

Vascular Aging- Covid 19 references

References

1. Saeed S, Mancia G. Arterial stiffness and COVID-19: a bidirectional cause-effect relationship. *J Clin Hypertens*. 2021;23:1099-103. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
2. Libby P, Lüscher T. COVID-19 is, in the end, an endothelial disease. *Eur Heart J*. 2020;41:3038-44. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
3. Fourie CMT, Schutte AE. Early vascular aging in the HIV infected: Is arterial stiffness assessment the ideal tool? *Virulence*. 2017;8:1075-7. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
4. Kotronias D, Kapranos N. Herpes simplex virus as a determinant risk factor for coronary artery atherosclerosis and myocardial infarction. *Vivo Athens Greece*. 2005;19:351-7. [[PubMed](#)] [[Google Scholar](#)]
5. Laurent S, Boutouyrie P, Cunha PG, et al. Concept of extremes in vascular aging. *Hypertension*. 2019;74:218-28. [[PubMed](#)] [[Google Scholar](#)]
6. Sequí-Domínguez I, Cavero-Redondo I, Álvarez-Bueno C, et al. Accuracy of pulse wave velocity predicting cardiovascular and all-cause mortality. a systematic review and meta-analysis. *J Clin Med*. 2020;9:2080. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
7. de Andrade CRM, Silva ELC, da Matta M de FB, et al. Vascular or chronological age: which is the better marker to estimate the cardiovascular risk in patients with type 1 diabetes? *Acta Diabetol*. 2016;53:925-33. [[PubMed](#)] [[Google Scholar](#)]
8. Lin M, Chan GC, Chan KW, et al. Vascular age is associated with the risk of dialysis or death in chronic kidney disease. *Nephrology*. 2020;25:314-22. [[PubMed](#)] [[Google Scholar](#)]
9. Nilsson PM. Early vascular ageing – a concept in development. *Eur Endocrinol*. 2015;11:26-31. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
10. Zanolli L, Rastelli S, Granata A, et al. Arterial stiffness in inflammatory bowel disease: a systematic review and meta-analysis. *J Hypertens*. 2016;34:822-9. [[PubMed](#)] [[Google Scholar](#)]
11. Lioufas N, Hawley CM, Cameron JD, et al. Chronic kidney disease and pulse wave velocity: a narrative review. *Int J Hypertens*. 2019;2019:9189362. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
12. Muhammad IF, Borné Y, Östling G, et al. Arterial stiffness and incidence of diabetes: a population-based cohort study. *Diabetes Care*. 2017;40:1739-45. [[PubMed](#)] [[Google Scholar](#)]

