

**370 THE mtDNA HAPLOGROUP J IS A PROTECTIVE FACTOR TO HIP AND KNEE OSTEOARTHRITIS**

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**Purpose:** Despite the glycolytic nature of articular chondrocytes, some studies indicate that the mitochondrion is implicated in OA. To test the hypothesis that mitochondrial DNA haplogroups contribute to the prevalence of OA, we analyzed the European mitochondrial DNA (mtDNA) haplogroups of knee and hip OA patients and healthy controls in a Spanish population.

**Methods:** We combined the single base extension (SBE) assay with the polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP) technique to obtain the different single nucleotide polymorphisms (SNPs) that characterize the European haplogroups in 457 cases of knee OA and 262 radiological controls. Knee OA samples were previously classified according to Kellgren and Lawrence scoring from Grade I to Grade IV. In order to replicate these results, we carried out a confirmatory study in 514 cases of hip OA and 578 symptomatic controls.

**Results:** Individuals carrying haplogroup J showed a significantly decreased risk of knee OA (odds ratio (OR) = 0.460; 95% confidence interval (CI): 0.282–0.748;  $p=0.002$ ). Regarding to Kellgren and Lawrence scoring, those individuals carrying haplogroup J had a less severe progression of knee OA (OR = 0.351; 95% CI: 0.156–0.787;  $p=0.012$ ), while those individuals carrying haplogroup U had a more severe progression (OR = 1.788; 95% CI: 1.094–2.922;  $p=0.025$ ). In the same way, individuals carrying haplogroup J showed a significantly decreased risk of hip OA too (OR = 0.661; 95% CI: 0.440–0.994;  $p=0.046$ ).

**Conclusions:** People carrying the haplogroup J are at a lower risk for developing knee and hip OA, and those who do develop knee OA and carry this haplogroup may have a lessened severity in the progression of this disease. Those knee OA patients that carry haplogroup U may have a more severe progression of the disease. These results indicate that mtDNA haplogroups contribute to the pathogenesis of OA.

**Imaging****371 TEMPORAL AND SPATIAL CHANGES OF ELEMENTAL DISTRIBUTIONS IN BONE AND CARTILAGE**

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**Purpose:** Although bone and cartilage act as reservoir for a member of elements and the perturbation of these elements are suggested to contribute to various diseases, little is known about their temporal and spatial distributions. Therefore the purpose of the present work was to research on temporal and spatial changes of elemental distributions in bone and cartilage using the nuclear microscopy technique.

**Methods:** We performed elemental mapping in bone and cartilage of normal mouse knee joints. Nine wild-type ICR mice were used in this study. Three knee joints of mice at the first day after birth were removed and frozen at minus eighty degrees with liquid nitrogen. Three knee joints of mice at three weeks and twenty weeks after birth were similarly prepared. Sagittal cross-sections of knee joint in 20  $\mu\text{m}$  thickness were cut using Cryostat to reduce the possibility of introducing extraneous metal contamination. The orientation of the section enabled us to obtain slices comprising different knee regions. The sections were frozen and inspected by optical microscopy in order to evaluate artifacts produced during sample manipulation. We measured elemental distributions in articular cartilage, trabecular bone, cortical bone, joint cartilage, growth plate, and joint cavity with the elemental mapping method using Energy Dispersive Spectrometer. Simple quantitative analysis was done triplicate and each element's weight percent ratio to Na was calculated.

