Author’s response to reviews

Title: Right subclavian double steal syndrome

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Author’s response to reviews: see over
We thank the reviewers for their comments and suggestions. We have done a thorough review of our manuscript and we answer each comment one by one.

Reviewer G. Georgiadis

1. General comments:

This is a case report presenting an interesting successful surgical correction of a symptomatic right subclavian-common carotid artery steal syndrome (double steal syndrome?) with the performance of a carotid (R)-carotid (L) PTFE bypass. Simultaneously, a left internal carotid artery (ICA) endarterectomy-angioplasty was performed for treating an asymptomatic ICA stenosis ~75%. However this didactic case is not bringing relevant novel information. Steal syndrome in the aortic arch, is a well known and already described vascular pathology, and this fact is documented by the literature presented by the authors (half of the references appeared before 1980).

1. General comment: Vertebro-subclavian steal syndrome is a well described entity since the decade of 70. The literature is full of papers on the matter and they come from these times. In contrast to, retrograde flow in the common carotid artery due to innominate occlusion (carotid-subclavian steal) has been extremely rare. There is one article – to our knowledge – Am J Roentgenol. 2006;186(2):394-400, which is first describing the patterns of duplex scan sonography in the affected common carotid artery and differentiates the reversal of arterial flow due to carotid-subclavian steal into complete reversal throughout the cardial cycle or partial reversal only during diastolic phase of cardiac cycle. This is very knew knowledge.

Our case presents in the same patient a classic vertebro-subclavian steal (angiographic evidence) and a carotid-subclavian steal (partial steal with flow reversal in diastole, duplex scan evidence) as well. We think this is quite important and rare finding so as to be presented.

Specific comments:

I. I am not sure about the complete occlusion of the innominate artery (IA) since selective catheterization of subclavian artery (Fig 2) reveals documentation of the presence of the angiographic catheter (via brachial approach) in the aortic arch (this catheter extents the pacemaker wire). Thus, an endovascular option would
be feasible and more prudent in that pre-occlusive lesion. Even if this is not the case (occlusion rather than pre-occlusive lesion of the IA), then why the authors didn’t negotiate the occlusion (a J-tip guidewire wire of 0.014 to 0.025 or 0.035 in, would rather pass through the IA occlusion) and perform primary stenting of the IA with a balloon expandable stent? The authors must provide a complete aortic arch angiogram to clarify the type of lesion.

II. Certainly the patient’s general condition was rather poor precluding a median sternotomy (aorto-innominate bypass is better than any transcervical bypass). Thus, occlusive lesions of the IA can be treated by a carotid-carotid bypass (as done by the authors) while other alternative methods include left subclavian-to-right carotid bypass, subclavian-subclavian bypass, or axillary-axillary arterial bypass. However, endovascular techniques have even lower morbidity and mortality than extra-anatomic bypasses. Endovascular options for this specific case are purely described by the authors, giving the impression of a failed experiment. In the case of IA pathology, endovascular treatment must precede any surgical reconstruction given the invasive character of the latter method. Did the authors tried to solve the problem with endovascular methods?

2. Specific comments:

I. The patient was a 200 meters claudicant due to bilateral external (on the right) and common-external (on the left) iliac artery occlusions, under conservative treatment due to his general poor condition and his willingness. This was the reason that the radiologist had performed upper extremity catheterization and a full aortic arch aortography. Initially, he performed a left branchial catheterization but he did not passed the aortic arch due to a dissecting plaque at the origin of the left subclavian artery (<50% stenosis). The figure no 3 showing with four sequential photos, the left to right vertebral arterial flow, has come from the selective catheterization of the left subclavian artery. He did then the right cathetirization through the unpulpable right branchial artery. The hydrophilic wire passed the innominate lesion (possibly through a subendothelial route) the radiologist made an infusion though the introduced catheter, took the picture and put out the wire.

We had to give the most safe and effective clinical solution to a 73 year old gentleman with very extensive and severe arterial disease and a previous CABG. Permanent
dizziness and many episodes of syncope with acceptable cardiac function was the indication for doing something invasively. We performed an outstanding arterial mapping with color duplex scan to answer what is going on with left carotid (not shown in any arteriogram) and reconfirm the arteriogram findings concerning the innominate occlusion or sub-occlusion, the right carotid and the vertebral-subclavian steal. After all, the patient presented with:

1. Innominate occlusion, as no antergrade flow could be seen with duplex scan combined with the reversal of arterial flow of the right common carotid artery during diastole.
2. Ostial dissecting plaque of the left subclavian without flow compromise.
3. Bilateral internal carotid stenosis of 75% each with ulceration – type III on the left side, type IV on the right side.
4. Bilateral iliac occlusions

II. The priorities for the patient were:
   a) Reestablishment of antergrade arterial flows through right carotid and right vertebral.
   b) Treatment of bilateral internal carotid stenoses.
   c) Treatment of left subclavian dissecting lesion?
   d) Treatment of bilateral iliac occlusions.