13. Jordan J, Nilsson PM, Kotsis V, et al. Joint scientific statement of the European Association for the Study of Obesity and the European Society of Hypertension: obesity and early vascular ageing. *J Hypertens*. 2015;33:425-34. [[PubMed](#)] [[Google Scholar](#)]
14. Bruno RM, Nilsson PM, Engström G, et al. Early and supernormal vascular aging: clinical characteristics and association with incident cardiovascular events. *Hypertens Dallas Tex*. 2020;76:1616-24. [[PubMed](#)] [[Google Scholar](#)]
15. Olsen MH, Angell SY, Asma S, et al. A call to action and a lifecourse strategy to address the global burden of raised blood pressure on current and future generations: the Lancet Commission on hypertension. *Lancet Lond Engl*. 2016;388:2665-712. [[PubMed](#)] [[Google Scholar](#)]
16. Donato AJ, Morgan RG, Walker AE, et al. Cellular and molecular biology of aging endothelial cells. *J Mol Cell Cardiol*. 2015;89:122-35. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
17. Childs BG, Durik M, Baker DJ, et al. Cellular senescence in aging and age-related disease: from mechanisms to therapy. *Nat Med*. 2015;21:1424-35. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
18. Seals DR, Jablonski KL, Donato AJ. Aging and vascular endothelial function in humans. *Clin Sci*. 2011;120:357-75. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
19. Jia G, Aroor AR, Jia C, et al. Endothelial cell senescence in aging-related vascular dysfunction. *Biochim Biophys Acta BBA - Mol Basis Dis* 2019;1865:1802-9. [[PubMed](#)] [[Google Scholar](#)]
20. Chia PY, Teo A, Yeo TW. Overview of the assessment of endothelial function in humans. *Front Med*. 2020;7:542567. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
21. Furchgott RF. Endothelium-derived relaxing factor: discovery, early studies, and identification as nitric oxide (Nobel Lecture). *Angew Chem Int Ed*. 1999;38:1870-80. [[PubMed](#)] [[Google Scholar](#)]
22. Torregrossa AC, Aranake M, Bryan NS. Nitric oxide and geriatrics: implications in diagnostics and treatment of the elderly. *J Geriatr Cardiol JGC*. 2011;8:230-42. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
23. Higashi Y, Noma K, Yoshizumi M, et al. Endothelial function and oxidative stress in cardiovascular diseases. *Circ J*. 2009;73:411-8. [[PubMed](#)] [[Google Scholar](#)]
24. Pennathur S, Heinecke JW. Mechanisms for oxidative stress in diabetic cardiovascular disease. *Antioxidants Redox Signal*. 2007;9:955-69. [[PubMed](#)] [[Google Scholar](#)]
25. Houde M, Desbiens L, D'Orléans-Juste P. Endothelin-1: biosynthesis, signaling and vasoreactivity. *Adv Pharmacol San Diego Calif*. 2016;77:143-75. [[PubMed](#)] [[Google Scholar](#)]

26. Sena CM, Leandro A, Azul L, et al. Vascular oxidative stress: impact and therapeutic approaches. *Front Physiol*; 9:1668. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
27. Lubos E, Kelly NJ, Oldebeken SR, et al. Glutathione peroxidase-1 deficiency augments proinflammatory cytokine-induced redox signaling and human endothelial cell activation. *J Biol Chem*. 2011;286:35407-17. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
28. Paneni F, Costantino S, Battista R, et al. Adverse epigenetic signatures by histone methyltransferase Set7 contribute to vascular dysfunction in patients with type 2 diabetes mellitus. *Circ Cardiovasc Genet*. 2015;8:150-8. [[PubMed](#)] [[Google Scholar](#)]
29. Pandey KB, Rizvi SI. Markers of oxidative stress in erythrocytes and plasma during aging in humans. *Oxid Med Cell Longev*. 2010;3:2-12. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
30. Gielis J, Quirynen L, Briedé J, et al. Pathogenetic role of endothelial nitric oxide synthase uncoupling during lung ischaemia-reperfusion injury†. *Eur J Cardio-Thorac Surg*. 2017;52(2):256-263. [[PubMed](#)] [[Google Scholar](#)]
31. Tesauro M, Mauriello A, Rovella V, et al. Arterial ageing: from endothelial dysfunction to vascular calcification. *J Intern Med*. 2017;281:471-82. [[PubMed](#)] [[Google Scholar](#)]
32. Bhayadia R, Schmidt BMW, Melk A, et al. Senescence-induced oxidative stress causes endothelial dysfunction. *J Gerontol A Biol Sci Med Sci*. 2016;71:161-9. [[PubMed](#)] [[Google Scholar](#)]
33. Marcus AJ, Broekman MJ, Drosopoulos JH, et al. The endothelial cell ecto-ADPase responsible for inhibition of platelet function is CD39. *J Clin Invest*. 1997;99:1351-60. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
34. Sawdey MS, Loskutoff DJ. Regulation of murine type 1 plasminogen activator inhibitor gene expression in vivo. Tissue specificity and induction by lipopolysaccharide, tumor necrosis factor-alpha, and transforming growth factor-beta. *J Clin Invest*. 1991;88:1346-53. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
35. Polgar J, Matuskova J, Wagner DD. The P-selectin, tissue factor, coagulation triad. *J Thromb Haemost JTH*. 2005;3:1590-6. [[PubMed](#)] [[Google Scholar](#)]
36. McEver RP. Selectins: initiators of leucocyte adhesion and signalling at the vascular wall. *Cardiovasc Res*. 2015;107:331-9. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
37. Muller WA. Getting leukocytes to the site of inflammation. *Vet Pathol*. 2013;50:7-22. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]

