



*Les nouvelles orientations de  
la prise en charge chirurgicale  
des scolioses neurologiques*

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Hôpital Necker

# ● ● ● | Introduction



- La majorité des patients handicapés développent une déformation rachidienne évolutive (75%) → Douleurs, inconfort, Pb respiratoires, Pb digestifs, réduction de l'espérance de vie, etc.

- Les déformations rachidiennes sont secondaires:

- Troubles du tonus et/ou de la force musculaire
- Troubles de l'équilibre



# ● ● ● | Introduction

- Le **Syndrome du Déficit de Verticalité** apparaît tôt
    - N'est pas une déformation fixée
    - Trouble fonctionnel +++
- Prise en charge précoce



# Traitement classique des Scolioses Neurologiques

Associe un traitement orthopédique initial, suivi d'une arthrodèse à l'adolescence, mais...

## 1/ Le traitement orthopédique:

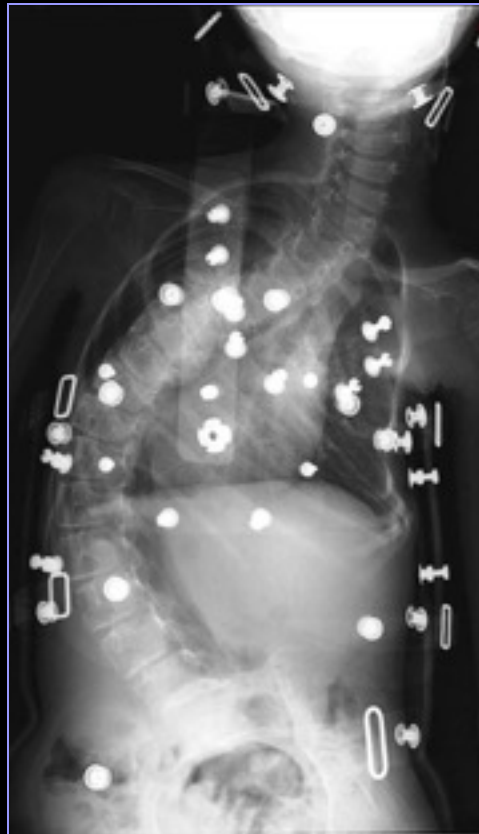
- Difficile
- Contraignant
- +/- bien toléré
- Exige une haute technicité
- Orthoprothésiste dépendant
- Couteux
- etc..



# Traitement classique

2/ Le TO est **inefficace** sur les troubles du tonus = **TTT palliatif**

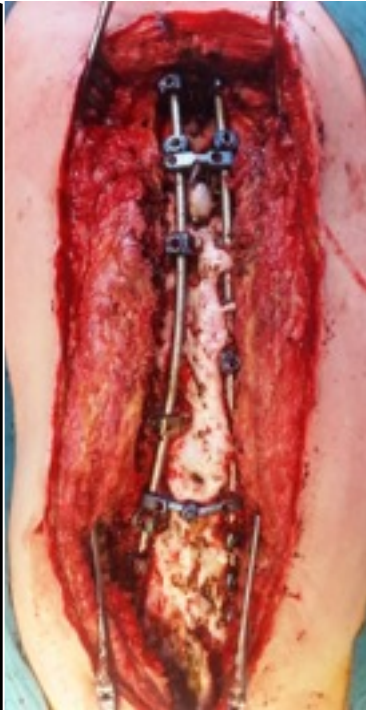
3/ Il est **incapable** d'arrêter l'évolution des SNM = **TTT d'attente**



# Traitement classique

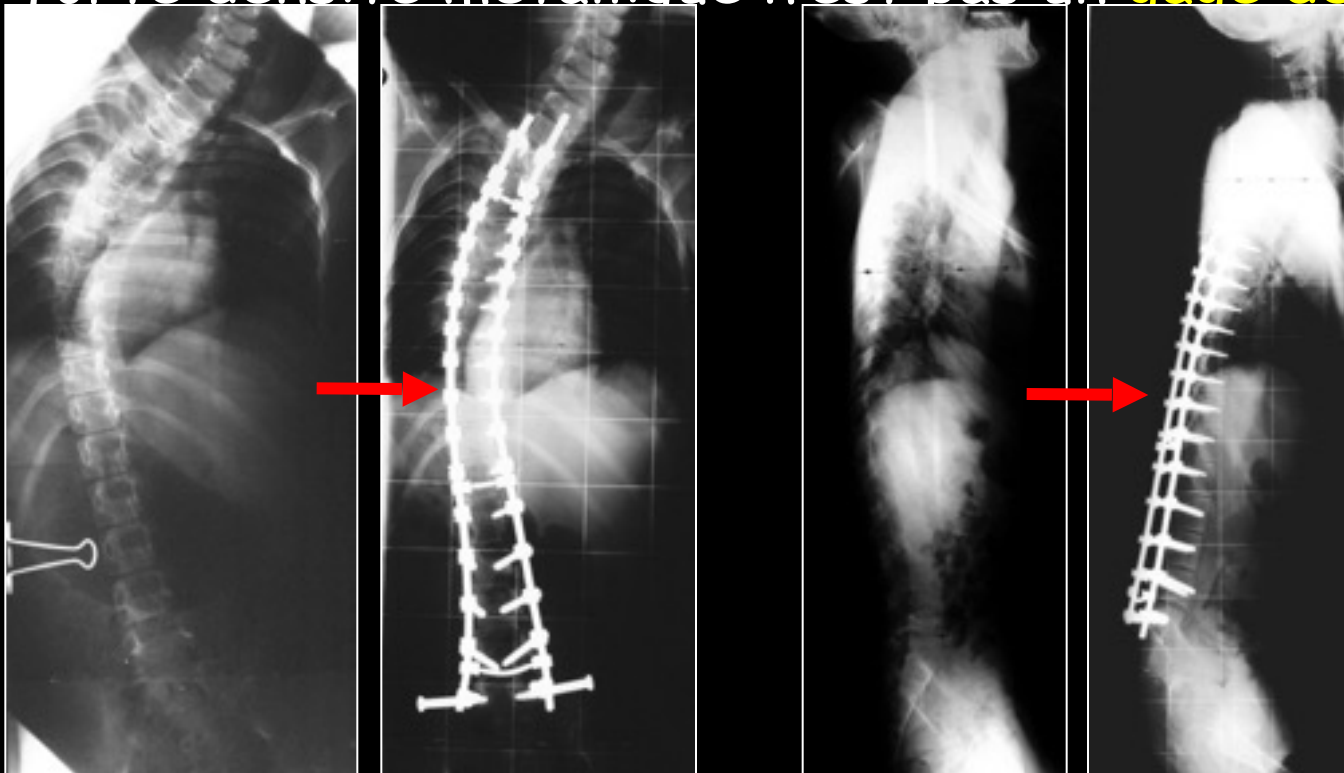
4/ L'arthrodèse dans les SNM est une chirurgie lourde, hémorragique et à **haut risque** (30 à 55% de complications)

5/ C'est une chirurgie qui **arrête la croissance** chez l'enfant (tronc et thorax) +++



# Traitement classique

- 6/ L'arthrodèse est un TTT mécaniquement **surdimensionné** par rapport aux besoins des patients neurologiques
- 7/ Une forte densité métallique n'est pas un **gage de qualité**



# Alternative

1/ **Plus efficace** et plus confortable que le traitement orthopédique,

2/ Moins lourde et **moins risquée** que l'arthrodèse (pour un résultat final au moins équivalent) ?



Chirurgie Mini Invasive



# ● ● ● | La Chirurgie Mini Invasive

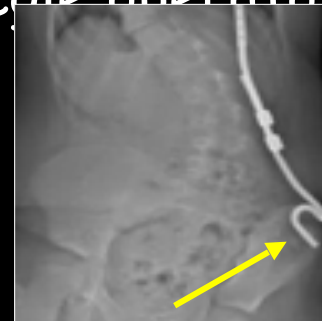
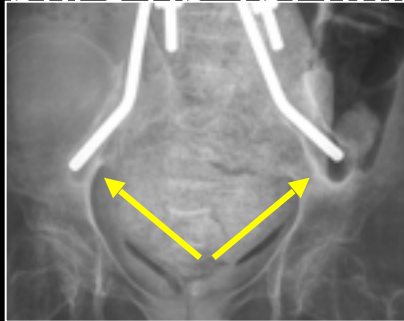
- 1/ Instrumentation sans greffe **définitive** (et non provisoire)
- 2/ ISG **évolutive** : → Correction progressive dans le temps
- 3/ Réalisée de façon **moins agressive**



# Mais l'instrumentation sans greffe

Est une chirurgie délicate, exigeante et sujette à de **nombreuses complications** liées:

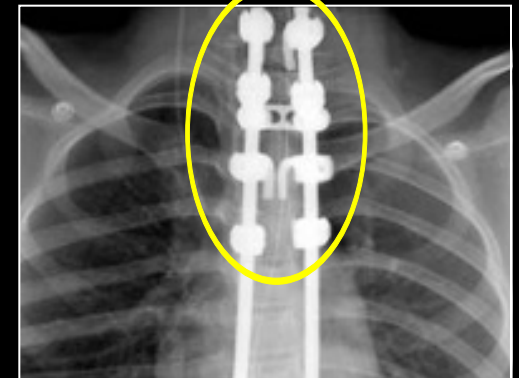
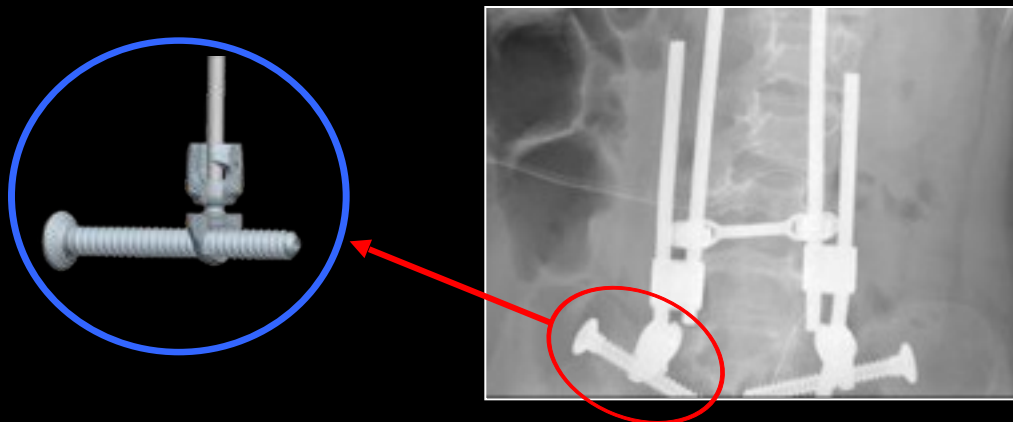
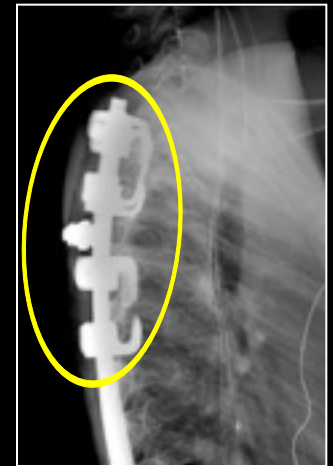
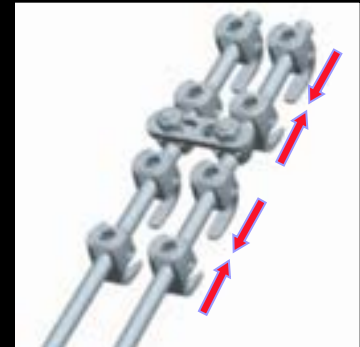
- 1- Mauvais état général des patients neurologiques
- 2- Mauvaise tenue des implants dans leur os fragile
- 3- Erreurs de technique ou de stratégie opératoire



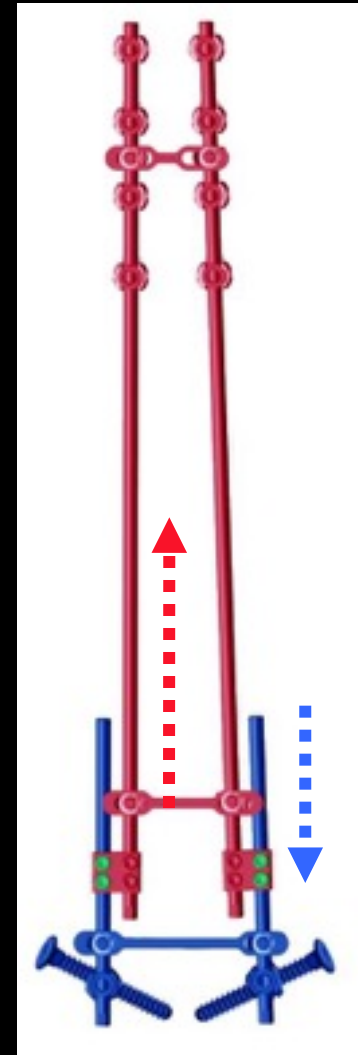
Comment les prévenir ?

