

Clinical Target Volumes for Benign Brain Tumours

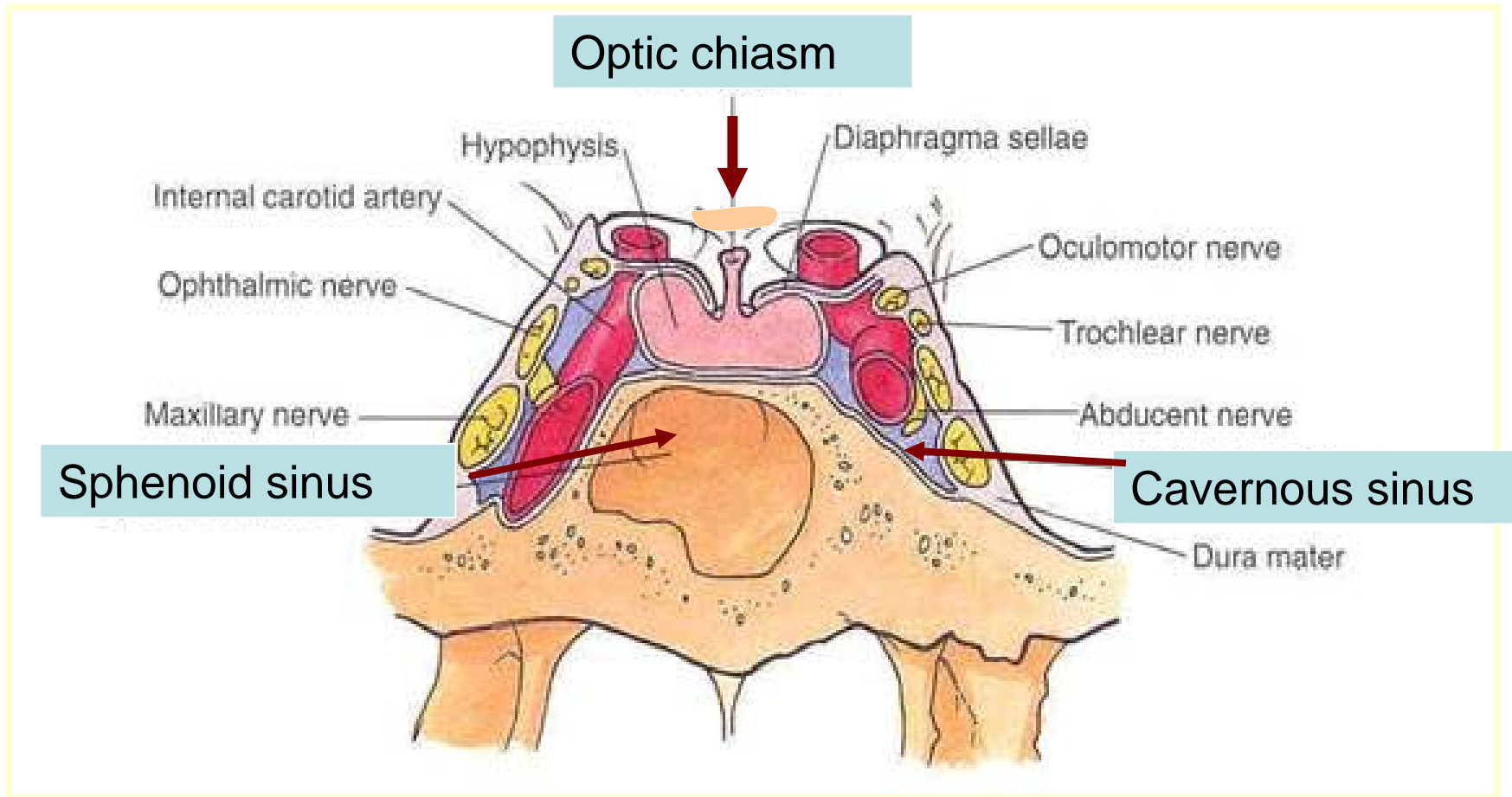
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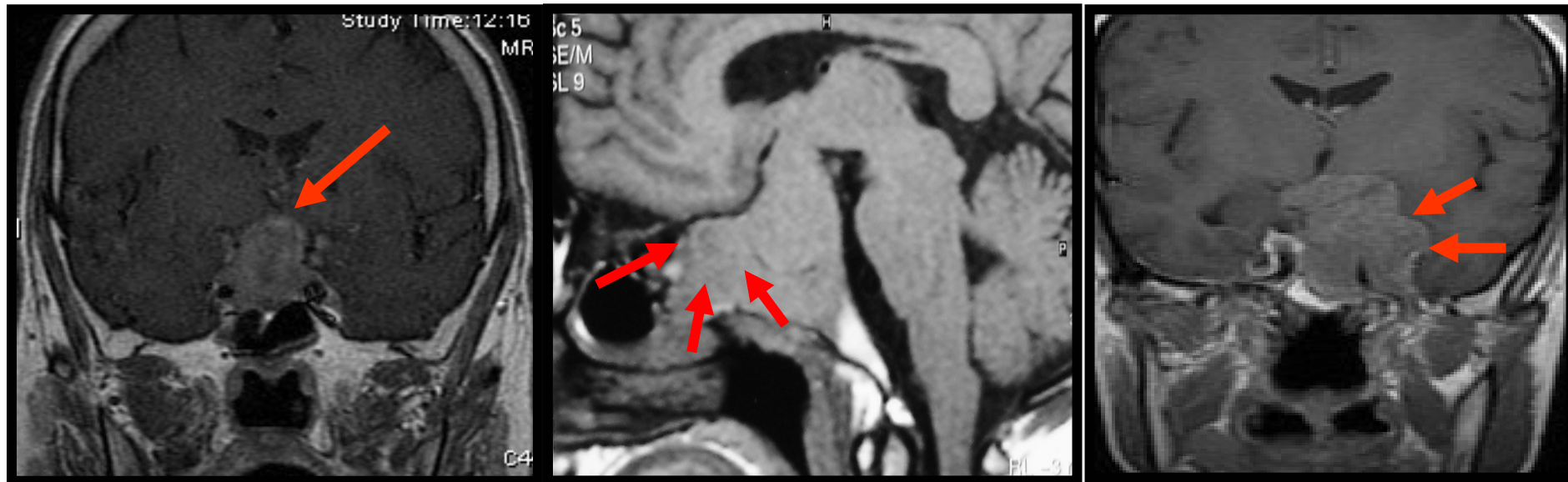
Benign brain tumors: Road map

