КЛИНИЧЕСКАЯ ДЕНСИТОМЕТРИЯ

Современные неинвазивные методы количественной диагностики остеопороза и оценки риска перелома

- *Двух-энергетическая рентгеновская абсорбциометрия*

  аксиальная и периферическая

- *Количественная компьютерная томография*

  аксиальная и периферическая

- *Костная ультрасонометрия*

  периферическая

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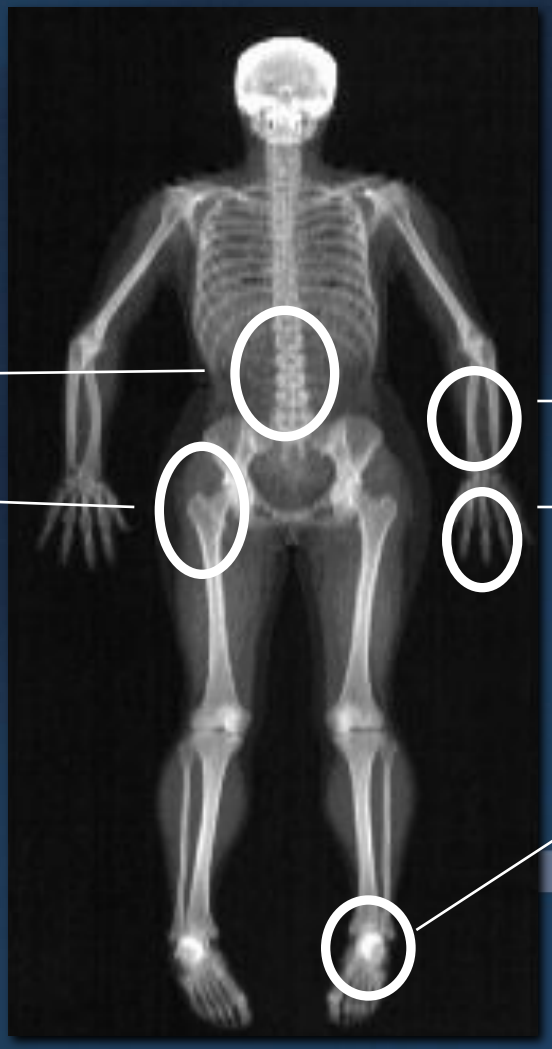
Аксиальные и периферические точки

Аксиальные

Spine

Hip



Периферические

Forearm

Phalanges

Heel

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Двух-энергетическая рентгеновская абсорбциометрия (DXA)

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Двух-энергетическая рентгеновская абсорбциометрия (DXA)

- Излучение с низкой энергией ослабляется костной и мягкими тканями в большей степени, чем излучение с высокой энергией.
- Разница в ослаблении «кость – мышца» для низкой энергии, больше, чем для высокой энергии.

Чтобы решить задачу с двумя неизвестными

(количество костной ткани и количество мягких тканей), следует использовать излучение, спектр которого имеет два пиковых значения в низкоэнергетической и высокоэнергетической области.

Специальный математический анализ позволяет оценить массу костного минерала и мягких тканей в исследуемой области.

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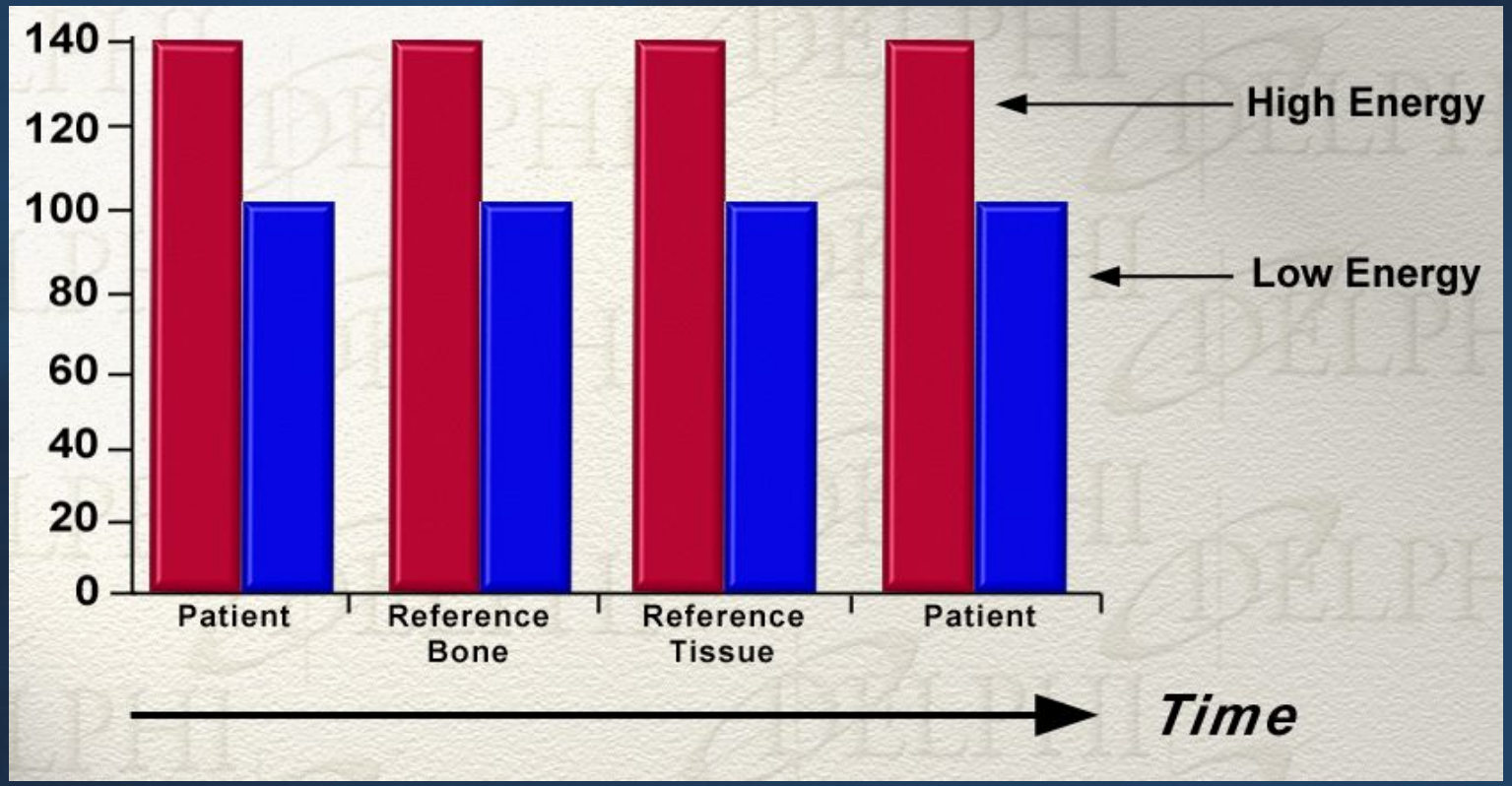
HOLOGIC: технология переключения энергии



