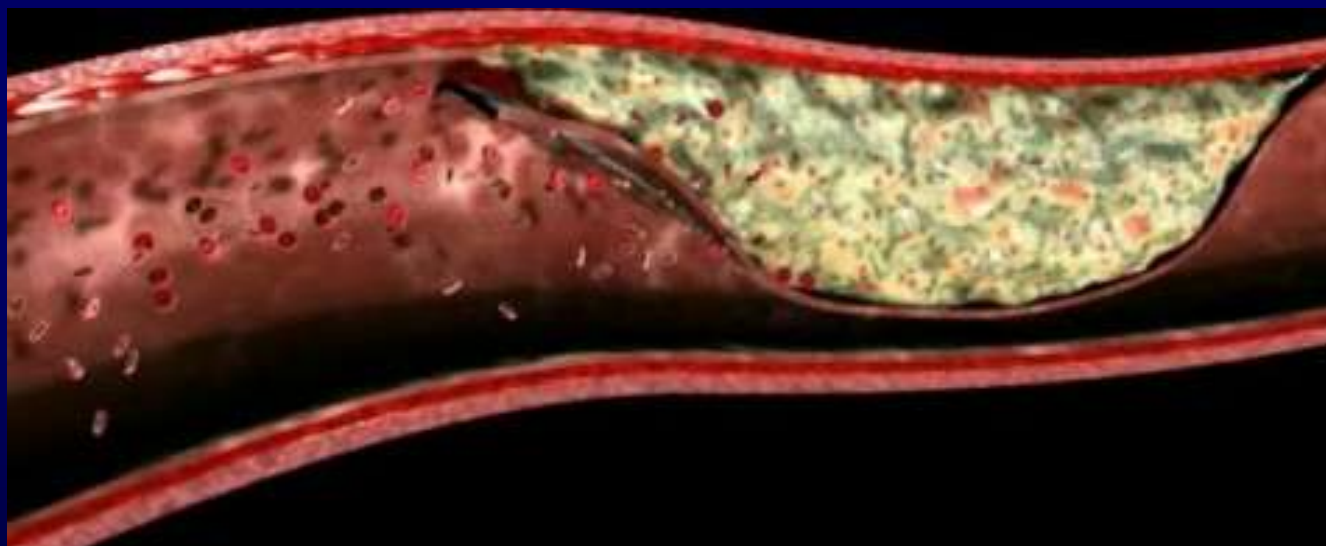




The 5th Annual International Neurosurgery Conference

27-30 December 2009

# EXTRA AND INTRACRANIAL ARTERIAL DISSECTIONS

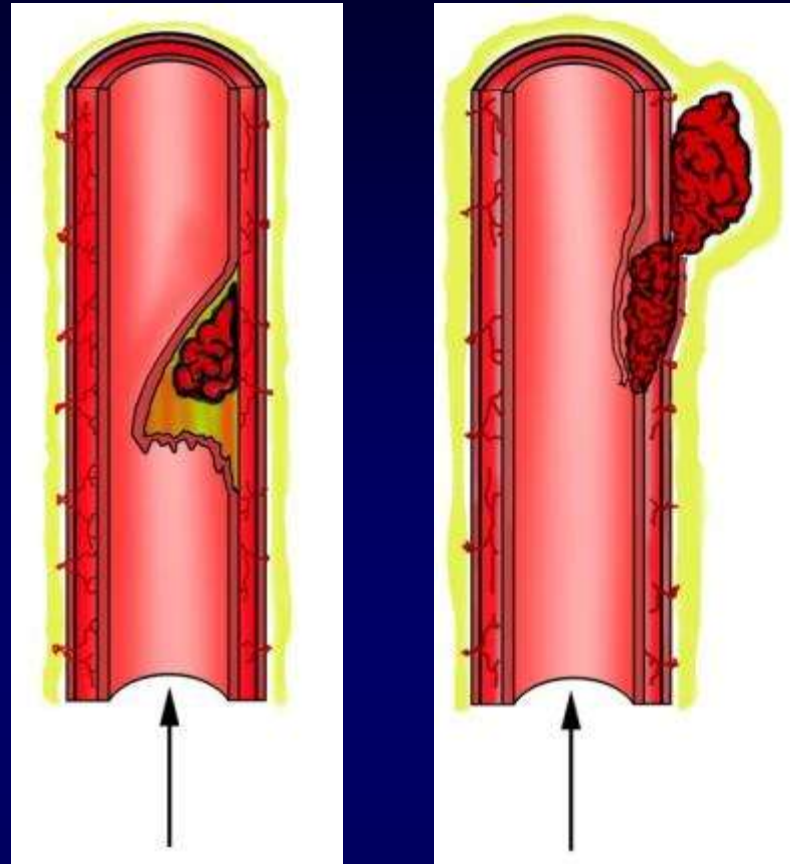


**PROF. DR. LEONIDAS QUINTANA MARÍN**  
**CÁTEDRA DE NEUROCIRUGÍA- UNIVERSIDAD DE VALPARAÍSO - CHILE**



1

## INTRODUCTION



The dissection is caused by the entry of blood into the arterial wall with formation of an intramural hematoma, that progresses separating the parietal layers, and may be located under the intima (sub-intimal) or between the media and adventitia (sub-adventitial).

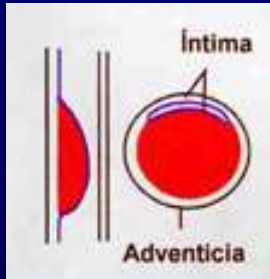
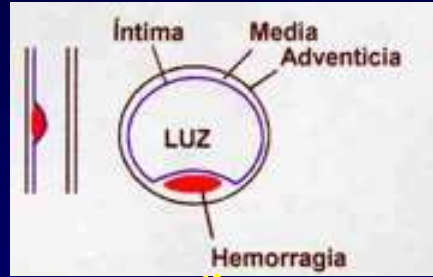
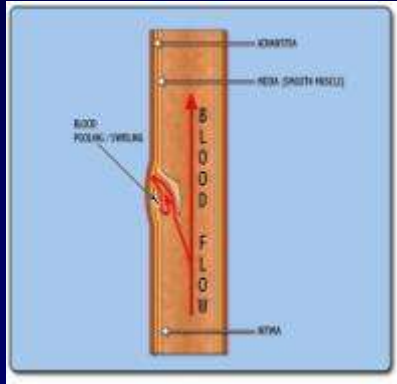
The first usually give symptoms of obstruction of the lumen, the second produce compression of adjacent structures or extravasation of blood.

## 2 EPIDEMIOLOGY

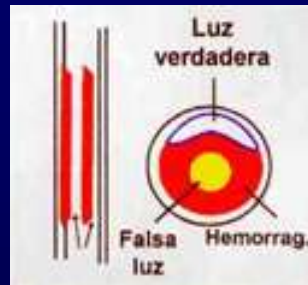
- The carotid artery dissections have an **annual incidence of 2.5 -3 / 100,000**. The data for the vertebral territory is **1-1.5 / 100.00 inhabitants / year**. (1)
- **This is a disease of young people (30 to 50 years)**, has also been described in children and older adults (2).
- **Corresponds to a 2.5 - 5% of the etiology of ischemic stroke** (3).
- In patients under 60 years produce about 22% (20-25%) of Ischemic stroke (4).
- **The most frequent site of dissection is the portion of extracranial vessels**.

1. Schievink WI, Mokri B, Whisnant JP. Internal carotid artery dissection in a community. Rochester, Minnesota, 1987-1992. Stroke 24 (11): 1678-80, 1993.
2. Schievink WI, Mokri B, O'Fallon M. Recurrent spontaneous cervical-artery dissection. N Engl J Med 330: 393-7, 1994.
3. Bogousslavsky J, Despland PA, Regli F. Spontaneous carotid dissection with acute stroke. Arch Neurol 44(2): 137-40, 1987.
4. Bevan H, Sharma K, Bradley W. Stroke in young adults. Stroke 21 (3): 382-6, 1990.

