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Osteoporosis

AB0606

IMPACT OF ABDOMINAL AORTIC CALCIFICATION AND SERUM CREATININE-TO-CYSTATIN C RATIO TO BONE FRAGILITY FRACTURE

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Background: Relationship between bone fragility fracture (BFF) and abdominal aortic calcification (AAC) has been discussed in recent decade.

Objectives: Now we investigated the relationship between the two and a new factor of BFF: serum creatinine-to cystatin C ratio (Cr/CysC).

Methods: A total of nine-hundred and thirty one osteoporotic patients were recruited. Diagnosis of osteoporosis was indexed by the criteria of Japanese Primary Osteoporosis Diagnostic Criteria. Patient's lumbar spine X-ray pictures were taken and dual-energy X-ray absorptiometry (DXA) of lumbar spine and hip joint were tested at the same time, and all of them were followed us for more than one year up to nine years with at least an administration of vitamin D. Anti-osteoporotic drugs were administered for 660 patients.

Vertebral compression fracture (VF) and AAC were evaluated with lateral view of X-ray picture. VF was classified in accordance with Semi-quantified method (SQ), and AAC was classified as follows: Grade0; No calcification, Grade1; Partial calcification not continued over one vertebral height, Grade2; Calcification continuous over one vertebral height. BFF history of the patients except of VF was harvested from the medical record and with interview. Patients' background at first measurement were measured and Cr/CysC was calculated as well. Prevalence of BFF at the baseline for each grade with SQ was compared according to the grade of AAC. Background factors including bone mineral densities (BMD) of the lumbar spine and hip joint measured using DXA were compared for each AAC grade.

Occurrence of BFF was picked up during following up (BFF_F/U) of the patients. Prevalence of BFF_F/U for each ACC grade was statistically compared, and relationship between BFF_F/U and factors at the baseline was statistically evaluated.

Results: A total of 219 of Grade0, 428 of Grade1, and 278 of Grade2 were recruited. Prevalence of BFF at baseline for each VF group was 182, 16, 9, and 12 for Grade0, 138, 98, 122, and 70 for Grade1, and 53, 45, 82, and 144 for Grade2, with Grade-0, Grade-1, Grade-2, and Grade-3 by SQ, respectively ($p < 0.01$). Factors that demonstrated significant correlation with occurrence of BFF were sex, age, BMD of the lumbar spine and the hip joint, and Cr/CysC with univariate mode binary logistic regression analysis. However, Cr/CysC did not demonstrate significant correlation using multivariate model.

Occurrence of BFF_F/U for each AAC group was 26, 90, and 82 for Grade0, Grade1, and Grade2, respectively ($p < 0.01$). The only factor that demonstrated significantly correlated with occurrence of BFF_F/U was Cr/CysC in the Grade1 and the Grade2 of the AAC classification.

Conclusion: ACC grade significantly correlates with occurrence of BFF. Cr/CysC also significantly correlates with occurrence of BFF after follow up under presence of AAC.

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AB0607

DO HIP STRUCTURAL ANALYSIS MEASUREMENTS PREDICT FRACTURE RISK IN PATIENTS WITH POLYMYALGIA RHEUMATICA?

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Background: Polymyalgia Rheumatica (PMR) is an inflammatory condition which commonly affects the elderly. Risk of fracture is higher in this group of patients compared to the general population and can lead to increased morbidity and mortality (1). Hip structural analysis (HSA) is a technique that uses dual-energy X-ray absorptiometry (DEXA) images to assess hip bone structure (2).

Objectives: To identify whether HSA measurements help predict fracture in patients with PMR.

Methods: Data were collected from June 2004 to October 2010 from PMR patients who had a DEXA scan at a District General Hospital. This included hip axis length (HAL), cross-sectional area (CSA), cross-sectional moment of inertia (CSMI), distance from centre of femoral head to centre of femoral neck (D1) and to inter-trochanteric line (D2), mean femoral neck diameter (D3), shaft angle (A) neck/shaft angle (Θ) and proximal femur strength index (SI) and distance from centre of mass of femoral neck to superior neck margin (Y). Fracture was predicted by a series of binomial logistic regression models, adjusted for age and sex. Odds ratios with 95% confidence intervals and area under the receiver operating characteristic curve (AUC) were calculated.

