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ENDOVASCULAR TREATMENT OF TANDEM CAROTID ARTERY STENOSES IN PATIENTS WITH MULTIFOCAL ATHEROSCLEROSIS

Sultonov M. A.[1]
Asliyev U. M. [1]
Musurmonov A. N. [1]
Mardonov J. N.[1,2]
Makhmudov K.O. [1,2]
[1]Republican Specialized Scientific and Practical Medical Center of Surgery named after Acad. V. Vakhidov, Tashkent, Uzbekistan
[2]Tashkent State Medical University, Tashkent, Uzbekistan

Abstract

Tandem stenoses of the brachiocephalic arteries represent a complex form of multifocal atherosclerosis and are associated with an increased risk of ischemic stroke. The aim of this study was to evaluate the safety and effectiveness of endovascular treatment of tandem carotid artery stenoses.

The study included 35 patients treated between 2022 and 2024, with a mean age of 66 ± 5 years. Patients presented with isolated and tandem lesions involving carotid, vertebral, subclavian arteries, and the brachiocephalic trunk. All patients underwent carotid artery stenting with the use of cerebral protection devices and received dual antiplatelet therapy prior to intervention.

The technical success rate was 100%, with restoration of arterial patency in all cases. In-hospital outcomes included one case of ischemic stroke (2.8%), no myocardial infarctions, and no mortality. Transient neurological symptoms were observed in some patients but resolved completely without persistent deficits.

Endovascular treatment of tandem carotid artery stenoses is a safe and effective method in patients with multifocal atherosclerosis. The use of embolic protection

systems contributes to improved clinical outcomes and reduced risk of complications.

Keywords: carotid artery stenosis; tandem lesions; endovascular treatment; carotid artery stenting; multifocal atherosclerosis; cerebral protection devices; ischemic stroke

Background

Tandem stenoses of the brachiocephalic arteries represent a complex manifestation of systemic atherosclerosis and are associated with a significantly increased risk of ischemic stroke. The coexistence of carotid, vertebral, and subclavian artery lesions leads to severe impairment of cerebral hemodynamics and worsens prognosis in patients with multifocal atherosclerosis (Naylor et al., 2018; Aboyans et al., 2018). Carotid endarterectomy has long been considered the standard of care; however, endovascular approaches have gained widespread acceptance due to their minimally invasive nature and comparable clinical outcomes (Brott et al., 2010). Management of tandem lesions remains challenging and requires an individualized strategy based on anatomical and hemodynamic factors (Galyfos et al., 2024).

Objective

To assess the safety and effectiveness of endovascular treatment of tandem carotid artery stenoses in patients with multifocal atherosclerosis.

Materials and Methods

The study included 35 patients with tandem carotid artery lesions treated between 2022 and 2024. The patients' age ranged from 58 to 79 years (mean age 66 ± 5 years).

Patient distribution included:

- isolated internal carotid artery (ICA) stenosis - 15 patients
- tandem brachiocephalic artery stenoses - 20 patients

Tandem lesions comprised:

- bilateral ICA stenoses
- combined carotid and vertebral artery stenoses
- combined carotid and subclavian artery stenoses
- involvement of the brachiocephalic trunk

The degree of stenosis ranged from 60% to 100% (including occlusions).

All patients received dual antiplatelet therapy (aspirin and clopidogrel) for 5-7 days prior to intervention. Endovascular stenting of the affected vessels was performed in all cases using cerebral protection devices to prevent distal embolization (Aboyans et al., 2018).

Results

The overall technical success rate was 100%, indicating high procedural feasibility and reliability of the endovascular approach. Adequate revascularization was achieved in all cases, with restoration of arterial lumen and improved angiographic blood flow. Stenting was most commonly performed at the ostial and proximal segments of the internal carotid artery, reflecting the typical localization of hemodynamically significant lesions. In patients with tandem pathology, either staged or single-session interventions were carried out depending on anatomical complexity and severity of stenosis. Despite the complexity of vascular involvement, including bilateral lesions and multivessel disease affecting carotid, vertebral, and subclavian arteries, all procedures were completed successfully without intraoperative complications requiring conversion or modification of the treatment strategy.

In the early postoperative (in-hospital) period, the following outcomes were observed:

- ischemic stroke - 1 case (2.8%)
- myocardial infarction - 0%
- mortality - 0%

Transient neurological symptoms (such as mild weakness, dizziness, or dysarthria) were observed in some patients; however, all symptoms resolved completely without persistent neurological deficit.

The routine use of cerebral protection devices likely contributed to the reduction of embolic complications and favorable early clinical outcomes (Brott et al., 2010).

Conclusion

Endovascular treatment of tandem brachiocephalic artery stenoses is a safe and effective strategy in patients with multifocal atherosclerosis.

The use of cerebral protection systems reduces the risk of embolic events and improves immediate clinical outcomes.

Carotid artery stenting may be considered a minimally invasive alternative to open surgical procedures for the prevention of ischemic stroke in this high-risk patient population.

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