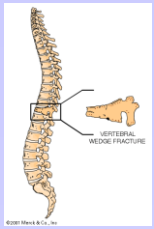

Vertebral fractures: diagnosis and non-pharmacological treatment to improve quality of life

Dr Emma Clark

Consultant Senior Lecturer in Rheumatology

University of Bristol

12th April 2018

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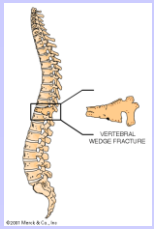

Disclosures

Unrestricted educational grants

- Lilly
- Servier
- Amgen

Unrestricted research grant

- P&G

Consultancy work

- Servier
- Optasia Medical

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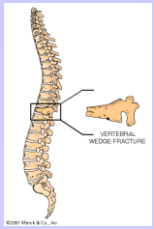

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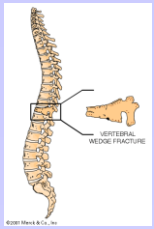
- Which of your patients may have vertebral fractures?
- Non-pharmacological management to improve health-related quality of life
- Adverse effects of ‘exercise’ and physical activity for people with vertebral fractures



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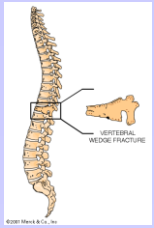
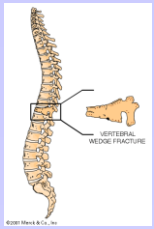


Why is it important to identify people with osteoporotic vertebral fractures?

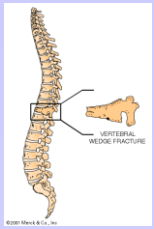
- They identify people at high risk of further osteoporotic fractures:
  - one in four will have a further vertebral fracture[1] within 5 years
  - and one in ten will have a limb fracture (including hip fracture)[2] within five years, and 30% of people die within one year of a hip fracture
- Reduced quality of life, worse than that post-hip fracture (from 0.70 for women aged 65 to 0.44)[3] – mainly a reduction in physical function[4]

[1] Kaptoge et al (2004) JBMR 19(12): 1982-1993 [2] Ismail et al (2001) Osteoporosis Int 12:85-90 [3] Oleksik et al (2000) J Bone Miner Res 15(7):1384-1392 [4] Al-Sari et al (2016) Osteop Int 27:2891-2900



How common are vertebral fractures?

[1] O'Neill at al (1996) JBMR 11:1010-1018



How common are vertebral fractures?

Age	EVOS[1]		GP electronic records in Bristol, UK	
	Female (%)	Male (%)	Female (%)	Male (%)
50-59	9.7	14.1	0	0.7
60-69	15.9	16.7	0.7	0.5
70-79	25.9	20.3	1.7	1.0

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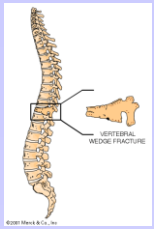

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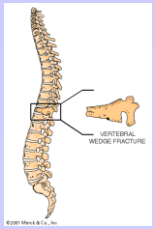

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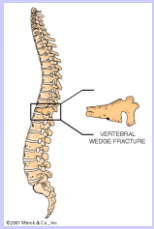

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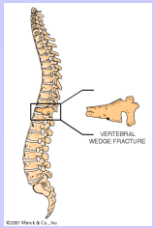
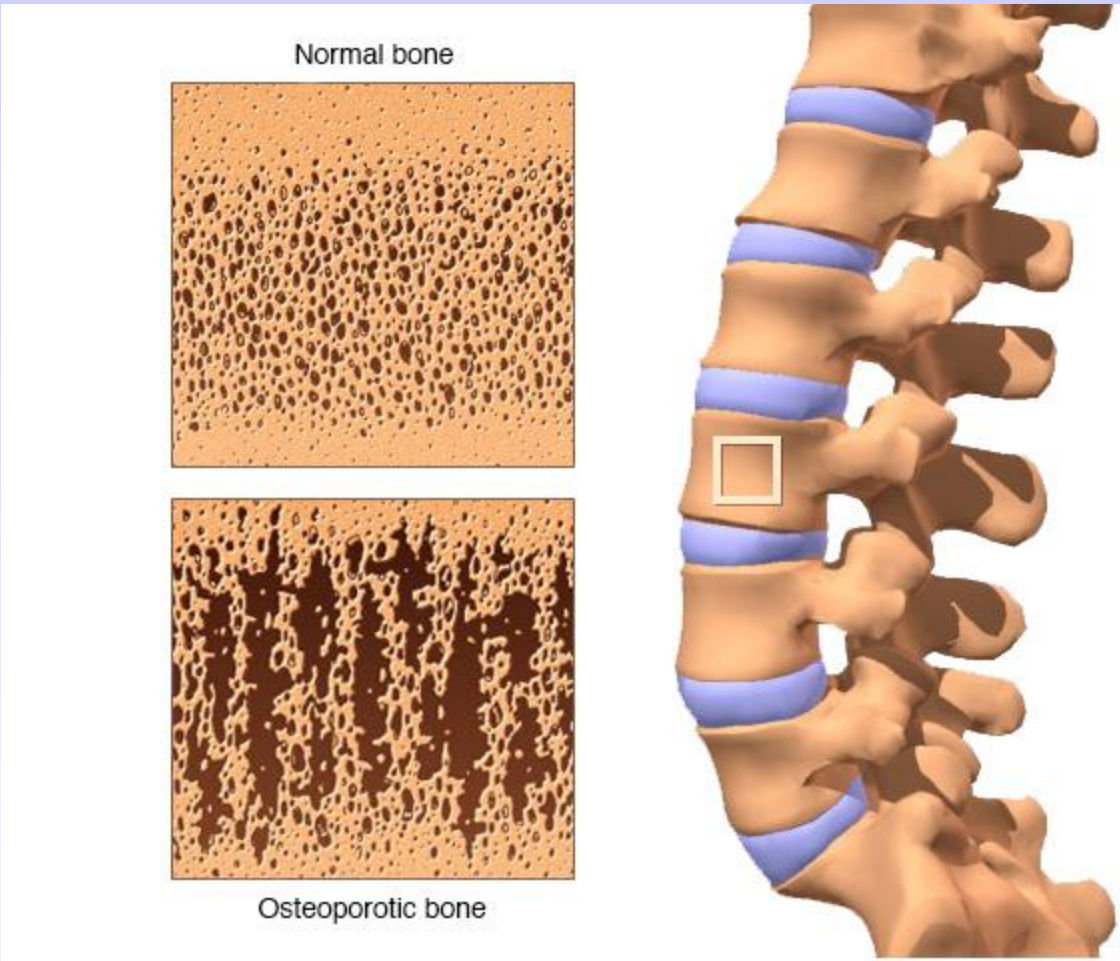


