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Artículo:

Iatrogenic dissection of the right coronary artery and the ascending aorta secondary to endoluminal angioplasty. A case report

Iatrogenic dissection of the right coronary artery and the ascending aorta secondary to endoluminal angioplasty. A case report

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Resumen

Se presenta el caso de una mujer de 54 años de edad con disección iatrogénica del ostium de la arteria coronaria derecha y extensión a la aorta ascendente, ocurrida durante la angioplastia intraluminal de una estenosis de la porción intermedia de la arteria coronaria derecha. Con el objeto de mantener el flujo sanguíneo coronario antes de la cirugía, la disección de la arteria coronaria fue tratada con la implantación de tres prótesis endovasculares que dilataron la obstrucción y sellaron la disección de la coronaria. La disección aórtica requirió tratamiento con el implante de un injerto aórtico de Haenoshield. Durante la cirugía se decidió colocar injerto vascular aortocoronario para garantizar el flujo sanguíneo distal de la coronaria derecha, debido al riesgo de trombosis de las endoprótesis coronarias por la extensa superficie metálica trombogénica de las férulas. Por otro lado, los anticoagulantes y antitrombóticos estaban contraindicados antes de la reparación quirúrgica. La evolución de la paciente fue satisfactoria. Se discuten causas, frecuencia y tratamiento de la iatropatogenia descrita.

Palabras clave: angioplastia arterial coronaria, disección arterial coronaria, disección aórtica, iatropatogenia.

Summary

The authors present the case of a 54-year-old woman with iatrogenic dissection of the right coronary artery ostium and extension of the dissection to the ascending aorta during the intraluminal angioplasty of an obstructive lesion in the middle portion of the right coronary artery. In order to maintain coronary blood flow before surgery, the coronary dissection was treated with the implantation of three direct coronary stents that dilated the stenosis and sealed the dissection of the coronary artery. The aortic dissection needed treatment with the implantation of a Haenoshield aortic graft. During the surgery, it was decided to implant an aortocoronary bypass graft to guarantee the distal right coronary blood flow, given the possible increased risk of thrombosis of the stents because of the large thrombogenic metallic surface of the stents. On the other hand, the administration of anticoagulants and antithrombotic drugs were not indicated because of the intended surgery of the aortic dissection. The evolution of the patient was satisfactory. Causes, frequency, and treatment procedures of this iatrogeny are discussed.

Key words: coronary angioplasty, coronary artery dissection, aortic dissection, iatrogeny.

Introduction

Complications secondary to intravascular catheterization have increased with the use of the percutaneous transluminal coronary angioplasty (PTCA), especially in patients with acute coronary syndrome.[1,2] Introduction of devices in the coronary lumen and administration of anticoagulant and potent antithrombotic drugs have increased the risk of complications.[3] The aim of this article is to present the clinical case of iatrogenic dissection of the right coronary artery extended to the aorta that occurred during a PTCA and to describe the treatment of this complication.

Case Report

We report the case of a 54-year-old woman who is obese, sedentary, and a heavy smoker, with a history of diabetes mellitus and systemic arterial hypertension. She presented chronic stable angina with electrocardiographic signs of inferior subendocardial lesion. The catheterization results were as follow: left ventricle and aortic pressures were 120/4 mm Hg,

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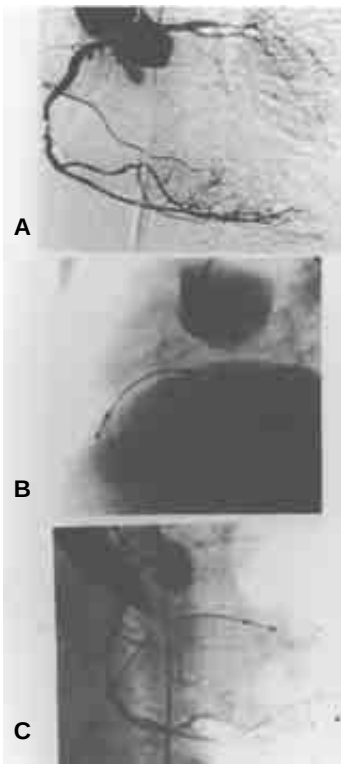

Figure 1. A) Right coronary angiography in ODA. A type C proximal lesion is observed in the right coronary artery. It is simultaneously visualized the aorta, and left coronary artery. B) Lateral view of a chest roentgenogram. It is observed contrast medium retained in the aortic wall, as well as a pacemaker in the right ventricle. C) Right coronary angiography after the angioplasty and the implant of three stents.

