BMD common mistakes
from request to interpretation

ALIREZA RAJAEI MD

ARRAJAEI@GMAIL.COM

RHEUMATOLOGY DEPARTMENT

LOGHMAN HOSPITAL


دکتر محمد شفیع زاده

Common BMD mistakes

I. Request
II. Positioning
III. Step 1: ID characters
IV. Step 2: Good scan criteria
V. Step 3: ROI(Region Of Interest) insertion
VI. Step 4: Area rules
VII. Step 5: Interpretation

Common mistakes in BMD
I. request

BMD request:

A) INDICATIONS MISTAKES

B) TECHNICAL MISTAKES

BMD request in indications mistakes

CORRECT INDICATIONS

Women aged ≥65 years

Postmenopausal women <65 years of age with risk factors for fracture

Women during the menopausal transition with clinical risk factors for fracture, such as low body weight, prior fracture or high-risk medication use

Men aged ≥70 years

Men <70 years old with clinical risk factors for fracture

Adults with a fragility fracture

Adults with a disease or condition associated with low bone mass or bone loss

Adults taking medications associated with low bone mass or bone loss

Anyone being considered for pharmacologic therapy

Anyone being treated, to monitor treatment effect

WRONG INDICATION

1. Skeletal pain in absence of other factors e.g. fractures or another clinical indication.

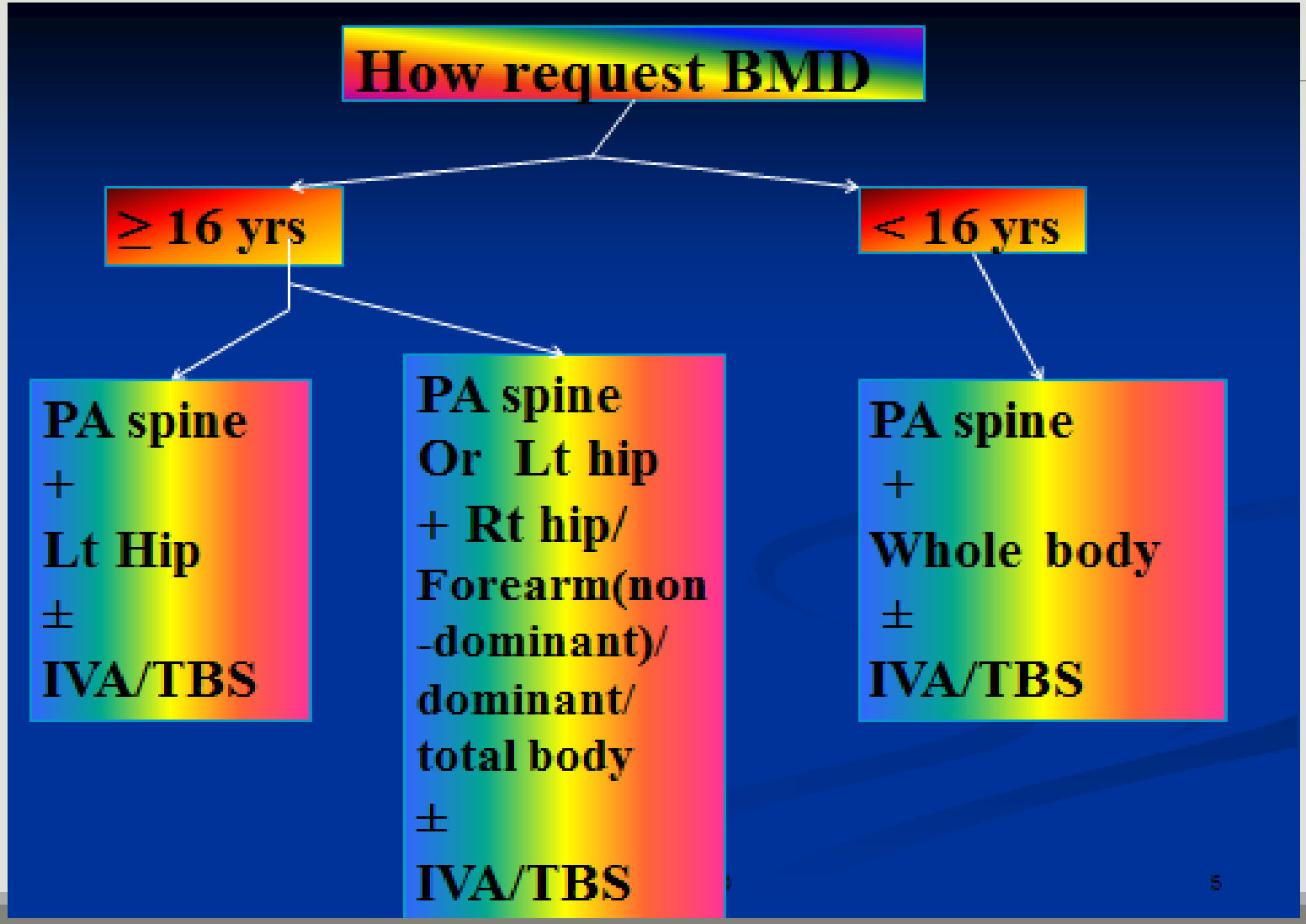
2. Chronic disease in absence of other risk factors.

3. Traumatic fractures in absence of another factor.

in women who are or might be pregnant

A patient whose weight exceeds the limit for the DXA table (typically about 130 kg for older instruments; 180–200 kg for others) should not be put on the table in case of damage to the table frame or injury to the patient.

BMD request: writing mistakes



How to do?(Positioning)

- Spine
- Hip
- Forearm
- Whole (Total)
- IVA (VFA)
- LDF
- Lateral
- Prosthetic

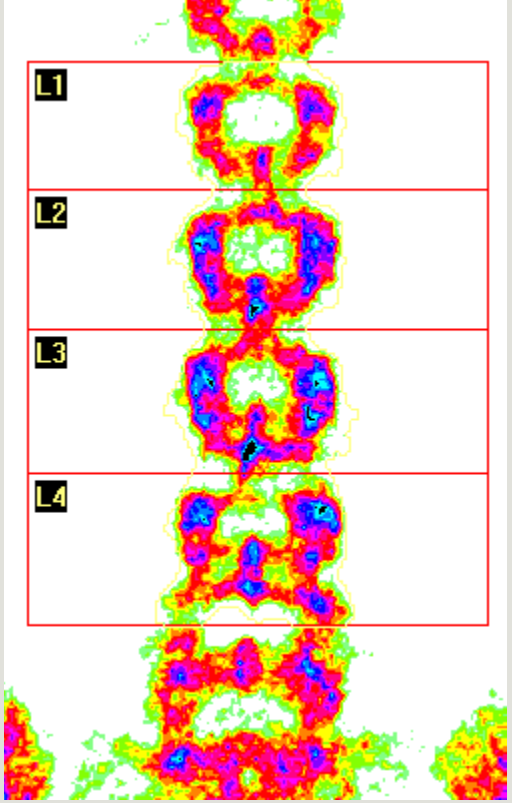
Spine

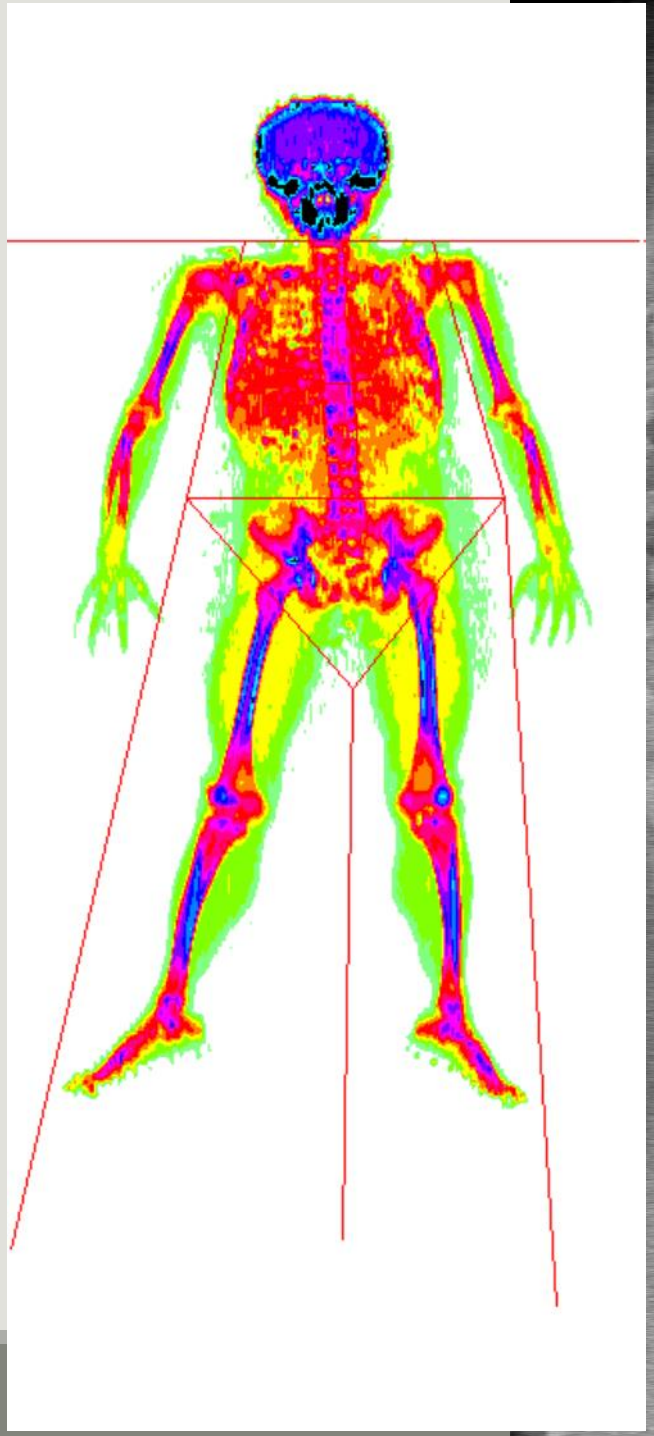
Hip

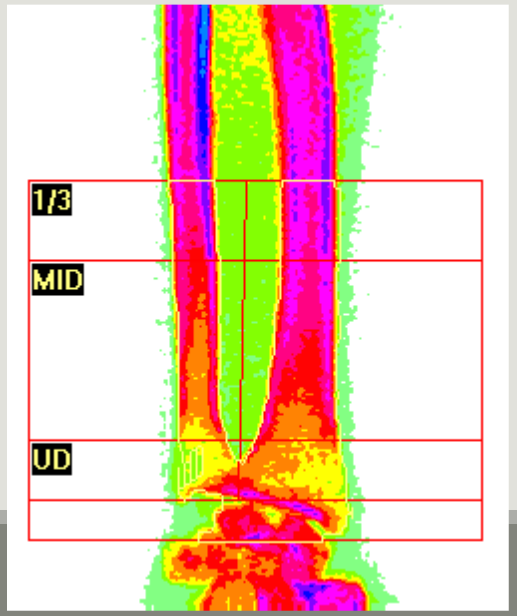
Forearm

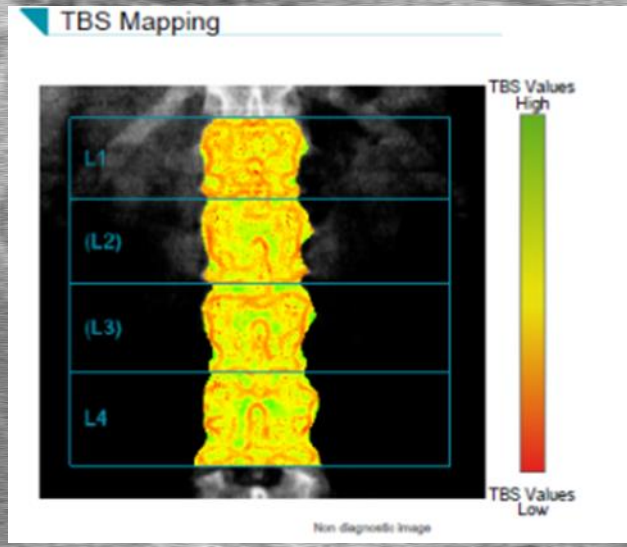
Whole (Total)

IVA/VFA


L1
L2
L3
L4




1/3
MID
UD


TBS Mapping
L1
(L2)
(L3)
L4
TBS Values High
TBS Values Low
Non diagnostic image

1- Personality or identification characters

Properly written of name, surname, gender, weight & height.

Selection of reference population: in countries such as Iran without exact reference population, based ISCD recommendation, for all regions except hip, first option is Caucasian, then White, but for hip first option is NANHANES III.

Name: Sakineh
Patient ID: 98.12.14
DOB: 16 February 1955

Sex: Female
Ethnicity: Caucasian

Height: 158.0 cm
Weight: 83.0 kg
Age: 65

Referring Physician: Dr.Rajaei

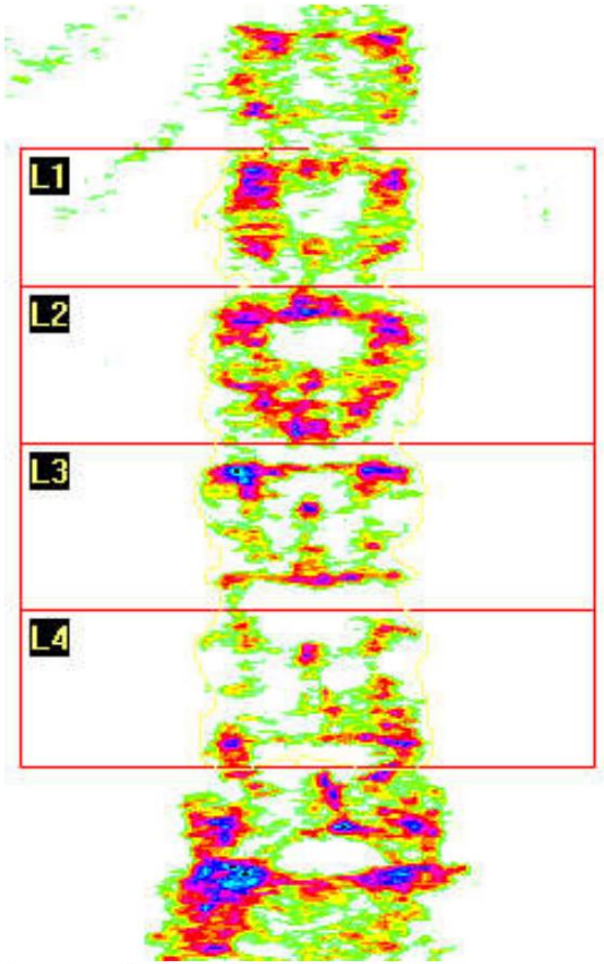


Image not for diagnostic use
116 x 131

Scan Information:

Scan Date: 20 February 2020 ID: A0220200F
Scan Type: f Lumbar Spine
Analysis: 20 February 2020 10:00 Version 13.6.0.2
Spine
Operator: NB
Model: Discovery W (S/N 83167)
Comment:

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	PR (%)	Z - score	AM (%)
L1	11.58	9.36	0.808	-1.7	82	-0.1	99
L2	14.44	12.12	0.840	-1.7	82	0.0	100
L3	14.72	10.79	0.733	-3.2	68	-1.4	83
L4	15.09	10.57	0.700	-3.3	66	-1.4	82
Total	**55.83**	**42.84**	**0.767**	**-2.5**	**73**	**-0.8**	**90**

Total BMD CV 1.0%
WHO Classification: Osteoporosis
Fracture Risk: High

PrintDate : 2013-11-18

Patient Information

PatientID.....586
Name.....shirin
BirthDate.....1941-01-01 (72.9)
Height.....159.0 cm

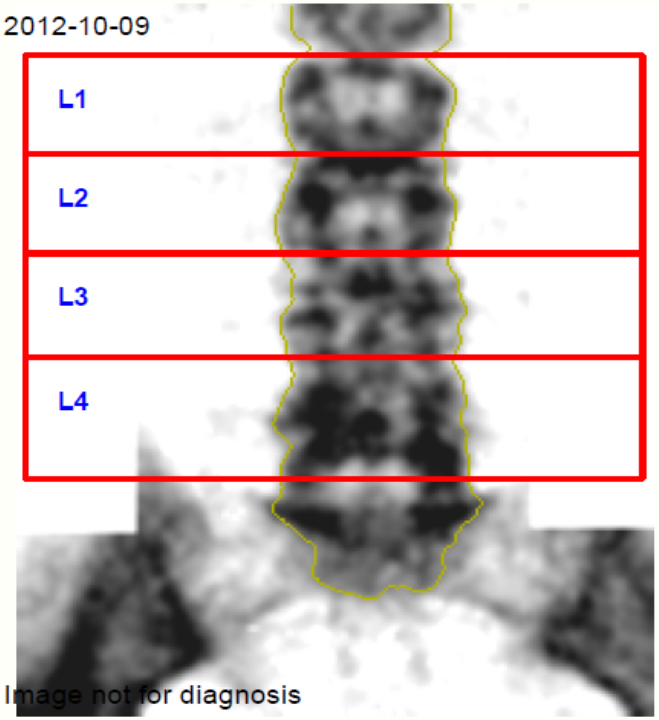
Doctor.....TestDoc
Ethnicity.....Asian
Gender.....Male
Weight.....62.0 Kg

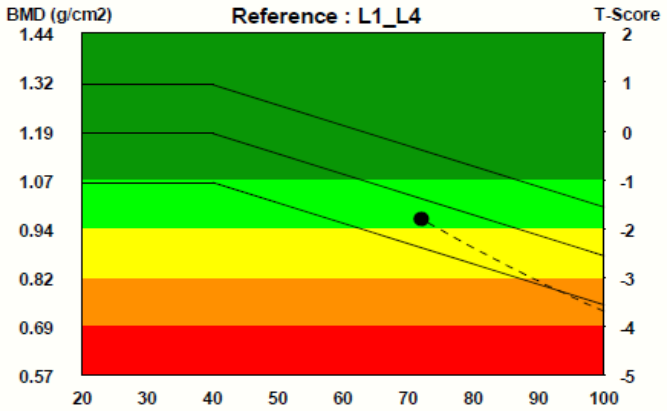
Q1

<Software Ver. 2.2/2.3 Spine Alg. : 3 >

Spine

2012-10-09





Region	BMD	T-Score	Z-Score	BMC(g)	Area(cm2)
L1	0.857	-2.1 (77%)	-0.8 (90%)	9.04	10.54
L2	0.998	-1.7 (83%)	-0.3 (96%)	10.94	10.97
L3	0.927	-2.3 (77%)	-0.8 (90%)	10.99	11.85
L4	1.048	-1.3 (87%)	0.2 (102%)	15.25	14.55
L1_L2	0.929	-1.8 (81%)	-0.5 (94%)	19.98	21.51
L1_L3	0.928	-1.9 (79%)	-0.6 (93%)	30.98	33.36
L1_L4	0.965	-1.8 (81%)	-0.5 (94%)	46.23	47.91
L2_L3	0.961	-1.9 (80%)	-0.6 (93%)	21.94	22.82
L2_L4	0.995	-1.7 (82%)	-0.4 (96%)	37.19	37.37
L3_L4	0.994	-1.7 (82%)	-0.4 (96%)	26.24	26.40

PrintDate : 2013-11-18

Patient Information

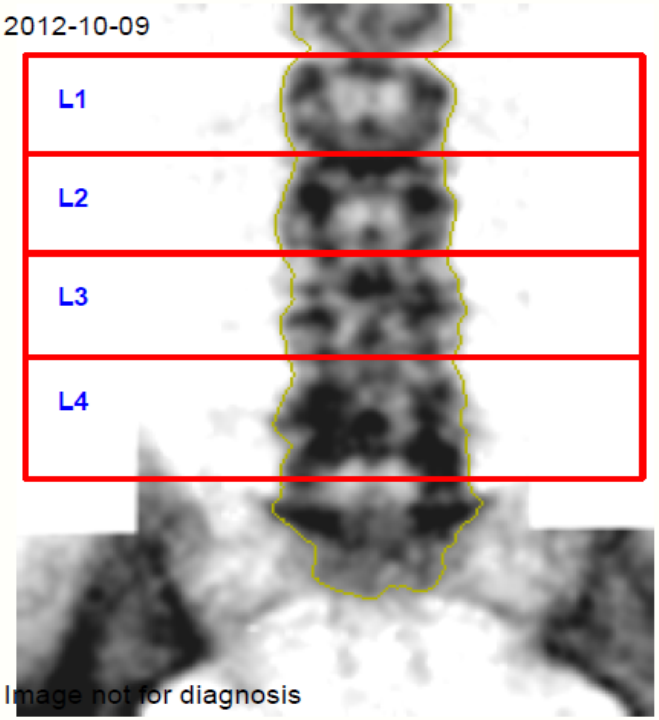
PatientID.....586
Name.....shirin
BirthDate.....1941-01-01 (72.9)
Height.....159.0 cm

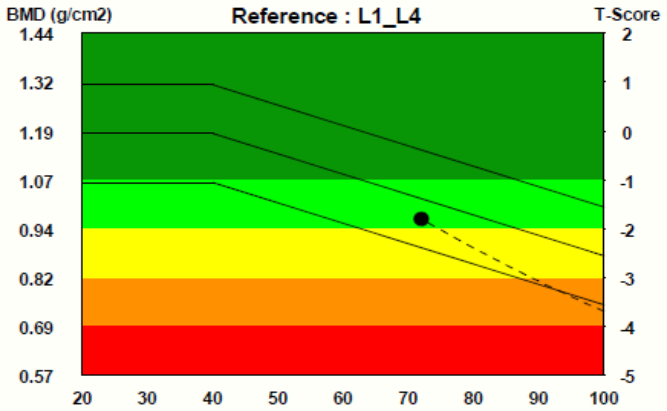
Doctor.....TestDoc
Ethnicity.....Asian
Gender.....Male
Weight.....62.0 Kg

<Software Ver. 2.2/2.3 Spine Alg. : 3 >

Spine

2012-10-09





Region	BMD	T-Score	Z-Score	BMC(g)	Area(cm2)
L1	0.857	-2.1 (77%)	-0.8 (90%)	9.04	10.54
L2	0.998	-1.7 (83%)	-0.3 (96%)	10.94	10.97
L3	0.927	-2.3 (77%)	-0.8 (90%)	10.99	11.85
L4	1.048	-1.3 (87%)	0.2 (102%)	15.25	14.55
L1_L2	0.929	-1.8 (81%)	-0.5 (94%)	19.98	21.51
L1_L3	0.928	-1.9 (79%)	-0.6 (93%)	30.98	33.36
L1_L4	0.965	-1.8 (81%)	-0.5 (94%)	46.23	47.91
L2_L3	0.961	-1.9 (80%)	-0.6 (93%)	21.94	22.82
L2_L4	0.995	-1.7 (82%)	-0.4 (96%)	37.19	37.37
L3_L4	0.994	-1.7 (82%)	-0.4 (96%)	26.24	26.40

Name: [redacted]	Sex: Female	Height: 161.0 cm
Patient ID: 95.04.04	Ethnicity: Caucasian	Weight: 66.0 kg
DOB: 16 February 1965		Age: 51

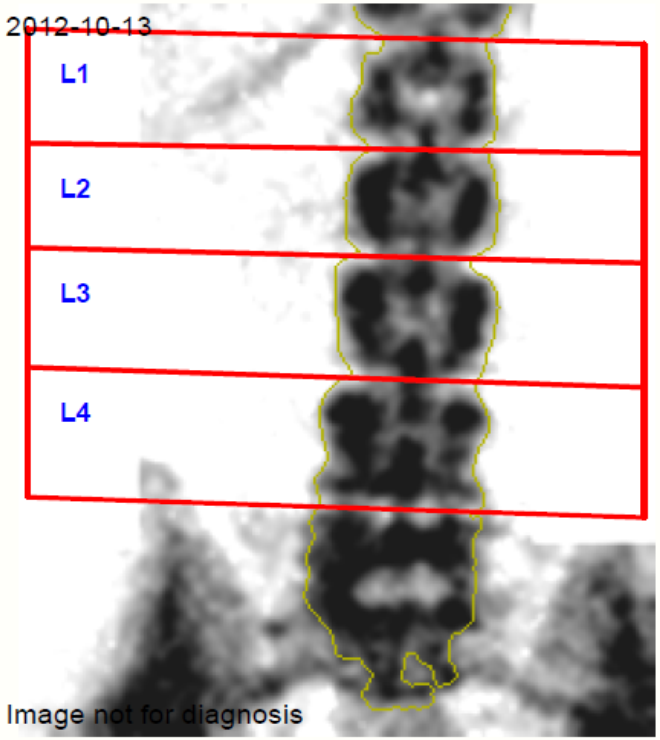
Name: [redacted]	Sex: Female	Height: 162.0 cm
Patient ID: 94.01.115	Ethnicity: White	Weight: 60.0 kg
DOB: 14 January 1961		Age: 54

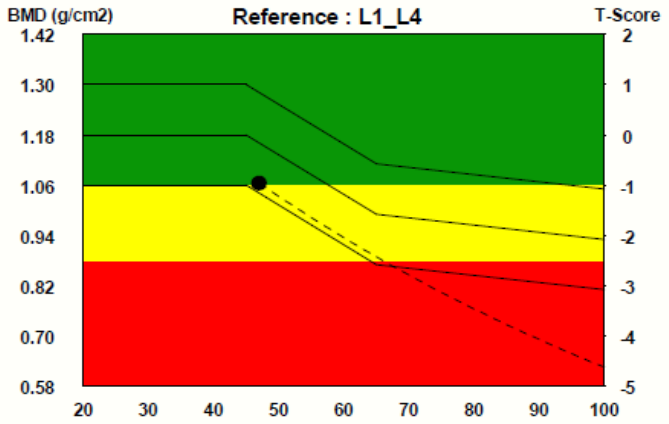
Patient Information

PatientID.....596
Name.....
BirthDate.....1966-01-01 (47.9)
Height.....154.0 cm
Menopause.....Yes

Doctor.....TestDoc
Ethnicity.....White
Gender.....Female
Weight.....82.0 Kg
<Software Ver. 2.2/2.3 Spine Alg. : 3 >

Spine





Region	BMD	T-Score	Z-Score	BMC(g)	Area(cm2)
L1	0.860	-2.2 (76%)	-2.2 (77%)	8.11	9.42
L2	1.028	-1.4 (86%)	-1.4 (86%)	10.30	10.02
L3	1.236	0.3 (103%)	0.4 (104%)	14.71	11.90
L4	1.084	-1.0 (90%)	-0.9 (91%)	14.45	13.33
L1_L2	0.947	-1.8 (81%)	-1.7 (82%)	18.41	19.44
L1_L3	1.056	-0.9 (90%)	-0.9 (91%)	33.11	31.35
L1_L4	1.065	-1.0 (90%)	-0.9 (91%)	47.56	44.68
L2_L3	1.141	-0.5 (95%)	-0.4 (96%)	25.01	21.92
L2_L4	1.119	-0.7 (93%)	-0.6 (94%)	39.46	35.26
L3_L4	1.155	-0.4 (96%)	-0.3 (97%)	29.15	25.24

PrintDate : 2013-11-18

Patient Information

Q2

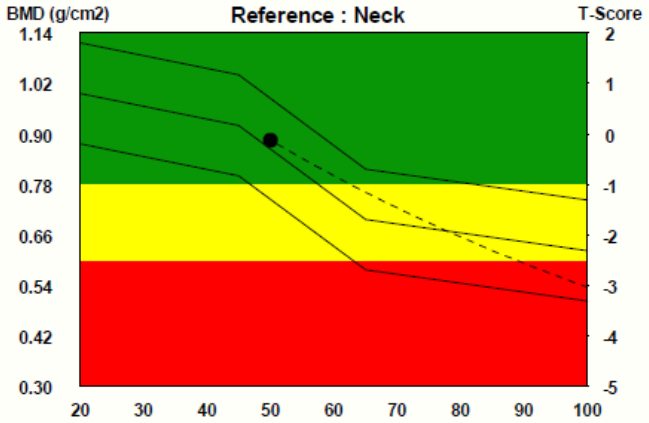
PatientID.....590
Name..... Helen
BirthDate.....1963-01-01 (50.9)
Height.....166.0 cm
Menopause.....Yes

Doctor.....TestDoc
Ethnicity.....Asian
Gender.....Female
Weight.....70.0 Kg
<Software Ver. 2.2/2.3 Left Femur Alg. : 2 >

Left Femur

2012-10-10

Image not for diagnosis



Region	BMD	T-Score	Z-Score	BMC(g)	Area(cm2)
Neck	0.885	-0.1 (98%)	0.1 (101%)	4.76	5.38
Wards	0.695	-1.4 (79%)	-1.0 (85%)	0.75	1.08
Troch	0.733	-0.2 (98%)	-0.5 (93%)	10.23	13.96
Shaft	0.926	-	-	-	-
Total	0.837	-0.8 (90%)	-0.8 (89%)	16.18	19.34

PrintDate : 2013-11-18

Patient Information

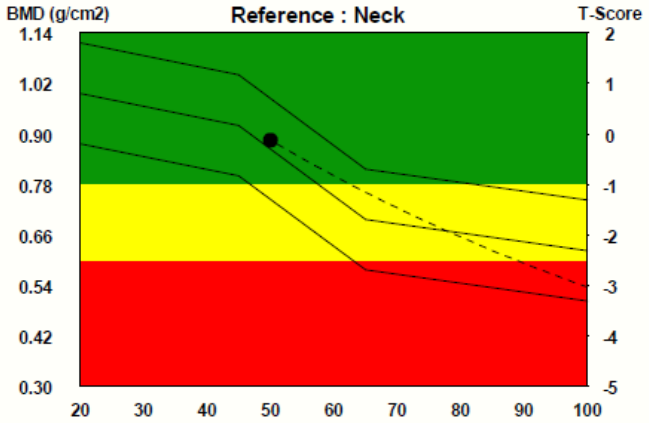
PatientID.....590
Name..... Helen
BirthDate.....1963-01-01 (50.9)
Height.....166.0 cm
Menopause.....Yes

Doctor..... TestDoc
Ethnicity.....Asian
Gender.....Female
Weight.....70.0 Kg
<Software Ver. 2.2/2.3 Left Femur Alg. : 2 >

Left Femur

2012-10-10

Image not for diagnosis



Region	BMD	T-Score	Z-Score	BMC(g)	Area(cm2)
Neck	0.885	-0.1 (98%)	0.1 (101%)	4.76	5.38
Wards	0.695	-1.4 (79%)	-1.0 (85%)	0.75	1.08
Troch	0.733	-0.2 (98%)	-0.5 (93%)	10.23	13.96
Shaft	0.926	-	-	-	-
Total	0.837	-0.8 (90%)	-0.8 (89%)	16.18	19.34

Manufacturers are advised to use National Health and Nutrition Examination Survey III young-adult Caucasian female BMD data as the reference standard for femoral neck and total proximal femur T-score calculation and to continue to use their own reference databases for lumbar spine T-score calculation . However, country-specific guidelines related to the use of T-scores may differ from international guidelines As an example, in Japan, T-scores are not used for diagnostic classification ; therefore, statements regarding T-scores for diagnosis are not applicable in Japan. If local reference data are available, they should be used to calculate Z-scores but not T-scores.

Key question #7

Which term is preferred, "Caucasian" or "White" when categorizing race?

ISCD official position

When reporting or referring to race, "White" is preferred to "Caucasian".