Results: 714 patients with PMR were identified, 182 were male and the mean age was 70.5. HAL, CSMI, D1, D2, D3, A, Θ, SI and Y were not significant predictors of fracture in regression models; odds ratios are included in Table 1. CSA predicted fracture risk; odds ratio was 0.988 with a 95% confidence interval of 0.980-0.997. The AUC for the CSA regression model was 0.6739.

Table 1. Odds ratios of fracture for different HSA parameters

HSA Parameter	Odds Ratio (95% confidence interval)
HAL	1.008 (0.982 - 1.035)
CSMI	1.000 (0.999 - 1.000)
CSA	0.988 (0.980 - 0.997)
D1	1.029 (0.972 - 1.089)
D2	1.010 (0.981 - 1.040)
D3	1.033 (0.962 - 1.109)
Y	1.087 (0.966 - 1.223)
A	0.983 (0.940 - 1.029)
Θ	1.007 (0.975 - 1.039)
SI	0.683 (0.406 - 1.150)

Conclusion: These data suggest that CSA helps predict the risk of fracture in patients with PMR. HAL, CSMI, D1, D2, D3, A, Θ, SI and Y do not predict fracture risk. Limitations of the study are that it was retrospective and only studied patients who underwent DEXA scans. The study may have been underpowered to detect the impact of some HSA measurements on fracture risk.

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AB0608

BONE MINERAL DENSITY, VITAMIN D STATUS AND BONE METABOLISM IN A COHORT OF ADULT PATIENTS WITH INFLAMMATORY BOWEL DISEASE

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Background: Patients with inflammatory bowel disease (IBD) have an increased risk of low bone mineral density (BMD) and bone fractures due to several mechanisms. However, the best management of osteoporosis in this population is yet to determine.

Objectives: To evaluate bone mineral density and other clinical, analytical and demographic features related with the risk of bone fractures in an IBD cohort.

Methods: Retrospective monocentric study including all the patients with IBD consecutively referred from Gastroenterology to the Rheumatology Department in a tertiary university hospital between January of 2013 and October 2020. Demographic, clinical and analytical data and BMD by dual-energy X-ray absorptiometry (DXA) (total hip, femoral neck and lumbar spine) were collected at the time of the first visit in the Rheumatology outpatient center. Correlations between variables were evaluated by Spearman rank test and Mann-Whitney U test was used in the comparison analysis between groups (significance level at $p < 0.05$), using SPSS 25.0 software.

Results: A total of 222 patients were included: 128 (57.7%) females, mean age of 43.4 (± 13.6) years, mean IBD duration of 11.6 (± 9.7) years. Regarding IBD: 163 (73.4%) had Crohn's disease (CD) and 59 (26.6%) had ulcerative colitis

(UC); azathioprine (41.9%) and infliximab (29.8%) were the most frequently used drugs; 10 patients (4.5%) were taking glucocorticoids, 104 (46.8%) had been previously treated with glucocorticoids and 65 (29.3%) had already been exposed to high doses of glucocorticoids (prednisolone equivalent dose ≥ 7.5 mg/day). Ten patients (4.5%) had previous fragility fractures and 32 (14.4%) fulfilled diagnostic criteria of osteoporosis by DXA (T score ≤ -2.5). One hundred eighty-one (81.5%) patients exhibited low levels of 25-hydroxy vitamin D (<30 ng/mL), 24 (10.8%) had high levels of parathormone and 150 (67.6%) showed elevated serum concentrations of beta-carboxy-terminal type-1 collagen crosslinks (beta-CTX). Three patients (1.4%) were under treatment with bisphosphonates and 18 (8.1%) were taking calcium and/or vitamin D supplements.

Of interest, serum levels of albumin correlated negatively with beta-CTX ($r = -0.401$; $p < 0.001$) and positively with osteocalcin ($r = 0.259$; $p < 0.001$). Correlations between clinical/analytical variables and BMD are presented in Table 1.

