The importance of three different sites assessment for osteoporosis evaluation and diagnosis

Importância da avaliação densitométrica nos três sítios coluna lombar, fêmur total e antebraço na avaliação e diagnóstico da osteoporose

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ABSTRACT
The aim of this study was to perform a retrospective review of 2,115 females patients that were submitted to the bone density measurements not only in the two standard lumbar spine and femoral sites recommended by WHO, IOF and ISCD, but, including also, the forearm site in the evaluation and diagnosis of osteoporosis. The tests were performed on equipment Hologic Discovery W and GE Prodigy showing...
proper readings for the mentioned sites. 646 of the 705 patients studied over fifty years of age were selected and the prevalence of osteoporosis according to age group was also determined. The results shows: Normals 26%, 40% 34% osteopenia and osteoporosis. 34% of the group with osteoporosis shows that the addition of the forearm site determines an increase of more than 9%, meaning that 100 patients with osteoporosis, more than nine would be missed, and that the prevalence of osteoporosis in the group aged from 50 to 59 was 21%, from 60 to 69 was 33% and to 70 years old age ahead was 55%. This study supports the conclusion that importance of including the forearm site in the evaluation and diagnosis of patients with suspicion and diagnosis of osteoporosis, as well as demonstrate the prevalence of osteoporosis occurs with increasing age, and according to the literature.

**Keywords:** Osteoporosis, clinical densitometry, diagnosis.

**RESUMO**
O objetivo deste trabalho foi efetuar um estudo retrospectivo em 2.115 pacientes do sexo feminino para avaliação e diagnóstico da osteoporose pela medida da densidade óssea nos dois sítios padrão da coluna lombar e fêmur recomendado pela WHO (World Health Organization), IOF (International Osteoporosis Foundation) e ISCD (International Society of Clinical Densitometry) e no qual se incluiu também a leitura do sítio do antebraço. Os exames foram realizados nos equipamentos Discovery W da Hologic e Prodigy da GE que mostram leituras apropriadas para os sítios mencionados. Do total dos 705 pacientes, foram selecionados 646 com mais de 50 anos de idade, mostrando: 26% normais, 40% com osteopenia e 34% com osteoporose. Neste estudo foi determinado, também a prevalência da osteoporose de acordo com a faixa etária. Do grupo com osteoporose, os resultados mostram que a adição do sítio do antebraço determina um incremento de mais de 9% no diagnóstico da osteoporose, significando que de 100 pacientes com osteoporose, nove não seriam diagnosticadas, permitindo concluir pela importância da inclusão do sítio do antebraço na avaliação e diagnóstico das pacientes com suspeita e no diagnóstico da doença. A prevalência de osteoporose na faixa etária de 50 a 59 anos foi de 21%, de 60 a 69 anos de 33% e de 70 anos em diante 55% mostrando que a prevalência de osteoporose aumenta progressivamente com a idade, de acordo com os dados encontrados na literatura.

**Palavras-chave:** Osteoporose, densitometria clínica, diagnóstico.

**1 INTRODUCTION**

The importance of early diagnosis of osteoporosis aiming at the prevention and treatment of his fearsome consequence, bone fracture is necessary. Low bone density is one of the most important elements for the diagnosis of osteoporosis and evaluate patients at high risk of fracture.

The social and economic cost of osteoporosis and its consequence, bone fracture is very large surpassing the days of hospitalization in hospitals of patients suffering from diabetes, myocardial infarction and breast cancer is essential to identify patients with osteoporosis and prevent fractures making treatment and appropriate preventive measures.

WHO - World Health Organization and the ISCD-International Society of Clinical Densitometry and the IOF-International Osteoporosis Foundation established guidelines for the diagnosis of osteoporosis based on the minimum reading on the website of the lumbar spine (L1-L4) and total femur. The forearm
site only being used when the femur and lumbar spine are not available and suspicion of hyperparathyroidism in which there is greater sensitivity changes of this pathology in the forearm, or when the patient exceeds the weight limit of the equipment. The study NORA - National Osteoporosis Risk Assessment (NORA) shows that the peripheral extent of the forearm is as good as that of other sites (1,2 and 3).

The peripheral location of the forearm and a small amount of subcutaneous tissue around it increases the precision and the accuracy of bone mass measurement reading making this site a satisfactory clinical alternative and an important parameter for the assessment of bone mineral status.

2 MATERIAL AND METHODS

A retrospective study of 2,115 patients in which the measurement of bone density was done in the most vulnerable regions to fracture, in which besides reading of the sites of the lumbar spine (L1-L4) in which the manufacturers should continue to use their own databases for the lumbar spine as the reference standard for T-scores and total femur. It was included in the examination the third of the forearm and used the equipment Hologic Discovery W and GE Prodigy showing proper readings for the mentioned sites.

• The WHO international reference standard for osteoporosis diagnosis is a T-score of -2.5 or less at the femoral neck.

◦ The reference standard from which the T-score is calculated is the female, white, age 20-29 years, NHANES III database

◦ In certain circumstances the 33% radius (also called 1/3 radius) may be utilized

Eliane Zanette et al. (04) show that 25% of patients considered to have risk of bone fracture by reading the lumbar spine site had the site of normal femoral neck, while 16% considered at high risk for reading in the femoral neck stand as normal lumbar spine concluding that the densitometric evaluation should include at least two different bone sites.

