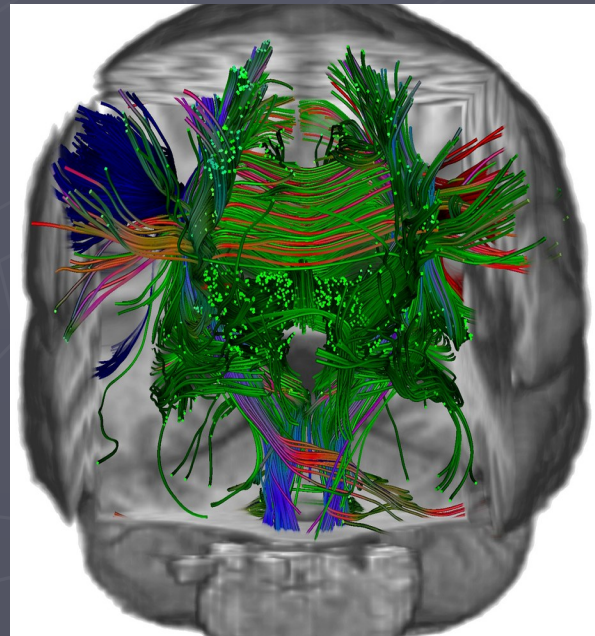
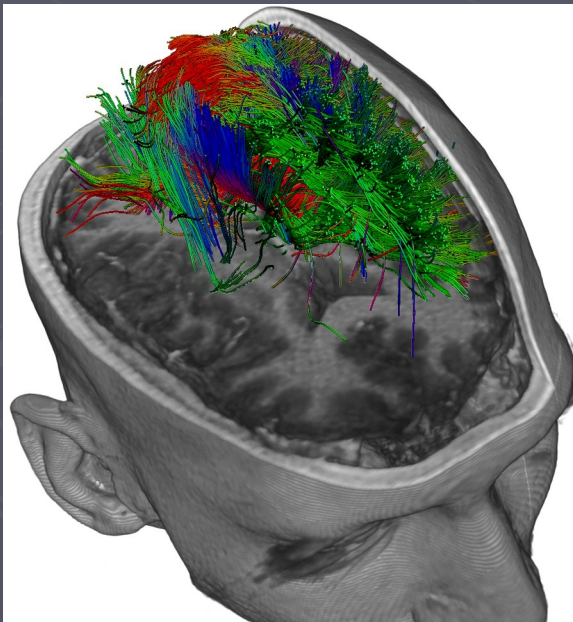


TENSEUR DE DIFFUSION DANS LES NERFS CRÂNIENS

Hôpital du Kremlin Bicêtre – Service de Neuroradiologie
Laure CACHEUX, Antony MOREL
Dr Denis DUCREUX



PLAN

- ▶ Principe du tenseur de diffusion
- ▶ Les nerfs crâniens visualisables
- ▶ Indications
- ▶ Technique et réalisation de la séquence
- ▶ Résultats : imagerie normale et pathologique

Principe du tenseur de diffusion

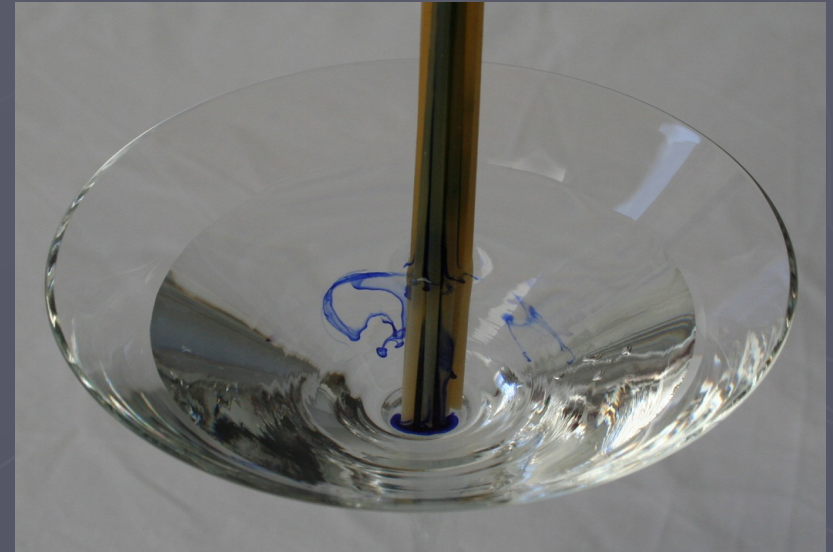
Étude des mouvements de l'eau **EXTRACELLULAIRE** dans le cerveau



ISOTROPIQUE

=> aléatoire

ex : LCR



ANISOTROPIQUE

=> mouvements prédéterminés

Fibres de substance
blanche

TENSEUR

visualisation **INDIRECTE**
des fibres nerveuses

Les nerfs crâniens visualisables

le tenseur permet de voir les nerfs II, V, VII et VIII

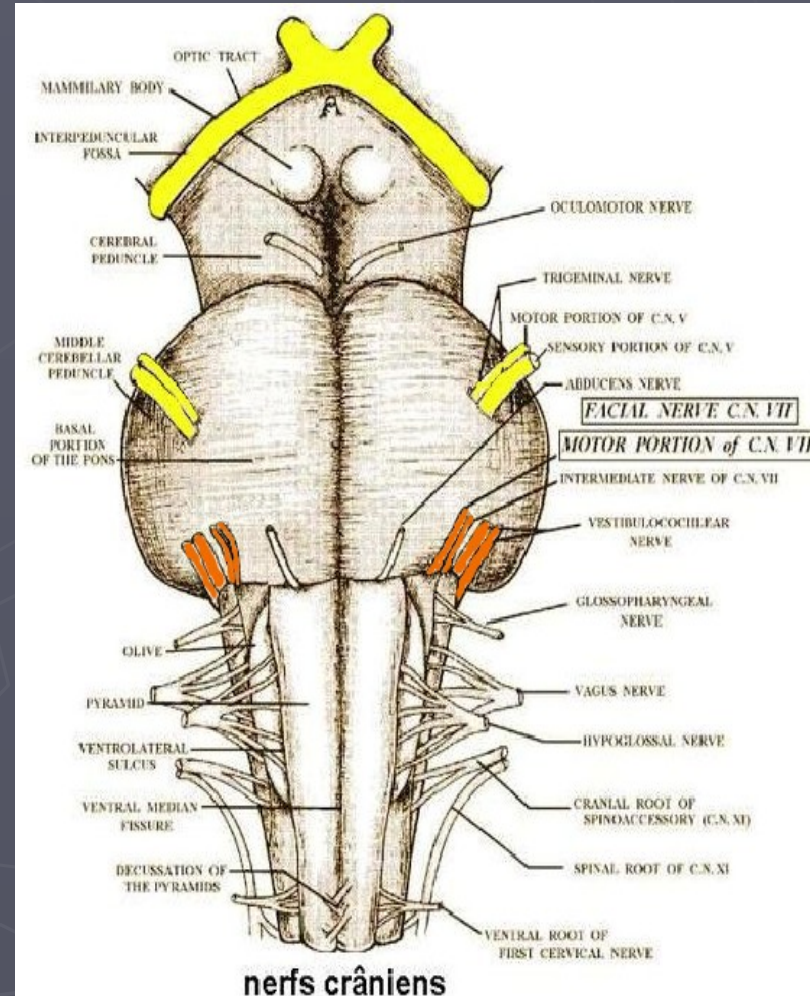
- TAILLE :

Visualisation des + gros nerfs

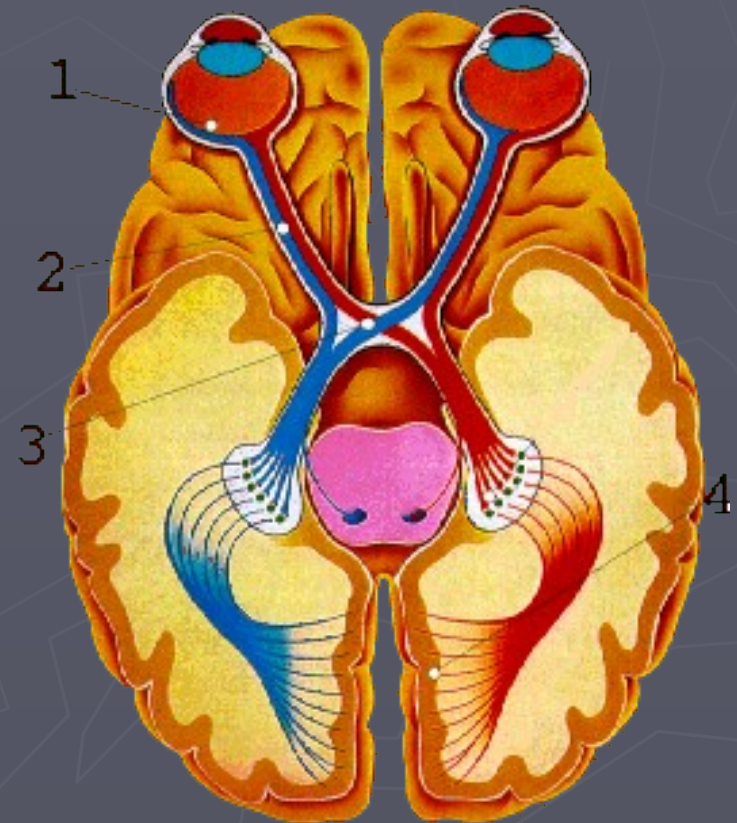
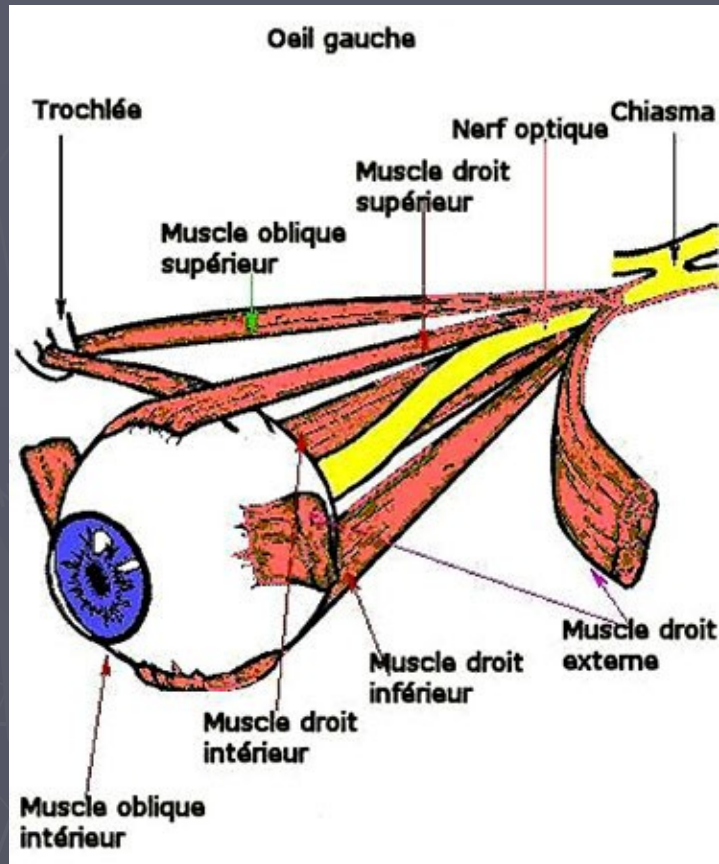
- TOPOGRAPHIE DES NERFS :

dans l'os => artéfact de susceptibilité

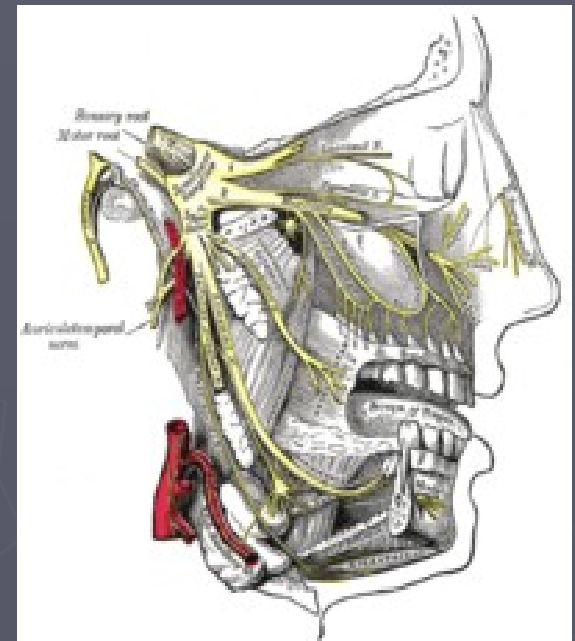
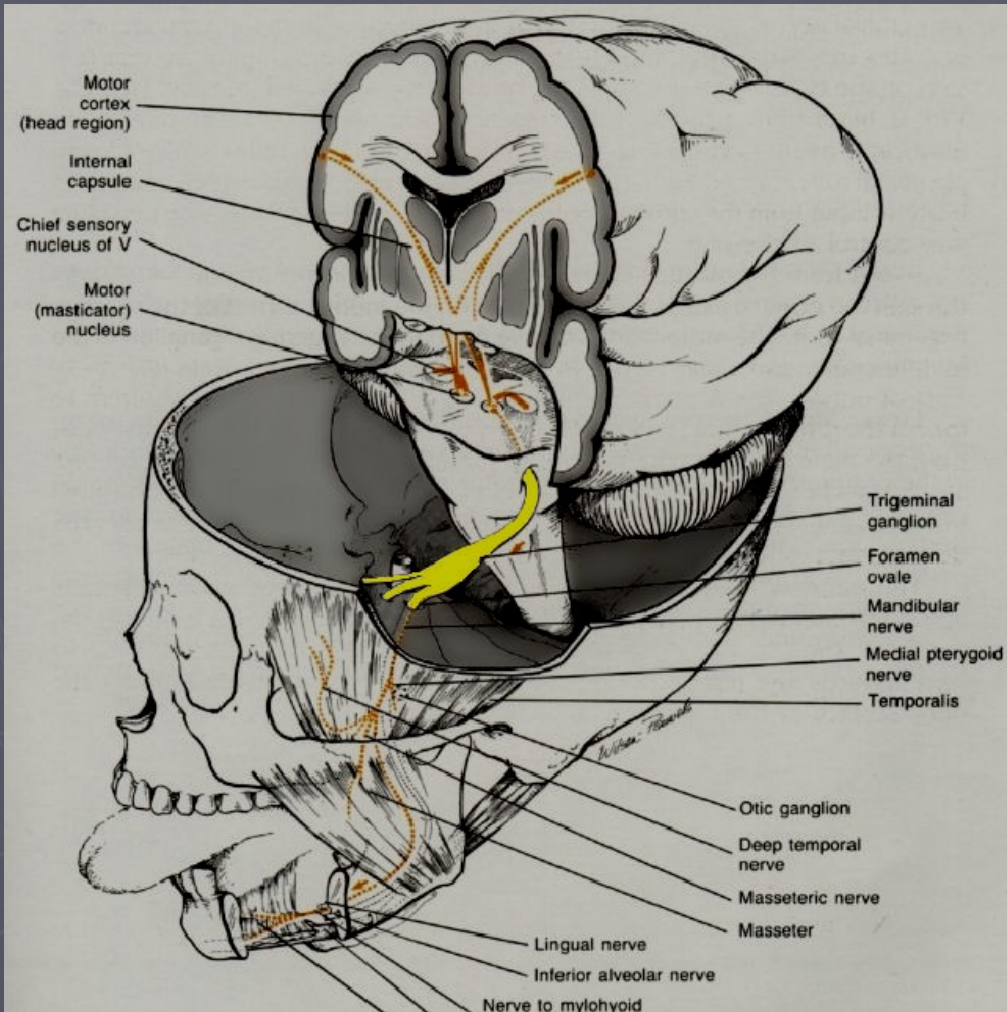
magnétique => nerfs non décelables