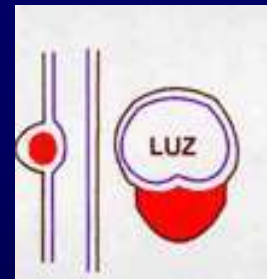
# PATHOPHYSIOLOGY



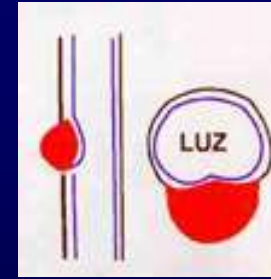
**SUBINTIMAL HEMORRHAGE  
STENOSIS- OCCLUSION**



**RUPTURE INSIDE THE  
LUMEN - FALSE LUMEN.**



**ANEURYSMATIC  
DILATION**

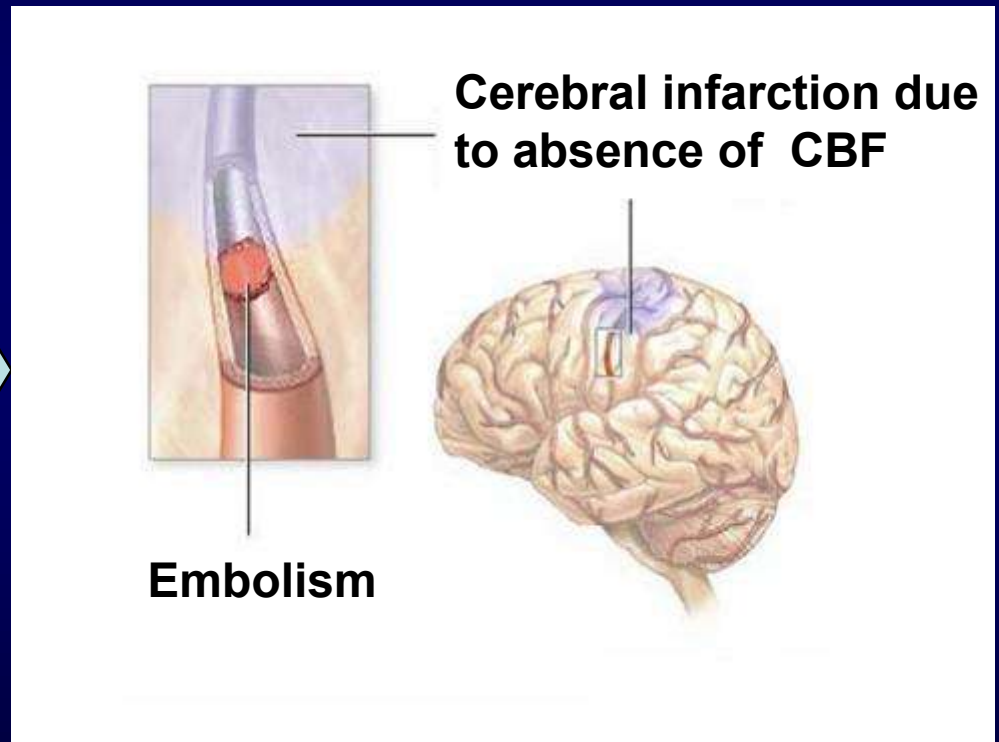
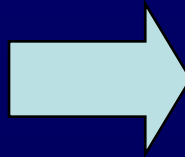
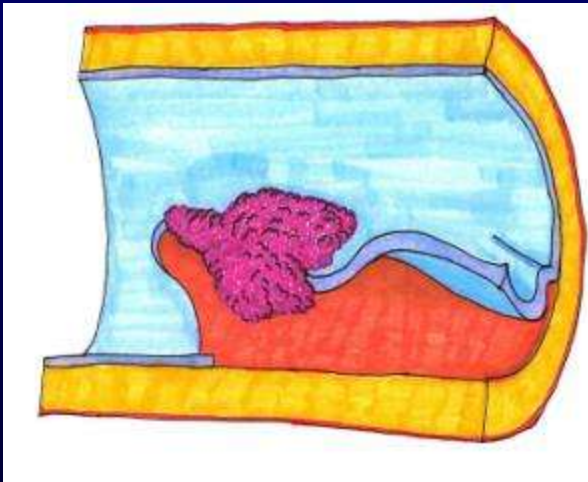
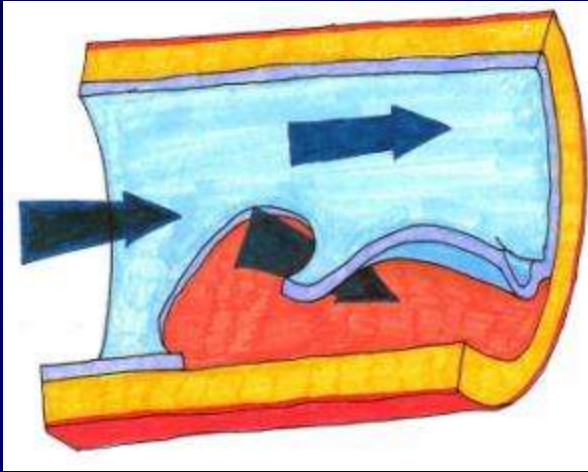


**PSEUDO-ANEURYSM**



### 3 Pathophysiology

Both may produce distal embolism to intracranial arteries.



# 4

## TOPOGRAPHY

### Distribution of cerebrovascular dissections

<b>Extracranial 90%</b>	<b>Intracranial 10%</b>
<b>- ICA 75 % at 2 cm distal from the bifurcation</b>	<b>- ICA supraclinoid segment, MCA (M1), and ACA (A1)</b>
<b>- Vertebral artery 25% segments V<sub>3</sub> , V<sub>1</sub></b>	<b>-Vertebral artery V<sub>4</sub> segment</b>
<b>ICA: internal carotid artery; V: vertebral artery; MCA: middle cerebral artery</b>	



4

# Extracranial arterial dissections

## Cervical ICA



**Sub-intimal cervical ICA dissection**

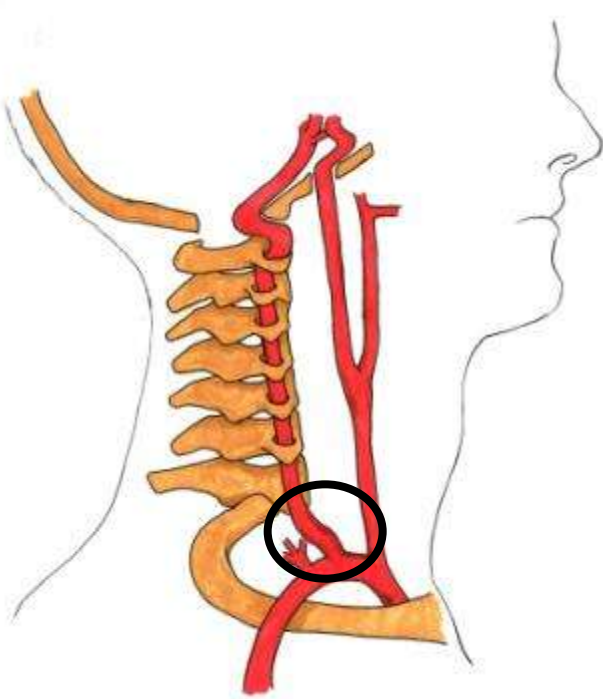


**Sub-adventitial cervical ICA dissection**

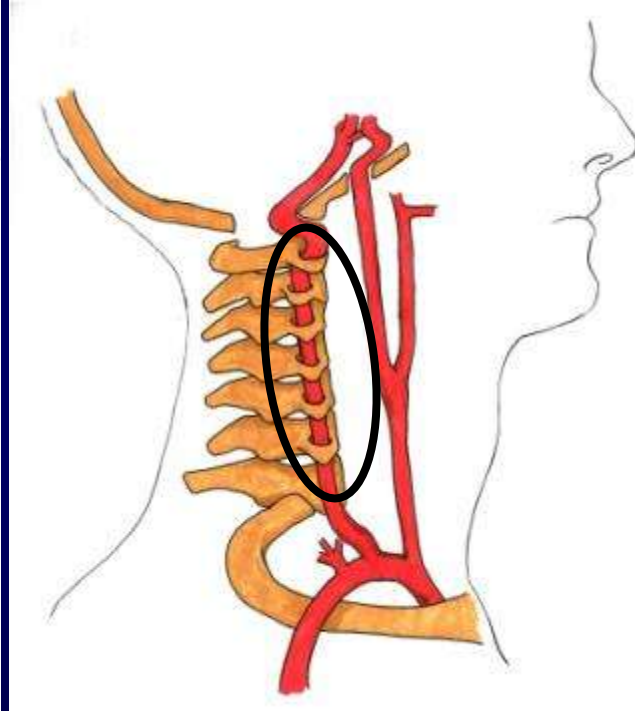
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# Extracranial arterial dissections

