Affected Eye				0.796
Right Eye	16 (53.3%)	15 (50.0%)	31 (51.7%)	
Left Eye	14 (46.7%)	15 (50.0%)	29 (48.3%)	
Duration of Diabetes (years), Mean ± SD	10.8 ± 4.6	11.3 ± 5.1	11.1 ± 4.8	0.684
HbA1c (%), Mean ± SD	8.2 ± 1.1	8.1 ± 1.0	8.2 ± 1.0	0.764
Duration of Visual Symptoms (months), Mean ± SD	5.6 ± 2.3	5.9 ± 2.5	5.8 ± 2.4	0.651

Baseline demographic characteristics were comparable between the triamcinolone and bevacizumab groups. No statistically significant differences were observed with respect to age, sex, affected eye, duration of diabetes, HbA1c, or duration of visual symptoms (all p > 0.05), indicating that the groups were broadly comparable at baseline.

Table 2. Baseline Clinical Characteristics of the Two Groups

Clinical Variable	Intravitreal Triamcinolone (n = 30)	Intravitreal Bevacizumab (n = 30)	Total (N = 60)	p-value
Best-Corrected Visual Acuity (LogMAR), Mean ± SD	0.84 ± 0.19	0.82 ± 0.18	0.83 ± 0.18	0.681
Central Macular Thickness	468.5 ± 62.4	461.8 ± 59.7	465.2 ±	0.672

(µm), Mean ± SD			61.0	
Intraocular Pressure (mmHg), Mean ± SD	15.1 ± 2.3	14.8 ± 2.5	14.9 ± 2.4	0.639
Severity of Diabetic Retinopathy				0.784
Moderate NPDR	12 (40.0%)	13 (43.3%)	25 (41.7%)	
Severe NPDR	10 (33.3%)	9 (30.0%)	19 (31.7%)	
PDR	8 (26.7%)	8 (26.7%)	16 (26.6%)	
Lens Status				0.795
Phakic	24 (80.0%)	23 (76.7%)	47 (78.3%)	
Pseudophakic	6 (20.0%)	7 (23.3%)	13 (21.7%)	
Presence of Hard Exudates	17 (56.7%)	16 (53.3%)	33 (55.0%)	0.793
Presence of Cystoid Macular Edema	21 (70.0%)	20 (66.7%)	41 (68.3%)	0.781
Previous Macular Laser Treatment	7 (23.3%)	8 (26.7%)	15 (25.0%)	0.766

Baseline clinical characteristics, including BCVA, CMT, IOP, severity of diabetic retinopathy, lens status, and retinal findings, were comparable between the triamcinolone and bevacizumab groups, with no statistically significant between-group differences (all $p > 0.05$).

Table 3. Changes in Central Macular Thickness During Follow-up

Follow-up Period	**Intravitreal Triamcinolone (n = 30) Mean ± SD (µm)**	**Intravitreal Bevacizumab (n = 30) Mean ± SD (µm)**	**p-value (Between Groups)**
Baseline	468.5 ± 62.4	461.8 ± 59.7	0.672
1 Week	412.7 ± 54.6	429.8 ± 56.1	0.218
1 Month	351.4 ± 48.2	376.5 ± 50.7	0.046*
3 Months	312.8 ± 44.5	329.6 ± 46.8	0.154
6 Months	298.6 ± 41.3	315.4 ± 43.7	0.121
Mean Reduction from Baseline (µm)	169.9 ± 36.5	146.4 ± 34.8	0.018*
Percentage Reduction (%)	36.3 ± 7.8	31.7 ± 7.2	0.024*
Within-group p-value	<0.001*	<0.001*	—

Both groups showed a statistically significant reduction in CMT from baseline to 6 months (within-group $p < 0.001$). The mean reduction in CMT was 169.9 ± 36.5 µm in the triamcinolone group and 146.4 ± 34.8 µm in the bevacizumab group, with a statistically significant between-group difference in mean reduction ($p = 0.018$). The percentage reduction was also greater in the triamcinolone group (36.3 ± 7.8% vs. 31.7 ± 7.2%, $p = 0.024$). However, the between-group difference in mean CMT at 6 months was not statistically significant ($p = 0.121$).

