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CLINICAL SIGNIFICANCE OF EXFOLIATIVE CYTOLOGY, DIGITAL CYTOMORPHOMETRY AND GINGIVAL MICROCIRCULATION IN CATARRHAL GINGIVITIS

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Background. Objective assessment of therapeutic outcomes in catarrhal gingivitis requires complementary structural and functional indicators of gingival tissue recovery.

Objective. To evaluate changes in exfoliative cytology, digital cytomorphometry and gingival microcirculation before and after treatment of catarrhal gingivitis.

Materials and Methods. Gingival exfoliative smears were assessed before and after treatment, with comparison to control samples. Digital cytomorphometric measurements were performed using QuPath 0.7.0; gingival microcirculation was assessed by laser Doppler flowmetry. Clinical, cytological and morphometric findings were integrated into a five-criterion treatment-response scoring system (0–10 points).

Results. Before treatment, exfoliative preparations showed reactive and dystrophic epithelial changes, increased neutrophils, lymphocytes and macrophages, and cellular debris. After treatment, epithelial cells demonstrated clearer contours, more uniform cytoplasmic staining and fewer inflammatory or degenerative features. Epithelial cell area increased from 1986.4 to 2118.7 μm² (+6.66%), and cytoplasmic area from 1839.6 to 1980.5 μm² (+7.66%), while nuclear area decreased from 146.8 to 138.2 μm² (−5.86%). The nuclear-to-cytoplasmic ratio fell from 0.080 to 0.070 (−12.50%; $p<0.05$). Laser Doppler flowmetry showed increases in microcirculation index from 16.9±0.4 to 20.6±0.4 perfusion units (+21.9%; $p<0.001$), blood-flow fluctuation from 1.71±0.06 to 2.26±0.07 perfusion units (+32.2%; $p<0.001$), and coefficient of variation from 10.1±0.3% to 11.0±0.2% (+8.9%; $p<0.05$). Post-treatment flowmetry indices did not differ significantly from control values ($p>0.05$). The proposed response scale categorized scores of 8–10 as high effectiveness, 5–7 as partial effectiveness and 0–4 as insufficient effectiveness.

Conclusion. Concordant improvement in cytological features, epithelial morphometry and microcirculatory indices supports the use of combined structural and functional measurements for objective evaluation of treatment response in catarrhal gingivitis. The nuclear-to-cytoplasmic ratio may serve as a particularly sensitive indicator of favorable cytomorphological changes.

Keywords. catarrhal gingivitis; exfoliative cytology; digital cytomorphometry; laser Doppler flowmetry; microcirculation; treatment response.