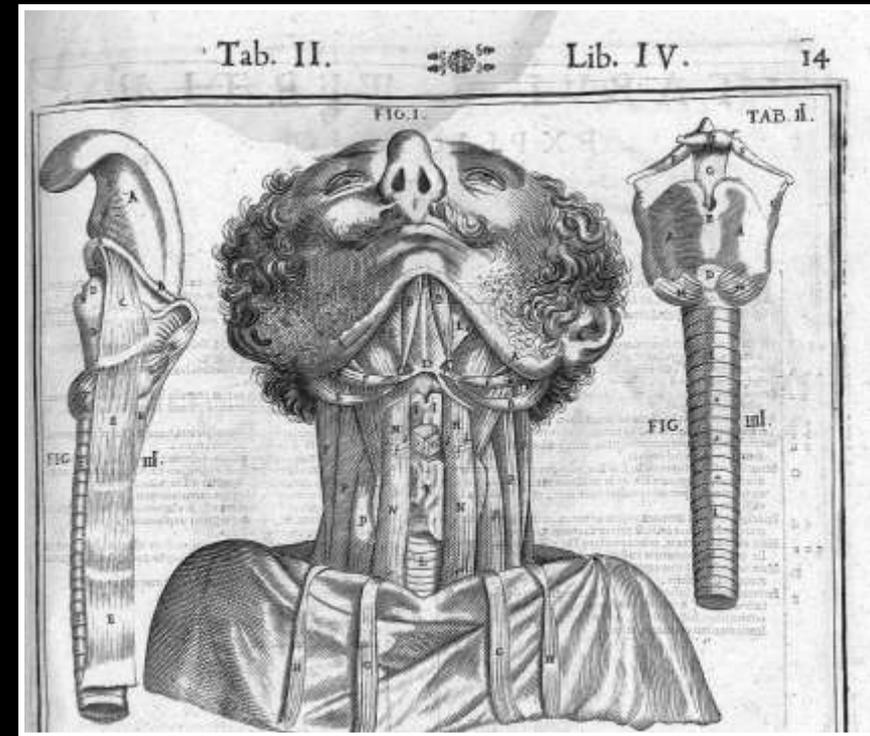


Radioanatomie Endocrinien

Hypophyse
Thyroïde
Parathyroïdes
Surrénales

Michel Montaudon



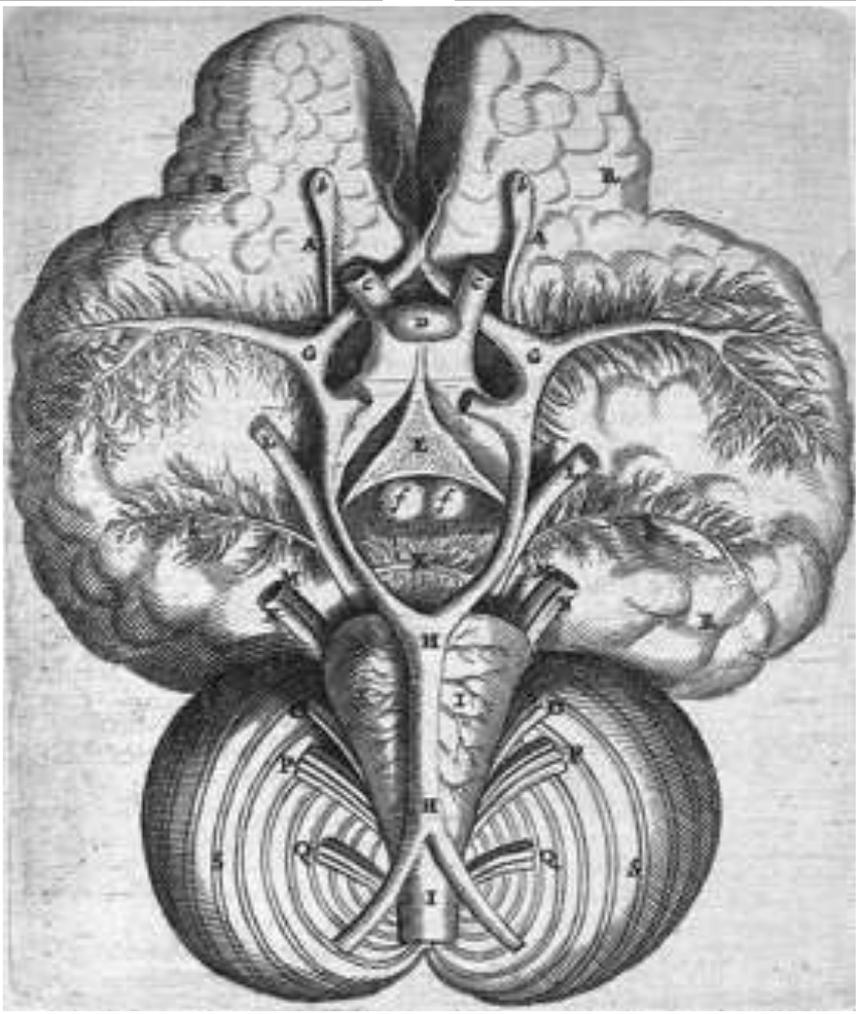
Cassero, 1627



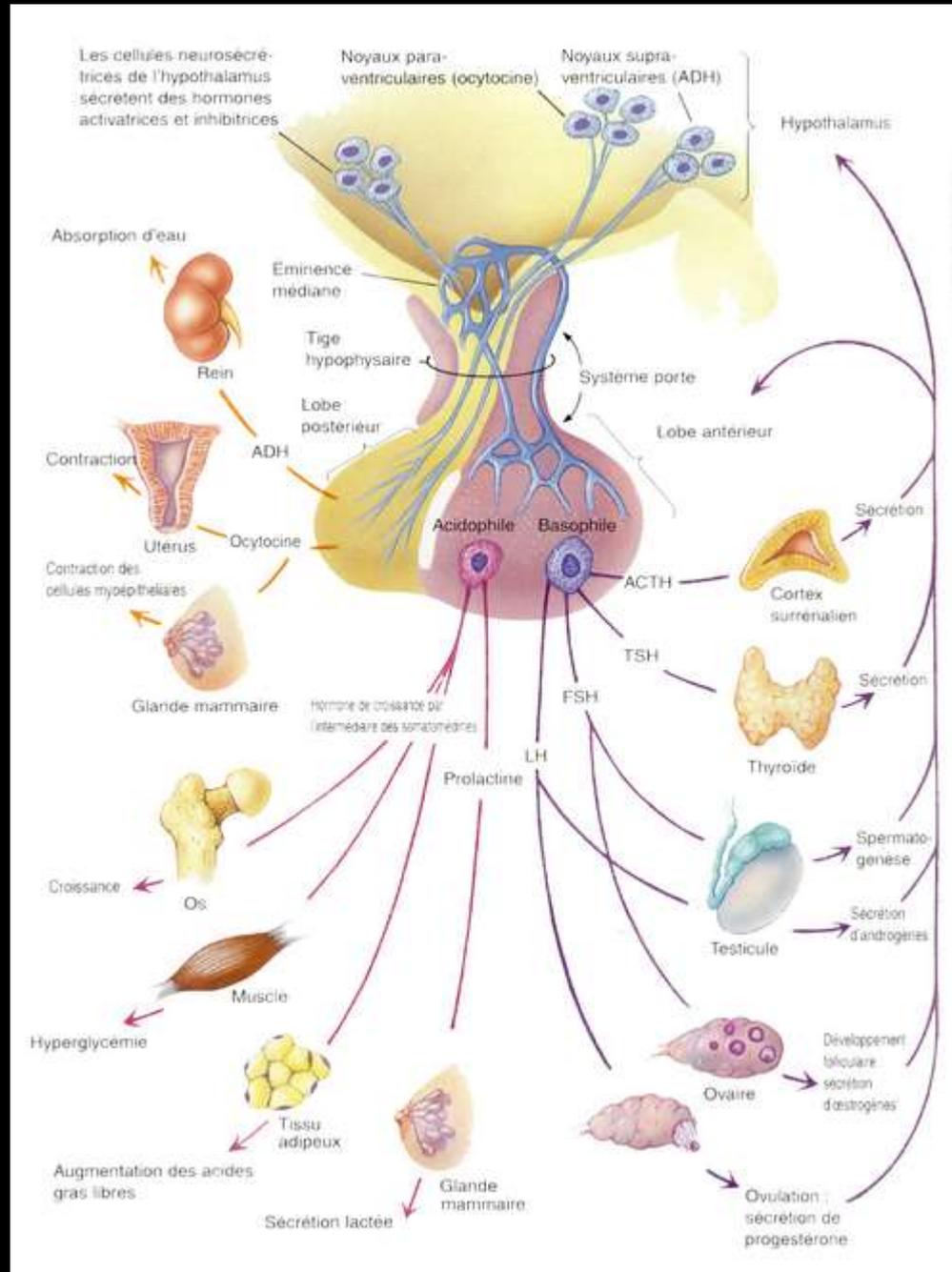
michel.montaudon@chu-bordeaux.fr

HYPOPHYS

E



Bartholini, 1651



EMBRYOLOGIE

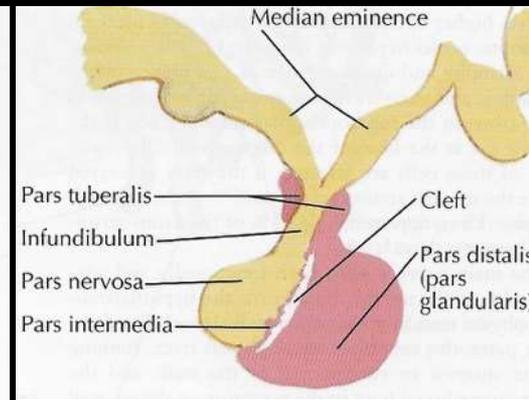
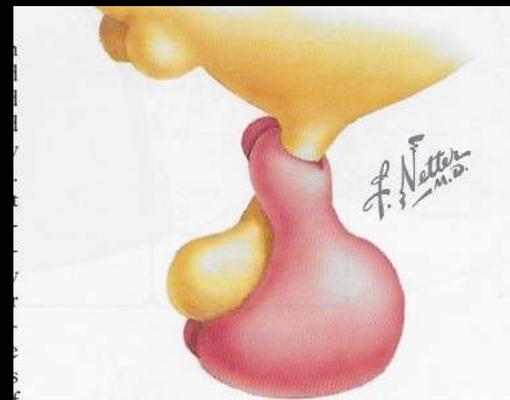
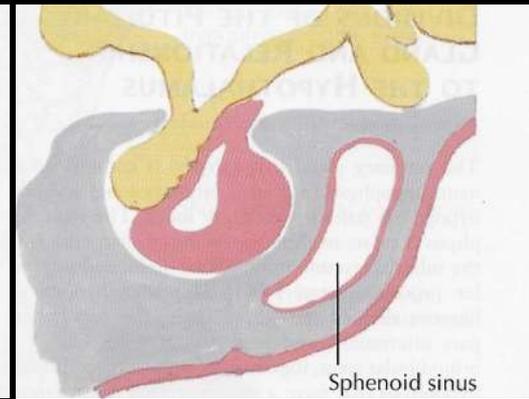
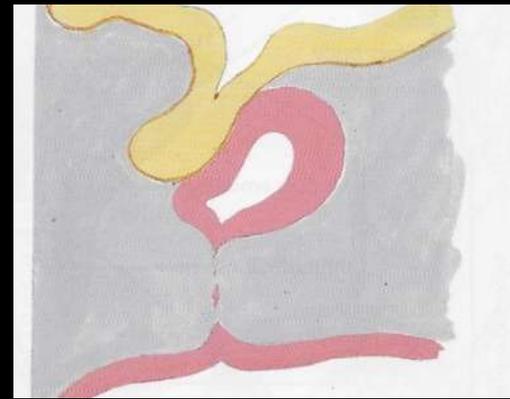
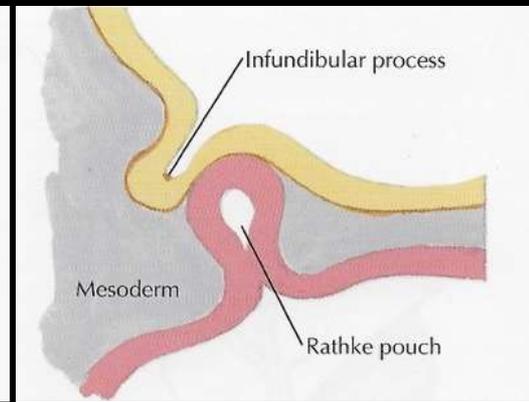
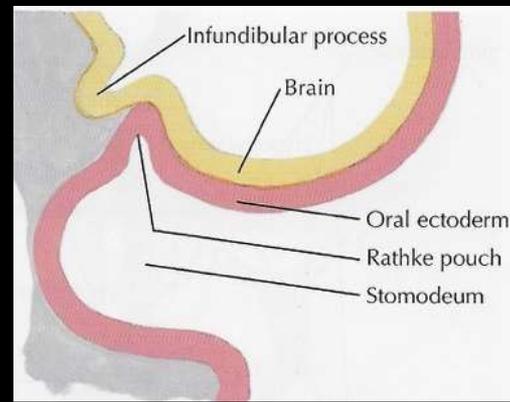
- ébauche **endoblastique**:
épaississement du toit du stomodeum
autour d'un diverticule donnant la
poche de Rathke

- ébauche **neuroectoblastique**: dérive
d'un bourgeon, le sacculus infundibuli,
issu de la partie ventrale du
diencephale à la 5^{ème} semaine et
s'étendant vers la poche de Rathke

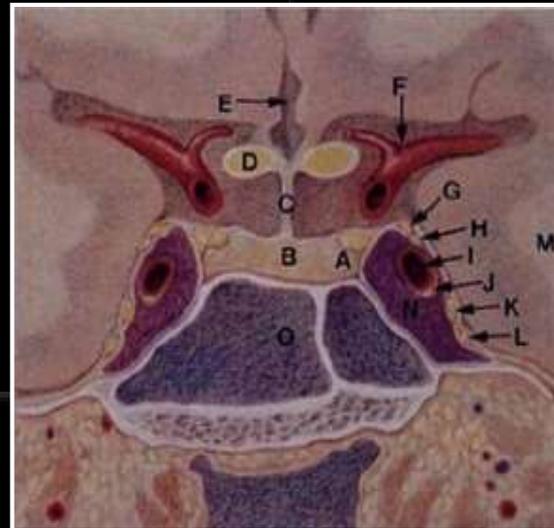
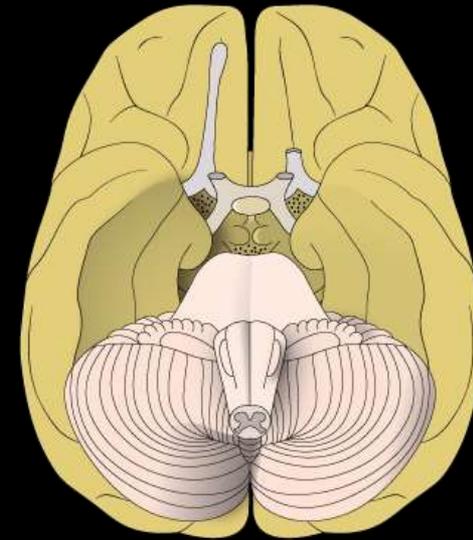
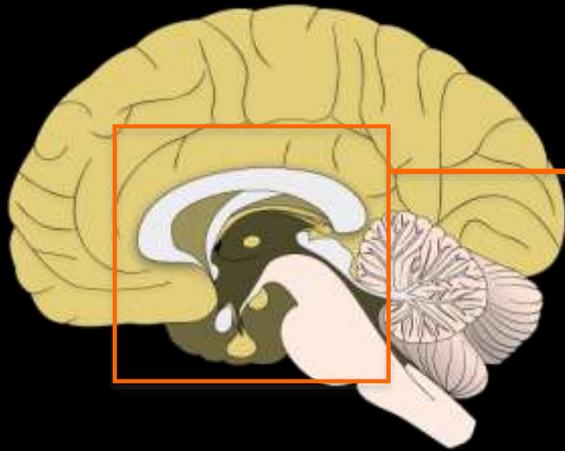
- rapprochement des deux ébauches
aboutissant à l'adénohypophyse et la
neurohypophyse

. antéhypophyse : lobe antérieur, lobe
tubaire et lobe intermédiaire

. **post hypophyse** : tige pituitaire,
infundibulum et lobe postérieur



ANATOMIE DESCRIPTIVE



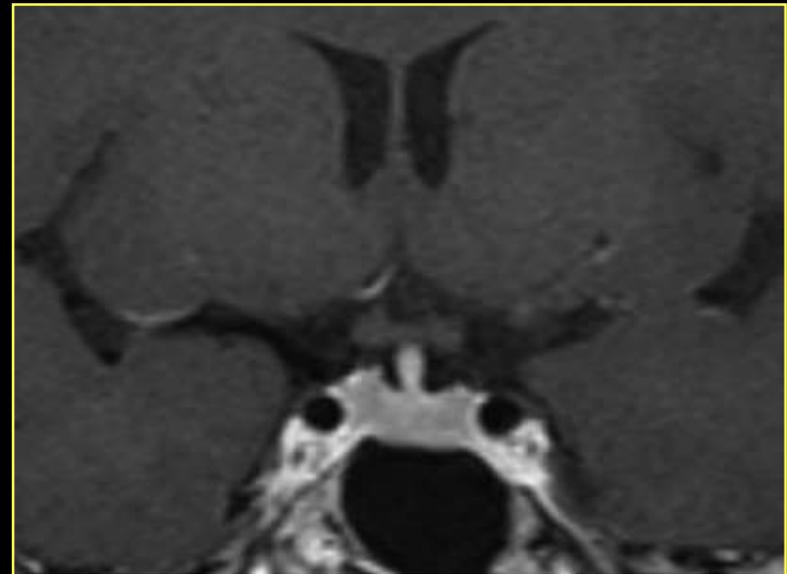
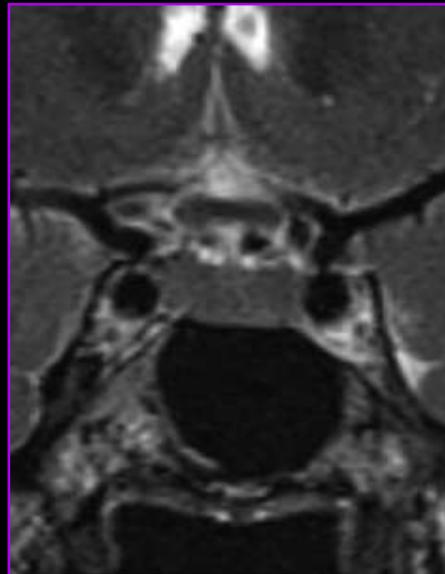
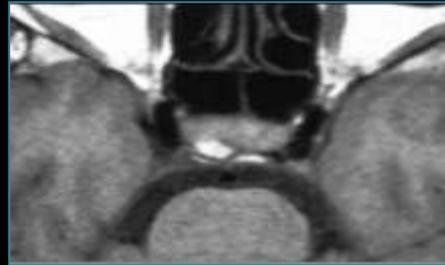
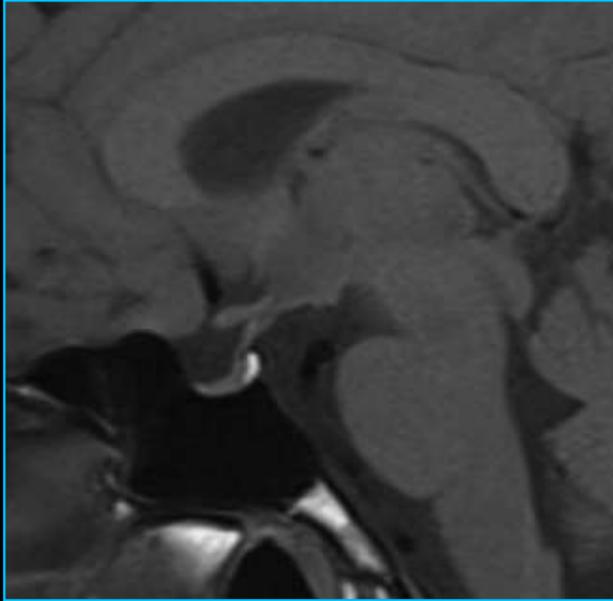
Age	Hauteur de l'hypophyse	Forme du diaphragme sellaire
< 6 semaines	4,5 ± 2 mm	Bombant
6 semaines - 2 ans	3,5 ± 1,2 mm	Plat
2 ans - 5 ans	4 ± 0,7 mm	Plat
5 - 10 ans	4,5 ± 0,6 mm	Plat
10 - 15 ans	5 ± 2 mm	Bombant chez fille
15 - 20 ans	5,5 ± 1,5 mm	Bombant chez fille

D'après Dietrich AJNR 1995, Argyropoulou Pedoscience 2002, Tien AJR 1992 ((8-11).

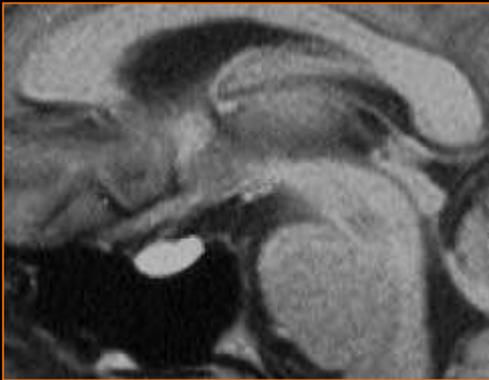
la hauteur hypophysaire : varie avec l'âge et le statut hormonal : homme 6 à 7 mm, femme 9 à 10 mm

IRM

- T1: antéH et tige en isosignal (substance grise), postH en hypersignal
- T2: antéH et tige en isosignal (substance grise)
- G+: antéH et tige très rehaussées



Anomalies de signal de l'antéhypophyse



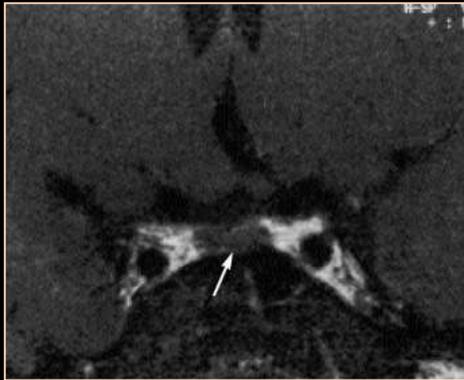
hyper T1: dépôts manganèse (nutrition parentérale)



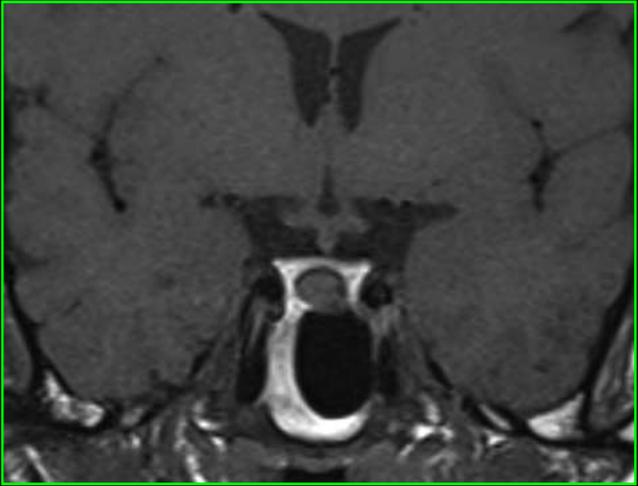
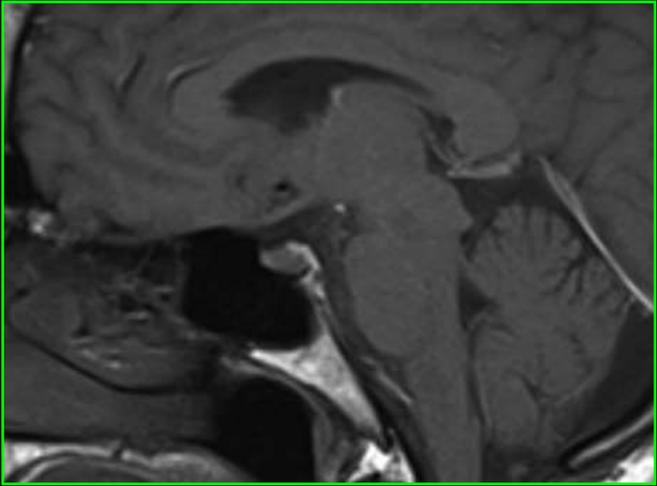
granules de sécrétions contenant des phospholipides



hypo T2, faible rehaussement: dépôts ferriques (thalassémies, hémochromatose)



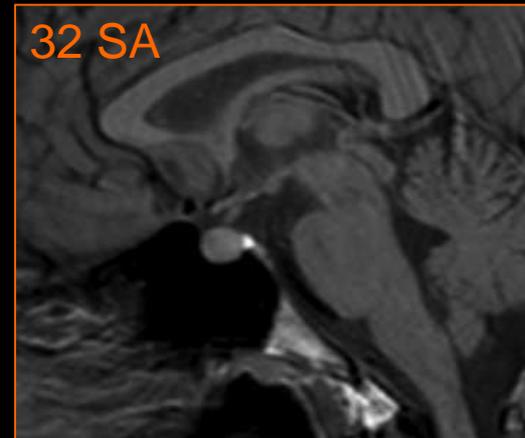
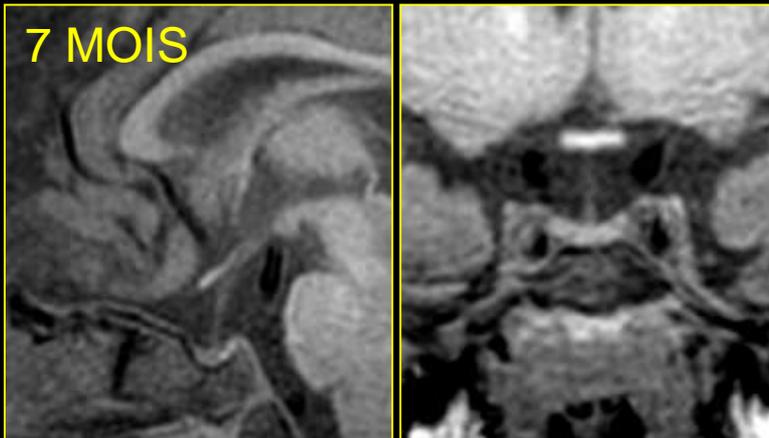
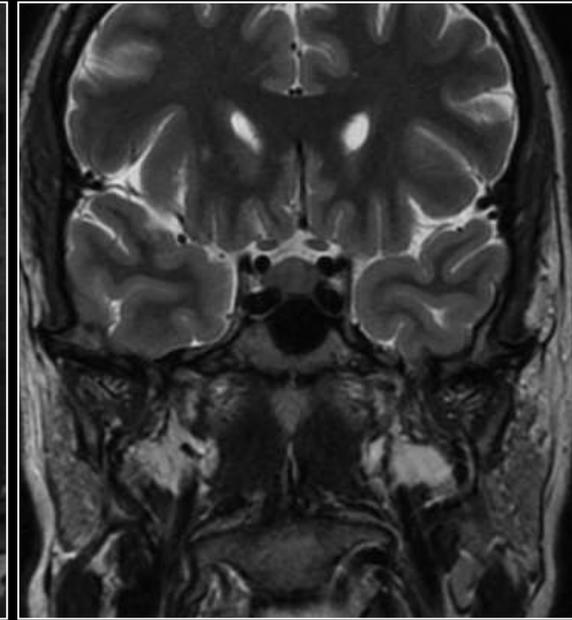
Anomalies de signal de la posthypophyse



perte hypersignal T1: diabète insipide, granulomatoses inflammatoires

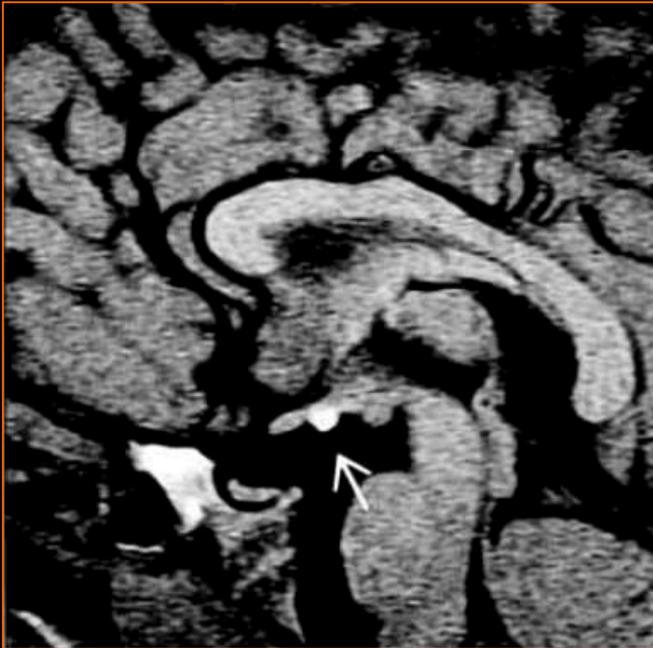
Grossesse et post-partum

Hypophyse prend 0.08 mm par semaine pendant la grossesse



Variantes

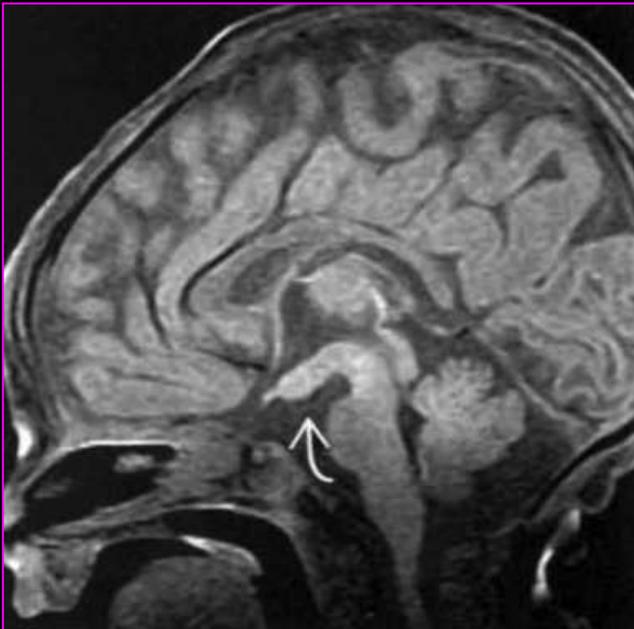
Anomalies congénitales tige



post-hypophyse ectopique
le long du tuber cinereum +
agénésie de la tige



double post hypophyse



absence de post-
hypophyse, double tige
pituitaire, anomalie de la
ligne médiane et du
plancher du V3

Variantes

Hypophyse convexe

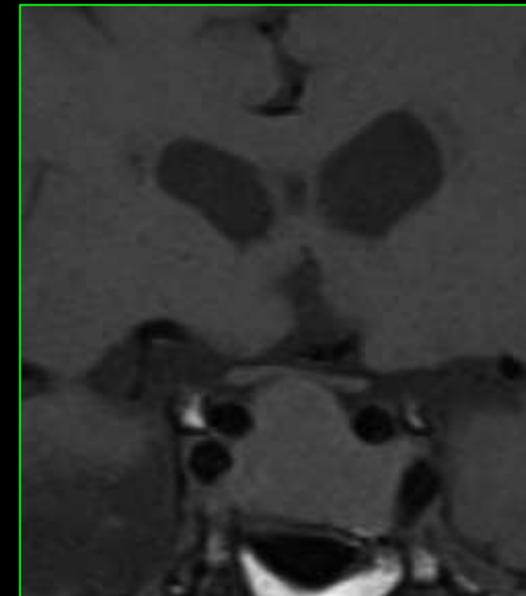
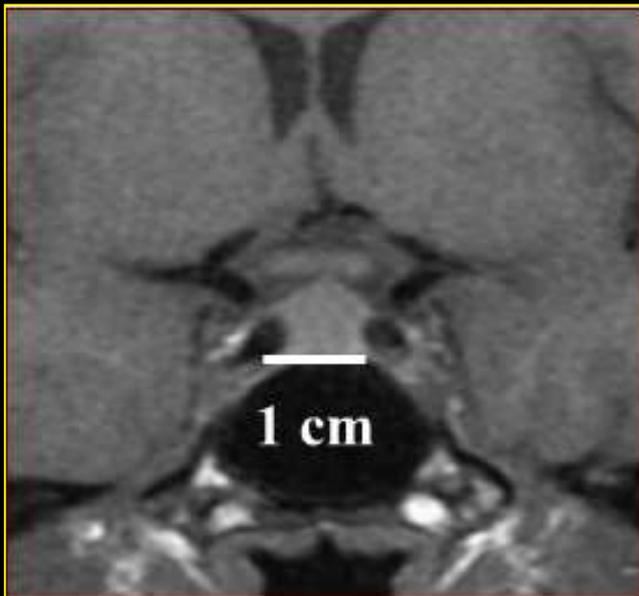


hypertrophie (grossesse, idiopathique)

inadaptation contenant - contenu

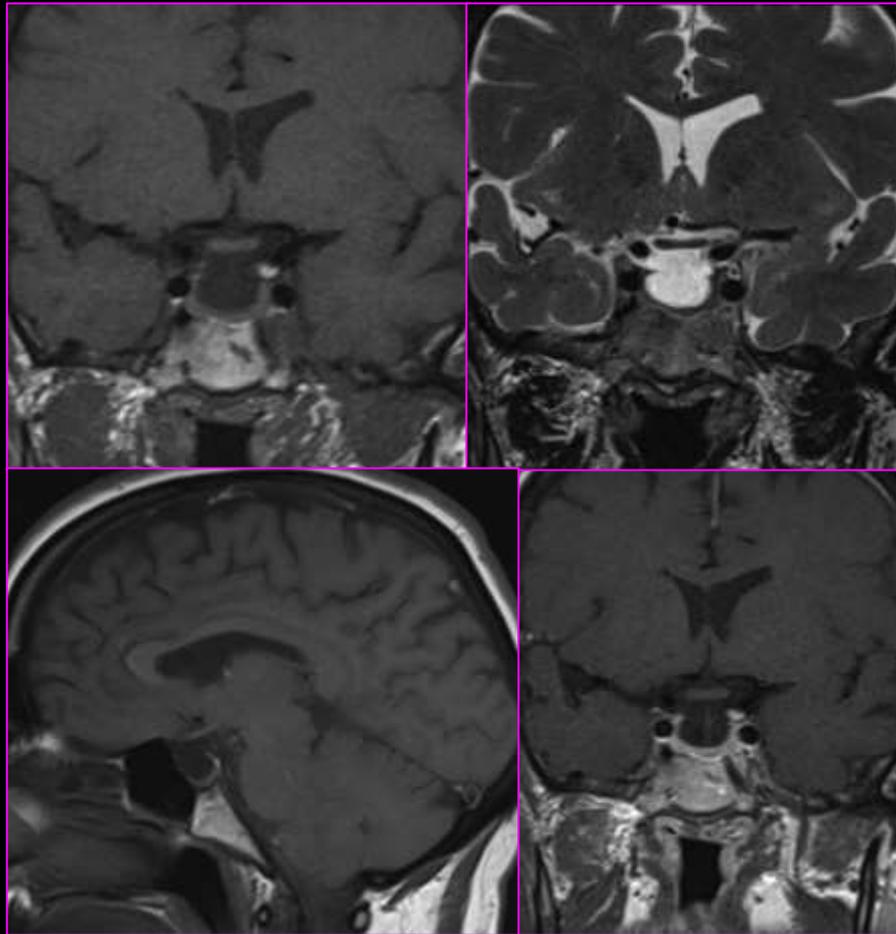
hyperplasie (hypothyroïdisme)

tumorale, hypophysite



Variantes

Arachnoïdocèle (selle turcique vide)



primitive : déhiscence du diaphragme sellaire
+ extension intra-sellaire du LCS, 5% cas,
asymptomatique

hypophyse laminée, tige centrée

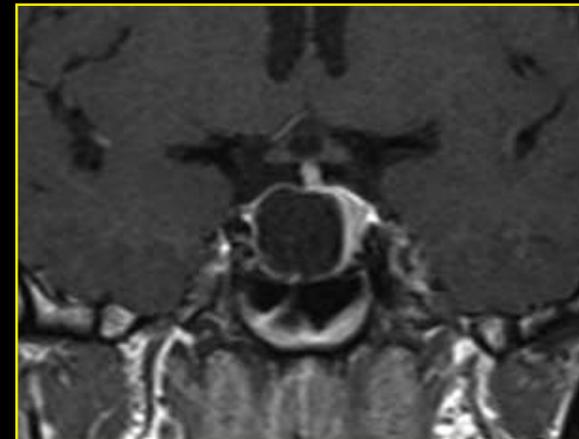
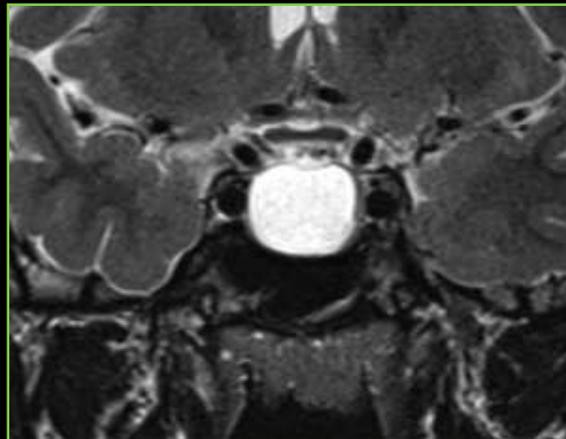
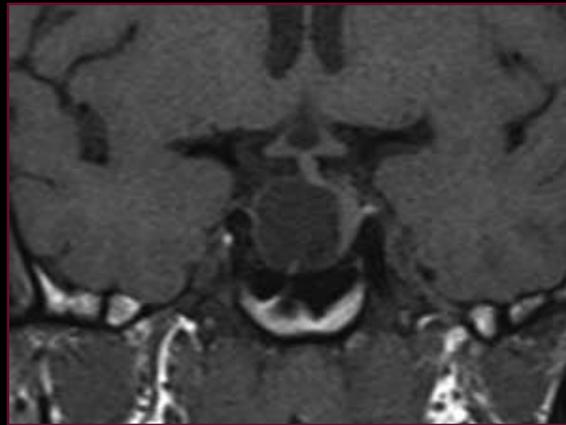
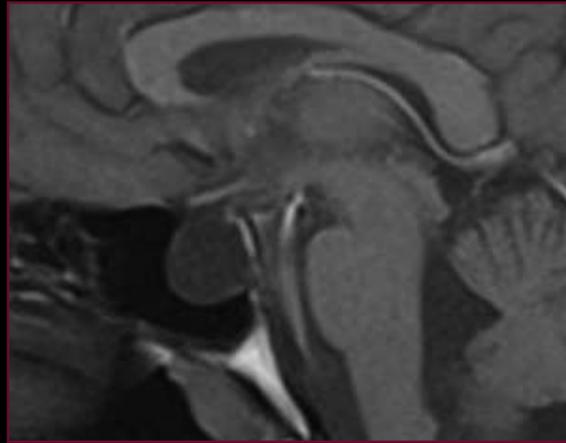


secondaire : exérèse ou régression
post thérapeutique

Variantes

Kyste de la poche de Rathke

hypo T1,
hyper T2,
pas de rehaussement



Vascularisation

réseau **hypothalamique** :

