

16.

BÖLÜM

ALT EKSTREMİTE VE PELVİK ARTERLERDE GİRİŞİMSEL İŞLEMLER

Zeynep Banu AYDIN¹
Ayhan ŞENOL²

ANATOMİ

Embriyonel dönemde alt ekstremiteler internal iliak arterin siyatik dalından çıkan aksiyel arterden beslenir (1). Bu damar gelişmekte olan ayağın plantar yüzünde sonlanır. Femoral arter eksternal iliak arterin devamı olarak uyluğun ön yüzü boyunca uzanır. Diz seviyesinde aksiyel arter ile birleşerek popliteal arteri oluşturur. Posteriyör tibial arter ve peroneal arter diz seviyesinin altında aksiyel arterden orijin alıp kruris posteriyoru boyunca uzanırlar. Anteriyör tibial arter popliteal arterden dallanıp kruris anteriyoru boyunca uzanır. Sonunda yüzeysel femoral arter baskın arter olur. Derin femoral arter femur başı seviyesinin altında ortaya çıkar. Çoğu aksiyel arter doğumdan önce geriler; tek kalıntıları inferiyör gluteal, popliteal ve peroneal arterlerdir.

Abdominal aorta dördüncü ya da beşinci lumbal vertebra seviyesinde ikiye ayrılarak sağ ve sol ana iliak arterleri oluşturur. Ana iliak arterler genellikle dal vermezler; nadiren aberran iliolumbal arter veya aksesuar renal arter dali verebilirler. Lumbosakral bileşke seviyesinde ana iliak arter eksternal ve internal iliak arter olarak ikiye ayrılır.

İnternal iliak arter medial ve posteriyora doğru ilerleyerek anteriyör ve posteriyör olarak iki gruba ayrılır. Hipogastrik arter de denilmektedir. Pelvik visera ve kasların beslenmesini sağlar. Dallanma paterni çeşitlilik gösterebilmektedir.

Anteriyör dallar:

- Obturator arter: Medial femoral sirkümfleks ve inferiyör epigastrik arterlerin dalları ile anastomoz yapar.

¹ Dr. Öğr. Üyesi Zeynep Banu AYDIN, Hitit Üniversitesi Tıp Fakültesi Erol Olçok Eğitim ve Araştırma Hastanesi, Radyoloji AD. zbanu1980@yahoo.com

² Uzm. Dr. Ayhan ŞENOL, SBÜ Gazi Yaşargil Eğitim ve Araştırma Hastanesi, Radyoloji Kliniği, drsenol@hotmail.com

Hastalar 1. hafta, 1. ay, 3. ay ve 6. aylarda kontrole çağrılır. Kronik kalıcı son- dalı hasta grubunda 30-45 gün sonra hasta hala spontan idrar yapamıyorsa iş- lem başarısız kabul edilir. 3. ay kontrolünde prostat hacmi takibi yapılır. Ancak klinik iyileşme her zaman prostat bezi boyutu ile ilişkili değildir. PAE işlemi sı- rasında gelişebilecek komplikasyonlar arasında idrar yolu enfeksiyonu, hematü- ri, hematospermi, üriner retansiyon yer alır. Nadiren vezikal arter diseksiyonu, ürosepsis, fokal mesane duvarı iskemisi gibi majör komplikasyonlar gelişebilir.

