cartilage in the late stage, bony spur forms in RA. These symptoms are very important in RA pathological development.
Methods: In this study, CIA was used as an animal model to elucidate further the pathological process of bony spur. The destruction of joints in the CIA model was observed by radiology and histology.
Results: In the radiological observation, bony spur formed in the knee and foot joint, which worsened as the disease progressed. Meanwhile, fusion and damage of articular cartilage was observed, and many osteoclasts were found in the histological sections.
Conclusion: Based on previous research on the CIA model and related investigations, the bony spur may have another main pathological process in the later stages of RA.

IBDW2014-00088-F0020
miRNA EXPRESSION PROFILES DURING ADIPOGENIC AND OSTEOGENIC DIFFERENTIATION OF MOUSE BMSCs

Qiufeng Zhou [a,b], Dan Li [a], Jing Long [a,b], Xinluan Wang [a], Nan Wang [a], Ling Qin [a,c]
[a]*Translational Medicine Research and Development Center, Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, Shenzhen 518055, China*
[b]*Institute of Biotechnology, Guilin Medical University, Guilin 541004, China*
[c]*Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong*

Objective: Identification of miRNA expression profiles during adipogenic and osteogenic differentiation of mouse bone marrow mesenchymal stem cells (BMSCs).
Materials and methods: BMSCs were isolated from the femurs and tibias of 4- to 6-week-old male C57BL/6 mice as previously described, and cultured in α-MEM supplemented with 10% FBS. Then BMSCs were identified by in vitro multi-lineage differentiation assays, including adipogenesis, osteogenesis and chondrogenesis. Subsequently, the cells were cultured in adipogenesis differentiation medium for 6 days and in osteogenesis differentiation medium for 10 days, respectively. Uninduced cells were included as control. miRNA profiles were analyzed using Agilent Mouse miRNA microarray slide (8 X 60K, Part number G4872A). Hierarchical clustering was performed with Multi-experiment Viewer (MeV) software. A selected subset of miRNAs changed more than 1.8-fold was selected for further real-time PCR analysis.
Results: The miRNA microarray analysis showed that 66 miRNAs were differentially expressed during adipogenic or osteogenic differentiation of mouse BMSCs. Real-time PCR analysis showed that, compared with the control, the expression level of miR-218-5p was increased 10-fold and 2.8-fold after adipogenic induction for 6 days and osteogenic induction for 10 days, respectively. Within the first three days of induction, miR-218-5p was increased 5.9-fold during adipogenic differentiation, yet without significant difference during osteogenic differentiation. The expression levels of miR-146a-5p and miR-223-3p were decreased 10.8-fold and 6.6-fold, respectively, during osteogenic differentiation.
Conclusions: miR-218-5p was increased during both adipogenic and osteogenic differentiation, with a significant predominance in adipogenic differentiation. In addition, miR-146a-5p and miR-223-3p were decreased during osteogenic differentiation. An effort will be made to understand their roles and mechanisms.
Acknowledgements
This work was supported by the grants from NSFC (No. 81200650 and 81302782).

IBDW2014-00089-F0021
ABNORMAL BONE MICRO-ARCHITECTURE AND ROD-PLATE CONFIGURATION IN OSTEOPENIC ADOLESCENT IDIOPATHIC SCOLIOSIS (AIS)

Ka Yee Cheuk [a], Ivy J. Zhang [a], ZhiWei Wang [a], Vivian W. Y. Hung [a,b], Bobby K. W. Ng [a], T. P. Lam [a], Arthur F. T. Mak [c], Jack C. Y. Cheng [a]
[a]*Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong*
[b]*Bone Quality and Health Assessment Centre, Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Shatin, Hong Kong*
[c]*Department of Mechanical and Automation Engineering, The Chinese University of Hong Kong, Shatin, Hong Kong*