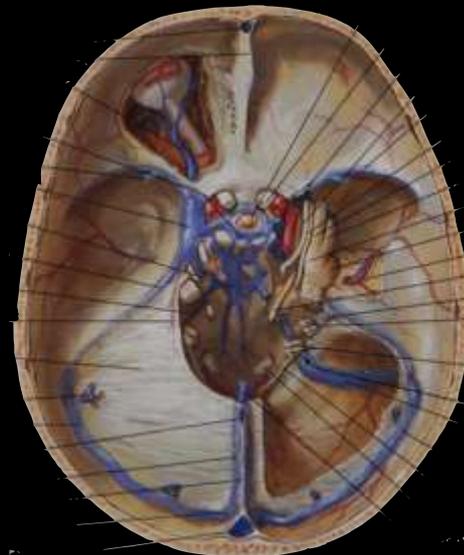
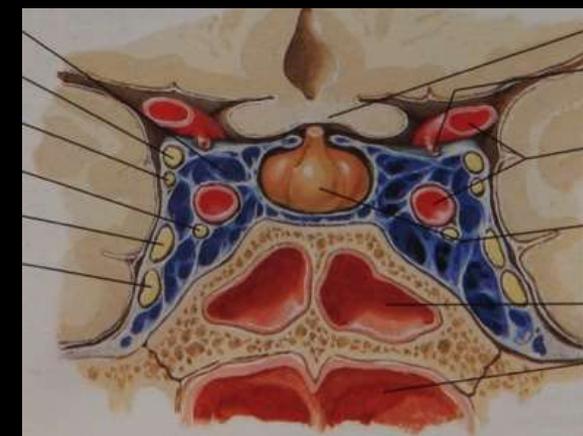
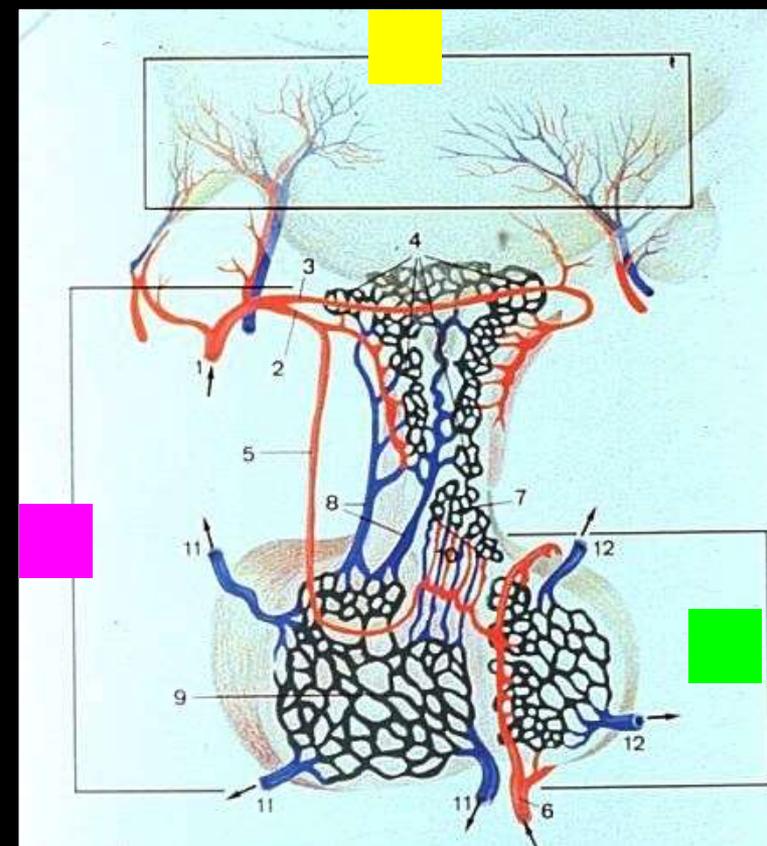
- hypothalamus
- branches du cercle de Willis

réseau **hypothalamo-tubéro-antéhypophysaire** :

- éminence médiane, tige pituitaire, antéhypophyse
- artères hypophysaires supérieures, issues des carotides internes supra-caverneuses

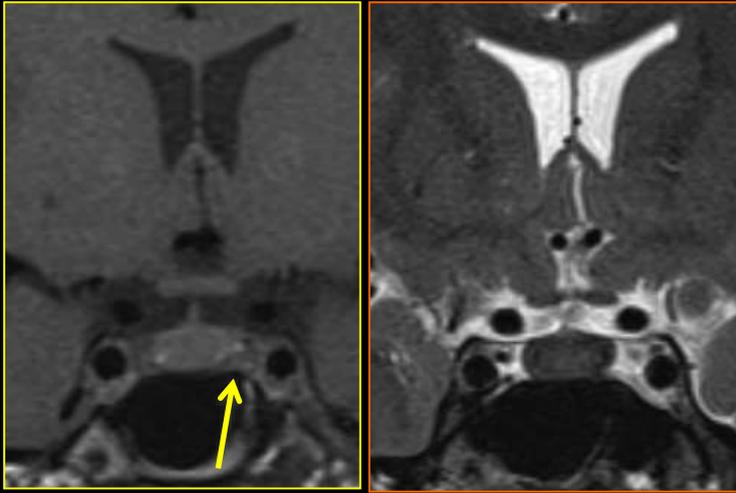
réseau **post-hypophysaire** :

- neurohypophyse
- artère hypophysaire inférieure issue des CI intra-caverneuses



drainage vers les sinus caverneux

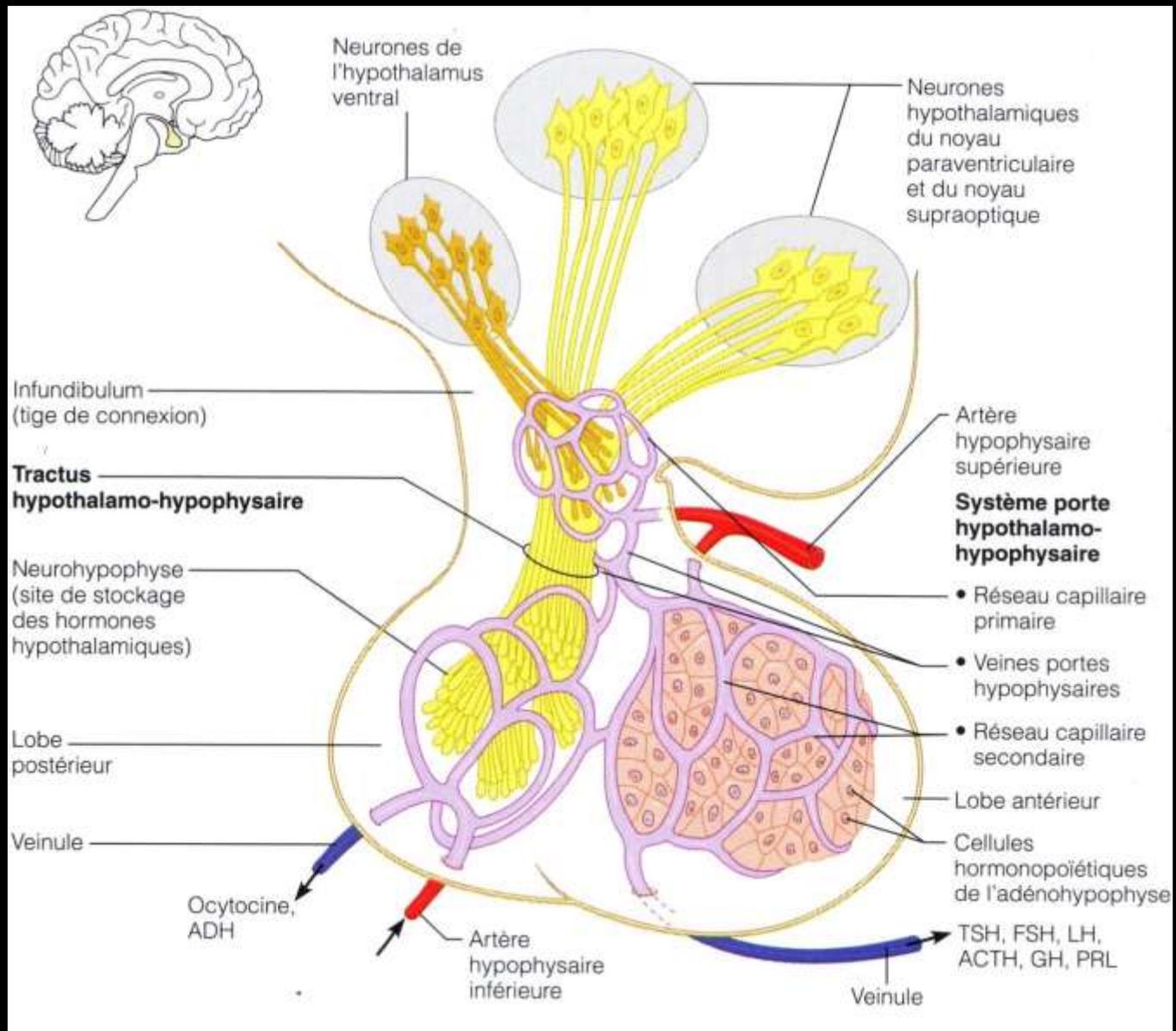
Pièges



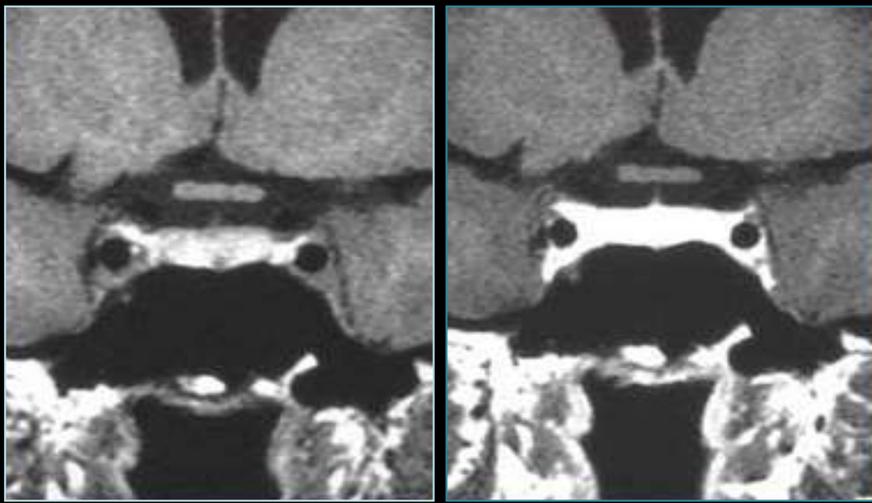
veines du sinus caverneux : flux lent :
hyposignal T1 et **hypersignal T2**
signal identique à celui d'un microadénome

sinus coronaire: dilatation et trop
bonne visibilité en cas d'hypotension
intracrânienne





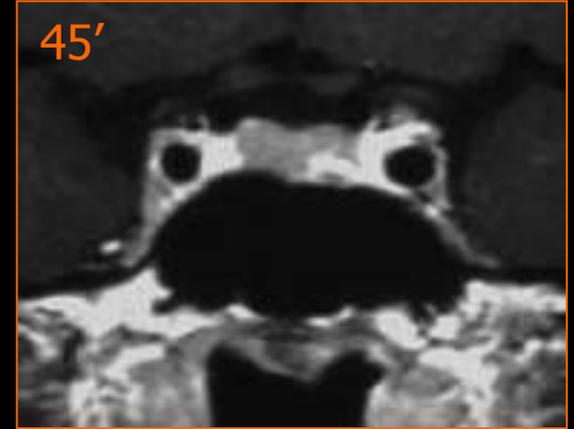
système porte hypothalamo-hypophysaire:
transport neuro-hormones sécrétées par l'hypothalamus



Gado: 0,05 mmol/kg

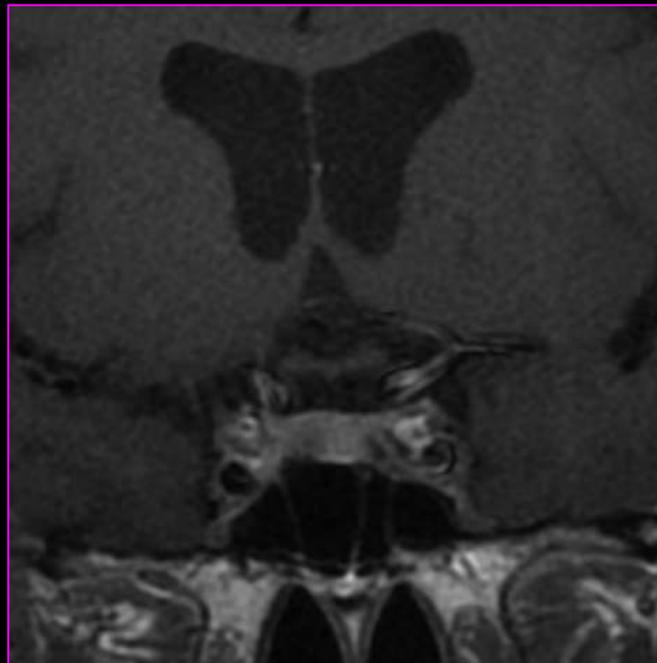
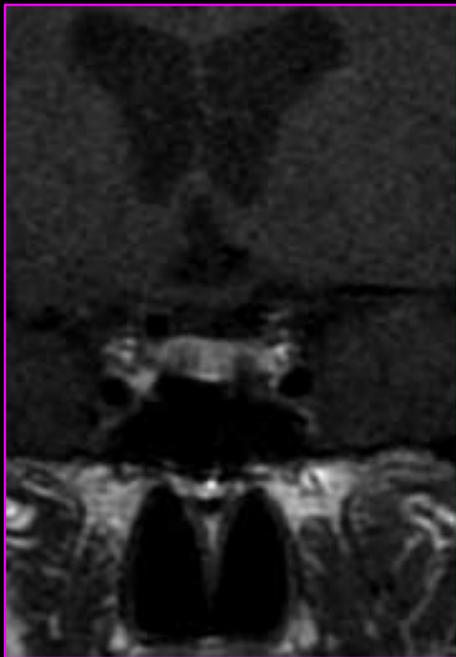
Gado: 0,1 mmol/kg

Rehaussement intense et homogène
Intérêt séquences dynamiques et retardées

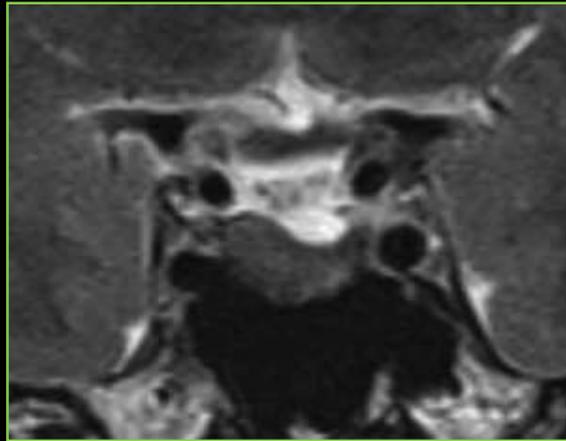
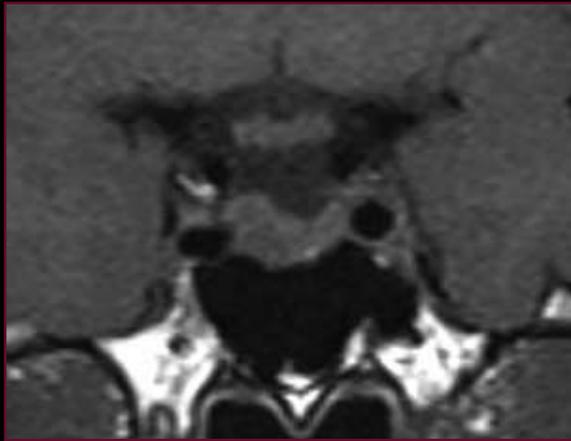


Adénome prend **moins vite**
que l'hypophyse normale

Adénome prend **moins** le Gado que l'hypophyse normale

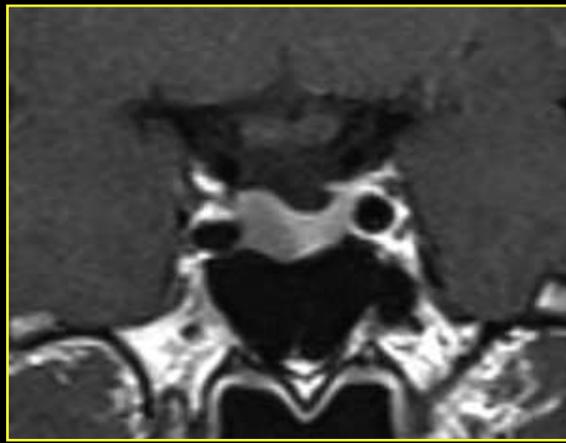
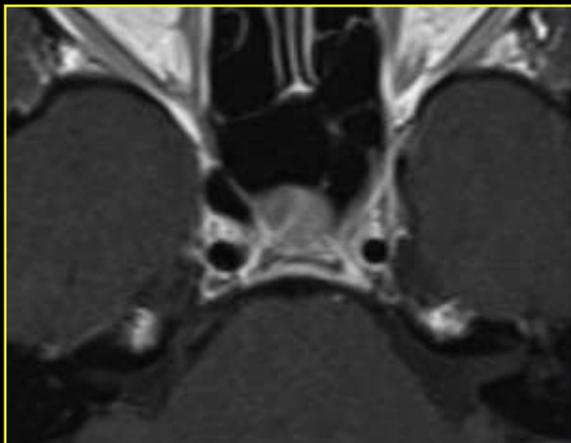


Adénome: iso ou **hypo T1**, **iso** ou hyper **T2**, **peu rehaussé**
si hémorragique: hyper T1 et T2,
si nécrotique ou kystique: hypo T1, hyper T2, non rehaussé

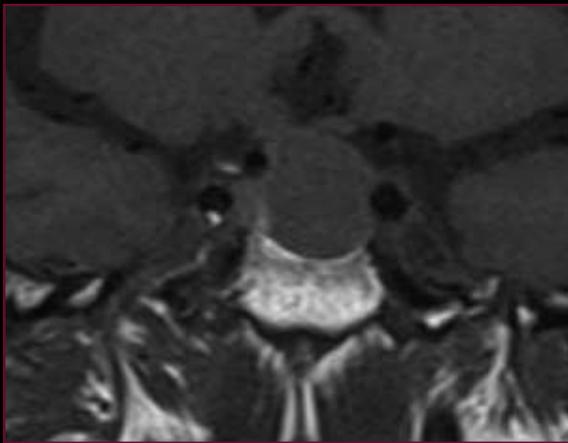
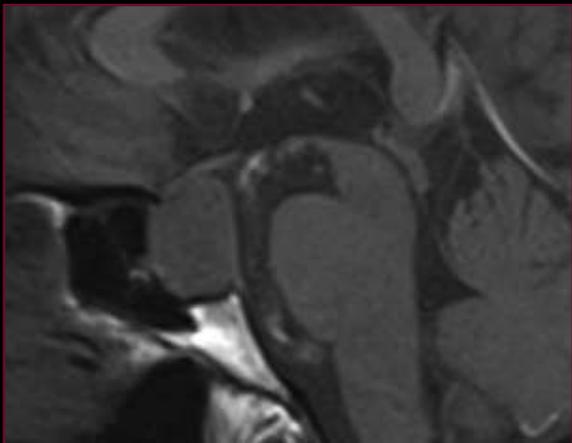


Micro-adénome à prolactine

3 à 10 mm



prolactine, ACTH

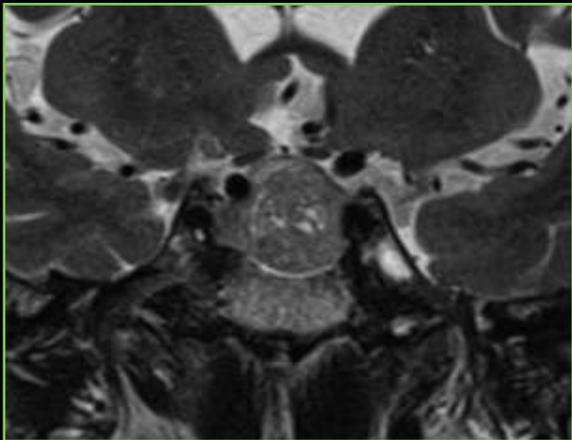


Macroadénome à GH

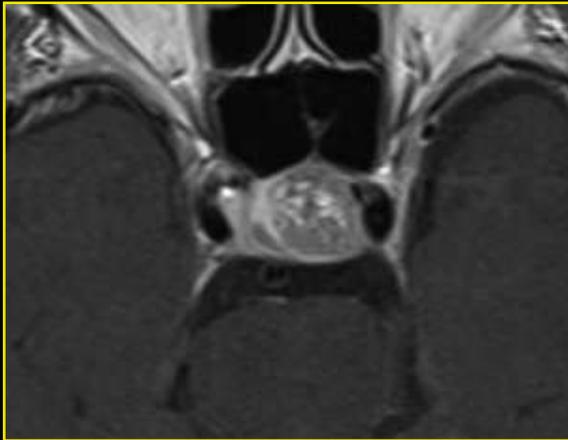
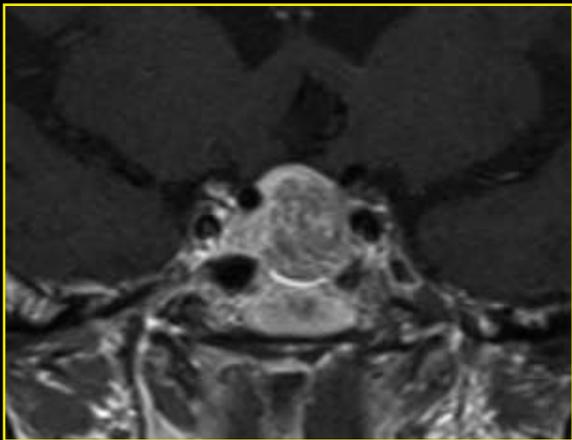
> 1 cm

T1

hétérogène



T2

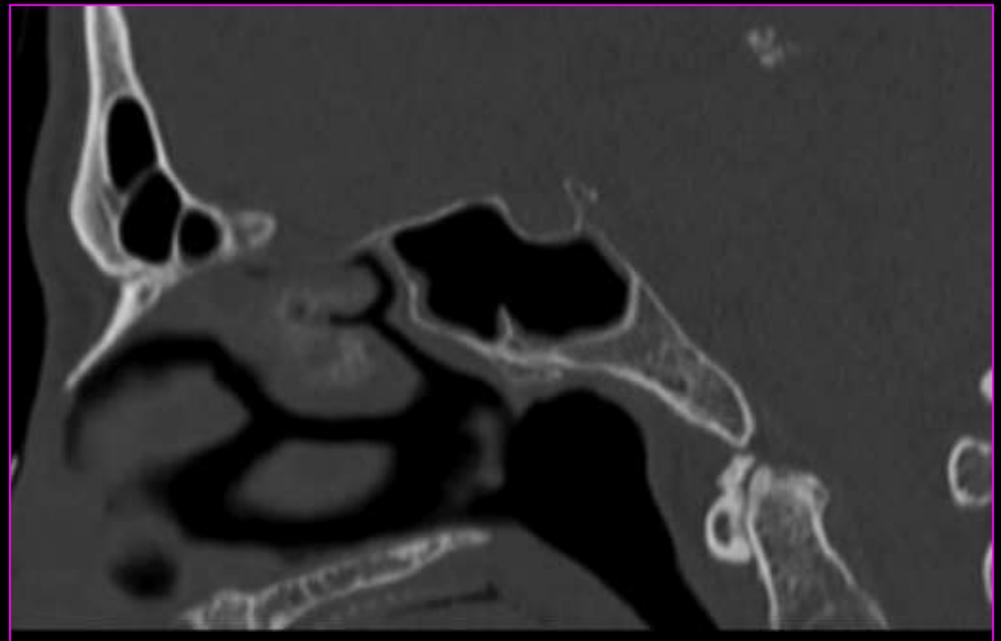
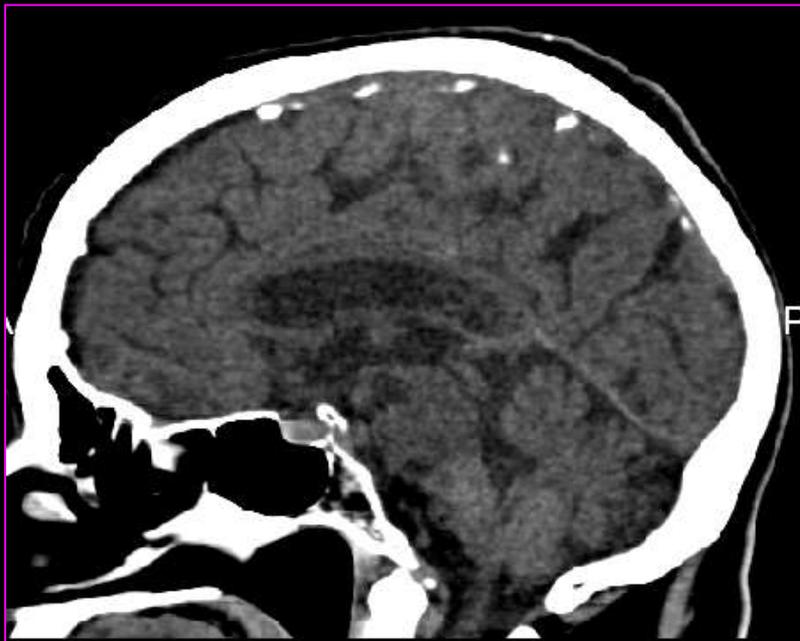
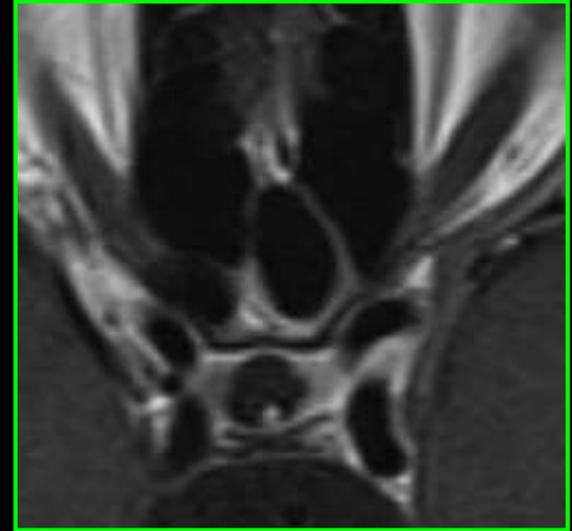
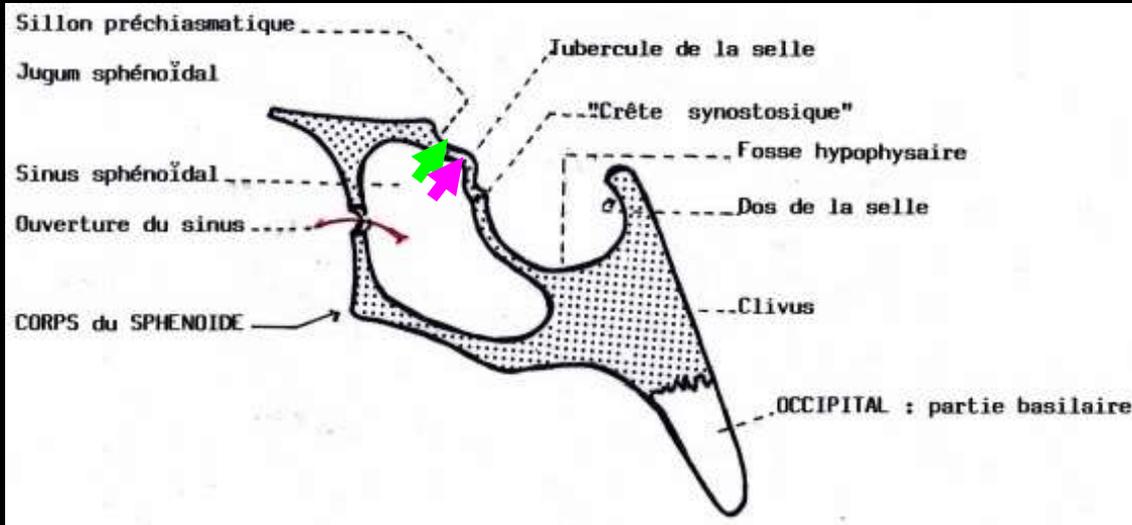


G+

Rapports

Loge ostéo-fibreuse selle turcique

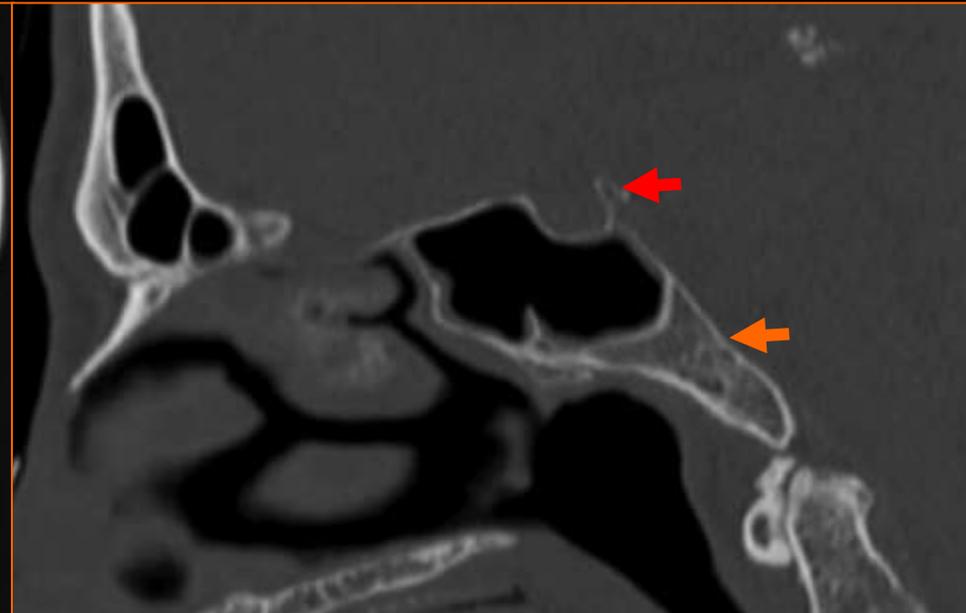
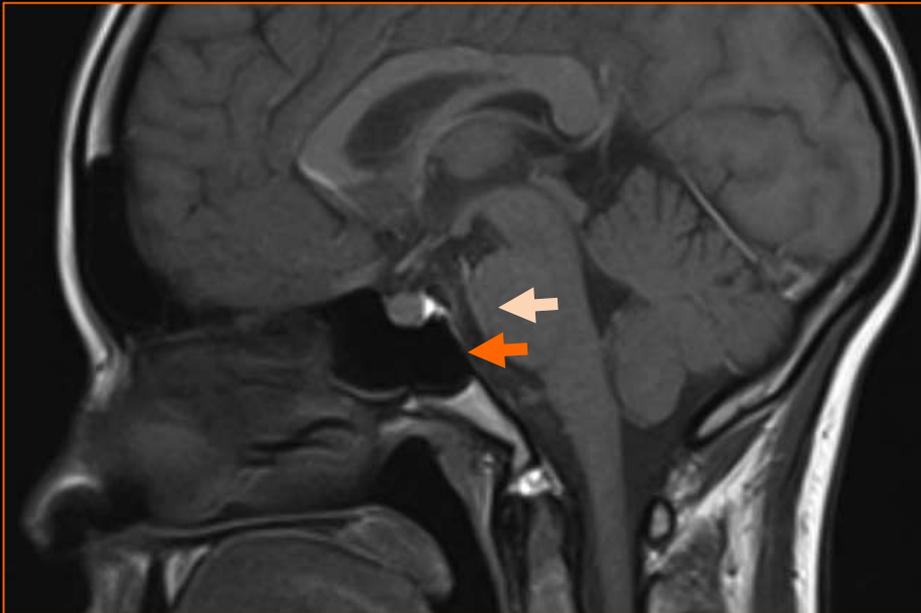
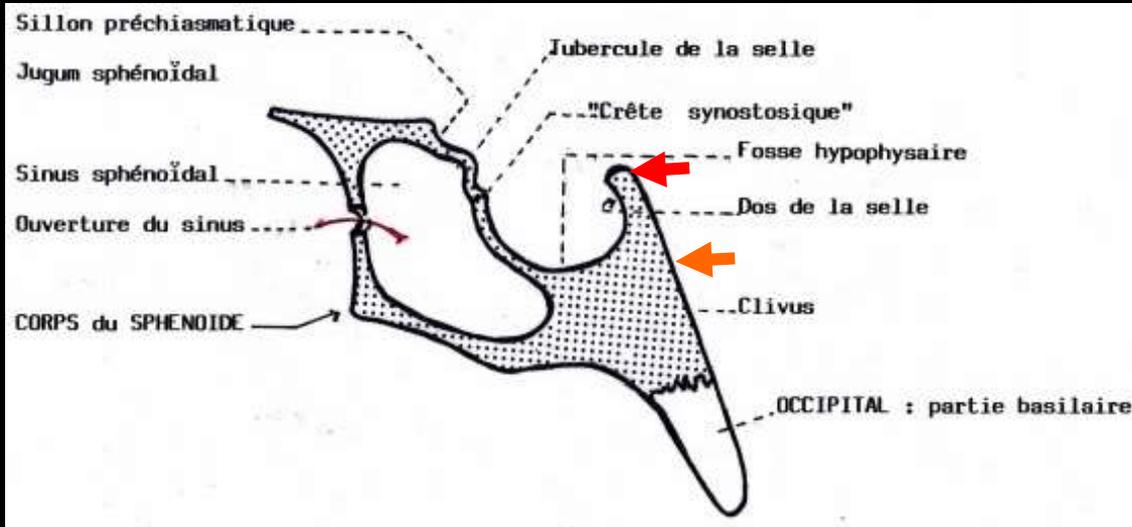
en avant : tubercule de la selle et sillon pré-chiasmatique