KAYNAKLAR

1. Williams PL, Bannister LH, Berry MM, Collins P, Dyson M, Dussek JE, Ferguson MW. Gray's anatomy: The anatomical basis of medicine and surgery (38th Edition). Churchill Livingstone, New York; 1995.
2. Stoyioglou A, Jaff MR. Medical treatment of peripheral arterial disease: a comprehensive review. *J Vasc Interv Radiol.* 2004;15(11): 1197-1207.
3. Rutherford RB, Becker GJ. Standards for evaluating and reporting the results of surgical and percutaneous therapy for peripheral arterial disease. *J Vasc Interv Radiol.* 1991;2(2): 169-174.
4. Rose SC. Noninvasive vascular laboratory for evaluation of peripheral arterial occlusive disease: Part II-clinical applications: chronic, usually atherosclerotic, lower extremity ische- mia. *J Vasc Interv Radiol.* 2000;11(10): 1257-1275.
5. Cambria RP, Kaufman JA, L'Italien GJ, et al. Magnetic resonance angiography in the management of lower extremity arterial occlusive disease: a prospective study. *J Vasc Surg.* 1997;25(2): 380-389.
6. Nelemans PJ, Leiner T, de Vet HC, et al. Peripheral arterial disease: meta-analysis of the diagnostic performance of MR angiography. *Radiology.* 2000;217(1): 105-114.
7. Bertschinger K, Cassina PC, Debatin JF, et al. Surveillance of peripheral arterial bypass grafts with three-dimensional MR angiography: comparison with digital subtraction angiography. *AJR Am J Roentgenol.* 2001;176(1): 215-220.
8. Rubin GD, Shiau MC, Leung AN, et al. Aorta and iliac arteries: single versus multiple dete- ctor-row helical CT angiography. *Radiology.* 2000;215(3): 670-676.
9. Duddalwar VA. Multislice CT angiography: a practical guide to CT angiography in vascular imaging and intervention. *Br J Radiol.* 2004; 77(1): 27-38.
10. Willmann JK, Mayer D, Banyai M, et al. Evaluation of peripheral arterial bypass grafts with multi-detector row CT angiography: comparison with duplex US and digital subtraction angiography. *Radiology.* 2003; 229(2): 465-474.
11. Catalano C, Fraioli F, Laghi A, et al. Infrarenal aortic and lower-extremity arterial disea- se: diagnostic performance of multi-detector row CT angiography. *Radiology.* 2004;231(2): 555-563.
12. Harisinghani M, Chen J, Weissleder R. Primer of Diagnostic Imaging (6th Edition). Else- vier; 2018.
13. Seldinger SI. Catheter replacement of the needle in percutaneous arteriography; a new tech- nique. *Acta Radiol.* 1953;39(5): 368-376.
14. Kalish J, Eslami M, Gillespie D, et al. Routine use of ultrasound guidance in femoral arterial access for peripheral vascular intervention decreases groin hematoma rates. *J Vasc Surg.* 2015;61(5): 1231-1238.
15. Stone PA, Campbell JE, AbuRahma AF. Femoral pseudoaneurysms after percutaneous ac- cess. *J Vasc Surg.* 2014;6 0(5):1359-1366.
16. Guidelines for percutaneous transluminal angioplasty. Society of Interventional Radiology

- Standards of Practice Committee. *J Vasc Interv Radiol.* 2003;14(9 Pt 2): 209-217.
17. Dormandy JA, Rutherford RB. Management of peripheral arterial disease (PAD). TASC Working Group. TransAtlantic Inter-Society Consensus (TASC). *J Vasc Surg.* 2000;31(1 Pt 2): 1-296.
 18. Schillinger M, Exner M, Mlekusch W, et al. Vascular inflammation and percutaneous transluminal angioplasty of the femoropopliteal artery: association with restenosis. *Radiology.* 2002;225(1): 21-26.
 19. Percutaneous transluminal angioplasty. American Medical Association. Council on Scientific Affairs, *JAMA.* 1984;251(6): 764-768.
 20. Connors III JJ, Wojak JC. *Interventional Neuroradiology, Strategies and Practical Techniques* (1st Edition). Philadelphia: W.B. Saunders; 1999.
 21. Consigny PM, Cragg AH, Waller BF. *Pathophysiology of vascular intervention, Vascular diseases* (1st Edition), Churchill Livingstone, New York; 1994.
 22. Castaneda-Zuniga WR, Formanek A, Tadavarthy M, et al. The mechanism of balloon angioplasty. *Radiology.* 1980;135(3): 565-571.
 23. Dotter CT. Transluminally placed coil spring endarterial tube grafts-long term patency in canine popliteal artery. *Invest Radiol.* 1969;4(5): 329-332.
 24. Gruntzig A. Transluminal dilatation of coronary-artery stenosis. *Lancet.* 1978;1(8058): 263.
 25. Bosch JL, Hunink MG. Meta-analysis of the results of percutaneous transluminal angioplasty and stent placement for aortoiliac occlusive disease. *Radiology.* 1997;204(1): 87-96.
 26. Johnston KW. Iliac arteries: reanalysis of results of balloon angioplasty. *Radiology.* 1993;186(1): 207-212.
 27. Tetteroo E, van Engelen AD, Spithoven JH, et al. Stent placement after iliac angioplasty: comparison of hemodynamic and angiographic criteria. *Radiology.* 1996;201(1): 155-159
 28. Henry M, Amor M, Ethevenot G, et al. Palmaz stent placement in iliac and femoropopliteal arteries: primary and secondary patency in 310 patients with 2-4 year follow-up. *Radiology.* 1995;197(1): 167-174.
 29. Murphy KD, Encarnacion CE, Le VA, et al. Iliac artery stent placement with the Palmaz stent: follow-up study. *J Vasc Interv Radiol.* 1995;6(3): 321-329.
 30. Sapoval MR, Chatellier G, Long AL, et al. Self-expandable stents for the treatment of iliac artery obstructive lesions: long-term success and prognostic factors. *AJR Am J Roentgenol.* 1996;166(5): 1173-1179.
 31. Leung DA, Spinosa DJ, Hagspiel KD, et al. Selection of stents for treating iliac arterial occlusive disease. *J Vasc Interv Radiol.* 2003;14 (2 Pt 1): 137-152.
 32. Palmaz JC, Laborde JC, Rivera FJ, et al. Stenting of the iliac arteries with the Palmaz stent: experience from a multicenter trial. *Cardiovasc Intervent Radiol.* 1992;15(5): 291-297.
 33. Murphy TP, Ariaratnam NS, Carney WI Jr, et al. Aortoiliac insufficiency: long-term experience with stent placement for treatment. *Radiology.* 2004;231(1): 243-249.
 34. Laborde JC, Palmaz JC, Rivera FJ, et al. Influence of anatomic distribution of atherosclerosis on the outcome of revascularization with iliac stent placement. *J Vasc Interv Radiol.* 1995;6(4): 513-521.
 35. Jens S, Conijn AP, Koelemay MJW, et al. Randomized trials for endovascular treatment of infrainguinal arterial disease: systematic review and meta-analysis (Part I: Above the knee). *Eur J Vasc Endovasc Surg.* 2014; 47(5): 524-535.
 36. Johnston KW. Femoral and popliteal arteries: reanalysis of results of balloon angioplasty. *Radiology.* 1992;183(3): 767-771.
 37. Matsi PJ, Manninen HI. Impact of different patency criteria on longterm results of femoropopliteal angioplasty: analysis of 106 consecutive patients with claudication. *J Vasc Interv Radiol.* 1995;6(2): 159-163.
 38. Clark TW, Groffsky JL, Soulen MC. Predictors of long-term patency after femoropopliteal angioplasty: results from the STAR registry. *J Vasc Interv Radiol.* 2001;12(8): 923-933.
 39. Jamsen TS, Manninen HI, Jaakkola PA, et al. Long-term outcome of patients with claudica-

