SERVIZIO SANITARIO REGIONALE
EMILIA-ROMAGNA
Azienda Ospedaliero - Universitaria di Ferrara

Diagnosi e trattamento endovascolare degli aneurismi cerebrali

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Società Medico Chirurgica di Ferrara

DIAGNOSTICA PER IMMAGINI
DEGLI ANEURISMI CEREBRALI

Intatti

- Di solito asintomatici
- Deficit di nervi cranici
- Sindrome del seno cavernoso
- Compressione sul tronco
- TIA

Rotti

- Cefalea intensa ed improvvisa
- Segni di irritazione meningea
- Nausea e Vomito
- Crisi epilettiche
- Perdita di coscienza

Aneurismi incidentali

Prevalenza 1-10% (letteratura)

Almeno 1 ogni 12-15 persone ha un'aneurisma

ISUIA 1 (N Engl J Med, 1998)

ISUIA 2 (Lancet, 2003) prospettico

> 4000 pz. F-U medio: 4 anni

rischio per anno

Aneurismi < 7 mm 0 %

7-13 mm 0.5 %

13-24 mm 3 %

> 25 mm 8 %

ISUIA

Aneurysm Size and Annual Rupture Rates

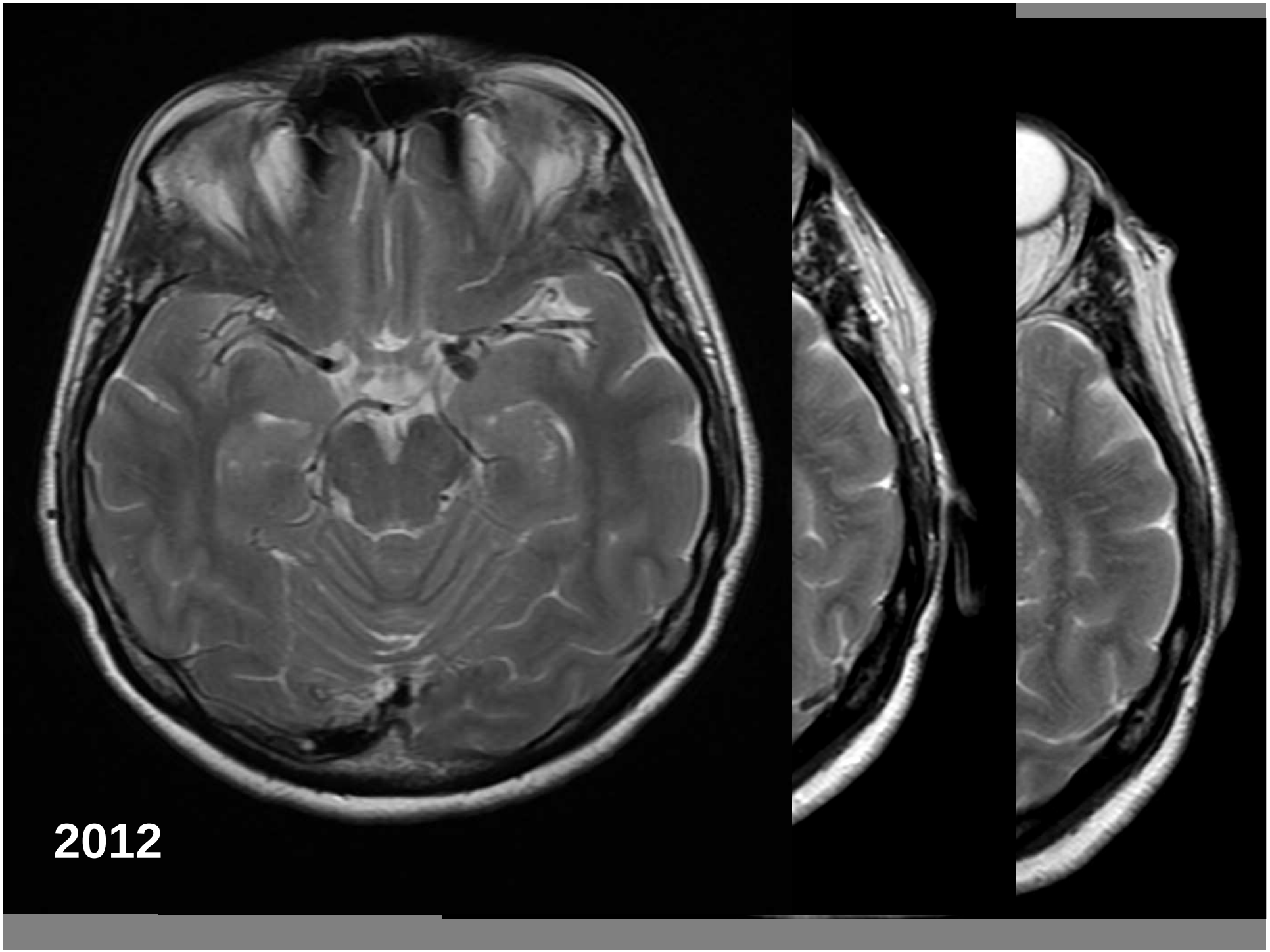
Aneurysm Size	Group 1 (No SAH)	Group 2 (Previous SAH)
2-6 mm	~0.1% 1/1000/year	~0.5% 1/200/year
7-9 mm	~0.5% 1/200/year	~0.5% 1/200/year
10-24 mm	7% in year #1, then 1%/year	1.0% 1/100/year
25+ mm	17% in year #1, then 2%/year	No data

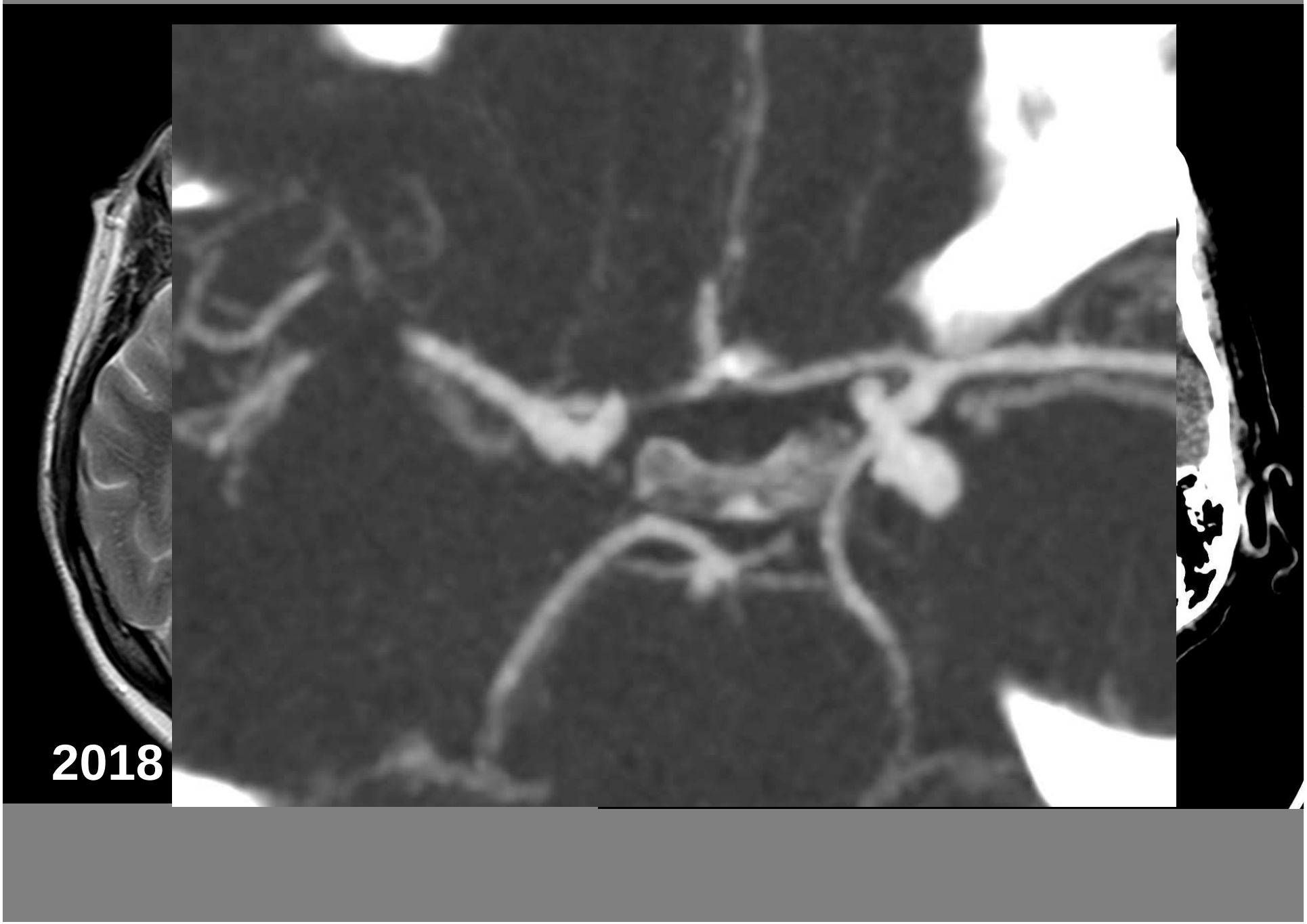
ANEURISMI NON ROTTI

Scoperti incidentalmente in corso di esami:

TC, Angio TC
RM, Angio RM

Visibili all’esame di base solo se di dimensioni > 3 mm,
con calcificazioni parietali, trombosi intrasacculari


2012


2018

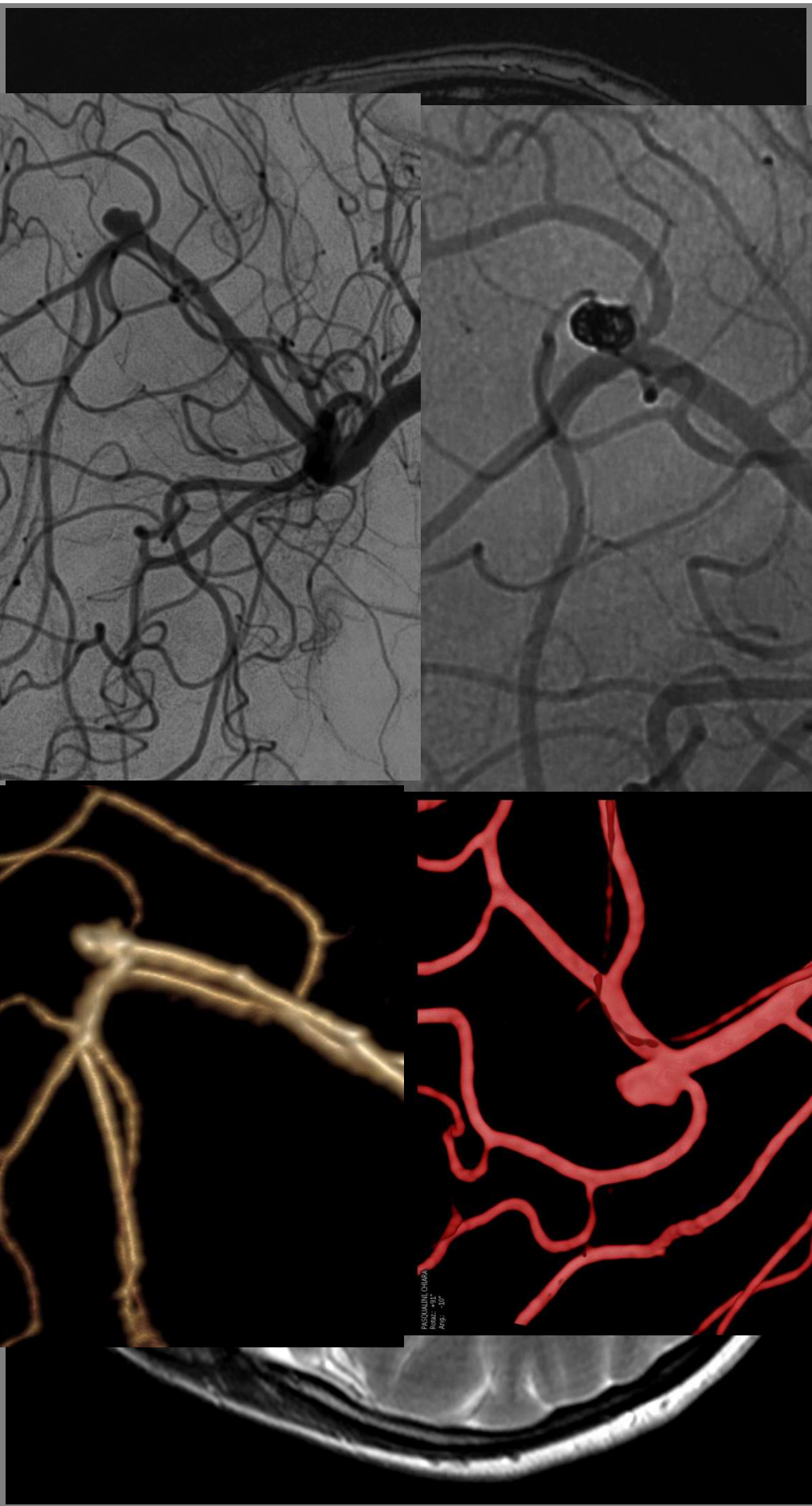


Table 1. Predictors, Criteria, and Points Composing the PHASES Score to Estimate the 5-Year Aneurysm Rupture Rate[10]

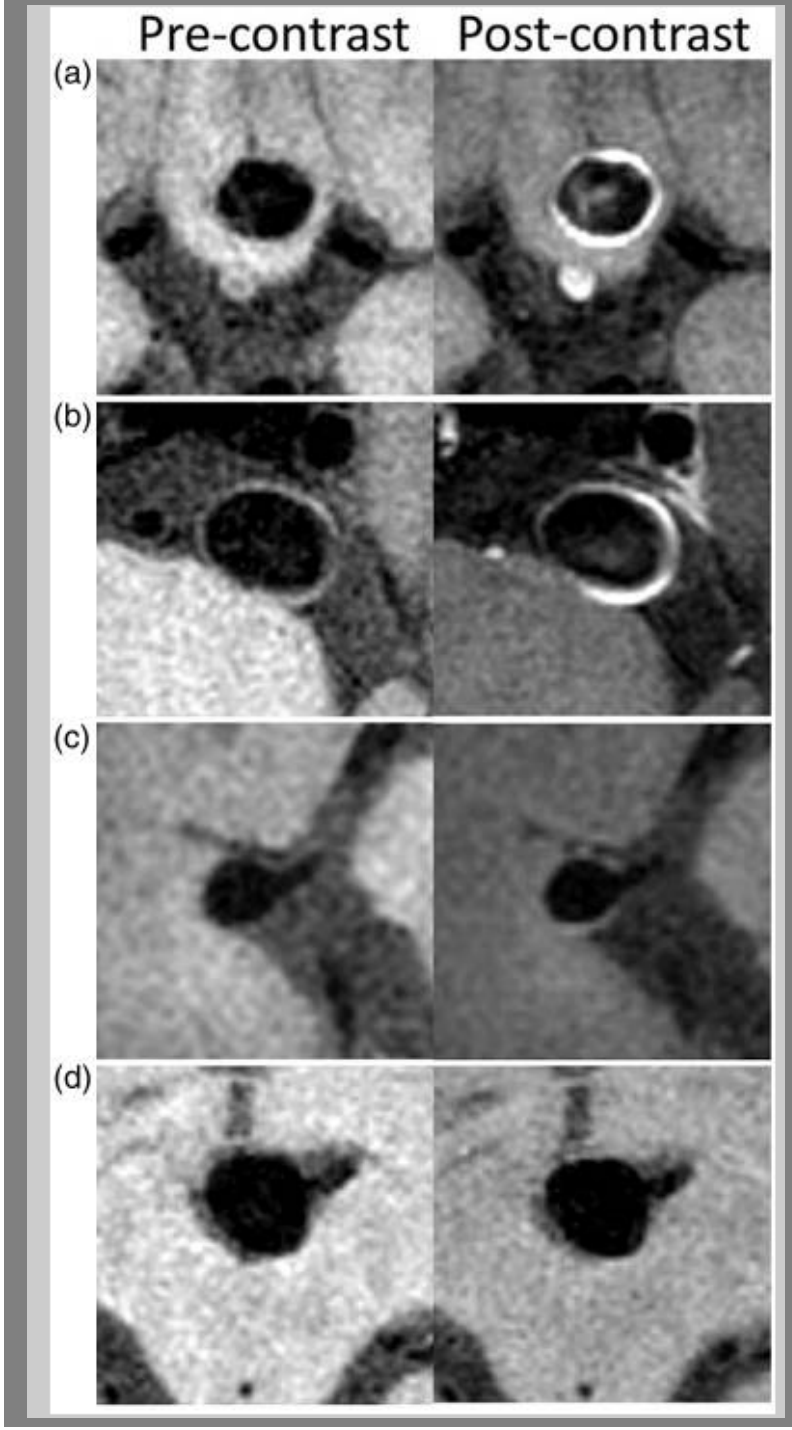
PHASES Aneurysm Risk Score	
Criteria	Points
Population	
North American, European (other than Finnish)	0
Japanese	3
Finnish	5
Hypertension	
No	0
Yes	1
Age	
<70 y	0
≥70 y	1
Size of aneurysm	
<7.0 mm	0
7.0–9.9 mm	3
10.0–19.9 mm	6
≥20.0 mm	10
Earlier SAH from another aneurysm	
No	0
Yes	1
Site of aneurysm	
ICA	0
MCA	2
ACA/PcoA/posterior circulation	4

