

# Surgical Treatment of Coronary Artery Aneurysm with Calcification and Stenosis: A Case Report and Review of the Literature

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## Case report

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# Abstract

Coronary artery aneurysm (CAA) has been increasingly reported in recent years. The symptoms are related to myocardial ischemia, such as angina pectoris, myocardial infarction, sudden death and congestive heart failure. This report describes a case of a giant CAA with calcification and stenosis involving two coronary arteries, and the patient underwent a complete arterialized coronary artery bypass graft. After 3 months of follow-up, it was found that the radial artery graft was occluded. In this report, all cases related to CAA with calcification and stenosis are summarized. According to the data, the following conclusions can be drawn: CAA seem to be more common in men; Kawasaki disease is likely to be a causative factor in some patients with asymptomatic CAA involving calcification and stenosis; CABG is a feasible treatment option for CAA with calcification and stenosis.

## Introduction

Coronary artery aneurysm (CAA) is defined as the epicardial coronary artery exceeds 1.5-2 times the normal adjacent coronary artery <sup>[1,2]</sup>, with the incidence is approximately 0.02-0.04% <sup>[1]</sup>. At present, the diagnostic criteria of CAA, especially giant CAA, is still inconclusive. And There is no consensus on the indications and methods of surgery for CAA. This report describes a case of CAA with calcification and stenosis and summarizes relevant cases since the first report.

## Case Description

A 31-year-old female, with the symptom of dyspnea after exercise for 3 years. After being admitted to the hospital, coronary computed tomography angiography revealed the formation of CAAs in the proximal left anterior descending artery and proximal right coronary artery with severe calcification, the dimensions were 2.5cm×1.6cm×2.0cm and 1.4cm×1.3cm×2.0cm respectively (Figure 1). Coronary angiography showed the middle part of the left anterior descending branch (LAD) was stenosis 90%, TIMI grade 1, 90% stenosis in the middle of RCA (Figure 2). The electrocardiography (ECG) showed normal sinus rhythm (Figure 3), and the outline of two coronary aneurysms can be seen on chest X-ray radiography (Figure 4). The echocardiogram showed LVED was 49mm, LA was 29mm, and the EF was 60%. The carotid artery CT showed that the lumen of the innominate artery. The carotid arteries, internal carotid arteries, external carotid arteries, bilateral subclavian arteries, and vertebral arteries were smoothly and without any narrowing by atheromatous plaque (Figure 2). The patient underwent coronary artery bypass graft. The left internal mammary artery and left radial artery were harvested, then bypass surgeries of the left internal mammary artery to LAD and the left radial artery to RCA were performed. 3 months after discharge, it was found that the patient's radial artery graft was occluded (Figure5).

## Discussion

A case with complete calcified coronary artery aneurysms involving both the right coronary artery and the left anterior descending artery is rare. Most coronary artery aneurysms involve only one artery, and less

than 25% of cases involve multiple arteries [3, 4]. CAAs with an artery diameter greater than 20 mm or four times the normal reference artery diameter was defined as giant coronary artery aneurysms [5, 6]. In this case, the dimension of the CAA was 2.5cm×1.6cm×2.0cm, and 1.4cm×1.3cm×2.0cm respectively, which can be classified as a giant coronary artery aneurysm involving bilateral coronary artery.

The most common cause of coronary artery aneurysms is atherosclerosis, and other causes including congenital heart disease, Kawasaki disease, Marfan syndrome, Ehlers-Danlos syndrome, Takayasu arteritis, nodular arteritis, and syphilitic aortitis, Scleroderma, systemic lupus erythematosus, Behçet's disease, fibromuscular dysplasia and iatrogenic injury [5, 7-9]. The patient did not have a history of atherosclerosis, connective tissue disease, or interventional therapy. To our knowledge, there are three reports that are similar to the clinical evolution and imaging manifestations of this case [10-12]. The causes of CAA did not seem to be clear, and maybe relate to the ambiguous history of Kawasaki disease in childhood without standardized treatment. It has been reported that 5/22 of cases with Kawasaki disease occurred calcification during follow-up. In addition, the report also proposed that the diameter of the aneurysm in the case with calcification is larger than that in the case without calcification [13]. Kaichi and colleagues pointed out that the risk of CAA in the long-term calcification (20 years) was as high as 94% for patients with Kawasaki disease without symptoms but with a CAA > 6 mm [11]. Therefore, for patients without symptoms in childhood and with CAAs calcification in adulthood, are more likely to have Kawasaki disease in childhood, and this kind of disease can be used as a risk stratification factor for long-term sudden death in patients with Kawasaki disease [14].

