TREATMENT OF MAJOR COMPLICATIONS AFTER CEA : RESTENOSIS AND PSEUDOANEURYSMS

PAOLO FRIGATTI
AZIENDA OSPEDALIERO UNIVERSITARIA DI UDINE
STRUTTURA OPERATIVA COMPLESSA
CHIRURGIA VASCOLARE ED ENDOVASCOLARE

CAROTID REVASCULARIZATION

GOLD STANDARD

- Zero Relevant Neurological Complication Rate (RNCR) in the Perioperatory period (30 days)
- No Hemodinamically significative restenosis or occlusions
- 0% RNCR in the long term Follow-up

RNCR = major stroke (disablig or Lethal)

RESTENOSIS

- POST CEA RESTENOSIS IS MOST FREQUENT AFTER :
  - DIRECT SUTURE
  - DACRON PATCH
  - PTFE PATCH
  - EVERSION ENDARTERECTOMY
  - BIOLOGICAL PATCH
  - CC-ICA BYPASS
- CAUSES: MIOINTIMAL HYPERPLASIA
  - RECURRENT ATHEROSCLEROSIS
  - MIXED

  Different plaques
  - •Fibrous
  - •Calcified
  - •Soft +/- thrombus
  - •Mixed

- OS for RESTENOSIS is controversial ,some Authors reported excellent results with re – CEA or By Pass but msot of studies report an higher postoperative neurological risk (RNCR) (8-20%)* and ,for this reason, the intervention should be indicated only in symptomatic patients ,moreover cranial nerve injouries are more frequent in redo surgery

**Healy DA, Zierler RE, Nicholls SC, Clowes AW, Primozich JF, Bergelin RO, et al. Long-term follow-up and clinical outcome of carotid restenosis. J Vasc Surg 1989;10:662-9.*
**O'Donnell TF Jr, Rodriguez AA, Fortunato JE, Welch HJ, Mackey WC. Management of recurrent carotid stenosis: should asymptomatic lesions be treated surgically? J Vasc Surg 1996;24:207-12.*
**AbuRahma AF, Jennings TG, Wulu JT, Tarakji L, Robinson PA. Redo carotid endarterectomy versus primary carotid endarterectomy. Stroke 2001;32:2787-92.*

ENDOVASCULAR TREATMENT

- Restenosis after CEA is ,nowadays,the most accepted indication to CAS

PRE-STENT POST-STENT

Fibrous Restenosis with small ulceration
4 years after CEA (direct suture)

Poor durability of carotid angioplasty and stenting for treatment of recurrent artery stenosis after carotid endarterectomy: An institutional experience

Andre R. Leger, MD,[a,b] Michael Neale, FRACS,[b] and John P. Harris, FRACS,[c] *Portland, Ore, and Sydney, Australia*

Table II. Dedicated series of CAS in carotid restenosis

Author	*No. of patients in study*	*No. of patients available for follow-up*	*Mean follow-up interval*	*Method of follow-up evaluation*	*% Restenosis*
Hobson	16	16	11 mo	Duplex scan	0
Yadav	22	8	6 mo	Angio	0
Lanzino	18*	13†	16 mo	Duplex scan and angio	7%
RPAH results	8	8	20.2 mo	Duplex scan and selected angio	75%

Conclusions: In contrast to the optimistic claims in other series, this limited series suggests that angioplasty with stenting for recurrent carotid artery occlusive disease after CEA, although relatively safe in the short term, has significant limitations in terms of durability of results. (J Vasc Surg 2001;33:1008-14.)

Does the type of carotid artery closure influence the management of recurrent carotid artery stenosis? Results of a 6-year prospective comparative study

Michele Antonello, MD, Giovanni P. Deriu, MD, Paolo Frigatti, MD, Pietro Amistà, MD, Sandro Lepidi, MD, Rudi Stramanà, Piero Battocchio, MD, Alberto Dall'Antonia, MD, *and* **Franco Grego, MD,** *Padua, Italy*

Objective. *The purpose of the study was to evaluate the results of reoperative surgery and carotid artery stenting (CAS) in cases of recurrent carotid artery stenosis (RCS) and to compare the results of all RCS (reoperative surgery + CAS) with primary carotid endarterectomy (CEA) performed during the study period.*

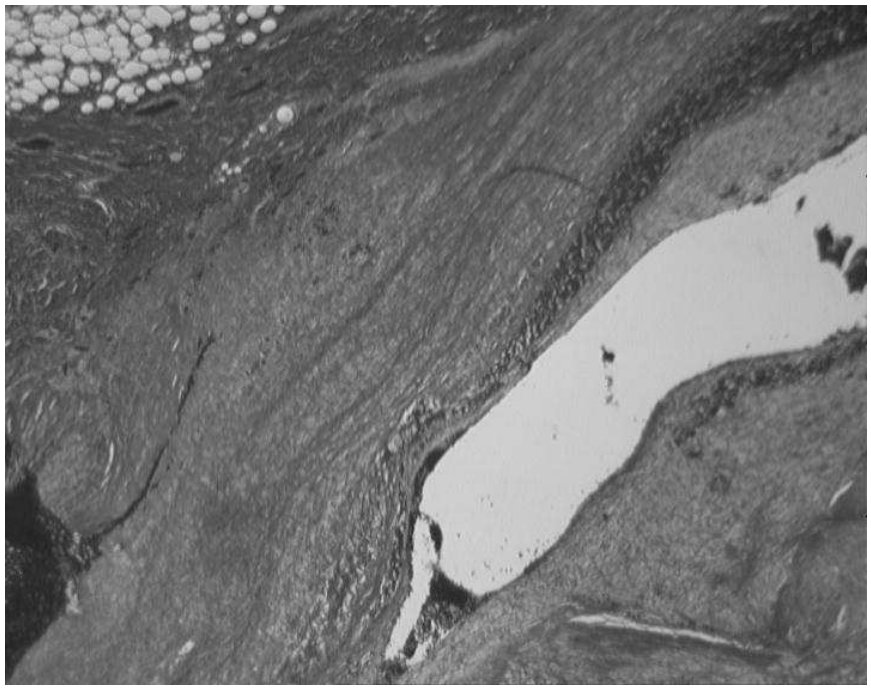
Summary Background Data. *Consensus has not yet been established on the best treatment for RCS. Recently CAS has emerged as a potential alternative to carotid endarterectomy.*

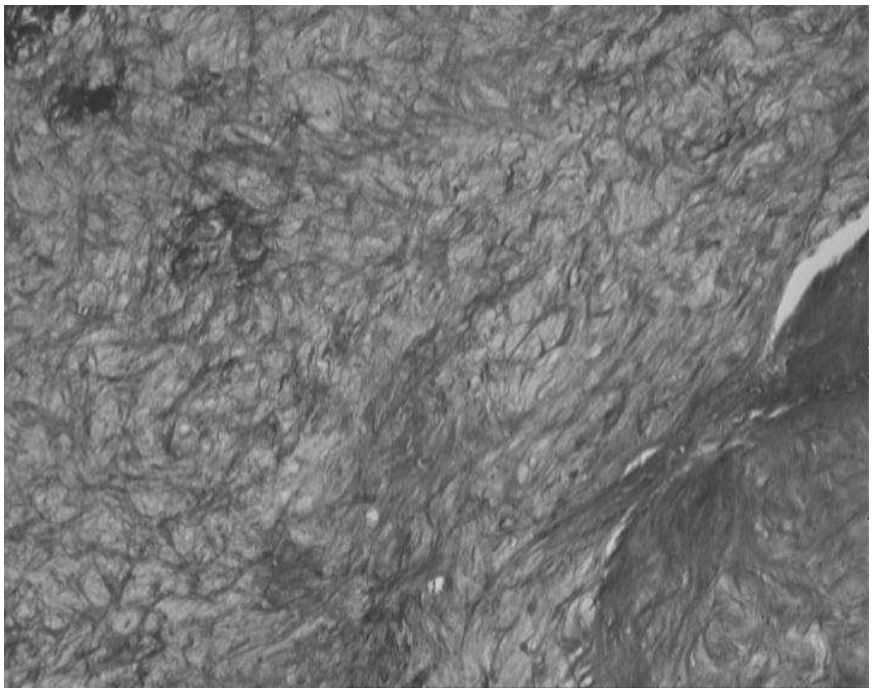
Methods. *A 6-year (Jan 2000-Dec 2005) prospective study was performed. Eligible patients were those with symptomatic or asymptomatic RCS ≥80% at a preoperative angiography or angio-computed tomography. The carotid plaques were classified at a preoperative ultrasonographic scan, according to the five type classification proposed by Geroulakos (Br J Surg 1993;80:1274-7). Patients with type 1 and 2 carotid plaque were not considered for CAS.*

Results. *56 patients were enrolled. Fifteen patients with a type 1-2 plaque underwent reoperative surgery, 41 with type 3-4 plaque underwent CAS. In 90.6% of primary closure a type 3-4 carotid plaque was found; a type 1-2 was observed in 84.5% of the polytetrafluoroethylene patch closure group. No statistical difference for the 30-day and the 6 year stroke-free rate was observed; similarly no differences emerged between all RCS (reoperative surgery + CAS) performed and primary CEA.*

