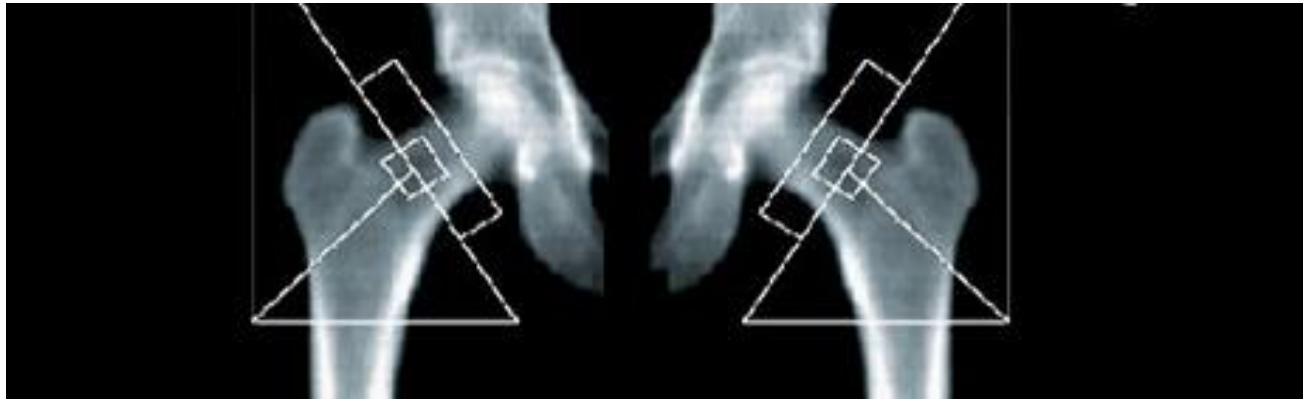
How to interpret and understand the information on a DXA report.

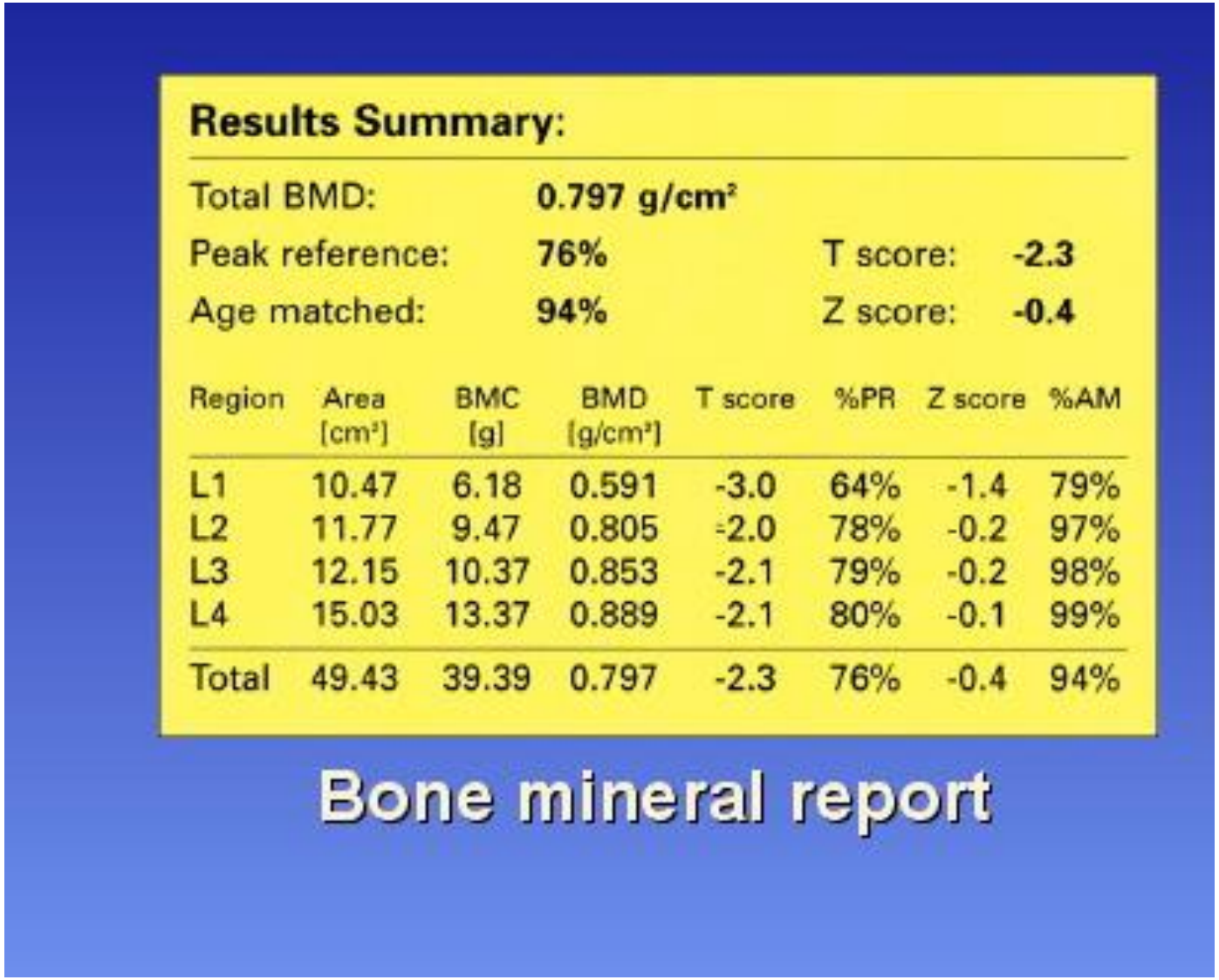
LECTURE 7

The BMD Printout

Images of anatomy

- Documents region measured
- Placement of ROI
- Artifacts on image
- Use for serial images to assist with consistency in measurements





The BMD Printout

Measurement of BMD for ROIs

- Area measured
  - Match areas measured on serial scans
- BMC
- BMD

The BMD Printout

Results Summary:

Total BMD:	**0.797 g/cm²**		
Peak reference:	**76%**	T score:	**-2.3**
Age matched:	**94%**	Z score:	**-0.4**

Region	Area [cm²]	BMC [g]	BMD [g/cm²]	T score	%PR	Z score	%AM
L1	10.47	6.18	0.591	-3.0	64%	-1.4	79%
L2	11.77	9.47	0.805	-2.0	78%	-0.2	97%
L3	12.15	10.37	0.853	-2.1	79%	-0.2	98%
L4	15.03	13.37	0.889	-2.1	80%	-0.1	99%
Total	49.43	39.39	0.797	-2.3	76%	-0.4	94%

Normal
- T-Score of -1.0 or better

Osteopenia/Low Bone Density
- T-Score between -1.0 and -2.5

Osteoporosis
- T-Score worse than -2.5

The BMD Printout

Results Summary:

Total BMD:	**0.797 g/cm²**		
Peak reference:	**76%**	T score:	**-2.3**
Age matched:	**94%**	Z score:	**-0.4**

Region	Area [cm²]	BMC [g]	BMD [g/cm²]	T score	%PR	Z score	%AM
L1	10.47	6.18	0.591	-3.0	64%	-1.4	79%
L2	11.77	9.47	0.805	-2.0	78%	-0.2	97%
L3	12.15	10.37	0.853	-2.1	79%	-0.2	98%
L4	15.03	13.37	0.889	-2.1	80%	-0.1	99%
Total	49.43	39.39	0.797	-2.3	76%	-0.4	94%

Severe Osteoporosis

- T-Score worse than -2.5 and evidence of fragility fractures
- Be careful when using this classification

The BMD Printout

Results Summary:

Total BMD:	**0.797 g/cm²**		
Peak reference:	**76%**	T score:	**-2.3**
Age matched:	**94%**	Z score:	**-0.4**