Objectives: Multiple studies have documented the presence of systemic osteopenia in AIS. Osteopenia was associated with severe curves and was reported to be one of the significant prognostic factors for curve progression in AIS. This study aimed to evaluate bone quality and bone strength parameters including rod-plate configuration and finite element analysis (FEA) with in vivo High-Resolution Peripheral Quantitative Computed Tomography (HR-pQCT) and to investigate their relationship with osteopenia in AIS Vs normal controls.
Material and Methods: 101AIS and 105 controls between 11-14 years old were recruited. Areal bone mineral density (aBMD) of bilateral femoral necks was measured with Dual Energy X-ray Absorptiometry (DXA). Subjects were classified into the osteopenic (Z-score$<$or$=$-1) and non-osteopenic (Z-score$>$-1) group. Bone Morphometry, volumetric bone mineral density (vBMD) and Trabecular Bone Micro-architecture were measured using HR-pQCT. Structural Model Index (SMI) quantifying the trabecular rod/plate configuration (a higher index indicating more rod-like configuration) and FEA in terms of Stiffness, Failure Load and Apparent Modulus were calculated with a standard algorithm.
Results: In the AIS group, osteopenic subjects showed higher SMI, lower Stiffness, lower Failure Load and lower Apparent Modulus when compared with non-osteopenic subjects (% difference $=$ 15.5%, -24.5%, -23.1% & -20.5% respectively, all with $p<0.001$). Similar differences in FEA profiles were noted between osteopenic and non-osteopenic subjects in the control group. In contrast, no significant difference in SMI was found between osteopenic and non-osteopenic controls. When all osteopenic subjects were considered, osteopenic AIS subjects had higher SMI when compared with osteopenic controls (% difference $=$ 9.1%, $p=0.012$).
Conclusions: This study showed that osteopenia was associated with lower bone strength and a specific pattern of SMI indicating preponderance of rod-like configuration in AIS subjects. Notably the association of higher SMI with osteopenia was seen in AIS but not in normal controls, thus providing strong evidences that osteopenia in AIS was different from osteopenia in non-AIS controls. Further investigations exploring the underlying biochemical and biomechanical mechanisms that bring about these specific endophenotypes are warranted for gaining further understanding of the etiopathogenesis of AIS.
This study was supported by Research Grants Council of the Hong Kong S.A.R., China (Project no: 468809 and 468411).

IBDW2014-00090-F0022
EVALUATING BONE STRENGTH WITH FINITE ELEMENT ANALYSIS FOR ADOLESCENT IDIOPATHIC SCOLIOSIS (AIS): A CASE-CONTROL STUDY WITH HR-pQCT

Ka Yee Cheuk [a], Lyn L. N. Wong [a], Alec Hung [a], Arthur F. T. Mak [b], K. M. Lee [c,d], Bobby K. W. Ng [a], T. P. Lam [a], Jack C. Y. Cheng [a,d]
[a]*Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Shatin, Hong Kong*
[b]*Department of Mechanical & Automation Engineering, The Chinese University of Hong Kong, Shatin, Hong Kong*
[c]*Lee Hysan Clinical Research Laboratory, The Chinese University of Hong Kong*
[d]*Joint Scoliosis Research Center of the Chinese University of Hong Kong and Nanjing University, Hong Kong, China*

Objectives: Although Adolescent Idiopathic Scoliosis (AIS) was associated with low bone mass, reports on bone mechanical properties in AIS are sparse. The objective of this study is to evaluate bone mechanical properties with finite element analysis (FEA) using in-vivo High-Resolution Peripheral Quantitative Computed Tomography (HR-pQCT) in AIS and compare that with normal controls.
Material and Methods: 97 AIS girls and 99 female controls between 11-14 years old were recruited. Dietary calcium intake and physical activity level were assessed with a standard Food Frequency Questionnaire and the Modified Baecke Questionnaire respectively. With HR-pQCT, an established model on morphology and micro-structure of the non-dominant distal radius was generated for FEA in terms of Stiffness, Failure Load and Apparent Modulus. Multivariate linear regression analysis was used to investigate the difference between AIS and controls after adjusting for age in Model 1 and for age, calcium intake and physical activity level in Model 2.
Results: 2-tailed Student's t-test showed AIS subjects had lower Stiffness, lower Failure Load and lower Apparent Modulus when compared with normal controls (% difference $=$ -6.81%, -7.10% & -8.10% respectively, all with $p<0.05$). AIS girls had lower Failure Load ($B=-136.0$, $p=0.04$) and lower Apparent Modulus ($B=-146.2$, $p=0.021$) in Model 1 with adjustment for age. In Model 2, difference in Apparent Modulus remained statistically significant with AIS being associated with lower Apparent Modulus after adjustment for age, calcium intake and physical activity level ($B=-137.1$, $p=0.037$).