Rapports

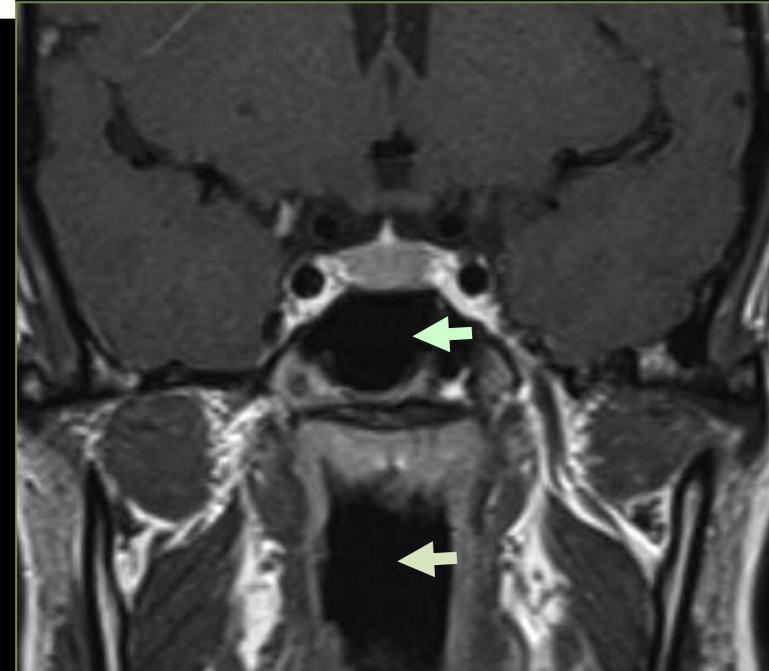
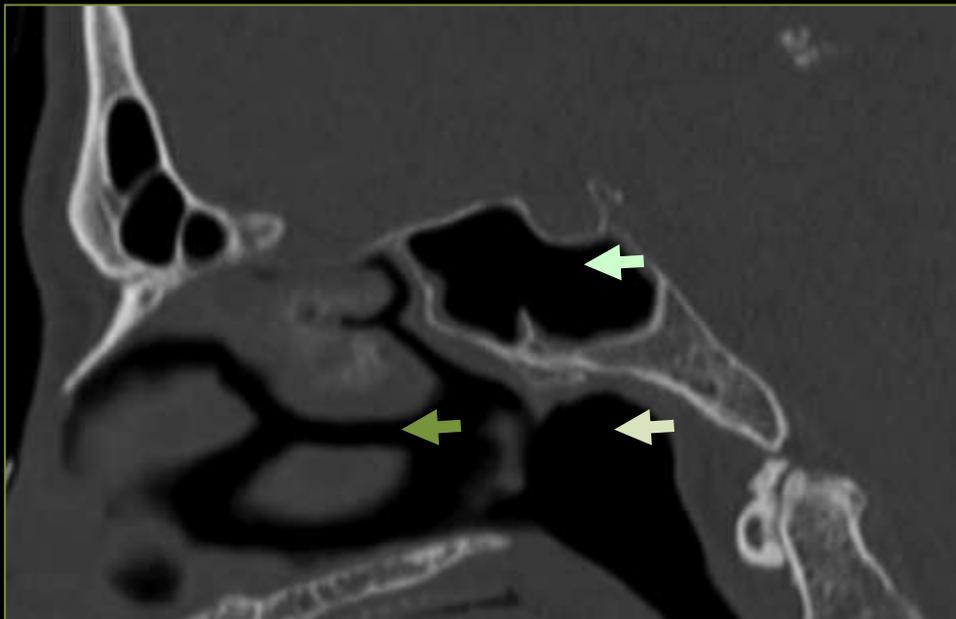
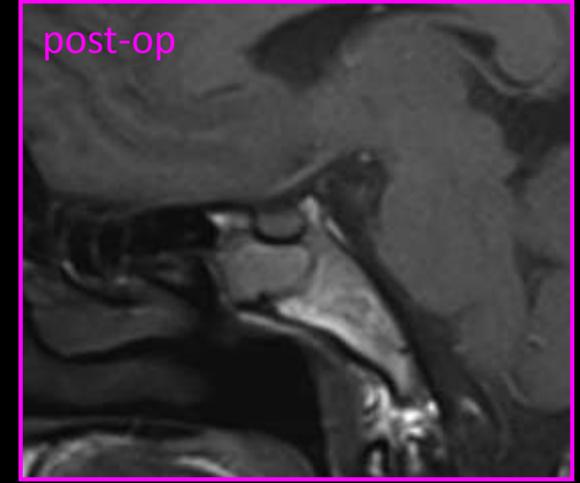
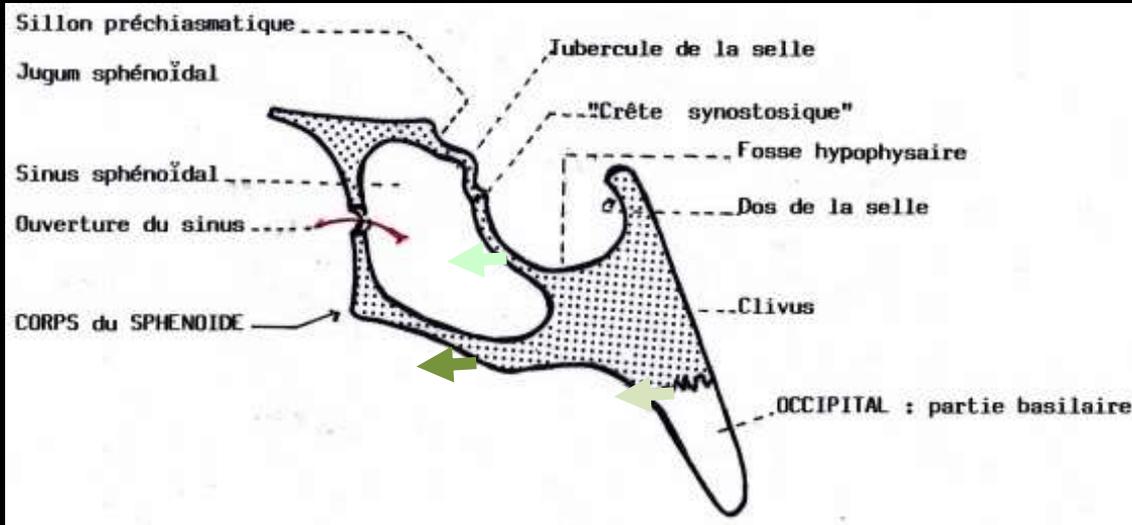
Loge ostéo-fibreuse selle turcique en arrière : dos de la selle, pr. clinoides postérieurs

a. basilaire, protubérance

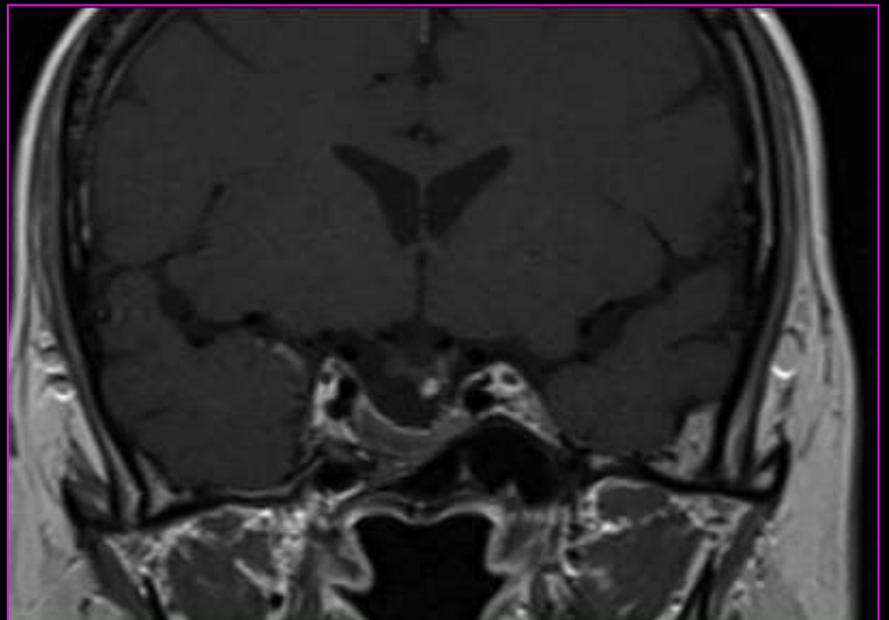
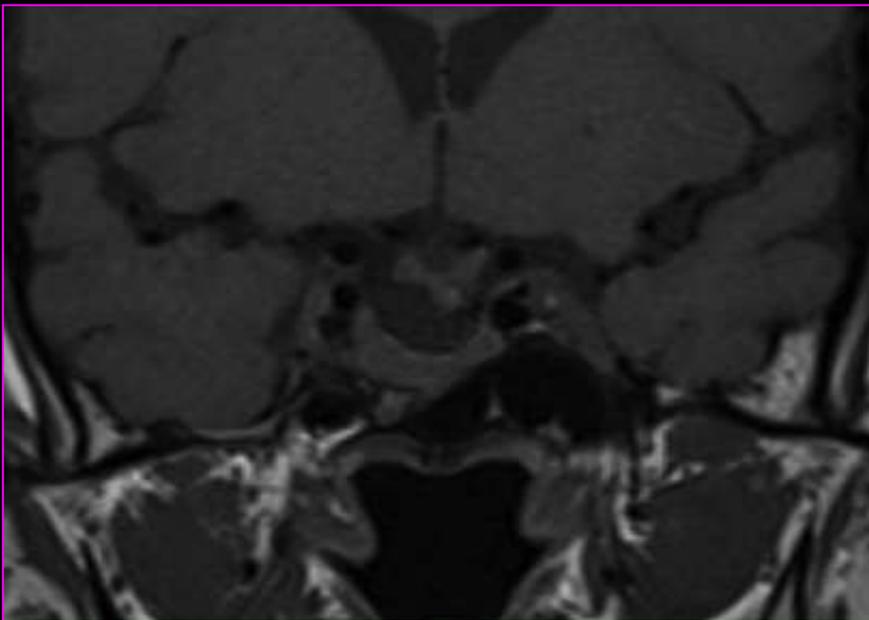
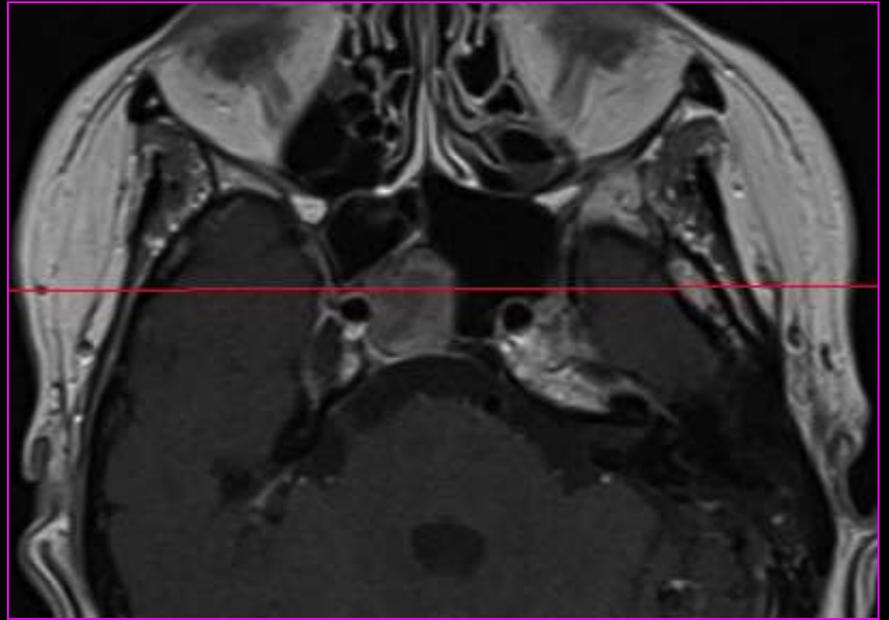
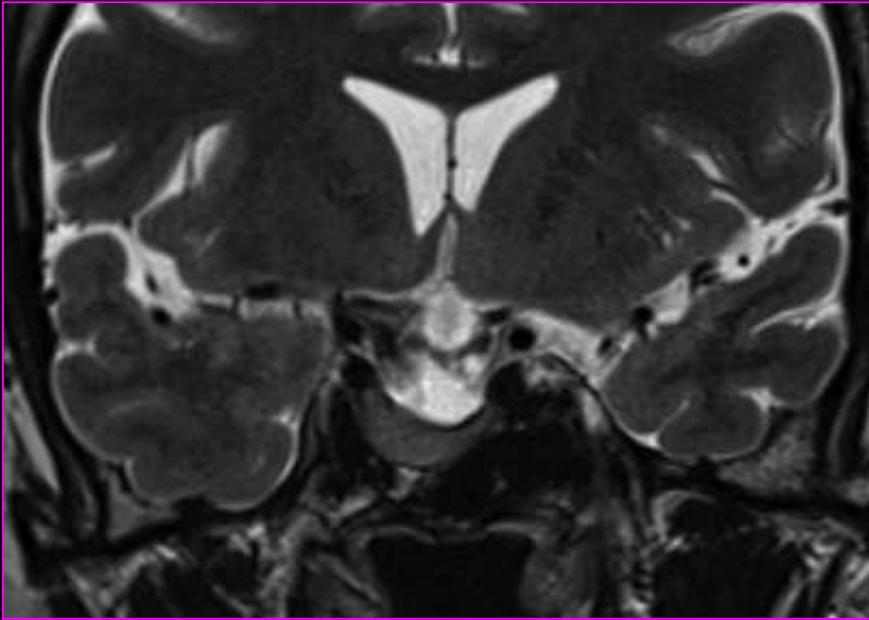


Rapports

Loge ostéo-fibreuse selle turcique en bas : sinus sphénoïdal, fosses nasales, rhino-pharynx

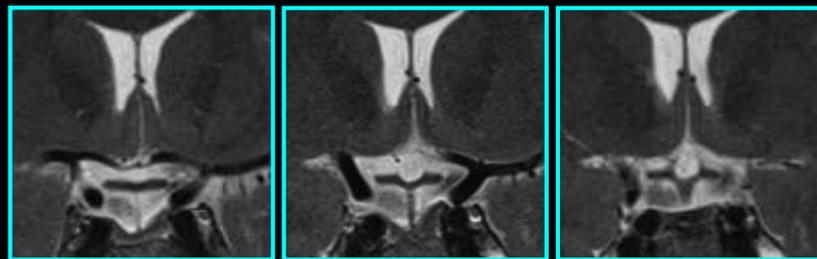
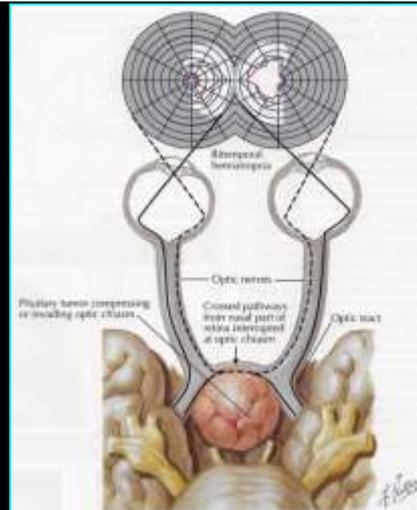
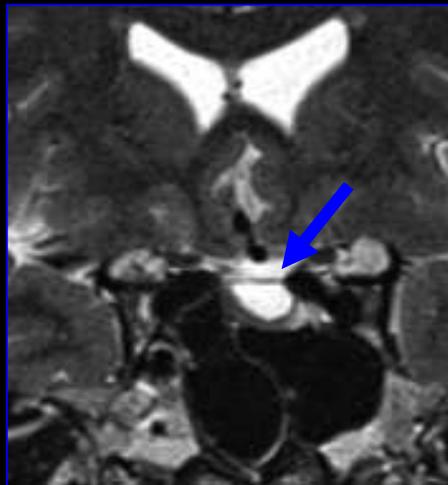
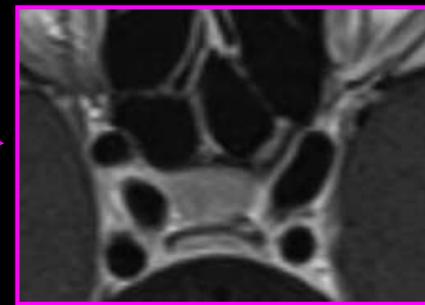
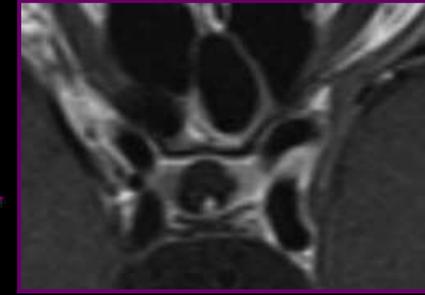
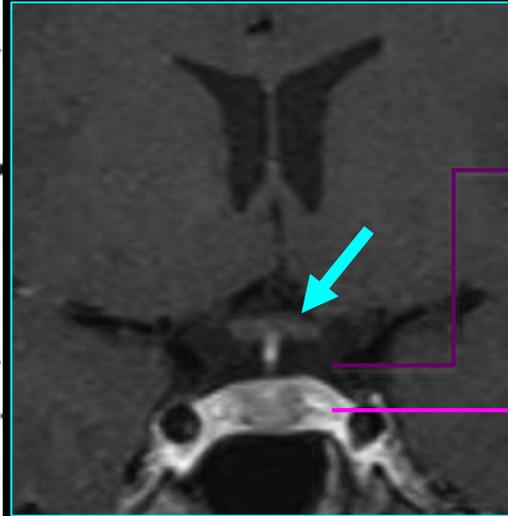
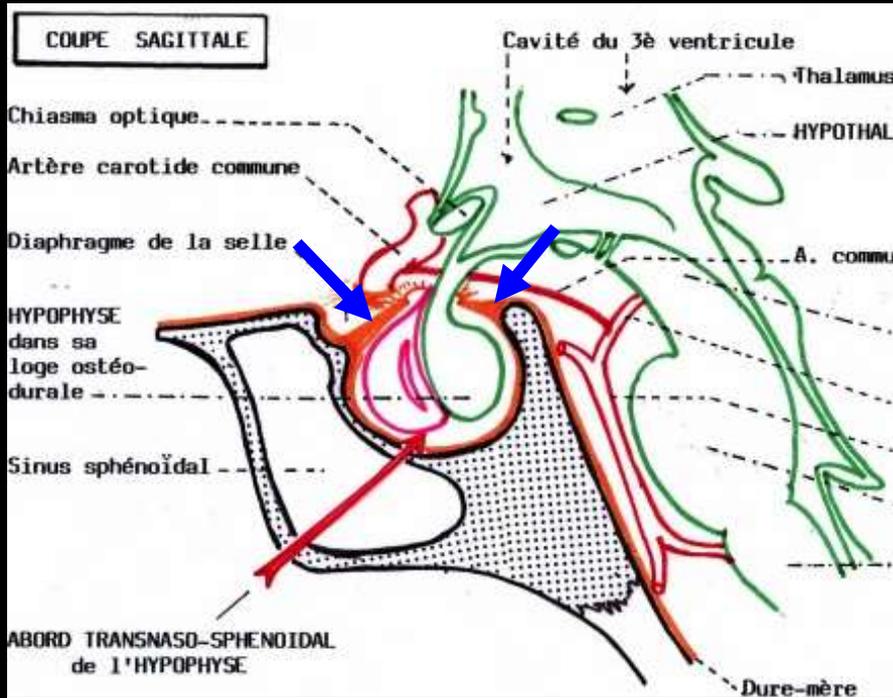


Extension infra-sellaire



Rapports

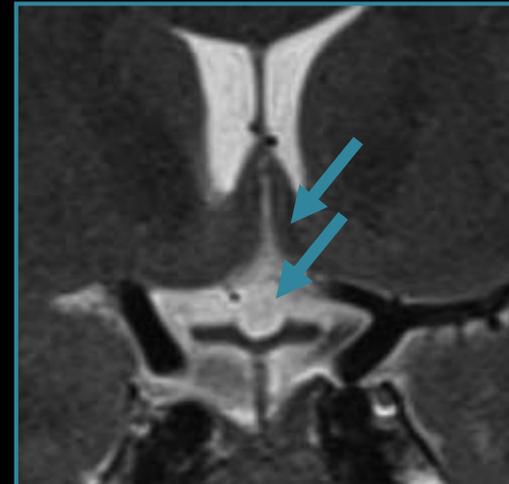
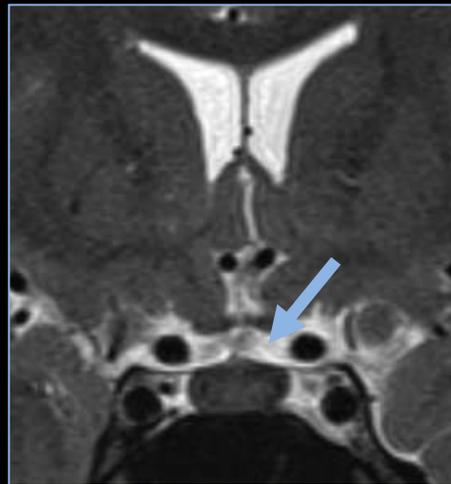
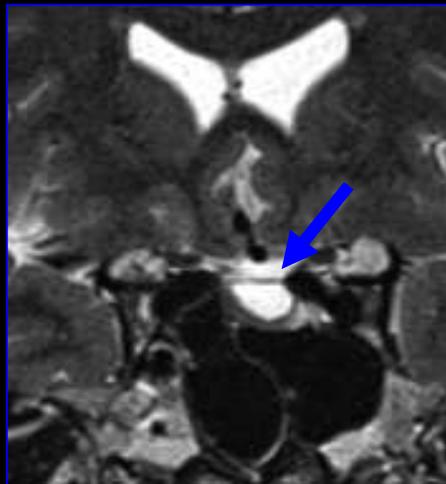
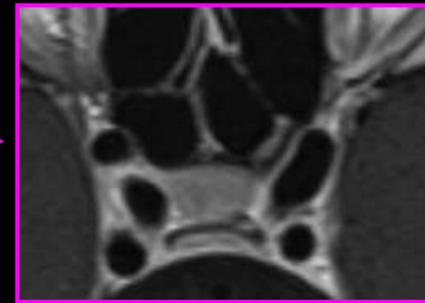
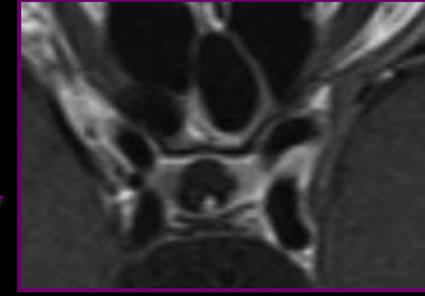
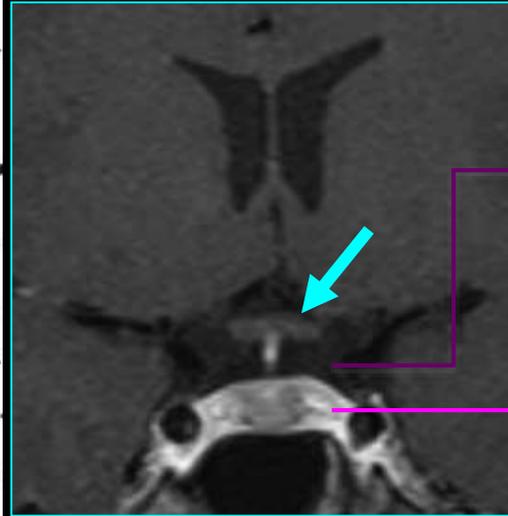
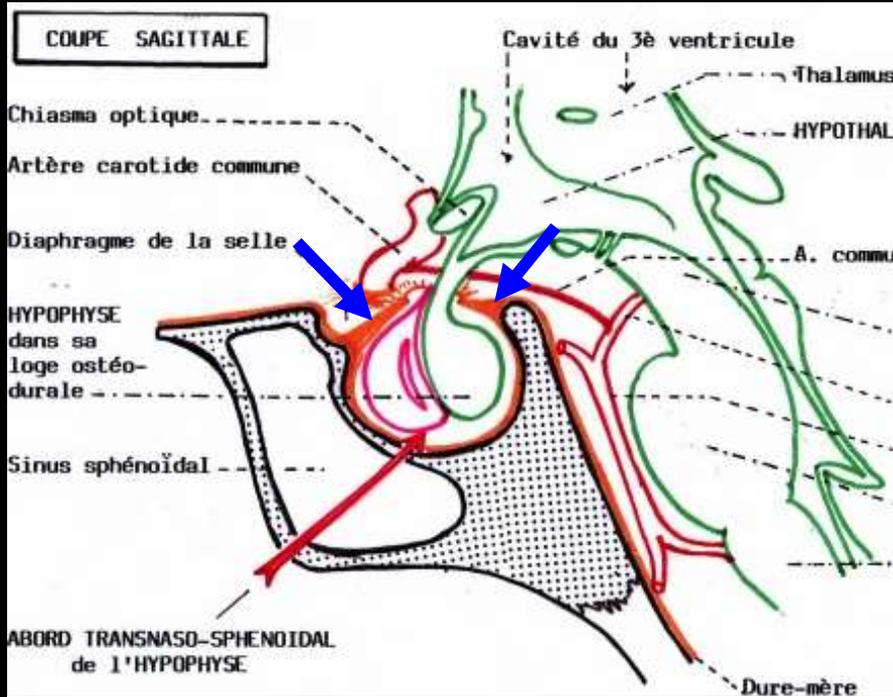
Loge ostéo-fibreuse méninge en haut : **diaphragme sellaire**, **chiasma optique**,



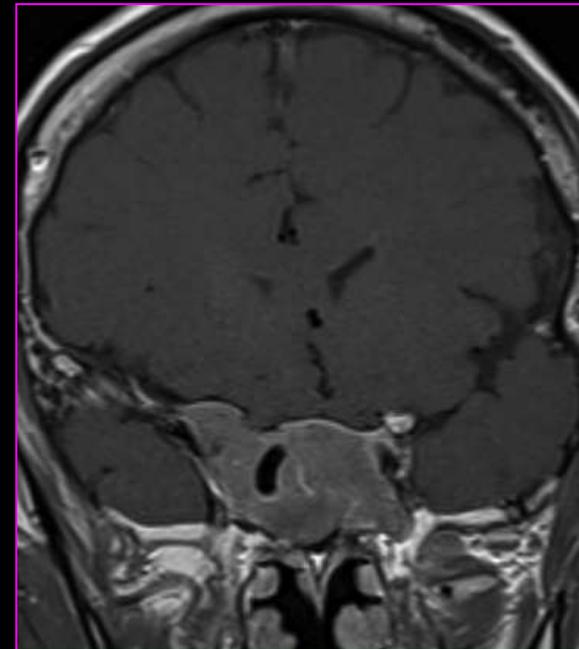
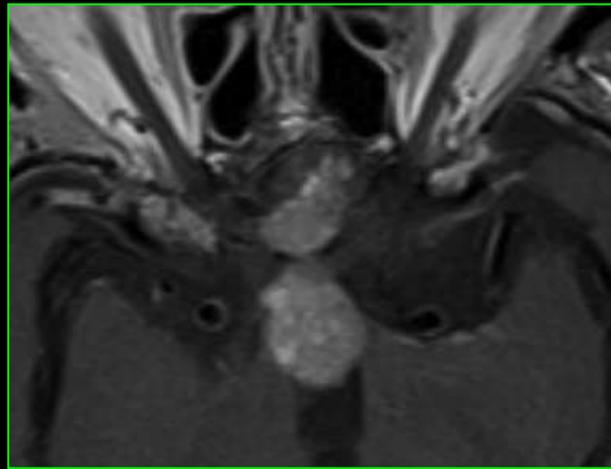
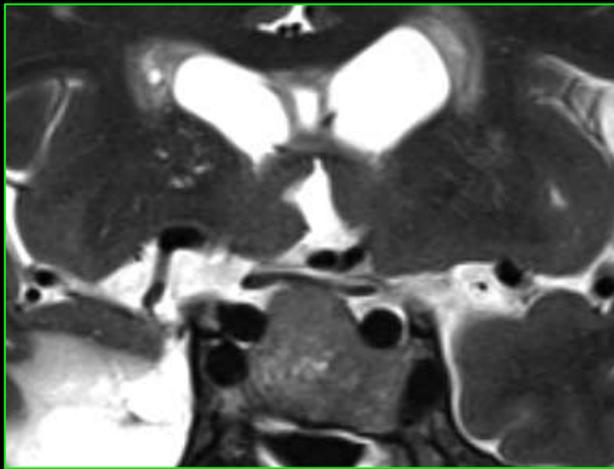
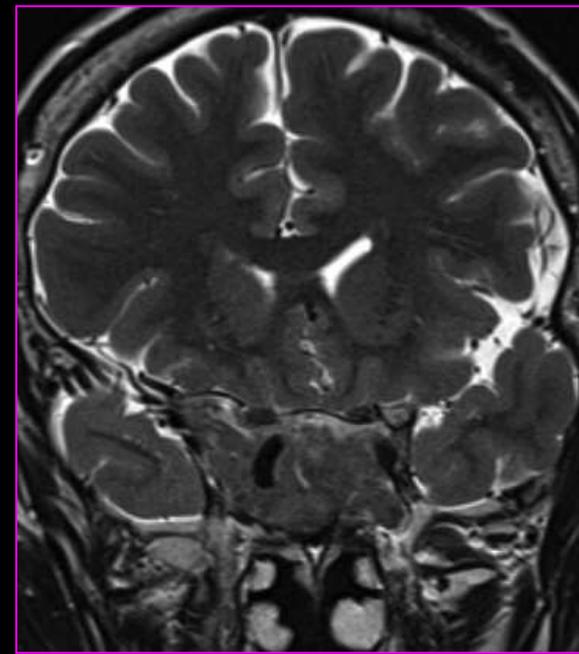
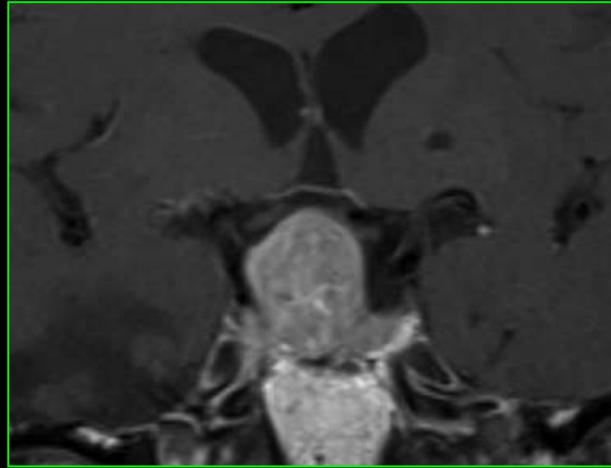
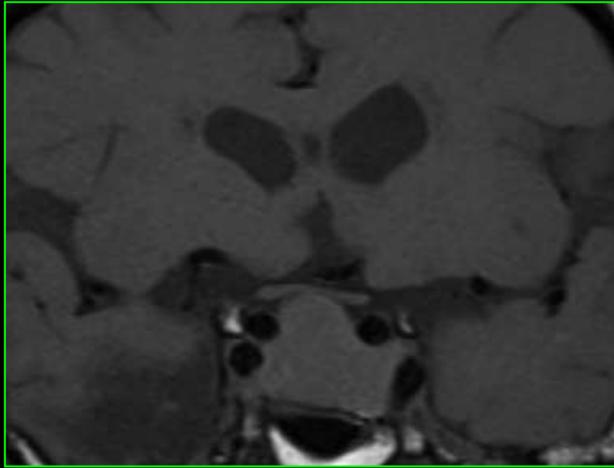
Rapports

