Age-Related Macular **Degeneration and Metformin**

Kimberly Nguyen, MD

1

Objectives

- Understand the basics of Age Related Macular Degeneration (AMD)
- Understand the relationship between metformin use and AMD
- Counsel patients with AMD on the potential ocular effects of metformin use

2

Outline

- AMD: Definition, epidemiology, pathophysiology, management, prognosis
 Metformin: Mechanism, indications, adverse effects
- Clinical trials demonstrating the relationship between metformin and AMD

Age-Related Macular Degeneration (AMD) Definition Chronic progressive degenerative disorder of the macula due to age related changes leading to loss of central vision Dry/nonexudative: small drusen -> geographic atrophy Wet/exudative: Neovascularization Stahl et al.

4

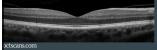
AMD Epidemiology

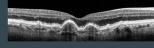
- Third most common cause of blindness worldwide
- Rare in pts under 55 yo
- More commonly in pts older than 75 years
- F>M
- Risk factors: light irides, age, smoking, hyperopia, hypertension, hypercholesterolemia, family history

5

AMD Pathophysiology

- RPE failure to process cellular debris
- Lipids deposited in Bruch's membrane
- Drusen (lipid, amyloid, complement factors, cellular components)
- Thickening of Bruch's, degeneration of collagen and elastin within Bruch's, increased glycation end products, accumulation of lipids and cellular debris form barrier between choroid and retina → relative ischemia with subsequent CNV





	_
AMD Management	
 Dry AMD: AREDS2 Decrease progression to wet AMD 	
Smoking cessation	
 Wet AMD: Anti-VEGF: bevacizumab, aflibercept, ranibizumab 	
,,	
	-
7	
	_
AREDS	
 Objective: Reduce the risk of vision loss in intermediate/stage 3 to advanced/stage4 nonexudative AMD 	
 Intermediate/stage 3 = 1 large druse >= 125um, extensive soft intermediate drusen (63-142 	
um) or nonsubfoveal GA • Advanced/stage 4 = vision loss due to neovascular AMD or subfoveal GA in one eye	
 AREDS formulation: VitC (500 mg), vitE (400 IU), betacarotene (15 mg), zinc (80 mg) Findings: 	
 Intermediate or advanced AMD had 25% risk reduction for progression to more advanced stage of AMD and 19% reduction in mod vision loss (>= 3 lines) at 5 years 	
23% reduction in progressing to advanced AMD at 10 years	
 No benefit for no AMD or early stage, no increased mortality 	
	-
8	
AREDS2	-
 Objective: Replaced beta carotene with lutein (10mg) and zeaxanthin (2 mg) and added omega 3 	
AREDS2: vitC, vitE, lutein, zeaxanthin, zinc; no betacarotene	
 Findings Similar visual outcomes as AREDS 	
Less risk of lung cancer in current and former smokers (beta carotene)	

D Prognosis		
Risk of developing advanced .	AMD in one eve at 5 or 10	vears
	ge drusen (>= 125um) (1 pe	
	/ \ 1	
Dunnaman of missenant about	annalities (1 maint)	
Presence of pigment abn		
	ormalities (1 point) nce of bilateral intermediate	e drusen (63-124um
	nce of bilateral intermediate	e drusen (63-124um
If no large drusen; present Presence of neovascular	nce of bilateral intermediate	e drusen (63-124um 10-Year Risk,%
If no large drusen; preser Presence of neovascular Table 4-1 Five- and 10-Year Risks	nce of bilateral intermediate AMD (2 points) of Advanced AMD in 1 Eye	
If no large drusen; preser Presence of neovascular Table 4-1 Five- and 10-Year Risks	nce of bilateral intermediate AMD (2 points) • of Advanced AMD in 1 Eye 5-Year Risk, %	
If no large drusen; preser Presence of neovascular Table 4-1 Five- and 10-Year Risks	nce of bilateral intermediate AMD (2 points) of Advanced AMD in 1 Eye 5-Year Risk, % 0.5	
If no large drusen; preser Presence of neovascular Table 4-1 Five- and 10-Year Risks	nce of bilateral intermediate AMD (2 points) of Advanced AMD in 1 Eye 5-Year Risk, % 0.5 3	10-Year Risk, % 1 7

