REVISTA SALUS
JOURNAL OF HEALTH SCIENCES

CASE REPORT

Subclavian steal syndrome after coronary artery bypass graft surgery

Roberto Ramos Barbosa[1]; Gabriel Miranda de Brito[2]; Renato Giestas Serpa[3]; Tiago de Melo Jacques[4]; Osmar de Araujo Calil[5]; Luiz Fernando Machado Barbosa[6]

[1]M.Sc./EMESCAM - (Professor).

[2,4]Physician/ Santa Casa de Misericórdia de Vitória Hospital.

[3,6]Physician/Escola Superior de Ciências da Santa Casa de Misericórdia de Vitória - (Professor).

[5]D.Sc./Escola Superior de Ciências da Santa Casa de Misericórdia de Vitória - (Professor).

Received on July 29, 2016

Approved on October 18, 2016

Keywords

Subclavian Steal Syndrome; Angioplasty; Endovascular Procedures; Angina Pectoris; Myocardial evascularization.

Abstract

Introduction: subclavian theft syndrome (SBS) is related to subclavian artery stenosis. In patients who were previously submitted to myocardial revascularization (CABG) surgery with internal-coronary mammary graft, SBS may trigger anginal symptoms. **Case Report:** we report two cases of angina pectoris after CABG, associated with left upper limb pain on exertion. Patients were diagnosed with SBS and submitted to percutaneous transluminal angioplasty with stent implantation in the subclavian artery, evolving with clinical improvement. **Discussion:** the reported cases are unusual in clinical practice and demonstrate the efficacy and safety of interventional endovascular treatment in SBS.

* Corresponding author: roberto.barbosa@emescam.br

INTRODUCTION

Coronary artery bypass grafting (CABG) is an invasive treatment of coronary artery disease (CAD) with a high indication and a high success rate[1]. The use of the internal mammary artery (IMA) as a conduit for coronary grafting in CABG has an excellent long term patency, obtaining the best clinical results for the technique[2]. In some patients, subclavian artery stenosis proximal to the origin of the IMA graft may cause a blood flow theft phenomenon, leading to myocardial ischemia[3].

Subclavian Burglary Syndrome (SBS) is typically described when a subclavian artery stenosis proximal to the origin of the vertebral artery causes a retrograde flow in the ipsilateral vertebral artery[4]. The prevalence of significant left subclavian artery stenosis in referred patients For CRM is around 0.2% to 6.8%[5]. Thence, SBS is an uncommon cause of angina after CABG, secondary to decreased or retrograde blood flow, in patients with patent graft IMA in situ for Coronary artery[6].

Two cases of BSS have been reported in patients previously submitted to CABG, in whom interventional treatment was successfully performed.

CASE REPORT

CASE 1 - A 77-year-old male patient with a history of congestive heart failure of ischemic etiology, added to arterial hypertension and dyslipidemia. Underwent CABG with left IMA grafting for anterior descending artery for 9 years. He sought the cardiology outpatient clinic referring to dizziness, pain in the left upper limb and intermittent precordialgia that worsens the effort of the upper left limb. In continuous use of enalapril, spironolactone, acetylsalicylic acid, clopidogrel, isosorbide mononitrate and carverdilol.

A cardiac catheterization was performed with a post-revascularization graft study, in which the flow of the anterior descending artery to the left subclavian artery through the left IMA graft (Figures 1A and 1B) was noticed, as well as 90% stenosis in the proximal portion of the Left subclavian artery (Figure 1C).

The patient was submitted to elective percutaneous transluminal angioplasty of the left subclavian artery with self-expanding stent implantation on 11/11/2013, restoring her normal flow, with good angiographic result and elimination of vertebral theft and anterior descending mammary stealing (Figure 1D).

