Original Article

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EFFECTIVENESS OF CAROTID ARTERY STENTING IN PATIENTS WITH CAROTID ARTERY STENOSIS

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ABSTRACT

Objective: To determine the effectiveness of carotid artery stenting in patients with carotid artery stenosis.

Study Design: Prospective cohort study

Place and Duration of Study: Study was conducted at Armed Forces Institute of Cardiology & National institute of heart diseases from Jan 2013 to Jan 2015

Patient and Methods: A total of 145 consecutive patients who underwent carotid artery stenting were enrolled in study. All the symptomatic patients with carotid stenosis ≥50% or asymptomatic patients with stenosis ≥60% determined by ultrasound or angiogram were intervened. Rail roading technique was used for carotid stenting. Procedural success was defined as successful stenting with 20% or less residual stenosis.

Result: Out of 145 patients 128(88.27%) were male while 17(11.72%) were female with average age of 62.68 years. In all cases embolic protection devices were used. Pre-dilatation was done in 56(38.62%) cases while in 89(61.37%) direct stenting was done. Temporary pacemaker (TPM) transvenous lead was used in 134(92.41%) patients. In 6(4.13%) patients procedure was abandoned. Only 3(2.06%) patients suffer stroke during procedure while 4(2.75%) develops pericardial effusion due to TPM. Procedural success was achieved in 139(95.86%) patients.

Conclusion: Carotid artery stenting is an effective and safe modality for treatment of carotid artery stenosis.

Keywords: Carotid artery stenosis, Carotid artery stenting, Stroke.

INTRODUCTION

Cardiovascular disease remains the leading cause of death throughout the world mostly affecting the western population. The global burden of disease can be estimated by the fact that 29.6% of all the death in 2010 throughout the world were due to cardiovascular disease, double the number of deaths caused by cancer [1]. Approximately 600000 people in US suffer from stroke each year leading to nearly about 160 000 deaths and leaves many people with major disability[2]. It has now become the third leading cause of death after heart disease and cancer[3]. About 70-85% of all the strokes are ischemic while 15-30% is hemorrhagic[4]. Carotid atherosclerotic disease is implicated in 15-30% of all ischemic strokes[5]. Atherosclerosis mainly affects carotid bifurcation and internal carotid artery. Carotid artery stenosis has been implicated as major risk factor in the development of stroke. Stenosis of internal carotid artery may be responsible for 10-20% of all strokes or transient ischemic attacks[6]. In patients with asymptomatic carotid artery stenosis the annual risk of stroke is 1.3-3.3%, while in symptomatic is 2-3% for those with transient monocular blindness and about 4% for those with transient cerebrovascular ischemia manifested as hemiparesis, hemiparasthesias[7]. Annual stroke rate increases to 15% in all patients with stenosis greater than 70%[8].

Recent randomized trials regarding the surgical management of carotid artery stenosis showed that carotid endarterectomy (CEA) is superior to medical treatment alone in all symptomatic and asymptomatic patients[9,10]. American Heart Association guidelines support CEA for all symptomatic patients with stenosis ≥50% and for asymptomatic patients with stenosis ≥60% as long as the expected perioperative stroke or death rate <3% and life expectancy >50%[11]. These trials set CEA as gold standard technique for the management of carotid artery stenosis until recently when minmal invasive techniques for carotid

revascularization challenged CEA as therapeutic approach. The transition from CEA for the treatment of carotid stenosis was a gradual one, and is accredited to the efforts of a multitude of surgeons – the foremost among them is Kerber, who performed the first acknowledged percutaneous transluminal carotid angioplasty in 1980[12]. The potential benefits of carotid angioplasty were first highlighted by the Carotid and Vertebral Artery Transluminal Angioplasty Study (CAVATAS)[13] which showed that endovascular approach avoid the main complication of CEA incision i.e cranial nerve injury and hematoma. Several trials have during the recent years have compared carotid artery stenting with CEA and fruitful results have been obtained.

Although carotid stenting has become a therapeutic modality for the treatment of carotid artery stenosis, its absolute efficacy and safety has not been established. Keeping this perspective in mind we conducted a study that determines the clinical outcome of carotid stenting at our setup and compared them against standards recognized in the field of interventional medicine. The aim is to bring practice at our setup in context with international benchmarks.

MATERIAL AND METHODS

From Jan 2013 to Jan2015, 145 consecutive patients underwent carotid stenting at Armed Forces Institute of Cardiology AFIC Rawalpindi. All the symptomatic patients with carotid stenosis ≥ 50% or asymptomatic patients with stenosis ≥ 60% determined by ultrasound or angiogram were included in study. Patients with acute or recent stroke <48 hours, intraluminal thrombus, total carotid occlusion, neurological deficit, renal failure, peripheral vascular disease, intracranial mass lesion, AV malformation, previous stent placement in the same artery, stent placement in contra lateral artery in last 30 days, reference segment diameter <4 mm or >9 mm, intracranial aneurysm >9 mm or allergy to stent component were excluded from the study. Procedural success was defined as the ability to stent successfully with residual stenosis less than 20% while study end points were defined as occurrence of major or minor stroke or death within 30 days of the procedure.

