

PROTHESE DE HANCHE EN IMAGERIE



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QUELQUES CHIFFRES

150 000 ARTHROPLASTIE DE HANCHE/ AN

1 MILLION DE PTH

AGE MOYEN 70 ANS

DURÉE DE VIE 15- 20 ANS

20% DE BILATÉRALE

5% DE RÉVISION DE PTH À 10 ANS

ETIOLOGIES

COXARTHROSE 75%

TRAUMATIQUE 9%

OSTÉONÉCROSE ASEPTIQUE 4%

DYSPLASIE 4%

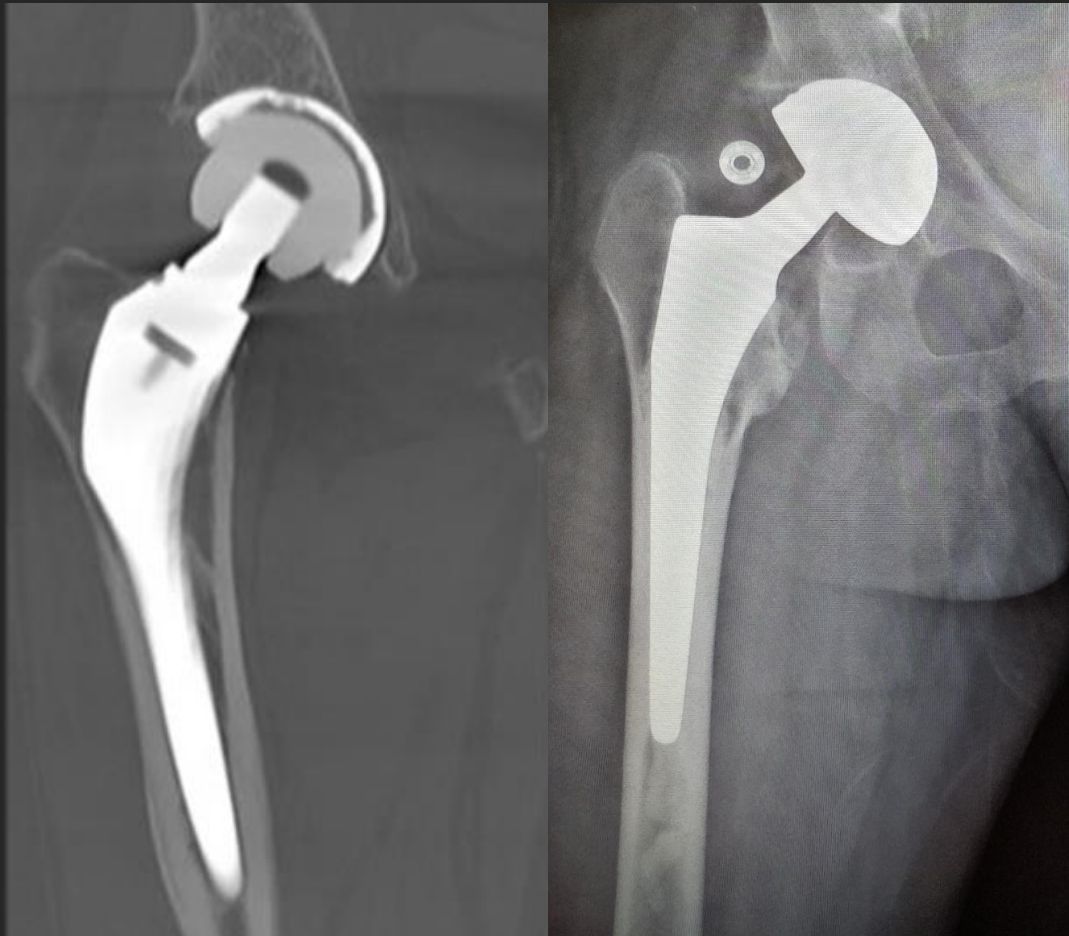
COXOPATHIE DESTRUCTRICE RAPIDE 3%

CIMENT / SANS CIMENT ?



LE COTYLE A-T-IL ETE FRAISÉ POUR ACCUEILLIR UN IMPLANT ?

OUI



NON

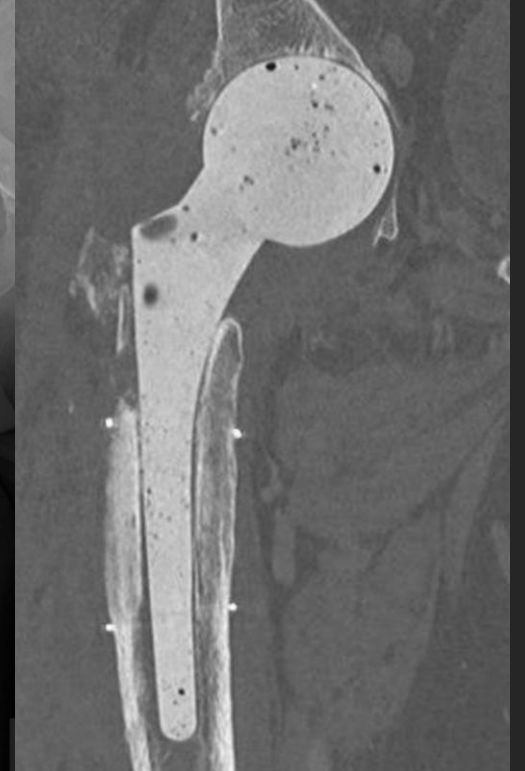
= Prothèse intermédiaire de hanche
= PIH
= Bicentrique



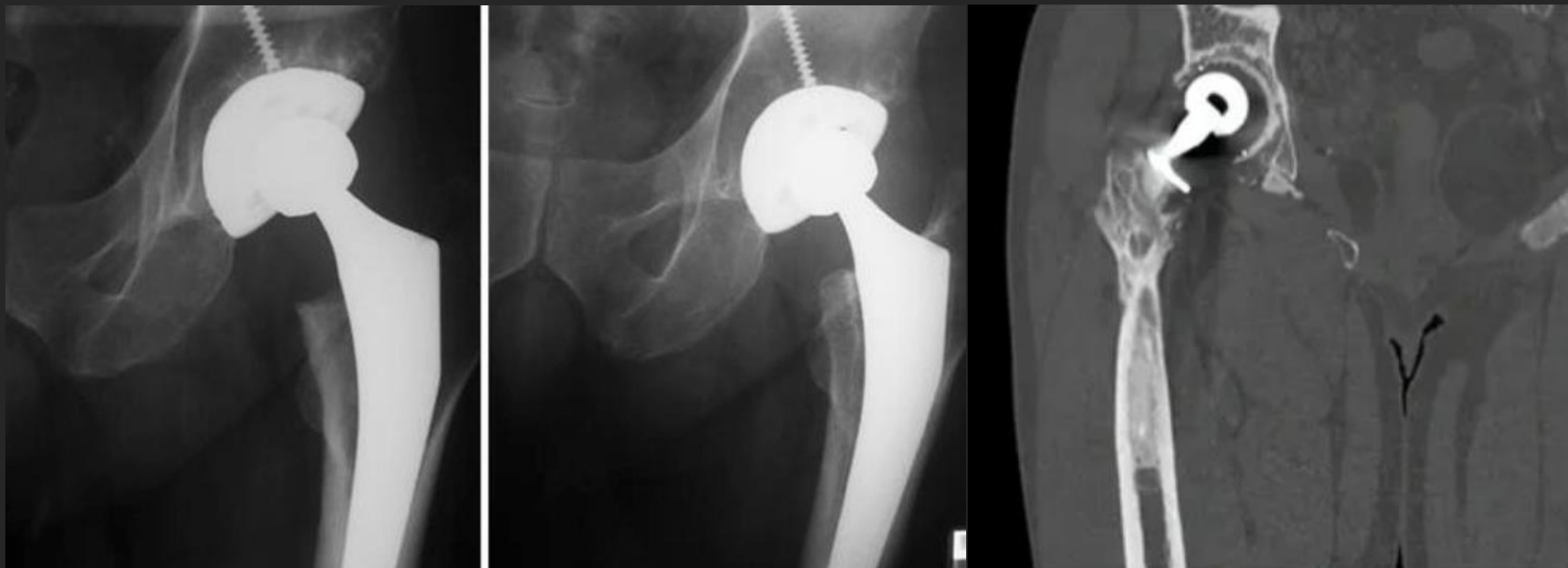
SPHERICITE CUPULE > 50%

LISERE CUPULE/OS

CECI N'EST PAS UNE PTH



SUIVI



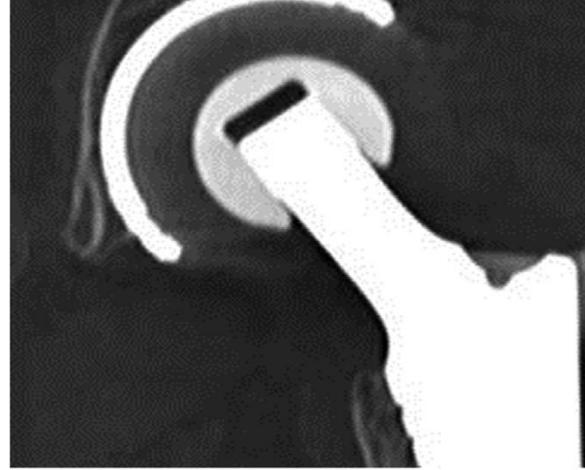
RADIOS ET EXAMEN CLINIQUE
3 MOIS, 1 AN, 2 ANS, 3ANS, 5 ANS, 7 ANS, 10 ANS

COUPLES DE FROTTEMENT EN TDM

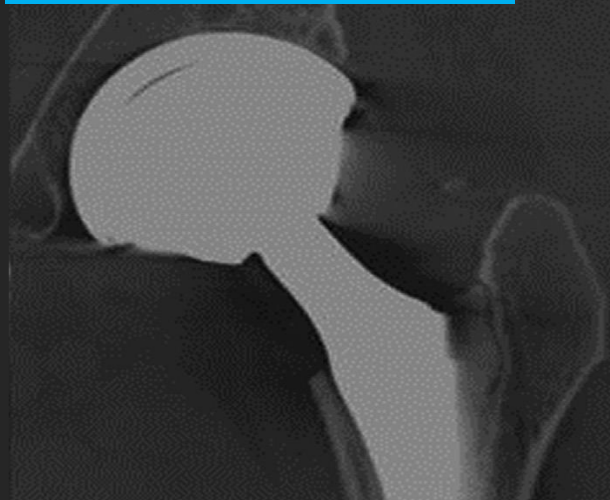
METAL PE



CERAMIQUE PE



METAL METAL



CERAMIQUE CERAMIQUE



Sochart et al. Clin Orthop Relat Res. 1999

Langton et al.. J Bone Joint Surg Br. 2011



Céram/céram



Céram/PE



Métal/PE



Métal/métal



PTH DOULOUREUSE

CONFLIT PSOAS/CUPULE

ALGODYSTROPHIE

DESCELLEMENT ASEPTIQUE/SEPTIQUE

OSSIFICATIONS PERIPROTHETIQUES

ABCES

PSEUDARTHROSE TROCHANTERIENNE

HEMATOME

PROJETEES DOULEURS

FRACTURES ET FISSURES

DESCELLEMENT ASEPTIQUE

COMPLICATION LA PLUS FREQUENTE DES PTH

- PERTE DE FIXATION D'UNE PROTHESE CIMENTEE
- ABSENCE/PERTE SECONDAIRE DE L'OSTEOINTEGRATION D'UNE PROTHÈSE NON CIMENTÉE

1. MECANIQUE

2. BIOLOGIQUE OU REACTION GRANULOMATEUSE

DESCELLEMENT ASEPTIQUE MECANIQUE

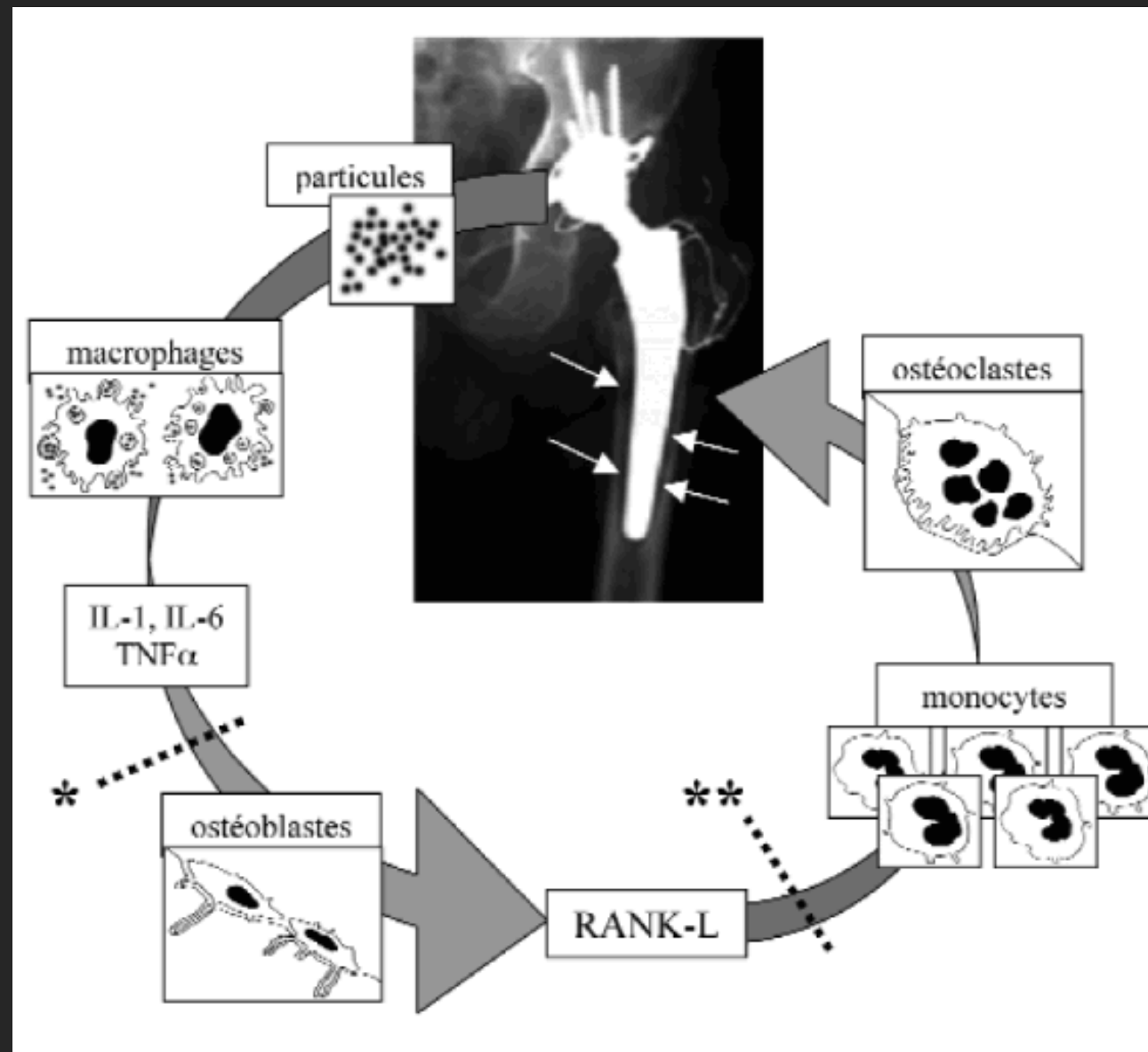
MAUVAISE FIXATION PRIMAIRE

PROTHESE **NON CIMENTEE**

SOUVENT ASSOCIE AU STRESS
SHIELDING



DESCELLEMENT ASEPTIQUE BIOLOGIQUE



DESCELLEMENT SEPTIQUE

DIFFICILE A DIFFERENCIER DU DESCELLEMENT ASEPTIQUE

SIGNES D'INFECTION SOUVENT ABSENT

1/3 DANS LES 3 MOIS

1/3 DANS L'ANNEE

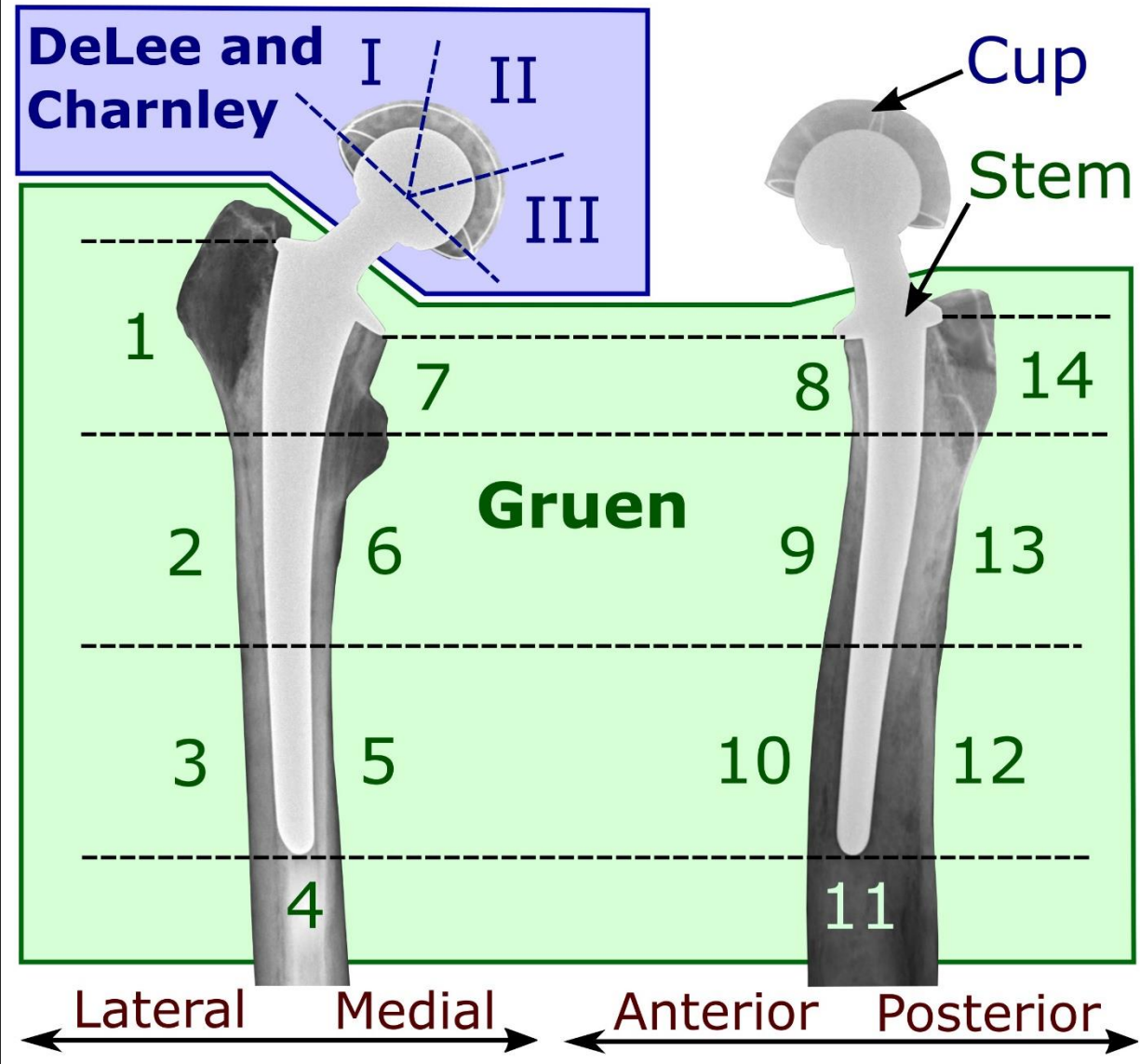
1/3 APRES 1 AN

HISTO = PRESENCE DE PNN

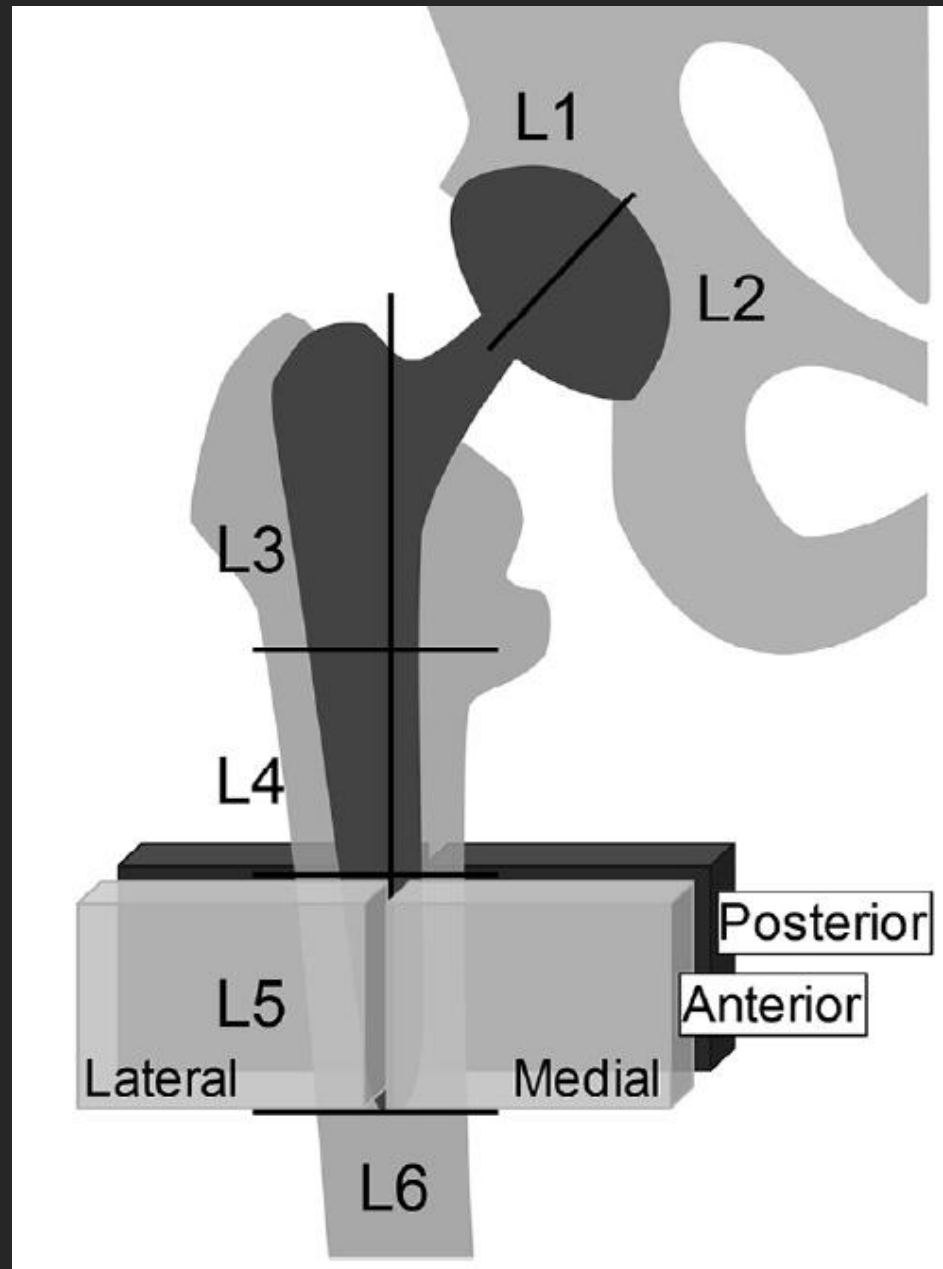
PRISE EN CHARGE DIFFERENTE

DIFFERENCIER DESCELLEMENT ASEPTIQUE/SEPTIQUE EST UN CHALLENGE

CLASSIFICATION DE GRUEN/ DELEE



CLASSIFICATION DE SCHWEIZER



SCINTIGRAPHIE OSSEUSE COUPLEE AU TDM

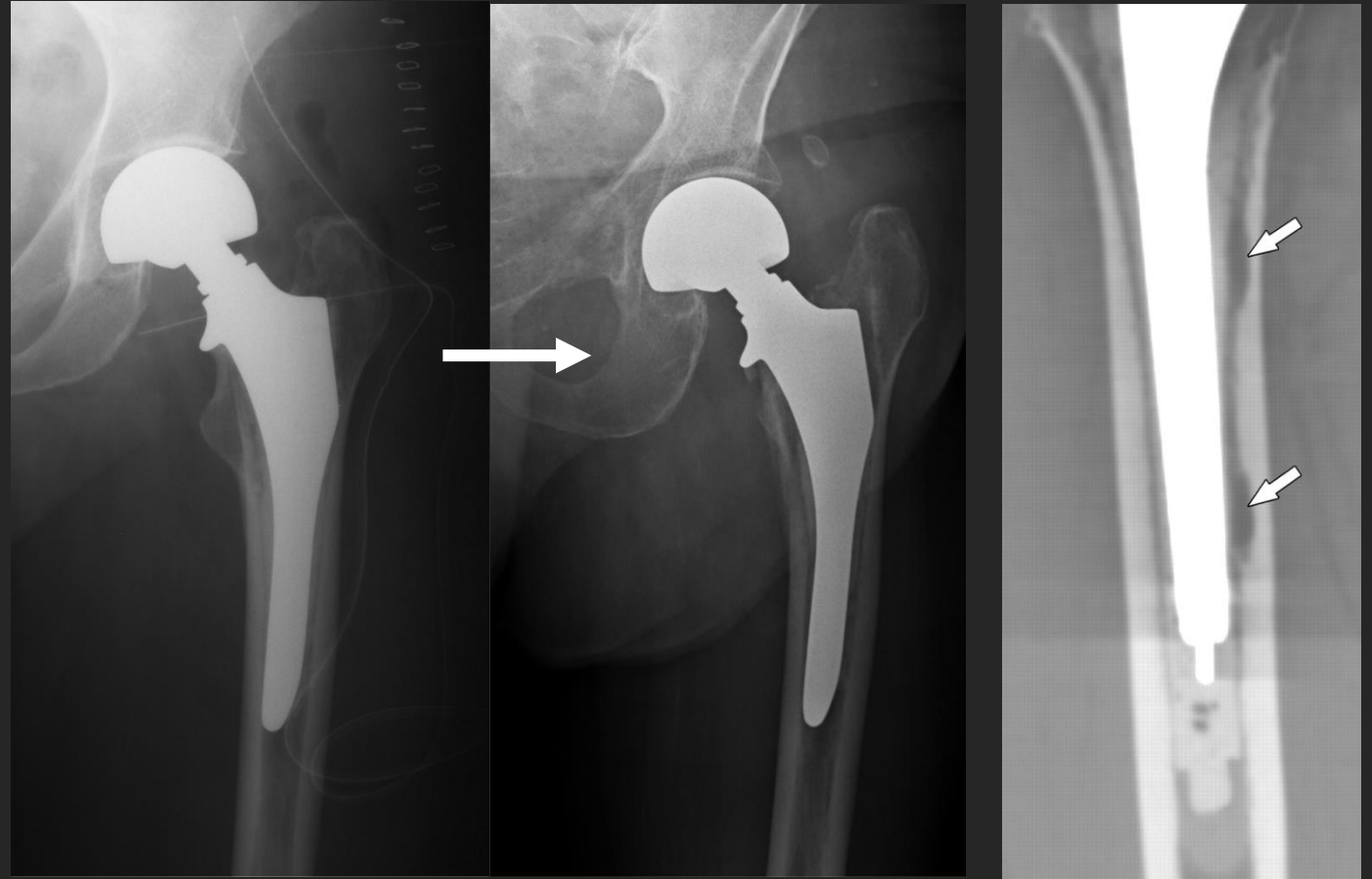
SCINTIGRAPHIE OSSEUSE => SENSIBILITE

FORTE VPN

TDM => SPECIFICITE

SIGNES TDM DE DESCELLEMENT

1. **LISERE** PERI-PROTHETIQUE >2mm
INTERFACE OS-PROTHESE OU
CIMENT-PROTHESE
2. **MIGRATION** (2 EXAMENS)
3. **FRACTURE DE CIMENT**