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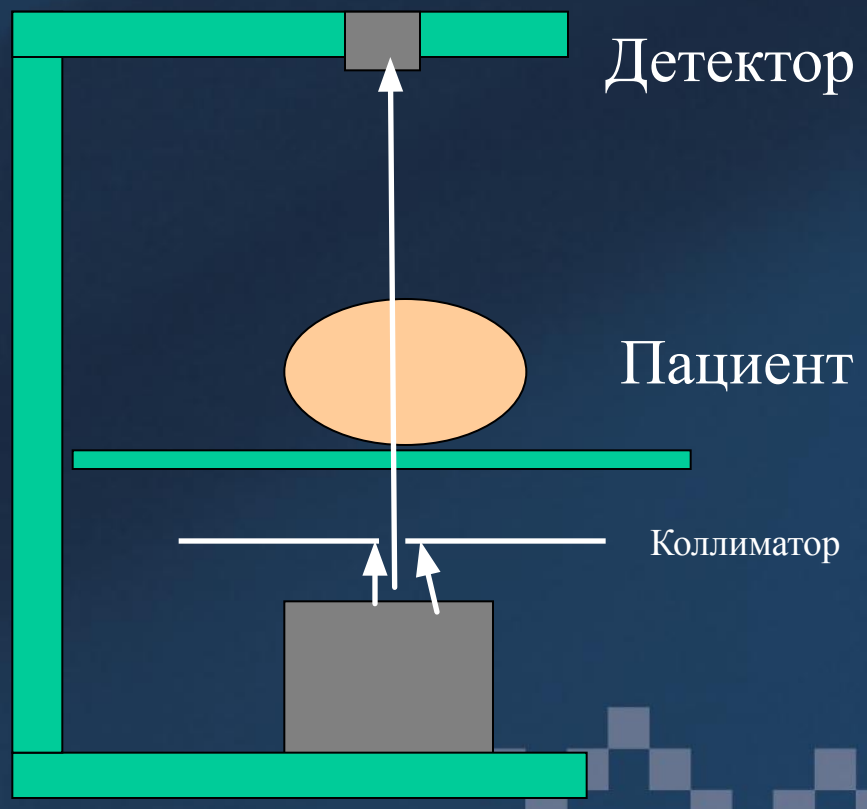
DXA денситометр



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Золотой стандарт

в клинической денситометрии

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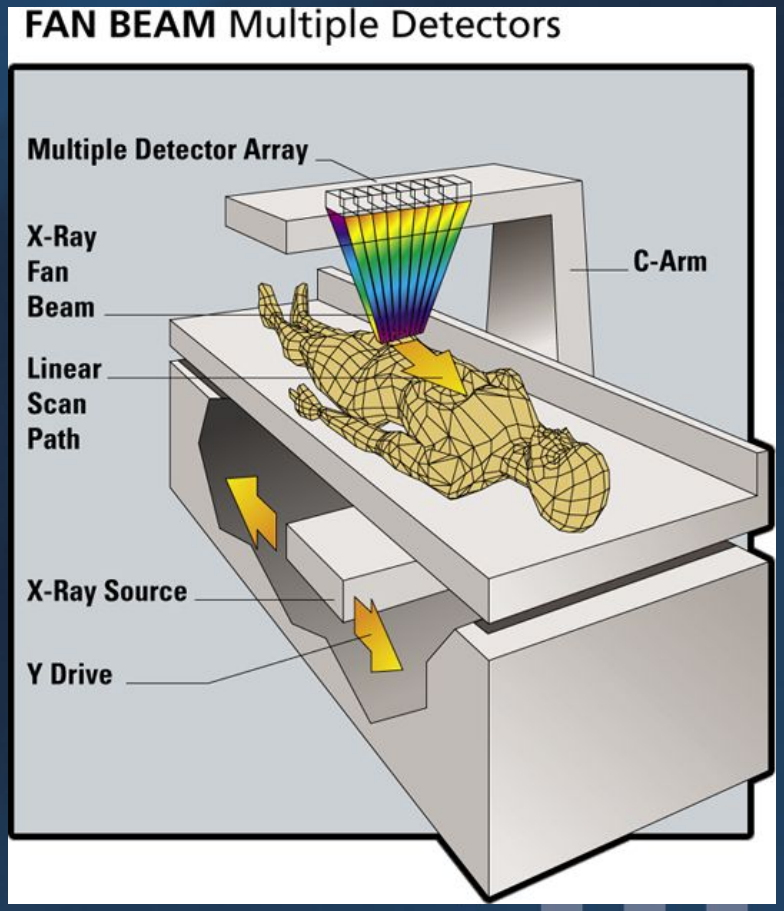
Третье поколение DXA денситометров



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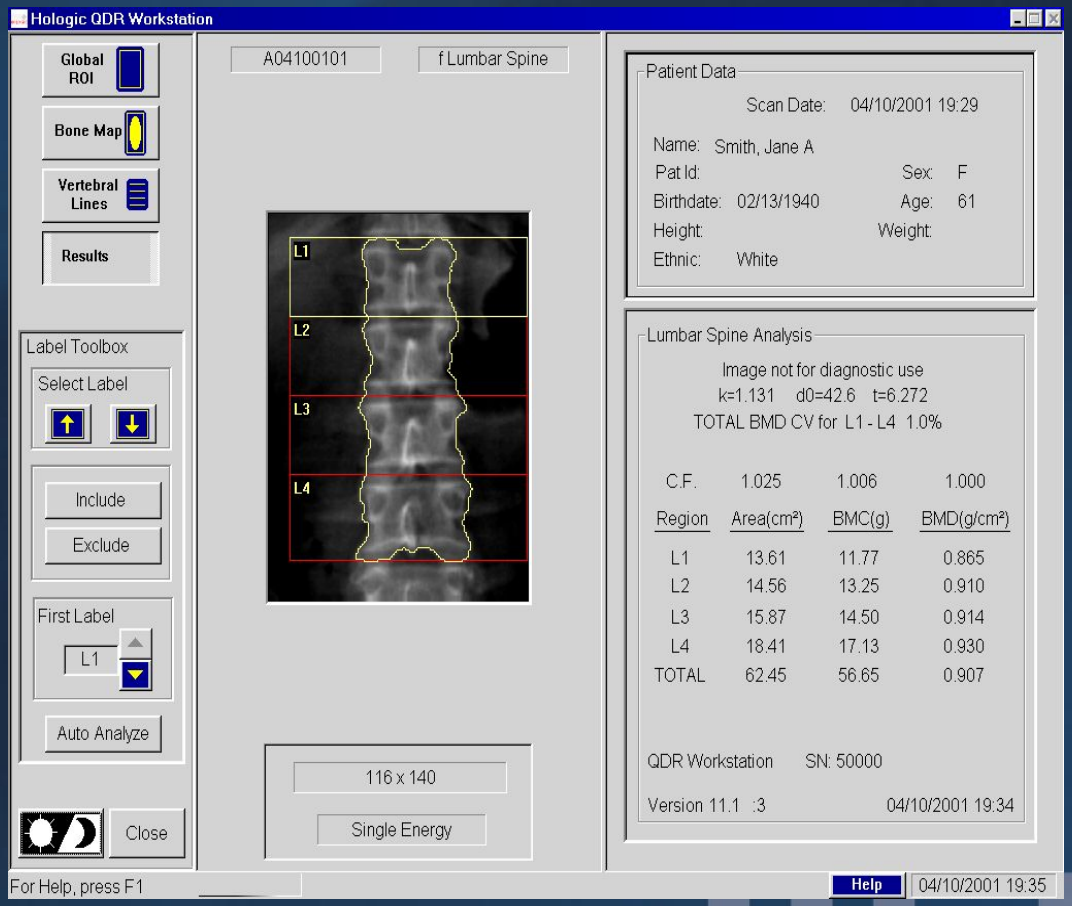
Анализ поясничных позвонков