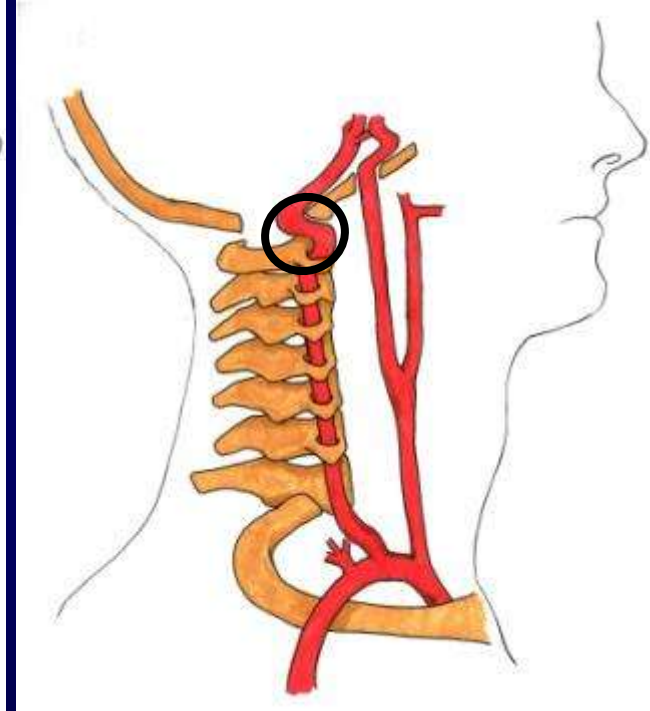
## Cervical Vertebral Artery



V1



V2



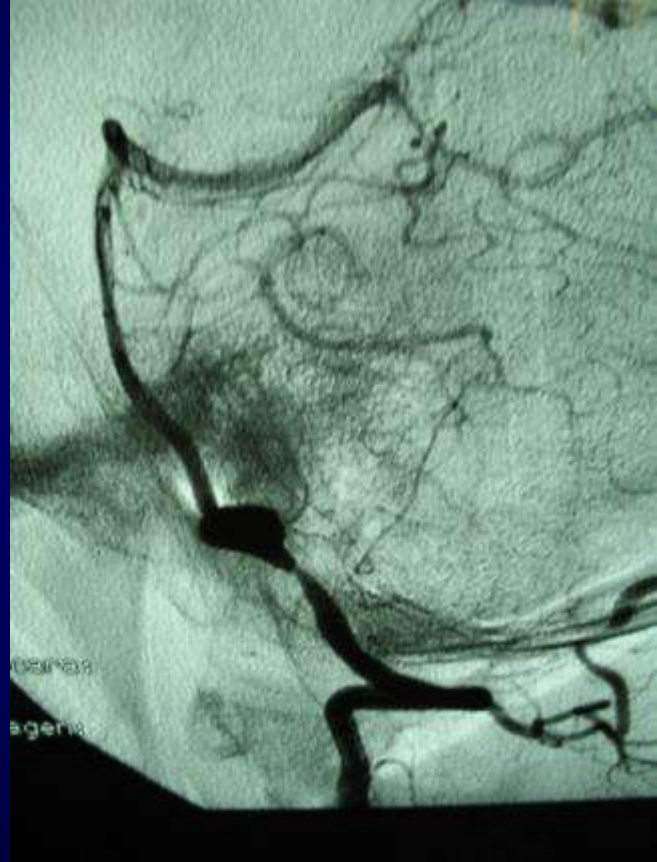
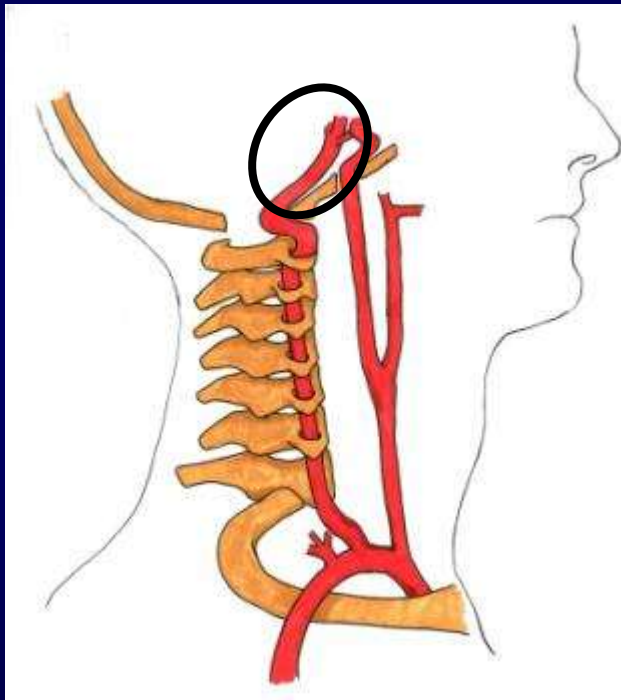
V3



# 4 Intracranial Arteries Dissections

## Intradural Vertebral Artery V4

V4



4

# Intracranial Arteries Dissections Internal Carotid Artery



**BLOOD BLISTER LIKE ANEURYSM**

## 5 ETIOLOGY

The most common presentation is spontaneous and secondly the traumatic.

In relation to **spontaneous dissections**, predisposing conditions have been described, as a basis:

### **Systemic Hypertension**

Dyslipidemia

Diabetes Mellitus

Smoking

History of cerebral and aortic aneurysms

Oral contraceptives

History of stroke and family history of arterial dissections

### **Diseases associated with connective tissue**

As several primary arteriopathy: fibromuscular dysplasia is present in 15 to 20% of cases, has also been linked to Marfan syndrome, Ehlers-Danlos type IV, cystic medial necrosis, a 1 antitrypsin deficiency, osteogenesis imperfecta , homocysteinemia and Pseudoxanthoma elasticum.

**NOTE: A study with electron microscopy showed abnormalities of connective tissue (collagen and elastic fibers) in 68% of patients with spontaneous dissection.**

## **5 ETIOLOGY**

With regard to **traumatic causes**, numerous publications have shown the association between minor cervical trauma and strong physical efforts with cerebrovascular dissections (25 to 41% of cases).

It has been described in relation to:

cough, vomiting

delivery

weightlifting

pushing vehicles

chiropractic neck exercises

flexo-extension of the neck in rockers

prolonged use of the phone with neck flexion

cervical rotation

## 6 CLINICAL PICTURE

### Extracranial Dissections

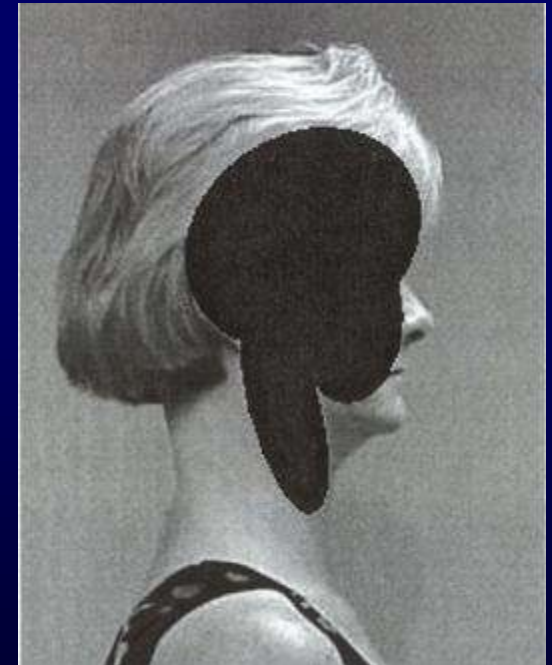
### Cervical Internal Carotid Artery

The classical clinical triad of ICA dissection is :

Ipsilateral headache

Cerebral ischemic signs and symptoms

Ipsilateral Claude Bernard-Horner Syndrome





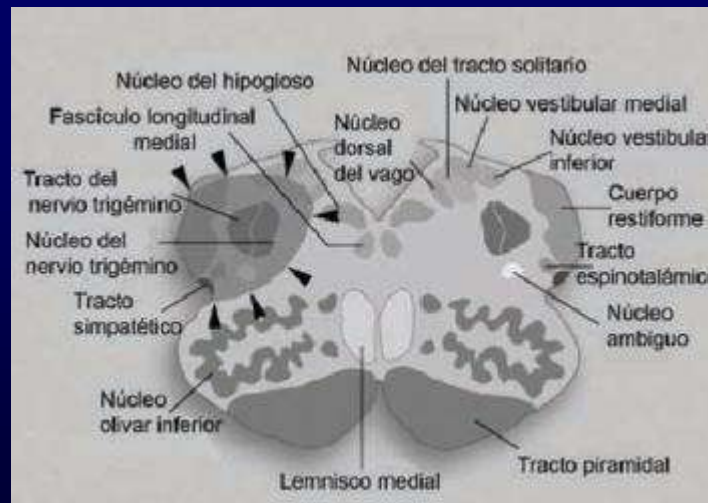
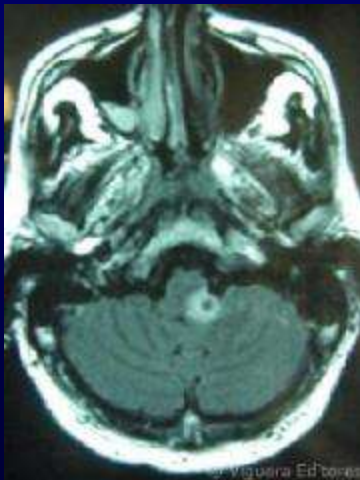
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# CLINICAL PICTURE

## Extracranial Dissections

### Vertebral Artery

Occipital headache  
Frequently a dorsal-lateral infarction of  
Medulla oblongata (Wallenberg Syndrome)



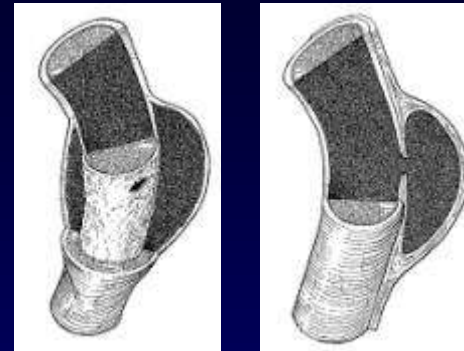


# 6 CLINICAL PICTURE

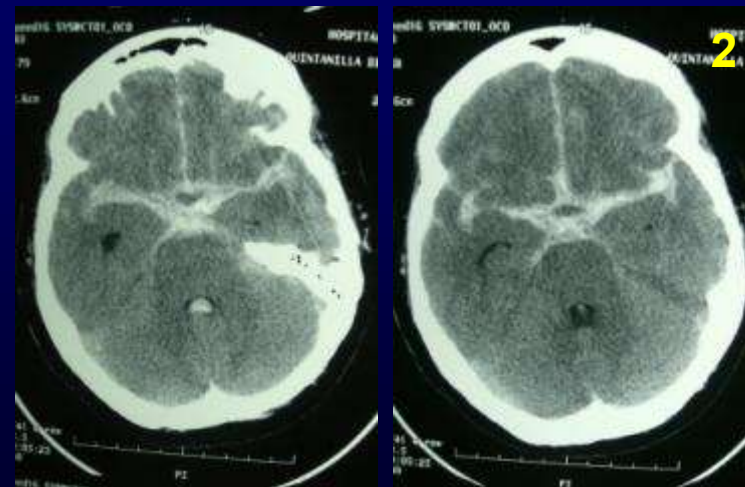
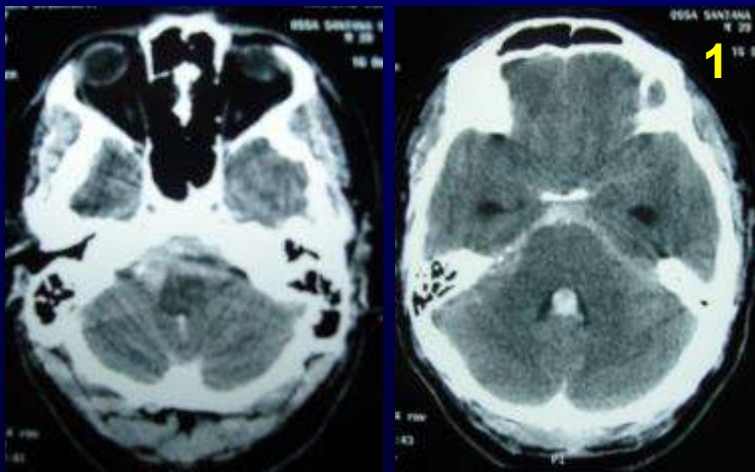
## Intracranial Dissections