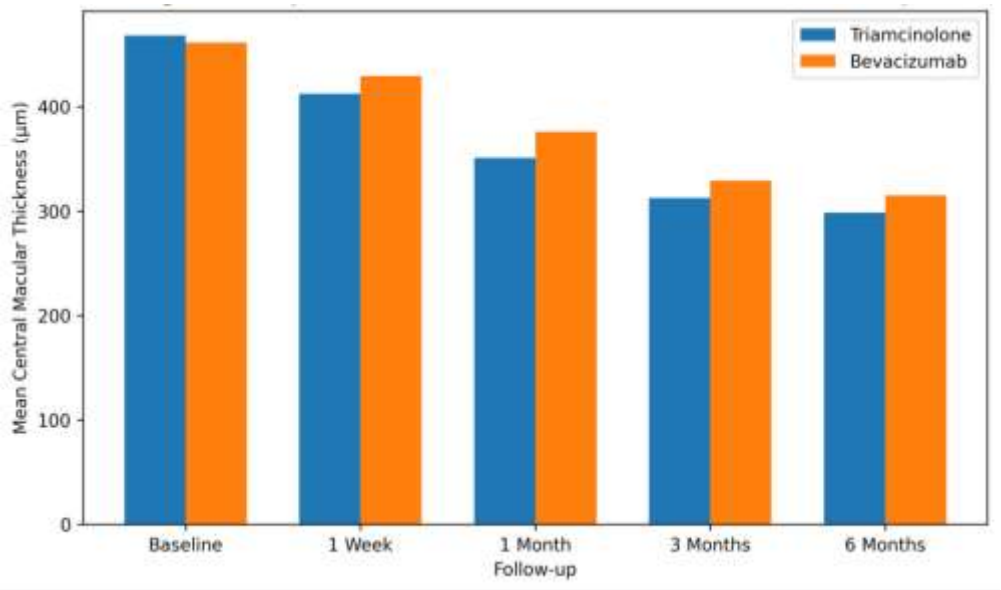

Figure 1. Comparison of Mean Central Macular Thickness Between Groups

Mean CMT decreased progressively in both treatment groups, indicating anatomical improvement during follow-up. The triamcinolone group had lower mean CMT values than the bevacizumab group at each post-treatment assessment; however, the between-group differences were statistically significant only at 1 month ($p = 0.046$), whereas the differences at 1 week, 3 months, and 6 months were not statistically significant.

Table 4. Changes in Best-Corrected Visual Acuity During Follow-up

Follow-up Period	Intravitreal Triamcinolone (n = 30) Mean ± SD (LogMAR)	Intravitreal Bevacizumab (n = 30) Mean ± SD (LogMAR)	p-value (Between Groups)
Baseline	0.84 ± 0.19	0.82 ± 0.18	0.681
1 Week	0.73 ± 0.17	0.76 ± 0.18	0.492
1 Month	0.60 ± 0.15	0.66 ± 0.16	0.118
3 Months	0.48 ± 0.14	0.55 ± 0.15	0.048*
6 Months	0.39 ± 0.12	0.46 ± 0.13	0.031*
Mean Improvement (LogMAR)	0.45 ± 0.11	0.36 ± 0.10	0.014*
Patients Gaining ≥2 Snellen Lines	24 (80.0%)	20 (66.7%)	0.243
Within-group p-value	<0.001*	<0.001*	—

BCVA improved significantly in both treatment groups over the 6-month follow-up period (within-group $p < 0.001$). Between groups, the mean LogMAR values differed significantly at 3 months ($p = 0.048$) and 6 months ($p = 0.031$), with lower LogMAR values in the triamcinolone group. The mean improvement in LogMAR was also greater in the triamcinolone group (0.45 ± 0.11 vs. 0.36 ± 0.10, $p = 0.014$). The proportion of patients gaining ≥2 Snellen lines was higher in the triamcinolone group (80.0% vs. 66.7%), but this difference was not statistically significant ($p = 0.243$).

