

FRACTURES THORACIQUES et LOMBAIRES sans TROUBLE NEUROLOGIQUE

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LIMITES du SUJET

- LESIONS TRAUMATIQUES de T1 à L5 COMPRISES
- SANS TROUBLE NEUROLOGIQUE (10%)

- LESIONS « FRAICHES »

- PSEUDARTHROSES et CALS VICIEUX





RACHIS THORACIQUE HAUT : T1 à T10

CHARNIERE THORACOLOMBAIRE : T11 à L2

RACHIS LOMBAIRE BAS : L3 à L5

PLAN

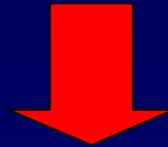
- **CLASSIFICATIONS**
- **EVALUATION RADIOLOGIQUE**
- **LES TRAITEMENTS**

- **PSEUDARTHROSES et CALS VICIEUX**

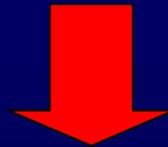


POURQUOI CLASSIFIER LES LÉSIONS TRAUMATIQUES ?

DEGRE d' INSTABILITE



RISQUE EVOLUTIF



POSSIBILITES THERAPEUTIQUES



LANGUAGE COMMUN

COMMENT CLASSIFIER LES LESIONS TRAUMATIQUES ?

ANATOMOPATHOLOGIE ↔ MECANISME

- **RADIOS SIMPLES**
- **TOMODENSITOMETRE** : arc postérieur , comminution du corps
- **IRM** : disques et ligaments



LES CONCEPTS

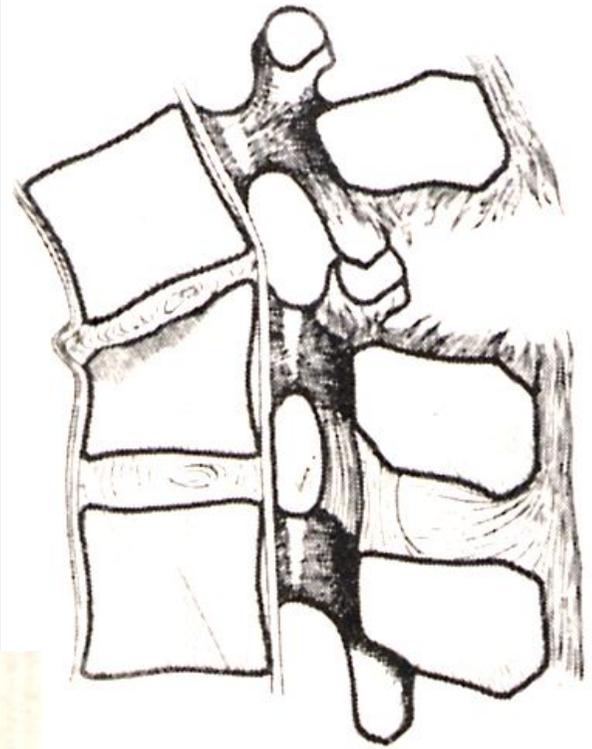
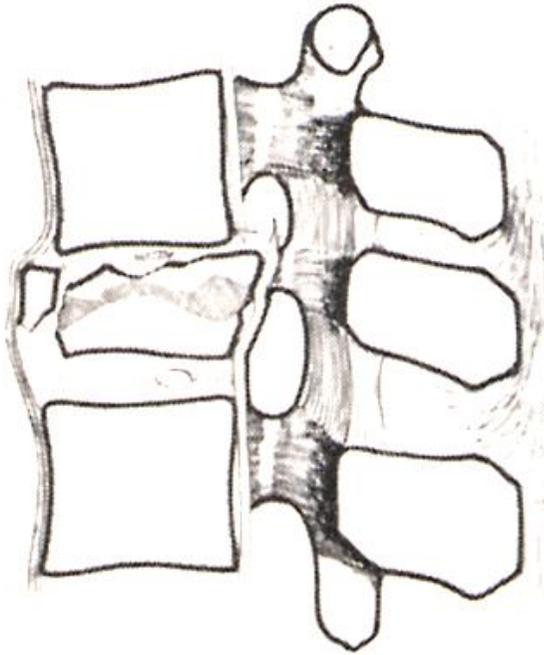
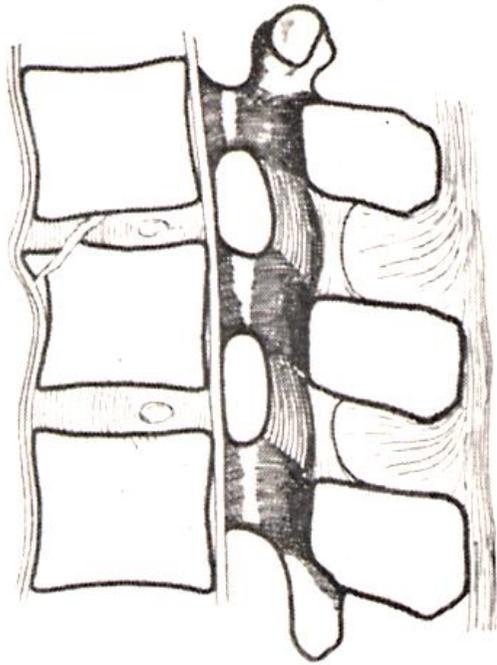
- **MUR VERTEBRAL POST.** (DECOULX et RIEUNAU , Symposium SOFCOT 1958)
- **SEGMENT VERTEBRAL MOYEN** (ROY-CAMILLE)
- **INSTABILITE DISCOLIGAMENTAIRE ou OSSEUSE** (LOUIS et GOUTALLIER , Symposium SOFCOT 1976)
- **3 COLONNES** (DENIS , 1983)
- **PIVOT** (LAULAN , 1990)



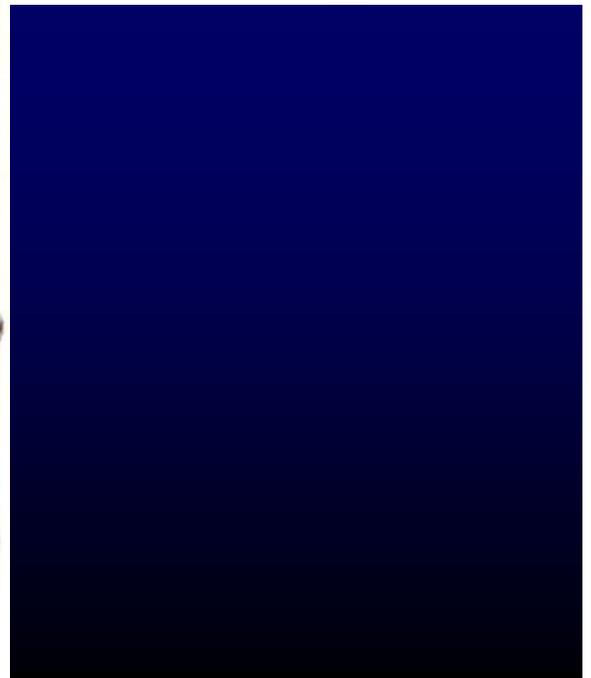
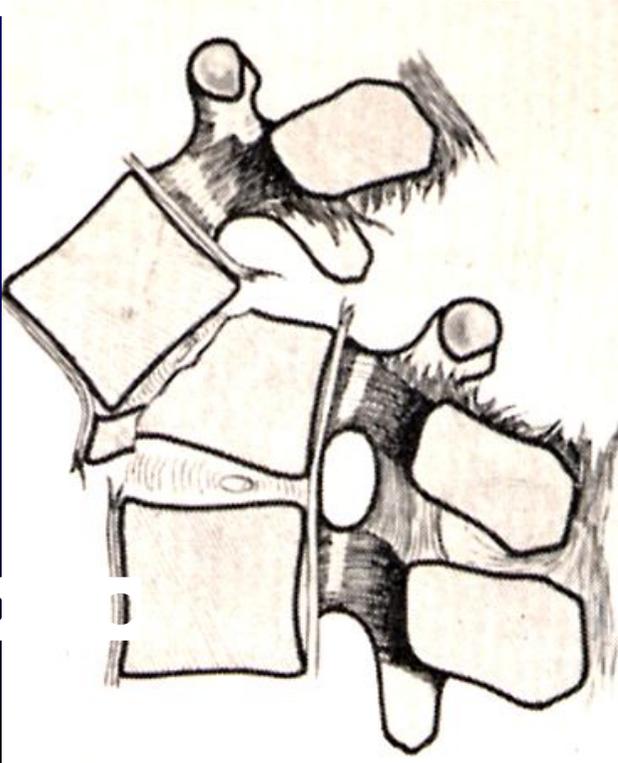
LES CLASSIFICATIONS « ANCIENNES »

- **BOELHER (1929)**
- **WATSON-JONES (1931)**
- **NICOLL (1949)**
- **HOLDSWORTH (1963)**





BOELHER (1929)

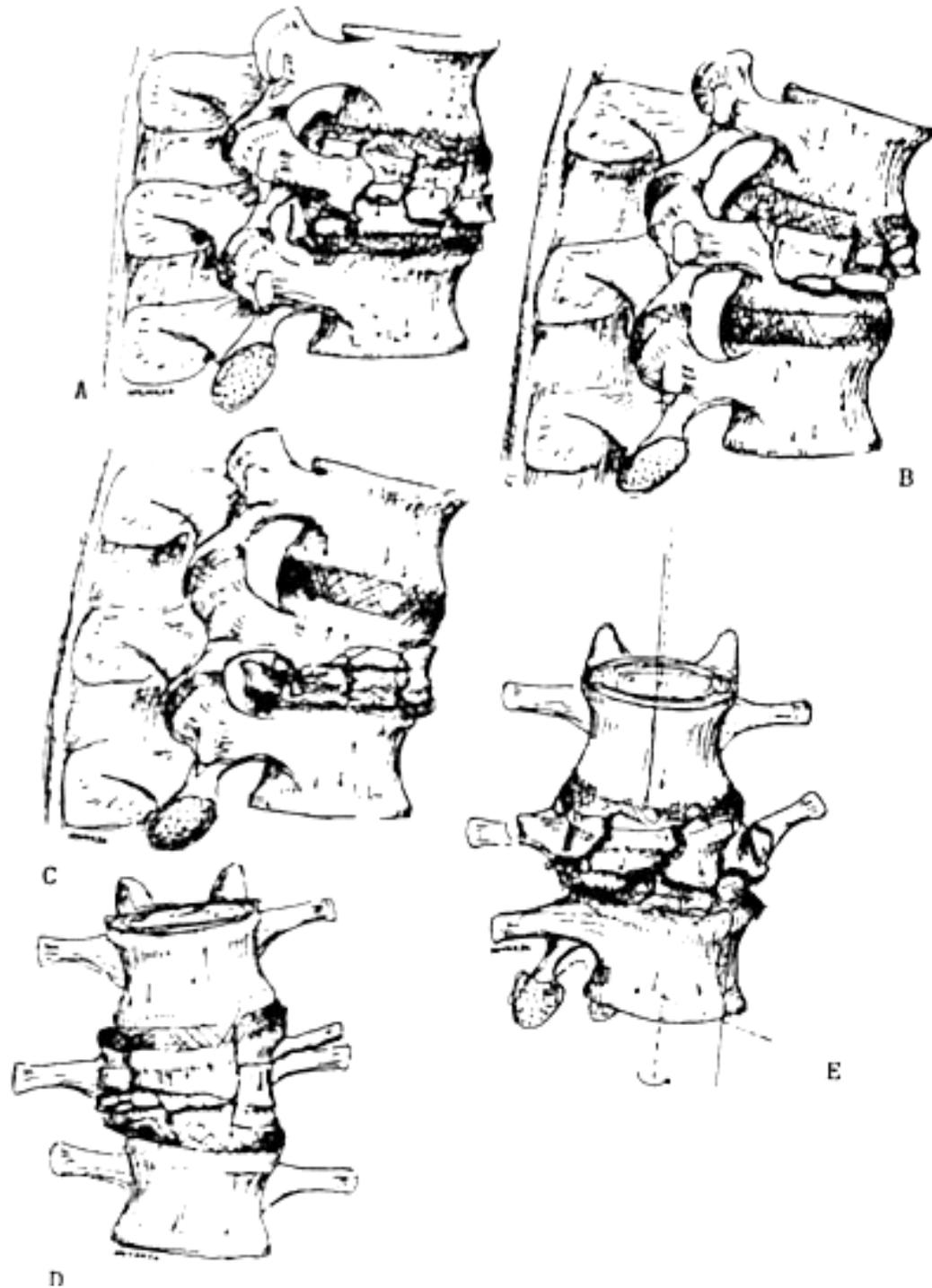


LES CLASSIFICATIONS

« MODERNES »

- **DENIS (1983)** : 412 dossiers (83 TDM)
- **LAULAN (1990)** : 100 dossiers (pivot , hauteurs des murs vertébraux)
- **MAGERL (1994)** : 1445 dossiers sur 10 ans
3 types A,B,C / 3 groupes 1,2,3 / 3 sous-groupes
code alphanumérique AO
- **VACCARO (2005)** : Thoraco Lumbar Injury
Classification & Severity Score (TLICS)

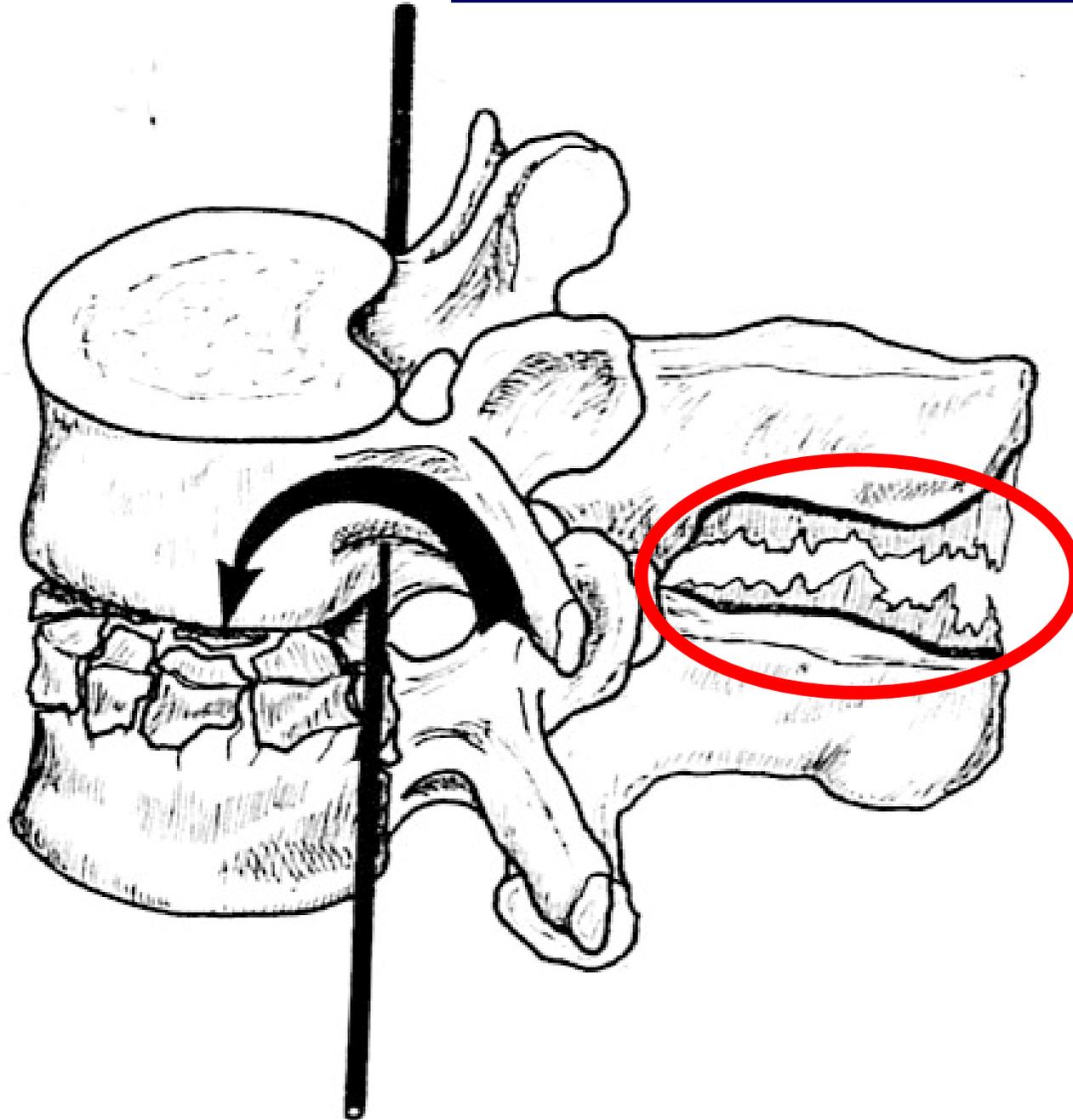
IRM obligatoire



~~**BURST**~~

DENIS (1983)

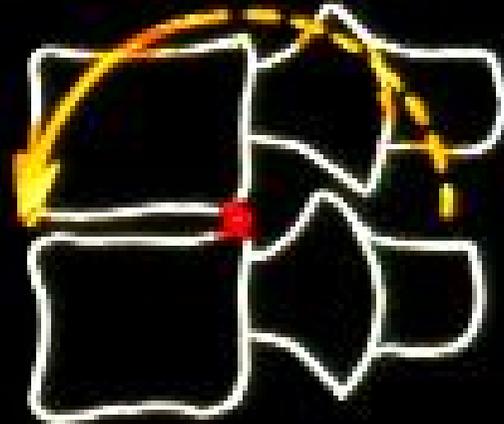
PIVOT de LAULAN (1990)



FLEXION



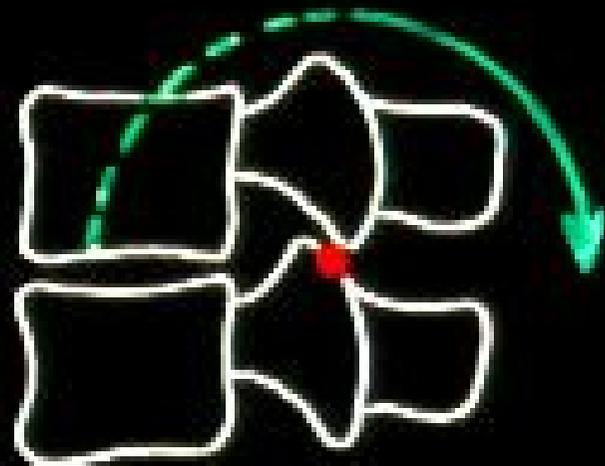
DISTRACTION



COMPRESSION DISTRACT



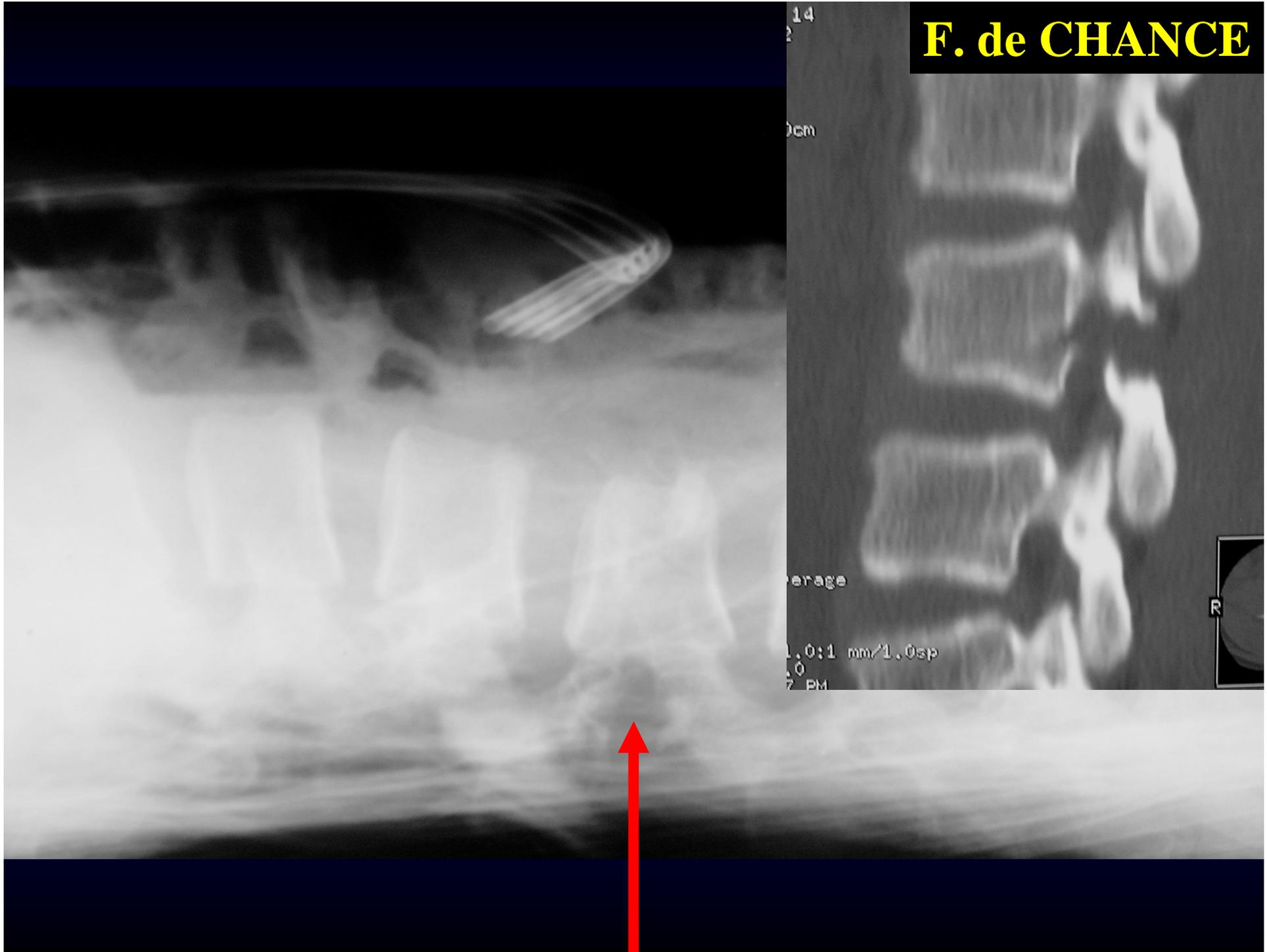
COMPRESSION

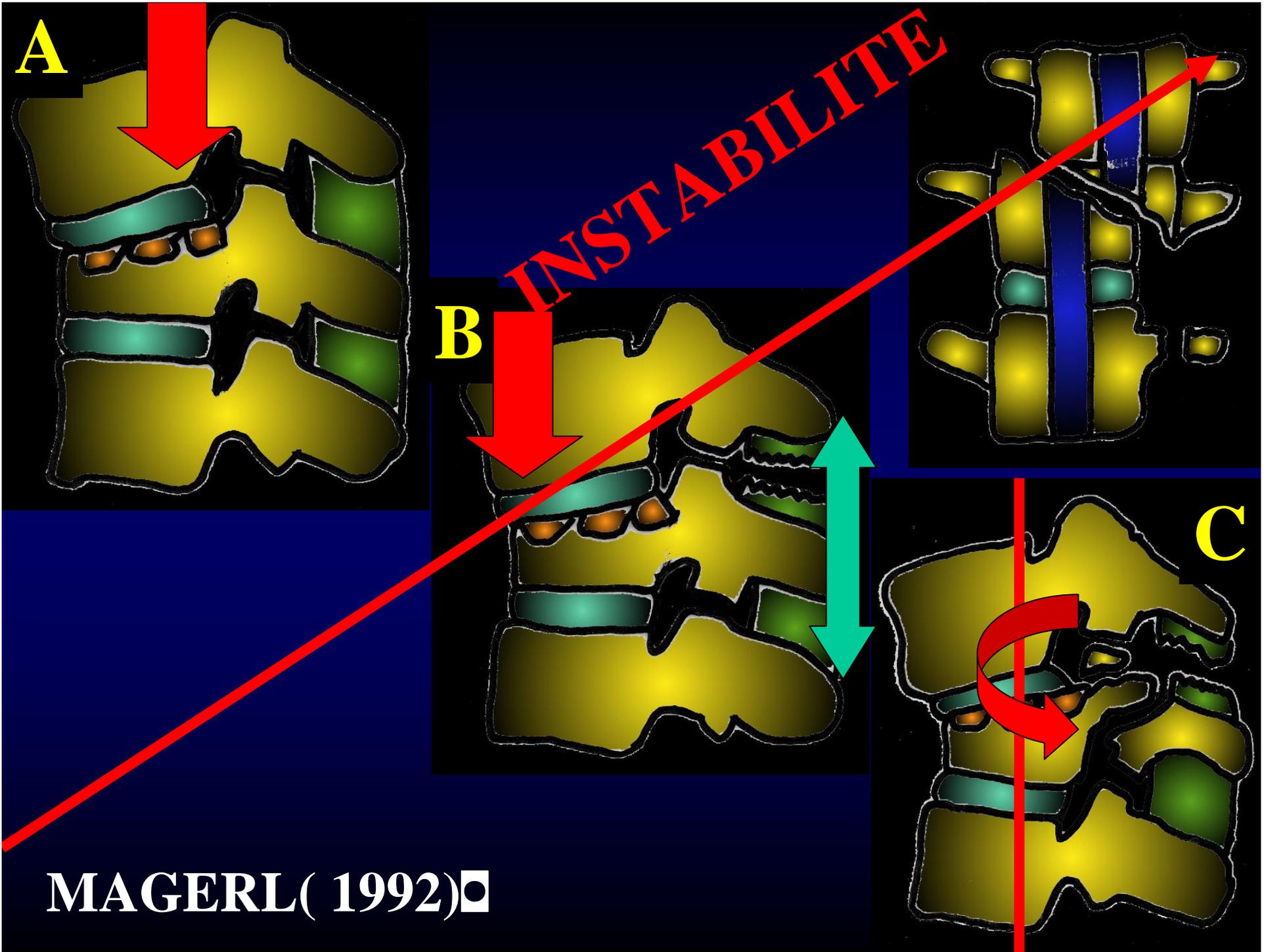


EXTENSION

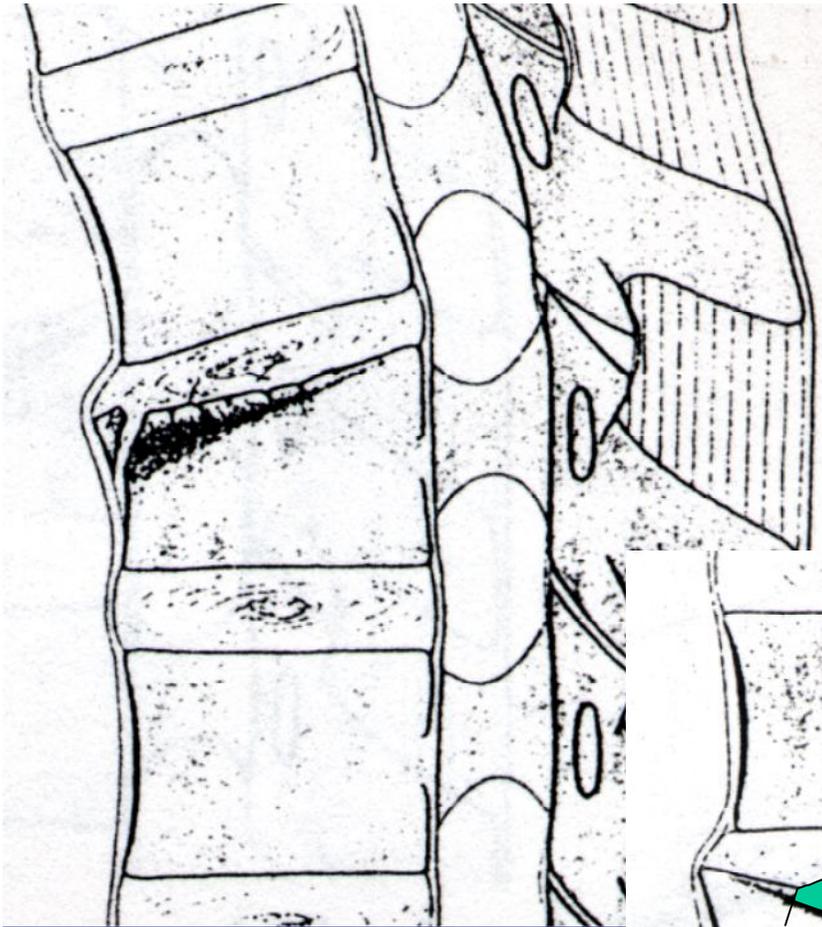


F. de CHANCE



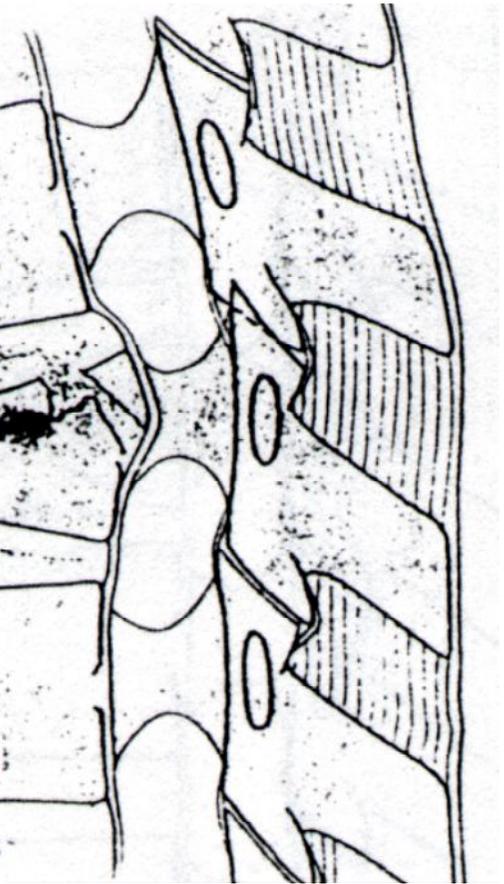
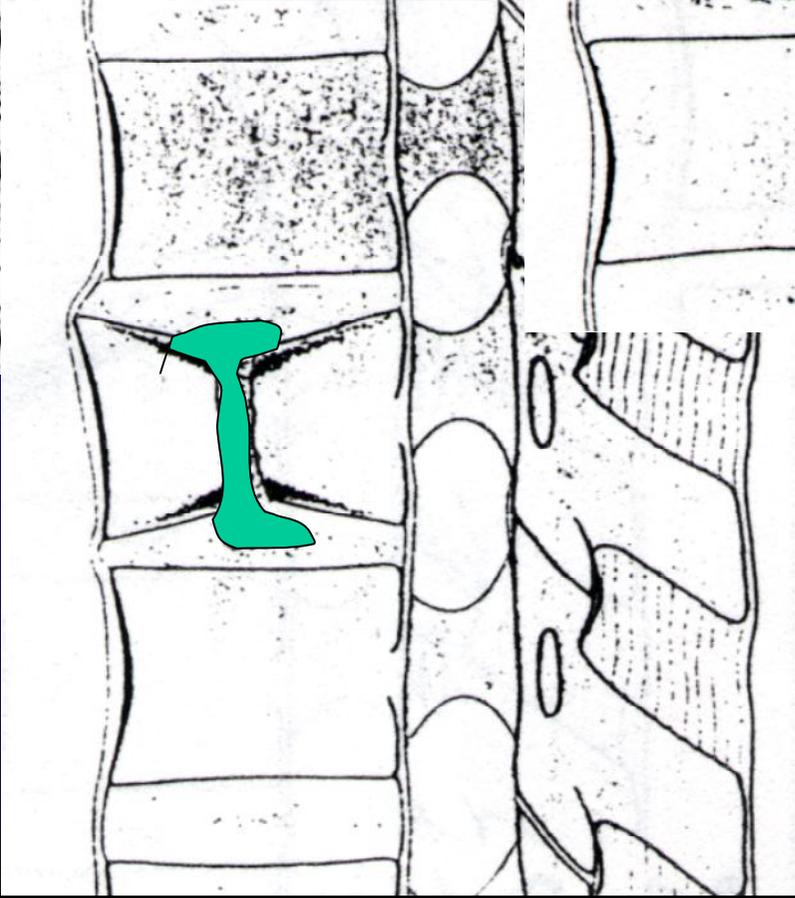


MAGERL(1992) □



A1

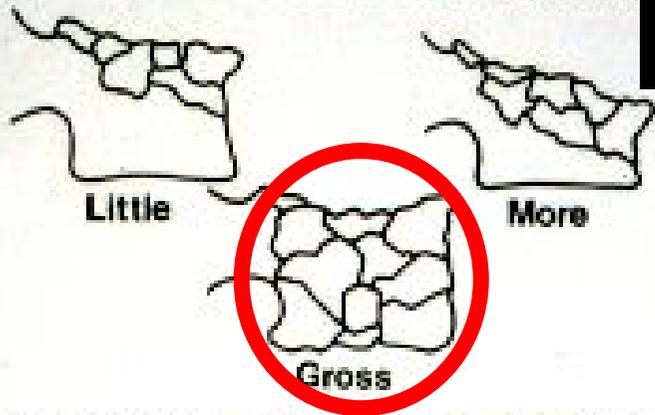
A2



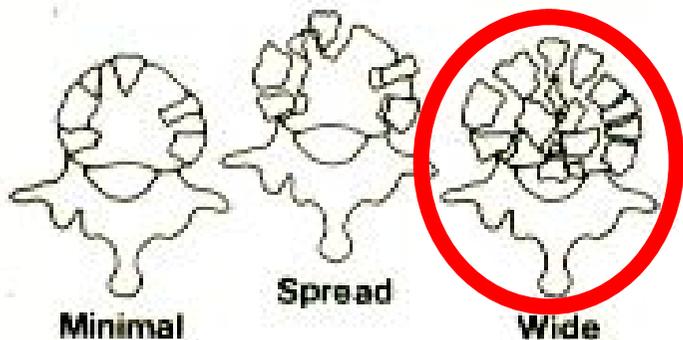
A3

LOAD SHARING CLASSIFICATION

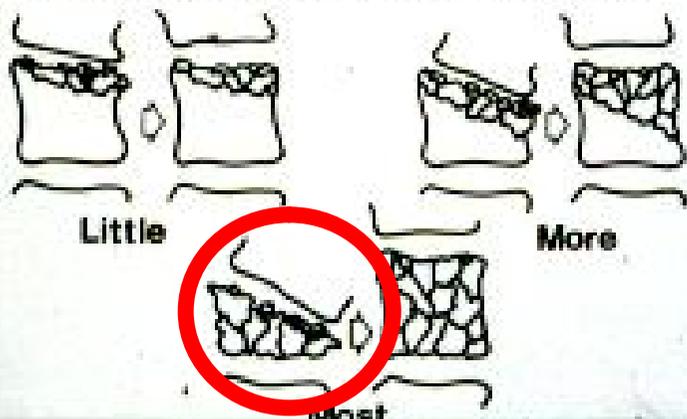
COMMINUTION/INVOLVEMENT



APPOSITION OF FRAGMENTS



DEFORMITY CORRECTION



Mac CORMACK(1994)

THORACO LUMBAR INJURY CLASSIFICATION & SEVERITY SCORE (TLICS) , VACCARO (2005)

- **LESION CORPOREALE**

comminutive : 1 ou 2 points

translation : 3 points

distraktion : 4 points

- **LIGAMENTS POSTERIEURS**

suspects : 2 points

rompus : 3 points

- **ETAT NEUROLOGIQUE**

radiculaire , médullaire incomplet : 2 points

médullaire complet : 3 points



THORACO LUMBAR INJURY CLASSIFICATION & SEVERITY SCORE (TLICS) , VACCARO (2005)

- **TOTAL < 3 : TT ORTHOPEDIQUE**
- **TOTAL > 5 : TT CHIRURGICAL**



REPETABILITE / REPRODUCTIBILITE

- **ONER (2002)** : 53 traumatisés , TDM , IRM
faible reproductibilité c. de MAGERL
- **WOOD (2005)** : 31 fractures avec
comparaison c. de DENIS et de MAGERL
- **VACCARO (2006)**

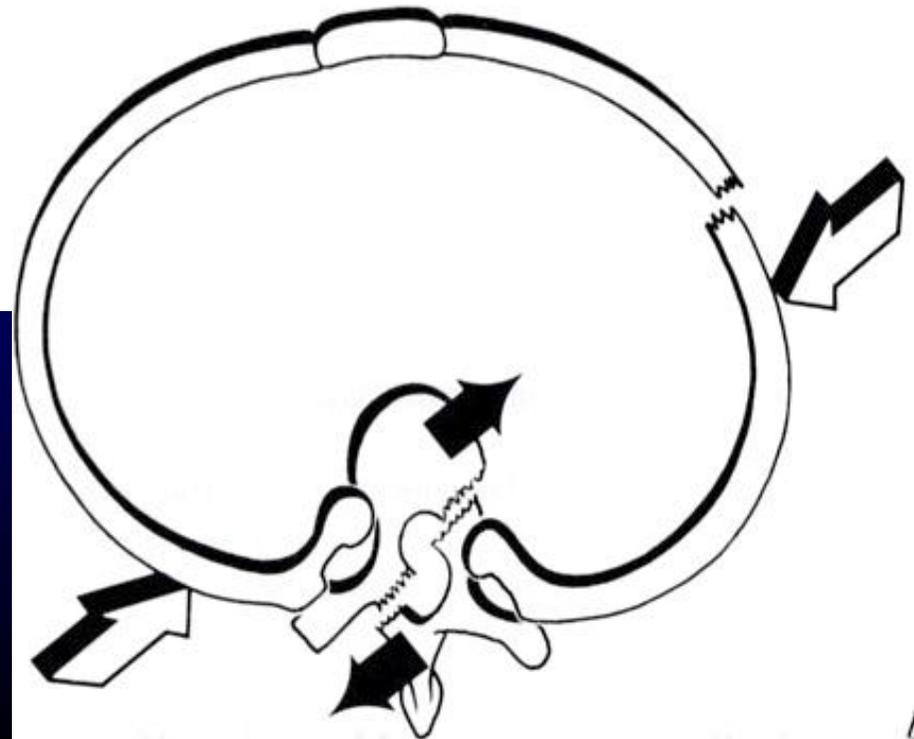
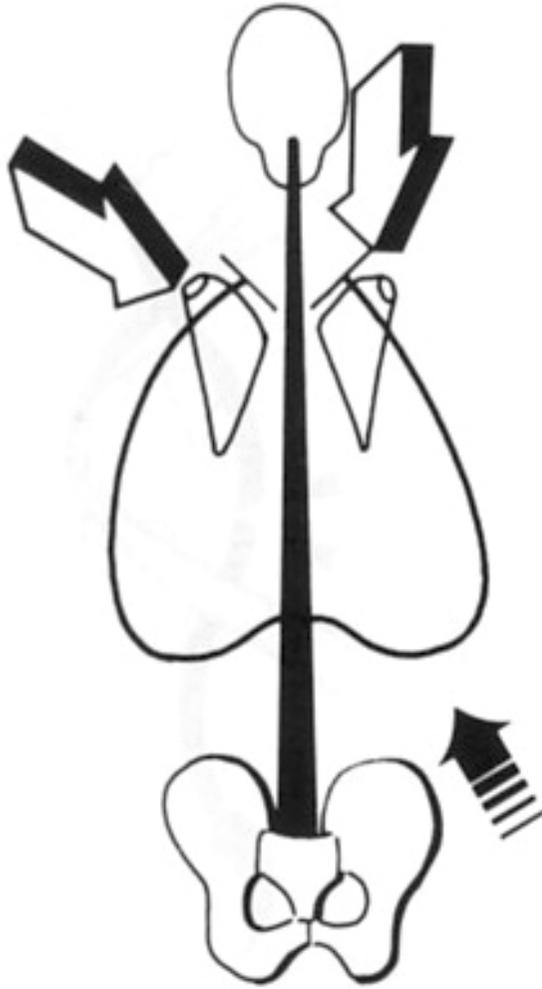


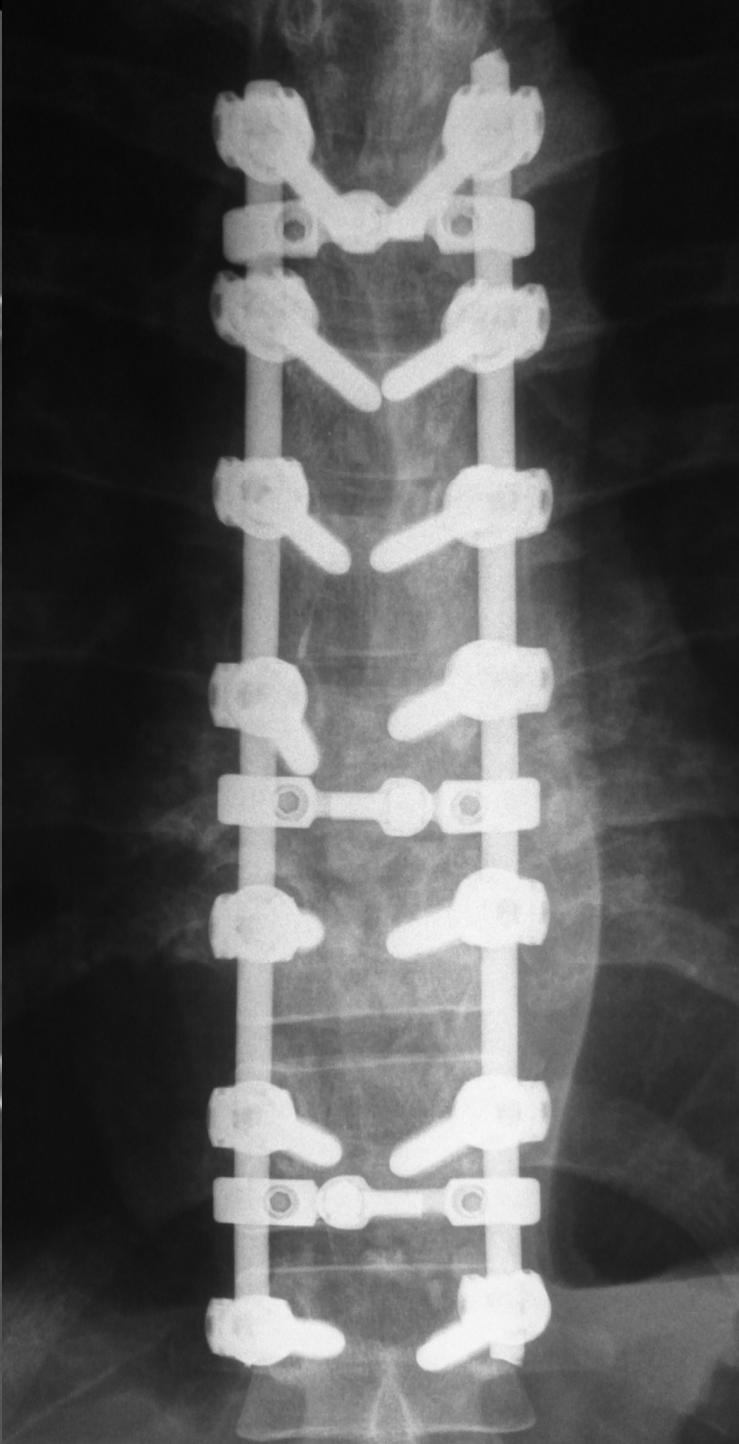
FRACTURES THORACIQUES HAUTES (20%)

FRACTURE-DISLOCATION (ARGENSON (1989) , SHAPIRO (2002))

- **Peu de troubles neurologiques**
- **Elargissement du canal rachidien**
- **60% de lésions de la cage thoracique ou de la ceinture scapulaire**
- **35 % de lésions rachidiennes étagées**
- **Tt chirurgical discuté : voie postérieure avec vissage pédiculaire étagé +++**

ARGENSON





FRACTURES LOMBAIRES BASSES (L3 à L5)

DISQUES HAUTS et MOBILES

POSTURE LORDOSANTE PEU EFFICACE

ARTHRODESE « ECONOMIQUE »



BILAN RADIOLOGIQUE

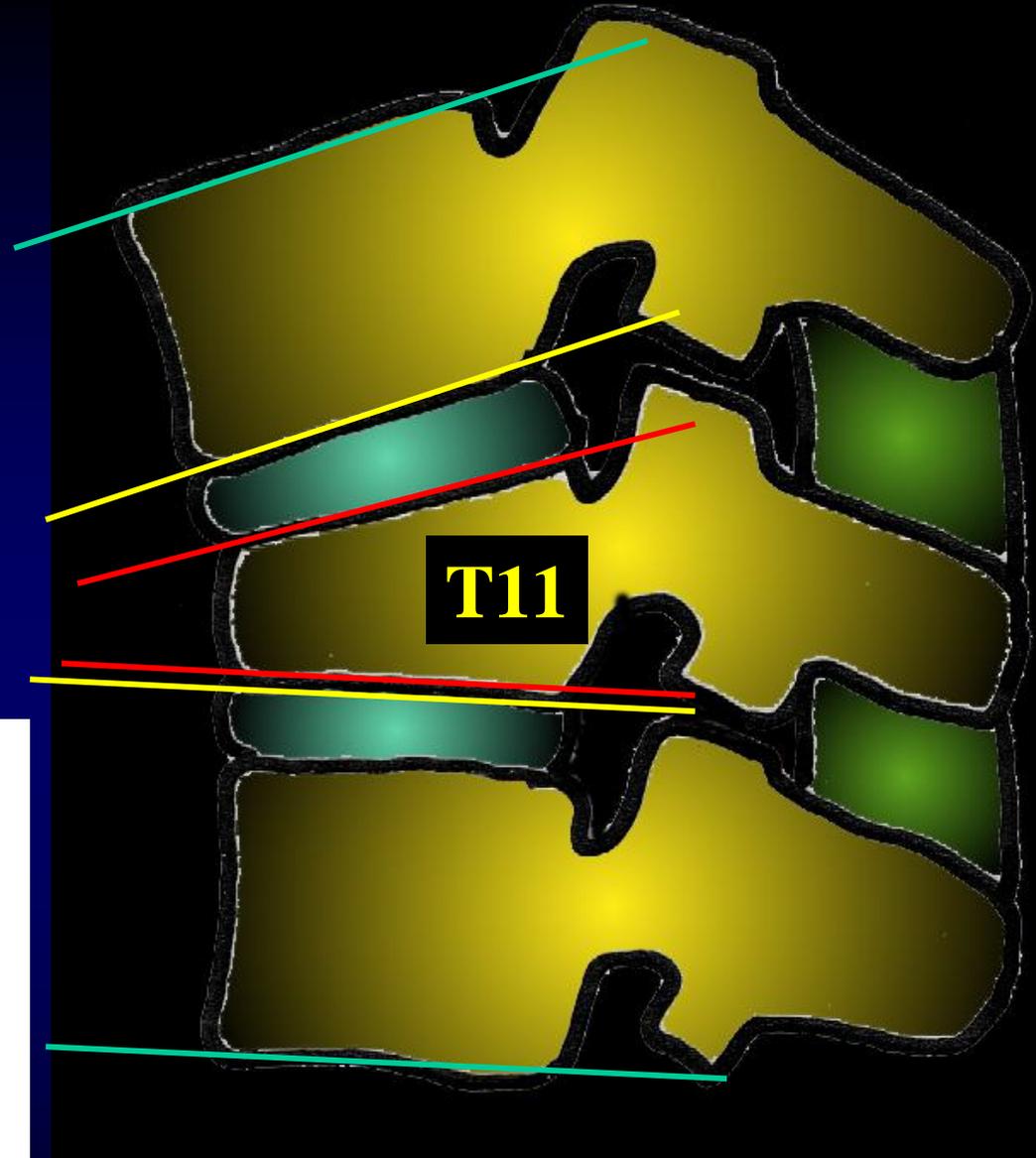
- CLICHES SIMPLES F et P , ALLONGE
- CLICHES DYNAMIQUES
- EVALUATION EQUILIBRE SAGITTAL
- TOMODENSITOMETRIE
- IRM



C. REGIONALE

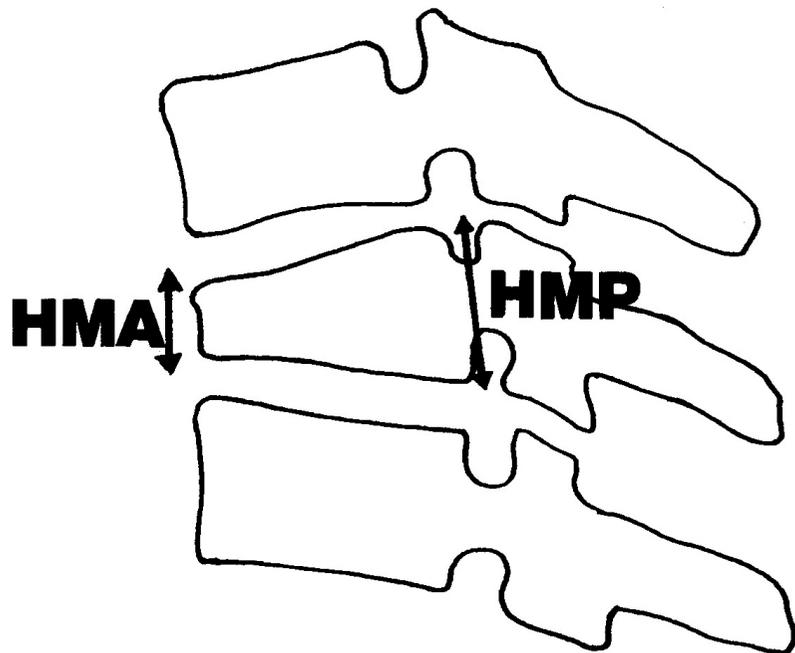
CYPHOSE LOCALE

C. VERTEBRALE



T11

HAUTEUR MUR VERTEBRAL

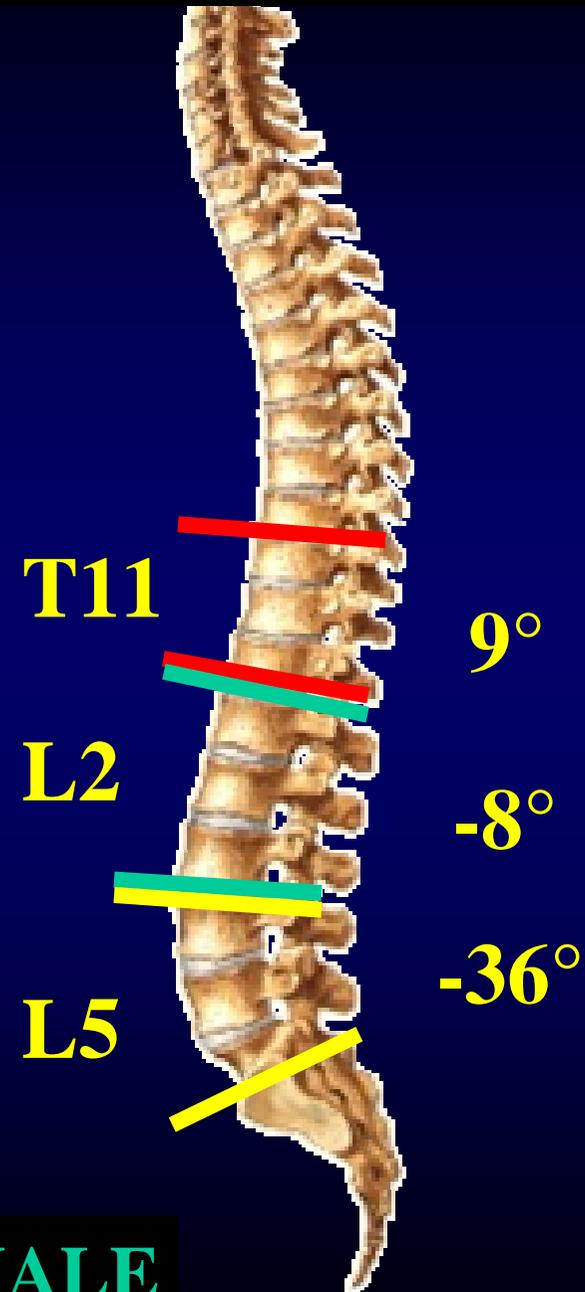


STAGNARA (1982) : **ANGULATION REGIONALE THEORIQUE** (A.R.Th.)

