

The background of the slide features two human figures from the waist up, rendered in a semi-transparent, light blue style. The spine of each figure is highlighted in a vibrant red color, drawing attention to the central theme of the presentation. The figures are positioned on either side of the central text, creating a symmetrical, anatomical frame.

Inter-hospital Geriatric Meeting: An older lady with low back pain: Is the new technology useful?

Presenter: Dr Ma HM
Supervisor: Dr Ho WS
PWH



Case History [1]

- 87/F, Madam Tsang
- Admitted to the medical unit of PWH on 14/11/10 for reduced oral intake and decrease in general condition



Case History [2]

- Presented to AED 3 days ago for LBP
 - Recent vertebroplasty done in private
 - X-ray L/S spine: degenerative spines and vertebral collapse
 - Stay in AED EMW
 - Back pain improved by physiotherapy
 - Tramadol 50mg QID and salcitonin 200 IU nasal given for 2 weeks
 - BP on high side: add hydrochlorothiazide 50mg daily and nifedpine SR 20mg bd
- Discharged on 13/11/2010



Case History [3]

- At medical ward, clarify the history of back pain from patient and relatives
 - LBP for 3 months already
 - Can only walk with few steps at home by holding onto the furniture
 - No history of falls
 - Not relieved by OTC analgesics
 - Sometimes poor sleep at night time due to pain
 - Bathing help from daughter, other ADL remained independent



Case History [4]

- Attended private 20 days before admission
- Private X-ray spine: collapse of T7 and T8 spines
- Vertebroplasty done on 26/10/10: 4ml bone cement injected in T8 vertebral body and 3ml cement into T7 vertebral body
- Back pain worsen despite operation done



Case History [5]

- PMH:
HT, hyperlipidemia, minor CAD
- Drug history: aspirin 80mg daily, atenolol 75mg daily, famotidine 40mg bd, hydrochlorothiazide 25mg daily, nifedipine slow release 20mg bd and simvastatin 20mg nocte
- NKDA
- FU by FM clinic
- Social history: living with daughter, ADLI, take care of her grandchildren, prepare meals for family members, walk unaided



Physical examination [1]

- General: emaciated, BW 40kg, dehydrated
- Tell history but tired
- Conscious and orientated to TPP
- Mood on low side (no suicidal ideation)
- BP: 139/76 (No postural drop), P: 80bpm, SaO₂: 99% (RA)
- Temp: 37.4
- Chest, cardiovascular and abdominal examination unremarkable



Physical examination [2]

- A large palpable bladder
- Anal tone normal
- Localized tenderness over the mid-thoracic spine
- Neurology: generalized limb weakness with power grade 4/5, reflexes normal and down-going plantar responses bilaterally
- Sensation over the UL and LLs intact



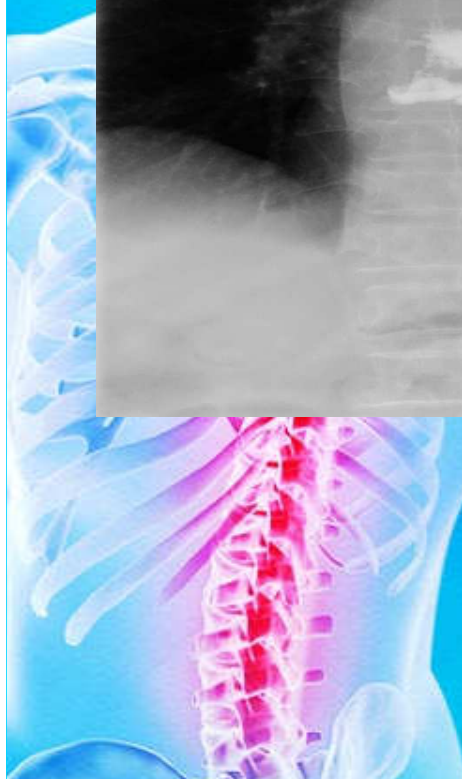
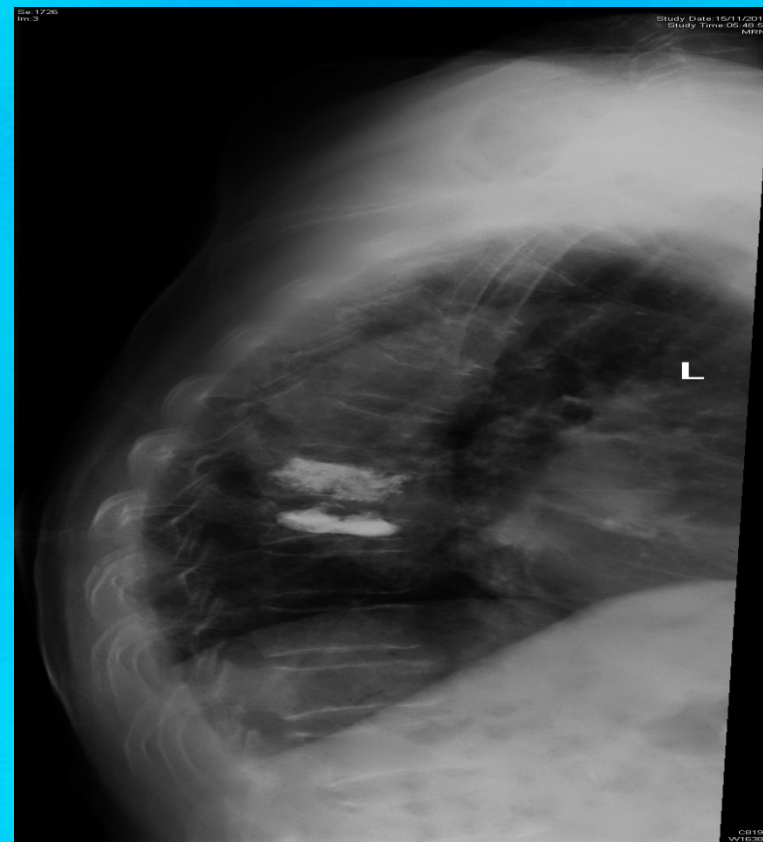
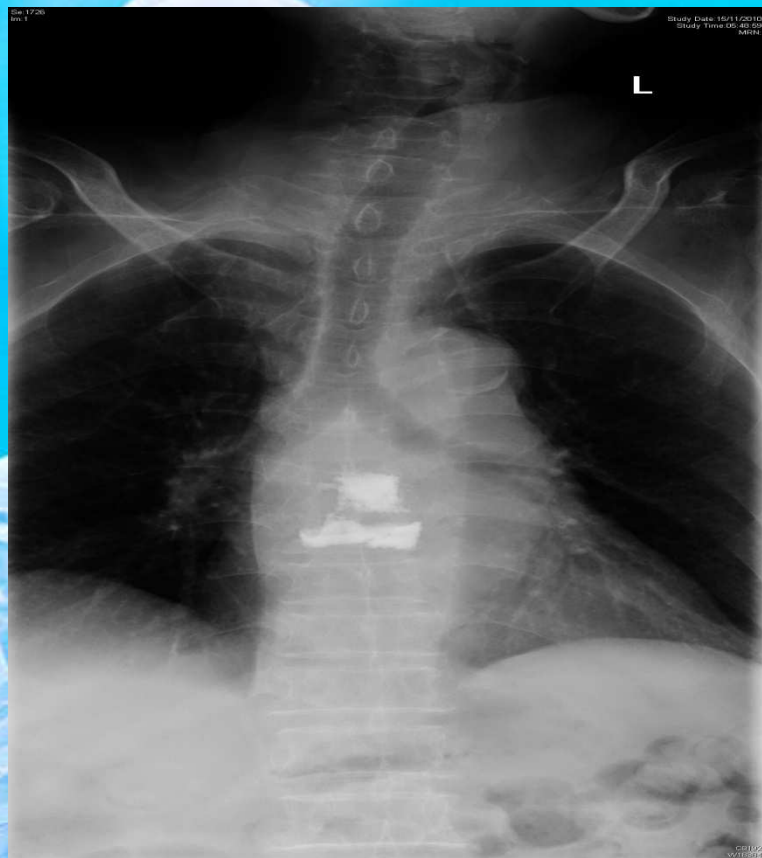
Physical examination [3]