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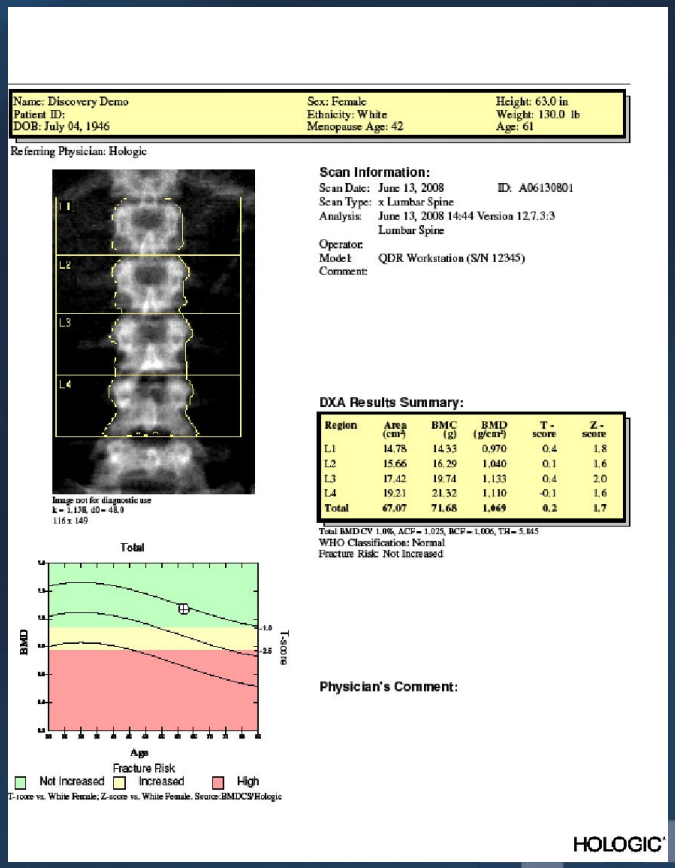
Форма отчета



Name: Discovery Demo
Patient ID:
DOB: July 04, 1946

Sex: Female
Ethnicity: White
Menopause Age: 42

Height: 63.0 in
Weight: 130.0 lb
Age: 61

Referring Physician: Hologic

L1
L2
L3
L4

Image not for diagnostic use
k = 1.138, d0 = 48.9
116 x 149

Scan Information:

Scan Date: June 13, 2008 ID: A06130801
Scan Type: x Lumbar Spine
Analysis: June 13, 2008 14:44 Version 12.7.3:3
Lumbar Spine
Operator:
Model: QDR Workstation (S/N 12345)
Comment:

DXA Results Summary:

Region	Area (cm^2)	BMC (g)	BMD (g/cm^2)	T - score	Z - score
L1	14.78	14.33	0.970	0.4	1.8
L2	15.66	16.29	1.040	0.1	1.6
L3	17.42	19.74	1.133	0.4	2.0
L4	19.21	21.32	1.110	-0.1	1.6
Total	**67.07**	**71.68**	**1.069**	**0.2**	**1.7**

Total BMDCV 1.08%, ACF = 1.025, BCF = 1.006, TH = 5.845
WHO Classification: Normal
Fracture Risk: Not Increased

Total

BMD
T-SCORE
Age

Fracture Risk
Not Increased Increased High

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

Physician's Comment:

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Мгновенная оценка состояния позвоночника (I V A)

- Моноэнергетический режим -140 кВ
- Время сканирования - 10 сек
- Разрешение – 0.3 мм
- Изображение в двух проекциях
- Лучевая нагрузка в 100 раз (!) меньше, чем при обычной рентгенографии

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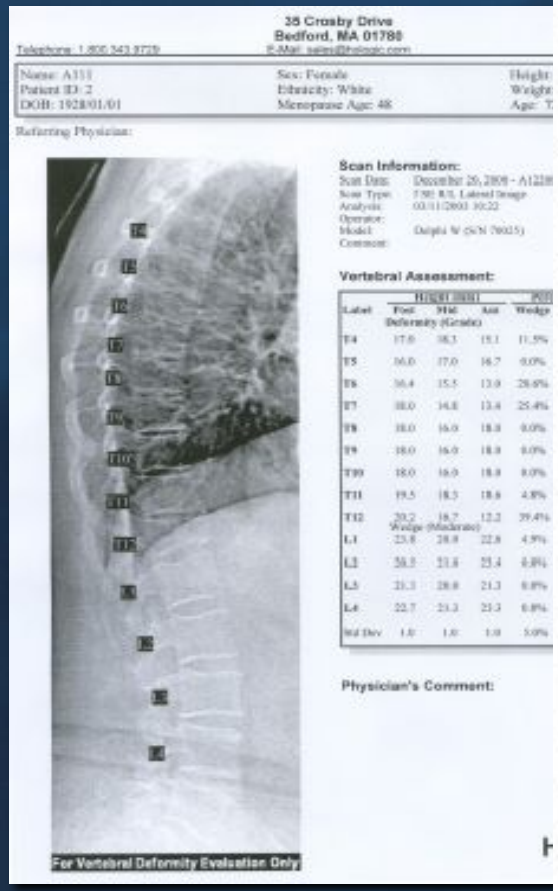
Количественная морфометрия позвоночника



Label	Height (mm) Post	Mid	Ant	Percent Deformation Wedge	Biconcave	Crush
	Deformity (Grade)					
T4	17.0	18.3	15.1	11.5%	-7.6%	0.0%
T5	16.0	17.0	16.7	0.0%	-5.9%	4.1%
T6	16.4	15.5	13.0	20.6%	5.4%	0.0%
T7	18.0	14.8	13.4	25.4%	17.7%	0.0%
T8	18.0	16.0	18.0	0.0%	11.1%	0.0%
T9	18.0	16.0	18.0	0.0%	11.1%	0.0%
T10	18.0	16.0	18.0	0.0%	11.1%	0.0%
T11	19.5	18.3	18.6	4.8%	6.2%	0.0%
T12	20.2	16.7	12.2	39.4%	17.3%	0.0%
	Wedge (Moderate)					
L1	23.8	20.0	22.6	4.9%	15.8%	0.0%
L2	20.5	21.0	23.4	0.0%	-2.4%	12.5%
L3	21.3	20.0	21.3	0.0%	6.1%	0.1%
L4	22.7	21.3	23.3	0.0%	6.0%	2.7%
Std Dev	1.0	1.0	1.0	5.0%	5.0%	5.0%