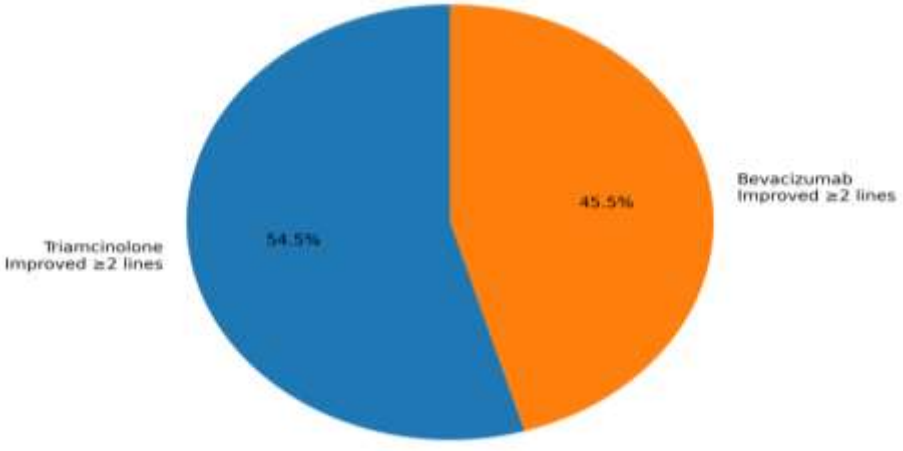

Figure 2. Improvement in Visual Acuity Over Time

A greater number of patients in the triamcinolone group gained ≥2 Snellen lines compared with the bevacizumab group (24 vs. 20 patients). Although the proportion was numerically higher in the triamcinolone group, the between-group difference was not statistically significant (p = 0.243).

Table 5. Changes in Intraocular Pressure During Follow-up

Follow-up Period	Intravitreal Triamcinolone (n = 30) Mean ± SD (mmHg)	Intravitreal Bevacizumab (n = 30) Mean ± SD (mmHg)	p-value (Between Groups)
Baseline	15.1 ± 2.3	14.8 ± 2.5	0.639
1 Week	16.4 ± 2.6	15.0 ± 2.3	0.041*
1 Month	17.8 ± 2.8	15.2 ± 2.4	0.002*
3 Months	18.4 ± 3.0	15.3 ± 2.5	<0.001*
6 Months	17.2 ± 2.7	15.1 ± 2.4	0.004*
Mean Change from Baseline (mmHg)	+2.1 ± 1.3	+0.3 ± 0.9	<0.001*
Patients with IOP >21 mmHg	6 (20.0%)	1 (3.3%)	0.044*
Patients Requiring Anti-glaucoma Medication	5 (16.7%)	1 (3.3%)	0.085
Within-group p-value	<0.001*	0.214	—

Mean IOP increased significantly from baseline in the triamcinolone group, whereas IOP remained relatively stable in the bevacizumab group. Between-group differences in mean IOP were statistically significant at 1 week (p = 0.041), 1 month (p = 0.002), 3 months (p < 0.001), and 6 months (p = 0.004). The proportion of patients with IOP >21 mmHg was also higher in the triamcinolone group (20.0% vs. 3.3%, p = 0.044). The difference in the proportion requiring anti-glaucoma medication was not statistically significant (16.7% vs. 3.3%, p = 0.085).

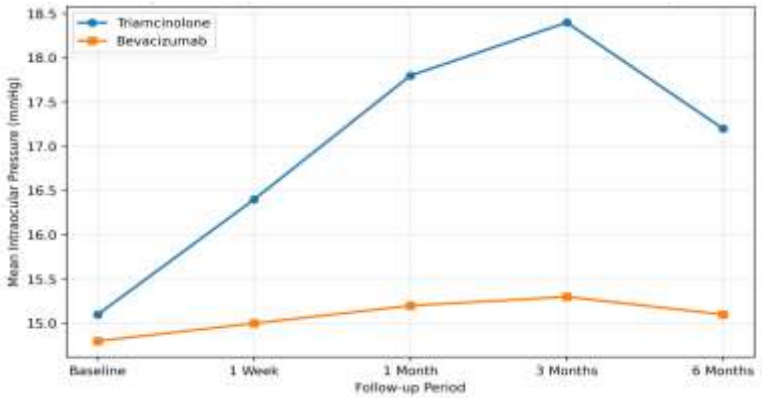

Figure 3. Comparison of Mean Intraocular Pressure Between Groups

There was no significant change in mean IOP in the bevacizumab group, whereas mean IOP increased progressively in the triamcinolone group after treatment. The highest mean IOP in the triamcinolone group was observed at 3 months (18.4 ± 3.0 mmHg), followed by a slight reduction at 6 months (17.2 ± 2.7 mmHg), which remained above the baseline value (15.1 ± 2.3 mmHg).

