

Surgical treatment of aortic dissection occurring during coronary angioplasty: a report of two cases

Koroner anjiyoplasti sırasında gelişen aort disseksiyonunun cerrahi tedavisi: İki olgu sunumu

Levent Yılık, Banu Lafcı, İbrahim Özsöyler, Bilgin Emreca, Ali Gürbüz

Department of Cardiovascular Surgery, İzmir Atatürk Training and Research Hospital, İzmir

Iatrogenic acute dissections of the ascending aorta following percutaneous vascular interventions are rare. Although patients with limited aortic involvement can be treated with stenting of the entry site of the coronary dissection, hemodynamically unstable patients with aortic dissection of retrograde extension to the aorta require surgical intervention. We presented two patients who underwent successful operative treatment for coronary dissections with retrograde extension to the ascending aorta, which occurred as a complication of coronary angioplasty.

Key words: Aneurysm, dissecting/surgery; angioplasty/complications; aortic disease; coronary disease.

Coronary artery dissection is a well-known complication of coronary angiography and angioplasty.^[1] But occurrence of acute dissection of the ascending aorta complicating coronary angiography or angioplasty is extremely rare.^[2,3] In a report, on 21.000 coronary angioplasties representing the combined experience of several interventional cardiologists, there were four acute aortic dissections for an incidence of 0.02%.^[4] Coronary dissections can be successfully treated by sealing the entry with a coronary stent. But proximal progression of the dissection into the aortic root may represent a therapeutic dilemma.^[5] Retrograde extension into the aortic root often requires urgent life-saving surgical intervention.^[5]

In this report, we describe 2 patients who had urgently operated for aortic dissection that occurred due to coronary angioplasty intervention.

CASE REPORT

Case 1- A 65-year-old female with a history of unstable angina pectoris was referred to the cardiology

Perkütan vasküler girişimi takiben gelişen akut iyatrojenik çıkan aort disseksiyonları nadirdir. Aortun sınırlı olarak etkilendiği durumlarda koroner disseksiyon giriş yerinin stentlenmesi yeterliyken, aorta retrograd ilerleme gösteren disseksiyonlarda ve hemodinamik olarak instabil hastalarda cerrahi girişim gerekir. Bu yazıda, koroner anjiyoplasti komplikasyonu olarak gelişen ve çıkan aorta retrograd uzanım gösteren koroner disseksiyonların cerrahi olarak başarıyla tedavi edildiği iki olgu sunuldu.

Anahtar sözcükler: Anevrizma, disseksiyon/cerrahi; anjiyoplasti/ komplikasyon; aort hastalığı; koroner hastalık.

department. The electrocardiogram (ECG) revealed sinus rhythm and deeply negative T waves from V1 to V6. Coronary angiography showed a subtotal occlusion of the proximal left anterior descending coronary artery (LAD), and diffusely diseased right coronary artery (RCA) with a 70% stenosis in proximal segment. She had a history of operation for cervix carcinoma. She underwent percutaneous coronary angioplasty for proximal LAD lesion. Retrograde dissection to the aorta from the LAD occurred during vascular intervention (Fig. 1). Stenting was impossible because the localization of the tear was uncertain. The patient was taken to urgent operation as she was hemodynamically unstable.

The surgery was performed under general anesthesia. After aortic and right atrial venous cannulation cardiopulmonary bypass (CPB) was instituted. The aorta was clamped and cardiac arrest was attained by antegrade infusion of isothermic hiperkalemik blood cardioplegic solution. The cardiac arrest was maintained by retrograde infusion of the cardioplegic solution. After the aortotomy incision, the dissected segment of the

Received: May 20, 2005 Accepted: August 18, 2005

Correspondence: Dr. Bilgin Emreca, Pamukkale Üniversitesi Tıp Fakültesi Kalp ve Damar Cerrahisi Anabilim Dalı, 20070 Kınıklı, Denizli.
Tel: 0258 - 212 88 37 e-mail: bilginemreca@yahoo.com



Fig. 1. Coronary angiogram demonstrating retrograde dissection to the aorta from the LAD.

aorta was explored (Fig. 2a). The left coronary artery was ligated from its origin, and the part of the aorta which was involved by dissection was excised and repaired by a Dacron patch with a diameter of 3x2 cm (Fig. 2b). The aorta was anastomozed in an end to end fashion afterwards (Fig. 2c). Coronary artery bypass (CABG) to the LAD, RCA and circumflex arteries was done using saphenous vein grafts. After hemodynamic stabilization of the patient, CPB was discontinued. Postoperatively, the patient had an uneventful recovery. The patient was discharged on the 8th day of the operation.

