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Osteoporosis

OP0294

DIFFERENTIAL INFLUENCE OF CO-MORBIDITIES ON SITE OF FRAGILITY FRACTURES

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Background: Fragility fractures (FF) can occur at various sites of the skeleton, and are associated with multiple risk factors [1]. The prevalence of FF markedly increases with age. As the longevity of the population increases, so will the incidence of FF, and that of associated co-morbidities and risk factors. There are few data on co-morbidities associated with fractures at each site.

Objectives: Identify associations of co-morbidities with sites of FF, by applying cluster analysis.

Methods: We reviewed 28868 patients presenting for BMD estimation at a district general hospital in North West England, 2004-2016. We identified patients who had sustained one or more FF at time of presentation. Site(s) of FF were recorded for each patient, including femur, forearm, humerus, pelvis, ribs, spine, tibia or fibula. The following co-morbidities or treatments were recorded: excess alcohol consumption (previous or current); bisphosphonates; coeliac disease; family history of FF; hormone replacement therapy; hyperparathyroidism; hyperthyroidism; inflammatory bowel disease; polymyalgia rheumatica; rheumatoid arthritis; smoking (previous or current); corticosteroids (previous or current). Cluster analysis was performed on fracture sites and co-morbidities, using Jaccard similarity coefficient, and plotted on a dendrogram. Results were divided into an optimal number of clusters, derived using the elbow and silhouette methods.

Results: 11003 of 28868 patients had sustained one or more FF at time of BMD estimation. Overall, 84.6% patients were female, mean age 67.5 years, and median T-score -1.12 SD. Cluster analysis was performed for FF sites and co-morbidities, with Jaccard similarity coefficients calculated. 4 clusters were identified (Figure 1): FF of forearm (n=5054), tibia/fibula (n=2617), spine (n=2352), associated with family history of FF, smoking, corticosteroids, and bisphosphonate treatment; FF of pelvis (n=300) associated with hyperparathyroidism, PMR, coeliac disease, and HRT; FF of femur (n=1181) and humerus (n=1131) associated with IBD and RA; FF of ribs (n=1022) associated with alcohol and hyperthyroidism.

Conclusion: Cluster analysis demonstrated 4 distinct subgroups of FF sites and associated co-morbidities. To our knowledge, this is the first study applying cluster analysis to evaluate co-morbidities associated with FF sites. Risk factors may influence trabecular more than cortical bone, accounting for the difference in clusters. Knowledge of risk factors associated with FF site subgroups will aid prophylaxis and management in at-risk patients.

References:

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Figure 1: Dendrogram of cluster analysis of 11003 patients with one or more fragility fractures. Fracture sites and co-morbidities/co-treatments are included. Optimal number of clusters was calculated using "Elbow method" and "Silhouette method." Clusters are defined by colour and grey dashed boxes. FH= family history; Tib/Fib= fracture of tibia or fibula; Hyperparathyroid= hyperparathyroidism; PMR= polymyalgia rheumatica; Coeliac= coeliac disease; HRT= hormone replacement therapy; IBD= inflammatory bowel disease; RA= rheumatoid arthritis; Hyperthyroid= hyperthyroidism.

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OP0295

CORRELATION BETWEEN CORTICAL THICKNESS RELATIVE TO TRANSVERSE DIAMETER ON MID-PORTION OF THIRD METACARPAL BONE AND BONE MINERAL DENSITY IN LUMBAR SPINE AND FEMORAL NECK FOR PATIENTS WITH RHEUMATOID ARTHRITIS

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Background: Rheumatoid arthritis (RA) is a determinant risk factor of osteoporosis. BMD is clearly defined as diagnosis criteria of osteoporosis in Japan; that is less than -2.5 with T-score measured with dual-energy X-ray absorptiometry (DXA). The marker of T-score <-2.5 is widely used worldwide; however, the testing system is very expensive, preventing its extensive adoption.

Objectives: We tried to evaluate BMD not measuring with DXA, but the other method that substituting DXA with another X-ray picture of hand that is routinely taken for Sharp/van der Heijde score (SHS) calculation.

Methods: Patient with RA, who met the American College of Rheumatology/European League Against Rheumatism classification criteria, visited our institute has been routinely calculated SHS in taking X-ray pictures of bilateral hands and feet at first consultation. Cortical thickness was calculated from mid-portion of third metacarpal bone in X-ray picture that was taken for the calculation of SHS as taking cancellous bone diameter of the third metacarpal bone from transverse diameter at the same point. We set Cortical Thickness Ratio (CTR) as cortical thickness relative to transverse thickness (Figure 1). BMD measurements at the lumbar spine (LS) and femoral neck (FN) were obtained, and BMD values are presented as g/cm² and T-score showing dissociation of the BMD compared with the mean BMD in healthy 30-year-old of the same sex with standard deviation was also presented. Patient with RA who underwent SHS calculation and BMD measurement at first consultation was picked up for the study. Relationship between BMD and the other parameters such as sex (male/female), age, disease duration (years), ACPA titer, RF titer, body mass index (BMI), CTR, the HAQ score, DAS28-CRP, SHS, PS-VAS, tartrate-resistant acid phosphatase-5b value (TRACP-5b), previous treatment for osteoporosis and RA before initial consultation (pTx_OP and pTx_RA) (Yes/No) at initial consultation was evaluated with linear regression analysis.

T-score<-2.5 was statistically evaluated with binary regression analysis for the parameters that demonstrated significant correlation in multivariate linear regression analysis.

Then, Cut-off index (COI) of CTR for the BMD represented with T-score <-2.5 for both of LS and FN was evaluated with Receiver's Operation Characteristics technique (ROC). Sensitivity, specificity, area under curve, odds ratio with 95% confidence interval (95%CI) for T-score <-2.5 was also calculated.

Results: A total of 300 patients were picked up for the study. BMDs were 0.867 and 0.682 with 0.203 and 0.143 for standard deviations, that means T-score was -1.93 and -1.86 with 1.64 and 1.15 for standard deviations in LS and FN, respectively. Mean transverse width of third metacarpal bone was 7.3 mm and thickness of the cortex was 2.00 mm, so CTR was 0.279 in average and 0.124 for standard deviation.

In linear regression analysis, BMD in LS demonstrated significant correlation with sex, CTR, and DAS28-CRP, while BMD in FN demonstrated significant correlation with sex, age, and CTR.

In binary regression analysis, CTR and DAS28-CRP demonstrated significant positive correlation with T-score <-2.5 in LS, while age and CTR demonstrated significant correlation in FN.

In ROC, cut-off index of CTR was 0.25 in both of LS and FN, and sensitivities demonstrated 67.9% and 76.1%, and specificity demonstrated 83.0% and 81.6% in LS and FN, respectively. Area under curve was 0.78 and 0.81 with 4.17 (95%CI: 2.51 – 6.92) and 4.90 (95%CI: 2.75 – 8.73) of odds ratios for LS and FN, respectively (Figure 2).

Conclusion: Results of this cross-sectional study encourages our hypothesis that thickness of cortical bone relative to full thickness in the long bone reflects BMD. CTR correlated with BMD in both of LS and FN. CTR of third metacarpal bone was suggested that has close correlation with BMD in both LS and FN. CTR could be strong candidate marker for screening of osteoporosis in patient with RA with the index less than 0.25.