- Unremarkable breast and thyroid examination
- No palpable cervical, axillary and inguinal lymph node
- MMSE 24/30 (5-4-3-4-3-5)
- GDS 5/15



Investigations [1]

- Urine multistix: RBC and WBC +ve; nitrite -ve
- Post void RU 389ml
- CXR bilateral lungs clear
- X-ray T/L/S spine: loss of vertebra height T7 and T8 vertebra. The hyperdense mass in the body of T7 and T8 vertebra may represent cement from previous vertebroplasty. Disc space, end plates and pedicles were grossly intact. Degenerative changes were noted over the lumbar spines.





Investigations [2]

- CBC: Hb 12.6, plt 344, WCC 8.3
- ESR 16, CRP 1.9
- RFT: 125/3.3/11.3/82, albumin 43
- LFT/CaPO₄ normal, RG 7.0
- Paired blood and urine tests (after giving NS for rehydration):
 - Serum Na 129, osmolality 262
 - Urine Na 71, osmolality 553
 - TSH 0.81, random cortisol 497
 - LDSST adequate response



Problem list

- Hyponatremia (HCT, poor intake)
- Dehydration (poor oral intake after tramadol / pain)
- Decreased GC (hyponatremia, dehydration, tramadol)
- Persistent LBP (worsen despite vertebroplasty)
- ? UTI v.s. asymptomatic bacteriuria



Initial Management

- Stop HCT and rehydrate with NS
- Insert urinary catheter
- Simplification of medication
- LBP
 - ❑ Paracetamol and opioid analgesic (dologesic and tramadol) + gabapentin
 - ❑ Salcitonin for osteoporotic LBP
 - ❑ Refer to PT for back physiotherapy and mobilization



Progress [1]

- Hyponatremia
 - ❑ Serum Na improved to 130
- Keep urinary catheter
 - ❑ Urine culture pending
- LBP
 - ❑ Better pain control after medication titration and physiotherapy
- Functional status
 - ❑ Sitting over the bedside with pair trunk control
 - ❑ Able to walk with rolator and two assistants



Progress [2]

- Case reviewed in our geriatric team round:
 - ❑ Patient was in low mood but GDS 5/15, plan to observe mood +/- consider anti-depressant
 - ❑ Pain control improved and plan to step down analgesics (stop gabapentin and keep tramadol only)
 - ❑ Consult orthopaedic team for assessment
 - ❑ Plan to transfer to SH for mobilization after orthopaedic assessment for:
 - Mobilization
 - Drug titration for LBP
 - Off urinary catheter

Progress [3]

- Developed fever (37.9°C) on Day 7
- No respiratory/abdominal/urinary symptoms
- Clear urine in BSB via urinary catheter
- Repeat physical examination similar, including thoracic spinal tenderness
- Urine multistix: blood large and protein +ve, WBC/nitrite both –ve
- Previous urine culture no growth
- Na 126, K 3.2, Cr 50, urea 5.2, osmolality 260
- CRP 14.8, WCC 6.8, Hb 11.1
- Repeat CXR no consolidation



Progress [4]

- Further deterioration with mental dullness and sudden onset of bilateral paraplegia on Day 10
- GCS 9/15 (E2M5V2)
- Responded to pain stimuli
- Bilateral lower limb power grade 1/5, hyporeflexia and left upgoing plantar response, no ankle clonus, anal tone preserved, upper limb power grade 3/5 bilaterally
- ? Cord compression
- ? Analgesics causing drowsiness (though cannot account for paraplegia)
- Stop tramadol
- Drowsiness not reversed by naloxone





