



# 骨质疏松及骨质疏松骨折的影像检查

北京积水潭医院放射科

程晓光

xiao65@263.net

北京大学

北京积水潭医院

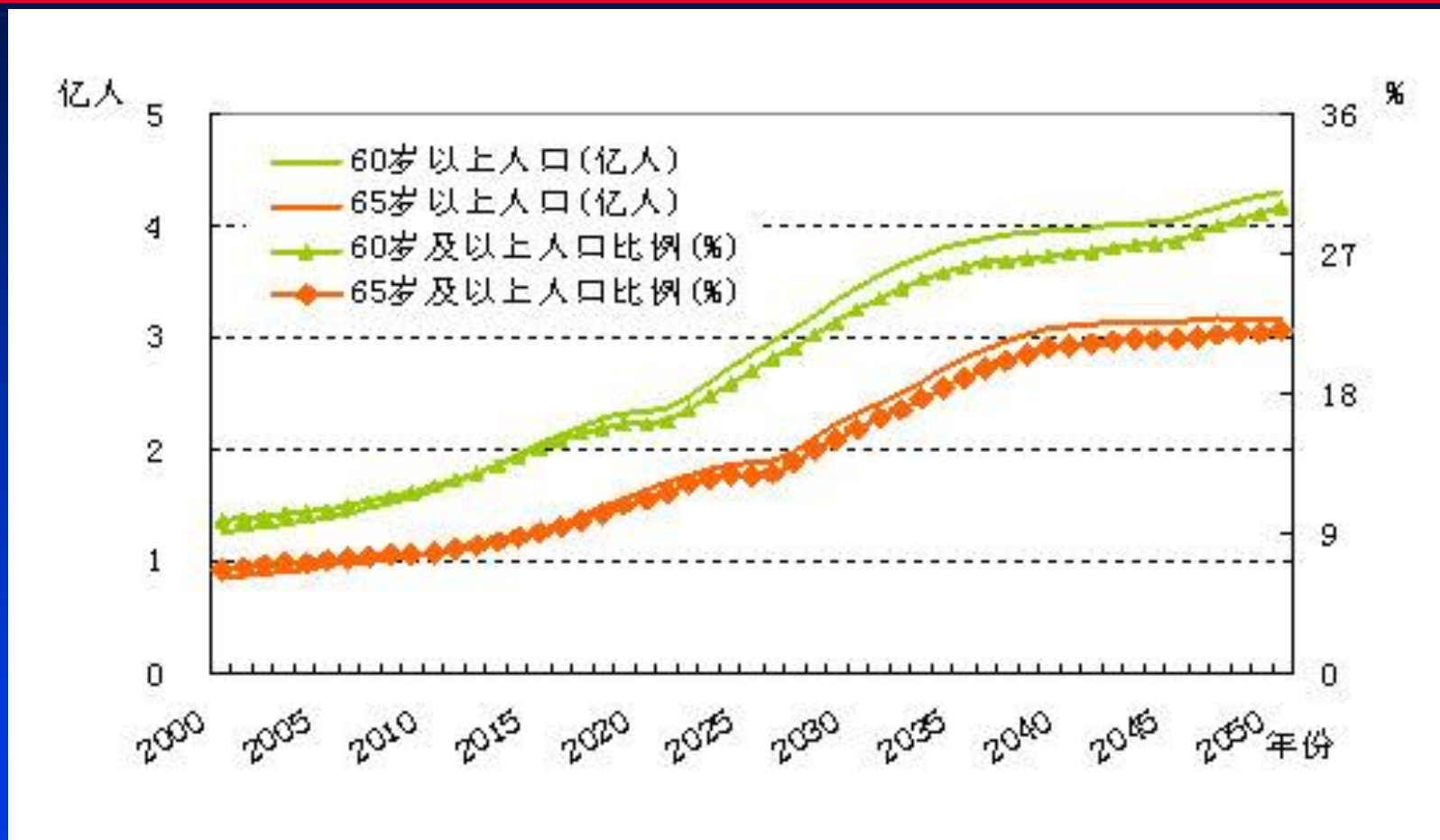


北京大学

北京积水潭医院



# 中国老年人口趋势



# 骨质疏松的定义-WHO

- 骨质疏松是一种全身性骨病：骨量减少和骨的微结构破坏，使骨的脆性增加，易发生骨折。
- A systemic skeletal disease characterized by **low bone mass** and **microarchitectural deterioration** of bone tissue, with a consequent increase **bone fragility** and susceptibility to fracture.



**World Health Organization (WHO), 1994**

北京大学

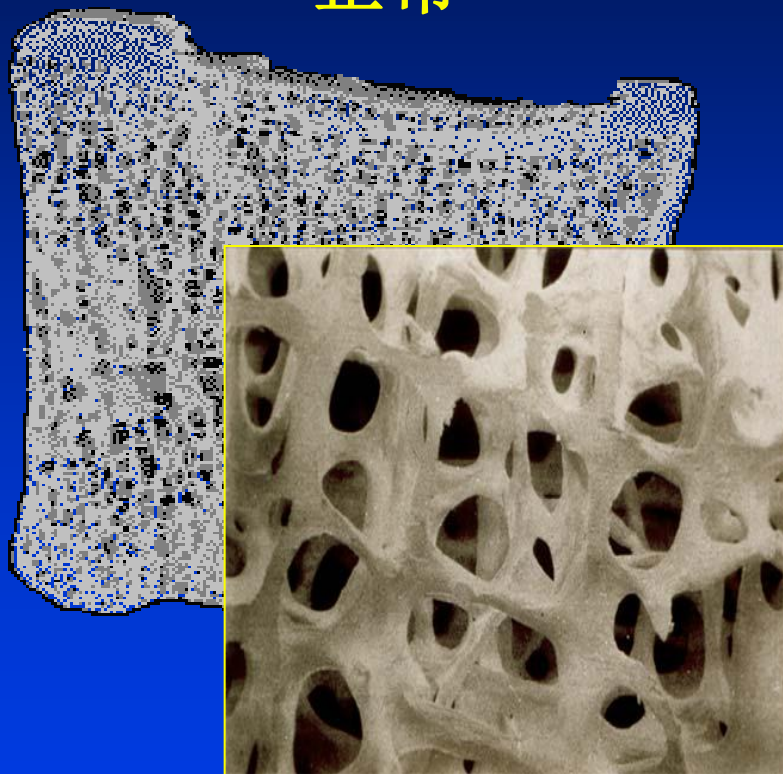
北京积水潭医院



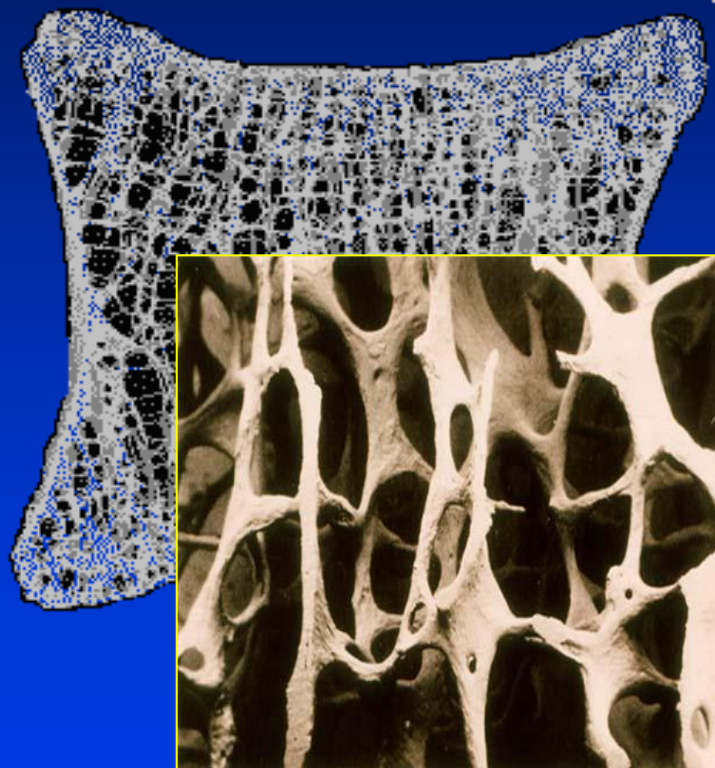


# 椎体Vertebral body

正常

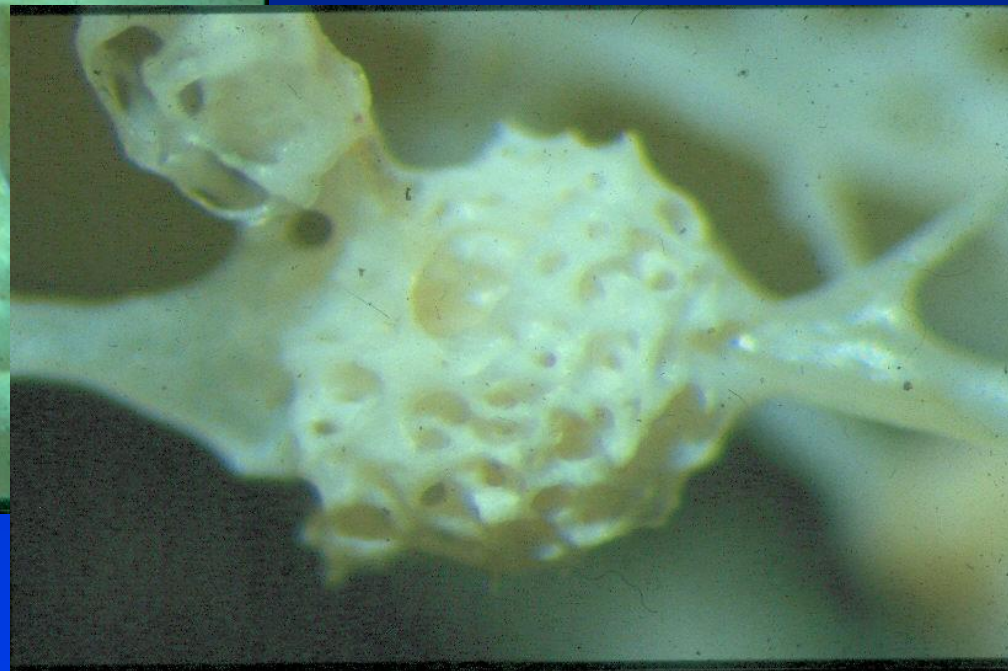
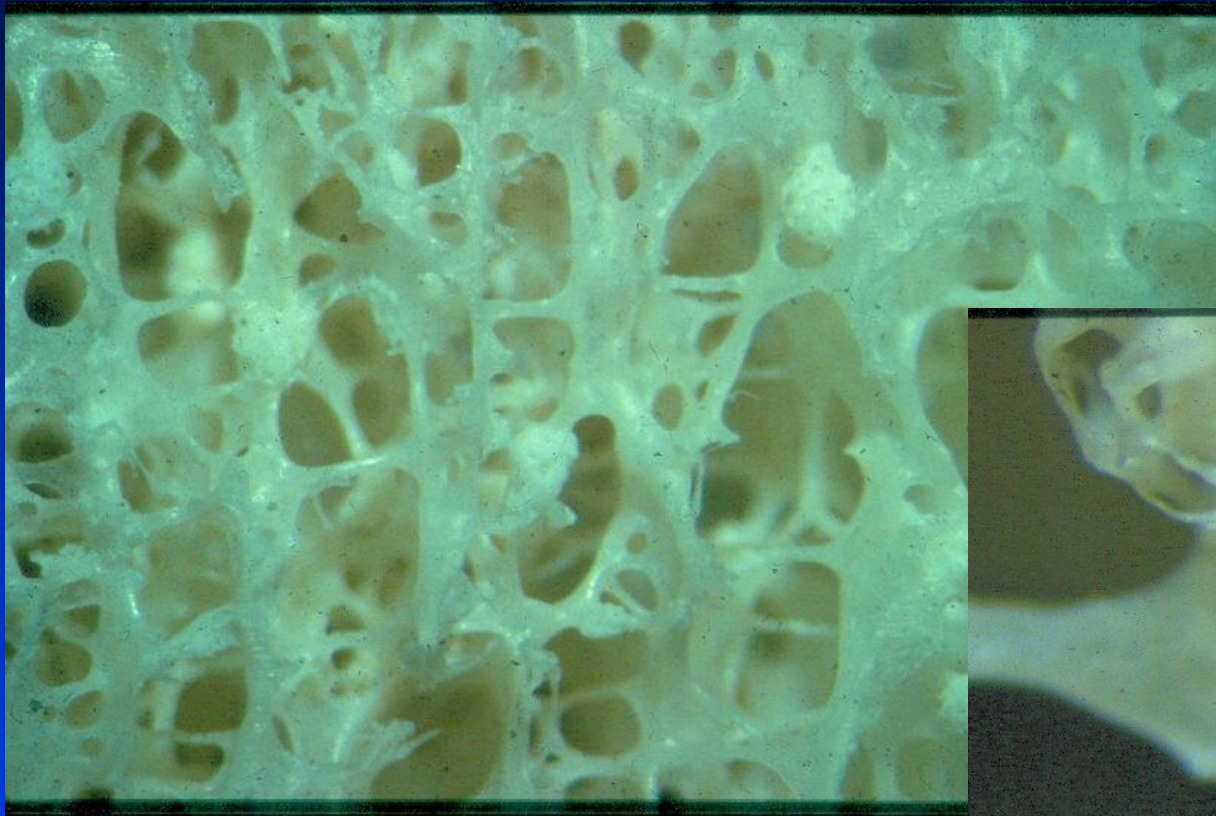


骨质疏松





# 微骨痂形成



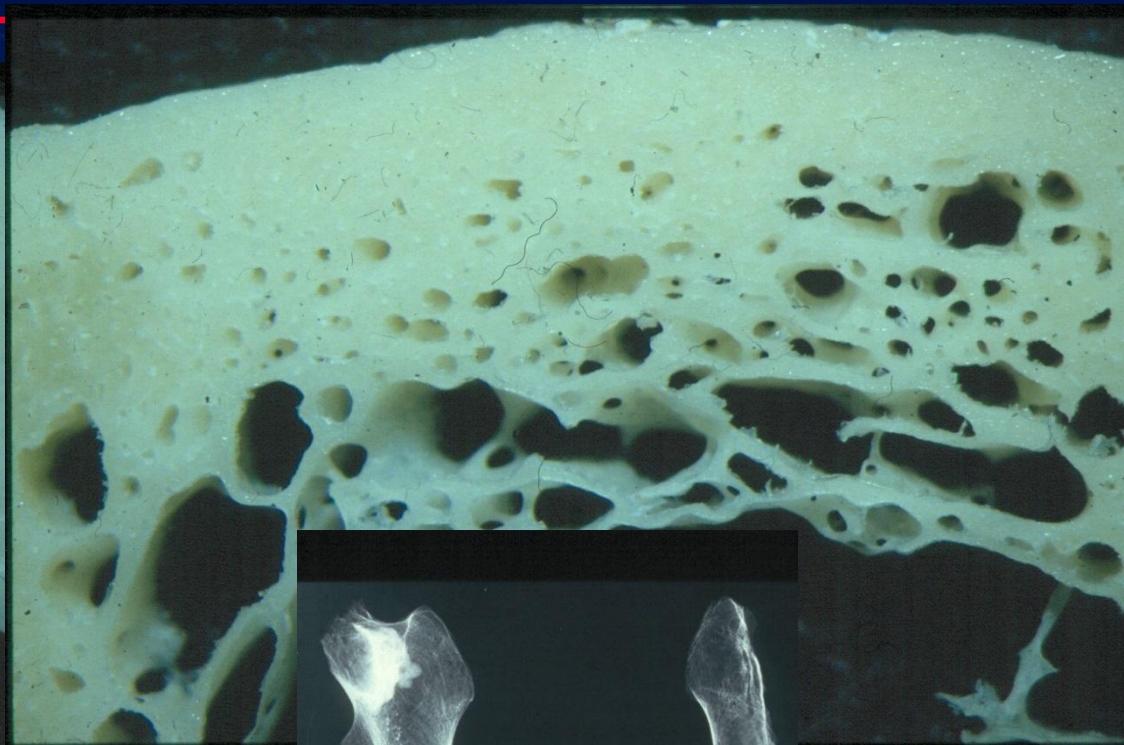
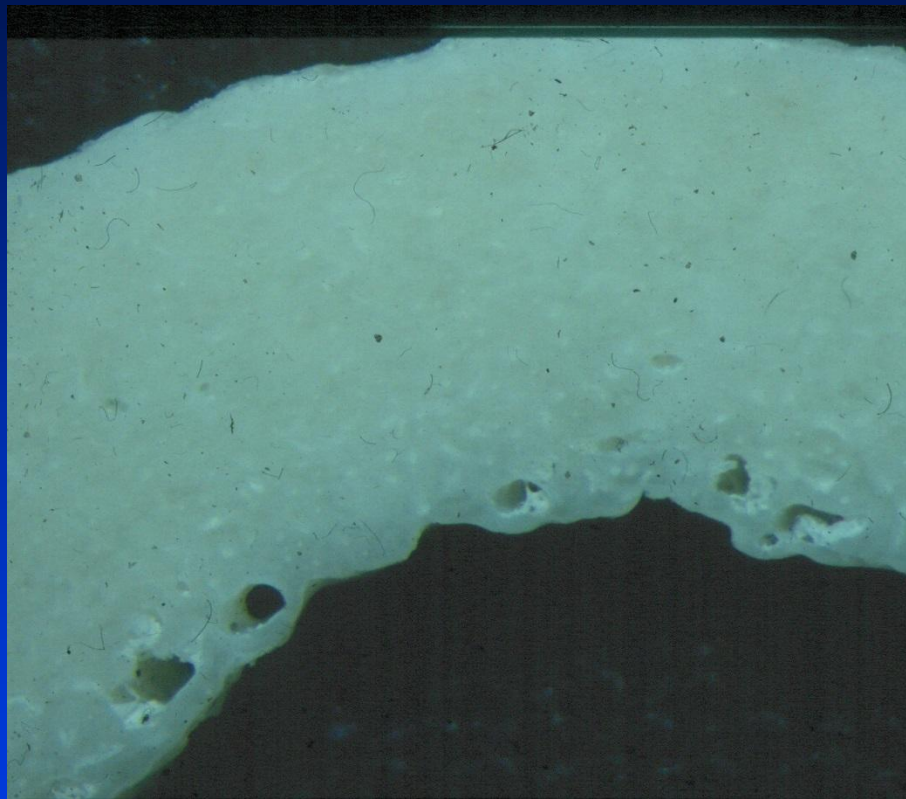
北京大学