Case 2- A 73-year-old female with a history of hypertension was admitted with effort angina. The ECG revealed sinus rhythm and negative T-waves in the inferior leads. Coronary angiography showed a 70% stenosis in the proximal segment of RCA. Retrograde dissection to the aorta from the RCA occurred during the angioplasty intervention. The patient had unstable angina and elevation of the ST segment in the inferior leads on ECG. Stenting of the dissected segment was technically impossible because the guide was not able to be introduced to the true lumen. Therefore, the patient was taken to urgent operation. Cardiopulmonary bypass was instituted as usual manner. After the aortotomy incision, the RCA was ligated from its origin and the part of the aorta which was involved by the dissection was excised

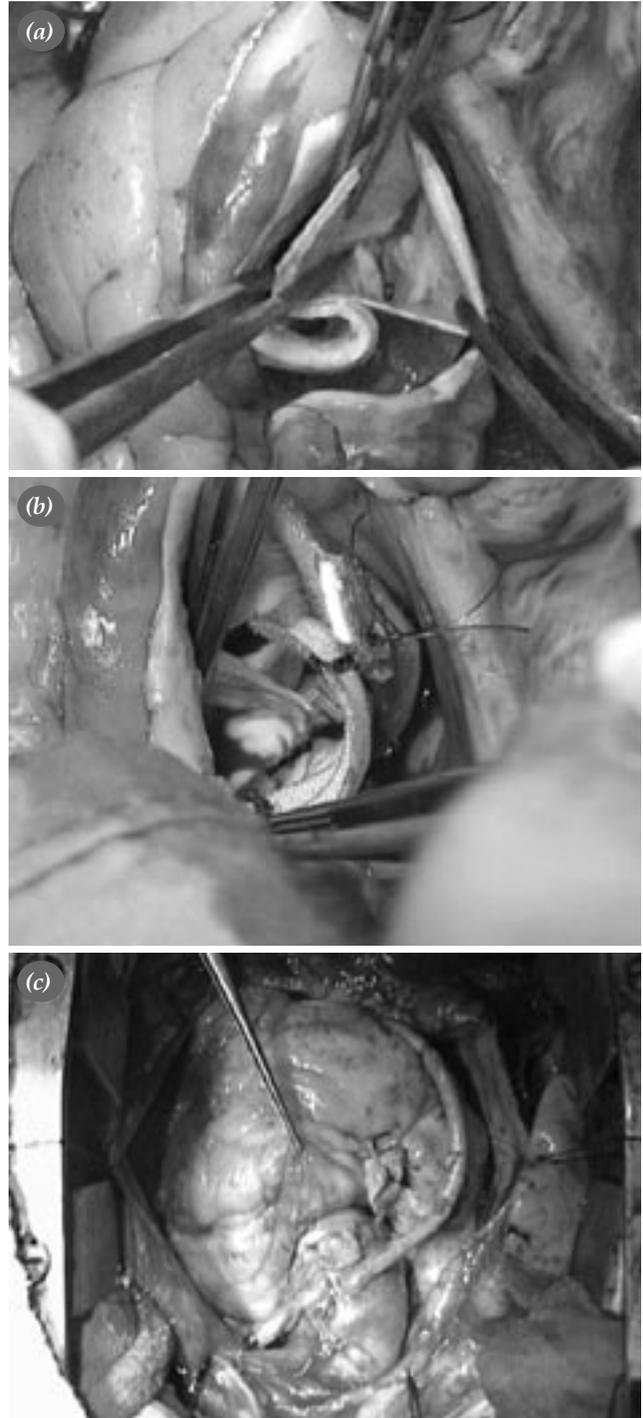


Fig. 2. (a) Intraoperative view of the dissected segment of the aorta. (b) Intraoperative view of the part of the aorta involved by dissection, which was repaired by a Dacron patch. (c) Completed aortic repair.

and repaired by a Dacron patch of 3x2 cm in diameter. The aorta was anastomozed in an end to end fashion. Aorta to RCA bypass was done using a saphenous vein graft. Cardiopulmonary bypass was left without any problem. The patient had an uneventful recovery in the

postoperative period. On 7th day postoperatively, the patient was discharged without any complication.

DISCUSSION

The development of iatrogenic aortic dissection secondary to coronary artery manipulation is a rare event. In a report on 5.649 coronary angioplasty procedures, there were 2 acute aortic dissections for an incidence of 0.03%.^[3] In another study, the data from 43.143 cardiac catheterizations showed 9 coronary artery- aortic dissections for an incidence of 0.02%^[6] Carter and Brinker^[7] described 3 cases of catheter induced ascending aortic dissection. The incidence was 0.02% for diagnostic angiography and 0.07% for coronary angioplasty cases. Of cases previously described, most of the affected coronary arteries were RCA.^[8]

In many cases, the origin of the dissection of the ascending aorta is localized at the ostium or in the proximal segment of the coronary artery when it occurs following a trauma caused by the tip of the guiding catheter or because of balloon dilatation. A vigorous manual injection of contrast material can play a role in extending the dissection to the aortic root.^[9]

