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Carotid Artery Stenting

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Abstract

Background: Friable, ulcerated, and thrombotic material may embolize during the intervention in lesions blocking the carotid artery. Plethora of safety measures have been implemented to reduce the chance of embolic incidents. According to the study's objectives, carotid artery stenting with a distal protection device was safe and effective. The patient and the procedure are as follows: Thirty patients with symptoms associated with carotid stenosis were studied at Benha University Hospitals after they had extracranial carotid artery angioplasty and stenting using a distal protection device. Remaining stenosis was found to be less than 20% in 27 patients (90%) whereas residual stenosis ranged from 20-40% in 2 (6.7%) and was more than 40% in 1 patient due to tense calcifications. The only person who had a little stroke had already progressed to a severe or deadly Stroke. One patient had an intracranial haemorrhage, while another had a temporary rise in creatinine that was corrected on its own accord after it occurred. Using cerebral protection devices to avoid distal embolization during carotid endovascular operations is possible and beneficial. While the immediate postoperative and intraprocedural outcomes are promising,

Keywords: Carotid artery stenosis, Carotid Artery Stenting, distal protection device.

1. Introduction

Atherosclerosis of the carotid arteries is a leading cause of stroke-related disability and mortality. Surgical endarterectomy has been shown to reduce stroke in both symptomatic and asymptomatic patients when compared to medicinal treatment. The risk of embolic neurological events after carotid artery stenting continues to rise despite improvements in stenting methods and the use of combination antiplatelet treatment (aspirin + clopidogrel or ticlopidine) [2].

Focal carotid arterial lesions include friable, ulcerated and embolizing thrombotic material throughout the procedure [3]. Several protective measures have been developed to reduce the risk of embolic events [4]. It seems that better stenting methods, more expertise by the interventionalists, and regular use of cerebral protection lead to comparable surgical outcomes. [5]

There are new methods being developed rapidly for CAS, such as specialised and miniaturised catheters, guide wires, and novel adjunctive treatments, which are all part of the changing intervention. The main issue with CAS and CEA is the incidence of cerebral ischemic episodes associated with the operation. To decrease the incidence of ipsilateral ischemic episodes during CAS, cerebral embolic protection devices (PD) were developed. Filter systems and occlusive systems, with or without reverse flow, are two examples of PD. Carotid artery stenting with a distal protection device was evaluated for safety and effectiveness in this research.

2. Patients and methods

The present study was a prospective clinical study including 30 patients suffering from syptoms related to carotid stenosis who underwent percutaneous angioplasty and stenting of the extracranial carotid artery protected by distal protection device

Inclusions criteria

- age >50 years of both sex
- monolateral or bilateral carotid critical stenosis (>70% carotid lesion)
- symptomatic for the culprit carotid lesion

Exclusion criteria

- Patients with a stroke within 1 week
- patients with 100% occlusion of the ipsilateral carotid artery
- thrombocytopenia, leucopenia, neutropenia, or gastrointestinal bleeding in the previous 3 months
- allergy to aspirin, clopidogrel, ticlopidine
- angiographic appearance of fresh thrombus at the carotid lesion site
- angiographic appearance of carotid chronic total occlusion or long preocclusive lesion (“string sign” lesion).

The cerebral protection system used consists of 3 components: an exchange length guidewire, a MicroSeal adapter, and a monorail aspiration catheter. The wire is a 0.014- or 0.018-in angioplasty-style wire with a segment of hollow nitinol hypotube. The distal wire segment is shapeable, radiopaque, and steerable. Just proximal to this platinum distal segment is a compliant latex balloon capable of occluding blood flow when inflated. The proximal end of the hypotube wire incorporates a moveable seal allowing inflation and deflation of the balloon via the detachable adapter.

After final occlusion balloon deflation and removal, angiography was repeated, confirming adequate lumen diameter in at least 2 orthogonal views. Intracranial views were repeated to check for vessel cutoff or flow abnormality. The patient underwent frequent brief neurological assessments during the procedure (question and answers, hand and foot movement) and a detailed neurological evaluation at the end of the procedure.

The patient was taken to a recovery area where the sheath was removed when the activated clotting time was <170 seconds. The patient remained on bed rest for 6 to 9 hours. The following morning, a detailed neurological examination by an independent observer was repeated. Discharge medications included aspirin 325 mg/d indefinitely and ticlopidine 250 mg BID or clopidogrel 75 mg/d for at least 2 weeks. The patient returned at 30

days for a repeated independent neurological examination.

Statistical Analysis

The data were coded, entered and processed on computer using Statistical package for social science (SPSS) (version 24).The results were represented in tabular and diagrammatic forms then interpreted.

