

**VIAGGIO ALLA (RI)SCOPERTA DELLA SINDROME DI CUSHING**

**ALTOGETHER TO BEAT CUSHING'S SYNDROME**

**Napoli, 10 aprile 2017**

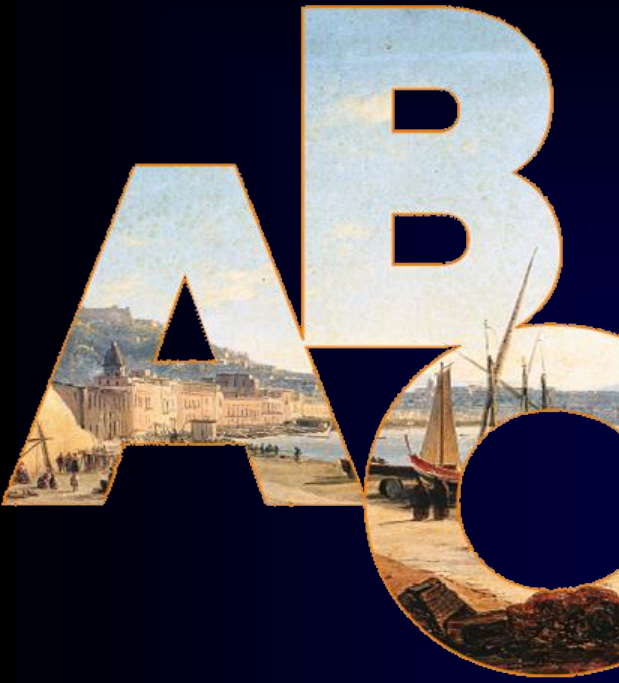
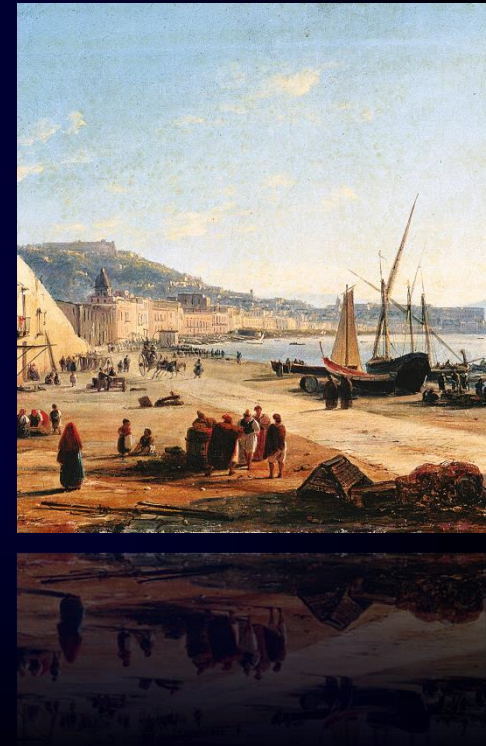
**FERDINANDO CARANCI**

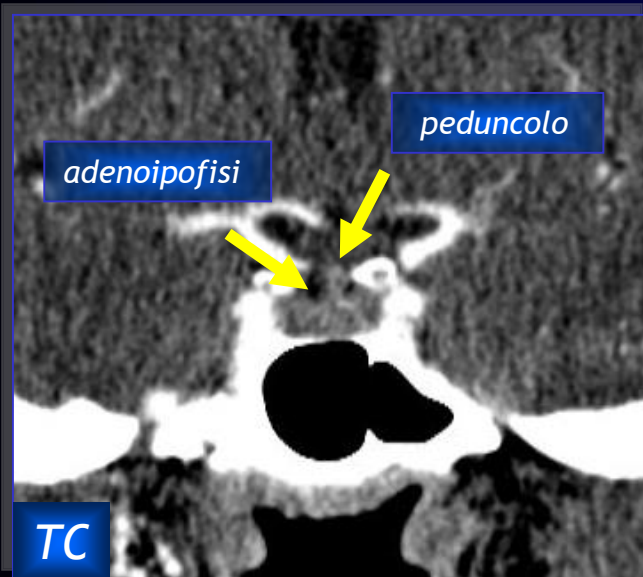
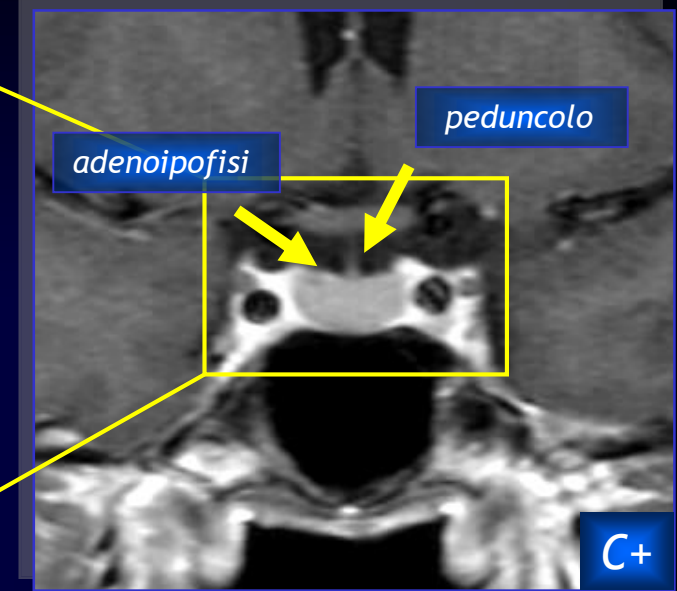
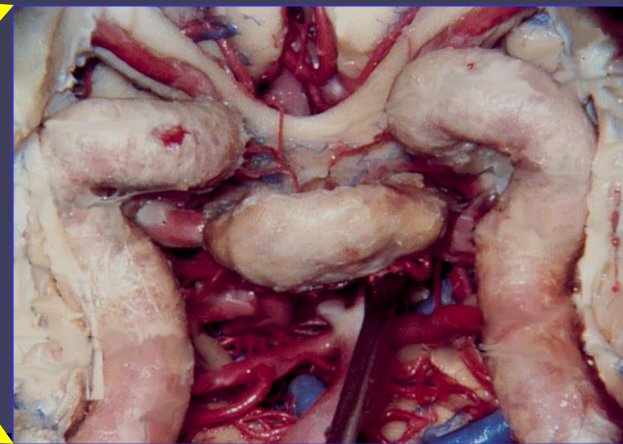
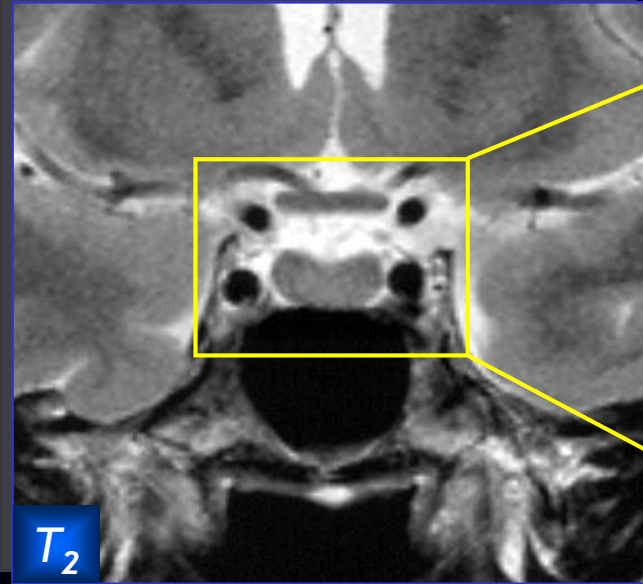
**RUOLO DELL'IMAGING**

**Dipartimento di Scienze per la Salute**

**Facoltà di Medicina e Chirurgia**

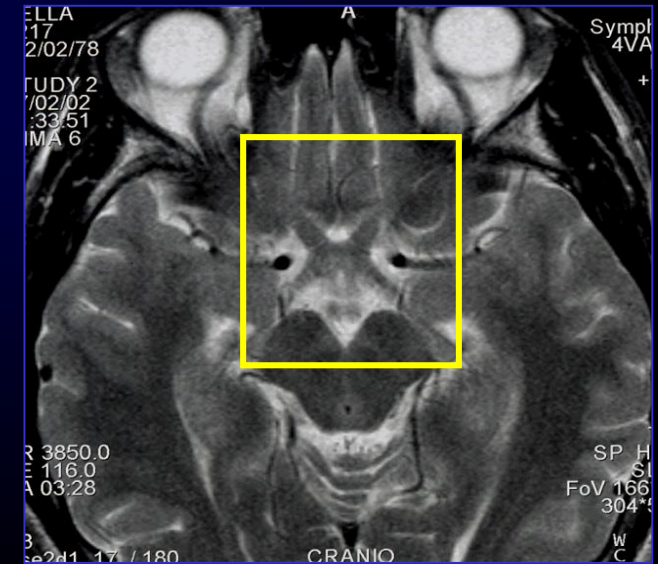
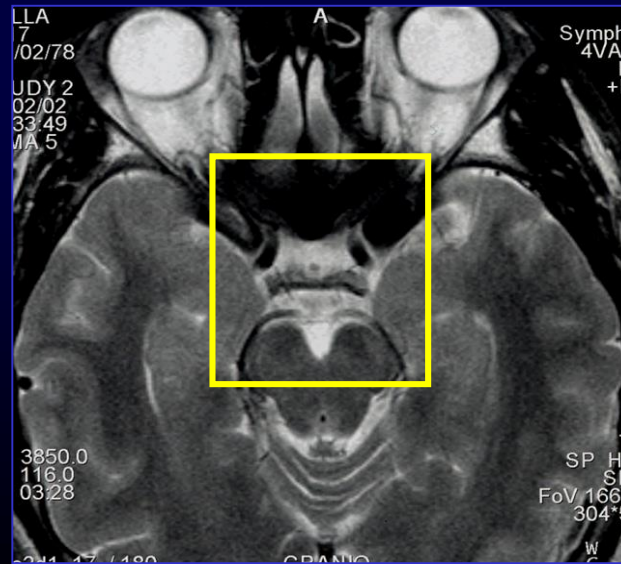
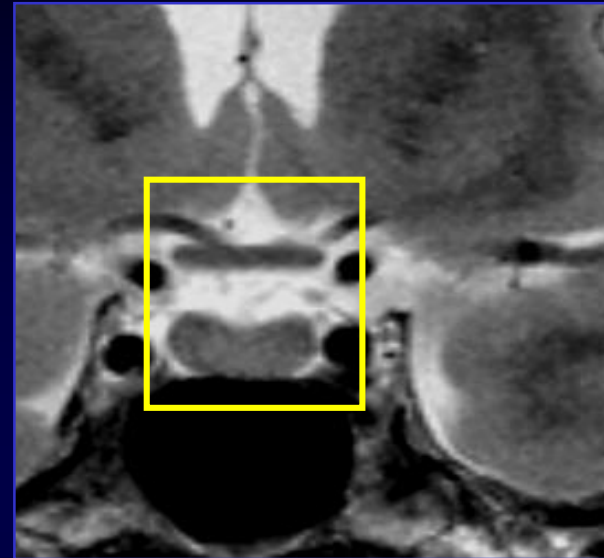
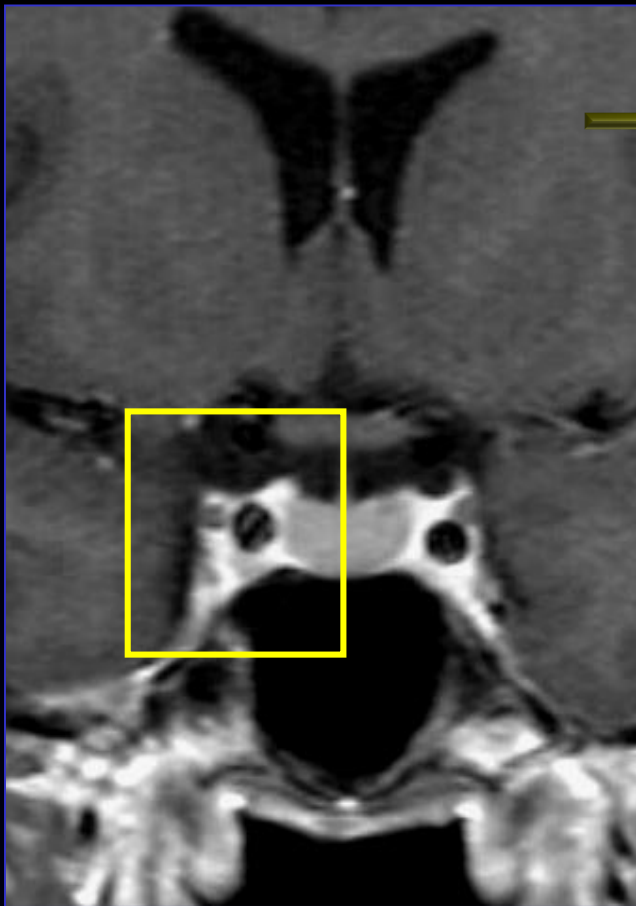
**UNIVERSITÀ DEL MOLISE**



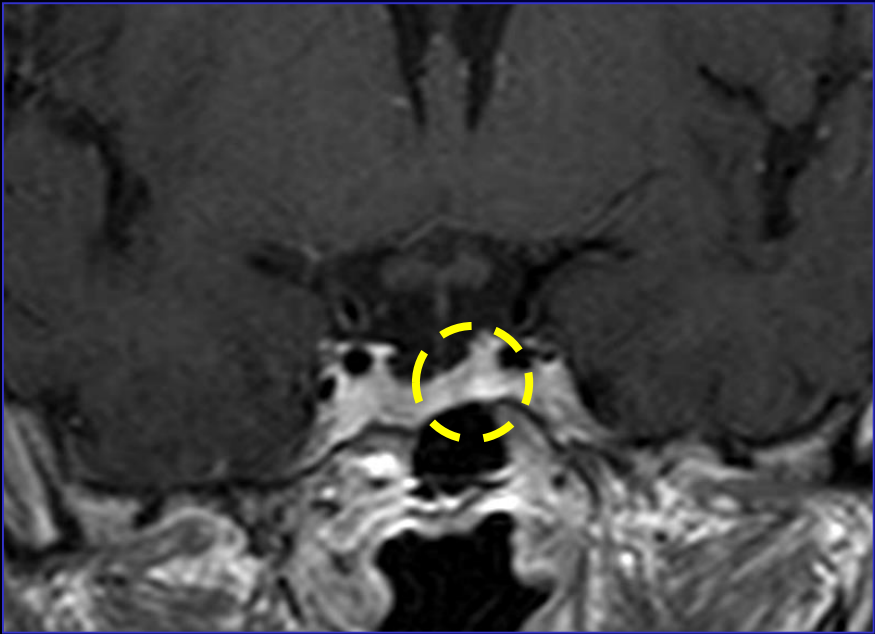
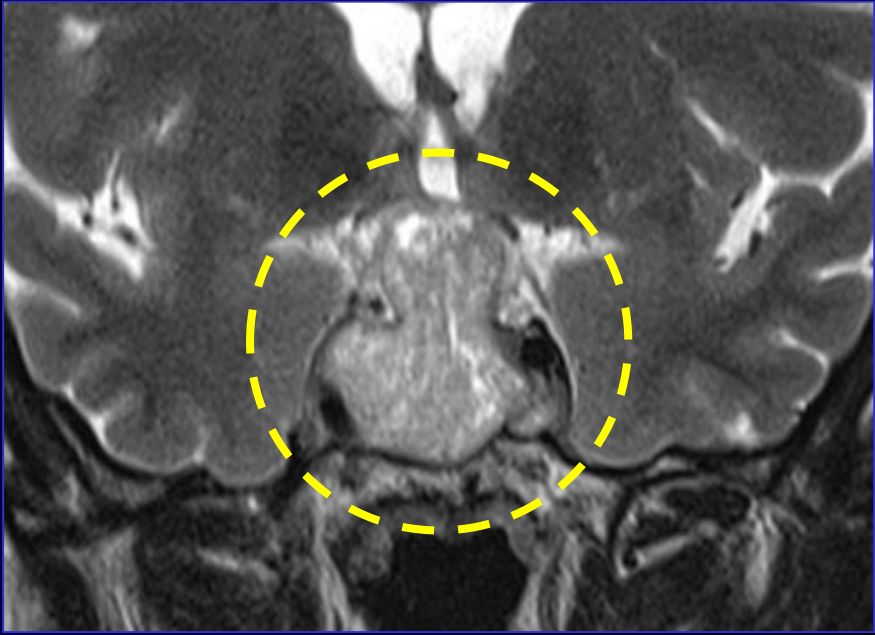
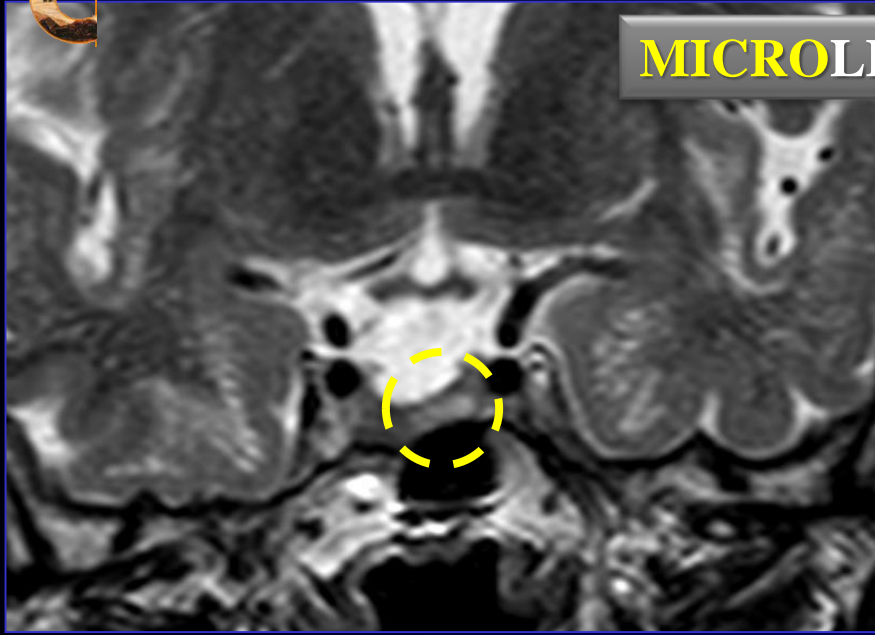


“... la **Risonanza Magnetica** riassume tutte le indicazioni per lo studio morfologico della regione sellare ...  
 ...la **Tomografia Computerizzata** deve essere riservata in seconda istanza a casi selezionati ...”