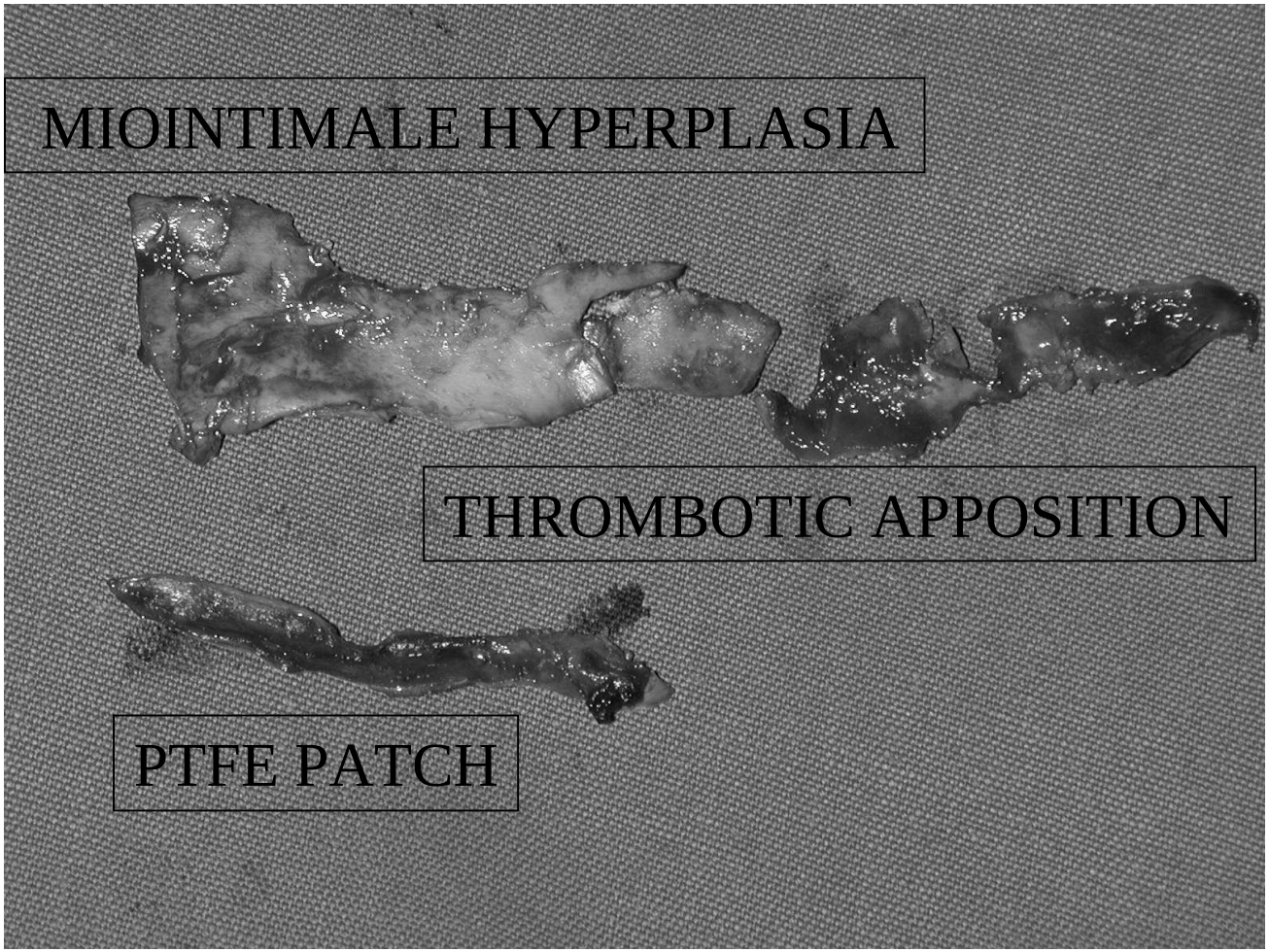
Conclusions. *CAS is an acceptable alternative to surgery in the management of RCS. An accurate patient selection is required. Restenosis after CEA and direct closure is mostly associated with fibrous material. In these cases CAS might be the best choice. (Surgery 2008;143:51-7.)*

Restenosis after direct suture





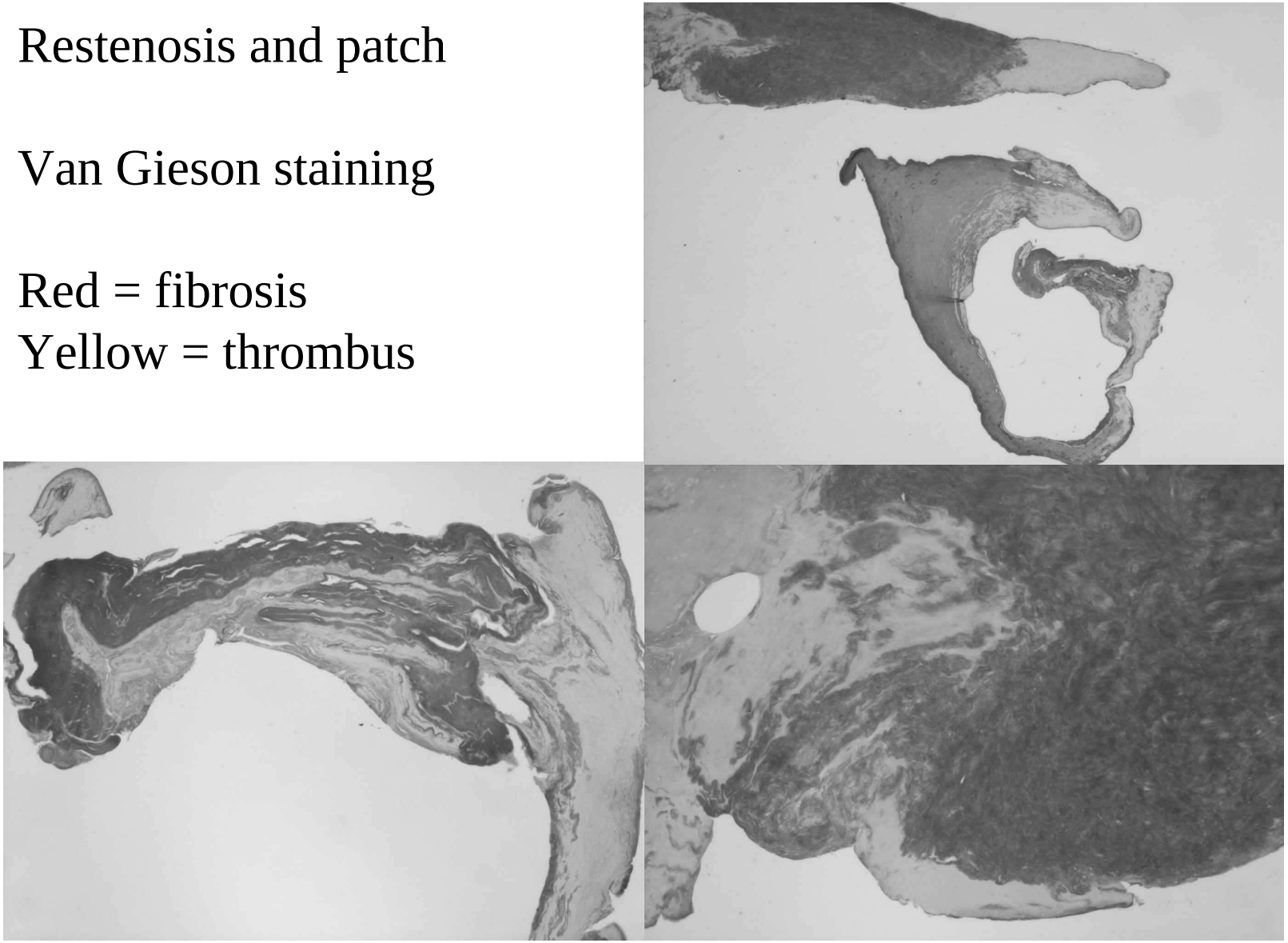
Restenosis after CEA with PTFE Patch: 3 Components