Who gets vertebral fractures

- Increasing age
- Females
- Osteoporosis
- Steroids[1,2]
- Smoking[3,4]



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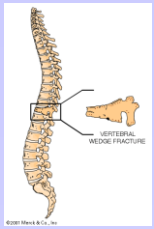
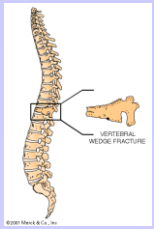
[1] LeBlanc et al (2015) JBMR 30(9):1667-1675 [2] Sugiyama et al (2011) Int Med 50(8):817-824 [3] van der Klift et al (2004) JBMR 19:1172-1180 [4] Jaramillo et al (2015) Annals Am Thor Soc 12(5):648-656



Clinical features that might indicate someone has a vertebral fracture

- History
- Examination



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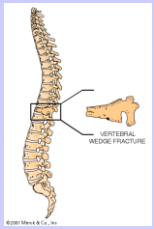
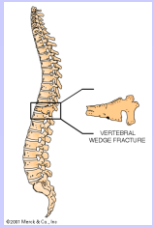


Clinical features that might indicate someone has a vertebral fracture

- History
  - Pain
  - Reported height loss



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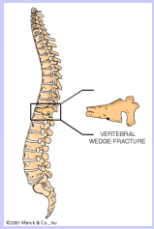

Pain

- Vertebral fractures may be clinically “silent”

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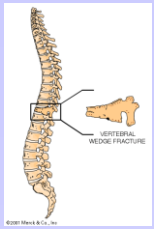


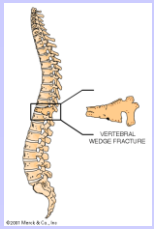
Pain

- New vertebral fractures occurring during a 4-year follow-up that did not come to clinical attention, were nonetheless associated with a two- to three-fold increase in back pain and limitation

  7223 white women older than 65 from SOF

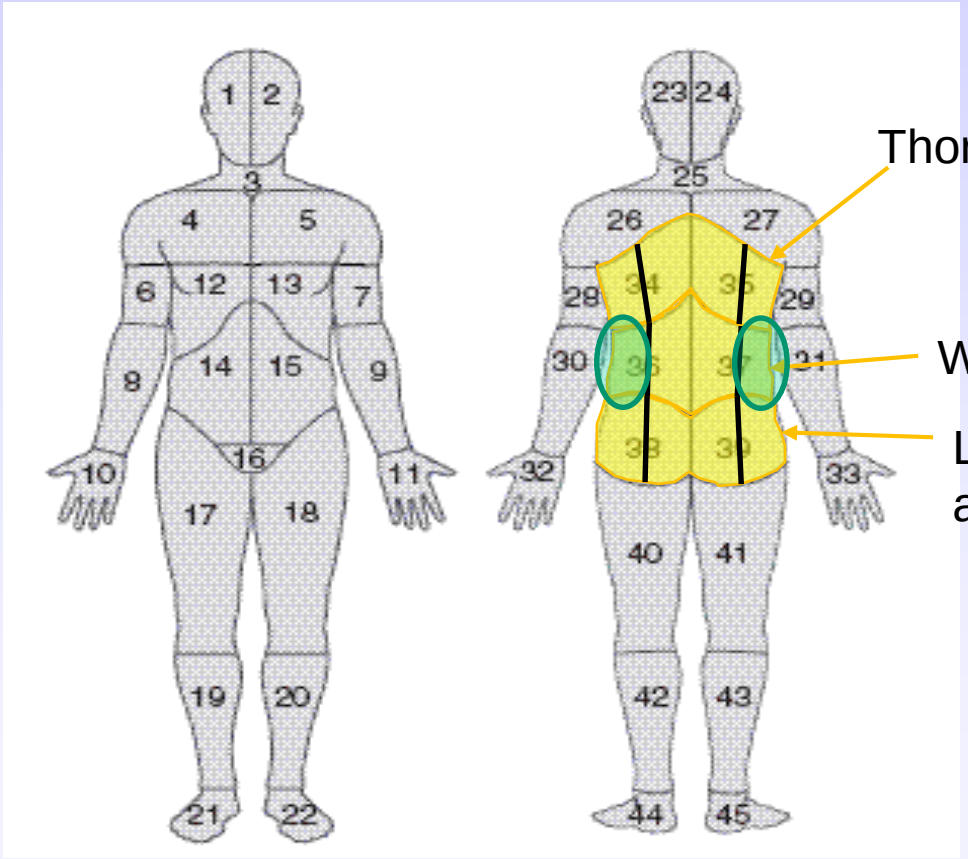
- Attitudes toward back pain in older women, and access to health care

[1] Nevitt MC et al, Ann Int Med 1998; 128: 793-800



Lateral back pain identifies prevalent vertebral fractures in postmenopausal women: cross-sectional analysis of a primary-care based cohort

EM Clark, AP Hutchinson, EV McCloskey, MD Stone, JC Martin, AK Bhalla, JH Tobias (2009) Rheumatology 49:505-512



Lateral waist pain is associated with a 4.5 fold increased risk of vertebral fractures (OR 4.48, 95%CI 2.02 to 9.94, P<0.001)

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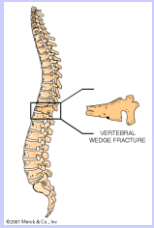

Using self-reports of pain and other variables to distinguish between older women with back pain due to vertebral fractures and those with back pain due to degenerative changes