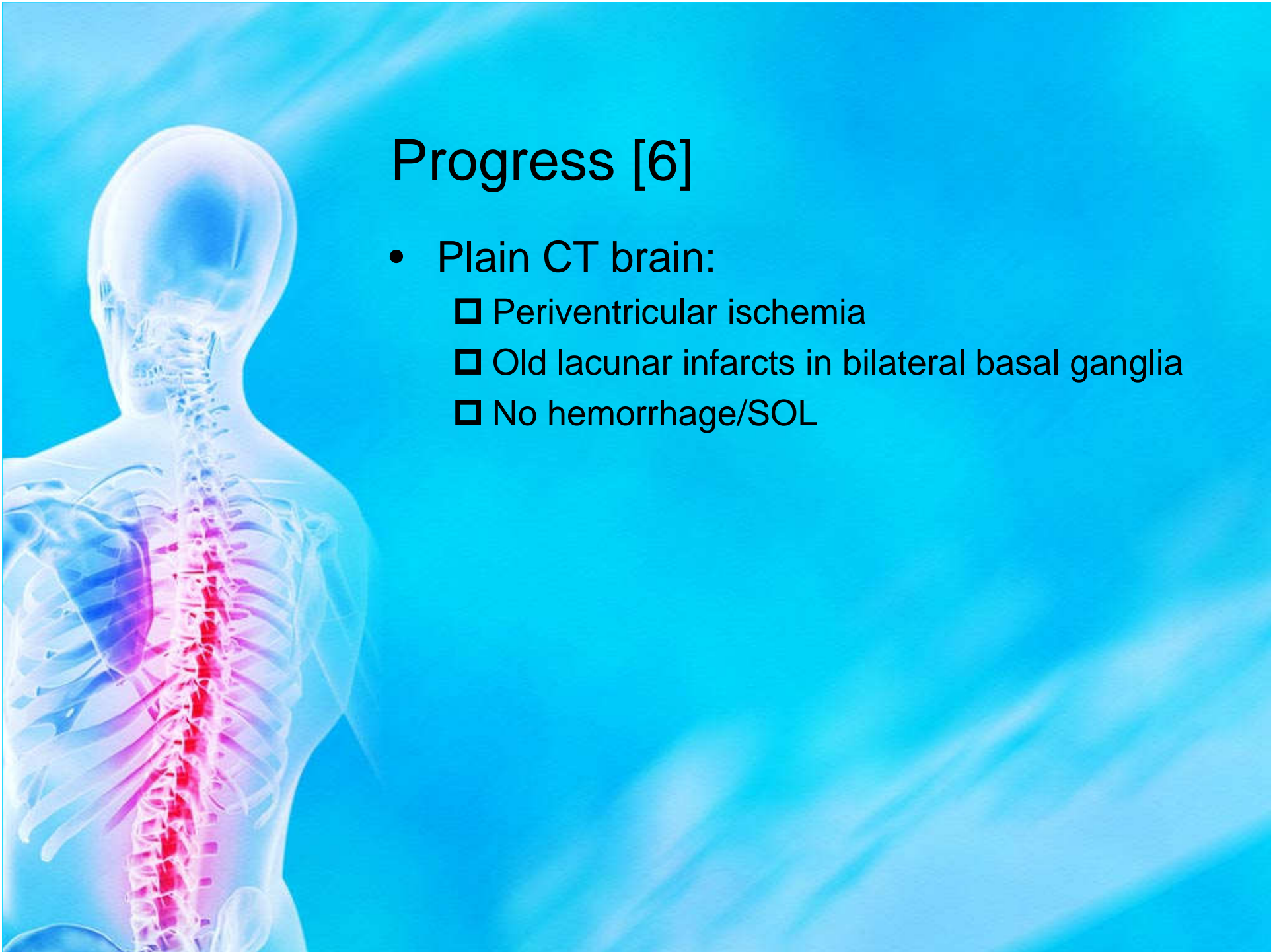
Progress [5]

- Urgent MRI scan of whole spine (no contrast):
 - ❑ Motion artefacts and suboptimal scan
 - ❑ Cervical spine was not well visualized
 - ❑ There was abnormal signal in the T7 and T8 vertebral bodies due to previous vertebroplasty
 - ❑ There was also partial collapse of T8 with mild posterior bony retropulsion
 - ❑ No significant canal stenosis or cord compression



Progress [6]

- Plain CT brain:
 - ❑ Periventricular ischemia
 - ❑ Old lacunar infarcts in bilateral basal ganglia
 - ❑ No hemorrhage/SOL





Progress [7]

- Neurologist suspected CNS infection (dullness + fever)
- LP attempted: first one failed and reattempt on the next day
- Second LP: mildly traumatic tap, OP 10cm, straw colored CSF (look like urine !)
- Add ceftriaxone 2g Q12H IV



Progress [8]

- CSF analysis:
WCC 70 (95% lymphocytes)
TP 6.05 (blood stained CSF)
Glucose 0.5
HSV1 and 2, Enterovirus and VZV –ve
Cytology negative for malignancy but a large amount of WBC (half polymorphs and half lymphocytes)

Causes of her neurological deterioration (?)

1. CNS infection

- ✓ Fever, high CRP and urine-like CSF
- ✓ Iatrogenic cause (LP)
- ✓ Increased CSF protein/WBC and low glucose
- x Insidious onset (not typical of meningitis)
- x Apparent lesion at cord level (bilateral upward plantar + hyporeflexia LL)
- x CSF opening pressure not elevated
- x CSF “urine-like” but NOT cloudy / turbid as expected with high protein / WBC



Causes of her neurological deterioration (?)

2. Cord compression

- ✓ Sudden onset of paralysis + LBP
- ✓ Neurological findings compatible with cord compression (L1 spinal level ~ T8/9 vertebral level)
- ✓ Elevated CSF protein level
- ✓ CSF opening pressure not high (obstruction above L4/5)
- x Not supported by MRI finding (absence of significant cord compression)



Causes of her neurological deterioration (?)

3. Vertebroplasty

- ✓ Is the CSF finding “normal” for vertebroplasty??? (high protein/WCC may be due to vertebroplasty, but low glucose was unexplainable)

Working diagnosis: **cord compression related to vertebroplasty**

Empirically treated as for **TB meningitis** as it was the only potentially reversible factor





Progress [9]

- CRP further elevated to ~30 (mg/L)
- Plan to repeat MRI brain and whole spine (with contrast) on 6/12/2010
- CSF MTB PCR negative
- Patient downhill trend and gasping
- Relatives agreed for comfort care
- Started on morphine drip
- Finally succumbed on 2/12/2010
- Cause of death: meningitis (put on the death certificate)



Questions on the case?



Our questions?

- Is it worthwhile to do vertebroplasty in this lady?
- What are possible side effects / complications associated with the procedure?
- Do we know the “normal” CSF changes after spinal manipulations?