GRADE: Fair – C – W

Rationale

Emerging literature is supporting harmonizing nomenclature for race classification as White, in preference to Caucasian. JAMA has endorsed this approach as it was adopted by the AMA Manual of Style, stating "language and terminology must be accurate, clear, and precise, and must reflect fairness, equity, and consistency in use and reporting of race and ethnicity" . Specifically,

Caucasian refers to people from the Caucasus region in Eurasia and therefore does not appropriately describe the broad categorization encompassed by the term White Additionally, there are cultural associations with this specific group that some might find sensitive . A preference for the term White is also demonstrated by government agencies including the National Institutes of Health (NIH) and Census Bureau Consistent with these and other reports, the American Society for Bone and Mineral Research (ASBMR) has advocated a shift to using White and recommends race classification within FRAX® also become compliant with this recommendation .

Name: [redacted], Sakineh
Patient ID: 98.12.14
DOB: 16 February 1955

Sex: Female
Ethnicity: Caucasian

Height: 158.0 cm
Weight: 83.0 kg
Age: 65

Referring Physician: Dr.Rajaei

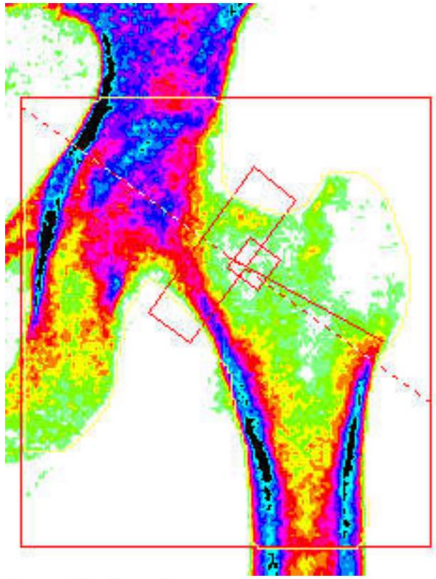


Image not for diagnostic use
110 x 121
NECK: 49 x 15
HAL: 101 mm

Scan Information:

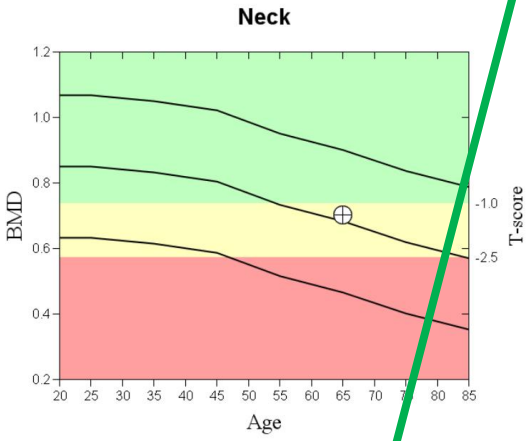
Scan Date: 20 February 2020 ID: A0220200E
Scan Type: x Left Hip
Analysis: 20 February 2020 09:59 Version 13.6.0.2
Hip
Operator: NB
Model: Discovery W (S/N 83167)
Comment:

DXA Results Summary:

Region	Area (cm^2)	BMC (g)	BMD (g/cm^2)	T-score	PR (%)	Z-score	AM (%)
Neck	**5.02**	**3.53**	**0.702**	**-1.3**	**83**	**0.2**	**103**
Troch	13.51	6.16	0.456	-2.4	65	-1.4	77
Inter	23.78	27.10	1.139	0.3	104	1.2	120
Total	42.32	36.78	0.869	-0.6	92	0.6	110
Ward's	1.17	0.42	0.361	-3.2	49	-0.9	77

Total BMD CV 1.0%
WHO Classification: Osteopenia

FRAX® WHO Fracture Risk Assessment Tool



10-year Fracture Risk[1]

Major Osteoporotic Fracture **8.0%**
Hip Fracture **0.7%**
Reported Risk Factors:
US (Caucasian), Neck BMD=0.702, BMI=33.2

[1] FRAX® Version 3.08. Fracture probability calculated for an untreated patient. Fracture probability may be lower if the patient has received treatment.

Comment:

All treatment decisions require clinical judgment and consideration of individual patient factors, including patient preferences, comorbidities, previous drug use and risk factors not captured in the FRAX model (e.g. frailty, falls, vitamin D deficiency, increased bone turnover, interval significant decline in BMD).

T-score vs. White Female. Source:2012 BMDCS/NHANES White Female. Z-score vs. White Female. Source:2012 BMDCS/NHANES White Female.

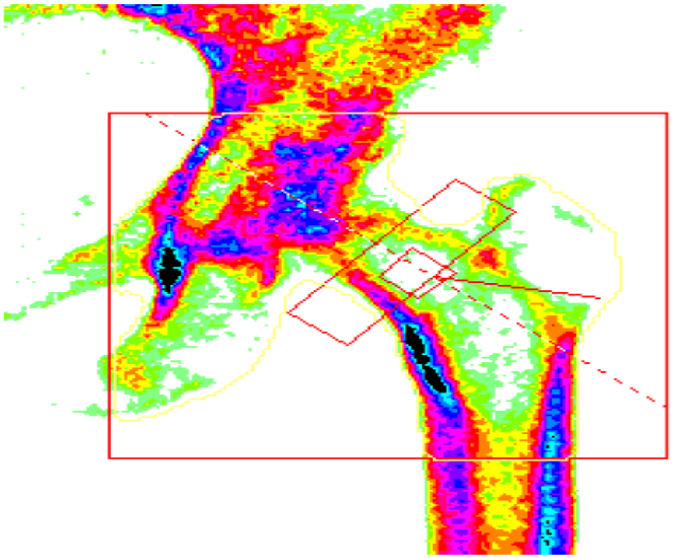
Common mis
analysis/inter

Name: [redacted], Fatemeh
Patient ID: 94.02.349
DOB: 16 February 1946

Sex: Female
Ethnicity: White

Height: 149.0 cm
Weight: 65.0 kg
Age: 69

Referring Physician: Dr.Rajaei



104 x 97
NECK: 49 x 15
DAP: 1.2 cGy*cm²

Scan Information:

Scan Date: 09 May 2015 ID: A0509151T
Scan Type: x Left Hip
Analysis: 09 May 2015 17:48 Version 13.3
Hip
Operator:
Model: Discovery W (S/N 83167)
Comment:

Q3

DXA Results Summary:

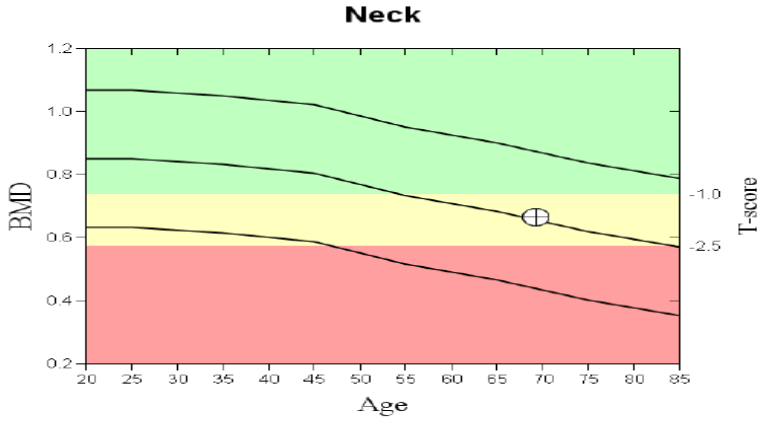
Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	PR (%)	Z - score	AM (%)
Neck	**4.97**	**3.30**	**0.664**	**-1.7**	**78**	**0.1**	**101**
Troch	7.13	4.14	0.581	-1.2	83	0.1	101
Inter	16.52	16.17	0.979	-0.8	89	0.4	107
Total	28.62	23.61	0.825	-1.0	88	0.5	108
Ward's	1.20	0.53	0.441	-2.5	60	0.0	100

Total BMD CV 1.0%
WHO Classification: Osteopenia

10-year Fracture Risk[1]

Major Osteoporotic Fracture **5.8%**
Hip Fracture **1.1%**
Reported Risk Factors:
Turkey, T-score(WHO)=-1.6, BMI=29.3

[1] FRAX® Version 3.05. Fracture probability calculated for an untreated patient. Fracture probability may be lower if the patient has received treatment.



Comment:

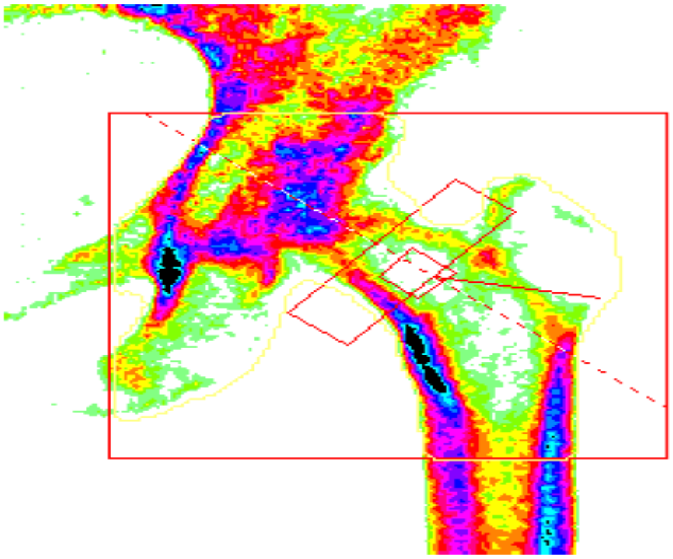
T-score vs. White Female; Z-score vs. White Female. Source:BMDCS/NHANES

Name: [redacted], Fatemeh
Patient ID: 94.02.349
DOB: 16 February 1946

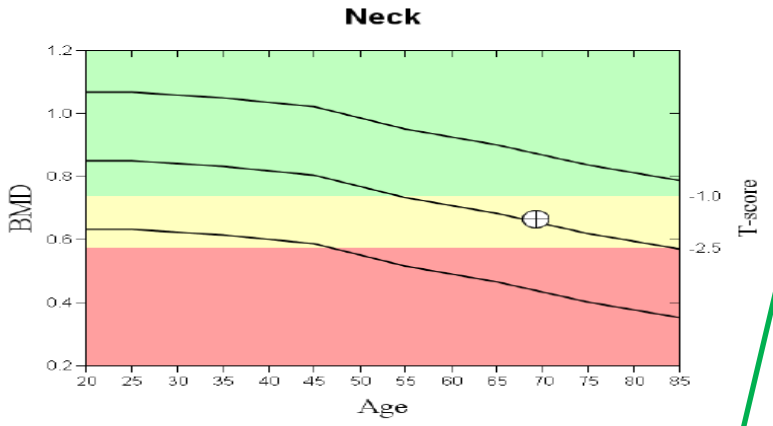
Sex: Female
Ethnicity: White

Height: 149.0 cm
Weight: 65.0 kg
Age: 69

Referring Physician: Dr.Rajaei



104 x 97
NECK: 49 x 15
DAP: 1.2 cGy*cm²



Scan Information:

Scan Date: 09 May 2015 ID: A0509151T
Scan Type: x Left Hip
Analysis: 09 May 2015 17:48 Version 13.3
Hip
Operator:
Model: Discovery W (S/N 83167)
Comment:

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	PR (%)	Z - score	AM (%)
Neck	**4.97**	**3.30**	**0.664**	**-1.7**	**78**	**0.1**	**101**
Troch	7.13	4.14	0.581	-1.2	83	0.1	101
Inter	16.52	16.17	0.979	-0.8	89	0.4	107
Total	28.62	23.61	0.825	-1.0	88	0.5	108
Ward's	1.20	0.53	0.441	-2.5	60	0.0	100

Total BMD CV 1.0%
WHO Classification: Osteopenia

FRAX® WHO Fracture Risk Assessment Tool

10-year Fracture Risk[1]

Major Osteoporotic Fracture **5.8%**
Hip Fracture **1.1%**
Reported Risk Factors:
Turkey, T-score(WHO)=-1.6, BMI=29.3

[1] FRAX® Version 3.05. Fracture probability calculated for an untreated patient. Fracture probability may be lower if the patient has received treatment.

Comment:

T-score vs. White Female; Z-score vs. White Female. Source:BMDCS/NHANES

Calculation Tool

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

Country: Iran Name/ID: [redacted] Fatemeh About the risk factors

Questionnaire:

1. Age (between 40 and 90 years) or Date of Birth
   Age: 69 Date of Birth: Y: M: D:
2. Sex — Male / Female
3. Weight (kg): 65
4. Height (cm): 149
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/cm^2)

Hologic | 0.664 | T-score: -1.6

Clear | Calculate

BMI: 29.3

The ten year probability of fracture (%)

with BMD

Major osteoporotic	5.6
Hip Fracture	1.6

If you have a TBS value, click here: Adjust with TBS

Name: [redacted], Tahereh
Patient ID: 0033343640
DOB: 14 May 1961

Sex: Female
Ethnicity: Caucasian

Height: 159.0 cm
Weight: 66.0 kg
Age: 60

Referring Physician: Dr.Rajaei

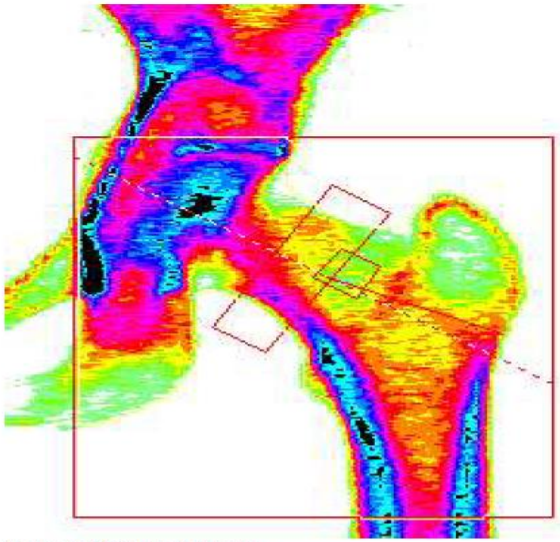


Image not for diagnostic use
101 x 108
NECK: 48 x 15
HAL: 101 mm

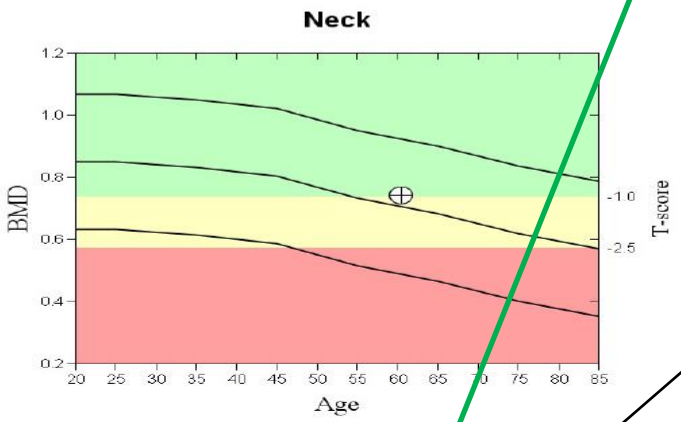
Scan Information:

Scan Date: 19 October 2021 ID: A10192105
Scan Type: f Left Hip
Analysis: 19 October 2021 08:41 Version 13.6.0.7
Hip
Operator: Sh
Model: Horizon Wi (S/N 304687M)
Comment:

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	PR (%)	Z - score	AM (%)
Neck	**4.46**	**3.31**	**0.743**	**-1.0**	**87**	**0.3**	**105**
Troch	10.36	5.99	0.578	-1.2	82	-0.3	94
Inter	20.72	22.84	1.102	0.0	100	0.7	112
Total	35.54	32.14	0.904	-0.3	96	0.7	110
Ward's	1.15	0.56	0.489	-2.1	67	-0.1	98

Total BMD CV 1.0%
WHO Classification: Normal



FRAX® WHO Fracture Risk Assessment Tool

10-year Fracture Risk[1]

Major Osteoporotic Fracture **7.2%**
Hip Fracture **0.4%**
Reported Risk Factors:
US (Caucasian), T-score(WHO)=-1.0, BMI=26.1

[1] FRAX® Version 3.08. Fracture probability calculated for an untreated patient. Fracture probability may be lower if the patient has received treatment.

Comment:

T-score vs. White Female. Source:2012 BMDCS/NHANES White Female. Z-score vs. White Female. Source:2012 BMDCS/NHANES White Female.

Name: [redacted]Tahereh
Patient ID: 0033343640
DOB: 14 May 1961

Sex: Female
Ethnicity: Caucasian

Height: 159.0 cm
Weight: 66.0 kg
Age: 60

Referring Physician: Dr.Rajaei

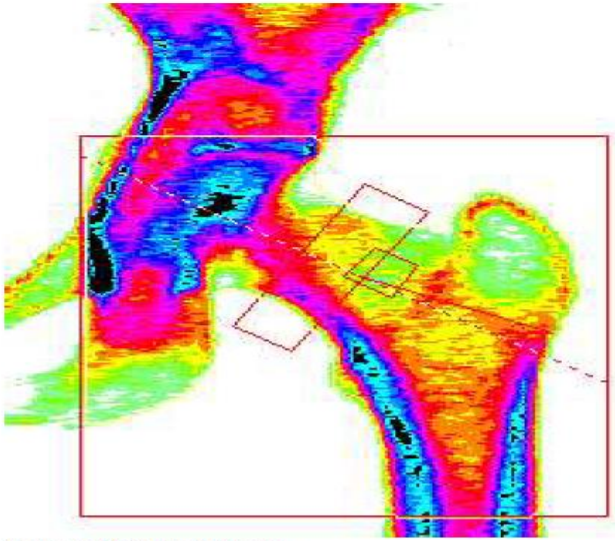


Image not for diagnostic use
101 x 108
NECK: 48 x 15
HAL: 101 mm

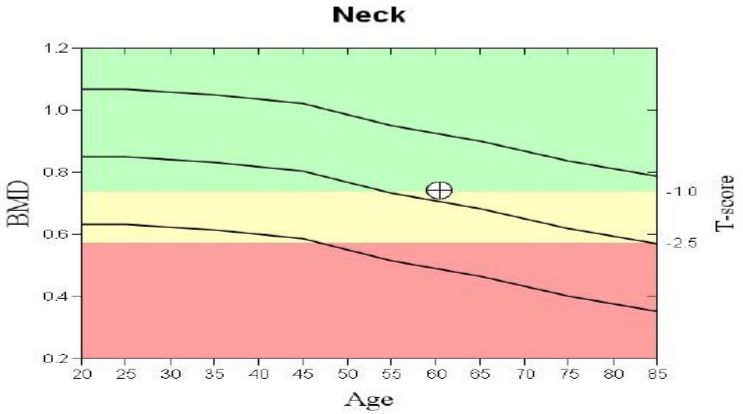
Scan Information:

Scan Date: 19 October 2021 ID: A10192105
Scan Type: f Left Hip
Analysis: 19 October 2021 08:41 Version 13.6.0.7
Hip
Operator: Sh
Model: Horizon Wi (S/N 304687M)
Comment:

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	PR (%)	Z - score	AM (%)
Neck	**4.46**	**3.31**	**0.743**	**-1.0**	**87**	**0.3**	**105**
Troch	10.36	5.99	0.578	-1.2	82	-0.3	94
Inter	20.72	22.84	1.102	0.0	100	0.7	112
Total	35.54	32.14	0.904	-0.3	96	0.7	110
Ward's	1.15	0.56	0.489	-2.1	67	-0.1	98

Total BMD CV 1.0%
WHO Classification: Normal



10-year Fracture Risk[1]

Major Osteoporotic Fracture 7.2%
Hip Fracture 0.4%
Reported Risk Factors:
US (Caucasian), T-score(WHO)=-1.0, BMI=26.1

[1] FRAX® Version 3.08. Fracture probability calculated for an untreated patient. Fracture probability may be lower if the patient has received treatment.

Comment:

T-score vs. White Female. Source:2012 BMDCS/NHANES White Female. Z-score vs. White Female. Source:2012 BMDCS/NHANES White Female.

Calculation Tool

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

Country: Iran Name/ID: [redacted]Tahereh About the risk factors

Questionnaire:

1. Age (between 40 and 90 years) or Date of Birth
   Age: 60 Date of Birth: Y: M: D:
2. Sex — Male / Female
3. Weight (kg): 66
4. Height (cm): 159
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/cm^2): Hologic 0.743 T-score: -1.0

Clear Calculate

BMI: 26.1

The ten year probability of fracture (%)

with BMD

Major osteoporotic	3.8
Hip Fracture	0.4

If you have a TBS value, click here: Adjust with TBS

T-scores are commonly used to define osteoporosis/low bone mass. A BMD more than 2.5 standard deviations below the mean for a young healthy adult white woman identifies 30 percent of all postmenopausal women as having osteoporosis; half of these women will already have had a fracture. The hip T-score is the site used in clinical decisions.

Z-score is less commonly used but may be helpful in identifying persons who should undergo a work-up for secondary causes of osteoporosis. A Z-score changes over time in relation to the T-score.

The following shows how one might interconvert T- and Z-scores.

Converting T-score to Z-score at the hip:

Age 50: T = Z - 0.37 ~ 0.5

Age 60: T = Z - 1.01 ~ 1

Age 70: T = Z - 1.56 ~ 1.5

Age 80: T = Z - 2.11 ~ 2

Age 90: T = Z - 2.52 ~ 2.5

Common BMD mistakes

Step 2: Good scan criteria

2-Good scan criteria

Five characters (first of 2 are constant):

1- straightening of each scan

2- absence of artifact

3- upper border of scan

4- lower border of scan

5- both sides borders(inner & outer)

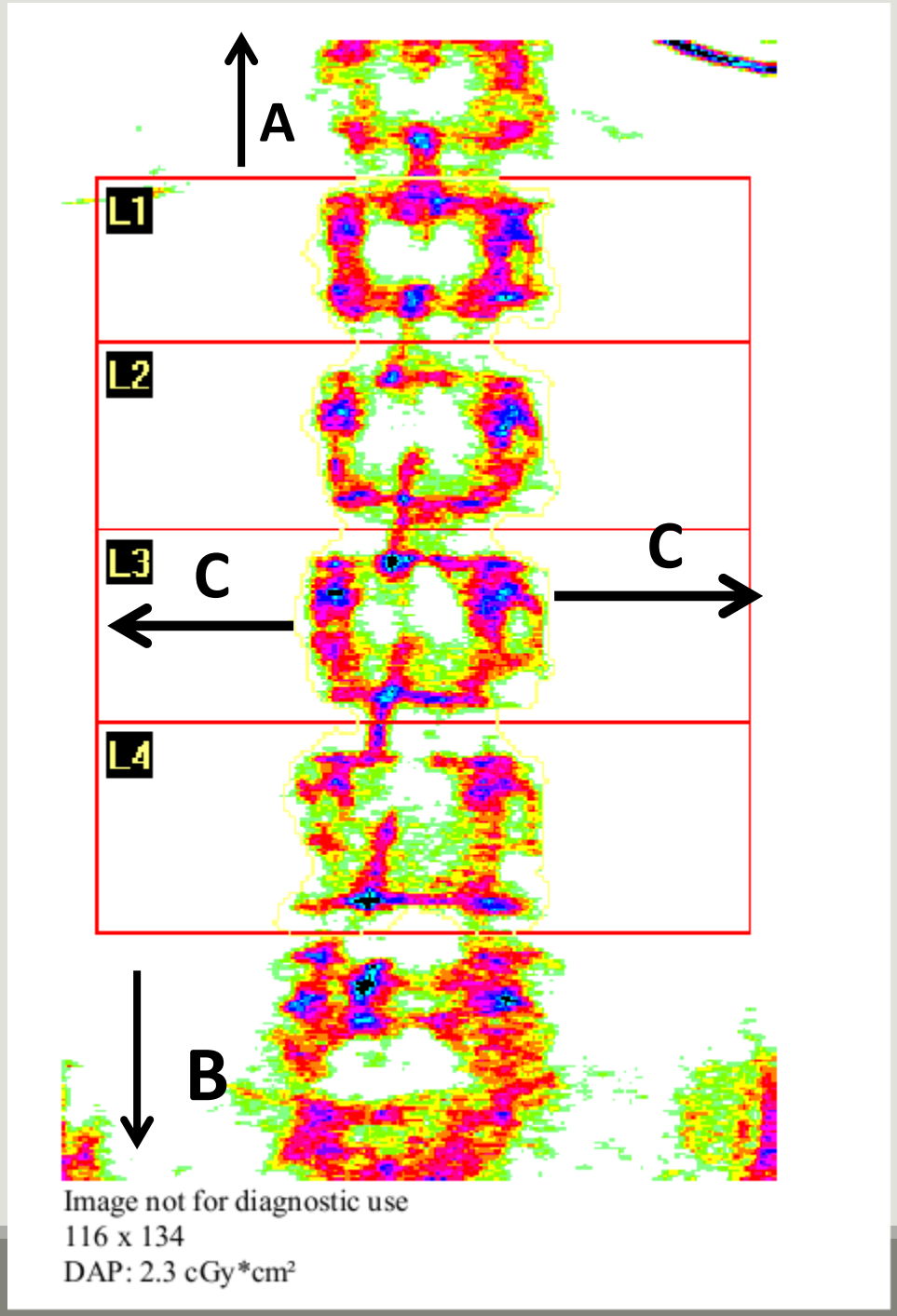
2-Good scan criteria

	Straight (S)	Absence of artifact	Upper border (A)	lower border (B)	Both sides (C)
PA Spine	+	+	At least half of T_{12}	At least half of L_5	At least 2 Cm for each sides
Hip	+	+	2 Cm above of upper border of trochanter	1.5 Cm below of lower border of lesser trochanter	Outer: 1 Cm soft tissue, Inner: 1Cm neck-ramus dis., no lesser troch.& ob. foramen
Forearm	+	+	proximal: after the max elbow prominence	Distal: 2 cm after radiocarpal joint	At least 1 Cm soft tissue
Whole body	+	+	1 Cm above top of head	1 Cm below of feet	1 Cm soft tissue

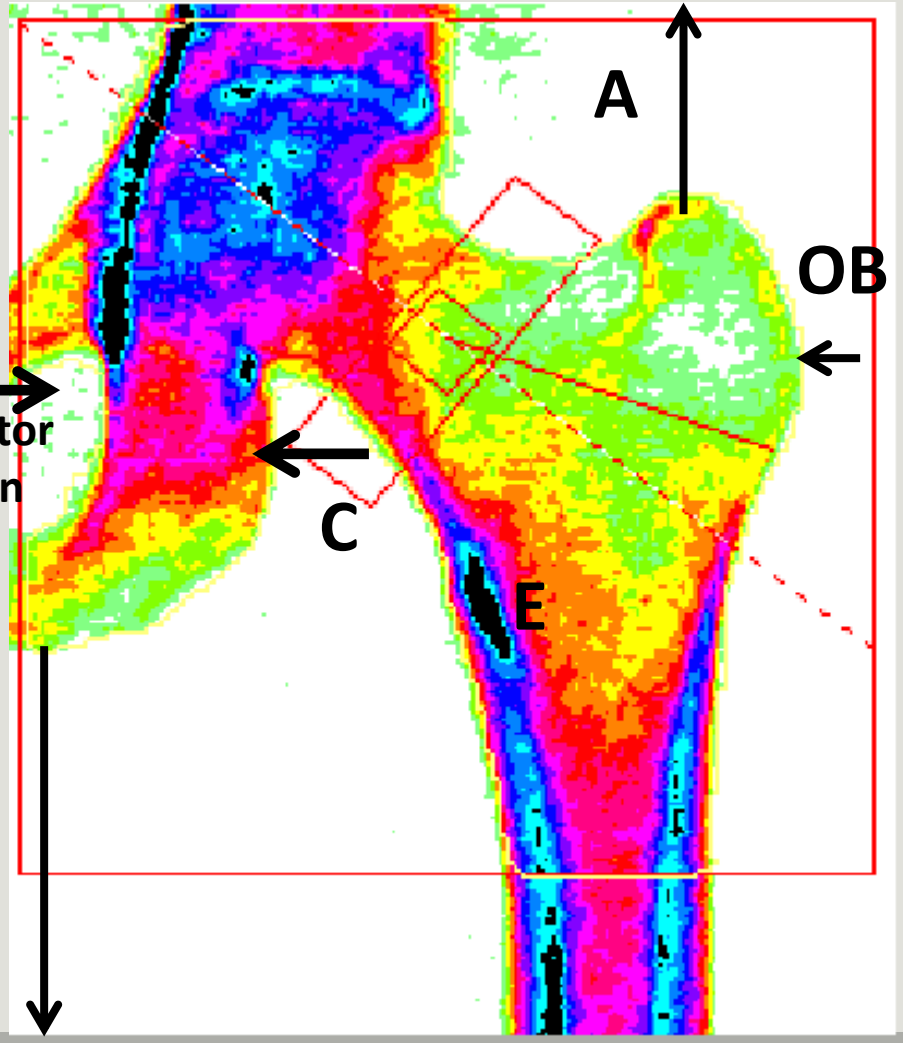
Factors modifying bone mineral density (BMD)*

Region	Increased BMD	Decreased BMD
Hip	Excessive or inadequate internal hip rotation rotation	
	Osteoarthritis	Artifact overlying soft tissue
	Metal artifact	Lytic lesions
	Focal skeletal sclerosis	
Spine	Osteophytes	
	Focal skeletal pathology (i.e., sclerosis, metastasis, or Paget's disease)	Artifacts overlying soft tissues
	Vertebral compression fracture	Rotoscoliosis
	Vascular calcification	Laminectomy
	Metal, radiology contrast, stones, calcium tablets or other artifact overlying spine	Lytic lesions

*Extremes of body weight or significant change (more than 10%) in body weight can have unpredictable effects on BMD and affect serial measurements.


