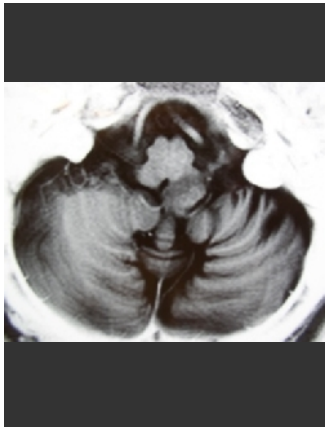
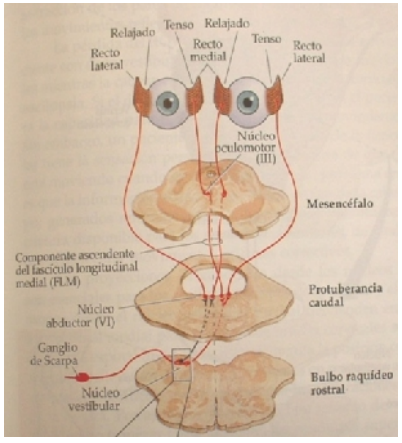
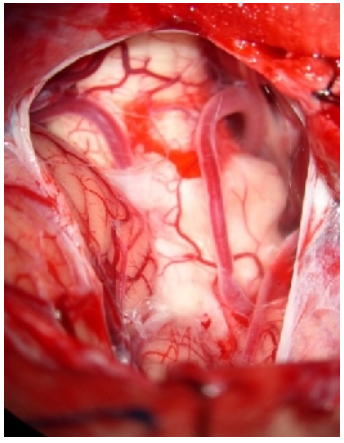
# Brainstem (BS) tumors in adults focusing on direct microsurgery





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*Argentina*

# BS tumors: Overview
# Differences by age

## Children

- incidence: 10-15%
- diffuse intrinsic glioma
- specially affecting the pons
- typical MRI findings are common

## Adults

- incidence: < 2%
- wider variety of pathological findings

*Guillamo JS et al, 2001*

*Laigle-Donadey F et al, 2008*

## Age of presentation

- **median : 32.5 years old**
- **age ranged : 16-70 years old**

## Overall survival

- **median: 59- 85 months**
- **range: 9-180 months**

*Bricolo A et al, 1991*
*Landolfi JC et al , 1998*
*Guillamo JS et al, 2001*
*Kesari S et al , 2008*
*Laigle-Donadey F et al, 2008*
*Rosenthal M et al, 2008*
*Salmaggi A et al, 2008*

# Symptomatology

- Headaches 44%
- Gait disturbances 61%
- Cerebellar symptoms 37%
- Weakness in both distal limbs 42%
- Cranial nerves impairment 87%
- Hydrocephalus 20-30%

*Guillamo JS et al, 2001*

*Laigley-Donadey F et al, 2008*

# Classification

- **Historical review:** Epstein (1985); Epstein &McCleary (1986); Stroink et al (1987); Barkovich (1990); Albright (1996); Fischbein et al (1996)

- **Since 2000, Classification of Choux M et al is wordlwide used:**

  I Diffuse

  II Focal intrinsic

  III Exophytic

  IV Cervicomedullary

# Preoperative work-up

- **MRI**
- **MR spectroscopy**
- **Systematic MRI exploration of the neuroaxis**
- **Angio-MRI or angiography are rarely necessary**

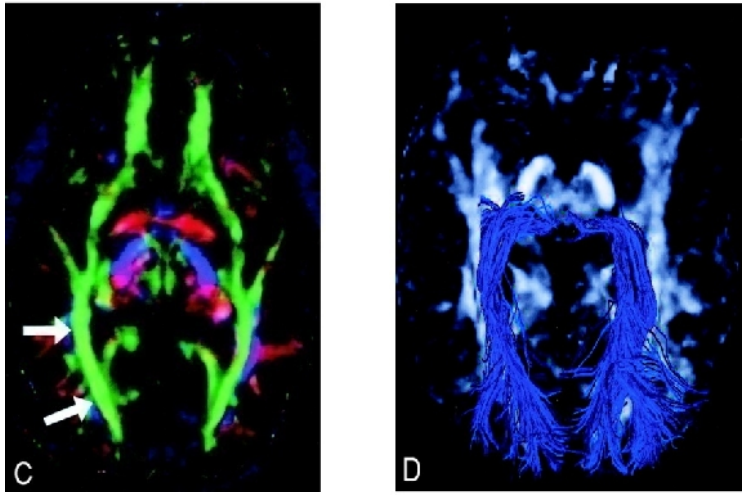
# MRI findings

- 50 % Diffuse infiltrating lesion without Gd-enhancement
- 31 % Focal lesion with Gd-enhancement
- 8 % Tectal lesion
- 11 % Other presentations

*Guillamo JS et al, 2001*

# Diffusion tensor imaging and tractography

will contribute to surgical strategy ….




*Phillips NS et al, 2005*

*Lui YW et al, 2007*

*Chen X et al, 2007*

*Helton K et al, 2008*

*Oppenheim C et al, 2007*

# Factors of better outcome

- **< 40 years-old**
- **Duration of the symptoms > 4 months**
- **KPS =>70**
- **MRI: “no” Gd-enhancement and “no” necrosis**
- **Tectal localization**

**bad prognosis: tumor affecting more than one segment of the BS**

*Guillamo JS et al, 2001*

*Laigle-Donadey F et al, 2008*

# Surgical management

**Controversies in the management of BS tumors in adult patients arise because of:**

- **Their low incidence.**
- **The dismal prognosis in children has probably discouraged treatment in adults for many years.**
- **The complexity of the brainstem surgery. It is assumed that the surgical neurological risk would be too high.**

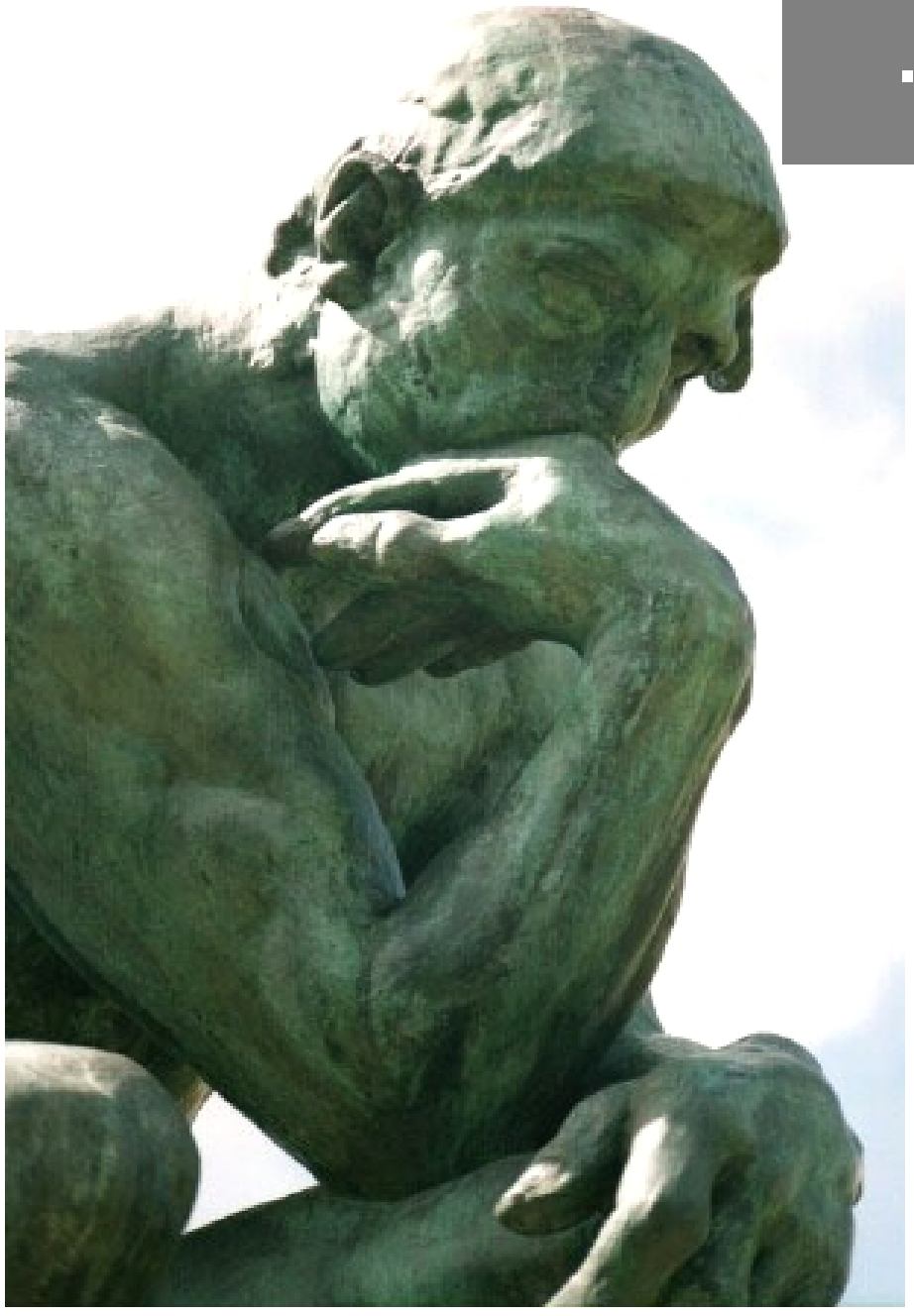
- **Since the first article of resective surgery for BS tumors in the English literature** (*Bricolo A et al . Acta Neurochir Suppl (Wien) 53: 148-58, 1991);* **other reports about promising surgical outcome have been published.**

- **However, many centers persist unwilling to perform microsurgery or even stereotactic biopsy for BS tumors in adults.**

- **This concern and the rationale about surgical treatment led us to treat a group of patients.**

# Objectives of discussion:

## . the surgical management



- microsurgery
- stereotactic biopsy
- empiric treatment

Comments differences, similarities ?