EM Clark, R Gooberman-Hill, TJ Peters (2016) Osteop Int 27:1459-1467

With vertebral fracture	Without vertebral fracture
▪ Pain for a few days/weeks	▪ Pain for months to years
▪ Brief or momentary pain	▪ Other severe pain experiences
▪ Improvement of pain on lying	▪ Negative effect of weather
▪ Pain described as crushing	▪ Pain radiating down legs

No difference in pain severity, or bothersomeness of back pain

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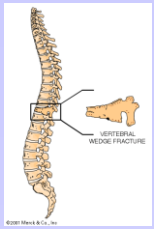

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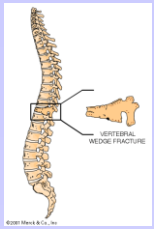
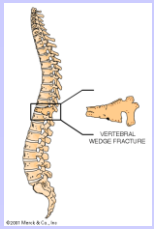


History of height loss

- Reported height loss
  = reported height at aged 25 minus measured height now
  – >4cm is associated with presence of vertebral fractures[1,2]

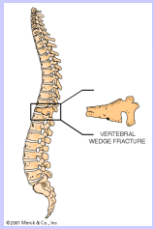
- Trousers or skirts now too long
- Can't reach up to cupboards that could reach before

[1] Nicholson PHF et al, Osteop Int 1993; 3: 300-307 [2] Tobias JH et al, Osteop Int 2007; 18: 35-43



Clinical features that might indicate someone has a vertebral fracture

- History
- Examination
  - Increased thoracic kyphosis
  - Rib to pelvis distance



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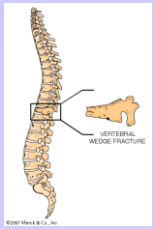

Increased thoracic kyphosis

- The majority of men and women with the most exaggerated kyphoses have no evidence of vertebral fracture or osteoporosis[1]

  1407 people aged 50-96 from the Rancho Bernado study in the US

  – Degenerative disc disease was the most common finding

[1] Schneider DL et al, J Rheum 2004; 31(4):747-752

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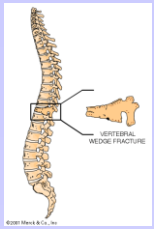

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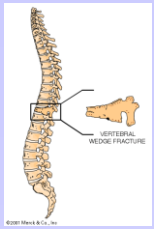
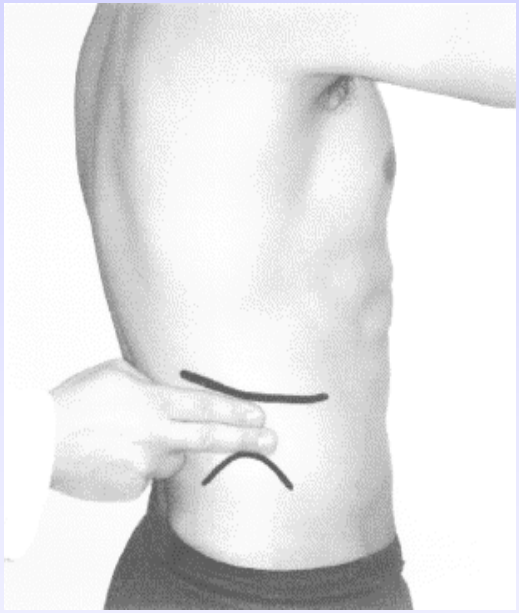


Rib to pelvis distance



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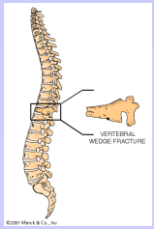
[1] Siminoski K et al, Am J Med 2003; 115:233-236



Rib to pelvis distance

Variable		0 VF (n=472)	1 VF (n=24)	>2 VFs (n=13)	Significance (three-group comparison)	>1 VF (n=37)	Significance (two-group comparison)
Rib-pelvis (FB)							
	1 (%)	101 (21%)	7 (29%)	7 (54%)	P=0.013	14 (38%)	P=0.016
	2 (%)	311 (66%)	15 (63%)	6 (46%)		21 (57%)	
	3 (%)	59 (13%)	2 (8%)	0 (0%)		2 (5%)	
	4 (%)	1 (<1%)	0 (0%)	0 (0%)		0 (0%)	

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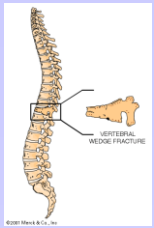
[1] Tobias et al, Osteop Int 2007; 18:35-43



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Rib-pelvis (FB)							
	1 (%)	101 (21%)	12.2%		P=0.013	14 (38%)	P=0.016
	2 (%)	311 (66%)	15 (63%)	6 (46%)		21 (57%)	
	3 (%)	59 (13%)	3.2%			2 (5%)	
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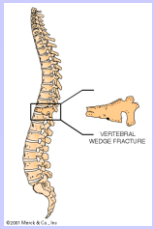
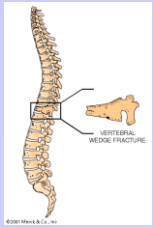


Examination for recent onset vertebral fractures

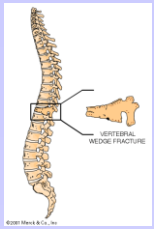
- New osteoporotic vertebral fractures are tender to gentle percussion whereas degenerative spinal disease is not[1]

[1] Langdon J et al (2010) Annals Royal Col Surg Eng 92(2):163-166



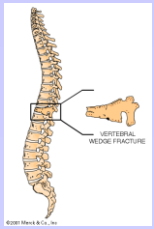
Summary of potentially useful features in history and examination

- Traditional risk factors for osteoporosis
  - Females
  - Older age
  - Smoking
  - Steroids in men and children
- Back pain
  - Lateral waist pain
  - Brief or momentary pain
  - Back pain improving on lying down
- Reported height loss of >4cm
- Rib-to-pelvis distance of 1 finger or less



Summary so far

- Vertebral fractures are common, important and associated with a reduced quality of life
- Many people with vertebral fractures are undiagnosed
- We know who is more likely to have a vertebral fracture



