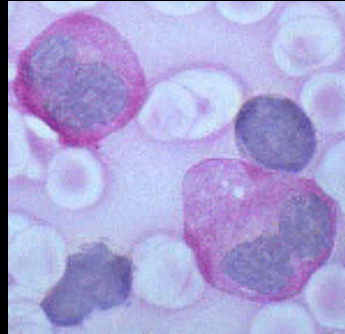




**AOSPINE**  
**EUROPE**



# ***Substitutos ósseos e factores estimulantes do osso***

Tomar, 2008

***Fernando Judas***

“O mercado europeu dos substitutos do osso representaram cerca de **60 milhões de dólares** em 2005, com uma perspectiva de **120** milhões de dólares em 2010”

Mainard D. Cahiers d'enseignement de la SOFCOT  
2007

**80 substitutos no mercado francês**

## **Substituto ósseo / substituto do osso**

“.....tout biomatériau d'origine humaine, animale, végétale ou synthétique, destiné à l'implantation chez l'homme, dans la perspective d'une reconstitution du stock osseux, par le renforcement d'une structure osseuse ou le comblement d'une perte de substance osseuse d'origine traumatique ou orthopédique”

**GESTO, 2005**

## **Substitutos do osso/ expansores/ promo. da regeneração óssea**

- Autoenxertos ósseos, medula óssea e concentrados de plaquetas autógenos....

- Aloenxertos ósseos (esponjosos, corticais, osteocartilagíneos, corticais desmineralizados)

- Biocerâmicos sintéticos

hidroxiapatite, fosfato tricálcico, mistos, biovidros...

cimentos bioativos de fosfato de cálcio

- Sulfato de cálcio sintético

- Xenoenxertos tratados (ceramização) de origem bovina e porcina

coral natural, hidroxiapatite coralina, carbonato de cálcio

- Biomoléculas (BMPs-2 e 7, TGFs, IGFs.....)

- Estimulação biofísica.....

**Autoenxerto  
esponjoso**

# Tríada de regeneração óssea

## Osso esponjoso

osteoblastos  
*Stem Cells*

osteoformação

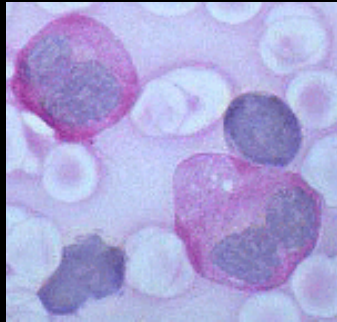
osteoidução

Matriz óssea descalcificada "DBM"  
Factores de crescimento - BMPs, PDGFs...

osteocondução

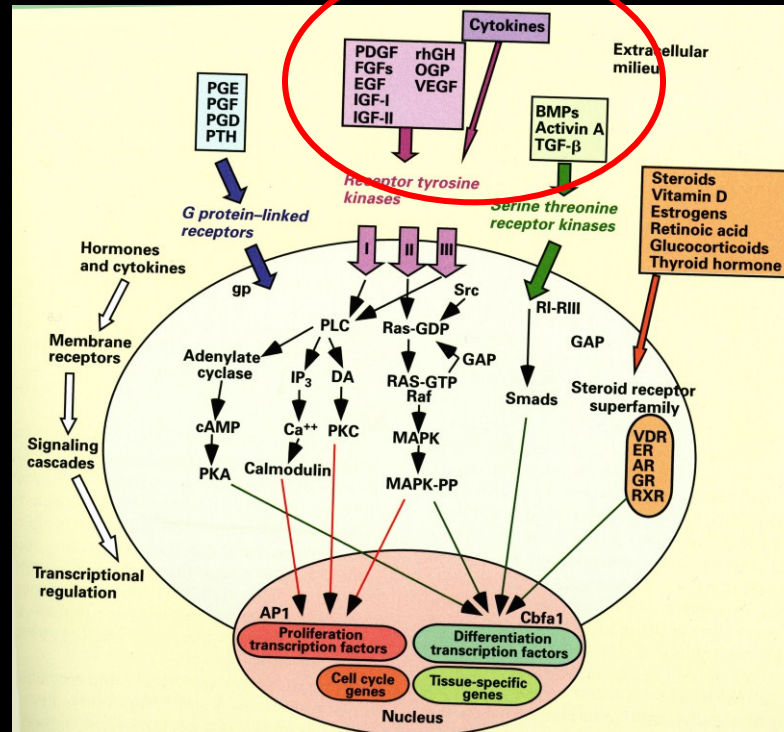
Aloenxerto ósseo, xenoenxerto ósseo, hidroxiapatite, fosfato tricálcico, biovidro, coral.....

# Stem Cells

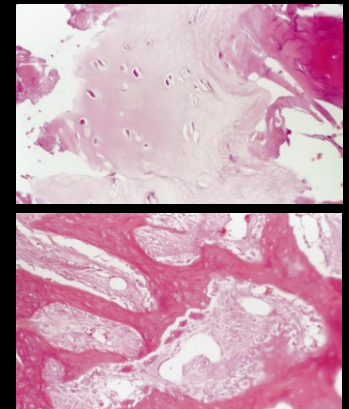


Mesenquimatomas pluripotenciais  
 Histaminais  
 Progenitoras  
 Germinativas  
 Indiferenciadas

**Stem cells**



Condroblastos  
 Osteoblastos  
 Fibroblastos  
 Mioblastos...





**rhBMP-2**  
**rhBMP-7**





medula óssea



1 *stem cell* em 100.000 células nucleadas

**Concentrado de plaquetas**

**Factores de crescimento**

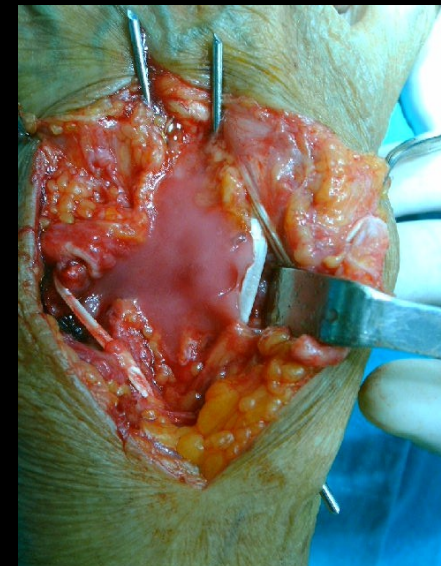
PDGF

TGF- $\beta$

IGF

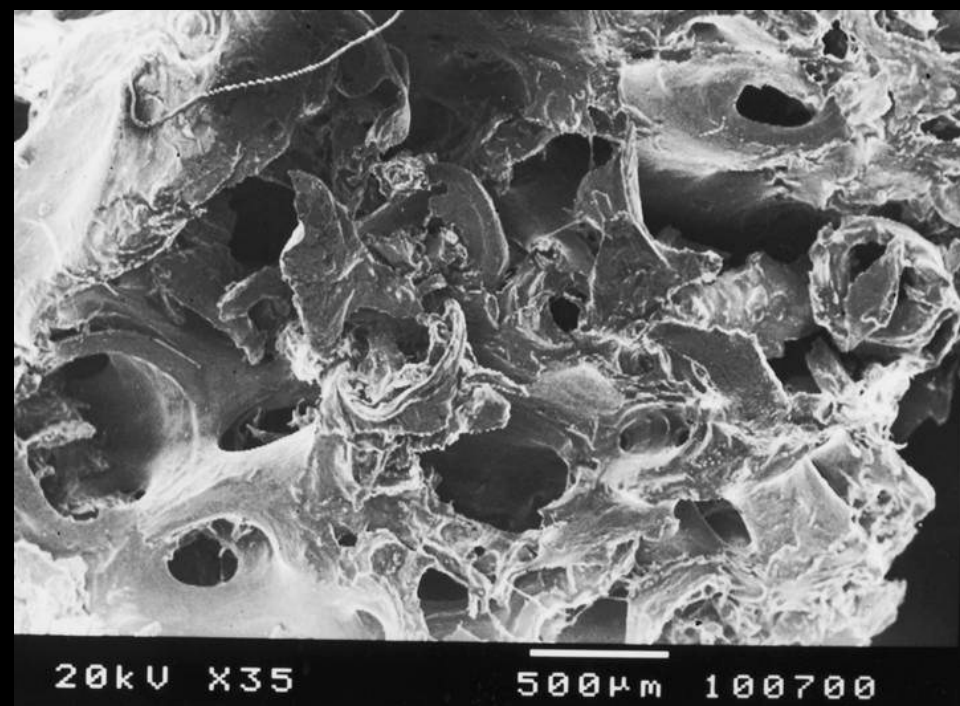
FGF

VEGF.....