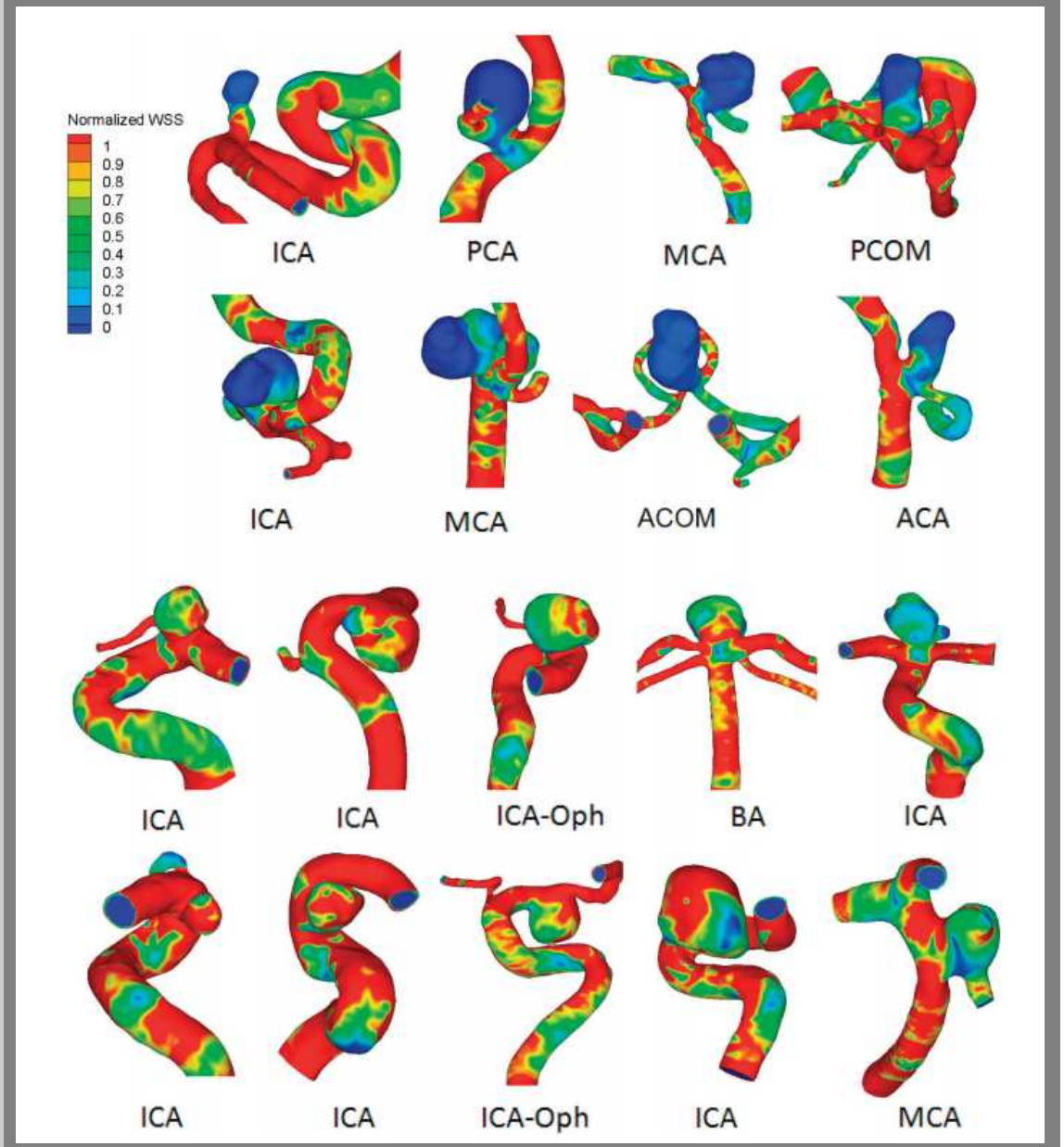
PHASES Score for the Management of Intracranial Aneurysm

A Cross-Sectional Population-Based Retrospective Study

Philippe Bijlenga, MD, PhD; Renato Gondar, MD; Sabine Schilling, PhD; Sandrine Morel, PhD; Sven Hirsch, PhD; Johanna Cuony, MS; Marco-Vincenzo Corniola, MD; Fabienne Perren, MD; Daniel Rüfenacht, MD; Karl Schaller, MD

Stroke. **2017;48:2105-2112**


Pre-contrast
Post-contrast
(a)
(b)
(c)
(d)


Normalized WSS
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
ICA
PCA
MCA
PCOM
ICA
MCA
ACOM
ACA
ICA
ICA
ICA-Oph
BA
ICA
ICA
ICA
ICA-Oph
ICA
MCA

Aneurismi rotti

- **TC: ESA acuta/subacuta ed ematomi intraparenchimali (la distribuzione del sangue pùò fornire sospetti sulla sede dell'aneurisma)**

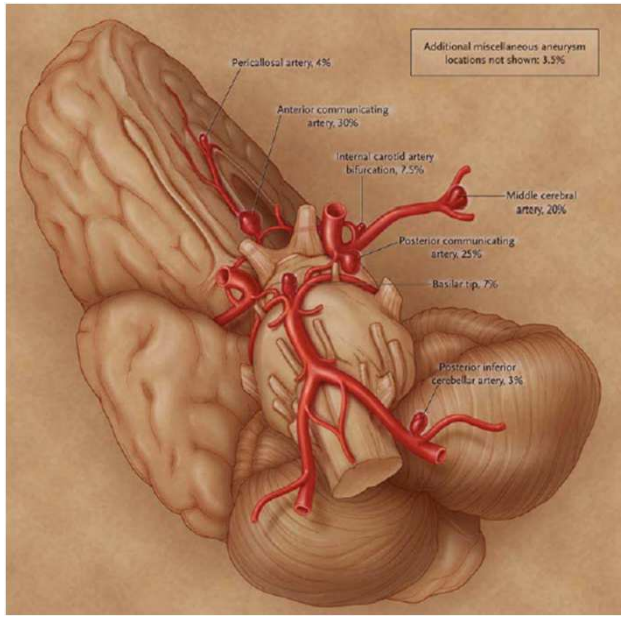
- **Angio TC solo se intervento NCH emergente (ematoma intraparenchimale)**

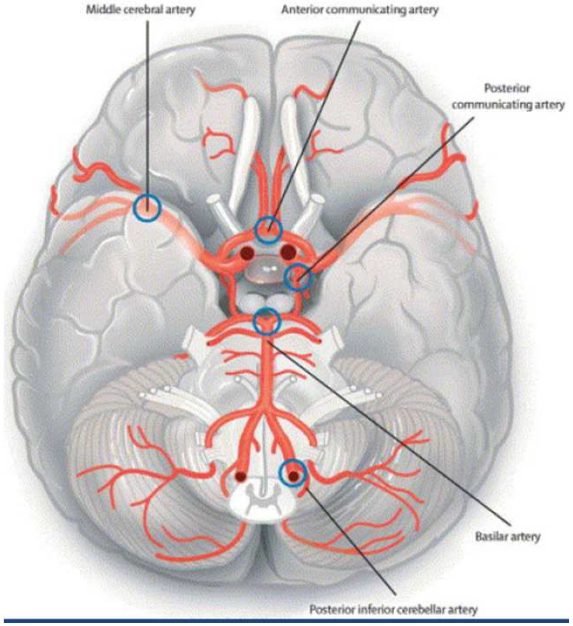
- **RM più sensibile nelle fasi più tardive in sospetto di ESA**