北京积水潭医院





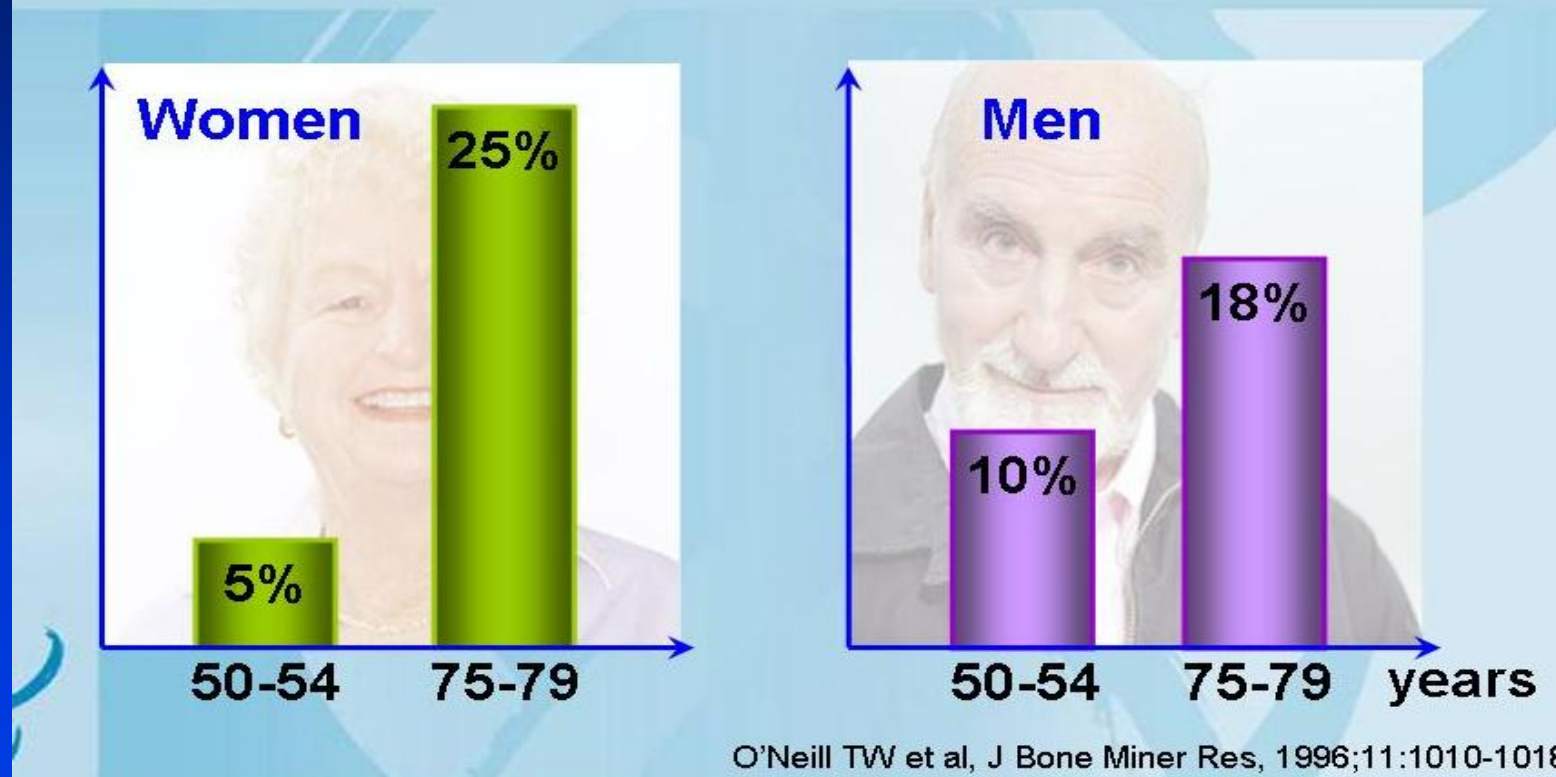
# 骨质疏松的形态表现



- 皮质骨松化和骨小梁化

# 欧洲椎体骨折患病率

## Prevalence of vertebral fractures in Europe



北京大学

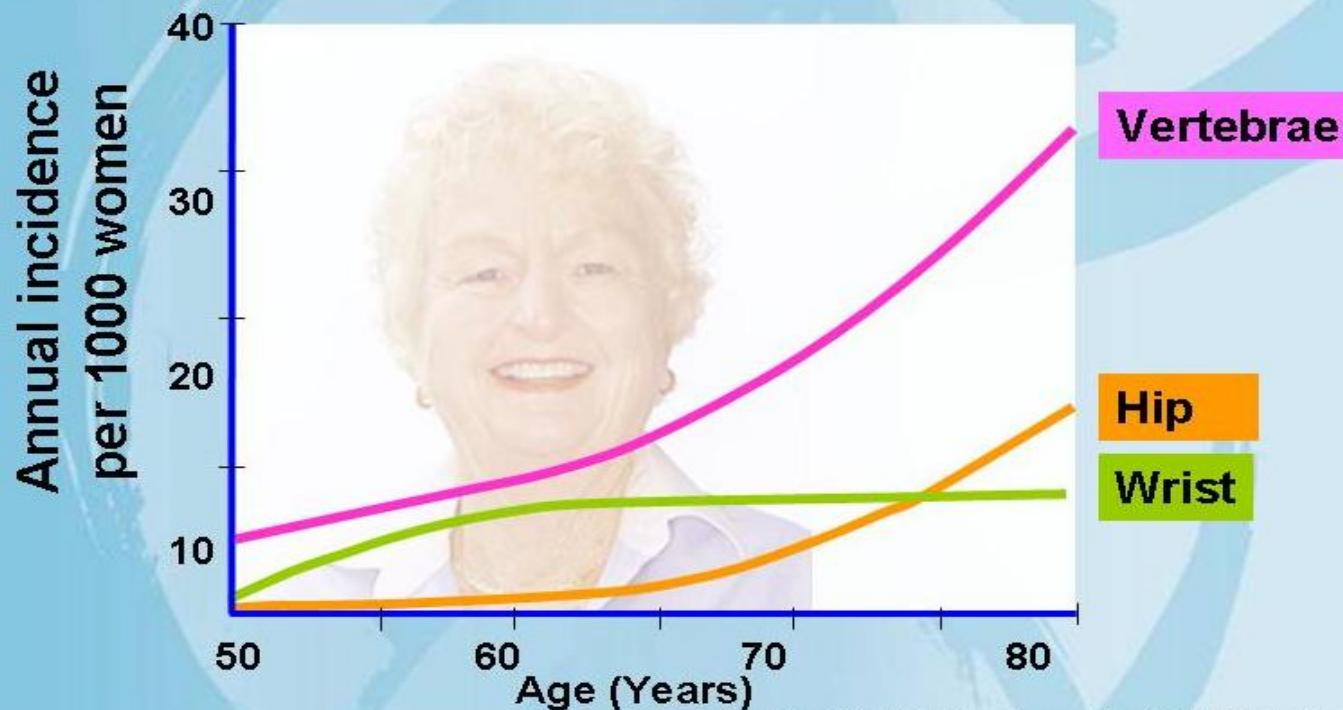
北京积水潭医院





# 女性骨质疏松性骨折与年龄

## Incidence of osteoporotic fractures in women



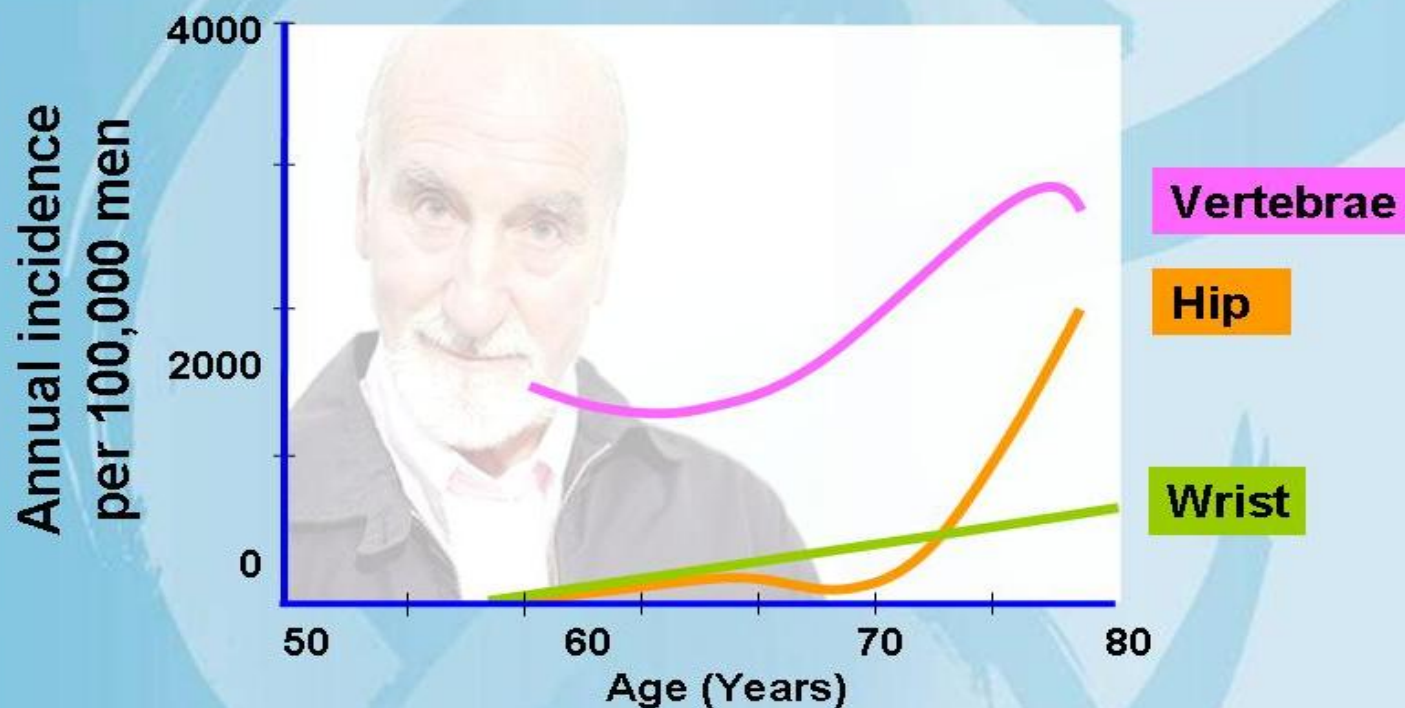
Wasnich RD, Osteoporos Int 1997;7 Suppl 3:68-72

北京大学

北京积水潭医院

# 男性骨质疏松性骨折与年龄

## Incidence of osteoporotic fractures in men



Wasnich RD, Osteoporos Int 1997;7 Suppl 3:68-72

北京大学

北京积水潭医院

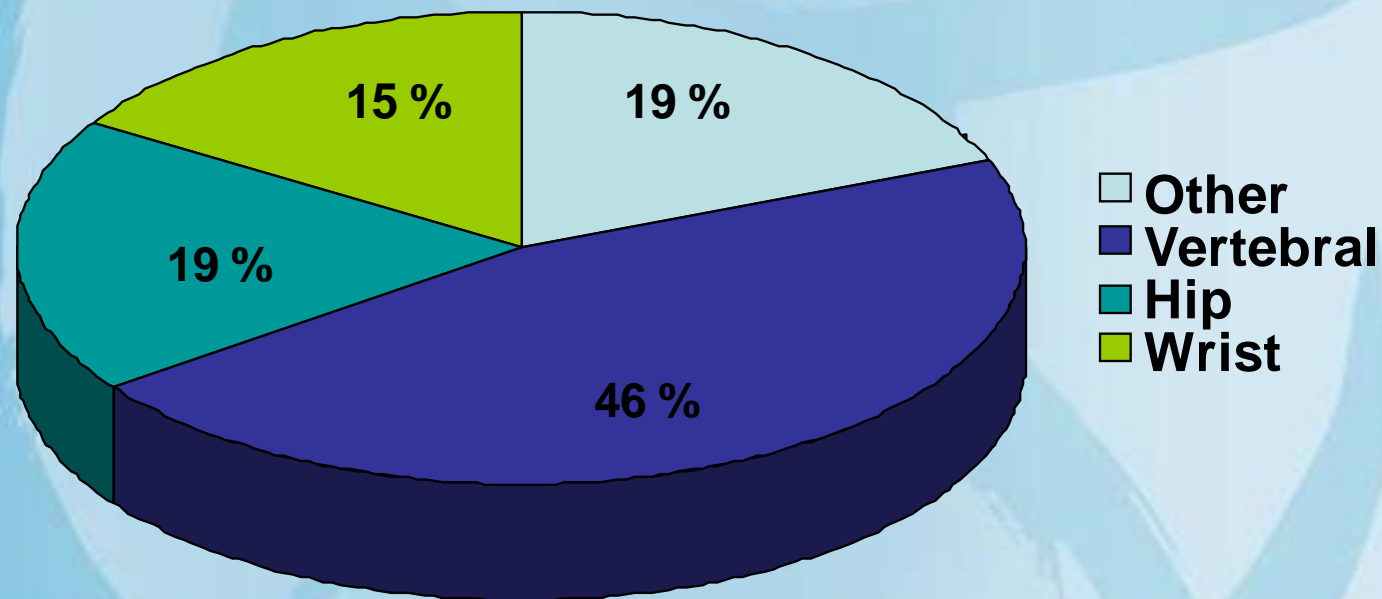


# 诊断标准之一：骨质疏松性骨折

- “脆性骨折”是诊断骨质疏松的标准之一。“脆性骨折”即由于轻微外伤，如从站立或更低的高度跌倒所致的骨折。
- Presence of a “fragility” fracture. Fracture due to minimal trauma, such as after fall from standing height or less.

# Osteoporosis affects the **entire** skeleton

- Osteoporosis is responsible for >1.5 million vertebral and non-vertebral fractures annually
- Spine, hip, and wrist fractures are most common



NIH/ORBD ([www.osteoporosis.org](http://www.osteoporosis.org)), 2000





# 骨质疏松性骨折的诊断

综合影像检查：

X线平片

CT

MRI

骨扫描

北京大学

北京积水潭医院



# 股骨颈(髋部)骨折-可以很容易

- 老年妇女，轻微外伤史。



北京大学

北京积水潭医院

# 股骨颈(髋部)骨折-可以很复杂



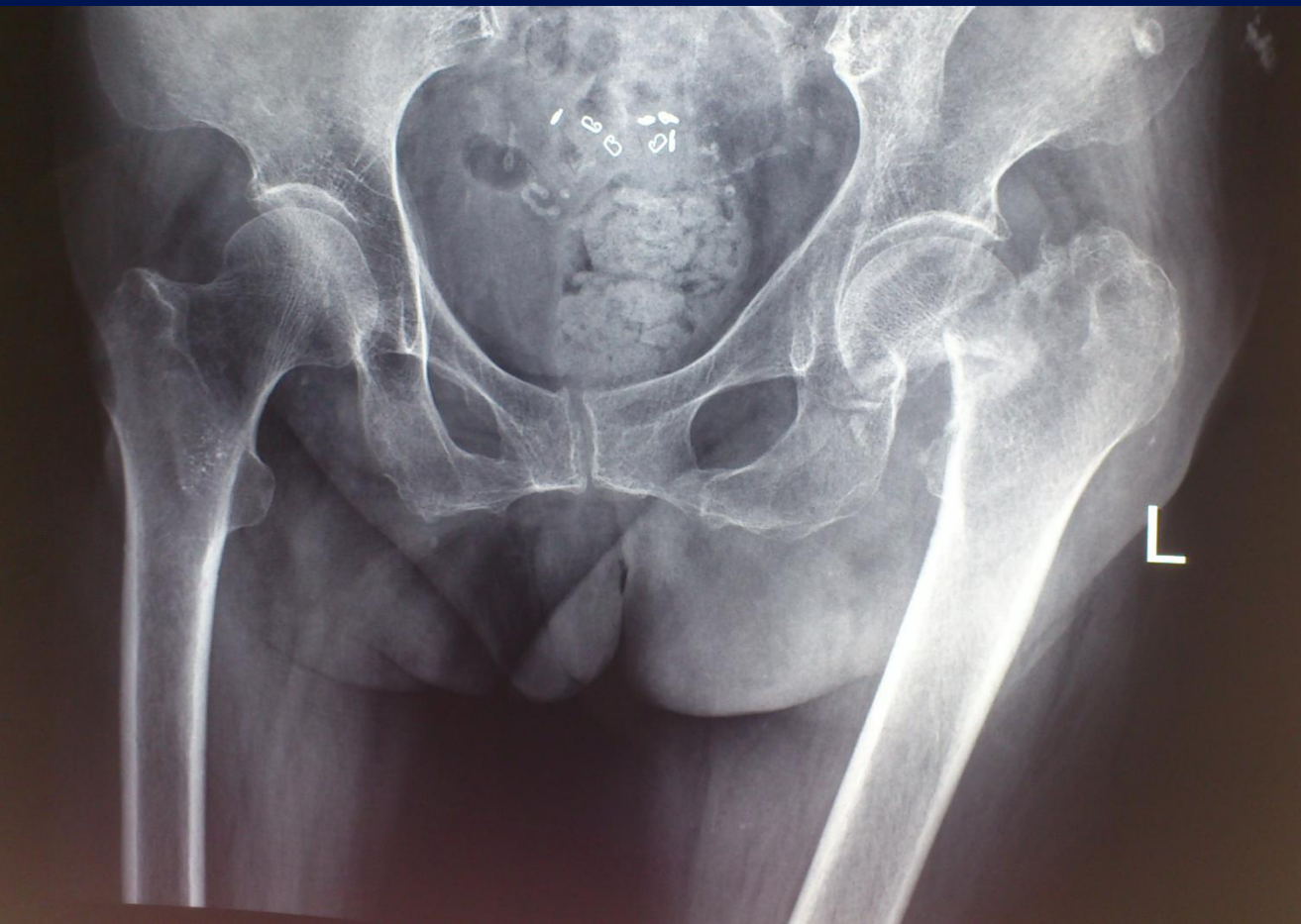
女, 84岁

北京大学  
北京积水潭医院





# 股骨颈嵌插骨折-10天后

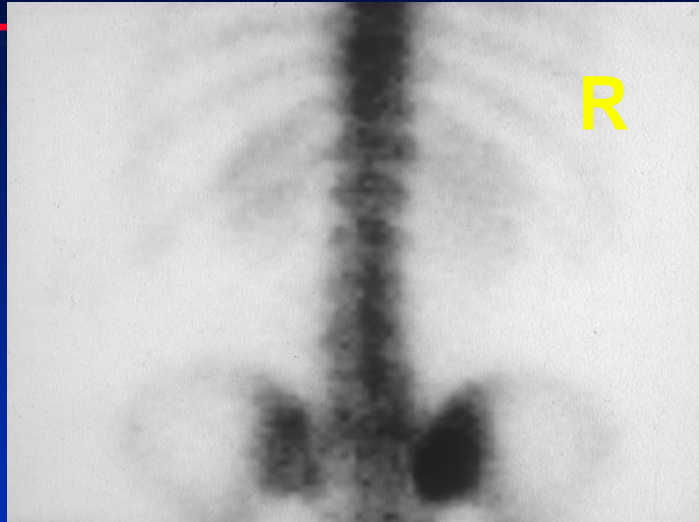


• 十天后

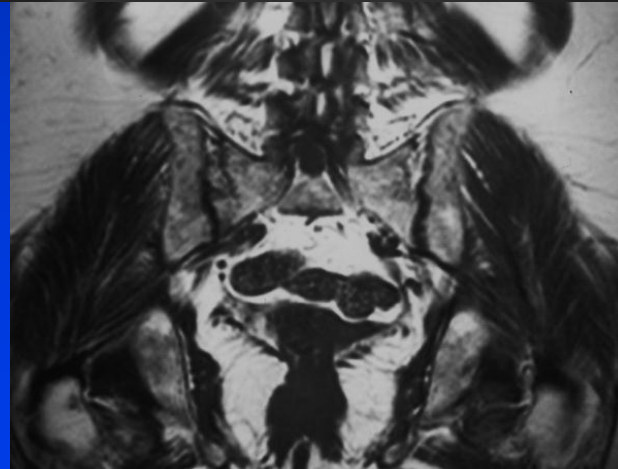




# 骶骨机能不全骨折



IF right sacrum



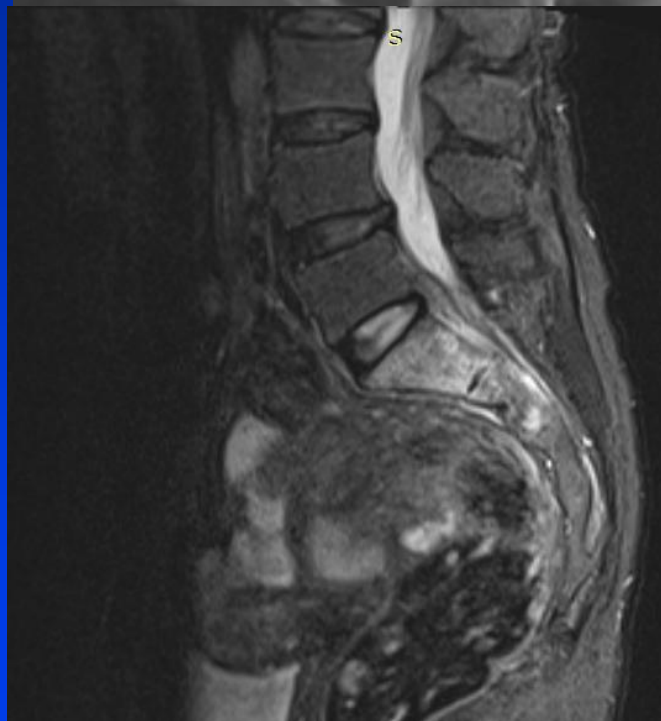
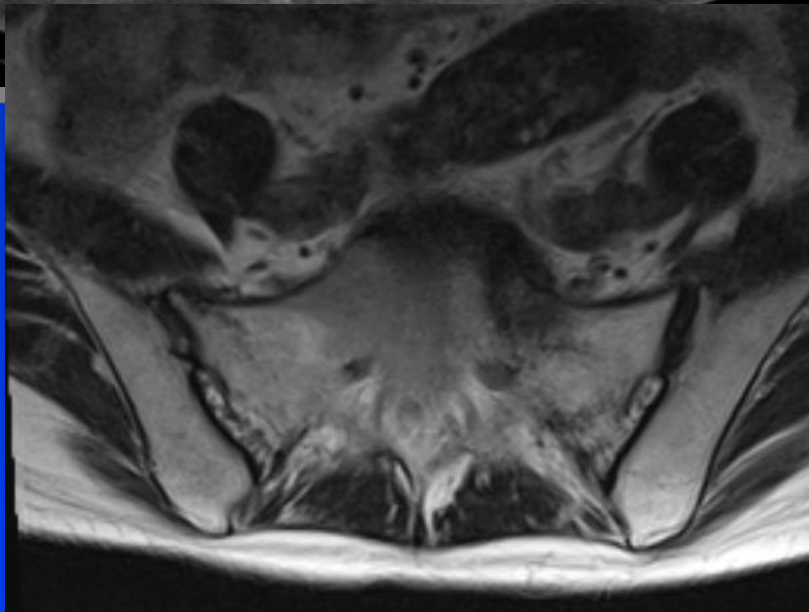
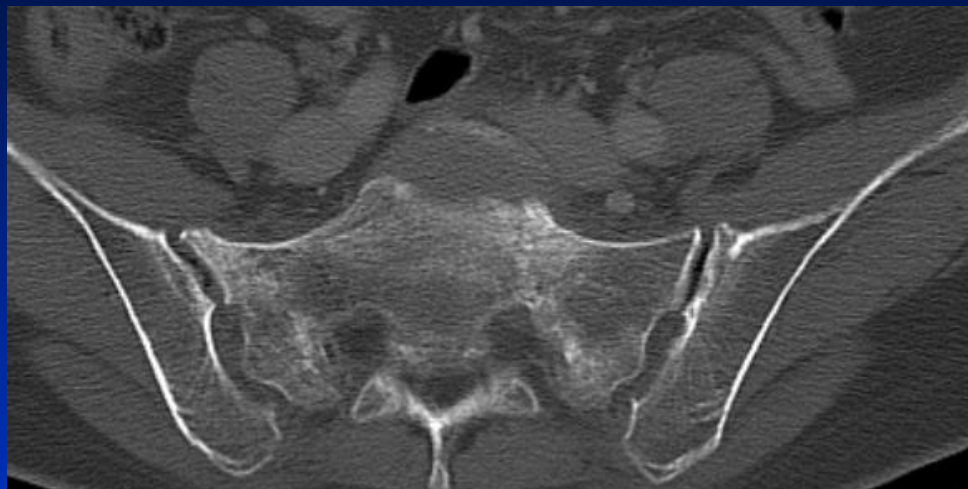
after long evolution