A
L1
L2
L3
L4
C
C
B
Image not for diagnostic use
116 x 134
DAP: 2.3 cGy*cm²

Inner border:
1- C > 1 cm
2. Absence of low lesser trochanter(E)
3. See the obturator foramen



OB ≈ 1 cm

A > B

Effect of Increasing Internal or External Rotation From the Neutral Position on the Femoral Neck Bone Mineral Density (g/cm^2) of Cadaveric Femurs

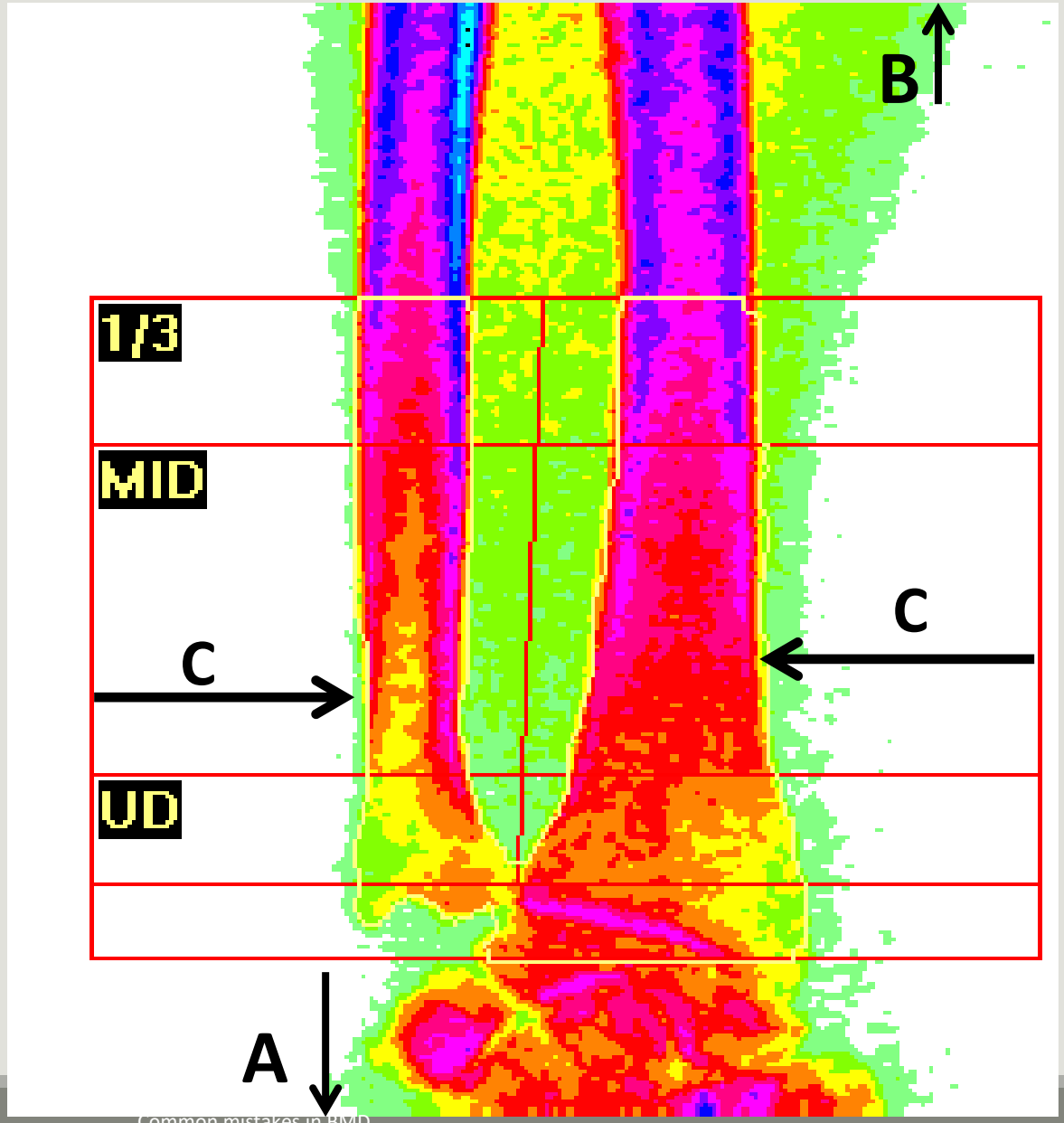
	Neutral	*External rotation from neutral of*			*Internal rotation from neutral of*		
Cadaver no.	0°	15°	30°	45°	15°	30°	45°
1	0.490	0.524	0.549	0.628	0.510	0.714	0.845
2	0.574	0.567	0.632	0.711	0.581	0.619	0.753
3	0.835	0.872	0.902	1.071	0.874	1.037	1.222
4	0.946	0.977	1.005	1.036	1.102	1.283	1.492

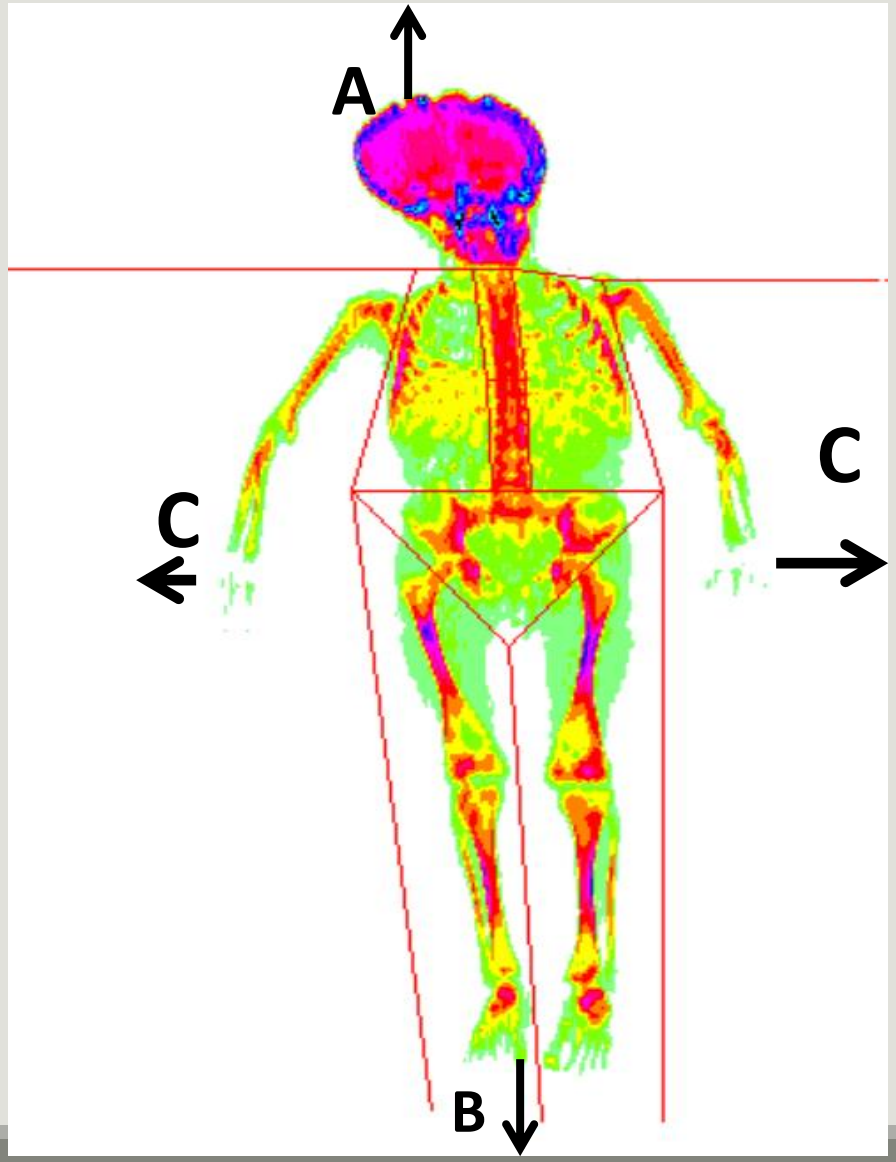
Reproduced with permission from *Calcif. Tissue Int.* 1995;57:340–343.

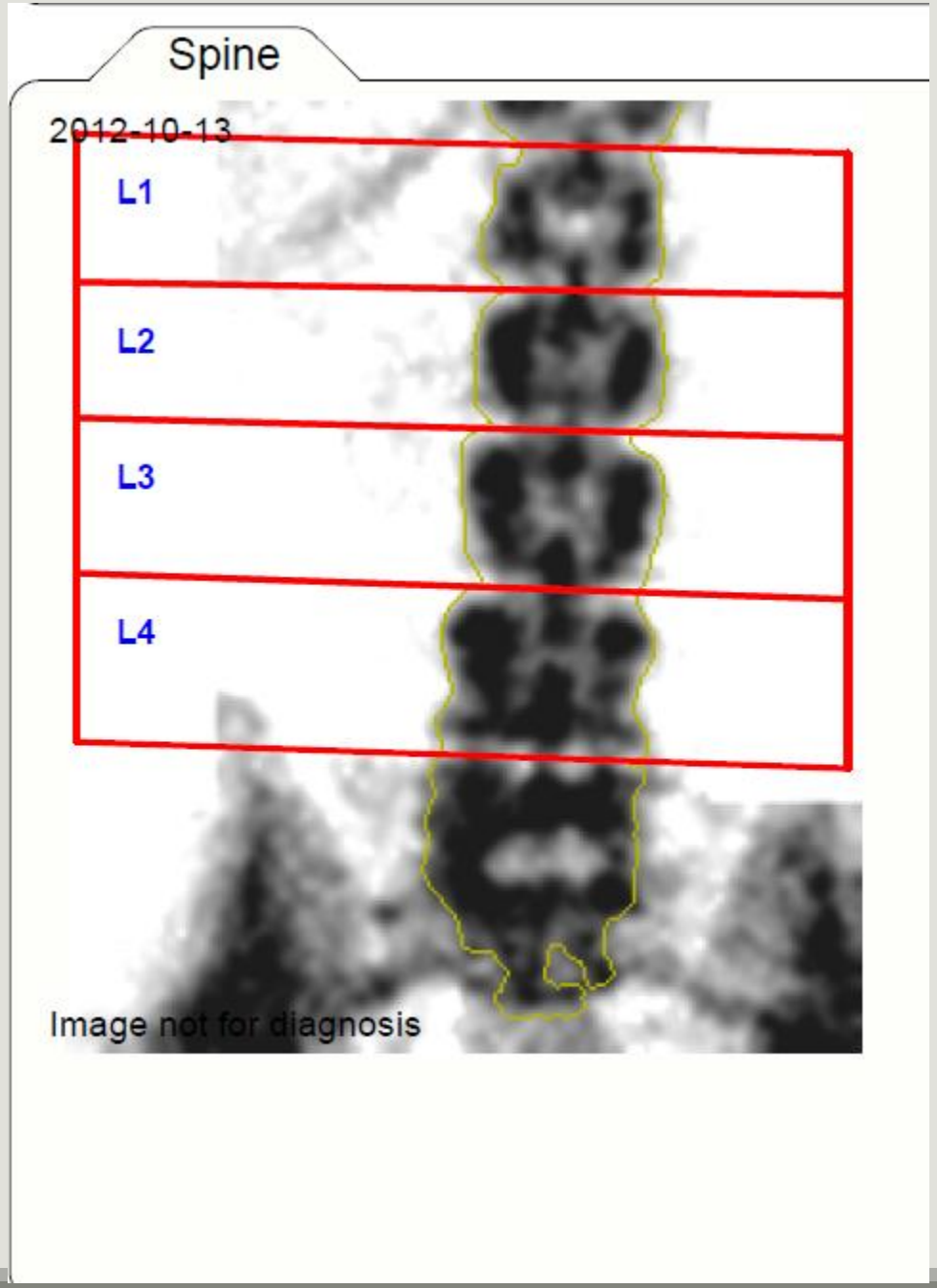
Factors modifying bone mineral density (BMD)*

Region	Increased BMD	Decreased BMD
Hip	Excessive or inadequate internal hip rotation rotation	
	Osteoarthritis	Artifact overlying soft tissue
	Metal artifact	Lytic lesions
	Focal skeletal sclerosis	
Spine	Osteophytes	
	Focal skeletal pathology (i.e., sclerosis, metastasis, or Paget's disease)	Artifacts overlying soft tissues
	Vertebral compression fracture	Rotoscoliosis
	Vascular calcification	Laminectomy
	Metal, radiology contrast, stones, calcium tablets or other artifact overlying spine	Lytic lesions

*Extremes of body weight or significant change (more than 10%) in body weight can have unpredictable effects on BMD and affect serial measurements.


B
1/3
MID
C
C
UD
A

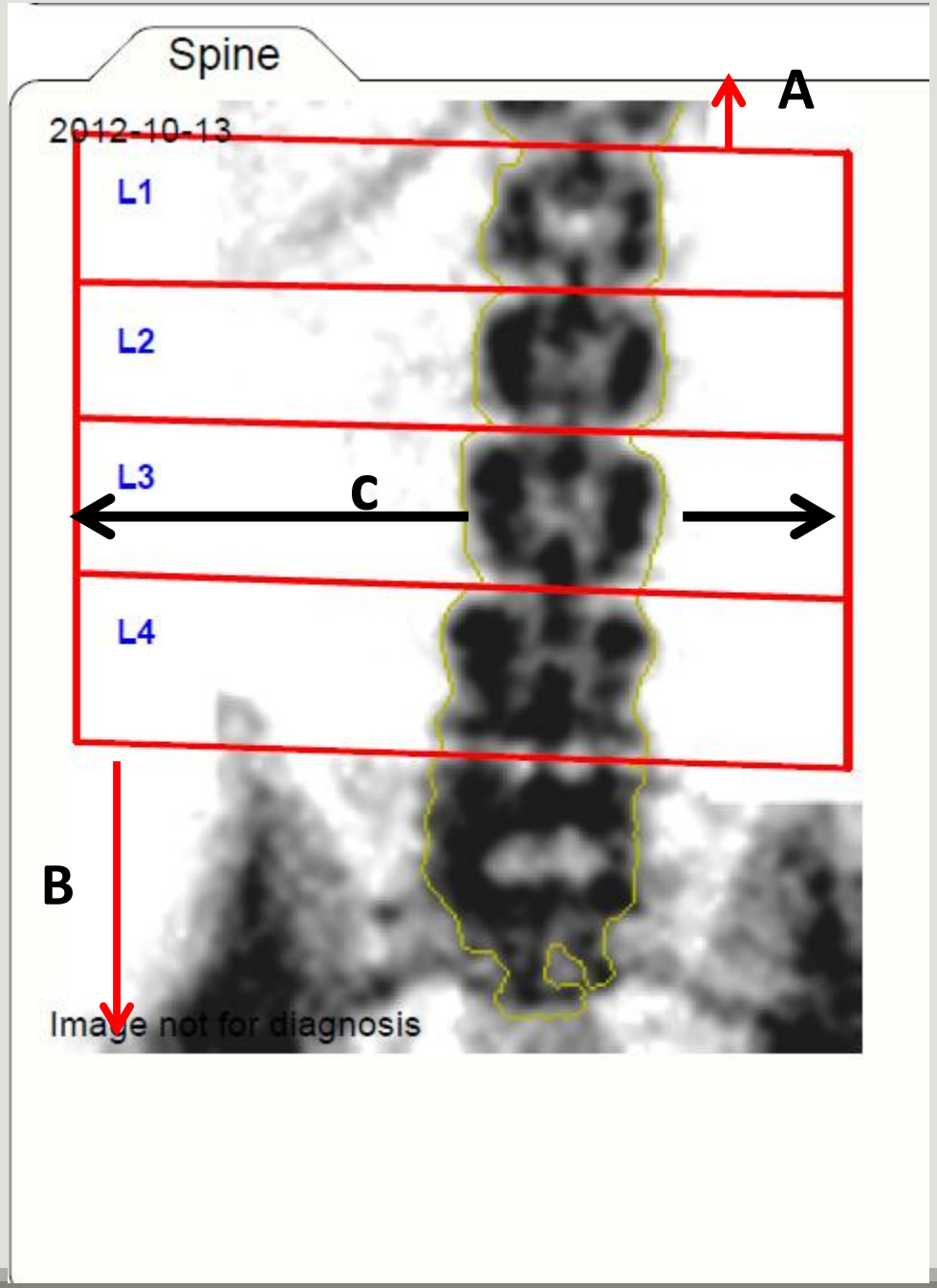

A
C
C
B

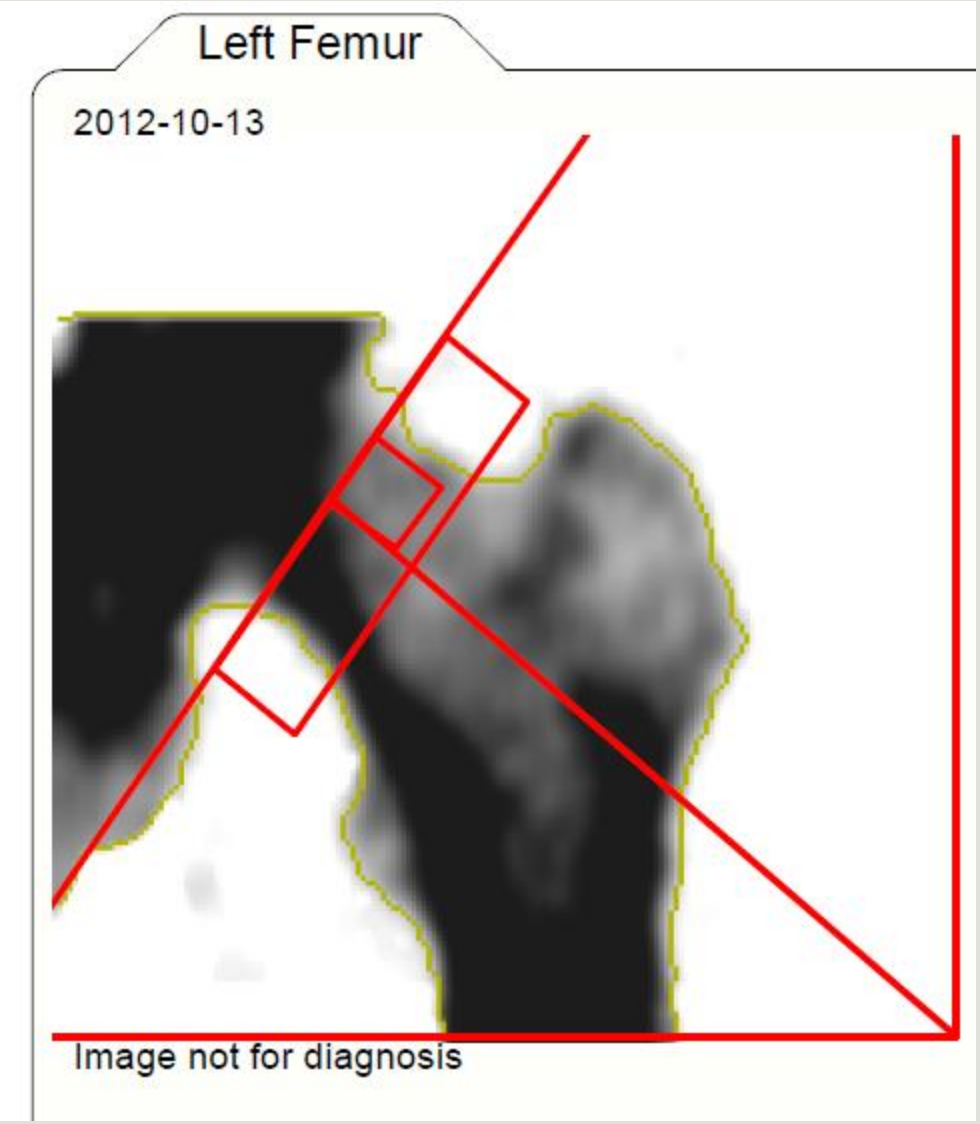


Q4

Step 2 technical errors:

1. A ≠ B
2. C error

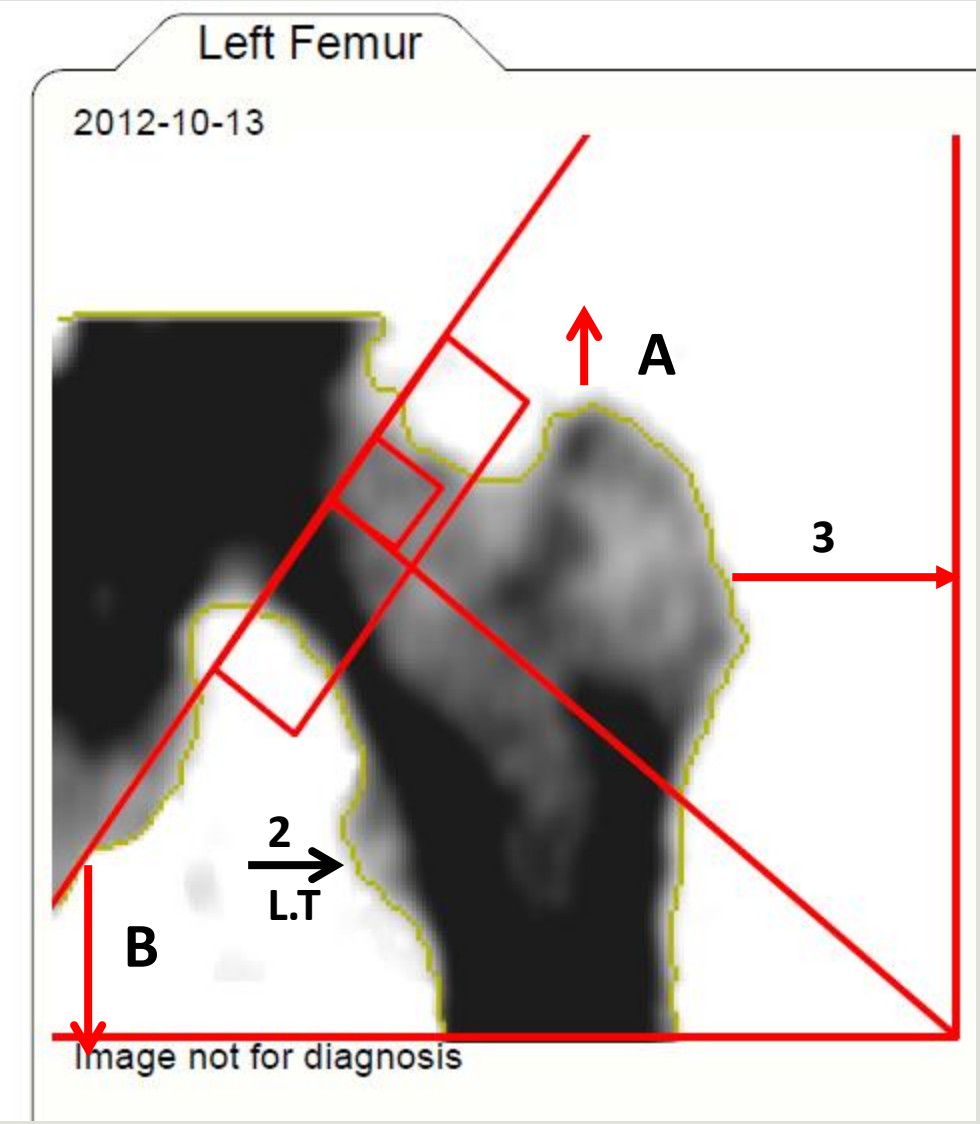




Q5

Step 2 technical errors:

1. A < B
2. Lesser trochanter prominency
3. OB > 1 cm & not visible obturator foramen



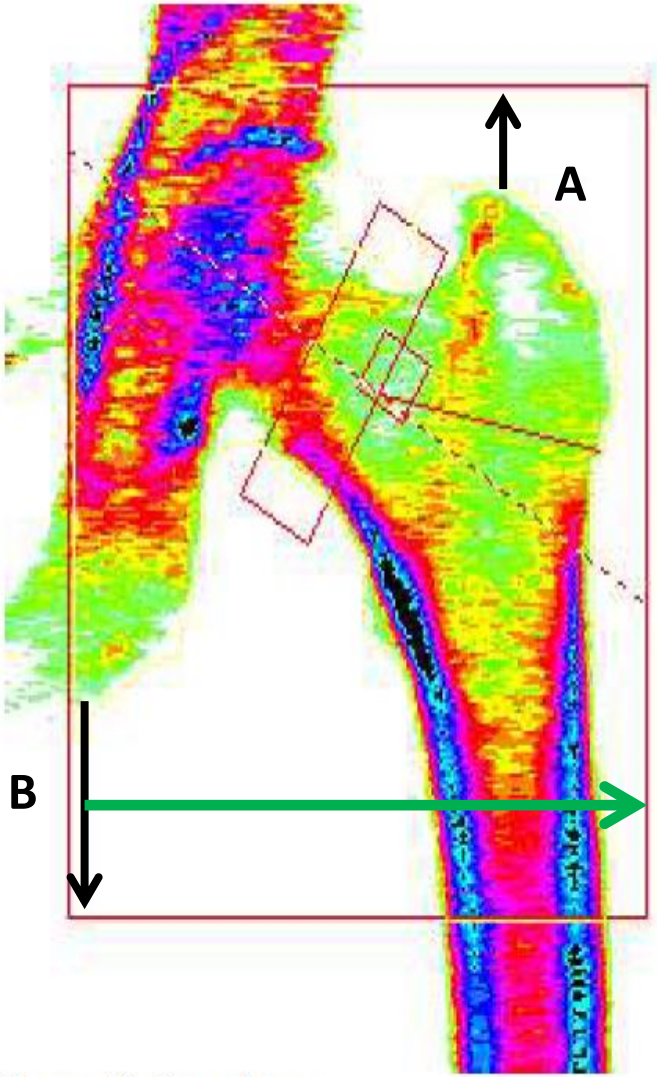


Image not for diagnostic use
105 x 118
NECK: 49 x 15

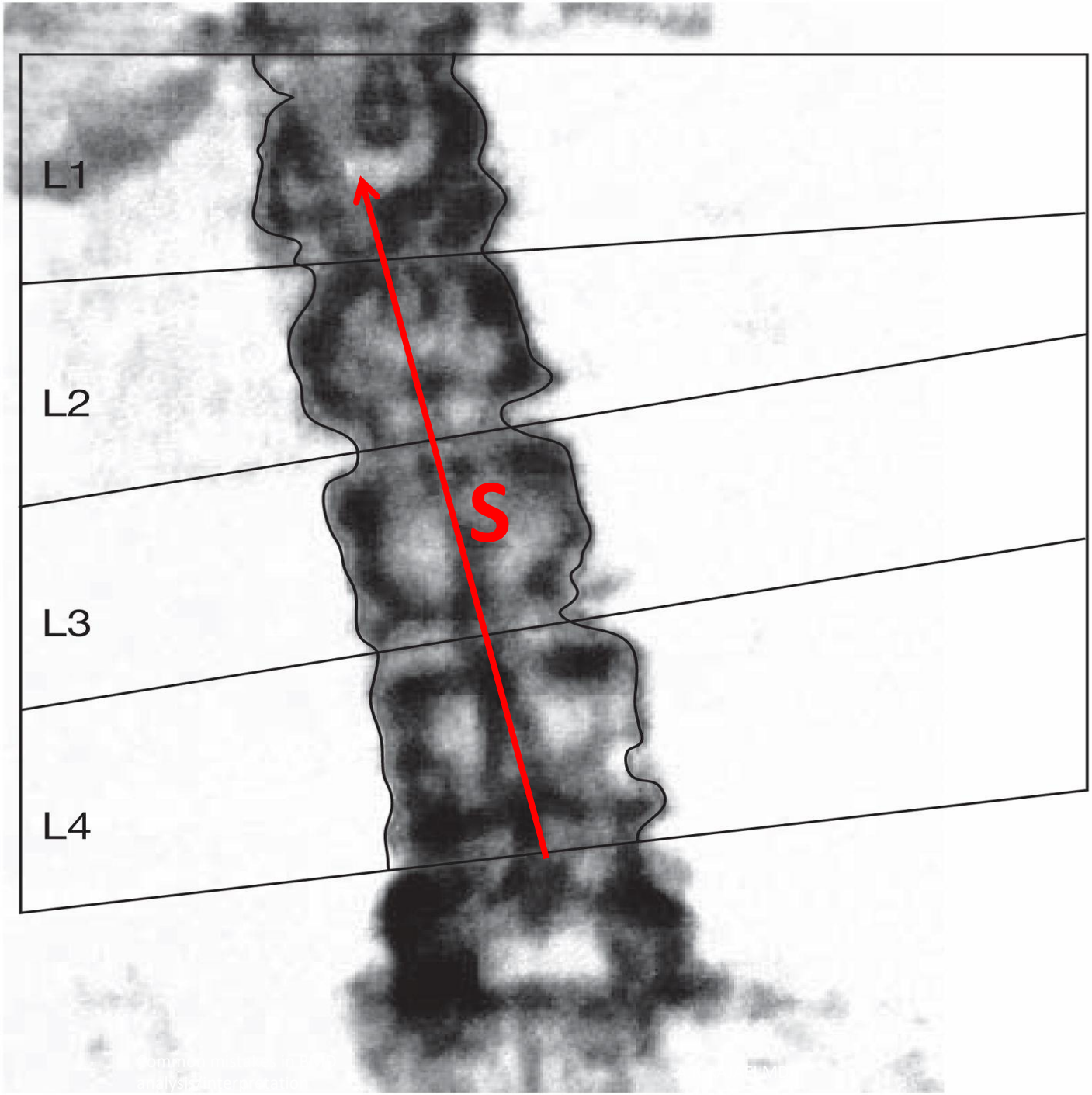
Scan Information:

Scan Date: 08 January 2022 ID: A01082218
Scan Type: f Left Hip
Analysis: 08 January 2022 15:29 Version 13.6.0.7
Hip
Operator: NB
Model: Horizon Wi (S/N 304687M)
Comment:

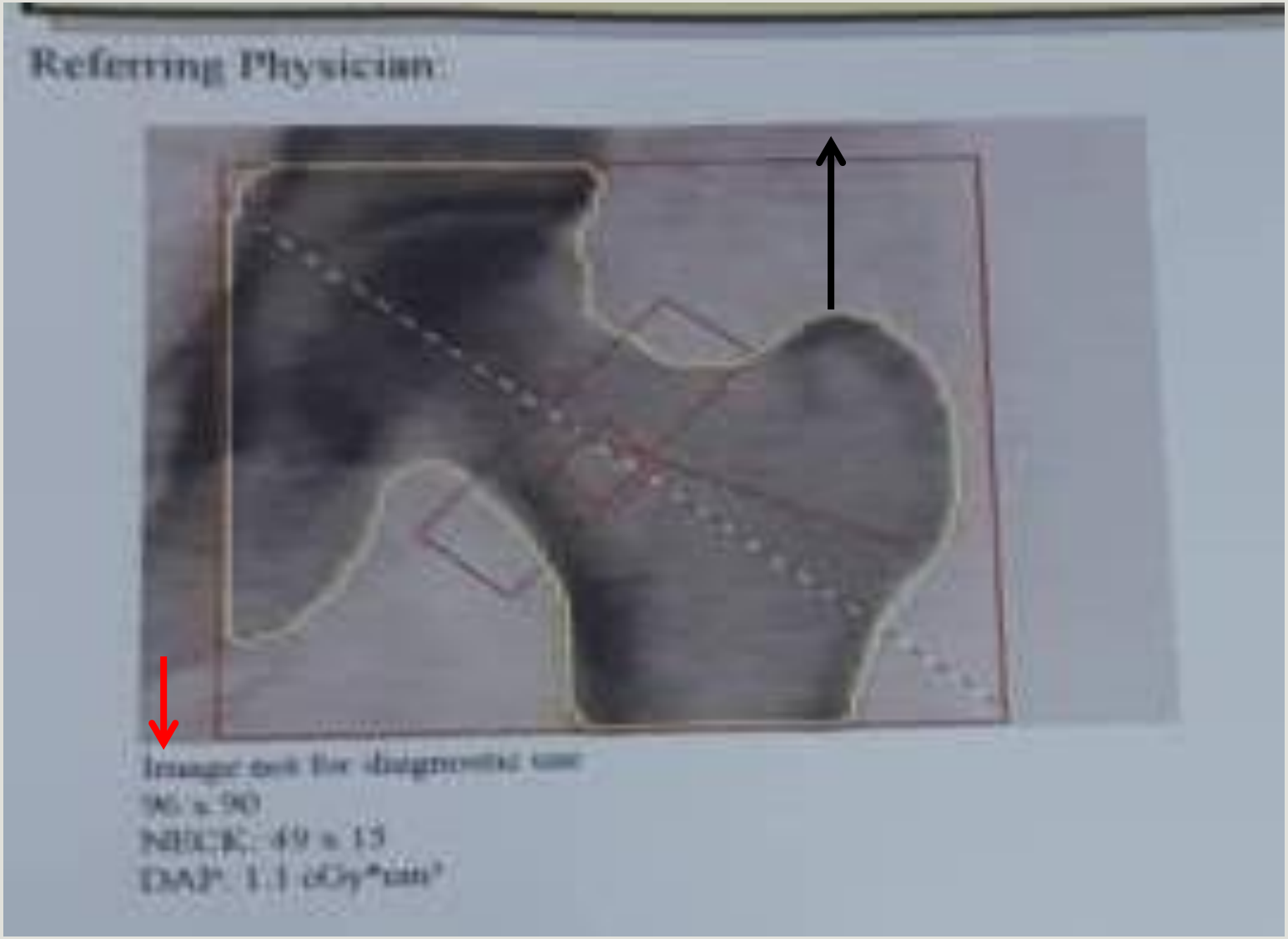
A < B

DXA Results Summary:

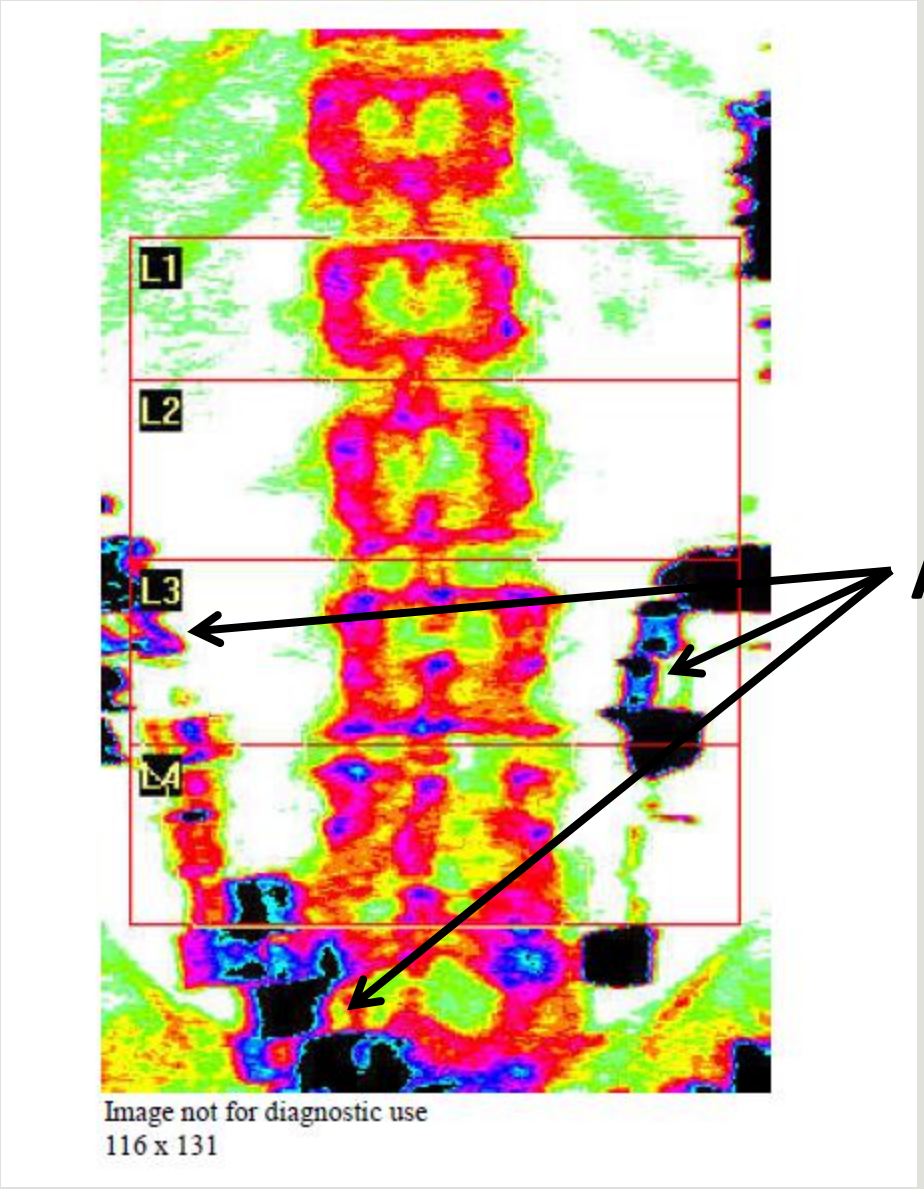
Region	Area (cm^2)	BMC (g)	BMD (g/cm^2)	T - score	PR (%)	Z - score	AM (%)
Neck	**5.07**	**3.45**	**0.681**	**-1.5**	**80**	**-0.1**	**98**
Troch	10.54	6.62	0.628	-0.7	89	0.3	104
Inter	25.90	27.56	1.064	-0.2	97	0.6	110
Total	41.51	37.64	0.907	-0.3	96	0.8	112
Ward's	1.00	0.48	0.476	-2.2	65	-0.1	98



DXA of the lumbar spine with poor positioning. This spine is tilted off-center. In order to obtain a valid bone mineral density measurement the lumbar spine should be perpendicular to the long edges of the DXA table. This patient should be repositioned and rescanned.


