RETINA SUMMARY BENCHMARKS FOR PREFERRED PRACTICE PATTERN® GUIDELINES

Introduction

These are summary benchmarks for the Academy's Preferred Practice Pattern® (PPP) guidelines. The Preferred Practice Pattern series of guidelines has been written on the basis of three principles.

- Each Preferred Practice Pattern should be clinically relevant and specific enough to provide useful information to practitioners.
- Each recommendation that is made should be given an explicit rating that shows its importance to the care process.
- Each recommendation should also be given an explicit rating that shows the strength of evidence that supports the recommendation and reflects the best evidence available.

Preferred Practice Patterns provide guidance for the pattern of practice, not for the care of a particular individual. While they should generally meet the needs of most patients, they cannot possibly best meet the needs of all patients. Adherence to these Preferred Practice Patterns will not ensure a successful outcome in every situation. These practice patterns should not be deemed inclusive of all proper methods of care or exclusive of other methods of care reasonably directed at obtaining the best results. It may be necessary to approach different patients' needs in different ways. The physician must make the ultimate judgment about the propriety of the care of a particular patient in light of all of the circumstances presented by that patient. The American Academy of Ophthalmology is available to assist members in resolving ethical dilemmas that arise in the course of ophthalmic practice.

The Preferred Practice Pattern® guidelines are not medical standards to be adhered to in all individual situations. The Academy specifically disclaims any and all liability for injury or other damages of any kind, from negligence or otherwise, for any and all claims that may arise out of the use of any recommendations or other information contained herein.

For each major disease condition, recommendations for the process of care, including the history, physical exam and ancillary tests, are summarized, along with major recommendations for the care management, follow-up, and education of the patient. For each PPP, a detailed literature search of PubMed and the Cochrane Library for articles in the English language is conducted. The results are reviewed by an expert panel and used to prepare the recommendations, which are then given a rating that shows the strength of evidence when sufficient evidence exists.

To rate individual studies, a scale based on the Scottish Intercollegiate Guideline Network (SIGN) is used. The definitions and levels of evidence to rate individual studies are as follows:

- I++: High-quality meta-analyses, systematic reviews of randomized controlled trials (RCTs), or RCTs with a very low risk of bias
- I+: Well-conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias
- I–: Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias
- II++: High-quality systematic reviews of case-control or cohort studies; high-quality case-control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal
- II+: Well-conducted case-control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal
- II–: Case-control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal
- III: Nonanalytic studies (e.g., case reports, case series)

Recommendations for care are formed based on the body of the evidence. The body of evidence quality ratings are defined by Grading of Recommendations Assessment, Development and Evaluation (GRADE) as follows:

- Good quality (GQ): Further research is very unlikely to change our confidence in the estimate of effect
- Moderate quality (MQ): Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate
- Insufficient quality (IQ): Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate; any estimate of effect is very uncertain

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RETINA SUMMARY BENCHMARKS FOR PREFERRED PRACTICE PATTERN® GUIDELINES

Introduction *(continued)*

Key recommendations for care are defined by GRADE as follows:

- Strong recommendation (SR): Used when the desirable effects of an intervention clearly outweigh the undesirable effects or clearly do not
- Discretionary recommendation (DR): Used when the trade-offs are less certain—either because of low-quality evidence or because evidence suggests that desirable and undesirable effects are closely balanced

In PPPs prior to 2011, the panel rated recommendations according to its importance to the care process. This "importance to the care process" rating represents care that the panel thought would improve the quality of the patient's care in a meaningful way. The ratings of importance are divided into three levels.

- Level A, defined as most important
- Level B, defined as moderately important
- Level C, defined as relevant but not critical

The panel also rated each recommendation on the strength of evidence in the available literature to support the recommendation made. The "ratings of strength of evidence" also are divided into three levels.

- Level I includes evidence obtained from at least one properly conducted, well-designed randomized controlled trial. It could include meta-analyses of randomized controlled trials.
- Level II includes evidence obtained from the following:
  - Well-designed controlled trials without randomization
  - Well-designed cohort or case-control analytic studies, preferably from more than one center
  - Multiple-time series with or without the intervention
- Level III includes evidence obtained from one of the following:
  - Descriptive studies
  - Case reports
  - Reports of expert committees/organizations (e.g., PPP panel consensus with external peer review)

This former approach, however, will eventually be phased out as the AAO adopted the SIGN and GRADE rating and grading systems.

