



Research Article

Management Of Carotid Artery Stenosis: Experiences in Dokuz Eylül University Hospital

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Abstract

Vascular brain diseases are known to be the second cause of death worldwide, and the third cause of death in the developed countries. Approximately 20 % of the cases with stroke are due to carotid artery atherosclerosis. The treatment of patients with carotid atherosclerosis consists of an effective medical treatment together with neuroradiologic interventions (stenting) or surgery (endarterectomy). In our university hospital from 2003 till now, symptomatic or asymptomatic patients with carotid artery atherosclerosis have been assessed by a multidisciplinary committee in which the instructors from the departments of neurology, cardiovascular surgery and interventional radiology take part and the treatment or preventive procedures for these patients have been assigned accordingly. Between June 2003 and September 2007, 139 patients referred mostly from the neurology department have been assessed by this committee in our hospital. In this article, the experiences from the demographic features, treatment decisions and outcomes of these patients are discussed. Of the 139 patients assessed by the committee, 37 patients have been decided to be followed only by a medical treatment, 97 patients have been decided to have an interventional treatment, and 5 patients have undergone endarterectomy. Among 97 patients decided to have an interventional treatment, 3 had an intracranial stenting. In the remaining 94 patients who had an extracranial stenting, 8 had subclavian and 86 had carotid artery stenting. After carotid stent procedure, in 2 cases a major and in 8 cases a minor neurological complication have developed. Finally, carotid stenting is a procedure with acceptable complication ratio and an alternative treatment to endarterectomy in experienced centers. Each center should have a treatment suggestion depending on its facilities and experiences, making a common decision together with patients by suggesting each alternative. Ideally this decision should be made by a committee in which a neurologist, an interventional radiologist and a cardiovascular surgeon take part, as in our center. More importantly, symptomatic patients require either interventional treatment or endarterectomy apart from medical treatment alone. The patients should be protected from a second stroke by an optimal medical treatment in addition to these procedures.

Keywords: Vascular brain diseases; stenting; Endarterectomy; Multidisciplinary approach

Karotis Arter Darlığına Yaklaşım: Dokuz Eylül Üniversitesi Hastanesi Deneyimi

Özet

Beyin damar hastalıkları, dünyada ikinci, gelişmiş ülkelerde üçüncü sıklıkta karşılaşılan ölüm nedenidir. Bütün inmelerin %20'si karotis aterosklerozuna bağlıdır. Karotis arter stenozu tedavisi, etkin bir medikal tedavi ve nöroradyolojik girişimsel tedavi (stentleme) ya da cerrahi (endarterektomi) tedaviyi içerir. Dokuz Eylül Üniversite hastanemizde 2003 yılından bu yana, asemptomatik ya da semptomatik karotis hastaları Nöroloji, Girişimsel Radyoloji ve

Kardiyovasküler Cerrahi Anabilim dallarından ilgili öğretim üyelerinin katılımı ile oluşturulan multidisipliner bir konsey tarafından değerlendirilip, tedavi kararı ve koruma stratejisi belirlenmektedir. Haziran 2003- Eylül 2007 tarihleri arasında büyük bölümü nöroloji kliniğince gönderilen 139 olgu hastanemiz karotis konseyinde tartışılmıştır. Bu makalede karotis konseyinde değerlendirilen ve tedavi planlamaları yapılan hastaların özellikleri, tedavi karar ve sonuçları doğrultusunda edinilen deneyimler tartışılmıştır. Konseyde değerlendirilen toplam 139 hastanın, 37'sine sadece medikal tedavi ile izlem kararı verilmiş, 97 hastaya girişimsel tedavi, 5 hastaya endarterektomi önerilmiştir. Girişimsel tedavi uygulanan 97 olgudan 3'üne intrakranial stent uygulanmıştır. Ekstrakranial stent uygulanan 94 hastadan 8'ine subklaviyan, 86'sına karotis stenti uygulanmıştır. Karotis arter stentleme işlemi sonrası 2 olguda major, 5 olguda minör komplikasyon gelişmiştir. Sonuçta karotis stent uygulamasının deneyimli merkezlerde ciddi komplikasyon riski yüksek olmayan, endarterektomiye alternatif bir tedavi seçeneği olduğu düşünülmüştür. Merkezler kendi olanaklarına, deneyimlerine göre girişimsel ya da cerrahi tedavi önerisinde bulunmalı, hastaya her iki seçenek de sunularak birlikte karar verilmelidir. İdeal olan merkezimizdeki gibi, nörolog, girişimsel radyolog ve vasküler cerrahların olduğu konseylerde bu kararların alınmasıdır. Önemli olan semptomatik hastaların, tek başına medikal tedaviye ek olarak, girişimsel tedavi ve endarterektomiden birine daha gereksinim duyduğudur. Bu tedavilere eklenen optimal medikal tedavi ile hastalar ikinci bir inmeden korunmaya çalışılmalıdır.