- Presentation, natural history and reasons to treat
 - Pituitary adenomas
 - Craniopharyngiomas
 - Acoustic neuromas
 - Meningiomas (WHO Grade 1)
- The gross and clinical targets for each
- The PTV and to what doses

Pituitary: Anatomic relations



Pituitary: Patterns of growth & symptoms/signs



Headache, vomiting

Cranial Nerves: Vision, 3rd, 4th, 5th & 6th

Amenorrhoea, galactorrhoea, acromegaly

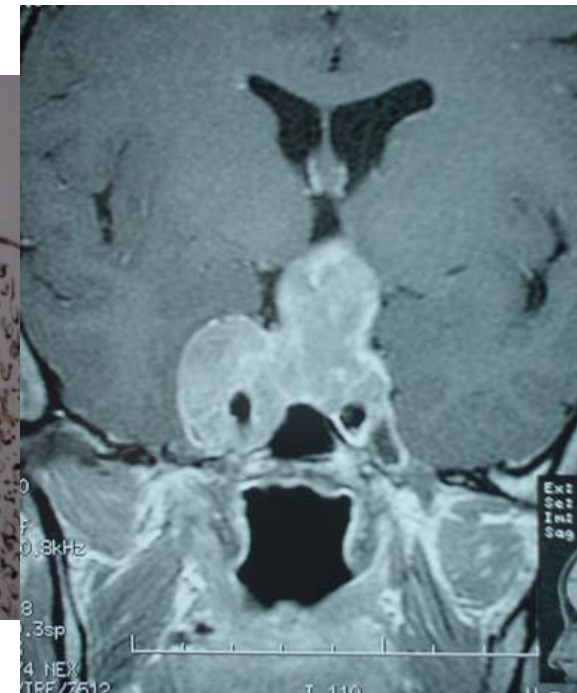
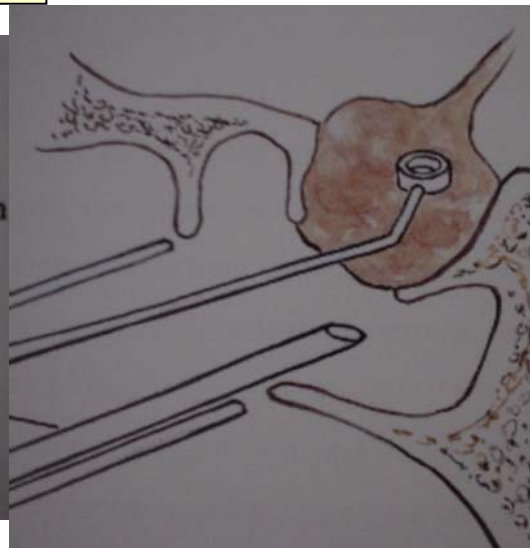
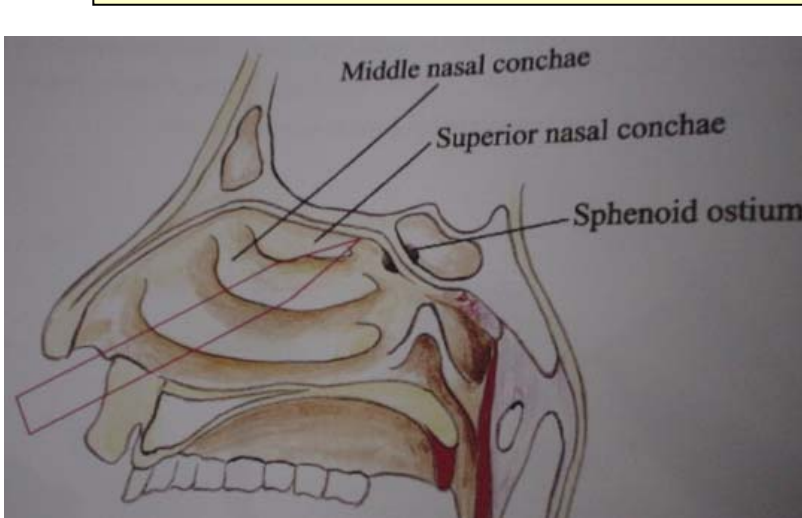
Pituitary: Surgical approach & Reasons to treat

