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BRIEF REPORT

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Coronary stenting for coronary artery narrowing in a heart transplant recipient

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Abstract Transplant atherosclerotic coronary disease remains the leading cause of death in heart transplant recipients. We report the first case of coronary stent implantation in a heart graft for epicardial focal stenosis. Due to the lower rate of restenosis after stenting in the native coronary artery, we suggest that coronary stenting be considered an acceptable, first intention therapeutic option instead of angioplasty alone whenever possible.

Key words Coronary artery stenosis, stent, heart transplantation · Stent, coronary artery stenosis, heart transplantation · Heart transplantation, coronary artery stenosis, stent

Introduction

Transplant atherosclerotic coronary disease (TACD) is the major obstacle to long-term survival in cardiac transplant recipients, with an estimated angiographic prevalence of 45 % at 3 years, 50 % at 5 years, and 90 % at 7 years [7, 17]. This accelerated form of coronary artery disease extends diffusely from epicardial vessels to the intraluminal arteries [1, 2]. Etiology of this chronic and diffuse form of arteriopathy is multifactorial and still unclear. Prolonged cold ischemia [11], obesity and hyperlipemia [4, 16, 18], immunological factors [10, 13], and cytomegalovirus (CMV) infection [5, 12] have been suggested as possible causes of the disease. However, none of these factors has been clearly identified as the main cause of TACD. Although angiographic appearance of TACD mostly presents diffuse narrowings, focal stenosis necessitating percutaneous transluminal coronary angioplasty (PTCA) may occur. Only one multicenter study reports experience with coronary artery revascularization including PTCA and directional atherectomy in heart transplant recipients suffering from TACD [8, 9]. We describe the case of a patient who underwent stent implantation for a TACD after repeated PTCA. This is, to the best of our knowledge, the first description of coronary stent implantation in a heart graft.

Case report

In February 1990, a 53-year-old woman underwent urgent aortic valve replacement for a valvular insufficiency due to acute bacterial endocarditis. Despite this intervention and normal coronary arteries at this time, she developed rapid, progressive heart failure and cardiac orthotopic transplantation was performed in August 1990. Standard immunosuppressive treatment with a triple drug regimen was started. This consisted of cyclosporin, 2×2 mg/kg per day, prednisone, 1 mg/kg per day progressively reduced to long-term 0.3 mg/kg per day, and azathioprine, 2×1 mg/kg per day. Endomyocardial biopsies were performed according to a standard schedule: once a week for the 1st month, twice a month during months 2–6, once a month during months 6–12, three to four times a year during years 1–3, and then once a year until year 5. Between 1990 and 1993, three episodes of grade IIIa rejection (according to the nomenclature of the International Society of Heart and Lung Transplantation [3] were documented. Two episodes

