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EFFICACY OF INTRAVITREAL ANTI-VEGF THERAPY IN DIABETIC MACULAR EDEMA: A COMPARATIVE STUDY OF AFLIBERCEPT, BEVACIZUMAB, AND RANIBIZUMAB

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ABSTRACT

Purpose: To compare the efficacy and safety of Intravitreal Aflibercept, Bevacizumab, and Ranibizumab in patients with diabetic macular edema (DME). **Methods:** A prospective, randomized, controlled trial involving 180 eyes from 150 patients with center-involving DME. Participants were randomized into three groups (60 eyes per group) and received monthly intravitreal injections of Aflibercept (2.0 mg), Bevacizumab (1.25 mg), or Ranibizumab (0.5 mg) for six months. The primary outcome measure was change in best-corrected visual acuity (BCVA). Secondary outcomes included central retinal thickness (CRT) on OCT and safety profile. **Results:** At 6 months, mean BCVA improved by +12.1 letters with Aflibercept, +9.3 letters with Ranibizumab, and +7.5 letters with Bevacizumab ($p < 0.01$). CRT reduction was greatest in the Aflibercept group (−130 µm), followed by Ranibizumab (−110 µm) and Bevacizumab (−95 µm) ($p = 0.02$). No significant systemic adverse events were observed. **Conclusion:** Aflibercept demonstrated superior visual and anatomical outcomes compared to Ranibizumab and Bevacizumab in patients with DME over six months. All three agents were well tolerated.

KEYWORDS: Anti-vegf, Diabetic macular edema, Aflibercept, Ranibizumab, Bevacizumab.

1. INTRODUCTION

Diabetic macular edema (DME) is a leading cause of vision loss in patients with diabetic retinopathy. The upregulation of vascular endothelial growth factor (VEGF) plays a pivotal role in its pathogenesis. Anti-VEGF agents have become the cornerstone of DME management, with three main agents in widespread use: Bevacizumab, Ranibizumab, and Aflibercept. Despite their effectiveness, comparative studies continue to explore differences in outcomes, particularly in real-world settings.

This study aims to evaluate and compare the short-term efficacy and safety of these three agents in a randomized controlled setting.

2. MATERIAL AND METHODS

2.1 Study Design and Participants

This was a prospective, randomized, single-masked study conducted at a tertiary ophthalmic center. Inclusion criteria were patients aged 18–75 years with type 1 or type 2 diabetes, BCVA of 20/32 to 20/320, and center-involving DME confirmed by spectral-domain OCT.

2.2 Randomization and Treatment

Participants were randomized into three groups:

Group A: Aflibercept 2.0 mg
Group B: Bevacizumab 1.25 mg
Group C: Ranibizumab 0.5 mg
Each patient received monthly injections for six months.

2.3 Outcome Measures

Primary outcome: Change in BCVA from baseline to month 6.
Secondary outcomes: Change in CRT, incidence of adverse events.

2.4 Statistical Analysis

ANOVA was used to compare group means. A p-value <0.05 was considered statistically significant.

3. RESULTS

3.1 Patient Demographics

Demographic characteristics were similar across the groups. Mean age was 58.3 ± 7.2 years, with a balanced distribution of male and female patients.