Patients under glucocorticoids had lower mean total hip BMD (0.874 ± 0.159 vs 1.008 ± 0.176 ; $p = 0.022$) and femoral neck BMD values (0.797 ± 0.174 vs 0.933 ± 0.179 ; $p = 0.014$) in comparison with the group of patients that were not taking glucocorticoids.

No statistically significant differences in BMD values were found between the following subgroups: DC vs UC; normal vs low levels of 25-hydroxy vitamin D; patients exposed vs not exposed to high doses of glucocorticoids.

Table 1. Correlations between clinical/analytical variables and the BMD in an IBD population (BMD: Bone Mineral Density; IBD: Inflammatory Bowel Disease; n.s. not significant).

	Total hip BMD	Femoral neck BMD	Lumbar Spine BMD
Age	$r = -0.356$; $p < 0.001$	$r = -0.469$; $p < 0.001$	$r = -0.259$; $p < 0.001$
Age at IBD diagnosis	$r = -0.254$; $p < 0.001$	$r = -0.327$; $p < 0.001$	$r = -0.226$; $p = 0.001$
IBD duration	$r = -0.147$; $p = 0.031$	$r = -0.218$; $p = 0.001$	n.s.
Hemoglobin	$r = 0.249$; $p < 0.001$	$r = 0.209$; $p = 0.002$	n.s.
Albumin	$r = 0.189$; $p = 0.005$	$r = 0.208$; $p = 0.002$	n.s.
Erythrocyte sedimentation rate	$r = -0.231$; $p = 0.001$	$r = -0.206$; $p = 0.003$	n.s.

Conclusion: Our results show an important prevalence of undiagnosed and untreated osteoporosis in patients with IBD. Stronger correlations were found between clinical/analytical variables and femoral neck BMD. Of note are the weak correlations of BMD with acute-phase markers (negative correlation with erythrocyte sedimentation rate and positive correlations with hemoglobin and albumin) and of nutritional status (evaluated by albumin) with bone markers (negative correlation with the bone reabsorption marker beta-CTX and positive correlation with the bone formation marker osteocalcin).

Disclosure of Interests: None declared.

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AB0609

RADIOFREQUENCY ECHOGRAPHIC MULTI-SPECTROMETRY FOR THE ASSESSMENT OF BOTH FEMORA IN PREGNANT WOMEN

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Background: Radiofrequency Echographic Multi-Spectrometry (REMS) is a non-ionizing innovative approach for the assessment of REMS-based bone mineral density (BMD) of the axial skeleton. The principle of the REMS technology is based on the analysis of native raw unfiltered ultrasound signals during an echographic scan of the lumbar spine or the femoral neck [1]. Several studies demonstrated the high concordance with dual energy X-ray absorptiometry (DXA) in terms of measured BMD with this novel technology [2,3]. In previous published literature it was envisaged to apply this technology for the examination of the axial bone density in pregnant women. Pregnancy-associated bone loss has been demonstrated as decreased bone mineral density (BMD) in previous studies [4].

Objectives: The aim of the current study is to compare the BMD values of both femora between pregnant and non-pregnant women matched for age and BMI using the novel REMS technology.

Methods: Of total fifty women twenty pregnant women (40%) and thirty non-pregnant women (60%) were included in the study. The mean age of the pregnant women was $32 \text{ years} \pm 5$ standard deviations (SD), (range 25-41 years) and the mean age of the non-pregnant women was $30 \text{ years} \pm 6$ standard deviations (SD), (range 24-39 years). REMS approach was used to assess REMS-based BMD and REMS-based Z-score values of the femoral neck. Furthermore, body mass index (BMI) and gestational age in weeks were evaluated.