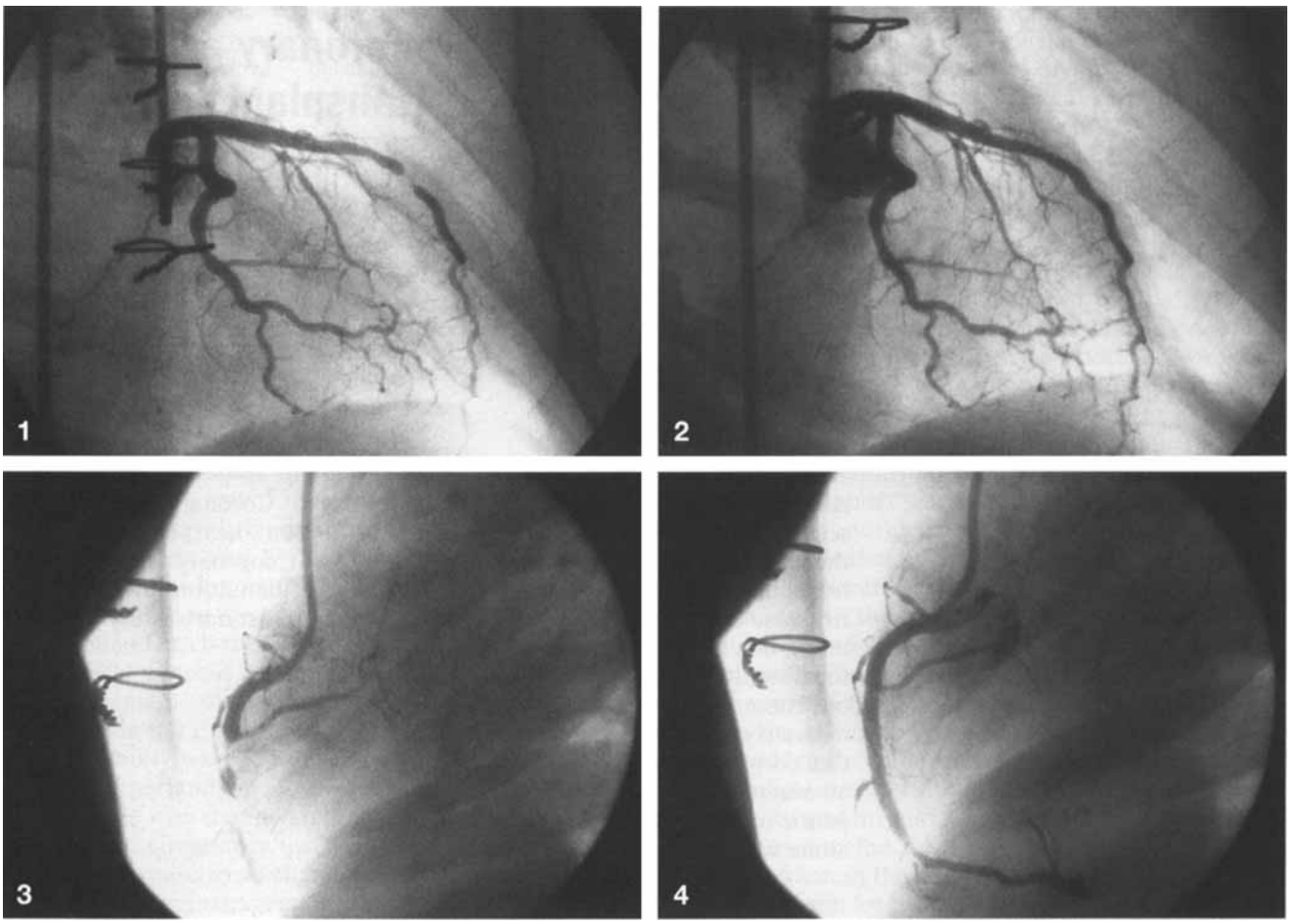

Fig. 1 August 1993: Severe stenosis of the median part of the LAD. Note the irregularities of the peripheral vessels

Fig. 2 August 1993: Excellent result of PTCA on the LAD

Fig. 3 January 1994: Severe stenosis of the median part of the RCA

Fig. 4 January 1994: Good result of PTCA on the RCA

were treated on an outpatient basis with a transient increase in prednisone up to 100 mg/day, and one episode required in-hospital treatment with antilymphocyte globulin (ATG) at 10 mg/kg per day for 5 days. Prior to transplantation, both recipient and donor had positive serology for CMV. There was no subsequent CMV reactivation during the 5-year follow-up. Retrospective HLA donor/recipient matching revealed a large mismatch: A 3/32 B 18/w 61, DR 2/5 for the donor and A 3/x, B 35/w 41 and DR 1/3 for the recipient.