Although proximal iatrogenic aortic dissections most often followed cardiac surgical procedures, distal dissections were more likely to follow cardiac catheterization. Compared with spontaneous aortic dissections, patients with iatrogenic aortic dissection were older and tended to have a higher incidence of arteriosclerosis.^[10] Predisposing conditions to aortic dissection include hypertension, older age, diabetes, history of arteriosclerosis, previous coronary artery bypass surgery, Marfan syndrome, congenitally unicuspid or bicuspid aortic valves and cystic medial necrosis.^[6,10] The role of cystic medial necrosis is controversial, as low grades degeneration are nonspecific and occur as a common aging change.^[6]

Dunning et al.^[6] proposed a classification for coronary dissection with retrograde extension into the aortic root. In class 1, there is a focal dissection limited to coronary cusp. In class 2, the dissection extends to the ascending aorta but less than 40 mm in length. In class 3 dissection, the dissection extends to the ascending aorta but more than 40 mm in length. Class 1 and class 2 dissections may be successfully managed by stenting the coronary dissection or close follow-up. These kinds of dissections have a good prognosis. But class 3 lesions may require surgical intervention. According to the International Registry of Aortic Dissection, a type A iatrogenic dissection has a high mortality (32%) that is similar to that of spontaneous aortic dissection (35%). In contrast to spontaneous aortic dissection, patients with iatrogenic aortic dissection were more likely to

present with indolent hemodynamic instability, often with hypotension or shock.^[10] Emergency coronary artery bypass surgery is indicated when coronary artery dissection is associated with unstable perfusion or residual severe stenosis.^[11] The other indication for surgery is the progression of the aortic dissection.

Partial aortic replacement by excision of the affected coronary sinus and coronary artery bypass may be a treatment of choice instead of total ascending aortic replacement in patients with class 3 iatrogenic aortic dissections. Following an invasive vascular procedure, iatrogenic aortic dissection should be kept in mind in the patients who are hemodynamically unstable or who have ischemic symptoms. Appropriate surgical intervention without a delay has good results. Another point is that, appropriate myocardial protection in these patients is very important, because homogenous distribution of the cardioplegic solution may not be attained due the dissection of the coronary artery when it is given in antegrade route. Therefore, combination of antegrade and retrograde infusion of the cardioplegic solution should be preferred for myocardial protection.

As a conclusion, we are in the opinion that surgery should not be delayed in those cases with retrograde extension of dissection into the aortic root and luminal narrowing resulting in significant hemodynamic compromise, and in those with coronary lesions necessitating surgical intervention.

REFERENCES

1. Hermans WR, Foley DP, Rensing BJ, Rutsch W, Heyndrickx GR, Danchin N, et al. Usefulness of quantitative and qualitative angiographic lesion morphology, and clinical characteristics in predicting major adverse cardiac events during and after native coronary balloon angioplasty. CARPORT and MERCATOR Study Groups. *Am J Cardiol* 1993;72:14-20.
2. Geraci AR, Krishnaswami V, Selman MW. Aorto-coronary dissection complicating coronary arteriography. *J Thorac Cardiovasc Surg* 1973;65:695-8.
3. Alfonso F, Almeria C, Fernandez-Ortiz A, Segovia J, Ferreiros J, Goicolea J, et al. Aortic dissection occurring during coronary angioplasty: angiographic and transesophageal echocardiographic findings. *Cathet Cardiovasc Diagn* 1997; 42:412-5.
4. Ruda-Vega M. Aortic dissection-exceedingly rare complication of coronary angioplasty. *Cathet Cardiovasc Diagn* 1997; 42:416.
5. Awadalla H, Salloum JG, Smalling RW, Sdringola S. Catheter-induced dissection of the left main coronary artery with and without extension to the aortic root: a report of two cases and a review of the literature. *J Interv Cardiol* 2004; 17:253-7.
6. Dunning DW, Kahn JK, Hawkins ET, O'Neill WW. Iatrogenic coronary artery dissections extending into and involving the aortic root. *Catheter Cardiovasc Interv* 2000; 51:387-93.

7. Carter AJ, Brinker JA. Dissection of the ascending aorta associated with coronary angiography. *Am J Cardiol* 1994; 73:922-3.
8. Bae JH, Kim KB, Kim KS, Kim YN. A case of aortocoronary dissection as a complication during a percutaneous transluminal coronary angioplasty (PTCA). *Int J Cardiol* 1998; 66:237-40.
9. Maiello L, La Marchesina U, Presbitero P, Faletra F. Iatrogenic aortic dissection during coronary intervention. *Ital Heart J* 2003;4:419-22.
10. Januzzi JL, Sabatine MS, Eagle KA, Evangelista A, Bruckman D, Fattori R, et al; International Registry of Aortic Dissection Investigators. Iatrogenic aortic dissection. *Am J Cardiol* 2002;89:623-6.
11. Chen YM, Chang CP, Wu CC, Shen CH, Ho WM. Cardiac catheterization-induced type-A aortic dissection detected by intra-operative transesophageal echocardiography-a case report. *Acta Anaesthesiol Taiwan* 2004;42:45-8.