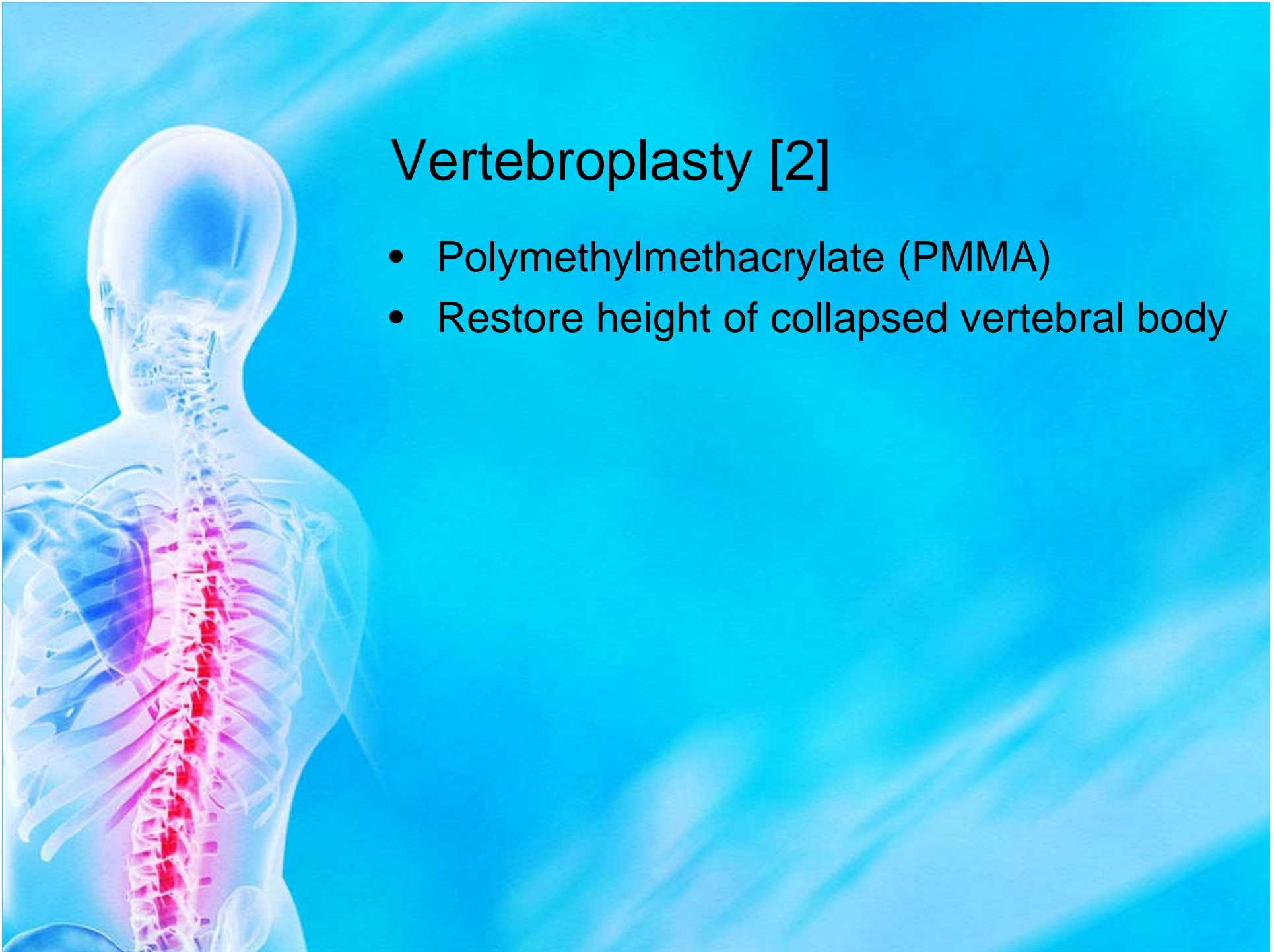


Vertebroplasty [1]

- First done by interventional radiologist in 1984 in France
- Osteoporosis compression fractures
- Vertebral fractures from benign and malignant tumours
- Percutaneous route under local analgesia
- Performed in day center
- Percutaneous vertebroplasty (PV): injection of bone cement under fluoroscopic guidance

Vertebroplasty [2]

