SURGICAL OUTCOME OF DOUBLE VALVE REPLACEMENT AND CORONARY ARTERY BYPASS GRAFTING IN FAMILIAL HYPERCHOLESTEROLAEMIA

Hilmi TOKMAKOĞLU, M.D., Cem YORGANCIOĞLU, M.D., Serdar GÜNAYDIN, M.D., Zeki CATAV, M.D., Kaya SÜZER, M.D.

Bayındır Medical Center, Department of Thoracic and Cardiovascular Surgery, Ankara-Turkey
Gazi Medical Journal 2000; 11: 187-190

ABSTRACT : *Familial hypercholesterolaemia is characterized by cutaneous xanthoma development from infancy, precocious and accelerated atherosclerosis with clinical signs of ischemic heart disease and frequent involvement of left heart valves, resulting in stenosis and/or incompetence with a high risk of mortality. We report a 22-year-old, pulmonary hypertensive patient who underwent mitral valve replacement and aortic valve replacement via Konno procedure, as well as coronary artery bypass grafting due to familial hypercholesterolaemia involving the mitral valve, aortic valve and right coronary artery, and discussed the outcome within the concepts of current literature.*

Key Words: *Heart Valve Replacement, Familial Hypercholesterolaemia, Coronary Artery Bypass Grafting.*

INTRODUCTION

Familial hypercholesterolaemia (FH) is an autosomal codominant inherited, condition with an abnormality in low-density lipoprotein receptor function, elevated plasma cholesterol levels and premature atherosclerosis. In patients dying in adolescence with FH, a combination of xanthoma of the skin and tendons, atheromatous plaques on the aortic and mitral valves, the coronary outlets and in the proximal aorta is frequently found (1). Mitral valve is involved in the atherosclerotic process at the cusp level. The cusps become thickened and stiff. Aortic stenosis is mainly due to atheromas infiltrating the Valsalva sinuses and the ascending aorta. Pulmonary hypertension is observed very rarely and is probably due to concomitant atheromatosis involving the pulmonary artery with secondary fatty embolism (2).

In this report, we present a patient with FH and pulmonary hypertension who underwent double valve replacement as well as coronary artery bypass grafting and discussed the outcome within the scope of current literature.

CASE REPORT

A 22 year-old male patient was admitted to the Cardiology department with the complaints of shortness of breath and palpitation. He was previously diagnosed to have FH Type 2a. On physical examination, the patient was in New York Heart Association (NYHA) Class III. 4X5 cm. xanthomas were present especially on the extensor side of extremities, Achilles tendon and sacrococcygeal region (Fig. 1). Blood pressure was 150/80 mmHg, heart rate was 84/min and rhythmic. On auscultation, a 3/4° systolodiastolic murmur was heard both at the apex and aortic

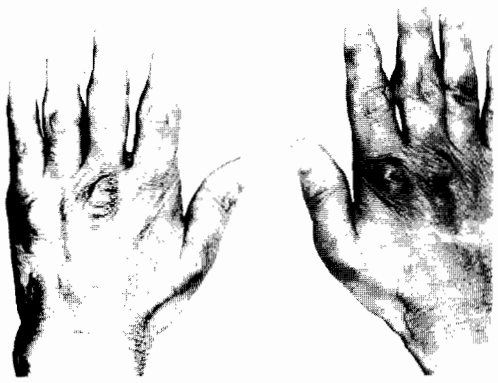

Fig. 1 : Xanthomas present especially on extensor side of the extremities.

focus. On laboratory examination, activation tests (anti-streptolisin O, C-reactive protein, Latex test) were negative. Hemoglobin was 9 g/dl. Serum total cholesterol level was 466 mg/dl, LDL 425 mg/dl, HDL19 mg/dl and VLDL 22 mg/dl.

ECG revealed sinus rhythm, left ventricular hypertrophy and left ventricular strain.

Preoperative Doppler echocardiography data is summarized in Table 1 and demonstrated in Fig 2A and B. On angiography, moderate hypoplasia of the ascending aorta and 90 % stenosis in the right coronary artery were observed. Moderate mitral and tricuspid regurgitation and a mild aortic regurgitation were shown.

The patient was scheduled for operation due to mitral and tricuspid regurgitation, aortic stenosis and incompetence, right coronary artery disease and pulmonary hypertension.

Anesthesia and Surgery:

After premedication with diazepam (10 mg I.M.), a radial artery catheter, two peripheral intravenous catheters and a pulmonary artery catheter were inserted when in the operating room. Hemodynamic parameters; heart rate, mean arterial pressure, central venous pressure, pulmonary artery pressure, rectal temperature and arterial blood gases were monitored throughout the procedure.