**Results:** The elemental mapping revealed that; (1) at one day after birth, main elements in articular cartilage were Na, O, P, S, and Ca; those in bone were Na, O, P, S, K, Ca, and Mg; (2) at three weeks after birth main elements in growth plate were Na, N, O, P, S, Cl, K and Ca; those in joint cartilage were Na, O, P, S, Cl and K; those in bone were Na, O, P, Ca and Mg; (3) at twenty weeks after birth, were Na, O, P, S, Cl, K and Ca;

those in bone were Na, O, P, S, K, Ca and Mg. After Na ratios of these elements were calculated for correction, we investigated the temporal and spatial changes of each elemental distribution. At the first day after birth, a spatial change was seen in the growth plate cartilage; the more cartilage matured toward hypertrophy, the more S and Ca it contained. Temporal changes of elemental distributions in the growth plate cartilage were seen; the more growth plate aged, the more S and Ca it contained. Temporal changes of elemental distributions in articular cartilage were seen. The more articular cartilage aged, the more S and Ca it contained. Temporal changes of elemental distributions in bone were seen. The more bone aged, the more Ca and Mg it contained. Spatial changes of elemental distributions in cortical bone were seen. The more cortical bone matured toward diaphysis, the more Mg and the less S it contained. On the other hand, No temporal or spatial changes of elemental distributions in joint space were seen. No significant temporal and spatial changes of P, Cl, K distributions were seen.

**Conclusions:** Elemental mapping was effective to gain information elemental distributions in bone and cartilage. Elemental distributions in bone and cartilage change temporally and spatially in vivo. These findings may help understand normal skeletal development and pathological processes. Although this is a study on normal bone and cartilage, our data may help discriminate between young and matured cartilage. Moreover, we believe that it is worth studying healing process of bone fracture, osteoarthritis and chronic rheumatoid arthritis with this method.

**372 DETERMINING PATTERNS OF RADIOGRAPHIC HAND OSTEOARTHRITIS IN A COMMUNITY-DWELLING POPULATION OF ADULTS AGED 50 YEARS AND OVER USING FACTOR ANALYSIS**

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**Purpose:** Patterns of radiographic osteoarthritis (ROA) are often examined in joint groups by row: distal interphalangeal joints (DIPs), proximal interphalangeal joints (PIPs) and metacarpal phalangeal joints (MCPs). The 1st carpometacarpal (1st CMC) and trapezioscapoid (TS) joints at the base of the thumb are often studied separately from the other joint groups. A recent review of radiographic studies of hand OA found that the interphalangeal (IP) joint of the thumb has been inconsistently studied, with the majority of studies (54%) not specifying whether the joint had been examined or within which joint group it had been classed. The objective of this study was to determine interrelationships of OA at different hand joints, particularly the thumb IP and 1st MCP joints using factor analysis.

**Methods:** The clinical assessment study of the hand (CAS-HA) is a prospective population-based cohort of 623 adults aged 50 years and over with self-reported hand pain or hand problems. Dorsi-palmer x-rays of the hands were obtained and 16 joints in each hand were scored systematically for the presence of OA using the Kellgren and Lawrence (K&L) grading system by a single observer. Radiographic OA for a single joint was defined as K&L  $\geq 2$ . Prior to the start of the study intra-rater reliability was tested and found to be good for the presence of OA in an individual joint (mean percentage agreement = 98%, mean kappa = 0.91). Analysis was completed on the 32 joints using principal components analysis (PCA) with varimax rotation to study patterns of ROA in the hand joints.

**Results:** Of the 623 participants, five did not have x-rays and 26 were excluded due to a diagnosis of an inflammatory arthritis. Four joints with less than 5% occurrence of ROA were excluded from the analysis (4th and 5th MCP joints in both the right and left hands). Four principal components were extracted and rotated, which explained 44% of variance in the data.

The joints of the hand grouped into (1) the DIP joints, (2) the PIP joints, (3) the MCP joints and (4) the thumb joints (including the thumb IP, 1st MCP, 1st CMC and TS joints). The only exception to this was the left thumb IP joint, which cross-loaded with the PIP joints (factor loading value = 0.348) and the thumb joints (factor loading value = 0.328).

**Conclusions:** In this population factor analysis has shown that the joints of the thumb, except for the left thumb IP joint, cluster together as a joint group as do the DIPs, the PIPs and the MCPs joints. Further work analysing the joints of the thumb should be undertaken to ascertain their contribution to pain and disability in this population.