J.Garcia  
提供

北京大学  
北京积水潭医院

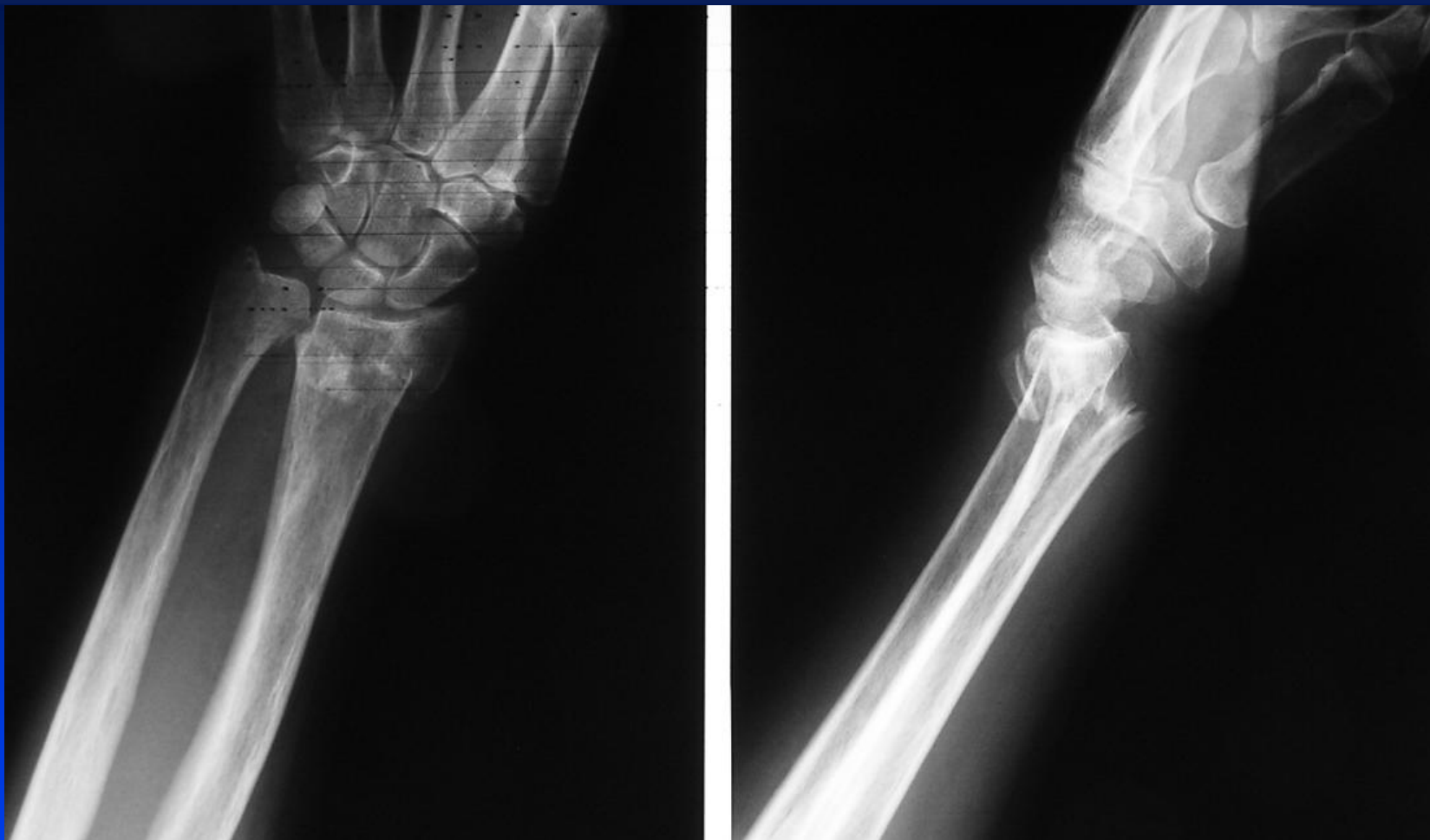


# 女性，52岁，腰疼





# Colles骨折



• 68岁妇女。

# 诊断骨质疏松性脊柱骨折-重要性

- 发现脊柱骨折，将来发生骨折的风险增加3-5倍
- 增加致残率和致死率
- 适当的治疗可以减少骨折
- 所以早期发现和诊断非常重要



Ensrud et al. J Am Geriatr Soc 48:241-249  
Johnell et al. Osteoporos Int 16(Suppl 2):S3-S7





# 骨质疏松椎体骨折的诊断-现状

---

患者常常没有注意，仅25%的椎体骨折有明显临床表现

放射科医生认识不足，经常“视而不见”  
和自我保护  
结果是多数脊柱骨折被漏掉

# 骨质疏松性脊椎压缩性骨折流行病学调查分析

- 1081例社区人群，>50岁
- X线平片
- 椎体压缩骨折患病率
- 安珍，等。中国骨质疏松杂志，2002年，8卷82页

表1 脊椎压缩骨折患病随年龄增大的变化

| 年龄组<br>(岁) | 受检例数<br>(人) | 脊椎压缩骨折  |        |              |
|------------|-------------|---------|--------|--------------|
|            |             | 患病例数(人) | 患病率(%) | 每10年患病率增长(%) |
| 50~        | 437         | 38      | 8.70   |              |
| 60~        | 349         | 53      | 15.18  | 6.48         |
| 70~        | 220         | 57      | 25.91  | 10.73        |
| ≥80~       | 75          | 27      | 36.00  | 10.09        |
| 合计         | 1081        | 175     | 16.19  |              |

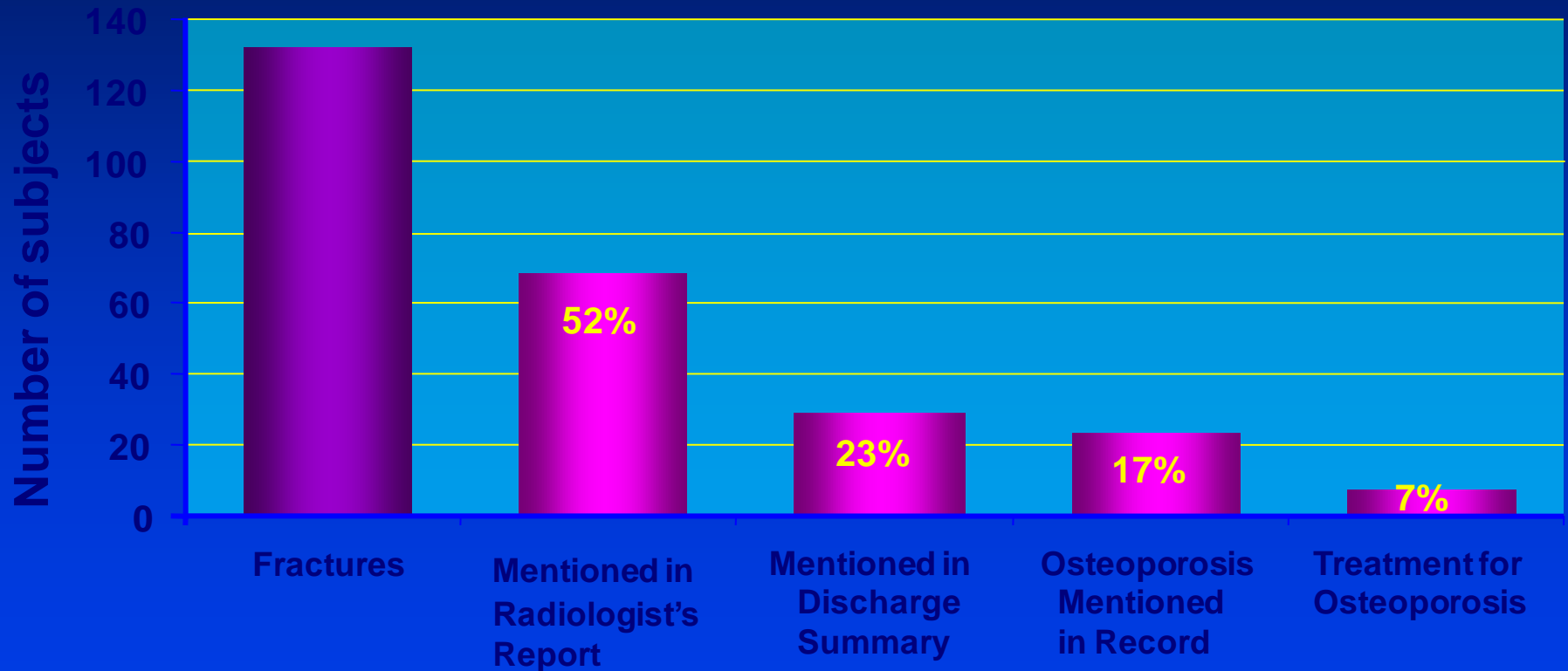
表2 不同性别、城乡骨质疏松压缩骨折患病率比较

| 指标 | 受检例数<br>(人) | 脊椎压缩骨折  |        |
|----|-------------|---------|--------|
|    |             | 患病例数(人) | 患病率(%) |
| 男  | 521         | 78      | 14.97  |
| 女  | 560         | 97      | 17.32  |
| 城市 | 533         | 71      | 13.32  |
| 乡村 | 548         | 104     | 18.98  |



# 椎体骨折常常被忽视

934 women age 60 and older, hospitalized for various reasons  
Chest x-rays reviewed for fracture



Gehlbach SH et al, Osteoporos Int, 2000;11:577-582

北京大学

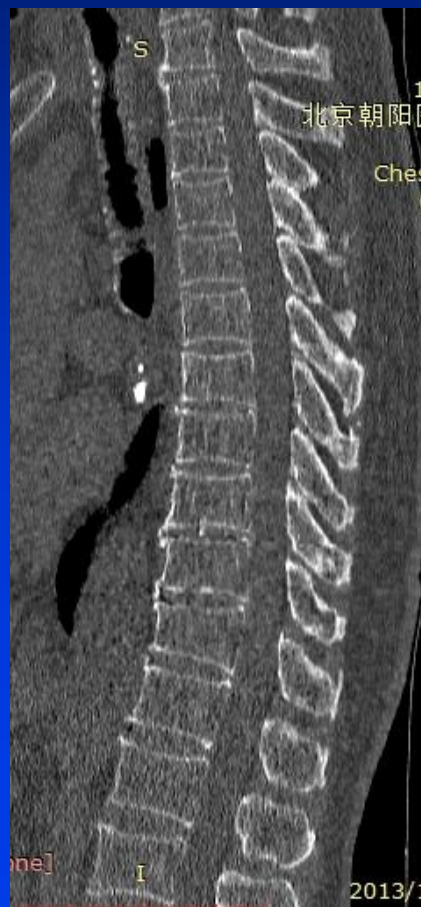
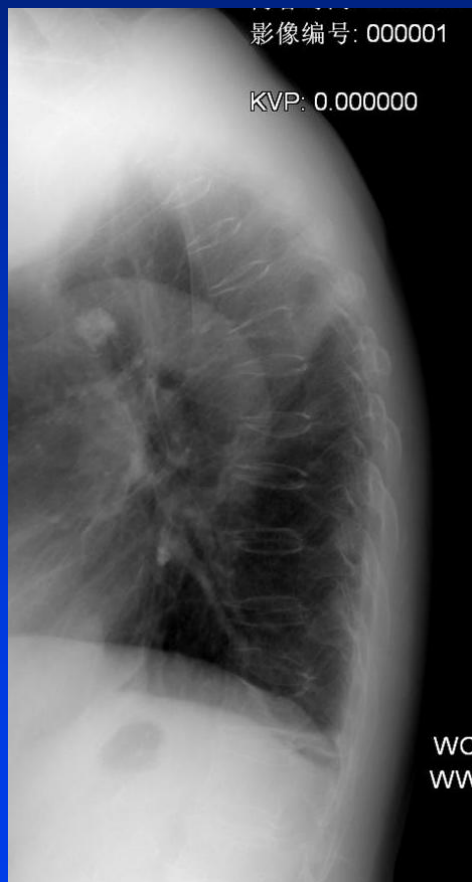
北京积水潭医院





# 脊柱骨折的影像检查方法

- 1, 胸腰正侧位X线平片; 2, CT扫描的定位像; 3, CT矢状重建图像; 4, MR检查





# 脊柱骨折的主要表现是椎体变形



Normal



Anterior



Middle  
Mild fracture



Posterior



Anterior



Middle  
Moderate fracture



Posterior



Anterior



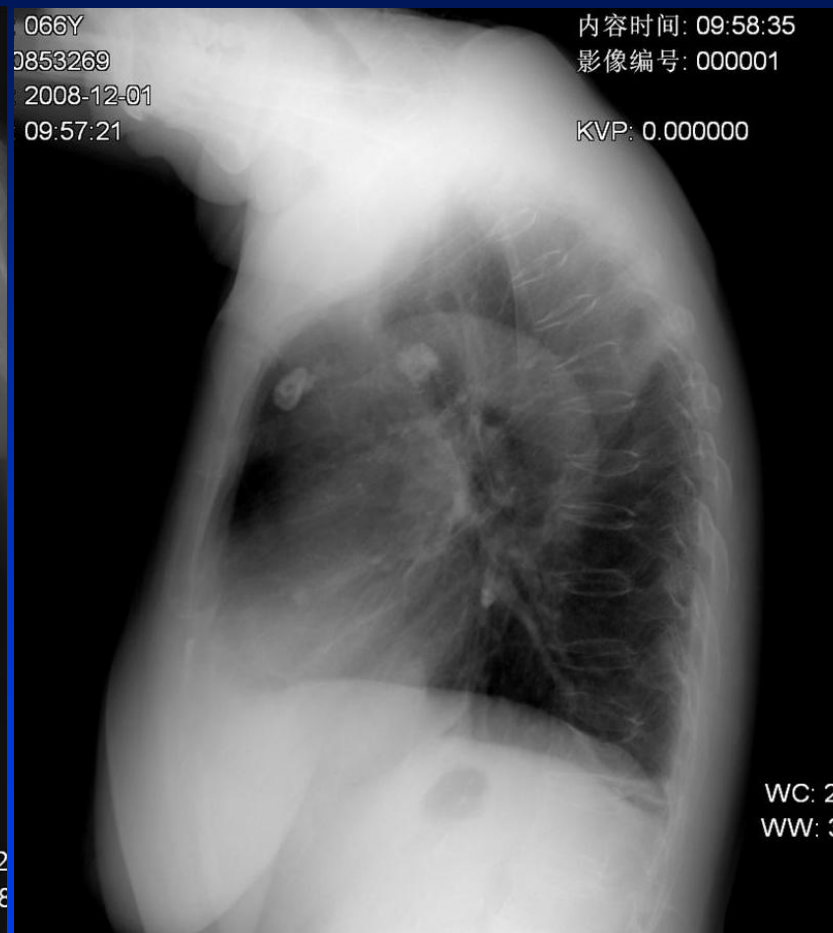
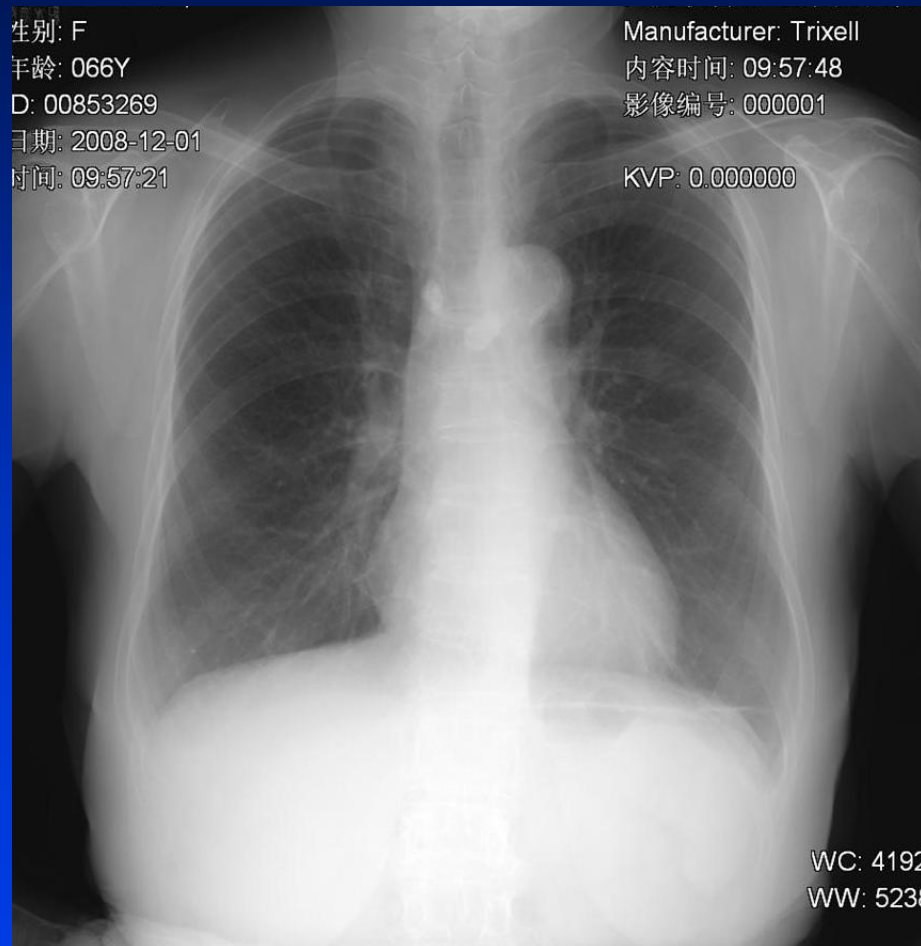
Middle  
Severe fracture



Posterior



# 胸部外伤



北京大学

北京积水潭医院





# 胸骨骨折，多发椎体骨折

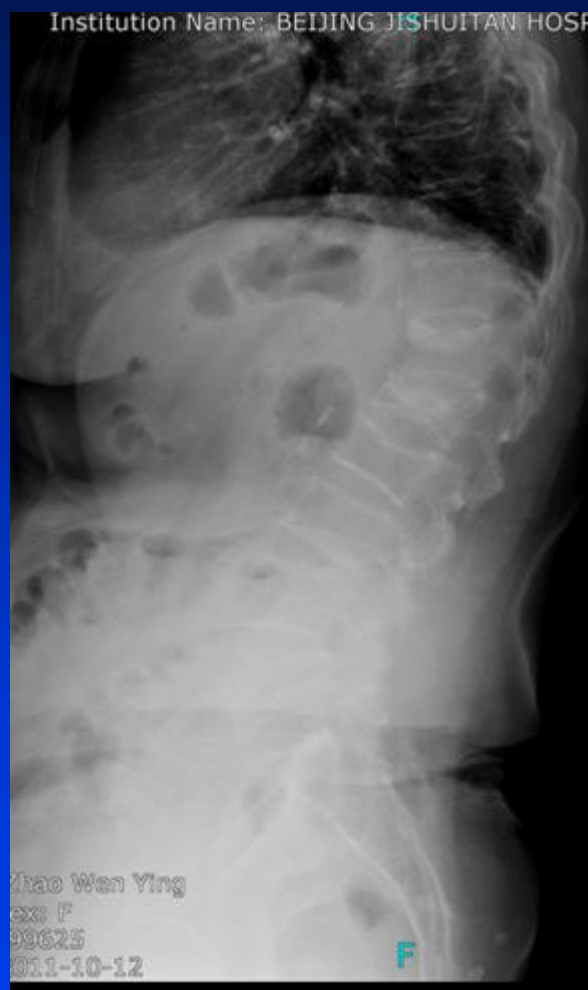


北京大学

北京积水潭医院



# 椎体骨折-主要表现为椎体压缩和终板凹陷





# 女性，64岁

Patient Name: BEIJING JISHUI TIAN HOSPITAL



北京大学

北京积水潭医院



# 骨疏松骨折：MR鉴别新鲜陈旧



• 女性，58岁。

北京大学  
北京积水潭医院





# 椎体骨折遗留椎体变形



• 防止“碰瓷”

北京大学

北京积水潭医院



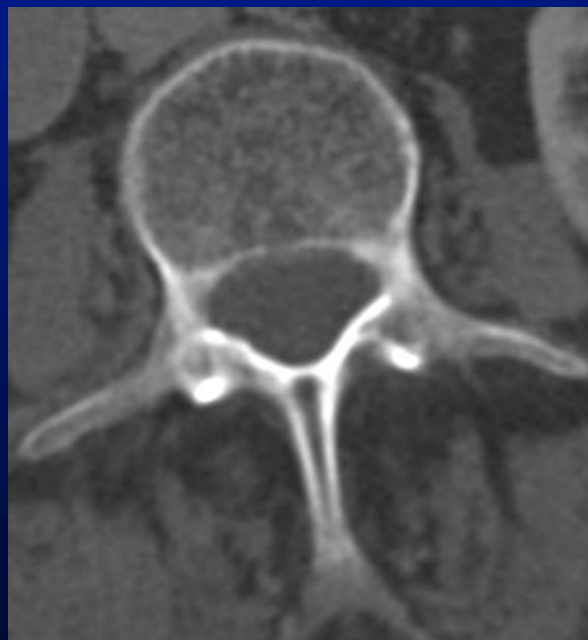
1.  
QCT  
technique

## CT - incidental fractures

2.  
Indications

- Fractures missed in axial CT images
- sagittal reformations demonstrate fractures