**Banco de Tecidos dos HUC**

## *Aloenxertos esponjosos granulados criopreservados*

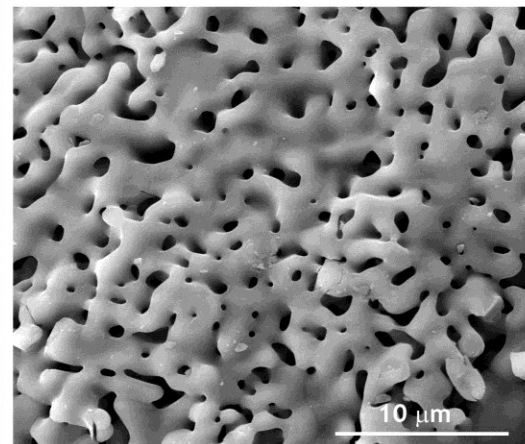
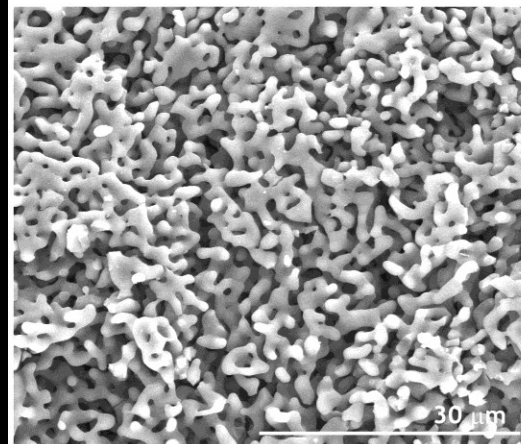
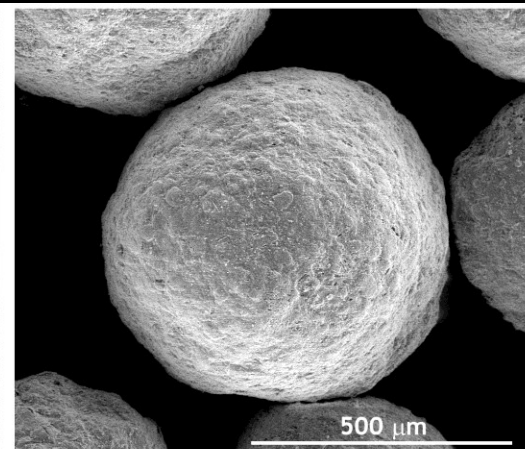
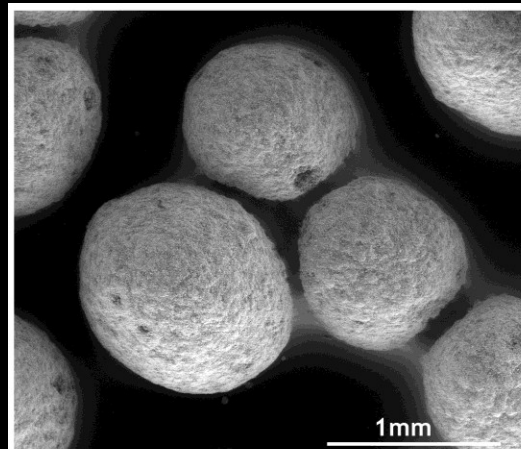


**Propriedades osteocondutoras favorecem a  
regeneração de osso novo**

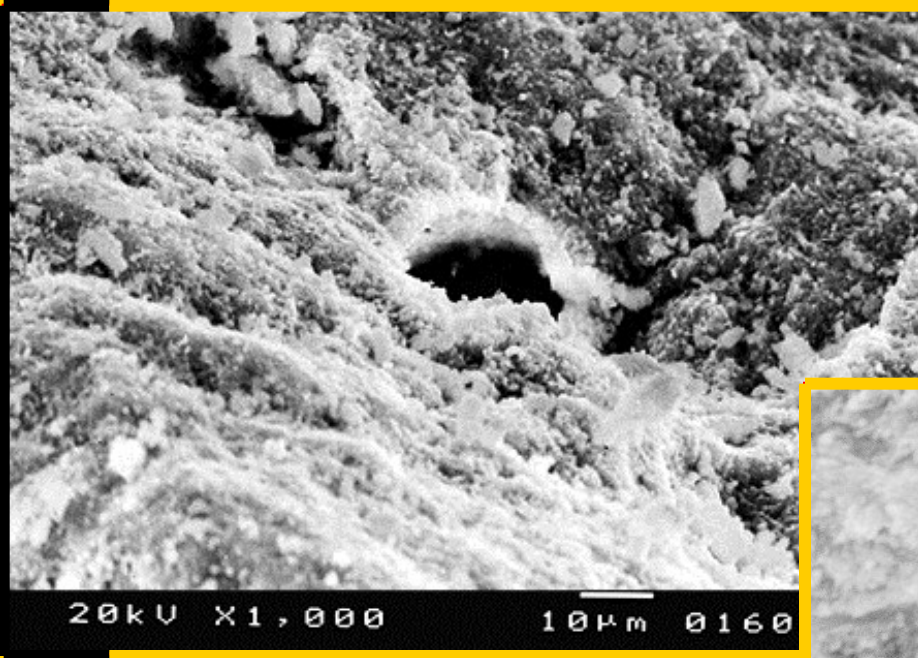


*Hidroxiapatite reforçada por um biovidro*

Estrutura idêntica à do osso humano



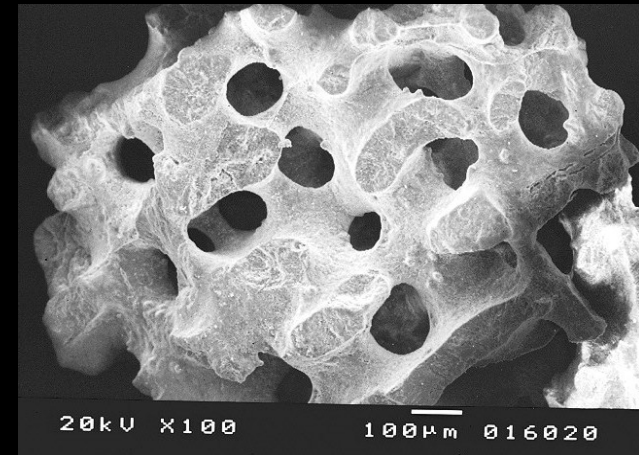
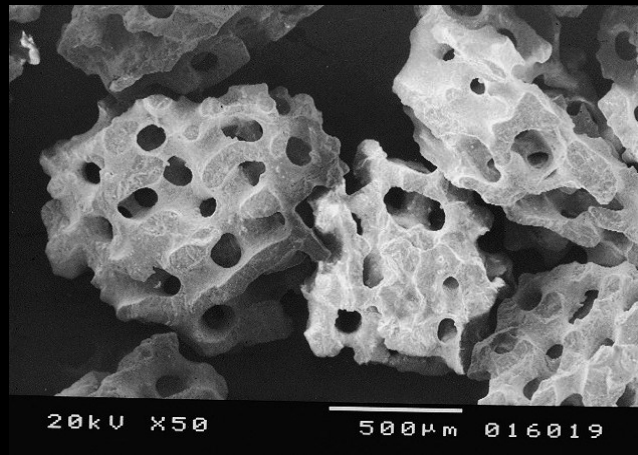
# CARACTERÍSTICAS MORFOLÓGICAS E ESTRUTURAIS - SEM



Micro-estrutura da parede de uma lacuna óssea rodeada por matriz mineralizada, sendo possível observar a presença de canaliculos ósseos.



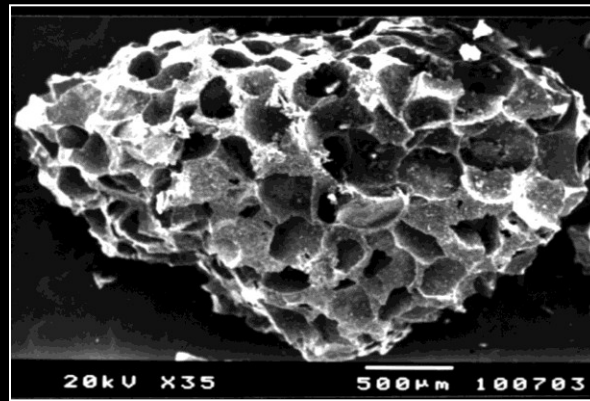
## Substitutos do Osso - resistência mecânica -



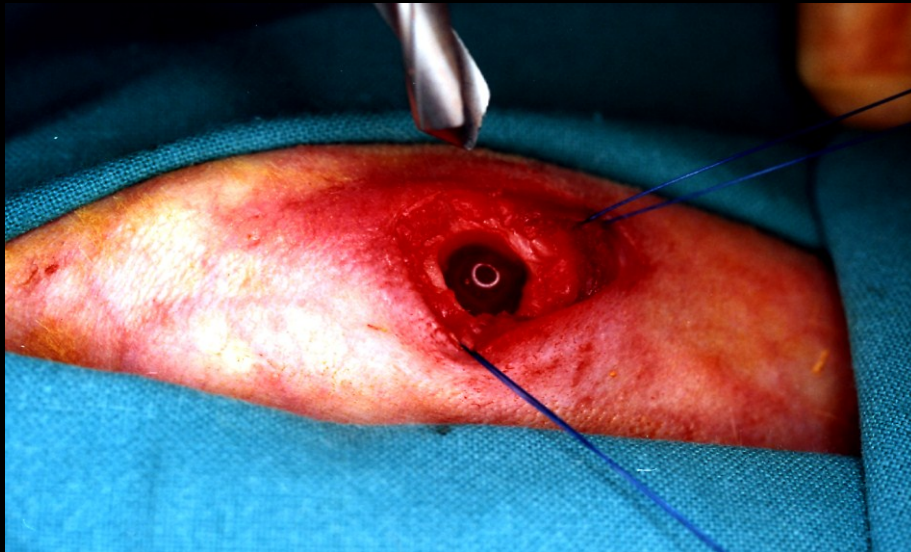
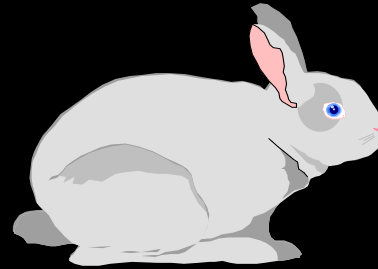
***Aloenxertos ósseos granulados/ hidroxiapatite***