Annual routine angiographic follow-up did not reveal any significant lesions until August 1993. At that time, the angiogram showed a unique, focal 75 % stenosis of the left anterior descending artery (LAD). Conventional PTCA was performed with an excellent result (Figs. 1, 2). A treadmill test performed before this procedure was normal (100 % of the maximum theoretical heart rate, at 7.1 METs, double product = 25'000). In October 1993, a control angiogram did not show restenosis. Before elective surgery for cholecystitis in January 1994, a preoperative angiogram revealed a new significant stenosis of the proximal right coronary artery (RCA) that was dilated with an excellent immediate result (Figs. 3, 4). In June 1994, control angiography showed restenosis of the proximal RCA and two new-onset lesions of the distal segment (Fig. 5). After PTCA, two Palmaz-Schatz stents were implanted in this RCA with an excellent final result, even considering the loss of a marginal branch (Fig. 6). In February 1995, the patient developed acute pulmonary edema. At the control angiogram (Figs. 7, 8) there were no significant lesions of the dilated segments but diffuse progression of the disease to the peripheral vessels. During the patient's hospital stay, retransplantation was discussed, as left ventricle dysfunction was considerable despite prolonged cardiopulmonary support. The patient developed acute renal failure, necessitating transient hemodialysis. She finally recovered and is presently doing well on cyclosporin and prednisone, in combination with diltiazem and furosemide.

Discussion

Acute bacterial endocarditis is an uncommon cause of severe congestive heart failure leading to heart transplantation even after valve replacement. Despite initial