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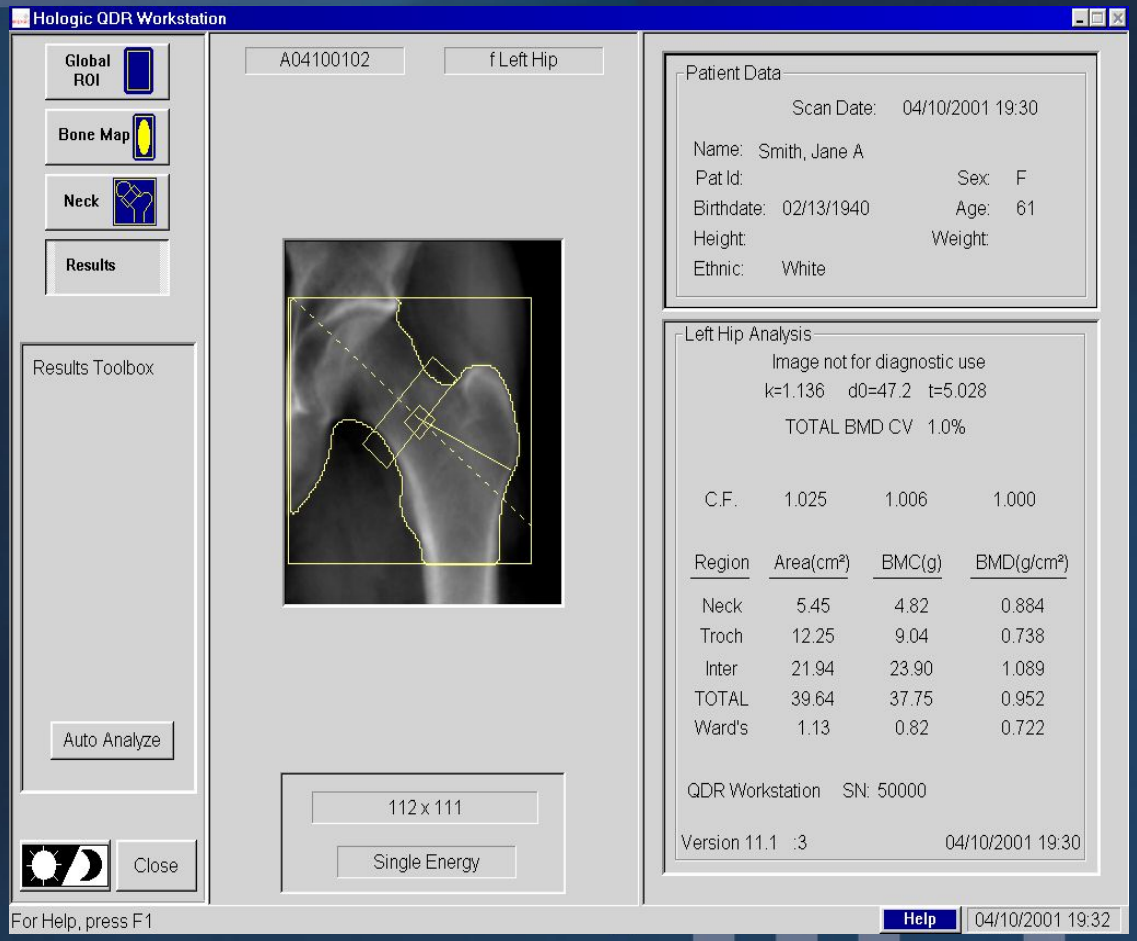
Анализ проксимального отдела бедра



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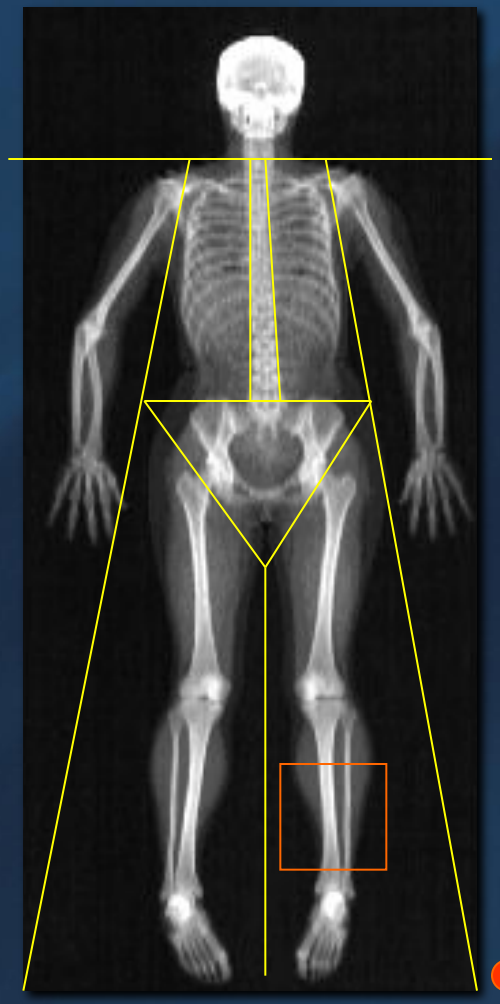
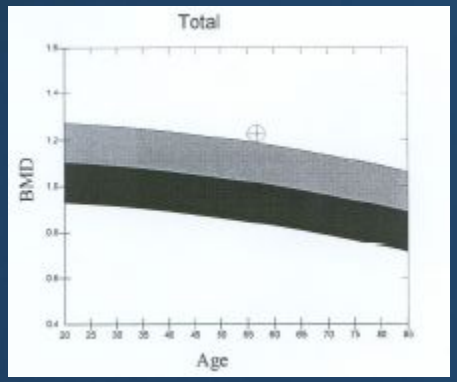
Общий и региональный анализ



- Общая МПК и минеральная масса
- Региональный анализ по 10 стандартным зонам
- Т и Z-индексы

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T - Score	Z - Score
L Arm	172.75	133.99	0.776		
R Arm	196.29	156.12	0.795		
L Ribs	140.43	104.43	0.744		
R Ribs	135.25	99.84	0.738		
T Spine	100.94	113.86	1.128		
L Spine	50.67	62.88	1.241		
Pelvis	205.07	259.19	1.264		
L Leg	365.85	428.90	1.172		
R Leg	370.23	436.58	1.179		
Subtotal	1737.47	1795.77	1.034		
Head	233.39	622.92	2.669		
Total	**1970.86**	**2418.69**	**1.227**	**1.4**	**2.5**
Sub-Region	Area (cm²)	BMC (g)	BMD (g/cm²)		



- Произвольный анализ

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Состав тела:
общий и региональный анализ

Минеральная масса

Жировая масса

Тощая масса

Общая масса

% жира

DXA Results Summary:

Region	BMC (g)	Fat (g)	Lean (g)	Lean+BMC (g)	Total Mass (g)	% Fat
L Arm	133.99	698.6	1671.2	1805.2	2503.8	27.9
R Arm	156.12	903.7	1933.7	2089.9	2993.6	30.2
Trunk	640.19	5993.3	20104.1	20744.3	26737.5	22.4
L Leg	428.90	1988.8	7029.9	7458.8	9447.6	21.1
R Leg	436.58	2192.5	7403.1	7839.7	10032.2	21.9
Subtotal	1795.77	11776.9	38142.1	39937.9	51714.8	22.8
Head	622.92	861.6	3111.1	3734.0	4595.6	18.7
Total	**2418.69**	**12638.5**	**41253.2**	**43671.9**	**56310.4**	**22.4**
Sub-Region	BMC (g)	Fat (g)	Lean (g)	Lean+BMC (g)	Total Mass (g)	% Fat

