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Dental Science

THE USE OF BioHPP AS AN AESTHETIC IMPLANT ABUTMENT: A REVIEW

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ABSTRACT New materials are being investigated in dentistry as a result of the need for implant abutments that are both aesthetically pleasing and biocompatible. High-performance polymer BioHPP, which is made from polyetherketoneketone (PEKK), has become more and more popular as an alternative to traditional zirconia and titanium abutments. The characteristics, therapeutic uses, and benefits of BioHPP are assessed in this review, along with its effects on durability, soft tissue integration, and cosmetic results. Future developments in digital dentistry and CAD/CAM technology are also covered, along with possible drawbacks and surface adjustments. Although BioHPP exhibits great potential, more extensive research is required to verify its feasibility as a common implant abutment material.

KEYWORDS : PEKK, BioHPP, CAD/CAM, Implant, Polyetherketoneketone

INTRODUCTION

The gold standard for replacing lost teeth is now dental implant restorations. The final prosthesis is supported by the implant abutment, which also ensures the best possible soft tissue response and cosmetic coherence. Because of their strength and biocompatibility, titanium abutments are still the standard option; however, their metallic look might detract from aesthetics, especially in anterior restorations [1-3]. Although zirconia abutments are more aesthetically pleasing, they have disadvantages, including a greater chance of fractures [4]. BioHPP, a tooth-colored polymer-based material with advantageous mechanical qualities, has surfaced as a viable substitute to address these issues. It is a promising material for implant abutments because of its special composition and flexibility, which provide benefits in stress distribution, soft tissue integration, and long-term stability [5,6].

BioHPP: Composition and Properties

Material Composition and Structure

BioHPP has great mechanical strength and stability since it is a member of the polyaryletherketone (PAEK) family, which is mostly made up of polyetherketoneketone (PEKK) [7, 8]. Stress concentration at the peri-implant bone interface is decreased by the material's modulus of elasticity, which is comparable to that of human bone[9].

Mechanical Strength And Load Distribution

Compared to ceramic abutments, BioHPP is less likely to fail catastrophically due to its high flexural strength and fatigue resistance [10,11]. Because of its capacity to absorb occlusal pressures, stress is distributed more evenly, which may lower the rates of implant failure and bone resorption [12].

Aesthetic and Soft Tissue Benefits

Because BioHPP is tooth-colored, there is no chance of metal show-through, which is a common problem with titanium abutments. Furthermore, BioHPP has excellent soft tissue adhesion, which improves the development of the mucosal seal and lowers inflammation around the implant[13,14].

Bacterial Adhesion and Surface Properties

BioHPP has a lower bacterial adhesion than titanium, which lowers the incidence of peri-implant illnesses. According to studies, surface alterations like plasma treatments or nanocoatings could improve its tissue integration and antibacterial qualities even more [15,16].

Clinical Applications of BioHPP Abutments

Aesthetic Considerations in Implant Restorations

BioHPP is perfect for anterior restorations where aesthetics are important because of its natural hue and translucency. Because BioHPP abutments fit in perfectly with soft tissues and ceramic prosthesis, clinical studies show that patients are more satisfied with these abutments [17,18].

Soft Tissue Stability and Biologic Seal

Preventing bacterial invasion and inflammatory reactions requires a stable peri-implant mucosal seal. According to research, BioHPP improves collagen fiber attachment and tissue compatibility, hence enhancing peri-implant health over the long term [19,20].

Long-Term Prosthetic Performance

Although BioHPP shows encouraging wear resistance, more research is needed to determine how long it will last in clinical situations. According to recent studies, BioHPP maintains implant stability comparably to zirconia, with a lower risk of abutment fracture or screw loosening [21,22].

CAD/CAM and Digital Workflow Integration

Because BioHPP is completely compatible with CAD/CAM technology, precise, personalized abutments are possible. It is an effective option for digital workflows because of its simplicity in milling and production, which decreases chairside time and increases restoration accuracy [23,24].

Comparison With Conventional Abutment Materials

Feature	Titanium	Zirconia	BioHPP
Strength	High	High but brittle	Moderate to high [25]
Aesthetics	Poor (metallic)	Good (opaque white)	Excellent (natural translucency) [26]
Biocompatibility	Excellent	Excellent	Excellent [27]
Soft Tissue Response	Moderate	Good	Superior [28]
Bacterial Adhesion	High	Moderate	Low [29]
Flexibility	Low (rigid)	Low	High (shock-absorbing) [30]

Future Perspectives And Challenges

Despite BioHPP's many benefits, there are still certain obstacles to overcome:

Long-Term Clinical Validation: To verify its longevity and success rates, additional randomized clinical trials are required [31].

Surface Modifications: Raising the surface roughness may improve tissue responsiveness and osseointegration even more [32].

Cost considerations: At the moment, the material is more costly than zirconia and titanium alternatives [33].

Performance in High-Stress Areas: Further investigation is needed to assess the posterior teeth's load-bearing capacity.

CONCLUSION

A promising development in implant prosthetics, BioHPP offers a special fusion of strength, biocompatibility, and aesthetics. It is a desirable substitute for zirconia and titanium abutments due to its superior soft tissue response, shock absorption, and reduced bacterial adherence. Even though preliminary clinical findings seem promising, more research and cost-effectiveness evaluations are required before BioHPP may be widely used in implant dentistry.

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