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Next Generation Smile Solutions—PEEK Crowns in Pediatric Dentistry

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ABSTRACT:

The restoration of primary teeth with extensive coronal destruction remains a clinical challenge in pediatric dentistry, requiring materials that combine durability, biocompatibility, and acceptable esthetics. Polyetheretherketone (PEEK) has recently emerged as a promising material for pediatric full-coverage restorations due to its favorable mechanical and biological properties. PEEK is a high-performance, semi-crystalline thermoplastic polymer characterized by high fracture resistance, low elastic modulus comparable to dentin, excellent wear resistance, and chemical stability. Its inherent biocompatibility and low plaque affinity make it suitable for use in the pediatric oral environment.

In pediatric dentistry, PEEK crowns—fabricated using computer-aided design/computer-aided manufacturing (CAD/CAM) technology—offer an alternative to conventional stainless steel crowns, preveneered crowns, and zirconia crowns. They provide improved esthetics over metal crowns while being less abrasive to opposing teeth compared with zirconia. Additionally, the lightweight nature of PEEK and its shock-absorbing capacity may reduce stress transmission to the underlying tooth structure.

Although current evidence on the clinical performance of PEEK crowns in children is limited, preliminary in vitro and short-term clinical reports suggest satisfactory marginal adaptation, adequate retention, and favorable patient and parental acceptance. This abstract highlights the material properties, clinical applications, advantages, and limitations of PEEK crowns in pediatric dentistry, emphasizing the need for well-designed long-term clinical trials to establish their efficacy and durability in primary and young permanent teeth.

1.INTRODUCTION

Background on Pediatric Dentistry

Pediatric dentistry plays a crucial role in ensuring the optimal growth and development of children, particularly through the maintenance of healthy primary teeth. Primary teeth not only aid in mastication and speech development but also serve as space maintainers for the succeeding permanent teeth .[1] Early loss of primary teeth can lead to malocclusion, nutritional deficiencies, and compromised self-esteem due to altered facial aesthetics. Therefore, preserving the integrity of primary dentition is essential for both functional and psychosocial reasons.[2]

In this context, restorative options in pediatric dentistry must address a combination of factors such as durability, biocompatibility, and aesthetic appeal. Increasingly, parents and children expect restorations that resemble natural teeth in color and form .[3] Thus, a restorative solution in pediatric dentistry not only has to meet functional demands—withstanding the forces of mastication and safeguarding pulpal health—but also provide a favorable aesthetic outcome that can support the child's self-confidence and social interactions.[1]

Evolution of Crowns in Pediatric Dentistry

Over the years, various types of crowns have been utilized to restore severely decayed or structurally compromised primary teeth. Traditionally, stainless steel crowns (SSCs) have been considered the gold standard due to their durability, ease of placement, and cost-effectiveness.[4] However, despite their proven longevity, SSCs have limitations in terms of aesthetics and potential allergic reactions in rare cases.

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To address the increasing demand for tooth-colored restorations, aesthetic alternatives such as composite strip crowns, porcelain/ceramic crowns, and zirconia crowns emerged .[5] These options offer enhanced esthetics but may present challenges including technique sensitivity, higher cost, and occasional concerns about strength and retention, particularly under the heavy occlusal forces often observed in pediatric patients .[6] As material science continues to advance, newer restorative options focusing on improved biocompatibility, aesthetics, and mechanical performance are under exploration, paving the way for the introduction of novel materials like polyetheretherketone (PEEK) .[7]

2.OVERVIEW OF PEEK AS A DENTAL MATERIAL

Definition and Chemical Structure

Polyetheretherketone (PEEK) is a high-performance polymer belonging to the polyaryletherketones (PAEK) family, characterized by its unique chemical structure comprising aromatic rings linked by ketone and ether groups. This semi-crystalline thermoplastic exhibits exceptional mechanical and chemical properties, making it suitable for various engineering and medical applications .[8] The inherent stability of the PAEK family lies in the strong bonds within its molecular structure, which confer high resistance to degradation under physiological conditions .[7]

PEEK's biocompatibility and mechanical strength have made it increasingly popular in medical and dental fields, where materials are subjected to both biological and functional demands. In dentistry, PEEK has gained attention as a restorative material due to its compatibility with CAD/CAM systems, enabling precise and customized restorations.[8]

Properties of PEEK Relevant to Dentistry

Mechanical Properties

PEEK exhibits superior strength, flexibility, and fatigue resistance, qualities that are essential for withstanding the forces of mastication in dental applications. Its modulus of elasticity (3-4 GPa) closely resembles that of human bone, reducing stress concentrations on adjacent structures.[9] Furthermore, its toughness ensures long-term durability, making it a promising alternative to traditional materials like metals and ceramics.[10]

Chemical Stability and Resistance to Wear

PEEK is highly resistant to chemical degradation and wear, even under conditions of constant exposure to saliva, enzymes, and dietary acids. These properties ensure its long lifespan and consistent performance in the oral environment .[7]Its ability to resist plaque accumulation and microbial colonization further supports its use in dental applications.[8]

Thermal Properties

The thermal stability of PEEK allows it to endure high temperatures without deformation, a crucial requirement during sterilization processes. Its low thermal conductivity minimizes heat transfer, enhancing patient comfort when used in restorations.[9]

Historical and Current Uses of PEEK in Dentistry

Initial Use in Prosthodontics

PEEK was first introduced in dentistry as a framework material for removable partial dentures. Its lightweight nature, combined with its high strength and flexibility, provided patients with a comfortable alternative to metallic frameworks .[8]PEEK's natural beige color and ability to blend with surrounding tissues made it aesthetically superior to metal-based prostheses.