The PPPs are intended to serve as guides in patient care, with greatest emphasis on technical aspects. In applying this knowledge, it is essential to recognize that true medical excellence is achieved only when skills are applied in a such a manner that the patients' needs are the foremost consideration. The AAO is available to assist members in resolving ethical dilemmas that arise in the course of practice. (AAO Code of Ethics)

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Age-Related Macular Degeneration (Initial and Follow-up Evaluation)

Initial Exam History (Key elements)

- Symptoms (metamorphopsia, decreased vision, scotoma, photopsia, difficulties in dark adaptation) *(II–, GQ, SR)*
- Medications and nutritional supplements *(II+, GQ, SR)*
- Ocular history *(II+, GQ, SR)*
- Systemic history (any hypersensitivity reactions)
- Family history, especially family history of AMD *(II+, GQ, SR)*
- Social history, especially smoking *(III, GQ, SR)*

Initial Physical Exam (Key elements)

- Comprehensive eye examination *(II++, GQ, SR)*
- Stereo biomicroscopic examination of the macula *(III, GQ, SR)*

Diagnostic Tests

Optical coherence tomography is important in diagnosing and managing AMD, particularly with respect to determining the presence of subretinal fluid and in documenting the degree of retinal thickening. *(III, GQ, SR)* Optical coherence tomography defines the cross sectional architecture of the retina in a manner that is not possible with any other imaging technology. It may reveal the presence of fluid that is not apparent on biomicroscopy alone. It also assists in evaluating the response of the retina and RPE to therapy by allowing structural changes to be followed accurately. *(II+, GQ, SR)*

Intravenous fundus fluorescein angiography in the clinical setting of AMD is indicated:

- when patient complains of new metamorphopsia
- when patient has unexplained blurred vision
- when clinical exam reveals elevation of the RPE or retina, subretinal blood, hard exudates or subretinal fibrosis *(II–, GQ, SR)*
- to detect the presence of and determine the extent, type, size, and location of CNV and to calculate the percentage of the lesion composed of or consisting of classic CNV *(III, IQ, DR)*
- to guide treatment (laser photocoagulation surgery or verteporfin PDT) *(III, IQ, DR)*
- to detect persistent or recurrent CNV following treatment *(III, IQ, DR)*
- to assist in determining the cause of visual loss that is not explained by clinical exam *(III, IQ, DR)*

Each angiographic facility must have a care plan or an emergency plan and a protocol to minimize the risk and manage any complications. *(III, GQ, SR)*

Follow-up Exam History

- Visual symptoms, including decreased vision and metamorphopsia *(II–, GQ, SR)*
- Changes in medications and nutritional supplements *(III, GQ, SR)*
- Changes in ocular history and systemic history *(II+, GQ, SR)*
- Changes in social history, especially smoking *(III, GQ, SR)*

Follow-up Physical Exam

- Visual acuity *(III, GQ, SR)*
- Stereo biomicroscopic examination of the fundus *(III, GQ, SR)*

Follow-up after Treatment for Neovascular AMD

- Examine patients treated with intravitreal injections of aflibercept, bevacizumab, or ranibizumab approximately 4 weeks after treatment *(III, GQ, SR)*
- Examine and perform fluorescein angiography at least every 3 months until stable after verteporfin PDT
- Examine patients treated with thermal laser photocoagulation via fluorescein angiography approximately 2 to 4 weeks after treatment and then at 4 to 6 weeks *(III, GQ, SR)*
- Subsequent examinations, OCT, and fluorescein angiography should be performed as indicated depending on the clinical findings and the judgment of the treating ophthalmologist *(III, GQ, SR)*

Patient Education

- Educate patients about the prognosis and potential value of treatment as appropriate for their visual and functional status *(III, GQ, SR)*
- Encourage patients with early AMD to assess their own visual acuity and to have regular dilated eye exams for early detection of intermediate AMD
- Educate patients with a high-risk AMD phenotype about methods of detecting new symptoms of CNV and about the need for prompt notification to an ophthalmologist *(III, GQ, SR)*
- Instruct patients with unilateral disease to monitor their vision in their fellow eye and to return periodically even in absence of symptoms, but promptly after onset of new or significant visual symptoms *(III, GQ, SR)*
- Instruct patients to report symptoms suggestive of endophthalmitis, including eye pain or increased discomfort, worsening eye redness, blurred or decreased vision, increased sensitivity to light, or increased number of floaters promptly *(III, GQ, SR)*
- Encourage patients who are currently smoking to stop because there are observational data that support a causal relationship between smoking and AMD and other considerable health benefits of smoking cessation *(I++, GQ, SR)*
- Refer patients with reduced visual function for vision rehabilitation (see www.aao.org/smart-sight-low-vision) and social services *(III, GQ, SR)*

