

Degenerative spine disease

- 花蓮慈濟大學 核心課程

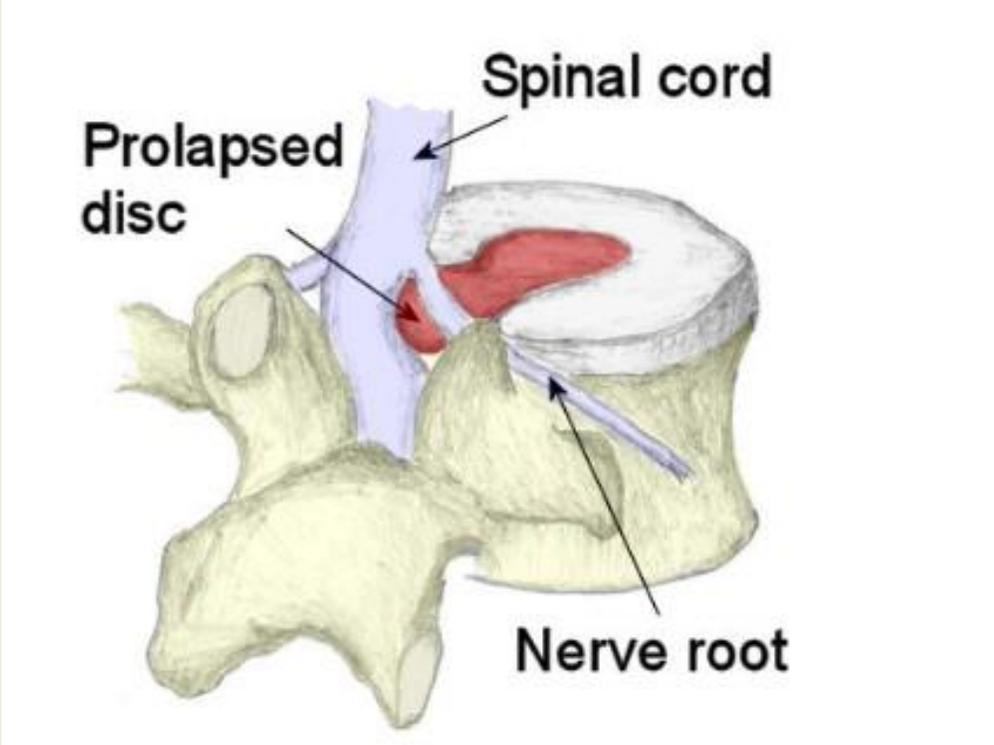
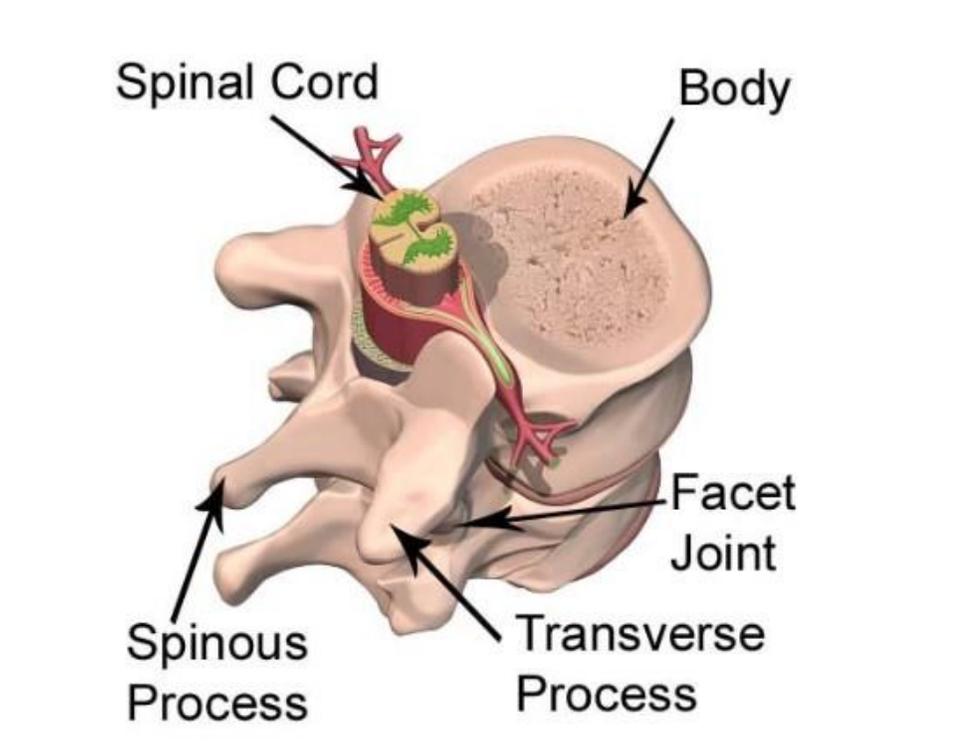
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Spine anatomy