Conclusions: Higher Stiffness, higher Failure Load and higher Apparent Modulus mean better resistance to deforming forces. Crude comparison indicated AIS was associated with lower Stiffness, lower Failure Load and lower Apparent Modulus. Analysis with Model 1 showed that the difference in Stiffness was due to confounding from age. Further analysis with Model 2 indicated the difference in Failure Load could arise from difference in calcium intake and physical activity level between AIS and controls. Notably AIS remained associated with lower Apparent Modulus after adjusting for age, calcium intake and physical activity level. This indicated the presence of an underlying biochemical or biomechanical mechanism yet to be identified. Further studies on this area are warranted in order to gain in-depth understanding of the nature of low bone mass and bone strength and their roles in the pathogenesis of AIS.

This study was supported by Research Grants Council of the Hong Kong S.A.R., China (Project no: 468809 and 468411).

IBDW2014-00091-F0023

SERUM VITAMIN D LEVEL CAN AFFECT THE TREATMENT OUTCOME OF WHOLE-BODY VIBRATION (WBV) FOR OSTEOPENIA IN GIRLS WITH ADOLESCENT IDIOPATHIC SCOLIOSIS (AIS)

Ka Yee Cheuk [a], Tsz Ping Lam [a,d], Bobby Kin Wah Ng [a,d], Louis Wing Hoi Cheung [a], Kwong Man Lee [c,d], Ling Qin [a,b], King Lok Liu [a], Queenie Wah Yan Mak [a], Fiona Wai Ping Yu [a], Yong Qiu [d,e], Jack Chun Yiu Cheng [a,d]

[a]*Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Shatin, Hong Kong*

[b]*Bone Quality and Health Centre, Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Shatin, Hong Kong*

[c]*Lee Hysan Clinical Research Laboratories, The Chinese University of Hong Kong*

[d]*Joint Scoliosis Research Center of the Chinese University of Hong Kong and Nanjing University, Hong Kong, China*

[e]*Spine Surgery, The Affiliated Drum Tower Hospital of Nanjing University Medical School, Nanjing, China*

Introduction: AIS was associated with osteopenia. Our randomized controlled trial(RCT) showed anabolic bone effects of WBV at the convex leg in AIS subjects. Our objective was to evaluate the role of Vit-D in modulating the treatment effect of WBV.

Materials and methods: This was nested within the above mentioned RCT on 122 AIS girls with BMD Z-scores < -1. They were randomly allocated to the Treatment or Control group. The Treatment group stood on a low-magnitude high-frequency WBV platform 20 mins/day, 5 days/week for 1 year. aBMD at femoral neck (FNaBMD) was measured with Dual-energy X-ray Absorptiometry at baseline and at 12-month. Serum 25(OH) Vit-D level was measured at 6-month.

Results: The mean age was 17.8(SD$=$1.5) years old. For those with serum 25(OH)Vit-D$>$40nmol/L, positive effects of WBV were greater at both sides with treatment effects also noted at the concave leg. The positive correlation between serum 25(OH)Vit-D and percentage increase in FNaBMD that was not present in the Control group was explicitly detectable in the Treatment group at the concave leg($p=0.033$).

Discussion and Conclusion: The results strongly suggested the treatment effect of WBV could be enhanced by Vit-D and that Vit-D insufficiency could affect negatively the treatment outcome of WBV for osteopenia in AIS girls.

Funding Source: GRF of RGC HK(Project no: 467808).

IBDW2014-00092-F0024

VITAMIN D STATUS AND ITS CORRELATION WITH BONE MINERAL DENSITY IN GIRLS WITH ADOLESCENT IDIOPATHIC SCOLIOSIS (AIS)

Ka Yee Cheuk [a], Tsz Ping Lam [a,d], Bobby Kin Wah Ng [a,d], Queenie Wah Yan Mak [a], Elisa Man Shan Tam [a], Kwong Man Lee [c,d], Ling Qin [a,b], Yong Qiu [d,e], Jack Chun Yiu Cheng [a,d]

[a]*Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Shatin, Hong Kong*

[b]*Bone Quality and Health Centre, Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Shatin, Hong Kong*

[c]*Lee Hysan Clinical Research Laboratories, The Chinese University of Hong Kong*

[d]*Joint Scoliosis Research Center of the Chinese University of Hong Kong and Nanjing University, Hong Kong, China*

[e]*Spine Surgery, The Affiliated Drum Tower Hospital of Nanjing University Medical School, Nanjing, China*

Introduction: AIS is associated with osteopenia and raised bALP. The prevalence of AIS correlated with latitudes of geographical regions. AIS could be associated with abnormal Vit-D physiology. Our aims were to evaluate Vit-D status and its correlation with aBMD in AIS and controls.

Methods: 212 AIS girls and 183 age and gender-matched normal controls were recruited. Serum 25(OH)Vit-D was measured with Liquid-chromatography Tandem-mass-spectroscopy and aBMD at femoral necks was measured with Dual-energy X-ray Absorptiometry.