CHECK-LIST TDM

LECTURE 3 PLANS +++

PARTIES MOLLES (MAR)

PARTIES OSSEUSES



PARTIES MOLLES

ABCES

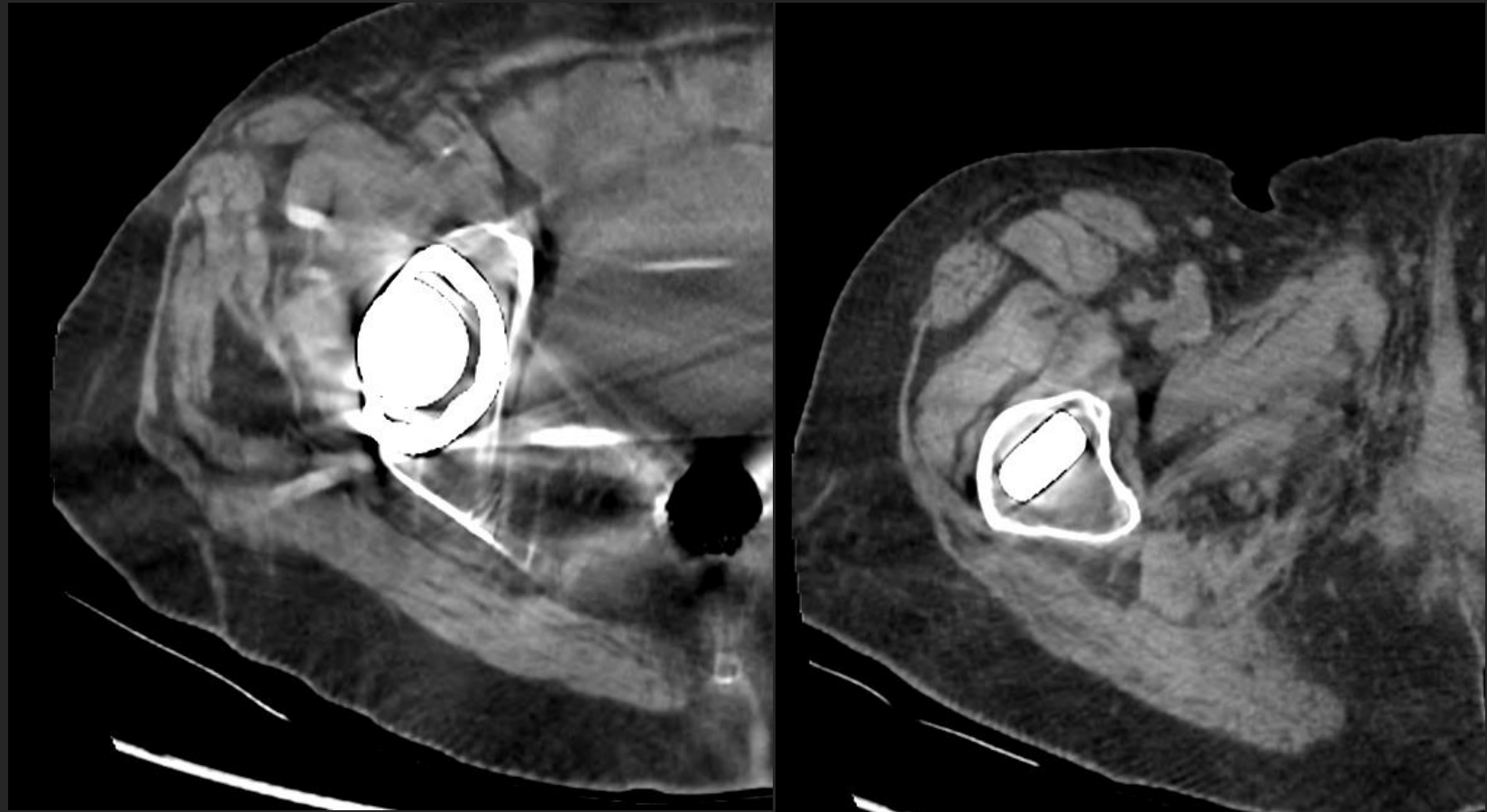
BURSITE

COLLECTION

DEGENERESCEN GRAISSEUSE
MUSCULAIRE (GLUTEAUX)

EPANCHEMENT ARTICULAIRE

FISTULE



PARTIES OSSEUSES

IMPLANT

POSITION
USURE/ASYMÉTRIE DU
PE
LUXATION
FRACTURE
DÉBORD DE CUPULE
CIMENTOPHYTE

CORTICALE

FRACTURE
EROSION ENDOSTÉALE
LYSE CORTICALE

INTERFACE

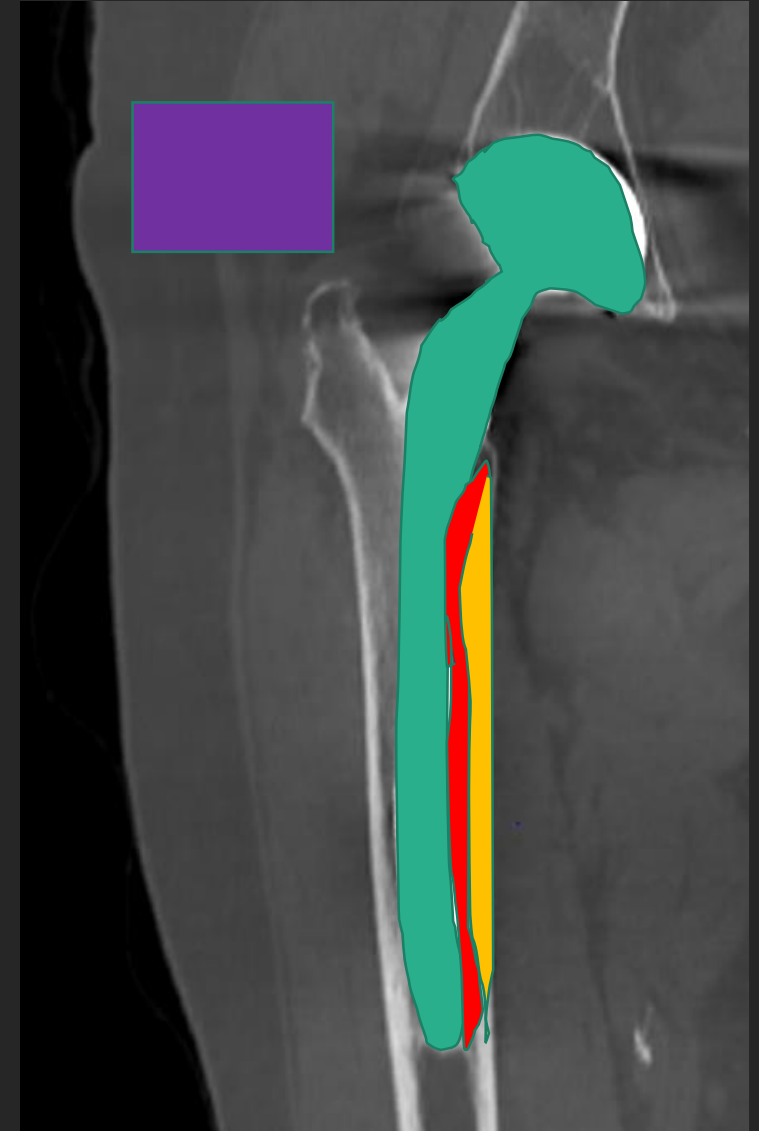
RÉSORPTION

INTERFACE

- OS-PROTHÈSE
- PROTHÈSE-CIMENT
- CIMENT-OS

OSSIFICATIONS

HÉTÉROTOPIQUES

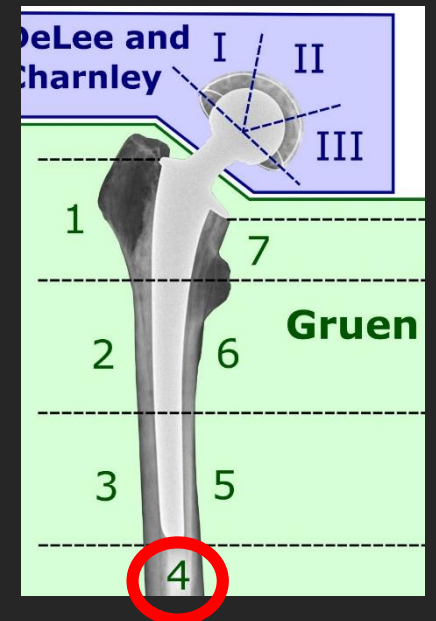
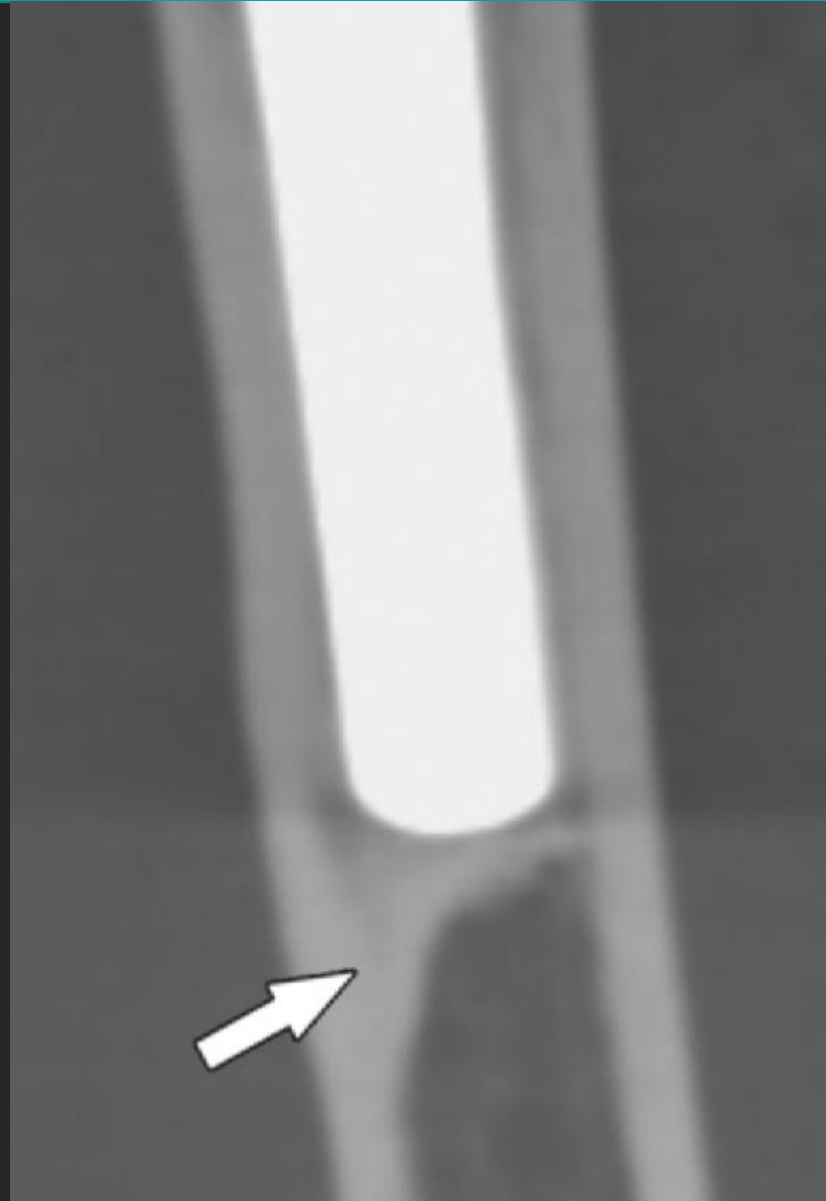


PIEDESTAL

CONDENSATION PAR OSSIFICATION
ENDOSTÉE SOUS L'EXTRÉMITÉ
DISTALE DE LA TIGE FÉMORALE

FIXATION DISTALE DE LA TIGE EN
ZONE 4

SON ABSENCE/DISPARITION PEUT
ETRE UN SIGNE DE DESCELLEMENT



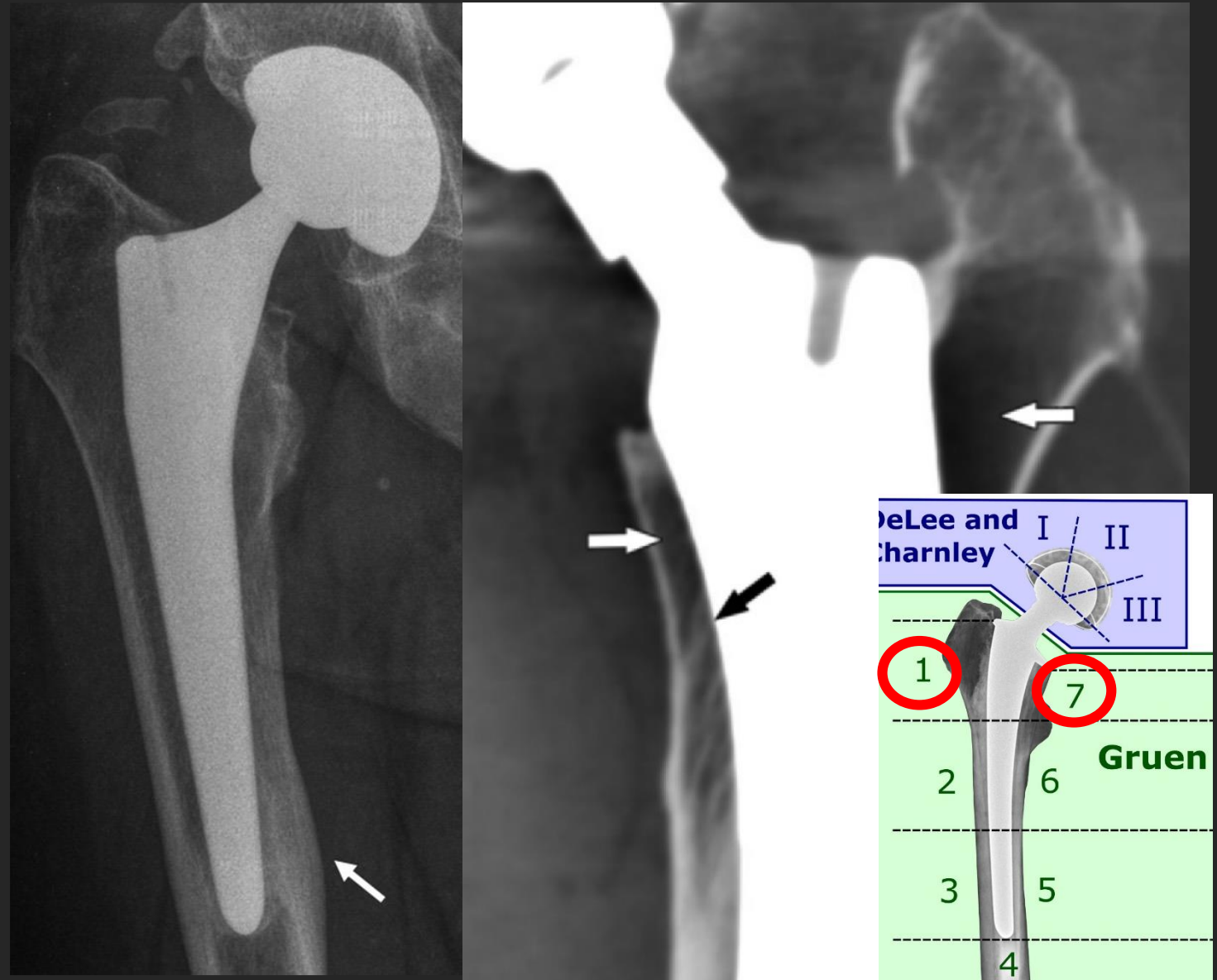
STRESS SHIELDING

REDISTRIBUTION DES CONTRAINTES

REMODELAGE OSSEUX

DÉMINÉRALISATION OSSEUSE
PROXIMALE

HYPERTROPHIE CORTICALE OSSEUSE
LE LONG DE LA TIGE FÉMORALE

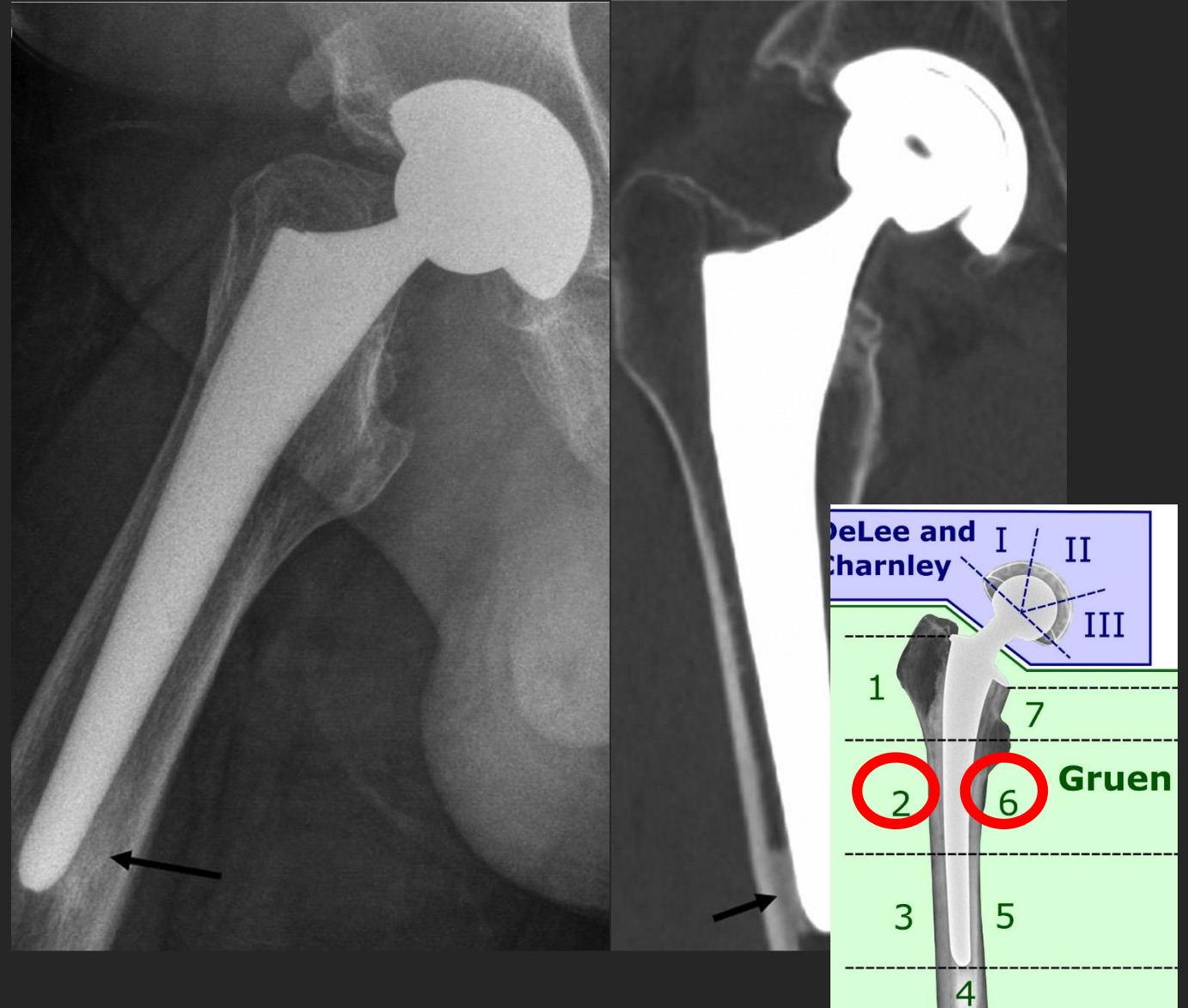


SPOT WELD

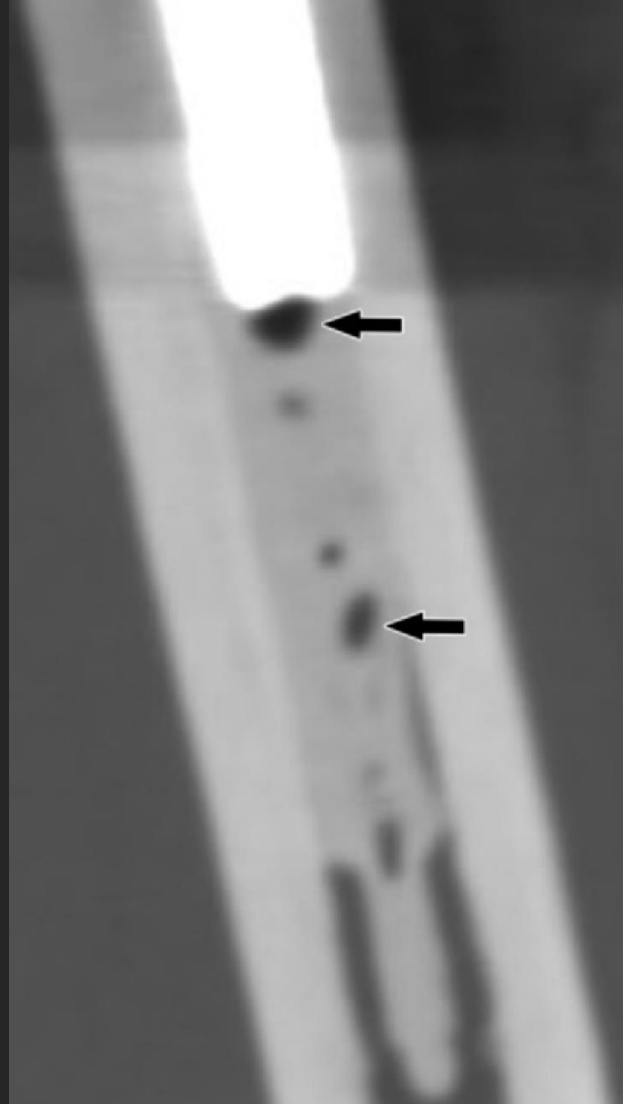
FORMATION D'OS PERPENDICULAIRE
ENTRE UNE PROTHESE NON CIMENTEE
ET LA SURFACE ENDOSTÉE

