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Diagnostische Präzision von DXL im Vergleich zu DXA bei pmp Frauen mit Frakturen

Christian Muschitz

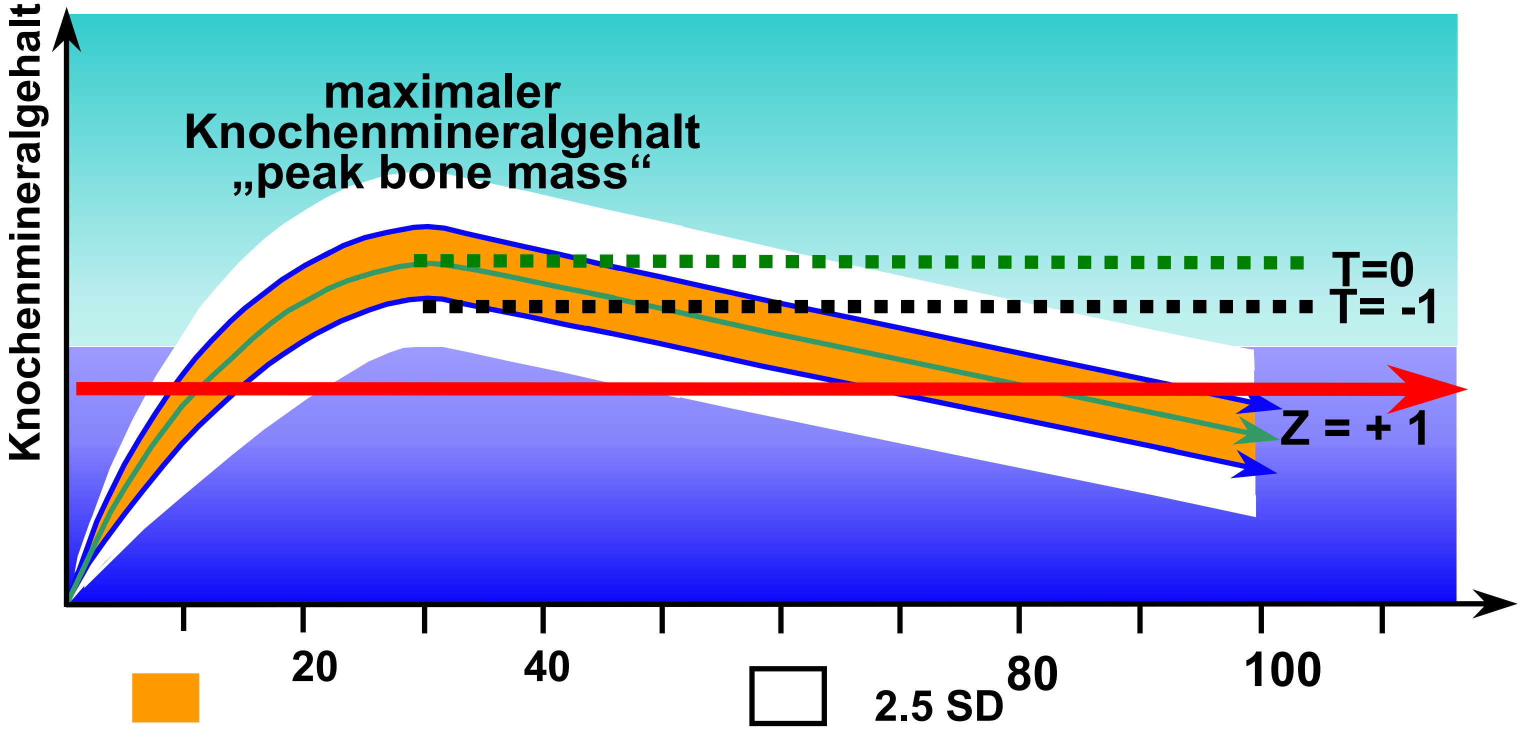
II. Medizinische Abteilung mit Rheumatologie, Osteologie & Gastroenterologie