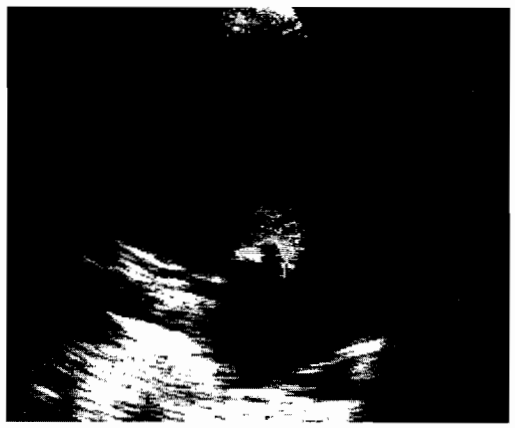

Fig. 2A : Preoperative doppler echocardiographic image demonstrating deposits and insufficiency of the left sided valves.

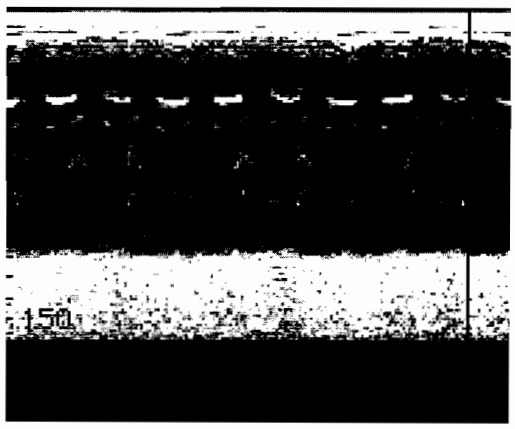

Fig. 2B : Preoperative M-mode echocardiography demonstrating valvular lesions.

Table 1 : Doppler echocardiographic data (preoperative).

Ejection Fraction Rate (%)	60
Fractional Shortening (%)	36
Interventricular Septum (cm)	1.54
End-diastolic Diameter (cm)	5.85
End-systolic Diameter (cm)	4.31
Pulmonary Artery Pressure (mmHg)	75
Left Atrium Diameter (cm)	4.5
Peak Aortic Gradient(mmHg)	81

Aortic regurgitation ($2/4^{o}$), mitral regurgitation ($3/4^{o}$) and tricuspid regurgitation ($3/4^{o}$) were observed. Ascending aorta is moderately hypoplastic (19 mm).

Anesthesia was induced by fentanyl (35 µg /kg) and muscle relaxation was established with pancronium (0.1 mg/kg). The patients were intubated endotracheally and ventilated with 100 % oxygen.

The standard median sternotomy incision was used for exposure of the heart. Cardiopulmonary bypass was instituted via the ascending aorta and bicaval cannulation. Deep hypothermia was induced at 21°C. Following cross clamping of the aorta, the heart was arrested by using topical ice slush and 10-15 cc/kg crystalloid potassium cardioplegia, continued with cold blood cardioplegia every 20 min, and finally warm blood cardioplegia was administered before releasing the aortic cross clamp.

Both valves were evaluated via aortotomy and left atriotomy. Fibrotic degeneration and lipid deposits were observed on the cusps of mitral valve. The mitral valve was completely incompetent. The aortic valve was stiff, calcified and stenotic. The aortic orifice was approximately about 17 mm Hegar wide. Since Nick or Manugian procedures would enlarge the aortic root only up to 19; Konno procedure was planned in order to obtain the widest aortic root.

Initially, right coronary artery bypass was performed using the saphenous vein.

The mitral valve was excised and replaced with 27 no. Carbomedics valve.

The aortic root was hypoplastic. During 15 min. total circulatory arrest at 21°C, the aortic root was enlarged via Konno procedure (aortoventriculoseptoplasty) by an elongated patch of the ascending aorta up to the arch. The aortic valve was replaced with 21 no. Carbomedics valve. Cardiopulmonary bypass was then finished with the standard procedure.

Total perfusion time and aortic cross clamp time were 206 min and 126 min, respectively. Peroperative period was completely uneventful.

Postoperative Period:

The patient was observed for 2 days in the ICU. Respiratory support was maintained for the initial 6 hours. Hemorrhage was 350 cc within the whole ICU period. No arrhythmia or need for inotropic support was observed. The patient suffered from decubitis ulcers of lipid deposits on the sacrococcygeal region during the ward stay but they were controlled by dermatological care. The patient was given simvastatin 20 mg b.p.d.

Blood and urine biochemistry and blood count levels were within the normal range. Serum the total cholesterol level was 374 mg/dl, LDL: 341 mg/dl, HDL:14 mg/dl and VLDL was 14 mg/dl in the first postoperative week.

Early postoperative period was uneventful. The patient was discharged on the 9th postoperative day.

In first month control, the patient was in NYHA I with no complaints. Physical examination was within normal range. Serum total cholesterol level was 245 mg/dl, LDL 215 mg/dl, HDL:19 mg/dl and VLDL was 12 mg/dl.