Metformin Mechanism of Action		
 Primary site of action: mitochondria Inhibit hepatic gluconeogenesis Opposing glucagon mediated signaling in the liver Minor: increase glucose uptake in skeletal muscle 	Plasma Methomin Gucanon Adenyatic cyclare activity with the Complex of Physics Adenyatic cyclare activity with the Complex of Physics Adenyatic Cyclare activity with the Complex of Physics Adenyatic Complex of Physics Adenyatic Complex of Physics Adenyatic Complex of Physics Adenyatic Complex of Physics Complex of P	

11

Metformin Indications • Diabetes mellitus type 2

Metformin Adverse Effects Nassestratering Glapper Glapper Describe Metalic tasts Lactic codosis (cast, most severe) AMD and Metformin Studies Nassestratering Nassestrateri		
National Vision of Control of Co	Mattauria Advance Effects	
Column AMD and Metformin Studies Biggs and a second sec		
Medille care Lactic acidosis (rare, most severe) Lactic acidosis (rare, most severe) AMD and Mettermin Studies Revera a) MAN (Spetiated 2018 for a most acidosis in house deals of developing of AMD Revera a) MAN (Spetiated 2018 for a most acidosis in house deals of developing of AMD Special Special Special (special special spec	• GI upset	
AMD and Metformin Studies Rower at 1 MMC Attributed 2021 Me Outcome Determine whole mention are assessed with student older of developing of AMD Outcome Determine whole mention are assessed with student older of developing of AMD Outcome Determine whole mention are assessed AMD (see) madded with central adjects Outcome Determine whole mention are assessed AMD (see) madded with central adjects Outcome Determine whole mention are assessed asses	Weakness	
AMD and Metformin Studies ### Bitter of al JAMA Lykhilados and Me. ### Clopsorth Performed whether motion use a suscissed with revkeed with of developing of AMD ### AMD and Metformin Studies ### Bitter of all JAMA Lykhilados and Memory and AMD (cases) matched with costnoil adjects ### Bitter of all JAMA Lykhilados and and an account of the received odds of developing AMD (01 0004, 95% C 0.00 d.00). ### Bitter of all JAMA Lykhilados and an account of the received odds of developing AMD (01 0004, 95% C 0.00 d.00). ### Bitter of all JAMA Lykhilados and account of the received odds of developing AMD (01 0004, 95% C 0.00 d.00). ### Bitter of all JAMA Lykhilados and account of the received odds of developing AMD (01 0004, 95% C 0.00 d.00). ### Bitter of all JAMA Lykhilados and provides the base for patential prospective cloimal stales. #### AMD and Metformin style used as a processive therapy for AMD and provides the base for patential prospective cloimal stales. ###################################		
AMD and Metformin Studies ### Bitter of al JAMA Lykhilados and Me. ### Clopsorth Performed whether motion use a suscissed with revkeed with of developing of AMD ### AMD and Metformin Studies ### Bitter of all JAMA Lykhilados and Memory and AMD (cases) matched with costnoil adjects ### Bitter of all JAMA Lykhilados and and an account of the received odds of developing AMD (01 0004, 95% C 0.00 d.00). ### Bitter of all JAMA Lykhilados and an account of the received odds of developing AMD (01 0004, 95% C 0.00 d.00). ### Bitter of all JAMA Lykhilados and account of the received odds of developing AMD (01 0004, 95% C 0.00 d.00). ### Bitter of all JAMA Lykhilados and account of the received odds of developing AMD (01 0004, 95% C 0.00 d.00). ### Bitter of all JAMA Lykhilados and provides the base for patential prospective cloimal stales. #### AMD and Metformin style used as a processive therapy for AMD and provides the base for patential prospective cloimal stales. ###################################		
AMD and Metformin Studies ### States of all MAN Cybinholes and Me. ### Objector Designed whether minimum associated with reduced order of developing of AMD ### AMD and Metformin Studies ### AMD and Metformin Studies #### AMD and Metformin Studies ##### AMD and Metformin Studies ##### AMD and Metformin Studies ###################################		
AMD and Metformin Studies ### Bitter of al JAMA Lykhilados and Me. ### Clopsorth Performed whether motion use a suscissed with revkeed with of developing of AMD ### AMD and Metformin Studies ### Bitter of all JAMA Lykhilados and Memory and AMD (cases) matched with costnoil adjects ### Bitter of all JAMA Lykhilados and and an account of the received odds of developing AMD (01 0004, 95% C 0.00 d.00). ### Bitter of all JAMA Lykhilados and an account of the received odds of developing AMD (01 0004, 95% C 0.00 d.00). ### Bitter of all JAMA Lykhilados and account of the received odds of developing AMD (01 0004, 95% C 0.00 d.00). ### Bitter of all JAMA Lykhilados and account of the received odds of developing AMD (01 0004, 95% C 0.00 d.00). ### Bitter of all JAMA Lykhilados and provides the base for patential prospective cloimal stales. #### AMD and Metformin style used as a processive therapy for AMD and provides the base for patential prospective cloimal stales. ###################################		
AMD and Metformin Studies ### States of all MAN Cybinholes and Me. ### Objector Designed whether minimum associated with reduced order of developing of AMD ### AMD and Metformin Studies ### AMD and Metformin Studies #### AMD and Metformin Studies ##### AMD and Metformin Studies ##### AMD and Metformin Studies ###################################	13	