# ANATOMIA NEURORADIOLOGICA



MICROLESIONE



MACROLESIONE



✓ strato sottile (1-3 mm)

✓ piano sagittale (logge cavernose)

✓ piano coronale (peduncolo ipofisario)

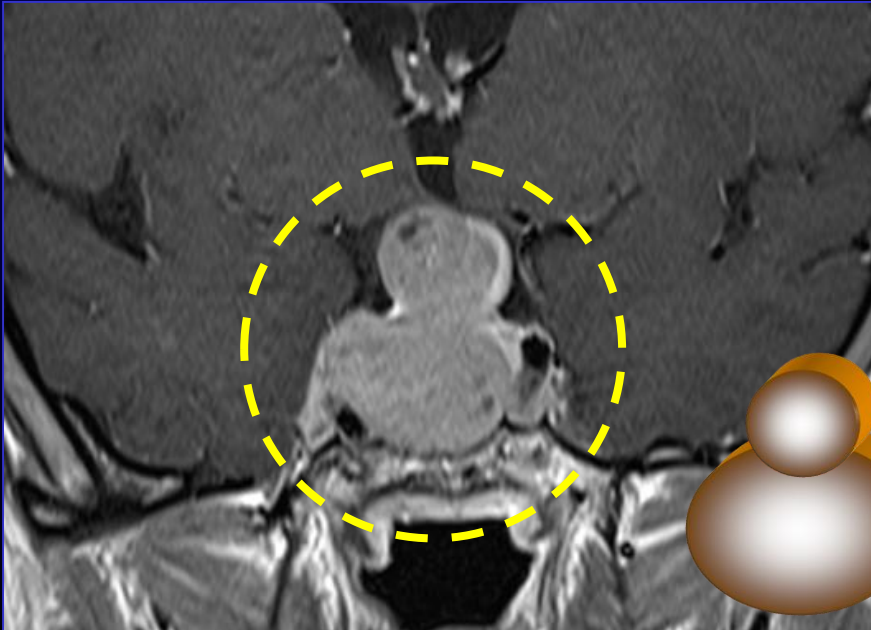
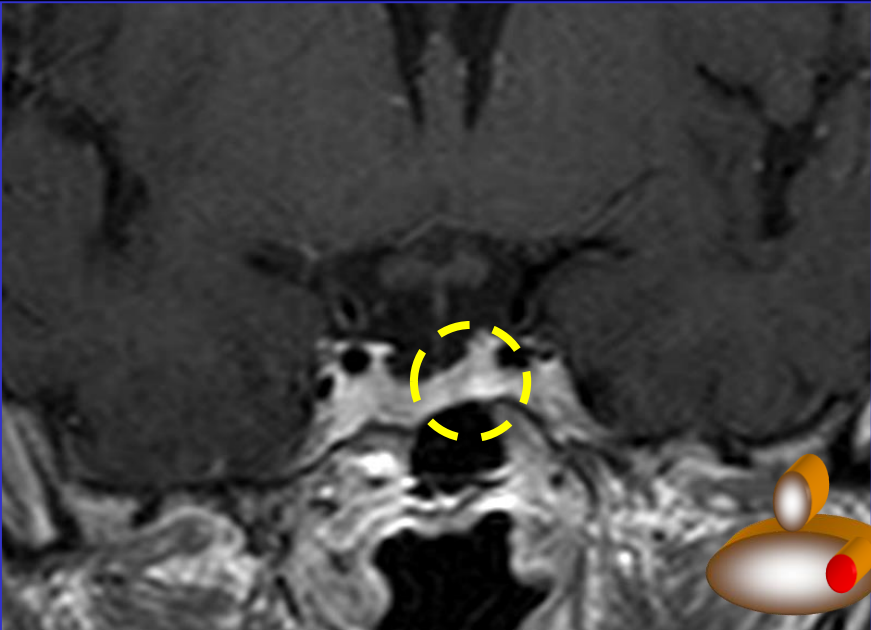
✓ piano assiale (pavimento sellare)

✓ strato sottile (2-3 mm)

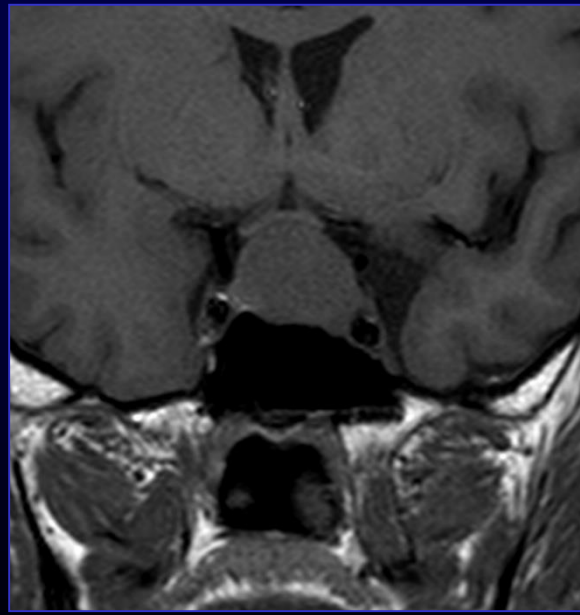
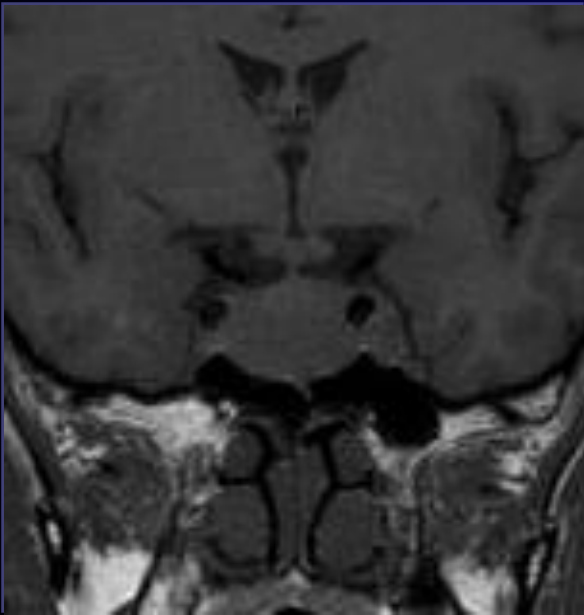
✓ piano sagittale (margini laterali della lesione)

✓ piano coronale (margine ant. - post. della lesione)

✓ piano assiale (margine caudale - craniale della lesione)



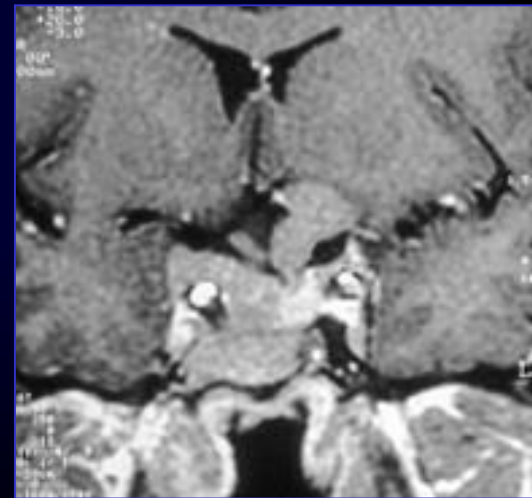
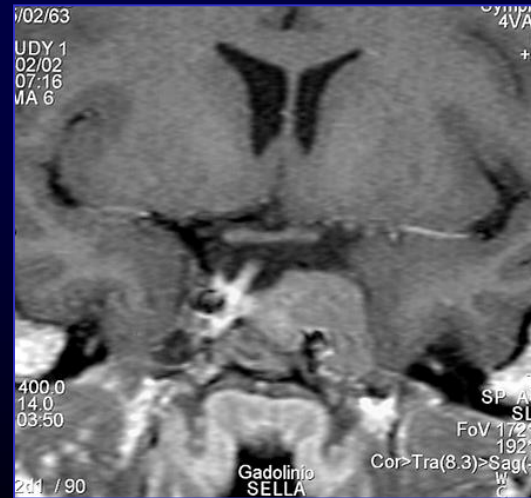
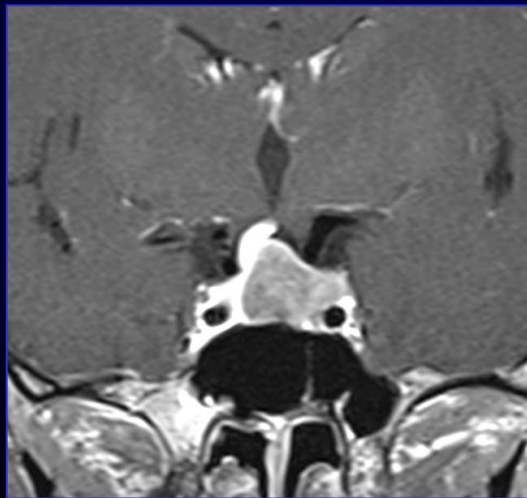
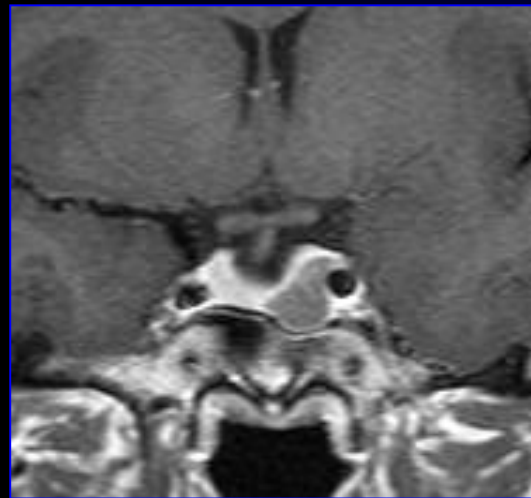
## RAPPORTI CON IL CHIASMA





# MACROADENOMA IPOFISARIO

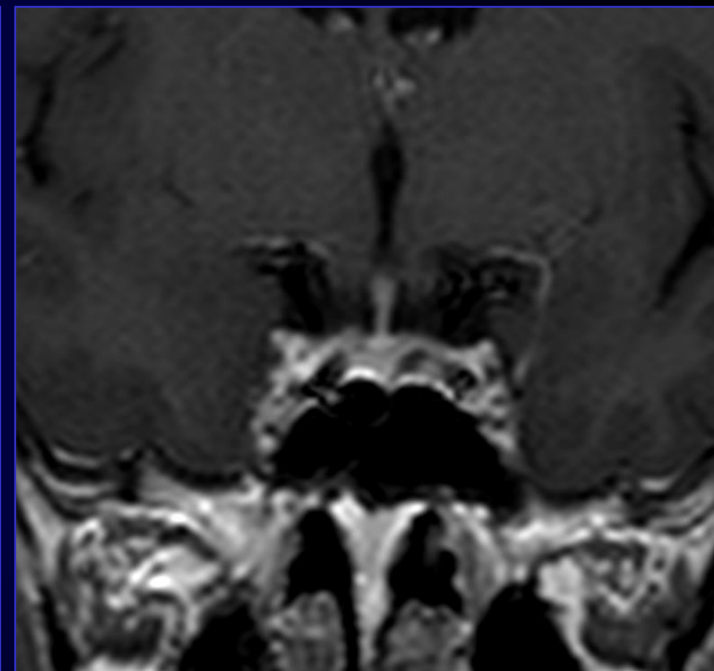
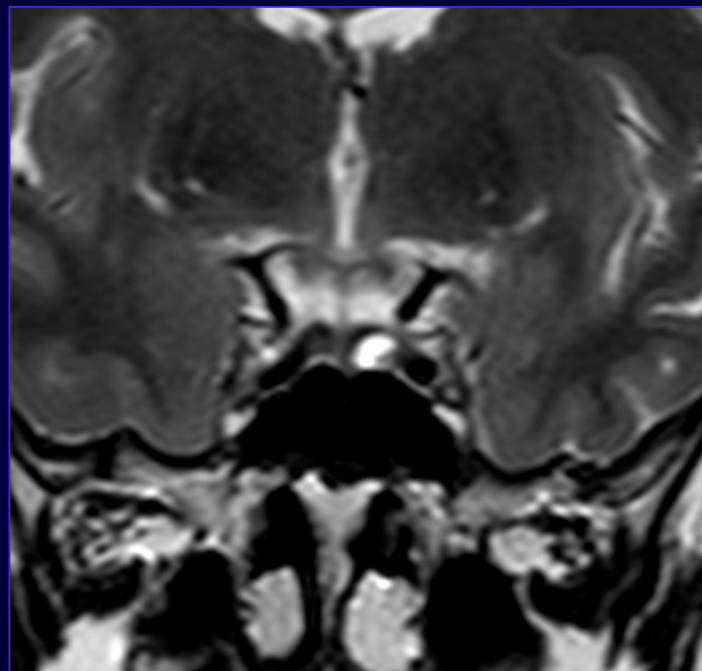
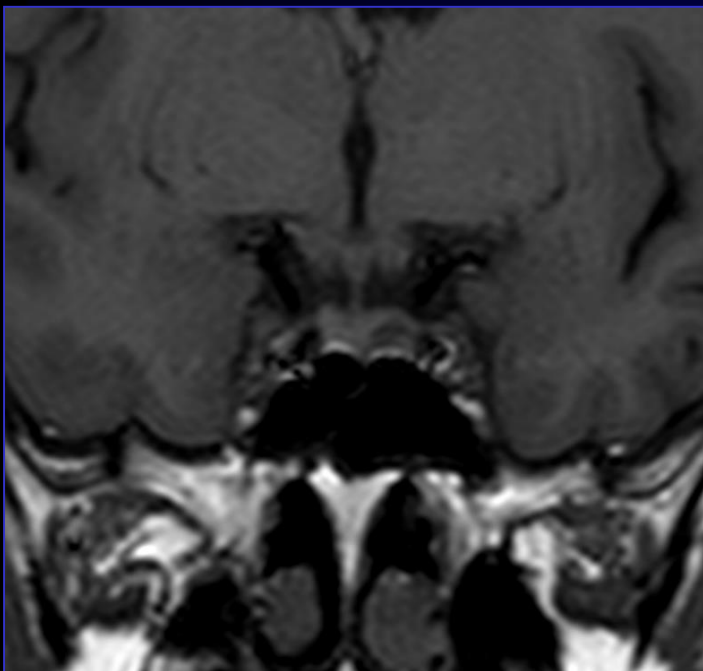
## RAPPORTI CON IL SENO CAVERNOSO



