

Vertébroplastie et Kyphoplastie dans les pathologies non tumorales

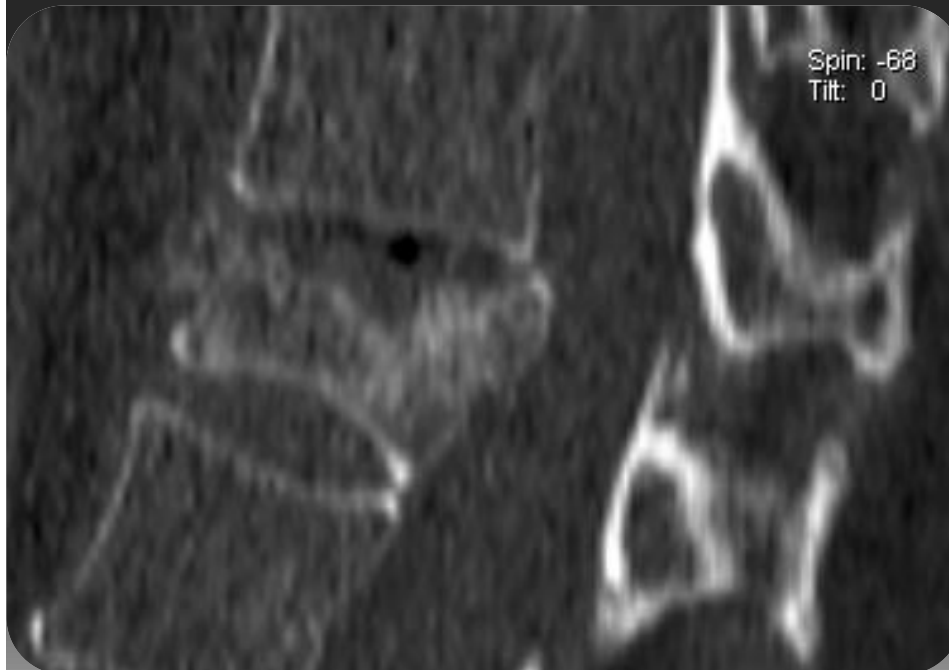
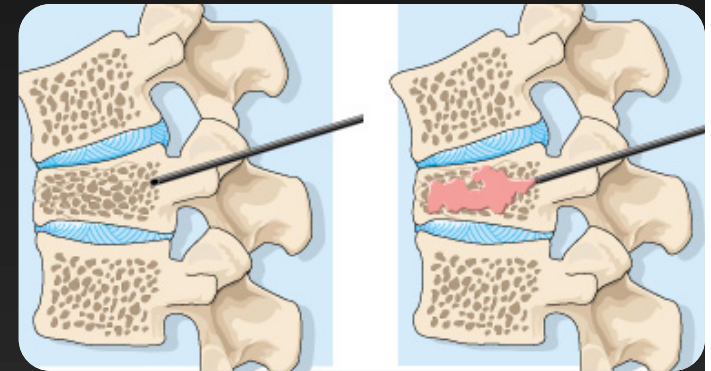


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Service de Radiologie – CHU de Saint-Etienne
SFR-RA, 5 février 2011

VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

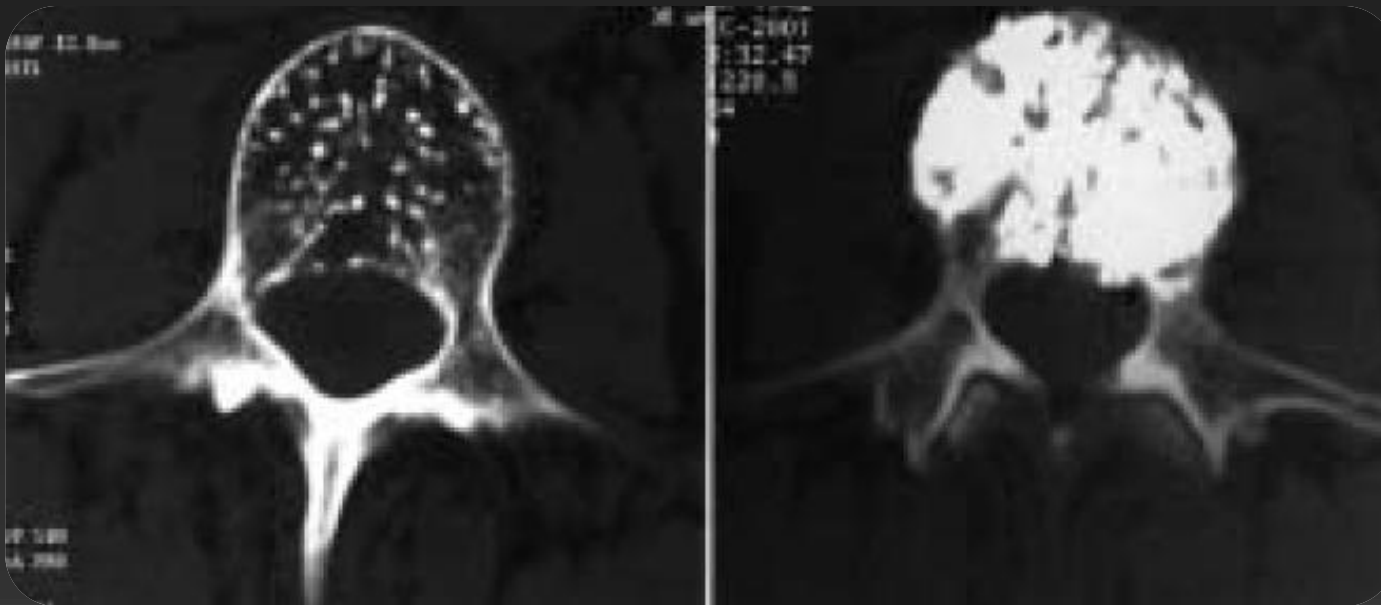
- Injection intravertébrale
- Voie transcutanée
- Ciment acrylique (PMMA)



VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

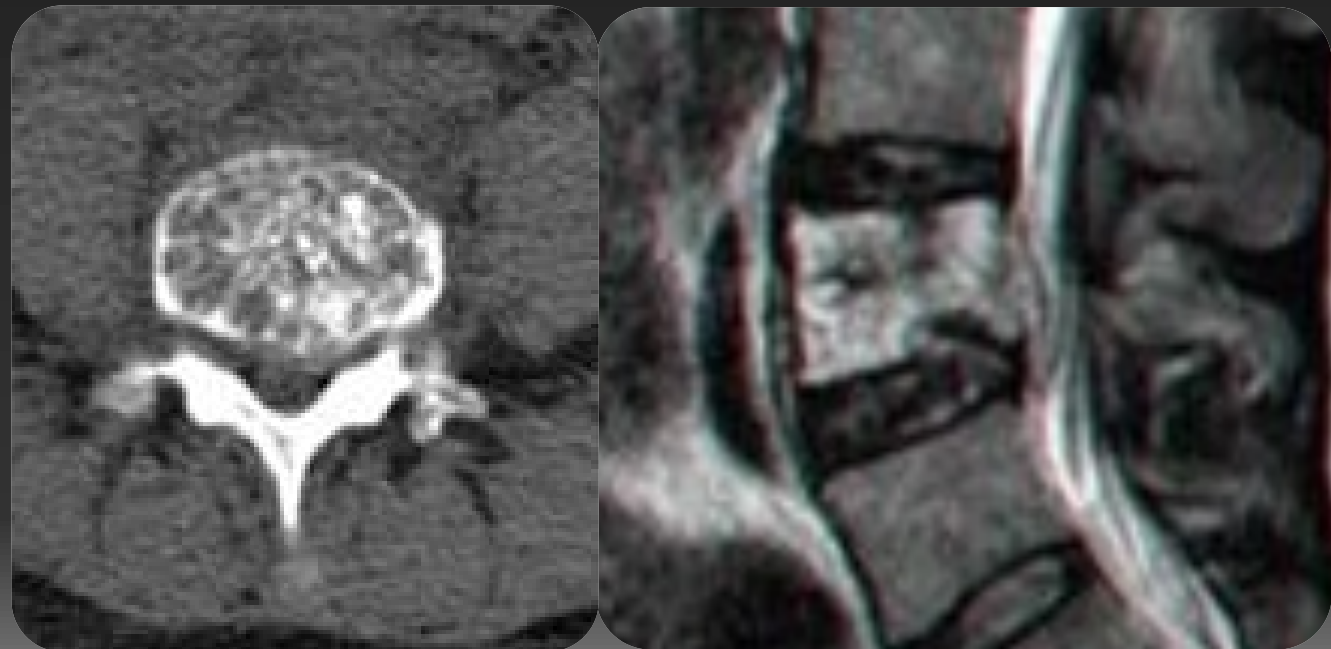
- Angiome vertébral
- Galibert et Deramond (1987)



VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

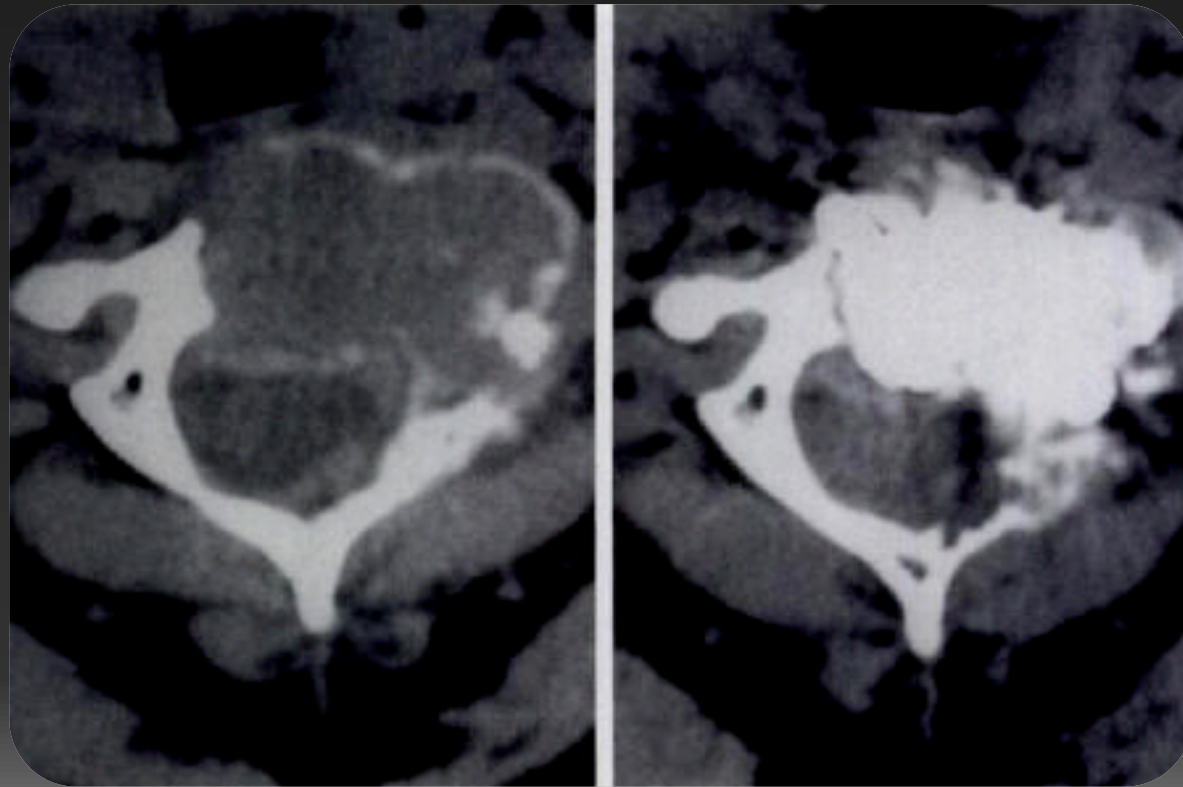
- Angiome vertébral
- Symptomatique
- Critères d'agressivité (Laredo et al, Radiology, 1986 et 1990)



VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- Métastases
- Kaemmerlen et al (1989)



VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- Fractures – tassements ostéoporotiques
- Gangi et al, AJNR 1994

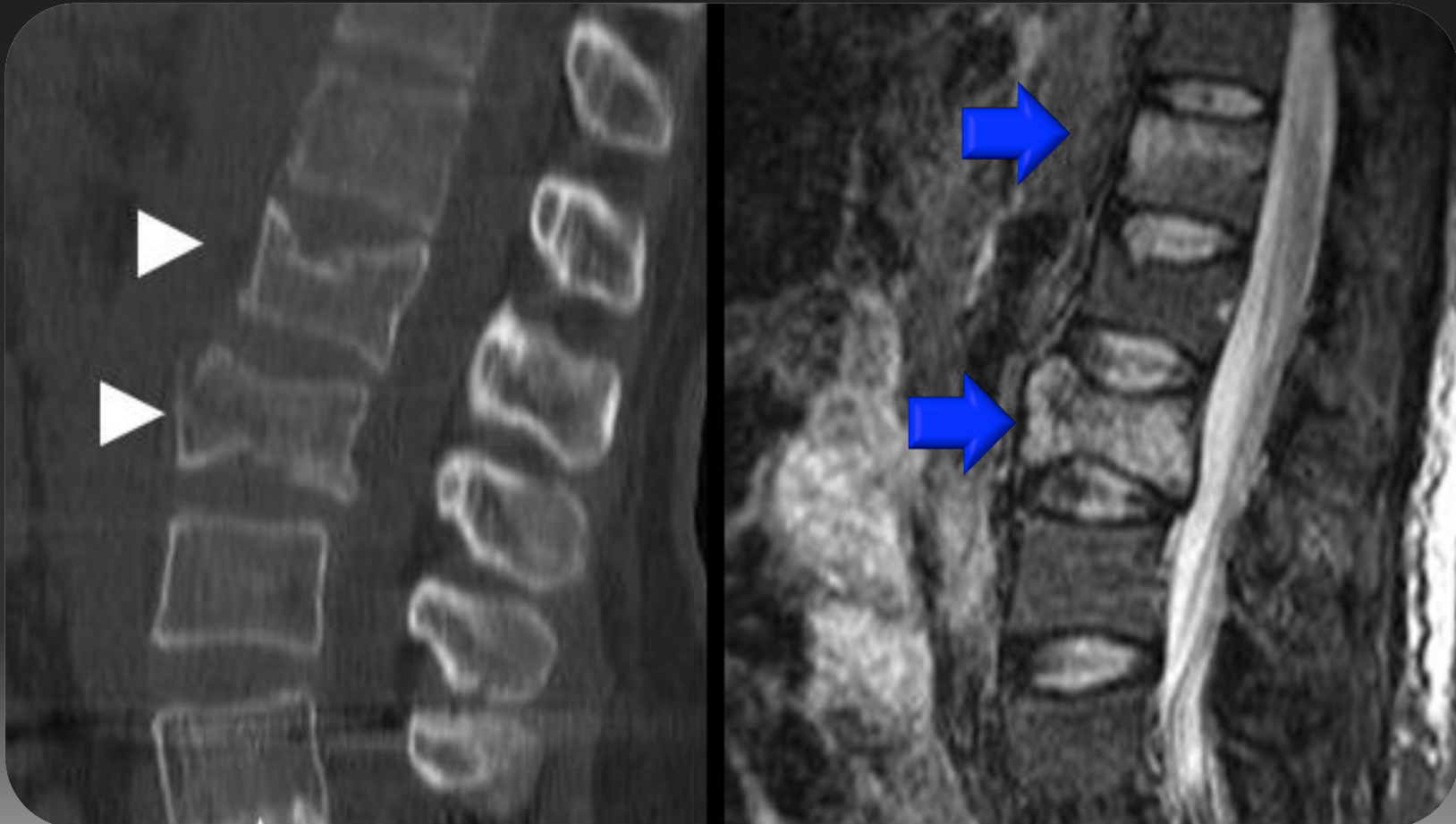


Jensen et al, Percutaneous polymethylmethacrylate vertebroplasty in the treatment of osteoporotic vertebral body compression fractures: technical aspects. AJNR Am J Neuroradiol 1997; 18:1897-1904.

VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- Fractures – tassements ostéoporotiques
- IRM pré-op !



VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- Fractures – tassements ostéoporotiques
- Maladie de Kummel

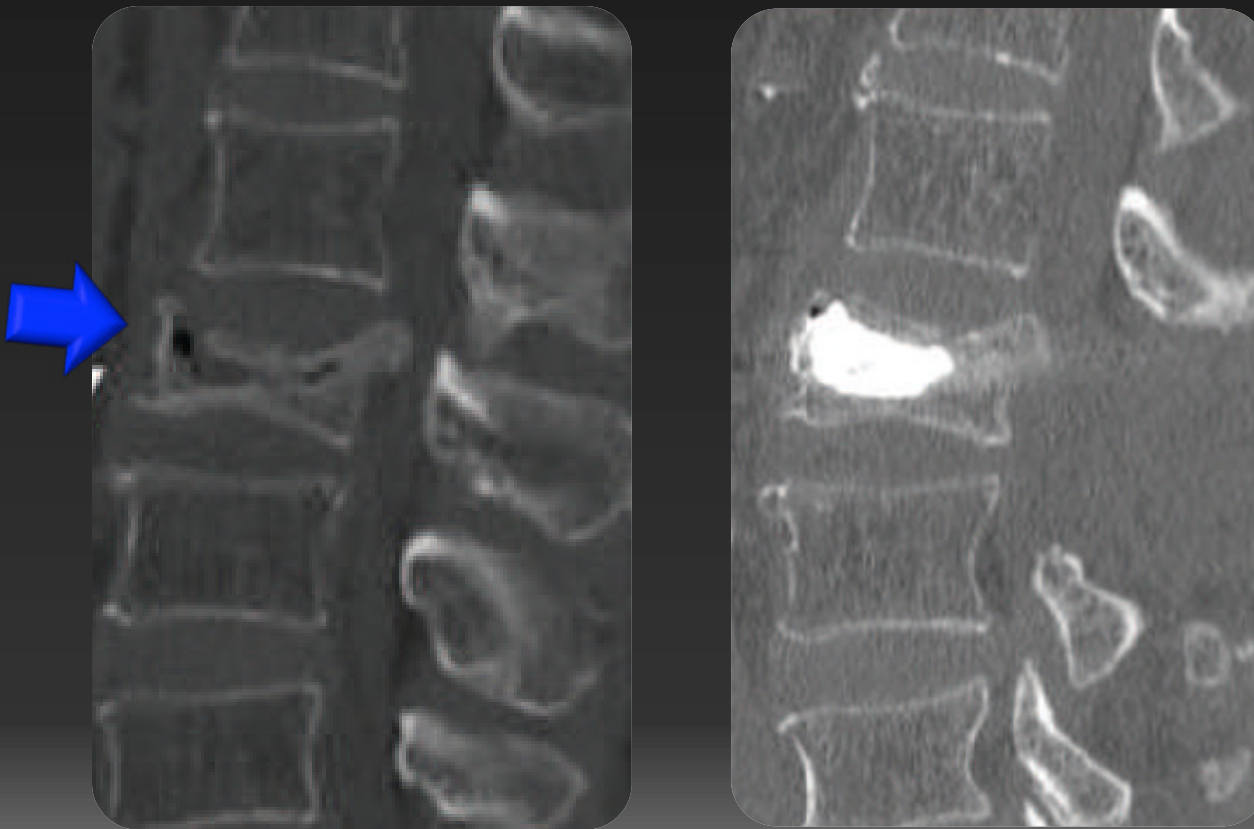


Massala et al, Kummel Disease Treatment by Unipedicular Vertebral Augmentation Using Curved Injection Cannula. Cardiovasc Intervent Radiol. 2010

VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- Fractures – tassements ostéoporotiques
- Maladie de Kummel

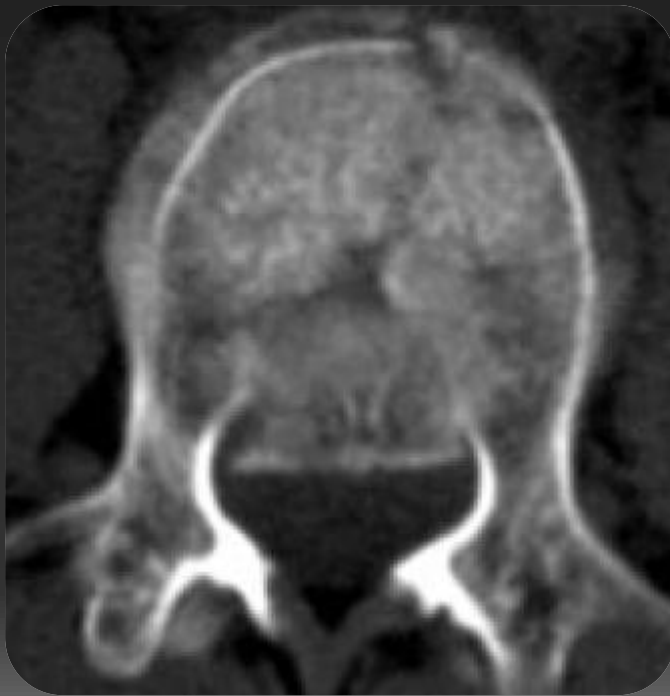


Freedman and Heller, Kummel disease: a not-so-rare complication of osteoporotic vertebral compression fractures J Am Board Fam Med. 2009 Jan-Feb;22(1):75-8.

VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

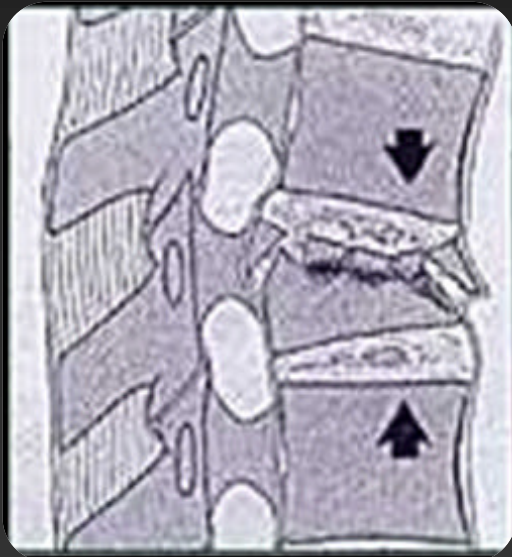
- Traumatique
- Huet et al (2005)



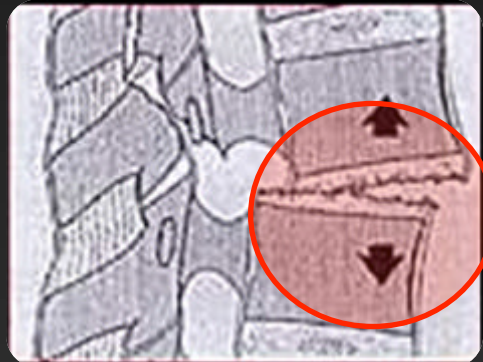
VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

MAGERL A
(66%)



MAGERL B et C



Instabilité
disco-ligamentaire:

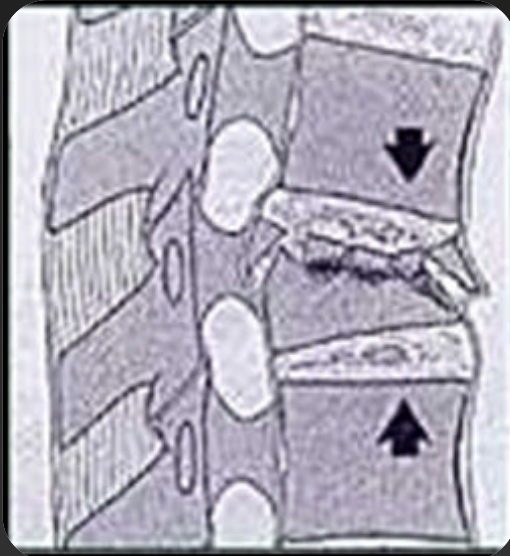


**TRAITEMENT
CHIRURGICAL**

VP et KP dans les pathologies non tumorales

Compression A1

MAGERL A
(66%)



A1.1



A1.2



A1.3

Séparation A2



A2.1



A2.2



A2.3

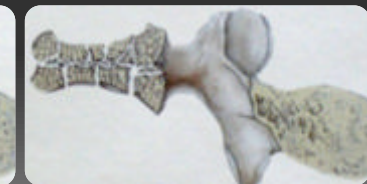
Burst A3



A3.1



A3.2



A3.3

VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- **Kyphoplasty (USA 1998)**
- ~~Réduction~~ **Réduction** de la cyphose
- ~~Réduction~~ **Réduction** des fuites
- Traumatisme



VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- VP ou KP
- Balistique : Scanner ou Scopie
- Injection de ciment **sous scopie**



VP et KP dans les pathologies non tumorales

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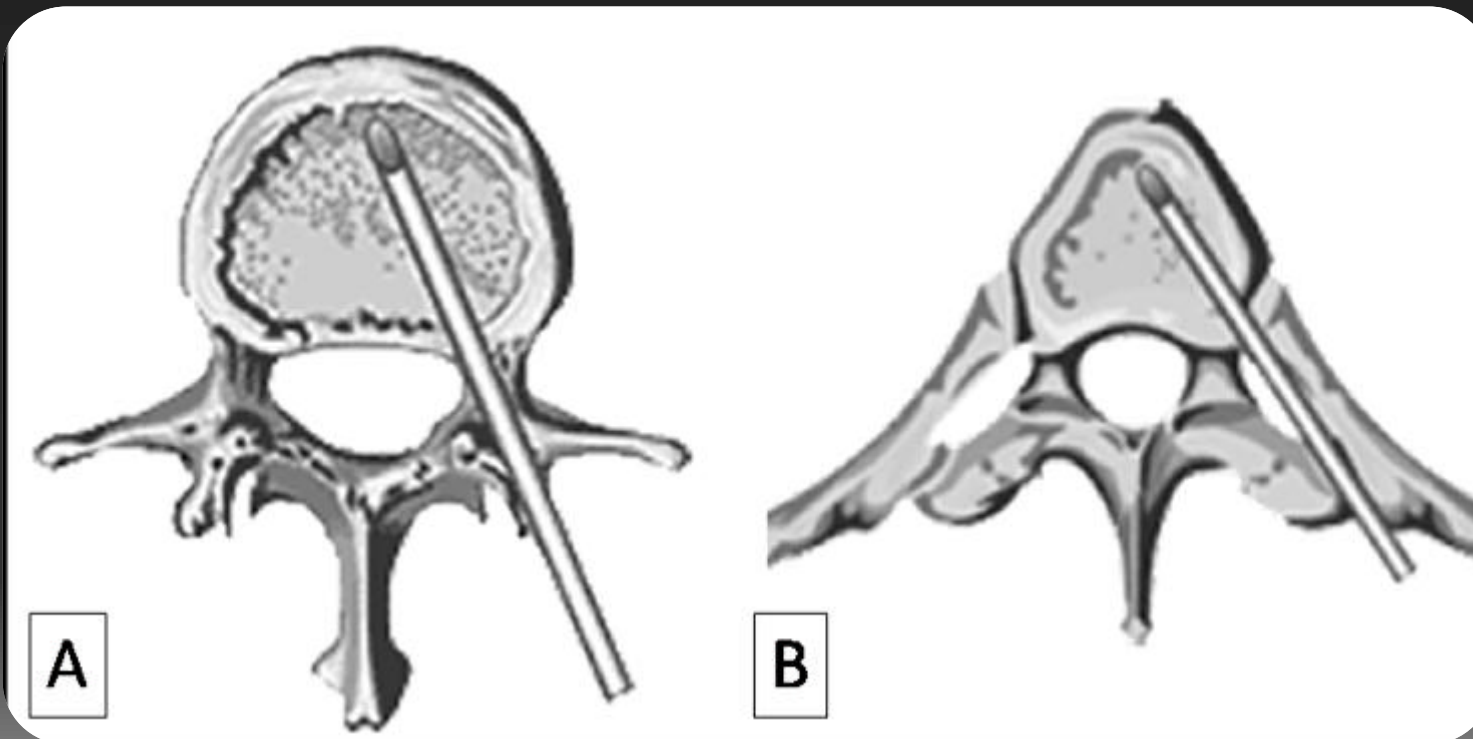
- VP ou KP
- Décubitus ventral
- Billots (réduction de la cyphose)



VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

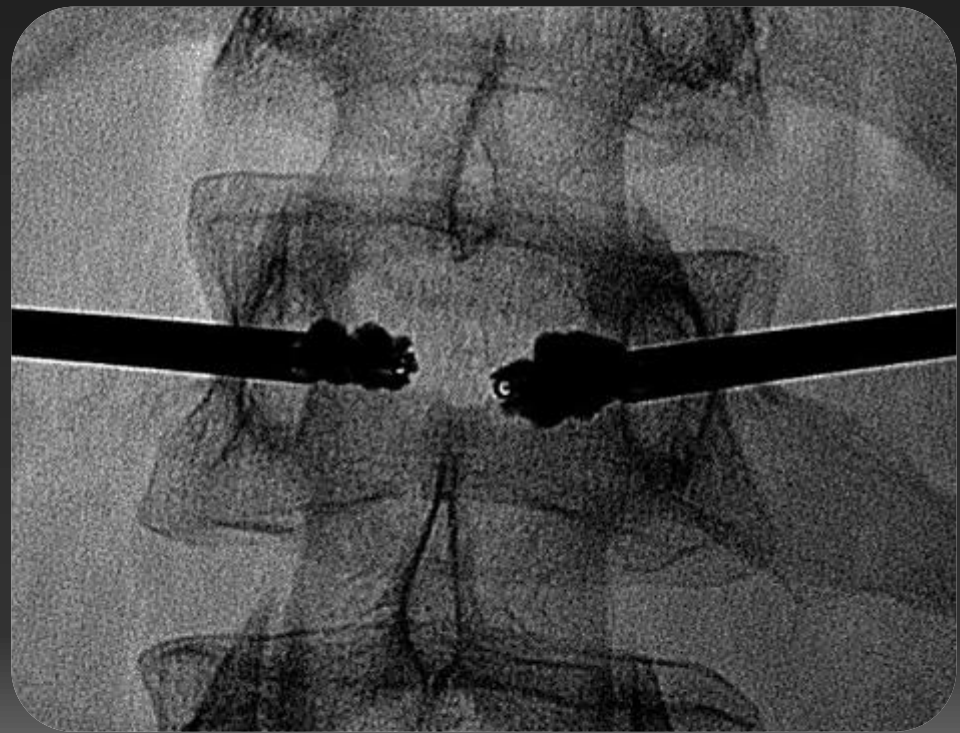
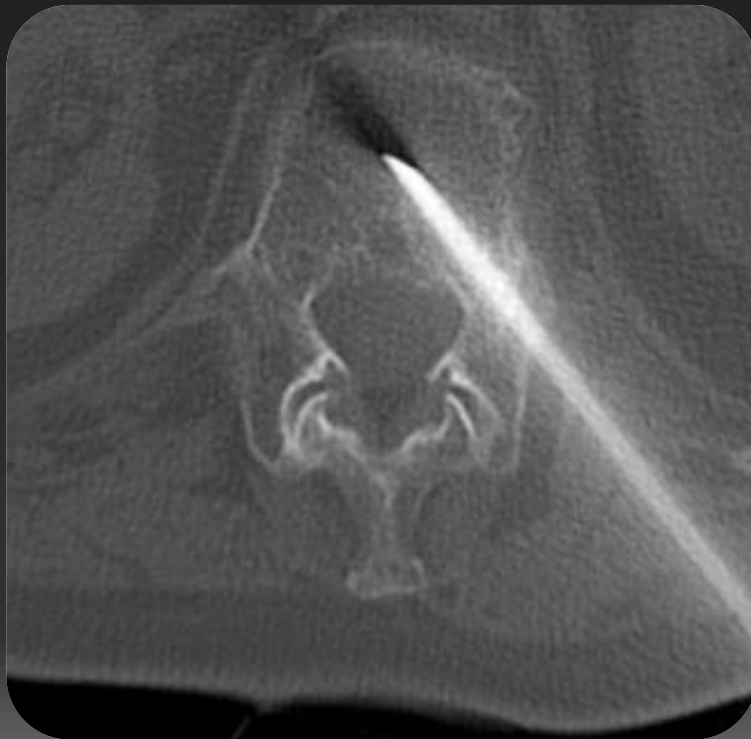
- Balistique : Scanner ou scopie
- Voie transpédiculaire
- Voie intercosto-transversaire



VP et KP dans les pathologies non tumorales

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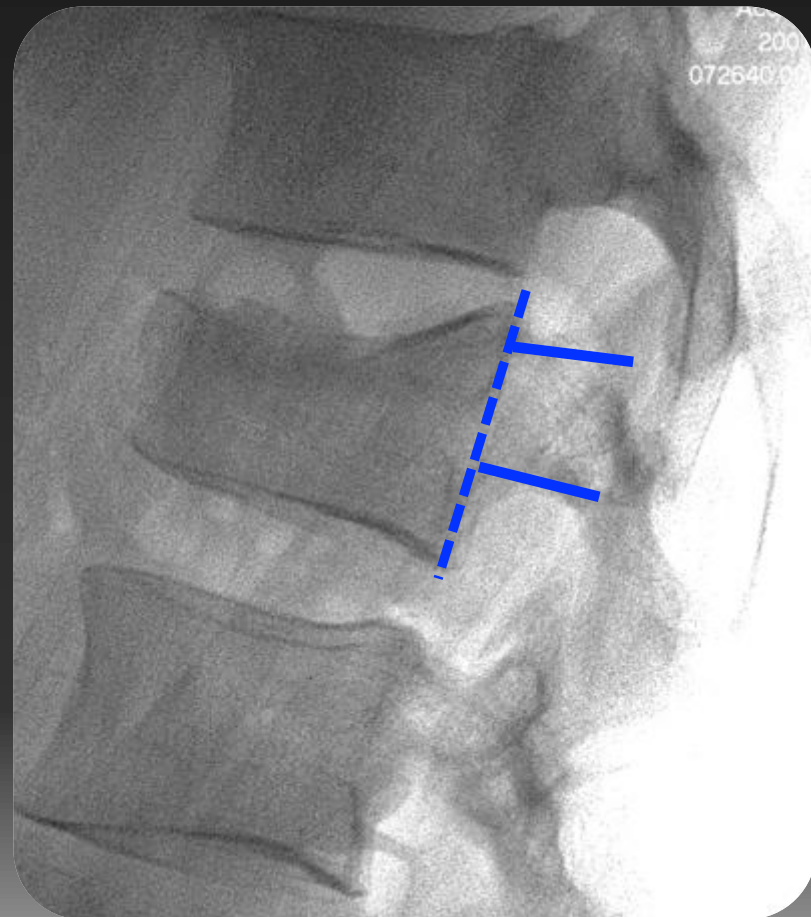
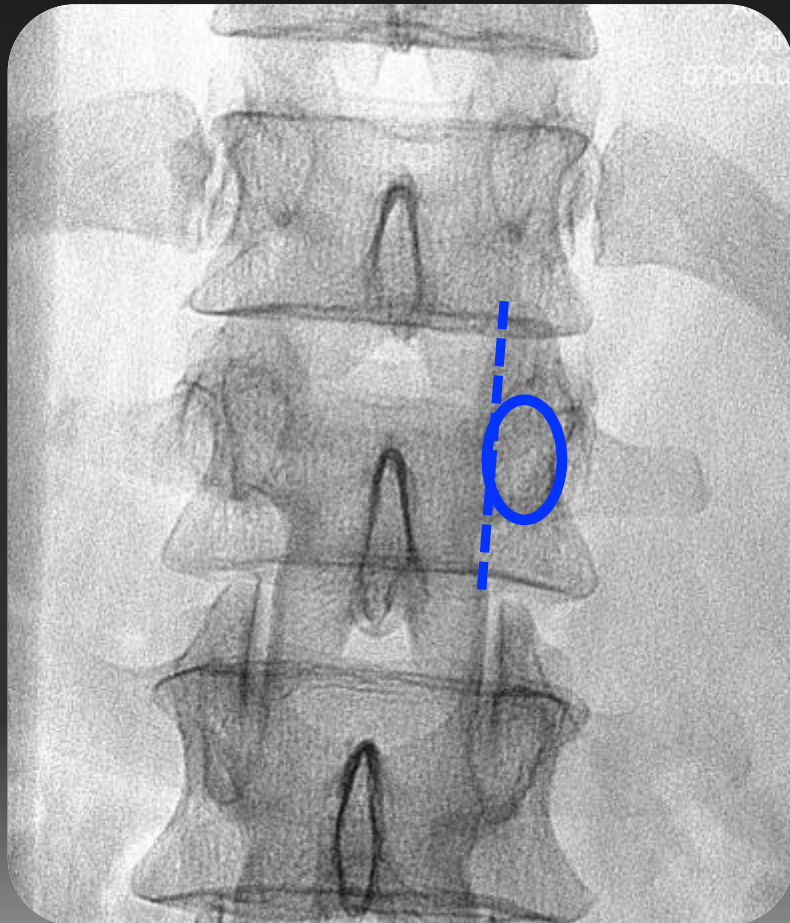
- Balistique : Scanner ou scopie
- Uni ou bi-pédiculaire



VP et KP dans les pathologies non tumorales

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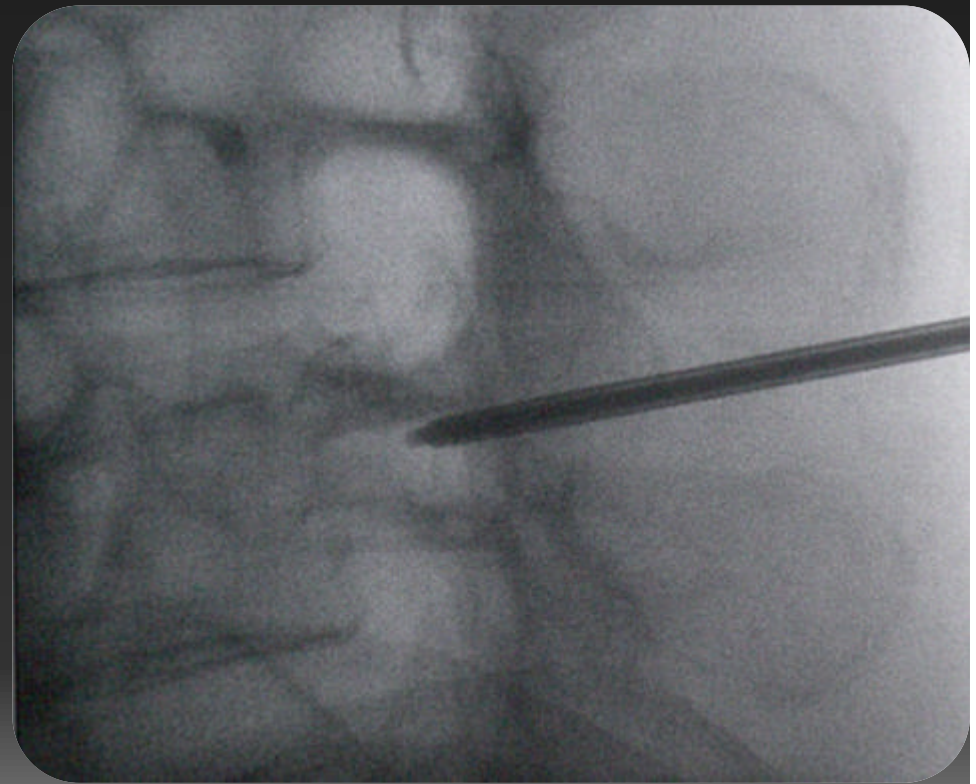
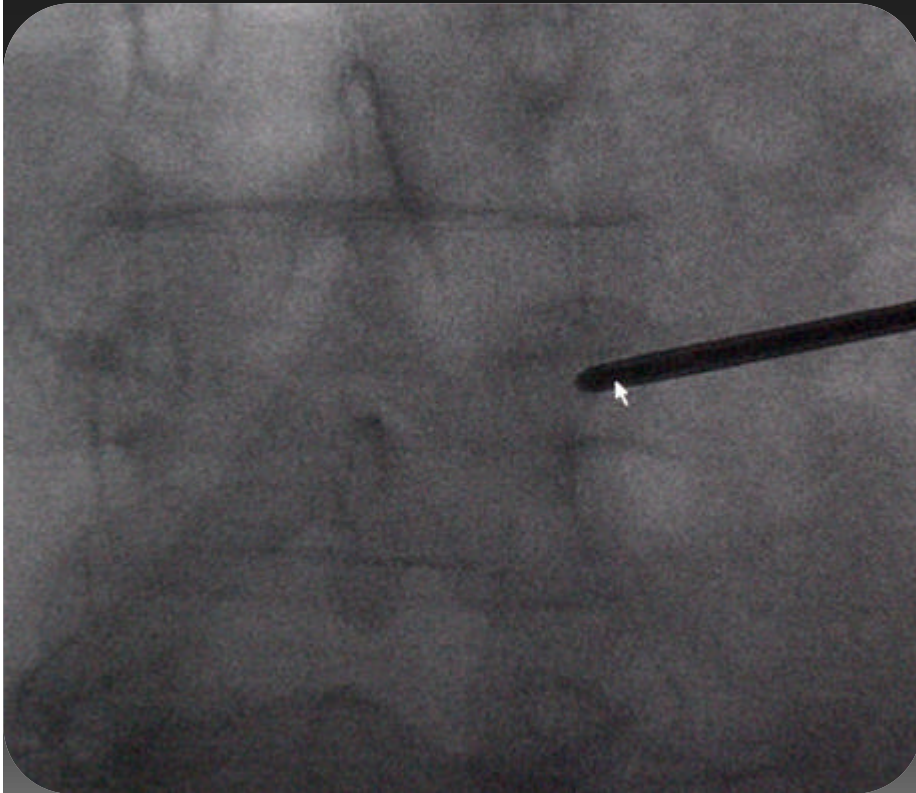
- Balistique : Scopie
- Voie transpédiculaire = « Stay in the ring »



VP et KP dans les pathologies non tumorales

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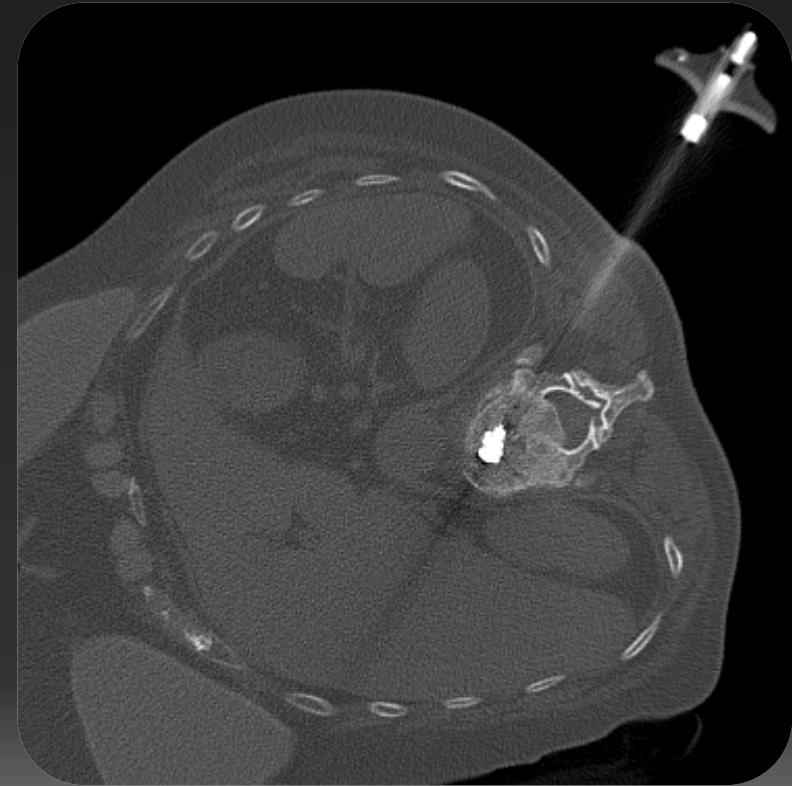
- Balistique : Scopie
- Voie transpédiculaire