Bilazor et al. JAMA Chykhalmid. 2021 Mar. Objective Demrinis whether metformin us is associated with reduced odds of developing of AMD Helicuse control study. System of older with mee diagnosed AMD (cases) mutched with control subjects. Employees design of metformin The methods of the properties from two subsects does of metformin showed the greatest potential benefit of the properties. In so in societate does of metformin showed the greatest potential benefit of the properties. In so in societate does of metformin showed the greatest potential benefit of the properties. In the properties of the methods of societal properties. Conclusions • Conclusions • Conclusions • Metformin may be useful as a preventive therapy for AMD and provides the basis for potential properties chinical trials and properties of the properties	13	
Bilazor et al. JAMA Chykhalmid. 2021 Mar. Objective Demrinis whether metformin us is associated with reduced odds of developing of AMD Helicuse control study. System of older with mee diagnosed AMD (cases) mutched with control subjects. Employees design of metformin The methods of the properties from two subsects does of metformin showed the greatest potential benefit of the properties. In so in societate does of metformin showed the greatest potential benefit of the properties. In so in societate does of metformin showed the greatest potential benefit of the properties. In the properties of the methods of societal properties. Conclusions • Conclusions • Conclusions • Metformin may be useful as a preventive therapy for AMD and provides the basis for potential properties chinical trials and properties of the properties		
Bilazor et al. JAMA Chykhalmid. 2021 Mar. Objective Demrinis whether metformin us is associated with reduced odds of developing of AMD Helicuse control study. System of older with mee diagnosed AMD (cases) mutched with control subjects. Employees design of metformin The methods of the properties from two subsects does of metformin showed the greatest potential benefit of the properties. In so in societate does of metformin showed the greatest potential benefit of the properties. In so in societate does of metformin showed the greatest potential benefit of the properties. In the properties of the methods of societal properties. Conclusions • Conclusions • Conclusions • Metformin may be useful as a preventive therapy for AMD and provides the basis for potential properties chinical trials and properties of the properties		
Bilazor et al. JAMA Chykhalmid. 2021 Mar. Objective Demrinis whether metformin us is associated with reduced odds of developing of AMD Helicuse control study. System of older with mee diagnosed AMD (cases) mutched with control subjects. Employees design of metformin The methods of the properties from two subsects does of metformin showed the greatest potential benefit of the properties. In so in societate does of metformin showed the greatest potential benefit of the properties. In so in societate does of metformin showed the greatest potential benefit of the properties. In the properties of the methods of societal properties. Conclusions • Conclusions • Conclusions • Metformin may be useful as a preventive therapy for AMD and provides the basis for potential properties chinical trials and properties of the properties		
Bilazor et al. JAMA Chykhalmid. 2021 Mar. Objective Demrinis whether metformin us is associated with reduced odds of developing of AMD Helicuse control study. System of older with mee diagnosed AMD (cases) mutched with control subjects. Employees design of metformin The methods of the properties from two subsects does of metformin showed the greatest potential benefit of the properties. In so in societate does of metformin showed the greatest potential benefit of the properties. In so in societate does of metformin showed the greatest potential benefit of the properties. In the properties of the methods of societal properties. Conclusions • Conclusions • Conclusions • Metformin may be useful as a preventive therapy for AMD and provides the basis for potential properties chinical trials and properties of the properties		
Bilazor et al. JAMA Chykhalmid. 2021 Mar. Objective Demrinis whether metformin us is associated with reduced odds of developing of AMD Helicuse control study. System of older with mee diagnosed AMD (cases) mutched with control subjects. Employees design of metformin The methods of the properties from two subsects does of metformin showed the greatest potential benefit of the properties. In so in societate does of metformin showed the greatest potential benefit of the properties. In so in societate does of metformin showed the greatest potential benefit of the properties. In the properties of the methods of societal properties. Conclusions • Conclusions • Conclusions • Metformin may be useful as a preventive therapy for AMD and provides the basis for potential properties chinical trials and properties of the properties		
Mellindis coccurate study System oddes with most diagnosed AMD (cases) matched with control subjects English years oddes with most diagnosed AMD (RD 054 575; CJ 072 085) Description associated which reduced odds of developing AMD (RD 054 575; CJ 072 085) Dose of more than 1809 of melformin one 22 years add not have reduced odds of developing control of the contro	AMD and Metformin Studies	
O Sue control study: System or older with row diagnood AMD (case) matched with control subjects Sugarante dusage of melderania Reading and the control of the control of the control of the control subjects Date dependent low to moderate does of netformin chosed the greatest posterial period of the control	Blitzer et al. JAMA Ophthalmol. 2021 Mar. Objective: Determine whether metformin use is associated with reduced odds of developing of AMD Method:	
