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Plenary Poster Presentations

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Plenary Poster P1
Effect Of Osteoarthritis on Periarticular Osteoporosis of The Knee in Chinese

***Fei Wang**, Shengjie Wang, Xiaomeng Wang, Chengliang Dai, Shiyu Tang*
Third Hospital of Hebei Medical University, Shijiazhuang, Hebei, China

Background: The purpose of this article is to study the change of bone mineral density (BMD) in periarticular subchondral regions of the knee joint in the patients with osteoarthritis (OA) of the knee.
Methods: Eighty patients with relatively mild OA of the knee and eighty normal volunteers matched for age and sex were recruited. BMD of distal femoral shaft, the lumbar spine, and several periarticular subchondral regions (lateral tibial compartments, medial tibial and both superficial and deep regions of the medial femoral) of the knee were measured by dual energy x-ray absorptiometry (DXA). Comparing the difference of the BMD between the patients and the normal volunteers.
Results: Compared with the normal volunteers, BMD was lower in 6 subchondral bone regions of the knees (n=53) of the female patients with OA (average decrease –14.6%), significant difference in all 6 subchondral regions (P<0.001 to P=0.005). BMD was lower than normal volunteers in 6 subchondral regions of the knees (n=27) of male patients with OA (average decrease –8.2%), significant difference in all 6 subchondral regions (P<0.001 to P=0.004). Compared with the normal volunteers, there was no significant difference in spinal BMD (L1–L4) or femoral shaft BMD for either female or male.
Conclusion: There was a significant decrease in periarticular subchondral BMD in female and male patients with relatively mild OA of the knee. OA of the knee can influence the periarticular subchondral BMD.

Plenary Poster P2
Association between Plastin 3 Gene Polymorphism and Osteoporotic Fracture in Postmenopausal Chinese Women

***Chong Shao**, Jinwei He, Wenzhen Fu, Chun Wang, Zhenlin Zhang*
Metabolic Bone Disease and Genetic Research Unit, Department of Osteoporosis and Bone Diseases, Shanghai Jiao Tong University, affiliated Sixth People's Hospital, Shanghai, China

Background: Plastin 3 (PLS3) gene is located on the X chromosome, encoding the actin-binding protein plastin 3, the protein is a member of protein family which responsible for the dynamic assembly and disassembly of actin cytoskeleton, recent studies found that mutations of the gene can lead to osteoporosis and fractures, and somewhat verified in the Rotterdam study population. The purpose of this study was to investigate the relationship between bone mineral density and *PLS3* gene polymorphism and the risk of osteoporotic fractures in Chinese postmenopausal women.
Methods: In this study, a total of 3912 unrelated Chinese Han postmenopausal women in Shanghai were recruited, all subjects including 1265 osteoporotic fracture patients (fracture group) and 2647 healthy controls without fractures (control group) were older than 45 years and more than 5 years since menopause. All members in fracture group needed to provide relevant medical history or the presence of X-ray film which can prove at least one fragility fracture (hip, spine or wrist fractures). All subjects were chosen in the period from February 2009 to September 2013 in our hospital outpatients and healthy community recruitment volunteers. All subjects underwent dual-energy X-ray absorptiometry bone density testing, including lumbar spine (L1-4), femoral neck and total hip. TaqMan genotyping technology was genotyped the 7 tag SNPs in *PLS3* gene for all subjects. Logistic regression analysis and other statistical methods were used to analysis the relationship between the SNP genotypes or haplotypes and osteoporotic fractures or bone mineral density (P<0.05 as statistically significant).
Results: The mean age, height and weight in fracture and control groups had statistically significant differences (P<0.05). The C/T genotype of rs2522179 and C/T genotype of rs2522188 were significantly associated with the risk of vertebral fractures which were adjusted after correction of height, weight, age, etc. The haplotype CAC of *PLS3* gene 3 SNP (rs757124, rs10521693 and rs2522179) was significantly associated with vertebral fractures which meant carrying the haplotype heterozygous individuals had a higher risk of vertebral fractures. The haplotype CAT was closely associated

with hip fracture risk; the individuals of carrying the haplotype heterozygous had a higher incidence of hip fracture risk. While we found no correlation between *PLS3* gene polymorphism with L1-4, femoral neck or total hip BMD.
Conclusion: This study described the distribution of *PLS3* polymorphism in Chinese postmenopausal women and revealed that SNPs (rs2522179 and rs2522188), haplotypes CAC and CAT (rs757124, rs10521693 and rs2522179) were the risk factors of osteoporotic lumbar or hip fracture.

Plenary Poster P3
Association between Dietary Intake of Flavonoid and Bone Mineral Density in Middle Aged and Elderly Chinese Women and Men
***Yuming Chen**, Zheqing Zhang, Liping He,*
Yanhua Liu, Jun Liu, Yixiang Su
Guangdong Provincial Key Laboratory of Food, Nutrition, and Health, School of Public Health, Sun Yat-sen University, Guangzhou, Guangdong, China