Region	Area [cm²]	BMC [g]	BMD [g/cm²]	T score	%PR	Z score	%AM
L1	10.47	6.18	0.591	-3.0	64%	-1.4	79%
L2	11.77	9.47	0.805	-2.0	78%	-0.2	97%
L3	12.15	10.37	0.853	-2.1	79%	-0.2	98%
L4	15.03	13.37	0.889	-2.1	80%	-0.1	99%
Total	49.43	39.39	0.797	-2.3	76%	-0.4	94%

Z-Score

- Compares patient to their peers
- Identifies need to look at secondary reasons for decrease in BMD

The BMD Printout

Bone Percentages

- Amount of bone patient has left compared to reference data

Results Summary:

Total BMD:	**0.797 g/cm²**		
Peak reference:	**76%**	T score:	**-2.3**
Age matched:	**94%**	Z score:	**-0.4**

Region	Area [cm²]	BMC [g]	BMD [g/cm²]	T score	%PR	Z score	%AM
L1	10.47	6.18	0.591	-3.0	64%	-1.4	79%
L2	11.77	9.47	0.805	-2.0	78%	-0.2	97%
L3	12.15	10.37	0.853	-2.1	79%	-0.2	98%
L4	15.03	13.37	0.889	-2.1	80%	-0.1	99%
Total	49.43	39.39	0.797	-2.3	76%	-0.4	94%

The BMD Printout

T-Score for each area measured

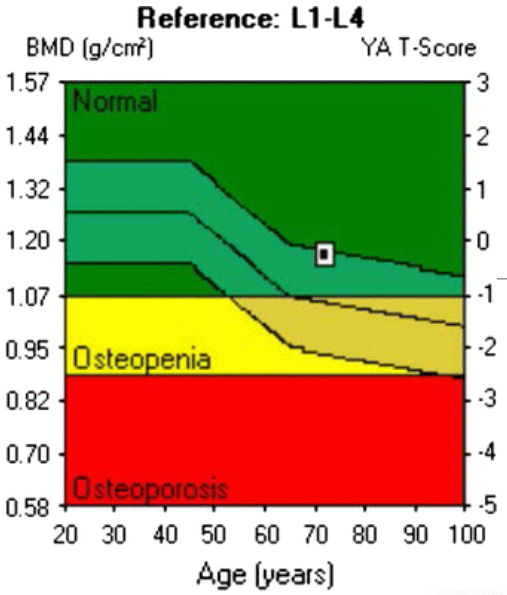
"Young-adult measurement"

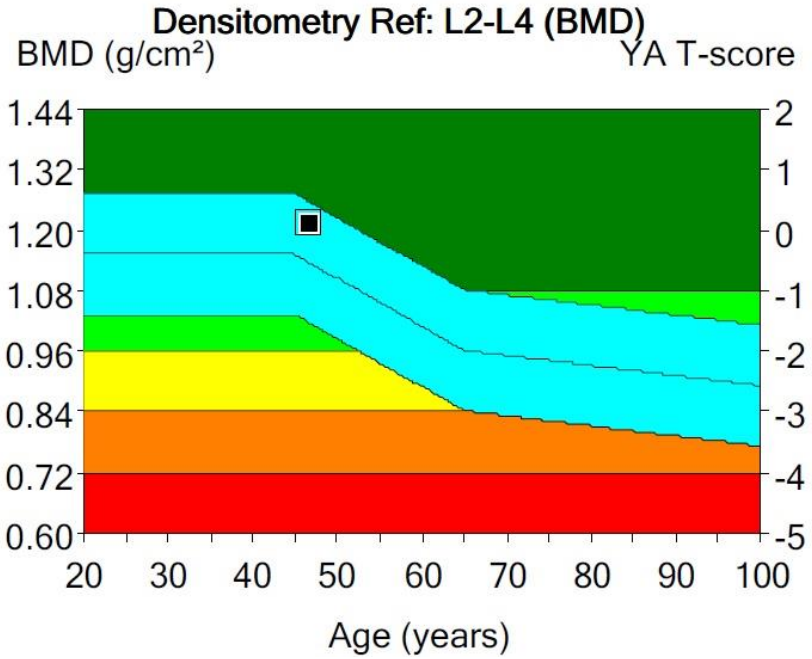
"Young-adult Z-Score"

Compares patient to peak bone mass somewhere between ages 25-35

- Check your printout for the T-Score range used by your system

Classifies patient's BMD status

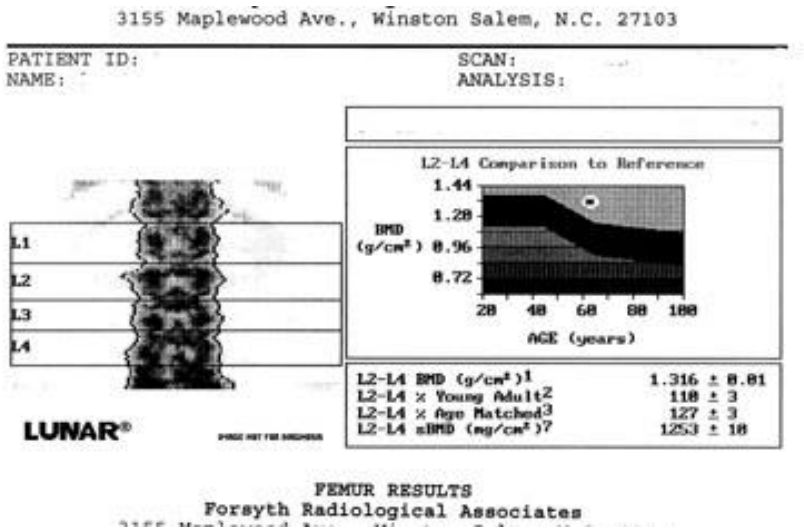


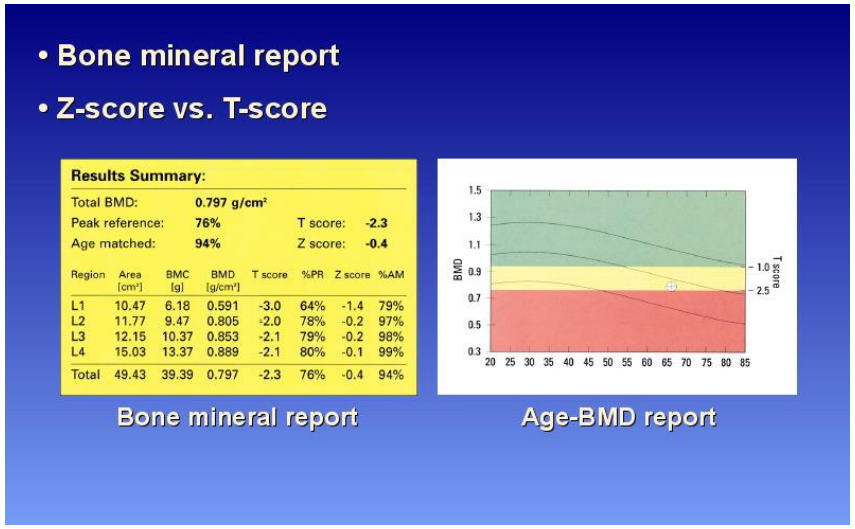


The BMD Printout

Reference graph (what the heck?)