- Nerf II = OPTIQUE



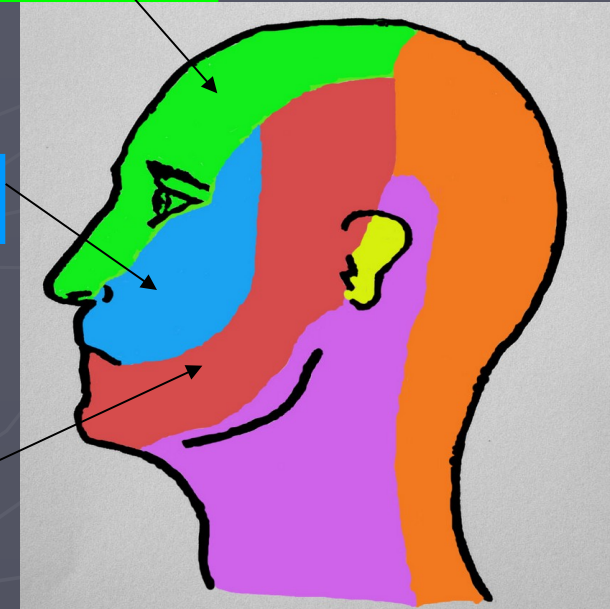
- Nerf V = TRIJUMEAU



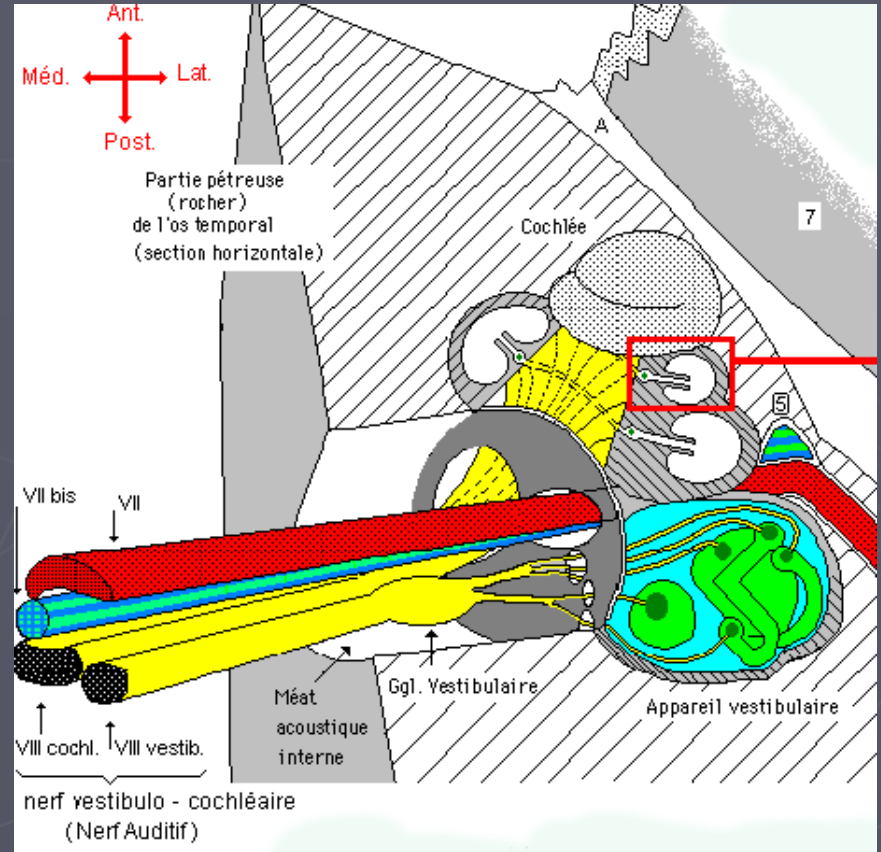
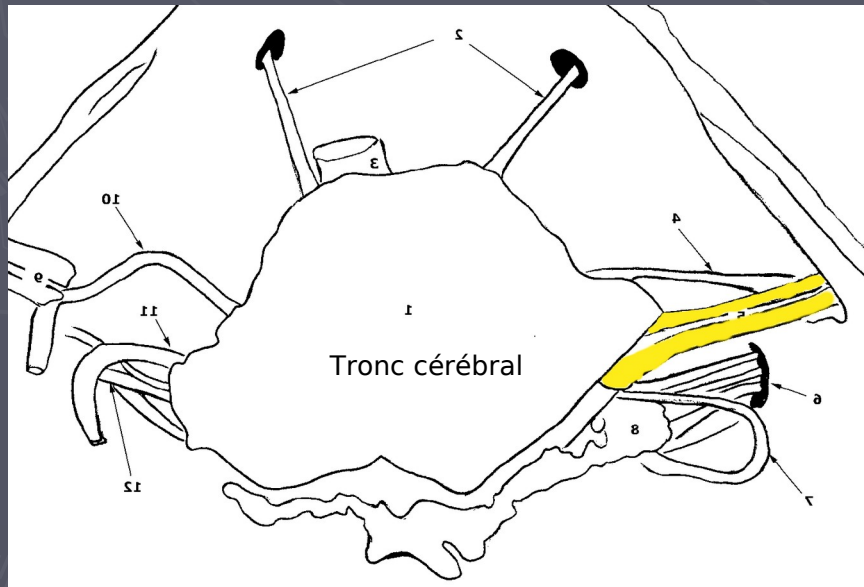
N.ophtalmique (V1)

N.maxillaire (V2)

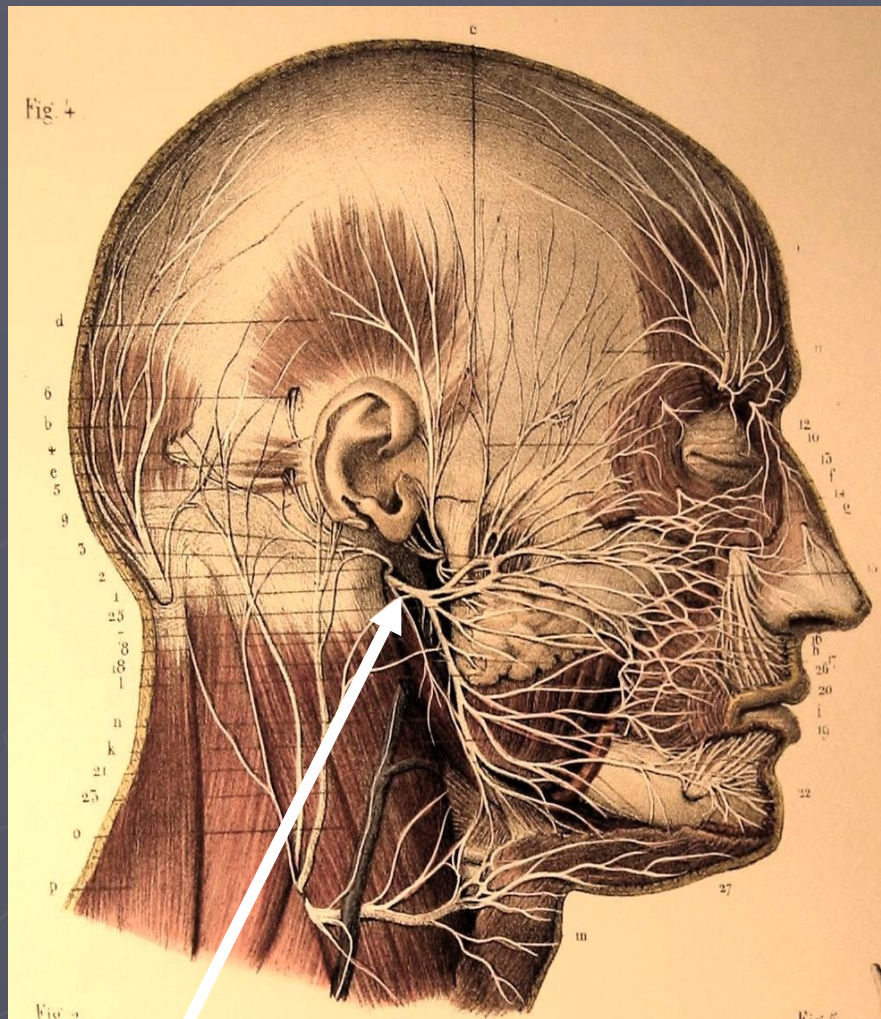
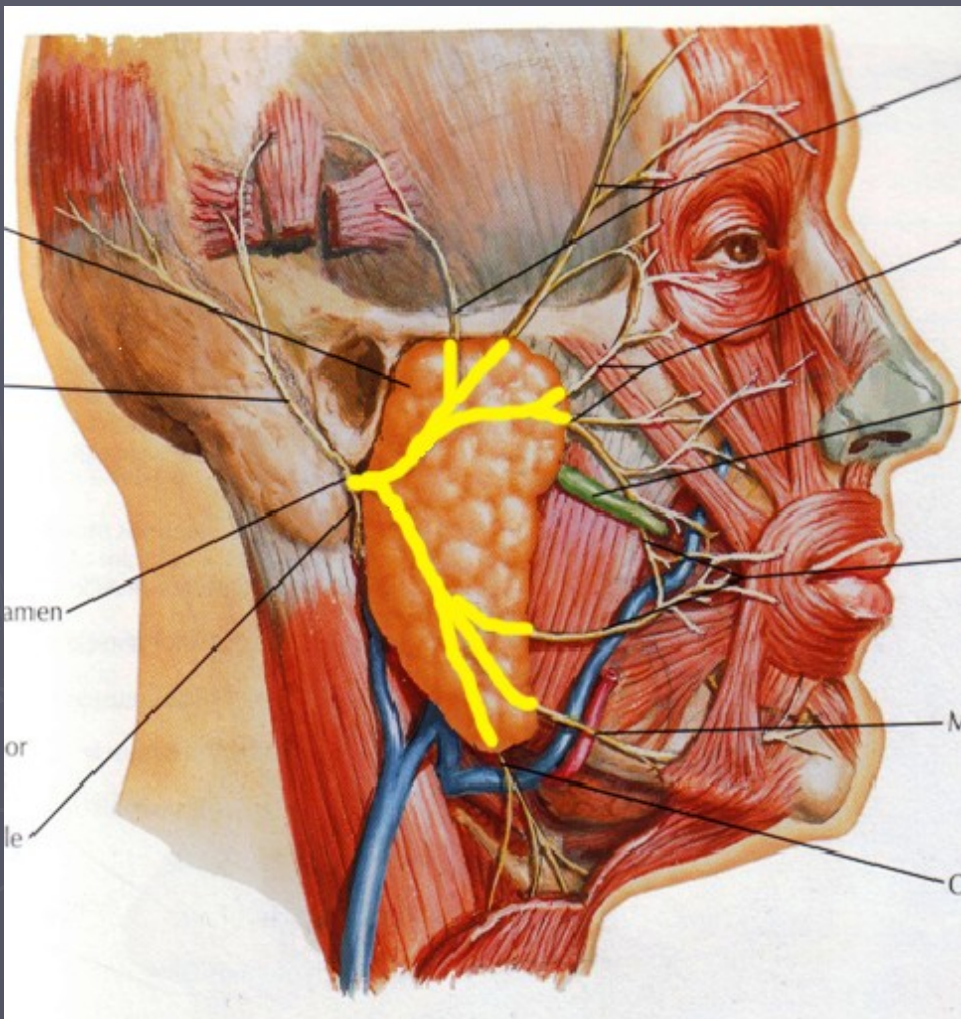
N.mandibulaire (V3)



- **Nerf VII et VIII = FACIAL ET COCHLEO-VESTIBULAIRE**
dans leur portion
cisternale



- **Nerf VII = FACIAL** dans sa portion intraparotidienne



Indications

Le tenseur est toujours intégré dans un protocole morphologique standard

- ∞ **II** : - patho. Inflammatoire (NORB dans les SEP)
 - ischémie du nerf optique
 - tumeur
- ∞ **V** : - tumeur (schwannome, méningiome)
 - conflits vasculo-nerveux
 - anomalie du V dans les syndromes cérébro-faciaux vasculaires (CAMS, Sturge Weber) ou en cas d'infections virales (herpès)
- ∞ **VII - VIII dans leur portion cisternale** :
 - tumeur (schwannome, méningiome)
 - conflits vasculo-nerveux
- ∞ **VII dans sa portion intraparotidienne** : pré-opératoire en cas de lésion parotidienne