Postoperative Doppler echocardiographic data is demonstrated in Table 2.

Table 2 : Doppler echocardiographic data (postoperative one month).

Ejection Fraction Rate (%)	65
Fractional Shortening (%)	36
Interventricular Septum (cm)	1.5
End-diastolic Diameter (cm)	4.8
End-systolic Diameter (cm)	3.2
Pulmonary Artery Pressure (mmHg)	38
Left Atrium Diameter (cm)	4.5

Normal functioning prosthetic valves in the mitral and aortic position.

The complete follow-up of 8 months was thoroughly uneventful. The patient is still in NYHA I with no complaints.

DISCUSSION

FH is a genetic disease characterized by high serum cholesterol levels and premature cardiac pathologies. Dominant hypercholesterolaemia is probably the main factor promoting the arteriosclerotic process and valvular pathologies (3). Premature, severe atheroma of the aortic valve or root is a specific feature of FH and carries a high mortality (4).

Haitas et al. reported the clinical follow-up of 49 patients with FH over a period of 13 years. 11 of them died, nine of myocardial infarction. 7 underwent coronary artery bypass grafting and another 5 had surgery to relieve supravalvular or

valvular aortic stenosis (5). As demonstrated, surgical intervention should be employed in FH. Otherwise, the patients have a very poor prognosis, unfortunately.

Physicians usually hesitate to suggest surgery because of the prejudice for poor results, but early surgical outcome is usually satisfactory. Kawasuji et al reported 95 patients with FH who underwent coronary artery bypass grafting with only 1 hospital death. The study revealed an actuarial survival rate of 90.9% at 10 years (6). These were the encouraging facts for us to carry out the surgical procedure for our patient.

Another question may be the late surgical results. In a five-year-follow-up, it was demonstrated that new atherosclerotic plaques were not observed in patients in whom total cholesterol levels were controlled to < 220 mg/dl; but in whom levels were >220 mg/dl, a new evolution of stenotic lesion was observed angiographically. It was assumed that new evolution of stenotic lesions following revascularization in patients with FH could be controlled significantly by lipid lowering therapy (7).

We have also planned an anti-cholesterol regimen for our patient for the follow-up. It was initially very difficult to control serum lipid levels but in a long- term therapy, especially serum cholesterol levels were within acceptable range. The 8-month-follow-up is still uneventful.

Our report is the first one to present double valve replacement with Konno procedure and concomitant coronary surgery in FH in the current literature. Our patient also had pulmonary hypertension both due to FH and bivalvular lesions. We think a successful surgical outcome within an eight-month period would be encouraging to suggest surgery as an alternative therapy for FH.

Correspondence to : Serdar GÜNAYDIN, M.D.
Kızılırmak Mah. 8. Sok. No: 7/35
Balgat
06520 ANKARA - TÜRKİYE
Phone-Fax: 0 312-285 36 64
e-mail: gunaydin@marketweb.net.tr

REFERENCES

1. Keller C, Lohmoller G, Schmitz H. Homozygous familial hypercholesterolemia. Cardiovascular findings in two patients. MMW Munch Med Wochenschr 1980, 28; 122: 1717-1720.
2. Pipitone S, Grillo R, Giudice G, Centineo G, Sperandeo V. Involvement of the heart valves and great vessels in homozygote familial hypercholesterolemia. G Ital Cardiol 1992, 22: 1225-1232.
3. Kita Y, Shimizu M, Sugihara N, Shimizu K, Miura M, Koimizu J, Mabuchi H, Takeda R. Abdominal aortic aneurysms in familial hypercholesterolemia-case reports. Angiology 1993, 44: 491-499.
4. Allen JM, Thompson GR, Myant NB, Steiner R, Oakley CM. Cardiovascular compications of homozygous familial hypercholesterolaemia. Br Heart J 1980, 44: 361-368.
5. Haitas B, Baker SG, Meyer TE, Joffe BI, Seftel HC. Natural history and cardiac manifestations of homozygous familial hypercholesterolaemia. Q J Med 1990, 76: 731-740.
6. Kawasuji M, Sakakibara N, Takemura H, Ushijima T, Ikeda M, Tabata S, Yamaguchi S, Watanabe Y. Arterial revascularization. 18-year experience with coronary artery bypass grafting in familial hypercholesterolemia. Jpn J Thorac Cardiovasc Surg 1999, 47: 330-334.
7. Fukuzawa S, Ozawa S, Inagaki M, Morooka S, Inoue T. Secondary prevention with lipid lowering therapy in familial hypercholesterolemia: a correlation between new evolution of stenotic lesion and achieved cholesterol levels after revascularization procedures. Intern Med 1999, 38: 330-335.