DEGENERATIVE INTERVERTEBRAL DISC DISEASE

- a. DISC BULGE
- b. ANNULAR TEAR
- c. HERNIATION

- ❖ PROTUSION
- ❖ EXTRUSION
- ❖ INTRAVERTEBRAL



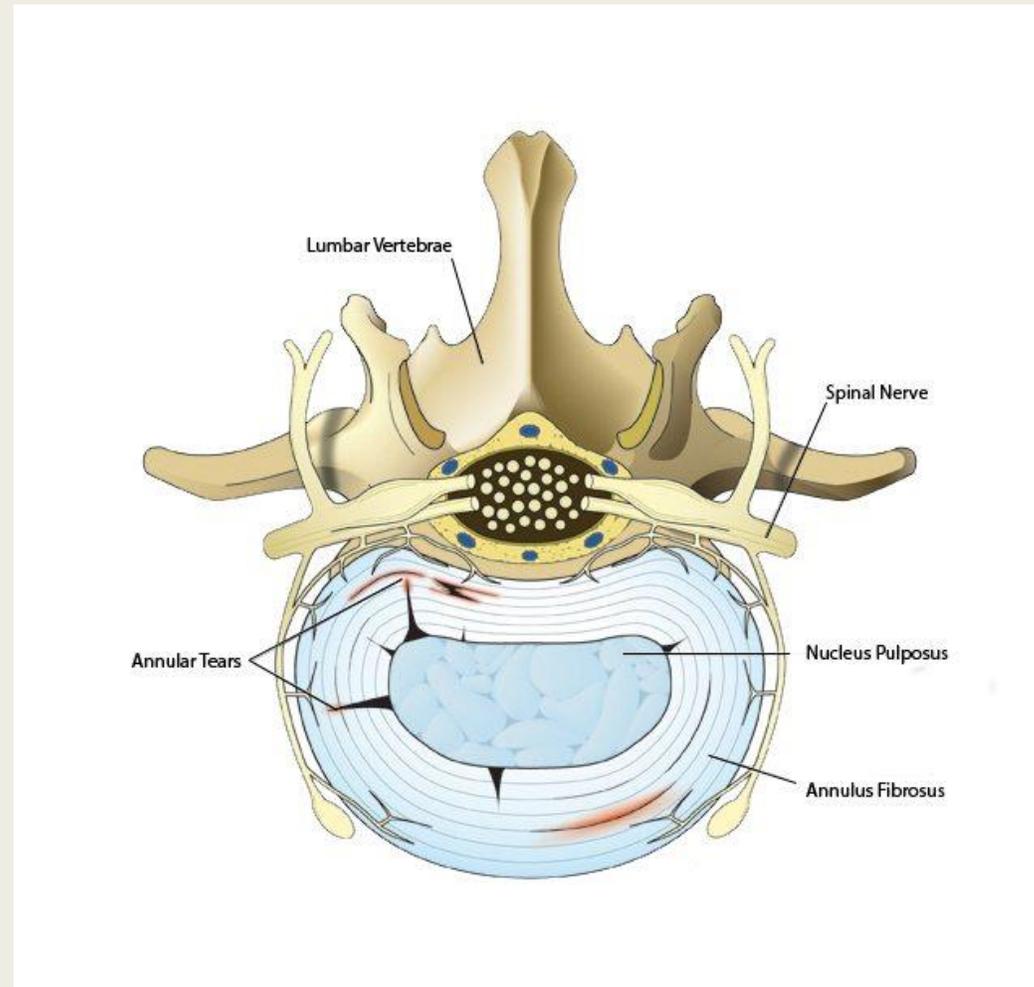
Degenerative disc disease (DDD) and osteoporosis

- DDD : the natural breakdown of the intervertebral disc of the spine
- Osteoporosis : is a skeletal disorder characterized by compromised bone strength predisposing to an increasing risk of fracture. Bone strength reflects the integration of two main features: bone density and bone quality

Other degenerative disease in spine

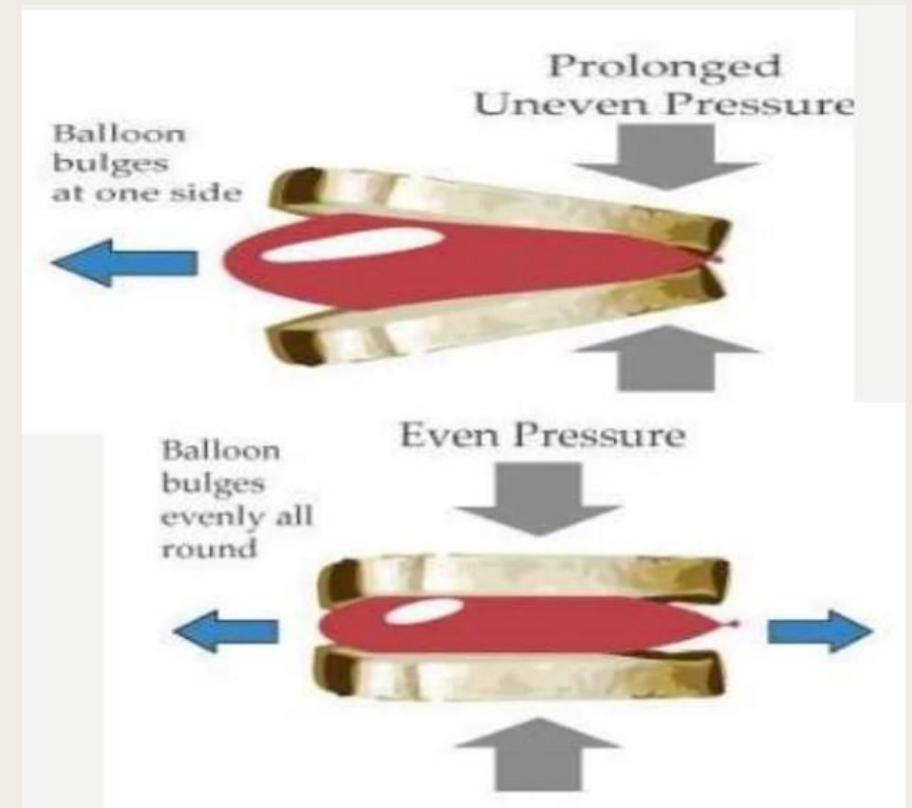
- Lumbar stenosis
- Spondylolisthesis
- Spinal compression fracture
- Acquired kyphotic or scoliosis change

Anatomy of disc



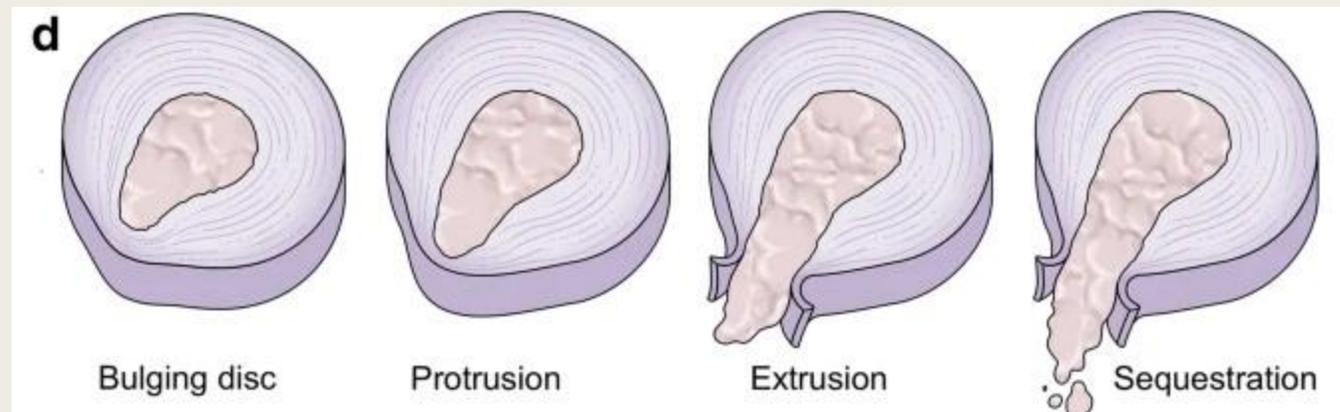
Degenerative changes of the disc

- **Pathologic changes**
 - 1. Water and proteoglycan content decreases
 - 2. Collagen fibers of AF become distorted
 - 3. Tears may occur in the lamellae
- **Results in**
 - 1. Decreased disc height and volume
 - 2. Impaired mobility
 - 3. Pain
 - 4. inflammation
 - 5. Neurological signs and symptoms



