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Osteoporosis

SAT0444

PREVALENCE OF VERTEBRAL FRACTURES BY BONE FRAGILITY IN PATIENTS BEFORE AND 1 YEAR AFTER LIVER TRANSPLANTATION

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Background: Bone fragility is frequent in patients awaiting orthotopic liver transplantation (OLT) for severe liver disease, leading to a high prevalence of fractures, particularly vertebral ones. During the year following OLT, there is an early decrease in bone density and a high incidence of new vertebral fractures (VF).

Objectives: To determine the prevalence of VF due to bone fragility during the year after OLT in a large population of patients.

Methods: We conducted a cohort, prospective, descriptive, monocentric study including all the patients with severe chronic liver disease and awaiting OLT. Patients were seen during the pre-transplant period and one year after OLT. At each visit demographic, clinical, biological (including bone remodeling markers) and bone mineral density (BMD) data with VFA (Vertebral fracture Assessment) were collected. We estimated the incidence of VF after OLT. We compared biological and morphological data.

Results: We have seen 272 patients before OLT (median age 59 years [Interquartile Range IQR: 53; 64], 75% male). Hepatopathy was due to alcoholic disease for 187 patients (69%). Before OLT, 12% had T-score < -2.5 SD (Standard Deviation) at lumbar spine site, 10% at total hip site and 10% at femoral neck site. Among the 272 patients, 31 had at least one VF (for a total of 49 VF). After OLT, we have seen 101 patients (median of 14 months [IQR: 5; 40] after OLT). For those 101 patients seen before and after OLT: we noted 18 VF for 12 patients (11.8%) before OLT and 29 VF for 18 patients (17.8%) after OLT on VFA. The VF incidence was 8.8 for 100 patients-years. During the year following OLT, there was a significant decrease of T-score at femoral neck and total hip sites. The number of osteoporotic patients was 13/101 (12.8%) at femoral neck and 14/101 (13.8%) at total hip. There was no significant change at the lumbar spine. Bone remodeling markers were significantly higher after OLT than before: CTX (µg/L) from 0.350 [IQR: 0.260; 0.501] before OLT to 0.490 [IQR: 0.279; 0.762] after OLT and osteocalcin (mg/mL) from 17 [IQR: 12; 22] to 30 [IQR: 19; 43], p<0.001. Fifteen of those 101 patients had an anti-osteoporotic drug prescribed before OLT despite being justified for 30 patients.

Conclusion: Despite bone fragility and a high fracture risk, patients undergoing OLT are not enough treated for osteoporotic disease. It seems justified to offer a systematic rheumatology visit to detect bone damage before OLT and 6 months after OLT when the damage is the most significant. The drug prescription should be systematically proposed in a situation of fracture before OLT and/or in case of low bone parameters after OLT.

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SAT0445

TRABECULAR BONE SCORE IMPROVES FRACTURE RISK STRATIFICATION IN PATIENTS WITH REDUCED BONE MINERAL DENSITY

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Background: Trabecular bone score (TBS) is a textural index of bone microarchitecture and has been found to be related to 3D bone structure. A number of cohort studies have demonstrated the value of TBS as an independent fracture risk in clinical trials. Yet, very little is known about the performance and clinical value of TBS in real life practice.

Objectives: To investigate the sensitivity and specificity of TBS in identifying prevalent fractures when compared with bone mineral density (BMD) measured by DXA. To evaluate the added value of TBS in fracture risk prediction above that obtained from DXA.

Methods: Consecutive patients aged ≥ 18 with BMI 15-37 attending a DXA plus TBS assessment were considered eligible. Sensitivity, specificity, and area under the curve (AUC) for prevalent major osteoporotic fracture (MOF) and clinical vertebral fractures (VF) were assessed for the following parameters: BMD lowest T-score ≤ -2.5 (neck of femur, total hip, or spine), TBS T-score ≤ -2.5, and either TBS or BMD T-score ≤ -2.5. BMD categories (normal, osteopenia, and osteoporosis) were stratified by TBS T-score: normal (T-score ≥ -1), moderate (-1 > T-score ≥ -2.5), and degraded TBS (T-score ≤ -2.5) resulting in 9 risk groups. Odds ratios were calculated for all risk categories and fracture prevalence was compared between the best and worst TBS strata at each BMD level using chi-square test.