BONNE INTÉGRATION DE LA PROTHÈSE

ZONES 2 ET 6 DE GRUEN



BULLES DANS LE CIMENT



OFFSET

TENSION DES GLUTÉAUX
DISTANCE ENTRE LE CENTRE
DE LA TÊTE FÉMORALE
ET L'AXE DU FUT
DIAPHYSAIRE

NORMALE = 41 ± 6 MM

TROP PETIT : LUXATION
TROP GRAND : DOULEURS



ORIENTATION DE LA CUPULE

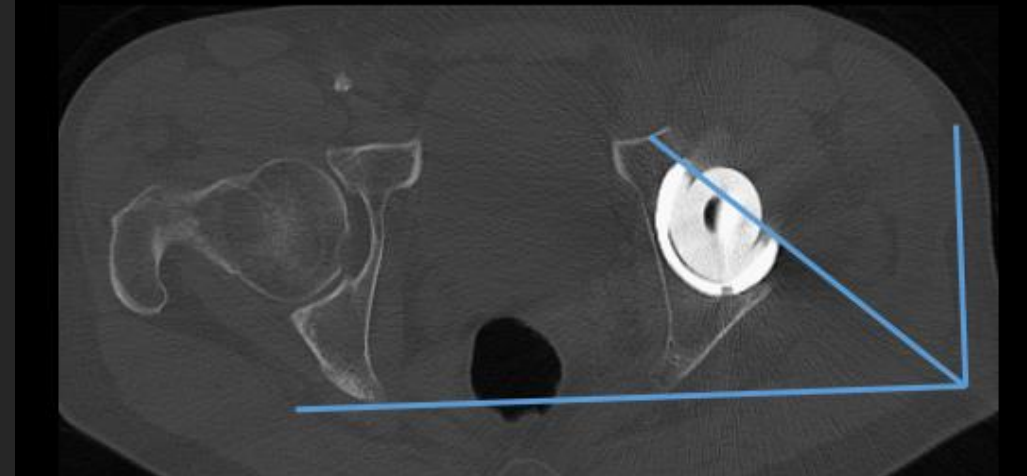
INCLINAISON LATÉRALE

- PLAN FRONTAL
- $40^{\circ} \pm 10$



ANTEVERSION

- PLAN AXIAL
- $15^{\circ} \pm 10$



ACQUISITION CT

- EXAMEN DE PREMIÈRE INTENTION D'UNE PROTHÈSE DOULOUREUSE SI RADIO NORMALES OU PAS
- OPTIMISATION DES PROTOCOLES :
 - DOUBLE ÉNERGIE
 - MAR
- ATTENTION MAR PEUT CRÉER DES FAUX LISERÉS