- Произвольный анализ

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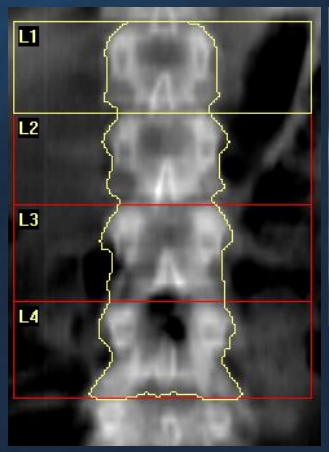
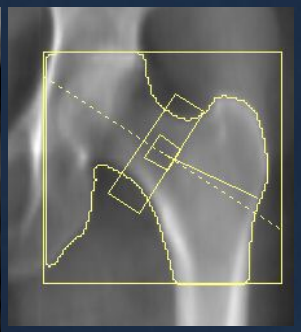
OSTEOPOROSIS ASSESSMENT

Hologic Product Line 2010





Серия Discovery i

- 65 детекторов
- 30-секундное измерение МПК
- 10-секундная оценка состояния позвоночника

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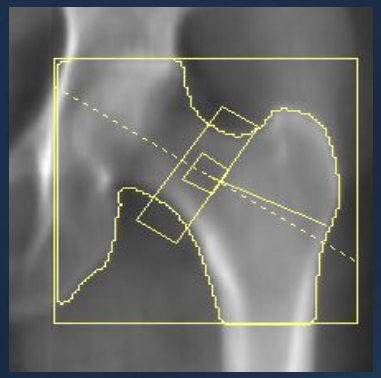
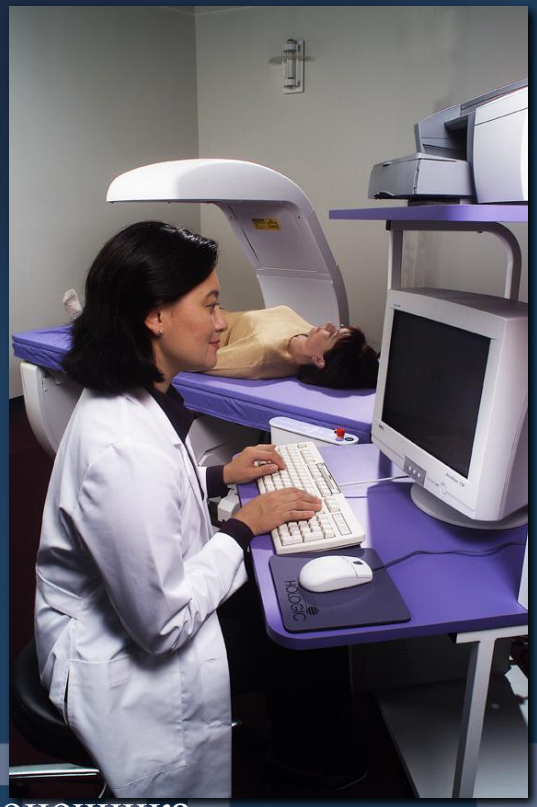
Hologic Product Line 2010

Серия Discovery





- 216 детекторов
- 10-секундное измерение МПК
- 10-секундная оценка состояния позвоночника

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Латеральное сканирование

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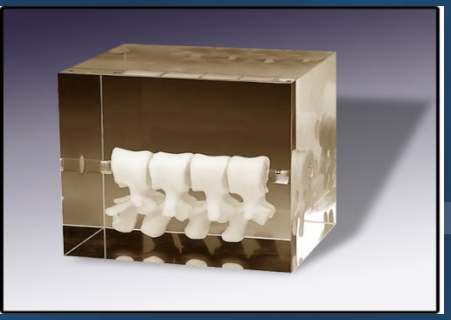
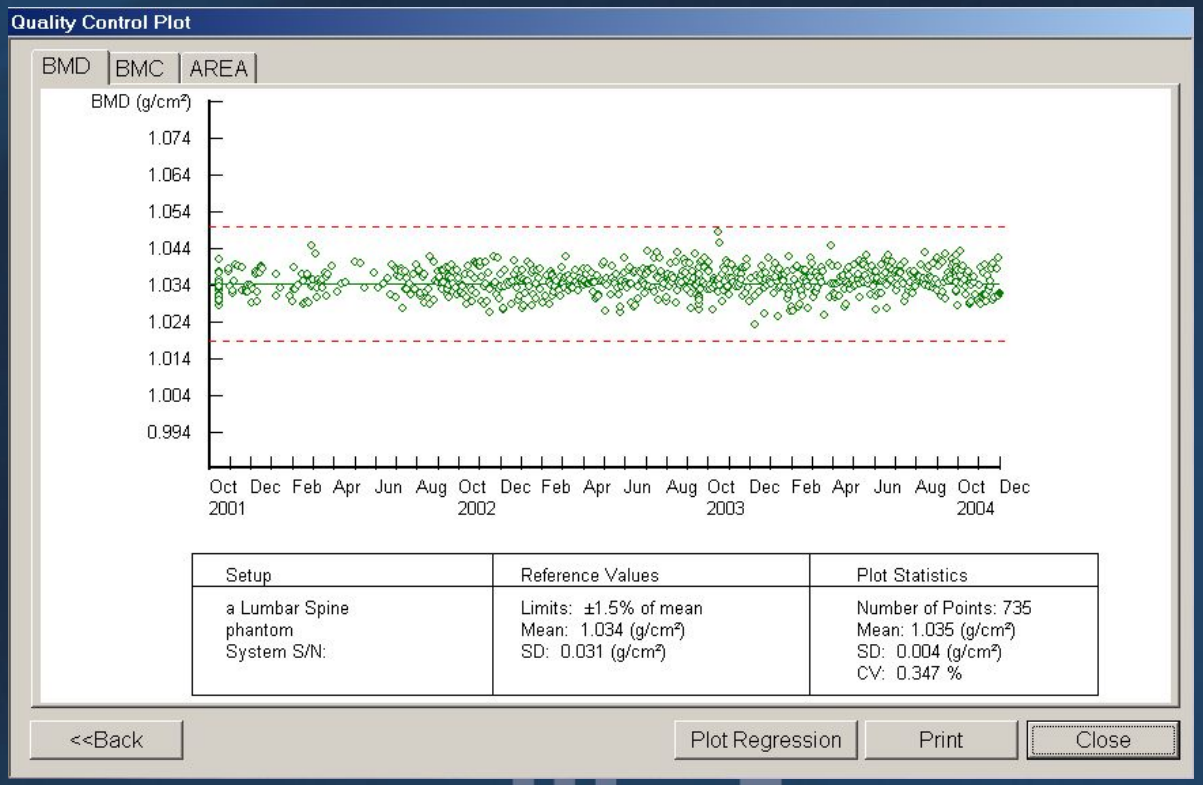


Контроль качества работы системы



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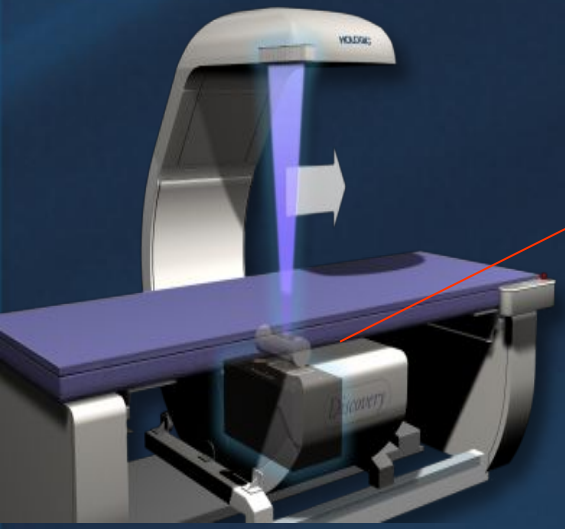
Контроль качества работы системы