- tion after balloon angioplasty of the femoropopliteal arteries. *Radiology*. 2002;225(2): 345-352.
40. Bakal CW, Cynamon J, Sprayregen S. Infrapopliteal percutaneous transluminal angioplasty: what we know. *Radiology*. 1996;200(1): 36-43.
 41. Bull PG, Mendel H, Hold M, et al. Distal popliteal and tibioperoneal transluminal angioplasty: long-term follow-up. *J Vasc Interv Radiol*. 1992;3(1): 45-53.
 42. Brown KT, Moore ED, Getrajdman GI, et al. Infrapopliteal angioplasty: long-term follow-up. *J Vasc Interv Radiol*. 1993;4(1): 139-144.
 43. Söder HK, Manninen HI, Jaakkola P, et al. Prospective trial of infrapopliteal artery balloon angioplasty for critical limb ischemia: angiographic and clinical results. *J Vasc Interv Radiol*. 2000;11(8): 1021-1031.
 44. Karalis DG, Quinn V, Victor MF, et al. Risk of catheter-related emboli in patients with atherosclerotic debris in the thoracic aorta. *Am Heart J*. 1996;131(6): 1149-1455.
 45. Matchett WJ, McFarland DR, Eidt JF, et al. Blue toe syndrome: treatment with intra-arterial stents and review of therapies. *J Vasc Interv Radiol*. 2000;11(5): 585-592.
 46. Razavi MK, Lee DS, Hofmann LV. Catheter-directed thrombolytic therapy for limb ischemia: current status and controversies. *J Vasc Interv Radiol*. 2003;14(12): 1491-1501.
 47. Weaver FA, Comerota AJ, Youngblood M, et al. Surgical revascularization versus thrombolysis for nonembolic lower extremity native artery occlusions: results of a prospective randomized trial. The STILE Investigators. Surgery versus Thrombolysis for Ischemia of the Lower Extremity. *J Vasc Surg*. 1996;24(4): 513-523.
 48. Ouriel K, Veith FJ, Sasahara AA. A comparison of recombinant urokinase with vascular surgery as initial treatment for acute arterial occlusion of the legs: Thrombolysis or Peripheral Arterial Surgery (TOPAS) Investigators. *N Engl J Med*. 1998;338(16): 1105-1111.
 49. Patel N, Sacks D, Patel RI, et al. SIR reporting standards for the treatment of acute limb ischemia with use of transluminal removal of arterial thrombus. *J Vasc Interv Radiol*. 2003;14(9 Pt 2): 453-465.
 50. Kessel DO, Berridge DC, Robertson I. Infusion techniques for peripheral arterial thrombolysis. *Cochrane Database Syst Rev*. 2004;(1):CD000985.
 51. Thrombolysis in the management of lower limb peripheral arterial occlusion-a consensus document. Working Party on Thrombolysis in the Management of Limb Ischemia. *Am J Cardiol*. 1998;81(2): 207-218.
 52. Ouriel K, Shortell CK, Azodo MV, et al. Acute peripheral arterial occlusion: predictors of success in catheter-directed thrombolytic therapy. *Radiology*. 1994;193(2): 561-566.
 53. McNamara TO, Fischer JR. Thrombolysis of peripheral arterial and graft occlusions: improved results using high-dose urokinase. *AJR Am J Roentgenol*. 1985;144(4): 769-775.
 54. Karnabatidis D, Spiliopoulos S, Tsetis D, et al. Quality improvement guidelines for percutaneous catheter-directed intra-arterial thrombolysis and mechanical thrombectomy for acute lower-limb ischemia. *Cardiovasc Intervent Radiol*. 2011;34(6): 1123-1136.
 55. Sullivan KL, Gardiner GA Jr, Kandarpa K, et al. Efficacy of thrombolysis in infrainguinal by-pass grafts. *Circulation*. 1991;83(2): 99-105.
 56. Vorwerk D. Mechanical thrombectomy is an alternative way to go: the European experience commentary on: quality improvement guidelines for percutaneous management of acute limb ischemia. *Cardiovasc Intervent Radiol*. 2006;29(1): 7-10.
 57. Wagner HJ, Starck EE. Acute embolic occlusions of the infrainguinal arteries: percutaneous aspiration embolectomy in 102 patients. *Radiology*. 1992;182(2): 403-407.
 58. Fraser SCA, Al-Kutoubi MA, Wolfe JH. Percutaneous transluminal angioplasty of the infra-popliteal vessels: the evidence. *Radiology*. 1996;200(1): 33-36.
 59. Hinchliffe RC, Andros G, Apelqvist J, et al. A systematic review of effectiveness of revascularization of the ulcerated foot in patients with diabetes and peripheral arterial disease. *Diabetes Metab Res Rev*. 2012;28(1): 179-217.
 60. Bakker K, Apelqvist J, Schaper NC, International Working Group on Diabetic Foot Editorial