Background: Studies *in vitro* and in animal models suggest a potential effect of flavonoids on bone health. Few studies have examined the association between the habitual intake of flavonoids and bone mineral density (BMD) in humans.
Methods: The cross-sectional study recruited 2,239 women and 1,078 men in urban Guangzhou, China. A 79-item quantitative food frequency questionnaire was administered in face-to-face interviews to assess habitual dietary flavonoid intake using food composition databases. BMD was measured at the whole body, femoral neck (FN) and lumbar spine (LS) by dual-energy X-ray absorptiometry (DXA).
Results: After adjusting for covariates, women consumed higher total flavonoids, flavonols, flavan-3-ols, flavones and proanthocyanidins tended to have higher BMD at either site (P-trend<0.05). In comparison with women in the lowest quartile, women in the highest quartile of total flavonoids intake had 0.023, 0.020 and 0.013 g/cm^2 higher BMD for the whole body, LS and FN, respectively. For the subclasses, the differences of BMD between the extreme quartiles at the three measured sites were 0.012—0.021 g/cm^2 for flavan-3-ols, 0.013—0.020 g/cm^2 for flavonols, 0.016—0.019 g/cm^2 for flavones and 0.014—0.016 g/cm^2 for proanthocyanidins, respectively. A higher intake of flavonones was associated with a higher BMD for whole body (P-trend: 0.041) and FN (P-trend: 0.022). No significantly association between intake of anthocyanins and BMD at any of the sites were observed. In men, however, no significant positive associations were found between total and individual flavonoid intake and BMD at any measured sites.
Conclusion: Dietary flavonoids intake was positively associated with BMD in women. Further large studies are needed to clarify this issue in men.

Plenary Poster P4
Nutritional and Dietary Factors and Risk of Hip Fractures in Elderly Chinese: A Matched Case-Control Study
***Yuming Chen**, Fangfang Zeng, Wenqiong Xue, Fan Fan, Haili Xie, Baohua Wu, Weifu Ouyang, Sulan tu*
Department of Medical Statistics & Epidemiology, School of Public Health, Sun Yat-sen University, Guangzhou, Guangdong, China

Background: To examine the association of nutritional and dietary factors with risk of hip fractures in elderly Chinese men and women.
Methods: 724 (M/F: 177/549) incident cases of hip fractures were enrolled from four hospitals, with 581 sex- and age-matched (±3 years) controls from hospitals or the community in Guangdong, China during 2008.1–2014.3. Face-to-face interviews were conducted to collect general information, habitual intake of foods and nutrients (by FFQ) and various covariates.
Results: Multivariate conditional logistic regression analyses showed: A dose-dependent decreased risk of hip fractures was associated with greater intakes of fruit & vegetables, seafoods, skin-free poultry, b-carotene and other antioxidantive nutrients, K and Mg, and high-qualit diet, but lower consumption of red meat, pickled vegetables, and oils & fat, and net endogenous acid production (NEAP). The multivariate adjusted odds ratios (95%CI) of hip fractures for various foods and nutrients comparing their consumption levels of extreme quartiles were: total fish & shell fish: 0.47(0.28–0.79), seafoods: 0.31(0.18–0.52), fresh-water fish: 0.80(0.48–1.31) , total fruit & vegetables: 0.22(0.13–0.39), vegetable: 0.29(0.17–0.52), fruit: 0.62(0.36–1.08), skin-free poultry: 0.52(0.34, 0.82), beta-carotene: 0.15(0.06–0.34), VC: 0.28(0.13–0.61), K: 0.27(0.13–0.53), Mg: 0.30(0.14–0.65), tea drinker (Y/N) : 0.72(0.54–0.95), red meat: 2.74(1.61, 4.67) , organ meat: 1.54(1.07, 2.23), pickled vegetable: 3.49(1.72–7.10), oil & fat: 4.48(2.15–9.34), and NEAP: 4.94(3.16–7.73), respectively. Dietary pattern analyses suggested that “healthy dietary pattern” was associated with lower hip fracture risk, whereas “high-fat dietary pattern” might increase the risk. Higher values of diet-quality scores ((HEI-2005, aHEI, DQI-I, aMed) were significantly associated with a decreased risk of hip fractures.
Conclusion: Greater intakes of fruit & vegetables, seafoods, skin-free poultry, antioxidantive nutrients, K and Mg, and, but lower consumption of red meat, pickled vegetables, fat, NEAP and lower-quality diet may be protective against hip fractures in elderly Chinese.

Plenary Poster P5
Trabecular Bone Score, Bone Mineral Density and Late-Onset Hypogonadism in Ukrainian Men of Various Ages
Vladyslav Povoroznyuk, Anna Musiienko, Yeugen Kreslov*
D.F. Chebotarev Institute of gerontology NAMS Ukraine, Kiev, Ukraine

Background: The aim of the study was to evaluate the Bone Mineral Density (BMD), Trabecular Bone Score (TBS) in men of various ages suffering from a late-onset hypogonadism (LOH).

Methods: We've examined 46 men aged 50-85 years (mean age – 64.5±1.3 yrs; mean height – 1.73±0.09 m; mean weight – 82.7±2.1 kg). The patients were divided into such age-dependent groups: 50-59 yrs (n=16), 60–69 yrs (n=14), 70 yrs and older (n=16). The BMD of total body, PA lumbar spine (L_1–L_4) and proximal femur were measured by the DXA method (Prodigy, GEHC Lunar, Madison, WI, USA), and PA spine TBS was assessed by the TBS iNsight software package installed on our DXA machine (Med-Imaps, Pessac, France). Total testosterone was measured in all the subjects using an enzyme immunoassay method (mean level – 14.8±0.9 nmol/l). Depending on the total testosterone level, all the subjects were divided into 2 groups: GI – with a testosterone level >12 nmol/l (normal), and GII – with a testosterone level <12 nmol/l (LOH).
Results: Frequency of hypogonadism in the study group was 34.8%, in the group of 50–59 years – 18%, 60–69 years – 42.9%, 70 years and older – 56.2%. TBS in men of 50–59 years was 1.064±0.04; 60-69 years – 1.065±0.05; 70 years and older – 1.016±0.04. TBS in men with LOH was significantly lower in the age group of 70 years and older, compared with healthy men of the same age (0.947± 0.05 vs 1.106±0.05, F=4.6; $P<0.05$). Significant differences between the groups of patients with hypogonadism and normal testosterone level as for the BMD L_1–L_4 and femoral neck were not found.
Conclusion: TBS in men with a late-onset hypogonadism was significantly lower in the age group of 70 years and older, compared with the healthy men. We didn't observe any significant differences as for the BMD L_1–L_4 and femoral neck.