DISC BULGE

- Generalized or circumferential disc displacement (involving 50% to 100% of the disc circumference) is known as " bulging" and is not considered a form of herniation.
- Types
 1. Bulging can be symmetrical (displacement of disc material is equal in all directions)
 2. Asymmetrical (frequently associated with scoliosis)



Annulus tear types

- **A: Concentric tears** : are circumferential lesions which are found in the outer layers of annular wall.
- They represent splitting between adjacent lamellae of the annulus , like onion rings
- Concentric tears are most commonly encountered in the outer annulus fibrosus, are believed to be of traumatic origin , especially from torsion overload injuries .
- **B: Radical Tears** : are characterized by annular tear.
- Permeates from the deep central part of the disc (nucleus pulposus)
- Extends outward toward the annulus
- Either a transverse or carnial-caudal plane.
- **C: Transeverse Tears:** also known as " peripheral tears" or " rim lesions" are horizontal ruptures of fibers, near the insertion in the bony ring apophyses.
- Their clinical significance remains unclear
- Transverse tears are believed to be traumatically induced and are often associated with small osteophytes



Disruption of concentric collagenous fibers comprising the annulus fibrosus

TYPES:

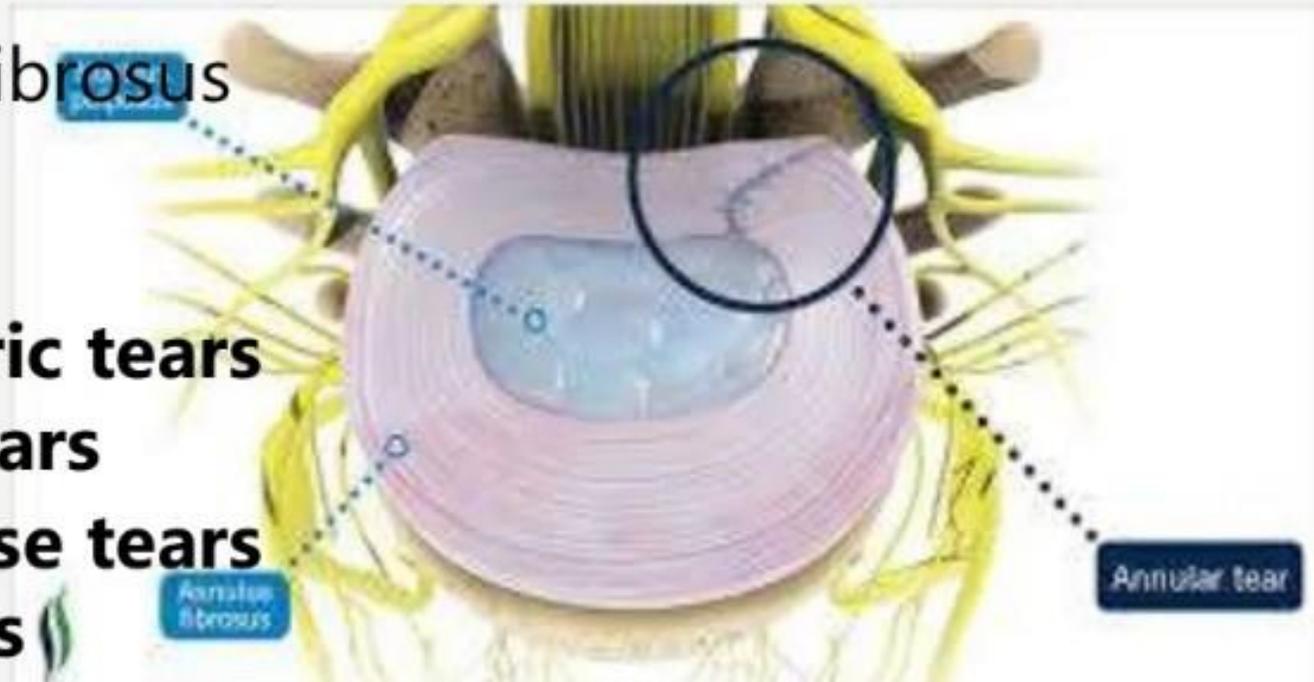
1. Concentric tears

2. Radial tears

3. Transverse tears

MR Findings

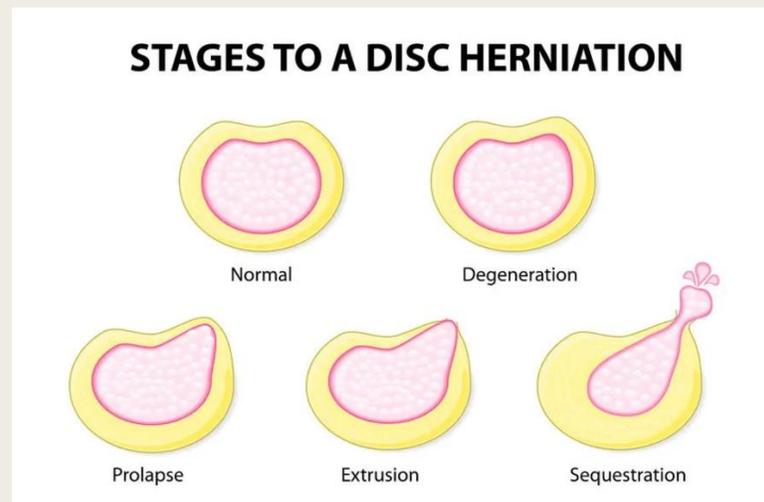
- T1WI: Contrast-enhancing nidus in disc margin
- T2WI: High signal zone at edge of disc which has low intrinsic signal



DISC HERNIATION

- Herniation is defined as a localized displacement of disc material (nucleus , cartilage, fragmented apophyseal bone, fragmented annular tissue) beyond the limits of the intervertebral disc space
- **Extruded disc herniations** : focal disc extension of which the base against the parent disc is narrower than the diameter of the extruded disc material, measure in the same plane.

