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Titanium and PolyEtherEthetKetone, an Alternative to Framework Cobalt-Chrome Dentures?

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Objectives The use of Cobalt-chrome (CoCr) alloy in removable partial dentures (RPDs) has raised concerns due to its carcinogenic and mutagenic properties. Titanium (Ti) and polyetheretherketone (PEEK) have emerged as potential alternatives, yet their mechanical and biological performances remain insufficiently explored.

This systematic review aims to compare the mechanical and biological performances of Ti and PEEK in RPDs against the reference material, CoCr.

Methods Following PRISMA guidelines, three databases were searched until March 2024. Only studies evaluating mechanical and/or biological properties of Ti, PEEK, and CoCr were included. Quality assessment was conducted using Rayyan software and bias risks were evaluated with the Methodological Index for Non-Randomized Studies (MINORS). Mechanical and biological aspects were analyzed.

Results Out of 138 identified articles, 18 met inclusion criteria, with most exhibiting low to moderate bias risks. Retention forces and fatigue were lower for Ti and PEEK compared to CoCr, with Ti also showing reduced hardness. PEEK demonstrated less deformation. Biocompatibility was adequate for both materials. Utilization of digital technologies and machining enhanced mechanical properties and biocompatibility.

Conclusions Titanium and PEEK present promising alternatives to CoCr for RPD frameworks, showing favorable mechanical and biological performances. However, further well-designed studies are necessary to ascertain their clinical applicability and long-term limitations, facilitating informed clinical decision-making.