

CHAPTER 4

THORACAL AORTIC DISSECTION

Mücahit DEMİRTAŞ¹

INTRODUCTION

Aortic dissection; It is defined as the displacement of the intima layer by pushing along the course of blood flow by separating the intima and media layers as a result of tearing in the media layer of the aorta (1). Despite innovations in diagnosis and treatment and advances in technology, the mortality-morbidity rate is still one of the cardiac emergencies. It can have negative consequences that affect many organs and systems. Malperfusion, which results in malnutrition of tissues and organs, causes significant problems and is seen in 16-33 % (2-4).

History

About 250 years ago, the cause of death of George the second king of England was stated as dissection by Maunoir, and the existence of this pathology was accepted by making a clear definition (5,6). Laennec used the term "dissecting aneurysm" by stating that dissection was seen early in the formation of aneurysm in the first quarter of the 19th century (7). The definition of cystic medial necrosis was described by Erdheim in 1930 (8). Davy and Gates made the first radiological definition (9). The first successful operations in this area were also made in the 20th century (10-12).

¹ MD. Department of Cardiovascular Surgery; KTO Karatay University, Medicana Medical Faculty Hospital, demirtasmucahit@hotmail.com

fore in patients with aortic dissection who have significant comorbidities and are not suitable for open surgical treatment (58). The endovascular treatment strategy is described in detail in the relevant section.

Deeb et al. reported that the risk of surgical death was approximately 90% in patients with acute type A dissection who developed circulatory disorders. And they stated that cardiopulmonary bypass, hypothermic circulatory arrest and excessive blood transfusion were the reason for this high rate (2). In acute dissection, the presence or absence of intraluminal thrombus is not an obstacle for emergency surgical treatment. Patients with subacute and chronic aortic dissection should also be treated electively within the framework of their current risk factors, clinical conditions, and regulated medical treatments (33). While continuing the debate on the place of surgical treatment for patients with acute distal aortic dissection, the current practice is to follow up closely in the intensive care unit under medical treatment (61-67). In acute type B dissection, since the vessel wall is thin and easily torn, it may not be transferred to the graft to be interposed. It is preferred that the diameter of the graft to be used is slightly smaller than the diameter of the aorta in order to prevent distal aneurysm formation (33).

REFERENCES

- Coselli JS, Köksoy C: Aortic Dissections. In: Franco KL, Verrier ED: Advanced Therapy in Cardiac Surgery Eds. BC Decker Inc 1999 (32); p 296-310
- Deeb GM, Williams DM, Bolling SF, Quint LE, Monaghan H, Sievers J, et all. Surgical delay for acute type A dissection with malperfusion. Ann Thorac Surg. 1997 Dec;64(6):1669-1775; discussion 1675-1677.
- Toda R, Moriyama Y, Masuda H, Iguro Y, Yamaoka A, Taira A. Organ malperfusion in acute aortic dissection. Jpn J Thorac Cardiovasc Surg. 2000 Sep;48(9):545-550.
- Müller BT, Grabitz K, Fürst G, Sandmann W. Die akute Aortendissektion. Diagnostik und Therapie von ischämischen Komplikationen [Acute aortic dissection. Diagnosis and therapy of ischemic complications]. Chirurg. 2000 Feb;71(2):209-214. German.
- Leonard JC. Thomas Bevill Peacock and the early history of dissecting aneurysm. Br Med J. 1979 Jul 28;2(6184):260-262.
- 6. Maunoir JP. Memoires Physiologiques et Practiques sur L'aneurys me et la Ligatüre des Arteres. Geneva, J.J. Paschoud, 1802.
- Laennec RTH. De L'auscultation Médiate ou Traité du Diagnostic des Maladies des Poumons et du Coeur, Fonde Principalemente sur ce Nouveau Moyen D'esploration. Paris, Brosson & Chaudé, 1819.

