

## References - Neovascular Phenotypes: Retinal Angiomatous Proliferation (RAP) or Type 3 Neovascularization

1. Oeller JN. [Atlas of rare ophthalmoscopic conditions and supplementary plates to the atlas of ophthalmoscopy]: Wiesbaden, Germany; 1904.
2. Slusher MM, Tyler ME. Choroidoretinal vascular anastomoses. *Am J Ophthalmol* 1980;90:217-22.
3. Boozalis GT, Schachat AP, Green WR. Subretinal neovascularization from the retina in radiation retinopathy. *Retina* 1987;7:156-61.
4. Kennedy JE, Wise GN. Retinochoroidal vascular anastomosis in uveitis. *Am J Ophthalmol* 1971;71:1221-5.
5. Gass JD, Oyakawa RT. Idiopathic juxtafoveolar retinal telangiectasis. *Arch Ophthalmol* 1982;100:769-80.
6. Green WR, Gass JD. Senile disciform degeneration of the macula. Retinal arterialization of the fibrous plaque demonstrated clinically and histopathologically. *Arch Ophthalmol* 1971;86:487-94.
7. Hartnett ME, Weiter JJ, Garsd A, Jalkh AE. Classification of retinal pigment epithelial detachments associated with drusen. *Graefes Arch Clin Exp Ophthalmol* 1992;230:11-9.
8. Slakter JS, Yannuzzi LA, Schneider U, et al. Retinal choroidal anastomoses and occult choroidal neovascularization in age-related macular degeneration. *Ophthalmology* 2000;107:742-53; discussion 53-4.
9. Yannuzzi LA, Negrao S, Iida T, et al. Retinal angiomatous proliferation in age-related macular degeneration. *Retina* 2001;21:416-34.
10. Kuhn D, Meunier I, Soubrane G, Coscas G. Imaging of chorioretinal anastomoses in vascularized retinal pigment epithelium detachments. *Arch Ophthalmol* 1995;113:1392-8.
11. Gass JD, Agarwal A, Lavina AM, Tawansy KA. Focal inner retinal hemorrhages in patients with drusen: an early sign of occult choroidal neovascularization and chorioretinal anastomosis. *Retina* 2003;23:741-51.
12. Silva RM, Cachulo ML, Figueira J, de Abreu JR, Cunha-Vaz JG. Chorioretinal anastomosis and photodynamic therapy: a two-year follow-up study. *Graefes Arch Clin Exp Ophthalmol* 2007;245:1131-9.
13. Silva RM, Faria de Abreu JR, Travassos A, Cunha-Vaz JG. Stabilization of visual acuity with photodynamic therapy in eyes with chorioretinal anastomoses. *Graefes Arch Clin Exp Ophthalmol* 2004;242:368-76.
14. Yannuzzi LA, Freund KB, Takahashi BS. Review of retinal angiomatous proliferation or type 3 neovascularization. *Retina* 2008;28:375-84.
15. Freund KB, Ho IV, Barbazetto IA, et al. Type 3 neovascularization: the expanded spectrum of retinal angiomatous proliferation. *Retina* 2008;28:201-11.
16. Lafaut BA, Aisenbrey S, Vanden Broecke C, Bartz-Schmidt KU. Clinicopathological correlation of deep retinal vascular anomalous complex in age related macular degeneration. *Br J Ophthalmol* 2000;84:1269-74.
17. Su D, Lin S, Phasukkijwatana N, et al. An Updated Staging System of Type 3 Neovascularization Using Spectral Domain Optical Coherence Tomography. *Retina* 2016;36 Suppl 1:S40-S49.
18. Sawa M, Ueno C, Gomi F, Nishida K. Incidence and characteristics of neovascularization in fellow eyes of Japanese patients with unilateral retinal angiomatous proliferation. *Retina* 2014;34:761-7.
19. Marques JP, Lains I, Costa MA, et al. Retinal Angiomatous Proliferation: A Quantitative Analysis of the Fundoscopic Features of the Fellow Eye. *Retina* 2015;35:1985-91.
20. Kim JH, Lee TG, Kim JW, Kim CG, Cho SW, Han JI. Small retinal haemorrhages accompanied by

macular soft drusen: prevalence, and funduscopy and angiographic characteristics. *Br J Ophthalmol* 2014;98:1066-72.