VP et KP dans les pathologies non tumorales

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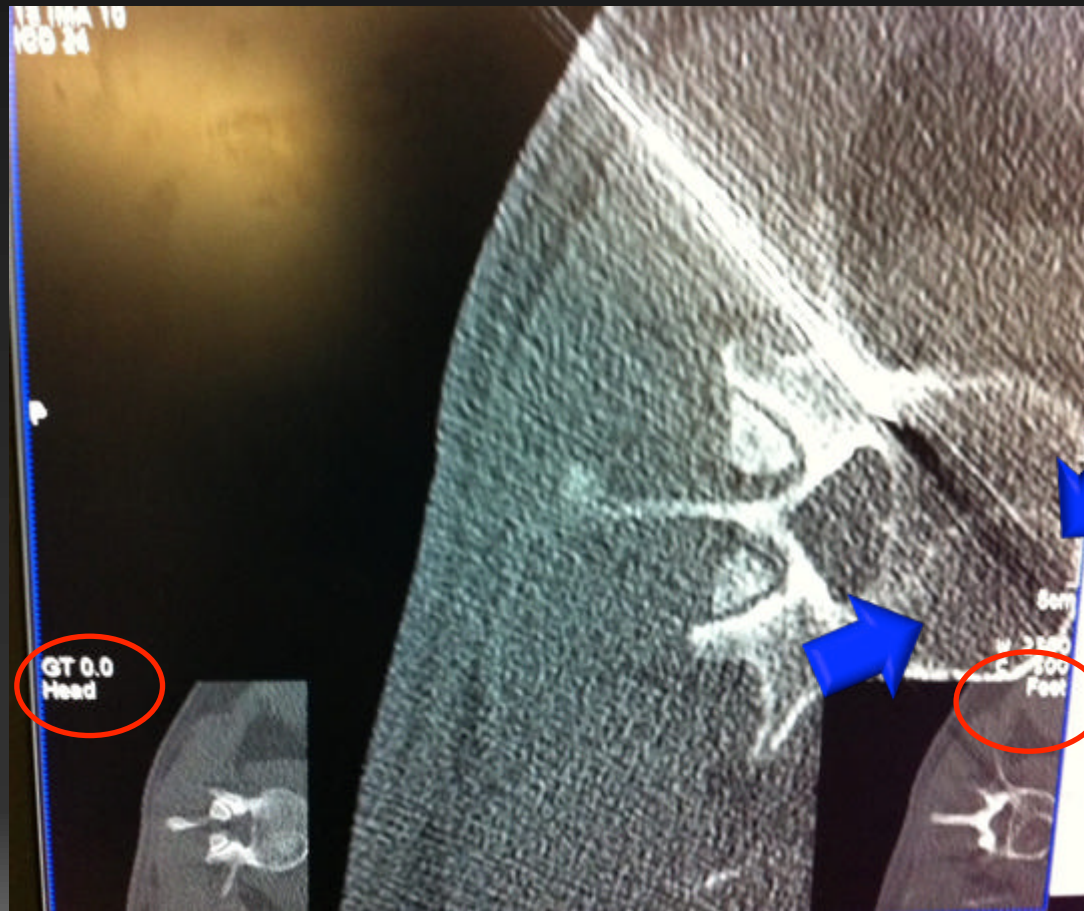
- Balistique : Scanner
- Possibilité de décubitus latéral (uni-pédiculaire)



VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- Balistique : Scanner



Care-Vision® Siemens

VP et KP dans les pathologies non tumorales

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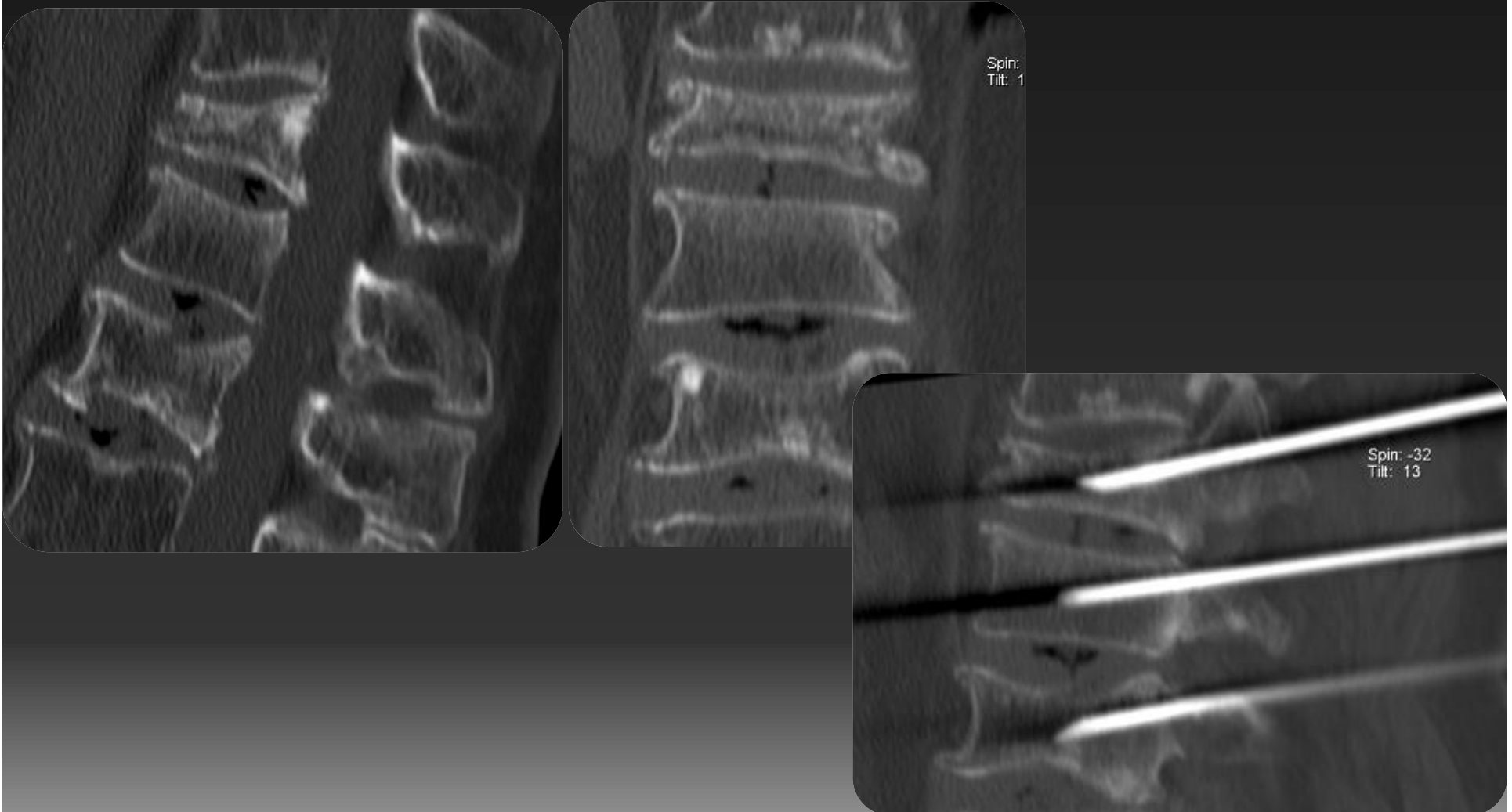
- Balistique : Scanner



VP et KP dans les pathologies non tumorales

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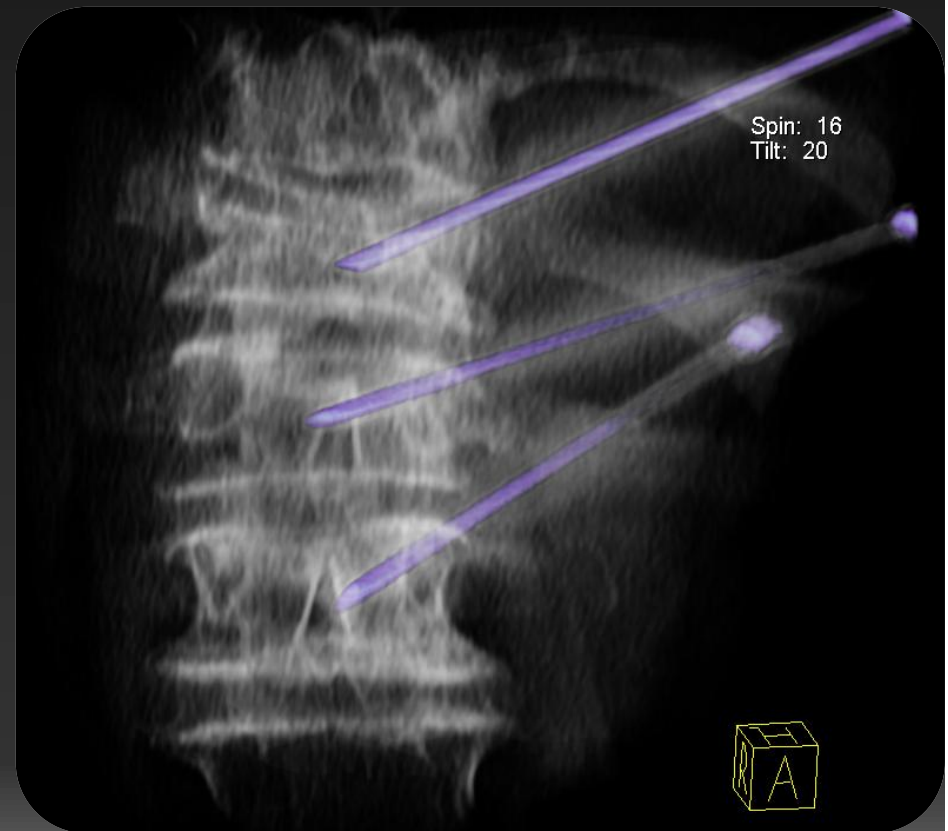
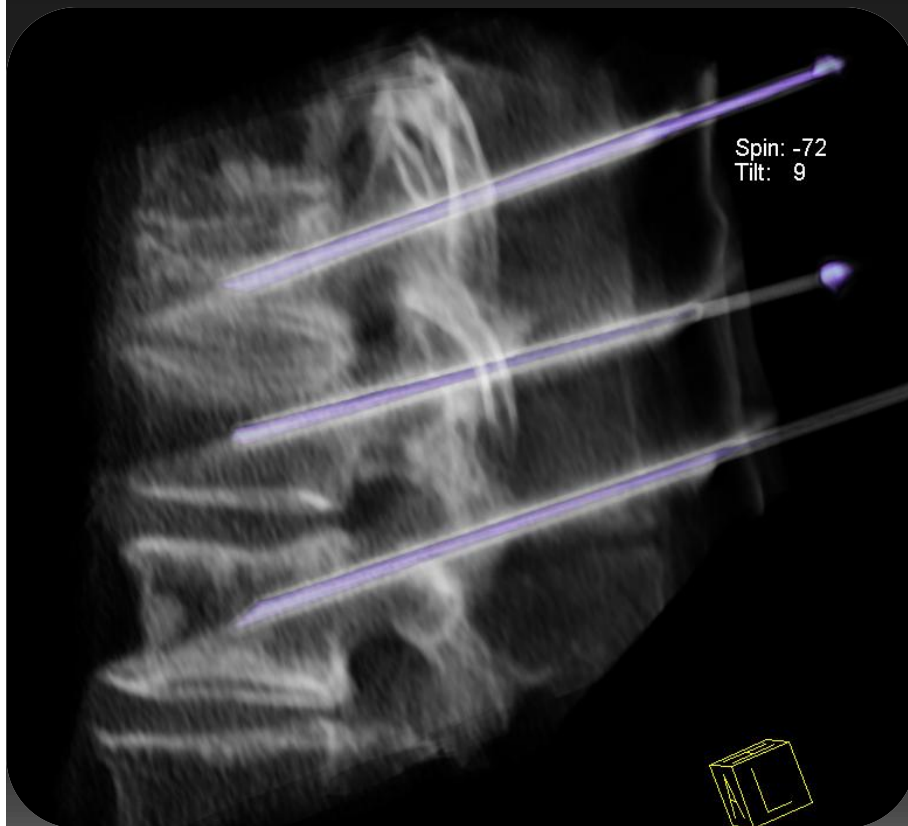
- Balistique : Scanner



VP et KP dans les pathologies non tumorales

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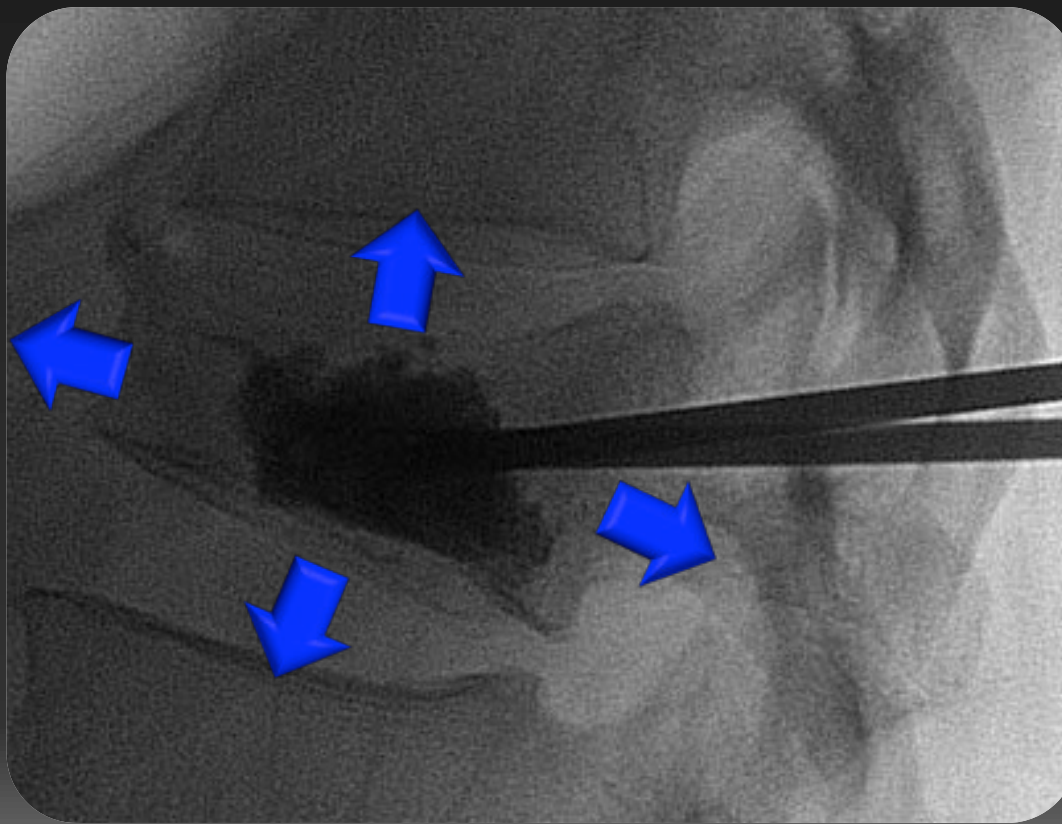
- Balistique : Scanner