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Age-Related Macular Degeneration (Management Recommendations)

Treatment Recommendations and Follow-up Plans for Age-Related Macular Degeneration

Recommended Treatment	Diagnoses Eligible for Treatment	Follow-up Recommendations
Observation with no medical or surgical therapies	No clinical signs of AMD (AREDS category 1)	As recommended in the Comprehensive Adult Medical Eye Evaluation PPP
	Early AMD (AREDS category 2)	Return exam at 6 to 24 months if asymptomatic or prompt exam for new symptoms suggestive of CNV
		OCT, fluorescein angiography, or fundus photos as appropriate
	Advanced AMD with bilateral subfoveal geographic atrophy or disciform scars	Return exam at 6 to 24 months if asymptomatic or prompt exam for new symptoms suggestive of CNV
		Fundus photos or fluorescein angiography as appropriate
Antioxidant vitamin and mineral supplements as recommended in the original AREDS and AREDS2 reports	Intermediate AMD (AREDS category 3)	Monitoring of monocular near vision (reading/Amsler grid)
	Advanced AMD in one eye (AREDS category 4)	Return exam at 6 to 18 months if asymptomatic or prompt exam for new symptoms suggestive of CNV
		Fundus photography and/or fundus autofluorescence as appropriate
		Fluorescein angiography and/or OCT for suspicion of CNV
Aflibercept intravitreal injection 2.0 mg as described in published reports	Macular CNV	Patients should be instructed to report promptly symptoms suggestive of endophthalmitis, including eye pain or increased discomfort, worsening eye redness, blurred or decreased vision, increased sensitivity to light, or increased number of floaters
		Return examination approximately 4 weeks after treatment initially; subsequent follow-up and treatment depends on the clinical findings and judgment of the treating ophthalmologist. An every 8-week maintenance treatment regimen has been shown to have comparable results to every 4 weeks in the first year of therapy.
		Monitoring of monocular near vision (reading/Amsler grid)
Bevacizumab intravitreal injection 1.25 mg as described in published reports The ophthalmologist should provide appropriate informed consent with respect to the off-label status	Macular CNV	Patients should be instructed to report any symptoms suggestive of endophthalmitis promptly, including eye pain or increased discomfort, worsening eye redness, blurred or decreased vision, increased sensitivity to light, or increased number of floaters
		Return exam approximately 4 weeks after treatment; subsequent follow-up depends on the clinical findings and judgment of the treating ophthalmologist
		Monitoring of monocular near vision (reading/Amsler grid)
Ranibizumab intravitreal injection 0.5 mg as recommended in ranibizumab literature	Macular CNV	Patients should be instructed to report any symptoms suggestive of endophthalmitis promptly, including eye pain or increased discomfort, worsening eye redness, blurred or decreased vision, increased sensitivity to light, or increased number of floaters
		Return exam approximately 4 weeks after treatment; subsequent follow-up depends on the clinical findings and judgment of the treating ophthalmologist
		Monitoring of monocular near vision (reading/Amsler grid)
PDT with verteporfin as recommended in the TAP and VIP reports	Macular CNV, new or recurrent, where the classic component is >50% of the lesion and the entire lesion is ≤5400 microns in greatest linear diameter	Return exam approximately every 3 months until stable, with retreatments as indicated
	Occult CNV may be considered for PDT with vision <20/50 or if the CNV is <4 MPS disc areas in size when the vision is >20/50	Monitoring of monocular near vision (reading/Amsler grid)
	Juxtafoveal CNV is an off-label indication for PDT, but may be considered in select cases.	
Thermal laser photocoagulation surgery as recommended in the MPS reports	May be considered for extrafoveal classic CNV, new or recurrent	Return exam with fluorescein angiography approximately 2 to 4 weeks after treatment, and then at 4 to 6 weeks and thereafter depending on the clinical and angiographic findings
	May be considered for juxtapapillary CNV	Retreatments as indicated
		Monitoring of monocular near vision (reading/Amsler grid)

AMD = age-related macular degeneration; AREDS = Age-Related Eye Disease Study; CNV = choroidal neovascularization; MPS = Macular Photocoagulation Study; OCT = optical coherence tomography; PDT = photodynamic therapy; TAP = Treatment of Age-Related Macular Degeneration with Photodynamic Therapy; VIP = Verteporfin in Photodynamic Therapy

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Diabetic Retinopathy (Initial and Follow-up Evaluation)

Initial Exam History (Key elements)