SCINTIGRAPHIE OSSEUSE - PROTHESES CIMENTEES

HYPERFIXATION VASCULAIRE ET PRECOCE DURANT 3 MOIS

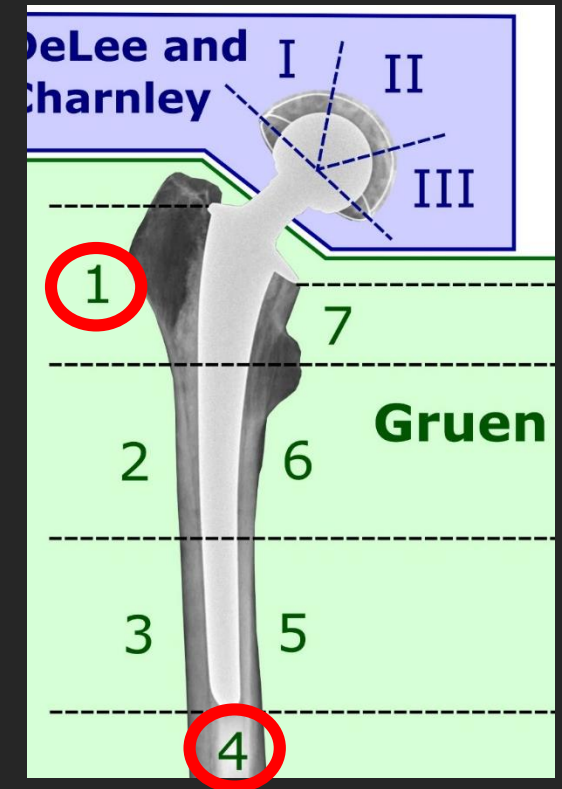
ANCRAGE IMMEDIAT

FIXATION NORMALE EN 6-12 MOIS

HYPERFIXATION PHYSIOLOGIQUE PEU INTENSE

➤ ZONE 1

➤ ZONE 4



SCINTIGRAPHIE OSSEUSE - PROTHESES NON CIMENTEES

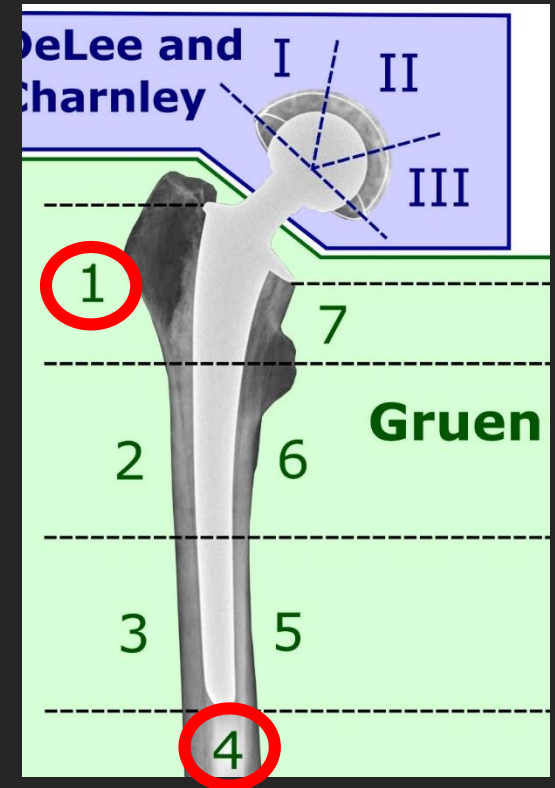
HYPERFIXATION VASCULAIRE ET PRECOCE DURANT 3 MOIS

OSTEOINTEGRATION++

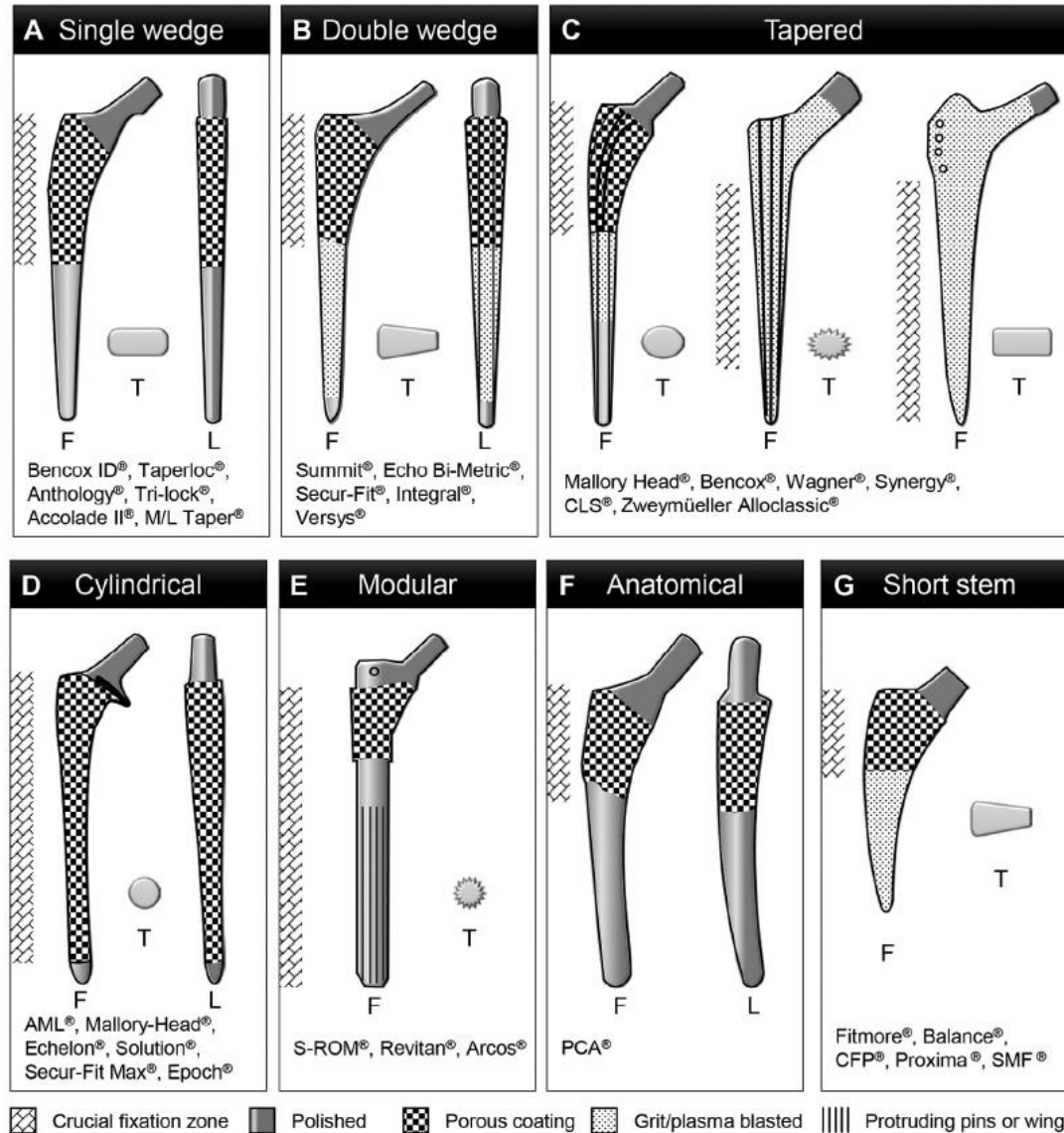
HYPERFIXATION PHYSIOLOGIQUE DE 2 ANS

- GRAND TROCHANTER (ZONE 1)
- QUEUE DE PROTHESE (ZONE 4)
- ACETABULUM

DELAIS AVANT EXAMEN DE 18 MOIS POST-OP

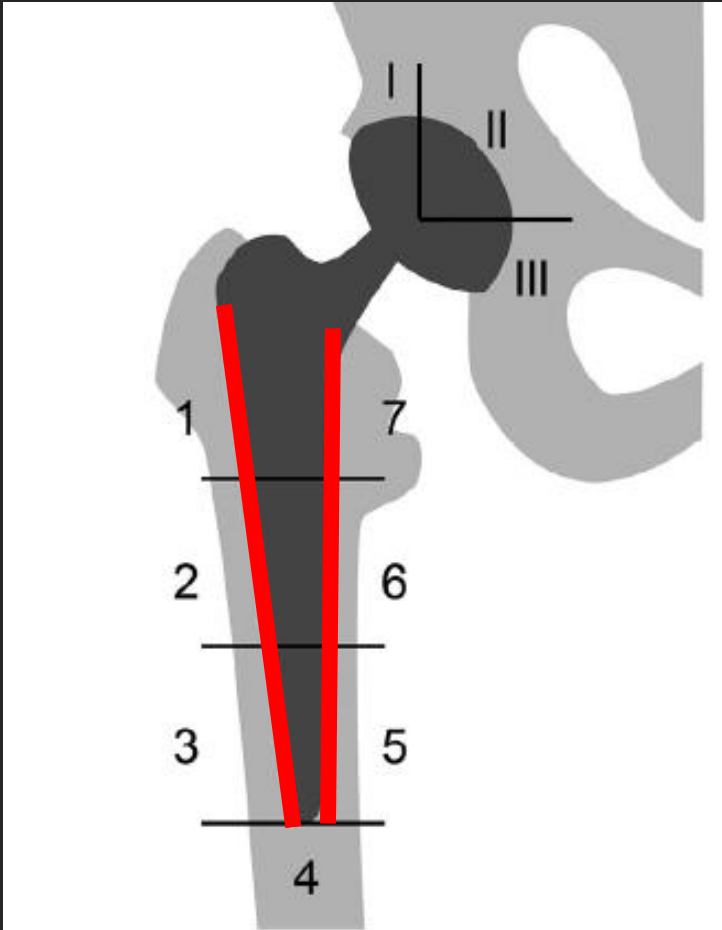


PROTHESES NON CIMENTEES

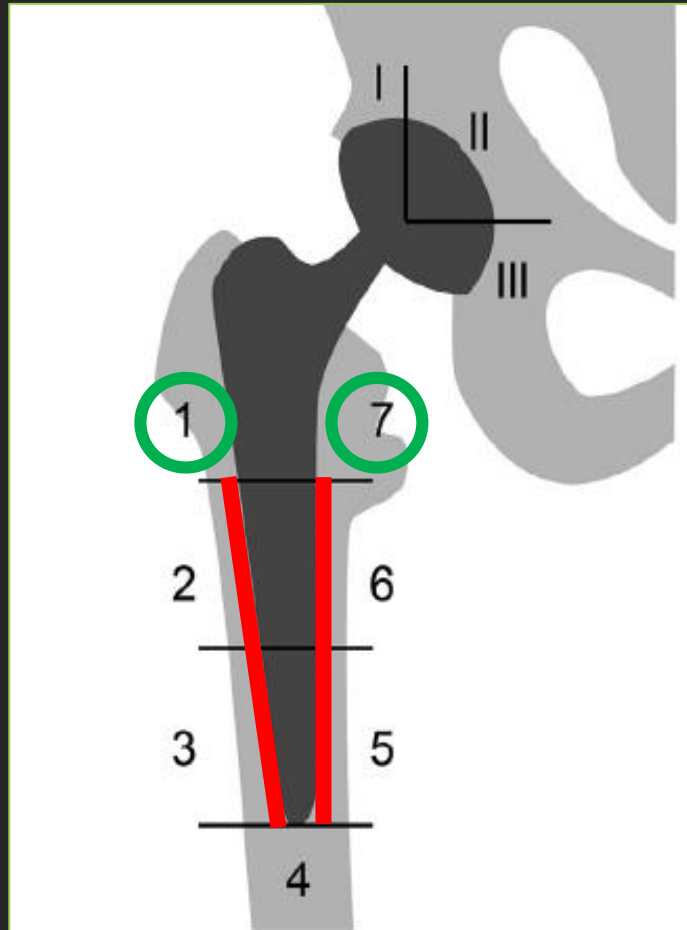


FIXATION FEMORALE

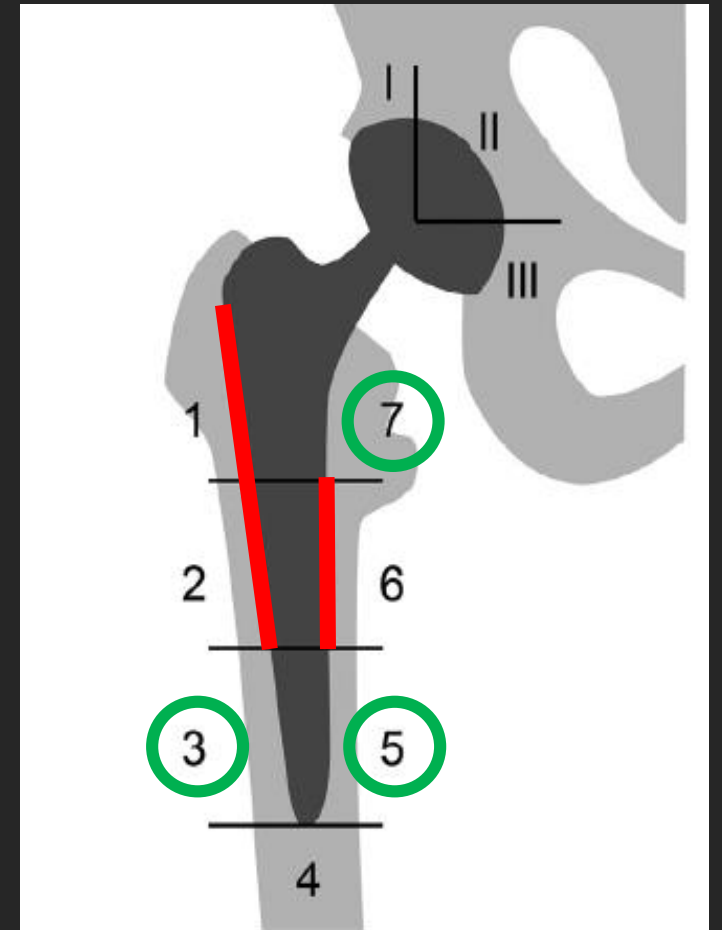
DESCELLEMENT PARTIE FEMORALE



ANCRAGE DIAPHYSAIRE

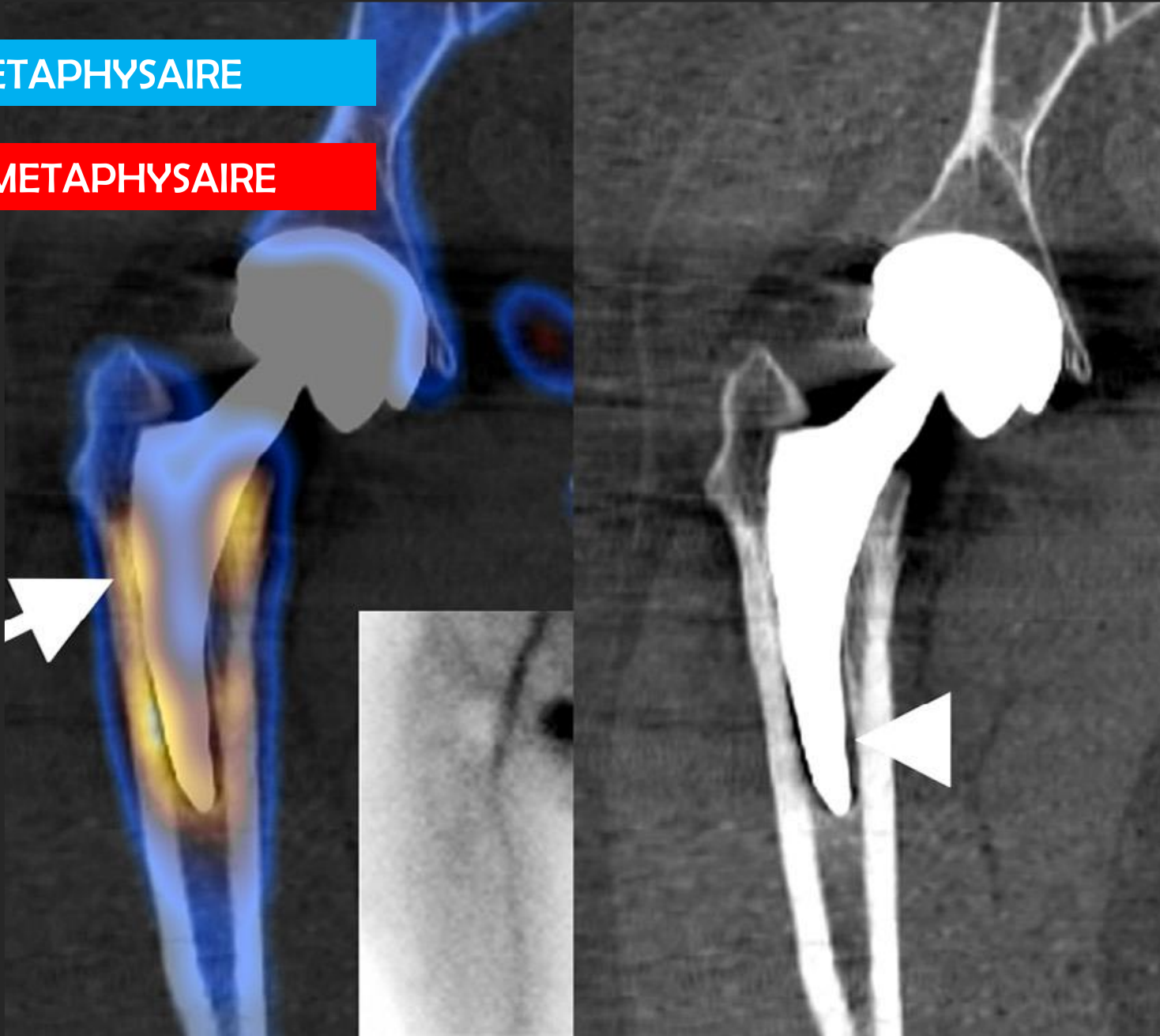


ANCRAGE METAPHYSAIRE



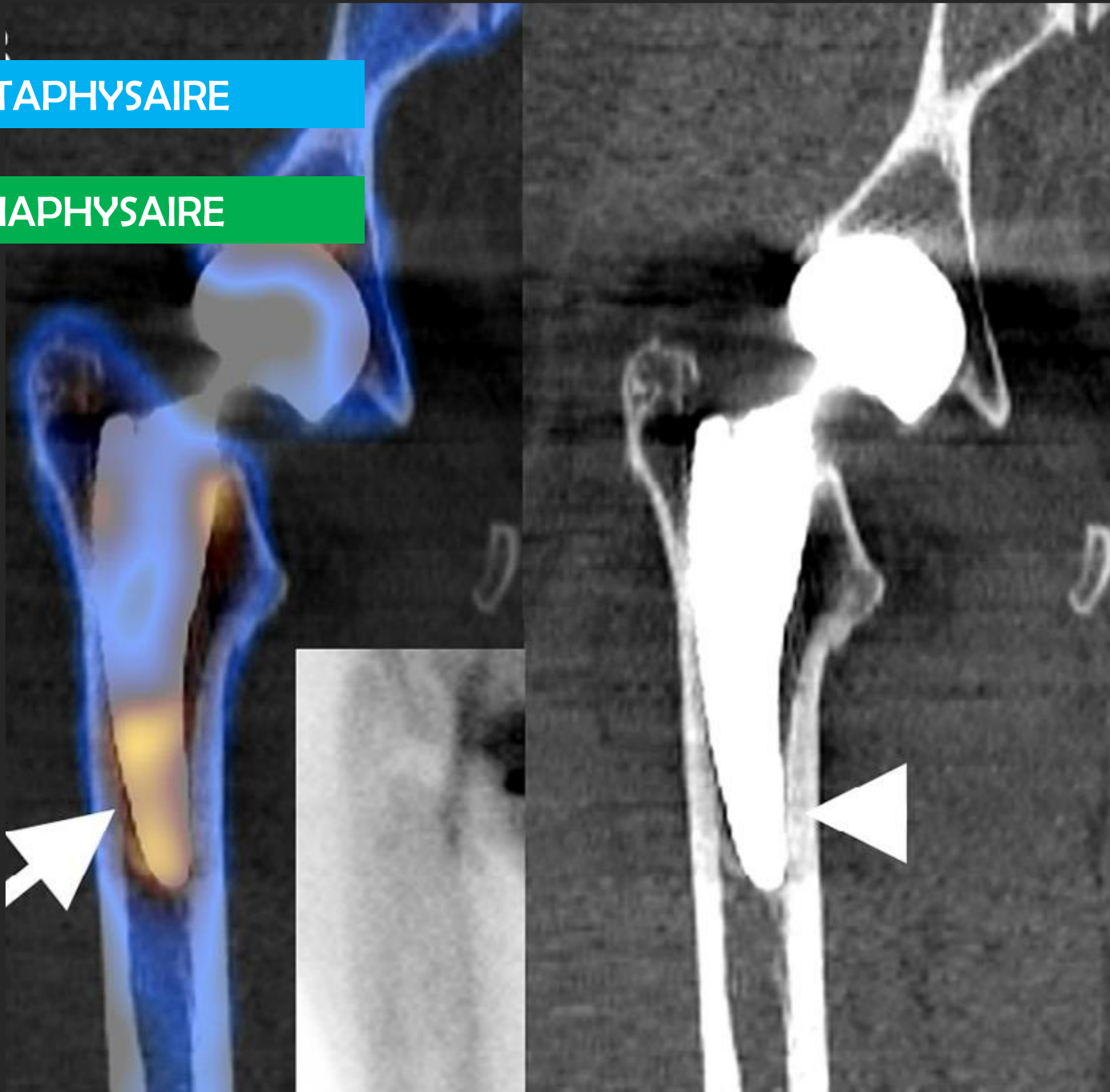
ANCRAGE METAPHYSAIRE

=> FIXATION METAPHYSAIRE



ANCRAGE METAPHYSAIRE

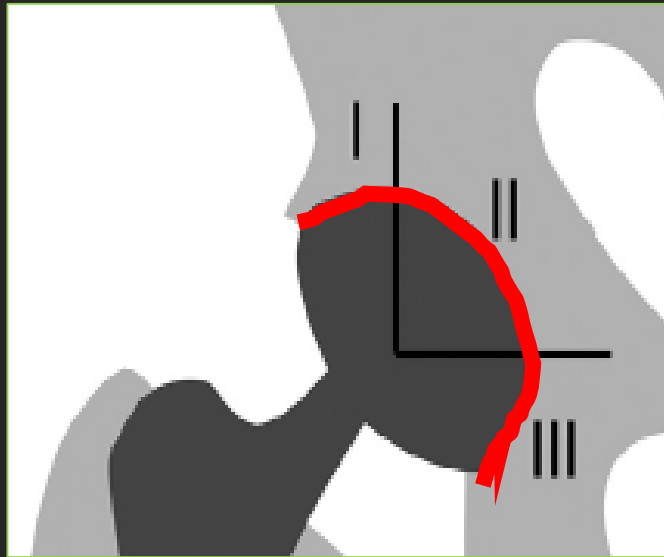
=> FIXATION DIAPHYSAIRE



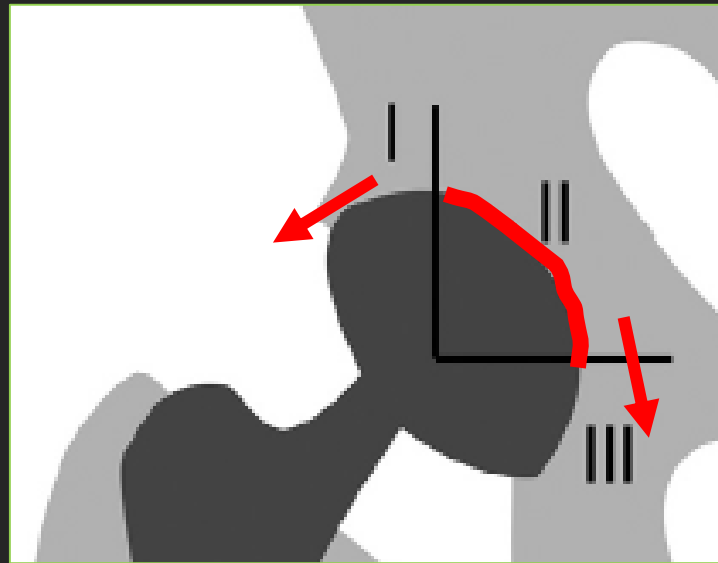
FIXATION ACETABULAIRE

- ATTENTION
HEMIARTHROPLASTIE
- REGION I DE DELEE

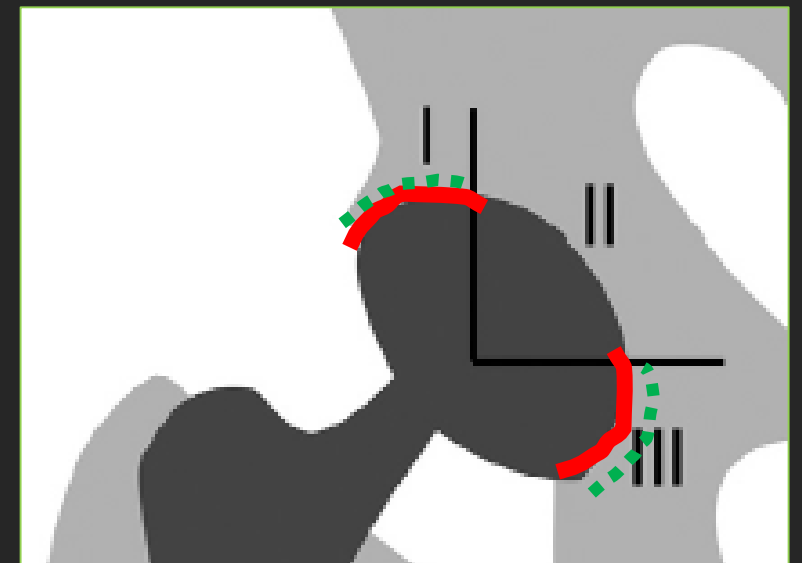
FIXATION DE TOUTE
L'INTERFACE OS-PROTHESE



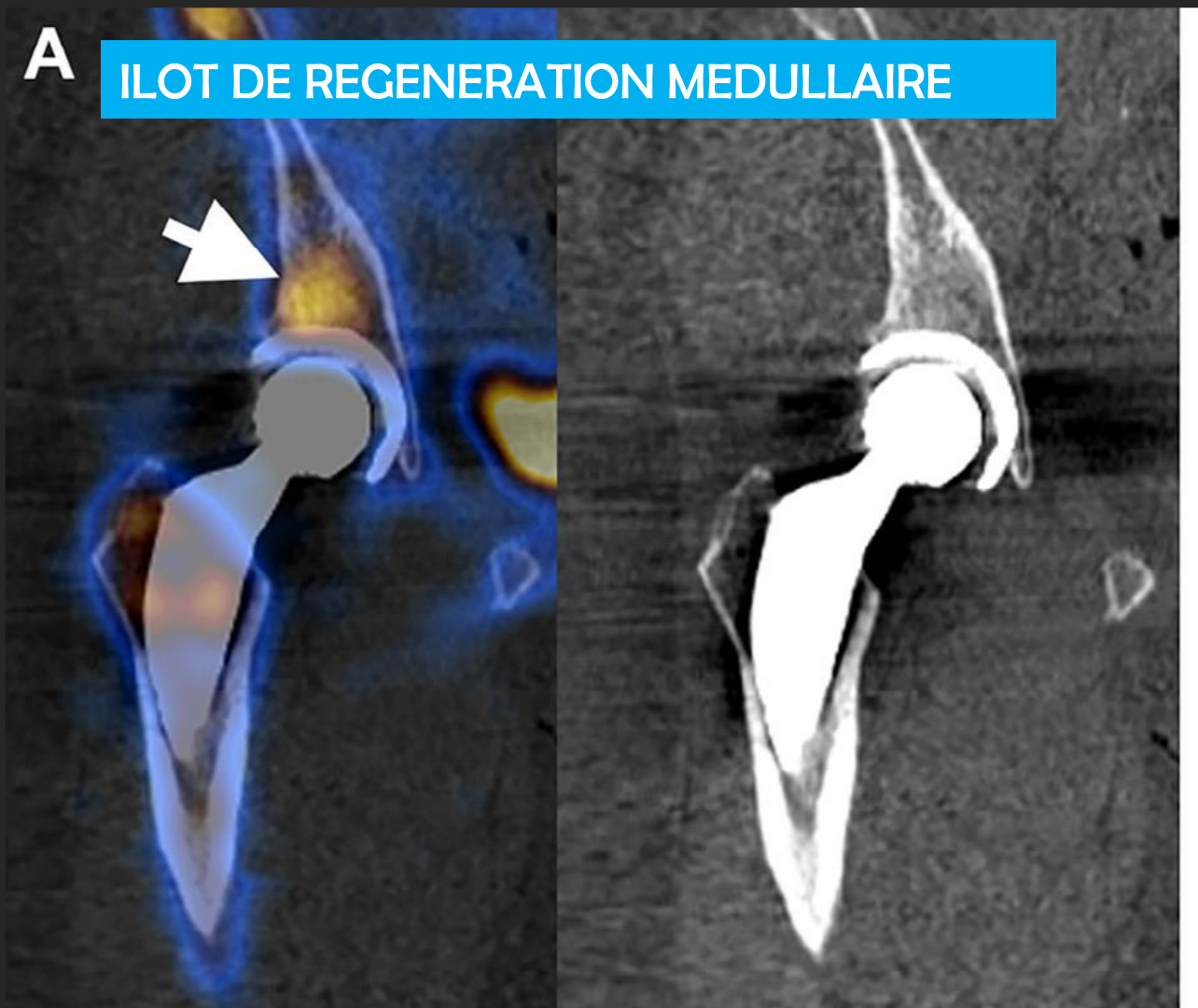
FIXATION II AVEC
EXTENSION VERS I OU III



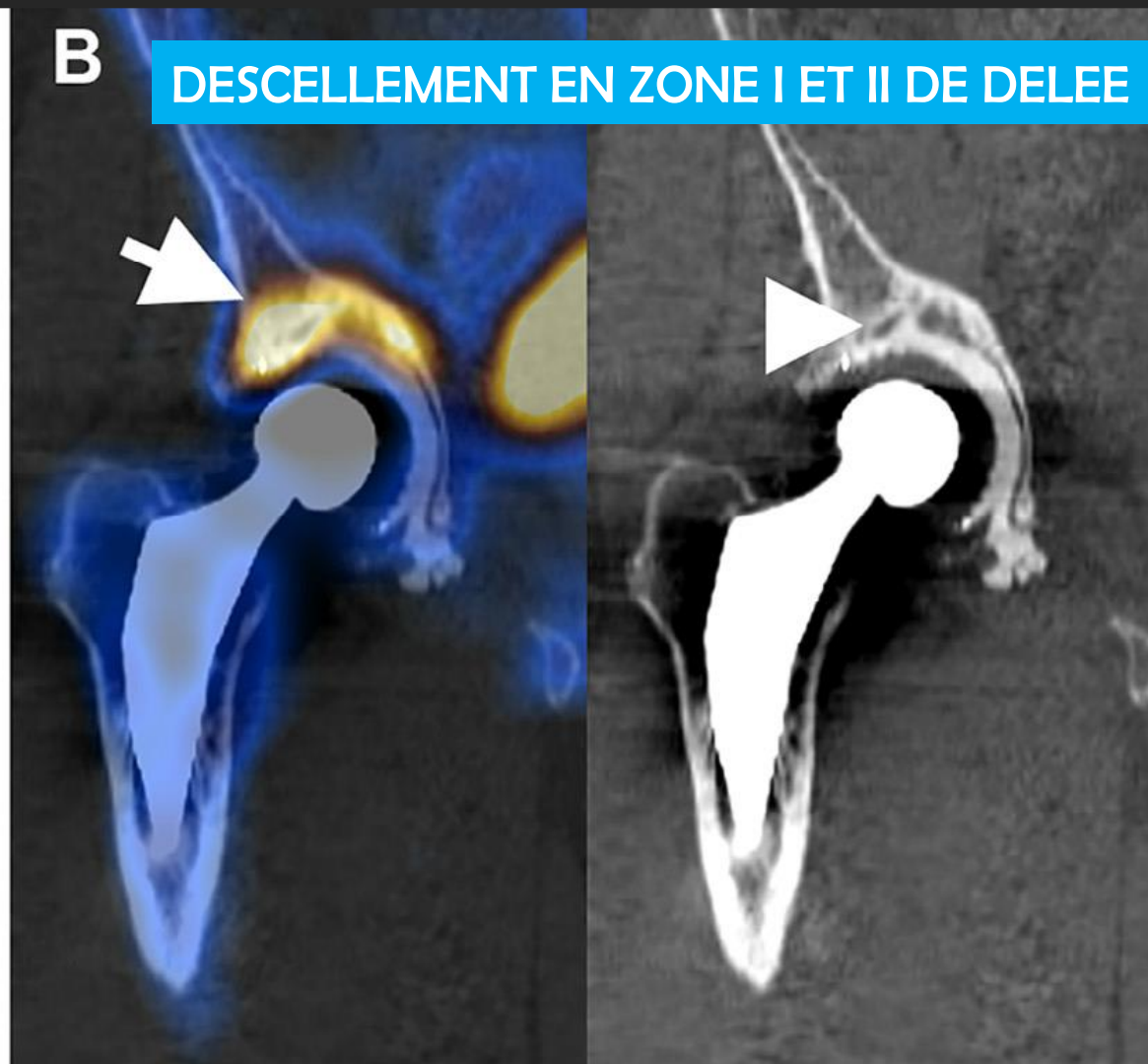
FIXATION I OU III AVEC LISERE



A ILOT DE REGENERATION MEDULLAIRE

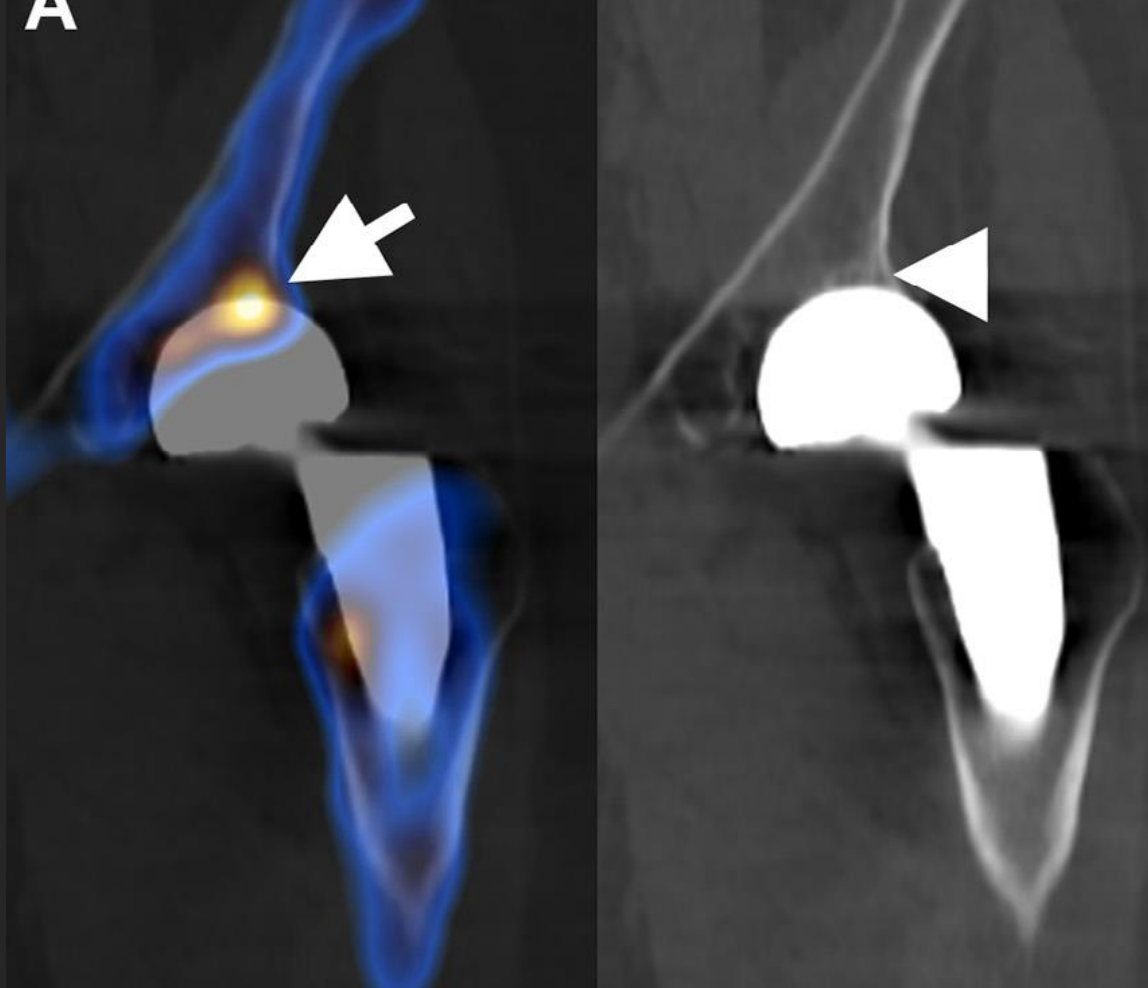


B DESCELLEMENT EN ZONE I ET II DE DELEE



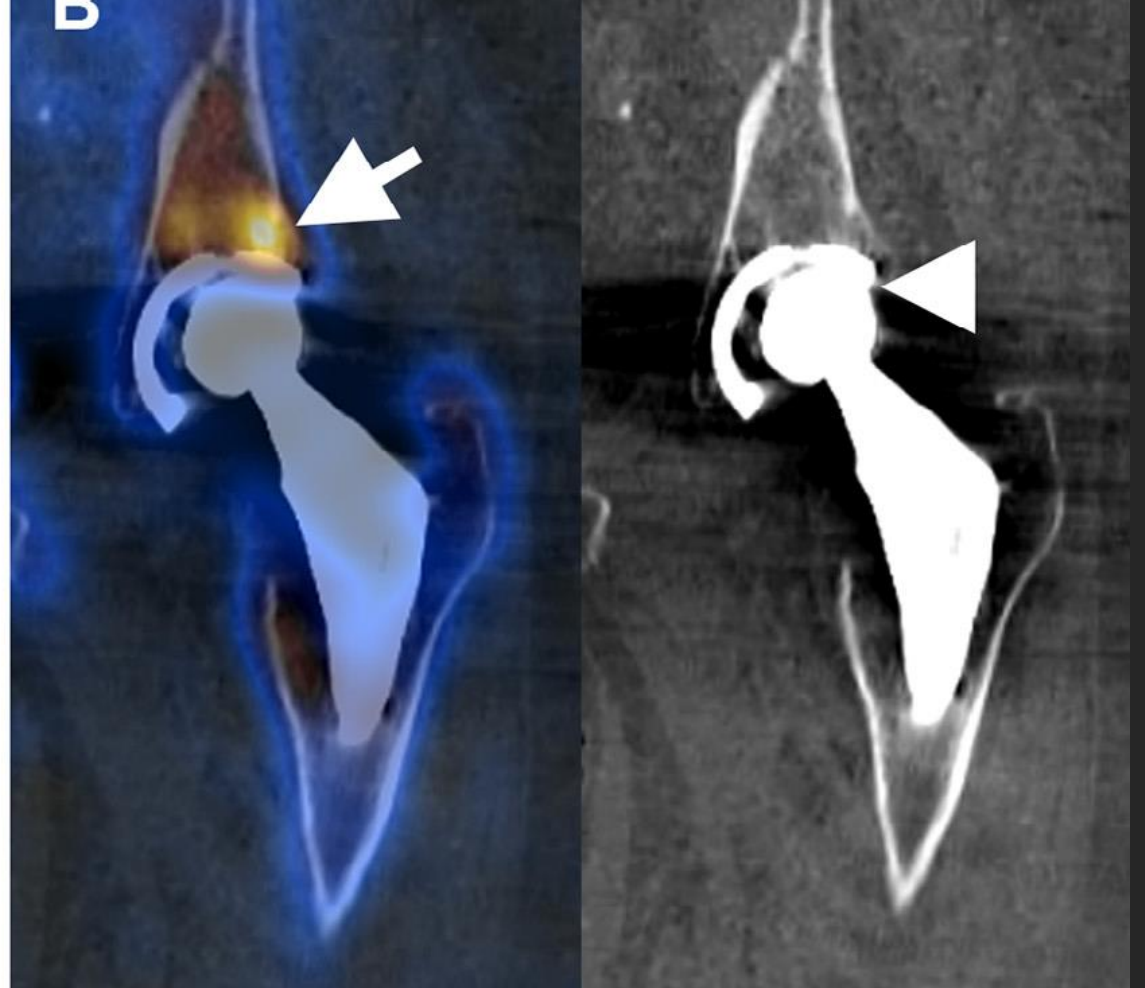
ARTHROSE SUR HEMIARTHROPLASIE

A



DESCELLEMENT COTYLOIDIEN

B



DESCELLEMENT SEPTIQUE – SIGNES TDM

APPOSITIONS PERIOSTEEES PLURILAMELLAIRE

BIPOLAIRE

CONTRAINTES en dehors des zone de contraintes

DESCELLEMENT PRECOCE

ENCOCHES ENDOSTEALES

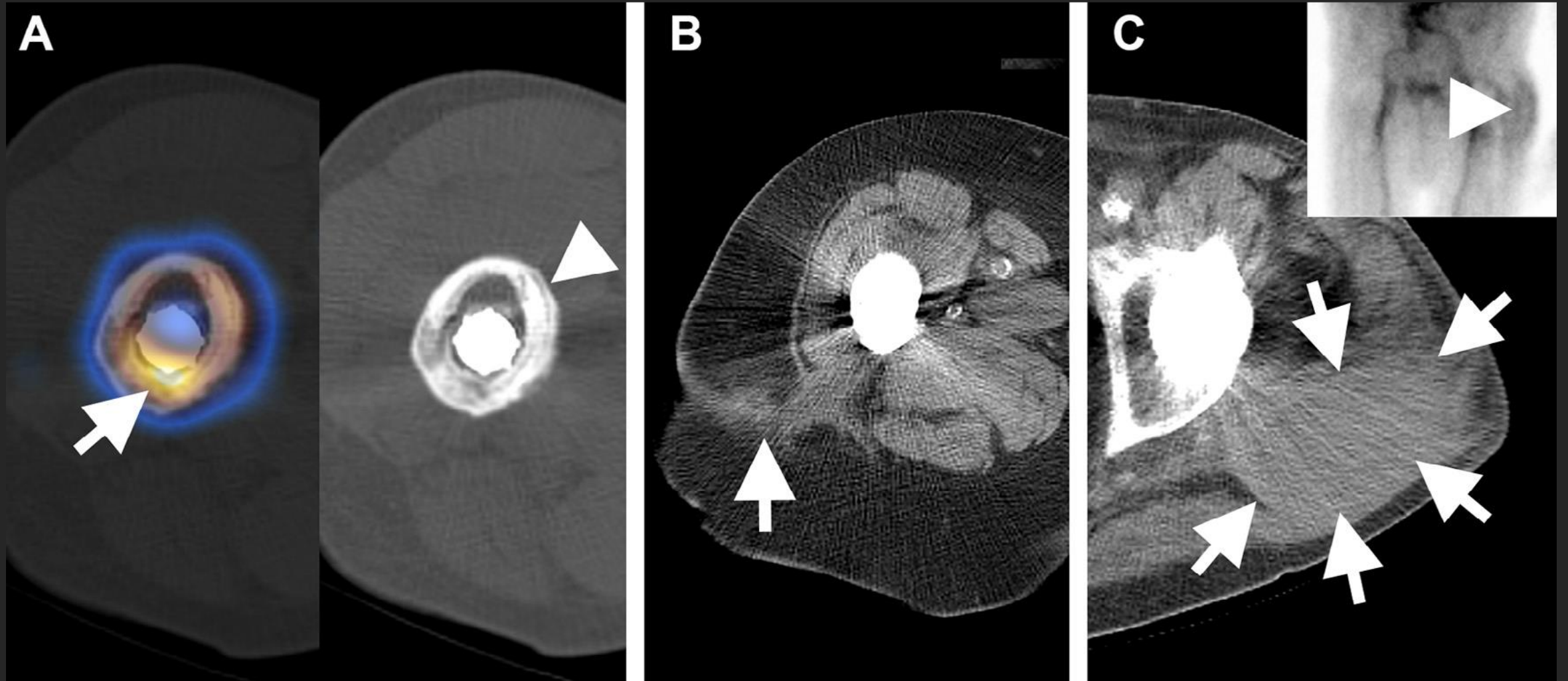
FLOUE OSTEOLYSE

PLURIFOCAL

OSTEOLYSE FLOUE

MOUS Abscess Bursite Collection Epanchement Fistule

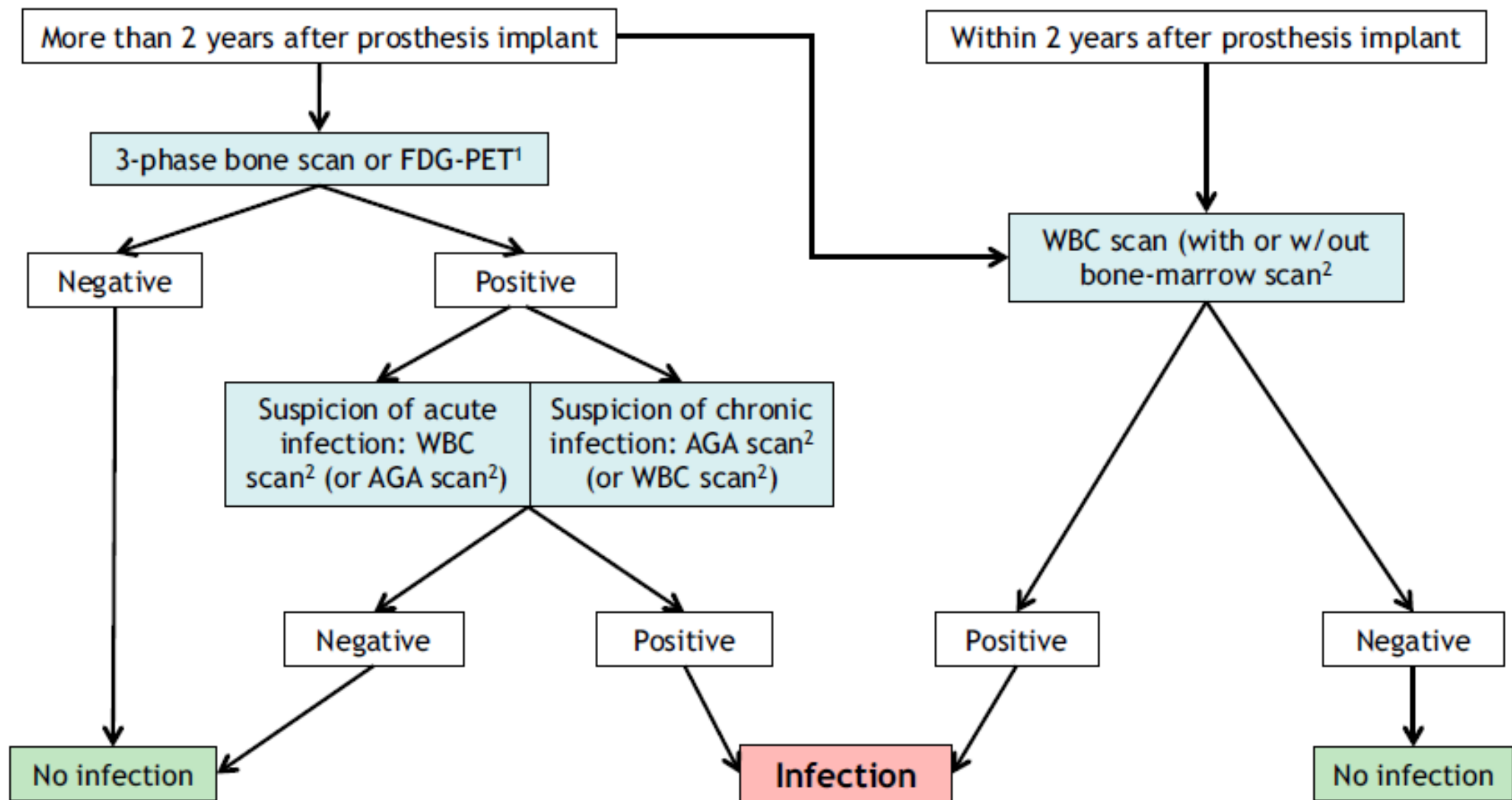
DESCELLEMENT SEPTIQUE



RECOMMENDATIONS 2019

14	CT can be effectively used to diagnose prosthetic joint infection	2
15	The diagnostic accuracy for 3-phase bone scintigraphy in patients with suspected infection within the first 2 years after hip or knee prosthesis placement is low	2
16	In case of negative 3-phase bone scintigraphy, the diagnosis of prosthetic joint infection can be excluded	2
17	In case of positive 3-phase bone scan, the addition of white blood cell scintigraphy leads to high diagnostic accuracy for prosthetic joint infection	2
18	In case of negative white blood cell scintigraphy, the probability of prosthetic joint infection is low	2
19	¹⁸ F-FDG-PET in patients suspected of prosthetic joint infection has high sensitivity but lower specificity than white blood cell scintigraphy or anti-granulocyte antibodies scintigraphy	2
20	Anti-granulocyte scintigraphy is a good alternative to white blood cell scintigraphy with similar sensitivity and specificity	2
21	Hybrid SPECT/CT imaging can improve localization of infection (and diagnostic accuracy)	2
22	Semi-quantitative analysis of white blood cell accumulation over time in white blood cell scan increases diagnostic accuracy for prosthetic joint infection	3
23	Combining white blood cell scan with bone marrow scan increases diagnostic accuracy for prosthetic joint infection detection	2