Referring Physician

Contrast media



3- ROI(Region Of Interest) insertion

For each region should be defined:

Spine: labeling of each vertebrae

Hip: put the femoral neck at the right place

Forearm: put the distal box at correct place

Whole body: put all boxes at right places

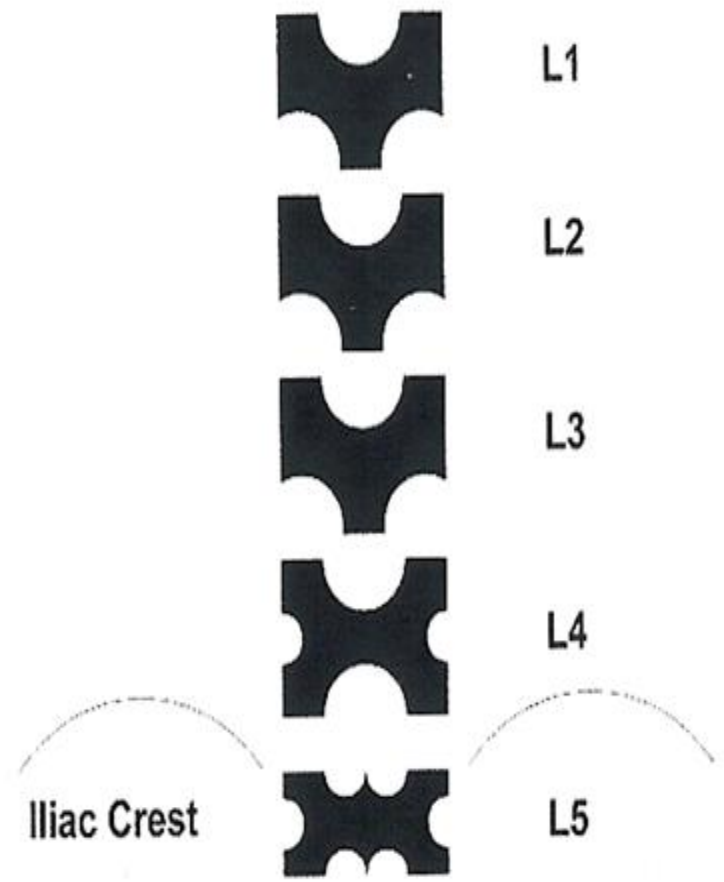
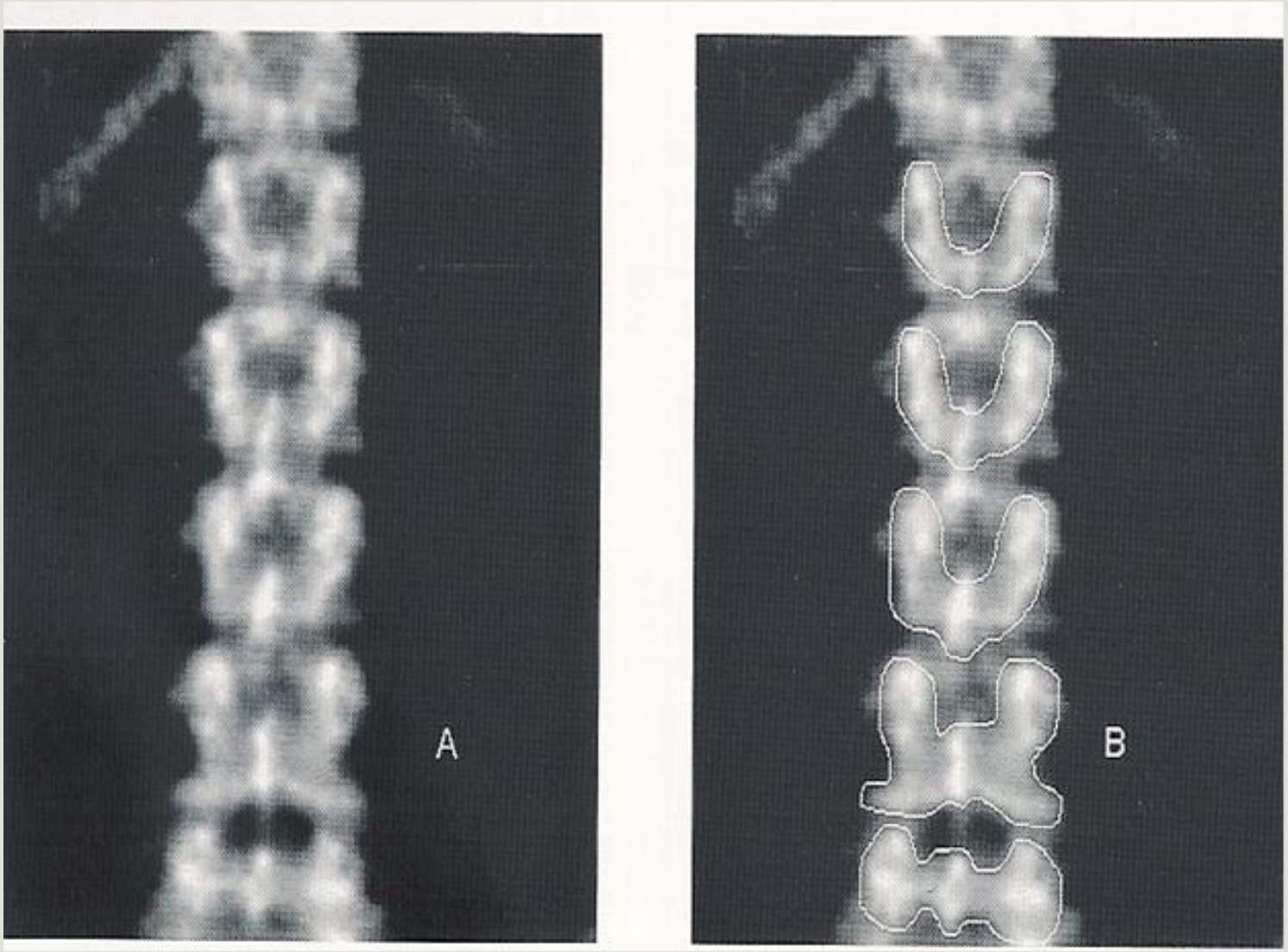


Fig. 2-3. The characteristic shapes of the lumbar vertebrae as seen on a DXA AP spine study.


A
B

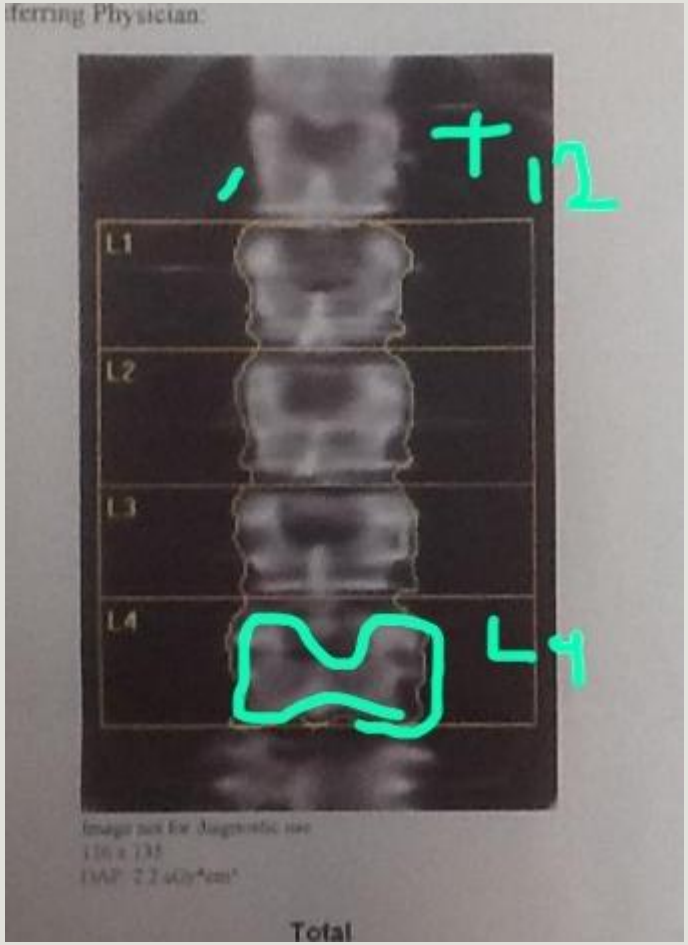
Labeling of vertebrae

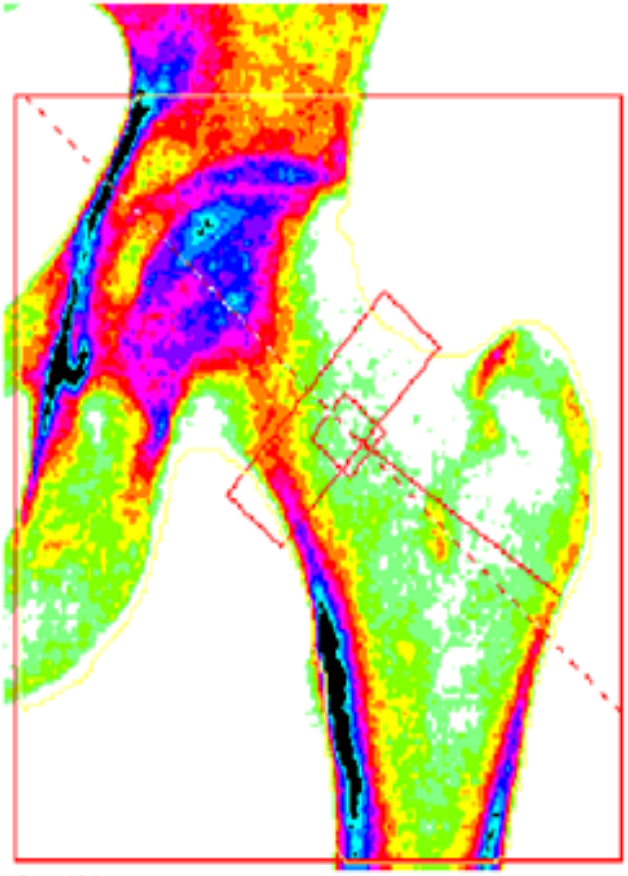
I. Shape of vertebrae:

- L1, L2, L3 are U shape
- L4 X or H shape
- L5 WM shape

II. Anatomic rules:

- Iliac crest is parallel of L5
- The tip of 12th rib is parallel to L1
- The longest transverse process is L3





124 x 136
NECK: 49 x 15
DAP: 1.2 cGy*cm²

Scan Information:

Scan Date: 21 December 2013 ID: A1221130H
Scan Type: x Left Hip
Analysis: 21 December 2013 09:36 Version 13.3
Hip
Operator:
Model: Discovery W (S/N 83167)
Comment:

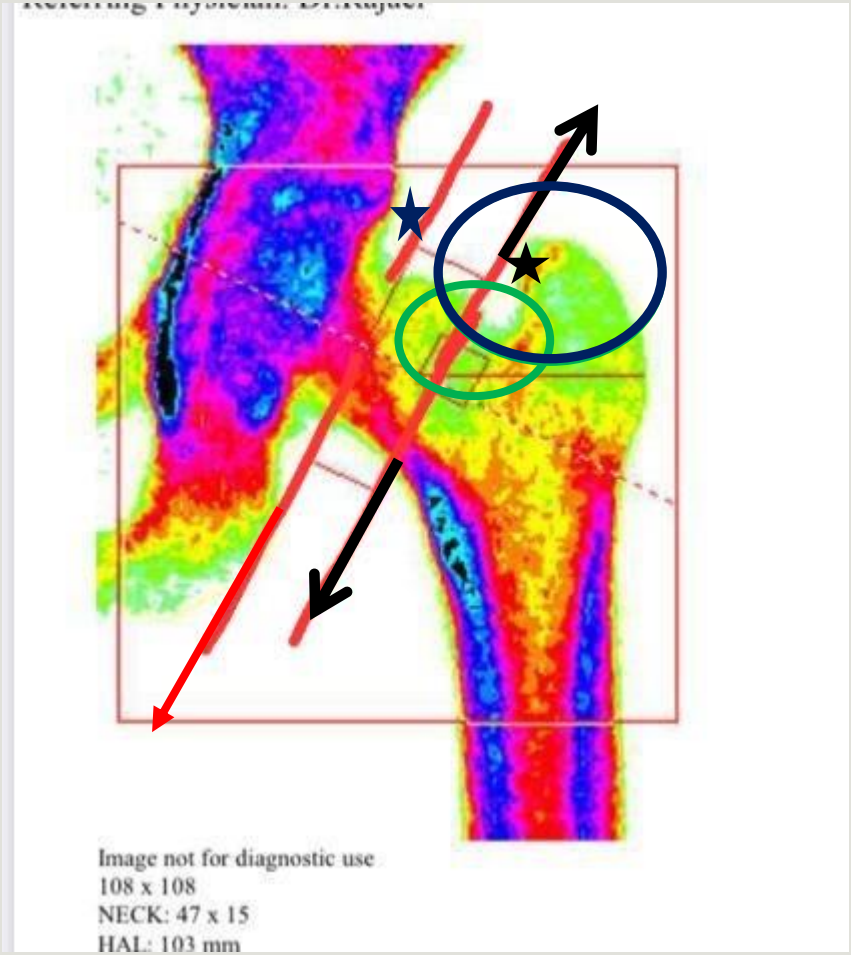
DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	PR (%)	Z - score	AM (%)
Neck	**6.26**	**4.41**	**0.704**	**-1.7**	**76**	**-0.8**	**87**
Troch	15.21	9.23	0.607	-1.3	78	-1.0	82
Inter	27.38	27.73	1.013	-1.0	85	-0.7	89
Total	48.84	41.37	0.847	-1.2	82	-0.8	87
Ward's	1.31	0.72	0.548	-1.7	70	-0.2	96

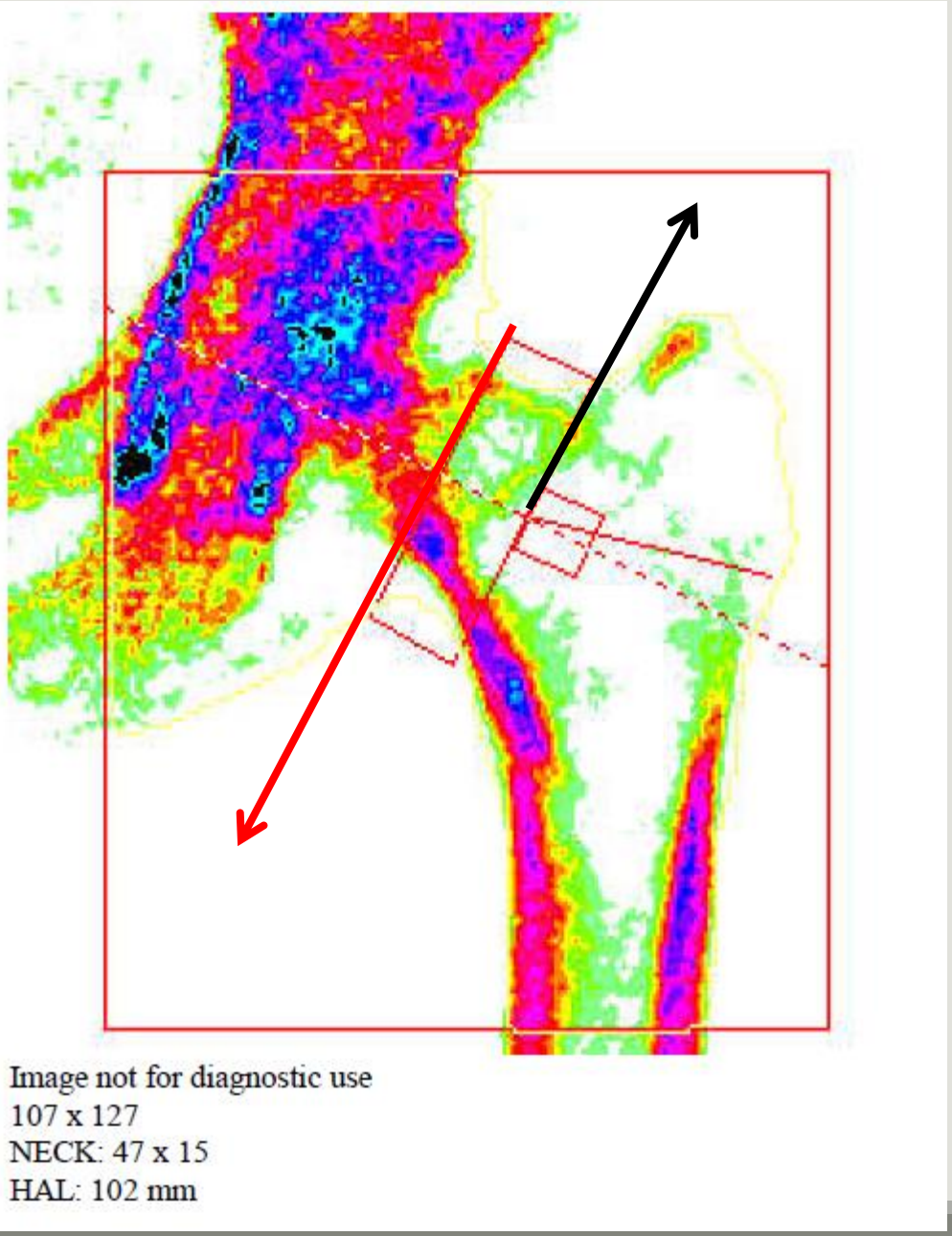
Total BMD CV 1.0%

Neck box replacement

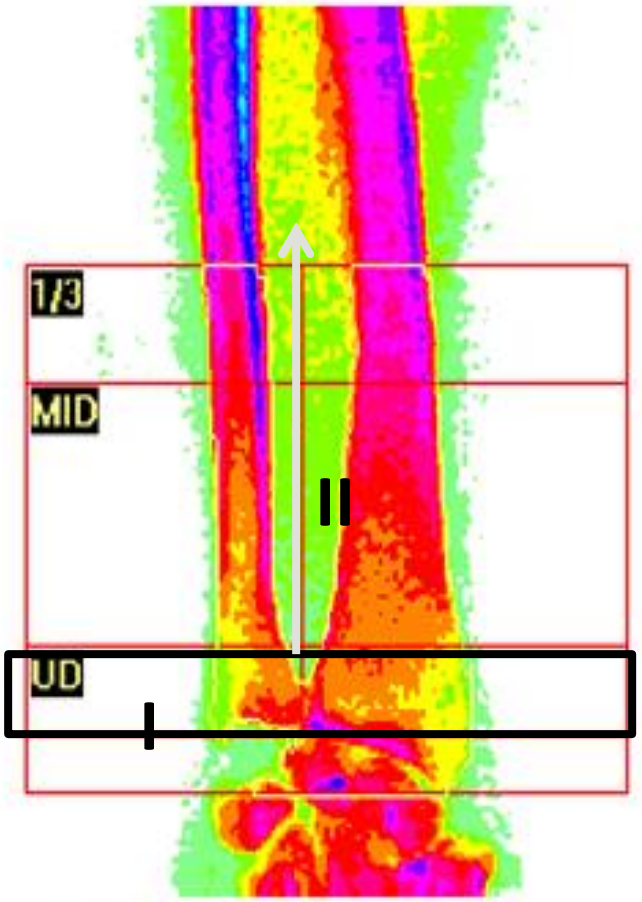
- Not passes the trochanter or head regions(★)
- The inner side of box if continues in lower part should be crosses the inf. Ramus(Red line)
- The outer side of box if continues should not crosses trochanter region in upper part(black line)
- The close relation between neck & ward boxes (green cycle)



Incorrect Neck Box replacement



The UD box(I) should be pass through the radioulnar joint & the radioulnar line(II) should be straight & 90 degree vertical.



Scan Information:

Scan Date: 10 December 2013 ID: A12101311
Scan Type: a R.Forearm
Analysis: 10 December 2013 14:11 Version 13.3
Right Forearm
Operator:
Model: Discovery W (S/N 83167)
Comment:

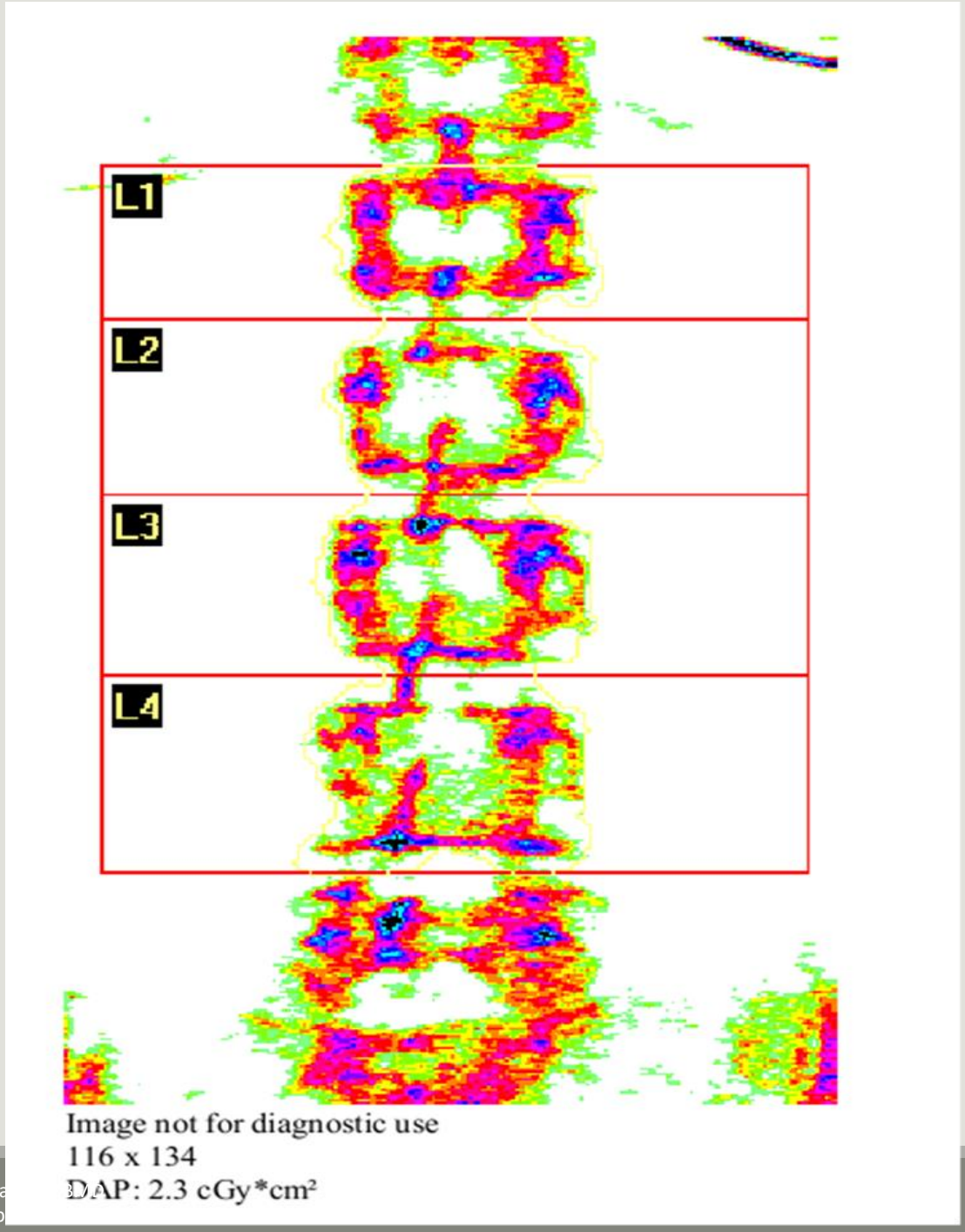
DXA Results Summary:

Radius	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	PR (%)	Z - score	AM (%)
1/3	**2.85**	**1.71**	**0.600**	**-1.6**	**86**	**-0.8**	**92**
MID	7.82	3.77	0.482	-2.3	79	-1.5	85
UD	4.31	1.65	0.383	-1.0	86	-0.5	93
Total	14.98	7.13	0.476	-1.9	82	-1.2	88

