

Acute left arm ischemia after TEVAR due to the anatomical variation of the vertebral artery – case report

Akutna ishemija lijeve ruke nakon TEVAR-a zbog anatomske varijante vertebralne arterije – prikaz slučaja

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Abstract. Aim: In this case we report acute left arm ischemia after thoracic endovascular aortic repair of the saccular thoracic aortic aneurysm due to a rare anatomical variation of the left vertebral artery. **Case report:** Thoracic aortic stent-graft was deployed to cover the aneurysm, but six hours later acute left arm ischemia occurred due to a rare form of vertebral artery origin from the aortic arch instead of from the left subclavian artery. This hostile anatomy led to an iatrogenic acute ischemia which was the indication for an emergency left-common-carotid-to-subclavian-artery bypass grafting. **Conclusion:** Multidisciplinary approach and careful pre-procedural planning should always be the standard procedure in complex cases to avoid this complication.

Key words: carotid artery; ischemia; subclavian artery; thoracic aortic aneurysm; vertebral artery

Sažetak. Cilj: U ovom slučaju prikazujemo akutnu ishemiju lijeve ruke nakon endovaskularnog popravka sakularne aneurizme torakalne aorte nastale zbog rijetke anatomske varijacije lijeve vertebralne arterije. **Prikaz slučaja:** Torakalni aortni stent-graft postavljen je za rješavanje aneurizme, ali šest sati kasnije nastala je akutna ishemija lijeve ruke uslijed rijetkog položaja ishodišta lijeve vertebralne arterije luka aorte umjesto iz lijeve arterije subklavije. Ova otežavajuća anatomija dovela je do nastanka jatrogene akutne ishemije što je bila indikacija za hitnim karotiko-subklavijalnim premoštenjem. **Zaključak:** Multidisciplinarni pristup i pažljivo planiranje prije postupka uvijek bi trebao biti standardni postupak u složenim slučajevima kako bi se izbjegla ova komplikacija.

Ključne riječi: aneurizma torakalne aorte; arterija subklavija; ishemija; karotidna arterija; vertebralna arterija

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INTRODUCTION

Isolated thoracic aortic aneurysms (TAA) were found in less than 1% of all autopsies¹. Aneurysms of the descending thoracic aorta account for 35% of all TAAs². A saccular form of the TAA represents minority of TAAs. During the treatment of TAAs with thoracic endovascular aortic repair (TEVAR) it is a common modification of standard procedure to cover the origin of the left subclavian artery due to THE lack of proximal landing zone with stent

Careful pre-procedural planning based on exact imaging, noticing important anatomical variations and multi-disciplinary pre-procedural approach should always be the standard procedure.

graft. If anatomical relations are normal there should not be any consequence. An aberrant origin of the left vertebral artery is rare³, but jointly formed in one patient, both the saccular TAA and the aberrant origin of the left vertebral artery from the aorta is extremely rare finding (only one case found in literature, describing saccular aneurysm of the distal aortic arch in combination with the aberrant left vertebral artery origin⁴). We present a patient who developed an acute left arm ischemia as a complication of an endovascular treatment just because of this particular combination of anatomic relations.



Figure 1. Saccular TAA (arrow)

CASE REPORT

A 60-year-old male patient was referred to an ENT surgeon due to hoarseness that HAD occurred abruptly two months earlier. The left vocal cord was found to be completely immobile. Computed tomography (CT) excluded a vocal cord tumor, but revealed a saccular thoracic aortic aneurysm (TAA) of 4 cm in axial diameter (Figure 1). This finding was confirmed on multislice computed tomographic angiography (MSCTA).

Based on the finding of the saccular TAA, a TEVAR procedure was indicated and eventually done two months later. The procedure itself was performed with no complications. Due to a small proximal landing zone beneath the left subclavian an it was necessary to cover its origin.

Six hours after the TEVAR procedure, the patient began to complain about the pain and coldness in the left arm and hand. After reevaluating the patient and the initial MSCTA, it was clear that there was an aberrant origin of the left vertebral artery as a separate branch of the aorta, which has been occluded with the covered stent during the TEVAR procedure (Figure 2, 3). This led to iatrogenic acute left arm ischemia. An urgent revascularization of the left arm in form of an emergency common carotid to subclavian artery bypass grafting was immediately done, using a Dacron silver graft (Interguard Silver, Maquet, Rastatt, Germany) 7 mm in diameter (Figure 4). Early postoperative period was uneventful. The patient was discharged on the seventh post-procedural day in a good general and local condition. Six months follow up showed palpable pulses of the radial and ulnar arteries. The patient had no pain in the arm, neither difficulties during hand movements.

DISCUSSION

Saccular aneurysms, although a rare form of the TAA, are an indication themselves for endovascular or open surgical repair. If it is feasible, endovascular procedure is always the first option due to fewer complications, less invasiveness, shorter duration of the procedure and lesser number of the in-hospital days and faster recovery than after open surgical reconstruction.