Technique et réalisation

➤ Le patient

- préparation et installation classique pour une IRM cérébrale
- préparation psychologique +++

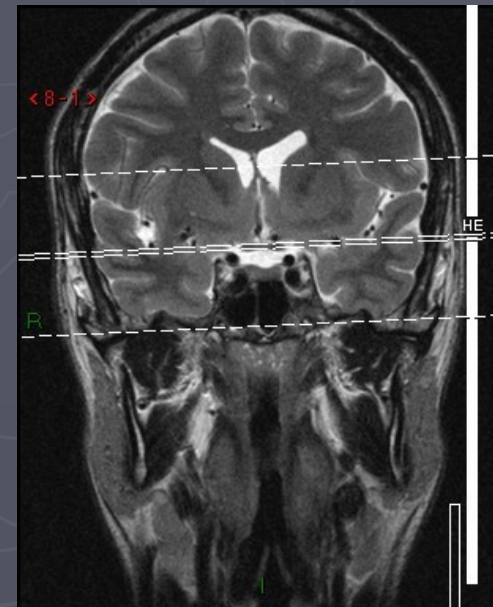
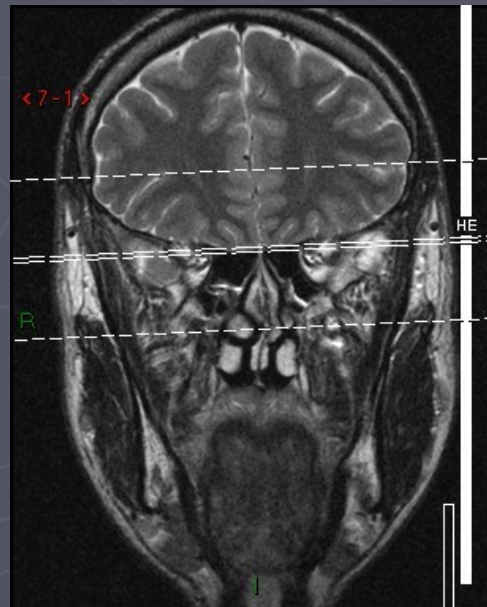
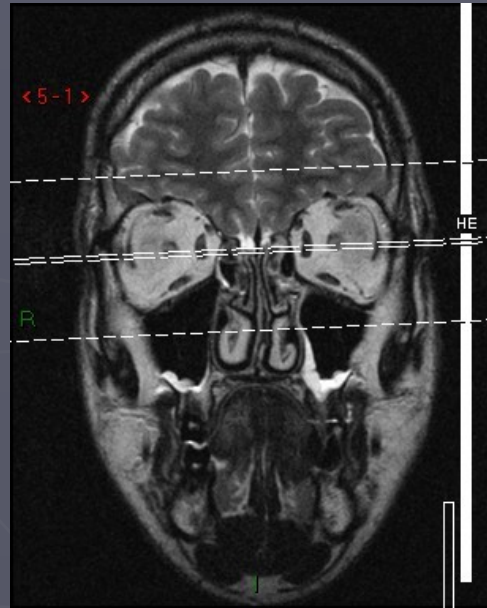
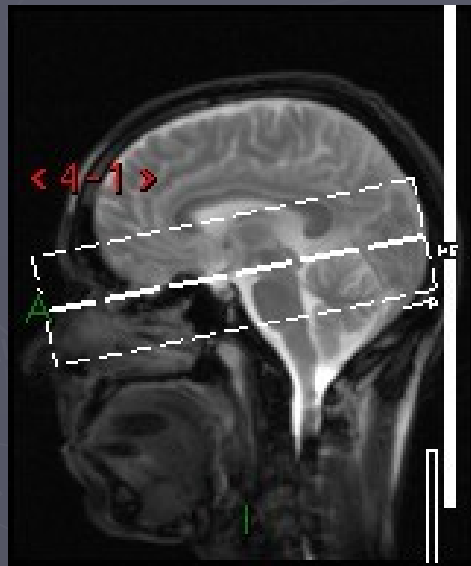
➤ L'examen

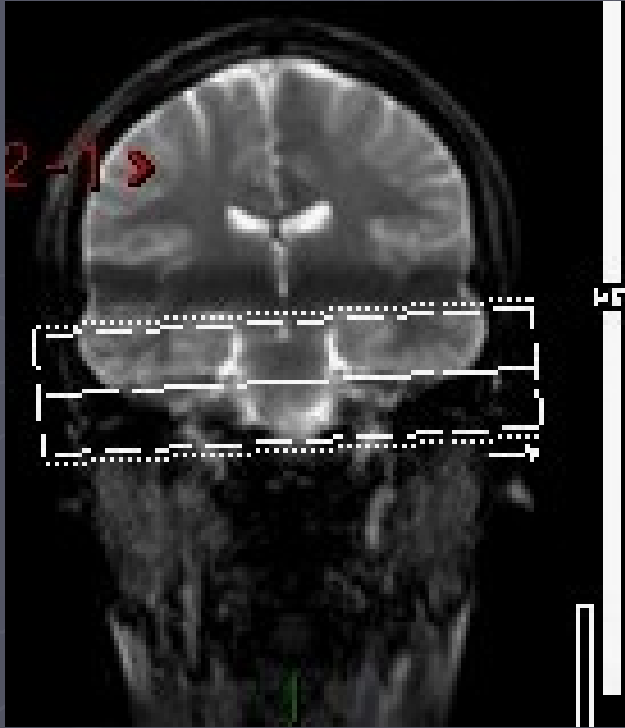
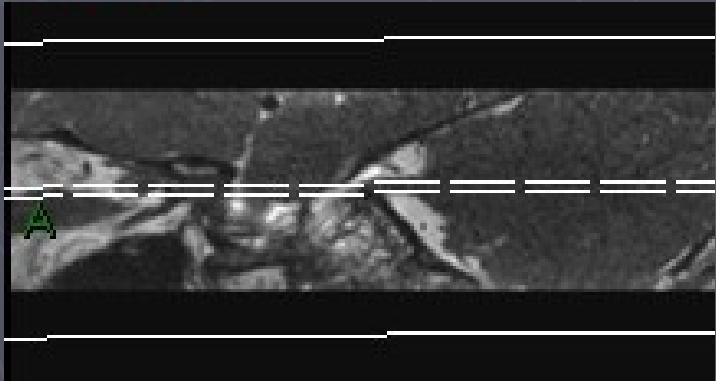
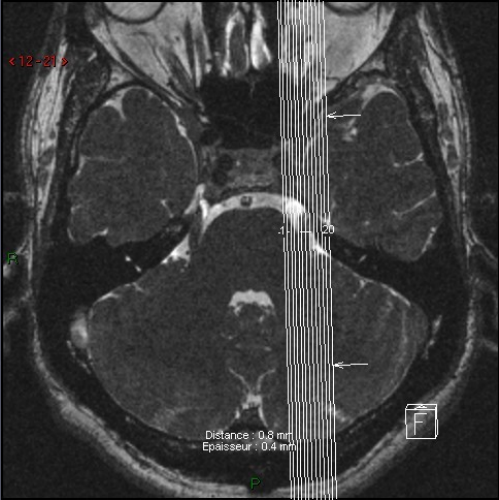
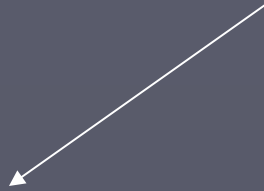
=> AVANT L'INJECTION DE GADOLINIUM

=> Siemens 1,5 T (Sonata)

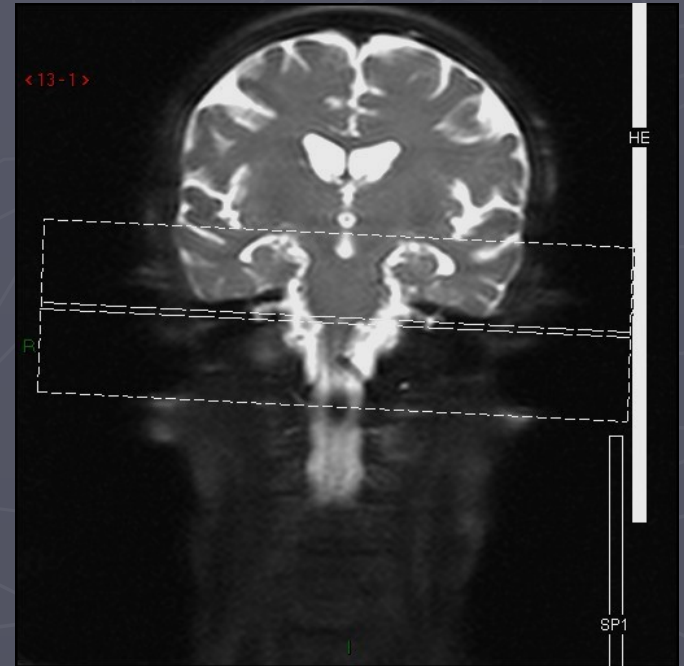
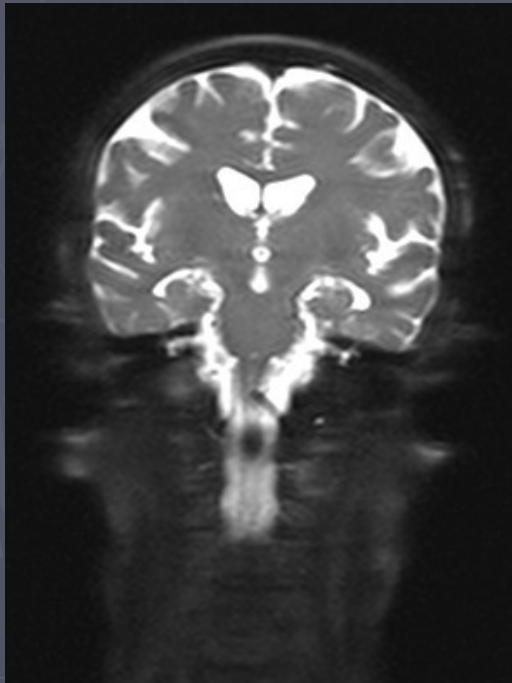
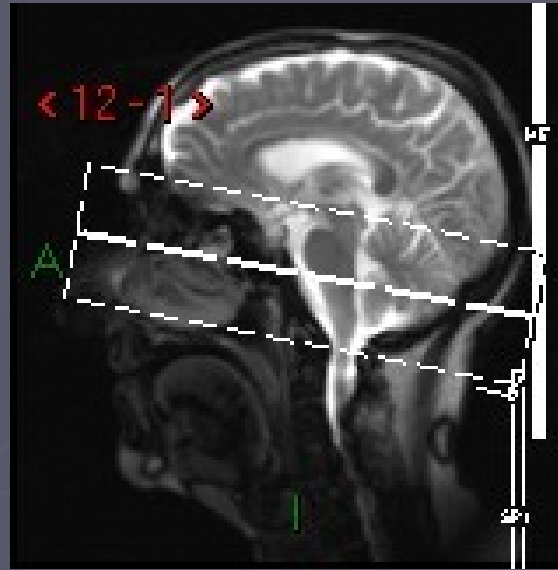
Antenne crâne, uniquement réceptrice

➤ Positionnement

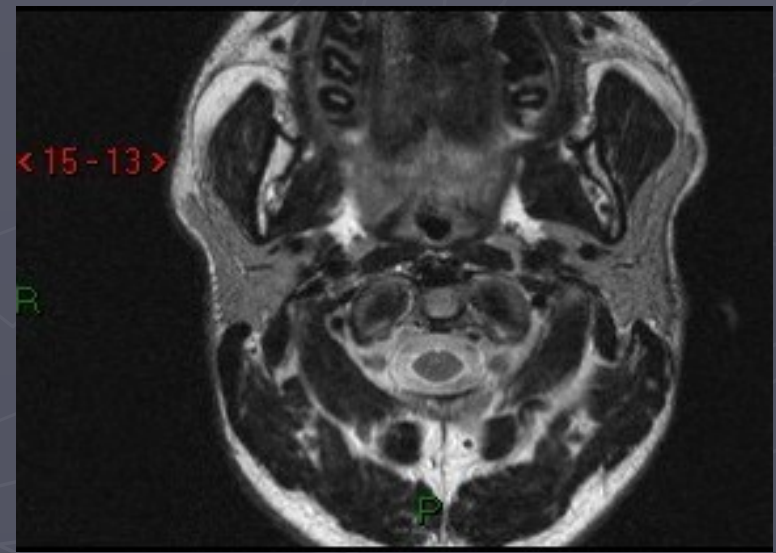
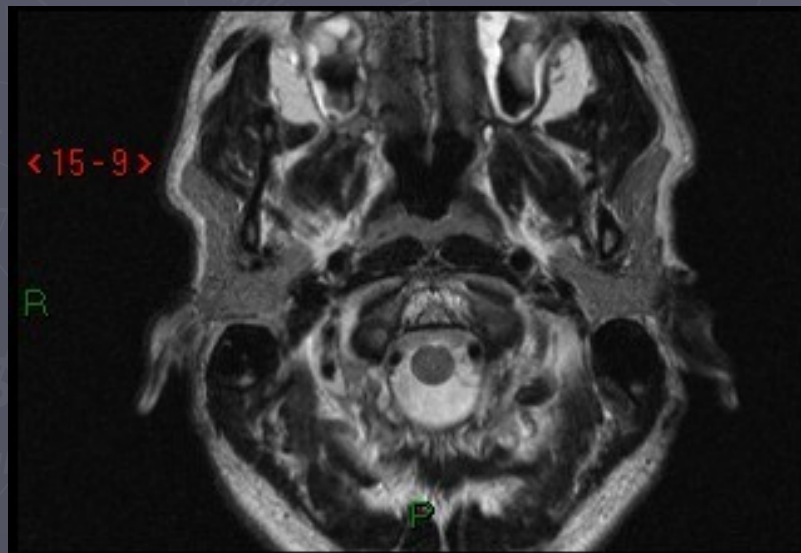
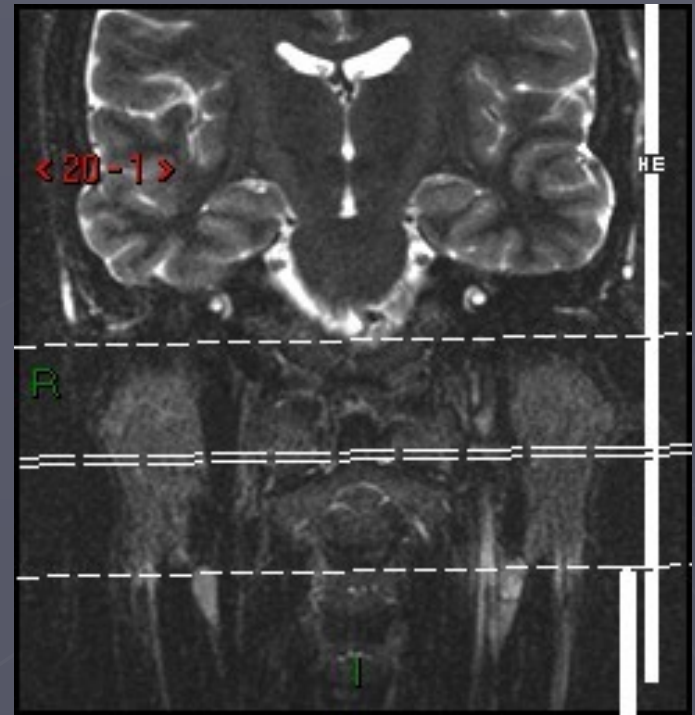
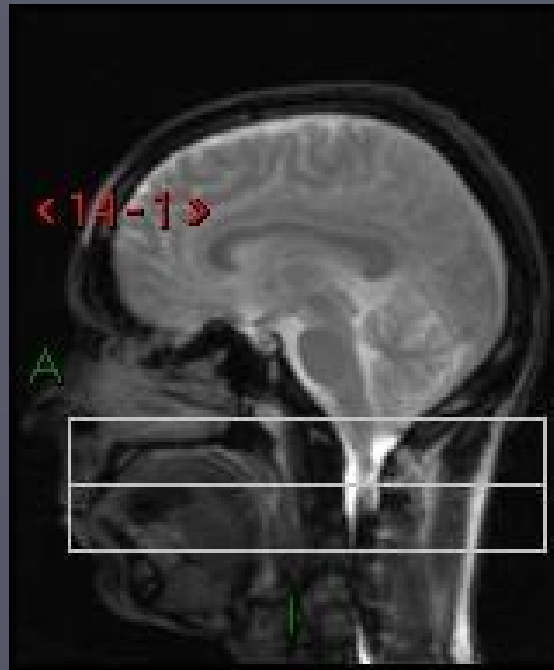