Loge ostéo-fibreuse méninge en haut : **diaphragme sellaire**, **chiasma optique**, **cit. chiasmaticque**

plancher du V3 et hypothalamus



Extension supra-sellaire

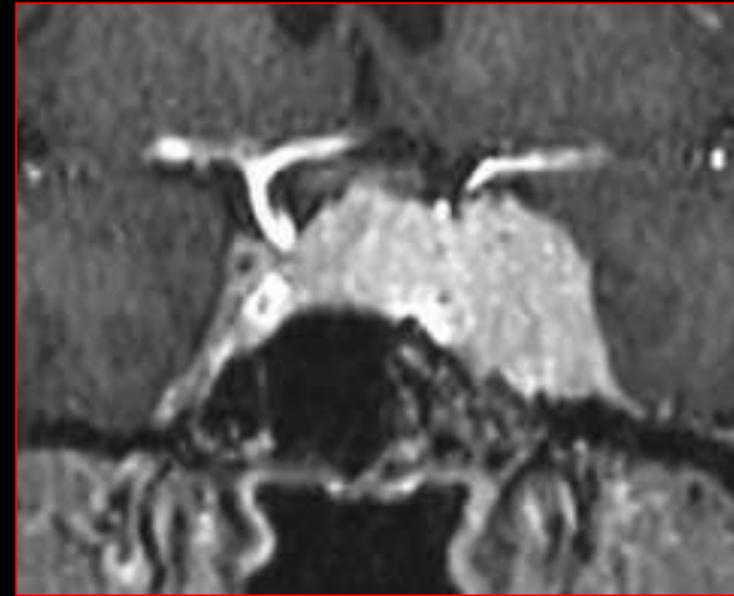
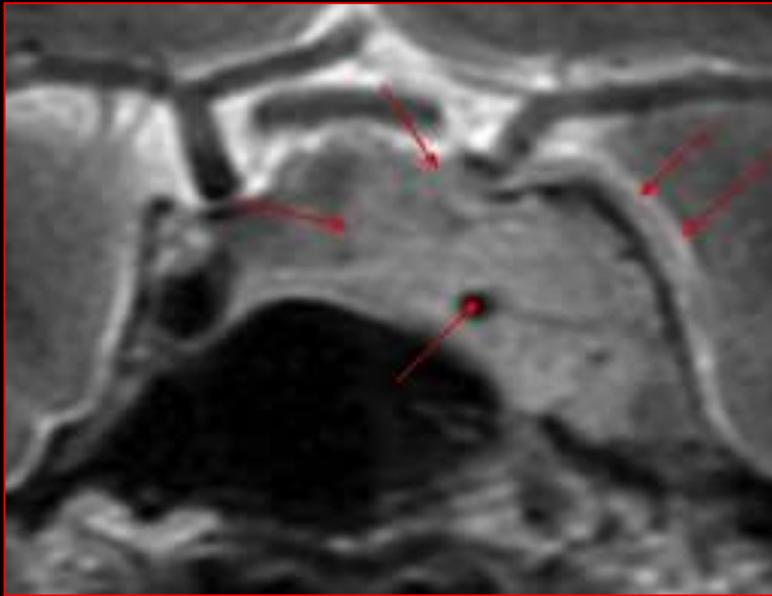


Chiasma

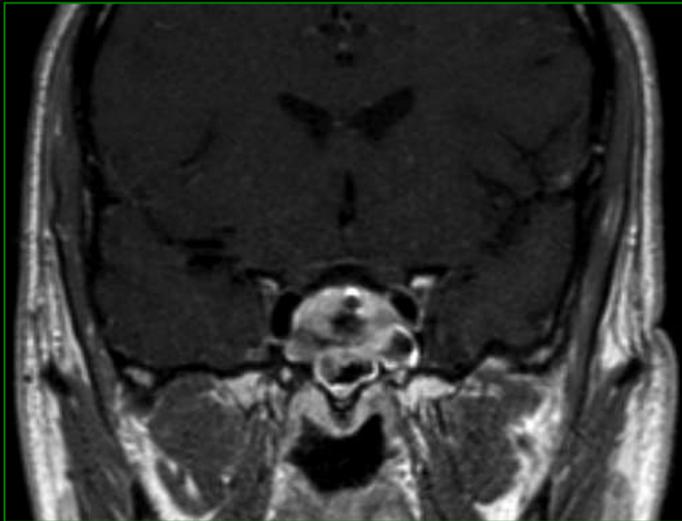
Citerne

Patho supra-sellaire à développement intra-sellaire

méningiome

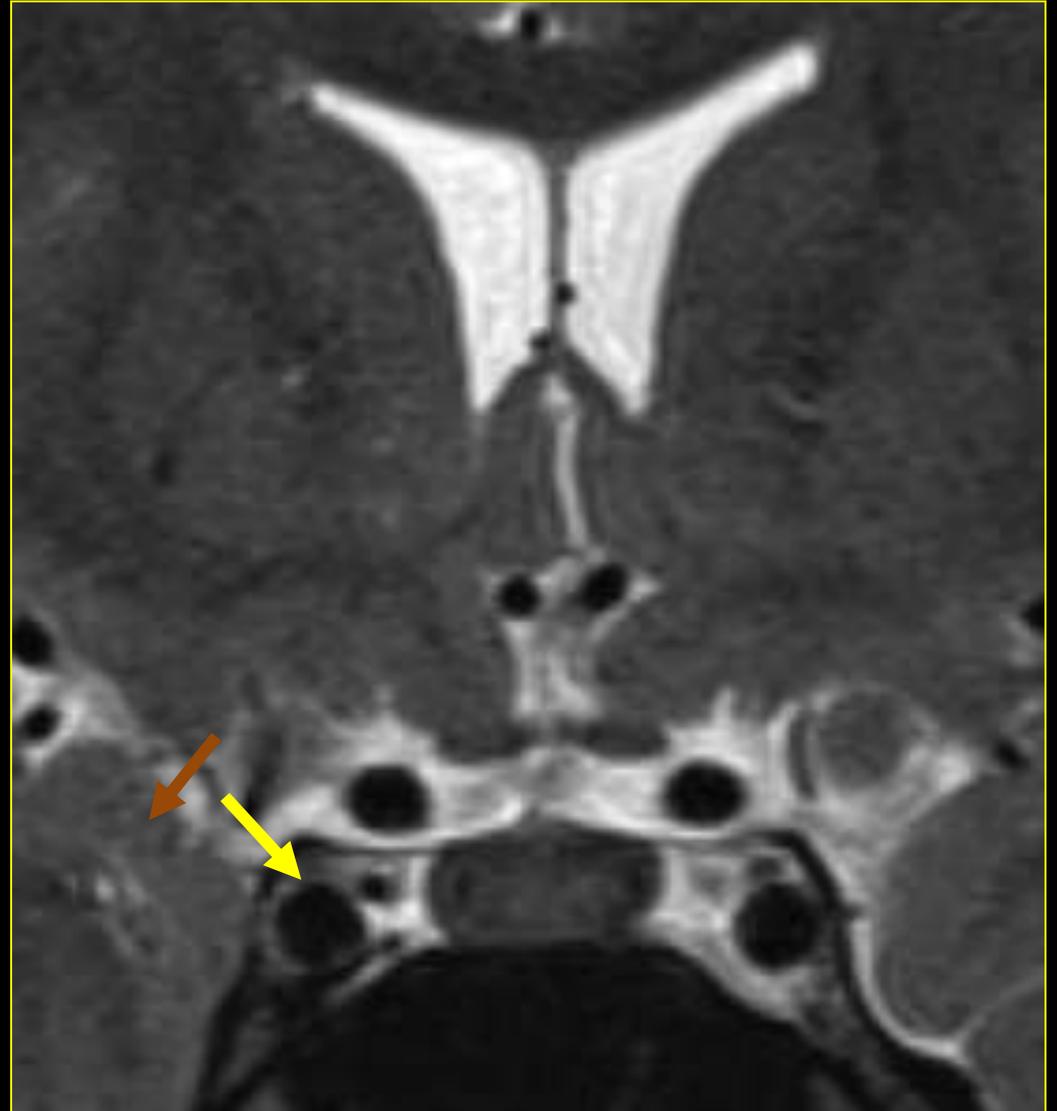
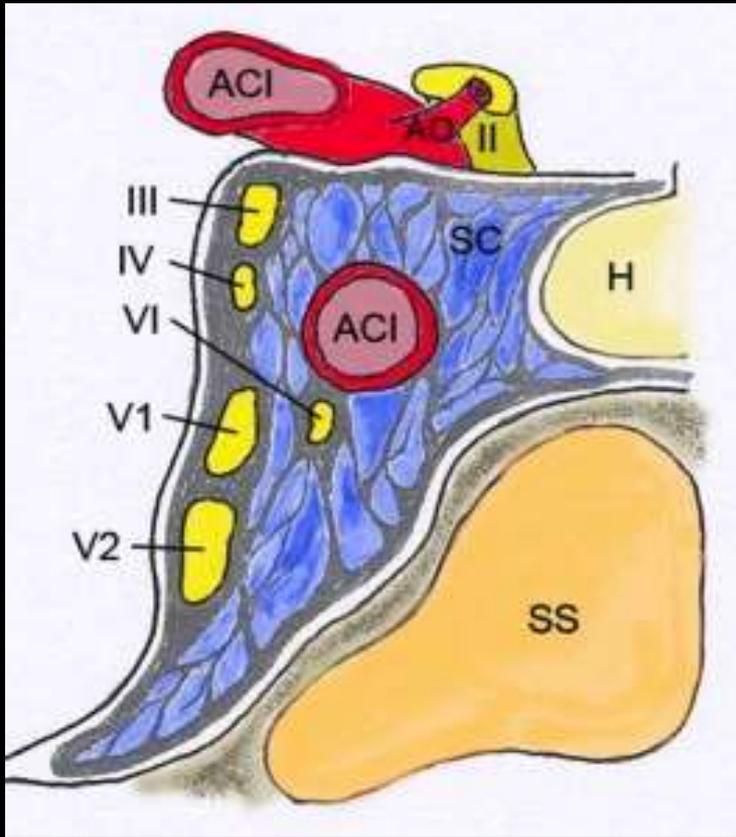


crâniopharyngiome

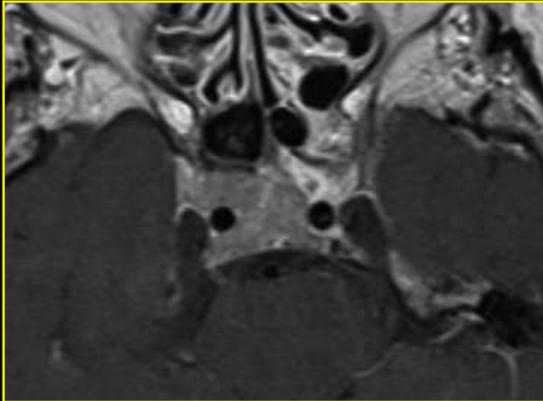
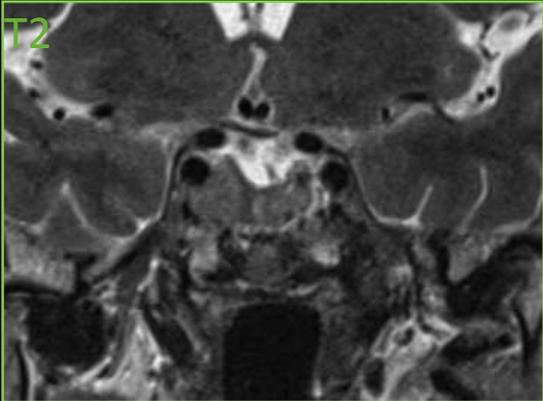
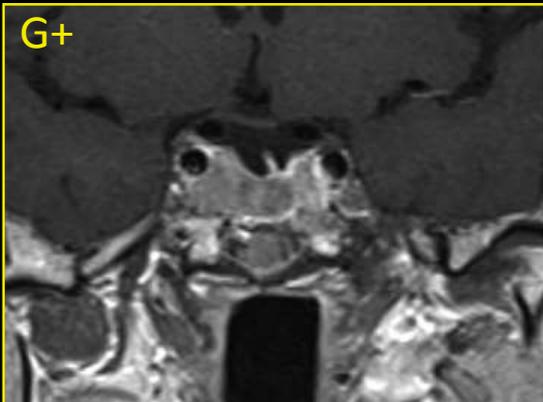
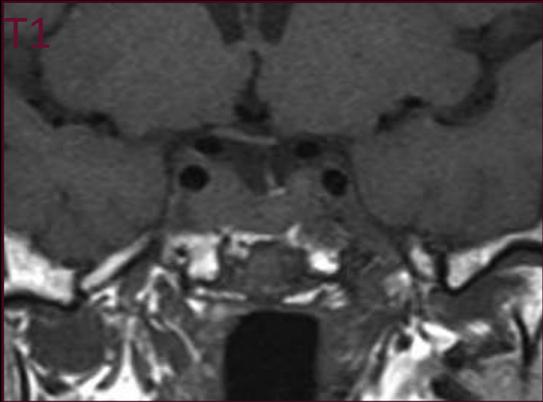
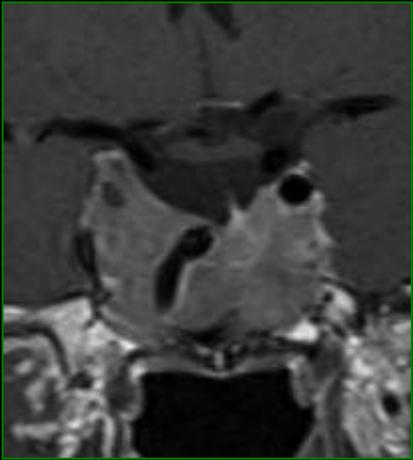
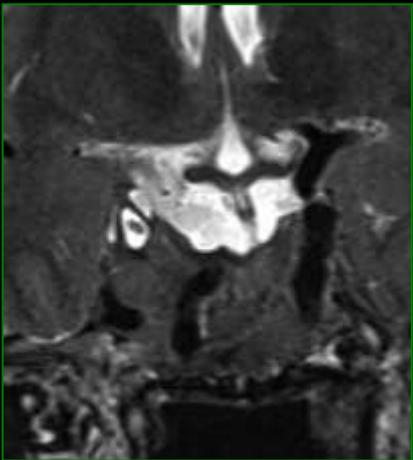
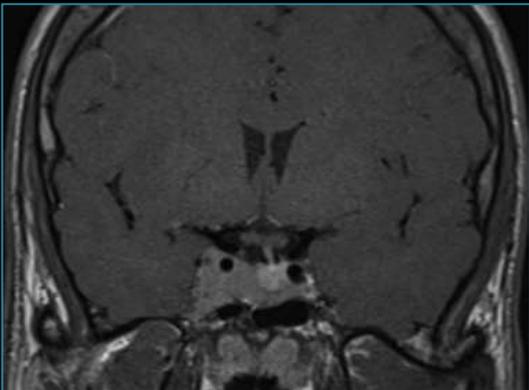
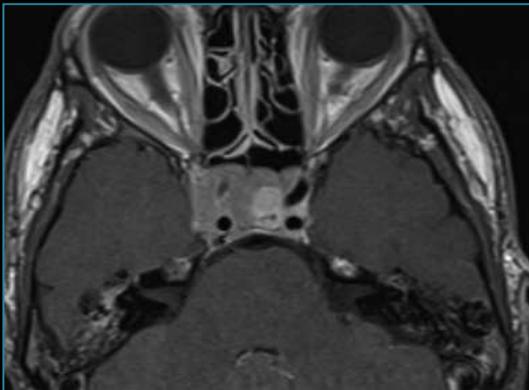


Rapports

Loge ostéo-fibreuse méninge latéralement : **sinus caverneux**, lobes temporaux



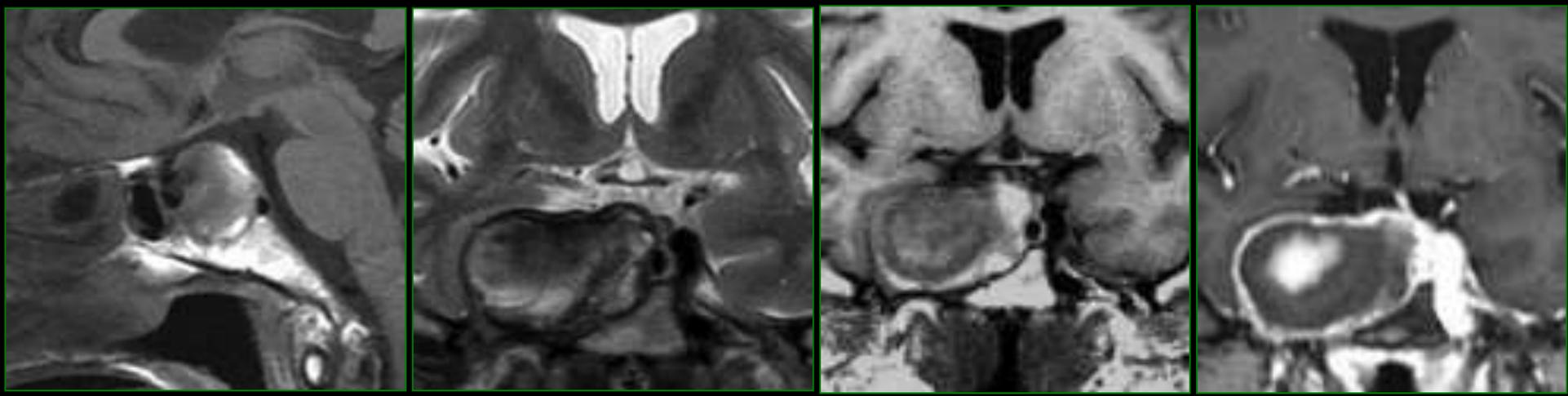
Extension latéro-sellaire



envahissement du sinus
caverneux droit

Patho latéro-sellaire à développement intra-sellaire

anévrisme de la CI

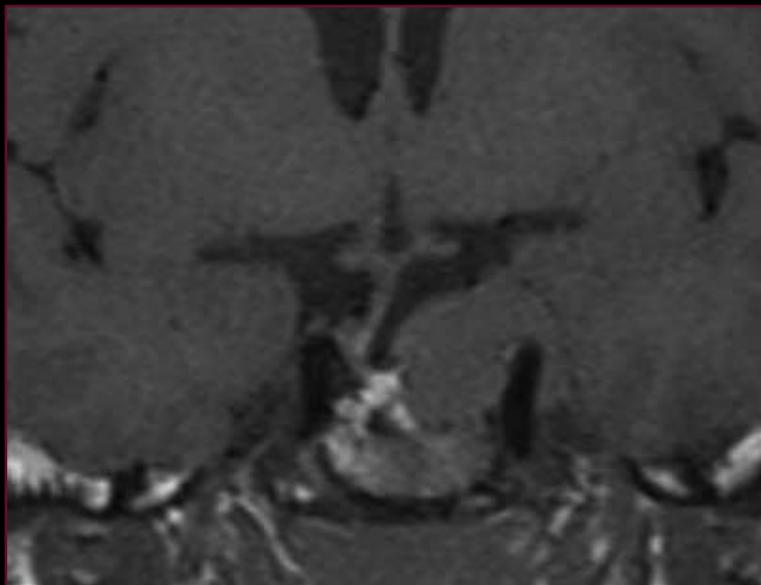


Indications

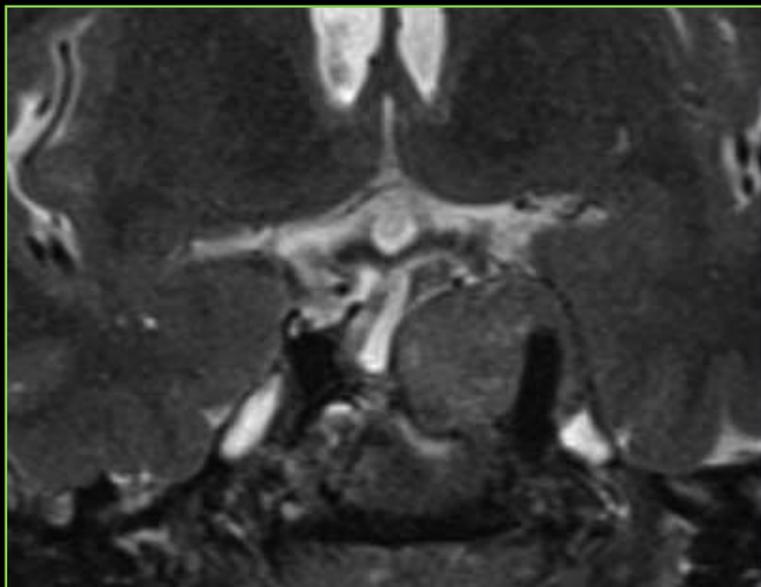
- **diagnostic**: dysfonctionnement hormonal, hypertension intracrânienne, altération du champ visuel, pathologie hypothalamo-hypophysaire devant un diabète insipide,
- **pronostic**: extension locale d'une tumeur hypothalamo-hypophysaire (sinus caverneux, chiasma, plancher sellaie),
- **sui**vi d'une pathologie traitée: résidu tumoral après chirurgie, fonte tumorale sous traitement anti-sécrétoire.

Adénomes, crâniopharyngiomes, méningiome, hypophysite, abcès hypophysaire, pathologies inflammatoires (tige et postH): sarcoïdose, histiocytose X

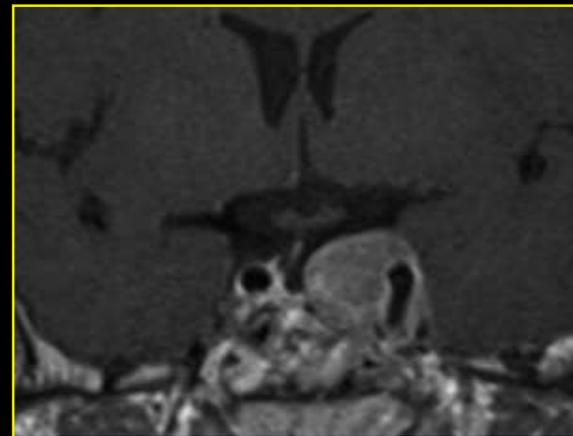
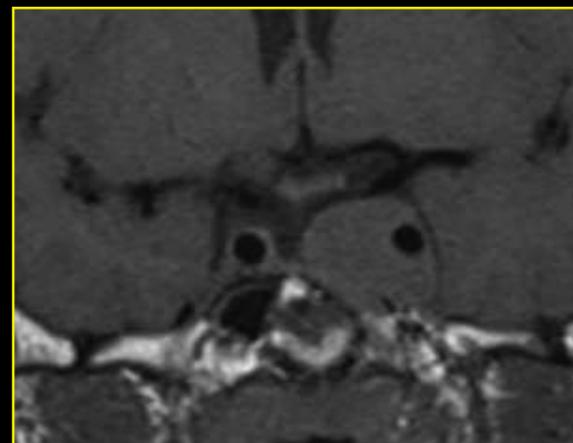
Résidu envahissant



T1

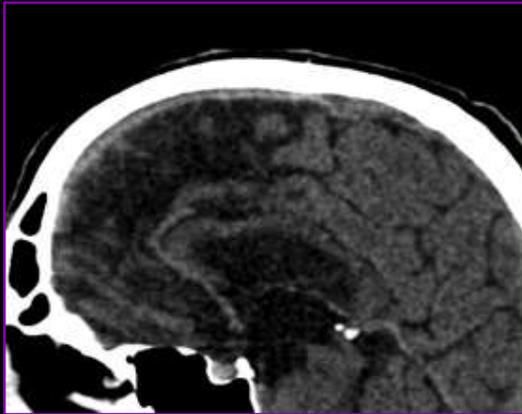
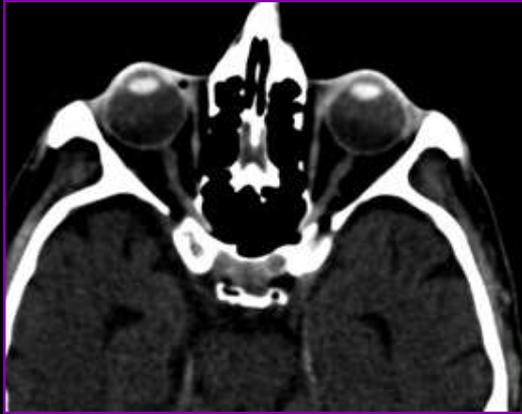
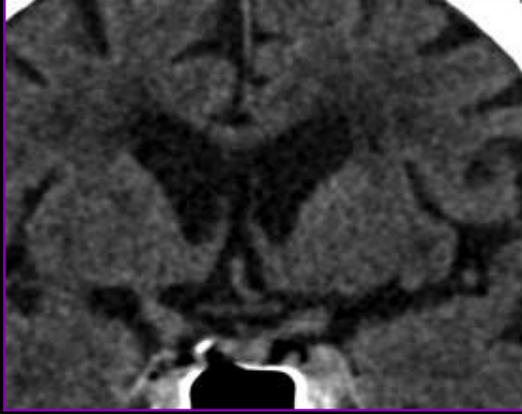


T2



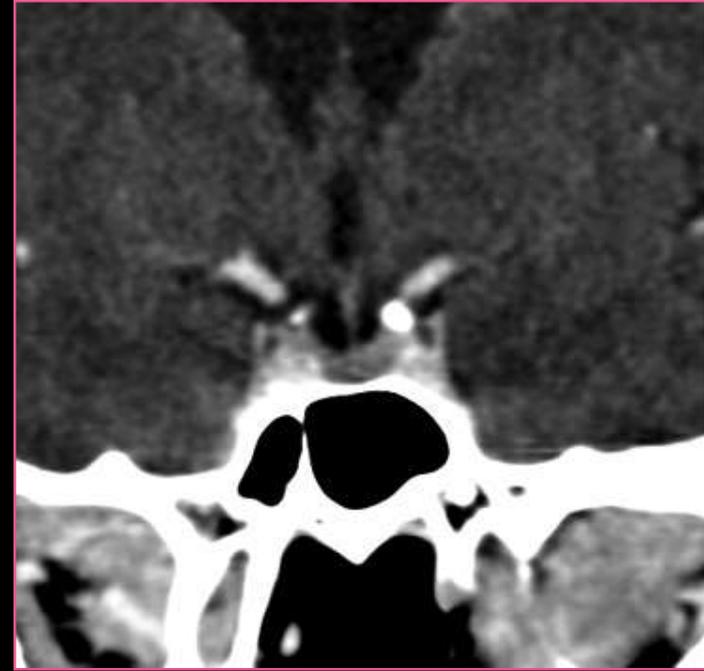
G+

TDM si contre-indication à l'IRM



sans contraste

avec contraste

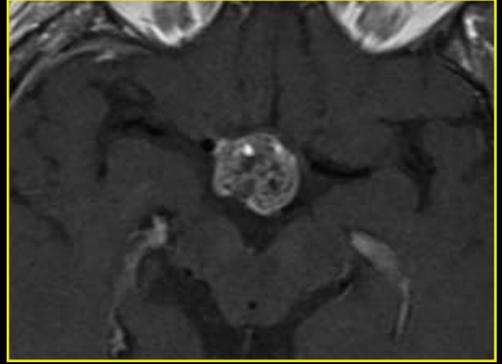
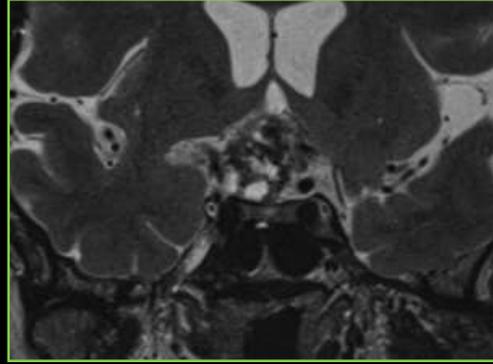
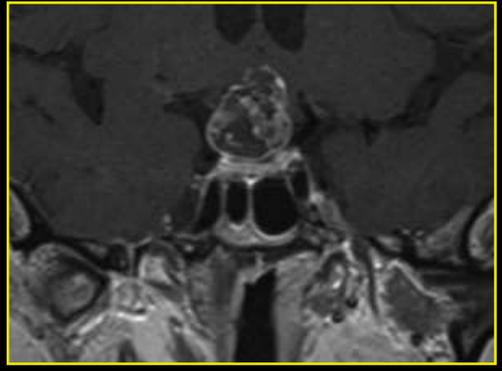
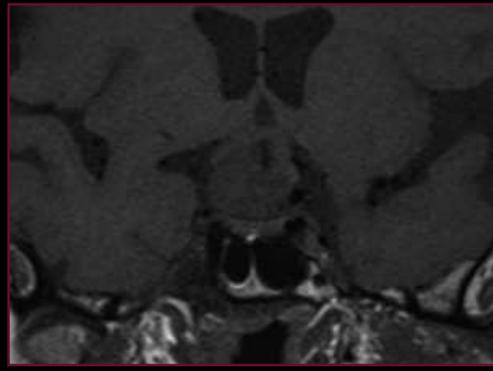
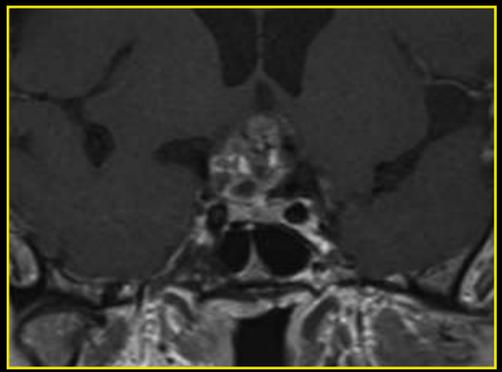
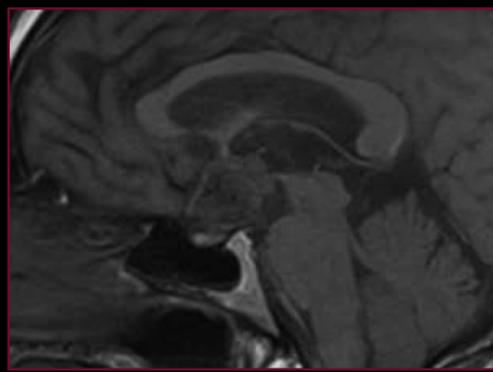
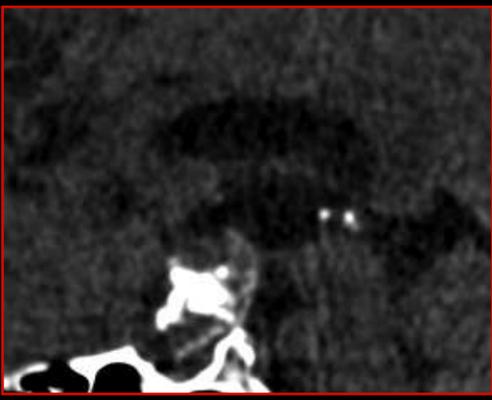


TDM pour rechercher des calcifications ou étudier les parois osseuses de la loge

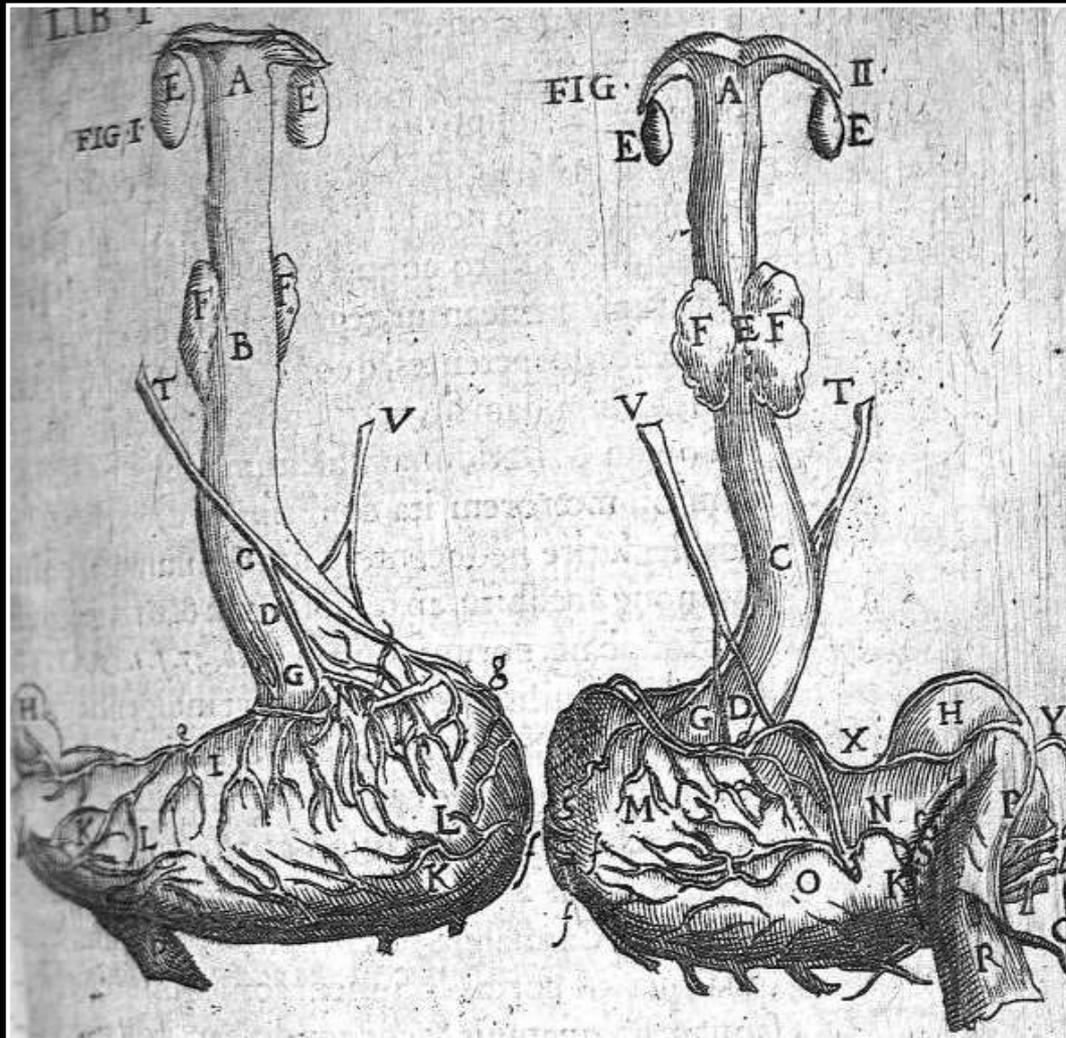
Crâniopharyngiome

tumeur épithéliale bénigne avec une association variable de composante tissulaire (**isointense**, **rehaussement**), contingent kystique (**hypo** ou **hypert T1**, **hyperT2**, **pas de rehaussement**) et **calcifications** (hypo T1 et T2)

parfois volumineux

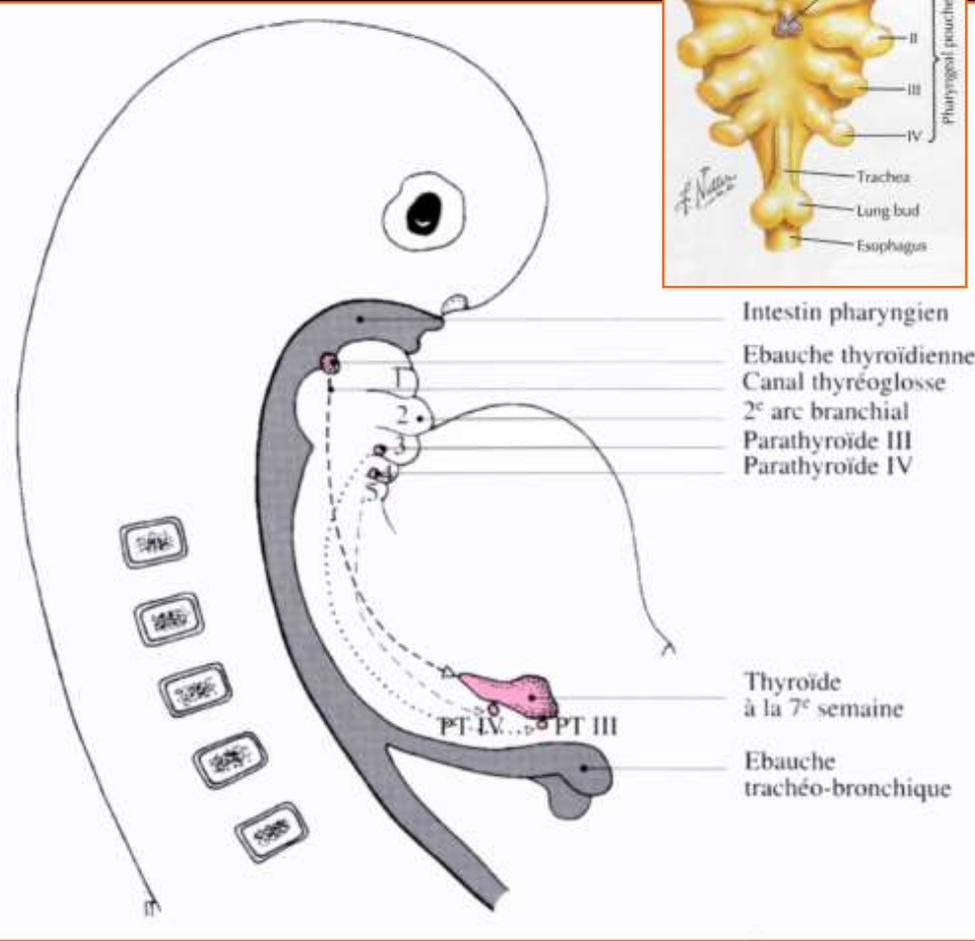
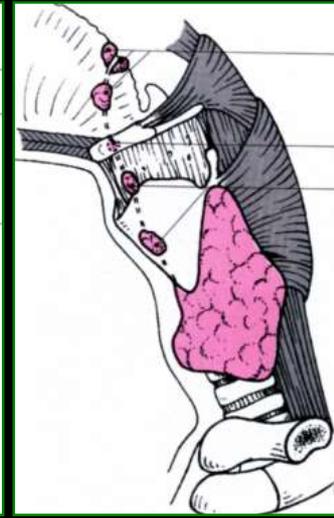
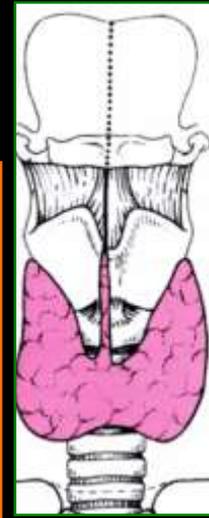
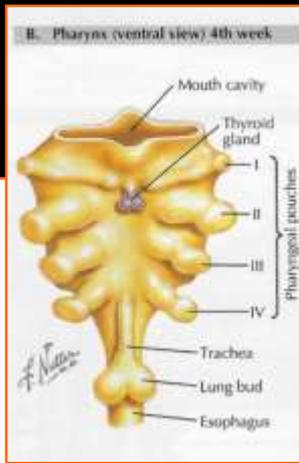