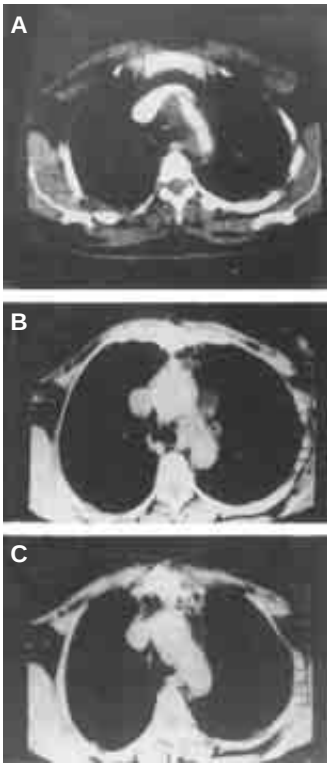

Figure 2. Computed axial tomography (CAT) before the surgery. A) It is observeed the aortic dissection, extending from the ascending aorta to the aortic arch, before the surgical correction. B) Control CAT eleven months after the surgery at the level of the aortic root. It is observed the Haenoshield device adequatly placed in the aorta. C) Same control CAT at the level of the aortic arch. It is observed no evidence of residual aortic dissection.

and 120/65 mm Hg, respectively; left ventricle contractility was normal (ejection fraction 0.87). Coronary angiography revealed normal left coronary artery and right coronary artery with a Type "C" lesion obstructing 85 % of the lumen in the mid-segment of the vessel, (reference artery diameter 3.7 mm) and distal blood flow TIMI III (figure 1A). No evidence of ulcerous or dissected atheromatous plaque was observed in the *ostium* or proximal segment of the right coronary artery. During the right coronary *ostium* catheterization with an 8F Judkins left-guiding catheter, the patient presented chest pain and bradycardia; a temporal transvenous pacemaker was placed in the right ventricle (figure 1B). The angiogram showed dissection of the right coronary artery, extending from the *ostium* all along the first segment of the artery. In addition, we visualized a dissection and hematoma of the aortic root and arch (figure 1B). As a result of these complications, the patient presented recurrent chest pain and developed systemic arterial hypotension.

In order to maintain blood flow to the right coronary artery and reduce myocardial ischemia and hemodynamic instability, the right coronary artery dissection was treated with the implant of three direct stents (Medtronic), two 3.5 × 30 mm and one 4.0 × 28 mm impacted at 10 and 12 atm. The proximal stent was delivered at the level of the coronary *ostium*, protruding 2 mm toward the aortic lumen in an attempt to seal the aortic dissection. The angioplasty restored the right coronary artery normal blood flow (figure 1C).

A computed axial tomography (CAT) showed the hematoma associated with the aortic dissection extended toward the aortic arch, affecting severely the aortic lumen (figure 2A). Aortic dissection and hematoma required surgical repair with the implant of a Haenoshield aortic graft. During the surgery it was decided to implant an inverted saphenous vein aorto-coronary bypass graft, connected distally to the right coronary artery to guarantee the distal right coronary blood flow in case of stent occlusion.

Clinical evolution of the patient was satisfactory. At the 11-month postoperative follow-up, the patient remained asymptomatic, in functional class I, according to the New York Heart Association and the Canadian Cardiovascular Society. A new CAT of control revealed no evidence of residual aortic dissection (figures 2B and 2C).

Discussion

Nine cases of aortic dissection among 43,143 cardiac catheterization procedures have been found.[1] The incidence of iatrogenic aortic dissection occurring during catheterization or angioplasty has been underestimated because of the resistance to publish such an accident.[3] As far as we know, until 1999, only 28 clinical cases of aortic dissection related to the catheterization procedure have been reported: 39 % during balloon dilation, 14 % during metallic guide manipulation, 29 % during guide catheter manipulation, and only two cases during coronary artery angiography, mainly coincident with the catheterization of the right coronary *ostium*.[4] The reported proportion of aortic dissection during coronary angioplasty is ~0.06.[5]

