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Complications of Carotid Stenting During Live Transmissions

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Objectives We sought to examine the acute and subacute results of carotid stenting performed during live transmissions.

Background Teaching courses focusing on live demonstrations of carotid interventions have been the key educational facility for physicians interested in learning state-of-the-art interventional techniques of carotid stenosis treatment. However, starting with the very first live demonstration of interventional procedures, there has been an ongoing discussion whether patients treated during live transmissions are at higher risk.

Methods Between March 1, 2001, and June 30, 2008, 186 high-grade lesions of the internal carotid artery in 186 patients have been treated by stent implantation during live transmissions to 22 interventional conferences at 3 high-volume centers. Technical success was defined as the ability to perform carotid stent implantation. The combined end point of death, major stroke, minor stroke, or myocardial infarction was defined as primary end point.

Results The procedure was technically successful in 185 of 186 (99.5%) interventions. Seventeen patients had 1 of the following acute in-hospital complications: major stroke in 2 (1.1%), minor stroke in 3 (1.6%), transient ischemic attack in 11 (5.9%), and amaurosis of the ipsilateral eye due to an occlusion of the retinal artery in 1 (0.5%). None of the patients died, and no myocardial infarctions occurred. The composite primary end point occurred in 6 (3.2%) patients.

Conclusions In this consecutive series of carotid stent cases performed by expert operators during live demonstration courses, the procedural and 30-day clinical outcomes were similar to the results appearing in the contemporary published data. (J Am Coll Cardiol Intv 2009;2:887–91) © 2009 by the American College of Cardiology Foundation

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Transcatheter treatment of carotid stenosis was first reported by Mathias in 1977 (1). Due to the gaining expertise and experience of interventionalists, the rapid development of this endovascular method, as well as the improvement of cerebral protection devices, the periprocedural event rate has decreased over the years (2–4). Teaching courses focusing on live demonstrations of carotid interventions have been

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the key educational facility for physicians interested in learning state-of-the-art interventional techniques of carotid stenosis treatment. However, starting with the very first live demonstration of interventional procedures, there has been an ongoing discussion whether patients treated during live transmissions are at higher risk. The purpose of this study is to report the acute and subacute results of carotid stenting performed during live transmissions, to compare the outcome with the results of published carotid stenting trials.

Abbreviations and Acronyms

CEA = carotid endarterectomy

NIHSS = National Institutes of Health Stroke Scale

TIA = transient ischemic attack

Methods

Between March 1, 2001, and June 30, 2008, in-hospital results of patients with carotid artery stenosis treated during live transmissions to 22 international conferences on endovascular treatment at 3 high-volume centers. Procedure data, information on complications, and follow-up data were collected with conference programs, live case schedules, and patient hospital records and entered prospectively into each center's database system. To incorporate the original databases of these centers, a common database system was developed by the CardioVascular Center Frankfurt in May 2006. Data received from procedures before this date were entered retrospectively, thereafter in a prospective manner (123 procedures retrospectively and 63 procedures prospectively entered into database). The analyzed population consisted of all patients in whom a carotid procedure was attempted during live transmissions to endovascular courses. The number of procedures/center is listed in Table 1. No exclusions were made concerning procedures in which guest operators were the main operator.

Informed consent for live demonstrations was received from all patients before the procedure. The diameter of stenosis was determined angiographically according to the NASCET (North American Symptomatic Carotid Endarterectomy Trial) measurement criteria (5). Technical success was defined as the ability to access the carotid artery lesion and successfully stent the stenosis with a residual stenosis of <20%. Independent neurological examinations including a neurological assessment according to the National Institutes of Health Stroke Scale (NIHSS), and clinical examinations were performed before and after the procedure, before discharge, and at 30 days.

Table 1. Procedures/Center

Center	Number of Procedures
CardioVascular Center Frankfurt, Frankfurt, Germany	98
Ospedale di Mirano, Mirano, Italy	34
Department of Angiology, Heart Center Leipzig, Leipzig, Germany	55

The combined end point of death, major stroke, minor stroke, or myocardial infarction at discharge was defined as primary end point. Secondary end point was defined as death, major stroke, minor stroke, or myocardial infarction at 30 days after procedure. Minor stroke was classified as a new neurological event that persisted more than 24 h and changed the NIHSS score by 2 to 3 points. Major stroke was defined as a new neurological event that persisted more than 24 h and changed the NIHSS score by at least 4 points. Embolic occlusion of the retinal artery was taken into account as a minor stroke. Diagnosis of myocardial infarction was based on the joint definition of European Society of Cardiology/American College of Cardiology for acute myocardial infarction in 2000, then adapted to the definition of European Society of Cardiology/American College of Cardiology Foundation/American Heart Association/World Heart Federation in 2007 (6,7). Rise and/or fall of cardiac biomarkers (preferably troponin) was detected with at least 1 value above the 99th percentile of the upper reference limit together with evidence of myocardial ischemia with at least 1 of the following:

Symptoms of ischemia;

Electrocardiographic changes indicative of new ischemia (new ST-T changes or new left bundle branch block;

Development of pathological Q waves in the electrocardiogram;

Imaging evidence of new loss of viable myocardium or new regional wall motion abnormality.

Platelet inhibitors (aspirin and clopidogrel) were given in preparation for the intervention in all patients. Between 0.5 and 1.0 mg atropine and 5,000 to 10,000 IU of heparin were administered routinely during the procedure. Angiography of the carotid artery was performed to identify the anatomical characteristics of the intracranial and carotid vessels and to provide information on the lesion. Intracranial circulation films were obtained immediately before and after the implantation procedure to document baseline and final results.