# ● ● ● | Fixation bipolaire solide

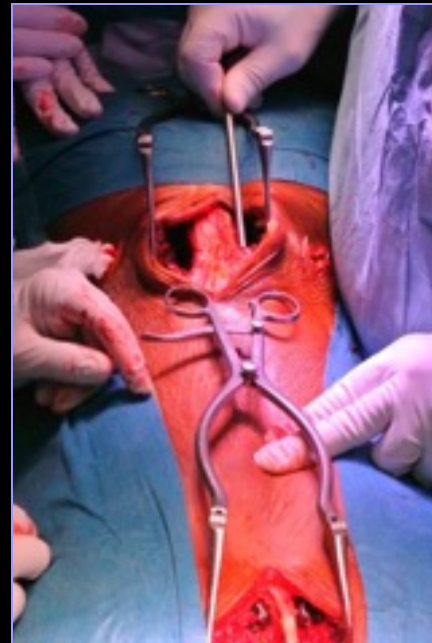
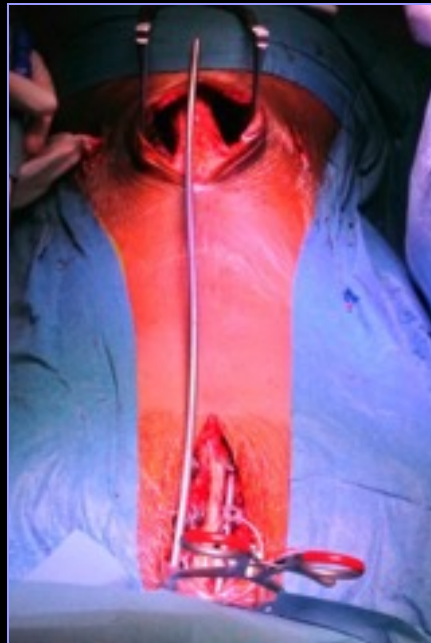
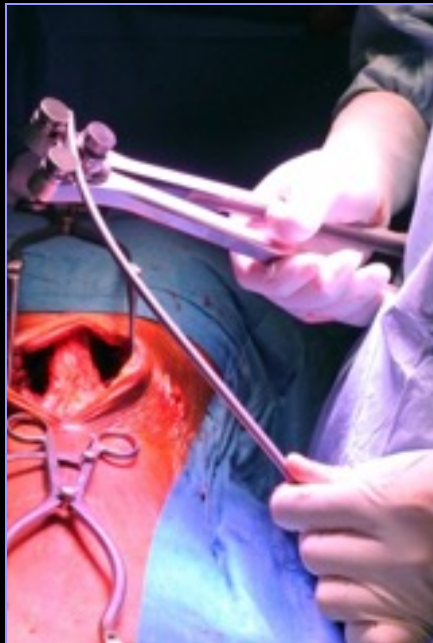
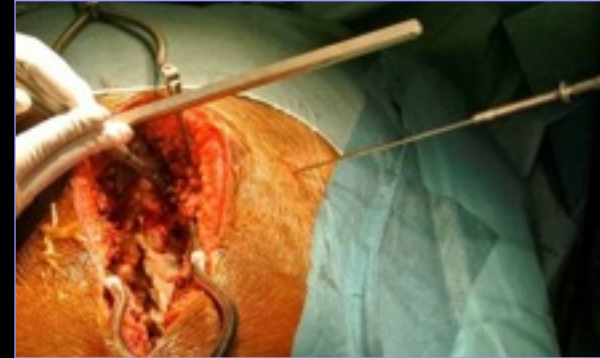
- Proximale (vertébrale) : 8 crochets en 2 « pinces » pédiculo-sus-lamaires bilatérales
- Distale (pelvienne) : Vis ilio sacrées +++



# Montage télescopique en cadre



# ● ● ● Voie mini invasive



# Suites opératoires

- Station assise/debout dès que possible sans contention externe (sauf tenue de tête)
- Retention des tiges (tous les 18 à 24 mois en attendant la tige automatique) →



j-1



j2 PO



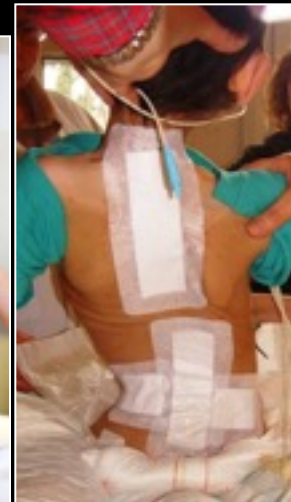
j-1



j3 PO



j-1

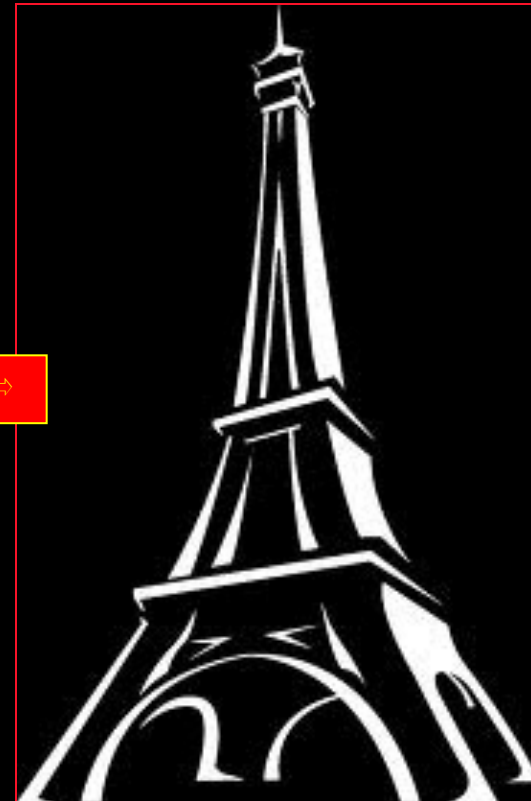
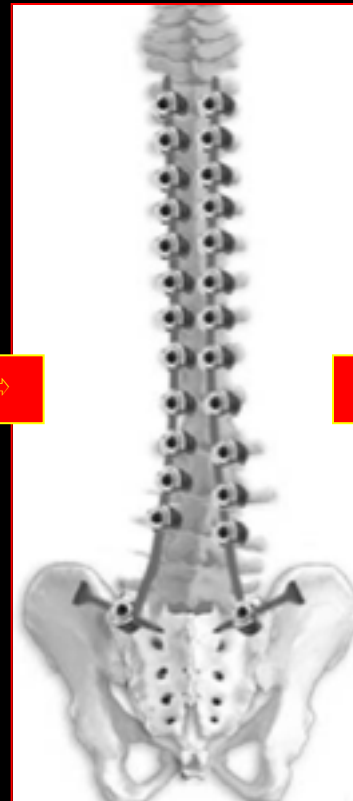
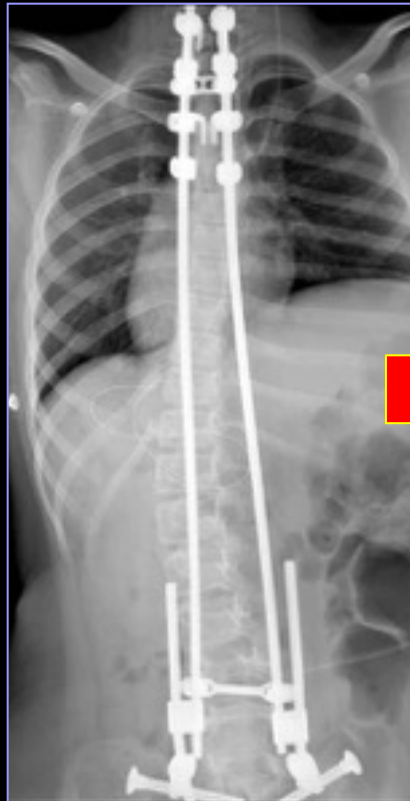
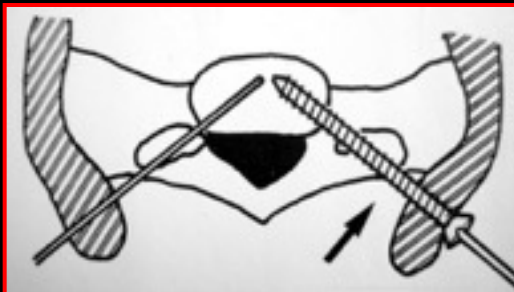


j5 PO

# Biomécanique

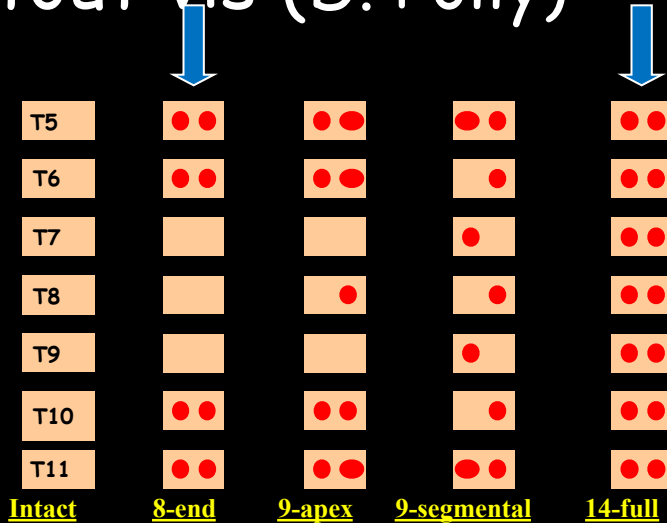
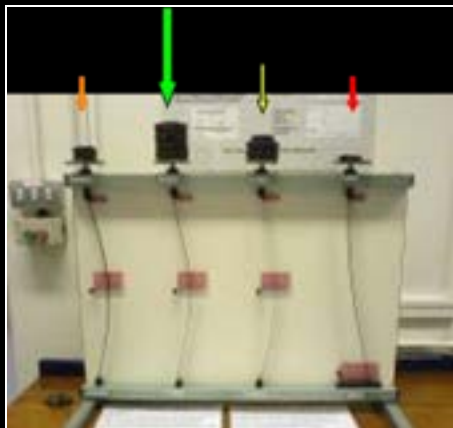
Le montage est :

→ Solide et stable (ancrage pelvien, forme géométrique)



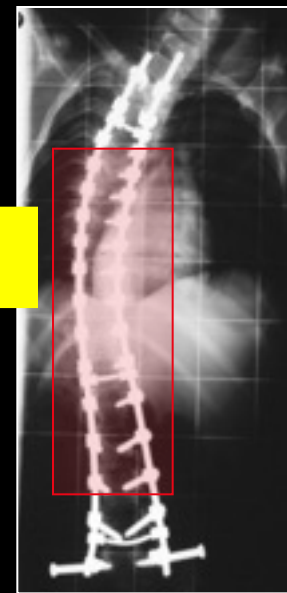
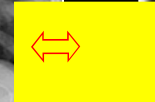
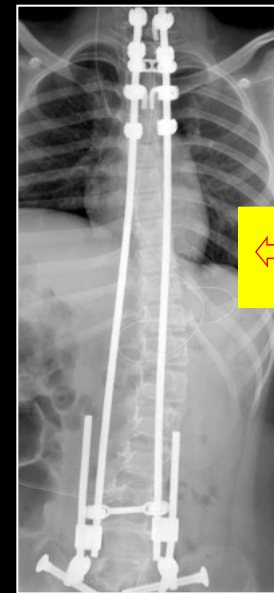
# Biomécanique

→ Le montage bipolaire est aussi solide qu'un montage tout vis (D. Polly)\*



● Pedicular screw

8-end ⇔ 14-full

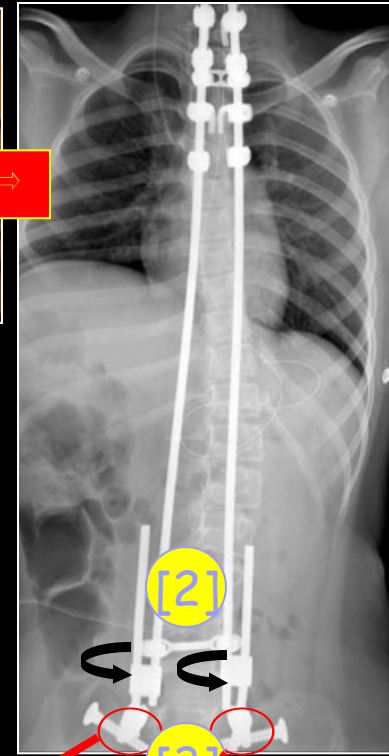


\* Pedicle Screw Fixation of the Thoracic Spine: An *In Vitro* Biomechanical Study on Different Configurations

Vedat Deviren, MD,\* Emre Acaroglu, MD,\* Joe Lee, BS,\* Masaru Fujita, MD,\*  
 Serena Hu, MD,\* Lawrence G. Lenke, MD,† David Polly, Jr., MD,‡ Timothy R. Kuklo, MD,§  
 Michael O'Brien, MD,|| David Brunfeld, MS,¶ and Christian M. Pustitz, PhD\*



# Biomécanique

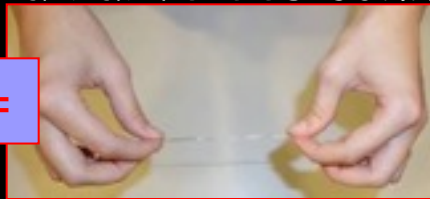


→ Montage résistant : "effets fusibles"