**SEGNI DIRETTI**

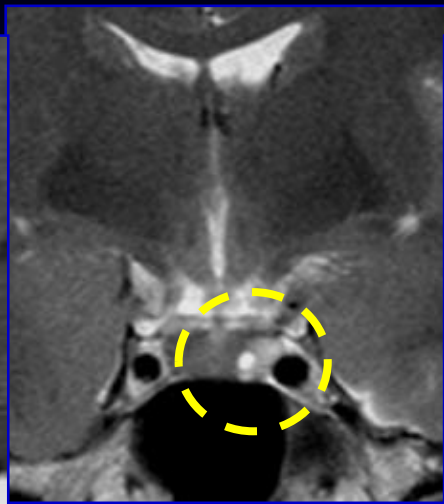
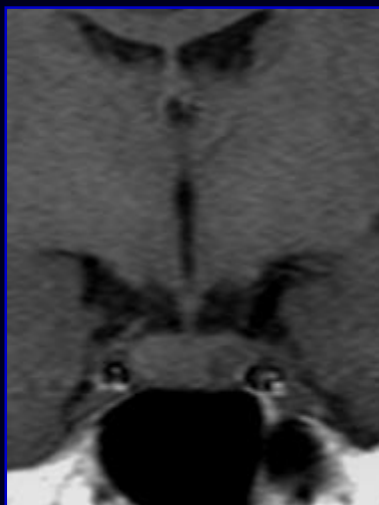
**lesione intraghiandolare < 10 mm**

- ✓ **area focale di alterato segnale**
- ✓ **area focale di alterata impregnazione**

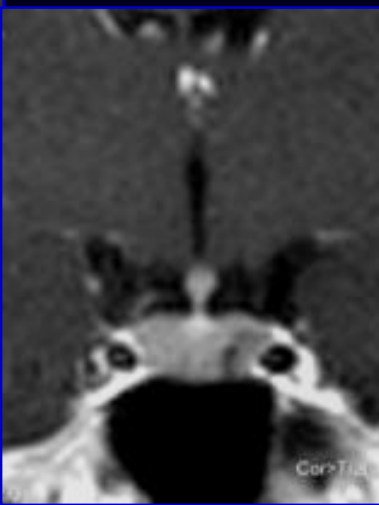




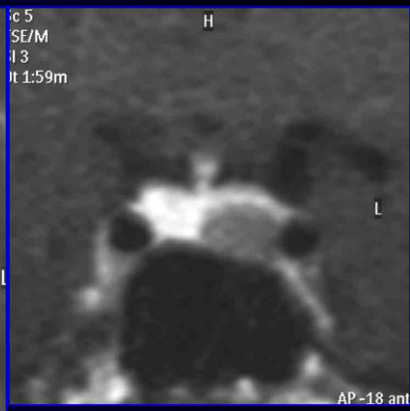
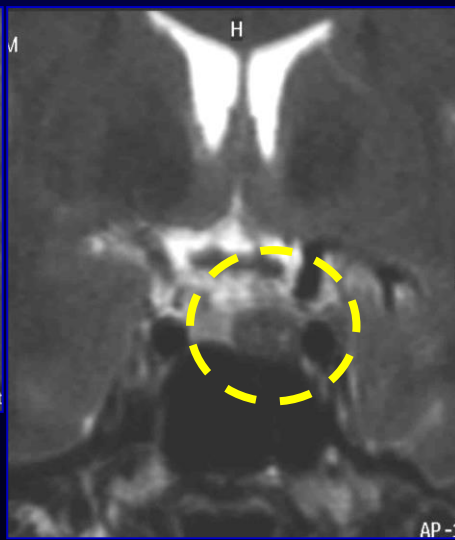
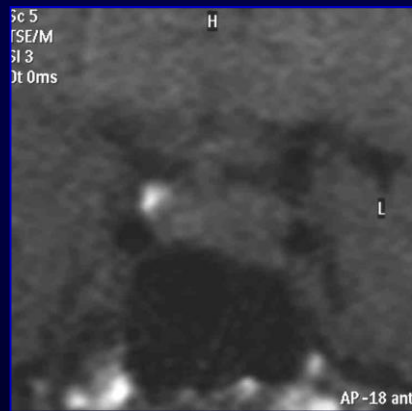
T<sub>2</sub>



PRL



GH



8/10 ADENOMI GH-SECERNENTI

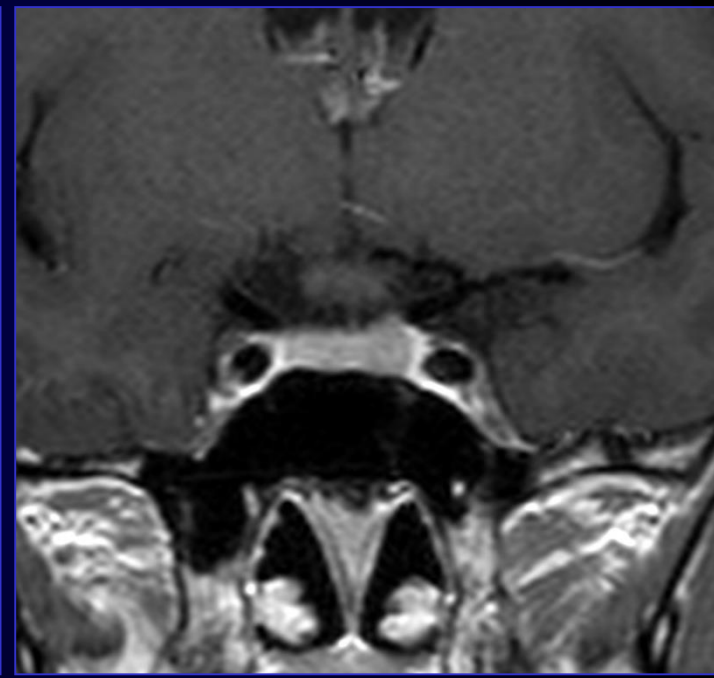
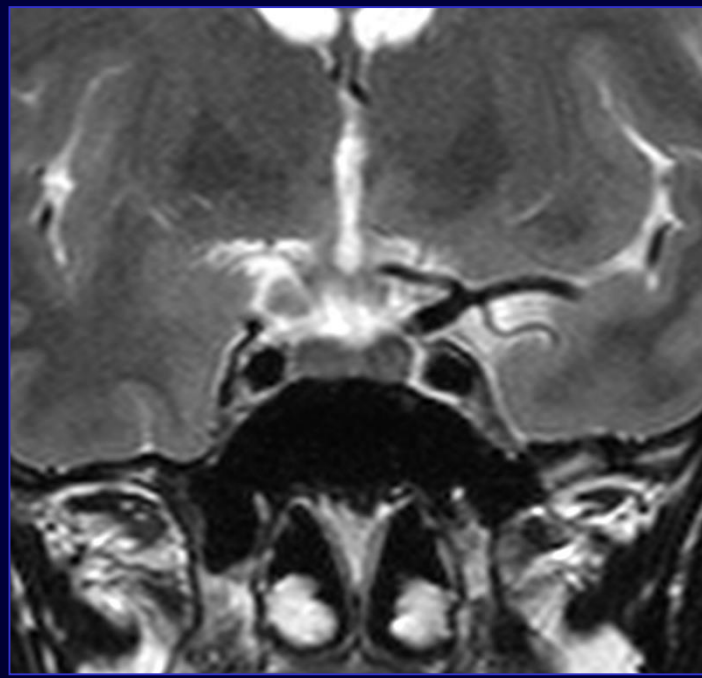
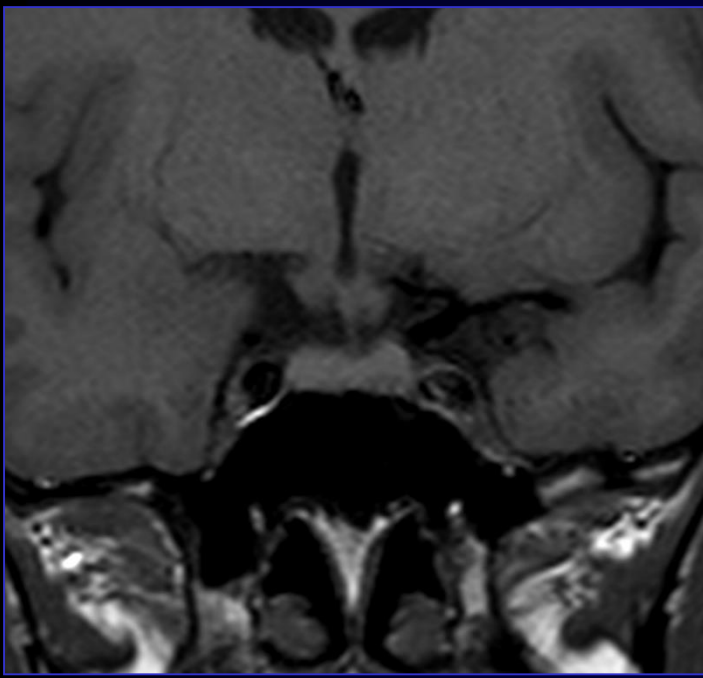
ipointensi in T2

Hagiwara A et Al: *Comparison of GH- and non GH-producing adenomas: imaging characteristics and pathologic correlation.* **Radiology** 228: 533-538, 2003.

**SEGNI DIRETTI**

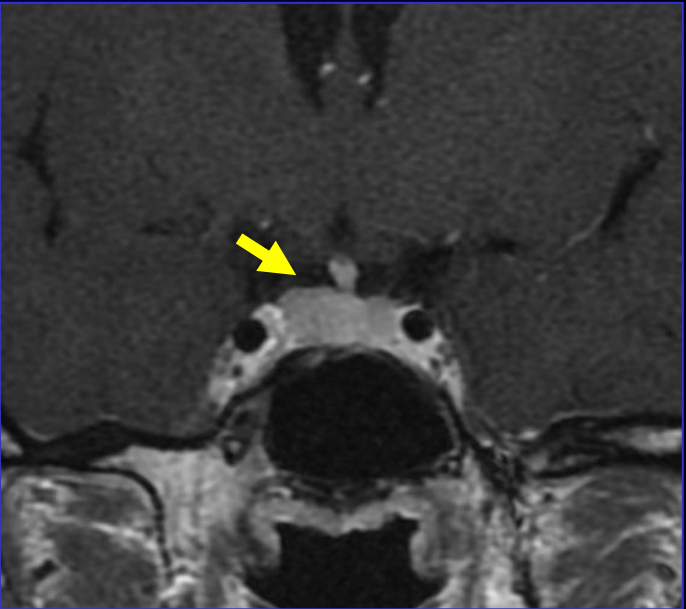
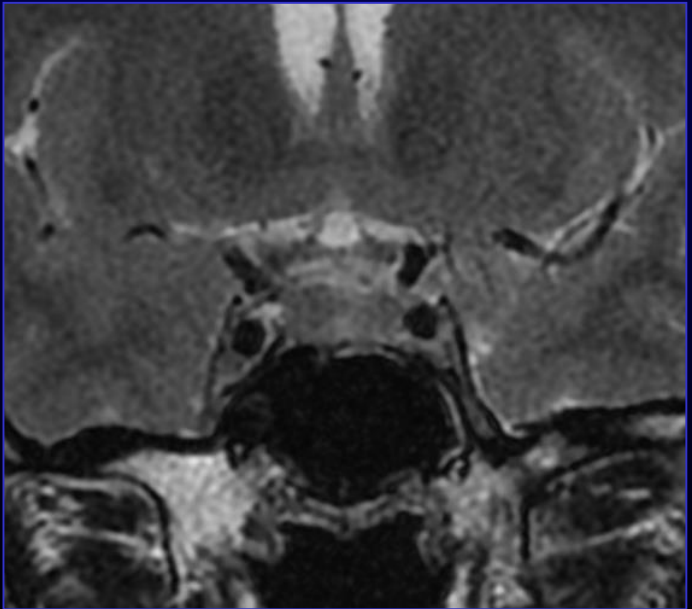
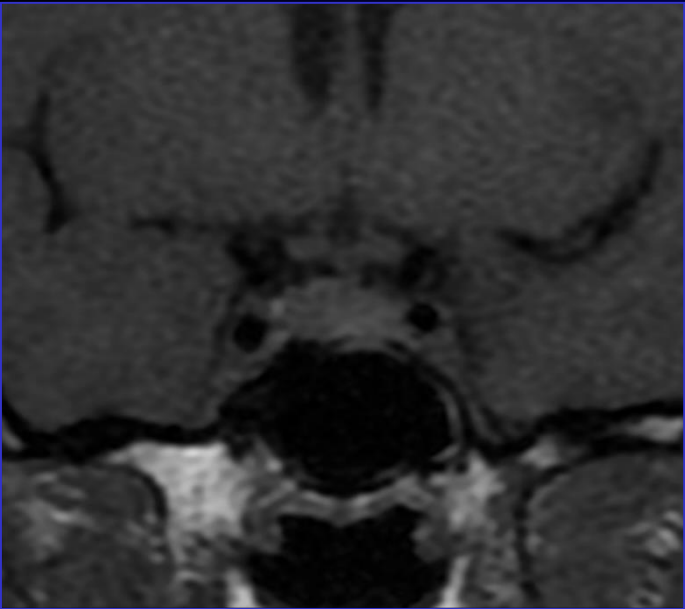
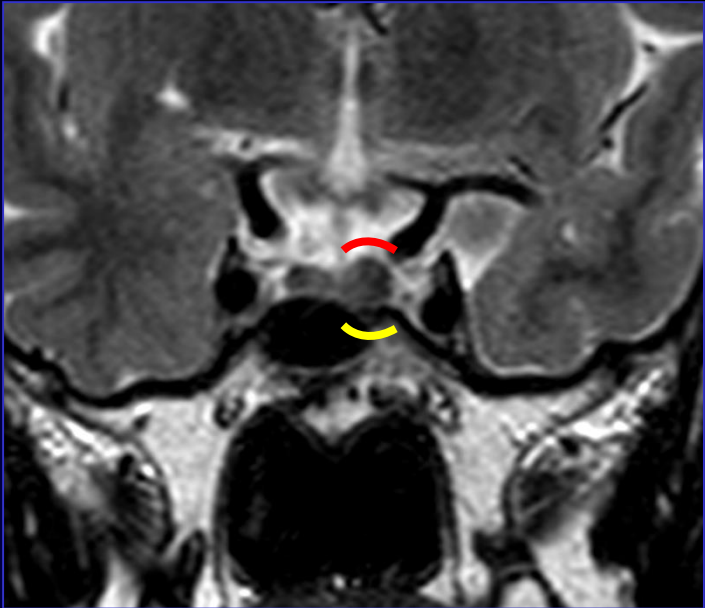
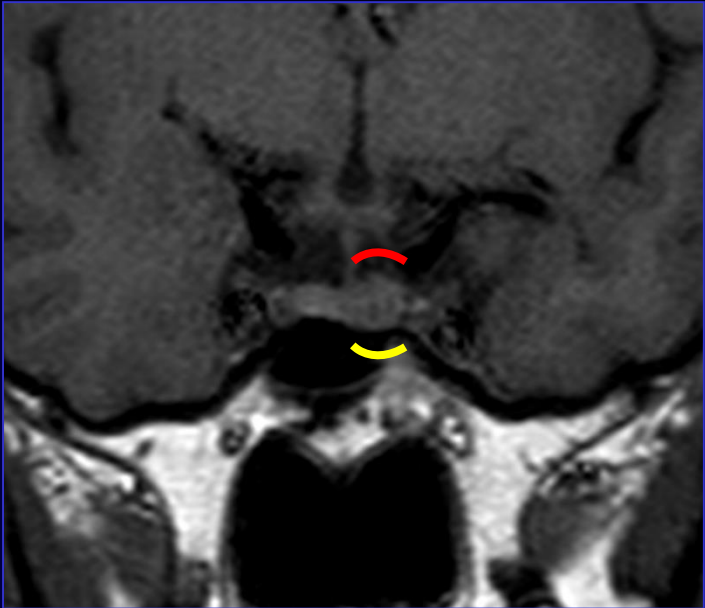
**lesione intraghiandolare < 10 mm**

- ✓ **area focale di alterato segnale**
- ✓ **area focale di alterata impregnazione**

