

Two-year data for Novartis brolocizumab reaffirm superiority versus aflibercept in reducing retinal fluid in patients with nAMD

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- - Year two results consistent with previously announced key secondary endpoint data on retinal fluid (IRF and/or SRF) showing superior reductions versus aflibercept
- - Superior reductions in central subfield thickness demonstrated at year one were reaffirmed at year two with brolocizumab 6 mg versus aflibercept
- - Robust visual gains shown in year one with brolocizumab were maintained in year two

EAST HANOVER, N.J., Oct. 27, 2018 /PRNewswire/ -- Novartis announced additional brolocizumab Phase III results from year two that reaffirmed its positive year one findings. Brolocizumab met its primary endpoint of non-inferiority versus aflibercept in best corrected visual acuity (BCVA) and exhibited superiority in key retinal outcomes at year one (48 weeks)^{1,2}. Secondary endpoints at year two (96 weeks) reaffirmed superiority of brolocizumab 6 mg in reduction of retinal fluid, an important marker of disease activity in patients with neovascular age-related macular degeneration (nAMD)^{1,3}. Approximately 20 to 25 million people are affected by nAMD, also known as wet AMD, a leading cause of blindness worldwide^{4,5}.

The year two HAWK and HARRIER findings demonstrated that fewer patients with nAMD had intra-retinal fluid (IRF) and/or sub-retinal fluid (SRF) — key markers used by physicians to determine injection frequency in clinical practice — with brolocizumab 6 mg versus aflibercept at week 96 [24% for brolocizumab 6 mg vs. 37% for aflibercept in HAWK (P=0.0001); 24% vs. 39%, respectively, in HARRIER (P<0.0001)]^{1*}.

Additionally, brolocizumab 6 mg patients continued to demonstrate reductions in central subfield thickness (CST) at week 96¹. An increase in CST in nAMD is an important measure of abnormal fluid accumulation and edema and may result in reduced vision. Absolute reductions in CST from baseline were -175 µm for brolocizumab 6 mg versus -149 µm for aflibercept in HAWK (P=0.0057) and -198 µm versus -155 µm, respectively, in HARRIER (P<0.0001)^{1*}.

Also at week 96, fewer brolocizumab 6 mg patients had sub-retinal pigment epithelium (sub-RPE) fluid (11% for brolocizumab 6 mg vs. 15% for aflibercept in HAWK; 17% vs. 22%, respectively, in HARRIER)¹.

Additionally, of patients on brolocizumab 6 mg who successfully completed year one on a 12-week dosing interval, 82% in HAWK and 75% in HARRIER were maintained on a 12-week dosing interval in year two¹.

"These findings at year two reaffirm the excellent year one brolocizumab data regarding retinal fluid reduction, a key goal for physicians treating patients with nAMD," said Dr. Pravin U. Dugel, Managing Partner, Retinal Consultants of Arizona; Clinical Professor, Roski Eye Institute, Keck School of Medicine, University of Southern California; and principal investigator of both trials. "These consistent results continue to support brolocizumab as a potential new treatment for patients with nAMD."

As previously announced, HAWK and HARRIER met their primary endpoint of non-inferiority in mean change in BCVA at week 48 with brolocizumab versus aflibercept^{1,2}. Brolocizumab maintained robust visual gains in

year two, with mean change in BCVA of 5.9 letters for brolucizumab 6 mg versus 5.3 letters for aflibercept in HAWK, and 6.1 letters versus 6.6 letters, respectively, in HARRIER¹.

"Over two years, brolucizumab consistently dried retinal fluid better than aflibercept; additionally, the robust visual gains shown in year one with brolucizumab were maintained in year two," said Shreeram Aradhye, Global Head Medical Affairs and Chief Medical Officer, Novartis Pharmaceuticals. "With sustained improvements in key anatomical outcomes that denote disease activity, brolucizumab is an important scientific advance and underscores our commitment to reimagining medicine."

No new, previously unreported types of safety events were identified at week 96, and brolucizumab continued to be comparable to aflibercept with the overall incidence of adverse events balanced across all treatment groups in both studies¹. The most frequent ocular adverse events ($\geq 5\%$ of patients in any treatment arm) were reduced visual acuity, conjunctival hemorrhage, vitreous floaters, eye pain, dry eye, retinal hemorrhage, cataract and vitreous detachment¹. The most frequent non-ocular adverse events were typical of those reported in a nAMD population; there were no notable differences between arms¹.

These new 96-week data, based on pre-specified secondary endpoints from the HAWK and HARRIER trials, were presented at the American Academy of Ophthalmology (AAO) 2018 Annual Meeting as a follow-up to the year one data presented in November 2017^{1,2}.