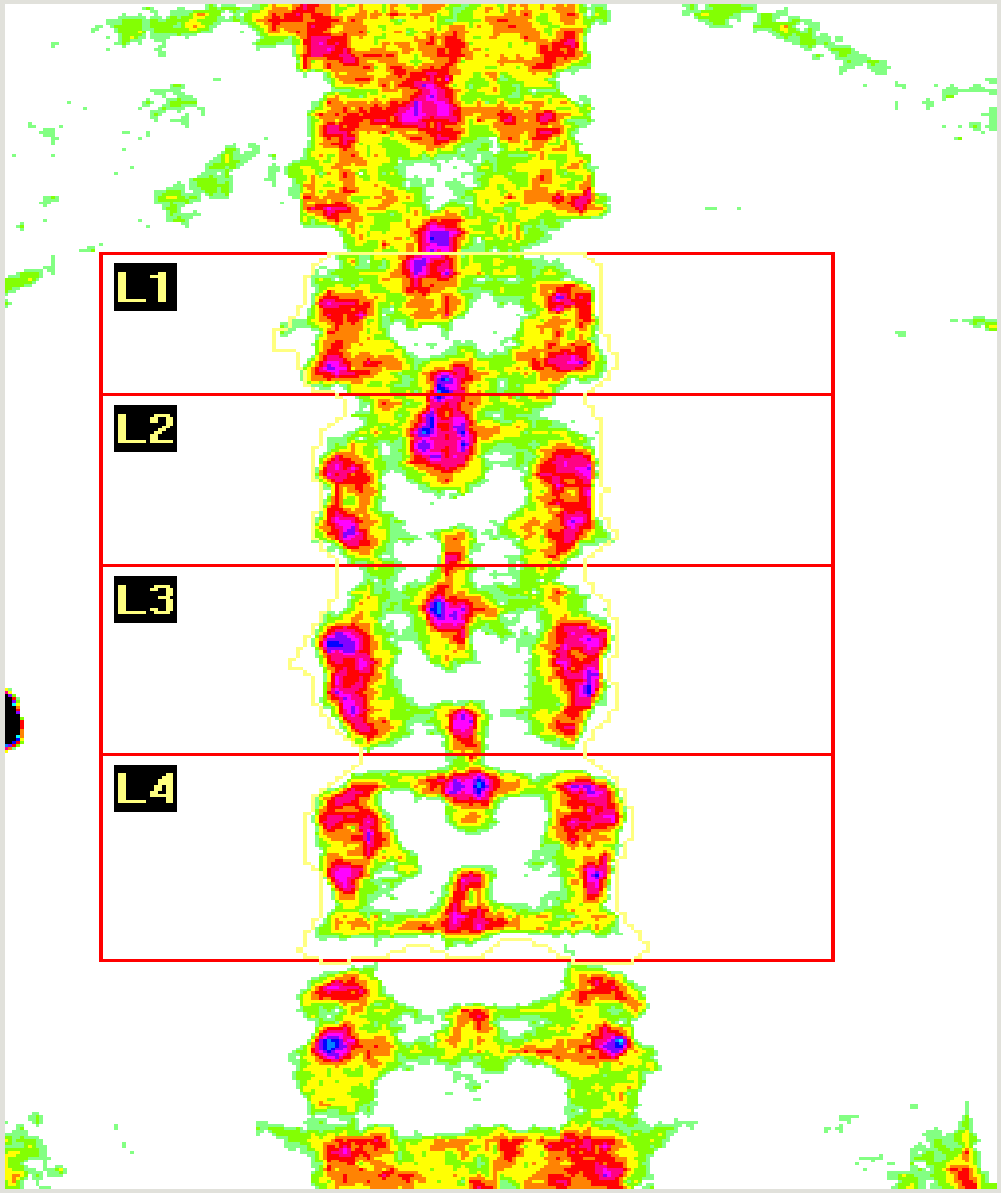
Total BMD CV 1.0%

Common BMD mistakes

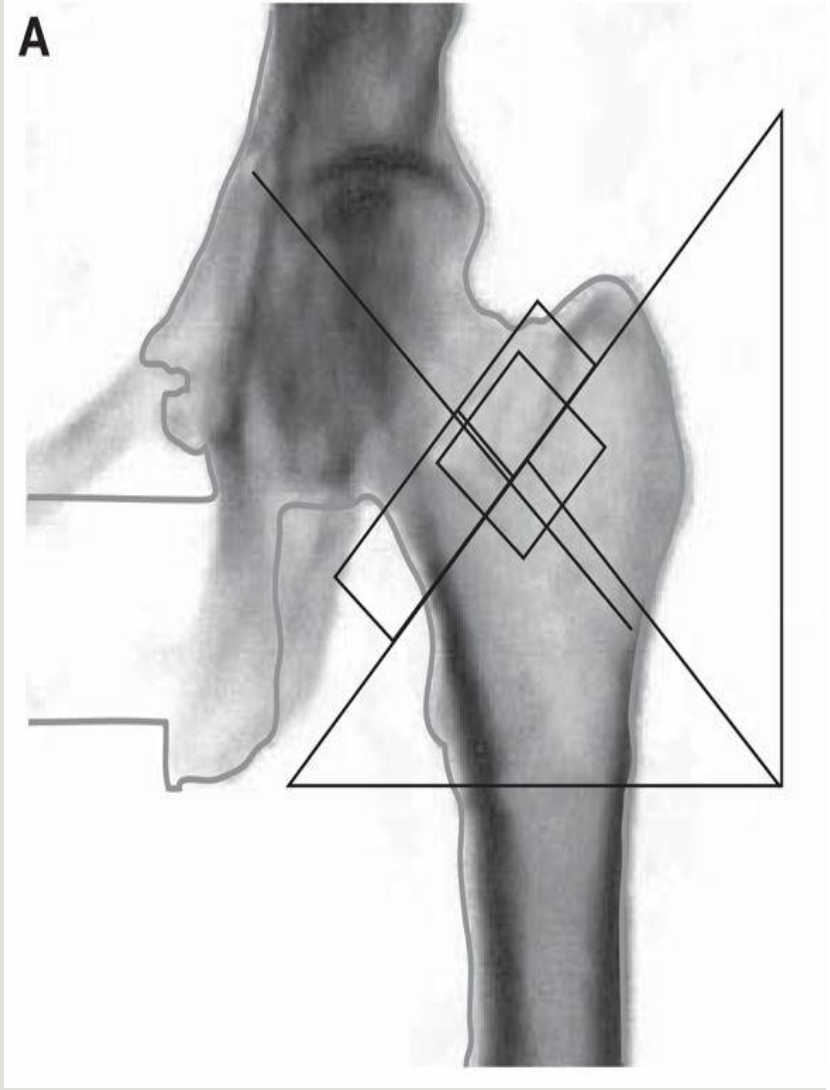
Step 3: ROI(Region Of Interest) insertion


L1
L2
L3
L4
Image not for diagnostic use
116 x 134
DAP: 2.3 cGy*cm²

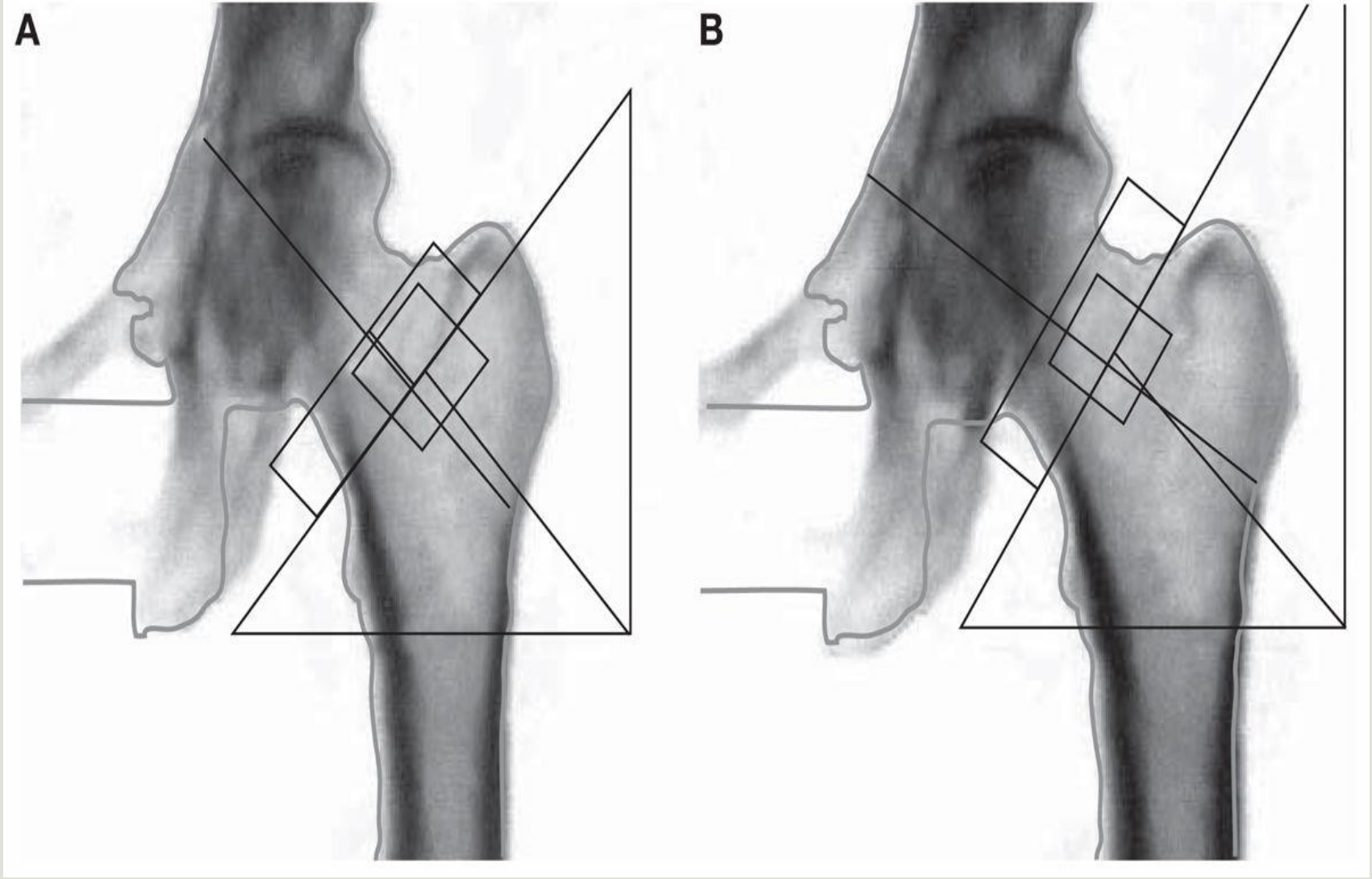
Q5



Labelling in incorrect, L4 falsely labelled and at this figure L4 is L3 and L4 is the lower vertebra



Q7



Femoral neck box placement.. (A) Incorrect analysis: femoral neck T-score = −3.2. (B) Correct analysis: femoral neck T-score = −3.0.

Referring Physician: Dr.Rajaei

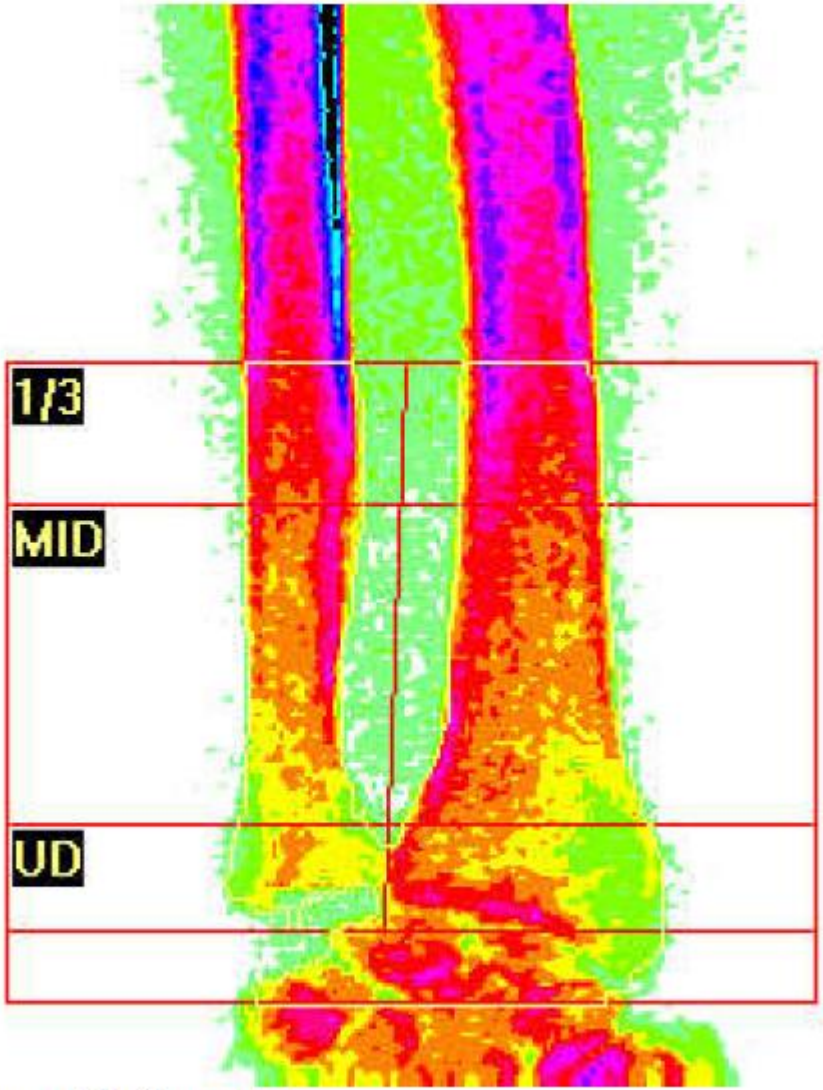
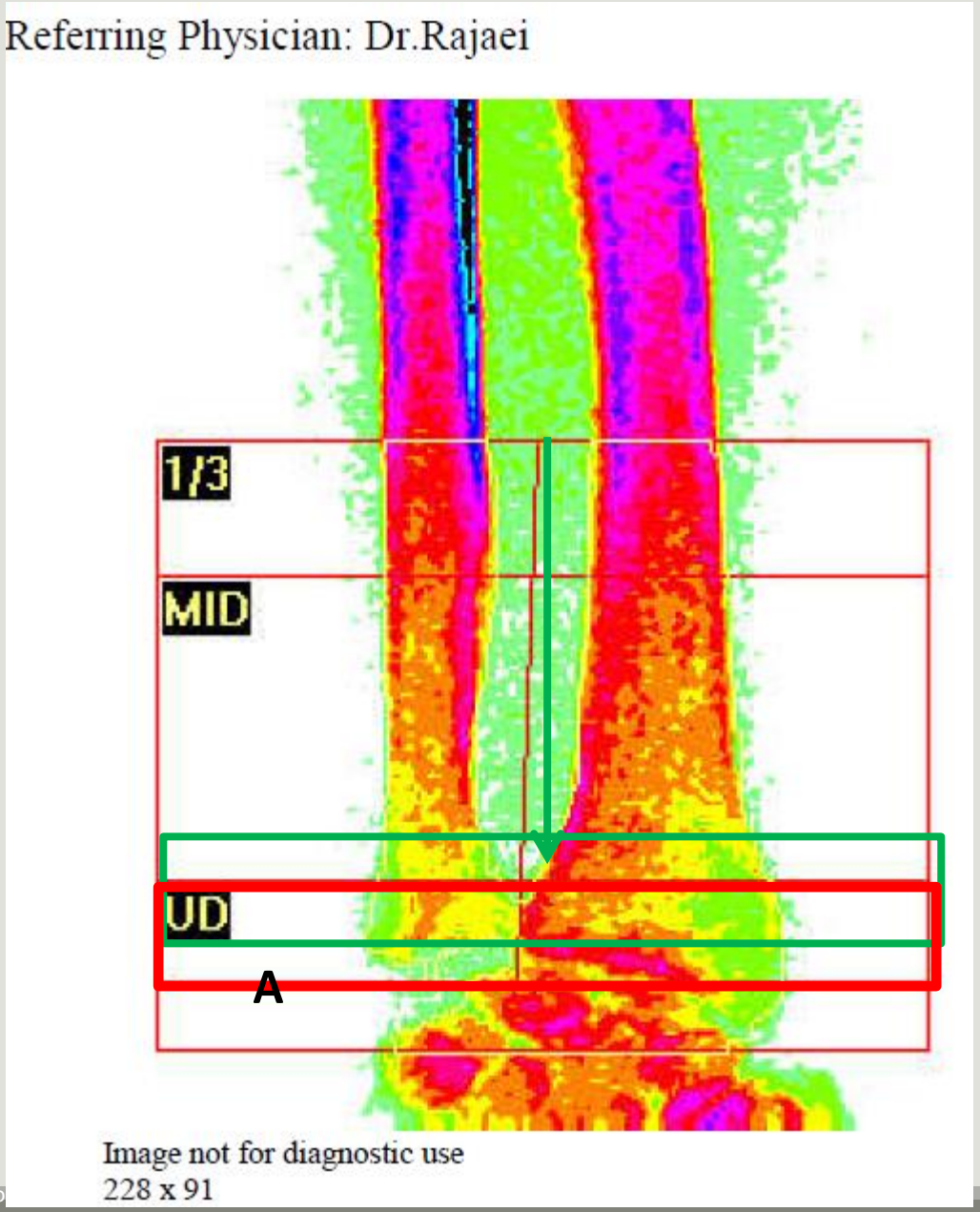


Image not for diagnostic use
228 x 91

Q8



Step 3 technical errors:

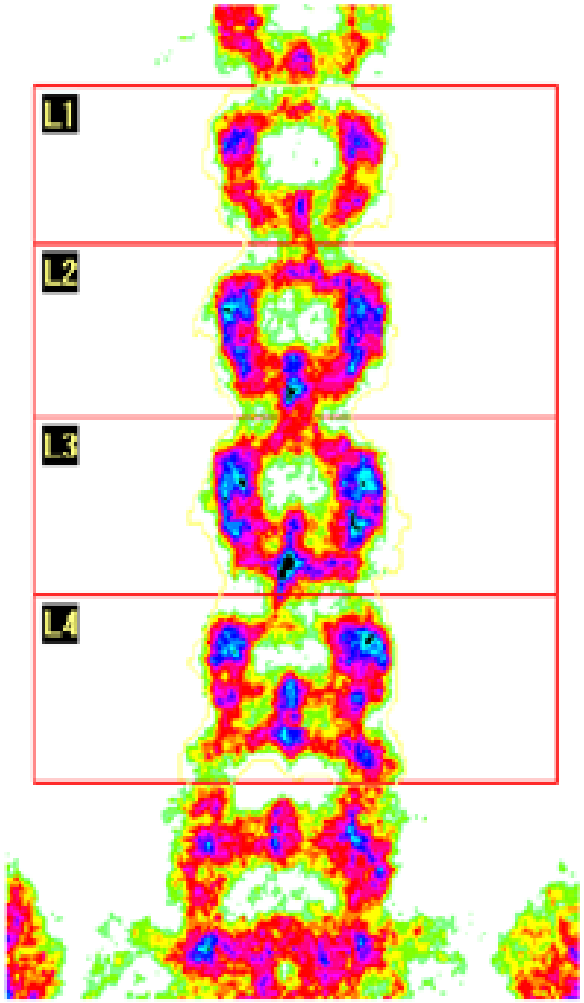
1. Incorrect A box insertion
2. 2. B line is not vertical

4- Rules of area

Since bone density is indirectly measured by BMC/area, and since area is determined by technician, so it must have rules that go beyond the specified limit.

Area: L1 (9.5-11.5) < L2 (10.5-13.5) < L3 (12-14,5) < L4 (15-18)

Total area: F= 40-50 M= 45-55



Scan Information:

Scan Date: 06 May 2013 ID: A0506131B
Scan Type: x Lumbar Spine
Analysis: 06 May 2013 11:04 Version 13.3
Spine
Operator:
Model: Discovery W (S/N 83167)
Comment:

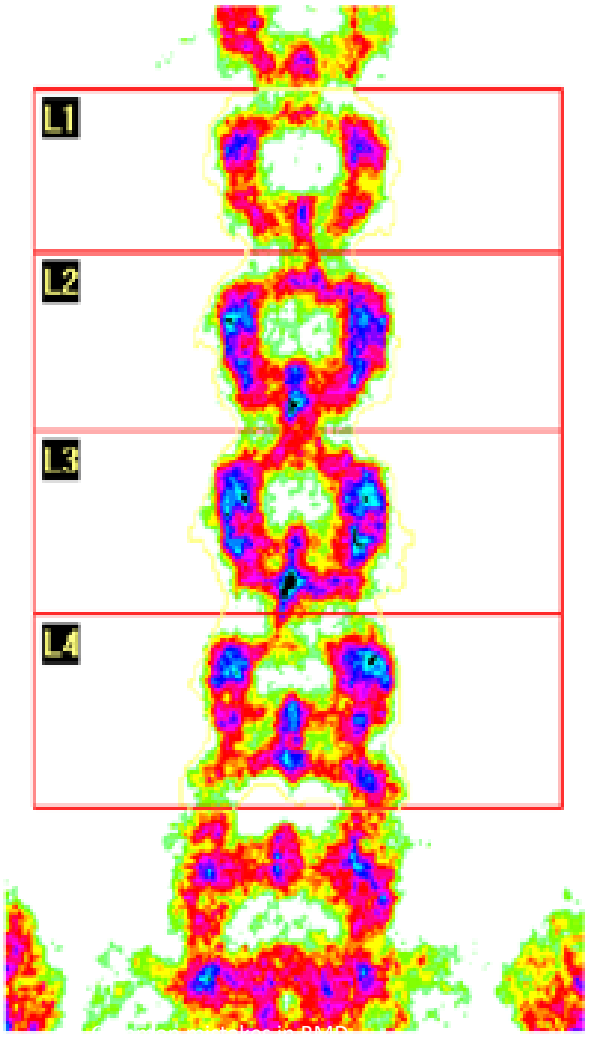
DXA Results Summary:

Region	Area (cm^2)	BMC (g)	BMD (g/cm^2)	T - score	PR (%)	Z - score	AM (%)
L1	11.89	10.42	0.876	-1.0	88	-1.0	89
L2	13.04	13.80	1.058	0.3	103	0.3	103
L3	14.34	15.27	1.065	-0.2	98	-0.1	99
L4	16.61	17.22	1.037	-0.2	98	-0.2	98
Total	**55.89**	**56.71**	**1.015**	**-0.3**	**97**	**-0.3**	**97**

Total BMD CV 1.0%

BMC: L1 < L2 < L3 < L4

BMD: L1 < L2 < L3 > L4



Scan Information:

Scan Date: 06 May 2013 ID: A0506131B
Scan Type: x Lumbar Spine
Analysis: 06 May 2013 11:04 Version 13.3
Spine
Operator:
Model: Discovery W (S/N 83167)
Comment:

DXA Results Summary:

Region	Area (cm^2)	BMC (g)	BMD (g/cm^2)	T - score	PR (%)	Z - score	AM (%)
L1	11.89	10.42	0.876	-1.0	88	-1.0	89
L2	13.04	13.80	1.058	0.3	103	0.3	103
L3	14.34	15.27	1.065	-0.2	98	-0.1	99
L4	16.61	17.22	1.037	-0.2	98	-0.2	98
Total	**55.89**	**56.71**	**1.015**	**-0.3**	**97**	**-0.3**	**97**

Total BMD CV 1.0%

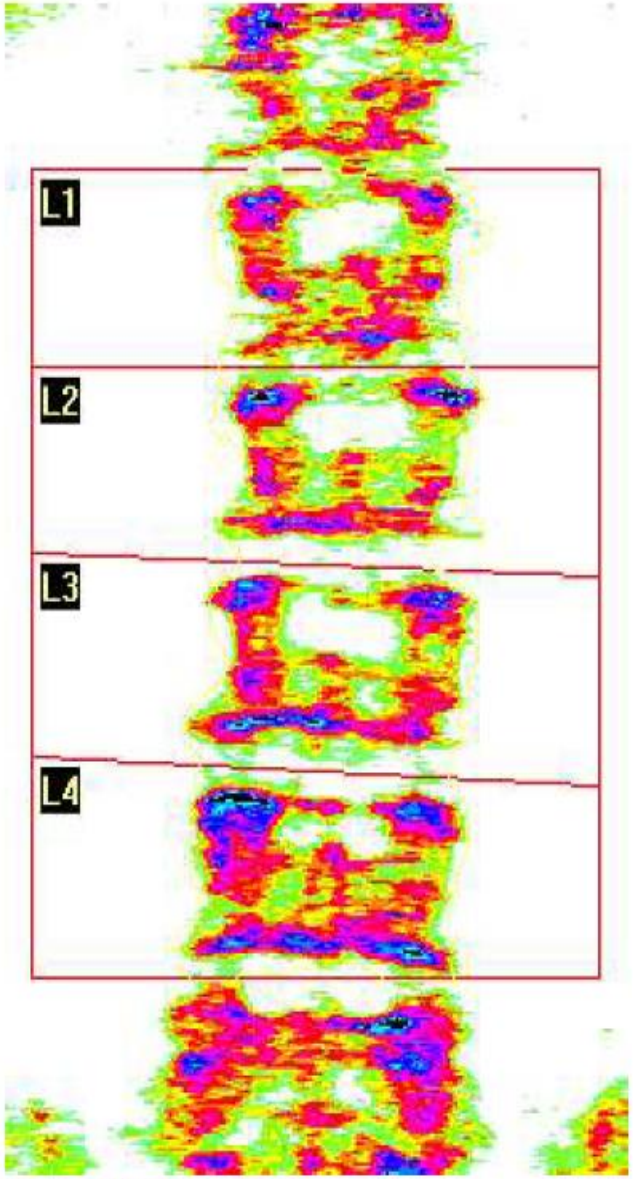


Image not for diagnostic use
116 x 140

Scan Information:

Scan Date: 28 December 2021 ID: A1228210T
Scan Type: f Lumbar Spine
Analysis: 28 December 2021 12:58 Version 13.6.0.7
Spine
Operator: Sh
Model: Horizon Wi (S/N 304687M)
Comment:

Q9

DXA Results Summary:

Region	Area (cm^2)	BMC (g)	BMD (g/cm^2)	T - score	PR (%)	Z - score	AM (%)
L1	17.28	16.69	0.966	-0.2	98	-0.1	99
L2	17.17	15.90	0.926	-0.9	90	-0.6	93
L3	19.09	19.48	1.020	-0.6	94	0.2	102
L4	19.64	22.44	1.142	0.7	108	1.4	116
Total	**73.18**	**74.50**	**1.018**	**-0.3**	**97**	**0.3**	**103**

Total BMD CV 1.0%

WHO Classification: Normal
Fracture Risk: Not Increased

Step I: not provided

Step II: Above: ½ T12

Below: ½ L5

Sides: 2 cm

Straightness: correct

Artifact: none

All of them is correct

Step III: ROI insertion: upper line: disc space between T12-L1

Lower line: disc space between L4-5

but need to define T12, L1, L2, L3, L4, L5

Based shape: L1, L2,L3 U

L4: X or H

L5:wm

Based anatomic landmarks:

- Iliac crest parallel to L5
- Lowest rib attached to T12
- Longest transverse process to L3

But labelling is correct.

Longest transverse process to L3: not seen

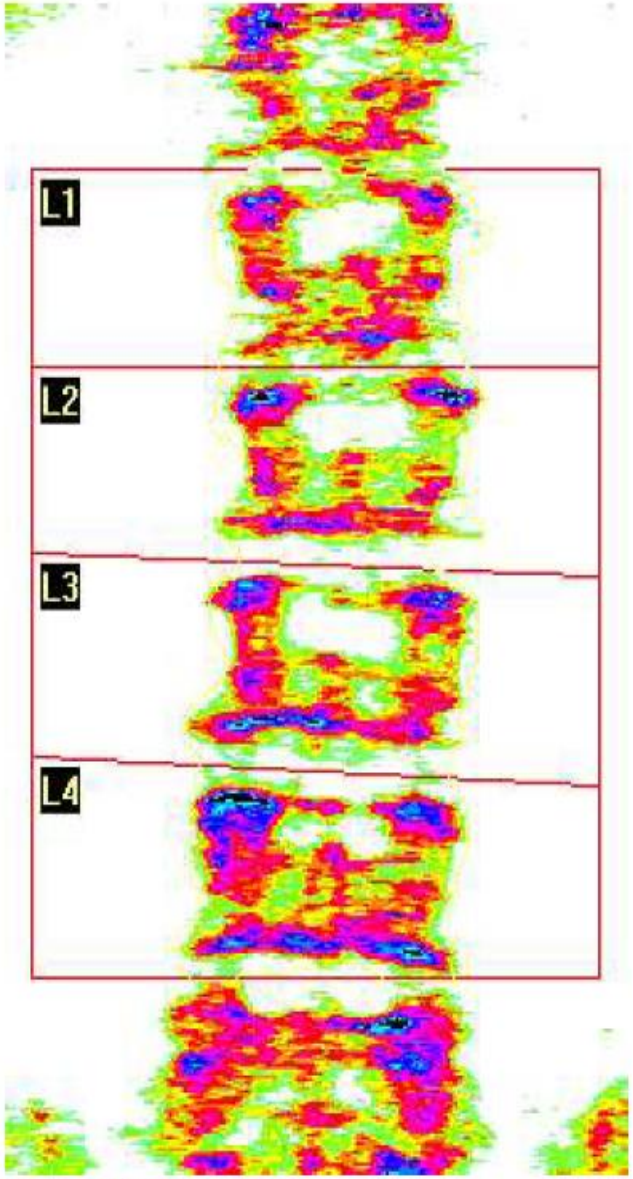


Image not for diagnostic use
116 x 140

Scan Information:

Scan Date: 28 December 2021 ID: A1228210T
Scan Type: f Lumbar Spine
Analysis: 28 December 2021 12:58 Version 13.6.0.7
Spine
Operator: Sh
Model: Horizon Wi (S/N 304687M)
Comment:

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	PR (%)	Z - score	AM (%)
L1	17.28	16.69	0.966	-0.2	98	-0.1	99
L2	17.17	15.90	0.926	-0.9	90	-0.6	93
L3	19.09	19.48	1.020	-0.6	94	0.2	102
L4	19.64	22.44	1.142	0.7	108	1.4	116
Total	**73.18**	**74.50**	**1.018**	**-0.3**	**97**	**0.3**	**103**

Total BMD CV 1.0%

WHO Classification: Normal
Fracture Risk: Not Increased

Step IV: Area: L1> L2< L3 < L4

Area: Incorrect.