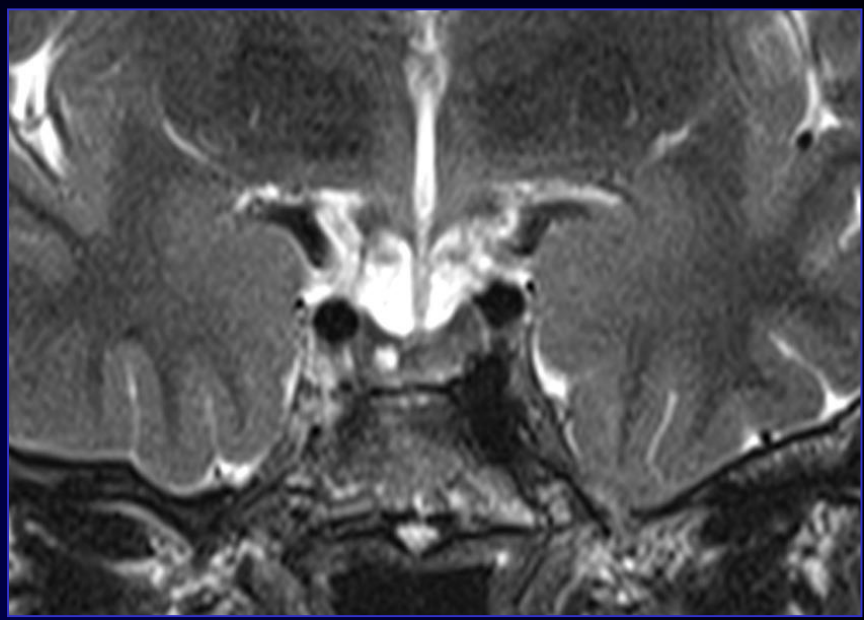
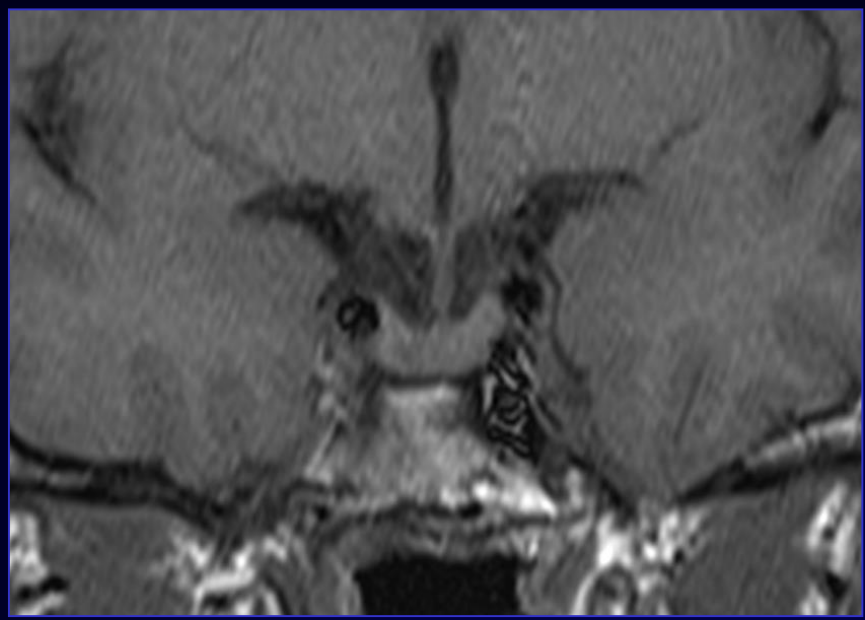


## SEGNI INDIRETTI

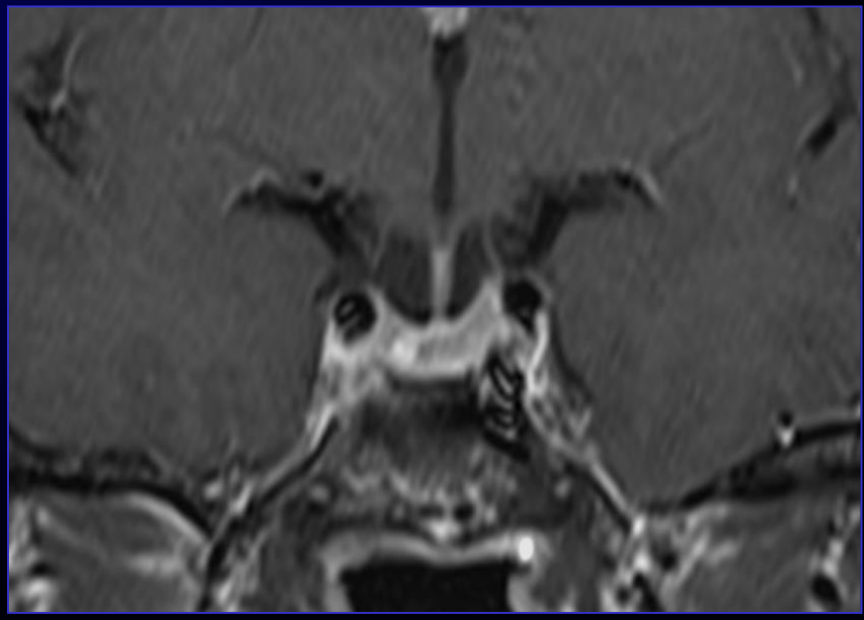
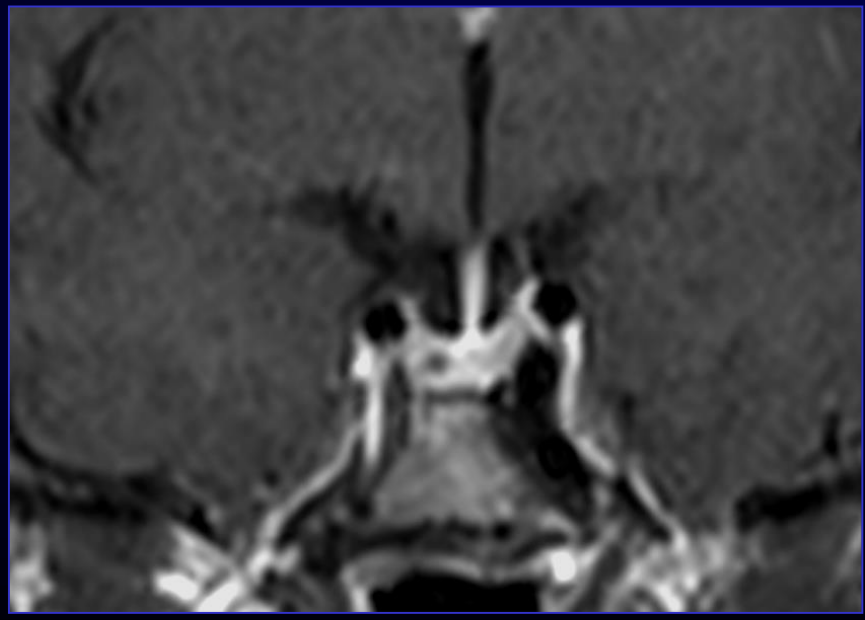
- ✓ convessità superiore
- ✓ erosione pavimento
- ➔ deviazione peduncolo



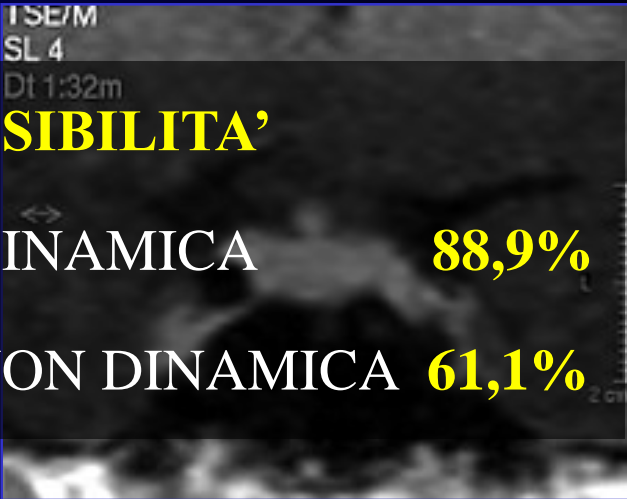
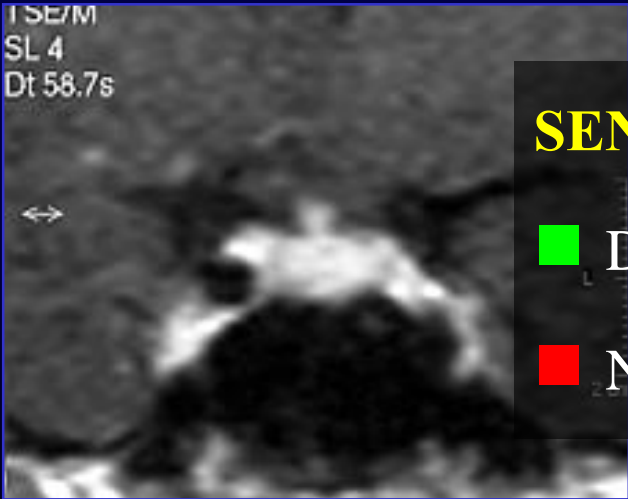
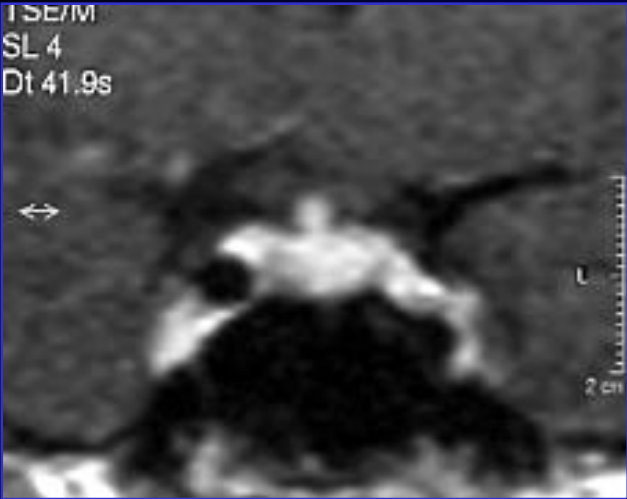
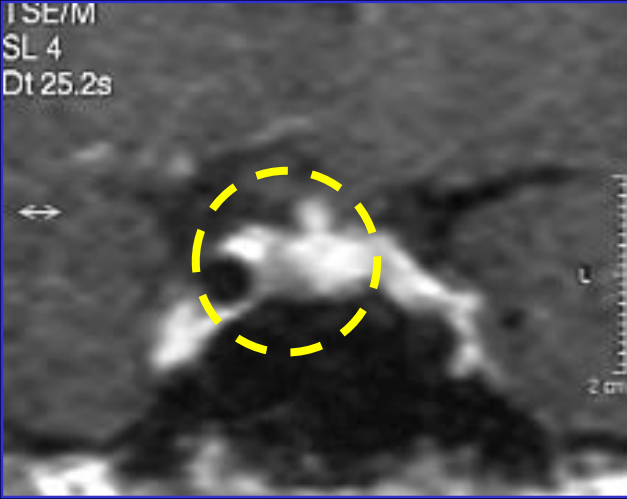
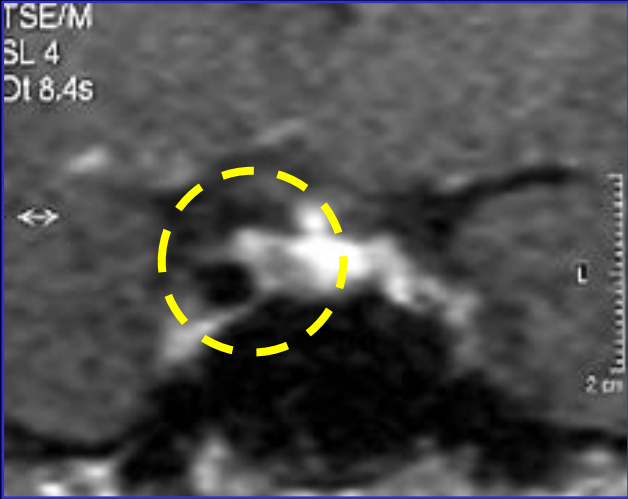
MdC



“flip-flop”



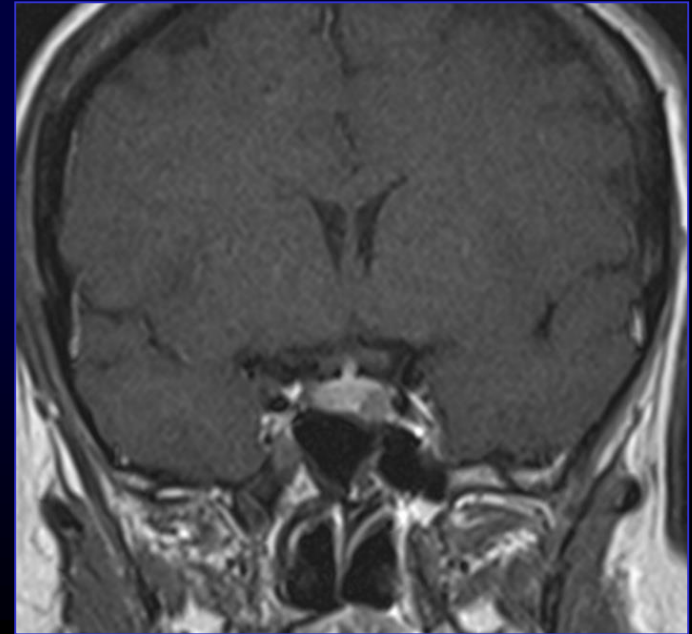
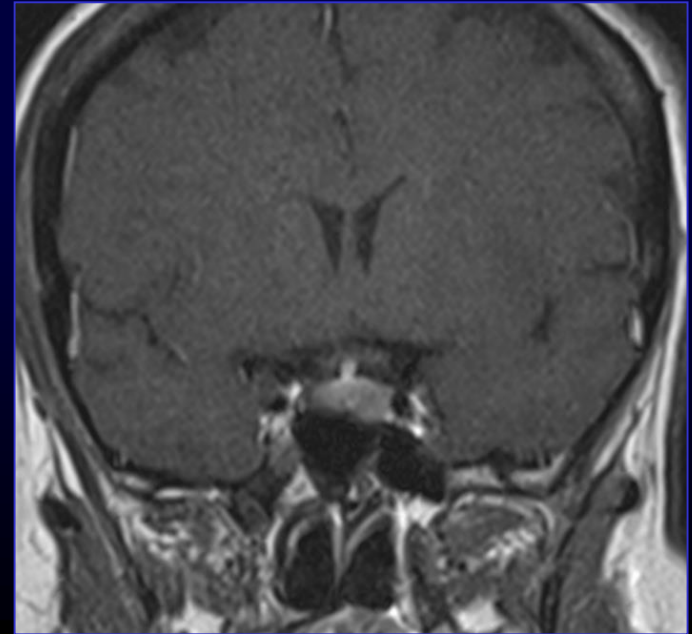
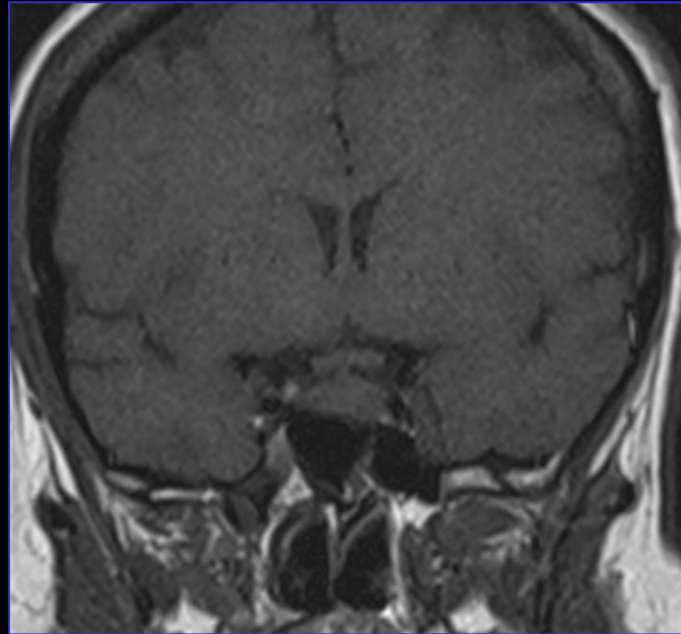
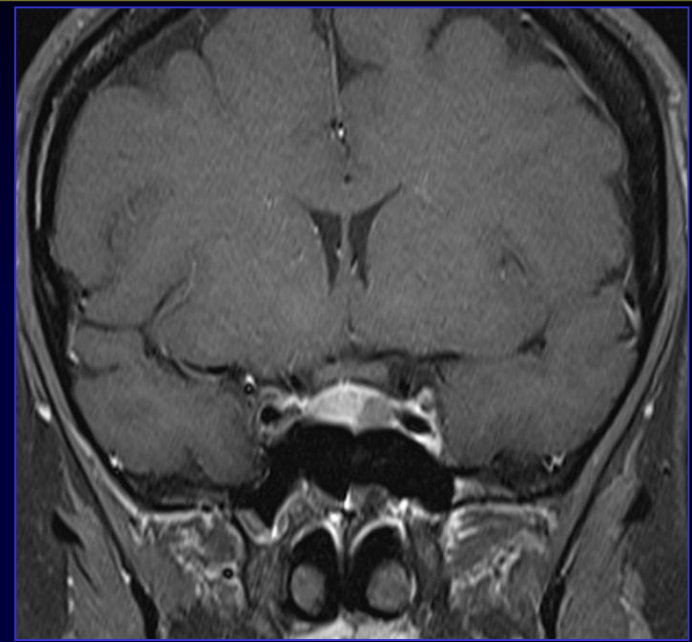
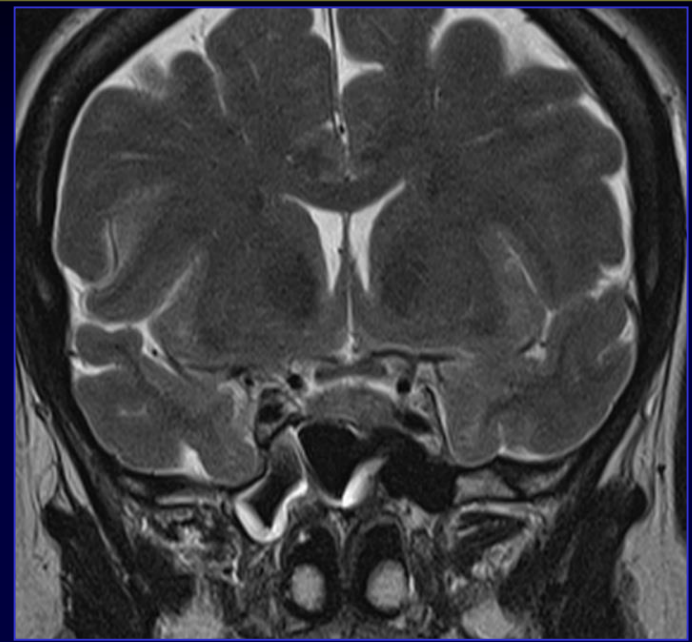
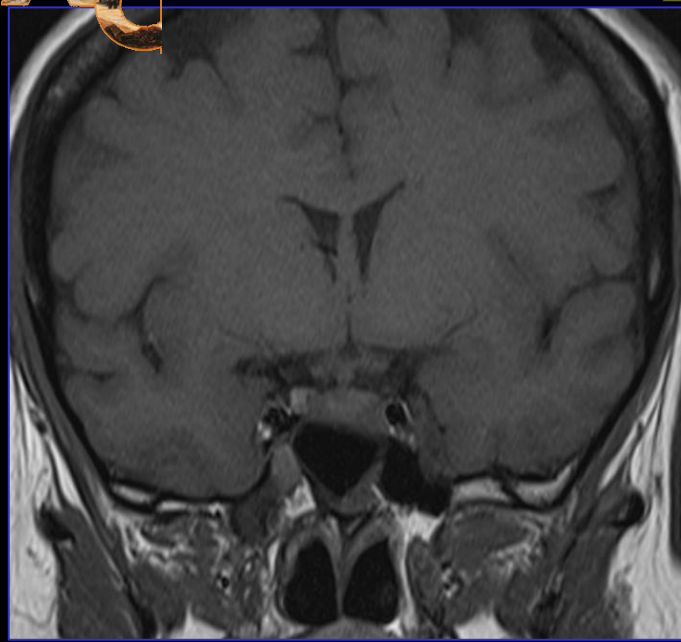
## RM DINAMICA