RECOMMENDATIONS 2019

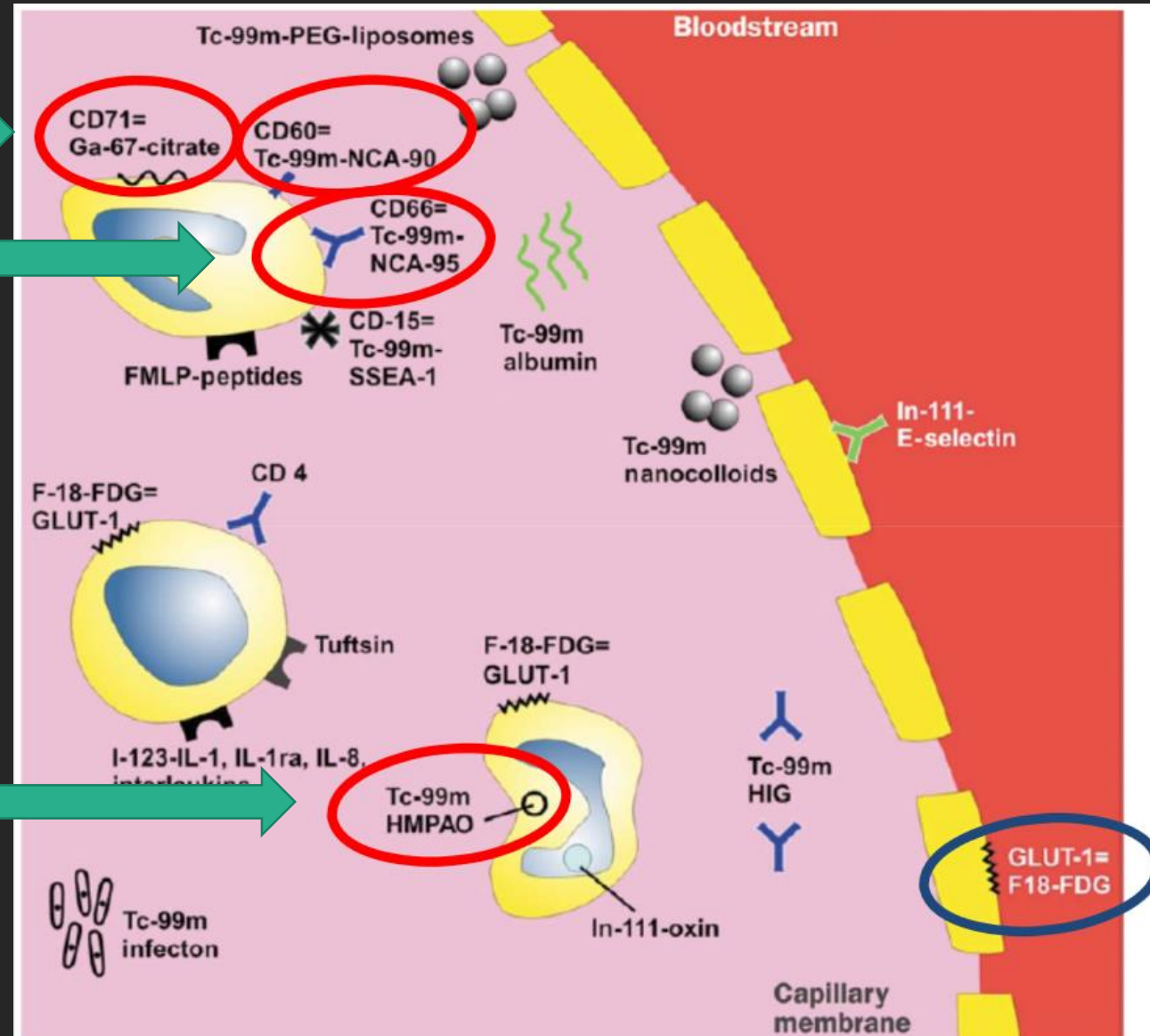


RADIOTRACEURS

LEUKOSCAN

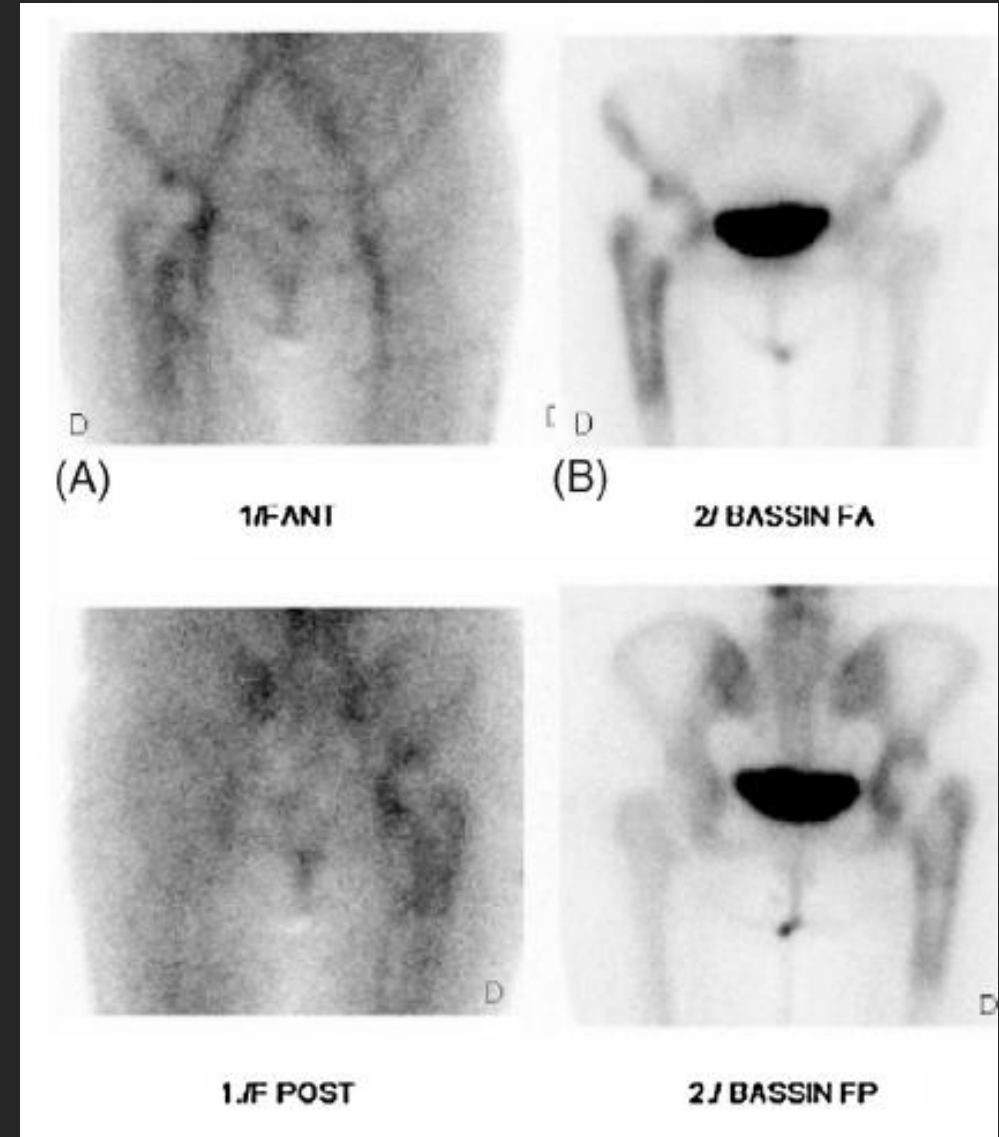
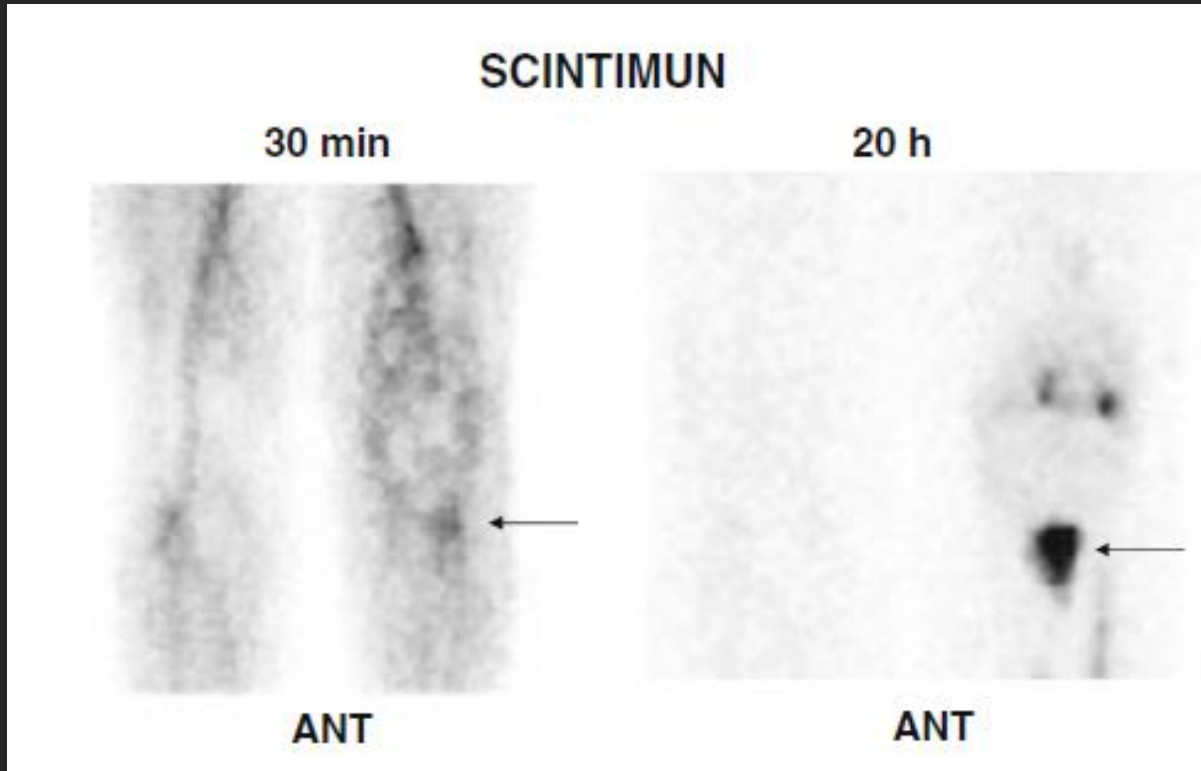
SCINTIMUN

LEUCOCYTES MARQUES



^{18}F -FDG

SCINTIGRAPHIE AUX ANTICORPS ANTI-LEUCOCYTES (SLM)



SCINTIGRAPHIE AUX ANTICORPS ANTI-GRANULOCYTES

SE 83% SPE 80%

PERFORMANCES DIAGNOSTIQUES SCINTIMUN COMPARABLE A LA SLM

Pakos et al. Radiology. 2007

Xing et al. Plos One. 2013

Richter et al. Eur J Nucl Med Mol Imaging. 2011

SCINTIGRAPHIE AUX LEUCOCYTES MARQUES

^{111}In $^{99\text{m}}\text{Tc}$ - HMPAO

MARQUAGE IN VITRO LEUCOCYTES

FACTEURS INFLUENCANT LA FIXATION:

- ✓ SITE INFECTE
- ✓ PATHOGENE
- ✓ ANTIBIOTIQUE ET CORTICOIDES
- ✓ VASCULARISATION

ANALYSE VISUELLE

FOYER : AUGMENTE EN TAILLE OU EN INTENSITE

- POSITIF: AUGMENTATION
- NEGATIF: DIMINUTION OU ABSENCE DE FIXATION
- EQUIVOQUE

ANALYSE SEMI-QUANTITATIVE

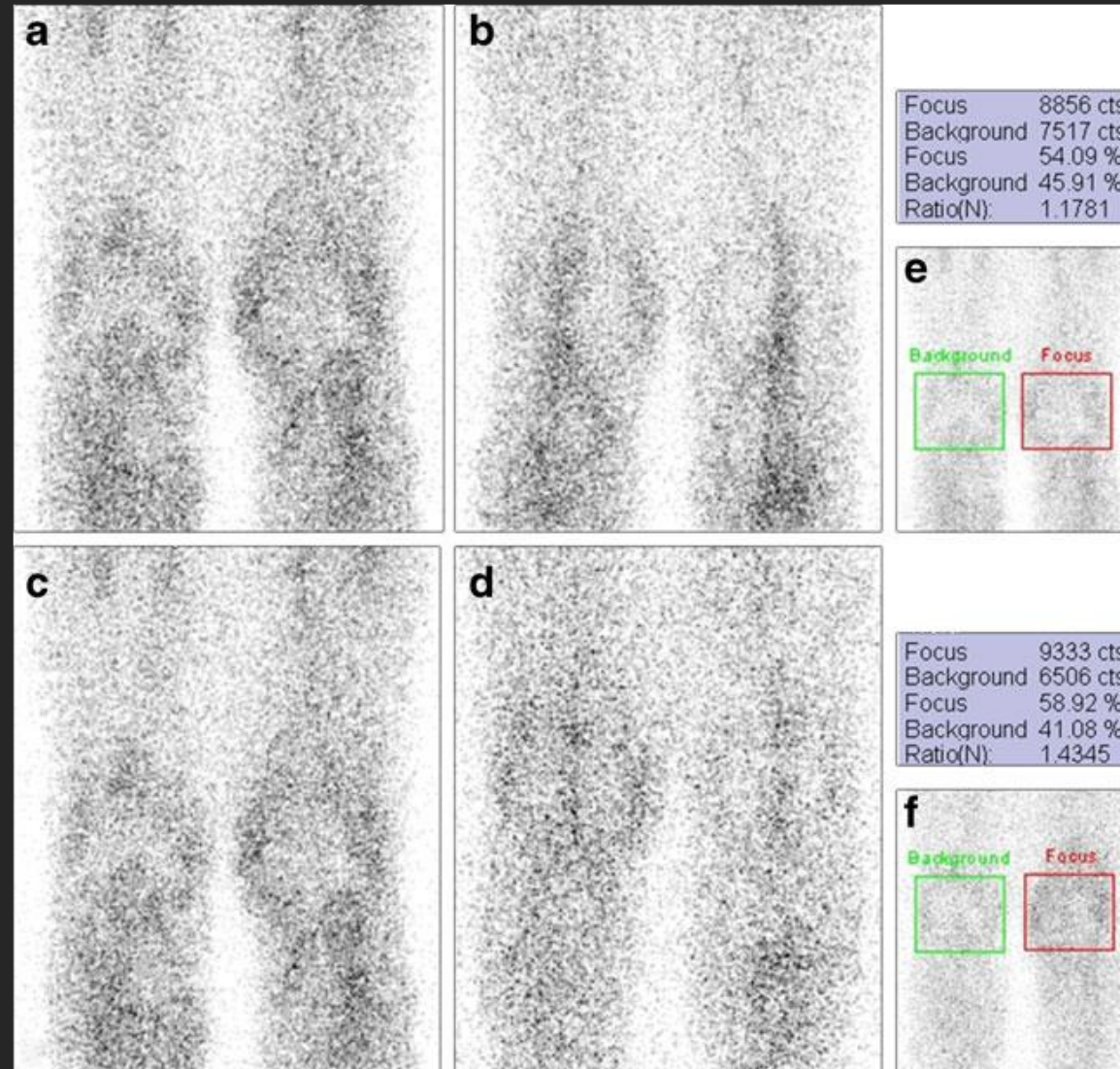
SI EQUIVOQUE

RATION LESION / ZONE DE REFERENCE J1 ET J2

POSITIF > 10%

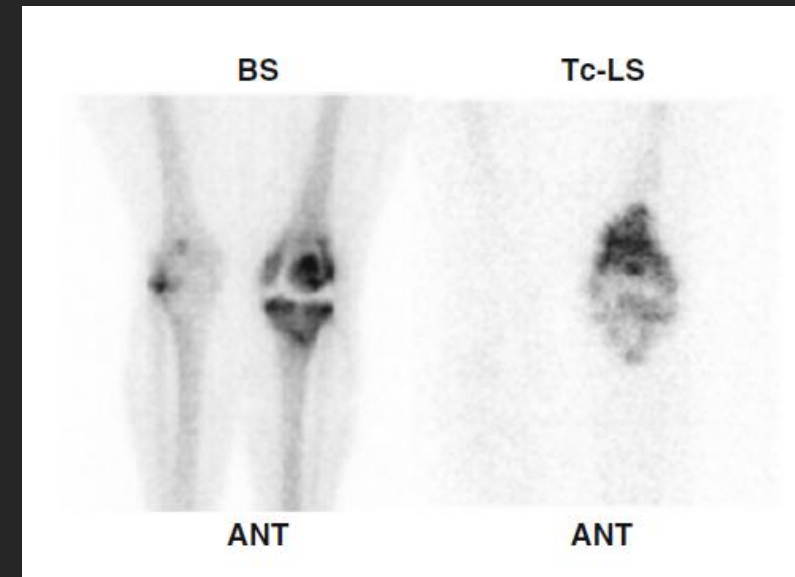
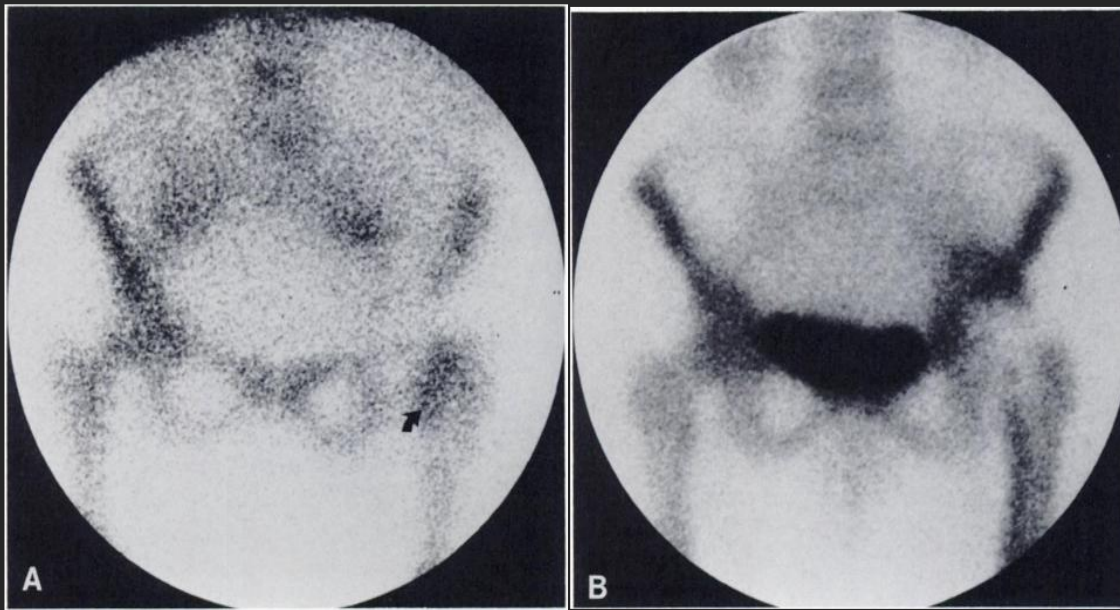
EQUIVOQUE DIMINUTION MODEREE OU STABLE = > SCINTIGRAPHIE MEDULLAIRE