∞ VII et VIII



∞ VII

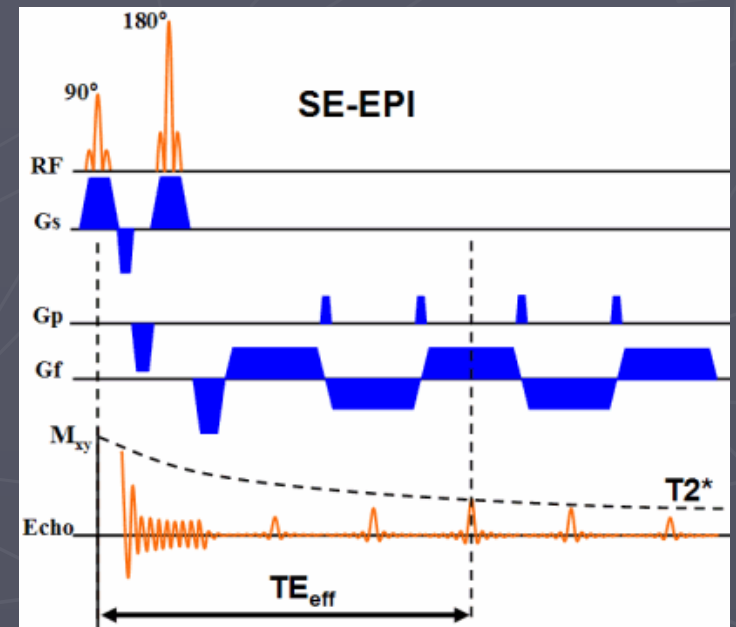
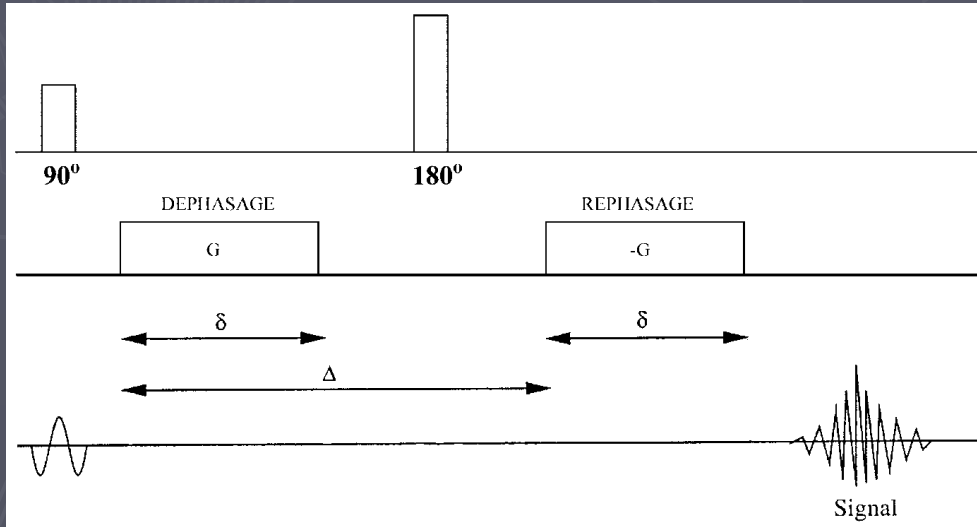


➤ La séquence

Séquence SPIN ECHO T2

Gradient de diffusion
b500

ECHO PLANAR (EPI)



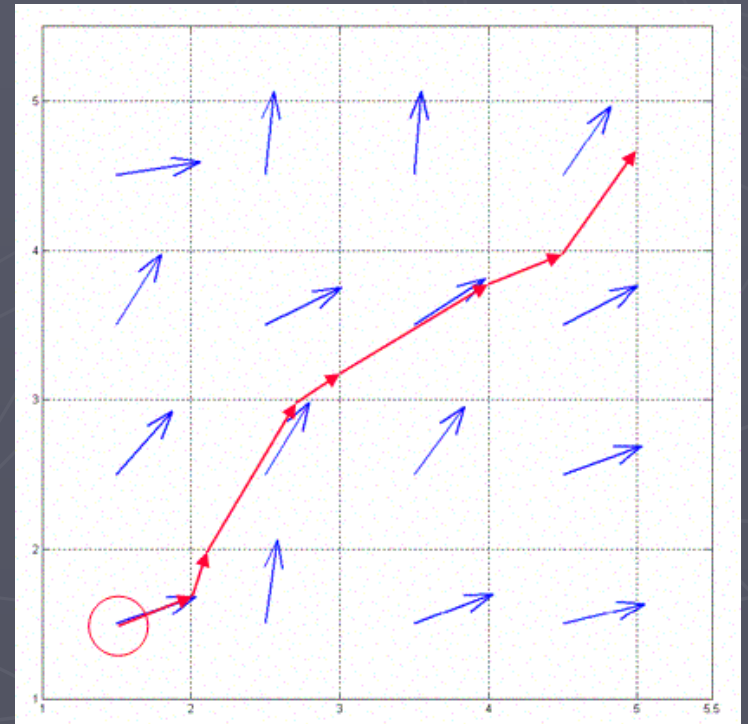
Où l'eau diffuse-t-elle ?

On répète cette séquence dans **25 DIRECTIONS**

Dans chaque voxel, on obtient la valeur vectorielle du déplacement de l'eau

Algorithme mathématique

Projection des fibres nerveuses



➤ Les paramètres

TR = 5400 ms

TE = 112 ms

Épaisseur de coupe = 2 mm

FOV = 200 x 200

Matrice = 128 x 128

Nombre de coupes = 30

Temps d'acquisition = 7 min

Fat Sat

Coefficient de diffusion (b) = 500

25 directions

Sens de la phase = ANT-POST

➤ Les artéfacts

L'ensemble des artéfacts « classiques » apparaissent (métalliques, mouvements, ...)

2 causes spécifiques d'artéfacts concernant le tenseur :

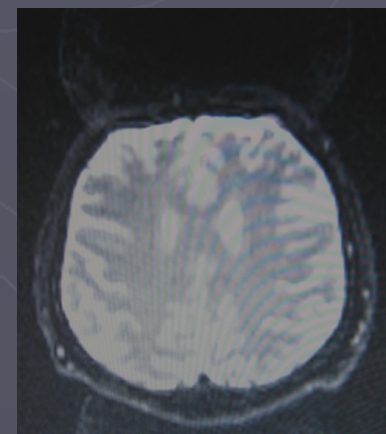
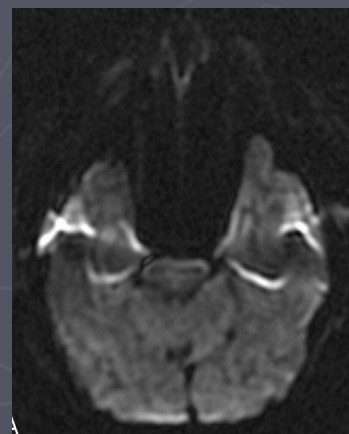
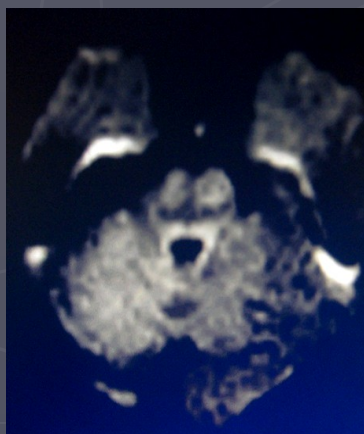
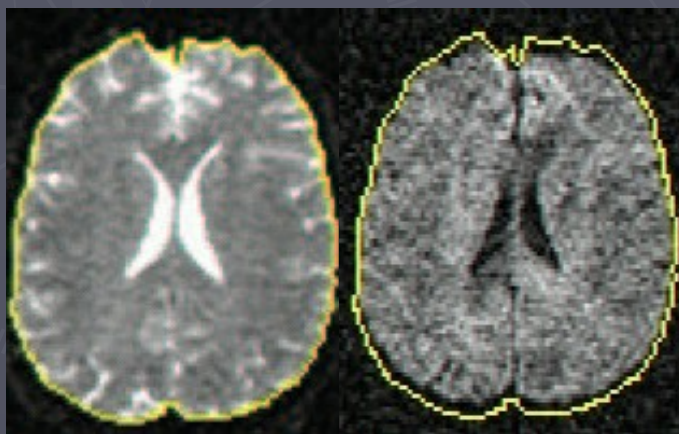
- . GRADIENTS DE DIFFUSION

courants induits => distorsion de l'image

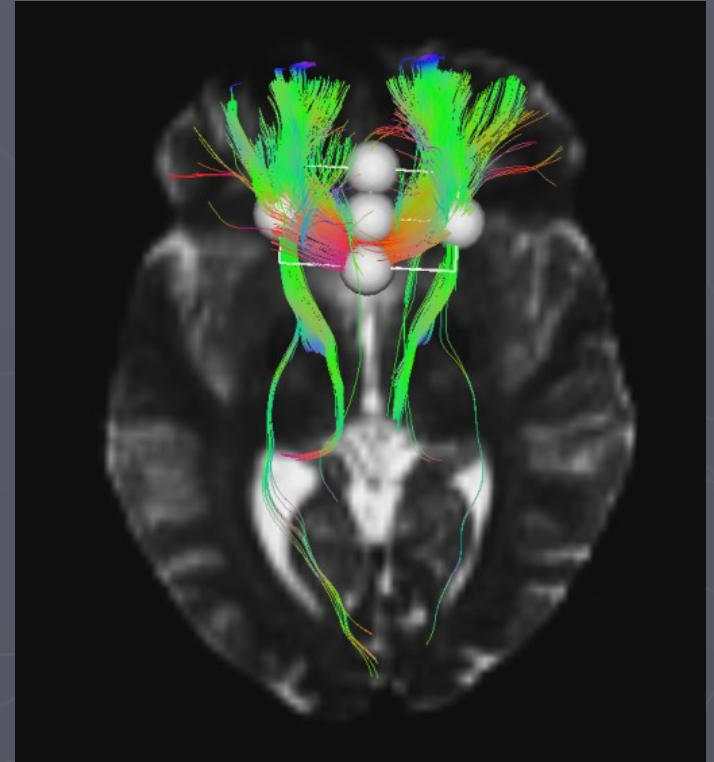
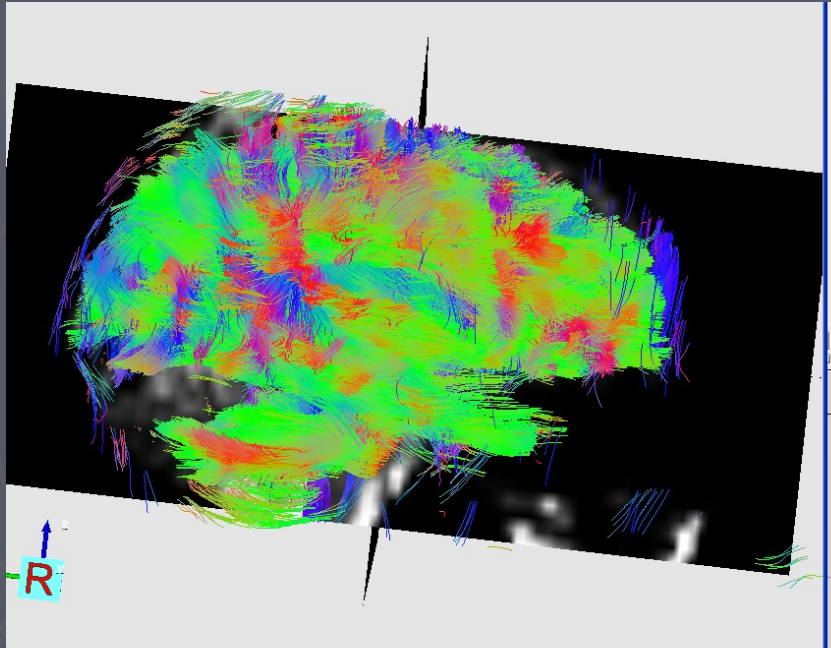
- . ECHO PLANAR

susceptibilité magnétique

images fantômes (courants induits)