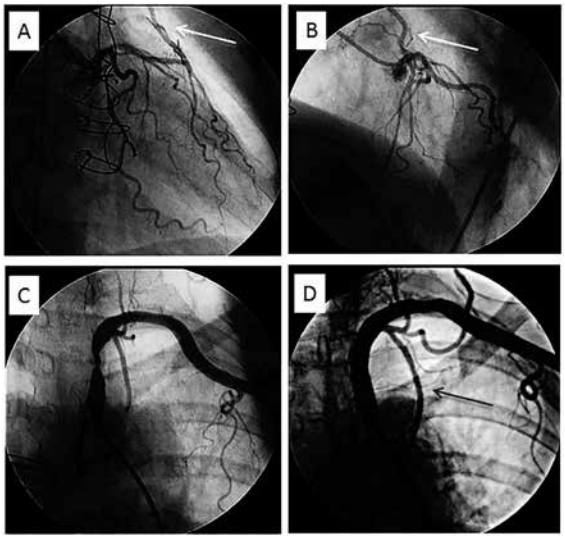

Figure 01

The patient progressed with complete improvement of symptoms during and after hospital discharge. Twenty days later, he was admitted to the emergency room with urinary tract infection and severe sepsis, with difficult to control organic dysfunctions. There was an evolution with progressive worsening of the condition, with septic shock of urinary focus refractory to the use of vasoactive drugs, leading to death three days after the hospital readmission.

CASE 2 - A 72-year-old female patient with a history of hypertension and type 2 diabetes mellitus who underwent CABG for 7 years with left IMA graft for the anterior descending artery. She reports a stable

angina, with worsening in the last month associated with frequent syncopes. She had typical chest pain triggered by exertion with the left upper limb. On domicile, she makes use of acetylsalicylic acid, losartan, atenolol, NPH insulin, omeprazole and clonazepam on domicile.

Cardiac catheterization exhibited an inversion of the left coronary artery flow through the left IMA graft with the anterior descending artery (retrograde coronary-subclavian flow) (Figure 2A). Selective angiography of the left subclavian artery illustrates 95% stenosis in the proximal portion of this vessel (Figure 2B).

Percutaneous transluminal angioplasty of the left subclavian artery with balloon-expandable stent implantation was performed on its proximal third on 1/16/2014, with success (figures 2C and 2D). The patient demonstrated good clinical evolution and complete improvement of the symptoms after the procedure. The observed clinical result persisted at the 1 year follow up, with good tolerance to the efforts.

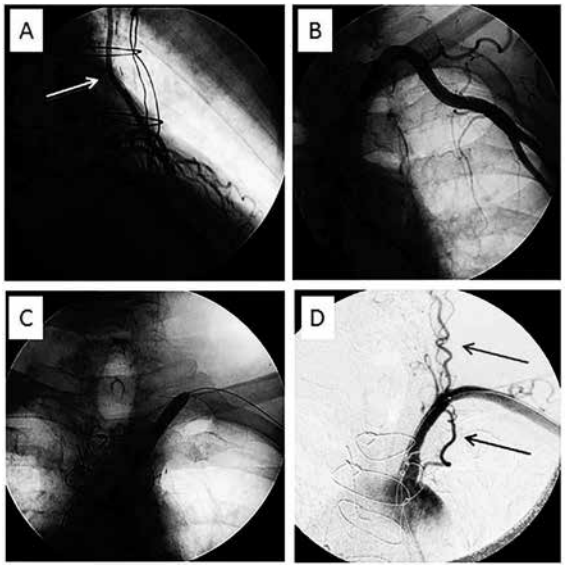

Figure 02

DISCUSSION

SBS refers to a pathological situation in which, as a result of a stenosis or occlusion of the proximal subclavian artery, retrograde flow occurs through the vertebral artery which causes insufficient cerebral perfusion and subsequently transient neurologic symptoms on account of cerebral ischemia[7]. Due to the vertebrobasilar circulation is a closed hydraulic system, the difference in pressure leads to reversal of the flow, pulling the blood from the contralateral vertebral artery to the basilar artery and then to the ipsilateral vertebral artery, "stealing" the flow of cerebral circulation[8].

Coronary-subclavian steal syndrome, a variant of SBS, is an uncommon complication of CABG when an IMA graft is used. This syndrome is distinguished by the retrograde flow of the graft into the subclavian artery to perfuse the distal end when a severe proximal stenosis is present in the subclavian artery. Accordingly, a coronary steal phenomenon may develop, in which the myocardium perfused by the graft may become ischemic, regardless of the patency of the graft vessels[9].

This phenomenon is usually caused by atherosclerosis. As most patients are asymptomatic, it presents as an incidental finding. Nonetheless, symptomatic patients usually present neurological symptoms, such as dizziness, hearing loss or syncope (vertebrobasilar insufficiency), or upper limb claudication, anginal symptoms, ischemic heart disease and heart failure, and the occurrence of infarction is uncommon acute myocardial infarction[10]. Physicians need a high degree of clinical suspicion to perform the diagnosis of this phenomenon, considering that the atypical presentations of this entity represent a challenge for the medical class[8].