Make sure patient's age is correctly plotted

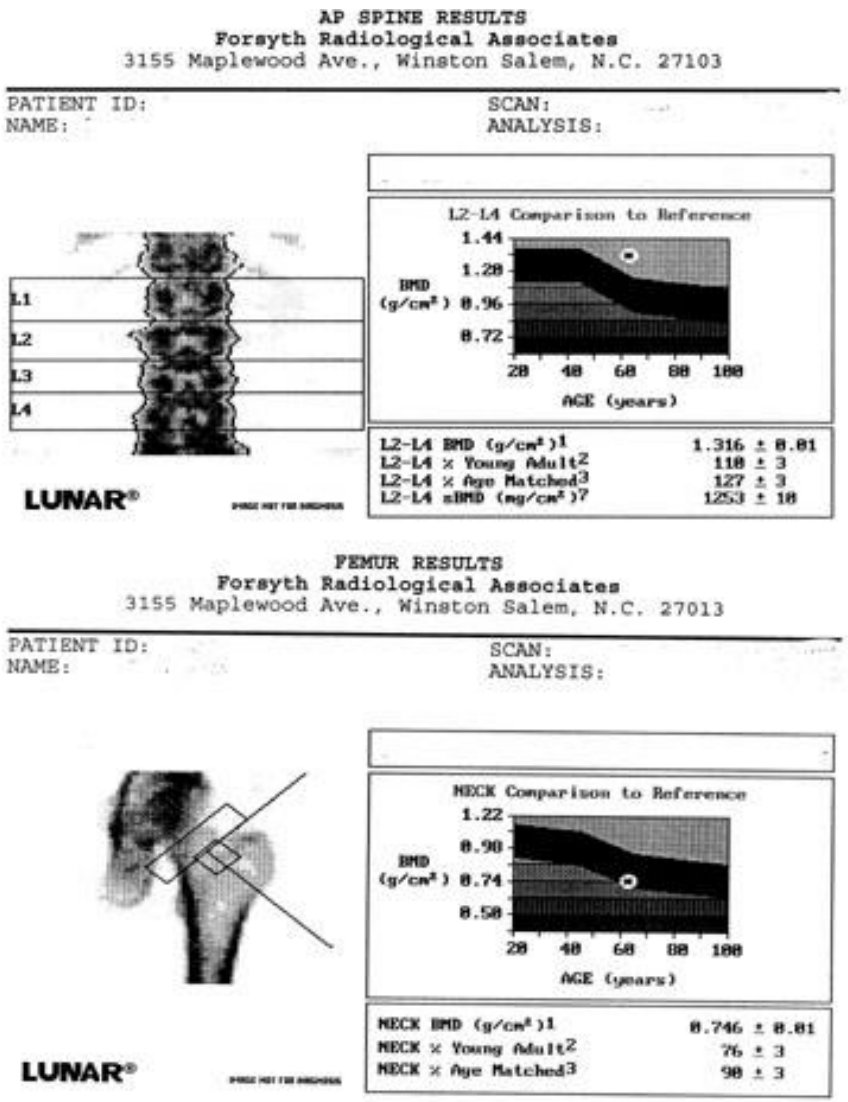




BMD Printout

Includes:

- Images to demonstrate anatomy and ROI placement
- Reference graph
- BMD measurement
- T-Scores
- Z-Scores



Patient Information

Name

DOB

Ethnic group

Sex

Height

Weight

Patient number

Physician name

BONE AND MINERAL LAB

Name: Patient ID: 26018-0281001 DOB:	Sex: Ethnicity: White	Height: 72.0 in Weight: 200.0 lb Age:

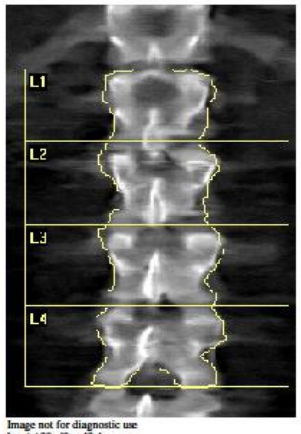


Image not for diagnostic use
k = 1.130, d0 = 43.4
116 x 146
DAP: 3.7 cGy*cm²

Scan Information:

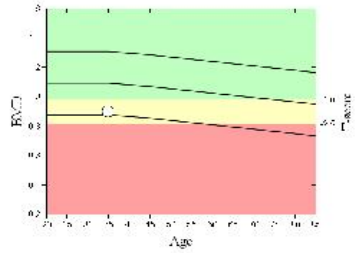
Scan Date: August 30, 2016 ID: A08301609
Scan Type: a Lumbar Spine
Analysis: August 30, 2016 11:28 Version 13.5.3:3
Spine
Operator: GLY
Model: Horizon A (S/N 100183)
Comment:

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	Z - score
L1	14.56	13.11	0.901	-1.6	-1.6
L2	17.03	15.57	0.914	-1.6	-1.6
L3	17.91	16.46	0.919	-1.7	-1.7
L4	18.13	15.72	0.867	-2.0	-2.0
Total	**67.62**	**60.87**	**0.900**	**-1.7**	**-1.7**

Total BMD CV 1.0%, ACF = 1.039, BCF = 1.008, TH = 8.379
WHO Classification: Osteopenia
Fracture Risk: Increased

Total

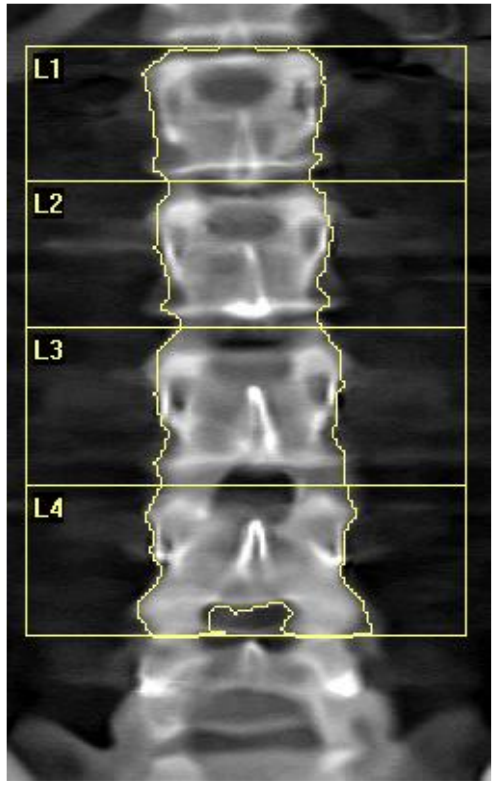


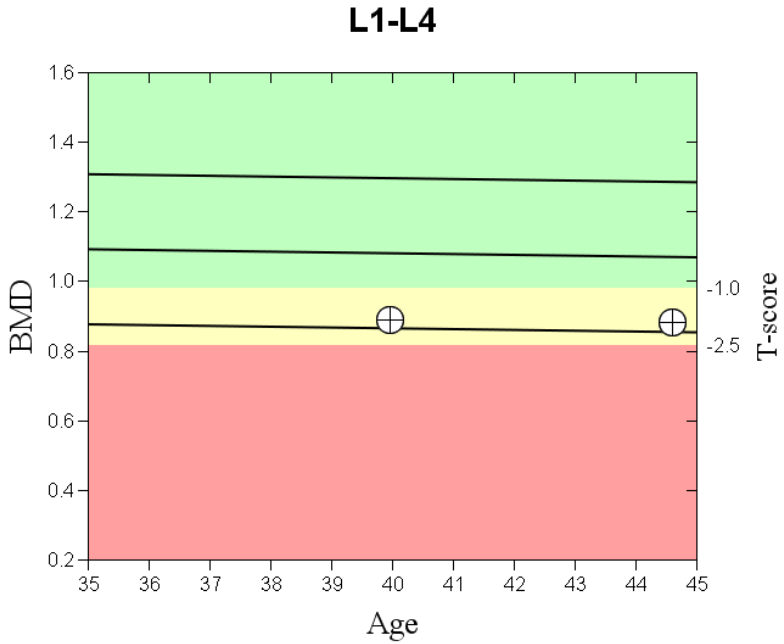
Comment:

T-score vs. White Male. Source:BMDCS/Hologic White Male. Z-score vs. White Male. Source:BMDCS/Hologic White Male.