3.  
CT  
and  
fractures



4.  
Routine  
CT  
BMD

5.  
New  
developments

*Bauer et al. Osteoporos Int. 2006;17(4):608-15.  
Mueller et al. Eur Radiol. 2008 Aug;18(8):1696-702*

1.  
QCT  
technique

# CT - incidental fractures

2.  
Indications

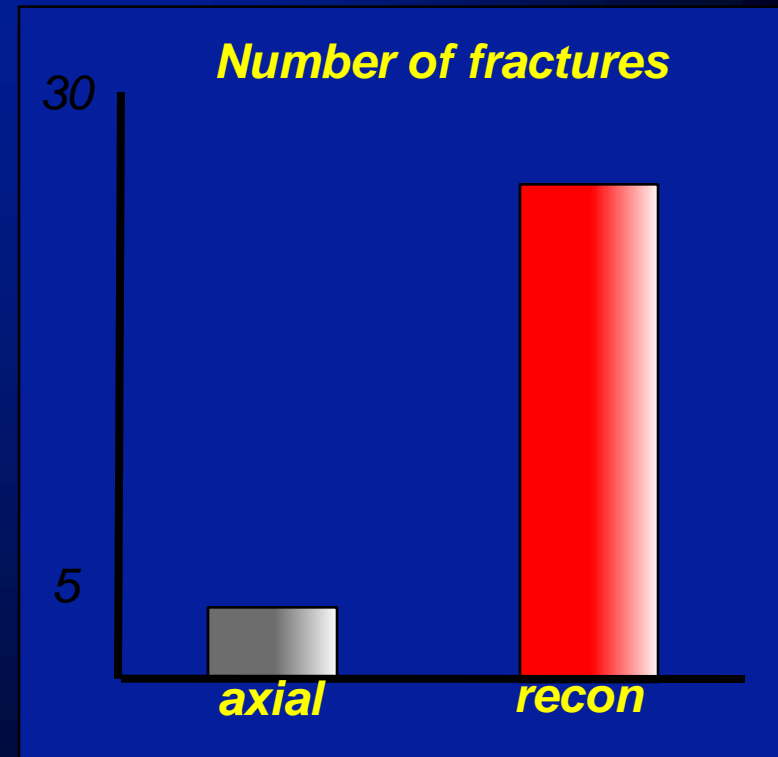
- Fractures detected in axial CT images vs. sagittal reformations

3.  
CT and fractures

- only **4/28 fractures detected** in axial images compared to sagittal reformations#
- **minimum** requirements for sagittal reformation **3 mm slice thickness** in axial images\*

4.  
Routine CT BMD

5.  
New developments



Mueller et al. Eur Radiol. 2008 Aug;18(8):1696-702#  
Bauer et al. Osteoporos Int. 2006;17(4):608-15\*

1.  
QCT  
techni  
que

# CT – incidental fractures

2.  
Indi  
cati  
ons

## Scout views

- Provides information on fracture status up to T8#
- thus only 10% of fractures (T7-1) are missed\*



3.  
CT  
and  
fractu  
res

4.  
Routin  
e CT  
BMD

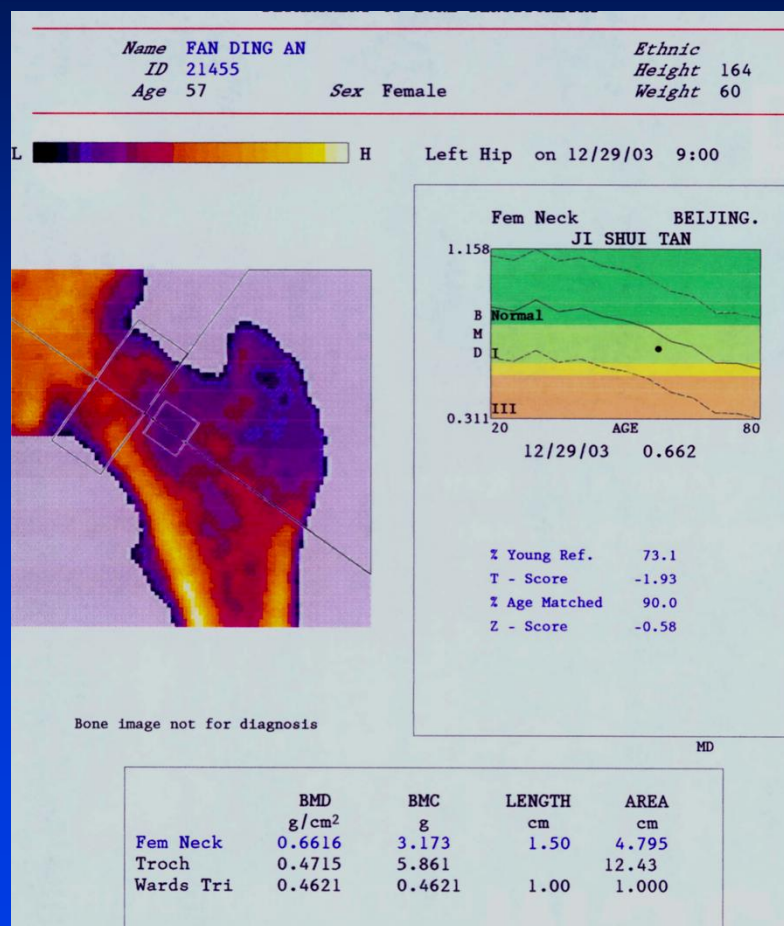
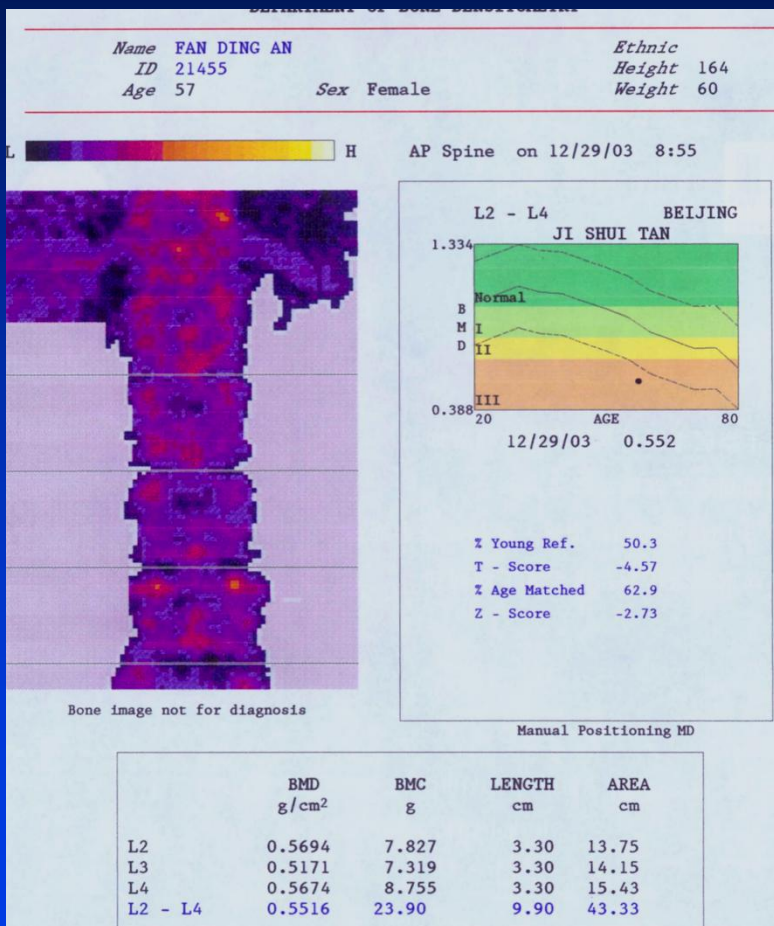
5.  
New  
develo  
pment  
s

*Link et al. Osteoporos Int. 2000;11(4):304-9#*

*Gilsanz et al. Radiology 1994; 190: 678-82#*

*Davis et al. Bone 1999;24:261-264\**

# 影像鉴别诊断：肿瘤 女，57岁，腰疼



• 腰椎和髋BMD低

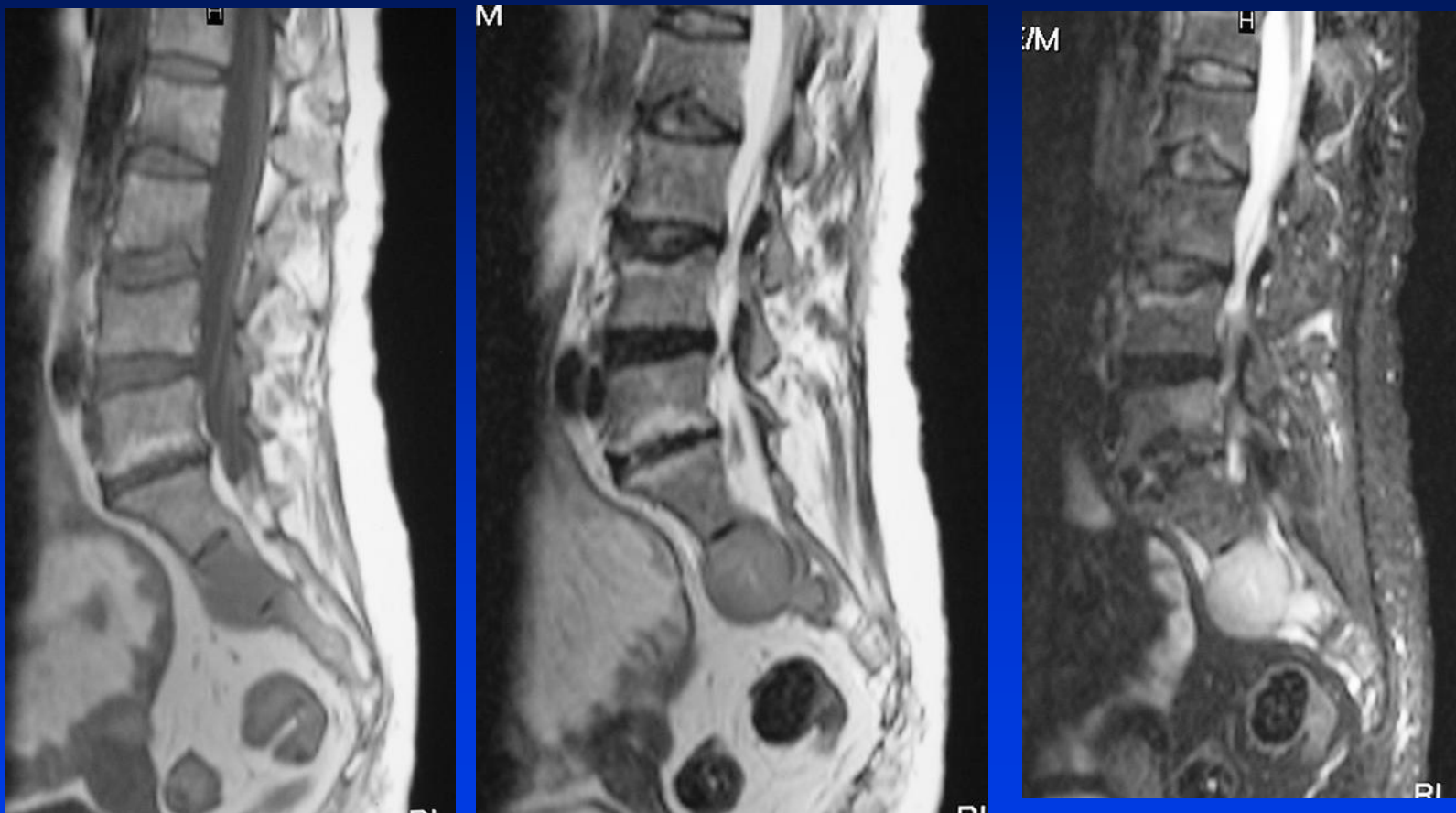
北京大学

北京积水潭医院





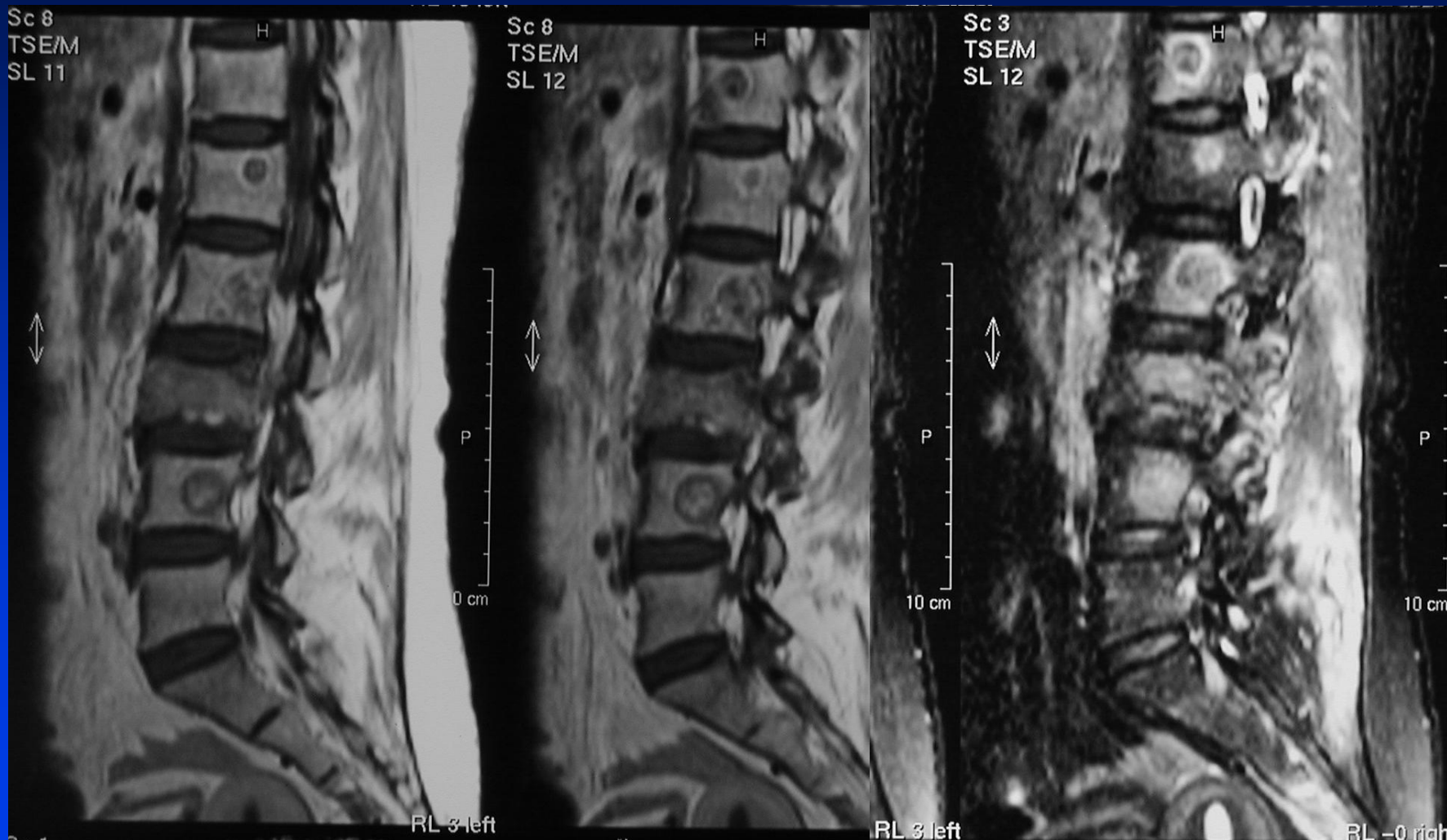
# 影像鉴别诊断：肿瘤 女，57岁，腰疼（续）



- 浆细胞性白血病



# 骨肿瘤病例



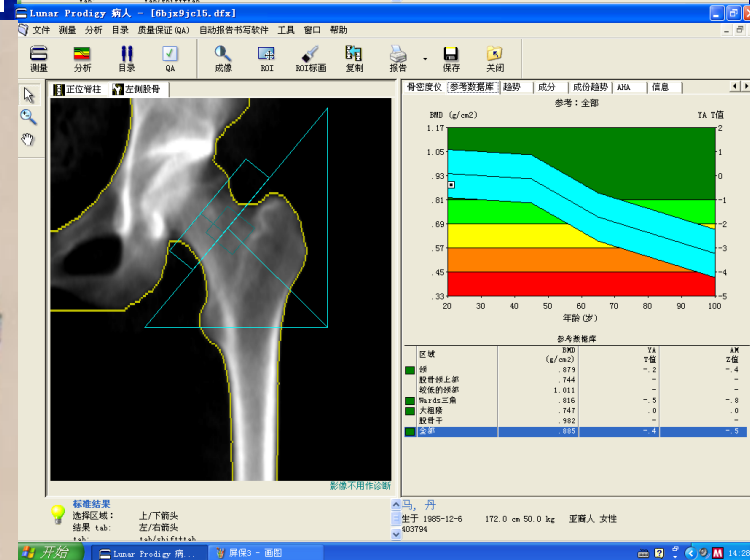
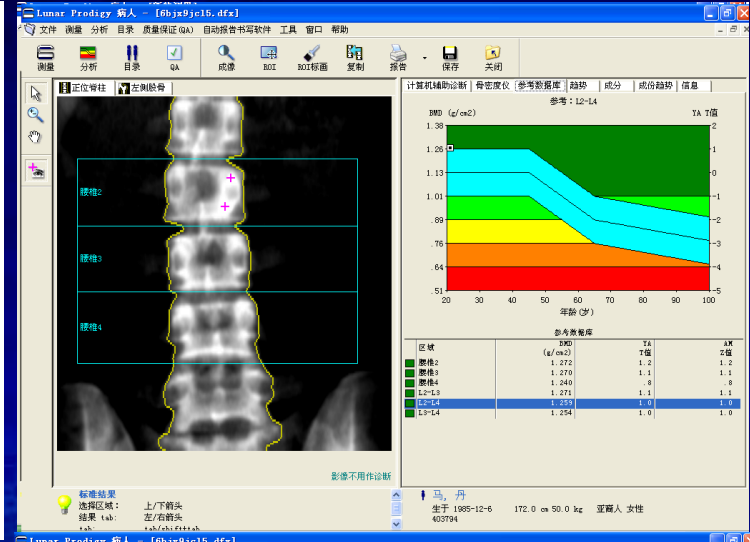


## 诊断标准之二：骨密度测量

- 骨密度测量技术是对被测物体骨矿含量、骨密度和体质成份进行无创性定量分析的方法。
- 目前主要采用的技术有下列几种：
  - 1, 双能X线骨密度仪 (DXA, pDXA)
  - 2, 定量CT (QCT, pQCT)
  - 3, 其他骨密度测量技术



# Dual energy X-ray absorptiometry (DXA)

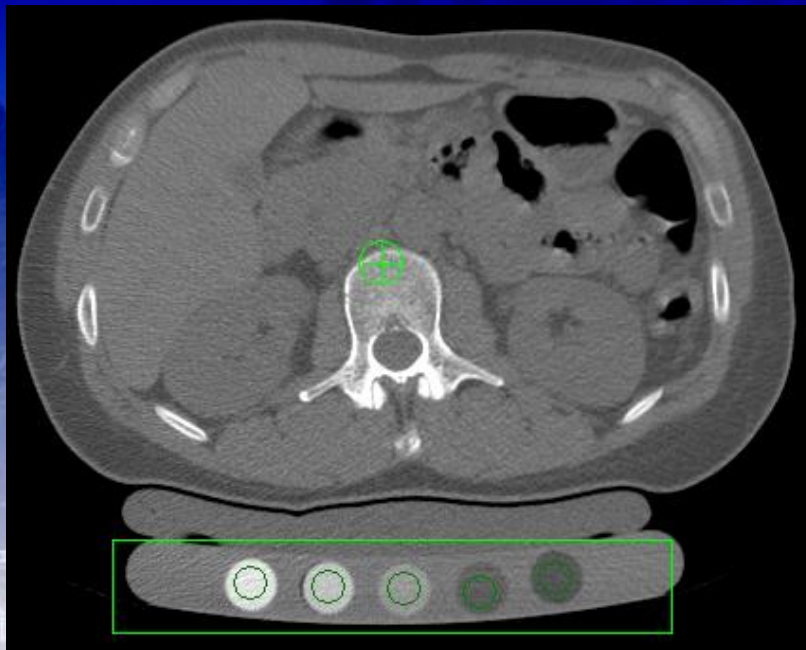






# QCT Technology

- QCT was introduced by Harry Genant in 1980s, it is to use clinical CT scanner to measure BMD and body composition with QCT system