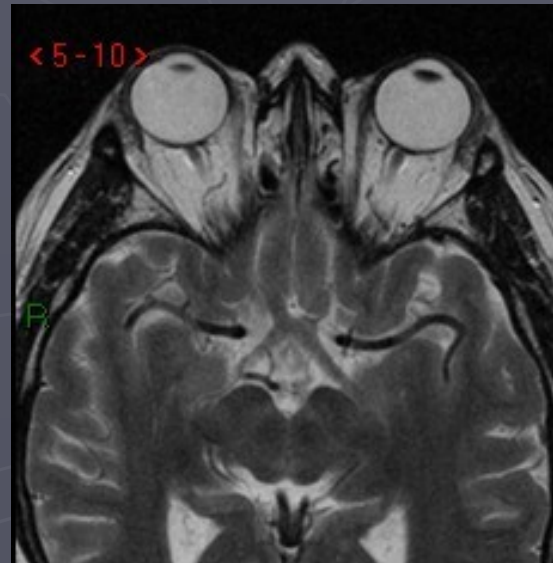
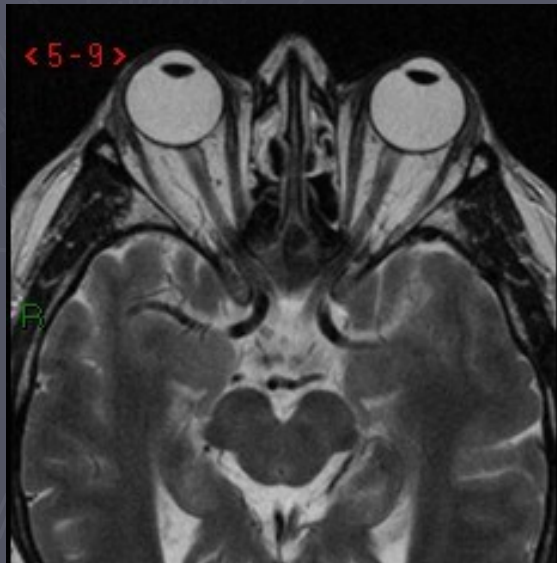
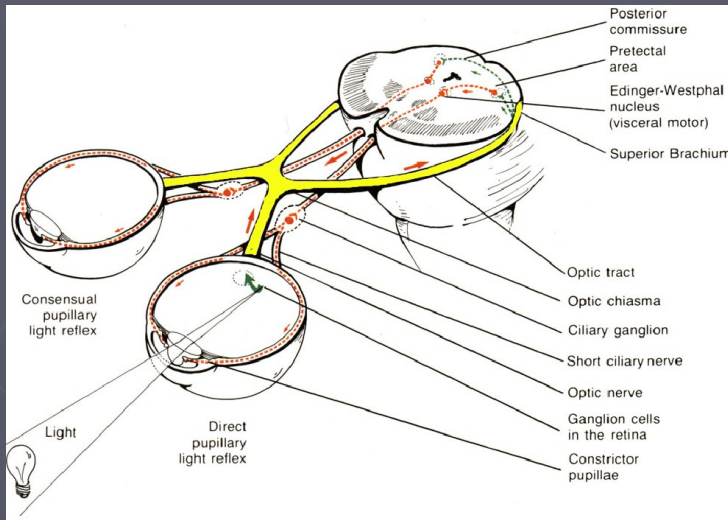
➤ Post traitement



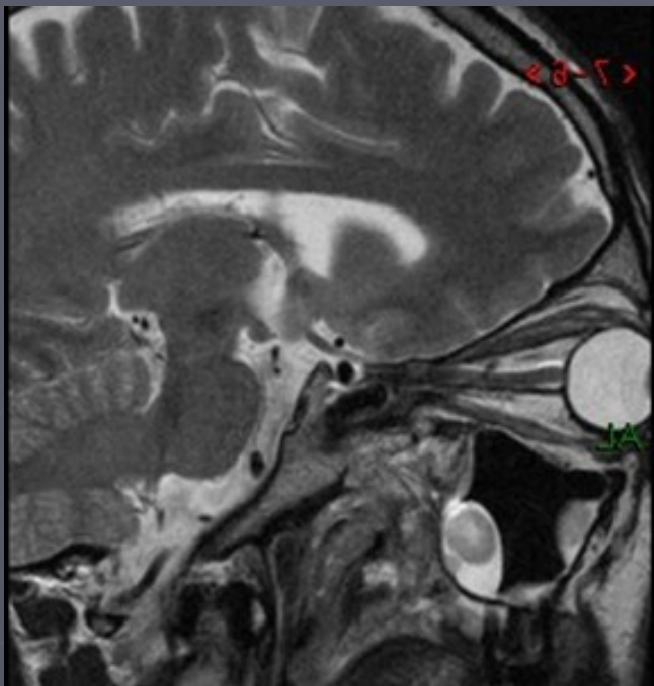
En cas de croisement de fibres dans un même voxel (algorithme FACT ++
+)
=> artefact



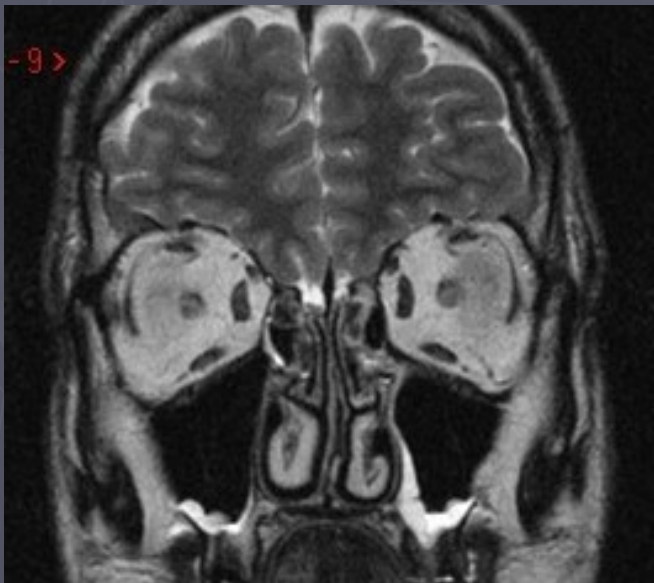
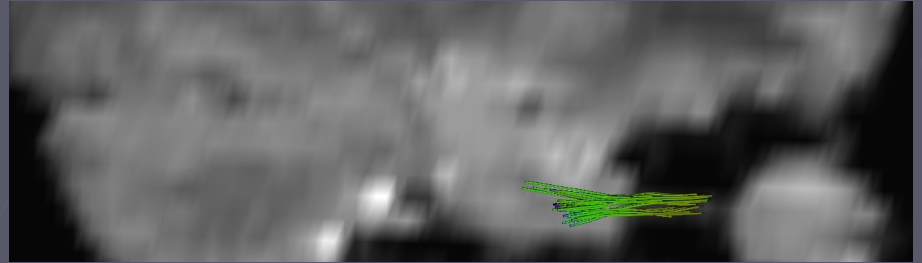
Imagerie normale



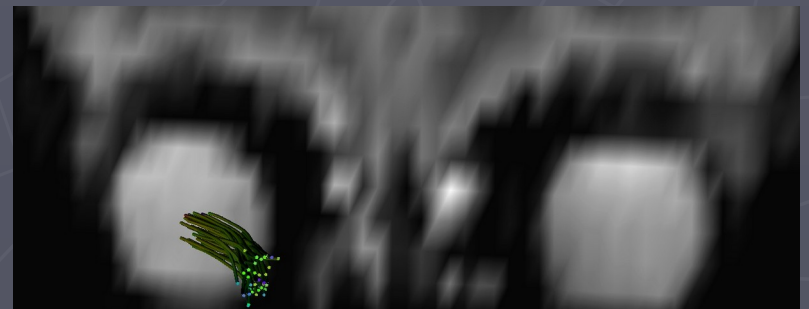
NO axial



sagittal T2

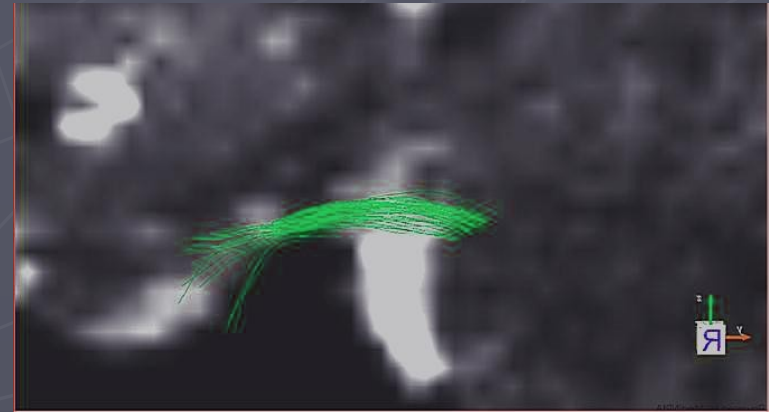
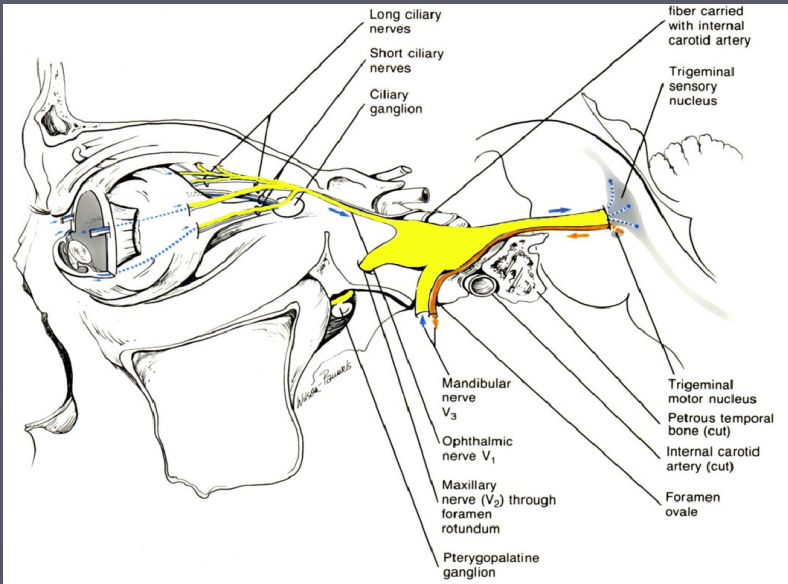