Mean, standard deviation, range, frequency, and percentage were use as descriptive statistics.

3. Results

There mean age of patients was 68 years . and 22 patients (73.3%) were males and 12 patients (26.7 %) were female

In our patient population, the **site of stenosis was** Right carotid in 16 (53.3%) of patients and 2 (6.7%) patients was diagnosed as Bilateral stenosis (when bilateral carotid stenosis >70%)

According to Angiographic evaluation in the present study's sample, the Diameter stenosis was 83.1 % in average with mean Lesion length of 15.7 mm

According to Carotid Artery Lesion Characteristics in the present study's sample, Ulceration >5 mm was presented in 16(53.3%) , Thrombus in 4 (13.3%) and Calcification in 19 (63.3%)

According to **Associated morbidities** in the present study's sample, maurosis fugax was found in 5 (16.6%) of patients, Transient ischemic attacks in 7 (23.3%), Cranial nerve injury in 2 (6.7%), Hypertension in 27 (90%), Hyperlipidemia in 26 (86.7%), Diabetes mellitus in 11 (36.7%), CHF in 6 (20%), CAD in 20 (66.7%) and Previous MI in 9 (30%).

According to operative data in the present study's sample, one patient required blood transfusion and one patients complicated by Surgical wound closure during surgery

According to stenting outcomes, 27(90%) of patients had Residual stenosis of <20% and 2 (6.7%) had Residual stenosis from 20-40% and only one patients had Residual stenosis >40% because of tense calcifications

According to immediate **In-hospital** postoperative Complications, one patient had Minor stroke while no patient advanced major of fatal stoke. One patient suffered from intracranial hemorrhage and another on from Temporary creatinine increase with treated spontaneously

After one year follow-up, Restenosis (significant) was happened in 2 (6.7%) of patients and one of them needed Dissection and one patient suffered from transit ischemic attacks

Table (1) Carotid Artery Lesion Characteristics.

Carotid Artery Lesion Characteristics	N (%)
Ulceration >5 mm, n (%)	16(53.3)
Thrombus, n (%)	4 (13.3)
Calcification, n (%)	19 (63.3)
Total	30

Table (2) Associated morbidities.

Associated morbidities	N (%)
Amaurosis fugax	5 (16.6)
Transient ischemic attacks	7 (23.3)
Cranial nerve injury	2 (6.7)
Hypertension	27 (90)
Hyperlipidemia	26 (86.7)
Diabetes mellitus	11 (36.7)
CHF	6 (20)
CAD	20 (66.7)
Previous MI	9 (30)
Total	30

Table (3) operative data**.**

Associated morbidities	N (%)
Bleeding requiring transfusion, n (%)	1 (3.3)
Surgical wound closure, n (%)	1 (3.3)
ICU days (mean)	1.3
Overall hospital days (mean)	2.8
Total	30

Table (4) Residual stenosis.

Residual stenosis	N (%)
<20%	27(90)
20-40%	2 (6.7)
>40%	1 (3.3)
Total	30

Table (5) In-hospital postoperative Complications.

postoperative Complications	N (%)
Fatal stroke	0
Major stroke	0
Minor stroke	1 (3.3)
Intracranial hemorrhage	1 (3.3)
Temporary creatinine increase	1 (3.3)
Total	30

4. Discussion

Predilatation is often required before the protective device (0.9 to 1.67 mm) is inserted in protected CAS (37 percent of patients in the current research). The removal of protective devices after stent implantation and postdilatation results in further microembolization. TCD and MRI investigations have shown that protective devices may decrease plaque embolization from a procedural standpoint, but they do not eradicate it. The associated learning curve of active interventionalists and improved periprocedural anticoagulation regimens using combined platelet inhibitors (acetylsalicylic acid, clopidogrel), low-molecular-heparin at l, are two other factors that quietly evolved in addition to recent dramatic technical progress (e.g., less traumatic, self-expandable stent devices, more friction-resistant introducer catheters, and better guide wire systems leading to marked improvement [9] These advancements may have played a significant role in the current period of protected CAS research in avoiding cerebral embolism.

Protection device danger is particularly addressed in the research of Cremonesi and colleagues in 2003. Complications such as internal carotid dissection (0.7 percent) or a stuck guide wire that required surgical approach (0.2 percent) were very rare, and all patients handled the procedure quite well. Even the authors may not have anticipated such a positive result. Other common issues include hemodynamic intolerance in occlusive balloon systems (5-15 percent of patients) and clogged nets. Cremonesi et al. (2003) and Kastrup et al. (2003) neither mentioned the failure rate while using protective mechanisms, suggesting that the success rate was 100 percent.