Niveau fracture	ARTh moyenne	Minimum (1)	Maximum (2)
T11	9°	- 12 °	22°
T12	7°	- 11°	20°
L1	1°	- 16°	20°
L2	- 8°	- 23°	11°
L3	- 19°	- 36°	- 6°
L4	- 33°	- 54°	- 16°
L5	- 36°	- 53°	- 18°

(1) Faible incidence pelvienne – (2) Forte incidence pelvienne

ANGULATION REGIONALE THEORIQUE (A.R.Th.)



= CYPHOSE REGIONALE NORMALE

**STAGNARA (1982) : ANGULATION REGIONALE THEORIQUE
(A.R.Th.)**

FARCY (1989) : SAGITTAL INDEX (S.I.)

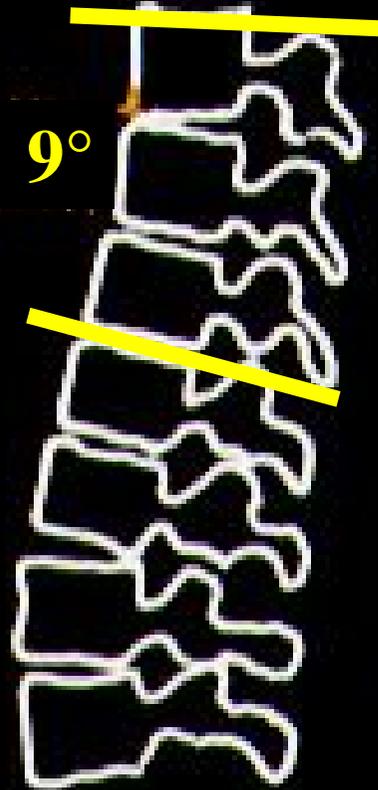
**ARGENSON et LASSALE (1995) : ANGULATION
REGIONALE TRAUMATIQUE (A.R.T.)**

ANGULATION REGIONALE TRAUMATIQUE (A.R.T.)

C.R. 30°



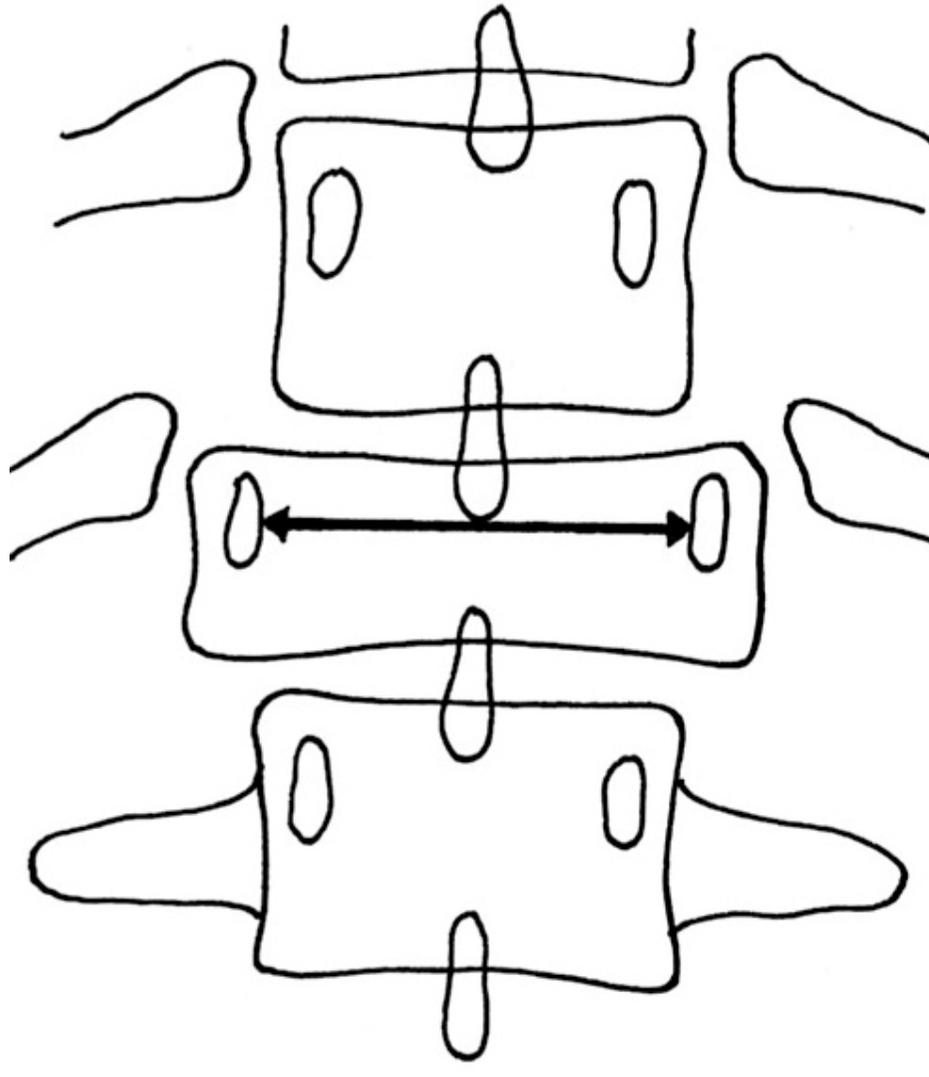
A.R.Th. 9°



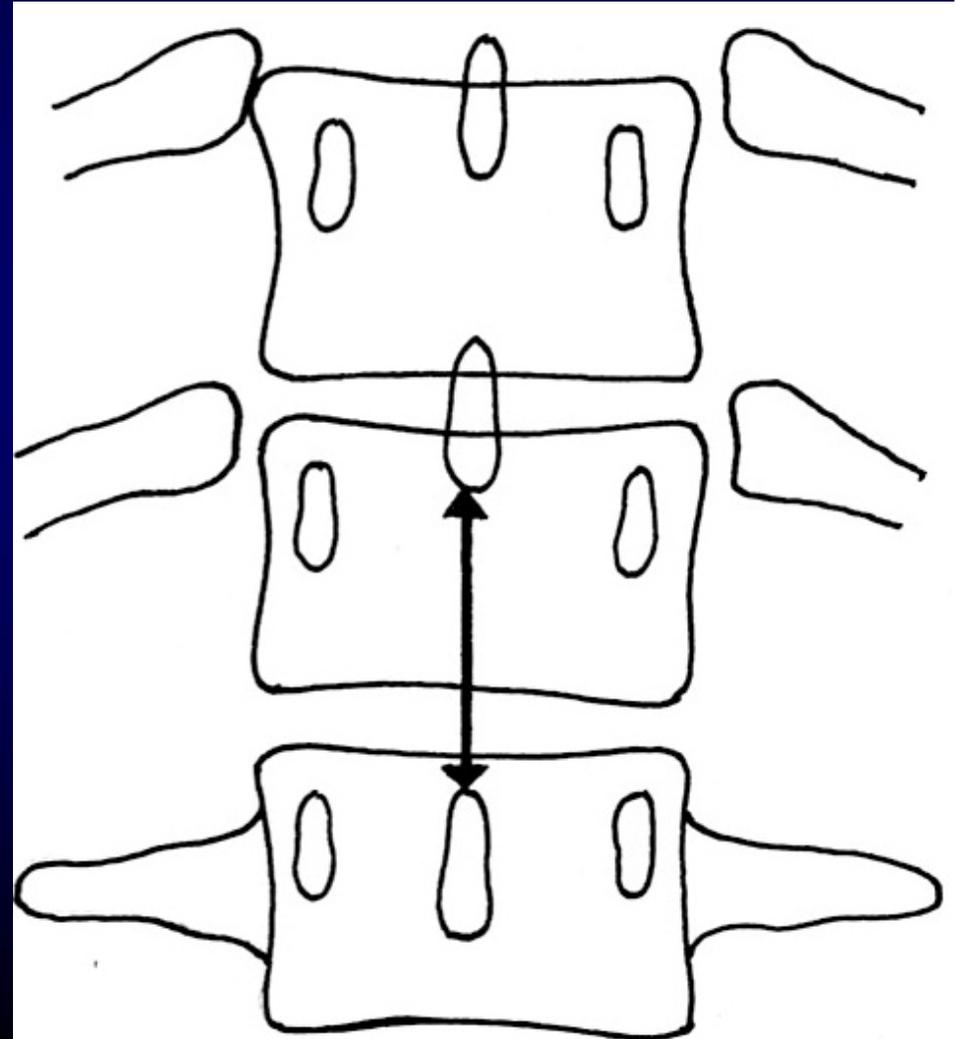
T11

$$\text{A.R.T.} = \text{C.R. (30°)} - \text{A.R.Th. (9°)} = 25°$$

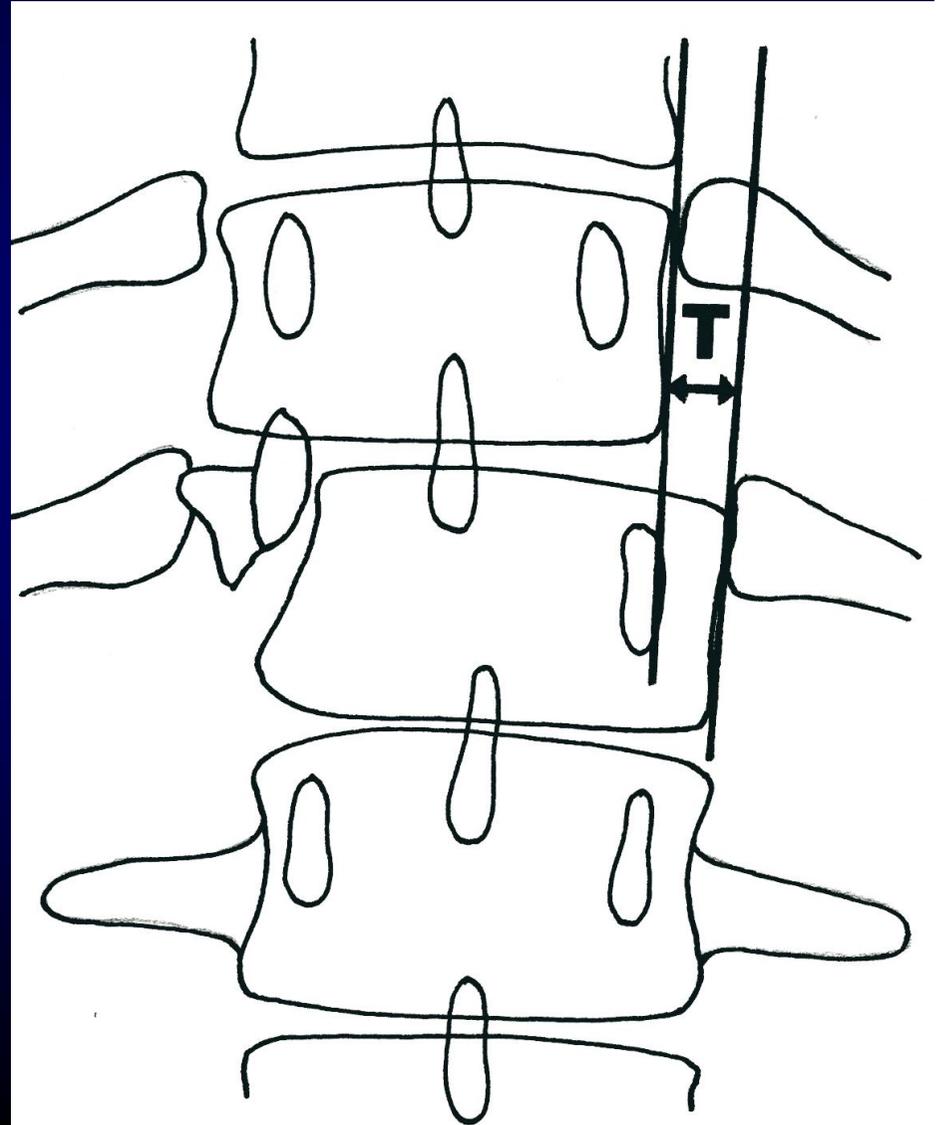
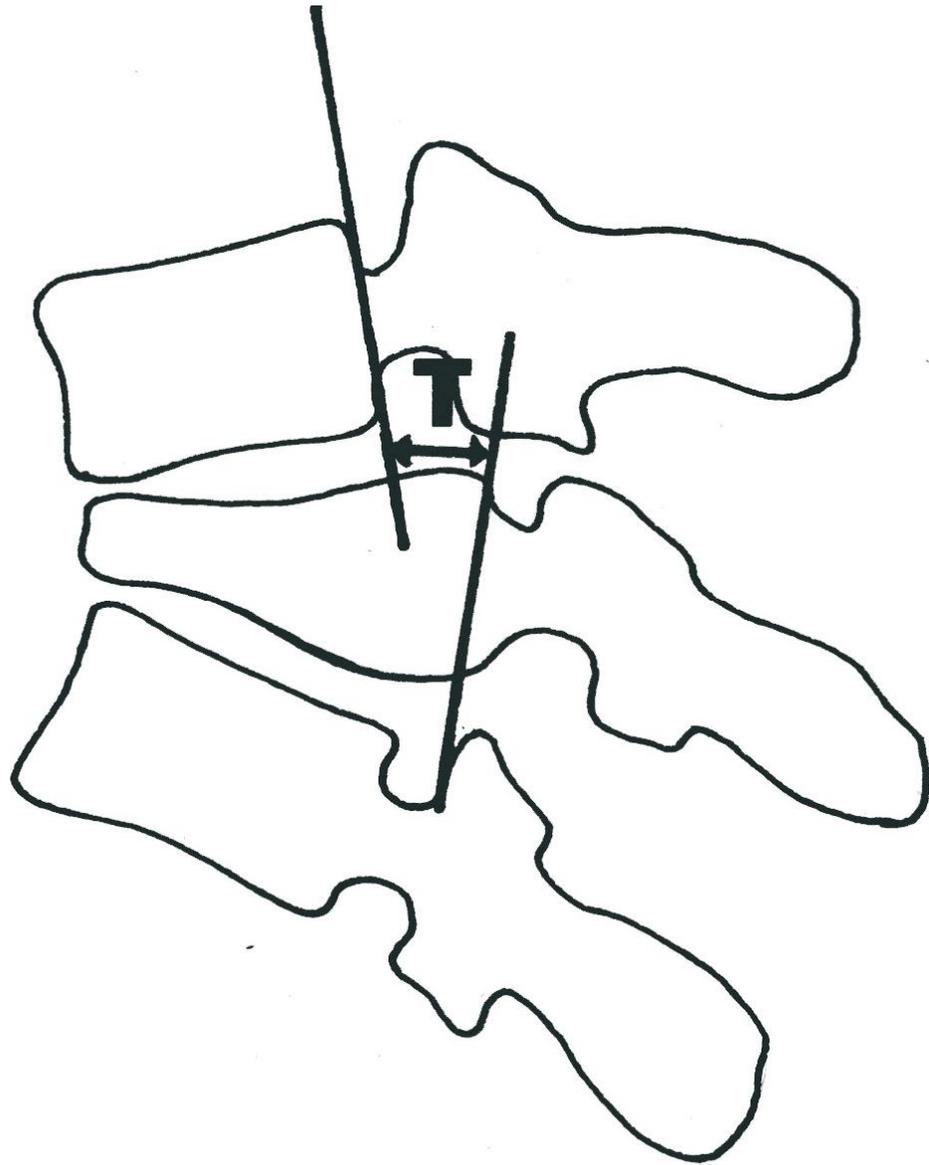
ECART INTERPEDICULAIRE



ECART INTEREPINEUX



TRANSLATION



CLICHES DYNAMIQUES

- **CLICHE en CHARGE (METHA (2004))**
C.V. augmentée de 7° en moyenne
- **CLICHE en FLEXION EXTENSION de PROFIL**
- **CLICHE de PROFIL sur BILLOT**

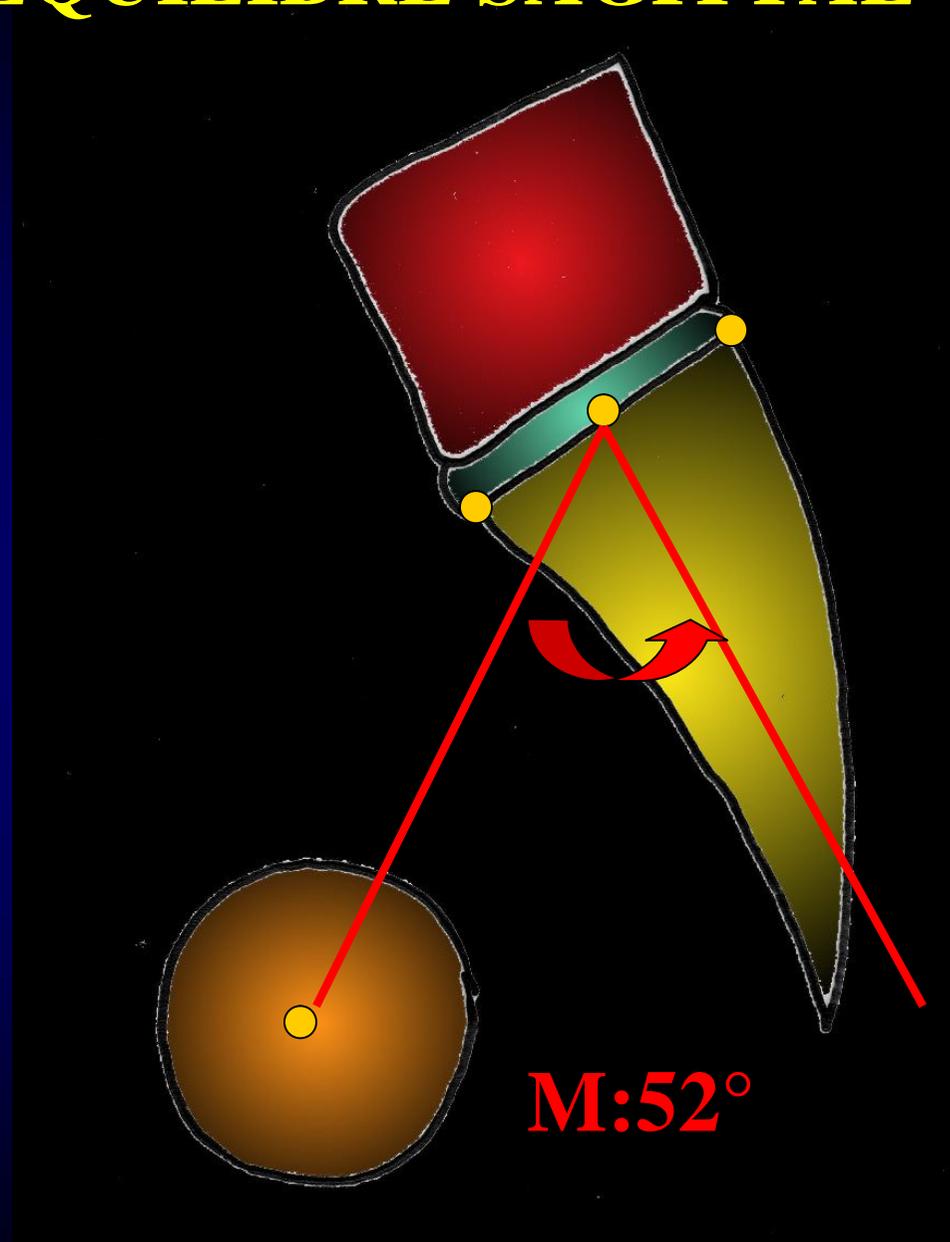
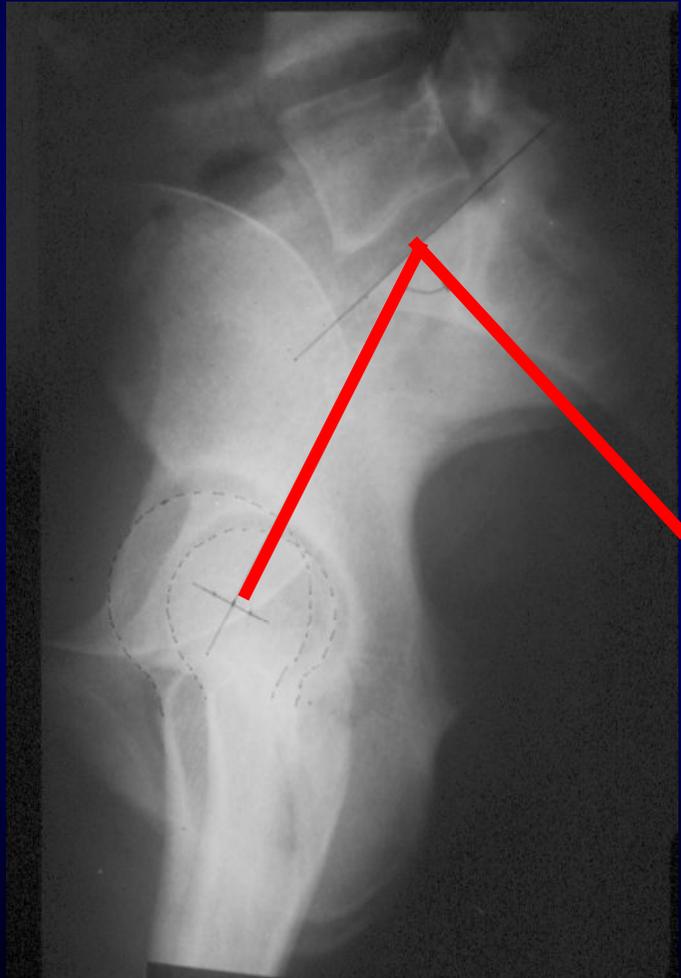


LESIONS ANCIENNES



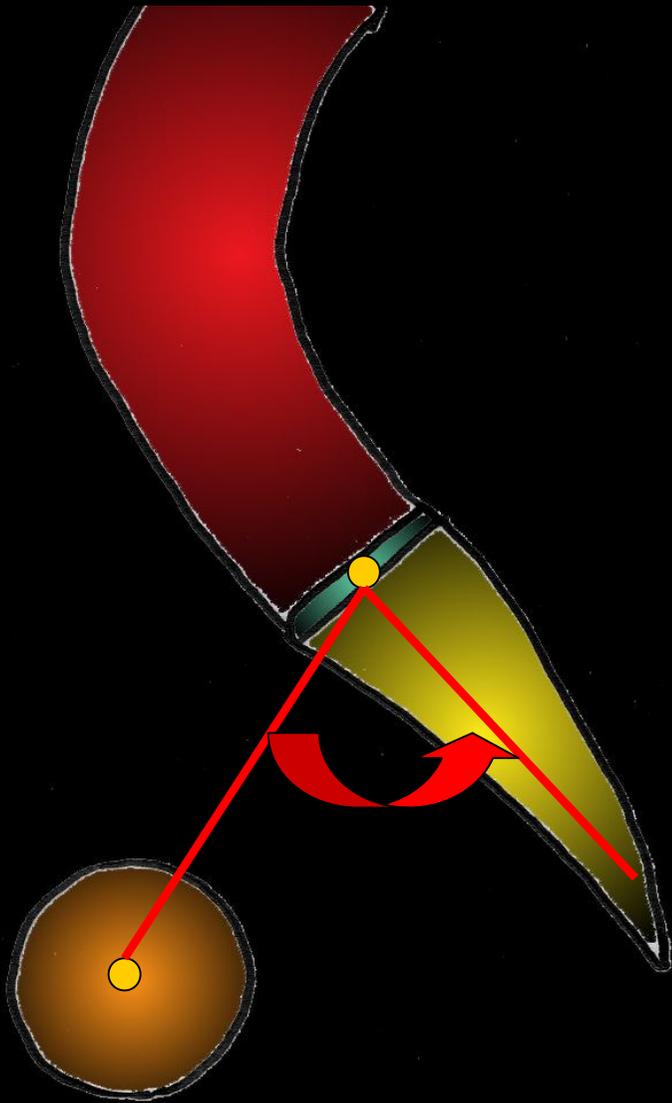
CLICHES DYNAMIQUES

EVALUATION de l'EQUILIBRE SAGITTAL

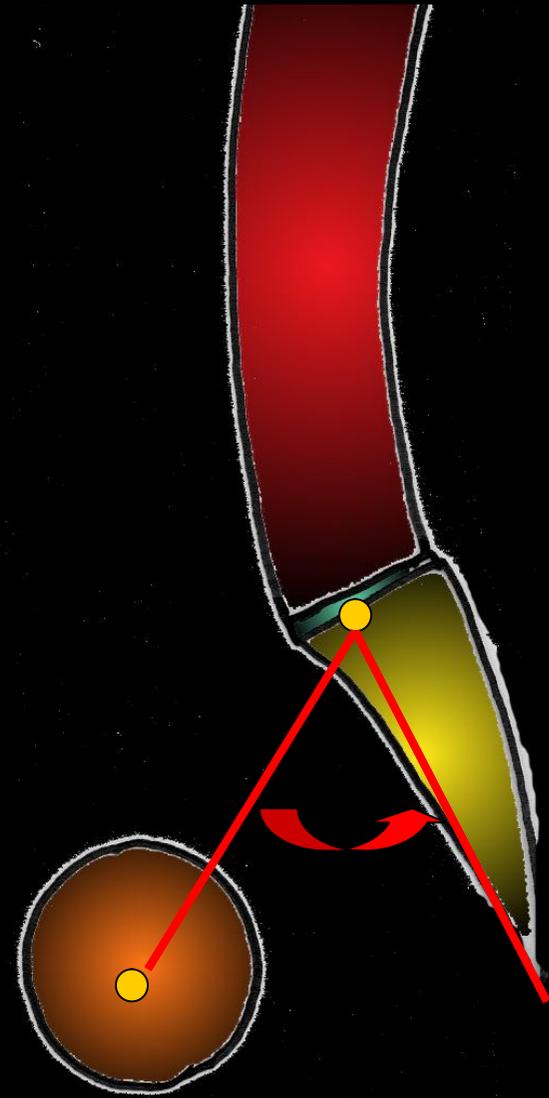


INCIDENCE PELVIENNE

DYNAMIQUE



STATIQUE



30 FRACTURES en COMPRESSION OPEREES

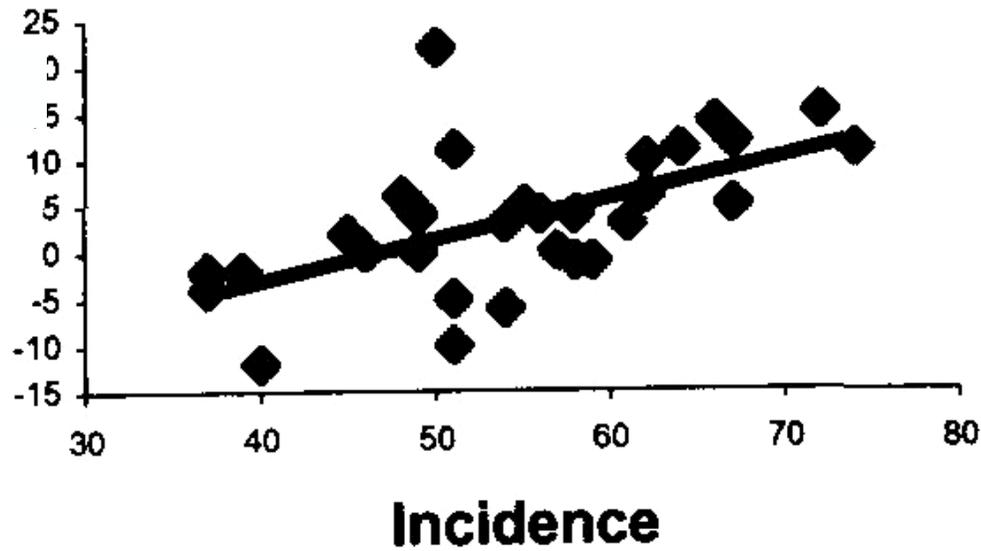
$R=0,87$



FALINE , SFCR 2006

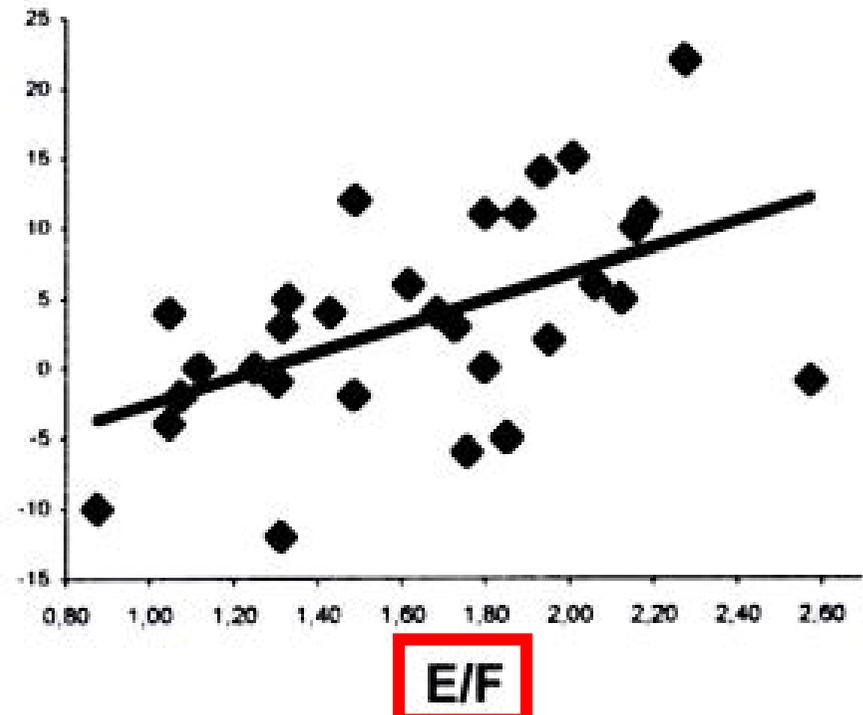
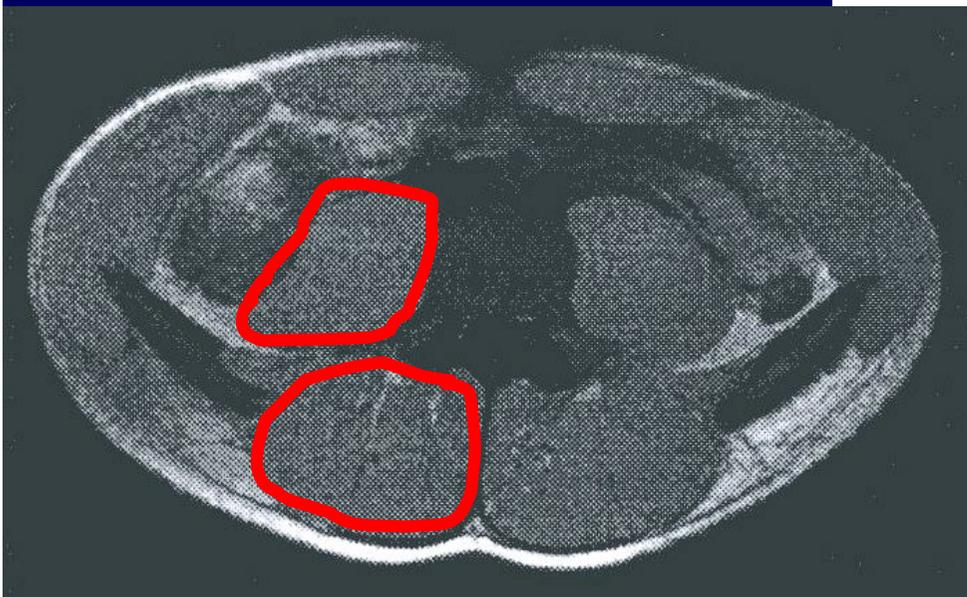
30 SUJETS VOLONTAIRES : E.S., MUSCLES EN IRM

ART L1

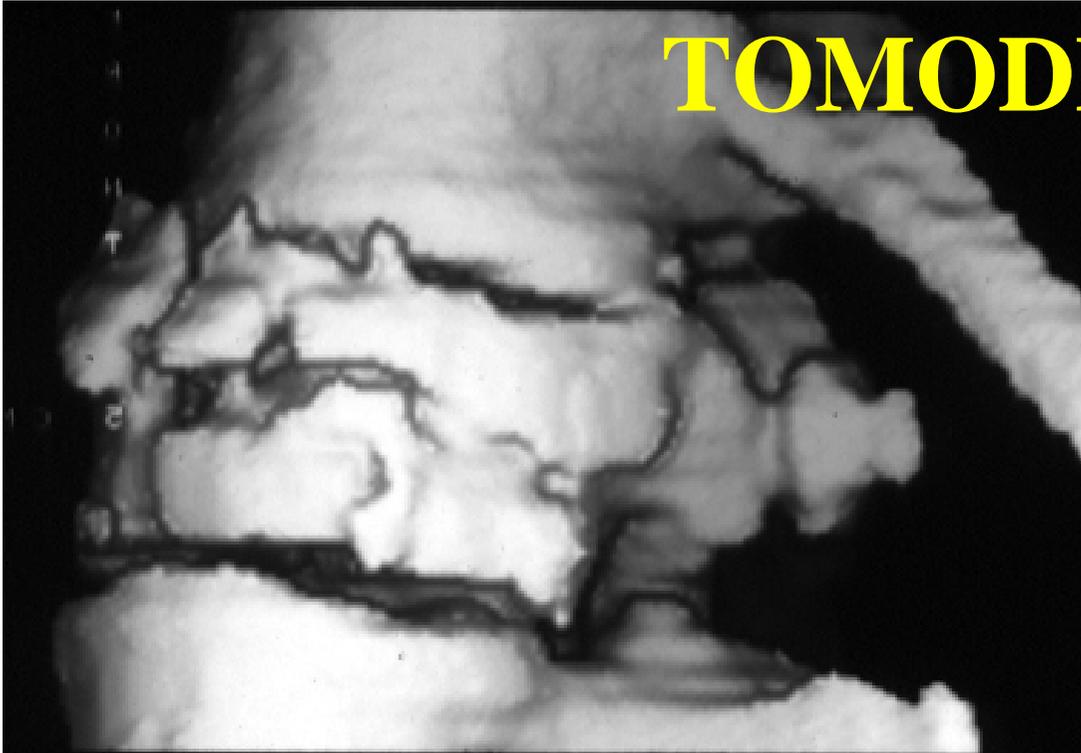


GILLE

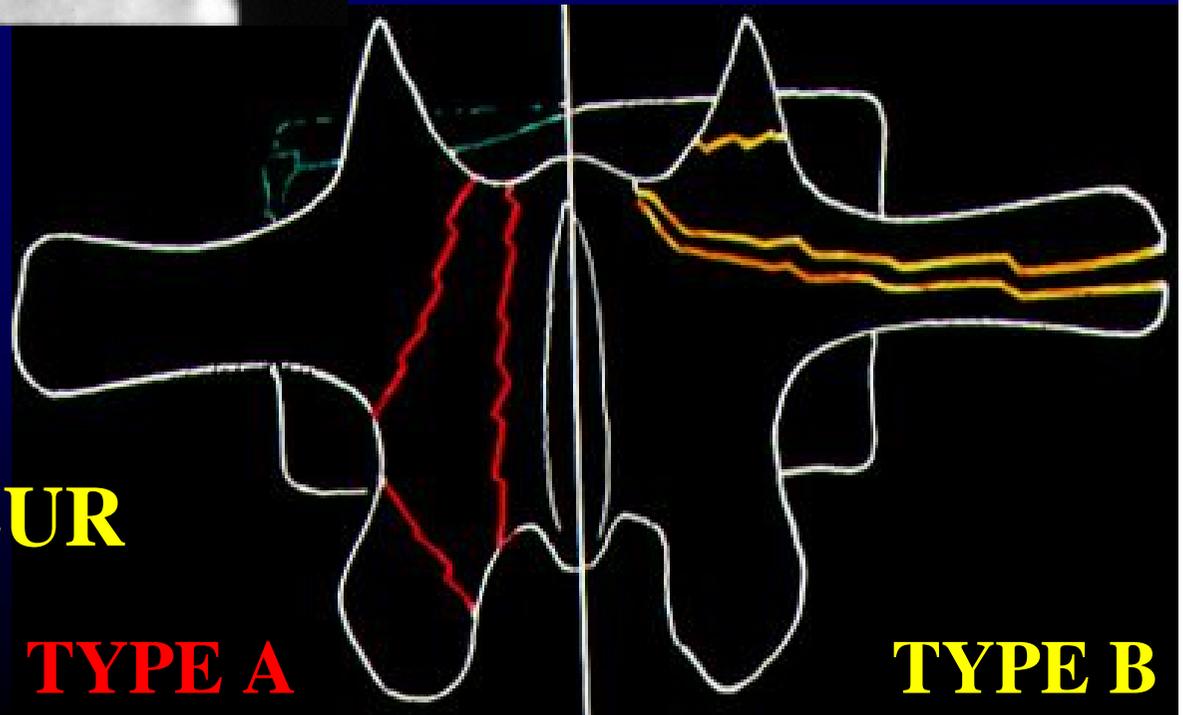
ART L1



TOMODENSITOMETRIE



1. ARC POSTERIEUR



TYPE A

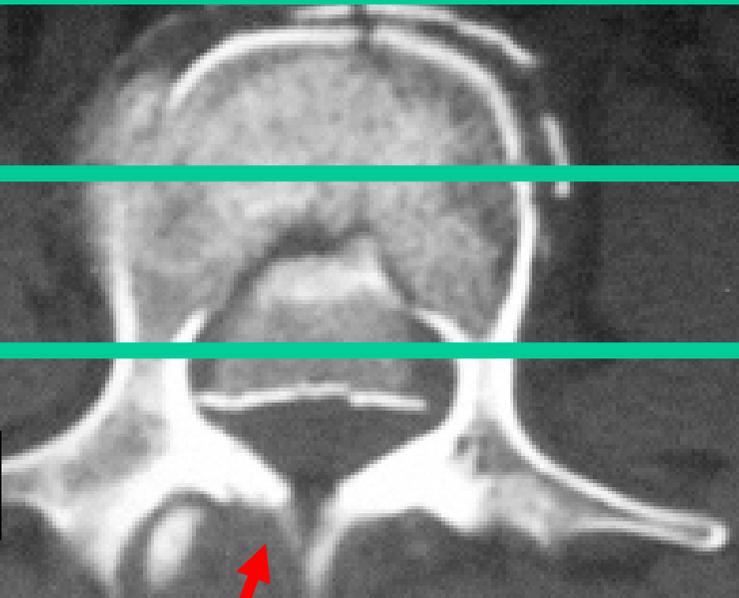
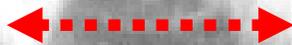
TYPE B

TYPE A

C.ANTERIEURE

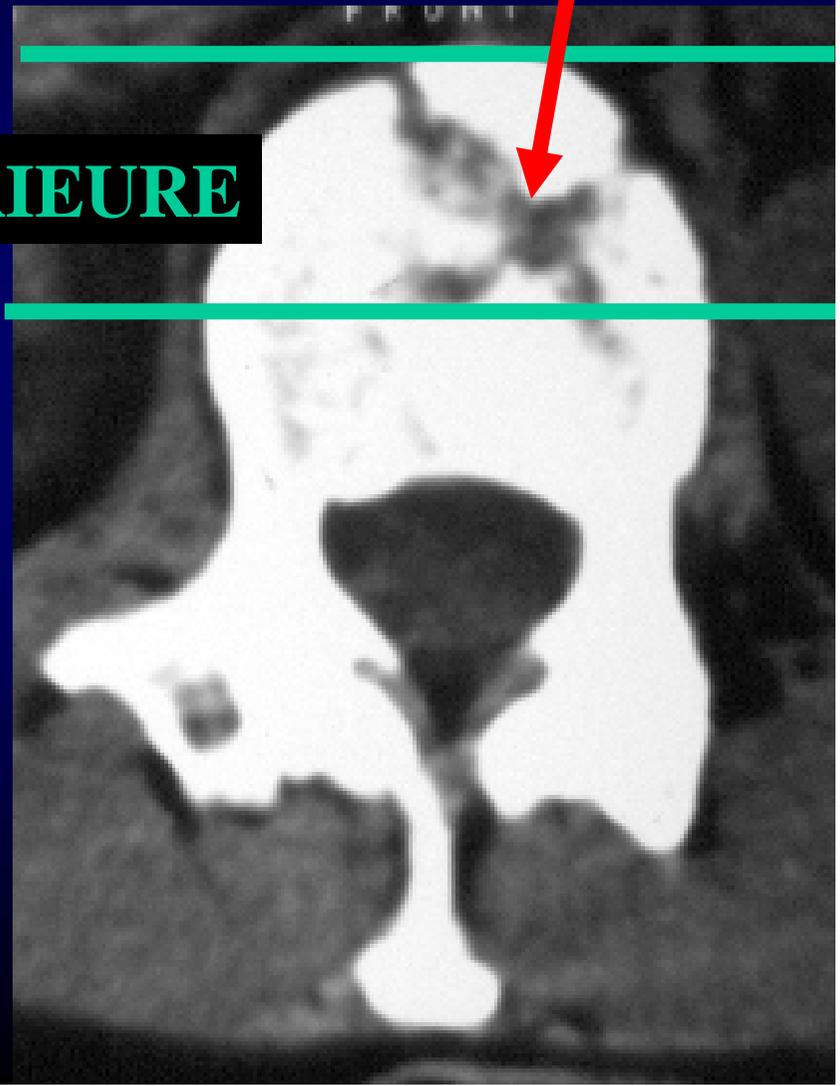
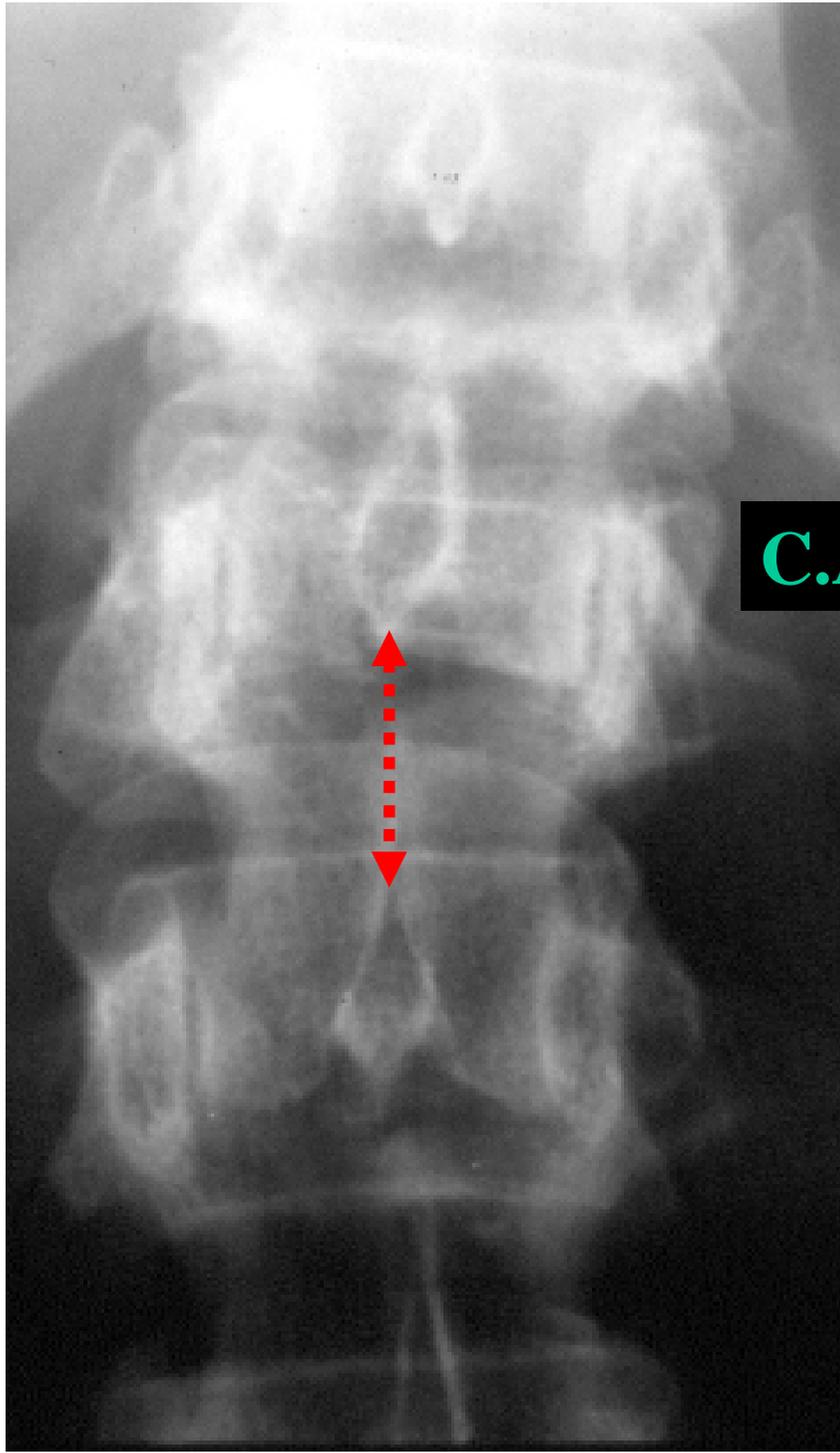
C. MOYENNE