38. Noels H, Weber C, Koenen RR. Chemokines as therapeutic targets in cardiovascular disease. *Arterioscler Thromb Vasc Biol.* 2019;39:583-92. [[PubMed](#)] [[Google Scholar](#)]
39. Franceschi C, Garagnani P, Parini P, et al. Inflammaging: a new immune–metabolic viewpoint for age-related diseases. *Nat Rev Endocrinol.* 2018;14:576-90. [[PubMed](#)] [[Google Scholar](#)]
40. Liu D, Richardson G, Benli FM, et al. Inflammaging in the cardiovascular system: mechanisms, emerging targets, and novel therapeutic strategies. *Clin Sci.* 2020;134:2243-62. [[PubMed](#)] [[Google Scholar](#)]
41. Prattichizzo F, De Nigris V, Spiga R, et al. Inflammaging and metaflammation: the yin and yang of type 2 diabetes. *Ageing Res Rev.* 2018;41:1-17. [[PubMed](#)] [[Google Scholar](#)]
42. Libby P. Interleukin-1 beta as a target for atherosclerosis therapy: the biological basis of CANTOS and beyond. *J Am Coll Cardiol.* 2017;70:2278-89. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
43. Harrison DG, Guzik TJ, Lob H, et al. Inflammation, immunity and hypertension. *Hypertension.* 2011;57:132-40. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
44. De Ciuceis C, Amiri F, Brassard P, et al. Reduced vascular remodeling, endothelial dysfunction, and oxidative stress in resistance arteries of angiotensin II-infused macrophage colony-stimulating factor-deficient mice: evidence for a role in inflammation in angiotensin-induced vascular injury. *Arterioscler Thromb Vasc Biol.* 2005;25:2106-13. [[PubMed](#)] [[Google Scholar](#)]
45. Samani NJ, Boulton R, Butler R, et al. Telomere shortening in atherosclerosis. *Lancet Lond Engl.* 2001;358:472-3. [[PubMed](#)] [[Google Scholar](#)]
46. Tomiyama H, Shiina K, Matsumoto-Nakano C, et al. The contribution of inflammation to the development of hypertension mediated by increased arterial stiffness. *J Am Heart Assoc Cardiovasc Cerebrovasc Dis.* 2017;6:e005729. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
47. Sanchis P, Ho CY, Liu Y, et al. Arterial ‘inflammaging’ drives vascular calcification in children on dialysis. *Kidney Int.* 2019;95:958-72. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
48. Shintouo CM, Mets T, Beckwee D, et al. Is inflammaging influenced by the microbiota in the aged gut? A systematic review. *Exp Gerontol.* 2020;141:111079. [[PubMed](#)] [[Google Scholar](#)]
49. Biagi E, Franceschi C, Rampelli S, et al. Gut microbiota and extreme longevity. *Curr Biol CB.* 2016;26:1480-5. [[PubMed](#)] [[Google Scholar](#)]