- Board. Practical guidelines on the management and prevention of the diabetic foot 2011. *Diabetes Metab Res Rev*. 2012;28(1): 225-231.
61. Adam DJ, Beard JD, Cleveland T, et al. Bypass versus angioplasty in severe ischaemia of the leg (BASIL): multicentre, randomised controlled trial. *Lancet*. 2005;366(9501): 1925-1934.
 62. Bradbury AW, BASIL trial Investigators and Participants. Bypass versus Angioplasty in Severe Ischemia of the Leg (BASIL) trial in perspective. *J Vasc Surg*. 2010;51(5): 1-4.
 63. Romiti M, Albers M, Brochado-Neto FC, et al. Meta-analysis of infrapopliteal angioplasty for chronic critical limb ischemia. *J Vasc Surg*. 2008;47(5): 975-981.
 64. Norgren L, Hiatt WR, Dormandy JA, et al. Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC II). *Eur J Vasc Endovasc Surg*. 2007;33(1): 1-75.
 65. Hafez HM, Woolgar J, Robbs JV. Lower extremity arterial injury: results of 550 cases and review of risk factors associated with limb loss. *J Vasc Surg*. 2001;33(6): 1212-1219.
 66. Britt LD, Weireter LJ, Cole FJ. Newer diagnostic modalities for vascular injuries: the way we were, the way we are. *Surg Clin North Am*. 2001;81(6): 1263-1279.
 67. Schwartz MR, Weaver FA, Bauer M, et al. Redefining the indications for arteriography in penetrating extremity trauma: a prospective analysis. *J Vasc Surg*. 1993;17(1): 116-122.
 68. Marin ML, Veith FJ, Panetta TF, et al. Transluminally placed endovascular stented graft repair for arterial trauma. *J Vasc Surg*. 1994;20(3): 466-472.
 69. Levien LJ. Popliteal artery entrapment syndrome. *Semin Vasc Surg*. 2003;16(3): 223-231.
 70. Erdoes LS, Devine JJ, Bernhard VM, et al. Popliteal vascular compression in a normal population. *J Vasc Surg*. 1994;20(6): 978-986.
 71. Konez O, Burrows PE. Magnetic resonance of vascular anomalies. *Magn Reson Imaging Clin N Am*. 2002;10(2): 363-388.
 72. Laor T, Burrows PE, Hoffer FA. Magnetic resonance venography of congenital vascular malformations of the extremities. *Pediatr Radiol*. 1996;26(6): 371-380.
 73. Dubois J, Garel L. Imaging and therapeutic approach of hemangiomas and vascular malformations in the pediatric age group. *Pediatr Radiol*. 1999;29(12): 879-893.
 74. White RI Jr, Pollak J, Persing J, et al. Long-term outcome of embolotherapy and surgery for high-flow extremity arteriovenous malformations. *J Vasc Interv Radiol*. 2000;11(10): 1285-1295.
 75. Burrows PE, Mason KP. Percutaneous treatment of low flow vascular malformations. *J Vasc Interv Radiol*. 2004;15(5): 431-445.
 76. Tan KT, Simons ME, Rajan DK, et al. Peripheral high-flow arteriovenous vascular malformations: a single-center experience. *J Vasc Interv Radiol*. 2004;15(10): 1071-1080.
 77. Pollak JS, White RI Jr. The use of cyanoacrylate adhesives in peripheral embolization. *J Vasc Interv Radiol*. 2001;12(8): 907-913.
 78. Castaneda F, Goodwin SC, Swischuk JL, et al. Treatment of pelvic arteriovenous malformations with ethylene vinyl alcohol copolymer (Onyx). *J Vasc Interv Radiol*. 2002;13(5): 513-516.
 79. Goodwin SC, Vedantham S, McLucas B, et al. Preliminary experience with uterine artery embolization for uterine fibroids. *J Vasc Interv Radiol*. 1997;8(4): 517-526.
 80. Pelage J, Julien C, Pluot E, et al. Uterine fibroid vascularization and clinical relevance to uterine fibroid embolization. *Radiographics*. 2005;25(1): 99-117.
 81. Ghai S, Rajan DK, Benjamin MS, et al. Uterine artery embolization for leiomyomas: pre and post procedural evaluation with US. *Radiographics*. 2005;25(5): 1159-1172.
 82. Levin RM, Haugaard N, O'Connor L, et al. Obstructive response of human bladder to BPH vs. rabbit bladder response to partial outlet obstruction: a direct comparison. *Neurourol Urodyn*. 2000;19(5): 609-629.
 83. DeMeritt JS, Elmasri FF, P'Esposito M, et al. Relief of benign prostatic hyperplasia-related bladder outlet obstruction after transarterial polyvinyl alcohol prostate embolization. *J Vasc Interv Radiol*. 2000;11(6): 767-770.
 84. Sun F, Sánchez FM, Crisóstomo V, et al. Benign prostatic hyperplasia: transcatheter arterial

