Intraoperative left subclavian artery occlusion with left hand ischaemia and steal syndrome in the left internal thoracic artery

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Abstract

We present a case of a 62-year old man with a left main stenosis, left coronary artery dominance, normal ejection fraction and no valvular pathology, and status post right carotid artery stenting, who was scheduled for elective coronary revascularization. We performed off-pump coronary revascularization, anastomosing the left internal thoracic artery to the left anterior descending artery, and three separate saphenous vein grafts to the intermediate artery and the first and second obtuse marginals, respectively. Proximally, the right internal thoracic artery was used as the inflow for all three venous grafts due to a heavily calcified ascending aorta. During the construction of the distal anastomoses to the obtuse marginals, the arterial pressure in the left radial artery suddenly dropped. The left hand was found to be pale and pulseless. A femoral artery catheter was placed for pressure monitoring and the anastomoses were completed as planned. Intraoperative transit-time graft flow measurement showed a reversed flow in the left internal thoracic artery. Postoperatively, angiography was performed showing a subtotal stenosis of the proximal left subclavian artery. The artery was dilated and stented. The postoperative course was uneventful and the patient was discharged on the 12th postoperative day.

Keywords: Coronary artery bypass • Subclavian steal syndrome • Off pump

CASE REPORT

A 62-year old man with worsening exertional chest pain, arterial hypertension and hypercholesterolaemia and status post right carotid artery stenting was scheduled for elective coronary revascularization. Preoperative coronary angiography showed left coronary dominance, 80% ostial and 70% distal left main stenosis with 60% proximal left anterior descending (LAD) artery stenosis, and a non-dominant right coronary artery with 80% proximal stenosis. Echocardiography showed 70% ejection fraction of the left ventricle and normal valve function.

During the operative procedure, first the left internal thoracic artery (LITA) and left great saphenous vein were harvested. The LITA was harvested in a skeletonized fashion. After opening the pericardium, a heavily calcified aorta was found. To avoid any clamping of the aorta, the upper half of the right internal thoracic artery (RITA) was harvested, to be used later as the inflow for the saphenous vein grafts. Then off-pump coronary artery revascularization with the LITA to the LAD was performed, followed by suturing of the distal anastomoses of the three saphenous vein grafts to the intermediate artery (IA) and the first (OM1) and second (OM2) obtuse marginals, respectively. Proximally, The IA graft was anastomosed end-to-side to the OM1 graft. The OM2 graft was routed on the right side of the heart and the proximal part of the OM2 graft was anastomosed end-to-end to the proximal part of the OM1 graft. Then the RITA was anastomosed end-to-side to the proximal part of the OM1 graft near the junction with the OM2 graft. During suturing of the distal anastomoses to the obtuse marginals, the arterial pressure in the left radial artery suddenly dropped. The left hand was found to be pale and pulseless. A femoral artery catheter was placed for pressure monitoring and the anastomoses were

Figure 1: Transit-time flow measurement on the LITA-to-LAD graft with the proposed direction of flow in the LAD and the LITA during systole and diastole. The values of the left radial artery and left femoral artery pressures during the flow measurement are shown.
completed as planned. Intraoperative transit-time graft flow measurement (MediStim, Oslo, Norway) showed a reversed systolic flow in the LITA graft and the pressure measured in the left radial artery was much lower than that in the left femoral artery (Fig. 1).

Postoperatively, there were no signs of myocardial ischaemia on electrocardiogram; the troponin levels were normal. The left hand was cold, pale and pulseless; however, it was not painful and there were no neurological deficits. On the third postoperative day, with the patient stable, extubated and with no inotropic support, angiography was performed, showing a subtotal stenosis of the proximal left subclavian artery (Fig. 2a and b). The proximal left subclavian artery was then dilated and stented with two 9 × 30 mm Protégé stents (ev3, Plymouth, MN, USA) (Fig. 2c). The postoperative course was uneventful and the patient was discharged home on the 12th postoperative day.

**CONCLUSION**

Intraoperative occurrence or worsening of a left subclavian artery stenosis is a rare event and to our knowledge not yet reported. In our case, the LITA was already anastomosed to the LAD when the pressure in the left radial artery dropped. Should this happen before the anastomosis, a different revascularization strategy would be chosen. The presence of a calcified aorta and also a proximal brachiocephalic trunk suggests that the proximal left subclavian artery was also heavily calcified. The use of the sternal retractor and abduction of the left hand might have produced some tension and cracks in the proximal left subclavian artery resulting in the subtotal stenosis. The transit-time flow measurement showed a negative systolic flow and a somewhat smaller forward flow during diastole. Despite the negative mean flow in the LITA, the blood flow to the myocardium was probably not impaired, since the negative flow and coronary steal occurred during systole when there is little flow to the myocardium due to myocardial contraction [1]. During diastole, however, the LITA flow was contributing positively to myocardial perfusion. Stenting is the preferred treatment for subclavian artery stenosis; however, in the case of a functioning LITA-to-LAD graft, care must be taken not to cover the ostium of the LITA [2–4].

**Conflict of interest:** none declared.

**REFERENCES**


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**Figure 2:** (a and b) A subtotal stenosis (arrows) of the proximal left subclavian artery. (c) Left subclavian artery stenting with two 9 × 30 mm Protégé stents (arrowheads).