50. Biagi E, Nylund L, Candela M, et al. Through ageing, and beyond: gut microbiota and inflammatory status in seniors and centenarians. *PLoS One*. 2010;5:e10667. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
51. Fransen F, van Beek AA, Borghuis T, et al. Aged gut microbiota contributes to systemical inflammaging after transfer to germ-free mice. *Front Immunol*. 2017;8:1385. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
52. Tang W, Zhu H, Feng Y, et al. The impact of gut microbiota disorders on the blood&brain barrier. *Infect Drug Resist*. 2020;13:3351-63. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
53. Ridker PM, Danielson E, Fonseca FAH, et al. Rosuvastatin to prevent vascular events in men and women with elevated C-reactive protein. *N Engl J Med*. 2008;359:2195-207. [[PubMed](#)] [[Google Scholar](#)]
54. Crittenden DB, Lehmann RA, Schneck L, et al. Colchicine use is associated with decreased prevalence of myocardial infarction in patients with gout. *J Rheumatol*. 2012;39:1458-64. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
55. McClelland RL, Jorgensen NW, Budoff M, et al. 10-year coronary heart disease risk prediction using coronary artery calcium and traditional risk factors: derivation in the MESA (Multi-Ethnic Study of Atherosclerosis) with validation in the HNR (Heinz Nixdorf Recall) study and the DHS (Dallas Heart Study). *J Am Coll Cardiol*. 2015;66:1643-53. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
56. New SEP, Aikawa E. The role of extracellular vesicles in de novo mineralization: an additional novel mechanism of cardiovascular calcification. *Arterioscler Thromb Vasc Biol*. 2013;33:1753-8. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
57. Kalampogias A, Siasos G, Oikonomou E, et al. Basic mechanisms in atherosclerosis: the role of calcium. *Med Chem Shariqah United Arab Emir*. 2016;12:103-13. [[PubMed](#)] [[Google Scholar](#)]
58. Sawabe M. Vascular aging: from molecular mechanism to clinical significance. *Geriatr Gerontol Int*. 2010;10:S213-20. [[PubMed](#)] [[Google Scholar](#)]
59. Mackey RH, Venkitachalam L, Sutton-Tyrrell K. Calcifications, arterial stiffness and atherosclerosis. *Adv Cardiol*. 2007;44:234-44. [[PubMed](#)] [[Google Scholar](#)]
60. Fok P-W, Lanzer P. Media sclerosis drives and localizes atherosclerosis in peripheral arteries. *PLoS One*. 2018;13:e0205599. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
61. Pescatore LA, Gamarra LF, Liberman M. Multifaceted mechanisms of vascular calcification in aging. *Arterioscler Thromb Vasc Biol*. 2019;39:1307-16. [[PubMed](#)] [[Google Scholar](#)]

62. Lanzer P, Boehm M, Sorribas V, et al. Medial vascular calcification revisited: review and perspectives. *Eur Heart J*. 2014;35:1515-25. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
63. London GM, Guérin AP, Marchais SJ, et al. Arterial media calcification in end-stage renal disease: impact on all-cause and cardiovascular mortality. *Nephrol Dial Transplant*. 2003;18:1731-40. [[PubMed](#)] [[Google Scholar](#)]
64. Stary HC. Macrophages, macrophage foam cells, and eccentric intimal thickening in the coronary arteries of young children. *Atherosclerosis*. 1987;64:91-108. [[PubMed](#)] [[Google Scholar](#)]
65. Bennett MR, Sinha S, Owens GK. Vascular smooth muscle cells in atherosclerosis. *Circ Res*. 2016;118:692-702. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
66. Wang JC, Bennett M. Aging and atherosclerosis: mechanisms, functional consequences, and potential therapeutics for cellular senescence. *Circ Res*. 2012;111:245-59. [[PubMed](#)] [[Google Scholar](#)]
67. Virmani R, Kolodgie FD, Burke AP, et al. Lessons from sudden coronary death: a comprehensive morphological classification scheme for atherosclerotic lesions. *Arterioscler Thromb Vasc Biol*. 2000;20:1262-75. [[PubMed](#)] [[Google Scholar](#)]
68. Zhu X-Y, Bentley MD, Chade AR, et al. Early changes in coronary artery wall structure detected by microcomputed tomography in experimental hypercholesterolemia. *Am J Physiol-Heart Circ Physiol*. 2007;293:H1997-2003. [[PubMed](#)] [[Google Scholar](#)]
69. Spagnoli LG, Orlandi A, Mauriello A, et al. Age-dependent increase of rabbit aortic atherosclerosis a morphometric approach. *Pathol - Res Pract* 1992;188:637-42. [[PubMed](#)] [[Google Scholar](#)]
70. Alexopoulos N, Raggi P. Calcification in atherosclerosis. *Nat Rev Cardiol*. 2009;6:681-8. [[PubMed](#)] [[Google Scholar](#)]
71. Gustafson D, Raju S, Wu R, et al. Overcoming barriers. *Arterioscler Thromb Vasc Biol*. 2020;40:1818-29. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
72. Goshua G, Pine AB, Meizlish ML, et al. Endotheliopathy in COVID-19-associated coagulopathy: evidence from a single-centre, cross-sectional study. *Lancet Haematol*. 2020;7:e575-82. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
73. Scialo F, Daniele A, Amato F, et al. ACE2: the major cell entry receptor for SARS-CoV-2. *Lung*. 2020;198:867-77. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]