Akademisches Lehrkrankenhaus der Universität Wien

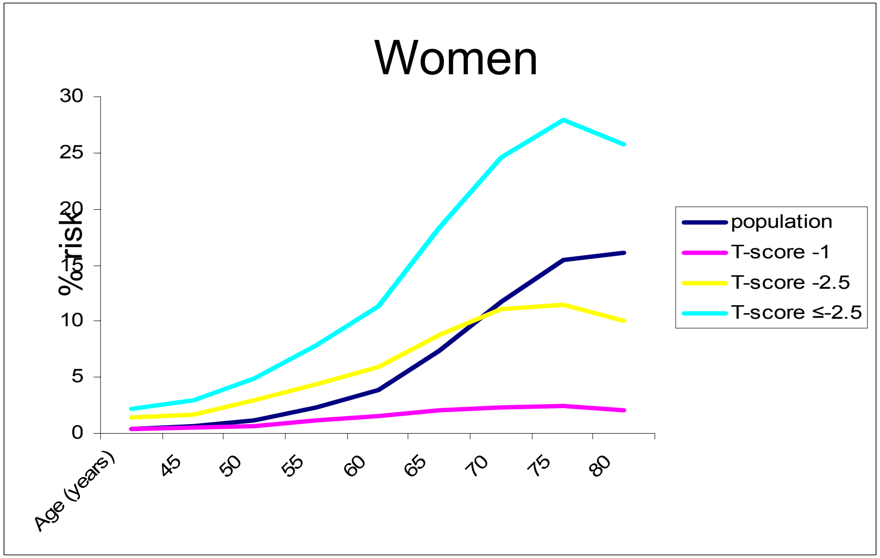
WHO Definition

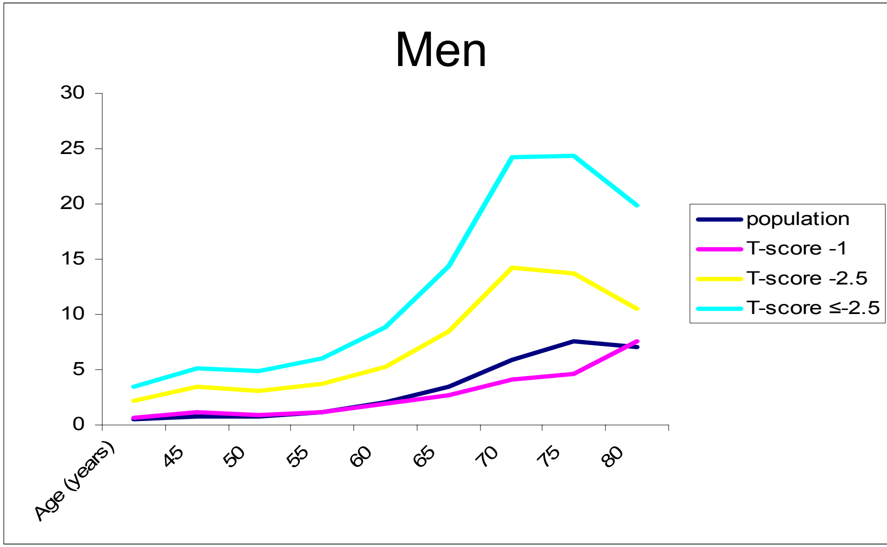
T-Score:

Normal	≥ - 1
Osteopenie	-1 bis -2,5
Osteoporose	≤ -2,5
Manifeste Osteoporose	≤ -2,5 und osteoporotische Fraktur



