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Surgery

Case Report: Coronary Artery Bypass Surgery in a Young Adolescent

M. Azizan Petra[1*], M. Zahid Kamaruddin[1], Alwi Mohamed Yunus[1]

[1]Institut Jantung Negara, Kuala Lumpur, Malaysia

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***Corresponding author:** M. Azizan Petra

Abstract **Case Report**

Kawasaki Disease (KD) is an immunological disease which affects mainly children and young adolescents. This disease has its own challenges; mainly diagnosis and subsequently the importance of starting treatment early to prevent coronary artery disease later on in their life. This case report intends to describe a young adolescent who was diagnosed late, and eventually developed coronary artery disease. This study also highlights the angiographic changes that can be observed in the coronaries. In this case, the patient underwent coronary artery bypass surgery (CABG), utilizing bilateral internal mammary arteries.

Keywords: Coronary Artery Bypass Surgery Young Adolescent.

INTRODUCTION

Kawasaki Disease is an immunological disease which affect mainly children and young adolescents [5]. KD remains a challenging disease to diagnose. Early diagnosis is paramount in order to start treatment. This is to prevent the sequelae of the disease in particular the development of coronary artery aneurysms which can progress into fulminant coronary artery disease needing revascularization.

CASE REPORT

This is a 14 years old boy who initially presented to the clinic with central chest pain, pressing in nature and was associated with exertion. Pain was non-radiating, and there were no other associated symptoms. On examination, his hemodynamics was stable. Cardiovascular examination was unremarkable. ECG shows sinus tachycardia of 100bpm with ST depression on V2, V3 and V4 leads. He underwent coronary angiography which showed triple vessel disease with LMS stenosis (Diagram 1).

Coronary angiogram report

LMS: Severely diseased throughout the artery, >50% stenosis with distal calcification.
LAD: Totally occluded from ostium, mid segment filled from RCA retrograde.
LCX: Totally occluded from ostium, mid segment filled from RCA retrograde.
RCA: Few significant stenosis with some aneurysmal segment proximally. Distally, few collaterals and retrograde supplying the left coronary system.

Repeat ECG showed ST depression on leads 1 and aVL with ST elevation in Lead III and aVF (Diagram 2). ECHO showed hypokinetic inferior and antero-septal wall with EF 45-50%.

His baseline biochemistry blood results including liver function test and lipid profile were unremarkable. Pre-operative CXR showed well expanded lung, otherwise unremarkable. Pre-operative lung function test was unremarkable.

Patient was then referred to Institut Jantung Negara, Kuala Lumpur, where he was admitted to High Dependency Unit. He was planned for urgent CABG after discussion with his parents whom he underwent on 15/3/21. Targets were LAD, D1, OM1 and dRCA. Patient was prepped the usual way with supine position. A right internal jugular central venous line and radial arterial line was inserted. Median sternotomy performed. Simultaneously, SVG of the left leg was performed by a surgical assistant. After performing sternotomy, we then proceeded to harvest the left internal mammary artery (LIMA) followed by the right internal mammary artery (RIMA) in a skeletonized fashion. Aortic cannulation size 24F (Sorin) and two stage venous cannulation (35/50F) Stockett. Aortic cross-clamped was placed followed by antegrade cardioplegia via the aortic root and cooling commenced to 32 degrees Celsius. Distal anastomosis was done with 7/0 Prolene and proximal anastomosis was done with 6/0 Prolene on a single cross clamp. Patient rewarmed and off cross clamp and weaned off bypass.

Patient decannulated, hemostasis secured. 2x right ventricle pacing wire attached. One mediastinal drain and bilateral pleural drain was placed. Sternum was closed with sternal wire while the fascia was closed with 2/0 Vicryl in a running fashion followed by the dermal layer. Skin was closed with 3/0 Monosyl.

Intra-operative findings showed that his coronaries were heavily calcified; RCA was ectatic which is consistent with the angiogram findings. The target was reasonably a good size except for the OM which was small. Patient then subsequently weaned off anaesthesia.

Patient was transferred to ICU where he required non-invasive ventilator (NIV) post operatively due to lung collapse. He spent three days in ICU; all drains were removed by day 4. He received vigorous chest physio and was mobilizing well. He progressed well in the ward and was discharged after 10 days post-operatively.

Risk Factors

On further history, patient's first episode of chest pain was 4 years ago where according to his father; the chest pain was associated with fever back then. However, they did not seek medical treatment at that time. His other risk factor includes being a second-hand smoker. He does not have any other past medical history. He has positive family history of ischemic heart disease where his father had a myocardial infarction at the age of 54 years old. He goes to secondary school and according to his father his study is excellent and was able to keep up with his peers.

DISCUSSION

In a young patient, it is well-known that the most common cause of coronary artery disease is Kawasaki Disease (KD) [3]. KD remains the culprit especially in patients who are less than 20 years old. Damage to the coronary arteries was first recognized by Kato et al. in 1975. They documented that in angiographic and echocardiographic studies, 25% went to develop coronary artery aneurysm in untreated KD patients [1]. The pathological changes in KD affect medium-sized extra parenchymal muscular arteries most commonly the coronary arteries [5]. The acute arteritis is characterized by a neutrophilic infiltrate originating from the lumen of the vessel and can be associated with extensive necrosis. Subacute vasculitis begins weeks after the onset of fever and can still be detected months to years later. This process is closely associated with luminal myofibroblastic proliferation (LMP). It is this process that result in luminal narrowing and consequent myocardial ischemia. A prominent feature of the histology of aneurysm is the almost universal finding of layered thrombus in the aneurysms associated with calcification [5].