About brolucizumab (RTH258)

Brolucizumab (RTH258) is a humanized single-chain antibody fragment (scFv) and the most clinically advanced, humanized single-chain antibody fragment to reach this stage of development. Single-chain antibody fragments are highly sought after in drug development due to their small size, enhanced tissue penetration, rapid clearance from systemic circulation and drug delivery characteristics^{6,7,8}.

The proprietary innovative structure results in a small molecule (26 kDa) with potent inhibition of, and high affinity to, all VEGF-A isoforms^{6,9}. In preclinical studies, brolucizumab inhibited activation of VEGF receptors through prevention of the ligand-receptor interaction^{6,8,9}. Increased signaling through the VEGF pathway is associated with pathologic ocular angiogenesis and retinal edema¹⁰. Inhibition of the VEGF pathway has been shown to inhibit the growth of neovascular lesions, resolve retinal edema and improve vision in patients with chorioretinal vascular diseases¹¹.

About HAWK and HARRIER study design

With more than 1,800 patients across 400 centers worldwide, HAWK (NCT02307682) and HARRIER (NCT02434328) are the first and only global head-to-head trials in patients with nAMD that prospectively demonstrated efficacy at week 48 using an innovative q12w/q8w regimen, with a majority of patients on q12w immediately following the loading phase^{2,12,13}. Both studies are 96-week prospective, randomized, double-masked multi-center studies and part of the Phase III clinical development of brolucizumab^{12,13}.

The studies were designed to compare the efficacy and safety of intravitreal injections of brolucizumab 6 mg (HAWK and HARRIER) and 3 mg (HAWK only) versus aflibercept 2 mg in patients with nAMD^{12,13}. In both trials, patients were randomized to either brolucizumab or aflibercept. Immediately following the 3-month loading phase, patients in the brolucizumab arms received a q12w dosing interval with an option to adjust to a q8w dosing interval based on masked disease activity assessments at defined visits. Aflibercept was dosed bi-monthly according to its label at the time of study initiation^{2,12,13}.

Brolucizumab met the primary efficacy objective of non-inferiority versus aflibercept in mean change in best-

corrected visual acuity (BCVA) from baseline to week 48 with high statistical significance². Additionally, brotacizumab demonstrated superiority in three secondary endpoints considered key parameters of nAMD: central subfield retinal thickness, retinal fluid (intraretinal fluid and/or subretinal fluid) and disease activity².

At year two, the most frequent ocular adverse events ($\geq 5\%$ of patients in any treatment arm) for brotacizumab 3 mg, 6 mg and aflibercept, respectively, in HAWK were conjunctival hemorrhage (10.9%, 8.1% and 8.9%), reduced visual acuity (9.5%, 6.1% and 8.1%), vitreous floaters (7.3%, 6.1% and 4.4%), eye pain (7.8%, 5.0% and 5.8%), retinal hemorrhage (3.9%, 5.8% and 5.6%), cataract (5.0%, 5.6% and 3.6%), vitreous detachment (6.7%, 5.3% and 5.3%) and dry eye (5.6%, 5.3% and 7.2%)¹. The incidences of these events for brotacizumab 6 mg and aflibercept, respectively, in HARRIER were conjunctival hemorrhage (4.6% and 5.1%), reduced visual acuity (8.6% and 7.0%), vitreous floaters (4.1% and 1.4%), eye pain (3.5% and 5.1%), retinal hemorrhage (3.2% and 1.1%), cataract (3.0% and 11.7%), vitreous detachment (2.7% and 2.2%) and dry eye (2.7% and 3.0%)¹.

About neovascular age-related macular degeneration (nAMD or wet AMD)

nAMD is the leading cause of severe vision loss and legal blindness in people over the age of 65 in North America, Europe, Australia and Asia, impacting an estimated 20 to 25 million people worldwide^{4,5}. nAMD occurs when abnormal blood vessels form underneath the macula, the area of the retina responsible for sharp, central vision. These blood vessels are fragile and leak fluid, disrupting the normal retinal architecture and ultimately causing damage to the macula^{14,15,16}.

Early symptoms of nAMD include distorted vision or metamorphopsia and difficulties seeing objects clearly¹⁷. Prompt diagnosis and intervention are essential. As the disease progresses, cell damage increases, further reducing vision quality. This progression can lead to a complete loss of central vision, leaving the patient unable to read, drive or recognize familiar faces¹⁴. Without treatment, vision can rapidly deteriorate¹⁸.

About Novartis in ophthalmology

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*Descriptive P-values related to pre-specified secondary endpoints assessed at weeks 16 and 48

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