Results: 540 patients (87% females, 68.1 ± 11.6 years) were included. 238 (44%) had MOF including 81 (15%) clinical VF. For MOF, BMD had higher sensitivity (49.6% vs 30.7%), lower specificity (68.2% vs 82.1%), and similar AUC (0.59 vs 0.56) versus TBS. For VF, the sensitivity, specificity and AUC for BMD were 60%, 64%, and 0.62 respectively versus 42%, 79.7%, and 0.61 for TBS. Combining TBS and BMD (either T-score ≤ -2.5) increased the sensitivity to 63% for MOF and 75.3% for VF without affecting AUC (0.6 and 0.64 respectively). Patients with osteoporosis and degraded TBS had the highest OR of 2.65 for MOF and 3.8 for VF. The fracture risk increased at the same level of BMD when TBS was degraded. Numerically, the risk of MOF increased steadily from strata 1 to 9 and was statistically significant for osteoporosis with degraded TBS and osteoporosis with moderate TBS. When both TBS and BMD were normal, the risk of fracture was significantly reduced. In the osteopenia and osteoporosis BMD categories, patients with degraded TBS had significantly higher prevalence of fracture compared to those with normal TBS in the same BMD category.

Conclusion: Fracture risk stratification can be improved when TBS is added to BMD. The sensitivity of predicting fracture may also improve when TBS and BMD are combined. Patients with both normal TBS and BMD have the lowest fracture risk, whereas those with degraded TBS and osteoporosis have the highest risk of fracture and should be targeted for early or more aggressive treatment.

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Table 1. Prevalence and risk of MOF and VF according to BMD stratified by TBS T-score

	Patients within category	Number of MOF	OR for MOF	Number of VF	OR for VF
Normal BMD & TBS	49	7 (14.3%)	0.19 (0.08-0.43)*	0	0.83 (0.80-.87)*
Normal BMD moderate TBS	19	5 (26.3%)	0.44 (0.16-1.24)	2 (10.5%)	0.66 (0.15-2.9)
Normal BMD degraded TBS	7	2 (28.6%)	0.50 (0.1-2.6)	1 (14.3%)	0.94 (0.11-7.9)
Osteopenia normal TBS	96	33 (34.4%)	0.61 (0.39-0.97)	7 (7.3%)	0.39 (0.18-0.88)*
Osteopenia moderate TBS	98	43 (43.9%)	0.99 (0.64-1.54)	11 (11.2%)	0.67 (0.34-1.32)
Osteopenia degraded TBS	57	30 (52.6%)	1.47 (0.85-2.55)	11 (19.3%)	1.41 (0.7-2.86)
Osteoporosis normal TBS	39	18 (46.2%)	1.1 (0.57-2.1)	6 (15.4%)	1 (0.42-2.6)
Osteoporosis moderate TBS	112	59 (52.7%)	1.55 (1.02-2.35)*	21 (18.8%)	1.42 (0.82-2.45)
Osteoporosis degraded TBS	63	41 (65.1%)	2.65 (1.53-4.59)*	22 (34.9%)	3.8 (2.12-6.83)*
Total	540	238		81	

Figure 1. Prevalence of MOF according to BMD T-score stratified by TBS T-score

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SAT0446

RISK OF ACUTE MYOCARDIAL INFARCTION (AMI) AMONG NEW USERS OF BISPHOSPHONATES: A NESTED CASE-CONTROL STUDY

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Background: Evidence suggest that bisphosphonates (BF) may inhibit atherosclerosis and vascular calcification. In several small-scale clinical trials, BF improved some intermediate targets of atherosclerosis. Observational studies found a lower risk of Acute Myocardial Infarction (AMI) or stroke among BF users compared to non-users. While this epidemiological evidence suggests that BF may protect against cardiovascular events a "prevalent user bias" cannot be excluded.