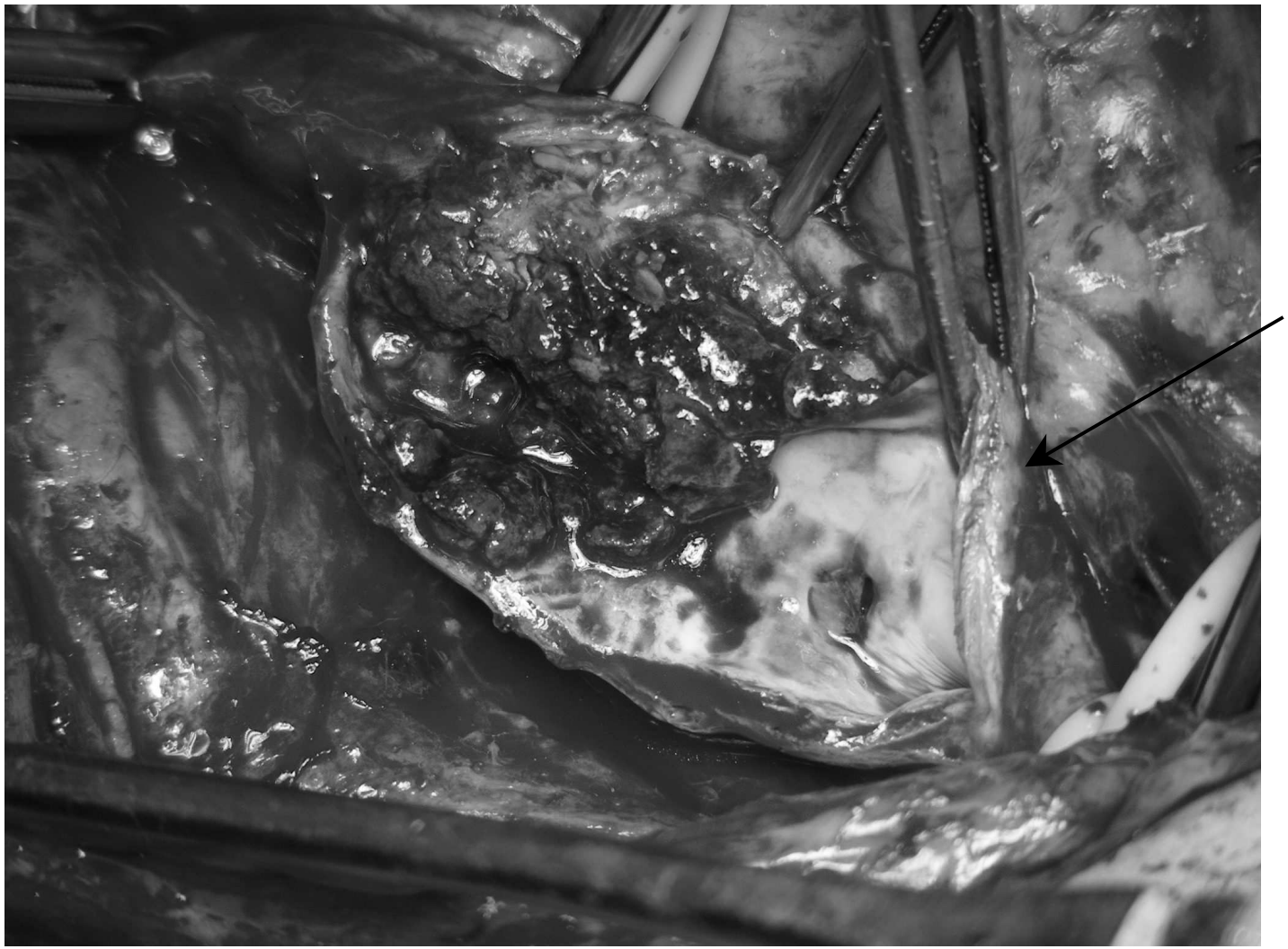
Restenosis and patch

Van Gieson staining

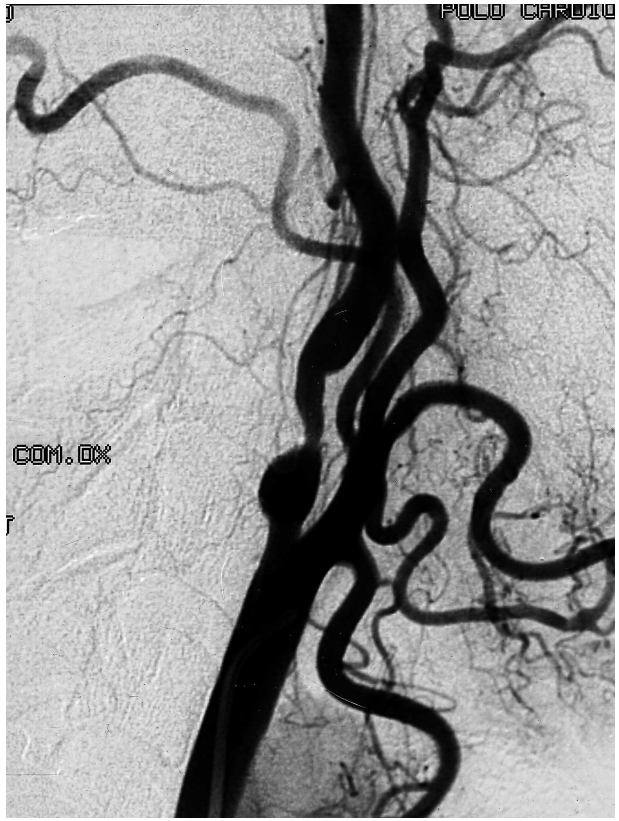
Red = fibrosis
Yellow = thrombus

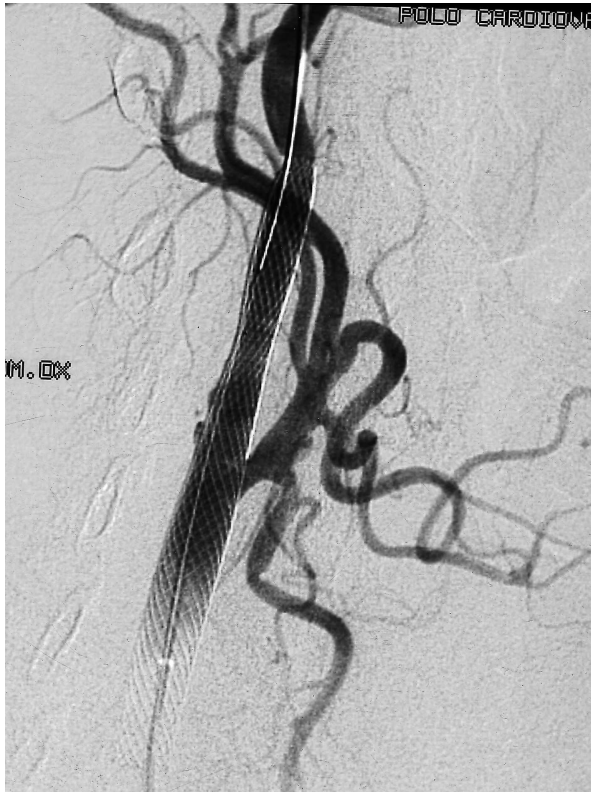


Restenosis after CEA with PTFE Patch

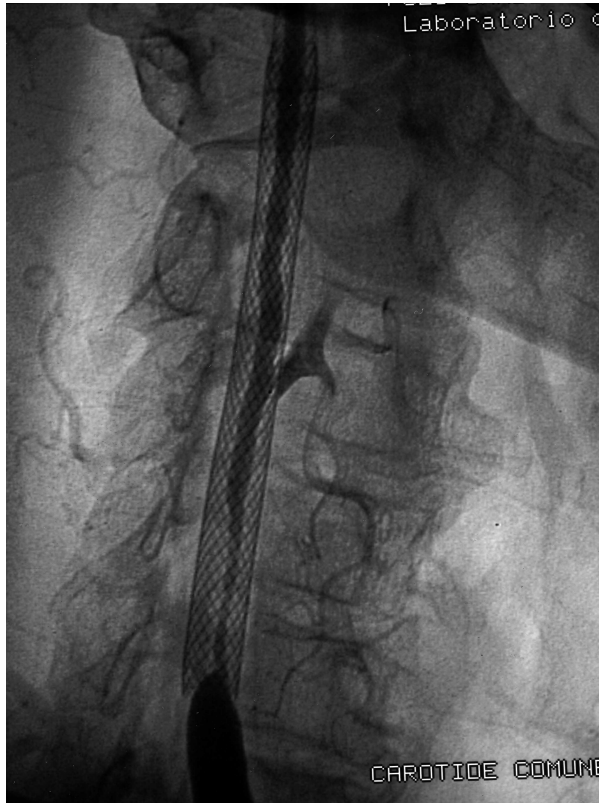


RESTENOSIS AFTER CEA AND DIRECT SUTURE



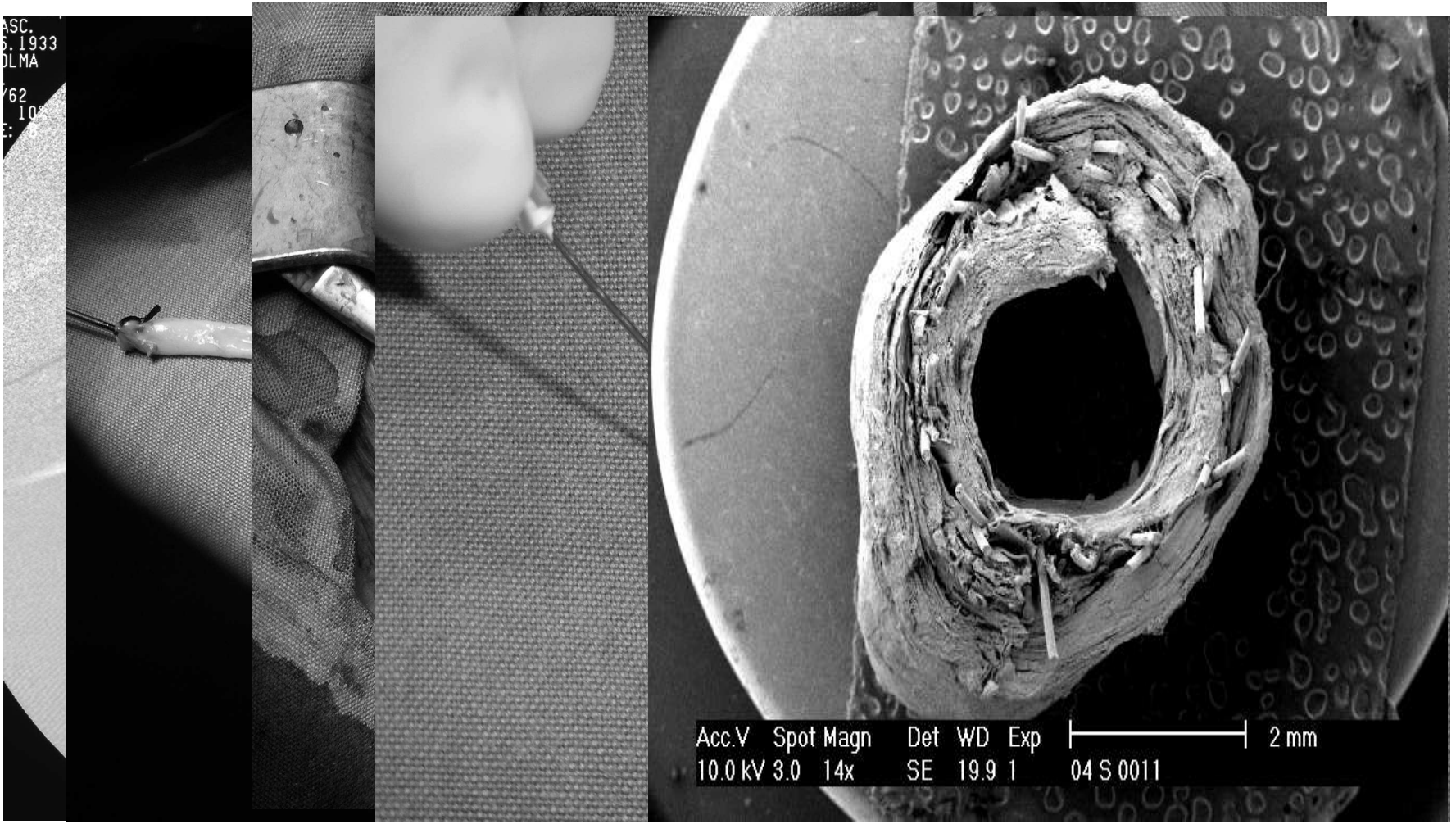


CAS + RESTENOSIS AFTER CAS AND 3 PTA

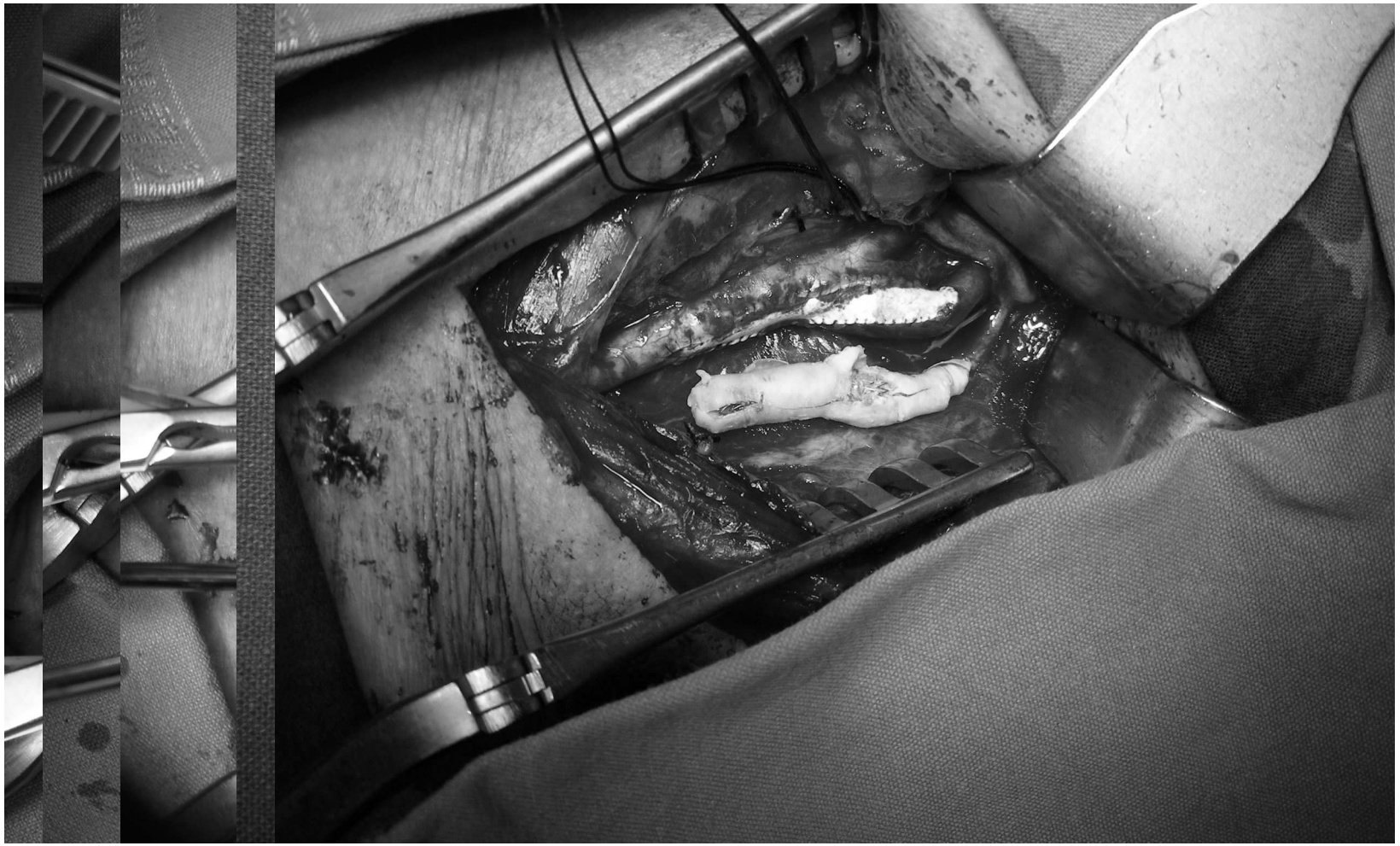


RESTENTING DURING LAST PTA

CAROTID RESECTION AND CC –ICA BYPASS



STENT EA



DEB

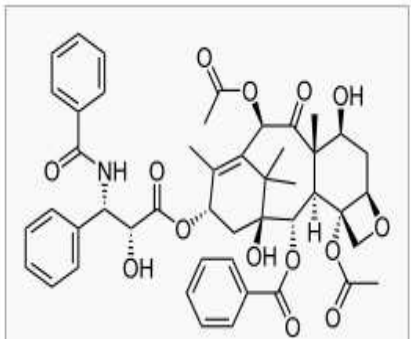
Using Drug-Eluting Balloons for Carotid In-Stent Restenosis Shows Promising Results

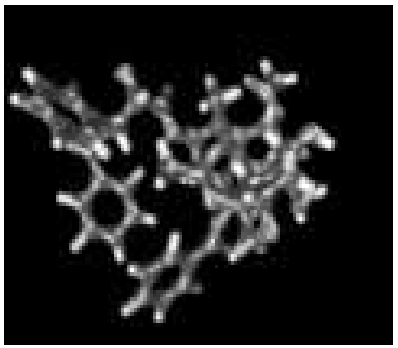
Use Of Drug-Eluting Balloon For The Treatment Of In-stent Restenosis After Carotid Artery Stenting

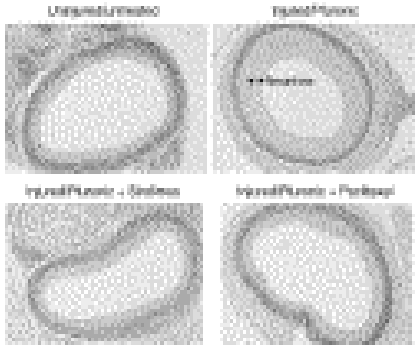
Piero Montorsi[1], Antonio Bartorelli[2], Franco Fabbiocchi[1], Stefano Galli[1], Alessandro Lualdi[1], Paolo Ravagnani[1], Giovanni Teruzzi[1], Daniela Trabattoni[1], Sarah Troiano[3]
[1]Centro Cardiologico Monzino, IRCCS, Milan, Italy, [2]Associate Professor University of Milan-Centro Cardiologico Monzino, Milan, Italy, [3]University of Milan, Milan, Italy

Background: In-stent restenosis (ISR) after carotid artery stenting (CAS) is a rare event. Endovascular treatment is considered for significant ISR (>80% diameter stenosis by Doppler US). Despite favorable acute results, recurrent ISR ranges between 0 and 50%. Evidence of DEB effectiveness for coronary and peripheral ISR treatment is accumulating. We assessed the safety and efficacy of DEB in ISR after CAS.