- Polymethylmethacrylate (PMMA)
- Restore height of collapsed vertebral body



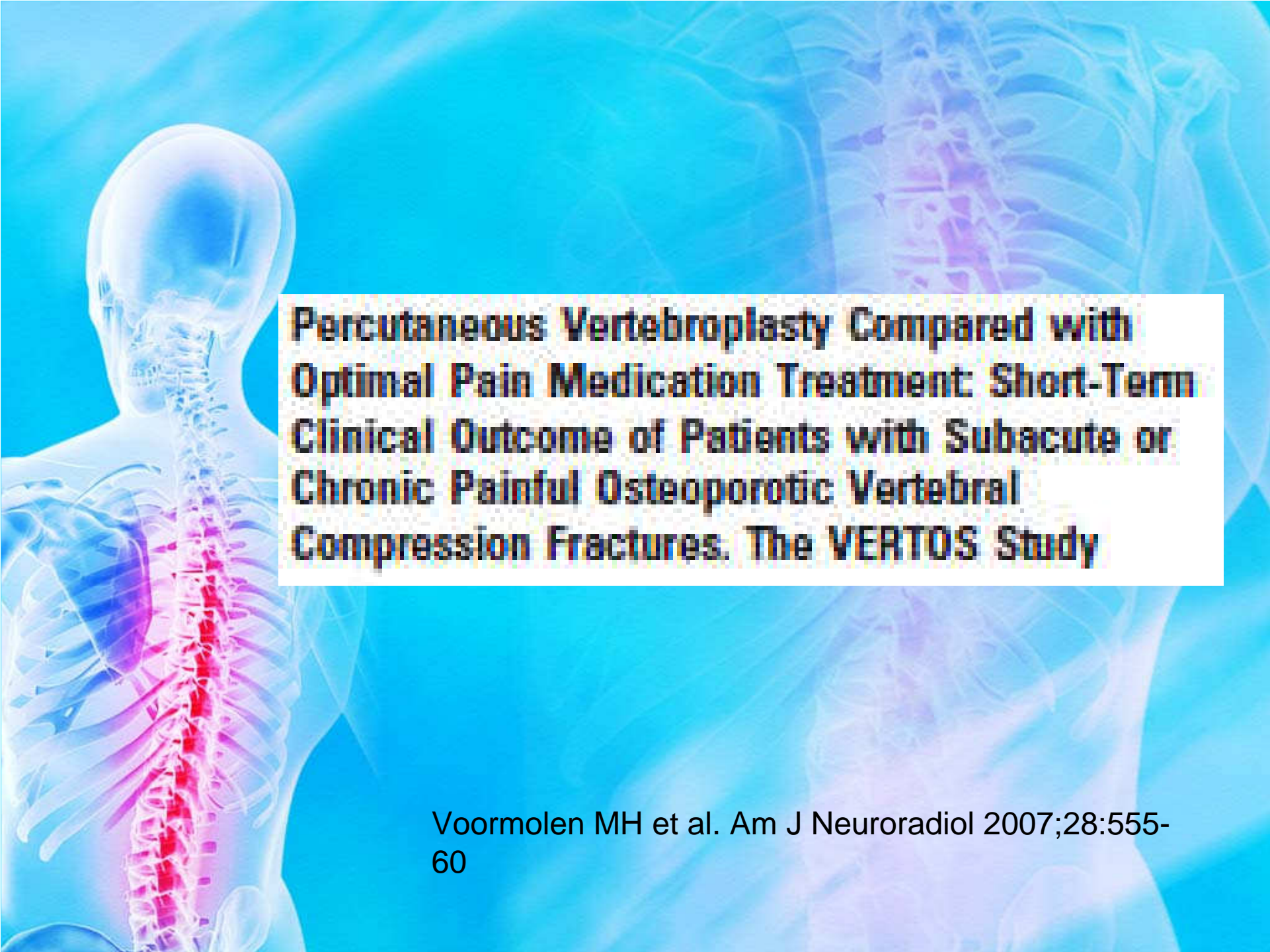


Kyphoplasty

- Balloon-assisted vertebroplasty
- An balloon inflates the vertebral body and pushes the end-plate apart before injecting bone cement
- Introduced in the early 1990s
- Performed by orthopaedic surgeon under general anaesthesia

The image features two human figures against a blue background. The figure on the left is a smaller, semi-transparent model of a human torso, with the spine highlighted in a bright red color. The figure on the right is a larger, more detailed semi-transparent model of a human torso, with the spine highlighted in a purple color. The text is overlaid on the right side of the image.

Literature Review on the RCTs
of Vertebroplasty or Kyphoplasty
in the Treatment of Osteoporotic
Back Pain



Percutaneous Vertebroplasty Compared with Optimal Pain Medication Treatment: Short-Term Clinical Outcome of Patients with Subacute or Chronic Painful Osteoporotic Vertebral Compression Fractures. The VERTOS Study

Voormolen MH et al. Am J Neuroradiol 2007;28:555-60



VERTOS 1 Study

- The first RCT to compare PV with conservative treatment
- P: Subacute to **CHRONIC** osteoporotic back pain, i.e. 6 weeks to 6 months, despite medical therapy (18 patients)
- I: Vertebroplasty (16 patients)
- C: Optimal pain medication (OPM)
- O: One year follow up for pain and QOL



VERTOS 1 Study

- Patient in the control arm can switch to vertebroplasty group after 2 weeks of starting treatment
- Mean duration of back pain: **3 months**
- Premature termination of the study due to high switch over rate (88%)
- Less pain and analgesic use at 1 day and 2 weeks in the PV group



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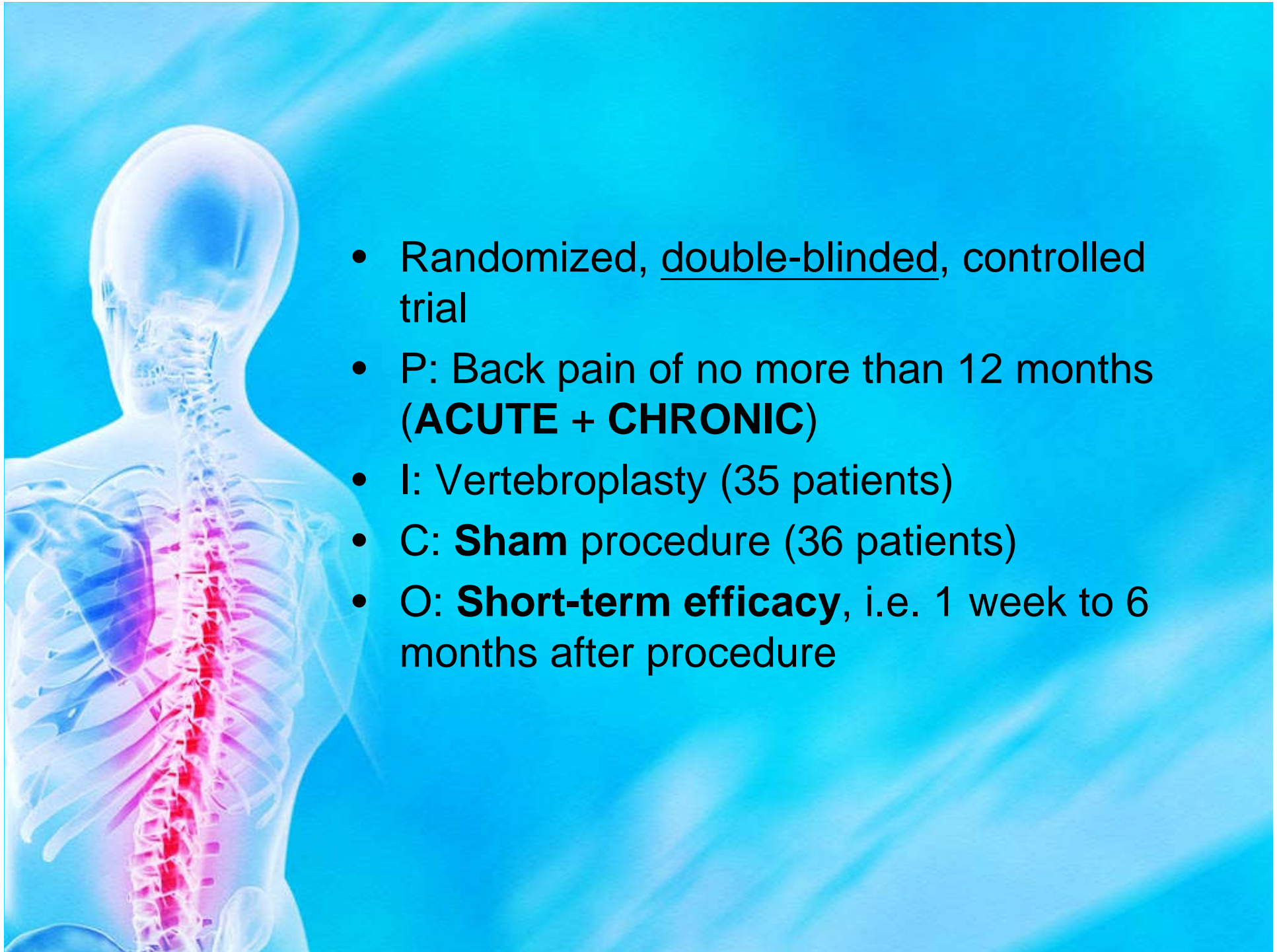
AUGUST 6, 2009