Anahtar Kelimeler: Beyin damar hastalıkları, stentleme, endarterektomi, multidisipliner yaklaşım

INTRODUCTION

Vascular brain diseases are known to be the second cause of death worldwide, and the third cause of death in the developed countries. Approximately 20 % of the cases with stroke are due to carotid artery atherosclerosis⁽⁶⁾. The treatment of patients with carotid atherosclerosis consists of an effective medical treatment together with either neuroradiologic interventions (stenting) or surgery (endarterectomy)^(4,8). The intervention therapy is a less invasive, percutaneous treatment in patients with high surgical risks in treatment of atherosclerotic carotid artery stenosis. After the approval of endarterectomy procedure in treatment of carotid artery stenoses, stenting procedures appear to be a potential alternative treatment option especially in the last decade. The data related to the stenting procedure up to date proved it to be as effective as the endarterectomy procedure.

In Dokuz Eylül University Hospital from 2003 till now, symptomatic or asymptomatic patients with carotid atherosclerosis have been assessed in

certain days of a week by a multidisciplinary committee consists of instructors from the departments of neurology, cardiovascular surgery and interventional radiology and the treatment or prevention procedures for these patients have been assigned accordingly. In this article the clinical features and treatment results of the patients assessed by this committee between June 2003 and September 2007 and in majority undergone intervention procedure in addition to medical treatment are presented. In order to analyze more homogeneous group, the features of the patients undergone carotid artery stenting are discussed in detail.

RESULTS

Between June 2003 and September 2007, 139 patients have been assessed and their treatment plans have been developed in the carotid committee in Dokuz Eylül University Hospital that mostly referred from the neurology department. For 37 of the 139 patients assessed by the committee, only follow up with a medical treatment, for 97 intervention treatment and for 5 endarterectomy treatment have been

recommended (Figure 1). In three patients among 97 patients decided to undergone intervention treatment, an intracranial stending was performed. In 8 patients of the remaining 94 patients with extracranial stents, subclavian artery and in 86 patients carotid artery stents were applied. Sixty seven of the 86 patients with carotid artery stending were male and 19 were female (77.9 % and 22.1 % respectively). The mean age of the subjects that ranged from 43 to 83 was 67.69 ± 9.06 years (Male = 67.5; Female = 68.05).

When the subjects were evaluated according to the risk factors such as hypertension, diabetes, hyperlipidemia, smoking and atrial fibrillation, the most frequent risk factor was found to be hypertension (80.2 %) (Figure 2).