According to the literatures, most coronary aneurysms are asymptomatic, some patients suffered from angina, myocardial infarction, sudden death, congestive heart failure, etc [5, 15]. In addition, the majority gender of cases were male, which was similar to the aggregated data of Morita, Keyser, Ino and Li, and these data suggest that CAAs may be more common in male patients [3, 4, 16, 17].

There are no an effective treatment for CAA, and further studies are needed to establish a guideline. Due to the risk of thrombosis associated with CAA, platelet inhibitors are used to prevent ischemic synthesis caused by fibrin thrombosis and microemboli, so antiplatelet and/or anticoagulation therapy were recommended [5, 18].

Surgical treatment was an option to avoid CAA rupture, dissection, myocardial ischemia and embolism [2, 19, 20], although their specific surgical treatment standards have not yet reached consensus [1]. For CAAs, multiple surgical strategies have been reported, including reconstruction, resection or exclusion, as well as ligation combined with coronary artery bypass, patch, or hybrid repair [21-25]. Especially for patients with normal distal vessels, coronary artery bypass grafting is the preferred treatment [1, 2]. According to the summary of all cases with CAA calcification and stenosis [2, 10, 12, 13, 22, 26-38] (Table 1), surgical treatment based on CABG can effectively solve the problem of CAA calcification and stenosis. Unfortunately, all reports have no long-term follow-up results.

The long-term patency rate of internal mammary artery bypass for coronary aneurysms is much higher than that of great saphenous vein bypass ( $77.1\pm 1.1\%$  compared to  $46.2\pm 6.3\%$  for patency 85 months after operation) [1, 39]. In this case, it was found that the radial artery graft was occluded 3 months after surgery. This outcome indicates that solitary bypass surgery may lead to competing blood flow thus cause occlusion of the graft, and it is necessary to treat the aneurysm during the surgery.

To summarize, we reported a case of a coronary artery aneurysm with calcification and stenosis involving two coronary arteries, and underwent a complete arterialized bypass operation. By reviewing the literature, male are the main affected population in CAAs. Kawasaki disease is likely to be a causative factor in some patients with asymptomatic CAA involving calcification and stenosis. And CABG is a feasible treatment option for coronary artery aneurysms with calcification and stenosis.

## References

- [1] Beckmann E, Rustum S, Marquardt S, et al. Surgical treatment of coronary artery aneurysms. *J Card Surg.* 2017. 32(11): 674-679.
- [2] Viola L, Keita L, Veerasingam D. Surgical treatment of a giant left main aneurysm. *Interact Cardiovasc Thorac Surg.* 2017. 24(1): 138-139.
- [3] Keyser A, Hilker MK, Husser O, Diez C, Schmid C. Giant coronary aneurysms exceeding 5 cm in size. *Interact Cardiovasc Thorac Surg.* 2012. 15(1): 33-6.
- [4] Li D, Wu Q, Sun L, et al. Surgical treatment of giant coronary artery aneurysm. *J Thorac Cardiovasc Surg.* 2005. 130(3): 817-21.
- [5] Crawley PD, Mahlow WJ, Huntsinger DR, Afiniwala S, Wortham DC. Giant coronary artery aneurysms: review and update. *Tex Heart Inst J.* 2014. 41(6): 603-8.
- [6] Kalisz K, Rajiah P. Radiological features of uncommon aneurysms of the cardiovascular system. *World J Radiol.* 2016. 8(05): 434-448.
- [7] Tsuda E, Tsujii N, Kimura K, Suzuki A. Distribution of Kawasaki Disease Coronary Artery Aneurysms and the Relationship to Coronary Artery Diameter. *Pediatr Cardiol.* 2017. 38(5): 932-940.
- [8] Hsu CY, Chana R, Ayoub C, et al. Surgical repair of a left main coronary artery aneurysm. *J Card Surg.* 2018. 33(10): 634-637.
- [9] Lawani O, Ganim R. Unique Findings and Novel Treatment Strategy of a Giant Coronary Artery Aneurysm Associated with a Significant Pericardial Effusion. *Case Rep Cardiol.* 2020. 2020: 8890806.
- [10] Song J, Gong SJ, Yu YH. Coronary aneurysm with calcification in a young adult: An unusual cause of cardiac arrest. *Med Intensiva.* 2019. 43(7): 453-454.