21. Kim JH, Kim JR, Kang SW, Kim SJ, Ha HS. Thinner choroid and greater drusen extent in retinal angiomatous proliferation than in typical exudative age-related macular degeneration. *Am J Ophthalmol* 2013;155:743-9, 9 e1-2.
22. Kim JH, Lee TG, Kim JW, Kim CG, Cho SW, Han JI. Small retinal haemorrhages accompanied by macular soft drusen: prevalence, and funduscopy and angiographic characteristics. *Br J Ophthalmol* 2014;98:1066-72.
23. Rouvas AA, Papakostas TD, Ntouraki A, Douvali M, Vergados I, Ladas ID. Angiographic and OCT features of retinal angiomatous proliferation. *Eye (Lond)* 2010;24:1633-42; quiz 43.
24. Kuehlewein L, Dansingani KK, de Carlo TE, et al. Optical Coherence Tomography Angiography of Type 3 Neovascularization Secondary to Age-Related Macular Degeneration. *Retina* 2015;35:2229-35.
25. Tan AC, Dansingani KK, Yannuzzi LA, Sarraf D, Freund KB. Type 3 Neovascularization Imaged with Cross-Sectional and En Face Optical Coherence Tomography Angiography. *Retina* 2017;37:234-246.
26. Querques G, Miere A, Souied EH. Optical Coherence Tomography Angiography Features of Type 3 Neovascularization in Age-Related Macular Degeneration. *Dev Ophthalmol* 2016;56:57-61.
27. Koh AH, Expert PCVP, Chen LJ, et al. Polypoidal choroidal vasculopathy: evidence-based guidelines for clinical diagnosis and treatment. *Retina* 2013;33:686-716.
28. Liu R, Li J, Li Z, et al. Distinguishing Polypoidal Choroidal Vasculopathy from Typical Neovascular Age-Related Macular Degeneration Based on Spectral Domain Optical Coherence Tomography. *Retina* 2016;36:778-86.
29. Mrejen S, Sarraf D, Mukkamala SK, Freund KB. Multimodal imaging of pigment epithelial detachment: a guide to evaluation. *Retina* 2013;33:1735-62.
30. Brancato R, Introini U, Pierro L, et al. Optical coherence tomography (OCT) angiomatous proliferation (RAP) in retinal. *Eur J Ophthalmol* 2002;12:467-72.
31. Politoa A, Napolitano MC, Bandello F, Chiodini RG. The role of optical coherence tomography (OCT) in the diagnosis and management of retinal angiomatous proliferation (RAP) in patients with age-related macular degeneration. *Ann Acad Med Singapore* 2006;35:420-4.
32. De Salvo G, Vaz-Pereira S, Keane PA, Tufail A, Liew G. Sensitivity and specificity of spectral-domain optical coherence tomography in detecting idiopathic polypoidal choroidal vasculopathy. *Am J Ophthalmol* 2014;158:1228-38 e1.
33. Campa C, Harding SP, Pearce IA, Beare NA, Briggs MC, Heimann H. Incidence of neovascularization in the fellow eye of patients with unilateral retinal angiomatous proliferation. *Eye (Lond)* 2010;24:1585-9.
34. Gross NE, Aizman A, Brucker A, Klancnik JM, Jr., Yannuzzi LA. Nature and risk of neovascularization in the fellow eye of patients with unilateral retinal angiomatous proliferation. *Retina* 2005;25:713-8.
35. Fujimura S, Ueta T, Takahashi H, Obata R, Smith RT, Yanagi Y. Characteristics of fundus autofluorescence and drusen in the fellow eyes of Japanese patients with exudative age-related macular degeneration. *Graefes Arch Clin Exp Ophthalmol* 2013;251:1-9.
36. Hartnett ME, Weiter JJ, Staurenghi G, Elsner AE. Deep retinal vascular anomalous complexes in advanced age-related macular degeneration. *Ophthalmology* 1996;103:2042-53.
37. Viola F, Massacesi A, Orzalesi N, Ratiglia R, Staurenghi G. Retinal angiomatous proliferation: natural history and progression of visual loss. *Retina* 2009;29:732-9.
38. Silva R, Cachulo ML, Fonseca P, et al. Age-related macular degeneration and risk factors for the development of choroidal neovascularisation in the fellow eye: a 3-year follow-up study. *Ophthalmologica* 2011;226:110-8.

