Is the Price of Bone Density Scan Test an Obstacle to Prevent Hip Fractures? Not Anymore.

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INTRODUCTION:

Bone density scan (DEXA) is the gold standard exam for detecting osteoporosis that causes hip fractures; however, due to its high cost it is an exam to which some patients, mainly in developing countries, have little or no access. This study aimed to investigate whether there is any statistical correlation between results of DEXA scans and scores from plain hip radiography, that is found to be comparatively cheaper.

METHODS:

This was a prospective double-blind controlled study. In total, 493 Caucasian female patients, over 60 years of age with osteoporosis were included in this study. All patients were sent for a DEXA scan as well as plain X-Rays of the hip. Two hip radiographic variables were analyzed: the Cortical Thickness Ratio (CTR) and the Canal:Calcar Femorale ratio (CCF).

The CTR score was calculated by drawing the midline of the lesser trochanter (line A). A parallel line (line B) was marked 10cm distal to line A. The CTR was calculated as the ratio between the total width of the diaphysis (line TW), deducting the width of the medullary canal (line MC), divided by the total width of the diaphysis (line TW) (figures 1 and 2), in the anteroposterior and lateral views.

The CCF score (figure 3) was measured by drawing the midline of the lesser trochanter (line A). The points X1 and X2 were marked 3cm from line A; points X3 and X4 were marked 10cm from line A, giving rise to line FI. Then lines B and C, that connect respectively points X1-X3 and X2-X4, were marked. The intersection of lines B and C with line A is indicative of the width of the calcar femorale width (line CF). The CCF score is described as the division of line FI by line CF.

The two radiographic hip scores were prospectively compared to DEXA scan results to identify any statistical correlations.

RESULTS:

There was a significant positive correlation between results of the DEXA scans and the CTR results in the AP view ($r = 0.694$; $p < 0.001$) (figure 4). It was determined the cut-off values for the status of normal, osteopenia and osteoporosis (figure 5). In the range for the normal diagnosis, the CTR-AP was between 0.56 and 0.59 mm; for osteopenia it was between 0.52 and 0.54 mm and for osteoporosis, the values were between 0.45 and 0.48 mm.

There was a strong positive correlation between the results of the DEXA scans and the CTR results in the lateral view ($r = 0.793$; $p < 0.001$) (figures 6 and 7). The diagnosis of normality was between 0.44 and 0.46 mm; for osteopenia it was between 0.38 and 0.40 mm and, for osteoporosis the values were between 0.29 and 0.32 mm.

There was no significant correlation between the DEXA scan results and the canal:calcar femorale ratio ($r = -0.099$; $p = 0.03$) (figure 8).

DISCUSSION AND CONCLUSION:

It was demonstrated that CTR-AP and CTR-L are related to DEXA results. The correlation of proximal femoral canal shape with bone mineral density suggests that radiographs scores may provide useful information for screening for osteoporosis and fracture risk of the hip. The CCF ratio is directly related to the height of the individuals studied, which is why it was not significantly correlated with DEXA results.

Although plain radiographs of the hip are easily accessible at low costs, they are not yet used as a predictive factor for bone fragility and its consequent fractures. In conclusion, CTR-AP and CTR-L are effective for the initial diagnosis of osteoporosis and can be used to prevent fractures around the hip.