VP et KP dans les pathologies non tumorales

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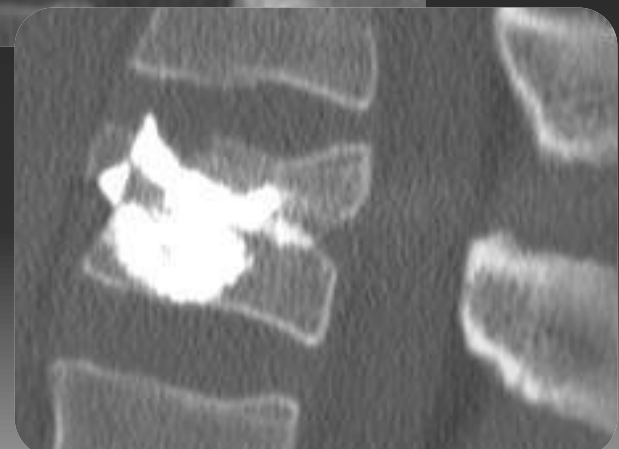
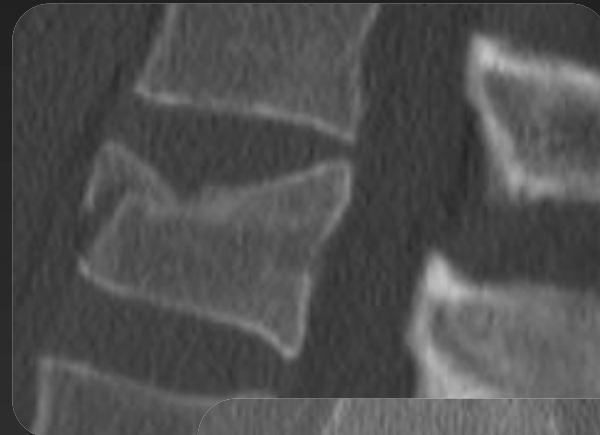
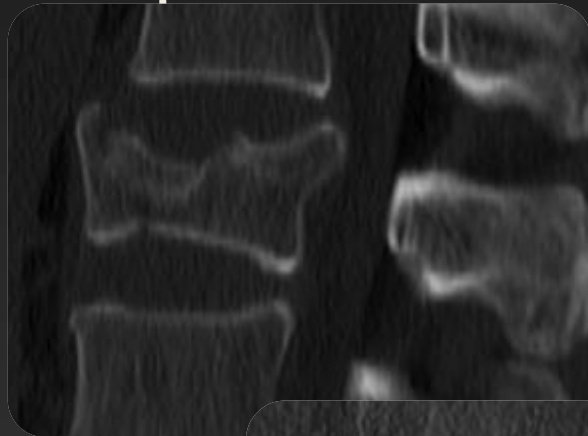
- VP : Injection du ciment (**sous scopie**)



VP et KP dans les pathologies non tumorales

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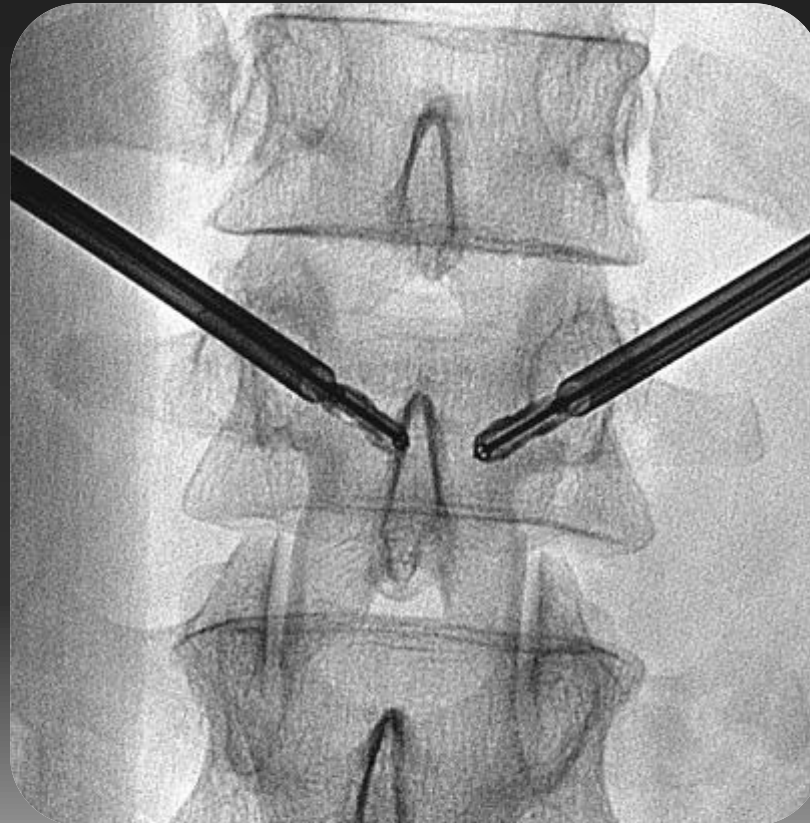
- VP : Injection du ciment
- Volume?
- Remplir le trait de fracture



VP et KP dans les pathologies non tumorales

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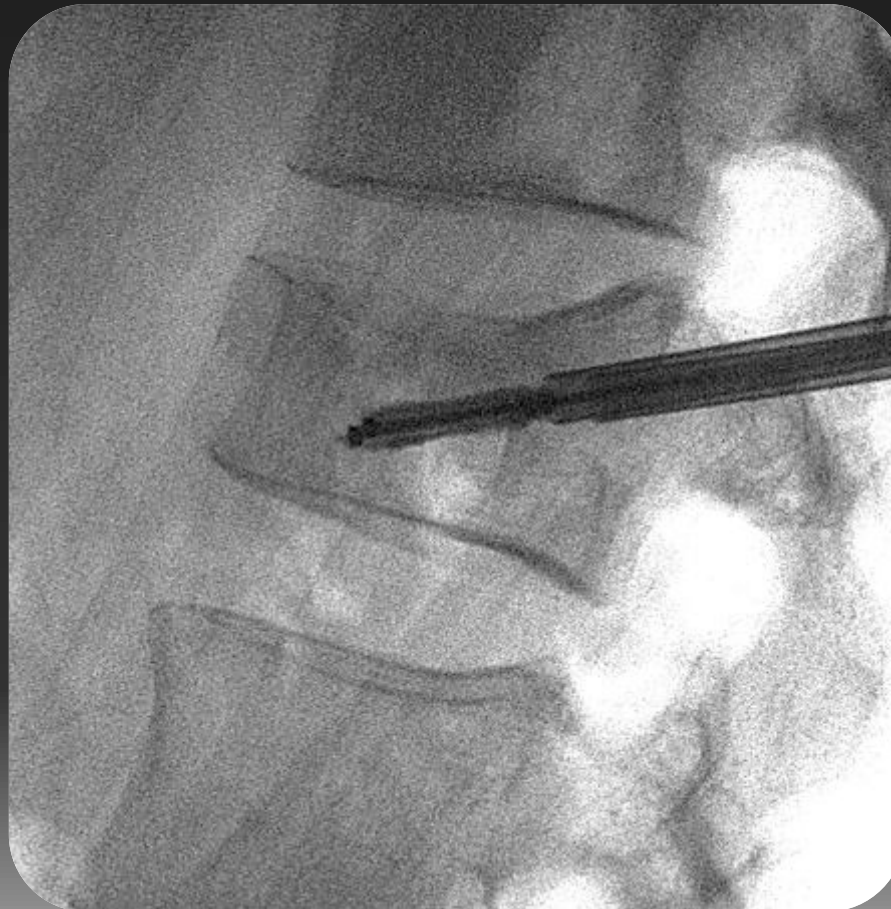
- **Kyphoplastie**
- Moins de fuites
- Procédure plus longue et trocars plus larges



VP et KP dans les pathologies non tumorales

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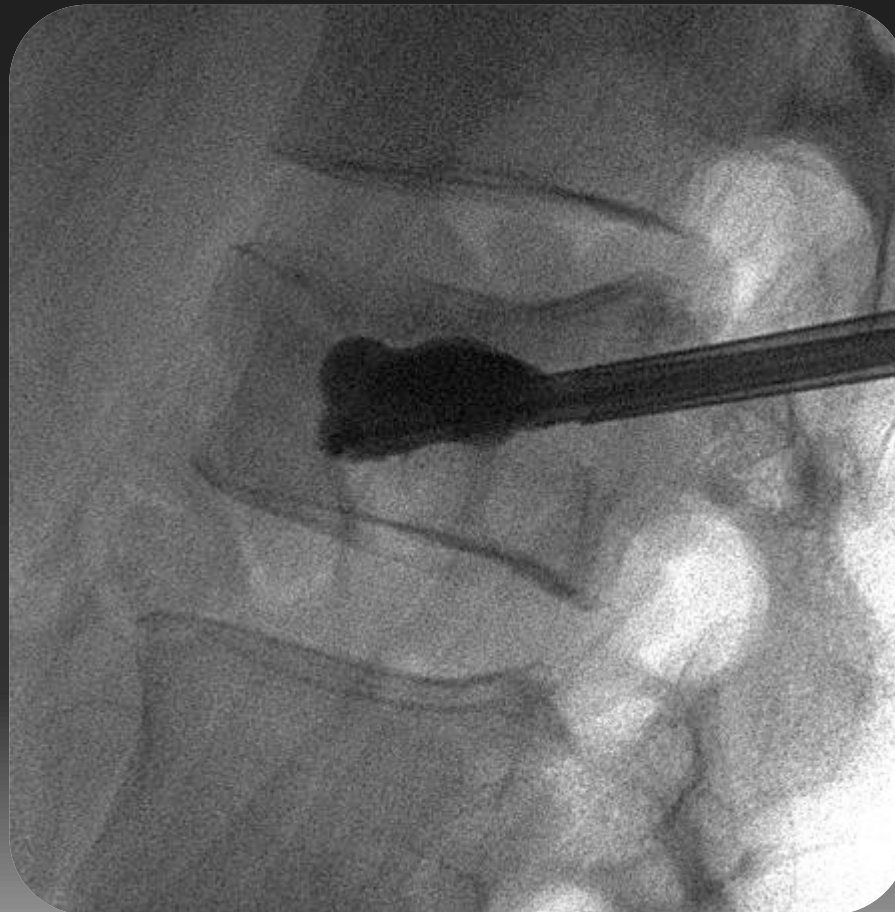
- **Kyphoplastie**
- Réduction de la cyphose vertébrale



VP et KP dans les pathologies non tumorales

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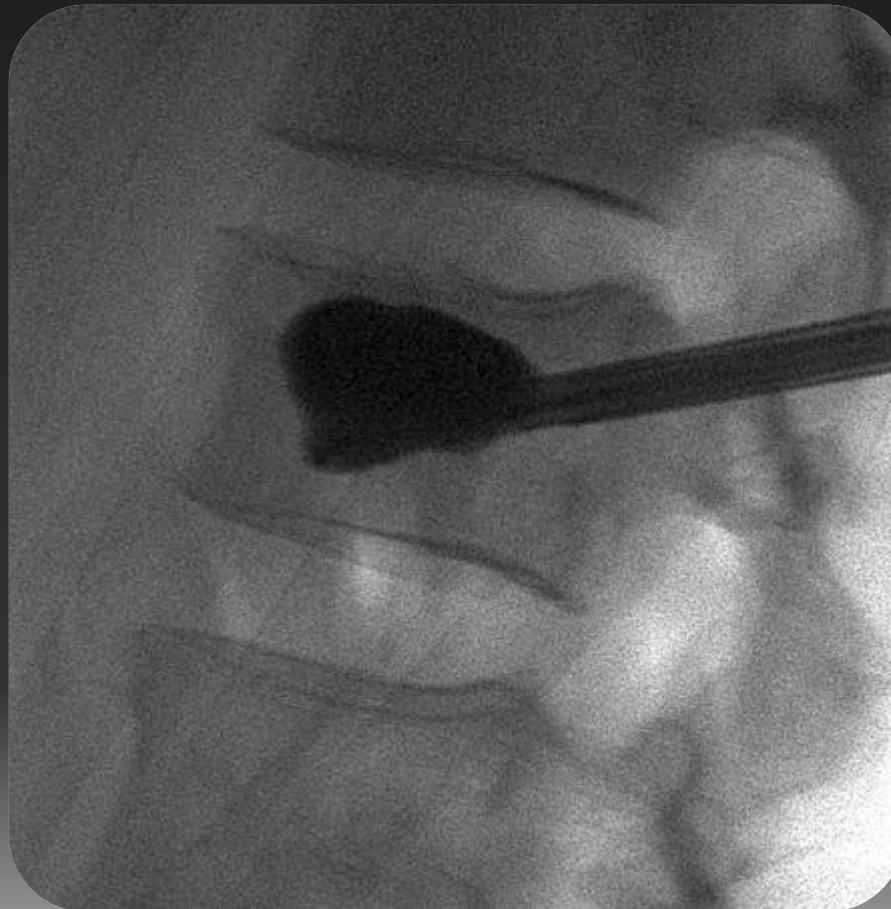
- **Kyphoplastie**
- Réduction de la cyphose vertébrale



VP et KP dans les pathologies non tumorales

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- **Kyphoplastie**
- Réduction de la cyphose vertébrale



