Syndrome de vol coronaro-sous-clavier traité par un pontage carotido-sous-clavier: à propos d'un cas et revue de littérature

Coronary Subclavian Steal Syndrome treated with Carotid to Subclavian Bypass: A case report and review of the literature

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Résumé

Le syndrome de vol coronaro-sous-clavier est une complication tardive du pontage aorto-coronaire. Il est défini par une inversion de flux dans l'artère mammaire gauche secondaire à une sténose serrée ou une occlusion de l'artere sous-clavière, entrainant ainsi une récidive angineuse. Le syndrome de vol coronaro-sous-clavier complique 0.2% à 6.8% des pontages aorto-coronaire utilisant l'artere mammaire gauche. Plusieurs moyens d'imagerie peuvent poser le diagnostic par la mise en évidence d'une sténose ou une occlusion de l'artère sous-clavière gauche. Bien que les procédures endovasculaires sont devenues le traitement de première ligne, la revascularisation chirurgicale est préférée dans certains cas lorsque le traitement endovasculaire n'est pas possible, et le pontage carotido-sous-clavier est une modalité qui offre d'excellents résultats à court, moyen et long terme. Nous rapportant le cas d'un patient se présentant pour une angine de poitrine secondaire à un syndrome de vol coronaro-sous-clavier qui a été traité, avec succès, par un pontage carotido-sous- clavier.

Mots-clés

Ischémie myocardique ; sténose de l'artère sous-clavière ; syndrome de vol coronaro-sous-clavier ; pontage carotido-sous-clavier

Summary

Coronary subclavian steal syndrome (CSSS) is a late complication of coronary artery bypass graft (CABG) surgery. It's defined by a reversal of flow in the LIMA graft due to a high grade stenosis or occlusion of the proximal subclavian artery, causing a functional LIMA graft failure and recurrence of myocardial ischemia. It occurs in 0.2% to 6.8% after CABG surgery. Once suspected from the physical examination, CSSS can be confirmed with multiple imaging modalities by detecting a significant stenosis or occlusion of the proximal subclavian artery. Both surgical and endovascular strategies are available for the treatment of CSSS.

Even if endovascular procedures have become the first line strategy for CSSS treatment, surgical revascularization is preferred in some cases when the percutaneous transluminal angioplasty (PTA) is not possible, and carotid to subclavian bypass (CSB) is a safe modality with excellent results in short, mid and long term.

This is a case of a patient who presented with CSSS and who was treated successfully by carotid to subclavian artery bypass as endovascular treatment was unfeasible.

Keywords

Myocardial Ischemia; Subclavian artery stenosis; Coronary subclavian steal syndrome; Carotid to subclavian artery bypass

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INTRODUCTION

The coronary subclavian steal syndrome (CSSS) is an unusual complication of coronary artery bypass graft (CABG) surgery. It occurs during left arm exertion when the left internal mammary artery (LIMA) is used for the bypass surgery and there is a high grade stenosis (>75%) or occlusion of the left subclavian artery (SA) [1].

The myocardial ischemia is a result of the retrograde flow of blood supply from coronary circulation to the upper arm perfusion during exertion.

CSSS is estimated to complicate 0.2% to 6.8% of patients who have undergone CABG with a LIMA graft [2], and the treatment consists on restoring normal blood circulation to the upper limb which can be offered by either angioplasty, with or without stent placement, or open surgery.

We report the case of a patient with CSSS successfully treated with carotid to subclavian bypass surgery.

CASE REPORT

A 64 year old man, active smoker with a history of coronary artery disease was admitted to our department for chest pain. In 2010 he had undergone a coronary artery bypass graft (CABG) including the left internal mammary artery (LIMA) to the left anterior descending artery (LAD) and the right internal mammary artery (RIMA) to the diagonal branch. In 2014 a percutaneous transluminal coronary angioplasty (PTCA) on the circumflex was performed.

Recently he developed typical angina pectoris on exertion especially when the left upper limb is used. No signs of vertebrobasilar insufficiency were reported.

The physical examination revealed asymmetric upper extremity blood pressure (100/60 mmHg in the right arm and 60/40 mmHg in the left arm), a regular pulse in the right arm and a reduced left radial pulse.

The electrocardiogram showed no significant abnormalities and the echocardiography revealed non dilated LV and a moderate hypokinesia of the inferobasal and inferoseptal walls with a conserved left ventricular ejection fraction (EF=58%)

A Coronary subclavian steal syndrome (CSSS) was suspected and further investigation by a computed tomography angiogram (CTA) of supra aortic vessels was performed showing a long proximal occlusion of the left subclavian artery with distal repermeabilization from LIMA collateral arteries (figure 1A). Coronary CT scan showed conserved patency of the LIMA graft (figure 1B). Revascularization of the left arm was thus necessary.