# Our Surgical Indications

**Stereotactic biopsy for:**

- **diffuse infiltrative tumors**

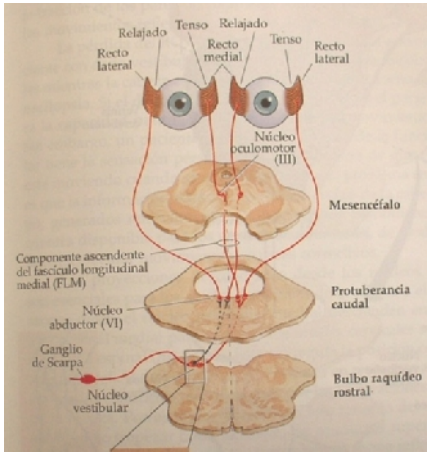
**We will focus on:**

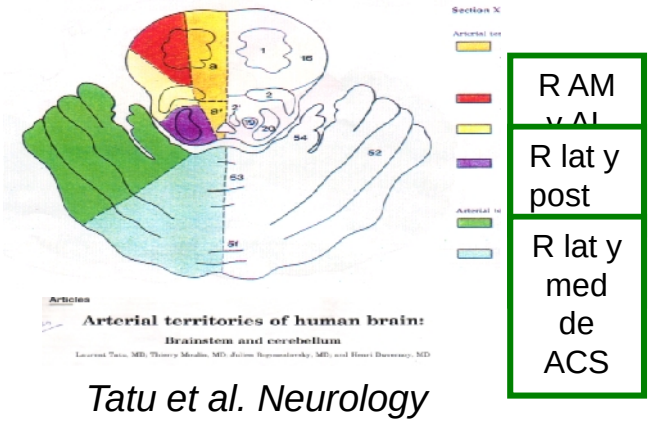
**Microsurgery for:**

- **focal tumors**
- **exophytic tumors**
- **with cystic component**
- **or for differential diagnosis**

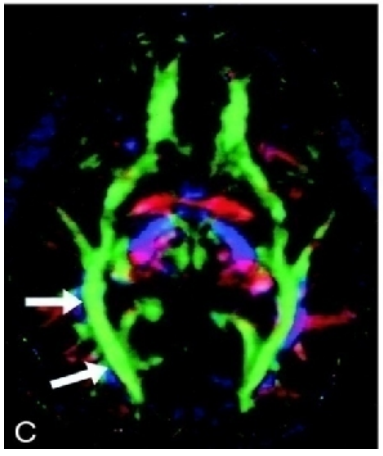
# Surgical strategy

**The principal factor determining which approach to choose is the location of the lesion.**



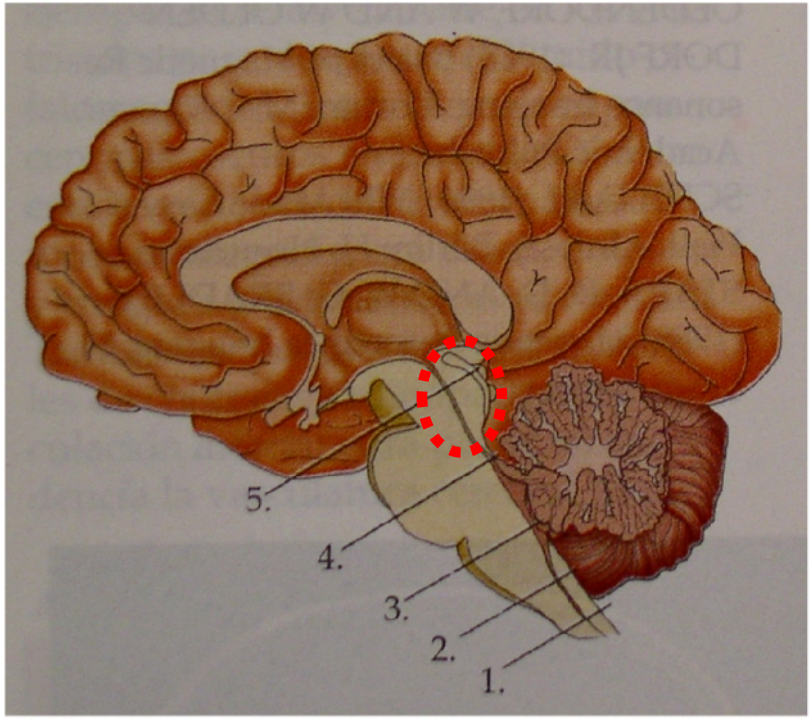




*Tatu et al. Neurology 1996;47:1125-35*




**Surgical planning focus on passing through as little normal tissue as possible and on avoiding critical structures.**

# Tumors of the Tectum




- **Low grade glioma is the most frequent tumor**
- **Generally they have indolent behaviour**
- **9-25% have calcifications**

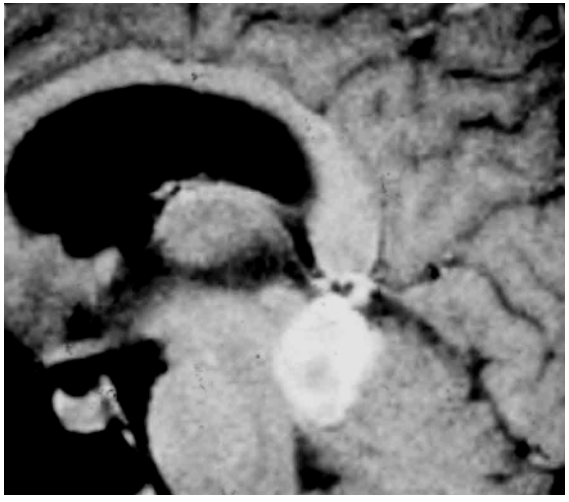
- **Symtomatic patients or with growing lesion should be operated on.**

- **Surgical approaches:**
  - **infratentorial supracerebellar approach**
  - **occipito- transtentorial**

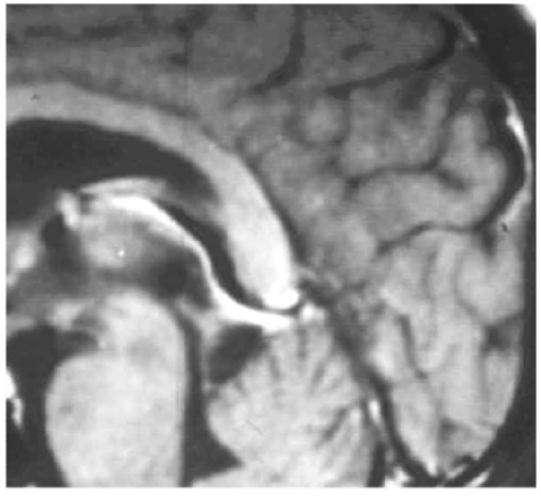
*Sun B et al, 1996*
*Lazaro BC et al, 2006*
*Chaddad Neto F et al, 2007*
*Ammirati M et al, 2002*
*Hauck EF et al, 2009*

# *Illustrative Case 1*

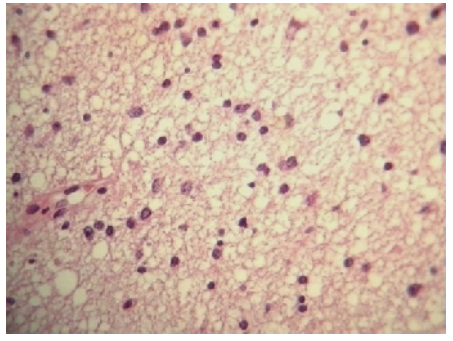
***A 30-year-old patient was operated on by infratentorial supracerebellar approach with good results.***