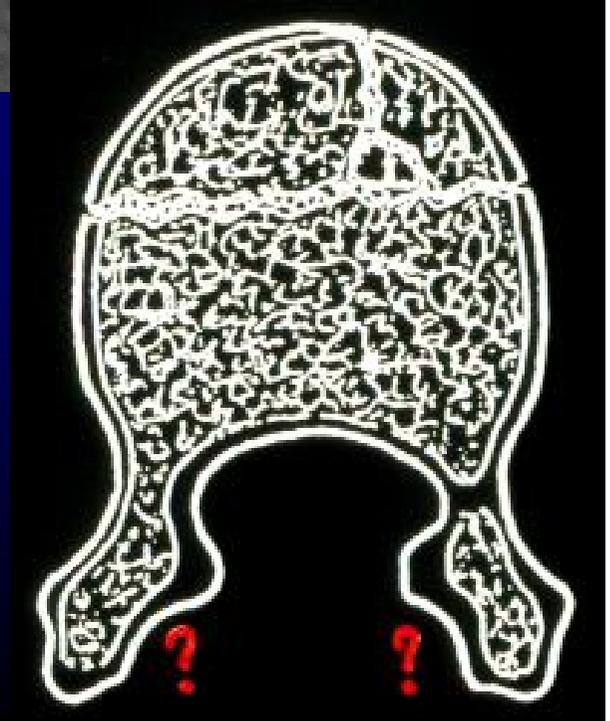
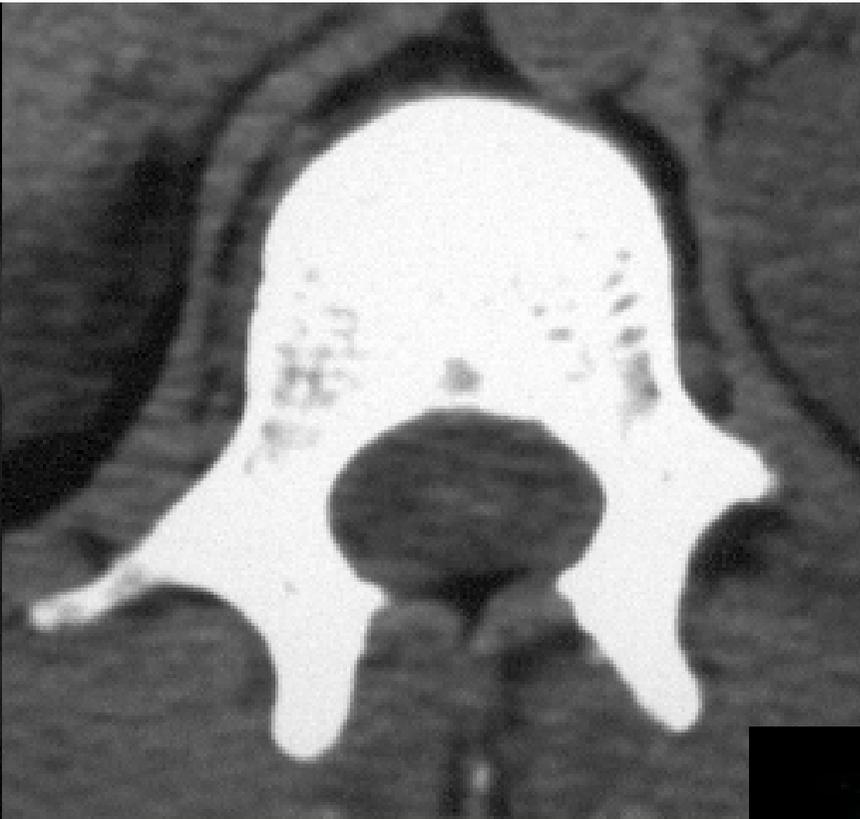
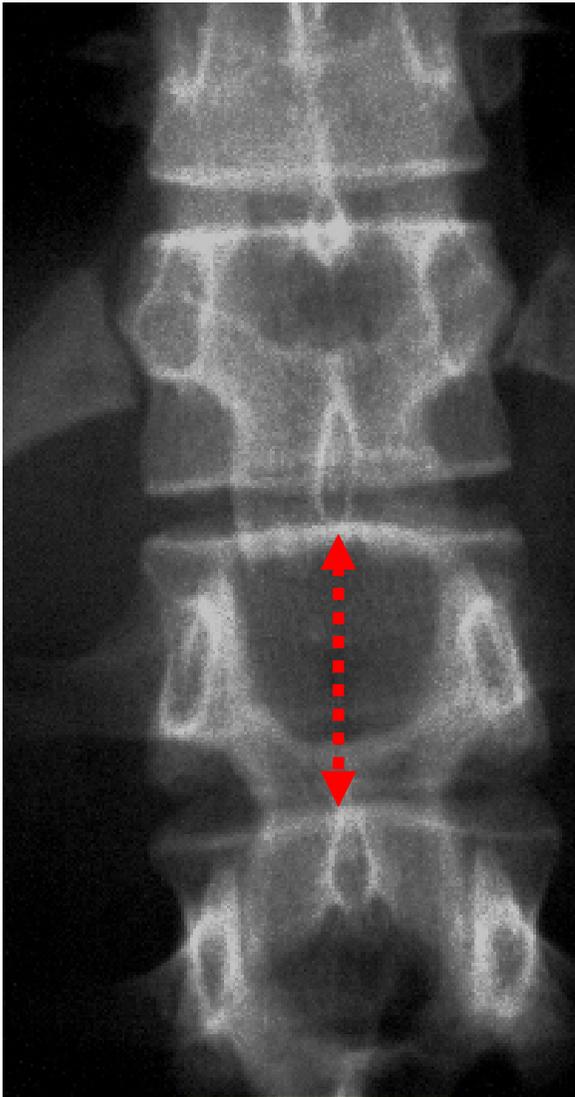
C.POSTERIEURE



TYPE B

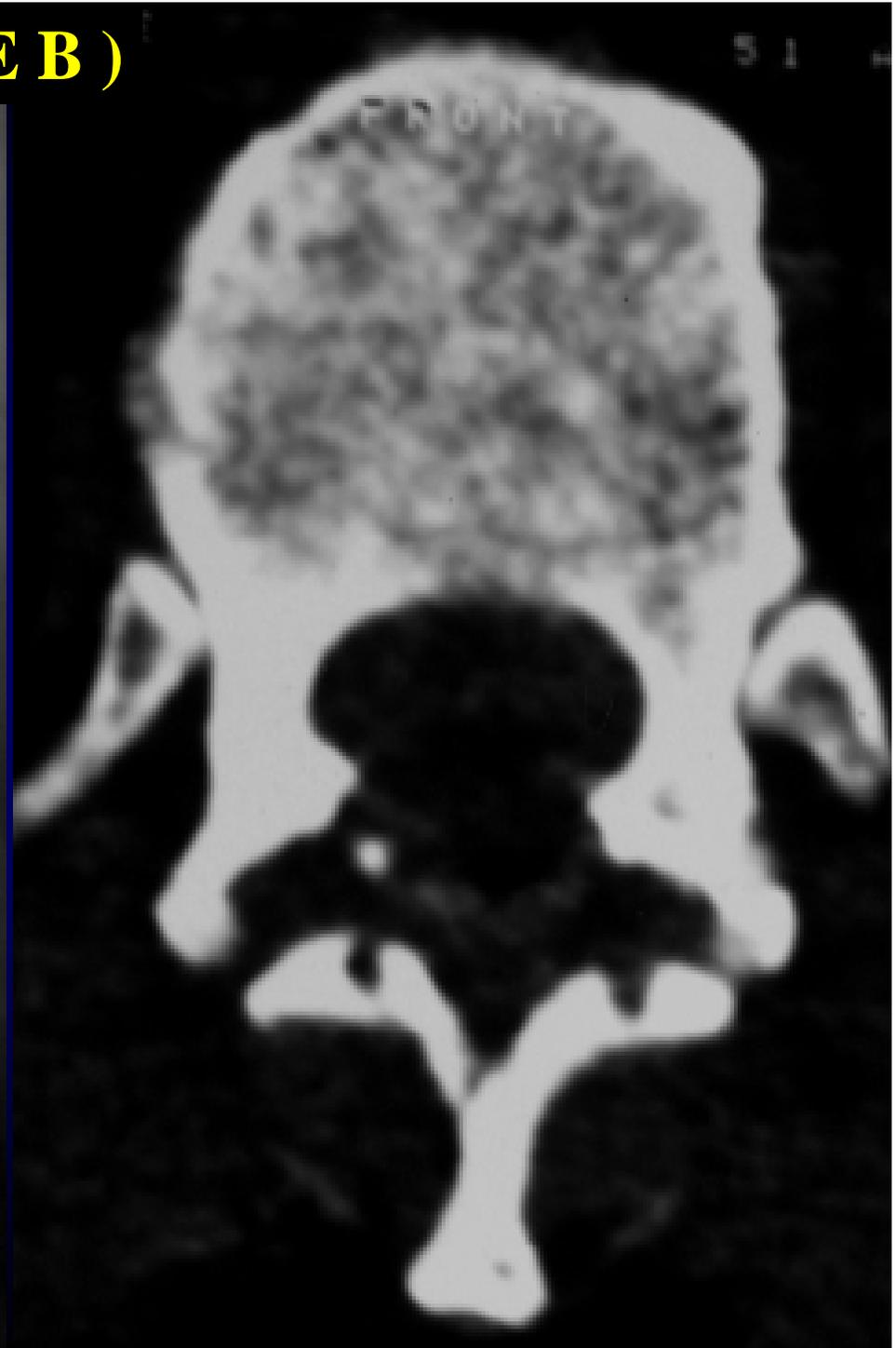
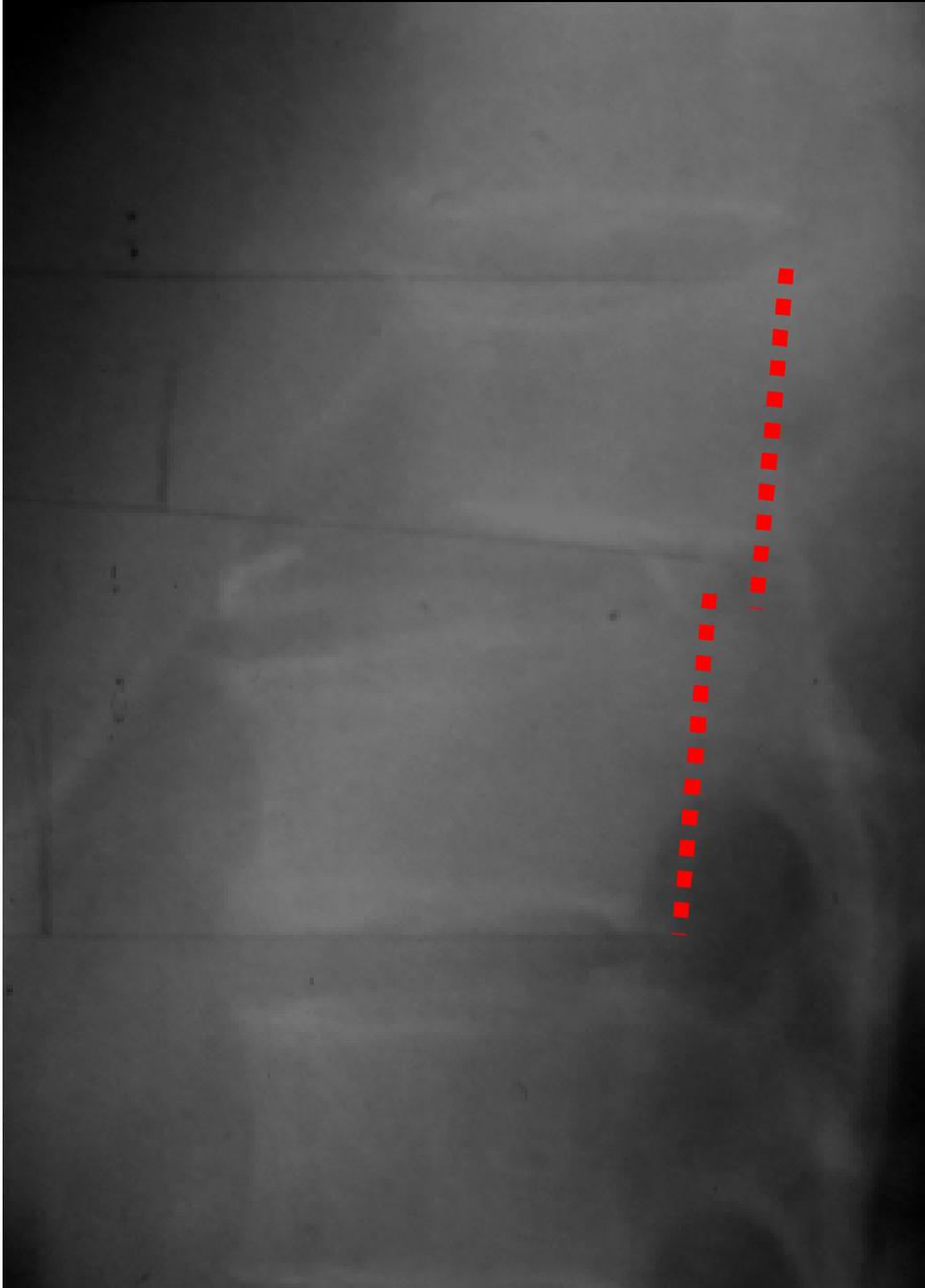
C.ANTERIEURE



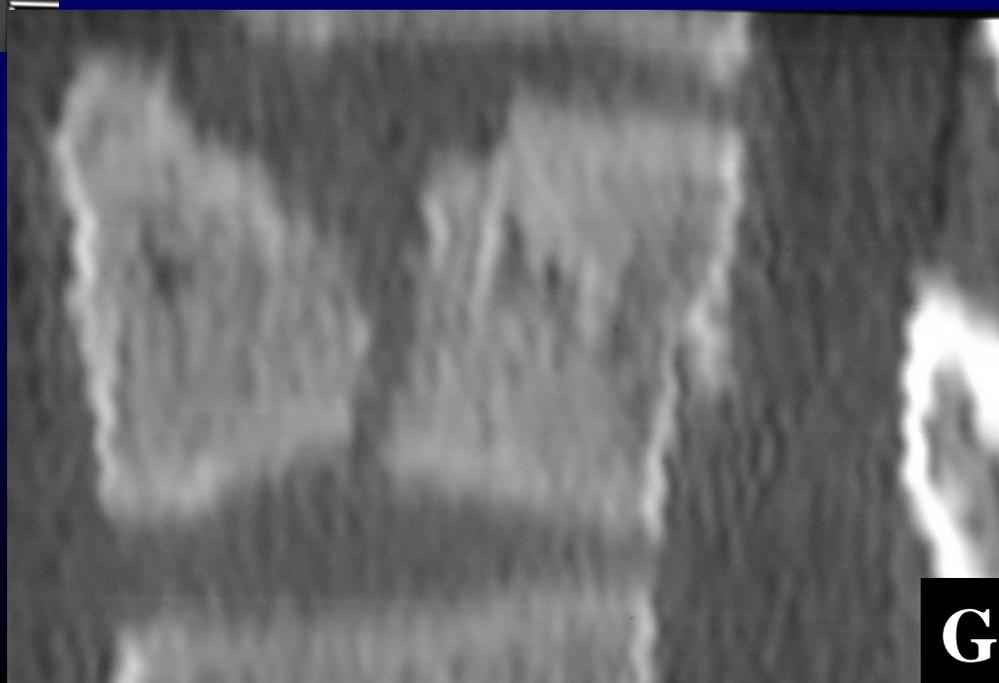
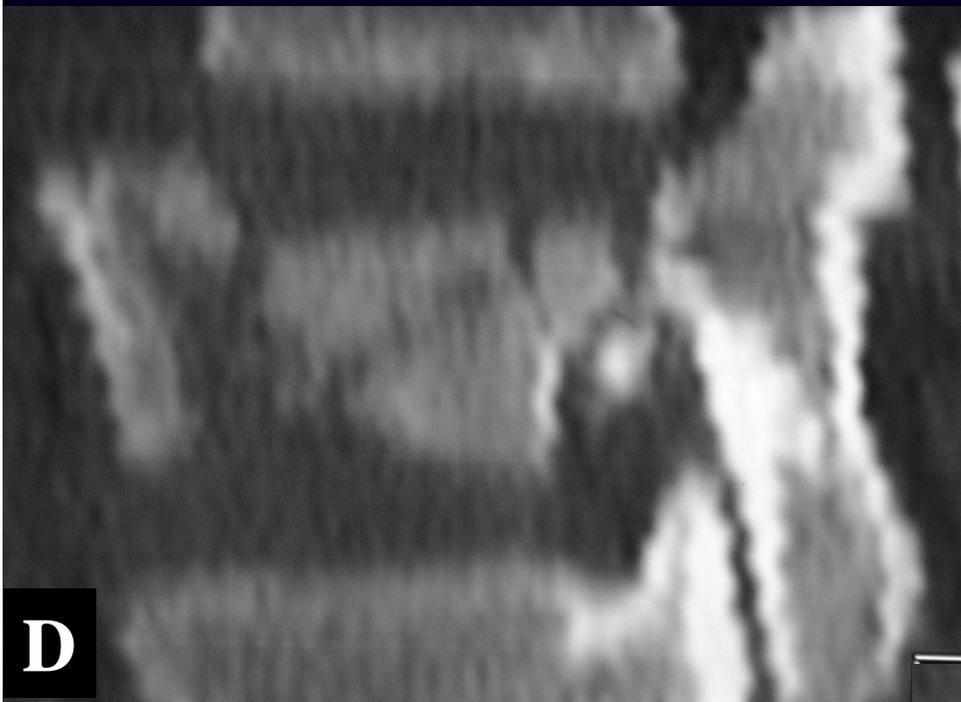


FACETTES NUES

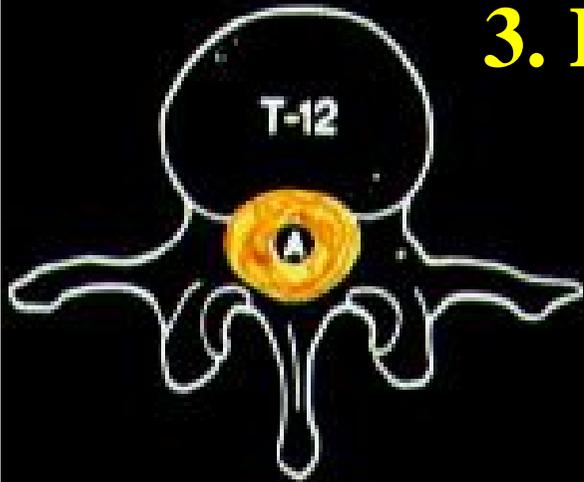
HYPEREXTENSION (TYPE B)



2. COMMUNITION CORPOREALE



3. RETRECISSEMENT CANALAIRE



$$\text{AIRE B ESTIMEE} = \frac{\text{AIRE A} + \text{AIRE B}}{2}$$



$$\% \text{ de COMPRESSION} = \frac{\text{AIRE B ESTIMEE} - \text{AIRE B}}{\text{AIRE B ESTIMEE}}$$



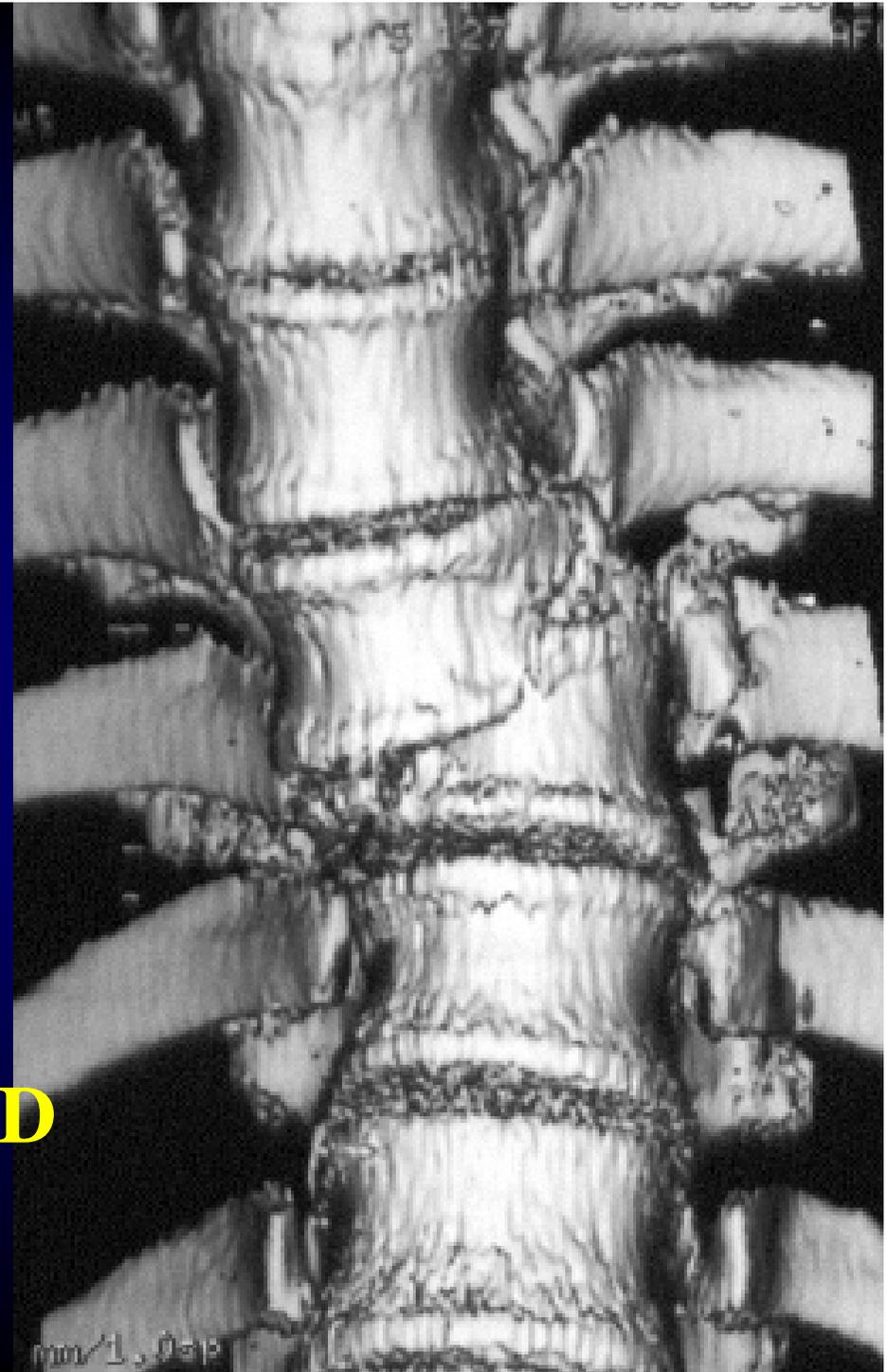
4. ETAT du STERNUM

4 ème COLONNE de BERG (1993)



C





5. RECONSTRUCTION 3D

TRAN (1992)

IRM

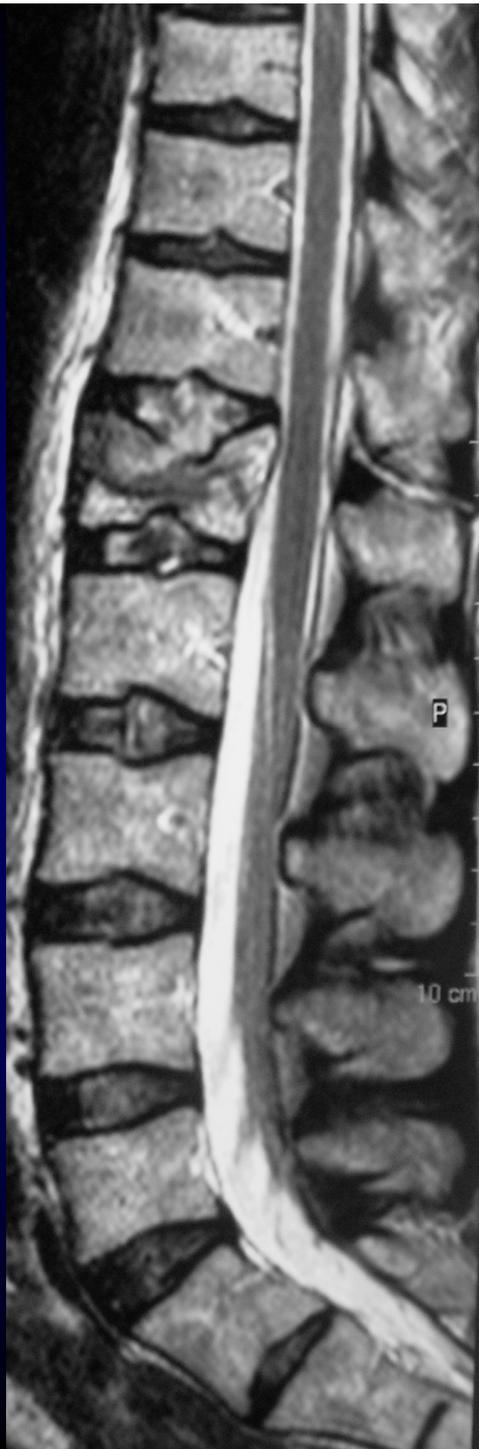
- **CONTUSION de l'OS SPONGIEUX (BONE BRUISE)**
- **LESIONS LIGAMENTAIRES POSTERIEURES**
- **LESIONS DISCALES**



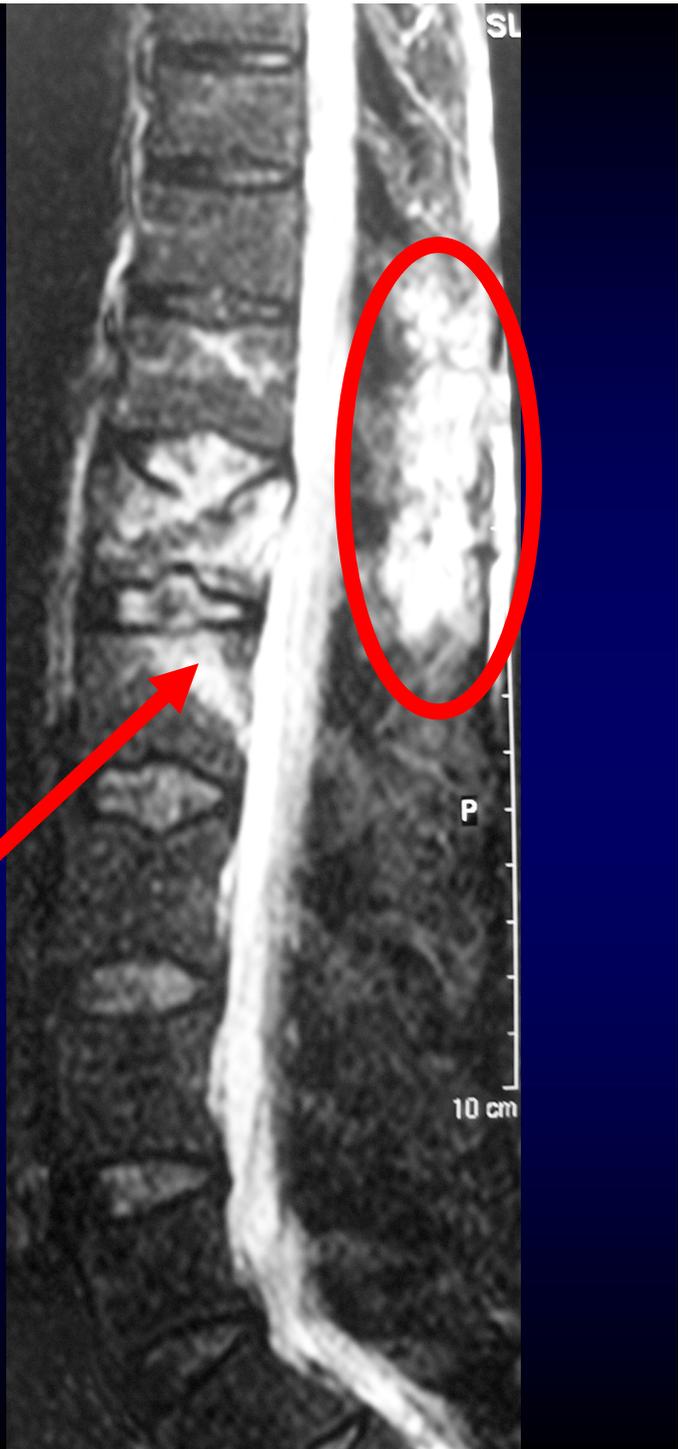
1. SYSTEME LIGAMENTAIRE POSTERIEUR



T2



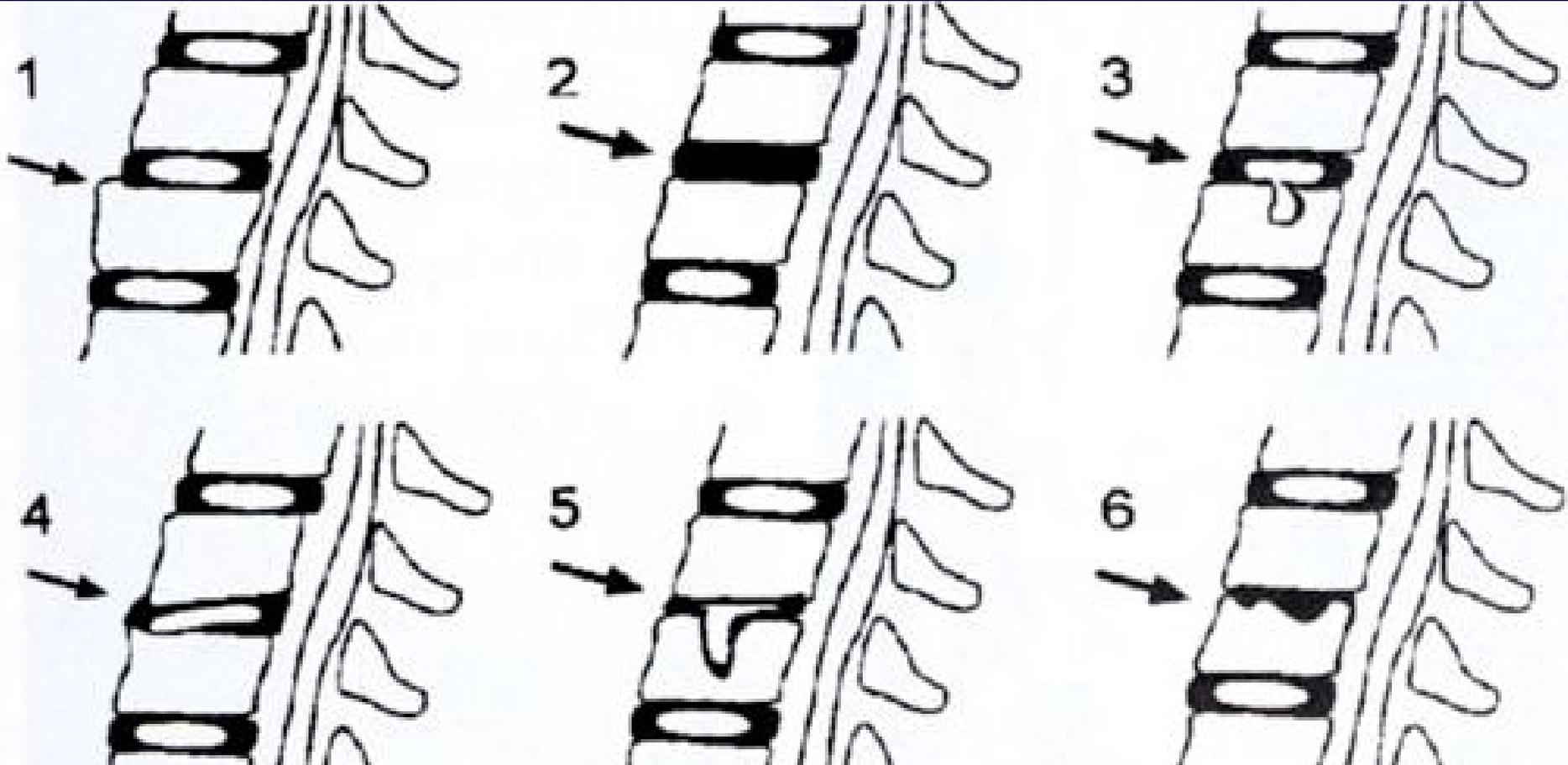
SAT FAT



T2

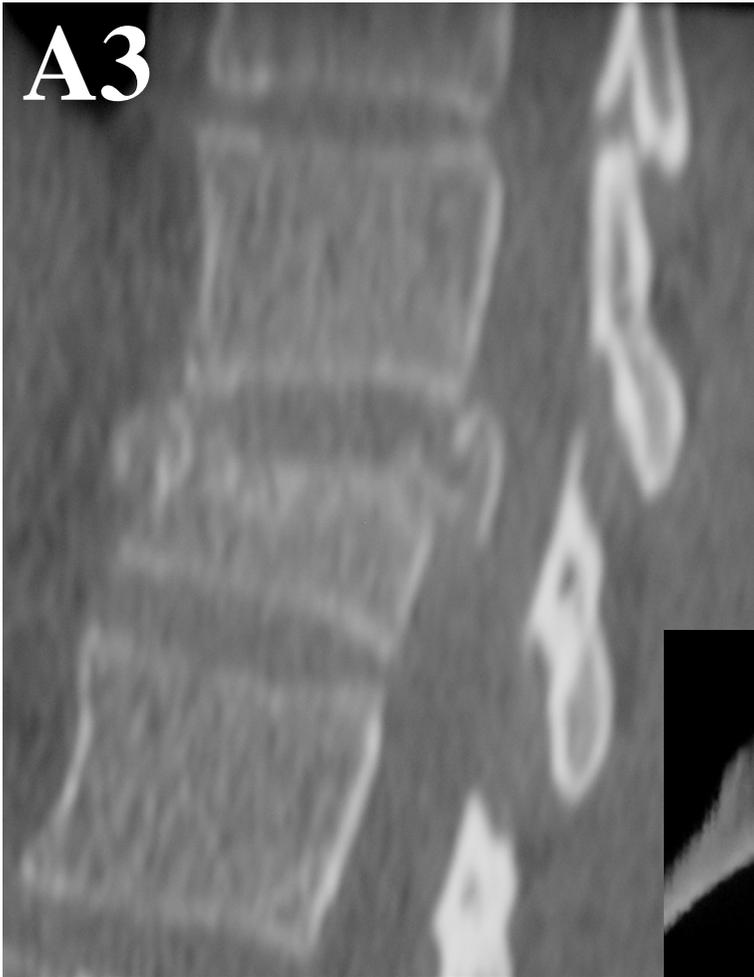


2. DISQUE INTERVERTEBRAL



5 TYPES de LESIONS DISCALES (ONER (1999))

A3



T1



T2



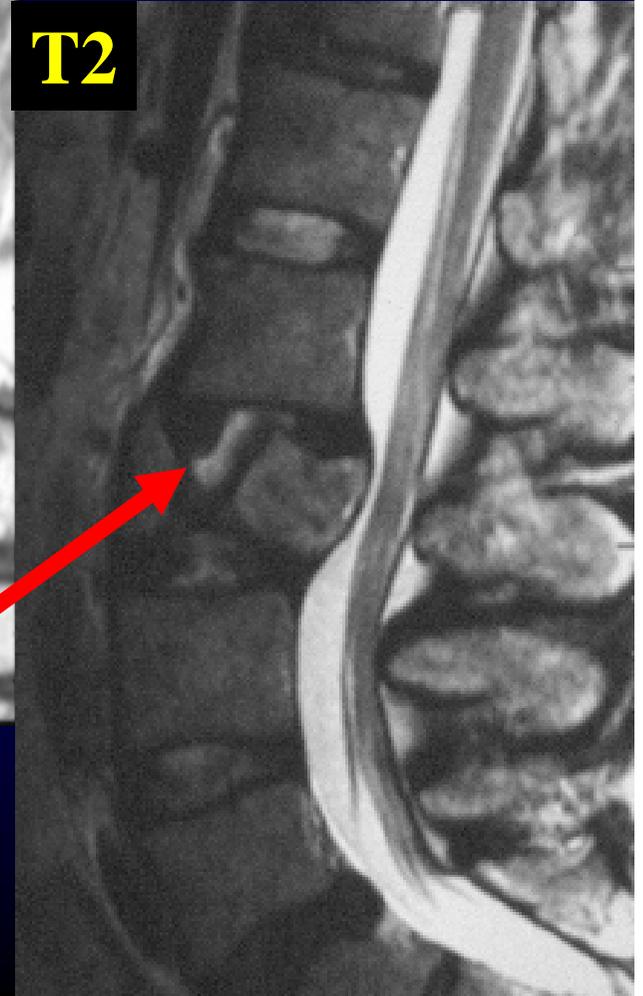
A2



T1



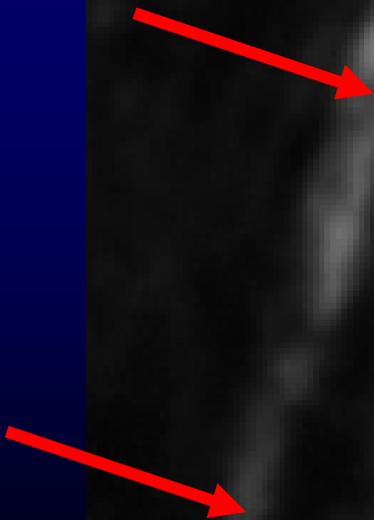
T2



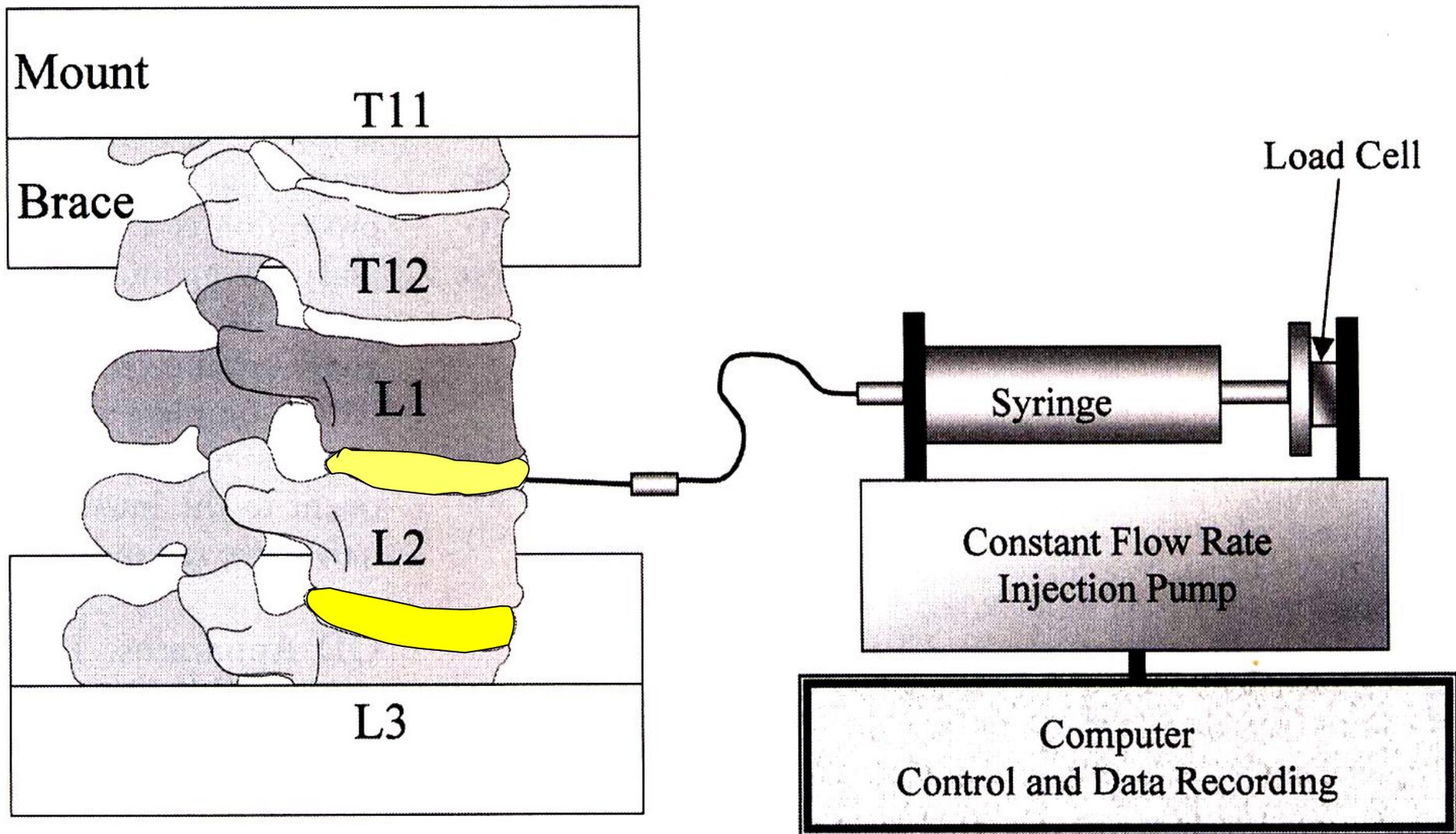
SANG dans le DISQUE

OCT-91
1:09:05

« LESIONS DISCALES ETAGEES »



T2



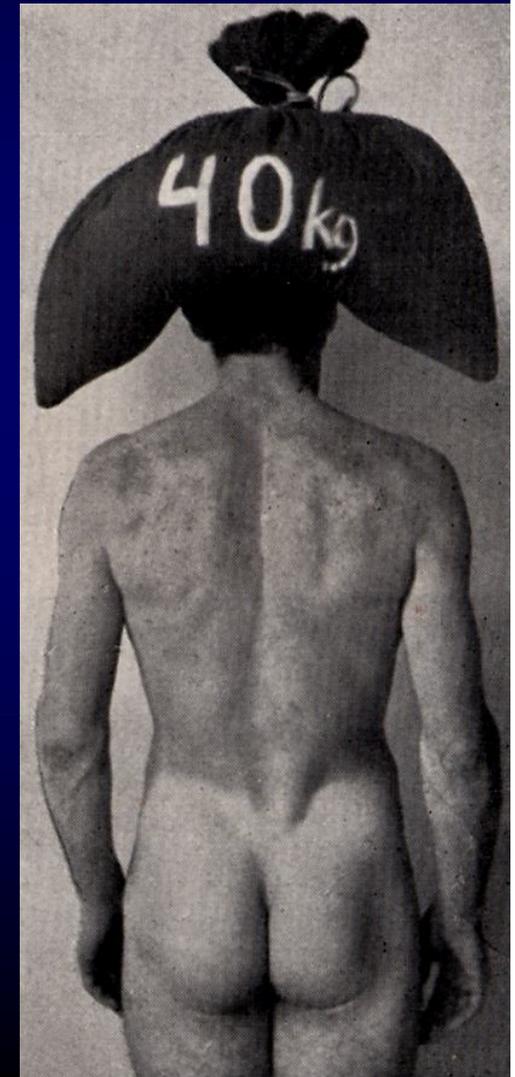
WANG , PANJABI (Spine 2002)

METHODES ORTHOPEDIQUES (non CHIRURGICALES)

- **TRAITEMENT FONCTIONNEL de MAGNUS**
- **CORSET RAPIDEMENT CONFECTIONNE
(CORSET IMMEDIAT)**
- **POSTURE + CORSET (CORSET SECONDAIRE)**



TRAITEMENT FONCTIONNEL (MAGNUS)



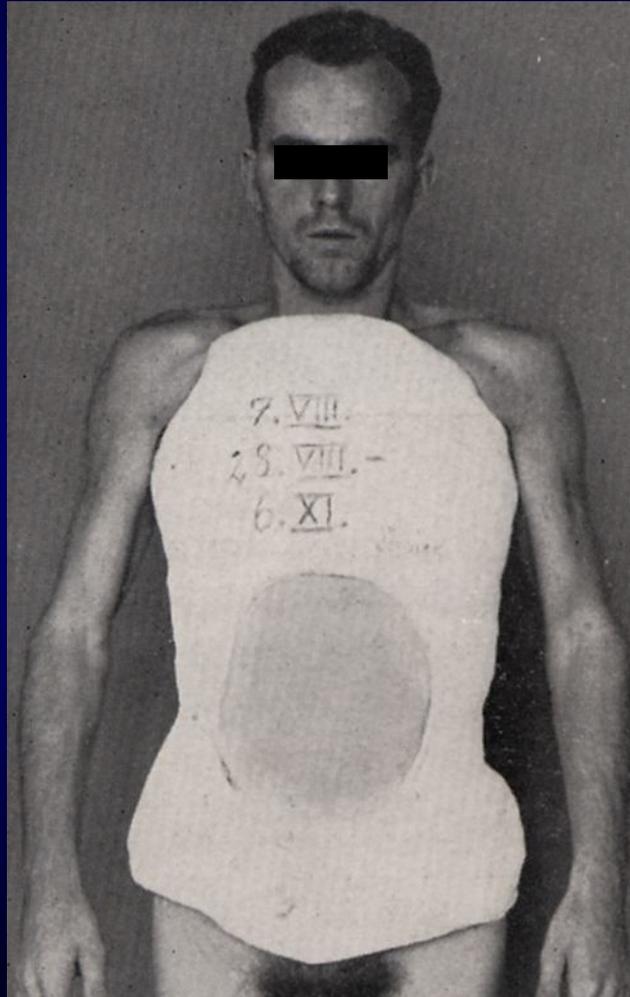
**RENFORCEMENT MUSCULAIRE PRECOCE
(EXTENSEURS)**

CORSET IMMEDIAT AMOVIBLE

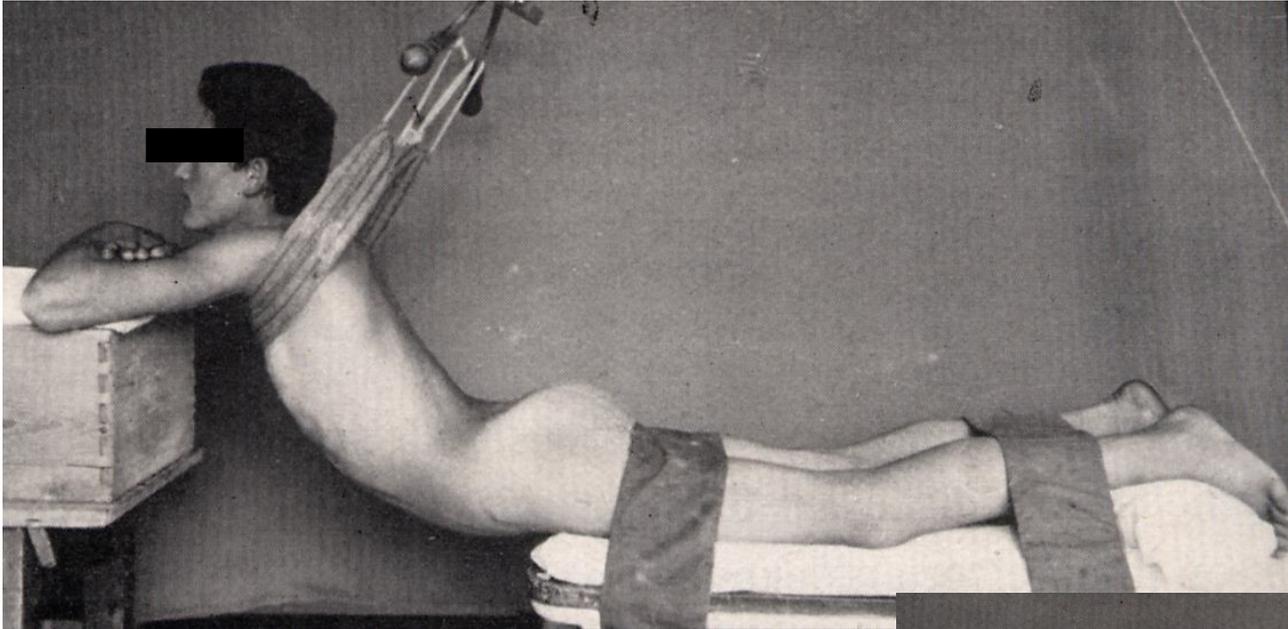


CORSET SECONDAIRE (BOELHER)

