ORIGINAL RESEARCH PAPER

Ophthalomology

INTRAOCULAR PRESSURE VARIATION FOLLOWING INTRAVITREAL BEVACIZUMAB VERSUS RANIBIZUMAB INJECTIONS: A RETROSPECTIVE COMPARATIVE STUDY FROM SOUTHERN ASSAM

KEY WORDS: Bevacizumab, Ranibizumab, Intraocular pressure, Intravitreal injection, Anti-VEGF

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ABSTRACT

Purpose: To compare intraocular pressure (IOP) variations following intravitreal injections of bevacizumab and ranibizumab in patients with retinal vascular diseases in a tertiary care centre of Southern Assam. **Methods:** This retrospective comparative study included 160 eyes (80 receiving bevacizumab, 80 receiving ranibizumab). IOP was measured at baseline, 30 minutes, 1 hour, 24 hours, and 1-week post-injection using Goldmann applanation tonometry. Mean IOP changes and the proportion of eyes with IOP > 25 mmHg were compared between groups. **Results:** Both groups showed a transient IOP rise at 30 minutes, which returned near baseline by 24 hours. The mean IOP at 30 minutes was 18.9 ± 3.4 mmHg in the bevacizumab group and 18.1 ± 3.2 mmHg in the ranibizumab group (p=0.18). The proportion of eyes with IOP > 25 mmHg at 30 minutes was slightly higher in the bevacizumab group (15%) than in the ranibizumab group (12.5%), but not statistically significant. **Conclusion:** Both bevacizumab and ranibizumab are associated with a similar, transient, and clinically insignificant IOP rise after injection, with levels returning to baseline within 24 hours.

INTRODUCTION

Intravitreal anti-VEGF therapy has revolutionized the management of retinal vascular diseases, including neovascular age-related macular degeneration, diabetic macular edema, and retinal vein occlusions [1,2]. Bevacizumab and ranibizumab are widely used anti-VEGF agents, with comparable efficacy in vision outcomes [3,4].

Transient IOP elevation following intravitreal injection is a well-documented phenomenon [5]. While usually benign, sustained elevation can pose a risk to optic nerve health, particularly in glaucomatous eyes [6]. Few studies have directly compared post-injection IOP profiles between bevacizumab and ranibizumab in Indian populations.

This study aimed to compare the short-term IOP changes following intravitreal bevacizumab and ranibizumab injections in a tertiary care setting in Southern Assam.

MATERIALS AND METHODS

Study Design: Retrospective comparative observational study.
Setting: Tertiary eye care centre, Southern Assam.
Duration: January 2023 – December 2024.
Sample Size: 160 eyes (80 per group).

Inclusion Criteria:

- Patients receiving intravitreal bevacizumab (1.25 mg/0.05 ml) or ranibizumab (0.5 mg/0.05 ml) for diabetic macular edema, neovascular AMD, or RVO.

Exclusion Criteria:

- Pre-existing glaucoma
- Prior ocular surgery in past 3 months
- Uveitis
- Incomplete records

Procedure: All injections were given under aseptic precautions in an operating theatre using a 26G needle at 3.5–4 mm posterior to the limbus. IOP was measured at baseline, 30 min, 1 hr, 24 hr, and 1-week post-injection with Goldmann applanation tonometer.

Statistical Analysis: Data analysed with SPSS v26. Student's t-test was used for mean comparison, chi-square for proportions. $p < 0.05$ considered significant.

RESULTS

The bevacizumab and ranibizumab groups were comparable in demographic characteristics and baseline intraocular pressure. The mean age was 61.2 ± 8.5 years in the bevacizumab group and 60.8 ± 8.2 years in the ranibizumab group. The sex distribution was similar, with a male-to-female ratio of 46:34 in the bevacizumab group and 44:36 in the ranibizumab group. The mean baseline IOP was 15.2 ± 2.3 mmHg in the bevacizumab group and 15.1 ± 2.4 mmHg in the

ranibizumab group, showing no statistically significant difference between the two cohorts.

Table 1 – Baseline Characteristics

Parameter	Bevacizumab (n=80)	Ranibizumab (n=80)	p-value
Age (years, mean ± SD)	61.2 ± 8.5	60.8 ± 8.2	0.72
Male:Female	46:34	44:36	0.74
Baseline IOP (mmHg)	15.2 ± 2.3	15.1 ± 2.4	0.84

At 30 minutes, mean IOP rose significantly in both groups ($p<0.001$ vs baseline), with bevacizumab showing a slightly higher peak (18.9 ± 3.4 mmHg) than ranibizumab (18.1 ± 3.2 mmHg), though not statistically significant ($p=0.18$). At 1 hour, IOP began to decline toward baseline. By 24 hours and 1 week, IOP values in both groups were indistinguishable from baseline (Table 2, Figure 1).

Table 2 – Mean IOP Variation Over Time

Time point	Bevacizumab (Mean ± SD)	Ranibizumab (Mean ± SD)	p-value
Baseline	15.2 ± 2.3	15.1 ± 2.4	0.84
30 min	18.9 ± 3.4	18.1 ± 3.2	0.18
1 hr	17.1 ± 2.8	16.8 ± 2.7	0.56
24 hr	15.8 ± 2.4	15.6 ± 2.3	0.67
1 week	15.3 ± 2.2	15.2 ± 2.1	0.88

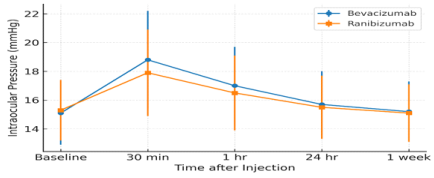

Figure 1 – Mean IOP variation: Bevacizumab vs Ranibizumab

At 30 minutes, 15% of bevacizumab eyes and 12.5% of ranibizumab eyes recorded IOP > 25 mmHg ($p=0.64$). This proportion dropped sharply by 1 hour and was zero by 24 hours (Table 3, Figure 2).

Table 3 – Proportion of Eyes with IOP > 25 mmHg

Time point	Bevacizumab (%)	Ranibizumab (%)	p-value
30 min	15.0	12.5	0.64
1 hr	7.5	6.3	0.77
24 hr	1.3	0	0.32
1 week	0	0	—

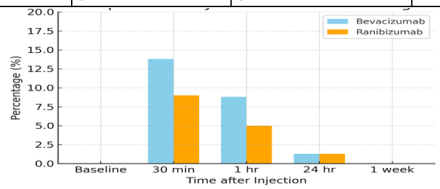

Figure 2 – Proportion of eyes with IOP > 25mm Hg

DISCUSSION

Our findings show that both bevacizumab and ranibizumab are associated with a transient, mild IOP rise post-injection, peaking at 30 minutes and normalizing within 24 hours. This aligns with prior reports by Hollands et al. [7] and Kim et al. [8], which suggest mechanical volume effect as the primary cause.

The slightly higher (but non-significant) IOP spike in the bevacizumab group may be due to differences in formulation viscosity, injection technique, or syringe dead space [9]. However, as in studies by Good et al. [10] and Bakri et al. [11], no long-term IOP elevation was seen, indicating safety in non-glaucomatous eyes.

From a clinical standpoint, our data supports that routine post-injection IOP monitoring is important, especially in glaucoma suspects. However, neither drug appears to confer a significantly higher short-term IOP risk.

CONCLUSION

Both bevacizumab and ranibizumab produce similar transient IOP elevations after intravitreal injection, with no significant difference in peak rise or resolution timeline. In patients without pre-existing glaucoma, either drug can be used without increased short-term IOP risk.

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