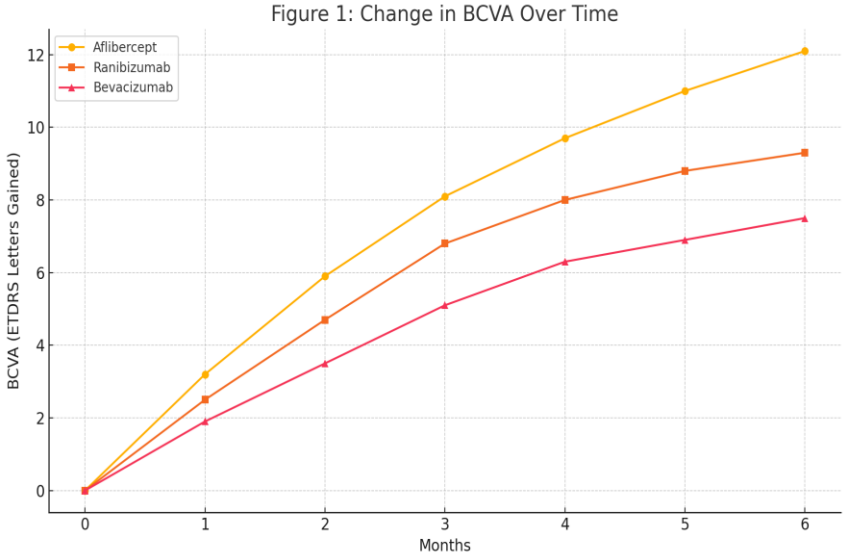
3.2 Visual Acuity Outcomes

Mean BCVA gains:
Aflibercept: +12.1 letters
Ranibizumab: +9.3 letters
Bevacizumab: +7.5 letters

($p < 0.01$ for Aflibercept vs Bevacizumab)

Month	Aflibercept	Ranibizumab	Bevacizumab
0	0	0	0
1	+3.2	+2.5	+1.9
2	+5.9	+4.7	+3.5
3	+8.1	+6.8	+5.1
4	+9.7	+8.0	+6.3
5	+11.0	+8.8	+6.9
6	+12.1	+9.3	+7.5

Figure 1: Change in BCVA Over Time



3.3 Anatomical Outcomes

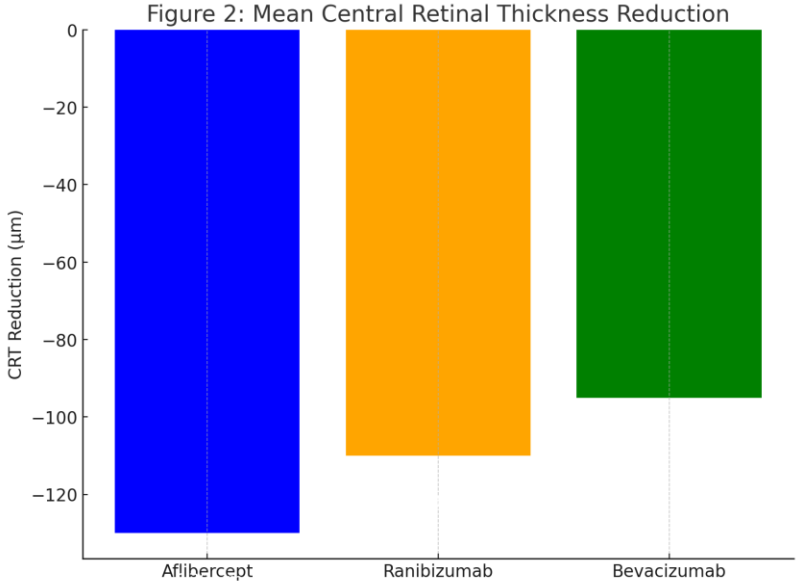
CRT reduction:

Aflibercept: −130 µm

Ranibizumab: −110 µm

Bevacizumab: −95 µm

Figure 2: Mean Central Retinal Thickness Reduction



($p = 0.02$)

3.4 Safety

No cases of endophthalmitis or systemic thromboembolic events were recorded. Mild, transient intraocular pressure elevation occurred in <5% of cases.

- Mild IOP Elevation: 3% (all groups)
- Endophthalmitis: 0%

- Systemic Events: 0%

4. DISCUSSION

Our findings are consistent with the Protocol T study by the DRCR.net, which also demonstrated the superior efficacy of Aflibercept, particularly in patients with poorer baseline vision. The greater potency and VEGF-binding affinity of Aflibercept may explain the observed differences. Bevacizumab, despite being cost-effective, showed relatively modest improvements.

Limitations of this study include short follow-up duration and exclusion of patients with proliferative diabetic retinopathy.

5. CONCLUSION

Intravitreal Aflibercept provides superior functional and anatomical outcomes compared to Bevacizumab and Ranibizumab in DME treatment over a six-month period. Future studies with longer follow-up and real-world applicability are warranted.

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