- [11] Kaichi S, Tsuda E, Fujita H. Acute coronary artery dilation due to Kawasaki disease and subsequent late calcification as detected by electron beam computed tomography. *Pediatr Cardiol*. 2008. 29(3): 568-573.
- [12] van Beek LM, Luijten H. Giant coronary aneurysms: three-dimensional reconstruction. *Neth Heart J*. 2012. 20(1): 42-3.
- [13] Norman A, Mary M. Coronary artery aneurysm with occlusion due to a calcified thrombus. *Heart*. 1948. 10(3): 165-166.
- [14] Dadlani GH, Gingell RL, Orié JD, et al. Coronary artery calcifications in the long-term follow-up of Kawasaki disease. *Am Heart J*. 2005. 150(5): 1016.
- [15] Bhindi R, Testa L, Ormerod OJ, Banning AP. Rapidly evolving giant coronary aneurysm. *J Am Coll Cardiol*. 2009. 53(4): 372.
- [16] Morita H, Ozawa H, Yamazaki S, et al. A case of giant coronary artery aneurysm with fistulous connection to the pulmonary artery: a case report and review of the literature. *Intern Med*. 2012. 51(11): 1361-6.
- [17] Ino T, Shimazaki S, Akimoto K. Coronary artery calcification in Kawasaki disease. *Pediatr Radiol*. 1990. 20(7): 520-3.
- [18] Turhan H, Yetkin E. What is the plausible strategy for the management of patients with isolated coronary artery ectasia and myocardial ischemia. *Int J Cardiol*. 2007. 117(2): 285-6.
- [19] Lazar JF, Compton M, Li F, Knight P. Excising a giant: report of a 7-cm coronary artery aneurysm. *Tex Heart Inst J*. 2013. 40(2): 173-5.
- [20] ElGuindy MS, ElGuindy AM. Aneurysmal coronary artery disease: An overview. *Glob Cardiol Sci Pract*. 2017. 2017(3): e201726.
- [21] Yoneyama F, Sakamoto H, Tokunaga C, Enomoto Y, Hiramatsu Y. Complex coronary artery aneurysm. *J Card Surg*. 2017. 32(1): 26-27.
- [22] Uchida T, Hamasaki A, Sadahiro M. A modified surgical approach for giant left coronary arterial aneurysm. *J Card Surg*. 2017. 32(8): 489-491.
- [23] Pinheiro BB, Fagundes WV, Gusmão CA, Lima AM, Santos LH, Vieira GB. Surgical management of a giant left main coronary artery aneurysm. *J Thorac Cardiovasc Surg*. 2004. 128(5): 751-2.
- [24] Koizumi S, Koyama T. Repair of a coronary artery aneurysm in close proximity to the left main trunk. *J Card Surg*. 2017. 32(5): 293-294.