VP et KP dans les pathologies non tumorales

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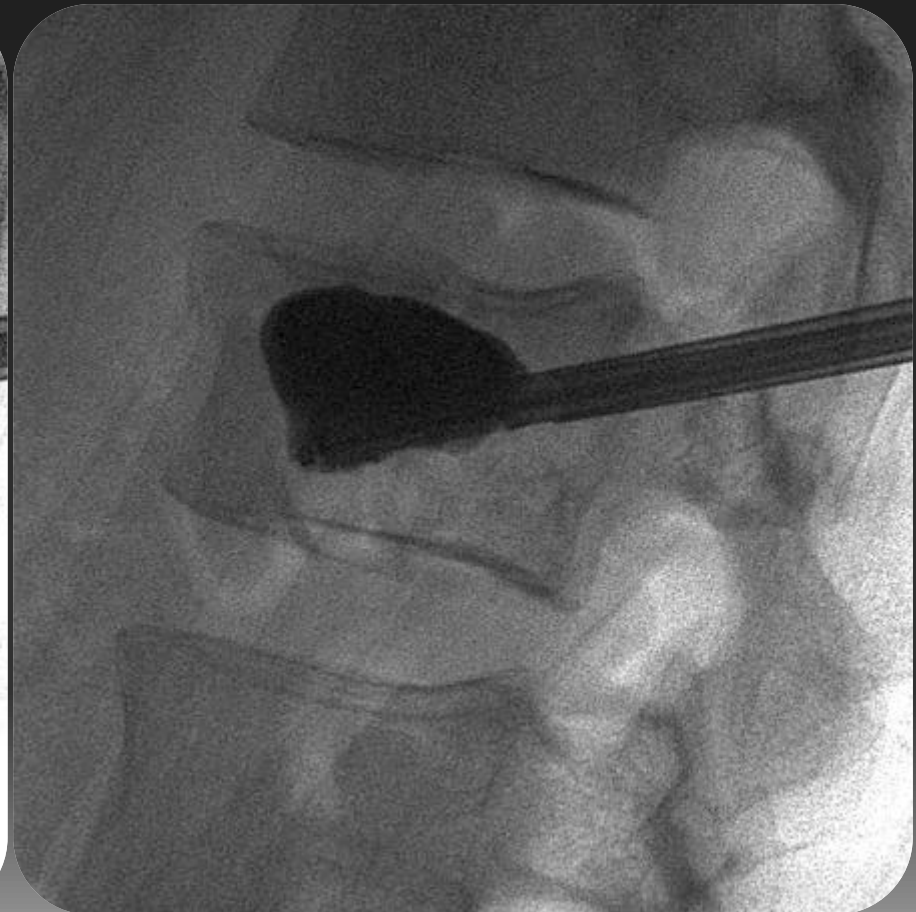
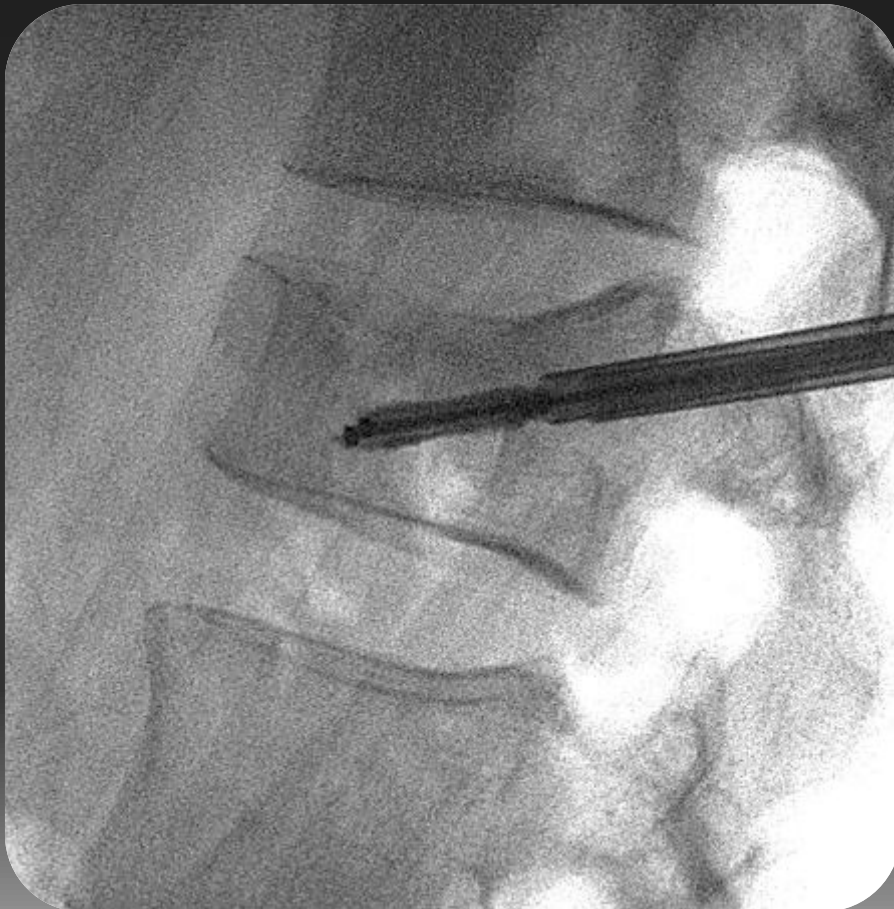
- **Kyphoplastie**
- Réduction de la cyphose vertébrale



VP et KP dans les pathologies non tumorales

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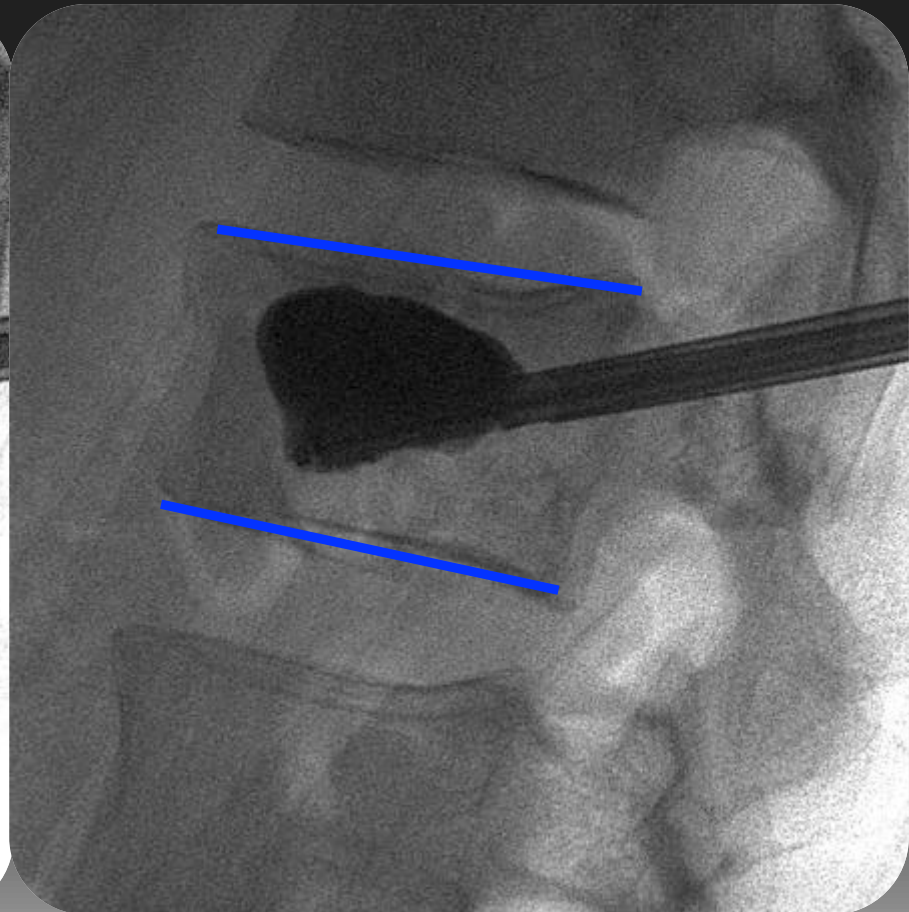
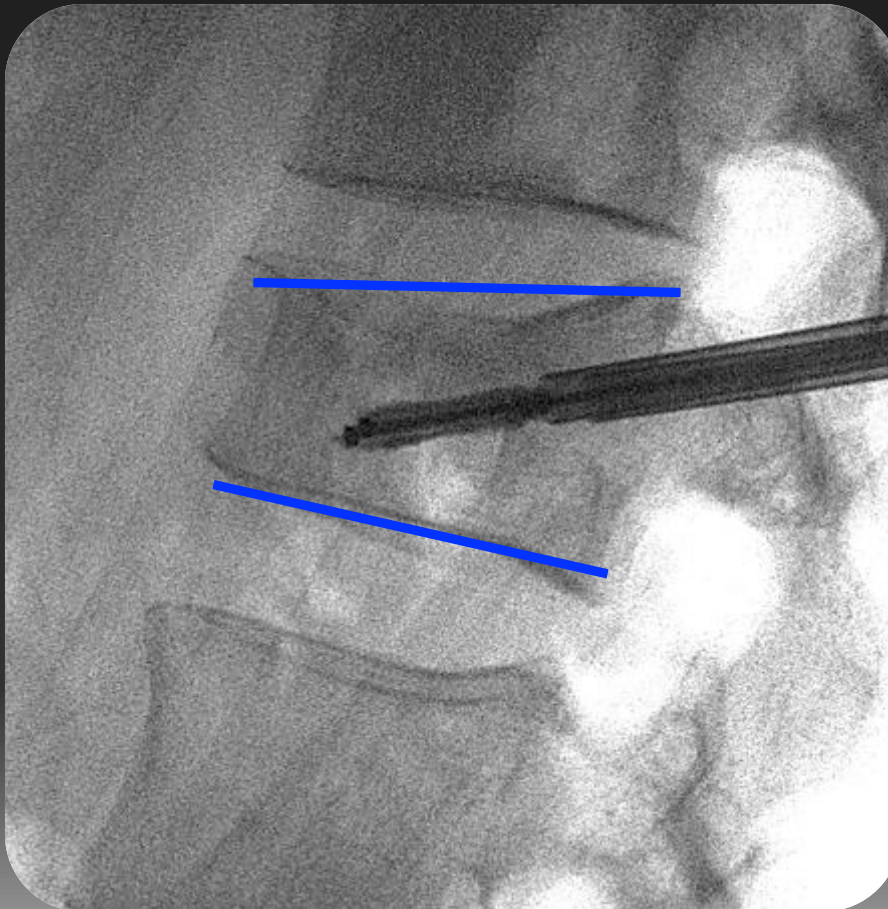
- **Kyphoplastie**
- Réduction de la cyphose vertébrale



VP et KP dans les pathologies non tumorales

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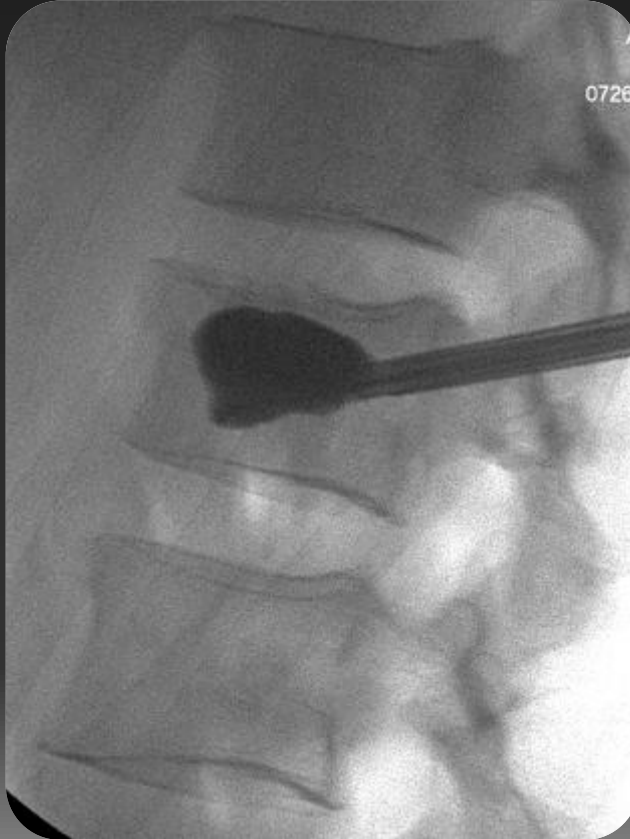
- **Kyphoplastie**
- Réduction de la cyphose vertébrale



VP et KP dans les pathologies non tumorales

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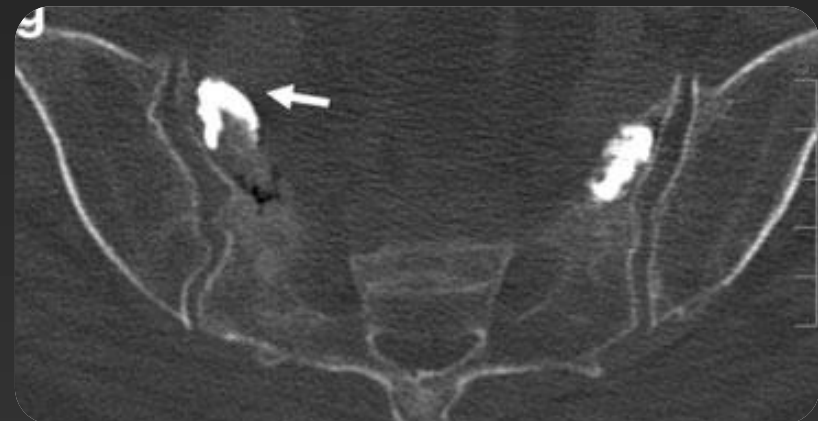
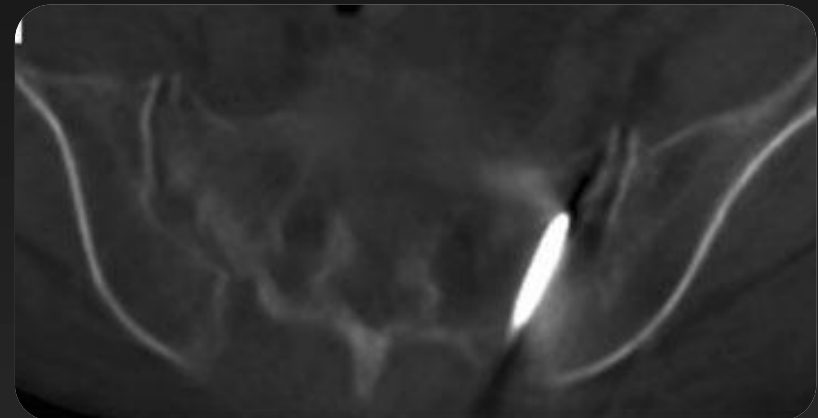
- **Kyphoplastie**
- Injection du ciment dans les cavités



VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- **Sacroplastie**



Kang et al, Percutaneous sacroplasty with the use of C-arm flat-panel detector CT: technical feasibility and clinical outcome. Skeletal Radiol. 2010

VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- **Effet antalgique (VP et KP)**
- Effet bénéfique à court terme (24-48H)
- Effet durable à long terme (1 an)

- **Hulme et al**, Vertebroplasty and kyphoplasty: a systematic review of 69 clinical studies. *Spine* 2006; 31: 1983–2001

- **Evans et al**, Vertebral compression fractures: pain reduction and improvement in functional mobility after percutaneous polymethylmethacrylate vertebroplasty retrospective report of 245 cases. *Radiology* 2003; 226: 366–72

- **Voormolen et al**, Prospective clinical follow-up after percutaneous vertebroplasty in patients with painful osteoporotic vertebral compression fractures. *J Vasc Interv Radiol* 2006; 17: 1313–20

- **Anselmetti et al**. Pain relief following percutaneous vertebroplasty: results of a series of 283 consecutive patients treated in a single institution. *Cardiovasc Intervent Radiol* 2007; 30: 441–47.

VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- **Effet antalgique (VP et KP)**
- **Étude INVEST (NEJM, Aout 2009)**

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

A Randomized Trial of Vertebroplasty for Osteoporotic Spinal Fractures

David F. Kallmes, M.D., Bryan A. Comstock, M.S., Patrick J. Heagerty, Ph.D.,
Judith A. Turner, Ph.D., David J. Wilson, F.R.C.R., Terry H. Diamond, F.R.A.C.P.,
Richard Edwards, F.R.C.R., Leigh A. Gray, M.S., Lydia Stout, B.S.,
Sara Owen, M.Sc., William Hollingworth, Ph.D., Basavaraj Ghdoke, M.D.,
Deborah J. Annesley-Williams, F.R.C.R., Stuart H. Ralston, F.R.C.P.,
and Jeffrey G. Jarvik, M.D., M.P.H.

VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- **Effet antalgique (VP et KP)**

METHODS

In this multicenter trial, we randomly assigned 131 patients who had one to three painful osteoporotic vertebral compression fractures to undergo either vertebroplasty or a simulated procedure without cement (control group). The primary outcomes were scores on the modified Roland–Morris Disability Questionnaire (RDQ) (on a scale of 0 to 23, with higher scores indicating greater disability) and patients' ratings of average pain intensity during the preceding 24 hours at 1 month (on a scale of 0 to 10, with higher scores indicating more severe pain). Patients were allowed to cross over to the other study group after 1 month.

RESULTS

All patients underwent the assigned intervention (68 vertebroplasties and 63 simulated procedures). The baseline characteristics were similar in the two groups. At 1 month, there was no significant difference between the vertebroplasty group and the control group in either the RDQ score (difference, 0.7; 95% confidence interval [CI], -1.3 to 2.8; $P=0.49$) or the pain rating (difference, 0.7; 95% CI, -0.3 to 1.7; $P=0.19$). Both groups had immediate improvement in disability and pain scores after the intervention. Although the two groups did not differ significantly on any secondary outcome measure at 1 month, there was a trend toward a higher rate of clinically meaningful improvement in pain (a 30% decrease from baseline) in the vertebroplasty group (64% vs. 48%, $P=0.06$). At 3 months, there was a higher crossover rate in the control group than in the vertebroplasty group (43% vs. 12%, $P<0.001$). There was one serious adverse event in each group.

VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- Effet antalgique (VP et KP)

The NEW ENGLAND
JOURNAL *of* MEDICINE

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AUGUST 6, 2009

VOL. 361 NO. 6

A Randomized Trial of Vertebroplasty for Painful Osteoporotic Vertebral Fractures

Rachelle Buchbinder, Ph.D., Richard H. Osborne, Ph.D., Peter R. Ebeling, M.D., John D. Wark, Ph.D., Peter Mitchell, M.Med., Chris Wriedt, M.B., B.S., Stephen Graves, D. Phil., Margaret P. Staples, Ph.D., and Bridie Murphy, B.Sc.

VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- Effet antalgique (VP et KP)
- Pas d'IRM systématique
- Inclusion si douleurs subaigües et chroniques
- Pas de groupe contrôle sans intervention
- (volume de ciment, cross-over...)

VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- Effet antalgique (VP et KP)
- Étude VERTOS II
- The Lancet , Aout 2010

Vertebroplasty versus conservative treatment in acute osteoporotic vertebral compression fractures (Vertos II): an open-label randomised trial

Caroline A H Klazen, Paul N M Lohle, Jolanda de Vries, Frits H Jansen, Alexander V Tielbeek, Marion C Blom, Alexander Venmans, Willem-Jan J van Rooij, Marinus C Schoemaker, Job R Juttman, Tjoen H Lo, Harald J J Verhaar, Yolanda van der Graaf, Kaspar J van Everdingen, Alex F Muller, Otto E H Elgersma, Dirk R Halkema, Hendrik Franssen, Xavier Janssens, Erik Buskens, Willem P Th M Mali

Summary

Background Percutaneous vertebroplasty is increasingly used for treatment of pain in patients with osteoporotic vertebral compression fractures, but the efficacy, cost-effectiveness, and safety of the procedure remain uncertain. We aimed to clarify whether vertebroplasty has additional value compared with optimum pain treatment in patients with acute vertebral fractures.

Methods Patients were recruited to this open-label prospective randomised trial from the radiology departments of six hospitals in the Netherlands and Belgium. Patients were aged 50 years or older, had vertebral compression fractures on spine radiograph (minimum 15% height loss; level of fracture at Th5 or lower; bone oedema on MRI), with back pain for 6 weeks or less, and a visual analogue scale (VAS) score of 5 or more. Patients were randomly allocated to percutaneous vertebroplasty or conservative treatment by computer-generated randomisation codes with a block size of six. Masking was not possible for participants, physicians, and outcome assessors. The primary outcome was pain relief at 1 month and 1 year as measured by VAS score. Analysis was by intention to treat. This study is registered at ClinicalTrials.gov, number NCT00232466.

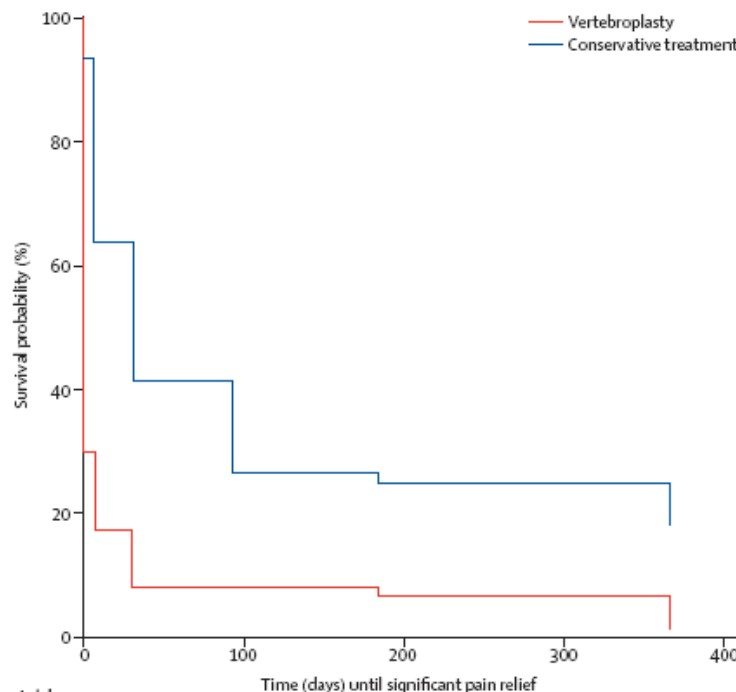
Findings Between Oct 1, 2005, and June 30, 2008, we identified 431 patients who were eligible for randomisation. 229 (53%) patients had spontaneous pain relief during assessment, and 202 patients with persistent pain were randomly allocated to treatment (101 vertebroplasty, 101 conservative treatment). Vertebroplasty resulted in greater pain relief than did conservative treatment; difference in mean VAS score between baseline and 1 month was -5.2 (95% CI -5.88 to -4.72) after vertebroplasty and -2.7 (-3.22 to -1.98) after conservative treatment, and between baseline and 1 year was -5.7 (-6.22 to -4.98) after vertebroplasty and -3.7 (-4.35 to -3.05) after conservative treatment. The difference between groups in reduction of mean VAS score from baseline was 2.6 (95% CI 1.74-3.37, $p<0.0001$) at 1 month and 2.0 (1.13-2.80, $p<0.0001$) at 1 year. No serious complications or adverse events were reported.

Interpretation In a subgroup of patients with acute osteoporotic vertebral compression fractures and persistent pain, percutaneous vertebroplasty is effective and safe. Pain relief after vertebroplasty is immediate, is sustained for at least a year, and is significantly greater than that achieved with conservative treatment, at an acceptable cost.

VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- Effet antalgique (VP et KP)
- Étude VERTOS II
- Efficacité sur la douleur et sur le coût financier



	Percutaneous vertebroplasty (n=94)	Conservative treatment (n=93)	p value
Drugs, 1 month	€24.36 (33.61)	€43.51 (50.93)	0.003
Drugs, 1 year	€204.88 (368.47)	€280.47 (352.89)	0.15
Family doctor, 1 month	€23.40 (49.16)	€14.13 (35.70)	0.14
Family doctor, 1 year	€970.30 (1167.49)	€900.11 (1386.70)	0.70
Medical specialist, 1 month	€46.08 (96.56)	€68.87 (169.53)	0.25
Medical specialist, 1 year	€2263.82 (3220.02)	€2138.99 (3558.86)	0.80
Physiotherapist, 1 month	€47.77 (71.71)	€16.68 (49.18)	0.001
Physiotherapist, 1 year	€694.72 (1249.80)	€640.69 (1331.45)	0.77
Hospital admission, 1 year	€2270.62 (9084.55)	€2006.44 (10 081.68)	0.85
PV (including MRI spine, CT spine, day care)*	€2339.60 (542.34)	€233.43 (725.43)	<0.0001
Total costs 1 month	€2611.89 (148.07)	€383.78 (745.66)	<0.0001
Total costs 1 year	€9182.78 (10 779.20)	€6327.45 (11 872.79)	0.087

Data are mean (SD). All patients assigned to percutaneous vertebroplasty (PV; who received the procedure or not) for whom information about costs were available were included in this analysis. * PV costs appear in both columns because several patients assigned to conservative treatment received PV.

Table 2: Direct medical costs

VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- Réduction de la cyphose



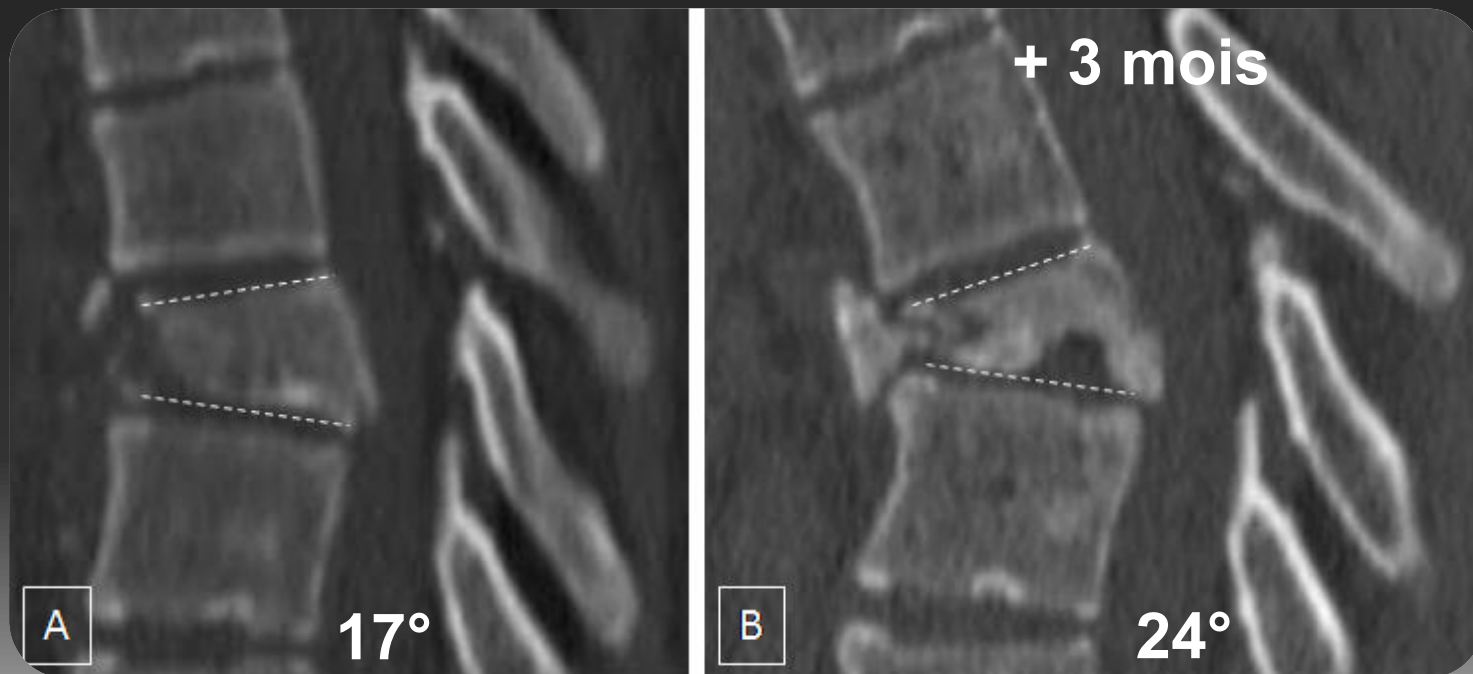
Tables d'extension utilisées par Hippocrate pour traiter les fractures du rachis

(Neurosurg Focus ©2004 American Society of Neurological Surgeons)

VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- **Réduction de la cyphose**
- Traitement orthopédique
- Progression de la cyphose sous corset
- Shen et al, Spine 2001 - Wood et al, J Bone Joint Surg Am 2003



VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- **Vertébroplastie**
- Stabilisation de la cyphose vertébrale à 2 ans
- Pitton et al, Cardiovasc Intervent Radiol, 2009



VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- **Vertébroplastie**
- Réduction de la cyphose par compression (billots et compression externe)
- Pitton et al, Cardiovasc Intervent Radiol, 2009
- McCann et al, Spine, 2006



VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

Vertébroplastie

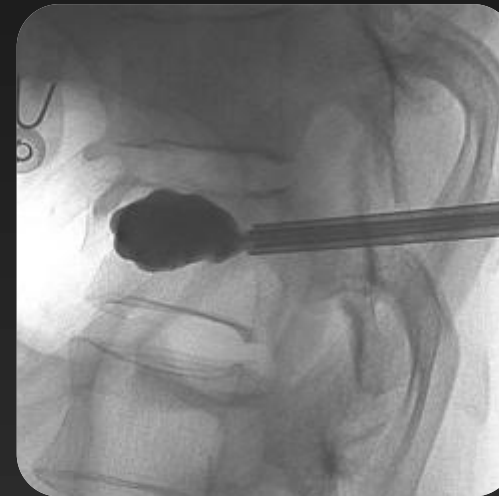


0 à 7° de réduction

Chin et al, Neurosurgery 2006

Hulme et al, Spine 2006

Kyphoplastie



3 à 10° de réduction

Voggenreiter, Spine 2005

Hiwatashi et al, Radiology, 2005

Shindle et al, Osteoporos Int, 2006

Grohs et al, J Spinal Disorder tech, 2005

Hulme et al Spine 2006

VP et KP dans les pathologies non tumorales

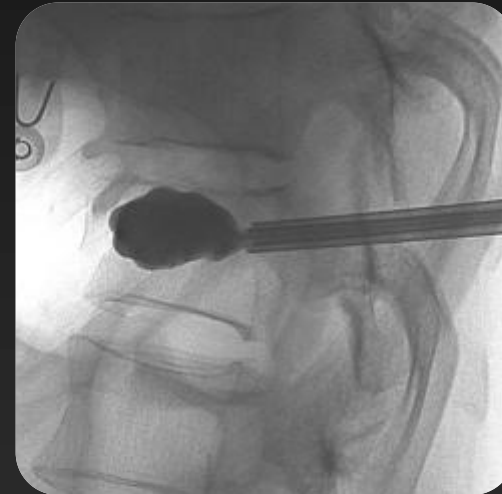
1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