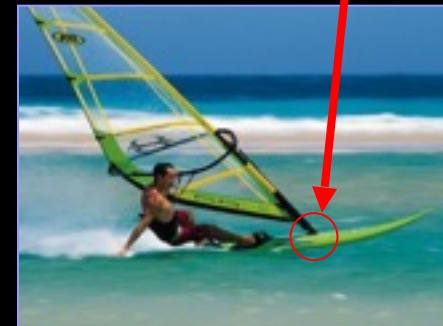
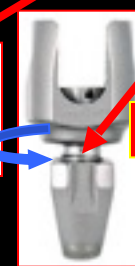
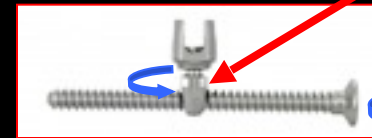
1/ Flexibilité des tiges (roseaux, trombone) [1]

2/ Rotation des dominos [2]

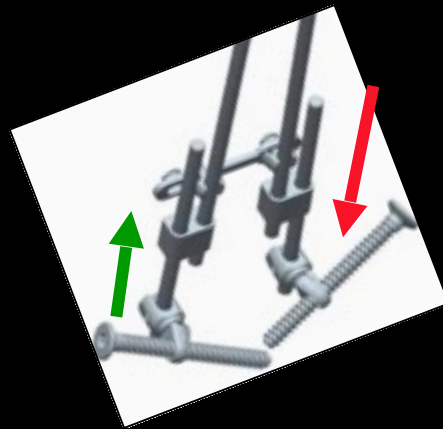
3/ Poly axialité des connecteurs (diabolo) [3]



[1]

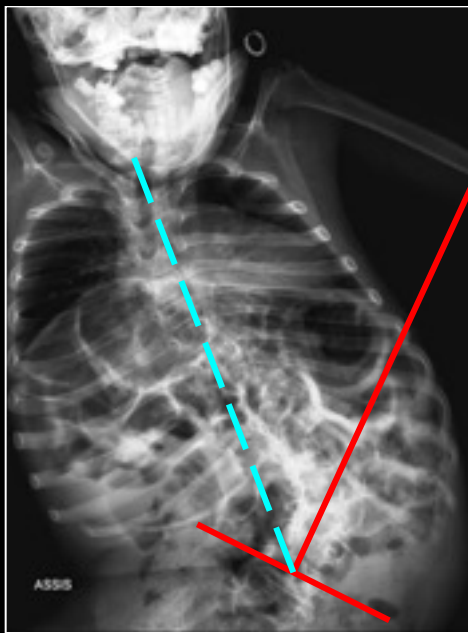


# Biomécanique



Le montage est :

→ Evolutif (télescopique → correction progressive avec des retentions +/- symétriques)

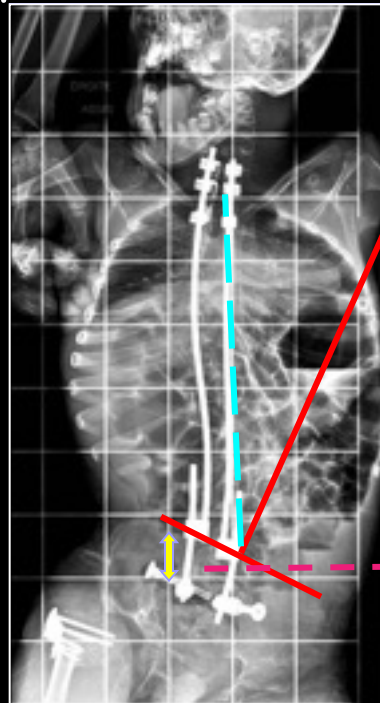


Initiale

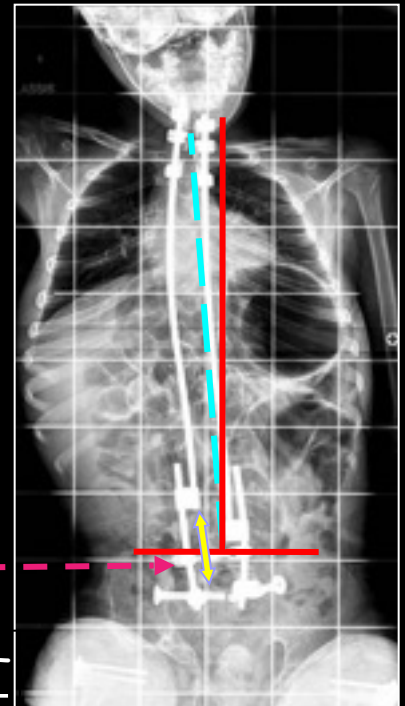


1a PO

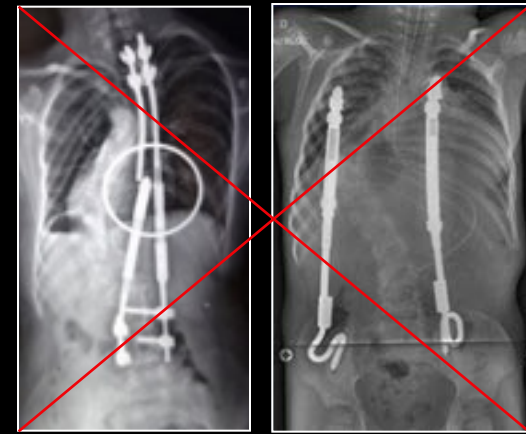
Pré RT



Post RT

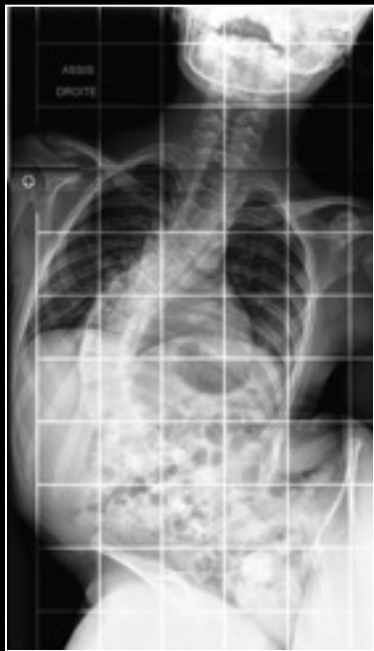


# Biomécanique

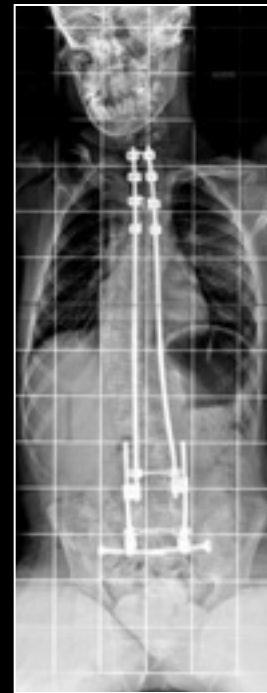


→ Le montage est définitif

Il aboutit à une ankylose rachidienne progressive



Initiale (12ans)



Finale (17ans) +2 RT

# L'ankylose postopératoire: «vieillessement artificiel»

N'est pas une notion nouvelle:

- Harrington(1960),
- Luque(1970),
- SQR-CD(1980)



Luque

SQR-CD

- A. Jain et col. (JBJS 2016) 30/167 TSG non ankylosés

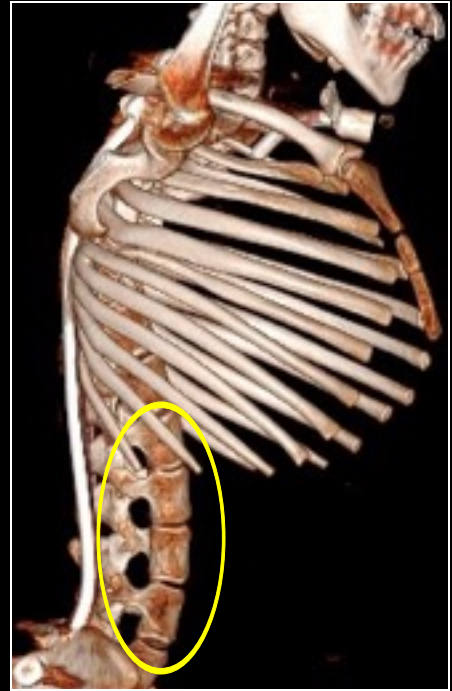
→ 18%



Fig. 2A through 2B Radiographs of a girl with neuromuscular scoliosis. Fig. 2A Initial presentation with a 137° curve at 13 years of age. Fig. 2B The patient with growing-rod treatment at age 13. Fig. 2C Final distraction at 16 years of age, after 4 intensifying distractions, demonstrating that the curve was corrected to 40°. Fig. 2D No curve progression was noted at the time of follow-up 1.7 years after the final surgery.



CUS



# Evolution de notre protocole

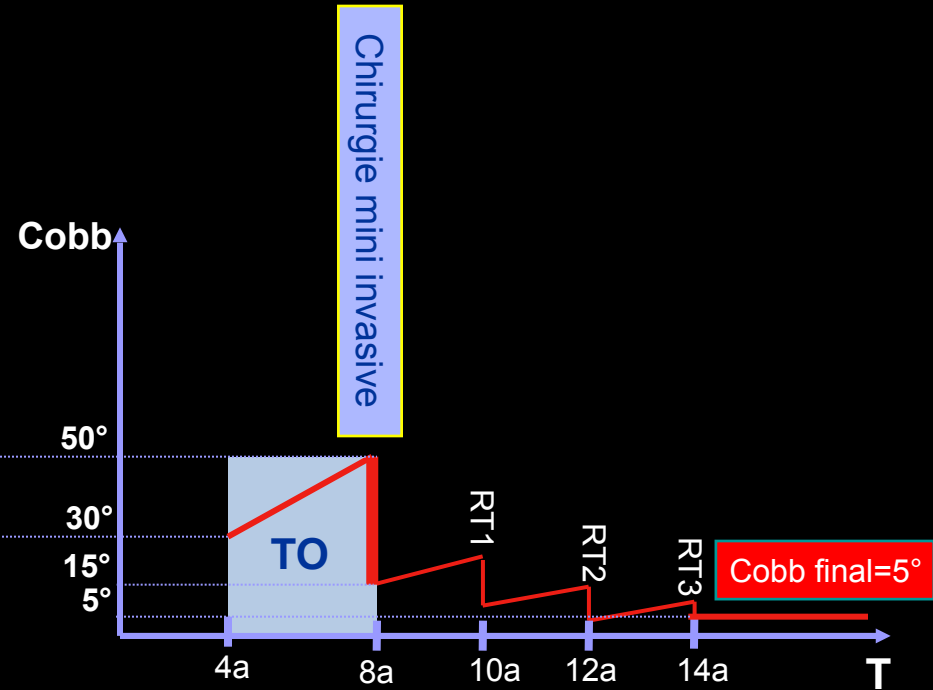
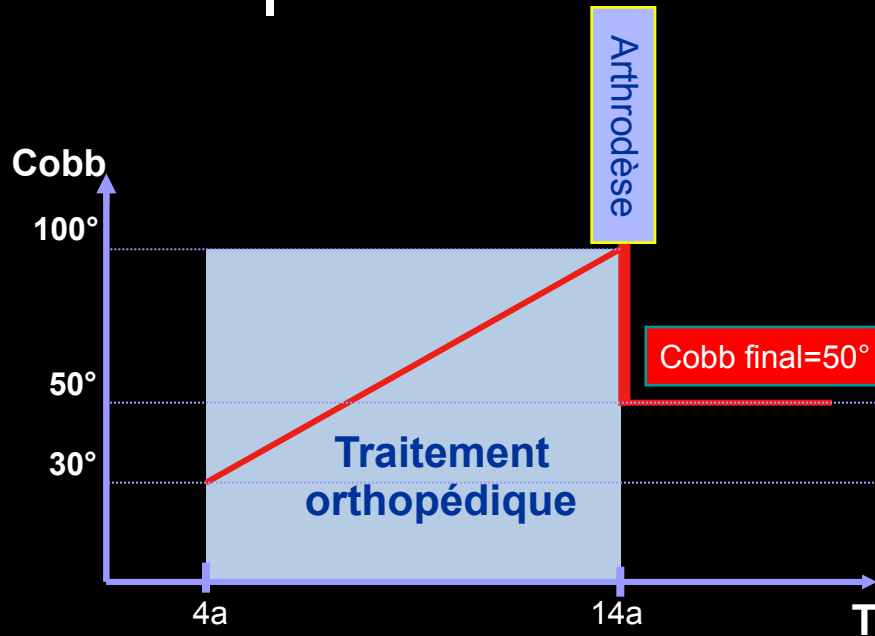


Schéma classique (St Vincent de Paul)

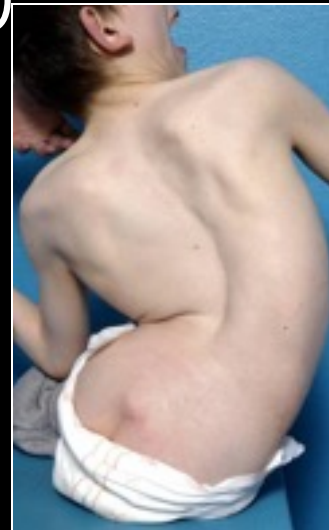
Nouveau Schéma (Necker)



# ● ● ● Notre série (Thèse M. Gaumé)

Etude rétrospective (2010-2015):

- 100 patients consécutifs, 58G + 42F
- Age opératoire moyen : 11+6a
- 61 PC, 22 ASI, 10 DM, 7 autres neuro
- Recul moyen : 2+7a (1 à 6a)