HOLOGIC

Components of BMD Printout





DXA Results Summary: L1-L4

Scan Date	Age	BMD (g/cm²)	T - score	BMD Change vs Baseline	BMD Change vs Previous
05/20/2021	44	0.883	-1.9	-0.9%	-0.9%
09/29/2016	39	0.890	-1.8		

* Denotes significance at 95% confidence level, LSC is 0.022 g/cm²

BONE AND MINERAL LAB

Name:	Sex:	Height: 69.0 in
Patient ID: 6874-0281001	Ethnicity:	Weight: 185.0 lb
DOB:		Age:

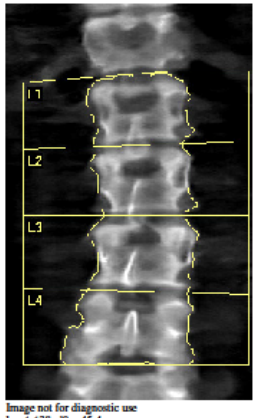


Image not for diagnostic use
k = 1.138, d0 = 45.4
116 x 151
DAP: 4.0 cGy*cm²

Scan Information:

Scan Date: September 30, 2019 ID: A09301908
Scan Type: a Lumbar Spine
Analysis: September 30, 2019 11:21 Version 13.5.3 Lumbar Spine
Operator: GLY
Model: Horizon A (S/N 100183)
Comment:

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T-score	Z-score
L1	17.83	18.54	1.040	0.3	0.7
L2	17.53	19.61	1.119	0.2	0.7
L3	20.16	21.73	1.078	-0.2	0.2
L4	23.39	26.41	1.129	-0.1	0.3
L1-L2	35.36	38.16	1.079	0.2	0.7
L1,L3	37.99	40.27	1.060	0.0	0.4
L1,L4	41.22	44.95	1.091	0.1	0.5
L2-L3	37.68	41.34	1.097	0.0	0.4
L2,L4	40.91	46.02	1.125	0.0	0.5
L3-L4	43.54	48.14	1.106	-0.2	0.3
L1-L3	55.52	59.88	1.079	0.1	0.5
L1-L2,L4	58.75	64.57	1.099	0.1	0.5
L1,L3-L4	61.38	66.68	1.086	0.0	0.4
L2-L4	61.07	67.75	1.109	-0.1	0.4
L1-L4	**78.90**	**86.30**	**1.094**	**0.0**	**0.5**

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

HOLOGIC

BONE AND MINERAL LAB

Name:	Sex:	Height: 70.0 in
Patient ID:	Ethnicity:	Weight: 187.0 lb
DOB:		Age:

Referring Physician: UNKNOWN, UNKNOWN

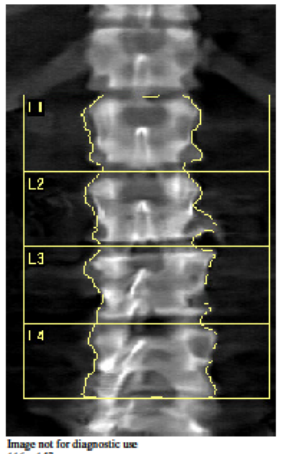
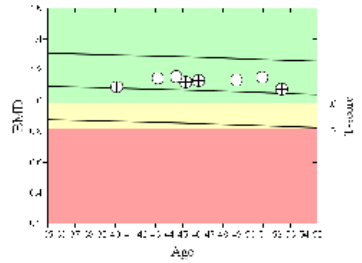


Image not for diagnostic use
116 x 143
DAP: 4.0 cGy*cm²

Scan Information:

Scan Date: May 07, 2021 ID: A0507210K
Scan Type: a Lumbar Spine
Analysis: May 07, 2021 14:23 Version 13.5.3 Spine
Operator: GLY
Model: Horizon A (S/N 100183)
Comment:

L1-L4



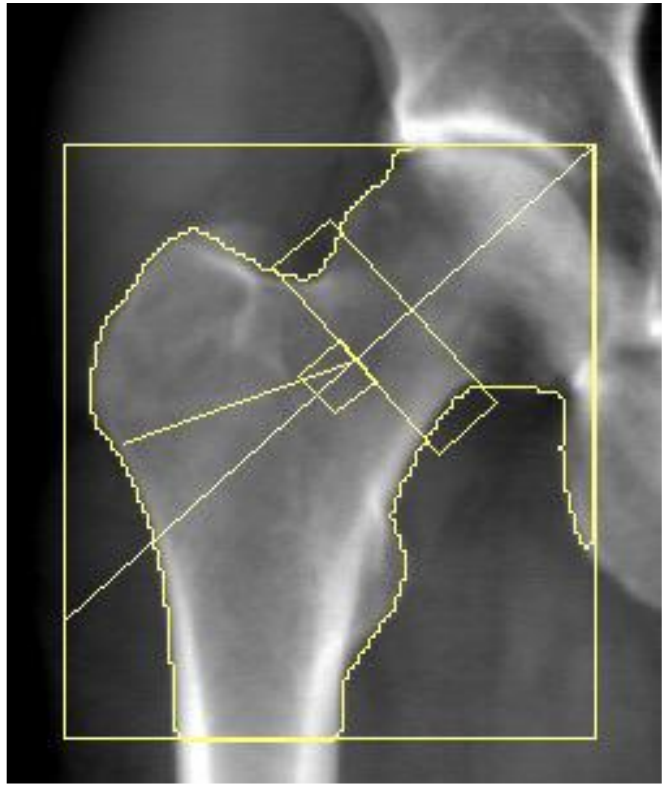
T-score vs. White Male. Source:BMDCS/Hologic White Male. Z-score vs. White Male. Source:BMDCS/Hologic White Male.

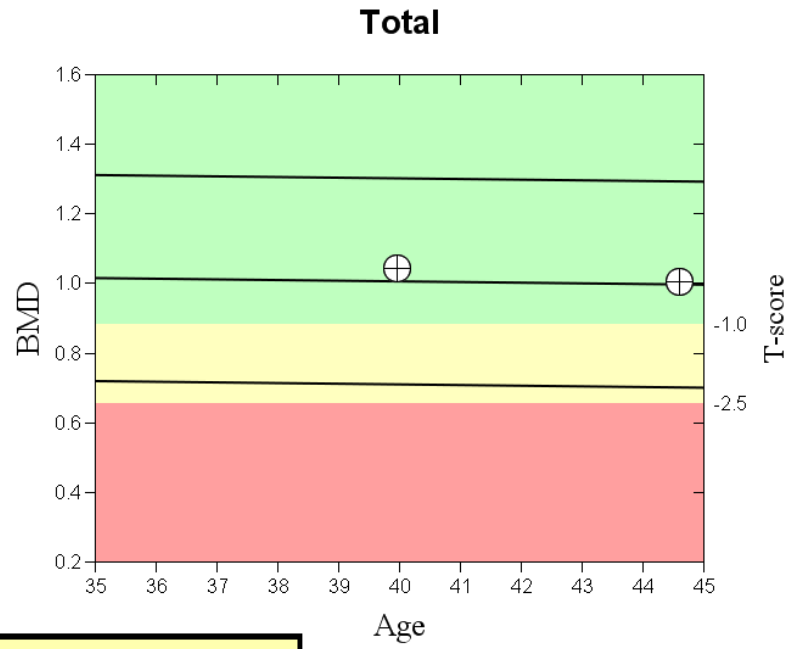
DXA Results Summary: L1-L4

Scan Date	Age	BMD (g/cm²)	T-score	BMD Change vs Baseline	BMD Change vs Previous
05/07/2021	52	1.076	-0.1	-1.1%	-6.7%*
12/02/2019	50	1.153	0.6	6.0%*	1.5%
12/21/2017	48	1.136	0.4	4.4%*	0.6%
03/05/2015	46	1.130	0.4	3.8%*	0.7%
03/19/2014	45	1.122	0.3	3.1%*	-3.1%*
07/09/2013	44	1.157	0.6	6.4%*	1.0%
02/22/2012	43	1.146	0.5	5.3%*	5.3%*
02/09/2009	40	1.088	0.0		

* Denotes significance at 95% confidence level, LSC is 0.022 g/cm²

HOLOGIC





10-year Fracture Risk

FRAX not reported because:

Man under age 50

Scan Date	Age	BMD (g/cm²)	T - score	BMD Change vs Baseline	BMD Change vs Previous
05/20/2021	44	1.004	-0.2	-3.6%*	-3.6%*
09/29/2016	39	1.042	0.1		