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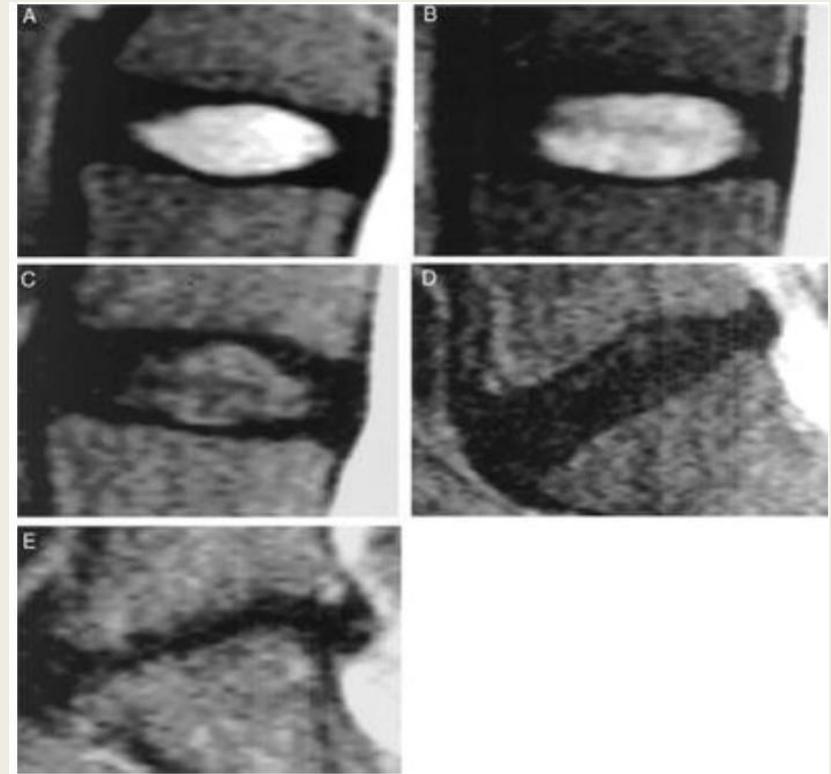


Protruded disc

- the base of the disc is broader than any other diameter of the displaced material.
- Based on a two-dimensional assessment of the disc contour in the transverse plane
- A protruded disc can be:
 - focal (involving <25% of the disc circumference)
 - broad-based (involving 25-50% of the disc circumference)

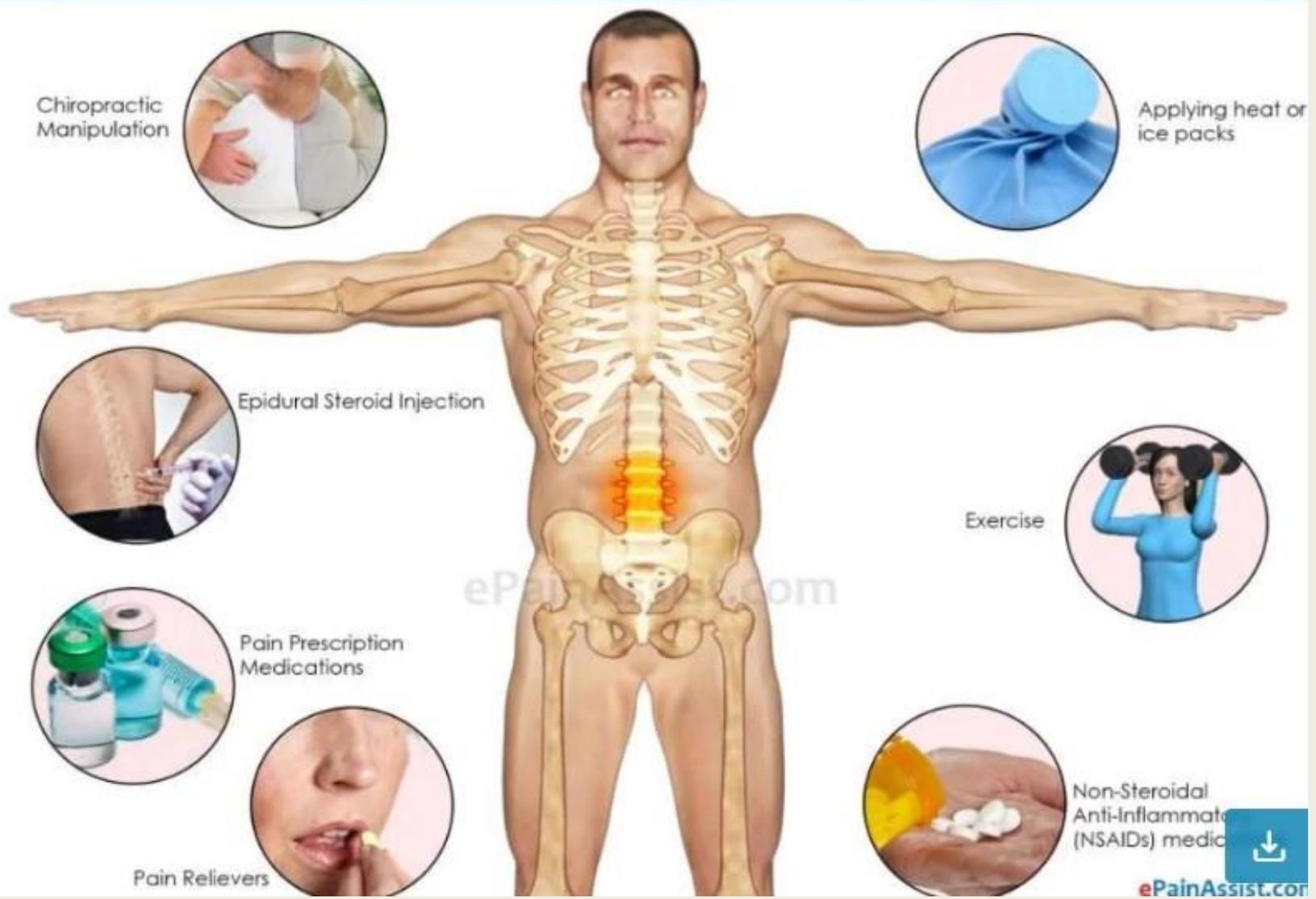
Diagnosis

- X ray: show spinal degenerative changes but not a herniated disc; rule out obvious underlying problems ex compression fracture or spondylolisthesis
- CT: relatively less used
- MRI : the best tool (Mobic change and Pfirrmann type)



