MEET 07

TREATMENT OF ACUTE OCCLUSION AND RESTENOSIS FOLLOWING CAROTID ARTERY STENTING

Chief
Vascular and Endovascular Surgery Department
UNIVERSITY OF SIENA
ITALY

Prof. Carlo Setacci
The first experiences of carotid balloon angioplasty reported in the literature involved high risks of:

- embolic complications,
- acute vessel occlusion,
- elastic recoil and restenosis.

In recent years, however, the introduction of adjunctive stenting has partially mitigated many of these concerns.

Routine use of cerebral protection devices

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Protected carotid stenting: clinical advantages and complications of embolic protection devices in 442 consecutive patients.

Cremonesi A, Manetti R, Setacci F, Setacci C, Castriota F.

Interventional Cardio-Angiology Unit, Department of Medical and Surgical Cardiology, Villa Maria Cecilia Hospital, Via Corriera 1, 48010 Coggiola, Italy.

BACKGROUND AND PURPOSE: Periprocedural embolization of debris during carotid stenting interventions may result in neurological deficit. This study was designed to evaluate in-hospital and 30-day adverse events in patients percutaneously treated for carotid artery disease with embolic protection devices. METHODS: From 1999 to June 2002, a total of 442 consecutive patients underwent percutaneous angioplasty and/or stenting of the extracranial carotid artery. The endovascular procedure was conducted under embolic protection devices. RESULTS: The percutaneous procedure was successful in 440 of 442 patients (99.5%). No periprocedural death occurred with any embolic protection device. All in-hospital stroke/death and 30-day ipsilateral stroke/death rate was 1.1%. The overall complication rate was 3.4%. Major adverse events included 1 major stroke (0.2%), 4 intracranial hemorrhages (0.9%), 1 carotid artery wall fissuration (0.2%), and 1 case of cardioembolism (0.2%). Minor adverse events included 4 minor strokes (0.9%) and 4 transient ischemic attacks (0.9%). The device-related complications were 4 (0.9%): 1 case of abrupt closure of the internal carotid artery because of spiral dissection and trapped guide wire (0.2%), and 2 cases of intimal dissection (0.5%). Transient loss of consciousness was also observed. Occlusive protection devices were used. CONCLUSION: The cerebral protection device is used is feasible and safe and exists for the proper use of some embolic protection devices.

Publication Types:
- Clinical Trial

PMID: 12843347 [PubMed - indexed for MEDLINE]
Acute carotid closure can be manifested in devastating neurological changes in the postoperative period.

As we have learned through the management of acute thrombosis after carotid endarterectomy, the therapeutic strategy for this acute complication includes **urgent surgical exploration**.
Our experience

15.12.2000 – 30.03.2007

2696 Carotid axis

1591 CEA (59%)

1105 CAS (41%)

3 ACUTE CAS THROMBOSIS
Case 1

- 82-year-old man with severe ischemic cardiopathy
- two episodes of transient right-sided hemiplegia.
- US scan → severe carotid artery stenosis (plaque substantially hypoechoic with small areas of hyperechoicity, type 2 Gray-Weale Classification).
- Dual antiaggregation therapy (acetylsalicylic acid 100 mg/die and ticlopidine 500 mg/die)
- CAS (Carotid Wallstent with Epi-filter, BSC)
Case 1
2nd day post-op

Crescendo Transient Ischemic Attacks

US

incomplete in-stent thrombosis

Emergency
Surgical neck exploration

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Caso 1

**Stent removal**  
(CEA with patch)

Full neurologic recovery occurred in the first day postop.

*plaque prolapse through the cell stent*
Case 2

- A 78-year-old man → transient ocular blindness
- US scan → 85% ICA stenosis and contralateral occlusion
- Dual antiaggregation therapy (acetylsalicylic acid 100 mg/die and ticlopidine 500 mg/die)
- CAS (Carotid Wallstent with Epi-filter, BSC)
Severe neurologic deficit and a decreased level of consciousness

Case 2
4 days later

He stopped taking the antiaggregation therapy

Complete stent thrombosis

At the time of re-admission to the hospital:

- PTL 810,000 mm$^3$
- WBC 33,000 mm$^3$

→ essential thrombocythemia with consequent leukocytosis
Case 2
4 days later

No antiaggregation therapy + thrombocytemia

Emergency stent removal and CEA with shunting and patching

The patient gradually improved from major stroke, but was left with a minor stroke
Case 3

- 72-year-old male hypertension, cardiopathy (previous CABG) and chronic atrial fibrillation
- US scan → hemodynamic carotid artery stenosis, due to a predominantly echogenic plaque with small areas of hypoechoicity (type 3, Gray-Weale Classification).
- Previous anticoagulant therapy, converted from coumadin to heparin + ASA 100 mg/die
- CAS (Carotid Wallstent with Epi-filter, BSC)
Case 3
2 hours after CAS