Surgery

- Non-functioning adenomas with mass effect
- Most secretory adenomas

Medical therapy

Prolactinomas



Residual (cavernous sinus invasion or suprasellar)

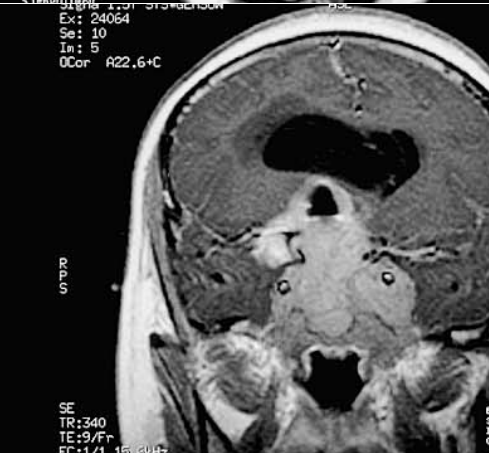
Recurrent (sometimes aggressive histology)

Persistently elevated hormonal levels (i.e. failure of normalization of GH, PRL or ACTH)

Trans-cranial approach for parasellar extension, ICA encasement⁵

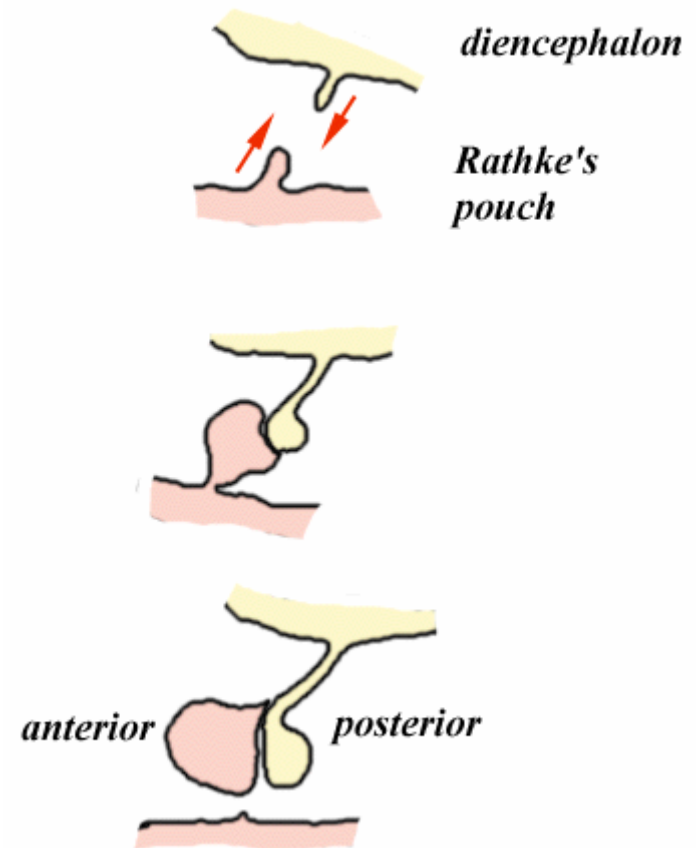
Pituitary: What to draw

- This is a BENIGN tumor. Takes several years to attain the size which calls attention (in non-functioning ones)
 - So, no hurry to treat a residual. It can be done 3-6months after surgery or at any time later
- Imaging needs:
 - The narrower, the better (2 mm for SCRT) say 3mm for conventional
 - Plain and ?contrast scans (Distinction with clivus is blurred, so avoided)
 - Study axial, sagittal and coronal scans on MRI to identify patterns of spread
 - Extension to sphenoid sinus can be real or more usually post surgical fat pad