# Notre série

- Correction de l'angle de **Cobb**
  - Pré opératoire:  $88.66^\circ$  ( $25^\circ$ - $149^\circ$ )
  - Dernier recul:  $34.88^\circ$  ( $5.6^\circ$ - $52.62^\circ$ ) → **61%**
- Correction de **l'obliquité pelvienne**
  - Pré opératoire:  $28.44^\circ$  ( $0^\circ$ - $79.50^\circ$ )
  - Dernier recul:  $4.78^\circ$  ( $0^\circ$ - $21.90^\circ$ )

9ans  
Pré



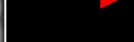
9ans  
PO



11ans  
(RT1)



13ans  
(RT2)



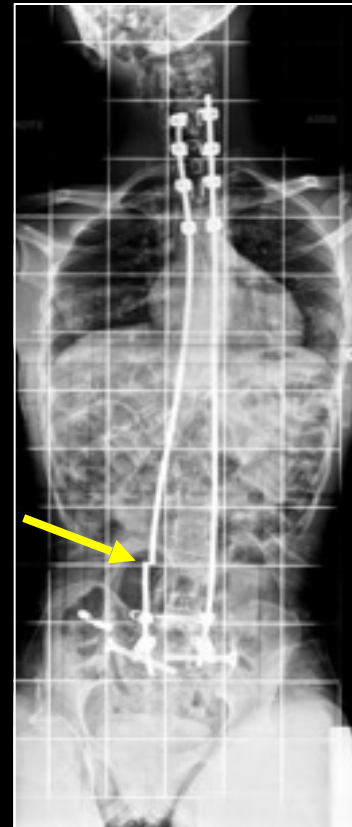
15ans  
(RT3)



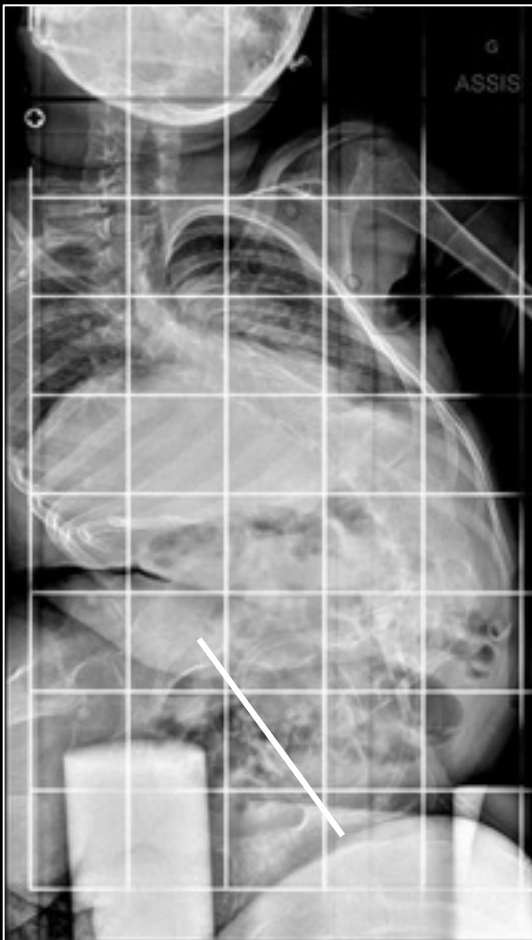


# ● ● ● | Notre série

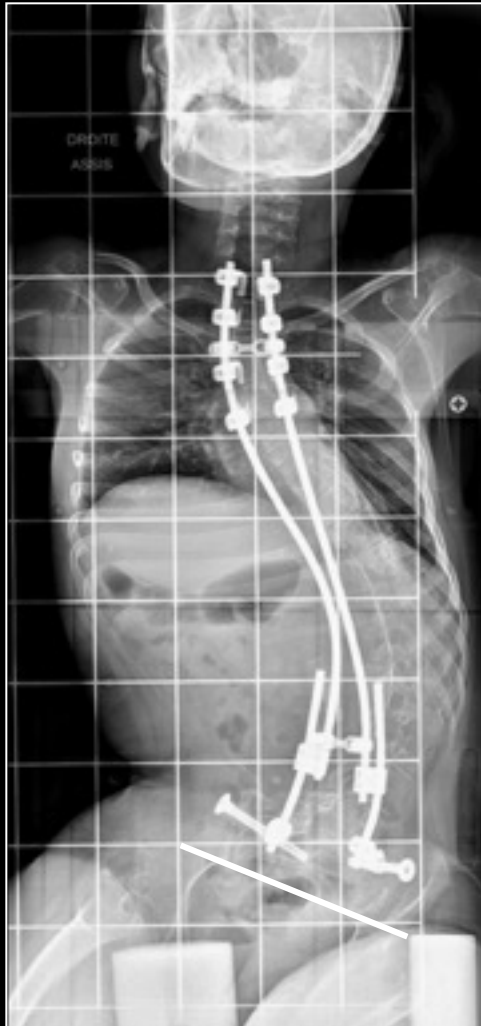
- Taux global de complications : **26%**
  - Infections: **16** (9 prof. + 7 superf.)
  - Liées aux implants: **6**
  - Digestives: 2
  - Pulmonaires: 2
- 10 interventions non programmées
- **14** Alertes PES dont 4 ont nécessité une modification du montage sans conséquences
- **1 Fracture de tige** (1<sup>ère</sup> version du montage)
- **Aucune** conversion en **arthrodèse**



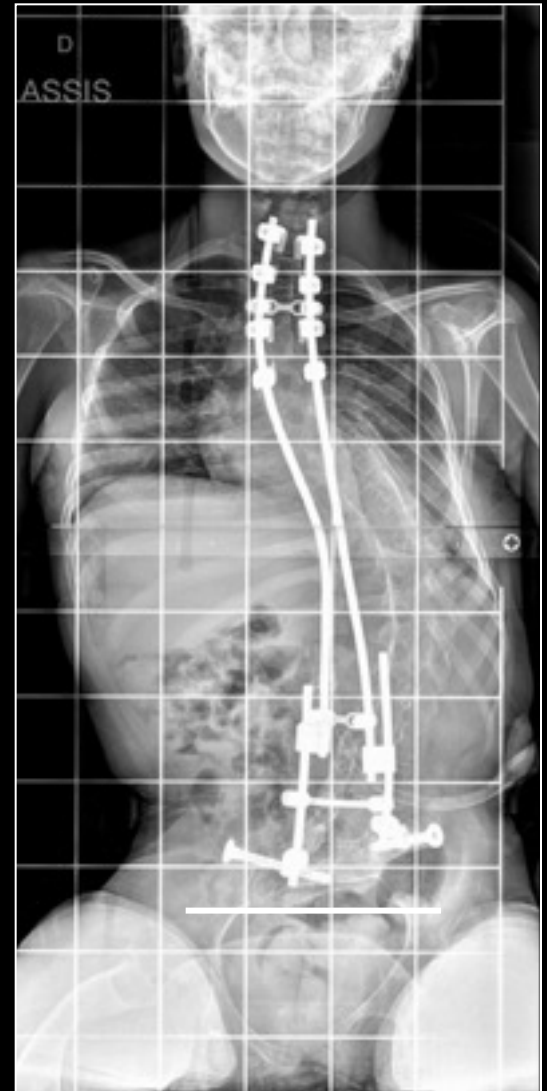
# Exemple 1 (11ans)



Initiale

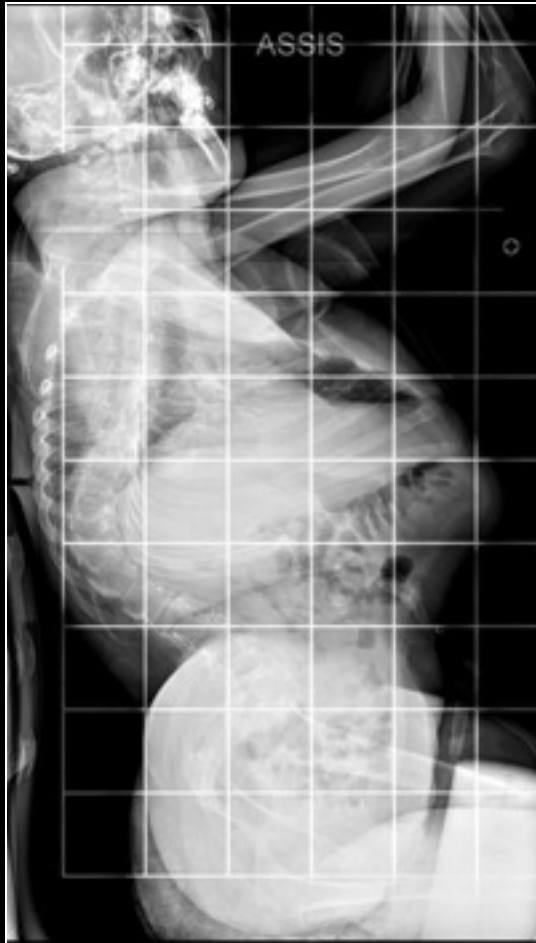


1an PO (Pré RT)



1an PO (Post RT)

# ● ● ● | Exemple 1



Initiale



1an PO (Pré RT)

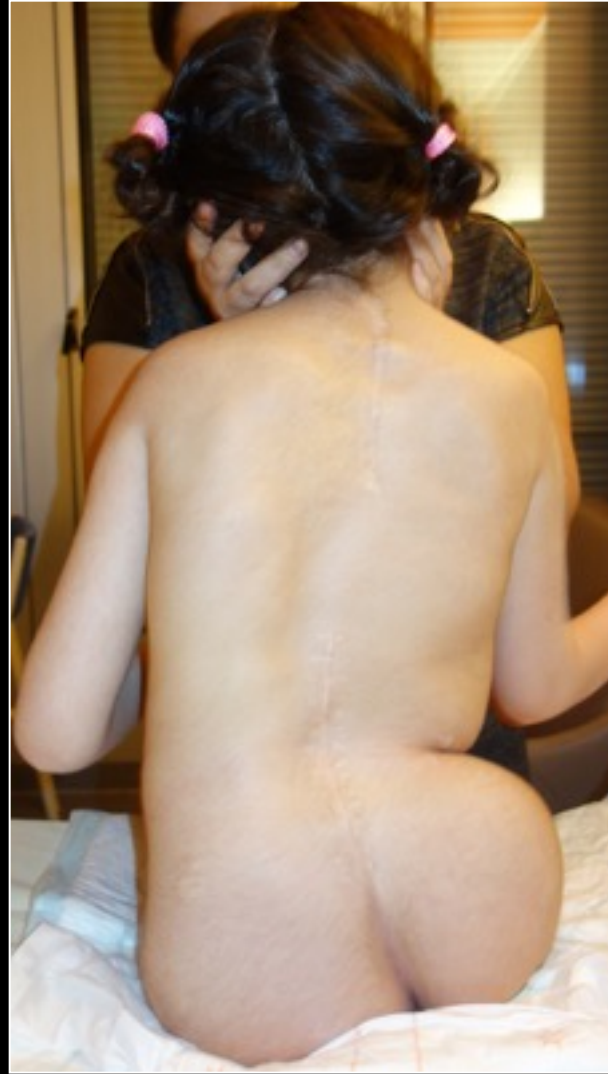


1an PO (Post RT)