Встроенная калибровочная система

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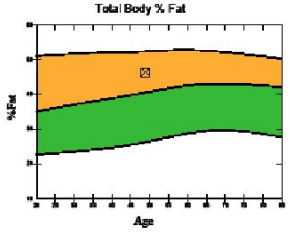
Новые возможности: расширенный отчет о составе тела

Hologic Imaging Center
35 Crosby Drive
Bedford, MA 01730

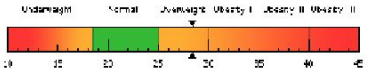
Telephone: 1.800.343.9729 E-Mail: sales@hologic.com Fax: 781.280.0668

Name: Advanced WB 08	Sex: Female	Height: 68.0 in
Patient ID: P228	Ethnicity: White	Weight: 187.0 lb
DOB: July 01, 1951		Age: 48



Source: NHANESWB

World Health Organization Body Mass Index Classification
BMI = 28.4 WHO Classification Overweight



BMI has some limitations and an actual diagnosis of overweight or obesity should be made by a health professional. Obesity is associated with heart disease, certain types of cancer, type 2 diabetes, and other health risks. The higher a person's BMI is above 25, the greater their weight-related risks.

Body Composition Results

Region	Fat Mass (g)	Lean+ BMC (g)	Total Mass (g)	% Fat	%Fat Percentile YN	%Fat Percentile AM
L Arm	2203	1961	4166	52.9		
R Arm	1938	2012	3951	49.1		
Trunk	15985	21053	37039	43.2		
L Leg	8489	7747	16236	52.3		
R Leg	8673	8248	16921	51.3		
Subtotal	37292	41021	78312	47.6		
Head	937	3395	4332	22.0		
Total	**38249**	**44416**	**82665**	**46.3**	**91**	**82**
Android	2399	3357	5756	41.7		
Gynoid	7547	7028	14574	51.8		

Scan Date: March 17, 2000 ID: A05170003
Scan Type: a Whole Body
Analysis: July 17, 2008 17:31 Version 13.0 Whole Body
Operator:
Model: Delphi W (S/N 70002)
Comment: Removed

Adipose Indices

Measure	Result	Percentile YN	Percentile AM
Total Body % Fat	46.3	91	82
Fat Mass/Height² (kg/m²)	12.8	79	65
Android/Gynoid Ratio	0.80		
% Fat Trunk/% Fat Legs	0.83	61	40
Trunk/Limb Fat Mass Ratio	0.75	41	20

Lean Mass Indices

Measure	Result	Percentile YN	Percentile AM
Lean Mass/Height² (kg/m²)	14.9	32	24
Appen. Lean Mass/Height² (kg/m²)	6.69	44	43

TBAR1889 - NHANES BCA calibration

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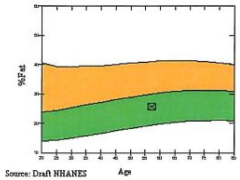
Новые возможности: расширенный отчет о составе тела

HOLOGIC, Inc.
35 Crosby Drive
Bedford, MA 01730-1401

Telephone: 781-999-7878 E-Mail: www.hologic.com Fax: 987-567-1234

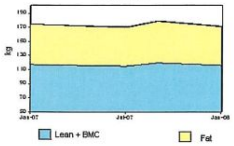
Name: test, m	Sex: Male	Height: 130.0 cm
Patient ID:	Ethnicity: White	Weight: 45.0 kg
DOB: January 16, 1951		Age: 57

Whole Body % Fat



Source: Draft NHANES

Mass change



%Fat Results Summary:

Scan Date	Age	%Fat	Percentile YN	Percentile AM	Vs Baseline	Vs Previous
01/01/08	57	25.8			1.1	0.4
07/05/07	56	25.4			0.7	0.1
01/10/07	56	25.3			0.6	0.2
06/15/06	55	25.1			0.4	0.2
02/21/06	55	24.9			0.2	0.2
04/15/05	54	24.7				

Total Fat Mass Results Summary:

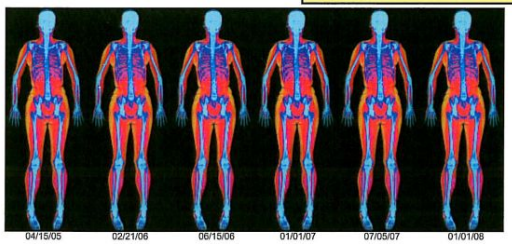
Scan Date	Age	Fat Mass(g)	Percentile YN	Percentile AM	Vs Baseline	Vs Previous
01/01/08	57	14542			616	198
07/05/07	56	14326			400	100
01/10/07	56	14226			300	100
06/15/06	55	14126			200	100
02/21/06	55	14026			100	100
04/15/05	54	13926				

Total Lean + BMC Results Summary:

Scan Date	Age	Lean+ BMC (g)	Percentile YN	Percentile AM	Vs Baseline	Vs Previous
01/01/08	57	41768			-708	-215
07/05/07	56	41963			-513	-195
01/10/07	56	42171			-305	-45
06/15/06	55	42216			-260	-117
02/21/06	55	42333			-143	-143
04/15/05	54	42476				

Total Mass Results Summary:

Scan Date	Age	Mass(g)	Percentile YN	Percentile AM	Vs Baseline	Vs Previous
01/01/08	57	56310			-135	-34
07/05/07	56	56344			-101	71
01/10/07	56	56273			-172	162
06/15/06	55	56111			-334	-188
02/21/06	55	56297			-148	-148
04/15/05	54	56445				



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Images not for diagnostic use