Realth Metrorini moscined with reduced odds of developing AMO (0R 094, 59% C. 10 29.00%) On deep dependent beat an impleate does of entire time allowed by agreed proteinal beautif Does of more time 1080) gof metionini nove 2 years did not have reduced odds of developing Metionini may be useful as a preventive therapy for AMD and provides the basis for potential prospective dinical trials AMD and Metformin Studies Romdhoniyyah et al. Ophitalmol Ther. 2021 Jun. Olopetive Systemic review and meta analysis to review beneficial associations between metformin and AMD Methods Systemic search of several databases for clinical studies between metformin and AMD (5 retrospective studies) Remails Ps. taking metformin were less likely to have AMD although statistical significance was not met (posoled alquised OR = 080, 59% Cl 054-105, 12 = 98.8%) One of the control of the processor of the failure to meet statistical significance Metrorini may be associated with decreased risk of any AMD (although should be interpreted with custom because of the failure to meet statistical significance)	Case-control study 55 years or older with new diagnosed AMD (cases) matched with control subjects	
Conclusions Mofformin may be useful as a preventive therapy for AMD and provides the basis for potential prospective clinical trials AMD and Metformin Studies Romalboniyah et al. Ophthalmol Ther. 2021 Jun. Objective. Systemic review and meta analysis to review beneficial associations between metformin and AMD. Methods Systemic search of several databases for clinical studies between metformin and AMD (5 retrospective studies) Results Ps. taking metformin were less likely to have AMD although statistical significance was not met (psocied adjusted OR = 080, 95% CI 054-105, IZ = 98.8%) Conclusions Metformin may be associated with decreased risk of any AMD (although should be interpreted with cuntom because of the failure to meet statistical significance)	 Results Metformin associated with reduced odds of developing AMD (OR 0.94, 95% CI, 0.92-0.96) 	
AMD and Metformin Studies Remdhonsysh et al. Ophthalmol Ther. 2021 Jun. Objective Systemic search of several databases for clinical studies between metformin and AMD Methods Systemic search of several databases for clinical studies between metformin and AMD Methods Physical Systemic search of several databases for clinical studies between metformin and AMD Methods Physical Systemic search of several databases for clinical studies between metformin and AMD Methods Physical Systemic search of several databases for clinical studies between metformin and AMD Methods Physical Systemic search of several databases for clinical studies between metformin and AMD (5 retrospective studies) Results Next Systemic search of several databases for clinical studies between metformin and AMD (5 retrospective studies) Results Metformin may be associated with decreased risk of any AMD (although should be interpreted with caution because of the failure to meet statistical significance)	AMD	
AMD and Metformin Studies Romdhoniyyah et al. Ophthalmol Ther. 2021 Jun. Objective: Systemic review and meta analysis to review beneficial associations between metformin and AMD Methods Systemic search of several databases for clinical studies between metformin and AMD (5 retrospective studies) Results Pis taking metformin were less likely to have AMD although statistical significance was not met (pooled adjusted OR = 0.80, 95% CI 0.54-1.05, 12 = 98.8%) Conclusions Metformin may be associated with decreased risk of any AMD (although should be interpreted with caution because of the failure to meet statistical significance)	 Metformin may be useful as a preventive therapy for AMD and provides the basis for potential 	
AMD and Metformin Studies Romdhoniyyah et al. Ophthalmol Ther. 2021 Jun. Objective: Systemic review and meta analysis to review beneficial associations between metformin and AMD Methods Systemic search of several databases for clinical studies between metformin and AMD (5 retrospective studies) Results Pis taking metformin were less likely to have AMD although statistical significance was not met (pooled adjusted OR = 0.80, 95% CI 0.54-1.05, 12 = 98.8%) Conclusions Metformin may be associated with decreased risk of any AMD (although should be interpreted with caution because of the failure to meet statistical significance)		
AMD and Metformin Studies Romdhoniyyah et al. Ophthalmol Ther. 2021 Jun. Objective: Systemic review and meta analysis to review beneficial associations between metformin and AMD Methods Systemic search of several databases for clinical studies between metformin and AMD (5 retrospective studies) Results Pis taking metformin were less likely to have AMD although statistical significance was not met (pooled adjusted OR = 0.80, 95% CI 0.54-1.05, 12 = 98.8%) Conclusions Metformin may be associated with decreased risk of any AMD (although should be interpreted with caution because of the failure to meet statistical significance)		-
Romdhoniyyah et al. Ophthalmol Ther. 2021 Jun. Objective: Systemic review and meta analysis to review beneficial associations between metformin and AMD Methods Systemic search of several databases for clinical studies between metformin and AMD (5 retrospective studies) Results Place taking metformin were less likely to have AMD although statistical significance was not met (pooled adjusted OR = 0.80, 95% CI 0.54-1.05, 12 = 98.8%) Conclusions Metformin may be associated with decreased risk of any AMD (although should be interpreted with caution because of the failure to meet statistical significance)	14	
