AGE-RELATED MORPHOLOGICAL CHARACTERISTICS OF THE FACET JOINT AND LIGAMENTS IN WOMEN AGED 30–39

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Background: Women of reproductive age experience increased morphofunctional stress on the spine, especially during pregnancy, which may lead to early degenerative changes in the facet joints and supporting ligaments.
Objective: To evaluate age-related morphological changes in the facet joint and associated ligaments in women aged 30–39 years.
Materials and Methods: Histological analysis of spinal specimens obtained from women aged 30–65 years was performed. Samples of facet joints and their stabilizing ligaments were stained using hematoxylin-eosin and Van Gieson methods. Morphometric evaluation was conducted to assess degenerative changes in articular cartilage and ligamentous tissue.

The study analyzed 70 spinal specimens obtained from women aged 25–65 years who underwent laminectomy and discectomy procedures. The samples were divided into three groups: Group 1 (30–39 years), Group 2 (40–49 years), and Group 3 (50–65 years).

- **Histological Processing:** Tissue samples were fixed in 10% neutral buffered formalin, decalcified, embedded in paraffin, and sectioned at 4 µm. Standard hematoxylin-eosin (H&E) staining was used for general morphology, while Van Gieson staining highlighted fibrous components of the ligaments and joint capsule.
- **Morphometric Analysis:** IEL-like collagen fiber density and thickness of articular cartilage were quantified using calibrated ocular micrometry.
- **Evaluation Criteria:** Degenerative changes were graded based on the presence of collagen fragmentation, fibrosclerosis, mucinous degeneration, and articular surface erosion.
- **Statistical Analysis:** Quantitative data were processed using Student's t-test and ANOVA. A p-value <0.05 was considered statistically significant.

Results: In women aged 30–39, destructive changes were primarily observed in the fibrous components of the facet joint capsule and the yellow ligament rather than the articular surfaces. Fibrosclerosis, fragmentation of collagen fibers, and mucinous edema were detected. Ligament instability was associated with chronic mechanical stress during pregnancy and increased body weight.

Histopathological analysis of the 30–39-year age group demonstrated that early degenerative changes were predominantly localized in the ligamentous structures rather than in the articular cartilage of the facet joints.

Facet Joint Capsule: Sections revealed focal fibrosclerosis with fragmentation of fuchsino-philic collagen fibers. Mucinous edema was occasionally observed in the interfascicular spaces, indicative of chronic biomechanical loading. The orientation of collagen bundles became irregular in comparison with the control group, suggesting the initiation of capsular instability.

Articular Cartilage: The hyaline cartilage of the facet joint remained largely preserved. Peripheral zones showed mild thinning, but the isogenous grouping of chondrocytes and the homogeneous extracellular matrix indicated an early stage of degenerative transformation rather than advanced pathology.

Yellow Ligament: Pronounced changes were identified in the ligamentum flavum, including irregular arrangement of collagen fibers and focal fibroelastic transformation. A reduction in elastic fiber density was observed, which may correlate with decreased biomechanical resilience of the posterior elements of the spine.

Correlative Findings: Degenerative alterations were significantly more evident in women with a body mass index exceeding the normative range by ≥15% and in multiparous individuals. This supports the hypothesis that both increased mechanical load and pregnancy-related spinal axis adaptation act as precipitating factors for early facet joint degeneration.
Conclusion: Morphological alterations in the facet joint at 30–39 years are mainly localized in the connective tissue of the joint capsule and ligaments. These findings highlight the early onset of degenerative processes influenced by biomechanical stress and hormonal changes in reproductive-age women.