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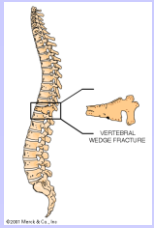
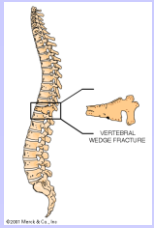


Reminder about complete management of people with vertebral fractures

- Assessment of underlying cause

- If due to bone fragility
  - Medications to reduce risk of future fracture in all
  - Assessment of calcium intake and supplementation if needed
  - Assessment of vitamin D status and supplementation if needed
  - Analgesics for pain relief if needed
  - Non-pharmacological interventions to improve quality of life



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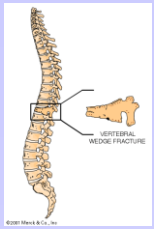

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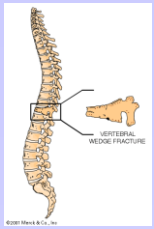
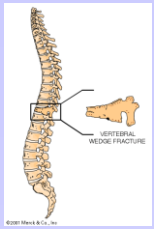


Non-pharmacological interventions to improve quality of life in people with…

- Acute vertebral fractures
- Chronic vertebral fractures



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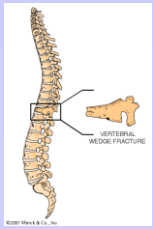


Cause of reduced health related quality of life in acute vertebral fractures

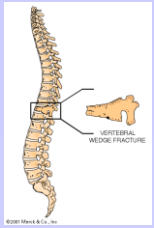
- Not completely understood

Pain

- Fractured trabeculae or cortex shifting with movement
- Associated release of cytokines required in the healing process
- Paraspinal muscle spasm

Other causes of reduced quality of life

- Fear of further fractures
- Fear of falling
- Reduced physical functioning



Acute painful vertebral fracture

Short period of rest (or none[1]) whilst pain-relieving medications are started

Early mobilisation with a rehabilitation, education and exercise programme guided by a healthcare professional

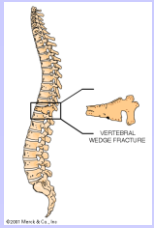
- Exercise and physiotherapy
- Education
- Bracing
- Local heat or cold

Still in pain at 6-8 weeks

Consider vertebral augmentation

University of BRISTOL

[1] Agulnek et al (2009) J Hosp Med 4(7):E20-E24.



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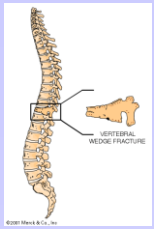

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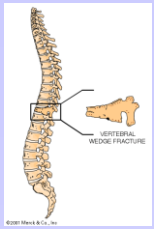


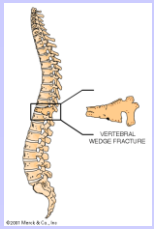
Exercise and physio in acute vertebral fractures

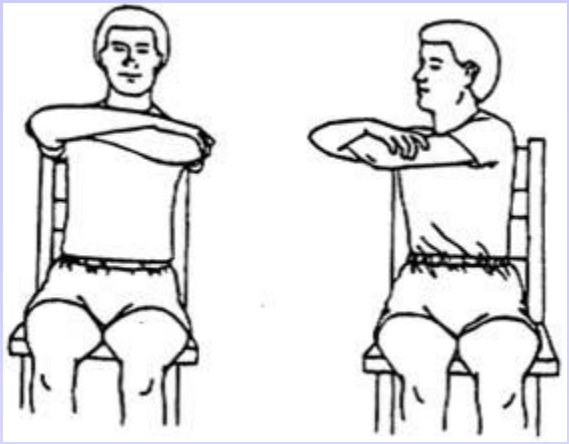
- Aims are pain relief and getting the person back to their normal activities as soon as possible

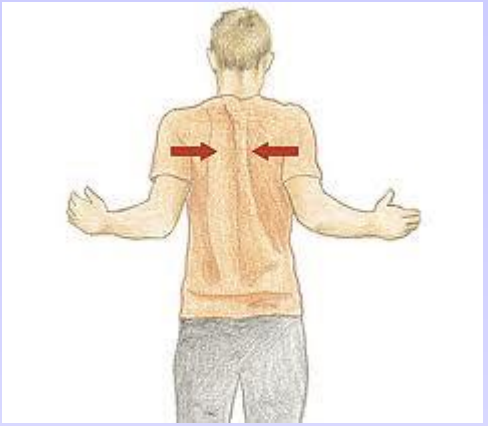
<u>Initial pain relieving exercises</u>

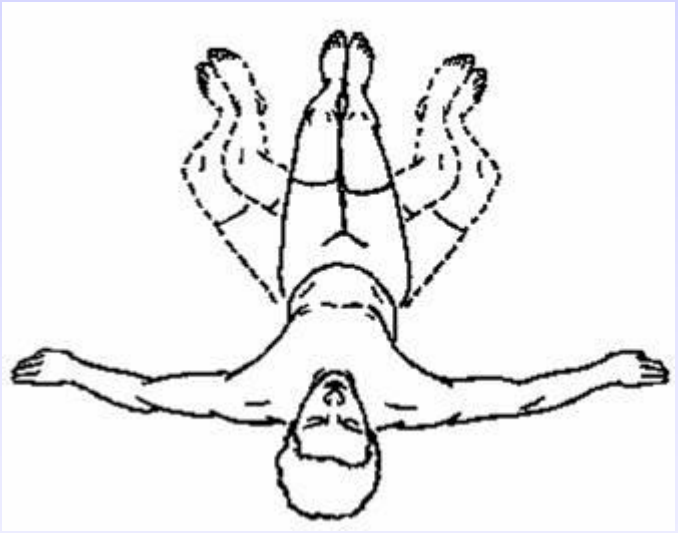
- Isometric contractions of paraspinal muscles: trunk rotation or scapular retraction[1]

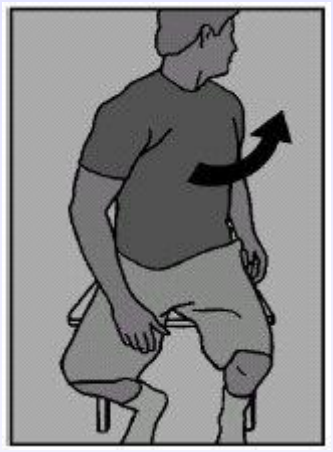
[1] Francis et al (2008) Osteop Int 19:895-903. [2] Devereux et al (2005) Aust J Physio 51(2):102-108











