Abstracts of the ECTS 2023 Congress featuring BRS Annual Meeting

ECTS 2023 Congress

50th European Calcified Tissue Society Congress

15 – 18 April 2023

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Each abstract was scored blind.

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Results: In a pilot study of 12-week-old wildtype littermates, 100% achieved union at 3 weeks post-osteotomy. In contrast, only 59% of young PolgA mice and 31% of old PolgA mice achieved comparable outcomes (Fig.1[A]). In comparisons of CT bone parameters, BV/TV was halved in the defect centre of old mice compared to young mice at week 2 (7.99±2.0% vs. 23.9±5.4%; p<0.0001) and week 3 (22.3±9.1% vs. 43.6±6.0%; p<0.001) (Fig.1[B]). Moreover, old mice exhibited significantly lower rates of formation and resorption between weeks 1 – 4, indicative of an overall diminished regenerative response (Fig.1[C]).

Conclusion(s): PolgA mice demonstrated impaired regeneration with age and thus present a suitable mouse model to investigate the effects of premature aging on bone healing.

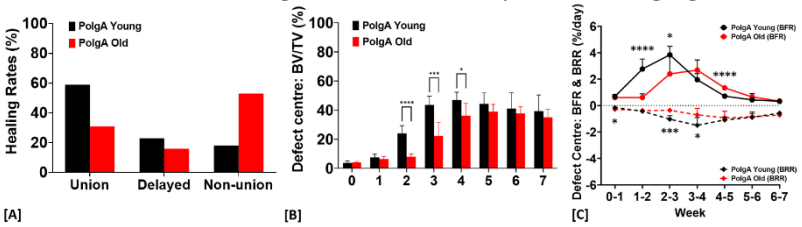

Fig 1: [A] Fracture healing rates in PolgA Young and PolgA Old mice. Fracture sites were classified as: (i) union (if bridged by week 3 post-surgery), (ii) delayed union (if bridged between weeks 4 – 7 post-surgery) and (iii) non-union (if not bridged up to 7 weeks post-surgery). **[B][C]** CT-derived bone parameters (BV: bone volume, TV: defect volume, BFR: bone formation rate, BRR: bone resorption rate) determined at each weekly time-point in the defect centre. Statistics: Data were tested for normal distribution (Shapiro–Wilk-Test). Depending on the test outcome, comparisons were performed at single time points using two-tailed t test or Mann–Whitney U-test. (* p < 0.05, ** p < 0.01, *** p < 0.001, **** p < 0.0001).

P140

Lipid and cellular profiles of acetabular and femoral bone marrow adipose tissues are distinct in hip osteoarthritis patients

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Abstract Text

Bone marrow (BM) adipose tissue (BMAT) has been described as lipotoxic factor with negative impacts on skeletal system regeneration and repair. As BMAT undergoes metabolic and cellular adaptations with age and disease, we assumed that investigation of BMAT-associated lipid profile and cellularity at different skeletal locations in osteoarthritis (OA) patients might contribute to understanding of lipid involvement in OA development and progression.

Acetabular and femoral BM, and femoral subcutaneous adipose tissue (fSAT) were obtained from matched patients (n=11, 5 women, 6 men; age: 65±11 years; BMI: 27.89±4.42 kg/m^2) undergoing hip arthroplasty surgery (Ethical approval I-97/11). BM, BMAT and fSAT were explored at the levels of total lipids, fatty acids, and cells, by using thin layer and gas chromatography and *ex vivo* cellular

assays. Statistical significance was estimated by non-parametric tests and Spearman's rank correlation (r) was calculated.

BMAT content was significantly higher in femoral (0.262±0.088 mL/g) than in acetabular BM (0.063±0.051 mL/g) (n=11, p=0.016). Negative associations with BMI of patients were found for femoral BM (r=-0.783, p=0.017, n=11) and BMAT (n=9, r=-1.000, p=0.017) tissue cellularity. Additionally, femoral BMAT cellularity declined with age (r=-0.675, n=10, p=0.037). Total lipid analyses revealed significantly lower triglyceride content in femoral than in acetabular BMAT and fSAT. Frequency of saturated palmitic, myristic and stearic acids were higher in femoral than in acetabular BMAT and fSAT, where palmitoleic, linoleic, oleic acids were more dominant. BMAT-associated compartments from both locations host lower frequency of non-hematopoietic $CD45^-$ neutral lipid-loaded cells when compared to BM. This associated with higher incidence of clonogenic mesenchymal stromal (stem) cells in acetabular (0.032± 0.04%) and femoral (0.021± 0.028%) BMATs and fSAT (0.031 ± 0.016%) than in their BM counterparts.

Collectively, our results indicate that the lipid profiles of hip BMAT impose significantly different BM microenvironments and distribution of cells with regenerative potential in OA patients.

New Investigator Seminar

P146

NOX4 deletion decreased obesity-induced bone loss and diminished bone marrow adiposity in high-fat-diet fed mice

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Abstract Text

Introduction: Obesity causes increased accumulation of adipose tissue not only in the periphery but also in bone marrow (BMAT). BMAT expansion is accompanied by higher ROS production causing oxidative stress which leads to an increased risk of bone fractures and bone loss. NADPH oxidase 4 (NOX4) is a major ROS producer affecting the differentiation potential of cells. Thus, we hypothesize that deletion of NOX4 may affect bone marrow mesenchymal stem cells (BM-MSCs) properties and bone homeostasis.