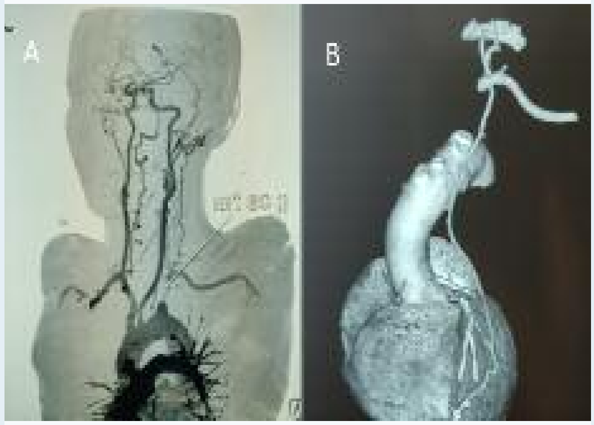

Figure 1 : A- Computed tomography angiogram of supra aortic vessels showing a long proximal occlusion of the left subclavian artery with distal repermeabilization from LIMA ; B- Coronary CT scan showing conserved patency of the LIMA graft

Given the long total occlusion in the proximal segment of the left subclavian artery, endovascular treatment was difficult and hazardous, thus we opted for a surgical revascularization as a first therapeutic option.

The patient was operated under general anesthesia and a carotid to subclavian bypass using a 6 mm PTFE graft was performed;

After an incision 1 cm above the middle third of the clavicle, and dissection of muscle layers, the approach of the left subclavian artery was made at 2 cm below the origin of the vertebral and left mammary arteries (figure 2A); the phrenic nerve was identified and carefully avoided. Through an incision parallel to the anterior edge of the sternocleidomastoidian (SCM) muscle the approach of the left common carotid artery was achieved.

These two incisions were joined together for a better exposure, and a carotid-to-subclavian bypass through a 6mm-PTFE graft was made (figure 2B).

During the surgery the patient was haemodynamically stable, without any ECG abnormalities.

The postoperative period was uneventful and on physical examination the radial artery was well pulsatile and the BP gradient between upper limbs was 10 mmHg.

The patient was discharged home at postoperative day 3.

During a three-month follow-up, he was found to be completely asymptomatic.

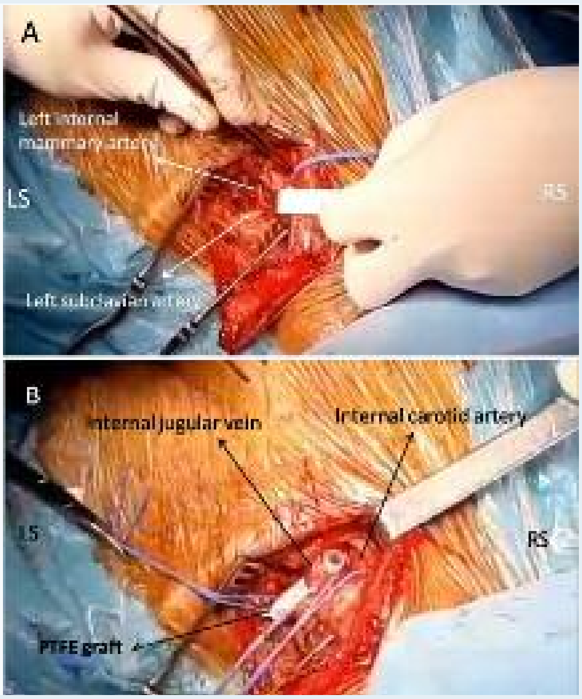

Figure 2 : Operative view showing A- the approach of the left subclavian artery and B- the carotid-to-sublavian artery bypass graft

DISCUSSION

CSSS is a late complication of CABG surgery; it's defined by a reversal of flow in the LIMA graft due to a high grade stenosis or occlusion of the proximal subclavian artery, causing a functional LIMA graft failure and recurrence of myocardial ischemia. [1]

The prevalence of subclavian artery stenosis (SAS) is approximately 2% of general population and 7% of patients with known or suspected peripheral artery disease (PAD) [3]. In patients who have both PAD and coronary artery disease requiring CABG surgery, 11.8% were found to have proximal left subclavian artery stenosis (LSAS) [4]. First reported in 1974 by Harjola and Valle [5,6], CSSS is estimated to complicate 0.2% to 6.8% of patients who have undergone CABG with a LIMA graft.[2]

Owing to the lack of knowledge of this phenomenon, the recurrence of angina pectoris after CABG surgery is often attributed to atherosclerotic progression of the coronary lesions or graft stenosis, and CSSS is rarely suspected, hence, its prevalence is likely to be underestimated [4,7]. However, the LIMA graft has been increasingly utilized as a conduit for myocardial revascularization because of its superior long term patency compared to saphenous vein graft. [8–10]

Usually, CSSS presents as a stable angina pectoris after selective exercise of the left upper limb, but it can also manifest as silent ischemia, acute coronary syndrome, decompensated heart failure, malignant ventricular arrhythmias, or recurrent pulmonary oedema [11–19]. Symptoms have been reported to occur between 2-31 years following surgery. Symptoms presenting within a year of CABG usually suggest a subclavian stenotic lesion that was missed before surgery [20].