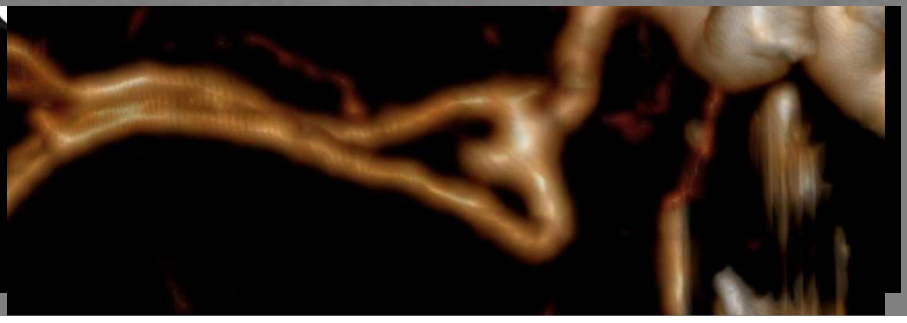
- **AGF GOLD STANDARD**

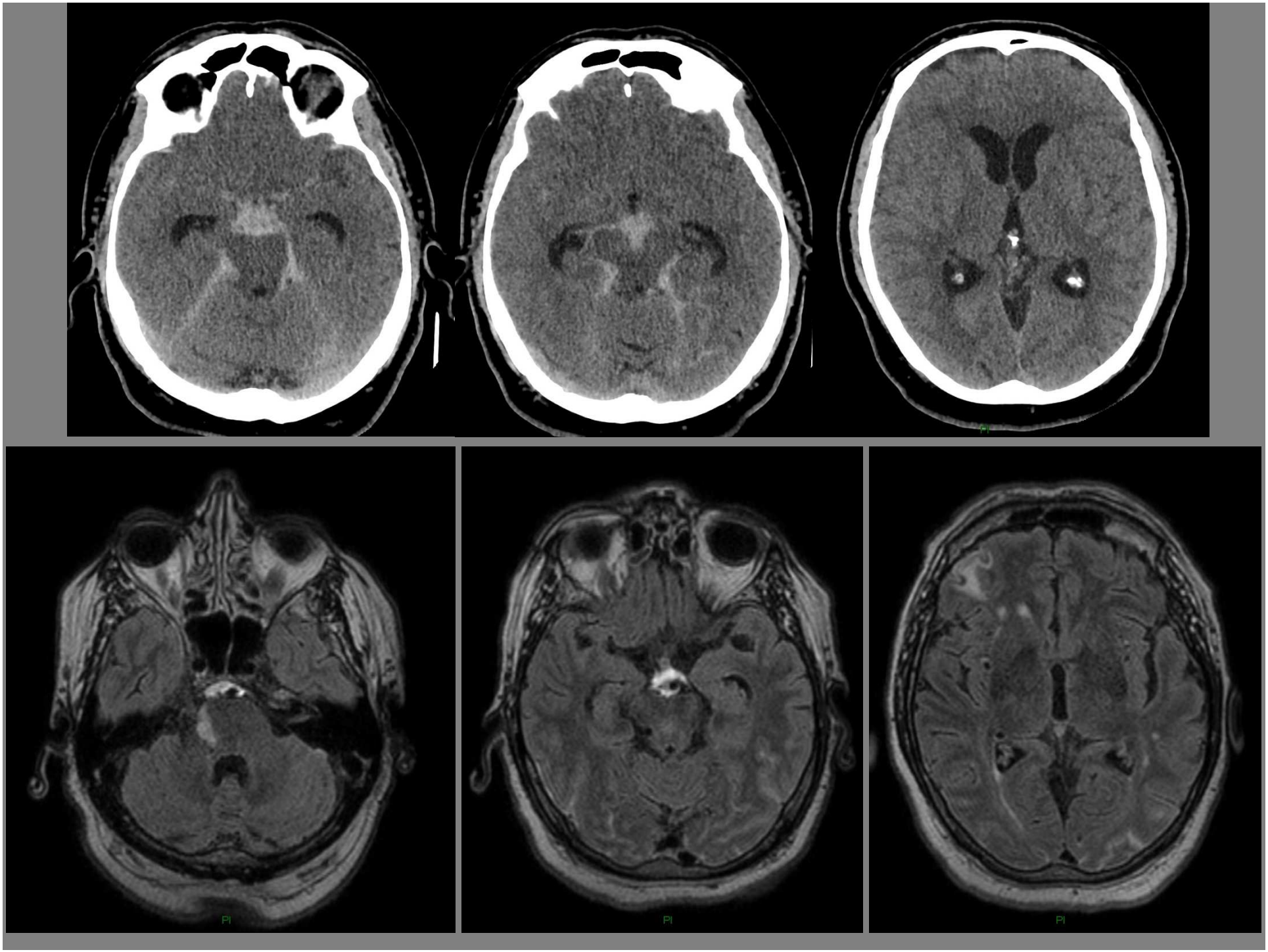
OBBIETTIVI DELL' IMAGING NEURORADIOLOGICO

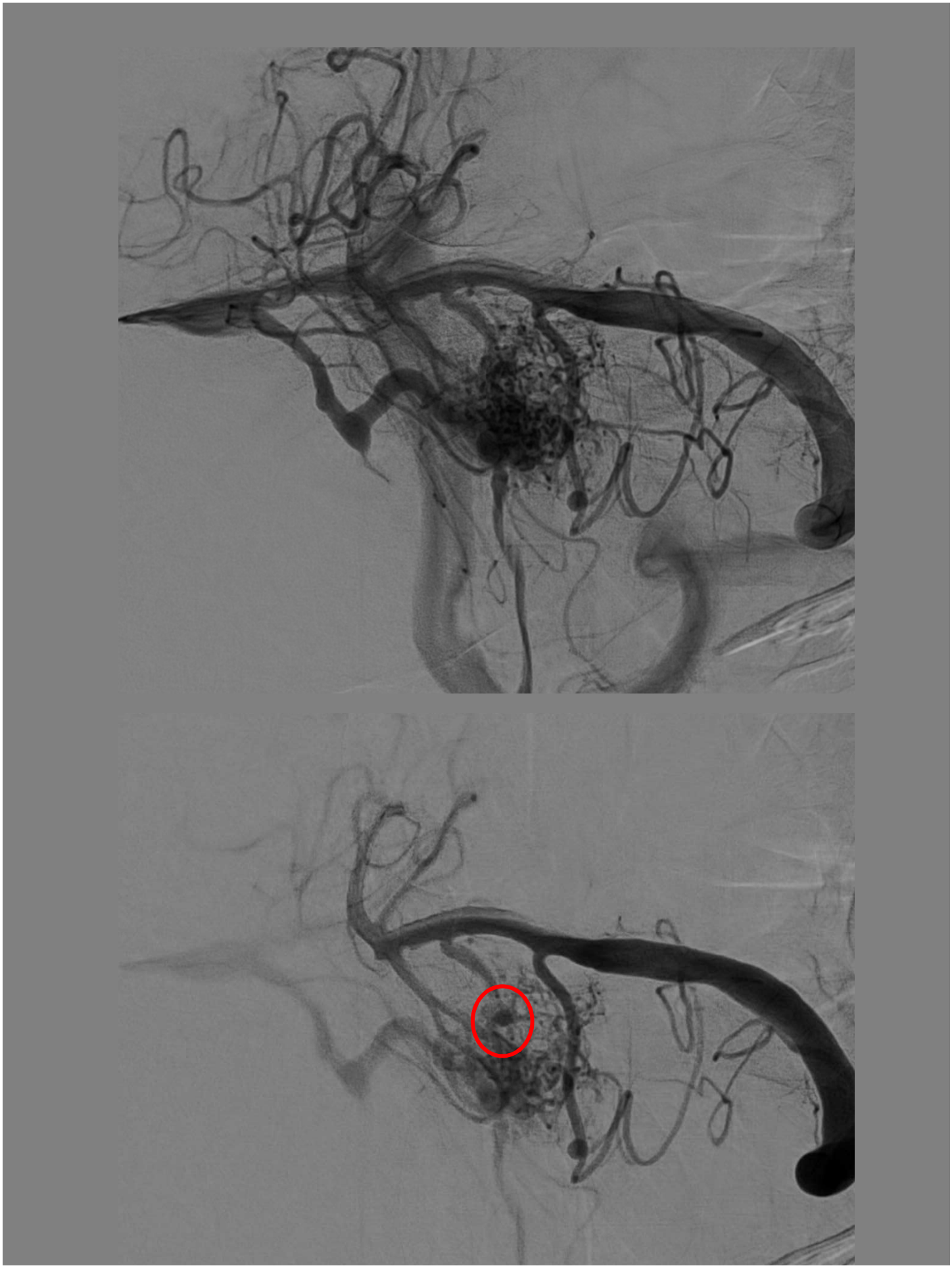
- Identificare la lesione, morfologia, dimensioni
- Valutare la sede / numero di aneurismi (quale si è rotto)
- Valutare il diametro del colletto (rapporto sacca/colletto)
- Valutare i rapporti con il vaso d'origine e con i vasi vicini
- Valutare l'eventuale presenza di vasospasmo
- Dare all'interventista/chirurgo informazioni utili per l'approccio e pianificazione terapeutica











ESA da rottura di aneurisma

Storia naturale

- **Risanguinamento**

  70% fatale

  - **24 h 4 - 10%**
  - **3-7 gg. 1,5%**
  - **2 sett. 20%**
  - **1 mese 33%**
  - **6 mesi 50%**
  - **Annuale 3%**

- Vasospasmo 30% 15% sintomatico
- Ischemia 30%
- Idrocefalo 20-60%
  - precoce
  - tardivo

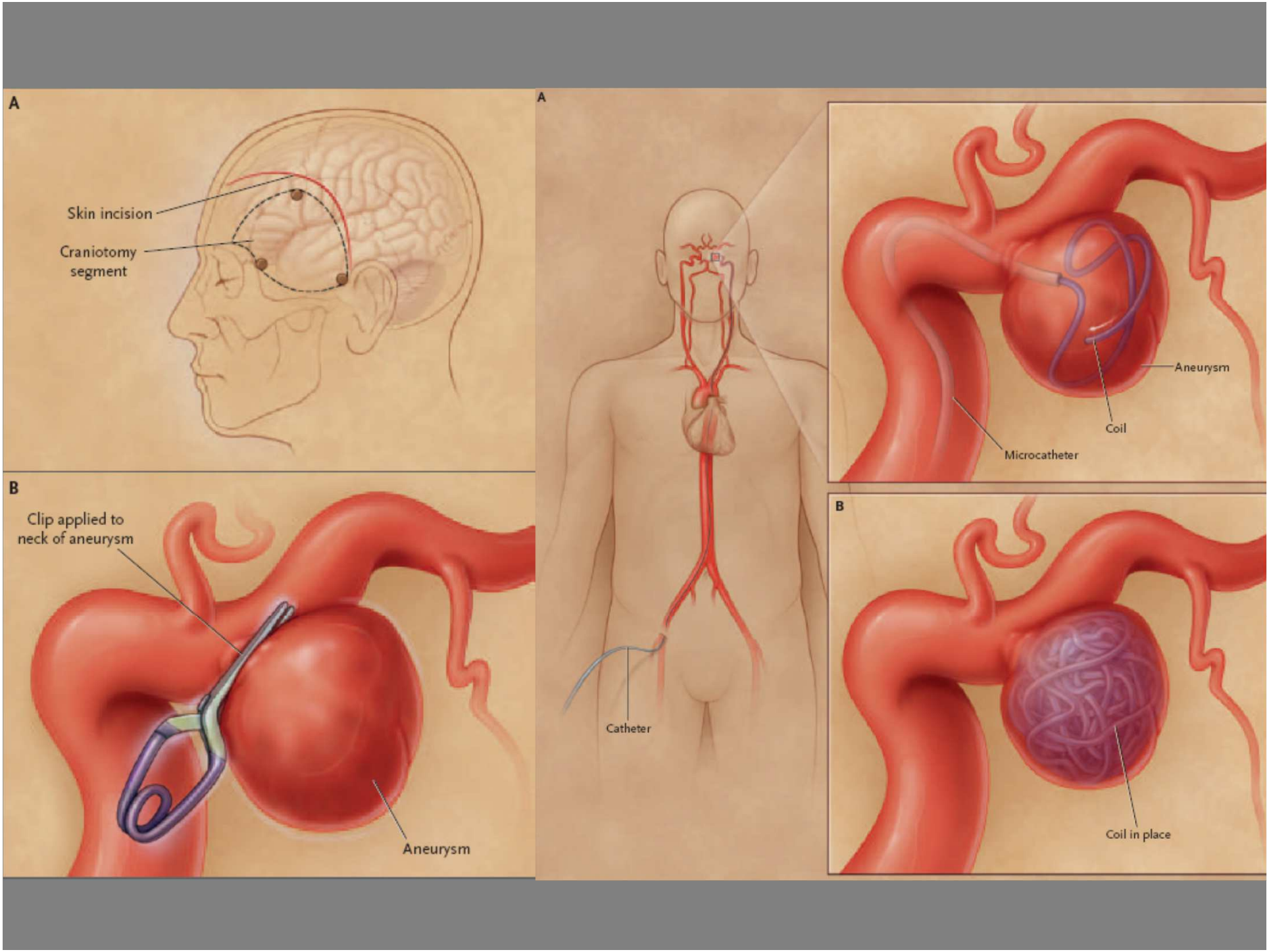
ESA da rottura di aneurisma

Prognosi

- Mortalità 35% (12% prima del ricovero)
- Dipendenza 25% (mRS =>3)
- Deficit cognitivi 20% (specie dopo clipping)

- Recupero completo **20%**
  - ansia, depressione, disturbi del sonno, anosmia

Non tutti tornano a fare il lavoro che facevano prima


A
Skin incision
Craniotomy segment
B
Clip applied to neck of aneurysm
Aneurysm
A
Catheter
Aneurysm
Coil
Microcatheter
B
Coil in place

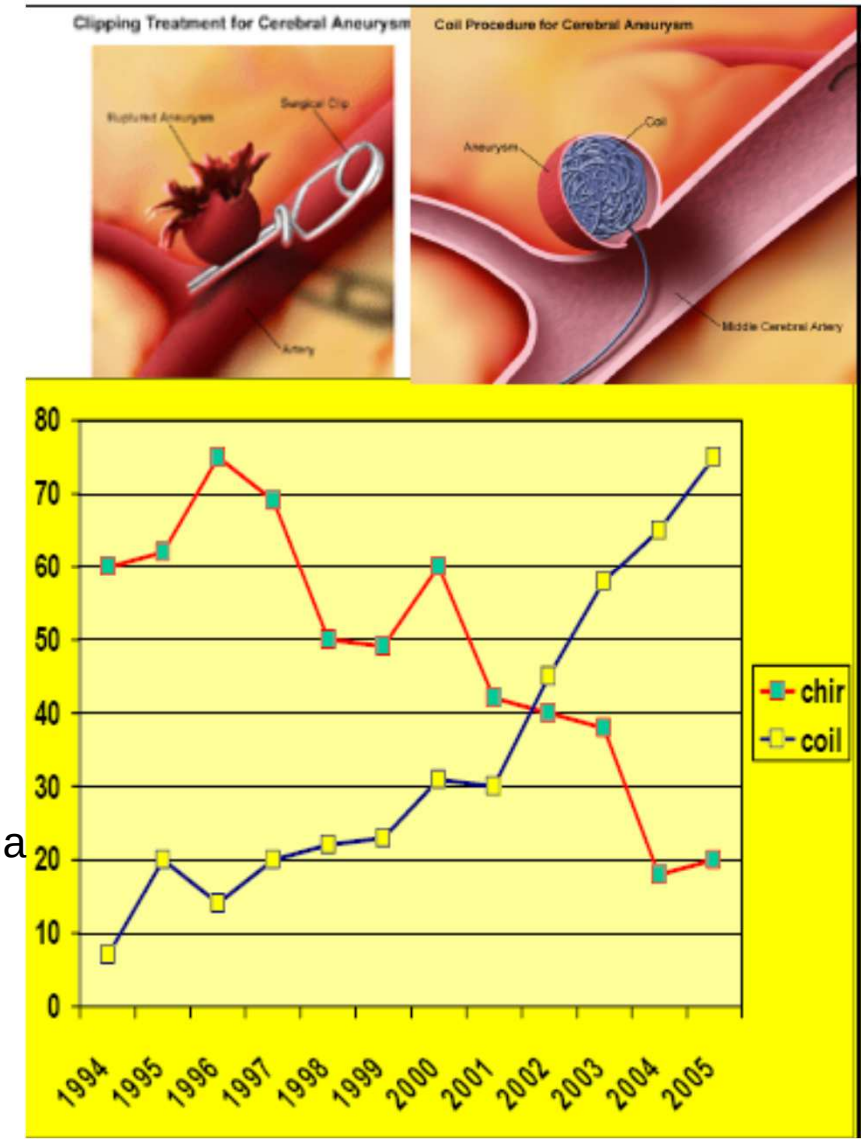
Terapia endovascolare

Vantaggi

- Rapidità
- < invasività
- Più di 1 aneurisma nella stessa seduta
- Minori giorni di degenza
- Reinserimento vita sociale più rapido

Svantaggi

- Utilizzo radiazioni ionizzanti
- Minor stabilità di trattamento (alte recidive vs NCH ma non differenze significative per risanguinamenti)
- Necessari FU con ARM e AGF



Tendenza mondiale **70% EVT** vs 30% NCH

Terapia endovascolare

Vantaggi

- Rapidità
- < invasività
- Più di 1 aneurisma nella stessa seduta
- Minori giorni di degenza
- Reinserimento vita sociale più rapido

Svantaggi

- Utilizzo radiazioni ionizzanti
- Minor stabilità di trattamento (alte recidive vs NCH ma non differenze significative per risanguinamenti)
- Necessari FU con ARM e AGF

European Stroke Organization Guidelines for the Management of Intracranial Aneurysms and Subarachnoid Haemorrhage

Thorsten Steiner[a] Seppo Juvela[d] Andreas Unterberg[b] Carla Jung[b]
Michael Forsting[c] Gabriel Rinkel[e]

Departments of [a]Neurology and [b]Neurosurgery, Heidelberg University, Heidelberg, and [c]Department of Radiology, University of Essen, Essen, Germany; [d]Department of Clinical Neurosciences, University of Helsinki, Helsinki, Finland; [e]Department Neurology, Utrecht University, Utrecht, The Netherlands

Cerebrovasc Dis 2013;35:93–112

Recommendation for Timing of Intervention

- Aneurysm should be treated as early as logistically and technically possible to reduce the risk of rebleeding; if possible it should be aimed to intervene at least within 72 h after onset of first symptoms
- This decision should not depend on grading (class III, level C)

Recommendation for Interventional Prevention of Rebleeding

- The best mode of intervention should be discussed in an interdisciplinary dialogue between Neurosurgery and Neuroradiology
- Based on this discussion patients should be informed and included in the process of decision making whenever possible
- In cases where the aneurysm appears to be equally effectively treated either by coiling or clipping, coiling is the preferred treatment (class I, level A)

Trattamento endovascolare degli aneurismi
- differenti strategie -

Come flusso
da modificare

- DB
- Trapping

Occlusione dell' arteria parente

Come sacca
da riempire

- Coiling
- Remodelling
- Stent + coils
- WEB

Spazio interno da riempire

Come parete
da curare

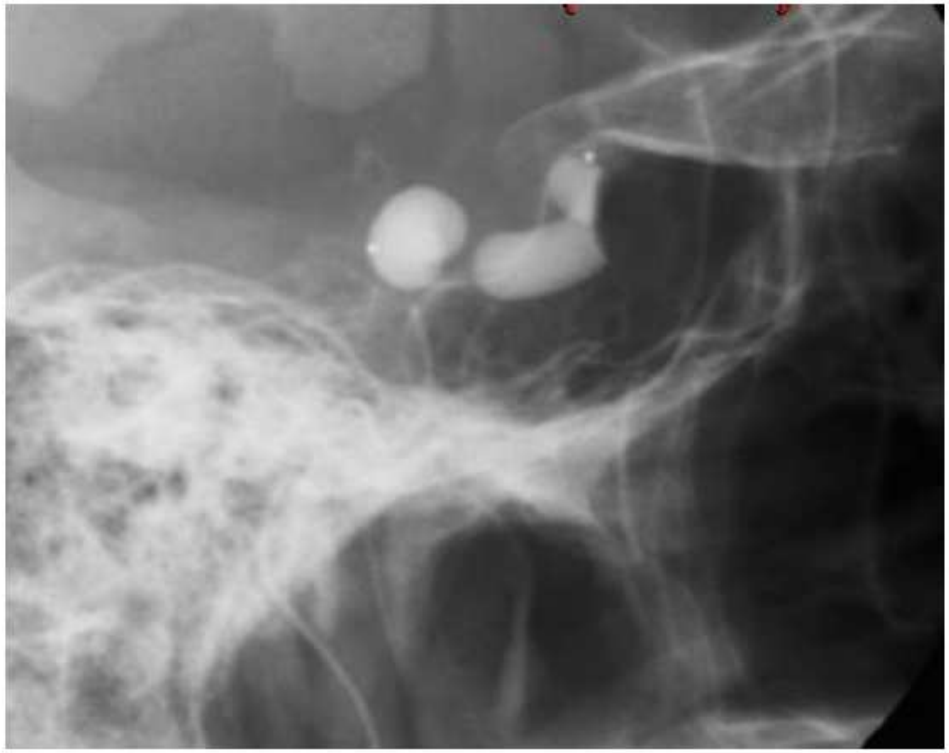
- Stent ricoperti
- Stent telescopici
- Diversori di flusso

Chiusura della breccia di parete

Diversione del flusso

Occlusione arteria parente

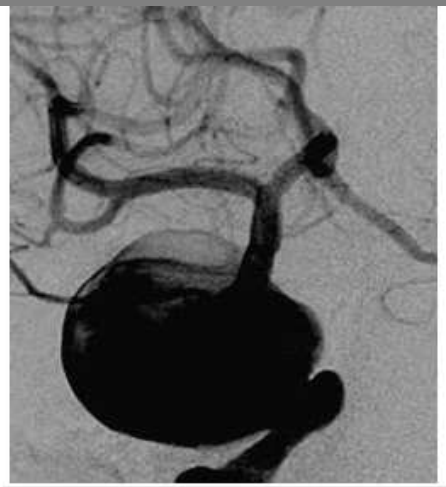
- Con palloncini distaccabili
- Con spirali