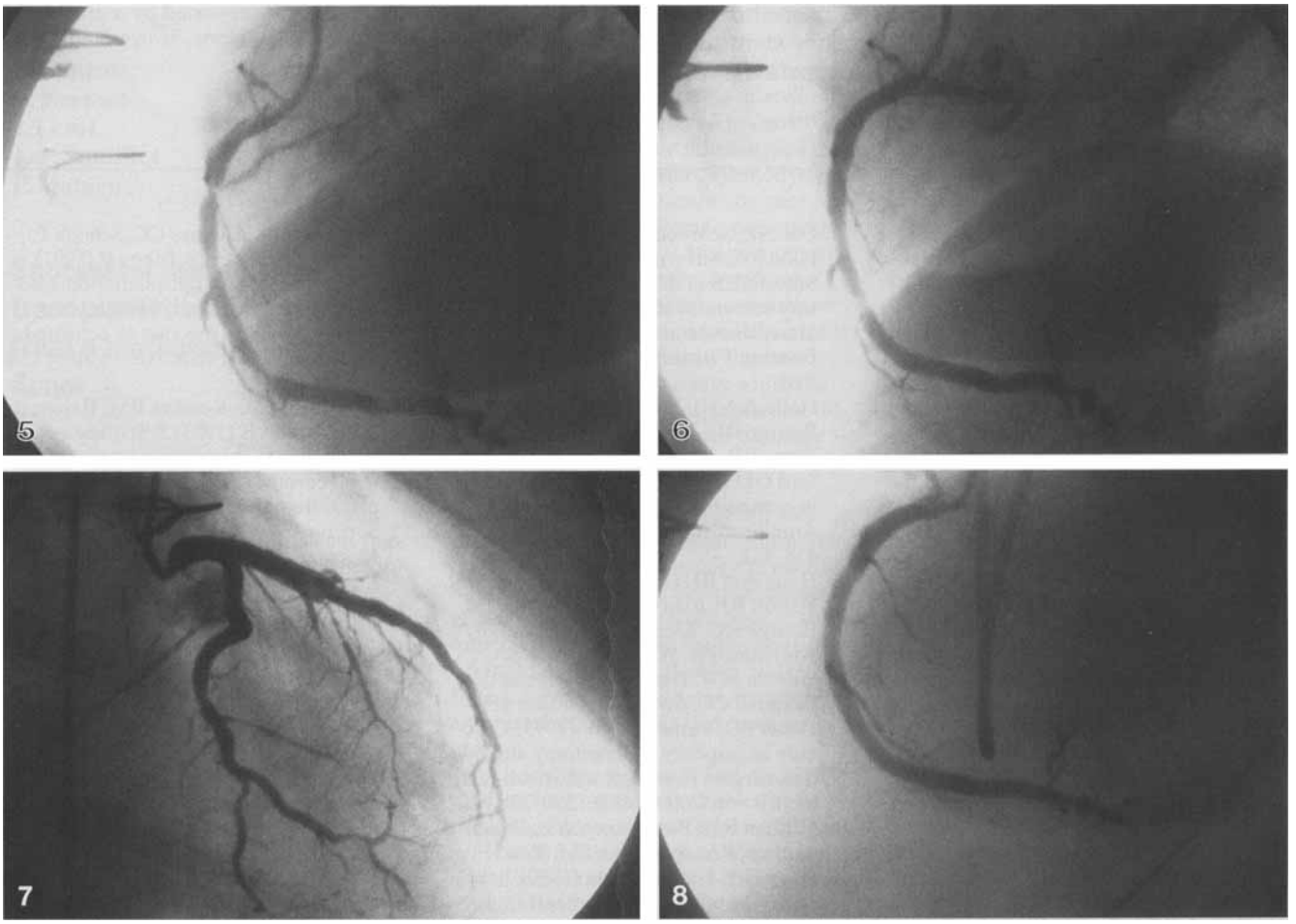

Fig. 5 June 1994: Restenosis of the proximal lesion of the RCA and development of a new distal lesion of this same vessel

Fig. 6 June 1994: Excellent result after implantation of two Palmaz-Schatz stents in the RCA. Note the loss of a marginal branch

Fig. 7 February 1995: No evidence of restenosis in the LAD

Fig. 8 February 1995: No evidence of restenosis in the RCA

infectious, our patient did not develop infectious complications as a result of immunosuppressive therapy during follow-up. Therefore, we think that heart transplantation is feasible in this acute condition, provided the intial infectious is kept under medical control.

Although TACD mainly shows an angiographically diffuse and heterogeneous appearance, focal stenosis may occur. There are, however, very few descriptions of PTCA in heart transplant recipients. Von Scheidt et al. [14] described 35 lesions treated in 23 procedures concerning seven patients. There was a primary procedural success rate of 100% with a reduction in the mean degree of the stenosis from 86% to 27% ($P < 0.001$). Angiographic restenosis at 4 months was 62% (18/29), which is a higher incidence than the 30% reported in nontransplanted patients.

Elective Palmaz-Schatz stenting for new-onset, discrete (lesion length < 15 mm, vessel size ≥ 3 mm) stenosis in native coronary arteries improves the immediate angiographic result and reduces the incidence of restenosis compared to PTCA alone [6, 15]. Endoluminal stents scaffold the vessel wall and reduce acute elastic recoil, leading to these better results. As described by von Scheidt [14], the incidence of restenosis in heart transplant patients seems to be higher than that in native hearts. The reason for that is unknown, and even in the unique multicenter trial on revascularization in cardiac transplant recipients [8, 9], the number of patients is too low to definitely demonstrate a higher restenosis rate. Based on our description of the first case with intracoronary stenting in a heart graft, it seems reasonable to propose elective stenting for focal lesions in heart transplant recipients in order to attempt to reduce the rate of restenosis.

Because of the small number of cases, randomized trials are certainly not feasible. However, this single

case demonstrates the efficacy of the procedure and should encourage the use of intracoronary stenting as whenever possible in heart transplant patients with TACD.