### Sub-adventitial

- 1-Fusiform appearance-Vertebral
- 2-Blood Blister Like Aneurysms-ICA



- 1-Vertebral artery– SAH- predominant of posterior fossa
- 2- ICA artery– SAH related with dorsal(superior) ICA- Parasellar SAH, or more extended, and frontal Intracerebral Hemorrhage.



# 7 IMAGENOLOGY

## Ultrasound

The use of complementary techniques of Doppler and carotid duplex with transcranial Doppler have a sensitivity of 95% (1).

**Is greater in cases of total occlusion or severe stenosis.**

Its main disadvantages are the lack of pathognomonic findings dissection and its limitation in diagnosing an intracranial dissection.

**It is now primarily used for screening and initial monitoring of patients.**

There are no studies on their specificity.

The findings may show are: occlusion, stenosis, emboli, echogenic "flap", thrombus, and "tapering" (longitudinally progressive occlusion) (1).

1. Sturzenegger M, Mattle HP, Rivoir A, Baumgartner RW. Ultrasound findings in carotid artery dissection: analysis of 43 patients. Neurology 45: 691-8, 1995.

# 7 IMAGENOLOGY

## Nuclear Magnetic Resonance

Today is the technique of choice for to study cerebrovascular dissections due to its high sensitivity and specificity, able to combine brain and vascular imaging, and it's a noninvasive study.

Other advantages are: it allows to visualize the intramural hematoma, the expansion of the arterial wall and the relationship with the neighboring parenchyma.

Among its disadvantages provides little information on the degree of stenosis and formation of pseudoaneurysms.

The usual findings in MRI are:

**the sign of the Crescent Moon ( hyperintense crescent moon in T2 sequences corresponding to intramural hematoma, around the vacuum signal flow of the blood flow)** hyperintense vessel, poor or no visualization of the vessel and compression of the lumen.

The Angio MRI can show: decreased lumen, blood in the false lumen or the presence of a "flap".



# 7

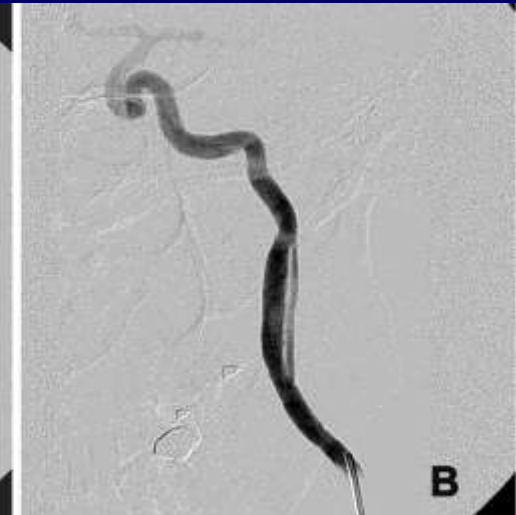
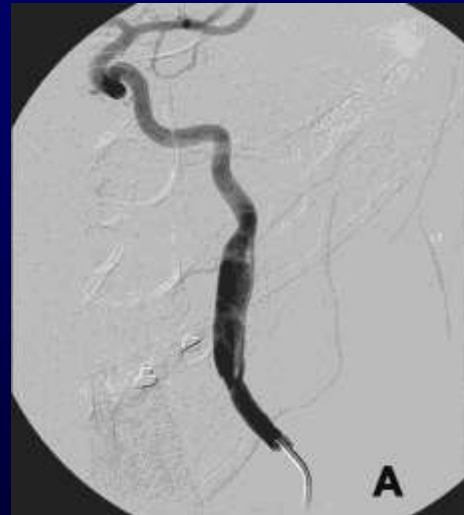
## IMAGENOLOGY

### Angiography

Despite advances in non-invasive techniques, angiography by digital subtraction remains **the gold standard** for diagnosis of this condition.

Has a high sensitivity and specificity to diagnose multiple dissections, underlying arteriopathy (eg FMD), obstruction of distal branches by a stroke and intracranial view.

Describes the following signs: **stenosis (string sign), "tapering", aneurysmatic dilation, intimal "flap", crookedness, subcranial distal stenosis, and the presence of a double lumen.**



## 8 TREATMENT

There is no prospective, randomized and controlled trial on the treatment of cerebrovascular dissections. All recommendations derived from case reports, expert opinion and small series. This is evidence of class C.

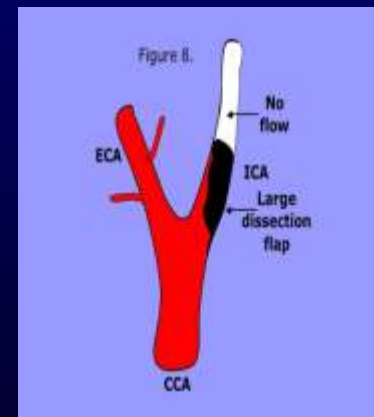
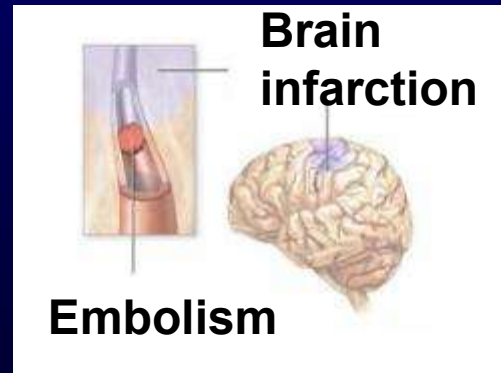
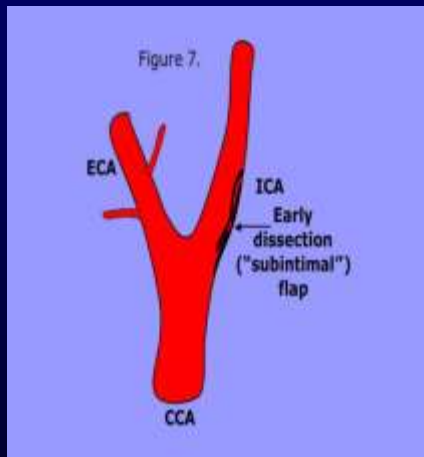
### Anticoagulation

Most authors recommend treatment in patients with signs of ischemia, or brain imaging evidence of intracranial stroke.

Morbidity and mortality associated with vascular dissection are due to brain infarction by cerebral embolism from the site of dissection and thrombosis in situ.

There is no consensus regarding the use of anticoagulants in asymptomatic patients or only presenting with local symptoms.

Given that 73% of these patients presented ischemic brain events (TIA or infarction) within the first month, it's reasonably indicate to treat them.



## **8 TREATMENT**

**Anticoagulation should be initiated as soon as possible because 82% of ischemic strokes occur in the first 7 days, but have been described to one month after the onset of symptoms, and also through the third month.**

**Despite anticoagulation, there are new signs of brain ischemia by up to 14% of cases.**

**Anticoagulation is initiated with intravenous heparin taking the thromboplastin time partially activated (TTPK) to 1.5 to 2 times the baseline of the patient, and then switched to oral anticoagulant, leading an "international normalized ratio (INR) between 2 and 3.**

**Contraindications to anticoagulation are the general, and the presence of a large stroke clinical or radiological.**

**In the case of cerebrovascular dissections anticoagulation is contraindicated when it is intracranial with signs of bleeding, due to high risk of vascular re-rupture and the presence of SAH.**

**We recommend a minimum of three months treatment for ischemic cases.**



# 8

## TREATMENT

### Antiplatelet Agents

The usefulness of antiplatelet agents, as well as anticoagulation, has not been demonstrated in this condition, with a good level of evidence. However, its use is recommended in cases where there is contraindication for anticoagulation.

Ongoing study CADISS .- (UK)

Double-blind, randomized, Anticoagulants vs. Antiplatelet Agent

### Thrombolysis

There is no evidence that the prognosis for both morbidity and mortality improvement, is different in the subgroup of stroke secondary to carotid dissection with the use of i.v. tissue plasminogen activator (tPA).

