

# RAM 2025

## Disease

Retinal arterial macroaneurysms are , focal dilations of retinal arterial branches (mostly **second-order retinal arterioles**) that can be classified as **hemorrhagic** or **exudative**.

Macroaneurysms range from **100 to 250µm** in diameter and are most often found in **the temporal retina**, along **the supero-temporal arteriole**.

Associated findings include capillary **telangiectasias**, vascular remodeling, and retinal **edema**. While visual prognosis is generally good, vision loss can occur from **macular edema, end-arteriole occlusion from thrombosis, or hemorrhage due to rupture of the aneurysm** .

Diagnosis is made on clinical exam and via imaging modalities such as and spectral-domain (SD-OCT), and treatment is traditionally observation, focal laser photocoagulation, or surgery. More recently, the use of anti-vascular endothelial growth factor (VEGF) has been suggested but not extensively studied as a possible treatment modality.

## Etiology and Pathophysiology

Fichte et al. described **vessel wall thickening** and the **presence of fibrin and foamy macrophages** upon histological inspection in retinal arterial macroaneurysms, similar to that seen in age-related arteriosclerotic changes in the vessel walls throughout the body . The localized ischemia due to focal embolic damage to the arterial walls from vascular disease can cause increased intimal collagen remodeling and increased permeability of vessels, thus predisposing the vessel to dilation.

## Pathology

**Linear breaks found in arterial walls on histopathology lead to a round or fusiform dilation of the arteriolar vessel wall.** This weakened arteriolar wall can rupture and cause hemorrhage and exudation at any level of the retina. If the hemorrhage or exudation affects the macula, the visual acuity is affected.

## Epidemiology

The Beijing Eye Study has reported on the incidence of arterial macroaneurysms as being 1 case per 9000 eyes primarily among the adult Chinese population . The majority of those affected are elderly and female , and there is a strong association with

**hypertension** (seen in 75% of patients). In hemorrhagic macroaneurysms, **10% of cases are bilateral** .

#### Primary prevention

Control of hypertension and arteriolar sclerosis risk factors are the mainstay of prevention.

#### Diagnosis

Fluorescein angiography can help visualize macroaneurysms which typically fill in the early arterial phase and stain the vessel walls. **Possible leakage may be found in later phases.**

#### History

Most commonly, retinal arterial macroaneurysm (RAM) is found **incidentally** on fundoscopic examination in an **asymptomatic** patient. However, patients may complain of acute vision loss due to **macular edema or hemorrhage**. Metamorphopsia or decreased vision are most commonly encountered when changes due to macroaneurysms (hemorrhage or edema) affect the fovea. Also presenting complaint may be floaters due to **VH** . Typically, patients have a history of **hypertension** .

#### Physical Examination and Imaging

Dilated fundus examination may enable visualization of an out-pocketing of the arterial wall, but in the setting of hemorrhage and/or exudation, it may be necessary to use imaging modalities such as FA and SD-OCT to confirm the diagnosis. Round or fusiform dilation of a retinal arteriole is usually seen within a third degree branch of one of the four main arcade arteries. **Most common location for a symptomatic macroaneurysm is from a branch of the superotemporal arcade.**

The aneurysm appears as a pulsating round or ovoid pooling of dye on FA, with filling either in the middle to late phase in saccular (sac-like) aneurysms or in the early phase in fusiform (spindle-shaped) aneurysms. SD-OCT can be helpful in quantifying the exudates in the exudative-type macroaneurysm.

While the presence of a retinal arterial macroaneurysm can be visualized on fundus examination, certain disease processes can present similarly such as **Coat's disease and von Hippel-Lindau disease**. Macroaneurysms can also occur secondary to **a branch retinal vein occlusion, diabetic retinopathy, radiation retinopathy, and retinal arteritis**, in which case the underlying cause should be teased out and treated.

**RAM is one of the few causes of hemorrhage at multiple levels (preretinal, retinal, and subretinal hemorrhage). Other causes include anemic/leukemic retinopathy and trauma (shaken baby syndrome).**

## Management

There are currently no approved guidelines for the management of macroaneurysms. Most macroaneurysms resolve spontaneously. In all patients with this diagnosis, a systematic work-up for hypertension and systemic vascular disease should be pursued.

Complicated retinal arterial macroaneurysms may be directly treated with moderate-intensity laser photocoagulation with two to three rows of large-spot-size (200-500µm) immediately adjacent to the macroaneurysm, especially if visual function is threatened due to increasing edema . **This treatment course is controversial, as some studies have demonstrated a significant decrease in visual acuity in post-laser eyes and possible occurrence of branch retinal arterial occlusion in upto 16% of cases.**

Cases of submacular hemorrhage can be treated with pneumatic displacement of the clot with or without **tissue plasminogen activator**, as hemorrhage is toxic to the retina and ellipsoid zone. In cases of premacular hemorrhage, YAG laser can be used to perform a posterior hyaloidotomy and release the hemorrhage into the vitreous for faster clearance.

Recent studies have shown promising results using **anti-VEGF agents** such as and in patients with **macroaneurysm-associated macular edema**, with one case series by Pichi et al. demonstrating a reduction in macular edema and hard exudates in all 38 eyes evaluated .

## Prognosis

The majority of eyes with the diagnosis of arterial macroaneurysm have good visual prognoses and usually regress spontaneously. **In general, patients with a hemorrhagic macroaneurysm have a better visual prognosis than those with an exudative macroaneurysm.** Patients with persistent macular edema or **subretinal hemorrhage** have the worst prognosis .

Ilopathic retinal vasculitis, aneurysms, and neuroretinitis (**IRVAN**) describes a syndrome characterized by the presence of retinal **vasculitis**, multiple **macroaneurysms**, **neuroretinitis**, and peripheral capillary **nonperfusion**. Systemic investigations are generally noncontributory, and **oral prednisone** has demonstrated little benefit. Capillary nonperfusion is often sufficiently severe to warrant panretinal photocoagulation.