Ten Year Probability of Hip fracture in Swedish Women

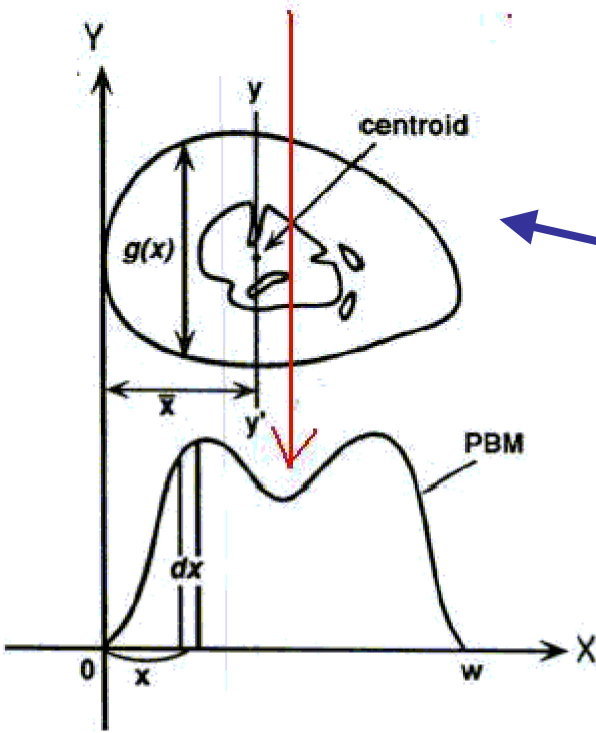




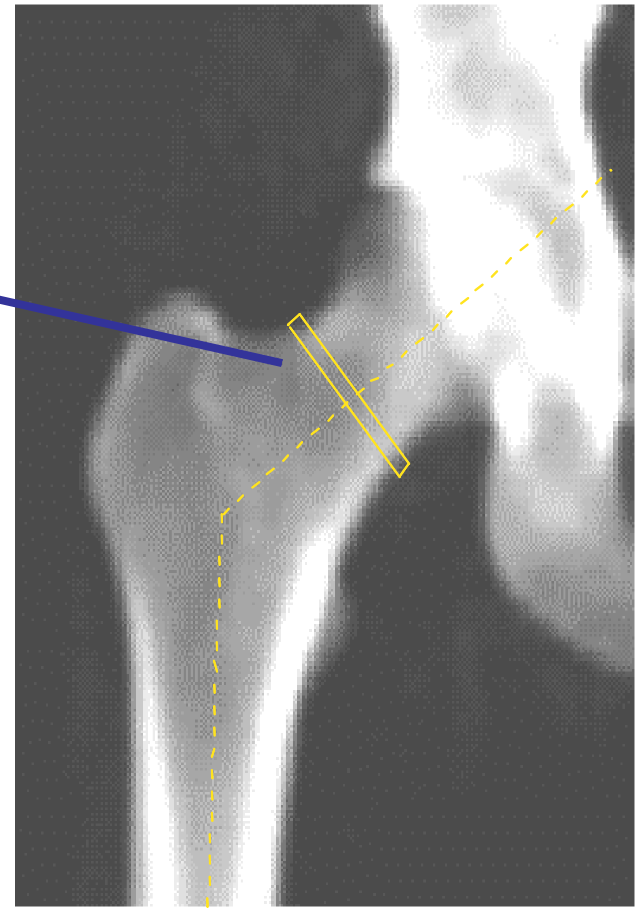
Adjusted to age and BMD at femoral neck

Kanis J. A., Borgstrom F. et al. Assessment of Fracture Risk; Osteoporosis International 16:581-589, 2005

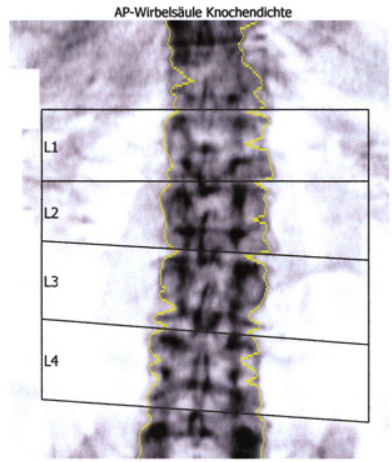
Mass/Density profiles by DXA – CSA (cm^2)

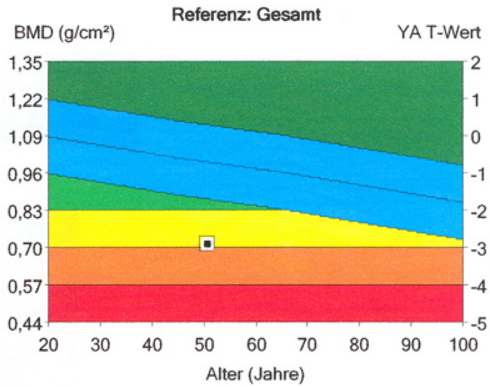


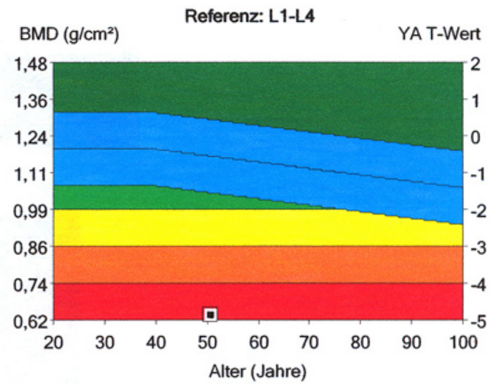
$$CSA = \int_0^{w} g(x)\, dx = \frac{k\, dx}{\rho} \sum PBM$$