● ● ● | Exemple 1



11ans



12a

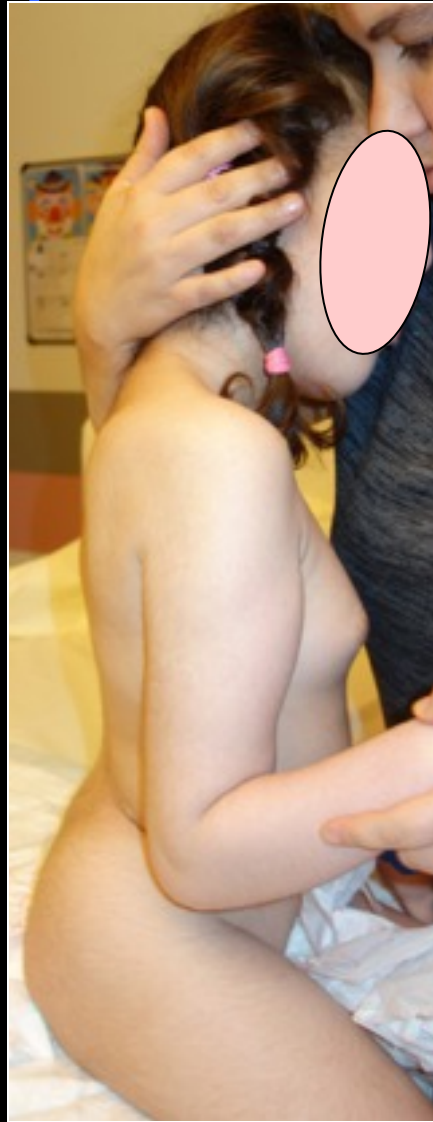


14ans

● ● ● | Exemple 1



11ans

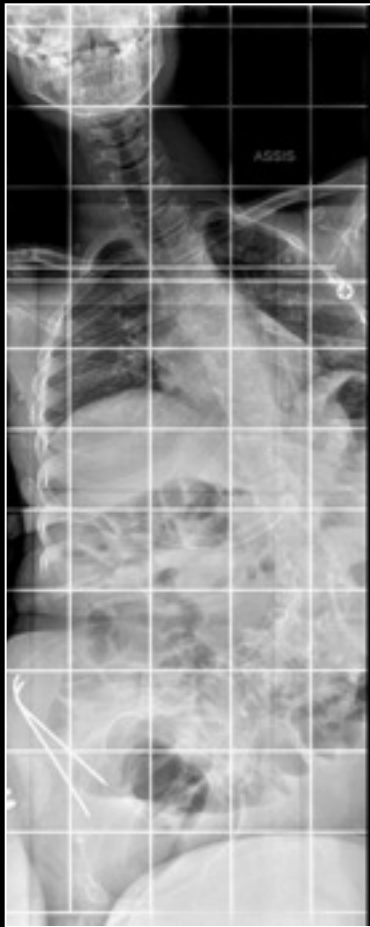


12a

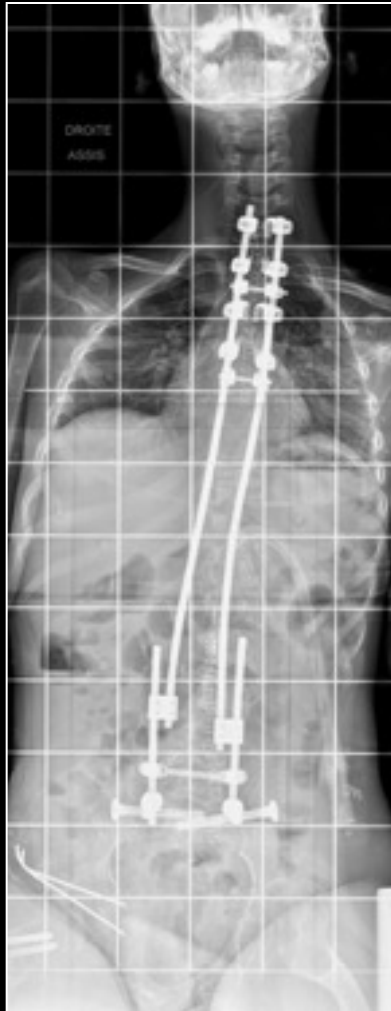


14ans

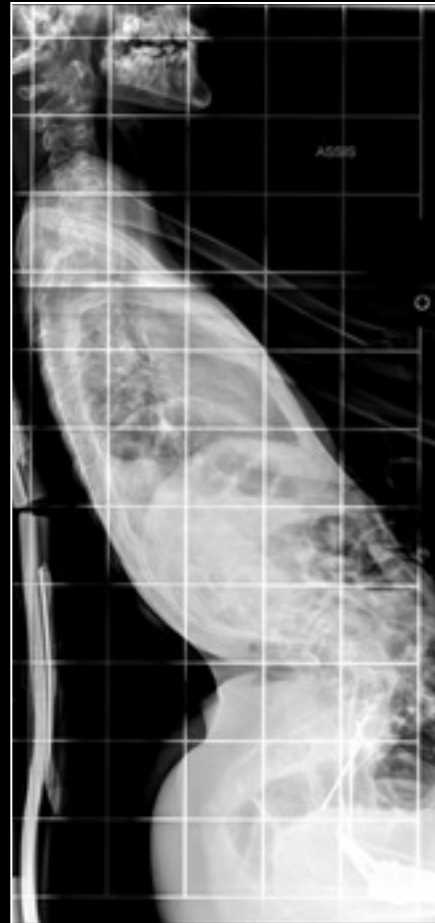
# ● ● ● Exemple 2 (13ans)



Initiale



PO



Initiale



PO

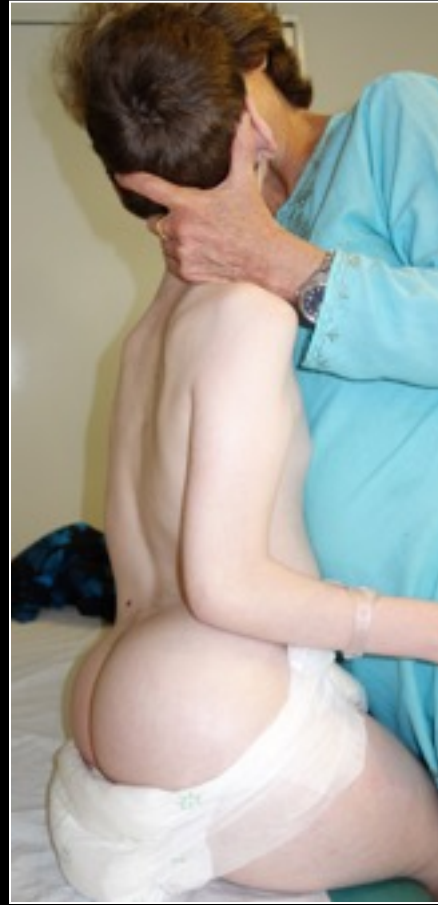
# Exemple 2



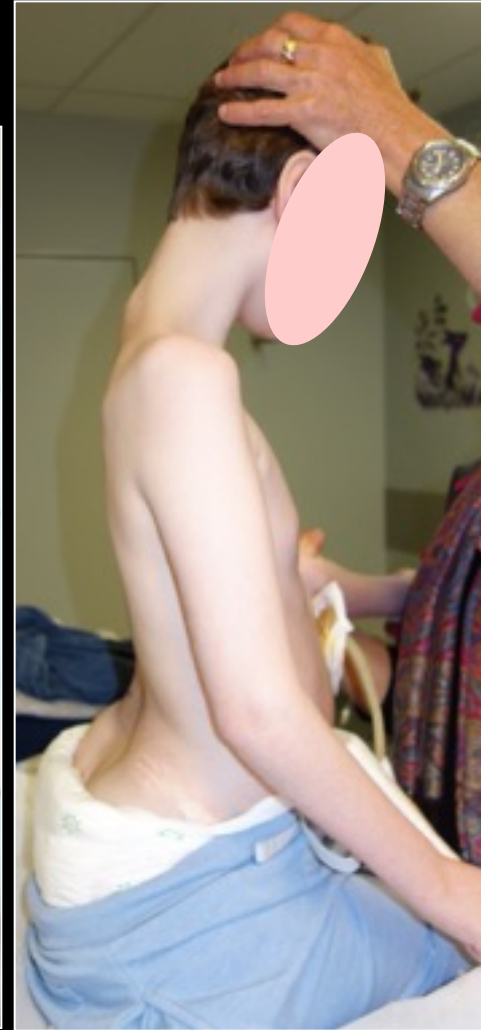
Initiale



1a PO

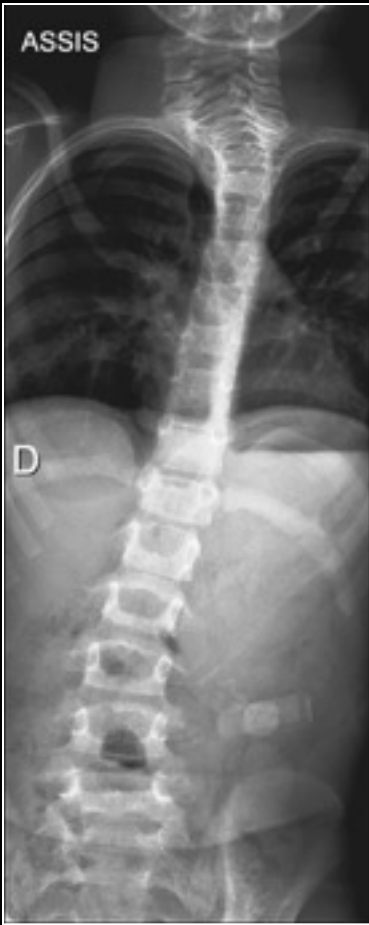


Initiale

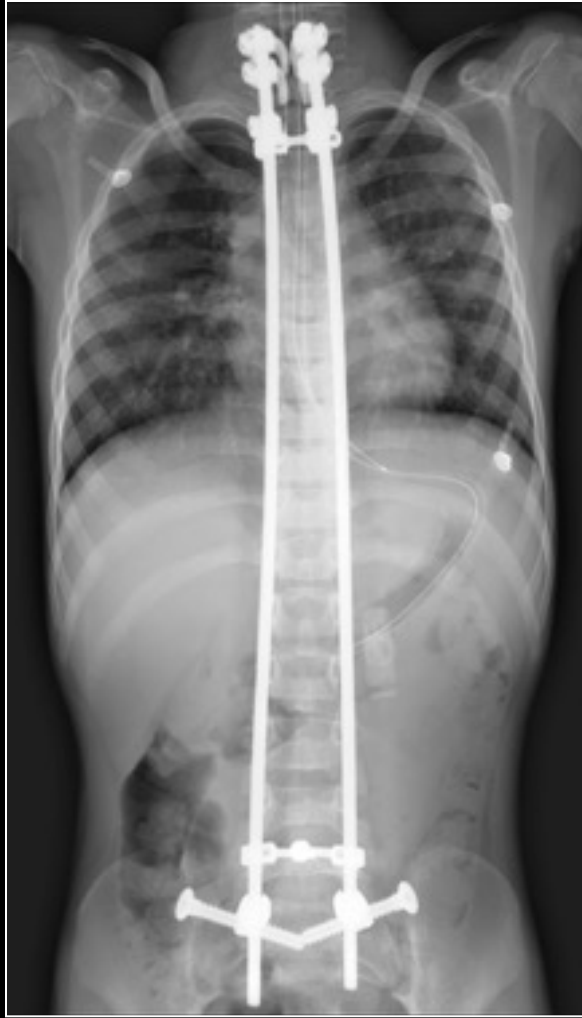


1a PO

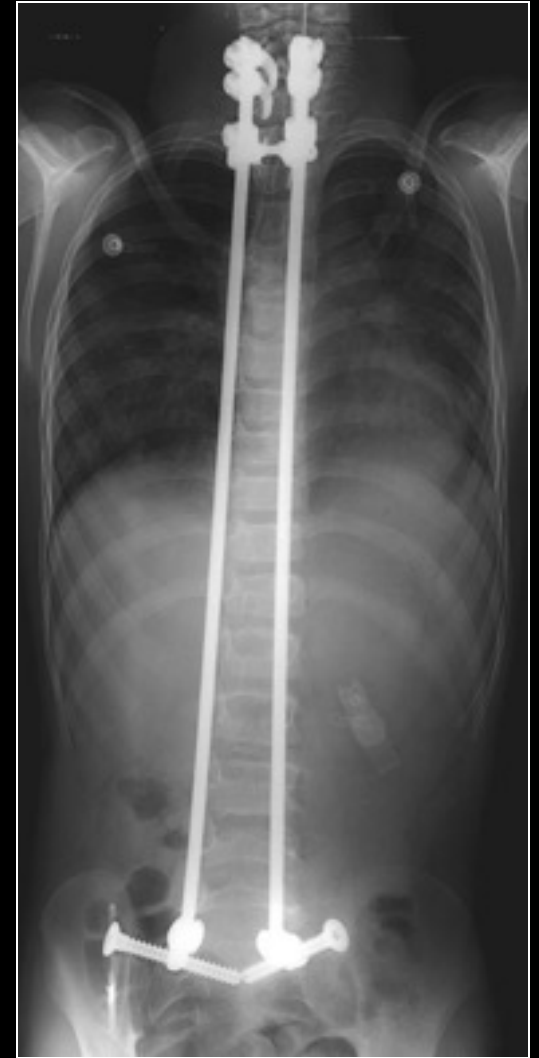
# ● ● ● Exemple 3 (10ans)