- Duration of diabetes *(II++, GQ, SR)*
- Past glycemic control (hemoglobin A1c) *(II++, GQ, SR)*
- Medications *(III, GQ, SR)*
- Medical history (e.g., obesity, renal disease, systemic hypertension, serum lipid levels, pregnancy) *(II++, GQ, SR)*
- Ocular history *(III, GQ, SR)*

Initial Physical Exam (Key elements)

- Visual acuity *(III, GQ, SR)*
- Slit-lamp biomicroscopy *(III, GQ, SR)*
- Measurement of IOP *(III, GQ, SR)*
- Gonioscopy before dilation when indicated (for neovascularization of the iris or increased IOP) *(III, GQ, SR)*
- Pupillary assessment for optic nerve dysfunction
- Thorough funduscopy including stereoscopic examination of the posterior pole *(III, GQ, SR)*
- Examination of the peripheral retina and vitreous, best performed with indirect ophthalmoscopy or with slit-lamp biomicroscopy *(III, GQ, SR)*

Diagnosis

- Classify both eyes as to category and severity of diabetic retinopathy and macular edema. *(III, GQ, SR)* Each category has an inherent risk for progression and is dependent on adherence to overall diabetes control.

Follow-up History

- Visual symptoms *(II+, GQ, SR)*
- Systemic status (pregnancy, blood pressure, serum cholesterol, renal status) *(III, GQ, SR)*
- Glycemic status (hemoglobin A1c) *(III, GQ, SR)*

Follow-up Physical Exam

- Visual acuity *(III, GQ, SR)*
- Measurement of IOP *(III, GQ, SR)*
- Slit-lamp biomicroscopy with iris examination *(III, GQ, SR)*
- Gonioscopy (preferably before dilation when iris neovascularization is suspected or if IOP is elevated) *(III, GQ, SR)*
- Stereoscopic examination of the posterior pole after dilation of the pupils *(III, GQ, SR)*
- Examination of the peripheral retina and vitreous when indicated *(III, GQ, SR)*
- OCT imaging when appropriate *(III, GQ, SR)*

Ancillary Tests

- Optical coherence tomography can be used to quantify retinal thickness, monitor macular edema, identify vitreomacular traction, and detect other forms of macular disease in patients with diabetic macular edema. *(III, IQ, DR)* Decisions to repeat anti-VEGF injections, change therapeutic agents (e.g., use of intraocular corticosteroids), initiate laser treatment, or even consider vitrectomy surgery are often based in part on OCT findings.
- Fundus photography may be useful for documenting the presence of NVE and NVD, the response to treatment, and the need for additional treatment at future visits. *(III, IQ, DR)*
- Fluorescein angiography is used as a guide for laser treatment of CSME and as a means of evaluating the cause(s) of unexplained decreased visual acuity. *(III, IQ, DR)* Angiography can identify macular capillary nonperfusion or sources of capillary leakage resulting in macular edema as possible explanations for visual loss. *(III, IQ, DR)*
- Fluorescein angiography is not routinely indicated as a part of the examination of patients with diabetes. *(III, GQ, SR)*
- Ultrasonography enables assessment of the status of the retina in the presence of a vitreous hemorrhage or other media opacity, and may be helpful to define the extent and severity of vitreoretinal traction, especially on the macula of diabetic eyes. *(III, GQ, SR)*

Patient Education

- Discuss results of exam and implications
- Encourage patients with diabetes but without diabetic retinopathy to have annual dilated eye exams *(II++, GQ, SR)*
- Inform patients that effective treatment for diabetic retinopathy depends on timely intervention, despite good vision and no ocular symptoms
- Educate patients about the importance of maintaining near-normal glucose levels and near-normal blood pressure and lowering serum lipid levels *(III, GQ, SR)*
- Communicate with the attending physician, e.g., family physician, internist, or endocrinologist, regarding eye findings *(III, GQ, SR)*
- Provide patients whose conditions fail to respond to surgery and for whom further treatment is unavailable with proper professional support and offer referral for counseling, rehabilitative, or social services as appropriate *(III, GQ, SR)*
- Refer patients with functionally limiting postoperative visual impairment for vision rehabilitation (see www.aao.org/smart-sight-low-vision) and social services *(III, GQ, SR)*

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Diabetic Retinopathy (Management Recommendations)