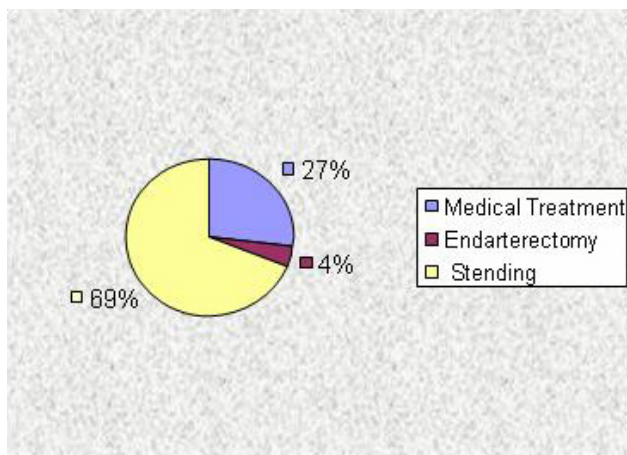


Figure 1: Treatment Recommendations of the Carotid Committee

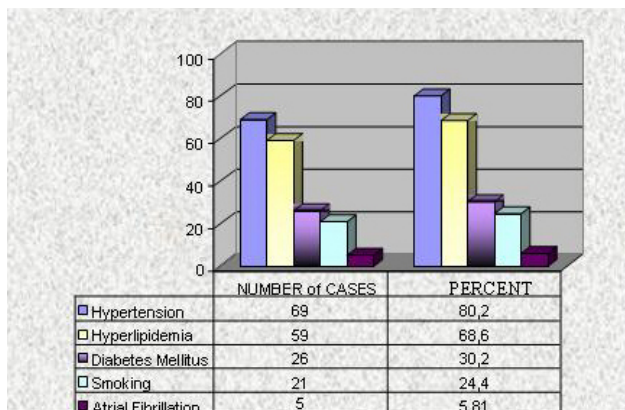


Figure 2: Risk Factors

Carotid artery stenosis was symptomatic in 81.3 % (n = 70) and asymptomatic in 18.6 % (n = 16) of the cases. The reason of the stroke was large vessel atherosclerosis in more than half of the cases (61.6 %), which then followed by transient ischemic attack in 11 cases (12.7 %), unclassified stroke in 4 cases (4.6 %), small vessel disease in 1 case (1.1 %) and hemorrhagic stroke in 1 case (1.1 %) (Figure 3). Among all cases with extracranial stending, procedure was performed to the symptomatic side in 45 cases (56.9 %) and to the asymptomatic side in 34 (43.0 %) cases.

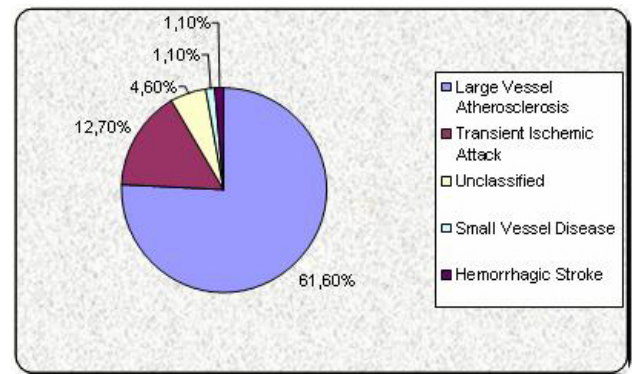


Figure 3: Stroke Types

Carotid artery stenoses were diagnosed by Cervical Doppler Ultrasonography (Doppler USG) in 79 %, Magnetic Resonance Angiography (MRA) in 33.7 % and Computed Tomography Angiography (CTA) in 17.4 % of the cases.

Before the stending procedure, nonselective bilateral carotid artery angiography and four system cerebral angiography (FSA) were applied via arcus aorta injections to all cases. After the establishment of stenosis by angiography, a stent was applied to that particular artery and dilatation procedure was applied to all patients before stending and to some patients after the procedure if necessary. A preventive apparatus was used during stenting procedure in all patients. Clopidogrel regimen was started to all patients at least 48 hours before the procedure. Heparine infusion was started

from 800 – 1000 U/h after procedure for 24 hours. All subjects were discharged recommending double antiaggregant (clopidogrel and aspirin) regimen by 3 months after stenting.

Since bilateral total occlusion was detected in 4 cases and a stenosis that necessitates stenting could not be detected in 1 case by diagnostic angiography, no intervention could be done in 5 of the subjects. In the remaining 81 cases, a stenosis that requires an endovascular intervention was confirmed by angiography. However, because of excessive tortuosity of the

vessel in one case and excessive stenosis of the vessel distal to the occlusion in another case, stenting procedure failed in 2 cases (2.47 %). These 2 cases were directed to endarterectomy process. Eventually, stenting procedure was successfully done in 79 cases (97.53 %). Unilateral stent was applied to 77 cases, to left internal carotid artery in 49 and to right in 28 cases, and bilateral stent was applied to 2 cases. Angiographies of 2 cases before and after carotid stenting are shown in Image 1 and 2.