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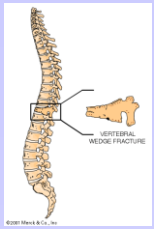


Exercise and physio in acute vertebral fractures

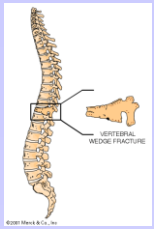
- Aims are pain relief and getting the person back to their normal activities as soon as possible

Initial pain relieving exercises

- Isometric contractions of paraspinal muscles: trunk rotation or scapular retraction[1]
- Hydrotherapy – also improve confidence
  - An RCT of a 10 week class improved quality of life[2]

Improving muscular strength, endurance, posture and balance

[1] Francis et al (2008) Osteop Int 19:895-903. [2] Devereux et al (2005) Aust J Physio 51(2):102-108

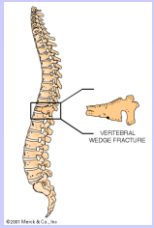


Exercise to improve outcomes in people with vertebral fractures

Summary of review by Giangregorio[1] on exercise to improve outcomes after vertebral fracture:

- Objectives were to evaluate the benefits and harms of exercise interventions of 4 weeks or greater
- Included all randomized trials up to Nov 2011: 7 trials were identified including 488 participants (4 male)

[1] Giangregorio LM et al (2013) Cochrane Database Syst Rev

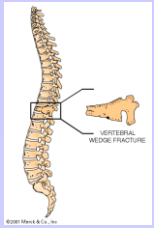


Exercise to improve outcomes in people with vertebral fractures

Exercise intervention[1]

- Diversity in frequency, intensity and duration of interventions: 3 studies used twice-weekly exercise and 4 used three times per week
- In addition, one recommended daily posture training and range of motion exercises
- No studies recommended a specific intensity – instead based on individual patient factors
- Four studies were centre-based interventions, of which 3 had continual supervision by a therapist
- Two studies combined a clinic-based physiotherapist led intervention with a home exercise component, and one was just home exercise

[1] Giangregorio LM et al (2013) Cochrane Database Syst Rev

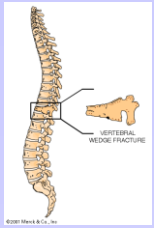


Exercise to improve outcomes in people with vertebral fractures

Overall summary[1]:

- Data reporting was generally poor so very little meaningful information can be extracted
- Individual trials reported that exercise could improve pain, walking speed, back extensor muscle strength and quality of life, but some trials reported no difference

[1] Giangregorio LM et al (2013) Cochrane Database Syst Rev



Acute painful vertebral fracture

Short period of rest (or none[1]) whilst pain-relieving medications are started

Early mobilisation with a rehabilitation, education and exercise programme guided by a healthcare professional

- Exercise and physiotherapy
- Education
- Bracing
- Local heat or cold

Still in pain at 6-8 weeks

Consider vertebral augmentation

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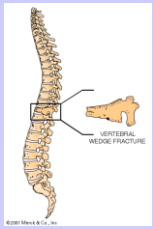
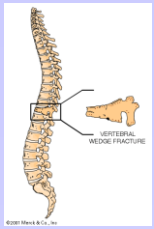
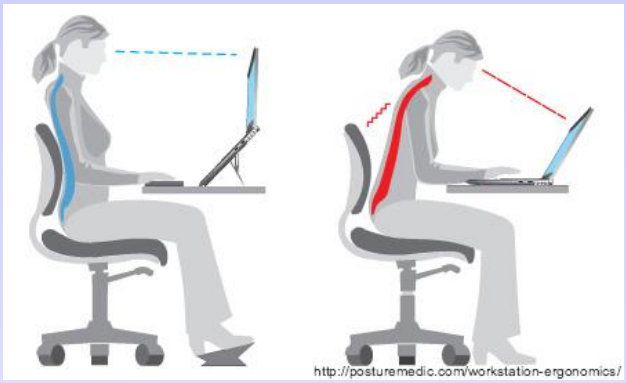


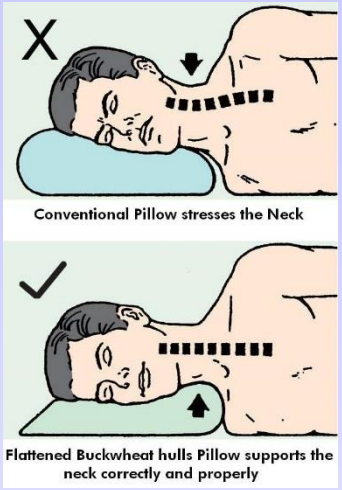
Education: acute vertebral fractures

About mobilisation and body positioning

- Ergonomic advice about lifting, carrying, getting in and out of bed, working at waist height







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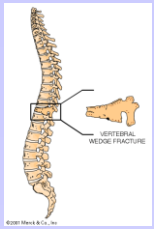
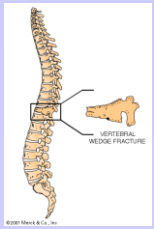


Education: acute vertebral fractures

About mobilisation and body positioning

- Ergonomic advice about lifting, carrying, getting in and out of bed, working at waist height
- Aids available: lumbar rolls, perching stools



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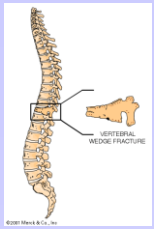