Results: The mean BMI of the pregnant women was $26 \text{ kg/m}^2 \pm 7 \text{ kg/m}^2$ (range 14 kg/m^2 - 42 kg/m^2) and those of the non-pregnant women was $25 \text{ kg/m}^2 \pm 5 \text{ kg/m}^2$

(range 16 kg/m^2 - 35 kg/m^2). The mean gestational age was 20 weeks' gestation ± 5 weeks' gestation (range 13-27 weeks' gestation). REMS-based mean BMD of the left femoral neck of the pregnant women was $0.793 \text{ g/cm}^2 \pm 0.167 \text{ g/cm}^2$ (range 0.563 g/cm^2 - 1.154 g/cm^2). REMS-based mean BMD of the right femoral neck of the pregnant women was $0.828 \text{ g/cm}^2 \pm 0.153 \text{ g/cm}^2$ (range 0.570 g/cm^2 - 1.161 g/cm^2). After comparing left femoral neck BMD with the right femoral neck BMD of the pregnant women, we found a linear correlation ($R = 0.764$). Left femoral neck BMD value (0.793 g/cm^2) of the pregnant women was significantly lower than those of the non-pregnant women (0.854 g/cm^2), $p = 0.002$. The mean left femoral Z-score of the pregnant women (-0.1 SD with range -2.5 SD- 2.9 SD) was also significantly lower compared to those of the non-pregnant women (1.2 SD with range -1.5 SD- 3.1 SD), $p = 0.003$.

Conclusion: This is the first study which provides data about BMD and Z-score values of both femora in pregnant women assessed with the radiation-free REMS technology. Pregnant women demonstrated significantly lower femoral neck BMD values and Z-scores compared to those of the non-pregnant women. Innovative REMS method could be very helpful for making decision about the treatment of pregnant women who are at risk of lower BMD due to concomitant diseases and/or treatment associated with osteoporosis.

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AB0610

NORMOCALCAEMIC HYPERPARATHYROIDISM AND BONE HEALTH – WORSE THAN ANTICIPATED?

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Background: Since the formal recognition of normocalcaemic hyperparathyroidism (nHPT) as a distinct entity in 2008, several studies have been published describing the characteristics of these individuals. Controversy exists regarding diagnostics and the role of parathyroidectomy in such cases. A chief reason for lack of consensus is the disagreement among experts regarding the potential complications and a bias towards perhaps benign nature of this condition.

Objectives: In order to understand the challenges posed by this cohort, we aim to characterise these patients at presentation to our metabolic bone diseases unit with a focus on bone health.

Methods: We interrogated our departmental database and undertook retrospective analysis of all patients presenting to metabolic bone service at our large university teaching hospital with a catchment population of 350,000. Individuals were included in the survey based on criteria of Vit D >70 nmol/L, normal calcium (2.20 - 2.60 mmol/L), eGFR >60 ml/min and PTH >6.9 pmol/L measured twice at least three months apart.

Results: Over six months review period, of 134 referrals, 42 (31%) were identified with nHPT. Follow up duration was two years. Mean age was 60 years (25-86). 38 (90%) were women with 31 (81%) post menopause. 34 (80%) were of Caucasian descent. All had comorbidities with median of five (1-14). Polyparmacy (>4 prescribed medicines) was common (36/42, 85%) with mean of seven prescribed medications (0-22). Mean Vit D was 88 (70.4-133.6), calcium 2.43 (2.26-2.58), creatinine 69.8 (48-115) and PTH 8.8 (7.2-14.2). Ten (24%) had already had fragility fractures with mean of two (0-4). 21 had DXA scan with mean T score of -3.78 (-2.1 - -6.0). 13/21 (31%) had osteoporosis. Oral and IV bisphosphonates, denosumab and teriparatide were prescribed to 12 (28.5%), 14 (33%), 4 (10%) and one patient respectively.

Conclusion: Our study suggests high prevalence of nHPT among patients referred to metabolic bone service with confirmed bone health issues. Nearly a third of patients have nHPT in this secondary care setting and a quarter have already suffered fragility fractures. These patients carry high comorbidity, polyparmacy and osteoporosis burden. Management of such patients is challenging owing to complex interplay of various ailments. Bone active agents are required for nearly two-thirds of this group. Though the natural course of nHPT is an area of active research, our data adds to the growing body of evidence that this is not a benign condition with particularly high fracture burden and poor bone quality.