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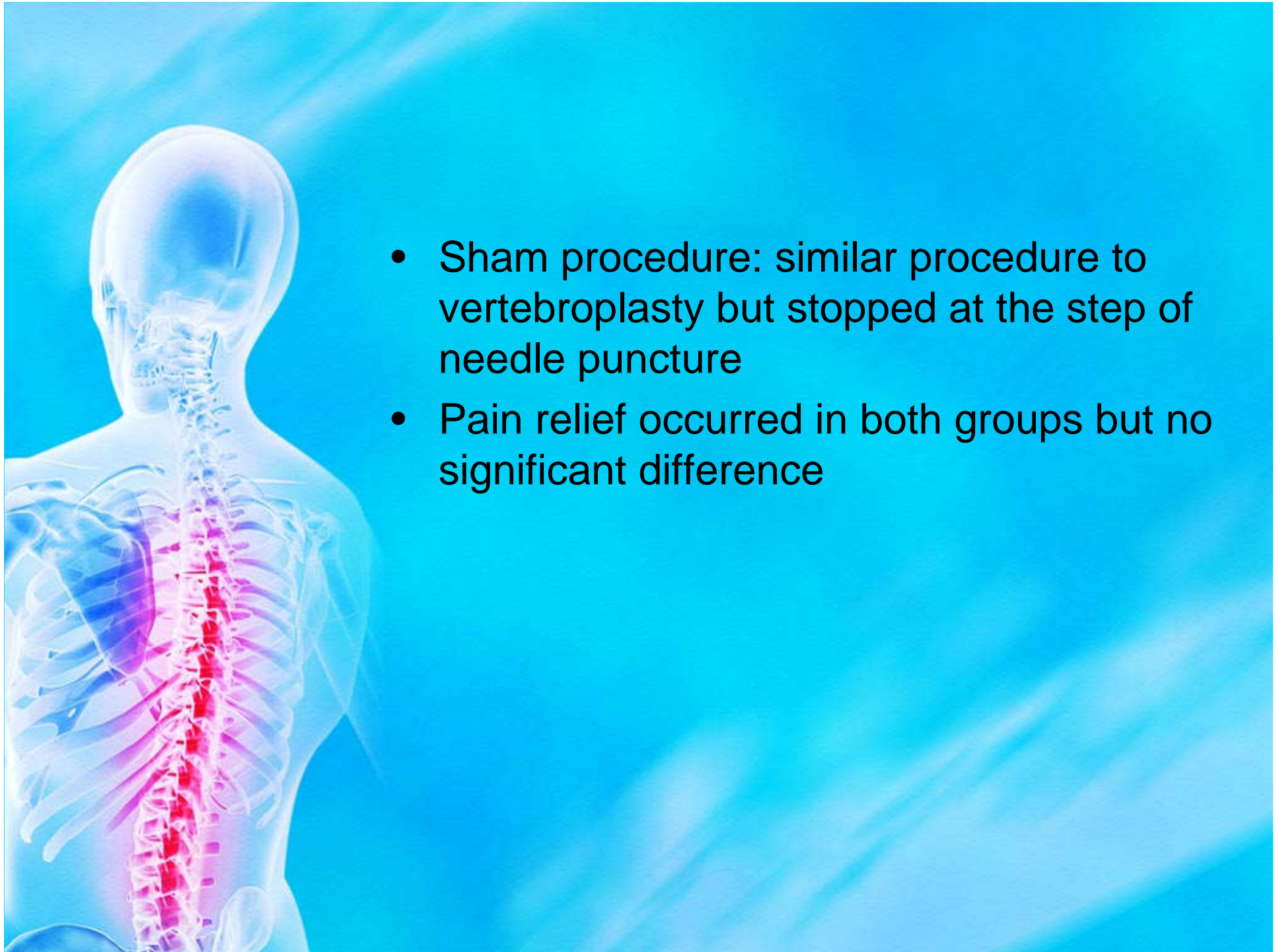
A Randomized Trial of Vertebroplasty for Painful Osteoporotic
Vertebral Fractures

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.

Buchbinder R et al. N Engl J Med 2009;361:557-568



- Randomized, double-blinded, controlled trial
- P: Back pain of no more than 12 months (**ACUTE + CHRONIC**)
- I: Vertebroplasty (35 patients)
- C: **Sham** procedure (36 patients)
- O: **Short-term efficacy**, i.e. 1 week to 6 months after procedure



- Sham procedure: similar procedure to vertebroplasty but stopped at the step of needle puncture
- Pain relief occurred in both groups but no significant difference



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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.

Kallmes DF et al. N Engl J Med 2009;361:569-579



Investigational Vertebroplasty Safety and Efficacy Trial (INVEST)

- Randomized, double-blinded, controlled trial
- P: Back pain of no more than 12 months
- I: Vertebroplasty (68 patients)
- C: Sham procedure (63 patients)
- O: short-term efficacy
- Significant improvement in back pain, functional disability and QOL at 3 day and 1 month after procedure in BOTH groups of patients WITHOUT statistically significant difference



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 Blank, Alexander Venmans, Willem Jan J van Rooij, Marinus C Schoemaker, Job R Juttmann, Tjoen H La, 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

Klazen CAH et al. Lancet 2010;376:1085-92




VERTOS II Study

- P: **ACUTE** back pain of 6 weeks or less
- I: Vertebroplasty (101 patients)
- C: Conservative treatment (101 patients)
- O: Pain relief
- Mean time from onset of pain to operation: 5.6 weeks



VERTOS II Study

- **Better pain relief** in the vertebroplasty group compared with the group treated conservatively **from 1 day to 1 month after the procedure**
- **The differences diminished with time**
- Vertebroplasty effective in providing control over **ACUTE** osteoporotic back pain
- Effect sustained for one year (but diminished with time)