 - If in doubt about involvement of an area, contour it!
 - So draw OBVIOUS residual and PRESUMED residual into one outline: Call it whatever you want GTV or CTV. No margins beyond obvious tumour are needed for a CTV
 - 3-5mm (or more) margin for PTV & 45Gy/25fx/5weeks for all types



Craniopharyngioma

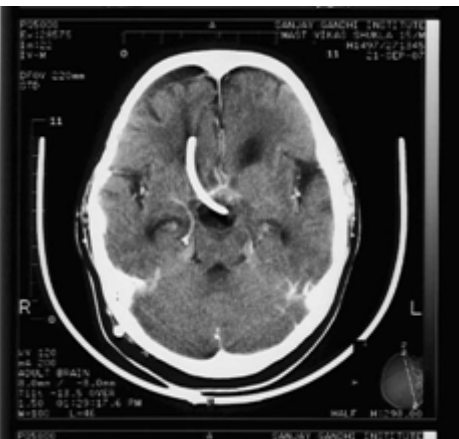
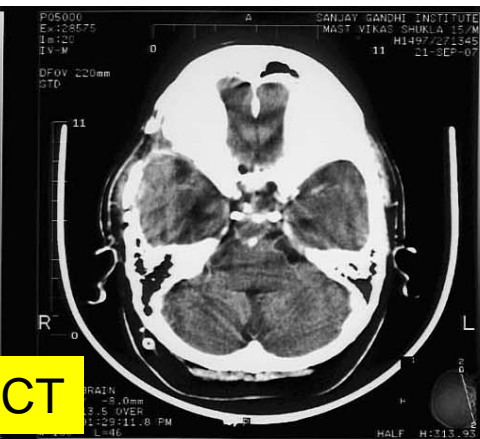
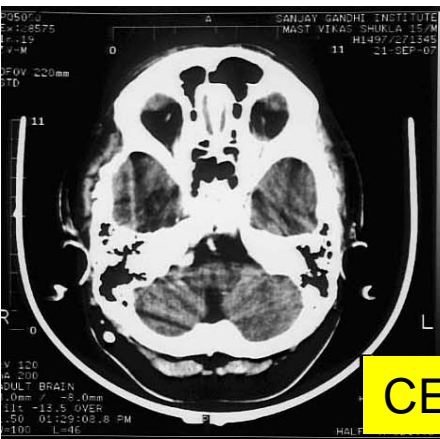
- Tumor arises from the remnant of Rathke's pouch in the supra-sellar area
- Usually cystic in children
- Headaches, visual problems and consequences of hypothalamic-pituitary damage
- Treatments:
 - Surgery (Biopsy, cyst drainage, partial removal or complete removal [mortality, morbidity, hypothalamic damage, visual deterioration, endocrine complications In 30-70%])
 - Partial excision + FSRT= 10yr FFP-75 to 85%



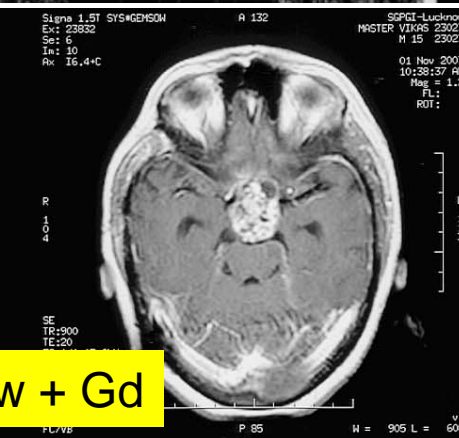
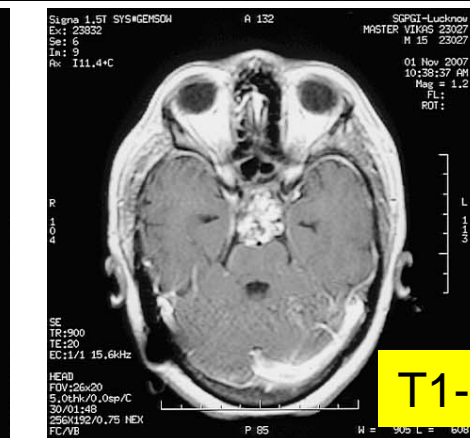
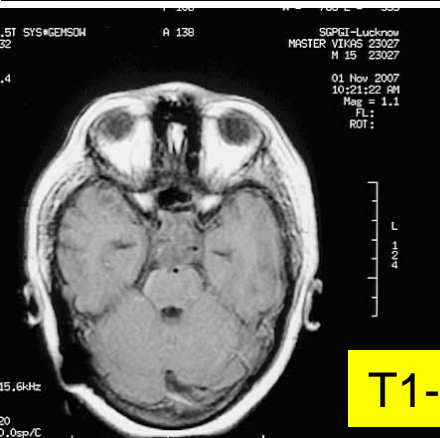
Craniopharyngioma: What to draw?

