

CABG for coronary artery lesions of Kawasaki disease at a Japanese hospital: Summary of a 30-year experience

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Abstract

In a recent national survey concerning Kawasaki disease, cardiac sequellae were reported in 2.6% of patients. Stenotic coronary lesions significantly affected the long-term prognosis. To assess the long-term outcome following coronary artery bypass grafting (CABG) for coronary artery lesions of Kawasaki disease, the medical records of 16 patients who underwent CABG at our hospital between 1985 and 2015 were analyzed retrospectively. The bypass graft remained patent in 11 patients during a mean postoperative follow-up period of 10.5 years.

One patient died, another developed graft stenosis, and three were lost to follow-up. Although the postoperative course of patients with internal thoracic artery (ITA) grafts was generally uneventful, competition between graft blood flow and flow in the original coronary may be problematic. We believe that a more rigorous selection of CABG candidates will improve the long-term prognosis of patients with coronary artery lesions of Kawasaki disease.

Key words: Kawasaki disease, coronary artery, bypass grafting

Introduction

First described by Kawasaki et al. in 1967, Kawasaki disease is characterized by systemic vasculitis affecting medium-sized blood vessels throughout the body.¹ In a national survey in Japan during 2013 and 2014,² more than 30,000 persons were affected by Kawasaki disease during the survey period, among whom 2.6% had cardiac sequellae. These coronary artery lesions impair myocardial blood flow, and eventually are likely to calcify, further compromising the myocardial blood supply.³

Medical treatments for coronary artery lesions affecting the myocardial blood flow generally include balloon dilation, stent placement, and rotary ablation procedures for calcified lesions. Surgical options for children include coronary artery bypass grafting (CABG), as initially reported in 1976.⁴ In our hospital, we have extensive surgical experience with adults, having aggressively performed CABG for coronary artery lesions of Kawasaki disease in collaboration

with cardiovascular surgeons.

Objective

To assess the long-term outcome following CABG for coronary artery lesions of Kawasaki disease.

Subjects and Methods

Subjects

Sixteen patients (12 men and 4 women) who had been diagnosed with coronary artery lesions of Kawasaki disease with anticipated or symptomatic myocardial ischemia underwent CABG in the Department of Cardiovascular Surgery at Kinki University Hospital between 1985 and 2015.

Methods

The clinical course, prognosis, and graft patency of these patients were evaluated retrospectively based on medical records. Graft patency was assessed by contrast-enhanced catheter angiocar-

diography or multi-detector computed tomography (MDCT, Figures 1 and 2).

In the assessment by MDCT, volume rendering images were created from the image data obtained to evaluate the status of the vascular graft and coronary artery. If the vascular morphology of the graft, junction, and its periphery were visualized, the graft and coronary artery were assessed as patent, with sufficient blood flow (Fig. 1). Since many vascular clips are usually attached to the graft, it was difficult to visualize and assess the surrounding vascular morphology. In view of the hemodynamics, the graft and coronary artery were assessed as patent if the blood flow between the central side of the

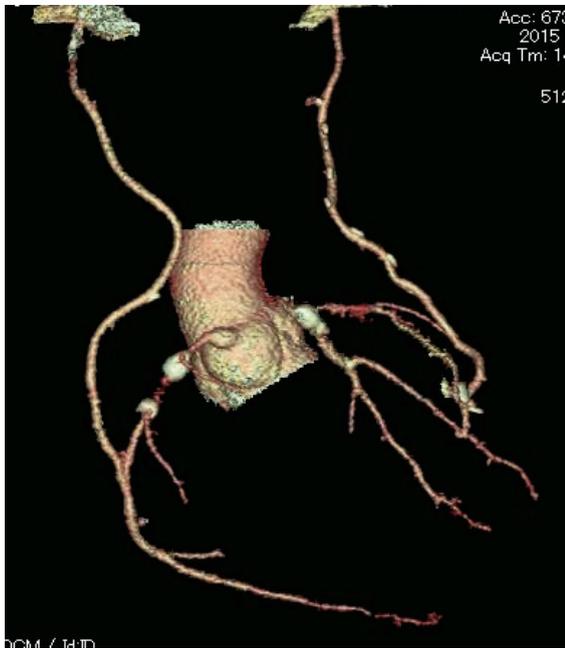


Fig. 1 Evaluation of CABG by volume-rendering imaging with MDCT (patient 10).

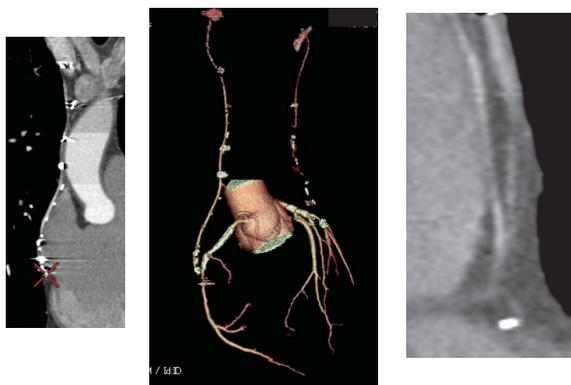


Fig. 2 Evaluation of CABG by volume-rendering imaging with MDCT (patient 16, poor blood flow).

graft and the graft-artery junction was visualized. If the blood flow was poor, and could not be visualized on volume rendering images, the graft-artery junction was evaluated using CT data (Fig. 2).