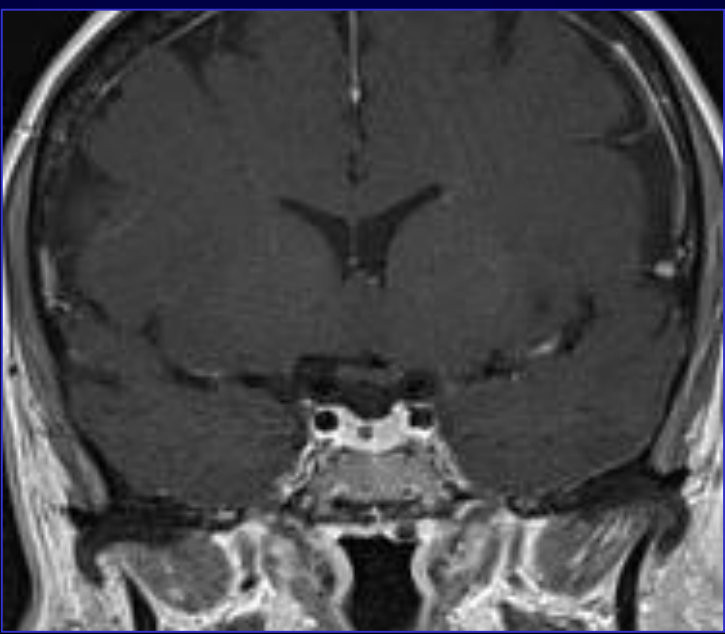
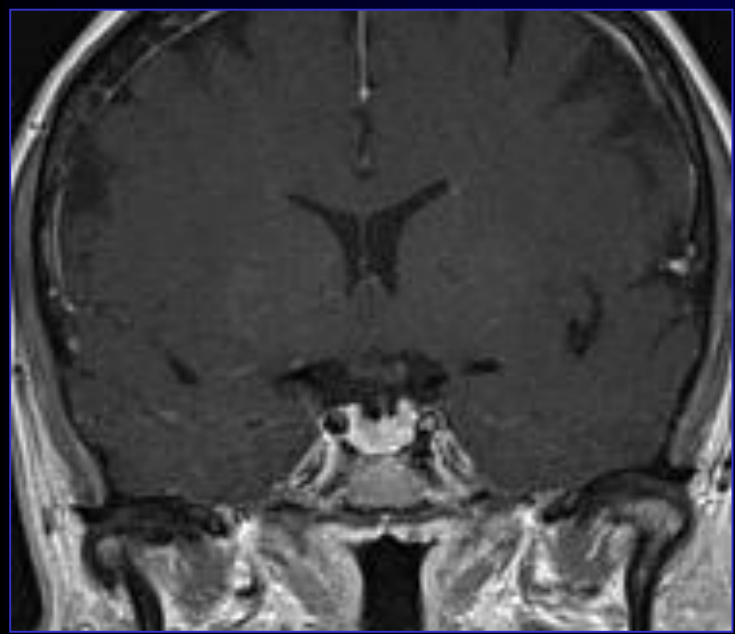
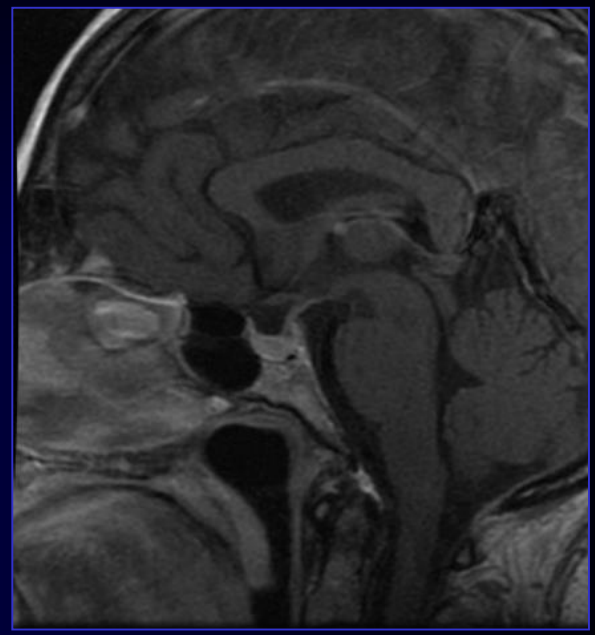
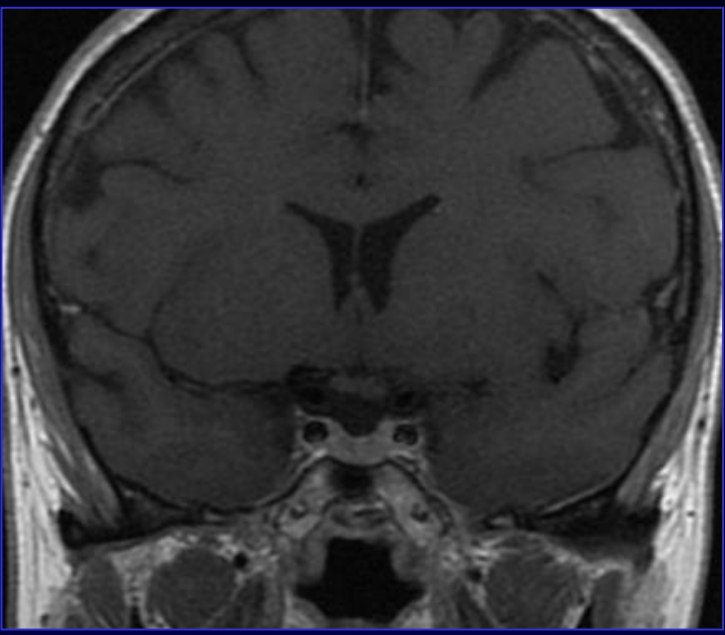
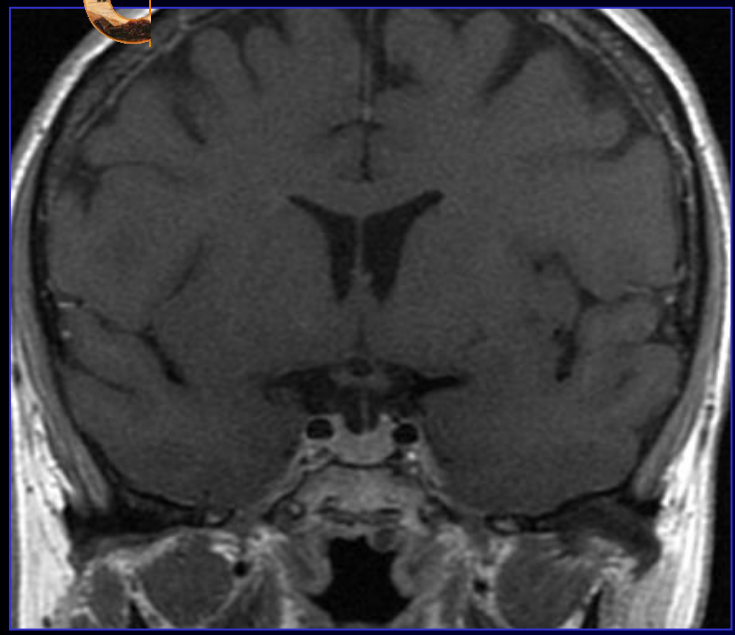


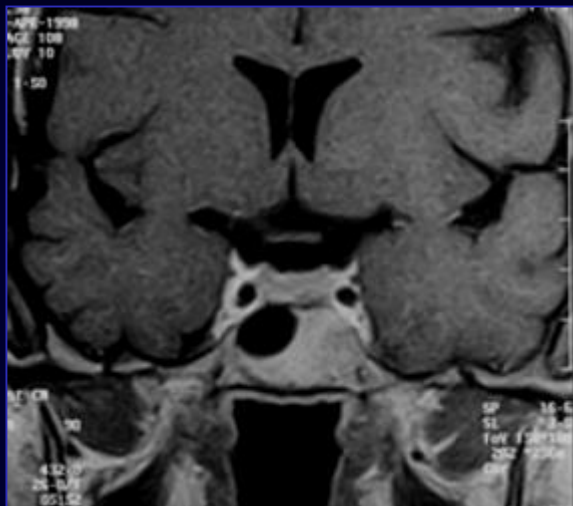
### SENSIBILITA'

- DINAMICA **88,9%**
- NON DINAMICA **61,1%**

Bartynski WS, et Al: *The effect of MR contrast medium dose on pituitary gland enhancement, microlesion enhancement and pituitary gland-to-lesion contrast conspicuity.* *Neuroradiology* 48 449-459, 2006.







TR/TE 422/26 ms  
FOV 15.8 · 18.0 cm



TR/TE 400/10 ms  
**FOV** 12 · 12 cm

*“Not all T1-weighted SE scans are equally accurate ... MRI technique, particularly FOV and TR/TE value, influences results ...”*

Iffat N. Chowdhury A change in pituitary magnetic resonance imaging protocol detects ACTH-secreting tumours in patients with previously negative results. Clinical Endocrinology (2010) 72, 502–506