Plenary Poster P6
The Relationship between Osteoporosis and Frailty in Older Women

***Fei Wang**, Chengliang Dai, Shiyu Tang, Xiaomeng Wang, Shengjie Wang*
Third Hospital of Hebei Medical University, Shijiazhuang, Hebei, China

Background: Despite sharing common biological pathways and risk factors such as age, sarcopenia, lack of physical activity, low body weight, and smoking, the relationship between osteoporosis (OP) and frailty is not clear. The purpose of our study was to uncover this relationship.
Methods: Three hundred twelve women were included and assessed for demographic, frailty and OP status at baseline and after 1 year. Frailty was assessed based on the Cardiovascular Health study (CHS) frailty phenotype and the Vulnerable Elders Survey (VES). OP was measured using dual photon absorptiometry bone mineral density (BMD). Descriptive statistics and regression models were used.
Results: At baseline, 312 women with a mean age of 73.5±4.6, body mass index (BMI) of 26.6±5.6 kg/m², and BMD of 0.68±0.22 g/cm² were assessed. No correlation was found between BMD and the CHS (BMD spine, r=0.017, p=0.775; BMD hips, r=0.034, p=0.314) or the VES frailty scales (BMD spine, r=0.025, p=0.457; BMD hips, r=–0.056, p=0.425). After 1 year, 232 (74.4 %) women were assessed. Women who were frail at baseline (VES) were found to have lower hip and spine BMD than women who were non-frail (hip, p=0.0253; spine, p=0.0056).
Conclusion: Frailty defined by the VES predicts a decrease in BMD after 1 year and frail older women should be assessed for osteoporosis.

Plenary Poster P7
A Multicenter, Randomized, Double-Blind, and Placebo-Controlled Study of Zuogui Pill and Yougui Pill for Improving Bone Mineral Density

***Dezhi Tang**, Chenguang Li, Xuejun Cui, Feng Yang, Dongfeng Zhao, Zhu Yang, Xiaofeng Li, Qin Bian, Bing Shu, Jing Wang, Weiwei Da, Wen Mo, Qi Shi, Yongjun Wang*
Longhua Hospital, Shanghai University of Traditional Chinese Medicine, Shanghai, China

Background: Natural herbal therapy offers an attractive alternative for the treatment of osteoporosis. The objective of this study is to evaluate the efficacy and safety of natural Chinese herbs, Zuogui Pill (ZGP) and Yougui Pill (YGP), for use in patients to improve bone mineral density (BMD).
Methods: 200 subjects were included double-blindly and randomly allocated into two groups, treatment and control. All subjects were diagnosed with low bone mineral density and kidney deficiency in Traditional Chinese Medicine (TCM). Subjects in treatment group were treated for 6 months with either ZGP or YGP based on clinical characters of TCM, while control group received placebo for the same period of time. Primary outcome was lumbar spine BMD as determined by using dual-energy X-ray absorptiometry. Secondary outcomes included visual analogue scale (VAS), quality of life (ECOS-16), and serum markers of bone metabolism. Adverse effects were documented for safety assessment. Follow-ups were performed at regular intervals during a one-year period.
Results: In ZGP group, lumbar spine BMD was increased by 4.1% from the baseline immediately after the treatment (P=0.047) and by 4.7% from the baseline at the end of the additional 6-month follow-up (P=0.055). Bone anabolic marker was also significantly improved after treatment ($P<0.05$). In YGP group, the VAS and ECOS-16 scores were also significantly reduced after treatment ($P<0.05$). Furthermore, bone resorption marker was significantly suppressed after treatment in YGP group ($P<0.05$), and bone anabolic marker was significantly increased ($P<0.05$), respectively. No severe adverse effects were observed in either ZGP group or YGP group.
Conclusion: ZGP and YGP are effective and safe therapeutic drugs for osteoporosis, which improve lumbar spine BMD, reduce pain intensity, alleviate bone resorption, and stimulate bone formation.

Plenary Poster P8
Relationships between Serum Omentin-1 Levels and Bone Mineral Density in Older Men with Osteoporosis

***Li Yang**, Bin Liao, XinLan Zhao, WenJing Li, AiPing Qin*
Department of Endocrinology, Hunan Province Geriatric Hospital, Changsha, Hunan, China

Background: To investigate the correlation between serum omentin-1 levels and the presence of patients with osteoporosis in older men.

Methods: 45 patients with osteoporosis in older men and 30 older men without osteoporosis were included in this study. Serum omentin-1, bone turnover biochemical markers, and BMD were determined in 45 older men with osteoporosis group or 30 older men without osteoporosis group (65–70 years old).
Results: Omentin-1 levels increased in older men with osteoporosis, and the differences remain significant after controlling for fat mass. Omentin-1 was negatively correlated with BMD. In the multiple linear stepwise regression analysis, omentin-1, lean mass, but not fat mass, were independent predictors of BMD for the combined group. The significant negative correlations between omentin-1 and bone-specific alkaline phosphatase (BAP), bone cross-linked N-telopeptides of type I collagen (NTX) were found. Omentin-1 was also independently associated with BMD and bone turnover markers in the older men with osteoporosis and control groups considered separately.
Conclusion: Omentin-1 was an independent predictor of BMD in the older men with osteoporosis, and negatively correlated with bone turnover biochemical markers. It suggested that omentin-1 may exert a negative effect on bone mass through the regulation of the osteoblast differentiation in the older men with osteoporosis.