- Tumor has proximity and propensity to invade with 'finger like' projections surrounding structures, i.e. pituitary & hypothalamus
- Use narrow slices, 2-3 mm and combination of plain and contrast CECT and T1-w (plain and with Gd) MRI in multiple planes
- See both pre-op and post op imaging
- GTV = visible residual lesion including solid and cystic components
- CTV = GTV (known microscopic extension is not considered a predictor of recurrence)
- GTV (CTV) to PTV expansion 5 – 10 mm depending upon technology
- Dose= 50Gy in 30 -33 fx (1.51-1.67 Gy/fx as proportion are children)

Minniti et al, Radiother Oncol 82:90-95, 2007



CECT



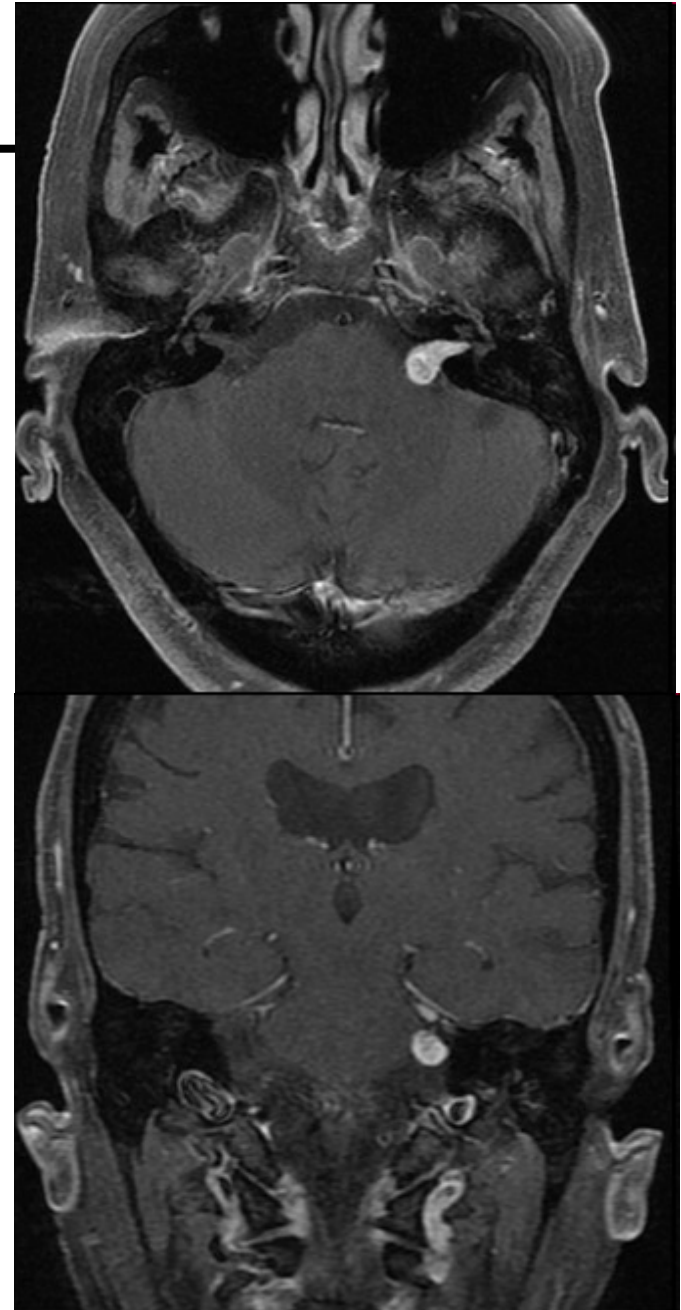
T1-w

T1-w + Gd



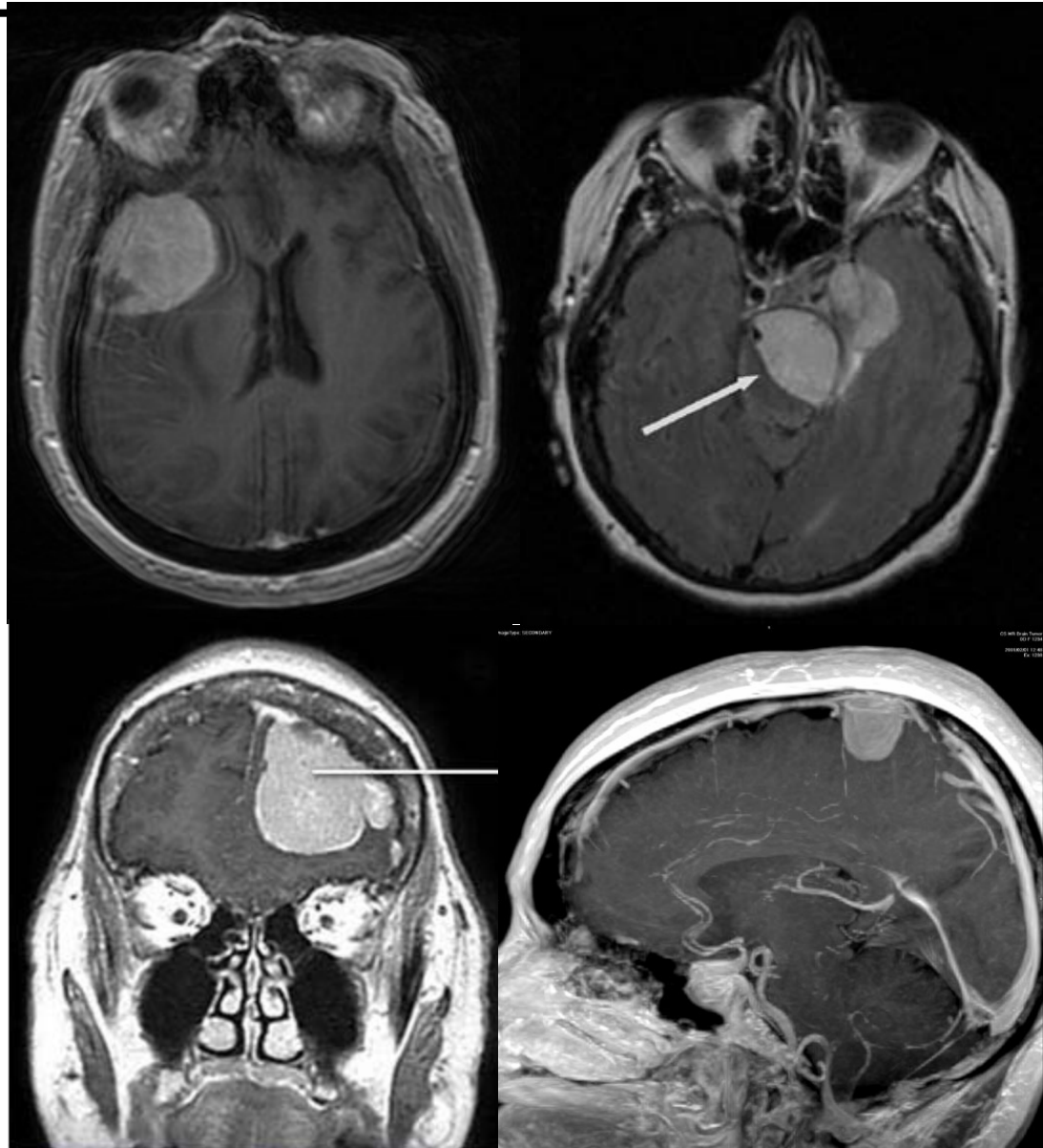
Acoustic Neuroma

- Benign tumor. Arises from VIII CN
- Slow growing (~1-4 mm/yr)
- Unilateral hearing loss, facial paresis, facial paresthesia, hydrocephalus
- Observation - till symptoms start bothering
- Radical surgery treatment of choice – damage to hearing and facial nerve
- Radiosurgery popular: radiation oncologists hardly get to treat this
- GTV = visible growth. No CTV. PTV according to immobilisation and technology (2-5mm)
- 21Gy/3fx, 40-48Gy, **50Gy/30fx**, 54Gy/30fx



Meningioma (WHO grade 1)