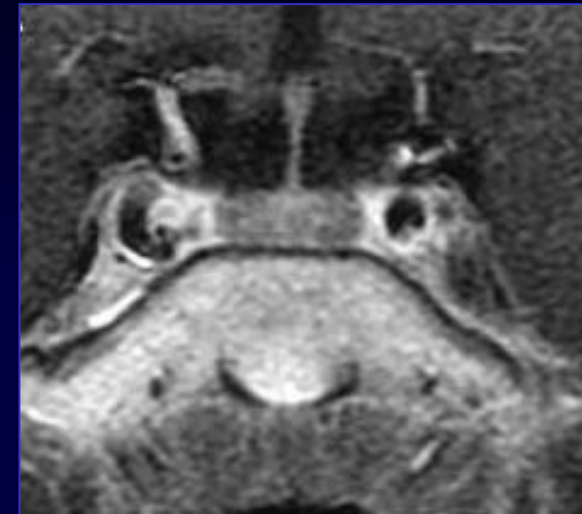


## SEQUENZA Spin-Echo 1.5T

TR/TE: 400/9 msec

FOV: 12 x 12 cm

slice thickness: 3 mm

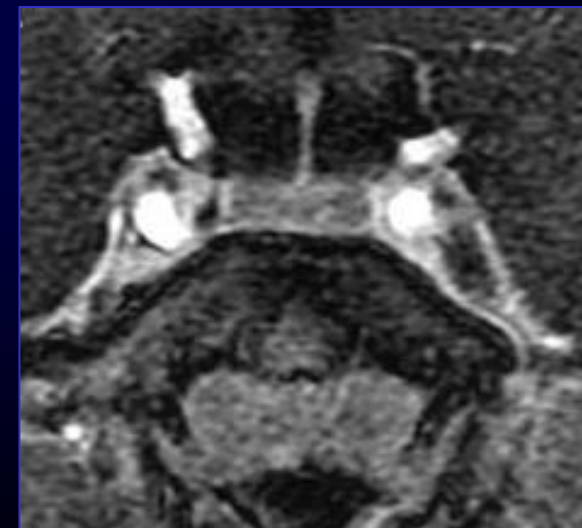


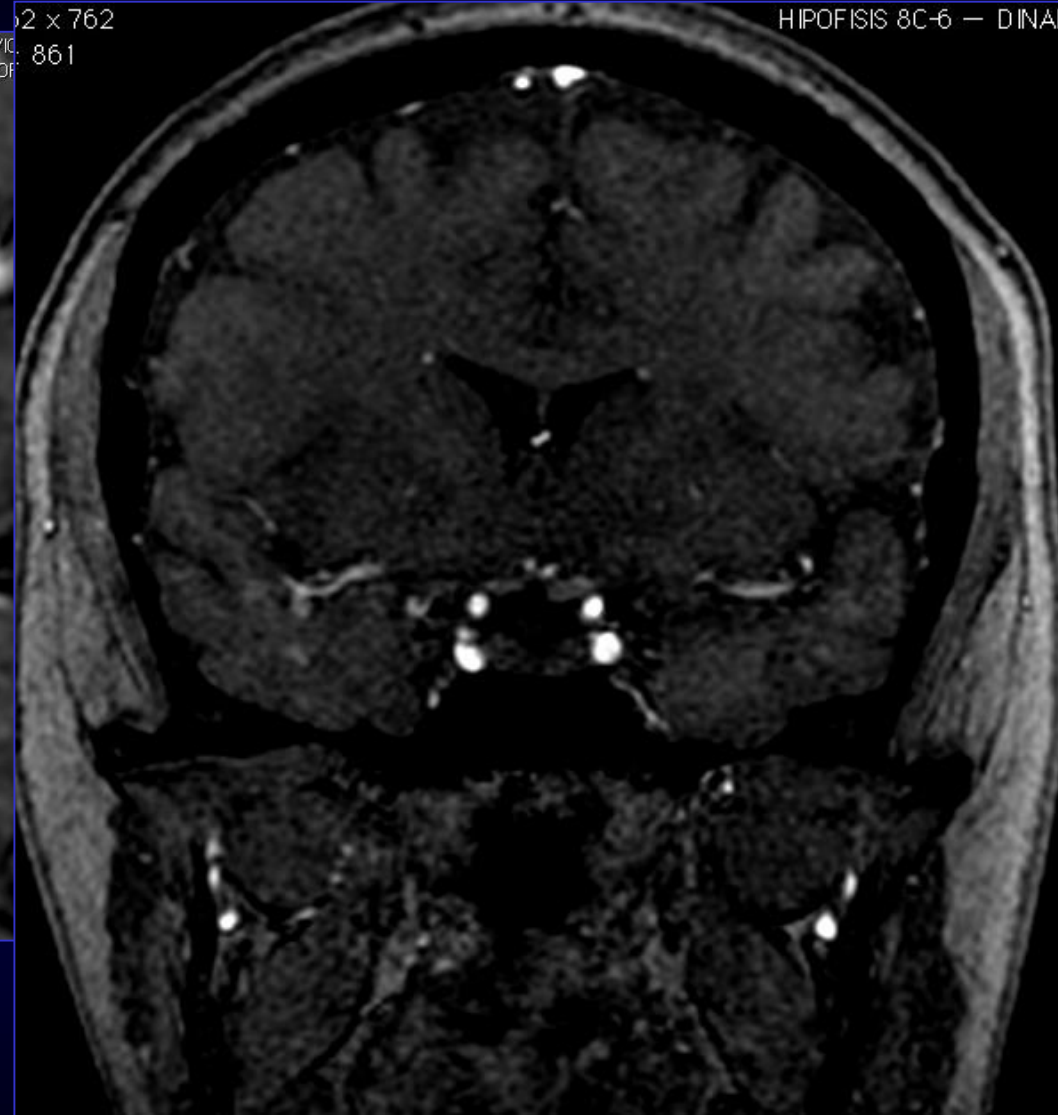
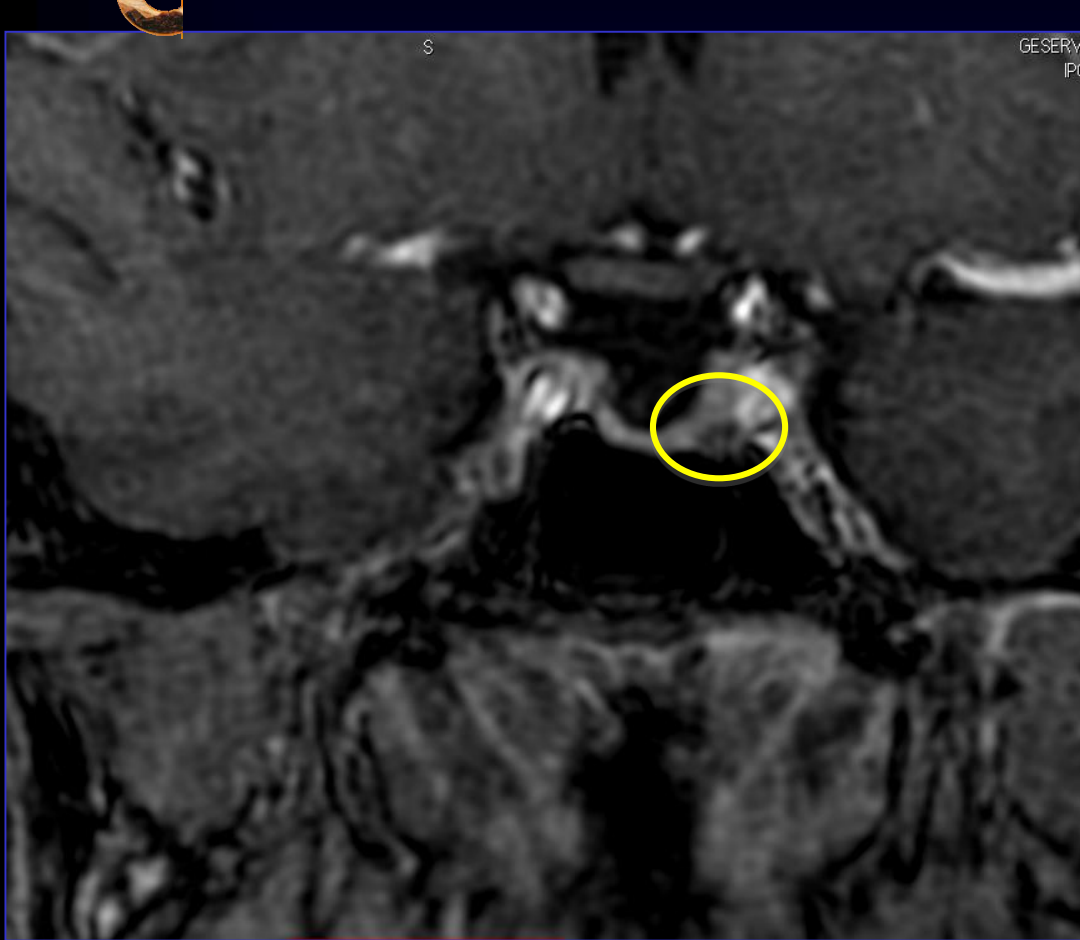
## SEQUENZA VI-SGE 1.5T

TR/TE: 10/3,3 msec

FOV: 16 x 16 cm

slice thickness: 1-2 mm



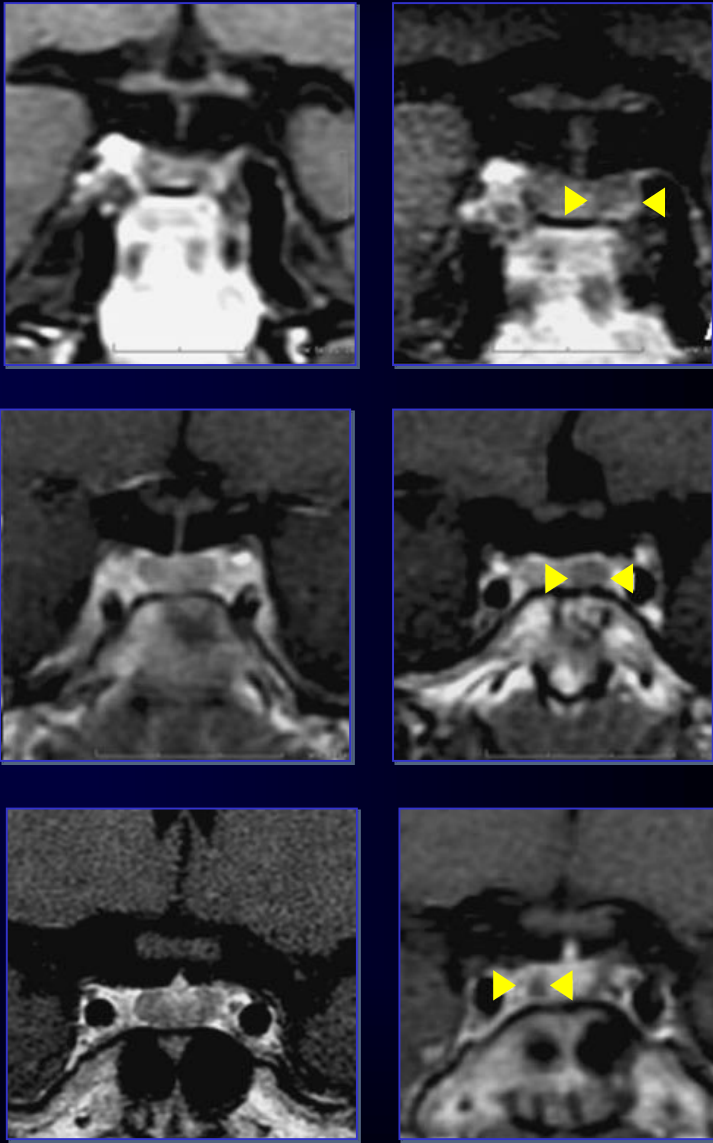


Sensitivity increases even beyond 3 mm if  
performed with high magnetic fields

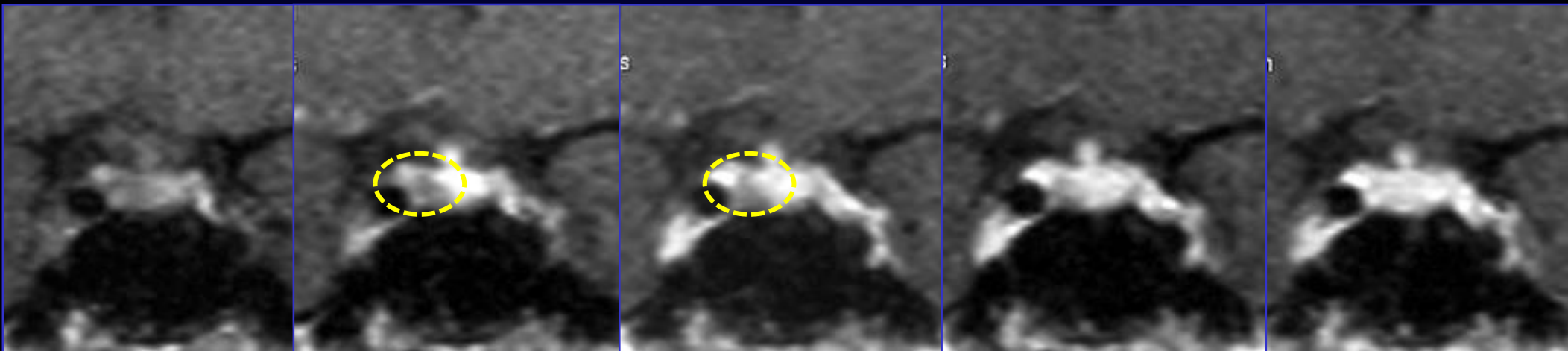
Ono E, Ozawa A, et al: *Diagnostic usefulness of 3 Tesla MRI of the brain for Cushing disease in a child.*  
*Clinical Pediatric Endocrinology* 2011; 20 (4), 89-93.

- 1. TR, TE, FOV
- 2. Campo magnetico elevato
- 3. Dose di Gadolinio

**SENSIBILITA' 100 %**



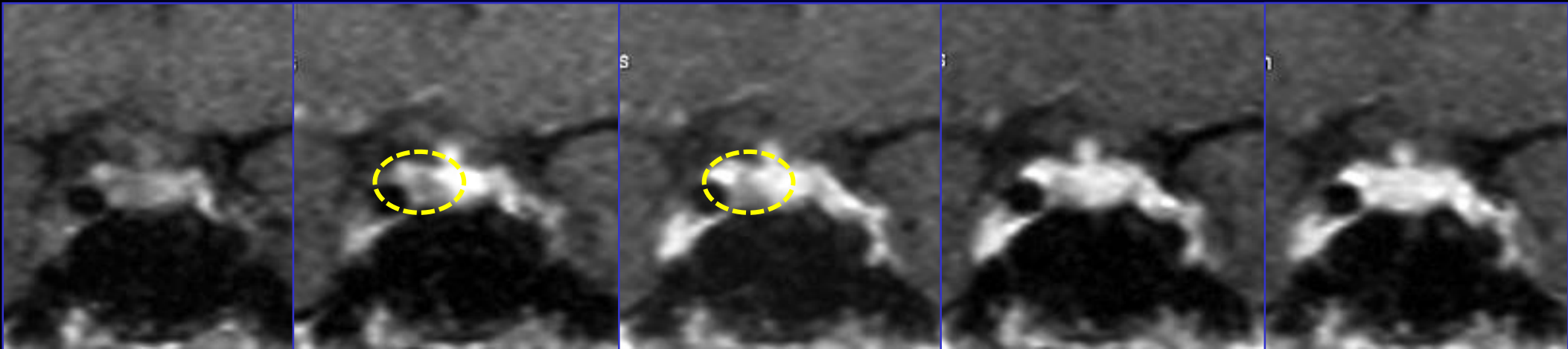
Lesly Portocarrero-Ortiz e A modified protocol using half-dose gadolinium in dynamic 3-Tesla magnetic resonance imaging for detection of ACTH-secreting pituitary tumors Pituitary (2010) 13:230–235



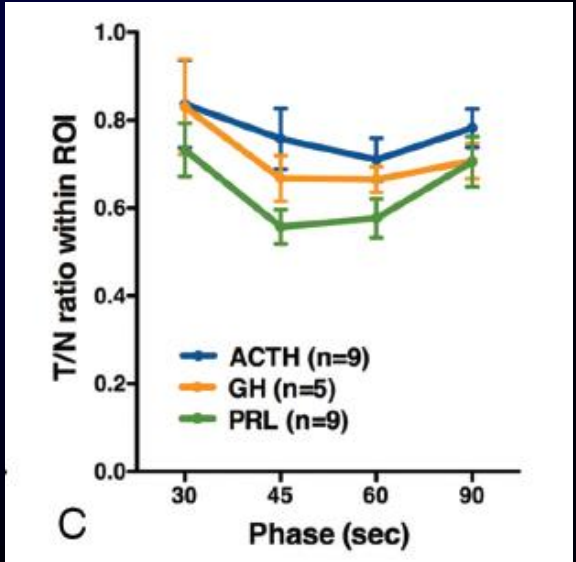
**LIMITI TECNICI**

- 1. dimensioni (!!)**
- 2. dinamica di impregnazione**

Kinoshita M, et Al. Pituitary-targeted Dynamic contrast-enhanced multisection CT for detecting MR Imaging—occult functional pituitary microadenoma. AJNR Am J Neuroradiol 2015; 36:904–08

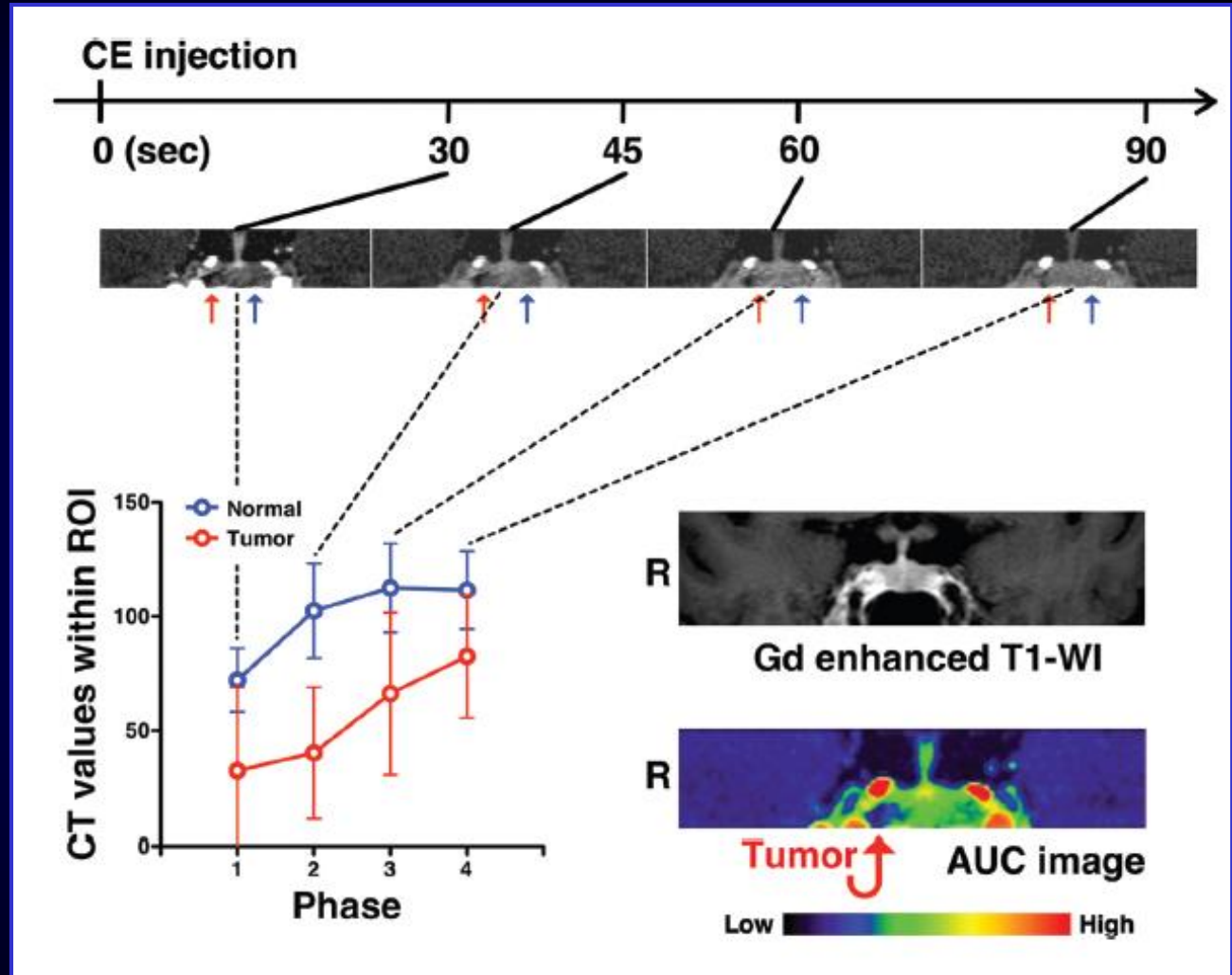


“... ACTH-secreting adenomas showed the highest tumor/node ratio among the 3 hormones, indicating the least contrast between the adenoma and normal pituitary gland ...”

