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PERFORMING TRANSCATHETER AORTIC VALVE IMPLANTATION IN PATIENTS WITH CAROTID STENOSIS

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ABSTRACT:

The management of carotid artery disease in patients with severe aortic stenosis referred for transcatheter aortic valve implantation is challenging. By reviewing the very limited amount of literature we will try to answer the question should we perform carotid revascularization before or after the TAVI procedure.

Keywords: Transcatheter aortic-valve implantation (TAVI), aortic artery stenosis, carotid stenosis, carotid artery stenting (CAS), carotid endarterectomy (CEA)

INTRODUCTION:

Combination of aortic stenosis and carotid artery stenosis is not uncommon.

Aortic stenosis is a disease with a long latency period, followed by fast progression of the symptoms with a high rate of death.

The classic symptoms of aortic stenosis are: angina pectoris – usually during physical effort and relieved by rest; heart failure - typically presents with paroxysmal nocturnal dyspnea, orthopnea, dyspnea during exertion, and shortness of breath; syncope occurs upon physical stress. Syncope is caused by vasodilatation in the presence of a fixed stroke volume and inability of the left ventricle to compensate for a sudden drop of BP when standing up. Less common reason for syncope are AV-blocks and short lasting arrhythmias, due to ischemic arias in hypertrophied myocardium [1, 2, 3].

The atherosclerotic plaques consist of cholesterol crystals, necrotic sells and lipids. When present in carotid arteries they can lead to thrombosis and embolization. Atherosclerotic disease of the carotid artery is usually associated with focal neurological deficit (such as by ipsilateral visual loss, motor skills deficit) caused by transient ischemic attacks (TIAs), strokes and cerebral infarctions [4].

The main indication for carotid revascularization is stroke prevention. It is contraindicated in patients with a severe neurological deficit with cerebral infarction, patients with totally occluded carotid artery and concurrent diseases that reduce the patient's life expectancy.

Patients with severe and symptomatic stenoses have a higher risk of stroke.

According to the North American Symptomatic Carotid Endarterectomy Trial (NASCET) symptomatic patents with >70% stenoses respond good to the treatment; In symptomatic patients with 50 – 69 % stenoses the profit is negligible and appears to be greater for males. Asymptomatic patients with greater than 60% narrowing profit significantly less than first group [5].

Depending on the periprocedural risk carotid endarterectomy (CEA) or carotid artery stenting (CAS) is chosen. Anatomical (bilateral stenosis, postoperative restenosis) and clinical (cardiopulmonary diseases, prior cranial injury) factors can increase the risk during an operation. For stenting they are as follows: anatomical (complex aortic arch and brachiocephalic arterial anatomy, presence of thrombus, and heavy calcification) and clinical (need for heart surgery within 30 days) [6].

"Carotid artery stenosis occurs in 8–13 % of patients with degenerative aortic stenosis. The risk of new postoperative stroke after cardiac surgery is thought to be two- to four-fold higher in patients with concomitant carotid stenosis" [7, 8].

AIM of the study:

The aim of this study is to analyze retrospectively additional database containing patients who suffer from aortic and carotid stenosis simultaneously, undergoing TAVI. By reviewing the very limited amount of literature we will try to answer the question should we perform carotid revascularization before or after the TAVI procedure.We try to determine what is the proper way to treat those patient even when they are completely asymptomatic and the carotid stenosis was an accidental finding during the preparational studies for TAVI.

Carotid artery stenting is performed in order to reduce the number of ischemic episodes. It has been proven that operative revascularization is highly beneficial for symptomatic patients. Interventional treatment has an advantage over operational when it comes to asymptomatic patients [9].

CAS has evolved rapidly over the last 15 years. Randomized trials comparing stenting with conservative treatment are not available. The role of stenting is not yet clear despite the existence of several studies comparing interventional with operational techniques. CAS should be considered in high surgical risk patients requiring revascularization according to the SAPPHIRE study results [7, 10].

It is recommended by the European Society of Cardiology (ESC) guidelines that symptomatic patients with high surgical risk undergo CAS (Class IIa). It is reasonable to perform CAS on asymptomatic patients with other indications for revascularizaion in high-volume centers with low rates

of periprocedural stroke (<3 %) (Class IIb), and on symptomatic patients in centers with < 6 % stroke rate (Class IIb). Endarterectomy is still first method of choice [11].

