CASE REPORT

Coronary artery bypass grafting with internal thoracic arteries may cause bilateral brachiocephalic vein occlusion, complicating pacemaker implantation

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Accepted 11 October 2016

SUMMARY

The number of patients with arrhythmia and ischaemic heart diseases is increasing. Patients with pacemaker implantation sometimes have brachiocephalic vein occlusion, and several aetiologies have been reported. However, coronary artery bypass grafting using the internal thoracic arteries is not fully discussed in the literature. We present a case of failed percutaneous pacemaker implantation due to bilateral brachiocephalic vein occlusion 8 years after coronary artery bypass grafting using the bilateral internal thoracic arteries. There were rich collateral veins consisting of hemiazygos and azygos veins. We then performed surgical implantation instead. Contrast CT or venography for such patients might be considered.

BACKGROUND

Permanent pacemaker implantations (PMIs) are commonly performed for bradycardia. Physicians generally insert the pacemaker leads via the left brachiocephalic vein (BCV). However, patients with previous PMIs, thoracic outlet syndrome¹ or venous angiectopia sometimes have BCV occlusion. As the population ages, the number of patients with arrhythmia and ischaemic heart diseases is also increasing. We herein present a case of bilateral BCV occlusion after coronary artery bypass grafting (CABG) with internal thoracic arteries (ITAs), which can complicate PMI.

CASE PRESENTATION

A 71-year-old woman who had CABG (left ITA to posterolateral branch and right ITA to left anterior descending artery) 8 years previously was diagnosed with Adams-Stokes syndrome and advanced atrioventricular block due to recurrent presyncope and pausing up to 5.9 s on Holter electrocardiogram.

TREATMENT

We planned emergency pacemaker implantation on the left precordium. However, the guidewire could not pass the left BCV ([figure 1](#), right panel). Venography showed total occlusion of the left BCV and very rich collateral circulation from the hemiazygos and azygos vein to the superior vena cava ([figure 2](#), upper panel, [video 1](#)). We abandoned this route and moved to the right precordial approach. However, the right BCV was also totally occluded on venography ([figure 1](#), left panel). We then gave up on percutaneous PMI. CT also revealed very

tortuous collateral circulation and total occlusion of the bilateral internal jugular veins ([figure 2](#), lower panel). We then switched to surgical PMI. The previous CABG made anterior thoracotomy impossible, so we implanted a VVI pacemaker via left lateral thoracotomy. She was discharged 6 days after the surgery without any postoperative complications.

Figure 1 Bilateral brachiocephalic vein occlusion. The right panel indicates occlusion of the right brachiocephalic vein. The right jugular vein is also occluded. The left panel shows occlusion of the left brachiocephalic vein. There is an extremely enlarged hemiazygos vein, which is a collateral vessel to the right heart.

Figure 2 The extremely enlarged hemiazygos and azygos veins. Left brachiocephalic vein occlusion causes rich collateral circulation to the right heart, consisting of the hemiazygos and azygos veins. (a, b, c) Each level of CT. The white arrowhead shows the hemiazygos vein; the white arrow shows the azygos vein emptying into the superior vena cava; the black arrowhead shows the transitional point from the hemiazygos to azygos veins.

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To cite: Nakabayashi K, Kato H, Sugiura R, *et al.* *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2016-217291

Video 1 The extremely enlarged hemiazygos and azygos veins. Left brachiocephalic vein occlusion causes rich collateral circulation to the right heart, consisting of the hemiazygos and azygos veins.

Figure 3 CT image obtained before coronary artery bypass grafting. On screening CT performed prior to coronary artery bypass grafting, the bilateral brachiocephalic veins were not occluded. The CT also showed no aortic arch aneurysm and nothing that would compress the veins, such as malignancy. The white arrowheads indicate the bilateral brachiocephalic veins.

OUTCOME AND FOLLOW-UP

We reviewed the CT image obtained before CABG, which revealed an intact venous system, no aortic arch aneurysm, and nothing else that could compress the veins, such as malignancy (figure 3). She had no history of irradiation and was not on haemodialysis; therefore, she had not undergone frequent venous cannulations. Screening tests for blood coagulation disorders revealed no significant findings. CT findings suggested that CABG itself might have caused the bilateral BCV occlusion. The patient provided written informed consent and agreed to publication of this case report.

DISCUSSION

To the best of our knowledge, this is the first case report in the literature to indicate that CABG with bilateral ITAs may cause bilateral BCV occlusion. It is expected that the number of patients with previous CABG who undergo PMI will increase.

ITAs have been accepted as the first choice graft in CABG due to their good patency and survival rate.² Most ITAs pass in front of the BCVs; therefore, several mechanisms may be responsible for BCV occlusion, including adhesion due to surgical invasion, venous injury during surgery or chronic mechanical compression by sternal wire. Nicola *et al* reported severe BCV stenosis after CABG (left ITA to left anterior descending artery). They speculated that closure of the sternum with stainless steel wires might have led to external compression.³ Their patient had acute left arm swelling, while ours had no symptoms. This discrepancy suggests the aetiology was different in our patient.

CABG could not be shown to directly cause the bilateral BCV occlusion; however, we speculated that CABG had some effect on BCV occlusion because of the timing of events. Therefore, if physicians have difficulty performing BCV cannulations in patients who have undergone CABG, contrast CT or venography might be considered. In addition, alternative access points, that is, the iliac vein,⁴ or a leadless pacemaker⁵ could also be considered.

Learning points

- ▶ In this increasingly ageing population, ischaemic heart diseases, arrhythmic diseases and accompanying comorbidities are increasing.
- ▶ Patients with pacemaker implantation sometimes have brachiocephalic vein occlusion, and several aetiologies have been reported.
- ▶ Coronary artery bypass grafting using the internal thoracic arteries may cause bilateral brachiocephalic vein occlusion.
- ▶ The hemiazygos and azygos veins can be effective collateral veins.
- ▶ Contrast CT or venography for such patients might be considered.

Contributors KN mainly designed and wrote the manuscript. HK and RS participated in this treatment and revised the manuscript. TO supervised it.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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