## 8 TREATMENT

### Surgery and Endovascular Treatment

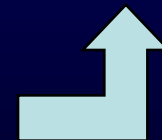
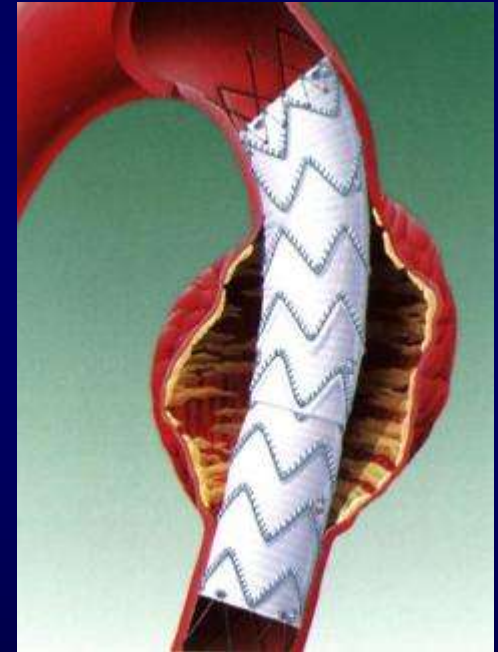
The surgery has been limited to the following cases:

**Recurrence of ischemic symptoms despite anticoagulation, dissecting aneurysm expansion, and SAH.**

The techniques used are:

- proximal vessel ligation, or "Trapping"
- Associated or not to high flow "bypass"
- Wrapping with muscle tissue or silk material
- Resection of the aneurysm with arterial reconstruction or by-pass.
- Clipping - time delayed

Recently, more works are published based on **the primary concept that is to treat the damaged wall of the artery** with stents and / or coils, using techniques of interventional radiology in this condition.



# DISSECTING ANEURYSMS OF THE ANTERIOR CIRCULATION

- \* **“BLOOD BLISTER LIKE” ANEURYSMS**
- \* **“CHIMAME” LIKE ANEURYSMS**

## **FREQUENCY**

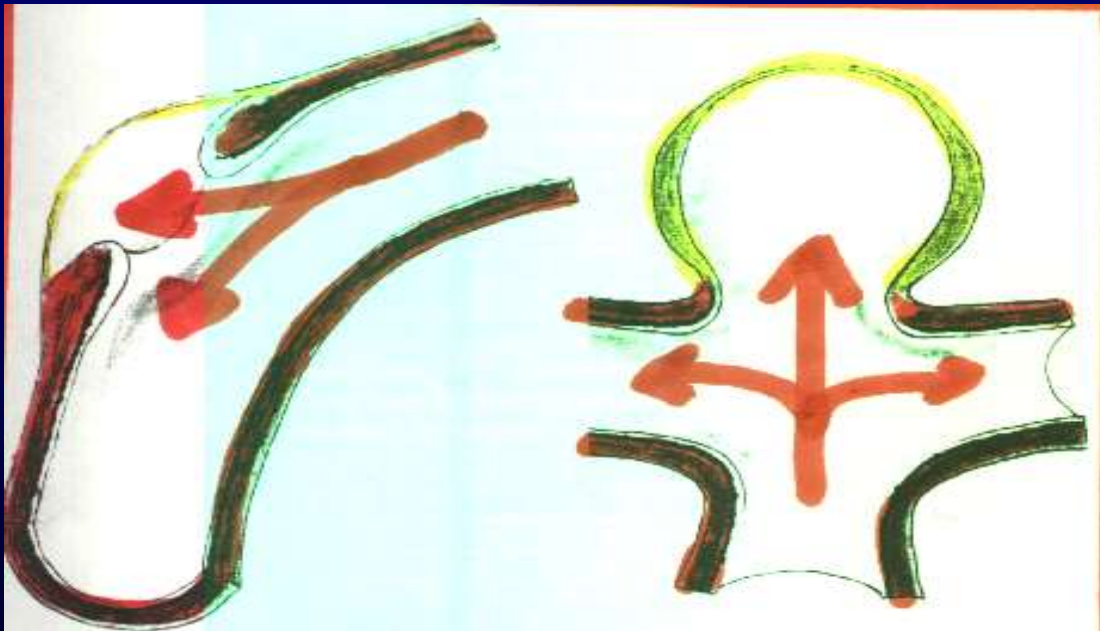
**0,3- 1% OF THE INTRACRANIAL ANEURYSMS  
(OHARA Y SUZUKI)  
OUR EXPERIENCE**

# ETIOPATHOGENY OF THE BLOOD BLISTER LIKE ANEURYSMS

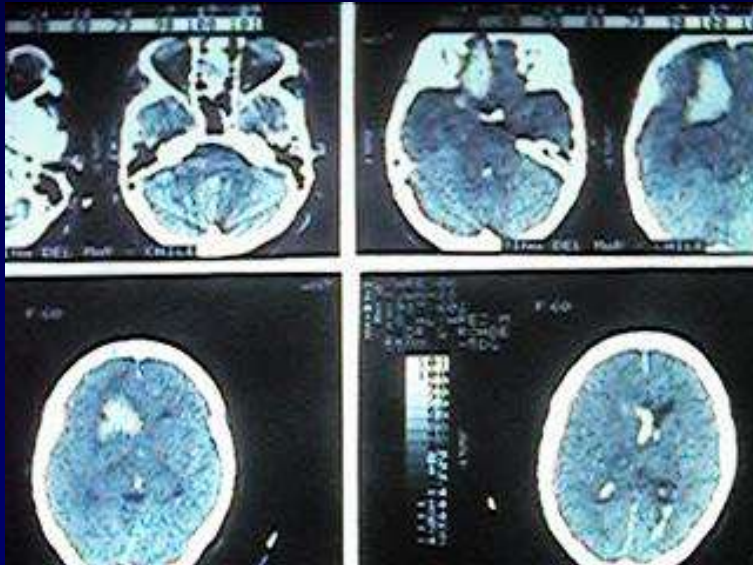
## 1-ACQUIRED INJURY OF THE ARTERIAL WALL

Systemic Hypertension- Arterial sclerosis- Lipohyalinosis  
Hypercholesterolemia- Atherosclerosis- atheromatous ulcer