Plenary Poster P9
The Relationship bvetween Serum Vitamin D Level and Blood Glucose in Type 2 Diabetic Osteoporosis Patients
***Yan Wang*[1,2]*, Lixin Zhou*[1,2]*, Xuelun Wu*[1,2]*, Jianxia Ma*[1,2]*, Peng Xue*[1,2]*, Yukun Li*[1,2]
[1]Department of Endocrinology, The Third Hospital of Hebei Medical University, Shijiazhuang, Hebei, China; [2]Key Laboratory of Orthopedic Biomechanics of Hebei Province, The Third Hospital of Hebei Medical University, Shijiazhuang, Hebei, China

Background: study the relationship between serum vitamin D level and blood glucose in type 2 diabetic osteoporosis patients.
Methods: 84 type 2 diabetes patients were selected from the Second Division of Endocrinology of the Third Hospital of Hebei Medical University, from June 2013 to December 2013. The bone mineral density (BMD) of all subjects were measured by the dual energy x-ray absorptiometry (DEXA) scan, while age, height, weight, BMI, menopause, diabetes duration were recorded. Biochemical indicators, including FPG, HbAlc, TG, TC, LDL, HDL, etc were measured. According to the WHO diagnostic criteria for osteoporosis, the 84 subjects of T2DM patients were divided into normal bone mass group (DMNB group, N=23), low bone mass group (DMLB group, N=39) and osteoporosis group (DMOP group, N=22). All subjects were fasted overnight for ≥8 h, venous blood samples were collected. Concentrations of Serum 25(OH)D3 were measured by radioimmunoassay. Statistical analyses were done by SPSS Software (V13.0,SPSS Inc, USA) $P<0.05$ was considered statistically significant.
Results: 1. The average concentrations of 25(OH)D3 was 16.245±6.775 ng/ml. The level of serum 25(OH)D3 in DMOP subjects was lower than that of DMLB and DMNB subjects ($P<0.05$). The prevalence of vitamin D deficiency, relative deficiency and adequate deficiency was 73% (61/84), 25% (21/84), 2% (2/84) in the total people respectively; 2. Serum 25(OH)D3 level was correlated inversely with serum FPG and HbA1C (r=–0.407, P=0.000; r=–0.308, P=0.004); There is no significant correlation between serum 25(OH)D3 level and TG, TC, HDL and LDL ($P>0.05$).
Conclusion: 1. The deficiency of vitamin D in T2DM is widespread, this phenomenon is more worse in diabetic osteoporosis; 2. Serum 25(OH)D3 level was closely related with FPG, HbA1c in patients with T2DM.There is no significant correlation between 25(OH)D3 and Lipid levels.

Plenary Poster P10
The Decline of Intraosseous Vaspermeability during Ovariectomy-Induced Bone Loss in Rats
***Siwei Li*[1]*, Guohong Du*[1]*, Xiaoxue Yin*[2]*, Zhongjun Liu*[1]*, Chunli Song*[2]*, Huijie Leng*[1]
[1]Department of Orthopaedics, Peking University Third Hospital, Beijing, China; [2]Beijing Key Laboratory of Spinal Diseases, Beijing, China

Background: Increased vascular permeability is one of the first stages in both physiological and pathological angiogenesis. Osteoporosis accompanies with reduced angiogenesis and vascularization. However, the crosstalk between the skeleton and vascularization, especially during osteoporosis progression, remains unclear. This study aims to investigate the effect of ovariectomy and estrogen supplementation on intraosseous vaspermeability.
Methods: The trabecular bone structure, vaspermeability in both proximal femoral metaphysis and bone marrow, and mRNA expression of vascular endothelial growth factor (VEGF) were compared among three groups: the sham operation rats (SHAM group), ovariectomized rats (OVX group) and OVX 17-estradiol-treated rats (OVX E group) respectively 7, 21, 35 and 63 days post ovariectomy. The vaspermeability was quantified as the concentration of Evans blue dye in bone through fluorescent quantitative methods. The bone structure was quantified as trabecular parameters through MicroCT. And the VEGF immunohistochemistry was investigated by staining procedures.
Results: The vaspermeability in the bone region of femoral metaphysis didn't have significant change among groups. But the vaspermeability in bone marrow decreased with osteoporosis progression, concomitant with a decrease in the expression of VEGF. With 17-Estradiol administration after ovariectomization, the vaspermeability alterations observed in bone vessels were prevented. At the same time, the change of VEGF expression caused by OVX was also reversed.
Conclusion: This study suggests that intraosseous vaspermeability might be functionally essential in blood vessel and bone formation during osteoporosis progression. The decline of intraosseous vaspermeability accompaned with altered VEGF might be associated with ovariectomy-induced osteoporosis.