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References

1. Billingham ME (1987) Cardiac transplant atherosclerosis. Transplant Proc 19 [Suppl 5]: 19–25
2. Billingham ME (1992) Histopathology of graft coronary disease. J Heart Lung Transplant 11: S38–S44
3. Billingham ME, Cary NRB, Hammond EH, Kemnitz J, Marboe C, McCallister HA, Snovar DC, Winters GL, Zerbe A (1990) A working formulation for the standardization of nomenclature in the diagnosis of heart and lung rejection: heart rejection study group. J Heart Transplant 9: 587–593
4. Eich D, Thompson JA, Ko D, Hastillo A, Lower R, Katz S, Katz M, Hess ML (1991) Hypercholesterolemia in long-term survivors of heart transplantation: an early marker of accelerated coronary artery disease. J Heart Lung Transplant 10: 45–49
5. Everett JP, Hershberger RE, Norman DJ, Chou S, Ratkovec RM, Cobanoglu A, Ott GY, Hosenpud JD (1992) Prolonged cytomegalovirus infection with viremia is associated with development of cardiac allograft vasculopathy. J Heart Lung Transplant 11: S133–S137
6. Fischman DL, Leon MB, Baim DS, Schatz RA, Savage MP, Penn I, Detre K, Veltri L, Ricci D, Nobuyoshi M (1994) A randomized comparison of coronary-stent placement and balloon angioplasty in the treatment of coronary artery disease. N Engl J Med 331: 496–501
7. Gao SZ, Schroeder JS, Alderman EL, Hunt SA, Silverman JF, Wiederhold V, Stinson EB (1987) Clinical and laboratory correlates of accelerated coronary artery disease in the cardiac transplant patients. Circulation 76 [Suppl 5]: V56–V61
8. Halle AA III, Wilson RF, Massin EK, Bourge RC, Stadius ML, Johnson MR, Wray RB, Young JB, Davies RA, Walford GD (1992) Coronary angioplasty in cardiac transplant patients. results of a multicentric study. Circulation 86: 458–462
9. Halle AA III, DiSciasco G, Massin EK, Wilson RF, Johnson MR, Sullivan HJ, Bourge RC, Kleiman NS, Miller LW, Aversano TR, Wray RB, Hunt SA, Weston MW, Davies RA, Rincon G, Crandall CC, Cowley MJ, Kubo SH, Fisher SG, Vetrovec GW (1995) Coronary angioplasty, atherectomy and bypass surgery in cardiac transplant recipients. J Am Coll Card 26: 120–128
10. Hruban RH, Beschorner WE, Baumgartner WA, Augustine SM, Ren H, Reitz BA, Hutchins GM (1990) Accelerated arteriosclerosis in heart transplant recipients associated with a T-lymphocyte-mediated endothelialitis. Am J Pathol 137: 871–882
11. Johnson MR (1992) Transplant coronary disease: non immunologic risk factors. J Heart Lung Transplant 11: S124–S132
12. Koskinen PK, Nieminen MS, Krogerus LA, Lemstrom KB, Mattila SP, Häyry PJ, Lautenschlager IT (1993) Cytomegalovirus infection and accelerated cardiac allograft vasculopathy in human cardiac allografts. J Heart Lung Transplant 12: 724–729
13. Salomon RN, Hughes CC, Schoen FJ, Payne DD, Pober JS, Libby P (1991) Human coronary transplantation-associated arteriosclerosis. Evidence for a chronic immune reaction to activated graft endothelial cells. Am J Pathol 138: 791–798
14. Scheidt W von, Kemkes BM, Reichart B, Erdmann E (1993) Percutaneous transluminal coronary angioplasty of focal coronary lesions after heart transplantation. Clin Investig 71: 525–530
15. Serruys PW, De Jaegere P, Kiemnenij F, Macaya C, Rutsch W, Heyndrickx G, Emanuelsson H, Marco J, Legrand V, Materne P (1994) A comparison of balloon-expandable stent implantation with balloon angioplasty in patients with coronary artery disease. N Engl J Med 331: 489–495
16. Stovin PGI, Sharples L, Hutter JA, Wallwork J, English TA (1991) Some prognostic factors for the development of transplant-related coronary artery disease in human cardiac allografts. J Heart Lung Transplant 10: 38–44
17. Uretsky BF, Murali S, Reddy PS, Rabin B, Lee A, Griffith BB, Hardesty RL, Trento A, Bahnson HT (1987) Development of coronary artery disease in cardiac transplant patients receiving immunosuppressive therapy with cyclosporine and prednisone. Circulation 76: 827–833
18. Winters GL, Kendall TJ, Radio SJ, Wilson JE, Costanzo-Nordin MR, Switzer BL, Remmenga JA, McManus BM (1990) Posttransplant obesity and hyperlipidemia: major predictors of severity of coronary arteriopathy in failed human heart allografts. J Heart Lung Transplant 9: 364–371