BONE AND MINERAL LAB

Name:	Sex:	Height: 72.0 in
Patient ID: 26018-0281001	Ethnicity:	Weight: 200.0 lb
DOB:		Age:

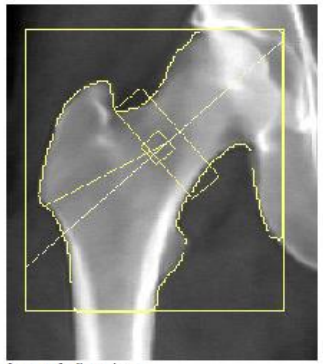


Image not for diagnostic use
k = 1.138, d0 = 48.3
106 x 115
NECK: 49 x 15
HAL: 119 mm
DAP: 2.9 cGy*cm²

Scan Information:

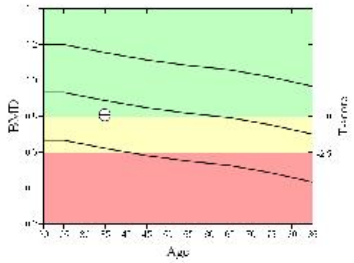
Scan Date: August 30, 2016 ID: A08301608
Scan Type: a Right Hip
Analysis: August 30, 2016 11:39 Version 13.5.3:3
Hip
Operator: GLY
Model: Horizon A (S/N 100183)
Comment:

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T-score	Z-score
Neck	**6.03**	**4.86**	**0.806**	**-0.9**	**-0.6**
Troch	13.39	10.12	0.756	-0.2	0.0
Inter	25.39	30.59	1.205	0.1	0.1
Total	44.80	45.57	1.017	-0.1	0.0
Ward's	1.13	0.69	0.613	-1.2	-0.7

Total BMD CV 1.0%, ACF = 1.039, BCF = 1.008, TH = 6.511
WHO Classification: Normal

Neck



10-year Fracture Risk

FRAX not reported because:
Man under age 50

Comment:

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

HOLOGIC

BONE AND MINERAL LAB

Name:	Sex:	Height: 72.5 in
Patient ID:	Ethnicity:	Weight: 178.0 lb
DOB:		Age:

Referring Physician: UNKNOWN, UNKNOWN

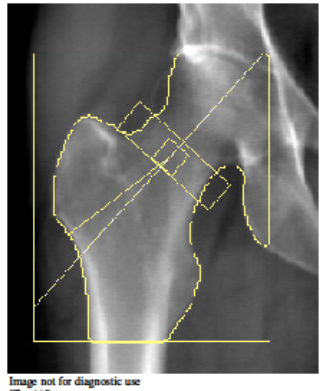
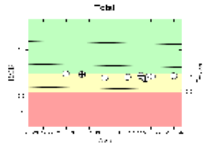


Image not for diagnostic use
97 x 118
NECK: 51 x 15
HAL: 111 mm
DAP: 3.0 cGy*cm²

Scan Information:

Scan Date: August 26, 2021 ID: A08262106
Scan Type: a Right Hip
Analysis: August 26, 2021 09:36 Version 13.5.3
Right Hip
Operator: GLY
Model: Horizon A (S/N 100183)
Comment:



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

10-year Fracture Risk[1]

Major Osteoporotic Fracture	**4.8%**
Hip Fracture	**0.5%**

Reported Risk Factors:
US (Caucasian), Neck BMD=0.724, BMI=23.8

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

DXA Results Summary:

Scan Date	Age	BMD (g/cm²)	T-score	BMD Change vs Baseline	BMD Change vs Previous
08/26/2021	53	0.861	-1.1	-3.3%*	0.7%
11/14/2018	51	0.855	-1.2	-4.0%*	0.1%
05/30/2018	50	0.854	-1.2	-4.1%*	3.9%*
12/20/2017	50	0.822	-1.4	-7.7%*	-5.1%*
05/03/2017	49	0.866	-1.1	-2.8%	2.1%
09/01/2015	47	0.849	-1.2	-4.7%*	0.9%
09/07/2012	44	0.842	-1.3	-5.5%*	-4.5%*
09/21/2009	42	0.882	-1.0	-1.1%	-1.1%
08/21/2007	39	0.891	-0.9		

* Denotes significance at 95% confidence level, LSC is 0.027 g/cm²

HOLOGIC

BONE AND MINERAL LAB

Name:	Sex:	Height:
Patient ID:	Ethnicity:	Weight:
DOB:		Age:

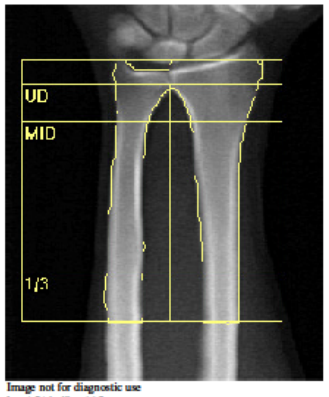


Image not for diagnostic use
k = 1.214, d0 = 66.2
208 x 107, Forearm Length: 29.3 cm
DAP: 0.6 cGy*cm²

Scan Information:

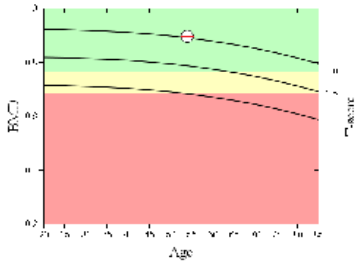
Scan Date: August 26, 2021 ID: A08262103
Scan Type: a L.Forearm
Analysis: August 26, 2021 09:44 Version 13.5.3:3
Left Forearm
Operator: GLY
Model: Horizon A (S/N 100183)
Comment:

DXA Results Summary:

Radius	Area (cm²)	BMC (g)	BMD (g/cm²)	T - score	Z - score
UD	3.90	2.11	0.543	-0.1	0.6
MID	9.09	6.89	0.758	1.0	1.4
1/3	**2.73**	**2.45**	**0.897**	**1.5**	**2.1**
Total	15.72	11.46	0.729	0.8	1.4

Total BMD CV 1.0%, ACF = 1.039; BCF = 1.008
WHO Classification: Normal
Fracture Risk: Not Increased

1/3 (Radius)



T-score vs. White Male. Source:BMDCS/Hologic Z-score vs. White Male. Source:BMDCS/Hologic

Comment:

HOLOGIC

ROYAL ADELAIDE HOSPITAL

Bone Densitometry Results

BMD Report

Includes:

- Indications for scan
- Diagnosis by MD
- Treatment recommendations if appropriate
- When the patient needs to be rescanned
- **May or may not include images**

Report Options

Each DXA scanner comes with a report option, and you can even format the report however you want it.

Many facilities will just have the radiologist put it in an x-ray format and it will look like an x-ray report.