Attualmente sempre meno frequente ma comunque molto efficace

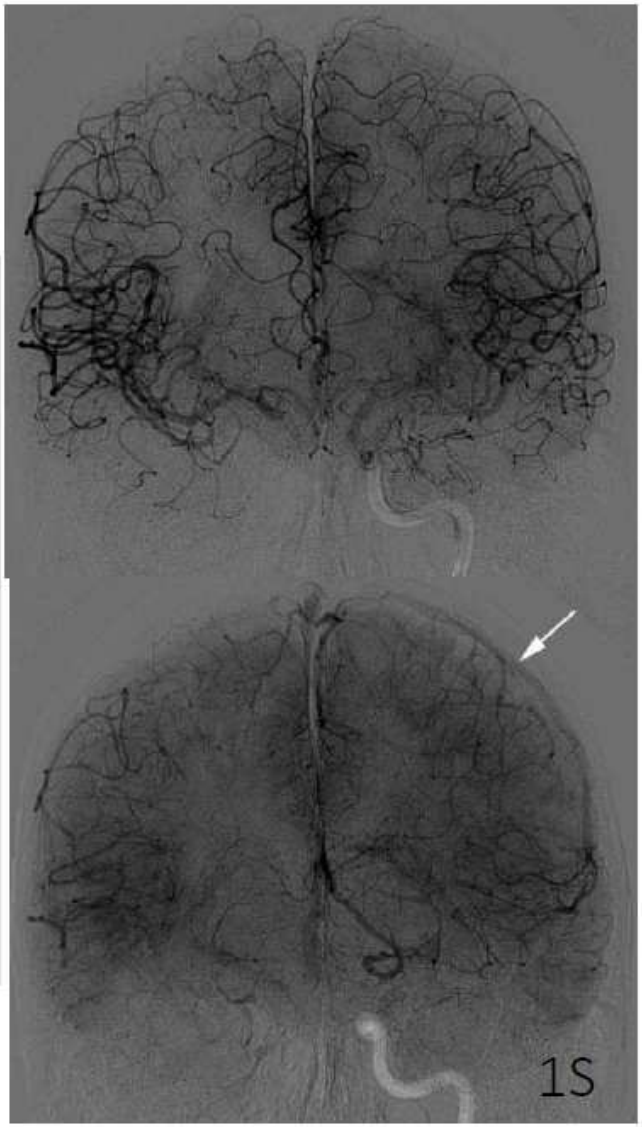
Sacrificio del vaso parente

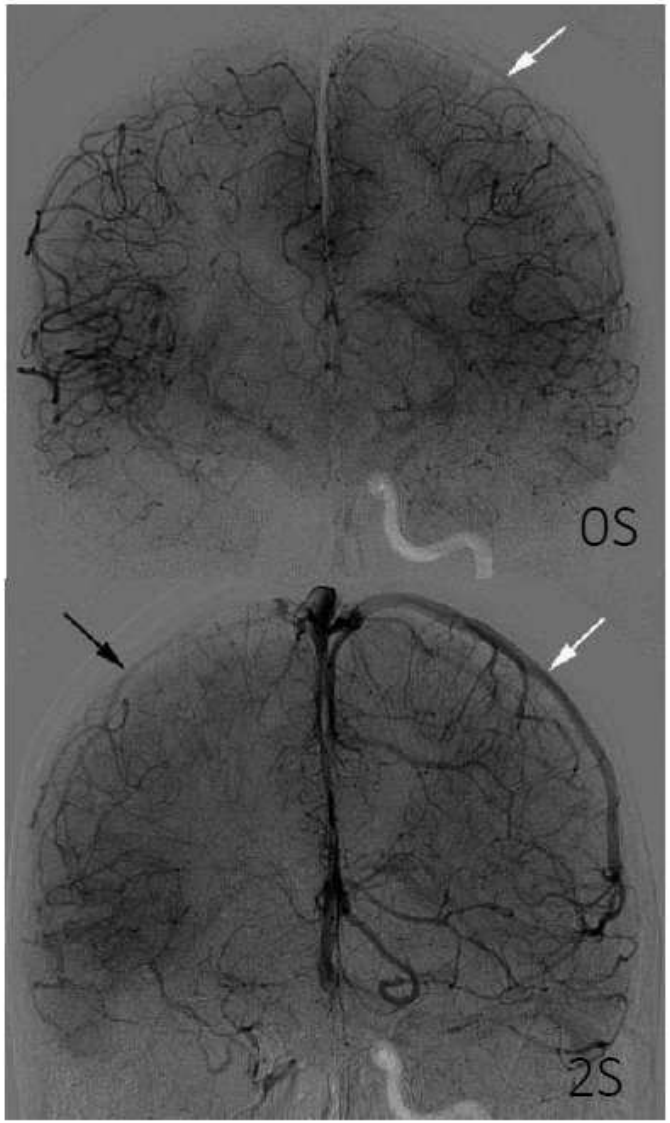
Test di occlusione



Venous opacification symmetry in the tested and control vascular territories was a reliable predictor of a subject's ability to tolerate carotid occlusion. Carotid sacrifice was found to be possible when the delay was <3 sec.

AJNR 2005





Trattamento endovascolare degli aneurismi
- differenti strategie -

Come **flusso** da modificare

- DB
- Trapping

Come **sacca** da riempire

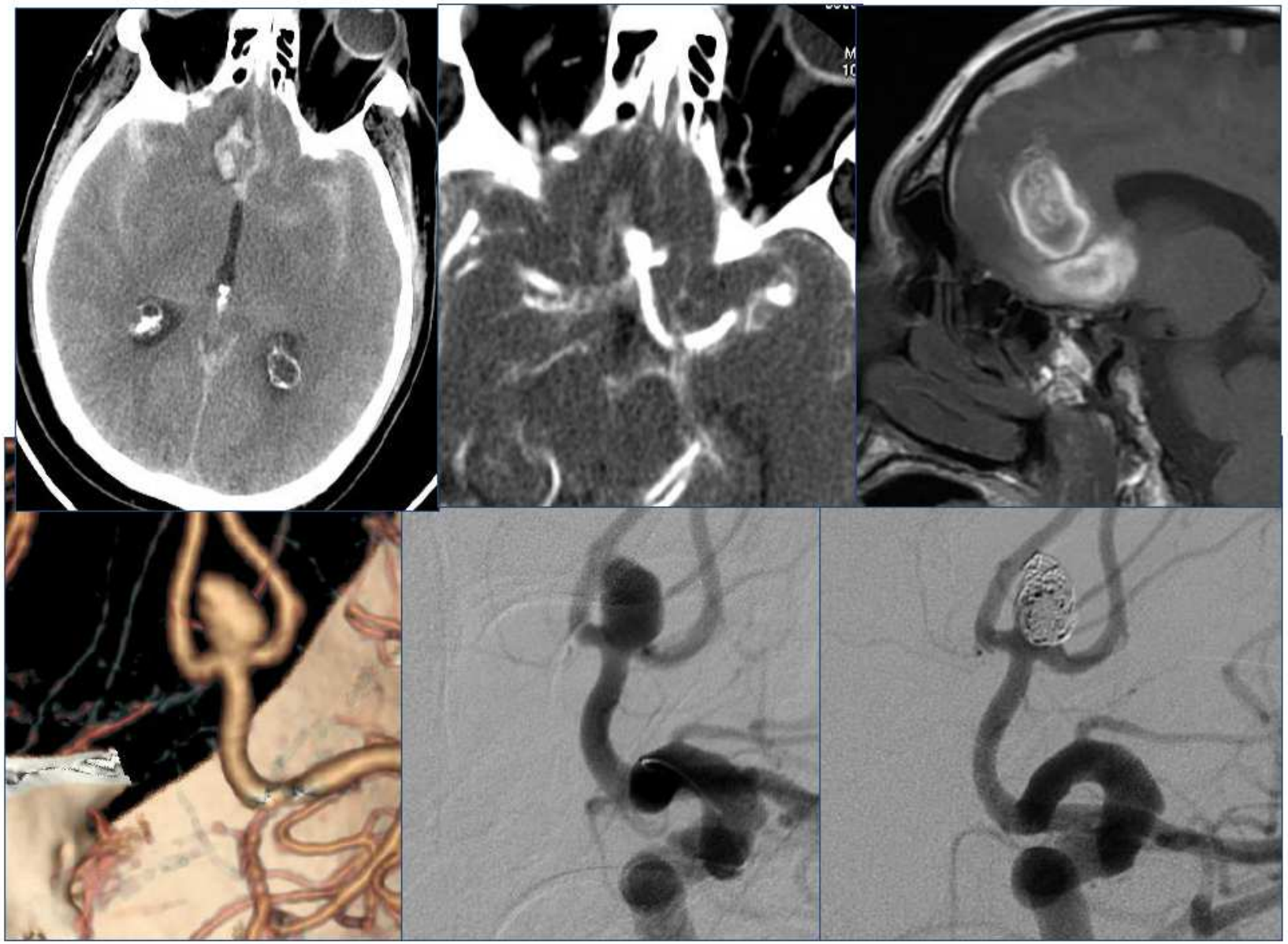
- Coiling
- Remodelling
- Stent + coils
- WEB

Spazio interno da riempire

Come **parete** da curare

- Stent ricoperti
- Stent autoesp.
- Diversori di flusso

Spirali distaccabili



Configurazione

- Helical 2D
- 3D spherical
- 3D omega
- 360°
- Delta

Grado di morbidezza

- Standard
- Soft
- Ultra
- Supersoft

helical

spherical

omega

impalcatura

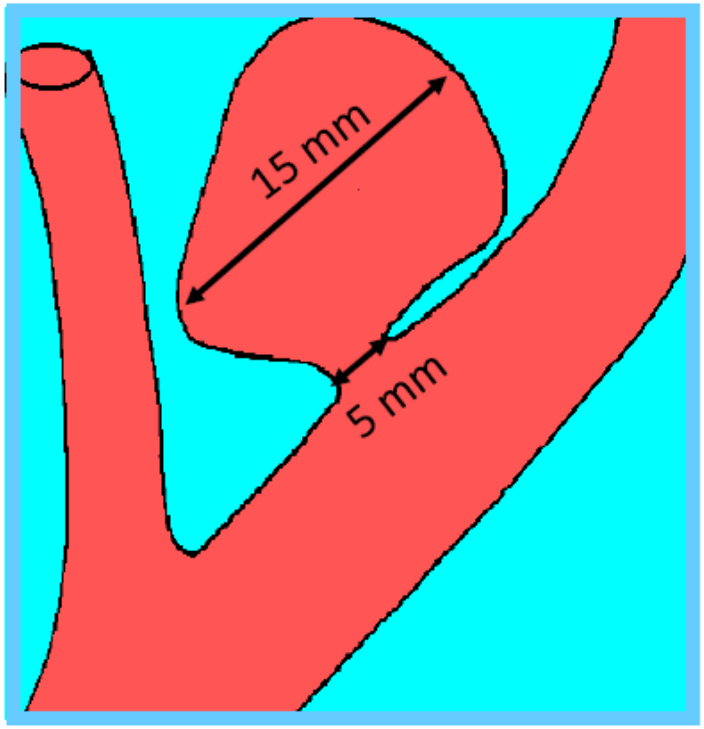
riempimento

delta

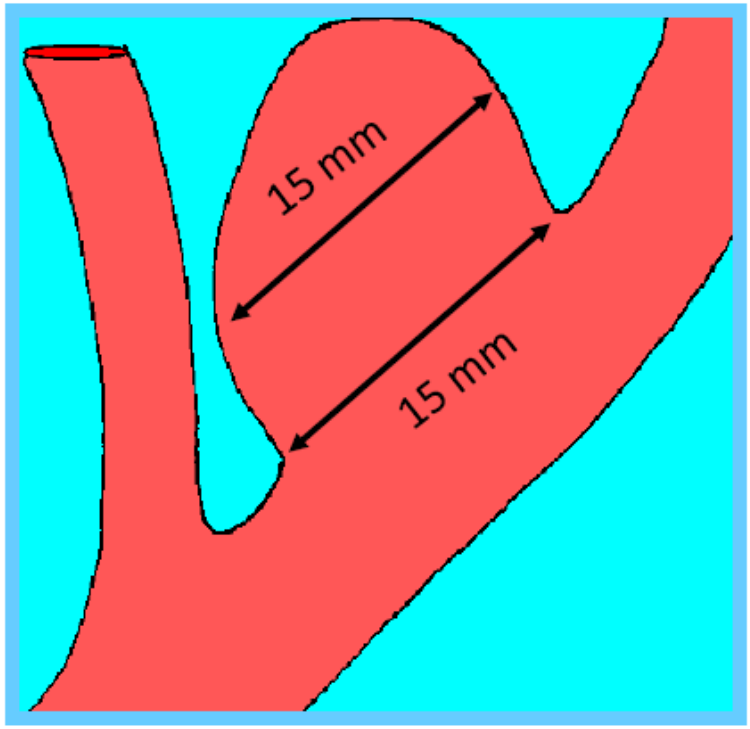
360°

RAPPORTO SACCA – COLLETTO
(dome to neck ratio)

rapporto 3



rapporto 1



Favorevole se > 1.6

Embolizzazione Assistita

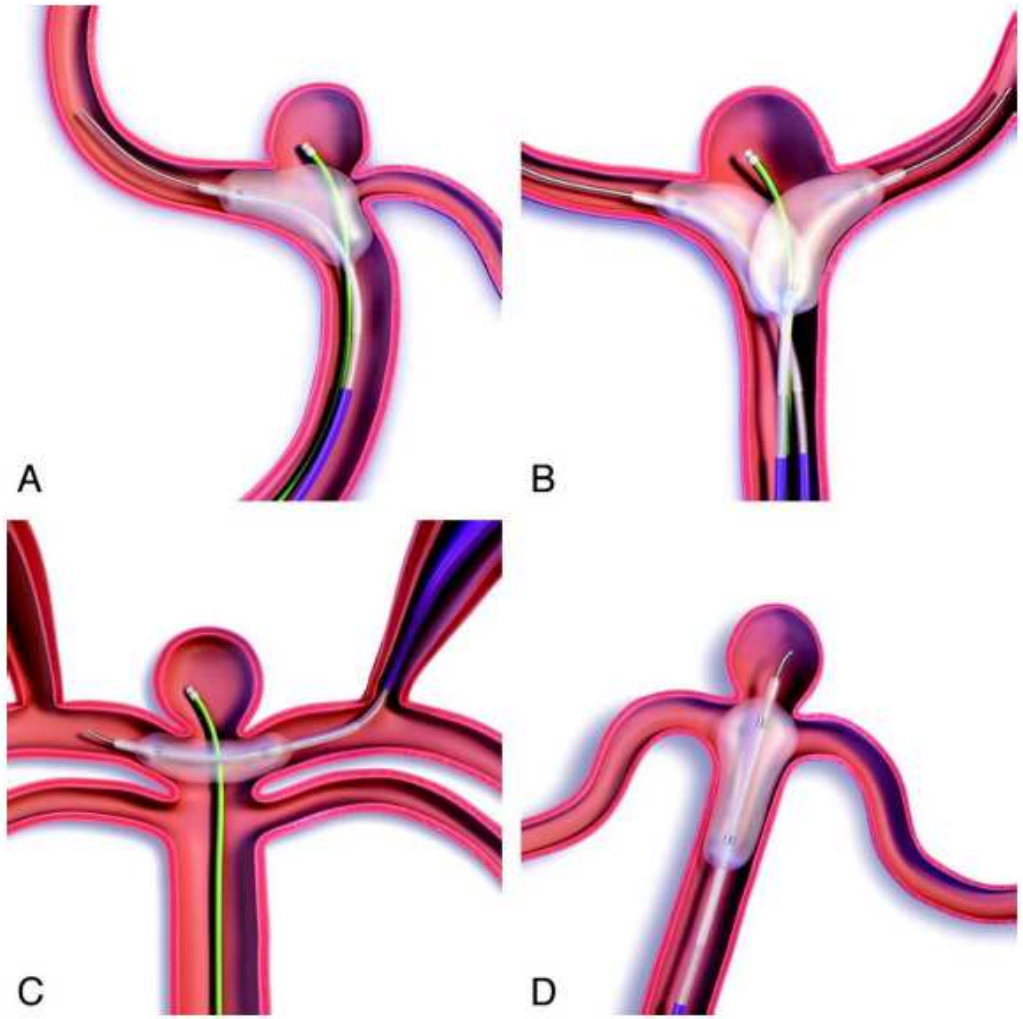
Per il trattamento degli aneurismi a colletto largo in cui, con il trattamento standard, le spirali rischiano di migrare fuori dalla sacca o in cui non è possibile ottenere un adeguato grado di occlusione e di compattamento della matassa, si sono affermati dei sistemi di assistenza al coiling:

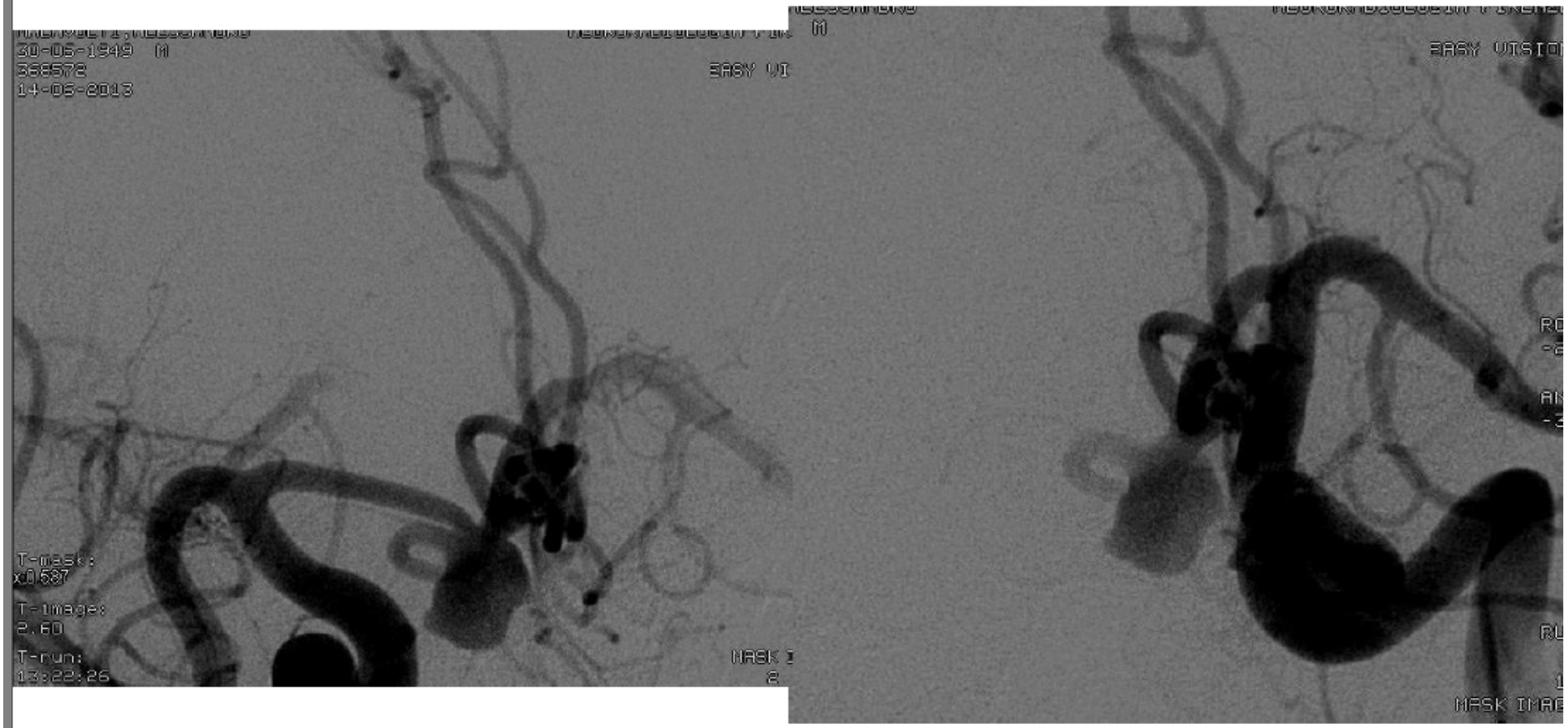
Balloon-assisted coiling

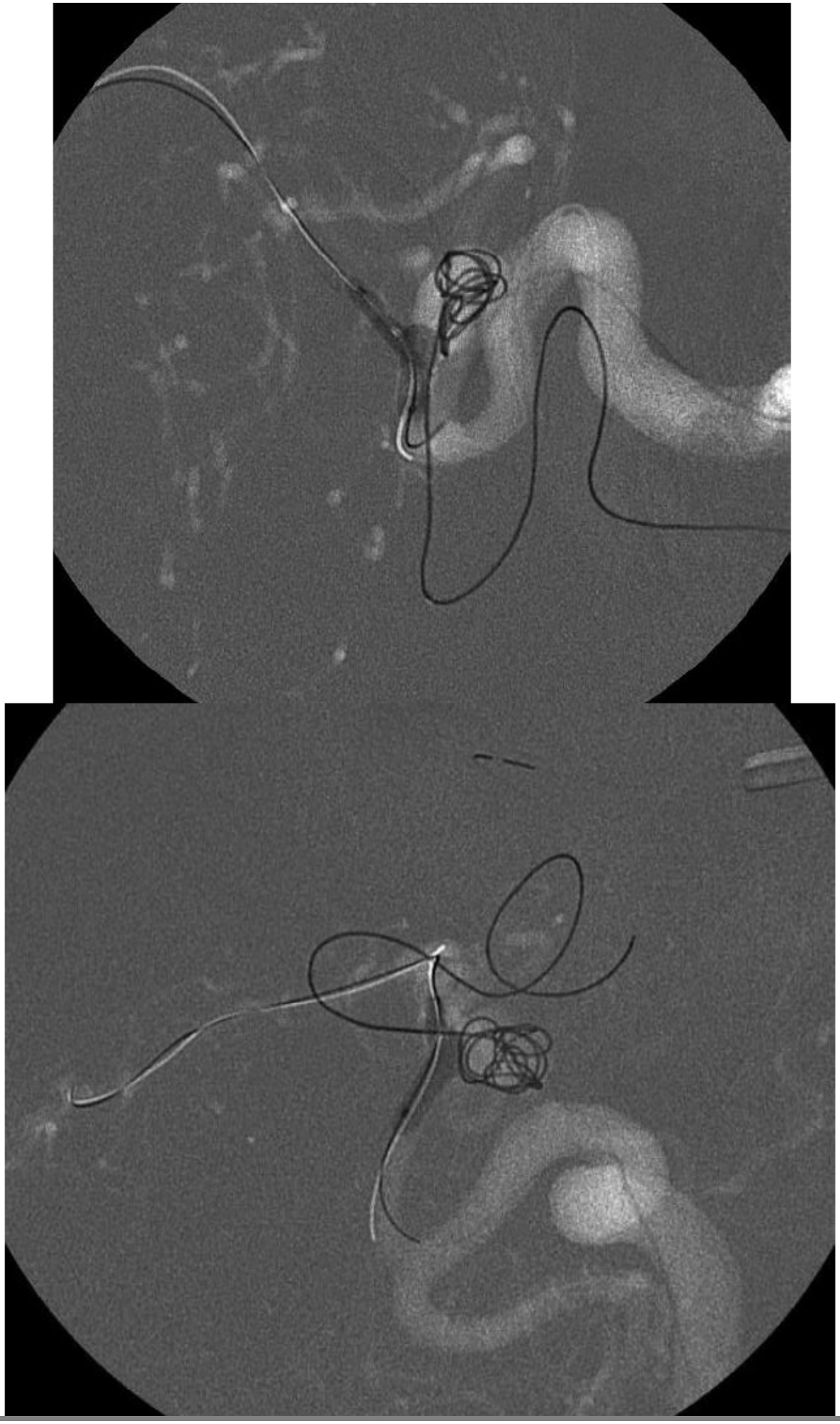
Stent-assisted coiling

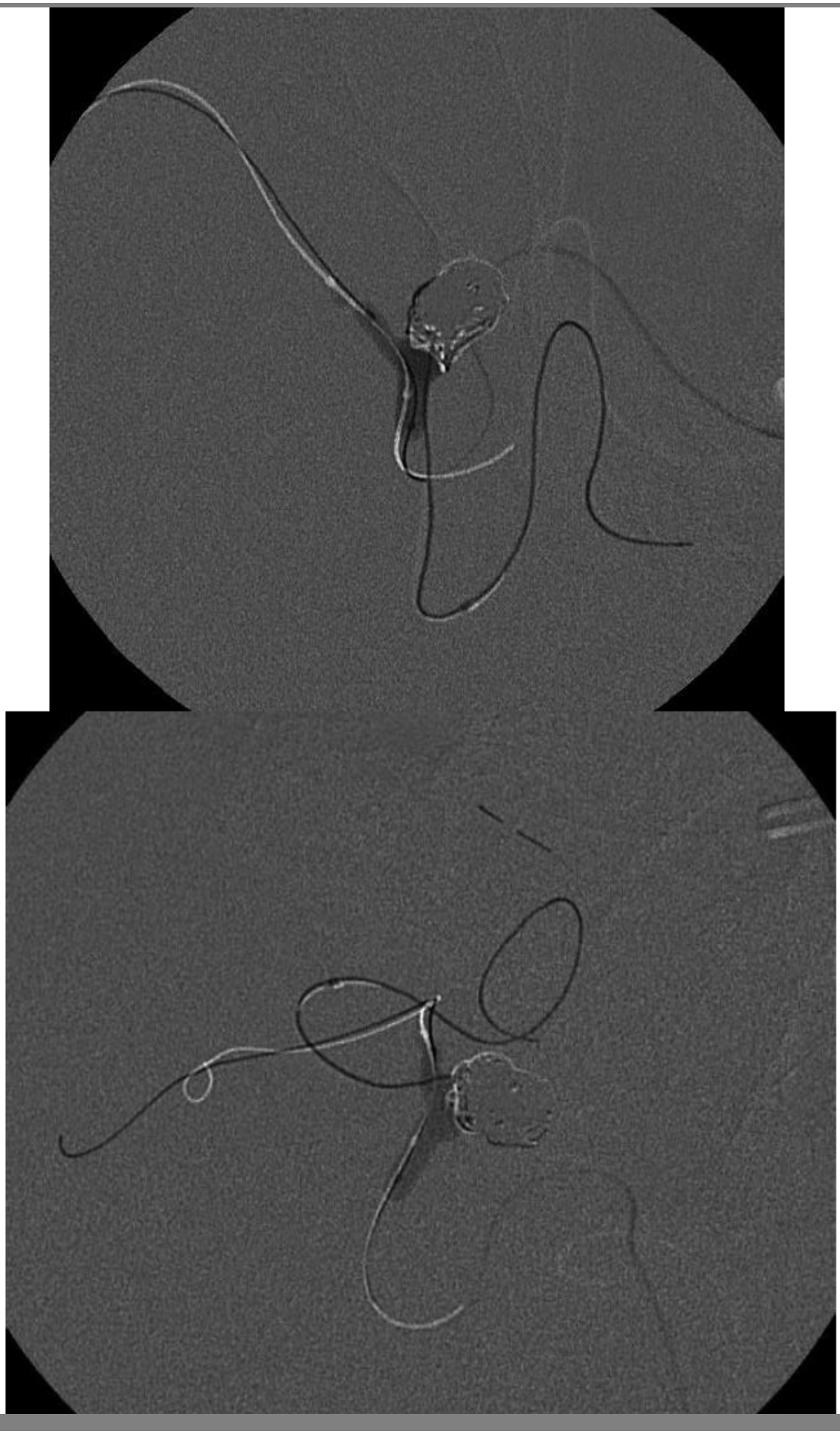
Balloon-assisted Coiling

Tecniche “Creative”




30-06-1949 M
368572
14-05-2013
EASY VI
T-mask:
x0.587
T-image:
2.60
T-run:
13:22:26
MASK I
2
M
EASY VISIO
MASK IMA






ID:AN2687752
No:30011
ModelPHILIPS INT

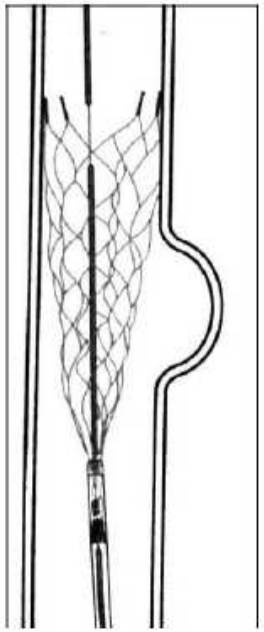
Stent-assisted Coiling

Rilasciando lo stent a copertura del colletto prima del rilascio delle spirali se ne previene la migrazione nel vaso parente e si favorisce la riparazione endoteliale