Diagnostik: DXA



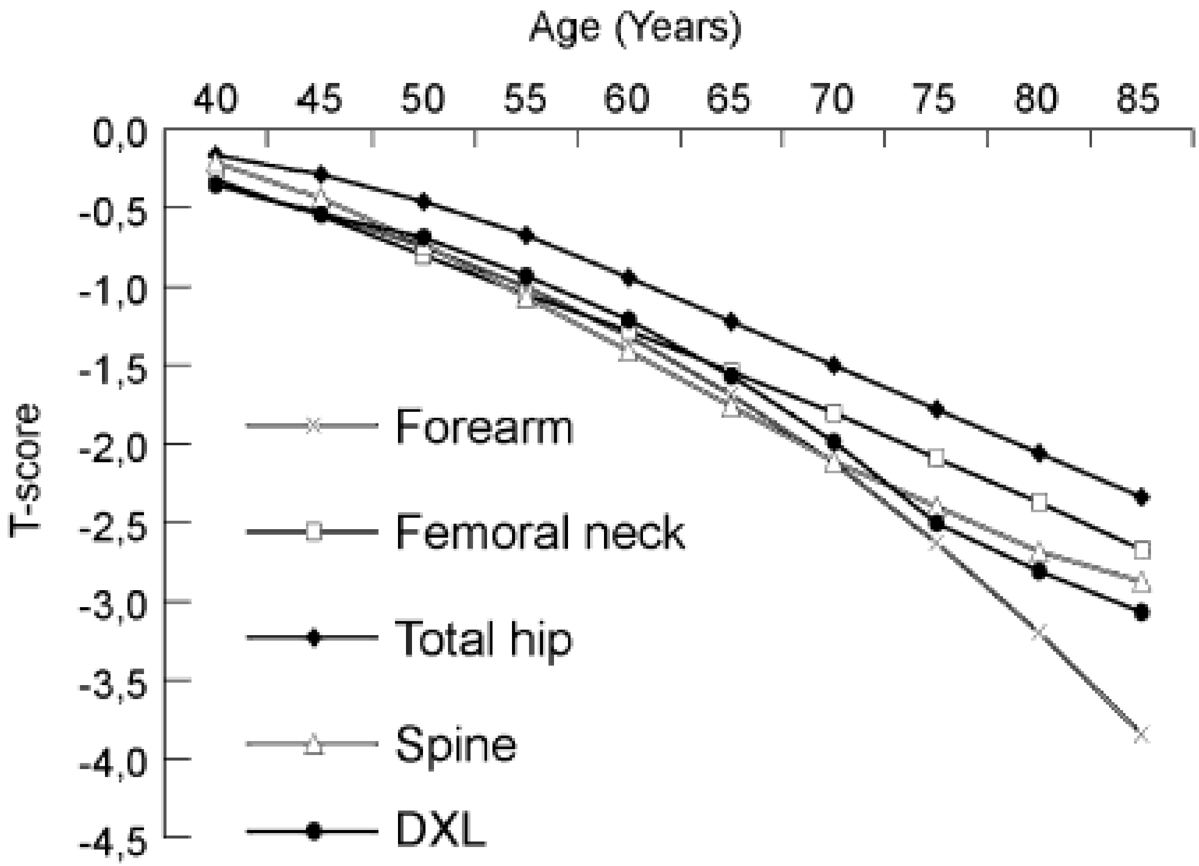




Bereich	BMD [1] (g/cm²)	Junge Erw. [2] (%)	Junge Erw. T-Wert	Altersvergl. [3] (%)	Altersvergl. Z-Wert
Hals	0,680	64	-3,0	71	-2,1
Troch	0,590	63	-3,1	68	-2,5
Gesamt	0,713	65	-2,9	72	-2,2

Bereich	BMD [1] (g/cm²)	Junge Erw. [2] (%)	Junge Erw. T-Wert	Altersvergl. [3] (%)	Altersvergl. Z-Wert
L1	0,521	45	-5,3	48	-4,7
L2	0,668	53	-4,8	56	-4,3
L3	0,674	55	-4,7	58	-4,1
L4	0,666	55	-4,6	58	-4,1
L1-L4	0,635	52	-4,9	55	-4,3

