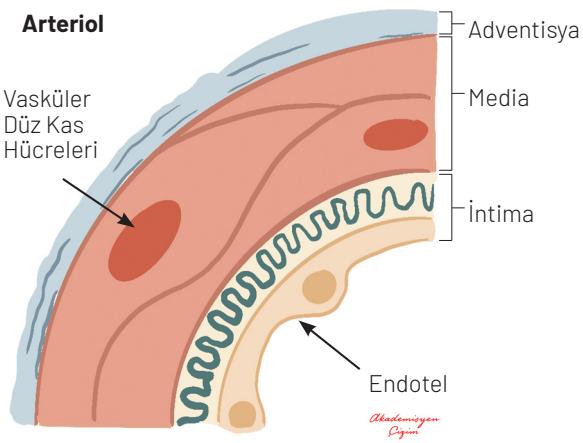
BÖLÜM 1

BİFURKASYON LEZYON ANATOMİSİ VE SINIFLANDIRMASI

Seda TÜKENMEZ KARAKURT
Hüseyin KARAKURT
Abdullah DOĞAN

1.Vasküler Yapı ve Ateroskleroz

Büyük damar yapısında iç tabakada tek sıra endotel hücrelerin oluşturduğu endotel tabakası bulunur. Endotel, kollajen ve elastik fibrillerle birlikte intima tabakasını oluşturmaktadır. Endotel hücreleri; vasküler düz kas hücreleri, elastik ve kollajen dokudan oluşan media tabakası ile yakın temas içindedir. En dışta ise yoğun matriks ve bağ dokusu içeren adventisya tabakası media tabakasını dışarıdan sarar. Arteriol yapısı da media ve adventisya tabakasının daha ince olması dışında benzerdir (Şekil 1.1)(1). Vasküler endotel; kan damarlarının lüminal tarafında yer alan ve dolaşımda bulunan moleküller ve patojenler için ilk bariyeri oluşturan yapıdır (2).



Şekil 1.1: Arteriol damar yapısı.

Sağlık Bilimleri Üniversitesi, İstanbul Mehmet Akif Ersoy Göğüs Kalp ve Damar Cerrahisi Eğitim ve Araştırma Hastanesi, Kardiyoloji Kliniği