Areas Typically Diagnosed

At Least one Hip:

- Neck Region
- Total Region

DXA Results Summary:

Region	Area (cm^2)	BMC (g)	BMD (g/cm^2)	T - score	Z - score
Neck	**5.89**	**4.96**	**0.842**	**-0.6**	**-0.3**
Troch	12.44	9.01	0.724	-0.4	-0.2
Inter	22.85	28.00	1.225	0.2	0.2
Total	41.18	41.96	1.019	-0.1	0.1
Ward's	1.31	0.87	0.663	-0.9	-0.2

Total BMD CV 1.0%, ACF = 1.039, BCF = 1.008, TH = 6.347
WHO Classification: Normal

L-Spine L1-4

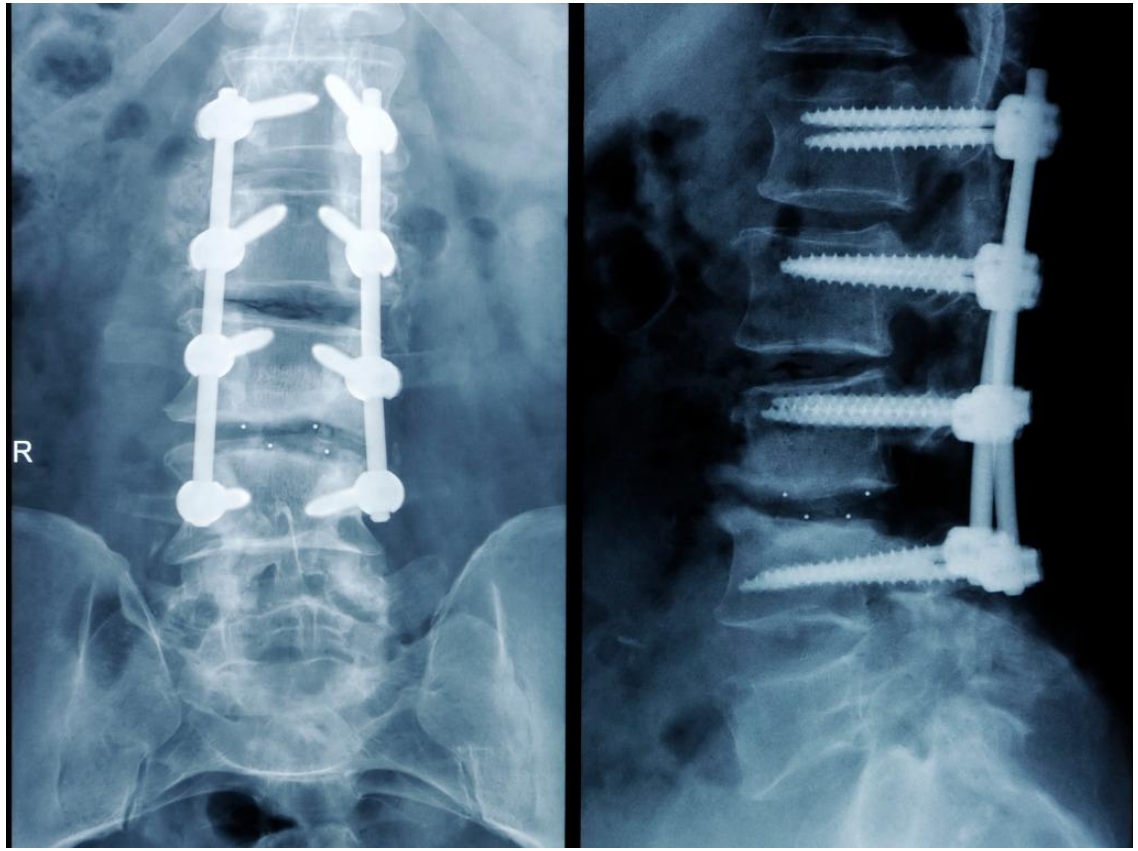
DXA Results Summary:

Region	Area (cm^2)	BMC (g)	BMD (g/cm^2)	T - score	Z - score
L1	13.96	13.75	0.985	-0.8	-0.8
L2	15.71	17.96	1.144	0.5	0.5
L3	16.38	18.98	1.159	0.5	0.5
L4	19.03	22.28	1.170	0.7	0.7
Total	**65.08**	**72.97**	**1.121**	**0.3**	**0.3**

Total BMD CV 1.0%, ACF = 1.039, BCF = 1.008, TH = 7.902
WHO Classification: Normal
Fracture Risk: Not Increased

What about these scans?

What If?



Spine Internal Artifacts

Internal artifacts such as spine hardware and hip replacements should **never** be included in the exam or the result.

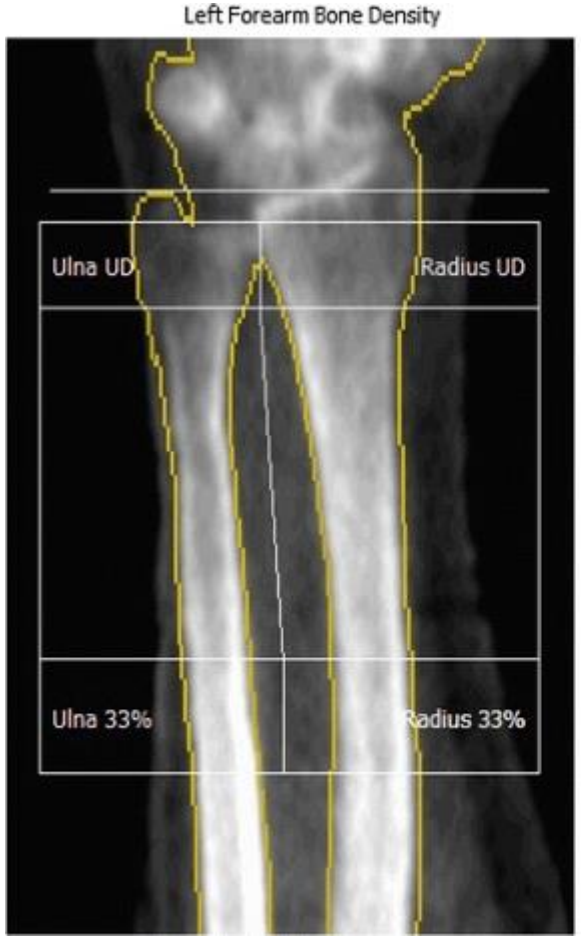
What do you do?

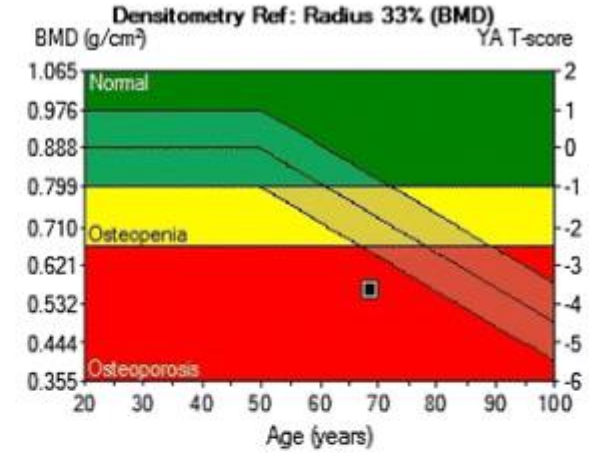
- For the spine you can include any were from 2 to 4 vertebrae.
- The vertebrae does not have to be adjacent to each other. It can be L1 and L3 if it needs to be.
- If all four vertebrae have hardware in them the spine must be excluded.
- If the spine is excluded scan the forearm in its place.

Degenerative Changes and Disease Processes

Spines like this normally would be excluded and a forearm scan should be performed. However, many places will perform the spine and add the forearm for spine comparison changes.

If you scan the forearm the 33% or 1/3 area is the area of the forearm that is diagnosed.





Region	1 BMD (g/cm²)	2 Young-Adult T-score	3 Age-Matched Z-score
Radius 33%	0.560	-3.7	-2.0

Forearms are also done if patient is too large for the table

Hip Replacements

Hip Replacements

Depending on your facility protocol, if you normally scan one hip scan the other hip without the replacement.

If your patient has bilateral hip replacements, then you will scan the forearm.

If you normally scan bilateral hip and one is replaced, then just scanning one hip should due.