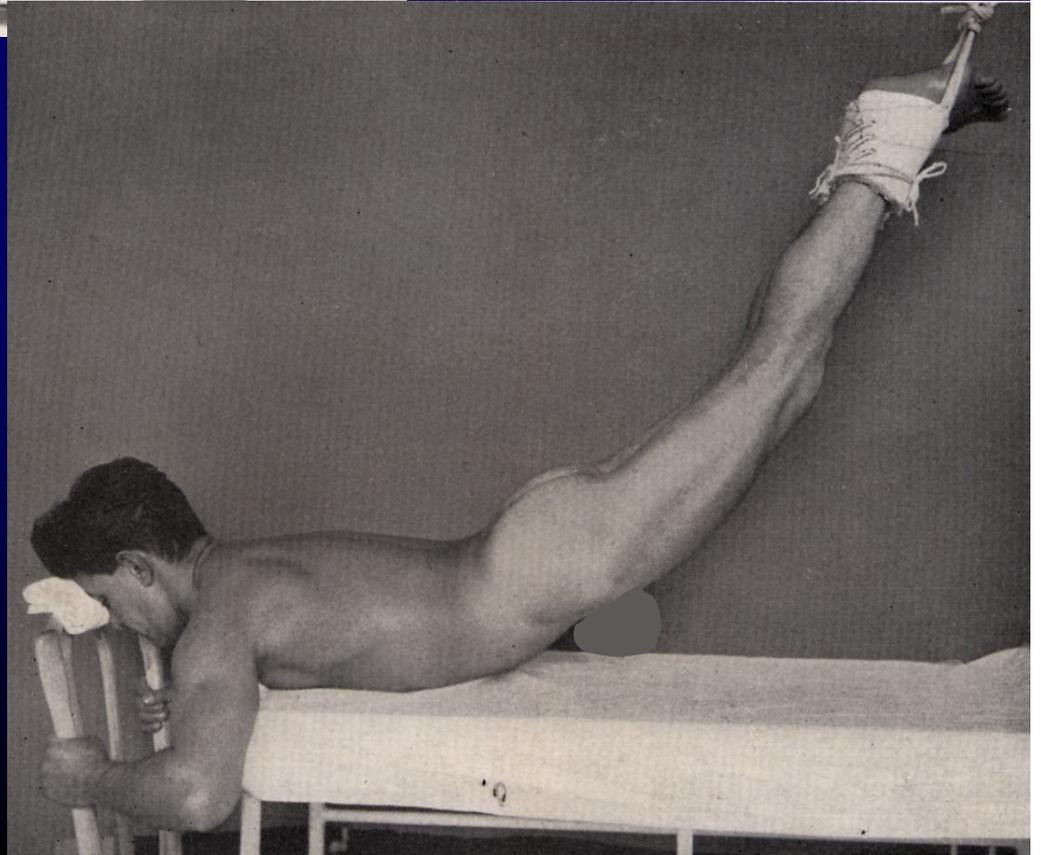
POSTURE LORDOSANTE (3 SEMAINES)



CORSET (2 MOIS)



**POSTURE
LORDOSANTE**



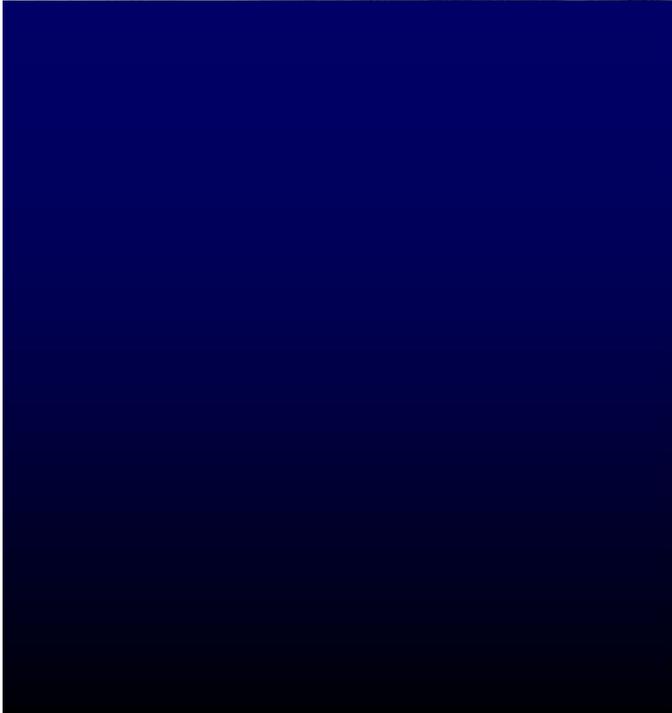
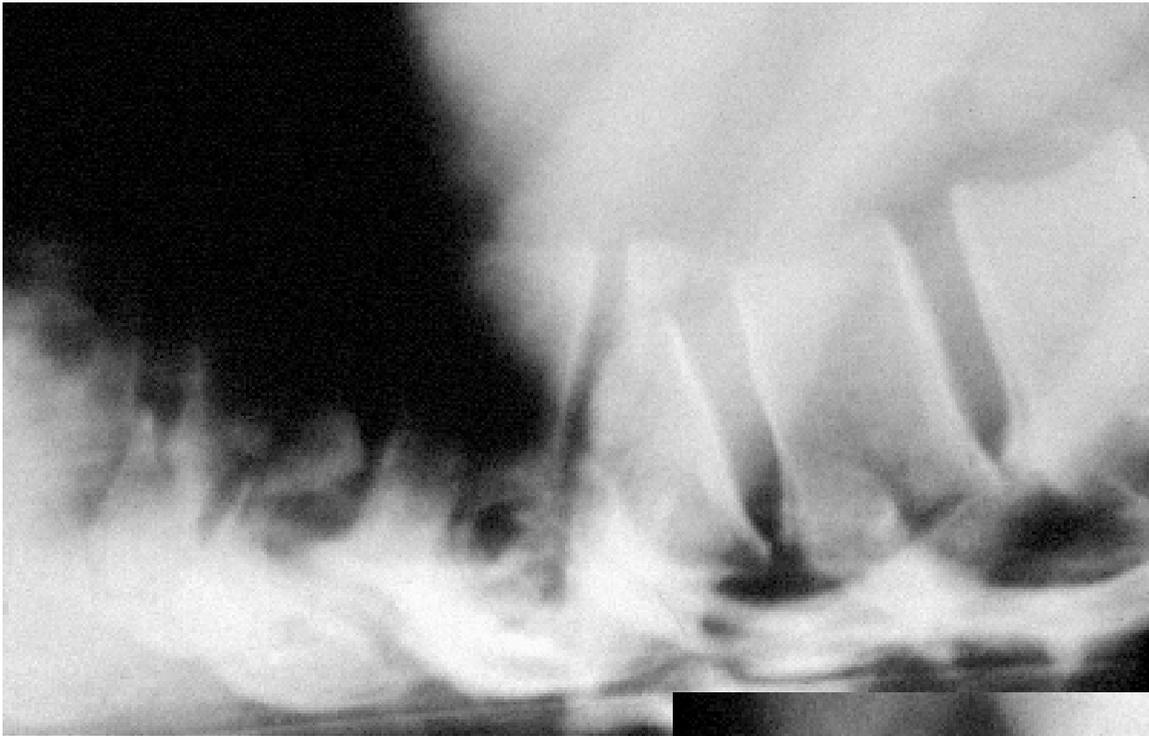


TRIVERSIN

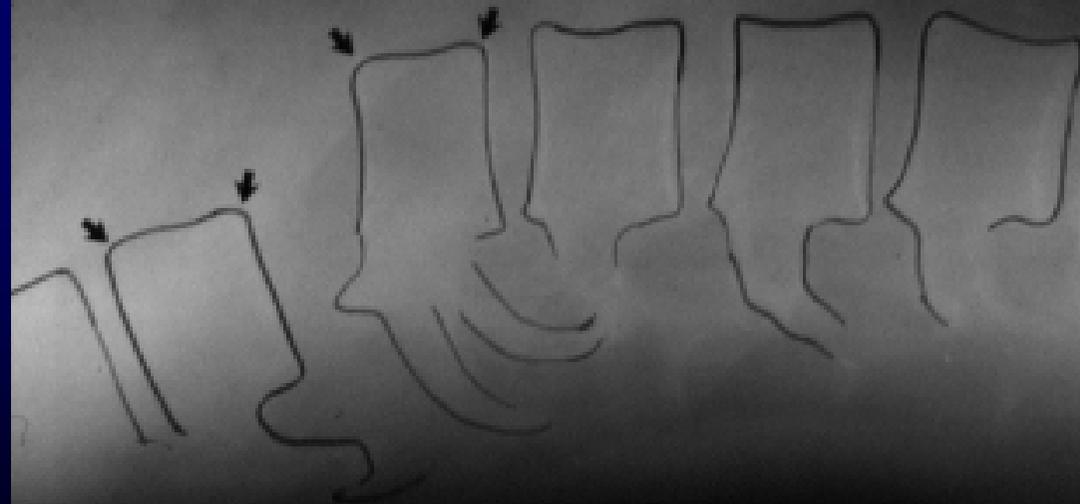
REDUCTION dans l'OS



REDUCTION dans le DISQUE



TYPE B en EXTENSION



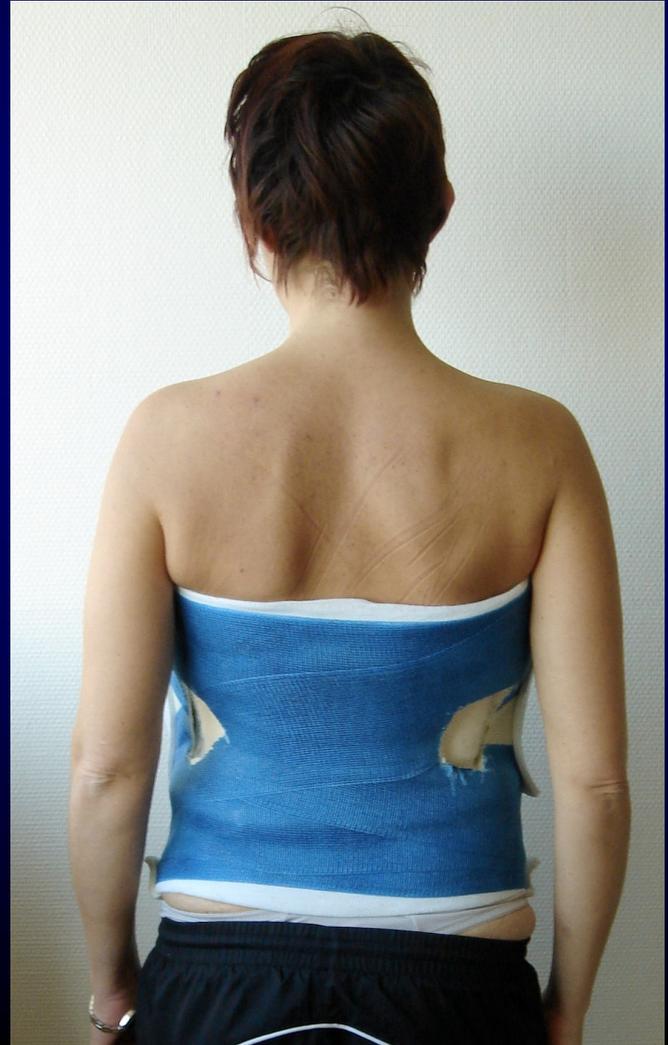
CONTRE INDICATION +++

COQUILLE MODULAIRE





TABLE de COTREL



SERIES ORTHOPEDIQUES

- **WEINSTEIN (1988)** : 42 patients suivis 20 ans
- **SYMPOSIUM SOFCOT (1995)** : 559 patients
5,3% d'échecs (types A3,B,C , fractures de L2 à L5 ,
ART>23°)
- **TROPIANO (2003)** : 41 patients , platre sous AG
8% de douleurs résiduelles , 81% de reprise de travail
- **ALANAY (2004)** : perte de hauteur discale en IRM

TT ORTHO versus TT CHIRURGICAL

- **RECHTINE (1999)**
tt ortho. : hospitalisation + longue
tt chir. : plus de complications
- **WOOD (2003)** : étude prospective et randomisée
tt ortho. : meilleurs résultats fonctionnels
tt chir. : meilleurs résultats anatomiques
- **Van Der ROER (2005)** : 17 publications sélectionnées

 pas de différence entre tt ortho. et tt chir.

TT ORTHOPEDIQUE : ETUDES du SERVICE

- **GANDON (1988) : 30 controles tomodensitométriques**
- **RAZAFIMHANDRY (2006) : 63 fractures**

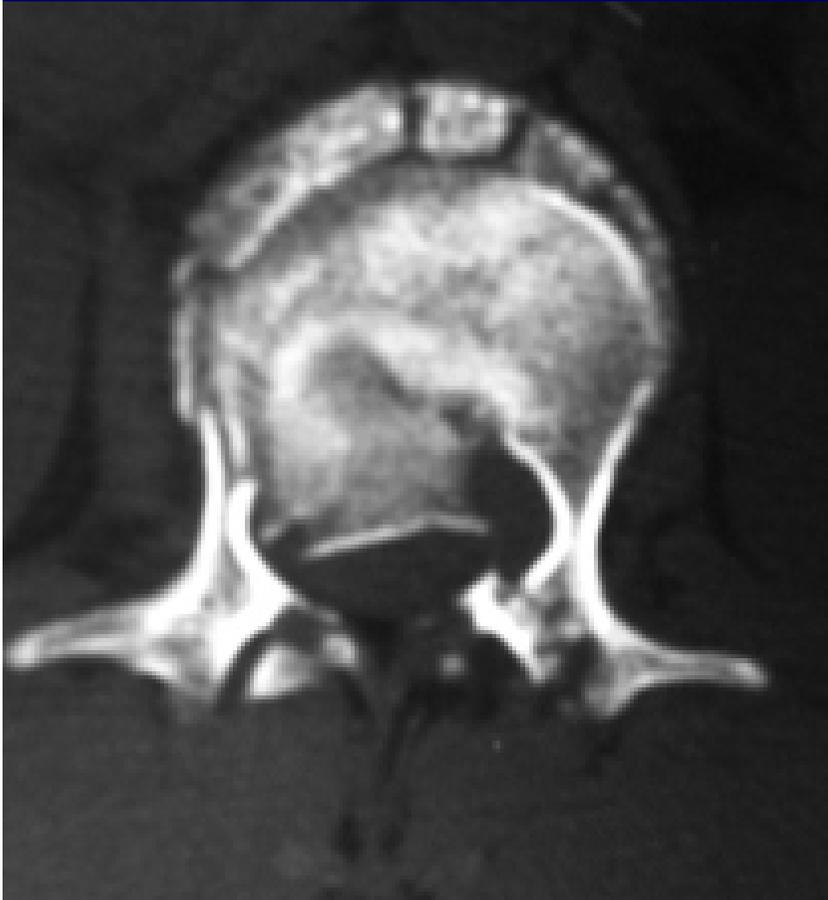
groupe 1 (33 patients) : corset précoce

groupe 2 (30 patients) : corset secondaire (POSTURE)

RESULTATS en TOMODENSITOMETRIE

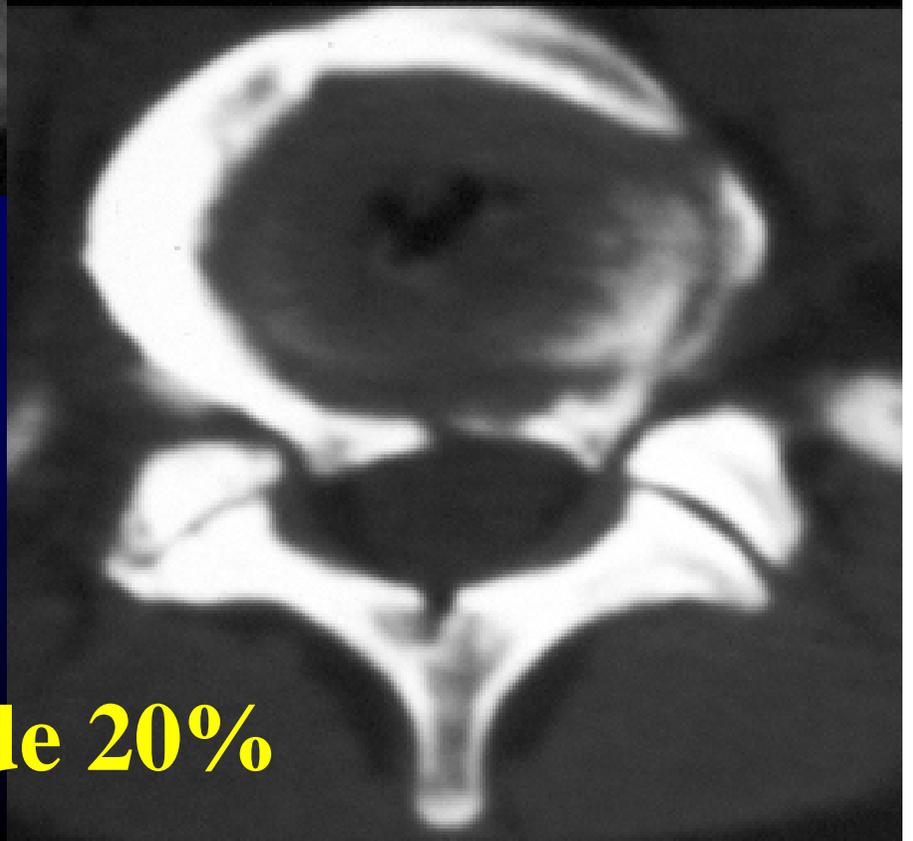
D. GANDON (1988)

30 patients contolés à un an après trauma.



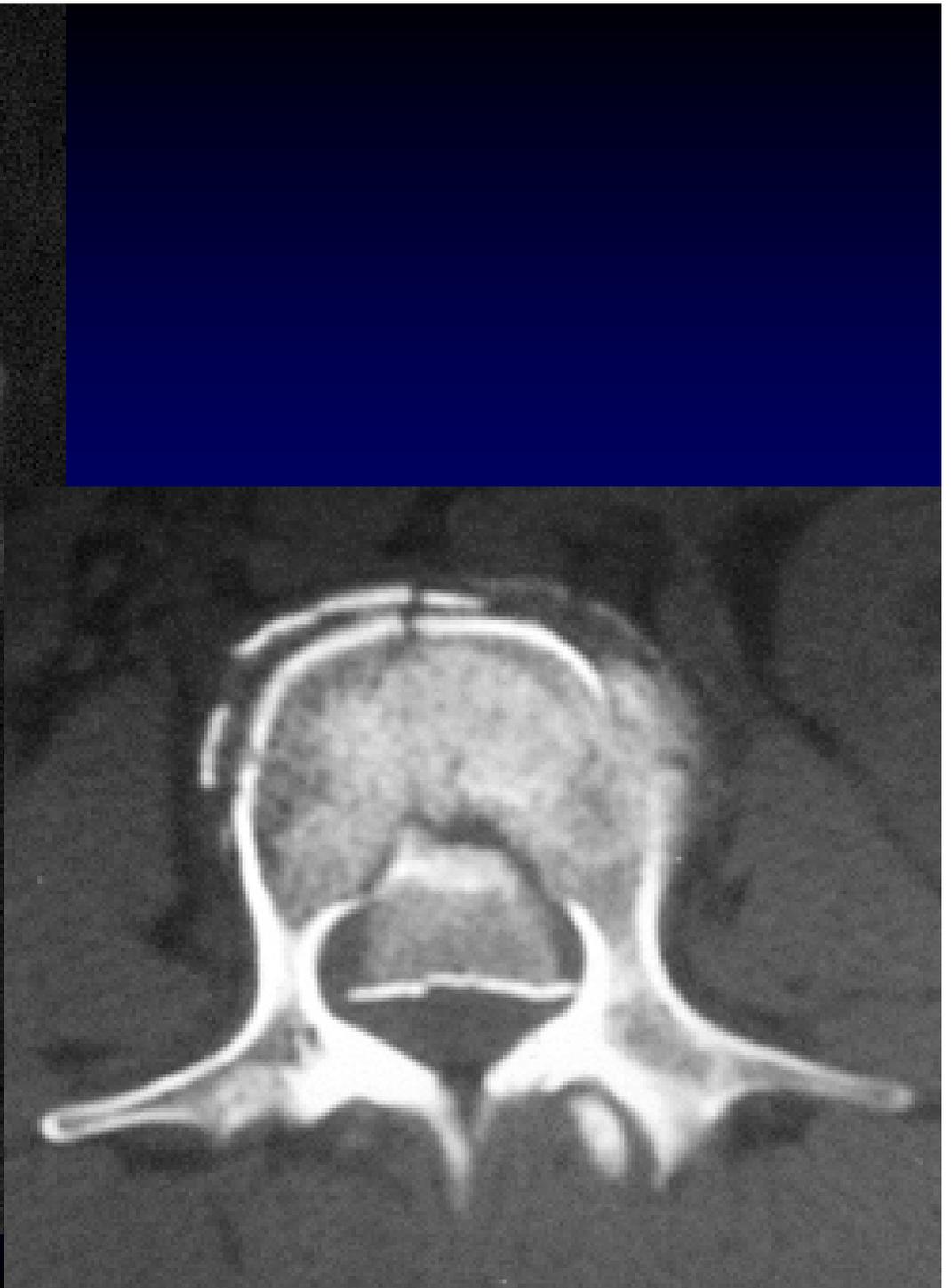
réduction entre 5 et 25% : 20

réduction entre 25 et 50% : 10



**à un an
pas de sténose de plus de 20%**

A3

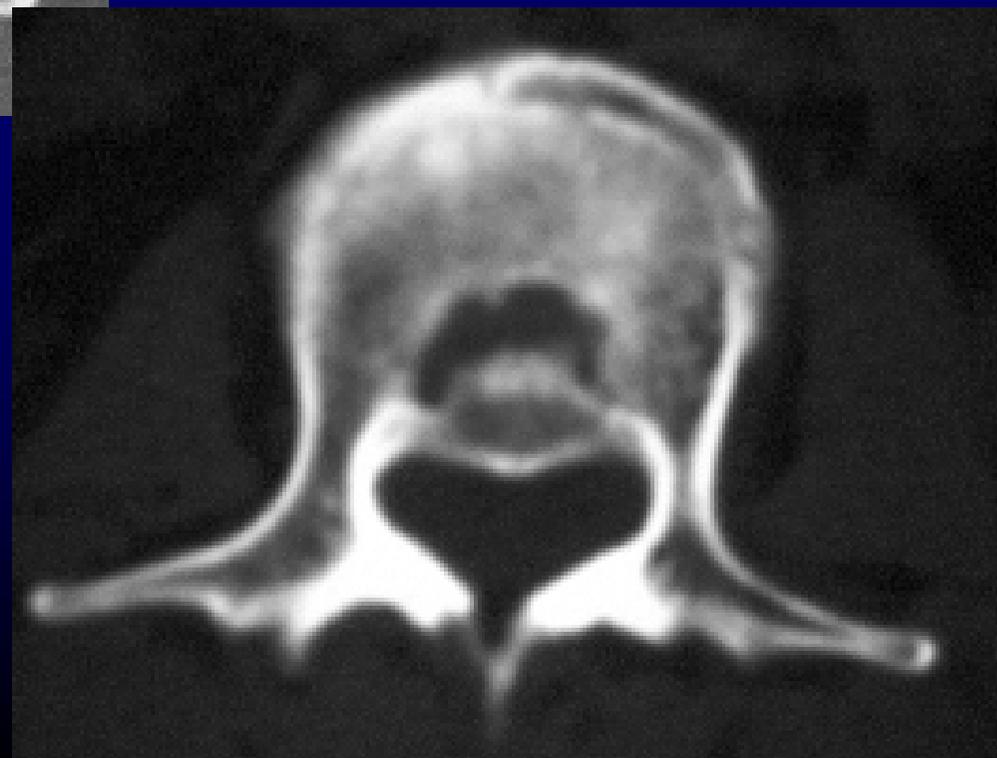




+1 AN



+2 ANS





SERIE de RAZAFIMHANDRY (2006)

- 63 traumatisés
- 33 types A1 , 12 types A2 , 17 types A3
- **GROUPE 1 : CORSET d'EMBLEE (33 cas)**
types A1 et A.R.T. < 15°
- **GROUPE 2 : POSTURE + CORSET (30 cas)**
types A2 et A3

 **Moins de perte angulaire dans le GROUPE 2 pour des lésions plus graves**

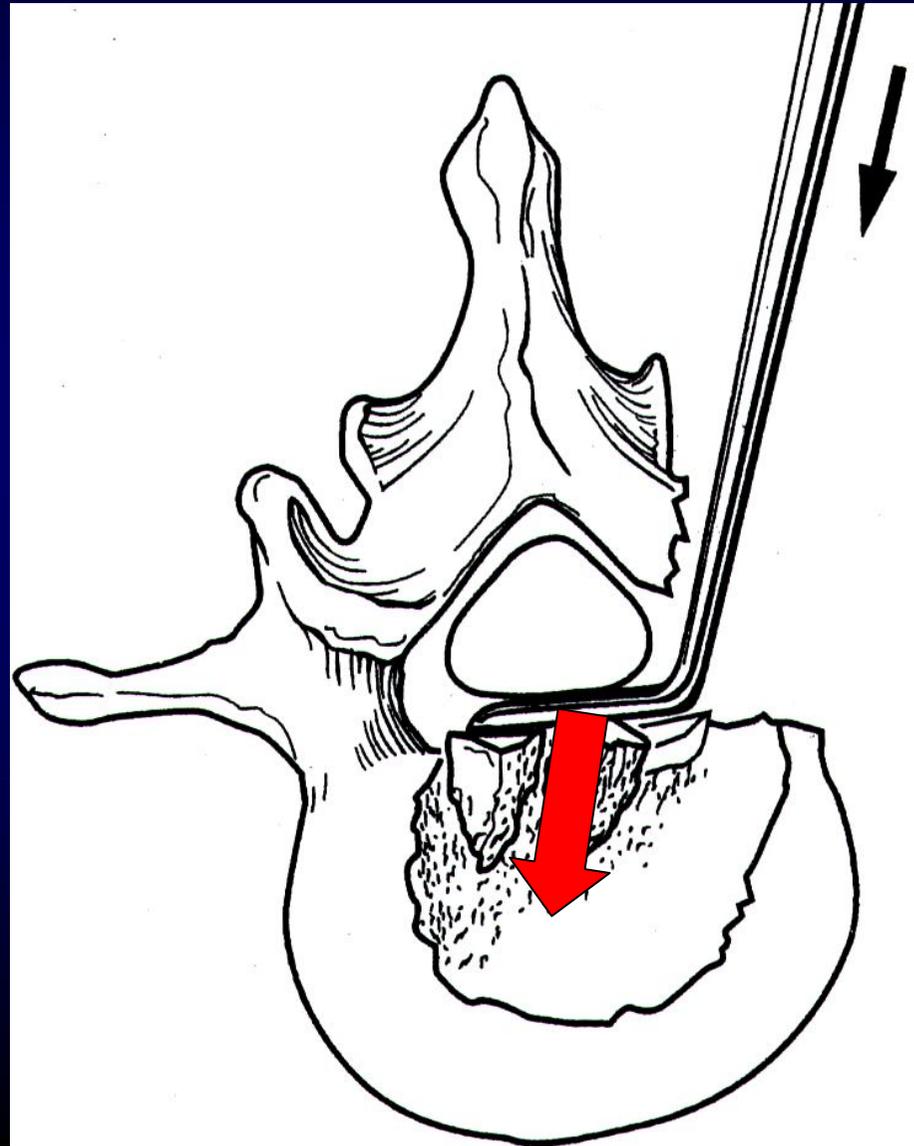
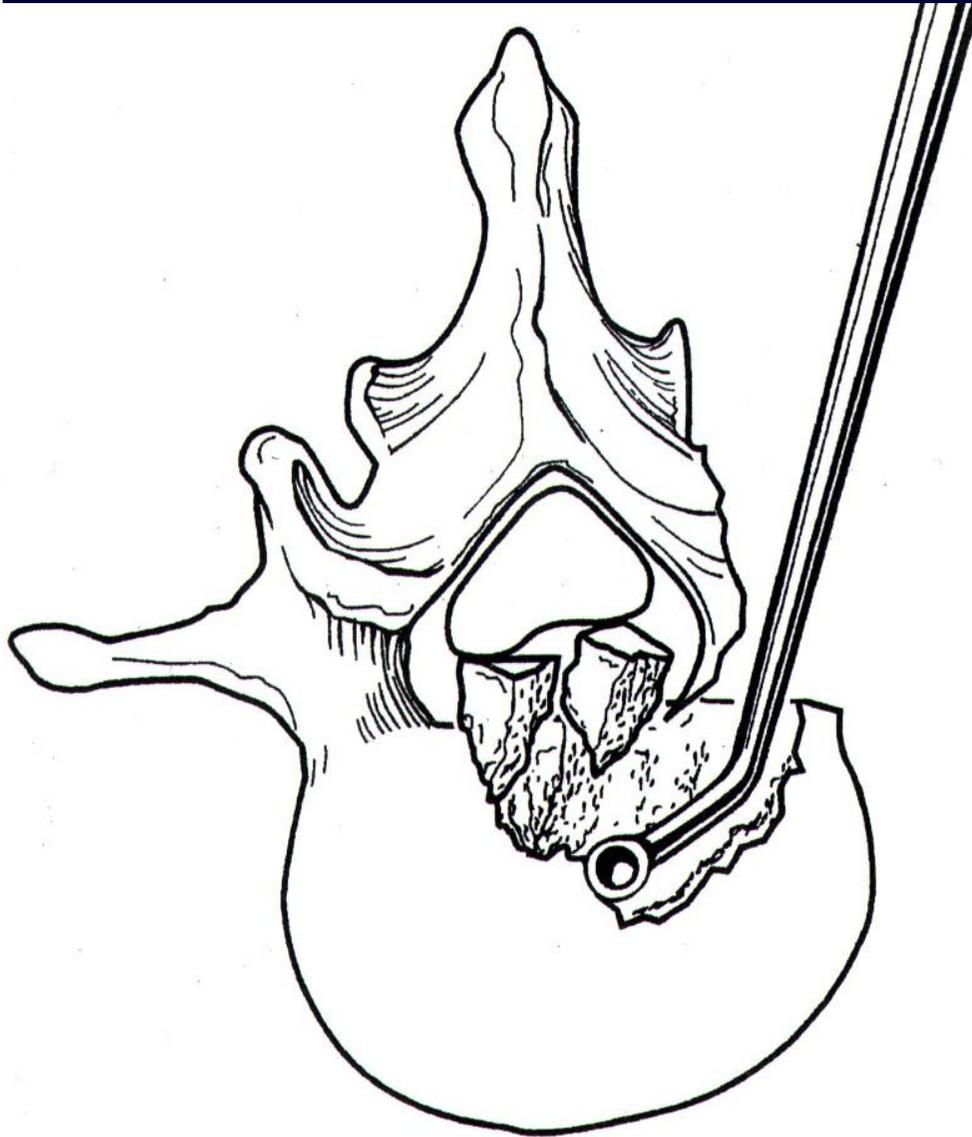
TT CHIRURGICAL

- **VOIE POSTERIEURE :**
réduction plus facile
décompression plus « difficile »
- **VOIE ANTERIEURE (7%, symposium SOFCOT 1995)**
reconstruction antérieure meilleure
- **VOIE COMBINEE POST. et ANT.**

VOIE POSTERIEURE

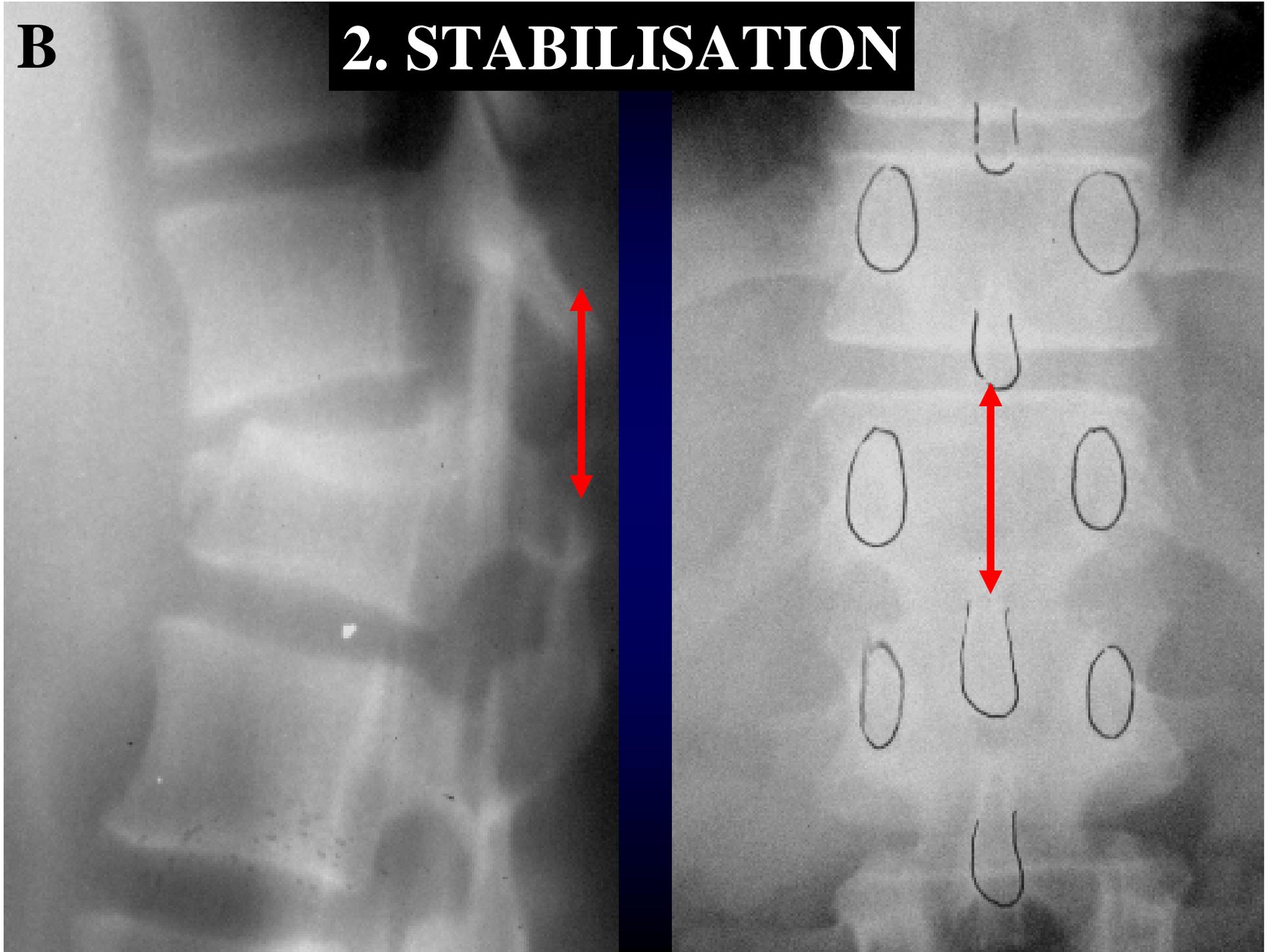


1. DECOMPRESSION



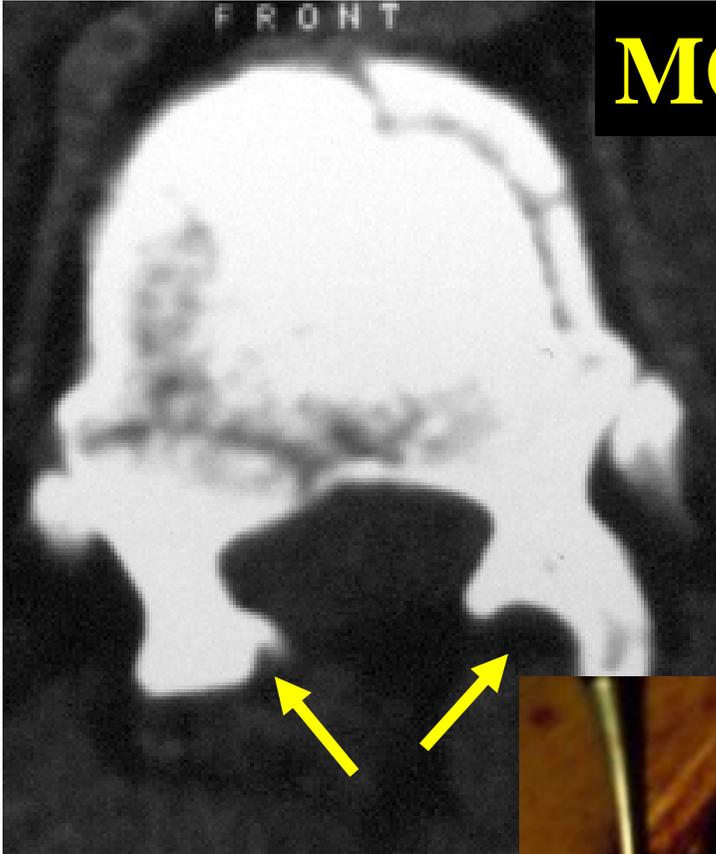
B

2. STABILISATION

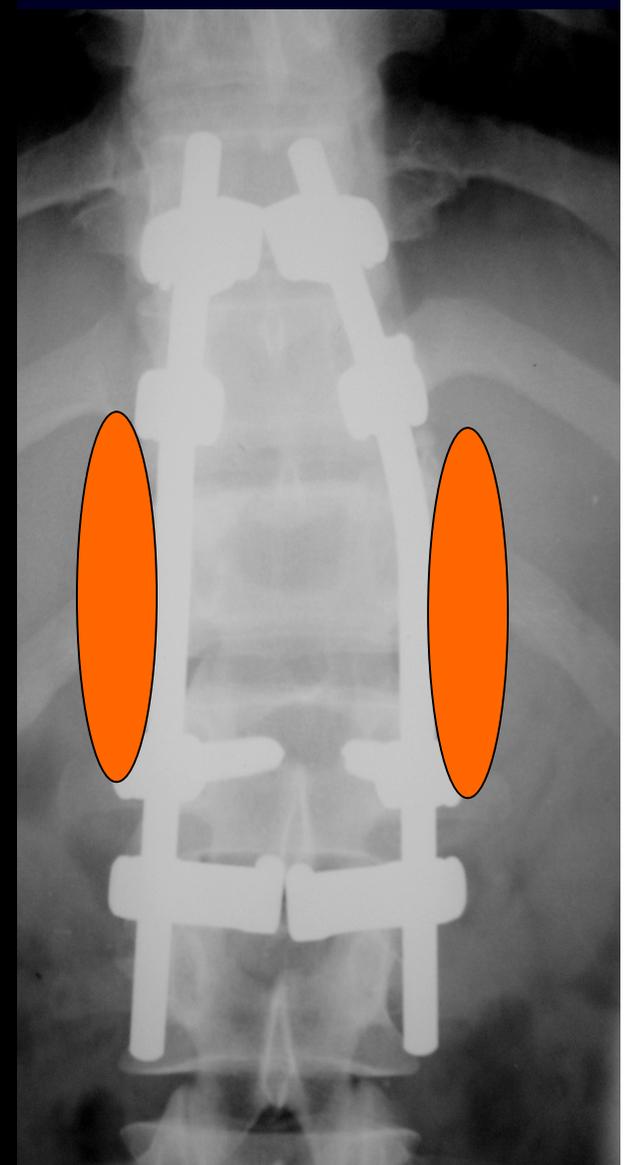
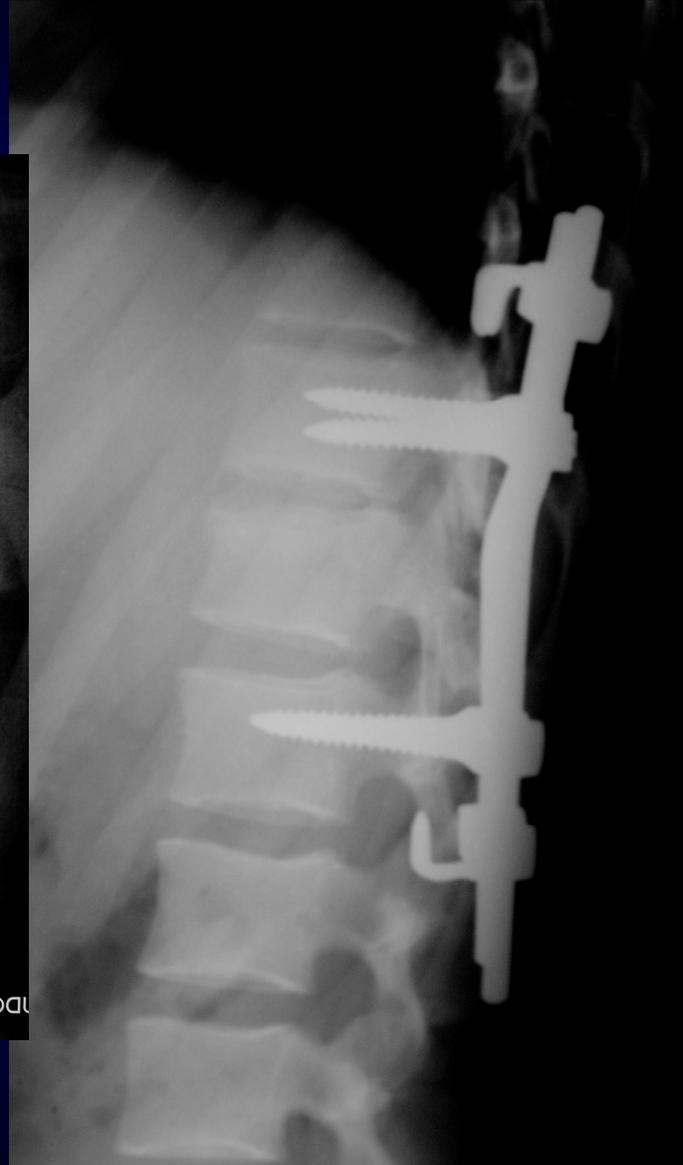


FRONT

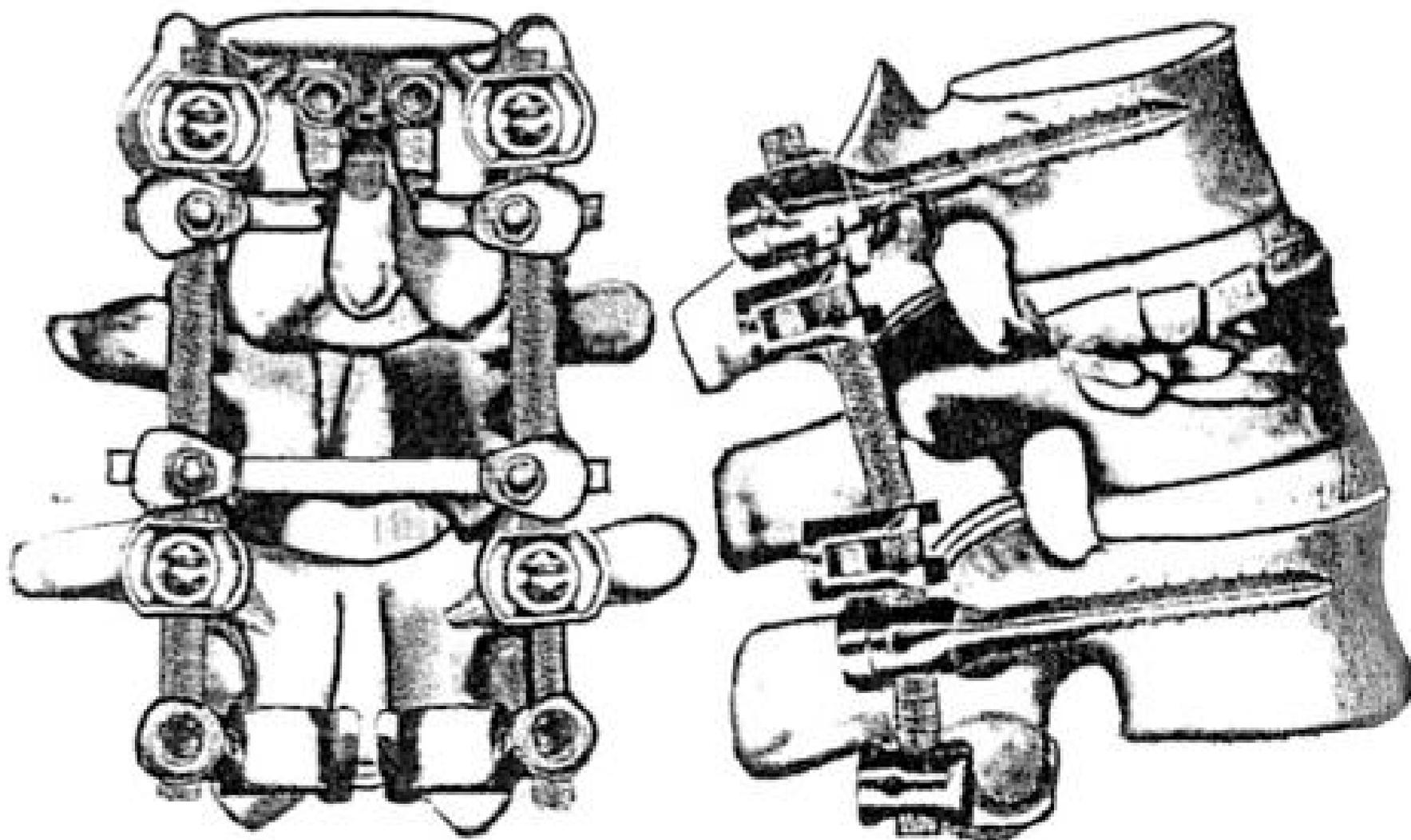
MONTAGE LONG



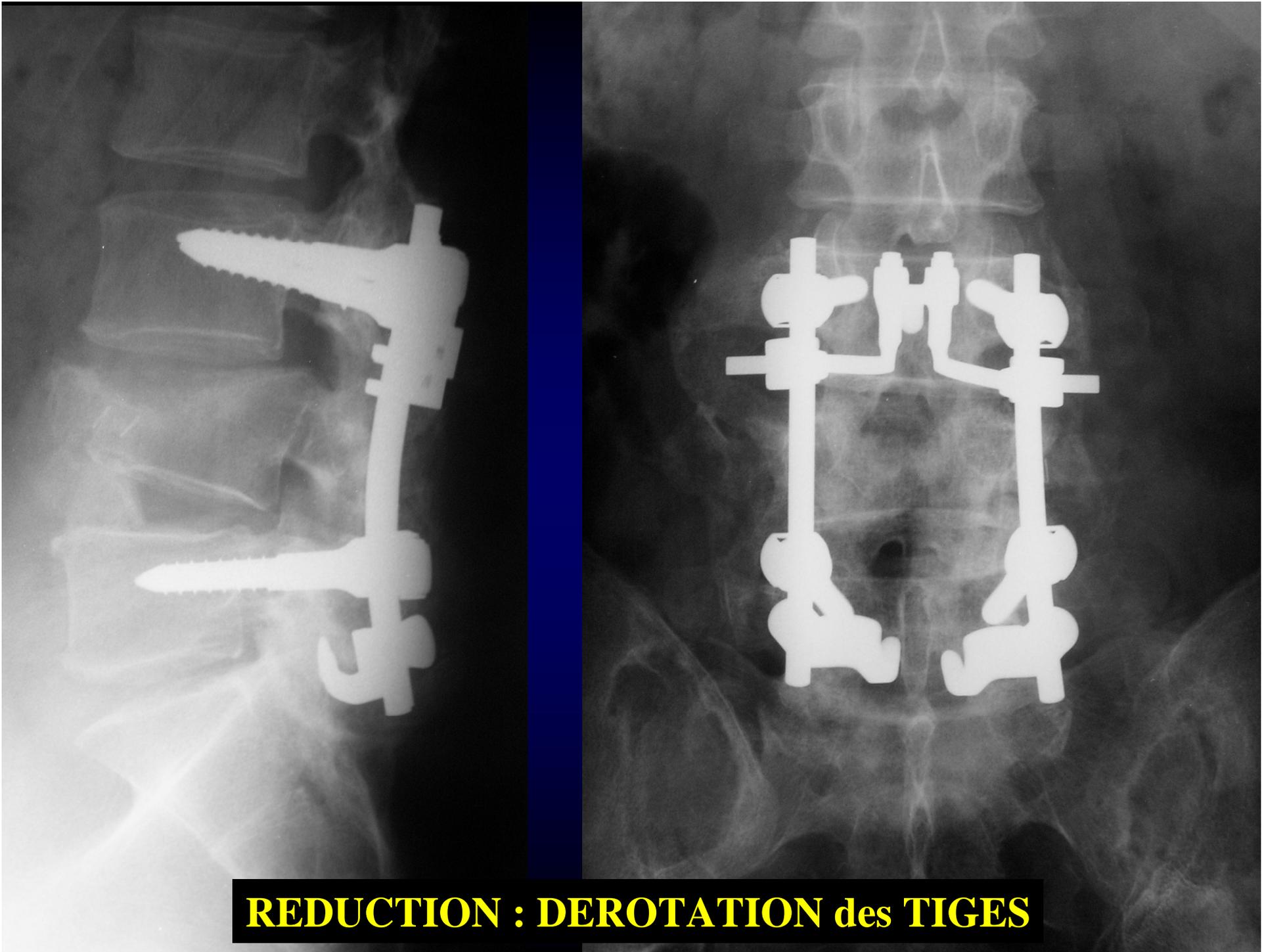
MONTAGE COURT



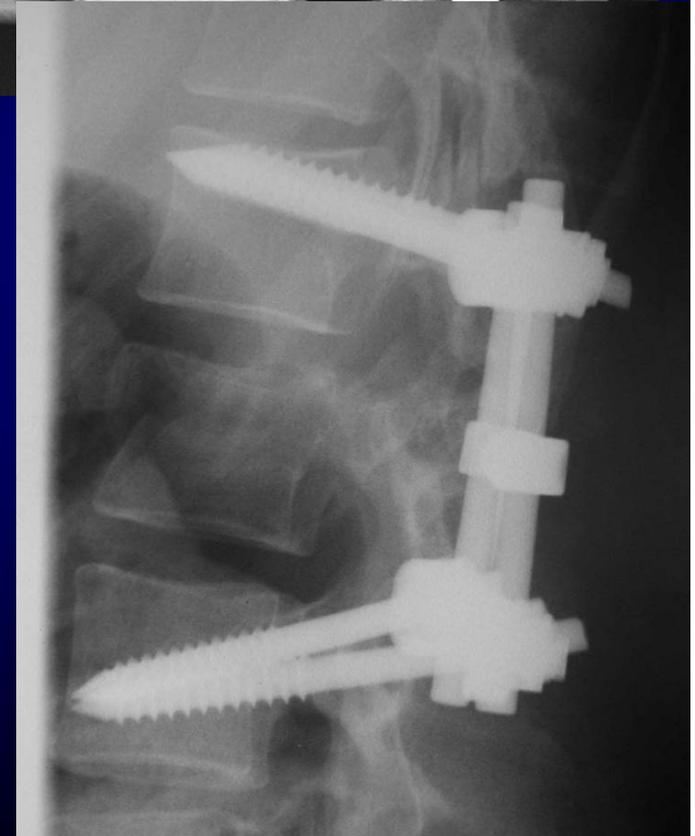
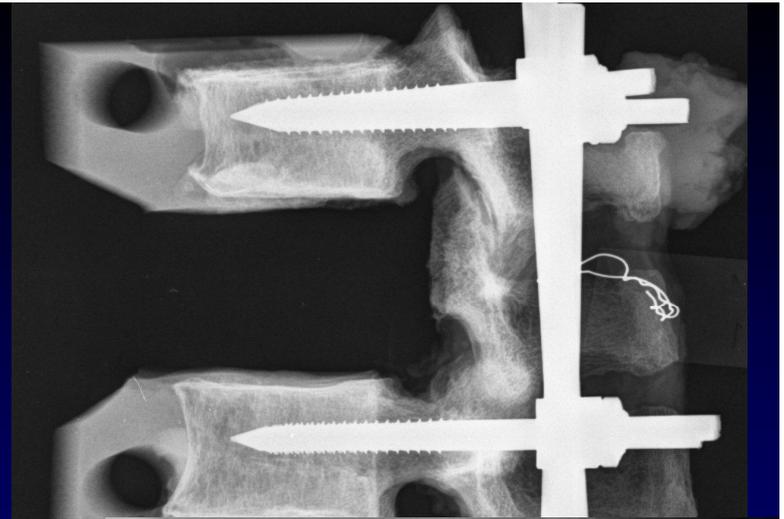
GREFFE POSTEROLATERALE