Age related Decline in T-scores



Kullenberg R. et al. Osteoporosis Int (2003) 14:823-827

DXA and DXL Technology

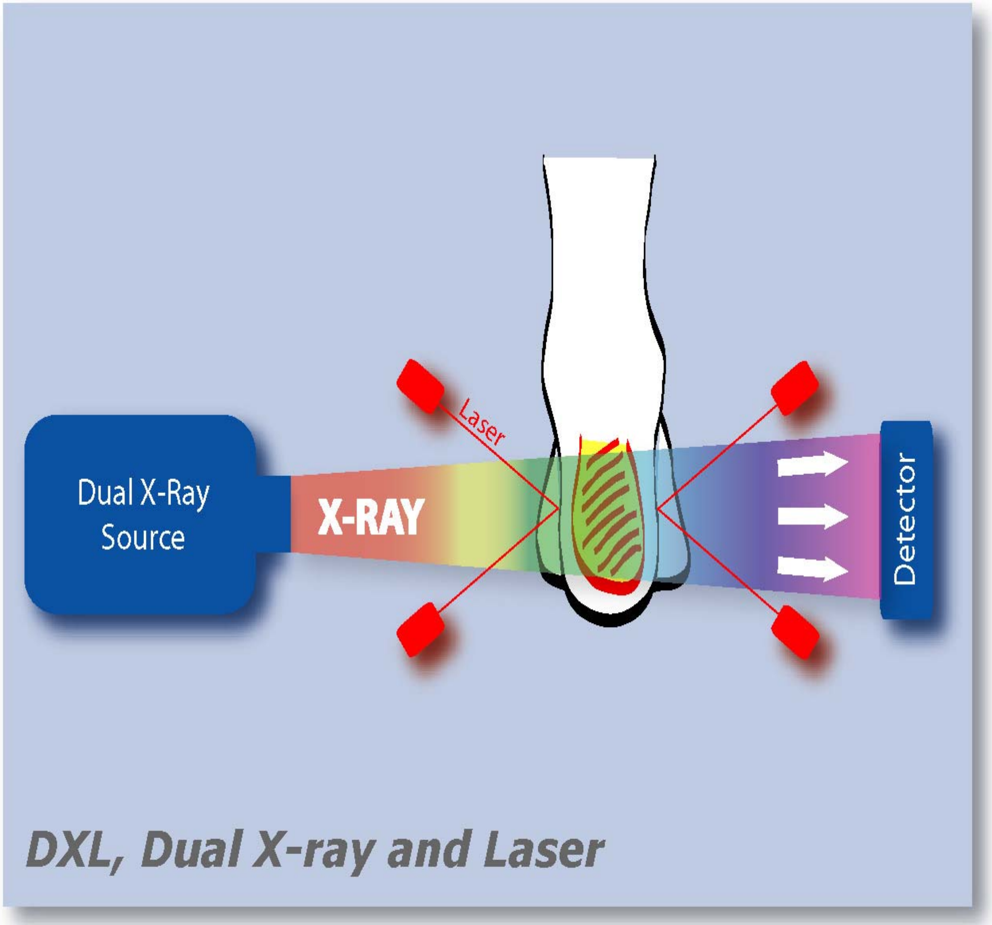
DXA:
fan beam Dual Energy X-ray Absorptiometry

Two compartment model: *first* bone and *second* composite of lean and adipose tissue at assumed constant ratio

DXL:
Laser technology estimates outside thickness of heel

Three compartments
BMD + soft/fatty tissue + outside heel thickness

DXA and DXL Technology II



DXL Calcscan Device

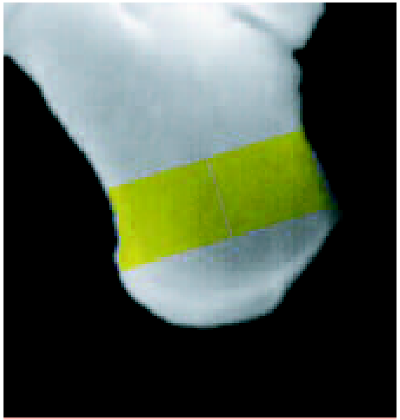
Measurement Time	< 55 sec
Effective dose	< 0.2 µSv
BMD Precision in vivo	1.2% CV[1]
BMD Precision in vitro	0.7% CV
BMD min – max	0.1 - 0.9 g/cm^2
Heel Thickness	20 – 110 mm
Weight	25 kg
Dimensions	l 79, w 42, h 32 cm

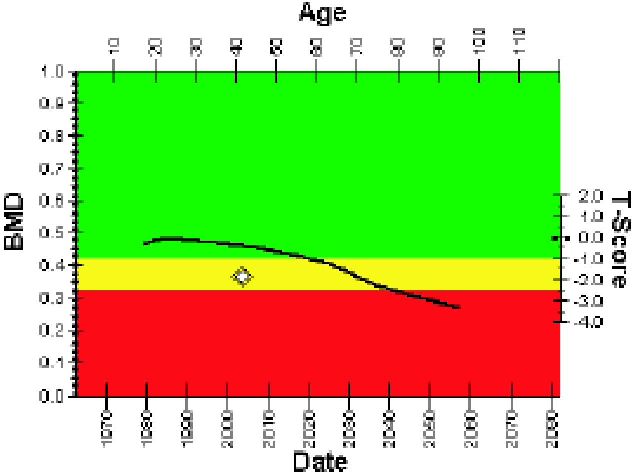
1 Hakulinen M A et al. Phys Med Biol 48(12);2003:1741-1752

DXL Measurement

Patient code:	*009*	BMM (g):	*1,839*
Patient name:	Demo	Area (cm):	*5,056*
Date of birth:	*1962-01-07*	Thickness (mm):	*50*
Date:	*2003-06-18*	BMD (g/cm):	*0,364*
Foot:	*Right*	T-Score:	*-1,8*
Meas. nr:	*15*	Z-Score:	*-1,5*
DXL serial nr:	*CS03-10092*		

The x-ray image is not intended for diagnosis.