Diagnosis can be easily suspected within patients who are suffering from recurrent ischemic signs after CABG surgery and who have, on physical examination, asymmetric pulses and blood pressures in both upper limbs, or less commonly abnormal bruit in the subclavian area. [12] The absence of significant SBP differential can be explained by equal bilateral SAS or development of extensive collaterals of the affected side.[21]

To confirm the diagnosis, multiple imaging modalities are available to detect the SAS, such as ultrasound duplex scan, digital subtraction angiography (DSA), computed tomography angiography (CTA) or magnetic resonance angiography (MRA).

Duplex ultrasonography imaging is a non-invasive, less expensive and more widely available means of screening the SA [20], and DSA has been considered as the gold standard for diagnosing SA stenosis and occlusion [1]. However, CTA offers anatomic view with precise information on lesion morphology, length and location [1,20,22]

Treatment of CSSS consists on revascularization of the SA which can be offered by either surgery or percutaneous transluminal angioplasty.

Before the emergence of endovascular therapy, surgical revascularization was the only way to treat CSSS, and it was associated with excellent long term patency and low mortality rates [12].

Recently, percutaneous transluminal angioplasty (PTA), alone or with stent placement, has become the first line therapy for CSSS as it is less invasive than open surgery and it has a good technical success rate and long term patency [12,23–26], however, it is not always feasible.

In fact, when the SA is totally occluded, percutaneous treatment may not be possible due to difficulty in passing the guide wire through the chronic occlusion [6], hence in these patients, surgical revascularization is the preferred therapeutic option.

Linni et al. recommend, in a study including 74 patients with SA lesions who underwent either percutaneous or surgical treatment from 1995 to 2007, PTA for SA stenosis, and surgery for SA occlusion. [30]

Furthermore, the restenosis rate for angioplasty is reported to be as high as 40.7% over five years in patients with CSSS, whilst the rate of recurrent stenosis following stenting is about 16%.[13,31–34]

Studies supporting surgical treatment of CSSS have demonstrated higher level of patency in the long term.[33,34]

In a study undertook to compare the immediate and long term outcomes of endovascular stenting vs. extrathoracic surgical bypasses performed specifically for SSS from 1989 to 2010, extrathoracic surgical bypasses were proved to be more durable in the long term. In fact, the cumulative primary patency rates at 1, 3, 5, and 10 years were 91%, 78%, 67%, and 49% for the stent group vs. 99%, 97%, 95%, and 89% for the bypass group. The cumulative secondary patency rates were 95%, 91%, 86%, and 64%, respectively, for the stent group vs. 99%, 99%, 98%, and 94% for the bypass group. [28]

The use of extraanatomic bypass of the carotid and subclavian arteries was first introduced by Diethrich et al in 1967 to reduce the complication rate of transthoracic reconstruction. [27]

Several extrathoracic surgical techniques have been reported to treat subclavian artery stenosis in the coronary subclavian steal syndrome for which endovascular treatment has failed. These techniques include subclavian to carotid transposition (SCT), axillo-axillary bypass (AAB) and carotid to subclavian artery bypass (CSB).

SCT involves only one anastomosis and does not need graft insertion. This procedure has excellent long-term durability, but it is not possible in all cases and may potentially worsen coronary ischemia during interruption of vertebral and internal mammary blood flow, which makes it a less attractive treatment option in this population. [28]

AAB is the preferred surgical procedure in patients having concomitant atherosclerotic occlusive lesions of the ipsilateral common carotid artery and/or internal carotid artery. It avoids manipulation of ipsilateral diseased carotid lesions. AAB has raised several concerns in the literature for its length and subcutaneous course, which might cause thrombosis, infection and skin erosion. AAB is usually avoided when there are controlateral subclavian lesions.

Song et al reported 11 cases of csss treated by AAB with 100% of graft patency at 3 years of follow up and freedom of skin erosion or graft infection in all cases. [28]

CSB was first described for treatment of CSSS by Diethrich in 1967 [27], and several studies have proved that CSB is a safe and efficient strategy with low potential for complication, and it offers excellent mid and long term durability.[29,37–39]

In a review of carotid sub-clavian artery bypass with PTFE performed for symptomatic stenosis or occlusion, AbuRahma et al reported an overall 10-year primary patency of 92% due to the shorteness of the graft length .[29]

CSB is preferred to AAB essentially when the ipsilateral carotid artery is free of lesions because in the presence of carotid lesions, 5- and 10-year patency rates decreases to 66.0 and 40.8%.

Another review of carotid subclavian bypass, performed between 1991 and 2001 for symptomatic CSS due to subclavian stenosis or occlusion not amenable to PTA and stent, reported the efficacy of carotid subclavian bypass; the results of the review showed that all bypasses have remained patent and no patient developed recurrent symptoms of MI. [6]

CONCLUSION

The association of recurrent angina and history of CABG surgery should alert us to suspect CSSS. Physical examination followed by imaging modalities can easily confirm the diagnosis.

Percutaneous treatment has recently emerged and some authors consider it the first line strategy, however, it is not always feasible and surgical revascularization, whose long term patency is proved to be higher, becomes the optimal therapeutic option.

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