Initiale



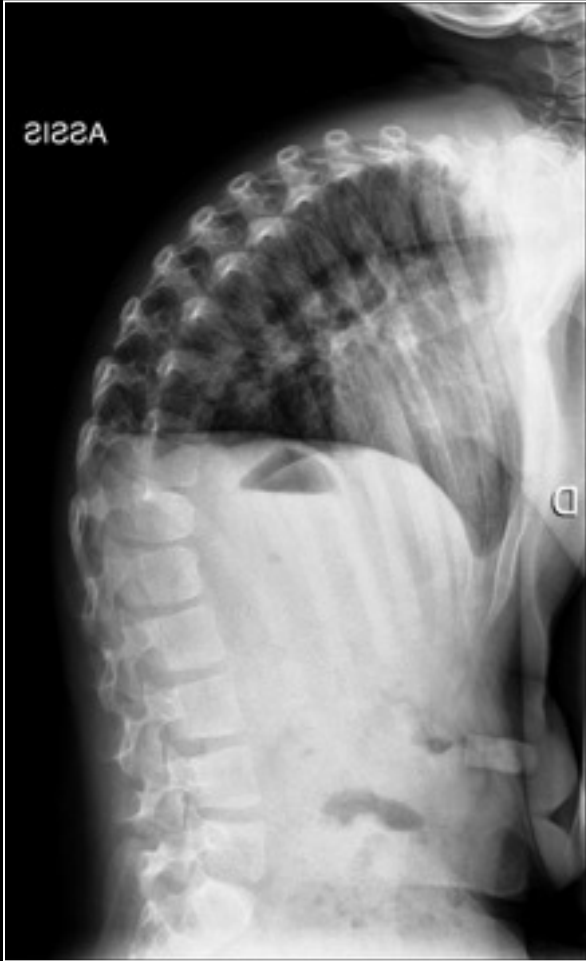
PO



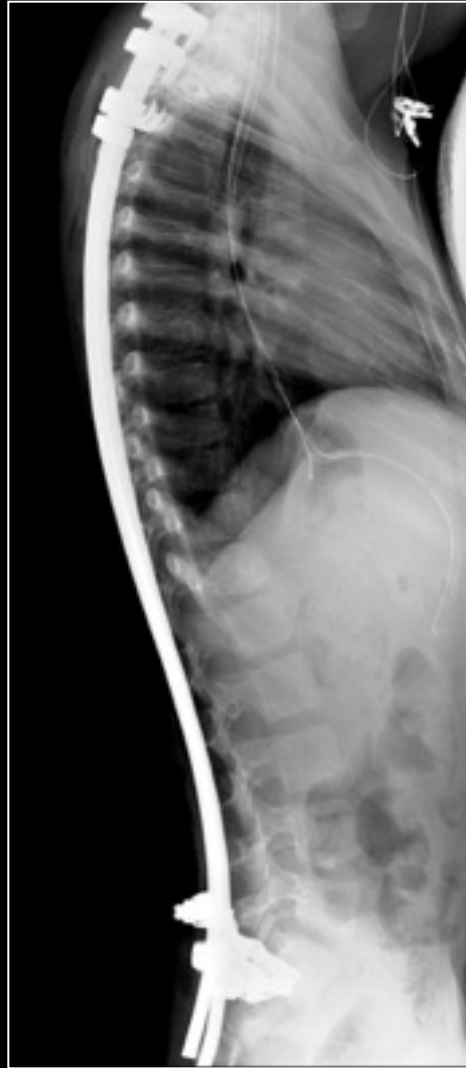
2a PO



# ● ● ● | Exemple 3



Initiale



PO

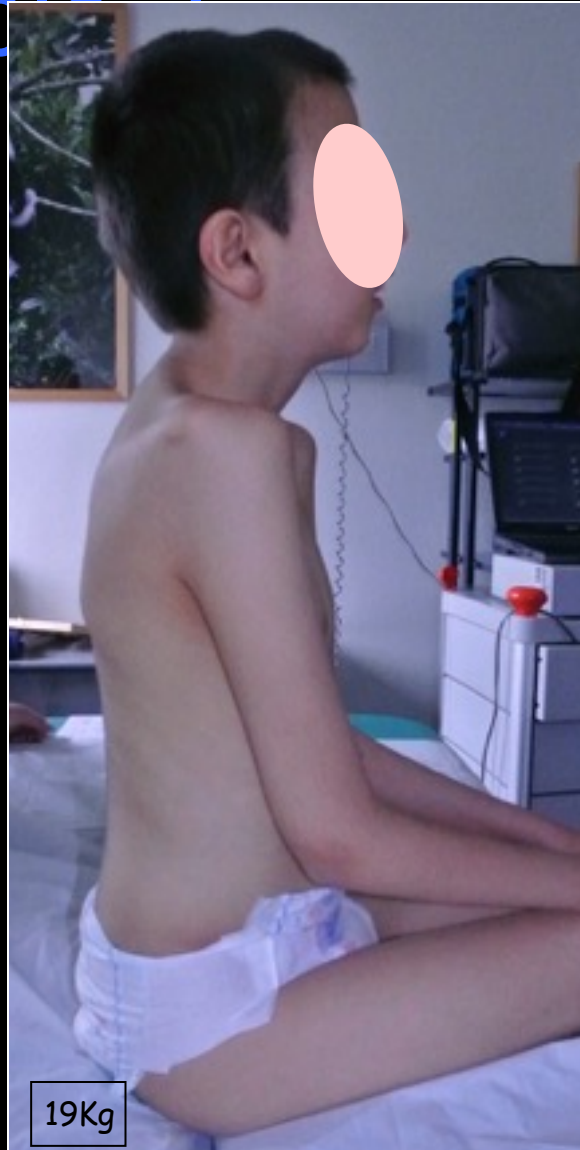


2a PO

# Exemple 2



Pré op

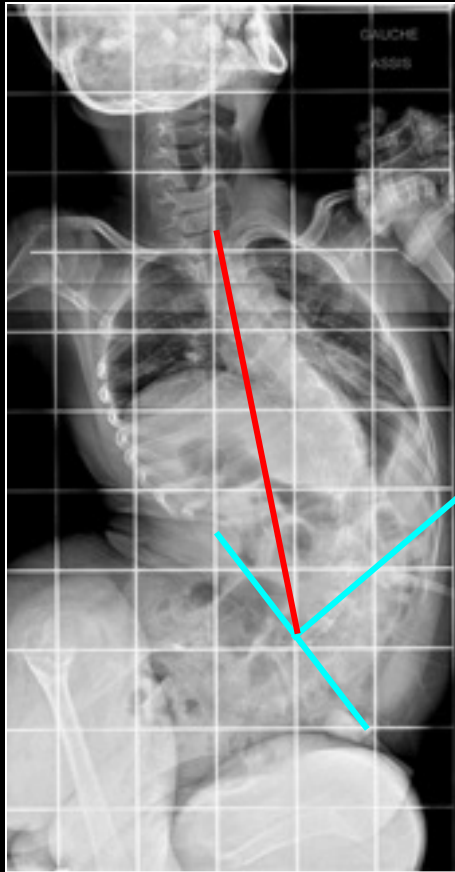


6m PO

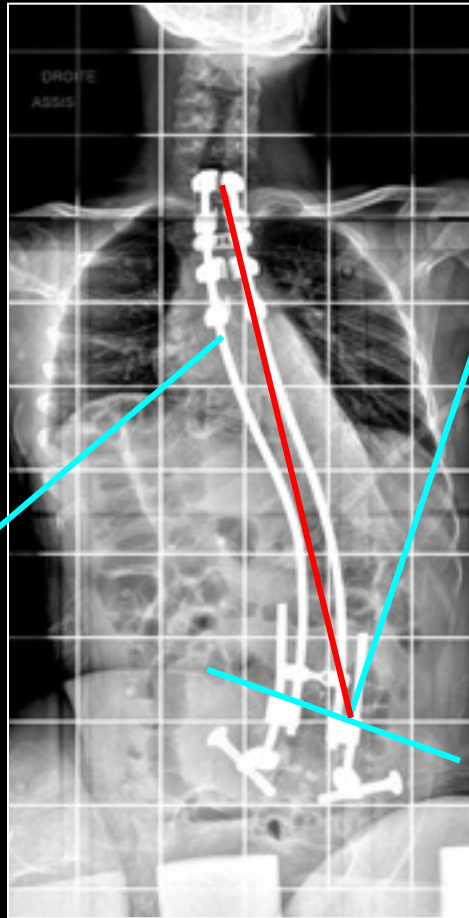


2a PO

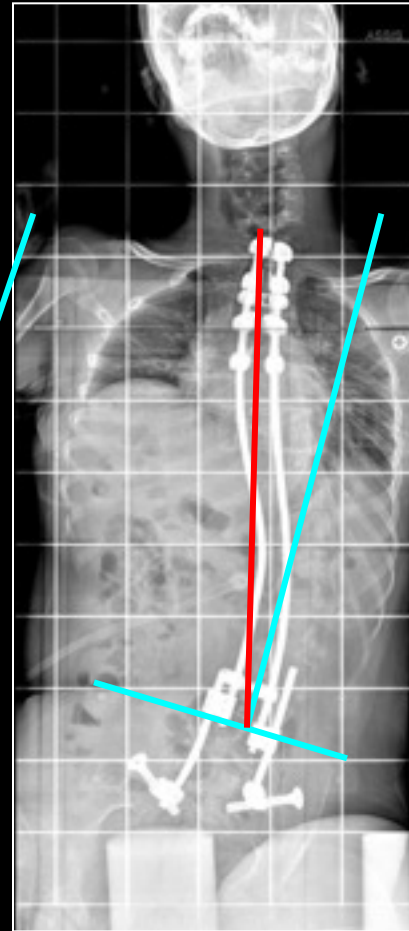
# Exemple 4 (14ans)



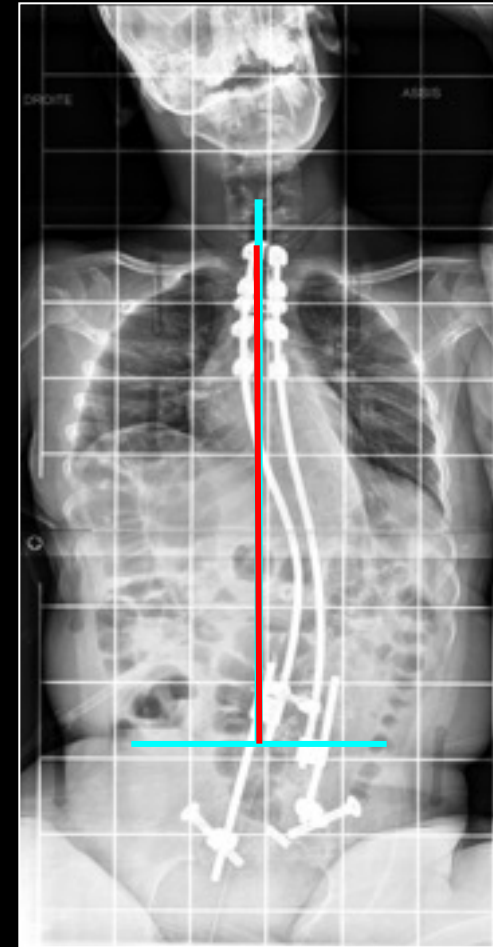
Initiale



PO



10mPO (Post RT1)



30mPO (Post RT2)

# ● ● ● | Exemple 4



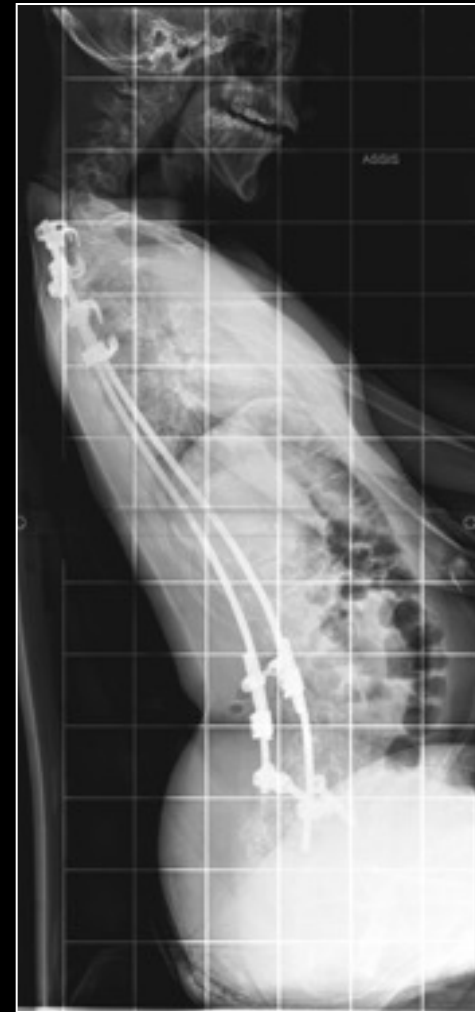
Initiale



PO



10m PO (Post RT1)



24m PO (Post RT2)

# Exemple 4



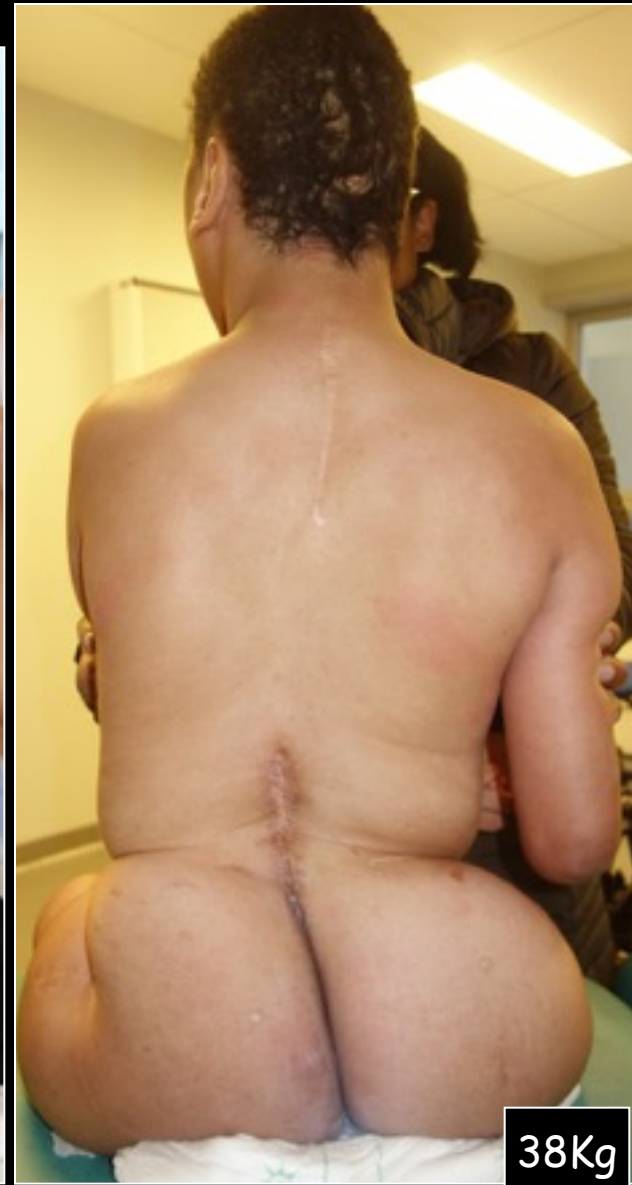
24Kg

Initiale



30Kg

10m PO (Post RT1)