Results: The mean 25(OH)Vit-D levels for AIS and controls were 41.6 ± 14.4 and 39.5 ± 11.5 nmol/L respectively($p=0.103$). Using multivariate linear regression model to adjust for age, body weight, armspan, season, physical activity and dietary calcium intake levels, the p-value on the correlation between aBMD and 25(OH)Vit-D level for the right and left side for controls were 0.055 and 0.047, and that for AIS were 0.804 and 0.466 respectively.

Discussion and Conclusions: AIS and Control group had suboptimal 25(OH) Vit-D levels. The positive correlation between 25(OH)Vit-D and aBMD seen in controls was not present in AIS subjects, thus indicating the possibility of Vit-D resistance in AIS. Whether this is responsible for osteopenia that characterizes AIS and how this is related to the pathogenesis of AIS warrant further studies.

Funding source: GRF of RGC of Hong Kong (Project no: 468809 and 468411).

IBDW2014-00093-F0025

THE EFFECT OF ENOXACIN ON BONE MINERAL DENSITY AND REDUCTION OF TITANIUM PARTICLE-INDUCED OSTEOLYSIS VIA SUPPRESSION OF JNK SIGNALING PATHWAY

An Qin, Xuqiang Liu, Xinhua Qu, Zanjing Zhai, Haowei Li, Zhengxiao Ouyang, Qiming Fan, Tingting Tang, Kerong Dai

Department of Orthopedics, Shanghai Key Laboratory of Orthopedic Implant, Shanghai Ninth People's Hospital, Shanghai Jiaotong University School of Medicine, Shanghai, PR China

Objective: The aim of this study was to assess the effect of enoxacin on bone mineral density and titanium particle-induced osteolysis. Wear particles liberated from the surface of prostheses are associated with aseptic prosthetic loosening. It is well established that wear particles induce inflammation, and that extensive osteoclastogenesis plays a critical role in peri-implant osteolysis and subsequent prosthetic loosening. Therefore, inhibiting extensive osteoclast formation and bone resorption could be a potential therapeutic target to prevent prosthetic loosening.

Methods: In this study, we demonstrated that enoxacin, a fluoroquinolone antibiotic, exerts potent inhibitory effects on titanium particle-induced osteolysis in a mouse calvarial model.

Results: Interestingly, the number of mature osteoclasts decreased after treatment with enoxacin in vivo, suggesting that osteoclast formation might be inhibited by enoxacin. We then performed in vitro studies to confirm our hypothesis and revealed the mechanism of action of enoxacin. Enoxacin inhibited osteoclast formation by specifically abrogating RANKL-induced JNK signaling.

Conclusion: Collectively, these results suggest that enoxacin, an antibiotic with few side effects that is widely used in clinics, had significant potential for the treatment of particle-induced peri-implant osteolysis and other diseases caused by excessive osteoclast formation and function.

IBDW2014-00095-F0026

ASSOCIATION BETWEEN VITAMIN D GENE RECEPTORS POLYMORPHISMS, SECONDARY HYPERPARATHYROIDISM, AND STRUCTURAL-FUNCTIONAL STATE OF BONE TISSUE IN POSTMENOPAUSAL WOMEN

Vladyslav V. Povoroznyuk, N. I. Balatska, N. V. Grygorieva

D.F. Chebotarev Institute of Gerontology NAMS, Ukraine

Introduction and aims: To determine the association between vitamin D gene receptors polymorphisms, secondary hyperparathyroidism, and structural-functional state of bone tissue in postmenopausal women.

Materials and methods: The study involved 178 postmenopausal women (the average age - 57.0 ± 1.2 yrs.). The VDR Bsm I region genotypes were determined by polymerase chain reaction-restriction fragment length polymorphism. BMD was measured by ultrasound densitometry of calcaneus by SAHARA (Hologic). 25(OH)D and iPTH in plasma were determined by using the Elecsys electrochemiluminescence immunoassay system.

Results: Genotype bb was found in 48 % of women and 37.6 % and 14.4% of women had genotype Bb and genotype BB, respectively. It was found that the genotype Bb was associated with the lowest incidence of osteoporosis (7.4 % vs. 22.1% with genotype bb) and fractures (23.1 % vs. 29.2% with genotype BB). Women with genotype bb recorded a high percentage of osteoporosis (22.1%) and women with genotype BB a high percentage of fractures (29.2%).