Romdhoniyyah et al. Ophthalmol Ther. 2021 Jun. Objective: Systemic review and meta analysis to review beneficial associations between metformin and AMD Methods Systemic search of several databases for clinical studies between metformin and AMD (5 retrospective studies) Results Place taking metformin were less likely to have AMD although statistical significance was not met (pooled adjusted OR = 0.80, 95% CI 0.54-1.05, 12 = 98.8%) Conclusions Metformin may be associated with decreased risk of any AMD (although should be interpreted with caution because of the failure to meet statistical significance)		
Romdhoniyyah et al. Ophthalmol Ther. 2021 Jun. Objective: Systemic review and meta analysis to review beneficial associations between metformin and AMD Methods Systemic search of several databases for clinical studies between metformin and AMD (5 retrospective studies) Results Place taking metformin were less likely to have AMD although statistical significance was not met (pooled adjusted OR = 0.80, 95% CI 0.54-1.05, 12 = 98.8%) Conclusions Metformin may be associated with decreased risk of any AMD (although should be interpreted with caution because of the failure to meet statistical significance)		
Romdhoniyyah et al. Ophthalmol Ther. 2021 Jun. Objective: Systemic review and meta analysis to review beneficial associations between metformin and AMD Methods Systemic search of several databases for clinical studies between metformin and AMD (5 retrospective studies) Results Place taking metformin were less likely to have AMD although statistical significance was not met (pooled adjusted OR = 0.80, 95% CI 0.54-1.05, 12 = 98.8%) Conclusions Metformin may be associated with decreased risk of any AMD (although should be interpreted with caution because of the failure to meet statistical significance)		
Romdhoniyyah et al. Ophthalmol Ther. 2021 Jun. Objective: Systemic review and meta analysis to review beneficial associations between metformin and AMD Methods Systemic search of several databases for clinical studies between metformin and AMD (5 retrospective studies) Results Place taking metformin were less likely to have AMD although statistical significance was not met (pooled adjusted OR = 0.80, 95% CI 0.54-1.05, 12 = 98.8%) Conclusions Metformin may be associated with decreased risk of any AMD (although should be interpreted with caution because of the failure to meet statistical significance)		
Romdhoniyyah et al. Ophthalmol Ther. 2021 Jun. Objective: Systemic review and meta analysis to review beneficial associations between metformin and AMD Methods Systemic search of several databases for clinical studies between metformin and AMD (5 retrospective studies) Results Place taking metformin were less likely to have AMD although statistical significance was not met (pooled adjusted OR = 0.80, 95% CI 0.54-1.05, 12 = 98.8%) Conclusions Metformin may be associated with decreased risk of any AMD (although should be interpreted with caution because of the failure to meet statistical significance)		
Objective: Systemic review and meta analysis to review beneficial associations between metformin and AMD Methods Systemic search of several databases for clinical studies between metformin and AMD (5 retrospective studies) Results Pts taking metformin were less likely to have AMD although statistical significance was not met (pooled adjusted OR = 0.80, 95% CI 0.54-105, I2 = 98.8%) Conclusions Metformin may be associated with decreased risk of any AMD (although should be interpreted with caution because of the failure to meet statistical significance)	AMD and Metformin Studies	
and AMD • Methods • Systemic search of several databases for clinical studies between metformin and AMD (5 retrospective studies) • Results • Pts taking metformin were less likely to have AMD although statistical significance was not met (pooled adjusted OR = 0.80, 95% CI 0.54-105, I2 = 98.8%) • Conclusions • Metformin may be associated with decreased risk of any AMD (although should be interpreted with caution because of the failure to meet statistical significance)		
 Systemic search of several databases for clinical studies between metformin and AMD (5 retrospective studies) Results Pts taking metformin were less likely to have AMD although statistical significance was not met (pooled adjusted OR = 0.80, 95% CI 0.54-105, 12 = 98.8%) Conclusions Metformin may be associated with decreased risk of any AMD (although should be interpreted with caution because of the failure to meet statistical significance) 	and AMD	
Results Pts taking metformin were less likely to have AMD although statistical significance was not met (pooled adjusted OR = 0.80, 95% CI 0.54-105, I2 = 98.8%) Conclusions Metformin may be associated with decreased risk of any AMD (although should be interpreted with caution because of the failure to meet statistical significance)	 Systemic search of several databases for clinical studies between metformin and AMD (5 	
met (pooled adjusted OR = 0.80, 95% CI 0.54-105, 12 = 98.8%) Conclusions Metformin may be associated with decreased risk of any AMD (although should be interpreted with caution because of the failure to meet statistical significance)	Results Pts taking metformin were less likely to have AMD although statistical significance was not	
interpreted with caution because of the failure to meet statistical significance)	met (pooled adjusted OR = 0.80, 95% CI 0.54-1.05, I2 = 98.8%) ■ Conclusions	
	interpreted with caution because of the failure to meet statistical significance)	-