- 8. Erdheim J. Medionecrosis aortae idiopathica cystica. Virchows Arch Pathol Anat Physiol, 1930;276:187.
- 9. Davy H, Gates M. A case of dissecting aneurysm of the aorta. Br Med J. 1922 Mar 25;1(3195):471-466.2.
- De Bakey ME, Henly WS, Cooley DA, Morris GC, Crawford ES, Beall AC. Surgical management of dissecting aneurysms of the aorta. The Journal of Thoracic and Cardiovascular Surgery. Volume 49, Issue 1, January 1965, Pages: 130-149.
- 11. Abbott OA. Clinical experiences with the application of polythene cellophane upon the aneurysms of the thoracic vessels. J Thorac Surg. 1949 Aug;18(4):435-461.
- 12. DeBakey ME, Cooley DA, Creech O Jr. Surgical considerations of dissecting aneurysm of the aorta. Ann Surg. 1955 Oct;142(4):586-610; discussion, 611-612.
- 13. Mészáros I, Mórocz J, Szlávi J, Schmidt J, Tornóci L, Nagy L, et all. Epidemiology and clinicopathology of aortic dissection. Chest. 2000 May;117(5):1271-1278.
- 14. Clouse WD, Hallett JW Jr, Schaff HV, Spittell PC, Rowland CM, Ilstrup DM, et all. Acute aortic dissection: population-based incidence compared with degenerative aortic aneurysm rupture. Mayo Clin Proc. 2004 Feb;79(2):176-180.
- 15. Nienaber CA, Fattori R, Mehta RH, Richartz BM, Evangelista A, Petzsch M, et all. International Registry of Acute Aortic Dissection. Gender-related differences in acute aortic dissection. Circulation. 2004 Jun 22;109(24):3014-3021.
- Hagan PG, Nienaber CA, Isselbacher EM, Bruckman D, Karavite DJ, Russman PL, et all. The International Registry of Acute Aortic Dissection (IRAD): new insights into an old disease. JAMA. 2000 Feb 16;283(7):897-903.
- 17. Hiratka LF, Bacris GL, Becman JA, Bersin RM, Carr VF, Casey DE Jr, et all. 2010 ACCF/AHA/AATS/ACR/ASA/SCA/SCAI/SIR/STS/SVM. Guidelines for the diagnosis and management of patients with thoracic aortic disease: Executive Summary. J Am Coll Cardiol 2010;55:e27-129.
- Larson EW, Edwards WD. Risk factors for aortic dissection: a necropsy study of 161 cases. Am J Cardiol. 1984 Mar 1;53(6):849-55.
- Marsalese DL, Moodie DS, Lytle BW, Cosgrove DM, Ratliff NB, Goormastic M, Kovacs A. Cystic medial necrosis of the aorta in patients without Marfan's syndrome: surgical outcome and long-term follow-up. J Am Coll Cardiol. 1990 Jul;16(1):68-73.
- 20. He R, Guo DC, Estrera AL, Safi HJ, Huynh TT, Yin Z, et all. Characterization of the inflammatory and apoptotic cells in the aortas of patients with ascending thoracic aortic aneurysms and dissections. The Journal of Thoracic and Cardiovascular Surgery, 2006;131(3), 671–678.
- 21. Tang PC, Coady MA, Lovoulos C, Dardik A, Aslan M, Elefteriades JA, et all. Hyperplastic cellular remodeling of the media in ascending thoracic aortic aneurysms. Circulation. 2005 Aug 23;112(8):1098-105.
- 22. De Paepe A, Devereux RB, Dietz HC, Hennekam R, Pyeritz R. Revised diagnostic criteria for the Marfan syndrome. American Journal Of Medical Genetics. 1996;62(4):417–426.
- 23. Braverman AC, Güven H, Beardslee MA, Makan M, Kates AM, Moon MR. The bicuspid aortic valve. Curr Probl Cardiol. 2005 Sep;30(9):470-522.