TECHNIQUE NICOISE (de PERETTI)



REDUCTION : DEROTATION des TIGES

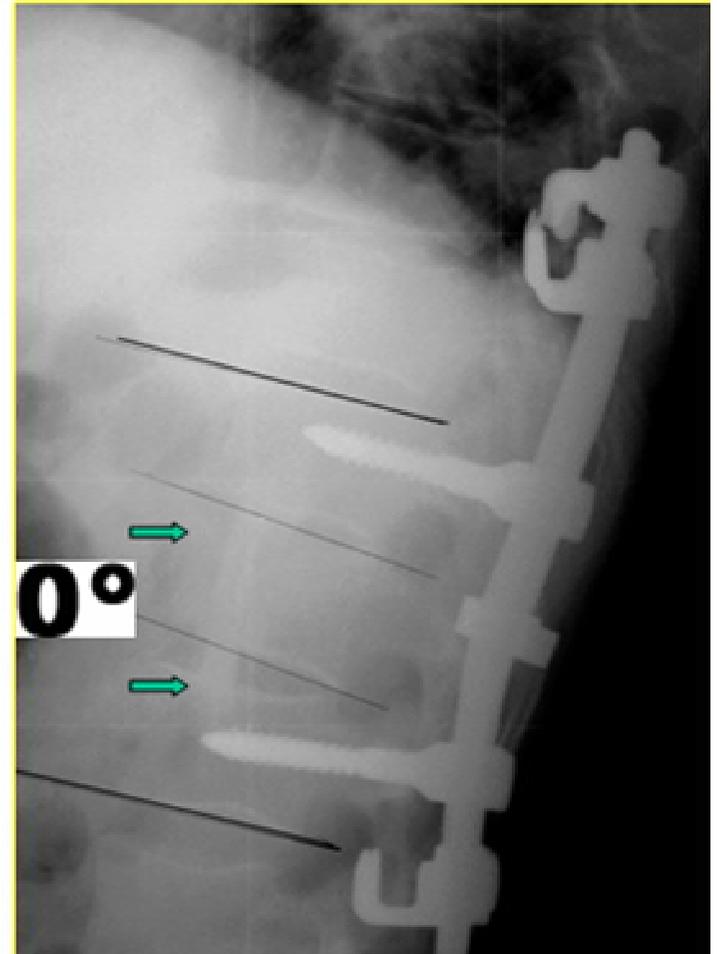
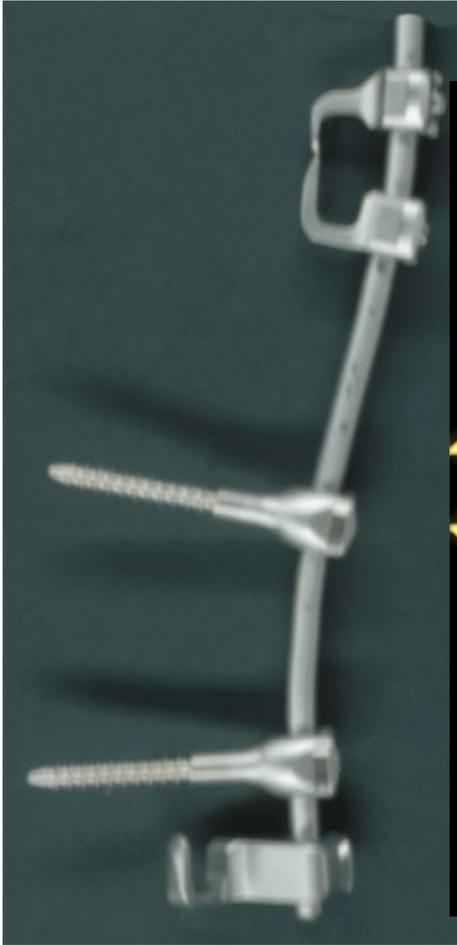


TECHNIQUE de Mac GILL , MONTREAL

(OUELLET)

REDUCTION : RAPPROCHEMENT des VIS de SCHANZ

TECHNIQUE STRASBOURGEOISE (STEIB)



REDUCTION : CINTRAGE in SITU

1 . CHIRURGIE POSTERIEURE

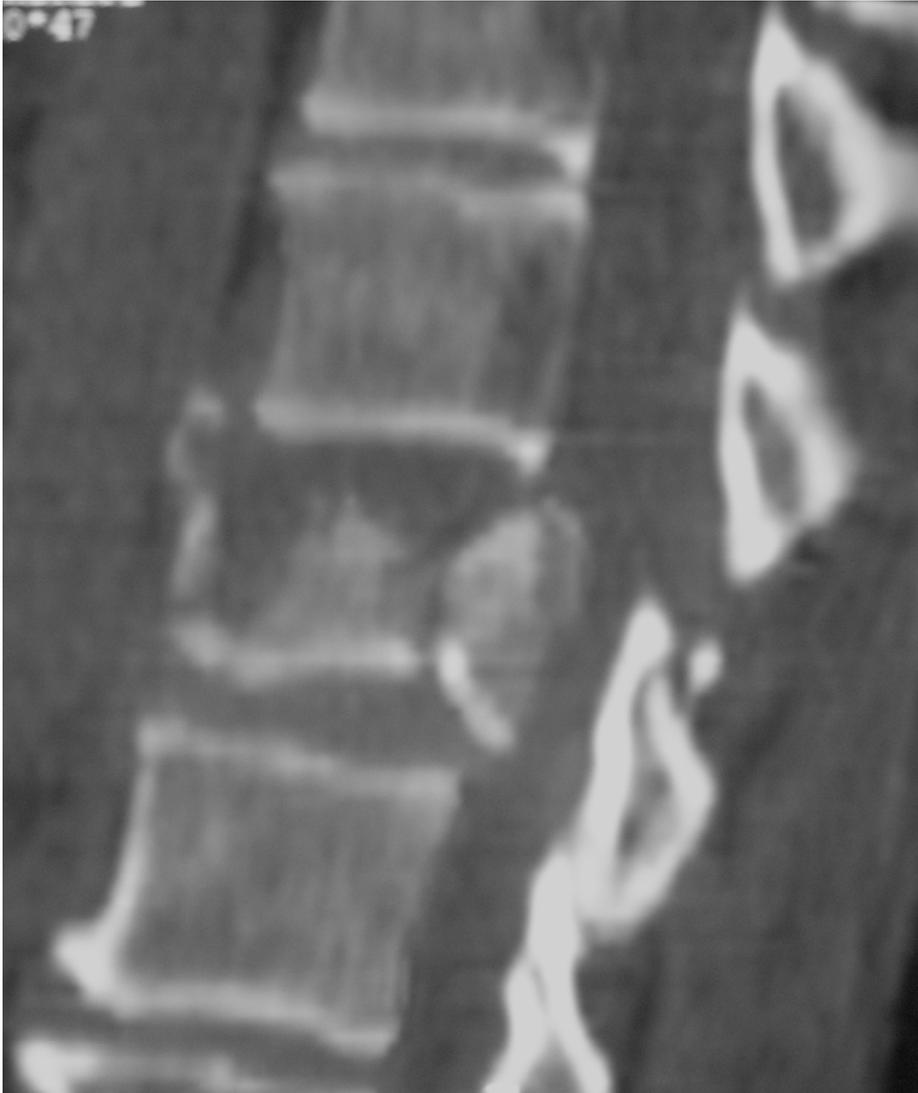


2 . SCANNER de CONTROLE

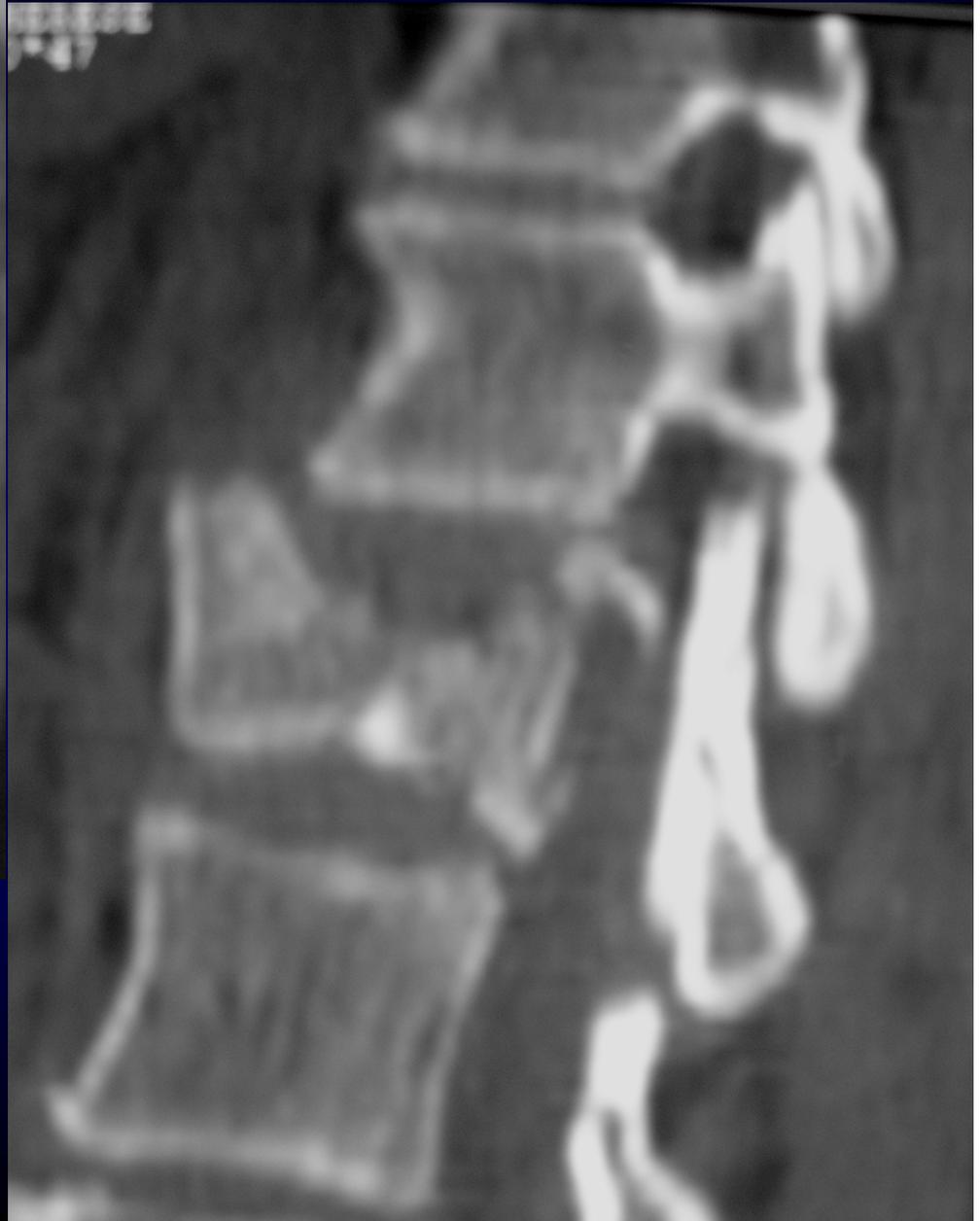


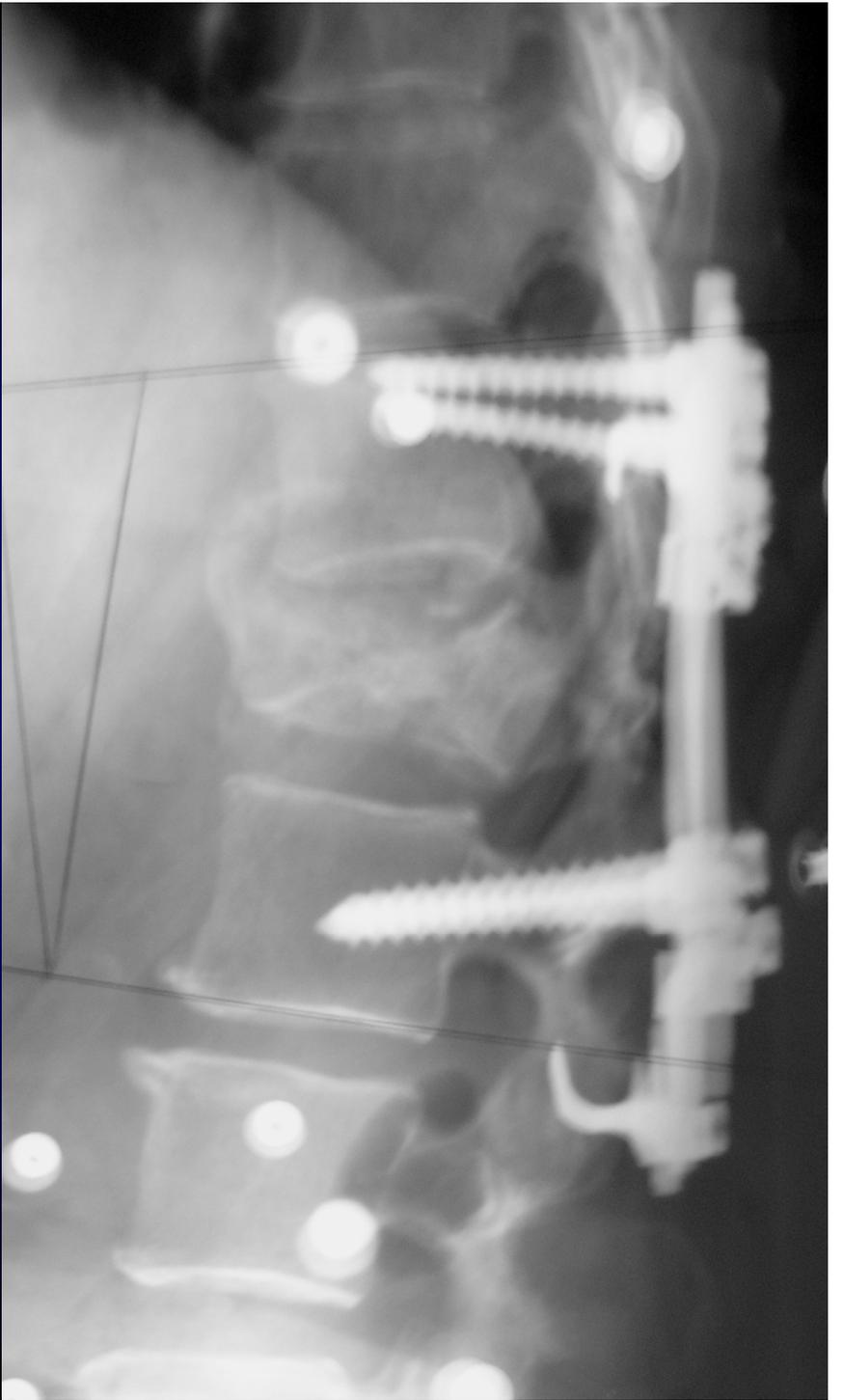
3 . RECONSTRUCTION ANTERIEURE

0°47

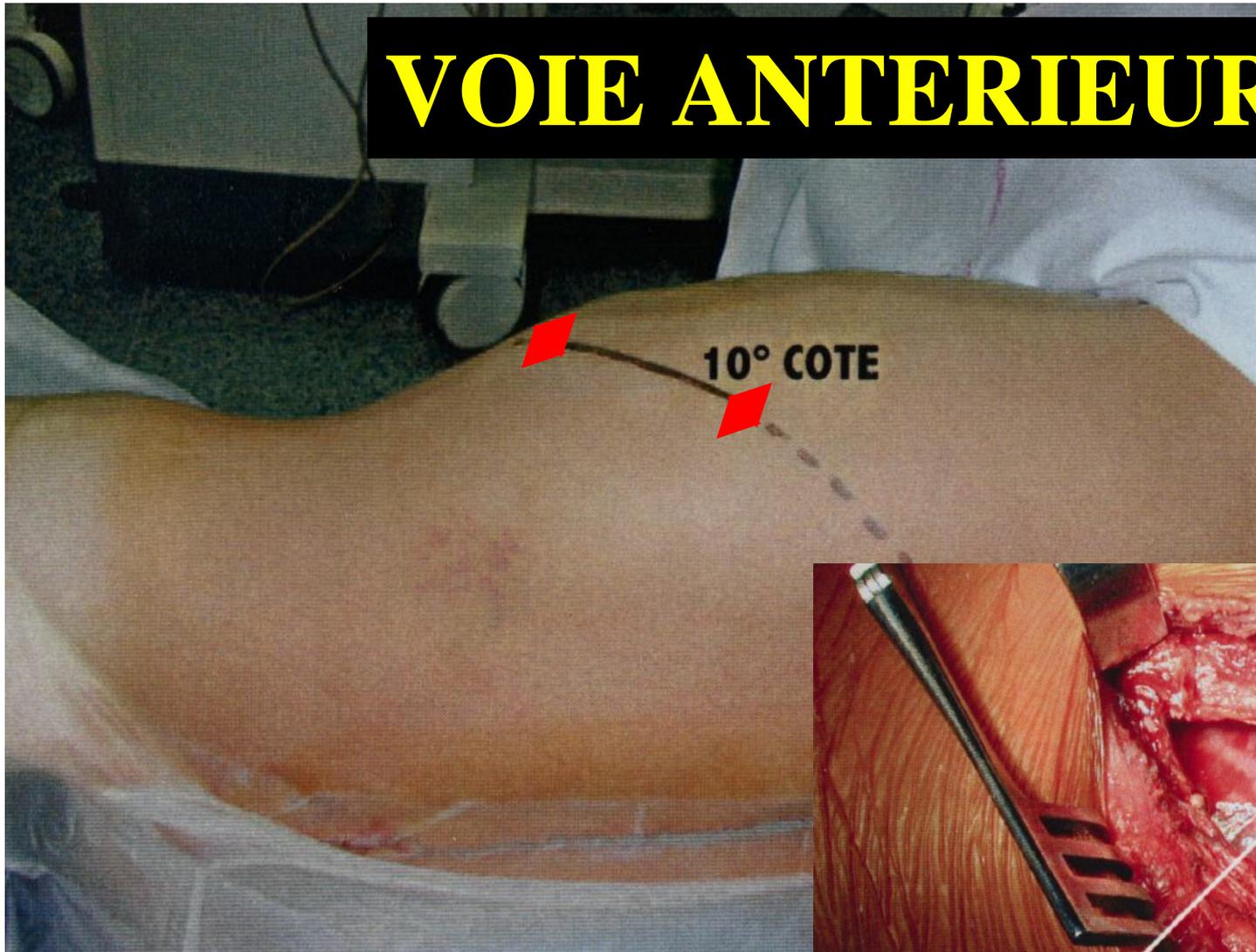


0°47

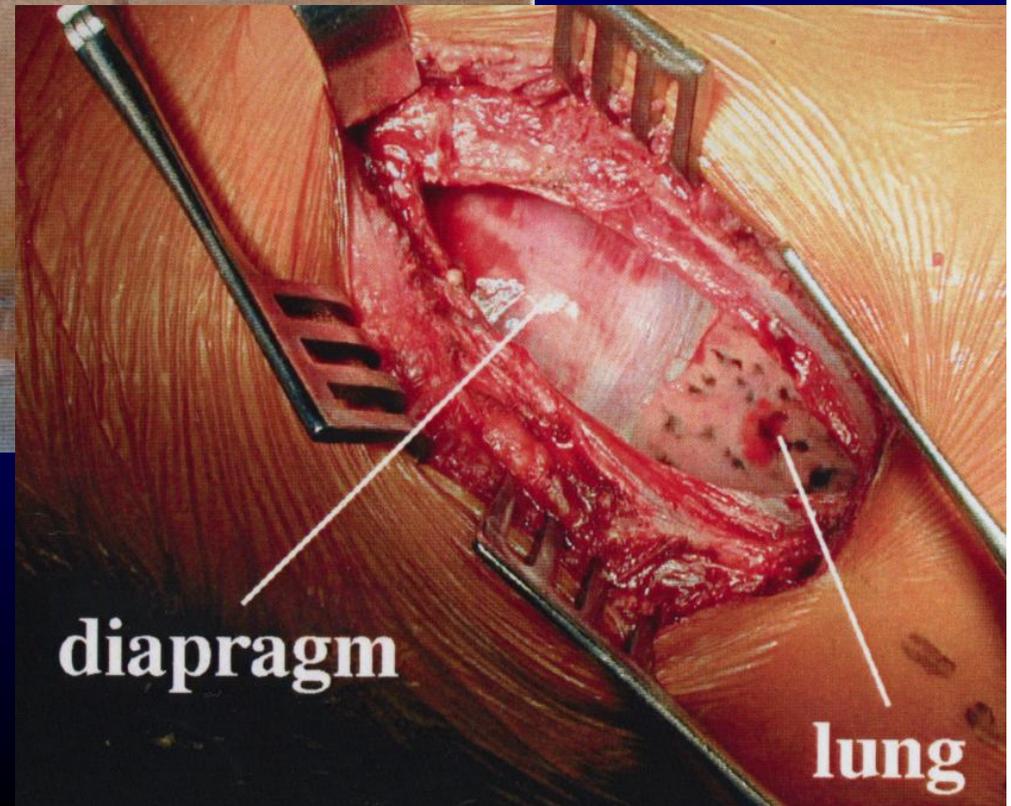




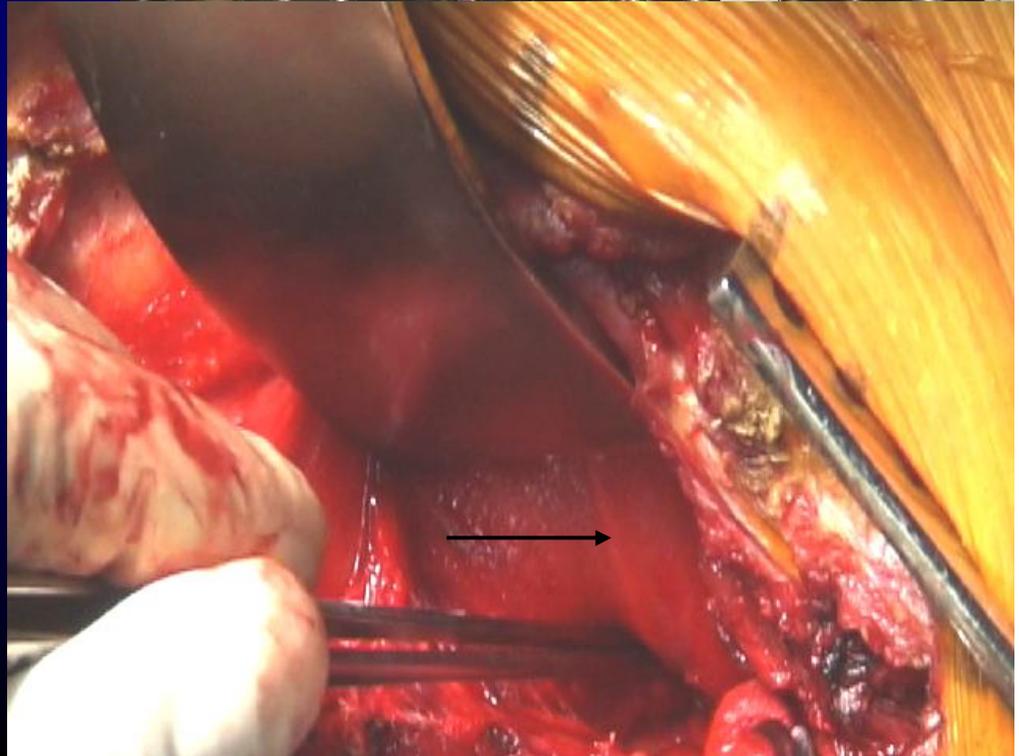
VOIE ANTERIEURE



MINI INVASIVE



VOIE EXTRAPEURALE

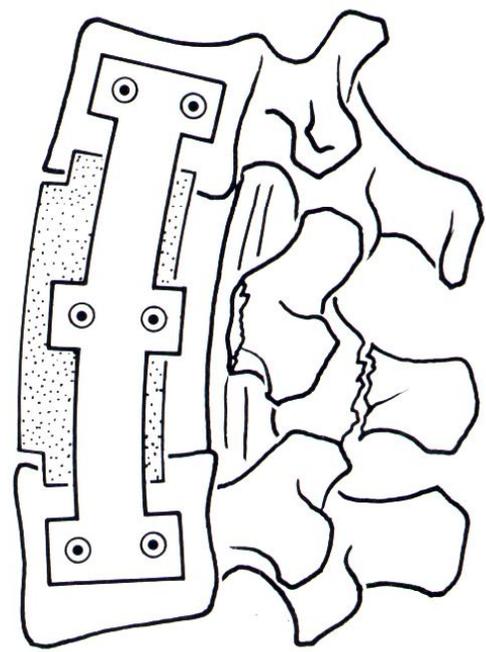
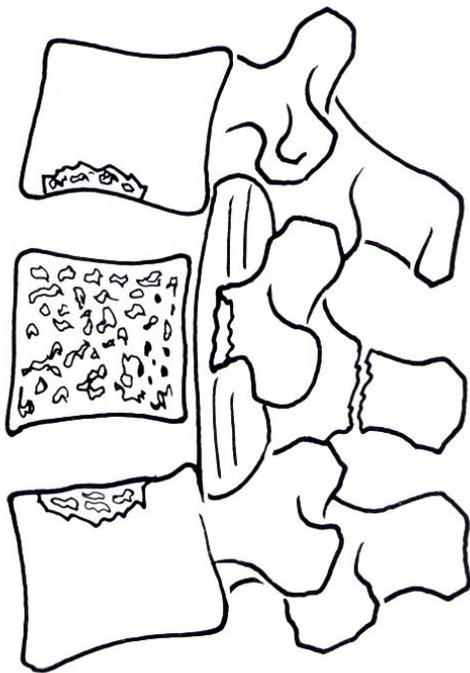
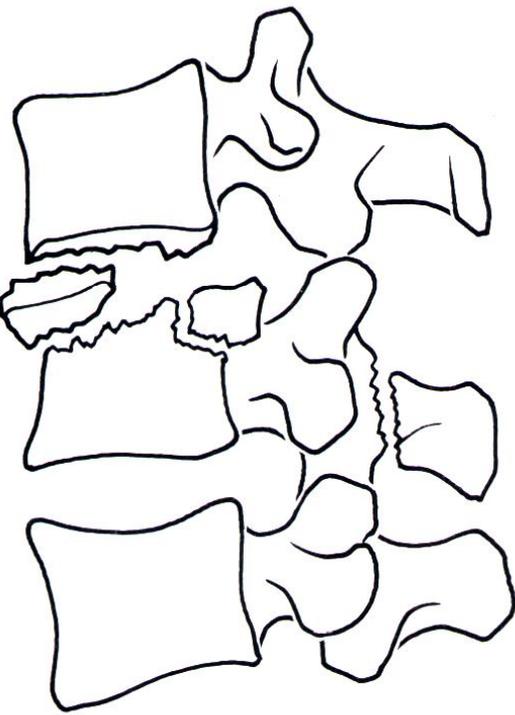
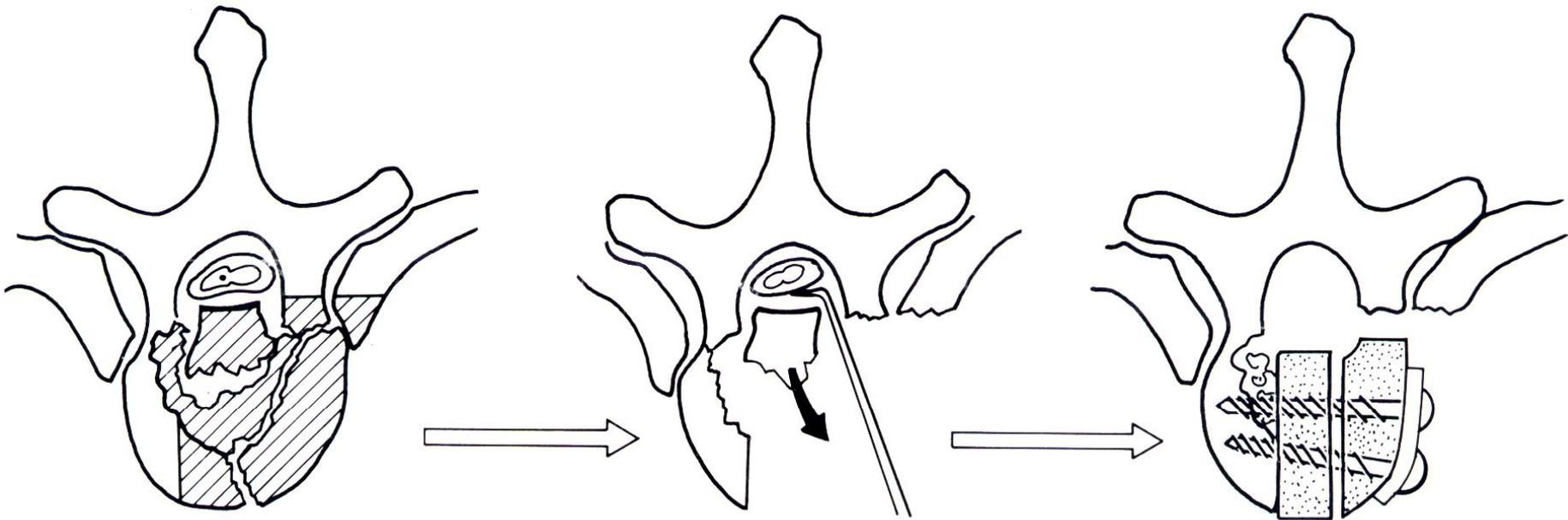




THORACOSCOPIE

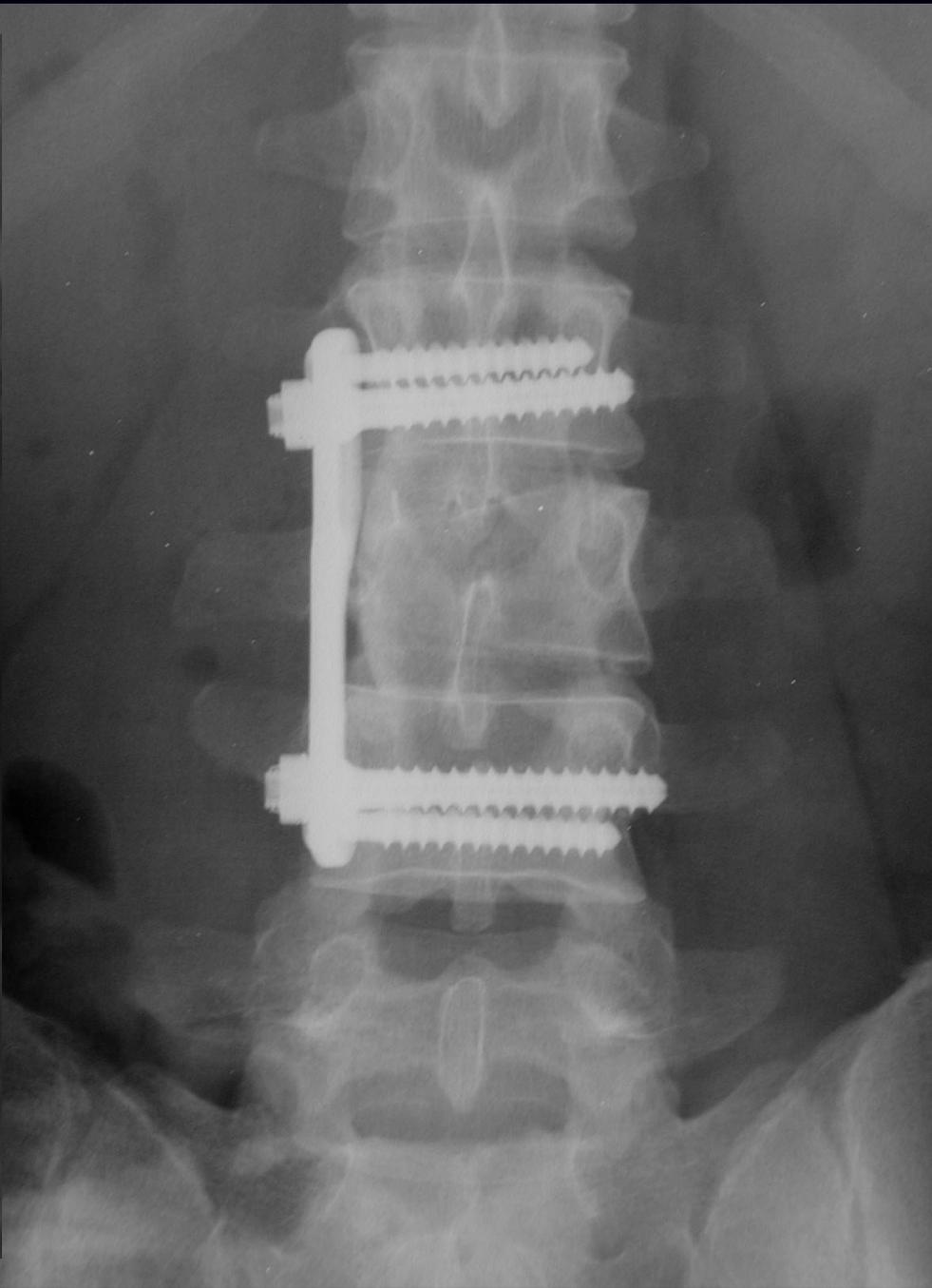
VIDEO ASSISTANCE

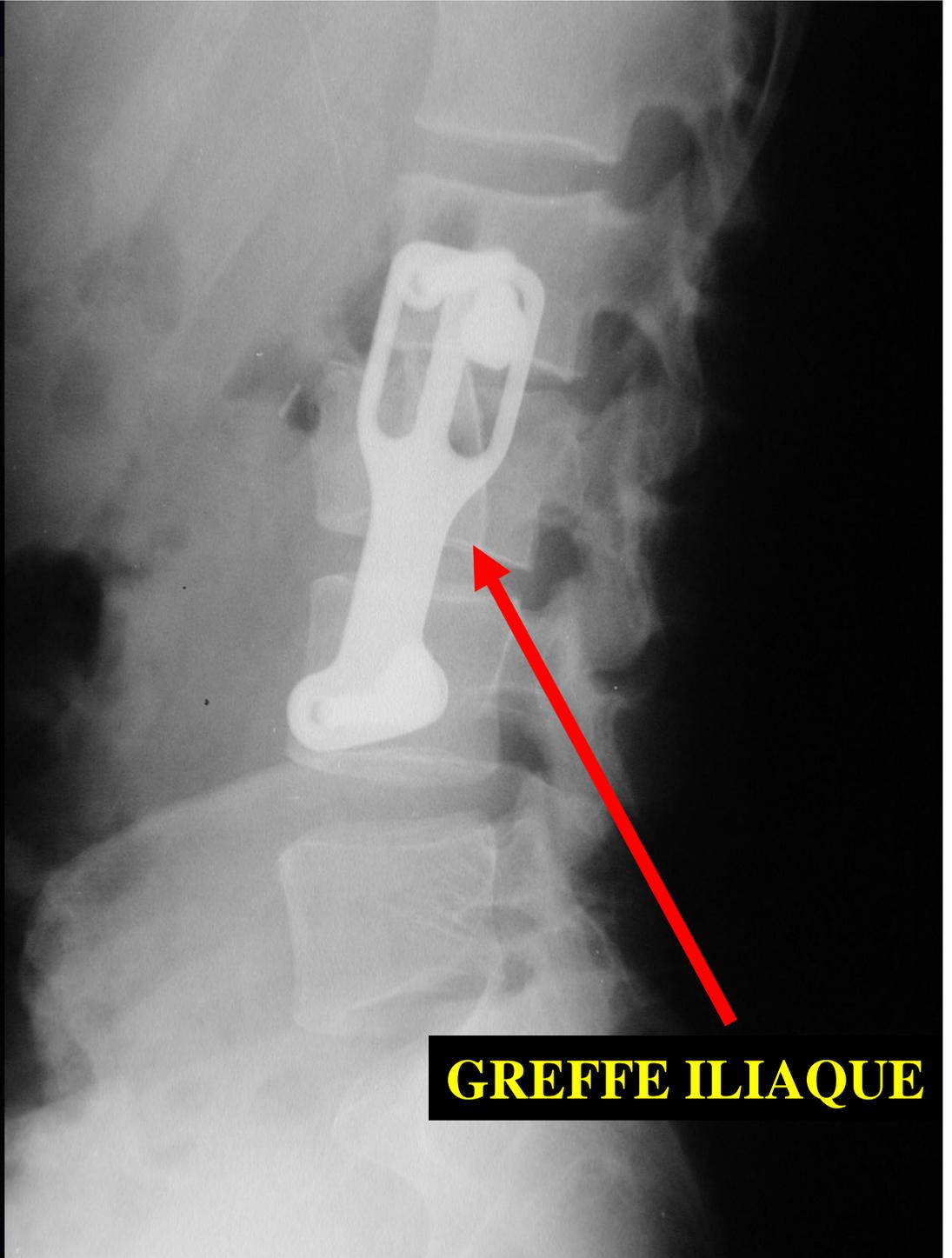




A2

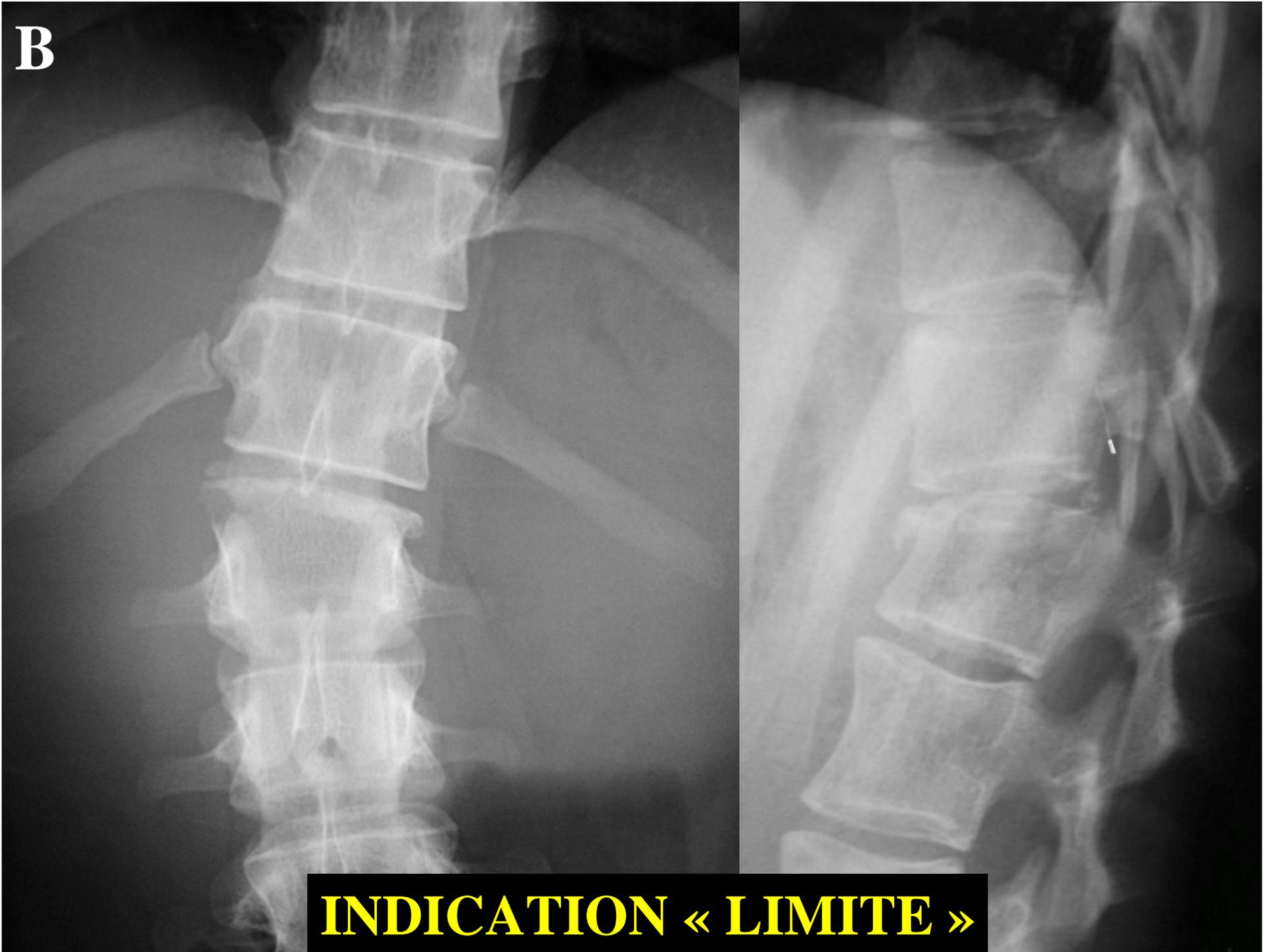




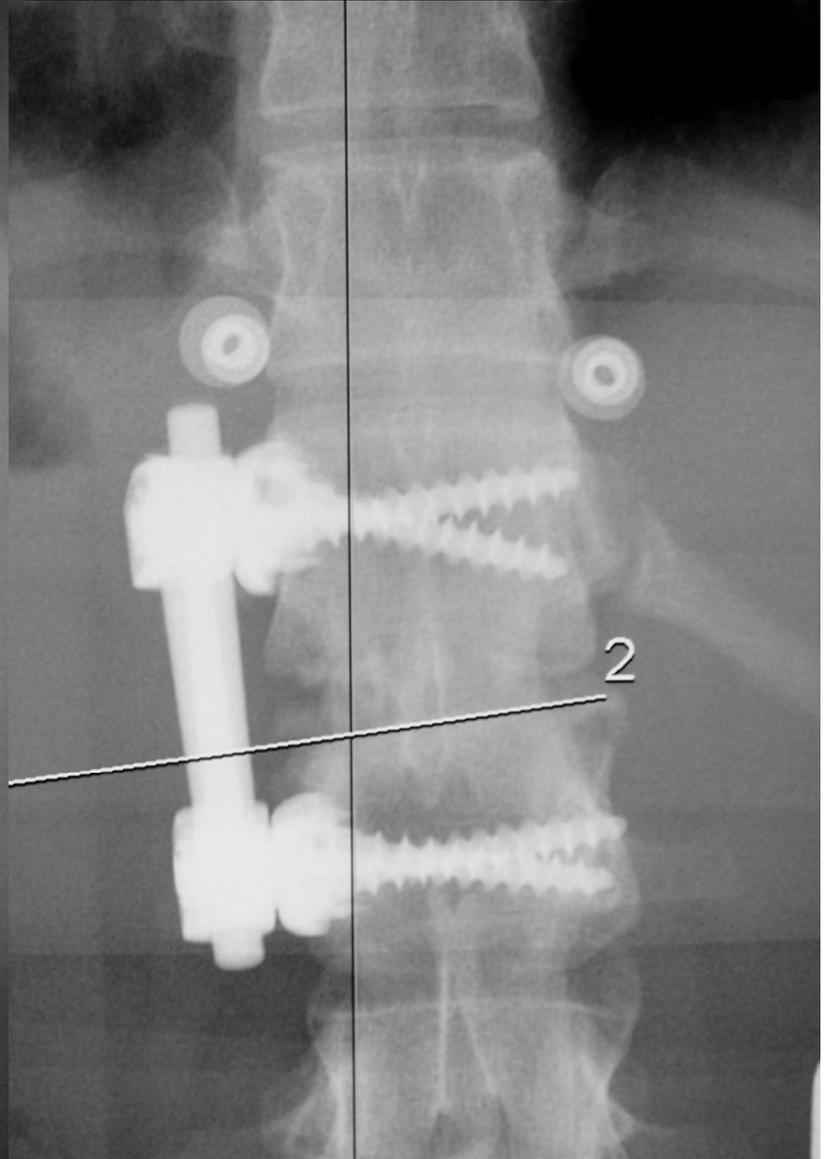


GREFFE ILIAQUE

B

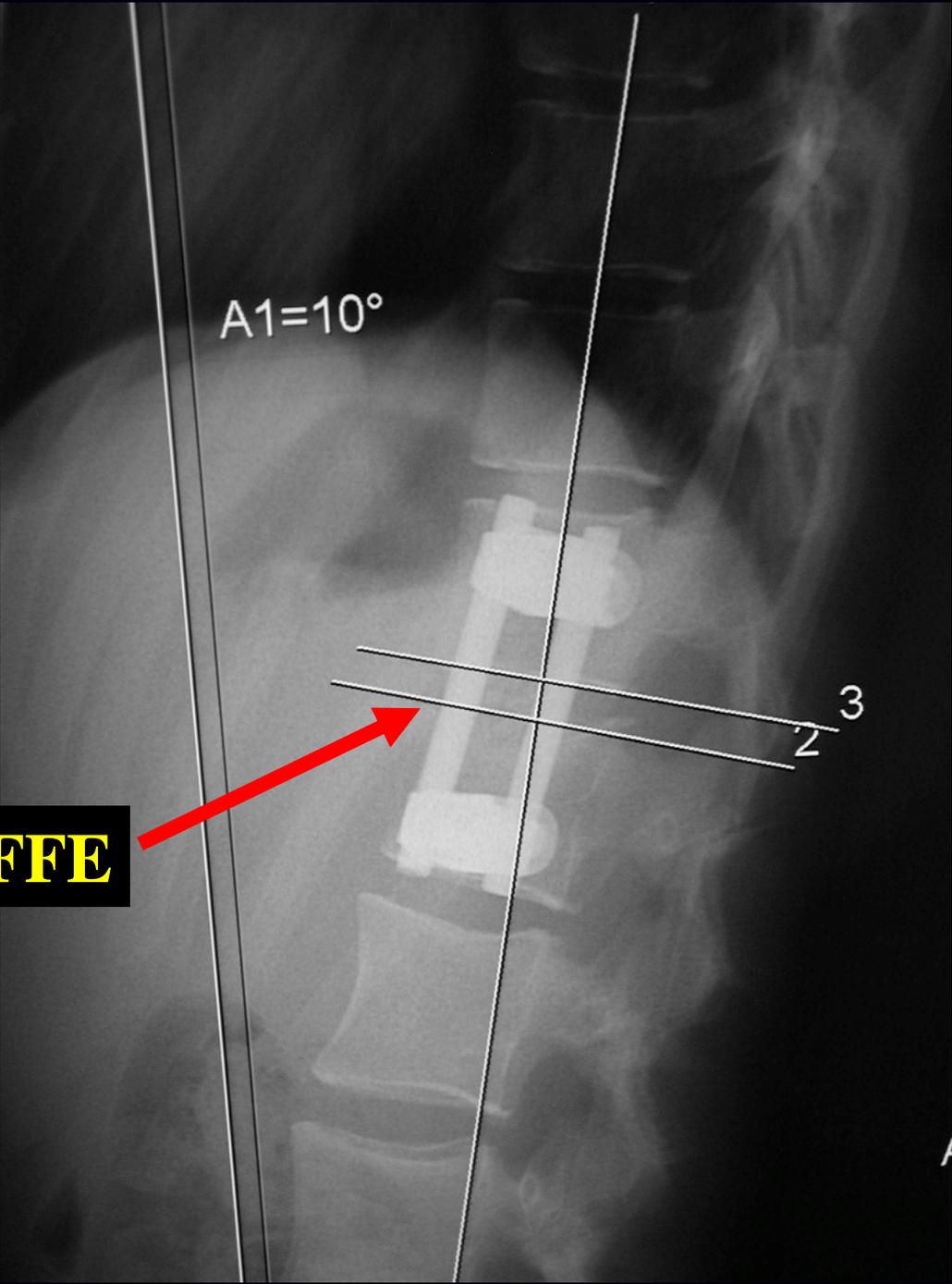


INDICATION « LIMITE »





GREFFE

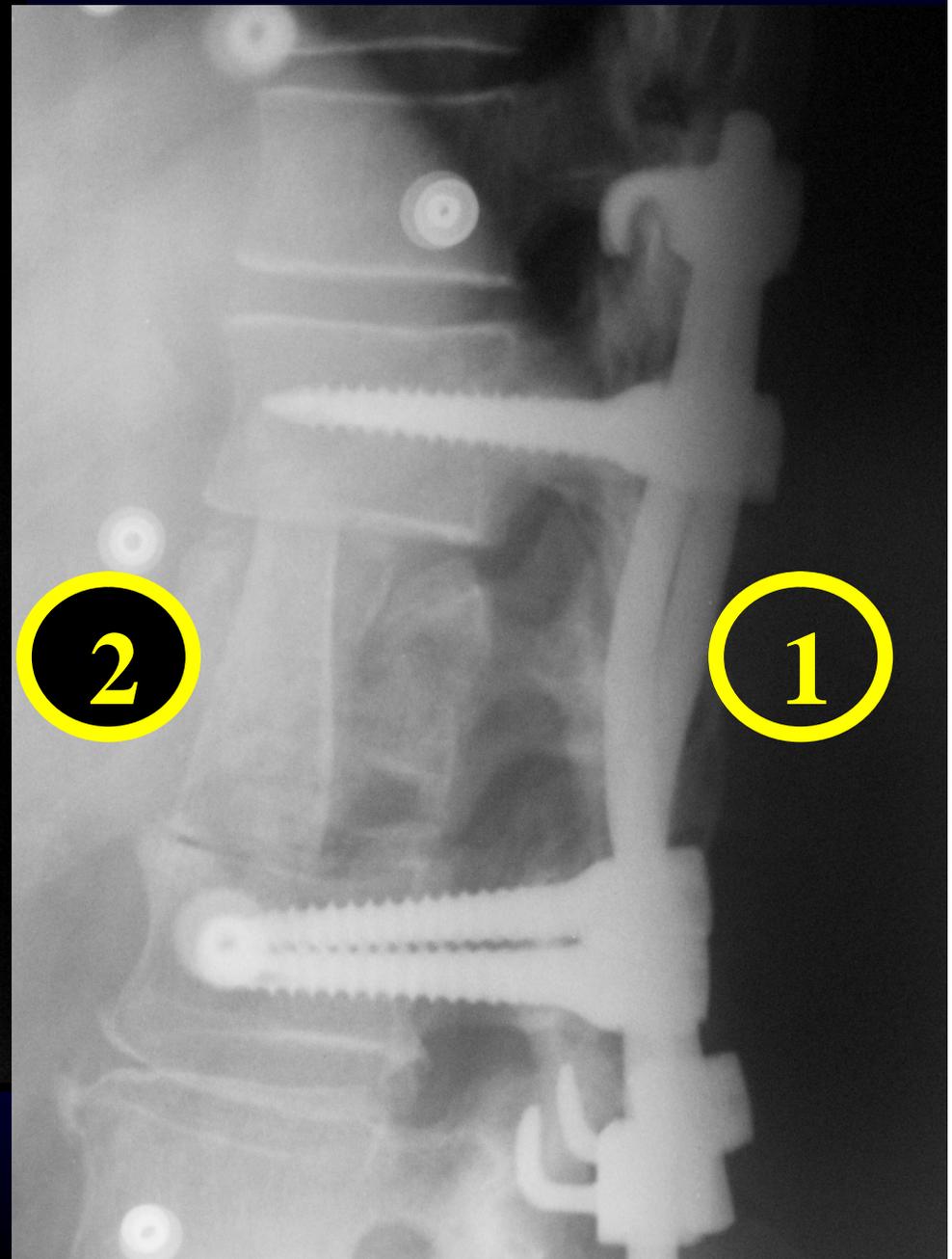


A1=10°

2 3

A3.3.