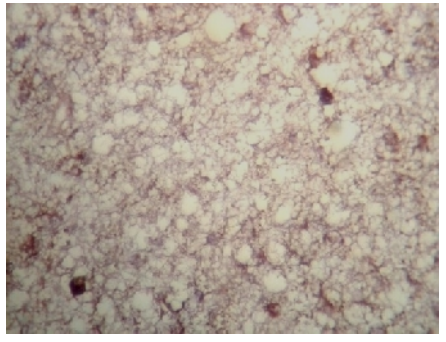


**Pre op MRI**

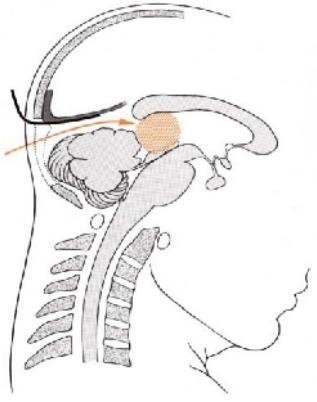


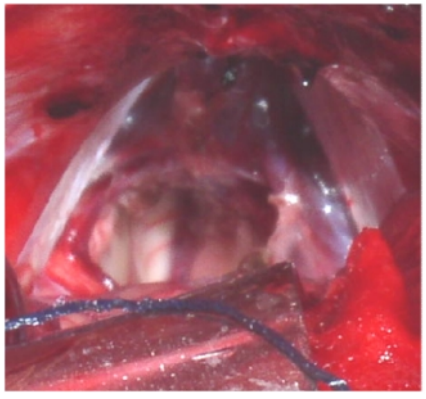
**Post op MRI**





**Low grade glioma**





# Tumors of the Mesencephalum

**There are different surgical approaches according to the location of the tumor:**

- **anterior location: transsylvian-subtemporal (orbitozygomatic craniotomy)**
- **posterior location: infratentorial-supracerebellar (below the inferior colliculli and through the superior medullary velum)**
- **lateral location: subtemporal or transsylvian-subtemporal**

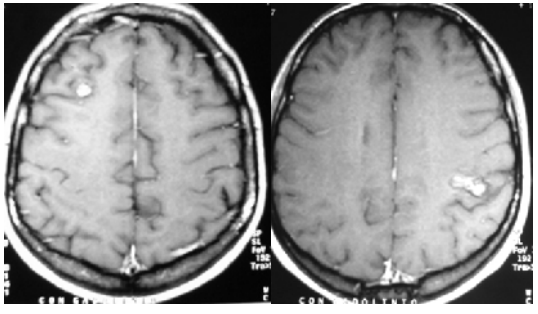
*Shi-Ting Li et al, 2007*
*J.Zhong S et al, 2007*
*Yeh DD et al , 2002.*

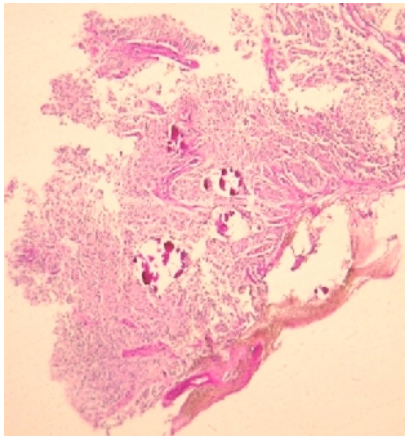
*Smith ER et al, 2003*
*Recalde RJ et al, 2008*
*Hauck EF et al , 2009*

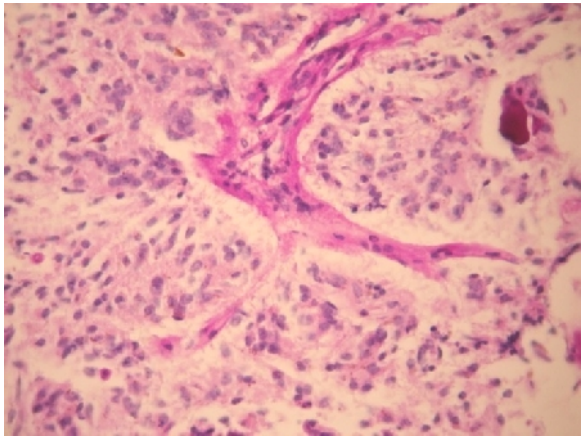
# *Illustrative Case 2*

***29 -year-old patient was operated on by infraten-torial supracerebellar approach below the inferior colliculi. The tumor was partially removed.***

***Later on, disseminated gliomatosis cerebri was confirmed with bad outcome.***







PAS 40X - **Pilocytic astrocytoma -** PAS 400X

# Tumors of the Pons

**There are different surgical approaches according to the location of the tumor:**

- **for lateral or anterolateral lesions: retrosigmoid approach or subtemporal-presigmoid approach**
- **for posterolateral or posterior lesions: inferior to the level of middle cerebellar peduncle: telovelar approach**
- **for posterior lesions: transvermian (less used to avoid injury to the nuclei of the VI and VII cranial nerves).**

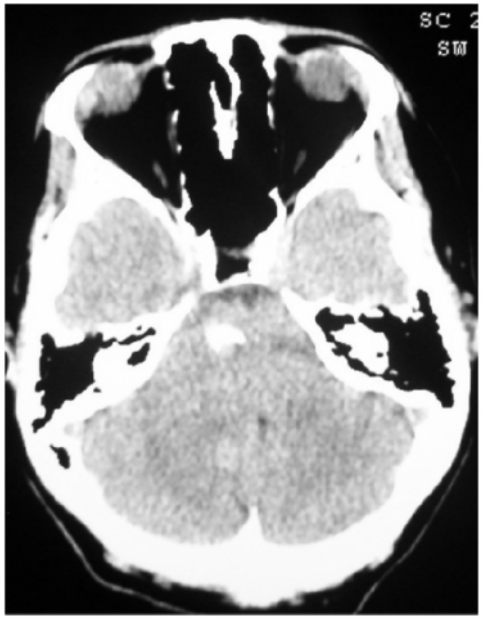
*Deshmukh VR et al, 2006*
*Sala F et al, 2007*

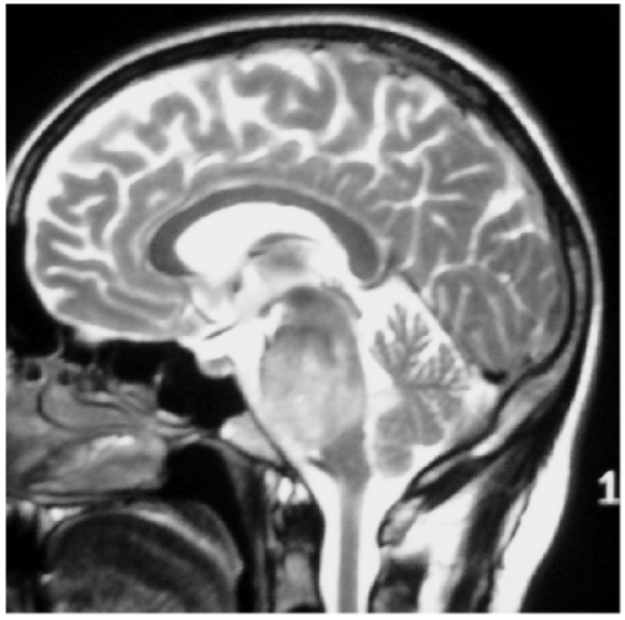
# *Illustrative Case 3*

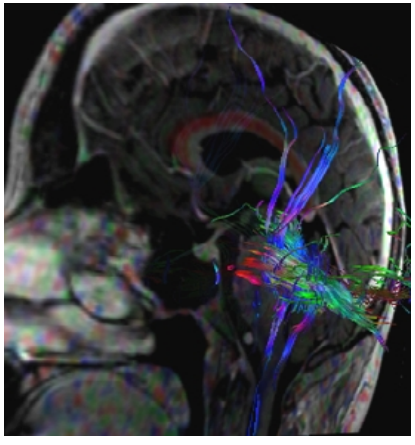
***A 38-year -old patient harboring a pontine tumor.***

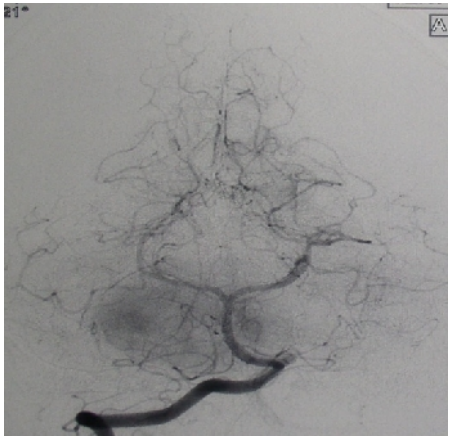
***Pre-operatively, she had an intratumoral bleeding. So, angiography was performed.***

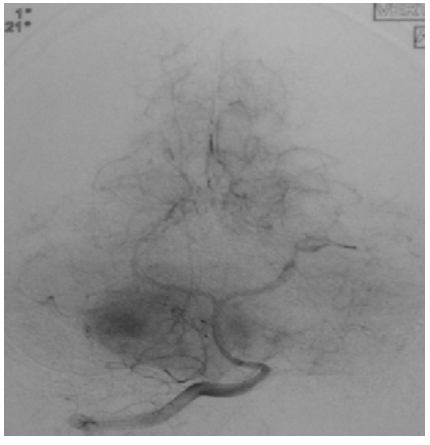
***Then , she was operated on by retrosigmoid approach without complications.***