Management Recommendations for Patients with Diabetes

Severity of Retinopathy	Presence of Macular Edema	Follow-up (Months)	Panretinal Photocoagulation (Scatter) Laser	Focal and/or Grid Laser*	Intravitreal Anti-VEGF Therapy
Normal or minimal NPDR	No	12	No	No	No
Mild NPDR	No	12	No	No	No
	ME	4–6	No	No	No
	CSME†	1*	No	Sometimes	Sometimes
Moderate NPDR	No	12‡	No	No	No
	ME	3–6	No	No	No
	CSME†	1*	No	Sometimes	Sometimes
Severe NPDR	No	4	Sometimes	No	No
	ME	2–4	Sometimes	No	No
	CSME†	1*	Sometimes	Sometimes	Sometimes
Non-high-risk PDR	No	4	Sometimes	No	No
	ME	2–4	Sometimes	No	No
	CSME†	1*	Sometimes	Sometimes	Sometimes
High-risk PDR	No	4	Recommended	No	Alternative[1,2]
	ME	4	Recommended	Sometimes	Usually
	CSME†	1*	Recommended	Sometimes	Usually

Anti-VEGF = anti-vascular endothelial growth factor; CSME = clinically significant macular edema; ME = non-clinically significant macular edema; NPDR = nonproliferative diabetic retinopathy; PDR = proliferative diabetic retinopathy

* Adjunctive treatments that may be considered include intravitreal corticosteroids or anti-VEGF agents (off-label use, except aflibercept and ranibizumab). Data from the Diabetic Retinopathy Clinical Research Network in 2011 demonstrated that, at two years of follow-up, intravitreal ranibizumab with prompt or deferred laser resulted in greater visual acuity gain and intravitreal triamcinolone acetonide plus laser also resulted in greater visual gain in pseudophakic eyes compared with laser alone. Individuals receiving the intravitreal injections of anti-VEGF agents may be re-examined as early as one month following injection.

† Exceptions include hypertension or fluid retention associated with heart failure, renal failure, pregnancy, or any other causes that may aggravate macular edema. Deferral of photocoagulation for a brief period of medical treatment may be considered in these cases. Also, deferral of CSME treatment is an option when the center of the macula is not involved, visual acuity is excellent, close follow-up is possible, and the patient understands the risks.

‡ Or at shorter intervals if signs approaching those of severe NPDR appear.

References:

1. Writing Committee for the Diabetic Retinopathy Clinical Research Network. Panretinal photocoagulation vs intravitreous ranibizumab for proliferative diabetic retinopathy: a randomized clinical trial. JAMA 2015;314:2137–46.

2. Olsen, TW. Anti-VEGF pharmacotherapy as an alternative to panretinal laser photocoagulation for proliferative diabetic retinopathy. JAMA 2015;314:2135–6.

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Idiopathic Epiretinal Membrane and Vitreomacular Traction (Initial Evaluation and Therapy)

Initial Exam (Key elements)

- Ocular history (e.g., posterior vitreous detachment, uveitis, retinal breaks, retinal vein occlusions, proliferative diabetic retinopathy, ocular inflammatory diseases, recent wound healing)
- Duration of symptoms (e.g., metamorphopsia, difficulty using both eyes together, and diplopia)
- Race/ethnicity
- Systemic history

Physical Exam (Key elements)

- Visual acuity
- Measurement of IOP
- Slit-lamp biomicroscopy of the anterior segment
- Spectral domain OCT to diagnose macula and retinal changes (e.g., proliferation of retinal pigment epithelial cells and/or retinal glial cells) *(III, GQ, SR)*
- Identify presence of extracellular matrix material, laminocytes, and/or vitreous cells
- ERMs and VMTs often occur together (OCT findings of VMT are similar, but posterior hyaloid remains partially attached to macula)
- Fluorescein angiogram may be helpful in evaluating ERMs and/or VMTs and associated retinal pathologies

Management Plan

- The decision to intervene surgically in patients with ERM/VMT usually depends upon the severity of symptoms, especially the impact on daily activities
- Patients should be informed that the majority of ERMs will remain stable and do not require therapy *(GQ, SR)*
- Patients should be reassured that there is a very successful surgical procedure that could address worsening symptoms or decreasing visual acuity *(GQ, SR)*
- Risks versus benefits of vitrectomy surgery should be discussed. Risks include cataract, retinal tears, retinal detachment, and endophthalmitis