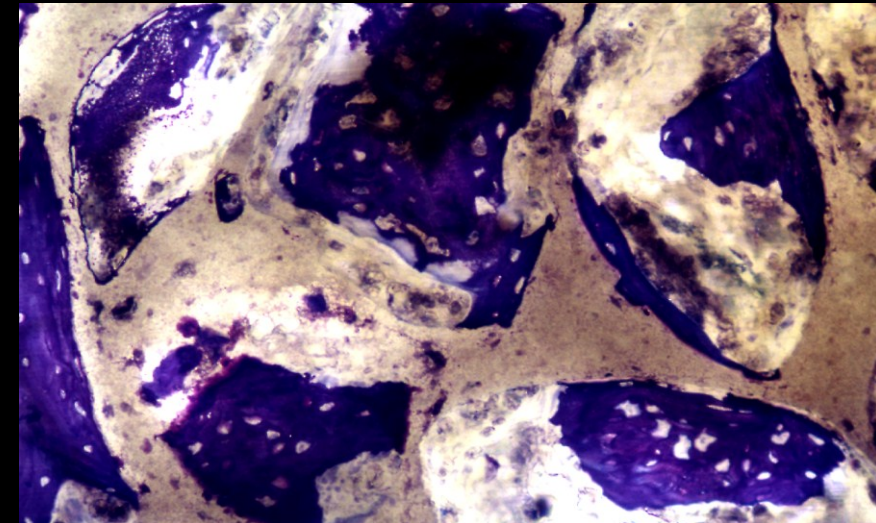
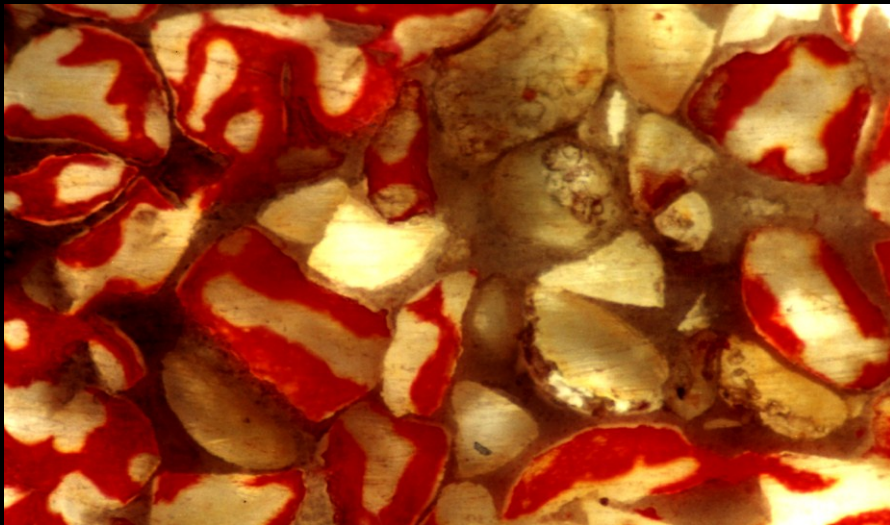
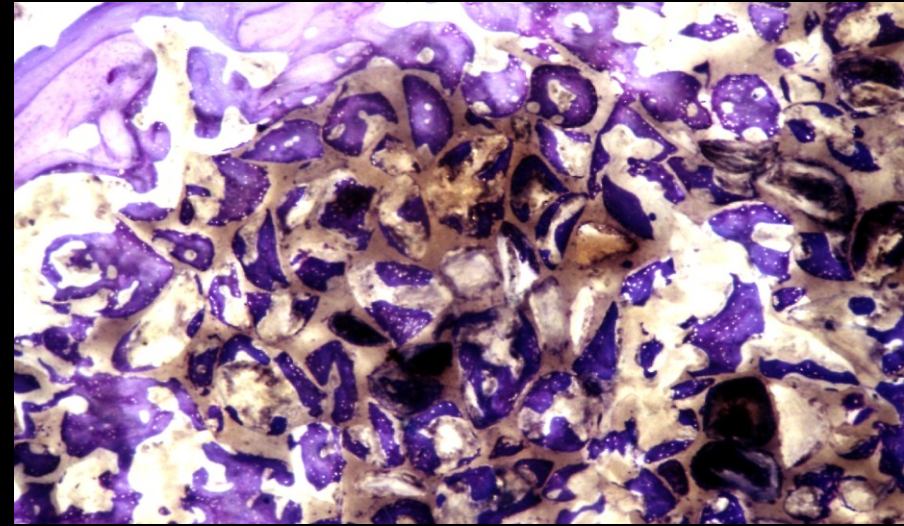
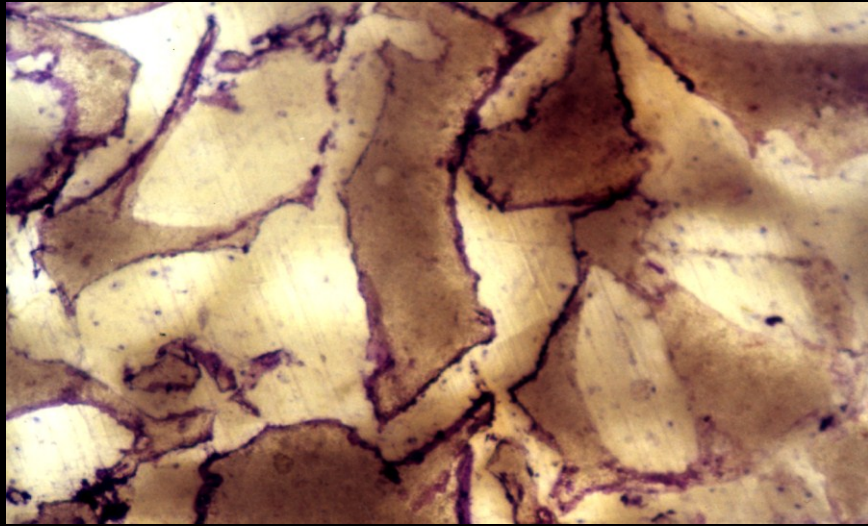
**200-300  $\mu\text{m}$**



**700-800  $\mu\text{m}$**

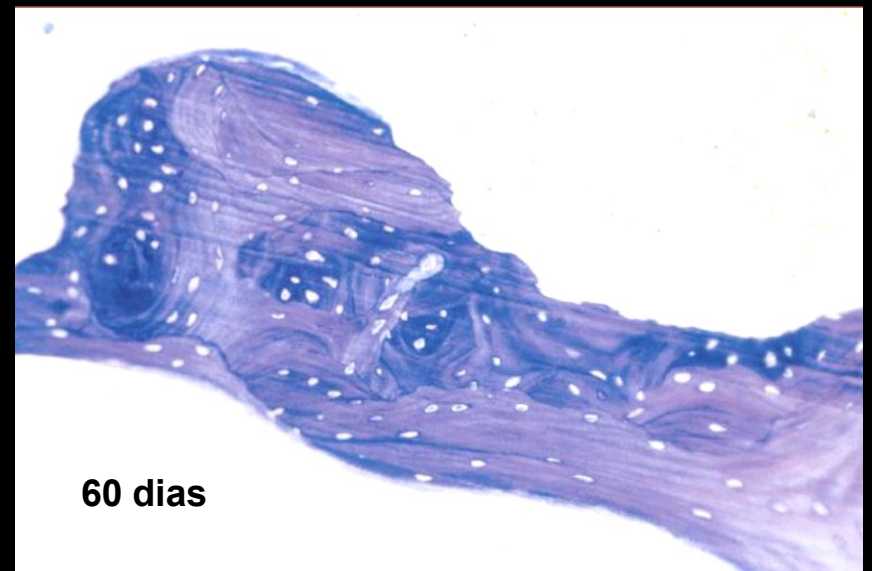
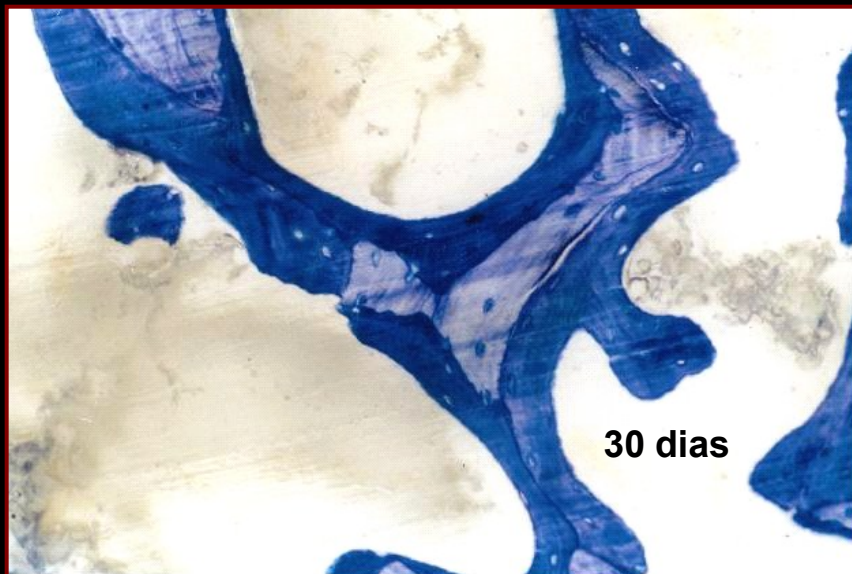
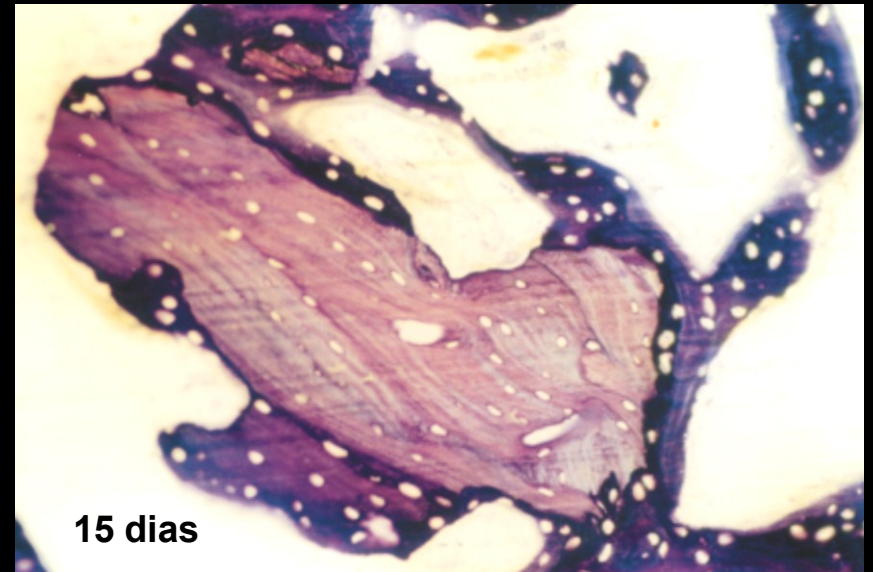
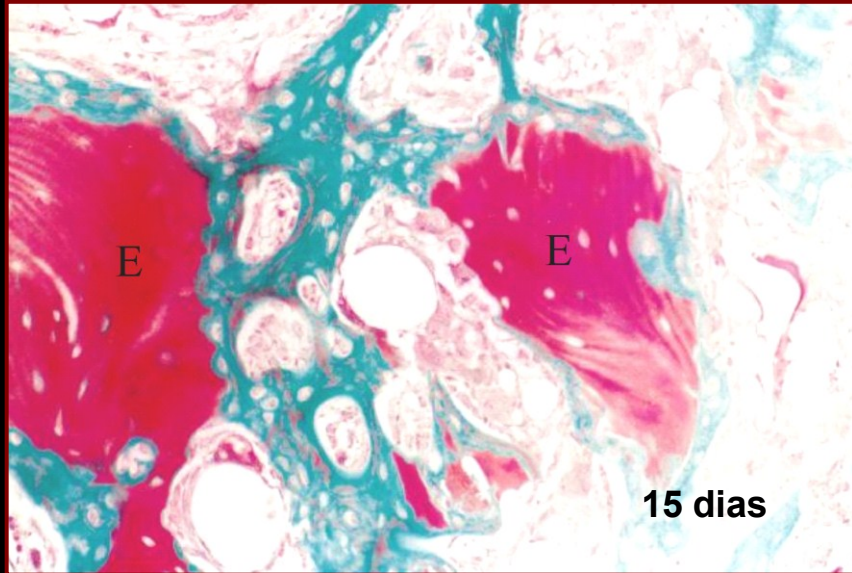