coronal T2

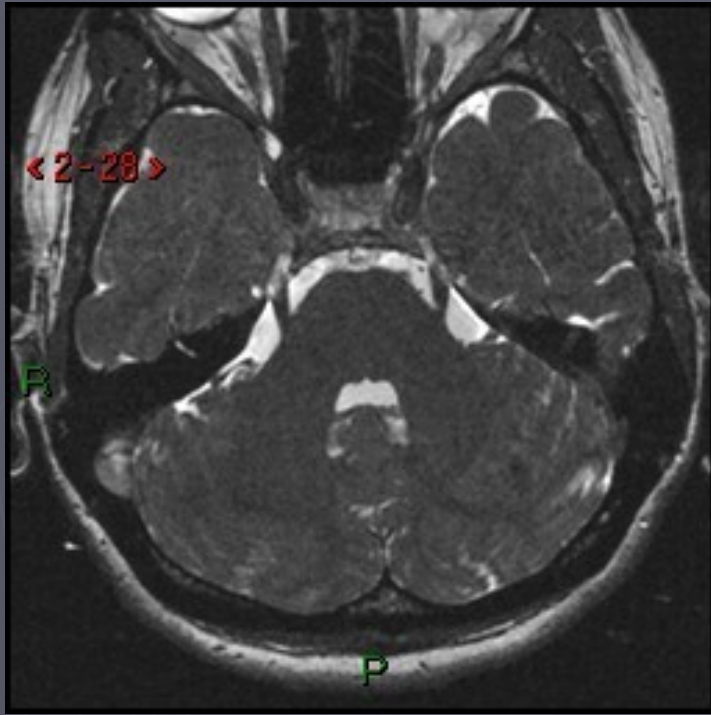


V

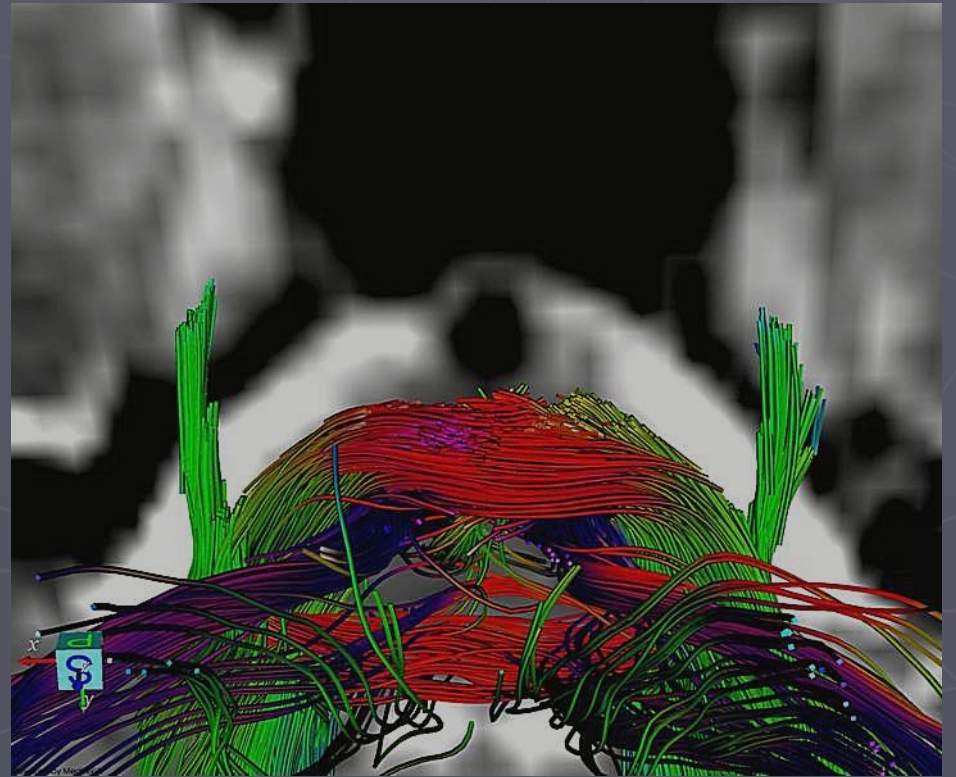
sagitta
|



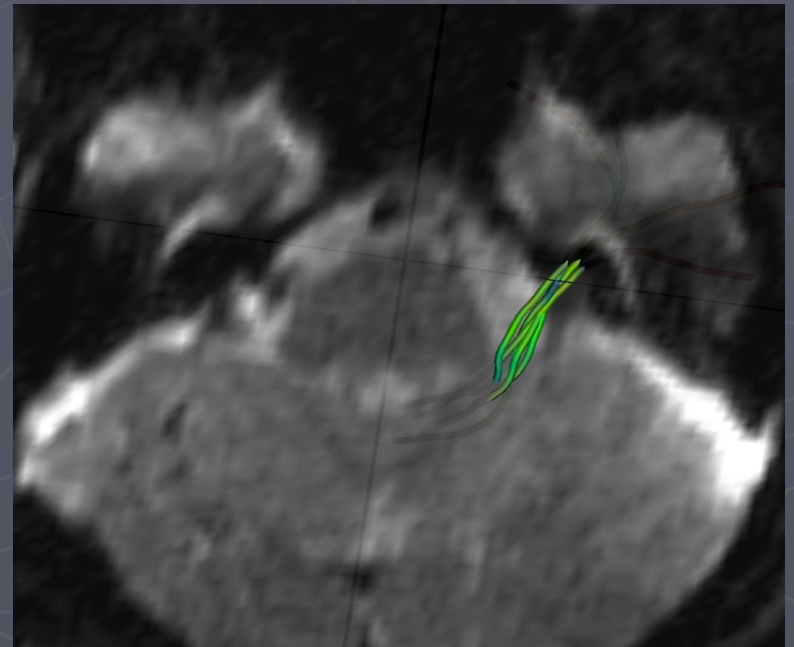
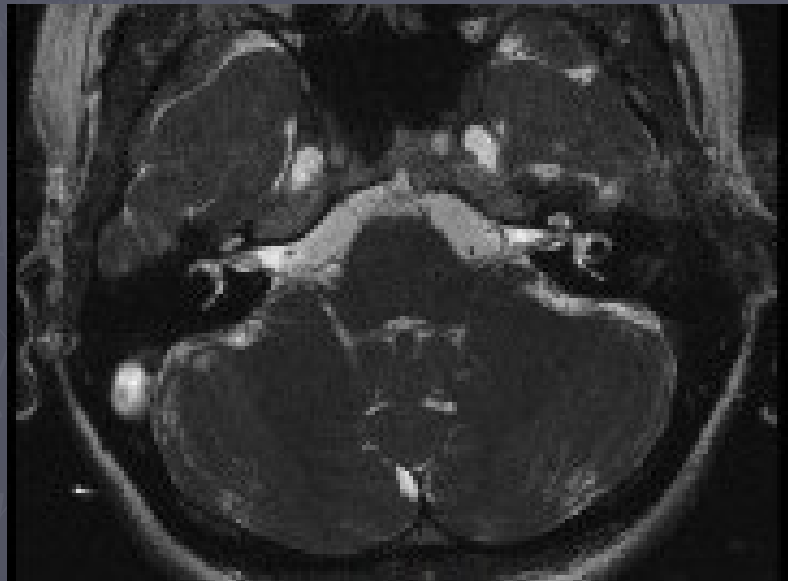
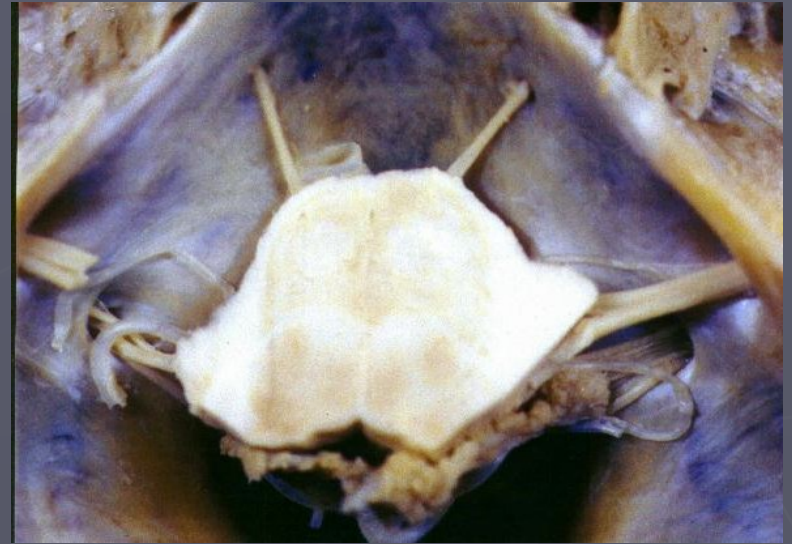
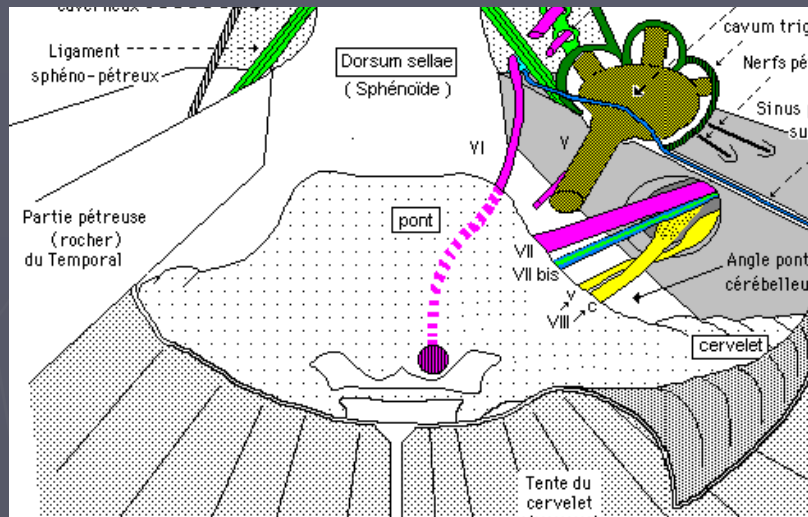
sagittal oblique CISS



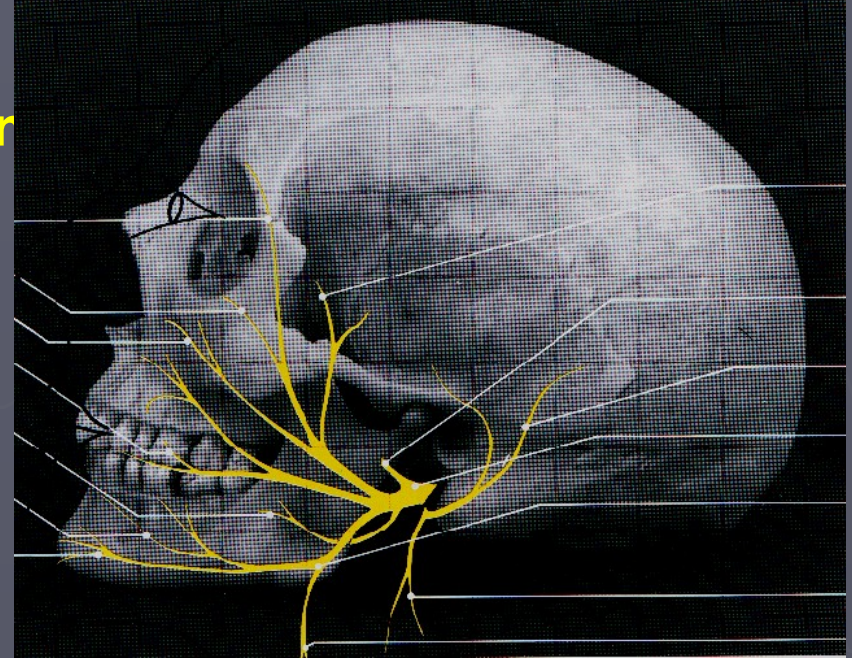
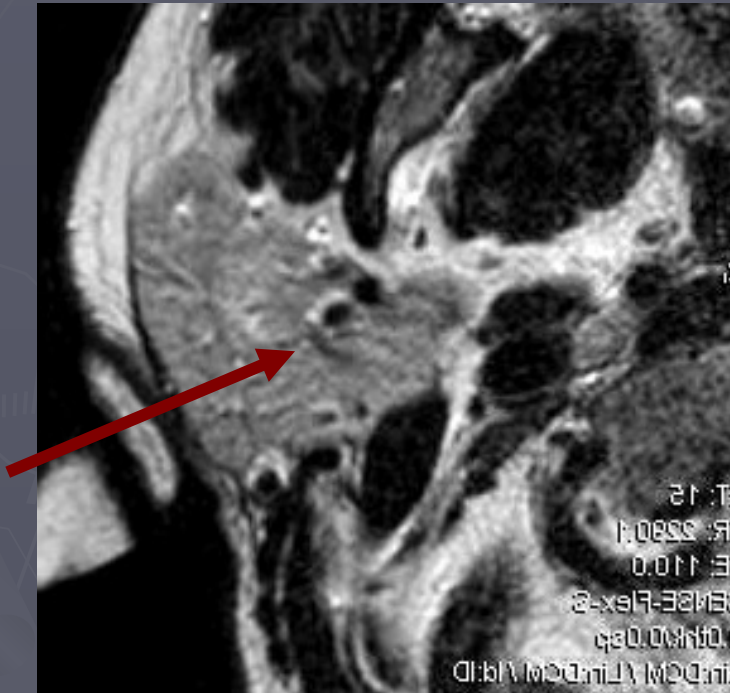
axial



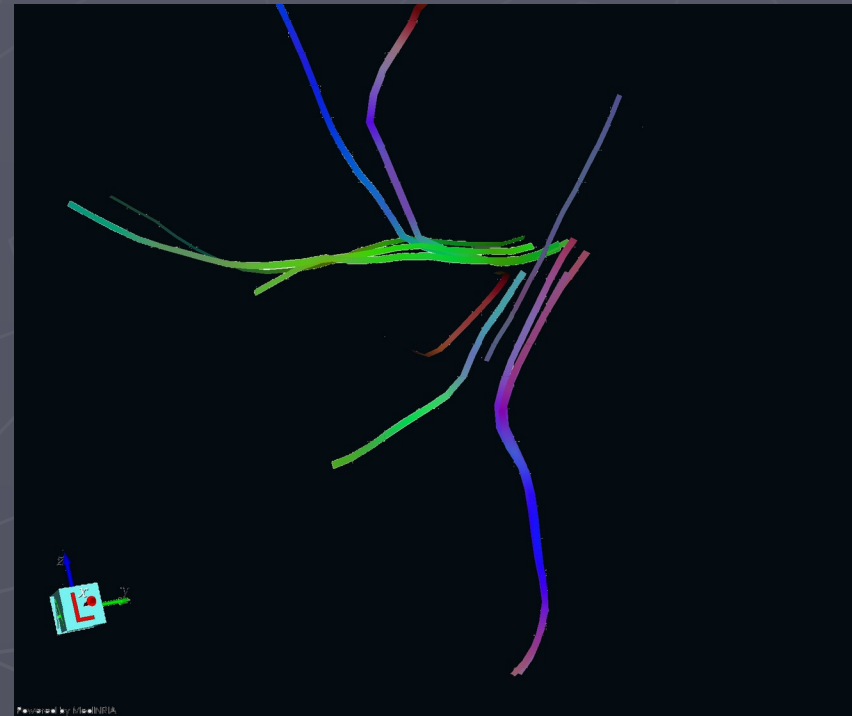
VII et VIII (portion cisternale)