Types of Reports You Might See

LET'S SEE WHAT WE SEE

--	10/22/1938 67.0 years	**Physician:**	[redacted]
Height / Weight:	60.0 in. 91.0 lbs.	**Measured:**	
Sex / Ethnic:	Female Asian	**Analyzed:**	

DualFemur Bone Density

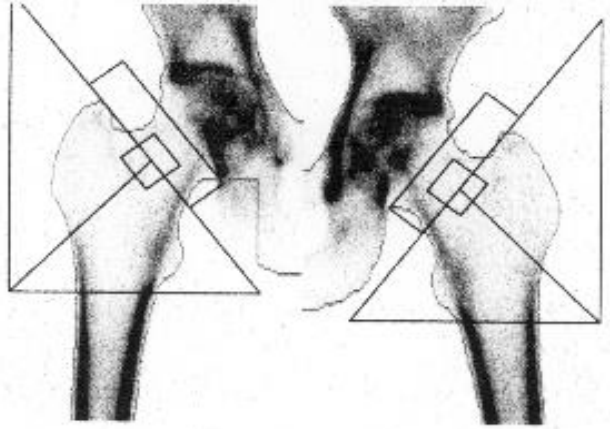
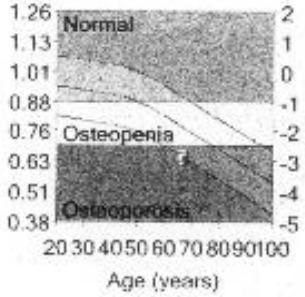
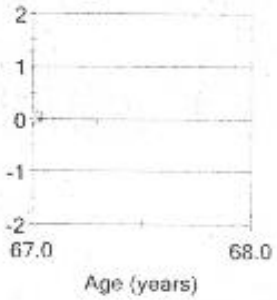


Image not for diagnosis





Region	BMD [1,6] (g/cm²)	Young-Adult [2,7] T-Score	Age-Matched [3] Z-Score
Neck			
Left	0.622	-3.0	-0.9
Right	0.640	-2.8	-0.8
Mean	0.631	-2.9	-0.8
Difference	0.018	0.2	0.2
Total			
Left	0.657	-2.8	-0.9
Right	0.640	-2.9	-1.1
Mean	0.648	-2.9	-1.0
Difference	0.017	0.1	0.1

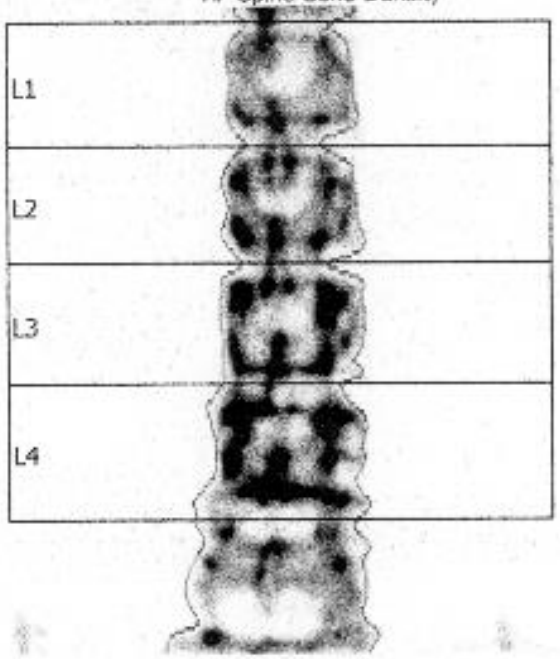
Trend: Total Mean

Measured Date	Age (years)	BMD [1,6] (g/cm²)	Change vs Baseline (%)	Change vs Baseline (%/yr)
10/29/2005	67.0	0.648	baseline	baseline

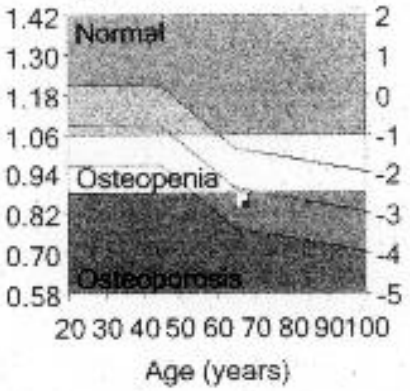
COMMENTS:

Birth Date:	10/22/1938 67.0 years	**Physician:**	
Height / Weight:	60.0 in, 91.0 lbs.	**Measured:**	
Sex / Ethnic:	Female Asian	**Analyzed:**	10/29/2005 10:54:42 AM (6.70)

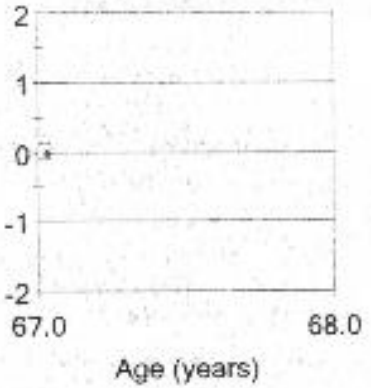
AP Spine Bone Density



Reference: L1-L4



Trend: L1-L4



Region	BMD [1] (g/cm²)	Young-Adult [2] T-Score	Age-Matched [3] Z-Score
L1	0.765	-3.0	-0.6
L2	0.822	-3.2	-0.7
L3	0.903	-2.5	-0.1
L4	0.924	-2.3	0.1
L1-L4	0.861	-2.7	-0.2
L2-L4	0.888	-2.6	-0.2

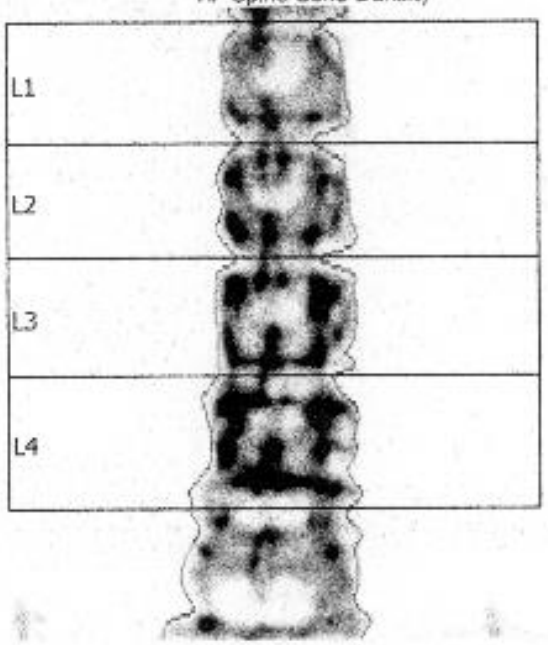
Trend: L1-L4

Measured Date	Age (years)	BMD [1] (g/cm²)	Change vs Baseline (%)	Change vs Baseline (%/yr)
10/29/2005	67.0	0.861	baseline	baseline

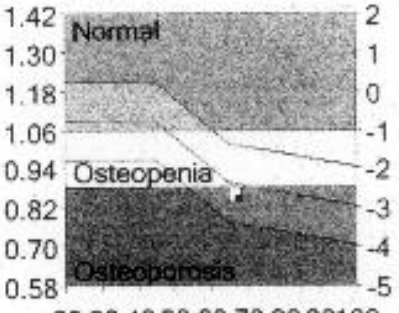
COMMENTS:

Birth Date:	10/22/1938 67.0 years	**Physician:**	DR. XU-Xudong & DR. CHEN Yongfang
Height / Weight:	60.0 in, 91.0 lbs.	**Measured:**	10/29/2005 10:54:10 AM (6.70)
Sex / Ethnic:	Female Asian	**Analyzed:**	10/29/2005 10:54:42 AM (6.70)

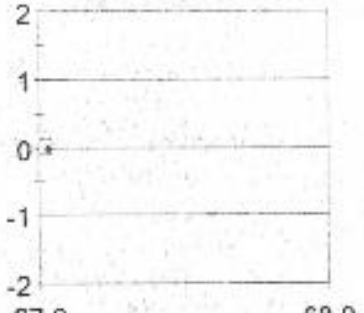
AP Spine Bone Density



Reference: L1-L4



Trend: L1-L4



Region	BMD [1] (g/cm²)	Young-Adult [2] T-Score	Age-Matched [3] Z-Score
L1	0.765	-3.0	-0.6
L2	0.822	-3.2	-0.7
L3	0.903	-2.5	-0.1
L4	0.924	-2.3	0.1
L1-L4	0.861	-2.7	-0.2
L2-L4	0.888	-2.6	-0.2

Trend: L1-L4

Measured Date	Age (years)	BMD [1] (g/cm²)	Change vs Baseline (%)	Change vs Baseline (%/yr)
10/29/2005	67.0	0.861	baseline	baseline