Endovascular treatment of the innominate occlusion was an option with specific disadvantages:
   a) The lesion could be possibly passed with a wire but then the angioplasty would be performed rather in a subendothelial route or in extremely eccentric way in a vessel which is known to fragile and the patient had a previous sternotomy rendering the emergent operation in case of rupture, a catastrophe.
   b) The possibility of having an alternative second endovascular approach (second wire) through femorals or left subclavian arteries was deemed neither possible nor safe.
   c) The feasibility of innominate endovascular angioplasty is known with severe danger of distal embolization. In this case the operator had to put one or two filters for protection of embolization (carotid and subclavian)?
d) The insertion of a filter in the right common carotid, at least, was technically very difficult or unfeasible before innominate angioplasty, as the only route was the right subclavian and the angioplasty had to be done in a retrograde way in the innominate artery.

e) The medium and long term results of subclavian angioplasty are inferior to operative ones. Specially for innominate occlusions or sub-occlusions we are unaware of series with medium or long term results.

f) We have an excellent series of 0% death-stroke rate of carotid endarterectomies (70 cases) and we have not adopted yet the questionable (from literature) CAS.

**TITLE**
The title of the article is somehow peculiar (double steal syndrome?). The authors should think an alternative (Right sided subclavian-common carotid artery steal syndrome? for example).

**TITLE**
The title describes in brief exactly the coexistence of two arterial steal syndromes. The vertebral-subclavian one and the carotid-subclavian steal. This coexistence is the unique value of the paper and not the successful standard surgical treatment.

**ABSTRACT**
Conclusion: The conclusion that carotid-carotid bypass is an excellent option for IA occlusive disease can not be based on this single case.

**ABSTRACT**
We agree with the reviewer that this is not a proper conclusion and we have changed it. Carotid-carotid extra-anatomic bypass was a good option for our patient, since he remains symptom free after one year of follow up.

**CASE PRESENTATION**

1) Verify the pressure drop in the “diseased” arm prior to the revascularization. The difference in blood pressure was 45-50mmHg between both arms.
2) Additionally one may ask why the authors decided to cannulate the right brachial (or radial?) artery although it was obviously (was there?) no palpable pulse and pressure drop in the ipsilateral arm

We have answered this comment in specific comments 1

3) Do the authors know if the right internal mammary artery was used in the previous CABG? Was there any clinical (coronary symptoms) or angiographic evidence (reversed flow via coronary arterial graft) of coronary steal syndrome?

The patient had a previous CABG with saphenous vein grafts. We have added this to the text.

4) The authors must give much more details of the operative procedure. What was for example, the course of the carotid-carotid PTFE bypass in relation to the esophagus?

The by pass was passed anteriorly to the trachea under the straple muscles.

5) Why only the left internal carotid artery (ICA) stenosis was treated since bilateral asymptomatic ICA stenosis (~75% on both sides) was present? In my view, right ICA stenosis seems anomalous. Was there any evidence in the color-duplex scanning for complicated plaque (for example: ulcerative, with intraplaque hemorrhage or thrombus)? What was the type of plaque?

Furthermore, if the authors policy is to leave untreated any asymptomatic ICA stenosis of that degree, then why not performing a subclavian (L)-carotid (R) bypass? Note that preliminary insertion of a subclavian (L)-carotid (R) bypass might increase vertebral perfusion and make subsequent left carotid endarterectomy safer without the need for carotid shunting.

Left carotid had more ulceration. Besides it is our policy, between equal carotid stenoses to perform first the left one. We will perform the right carotid stenosis after close follow up.

We totally disagree with the idea of comparing a L subclavian – R carotid bypass to a L carotid – R carotid bypass (double length, dysfunction in movements of the neck). Besides, in our case left subclavian had an ostial <50% stenosis.

6) What was the rationale for doing the left carotid endarterectomy first?

We have answered this before in (5).

7) What the authors have to discuss and propose about the significant coiling of the right ICA?
Coiling in our 73 year old male is the least. Certainly, when performing the right carotid stenosis we will fix it.

8) Provide a complete aortic arch angiography.
   We have answered this commend in specific comments I.

9) Explain why not performing any endovascular techniques.
   We have answered this commend in specific comments II.

DISCUSSION
(1) A brief review of the results of the endovascular and surgical options for treating subclavian-common carotid artery steal syndrome in an era of IA occlusion would be of a value.
(2) Give much more details about all surgical options regarding IA occlusion.
(1), (2) We add some information. Also see specific comments I and specific comments II.

FIGURE 2
(1) What was the behaviour of the stenotic lesions seen in the subclavian artery (initial and mid portion segment) on follow-up examinations? Where these lesions hemodynamically insignificant? What was the percentage of stenosis of each lesion?
(1) Stenotic lesions of initial and mid portion segments in subclavian artery were not considered to be that significant for acute treatment. In case they progress we will consider endovascular treatment.

Reviewer I. Griniatsos:

COMMENTS:
1. I think that references from the decade of ‘60 should be replaced by recent ones, except the reference which is highly explanatory for the disease.
(1) We replaced some and renumerated according to order of appearance:


2. The references have not been formatted according to the JMCN instructions for authors. Please check and correct accordingly.

We tried to format.

3. Please renumber the references in the correct order throughout the text. (The order 5, 13, 14, 16, 5, 7, 8, etc) is incorrect.

The references were renumbered in order of text appearance after they were replaced.

Yours sincerely

The authors