The Pfirrmann grading scale for intervertebral disc degeneration: Grade I—a normal disc; Grade II—an inhomogeneous disc with normal disc height and a clear difference between the nucleus and annulus; Grade III—an inhomogeneous gray disc with a loss of the clear border between the nucleus and annulus and normal to slightly decreased disc height; Grade IV—an inhomogeneous hypointense dark gray disc with significant disc height loss; Grade V—a inhomogeneous black disc with disc space collapse

MANAGEMENT FOR DDD

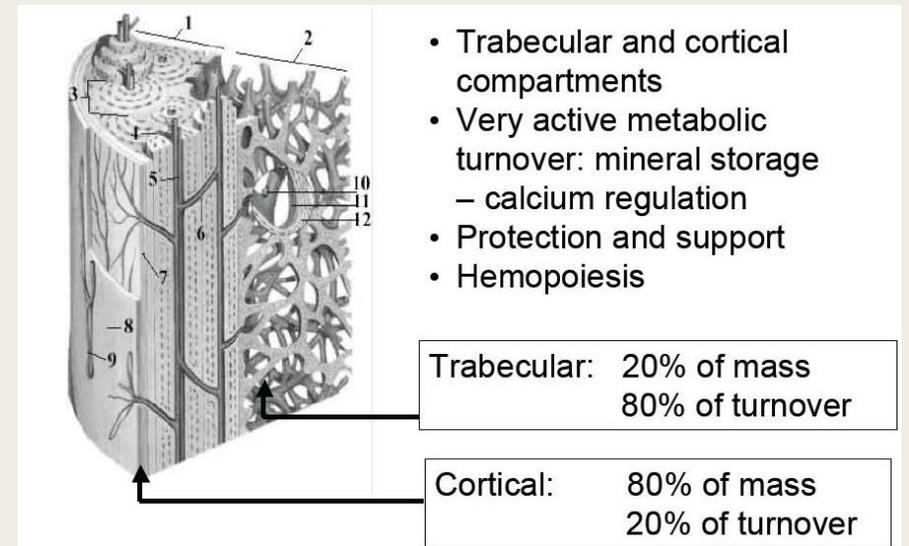


Surgical strategy of DDD

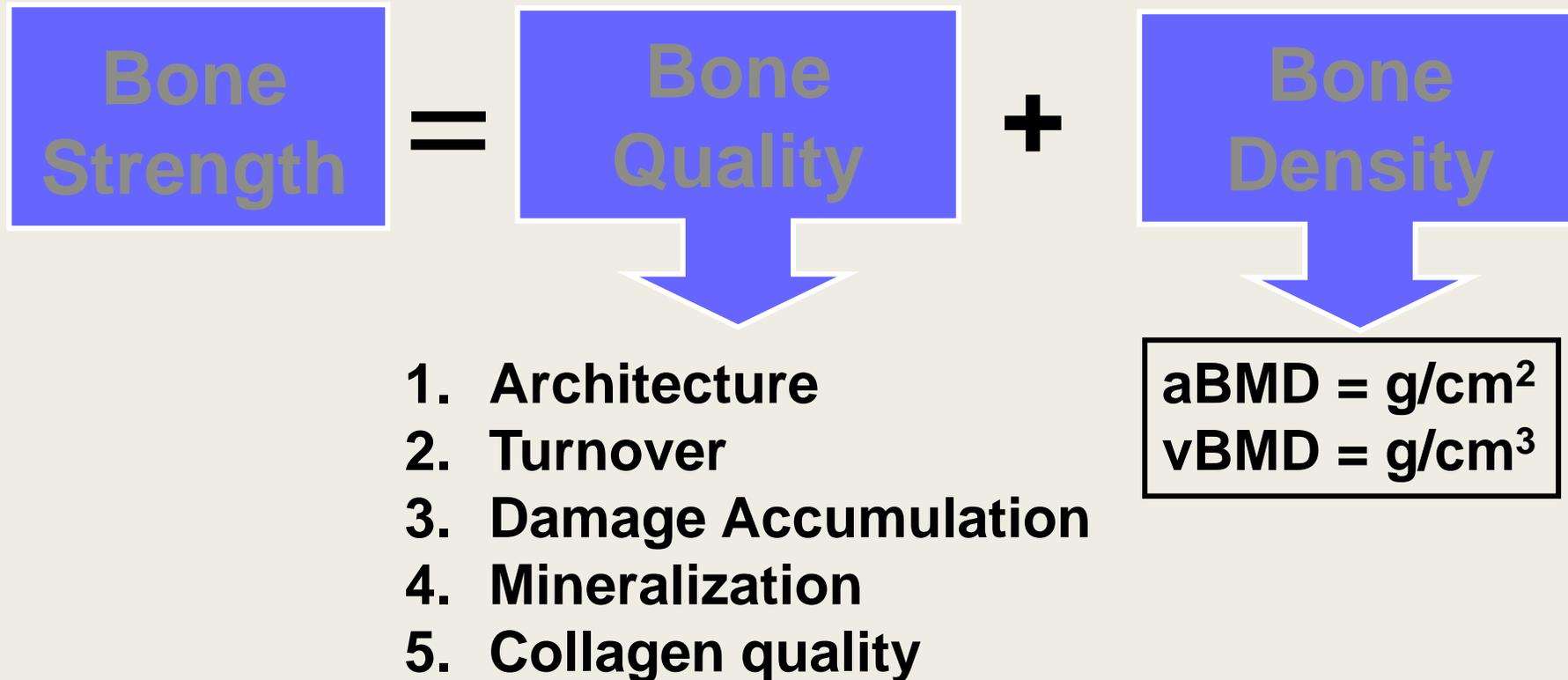
- PRP injection
- 羊膜細胞注射
- Discectomy under microscopy or endoscopy
- Dynamic fixation or IPD
- TPS with fusion

Osteoporosis

Osteoporosis : is a skeletal disorder characterized by compromised bone strength predisposing to an increasing risk of fracture. Bone strength reflects the integration of two main features: bone density and bone quality