In the absence of a specific diagnostic test for KD, a set of clinical criteria is used to establish diagnosis of KD [2]. The most important elements in timely diagnosis and treatment are meticulous history taking and thorough physical examination [5]. Early treatment is important and the goal of treatment is to abrogate systemic and tissue-level inflammation as rapidly as possible and to prevent thrombosis in developing aneurysm [5]. Subsequently, acute coronary syndrome complicating coronary artery disease is a major determinant of prognosis and should be prevented [6]. The main treatment is high dose of IVIG plus aspirin within 10 days after the onset of fever. Studies show that by early commencement of treatment, the rate of coronary artery aneurysm can be decreased from 25% to 5% [4].

The challenge in this case is coming to the conclusion of the cause of the coronary artery disease. As mentioned before, there is no pathognomonic laboratory test for KD. Diagnosis is based on clinical criteria during the acute phase. However, for this particular 14-year-old boy, it is most likely that the cause of his coronary artery disease is due to KD based on the retrospective history obtained plus his coronary angiogram results.

This is supported by the description of Kato et al. Another study also described that aneurysms of the coronary artery were present in more than 90% of patients. Aneurysms were more frequently located in the RCA in 62% of the cases [1], which is also consistent with the findings in our patient above. His previous history of chest pain associated with fever might have indicated the acute phase of his KD then. His current presenting symptom has also been described in one of the studies where 52% of the patients have chest pain which is associated with exertion [1].

For his CABG, we maximized the use of his IMA where bilateral IMA were used as the conduit. IMA is the most important vessel for revascularization in young patients as they will be entering the phase of atherosclerosis as they grow older. It is observed that IMA is spared from atherosclerosis and adult patients re-vascularized with this graft survived longer than those with SVG [3]. The other benefit of IMA specifically in KD is that IMA involvement in KD is extremely rare [3] and this certainly adds to the longevity of the graft.

Certainly, if the patient requires revascularization in the future, whenever feasible we will still be able to use the un-harvested SVG, and/or radial artery.

CONCLUSION

Coronary artery disease due to KD continues to pose a challenge in both diagnosing the disease

timely. Early treatment may reduce the risk of subsequent coronary artery aneurysm development. IMA remains the most favourable conduit in young patients. Future research studies aiming at following up these patients and assessing the longevity of the graft would provide more insight to this aspect of the KD sequelae and the impact that they may have on these patient as they grow up into their adult phase.

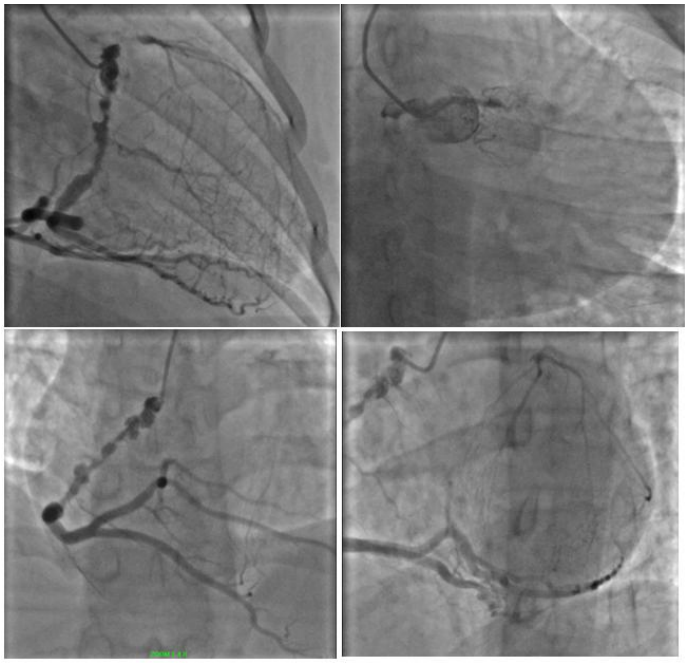

Diagram-1

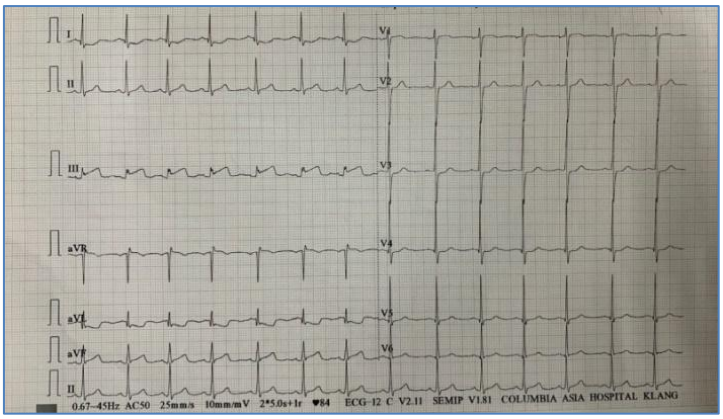

Diagram-2

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