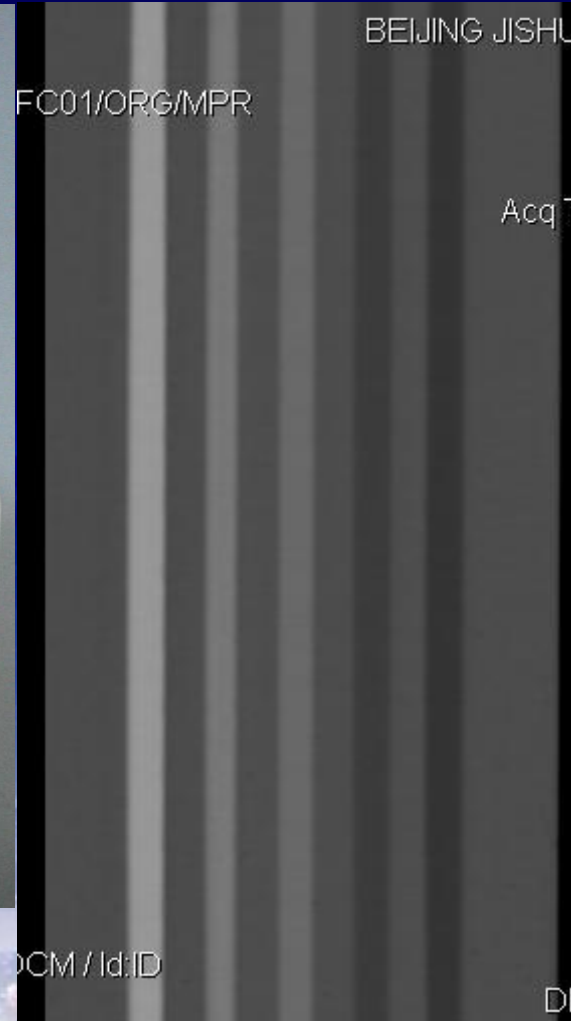
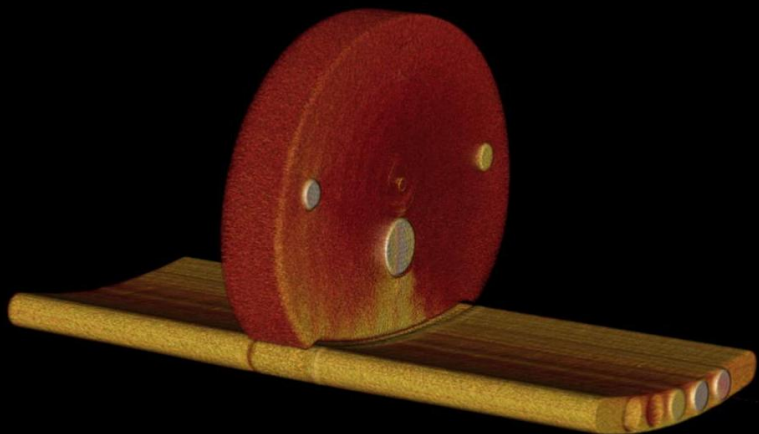


# Mindways QCT system

- parts:  
QA phantom  
calibration phantom  
workstation



Img T



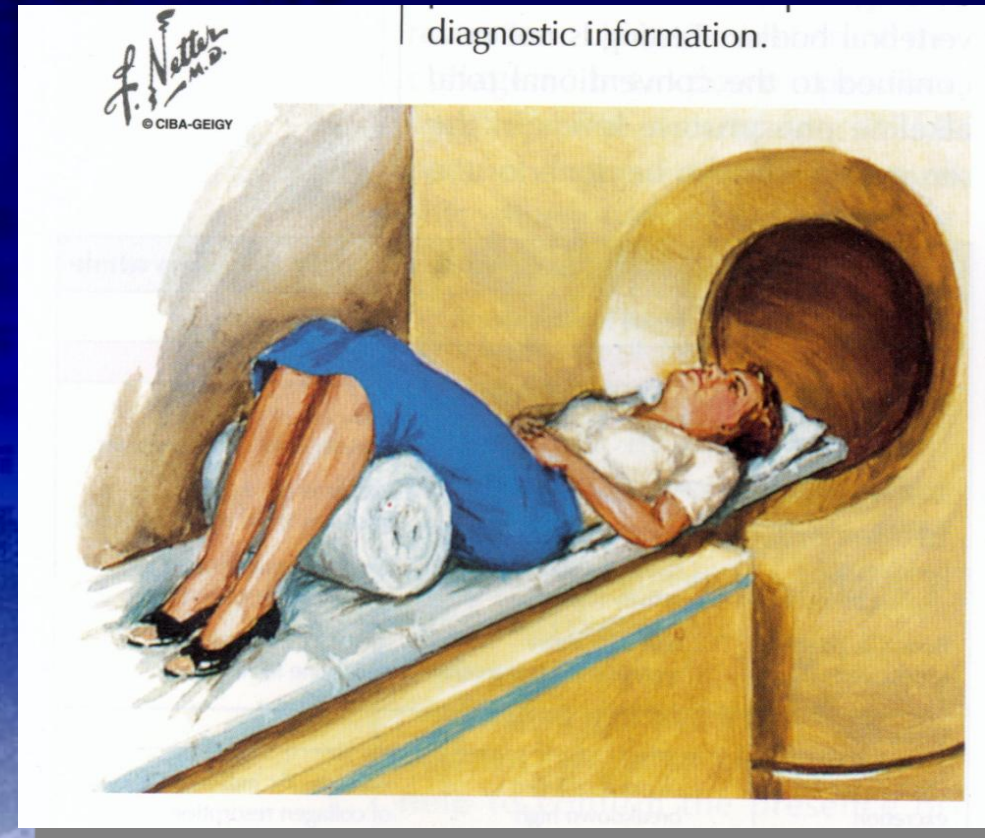
北京大学

北京积水潭医院



# QCT protocol

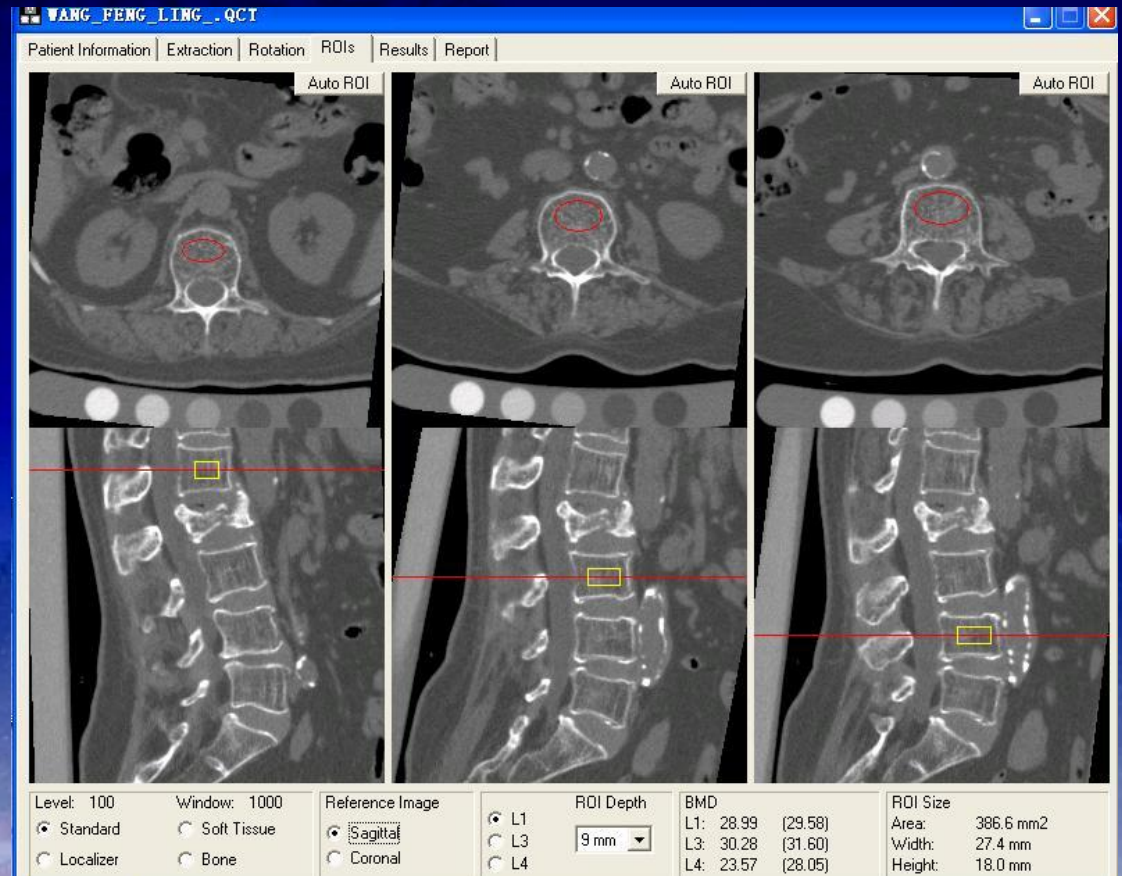
- Clinical CT scanner
- Mindways QCT
- Supine position, phantom beneath the back
- CT data are transformed to QCT workstation for BMD





# 3 D QCT exam

- Sag Cor and axial 3 axis adjustment for location
- High precision
- fast
- Retriavable Data
- User friendly



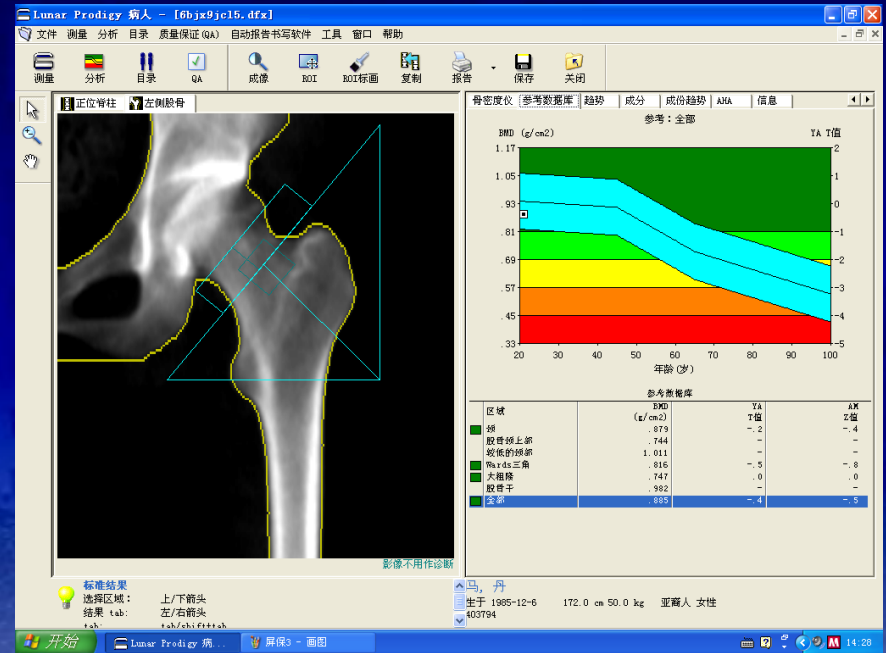
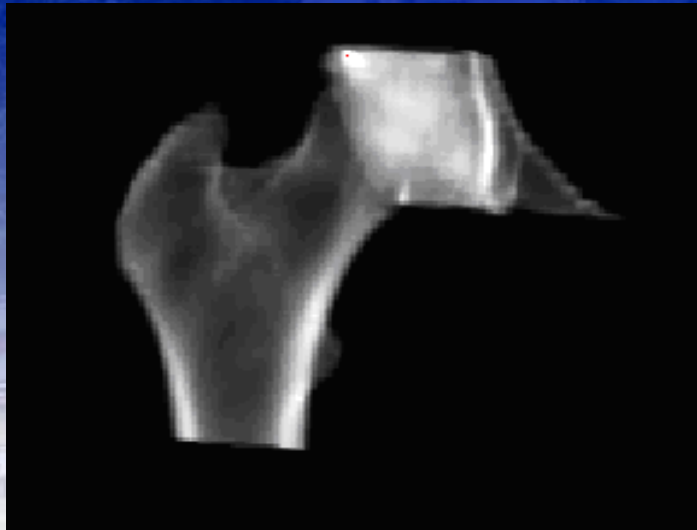
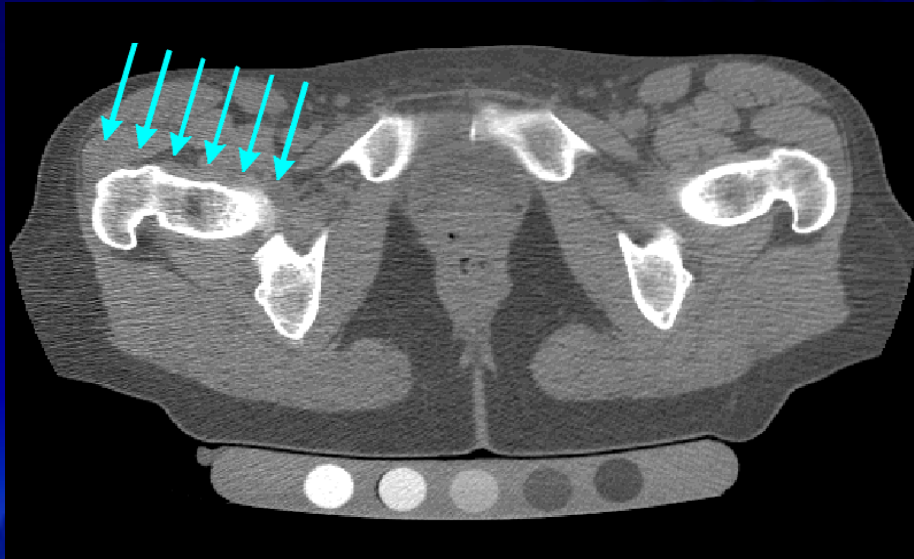
北京大学

北京积水潭医院





# QCT vs DXA hip BMD



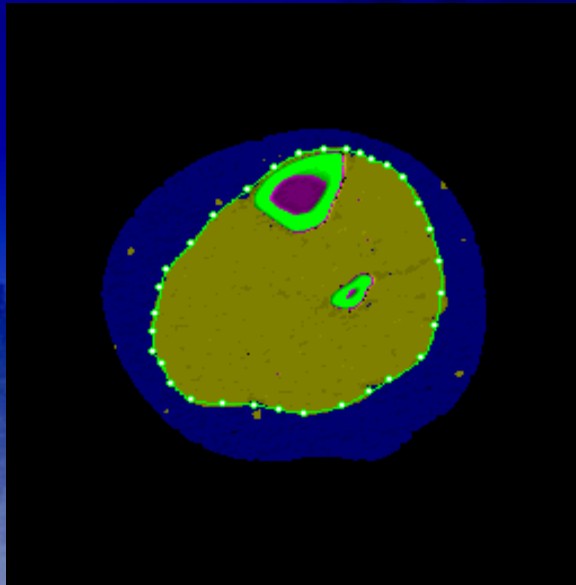
• DXA



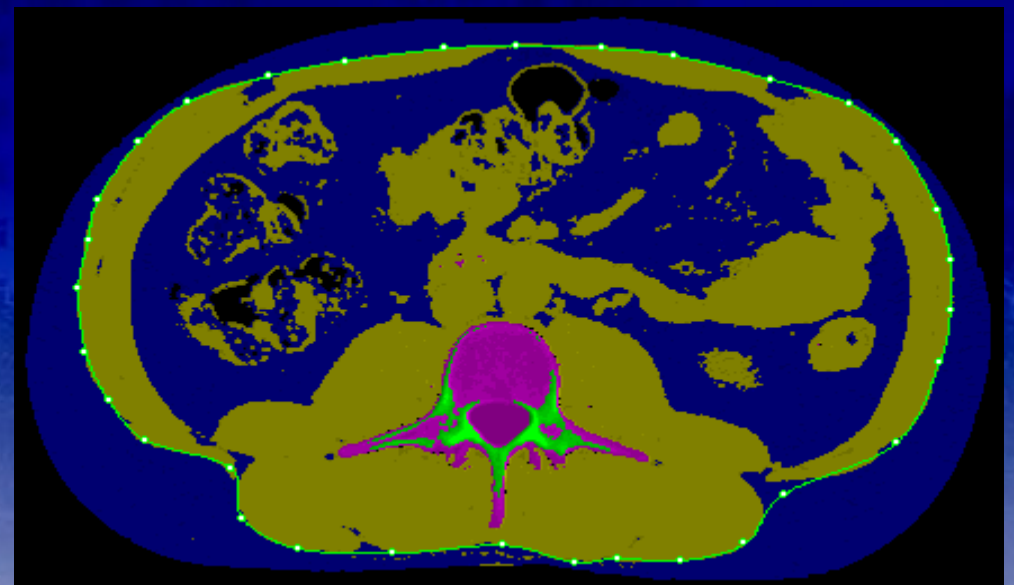
北京大学

北京积水潭医院

## Tibia



## Abdomen



BONE + MUSCLES + FAT



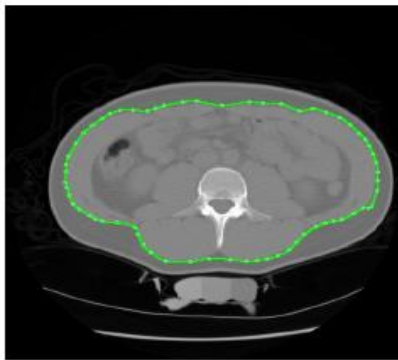
北京大学

北京积水潭医院



# Tissue Analysis Reporting

## QCT PRO Tissue Analysis Report



### Patient Information

Name: 027JC, IMAGE2  
 ID: 0  
 Date: 11/10/2005  
 Sex: Male  
 DOB: 3/19/1988  
 Age: 17  
 Exam: 35584  
 Radiologist: cmbRadiologist  
 Referring Physician: UNKNOWN UNKNOWN  
 Comments:

### CT Scan Technique

CT Scanner: GE MEDICAL SYSTEMS LightSpeed QX/i  
 CT Scanner ID: CHLA\_OCO  
 kVp: 80  
 Gantry Angle: -1.0  
 mA: 70  
 Slice Thickness (mm): 10.000  
 Table Position: 63.3  
 SFOV: 500  
 Pixel Size (mm): 0.674  
 Scan Time (s): 2.00  
 Slice Spacing (mm): 29.760  
 Table Height: 149.9

### Method Assumptions and Data

Calibration Slope: 1.9066  
 Fat Density (g/cm3): 0.923  
 Muscle Density (g/cm3): 1.055  
 Cancellous Threshold: 190.7  
 Calibration Intercept: 986.6  
 Fat CT Value: -110.5  
 Muscle CT Value: 52.1  
 Cortical Threshold: 667.3

### Segmentation Thresholds

|        |      |      |
|--------|------|------|
| Fat    | 786  | 957  |
| Muscle | 958  | 1176 |
| Bone   | 1177 | 1654 |

Range: 0.100  
 GMM Iterations: 0  
 Snake Iterations: 20  
 Options Word: 55  
 Skin Count: 5796  
 Amoeba Iterations: 0

### Fits of Data to Model

|                |        |          |
|----------------|--------|----------|
| Mean and SD 1: | 1086.6 | 485907.2 |
| Mean and SD 2: | 1037.7 | 485907.2 |
| Mean and SD 3: | 968.0  | 485907.2 |
| Mean and SD 4: | 900.8  | 485907.2 |

### Composition Results for Image

| Tissue             | Mass (g) | Area (cm2) | Volume (cm3) |
|--------------------|----------|------------|--------------|
| Fat                | 104.4    | 113.2      | 113.2        |
| Muscle             | 302.8    | 287.0      | 287.0        |
| Cortical Mineral   | 2.4421   | 4.922      | 4.922        |
| Cancellous Mineral | 3.3906   | 18.203     | 18.203       |
| Skin               |          | 26.32      | 26.32        |

### Composition Results for Spine

| Tissue             | Mass (g) | Area (cm2) | Volume (cm3) |
|--------------------|----------|------------|--------------|
| Fat                | 24.6     | 26.6       | 26.6         |
| Muscle             | 296.3    | 280.8      | 280.8        |
| Cortical Mineral   | 2.4421   | 4.922      | 4.922        |
| Cancellous Mineral | 3.3906   | 18.203     | 18.203       |

### Bone Density (mg/cm3)

| Region | Cortical | Cancellous | Integral |
|--------|----------|------------|----------|
| Image  | 496.2    | 186.3      | 252.2    |
| Spine  | 496.2    | 186.3      | 252.2    |

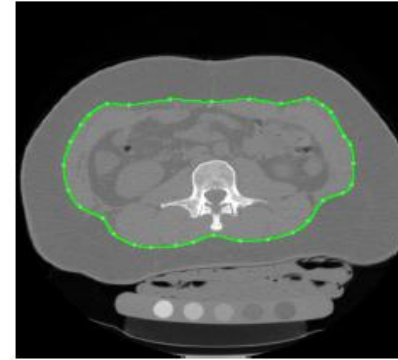
### Fat-Lean Ratios

| Region            | Volume | Mass  |
|-------------------|--------|-------|
| Image             | 0.394  | 0.345 |
| Spine             | 0.095  | 0.083 |
| Image (CT Weight) | 0.225  | 0.197 |
| Spine (CT Weight) | 0.000  | 0.000 |
| Image (Cluster)   | 0.721  | 0.631 |
| Spine (Cluster)   | 0.333  | 0.291 |

### Bone-Muscle Ratios

| Region            | Volume | Mass  |
|-------------------|--------|-------|
| Image             | 0.081  | 0.019 |
| Spine             | 0.082  | 0.020 |
| Image (CT Weight) | 0.071  | 0.017 |
| Spine (CT Weight) | 0.075  | 0.018 |

## QCT PRO Tissue Analysis Report



### Patient Information

Name: 7, 7  
 ID: 0  
 Date: 12/23/2005  
 Sex: Male  
 DOB: 1/1/1977  
 Age: 28  
 Exam:  
 Radiologist: ???  
 Referring Physician: cmbPhysician  
 Comments:

### CT Scan Technique

CT Scanner: GE MEDICAL SYSTEMS LightSpeed Ultra  
 CT Scanner ID: ???  
 kVp: 80  
 Gantry Angle: 0.0  
 mA: 360  
 Slice Thickness (mm): 2.500  
 Table Position: -98.4  
 SFOV: 500  
 Pixel Size (mm): 0.742  
 Scan Time (s): 13.20  
 Slice Spacing (mm): 2.500  
 Table Height: 173.2