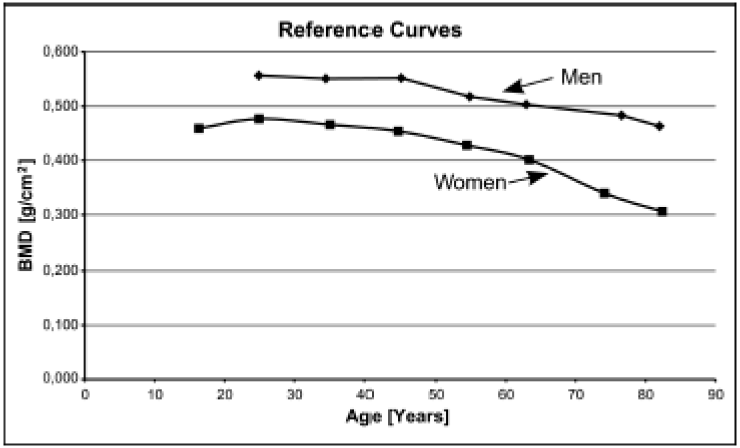


Female - Europe - 1003

Reference Groups for DXL Database

North European Caucasions recruited from workplaces, universities, nursing homes, pensioner associates

Exclusion criteria:
History of osteoporosis treatment by BPH or calcitonin, use of corticosteroids > 3 months, extended bed rest



	Female-Europe-1003	Male-Europe-1004
Number	993	459
Mean age (±SD)	48.2 ± 15.2	47.0 ± 15.2
Weight (kg), mean (±SD)	67.3 ± 11.1	82.8 ± 12.0
Height (cm), mean (±SD)	165.6 ± 6.3	179.1 ± 6.8
Body mass index (kg/cm2), mean (±SD)	24.5 ± 3.8	25.8 ± 3.4
Peak bone mass (g/cm2) ±1SD, age	0.485 ± 0.066, 22	0.556 ± 0.074, 25

Sensitivity/Specificity in Osteoporosis/Osteopenia

	Osteoporosis	Osteopenia
Sensitivity	80	82
Specificity	82	89
Positive predictive value	82	85
Negative predictive value	81	69

251 Swedisch patients mean age 61.8 ± 14.5 years attending an osteoporosis clinic
Measurements by DXA (Lunar DPXL and DXL Calcscan)
Criterion for diagnosis of osteoporosis: T-score at spine or femoral neck

Kullenberg R. et al. Osteoporosis Int (2003) 14:823-827

Indicators for Prevalence of Osteoporosis[1]

	DXA Femoral neck	DXA Total hip	DXA Lumbar spine	DXA Total forearm	DXL Heel
T-score -2.5	17	10	24	22	18

Prevalence of osteoporosis for 65 year old Caucasian woman at cut off point of T-score -2.5

DXA: NHANES III Database[2] (spine, forearm (total region), hip (total, femoral neck)

DXL: 1051 healthy Swedish women aged 15 – 85 years

1 Kullenberg R. et al. Osteoporosis Int (2003) 14:823-827

2 Locker AC et al. Osteoporosis Int (1998) 8:468-489

The Vienna iDXA – DXL Pilot Study

Objectives:
Evaluation of T-score based diagnostic accuracy of DXL of calcaneus in comparison to DXA of spine and hip
Calculation of sensitivity and specificity

Study Design:
Retrospective, cross sectional, not population based

Patients:
69 random postmenopausal women with a history of vertebral and non-vertebral fractures (out of 650 patient measurements)

Devices:
GE Lunar iDXA – Software Version ENCORE 11.2
Demetech AB DXL Calcscan – Software Version 1.3

Patient specific Data

	Vertebral fracture *n =13*	Non vertebral fracture *n = 56*
Age (years)	73 ± 13	62 ± 12*
BMI	23 ± 6	26 ± 6$^{n.s.}$
DXL Heel (g/cm^2)	0.270 ± 0.06	0.372 ± 0.07**
LS BMD (g/cm^2)	0.843 ± 0.15	1.048 ± 0.16**
Fem Neck BMD (g/cm^2)	0.707 ± 0.11	0.853 ± 0.12*
Total Hip BMD (g/cm^2)	0.725 ± 0.13	0.888 ± 0.14*

* P < 0.05   ** P < 0.0001

Scanning Sites – Correlation Coefficient

	DXL Heel g/cm^2	LS g/cm^2	L Tot Hip g/cm^2	L Fem Neck g/cm^2
DXL Heel (g/cm^2)		0.70*	0.67*	0.70*
LS (g/cm^2)			0.76*	0.78*
Left Total Hip (g/cm^2)				0.92*
Left Fem Neck (g/cm^2)				

* $P < 0.00001$

Sensitivity and Specificity (T-score ≤ 2.5)