Complete left hemiplegia associated with acute ischemia of the right leg

US

- Complete carotid stent thrombosis
- Right femoral-popliteal occlusion

Carotid thrombosis limited to the intrastent segment
Case 3
2 hours after CAS

Cardiac multiple embolism as the cause of the two ischemic complications (CAS and femoral-popliteal thrombosis)

3rd ischemic complication → two hours later, acute ischemia of the left upper limb
Case 3
2 hours after CAS

The entire clot was pulled out using forceps and an aspirator, and an excellent run-off was achieved, without the need to remove the stent.

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Acute CAS thrombosis

SURGICAL INTERVENTION?

ENDOVASCULAR APPROACH?

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ENDOVASCULAR TREATMENT OF AN INTERNAL CAROTID ARTERY THROMBUS USING REVERSAL OF FLOW: A CASE REPORT

Parodi JC, Rubin BG, Azizzadeh A, Batoli M, Sicari GÁ.
Vascular and Endovascular Surgery – University of Siena
The intraluminal manipulation + thrombolysis → clot fragmentation and ↑ risk of distal intra-cerebral embolisation
Discussion

Our three cases demonstrate the *multi-factorial pathogenesis* of acute carotid stent thrombosis

**MAIN FOCUSES**
- Dual antiaggregation therapy
- Soft plaque → prolapse through cell stent
- Pro-coagulant conditions (thrombocytosis)
- Other embolic sources

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Another of the prevalent concerns about the CAS procedure was the development of *restenosis*, similar to that observed after stenting of other arterial districts.
Follow up

- Duplex scan at 1, 3, 6, 9 and 12 months, then every 6 months

19 restenosi intrastent (1.7%)
Our experience

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19 IN-STENT RESTENOSIS (1.7%)
All patients received a further endovascular treatment (using a cerebral protection devices)
The most effective cerebral protection for in-stent restenosis is an further endovascular treatment.

**Early experience**

- 10 carotid ISR → rBA → 3 optimal response to dilatation → residual stenosis >30% → 7 rCAS

**Last experience**

- 5 carotid ISR → CB → 4 optimal response to dilatation → residual stenosis >30% → 1 rCAS

**Abbreviations**

- ISR = in-stent restenosis
- rBA = repeat balloon angioplasty
- rCAS = repeat carotid artery stenting
- CB = cutting balloon

**References**


IN-STENT RESTENOSIS AFTER CAROTID ANGIOPLASTY AND STENTING: A CHALLENGE FOR THE VASCULAR SURGEON.

*Eur J Vasc Endovasc Surg* 2005; 28: 601-607

Vascular and Endovascular Surgery – University of Siena
Univariate and multivariate analysis: results

- prior surgical carotid restenosis (p=0.039)
- + postoperative fever (OR = 5.3)
- + need of pre-dilatation (OR = 3.9)
- + presence of concomitant malignancy or auto immune disease (OR = 3.4)
TROMBOSI ACUTA POST-CAS

Our STRATEGY

URGENT SURGICAL RE-INTERVENTION

ENDOVASCULAR SOLUTION

Late complication
In-stent restenosis

Setacci C, de Donato G et al
SURGICAL MANAGEMENT OF ACUTE CAROTID THROMBOSIS FOLLOWING ANGIOPLASTY AND STENTING

- Repeat Balloon angioplasty
- Repeat stenting
- Cutting Balloon Angioplasty

Setacci C, de Donato G et al
IN-STENT RESTENOSIS AFTER CAROTID ANGIOPLASTY AND STENTING: A CHALLENGE FOR THE VASCULAR SURGEON.
Our data demonstrates an encouragingly low rate (0.3%) of acute carotid thrombosis after CAS.

The management of acute post-CAS thrombosis is very similar to the management of acute post-CEA thrombosis. Both require emergency evaluation and emergency definitive surgical repair to minimize neurological morbidity.

Setacci C et al
SURGICAL MANAGEMENT OF ACUTE CAROTID THROMBOSIS FOLLOWING ANGIOPLASTY AND STENTING
RESTENOSIS IS A PROBLEM FOR BOTH CEA AND CAS!

Our experience with a large cohort of CAS showed an encouragingly low incidence of ISR (1.7%) and successful treatment by repeat endovascular intervention. We recommend attempting all endovascular possibilities before performing stent removal.

Setacci C, et al
IN-STENT RESTENOSIS AFTER CAROTID ANGIOPLASTY AND STENTING: A CHALLENGE FOR THE VASCULAR SURGEON.
Vascular and Endovascular Surgery – University of Siena
thank you for your attention