- 24. Hirst AE, Gore I: The etiology and pathology of aortic dissection. P. 13. In Doroghazi RM, Slater EE (eds): Aortic Dissection. McGraw-Hill, New York , 1983.
- Svensson LG, Crawford ES. Aortic dissection and aortic aneurysm surgery: clinical observations, experimental investigations, and statistical analyses. Part II. Curr Probl Surg. 1992 Dec;29(12):913-1057.
- 26. Reece TB, Green GR, Kron IL. Aortic dissection. In: Cohn LH, editör. Cardiac Surgery in the Adult. Newyork, NY: McGraw-Hill, 2008;1195-1222.
- 27. O'Gara PT, DeSanctis RW. Acute aortic dissection and its variants. Toward a common diagnostic and therapeutic approach. Circulation. 1995;92:1376-1378.
- 28. Nienaber CA, Sievers HH. "Intramural hematoma in acute aortic syndrome: more than one variant of dissection?" Circulation. 2002;106:284-285.
- 29. Moizumi Y, Komatsu T, Motoyoshi N, Tabayashi K. Clinical features and longterm outcome of type A and type B intramural hematoma of the aorta. J Thorac Cardiovasc Surg 2004;127:421-427.
- 30. Choi SH, Choi SJ, Kim JH, Bae SJ, Lee JS, Song KS, et all. Useful CT Findings for Predicting the Progression of Aortic Intramural Hematoma to Overt Aortic Dissection. Journal of Computer Assisted Tomography 2001;25:295-299.
- Moriyama Y, Yotsumoto G, Kuriwaki K, Watanabe SI, Hisatomi K, Shimokawa S, et all. Intramural hematoma of the thoracic aorta. European journal of cardio-thoracic surgery official journal of the European Association for Cardio-thoracic Surgery 1998;13:230-239.
- Kaji S, Akasaka T, Horibata Y, Nishigami K, Shono H, Katayama M, et all. Long-Term Prognosis of Patients With Type A Aortic Intramural Hematoma. Circulation. 2002;106:1248-1252.
- 33. Yağdı T, Engin Ç, Ayık MA. Aort diseksiyonları, Paç M, Akçevin A, Aka A, Büket S, Sarıoğlu T editörler. Kalp ve damar cerrahisi 2. Baskı. Ankara: MN Medikal & Nobel tıp kitap sarayı. 2013;1363-1383.
- 34. Erbel R, Alfonso F, Boileau C, Dirsch O, Eber B, Haverich A, et all. Task Force on Aortic Dissection, European Society of Cardiology. Diagnosis and management of aortic dissection. Eur Heart J. 2001 Sep;22(18):1642-1681.
- 35. FLempel JK, Frazier AA, Jeudy J, Kligerman SJ, Schultz R, Ninalowo HA et al. Aortic arch dissection: a controversy of classification. Radiology 2014;271:848–55
- 36. Park SW, Hutchison S, Mehta RH, Isselbacher EM, Cooper JV, Fang J, et all. Association of painless acute aortic dissection with increased mortality. Mayo Clin Proc. 2004 Oct;79(10):1252-1257.
- 37. Klompas M. "Does this patient have an acute thoracic aortic dissection?" JAMA 287 17 (2002): 2262-2272.
- Nallamothu BK, Mehta RH, Saint S, Llovet A, Bossone E, Cooper JV, et all. Syncope in acute aortic dissection: diagnostic, prognostic, and clinical implications. Am J Med. 2002 Oct 15;113(6):468-471.
- 39. von Kodolitsch Y, Schwartz AG, Nienaber CA. Clinical prediction of acute aortic dissection. Archives of internal medicine, 2000;160:2977-2982.

- 40. Miller DC, Stinson EB, Oyer PE, Rossiter SJ, Reitz BA, Griepp RB, et all. Operative treatment of aortic dissections. Experience with 125 patients over a sixteen-year period. J Thorac Cardiovasc Surg. 1979 Sep;78(3):365-82.
- Yağdı T, Atay Y, Engin Ç, Mahmudov R, Tetik O, Iyem H, et all. Impact of Organ Malperfusion on Mortality and Morbidity in Acute Type A Aortic Dissections. Journal of Cardiac Surgery, 2006;21:363-369.
- 42. Henke PK, Williams DM, Upchurch GR Jr, Proctor M, Cooper JV, Fang J, et all. Acute limb ischemia associated with type B aortic dissection: clinical relevance and therapy. Surgery. 2006 Oct;140(4):532-539; discussion 539-540.
- 43. Coselli JS, Crawford ES. Composite aortic valve replacement and graft replacement of the ascending aorta plus coronary ostial reimplantation: how I do it. Semin Thorac Cardiovasc Surg. 1993 Jan;5(1):55-62.
- 44. Anagnostopoulos CE, Prabhakar MJS, Kittle CF. Aortic dissections and dissecting aneurysms. Am J Cardiol 1972;30:263-273.
- 45. Erbel R, Aboyans V, Boileau C, Bossone E, Bartolomeo RD, Eggebrecht H et al. 2014 ESC guidelines on the diagnosis and treatment of aortic diseases: document covering acute and chronic aortic diseases of the thoracic and abdominal aorta of the adult: the Task Force for the Diagnosis and Treatment of Aortic Diseases of the European Society of Cardiology (ESC). Eur Heart J. 2014;35:2873–2926.
- 46. Patel PD. and Arora RR. Pathophysiology, diagnosis, and management of aortic dissection. Therapeutic Advances in Cardiovascular Disease. 2(6): 439-468.
- 47. Gregorio MC, Baumgartner FJ, Omari BO. The presenting chest roentgenogram in acute type A aortic dissection: a multidisciplinary study. Am Surg. 2002 Jan;68(1):6-10.
- 48. Von Kodolitsch Y, Nienaber CA, Dieckmann C, Schwartz AG, Hofmann T, Brekenfeld C, et all. Chest radiography for the diagnosis of acute aortic syndrome. Am J Med. 2004 Jan 15;116(2):73-77.
- 49. Svensson LG, Labib SB, Eisenhauer AC, Butterly JR. Intimal tear without hematoma: an important variant of aortic dissection that can elude current imaging techniques. Circulation. 1999 Mar 16;99(10):1331-1336.
- Smith DC, Jang CG. Radiologic diagnosis of aortic dissection. p. 71. In Doroghazi RM, Slater EE (eds): Aortic Dissections. McGraw-Hill. New York, 1983.
- 51. Pearson AC, Castello R, Labovitz AJ. Safety and utility of transesophageal echocardiography in the critically ill patient. Am Heart J. 1990 May;119(5):1083-1089.
- 52. Shiga T, Wajima Z, Apfel CC, Inoue T, Ohe Y. Diagnostic accuracy of transesophageal echocardiography, helical computed tomography, and magnetic resonance imaging for suspected thoracic aortic dissection: systematic review and meta-analysis. Arch Intern Med. 2006 Jul 10;166(13):1350-6.
- 53. Sommer T, Fehske W, Holzknecht N, Smekal AV, Keller E, Lutterbey G, et all. Aortic dissection: a comparative study of diagnosis with spiral CT, multiplanar transesophageal echocardiography, and MR imaging. Radiology. 1996 May; 199(2):347-352.
- 54. Yoshida S, Akiba H, Tamakawa M, Yama N, Hareyama M, Morishita K, et all. Thoracic involvement of type A aortic dissection and intramural hematoma:

diagnostic accuracy--comparison of emergency helical CT and surgical findings. Radiology. 2003 Aug;228(2):430-435.

- 55. Bansal RC, Chandrasekaran K, Ayala K, Smith DC. Frequency and explanation of false negative diagnosis of aortic dissection by aortography and transesophageal echocardiography. J Am Coll Cardiol. 1995 May;25(6):1393-401.
- 56. Weintraub AR, Schwartz SL, Pandian NG, Katz SE, Kwon OJ, Millan V, et all. Evaluation of acute aortic dissection by intravascular ultrasonography. N Engl J Med. 1990 Nov 29;323(22):1566-1567.
- 57. Crawford ES, Coselli JS, Svensson LG, Safi HJ, Hess KR. Diffuse aneurysmal disease (chronic aortic dissection, Marfan, and mega aorta syndromes) and multiple aneurysm. Treatment by subtotal and total aortic replacement emphasizing the elephant trunk operation. Ann Surg. 1990 May;211(5):521-537.
- 58. Özyaprak B, Yılmaz C, Karaca Ü, Ata F, Ata Y, Gamlı M, et all. Our anesthesia experience in patients with aortic pathologies who underwent endovascular treatment. Annals Of Clinical And Analytical Medicine, 2020;cilt.11:335-339.
- 59. Maraj R, Rerkpattanapipat P, Jacobs LE, Makornwattana P, Kotler MN. Metaanalysis of 143 reported cases of aortic intramural hematoma. Am J Cardiol. 2000 Sep 15;86(6):664-668.
- Januzzi JL, Movsowitz HD, Choi J, William B. Abernethy and Eric M. Isselbacher. "Significance of recurrent pain in acute type B aortic dissection." The American journal of cardiology 87 7 (2001): 930-933.
- 61. Miller DC, Mitchell RS, Oyer PE, Stinson EB, Jamieson SW and Shumway NE. "Independent determinants of operative mortality for patients with aortic dissections." Circulation 70 3 Pt 2 (1984): 1153-164.
- 62. Ergin MA, Lansman SL, Griepp RB: Acute dissections of the aorta. Cardiac Surgery: State of the Art Re- views, 1987.1:377-391.
- 63. Bojar RM. Aortic dissections. In:Bojar RM, Ed. Adult Cardiac Surgery. Boston, Blackwell Scientific Publications, 1992;pp:240-272.
- 64. Schor JS, Yerlioglu ME, Galla JD, Steven Lansman, M. Arisan Ergin and Randall B. Griepp. "Selective management of acute type B aortic dissection: long-term followup." The Annals of thoracic surgery 61 5 (1996):1339-1341.
- 65. Iguchi A, Tabayashi K. "Outcome of medically treated Stanford type B aortic dissection." Japanese circulation journal 62 2 (1998): 102-105.
- 66. Safi HJ, Miller CC III. Thoracic vasculature, in Townsed C (ed): Textbook of Surgery (16th ed). Philadelphia, PA, Saunders, 2001;pp:1313-1338.
- 67. Wheat MW Jr. Current status of medical therapy of acute dissecting aneurysms of the aorta. World J Surg 2001;4:563-569.