## Grânulos de hidroxiapatite



2 meses de evolução

# *Aloenxertos ósseos esponjosos granulados criopreservados*



# Bone allografts/Tissue Banking





Coimbra University Hospital Tissue Bank



# Banco de Tecidos dos HUC

## Aloenxertos aplicados 1982-2007





**Cortical bone allograft**



20kV X50

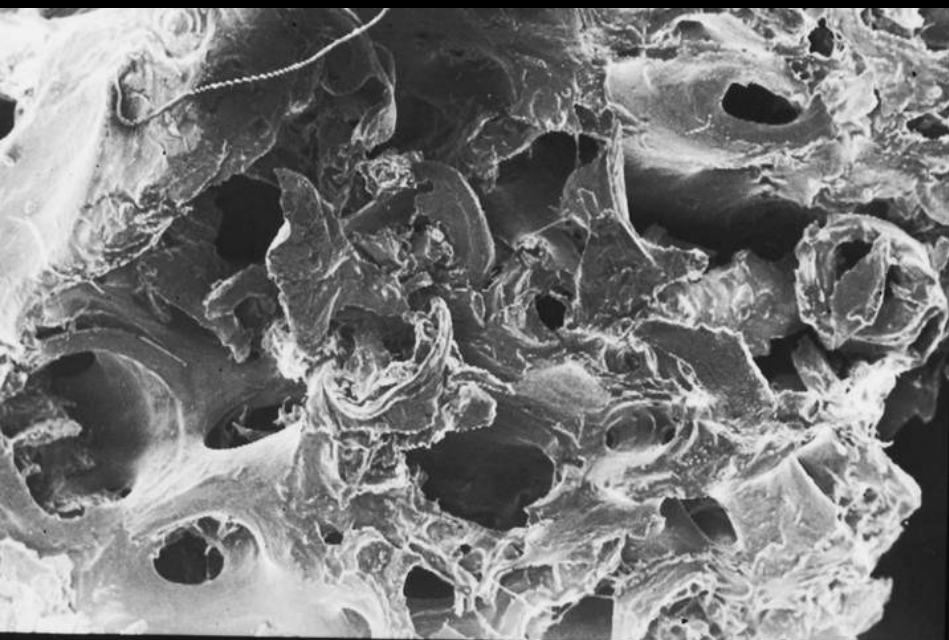
500µm 207020



**Osteoarticular and osteochondral allografts**



**Cancellous bone allograft**



20kV X35

500µm 100700

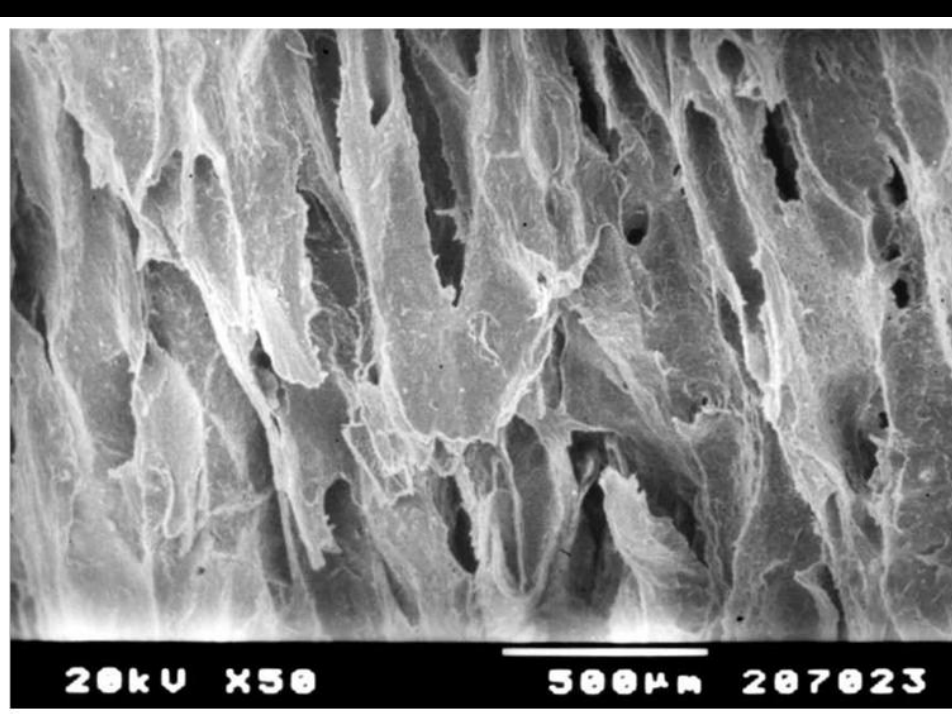


HOSPITAIS DA  
UNIVERSIDADE DE COIMBRA  
BANCO DE OSSOS  
Tel: (351) 400609 - Fax: (351) 404380  
Tipo de envase: *Granulado*  
Código: *935-2* Ref: *62*  
Data: *30/9/01*  
Valid: *30/9/03*  
Conservação: *azul*  
N.º C. - Mod. 189 - 10.000 ea. - 10196

HOSPITAIS DA  
UNIVERSIDADE DE COIMBRA  
BANCO DE OSSOS  
Tel: (351) 400609 - Fax: (351) 404380  
Tipo de envase: *Granulado*  
Código: *2400-1* Ref: *935-7*  
Data: *30/9/01*  
Valid: *30/9/03*  
Conservação: *azul*  
N.º C. - Mod. 189 - 10.000 ea. - 10196



**Demineralised bone matrix (DBM)**  
Cryopreserved



Cortical bone allograft  
**superficial demineralized**

DBM is the only osteoinductive bone allograft material (BMP)