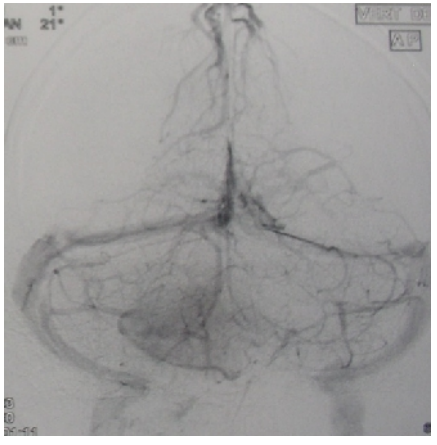




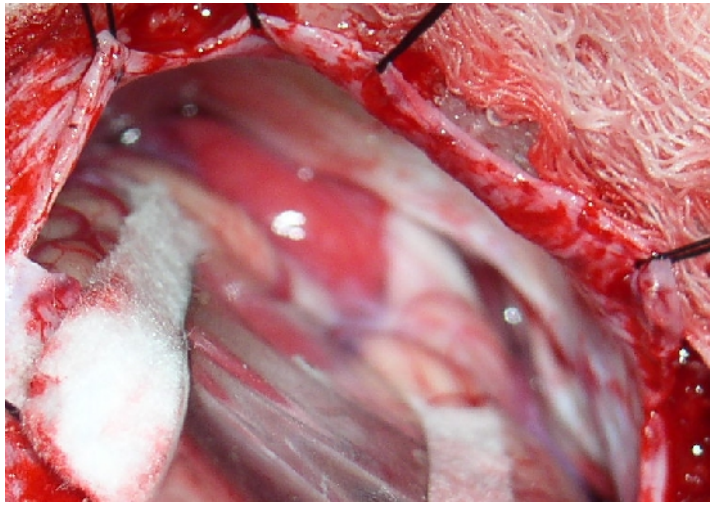


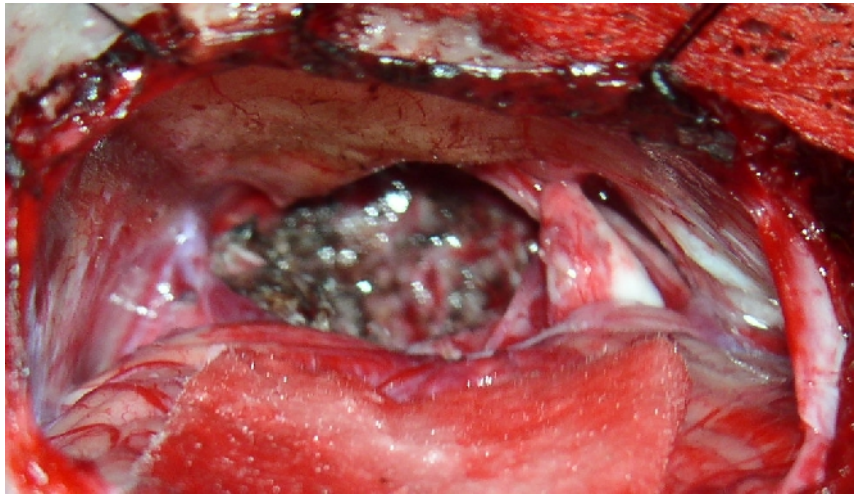


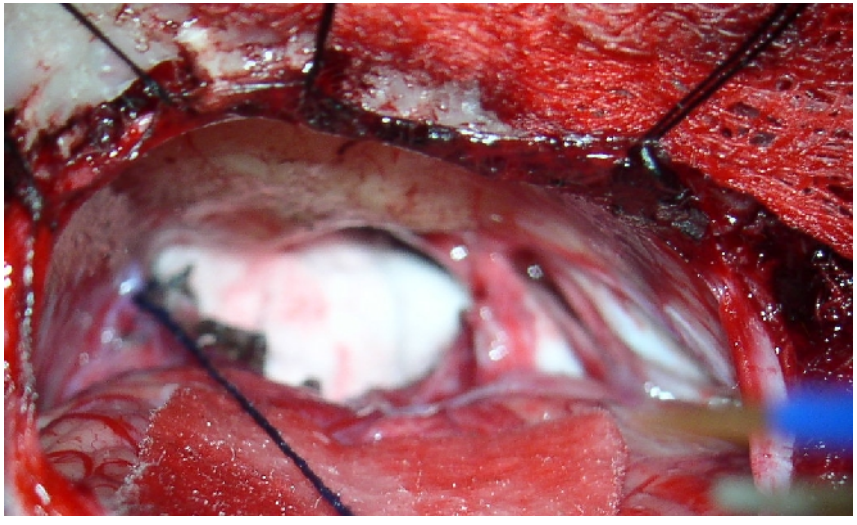




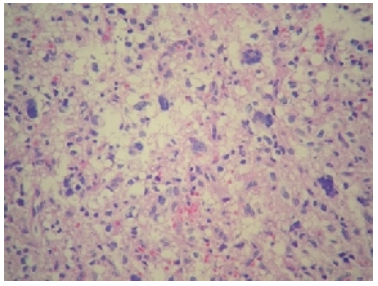
**Suboccipital retrosigmoid approach  was performed. Electrophysiological monitoring included the monitoring of cranial nerves, and somatosensory, motor, and brainstem evoked potentials**



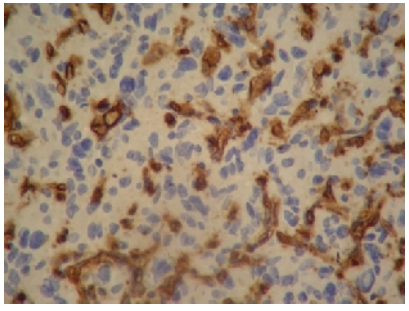




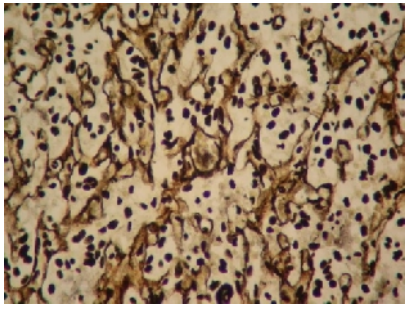
## Pathology:
## Cellular Hemangioblastoma



HE:cellular proliferation, atypias, xantomized cells

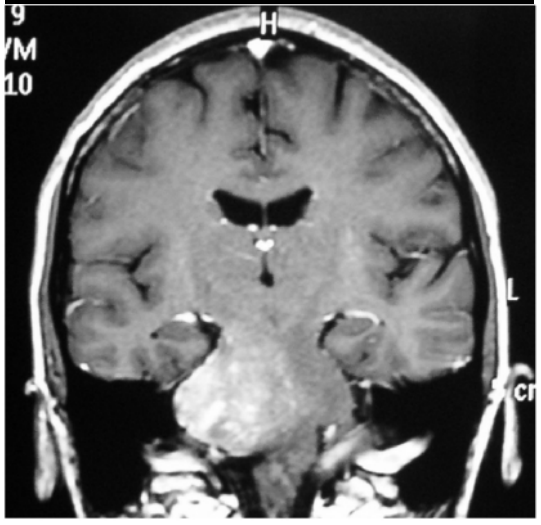


CD 34

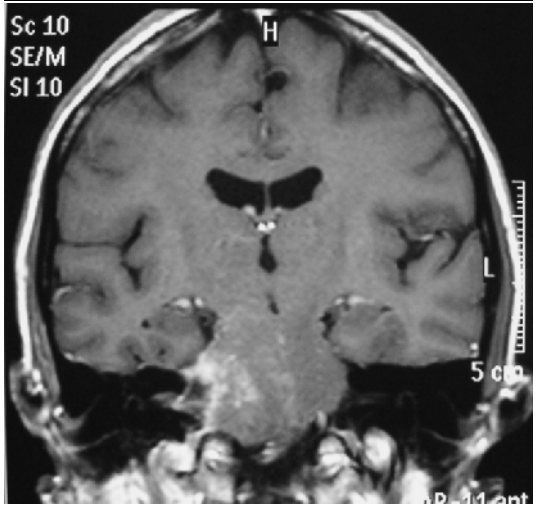


Scarce perivascular reticulum

**Pre op MRI**

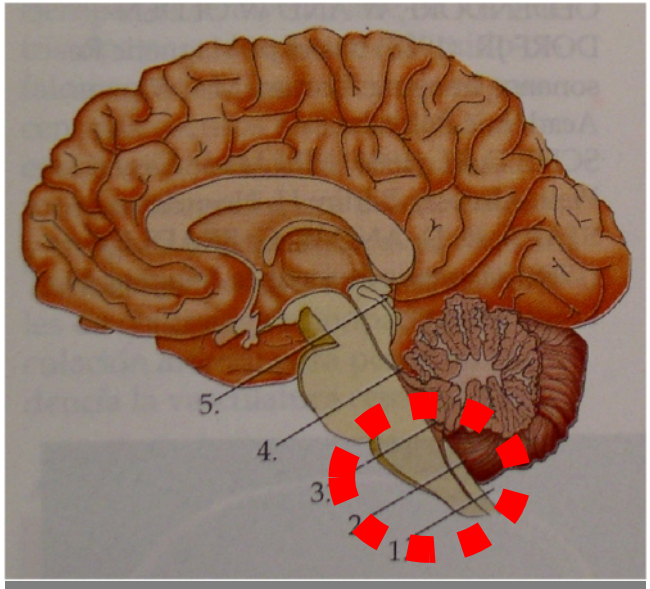



**24 hs post op MRI**




**The patient in rehabilitation 10 days after surgery**

# Tumors of the medulla oblongata




**20 % of BS tumors**

## Surgical approaches

- **for posterior medullary tumors:**
  **a suboccipital craniotomy and subtonsillar approach is appropriate**
- **for anterolateral medullary lesions:**
  **a far-lateral suboccipital approach might be neccessary**