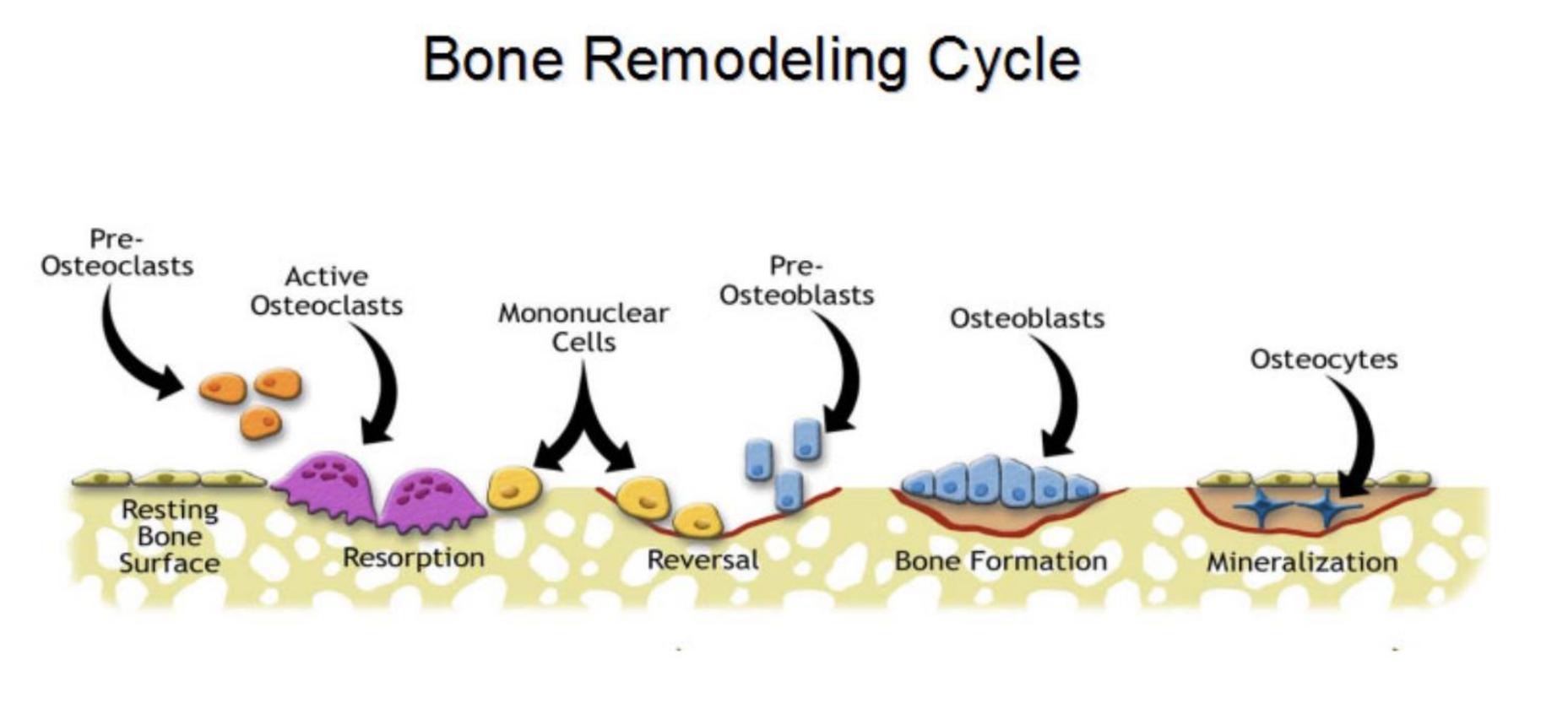


Compromises Bone Strength Increases Risk of Fracture

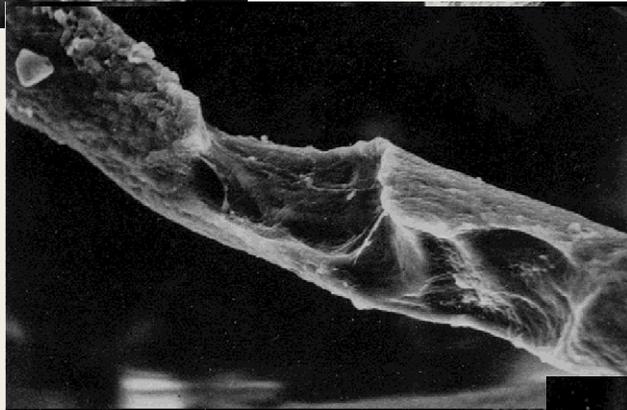
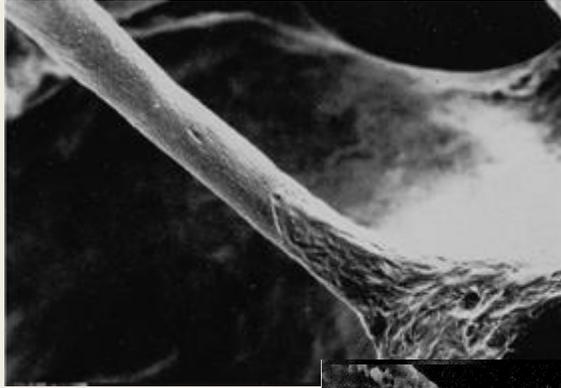


Bone Remodeling Sequence in Healthy Subjects

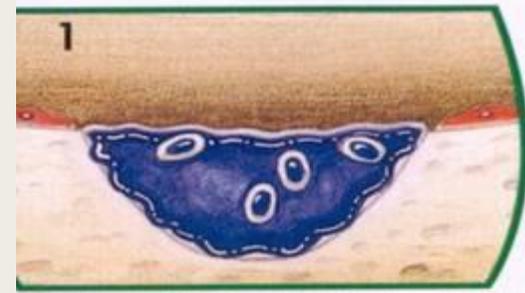
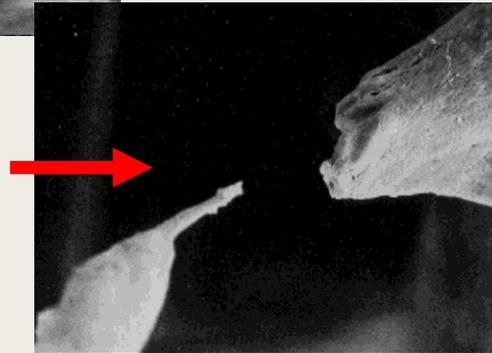
Bone Remodeling Cycle



Osteoporosis = Imbalance between osteoblasts and osteoclasts



**Results in thinning and eventual loss
of trabecular connectivity**



Cells called osteoclasts dissolve excessive amounts of bone tissue, leaving deep cavities.