Plenary Poster P11

Fluorescent Bisphosphonate Imaging Probes: New Tools for Bone Related Imaging Studies

***Shuting Sun*[1,2]*, Frank Hal Ebetino*[2]*, Charles E. McKenna*[1]
[1]University of Southern California, Los Angeles, CA, USA; [2]BioVinc LLC, Culver City, CA, USA

Background: Bisphosphonates (BPs) are therapeutic agents for treatment of bone disorders such as osteoporosis and Paget's disease. Several nitrogen-containing bisphosphonates (N-BPs) and phosphonocarboxylate (PC) analogues also have potential as anti-cancer agents. Recently, there have been studies indicating their potential use in some inflammatory diseases such as rheumatoid arthritis, inflammatory bowel disease and pulmonary fibrosis. However, details of the skeletal distribution, cellular uptake and mechanisms of these drugs remain to be elucidated, stimulating the creation of imaging probes which mimic some or all of their pharmacological properties.
Method: A fluorescent imaging "toolkit" with more than 20 probes derived from all three clinically relevant heterocyclic N-BP drugs (risedronate, zoledronate and minodronate) and related analogues have been successfully synthesized. A linking strategy with two routes was applied under exceedingly mild conditions and introduced a terminal amino group in drug-linker intermediates capable to conjugate with the commercially available activated ester of fluorescent dyes.
Results: The 'toolkit' contains a series of fluorescent probes ranging from visible to near infrared optical window as well as a wide range of mineral affinities. In addition, we have obtained evidence that certain probes (e.g. the FAM- and ROX- conjugates) have anti-prenylation and anti- resorptive effects *in vitro* and *in vivo*, demonstrating that the probes could retain biological activities of the parent BP drugs. Due to their diverse spectroscopic and pharmacological properties, the fluorescent imaging probe "toolkit" has been successfully utilized in various biological research projects including osteoclast imaging, drug distribution at bone skeleton and cellular level, mechanism studies of osteonecrosis of the jaw (ONJ), cancer imaging, *et al*.
Conclusion: The fluorescent bisphonates are demonstrated to be a more permanent marker of bone metabolism than traditional histomorphometric labels such as calcein; in addition, they also exhibit a propensity to label resorbing surfaces as well as forming surfaces unlike non-BP labels. In conclusion, the fluorescent bisphosphonate probes provide a new marker of bone turnover, as well as provide methods to identify localization of BPs in normal and diseased models.

Plenary Poster P12

Monocyte Chemotactic Protein-1 (MCP-1) Regulates Activated Remodeling

Mark Forwood*, Gemma Diessel, Andy Wu, Ian Cassady, Wendy Kelly, Nigel Morrison*
Griffith University, Gold Coast, QLD, Australia

Background: Monocyte chemotactic protein-1 (MCP-1) belongs to the CC chemokine superfamily (as CCL2). It plays a critical role in recruitment and activation of leukocytes during acute inflammation, and has the highest level of gene induction in bone following anabolic PTH treatment.[1] We reported that MCP-1 is also specifically regulated during bone remodeling that is activated to repair stress fracture.[2] We hypothesized that MCP-1 is a necessary regulator of recruitment and activation of osteoclasts required for skeletal repair and remodeling.
Methods: We used the ulnar stress fracture model, allowing scrutiny of focal remodeling with a known time course and precise anatomical location. Within 4 hours of stress fracture initiation, we observed significant increases in MCP-1 gene expression ($P<0.01$), followed by increased serum levels within 24h ($P<0.05$). To test our hypothesis, we used a plasmid DNA encoding a dominant negative mutant of MCP-1 (7ND) to specifically inhibit MCP-1 *in vivo*. Stress fracture was created in the right ulna of Wistar rats using cyclic end-loading. Unloaded animals were used as a control. 24 h prior to loading, 7ND plasmid vector, saline or empty vector control (pcDNA3.1), were injected in the thigh muscle to overexpress 7ND protein, effecting its secretion into systemic circulation. Rats were euthanized 4h (n=5/group) or 2 weeks (n=10/group) after loading for gene expression or histomorphometric analysis, respectively.
Results: Using qPCR analysis, there was 33-fold increase in MCP-1 expression 4h after loading ($P<0.001$), which was abolished by 7ND treatment. At 2 weeks, there was a profound suppression of osteoclast number (61%), resorption area (50%) and new bone formation (60%) in basic multicellular units that initiate remodelling of the stress fracture ($P<0.05$). Conversely, 7ND treatment had no effect on formation of periosteal woven bone. MCP-1 is markedly upregulated by stress fracture, but also by intermittent PTH treatment.
Conclusion: We therefore conclude that MCP-1 is a critical regulator of chemotaxis and osteoclast differentiation during initiation events of bone remodelling.

Plenary Poster P13

Up-Regulated CKIP-1 Expression within Osteoblasts Associates with Reduced BMP Signaling and Decreased Bone Formation during Aging

***Baosheng Guo*[1]*, Chao Liang*[2]*, Xiaohua Pan*[3]*, Liangqiang Zhang*[2]*, Aiping Lu*[1]*, Baoting Zhang*[4]*, Ge Zhang*[1]
[1]Institute for Advancing Translational Medicine in Bone & Joint Diseases, School of Chinese Medicine, Hong Kong Baptist University, Hong Kong SAR, China; [2]State Key Laboratory of Proteomics, Beijing Proteome Research Center, Beijing Institute of Radiation Medicine, Beijing, China; [3]Shenzhen People's Hospital, Shenzhen, Guangdong, China; [4]School of Chinese Medicine, The Chinese University of Hong Kong, Hong Kong SAR, China

Background: Casein kinase-2 interacting protein-1 (CKIP-1) specifically targets the linker region between the WW domains of smad ubiquitination regulatory factor 1 (Smurf 1) to promote its ubiquitylation of Smad 1/5. However, the exact pathological role of *Ckip-1* in aging-induced bone formation reduction is still not well elaborated.
Objectives: We aimed to investigate the expression profile of CKIP-1, p-Smad1/5 and bone formation in bone tissue from clinical osteoporotic patients and osteoporotic rat bone during aging.

