Case Report

Aortic Valve Replacement in a Patient with Alpha-Thalassemia

Tadashi Omoto, MD,[1] Takeo Tedoriya, MD,[1] Yasuyuki Kondo, MD,[1] Hirofumi Izuka, MD,[1] Masaya Oi, MD,[1] Naoko Nagano, MD,[1] Tadamasa Miyauchi, MD,[1] Noboru Ishikawa, MD,[1] and Hitoshi Kasegawa, MD[2]

Cardiac valve disease resulting from elastic tissue defects has been demonstrated in patients with beta-thalassemia; however, valve disorders of patients with alpha-thalassemia have been rarely discussed. We present the case of a patient with alpha-thalassemia and severe aortic regurgitation with left ventricular dysfunction. The patient underwent successful aortic valve replacement with mechanical prosthesis. Histopathology of the excised valve showed elastic tissue disruption and chronic thrombus on the ventricular side. Hypercoagulative states have been observed in patients with alpha-thalassemia as beta-thalassemia; therefore special attention should be taken in perioperative anticoagulation therapy. (Ann Thorac Cardiovasc Surg 2010; 16: 365–366)

Key words: anemia, valve, coagulation

Introduction

Cardiac valve disease as a result of elastic tissue defects is known in patients with beta-thalassemia. We present the case of a patient with alpha-thalassemia-1 and severe aortic regurgitation who underwent successful aortic valve replacement.

Clinical Summary

A 36-year-old man was referred to our hospital with severe aortic valve insufficiency. He had no major medical or family history. Anemia has never been pointed out previously. Preoperative hemoglobin and serum ferritin levels were 9.4 g/dl and 500 ng/ml, respectively. Reticulocytes comprised 1.9%. Polymerase chain reaction analysis revealed double alpha-globin gene deletion, and he was diagnosed as alpha-thalassemia-1 (abbreviated -, -, Southeast Asian [SEA] type). Echocardiography showed severe aortic regurgitation with left ventricular (LV) dysfunction (ejection fraction 35%) and LV dilatation (end-diastolic/end-systolic diameter 93/76 mm). Computed tomography (CT) showed calcification of the ascending aorta and abdominal aorta. Aortic valve replacement was recommended; it was tricuspid with a prolapsed left cusp. So the aortic valve was removed, and replacement was made using an On-X bileaflet mechanical valve (25 mm; Medical Carbon Research Institute LLC, Austin, Texas). In the operating room, the patient required red blood cell transfusions. Postoperative values of hemoglobin and hematocrit were 9.9 mg/dl and 30.6%, respectively. During microscopic examination, a disruption of collagen fibers in pars fibrosa and of acid mucopolysaccharide infiltration, without inflammatory cell infiltration, were observed (Fig. 1). Furthermore, chronic thrombosis was found on the ventricular side of aortic valve cusps, which suggested the hypercoagulative state of this patient. The postoperative course was uneventful, and the patient is doing well at six months of follow-up.

From [1]Department of Surgery, Division of Thoracic and Cardiovascular Surgery Showa University, Tokyo; [2]Hanzomon Cardiovascular Clinice, Tokyo, Japan

Received May 26, 2009; accepted for publication August 25, 2009
Address reprint requests to Tadashi Omoto, MD: Department of Surgery, Division of Thoracic and Cardiovascular Surgery, Showa University, Tokyo, Hatanodai 1–5–8, Shinagawa-ku, Tokyo 142–8666, Japan.

Discussion

Alpha-thalassemia is an inherited hemoglobin disorder caused by impaired synthesis of the alpha-globin chain.[1] Two phenotypes have been defined: Alpha-thalassemia-1 is associated with a complete absence of alpha-globin synthesis, and alpha-thalassemia-2 with only a reduction. The alpha-thalassemia-1 phenotype is caused by several deletions affecting both alpha-globin genes, and the deletion of −, −, SEA extends from the 3' end of the ζ-gene through the alpha-1-globin gene.[1] In patients with alpha-thalassemia-1, alpha chain synthesis is impaired, but balanced; anemia is relatively mild, and hemolytic and proliferative features of thalassemia major are not observed.

Studies of patients with beta-thalassemia[2] have revealed the following.