Stent

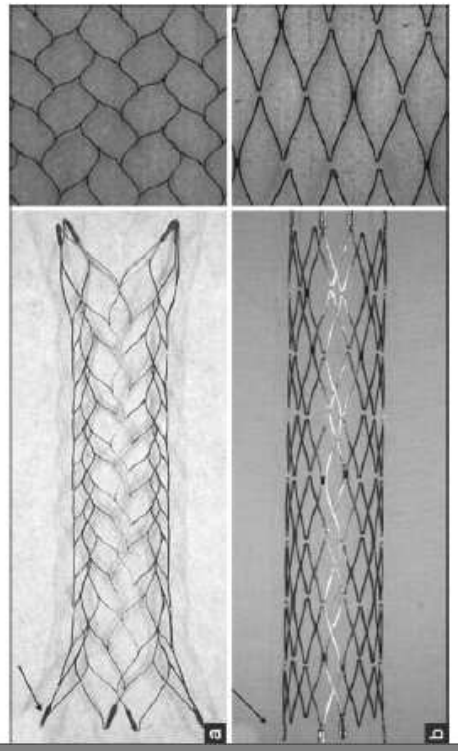
su pallone

autoespandibili



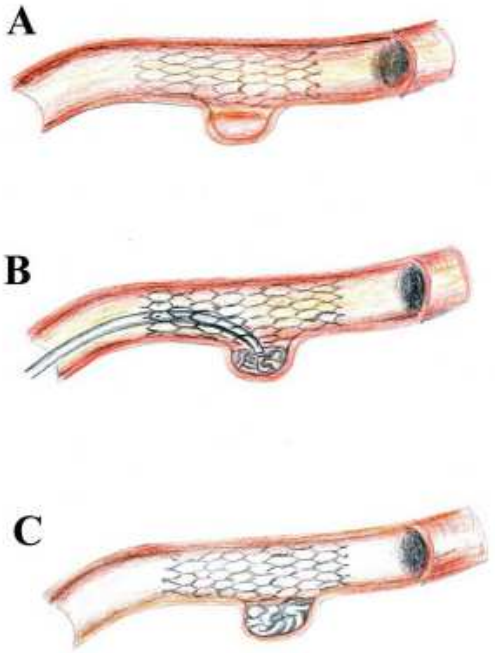
celle chiuse

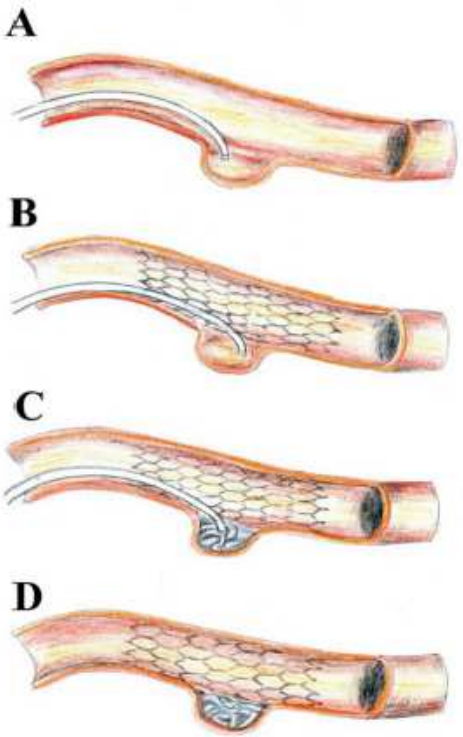
celle aperte



Stent-assisted Coiling

tecnica standard



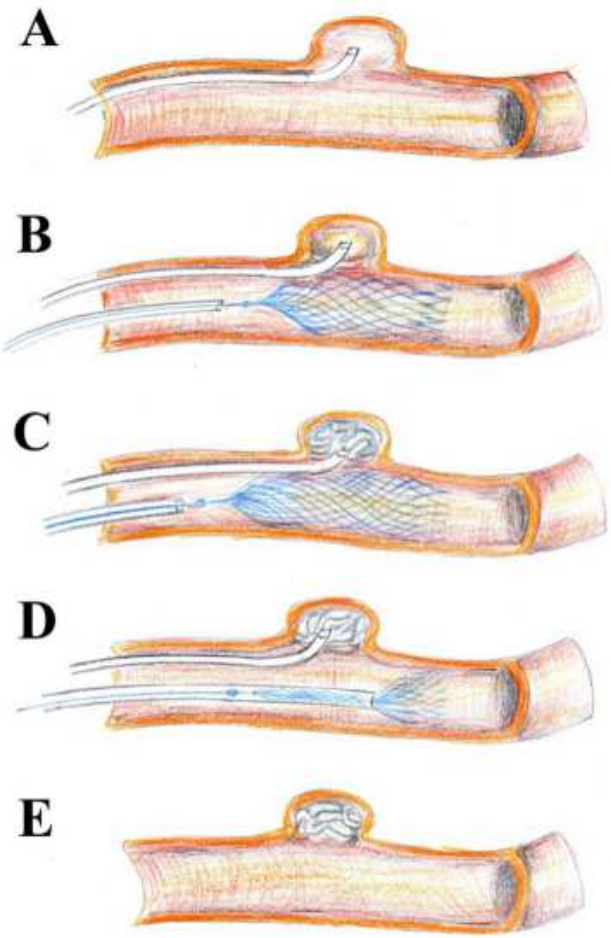


jailing

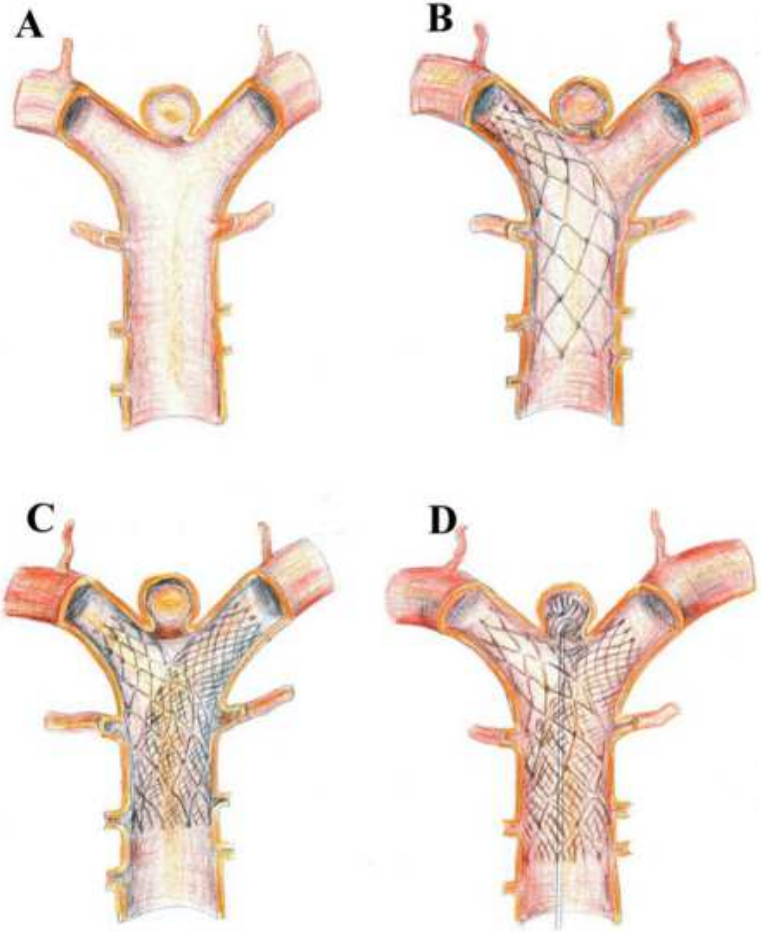
Stent-assisted Coiling

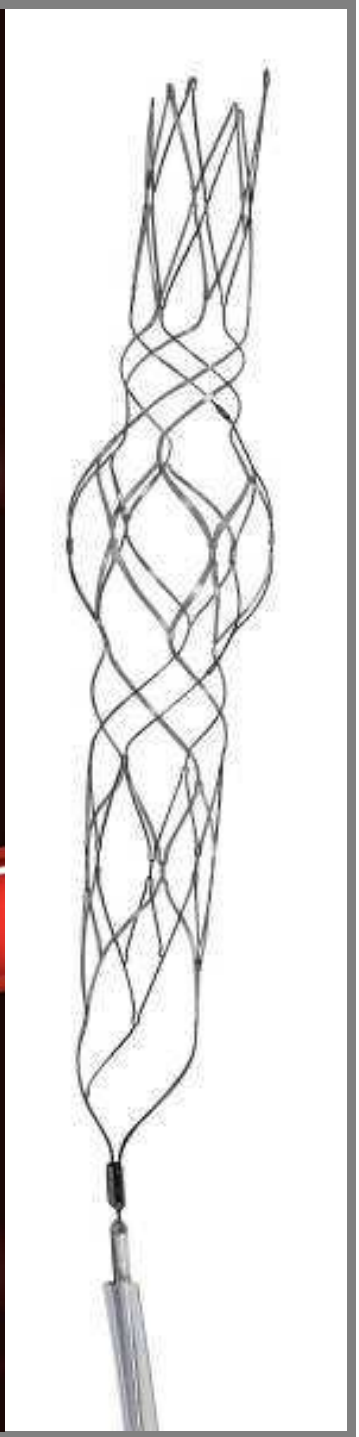
Tecniche "Creative"

stenting temporaneo



Y stenting

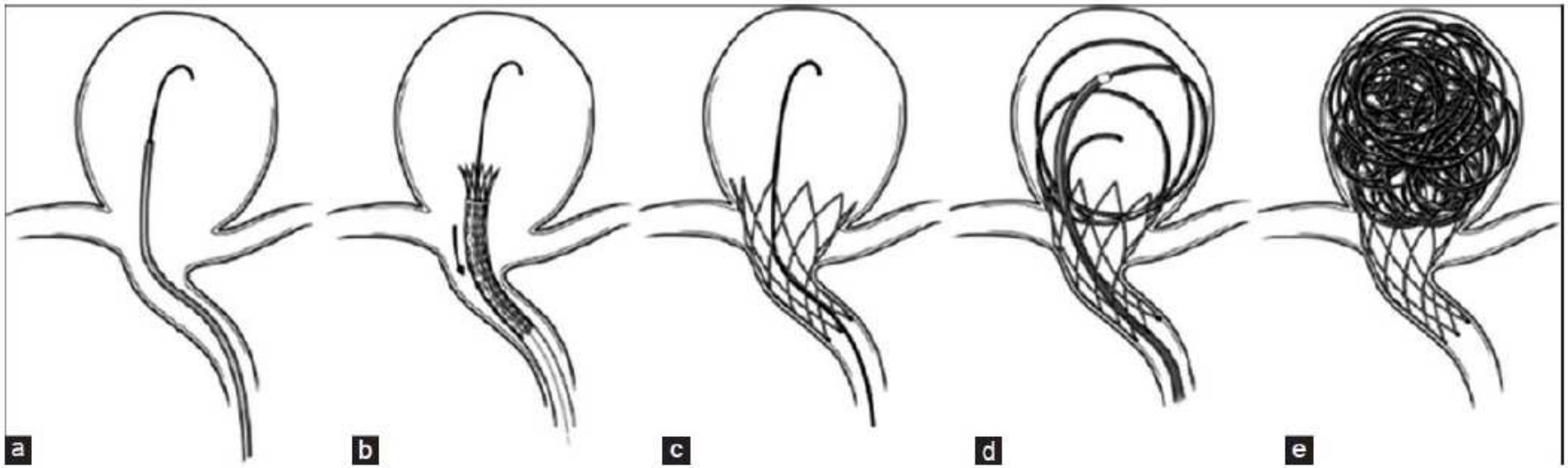




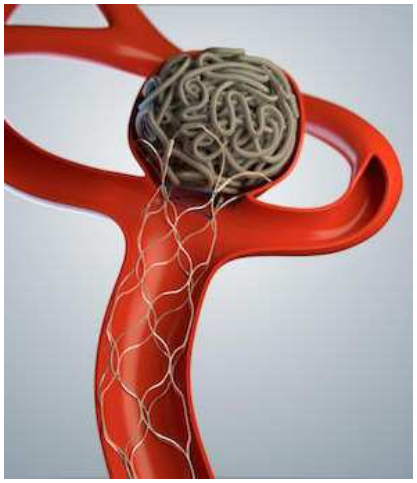
Stent-assisted Coiling

Tecniche “Creative”

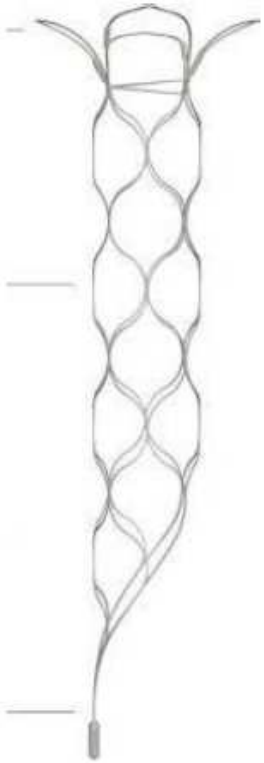
Stenting a cono gelato
(Waffle cone)



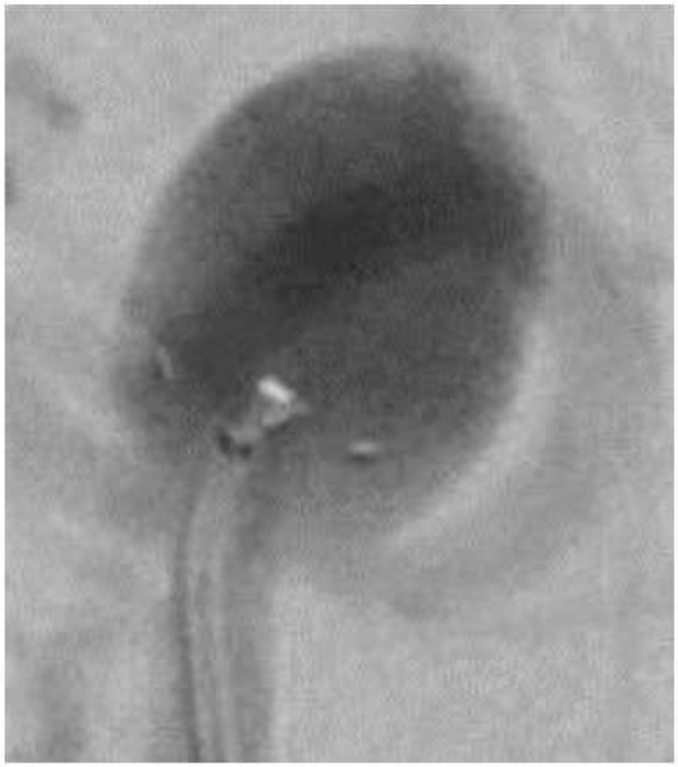
Stent-assisted Coiling
Tecniche “Creative”