## 2 - HEMODYNAMIC STRESS OF CBF OVER AREA WITH STRUCTURAL DYSFUNCTION OF COLLAGEN



# DORSAL ICA- BLOOD BLISTER LIKE ANEURYSM





# “BLOOD BLISTER LIKE ANEURYSM” OF ANTERIOR CEREBRAL ARTERY- A1

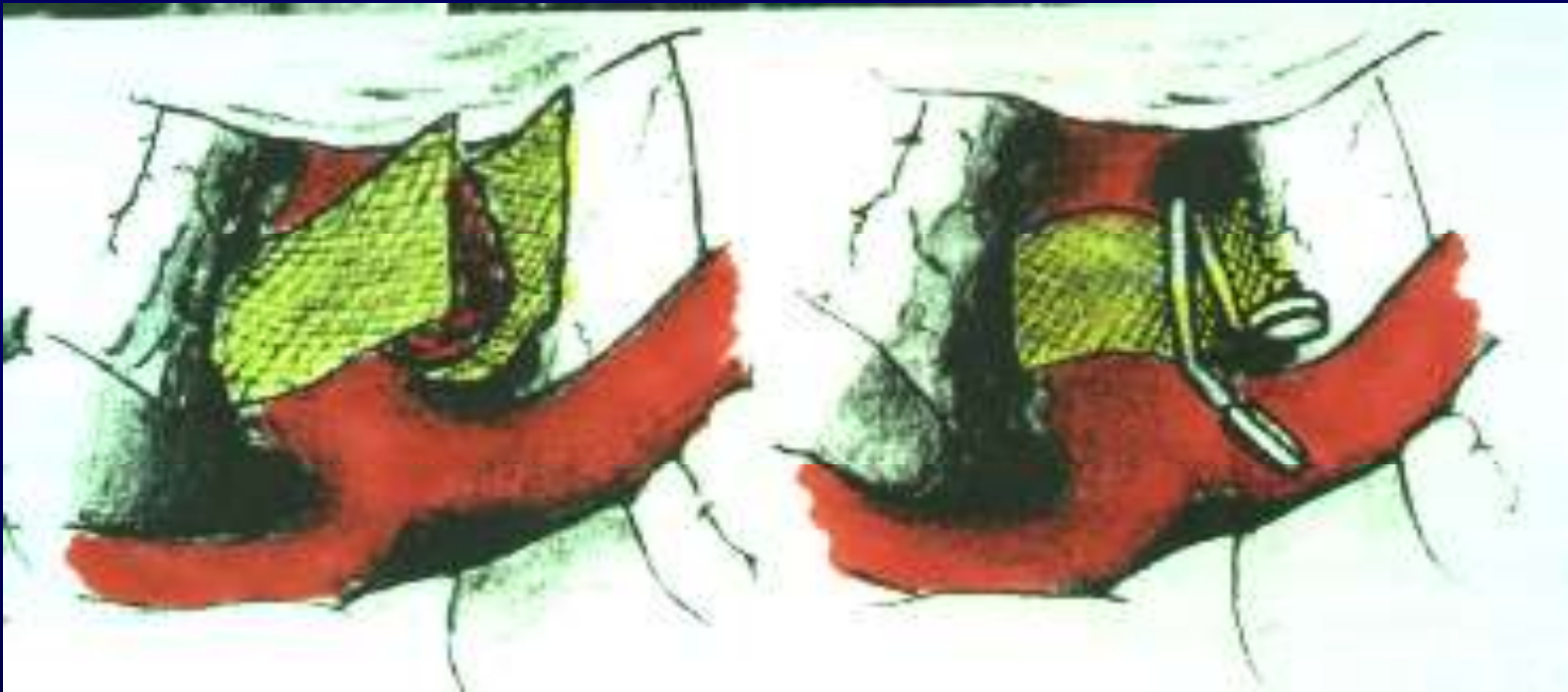




# SURGICAL TECHNIQUE

- **WRAPPING + CLIPPING**
- **CLIPPING**
- **TRAPPING + BY-PASS**
- **ANGIOPLASTY  
(ANEURYSMORRAPHY)**

## WRAPPING OF THE BLOOD BLISTER LIKE ANEURYSM



8

## DIRECT CLIPPING OF THE BLOOD BLISTER LIKE ANEURYSM

- FOLLOWING THE DIRECTION OF THE ARTERY
- LATE SURGERY
- ”LIGHT” CLIP



8

# BLOOD BLISTER LIKE ANEURYSM RIGHT ANTERIOR CEREBRAL ARTERY (A1)

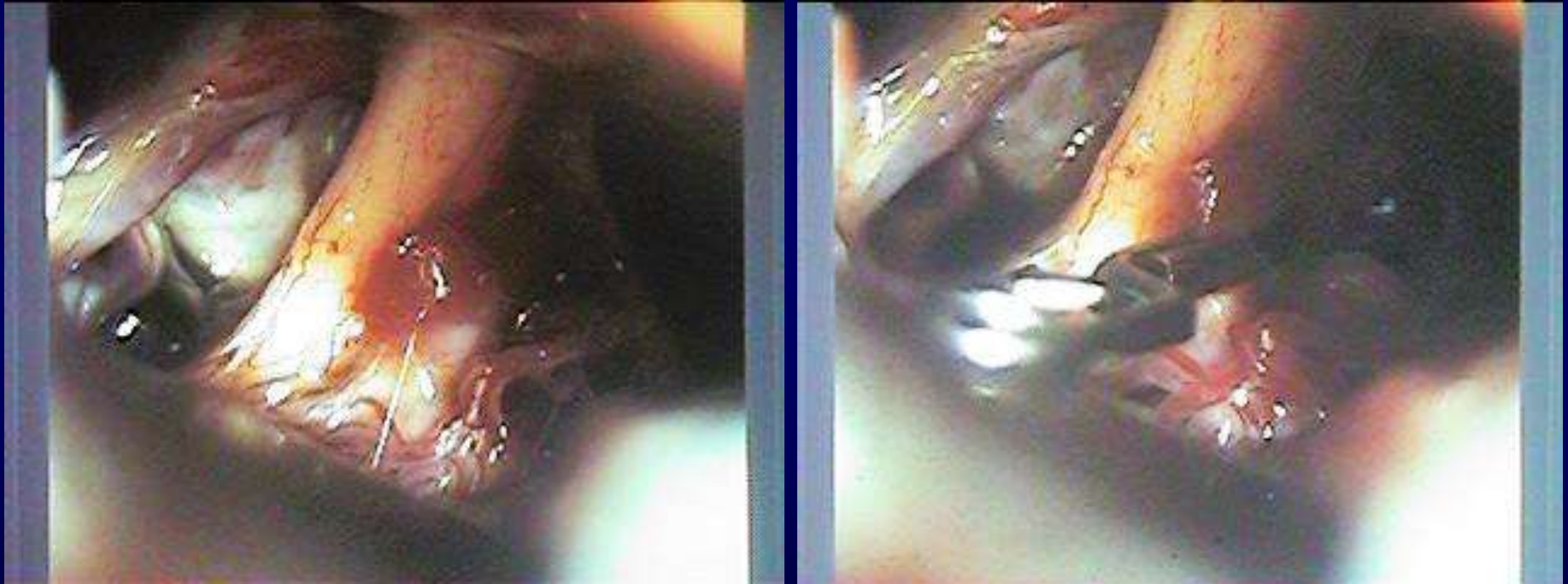


Quintana L.:“Aneurismas como Ampolla de Sangre”, Rev.Chil.Neurocirug. 17: 41-48, 2001.



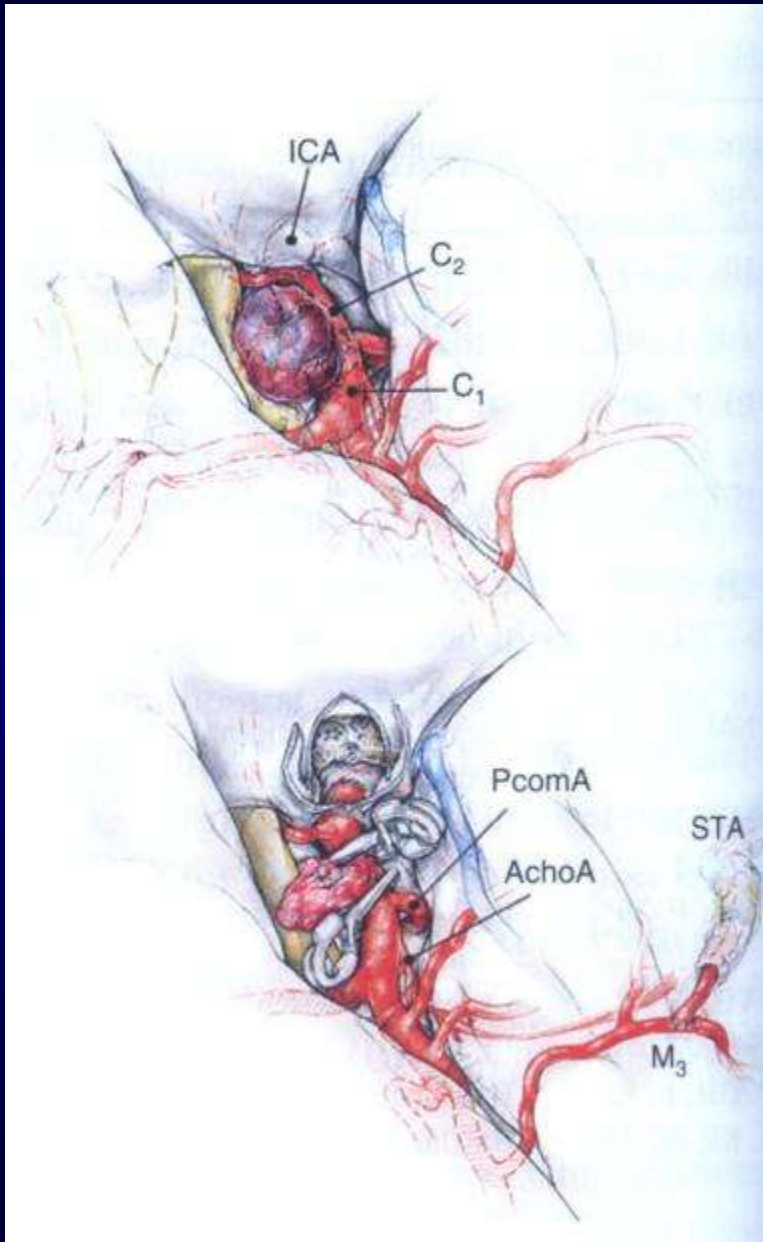
8

# BLOOD BLISTER LIKE ANEURYSM LEFT ANTERIOR CEREBRAL ARTERY (A1)



Quintana L.:“Aneurismas como Ampolla de Sangre”, Rev.Chil.Neurocirug. 17: 41-48, 2001.