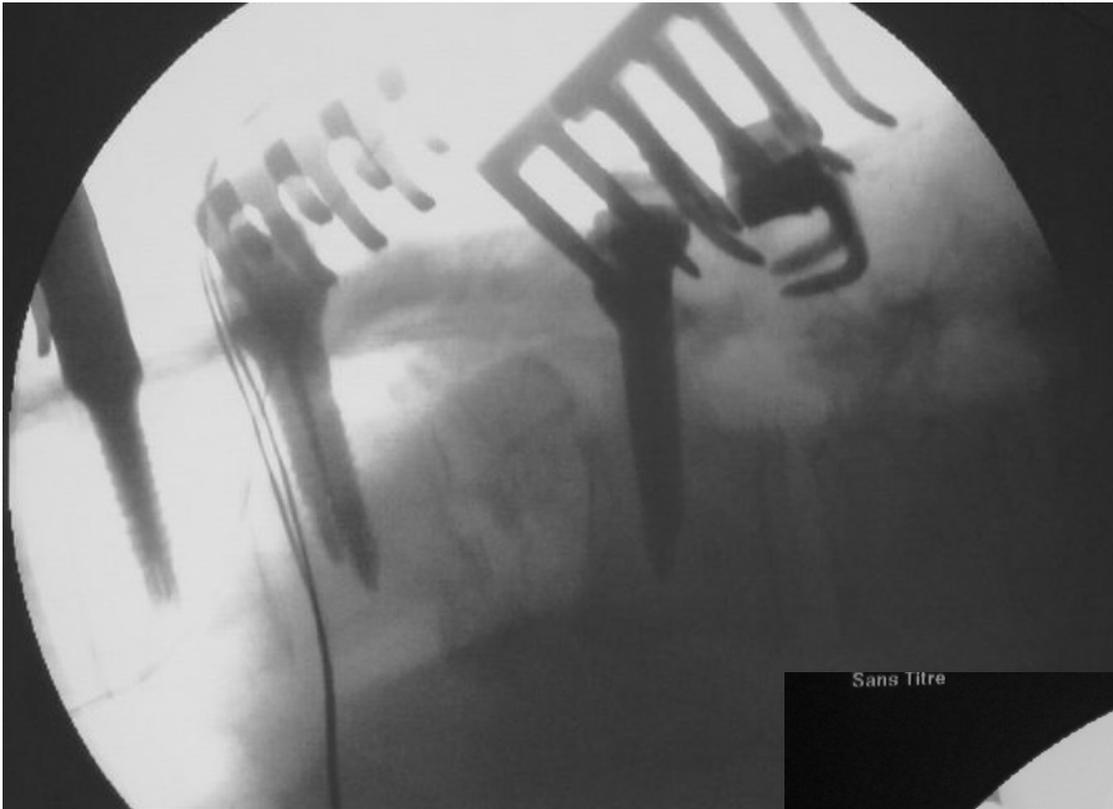
DOUBLE VOIE d'ABORD



C







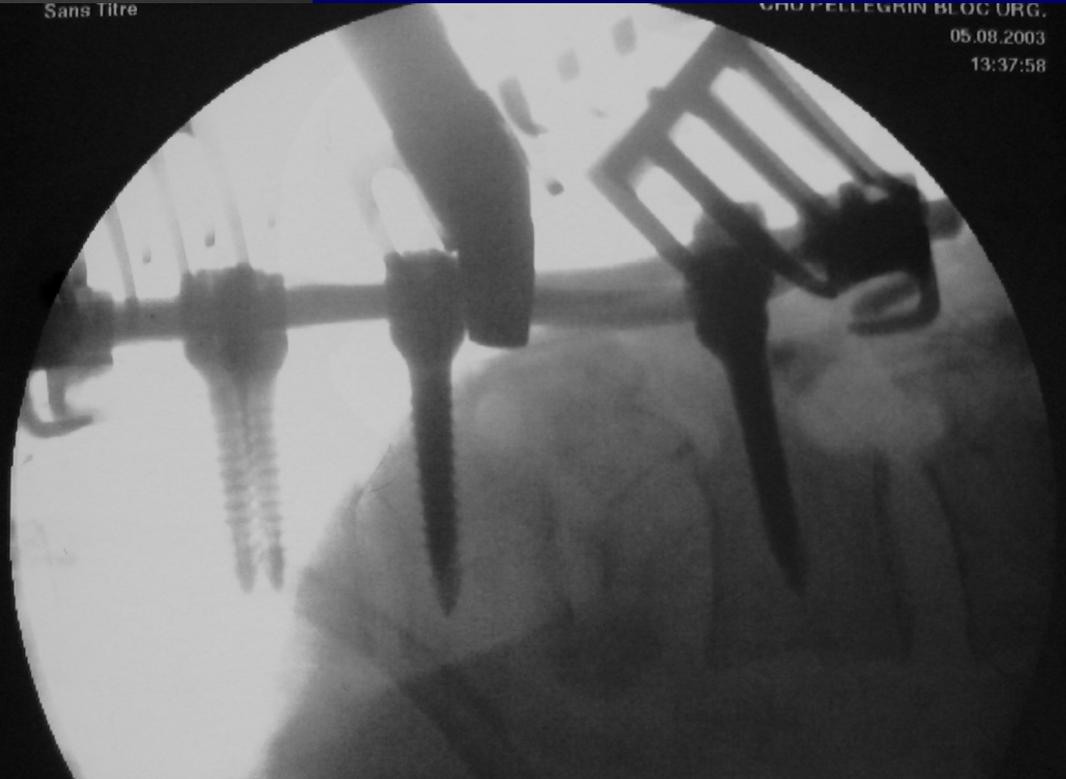
CINTRAGE in SITU

Sans Titre

CHU PELLEGRIN BLOG URG.

05.08.2003

13:37:58

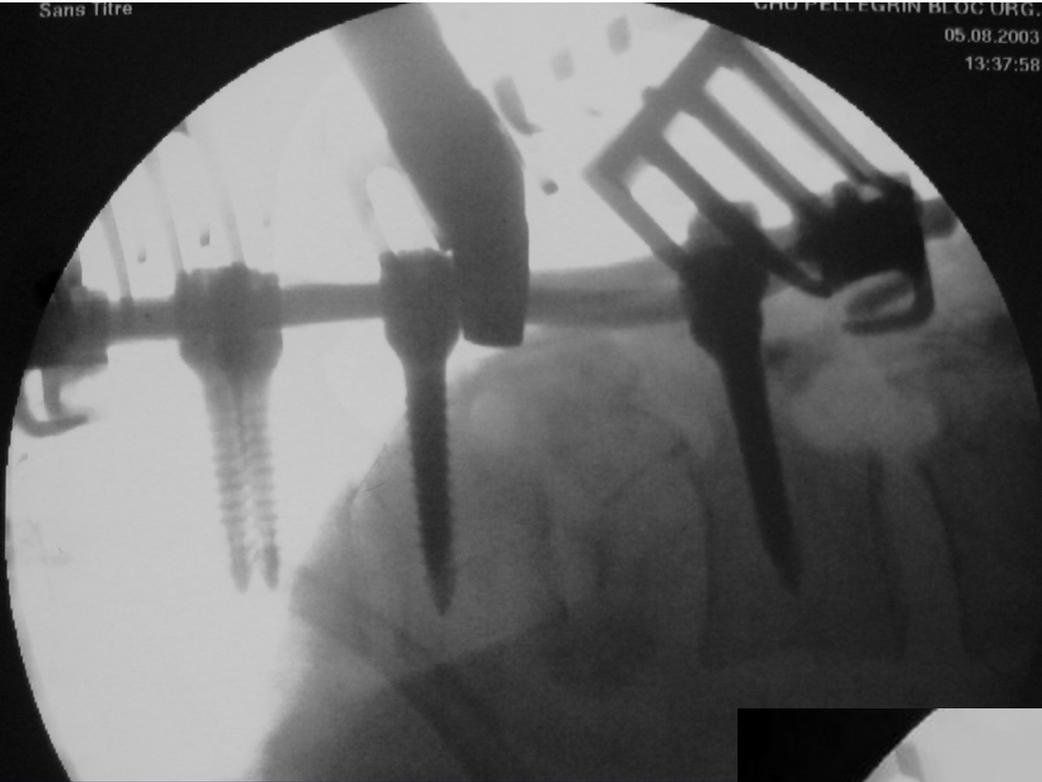


Sans titre

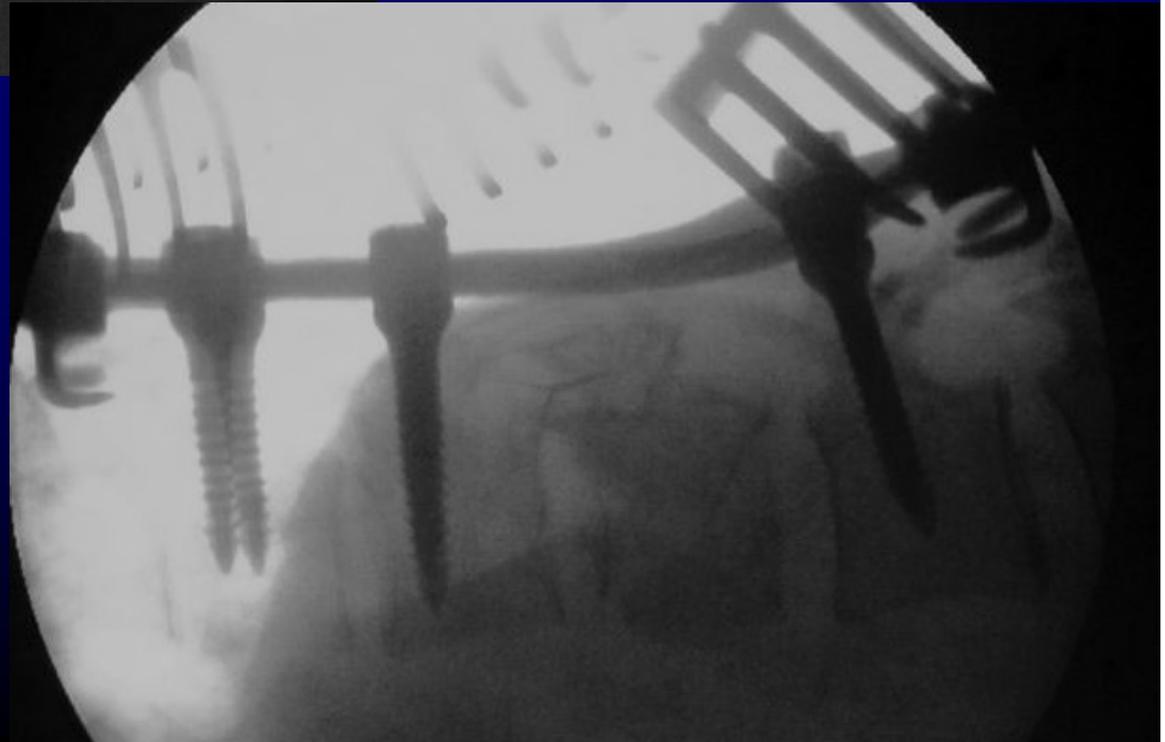
CHU PELEGRIN BLOC ORL

05.08.2003

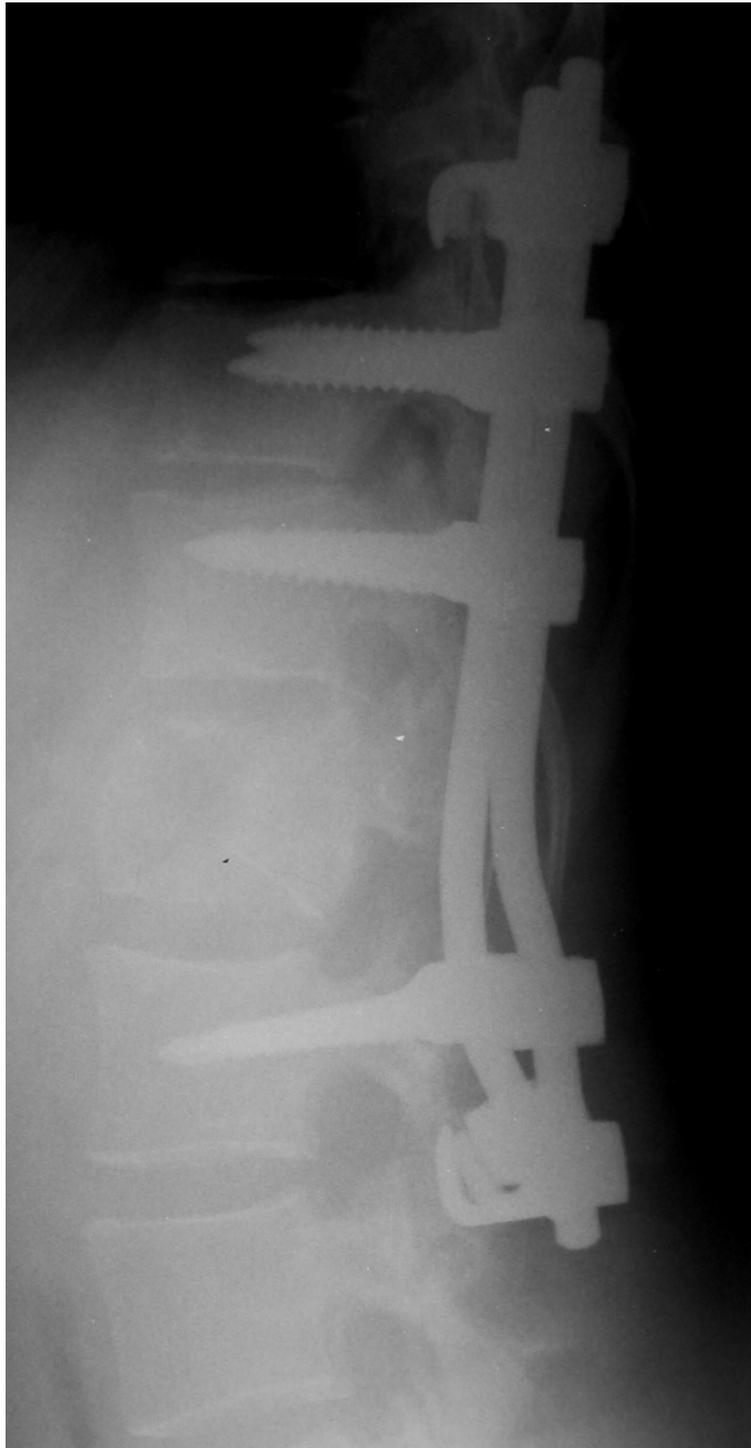
13:37:58

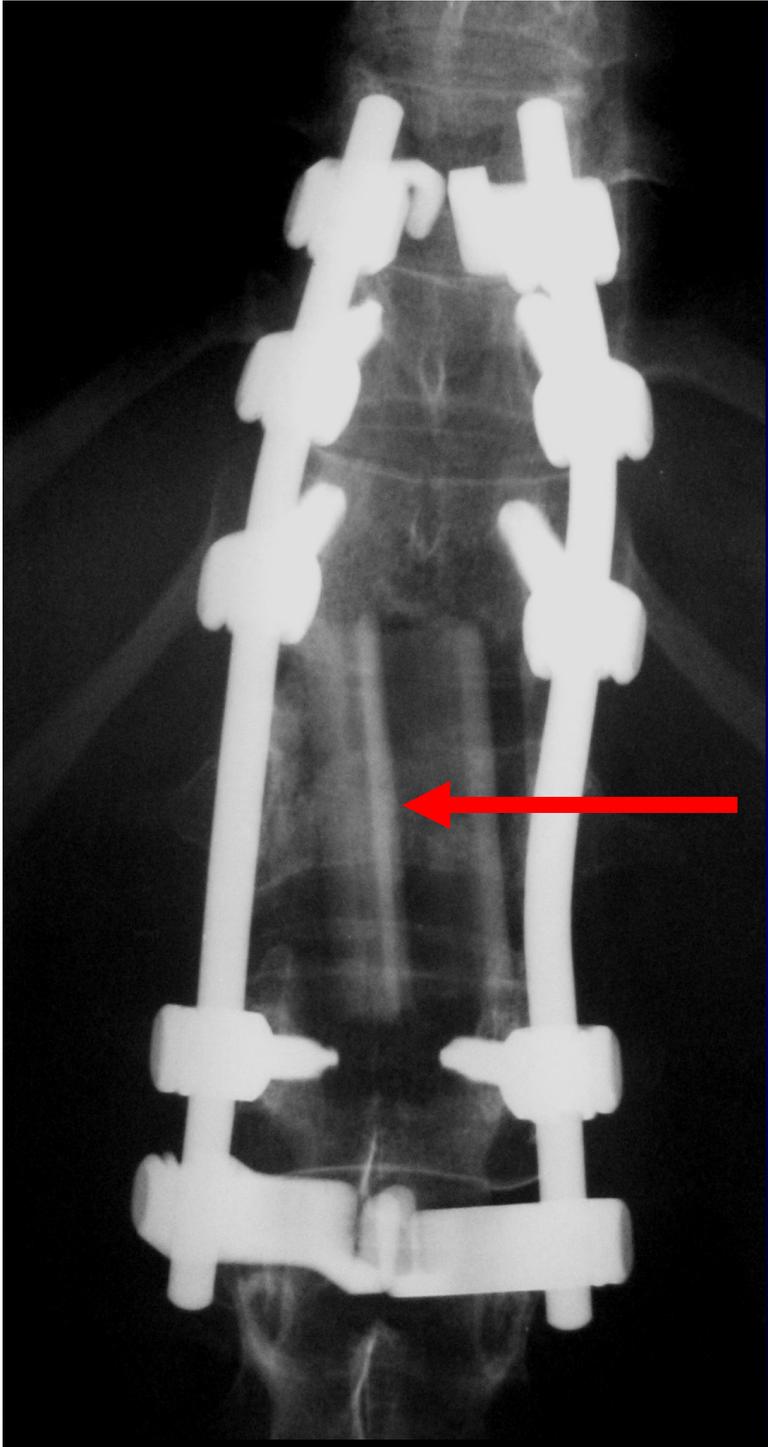


DISTRACTION DOUCE

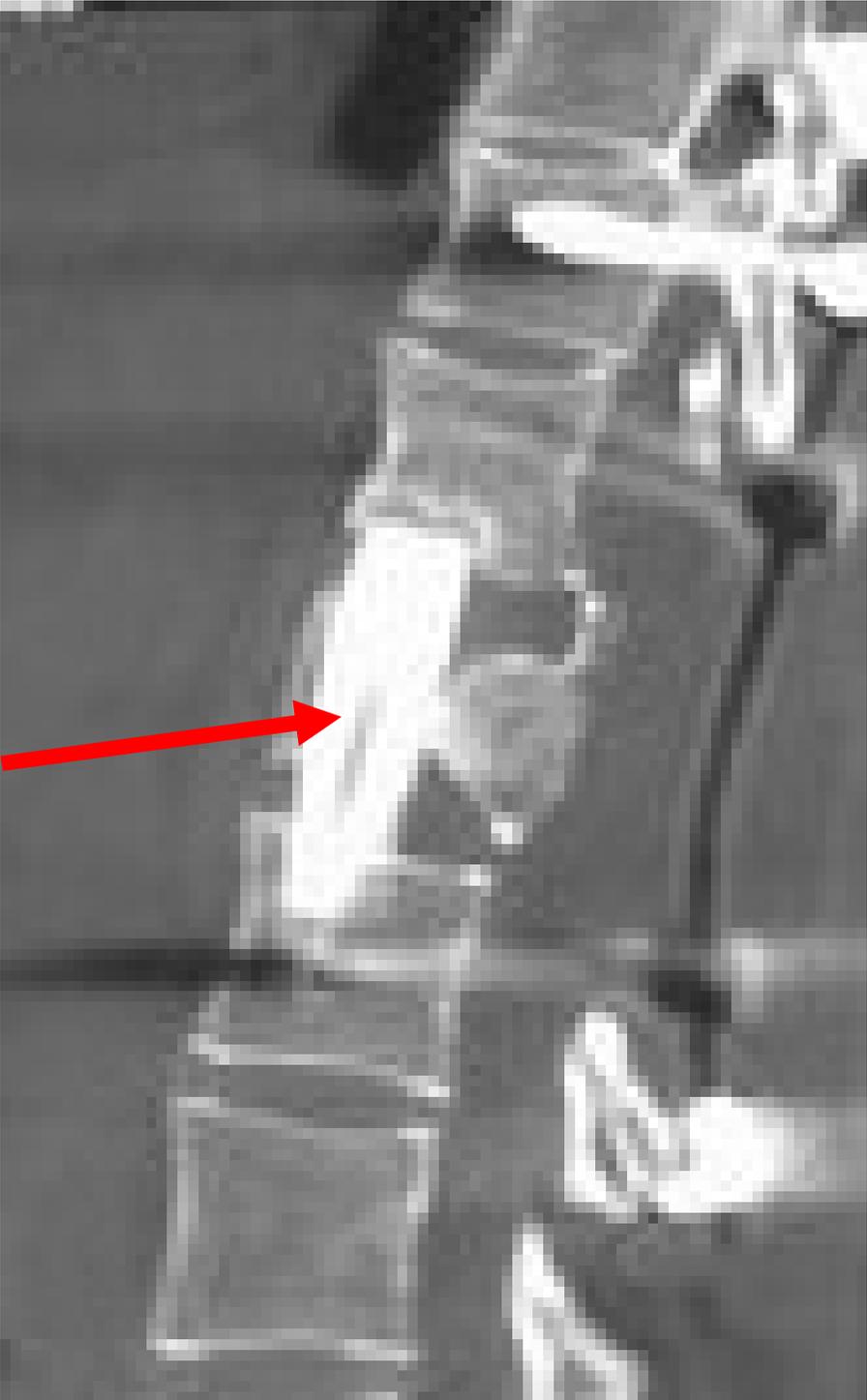


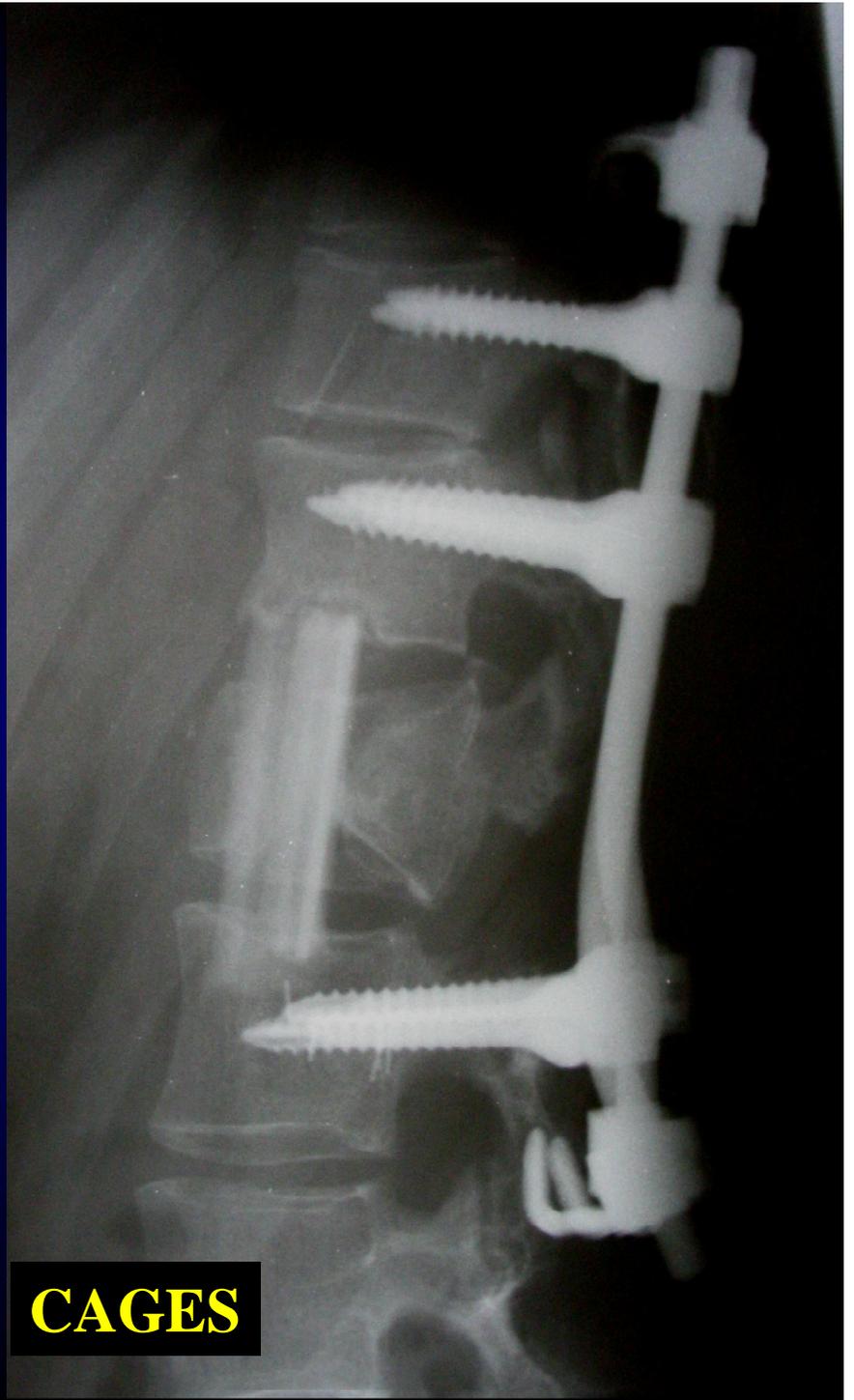
SCAN POSTOPERATOIRE





FIBULA

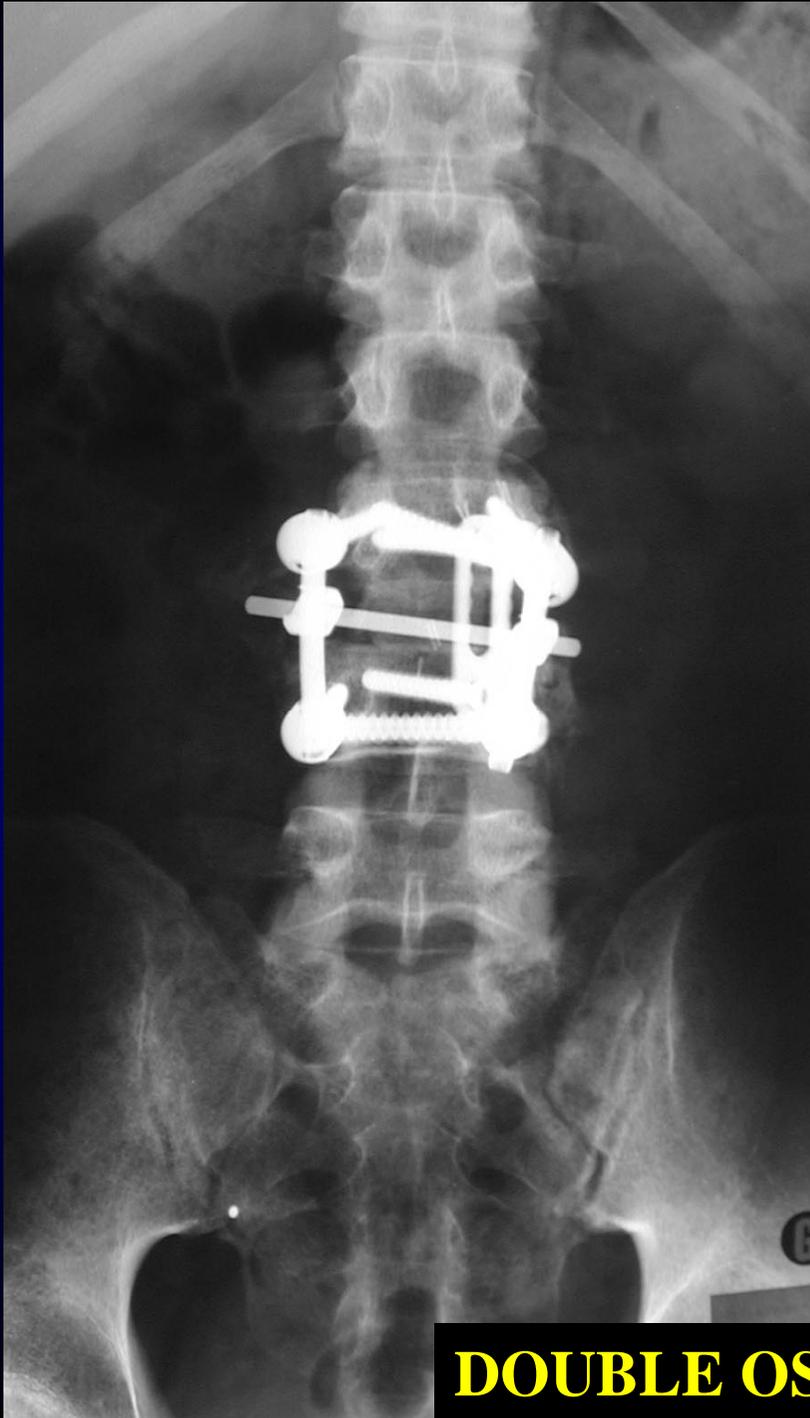




C



MONTAGE COURT



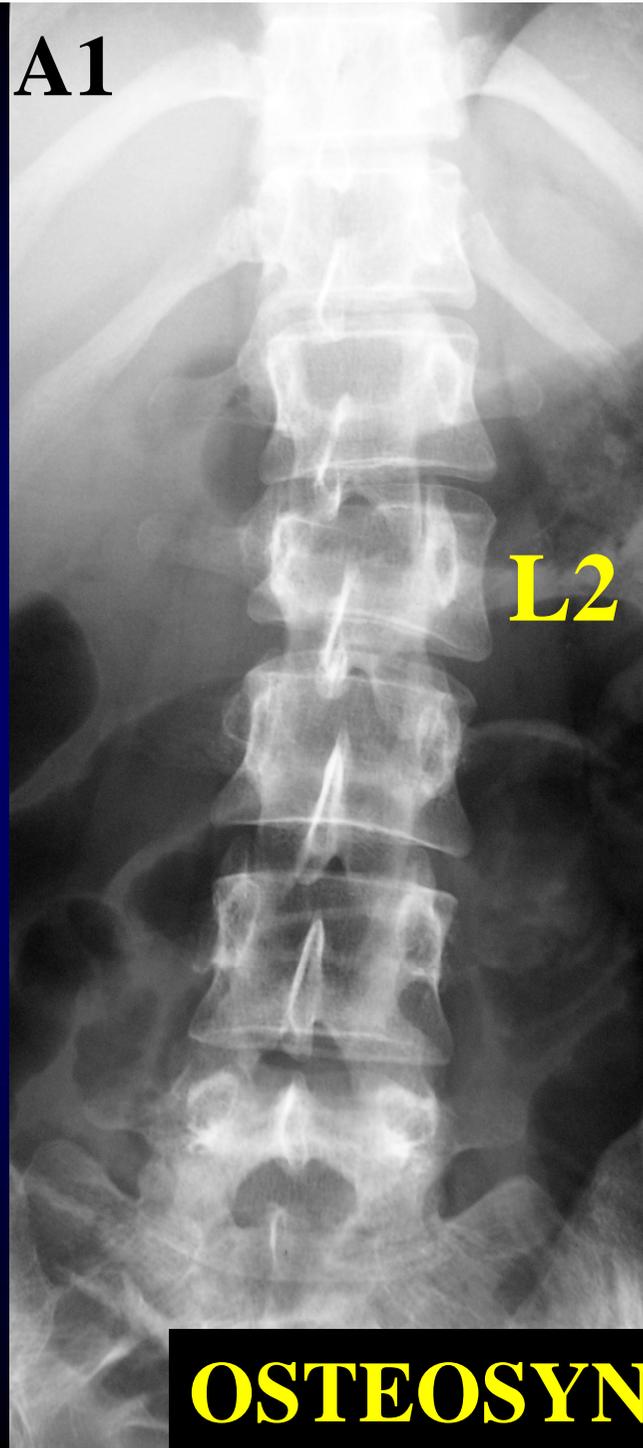
DOUBLE OSTEOSYNTHÈSE

NOUVELLES TECHNIQUES

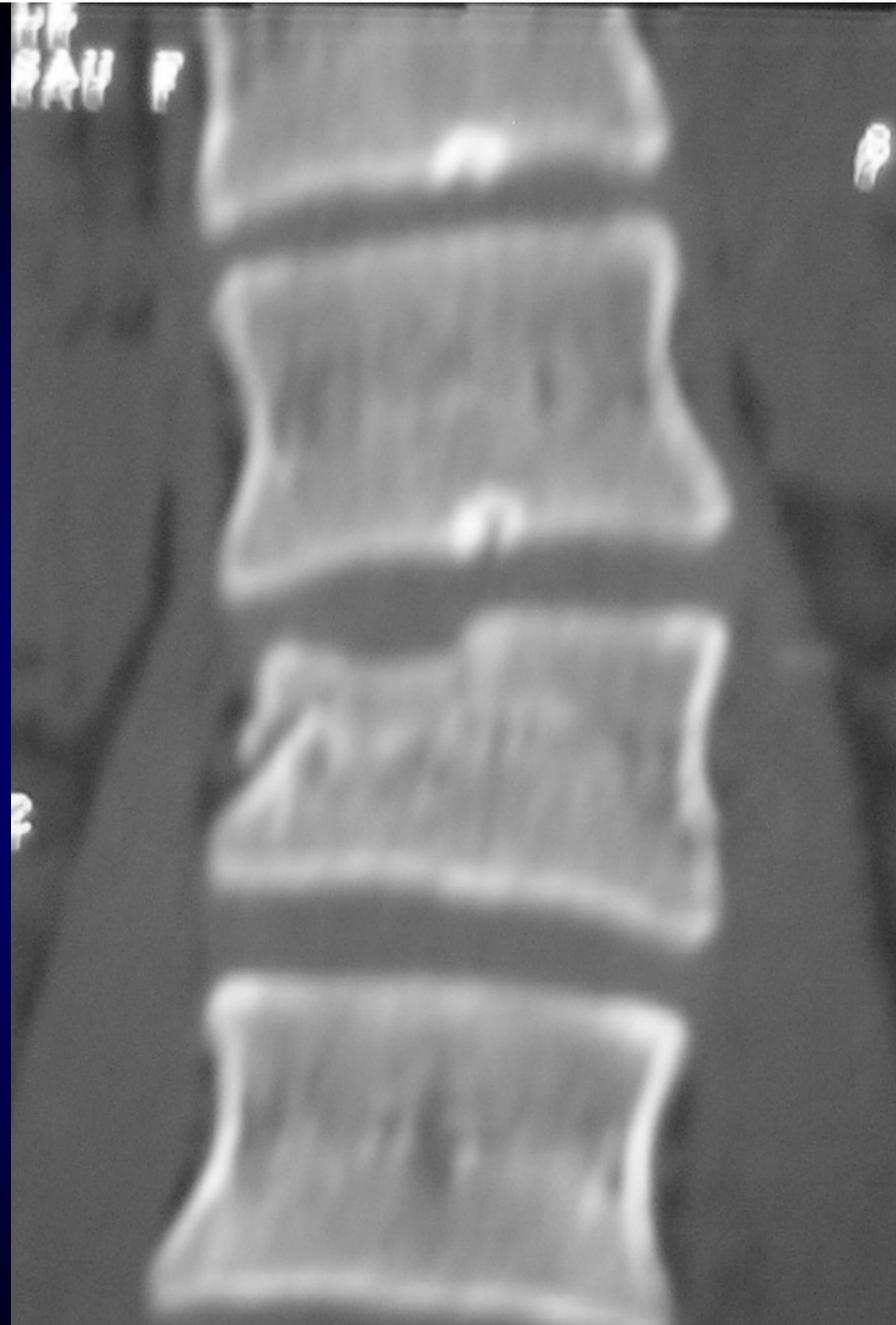
- **OSTEOSYNTHESE PERCUTANEE**
- **VERTEBROPLASTIE**



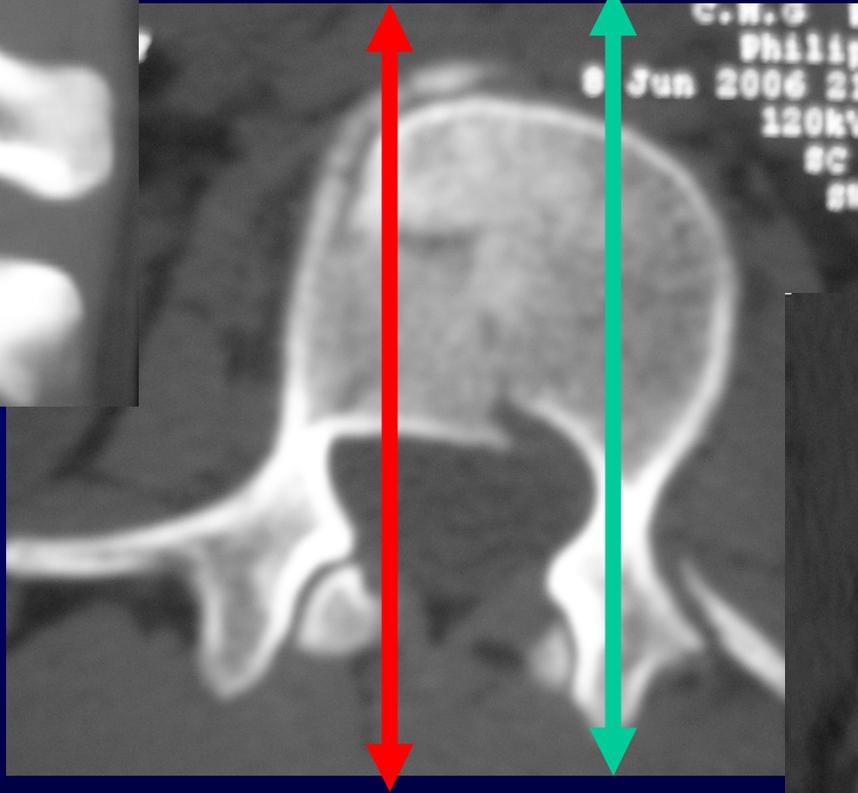
A1

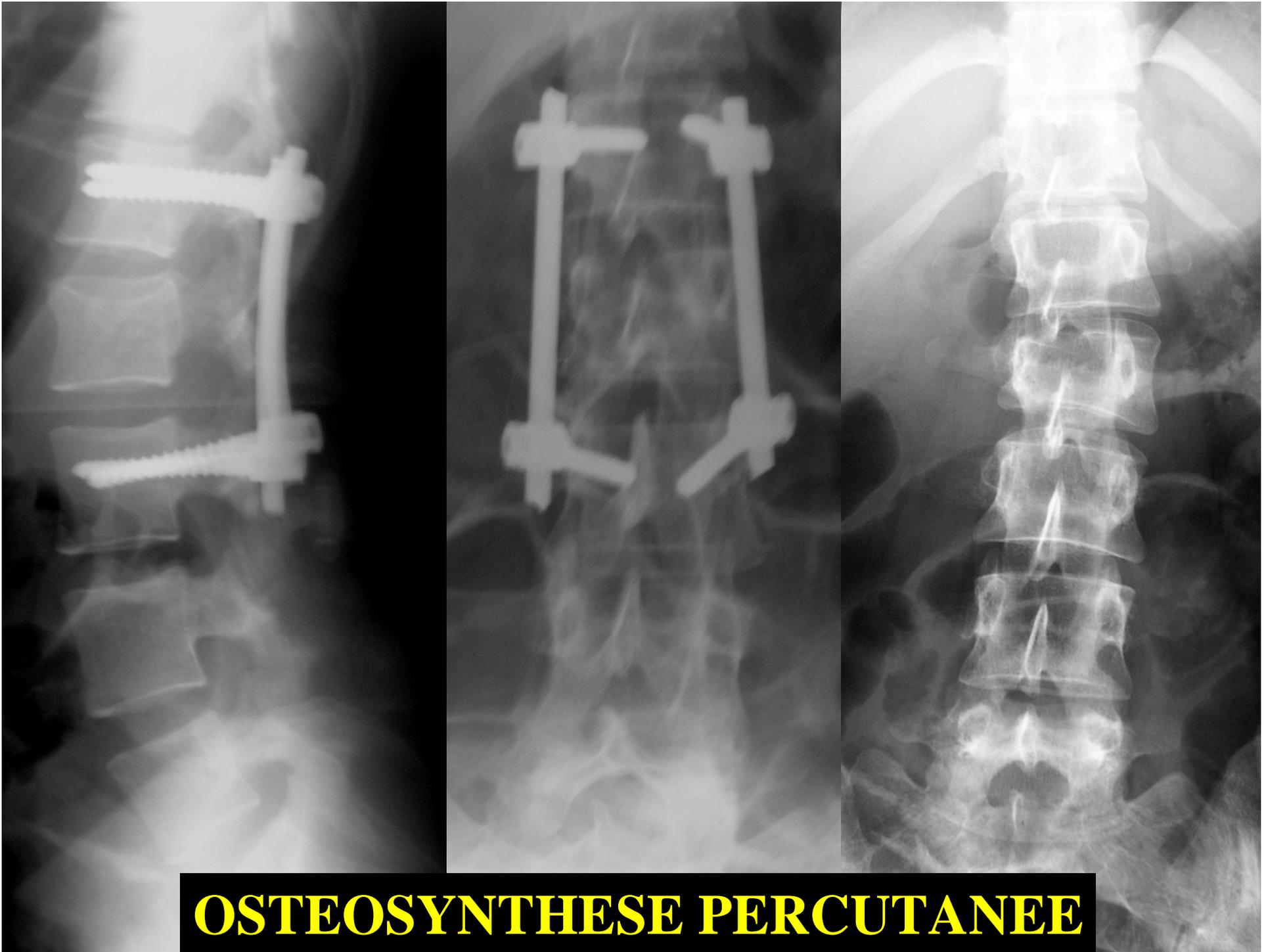


L2



OSTEOSYNTHESE PERCUTANEE





OSTEOSYNTHESE PERCUTANEE

VERTEBROPLASTIE en TRAUMATOLOGIE AIGUE

VERTEBROPLASTIE ISOLEE

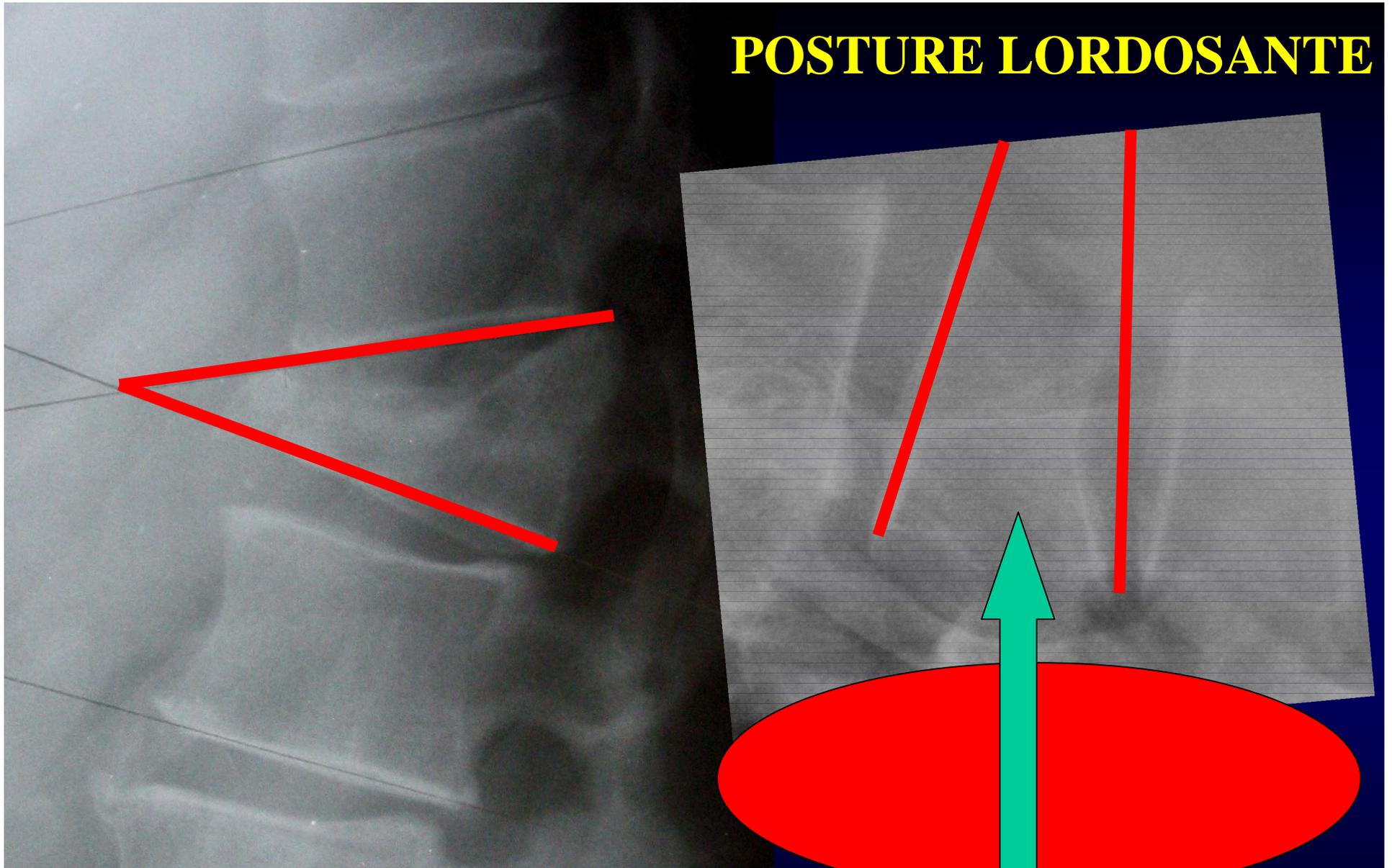
- **INDICATION** dans les types A1
- **CORRECTION** de la **CYPHOSE** (Posture , Ballonnet)
- **CIMENT ACRYLIQUE** ou « **BIOLOGIQUE** »