BMD: L1> L2< L3< L4

L1> L2: Incorrect

L2< L3: correct

L3< L4: Incorrect

Best region for report: L2-3

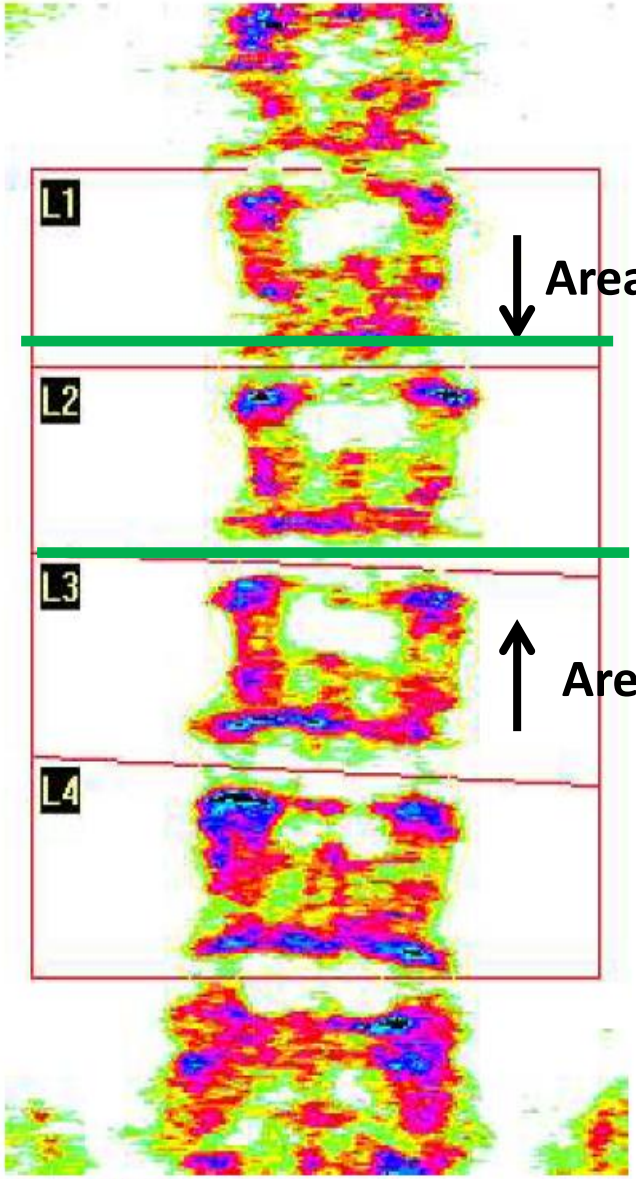


Image not for diagnostic use
116 x 140

Scan Information:

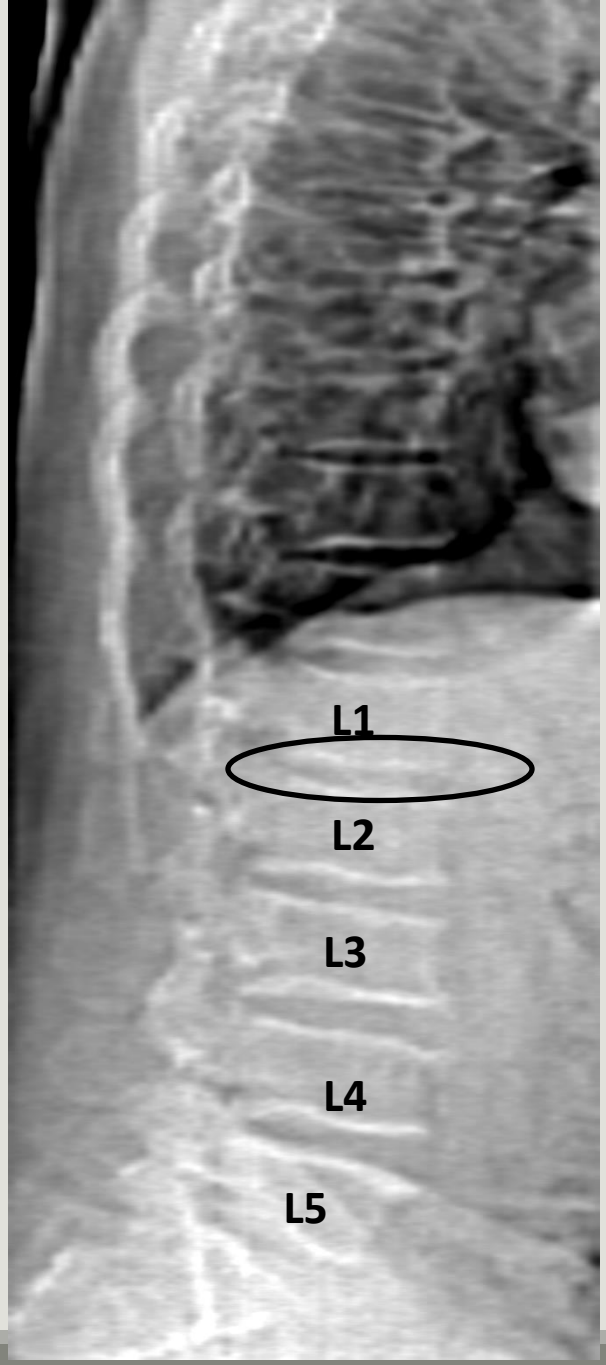
Scan Date: 28 December 2021 ID: A1228210T
Scan Type: f Lumbar Spine
Analysis: 28 December 2021 12:58 Version 13.6.0.7
Spine
Operator: Sh
Model: Horizon Wi (S/N 304687M)
Comment:

DXA Results Summary:

Region	Area (cm^2)	BMC (g)	BMD (g/cm^2)	T - score	PR (%)	Z - score	AM (%)
L1	17.28	16.69	0.966	-0.2	98	-0.1	99
L2	17.17	15.90	0.926	-0.9	90	-0.6	93
L3	19.09	19.48	1.020	-0.6	94	0.2	102
L4	19.64	22.44	1.142	0.7	108	1.4	116
Total	**73.18**	**74.50**	**1.018**	**-0.3**	**97**	**0.3**	**103**

Total BMD CV 1.0%

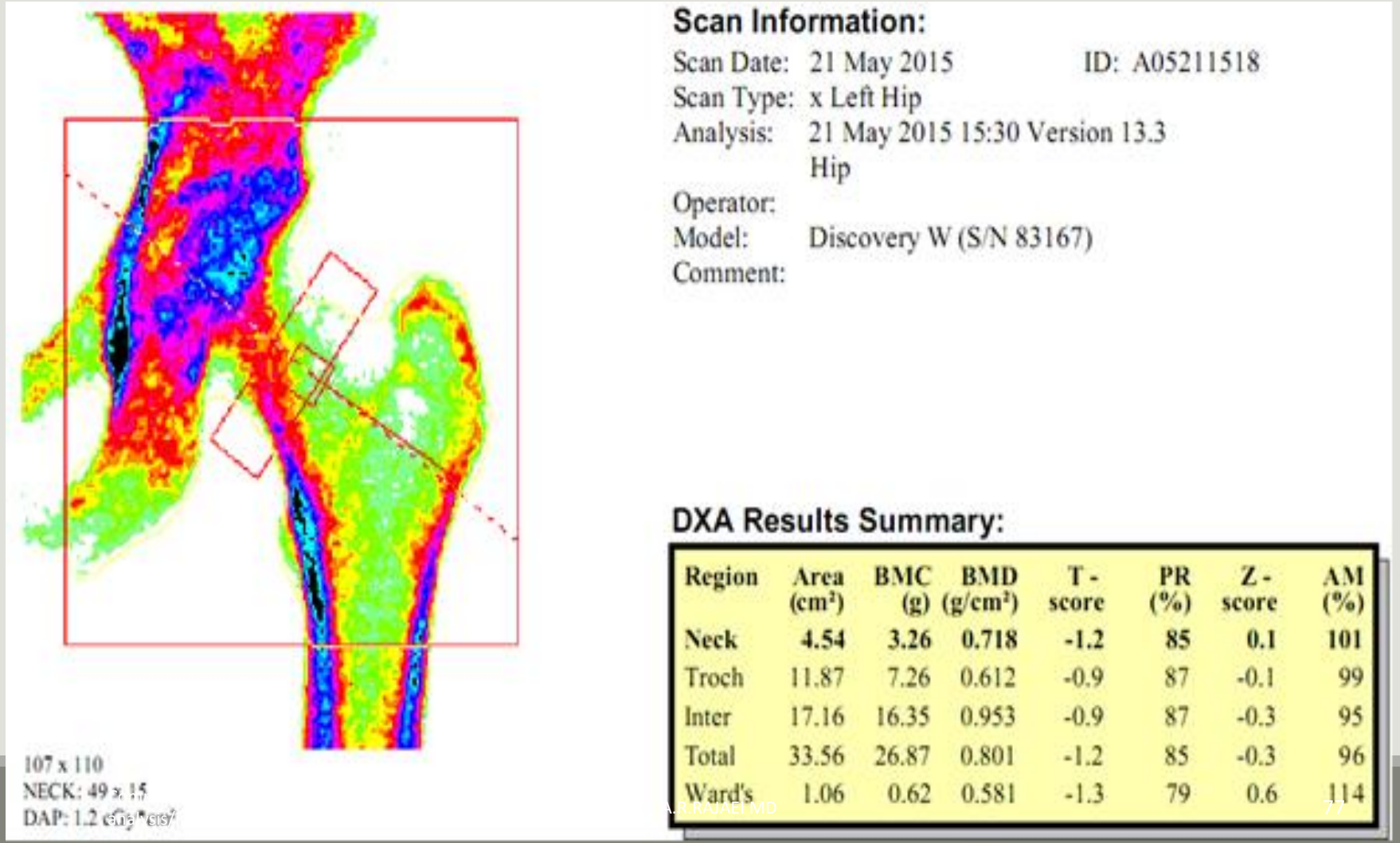
WHO Classification: Normal
Fracture Risk: Not Increased


L1
L2
L3
L4
L5

Area rules: ward < ½-1/3 neck area

Trochanter: F= 11 ± 3 M= 13 ± 3

Neck: F > 4.5 M > 5



Scan Information:

Scan Date: 21 May 2015 ID: A05211518
Scan Type: x Left Hip
Analysis: 21 May 2015 15:30 Version 13.3
Hip
Operator:
Model: Discovery W (S/N 83167)
Comment:

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	PR (%)	Z - score	AM (%)
Neck	**4.54**	**3.26**	**0.718**	**-1.2**	**85**	**0.1**	**101**
Troch	11.87	7.26	0.612	-0.9	87	-0.1	99
Inter	17.16	16.35	0.953	-0.9	87	-0.3	95
Total	33.56	26.87	0.801	-1.2	85	-0.3	96
Ward's	1.06	0.62	0.581	-1.3	79	0.6	114

Q10

[redacted]

Phone: +9888832864-6

Name: [redacted], azam
Patient ID: 3872647245
DOB: 24 August 1965

Sex: Female
Ethnicity: White
Menopause Age: 52

Height: 170.0 cm
Weight: 62.0 kg
Age: 57

Referring Physician:

123 x 130
NECK: 49 x 13
HAL: 117 mm

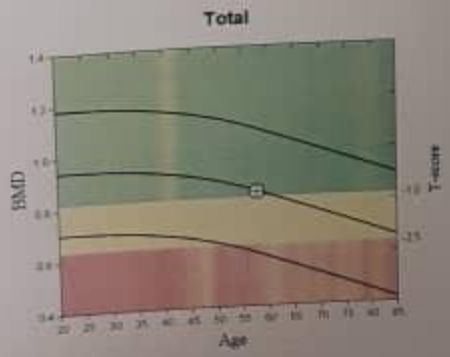
Scan Information:

Scan Date: 24 April 2023 ID: A0424230F
Scan Type: f Left Hip
Analysis: 24 April 2023 14:24 Version 13.6.1.3
Hip
Operator:
Model: Horizon Wi (S/N 305791M)
Comment:

DXA Results Summary:

Region	Area (cm^2)	BMC (g)	BMD (g/cm^2)	T-score	PR (%)	Z-score	AM (%)
Neck	4.32	3.44	0.797	-0.5	94	0.7	111
Troch	15.75	7.79	0.494	-2.1	70	-1.3	79
Inter	26.67	28.02	1.051	-0.3	96	0.3	104
Total	**46.73**	**39.25**	**0.840**	**-0.8**	**89**	**0.0**	**100**
Ward's	1.13	0.55	0.489	-2.1	67	-0.2	94

Total BMD CV 1.0%
WHO Classification: Normal



10-year Fracture Risk[1]

Major Osteoporotic Fracture	**5.5%**
Hip Fracture	**0.2%**

Reported Risk Factors:
US (Caucasian), Neck BMD=0.797, BMI=21.5

[1] FRAX® Version 3.08. Fracture probability calculated for an untreated patient. Fracture probability may be lower if the patient has received treatment.

Comment:

All treatment decisions require clinical judgment and consideration of individual patient factors, including patient preferences, comorbidities, previous drug use and risk factors not captured in the FRAX model (e.g. frailty, falls, vitamin D deficiency, increased bone turnover, interval significant decline in BMD).

T-score vs. White Female. Source:2012 BMDCS/NHANES White Female. Z-score vs. White Female. Source:2012 BMDCS/NHANES White Female

Step I: **Name:** probable

Sex: Female

Weight & Height: probable

Ethnicity: Incorrect(foonote: **NANHENS III** & ethnicity ***White***)

Step II: Above: ≥ 2 Cm

Below: ≥1.5 Cm (A > B) **Incorrect**

Sides: **Inner:** neck-ramus distance > 1 Cm, **visibility of obturator foramen** & no or low visibility of lesser trochanter

Outer: ≥ 1 Cm of soft tissue

Straightness: correct

Artifact: present(Red arrow)

All of them is correct except artifact & scan should be restarted.

[redacted]

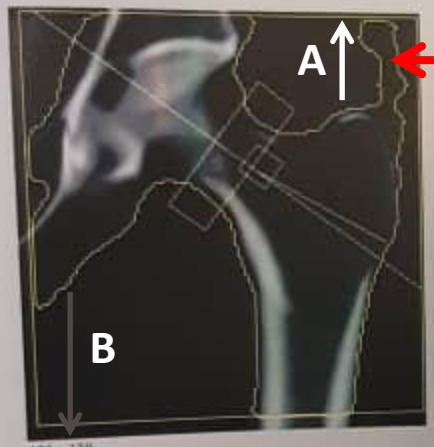
phone: +9888832864-6

Name: [redacted], azam
Patient ID: 3872647245
DOB: 24 August 1965

Sex: Female
Ethnicity: White
Menopause Age: 52

Height: 170.0 cm
Weight: 62.0 kg
Age: 57

Referring Physician:



123 x 130
NECK: 49 x 15
HAL: 117 mm

Scan Information:

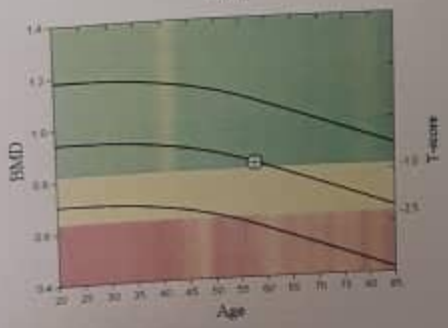
Scan Date: 24 April 2023 ID: A0424230F
Scan Type: f Left Hip
Analysis: 24 April 2023 14:24 Version 13.6.1.3
Hip
Operator:
Model: Horizon Wi (S/N 305791M)
Comment:

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T-score	PR (%)	Z-score	AM (%)
Neck	4.32	3.44	0.797	-0.5	94	0.7	111
Troch	15.75	7.79	0.494	-2.1	70	-1.3	79
Inter	26.67	28.02	1.051	-0.3	96	0.3	104
Total	**46.73**	**39.25**	**0.840**	**-0.8**	**89**	**0.0**	**100**
Ward's	1.13	0.55	0.489	-2.1	67	-0.2	94

Total BMD CV 1.0%
WHO Classification: Normal

Total



10-year Fracture Risk[1]

Major Osteoporotic Fracture	**5.5%**
Hip Fracture	**0.2%**

Reported Risk Factors:
US (Caucasian), Neck BMD=0.797, BMI=21.5

[1] FRAX® Version 3.08. Fracture probability calculated for an untreated patient. Fracture probability may be lower if the patient has received treatment.

Comment:

All treatment decisions require clinical judgment and consideration of individual patient factors, including patient preferences, comorbidities, previous drug use and risk factors not captured in the FRAX model (e.g. frailty, falls, vitamin D deficiency, increased bone turnover, interval significant decline in BMD).

T-score vs. White Female. Source:2012 BMDCS/NHANES White Female. Z-score vs. White Female. Source:2012 BMDCS/NHANES White Female

Step III: neck box replacement

4 characters:

- should not be enter to head & GT(white arrows)
- **Inner border line continues should be crossed of ramus or very near to ramus(Red arrow)**
- Outer border line continues do not enter to GT(Green arrow)
- Neck box should be near to ward box(Green cycle)

Neck box should be moved to inner side

phone: +9888832864-6

Name: [redacted] azam
Patient ID: 3872647245
DOB: 24 August 1965

Sex: Female
Ethnicity: White
Menopause Age: 52

Referring Physician:

123 x 130
NECK: 49 x 15
HAL: 117 mm

Scan Information:

Scan Date: 24 April 2023
Scan Type: f Left Hip
Analysis: 24 April 2023 14:24 W
Hip
Operator:
Model: Horizon Wi (S/N 3057
Comment:

DXA Results Summary:

Region	Area (cm^2)	BMC (g)	BMD (g/cm^2)
Neck	4.32	3.44	0.797
Troch	15.75	7.79	0.494
Inter	26.67	28.02	1.051
Total	**46.73**	**39.25**	**0.840**
Ward's	1.13	0.55	0.489

Total BMD CV 1.0%

Step IV: Area: Neck: F ≥ 4.5 & M≥ 5

Greater trochanter: F 11 ± 3 & M 13 ± 3

Neck/ward ratio: ≥ 3

All relatively GT is higher

Step V: lower T/Z score in neck or total region.

Total: T-score & normal

If all of 4 steps are correct the result is conclusive

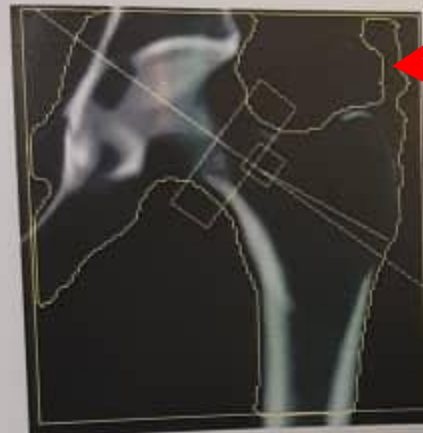
phone: +9888832864-6

Name: [redacted], azam
Patient ID: 3872647245
DOB: 24 August 1965

Sex: Female
Ethnicity: White
Menopause Age: 52

Height: 170.0 cm
Weight: 62.0 kg
Age: 57

Referring Physician:



123 x 130
NECK: 49 x 15
HAL: 117 mm

Scan Information:

Scan Date: 24 April 2023 ID: A0424230F
Scan Type: f Left Hip
Analysis: 24 April 2023 14:24 Version 13.6.1.3
Hip
Operator:
Model: Horizon Wi (S/N 305791M)
Comment:

Trochanter area: 8-14

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	PR (%)	Z - score	AM (%)
Neck	4.32	3.44	0.797	-0.5	94	0.7	111
Troch	15.75	7.79	0.494	-2.1	70	-1.3	79
Inter	26.67	28.02	1.051	-0.3	96	0.3	104
Total	**46.73**	**39.25**	**0.840**	**-0.8**	**89**	**0.0**	**100**
Ward's	1.13	0.55	0.489	-2.1	67	-0.2	94

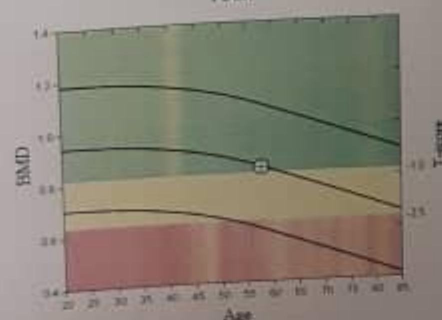
Total BMD CV 1.0%
WHO Classification: Normal

10-year Fracture Risk[1]

Major Osteoporotic Fracture 5.5%
Hip Fracture 0.2%
Reported Risk Factors:
US (Caucasian), Neck BMD=0.797, BMI=21.5

[1] FRAX® Version 3.08. Fracture probability calculated for an untreated patient. Fracture probability may be lower if the patient has received treatment.

Total

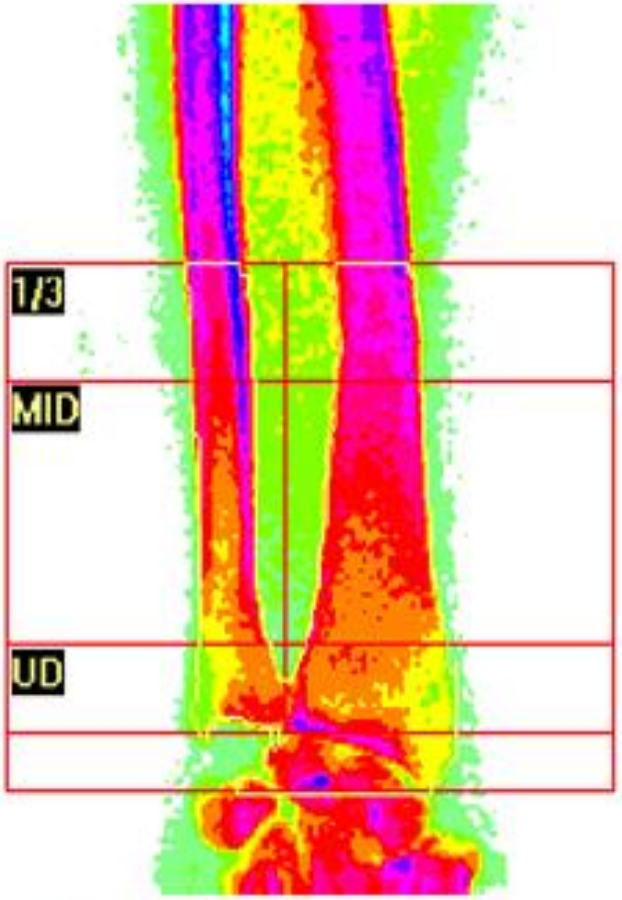


T-score vs. White Female. Source:2012 BMDCS/NHANES White Female. Z-score vs. White Female. Source:2012 BMDCS/NHANES White Female.

Comment:
All treatment decisions require clinical judgment and consideration of individual patient factors, including patient preferences, comorbidities, previous drug use and risk factors not captured in the FRAX model (e.g. frailty, falls, vitamin D deficiency, increased bone turnover, interval significant decline in BMD).

HOLOGIC®

Area: 1/3 of radius > 2 & Total: >12



228 x 91
DAP: 0.8 cGy*cm²

Scan Information:

Scan Date: 10 December 2013 ID: A12101311
Scan Type: a R.Forearm
Analysis: 10 December 2013 14:11 Version 13.3
Right Forearm
Operator:
Model: Discovery W (S/N 83167)
Comment:

DXA Results Summary:

Radius	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	PR (%)	Z - score	AM (%)
1/3	2.85	1.71	0.600	-1.6	86	-0.8	92
MID	7.82	3.77	0.482	-2.3	79	-1.5	85
UD	4.31	1.65	0.383	-1.0	86	-0.5	93
Total	14.98	7.13	0.476	-1.9	82	-1.2	88

Total BMD CV 1.0%

	Area	Others
Spine	L1<L2<L3<L4	BMD: L1<L2<L3>L4
Hip	Neck: F ≥ 4.5 & M ≥ 5 GT: F= 11 ± 3 & M= 13 ± 3 Neck/ward = 2-3/1	
Forearm	1/3 > 2 cm^2 Total > 10 cm^2	
Whole	Changes based age	

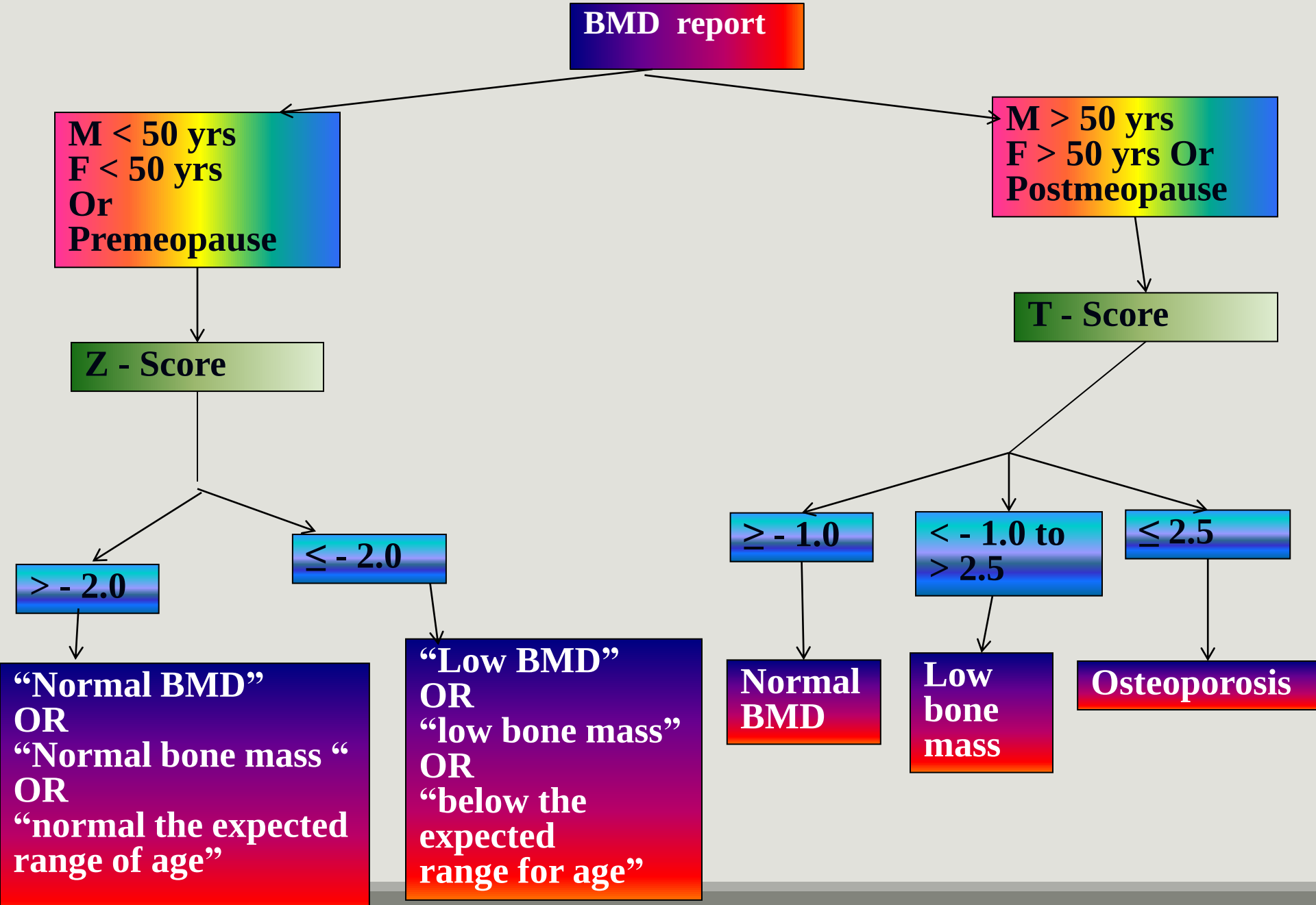
5- selection of best region of each scan

Based on results.

At spine, at first four vertebrae or L1-4 is better then three near vertebrae such as L1-3 or L2-4 & finally the adjacent vertebrae such as L1-2, L2-3 & L3-4 can be used and we cannot use of one vertebra.

At hip: the lowest score(T or Z) between neck & total.

At forearm: 1/3 of radius is best region.


BMD report
M < 50 yrs
F < 50 yrs
Or
Premeopause
M > 50 yrs
F > 50 yrs Or
Postmeopause
Z - Score
T - Score
> - 2.0
≤ - 2.0
≥ - 1.0
< - 1.0 to
> 2.5
≤ 2.5
“Normal BMD”
OR
“Normal bone mass “
OR
“normal the expected
range of age”
“Low BMD”
OR
“low bone mass”
OR
“below the
expected
range for age”
Normal
BMD
Low
bone
mass
Osteoporosis

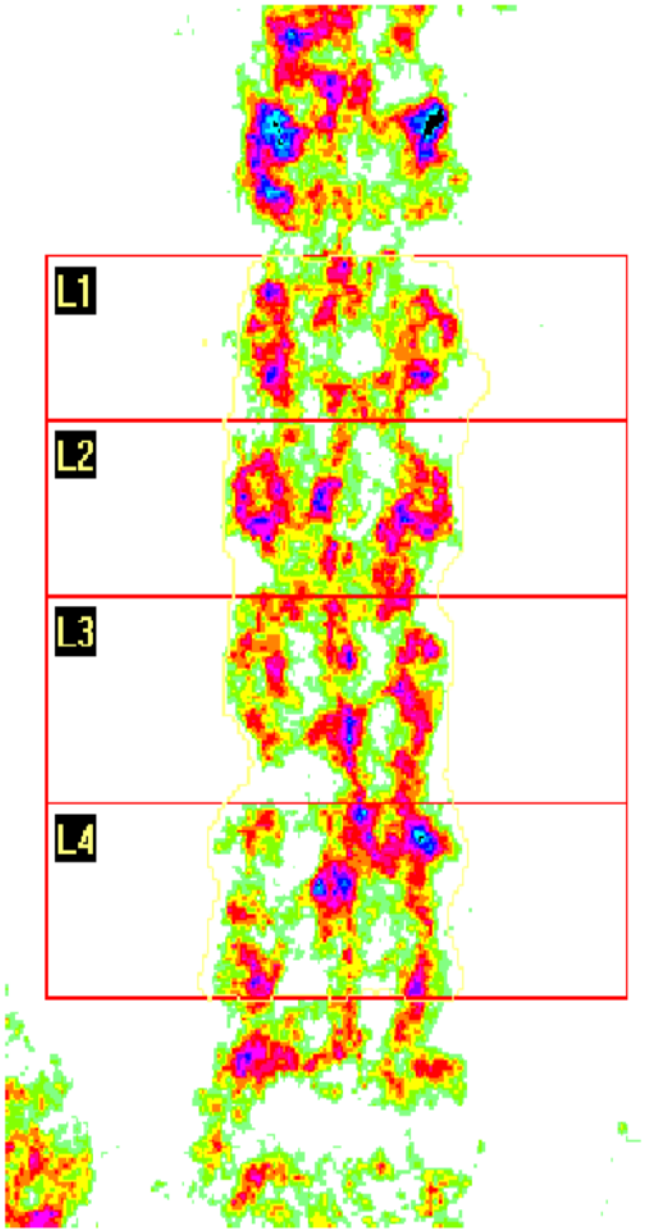


Image not for diagnostic use
116 x 123
DAP: 1.6 cGy*cm²

Scan Information:

Scan Date: 21 June 2016 ID: A06211608
Scan Type: x Lumbar Spine
Analysis: 21 June 2016 09:47 Version 13.3
Spine
Operator:
Model: Discovery W (S/N 83167)
Comment:

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	PR (%)	Z - score	AM (%)
L1	12.53	12.08	0.963	-0.2	97	0.3	104
L2	13.85	13.91	1.004	-0.2	98	0.4	105
L3	15.11	14.36	0.950	-1.2	88	-0.6	94
L4	16.56	16.46	0.994	-0.6	94	0.1	101
Total	**58.05**	**56.81**	**0.979**	**-0.6**	**93**	**0.0**	**100**

Total BMD CV 1.0%
WHO Classification: Normal
Fracture Risk: Not Increased

DXA Results Summary:

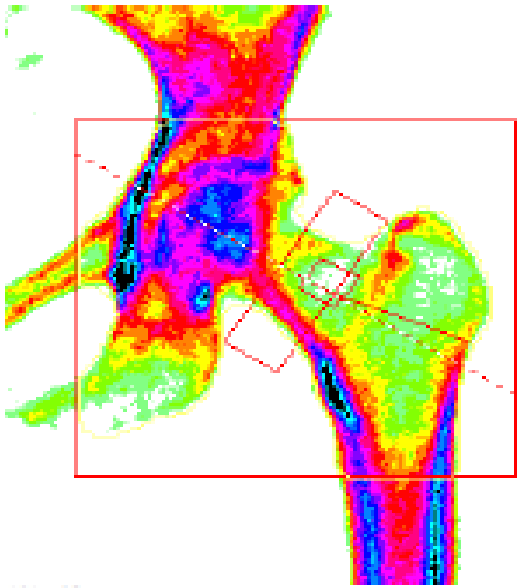
Region	Area (cm^2)	BMC (g)	BMD (g/cm^2)	T - score	PR (%)	Z - score	AM (%)
L1	12.53	12.08	0.963	-0.2	97	0.3	104
L2	13.85	13.91	1.004	-0.2	98	0.4	105
L3	15.11	14.36	0.950	-1.2	88	-0.6	94
L4	16.56	16.46	0.994	-0.6	94	0.1	101
L1-L2	26.38	25.98	0.985	0.1	101	0.6	108
L1,L3	27.64	26.44	0.956	-0.5	94	0.1	101
L1,L4	29.09	28.54	0.981	-0.5	95	0.1	101
L2-L3	28.96	28.27	0.976	-0.7	92	-0.1	99
L2,L4	30.40	30.37	0.999	-0.7	93	-0.1	99
L3-L4	31.67	30.83	0.973	-1.2	88	-0.5	95
L1-L3	41.49	40.34	0.972	-0.4	96	0.2	102
L1-L2,L4	42.94	42.45	0.989	-0.4	96	0.2	102
L1,L3-L4	44.20	42.90	0.971	-0.7	92	-0.1	99
L2-L4	45.51	44.73	0.983	-0.9	91	-0.2	98
L1-L4	58.05	56.81	0.979	-0.6	93	0.0	100

Name: [redacted] Simin
Patient ID: 92.02.254
DOB: 14 January 1952

Sex: Female
Ethnicity: White

Height: 151.0 cm
Weight: 45.0 kg
Age: 61

Referring Physician: Dr.Mirbaha



101 x 95
NECK: 48 x 15
DAP: 1.2 cGy*cm²

Scan Information:

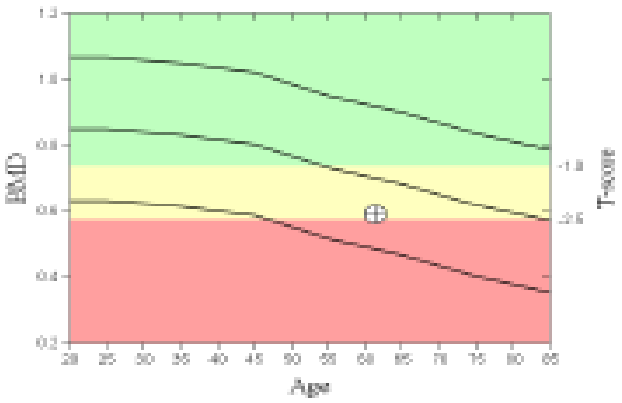
Scan Date: 06 May 2013 ID: A0506130B
Scan Type: x Left Hip
Analysis: 06 May 2013 08:44 Version 13.3
Hip
Operator:
Model: Discovery W (S/N 83167)
Comment:

DXA Results Summary:

Region	Area (cm^2)	BMC (g)	BMD (g/cm^2)	T - score	PR (%)	Z - score	AM (%)
Neck	4.25	2.51	0.591	-2.3	70	-1.0	84
Troch	8.94	5.37	0.601	-1.0	85	-0.1	99
Inter	13.45	12.11	0.900	-1.3	82	-0.5	92
Total	26.64	20.00	0.750	-1.6	80	-0.6	92
Ward's	1.13	0.42	0.371	-3.1	50	-1.1	75

Total BMD CV 1.0%
WHO Classification: Osteopenia

Neck



10-year Fracture Risk[1]

Major Osteoporotic Fracture 1.3%
Hip Fracture 0.3%
Reported Risk Factors:
Turkey, T-score(WHO)=-2.2, BMI=19.7

[1] FRAX® Version 3.01. Fracture probability calculated for an untreated patient. Fracture probability may be lower if the patient has received treatment.