*Kellogg JX et al, 1997*
*Mussi AC et al, 2000,*
*Jean WC et al, 2003*

*Kyoshima et al, 2004*
*Morota N et al, 2006*
Parker F et al, 2009

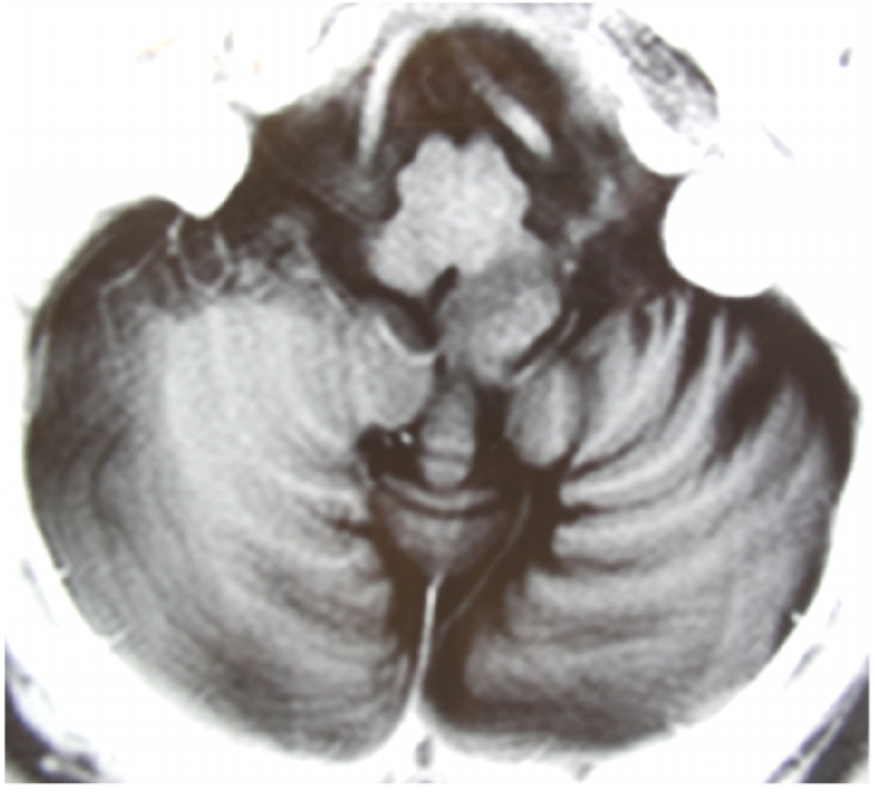
- **For tumors of medulla oblongata, we performed microsurgery that offers simultaneously diagnostic confirmation and posterior fossa decompression.**

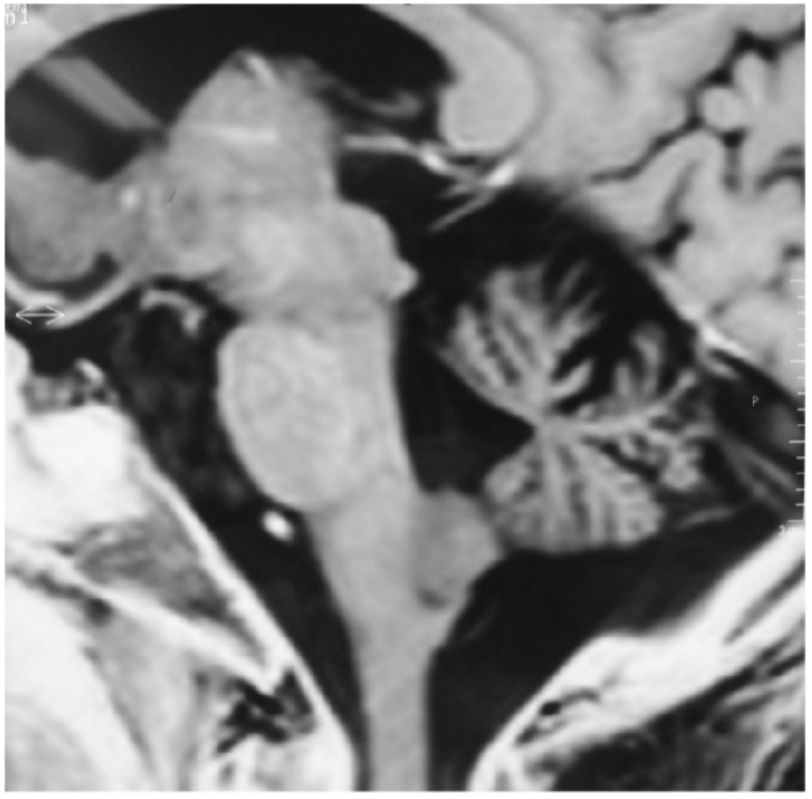
- **The subtonsillar approach provides an ample surgical view to the foramen of Luschka laterally and up to the middle cerebellar peduncle.**

- **Tumors of the medulla oblongata produce “per se” a mild elevation of the tonsils making the access easier.**

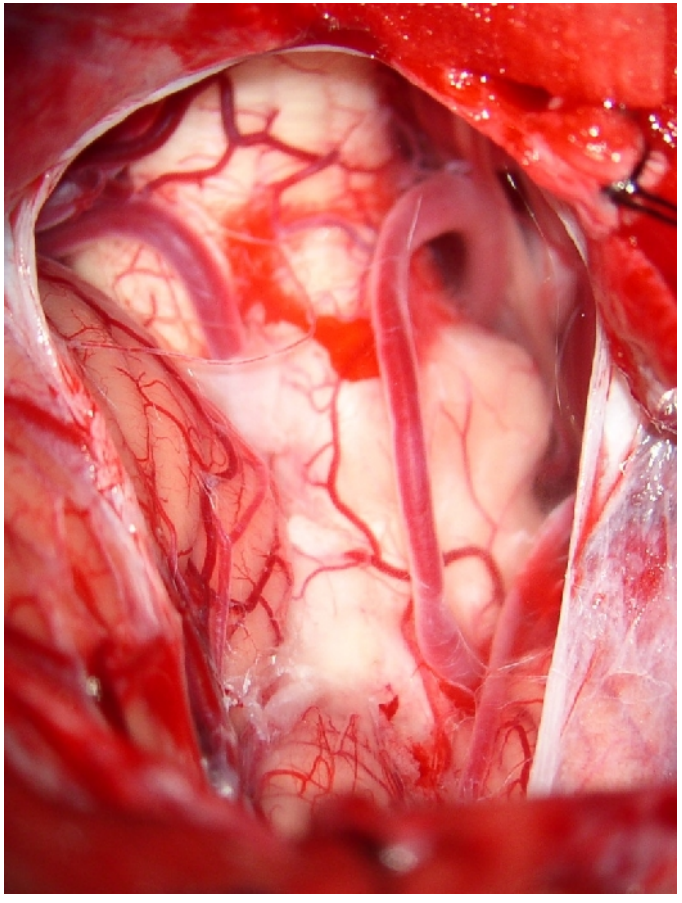
# *Illustrative Case 4*

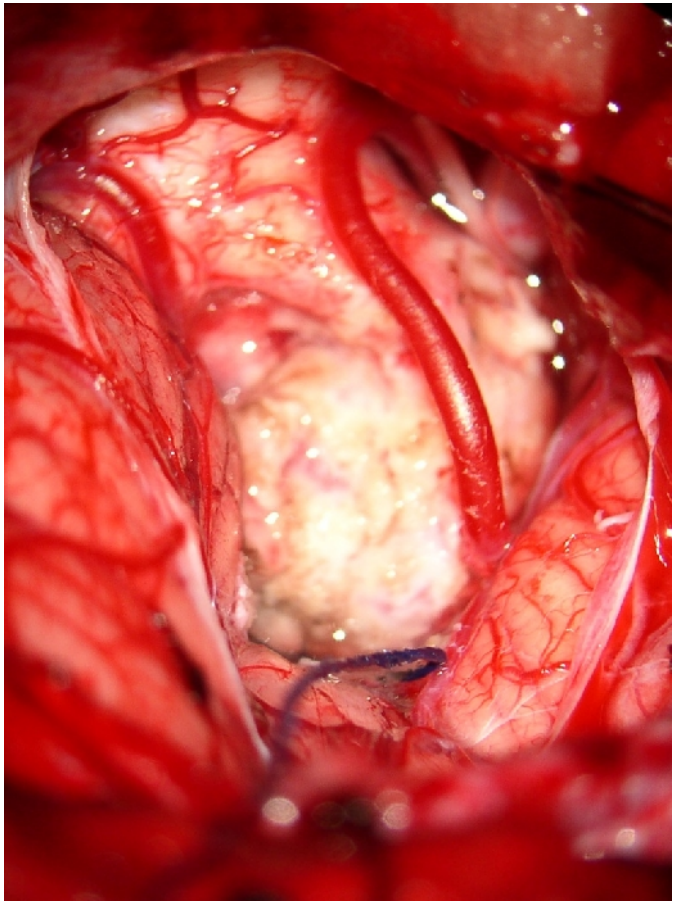
- **41- year-old woman. KPS 90**
- **6-month history of : headaches, vertigo, unsteadiness and persistent cough.**