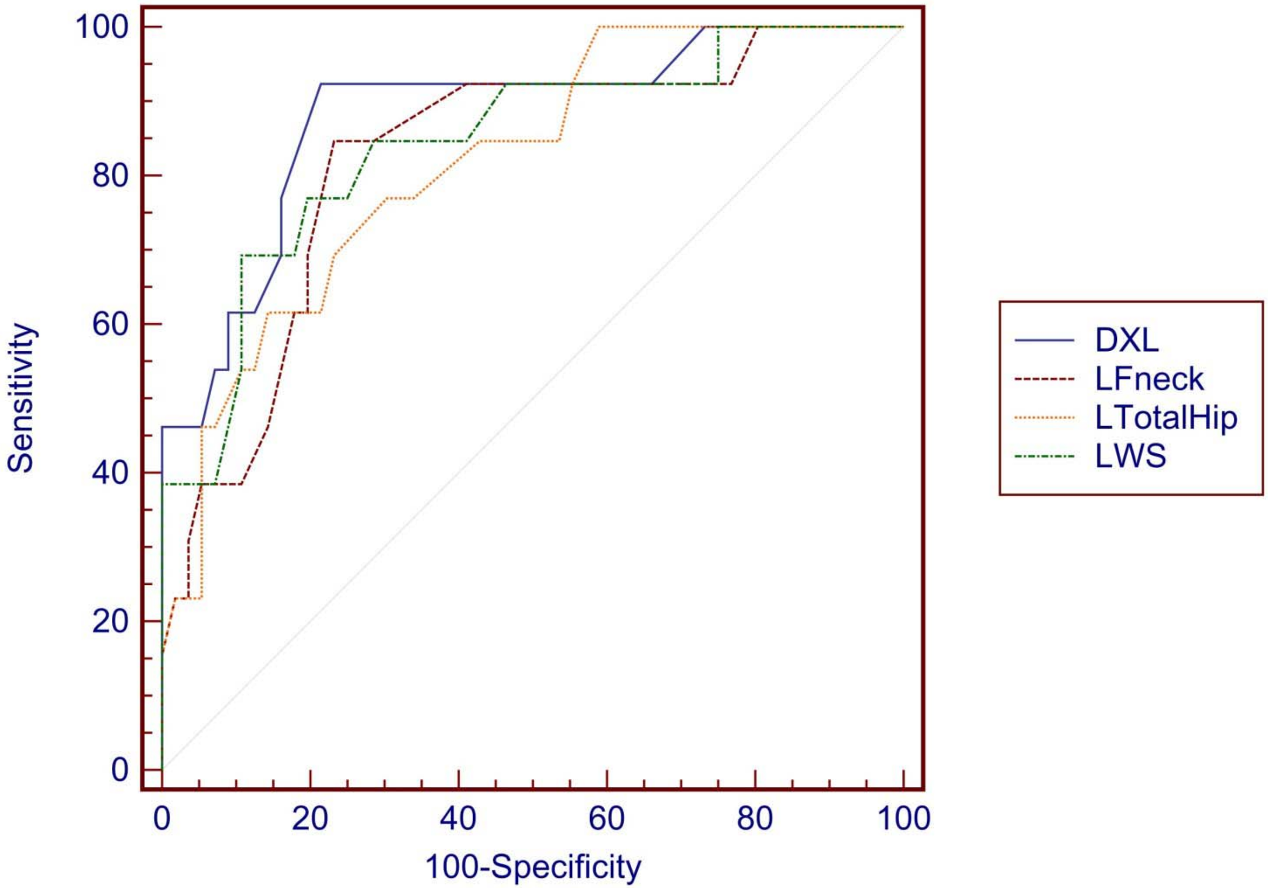
	Sensitivity (%)	Specificity (%)
DXL Heel	77	84
Left Femoral Neck	39	93
Left Total Hip	62	86
Lumbar spine	69	89
L Fem Neck & L Total Hip	54	89
Lumbar Spine & L Fem Neck	69	84
Lumbar Spine & Total Hip	77	84
All Sites	77	84

Area under curve (AUC)