VERTEBROPLASTIE COMPLEMENTAIRE

- **RENFORCEMENT CORPOREAL** après
**INSTRUMENTATION POSTERIEURE (PER or POST
OPERATOIRE)**

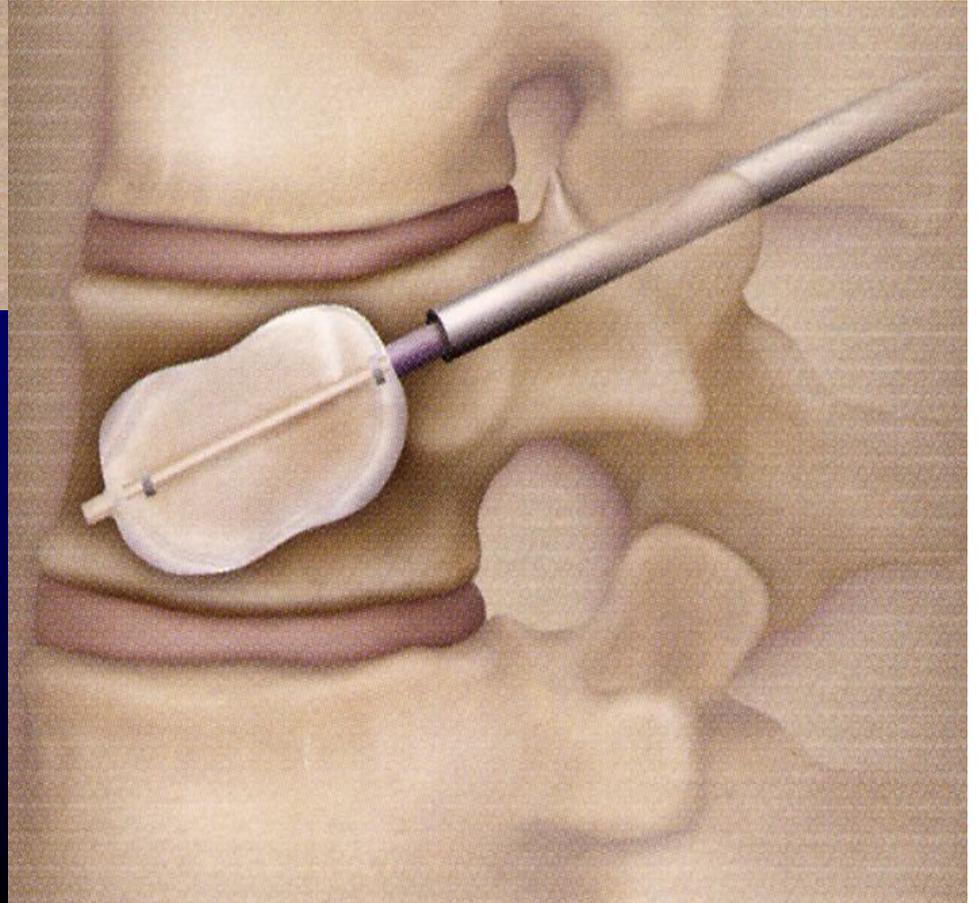
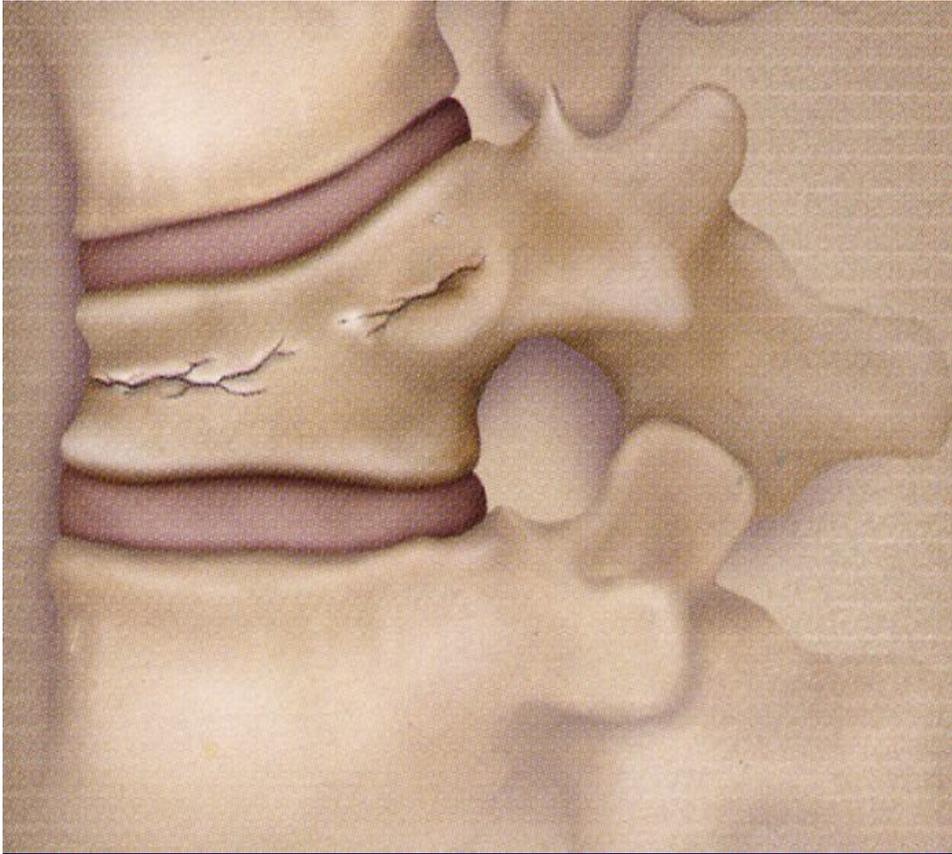


POSTURE LORDOSANTE



VERTEBROPLASTIE ISOLEE

CYPHOPLASTIE





COURT

AVANTAGES de la VERTEBROPLASTIE

VERTEBROPLASTIE ISOLEE

- **PAS DE POSTURE LORDOSANTE**
- **PAS D'IMMOBILISATION EXTERNE**
- **EFFET ANTALGIQUE IMMEDIAT**

VERTEBROPLASTIE COMPLEMENTAIRE

- **PAS DE GREFFE SECONDAIRE**



G MAESTRETTI , P OTTEN

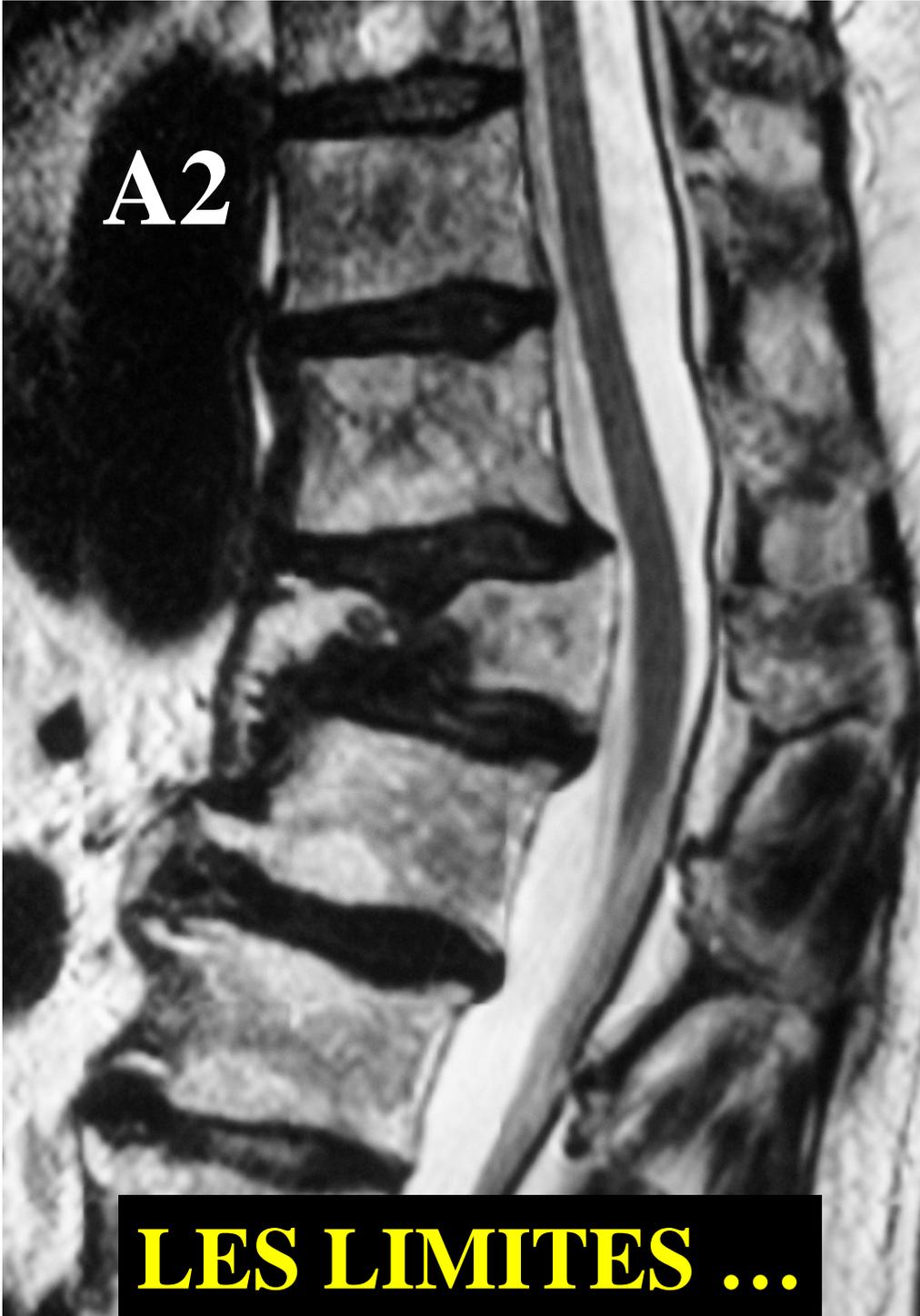
Table Ronde SOFCOT 2005

VERTEBROPLASTIES ISOLEES

- 28 patients : A1 , A3.1 , A3.2
- Posture + Cyphoplastie
- Phosphate de Calcium
- Effet antalgique
- Correction angulaire maintenue

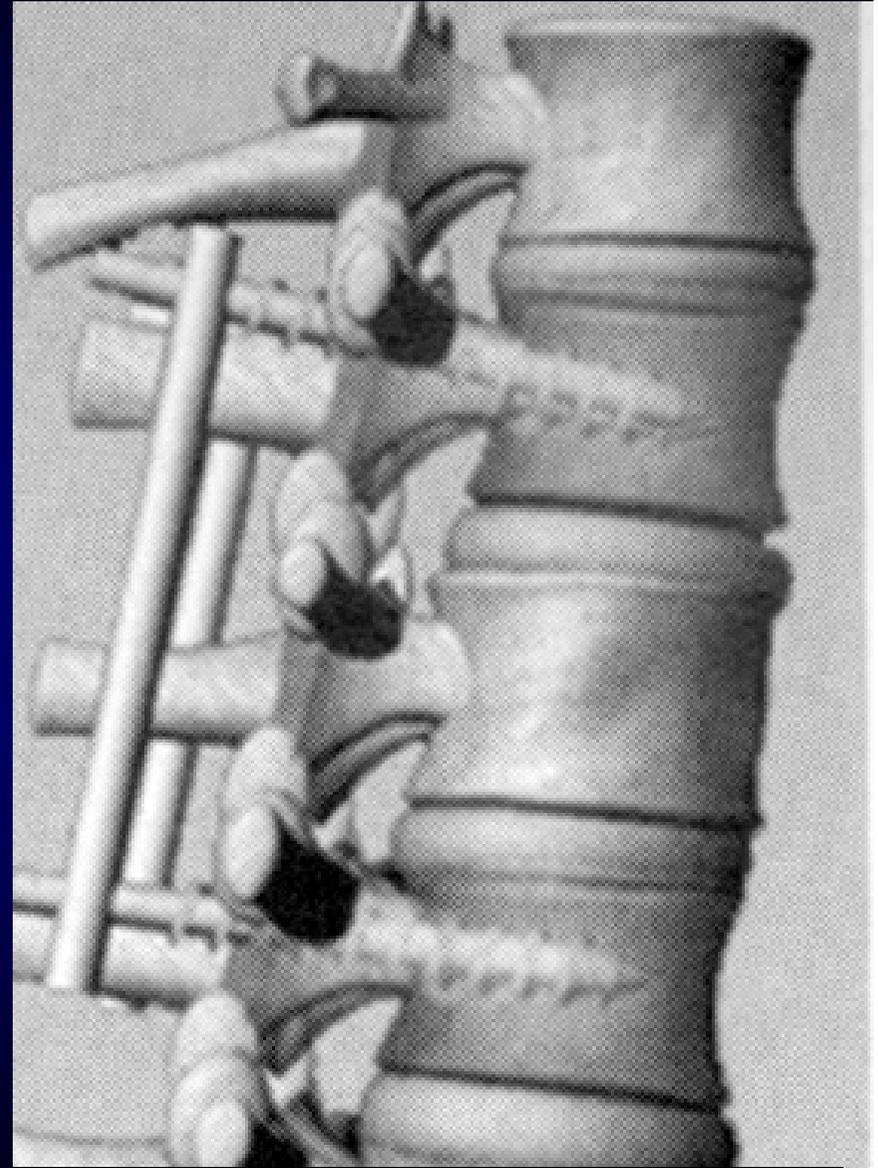
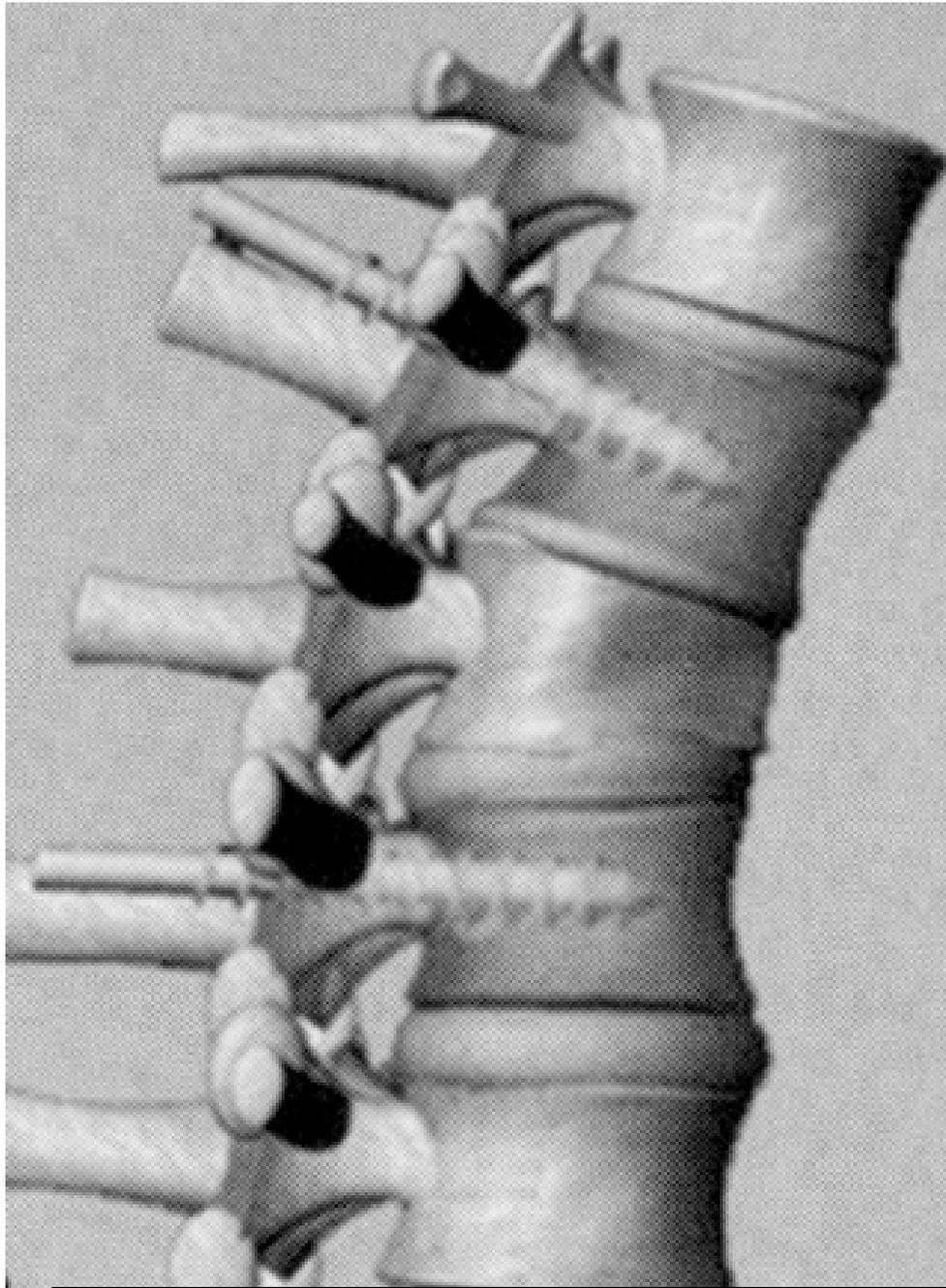


A2

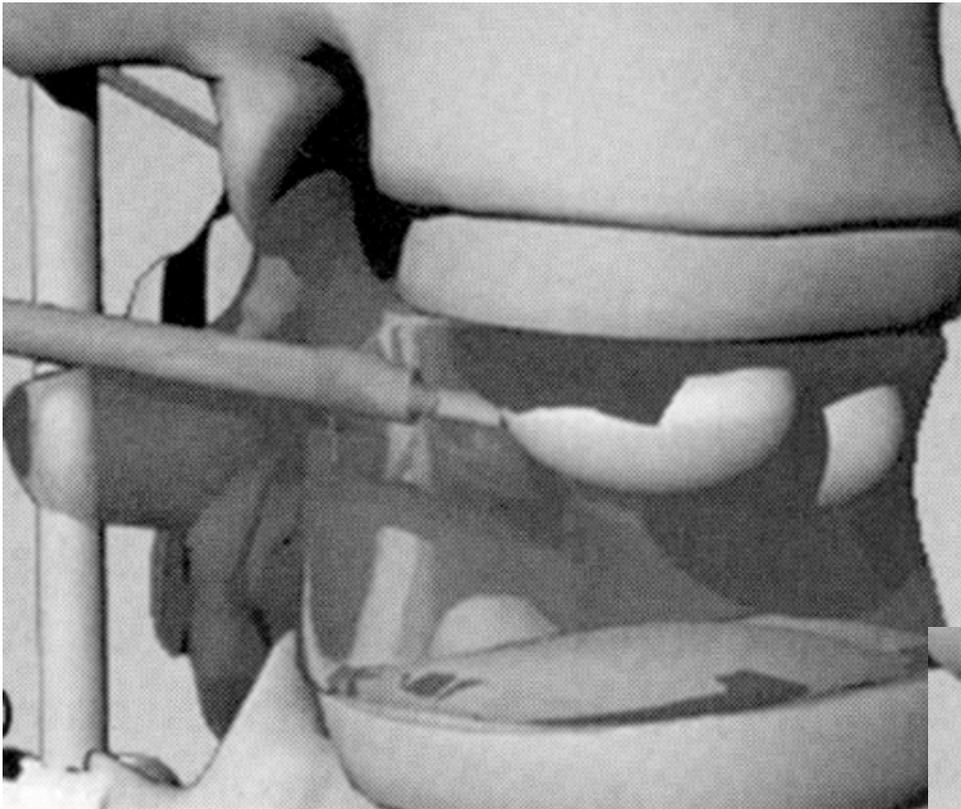


LES LIMITES ...

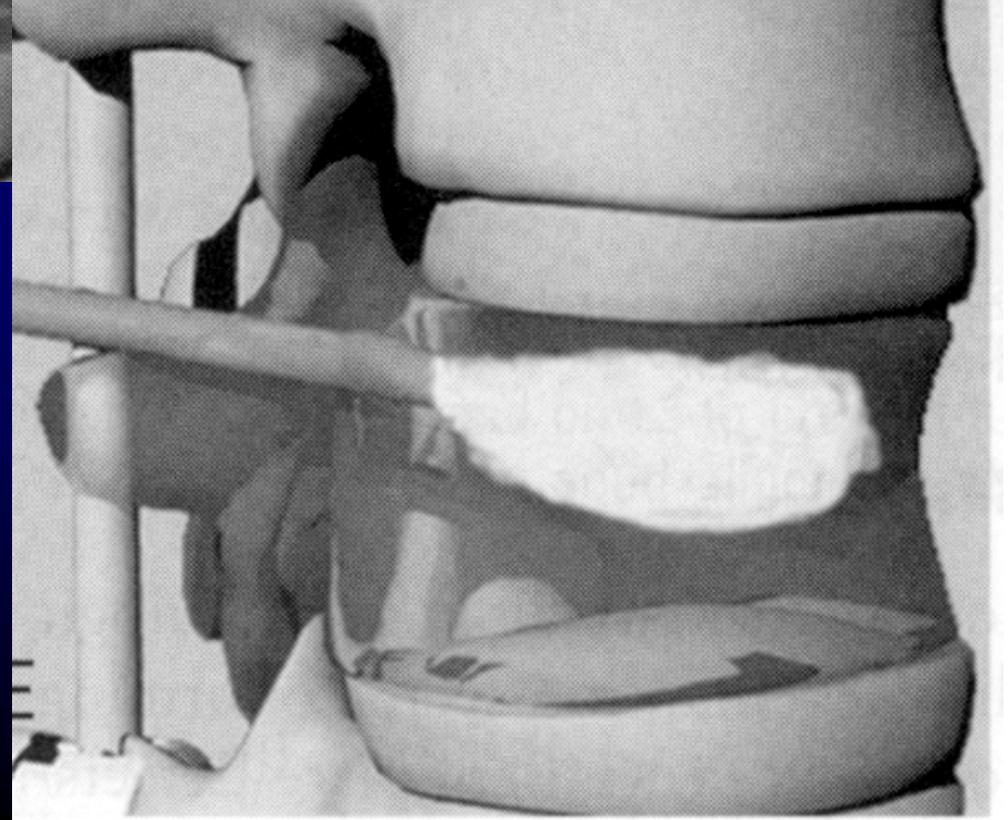
ONER , VERLAN (2006)



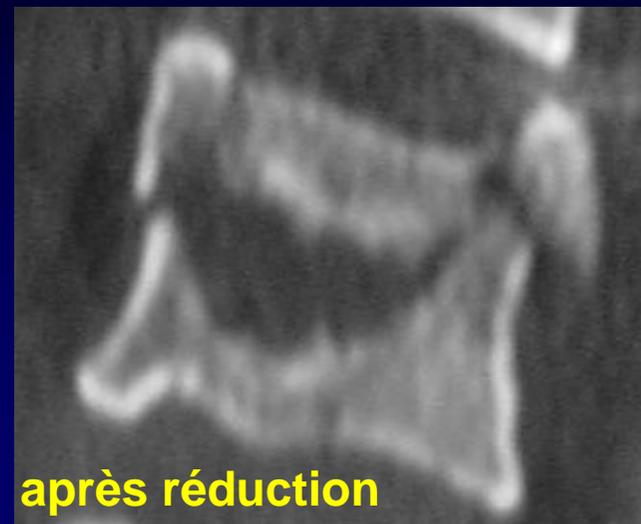
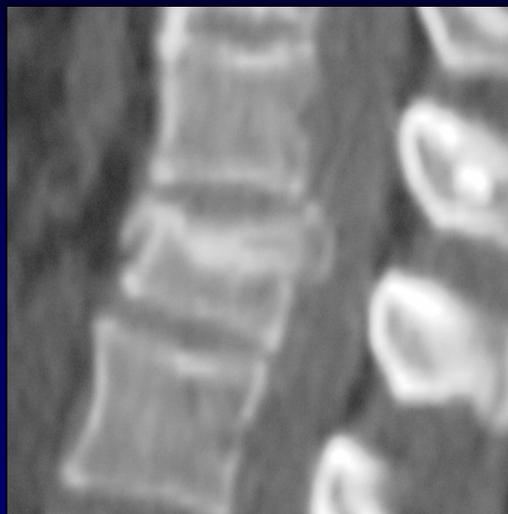
VERTEBROPLASTIES COMPLEMENTAIRES



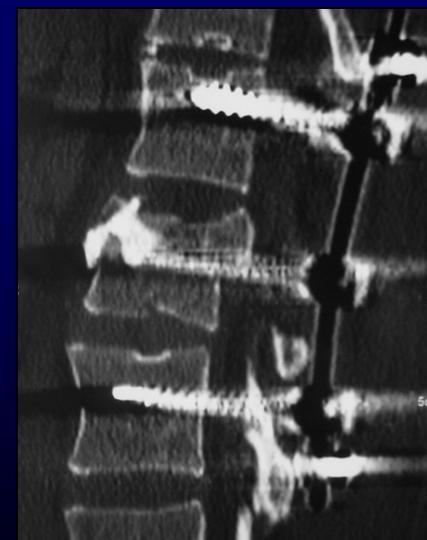
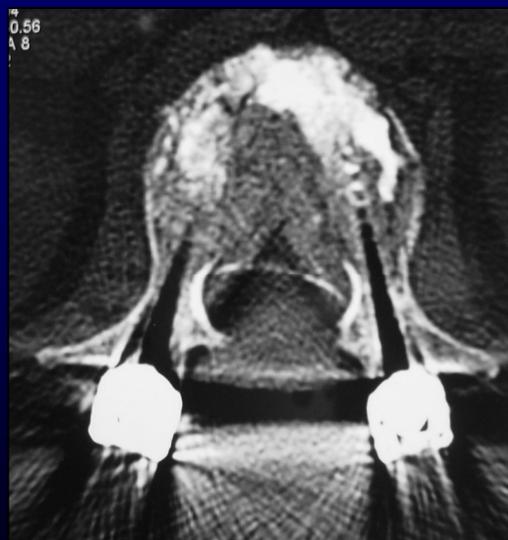
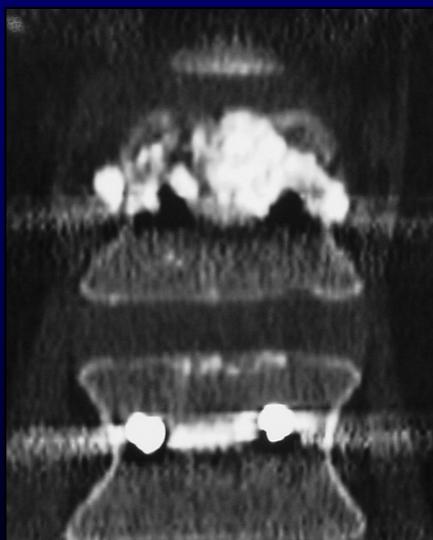
**PHOSPHATE de CALCIUM >
METHYL METHACRYLATE**



VIS LESIONNELLE + PHOSPHATE de CALCIUM

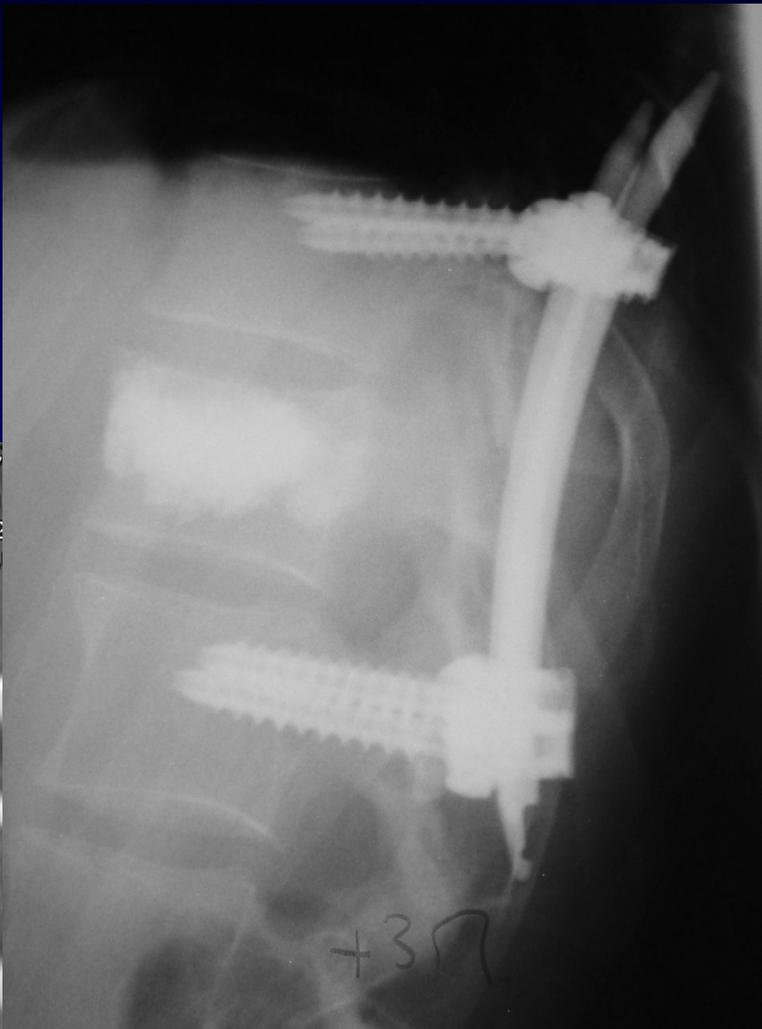


après réduction



VOUAILLAT , TONETTI

VERTEBROPLASTIE + OSTEOSYNTHESE PERCUTANEE

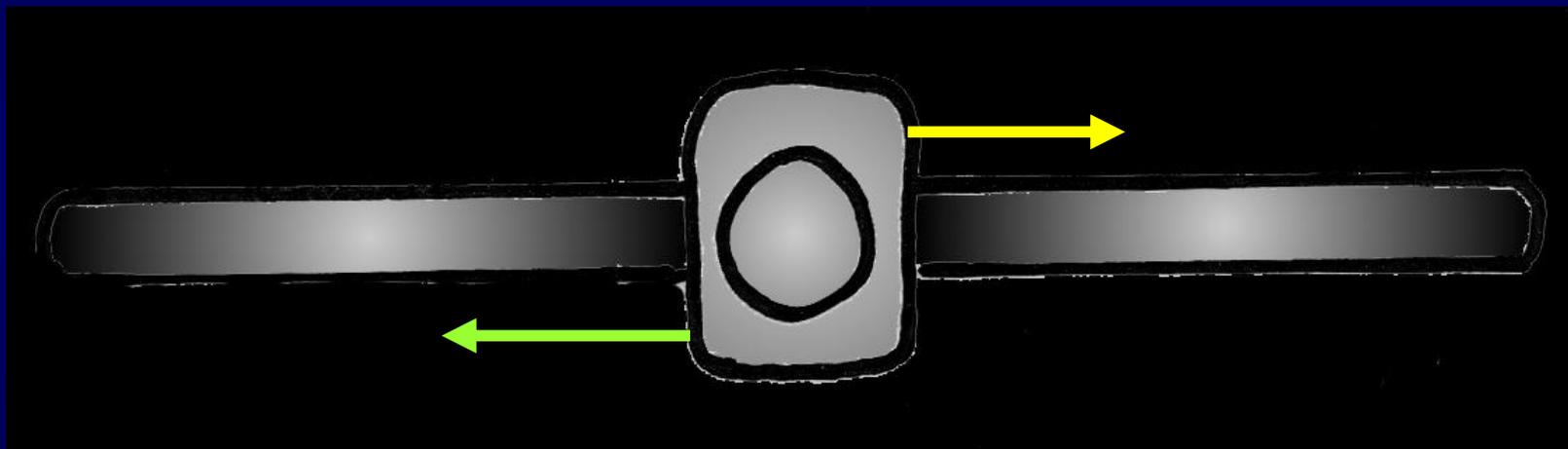


COURT

INDICATIONS THERAPEUTIQUES

- ~~CV~~
- ~~REDUCTION CANAL RACHIDIEN~~
- ART $> 15^\circ$ TT CHIRURGICAL
 $< 10^\circ$ TT ORTHOPEDIQUE
- CURSEUR LIGAMENT-OS

L
I
G
A
M
E
N
T



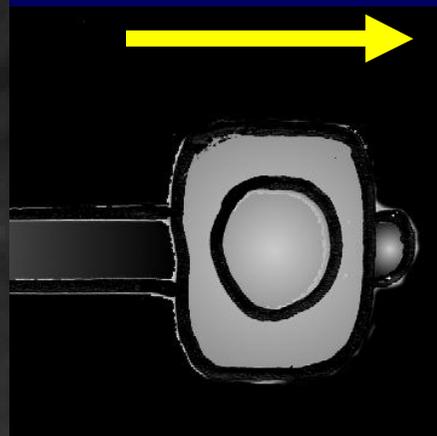
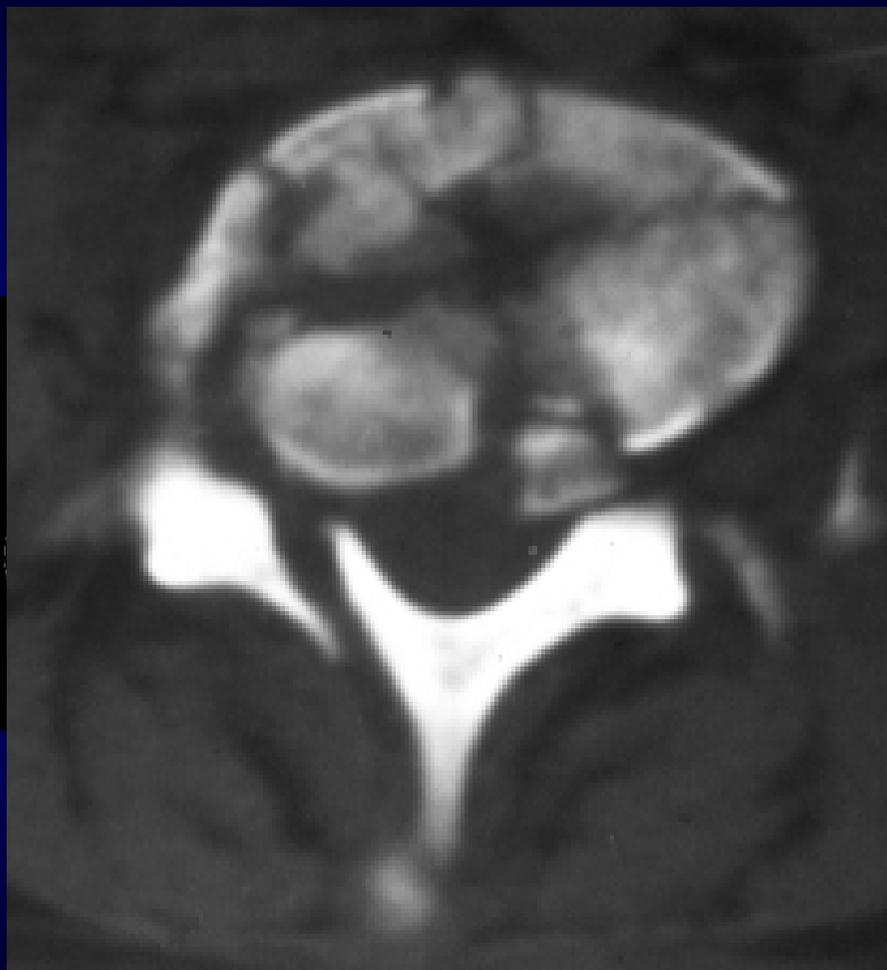
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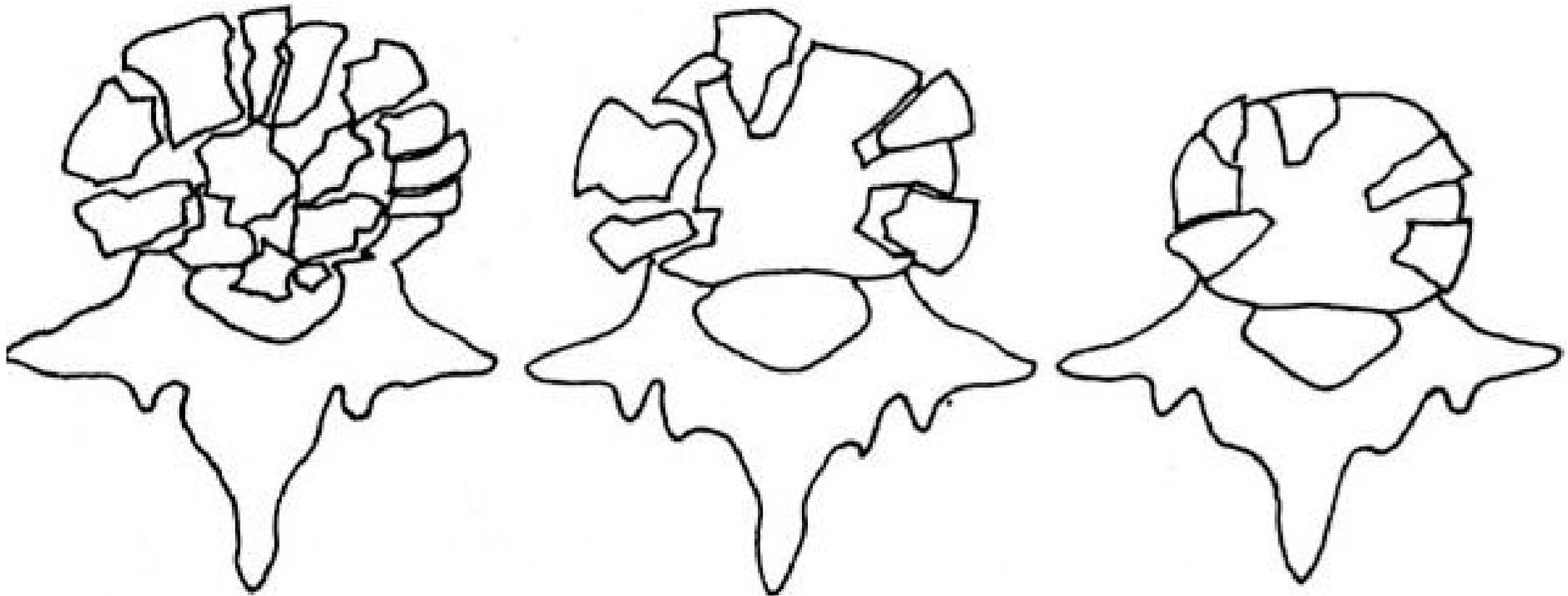


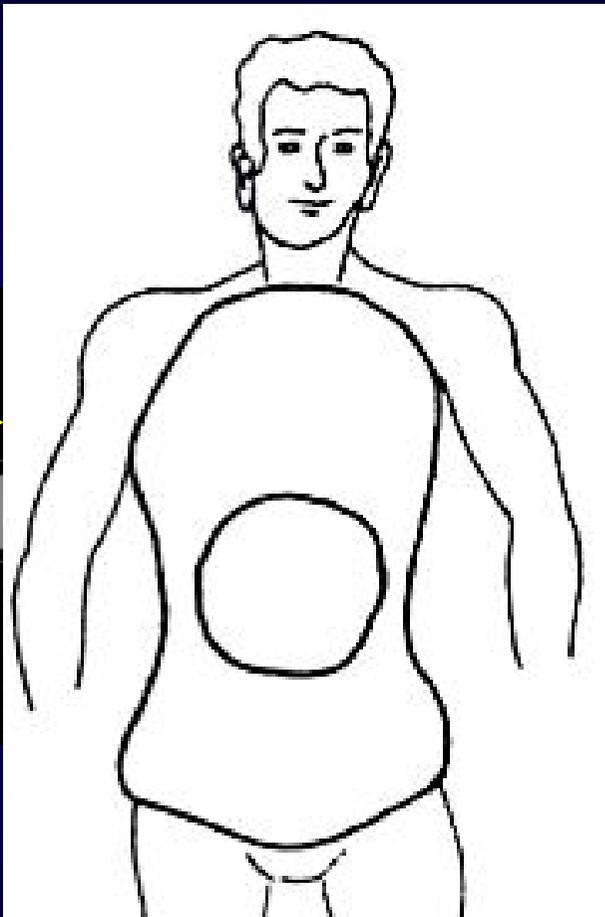
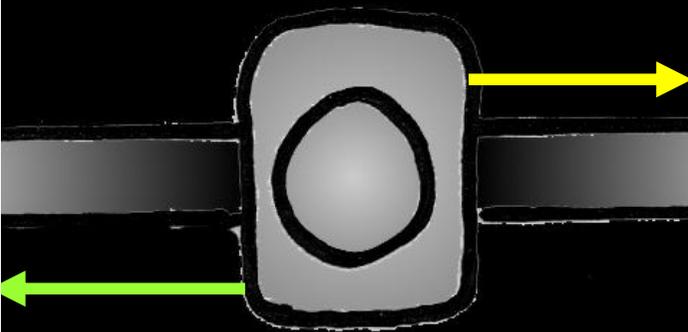
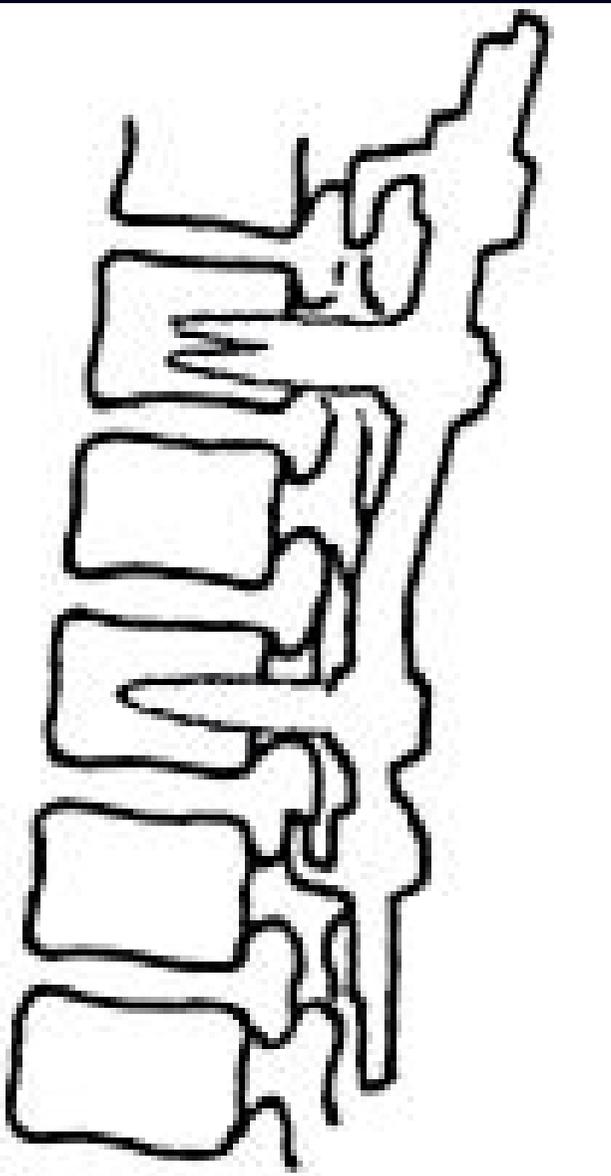
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S

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INDICATIONS du TT ORTHOPEDIQUE (70%)

- **Toujours à discuter dans les types A1**
- **Prudence pour les types A2 et A3.3.**
- **Bien différencier type A et type B en flexion**

INDICATIONS « LIMITES » du TT ORTHOPEDIQUE

- Lésions étagées
- Polytraumatisé
- Lésions lombaires basses
- Obésité



INDICATIONS THERAPEUTIQUES

- VERTEBROPLASTIE : ?