Kaynaklar

1. Rhodin J.A. Ultrastructure of mammalian venous capillaries, venules, and small collecting veins. J. Ultrastruct. Res. 1968, 25, 452–500
2. Reitsma S., Slaaf D.W.,Vink H. et al. The endothelial glycocalyx: Composition, functions, and visualization. Pflug. Arch. Eur. J. Physiol. 2007, 454, 345–359.
3. Zhang B.; Gu J.; Qian, et al. Correlation between quantitative analysis of wall shear stress and intima-media thickness in atherosclerosis development in carotid arteries. Biomed. Eng. Online 2017, 16, 137.
4. Gordon E.; Schimmel L.; Frye M. The Importance of Mechanical Forces for in vitro Endothelial Cell Biology. Front. Physiol. 2020, 11, 684
5. Böyum, A. Isolation of mononuclear cells and granulocytes from human blood. Isolation of monuclear cells by one centrifugation, and of granulocytes by combining centrifugation and sedimentation at 1 g. Scand. J. Clin. Lab. Investig. Suppl. 1968, 97, 77–89.
6. Favero G.; Paganelli C.; Buffoli B.; et al. Endothelium and Its Alterations in Cardiovascular Diseases: Life Style Intervention. BioMed Res. Int. 2014, 2014, 801896 .
7. Campinho P.; Vilfan A.; Vermot J. Blood Flow Forces in Shaping the Vascular System: A Focus on Endothelial Cell Behavior. Front. Physiol. 2020, 11, 552
8. Davies P.F. Flow-mediated endothelial mechanotransduction. Physiol. Rev. 1995, 75, 519–560.
9. Esper R.J.; Nordaby R.A.; Vilariño J.O.; et al. Endothelial Dysfunction: A Comprehensive Appraisal. Cardiovasc. Diabetol. 2006, 18, 1–18.
10. Gimbrone M.A., Jr.; García-Cardeña G. Vascular Endothelium, Hemodynamics, and the Pathobiology of Atherosclerosis. Cardiovasc. Pathol. 2013, 22, 9–15.
11. Natural history of aortic and coronary atherosclerotic lesions in youth. Findings from the PDAY Study. Pathobiological Determinants of Atherosclerosis in Youth (PDAY) Research Group. Arter. Thromb. A J. Vasc. Biol. 1993, 13, 1291–1298.
12. Hermida N.; Balligand J.-L. Low-Density Lipoprotein-Cholesterol-Induced Endothelial Dysfunction and Oxidative Stress: The Role of Statins. Antioxid. Redox Signal. 2014, 20, 1216–1237.
13. Mundi S.; Massaro M.; Scoditti E.; et al. Endothelial permeability, LDL deposition, and cardiovascular risk factors—A review. Cardiovasc. Res. 2018, 114, 35–52
14. Yu X.-H.; Fu Y.-C.; Zhang D.-W.; et al. Foam cells in atherosclerosis. Clin. Chim. Acta 2013, 424,245–252.
15. Allahverdian S.; Chehroudi A.C.; McManus,B.M.; et al. Contribution of Intimal Smooth Muscle Cells to Cholesterol Accumulation and Macrophage-Like Cells in Human Atherosclerosis. Circulation 2014, 129, 1551–1559.
16. Stary H.C.; Chandler A.B.; Glagov S.; et al. A definition of initial, fatty streak, and intermediate lesions of atherosclerosis. A report from the Committee on Vascular Lesions of the Council on Arteriosclerosis, American Heart Association. Circulation 1994, 89, 2462–2478.
17. Caro CG, Fitz-Gerald JM, and Schroter RC. Arterial wall shear and distribution of early atheroma in man. Nature 223: 1159–1160, 1969.
18. Cheng C, Tempel D, van Haperen R, et al. Atherosclerotic lesion size and vulnerability are determined by patterns of fluid shear stress. Circulation 113: 2744– 2753, 2006.
19. Cheng C, van Haperen R, de Waard M, et al. Shear stress affects the intracellular distribution of eNOS: Direct demonstration by a novel in vivo technique. Blood 106: 3691–3698, 2005.
20. Huo Y, Wischgoll T, and Kassab GS. Flow patterns in three- dimensional porcine epicardial coronary arterial tree. Am J Physiol Heart Circ Physiol 293: H2959–2970, 2007.
21. Suo J, Oshinski JN, and Giddens DP. Blood flow patterns in the proximal human coronary arteries: relationship to ath- erosclerotic plaque occurrence. Mol Cell Biomech 5: 9–18, 2008.
22. Nakazawa G, Yazdani SK, Finn AV, et al. Pathological findings at bifurcation lesions: the impact of flow distribution on atherosclerosis and arterial healing after stent implantation. J Am Coll Cardiol. 2010 Apr 20;55(16):1679-87. doi: 10.1016/j.jacc.2010.01.021. PMID: 20394871.
23. Stankovic G., Darremont O., Ferenc M., et al. Percutaneous coronary interven- tion for bifurcation lesions: 2008 consensus document from the fourth meeting of the European Bifurcation Club. EuroIntervention 2009; 5(1): 39–49, doi: 10.4244/eijv5i1a8.
24. Serruys PW, Onuma Y, Garg S, et al; ARTS II Investigators. 5-year clinical outcomes of the ARTS II (Arterial Revascularization Therapies Study II) of the sirolimus-eluting stent in the treatment of patients with multivessel de novo coronary artery lesions. J Am Coll Cardiol 2010;55(11):1093–1101
25. Tanabe K, Hoye A, Lemos PA, et al. Restenosis rates following bifurcation stenting with sirolimus-eluting stents for de novo narrowings. Am J Cardiol 2004;94(1):115–118
26. Ge L, Airoldi F, Iakovou I, et al. Clinical and angiographic outcome after implantation of drug-eluting stents in bifur- cation lesions with the crush stent technique: importance of final kissing balloon post-dilation. J Am Coll Cardiol 2005;46(4):613–620
27. Lassen J.F., Holm N.R., Stankovic G., et al. Percutaneous coronary intervention for coronary bifurcation disease: consensus from the first 10 years of the European Bifurcation Club meetings. EuroIntervention 2014; 10(5): 545–560, doi: 10.4244/EIJV10I5A97.
28. Bil J. Przezskórne leczenie zwężeń w bifurkacjach wieńcowych. Anno Do- mini 2015. Kardiol. Inwazyjna 2015; 10(1); 9–14.
29. Hahn JY, Gwon HC, Kwon SU, et al. Comparison of vessel geometry in bifurcation between normal and diseased