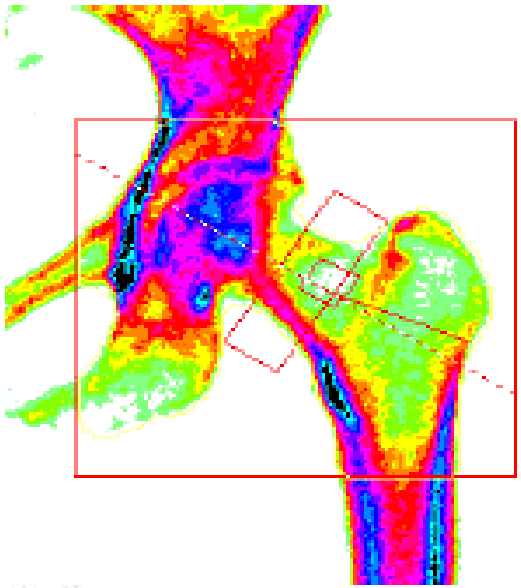
Comment:

Name: [redacted], Simin
Patient ID: 92.02.254
DOB: 14 January 1952

Sex: Female
Ethnicity: White

Height: 151.0 cm
Weight: 45.0 kg
Age: 61

Referring Physician: Dr.Mirbaha



101 x 95
NECK: 48 x 15
DAP: 1.2 cGy*cm²

Scan Information:

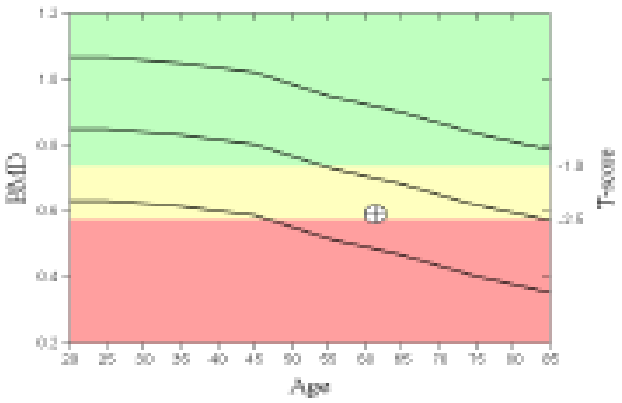
Scan Date: 06 May 2013 ID: A0506130B
Scan Type: x Left Hip
Analysis: 06 May 2013 08:44 Version 13.3
Hip
Operator:
Model: Discovery W (S/N 83167)
Comment:

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T-score	PR (%)	Z-score	AM (%)
Neck	4.25	2.51	0.591	-2.3	70	-1.0	84
[illegible]					85	-0.1	99
Inter	13.45	12.11	0.900	-1.3	82	-0.5	92
Total	26.64	20.00	0.750	-1.6	80	-0.6	92
Ward's	1.13	0.42	0.371	-3.1	50	-1.1	75

Total BMD CV 1.0%
WHO Classification: Osteopenia

Neck



10-year Fracture Risk[1]

Major Osteoporotic Fracture	1.3%
Hip Fracture	0.3%

Reported Risk Factors:
Turkey, T-score(WHO)=-2.2, BMI=19.7

[1] FRAX® Version 3.01. Fracture probability calculated for an untreated patient. Fracture probability may be lower if the patient has received treatment.

Comment:

Types of comparison

Same Center & Same Device (SCSD)

Same center & Different Devices(SCDD)

Different Centers & Same Devices(DCSD)

Different Centers & Different Devices(DCDD)

Same Center & Same Device (SCSD)

Step 1: check & control the ID of patient esp. height & weight because may be changed.

CAUTION:

If any problem or technical errors present in first and or second scan, we can change it.

Same Center & Same Device (SCSD): Step 2

Step 2: good scan criteria

Its very important that take the scan same as the first as much as possible except artifacts if present in first scan.

CAUTION:

If any problem or technical errors present in first scan, we cannot change it, therefore keeping of good scan criteria on first scan is very vital.

Second scan shape should be very similar to first scan

Name: Ataran, Masoomeh
Patient ID: 99.02.36
DOB: 14 March 1945

Sex: Female
Ethnicity: Caucasian

Height: 160.0 cm
Weight: 68.0 kg
Age: 73

Referring Physician: Dr.Rajaei

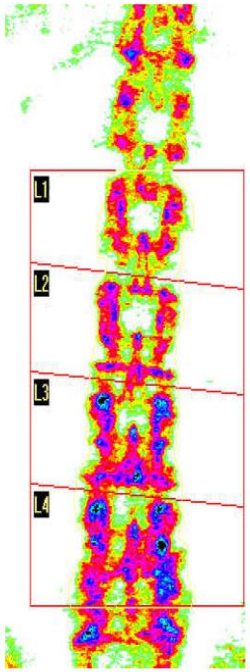


Image not for diagnostic use
113 x 133

Scan Information:

Scan Date: 08 May 2018 ID: A0508180C
Scan Type: f Lumbar Spine
Analysis: 08 May 2018 08:43 Version 13.3 Spine
Operator: Sh
Model: Discovery W (S/N 83167)
Comment:

DXA Results Summary:

Region	Area (cm^2)	BMC (g)	BMD (g/cm^2)	T-score	PR (%)	Z-score	AM (%)
L1	14.74	14.29	0.970	-0.2	98	1.8	127
L2	15.12	16.02	1.060	0.3	103	2.5	136
L3	17.40	20.63	1.185	0.9	109	3.3	144
L4	20.80	25.54	1.228	1.5	116	4.0	155
Total	**68.06**	**76.48**	**1.124**	**0.7**	**107**	**3.0**	**141**

Total BMD CV 1.0%
WHO Classification: Normal
Fracture Risk: Not Increased

Name: Ataran, Masoomeh
Patient ID: 99.02.36
DOB: 14 March 1945

Sex: Female
Ethnicity: Caucasian

Height: 161.0 cm
Weight: 66.0 kg
Age: 75

Referring Physician: Dr.Rajaei

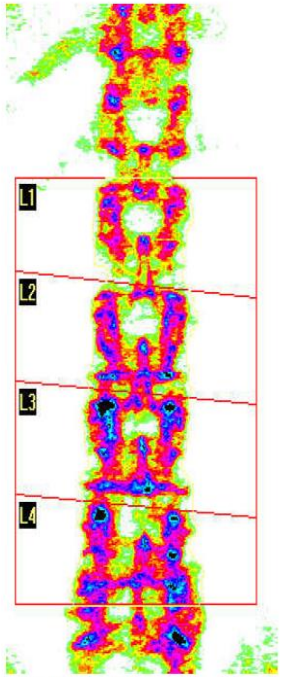


Image not for diagnostic use
113 x 129

Scan Information:

Scan Date: 29 April 2020 ID: A04292004
Scan Type: f Lumbar Spine
Analysis: 29 April 2020 10:01 Version 13.6.0.2 Spine
Operator: NB
Model: Discovery W (S/N 83167)
Comment:

DXA Results Summary:

Region	Area (cm^2)	BMC (g)	BMD (g/cm^2)	T-score	PR (%)	Z-score	AM (%)
L1	14.06	12.92	0.919	-0.6	93	1.5	122
L2	15.32	16.34	1.066	0.3	104	2.7	139
L3	16.95	19.20	1.133	0.4	105	3.0	140
L4	17.14	19.72	1.151	0.8	108	3.4	148
Total	**63.47**	**68.19**	**1.074**	**0.2**	**103**	**2.7**	**137**

Total BMD CV 1.0%
WHO Classification: Normal
Fracture Risk: Not Increased

Second scan shape should be very similar to first scan

Name: Ataran, Masoomeh
Patient ID: 99.02.36
DOB: 14 March 1945

Sex: Female
Ethnicity: Caucasian

Height: 160.0 cm
Weight: 68.0 kg
Age: 73

Referring Physician: Dr.Rajaei

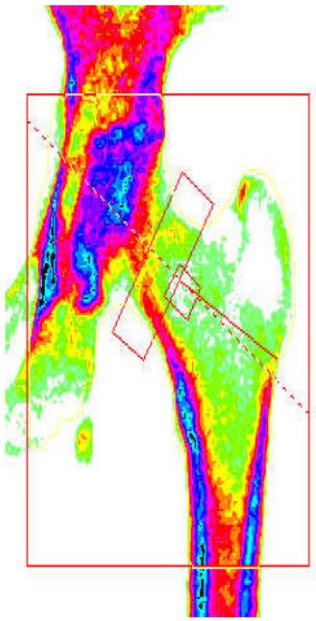


Image not for diagnostic use
110 x 119
NECK: 49 x 15

Scan Information:

Scan Date: 08 May 2018 ID: A0508180B
Scan Type: x Left Hip
Analysis: 08 May 2018 08:42 Version 13.3
Hip
Operator: Sh
Model: Discovery W (S/N 83167)
Comment:

DXA Results Summary:

Region	Area (cm^2)	BMC (g)	BMD (g/cm^2)	T-score	PR (%)	Z-score	AM (%)
Neck	**4.90**	**3.53**	**0.722**	**-1.1**	**85**	**0.8**	**115**
Troch	13.94	7.21	0.518	-1.8	74	-0.4	93
Inter	23.17	24.50	1.057	-0.3	96	1.2	121
Total	42.00	35.24	0.839	-0.8	89	0.8	114
Ward's	1.19	0.57	0.474	-2.2	65	0.5	114

Name: Ataran, Masoomeh
Patient ID: 99.02.36
DOB: 14 March 1945

Sex: Female
Ethnicity: Caucasian

Height: 161.0 cm
Weight: 66.0 kg
Age: 75

Referring Physician: Dr.Rajaei

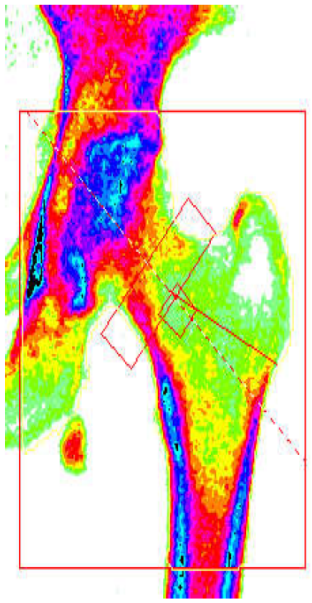
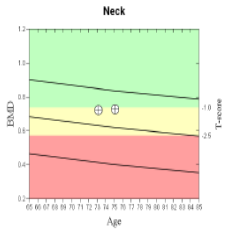


Image not for diagnostic use
106 x 119
NECK: 48 x 15
HAL: 110 mm

Scan Information:

Scan Date: 29 April 2020 ID: A04292003
Scan Type: x Left Hip
Analysis: 29 April 2020 09:59 Version 13.6.0.2
Hip
Operator: NB
Model: Discovery W (S/N 83167)
Comment:



T-score vs. White Female. Source:2012 BMDCS/NHANES White Female. Z-score vs. White Female. Source:2012 BMDCS/NHANES White Female.

FRAX® WHO Fracture Risk Assessment Tool

10-year Fracture Risk[1]

Major Osteoporotic Fracture 10%
Hip Fracture 1.7%
Reported Risk Factors:
US (Caucasian), Neck BMD=0.727, BMI=25.5

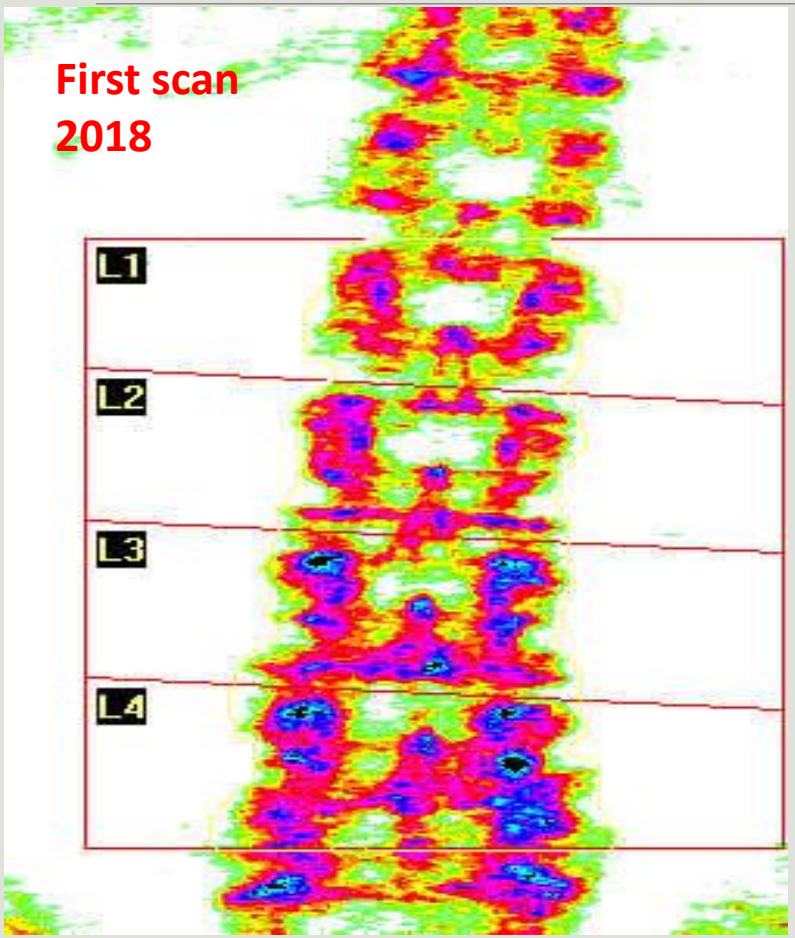
Same Center & Same Device (SCSD): Step 3= ROI insertion

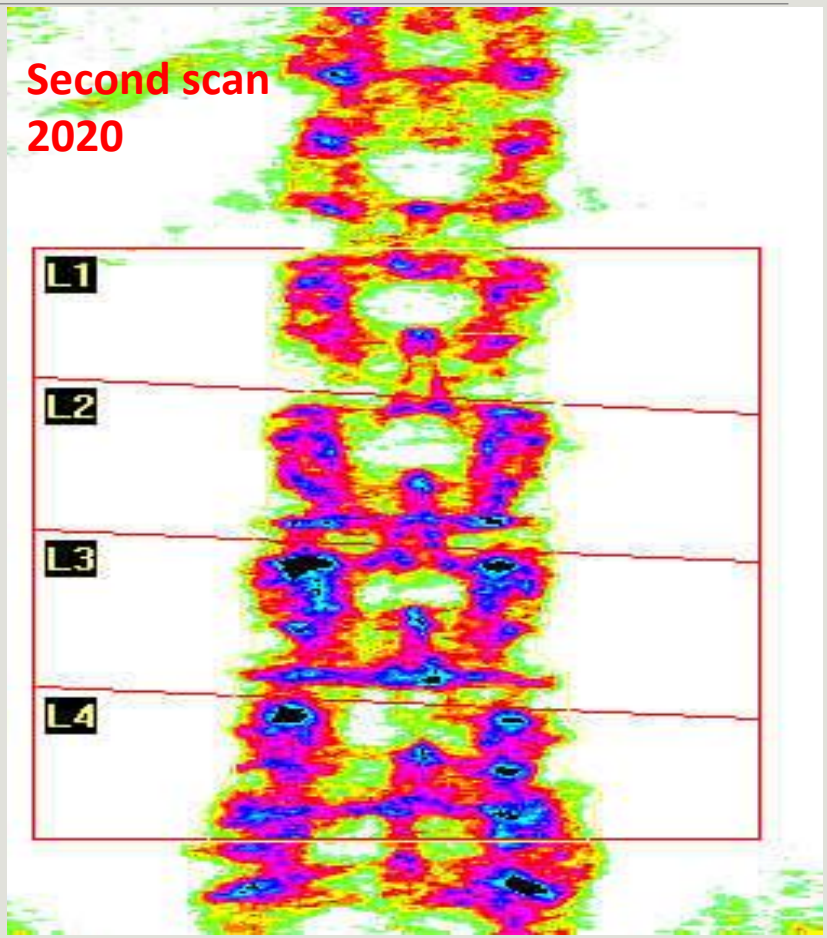
Insertion of ROI boxes on correct region on both scan is very crucial.

CAUTION:

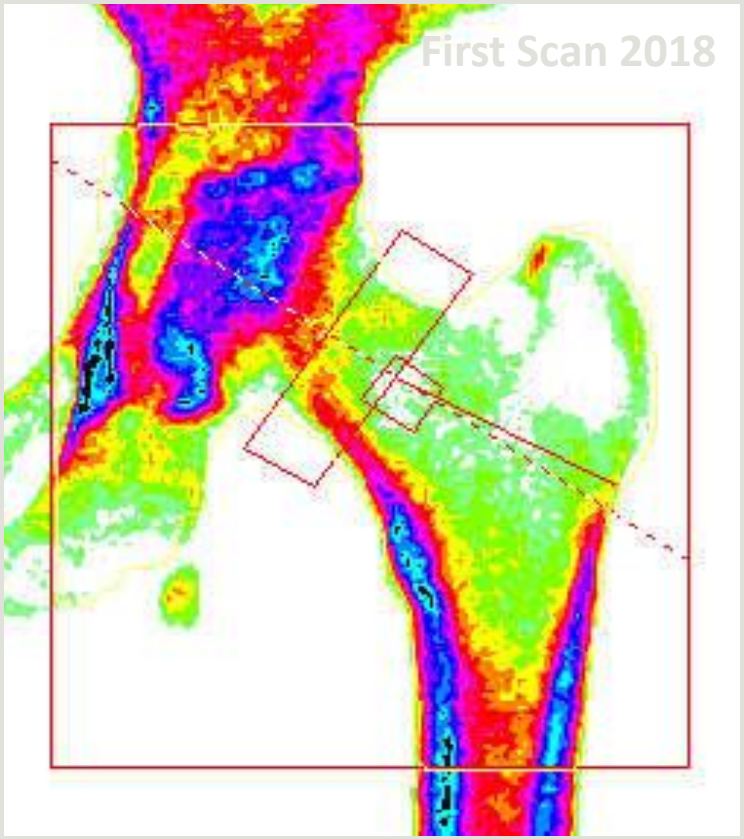
If any problem or technical errors present in first and or second scan, we can change it.

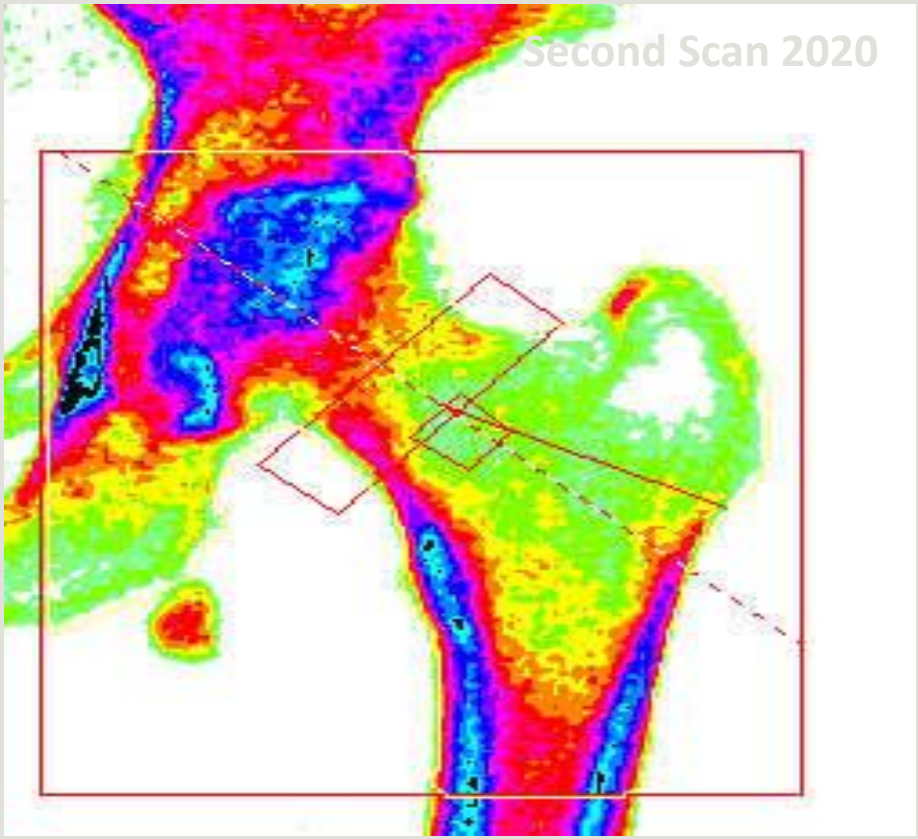
On spine scan: labeling of vertebra is should be similar.





On hip scan: neck box insertion is should be similar.





Where is the best region for neck box:

The neck box should be replaced on the neck area as that:

1-Not passes the trochanter or head regions
2- The inner side of box if continues in lower part should be crosses the inf. Ramus
3- The outer side of box if continues should not crosses trochanter region in upper part.

Name: A[redacted], Narjes
Patient ID: 99.03.169
DOB: 14 March 1948

Sex: Female
Ethnicity: Caucasian

Height: 152.0 cm
Weight: 66.0 kg
Age: 70

Referring Physician: Dr.Rajaei

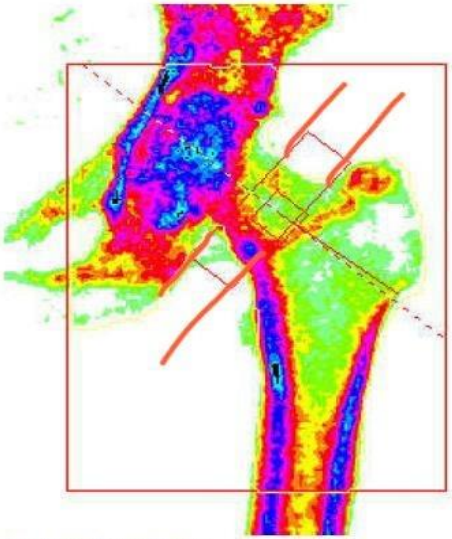


Image not for diagnostic use
100 x 124

Scan Information:

Scan Date: 10 April 2018 ID: A04101809
Scan Type: x Left Hip
Analysis: 10 April 2018 09:43 Version 13.3
Hip
Operator: Sh
Model: Discovery W (S/N 83167)
Comment:

XIII

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	PR (%)	Z - score	AM (%)
Neck	4.54	3.45	0.760	-0.8	90	1.0	117
Troch	9.74	5.72	0.587	-1.1	83	0.2	103
Inter	21.56	20.81	0.965	-0.9	88	0.4	107
Total	**35.84**	**29.98**	**0.836**	**-0.9**	**89**	**0.6**	**110**
Ward's	1.33	0.78	0.586	-1.3	80	1.3	134

Name: Azimi Badrabadi, Narjes
Patient ID: 99.03.169
DOB: 14 March 1948

Sex: Female
Ethnicity: Caucasian

Height: 151.0 cm
Weight: 64.0 kg
Age: 72

Referring Physician: Dr.Rajaei

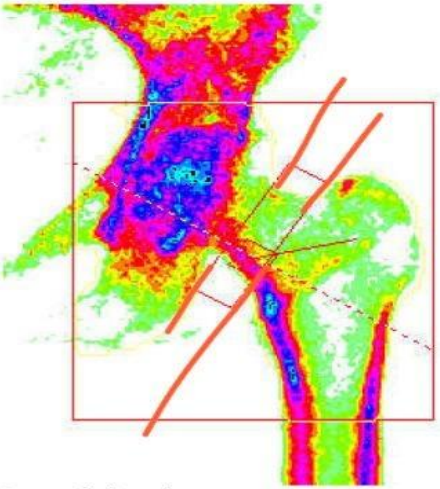


Image not for diagnostic use
96 x 102
NECK: 48 x 12
HAL: 92 mm

Scan Information:

Scan Date: 15 June 2020 ID: A0615200J
Scan Type: x Left Hip
Analysis: 15 June 2020 09:53 Version 13.6.0.2
Hip
Operator:
Model: Discovery W (S/N 83167)
Comment:

XIV

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	PR (%)	Z - score	AM (%)
Neck	3.64	2.84	0.780	-0.6	92	1.3	123
Troch	6.37	4.48	0.703	0.0	100	1.4	126
Inter	19.79	15.92	0.804	-1.9	73	-0.5	91
Total	**29.81**	**23.25**	**0.780**	**-1.3**	**83**	**0.3**	**105**
Ward's	1.04	1.05	1.010	2.4	138	5.0	240

Total BMD CV 1.0%
WHO Classification: Osteopenia

Same Center & Same Device (SCSD): Step 4: rules of region

Determination of total area for comparison:

For spine scans:

Selection of which vertebrae keeps the below rules on first scan:

Area: L1>L2>L3>L4

BMD: L1>L2>L3<L4

- Selection of which vertebrae keeps the below rules on second scan:

Area: L1>L2>L3>L4

BMD: L1>L2>L3<L4

Same Center & Same Device (SCSD): Step 4: rules of region

If both scans have same region of kept rules for example both shows L1-4 or L2-4, L1-3, L3-4 and etc. we can g to later stage of comparison, but if on first scan 2 vertebrae for example L2-3 is suitable & on second scan 3 vertebrae for example L2-4 was suitable, we use L2-3 for comparison.

After selection of kept rules region, we should see the total area of two scan and as a rule the difference of these should not above 2 cm.

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	PR (%)	Z - score	AM (%)
L1	9.95	7.17	0.720	-2.5	73	-0.6	92
L2	10.52	7.52	0.714	-2.9	69	-0.8	89
L3	11.35	7.89	0.695	-3.5	64	-1.3	82
L4	13.70	10.53	0.769	-2.7	72	-0.4	95
L1-L2	20.48	14.69	0.717	-2.4	73	-0.4	94
L1,L3	21.31	15.06	0.707	-2.8	70	-0.7	90
L1,L4	23.65	17.70	0.748	-2.6	72	-0.5	93
L2-L3	21.88	15.41	0.704	-3.2	67	-1.1	86
L2,L4	24.22	18.05	0.745	-3.0	69	-0.8	89
L3-L4	25.05	18.42	0.735	-3.3	67	-1.1	86
L1-L3	31.83	22.58	0.709	-2.8	70	-0.7	90
L1-L2,L4	34.18	25.22	0.738	-2.7	71	-0.6	92
L1,L3-L4	35.01	25.5	0.731	-2.9	69	-0.8	89
L2-L4	35.58	25.94	0.729	-3.2	68	-1.0	87
L1-L4	**45.53**	**33.11**	**0.727**	**-2.9**	**69**	**-0.8**	**89**

VIII

Total BMD CV 1.0%

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	PR (%)	Z - score	AM (%)
L1	9.53	6.58	0.691	-2.7	70	-0.7	90
L2	10.96	7.59	0.693	-3.0	67	-0.8	88
L3	11.41	7.09	0.621	-4.2	57	-1.9	75
L4	13.81	10.61	0.768	-2.7	72	-0.3	96
L1-L2	20.48	14.17	0.692	-2.6	71	-0.5	92
L1,L3	20.94	15.67	0.653	-3.3	64	-1.1	84
L1,L4	23.34	17.19	0.736	-2.7	71	-0.5	93
L2-L3	22.37	14.68	0.656	-3.7	62	-1.4	81
L2,L4	24.77	18.19	0.735	-3.1	68	-0.8	89
L3-L4	25.23	17.70	0.701	-3.6	64	-1.3	83
L1-L3	31.90	21.26	0.666	-3.2	65	-1.0	86
L1-L2,L4	34.29	24.77	0.722	-2.8	70	-0.6	91
L1,L3-L4	34.75	24.28	0.699	-3.2	66	-1.0	87
L2-L4	36.18	25.28	0.699	-3.5	65	-1.1	85
L1-L4	**45.71**	**31.86**	**0.697**	**-3.2**	**67**	**-0.9**	**87**

X

Total BMD CV 1.0%

Same Center & Same Device (SCSD): Step 4: rules of region

But for hip region, the only region can be used for comparison is TOTAL, on special cases the trochanter or body may be used but never ever uses of neck for comparison.

On forearm region, comparison should be done based on TOTAL not 1/3 or 33%.