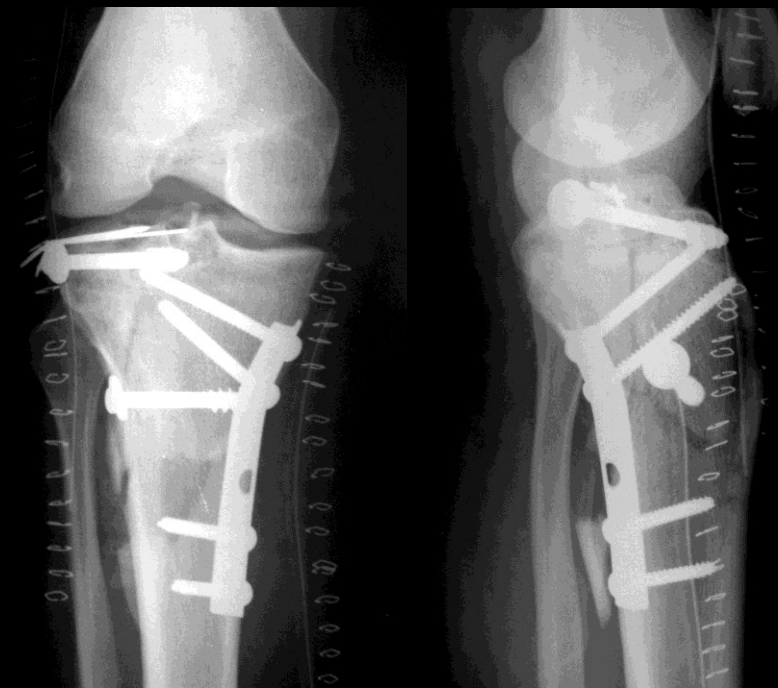


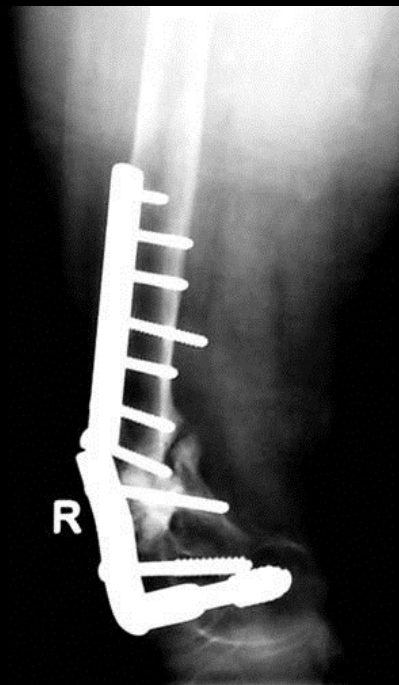
## Freeze-dried bone allograft

Processed, vacuum-packed and  
sterilized by gamma irradiation –  
25 kGy -



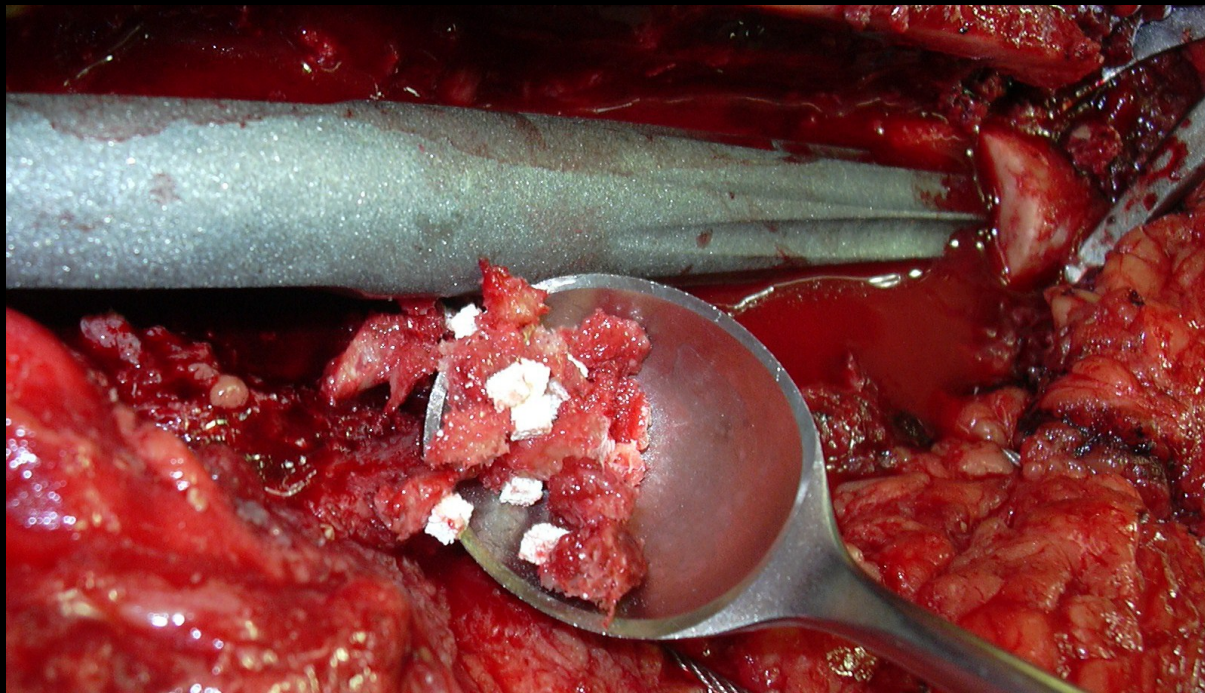
**Cancellous bone allograft (morsellized) in reconstruction of fractures**



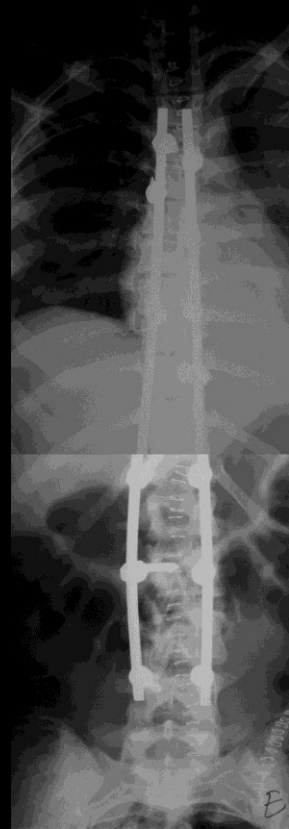
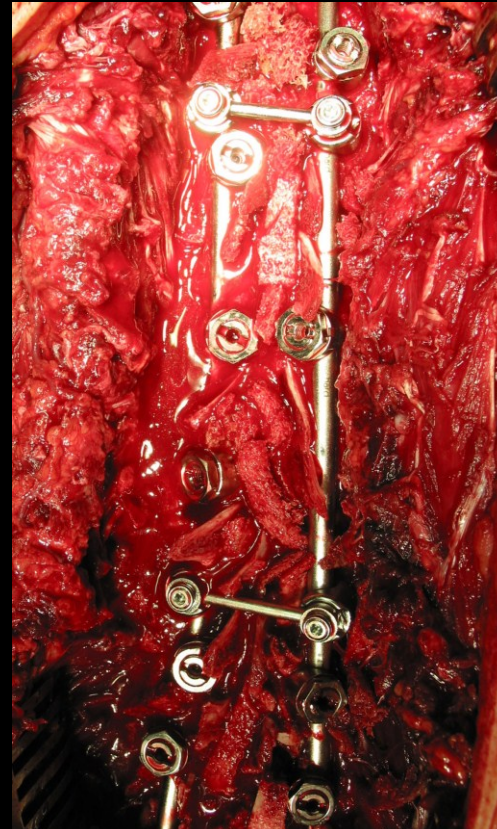
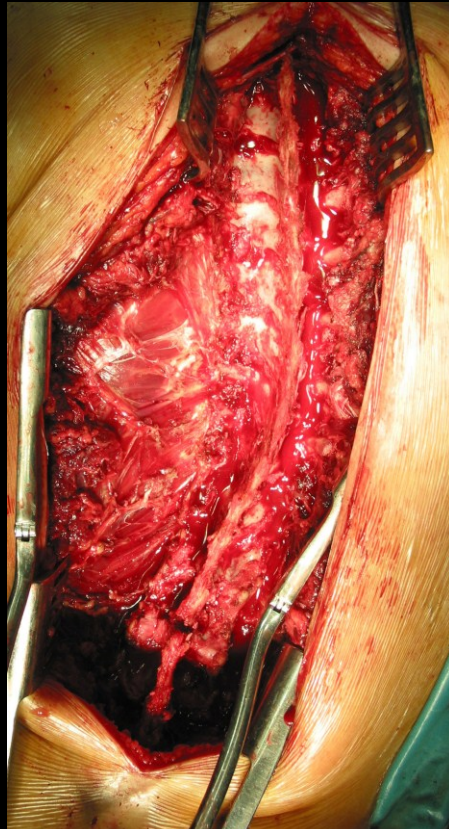


- Autoenxertos ósseos
- Aloenxertos ósseos « DBM »
- Substitutos sintéticos do osso  
hidroxiapatite, fosfato tricálcico,  
cimento fosfocálcico, biovidros...

Técnica cirúrgica, experiência e  
convicções pessoais do cirurgião



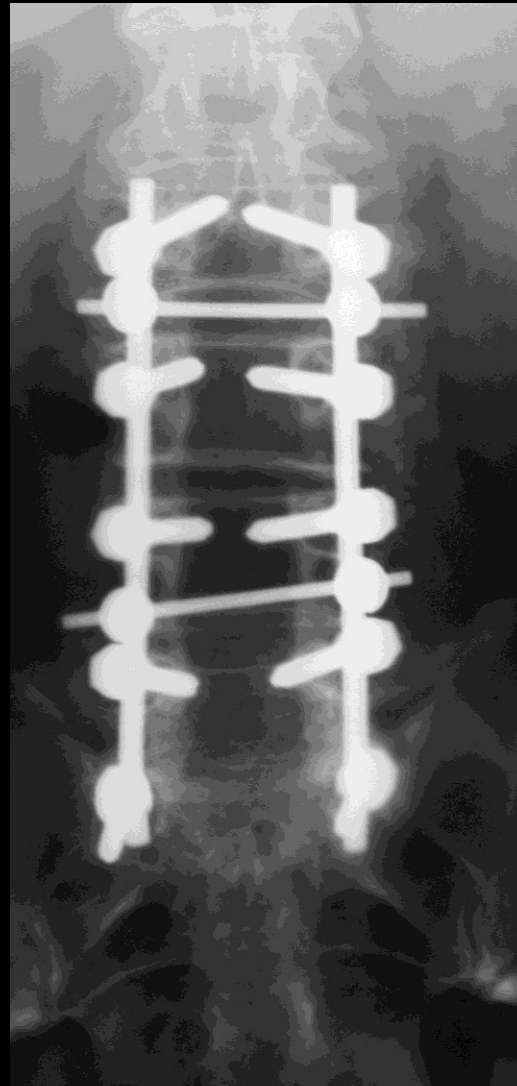
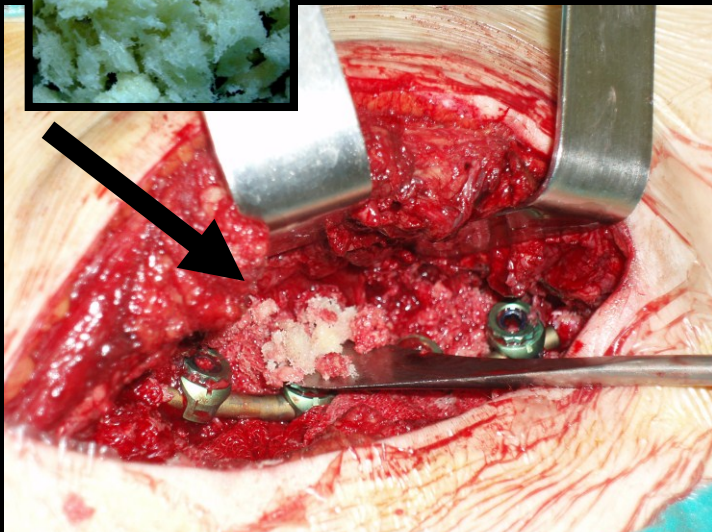
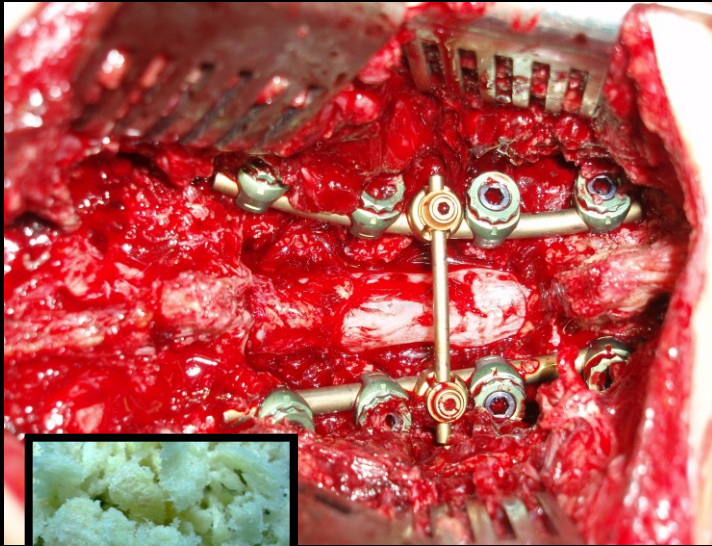
# Escolioses