Methods: Significant ISR occurred in 11/803 (1.3%) consecutive CAS procedures at a median F/U of 624±580 days. In 7 pts (6 internal and 1 common carotid arteries), DEB (In.Pact Admiral,Invatec-Medtronic,Italy) treatment (single 3-minute inflation) was performed after standard predilation with distal cerebral protection. DEB size was selected by IVUS (1:1 stent to DEB size ratio). Post-DEB, patients were treated with double antiplatelet therapy for 3 months. Acute and long-term clinical outcomes were obtained in all pts.
Results: Technical and procedural success was 100%. Angiographic stenosis decreased from 83±5% to 18±6%. Minimal lumen area by IVUS increased from 3.2±1.8 to 12.6±2.1mm2 (p<0.001), stent area was unchanged (from 17.5±4.7 to 17.3±4.7mm2) and restenosis area decreased from 13.6±5.8 to 4.6±3.3mm2 (p<0.001). At a F/U of 412±52 days (range 343-455), no clinical event occurred. Average Doppler Peak Systolic

TAXOLO (PACLITAXEL))





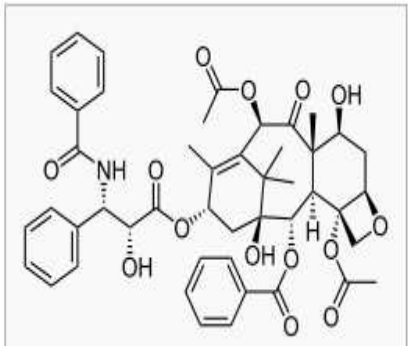


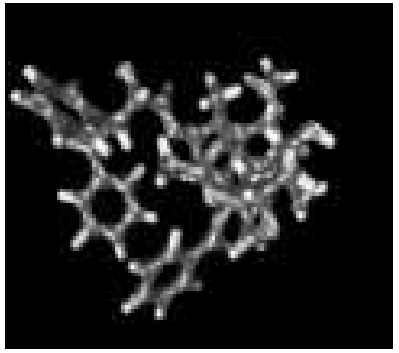
DEB AND CAROTID RESTENOSIS: UNCERTAINTIES

-TAXOLO EFFECTS ON CNS

-DEB EMBOLIC RISK (MATRIX)

TAXOLO (PACLITAXEL))





Paclitaxel is a mitotic inhibitor used in cancer chemotherapy. It was discovered in a U.S. National Cancer Institute program at the Research Triangle Institute in 1967 when Monroe E. Wall and Mansukh C. Wani isolated it from the bark of the Pacific yew tree, *Taxus brevifolia* and named it **taxol**. Later it was discovered that endophytic fungi in the bark synthesize paclitaxel.

Clinical Cancer Research

AACR

Increased Penetration of Paclitaxel into the Brain by Inhibition of P-Glycoprotein

E. Marleen Kemper, A. Erik van Zandbergen, Cindy Cleypool, et al.

Clin Cancer Res 2003;9:2849-2855.

Zotarolimus-Eluting Stent for the Treatment of Recurrent, Severe Carotid Artery In-Stent Stenosis in the TARGET-CAS Population

J ENDOVASC THER
2012;19:316–324

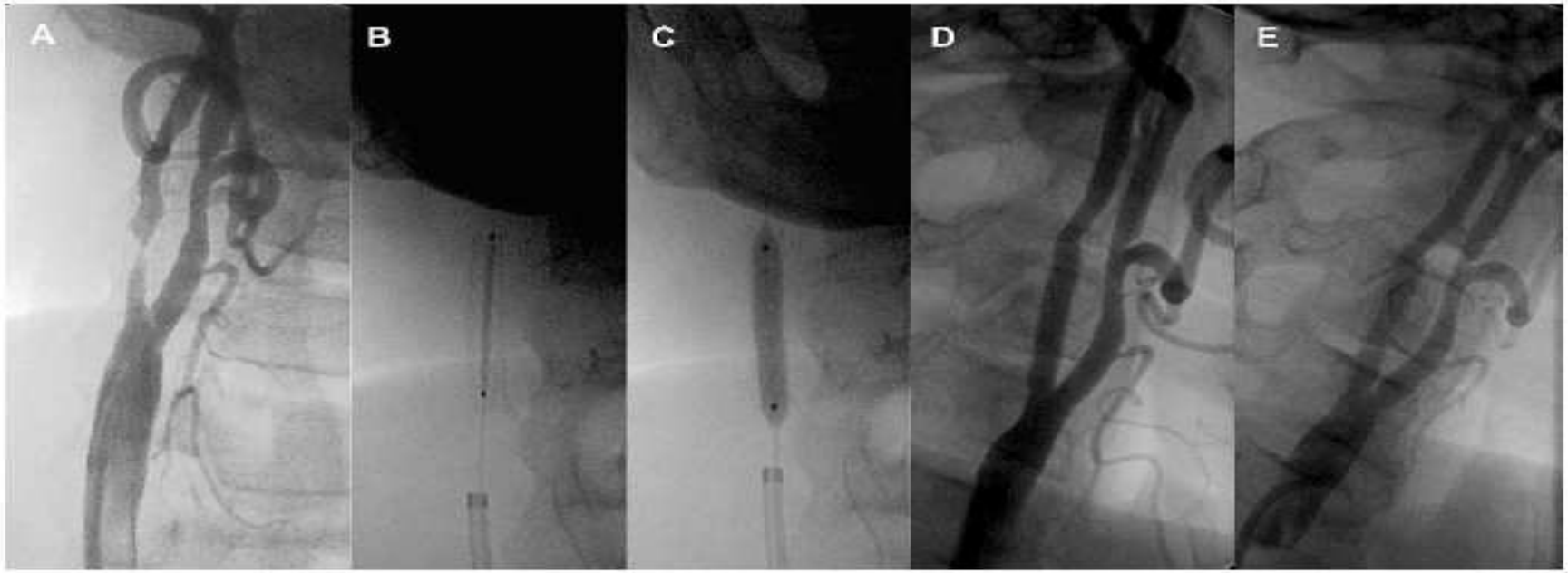
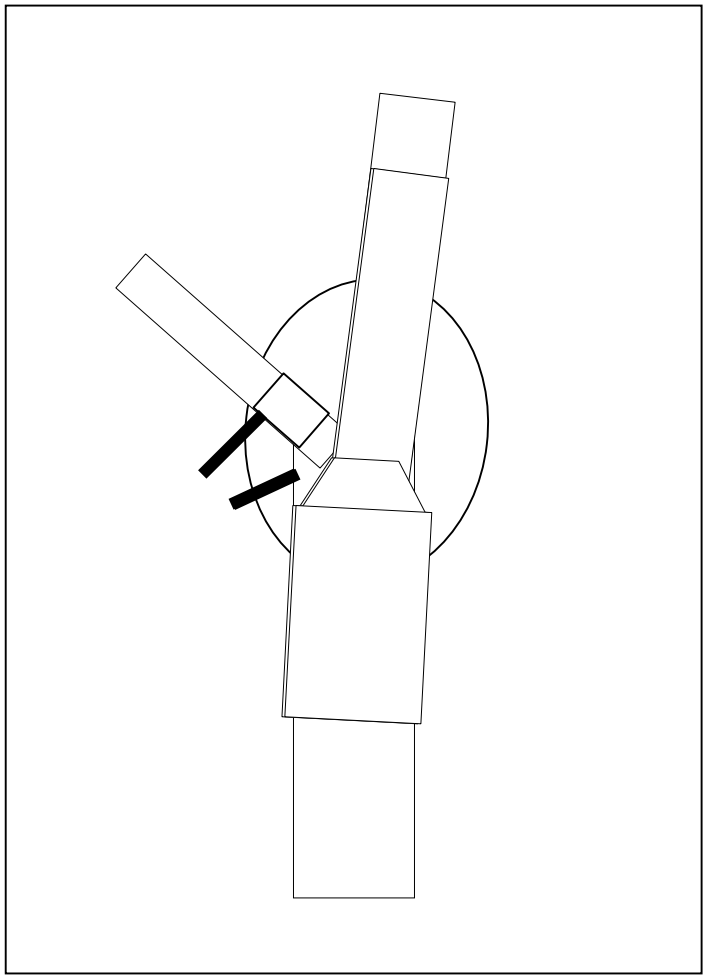