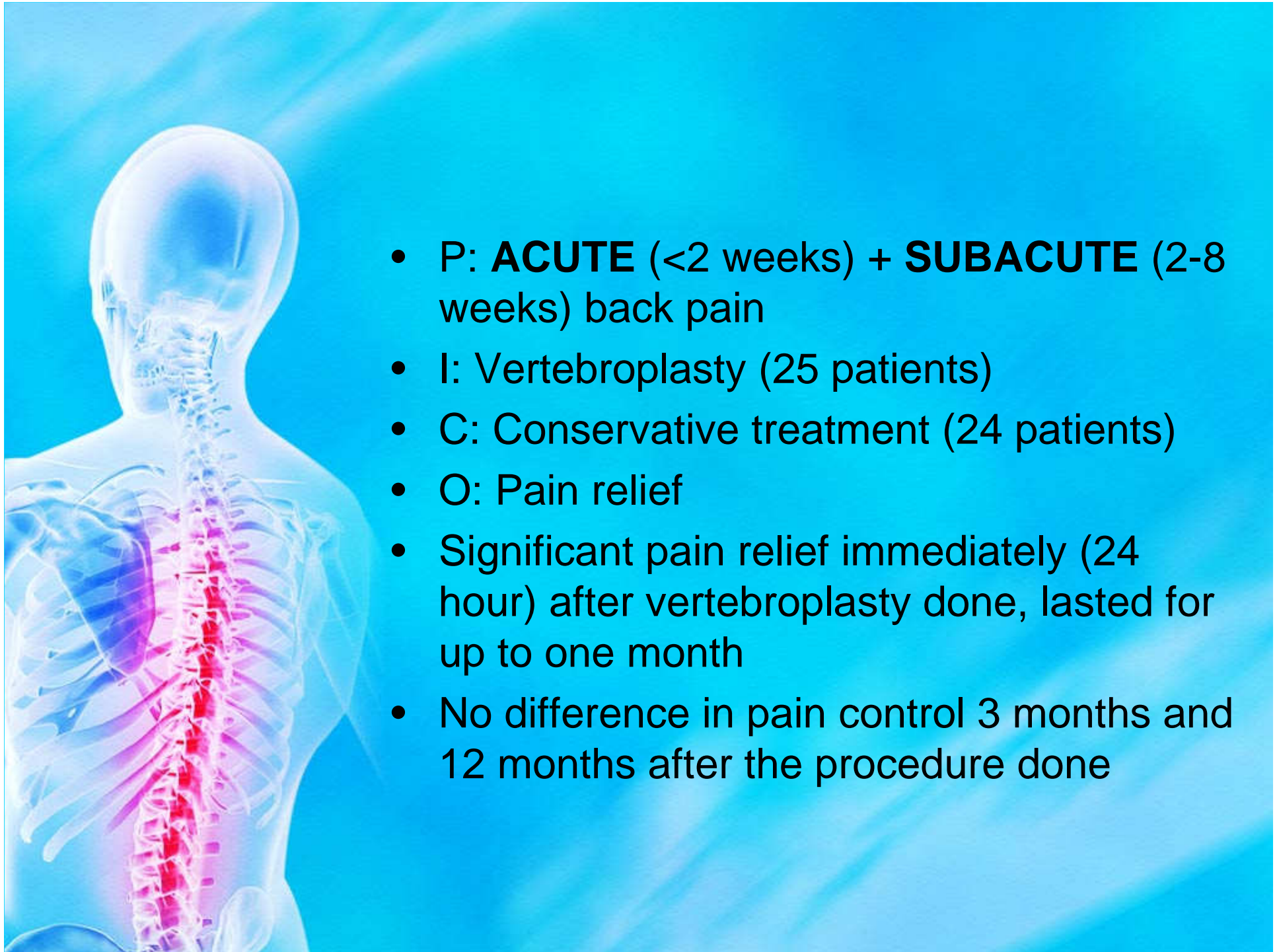


**Twelve-Months Follow-up in Forty-Nine Patients
With Acute/Semiacute Osteoporotic Vertebral
Fractures Treated Conservatively or With
Percutaneous Vertebroplasty**


A Clinical Randomized Study

Rikke Rousing, MD, Karina L. Hansen, MD, Mikkel O. Andersen, MD,
Stig M. Jespersen, MD, PhD, Karsten Thomsen, MD, DMSc, and Jens M. Lauritsen, MD, PhD

Rousing R et al. Spine 2010;35:478-482



- P: **ACUTE** (<2 weeks) + **SUBACUTE** (2-8 weeks) back pain
- I: Vertebroplasty (25 patients)
- C: Conservative treatment (24 patients)
- O: Pain relief
- Significant pain relief immediately (24 hour) after vertebroplasty done, lasted for up to one month
- No difference in pain control 3 months and 12 months after the procedure done



W Efficacy and safety of balloon kyphoplasty compared with non-surgical care for vertebral compression fracture (FREE): a randomised controlled trial

Douglas Wardlaw, Steven R Cummings, Jan Van Meirhaeghe, Leonard Bastian, John B Tilman, Jonas Ranstam, Richard Eastell, Peter Shabe, Karen Talmadge, Steven Boonen

Wardlaw D et al. Lancet 2009;373:1016-24



FREE Study

- P: **ACUTE** vertebral fractures (mean 5.6 weeks+/- 4.4)
- I: Balloon kyphoplasty (149 patients)
- C: Conservative treatment (151 patients)
- O: Pain relief
- Kyphoplasty provided better pain control than conservative treatment at 1 month after procedure done
- Effect lasted up to 12 months