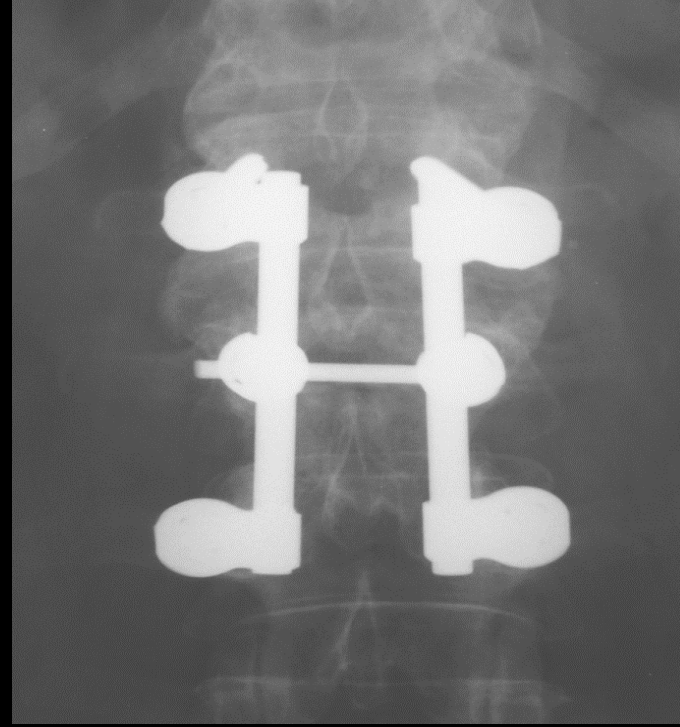
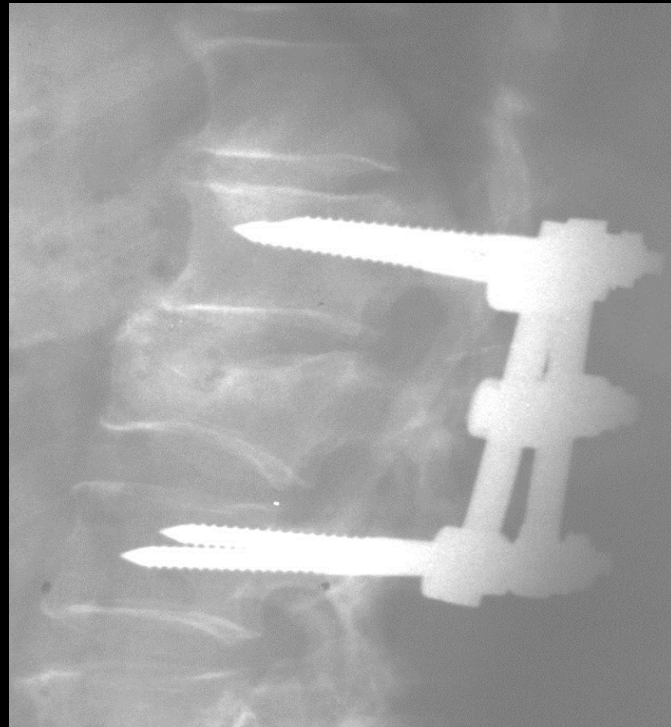
# FUSÃO INTERVERTEBRAL LOMBAR

## Fusão postero - lateral inter-transversária

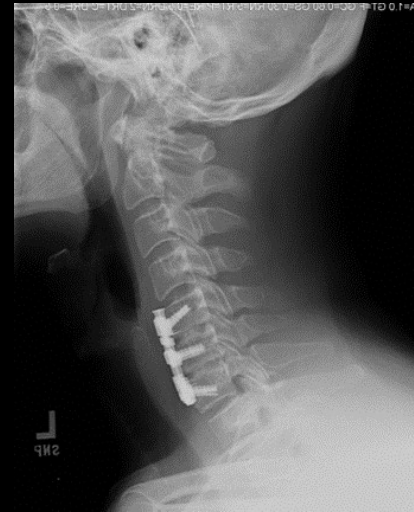
Aloenxerto esponjoso granulado criopreservado

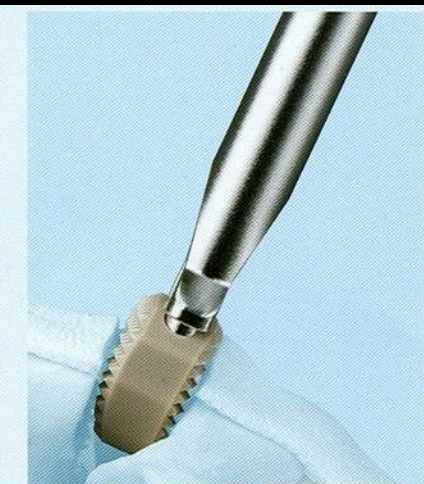
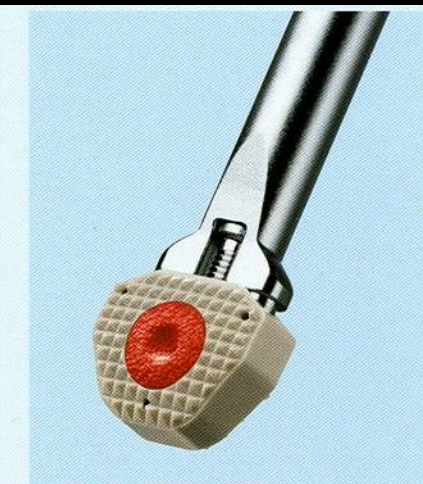
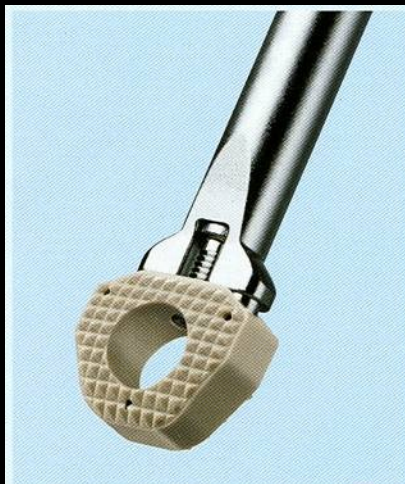
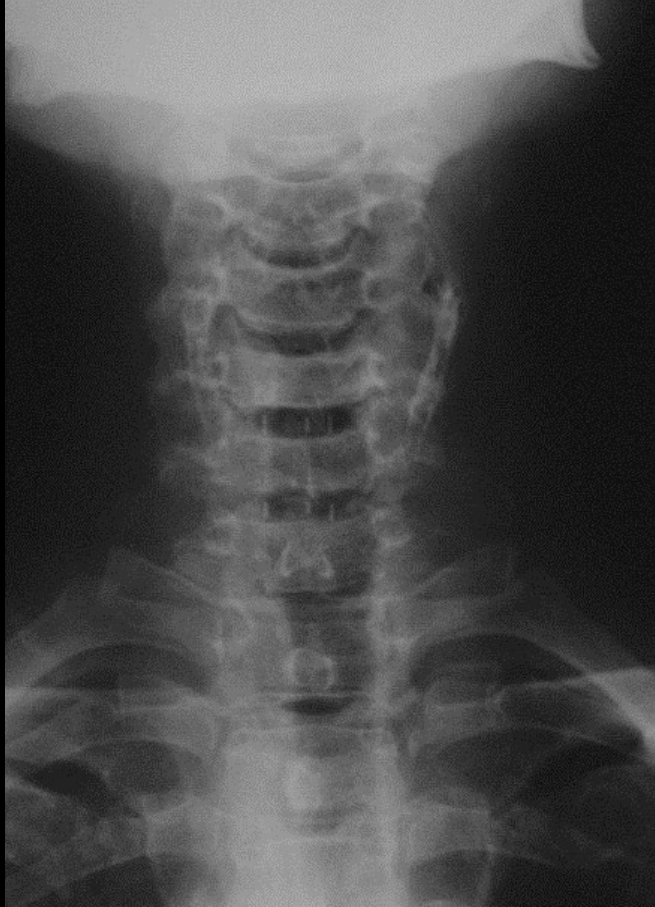


# Fraturas traumáticas – fusão lombar



# Artrodese anterior inters. da coluna cervical





**MO  
BMPs**

# Cortical strut (biological plate)

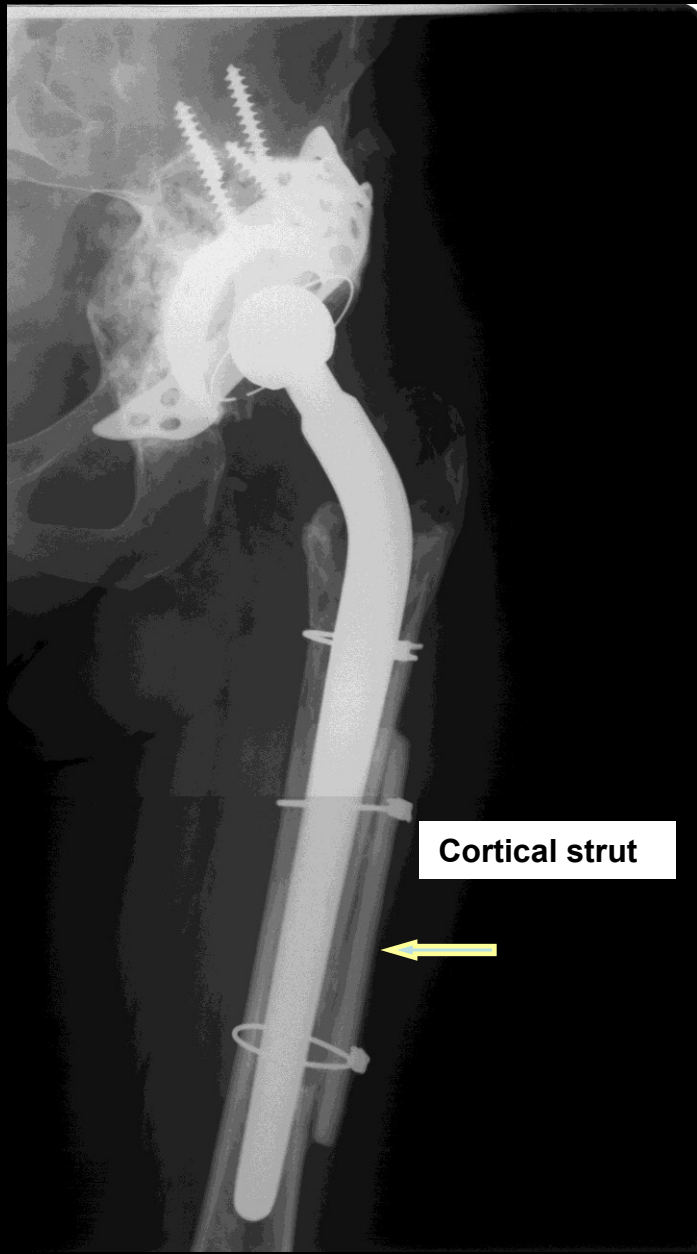


MMMS, femal, 45 y, Rheumatoid Arthristis , PU 1960200896.

