# Treatment Outcomes With Anti-VEGF Therapy for Retinal Vein Occlusion: An Analysis of Real-World Data From 16 UK Centres

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## Objective

To characterise anti–vascular endothelial growth factor (VEGF) treatment patterns and long-term visual acuity (VA) outcomes in patients with macular oedema secondary to retinal vein occlusion (RVO) being treated in routine clinical practice in the United Kingdom (UK)

## Conclusions

These data from the United Kingdom over 60 months show that, on average, anti-VEGF injections improve vision in eyes with macular oedema secondary to RVO, but eyes may require long-term treatment to maintain baseline or any improvement in vision

With longer follow-up, VA gains were lower, as was the average number of anti-VEGF injections

Intravitreal steroid and macular laser use were higher with longer follow-up

Greater vision improvements were observed among eyes with a high vs low number of injections, highlighting a need for more durable treatments and long-term monitoring to maintain vision in eyes with RVO

In contrast to highly selected clinical trial participants, this analysis reflects the long-term visual outcomes of heterogenous real-world RVO patients treated with anti-VEGF therapy

**Financial Disclosures**

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**Study Disclosures**

- This study was a non-interventional, retrospective, secondary data use study, leveraging data from Medisoft electronic health records. The study was considered exempt from institutional review board review as the research involved only the collection of existing data, which had been de-identified and are unable to be traced
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## Background

- RVO is a chronic disease requiring ongoing management[1]
- Intravitreal injections of anti-VEGF agents are the standard-of-care treatment for macular oedema due to RVO[2,3]
- However, outcomes, including vision gains, are generally suboptimal in clinical practice vs outcomes from randomised controlled trials[4]
- This is thought to at least in part reflect fewer anti-VEGF injections received in clinical practice,[4] which may be due to the burden of treatment to patients and caregivers[5]
- There are also limited data on long-term outcomes from up to 5 years of treatment of RVO

## Methods

### Study Design: Retrospective Observational Study

- Medisoft electronic health record data from 2013 to 2023
- Contributed by 16 UK National Health Service trusts

### Study Eyes: Inclusion Criteria

- Macular oedema secondary to branch retinal vein occlusion (BRVO), central retinal vein occlusion (CRVO) or hemiretinal vein occlusion (HRVO)
- Treatment naïve to anti-VEGFs, intravitreal steroids, vitrectomy and laser therapy
- ≥ 1 intravitreal anti-VEGF injection on or after diagnosis
- VA measured at index injection
- ≥ 3 months, follow-up after index injection

### Data Analysis

- Observation period: up to 60 months after index injection
- Treatment patterns and VA outcomes were evaluated descriptively
- CRVO and HRVO eyes were analysed together

## Limitations

- Limited generalisability beyond the United Kingdom
- Missing data (eg, due to loss to follow-up)
- Anatomical outcomes were not available for assessment

## References

1. Schmidt-Erfurth U et al. *Ophthalmologica.* 2019;242(3):123-162.
2. Flaxel CJ et al. *Ophthalmology.* 2020;127(2):288-320.
3. Nicholson L et al. *Eye.* 2022;36(5):909-912.
4. Ciulla T et al. *Br J Ophthalmol.* 2021;105(12):1696-1704.
5. Sivaprasad S, Oyetunde S. *Clin Ophthalmol.* 2016;10:939-946.