Methods: The bone specimens from 20 fractured women were divided into 60~69 yr, 70~79 yr and 80~89 yr group and subjected to real-time PCR analysis (CKIP-1 and ALP mRNA expression) or western blot analysis (p-Smad1/5 protein expression). Subsequently, the ovariectomized (OVX) SD rats were sacrificed at 9, 13 and 17 months after ovariectomy, respectively. All the rats were injected intraperitoneally with calcein green (10 mg/kg) and xylenol orange (30 mg/kg) 10 and 2 days before sacrifice. The bilateral femurs were subjected to immunofluorescence analysis for ALP, CKIP-1 and p-Smad1/5 expression, respectively. All the clinical procedures were approved by the Committees of Clinical Ethics in the Shenzhen People's Hospital.
Results: We found that the increased expression of the intraosseous CKIP-1 mRNA correlated with the decreased expression of the ALP mRNA and the p-Smad1/5 protein during aging in female fractured patients. In consistent with the human data, we also found increased instances of CKIP-1 positive staining and decreased instances of p-Smad1/5 staining in osteoblasts (ALP^+ cells) on the sections from distal femur.
Conclusion: Increased expression of Ckip-1 within osteoblasts associates with reduced BMP signaling and decreased bone formation during aging, which indicated that increased CKIP-1 suppress BMP signaling to inhibit bone formation during aging.

Plenary Poster P14
Progesterone Receptor in Bone Cells Regulates Bone Mass Accrual
***Wei Yao**, Zhendong Zhong*
Center for Musculoskeletal Health, University of California at Davis Medical Center, Sacramento, CA, USA

Background: Sexual dimorphism in bone is well known; men tend to have higher peak bone mass than women. Using a progesterone receptor global knockout (PRKO) mouse model, our laboratory previously reported that PRKO mice displayed a high-bone-mass phenotype with increased bone formation in female and decreased bone resorption in males compared to Wild-type (WT) controls, resulting in higher peak bone mass in both genders.
Methods: To further elucidate the role of progesterone signaling in osteoprogenitor cells and the attainment of peak bone mass, bone-specific PR conditional knockout mice were generated in our laboratory by crossing PR-flox mice to Prx1-Cre mice. Prx-1 is normally expressed by the early stage osteoprogenitor cells. Bone mass acquisition was assessed by microCT and bone turnover by dynamic histomorphometry.
Results: We found that Prrx1-Cre-driven PR-flox male animals developed 50–100% higher trabecular bone volume from 1 to 4 months of age compared to the WT littermates. In contrast, female mice homozygous for Prrx1-Cre; PR-flox knockout mice, had similar gains in PBM by one month of age as the WT mice but the rate of bone loss was substantially lower than their WTs thereafter.
Conclusion: PR deletion in pre-osteoblast (Prx1+) resulted in higher peak bone mass and bone formation in both sexes. Further investigations are ongoing to decipher the PR signaling cascades involved in bone formation.

Plenary Poster P15
EphB2/EphrinB1 Signaling Improves Bone Mass Of OVX Mice Through Increasing Osteogenesis and Inhibiting Osteoclastogenesis
***Liu Yang**, Qizhen He, Qiyue Shi, Jian Liu, Zhuojing Luo*
Institute of Orthopedics, Xijing Hospital, Fourth Military Medical University, Xi'an, Shanxi, China

Background: The loss of estrogen at menopause causes the increasing bone-resorbing activity of osteoclasts to outpace the bone-forming activity of osteoblasts, always leading to the occurrence of postmenopausal osteoporosis (PMOP). Recently the Ephrin/Eph family of receptor tyrosine kinases has been shown to play an important role in regulating bone homeostasis. However the function of Ephrin/Eph in estrogen-deficient osteoporosis has not been mentioned.
Methods: In this study, we adopt ovariectomized (OVX) mice as a model of estrogen-deficient osteoporosis and dissected the important role of EphrinB1/EphB2 signaling in maintaining bone mass *in vivo* and *in vitro*.
Results: First, we found that the expression of EphB2 and EphrinB1 was significantly reduced respectively in the osteoblasts and osteoclasts of OVX mice. To further investigate whether the bidirectional EphrinB1/EphB2 signaling can influence bone quantity in OVX mice, we respectively treated them with 2 μg/ml of soluble EphrinB1-Fc, EphB2-Fc and control human IgG-Fc. And micro-CT analyses showed the skeletal microarchitecture was improved after treatment. Furthermore by detecting the expression of osteoblast and osteoclast markers, we found that EphrinB1/EphB2 forward signaling promoted osteoblast differentiation in OVX-BMSCs and EphrinB1/EphB2 reverse signaling suppressed osteoclast differentiation in OVX-osteoclast *in vitro*.
Conclusion: These date suggested that the dysfunction of bidirectional EphrinB1/EphB2 signaling might contribute to the pathogenesis of estrogen-deficient osteoporosis and this signaling could be a target in the prevention and treatment of osteoporosis.

Plenary Poster P16
Treatment and Genotype-Phenotype Analysis in Chinese Patients with Osteogensis Imperfecta of Type V
***Yi Liu**[1], Mei Li[1], Peiran Zhou[1], Fang Lv[1], Weibo Xia[1], Wei Yu[2], Yan Jiang[1], Oui Wang[1], Xiaoping Xing[1]*
[1]Department of Endocrinology, Key Laboratory of Endocrinology, Ministry of Health, Peking Union Medical College Hospital, Chinese Academy of Medical Science, Beijing, China; [2]Department of Radiology, Peking Union Medical College Hospital, Chinese Academy of Medical Science, Beijing, China

Background: Osteogenesis imperfecta (OI) type V is rare, autosomal dominant inherited disease characterized by multiple fractures, radial head dislocation, intraosseous membrane calcification of the forearm, and hypercallus formation at the site of fractures. OI type V is caused by interferon-induced transmembrane protein 5 (IFITM5) mutation. We aim to investigate the effects of zoledronate and analyze the correlation of genotype and phenotype in Chinese patients with OI of type V.