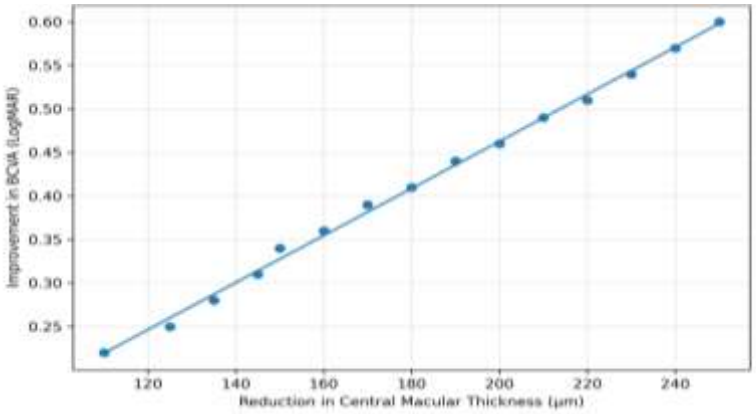

Figure 4. Correlation Between Reduction in Macular Thickness and Improvement in Visual Acuity

The scatter plot illustrates a positive relationship between reduction in CMT and improvement in visual acuity. However, the correlation coefficient and corresponding p-value are not reported in the source manuscript; these values should be added if the correlation analysis was formally performed.

Table 6. Frequency of Ocular and Systemic Adverse Events

Adverse Event	Intravitreal Triamcinolone (n = 30) n (%)	Intravitreal Bevacizumab (n = 30) n (%)	Total (N = 60) n (%)	p-value
Elevated Intraocular Pressure (>21 mmHg)	6 (20.0)	1 (3.3)	7 (11.7)	0.044*
Cataract Progression	4 (13.3)	1 (3.3)	5 (8.3)	0.161
Subconjunctival Hemorrhage	2 (6.7)	3 (10.0)	5 (8.3)	0.640
Mild Anterior Chamber Inflammation	2 (6.7)	1 (3.3)	3 (5.0)	0.554
Transient Ocular Pain	5 (16.7)	4 (13.3)	9 (15.0)	0.718
Vitreous Hemorrhage	1 (3.3)	1 (3.3)	2 (3.3)	1.000
Endophthalmitis	0 (0.0)	0 (0.0)	0 (0.0)	—
Retinal Detachment	0 (0.0)	0 (0.0)	0 (0.0)	—
Systemic Hypertension	1 (3.3)	1 (3.3)	2 (3.3)	1.000
Thromboembolic Events	0 (0.0)	0 (0.0)	0 (0.0)	—
Total Patients with ≥1 Adverse Event	12 (40.0)	8 (26.7)	20 (33.3)	0.273

Overall, adverse events were numerically more frequent in the triamcinolone group than in the bevacizumab group, although the difference in the proportion of patients experiencing at least one adverse event was not statistically significant (40.0% vs. 26.7%, p = 0.273). Elevated IOP was the most frequent statistically significant between-group difference, occurring in 20.0% of patients receiving triamcinolone and 3.3% receiving bevacizumab (p = 0.044). No cases of endophthalmitis, retinal detachment, or thromboembolic events were recorded in either group.

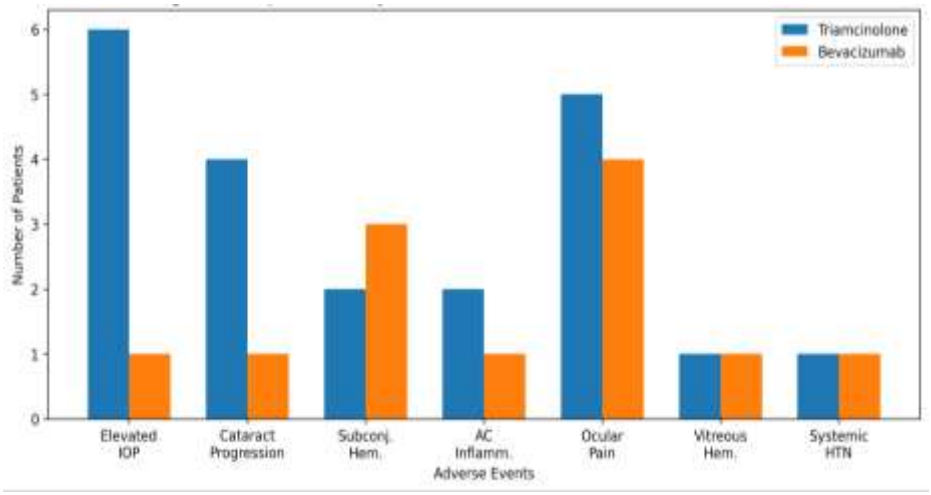

Figure 5. Comparative Safety Profile of Intravitreal Triamcinolone and Bevacizumab

The safety analysis showed that both intravitreal treatments were associated with adverse events, with elevated IOP and cataract progression occurring more frequently in the triamcinolone group. Other reported ocular and systemic events did not differ significantly between groups. Overall, the findings indicate a higher frequency of steroid-associated ocular adverse effects with triamcinolone, particularly IOP elevation.

