



MORPHOLOGICAL CRITERIA OF CARTILAGE DEGRADATION IN POST-TRAUMATIC GONARTHROSIS

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Introduction

Post-traumatic gonarthrosis (PTG) is one of the most common pathological conditions of the knee joint, developing as a consequence of traumatic injuries and characterized as a destructive-degenerative disease. Unlike primary osteoarthritis, PTG often occurs in relatively younger patients and is associated with previous meniscal, ligamentous, or intra-articular injuries. The key mechanism in its pathogenesis is the progressive degradation of the articular cartilage, accompanied by subchondral bone sclerosis and microstructural alterations under the influence of inflammatory mediators.

In recent years, morphological and morphometric investigations have become increasingly important in evaluating cartilage degradation in PTG. These criteria not only provide objective markers for disease staging but also play a crucial role in the selection of adequate therapeutic strategies.

Aim

To determine the key morphological criteria of cartilage degradation in post-traumatic gonarthrosis and to assess them based on microscopic and morphometric findings.

Materials and Methods

The study included 30 patients (aged 18–60 years) diagnosed with post-traumatic gonarthrosis. Alongside clinical and instrumental examinations, cartilage specimens obtained from the knee joint were subjected to histological and morphometric analysis. The thickness of hyaline cartilage, chondrocyte count, lacunar area and shape, as well as changes in the interstitial matrix and subchondral bone, were evaluated. Morphometric assessment included measurements of cartilage thickness, cellular density, and the degree of subchondral sclerosis.

Results

The study revealed several morphological criteria of cartilage degradation in PTG:





- Surface changes: The superficial layer of hyaline cartilage showed microfissures, disorganized collagen fibers, and disruption of the normal cellular arrangement, representing early degradation features.
- Chondrocyte alterations: A marked reduction in the number of chondrocytes was observed, with nuclear pyknosis and signs of apoptosis in certain specimens.
- Matrix changes: Homogenization, mineralization, and hyalinization processes in the extracellular matrix were evident in advanced cases.
- Morphometric indicators: The average thickness of cartilage was reduced by 30–45% compared to normal values. The lacunar area was significantly decreased, while sclerosis of the subchondral bone became more pronounced.
- Inflammatory changes: In some cases, vascular alterations resembling vasculitis and inflammatory infiltrates were detected in the subchondral region, indicating a chronic degenerative process.

Discussion

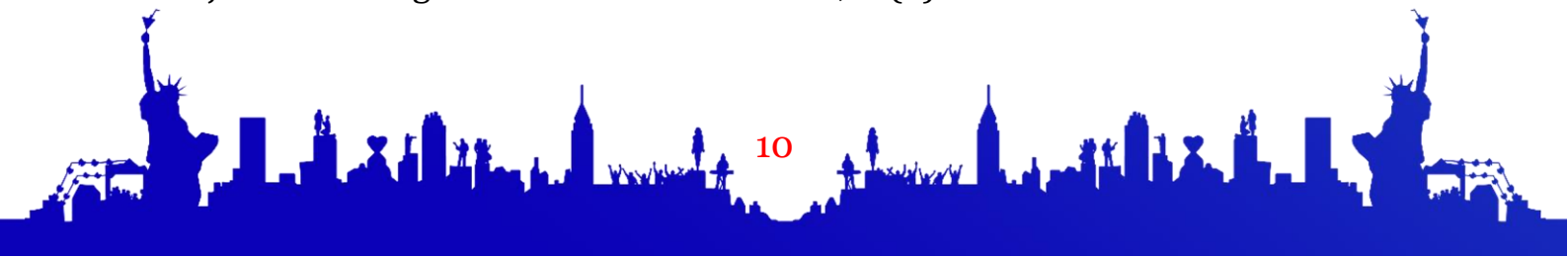
These findings suggest that the major morphological criteria of cartilage degradation in PTG include thinning of the cartilage layer, reduction in chondrocyte density, nuclear pyknosis, mineralization of the extracellular matrix, and progressive subchondral bone sclerosis. The severity and prevalence of these features were correlated with disease progression. In younger patients, surface changes and cellular disorganization were predominant, while in older patients, mineralization and subchondral sclerosis were more evident.

Conclusion

Cartilage degradation in post-traumatic gonarthrosis is characterized by a set of morphological criteria reflecting different stages of the pathological process. These include progressive thinning of the cartilage layer, reduced chondrocyte count, nuclear pyknosis, mineralization of the extracellular matrix, and sclerosis of the subchondral bone. Comprehensive assessment of these criteria is essential for a better understanding of PTG pathogenesis, for establishing objective diagnostic markers, and for developing age-specific therapeutic strategies.

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