Objectives: To analyze the hypothesis that BF reduce the risk of AMI in new users and assess whether the effect depends on the duration of treatment.

Methods: Case-control study nested in a primary cohort composed of patients aged 40 to 99 years, with at least one year of follow-up in the BIFAP database during the 2002-2015 study period. From this cohort of patients, we identified incident cases of AMI and randomly selected five controls per case, matched by exact age, gender, and index date. Adjusted odds ratios (AOR) and their corresponding 95% confidence interval (CI) were calculated through an unconditional logistic regression. Only new users of BF were considered.

Results: A total of 23,590 cases of IAM and 117,612 controls were included. The mean age was 66.8 (SD 13.4) years and 72.52% were male, in both groups. 584 (2.47%) cases and 2,892 (2.46%) controls used or had used some bisphosphonate. The use of BF was not associated with a lower risk of IAM (**AOR 0.97; 95%CI: 0.84–1.13**). Nor was it associated with the duration of treatment (**AOR less than 1 year = 0.91; 95%CI: 0.72–1.15**); **AOR more than 1 year = 1.01; 95%CI: 0.84–1.21**). The stratified analysis by age and sex also did not show either a protective effect of BF. Detailed results by BF type are shown in the following table:

	Cases (%)	Controls (%)	Non-adjusted OR	Adjusted OR
	N=23590	N=117612	(95% CI)	(95% CI)
Bisphosphonates				
Non users	23006 (97.52)	114720 (97.54)	1 (Ref.)	1 (Ref.)
Current	276 (1.17)	1458 (1.24)	0.93 (0.81-1.06)	0.97 (0.84-1.13)
Recent	109 (0.46)	478 (0.41)	1.13 (0.92-1.40)	1.11 (0.89-1.40)
Past	199 (0.84)	956 (0.81)	1.04 (0.89-1.21)	1.01 (0.86-1.20)
Alendronic acid				
Non users	23338 (98.93)	116421 (98.99)	1 (Ref.)	1 (Ref.)
Current	88 (0.37)	469 (0.40)	0.91 (0.72-1.15)	0.97 (0.76-1.24)

	Cases (%)	Controls (%)	Non-adjusted OR	Adjusted OR
	N=23590	N=117612	(95% CI)	(95% CI)
Recent	46 (0.19)	201 (0.17)	1.17 (0.84-1.61)	1.18 (0.83-1.66)
Past	118 (0.50)	521 (0.44)	1.12 (0.91-1.37)	1.13 (0.91-1.40)
Alendronic acid+Vid				
Non users	23509 (99.66)	117155 (99.61)	1 (Ref.)	1 (Ref.)
Current	34 (0.14)	207 (0.18)	0.81 (0.56-1.17)	0.89 (0.60-1.31)
Recent	15 (0.06)	77 (0.07)	0.94 (0.54-1.63)	0.71 (0.40-1.29)
Past	32 (0.14)	173 (0.15)	0.92 (0.63-1.35)	0.83 (0.56-1.25)
Alendronic acid (all)				
Non users	23274 (98.66)	116057 (98.68)	1 (Ref.)	1 (Ref.)
Current	122 (0.52)	671 (0.57)	0.89 (0.73-1.08)	0.95 (0.77-1.18)
Recent	58 (0.25)	261 (0.22)	1.11 (0.83-1.48)	1.03 (0.76-1.39)
Past	136 (0.58)	623 (0.53)	1.08 (0.89-1.31)	1.05 (0.86-1.29)
Ibandronic acid				
Non users	23504 (99.64)	117174 (99.63)	1 (Ref.)	1 (Ref.)
Current	41 (0.17)	216 (0.18)	0.96 (0.68-1.34)	1.00 (0.70-1.42)
Recent	18 (0.08)	69 (0.06)	1.24 (0.74-2.09)	1.38 (0.80-2.36)
Past	27 (0.11)	153 (0.13)	0.87 (0.57-1.31)	0.88 (0.57-1.35)
Risedronic acid				
Non users	23355 (99.00)	116446 (99.01)	1 (Ref.)	1 (Ref.)
Current	102 (0.43)	527 (0.45)	0.95 (0.76-1.18)	0.95 (0.79-1.25)
Recent	47 (0.20)	186 (0.16)	1.27 (0.92-1.75)	1.17 (0.83-1.66)
Past	86 (0.36)	453 (0.39)	0.94 (0.75-1.19)	0.93 (0.72-1.19)