ANALYSE SEMI-QUANTITATIVE



SLM ET SCINTIGRAPHIE OSSEUSE

FOYER OSSEUX **NON CONGRUENT** EN LEUCOCYTES MARQUES SPATIALEMENT / INTENSITE



SLM ET SCINTIGRAPHIE MEDULLAIRE

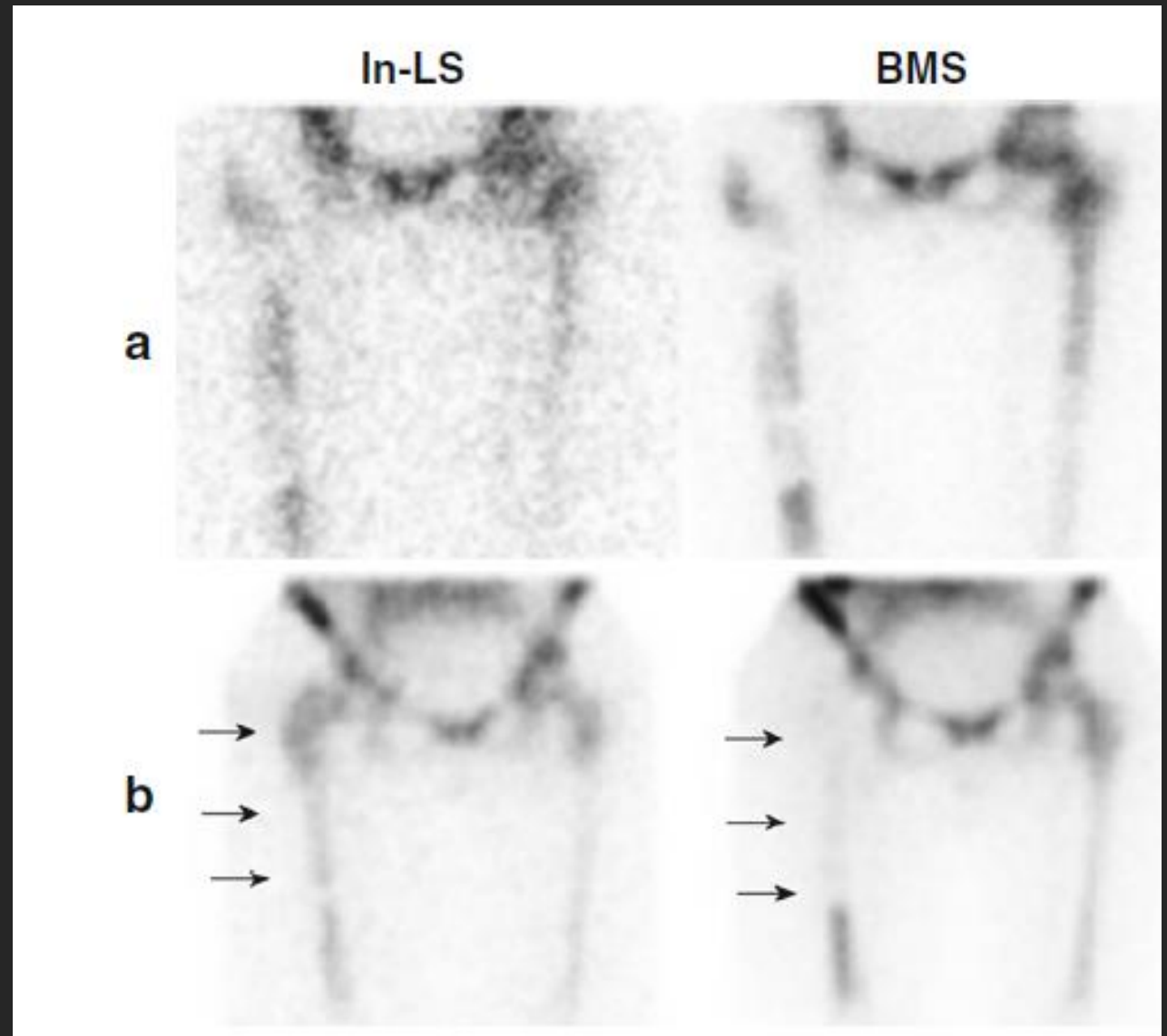
POSSIBLE FOYER MEDULLAIRE
PERIPROTHETIQUE

^{99}Tc SULFURE DE RHENIUM NANOCIS

DISTRIBUTION DANS LE **SYSTEME**
RETICULOENDOTHELIAL

EXAMEN DE REFERENCE

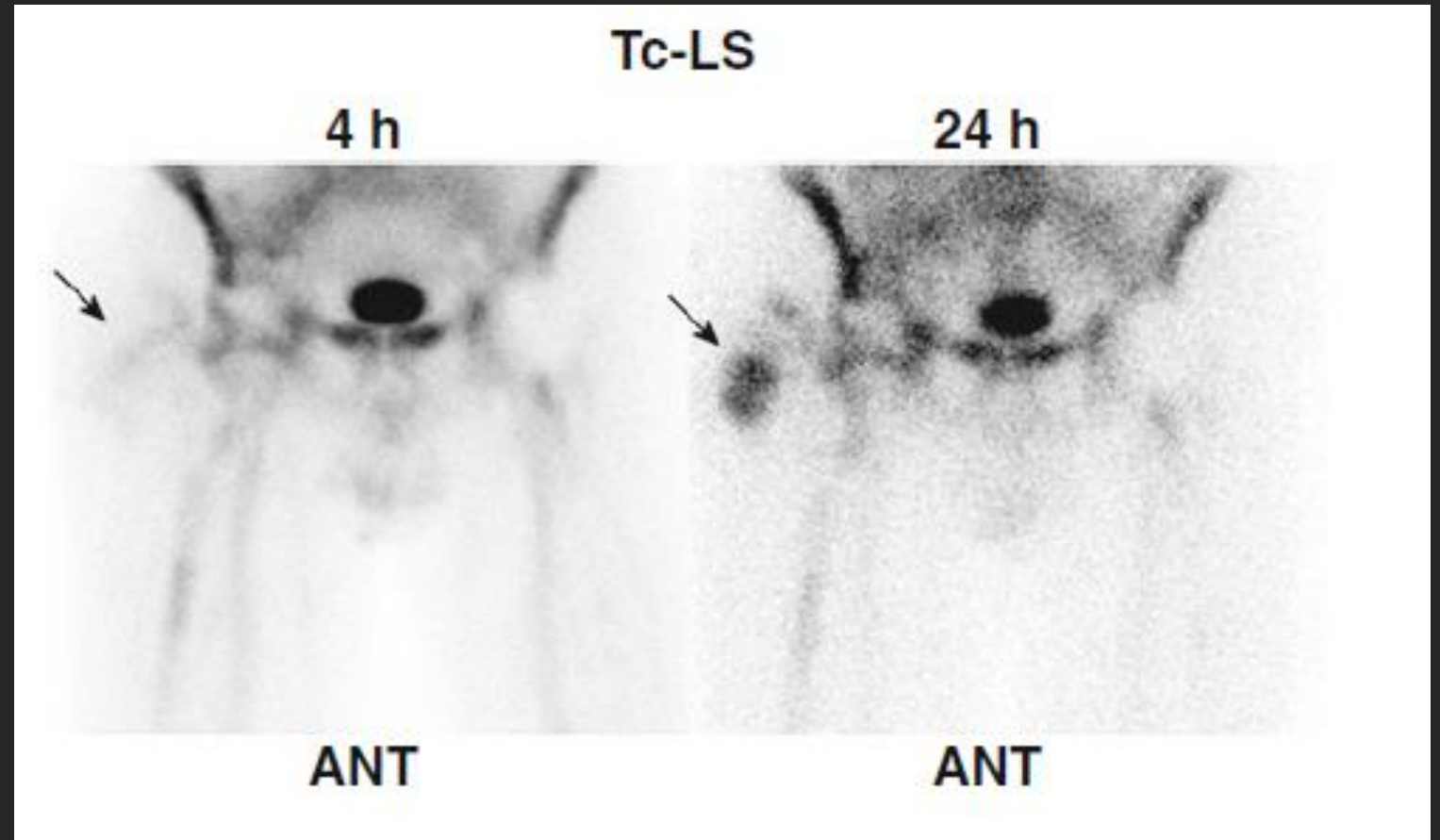
EXACTITUDE SLM + SM = **90%**



SLM ET SCINTIGRAPHIE MEDULLAIRE

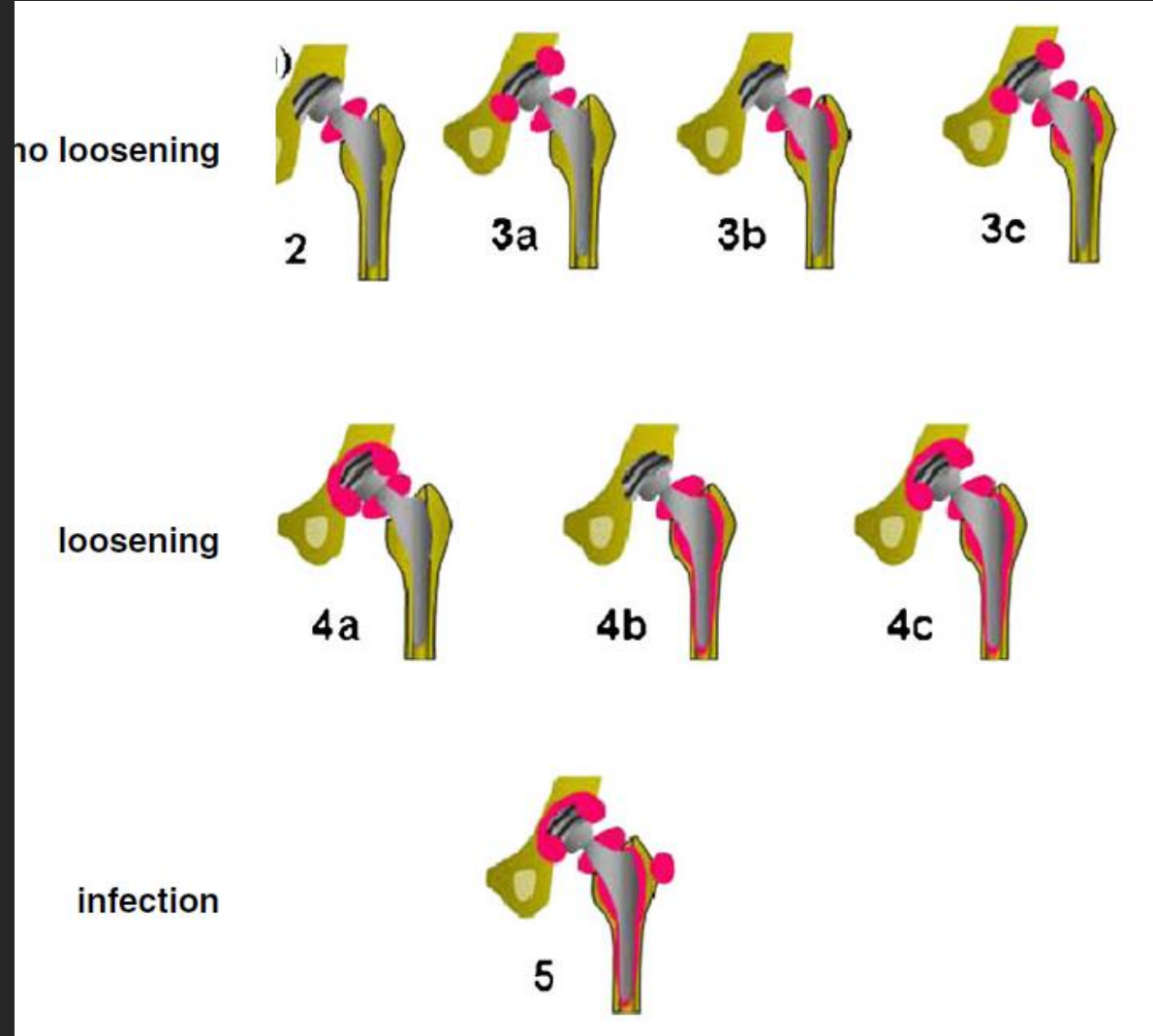
NORMAL: MOELLE OSSEUSE ET
FOYER DE MOELLE ECTOPIQUE

OSTEOMYELITE: Foyer en SLM
NON CONGRUENT EN
SCINTIGRAPHIE MEDULLAIRE
EXAMEN EN 2J

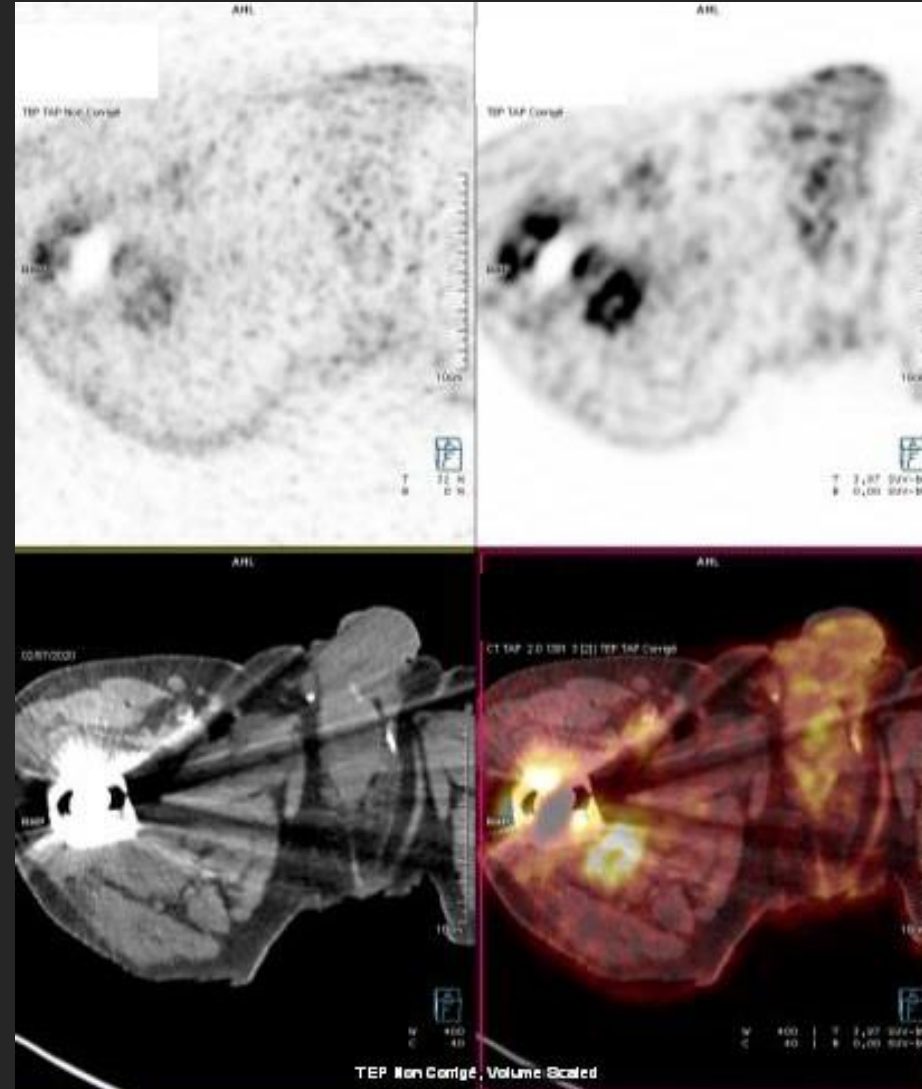


Glaudemans et al. Eur J Nucl Med Mol Imaging. 2013
Pelosi et al. J Nucl Med. 2004
Signore et al. Eur J Nucl Med Mol Imaging. 2018

TEP TDM AU ^{18}F -FDG - CLASSIFICATION DE REINARTZ



TEP TDM AU ^{18}F -FDG - CLASSIFICATION DE REINARTZ



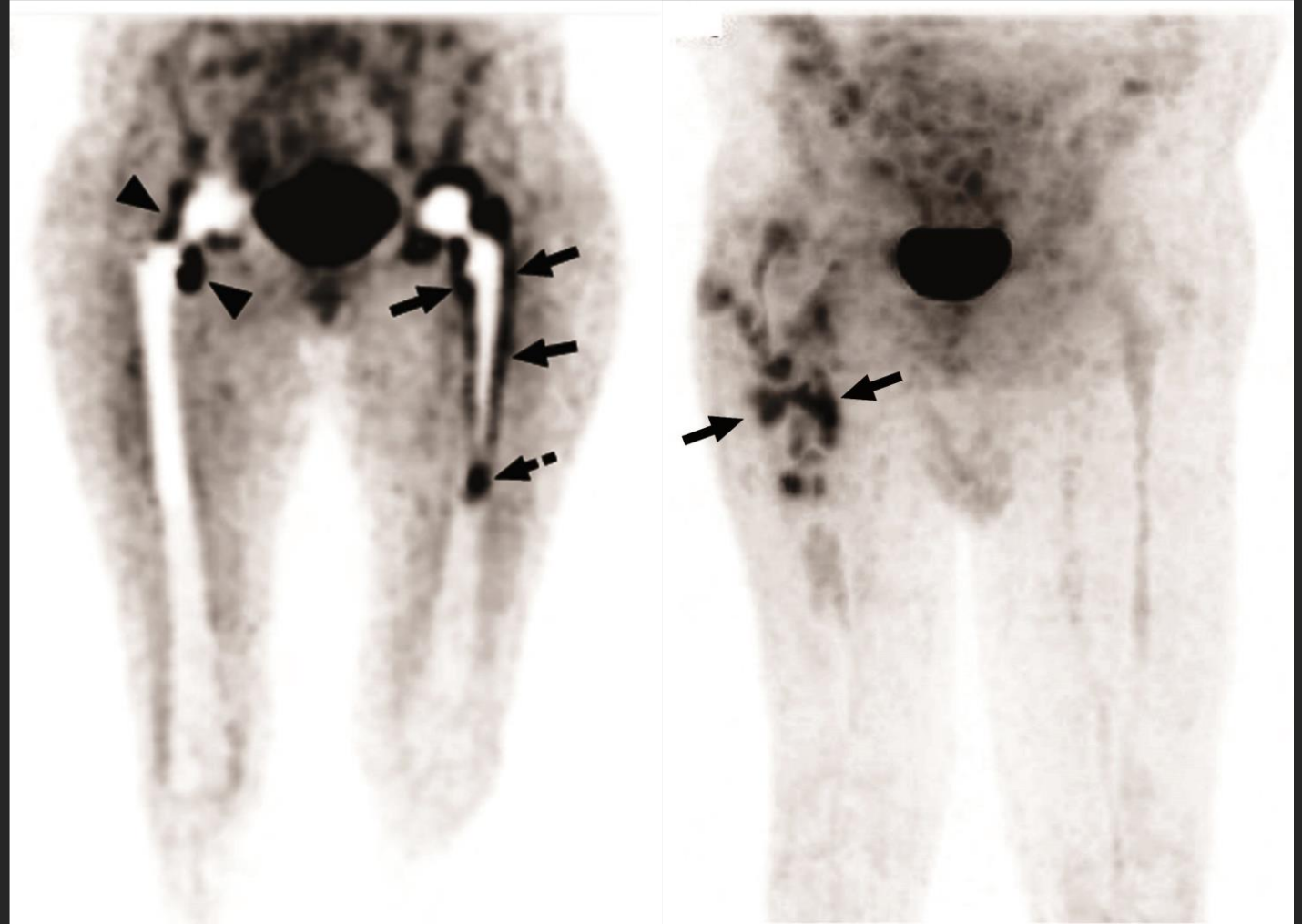
TEP TDM AU ^{18}F -FDG - CRITERES DE ZHUANG

POSITIF

HYPERMETABOLISME
INTERFACE OS-PROTHESE
PARTIE MOYENNE DE LA TIGE
FEMORALE

NEGATIF

HYPERMETABOLISME LIMITE
AUX TISSUS MOUS OU
ADJACENT AU COL FEMORAL



OSSIFICATIONS PERI-PROTHETIQUES

FRÉQUENTES

RAREMENT SYMPTOMATIQUES

DOULEURS MAL SYSTÉMATISÉES

15J POST-OPÉATOIRE

DIFFICULTÉS OPÉATOIRE, VOIE ANTERIEURE

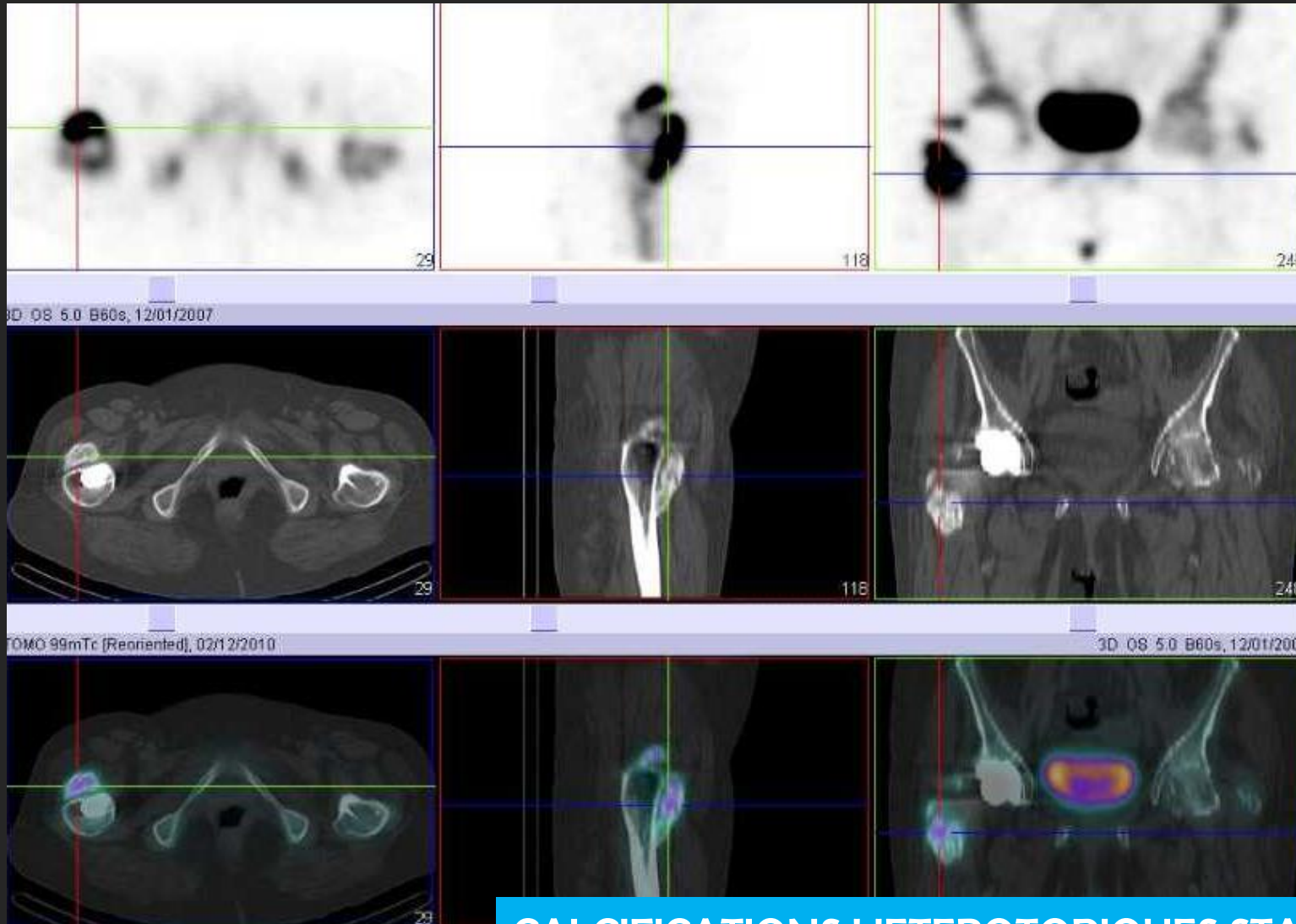
AUGMENTATION DU VOLUME 3 MOIS

PUIS MATURATION PENDANT 2 ANS PUIS STABILITÉ

RISQUE = DIMINUTION MOBILITE ARTICULAIRE

INTERET SCINTIGRAPHIE OSSEUSE

OSSIFICATIONS PERI-PROTHETIQUES



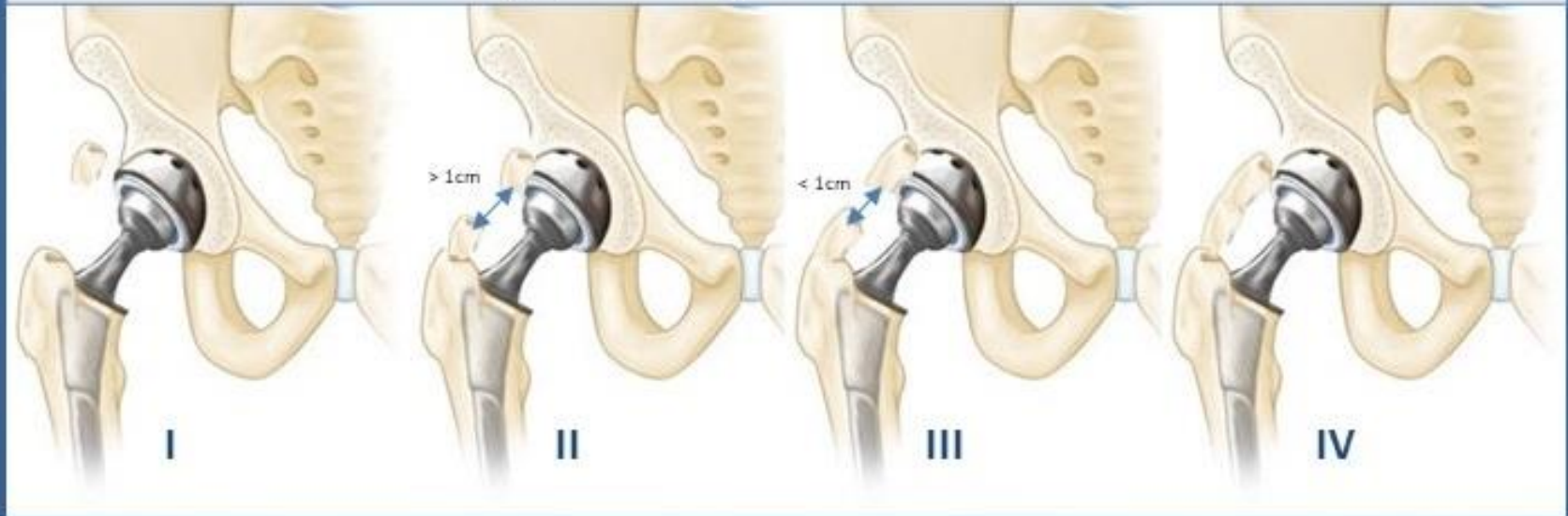
CALCIFICATIONS HETEROTOPIQUES STADE 2 DE BROOKER

CLASSIFICATION DE BROOKER

Brooker classification of Heterotopic bone formation

It is based on an AP radiograph of the pelvis and hip.