THYROIDE - PARATHYROIDES



Bauhin, 1605

EMBRYOLOGIE



3^{ème} semaine: diverticule thyroïdien à la face antérieure de l'intestin pharyngien, sous le tubercule lingual

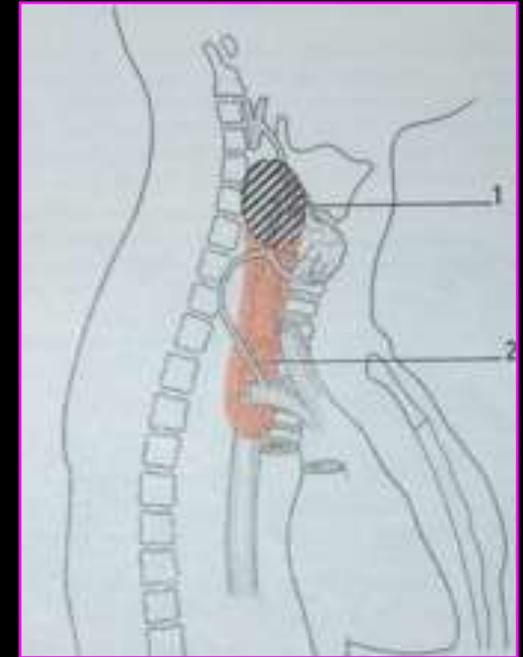
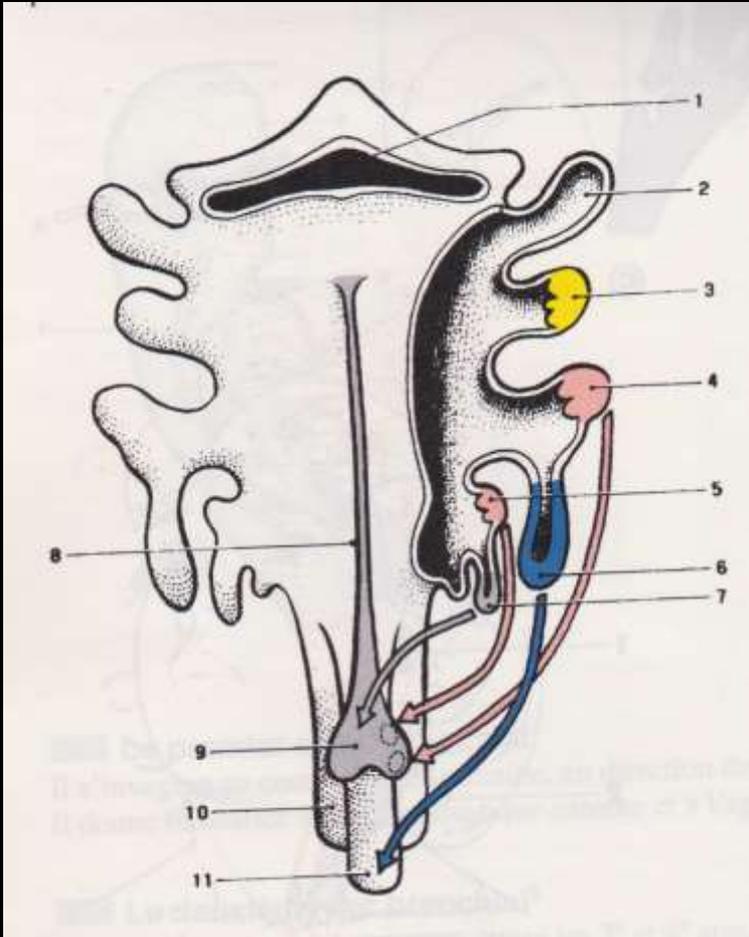
7^{ème} semaine: la thyroïde atteint sa position pré-trachéale et le tractus régresse

PT supérieures ou **P4** migrent en direction caudale au contact de partie latérale de la thyroïde

PT inférieures ou **P3** suivent le thymus

P4: postéro-interne, inter trachéo-oesophagien, intrathyroïdien

P3: dans 10 à 15 %: lame thyro-thymo-péricardique, médiastin antérieur



tonsille palatine

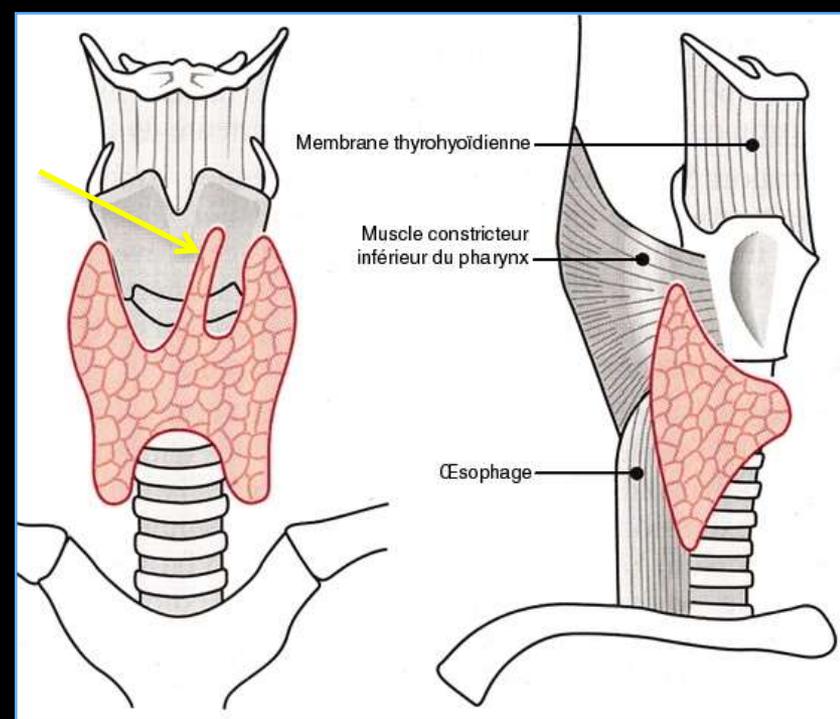
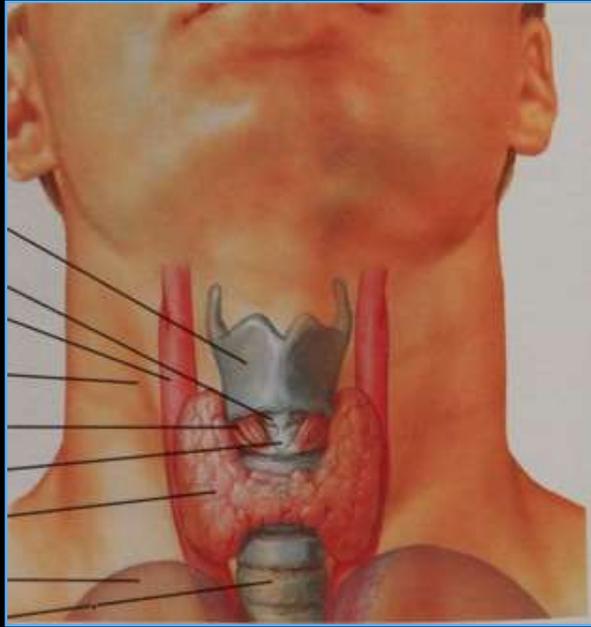
parathyroïdes inférieure et supérieure

thyroïde endocrinocytes parafolliculaires de la thyroïde ou cellules C (calcitonine, APUD)

thymus

ANATOMIE

Thyroïde



Mensurations:

Lobe:

40 à 60 mm de haut
10 à 25 mm de large
10 à 20 mm d'épaisseur

Isthme:

10 à 20 mm de haut
<10 mm d'épaisseur

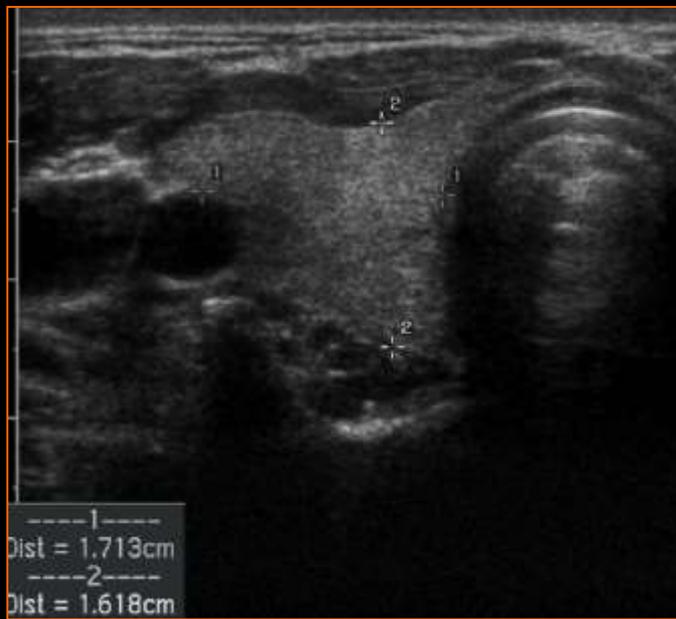
Poids: 15-20 g

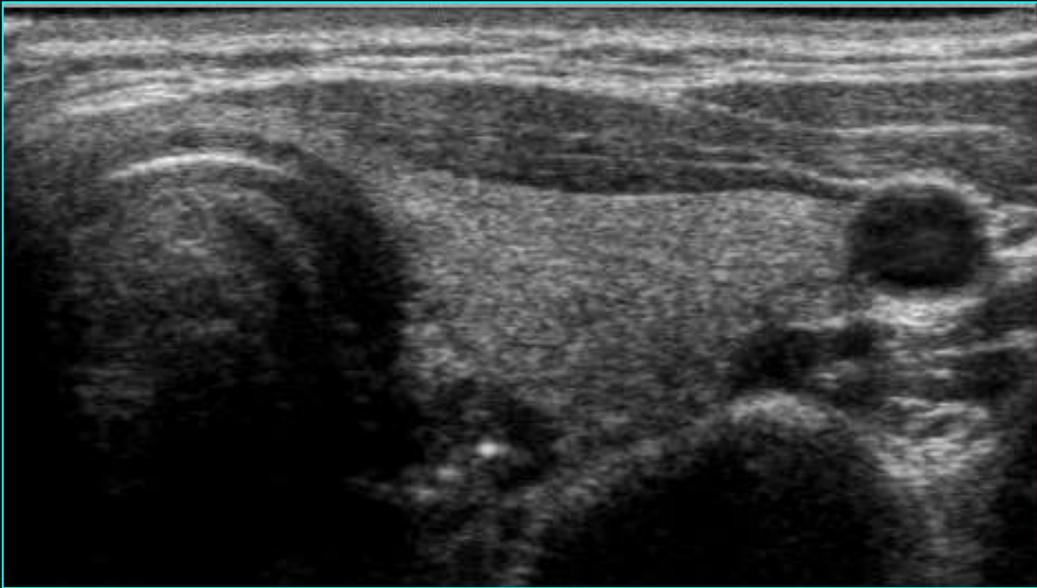
Morphologie:

forme de H dans 65 % des cas : 2 lobes latéraux, un isthme
isthme peut manquer (jonction 1/3 moy-1/3 inf du lobe)
asymétrie des lobes

Particularités anatomiques:

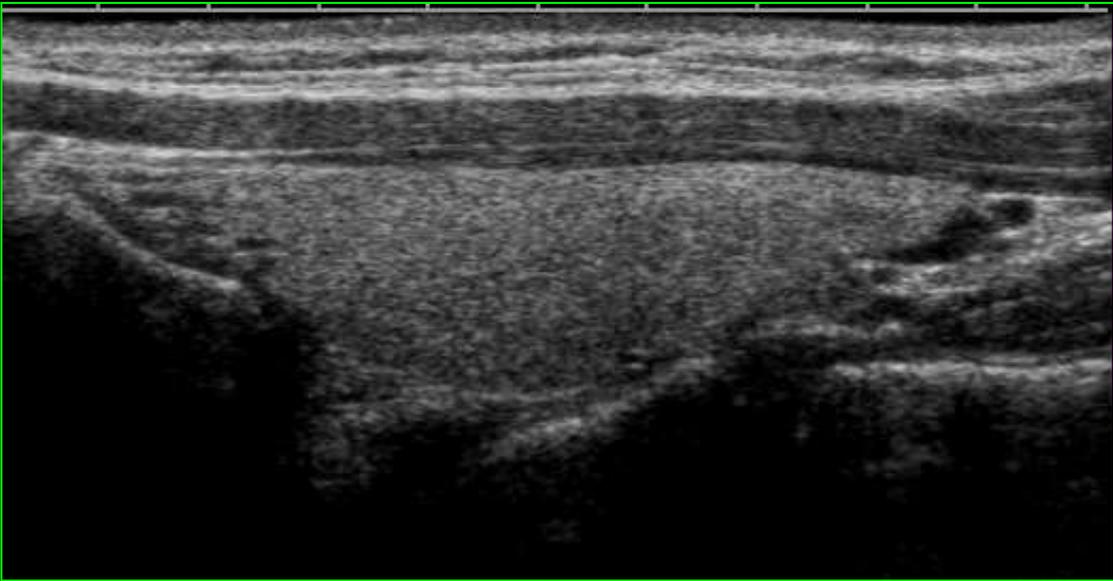
pyramide de Lalouette dans 30% cas
lobules adjacents
mobile à la déglutition





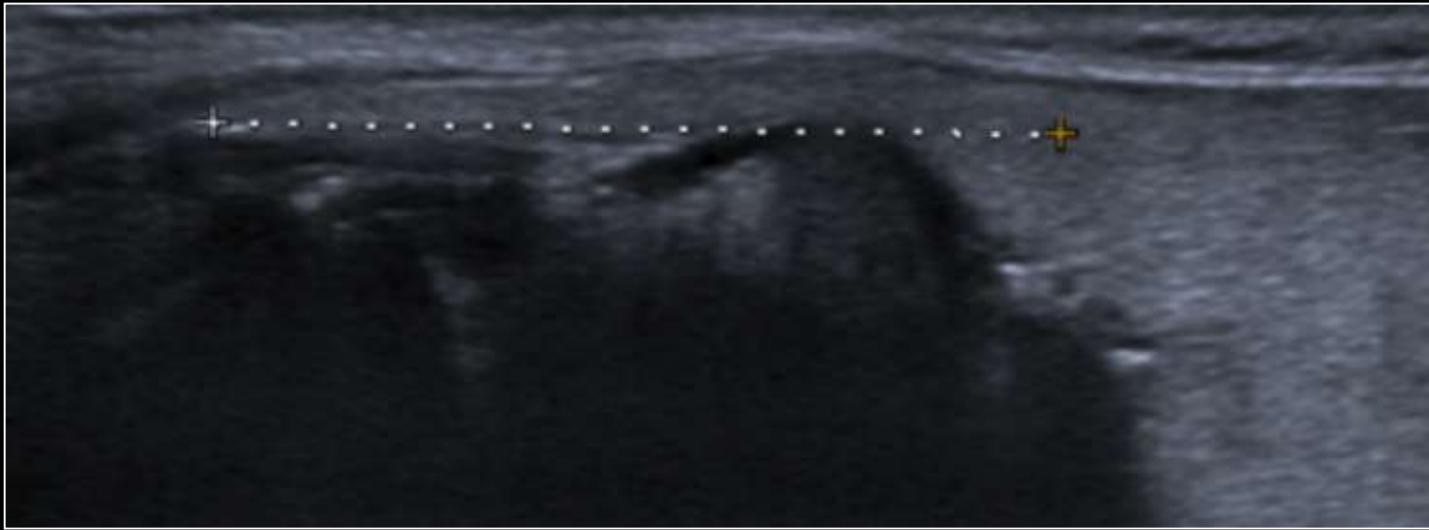
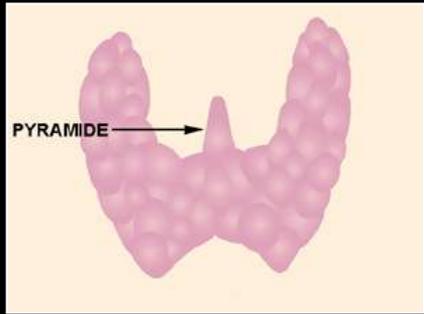
Transverse lobe G

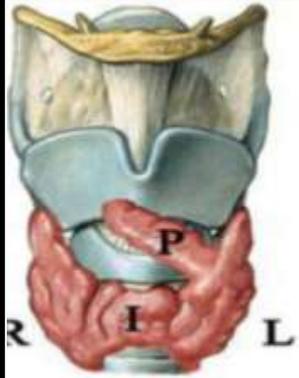
volume= $L \times l \times E \times 0,5$



Longitudinale lobe G

Pyramide de Lalouette





1



2



3



4



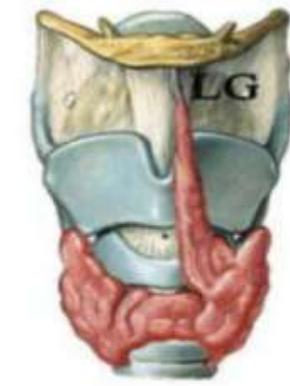
5



6



7



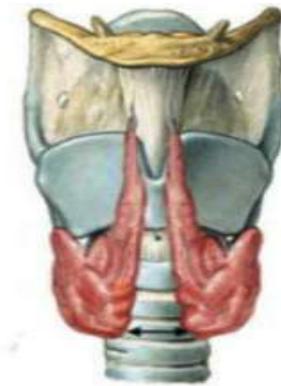
8



9



10



11



12

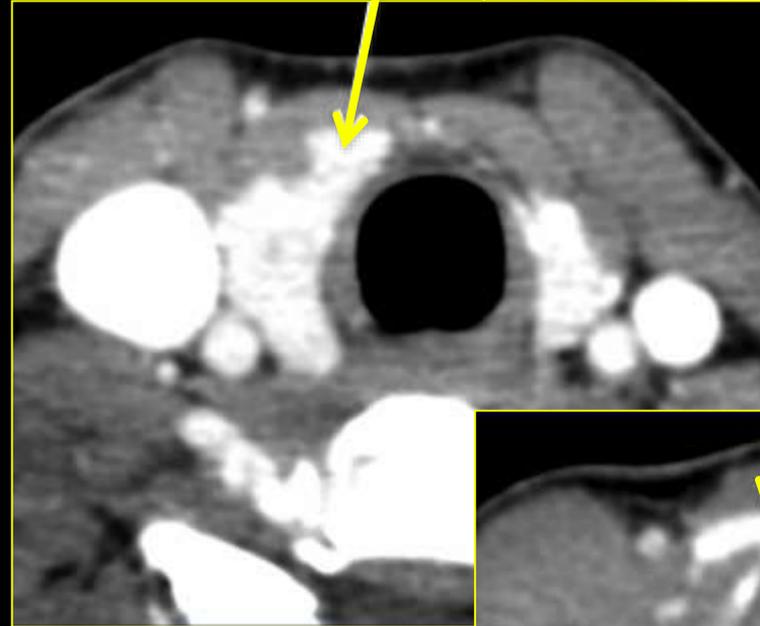
Pyramide de Lalouette

sagittale médiane

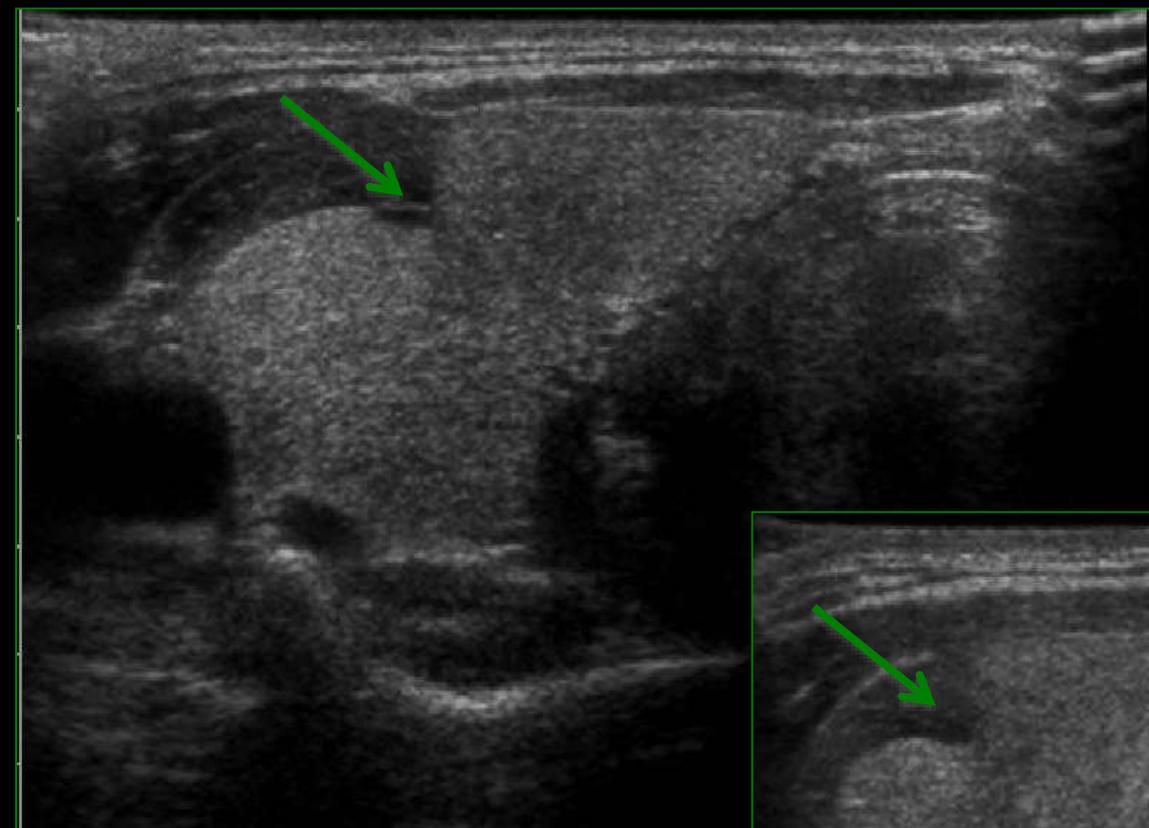


Pyramide de Lalouette

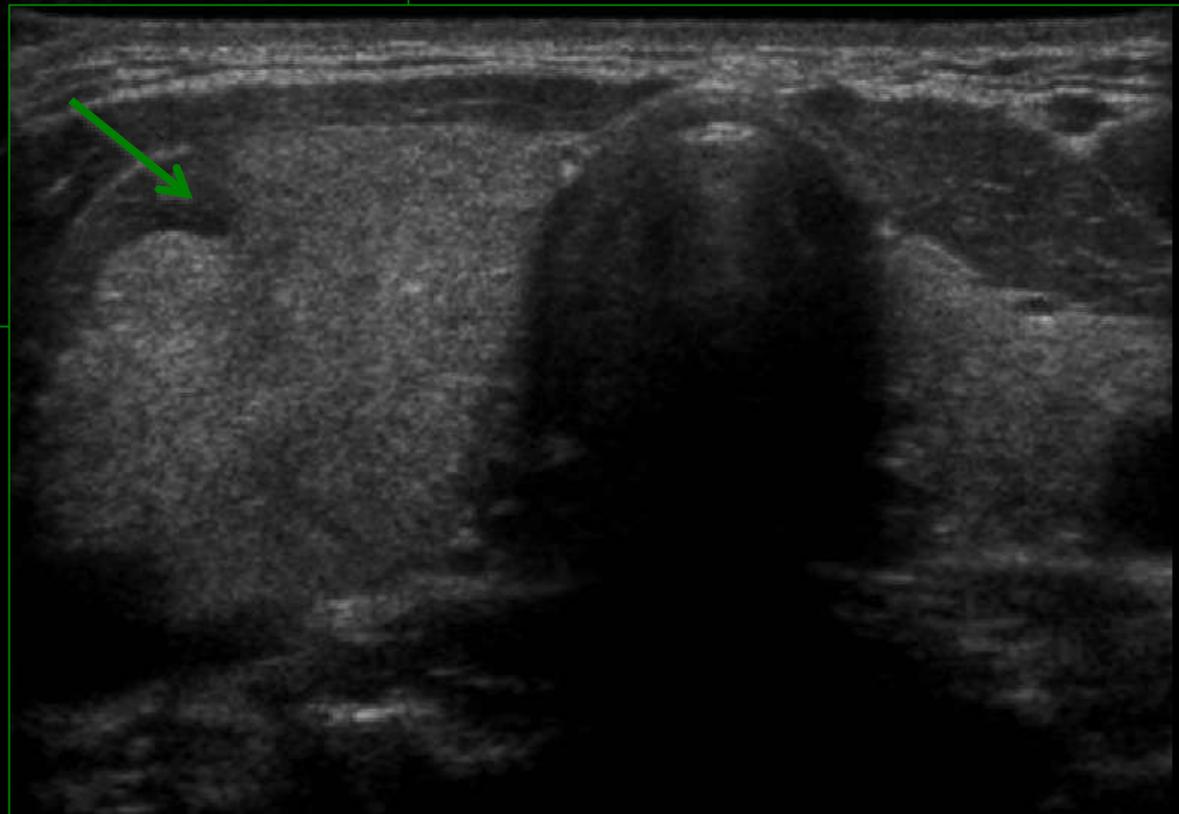
para-sagittale



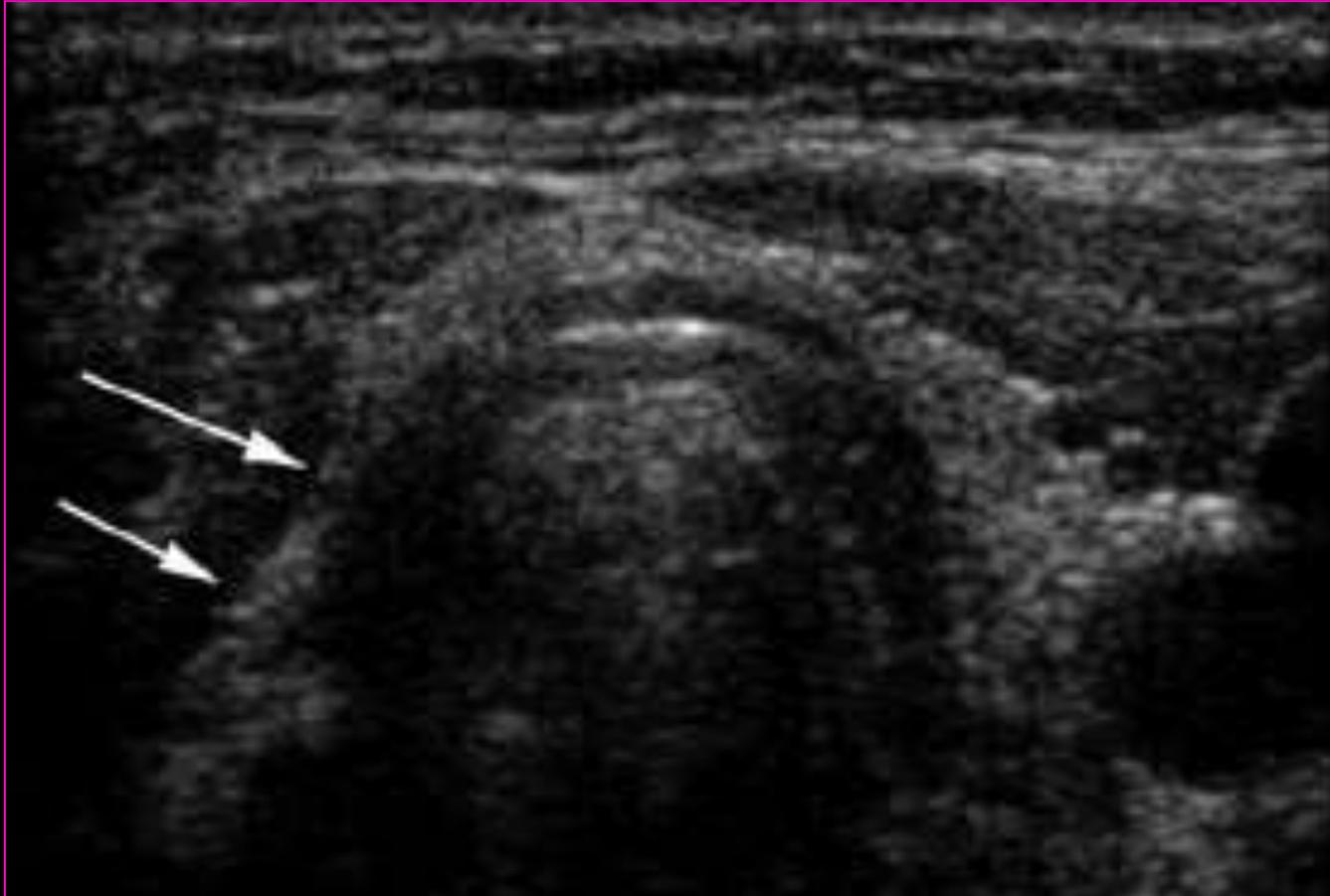
Variantes



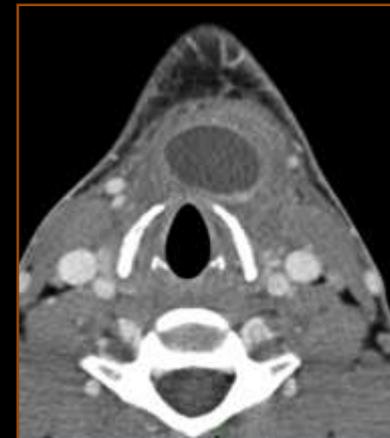
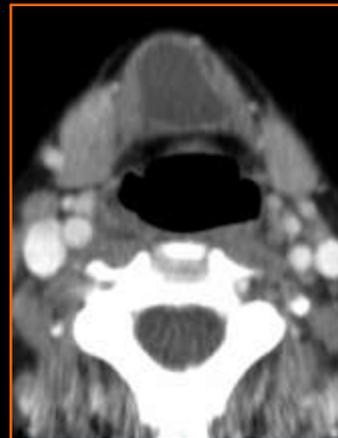
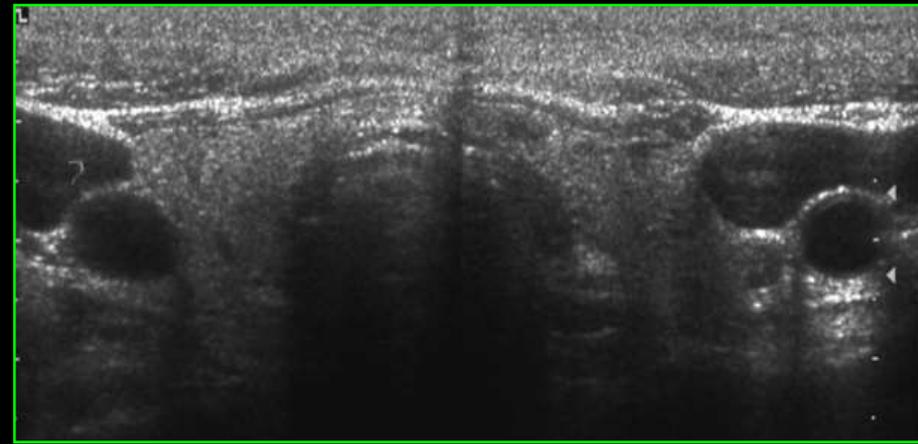
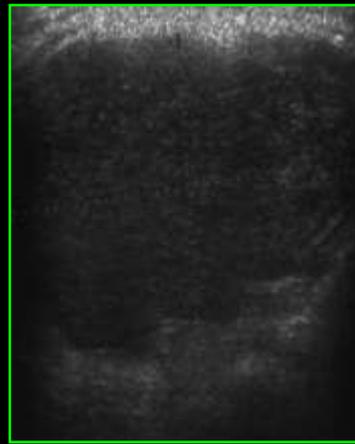
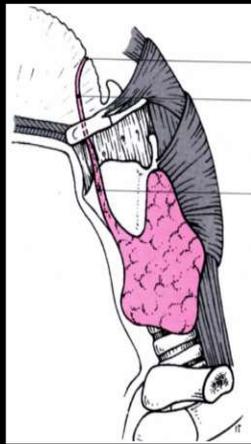
incisure lobo-isthmique