Surgery and Postoperative Care

- Vitrectomy surgery is often indicated in patients who are affected with a decrease in visual acuity, metamorphopsia, and double vision *(II, MQ, DR)*
- Patients do not typically improve without vitrectomy surgery when the area of VMT is broad (>1500 µm), when there is an accompanying pathologic detachment of the macula, or when the presenting visual acuity is poor *(III, IQ, DR)*
- Vitrectomy surgery for ERM or VMT usually leads to an improvement in visual acuity since the outer retina, ellipsoid zone, and the photoreceptors outer segment length may improve or even normalize after surgery *(III, IQ, DR)*
- A patient with an ERM should be informed that it is unlikely that intravitreal ocriplasmin will lead to effective treatment *(III, GQ, SR)*
- Hypotony and elevated IOPs are a well-known risk of vitrectomy surgery and should be monitored postoperatively
- Patients should be examined postoperatively day 1, and again 1 to 2 weeks following surgery, or sooner depending upon the development of new symptoms or new findings during early postoperative examination *(GQ, SR)*

Patient Education and Follow-up

- Comparing OCT images in the abnormal versus normal eye can aid patient understanding
- Patients should be encouraged to periodically test their central vision monocularly to detect changes that may occur over time, like small central scotoma *(GQ, SR)*
- Patients should be informed to notify their ophthalmologist promptly if they have symptoms such as an increase of floaters, loss of visual field, metamorphopsia, or a decrease in visual acuity *(III, GQ, SR)*

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Idiopathic Macular Hole (Initial Evaluation and Therapy)

Initial Exam History (Key elements)

- Duration of symptoms *(III, GQ, DR)*
- Ocular history: glaucoma, retinal detachment or tear, other prior eye diseases or injuries, ocular surgery, or prolonged sun or eclipse gazing *(III, GQ, DR)*
- Medications that may be related to macular cystoid edema *(III, GQ, DR)*

Initial Physical Exam (Key elements)

- Visual acuity *(III, GQ, SR)*
- Slit-lamp biomicroscopic examination of the macula and the vitreoretinal interface, and the optic disc *(III, GQ, SR)*
- Indirect peripheral retinal examination *(III, GQ, SR)*

Management Recommendations for Macular Hole

Stage	Management	Follow-up
1-A and 1-B	Observation	Follow-up at 2–4 month intervals in the absence of new symptoms
		Recommend prompt return if new symptoms develop
		Encourage monocular visual acuity testing with Amsler grid
2	Vitreoretinal surgery*	Follow-up at 1–2 days postoperatively, then 1–2 weeks
		Frequency and timing of subsequent visits varies depending on the outcome of surgery and the patient's clinical course
		If no surgery, follow up every 2–4 months
2	Vitreopharmacolysis†	Follow-up at 1 week and 4 weeks, or with new symptoms (i.e., retinal detachment symptoms)
3 or 4	Vitreoretinal surgery	Follow-up at 1–2 days postoperatively, then 1–2 weeks
		Frequency and timing of subsequent visits varies depending on the outcome of surgery and the patient's clinical course

* Although surgery is usually performed, observation may also be appropriate in selected cases.

† Although ocriplasmin has been approved by the U.S. Food and Drug Administration for vitreomacular adhesion, its use for treatment of idiopathic macular hole without vitreomacular traction or adhesion would currently be considered off-label use.

Surgical and Postoperative Care if Patient Receives Treatment

- Inform the patient about relative risks, benefits, and alternatives to surgery, and the need for use of expansile intraocular gas or facedown positioning postoperatively *(III, GQ, SR)*
- Formulate a postoperative care plan and inform the patient of these arrangements *(III, GQ, SR)*
- Inform patients with glaucoma of possible postoperative increase in IOP *(III, GQ, SR)*
- Examine postoperatively within 1 or 2 days and again 1 to 2 weeks after surgery *(III, GQ, DR)*

Patient Education

- Inform patients to notify their ophthalmologist promptly if they have symptoms such as an increase in floaters, a loss of visual field, metamorphopsia, or a decrease in visual acuity *(III, GQ, SR)*
- Inform patients that air travel, travel to high altitudes, or general anesthesia with nitrous oxide should be avoided until the gas tamponade is nearly completely gone *(III, GQ, SR)*
- Inform patients who have had a macular hole in one eye that they have a 10% to 15% chance of macular hole formation in the fellow eye, especially if the vitreous remains attached *(III, GQ, SR)*
- Refer patients with functionally limiting postoperative visual impairment for vision rehabilitation (see www.aao.org/smart-sight-low-vision) and social services *(III, GQ, SR)*

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Posterior Vitreous Detachment, Retinal Breaks and Lattice Degeneration (Initial and Follow-up Evaluation)

Initial Exam History (Key elements)

- Symptoms of PVD *(II+, GQ, SR)*
- Family history of RD, related genetic disorders *(II–, GQ, SR)*
- Prior eye trauma *(III, GQ, SR)*
- Myopia *(II+, GQ, SR)*
- History of ocular surgery including refractive lens exchange and cataract surgery *(II++, GQ, SR)*