Methods: We assessed nine patients with type V OI (aged from 20 months to 29 years) diagnosed in Peking Union Medical College Hospital. Control group composed of nine patients diagnosed with type I to type IV, matched by gender, age and severity of bone disease. 5 mg zoledronate was intravenously given to patients yearly for one year. Bone mineral density (BMD) z-score at lumbar spine and proximal femur, serum levels of calcium, phosphorus, alkaline phosphatase, cross linked C-telopeptide of type I collagen, extremity fracture incidence, and safety parameters were measured. The correlation of genotype and phenotype was analyzed in Chinese patients with OI of type V.
Results: The c.-14C>T mutation was detected in all seven patients underwent genetic analysis. Lumbar spine BMD z score rose from –2.6±1.9 to –1.0±0.8 (P<0.001). Zoledronic acid significantly decreasedβ-CTX from baseline by 67% in type V OI (P<0.001). Fracture incidence significantly dropped from 0.85 fractures/year at baseline to 0.33 fractures/year (P=0.045) in type V OI There was no significant difference between type V patients and control group on BMD z score, height z score, bone turnover marker and fracture incidence. The severity of disease and response to zoledronic acid varied in type V patients.
Conclusion: Intravenous zoledronic acids for two years in OI of type V significantly increased lumbar spine BMD Z score.

Plenary Poster P17
Concern and Risk Perception: Effects on Osteo-Protective Behaviour
Annica Barcenilla-Wong
University of Sydney, Sydney, Australia

Background: To determine the effect level of concern for osteoporosis as well as self-perceived risk of osteoporosis and fracture on, seeking medical advice, bone mineral testing (BMD) and anti-osteoporosis medication (AOM).
Methods: Study subjects were female Australian participants of the Global Longitudinal study of Osteoporosis in Women (GLOW) who were not on osteoporosis treatment at the time of the earlier assessment. Self-administered questionnaires were collected annually from 2007–2010. Study outcomes included self-reported seeking of medical advice regarding osteoporosis, BMD testing and use of anti-osteoporosis medications (i.e. estrogen, selective estrogen receptor modulators, bisphosphonates, calcitonin, parathyroid hormone, and strontium) in the last 12months at the late assessment. Logistic regression was used in the analysis. The lack of independence in the study outcomes for multiple assessments in the same woman was accounted for using generalised estimating equations (GEE).
Results: There were 2,874 assessments from 1,095 women (mean age 66±9.4, range 55–97 years) for the study. Of women with osteoporosis or with a higher perceived risk to osteoporosis, only 22.2% and 40.4% respectively noted a higher perceived risk to fracture. Concern significantly increased the likelihood of seeking medical advice however, had no significant impact on screening or treatment. Heightened self-perceived risks of osteoporosis and fracture both significantly increased the likelihood of seeking medical advice and BMD testing while an elevated self-perceived fracture risk increased the likelihood of taking AOM.
Conclusion: Concern and risk perceptions to osteoporosis and fracture were found to be significantly associated with certain bone-protective behaviours in this prospective study. However, the apparent lack of association between perceived risk of osteoporosis and fracture illustrates the need for future studies to explore this disconnect further and also challenges future education programs to emphasize the connection between osteoporosis and fracture as only elevated self-perceived fracture risk was associated with higher intake of AOM.

Plenary Poster P18
Reference Values of Bone Mineral Density and Prevalence of Osteoporosis in Chinese Adults
Yuming Chen[1], *Zheqing Zhang[1], Suzann C. Ho[2], Zongqiu Chen[1,3], Caixia Zhang[1]*
[1]Guangdong Provincial Key Laboratory of Food, School of Public Health, Sun Yat-sen University, Guangzhou, Guangdong, China; [2]School of Public Health and Primary Care, The Chinese University of Hong Kong, Hong Kong SAR, China; [3]Guangzhou Center for Disease Control and Prevention, Guangzhou, Guangdong, China

Background: Well-accepted reference value of bone mineral density (BMD) is lacking in Chinese. We established the reference database and assessed osteoporosis prevalence based on published literature conducted in the Mainland China, Taiwan and Hong Kong Chinese.
Methods: We searched for all published articles indexed in MEDLINE, PubMed, CNKI and SinoMed up to January 2013. We included cross-sectional studies that examined BMD using a dual-energy X-ray absorptiometry at the femur neck (FN) and/or lumbar spine (LS) in healthy adults. Overall age-specific mean (SD) BMD were pooled after standardization.
Results: Ninety one studies including 51,906 males and 88,006 females (320y) in 38 cities in China were included in this pooling study. Gender- and age-specific reference curves of standardized BMD (sBMD) at the LS and FN were constructed. The sBMD cutoffs for osteoporosis classification were 0.746 and0.549 inwomen, and 0.680 and 0.568 (g/cm^2) in men; As compared to the relevant peak BMD, BMDs at the lumbar spine were respectively lower by 14.2%, 22.5%, 26.2% and 28.8% (women), and 4.4%, 6.6% 8.2% and 11.6% (men); while femur neck BMD were lower by 11.2%, 21.1%, 27.0% and 32.1% (women), and 11.1%, 14.9%, 19.3% and 23.2% (men) in the age groups 50-, 60-, 70- and 80- (year); Age-standardized prevalence of osteoporosis was 23.9% and 12.5% in women and 3.2% and 5.3% in men aged 350 years at the LS and FN, respectively. Meta-regression analysis showed that greater age and altitude, lower latitude, smaller city size, earlier detection time and random sample were correlated to lower sBMD in at least one gender-specific bone sites.
Conclusion: We have established a national-wide BMD reference database at the LS and FN for Chinese adults, and estimated the prevalence of osteoporosis in the middle-aged and elderly Chinese population.