## Results

### BRVO and C/HRVO Final Cohorts

**Initial RVO diagnosis with secondary macular oedema between 2013 and 2023**
Patients/Eyes: BRVO, n = 6167/6291 (100%); CRVO, n = 5487/5633 (100%); HRVO, n = 1049/1054 (100%)

**Demographic data present and age ≥ 18 years**
Patients/Eyes: BRVO, n = 6166 (99.9%)/6290 (99.9%); CRVO, n = 5483 (99.9%)/5629 (99.9%); HRVO, n = 1049/1054 (100%)

**Eyes treatment naïve to anti-VEGF, IVT steroids and vitrectomy at index treatment**
Patients/Eyes: BRVO, n = 5740 (93.1%)/5849 (93.0%); CRVO, n = 5004 (91.2%)/5134 (91.1%); HRVO, n = 963 (91.8%)/967 (91.8%)

**VA measurement within 30 days before or on index treatment date and ≥ 3-month follow-up**
Patients/Eyes: BRVO, n = 4414 (71.6%)/4492 (71.4%); CRVO, n = 4004 (73.0%)/4089 (72.6%); HRVO, n = 805 (76.7%)/808 (76.7%)

**Eyes without DR moderate non-proliferative or worse, proliferative DR, GA, DME, nAMD, mCNV, CME, retinal neovascularisation, diagnosis of both BRVO and CRVO or BRVO and HRVO on or before diagnosis**
Patients/Eyes: BRVO, n = 4409 (71.5%)/4484 (71.3%); CRVO, n = 3528 (64.3%)/3598 (63.9%); HRVO, n = 647 (61.7%)/650 (61.7%)

**Received ≥ 1 anti-VEGF after diagnosis and receiving anti-VEGF as index treatment**
Patients/Eyes: BRVO, n = 3465 (56.2%)/3511 (55.8%); CRVO, n = 2972 (54.2%)/3018 (53.6%); HRVO, n = 547 (52.1%)/550 (52.2%)

| Final Cohorts | BRVO | C/HRVO |
|---|---|---|
| | Patients: n = 3465<br>Eyes: n = 3511 | Patients: n = 3514<br>Eyes: n = 3568 |

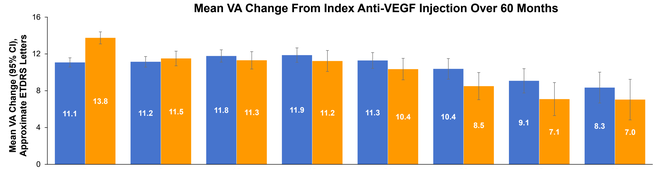
BRVO, branch retinal vein occlusion; CME, cystoid macular oedema; CRVO, central retinal vein occlusion; C/HRVO, central/hemiretinal vein occlusion; DME, diabetic macular oedema; DR, diabetic retinopathy; GA, geographic atrophy; HRVO, hemiretinal vein occlusion; IVT, intravitreal; mCNV, myopic choroidal neovascularisation; nAMD, neovascular age-related macular oedema; RVO, retinal vein occlusion; VA, visual acuity; VEGF, vascular endothelial growth factor.

### Baseline Demographics and Clinical Characteristics

| Baseline Characteristics (Patient-Level) | BRVO, n = 3465 | C/HRVO, n = 3514 |
|---|---|---|
| Age at index date, mean years (SD) | 71.5 (12.2) | 73.6 (12.4) |
| **Sex, n (%)** | | |
| Female | 1852 (53.5) | 1671 (47.6) |
| **Race, n (%)** | | |
| White | 2846 (82.1) | 2979 (84.8) |
| Asian | 89 (2.6) | 75 (2.1) |
| Black | 20 (0.6) | 27 (0.8) |
| Other/Mixed | 27 (0.8) | 26 (0.7) |
| Not stated | 483 (13.9) | 407 (11.6) |
| **IMD decile, n (%)** | | |
| 1–4 | 1080 (31.2) | 1184 (33.7) |
| 5–10 | 2367 (68.3) | 2306 (65.6) |
| Not stated | 18 (0.5) | 24 (0.7) |
| **Eye Characteristics (Eye-Level)** | **BRVO, n = 3511** | **C/HRVO, n = 3568** |
| Phakic lens status, n (%) | 2619 (74.6) | 2752 (77.1) |
| Duration since diagnosis at index treatment, days (SD) | 27.3 (110.8) | 24.9 (116.8) |
| **VA at index treatment (analysis groups), n (%)** | | |
| ≤ 35 ETDRS letter score | 564 (16.1) | 1494 (41.9) |
| ≥ 70 ETDRS letter score | 908 (25.9) | 412 (11.6) |
| ≥ 85 ETDRS letter score | 61 (1.7) | 22 (0.6) |