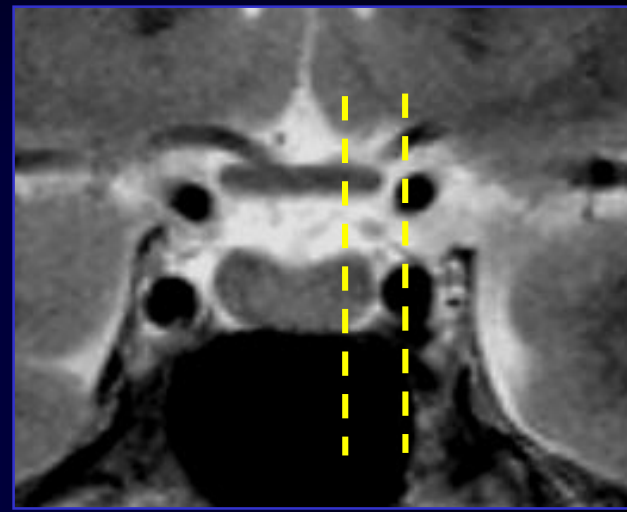
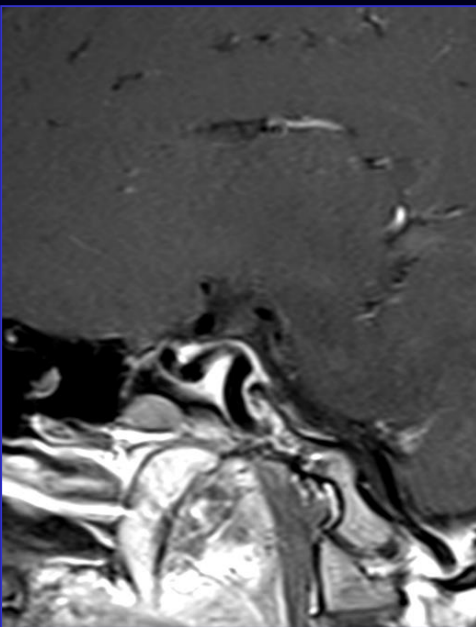
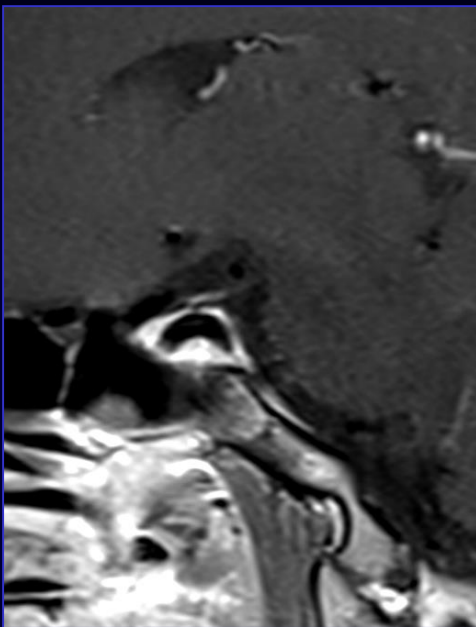
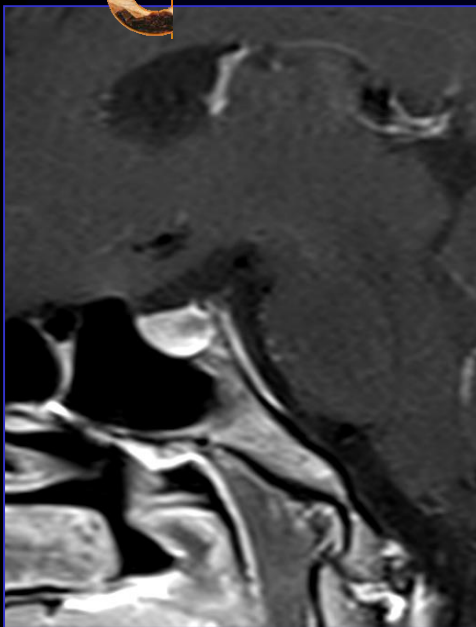


1. risoluzione temporale

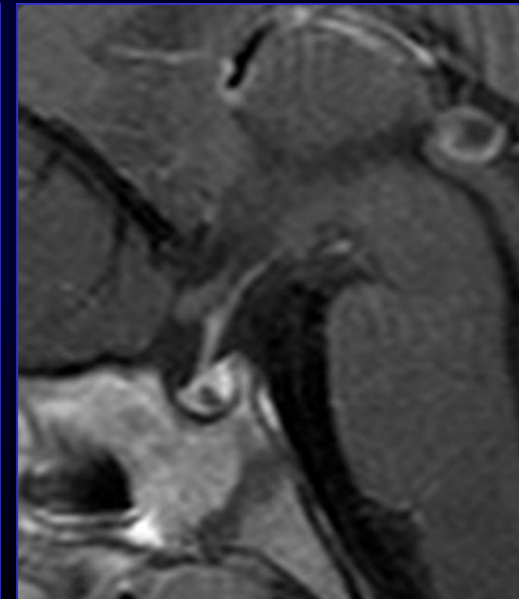
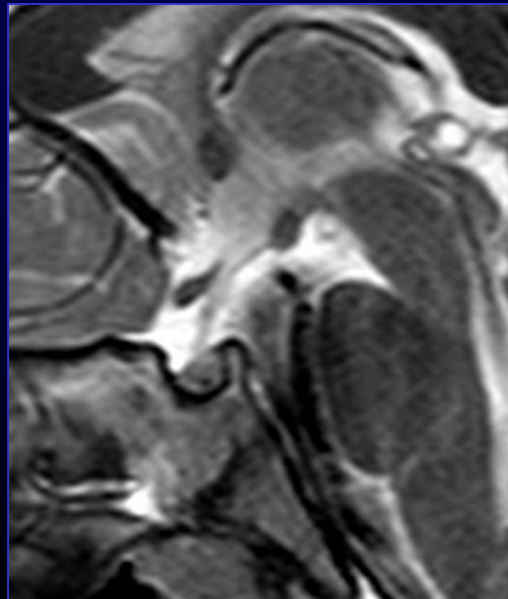
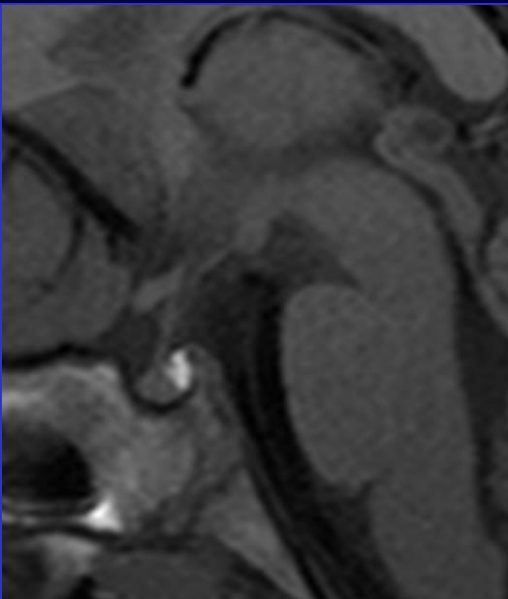
2. imaging 3D senza gap



FALSI POSITIVI



CISTI DELLA PARS INTERMEDIA

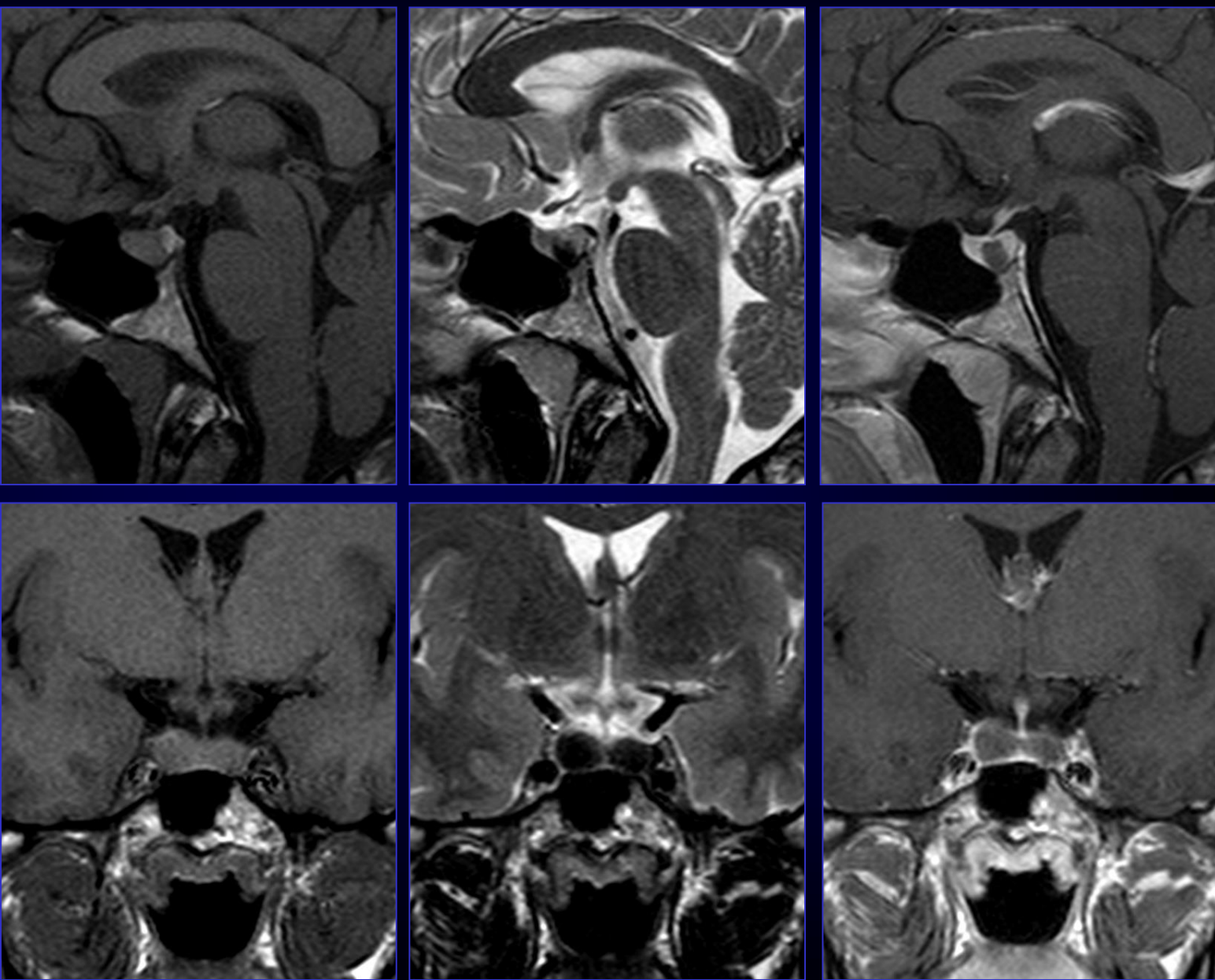


## CISTI DELLA TASCA DI RATHKE

✓ sede

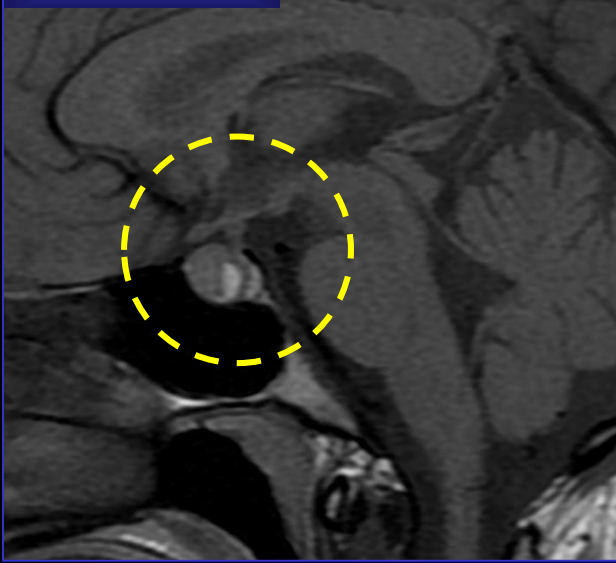
✓ segnale

✓ impregnazione (-)