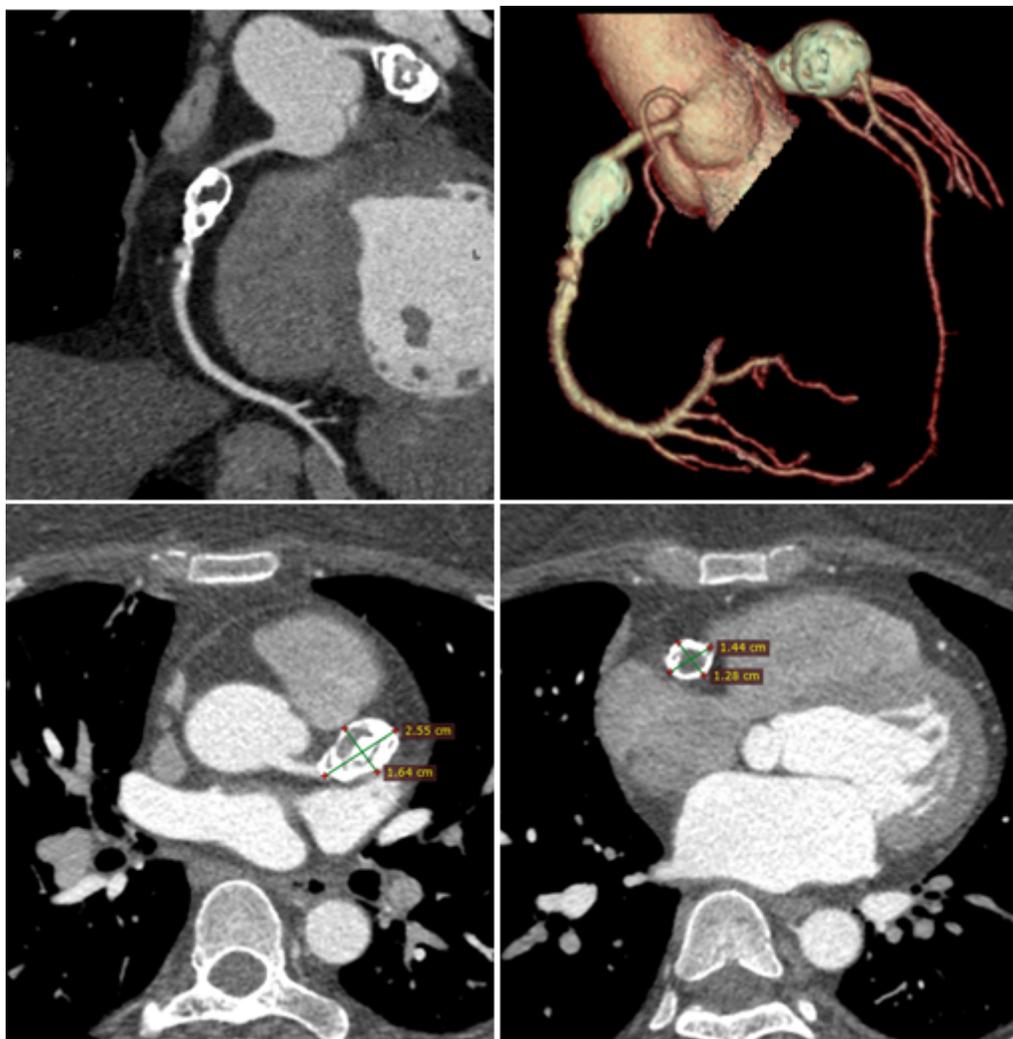
- [25] Er F, Çakır H, Erdolu B, Ay D. Left main coronary artery aneurysm presenting with unstable angina. *J Card Surg*. 2018. 33(8): 440-441.
- [26] Kostopanagiotou K, Poulou A, Chatzis A, Khoury M. Multiple Giant Coronary Artery Aneurysms Surgically Treated with Bypass Grafting: A Challenging Rarity. *Case Rep Surg*. 2018. 2018: 2096902.
- [27] Chung Y, Roh SY. Ovoid-shaped Left Main Coronary Calcified Aneurysm Leading to Unstable Angina Requiring Surgical Intervention. *Korean Circ J*. 2019. 49(1): 113-114.
- [28] Park H, Hong YJ, Ahn YK, Jeong MH, Cho JG, Park JC. Multiple giant calcified aneurysms of three coronary arteries. *Korean J Intern Med*. 2017. 32(6): 1101-1103.
- [29] Wang H, Zhang Y, Xie Y, Wang H, Yuan J. Giant right coronary artery aneurysms presenting as a cardiac mass: Case report. *Medicine (Baltimore)*. 2016. 95(38): e4924.
- [30] Peng Y, Li Y, Jiang Y. Rare case of a giant thrombosed left anterior descending coronary artery aneurysm. *J Cardiothorac Surg*. 2020. 15(1): 204.
- [31] Johnston N, Snow A, McMahon C J. Unexpected coronary arterial calcification and thrombosis late after Kawasaki disease. *BMJ Case Rep*. 2016. bcr2016216451.
- [32] Saghir I, Moeen Z, Saghir G, Bangash S, Tariq S, Akter S. Giant Right Coronary Artery Aneurysm: A Case Report. *Cureus*. 2018. 10(11): e3609.
- [33] Everett JE, Burkhart HM. Coronary artery aneurysm: case report. *J Cardiothorac Surg*. 2008. 3: 1.
- [34] Park SH, Kim SE, Ryu SK. Left main coronary artery aneurysm with chronic total occlusion of both left coronary arteries in a young athlete. *Heart*. 2001. 85(1): E1.
- [35] Gerbaud E, Cailliez H, Montaudon M. Giant thrombosed aneurysm of the right coronary artery. *Arch Cardiovasc Dis*. 2014. 107(1): 69-71.
- [36] Park JY, Tilbury RT, Mayo Clinic R. Management of a giant calcific coronary artery aneurysm. *J Am Coll Cardiol*. 2017. 69(11): 2480.
- [37] Hernández V, Saavedra J. Giant Coronary Aneurysm in Kawasaki Disease. *Revista Española De Cardiología*. 2008 .
- [38] Okumori M, Tokuno S, Nogami Y, Kann I, Tanaka Y. Treatment of a giant coronary artery aneurysm in an adult with a history of Kawasaki disease by resection and bypass grafting: report of a case. *Surg Today*. 1995. 25(4): 373-7.
- [39] Yeu BK, Menahem S, Goldstein J. Giant coronary artery aneurysms in Kawasaki disease—the need for coronary artery bypass. *Heart Lung Circ*. 2008. 17(5): 404-6.