The recent large trial CREST found that there are no significant differences in long-term outcomes between CAS and CEA including the whole cohort [12].

Operative replacement of the aortic valve in patient suffering from AOS improves symptoms and survival. The mortality rate is low . About one third of all patients that need aortic valve replacement are at high risk for death and major complications during, because of factors as advanced age, left ventricular dysfunction, or other conditions. For these patients TAVI is a viable alternative [13].

Transcatheter aortic-valve implantation (TAVI) is a new catheter based procedure, in which a prosthetic valve implanted within stenotic native aortic valve. The first procedure was performed in 2002 [14, 15]. Today the number of patients that underwent TAVI procedure is >50 000 [13].

The Placement of Aortic Transcatheter Valves (PARTNER) trial is the largest study comparing SAVR and TAVI. Stroke is considered one of the most important periprocedural complication of both procedures. "Stroke is defined as an acute episode of focal or global neurological dysfunction caused by the brain, spinal cord, or retinal vascular injury as a result of hemorrhage or infarction." [16].

Sometimes the occurrence of stroke happens late after the TAVI procedure and can be attributed to other factors such as preexisting carotid stenosis and atrial fibrillation [16]. In those cases the direct cause of the stroke is hard to determine but reevaluation of the antithrombotic medication and stenting of a known carotid lesion is reasonable.

When performing TAVI, strokes are related to debris, breaking off the aorta when crossing its arch and when passing the valve and deploying the valve. Improving the design and reducing the size of the implantable valves and the delivery systems leads to significant reduction in periprocedural stroke rates [17]. According to the STS database stroke occured in 1.5 % of the patients that underwent cardiac surgery [18]. The earlier TAVI trials showed higher incidence of stroke compared to SAVR but in PARTNER II trial where the new Sapien 3 valve was used only 0.9% had disabling stoke at 30 days after the procedure [17, 18].

The Cardiology department of Pomeranian Medical University in Poland conducted a study in which 246 patients underwent CAS. 14 of those had aortic stenosis and 2 of those had procedure-related deaths which is higher mortality rate than the rest of the group. This study suggests that patients who undergo CAS and have aortic stenosis as a comorbidity are at higher risk of death [7].

Hospital of the University of Pennsylvania is described 129 postoperative patients after SAVR. MRI study was performed on all of them and it was revealed that 60 patients (46%) have embolic infarcts, watershed had 2 of them (2%), and both - 17 (13%). There was an association between watershed infarct and the presence of internal carotid artery stenosis ≥70% [19].

An American study described 294 TAVI patients, 51 of which (19%) had at least 50% stenosis of a carotid or vertebral artery. Transfemoral access was less common in the carotid and vertebral artery disease group (55 % vs 77 %). Stroke had 6.8% of patients within 30 days after the procedure. None of the patients in the carotid and vertebral artery disease group had a stroke. Mortality and overall survival rate in the next 30 days in both groups was the same [20].

In Departments of Cardiology and Neurology, Tel-Aviv Medical Center in Israel a study included 171 patients with CAS in patients undergoing TAVI. Carotid plaques had 164 (96 %) of the patients, severe stenoses (≥70 % stenosis) were present in 15 (9 %) patients. CAS was not associated with higher 30-day mortality or stroke rates [21].

Study of 52 patients by Kar et al. evaluated carotid interventions in patients with aortic valve stenosis. The procedure was successful in 51 cases. None of them had a stroke in 30 day follow up. Five patients (10%) died before AVR.

DISCUSSION:

Many of the patients with aortic and carotid stenosis are in the high risk group for both TAVI and SAVR.

Stroke rate after cardiac surgery is 0.8 – 4 % . Combined procedures (SAVR and CABG) are more risky. The risk of stroke is much higher when a CS is present. Carotid revascularization before cardiac surgery is a common practice and a lot of data supports this approach.

CAS and CEA both can lead to cardiovascular instability, whch can significantly worsen the condition of patients suffering from degenerative aortic stenosis (DAS). Particularly undesirable are any drops in systolic blood pressure which are more common and long lasting when performing CEA.

CONCLUSION:

The prevalence of CAS in patients undergoing TAVI is high. The presence or absence of carotid or vertebral artery stenosis was not significantly related to the occurrence of TAVI procedure related stroke. Routine screening for carotid and vertebral artery stenoses before TAVI does appear justified but always treating them first does not.

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