AMD and Metformin Studies	
Stewart et al. Ophthalmol Retina, 2020 Nov. Objectives: Evaluate the development of AMD in those taking metformin vs not taking the	
drug • Methods • Cross sectional retrospective study	
N = 3120 diabetic pts >60 years old Results	
 Those taking metformin were less likely to have age-related macular degeneration compared with those not taking the drug (OR 0.70, 95%CI 0.55-0.88) 	
16	
AND and Markeninia Christian	
AMD and Metformin Studies	
 Chen et al.) Opthahlmol. Oct 2019. Objectives: whether metformin is associated with a lower risk of subsequent AMD in patients with type 2 diabetes 	
Methods Retrospective cohort study	
 Type 2 diabetics using metformin (N=45,524) vs type 2 diabetics not using metformin (N = 22,681) Results 	
 Metformin group had a significantly lower risk of AMD (adjusted HR = 0.54; 95% confidence interval [CI], 0.50-0.58) 	_
 Conclusions Among patients with type 2 diabetes, those who use metformin are at a significantly lower risk of developing AMD relative to individuals who do not use metformi 	
Significantly lower AMD risk was found with a higher dose of metformin	
17	
AMD and Metformin Current Clinical Trials	
Title: Metformin for the minimization of Geographic Atrophy Progression in Patients with AMD	
 Objectives: The purpose of this study is to determine whether metformin, an FDA-approved drug for the treatment of type II diabetes, is a safe and effective treatment to decrease the progression of geographic atrophy in non-diabetic patients with Age-related Macular Degeneration (AMD). 	
 Treatment vs observation groups Treatment group: Metformin daily for 18 months + standard ophthalmic care over 24 months 	
Observation group: standard ophthalmic care over 24months Testing: fundus photos, autofluorescence, OCT Outcomes Outcomes	
Rate of change in area of geographic atrophy on imaging BCVA Systemic estate of matformin use (monitoring for adverse affects)	