# Tables

Table 1-Reports of coronary aneurysm with calcification and stenosis

No.	Age	Gender	Location of aneurysm	Calcification	Symptoms	Etiology	Surgical approach	Outcome	Author
1	14 m		prox LM T, prox RCA	prox LM T	chest pain	Kawasaki disease	CABG ×2	uneventful	Johnston
2	57 m		LM T, LAD, LCX, RCA	prox RCA	chest pain	atherosclerosis	CABG ×4, endarterectomy, ligation	uneventful	Kostopanagiotou
3	34 m		distal LM T	distal LM T	chest pain	?	CABG ×2	uneventful	Chung
4	39 m		prox LAD, prox LCX, prox RCA, mid RCA	prox LAD, prox LCX, prox RCA, mid RCA	asymptomatic	?	CABG ×3	uneventful	Park H
5	65 m		mid RCA, distal RCA	mid RCA, distal RCA	asymptomatic	atherosclerosis	CABG ×3, thrombectomy	uneventful	Wang
6	49 m		prox LAD	prox LAD	chest distress and palpitations	?	CABG ×2, ligation, resection	uneventful	Peng
7	75 m		distal LM T	distal LM T	chest pain	?	CABG ×3, ligation	uneventful	Vibla
8	80 f		prox LM T	prox LM T	cough	?	ligation, resection, thrombectomy	uneventful	Uchida
9	80 m		distal RCA	distal RCA	asymptomatic	atherosclerosis	none	uneventful	Saghir
10	66 m		distal LM T	distal LM T	asymptomatic	atherosclerosis	CABG ×2, resection	uneventful	Everett
11	31 m		distal LM T	prox LAD, prox LCX	myocardial infarction	?	CABG ×2	uneventful	Park SH
12	23 m		prox LAD, prox RCA	prox LAD, prox RCA	coma and sudden death	congenital defect	-	-	Ashton
13	31 m		prox LAD, prox RCA	prox LAD, prox RCA	chest pain	Kawasaki disease	medication	uneventful	van Beek
14	79 m		distal RCA	distal RCA	myocardial infarction	atherosclerosis	-	-	Gerbaud
15	71 m		mid LAD	mid LAD	asymptomatic	atherosclerosis	CABG ×3, resection	uneventful	Jae Yoon Park
16	29 m		prox LAD, prox RCA	prox LAD, prox RCA	cardiac arrest	Kawasaki disease	Referred to surgery	uneventful	Song
17	22 m		prox LAD	prox LAD	chest pain	Kawasaki disease	CABG ×2	uneventful	Verónica
18	22 m		distal LM T	distal LM T, prox LAD	asymptomatic	Kawasaki disease	CABG ×2, resection	uneventful	Ookumori