38Kg

30m PO (Post RT2)

● ● ● Exemple 4



Initiale



10m PO (Post RT1)

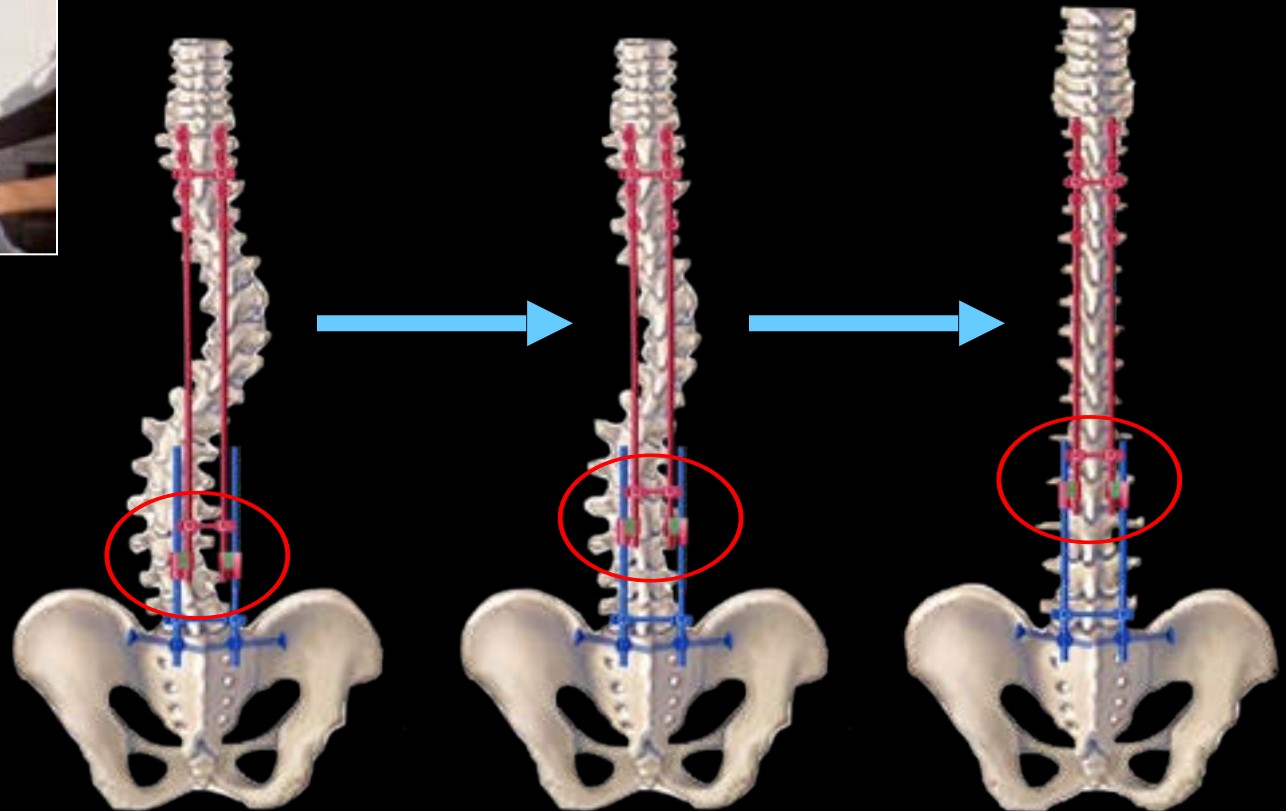
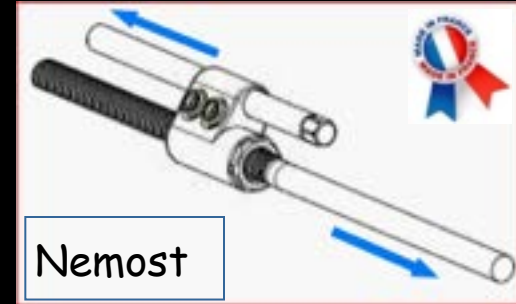


30m PO (Post RT2)

# ● ● ● Eviter la chirurgie répétée

→ « **Tige Nemost** »

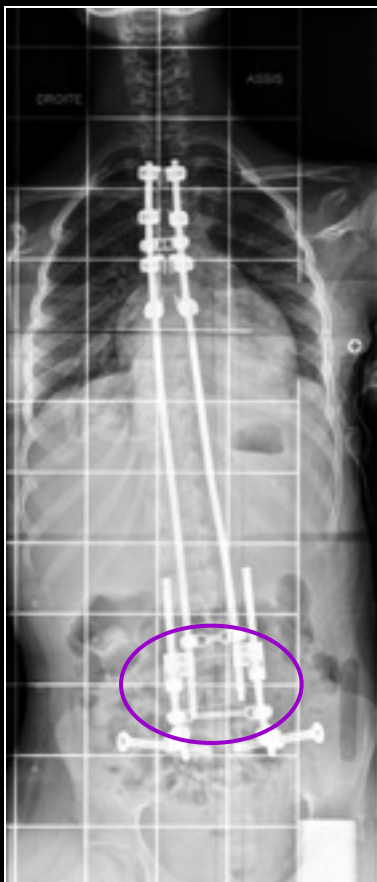
auto extensible (+/- traction)



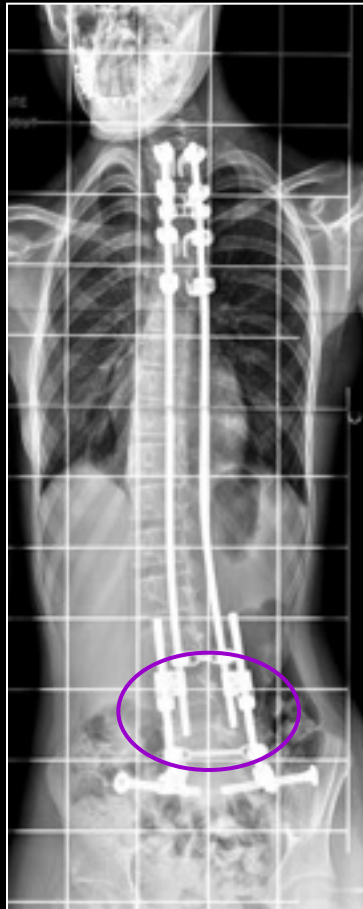
# Cas 1 (Friedreich, 12ans)



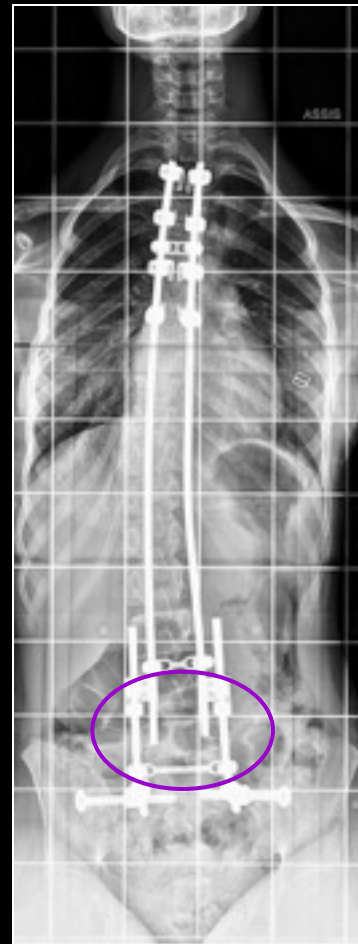
Initiale



PO



3m PO



6m PO



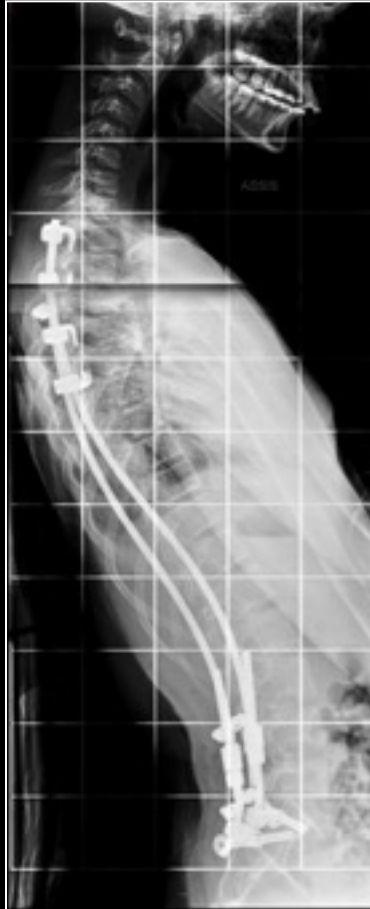
12m PO



# Cas 1



Initiale



PO



3m PO



6m PO



12m PO

● ● ● | Cas 1



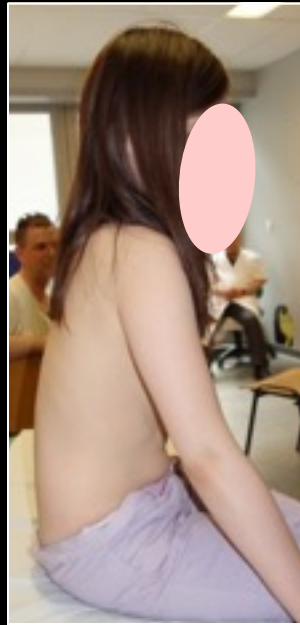
Initiale



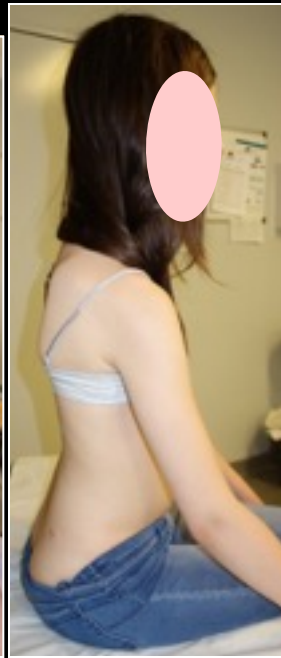
6m PO



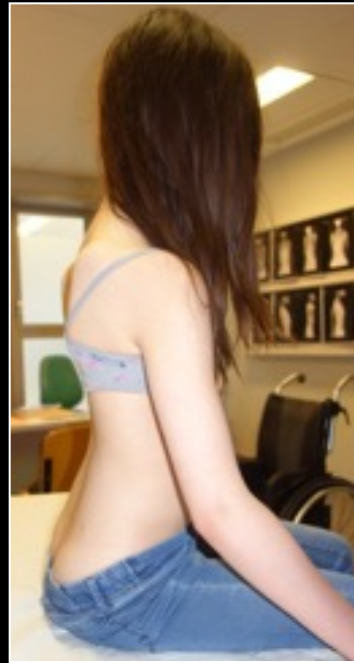
12m PO



Initiale

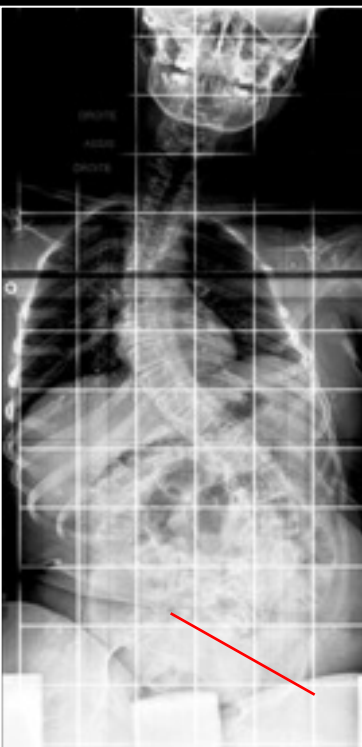


6m PO



12m PO

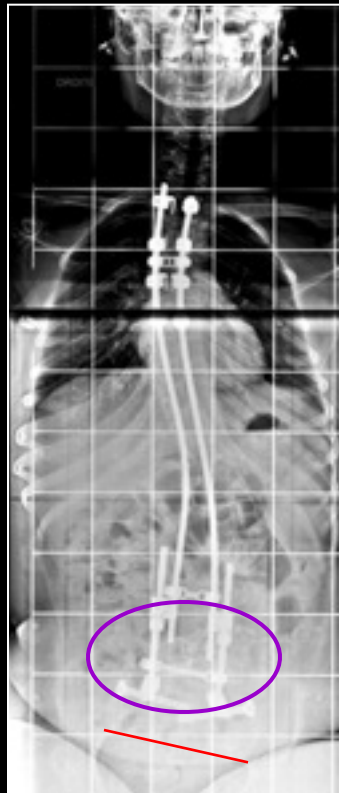
# Cas 2 (ASI, 11ans)