agénésie lobaire



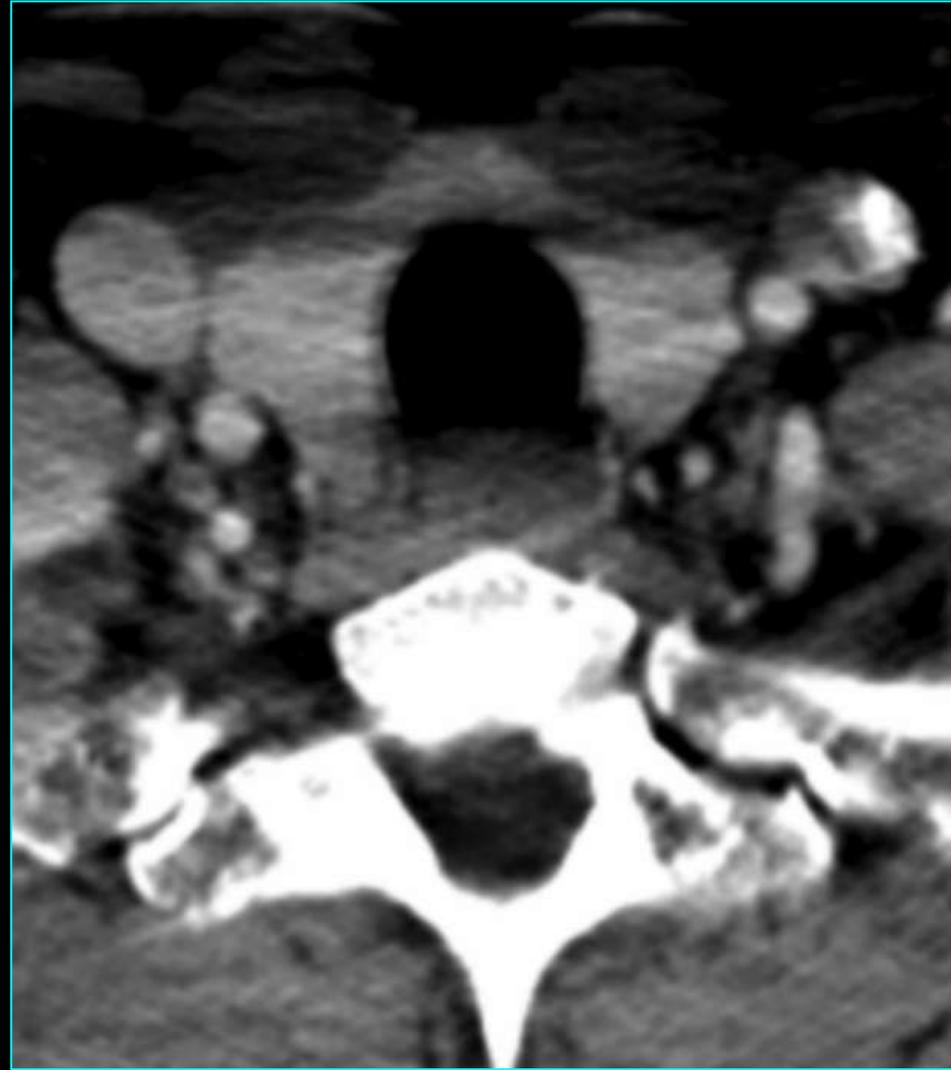
Kyste du tractus thyroïdienne



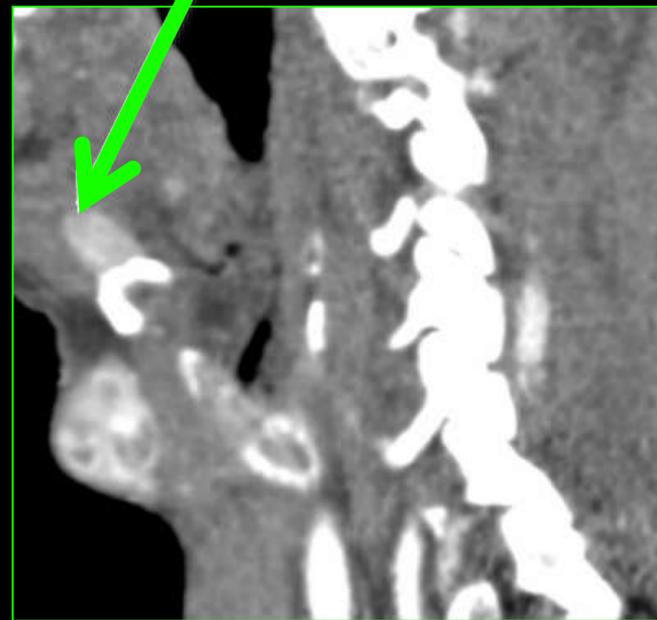
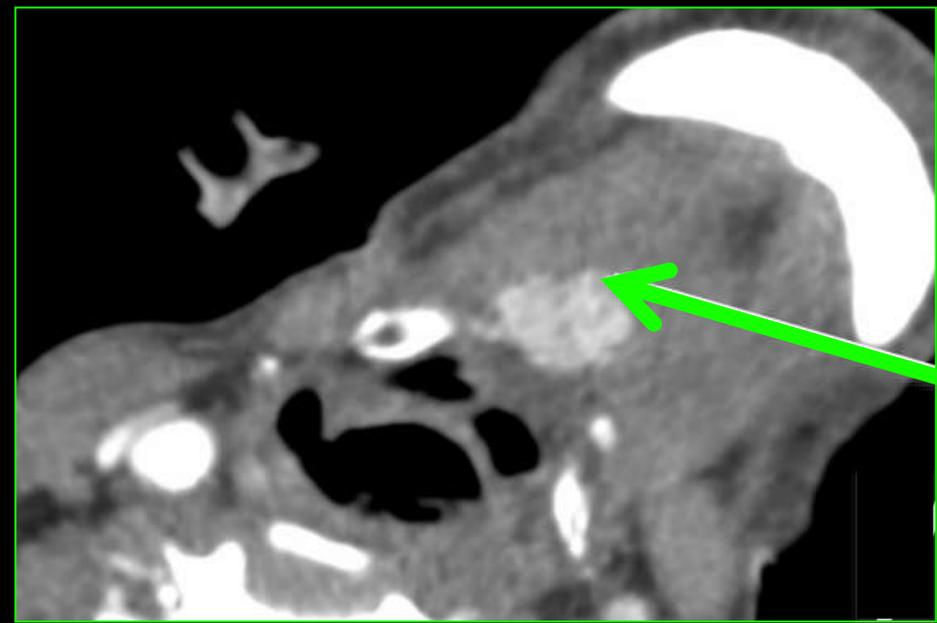
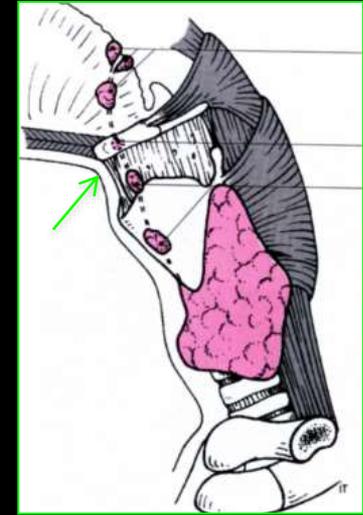
tuméfaction médiane, liquidienne, en rapport avec l'os hyoïde

indépendant de la thyroïde, glande normale en place

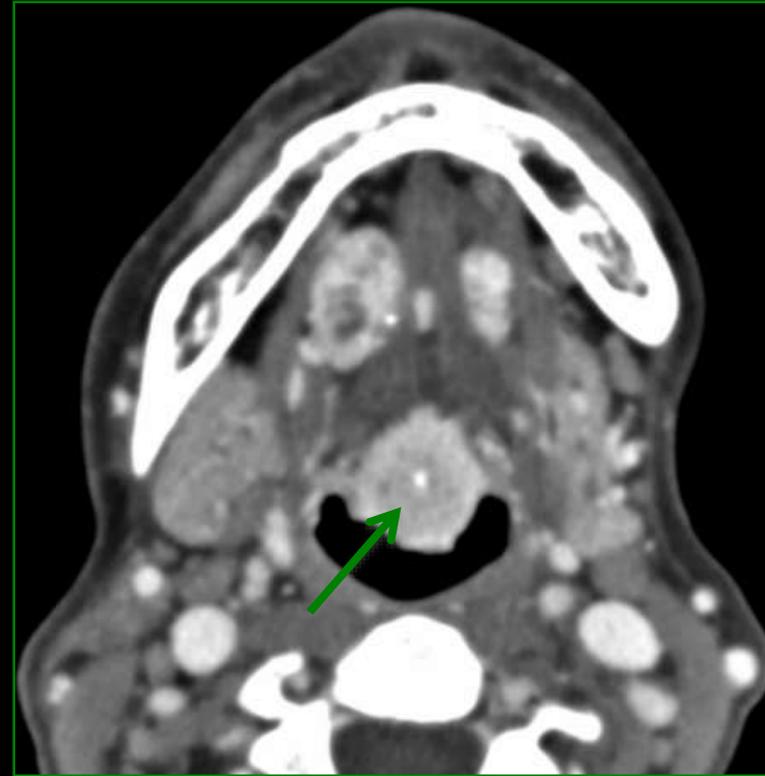
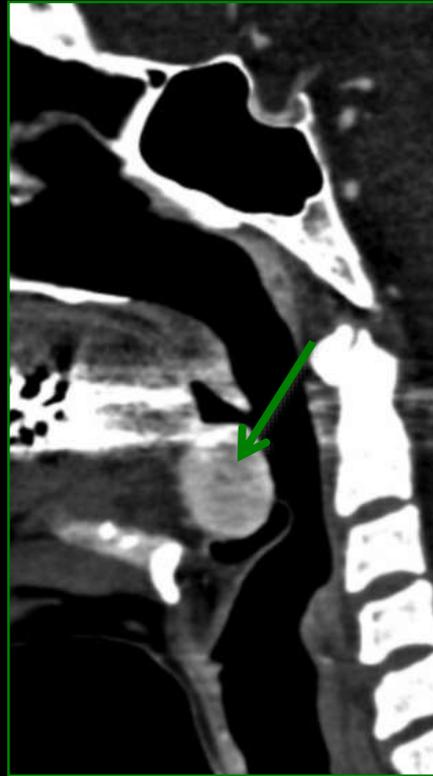
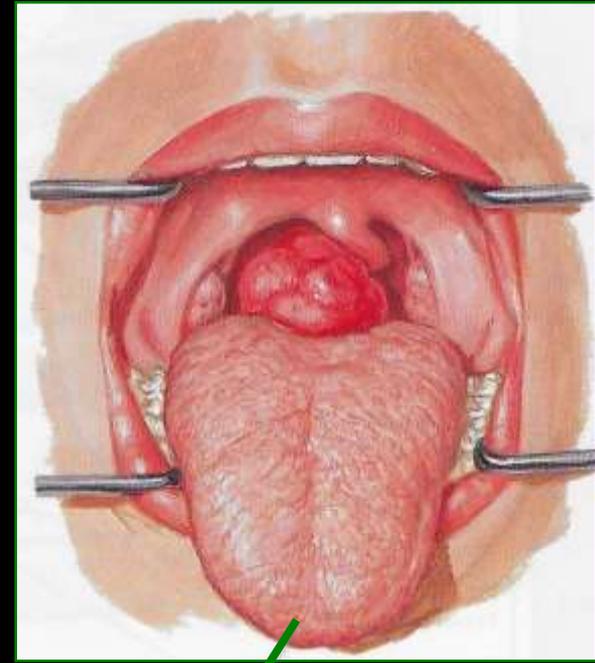
Kyste du tractus thyroéglasse localisation basi-linguale (2%)



Thyroides ectopiques



Thyroïde ectopique linguale



Aberrant and normal locations of thyroid tissue

Lingual

Intralingual

Thyroglossal tract

Sublingual

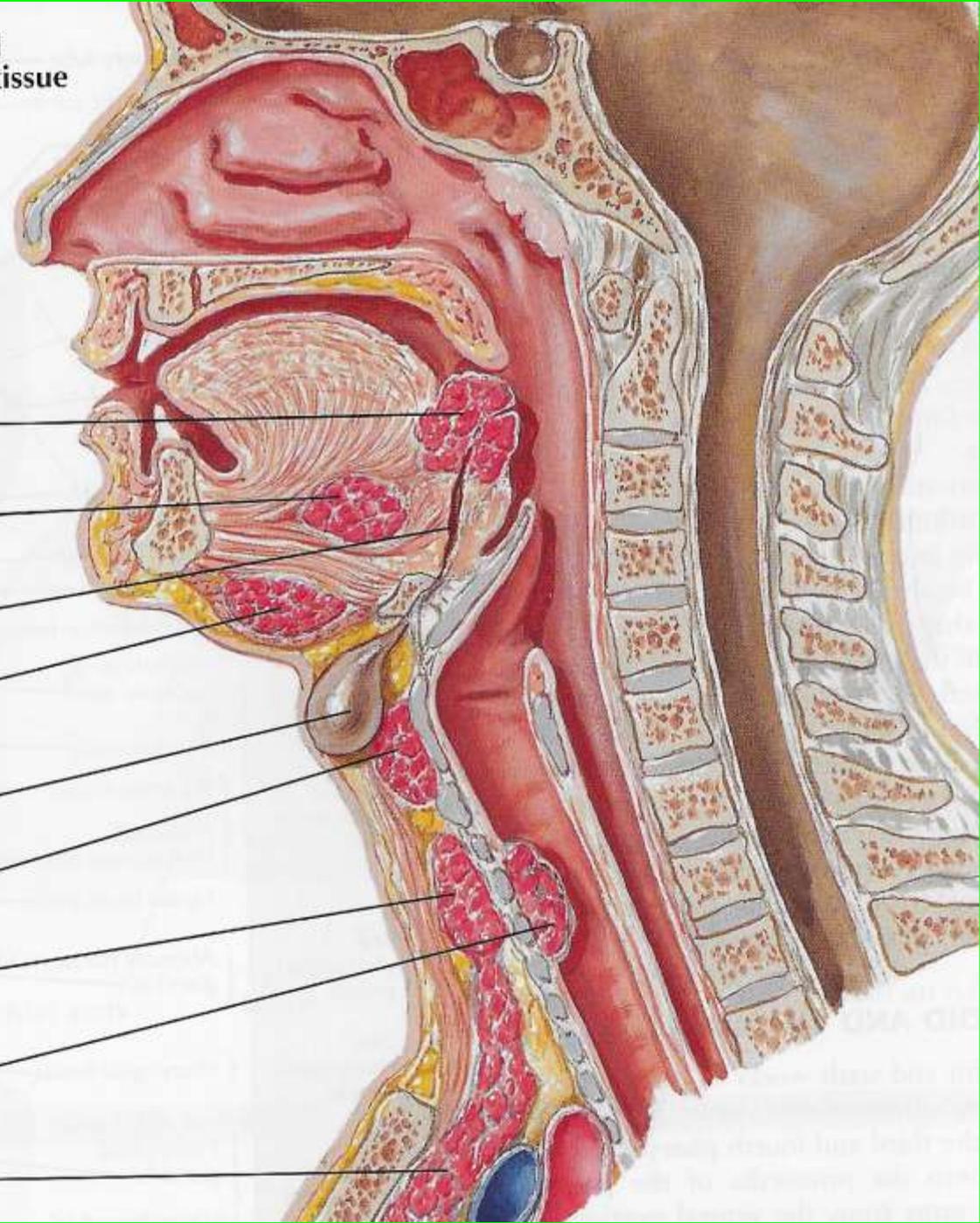
Thyroglossal cyst

Prelaryngeal

Normal

Intratracheal

Substernal



Anatomie Parathyroïdes

Morphologie:

allongées, ovoïdes

4 à 6 mm de long, 2 à 4 de large, 0,5 à 2 d'épaisseur

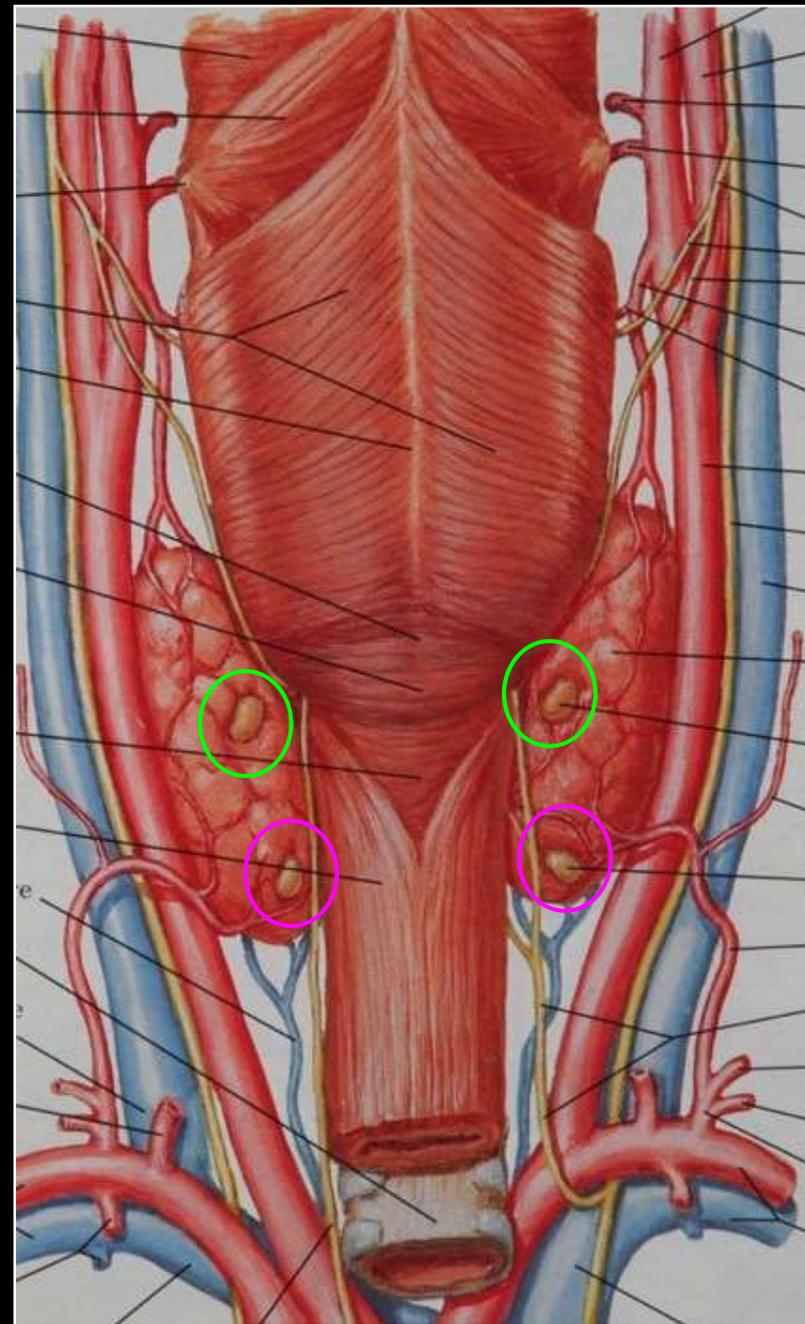
poids total < 200 mg

Localisation:

parathyroïdes supérieures (P4): en arrière de la face dorsale du tiers moyen de la thyroïde

parathyroïdes inférieures (P3): en arrière du pôle inférieur, à hauteur du point de pénétration du pédicule thyroïdien inférieur

Les glandes parathyroïdes normales sont trop petites pour être visibles par échographie, TDM ou IRM

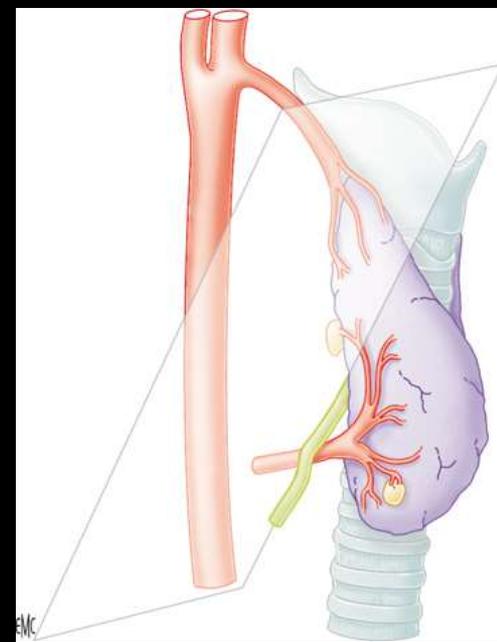


4 glandes dans 85% des cas

dans 3 à 13% : seulement 3

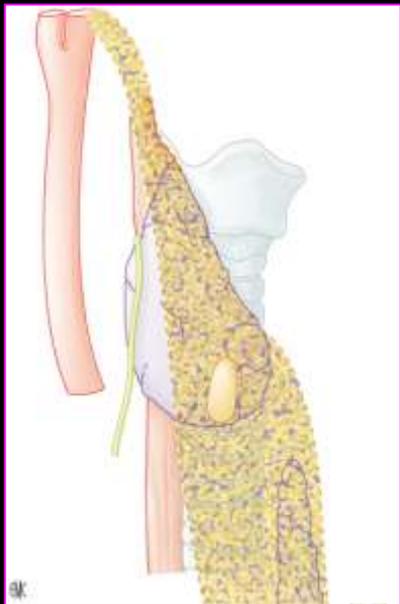
dans 6 à 13% : 5 à 12

- P4 rétro-récurrentielle
- P3 pré-récurrentielle

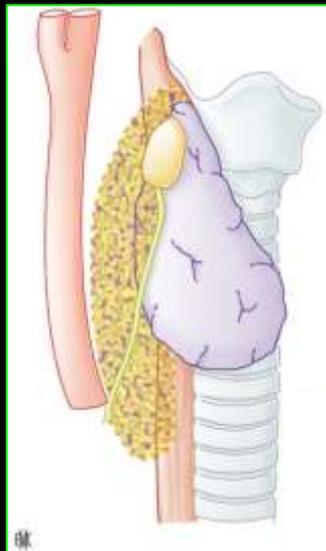


Ectopies :

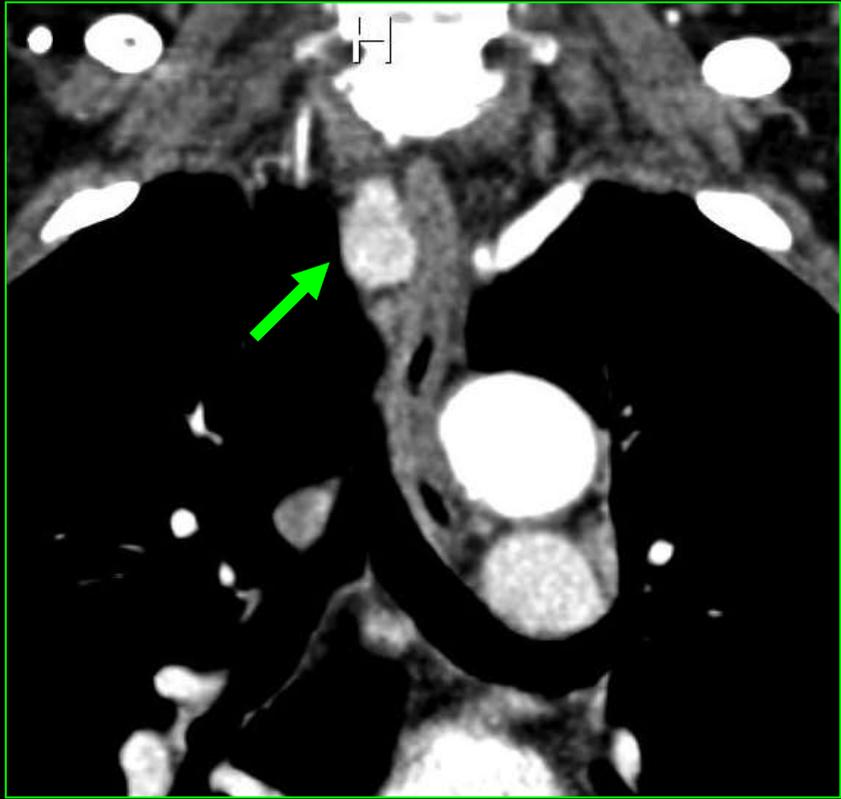
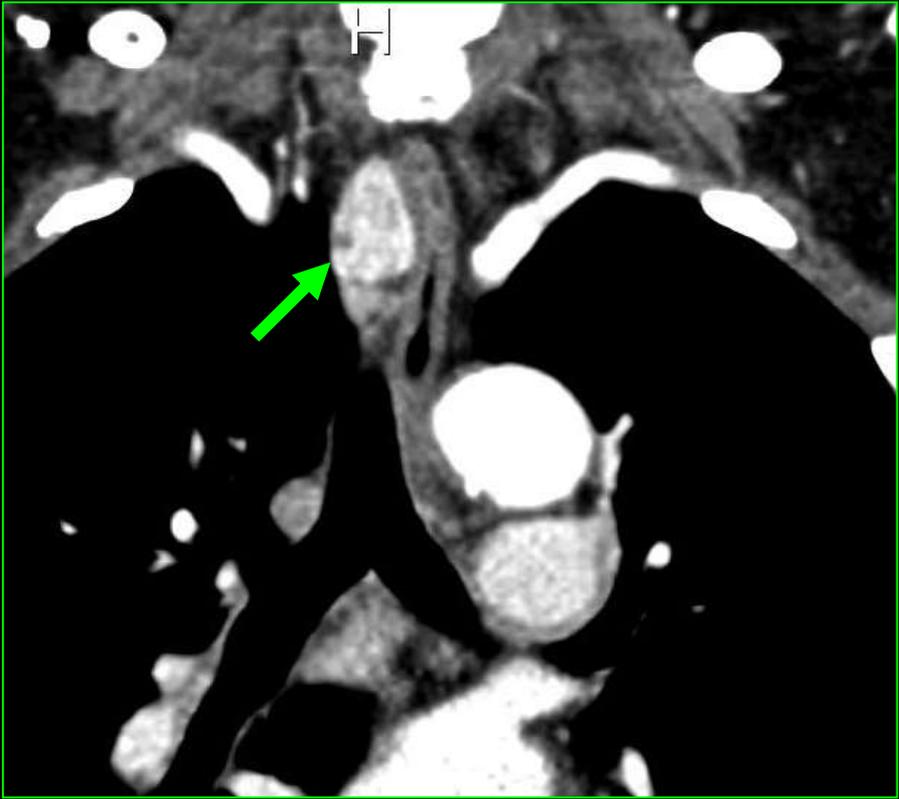
P3 : dans 10 à 15 % : lame thyro-thymo-péricardique, médiastin antérieur



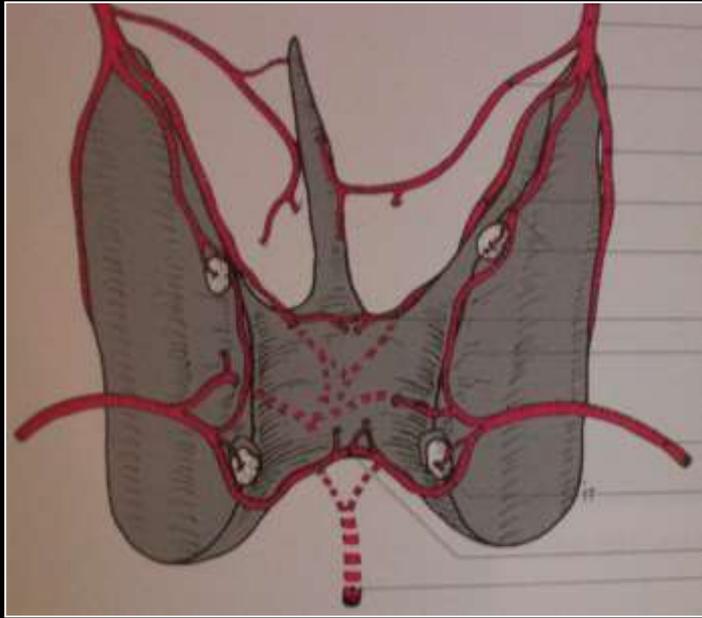
P4 : postéro-interne, inter trachéo-oesophagienne , intrathyroïdienne



P4 adénome ectopique



Anatomie vascularisation



a. thyroïdienne supérieure

a. laryngée supérieure

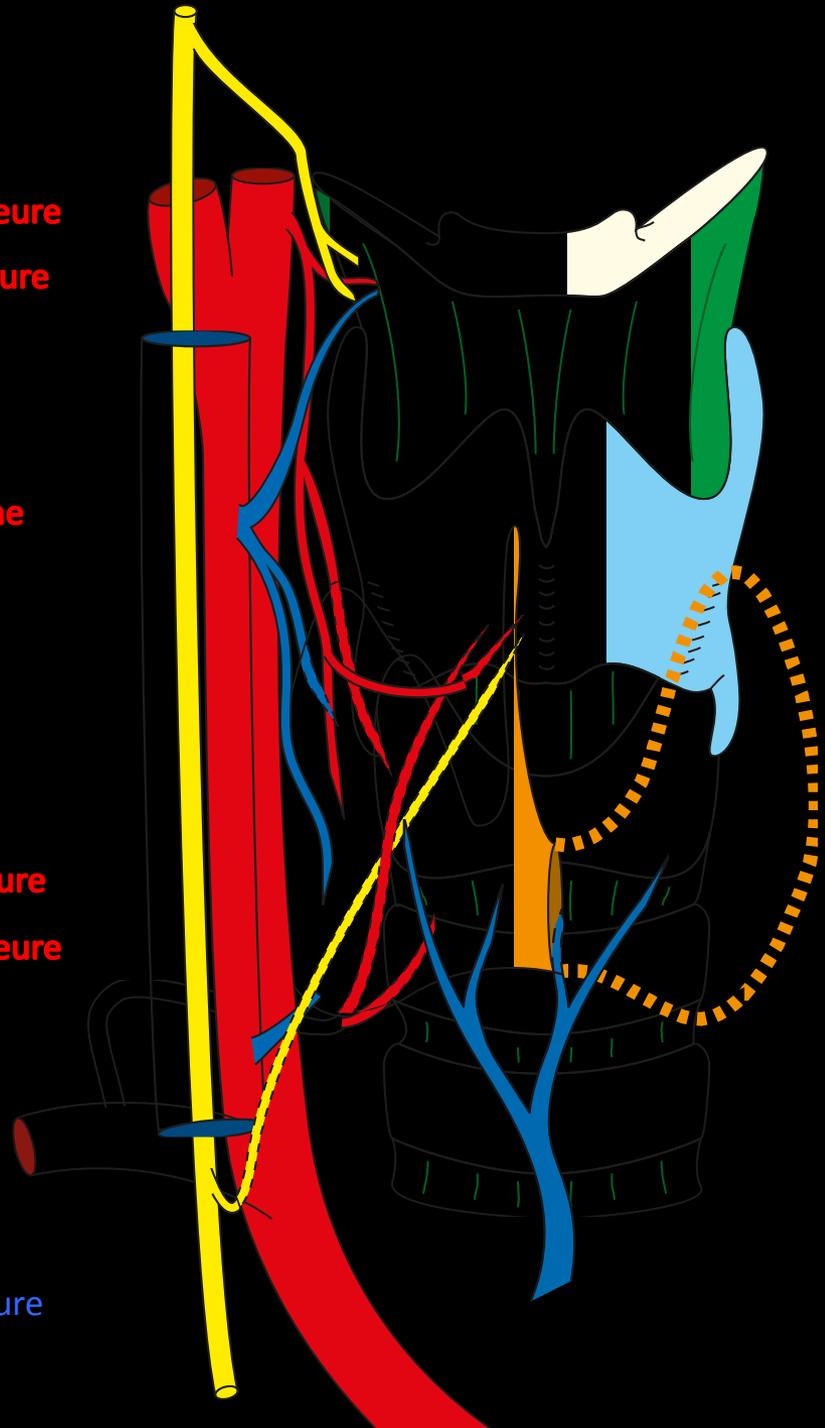
a. crico-thyroïdienne

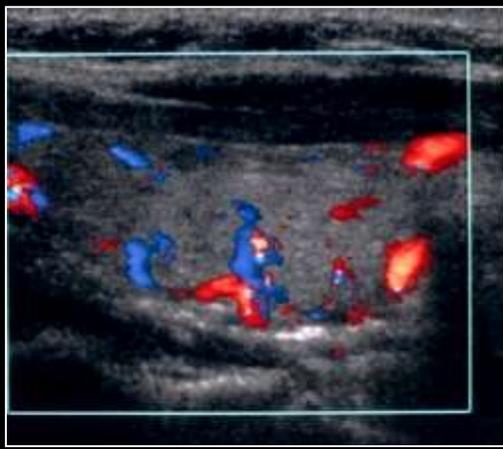
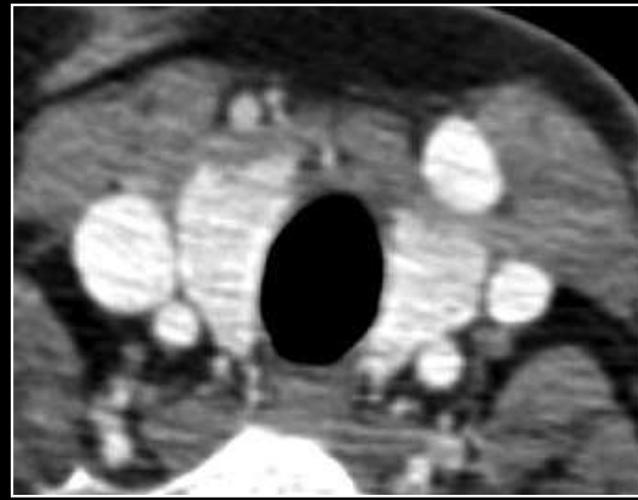
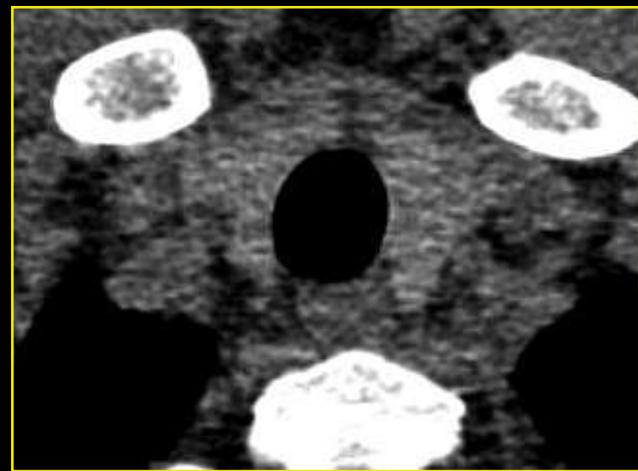
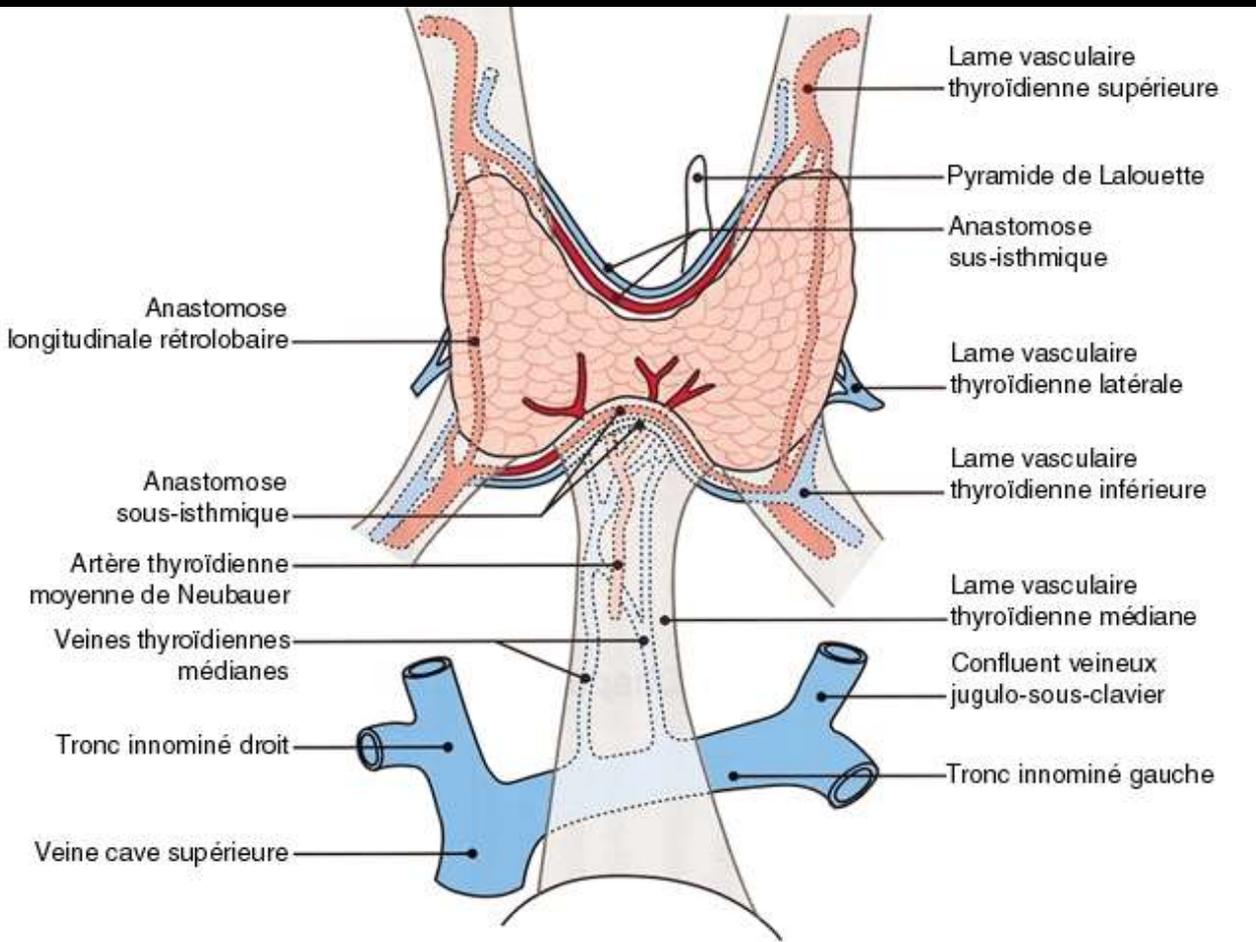
a. thyroïdienne inférieure