Until then, the combined assessment of both bone sites had been considered to be the most appropriate procedure.

The literature shows that the prevalence of osteoporosis varies depending on the area studied, as it is proportional to the number of sites evaluated, that is, the largest sites evaluated the chance of detecting an area below the normal range and thus the diagnosis of osteoporosis / osteopenia (05, 06, 07).

When the measurement of bone density is made in the three regions most vulnerable to fracture (hip, lumbar spine and forearm third) approximately 30% of women after menopause and after age 50 have osteoporosis. (08)
The prevalence of osteoporosis according to the WHO criteria aged between 50 and 79 years is 38% in the lumbar spine; 11.6% in the total femur and 5.8% in the middle third of the forearm.

The prevalence of osteoporosis and vertebral fractures in postmenopausal women, mostly without clinical symptoms, and over the age of 50 to 64 was 28.8% in the lumbar spine and 18.8% in the neck femur. In the range of 60.9 ± 8.3 years, 33.2% at the lumbar spine and between 70 and 79 years, 38.2%. With more than 80 years, 54.5% had osteoporosis at the lumbar spine and 72.7% in the femoral neck.

The prevalence of osteoporosis in the Japanese population in the same range above was 35.1% in the lumbar spine; 9.4% in total femur and 51.2% in the forearm. This explains the low incidence of hip fracture in Japanese women (10).

The prevalence of fractures significantly increased with age, since the rate of 20% between 50 and 59 years, 25.6% between 60 and 69 years, 58.3% between 70 and 79 years, and 81.2% between 80 and 89 years (09).

3 RESULTS

2,115 patients were studied by measuring the bone density of the regions of the femoral neck, lumbar spine and third of the forearm, 59 were excluded due to age below 50 years, and obtained the following results: normal: 25% (528) with osteopenia: 42% (862) and osteoporosis: 33% (693) Graph 1.

Among the patients with osteoporosis where the reading was performed on each of the three sites alone CL = spine (red), AB = forearm third (yellow) and femoral neck CF = (blue), the results (Graph 2) show data compatible with osteoporosis in isolation in the following percentages: (CL) lumbar spine 33% (347); (AB) third of the forearm 5% (50) and (CF) 2% (20) femoral neck by 23% (20) patients, revealing that the inclusion of reading forearm contributed to increased diagnostic accuracy of osteoporosis 57% of cases. This means that in a hundred patients with osteoporosis nine cease to be diagnosed when it is not
the examination of the forearm site. Graphic 2. Considering the combined reading of two and three sites we find the following values: lumbar spine and forearm = 19% (45); femoral neck and forearm = 5% (11) and lumbar spine and femoral neck = 3% (7) and osteoporosis in 3 sites = 17% (41).

From the group of patients studied diagnosed with osteoporosis and fracture risk, and in accordance with the reading of the findings in each of the three sites alone and in combination, and these results corrected to 100%, the following results were obtained: 53% for the lumbar spine, 31% for the proximal third of the forearm, and 16% for the total hip (Graphic 2).

The highest percentage for the proximal third of the forearm and the positive correlation with the findings of the lumbar spine in relation to the percentage of the total femur site highlights its outstanding contribution to the diagnosis of osteoporosis.
The largest percentage of osteoporosis at the site of lumbar region is due to the presence and predominance of trabecular bone itself of the lumbar vertebrae suffer more intensely the menopause action and most of the causes of secondary osteoporosis, as excess steroids, hyperthyroidism, poor syndrome absorption, liver disease, rheumatoid arthritis and drugs that primarily affects the spine, explaining the higher prevalence of osteoporosis in the lumbar spine.

Since cortical bone in turn richer in the forearm region suffers mainly from the effect of patients with primary hyperparathyroidism which promotes increased bone turnover, low mineral density and increased risk of fracture, is recommended for the evaluation of patients with suspected or with primary hyperparathyroidism given the high sensitivity of this bone site metabolic changes of this pathology.

Of the 646 patients, 40.2% (260) were osteopenia distributed as follows: in isolation and in each of three sites: forearm 34% (88) 12.7% lumbar spine (33) and femoral neck 5% (13); osteopenia combined in two sites: the lumbar spine and forearm 14.5% (37); lumbar spine and femoral neck, 13.3% (34); femoral neck and forearm 1.4% (3) and 20% of (52) had three sites in osteopenia. Graph 3

Of the total ds 646 patients aged 50 and more years of age, the prevalence of osteoporosis was 21% in the age group 50-59 years 33% 60-69 years and 55% aged 70 years and older. These results are presented in accordance with the literature data and prove that osteoporosis increases progressively with age.
4 CONCLUSION

The impact of the addition of the densitometric reading of the proximal third of the forearm site to the two standard densitometric reading of total hip and lumbar spine increased the diagnostic accuracy of osteoporosis by more than 9% of cases, and shows a positive correlation with the lumbar spine contributing to strengthen the importance of the forearm site in the diagnosis of osteoporosis / osteopenia putting in relief benefit for patients and enabling the treatment and prevention of most feared consequence of osteoporosis, bone fracture.
REFERENCES

01 - Jonathan Bayly et al. Faculty Education and Science, University of Derby.

A capacidade do sítio da densitometria do antebraço predizer fraturas em qual- quer sítio da mulher se apresenta tão boa quanto a de outros sítios.