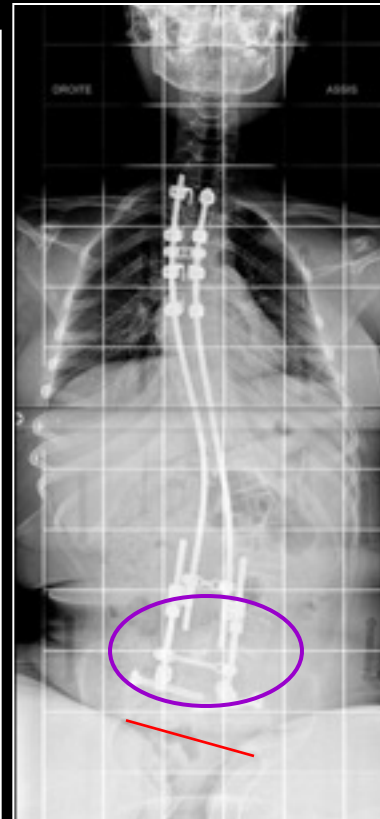
Initiale



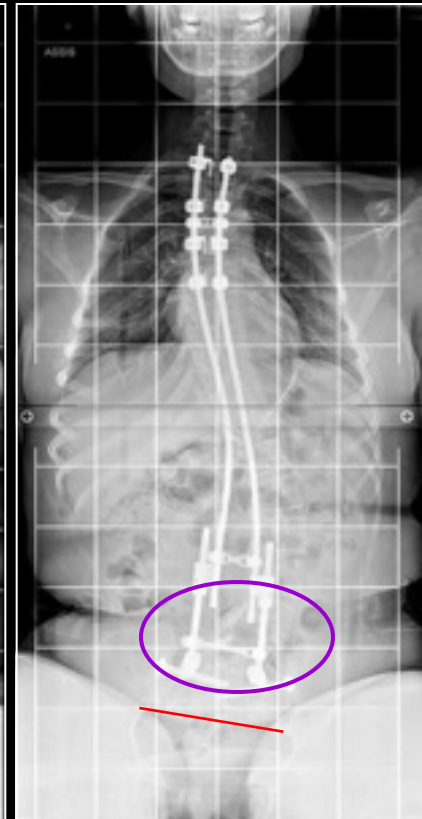
PO



3m PO

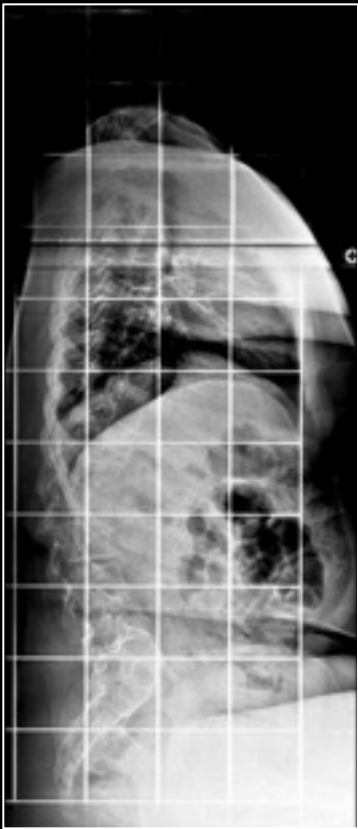


6m PO

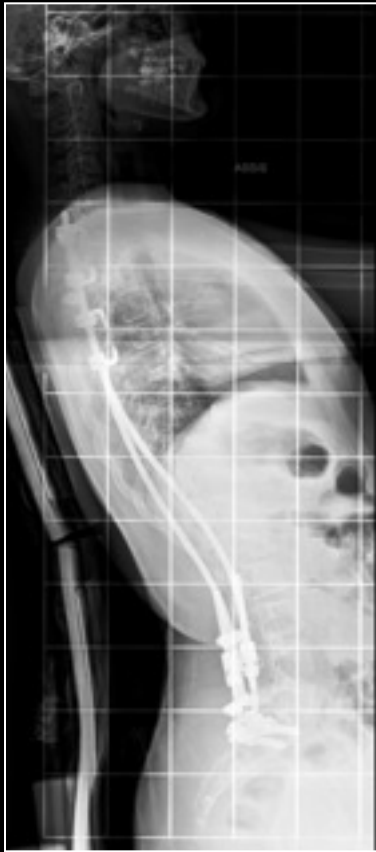


12m PO

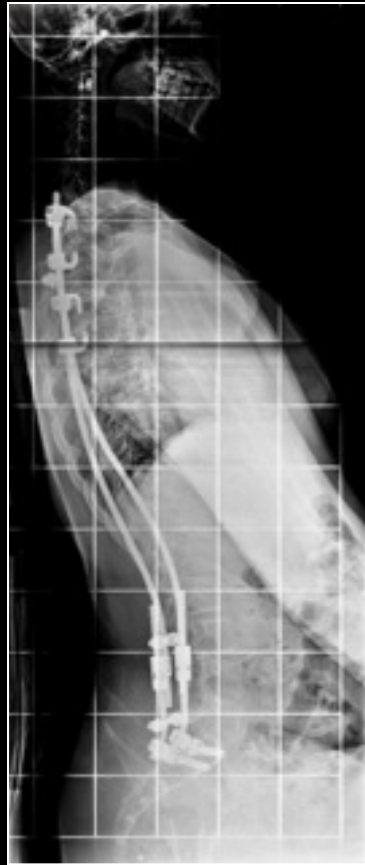
# Cas 2



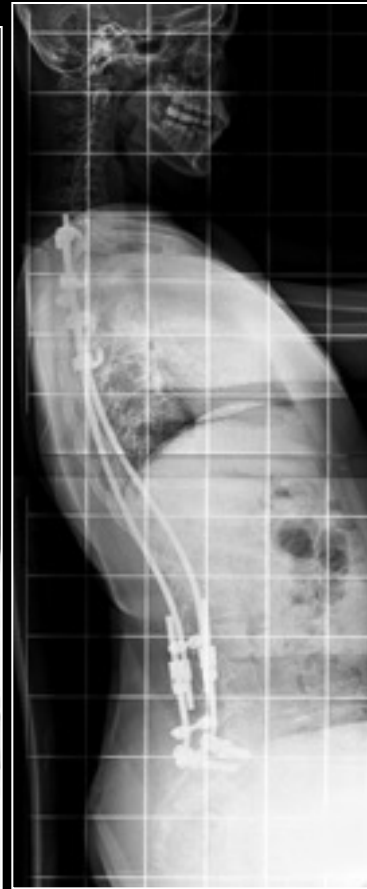
Initiale



PO



3m PO



6m PO



12m PO

● ● ● | Cas 2



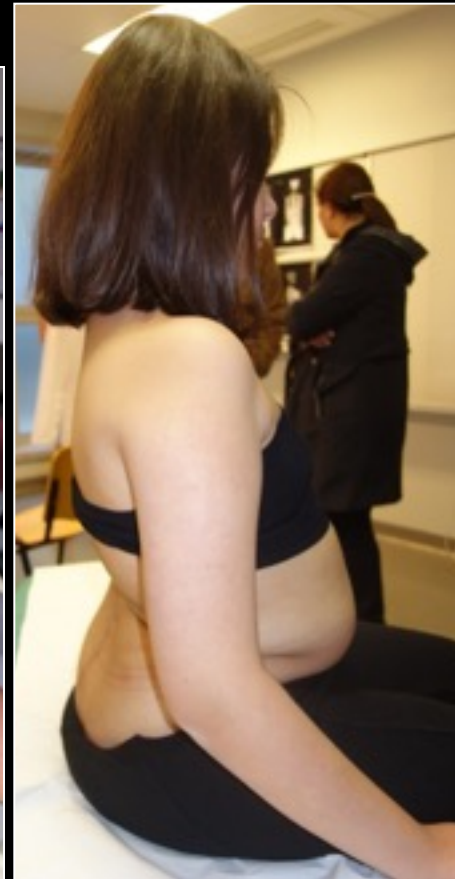
Initiale



6m PO



Initiale

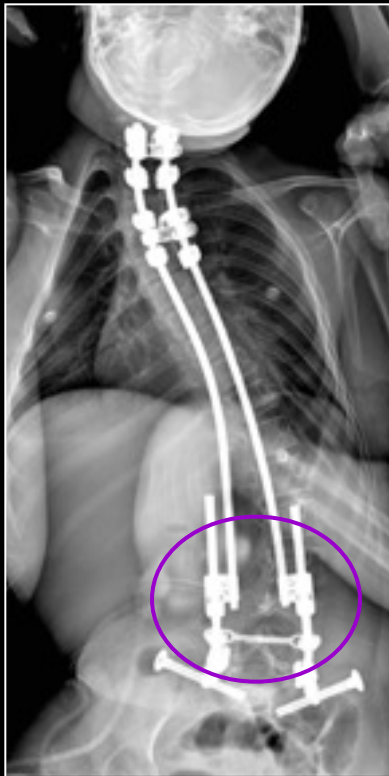


6m PO

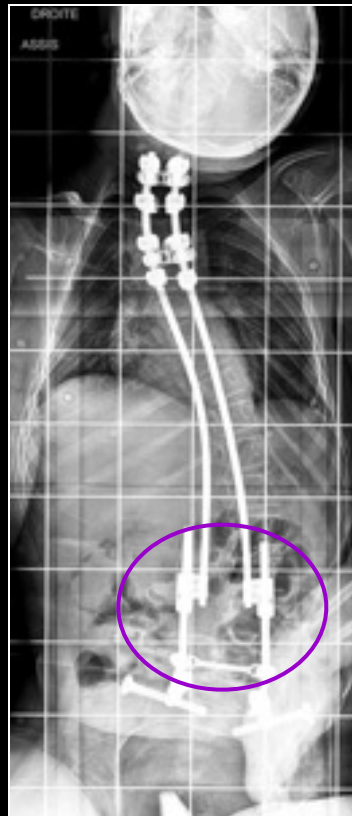
● ● ● | Cas 3 (MM, 10ans)



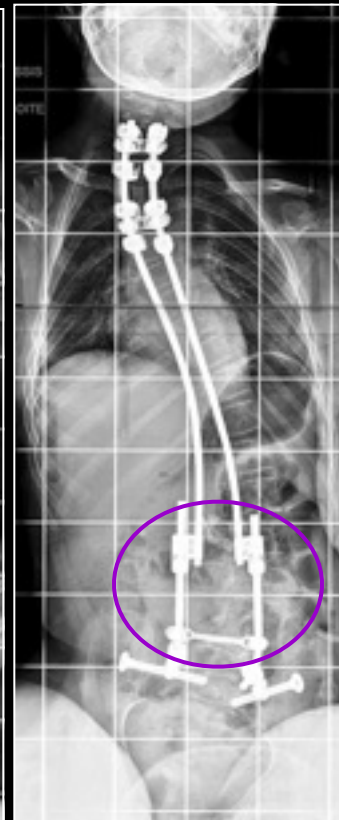
Initiale



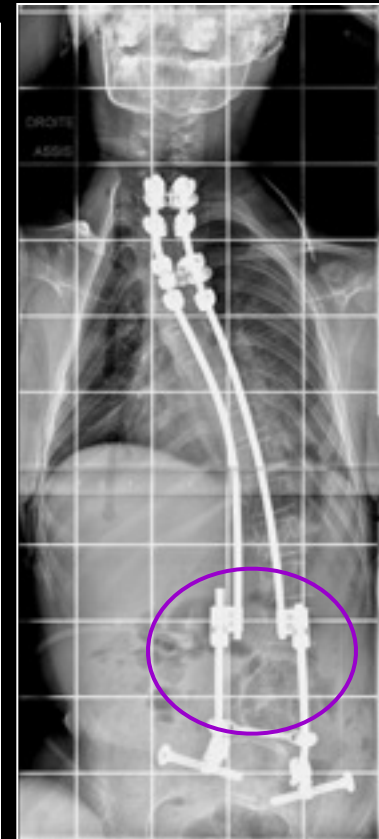
PO



3m PO



6m PO



12m PO

# Cas 3



Initiale



1m PO



3m PO



6m PO



12m PO

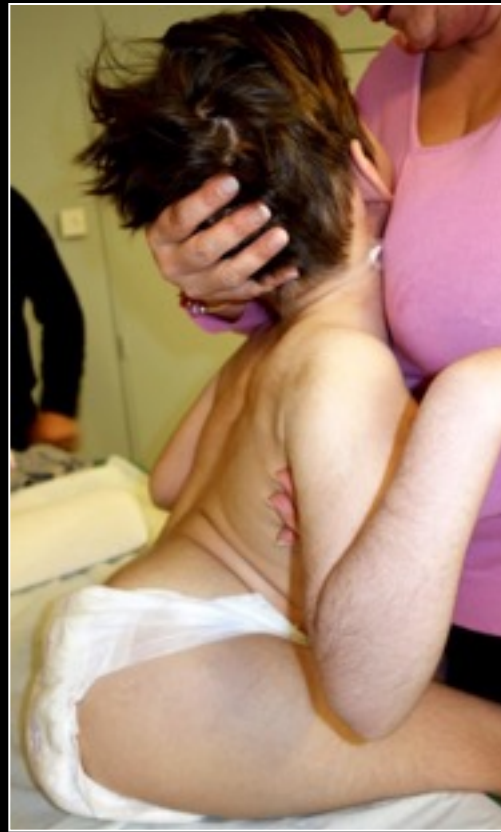
● ● ● | Cas 3



Initiale



6m PO



Initiale



6m PO



# ● ● ● | Conclusion

## La chirurgie mini invasive des SN :

- Donne un résultat au moins aussi bon que celui de l'arthrodèse tout en réduisant le taux de complications
- Améliore l'EG, le confort ainsi que la qualité de vie du patient et de son entourage
- A réaliser précocement 7 à 10ans (indication fonctionnelle)