It is remarkable that this group has such a high success rate, particularly when contrasted with other research groups renowned for their abilities and extensive experience, where a failure rate of up to 20% was recorded. [8]

The ischemic neurological event rate was 2.5 percent in a previous study by Cremonesi et al 2000 [9] on a CAS cohort of 119 patients treated without protective devices (2 minor strokes, 1 transient ischemic attack). Occlusive protection devices intolerance was found in six individuals in this research. The symptoms were temporary. It's estimated that if you add together the number of strokes, transient ischemic attacks and small strokes (n=4), the ischemic neurological event rate in this study would be 2.5%. The asymptomatic technical complication rate of 0.9 percent should only be remembered for future reference.

There was a number of single-center trials from 1996 to 2003 that were included in the evaluation by Kastrup et al. [11], with patients treated under a wide range of circumstances. CAS with protection had a 30-day stroke and mortality rate of 1.8%, compared to 5.5% without protection.

It was shown wrong in the NASCET trial in 1991 [12] that the complication rate in CEA was just 1% as stated in the majority of single-center uncontrolled trials. According to this report, the scientific discussion about CAS protection devices is still in the "pre-NASCET stage." In the future, efforts should be directed only toward completing the studies that are still open comparing CEA and CAS (CREST in the United States, EVA3S in France, ICSS or CAVATAS2 in the United Kingdom, and SPACE in Germany). The main goal of all European studies is to encourage secondary analysis. Because the use of protective devices is optional in SPACE and CAVATAS2, a subsequent subgroup analysis of that usage may be possible.

We must all admit that our past choices have been based on speculation rather than solid facts. Conclusions with clinical and economic ramifications can't be drawn just yet. Current NASCET analogue design studies, in our opinion, need encouragement. The studies' findings should be awaited before applying the conclusions.

We wanted to see how safe and effective carotid artery stenting with an external distal protection device was.

Thirty patients with symptoms associated with carotid stenosis were studied at Benha University Hospitals after they had percutaneous angioplasty and distal carotid artery stenting.

Patients were on average 68 years old. There were 22 men (73.3 percent) and 12 women (26.7 percent) in the group.

In our patient group, right carotid stenosis affected 16 (53.3 percent) of patients, while bilateral stenosis affected 2 (6.7 percent) of patients.

The average diameter stenosis in the current study's sample was 83.1 percent, with a mean lesion length of 15.7 millimetres, according to angiographic assessment.

It was found that in the current research sample, Ulceration >5 mm was present in 16, Thrombus was present 4 (13.3 percent) and Calcification was present in 19 according to Carotid Artery Lesion Characteristics (63.3 percent).

Patients with Maurois fugax, transient ischemic attacks (TIAs), cranial nerve injury (CNI), hypertension (90 percent), hyperlipidemia (86 percent), diabetes mellitus (11 percent), CHF (20 percent), CAD (20

percent), or previous MI (nine percent) were shown to have associated morbidities (30 percent).

One patient needed blood transfusion, and one patient's operation was complicated by surgical wound closure, according to operative data from the current study's sample.

Patients with residual stenosis of less than 20 percent and those with residual stenosis between 20 and 40 percent had better results after stenting, with just one patient having a residual stenosis more than 40 percent due to tense calcifications.

One patient had a little stroke, but no one had a severe or deadly stroke that had progressed during the first 24 hours after surgery, according to the In-Hospital Postoperative Complications. One patient had an intracranial haemorrhage, while another had a temporary rise in creatinine that was corrected on its own accord after it occurred.

Restenosis (significant) occurred in 2 (6.7%) of patients after a year of follow-up, and one patient required dissection, while another experienced transit ischemia episodes.

A procedure's potential advantages will be determined by how many problems are connected with treating stenotic carotid arteries [13]. Stenting followed the same safety standards as surgical endarterectomy since it has been done so often in the past. Surgical therapy for severe extracranial carotid stenosis should only be done if the cumulative perioperative stroke and mortality risk can be maintained at 6 percent in symptomatic patients and 3 percent in asymptomatic patients, according to recommendations established by the American Heart Association [14].

Endovascular therapy of carotid diseases has been shown in certain trials to be associated with an increased risk of cerebral ischemia events and, more generally, with a complication rate that is comparable to that of conventional surgery. [2]

The use of cerebral protection devices may be deemed beneficial because of the high procedural success, low device-related problems, and low in-hospital complications that we have documented when comparing our findings with the published literature.

It is possible and beneficial to employ a large number of cerebral protection devices during carotid endovascular operations to avoid distal embolization. While the immediate postoperative and intraprocedural outcomes are promising, the long-term effects remain uncertain.

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