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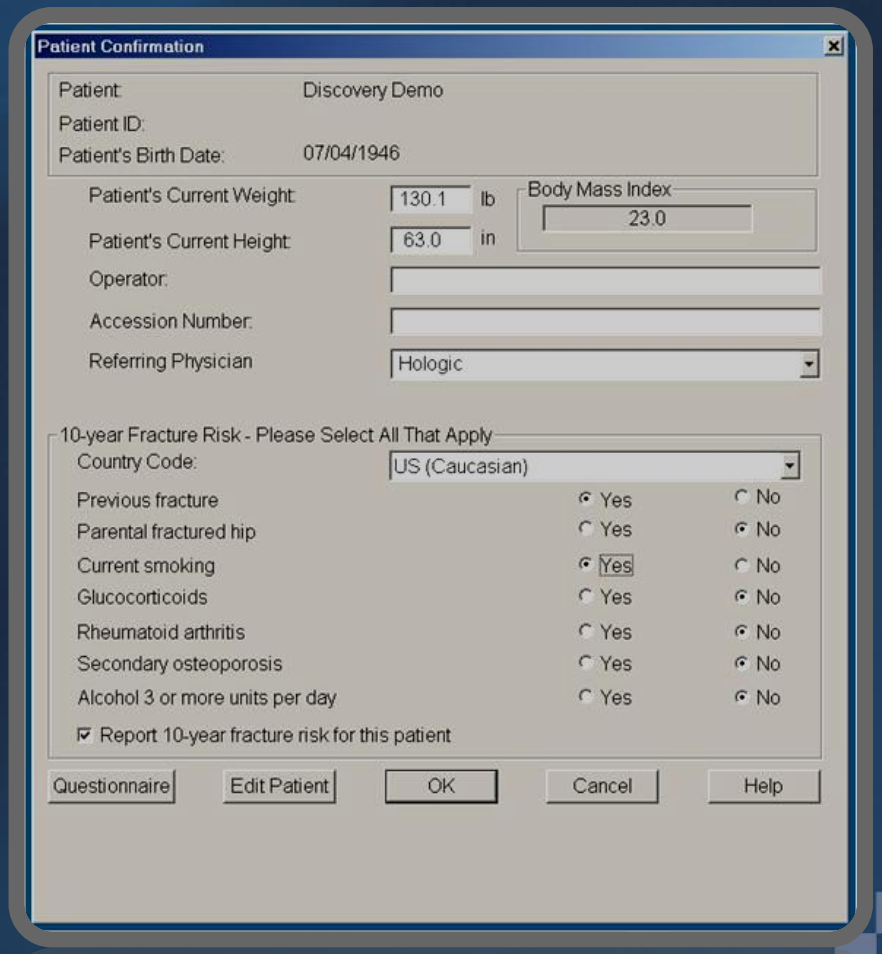
Новые возможности: программа FRAX™ (комбинация факторов риска переломов)



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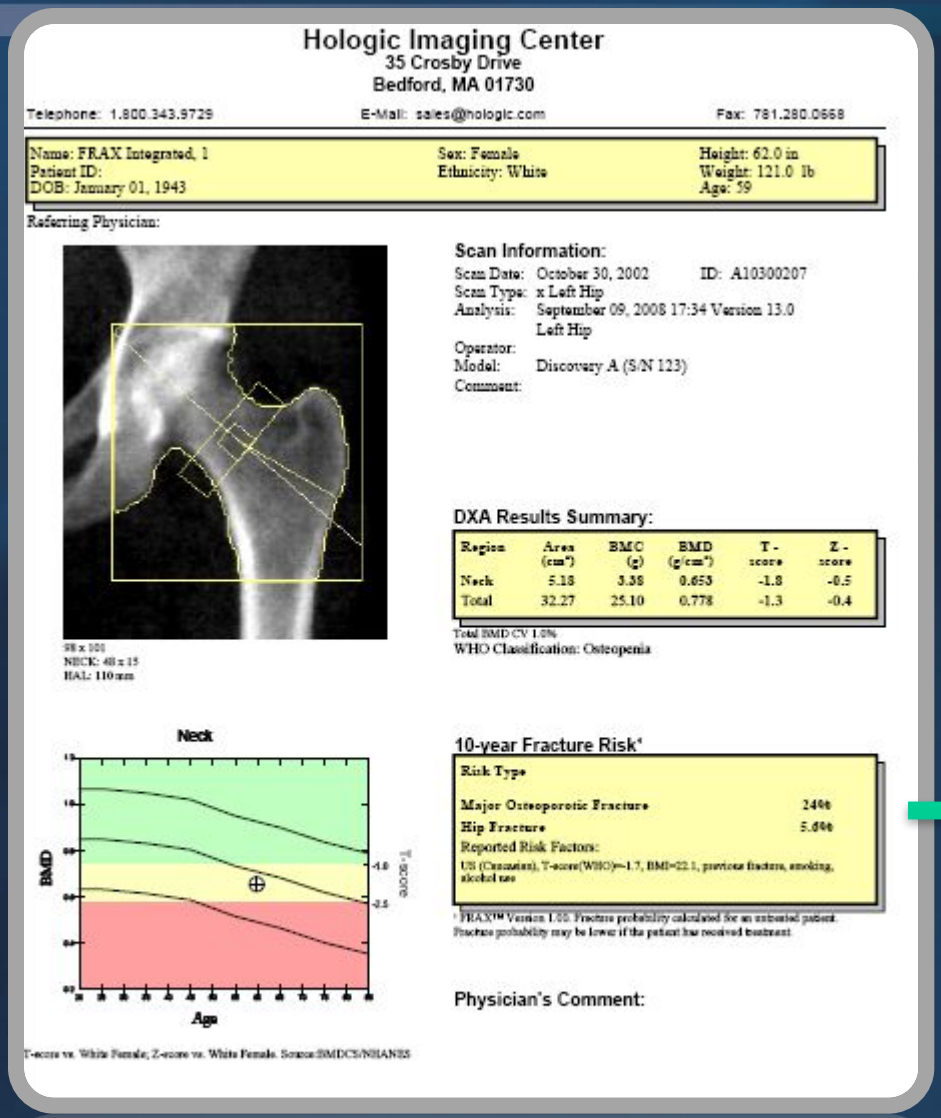
Программа FRAX : интегрированный отчет



Hologic Imaging Center
35 Crosby Drive
Bedford, MA 01730

Telephone: 1.800.343.9729 E-Mail: sales@hologic.com Fax: 781.280.0668

Name: FRAX Integrated, 1
Patient ID:
DOB: January 01, 1943

Sex: Female
Ethnicity: White

Height: 62.0 in
Weight: 121.0 lb
Age: 59

Referring Physician:

Scan Information:
Scan Date: October 30, 2002 ID: A10300207
Scan Type: x Left Hip
Analysis: September 09, 2008 17:34 Version 13.0
Left Hip
Operator:
Model: Discovery A (S/N 123)
Comment:

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T-score	Z-score
Neck	5.18	3.38	0.653	-1.8	-0.5
Total	32.27	25.10	0.778	-1.3	-0.4

Total BMD CV 1.0%
WHO Classification: Osteopenia

Neck
BMD
T-score
Age

10-year Fracture Risk[1]

Risk Type

Major Osteoporotic Fracture 24%
Hip Fracture 5.0%
Reported Risk Factors:
US (Caucasian), T-score(WHO)=-1.7, BMI=22.1, previous fracture, smoking, alcohol use

[1] FRAX™ Version 1.00. Fracture probability calculated for an untreated patient. Fracture probability may be lower if the patient has received treatment.

Physician's Comment:

10-year Fracture Risk[1]

Risk Type	
Major Osteoporotic Fracture	21%
Hip Fracture	3.6%

Reported Risk Factors:

US (Caucasian), T-score(WHO)=-1.7, BMI=22.1, previous fracture, smoking

FRAX™ Version 1.00. Fracture probability calculated for an untreated patient. Fracture probability may be lower if the patient has received treatment.