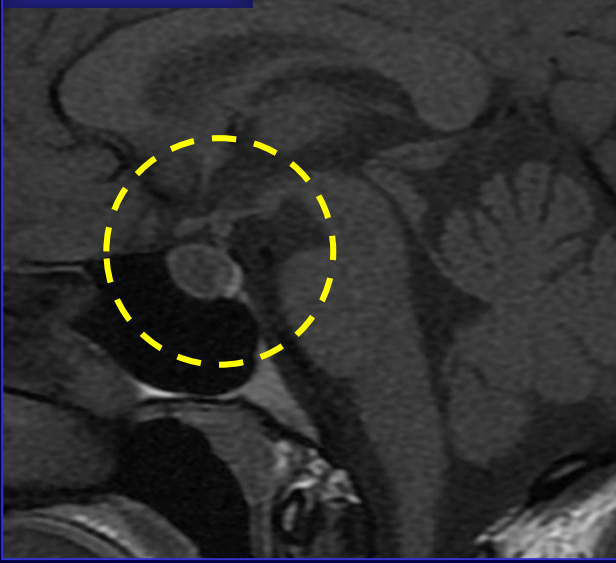




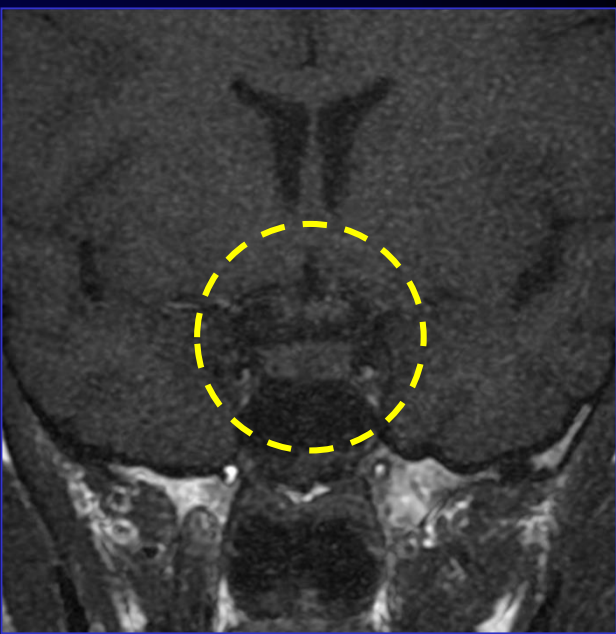
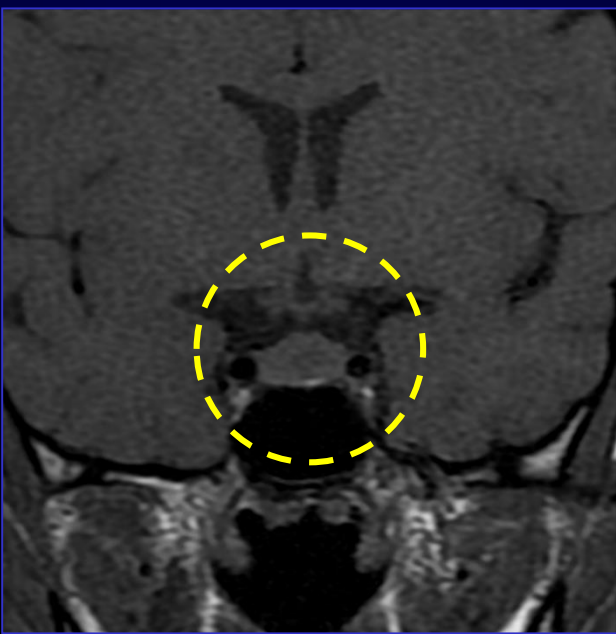
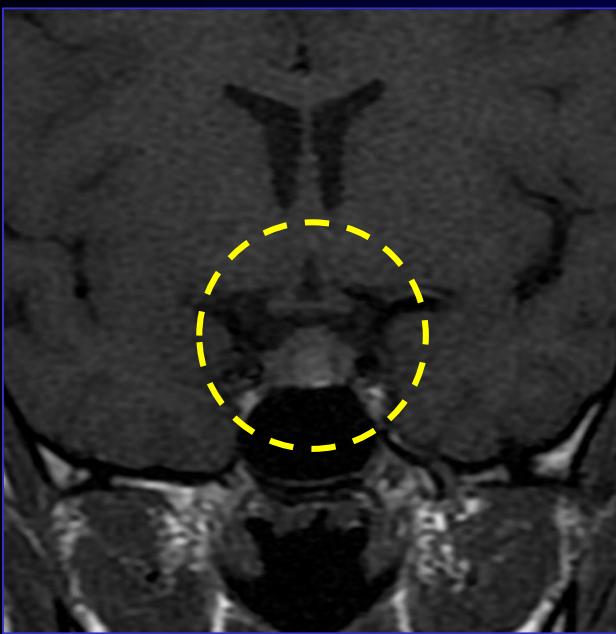
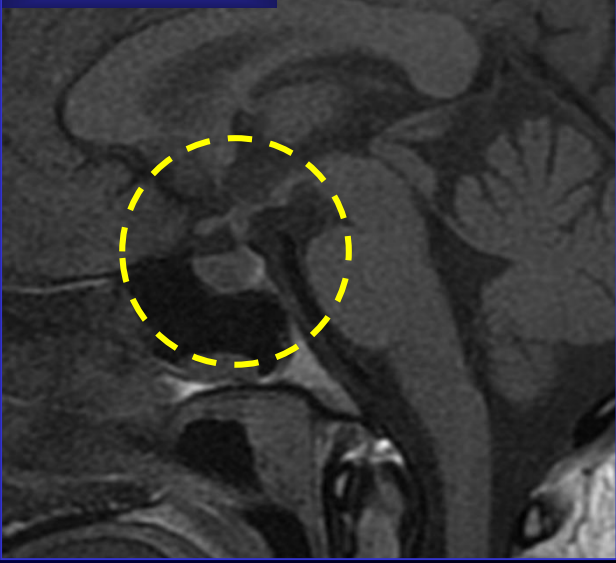
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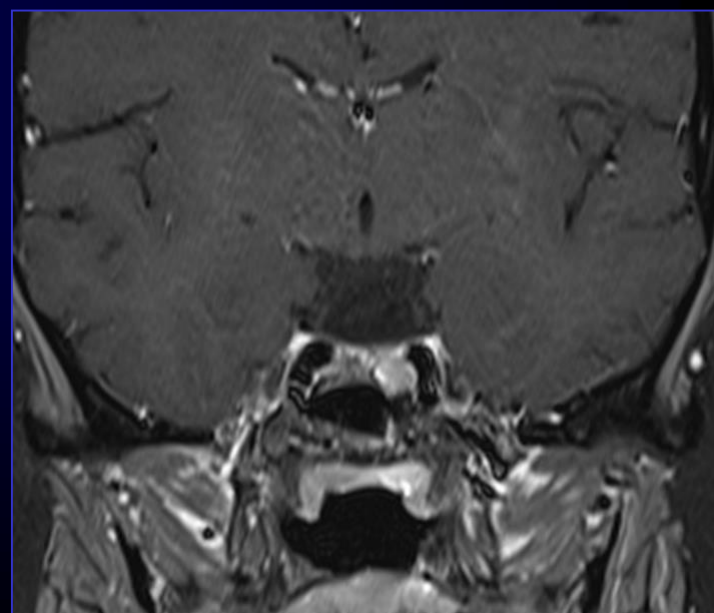
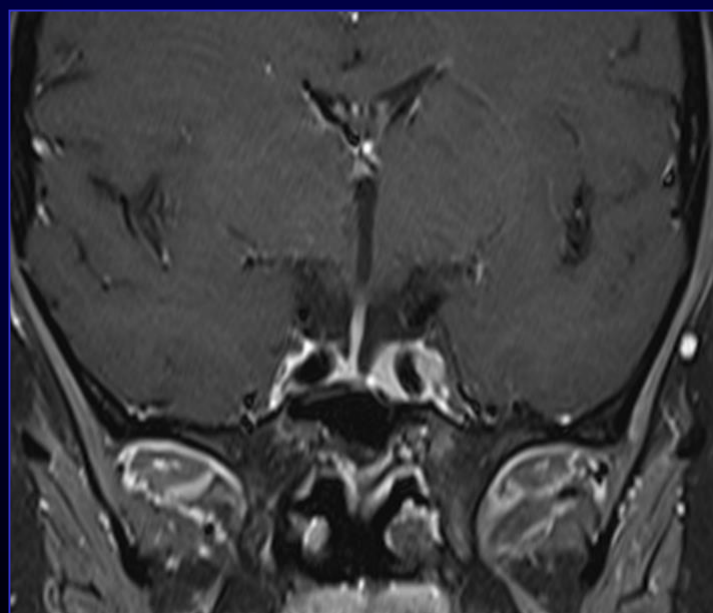
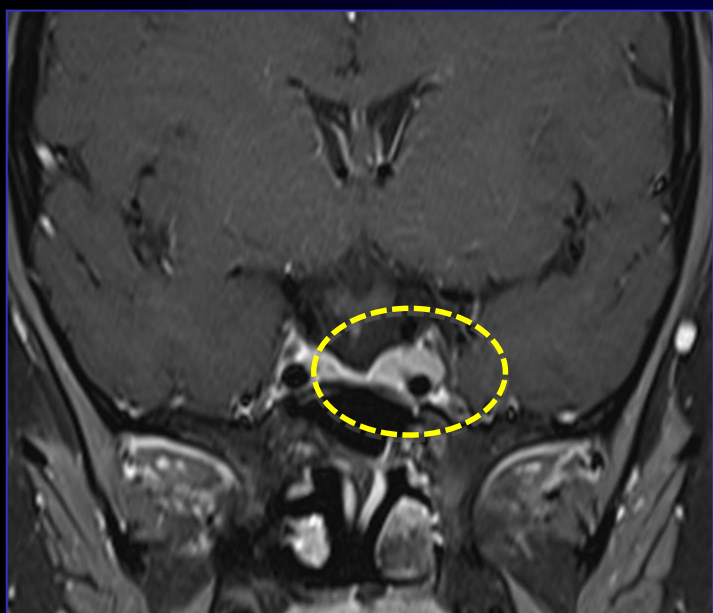
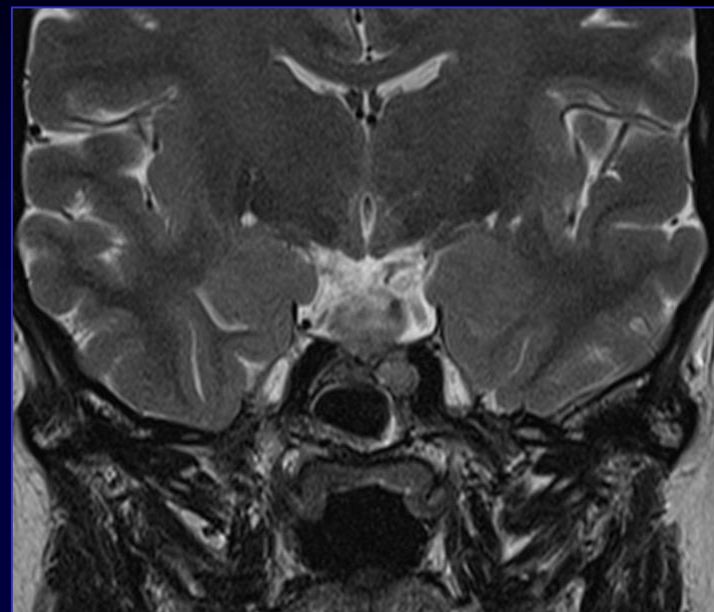
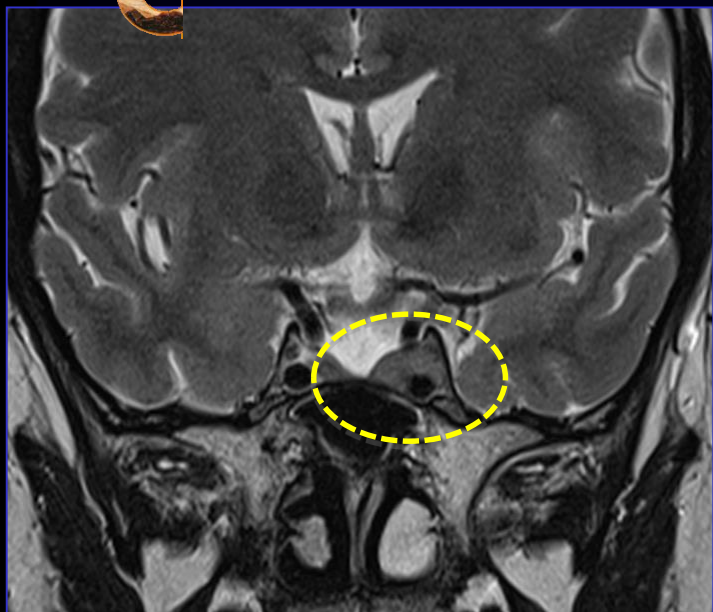


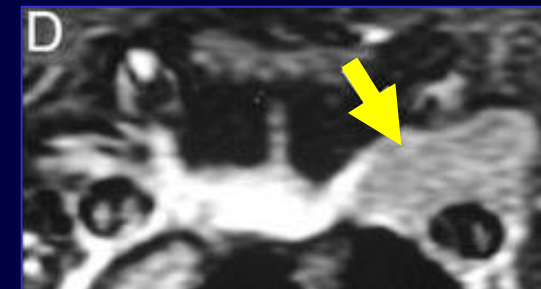
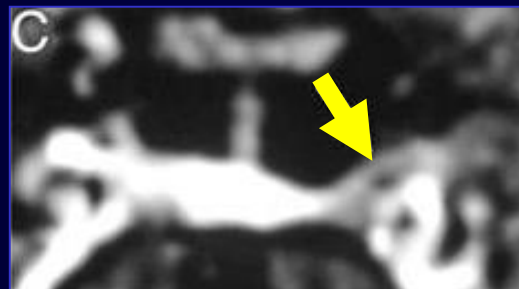
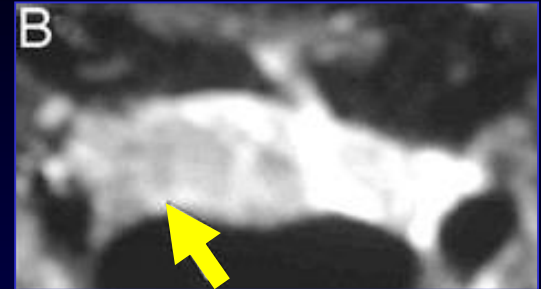
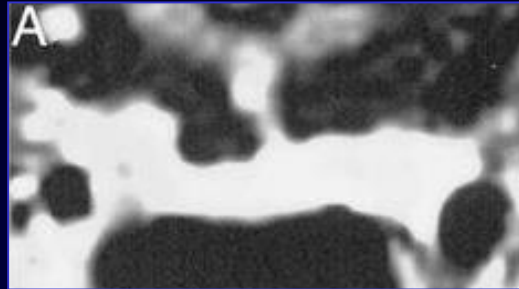
14/5/2010



17/11/2011

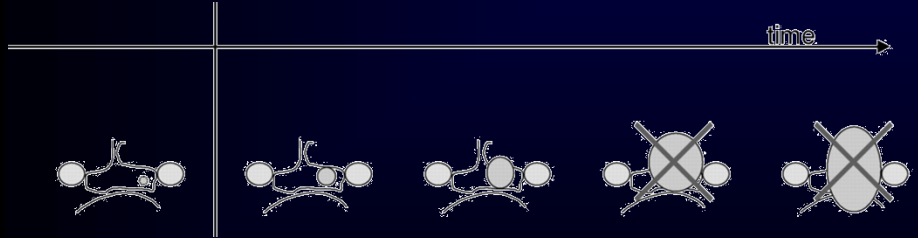




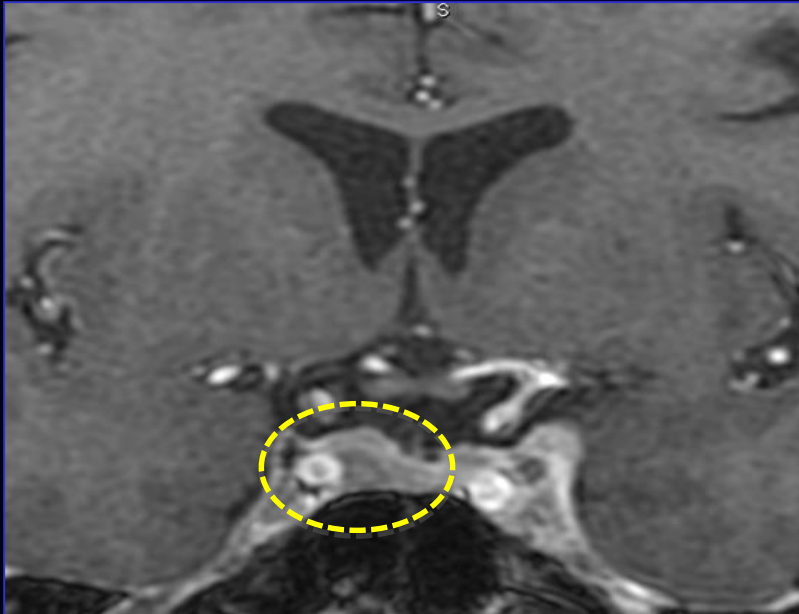


**PRE-ADRENALECTOMIA**

**POST-ADRENALECTOMIA**



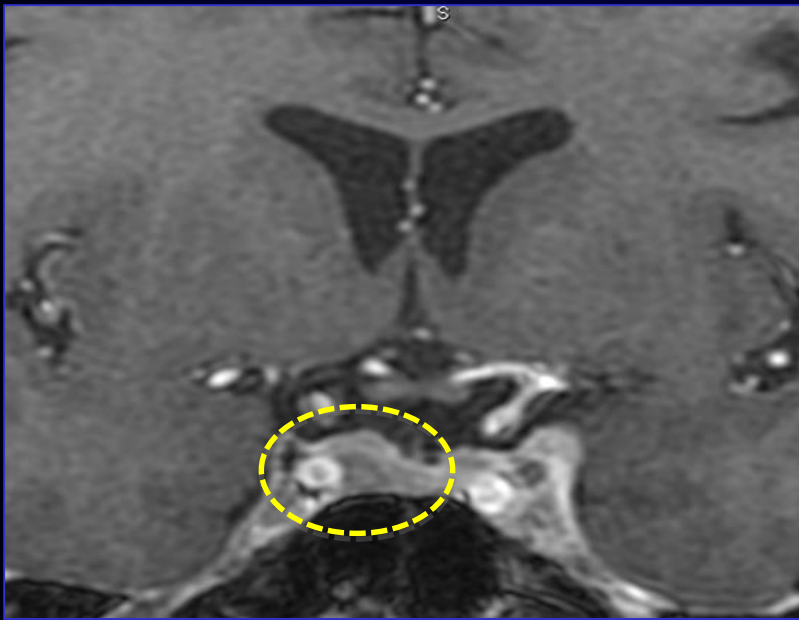
Assie G, et al. Corticotroph tumor progression after adrenalectomy in Cushing's Disease: A reappraisal of Nelson's Syndrome. J Clin Endocrinol Metab 2007; 92 (1): 172-179



**3T > 1.5 T**

**DOSE  
Gadolinium**

**SCELTA DLLE  
SEQUENZE:  
DYNAMIC SPIN-ECHO,  
SPGR o VI-SGE**



Clinical and biochemical findings suspicious for an ACTH-secreting pituitary adenoma

Pituitary MRI

|                     | Coil Type | Plane | Mode | Pulse Sequence | TE                    | TR           | FOV      | Slice Thickness | Matrix Size |
|---------------------|-----------|-------|------|----------------|-----------------------|--------------|----------|-----------------|-------------|
| SAGITTAL T1         | Head      | SAG   | 2D   | SE             | 10.3 ± 0.5 ms         | 400 ms       | 12-14 cm | 1-1.5 mm        | ≥ 256x512   |
| CORONAL T1          | Head      | COR   | 2D   | SE             | 10.3 ± 0.5 ms         | 400 ms       | 12-14 cm | 1-1.5 mm        | ≥ 256x512   |
| CORONAL T2          | Head      | COR   | 2D   | SE             | 100-120 ms            | 3000-4000 ms | 14-18 cm | 1-1.5 mm        | ≥ 256x512   |
| CORONAL DINAMIC     | Head      | COR   | 2D   | SE             | 17 ms                 | 400 ms       | 12-14 cm | 1-1.5 mm        | 256x192     |
| SAGITTAL T1 POST FS | Head      | SAG   | 2D   | SE             | 10.3 ± 0.5 ms         | 400 ms       | 12-14 cm | 1-1.5 mm        | ≥ 256x512   |
| CORONAL T1 POST FS  | Head      | COR   | 2D   | SE             | 10.3 ± 0.5 ms         | 400 ms       | 12-14 cm | 1-1.5 mm        | ≥ 256x512   |
| CORONAL VI-SGE      | Head      | COR   | 3D   | GE             | 3.3 ms Flip angle 15° | 10-15 ms     | 16 cm    | 1 mm            | 256x205     |

Vitale G, Tortora F, Caranci F, Pivonello R, Colao AM et Al. on behalf of the **A.B.C. Group**. Pituitary Magnetic Resonance Imaging in Cushing's disease. *Endocrine* 2017; 55: 691-696