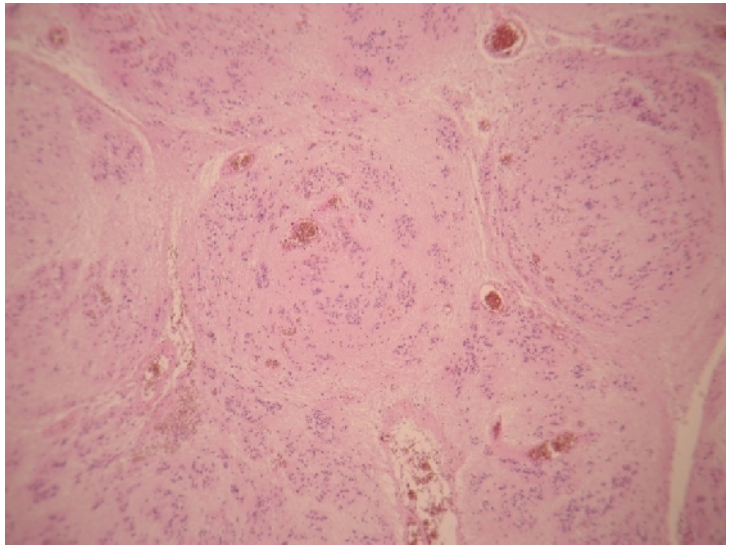


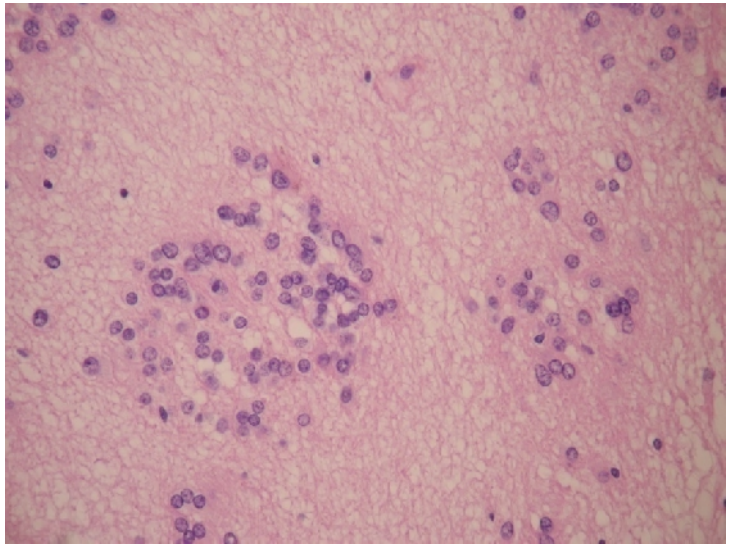
# Subtonsillar approach was performed

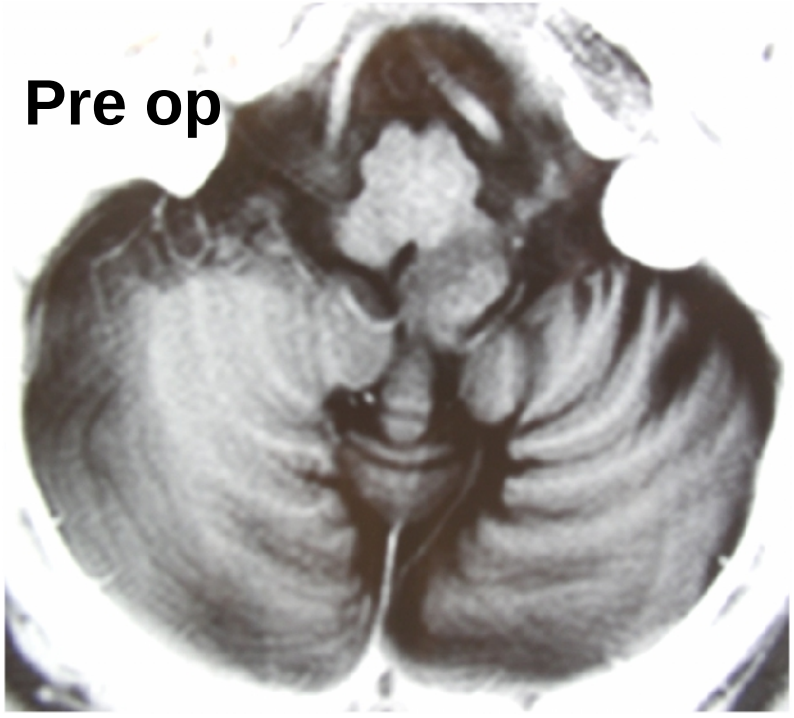


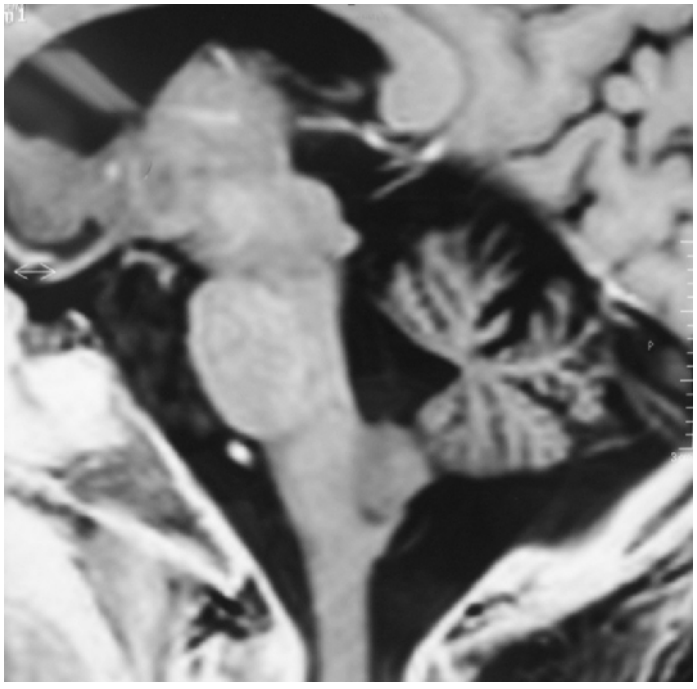


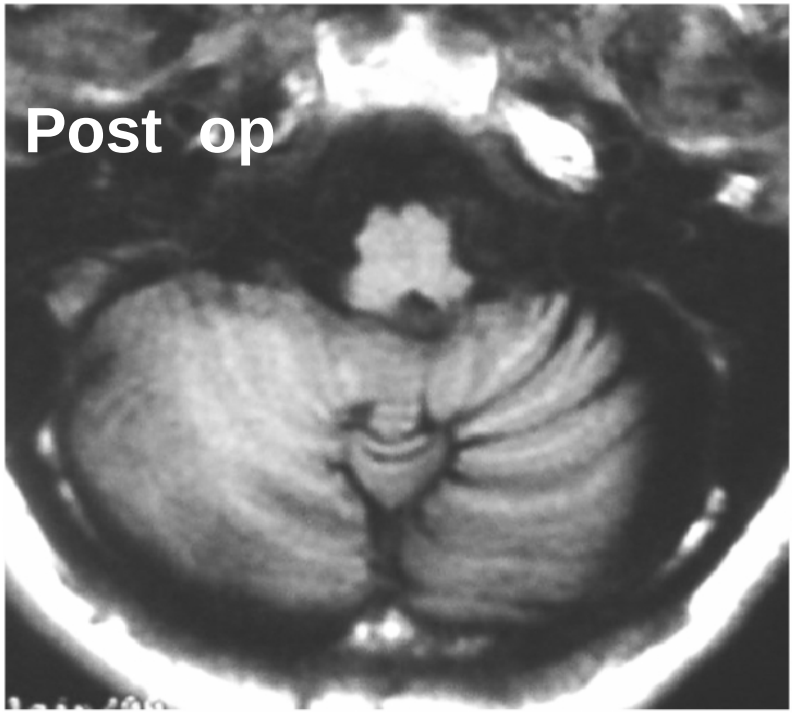
# Pathology: subependymoma

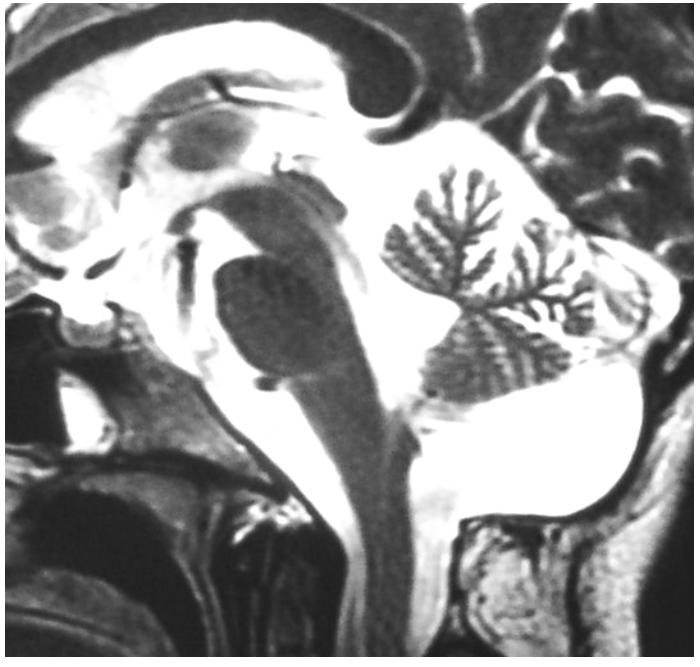





Pre op

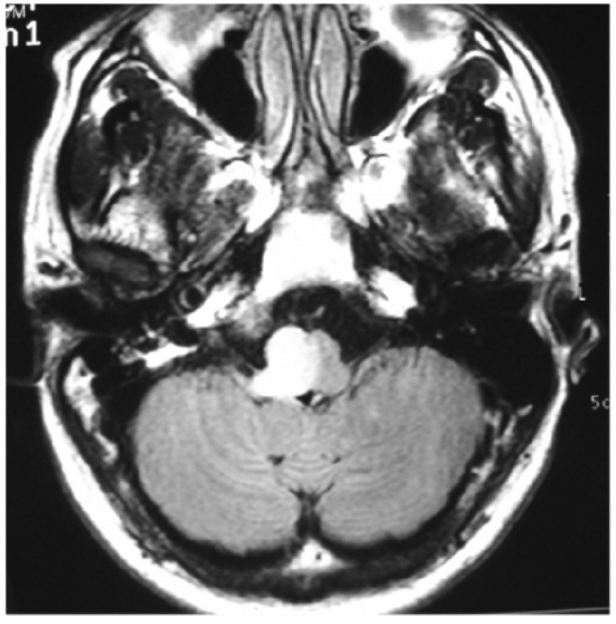


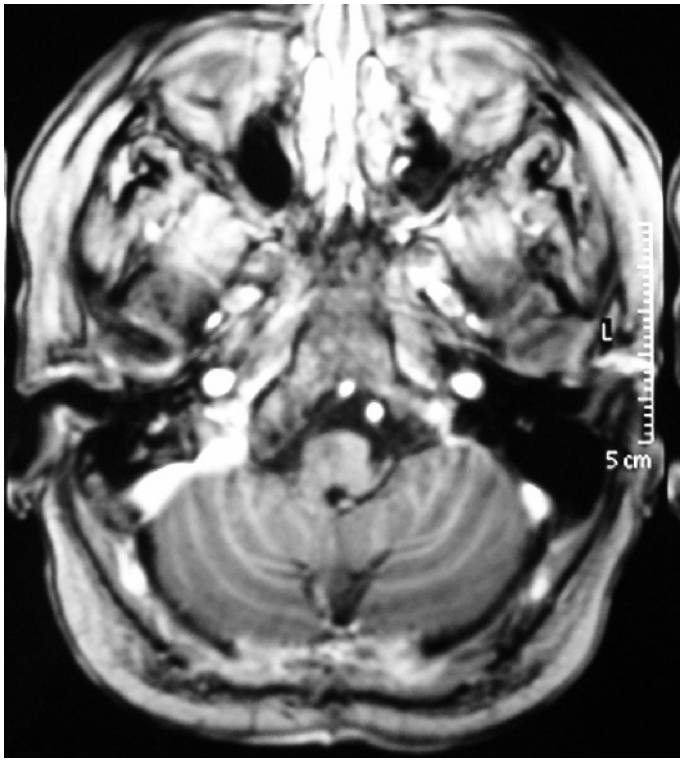