Initial Physical Exam (Key elements)

- Confrontation visual field examination, and assessing for the presence of a relative afferent pupillary defect *(III, GQ, SR)*
- Examination of the vitreous for hemorrhage, detachment, and pigmented cells *(II+, GQ, SR)*
- Examination of the peripheral fundus with scleral depression. The preferred method of evaluating peripheral vitreoretinal pathology is with indirect ophthalmoscopy combined with scleral depression. *(III, GQ, SR)*

Ancillary Tests

- Optical coherence tomography may be helpful to evaluate and stage the PVD *(II+, MQ, DR)*
- Perform B-scan ultrasonography if peripheral retina cannot be evaluated. If no abnormalities are found, frequent follow-up examinations are recommended. *(III, IQ, DR)*

Surgical and Postoperative Care if Patient Receives Treatment:

- Inform patient about the relative risks, benefits, and alternatives to surgery *(III, GQ, SR)*
- Formulate a postoperative care plan and inform patient of these arrangements *(III, GQ, SR)*
- Advise patient to contact ophthalmologist promptly if they have a substantial change in symptoms such as floaters, visual field loss, or decreased visual acuity *(II+, GQ, SR)*

Follow-up History

- Visual symptoms *(III, GQ, SR)*
- Interval history of eye trauma or intraocular surgery *(III, GQ, SR)*

Follow-up Physical Exam

- Visual acuity *(III, GQ, SR)*
- Evaluation of the status of the vitreous, with attention to the presence of pigment, hemorrhage, or syneresis *(III, GQ, SR)*
- Examination of the peripheral fundus with scleral depression *(III, GQ, SR)*
- Optical coherence tomography if vitreomacular traction is present *(III, GQ, SR)*
- B-scan ultrasonography if the media are opaque *(III, GQ, SR)*

Patient Education

- Educate patients at high risk of developing retinal detachment about the symptoms of PVD and retinal detachment and the value of periodic follow-up exams *(III, GQ, SR)*
- Instruct all patients at increased risk of retinal detachment to notify their ophthalmologist promptly if they have a substantial change in symptoms such as increase in floaters, loss of visual field, or decrease in visual acuity *(II+, GQ, SR)*

Care Management

Management Options

Type of Lesion	Treatment*
Acute symptomatic horseshoe tears	Treat promptly
Acute symptomatic operculated tears	Treatment may not be necessary
Acute symptomatic dialyses	Treat promptly
Traumatic retinal breaks	Usually treated
Asymptomatic horseshoe tears (without subclinical RD)	Often can be followed without treatment
Asymptomatic operculated tears	Treatment is rarely recommended
Asymptomatic atrophic round holes	Treatment is rarely recommended
Asymptomatic lattice degeneration without holes	Not treated unless PVD causes a horseshoe tear
Asymptomatic lattice degeneration with holes	Usually does not require treatment
Asymptomatic dialyses	No consensus on treatment and insufficient evidence to guide management
Eyes with atrophic holes, lattice degeneration, or asymptomatic horseshoe tears where the fellow eye has had a RD	No consensus on treatment and insufficient evidence to guide management

PVD = posterior vitreous detachment; RD = retinal detachment

*There is insufficient evidence to recommend prophylaxis of asymptomatic retinal breaks for patients undergoing cataract surgery.

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Retinal and Ophthalmic Artery Occlusions (Initial Evaluation and Therapy)

Initial Exam (Key elements)

- Initial exam should include all aspects of a comprehensive adult medical eye evaluation (see Comprehensive Adult Medical Eye Evaluation PPP for details) with special attention paid to retinal vascular disease elements *(II+, MQ, SR)*
- Medical history should include a careful review of systems for embolic disease (e.g., transient ischemic symptoms, lateralizing weakness, paresthesias)
- GCA symptoms (e.g., headaches, scalp tenderness, malaise, fatigue, temporal tenderness, fever, history of polymyalgia rheumatic) must be recognized

Physical Exam (Key elements)

- Visual acuity
- Measurement of IOP
- Slit-lamp biomicroscopy
- Dilated examination of the far peripheral retina with indirect ophthalmoscopy
- Gonioscopy when IOP is elevated or when iris neovascularization risk is suspected (prior to dilation)
- Funduscopy
- Relative afferent pupil defect assessment
- Slit-lamp biomicroscopy of the posterior pole
- Examination of the peripheral retina using indirect ophthalmoscopy through a dilated pupil to assess: retinal hemorrhages, cotton-wool spots, retinal emboli, retinal vascular "boxcarring," and optic disc neovascularization