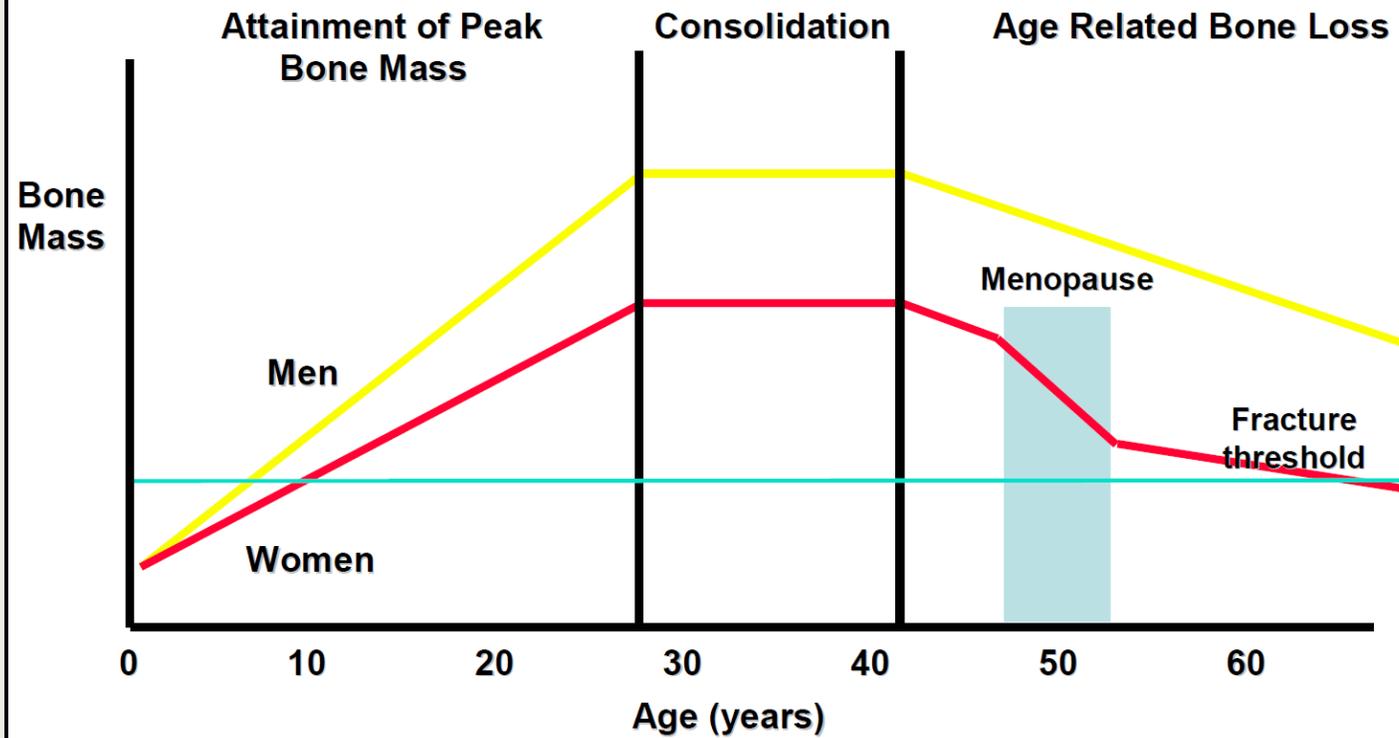


Next, other cells, called osteoblasts, enter the cavity and begin to produce new bone.



In osteoporosis, new bone production is insufficient to refill the deepened cavities, resulting in bone loss.

Age Related Changes in Bone Mass¹



1. Compston JE. Clinical Endocrinology 1990; 33: 653-682.

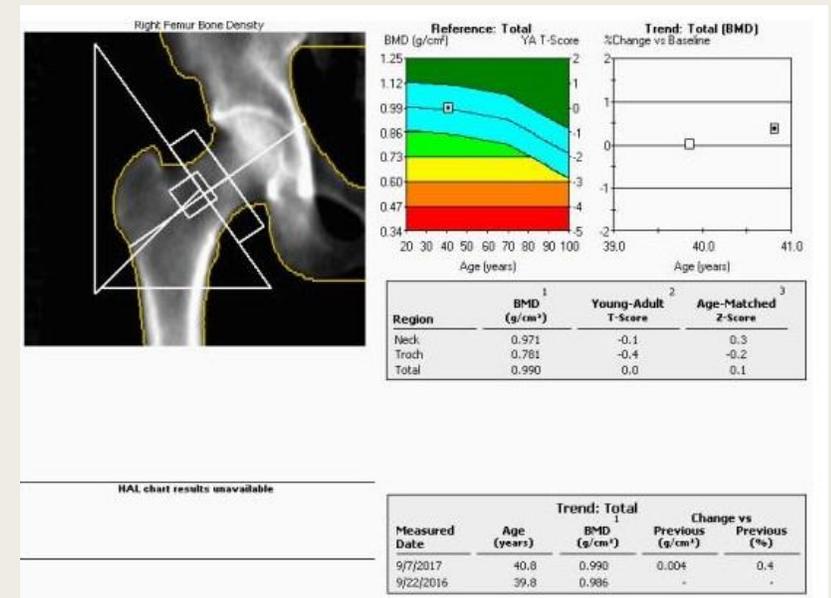
Bone density measurement

- 1. QUS- quantitative ultrasound → only screen
- 2. QCT or pQCT – gm/CM³
- 3. DXA- Dual-energy x-ray absorptiometry. gold standard



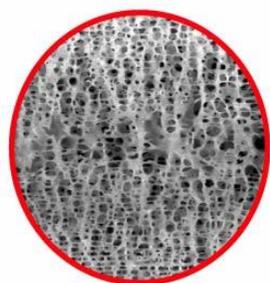
T score and Z score

- T-score = $(\text{BMD}_{\text{patient}} - \text{BMD}_{\text{young-normal-reference}}) / \text{SD}_{\text{young-normal-reference}}$
- Z-score = $(\text{BMD}_{\text{patient}} - \text{BMD}_{\text{age-matched reference}}) / \text{SD}_{\text{age-matched reference}}$
- WHO: T-score is diagnosis tool for 停經後所有婦女及50歲以後所有男性。

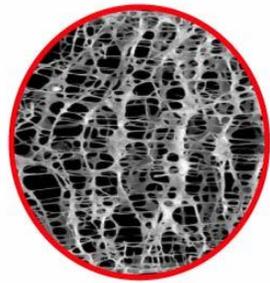


世界衛生組織對骨質疏鬆症的定義

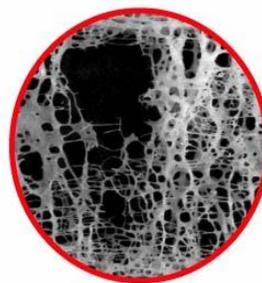
正常骨質	骨質密度標準差大於 -1
骨質稀少	骨質密度標準差介於 -1及-2.5 之間
骨質疏鬆	骨質密度標準差小於 -2.5
嚴重的骨質疏鬆	骨質密度標準差小於 -2.5，並且已有因骨質疏鬆所引起的骨折



正常骨質



骨質流失



嚴重骨鬆

Osteoporosis and fracture risk

■ <http://www.sheffield.ac.uk/FRAX/>

FRAX[®] Fracture Risk Assessment Tool

Home Calculation Tool Paper Charts FAQ References CE Mark English

Welcome to FRAX[®]

The FRAX[®] tool has been developed using individual patient models that take into account bone mineral density (BMD) at the hip and/or spine.