Vertébroplastie



400 euros / étage

Kyphoplastie



3000 euros / étage

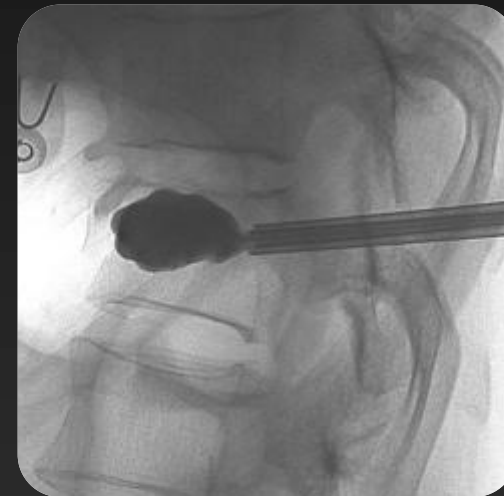
VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

Vertébroplastie



Kyphoplastie



STIC 2005 KYPHO :

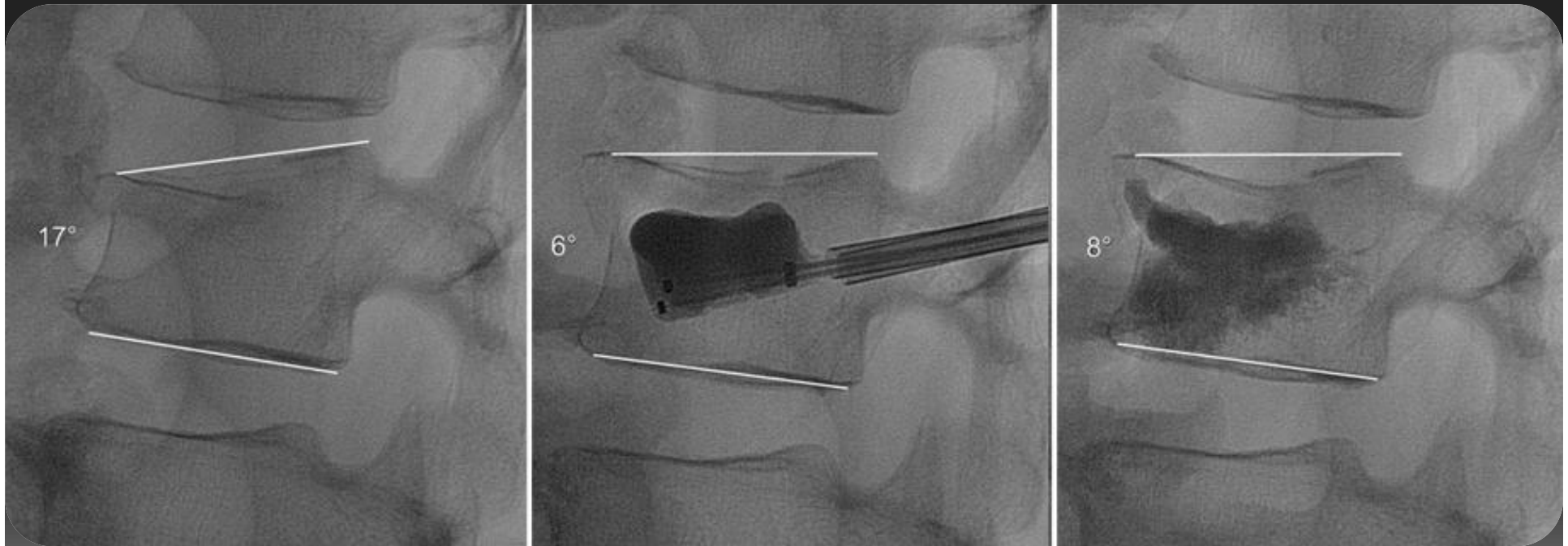
Évaluation médicale et économique du traitement par Kyphoplastie des fractures vertébrales

- Ostéoporose < 6 semaines
- Ostéoporose > 6 semaines
- Traumatisme

VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

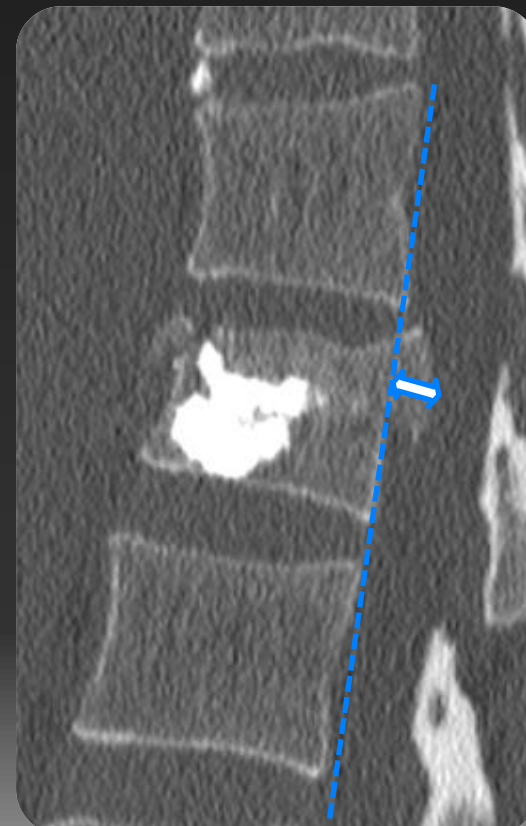
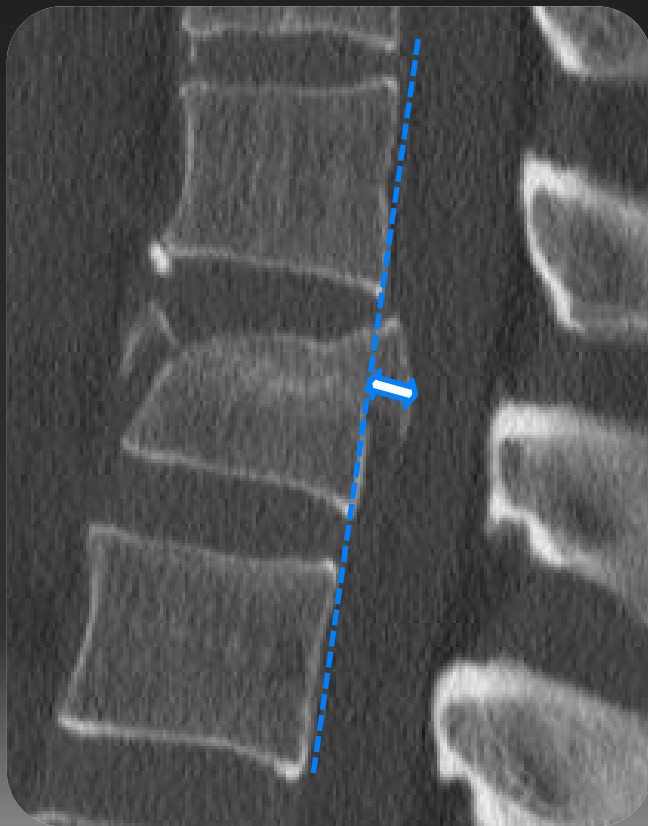
- **Kyphoplastie**
- Fractures fraîches +++
- Traumatisme +++



VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

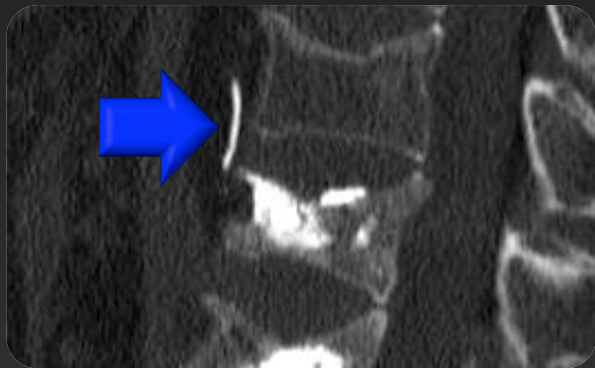
- **Kyphoplastie**
- Pas d'aggravation du recul du mur vert postérieur
- Stoffel et al, J Neurosurg Spine 2007



VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- Fuites de ciment
- Discales
- Veineuses (embolies)
- Foraminales et Épidurales



Laredo et Hamze
Skeletal Radiology 2004

VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- Fuites de ciment
- Kyphoplasties 7-13%
- Vertébroplasties 19-55%
- Hulme et al 2006; Eck et al 2007; Pflugmavher et al 2006; Pitton et al 2007

VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- Fuites de ciment
- VERTOS II (Venmans et al, Neuroradiology 2010 et AJNR 2010)
- Fuites extravertébrales : 80% des patients !
- Embols pulmonaires de ciment : 26% des patients !
- 100% asymptomatiques

VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

A Review of Complications Associated with Vertebroplasty and Kyphoplasty as Reported to the Food and Drug Administration Medical Device Related Web Site

David A. Nussbaum, MS, Philippe Gailloud, MD, and Kieran Murphy, MD

In 2002, approximately 38,000 vertebroplasties and 16,000 kyphoplasties were performed in the United States. As the use of both modalities for the treatment of vertebral compression fractures has increased, so have questions regarding safety and efficacy. The authors addressed this by reviewing both the current literature and complications data reported to the Food and Drug Administration (FDA) Center for Devices and Radiological Health through the on-line database (<http://www.fda.gov/cdrh/maude.html>) and through the Office of the Freedom of Information Act at the FDA. Although both procedures are largely safe, the FDA data highlight two main concerns: reactions to the use of acrylic (polymethylmethacrylate) bone cement, including hypotension and, in some cases, death, especially when multiple vertebral levels are treated in one setting; and a possible increased risk with kyphoplasty of pedicle fracture and cord compression.

J Vasc Interv Radiol 2004; 15:1185–1192

Abbreviations: FDA = Food and Drug Administration, MAUDE = manufacturer and user facility device experience, PMMA = polymethylmethacrylate, VCF = vertebral compression fracture

- Rarement symptomatiques (<0.01%):
FDA 200.000 procédures = 8 décès
25 troubles neuros
(Nussbaum et al, JVIR 2004)

VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- **Fractures adjacentes**
- 20 – 25 % des patients (3 ans)
- Fuites discales ? Modifications biomécaniques?
- Pflugmacher et al, Acta Radiol 2006; Pitton et al, Eur Radiol 2008; Lin et al, AJNR 2007

VP et KP dans les pathologies non tumorales

1. Indication 2. Technique 3. Résultats (Antalgie – Cyphose) 4. Complications

- Fractures adjacentes
- Histoire naturelle de l'ostéoporose : 25%

VERTOS II (Klazen et al, AJNR 2010):

- Le risque de fractures adjacentes augmente avec le nombre de tassements (cyphose)
- Réduire la cyphose permet de réduire le nombre de nouvelles fractures

VP et KP dans les pathologies non tumorales

Conclusion

- Gestes sûrs avec peu de complications
- Angiome douloureux: traitement de référence
- Ostéoporose et traumatisme
- Sélection des patients : Études nécessaires
- Volume de ciment
- Kyphoplasties : Traumatisme? Fractures fraîches?
- Ciments: PMMA, Hydroxyapatite, ...

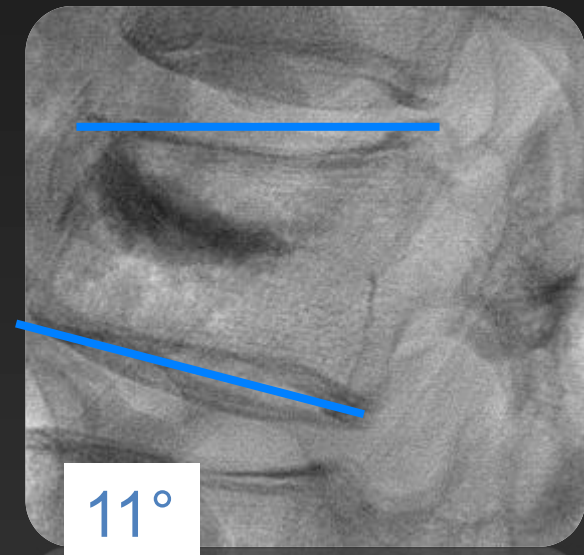
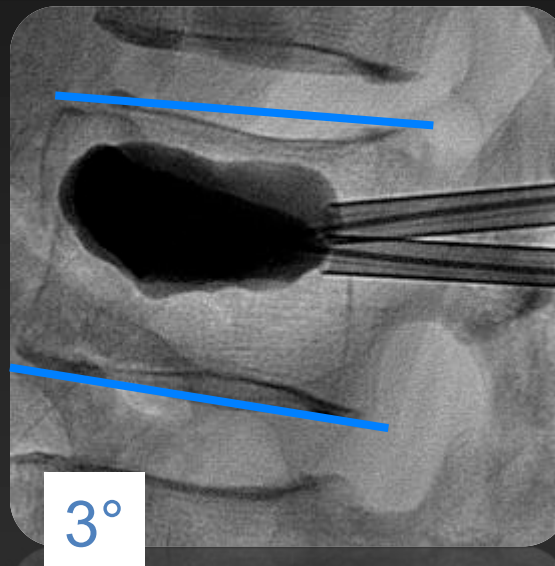
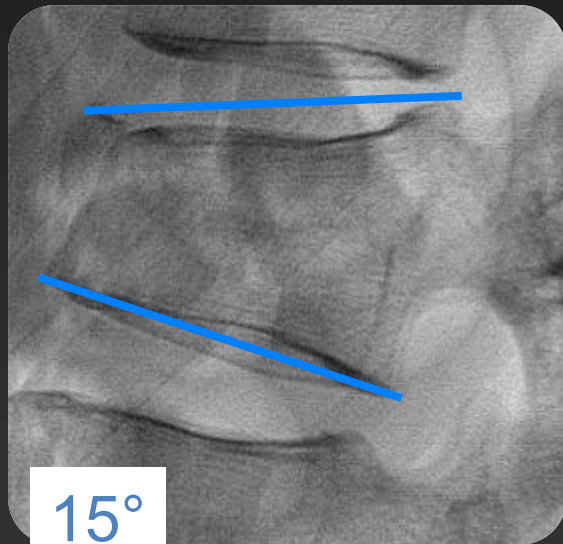
Vertébroplastie et Kyphoplastie dans les pathologies non tumorales



Aurélien Lambert – Fabrice-Guy Barral
Imagerie Musculo-Squelettique
Service de Radiologie – CHU de Saint-Etienne
SFR-RA, 5 février 2011

VP et KP dans les pathologies non tumorales

Conclusion



Perte de réduction de 8 ° !

VP et KP dans les pathologies non tumorales

Conclusion