- embolization as potential treatment- preliminary study in pigs. *Radiology*. 2008;246(3): 783-789.
85. Haanen C, Vermes I. Apoptosis and inflammation. *Mediators Inflamm*. 1995;4(1): 5-15.
 86. Carnevale FC, Antunes AA. Prostatic artery embolization for enlarged prostates due to benign prostatic hyperplasia. How I do it. *Cardiovasc Intervent Radiol*. 2013;36(6): 1452-1463.
 87. Mirakhur A, McWilliams JP. Prostate Artery Embolization for Benign Prostatic Hyperplasia: Current Status. *Can Assoc Radiol J*. 2017;68(1): 84-89.
 88. Pisco J, Campos Pinheiro L, Bilhim T, et al. Prostatic arterial embolization for benign prostatic hyperplasia: short and intermediate term results. *Radiology*. 2013;266(2): 668-677.
 89. Carnevale FC, da Motta-Leal-Filho JM, Antunes AA, et al. Quality of life and clinical symptom improvement support prostatic artery embolization for patients with acute urinary retention caused by benign prostatic hyperplasia. *J Vasc Interv Radiol*. 2013;24(4): 535-542.
 90. Bagla S, Martin CP, van Breda A, et al. Early results from a United States trial of prostatic artery embolization in the treatment of benign prostatic hyperplasia. *J Vasc Interv Radiol*. 2014;25(1): 47-52.