74. Abassi Z, Higazi AAR, Kinaneh S, et al. ACE2, COVID-19 infection, inflammation, and coagulopathy: missing pieces in the puzzle. *Front Physiol.* 2020;11:1253. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
75. Zou X, Chen K, Zou J, et al. Single-cell RNA-seq data analysis on the receptor ACE2 expression reveals the potential risk of different human organs vulnerable to 2019-nCoV infection. *Front Med.* 2020;14:185-92. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
76. Hamming I, Timens W, Bulthuis MLC, et al. Tissue distribution of ACE2 protein, the functional receptor for SARS coronavirus. A first step in understanding SARS pathogenesis. *J Pathol.* 2004;203:631-7. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
77. Datta PK, Liu F, Fischer T, et al. SARS-CoV-2 pandemic and research gaps: Understanding SARS-CoV-2 interaction with the ACE2 receptor and implications for therapy. *Theranostics.* 2020;10:7448-64. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
78. Wang W, McKinnie SMK, Farhan M, et al. Angiotensin-converting enzyme 2 metabolizes and partially inactivates Pyr-Apelin-13 and Apelin-17. *Hypertension.* 2016;68:365-77. [[PubMed](#)] [[Google Scholar](#)]
79. Galán M, Jiménez-Altayó F. Small resistance artery disease and ACE2 in hypertension: a new paradigm in the context of COVID-19. *Front Cardiovasc Med.* 2020;7:588692. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
80. Turner AJ, Hiscox JA, Hooper NM. ACE2: from vasopeptidase to SARS virus receptor. *Trends Pharmacol Sci.* 2004;25:291-4. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
81. Tan LY, Komarasamy TV, RMT Balasubramaniam V. Hyperinflammatory immune response and COVID-19: a double edged sword. *Front Immunol;* 12:742941. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
82. Clapp BR, Hingorani AD, Kharbanda RK, et al. Inflammation-induced endothelial dysfunction involves reduced nitric oxide bioavailability and increased oxidant stress. *Cardiovasc Res.* 2004;64:172-8. [[PubMed](#)] [[Google Scholar](#)]
83. Palombo C, Kozakova M. Arterial stiffness, atherosclerosis and cardiovascular risk: pathophysiologic mechanisms and emerging clinical indications. *Vasc Pharmacol.* 2016;77:1-7. [[PubMed](#)] [[Google Scholar](#)]
84. Vlachopoulos C, Dima I, Aznaouridis K, et al. Acute systemic inflammation increases arterial stiffness and decreases wave reflections in healthy individuals. *Circulation.* 2005;112:2193-200. [[PubMed](#)] [[Google Scholar](#)]
85. Bouvet C, Moreau S, Blanchette J, et al. Sequential activation of matrix metalloproteinase 9 and transforming growth factor β in arterial

elastocalcinosis. *Arterioscler Thromb Vasc Biol.* 2008;28:856-62.