Figure 1 ◆ (**A**) A 50-year-old man treated with CAS 17 months earlier for RICA stenosis presented with asymptomatic recurrent ISS that became critical (92%) 6 months after in-stent balloon angioplasty was performed for the initial ISS. (**B**) A 4.0-×24-mm ZES was positioned within the self-expanding 4–9-×30-mm NexStent. (**C**) The ZES was implanted with up to 16 atmospheres of balloon pressure. Angiographic results immediately after the procedure (**D**) and at 12 months (**E**).

EXTRACRANIC CAROTID PSEUDOANEURYSMS



- POST TRAUMATIC
  - ASEPTIC(60%)
  - INFECTIVE(40%)

- POST CEA (>1%)
- AFTER LATEROCERVICAL SURGERY
- INFECTION

EXTRACRANIC CAROTID PSEUDOANEURYSMS

Vascular and
Endovascular Surgery
Volume 43 Number 6
December 2009 571-577

10.1177/1538574409334827
http://ves.sagepub.com

Carotid Artery Pseudoaneurysm After Carotid Endarterectomy: Case Series and a Review of the Literature

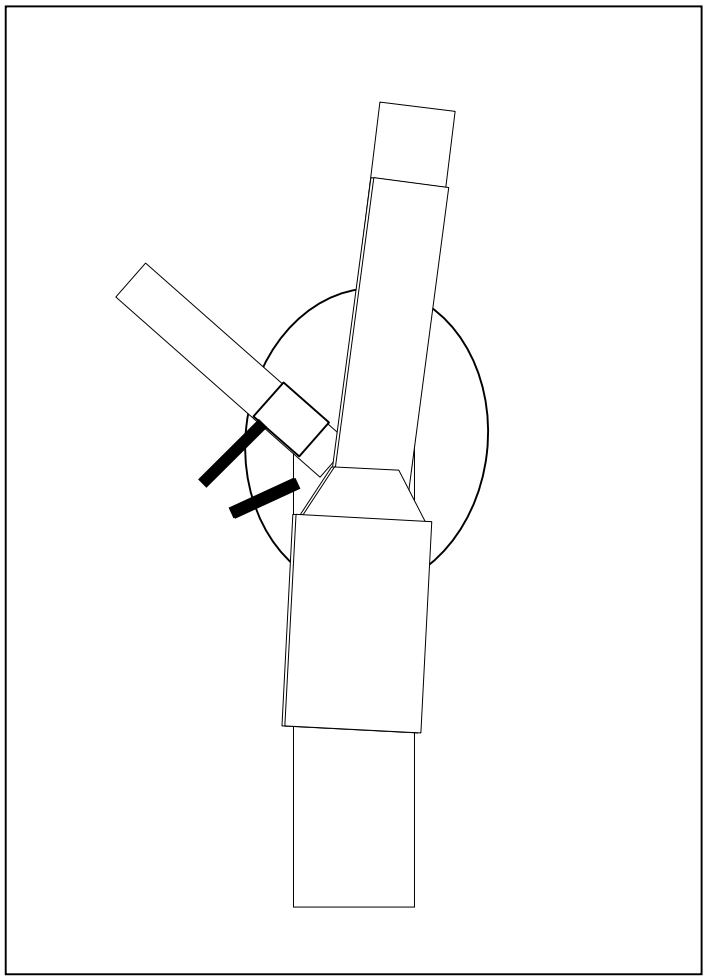
Mohamed F. Abdelhamid, MRCS, Ed, Michael L. Wall, MRCS, and Rajiv K. Vohra, PhD

Introduction

Carotid endarterectomy is the most commonly performed operation in vascular surgery in the western world today. Development of pseudoaneurysm (PA) following carotid endarterectomy (CEA) is a rare complication with an incidence of less than 1% of all CEA.[1] The etiology of PA formation includes suture failure, degeneration of arterial wall, or patch material and infection.[2] Infection as a cause of carotid PA is uncommon as the incidence of post-CEA infection is as low as 0.025% to 0.625%; this is mostly caused by staphylococci.[3]