- Meningiomas, 90% are benign, can occur at any meningeal surface
- Complete surgical excision is curative: depends upon size, location (e.g. encompassing cranial arteries, venous sinuses) and general condition
- Incomplete surgery: recurrence is 30-70% @ 5 - 10 yrs, with further RT- 80-85% (No RCT, benefit unproven)

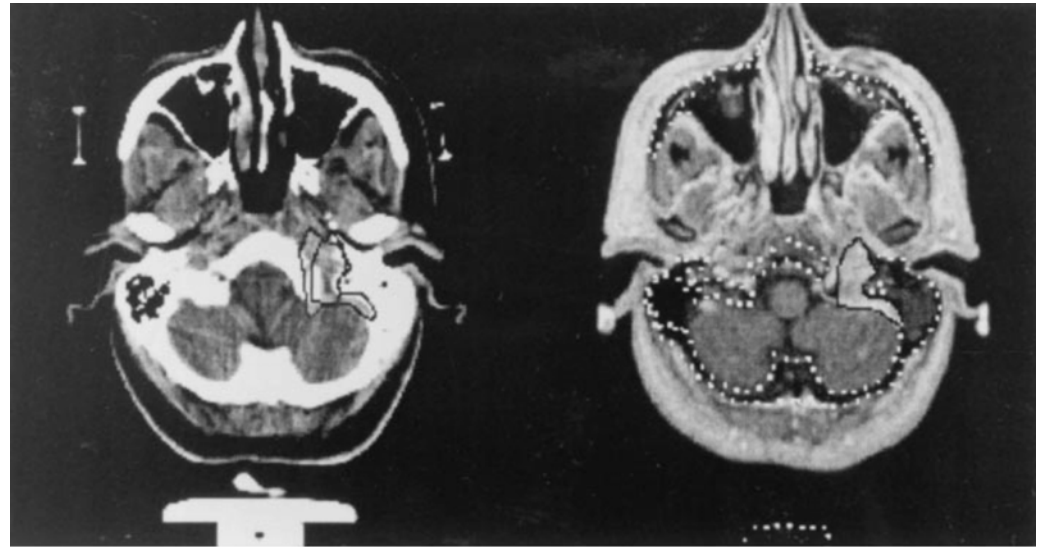


Meningioma (imaging needs and what to draw)

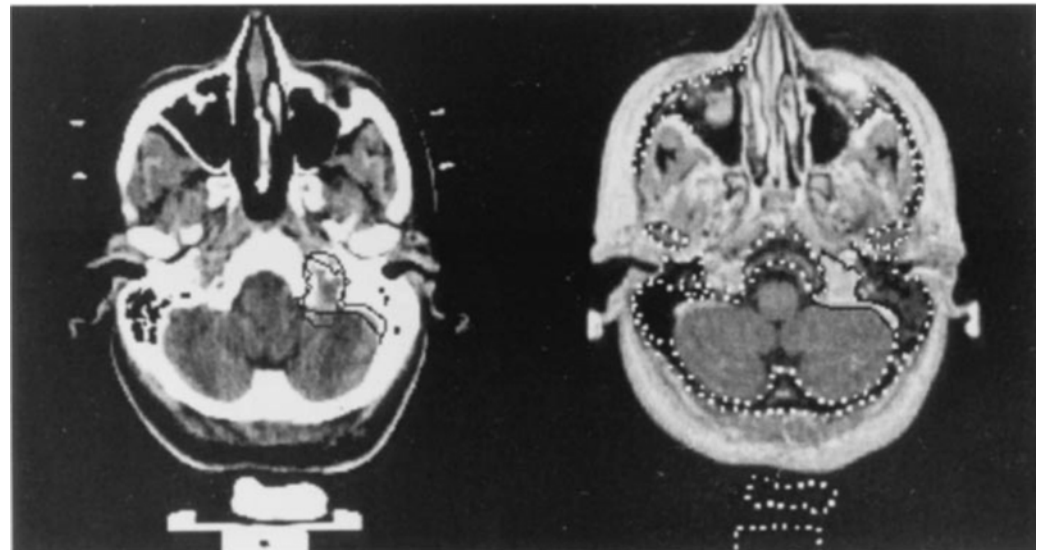
- Study pre and post operative imaging (plain and CECT, T1-w –plain and with Gd), in multiple planes to appreciate spread of tumor
- RTP scans at 2-3 mm, fused with T1-w post Gd scans
- GTV = enhancing mass AND abnormal bone presumed to contain active tumour (If this condition is met, then no need to draw a separate CTV)
- PTV = 3-5 or 10 mm margin according to immobilisation and technology
- Outline brainstem, eyes, optic nerves and optic chiasm
- Doses: 50 – 55 Gy at 1.8Gy/fx (55Gy/33fx)