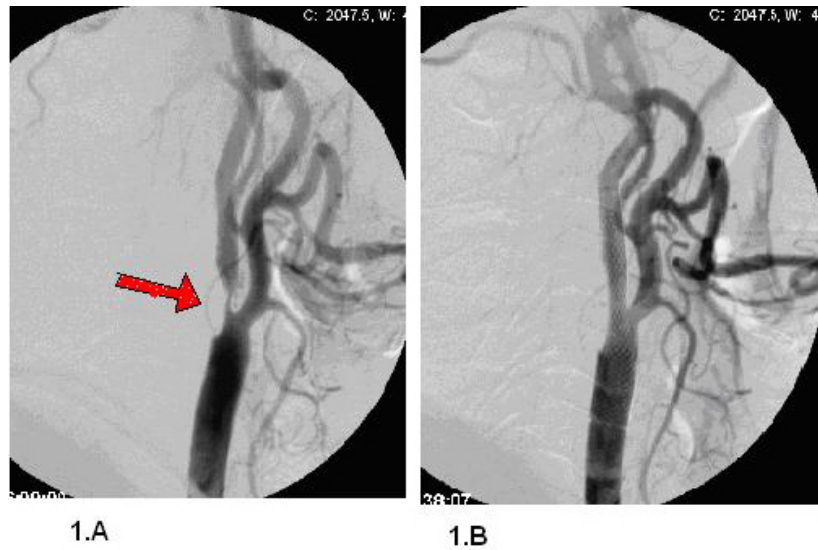


Image 1: A stenosis over 90 % in right internal carotid artery according to NASCET criteria is illustrated (A). Imaging of the same case after stenting (B).

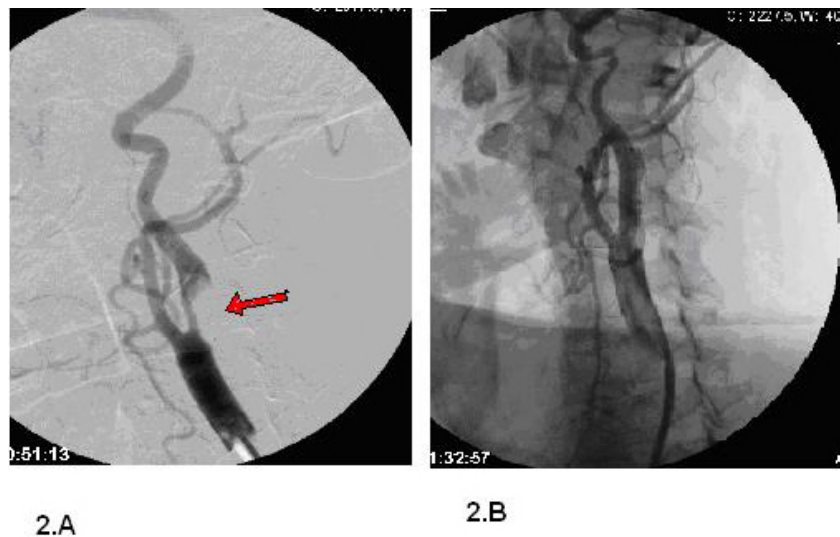


Image 2: A stenosis of 70-80 % in left internal carotid artery at the level of bulb according to NASCET criteria is illustrated (A). Imaging after stenting (B).

No complication was observed during and after application in 66 of the 81 patients (81.48 %) decided to have carotid artery stent procedure by angiography. Five cases with minor stroke (6.17 %) were improved and discharged without a sequela. A major stroke was observed in 2 cases (2.47 %). In one of these cases a dissection of one of the branches of left renal artery and intraabdominal bleeding developed at the same time. This case was improved and discharged with a severe sequela after intensive care follow up. No additional complication was developed in the other

case with major stroke and was improved and discharged with a mild sequela. There were some non-neurologic complications such as hypotension, bradycardia and arrhythmia observed during and 24 hours after the procedure that improved with a symptomatic treatment or even without a treatment in 8 cases (9.88 %) (Table 1).

In more than half of the cases the intervention was applied within one month after stroke, mostly within 2 weeks (Table 2).

Table 1: Complications in cases with stenting

	n	%
No complication	66	81.48
Major stroke	2	2.47
Minor stroke	5	6.17
Non-neurologic	8	9.88

Table 2: The duration between stroke attack and stenting in patients.