Pseudoaneurysm formation after patch angio-

CAROTID BIFURCATION PSEUDOANEURYSMS: TECHNIQUE



TECHNIQUE

1 INTRODUCER 8-10 F IN CC

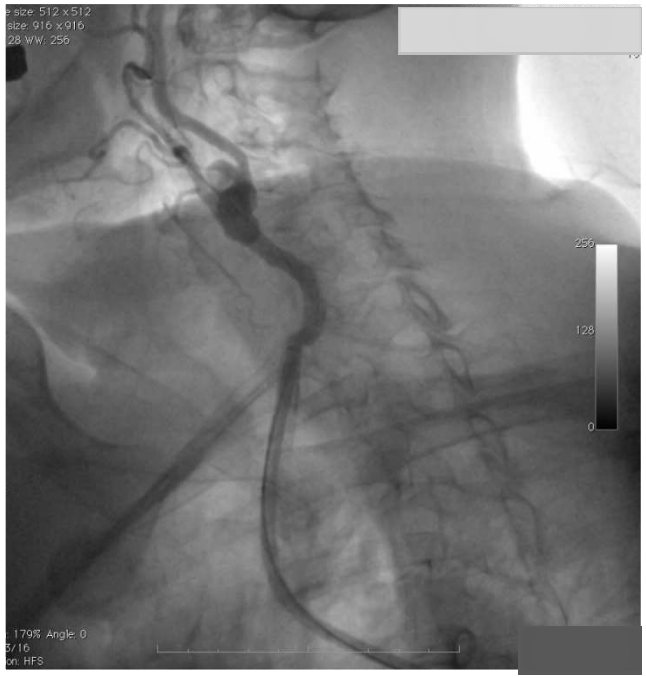
2 EMBO LIZATION ECA/ SUP THIROIDEA

3 SINGLE STENT GRAFT (?)

4 TELESCOPIC STENT GRAFT

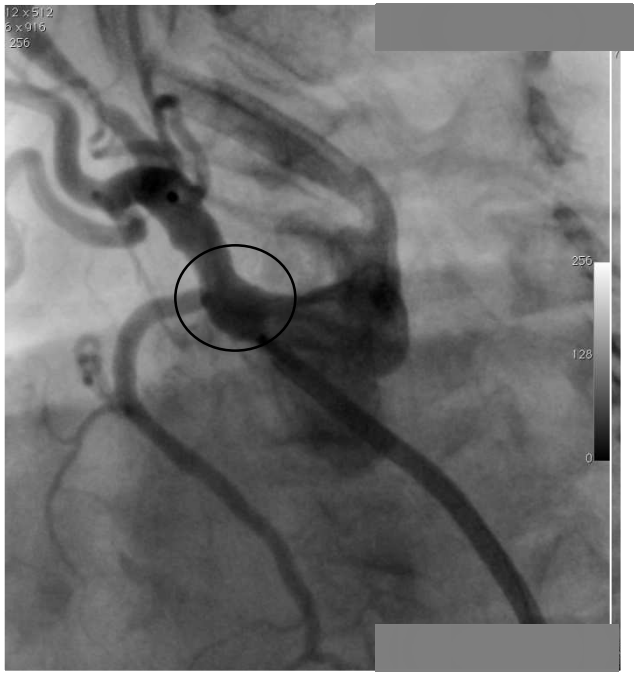
POST CEA EXTRACRANIC CAROTID PSEUDOANEURYSMS

SINGLE STENT



10X80 ARROW INTRODUCER

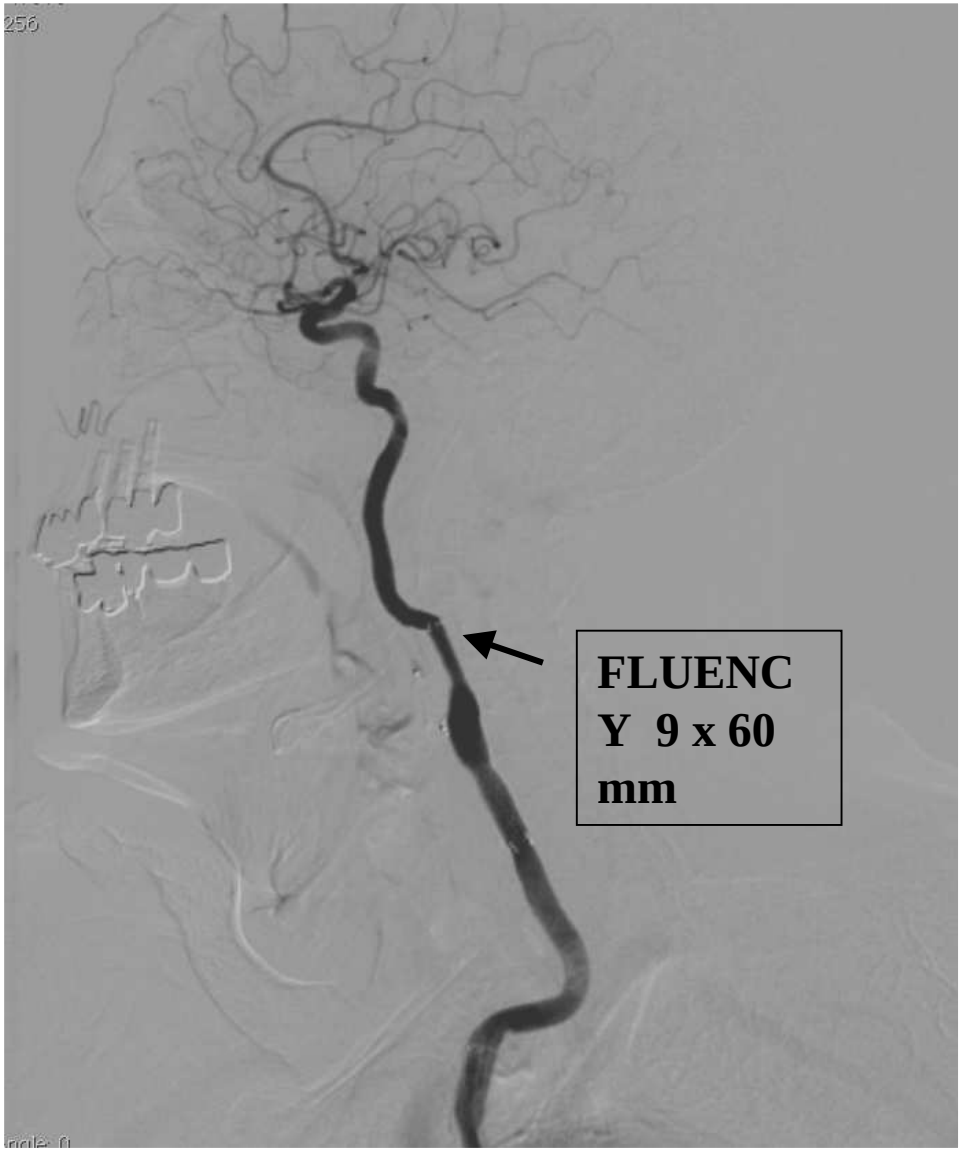
GUIDING CAT 6 F IN CEA

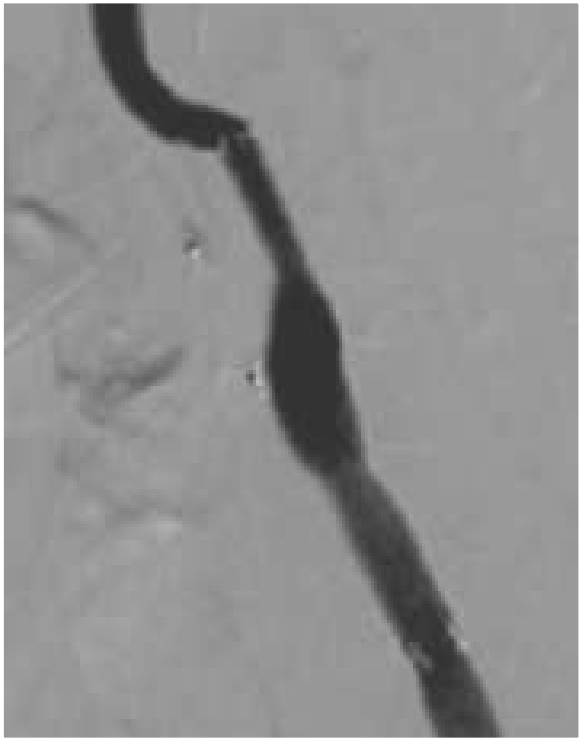


STA COVERAGE AMPLATZER IN CEA

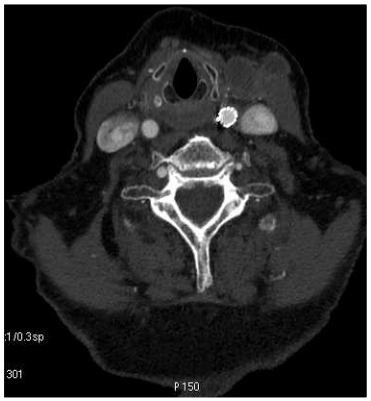
- RAPID GROWTH
- PAIN
- COMPRESSIVE SYNDROME