seg- ments:intravascular ultrasound analysis. Atherosclerosis 2008;201(2):326–331
30. Foin N, Secco GG, Ghilencea L., et al. Final prox- imal post-dilatation is necessary after kissing balloon in bifurcation stenting. EuroIntervention 2011;7(5):597–604
31. Thomas M., Hildick-Smith D., Louvard Y., et al. Percutaneous coronary intervention for bifurcation disease. A consensus view from the first meeting of the European Bifurcation Club. EuroIntervention 2006; 2(2): 149–153.
32. Lunardi M, Louvard Y, Lefèvre T, et al. Definitions and Standardized Endpoints for Treatment of Coronary Bifurcations. EuroIntervention. 2022 May 18:EIJ-E-22-00018. doi: 10.4244/EIJ-E-22-00018. Epub ahead of print. PMID: 35583108.
33. Medina A, Suarez de Lezo J, Pan M. A new classification of coronary bifurcation lesions. Rev Esp Cardiol. 2006; 59(2):183
34. Latib A, Colombo A. Bifurcation disease: what do we know, what should we do? JACC Cardiovasc Interv. 2008; 1(3):218-226
35. Costa RA, Furuichi S, Lansky AJ, et al. Midterm clinical outcomes from the intravascular ultrasound investigation of the parent vessel and the side branch in coronary bifurcation lesions treatedwith different stenting techniques. J Am Coll Cardiol. 2008; 51:B51
36. Latib A, Moussa I, Sheiban I, et al. When are two stents needed? Which technique is the best? How to perform? EuroIntervention. 2011; 6(Suppl J):J81–J87
37. Hildick-Smith D, Lassen JF, Albiero R, et al. Consensus from the 5th European bifurcation club meeting. EuroIntervention. 2010; 6(1):34–38
38. Chen SL, Sheiban I, Xu B, et al. Impact of the complexity of bifurcation lesions treated with drug-eluting stents: the DEFINITION study (Definitions and impact of complEx biFurcation lesIons on clinical outcomes after percutaNeous coronary IntervenTIOn using drugeluting steNts). JACC Cardiovascular Intervention. 2014;7(11): 1266-1276
39. Kim HY, Doh JH, Lim HS, et al. Identification of coronary artery side branch supplying myocardial mass that may benefit from revascularization. JACC Cardiovasc Interv. 2017; 10(6):571-581
40. Steigen TK, Maeng M, Wiseth R et al. Randomized study on simple versus complexstenting of coronary artery bifurcation lesions: the Nordic bifurcation study. Circulation. 2006; 114(18):1955–1961
41. Pan M, de Lezo JS, Medina A, et al. Rapamycin-eluting stents for the treatment of bifurcated coronary lesions: a randomized comparison of a simple versus complex strategy. Am Heart J. 2004; 148(5):857–864
42. Pan M, Suarez de Lezo J, Medina A, et al. Drug-eluting stents for the treatment of bifurcation lesions: a randomized com- parison between paclitaxel and sirolimus stents. Am Heart J. 2007; 153(1):15e1–15e7
43. Hoye A, Iakovou I, Ge L, et al. Long-term outcomes after stenting of bifurcation lesions with the "crush" technique: predic- tors of an adverse outcome. J Am Coll Cardiol. 2006; 47(10): 1949–1958
44. Thuesen L, Kelbaek H, Klovgaard L, et al. Comparison of sirolimus-eluting and bare metal stents in coronary bifurcation lesions: subgroup analysis of the Stenting Coronary Arteries in Non-Stress/Benestent Disease Trial (SCANDSTENT). Am Heart J. 2006; 152(6):1140–1145
45. Colombo A, Moses JW, Morice MC, et al. Randomized study to evaluate sirolimus-eluting stents implanted at coronary bifurcation lesions. Circulation. 2004; 109(10):1244–1249
46. Chaudhry EC, Dauerman KP, Sarnoski CL, et al. Percutaneous coronary intervention for major bifurcation lesions using the simple approach: risk of myocardial infarction. J Thromb Thrombolysis. 2007; 24(1):7–13
47. Koo BK, Park KW, Kang HJ, et al. Physiological evaluation of the provisional side-branch intervention strategy for bifurcation lesions using fractional flow reserve. Eur Heart J. 2008; 29(6):726–732
48. Furukawa E, Hibi K, Kosuge M, et al. Intravascular ultrasound predic- tors of side branch occlusion in bifurcation lesions after percutaneous coronary intervention. Circ J. 2005; 69(3):325–330
49. Costa RA, Kyono H, Costa M, et al. Coronary artery bifurcation lesions: anatomy. In: Moussa ID, Colombo A (eds) Tips and tricks in interven- tional therapy of coronary bifurcation lesions. 2010, 1st edn. Informa Healthcare, London
50. Hildick-Smith D, Arunothayaraj S, Stankovic G, et al. Percutaneous coronary intervention of bifurcation lesions. EuroIntervention. 2022; 18(4):e273-e291.
51. Ellis SG, Vandormael MG, Cowley MJ, et al. (1990) Coronary morphologic and clinical determinants of procedural outcome with angioplasty for multivessel coronary disease. Implications for patient selection. Multivessel angioplasty prognosis study group. Circulation. 2022; 82(4):1193–1202
52. Lansky A, Tuinenburg J, Costa M, et al. Quantitative angiographic methods for bifurcation lesions: a consensus statement from the European Bifurcation Group. Catheter Cardiovasc Interv. 2009; 73(2):258–266
53. Lefevre T, Louvard Y, Morice MC, et al. Stenting of bifurcation lesions: classification, treatments, and results. Catheter Cardiovasc Interv. 2000; 49(3):274–283.