

Glycosaminoglycan, a Cartilage Erosion Marker in Synovial Fluid of Osteoarthritis Patients Strongly Correlates with WOMAC Function Subscale

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Abstract : Cartilage is an extracellular matrix composed of aggrecan, which imparts it with a great tensile strength, stiffness and resilience. Disruption in cartilage metabolism leading to progressive degeneration is a characteristic feature of Osteoarthritis (OA). The process involves enzymatic depolymerisation of cartilage specific proteoglycan, releasing free glycosaminoglycan (GAG). This released GAG in synovial fluid (SF) of knee joint serves as a direct measure of cartilage loss, however, limited due to its invasive nature. Western Ontario and McMaster Universities Arthritis Index (WOMAC) is widely used for assessing pain, stiffness and physical-functions in OA patients. The scale is comprised of three subscales namely, pain, stiffness and physical-function, intends to measure patient's perspective of disease severity as well as efficacy of prescribed treatment. Twenty SF samples obtained from OA patients were analysed for their GAG values in SF using DMMB based assay. LK 1.0 vernacular version was used to attain WOMAC scale. The results were evaluated using SAS University software (Edition 1.0) for statistical significance. All OA patients revealed higher GAG values compared to the control value of $78.4 \pm 30.1 \mu\text{g/ml}$ (obtained from our non-OA patients). Average WOMAC calculated was 51.3 while pain, stiffness and function estimated were 9.7, 3.9 and 37.7, respectively. Interestingly, a strong statistical correlation was established between WOMAC function subscale and GAG ($p = 0.0102$). This subscale is based on day-to-day activities like stair-use, bending, walking, getting in/out of car, rising from bed. However, pain and stiffness subscale did not show correlation with any of the studied markers and endorsed the atypical inflammation in OA pathology. On one side, where knee pain showed poor correlation with GAG, it is often noted that radiography is insensitive to cartilage degenerative changes; thus OA remains undiagnosed for long. Moreover, active cartilage degradation phase remains elusive to both, patient and clinician. Through analysis of large number of OA patients we have established a close association of Kellgren-Lawrence grades and increased cartilage loss. A direct attempt to correlate WOMAC and radiographic progression of OA with various biomarkers has not been attempted so far. We found a good correlation in GAG levels in SF and the function subscale.

Keywords : cartilage, Glycosaminoglycan, synovial fluid, western ontario and McMaster Universities Arthritis Index

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