a. laryngée postérieure

v. jugulaire interne

v. thyroïdienne inférieure





Anatomie

rapports

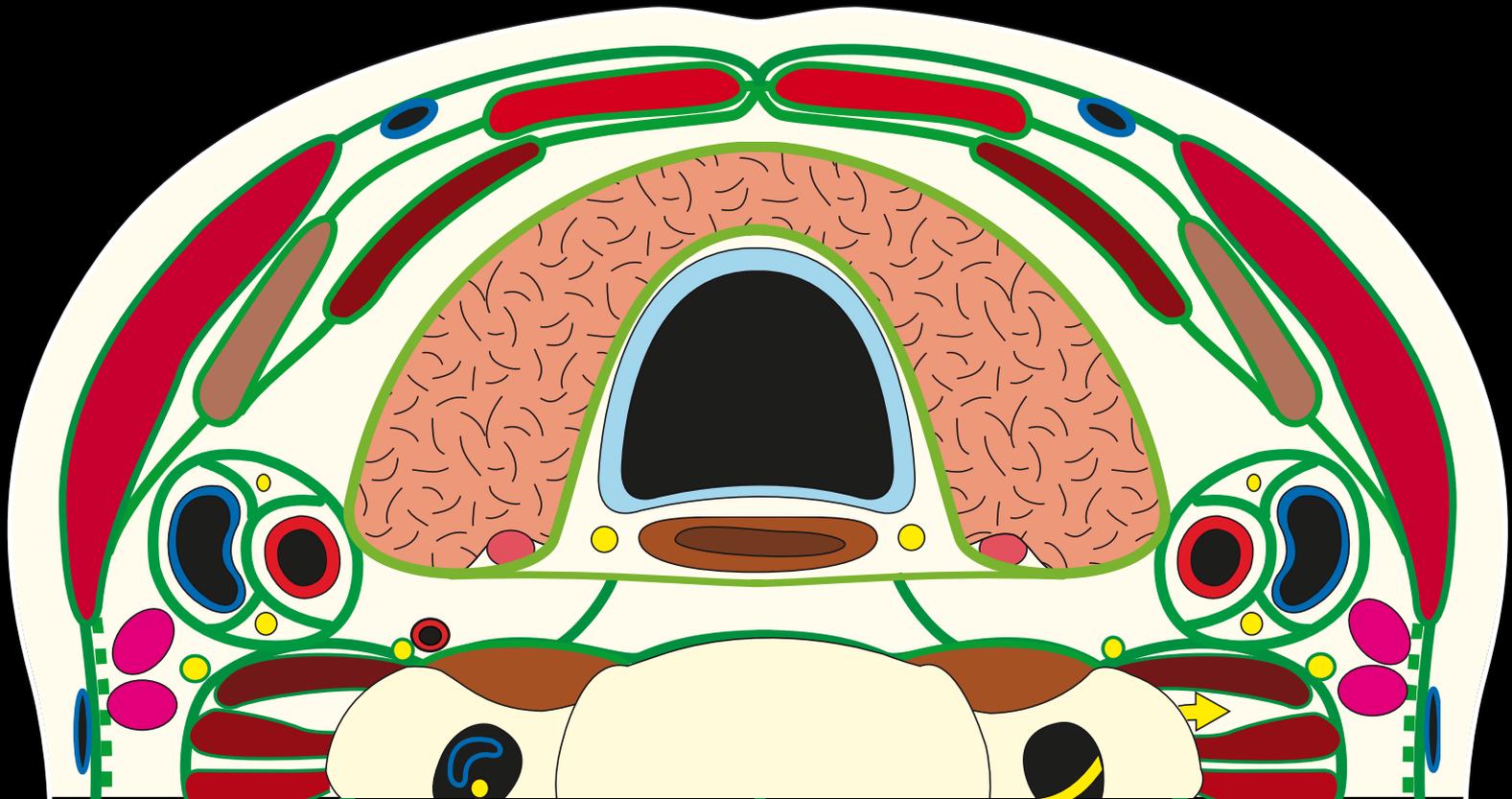
trachée

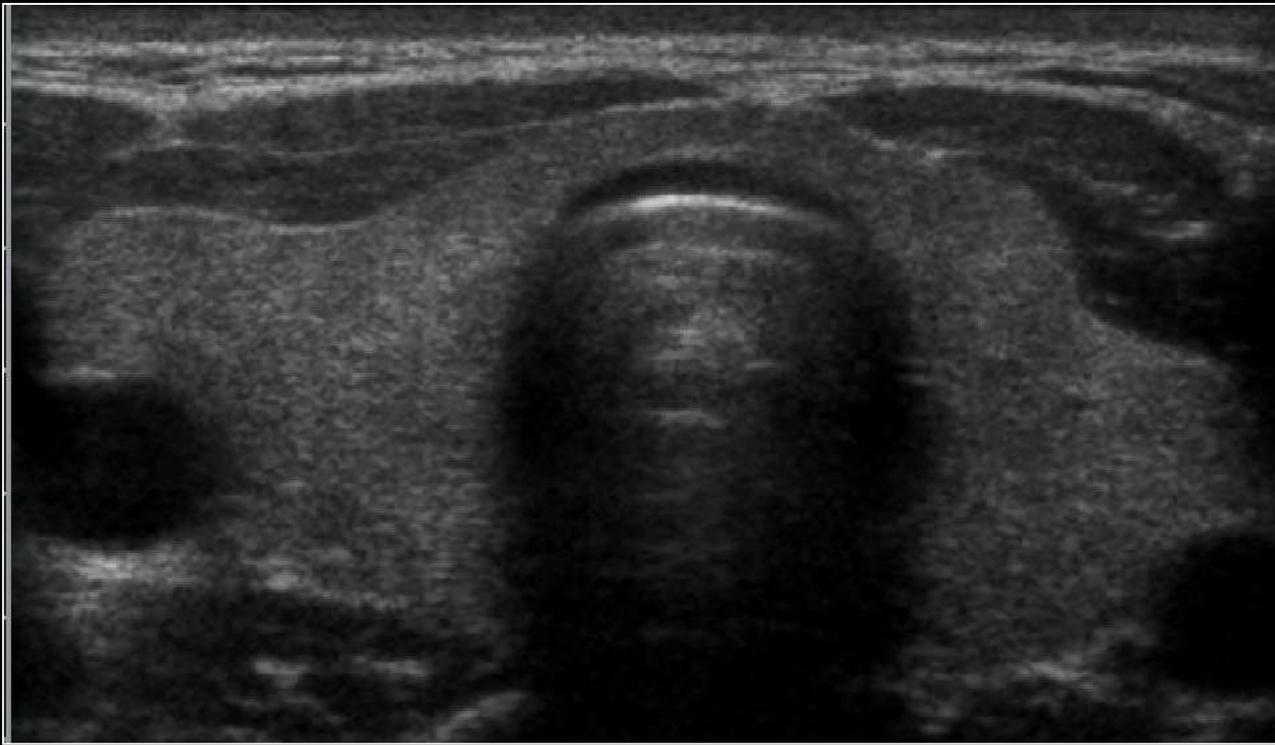
œsophage

glande thyroïde glandes para-thyroïdes lame prétrachéale

gaine jugulo-carotidienne: a. carotide commune, v. jugulaire interne, anse cervicale du XII, X
mm. sterno-cléïdo-mastoidien, omo-hyoïdien, sterno-thyroïdien, sterno-hyoïdien

nerfs récurrents



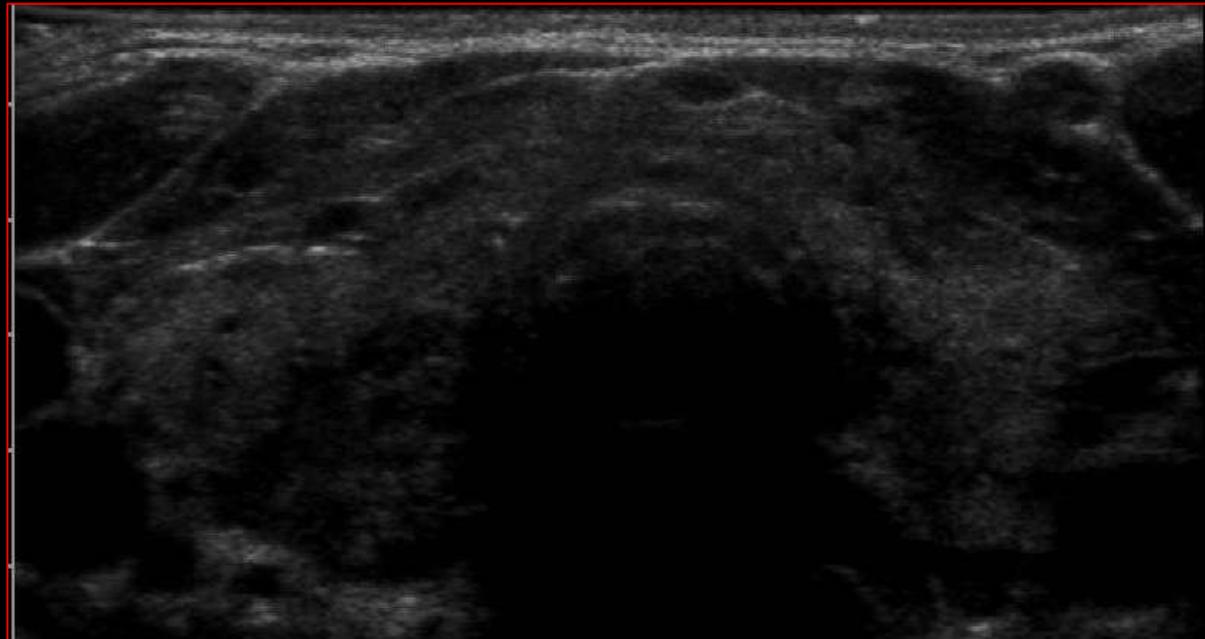


Echogénicité normale

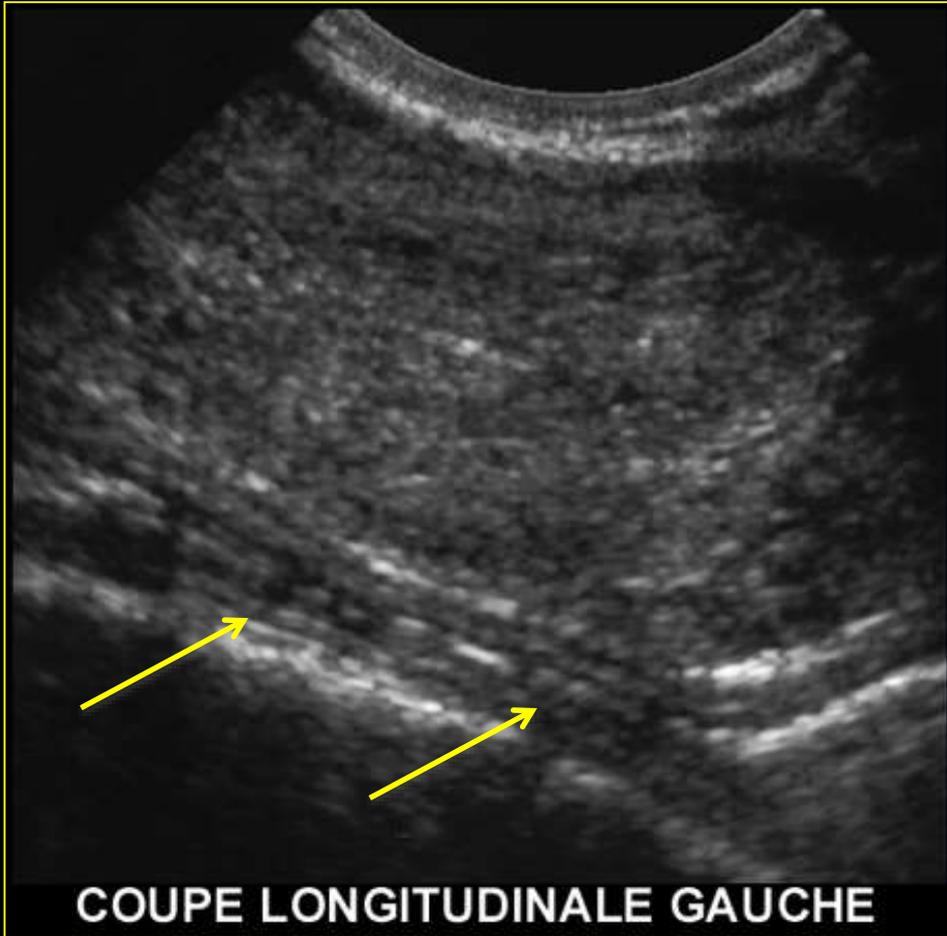
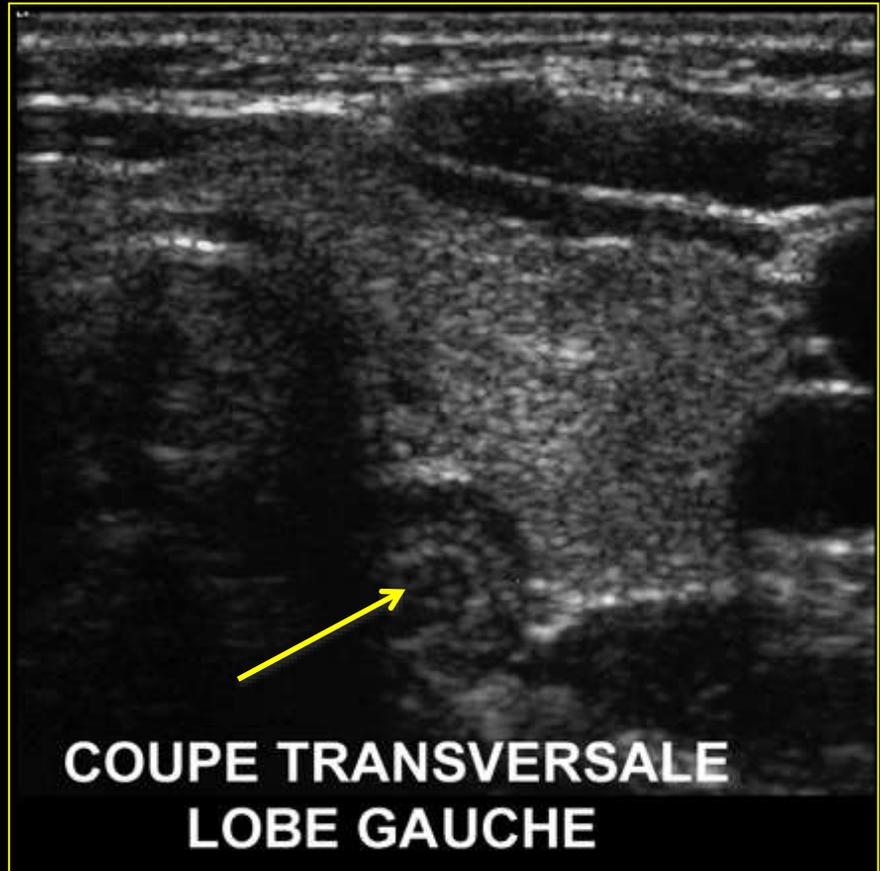
Homogène

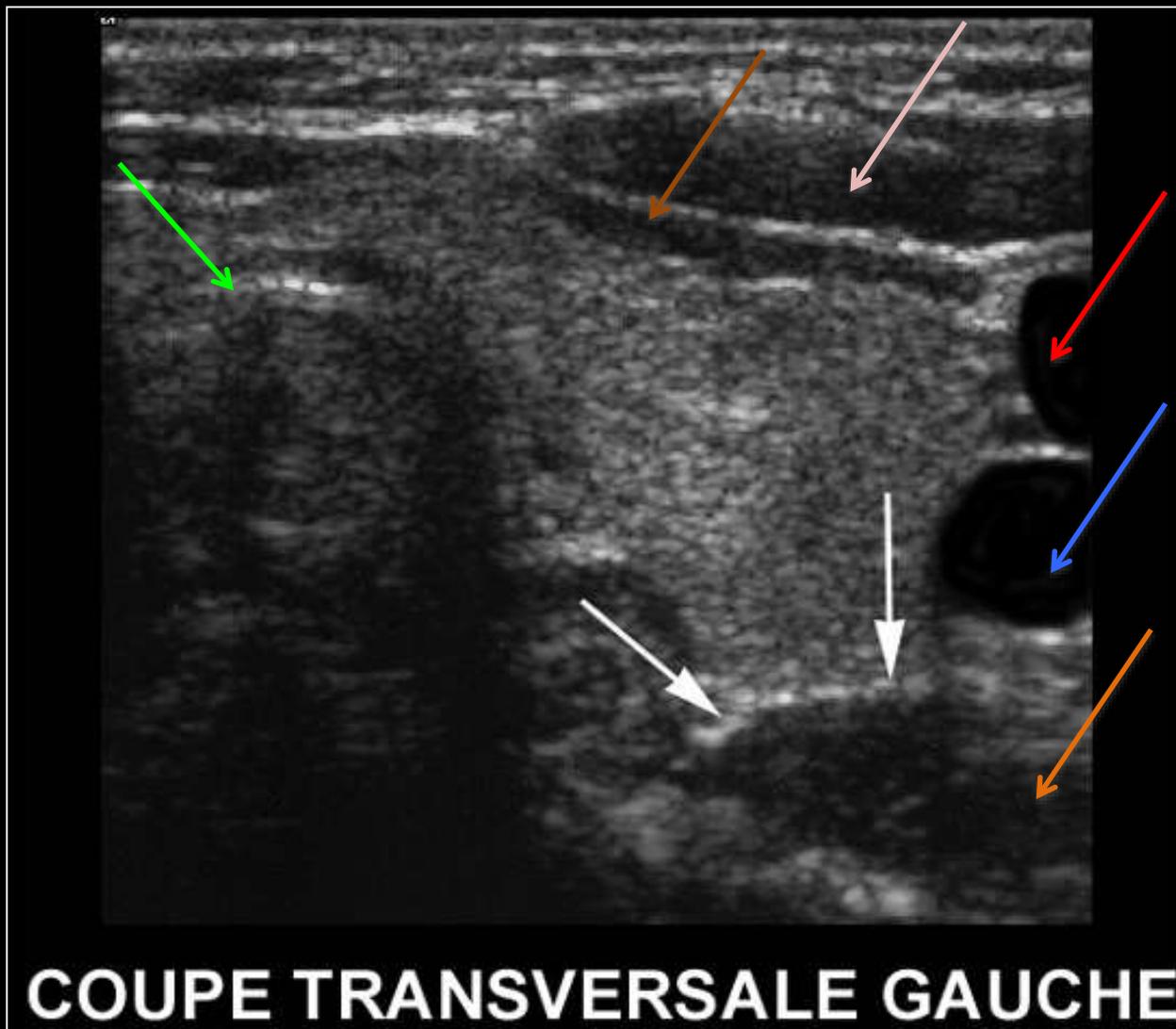
Hyper échogène par rapport aux muscles

Hypoéchogénicité
Perte gradient / muscles
thyroïdite



oesophage





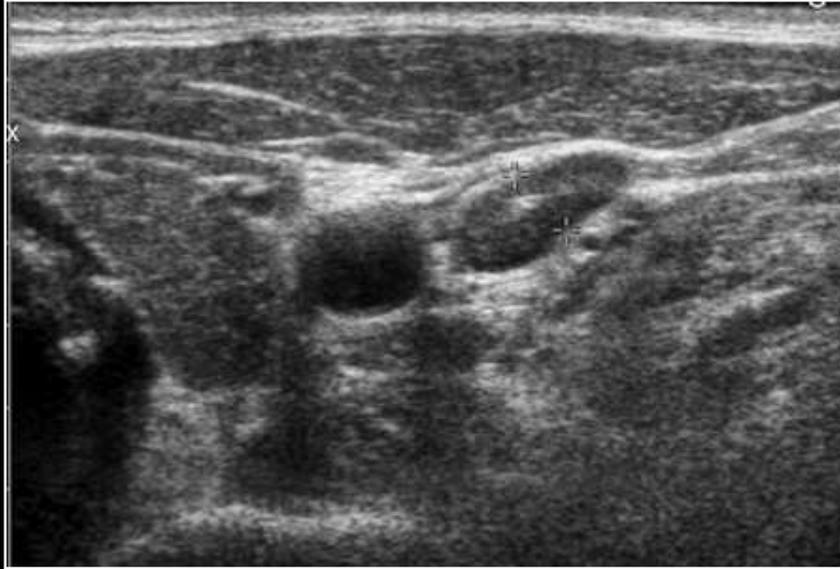
long du cou, **scalène antérieur**, **sterno-thyroïdien**, **sterno-cléïdo-mastoïdien**

trachée

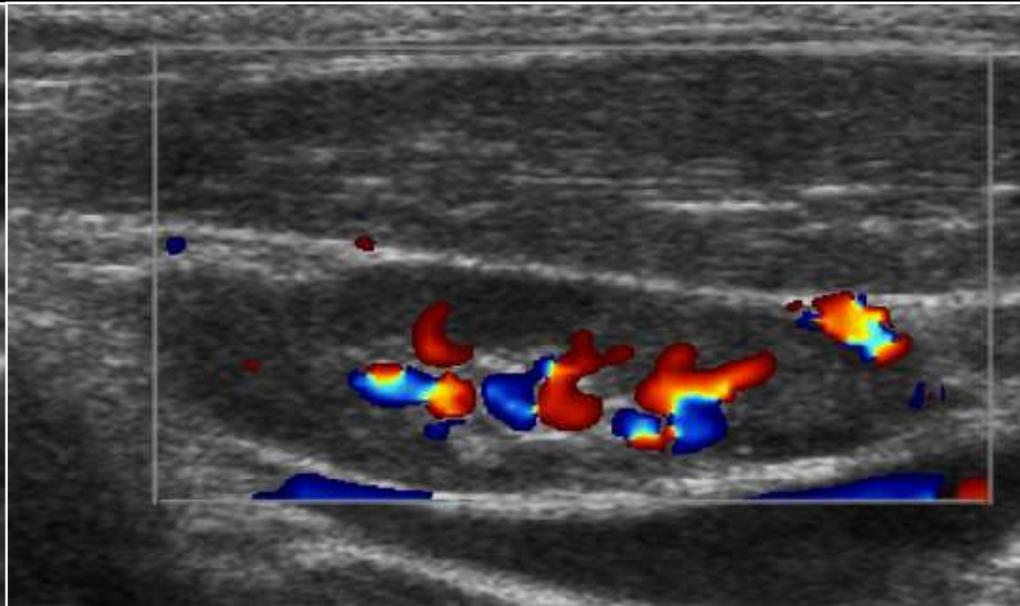
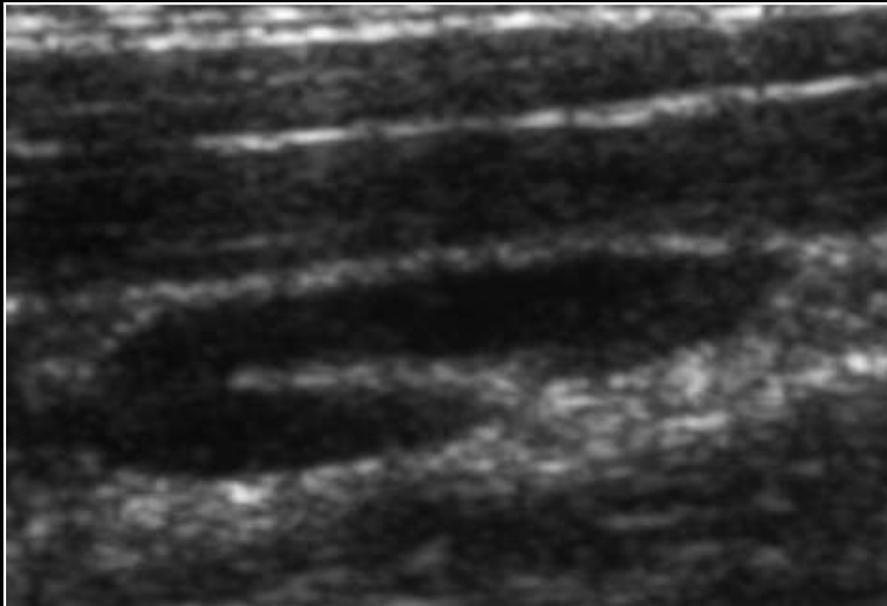
carotide commune, **jugulaire interne**

Noeuds lymphatiques

ovale
petit axe < 8 mm
hile hyperéchogène
vascularisation hile



adénomégalie



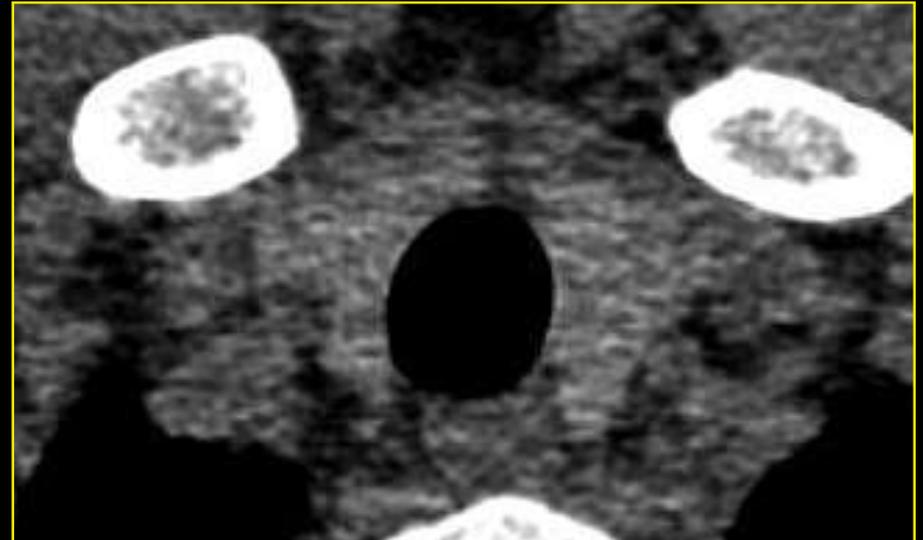
Imagerie en coupes

TDM et IRM ont des indications restreintes aux limites techniques de l'échographie:

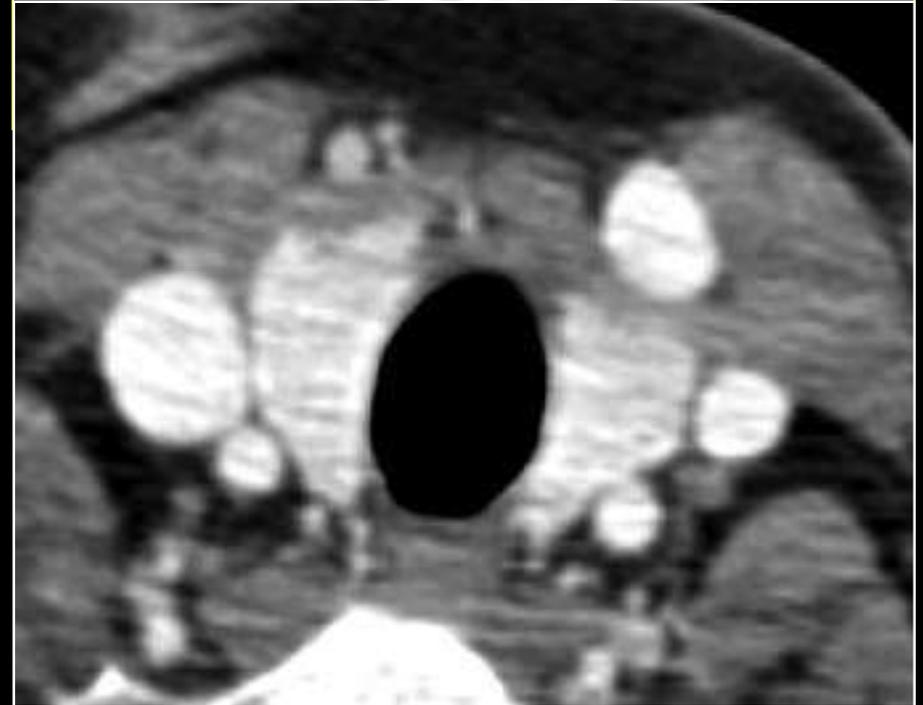
- Fenêtre aveugle : rétro trachéale, médiastin antérieur
- Situation basse de thyroïde ne permettant pas d'analyser les pôles inférieurs
- Topographie d'un goitre à prolongement médiastinal et rapports
- Distinction tumeur thyroïdienne / extension loco-régionale tumeur ORL
- Parathyroïdes: récurrences ou modifications anatomiques post chirurgicales
- Recherche de glandes ectopiques

Tomodensitométrie

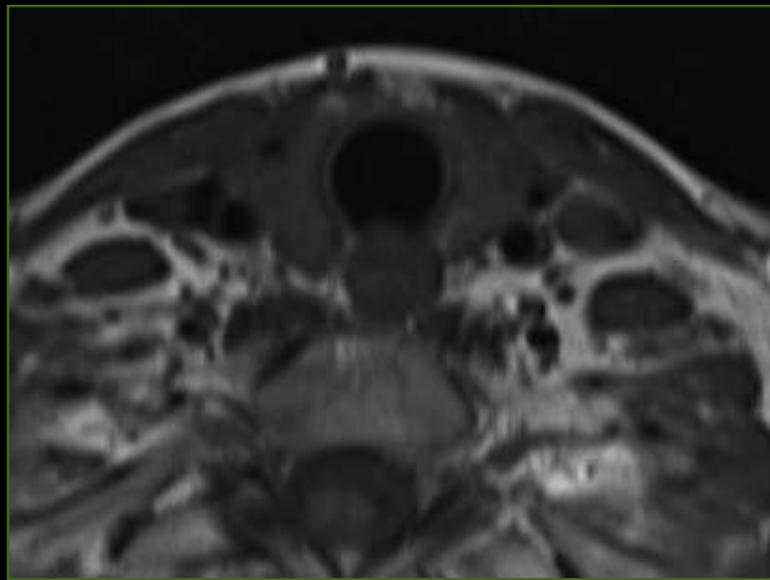
- sans injection:
homogène,
de densité spontanée élevée (50 à 120 UH)
en raison de sa teneur iodée



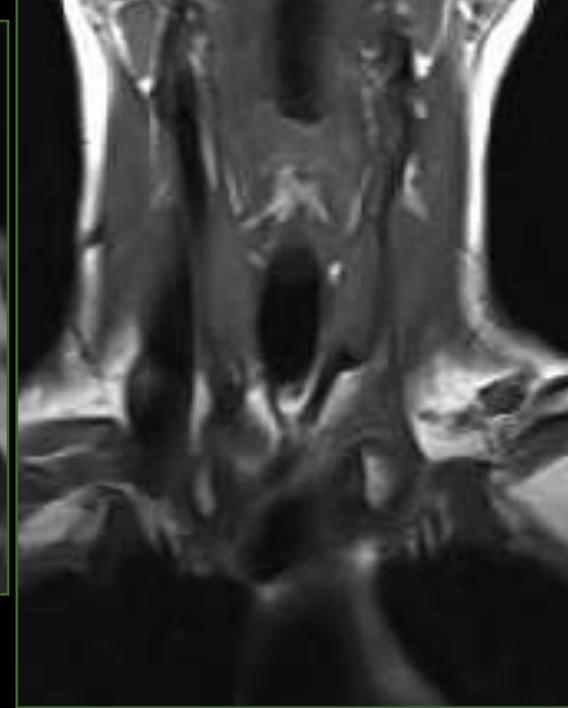
- avec injection:
prise de contraste homogène et intense,
décroissance lente



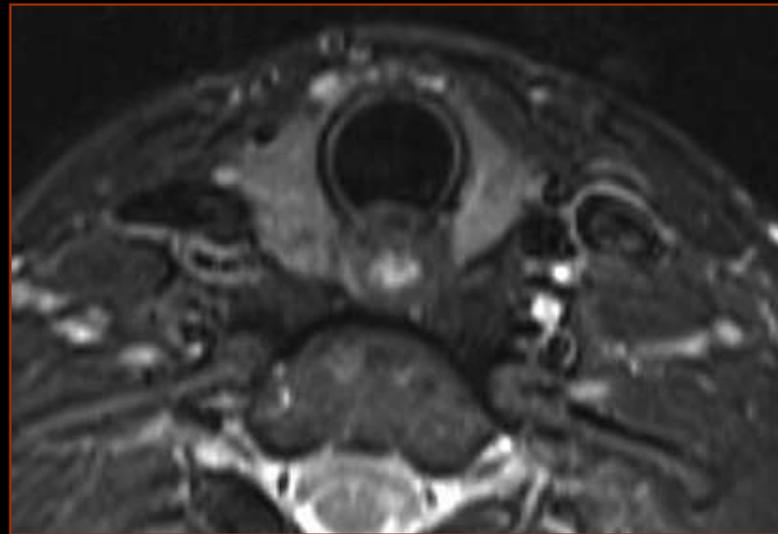
IRM



Isosignal T1 par rapport aux muscles



Hypersignal T2 par rapport aux muscles



Rehaussement intense et homogène



Séméiologie thyroïde

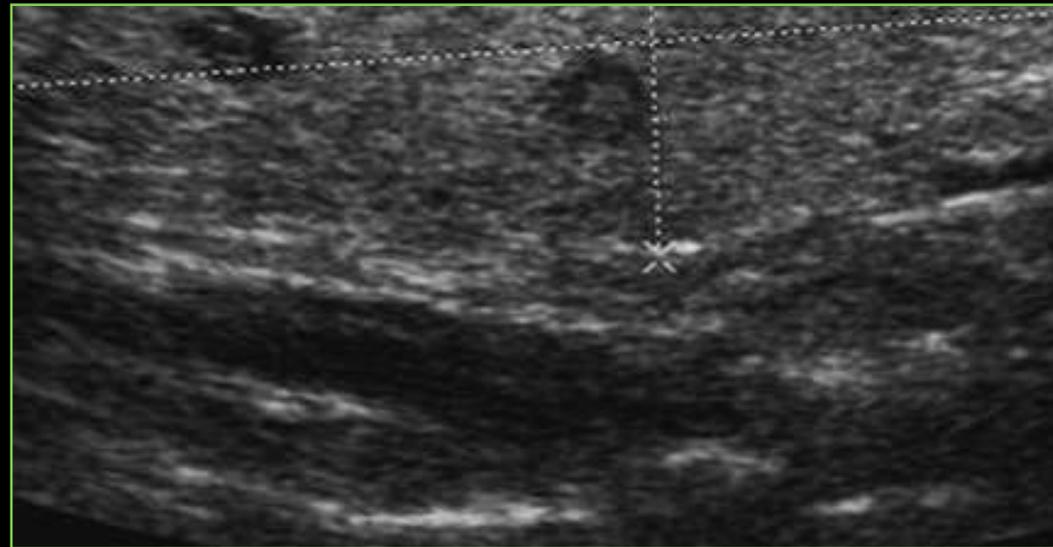
exploration d'une dysthyroïdie d'origine thyroïdienne

découverte fortuite d'un nodule (examen clinique, autre examen radiologique,...)