39. Daniel E, Shaffer J, Ying GS, et al. Outcomes in Eyes with Retinal Angiomatous Proliferation in the Comparison of Age-Related Macular Degeneration Treatments Trials (CATT). *Ophthalmology* 2016;123:609-16.
40. Gharbiya M, Parisi F, Cruciani F, Bozzoni-Pantaleoni F, Pranno F, Abdolrahimzadeh S. Intravitreal Anti-Vascular Endothelial Growth Factor for retinal angiomatous proliferation in treatment-naive eyes: Long-term Functional and Anatomical Results Using A Modified PrONTO-Style Regimen. *Retina* 2014;34:298-305.
41. Sutter FK, Kurz-Levin MM, Fleischhauer J, Bosch MM, Barthelmes D, Helbig H. Macular atrophy after combined intravitreal triamcinolone acetonide (IVTA) and photodynamic therapy (PDT) for retinal angiomatous proliferation (RAP). *Klin Monbl Augenheilkd* 2006;223:376-8.
42. Montero JA, Ruiz-Moreno JM, Sanabria MR, Fernandez-Munoz M. Efficacy of intravitreal and periocular triamcinolone associated with photodynamic therapy for treatment of retinal angiomatous proliferation. *Br J Ophthalmol* 2009;93:166-70.
43. McBain VA, Kumari R, Townend J, Lois N. Geographic atrophy in retinal angiomatous proliferation. *Retina* 2011;31:1043-52.
44. Marques MF, Marques JP, Gil JQ, et al. Long-Term Management of RAP Lesions in Clinical Practice: Treatment Efficacy and Predictors of Functional Improvement. *Ophthalmic Res* 2016;55:119-25.
45. Yamazaki T, Koizumi H, Yamagishi T, Kinoshita S. Subfoveal Choroidal Thickness in Retinal Angiomatous Proliferation. *Retina* 2014;34:1316-22.
46. Hayashi H, Yamashiro K, Gotoh N, et al. CFH and ARMS2 variations in age-related macular degeneration, polypoidal choroidal vasculopathy, and retinal angiomatous proliferation. *Invest Ophthalmol Vis Sci* 2010;51:5914-9.
47. Caramoy A, Ristau T, Lechanteur YT, et al. Environmental and genetic risk factors for retinal angiomatous proliferation. *Acta Ophthalmol* 2014;92:745-8.
48. Bressler NM. Photodynamic therapy of subfoveal choroidal neovascularization in age-related macular degeneration with verteporfin: two-year results of 2 randomized clinical trials-tap report 2. *Arch Ophthalmol* 2001;119:198-207.
49. Massacesi AL, Sacchi L, Bergamini F, Bottoni F. The prevalence of retinal angiomatous proliferation in age-related macular degeneration with occult choroidal neovascularization. *Graefes Arch Clin Exp Ophthalmol* 2008;246:89-92.
50. Maruko I, Iida T, Saito M, Nagayama D, Saito K. Clinical characteristics of exudative age-related macular degeneration in Japanese patients. *Am J Ophthalmol* 2007;144:15-22.
51. Spaide RF. Fundus autofluorescence and age-related macular degeneration. *Ophthalmology* 2003;110:392-9.
52. Cantsilieris S, White SJ, Richardson AJ, Guymer RH, Baird PN. Comprehensive analysis of Copy Number Variation of genes at chromosome 1 and 10 loci associated with late age related macular degeneration. *PLoS One* 2012;7:e35255.
53. Wegscheider BJ, Weger M, Renner W, et al. Association of complement factor H Y402H gene polymorphism with different subtypes of exudative age-related macular degeneration. *Ophthalmology* 2007;114:738-42.
54. Ohkuma Y, Hayashi T, Sakai T, et al. Retinal angiomatous proliferation associated with risk alleles of ARMS2/HTRA1 gene polymorphisms in Japanese patients. *Clin Ophthalmol* 2014;8:143-8.
55. Tanaka K, Nakayama T, Yuzawa M, et al. Analysis of candidate genes for age-related macular degeneration subtypes in the Japanese population. *Mol Vis* 2011;17:2751-8.
56. Shimada H, Kawamura A, Mori R, Yuzawa M. Clinicopathological findings of retinal angiomatous proliferation. *Graefes Arch Clin Exp Ophthalmol* 2007;245:295-300.
57. Monson DM, Smith JR, Klein ML, Wilson DJ. Clinicopathologic correlation of retinal angiomatous proliferation. *Arch Ophthalmol* 2008;126:1664-8.
58. Aiello LP, Avery RL, Arrigg PG, et al. Vascular endothelial growth factor in ocular fluid of patients

with diabetic retinopathy and other retinal disorders. *N Engl J Med* 1994;331:1480-7.

