Subclavian artery revascularization with carotico-subclavian bypass grafting
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Citation

Abstract
Symptomatic atherosclerotic stenosis of the subclavian artery is uncommon and it's found in up to 25% of supraaortic lesions. Excellent long-term results underline that bypass grafting procedure is the more elegant and better concept treating this lesion.

We aimed to present our successful caroticosubclavian bypass procedure under the light of literature to a patient who was admitted to our clinic with complaints of dizziness; pain, numbness and fatigue at her left arm.

Subclavian artery revascularization by carotid-subclavian bypass is the recommended procedure of choice for symptomatic subclavian arterial stenotic lesions. It is safe and effective and has an excellent long-term patency rate with a low peri-operative mortality and morbidity.

INTRODUCTION
Subclavian artery stenosis is found in up to 25% of supraaortic lesions. Arteriosclerosis was the predominant cause of disease. Indications for surgery included vertebrobasilar insufficiency, upper extremity ischemia (symptoms of arm ischemia are: exertional pain, rest pain and ulceration), and the combination of both. Carotid-subclavian bypass led to excellent long-term patency rates and can provide durable relief of symptoms with minimal perioperative morbidity and mortality. Therefore, it is a worthwhile procedure to correct proximal subclavian artery stenosis.

CASE PRESENTATION
A 46-year-old woman presented with a 6 month history of vertigo, pain and pins and needles at left upper extremity. Left radial and ulnar pulses were not palpable. There was coldness and increasing fatigue also.

Arterial color flow Doppler ultrasound was carried out to her left upper extremity revealing that left subclavian-, axillary-, and brachial arteries were prominently narrowed when compared to the right. Moreover, throughout the distal segments of the subclavian artery, triphasic flow pattern was replaced by the poststenotic monophasic pattern. Occlusive lesion was documented preoperatively by digital subtraction angiography (DSA). It showed a preocclusive lesion throughout a segment of 2 cm of proximal left subclavian artery and this pronounced artery was thinner in calibration (Figure 1).
The left subclavian artery was filled by the ipsilateral vertebral artery and collateral vascular structures at the late phase. The left common carotid artery was patent.

Under general anesthesia, a horizontal supraclavicular incision of 7 to 8 cm was made. The omohyoid muscle was retracted from the anterior border of sternocleidomastoid muscle. The subclavian artery was carefully prepared since it is usually located next to the phrenic nerve. The integrity of the ductus thoracicus and lymphatic chain was preserved. The left common carotid artery was reached medially by mobilizing the internal jugular vein. The subclavian artery was prepared up to the stenotic segment proximally. After bolus intravenous administration of 5000 IU heparin, side-biting clamps were placed on both common carotid and subclavian arteries. After arteriotomies a 8 mm ringed PTFE graft was interposed in an end-to-side fashion on both arteries. (Figures 2 and 3).

Postoperative recovery was uncomplicated. Symptoms resolved in our patient, and she did not require major or minor amputations. Acetylsalicylic acid was used for postoperative antiaggregation. Left radial and ulnar arterial pulses were patent. Patency was determined during late
follow-up period by duplex examination. Postoperative duplex data confirmed complete patency of the PTFE graft.

**DISCUSSION**

Symptomatic atherosclerotic lesions of the subclavian artery are rare. Atherosclerotic disease of the proximal brachiocephalic circulation may produce disabling symptoms referable to cerebral or upper extremity hypoperfusion and embolization. Bypass of occlusive lesions can provide durable relief of symptoms with minimal complications. Bypass grafting is the procedure of choice but controversies exist concerning the optimal technique and the effect of postoperative antithrombotic therapy on long-term patency.

In the study of AbuRahma et al., they analyze the long-term results of a large series of carotid-subclavian bypass grafts for subclavian artery disease in which PTFE was uniformly used; the study can be used as a future reference to compare the results of subclavian artery percutaneous transluminal angioplasty/stenting. The mean follow-up was 7.7 years with a median of 7.0 years (range, 1-19 years). The symptom-free survival rates at 1, 3, 5, and 10 years were 100%, 96%, 82%, and 47%, respectively. The overall survival rates at 1, 3, 5, and 10 years were 100%, 98%, 86%, and 57%. Finally, they concluded that carotid-subclavian bypass grafts with PTFE grafts for subclavian artery disease are safe, effective, and durable and should remain the procedure of choice, particularly in good-risk patients. In the study of Law et al., polytetrafluoroethylene grafts demonstrated the highest bypass graft patency rate (95.2 +/- 4.6%), followed by dacron grafts (83.9 +/- 10.5%) and saphenous vein grafts (64.8 +/- 16.5%). Postoperative medication with acetylsalicylic acid seems to increase long-term bypass function significantly.

Therapy for atherosclerotic occlusive subclavian arterial disease is undergoing a paradigm shift from open to endoluminal therapy. Since the advent of subclavian artery percutaneous transluminal angioplasty/stenting, several authorities advocate it as the treatment of choice for patients with subclavian artery disease, claiming results equal to or better than those of reconstructive vascular surgery. However, most of their quoted surgical series included patients who may have other brachiocephalic disease who were treated nonuniformly by means of various bypass grafts with different grafts in the same series (Dacron, polytetrafluoroethylene -PTFE-, or vein). Defraigne et al concluded that carotid-subclavian bypass is a safe and efficient method for revascularization of the subclavian artery in their study.

In conclusion, carotid-subclavian bypass is a safe and durable procedure for relief of symptomatic occlusive disease of the subclavian artery. It has an excellent long-term patency rate with a low peri-operative morbidity.

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