Post op

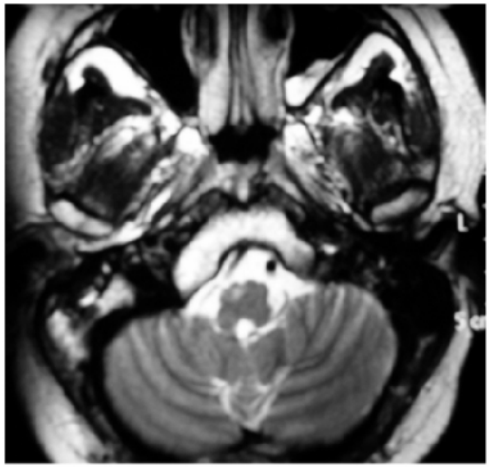


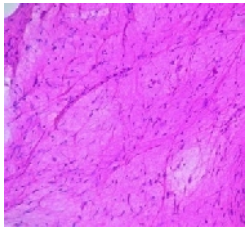
# *Illustrative Case 5*

- **A 29-year-old man.**
- **KPS 70**
- **2 months history of:**
  **rt hemiparesis,**
  **rt hypoacusia,**
  **rt facial palsy,**
  **dysphagia,**
  **dysphonia.**







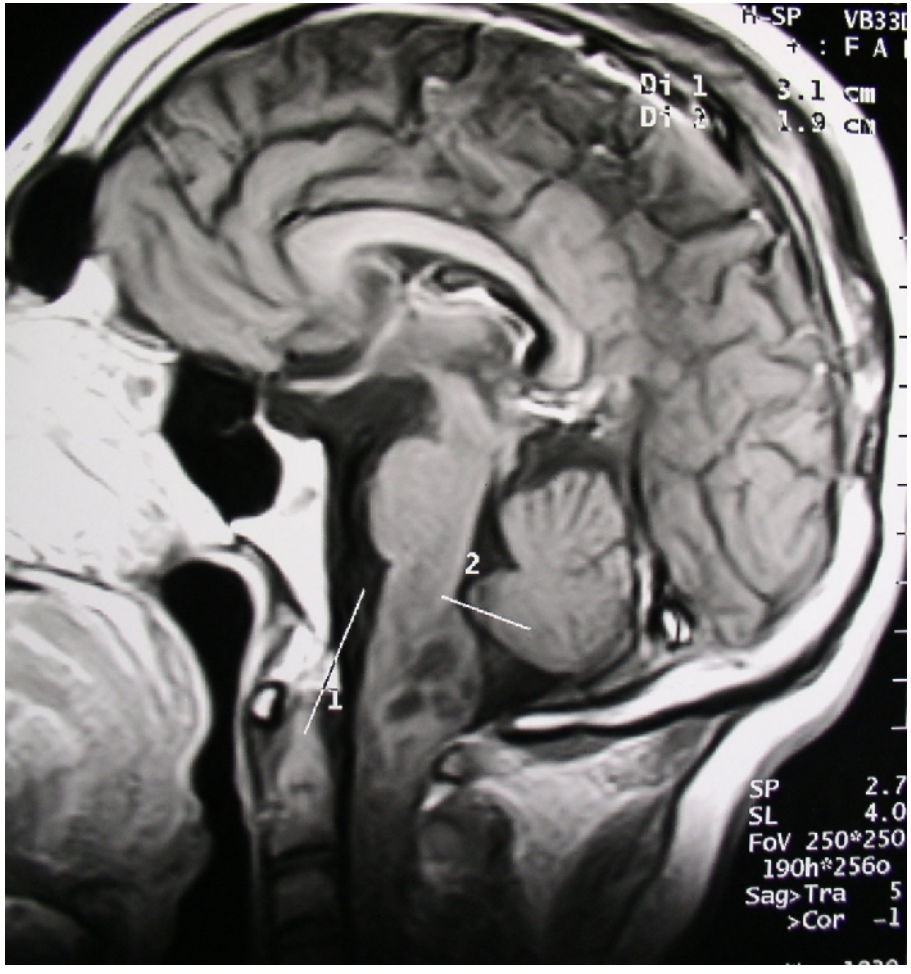
**Pathology:**
**Inflammatory demyeli-nating disease (IDD)**