Plenary Poster P19

The efficacy and safety of ipriflavone in postmenopausal women with osteopenia or osteoporosis: a systematic review and meta-analysis

***Lili Chen*[1]**, *Xiaoya Zhou*[1], *Songlin Peng*[2], *Shishu Huang*[3,4]
[1]Research Centre for Human Tissues and Organs Degeneration, Shenzhen Institute of Advanced Technology, Chinese Academy of Science, Shenzhen, Guangdong, China; [2]Department of Spine Surgery, Shenzhen Peoples Hospital, Jinan University Second College of Medicine, Shenzhen, Guangdong, China; [3]State Key Laboratory of Oral Diseases, West China College of Stomatology, Sichuan University, Chengdu, Sichuan, China; [4]Department of Orthopaedics and Traumatology, The University of Hong Kong, Pokfulam, Hong Kong Special Administrative Region, China

Background: Ipriflavone (IP), a synthesized derivative of isoflavone, has become an over-the-counter drug for prevention of osteoporosis (OP) since 1989 in over 22 countries. Although clinical trials have proved that IP is beneficial for the prevention and treatment of osteoporosis, its efficacy and safety have not been confirmed due to some contradictory reports. With the wide acceptance of IP in osteoporotic women, it is therefore necessary to give a systematic review and meta-analysis for further evaluation.
Methods: We searched randomized control trials (RCTs) in PubMed and CENTRAL which used the regimen of IP in postmenopausal women with osteopenia or osteoporosis. The efficacy referred to the absolute change (grams per square centimeter) or relative change (in percent) in bone mineral density (BMD) and bone turnover markers. The safety profiles were the adverse events and the number of subject withdrawals due to the adverse reaction. Meta-analysis pooled the standard mean difference (SMD) of BMD in lumbar spine, subgroup analysis, and odds ratio (OR).
Results: Ten RCTs (n=1605) met the eligibility criteria were included in this systematic review. The increase in lumbar spine BMD of the IP group was greater than that of the placebo group (random effect model: SMD=0.36; 95%CI= (0.09, 0.62)). In terms of safety profile, most frequent reactions were gastrointestinal symptoms, but withdrawals because of adverse reaction were similar in the IP group compared to placebo control at the same time interval (6 studies, 2 years, fixed effect OR (95%CI)=0.90 (0.62 to 1.32), p=0.77, I^2=0).
Conclusion: We found that IP significantly increases bone mineral density and has inhibitory effect on bone resorption markers in the postmenopausal women with osteopenia or osteoporosis. Gastrointestinal symptoms may occur, but withdrawals because of adverse reaction were not statistically increased.

Plenary Poster P20

Novel Mutations of CLCN7 Cause Dominant Osteopetrosis Type II (ADO-II) and Intermediate Autosomal Recessive Osteopetrosis (IARO) in Chinese Patients

***Qianqian Pang*[1,2]**, *Yue Chi*[1], *Zhen Zhao*[1], *Xiaoping Xing*[1], *Mei Li*[1], *Ou Wang*[1], *Yan Jiang*[1], *Yue Sun*[1], *Jin Dong*[1,2], *Weibo Xia*[1]
[1]Department of Endocrinology, Key Laboratory of Endocrinology, The Ministry of Health, Peking Union Medical College Hospital, Chinese Academy of Medical Sciences, Beijing, China; [2]Department of Endocrinology, the First affiliated Hospital of Shanxi Medical University, Taiyuan, Shanxi, China

Background: Mutations in *CLCN7* lead to defects in the chloride channel, which give rise to osteopetrosis from asymptomatic to relatively mild symptoms in ADO-II patients, to the mild or very severe phenotype in IARO/ARO. This study is to characterize the clinical manifestations of ADO-II/IARO patients, and screen the novel mutations in eight unrelated Chinese patients with CLCN7-related osteopetrosis.
Methods: We extracted genomic DNA from the probands, their parents and wild type controls. Then we used the primers of CLCN7 to screen for CLCN7 mutations in these patients. The identified CLCN7 mutations were subsequently investigated in their relatives.
Results: The clinical course of IARO differs from that of ADO-II patients, the patient 5 with IARO suffered from severe osteomyelitis and optic nerve compression, which were barely found in ADO-II patients. Higher BMD values were found in all patients, whereas, the BMD of the IARO patient was much higher than the ADOII patients. Genetic analysis revealed 8 heterozygous missense mutations and a splice site mutation in the CLCN7 gene: the IARO patient with a novel compound heterozygous mutation in CLCN7 (p.L224R; c.2073G>C), the splice site mutation c.2073G>C caused exon 22 partly skipping, which resulted in frameshift and was predicted to lead to a truncated protein; 7 ADO-II patients with 7 heterozygous mutations in CLCN7, including 5 novel mutations (G347R; S473N; S224Y; R326G; L564P) and 2 reported mutations (R286W; L213F). No identical mutations were detected in the 100 unrelated control samples.
Conclusion: We have identified 7 novel mutations and 2 known mutations of CLCN7gene in this study. These findings enriched the database of CLCN7 mutations. We also summarized and compared the differences between ADO-II and IARO both in genotype and phenotype, which made it available for clinicians to improve their understandings of osteopetrosis.