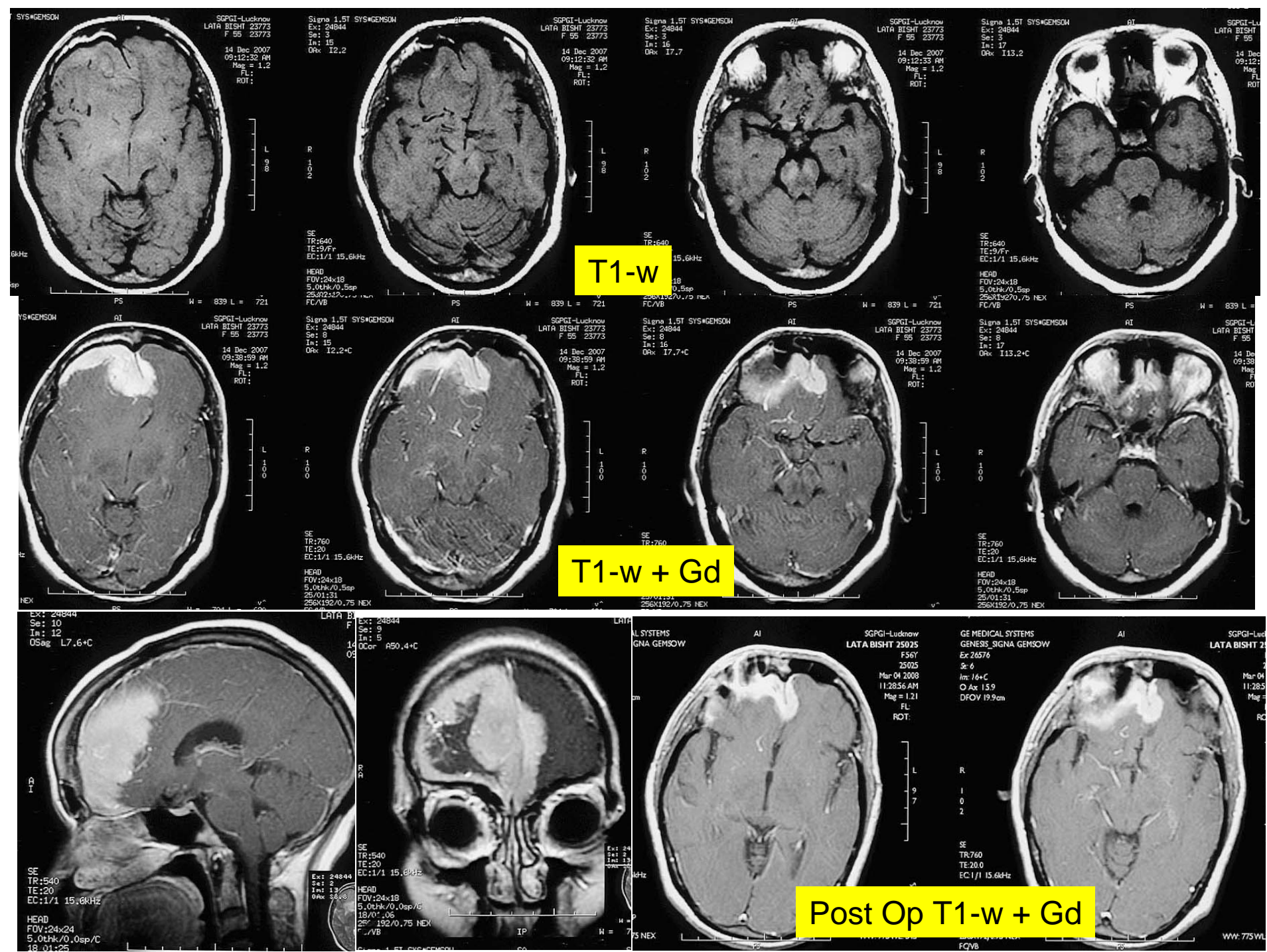
Meningioma (imaging needs and what to draw)

- MR shows more soft tissue
- CT shows bone destruction better
- MR shows volumes larger but not inclusive of CT volumes: so contour on both and use the union (till we know better)



(a)





Conclusion

- Imaging should include both CT and MR and studied carefully in all planes
- RTP scans are 2-3 mm with contrast (except pituitary) and fuse with contrast enhanced MRI when available
- For pituitary, acoustic, meningioma (WHO Grade 1) and craniopharyngeoma: GTV is what you see post operatively and include presumed tumor, such as shaved off bones, or cyst cavities
- The need to expand to CTV is then not necessary
- PTV expansion is based on immobilisation and radiation equipment in the main