59. Tolentino MJ, Miller JW, Gragoudas ES, et al. Intravitreal injections of vascular endothelial growth factor produce retinal ischemia and microangiopathy in an adult primate. *Ophthalmology* 1996;103:1820-8.
60. Bottoni F, Massacesi A, Cigada M, Viola F, Musicco I, Staurenghi G. Treatment of retinal angiomatic proliferation in age-related macular degeneration: a series of 104 cases of retinal angiomatic proliferation. *Arch Ophthalmol* 2005;123:1644-50.
61. Reche-Frutos J, Calvo-Gonzalez C, Donate-Lopez J, et al. Retinal angiomatic proliferation reactivation 6 months after high-dose intravitreal acetamide triamcinolone and photodynamic therapy. *Eur J Ophthalmol* 2007;17:979-82.
62. Johnson TM, Glaser BM. Focal laser ablation of retinal angiomatic proliferation. *Retina* 2006;26:765-72.
63. Borrillo JL, Sivalingam A, Martidis A, Federman JL. Surgical ablation of retinal angiomatic proliferation. *Arch Ophthalmol* 2003;121:558-61.
64. Boscia F, Furino C, Prascina F, Delle Noci N, Sborgia L, Sborgia C. Combined surgical ablation and intravitreal triamcinolone acetamide for retinal angiomatic proliferation. *Eur J Ophthalmol* 2005;15:513-6.
65. Nakata M, Yuzawa M, Kawamura A, Shimada H. Combining surgical ablation of retinal inflow and outflow vessels with photodynamic therapy for retinal angiomatic proliferation. *Am J Ophthalmol* 2006;141:968-70.
66. Shiragami C, Iida T, Nagayama D, Baba T, Shiraga F. Recurrence after surgical ablation for retinal angiomatic proliferation. *Retina* 2007;27:198-203.
67. Criswell MH, Ciulla TA, Lowseth LA, Small W, Danis RP, Carson DL. Anastomatic vessels remain viable after photodynamic therapy in primate models of choroidal neovascularization. *Invest Ophthalmol Vis Sci* 2005;46:2168-74.
68. Kusserow C, Michels S, Schmidt-Erfurth U. [Chorioretinal anastomosis as unfavourable prognostic factor during photodynamic therapy]. *Ophthalmologie* 2003;100:197-202.
69. Boscia F, Furino C, Sborgia L, Reibaldi M, Sborgia C. Photodynamic therapy for retinal angiomatic proliferations and pigment epithelium detachment. *Am J Ophthalmol* 2004;138:1077-9.
70. Boscia F, Parodi MB, Furino C, Reibaldi M, Sborgia C. Photodynamic therapy with verteporfin for retinal angiomatic proliferation. *Graefes Arch Clin Exp Ophthalmol* 2006;244:1224-32.
71. Mantel I, Ambresin A, Zografos L. Retinal angiomatic proliferation treated with a combination of intravitreal triamcinolone acetamide and photodynamic therapy with verteporfin. *Eur J Ophthalmol* 2006;16:705-10.
72. van de Moere A, Kak R, Sandhu SS, Talks SJ. Anatomical and visual outcome of retinal angiomatic proliferation treated with photodynamic therapy and intravitreal triamcinolone. *Am J Ophthalmol* 2007;143:701-4.
73. Krebs I, Krepler K, Stolba U, Goll A, Binder S. Retinal angiomatic proliferation: combined therapy of intravitreal triamcinolone acetamide and PDT versus PDT alone. *Graefes Arch Clin Exp Ophthalmol* 2008;246:237-43.
74. Lai TY, Chan WM, Liu DT, Lam DS. Ranibizumab for retinal angiomatic proliferation in neovascular age-related macular degeneration. *Graefes Arch Clin Exp Ophthalmol* 2007;245:1877-80.
75. Konstantinidis L, Mameletzi E, Mantel I, Pournaras JA, Zografos L, Ambresin A. Intravitreal ranibizumab (Lucentis) in the treatment of retinal angiomatic proliferation (RAP). *Graefes Arch Clin Exp Ophthalmol* 2009;247:1165-71.
76. Montero JA, Fernandez MI, Gomez-Ulla F, Ruiz-Moreno JM. Efficacy of intravitreal bevacizumab to treat retinal angiomatic proliferation stage II and III. *Eur J Ophthalmol* 2009;19:448-51.
77. Ghazi NG, Knape RM, Kirk TQ, Tiedeman JS, Conway BP. Intravitreal bevacizumab (avastin) treatment of retinal angiomatic proliferation. *Retina* 2008;28:689-95.

78. Matsumoto H, Sato T, Morimoto M, et al. Treat-and-Extend Regimen with Aflibercept for Retinal Angiomatous Proliferation. *Retina* 2016;36:2282-2289.
79. Scott AW, Bressler SB. Retinal angiomatous proliferation or retinal anastomosis to the lesion. *Eye (Lond)* 2010;24:491-6.
80. Rouvas AA, Papakostas TD, Vavvas D, et al. Intravitreal ranibizumab, intravitreal ranibizumab with PDT, and intravitreal triamcinolone with PDT for the treatment of retinal angiomatous proliferation: a prospective study. *Retina* 2009;29:536-44.
81. Saito M, Shiragami C, Shiraga F, Nagayama D, Iida T. Combined intravitreal bevacizumab and photodynamic therapy for retinal angiomatous proliferation. *Am J Ophthalmol* 2008;146:935-41 e1.
82. Shima C, Gomi F, Sawa M, Sakaguchi H, Tsujikawa M, Tano Y. One-year results of combined photodynamic therapy and intravitreal bevacizumab injection for retinal pigment epithelial detachment secondary to age-related macular degeneration. *Graefes Arch Clin Exp Ophthalmol* 2009;247:899-906.

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