The genuine prevalence of SBS is still unidentified. Even though estimated between 0.6% and 6%, there is some controversy, since up to 80% of patients with this phenomenon are asymptomatic. Most of patients with symptoms have simultaneous cerebrovascular lesions[8]. Other confounding factors include failure of non-invasive diagnostic methods, lack of comprehension about the problem, and

attribution of symptoms to other causes[11]. The SBS incidence in patients already undergoing CABG Was described between 0.1 and 3.4%[6].

The noninvasive diagnostic method of choice for subclavian artery stenosis is the detection of an ankle-brachial index (ABI), increased at rest or after an exercise test[12]. ABI is calculated as the ratio of systolic blood pressure measured at the ankle And of the measurement in the brachial artery. The cuff of the sphygmomanometer is placed just above the ankle and a doppler instrument is used to gauge the pressure of the anterior and posterior tibial arteries on each foot. Then, the highest systolic pressure of the ankle is divided by the highest systolic pressure of the arm. In a regular test, the ITB value is greater than 1.0[13].

The discrepancy in systolic pressure of 10 mmHg or more between the arms, as well as reduced ABI, is correlated with peripheral vascular disease, with low sensitivity but high specificity. Some experts consider these discrepancies in systolic blood pressure to be 15mmHg or higher[12].

In order to obtain diagnostic confirmation of BSS, numerous imaging tools can be used to detect stenosis and notice reverse flow in the vertebral artery. The carotid and vertebral ecodoppler is the most commonly used and usually the first diagnostic test, which can semi-quantify the subclavian artery stenosis and diagnose another extracranial obstructive carotid disease. Most recently, better quality images have been obtained with magnetic resonance angiography. Invasive cerebral angiography still is the gold standard method because of its high sensitivity and specificity[12]. Non-invasive functional tests, such as stress echocardiography and myocardial perfusion scintigraphy, may be useful for evaluating coronary-subclavian theft syndrome in patients with prior surgical myocardial revascularization[8].

Invasive treatment - surgical or percutaneous - for SBS is usually reserved for highly symptomatic patients and refractory to optimized clinical treatment. Therapeutic options include percutaneous transluminal angioplasty with stent implantation in the subclavian artery and surgical bypass of subclavian artery stenosis. Placement of the stent in the subclavian artery is commonly performed by the femoral artery, and is the method of choice by the reason of low mortality, shorter hospitalization time, and rapid recovery[8,14].

Percutaneous transluminal angioplasty of obstructive lesions of the proximal portion of the subclavian artery is not only an effective initial treatment but is also effective in the long term. Furthermore, clinically significant restenosis - the leading cause of therapeutic failure - can be treated with endovascular repeat procedures[15]. This minimally invasive treatment should be the first choice for the treatment of obstructive lesions of the proximal portion of the subclavian artery in which the technical applicability Is reasonable, with a good risk vs. risk ratio. Benefit ratio[16,17]. The success of the percutaneous approach can reach 90%, with a 5-year vascular patency index of up to 85% [14]. Nonetheless, there are no prospective studies that show the superiority of one treatment over another in cases of BSS. This way, the conduct of each case may be individualized.

Regardless of the percutaneous treatment it is extremely important to control the risk factors as part of the therapy for secondary prevention. Smoking cessation, lifestyle modification, antiplatelet therapy, blood pressure control, management of hyperlipidemia, and diabetes control play an important role in the management of BSH caused by atherosclerosis[8].

In the cases described here, patients presented typical anginal symptoms after physical activities which used the left upper limb and, in one case, vertebrobasilar symptoms such as syncope, vertigo

and headache were also present. SBS, a diagnosis rarely confirmed in our country, was considered as a diagnostic hypothesis only at the time of coronary angiography, being treated by a successful percutaneous intervention and low morbidity.

It is likely that the death observed in the first case had no direct relationship with the procedure performed or the patient's underlying disease. Even though no postmortem study was performed, the unfavorable outcome was due to septic shock of urinary focus, with severe organ dysfunctions and rapid clinical deterioration.