All patients were explained about the procedure and a written informed consent was taken. All the patients were given aspirin once daily atleast 72 hours prior to procedure and thienopyridine derivative (ticlopidine 250 mg BID or clopidogrel 150 mg BID) for 2 days before the procedure and were continued for 4 weeks. Unfractionated heparin was infused during procedure to maintain a proper clotting time.

Vascular access was gained by the placement of 8F arterial sheath in femoral artery and 6F venous sheath in femoral vein. A 5F TPM lead was placed in right ventricle for emergency pacing. A flouroscopy guided guide wire is introduced into the aorta. Rail roading technique was used and 8F multipurpose guide was placed over a 5F JB3 diagnostic catheter. This whole assembly was introduced over the guide wire into aortic arch. JB curve helps in engaging the internal carotid artery (ICA) and guide wire was placed in artery. JB curve and guide wire were removed after sliding multipurpose guide wire over guide wire into ICA. Carotid arteriogram in AP, lateral and intracerebral view was obtained. Appropriate size distal protection device was deployed distal to lesion in ICA. Pre-dilatation was done with 2-3mm coronary balloon after which self expanding tapering carotid stent was deployed across the lesion. Post dilatation if required was done keeping in mind 15-20% residual stenosis. A repeat arteriogram along with cerebral view was done and wires and guide were removed. Pressure bandage was applied to access site. Arterial and venous sheath were removed 4 hours after procedure. Patient was kept under supervision after procedure for hypertension to prevent hyper perfusion syndrome. Patient demographic and angiographic data was recorded. Finally all the data was analyzed by using descriptive statistics.

RESULTS

Out of 145 patients 128(88.27%) were male while 17(11.72%) were female with average age of 62.68 years (38-83 years). In all cases embolic protection devices were used. Out of 145 stents

deployed 134 (92.41%) were Acculink type stents (self expanding) while 11 (7.5%) were others. Pre-dilatation was done in 56(38.62%) cases while in 89(61.37%) direct stenting was done. Temporary pacemaker (TPM) transvenous lead was used in 134(92.41%) patients. In 6(4.13%) patients procedure was abandoned because of failure to engage the guide catheter in CCA (in 3/6 patients), due to failure to cross tortuous vessel (in 2/6 patients) while in one case due to development of bovine neck due to blood leakage. Only 3(2.06%) patients suffer stroke during procedure while 4(2.75%) develops pericardial effusion due to TPM. Procedural success was achieved in 139(95.86%) patients.

Table: Carotid artery stenting-characteristics.

Characteristics	N(%)
Male	128(88.27%)
Female	17(11.72%)
Age (years)	62.68 (38-83)
Carotid artery involved	
Right ICA	22(59.45%)
Left ICA	15(40.54%)
Total Stents deployed =37	
Acculink stents	134 (92.41%)
Others	11 (7.5%)
Predilatation	56(38.62%)
Direct stenting	89(61.37%)
Temporary pacemaker	134(92.41%)

DISCUSSION

Carotid artery stenting is rapidly replacing endarterectomy and is increasingly emerges as an excellent alternative to endarterectomy for patients with carotid stenosis, especially in those patients deemed to be at higher risk for endarterectomy[14,15]. Carotid stenting is now being performed in many centers around the world with low complication rates[16]. Until the last two decades, CEA was the gold standard for the treatment of carotid stenosis but with the invent of minimal invasive technique the perception of doctor as well as doctor toward treatment modality has changed. Several trials comparing both treatment modalities have been done over the last decades. Both the techniques are associated with important peri-procedural complications mainly stroke. The only randomized study to date, the Carotid and Vertebral Artery Transluminal Angioplasty Study (CAVATAS) comparing carotid angioplasty and CEA demonstrated a stroke rate of 10% and 9.9% respectively[17]. Similarly CREST, SPACE and SAPPHIRE trials shows same results[18-20]. However SAPPHIRE trial was found to be superior to CEA among high risk surgical patients. Similarly various meta-analysis were carried out over the last few years to compare both techniques. Meta-analysis by Yavin et al and Bangalore S et al shows significantly higher stroke risk for both techniques[21 22].

In our descriptive study procedural success was achieved in about 96% cases which are comparable to various registry studies. In SAPPHIRE and SECURITY registry study technical success was achieved in 96.7% and 93.7% cases respectively[23,24]. High technical success may be attributed to the use of embolic protection devices (EPD). This fact is supported by data from many registries and as well as analysis from the Endarterectomy Versus Angioplasty in Patients With Symptomatic Severe Carotid Stenosis (EVA-3S) trial[25,26].

Direct stenting or pre-dilatation before stenting is still a dilemma and need debates. In our study pre-dilatation was done in 39% cases. However in a study by Montorsi P et al there is statistically no difference in outcome comparing direct stenting and pre-dilatation[27]. Similarly

TPM are not recommended internationally anymore and is replaced by the use of intravenous atropine[28].

Carotid artery stenting if performed by experienced hand at experienced centers is an acceptable alternative to CEA especially for patients who are surgically at high risk. However patient's preference and anatomy must be taken into consideartion.

CONCLUSION

Carotid artery stenting in our clinical setup has comparable results to the data available from different interventional facilities round the world. Carotid artery stenting is thus an effective and safe modality for treatment of carotid artery stenosis in our clinical setup.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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