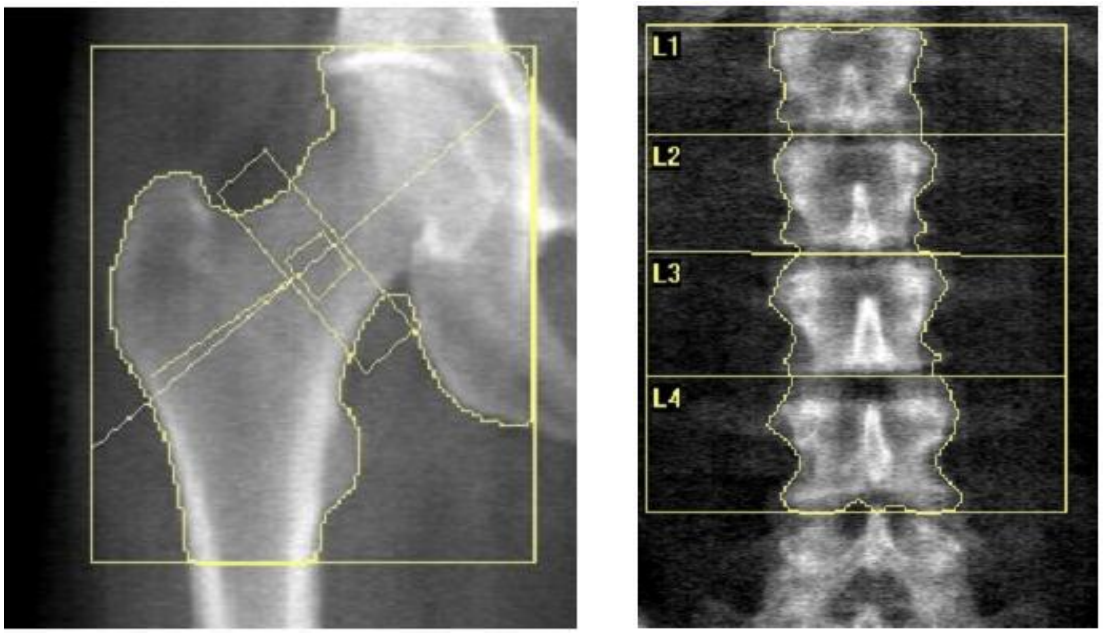
Bone mineral densitometry information

Osteoporosis will affect one in two women and one in five men during their lifetime. Bone calcium mineral content accounts for about 80% of bone strength, and so measurement of bone density gives a good indication of fracture risk. The National Osteoporosis Society recommends the use of dual-energy x-ray absorptiometry (DXA) to assess bone mineral density.

The RNHRD uses the Hologic Discovery bone densitometer, which allows bone mineral density to be assessed in a few minutes. The patient is carefully positioned on the couch and the densitometer acquires information using a low-power fan-shaped x-ray beam which moves along the patient. The total effective dose is similar to one day's background radiation. The machine measures the strength of the x-ray beam once it has passed through the patient. DXA allows bone and soft tissue information to be separated. This is used to build up an image of calcium density and the amount of calcium in the bones is then calculated in a region of interest defined by the operator.

The usual examination sites are the lumbar spine (L1-L4) and proximal femur, which are good general indicators of skeletal density. We are also able to measure the forearm and the whole body (including measurement of body composition). Images of the length of the spine from the front or the side view may also be acquired, to allow vertebral fracture assessment for monitoring changes in the shape of spinal vertebrae. Estimates of the likelihood of future fracture can be made using the integrated fracture risk assessment tool (FRAX).



PA lumbar spine and left proximal femur DXA images showing analysis regions of interest

The densitometer produces a numerical bone mineral density (BMD) value for each region of interest, together with a T score and Z score.

DXA Results Summary:

Region	Area (cm^2)	BMC (g)	BMD (g/cm^2)	T - score	PR (%)	Z - score	AM (%)
Neck	**4.74**	**3.17**	**0.668**	**-1.6**	**79**	**-0.5**	**93**
Troch	10.82	6.27	0.580	-1.2	82	-0.5	93
Inter	18.24	18.80	1.031	-0.4	94	0.1	101
Total	33.80	28.24	0.836	-0.9	89	-0.1	99
Ward's	1.18	0.66	0.559	-1.5	76	0.3	107

DXA results from the proximal femur

The most commonly used regions are lumbar spine, total hip and femoral neck. The results are presented in relation to a normal population, and are most often expressed in terms of standard deviations away from a mean value.

The T score is defined as the number of standard deviations a patient's BMD lies from the mean peak bone density of a matching young normal population. The T score is negative if the patient's result is below the young normal value, so the more negative the T score, the worse the bone density of the patient. The Z score is similar, but compares the patient's result with average results expected for the patient's age.

The World Health Organisation (WHO) have defined osteopenia (low bone mass) as a T score of less than –1 and osteoporosis as a T score of less than –2.5 (WHO technical report 843, 1994). Fracture risk increases continuously as the T-score becomes more negative. Cummings et al showed that age-adjusted risk of hip fracture increased by a factor of 2.6 for each standard deviation decrease in femoral neck bone density in older women (Lancet 1993; 341:72-5).

Plot of BMD result in relation to normal data