SBS is usually seen as a diagnostic challenge that may cause several symptoms and reduce quality of life. It is frequently observed in patients with advanced atherosclerosis, and may be satisfactorily treated by interventional techniques with stent implantation in the subclavian artery, capable of solving the flow reversal by coronary IMA grafting and reducing myocardial ischemia. The reported cases illustrate the technical feasibility and therapeutic success of this approach, as well as demonstrate the high risk profile for atherosclerotic diseases presented by these patients.

REFERENCES

1. Deb S, Wijeysundera HC, Ko DT, Tsubota H, Hill S, Fremes SE. Coronary artery bypass graft surgery vs percutaneous interventions in coronary revascularization: a systematic review. JAMA. 2013 Nov 20;310(19):2086-95.

2. Windecker S, Kolh P, Alfonso F, Collet JP, Cremer J, Falk V, et al. 2014 ESC/EACTS Guidelines on myocardial revascularization: The Task Force on Myocardial Revascularization of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS) Developed with the special contribution of the European Association of Percutaneous Cardiovascular Interventions (EAPCI). Eur Heart J 2014;35:2541–2619.

3. Prasad A, Prasad A, Varghese I, Roesle M, Banerjee S, Brilakis ES. Prevalence and treatment of proximal left subclavian artery stenosis in patients referred for coronary artery bypass surgery. Int J Cardiol. 2009 Mar 20;133(1):109-11.

4. Osiro S, Zurada A, Gielecki J, Shoja MM, Tubbs RS, Loukas M. A review of subclavian steal syndrome with clinical correlation. Med Sci Monit. 2012;18(5): RA57–RA63.

5. Hwang HY, Kim JH, Lee W, Park JH, Kim KB. Left subclavian artery stenosis in coronary artery bypass: prevalence and revascularization strategies. Ann Thorac Surg. 2010 Apr;89(4):1146-50.

6. Carrascal Y, Arroyo J, Fuertes JJ, Echevarría JR. Massive coronary subclavian steal syndrome. Ann Thorac Surg. 2010 sep;90(3):1004-06.

7. Budincevic H, Starcevic K, Bielen I, Demarin V. An aberrant subclavian artery exhibiting the partial steal phenomenon in a patient with VACTERL association. Intern. Med. 2014;53(16):1859–1861.

8. Alcocer F, David M, Goodman R, Jain SKA, David S. A forgotten vascular disease with important clinical implications. Subclavian steal syndrome. Am J Case Rep. 2013; 14:58–62.

9. Younus U, Abbott B, Narasimha D, Page BJ. Coronary subclavian steal syndrome: an unusual cause of angina in a post-CABG patient. Case Rep Cardiol 2014 29;2014:769273.

10. Mandak J, Lojik M, Tuna M, Chek JL. Coronary subclavian steal syndrome causing acute myocardial infarction in a patient undergoing coronary-artery bypass grafting. Case Rep Med. 2012;2012:798356.

11. Takach TJ, Reul GJ, Cooley DA, Duncan JM, Livesay JJ, Ott DA, et al. Myocardial thievery: the coronary-subclavian steal syndrome. Annals of Thoracic Surgery 2006;81(1):386-92.

12. Clark CE, Taylor RS, Shore AC, Ukoumunne OC, Campbell JL. Association of a difference in systolic blood pressure between arms with vascular disease and mortality: a systematic review and meta-analysis. Lancet 2012;379:905–914.

13. Ruiz-Canela M, Martínez-González MA. Lifestyle and dietary risk factors for peripheral artery disease. Circ J. 2014;78(3):553-9.

14. Potter BJ, Pinto DS. Subclavian steal syndrome. Circulation. 2014 Jun 3;129 (22):2320-3.

15. De Vries JP, Jager LC, Van den Berg JC, Overtoom TT, Ackerstaff RG, Van de Pavoordt ED, et al. Durability of percutaneous transluminal angioplasty for obstructive lesions of proximal subclavian artery: long-term results. J Vasc Surg. 2005 Jan;41(1):19-23.

16. Wang KQ, Wang ZG, Yang BZ, Yuan C, Zhang WD, Yuan B, et al. Long-term results of endovascular therapy for proximal subclavian arterial obstructive lesions. Chin Med J (Engl). 2010 Jan 5;123(1):45-50.

17. Osterne CME, Osterne ECV, Motta VP, Motta PAM, SalameI CK, Osterne TEC. Tratamento percutâneo de angina refratária secundária a estenose de artéria subclávia esquerda em paciente revascularizado. Arq Bras Cardiol. 20