Grade I	islands of bone within soft tissues.
Grade II	bone spurs leaving > 1 cm between opposing bone surfaces.
Grade III	bone spurs leaving < 1 cm between opposing bone surfaces.
Grade IV	radiographic ankylosis of the hip.



SYNDROME DU CONFLIT PSOAS-CUPULE

5% DES PTH DOULOUREUSES

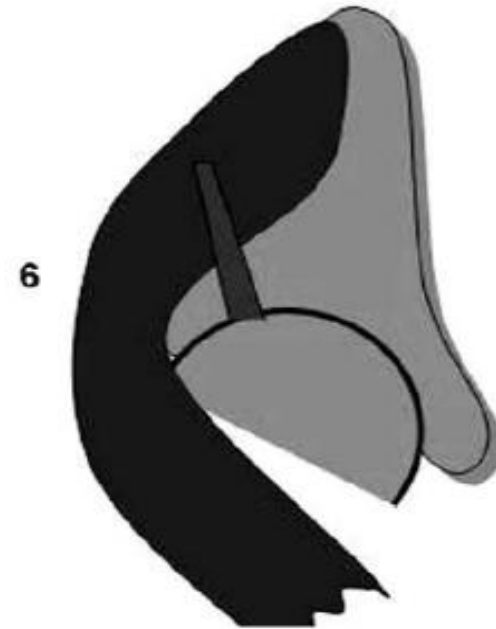
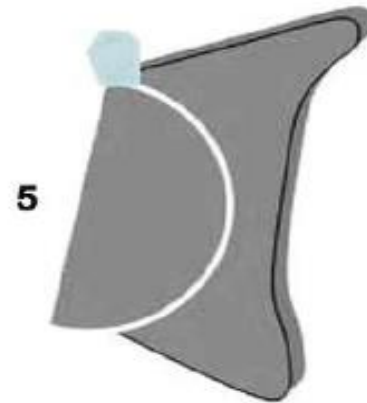
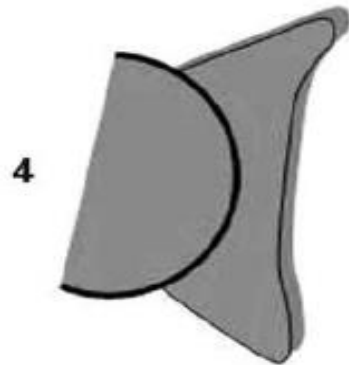
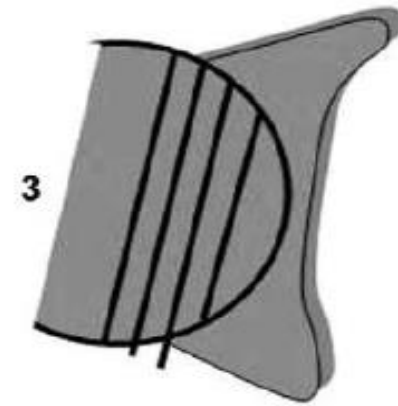
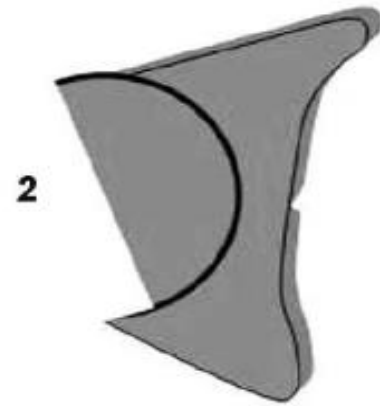
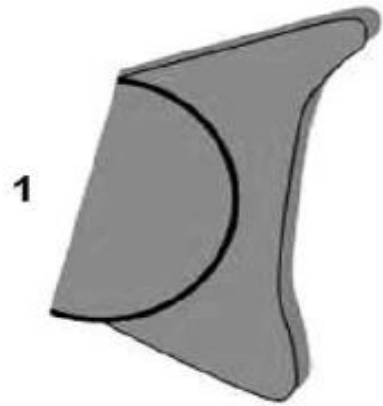
30-40% DE BURSITE ASSOCIÉE

ASSEZ PRÉCOCE APRÈS INTERVENTION

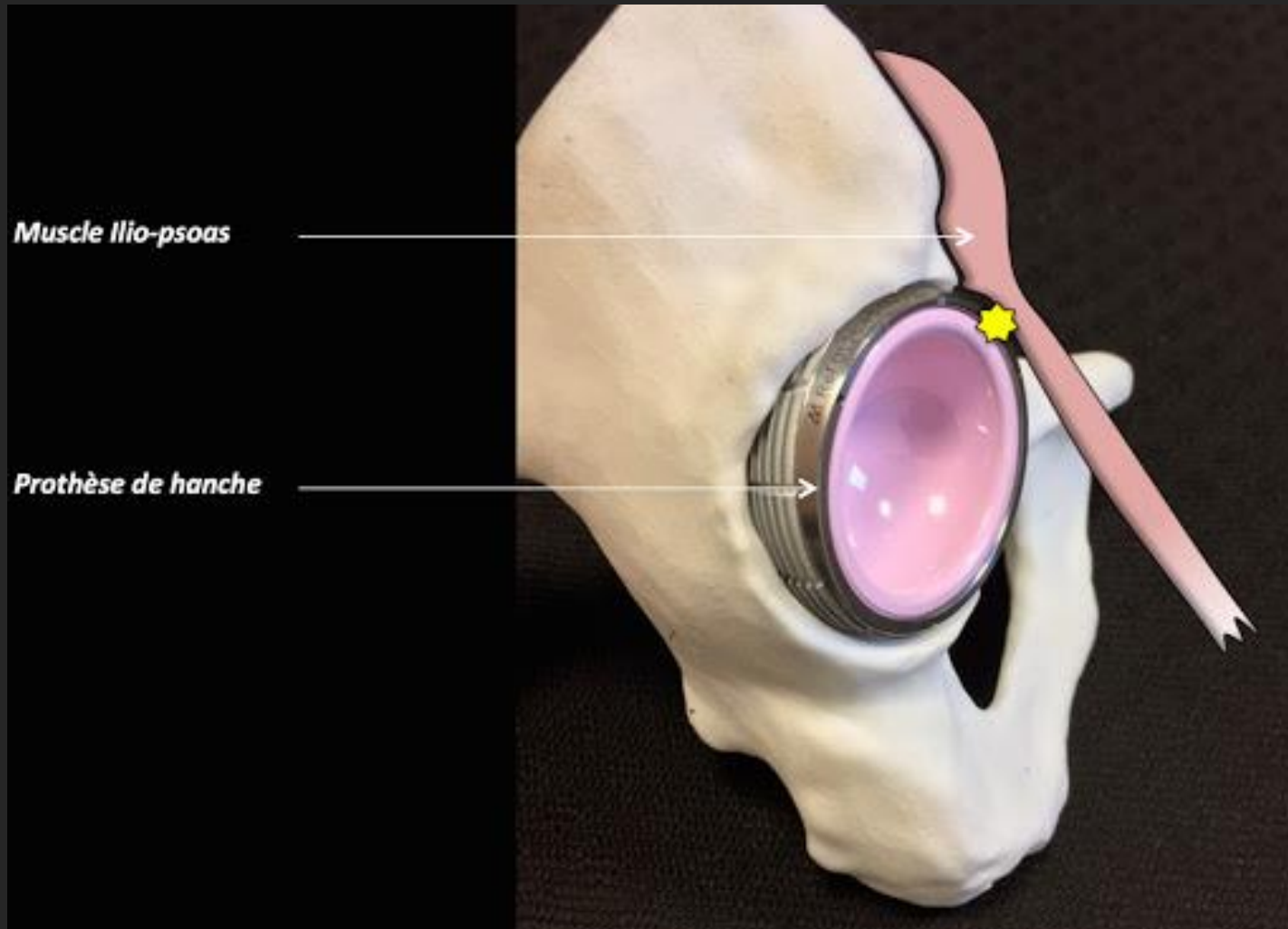
FRICTIONS RÉPÉTÉES DE LA PARTIE POSTÉRIEURE DU MUSCLE
AVEC

- DEBORD ANTERIEUR DE CUPULE
- VIS
- CIMENTOPHYTE

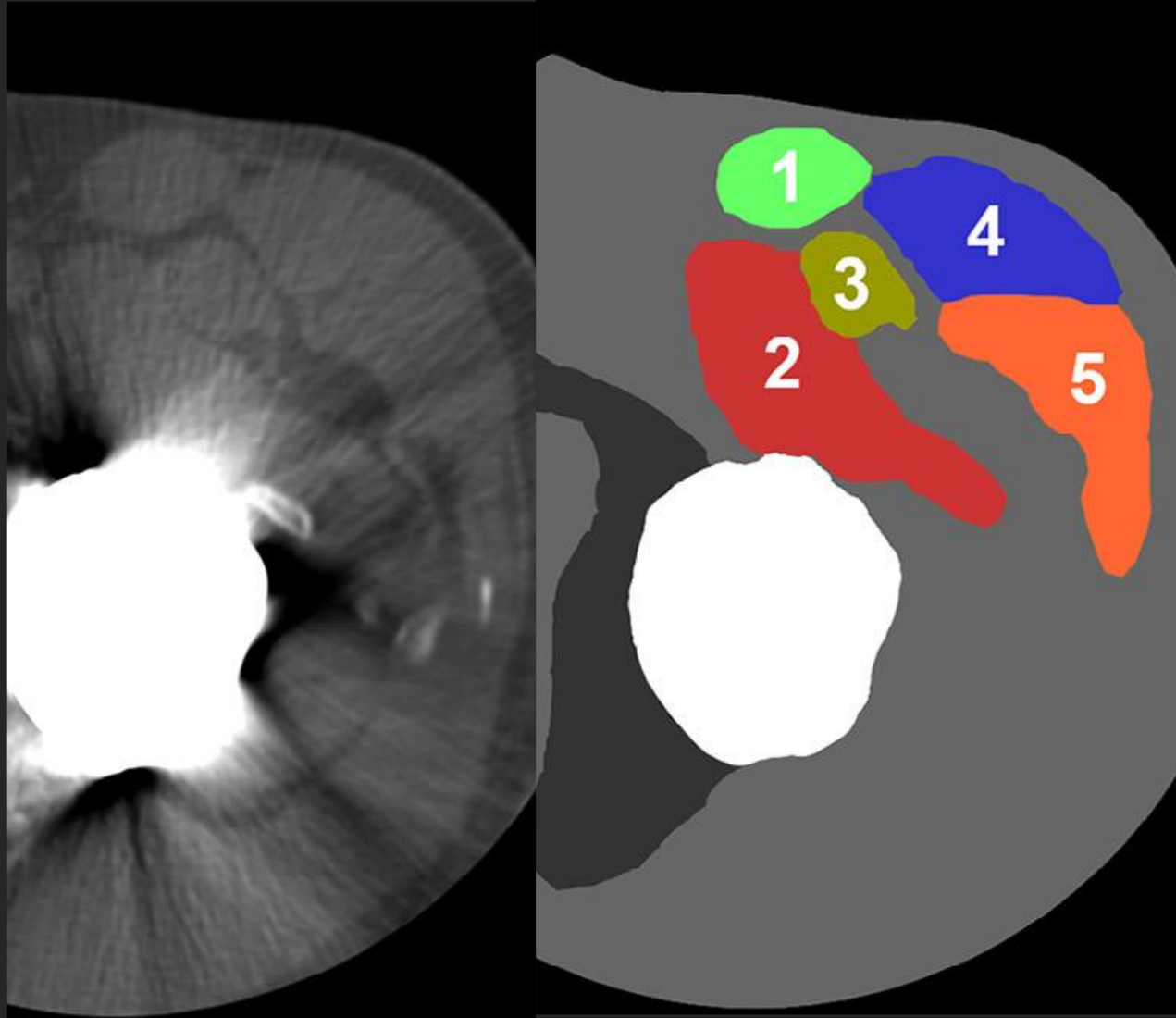
SYNDROME DU CONFLIT PSOAS-CUPULE



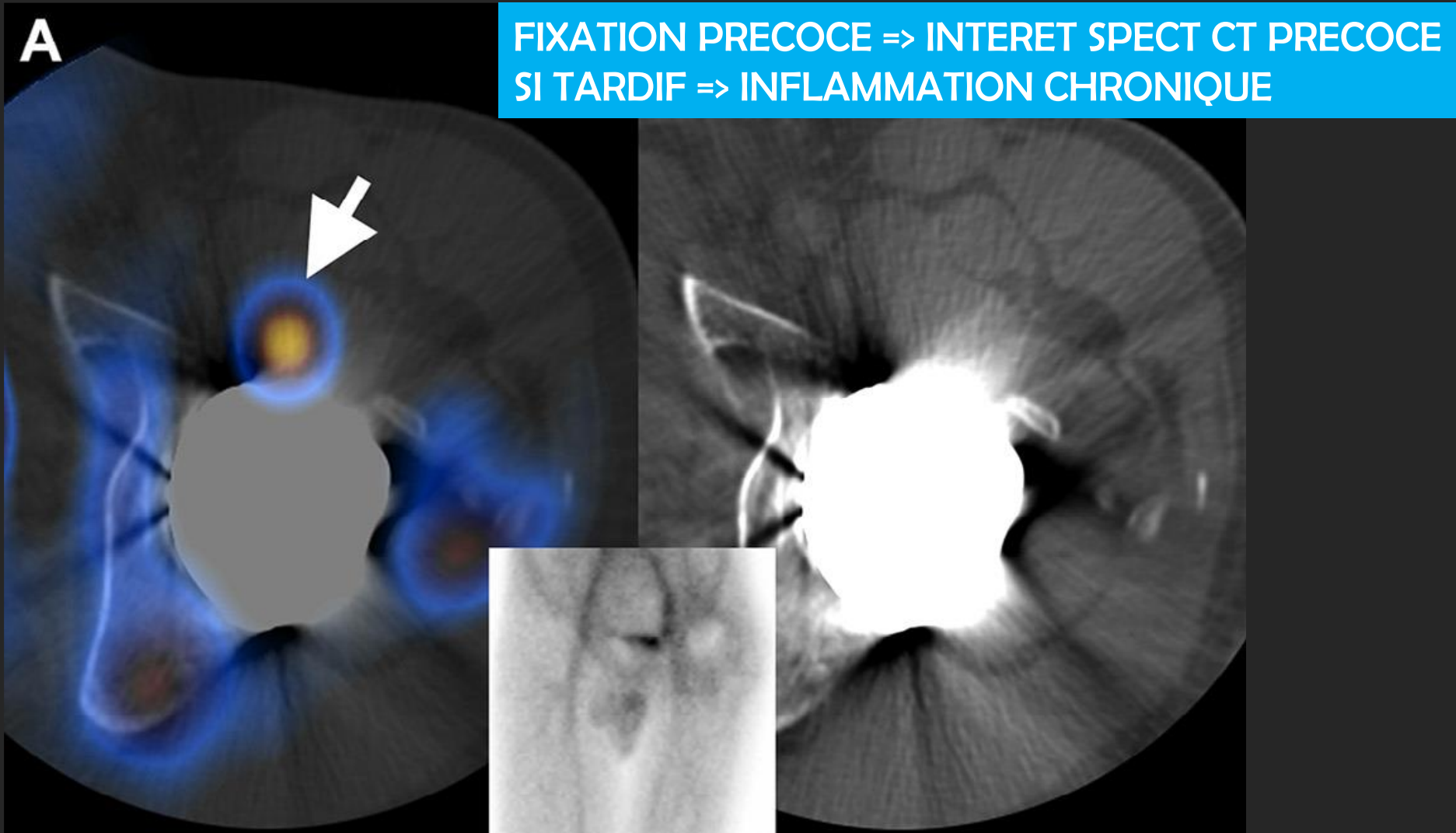
SYNDROME DU CONFLIT PSOAS-CUPULE



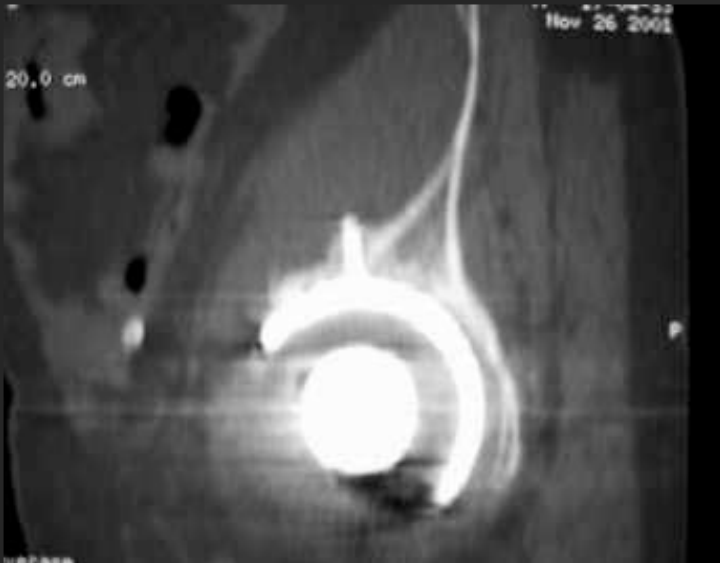
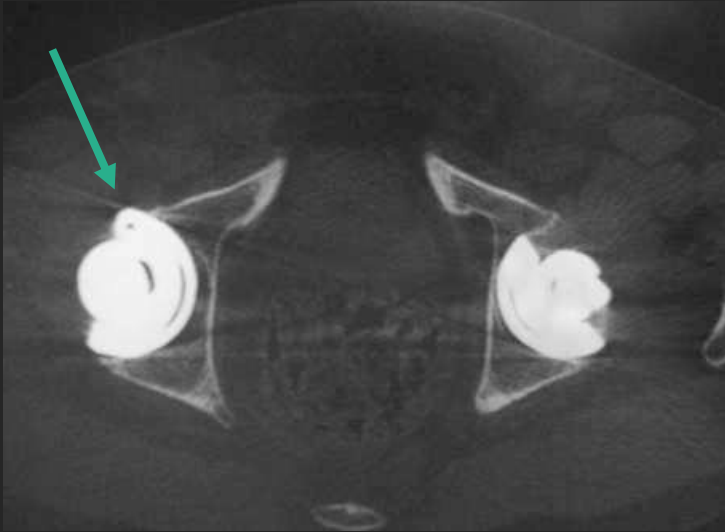
SYNDROME DU CONFLIT PSOAS-CUPULE