The FRAX[®] models have been developed using population-based cohorts from Australia, Europe, Middle East & Africa, North America, Latin America, and Oceania. In their most sophisticated form, the models are computer-driven and are available in paper versions, based on the available data, and can be downloaded.

The FRAX[®] algorithms give the output as a 10-year probability of a major osteoporosis-related fracture (hip or shoulder fracture).

Dr. John A Kanis
Professor Emeritus,
University of
Sheffield

Asia
China
India
Indonesia
Japan
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Thailand
Uzbekistan

FRAX Desktop Application
Click here to view the applications available

Web Version 4.3
View Release Notes

Links
www.iofbonehealth.org
www.nof.org
www.jpof.or.jp
www.esceo.org

40475812
Individuals with fracture risk assessed since 1st June 2011

Clarification
The University of Sheffield launched the FRAX tool in 2008. At that time the University hosted the The World Health Organisation (WHO) Collaborating Centre for Metabolic Bone Diseases (1991-2010), and the FRAX tool is based on data generated from that centre. However, FRAX was neither developed or endorsed by WHO. Any references to the 'WHO tool' or to the WHO Collaborating Centre after it finished its work in 2010 are incorrect.

Calculation Tool

Please answer the questions below to calculate the ten year probability of fracture with BMD.

Country: **Taiwan** Name/ID: [About the risk factors](#)

Questionnaire:

1. Age (between 40 and 90 years) or Date of Birth
Age: Date of Birth: Y: M: D:

2. Sex Male Female

3. Weight (kg)

4. Height (cm)

5. Previous Fracture No Yes

6. Parent Fractured Hip No Yes

7. Current Smoking No Yes

8. Glucocorticoids No Yes

9. Rheumatoid arthritis No Yes

10. Secondary osteoporosis No Yes

11. Alcohol 3 or more units/day No Yes

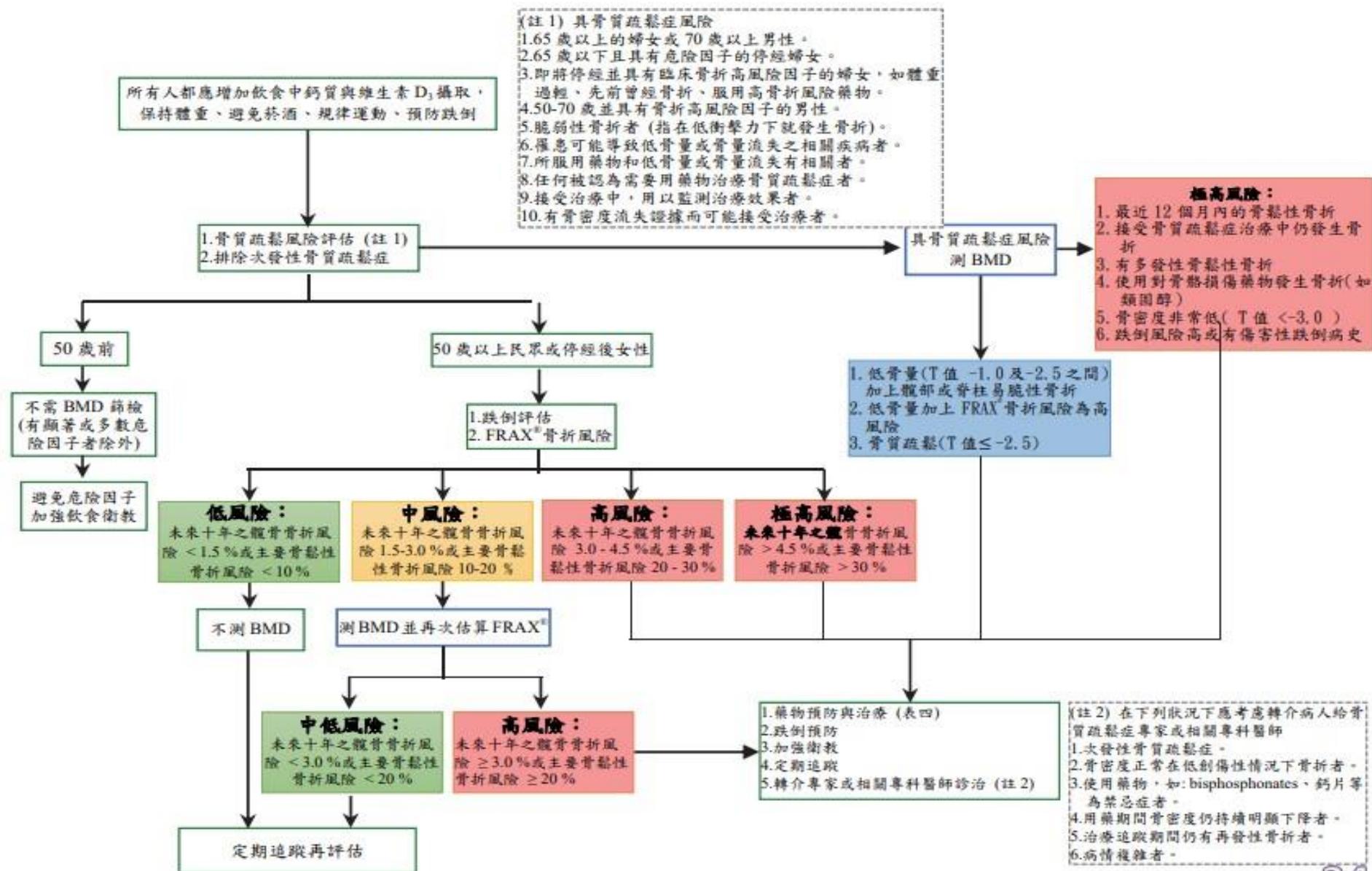
12. Femoral neck BMD (g/cm²)
Select BMD

Weight Conversion
Pounds kg

Height Conversion
Inches cm

01114444
Individuals with fracture risk assessed since 1st June 2011

圖六. 台灣成人骨質疏鬆症之評估與治療流程



Thanks for your attention