### Method Assumptions and Data

Calibration Slope: 1.7190  
 Fat Density (g/cm3): 0.923  
 Muscle Density (g/cm3): 1.055  
 Cancellous Threshold: 171.9  
 Calibration Intercept: 1014.2  
 Fat CT Value: -104.6  
 Muscle CT Value: 51.5  
 Cortical Threshold: 601.6

### Segmentation Thresholds

|        |      |      |
|--------|------|------|
| Fat    | 820  | 988  |
| Muscle | 989  | 1185 |
| Bone   | 1186 | 1616 |

Range: 0.100  
 GMM Iterations: 1  
 Snake Iterations: 10  
 Options Word: 59  
 Skin Count: 7194  
 Amoeba Iterations: 0

### Fits of Data to Model

|                |        |       |
|----------------|--------|-------|
| Mean and SD 1: | 1079.4 | 183.0 |
| Mean and SD 2: | 1036.6 | 252.0 |
| Mean and SD 3: | 924.2  | 123.8 |
| Mean and SD 4: | 903.1  | 66.6  |

### Composition Results for Image

| Tissue             | Mass (g) | Area (cm2) | Volume (cm3) |
|--------------------|----------|------------|--------------|
| Fat                | 95.3     | 413.0      | 103.2        |
| Muscle             | 66.8     | 253.2      | 63.3         |
| Cortical Mineral   | 1.2712   | 10.191     | 2.548        |
| Cancellous Mineral | 1.0485   | 19.770     | 4.942        |
| Skin               |          | 39.63      | 9.91         |

### Composition Results for Spine

| Tissue             | Mass (g) | Area (cm2) | Volume (cm3) |
|--------------------|----------|------------|--------------|
| Fat                | 18.4     | 79.8       | 20.0         |
| Muscle             | 65.9     | 249.9      | 62.5         |
| Cortical Mineral   | 1.2712   | 10.191     | 2.548        |
| Cancellous Mineral | 1.0485   | 19.770     | 4.942        |

### Bone Density (mg/cm3)

| Region | Cortical | Cancellous | Integral |
|--------|----------|------------|----------|
| Image  | 499.0    | 212.1      | 309.7    |
| Spine  | 499.0    | 212.1      | 309.7    |

### Fat-Lean Ratios

| Region            | Volume | Mass  |
|-------------------|--------|-------|
| Image             | 1.631  | 1.427 |
| Spine             | 0.319  | 0.279 |
| Image (CT Weight) | 1.638  | 1.433 |
| Spine (CT Weight) | 0.284  | 0.249 |
| Image (Cluster)   | 1.682  | 1.472 |
| Spine (Cluster)   | 0.402  | 0.351 |

### Bone-Muscle Ratios

| Region            | Volume | Mass  |
|-------------------|--------|-------|
| Image             | 0.118  | 0.035 |
| Spine             | 0.120  | 0.035 |
| Image (CT Weight) | 0.119  | 0.035 |
| Spine (CT Weight) | 0.117  | 0.034 |





# QCT质量控制



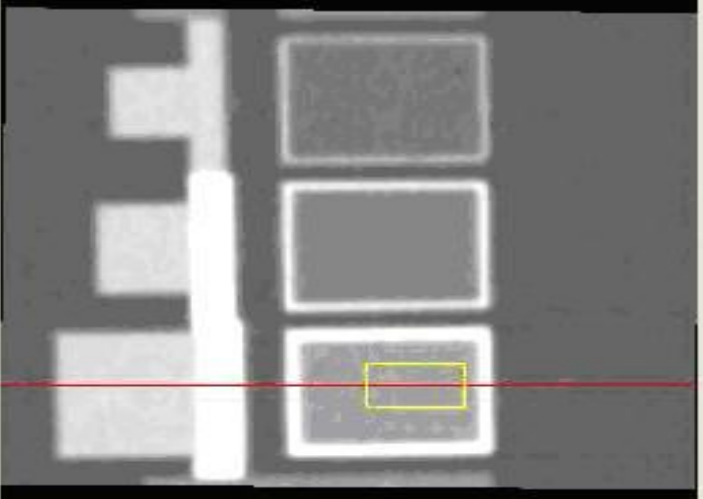
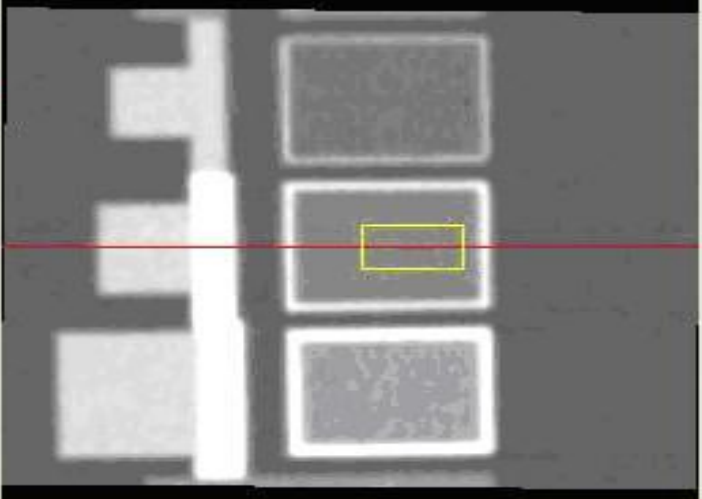
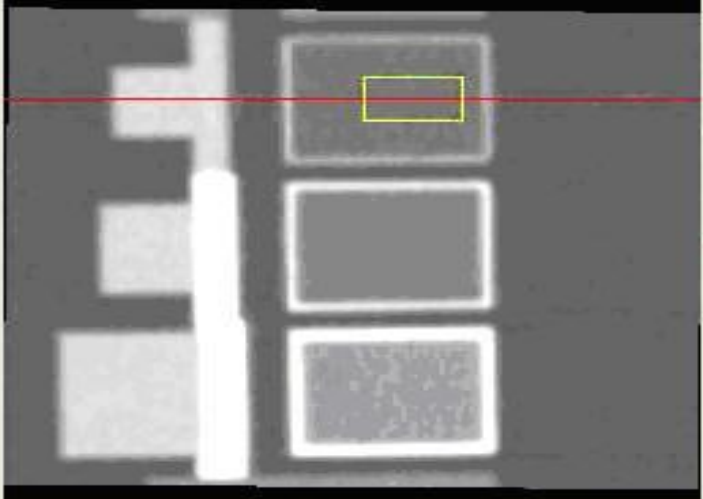
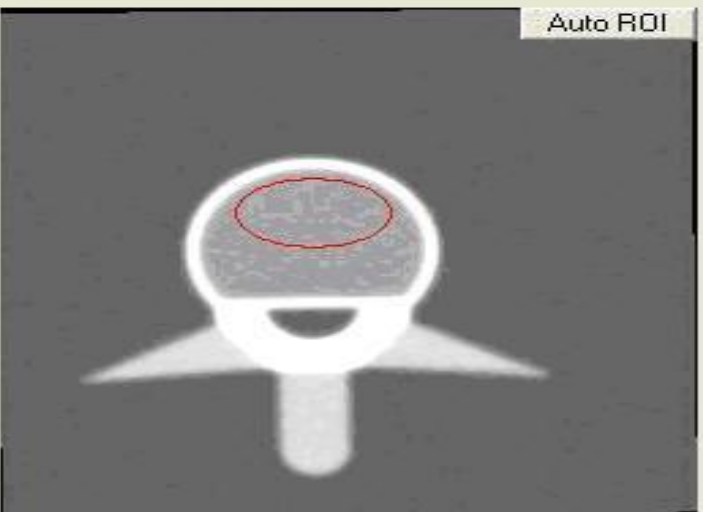
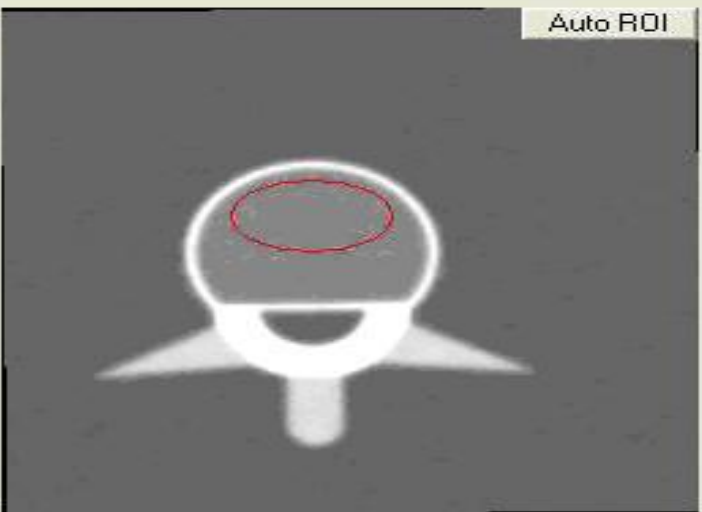
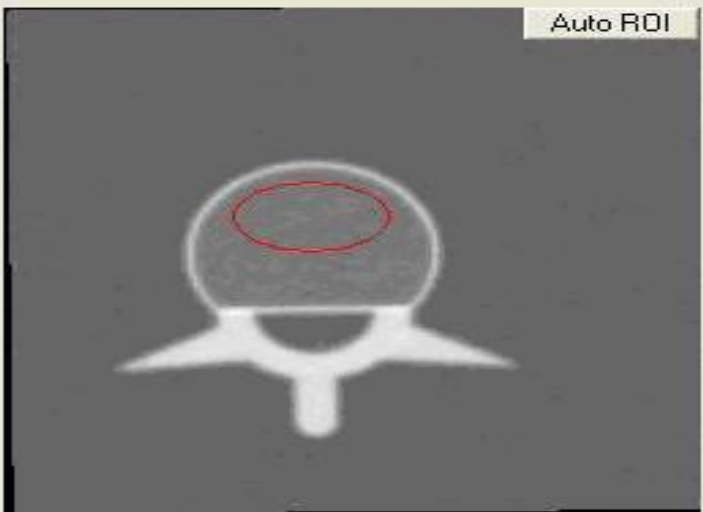
北京大学 北京积水潭医院





# 欧洲体模





|   |                                   |   |           |                   |                             |
|---|-----------------------------------|---|-----------|-------------------|-----------------------------|
| Level: 100                                | Window: 1000                      | Reference Image                           | ROI Depth | BMD               | ROI Size                    |
| <input checked="" type="radio"/> Standard | <input type="radio"/> Soft Tissue | <input checked="" type="radio"/> Sagittal | 9 mm      | L1: 48.19 (7.37)  | Area: 267.9 mm <sup>2</sup> |
| <input type="radio"/> Localizer           | <input type="radio"/> Bone        | <input type="radio"/> Coronal             |           | L2: 99.99 (7.10)  | Width: 23.5 mm              |
|   |                                   |   |           | L3: 196.37 (8.02) | Height: 14.5 mm             |

在QCT PRO工作站上测量L1-L4腰椎体楔，选好测量位置后软件自动生产的感兴趣区（ROI）



# 结 果

|      | L1          |       | L2           |       | L3           |       | b整体精密度 |       |
|------|-------------|-------|--------------|-------|--------------|-------|--------|-------|
|      | 平均值±SD      | CV %  | 平均值±SD       | CV %  | 平均值±SD       | CV %  | SD     | CV%   |
| QCT1 | 51.24±0.414 | 0.807 | 99.75±0.463  | 0.464 | 185.95±0.780 | 0.419 | 0.575  | 0.512 |
| QCT2 | 53.75±0.361 | 0.671 | 103.36±0.572 | 0.553 | 195.95±0.820 | 0.420 | 0.613  | 0.523 |
| QCT3 | 54.40±0.531 | 0.976 | 109.15±0.460 | 0.421 | 210.21±0.858 | 0.408 | 0.640  | 0.514 |

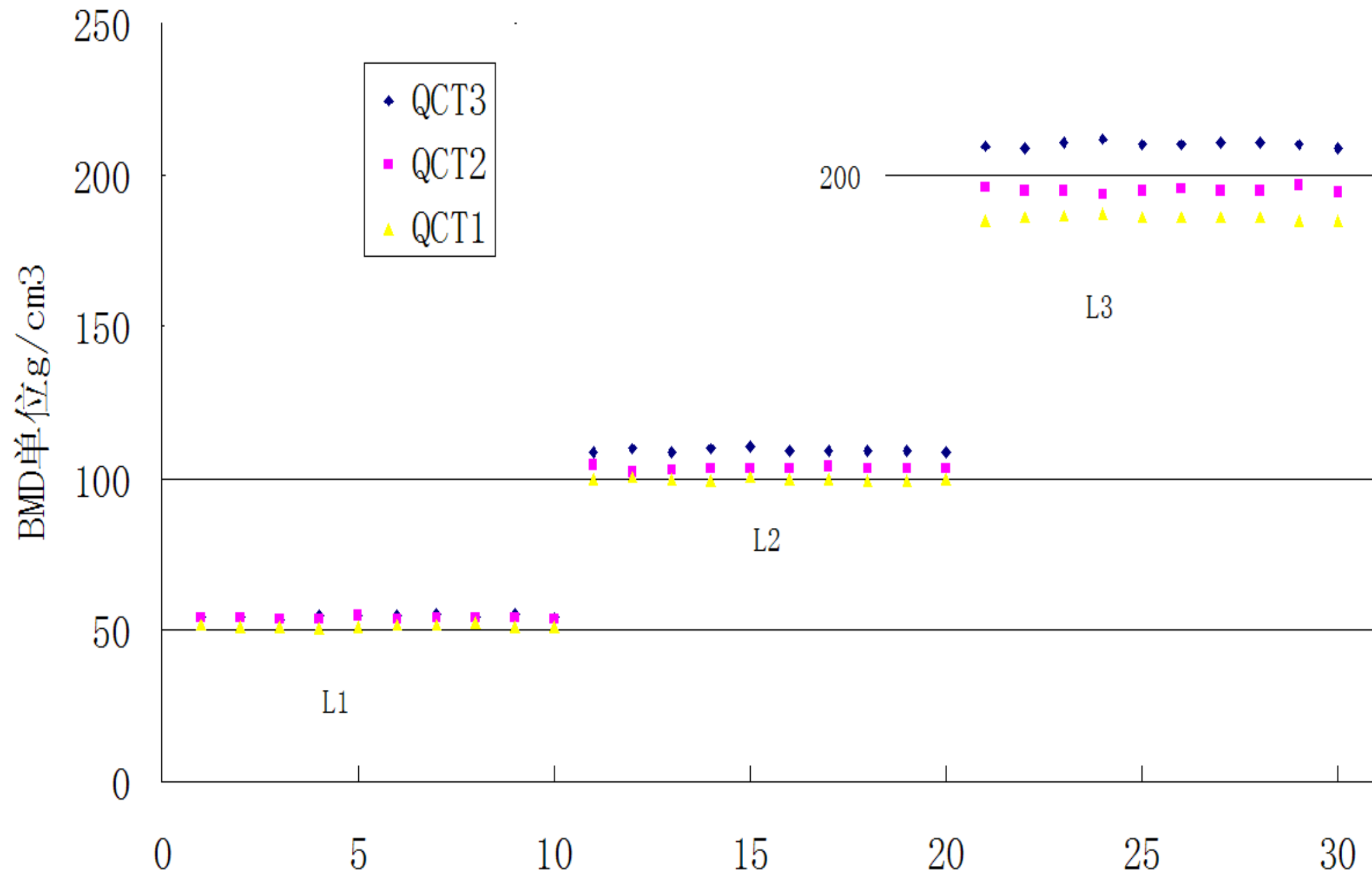
QCT测量的结果单位为mg/cm<sup>3</sup>, DXA测量结果的单位为g/cm<sup>2</sup>; a处两结果间差异无统计学意义p= 0.081; b处按照公式(3)计算得出。

QCT测量的结果单位为mg/cm<sup>3</sup>, DXA测量结果的单位为g/cm<sup>2</sup>; a处两结果间差异无统计学意义p= 0.081; b处按照公式(3)计算得出



北京大學

北京积水潭医院







# BMD测量与常规放射检查的辐射剂量

| BMD测量   | 有效剂量 (mSV) | 放射检查   | 有效剂量 (mSV) |
|---------|------------|--------|------------|
| 成人腰椎DXA | 0.013      | 胸片正位片  | 0.02       |
| 成人髌部DXA | 0.009      | 腰椎正侧位片 | 0.7+0.3    |
| 二维QCT   | 0.06-0.3   | 乳腺钼靶   | 0.4        |
| 三维腰椎QCT | 1.5        | 成人腹部CT | 8          |
| 三维髌部QCT | 2.5-3      | 牙片     | 0.005      |
| pQCT前臂  | <0.01      | 胸椎侧位片  | 0.3        |

Eur Radiol (2010) 20: 2707-2714  
DOI 10.1007/s00330-010-1845-0

MUSCULOSKELETAL

John Damilakis  
Judith E. Adams  
Giuseppe Guglielmi  
Thomas M. Link

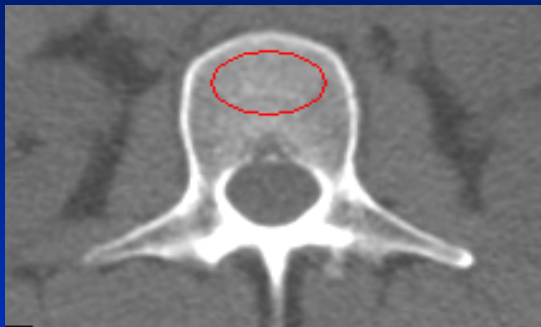
**Radiation exposure in X-ray-based imaging techniques used in osteoporosis**

积水潭医院



# QCT和DXA-测量不同

QCT: 仅松质骨

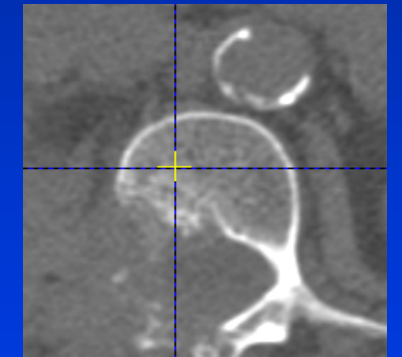
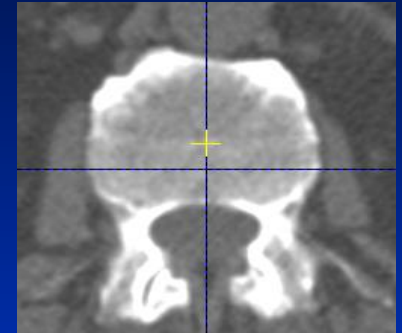


DXA: 皮质骨+松质骨



DXA测量脊柱受下列因素影响:

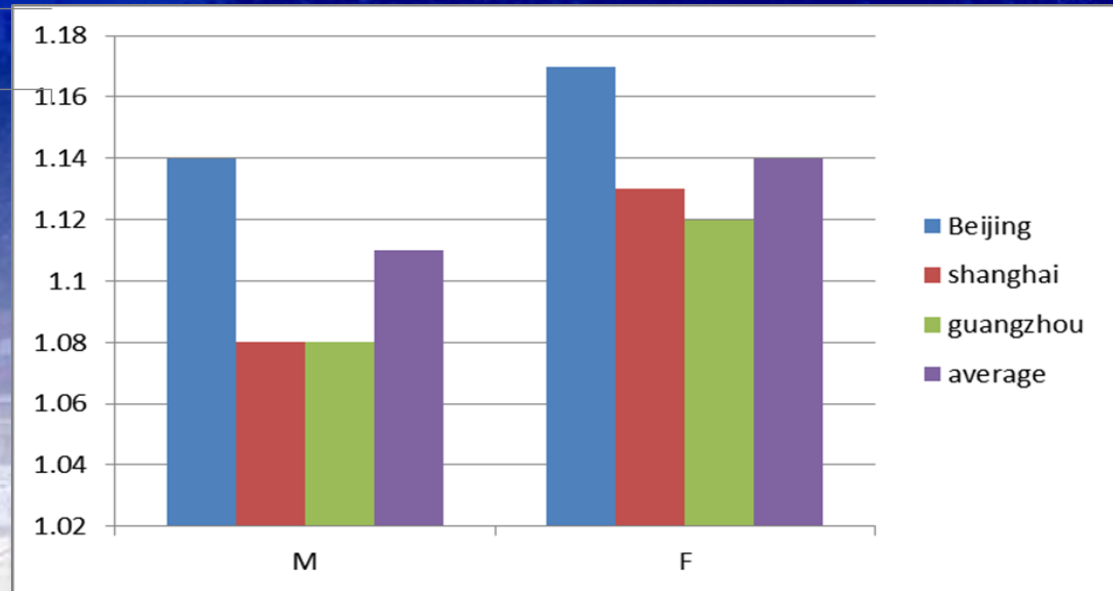
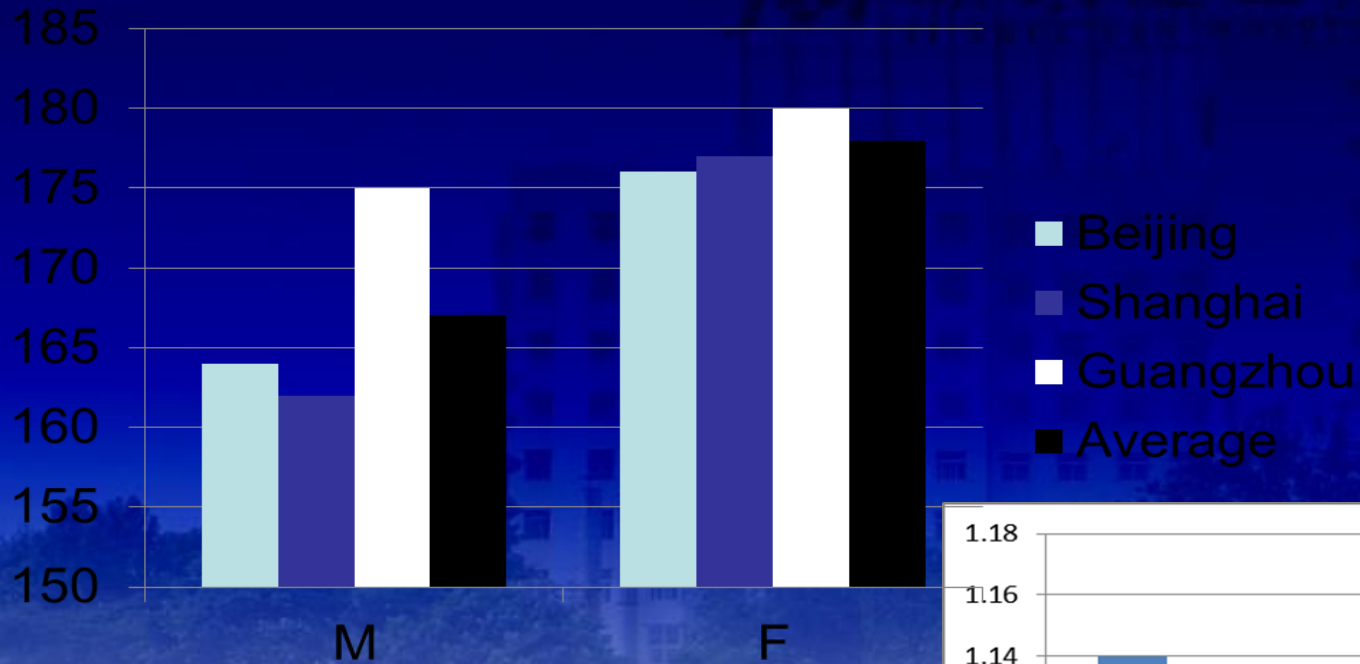
- Osteoarthritis
- Aortic calcifications
- Vertebral fractures or deformities
- Scoliosis
- Obesity