15 Y

2005

Cortical strut



PU 19321200268



1 ano pos.

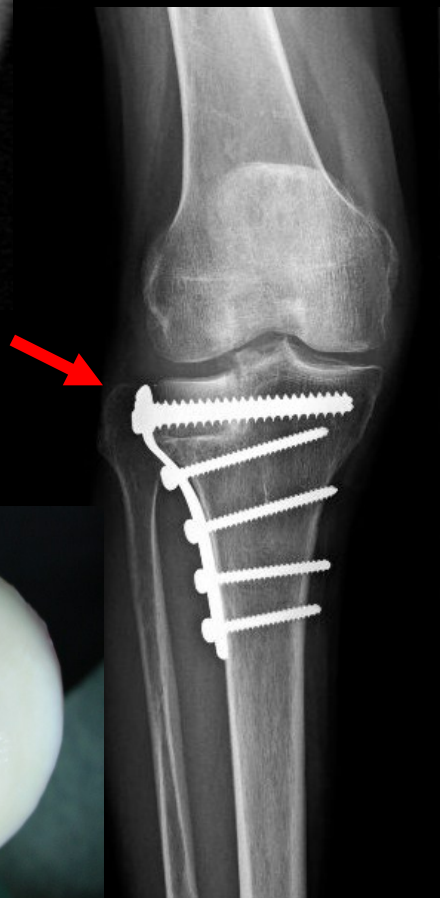
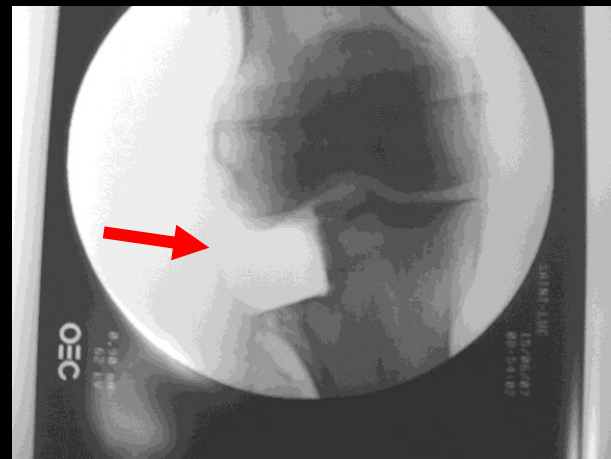
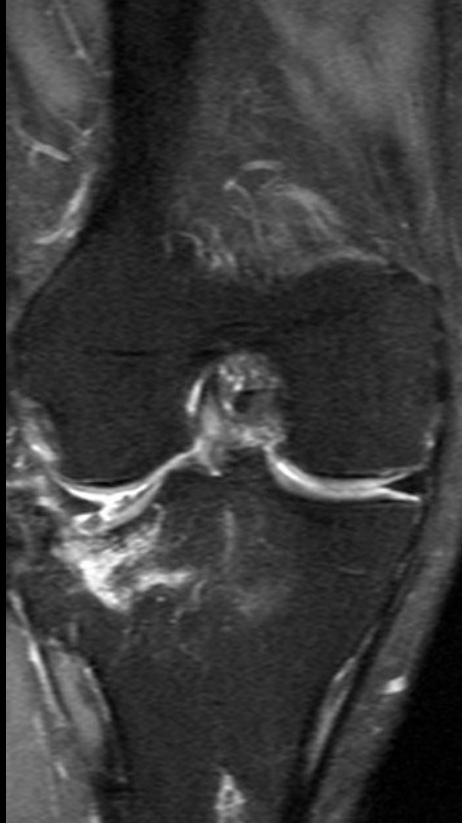
(R)



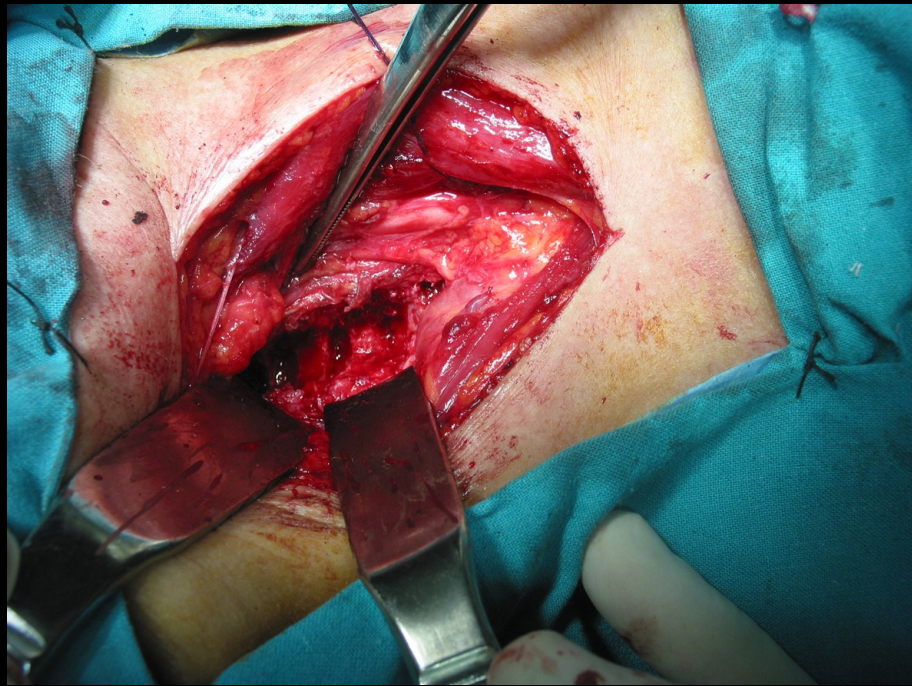
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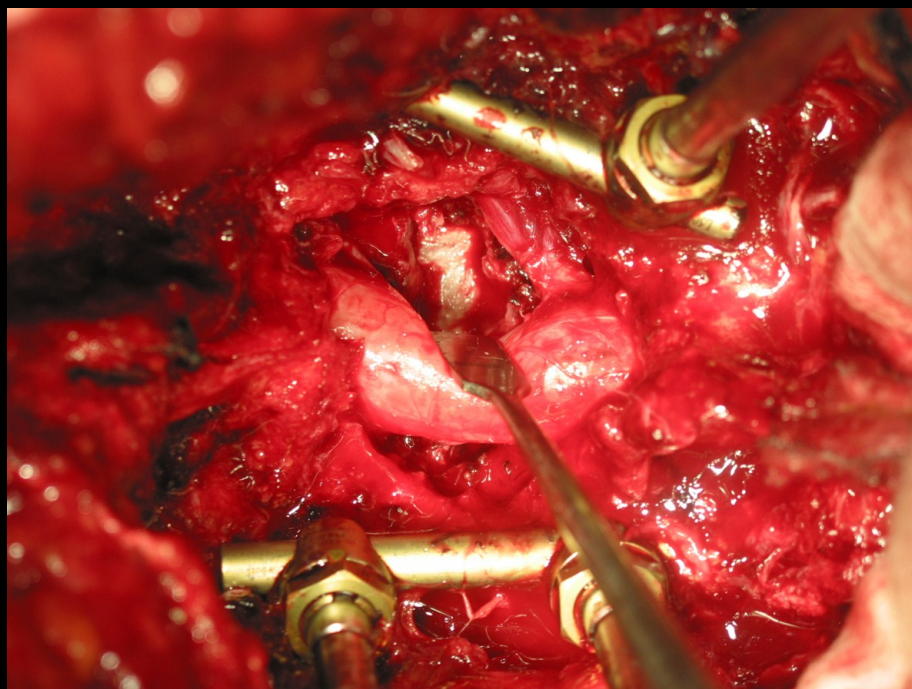
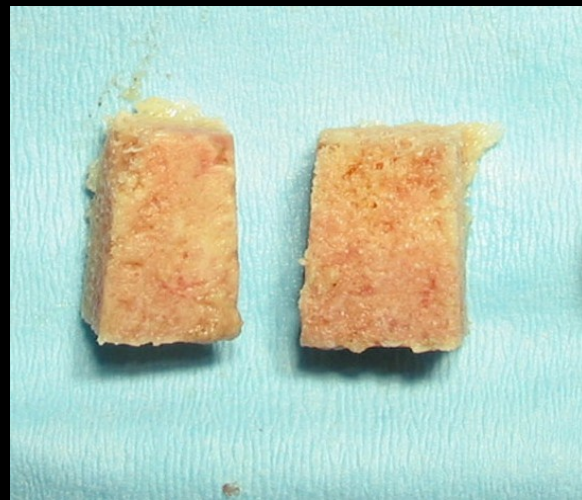
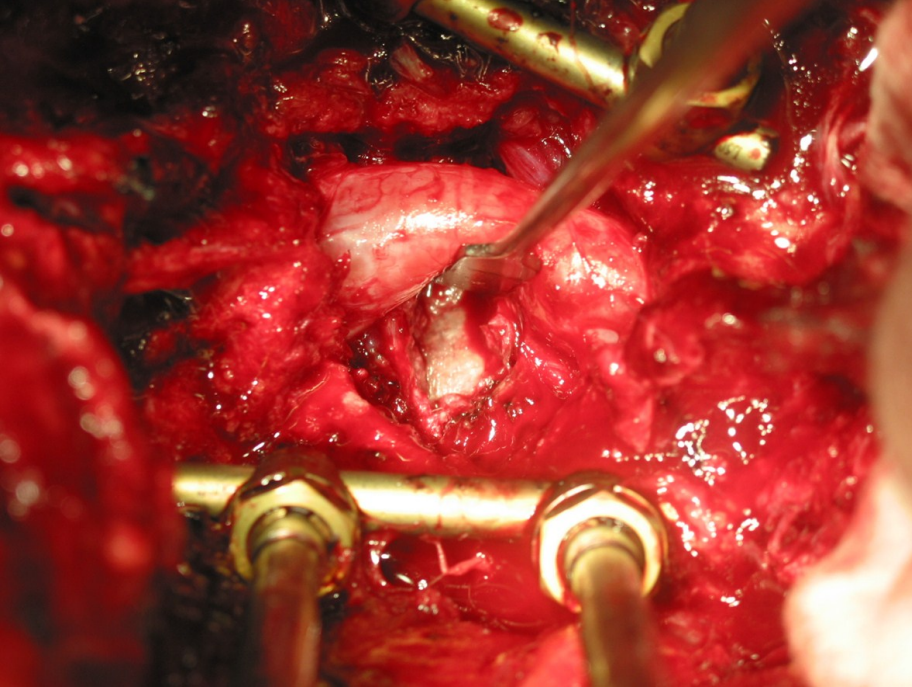
2007