IMD decile of 1 reflects most deprived, 10 reflects least deprived. BRVO, branch retinal vein occlusion; C/HRVO, central/hemiretinal vein occlusion; ETDRS, Early Treatment Diabetic Retinopathy Study; IMD, index of multiple deprivation; SD, standard deviation; VA, visual acuity.

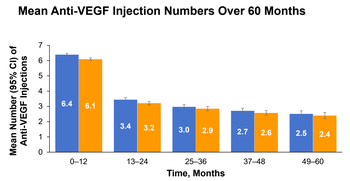
### On Average, VA Gains Were Observed After Index Anti-VEGF Injection in BRVO and C/HRVO Eyes; VA Gains Were Lower With Longer Follow-Up




| | | 3 | 6 | 12 | 18 | 24 | 36 | 48 | 60 |
|---|---|---|---|---|---|---|---|---|---|
| BRVO | n | 3052 | 2642 | 2137 | 1723 | 1654 | 1058 | 769 | 497 |
| | Baseline VA | 55.4 | 55.8 | 56.1 | 56.4 | 56.4 | 56.9 | 58.0 | 58.0 |
| C/HRVO | n | 3127 | 2687 | 2091 | 1642 | 1651 | 1065 | 734 | 498 |
| | Baseline VA | 39.7 | 40.2 | 40.9 | 41.5 | 41.5 | 42.6 | 43.7 | 43.8 |

VA measurements were collected within ± 30 (up to 18 months) or ± 60 (from 24 to 60 months) days from date of interest to increase likelihood of collecting a measurement for each eye. The reading closest to the date of interest was used in eyes with 2 readings within the buffer window. BRVO, branch retinal vein occlusion; C/HRVO, central/hemiretinal vein occlusion; CI, confidence interval; ETDRS, Early Treatment Diabetic Retinopathy Study; VA, visual acuity; VEGF, vascular endothelial growth factor.

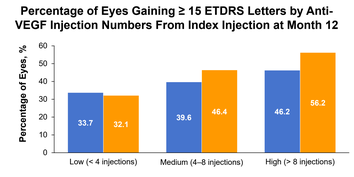
### Number of Anti-VEGF Injections Was Highest in the First Year and Lower in Years 2–5 in BRVO and C/HRVO Eyes




| | | 0–12 | 13–24 | 25–36 | 37–48 | 49–60 |
|---|---|---|---|---|---|---|
| BRVO | n | 2856 | 2007 | 1369 | 1012 | 673 |
| C/HRVO | n | 2879 | 2055 | 1420 | 993 | 679 |

BRVO, branch retinal vein occlusion; C/HRVO, central/hemiretinal vein occlusion; CI, confidence interval; VEGF, vascular endothelial growth factor.

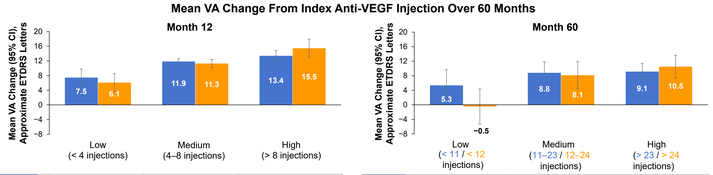
### More BRVO and C/HRVO Eyes With High Injection Numbers Gained ≥ 15 Letters vs Low Injection Numbers at Month 12




| | | Low (< 4 injections) | Medium (4–8 injections) | High (> 8 injections) |
|---|---|---|---|---|
| BRVO | n | 202 | 1474 | 461 |
| C/HRVO | n | 237 | 1553 | 301 |

VA measurements were collected within ± 30 (≤ 18 months) or ± 60 (from 24 to 60 months) days from date of interest to increase likelihood of collecting a measurement for each eye. The reading closest to the date of interest was used in eyes with 2 readings within the buffer window. BRVO, branch retinal vein occlusion; C/HRVO, central/hemiretinal vein occlusion; ETDRS, Early Treatment Diabetic Retinopathy Study; VA, visual acuity; VEGF, vascular endothelial growth factor.