VII (portion intraparotidienne)



sagittal



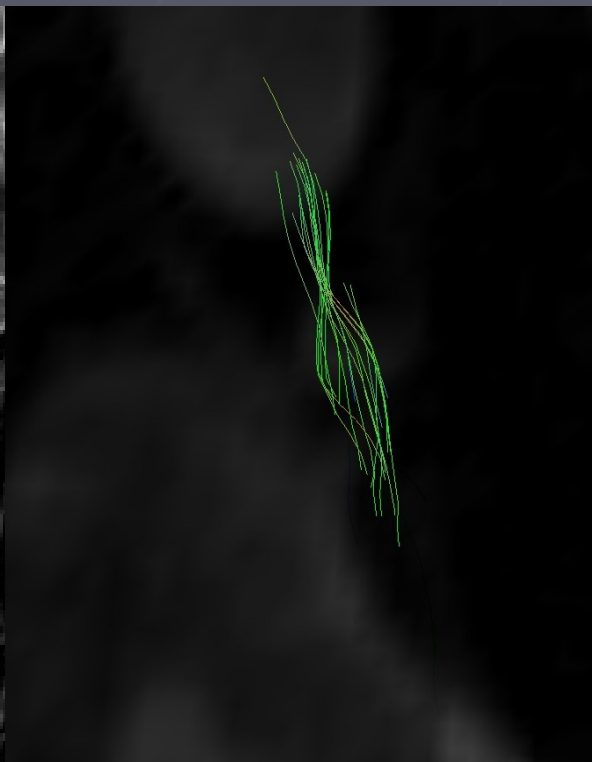
Quelques cas cliniques



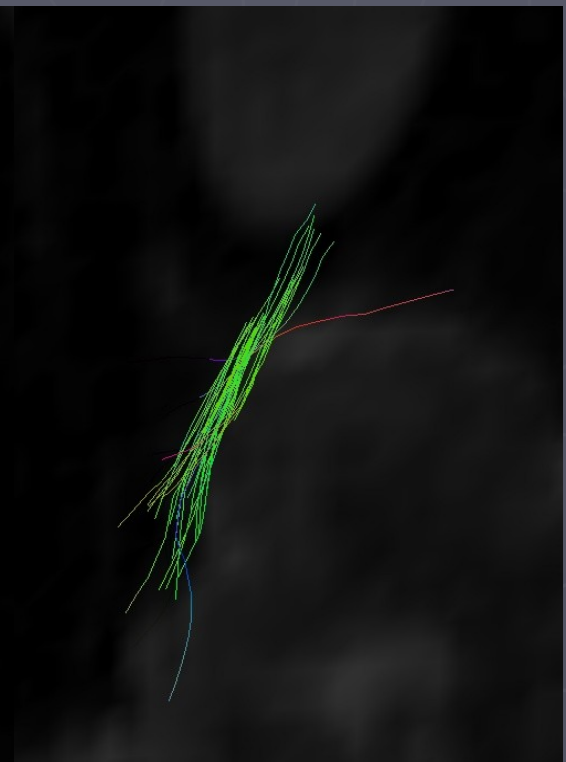
SEP depuis 1998, NORB aigue droite



Hypersignal T2 du NO droit

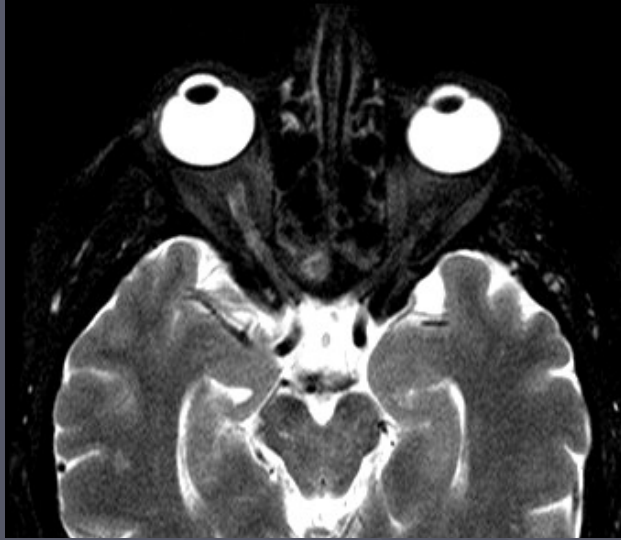


NO droit
destruction des fibres

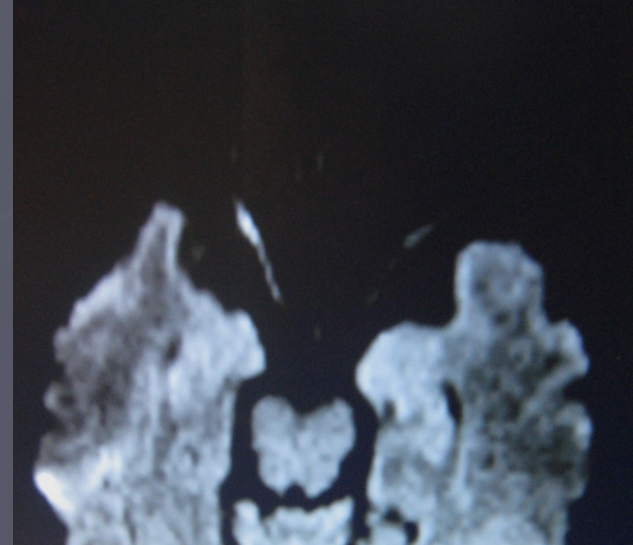


NO gauche
aspect normal

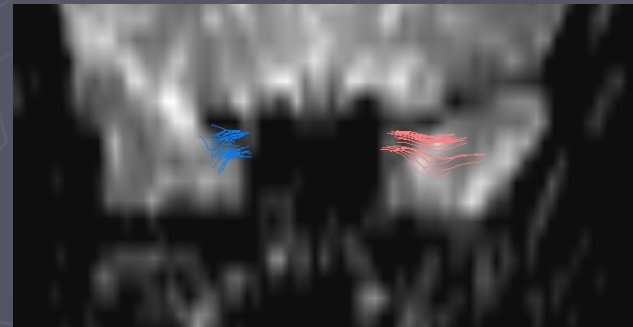
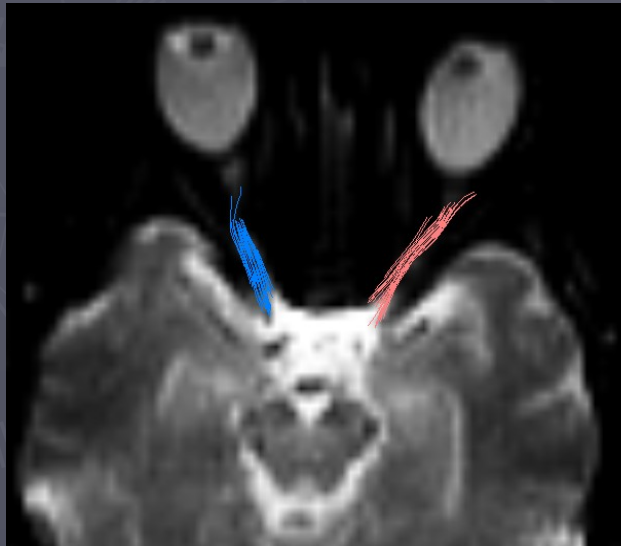
Ischémie nerf optique



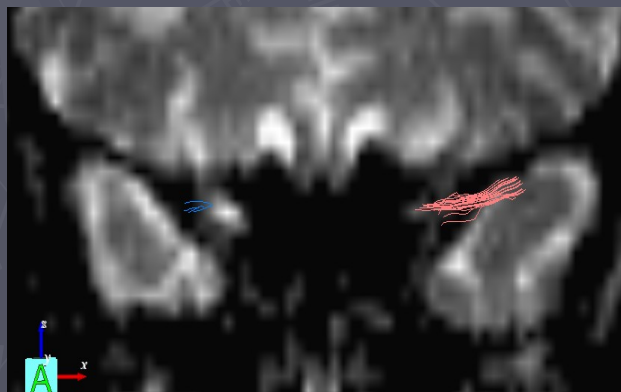
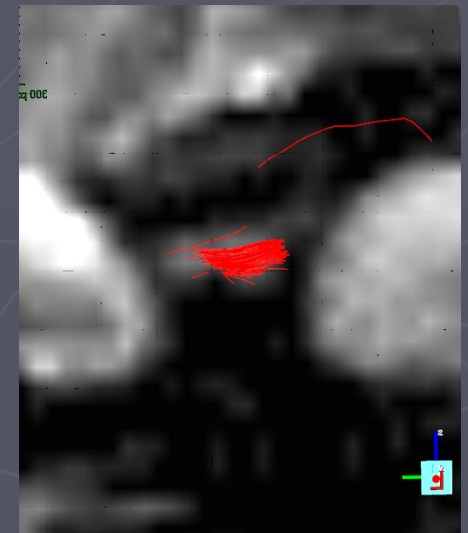
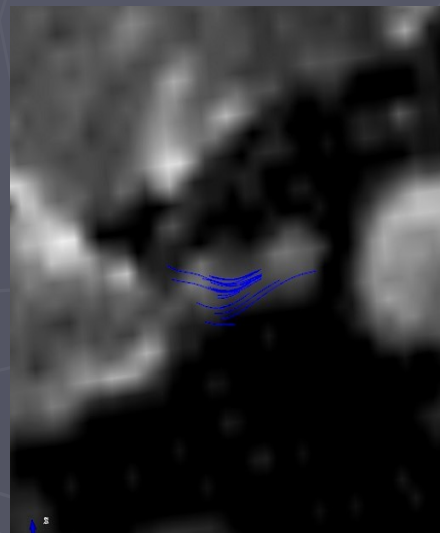
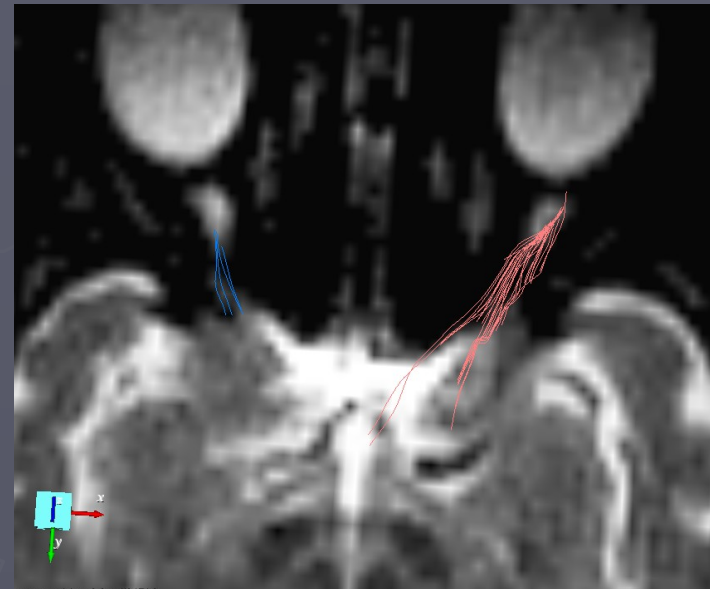
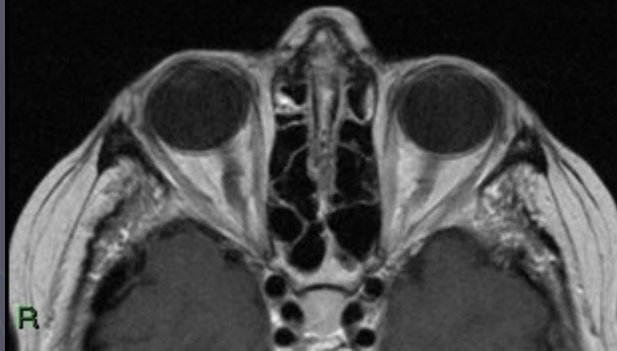
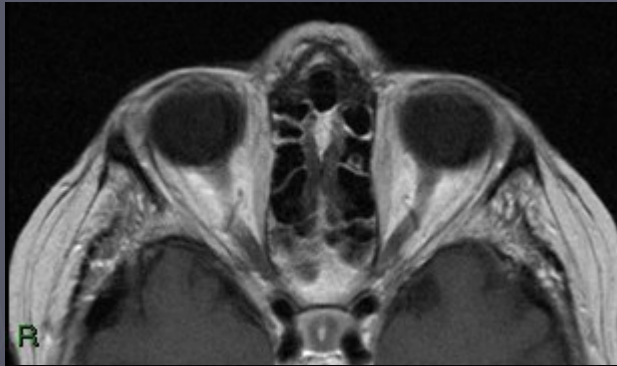
Hypersignal STIR du NO droit



Hypersignal DIFF du NO droit



Contrôle à 6 mois



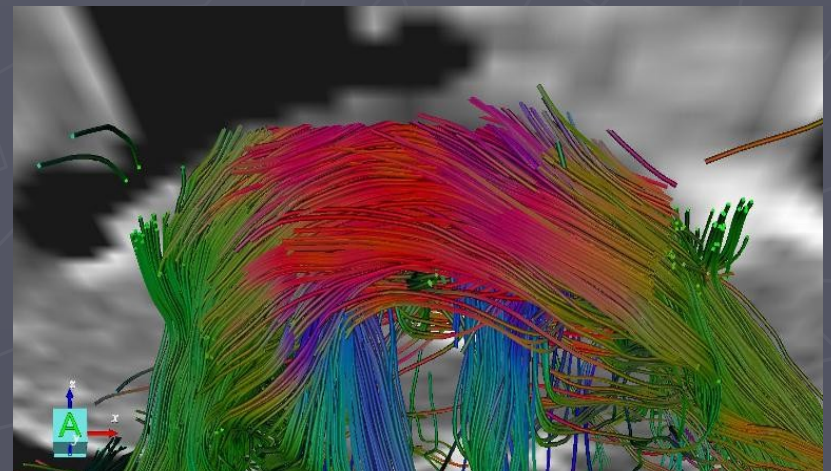
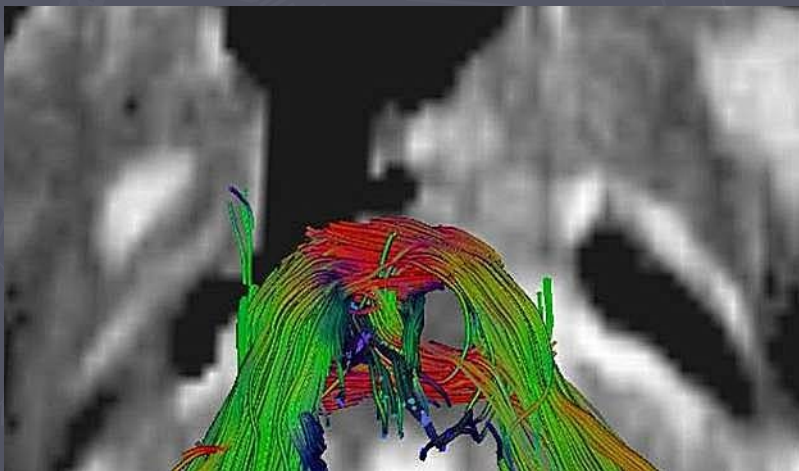
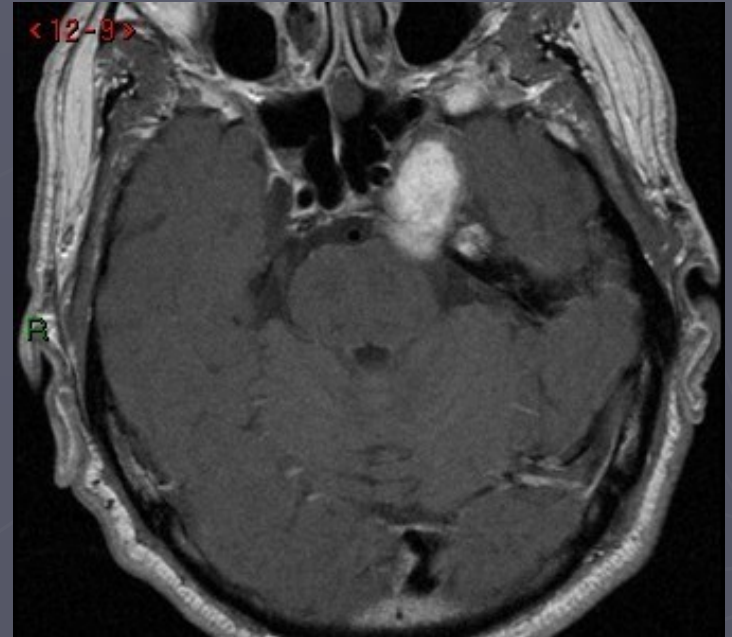
coronal