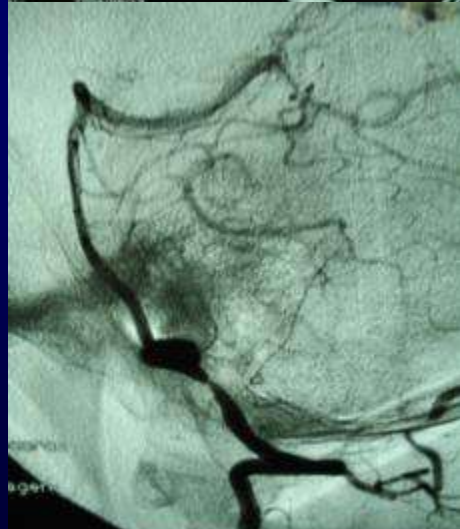
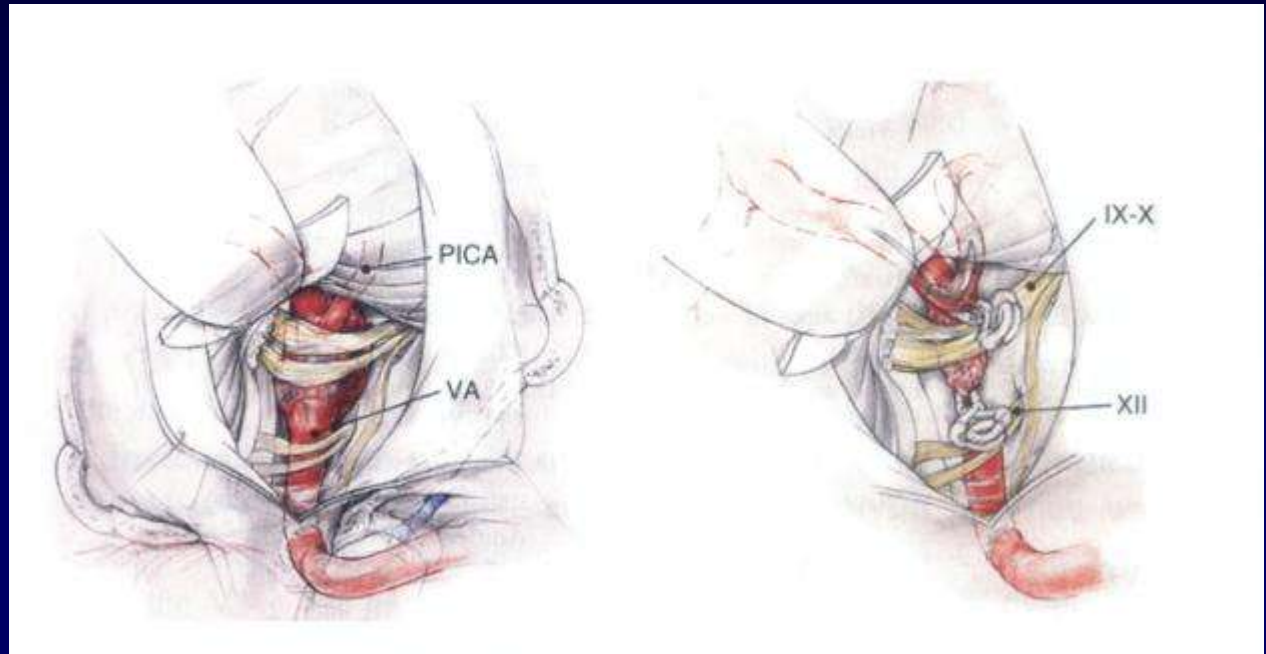
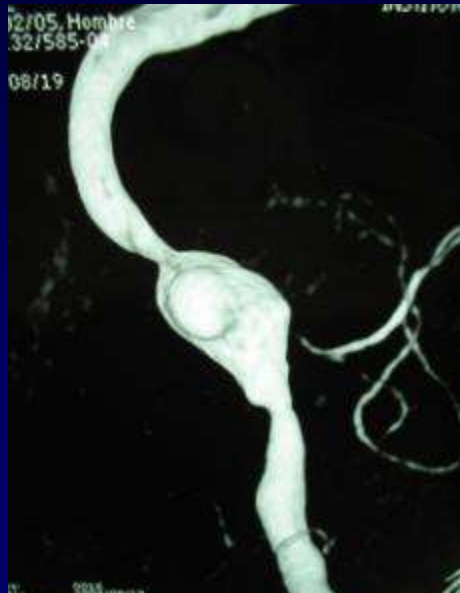
## 8 TRAPPING + BY PASS



Yonekawa Y., Zumofen H., Imhof G., Roth P., Kahn N.: Hemorrhagic cerebral dissecting aneurysms: surgical treatment and results. *Acta Neurochir Suppl*, 103:61-69, 2008.



# 8 DISSECTING ANEURYSM OF THE VERTEBRAL ARTERY

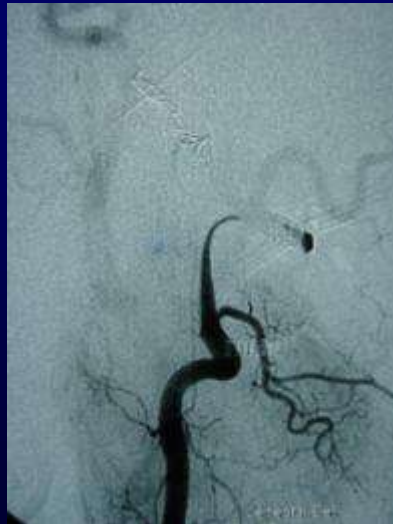
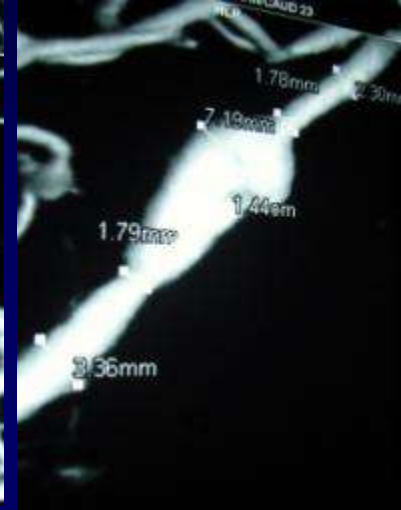
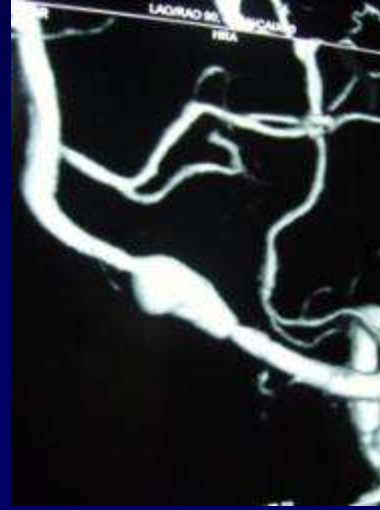
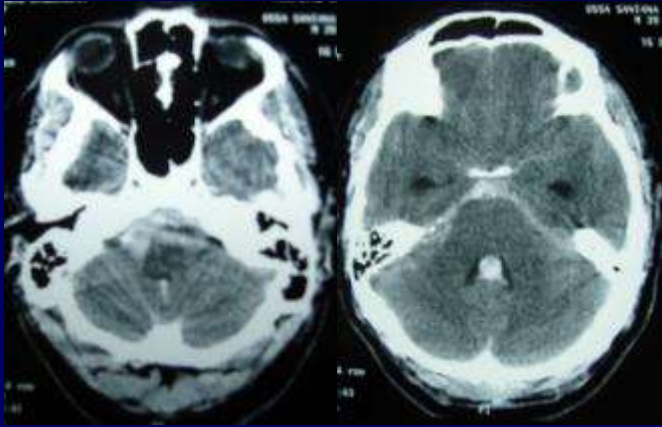


Yonekawa Y., Zumofen H., Imhof G., Roth P., Kahn N.: Hemorrhagic cerebral dissecting aneurysms: surgical treatment and results.

Acta Neurochir Suppl, 103:61-69, 2008.

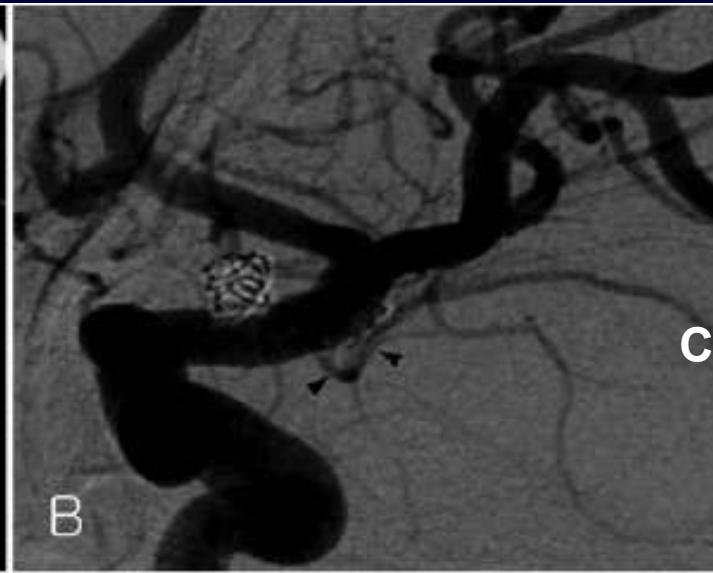
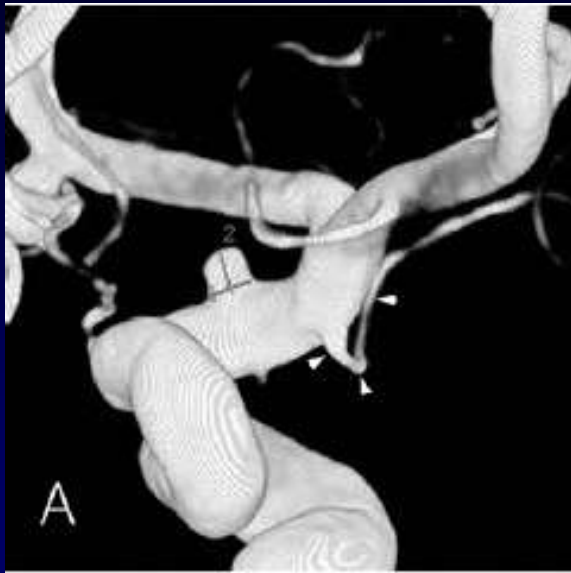
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39 YEARS OLD MALE , WITH HYPERTENSION, SUDDENLY COMPLAINTS OF SEVERE RIGHT OCCIPITAL HEADACHE, AND LATER ALL THE HEAD. SAH SIGNS, WITHOUT LOCAL SIGNS.