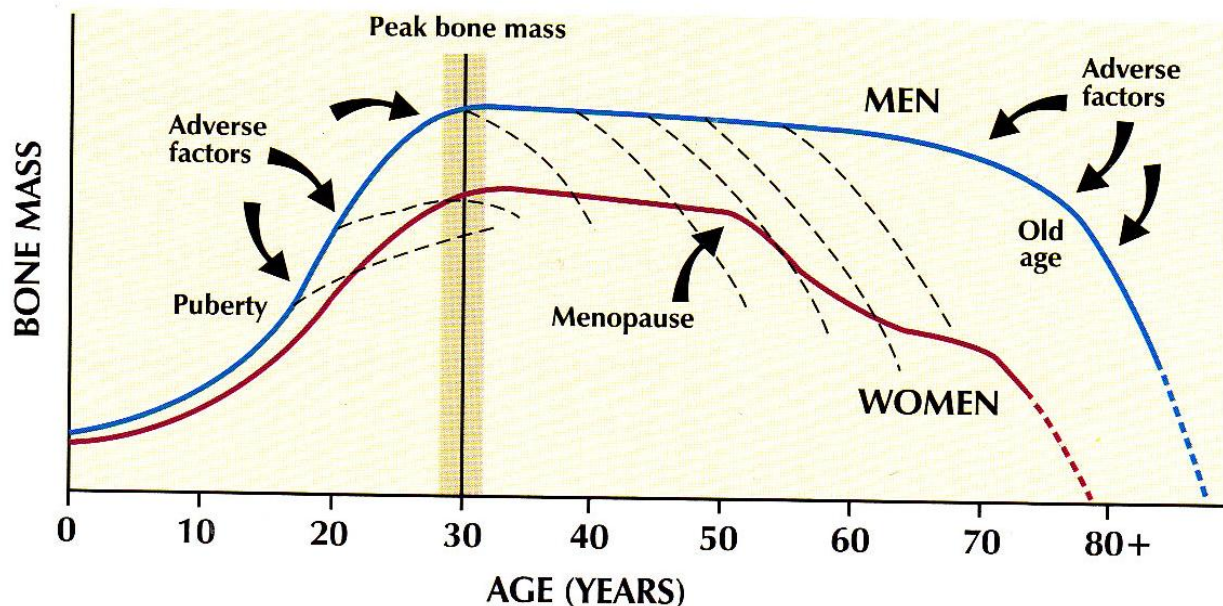
# Do people really differ in BMD?

## QCT vs DXA



# 骨量的自然演变是一个连续过程 不应该有“金标准”

## 需要有一个临界值把高危人群挑出来



The natural history of bone. After peaking by the age of about 30, the bone mass declines slowly at first, before accelerating at the menopause, in old age and under other adverse influences (represented by dotted lines). All such influences are cumulative, whether they diminish the peak bone mass in youth or cause bone loss later in life





# Diagnosis of osteoporosis

| QCT spine    | Diagnosis    | DXA                              |
|--------------|--------------|----------------------------------|
| > 120 mg/ml  | normal       | > -1.0 SD                        |
| 120–80 mg/ml | Osteopenia   | $1.0 > T\text{-value} > -2.5$ SD |
| < 80 mg/ml   | osteoporosis | < -2.5 SD                        |

- 2007 ISCD, ACR 2008 and 2013. hip as DXA
- Spine is enough





# T值

$$\frac{\text{病人的BMD} - \text{正常成人的平均BMD}}{\text{正常成人的标准差(SD)}}$$

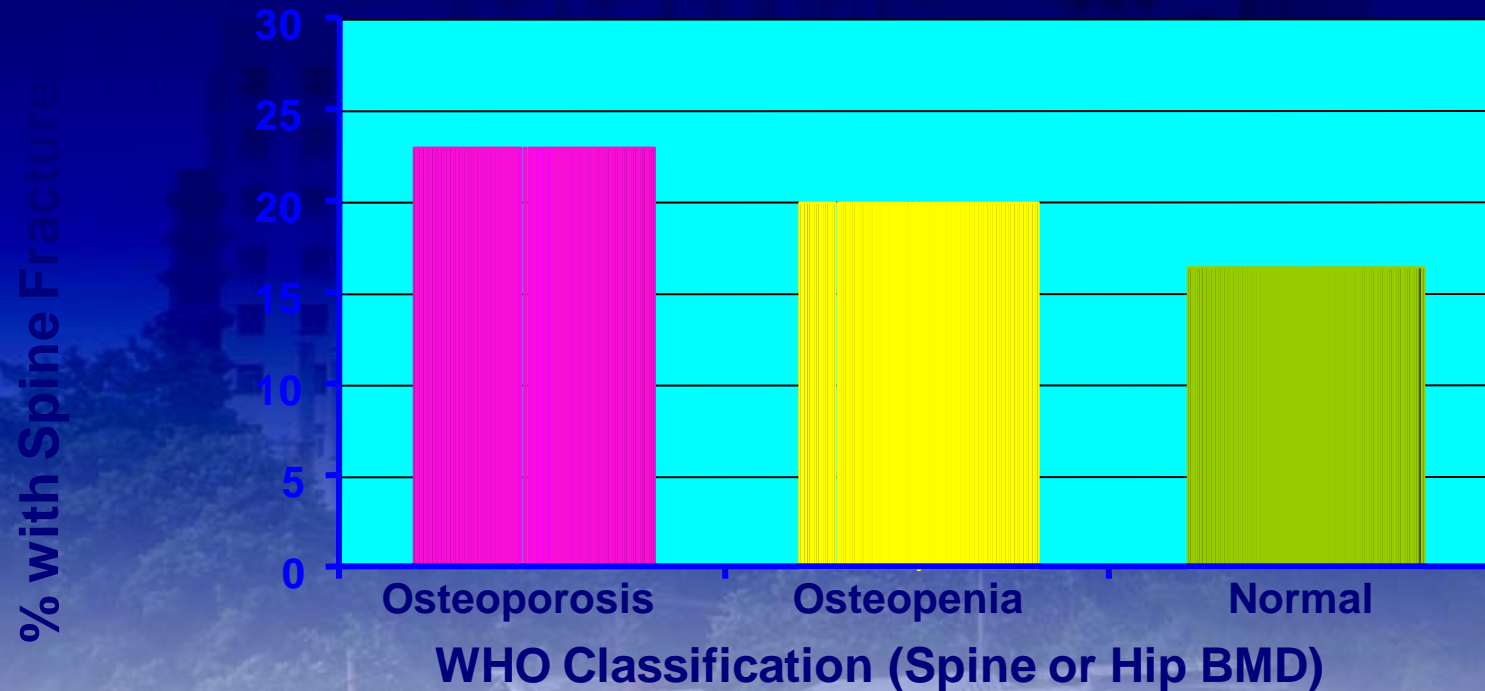
举例

$$T\text{值} = \frac{0.7 \text{ g/cm}^2 - 1.0 \text{ g/cm}^2}{0.1 \text{ g/cm}^2} = -3.0 \text{ (SD)}$$



# Classification by T-score alone misses patients with fractures

## Classification by BMD alone misses patients with fractures



- 50% of women with vertebral fracture are not osteoporotic by BMD
- 1/3 of women needing Rx are missed using BMD alone

Greenspan S et al, J Clin Densitom 2001;4:373-380



北京大学

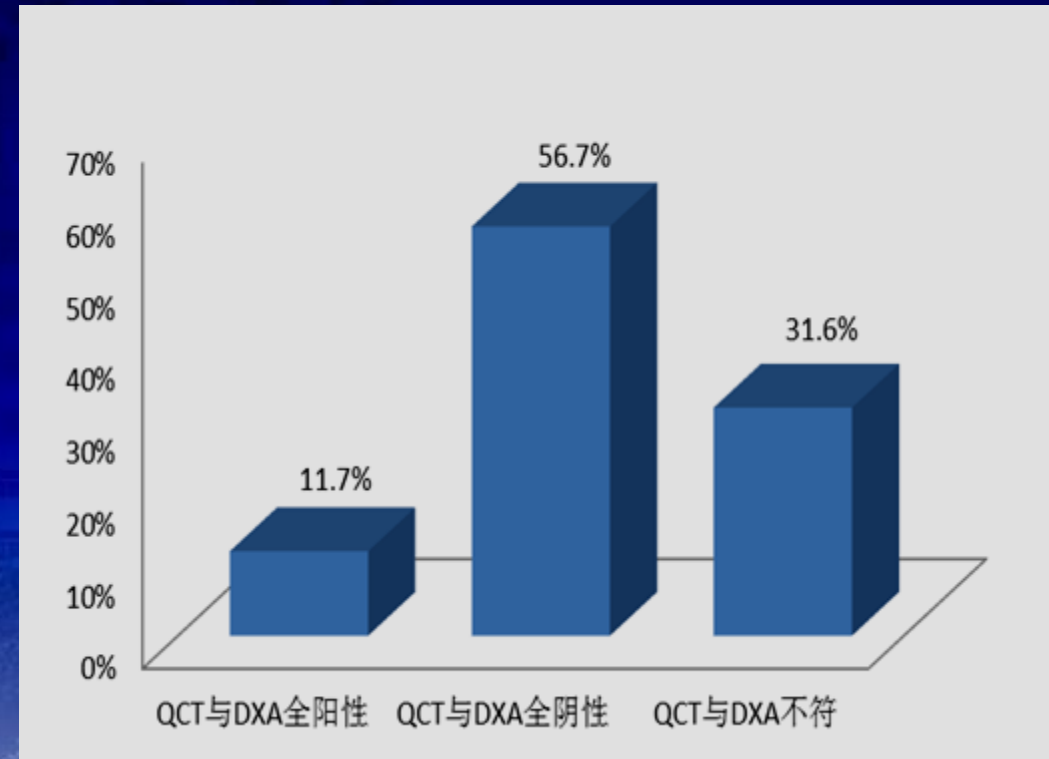
北京积水潭医院





# Comparison QCT vs DXA

- Elders people 367
  - Males 154
  - Female 213
- Age 47-92 year old (mean age  $69.9 \pm 11.0$ )
- Mindways QCT, GE Lunar iDXA same time



QCT is more sensitive in detecting osteoporosis, avoiding misdiagnosis

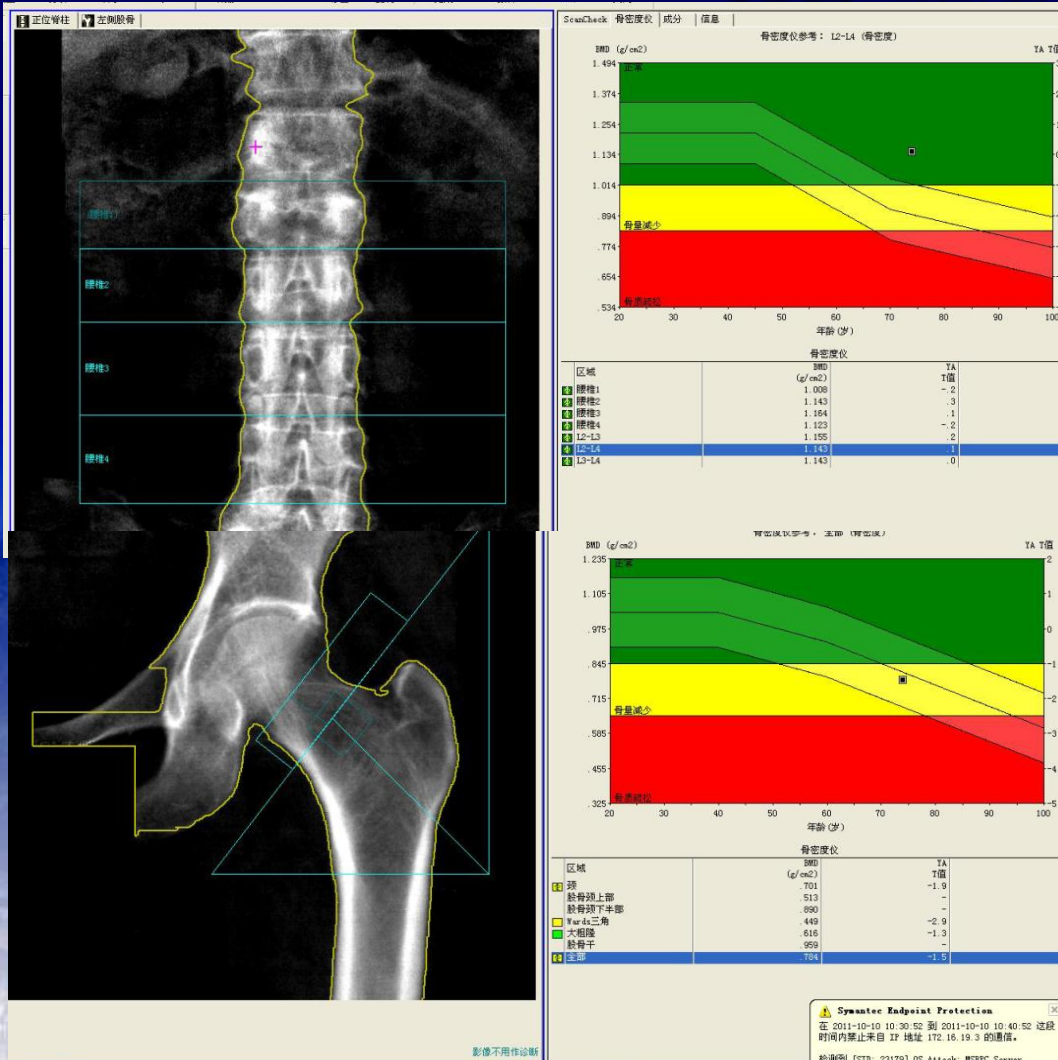


北京大学

北京积水潭医院



# 74 years old , female back pain



- DXA result
- L2-L4 1.143 g/cm<sup>2</sup>
- T 0.2
- Neck 0.701 g/cm<sup>2</sup>
- T -1.9
- Total 0.784 g/cm<sup>2</sup>
- T -1.5
- diagnosis: osteopenia



北京大学

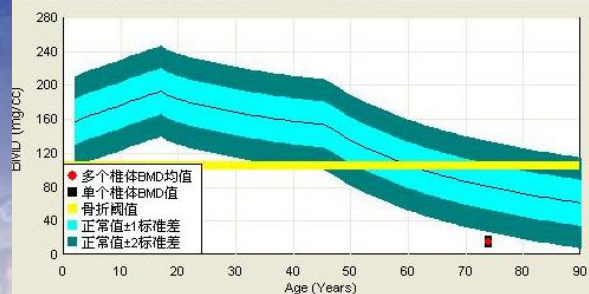
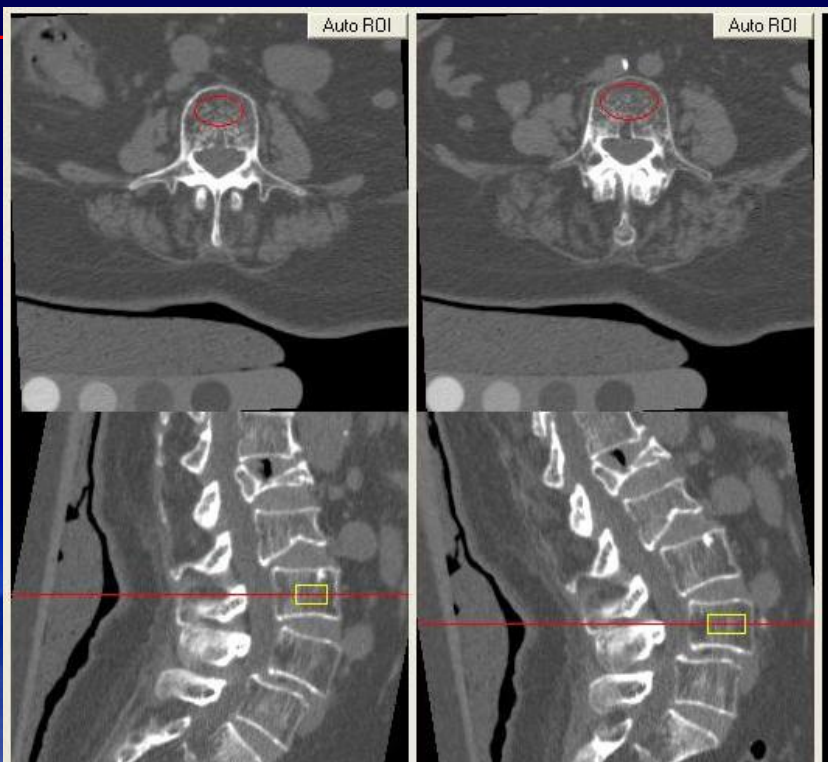
北京积水潭医院





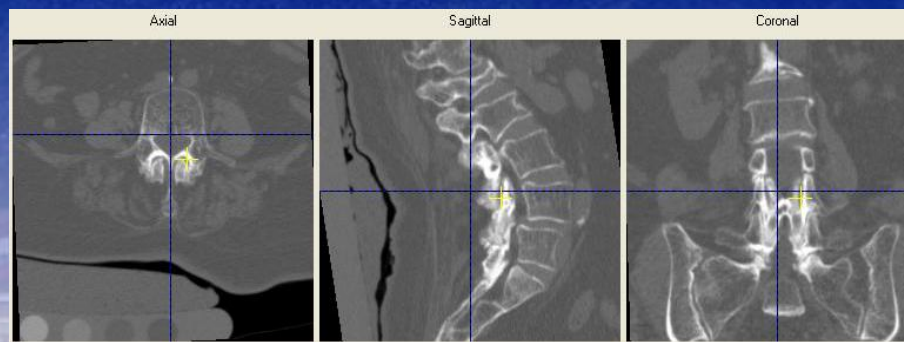
# QCT results

- L3 12.3 mg/cc
- L4 17.6 mg/cc
- Average 14.9 mg/cc
- T -5.9
- diagnosis: osteoporosis with fracture



患者BMD值与同龄人正常BMD值间的对比图  
参照值

| Exam Results |                          |
|--------------|--------------------------|
| T11:         | -                        |
| T12:         | -                        |
| L1:          | -                        |
| L2:          | -                        |
| L3:          | 12.30 mg/cm <sup>3</sup> |
| L4:          | 17.60 mg/cm <sup>3</sup> |
| Average:     | 14.95 mg/cm <sup>3</sup> |
| Z score:     | -2.51                    |
| T score:     | -5.90                    |



北京大学

北京积水潭医院





A



FL

NAME : Wei Wei  
Patient Sex: F  
ID : 02313454  
DATE : 2010-05-28



FL

Instance : Wei Wei  
Patient Sex: F  
ID : 02313454  
Study : 2010-05-28



FL

NAME : Wei Wei  
Patient Sex: F  
ID : 02313454  
DATE : 2010-05-28

Instance  
Slic  
Study Ti

**T<sub>QCT</sub> -4.8SD**  
**T<sub>DXA</sub> -1.4SD**

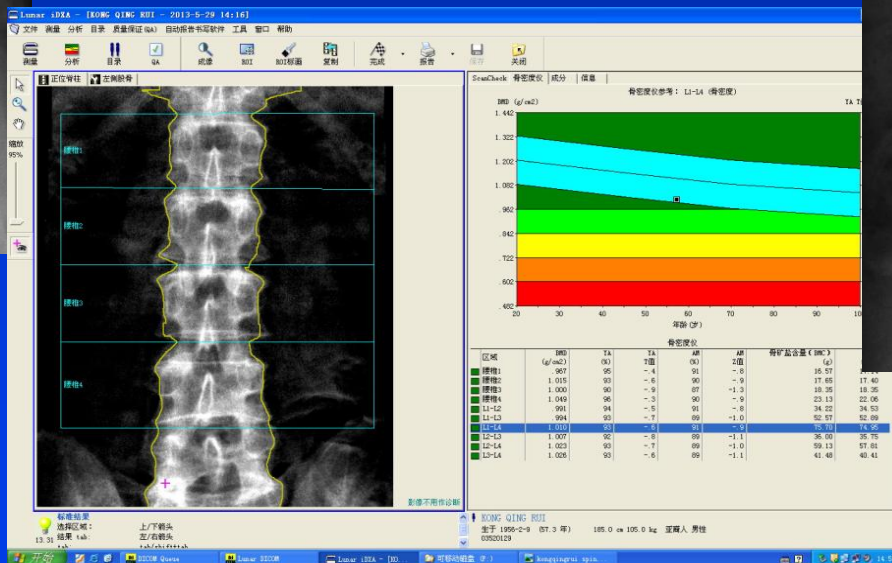
# 有无骨质疏松?螺钉固定是否需要骨水泥?