# Figures



## Figure 1

Coronary computed tomography angiography showed the formation of fusiform CAAs in the proximal left anterior descending artery and proximal right coronary artery with severe calcification. The dimension of CAA in LAD was 2.5cm×1.6cm×2.0cm, and the dimension of CAA in RCA was 1.4cm×1.3cm×2.0cm.



## Figure 2

Coronary angiography: A, 90% stenosis in the middle part of LAD, TIMI grade 1. B, 90% stenosis in the middle part of RCA.

清华大学第一附属医院心电图报告单

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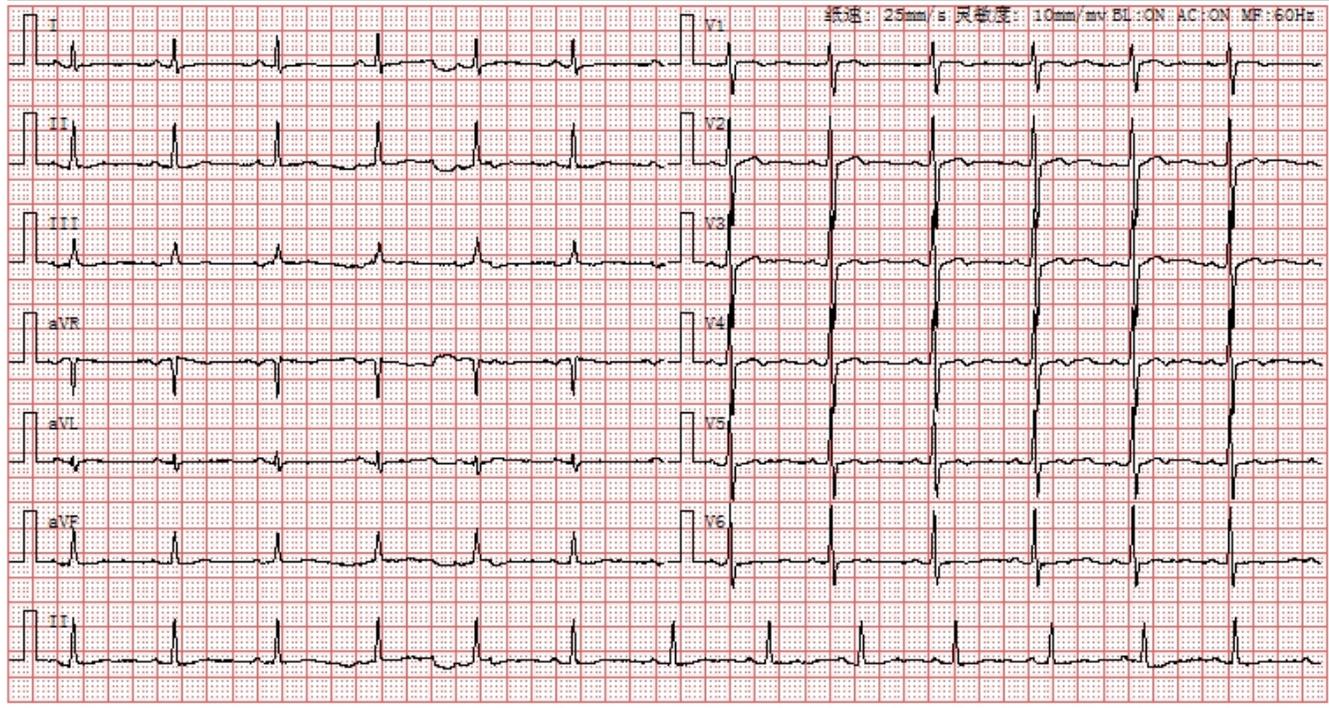
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P-R:156ms