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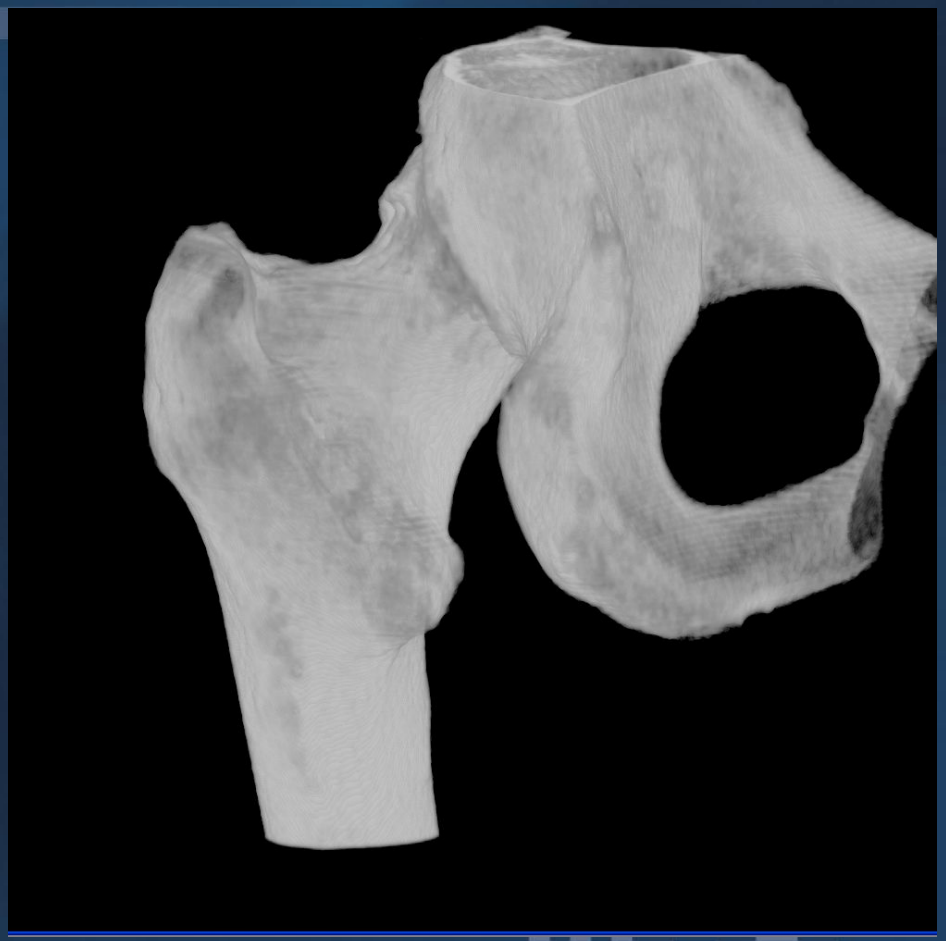
Что еще хотят исследователи ?



Объемную плотность…. и структуру !

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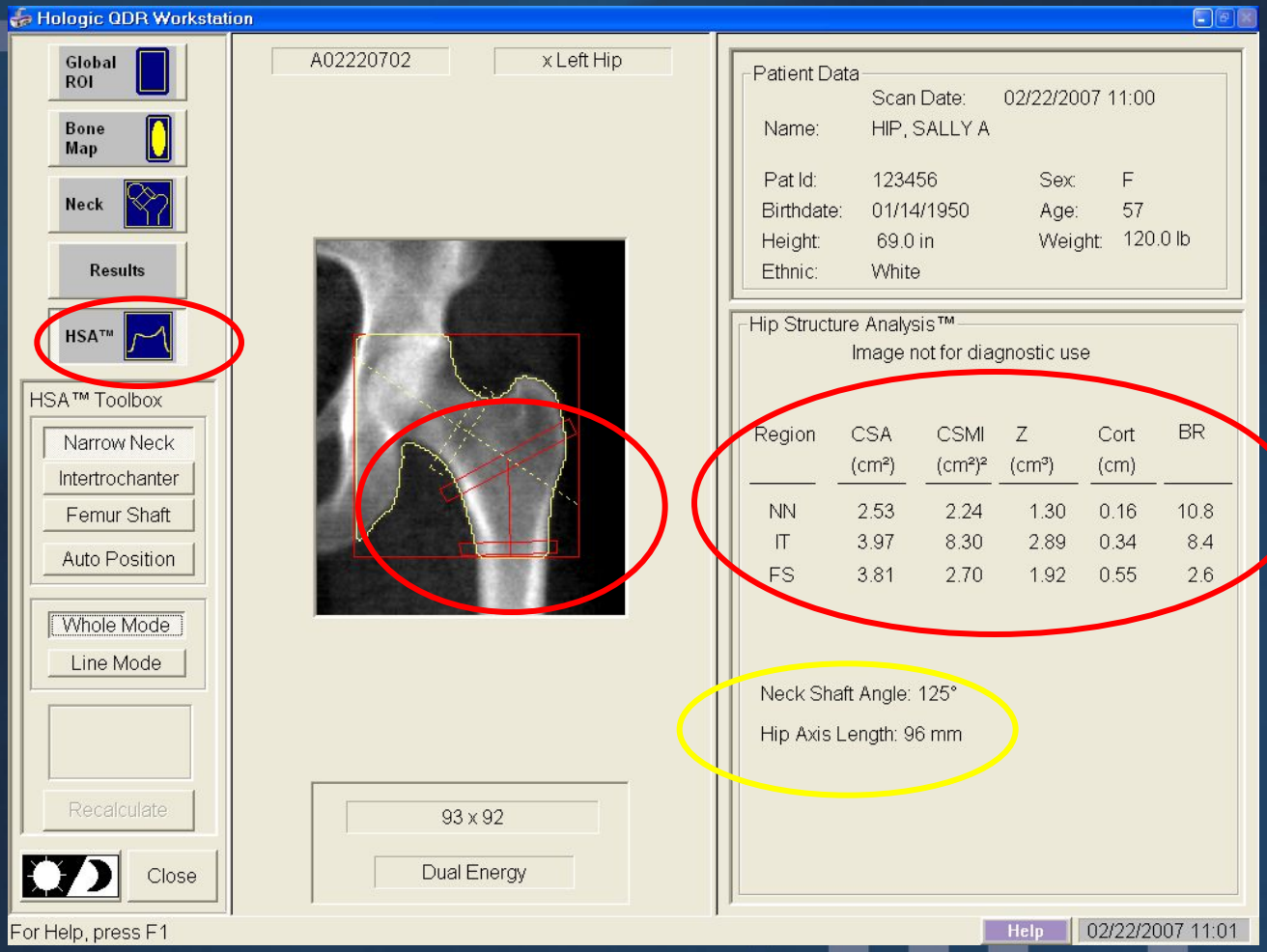
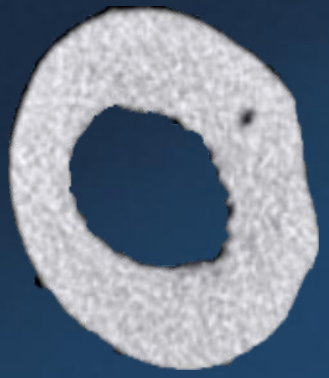
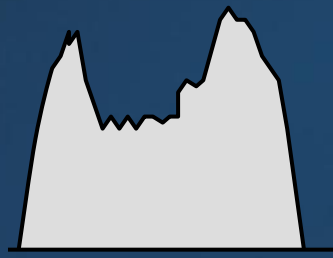
Новые возможности: анализ структуры бедра







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Новые возможности: 3 D анализ (2011)

Трехмерное изображение проксимального отдела бедра

с последующей оценкой объемной плотности и геометрических параметров.

Важное клиническое средство изучения структуры и прочностных свойств кости

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