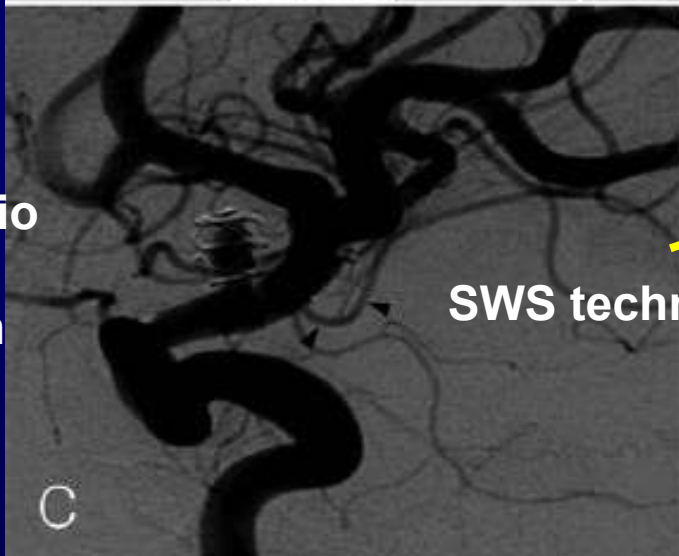
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ICA-BBL An

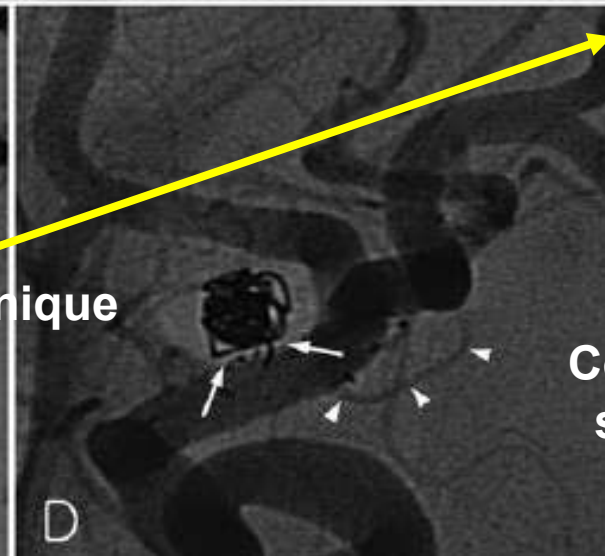


Control Angio

Control Angio  
two months  
An regrowth



SWS technique



Control Angio  
six months



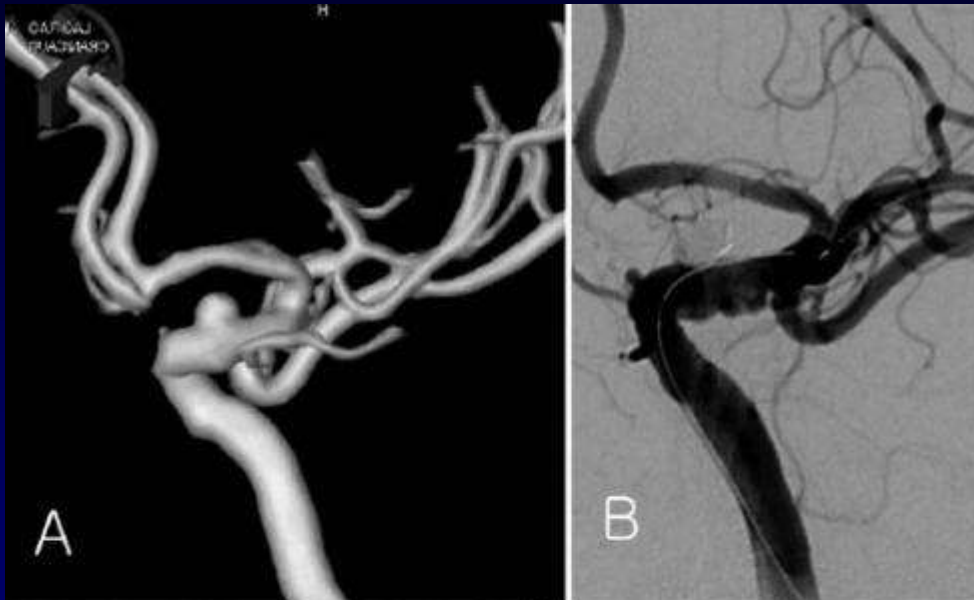
Byung-Hee Lee, Byung Moon Kim, Moon Sun Park, Sung Il Park, Eun Chul Chung, Sang Hyun Suh, Chun Sik Choi, Yu Sam Won, In Kyu Yu : Reconstructive endovascular treatment of ruptured blood blister-like aneurysms of the internal carotid artery.

J. Neurosurg, published online December 1, 2008; DOI: 10.3171/2008.7.JNS08257.pp 1-6.



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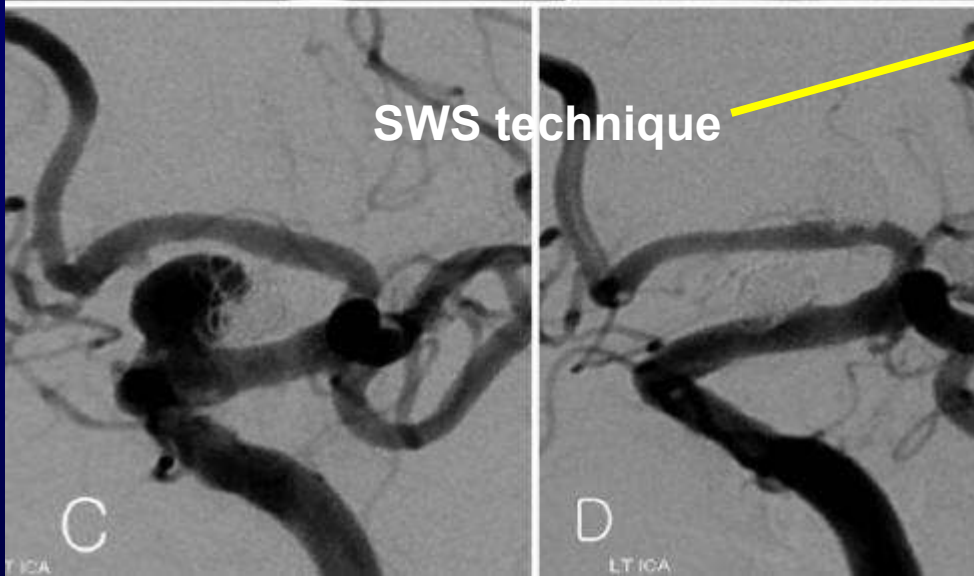
ICA-BBL An



Control Angio



Control Angio  
two months  
An regrowth



Control Angio  
three months

# BLOOD BLISTER LIKE ANEURYSMS

## CONCLUSIONS

- Uncommon Aneurysms (1%)
- Associated with arteriosclerosis and / or atherosclerosis, or collagen dysfunction
- Located in arterial course
- Fragile walls of neck and dome
- Treatment of Surgery, Endovascular and Medical are rapidly developing.



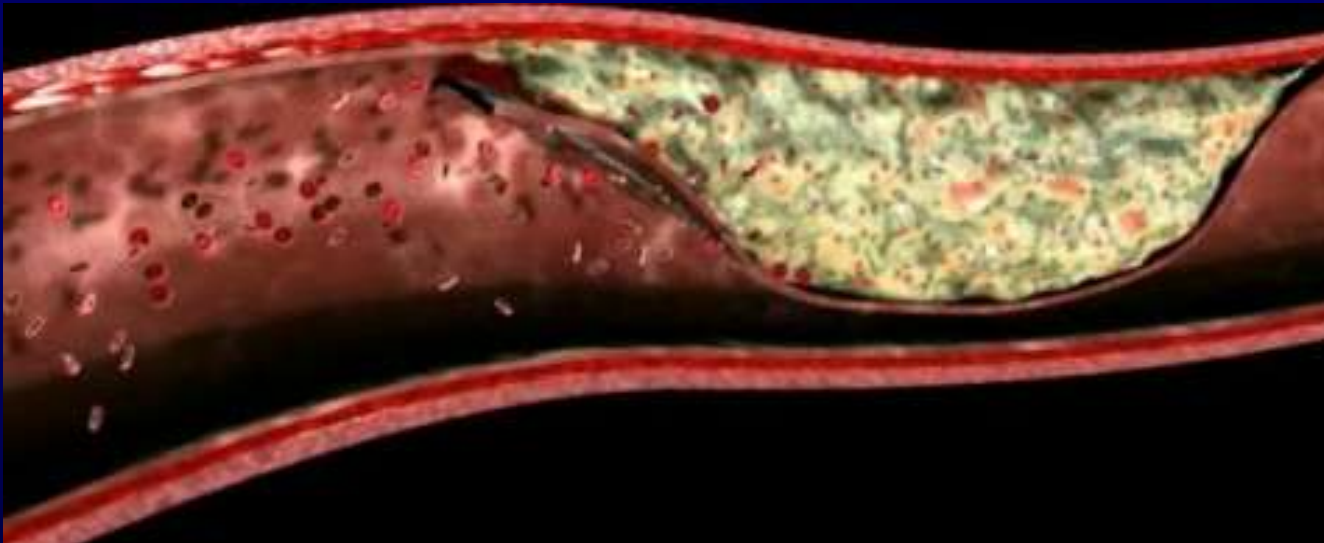




# The 5th Annual International Neurosurgery Conference

27-30 December 2009

***THANK YOU VERY MUCH !!!***



**PROF. DR. LEONIDAS QUINTANA MARÍN  
CÁTEDRA DE NEUROCIRUGÍA- UNIVERSIDAD DE VALPARAÍSO - CHILE**