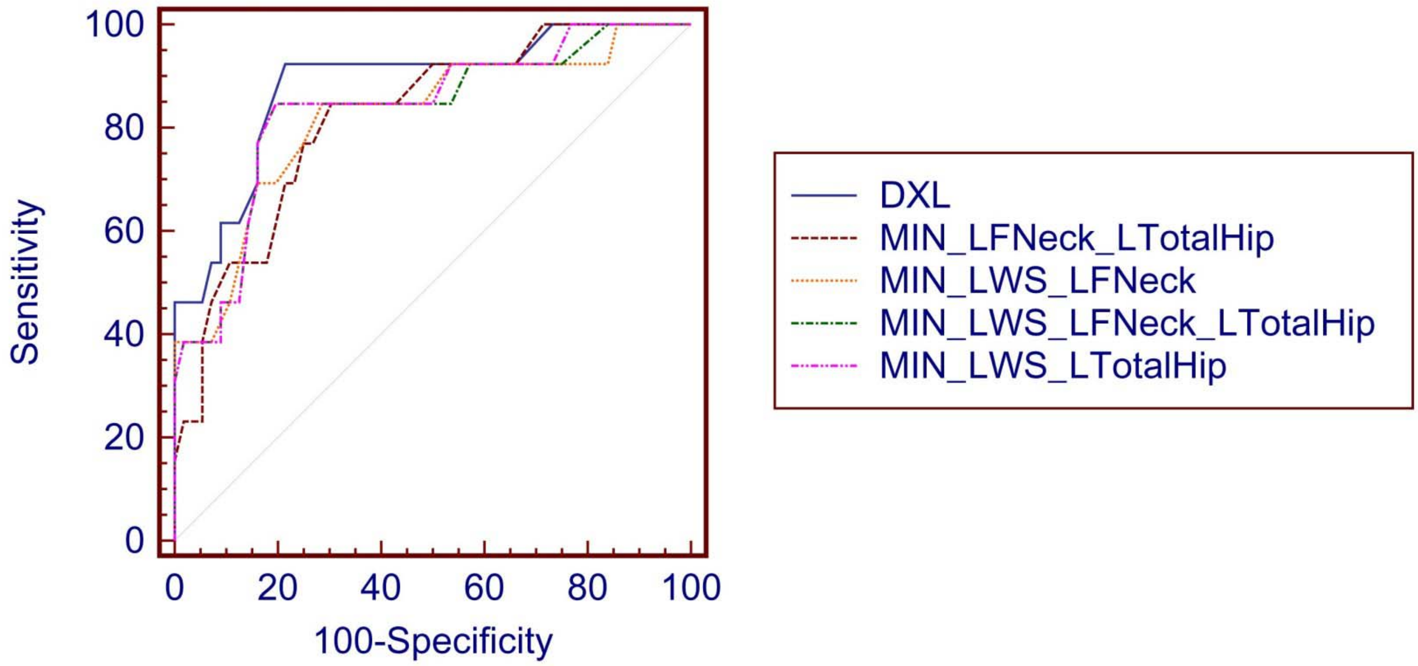
	AUC	SD
DXL Heel	0.883	0.042
Left Femoral Neck	0.823	0.054
Left Total Hip	0.817	0.055
Lumbar spine	0.843	0.050
L Fem Neck & L Total Hip	0.820	0.055
Lumbar Spine & L Fem Neck	0.820	0.055
Lumbar Spine & Total Hip	0.837	0.052
All Sites	0.830	0.053

AUC calculated with 95% CI

Area under curve (AUC) II



Area under curve (AUC) III



Sensitivity and Specificity (T-score ≤ 2.5)

	Sensitivity (%)	Specificity (%)
DXL Heel	77	84
Left Femoral Neck	39	93
Left Total Hip	62	86
Lumbar spine	69	89
L Fem Neck & L Total Hip	54	89
Lumbar Spine & L Fem Neck	69	84
Lumbar Spine & Total Hip	77	84
All Sites	77	84

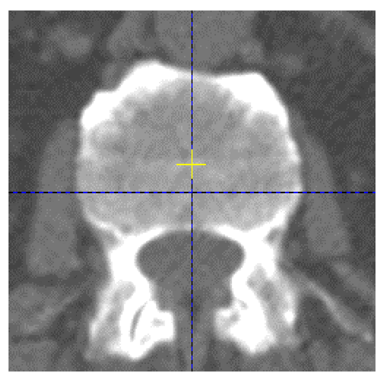
Sensitivity and Specificity (optimized)

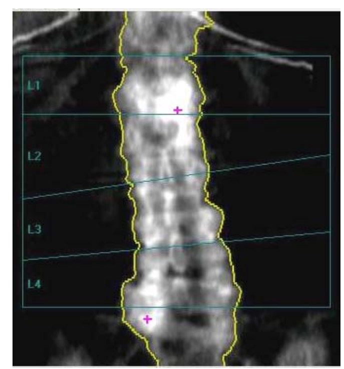
	Sensitivity (%)	Specificity (%)	optimized T-score
DXL Heel	92	79	-2.4
Left Femoral Neck	85	77	-1.7
Left Total Hip	62	86	-2.1
Lumbar spine	69	89	-2.5
L Fem Neck & L Total Hip	85	70	-1.7
Lumbar Spine & L Fem Neck	85	71	-2.2
Lumbar Spine & Total Hip	85	80	-2.4
All Sites	85	80	-2.4

Conclusion

- At patients with prevalent fractures BMD measurements of the calcaneus by DXL are comparable to BMD measurements of spine and hip by DXA to identify patients at risk for further osteoporotic fracture

- DXL measurents are not biased by unappreciated vertebral fractures or deformaities, aortic calcification, osteoarthritis, obesity





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EIN UNTERNEHMEN DER VINZENZ GRUPPE WIEN