**Long term follow-up:**
**the patient developed a CNS demyelinating disease (MS)**

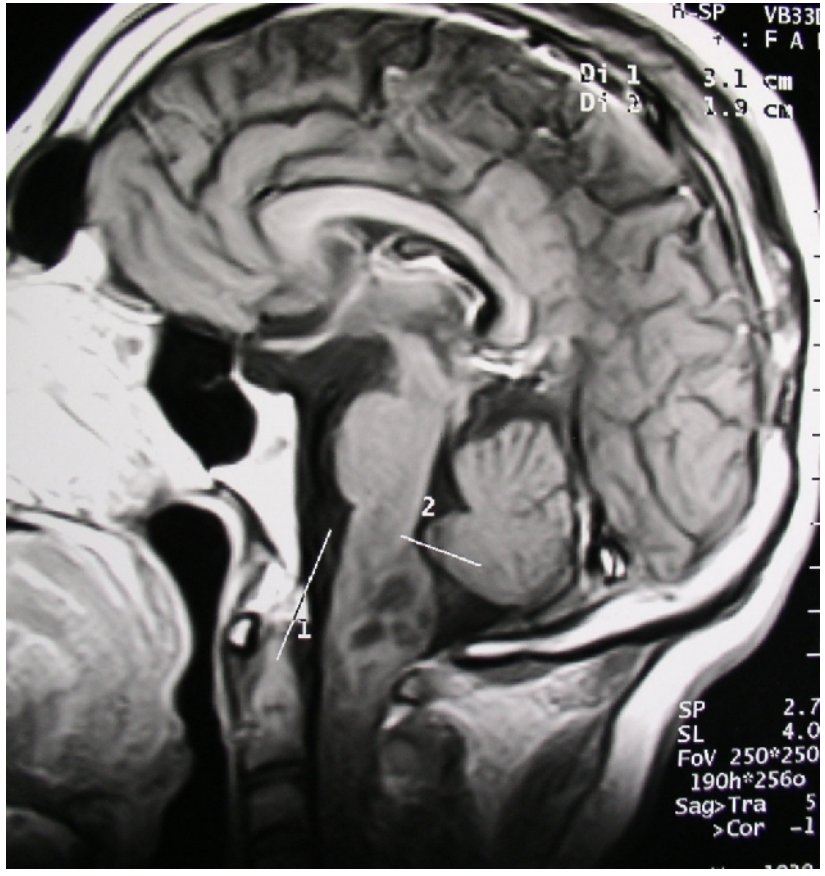
# *Illustrative Case 6*

- **30-year-old man**
- **KPS 60**

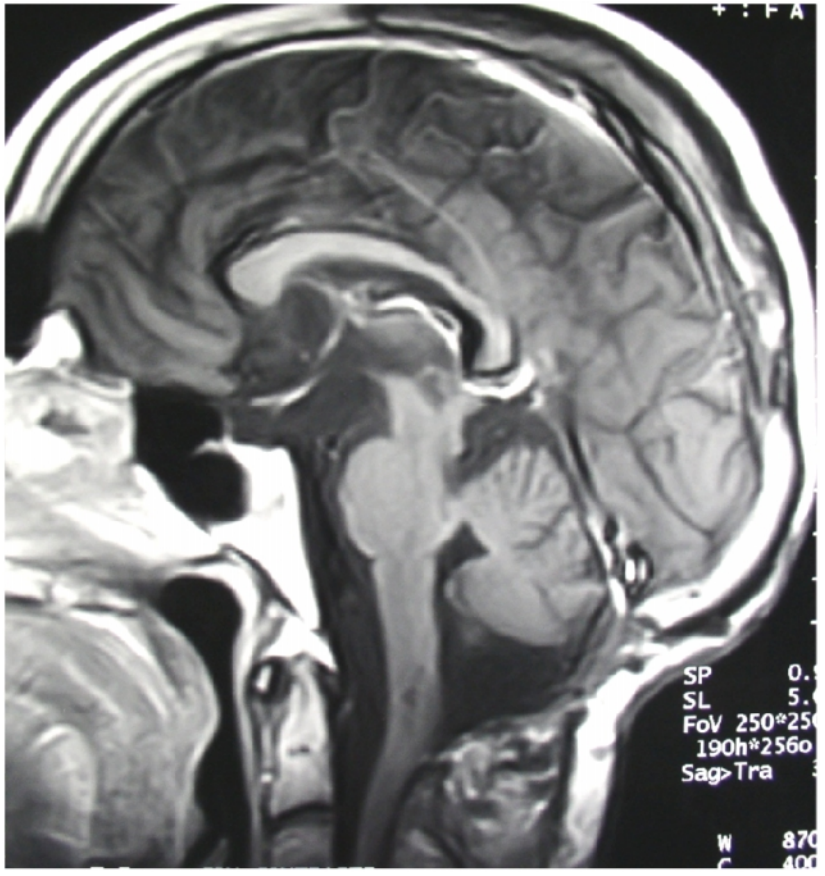
- **2-month history of: headaches, vomiting, gait ataxia, dysphonia, dysphagia, urinary incontinence.**



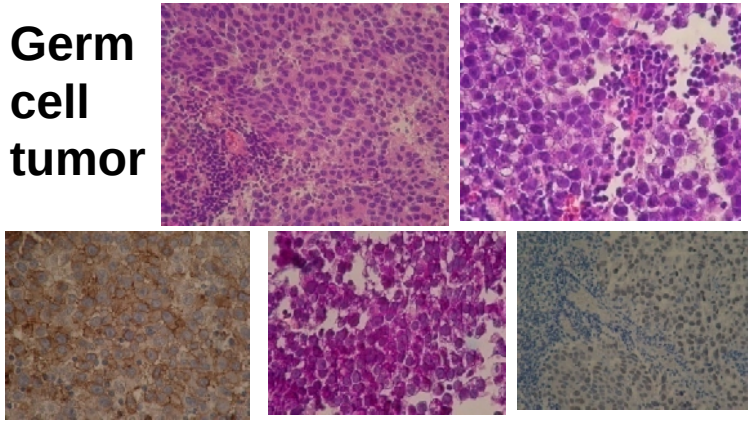
## Pre-op MRI




## Post-op MRI



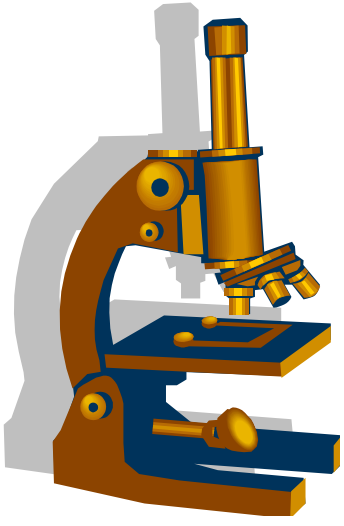

**Germ cell tumor**



**There was no complications. Post operatively, he received chemotherapy and radiotherapy.**

# In conclusion

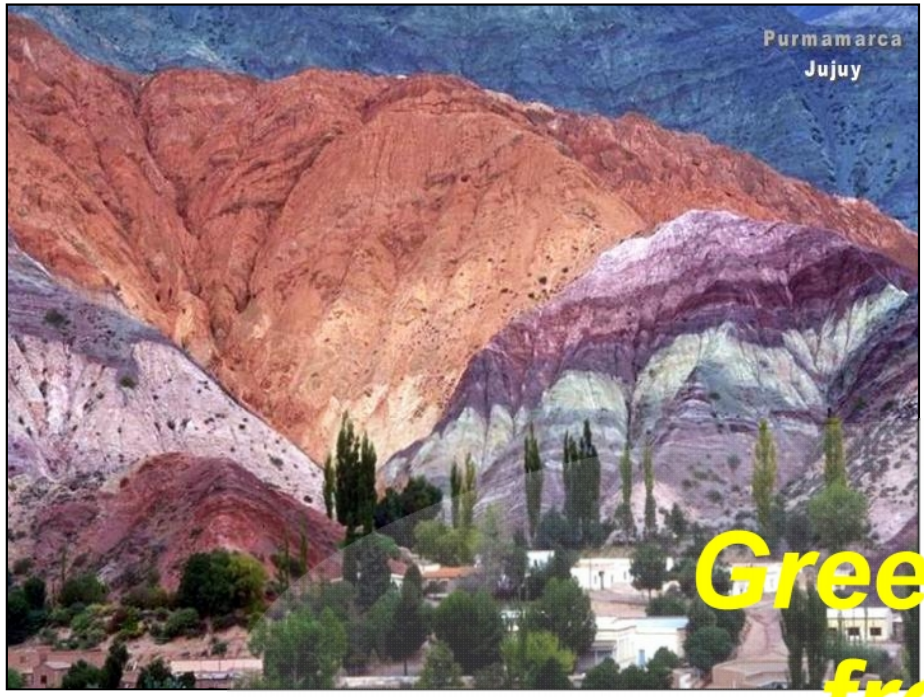
- **Awareness of the histopathology of BS tumors is crucial to define:**



  - **the course of treatment**
  - **the prognosis**
  - **and could avoid the disastrous consequences of empiric treatments**

# However, we need to know more...

- **Although we are encouraged to approach BS tumors in adults,**
- **we recognize that well evidence-based studies will be conducted in order to define the surgical outcome in large series of patients.**




# Greetings from Argentina !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*The author has no personal financial or institutional interest in any of the materials or devices described in this article. Pictures of patients were authorized by them for presentation with academic purposes.*