The frequency of isolated coronary artery dissection diverges according to the imaging technique utilized to observe such complication: 20 to 40 % with coronary angiography, and 60 to 80 % with intracoronary ultrasound. Dissection of both coronary arteries could be fatal. Compared with left coronary artery dissection, right coronary artery dissection is better tolerated.[6,7] In our patient, the coronary artery dissection was Type D, long, and with a high degree of complexity because the point of rupture coincided with the aortic dissection. On the other hand, aortic dissection and hematoma could obstruct the coronary blood flow, worsening the damage due to coronary artery dissection.[8]

These complications could be due to: 1) the material used in the angioplasty, 2) wrong manipulation during the PTCA, and 3) inherent characteristics of the patient. Devices used in the coronary angioplasty (guide and balloon catheters, devices for rotablation or atherectomy, stents, etc.) increase the probability of complications during the PTCA. Risk of complication increases with the wrong manipulation of these devices: sudden and forced injection of contrast media; imprudent and forced rotation of the catheter, and deep or non-axial introduction of the guide catheter in the coronary *ostium*, especially when back support is absent.[9,10] The risks of complications increase during the training period of future interventional cardiologists.

Compared with Judkins catheters, the Amplatz and Multipurpose catheters are prone to cause ostial dissection. Back-and-forth motion of the catheter through the coronary *ostium*, coincident with the cardiac beat, may contribute to coronary artery dissection. Among 12,367 catheterization procedures, eight cases of coronary artery dissection due to erroneous manipulation of the catheter have been reported.[5] The presence of atheroma and/or calcification affecting the arteries could also be related to coronary artery dissection. In our patient, because coronary blood flow was severely affected by the atherosclerotic coronary lesion as well as the acute dissection, the patient suddenly experienced intense chest pain and developed dangerous hemodynamic instability that demanded immediate reestablishment of the normal blood flow by the implantation of stents to avoid an acute myocardial infarction and a fatal outcome.

To treat the ostial coronary lesion a stent must be delivered in coronary *ostium*, protruding 1 to 2 mm into the aortic lumen. This maneuver was performed with the intent of sealing the aortic dissection. Good results have been obtained with the installation of an intraluminal stent in the ascending aorta to avoid the extension of the hematoma. The definitive treatment of the acute aortic dissection depends on the severity of signs and symptoms.[11] Limited and stable dissections can be treated conservatively or by means of intraluminal aortic stents. Extensive dissections must be treated in the operating room or even with aortic stents in selected cases.[1] Surgery must be considered when aortic dissection occurs in the proximity of the coronary *ostium*. When the aortic dissection is small, good surgical results are obtained joining the edges of the injury with some suture stitches.[4] Replacement of the ascending aorta, i.e., with Gelatin-Resorcino-Formaldehyde prosthesis, is the traditional surgical treatment.[12]

In the case of our patient the aortic dissection was extensive, severe, and affected the coronary flow and for these reasons surgical repair was the selected therapy. Some factors could increase the risk of acute stent occlusion in this patient, i.e., the thrombogenic surface of the metallic stents (~85 mm length) and the contraindication to administer anticoagulant or antithrombotic drugs before the aortic surgery. With protrusion of the ostial stent 2 mm throughout the aortic lumen, the origin of the aortic dissection nearby the coronary ostium allows us to perform the aortocoronary bypass, given the increased probability of ostial coronary blood flow compromise.

Our patient experienced a severe complication. Factors involved with this complication could be the large diameter catheter (8F), the catheter stiffness along with its erroneous manipulation, the to-and-fro catheter movements, the inappropriate non-coaxial position of the catheter in the *ostium* and the unnoticed presence of an atheroma plaque, disrupted by the tip of the catheter at the site of the arterial dissection. Although presently there are guide catheters with a diameter narrower than 8F, which facilitate the coronary artery procedures, there are occasions where the interventionist is forced to use wider diameter catheters. At any rate, catheters 8 and 9F have been used for a long time without particular

difficulties. Isolated or associated, these factors could be responsible for the arterial dissection. Intraluminal pressure control during coronary artery catheterization could avoid the dissection.

Conclusions

Although the characteristics of intraluminal devices, and patients' inherent characteristics are factors involved with complications related to PTCA, wrong maneuvers and manipulations are the main cause of arterial dissection. Cautious device manipulation after careful visualization of vascular anatomy, along with gentle contrast medium injection, could avoid severe complications, such as the coronary artery and aortic dissection reported in this article.

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