# Mielopatia cervical

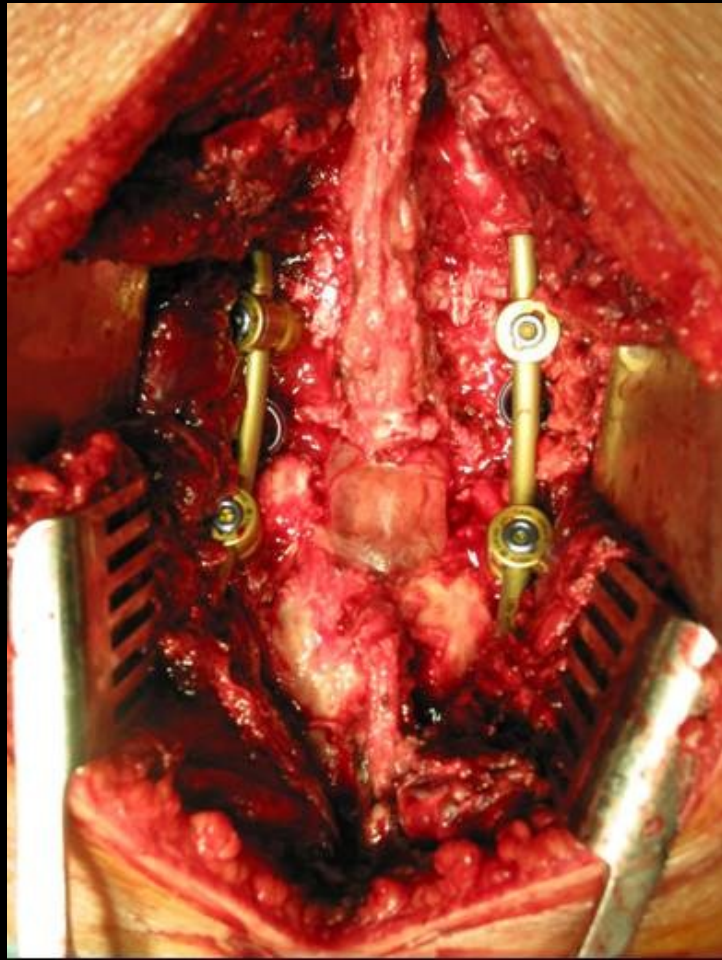


DESC. CERVICAL

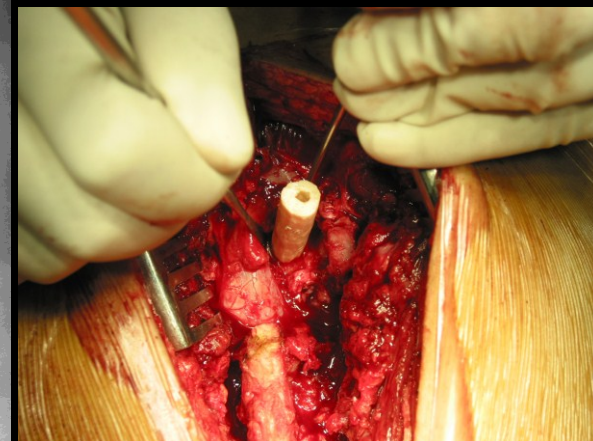


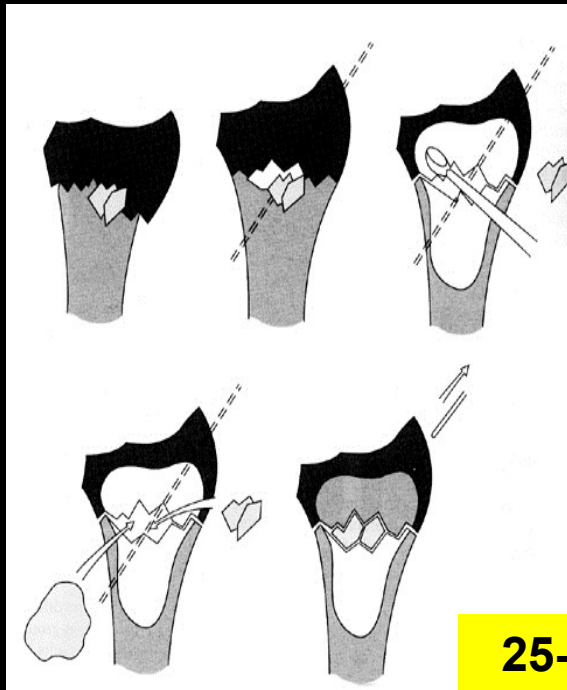


“DBM”



# Espondilolistesis fixação "in situ"



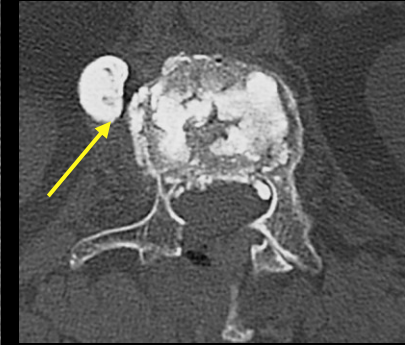
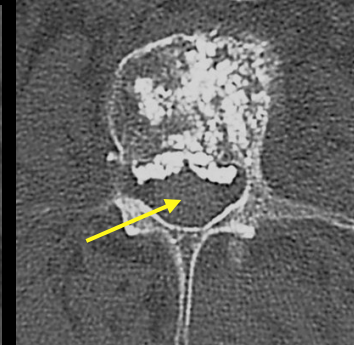
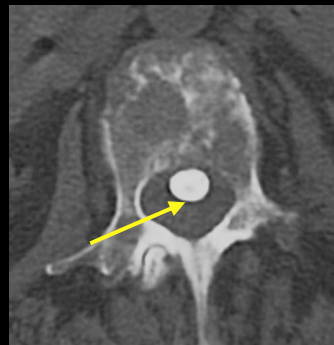
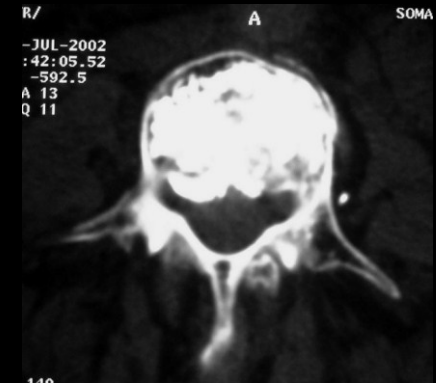
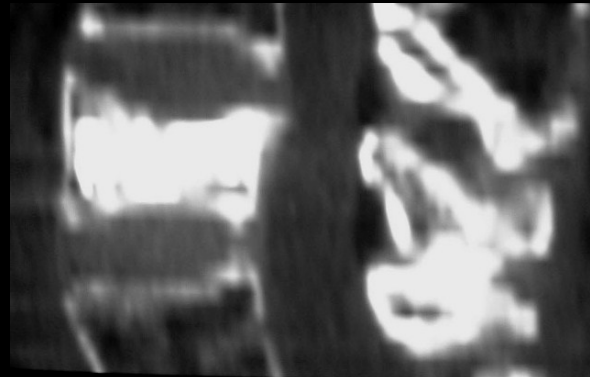
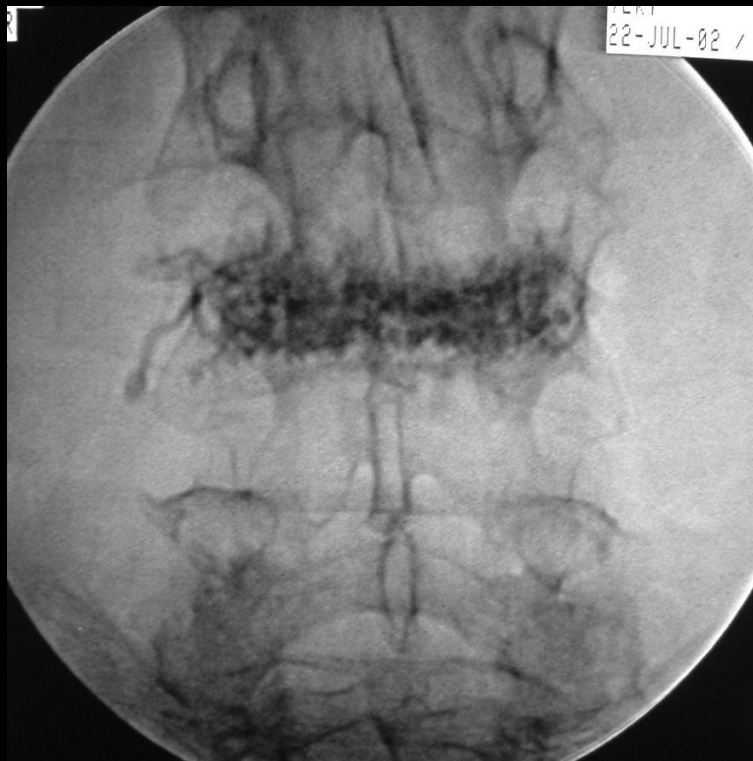


**25-35 MPa**

**Cimentos de fosfato de cálcio**



# Vertebroplastia



*Risco de extravasação do cimento para o canal vertebral*

*Embolia pulmonar*

*Não corrige a deformidade vertebral*





*Troficidade local, Técnica cirúrgica  
Estabilidade mecânica  
Reabilitação pós-operatória  
Estado geral do paciente....*



***..obter o melhor resultado***

# ***Biomateriais Compostos***

**Cultura de  
células**

**Moléculas  
bioativas**

***ESTRUTURA MATRICIAL***