Figure 2. Aberrant origin of the left vertebral artery as a separate branch of the aorta (arrow) – pre-TEVAR MSCTA



Figure 3. Covered stent covered the left vertebral artery (arrow)

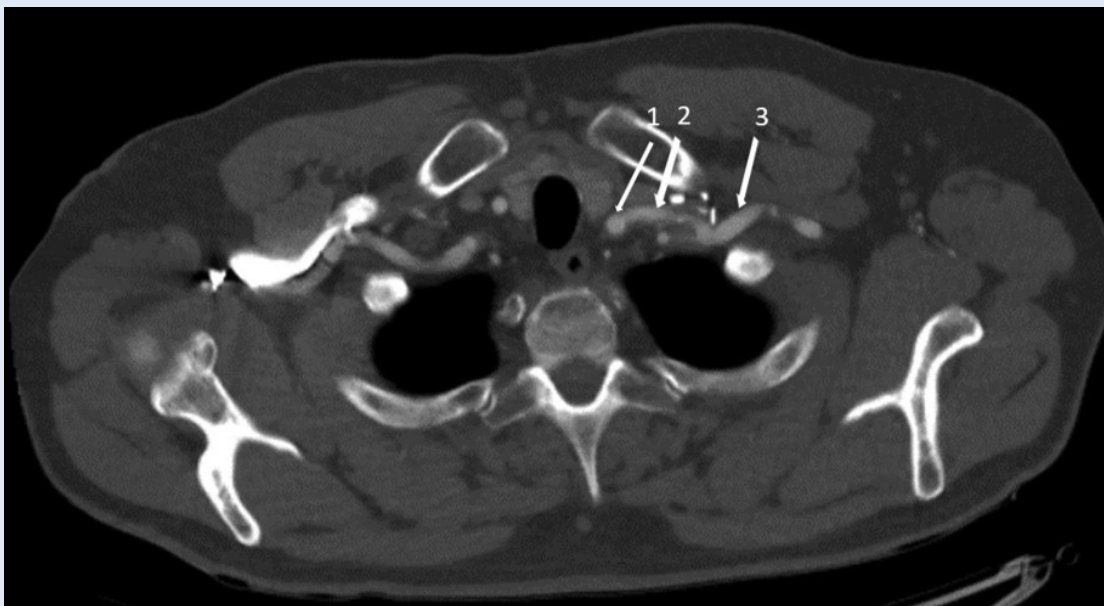


Figure 4. Common carotid to subclavian artery bypass graft (arrow 1 – left common carotid artery, arrow 2 – bypass, arrow 3 – left subclavian artery)

In case of a short landing zone during TEVAR deployment a common modification of the standard procedure is covering the origin of the left subclavian artery. This is possible because the left vertebral artery can enable enough blood supply

to the arm in form of reversed flow from the brain to the arm without a steal syndrome. In this particular patient, the anatomic position of the TAA and short landing zone required such placement of the TEVAR completely over the left sub-

clavian artery. The stent graft was placed as planned, but an acute complication in form of a left arm and hand ischemia developed post-procedurally. This complication developed due to the aberrant orifice of the left vertebral artery from the aorta instead of from the subclavian artery, where it usually originates from. Therefore, while covering the origin of the left subclavian artery with TEVAR, in order to successfully cover the TAA, the origin of the left vertebral artery was also covered and complete iatrogenic inter-

In complex cases the potential revascularisation should be performed before or during TEVAR procedure to avoid this complications.

ruption of the blood flow to the left arm occurred. This complication can happen if the anatomic positions were not recognized before the procedure. Iatrogenic acute left arm ischemia does not normally occur if origin of left vertebral artery is positioned at the subclavian artery. In case when the origin of the left subclavian artery is covered by stent graft, the blood flows into the arm in retrograde way from the brain via left vertebral artery into the left subclavian artery, which in that case supplies the arm. This blood supply is usually enough for the arm and it rarely causes the subclavian steal syndrome.

In such an anatomically hostile situation like in this patient, a revascularization is necessary⁵⁻⁷. The question is whether the revascularization should be performed before, during or after TEVAR procedure. This depends on the timing of recognition of the actual aberrant anatomic positions of blood vessels and clinical presentation. In this case, an arm ischemia was recognized post-procedurally, after the symptom occurred, so the revascularization was done urgently.

CONCLUSIONS

Covering of the left subclavian artery during TEVAR is common and safe modification of standard procedure^{8,9}. Most common complication of the procedure is endoleak. But in some cases of adverse anatomy a iatrogenically induced left arm ischemia can occur and the common carotid

to subclavian artery bypass grafting need to be done before, during or after the TEVAR procedure to prevent or to cure left arm ischemia^{10,11}.

The potential need for bypass procedure can be anticipated based on the pre-TEVAR MSCTA imaging, or during TEVAR based on the lack of contrast in late series of the contrast angiography in subclavian and vertebral arteries. Bypass can be performed also after the procedure, but this usually means that the symptoms of the acute ischemia are already present which is the worst of the scenarios, but if recognized on time, it is still prone to success – like in this patient.

Multidisciplinary approach in complex cases, careful pre-procedural planning based on MSCTA and decision-making is of utmost importance especially if the TEVAR is not urgently necessary¹². In cases with altered anatomical relations a decision regarding the timing of revascularization (before or during the procedure) should be made in advance to prevent this potential complications. After TEVAR is done, the indication for the revascularization is much more often a neurological impairment¹³, rather than acute ischemia.

Conflict of interest: Authors declare no conflicts of interest.

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