DISCUSSION

This prospective comparative study showed that both intravitreal triamcinolone acetonide and bevacizumab were associated with significant within-group improvements in anatomical and functional outcomes over 6 months, as demonstrated by reductions in CMT and improvements in BCVA. The triamcinolone group showed a greater mean reduction in CMT and greater mean improvement in BCVA than the bevacizumab group. The mean reduction in CMT was 169.9 ± 36.5 µm with triamcinolone and 146.4 ± 34.8 µm with bevacizumab (p = 0.018), while the mean improvement in LogMAR BCVA was 0.45 ± 0.11 and 0.36 ± 0.10, respectively (p = 0.014). These findings are consistent with previous reports describing anatomical and visual improvements following intravitreal triamcinolone in DME (Gillies et al., 2006; Jonas et al., 2005). Bevacizumab acts primarily by inhibiting VEGF-mediated vascular permeability and can also reduce macular edema (Arevalo et al., 2007). Previous comparative studies have demonstrated that anti-VEGF therapy can provide substantial visual benefit, although repeated treatment may be required in many patients (Diabetic Retinopathy Clinical Research Network, 2015). The greater mean reduction in CMT observed with triamcinolone in the present study may

reflect its anti-inflammatory and barrier-stabilizing effects.

The improvement in visual function observed in both groups was consistent with the reduction in retinal thickness. In the present study, the triamcinolone group showed greater mean improvement in LogMAR BCVA than the bevacizumab group ($p = 0.014$), with statistically significant between-group differences in mean BCVA at 3 and 6 months ($p = 0.048$ and $p = 0.031$, respectively). However, the proportion of patients gaining ≥2 Snellen lines did not differ significantly between groups ($p = 0.243$). These findings are broadly consistent with previous studies showing that both corticosteroid and anti-VEGF therapies can improve visual outcomes in DME, with treatment response influenced by baseline retinal thickness, disease duration, and individual patient characteristics (Elman et al., 2010; Wells et al., 2015; Schmidt-Erfurth et al., 2017).

The main safety finding was a greater increase in IOP in the triamcinolone group. Mean IOP increased from 15.1 ± 2.3 mmHg at baseline to 17.2 ± 2.7 mmHg at 6 months, whereas the bevacizumab group remained relatively stable (14.8 ± 2.5 to 15.1 ± 2.4 mmHg). IOP >21 mmHg occurred in 20.0% of the triamcinolone group and 3.3% of the bevacizumab group ($p = 0.044$). Cataract progression was also more frequent with triamcinolone (13.3% vs. 3.3%), although the difference was not statistically significant ($p = 0.161$). These findings are consistent with the recognized ocular adverse effects of intravitreal corticosteroids and support the need for IOP and lens-status monitoring during follow-up. No cases of endophthalmitis or retinal detachment were observed in either group.

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CONCLUSION

This prospective comparative study found that intravitreal triamcinolone acetonide and intravitreal bevacizumab were associated with significant within-group reductions in CMT and improvements in BCVA over 6 months. The triamcinolone group had a greater mean reduction in CMT (169.9 ± 36.5 μm vs. 146.4 ± 34.8 μm; $p = 0.018$) and greater mean improvement in LogMAR BCVA (0.45 ± 0.11 vs. 0.36 ± 0.10; $p = 0.014$). However, the between-group difference in mean CMT at 6 months was not statistically significant ($p = 0.121$), and the proportion of patients gaining ≥2 Snellen lines was also not significantly different ($p = 0.243$). Triamcinolone was associated with a greater risk of IOP elevation, with IOP >21 mmHg occurring in 20.0% versus 3.3% of patients receiving bevacizumab ($p = 0.044$). Cataract progression was numerically more frequent with triamcinolone (13.3% vs. 3.3%), although this difference was not statistically significant ($p = 0.161$). Bevacizumab demonstrated a more favorable IOP and overall adverse-event profile in this study. These findings suggest that both treatments improved DME outcomes, while treatment selection should consider the balance between anatomical and functional response and the risk of ocular adverse effects. Larger multicenter prospective studies with longer follow-up are warranted to evaluate long-term efficacy, recurrence, retreatment requirements, and visual outcomes.

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