SYNDROME DU CONFLIT PSOAS-CUPULE

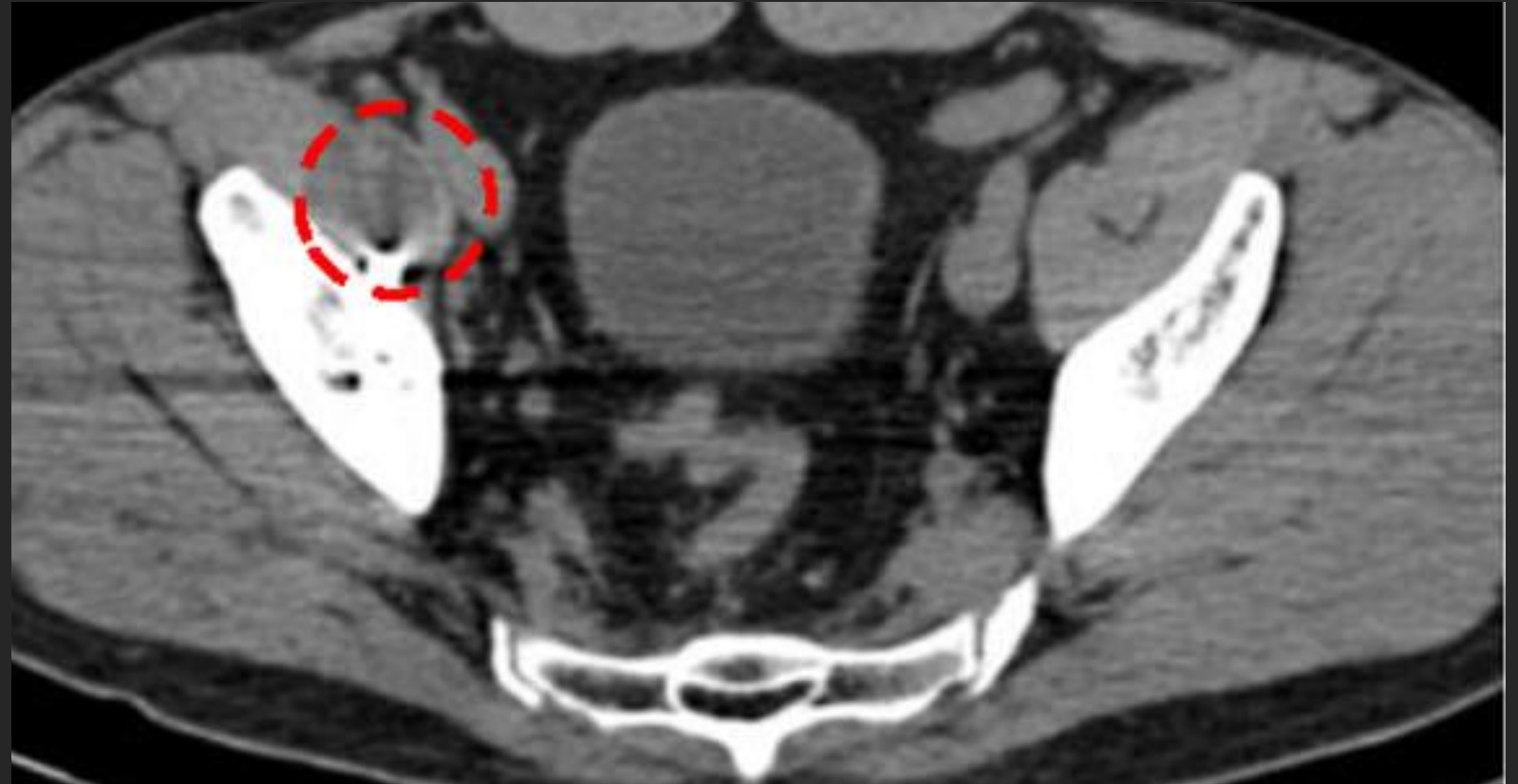


SYNDROME DU CONFLIT PSOAS-CUPULE



ABCES

HYPERFIXATION
PERIPHERIQUE TARDIVE



PSEUDARTHROSE TROCHANTERIENNE

RARE

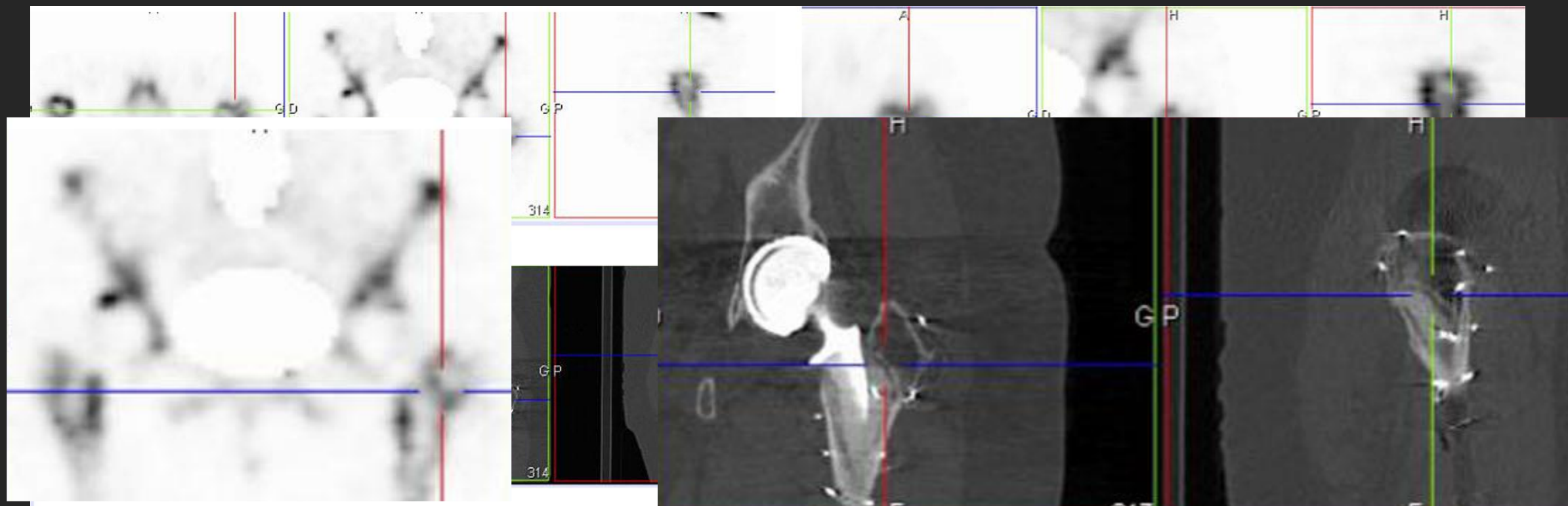
APPUI TROP PRECOCE

FIXATION INSUFFISANTE

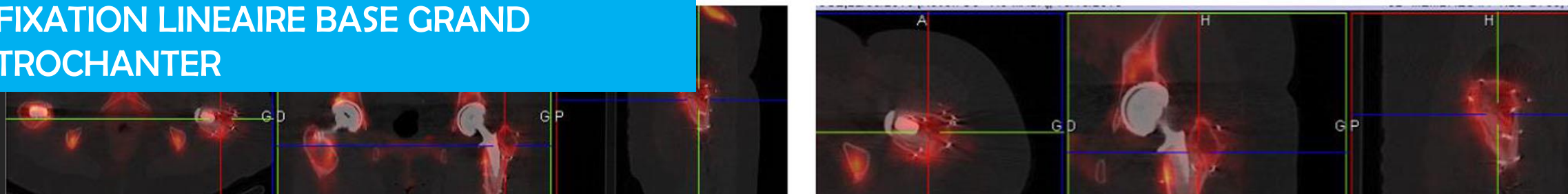
DOULEUR À LA PRESSION RÉGION TROCHANTERIENNE

VOIE D'ABORD LATÉRALE OU CHANGEMENT DE PROTHESE

PSEUDARTHROSE TROCHANTERIENNE



FIXATION LINEAIRE BASE GRAND
TROCHANTER

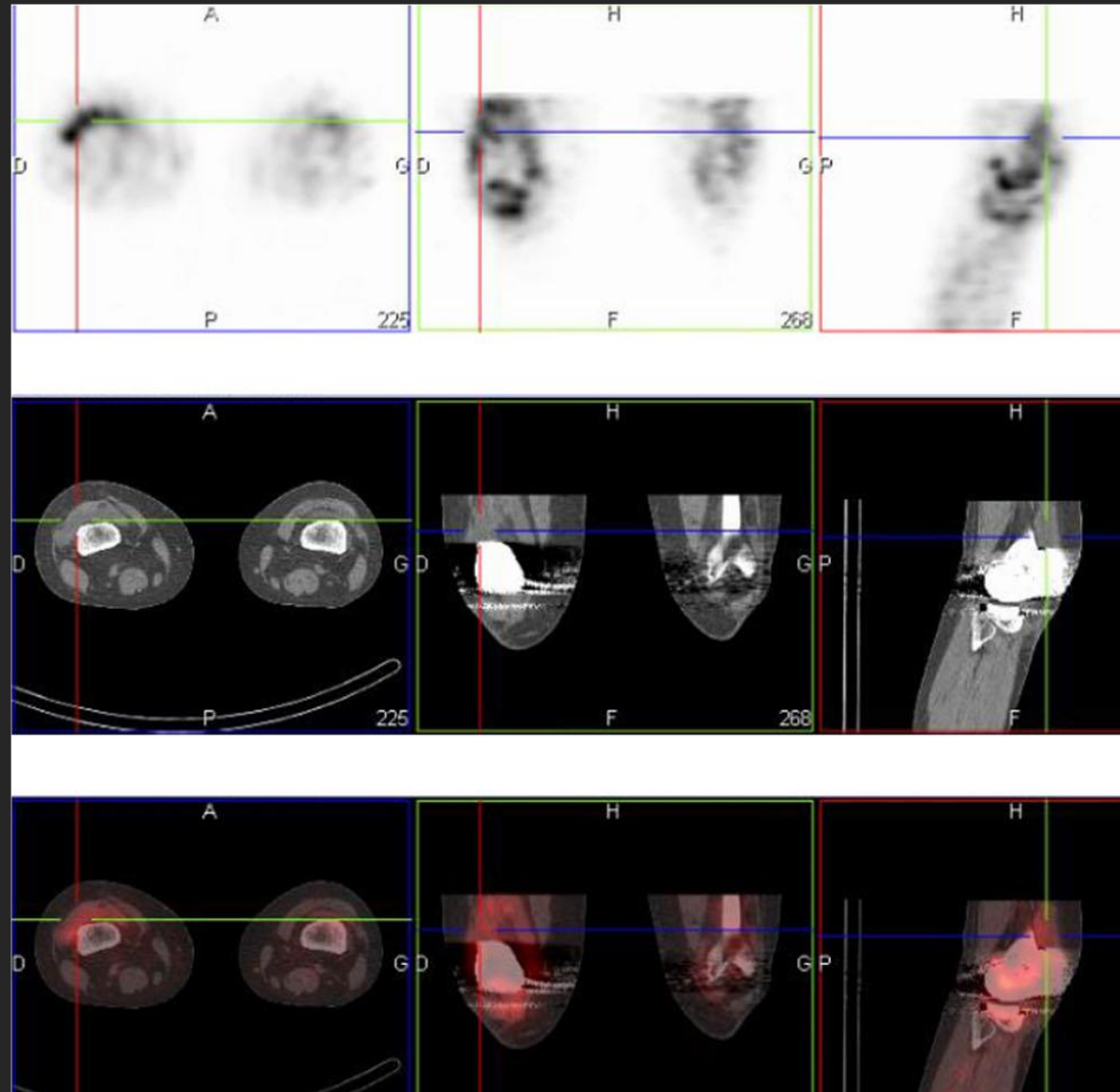


HEMATOME

HYPERFIXATION SUR LE TEMPS
TISSULAIRE

INTERET SPECT CT PRECOCE

NON FIXANT EN TARDIF

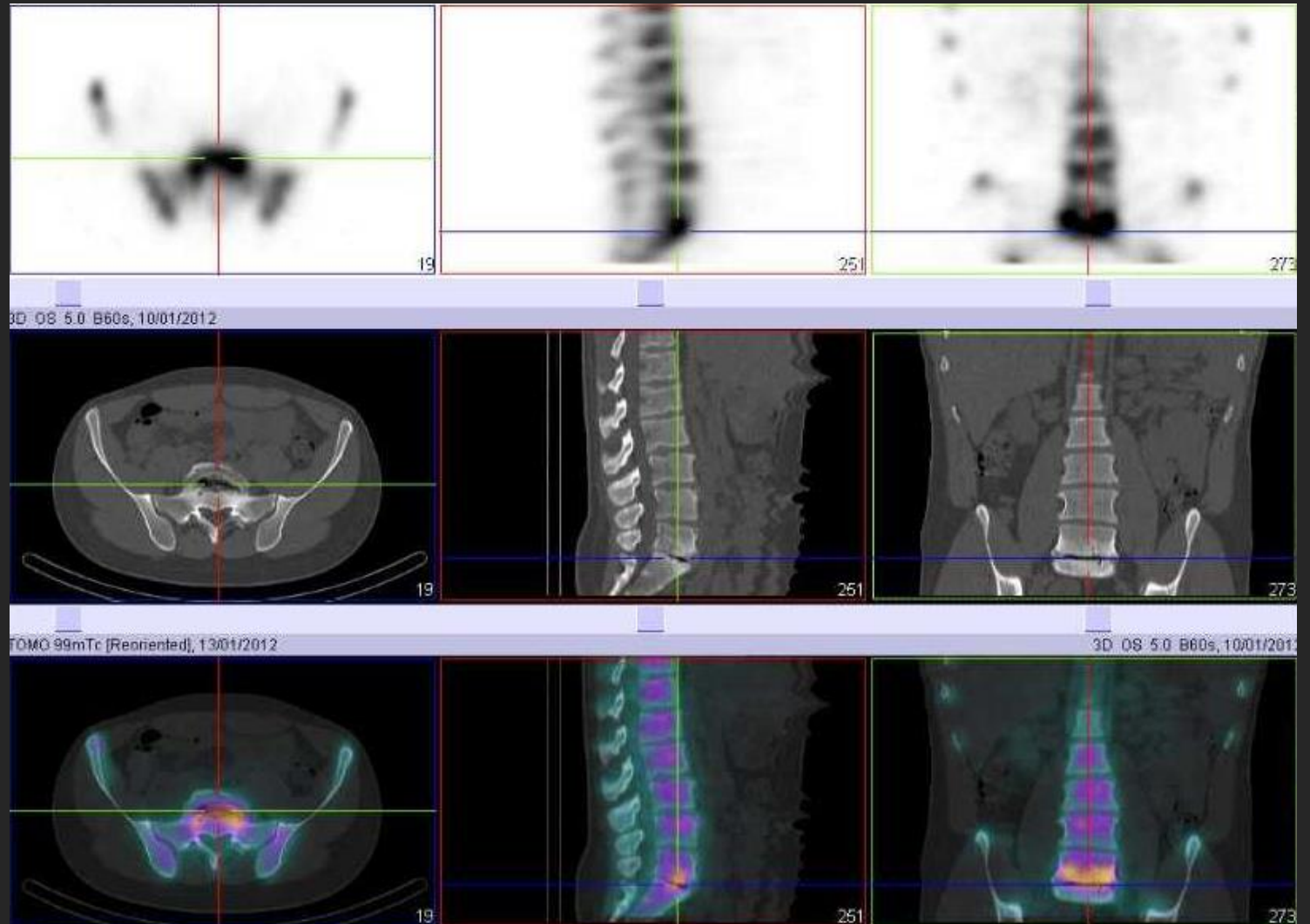


DOULEURS PROJETEES

FRACTURE VERTEBRALE

FRACTURE BASSIN

RACHIS DEGENERATIF



**FRACTURES
PERI-PROTHETIQUES**

OSTEOPOROSE

STRESS SHIELDING

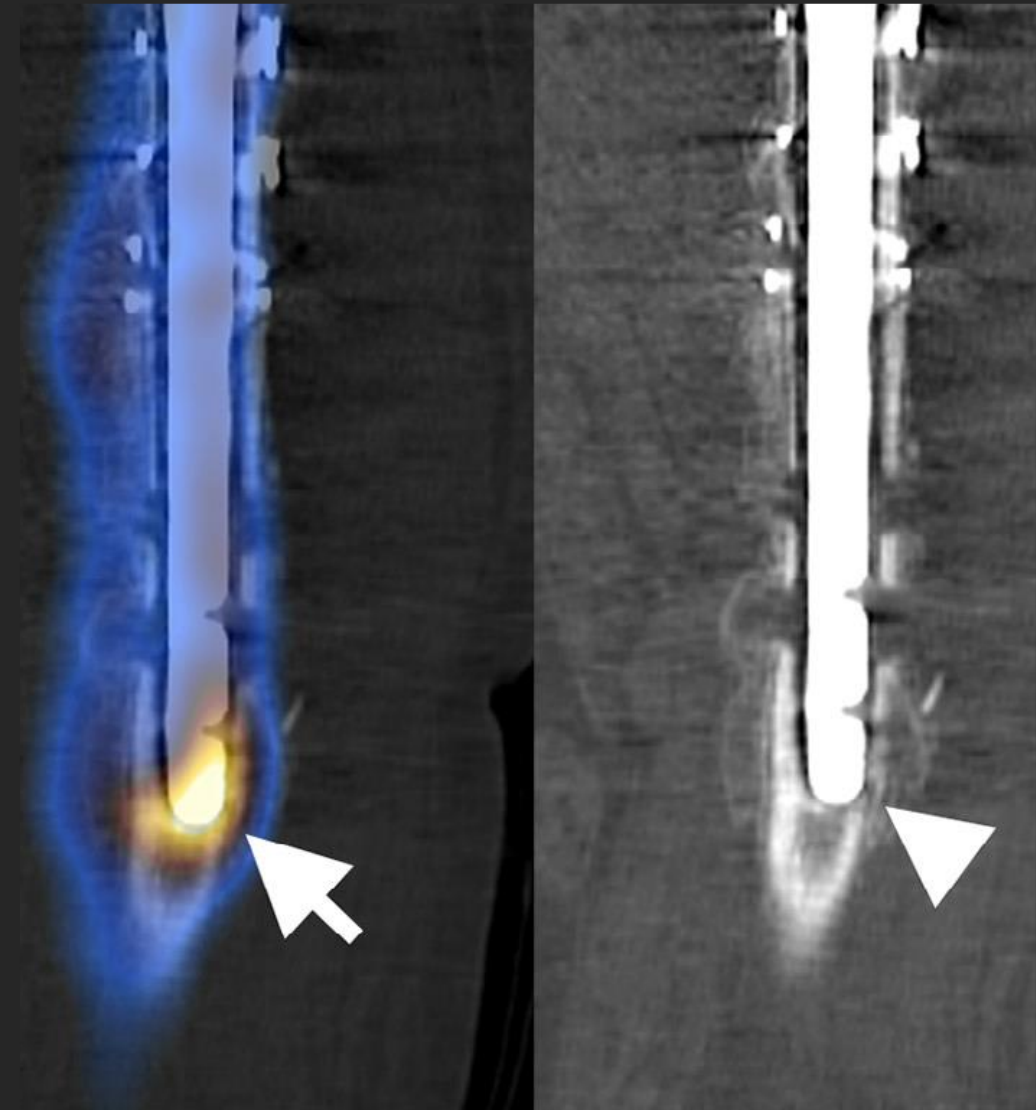
DESCELLEMENT

FEMORALE > ACETABULAIRE

QUEUE DE PROTHESE ++

FIXATION PRECOCE ET
TARDIVE

PERPENDICULAIRE AXE OS



CLASSIFICATION DE VANCOUVER

A REGION TROCHANTERIENNE

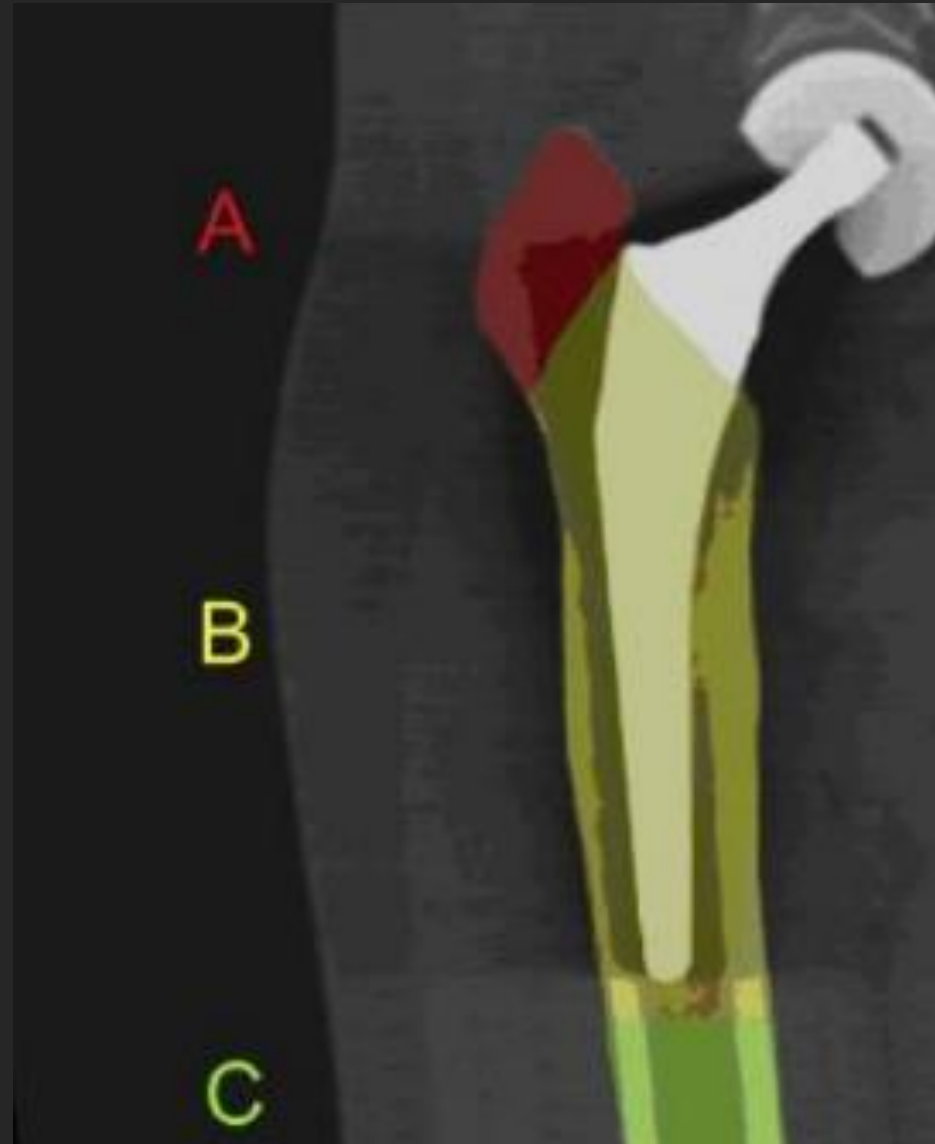
B TIGE FEMORALE

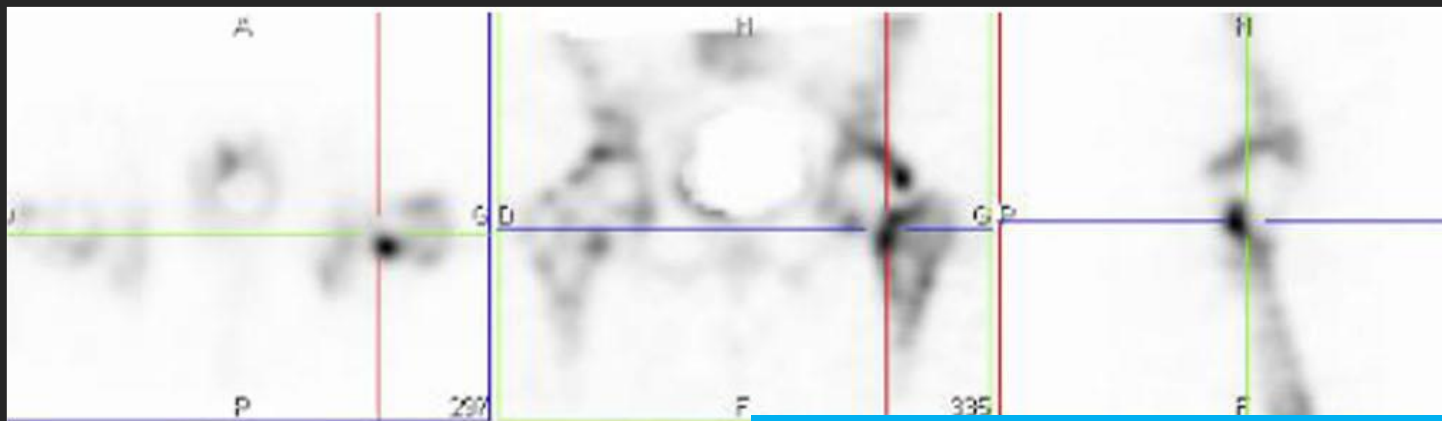
B1 SANS DESCELLEMENT

B2 AVEC DESCELLEMENT
FEMORAL

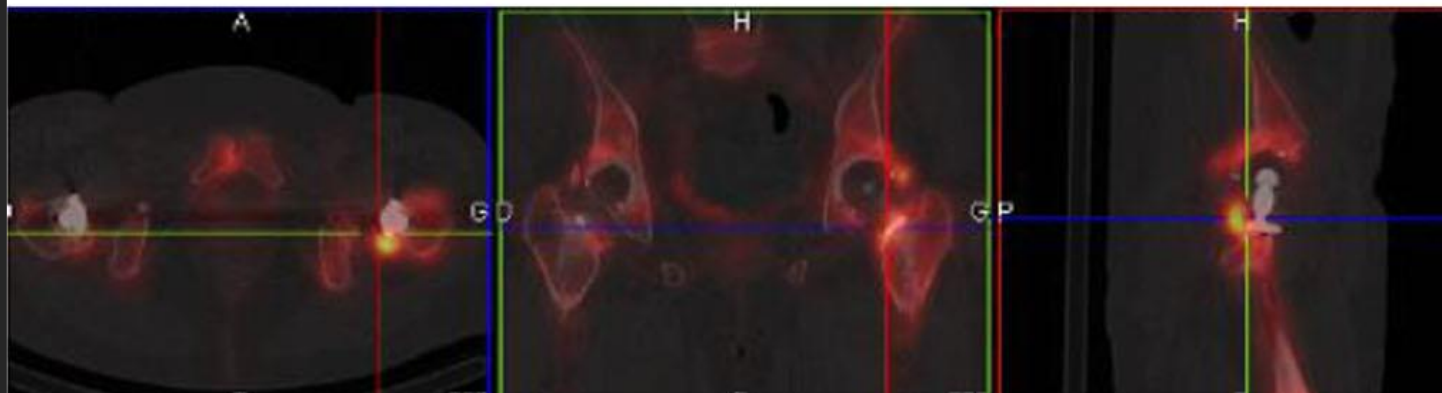
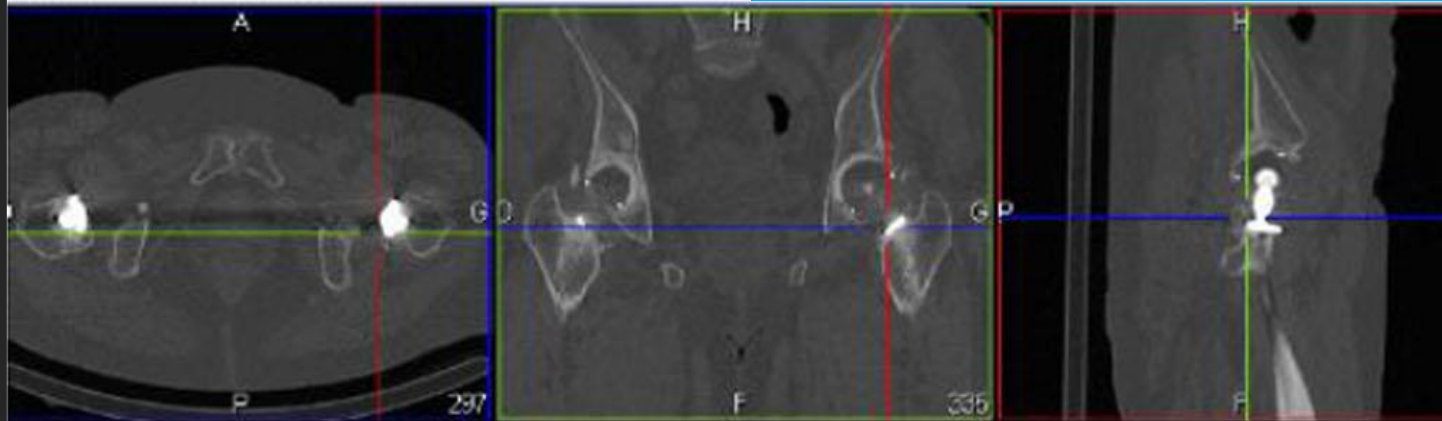
B3 AVEC DESCELLEMENT ET OS
PAUVRE

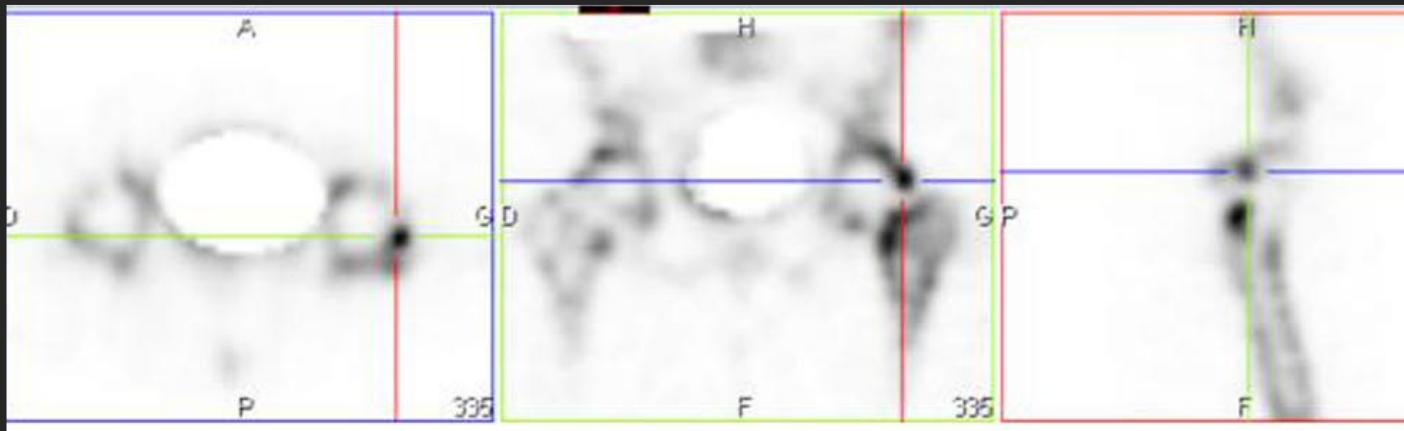
C A DISTANCE DE LA TIGE





FISSURE EN ZONE 7 DE GRUEN





FISSURE EN ZONE I DE DELEE