Diagnostic Tests

- Color and red-free fundus photography
- Fluorescein angiogram
- Optical coherence tomography
- Ultrasonography in the setting of significant media opacity

Care Management

- Acute symptomatic OAO, CRAO, or BRAO represent urgent ophthalmic conditions and require prompt evaluation
- Physicians should immediately consider GCA in patients 50 years of age or older
- In cases of GCA, physicians should initiate urgent systemic corticosteroid therapy to prevent vision loss in the fellow eye or vascular occlusion elsewhere *(I-/I+, GQ, SR)*
- Diabetics should be carefully monitored since systemic corticosteroid treatment may destabilize glucose control

Ophthalmologists should refer patients with retinal vascular disease to the appropriate setting, depending on the nature of the retinal occlusion.

- Acute symptomatic OAOs or CRAOs from embolic etiologies should prompt an **immediate** referral to the nearest stroke center
- At present there is no evidence in support of treating asymptomatic patients who have a BRAO with an expedited stroke work-up

Patient Follow-up

- Follow-up should consider the extent of retinal or ocular ischemia neovascularization. Patients with greater ischemia require more frequent follow-up
- Many patients with retinal vascular disease will lose substantial vision despite various treatment options and should be referred for appropriate social services and vision rehabilitation

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Retinal Vein Occlusions (Initial Evaluation and Therapy)

Initial Exam (Key elements)

- Ocular history (e.g., glaucoma, other ophthalmologic disorders, ocular injections, surgery, including retinal laser treatment, cataract surgery, refractive surgery)
- Location and duration of vision loss
- Current medications
- Systemic history (e.g., systemic hypertension, diabetes, hyperlipidemia, cardiovascular disease, sleep apnea, coagulopathies, thrombotic disorders, and pulmonary embolus)

Physical Exam (Key elements)

- Visual acuity
- Measurement of IOP
- Slit-lamp biomicroscopy to detect fine abnormal new iris vessels
- Dilated examination of the far peripheral retina with indirect ophthalmoscopy
- Gonioscopy prior to pupil dilation; especially in cases of an ischemic CRVO, when IOP is elevated, or when iris neovascularization risk is high
- Binocular funduscopic evaluation of the posterior pole

Diagnostic Tests

- Color fundus photography to document retinal findings
- Fluorescein angiogram to evaluate the degree of vascular occlusion
- Optical coherence tomography to detect macular disease
- Ultrasonography (e.g., when vitreous hemorrhage is present)

Care Management

- Best prevention is to manage risk factors aggressively by optimizing control of diabetes mellitus, hypertension, and hyperlipidemia *(I+, GQ, SR)*
- Participants who received a 4-mg corticosteroid treatment dose had higher rates of cataract formation, cataract surgery, and elevated IOP, indicating a preference for a 1-mg dose *(I++, GQ, SR)*
- Multiple studies have demonstrated the efficacy of anti-VEGF agents in the treatment of macular edema associated with BRVO *(I++, GQ, SR)*
- Randomized controlled studies have shown the efficacy of anti-VEGF agents in treating macular edema related to CRVO *(I++, GQ, SR)*
- Betadine antiseptic drops and a lid speculum are recommended during all intravitreal injections *(III, MQ, DR)*
- Intravitreal triamcinolone, dexamethasone, and other corticosteroids have been shown to be efficacious for macular edema associated with CRVO, yet there are known associated risks of cataracts and glaucoma *(I+, GQ, SR)*
- Laser treatment remains a viable treatment in eyes with BRVO, even if the duration of the disease is greater than 12 months *(I+, GQ, SR)*
- Sectoral pan retinal photocoagulation is still recommended for neovascularization when complications such as vitreous hemorrhage or iris neovascularization occur *(I+, GQ, SR)*
- Ophthalmologists caring for patients with retinal vascular occlusion should be familiar with specific recommendations of relevant clinical trials due to the complexity of diagnosis and treatment *(I++, GQ, SR)*

Patient Follow-up

- Ophthalmologist should refer patients with an RVO to a primary care physician for appropriate management of their systemic condition and communicate results to the physician managing the patient's ongoing care *(I+, GQ, SR)*
- Risk to the fellow eye should be communicated to both the primary care provider and the patient *(I+, MQ, SR)*
- Patients whose conditions fail to respond to therapy and when further treatment is unavailable should be provided with professional support and offered a referral for counseling, vision rehabilitation, or social services as appropriate *(I++, GQ, SR)*

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