	Kallmes et al (2009) ²⁴	Buchbinder et al (2009) ²⁵	Wardlaw et al (2009, FREE) ²⁶	Rousing et al (2010) ²⁷	Klazen et al (2010, Vertos II) ²⁸
Intervention	Vertebroplasty	Vertebroplasty	Kyphoplasty	Vertebroplasty	Vertebroplasty
Inclusion criteria	Fracture age <1 year	Fracture age <1 year	Fracture age <3 months confirmed by MRI	Fracture age <8 weeks confirmed by MRI	Fracture age <6 weeks confirmed by MRI
Group sizes	131 (68 PV, 63 sham)	78 (38 PV, 40 sham)	300 (149 BKP, 151 NSM)	50 (26 PV, 24 NSM)	202 (101 PV, 101 NSM)
Primary outcome	RMDQ (difference 0.7, 95% CI -1.3 to 2.8, p=0.49) and pain (difference 0.7, -0.3 to 1.7, p=0.19) at 1 month, not significant	Pain at 3 months (difference 0.6, 95% CI -0.7 to 1.8, p value not reported)	QOL (SF-36 PCS) at 1 month (difference 5.2, 95% CI 2.9 to 7.4, p<0.0001), significant	Pain relief at 1 day (7-9 before operation to 2-0 after 12-24 h, p<0.00); no difference in pain between the groups after 3 and 12 months	Pain relief at 1 month (difference 2.6, 95% CI 1.74 to 3.37, p<0.0001) and 1 year (difference 2.0, 1.13 to 2.80, p<0.0001), significant
Secondary outcomes	SF-36 (all domains), EQ-5D, pain frequency index, pain bothersomeness index, SOF-ADL, activity (mobility, limitations), opioid use, procedure guess	RMDQ, EQ-5D, QUALEFFO, AqoL, pain at rest and in bed, perceived recovery	SF-36 (all domains), EQ-5D, RMDQ, pain, restricted activity days, narcotic use, radiographic assessment, economic data; All at 1, 3, 6, and 12 months	SF-36, DPG, EQ-5D, Barthel index, MMSE, tandem test, timed up and go, repeated chair test	EQ-5D, QUALEFFO, RMDQ, cost effectiveness at 1 month and 1 year estimated with the EQ-5D
Pain relief	Not significant	Not significant	Significant at 1 week and 1, 3, 6, and 12 months	Significant at 1 day; not significant at 3 and 12 months	Significant at 1 week and 1, 3, 6, and 12 months
Complications	1 thecal sac injury	1 adjacent osteomyelitis, necessitating surgical drainage and antibiotic treatment	1 urinary-tract infection; 1 subcutaneous haematoma	Some asymptomatic cement leaks	1 urinary-tract infection; 1 asymptomatic cement deposition in pulmonary artery

PV-percutaneous vertebroplasty, BKP-balloon kyphoplasty, NSM- non-surgical management, RMDQ-Roland Morris Disability Questionnaire, QOL- quality of life, SF-36-short form 36, PCS-physical component summary score, EQ-5D-EuroQoL-5 dimensions, SOF-ADL-Study of Osteoporotic Fractures and Activities of Daily Living, QUALEFFO-Quality of Life Questionnaire of the European Foundation for Osteoporosis, AqoL-Assessment of Quality of Life, DPG-Dallas Pain Questionnaire, MMSE-mini-mental state examination.

Table Randomised trials of balloon kyphoplasty and percutaneous vertebroplasty



Summary on vertebroplasty

- Relieving **acute** osteoporotic back pain
 - May be considered if optimal medical therapy is not enough to relieve back pain
- Additional “analgesic” effects (over medical + rehabilitation treatment) seems to wean off by **one year**
 - Value for beyond-acute LBP?

Recurrent back pain after vertebroplasty

TABLE 1: Summary of Causes of Recurrent Pain After Percutaneous Vertebroplasty

Cause	Incidence	Time Between Procedure and Pain Onset	Clinical Finding	Risk Factor	Imaging Finding	Treatment and Prognosis	Prevention
Rib fracture	0.3–6.9% [5, 7, 8]	24 h	Focal tenderness at the chest wall	Severe osteoporosis, long procedure time, muscle spasm during procedure, poor technique	Linear and nondisplaced fracture best depicted on CT images	Conservative treatment with analgesics	No more than three levels in one procedure, appropriate technique [7]
Infection	0.3–1.6% [18]	Days to months	Fever, back pain Increased WBC count and erythrocyte sedimentation rate	Immunocompromise and systemic infection [12, 15]	Fluid around cement and in the paraspinal region, destruction of endplate and adjacent disk	Initial conservative treatment; if failed, surgical débridement [17]	Prophylactic antibiotic injection [10, 22]
Nonhealing bone–cement interface	27% [29]	Days to months	Back pain with intolerance of extensive walking or sitting; laboratory data usually normal	Vacuum clefts, vertebral location, and possibly severity of untreated compression fracture	Fluid around the cement with or without bone marrow edema in the residual bone	Initial conservative treatment; if failed, repeated percutaneous vertebroplasty or removal of cement	Bed rest with minimal movement for 2 or 3 days after procedure
New symptomatic compression fracture	42.9% (11.5-mo follow-up) [32]	Within 30 d in 67% of cases (2-y review) [33]	Recurrent back pain adjacent to treated levels or at different location in thoracolumbar spine	Preoperative and postoperative risk factors	New-onset bone marrow edema with or without collapse of vertebral body	Repeated percutaneous vertebroplasty	Prophylactic vertebroplasty
Leakage	Total, 19.7% [56] to 26.5% [57]; symptomatic leakage, 1.6% [56]		Radiculopathy, myelopathy, or both	Osteolytic metastatic disease [22], increased amount of injected cement [57], injection technique [57, 59, 60], injection time [58]	Postoperative CT best depicts extension and severity of leakage	Conservative treatment with pain control or operation	Adequate opacification of cement and appropriate technique [55]
Idiopathic	1.1–4% [29, 58]	Immediately after procedure	Transient pain exacerbation	None	No specific findings on CT and MRI	Conservative treatment with pain control	None

Cement leakage [1]

- Cement leakage outside vertebral body during vertebroplasty, sometimes even into the disc
- May result in painful new adjacent vertebral compression fracture (VCF)
- Usually responded to conservative treatment





Cement leakage [2]

- Retrospective review of 106 consecutive patients undergoing vertebroplasty
- Age: 50-96 years (range)
- New adjacent VCF occurred in 18.9% (20/106) of patients during 24 months of follow-up (mean 38 months)
- Thoracolumbar junction (18), lumbar (3) and thoracic (1)
- Cement leakage occurred in 26 patients: 11 had new adjacent VCF

CSF biochemical changes with vertebroplasty

- No articles could be searched for it





Suggestions on vertebroplasty

- Optimization of medications for acute osteoporotic LBP
- Consider referral to orthopaedic surgeon or interventional radiologist for considering vertebroplasty despite optimal medical therapy for 4 weeks
- Not recommended for chronic LBP
- Beware of possible complications, such as embolism, cement leakage, vertebral compression fracture and spinal infection

Novel treatment/new technology for geriatric population

- Selection of appropriate groups of patients, i.e. careful digestion of inclusion and exclusion criteria of studies
- Cautions against the possible side-effects
- OHAs: glitazone, gliptin
- NSAIDs: rofecoxib (Vioxx ®)



An anatomical illustration of the human spine and ribcage, rendered in a semi-transparent, glowing blue and purple style. The spine is shown in a central, vertical orientation, with the ribcage branching out to the sides. The background is a solid, light blue color. The word "Discussion" is centered in the middle of the image in a bold, black, sans-serif font.

Discussion