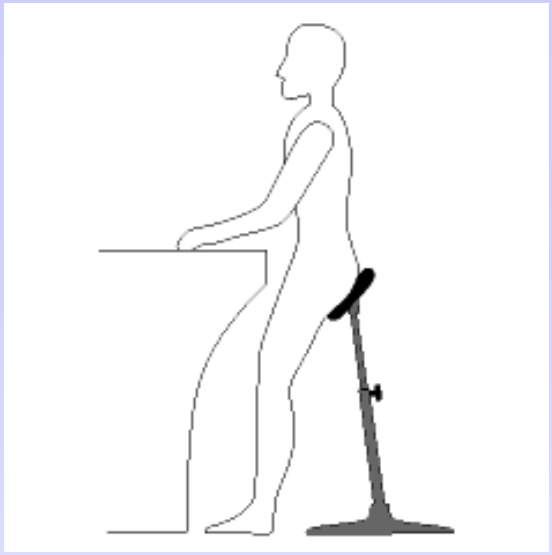

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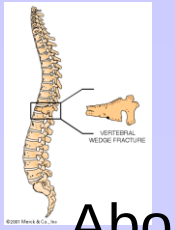
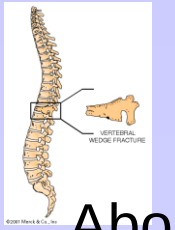


Education: acute vertebral fractures

About mobilisation and body positioning

- Ergonomic advice about lifting, carrying, getting in and out of bed, working at waist height
- Aids available: lumbar rolls, perching stools
- Importance of adherence to exercise regimes, medications, back care and postural awareness

[1] Olsen et al (2014) Osteop Int 25(8):2017-2025 [2] Sherrington C et al (2016) J Sports Med 51(24):1749



Education: acute vertebral fractures

About mobilisation and body positioning

- Ergonomic advice about lifting, carrying, getting in and out of bed, working at waist height
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About osteoporosis

- Why the fracture occurred
- Lifestyle changes that patients can implement themselves

About falling

- Group-based circuit exercise programme plus education session focusing on falls reduction and challenges specific to osteoporosis and vertebral fractures reduces fear[1] and falls[2]

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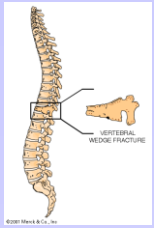
[1] Olsen et al (2014) Osteop Int 25(8):2017-2025 [2] Sherrington C et al (2016) J Sports Med 51(24):1749



Acute painful vertebral fracture

Short period of rest (or none[1]) whilst pain-relieving medications are started

Early mobilisation with a rehabilitation, education and exercise programme guided by a healthcare professional

- Exercise and physiotherapy
- Education
- Bracing
- Local heat or cold

Still in pain at 6-8 weeks

Consider vertebral augmentation

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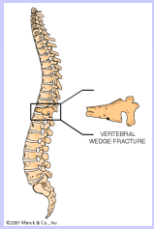

Acute vertebral fractures: local heat or cold

- May be helpful[1]
- Wheat bags for heating in the microwave
- Specifically designed ice packs or frozen peas in a damp towel

- Apply for 10-20 minutes then remove

[1] Lantz et al (1986) Spine 11:838-842

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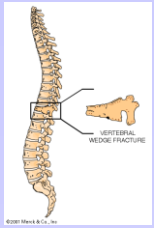

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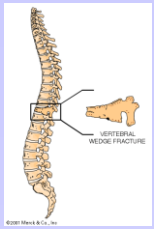

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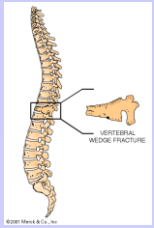

Acute vertebral fractures: bracing

- Decrease postural flexion, reduce load on fractured vertebral body, relieve paraspinal muscle spasm

- A systematic review and meta-analysis of bracing showed a reduction in pain and disability in those assigned the brace[1]
- One study also identified an increase in trunk muscle strength in those randomised to the brace[2] = counter-intuitive

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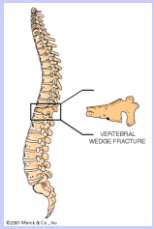
[1] Rzewuska et al (2015) Europ Spine J 24(4):702-714 [2] Pfeifer et al (2004) Am J Phys Med Rehab 83:177-186..



Non-pharmacological interventions to improve quality of life in people with…

- Acute vertebral fractures
- Chronic vertebral fractures

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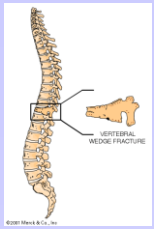

Cause of reduced health related quality of life in chronic vertebral fractures

- Not completely understood

Pain

- Mechanical alterations in the spine due to the vertebral deformity affecting alignment of the trunk
- Altered body posture
- Changes in muscles, other paraspinal tissues and spinal mechanics[1]
- Pain may not be related to the prevalent vertebral fractures

Predictors of reduced quality of life[2]

- Living in long-term care
- Smoking
- Meds such as sedatives
- History of falls

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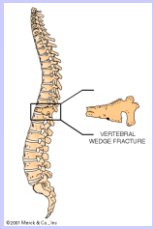
[1] Gold DT (1996) Bone 18(s3):185-189 [2] Papaioannou et al (2006) Osteop Int 17(3):355-363



Chronic back pain with prevalent vertebral fractures

Exercise and physiotherapy

Pain management programmes

Taping

Education

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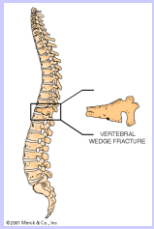

Chronic back pain with prevalent vertebral fractures

Exercise and physiotherapy

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Taping

Education

Is currently a study underway: PROVe[1] – results in late 2018

[1] Barker et al (2013) Trials 15:22

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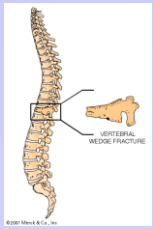

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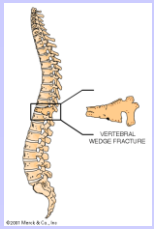

Chronic vertebral fractures: taping

- Applied to the skin of the back
- Aims to provide proprioceptive feedback and improve posture – extension, not flexion

- Have been two RCTs which incorporated taping into its multi-modal package[1,2] which showed improvements in pain, function and QOL
- Care with delicate skin

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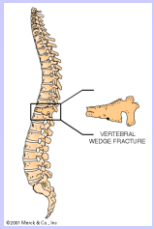
[1] Bennell et al (2010) BMC Musculoskel Dis 11:36-47 [2] Palmer et al (2017) EULAR abstract 640



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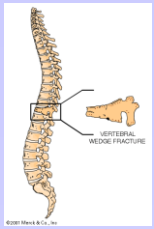

Chronic vertebral fractures: Pain management programmes

- Multidisciplinary interventions for people with long standing musculoskeletal pain of any origin
- Reasonable evidence to support the use of cognitive behavioural approaches integrated within a multidisciplinary rehab programme for chronic pain[1]
- Can improve quality of life and reduce pain perception[2]
- Effectiveness depends on
  - Experience of supervisors
  - Length of follow-up

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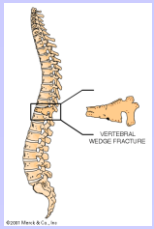
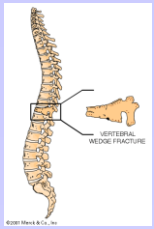
[1] Morley et al (2002) New York: Guildford Press 52-68. [2] Dysvik et al (2011) J An Nurs 68:1061-1072.