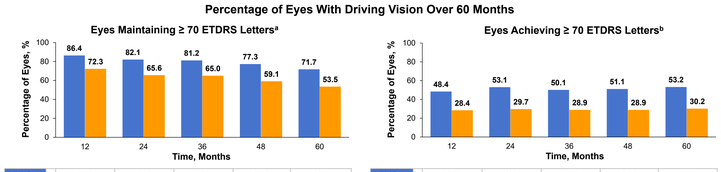
### VA Change From Index Injection to Months 12 and 60 Was Lower in BRVO and C/HRVO Eyes With Low vs High Injection Numbers




| | | Low (< 4 injections) | Medium (4–8 injections) | High (> 8 injections) | Low (< 11 / < 12 injections) | Medium (11–23 / 12–24 injections) | High (> 23 / > 24 injections) |
|---|---|---|---|---|---|---|---|
| BRVO | n | 202 | 1474 | 461 | 90 | 167 | 240 |
| C/HRVO | n | 237 | 1553 | 301 | 117 | 187 | 194 |

VA measurements were collected within ± 30 (up to 18 months) or ± 60 (from 24 to 60 months) days from date of interest to increase likelihood of collecting a measurement for each eye. The reading closest to the date of interest was used in eyes with 2 readings within the buffer window. Categories for injection counts over 60 months are based on tertiles. BRVO, branch retinal vein occlusion; C/HRVO, central/hemiretinal vein occlusion; CI, confidence interval; ETDRS, Early Treatment Diabetic Retinopathy Study; VA, visual acuity; VEGF, vascular endothelial growth factor.

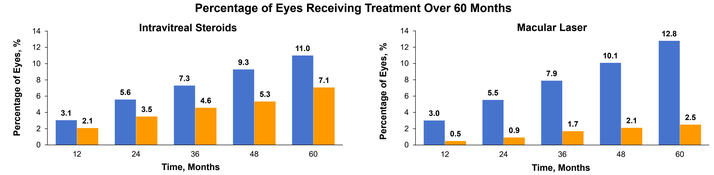
### Fewer BRVO and C/HRVO Eyes Maintained Driving Vision Over Time; Eyes Achieving Driving Vision Were Stable Across the Study




| | | 12 | 24 | 36 | 48 | 60 |
|---|---|---|---|---|---|---|
| BRVO | n | 565 | 440 | 292 | 225 | 138 |
| C/HRVO | n | 238 | 192 | 123 | 93 | 71 |
| BRVO | n | 1572 | 1214 | 766 | 544 | 359 |
| C/HRVO | n | 1853 | 1459 | 942 | 641 | 427 |

[a] n reflects eyes with ≥ 70 ETDRS letters at index. [b] n reflects eyes with < 70 ETDRS letters at index. BRVO, branch retinal vein occlusion; C/HRVO, central/hemiretinal vein occlusion; ETDRS, Early Treatment Diabetic Retinopathy Study.

### Intravitreal Steroids and Macular Laser Treatments Were More Common Among BRVO and C/HRVO Eyes With Longer Follow-Up




| | | 12 | 24 | 36 | 48 | 60 |
|---|---|---|---|---|---|---|
| BRVO | n | 2856 | 2007 | 1369 | 1012 | 673 |
| C/HRVO | n | 2879 | 2055 | 1420 | 993 | 679 |
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BRVO, branch retinal vein occlusion; C/HRVO, central/hemiretinal vein occlusion.