Name: Azimi Badrabadi, Narjes
Patient ID: 99.03.169
DOB: 14 March 1948

Sex: Female
Ethnicity: Caucasian

Height: 151.0 cm
Weight: 64.0 kg
Age: 72

Referring Physician: Dr.Rajaei

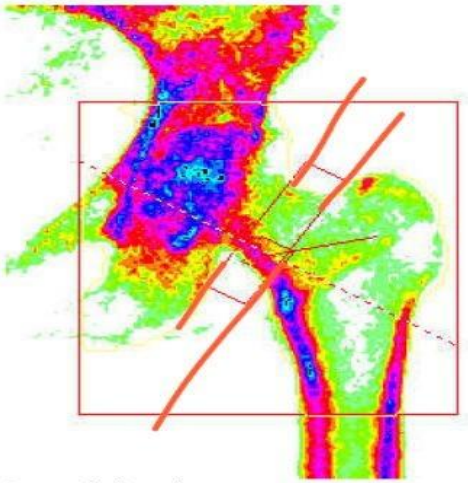


Image not for diagnostic use
96 x 102
NECK: 48 x 12
HAL: 92 mm

Scan Information:

Scan Date: 15 June 2020 ID: A0615200J
Scan Type: x Left Hip
Analysis: 15 June 2020 09:53 Version 13.6.0.2
Hip
Operator:
Model: Discovery W (S/N 83167)
Comment:

XIV

DXA Results Summary:

Region	Area (cm^2)	BMC (g)	BMD (g/cm^2)	T - score	PR (%)	Z - score	AM (%)
Neck	3.64	2.84	0.780	-0.6	92	1.3	123
Troch	6.37	4.48	0.703	0.0	100	1.4	126
Inter	19.79	15.92	0.804	-1.9	73	-0.5	91
Total	**29.81**	**23.25**	**0.780**	**-1.3**	**83**	**0.3**	**105**
Ward's	1.04	1.05	1.010	2.4	138	5.0	240

Total BMD CV 1.0%
WHO Classification: Osteopenia

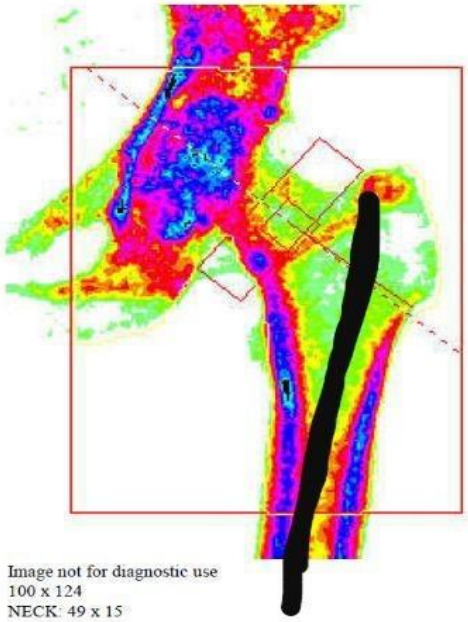


Image not for diagnostic use
100 x 124
NECK: 49 x 15

Scan Information:

Scan Date: 10 April 2018 ID: A04101809
Scan Type: x Left Hip
Analysis: 10 April 2018 09:43 Version 13.3
Hip
Operator: Sh
Model: Discovery W (S/N 83167)
Comment:

XI

DXA Results Summary:

Region	Area (cm^2)	BMC (g)	BMD (g/cm^2)	T - score	PR (%)	Z - score	AM (%)
Neck	4.54	3.45	0.760	-0.8	90	1.0	117
Troch	9.74	5.72	0.587	-1.1	83	0.2	103
Inter	21.56	20.81	0.965	-0.9	88	0.4	107
Total	**35.84**	**29.98**	**0.836**	**-0.9**	**89**	**0.6**	**110**
Ward's	1.33	0.78	0.586	-1.3	80	1.3	134

Total BMD CV 1.0%
WHO Classification: Normal

Tehran, Iran

Telephone: 02122872423

Name: Azimi Badrabadi, Narjes	Sex: Female	Height: 152.0 cm
Patient ID: 99.03.169	Ethnicity: Caucasian	Weight: 66.0 kg
DOB: 14 March 1948		Age: 70

Referring Physician: Dr.Rajaei

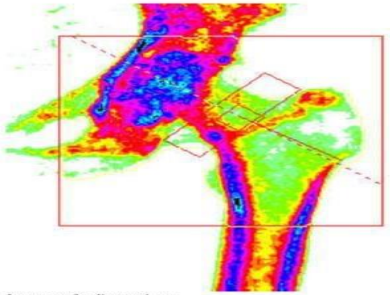


Image not for diagnostic use
100 x 102
NECK: 49 x 15
HAL: 90 mm

Scan Information:

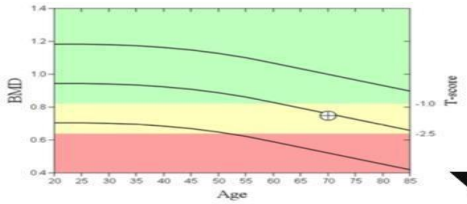
Scan Date: 10 April 2018 ID: A04101809
Scan Type: x Left Hip
Analysis: 30 July 2020 11:16 Version 13.6.0.2
Hip
Operator: Sh
Model: Discovery W (S/N 83167)
Comment:

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	PR (%)	Z - score	AM (%)
Neck	5.60	3.83	0.684	-1.5	81	0.3	105
Troch	9.65	5.67	0.587	-1.1	84	0.2	103
Inter	15.85	13.75	0.868	-1.5	79	-0.2	96
Total	**31.10**	**23.25**	**0.748**	**-1.6**	**79**	**-0.1**	**99**
Ward's	1.33	0.77	0.581	-1.3	79	1.2	133

Total BMD CV 1.0%
WHO Classification: Osteopenia

Total



10-year Fracture Risk[1]

Major Osteoporotic Fracture	**9.8%**
Hip Fracture	**1.4%**

Reported Risk Factors:
US (Caucasian), Neck BMD=0.684, BMI=28.6

[1] FRAX® Version 3.08. Fracture probability calculated for an untreated patient. Fracture probability may be lower if the patient has received treatment.

XVI

Comments:
All treatment decisions require clinical judgment and consideration of individual patient factors, including patient preferences, comorbidities, previous drug use and risk factors not captured in the FRAX model (e.g. frailty, falls, vitamin D deficiency, increased bone turnover, interval significant decline in BMD).

T-score vs. White Female. Source:2012 BMDCS/NHANES White Female. Z-score vs. White Female. Source:2012 BMDCS/NHANES White Female.

0 cm
kg

Referring Physician: Dr.Rajaei

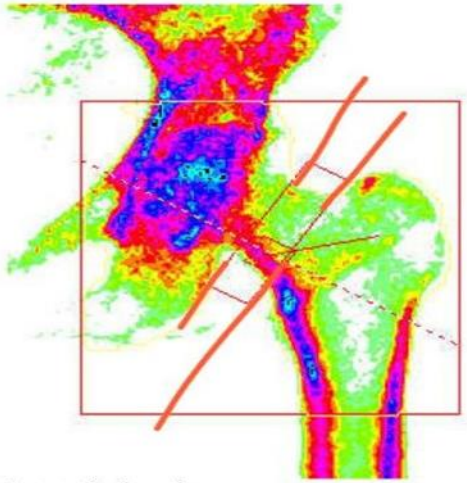


Image not for diagnostic use
96 x 102
NECK: 48 x 12
HAL: 92 mm

Scan Information:

Scan Date: 15 June 2020 ID: A0615200J
Scan Type: x Left Hip
Analysis: 15 June 2020 09:53 Version 13.6.0.2
Hip
Operator:
Model: Discovery W (S/N 83167)
Comment:

XIV

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	PR (%)	Z - score	AM (%)
Neck	3.64	2.84	0.780	-0.6	92	1.3	123
Troch	6.37	4.48	0.703	0.0	100	1.4	126
Inter	19.79	15.92	0.804	-1.9	73	-0.5	91
Total	**29.81**	**23.25**	**0.780**	**-1.3**	**83**	**0.3**	**105**
Ward's	1.04	1.05	1.010	2.4	138	5.0	240

Total BMD CV 1.0%
WHO Classification: Osteopenia

Same Center & Same Device (SCSD): Step 5: interpretation

We have three stages in this step:

Stage 1: Separate report of each scan

Stage 2: Determine of percent change on compared scan

Stage 3: Define of response as complete , partial or no response.

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	PR (%)	Z - score	AM (%)
L1	9.95	7.17	0.720	-2.5	73	-0.6	92
L2	10.52	7.52	0.714	-2.9	69	-0.8	89
L3	11.35	7.89	0.695	-3.5	64	-1.3	82
L4	13.70	10.53	0.769	-2.7	72	-0.4	95
L1-L2	20.48	14.69	0.717	-2.4	73	-0.4	94
L1,L3	21.31	15.06	0.707	-2.8	70	-0.7	90
L1,L4	23.65	17.70	0.748	-2.6	72	-0.5	93
L2-L3	21.88	15.41	0.704	-3.2	67	-1.1	86
L2,L4	24.22	18.05	0.745	-3.0	69	-0.8	89
L3-L4	25.05	18.42	0.735	-3.3	67	-1.1	86
L1-L3	31.83	22.58	0.709	-2.8	70	-0.7	90
L1-L2,L4	34.18	25.22	0.738	-2.7	71	-0.6	92
L1,L3-L4	35.01	25.5	0.731	-2.9	69	-0.8	89
L2-L4	35.58	25.94	0.729	-3.2	68	-1.0	87
L1-L4	**45.53**	**33.11**	**0.727**	**-2.9**	**69**	**-0.8**	**89**

VIII

Total BMD CV 1.0%

DXA Results Summary:

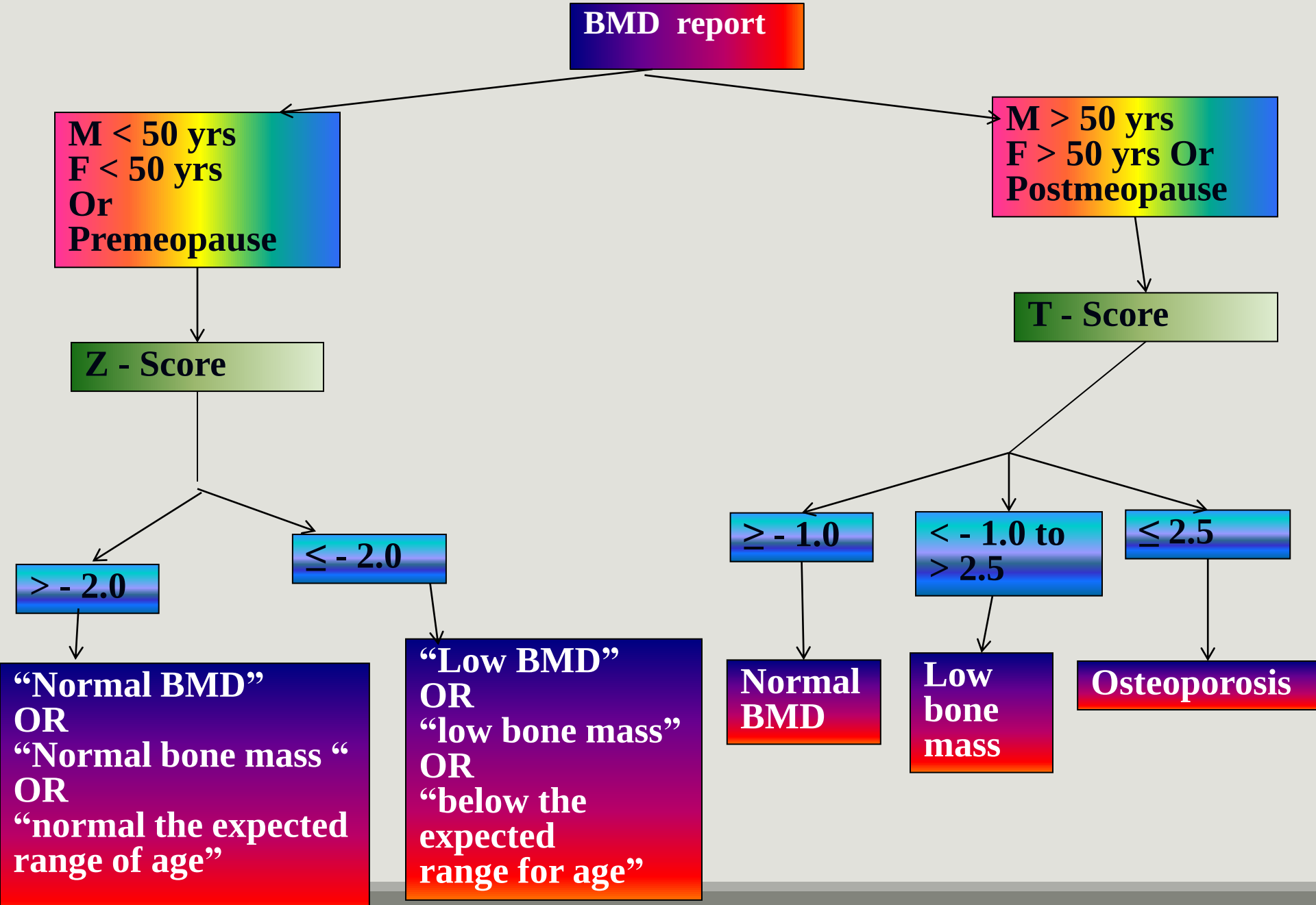
Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	PR (%)	Z - score	AM (%)
L1	9.53	6.58	0.691	-2.7	70	-0.7	90
L2	10.96	7.59	0.693	-3.0	67	-0.8	88
L3	11.41	7.09	0.621	-4.2	57	-1.9	75
L4	13.81	10.61	0.768	-2.7	72	-0.3	96
L1-L2	20.48	14.17	0.692	-2.6	71	-0.5	92
L1,L3	20.94	15.67	0.653	-3.3	64	-1.1	84
L1,L4	23.34	17.19	0.736	-2.7	71	-0.5	93
L2-L3	22.37	14.68	0.656	-3.7	62	-1.4	81
L2,L4	24.77	18.19	0.735	-3.1	68	-0.8	89
L3-L4	25.23	17.70	0.701	-3.6	64	-1.3	83
L1-L3	31.90	21.26	0.666	-3.2	65	-1.0	86
L1-L2,L4	34.29	24.77	0.722	-2.8	70	-0.6	91
L1,L3-L4	34.75	24.28	0.699	-3.2	66	-1.0	87
L2-L4	36.18	25.28	0.699	-3.5	65	-1.1	85
L1-L4	**45.71**	**31.86**	**0.697**	**-3.2**	**67**	**-0.9**	**87**

X

Total BMD CV 1.0%

Stage 1 of step 5

Based on selected region definition on previous step & below algorithm the final result of each scan explained.


BMD report
M < 50 yrs
F < 50 yrs
Or
Premeopause
M > 50 yrs
F > 50 yrs Or
Postmeopause
Z - Score
T - Score
> - 2.0
≤ - 2.0
≥ - 1.0
< - 1.0 to
> 2.5
≤ 2.5
“Normal BMD”
OR
“Normal bone mass “
OR
“normal the expected
range of age”
“Low BMD”
OR
“low bone mass”
OR
“below the
expected
range for age”
Normal
BMD
Low
bone
mass
Osteoporosis

Stage 2 of step 5

Cbmd= second or last BMD – first or previous scan/first or previous scan X 100
=BMDL1-2=bmd L1-2(2020) - bmd L1-2(2018)/bmd L1-2(2018)x100
=0.692-0.717/0.717
= -3.5%

Stage 2 of step 5

Cbmd hip= total hip BMD 2020- total hip BMD2018/ total hip BMD2018 x 100

= /0.780-0.748/0.748 x100

=4.3%

	(cm²)	(g)	(g/cm²)	score	(%)	score	(%)
L1	9.13	4.89	0.536	-4.1	54	-2.3	67
L2	11.65	6.80	0.584	-4.0	57	-2.1	72
L3	12.15	8.27	0.680	-3.7	63	-1.6	80
L4	12.67	7.46	0.589	-4.3	56	-2.2	71
L1-L2	20.78	11.70	0.563	-3.8	57	-1.9	73
L1,L3	21.27	13.16	0.619	-3.6	61	-1.6	77
L1,L4	21.79	12.35	0.567	-4.3	55	-2.3	69
L2-L3	23.80	15.07	0.633	-3.9	60	-1.8	76
L2,L4	24.32	14.26	0.586	-4.5	54	-2.4	69
L3-L4	24.81	15.73	0.634	-4.2	58	-2.1	73
L1-L3	32.93	19.96	0.606	-3.7	60	-1.8	76
L1-L2,L4	33.44	19.16	0.573	-4.2	55	-2.2	70
L1,L3-L4	33.94	20.62	0.608	-4.0	58	-2.0	73
L2-L4	36.47	22.53	0.618	-4.2	57	-2.1	73
L1-L4	**45.59**	**27.42**	**0.601**	**-4.1**	**57**	**-2.0**	**73**

VIII

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	PR (%)	Z - score	AM (%)
L1	11.45	6.66	0.582	-3.7	59	-1.8	75
L2	12.05	7.06	0.586	-4.0	57	-1.9	74
L3	12.11	8.07	0.666	-3.8	61	-1.5	80
L4	14.78	7.79	0.527	-4.9	50	-2.5	65
L1-L2	23.49	13.72	0.584	-3.6	60	-1.6	77
L1,L3	25.55	14.75	0.625	-3.5	62	-1.4	80
L1,L4	26.23	14.46	0.551	-4.4	53	-2.3	69
L2-L3	24.16	15.12	0.626	-3.9	59	-1.7	77
L2,L4	26.83	14.85	0.553	-4.8	51	-2.5	67
L3-L4	26.89	15.86	0.590	-4.6	54	-2.4	69
L1-L3	35.60	21.79	0.612	-3.7	60	-1.6	78
L1-L2,L4	38.28	21.51	0.562	-4.3	54	-2.1	70
L1,L3-L4	38.34	22.52	0.587	-4.2	56	-2.0	72
L2-L4	38.94	22.92	0.589	-4.5	55	-2.2	71
L1-L4	**50.39**	**29.58**	**0.587**	**-4.2**	**56**	**-2.0**	**73**

IX

Total BMD CV 1.0%

BMDL1-2=bmd L1-2(2020) - bmd L1-2(2017)/bmd L1-2(2017)x100

=0.584 - 0.563/0.563 x100

=3.7%

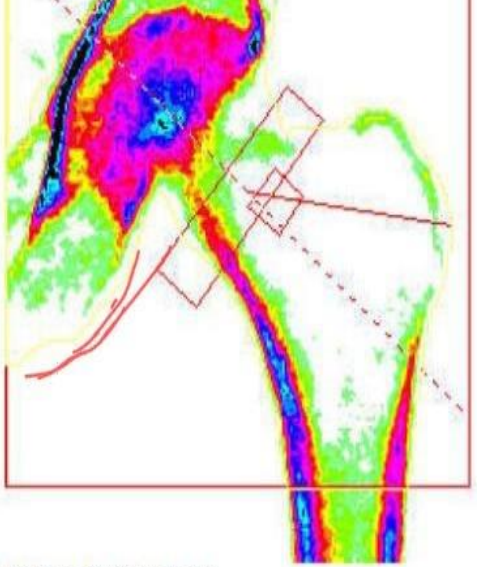


Image not for diagnostic use
118 x 111

Operator:
Model: Discovery W (S/N 83167)
Comment:

XIII

DXA Results Summary:

Region	Area (cm^2)	BMC (g)	BMD (g/cm^2)	T - score	PR (%)	Z - score	AM (%)
Neck	4.76	1.99	0.417	-3.9	49	-2.2	63
Troch	8.29	2.85	0.344	-3.6	49	-2.3	60
Inter	25.04	12.15	0.485	-4.0	44	-2.8	53
Total	**38.09**	**16.98**	**0.446**	**-4.1**	**47**	**-2.6**	**58**
Ward's	1.18	0.23	0.194	-4.6	26	-2.2	43

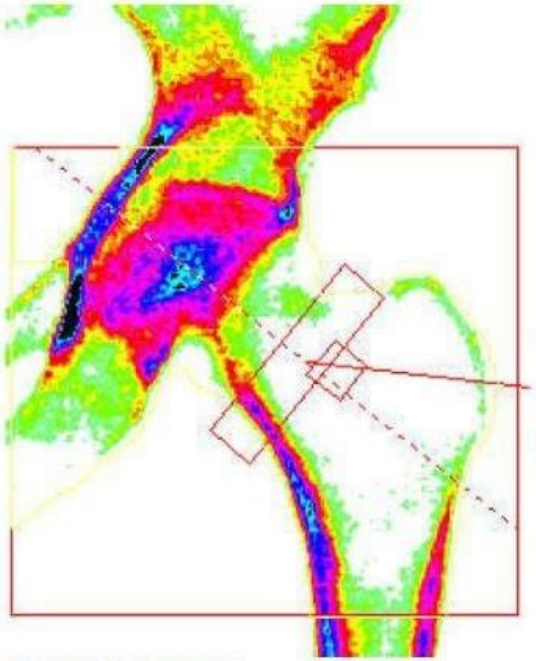


Image not for diagnostic use
118 x 111
NECK: 51 x 13
HAL: 109 mm

Scan Information:

Scan Date: 26 February 2020 ID: A02262005
Scan Type: x Left Hip
Analysis: 26 February 2020 08:41 Version 13.6.0.2
Hip (low density)
Operator: NB
Model: Discovery W (S/N 83167)
Comment:

XIV

DXA Results Summary:

Region	Area (cm^2)	BMC (g)	BMD (g/cm^2)	T - score	PR (%)	Z - score	AM (%)
Neck	**5.18**	**1.92**	**0.371**	**-4.3**	**44**	**-2.4**	**58**
Troch	7.16	2.46	0.344	-3.6	49	-2.2	61
Inter	22.50	11.43	0.508	-3.8	46	-2.5	57
Total	34.84	15.81	0.454	-4.0	48	-2.4	60
Ward's	1.17	0.29	0.244	-4.2	33	-1.6	57

Total BMD CV 1.0%
WHO Classification: Osteoporosis

Cbmd hip= total hip Bmd 2020 - total hip bmd2017/ total hip bmd2017 x 100

= 0.454 - 0.446/0.446 x100

=1.8%

Stage 3 of step 5

Response to treatment needs to information

1- the device precision

2- the center LSC

For SCSD

Definition as below:

≥ 7% increase on BMD= complete response

Between +7% & -7% = Partial response

< -7% decrease on BMD = no response

Refractory to osteoporosis treatment

Occurrence of two fragile(low trauma)

vertebral fractures after 1 yr of correct treatment or one vertebra & one another regions(forearm, rib, humerus, tibia, pelvis)

Occurrence of fragility hip fracture after 1 year of correct treatment .

Occurrence of one fragile vertebra fracture

and decrease of above 7% BMD(with this sequence: spine, then hip(total, troc, inter/body) & forearm total) on SCSD after 1 year of correct treatment.

BMDL1-2=bmd L1-2(2020) - bmd L1-2(2017)/bmd L1-2(2017)x100

=0.584 - 0.563/0.563 x100

=3.6%

CONCLUSION: **PARTIAL RESPONSE**

Cbmd hip= total hip Bmd 2020 - total hip bmd2017/ total hip bmd2017 x 100

= 0.454 - 0.446/0.446 x100

=1.8%

CONCLUSION: **PARTIAL RESPONSE**

Google

sbmd calculator

All | Images | Videos | News | More | Tools

About 91 results (0.58 seconds)

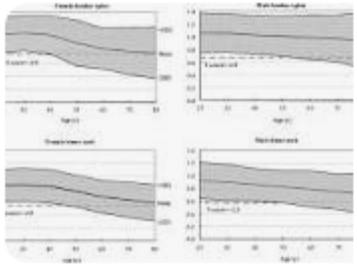
University of Washington
https://courses.washington.edu › bonephys › opBMDs

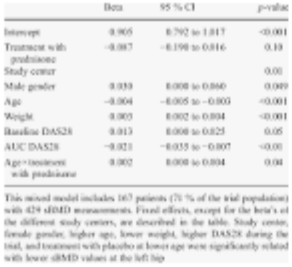
BMD standardization

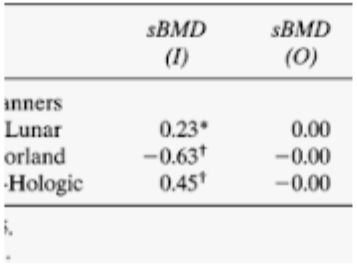
These are the equations: **sBMD** = 1000 (a + b x BMD). Manufacturer, Parameter, Femoral neck, Trochanter, Total hip. Hologic, a, 0.019, -0.017, 0.006.

You've visited this page many times. Last visit: 4/12/23

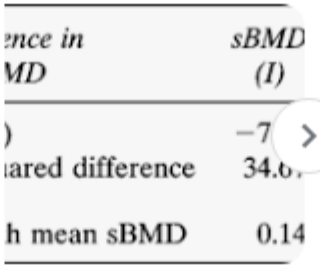
Images for sbmd calculator







	sBMD (I)	sBMD (O)
nners		
Lunar	0.23*	0.00
orland	−0.63†	−0.00
Hologic	0.45†	−0.00



	sBMD (I)
ence in MD	
)	−7
ared difference	34.6
h mean sBMD	0.14

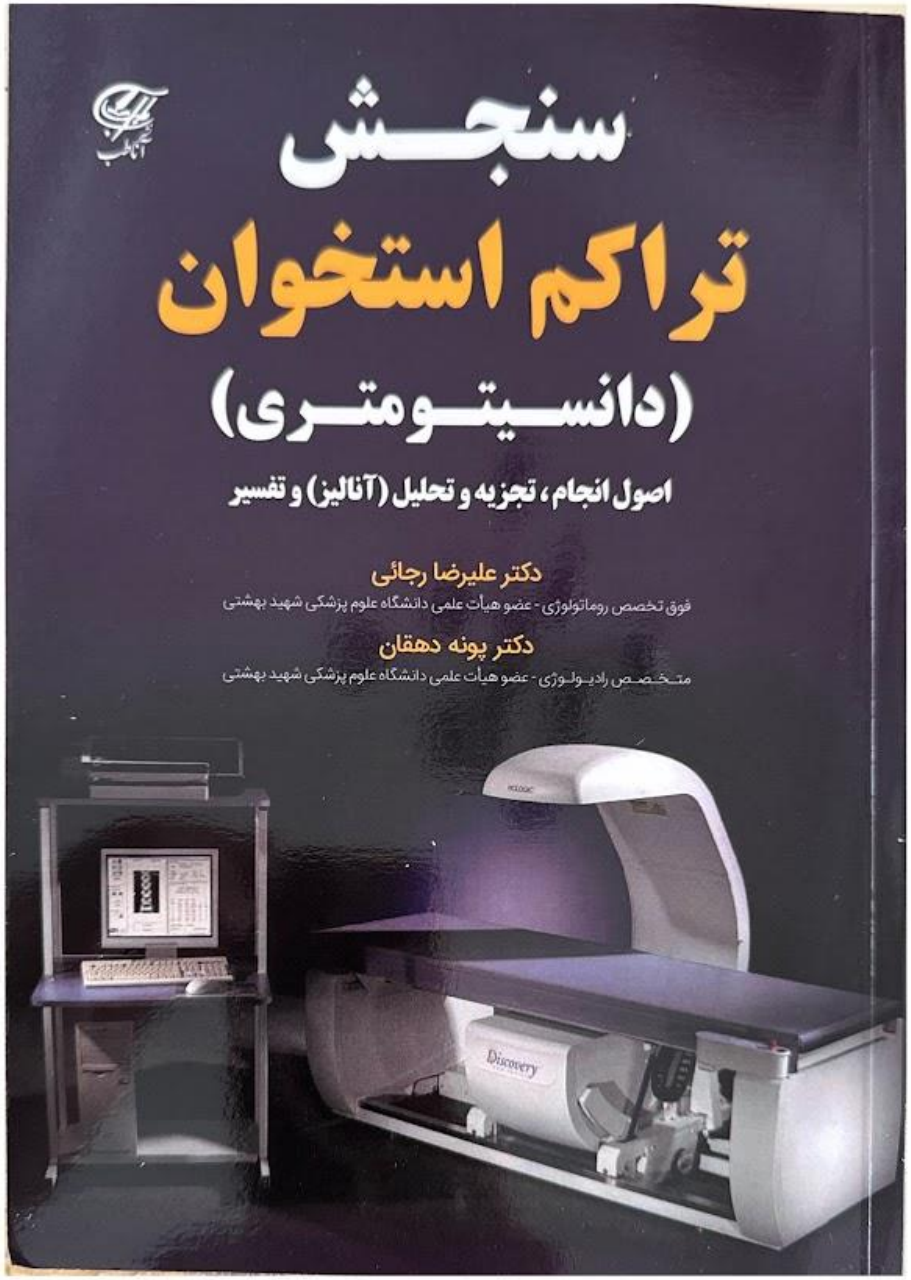
Feedback

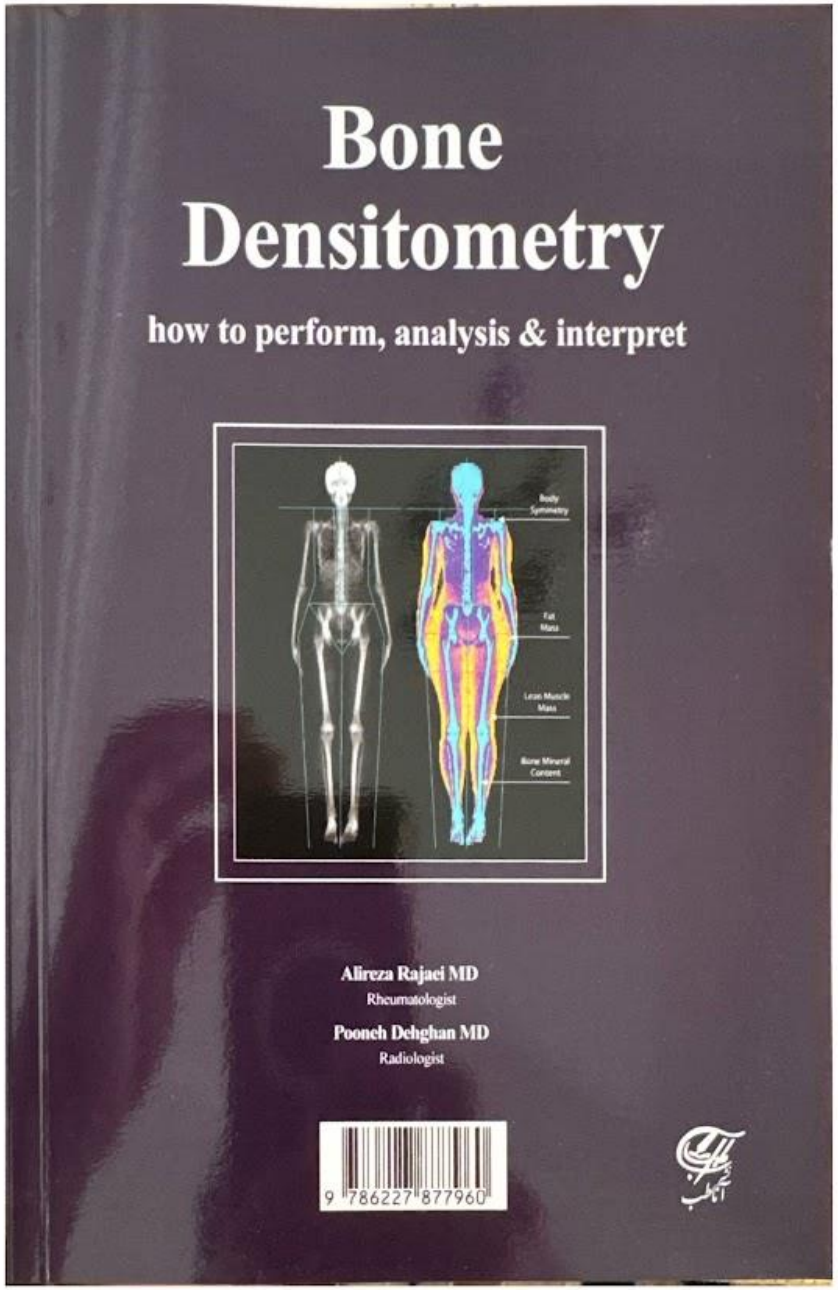
More images →

differences are clinically important, making it difficult to compare a measurement made from one machine to the other. For example, the hip bone density on a Lunar scan is about 6% higher than on a Hologic scan. If the physician must try to compare studies done on different machines, the best way is to apply the following equations:

FEMORAL NECK		TOTAL HIP	
First Measurement (•) Hologic ( ) Lunar ( ) Norland 0.000 g / cm2	Second Measurement (•) Hologic ( ) Lunar ( ) Norland 0.000 g / cm2	First Measurement (•) Hologic ( ) Lunar ( ) Norland 0.446 g / cm2	Second Measurement (•) Hologic ( ) Lunar ( ) Norland 0.454 g / cm2
click to convert		click to convert	
--- mg/cm2	--- mg/cm2	456 mg/cm2	464 mg/cm2
--- % change		1.8 % change	

LUMBAR SPINE	
First Measurement (•) Hologic ( ) Lunar ( ) Norland 0.563 g / cm2	Second Measurement (•) Hologic ( ) Lunar ( ) Norland 0.584 g / cm2
click to convert	
612 mg/cm2	634 mg/cm2
3.6 % change	


سنجش
تراکم استخوان
(دانسیتومتری)
اصول انجام، تجزیه و تحلیل (آنالیز) و تفسیر
دکتر علیرضا رجائی
فوق تخصص روماتولوژی - عضو هیأت علمی دانشگاه علوم پزشکی شهید بهشتی
دکتر پونه دهقان
متخصص رادیولوژی - عضو هیأت علمی دانشگاه علوم پزشکی شهید بهشتی
Discovery


Bone
Densitometry
how to perform, analysis & interpret
Body Symmetry
Fat Mass
Lean Muscle Mass
Bone Mineral Content
Alireza Rajaei MD
Rheumatologist
Pooneh Dehghan MD
Radiologist
9 786227 877960


LACKAWANNA