- CT : IMPENDING ROPTURE

SINGLE COVERED STENT

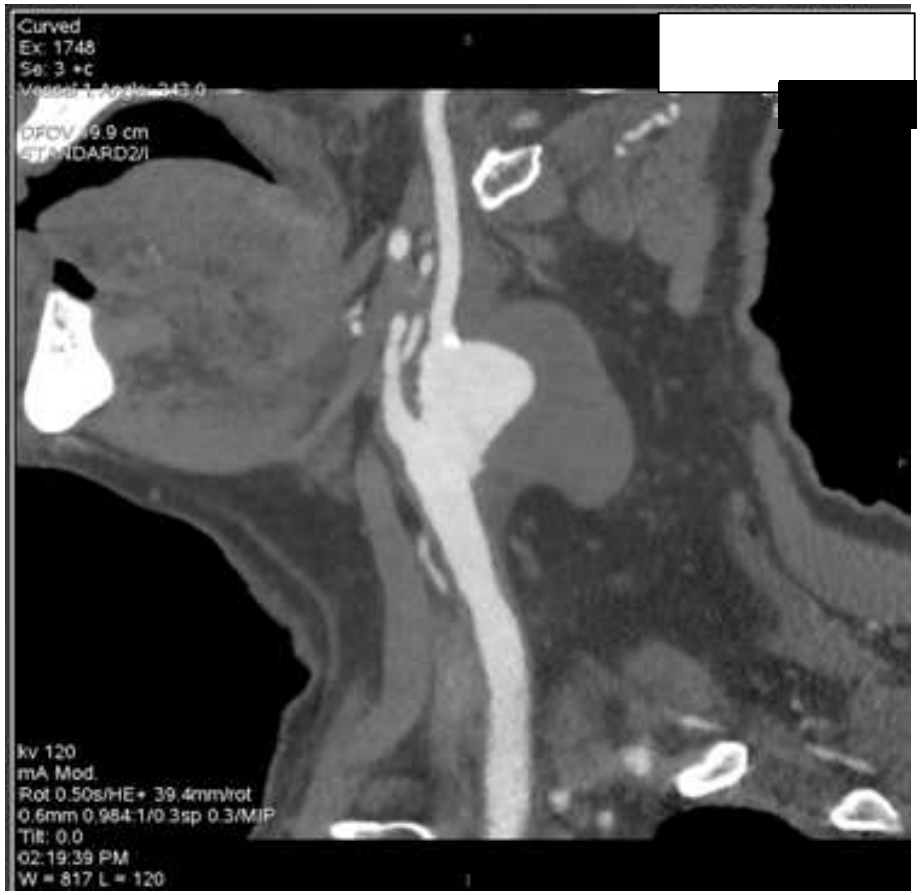


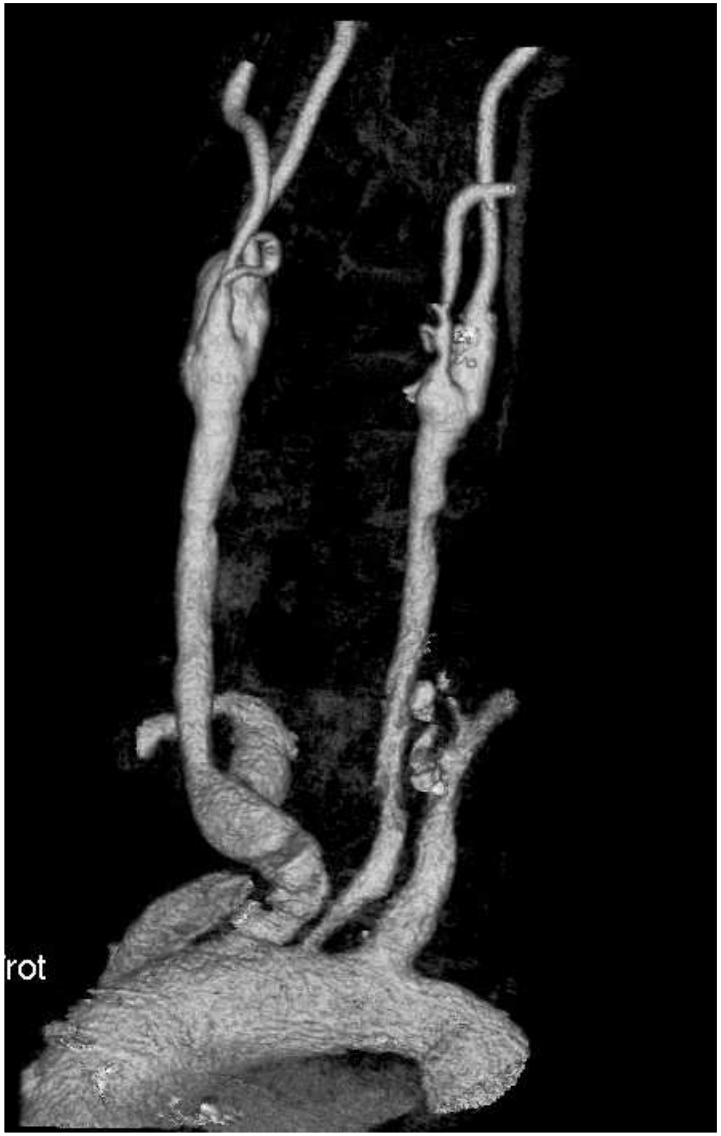


ANGIO-CT AFTER 14 MTHS

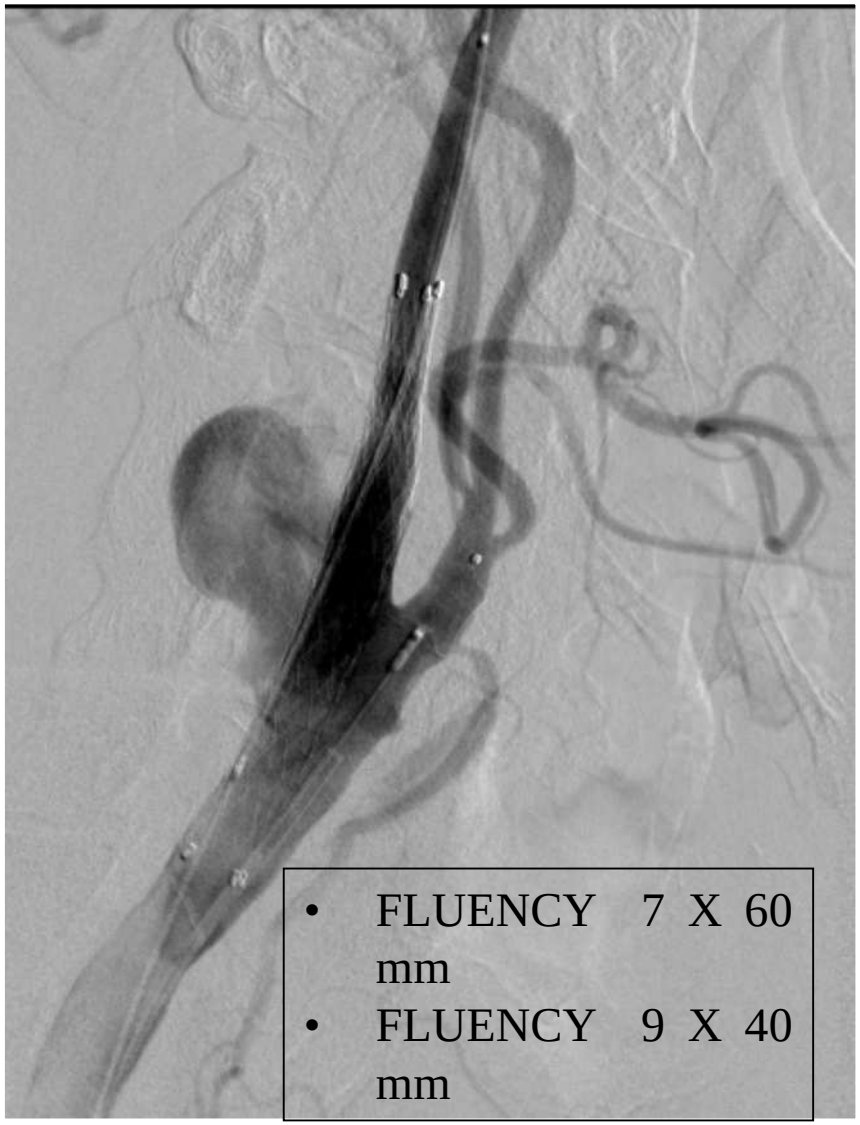


PSEUDOANEURYSM POST L CEA





ENDOVASCULAR TREATMENT : TECHNIQUE

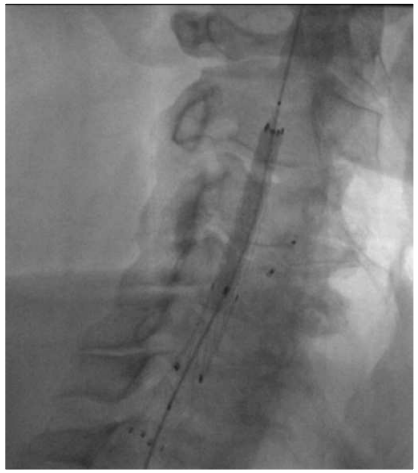


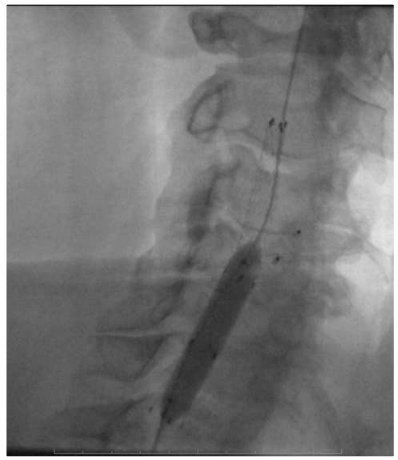
- FLUENCY 7 X 60 mm
- FLUENCY 9 X 40 mm

1 CRANIAL CS DEPLOYMENT

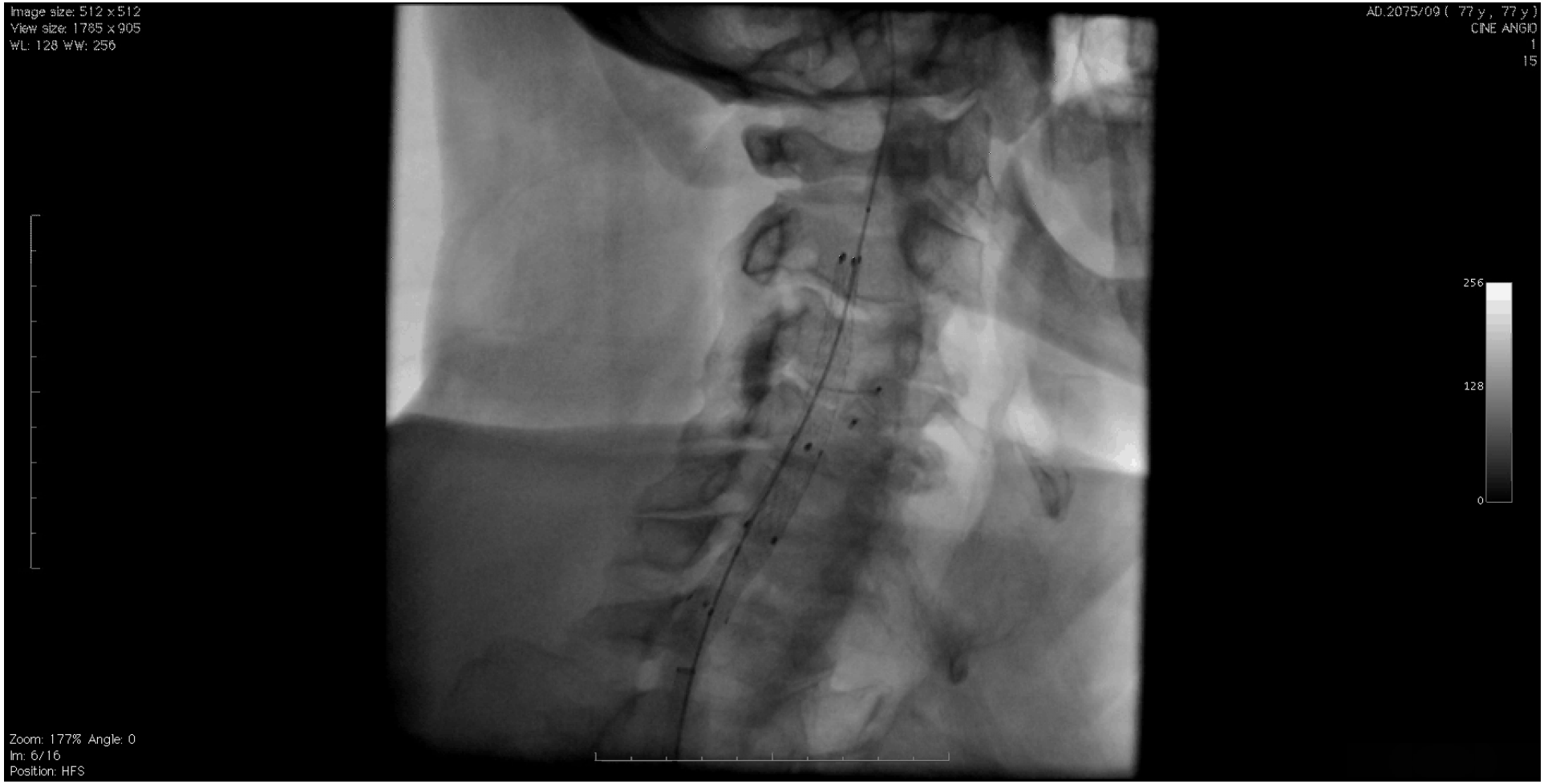
2 AMPLATZER DEPLOYMENT IN CEA

3 DISTAL CS DEPLOYMENT

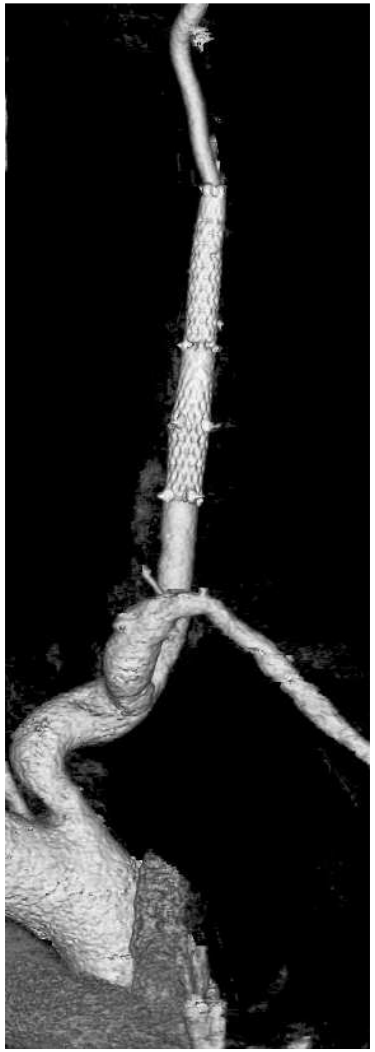




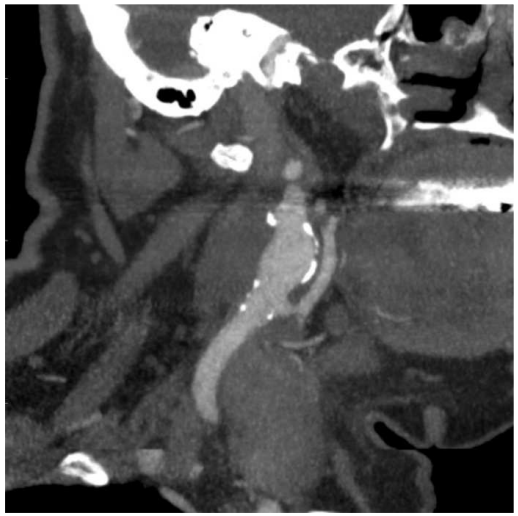