(1) LV dysfunction induced by chronic iron overload is the most common cause of death in patients with thalassemia major. (2) The multiple-organ effects of chronic anemia and tissue hypoxia, along with associated compensatory reactions that include enhanced erythropoiesis and increased iron absorption, appear in thalassemia intermedia. (3) Valve leaflet thickening, valve stenosis, and regurgitation appear in patients with thalassemia.

The pathogenesis of cardiac valve disease in patients with thalassemia is associated with elastic tissue disruption.[2] The strong oxidative stress caused by accumulated and prolonged effects of chronic hemolysis may be responsible for elastin metabolism and structural properties.[2] In the case we present, there is a significant disruption of collagen fibers in pars fibrosa and chronic thrombosis on the ventricular side in valve histology, which suggests a hypercoagulative state in this patient (Fig. 1).

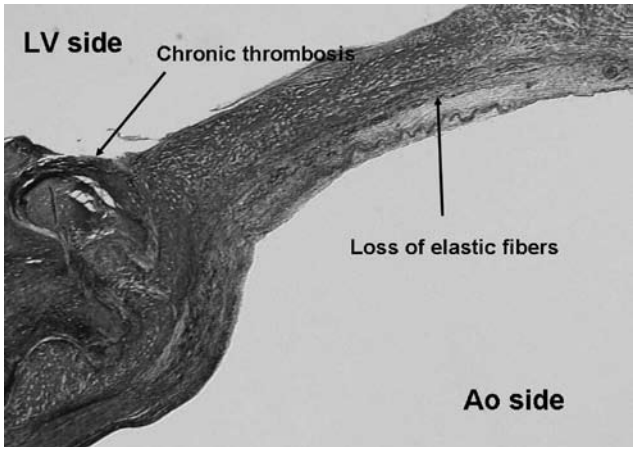

Fig. 1. Histopathology shows a disruption of collagen fibers in pars fibrosa and chronic thrombosis on the ventricular side. LV, left ventricle; Ao, aorta

Few reports have described patients with beta-thalassemia who have undergone cardiac valve operations; however, their hypercoagulative states may be associated with perioperative thrombotic complications. Farmakis et al.[3] reported their experience of aortic valve replacement in a patient with beta-thalassemia intermedia. The patient underwent a successful valve replacement by mechanical prosthesis, but rapid thrombosis occurred 16 months after the operation despite proper antithrombotic therapy. Successful mitral valve replacement by mechanical prosthesis in a patient with beta-thalassemia major has also been reported.[4] In the present case, we chose a mechanical prosthesis based on the assumption that the age of the patient would compromise the longevity of a biological valve. Patients with thalassemia reportedly carry a risk of thrombosis of the valve prosthesis despite a standard warfarin-based anticoagulation therapy. This risk is believed to be of multifactorial origin, and an important role may be played by a hypercoagulable state caused by thrombocytosis, defective erythrocyte and platelet membrane phospholipids, increased blood levels of activation peptides, and decreased levels of antithrombotic proteins.[5]

In conclusion, prosthetic valve replacement has a risk of thrombotic complication in patients with thalasemia. Although patients with alpha-thalasemia have mild hematological features, the hypercoagulative state should be taken into consideration for perioperative management.

References

1. Lukens JN. The thalassemias and related disorders. In: Lee RG, Foerster J, eds. Wintrobe's Clinical Hematology. 10th ed. Baltimore, Maryland: Williams & Wilkins; 1999: 1407–9.
2. Aessopos A, Farmakis D, Karagiorga M, Voskaridou E, Loutradi A, et al. Cardiac involvement in thalassemia intermedia: a multicenter study. *Blood* 2001; **97**: 3411–6.
3. Farmakis D, Polonifi A, Deftereos S, Tsironi M, Papaioannou I, et al. Aortic valve replacement in a patient with thalassemia intermedia. *Ann Thorac Surg* 2006; **81**: 737–9.
4. Botta L, Savini C, Martin-Suarez S, Dell' Amore A, Camurri N, et al. Successful mitral valve replacement in a patient with a severe form of beta-thalassaemia. *Heart, Lung and Circ* 2008; **17**: 62–79.
5. Schrier SL, Angelucci E. New strategies in the treatment of the thalassaemias. *Ann Rev Med* 2005; **56**: 157–71.