sagittal NO droit

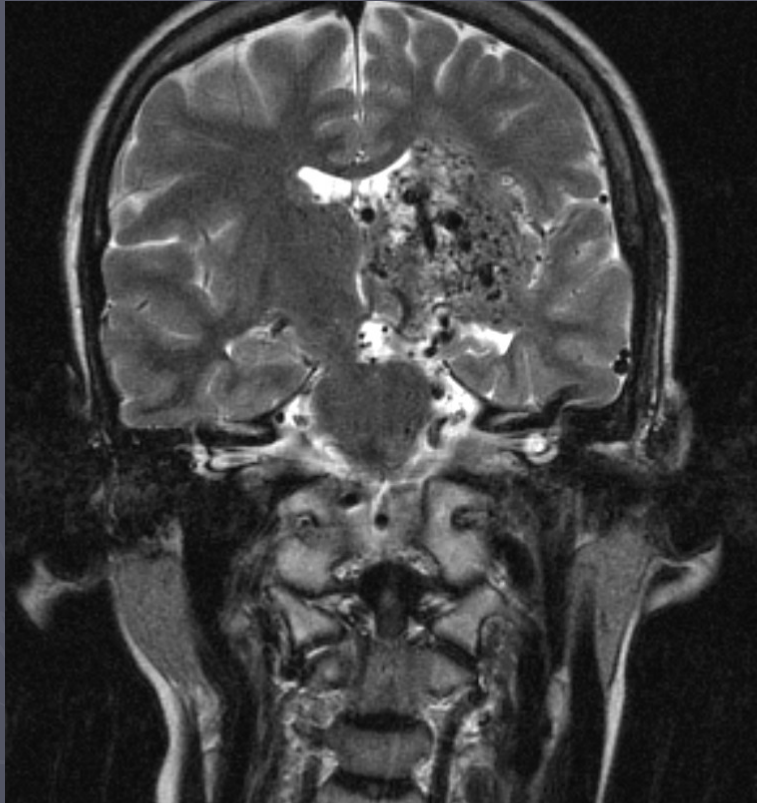
sagittal NO gauche

V

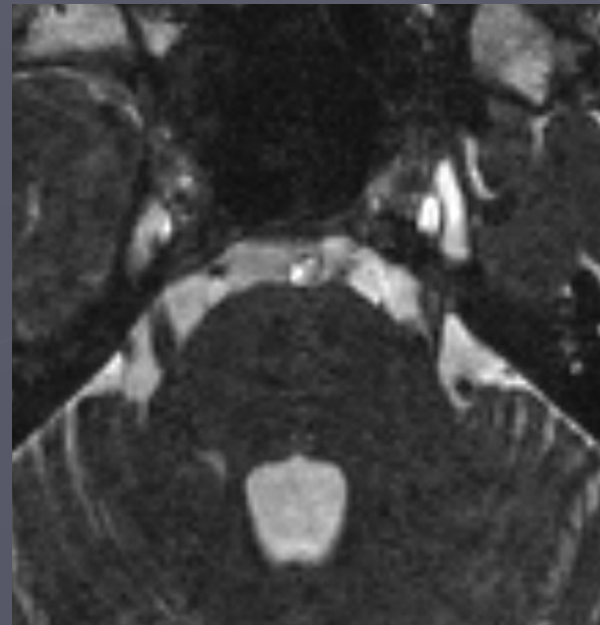
Méningiome du nerf V



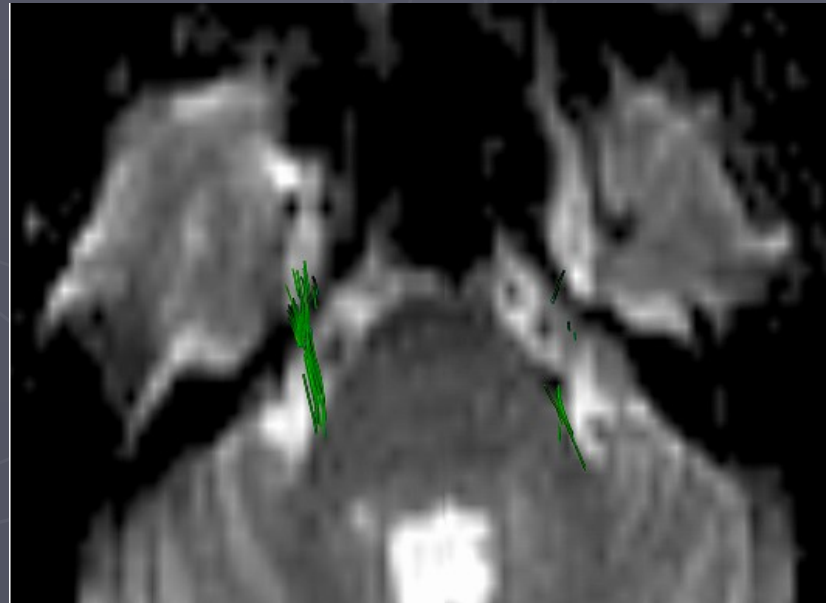
CAMS



coronal T2

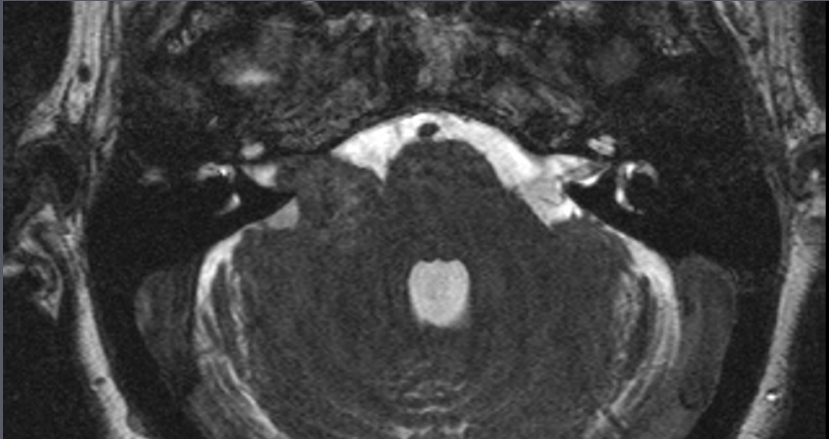


axial CISS

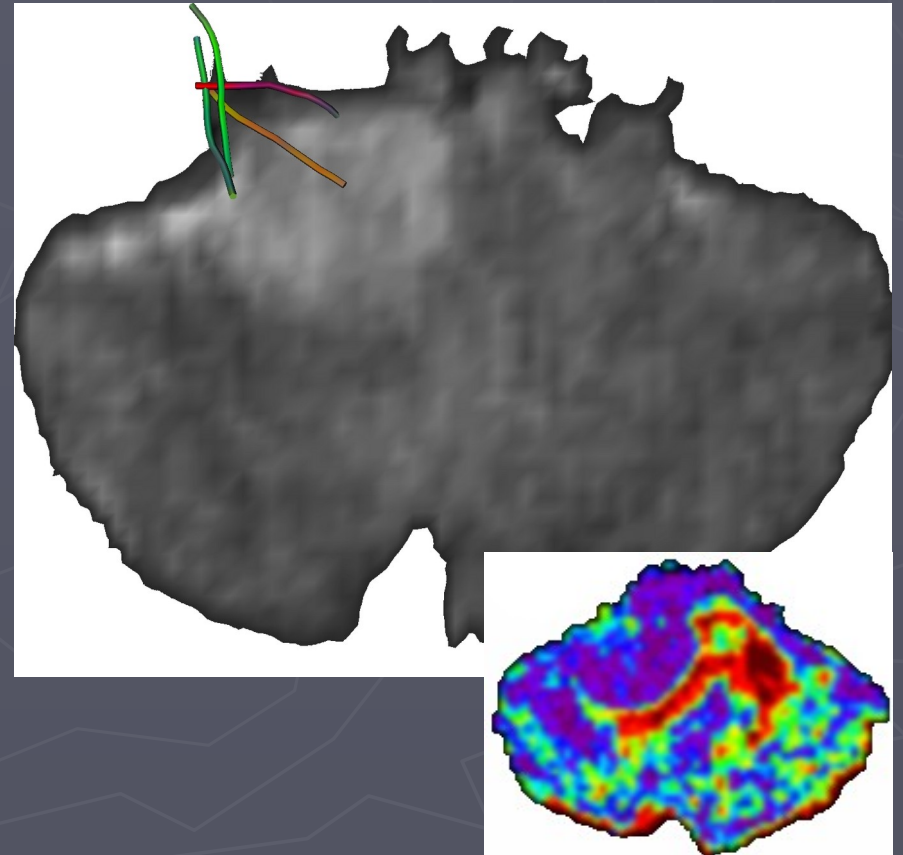


VII et VIII

Schwannome du VIII

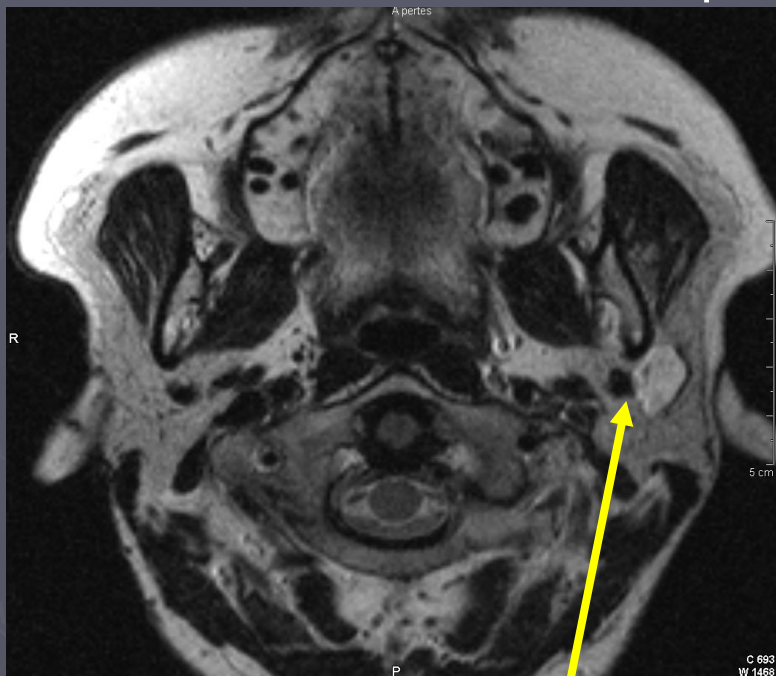


axial CISS

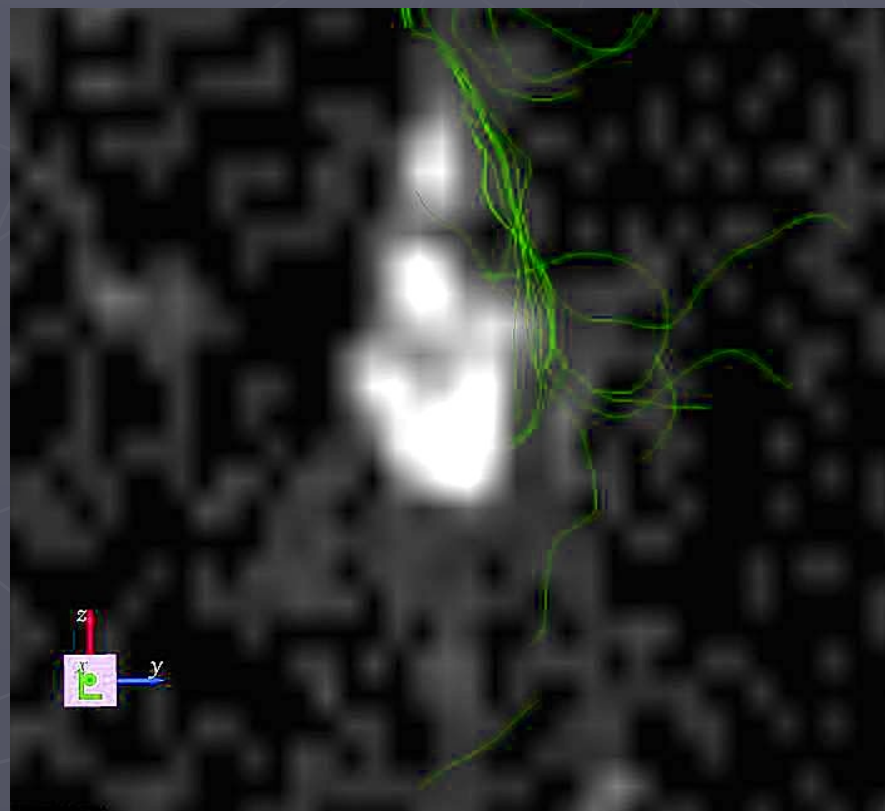


VII

Adénome pléomorphe exofacial



sagitta



Conclusion

- **Bonne visualisation des plus gros nerfs crâniens, en complément des séquences standards**
- **Aide au diagnostic**
- **Suivi évolutif amélioré**
- **Aide dans le traitement des pathologies**
- **AVENIR : diagnostic de lésions non visibles sur l'imagerie « classique » et pronostic envisageable**