ENDOVASCULAR TREATMENT : FINAL CONTROL

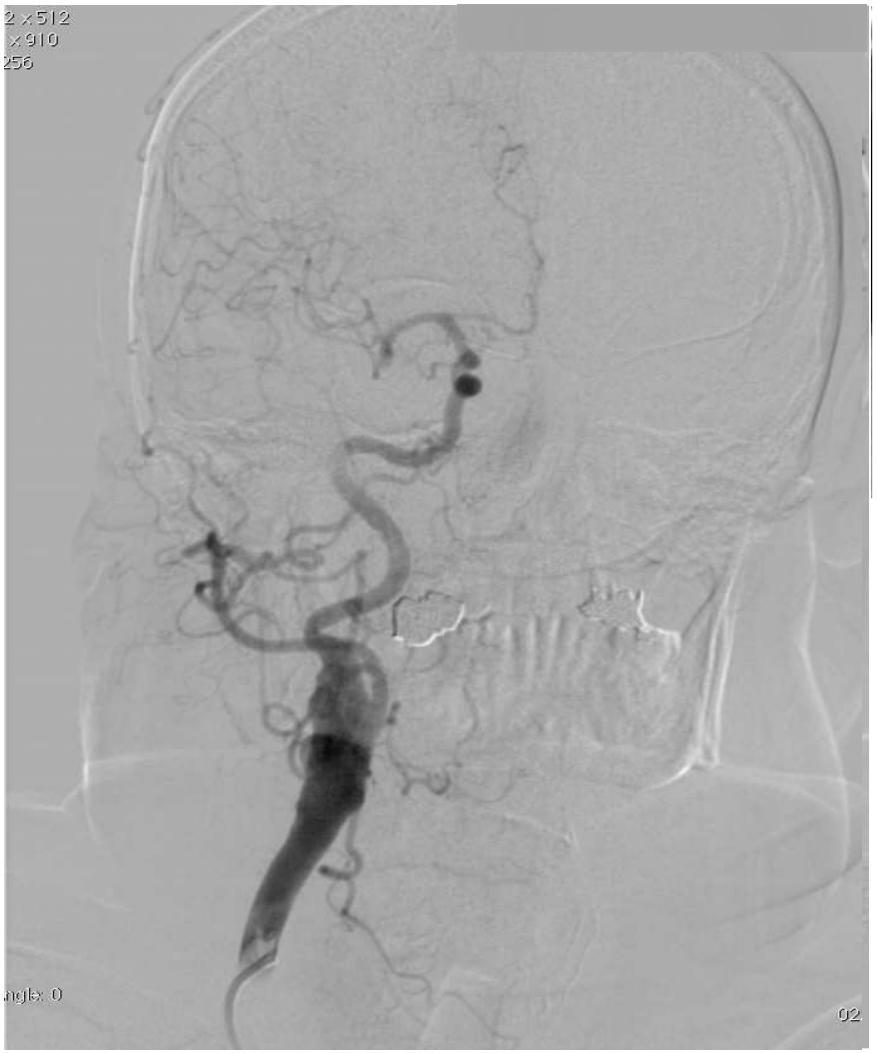


ANGIO-CT AFTER 6 MTHS

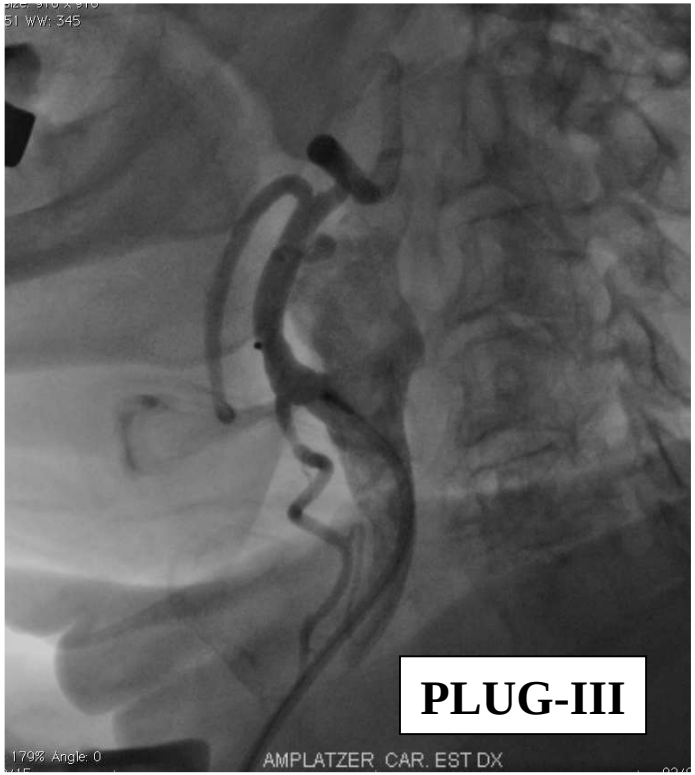


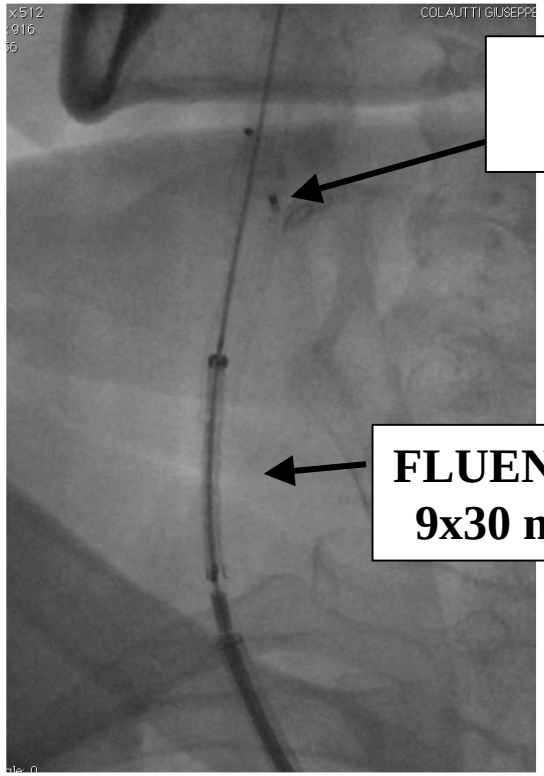
PSEUDOANEURYSM POST R CEA

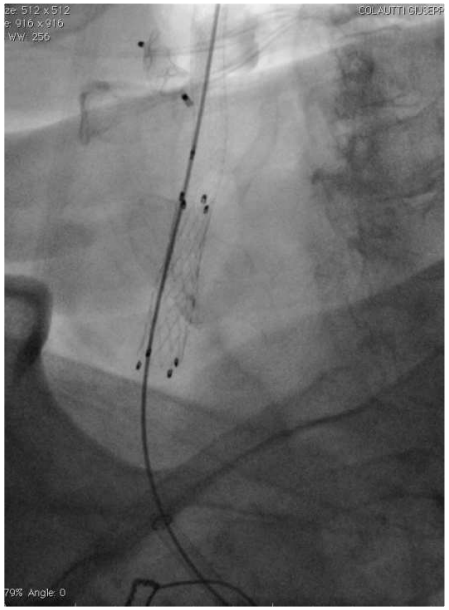




ENDOVASCULAR TREATMENT : TECHNIC



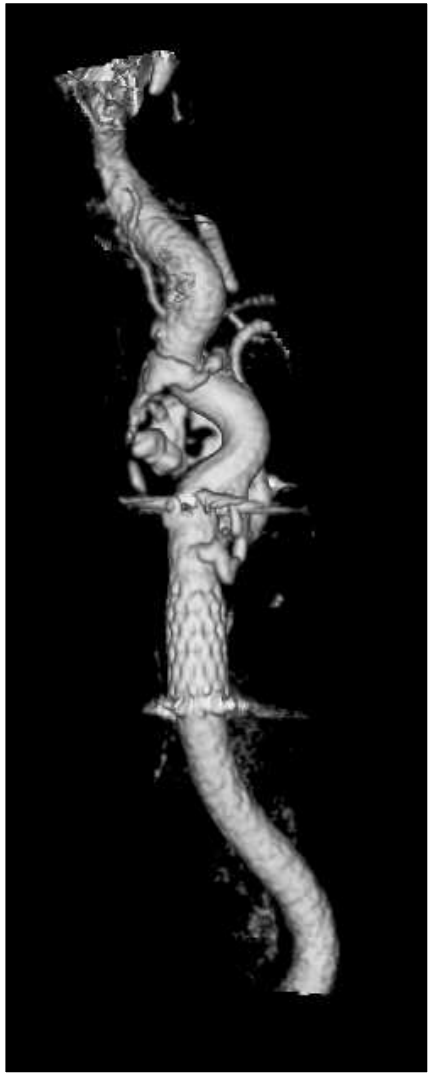


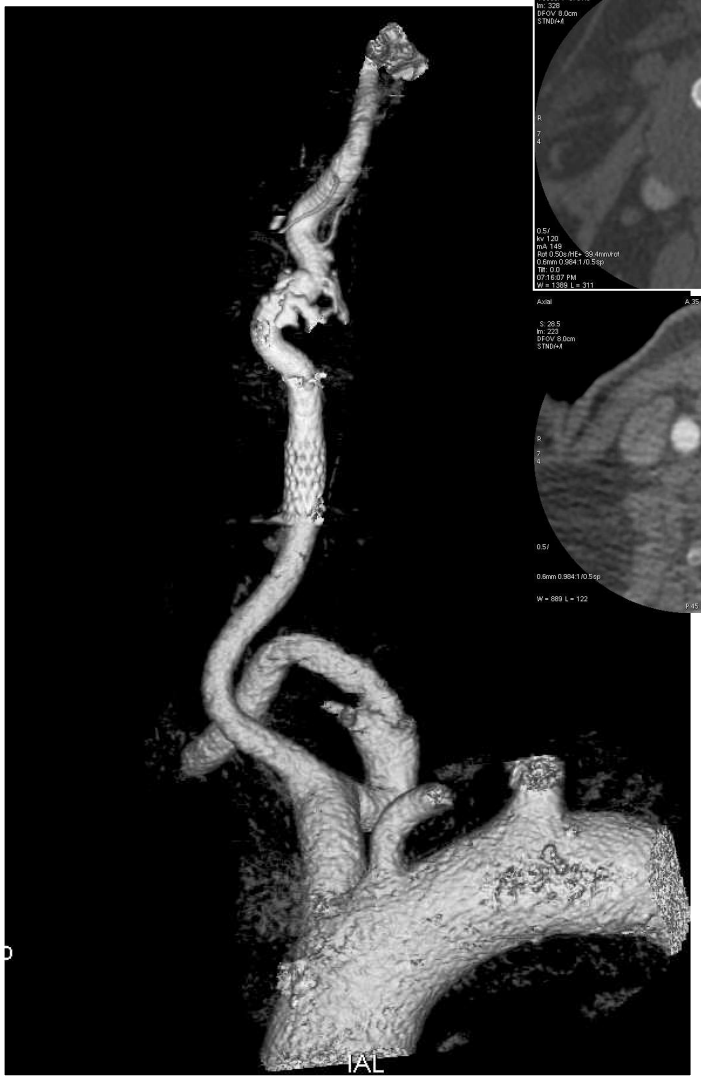


AMPLATZER IN CEA

ENDOVASCULAR TREATMENT : FINAL CONTROL

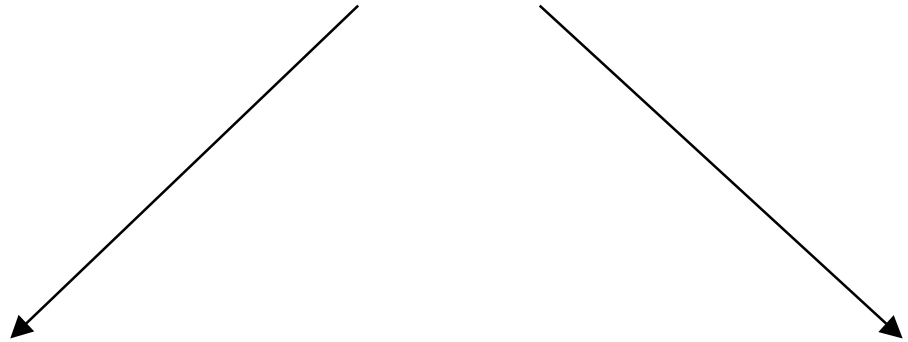
ANGIO-CT AFTER 1 MTHS





ANGIO-CT AFTER 6 MTHS

WHAT'S THE BEST TREATMENT FOR CAROTID COMPLICATIONS AFTER CEA?



ENDOVASCULAR TREATMENT

OPEN SURGERY