QT/QTc:372/424ms  
QRS电轴:+58°  
RV5/SV1:1.08/0.59mV

心率:78 bpm  
Rv5+Sv1: 1.67mV



诊断提示:

- 1、窦性心律
- 2、T波改变

签名: 李华

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Figure 3

Baseline electrocardiogram.

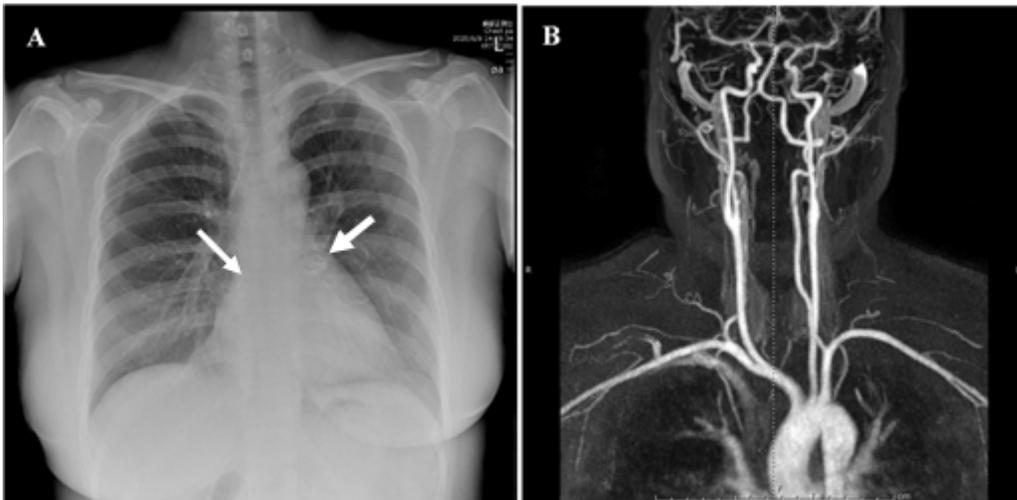
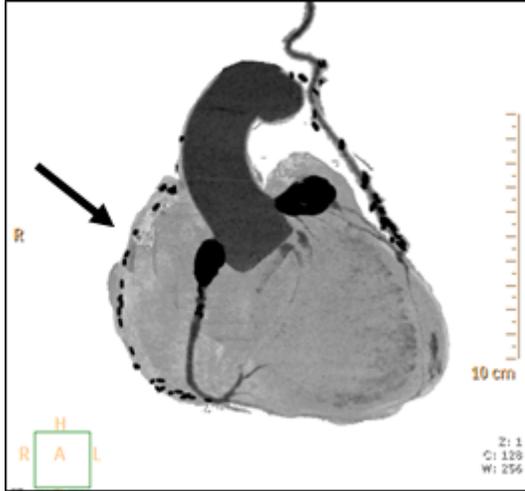


Figure 4

A, The chest radiograph showed CAAs of LAD and RCA (two white arrows). B, carotid artery CT showed that each blood vessel was normal.



**Figure 5**

Coronary computed tomography angiography showed the radial artery graft was occluded (black arrow).