Results

Table 1 presents data describing the 16 patients with a total of 23 grafts. In the early period of this series, the great saphenous vein (GSV) was used in 2 patients (2 grafts), 1 of whom died suddenly 15 years postoperatively, possibly of myocardial infarction caused by graft obstruction. Since the other patient was lost to follow-up at 16 years postoperatively, his remaining course was unclear. From 1987, internal thoracic artery (ITA) grafts became the mainstay in CABG, with graft patency confirmed in all patients on follow-up. Both the ITA and GSV were used in 2 patients, in 1 of whom both grafts were confirmed to be patent 26 years postoperatively. For the other patient, who changed hospitals, graft patency is unclear. In only 1 of the 16 patients, blood flow through the bypass graft was evaluated as poor at 9 years postoperatively. Nonetheless, the graft was patent, and remained so for at least 15 years postoperatively (Figure 2).

In 13 patients with a total of 19 grafts who had sufficient follow-up, the survival rate was 92.3%. The patency of 18 grafts (17 ITA and 1 GSV) was maintained for a maximum of 29 years, with an overall patency rate of 94.7%. Patency rates of ITA and GSV grafts were 100 and 50%, respectively.

All patients have been resumed their normal activities, with some limitations due to anticoagulant therapy and heart failure that there was since before CABG.

Discussion

Before the widespread use of CABG using the ITA, 22 and 87% of patients with coronary artery lesions of Kawasaki disease were reported to die between the first and third episodes of myocardial infarction respectively.⁵ Considering the need for the long-term prevention of myocardial ischemia caused by coronary artery lesions of Kawasaki disease, ITA-CABG became widely used in children as well as in adults.

The results of the present study suggest that

Table 1 Sixteen patients with Kawasaki disease undergoing CABG in our hospital

Patient no.	Current age, years	Sex	Age at CABG, years	Years from disease onset to CABG	Postoperative period (years)	Recipient coronary arteries	Graft	Postoperative course and graft
1	41	M	11	9	-	#7	GSV	Death (15 years after CABG)
2	41	M	13	12	28	#3	GSV	Further participation declined
3	35	M	7	7	28	#7	ITA	Patent
4	36	F	8	6	28	#9	ITA	Unknown (follow-up refused)
5	38	M	9	8	29	#7 #13	ITA GSV	Patent
6	31	M	7	2	24	#3 #7	ITA	Patent
7	48	M	37	37	11	#8 #4PD	ITA GSV	Unknown (followed at another hospital)
8	16	M	5	5	11	LAD	ITA	Patent
9	37	M	26	23	11	#3	ITA	Patent
10	12	M	12	12	0	#8 #3	ITA	Patent
11	15	M	8	8	7	#11 #7	ITA	Patent
12	12	F	7	2	5	#7	ITA	Patent
13	40	F	39	33	1	#3	ITA	Patent
14	12	F	12	10	0	#7 #3	ITA	Patent
15	18	M	18	12	0	#3	ITA	Patent
16	43	M	28	25	15	#2 #7	ITA	Poor blood flow

when the ITA is used for CABG for coronary artery disease due to Kawasaki disease, long-term graft patency is likely to be achievable, and cardiac events can be prevented. Kitamura et al. reported in 1988 that in children undergoing CABG using ITA grafts, growth of the grafts in proportion with somatic growth could be expected.⁶ When CABG is needed at a young age, as in coronary artery disease of Kawasaki disease, ITA grafts, therefore, are preferable. Our experience led to a similar conclusion.

The use of GSV grafts is controversial as they show a low rate of long-term graft patency.^{7,8} We used GSV grafts in the 1980s, in part because of the paucity of published reports. However, since the report of Kitamura et al.,^{4,5} we have relied mainly on ITA grafts. If more than one bypass graft is required, a GSV graft may be included. A GSV graft in 1 of our patients with sufficient follow-up remained patent for an extended period.

The pathologic lesions peculiar to Kawasaki disease appear to be involved when stenosis occurs in ITA grafts that were expected to remain patent for a long time. Coronary artery lesions of Kawasaki disease are highly likely to calcify over time, which differs from the course of lesions in typical coronary artery disease. Such changes can interfere with evaluation of the degree of stenosis. We suspect that if CABG is

performed without sufficient evaluation of the stenotic lesions requiring intervention, residual blood flow through the original coronary artery with an uncertain degree of stenosis can compete with blood flow through the graft-artery junction. Such competition could reduce blood flow to the graft artery, leading to narrowing of the graft. We consider a similar mechanism to be partly responsible for the narrowing of grafts in the patients in this study. However, ITA grafts in functionally no-flow situations can become recanalized several years later.⁹ Careful follow-up will be continued of our group of patients.

Conclusion

The use of ITA grafts in CABG for coronary artery lesions of Kawasaki disease contributes to a favorable long-term prognosis.

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