micronodules (< 5 mm): thyroïde
« vieillissante »

nodules 5 - 10 mm: surveillance tous les 1 – 2
ans

nodules > 10 mm : 2 – 6 % cancers



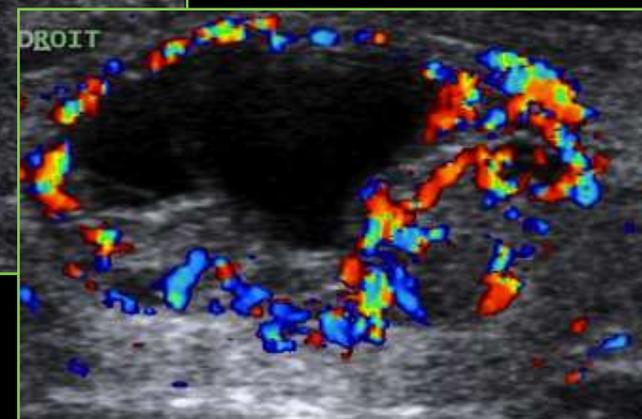
Séméiologie du nodule liquidien

Taille, localisation

Echostructure

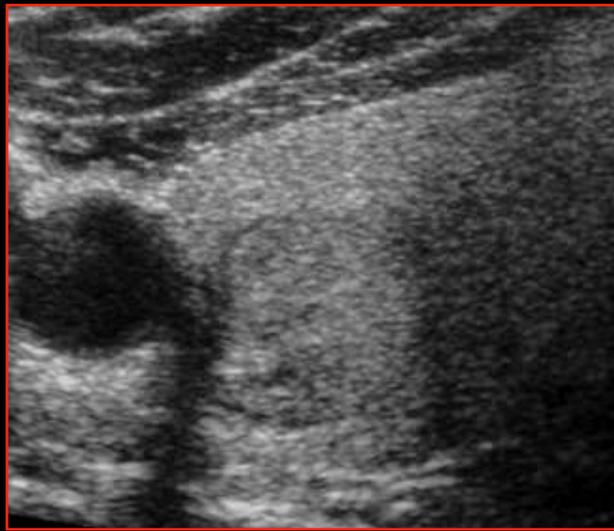
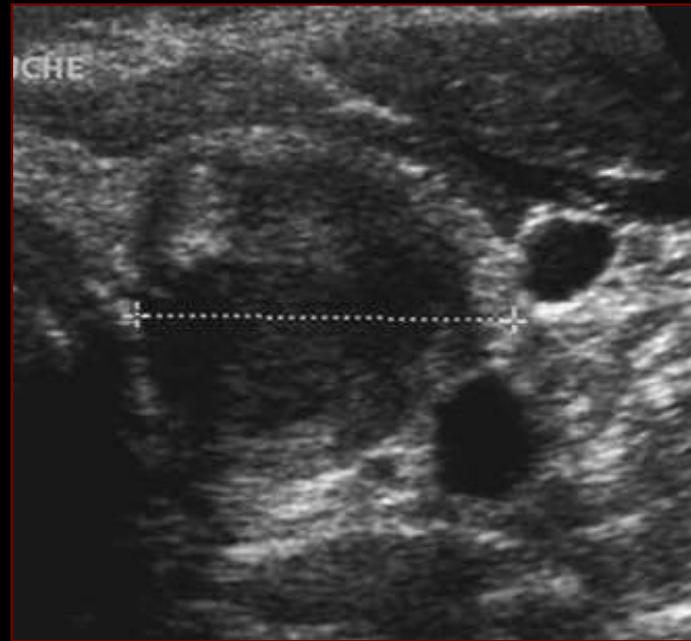


solide



Nodules solides

hypoéchogène



isoéchogène



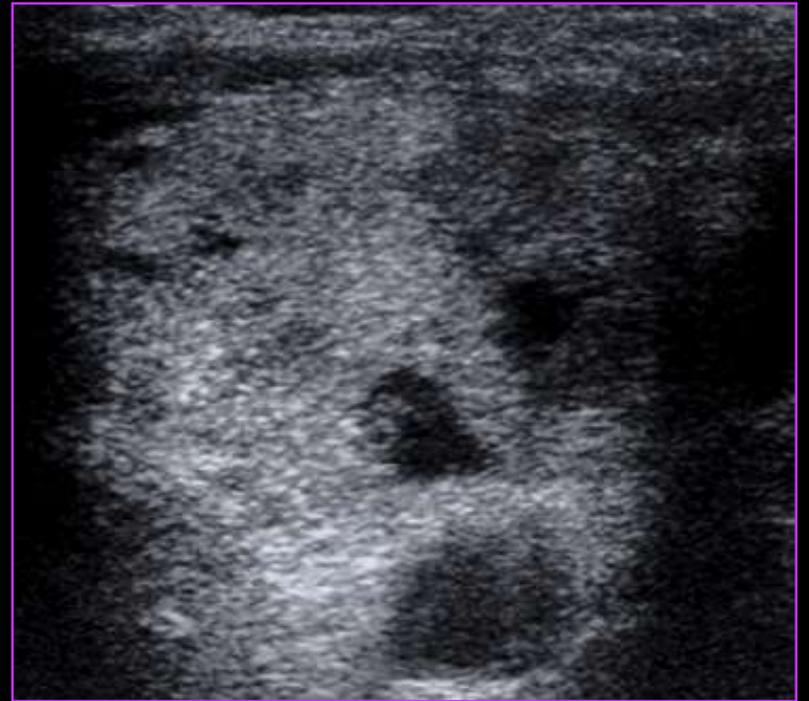
hyperéchogène (2 à 4% malin)



Contours

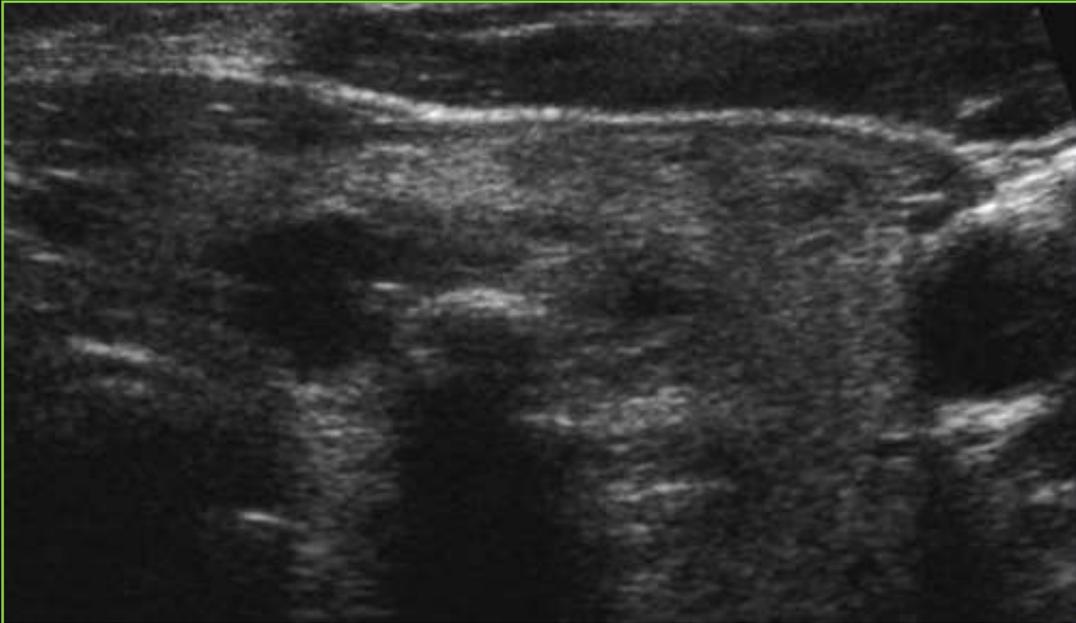


nets



flous

Calcifications

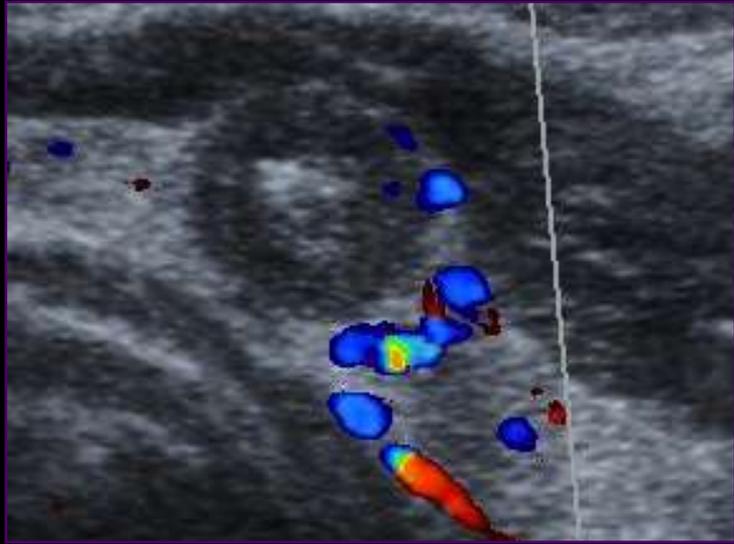


macrocalcifications: bénin

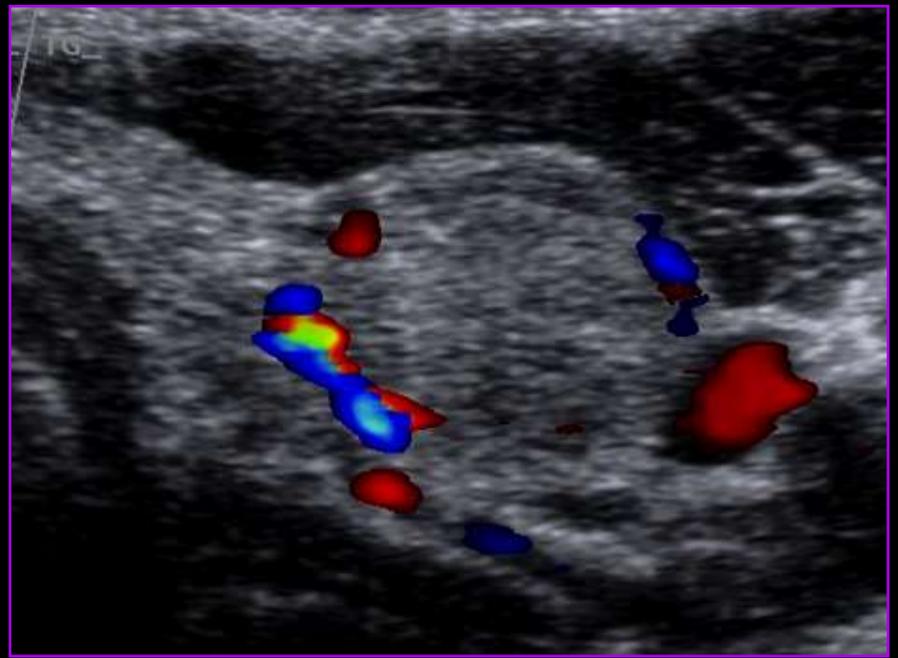


microcalcifications: suspect

Vascularisation

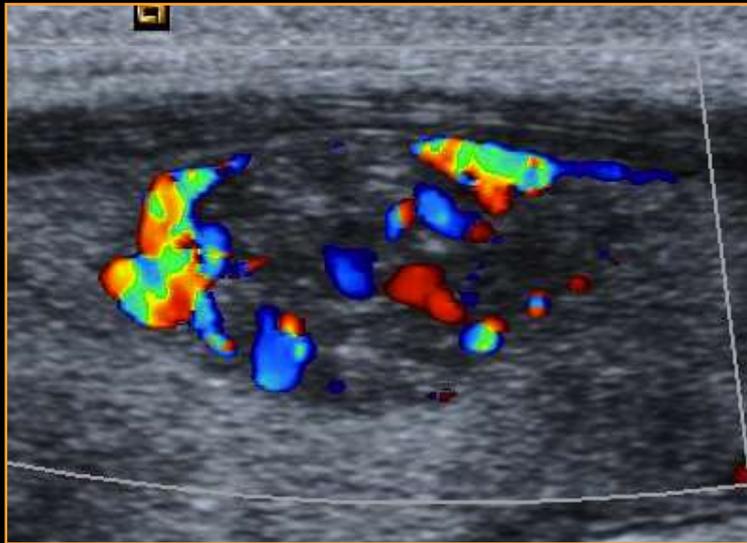


sans: bénin

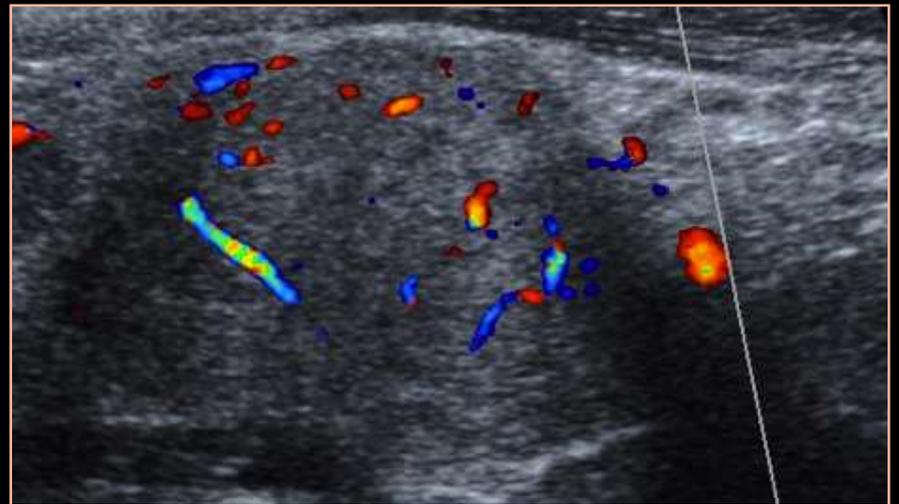


périnodulaire

mixte: suspect



centrale: suspect



Le nodule **malin** typique est

- **hypoéchogène**

- à contours **flous** (même partiellement)

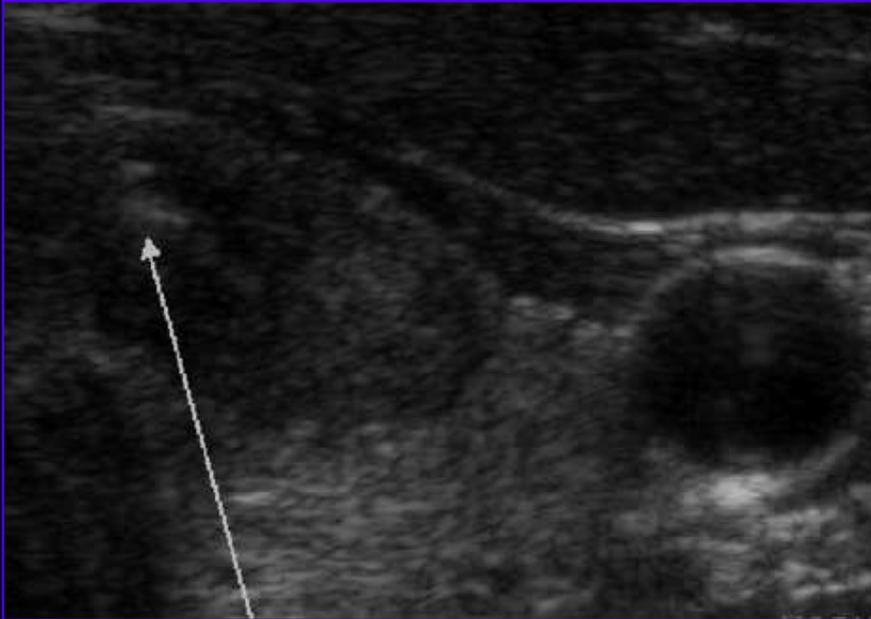
- le siège de **microcalcifications** nombreuses, en amas ou diffuses

- son **épaisseur** est supérieure à sa largeur

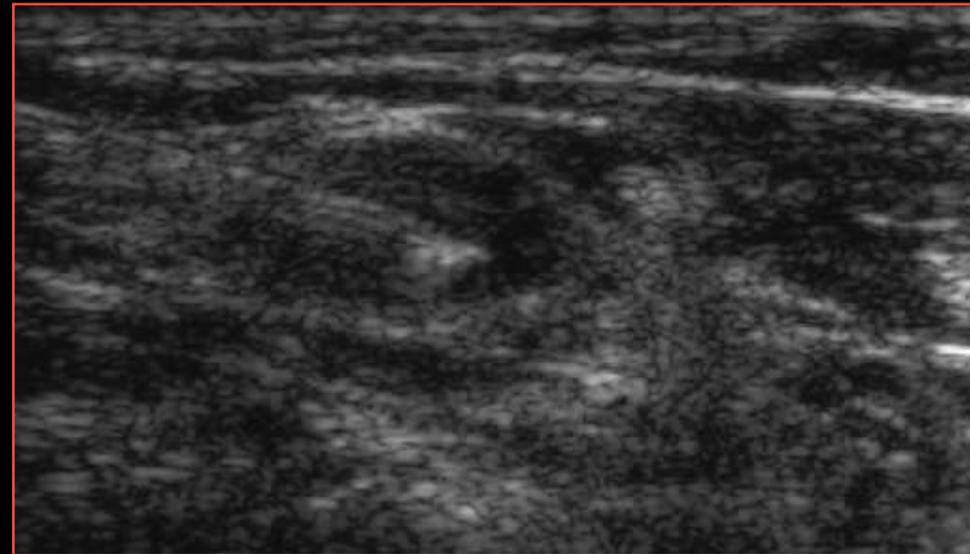
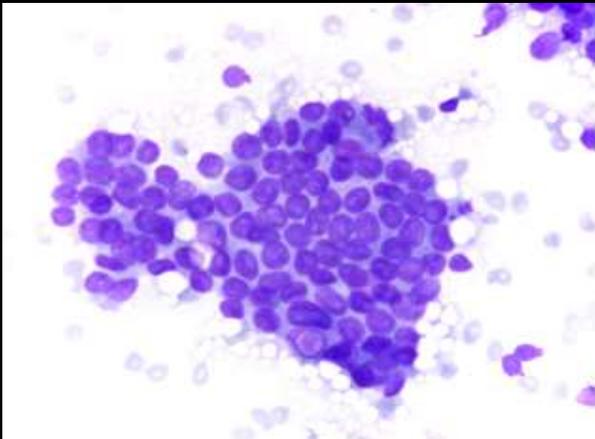
- présente une **hypervascularisation intranodulaire**

Autres éléments du diagnostic

- scintigraphie : froid
- cytoponction échoguidée



nodule

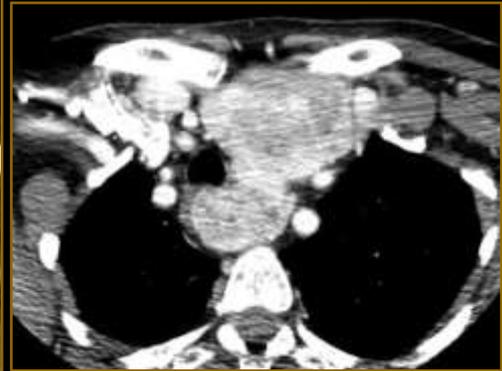
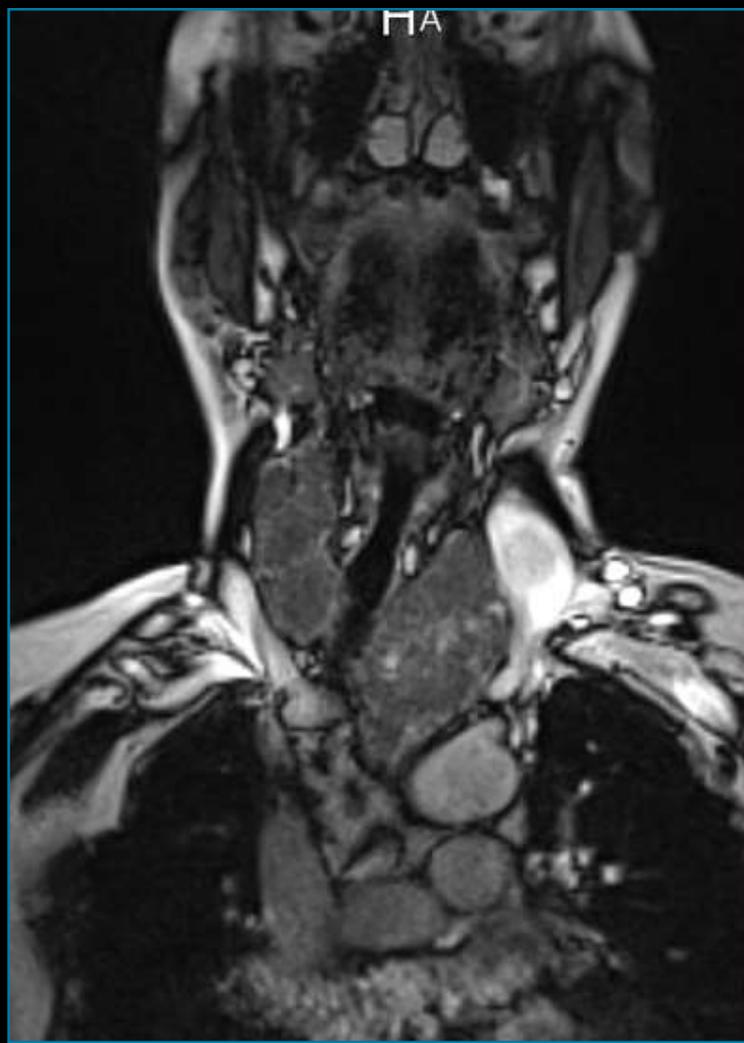


adénopathie jugulocarotidienne

Place du TDM et de l'IRM

nodule: aucune

goître: extension, rapports, compression



Séméiologie parathyroïdes

Les glandes parathyroïdes normales sont trop petites pour être visibles par échographie, TDM ou IRM

L'imagerie des parathyroïdes

- n'est utile qu'en cas d'hyperfonctionnement,
- n'apporte qu'un élément **topographique** (diagnostic biologique)

Lors des hyperparathyroïdies primaires:

- . par hyperplasie (15%): exploration des 4 glandes, recherche d'une localisation ectopique (médiastinale)
- . par adénome (85%): localiser la glande pathologique (adaptation de la voie d'abord, diminution du temps opératoire, limitation des risques de morbidité récurrentielle)
- . par cancer (<1%): localisation

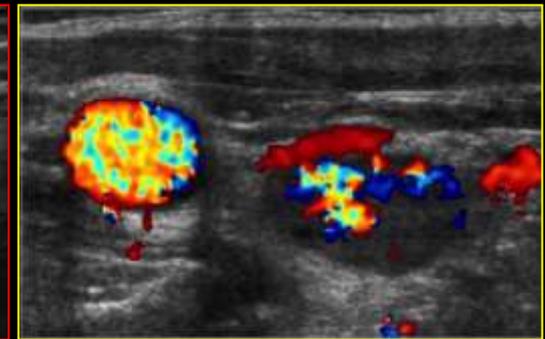
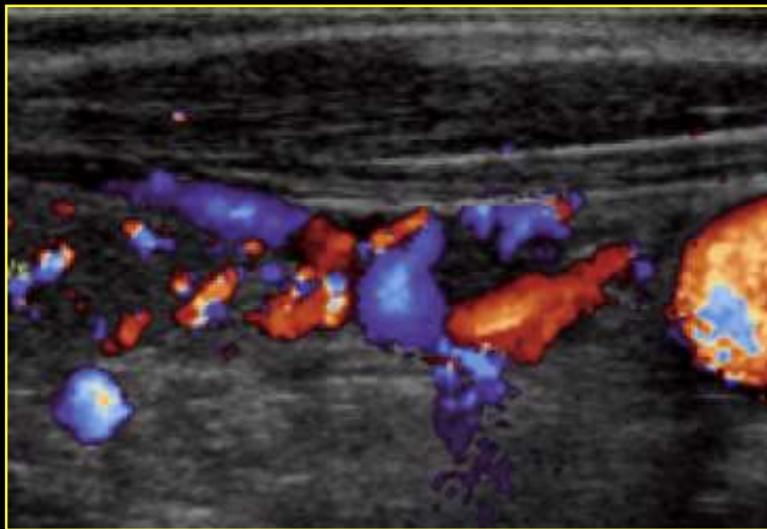
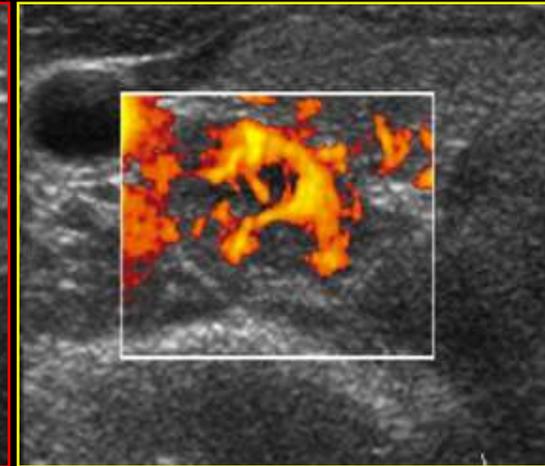
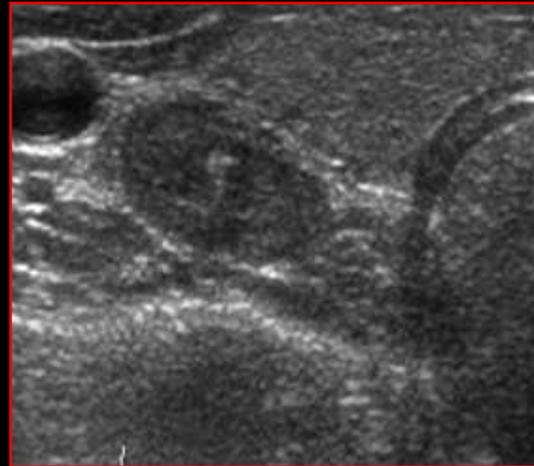
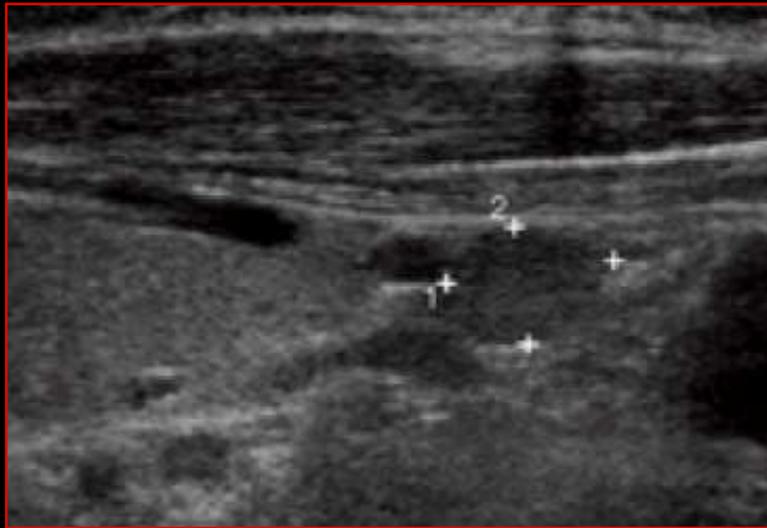
Lors des hyperparathyroïdies secondaires (atteinte diffuse des 4 glandes): localiser une ectopie

Adénome

Le plus souvent unique (95%),
plus gros qu'une hyperplasie (10-15 mm)

- échographie:

hypoéchogène, presque anéchogène,
souvent **hypervascularisé** en doppler

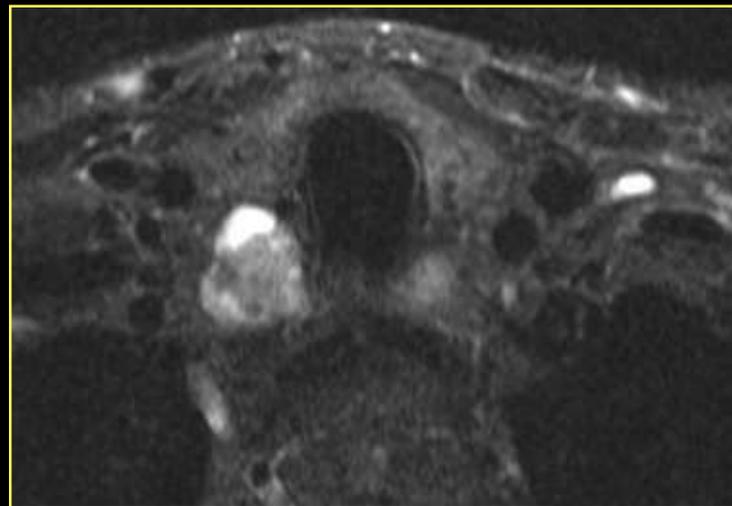
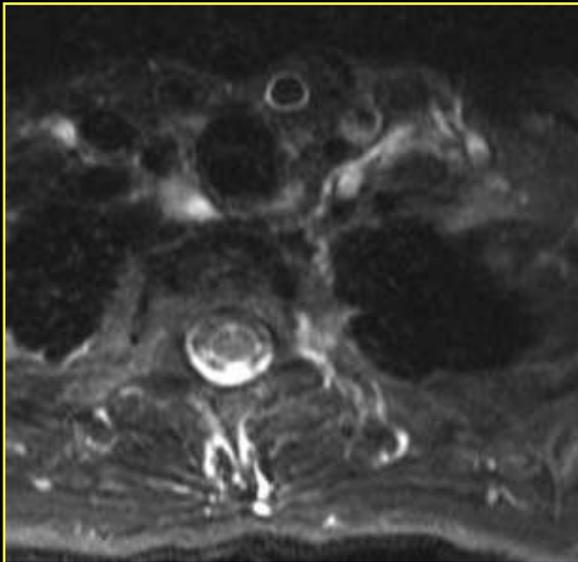
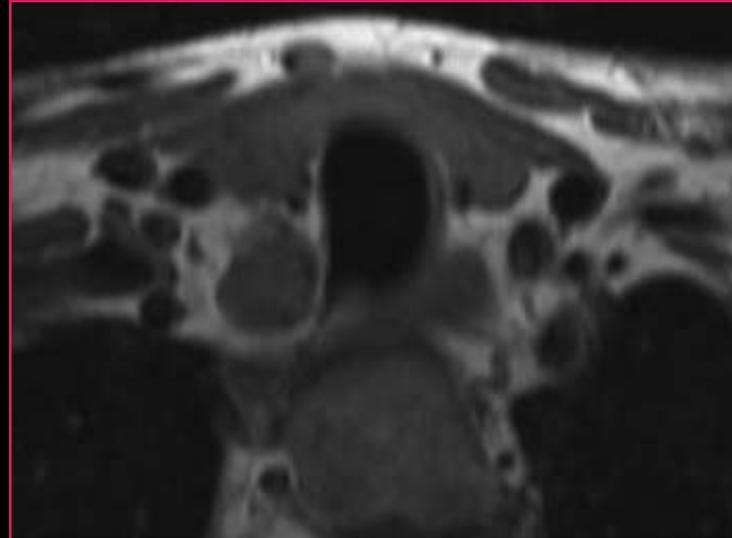
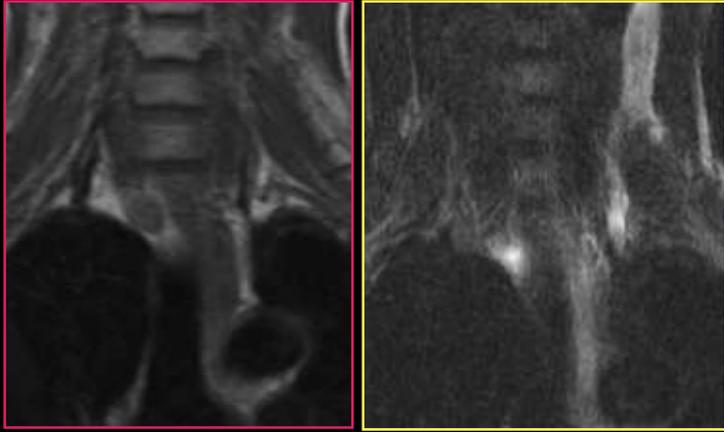


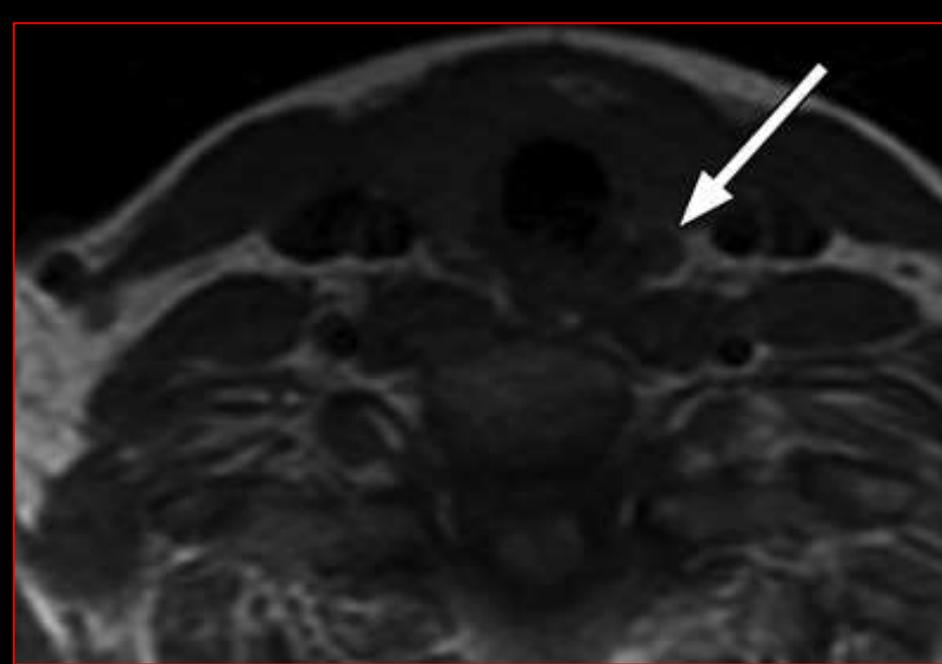
Adénome

- IRM cervico-médiastinale:

T1: isosignal,

T2 fatsat ou STIR: hypersignal





Adénome parathyroïdien supérieur gauche: **isosignal T1**, **hypersignal T2**, **rehaussement après Gadolinium**

Adénome

- TDM (exploration cervico-médiastinale en coupes fines):
hypervascularisé,