COMMENTS:

Patient:	[redacted]		**Patient ID:**	P&G6	
Birth Date:		36.6 years	**Referring Physician:**	Dr. Petak	
Height / Weight:	64.0 in.	125.0 lbs.	**Measured:**	04/12/2005	10:38:52 AM (9.15)
Sex / Ethnic:	Female	White	**Analyzed:**	04/12/2005	10:38:56 AM (9.15)

DualFemur Bone Density

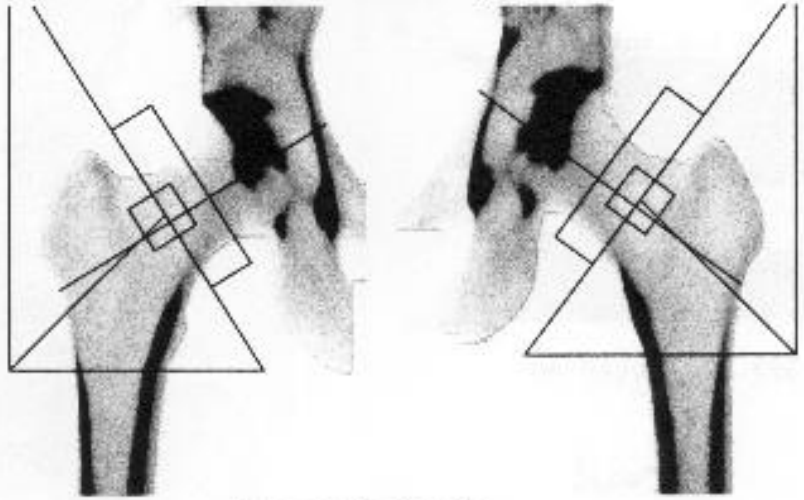
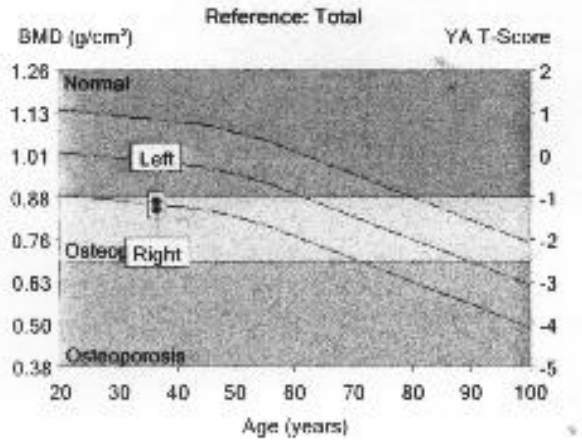
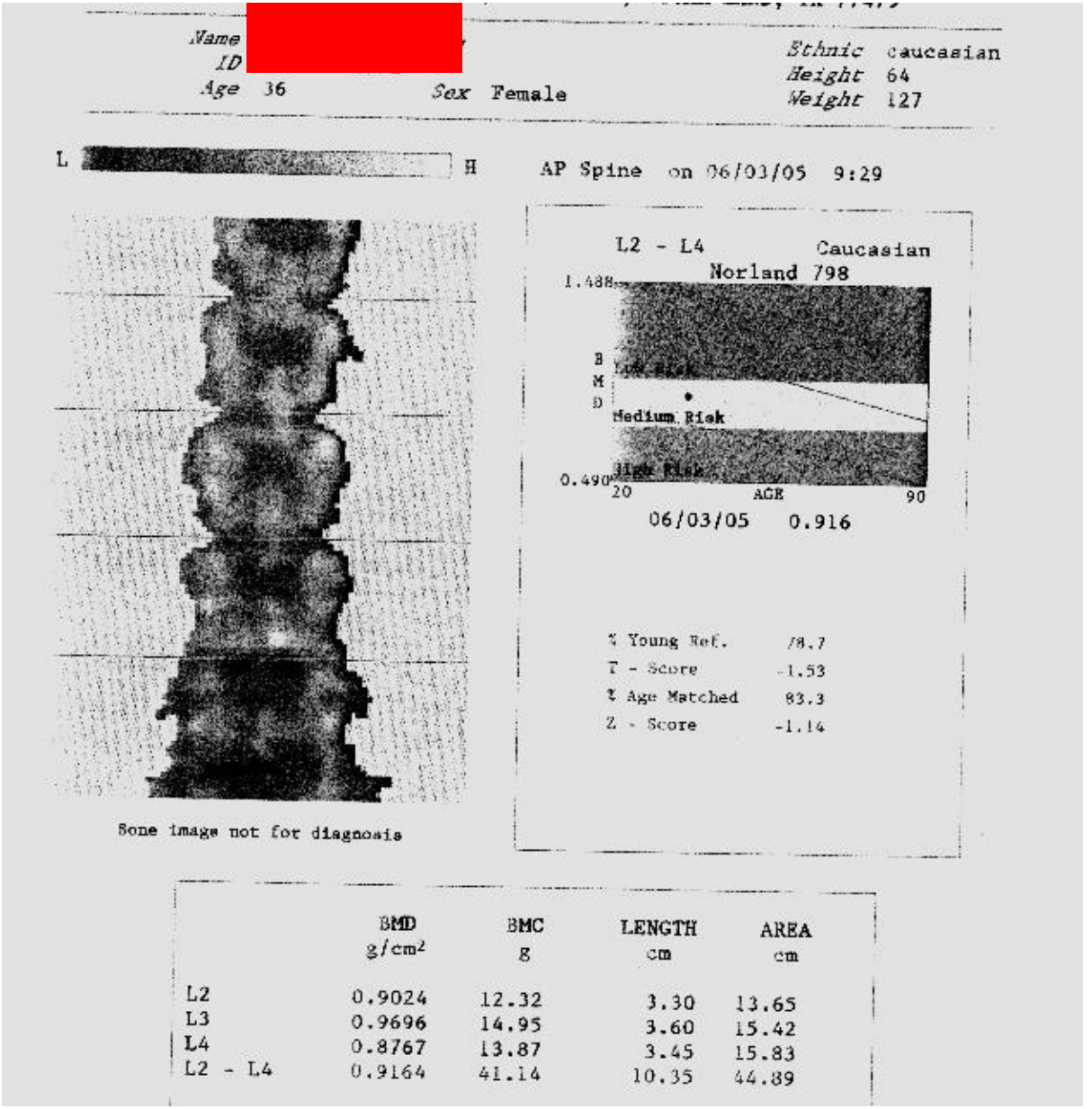


Image not for diagnosis



Region	BMD [1] (g/cm²)	Young-Adult [2,7] (%)	Young-Adult [2,7] T-Score	Age-Matched [3] (%)	Age-Matched [3] Z-Score
Neck					
Neck Left	0.807	78	-1.7	81	-1.3
Neck Right	0.827	80	-1.5	83	-1.2
Neck Mean	0.817	79	-1.6	82	-1.3
Neck Diff.	0.021	2	0.2	2	0.2
Total					
Total Left	0.871	86	-1.1	88	-0.9
Total Right	0.842	84	-1.3	85	-1.2
Total Mean	0.856	85	-1.2	87	-1.0
Total Diff.	0.030	3	0.2	3	0.2

Norland report



Name [redacted]
ID
Age 36 Sex Female
Ethnic caucasian
Height 64
Weight 127

L H

AP Spine on 06/03/05 9:29

L2 - L4 Caucasian
Norland 798
1.488
BMD
Medium Risk
High Risk
0.490
20 AGE 90
06/03/05 0.916

Bone image not for diagnosis

% Young Ref. 78.7
T - Score -1.53
% Age Matched 83.3
Z - Score -1.14

	BMD g/cm²	BMC g	LENGTH cm	AREA cm
L2	0.9024	12.32	3.30	13.65
L3	0.9696	14.95	3.60	15.42
L4	0.8767	13.87	3.45	15.83
L2 - L4	0.9164	41.14	10.35	44.89