[[PubMed](#)] [[Google Scholar](#)]

86. Orr AW, Lee MY, Lemmon JA, et al. Molecular mechanisms of collagen isotype-specific modulation of smooth muscle cell phenotype. *Arterioscler Thromb Vasc Biol.* 2009;29:225-31. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]

87. Stepan J, Barodka V, Berkowitz DE, et al. Vascular stiffness and increased pulse pressure in the aging cardiovascular system. *Cardiol Res Pract.* 2011;2011:263585. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]

88. Constantinides P. The role of arterial wall injury in atherogenesis and arterial thrombogenesis. *Zentralblatt Allg Pathol U Pathol Anat.* 1989;135:517-30.

[[PubMed](#)] [[Google Scholar](#)]

89. Davis C, Fischer J, Ley K, et al. The role of inflammation in vascular injury and repair. *J Thromb Haemostasis.* 2003;1:1699-709. [[PubMed](#)] [[Google Scholar](#)]

90. Monteil V, Kwon H, Prado P, et al. Inhibition of SARS-CoV-2 infections in engineered human tissues using clinical-grade soluble human ACE2. *Cell.* 2020;181:905-13. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]

91. Ferrario CM, Jessup J, Chappell MC, et al. Effect of angiotensin-converting enzyme inhibition and angiotensin II receptor blockers on cardiac angiotensin-converting enzyme 2. *Circulation.* 2005;111:2605-10. [[PubMed](#)] [[Google Scholar](#)]

92. Varga Z, Flammer AJ, Steiger P, et al. Endothelial cell infection and endotheliitis in COVID-19. *Lancet Lond Engl.* 2020;395:1417-8. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]

93. Lei Y, Zhang J, Schiavon CR, et al. SARS-CoV-2 spike protein impairs endothelial function via downregulation of ACE2. *BioRxiv Prepr Serv Biol.* 2020. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]

94. Gopal R, Marinelli MA, Alcorn JF. Immune mechanisms in cardiovascular diseases associated with viral infection. *Front Immunol*; 11:570681. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]

95. Gelzo M, Cacciapuoti S, Pinchera B, et al. Matrix metalloproteinases (MMP) 3 and 9 as biomarkers of severity in COVID-19 patients. *Sci Rep.* 2022;12:1212. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]

96. Li T, Li X, Feng Y, et al. The role of matrix metalloproteinase-9 in atherosclerotic plaque instability. *Mediat Inflamm.* 2020;2020:3872367. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]

97. Florence JM, Krupa A, Booshehri LM, et al. Metalloproteinase-9 contributes to endothelial dysfunction in atherosclerosis via protease activated receptor-1. *PLoS One.* 2017;12:e0171427. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]

98. Robles JP, Zamora M, Adan-Castro E, et al. The spike protein of SARS-CoV-2 induces endothelial inflammation through integrin $\alpha 5\beta 1$ and NF- κ B signaling. *J Biol Chem*. 2022;298:101695. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
99. Fatkhullina AR, Peshkova IO, Koltsova EK. The role of cytokines in the development of atherosclerosis. *Biochem Biokhimiia*. 2016;81:1358-70. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
100. Galkina E, Ley K. Vascular adhesion molecules in atherosclerosis. *Arterioscler Thromb Vasc Biol*. 2007;27:2292-301. [[PubMed](#)] [[Google Scholar](#)]
101. Katsuumi G, Shimizu I, Yoshida Y, et al. Vascular senescence in cardiovascular and metabolic diseases. *Front Cardiovasc Med*; 5:18. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
102. Mongelli A, Barbi V, Gottardi Zamperla M, et al. Evidence for biological age acceleration and telomere shortening in COVID-19 survivors. *Int J Mol Sci*. 2021;22:6151. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
103. AlGhatrif M, Tanaka T, Moore AZ, et al. Age-associated difference in circulating ACE2, the gateway for SARS-COV-2, in humans: results from the InCHIANTI study. *GeroScience*. 2021;43:619-27. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
104. Said MA, Eppinga RN, Lipsic E, et al. Relationship of arterial stiffness index and pulse pressure with cardiovascular disease and mortality. *J Am Heart Assoc*; 7:e007621. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]