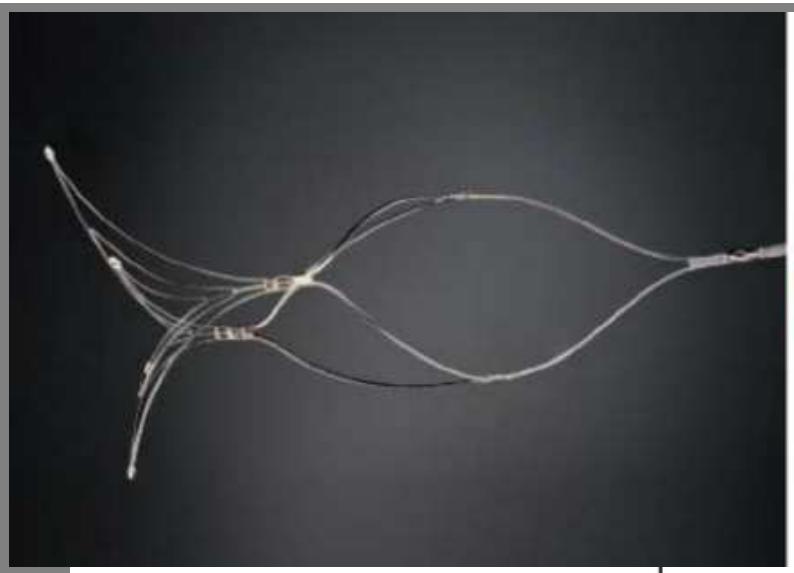


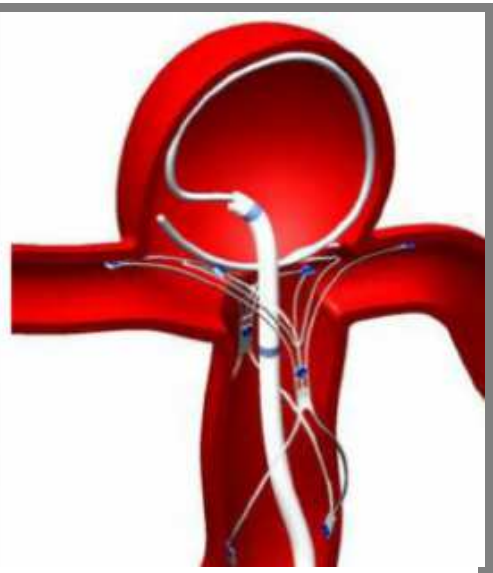
Stenting a cono gelato



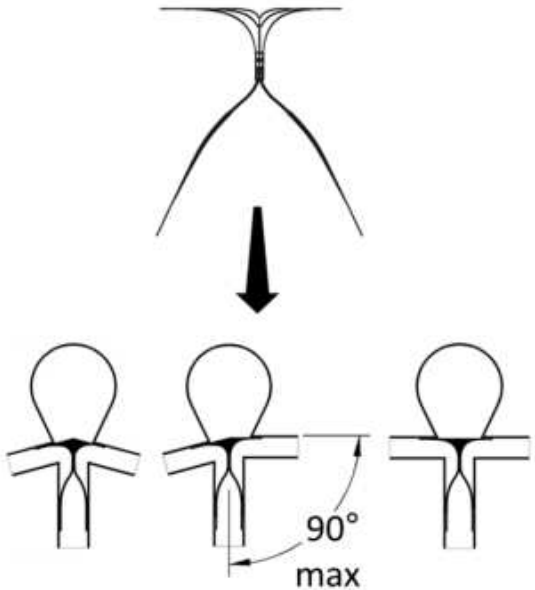
pCONUS





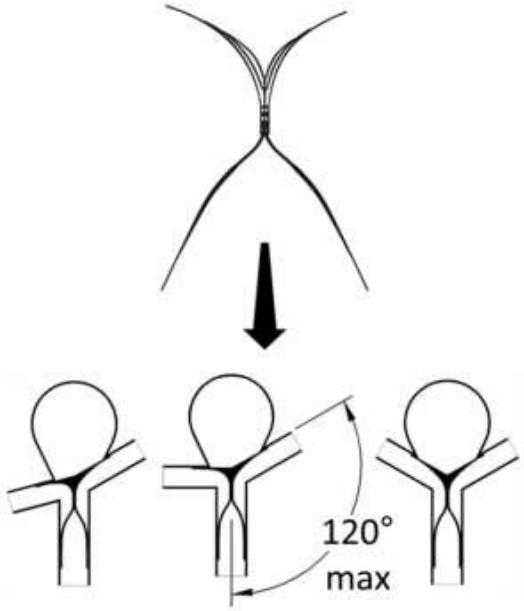


T PulseRider



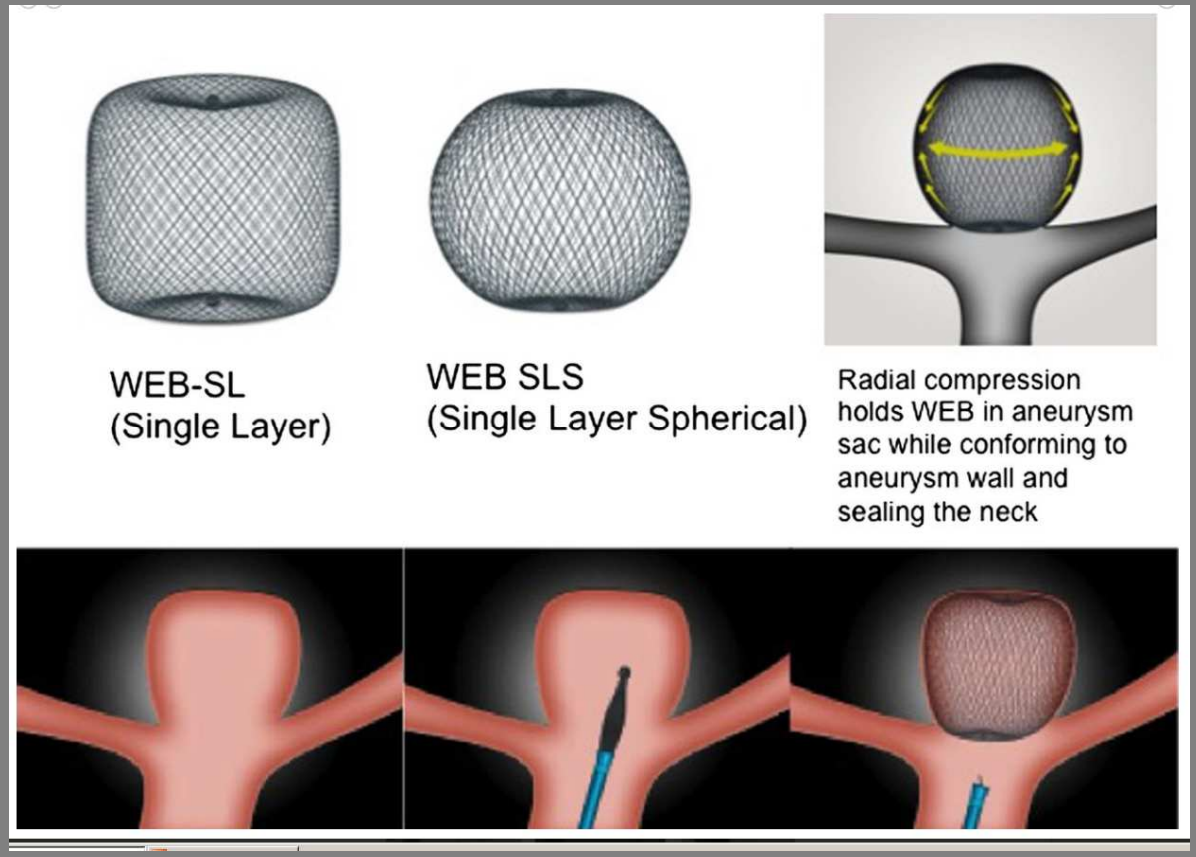
Typical examples of anatomical variations appropriate for "T" shape PulseRider

Y PulseRider



Typical examples of anatomical variations appropriate for "Y" shape PulseRider

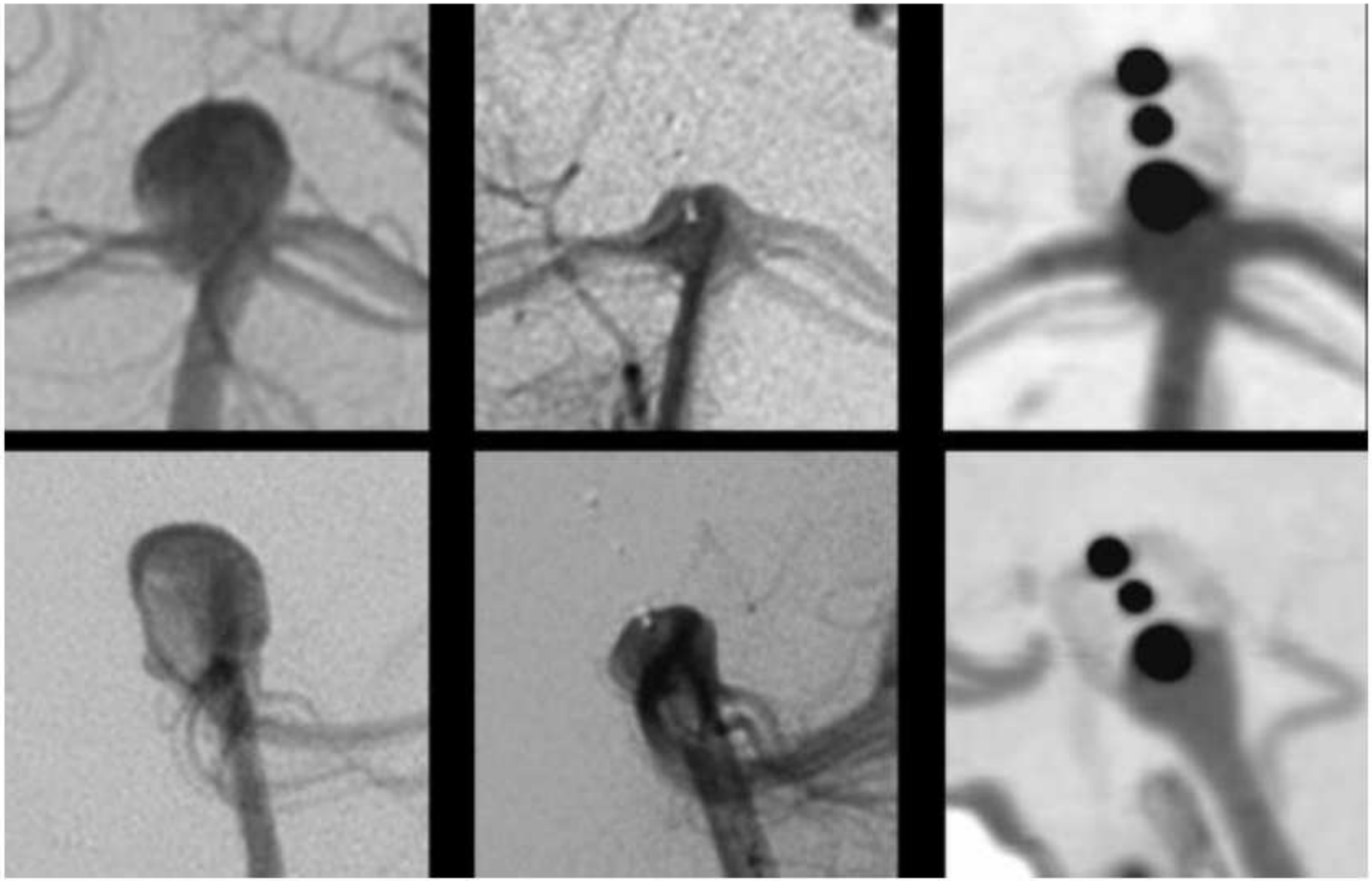
DIVERSORI DI FLUSSO INTRASACCULARI



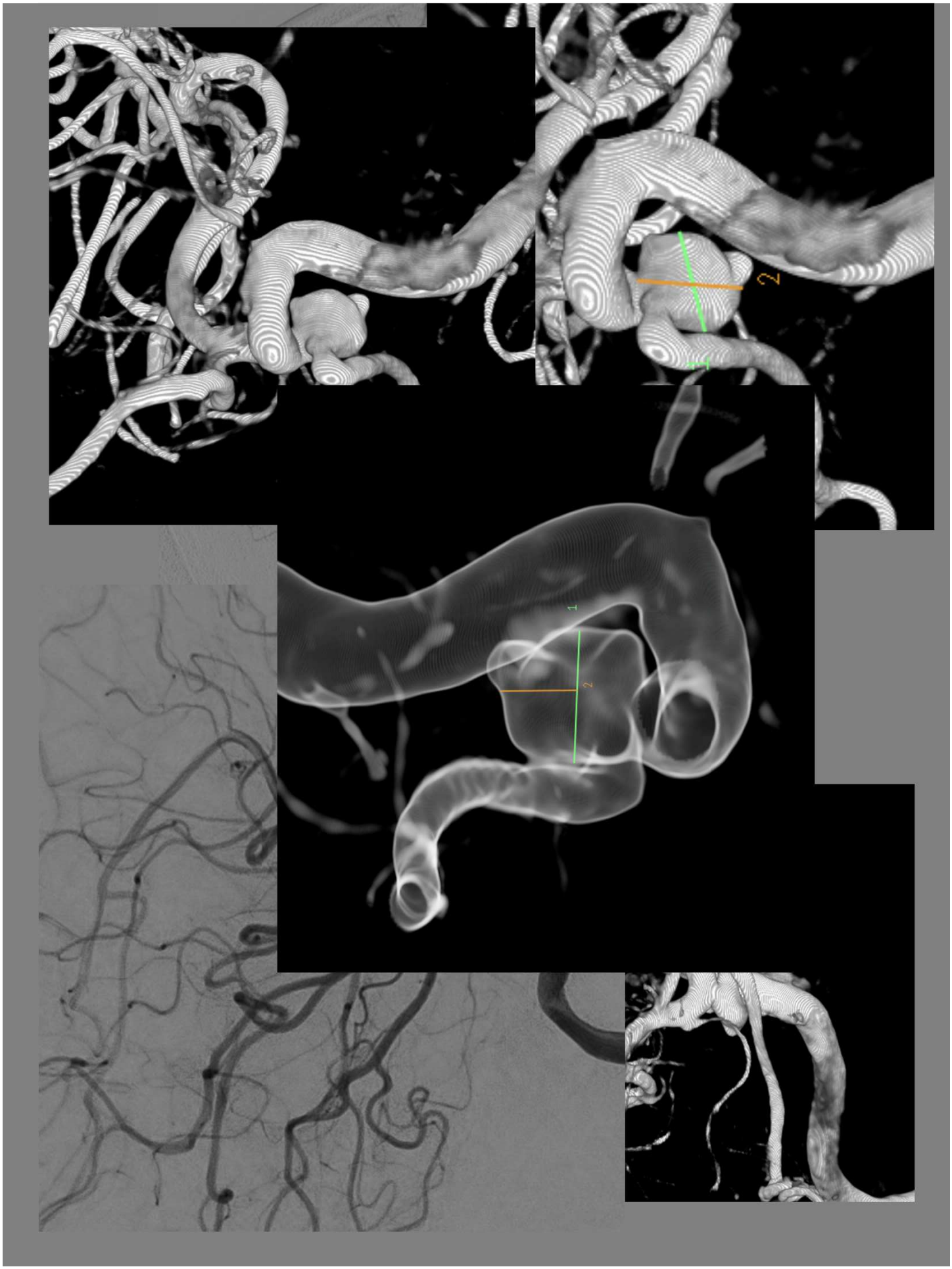
WEB II

Aneurisma apice della basilare intatto
Ø 10,5 x 9,6 x 9,5 mm

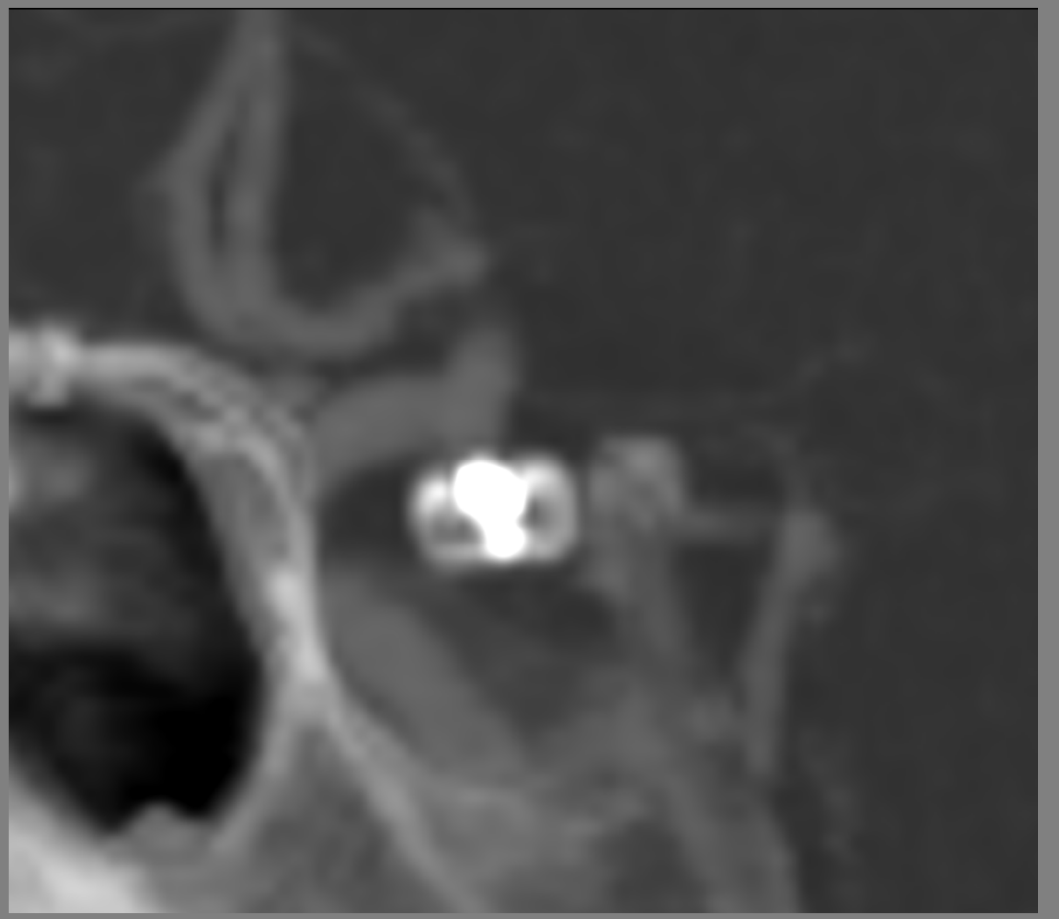
Aneurisma apice della basilare intatto
Ø 10,5 x 9,6 x 9,5 mm



dopo 1 anno


2
1
1
2


V 4.60 cm
lter
OI



Trattamento endovascolare degli aneurismi
- differenti strategie -

Come flusso
da modificare

- DB
- Coiling

Come sacca
da riempire

- Coiling
- Remodelling
- Stent + coils
- WEB

Come parete
da curare

- Stent ricoperti
- Stent autoesp.
- Diversori di flusso

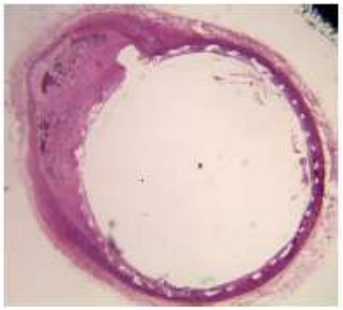
Chiusura
della breccia
di parete

STENT INTRACRANICI per Diversione di Flusso

- Celle molto strette con conseguente bassa porosità
- Marcato rallentamento del flusso ematico all'interno dell'aneurisma e conseguente progressiva trombosi
- Endotelizzazione dello stent con riparazione della parete arteriosa
- Occlusione ritardata dell'aneurisma (3-12 mesi)