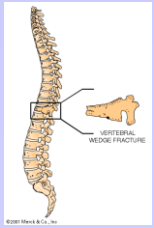


Summary of non-pharmacological treatment of vertebral fractures

- There are non-pharmacological therapies that can improve pain, function and quality of life in people with acute and chronic vertebral fractures
- Don’t underestimate the benefit of ergonomic advice, good posture and safe lifting for all



- Importance of vertebral fractures
- Which of your patients may have vertebral fractures?
- Non-pharmacological management to improve health-related quality of life
- Adverse effects of ‘exercise’ and physical activity for people with vertebral fractures

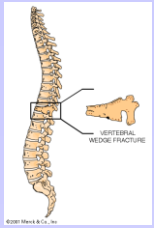


Adverse effects of ‘exercise’ in people with vertebral fractures

- Patients and healthcare professionals often question the safety of physical activity and exercise for people with vertebral fractures and/or osteoporosis
- Providing accurate and consistent advice, stratified by degree of osteoporosis and/or fracture risk would be ideal

BUT

- ….not currently possible because of limited data on adverse events associated with RCTs of exercise interventions, studies not including high risk patients, inconsistencies in exercise interventions…

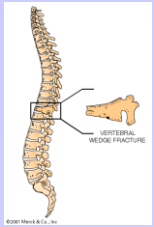


Adverse effects of 'exercise' in people with vertebral fractures

- Summary of adverse events in review by Giangregorio[1] on exercise to improve outcomes after vertebral fracture:
  - Data reporting was generally poor
  - No studies reported on fractures, adverse events or falls

- Update of review by Giangregorio[2] :
- 3 additional trials were identified including 190 participants (0 male)
- Data reporting was generally poor so very little meaningful information can be extracted
- Adverse events very poorly reported
- None reported minor adverse events

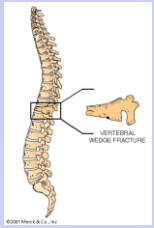
[1] Giangregorio LM et al (2013) Cochrane Database Syst Rev [2] Gibbons N, Whitney J (2017) MSc Thesis, Kings College London



Adverse effects of ‘exercise’ in people with vertebral fractures

Serious adverse events:

- One study reported two serious adverse events of *breathing difficulties* whilst undertaking functional exercises during activities of daily living.
- Another study reported *worsening knee pain* attributable to the intervention.
- *Vertebral fractures* occurred equally between intervention and control groups with two in each group.
- There were five *non-vertebral fractures* in the control and two in the intervention group, a difference which was not significant

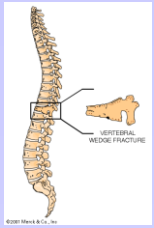


Adverse effects of ‘exercise’ in people with vertebral fractures

- Review of observational data[1] of all case reports/series and non-randomised trials of exercise in people with osteoporosis or osteopaenia to specifically look for any adverse effects

- The greater majority of studies reported no adverse events, reduced incidence/improvement in adverse events or no significant change after physical activity or exercise
- Horseback riding, golfing, and activities that involved spinal forward flexion were associated with a greater risk of back pain and an increase in vertebral fractures

[1] Knutsford S et al (2018) Submitted



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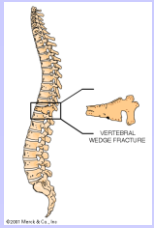

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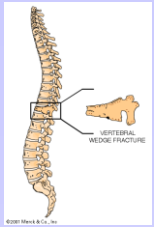
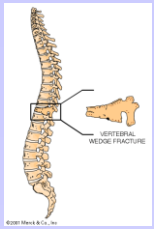


Adverse effects of ‘exercise’ in people with vertebral fractures

Forward flexion

- One study of 59 women with osteoporosis[1] undertaking forward flexion, and one case report of three women with osteoporosis[2] doing yoga, report vertebral fractures occurring
- The study[1] showed women who carried out spinal flexion exercises (sitting in a chair, leaning forward with arms hanging down and head bent forward to stretch the erector spinal muscles, and sit-ups) were more likely to develop new vertebral fractures than women who did spinal extension exercises

[1] Sinaki M et al (1984) Arch Phys Med Rehabil 65(10):593-596 [2] Sinaki M (2013) Pain Pract 13(1):68-75



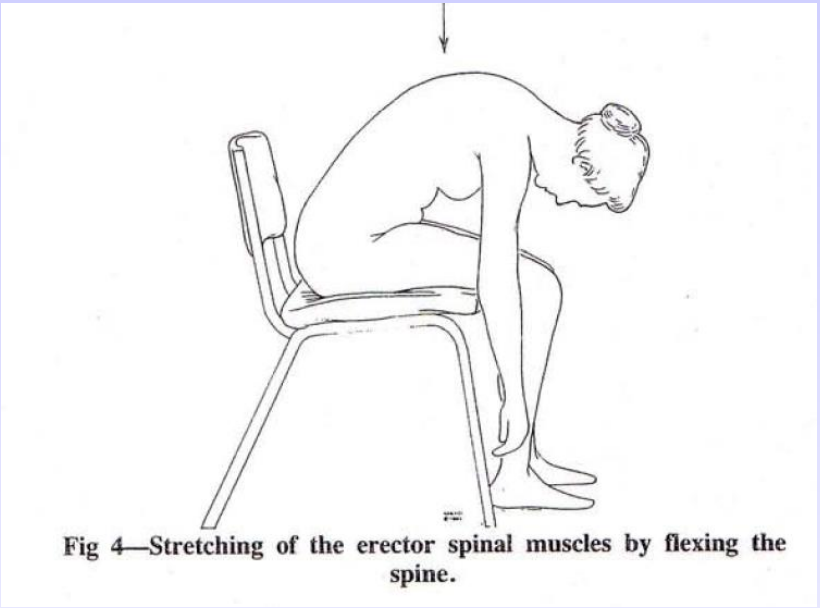


Fig 4—Stretching of the erector spinal muscles by flexing the spine.