- TT CHIRURGICAL :

type B : VOIE POST.

type A2 , A3.3. : VOIE ANT.

type C : DOUBLE TEMPS



PSEUDARTHROSE et CAL VICIEUX

- PSEUDARTHROSE FIBREUSE ou OSSEUSE
- CAL VICIEUX : « POST TRAUMATIC KYPHOSIS »
- CLINIQUE :
 - DOULEUR
 - 20% de TROUBLES NEUROLOGIQUES



TT CHIRURGICAL

- **CHIRURGIE en 1 TEMPS**
ANTERIEUR : PSEUDARTHROSE MOBILE
POSTERIEUR : OSTEOTOMIE
- **CHIRURGIE en 2 TEMPS**
SEPARES
SIMULTANES (ACAROGLU , FARCY(1996))
- **CHIRURGIE en 3 TEMPS (« back , front , back »)**

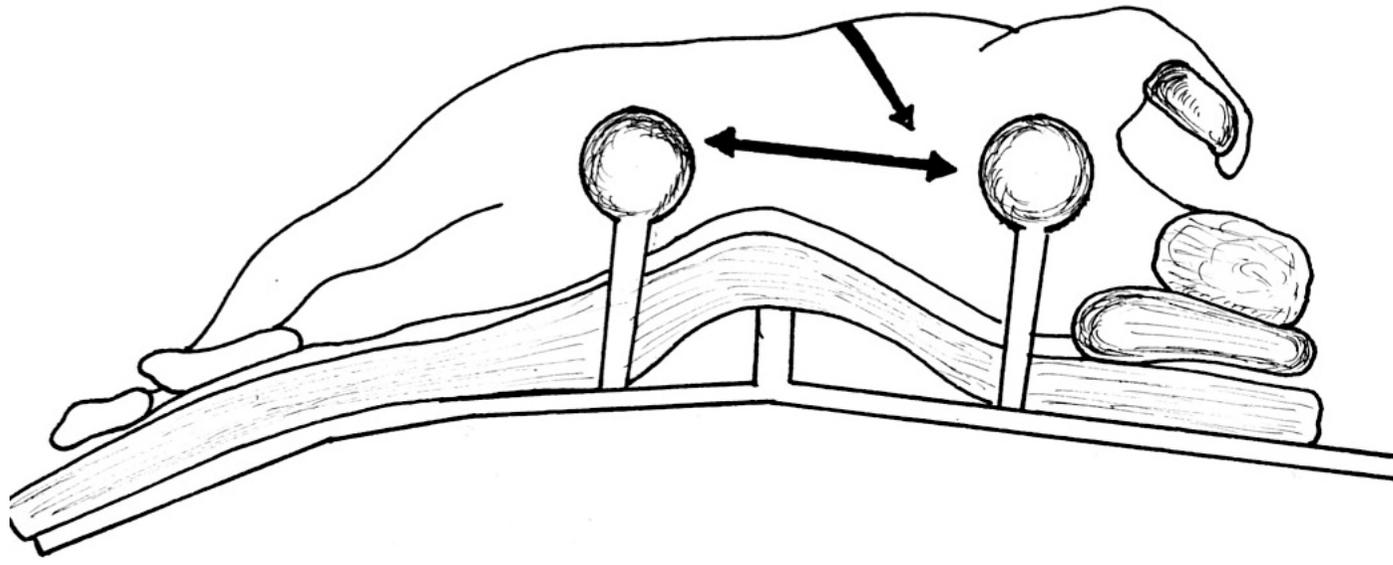
A3



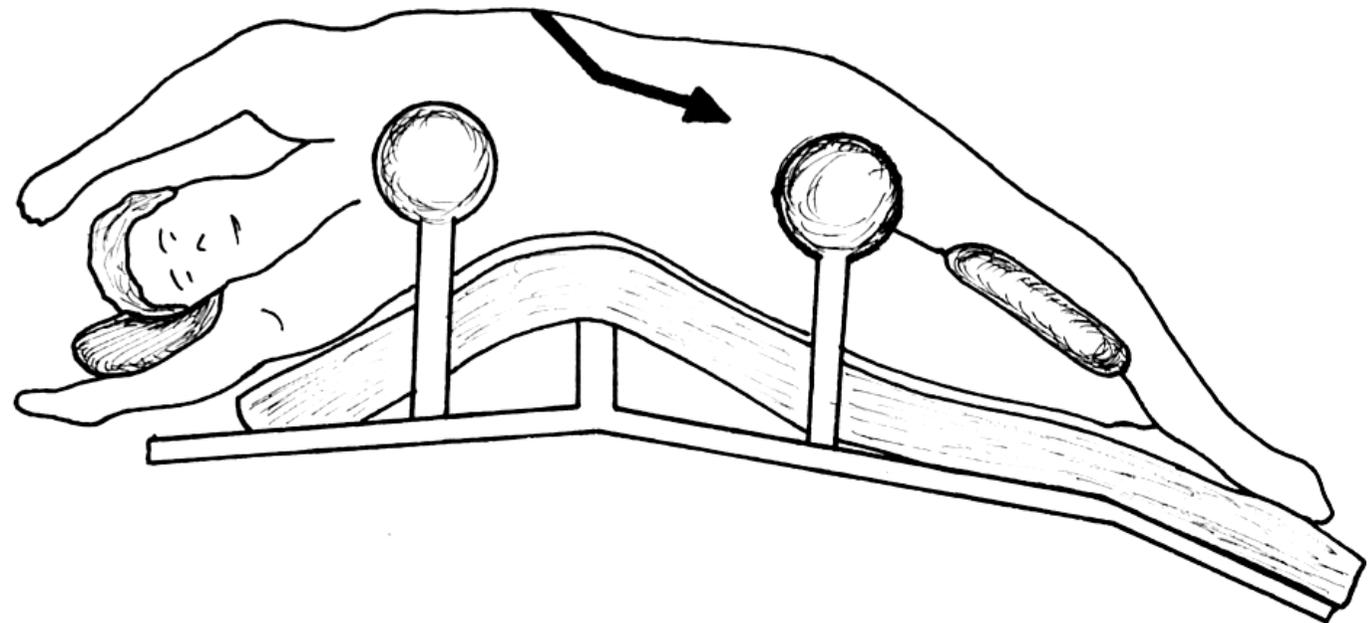
UP



VOIE d'ABORD ANTERIEURE

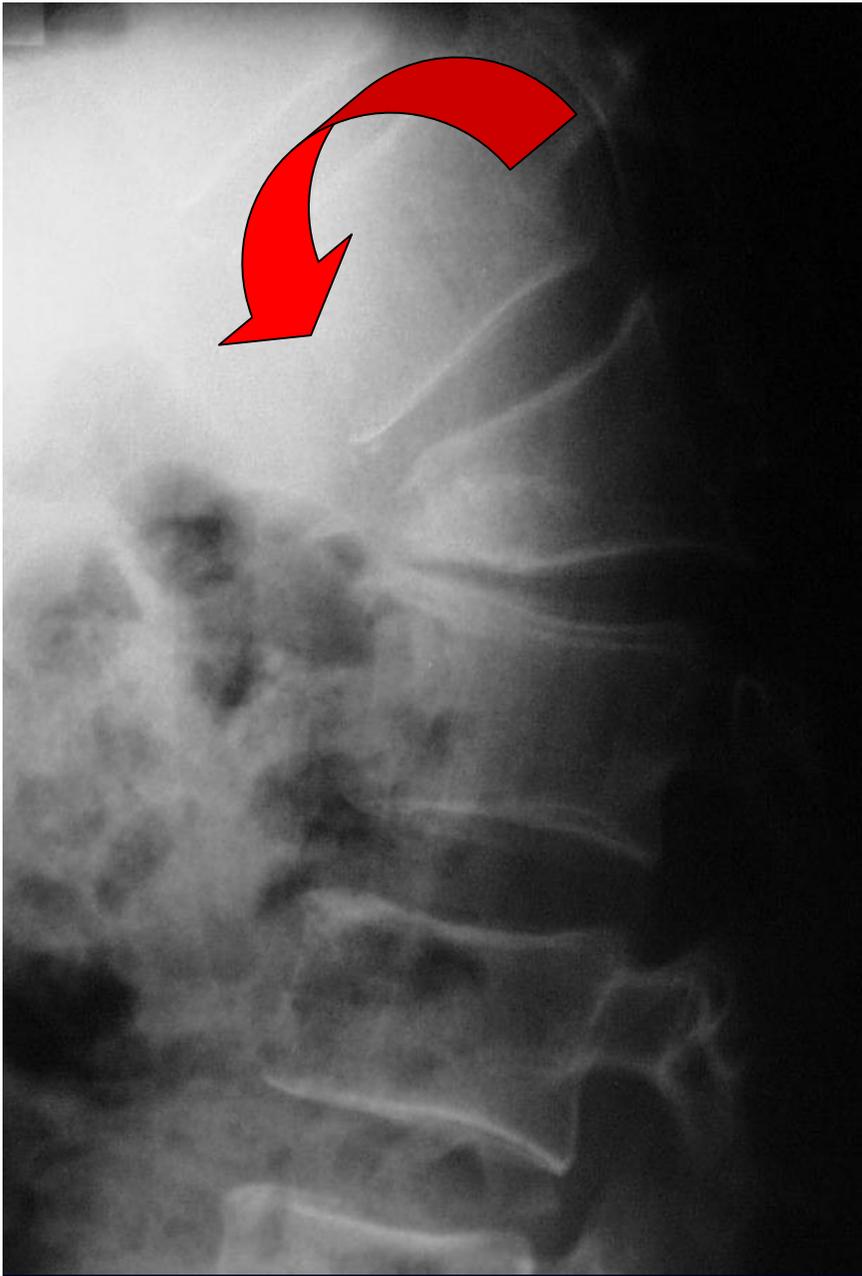


VOIE d'ABORD COMBINEE SIMULTANEE

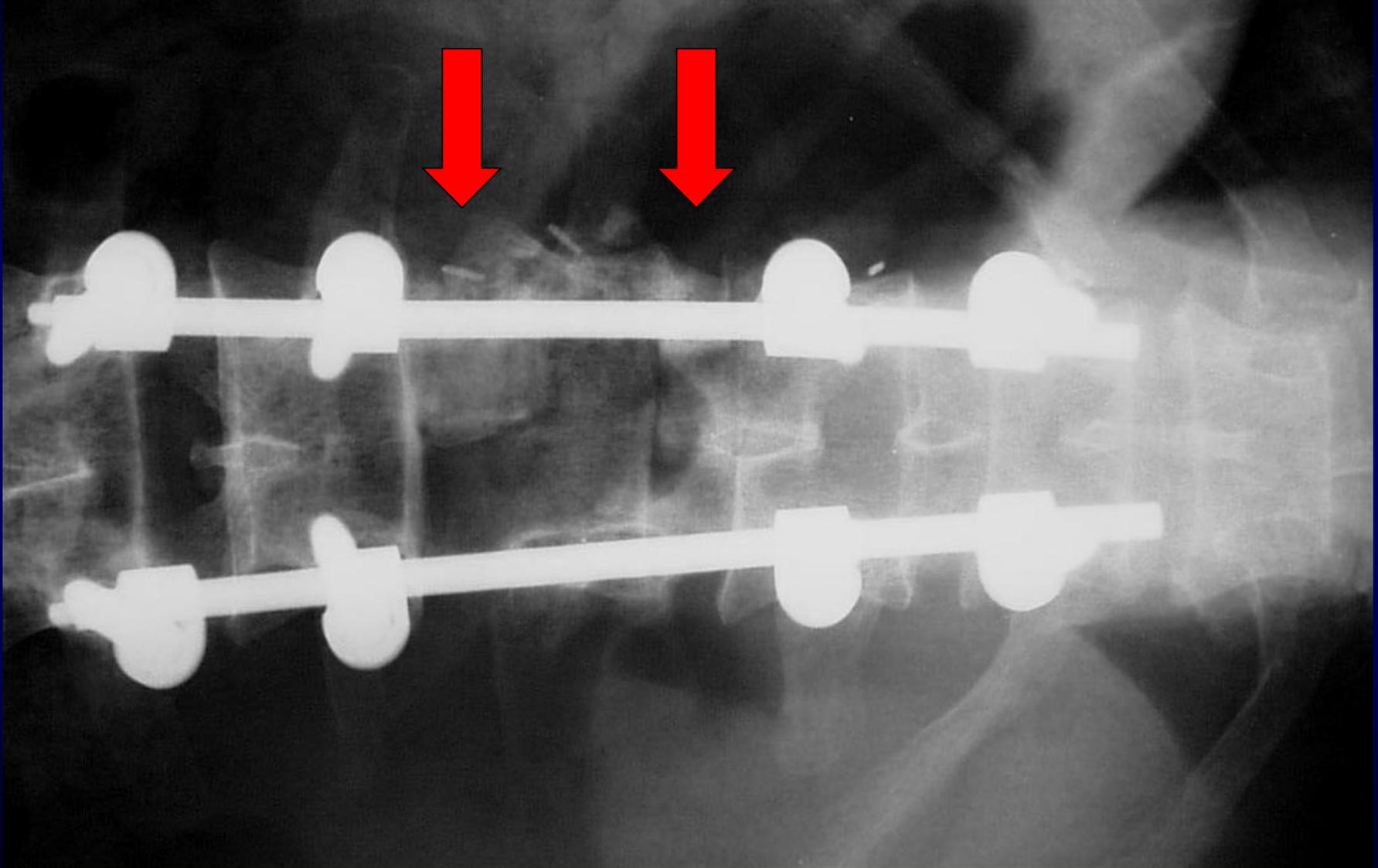


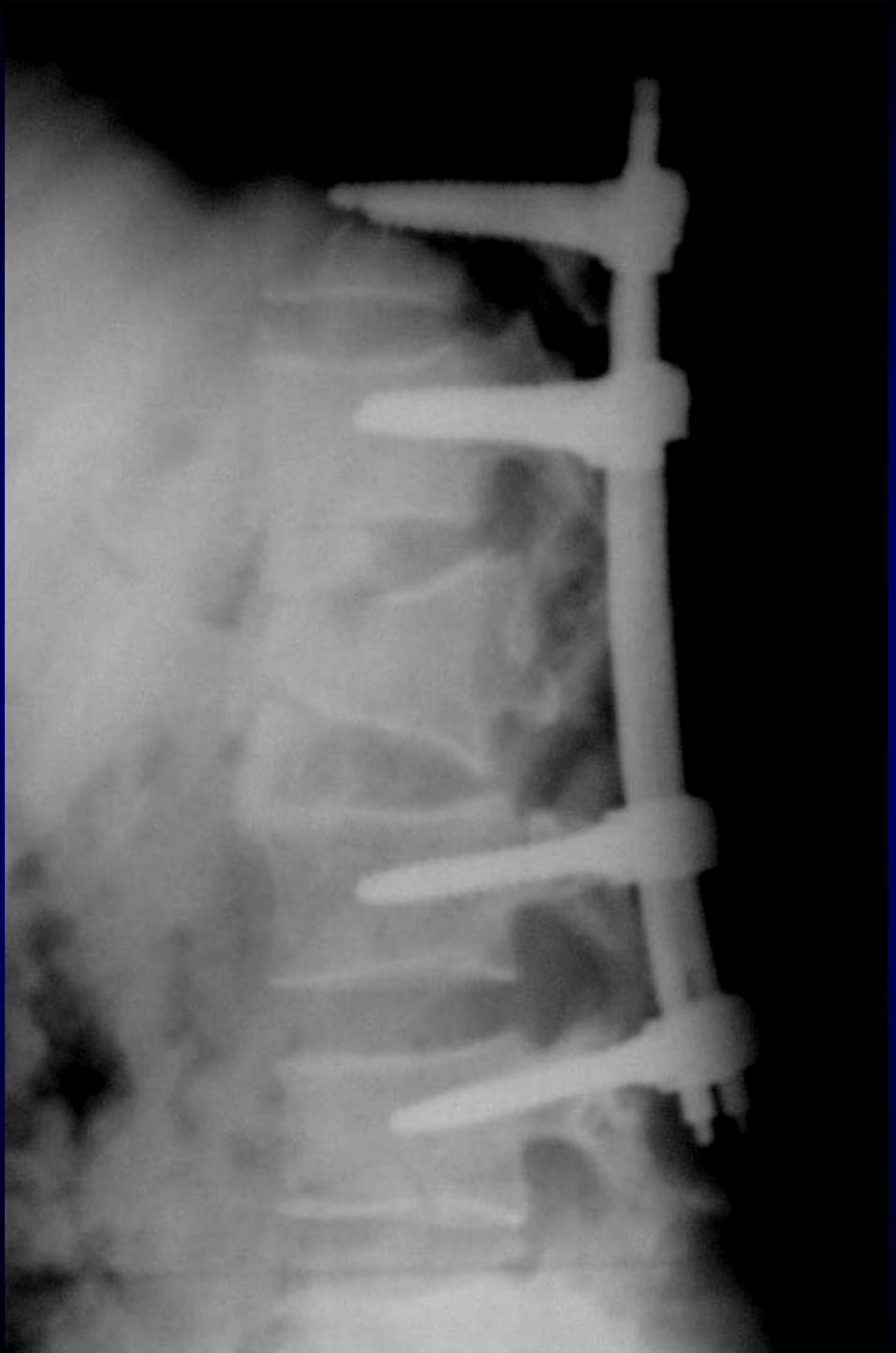
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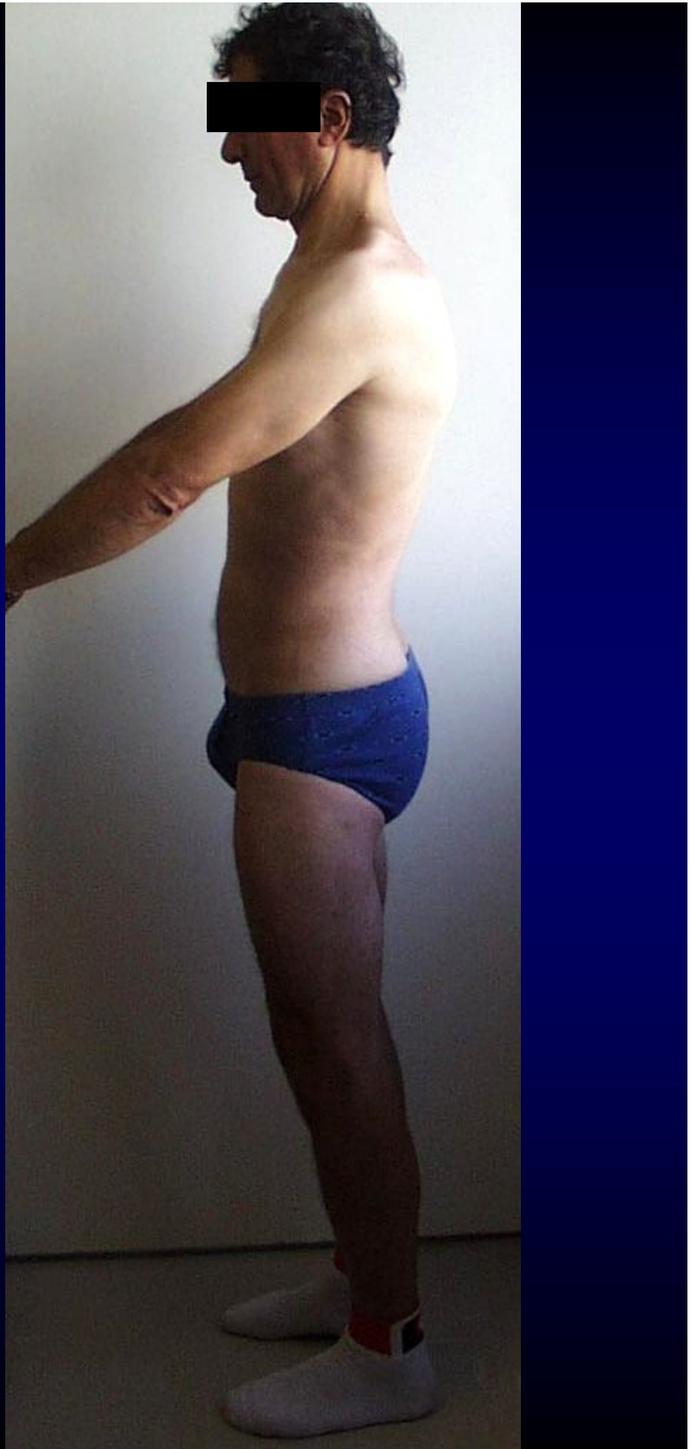




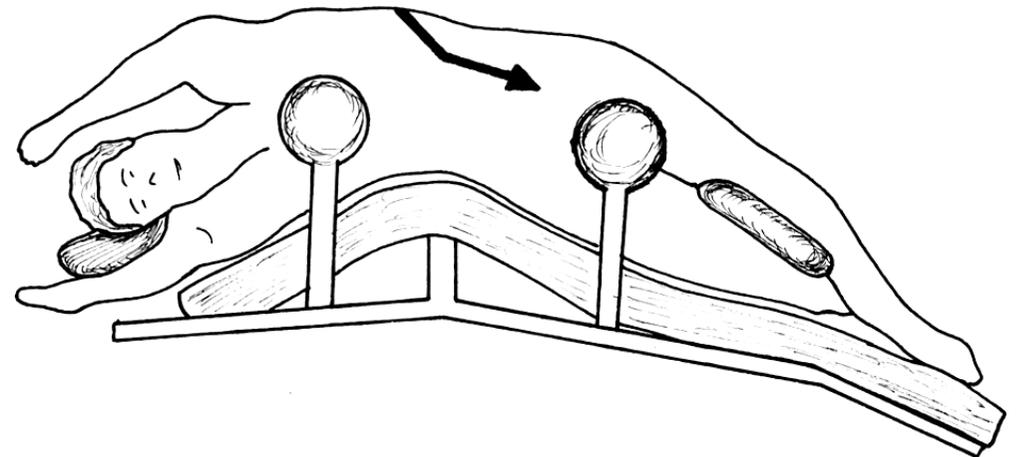
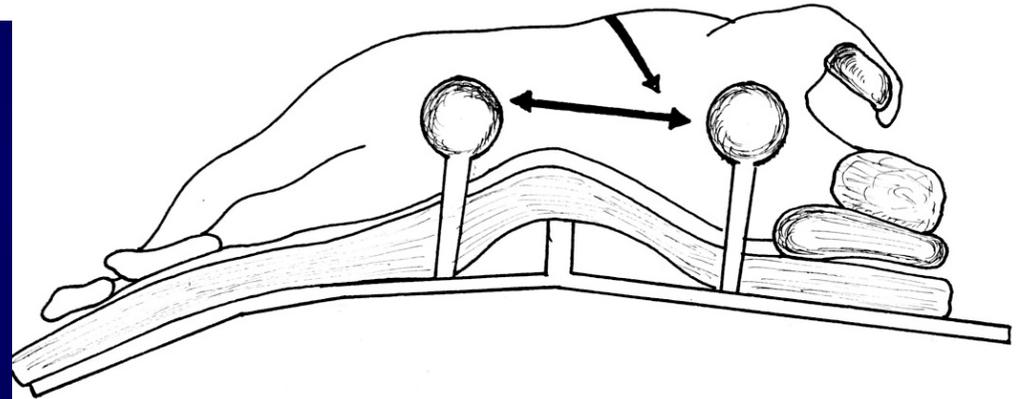
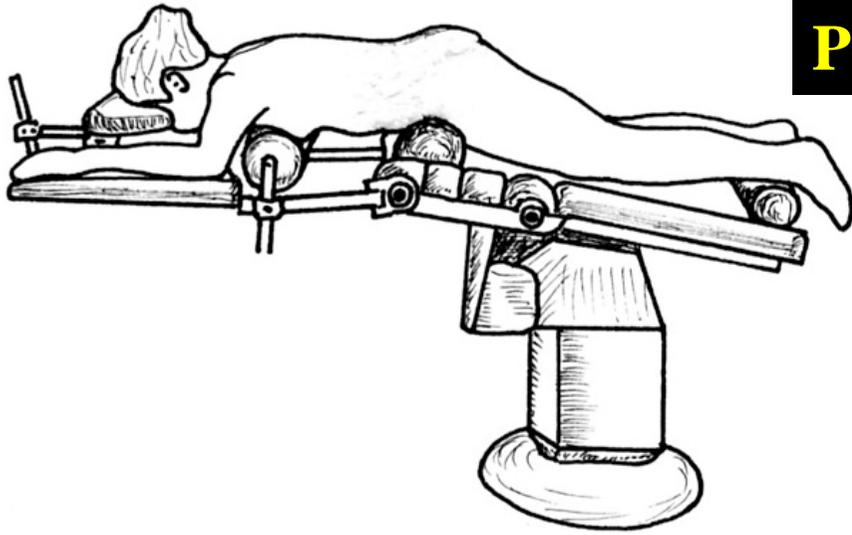




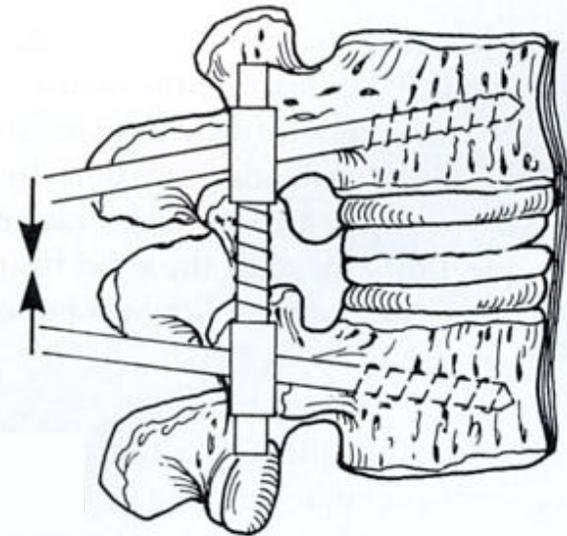
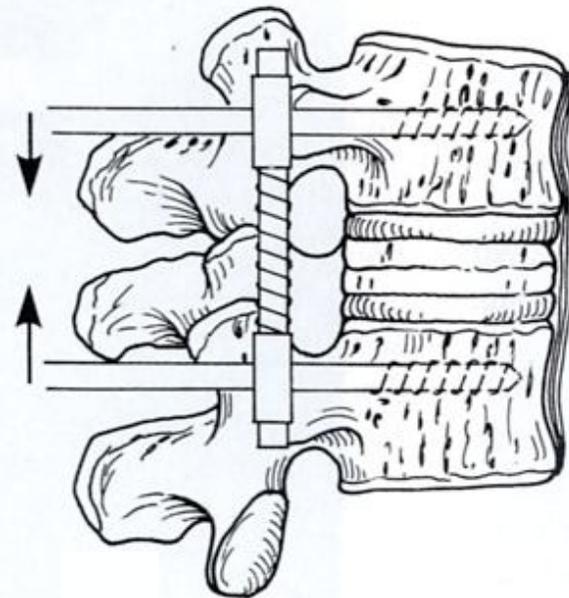
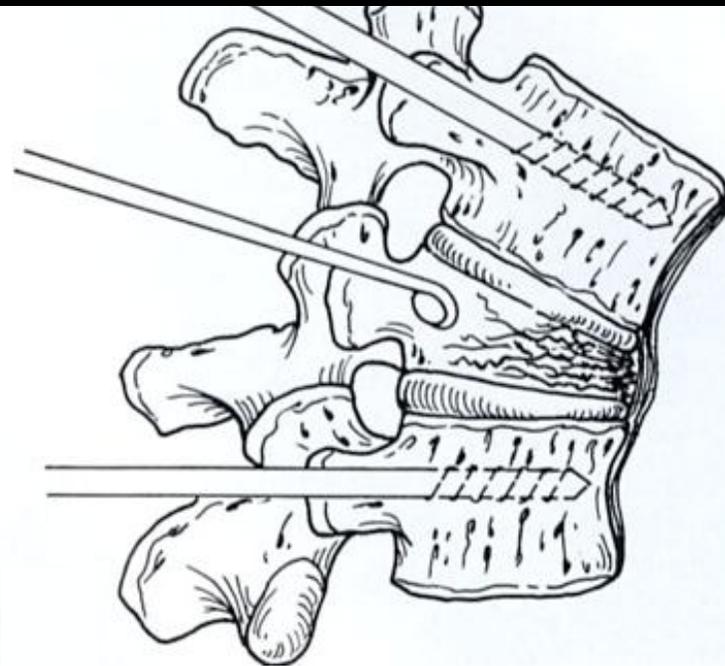
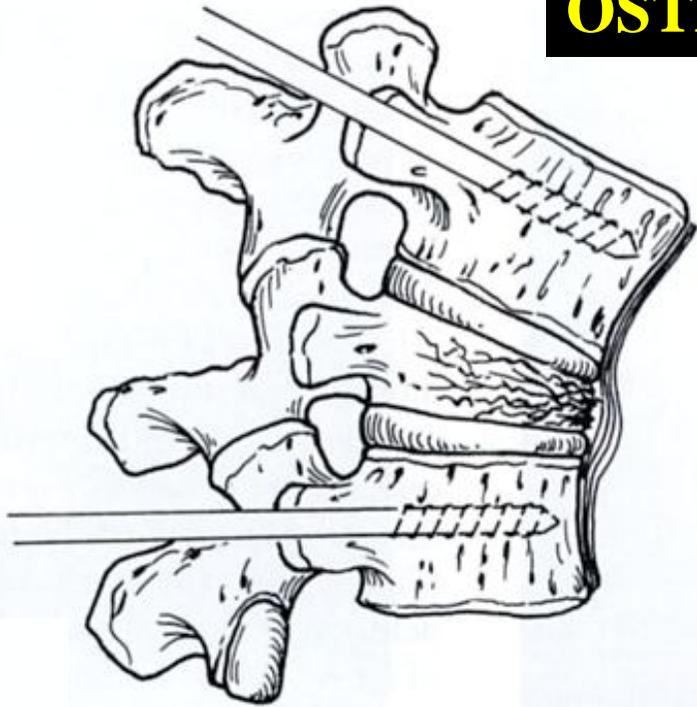


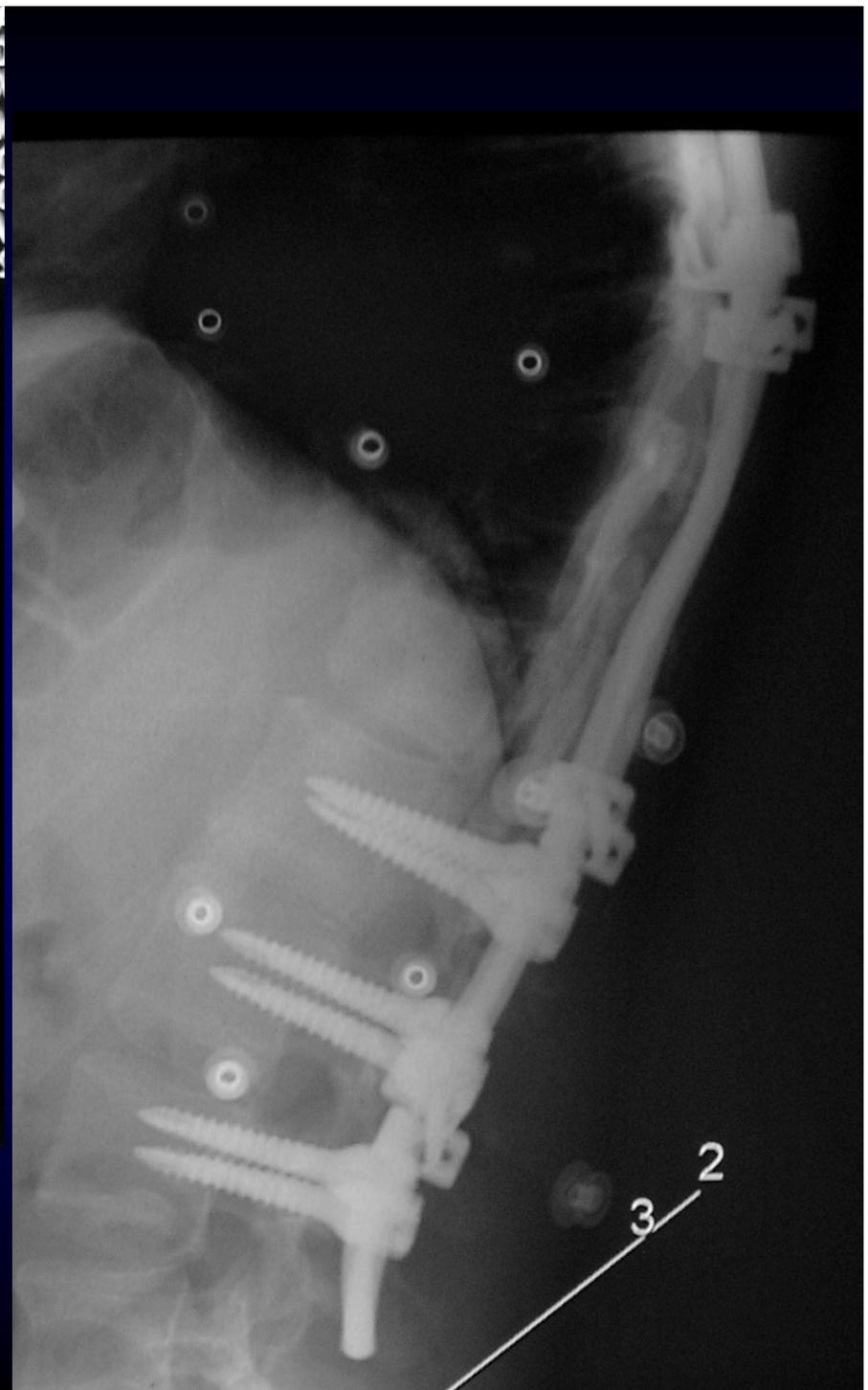


POSE d'IMPLANTS POSTERIEURS

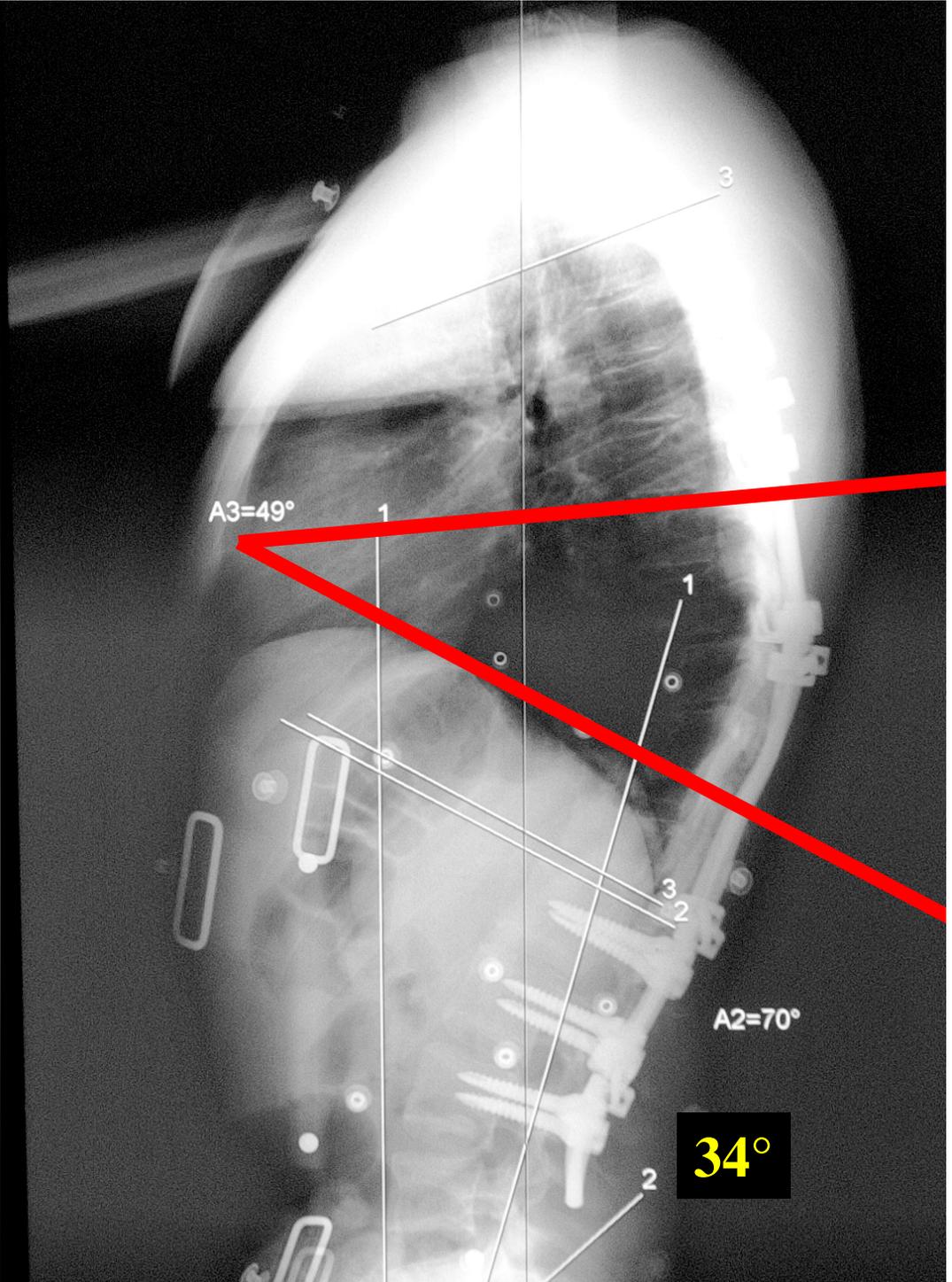
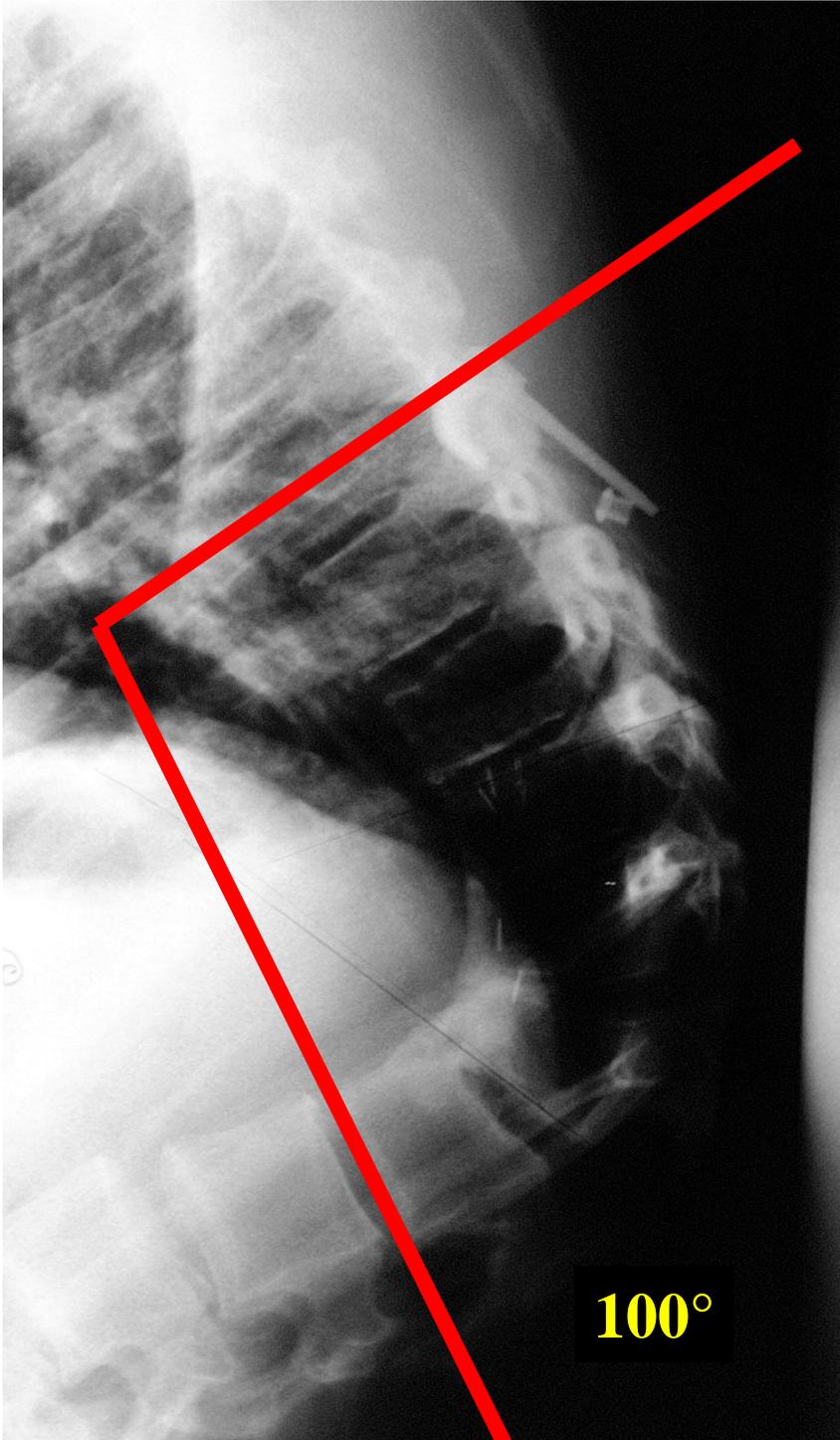


OSTEOTOMIE TRANS PEDICULAIRE





CAL VICIEUX



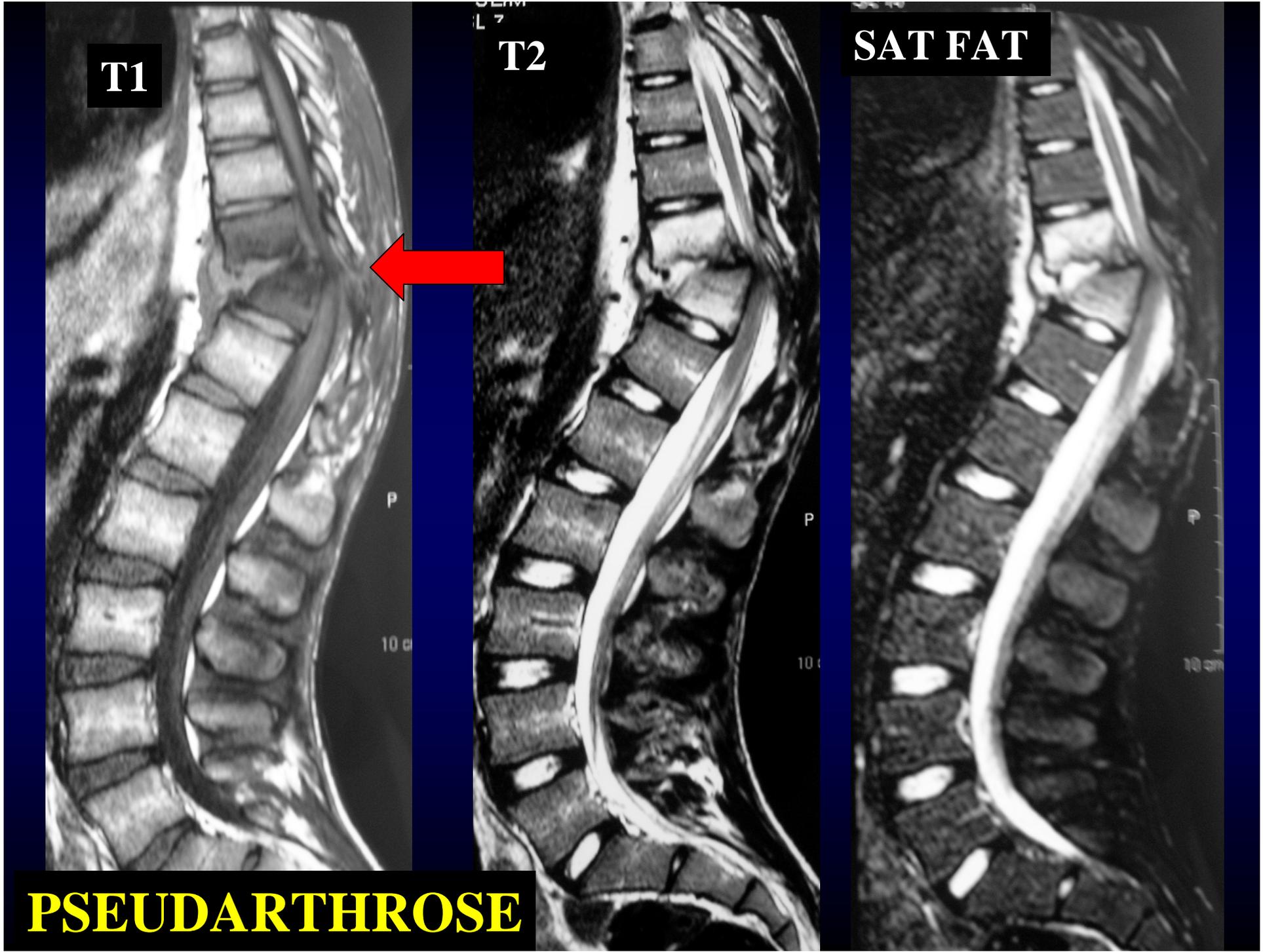
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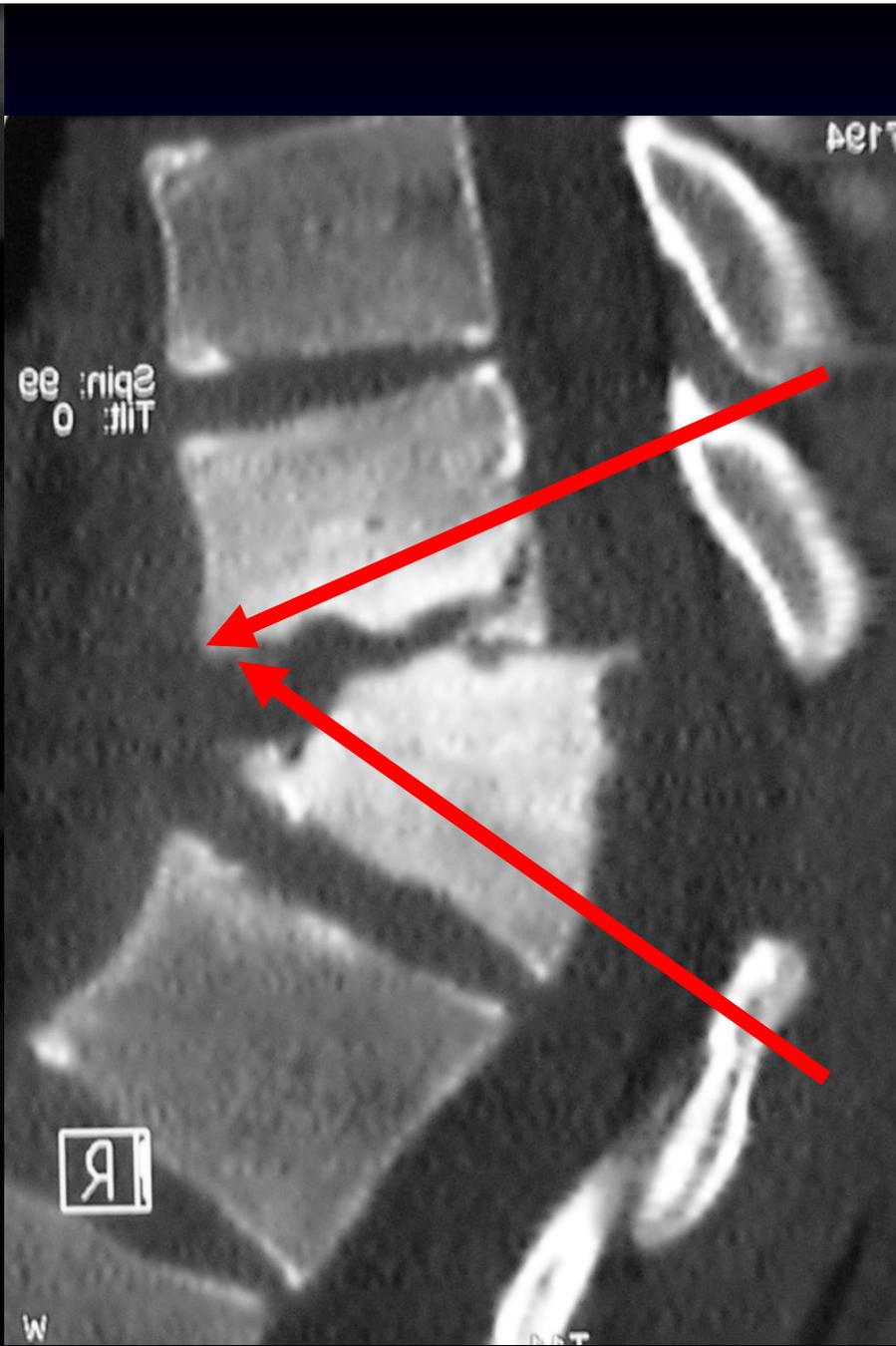
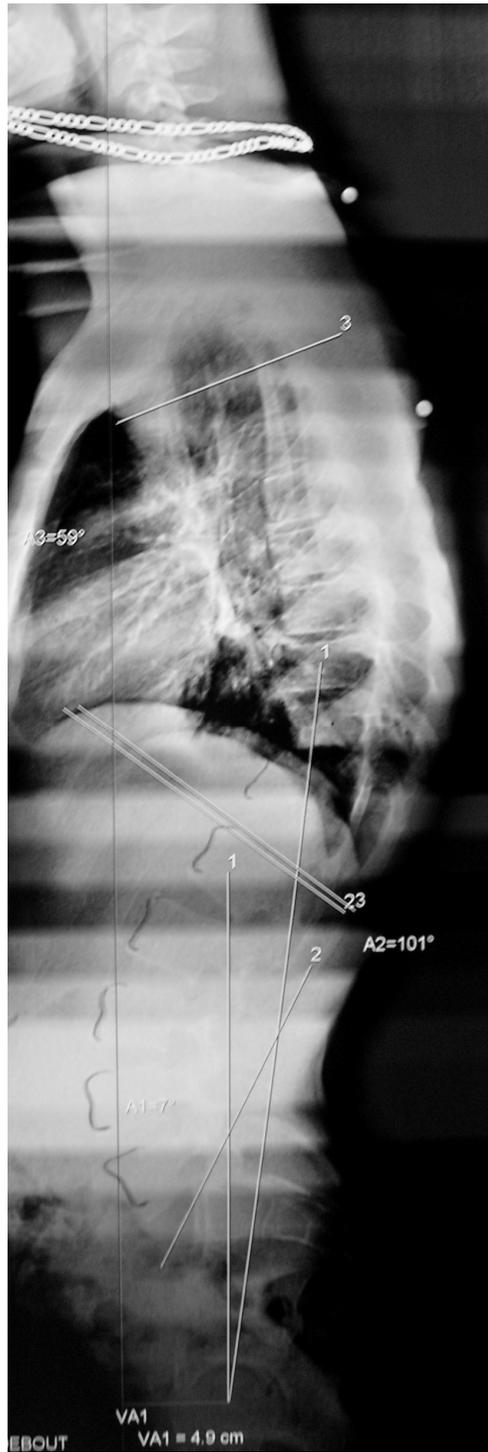
T2

SAT FAT



PSEUDARTHROSE





CLASSIFICATIONS

BILAN RADIOLOGIQUE

TT ORTHOPEDIQUE

TT CHIRURGICAL

VERTEBROPLASTIE , VISSAGE PERCUTANE

CALS VICIEUX