DXA骨密度, L1-4

1.01g/cm<sup>2</sup>, T值-0.6, 诊断骨密度正常

QCT 36mg/ml, 诊断骨质疏松 <50mg/ml加水泥



男性, 57岁, 腰痛,  
身高180厘米, 体重  
105公斤

北京大学

北京积水潭医院

# 有无骨质疏松?螺钉固定是否需要骨水泥?



男性, 59岁, 腰痛

QCT骨密度 120 mg/ml, 骨密度正常, 不加水泥

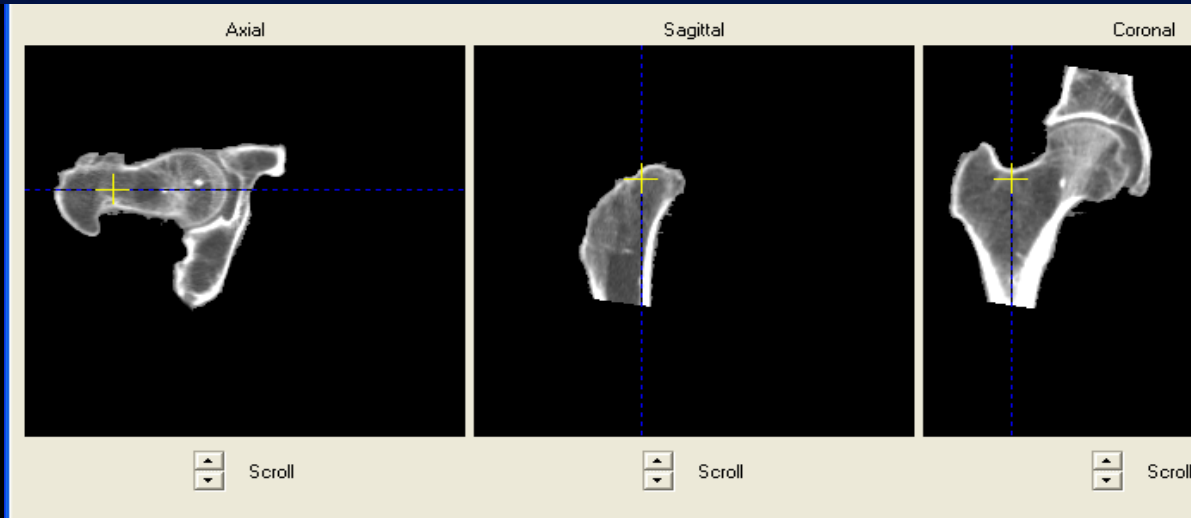
北京大学

北京积水潭医院





# 髋关节QCT (CTXA)



Patient Information | Extraction | Rotation | ROIs | Results | Report

CT Value Projection

Volume Projection

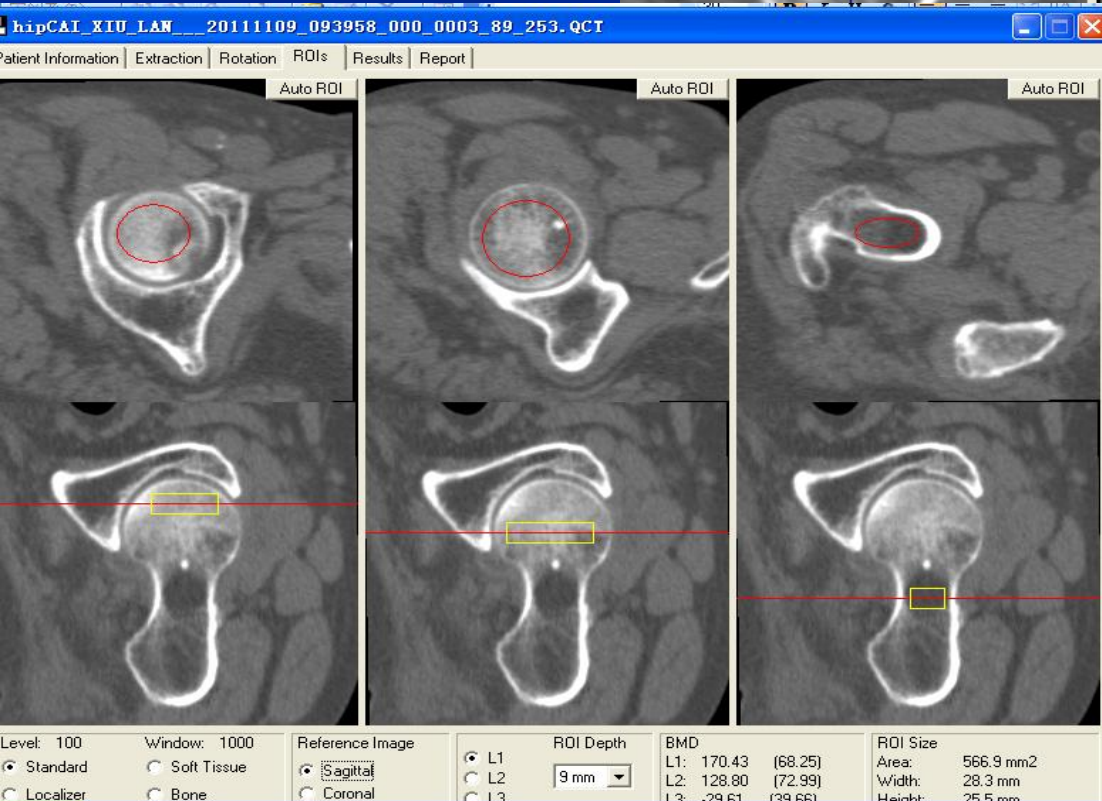
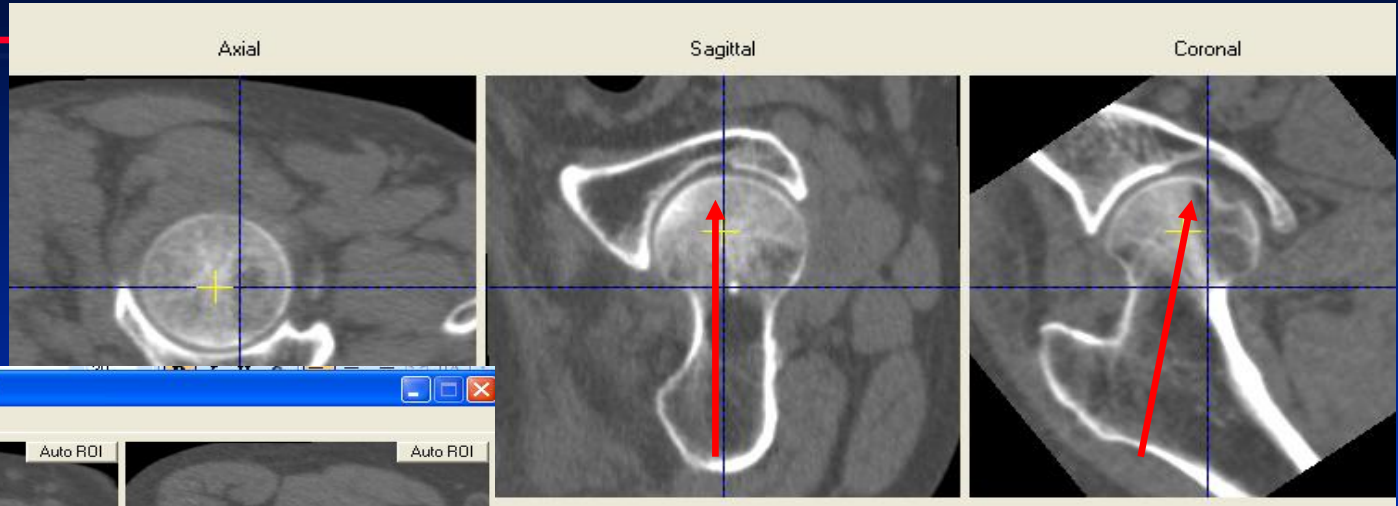
Surface Rendering

| ROI             | BMD (g/cm <sup>2</sup> ) | BMD (mg/cc) | Mass (g) | Area (cm <sup>2</sup> ) | Volume (cc) |
|-----------------|--------------------------|-------------|----------|-------------------------|-------------|
| Femoral Neck    | .415                     | 172.7       | 2.06     | 4.95                    | 11.9        |
| Trochanter      | .295                     | 95.6        | 3.32     | 11.23                   | 34.7        |
| Intertrochanter | .636                     | 219.0       | 12.19    | 19.18                   | 55.7        |
| Total           | .495                     | 171.7       | 17.63    | 35.60                   | 102.7       |

• 测得髋关节与DXA一样的骨密度，可以诊断骨质疏松



# 股骨颈骨折术前评估



## BMD

- 股骨头 170 mg/ml
- 股骨头下 129 mg/ml
- 股骨颈 -29 mg/ml

北京大学

北京积水潭医院

# 随访。女，63岁，严重骨质疏松，骨折8次

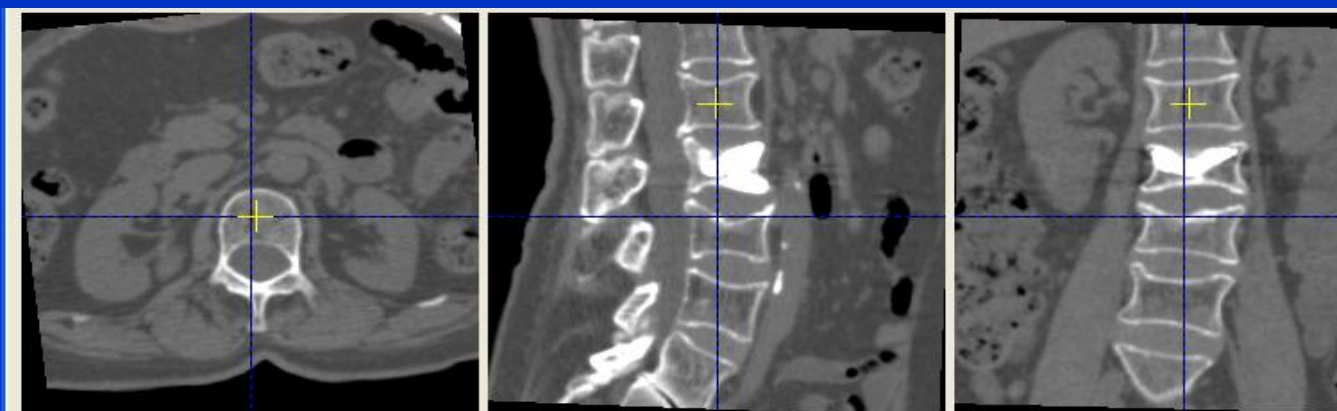
• 2011-7-11 QCT L1 34mg/ml



• 2012-9-6, 使用复泰奥5次

• 腰椎L1 BMD增加了16mg/ml,既增加了47%。

• 2013-8-29, QCT L1 50mg/ml



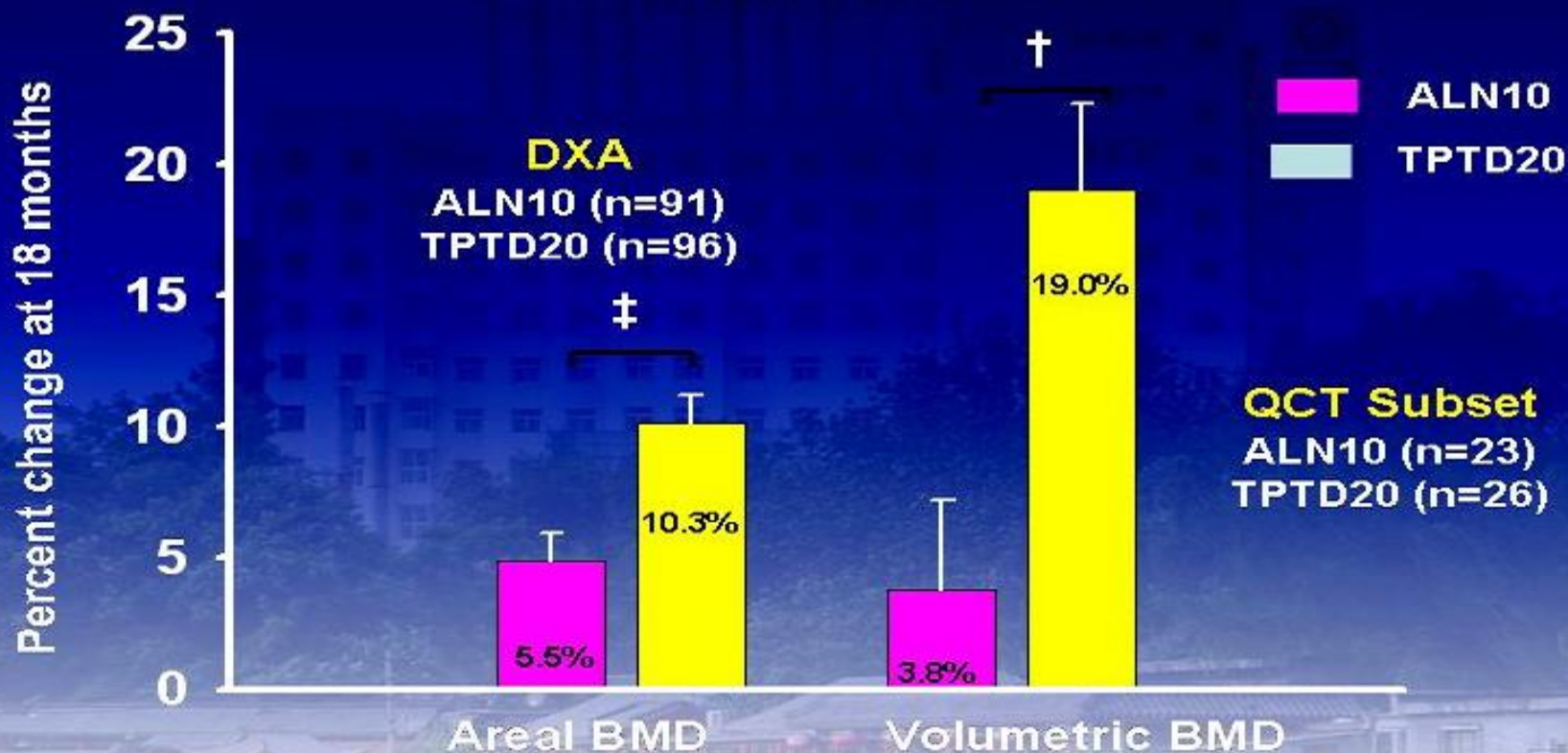
北京大学

北京积水潭医院





# QCT可以用于随访和监测-QCT更敏感



FACT Trial

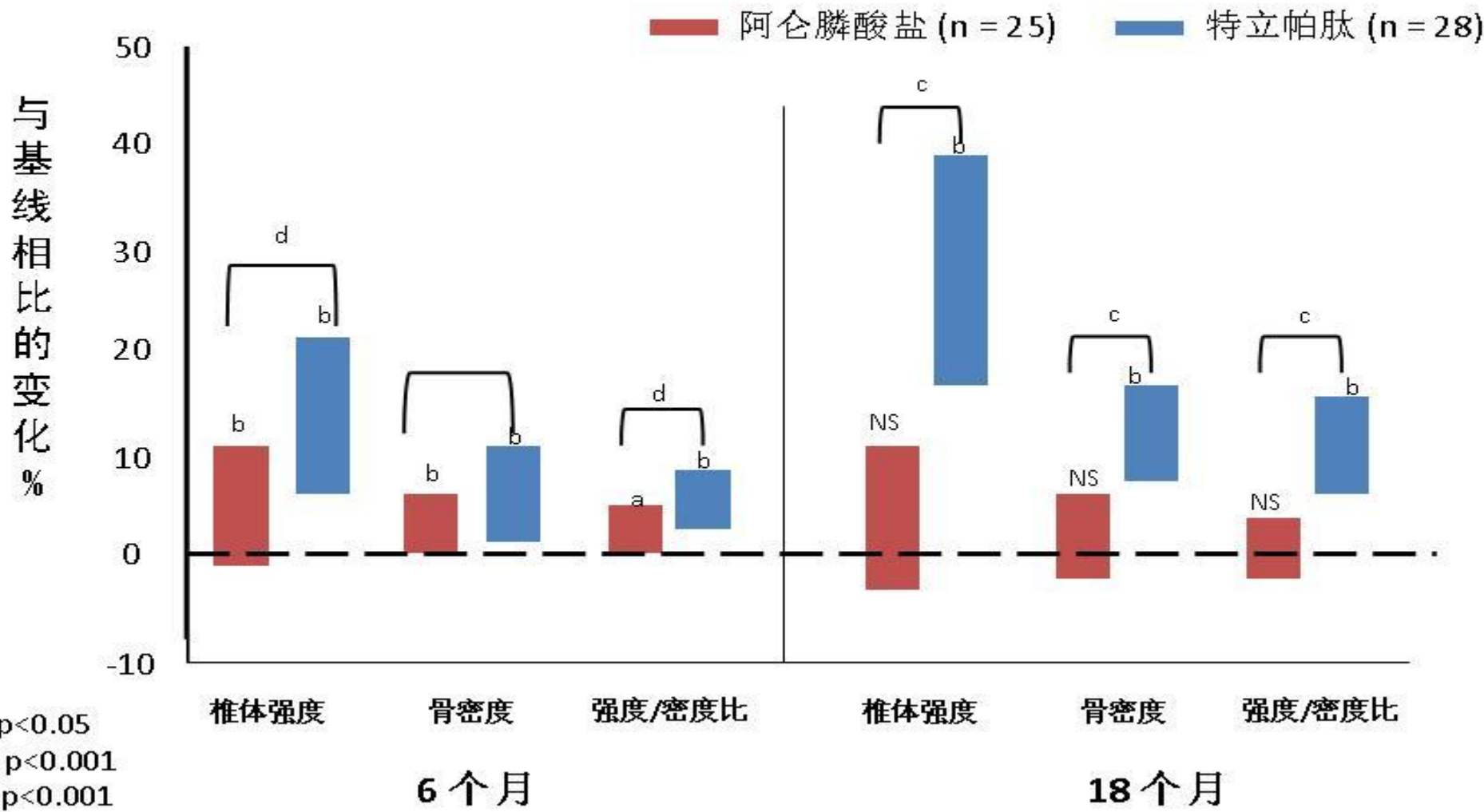
P<0.01 ALN10 vs TPTD20  
P<0.001 ALN10 vs TPTD20



北京大学

北京积水潭医院

# QCT有限元分析:治疗前后椎体强度的变化



# 充分利用现代网络技术 开展网络培训教育



- 中国医师协会放射医师分会网站：  
[www.chinaradiologists.org](http://www.chinaradiologists.org)
- 微信号：
- **放射学院**

放射医师分会LOGO 放射医师学院LOGO

北京大学

北京积水潭医院





# 五城市开幕式情景

可在此处访问会议控件

退出全屏视图



西安

您正在观看高质量视频。

开始我的视频

将我取消静音



西安



贵阳



昆明



兰州



银川

北京大学

北京积水潭医院

# 五城市讲课情景

您正在查看：兰州的桌面      正在查看 兰州的桌面

## 垂体病变诊断思路

Peking Union Medical College Hospital  
北京协和医院

- 临床症状、病史
- 相关实验室检查
  - 内分泌激素
  - 脑脊液： $\beta$ -HCG、AFP
- 影像学表现
- 随诊复查

需要具体分析每一个病例！

参加者

会放射医师学院——飞利浦西部放射医师继...

兰州

Linda wang (主持人, 我)

指定为主讲者

北京大学

北京积水潭医院



# 小结

- 有骨质疏松性骨折可以诊断骨质疏松，应该注意骨质疏松性骨折的综合影像检查和鉴别诊断
- 骨密度测量是诊断骨质疏松的标准之一，要注意DXA和QCT之间的区别。
- 使用DXA的-2.5SD标准时，要注意所使用DXA机器型号和参考数据库，以及可能出现的假阴性。
- QCT骨密度测量可以避免DXA的假阴性
- MR检查在骨质疏松骨折的诊断中有重要作用





欢迎到积水潭医院参观指导！  
程晓光

xiao65@263.net

13911047830



• 什刹海日落遥望积水潭医院

北京大学  
北京积水潭医院