Duration	n	%
0 – 2 weeks	35	40.69
2 – 4 weeks	10	11.62
4 weeks - 2 months	8	9.3
2 – 3 months	8	9.3
3 – 6 months	6	6.97
> 6 months	19	22.09

DISCUSSION

Carotid artery stenoses constitute a considerable part of the ischemic cerebrovascular diseases. In patients with minor stroke or transient ischemic attack having carotid artery stenosis over 50 % have 20 – 30 % risk of ipsilateral stroke within the following first 30 days⁽⁸⁾. The same risk is almost 100 times less in asymptomatic patients⁽⁸⁾. In symptomatic patients, surgical treatment of carotid artery stenosis was proved to be effective^(4,12,13). Endarterectomy is known

to reduce the stroke risk in symptomatic patients with ≥ 50 % carotid stenosis for years. The guidelines of American Heart Association recommend endarterectomy in symptomatic patients with 50 – 99 % stenosis and in asymptomatic patients with 60 – 99 % stenosis⁽²⁾.

Recently, carotid artery stenting procedure is being used as a potential alternative treatment option to endarterectomy. Our all patients were discussed on the carotid consultative council and stenting therapy mostly became treatment option. However

the both treatment alternatives were offered as a choice of treatment to all patients and they approved stenting therapy. Carotid artery stenting is especially preferred in cases with increased risk for endarterectomy complications such as congestive heart failure, severe obstructive pulmonary disease, uncontrolled angina pectoris and systemic reasons in patients with anesthetic and surgical risks and also for technical reasons in obese patients with short neck, in the presence of contralateral carotid artery occlusion, in neck radiotherapy history, in case carotid artery bifurcation is at the level or above the C2 vertebra, in distal internal carotid artery lesions within 3 cm or above the bifurcation, or in restenosis cases^(1,10,11). Furthermore stent procedure became an important alternative to endarterectomy in almost all patients due to decreased restenosis rates and considerable morbidity and mortality rates. Randomized controlled trials like SAPHIRE (The Stenting and Angioplasty with Protection in Patients at High Risk for Endarterectomy) study showed that carotid artery stent procedure is as effective as endarterectomy or even superior in symptomatic patients with increased risk^(13,14).

Since carotid artery stenting is applied while blood perfusion of brain is continuing and permits simultaneous neurologic follow up, its superiority to surgical treatment is becoming a widespread opinion. CREST (Carotid Revascularization Endarterectomy Versus Stenting) study revealed that stroke and mortality risk was 2.7 %⁽⁵⁾. Recently major and minor stroke risks have been reported to be 1 % and 4.8 % respectively with the technological progressions especially by the use of preventive measures during embolization⁽⁹⁾. No mortality was observed in total of 81 patients with carotid stenting in our study. Major and minor stroke rates were similar to those reported in literature (2.5 % and 6.2 % respectively). The success rate of the procedure was

considerably high. Our result showed that with acceptable complication and increased success rates, carotid artery stenting procedure is successfully being performed in selected patients in our center. In patients with carotid artery stenosis, the repetition risk of an ischemic attack is known to be highest within first days or weeks after the first attack and the treatment of carotid stenosis is suggested as soon as possible in appropriate patients. Stenting was performed to half of the patients within the first 1 month, mostly within first 2 weeks (77.78 %) in our study. This timing condition is in accordance with modern treatment approaches and results in optimal benefit and also is similar to timing of centers known to be authorized worldwide.

In summary, carotid artery stenting is an alternative treatment to endarterectomy without severe complication risks in experienced centers. Each center should have treatment options depending on the facilities and experiences of the center, making a common decision together with patients by suggesting each alternative. Ideally this decision should be made by a committee in which a neurologist, an interventional radiologist and a cardiovascular surgeon take part, as in our center. More importantly, it should be noted that symptomatic patients require either interventional treatment or endarterectomy besides the medical treatment. It is clear that each center would show a different tendency in this aspect. Until the long term results of interventional treatment are clarified, each center should make their treatment decision according to their experiences. The patients should be protected from a second stroke by an optimal medical treatment added onto these procedures.

****Dokuz Eylül University Hospital Carotid Committee**

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