Conclusion: Our results do not support a cardioprotective effect of BF, regardless of the duration of treatment, age, sex or background cardiovascular risk.

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SAT0447

CORRELATES OF RADIAL BONE MICROARCHITECTURES IN OLDER ADULTS

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Background: Weight, dietary patterns, vitamin D, physical activity and grip strength have been suggested to be associated with bone loss in older adults. However, studies have yet been performed to investigate the associations between these factors and radial bone microarchitecture.

Objectives: This study aimed to describe the associations of weight, dietary patterns, serum 25-hydroxyvitamin D (25(OH)D) concentrations, physical activity and grip strength with bone measures in older adults.

Methods: Cross-sectional data on 201 older adults (mean age 72 years, female 46%) from a population-based cohort study were analysed. Weight, dietary patterns, serum 25(OH)D concentrations, physical activity (steps per day), grip strength were collected and analysed from baseline to 10-year follow-up. Areal bone mineral density (aBMD) at spine, hip and whole body were measured by dual-energy X-ray absorptiometry (DXA). Radial cortical and trabecular bone microarchitectures were measured by high-resolution peripheral computed tomography (HRpQCT). Multivariable linear regression was used to analyse associations of study factors with bone measures.

Results: Weight was positively associated with radial bone area (total: $\beta=0.18$, 95% CI: 0.07, 0.29; cortical: $\beta=0.12$, 95% CI: 0.03, 0.21; trabecular: $\beta=0.18$, 95% CI: 0.05, 0.32), and was inversely associated with compact cortical volumetric bone mineral density (vBMD) ($\beta=-0.19$, 95% CI: -0.37, -0.01) and trabecular thickness ($\beta=-0.25$, 95% CI: -0.43, -0.07). Ten-year changes in weight were not significantly associated with bone measures, apart from radial trabecular separation ($\beta=0.15$, 95%CI: 0.009, 0.28). Western dietary pattern scores were inversely associated with radial vBMD (total: $\beta=-0.17$, 95% CI: -0.32, -0.01; cortical: $\beta=-0.19$, 95% CI: -0.34, -0.04; compact cortical: $\beta=-0.19$, 95% CI: -0.34, -0.04; outer transitional zone: $\beta=-0.20$, 95% CI: -0.35, -0.06), and were positively associated with cortical porosity (cortical: $\beta=0.18$, 95% CI: 0.03, 0.33; compact cortical: $\beta=0.19$, 95% CI: 0.04, 0.34; outer transitional zone: $\beta=0.20$, 95% CI: 0.06, 0.35). Steps per day were not significantly associated with bone measures, apart from inner transitional zone area and thickness ($\beta=0.12$, 95% CI: 0.003, 0.24; $\beta=0.19$, 95% CI: 0.05, 0.33). Healthy food pattern scores, serum 25(OH)D and grip strength were not significantly associated with radial HRpQCT measures.

Conclusion: Higher weight, but not weight change, was beneficial for radial cortical and trabecular bone area but also associated with worse compact cortical vBMD and trabecular thickness. Higher western dietary pattern scores had adverse effects on radial vBMD and cortical porosity while physical activity had inconsistent associations.

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