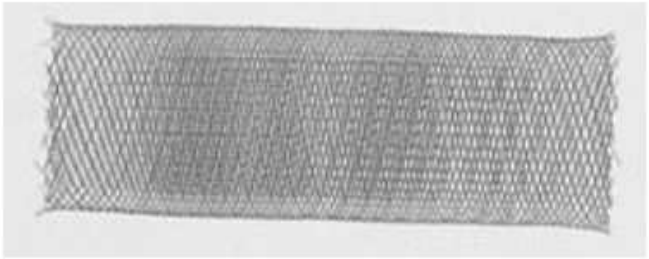
30 gg

90 gg

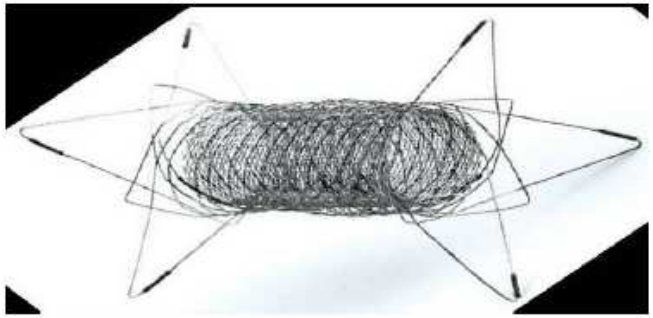


180 gg

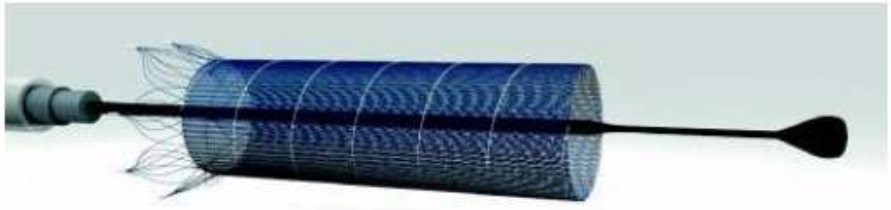
STENT INTRACRANICI per Diversione di Flusso



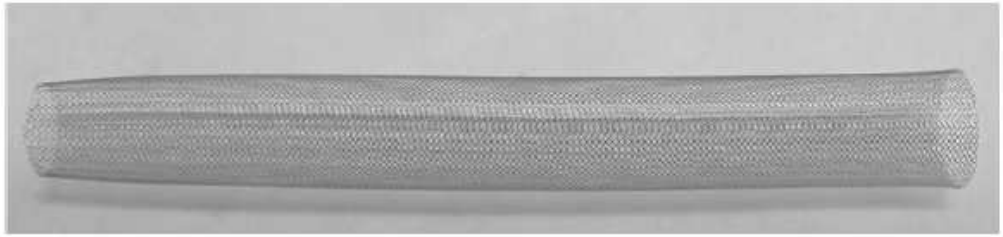
48 fili



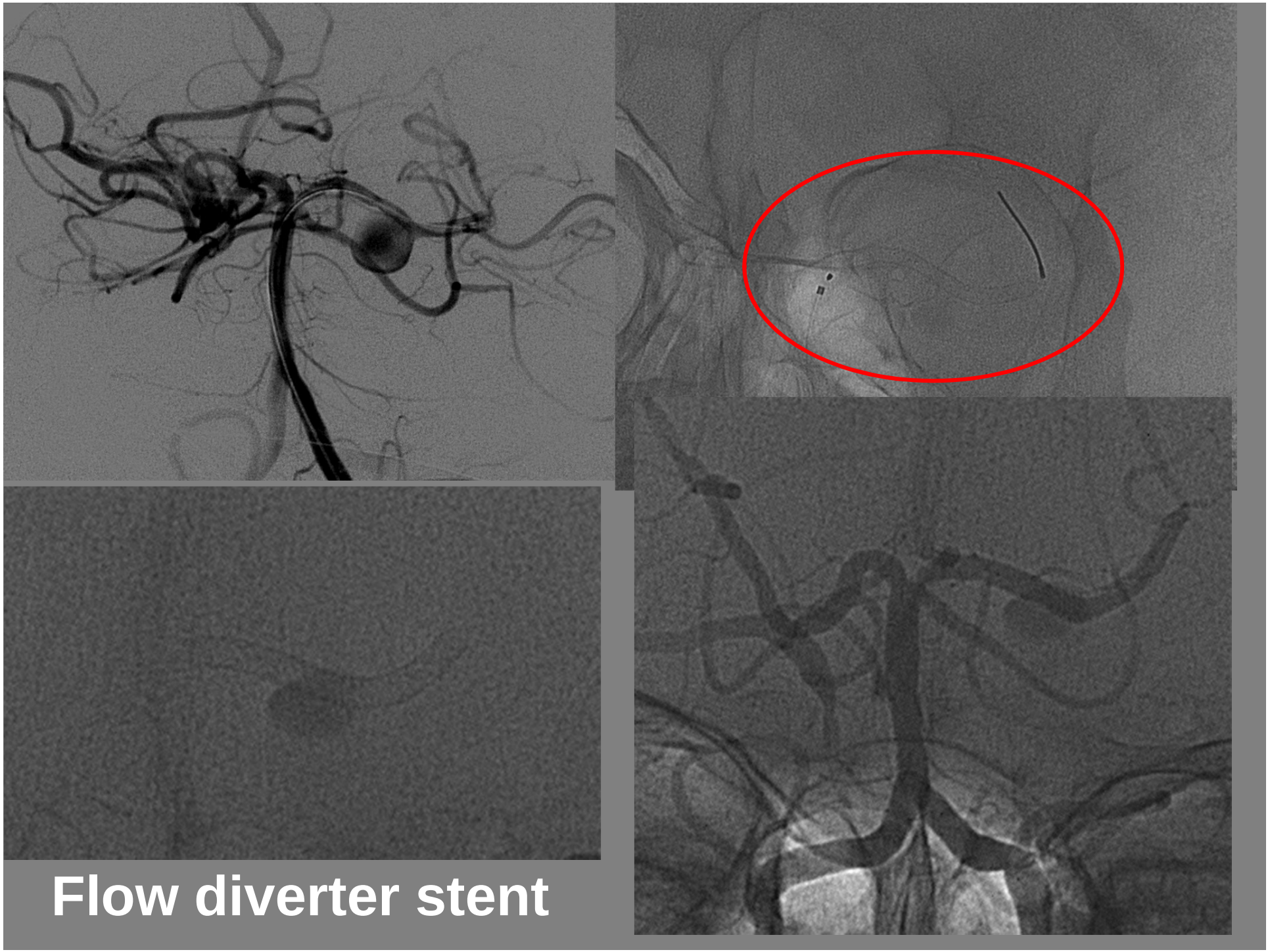
16 + 48 fili

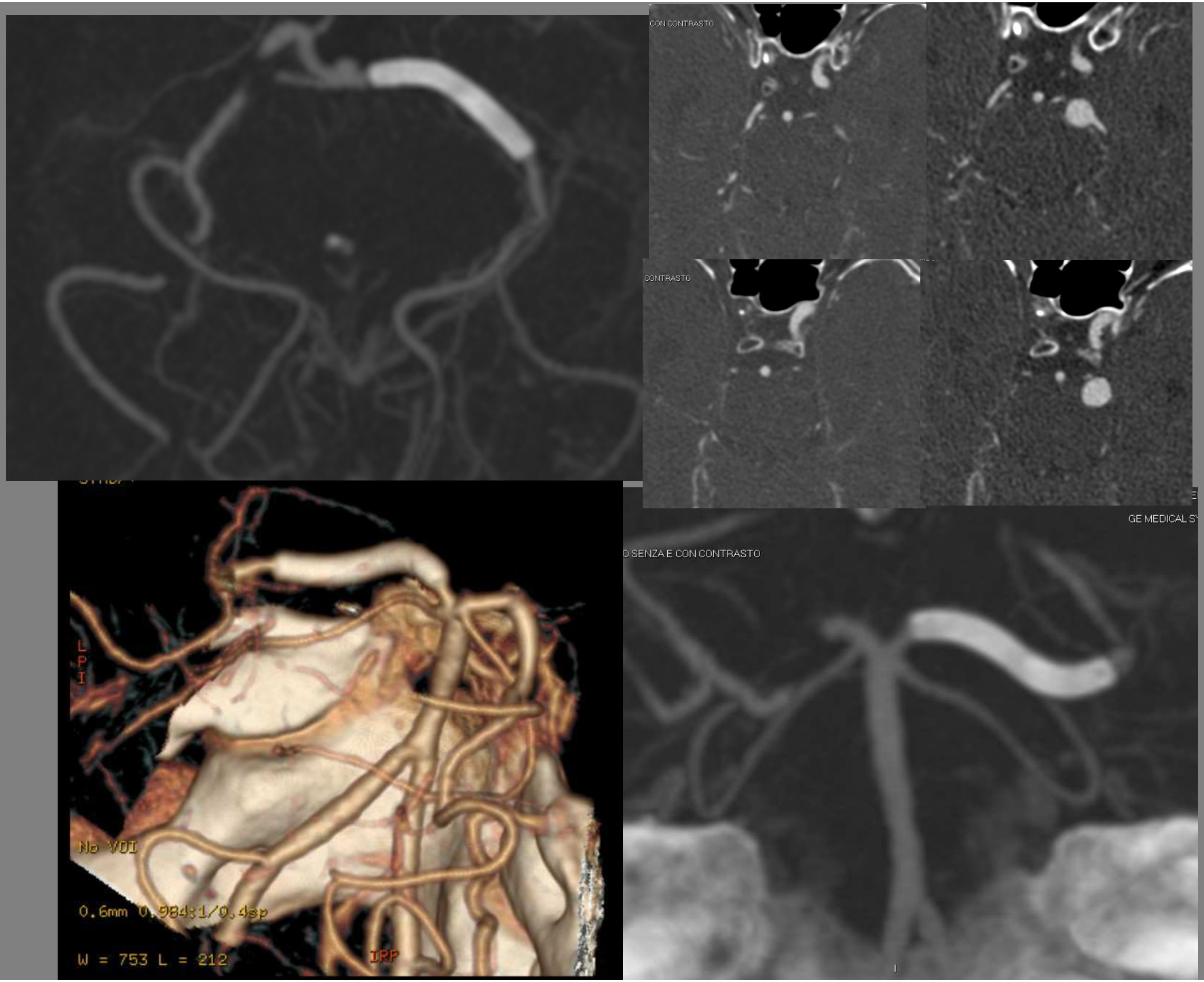


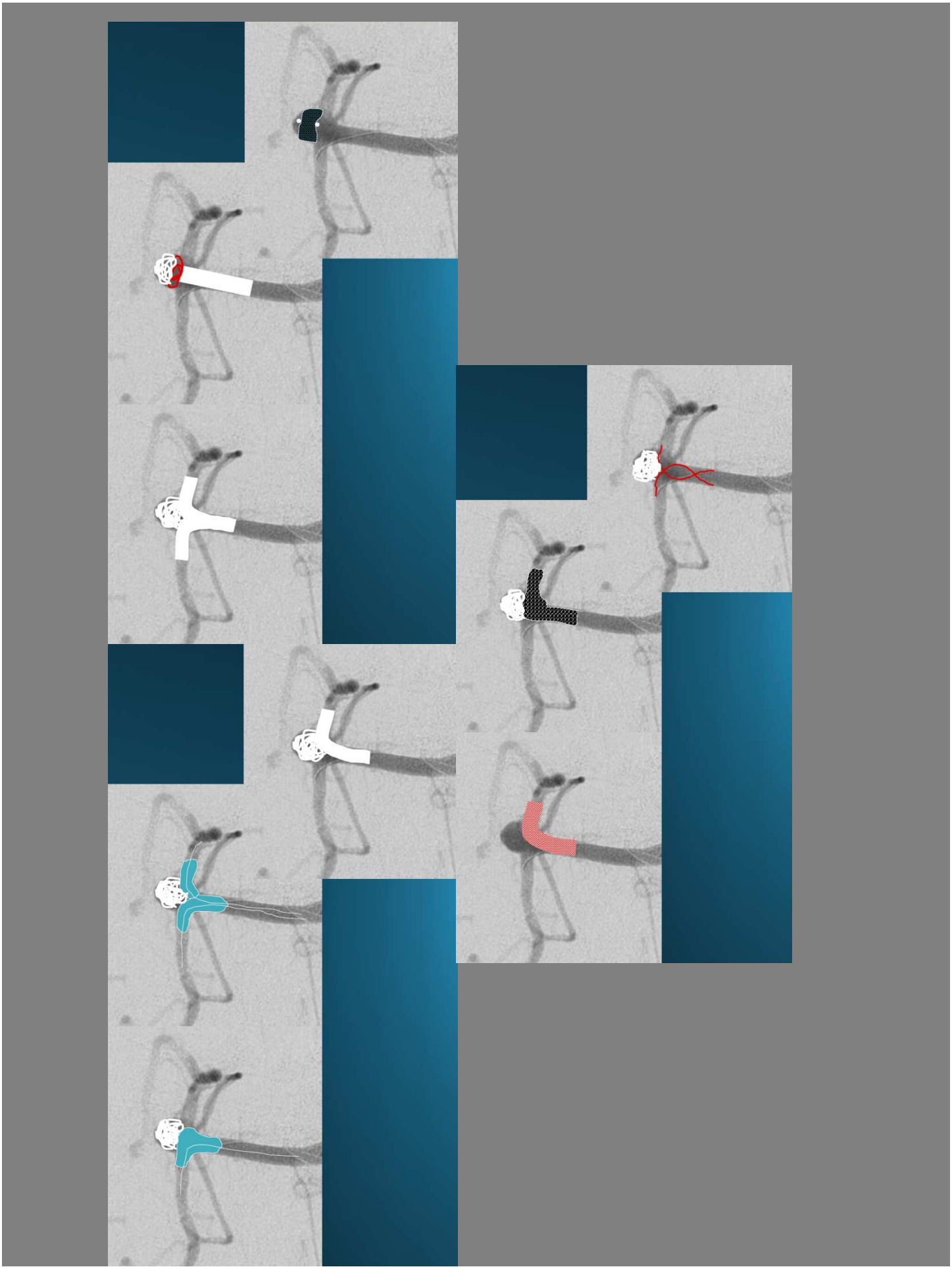
64 fili



96 fili


Flow diverter stent


CON CONTRASTO
CONTRASTO
GE MEDICAL S
O SENZA E CON CONTRASTO
L
P
I
No VOI
0.6mm 0.984:1/0.4sp
W = 753 L = 212
IRP



Grazie a voi per l’attenzione e.....
a loro!