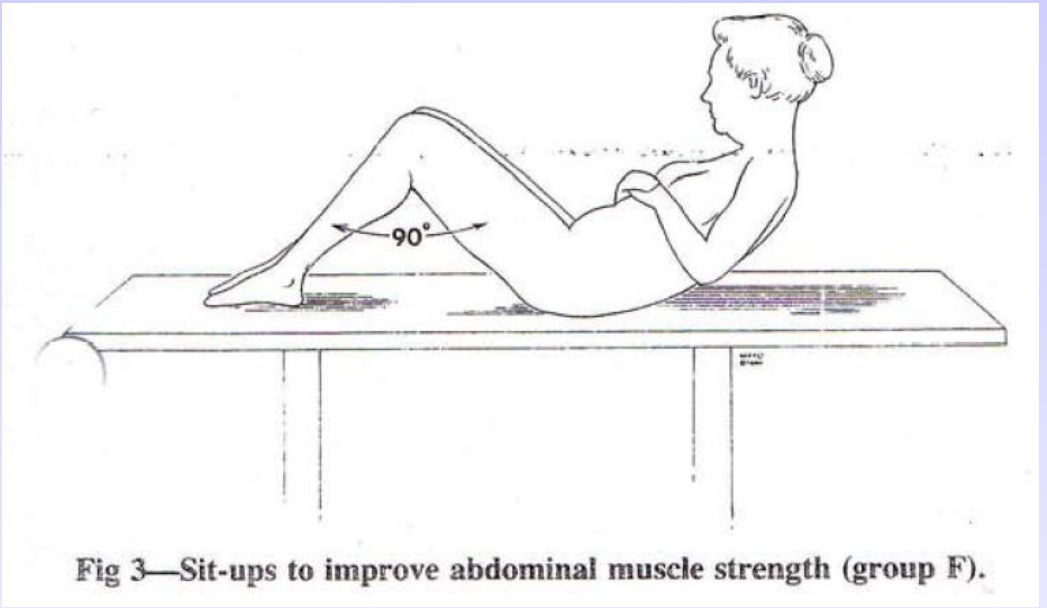


Fig 3—Sit-ups to improve abdominal muscle strength (group F).

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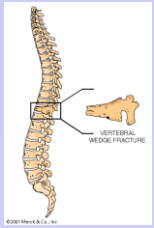
[1] Sinaki M et al (1984) Arch Phys Med Rehabil 65(10):593-596



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- The case report[2] reported participation in yoga involving spinal flexion exercises resulted in back pain and vertebral fractures

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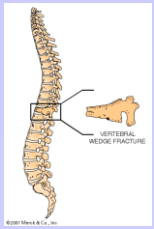

A

B

C

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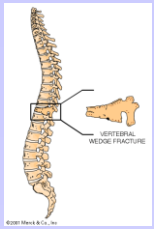
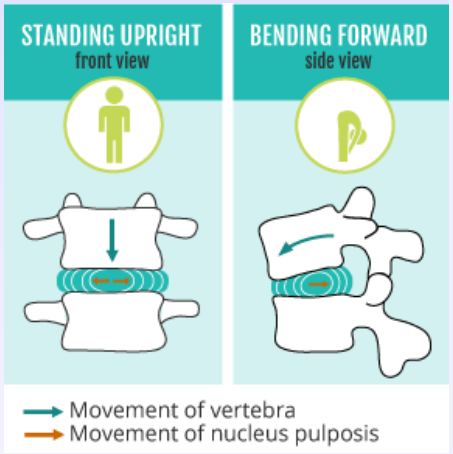


Adverse effects of ‘exercise’ in people with vertebral fractures

Forward flexion

- Evidence that forward spinal flexion exercises cause vertebral fractures is limited
- But, it is mechanically plausible that forward flexion increases the load on the front of the vertebral bodies



- Seems reasonable to recommend people with osteoporosis avoid specific, repetitive and forced spinal forward flexion exercises, and instead focus on extension
- No evidence that single forward flexion movements in daily activities cause vertebral fractures

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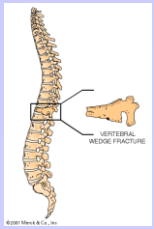
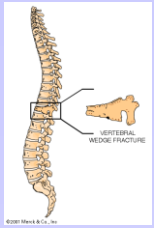


Adverse effects of ‘exercise’ in people with vertebral fractures

Overall, the evidence is reassuring

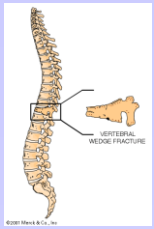
<u>General sensible advice</u>

- Safe lifting for all
- Proper instruction on correct spinal movements during general daily life for everyone, not just those with osteoporosis or vertebral fractures
- Continue doing exercises that people enjoy and are experienced in
- Consider modifying yoga poses rather than avoid yoga
- Consider avoiding sit-ups and use isometric strengthening of abdominal muscles instead



Overall conclusions

- Osteoporotic vertebral fractures are more common in older women, and in those who smoke or are on steroids
- People with vertebral fractures have a high risk of future fracture, and reduced quality of life
- Non-pharmacological management can improve pain and health-related quality of life
  - Don’t under-estimate the benefits of advice on lifting and moving
  - A spell of supervised exercise can improve self-confidence and help re-establish normal routines
- Proper instruction on correct spinal movements during general daily life for everyone, not just those with diagnosed osteoporosis or vertebral fractures
- Don’t put people off exercise – evidence for adverse events is reassuring



Thank you

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