Conclusions	
 AMD is a chronic progressive degenerative disorder of the macula due to age related changes leading to loss of central vision 	-
 AREDS2 supplementation has been shown in clinical trials to decrease the risk of progression from nonexudative to exudative AMD 	
 Metformin is a widely used oral medication for the management of diabetes mellitus type 2 	
 Metformin use may be associated with a decreased risk of developing AMD Further studies are required to evaluate the efficacy of metformin use and the 	
development of AMD	
19	
References	
1 Change & Makid Manage ACT DELATED MACHED DECEMBERTION Don Localistical MICESCANIA CO	
 Sald A, The Disposis and Treatment of the picked Marcial Engineering. These Actived Sci. 2020;175:49(5)(5):50 feet StillMicroels 2000(00):31. Permisorae, Lacthonium, MacHeronium—Bood er elicition and efficial engineering feet Sci. 2020;175:49(5)(5):50 feet StillMicroels 2020(00):31. Permisorae, Lacthonium, MacHeronium, Sci. 2021(1):56. Britzer AT, Harm SA, Colly KA, Soordin D, Association of Metformin User With Age-Related Macular Degeneration: A Case-Control 	
Sudy, JAMA, Opithalmel. 2021 Mr. 1139(3):302-390 doi: 10.1001/jamaepithalmel.2020.6531. PMD 3477566, PMCID: PMCR21082. Romediumyah DF, Harding SF, Cheyne CP, Bener NAV. Metironia, in A benefal Back in Age Related Medical Degeneration: A Systematic Review and Meta Analysis Opithalmol Ther. 2021 Jur;10(2):245-260 doi: 10.1007/s40123-021-00344-3. Epub 2021 Apr 12. PMD: 33864958. PMCID: PMCO307958.	
 Dang KE, WA. T. Hai YN. De HJ. Nesdy-found functions of melformin for the presention and treatment of age-related mencular degeneration for 10 [Online]. and 2004 [2018] 88(8):1274/1280 60. 1018/2019/2019/2018 2018/2019/2019/2019/2019/2019/2019/2019/2019	
Ophthalmol Retina. 2020 Nov;4(11):118:1119. doi: 10.1016/j.oret.2020.06.003 Epub. 2020 Jun 7. PMID: 325:2555; PMCID: PMCR09465. 8. Chen YV, Shen YC Lai YJ, Wang CV, Lin KH, Feng SC, Linng CV, Wei LC. Chen P. Association between Metfermin and a Lower Risk of Age-Related Macular Degeneration in Patients with Type 2 Diabetes. J Ophthalmol. 2019 Oct 31:2019:1649156. doi: 10.1155/2019/1649156. PMID: 3174371; PMCID: PMC0887598.	
10.1155/2019/1649156. PMID: 31781371; PMCID: PMC6875398	
20	
	-
Thank you!	
Questions/comments?	
	-