Expansion into Implant Abutments and Orthodontic Applications

Over time, PEEK expanded its applications to include implant abutments, where its biocompatibility and ability to distribute occlusal forces evenly helped reduce peri-implant stresses .[12]In orthodontics, PEEK wires and brackets have been explored as metal-free alternatives, offering hypoallergenic solutions for patients sensitive to nickel and other metals .[9]

Emerging Use in Crown and Bridge Restorations

Recently, PEEK has gained recognition for its potential in crown and bridge restorations, particularly in cases where aesthetics and biocompatibility are critical. Its ability to mimic the color of natural teeth while providing sufficient strength makes it a viable alternative to zirconia and metal-ceramic crowns .[11]Additionally, PEEK's compatibility with CAD/CAM workflows facilitates the production of precise, patient-specific restorations .[8]

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This evolving trajectory of PEEK's applications underscores its versatility and growing relevance in modern dentistry, paving the way for its broader adoption in pediatric dentistry as a material for crowns and other restorative procedures.

3.RATIONALE FOR USING PEEK CROWNS IN PEDIATRIC DENTISTRY

Biocompatibility and Safety

One of the key advantages of using polyetheretherketone (PEEK) crowns in pediatric dentistry is their biocompatibility. PEEK is inherently non-allergenic and non-toxic, which makes it a safe restorative option for children, especially those with sensitivities or allergies to metals commonly found in stainless steel crowns .[9]Additionally, PEEK's chemical inertness ensures that it does not release harmful substances into the oral environment, further supporting its use in young patients .[8]

PEEK's smooth surface and low plaque adhesion significantly reduce the risk of secondary caries and gingival irritation, contributing to better oral hygiene outcomes compared to traditional crown materials .[7] These properties make PEEK an attractive choice for ensuring tissue compatibility and maintaining long-term oral health in pediatric patients.

Mechanical and Aesthetic Considerations

PEEK crowns offer a combination of strength and fracture resistance, making them well-suited for the high occlusal forces associated with pediatric mastication.[11] Their modulus of elasticity closely mimics that of natural teeth, which helps in distributing masticatory forces more evenly and minimizes stress concentrations on the tooth and surrounding tissues .[12]

In terms of aesthetics, PEEK crowns provide significant advantages over traditional stainless steel crowns. They can be customized to match the natural color of teeth, offering superior esthetics that are particularly important in visible areas of the dental arch.[8]Unlike zirconia crowns, PEEK also allows for some flexibility in color modification, making it possible to achieve a more natural appearance without compromising mechanical properties.[7]

Minimally Invasive Approach

A major benefit of PEEK crowns is their minimally invasive nature. These crowns require conservative tooth preparation, ensuring that maximum natural tooth structure is preserved during the restoration process .[7]This is particularly advantageous in pediatric dentistry, where maintaining the integrity of primary teeth is essential for guiding the eruption of permanent teeth and preserving arch integrity .[1]

Preserving tooth structure also reduces the risk of pulp exposure and postoperative sensitivity, enhancing the overall comfort and experience for pediatric patients during and after the treatment .[11]

Comparison with Existing Pediatric Crown Materials

PEEK crowns represent a promising alternative to commonly used pediatric crown materials such as stainless steel crowns (SSCs), composite strip crowns, and zirconia crowns. SSCs have long been favored for their durability and affordability, but their metallic appearance and potential for allergic reactions are significant drawbacks.[4] Composite strip crowns offer aesthetic benefits but lack the strength and fracture resistance needed for long-term success in high-stress areas .[5]

Zirconia crowns, on the other hand, provide excellent aesthetics and strength, but they require more aggressive tooth preparation due to their rigidity and are prone to chipping under extreme loads.[6] PEEK crowns, with their balance of strength, flexibility, and esthetics, fill an important gap between these existing options. Their ability to combine aesthetic customization with biocompatibility and minimally invasive application makes them an ideal solution for pediatric restorative needs .[9]

PEEK's unique properties position it as a next-generation material that addresses the limitations of traditional crown materials while catering to the evolving demands of parents and clinicians for safe, durable, and aesthetic solutions in pediatric dentistry.

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4.FABRICATION AND LABORATORY PROCEDURES

CAD/CAM Workflow

The use of CAD/CAM (Computer-Aided Design and Computer-Aided Manufacturing) technology has revolutionized the fabrication of dental restorations, including PEEK crowns for pediatric dentistry. The process begins with **digital scanning** of the pediatric dentition, using intraoral scanners to capture precise 3D images of the teeth and surrounding tissues. This step eliminates the discomfort associated with traditional impression methods, making it especially suitable for children .[9]

Once the digital scan is completed, **design parameters** are defined for the PEEK crowns, considering factors such as crown dimensions, occlusal anatomy, and marginal fit. The flexibility of CAD software allows for the customization of crown shapes and sizes to accommodate variations in pediatric dental anatomy .[11]After the design is finalized, the PEEK material is **milled** using high-precision milling machines. The resulting crowns undergo **finishing processes**, including polishing, to achieve a smooth surface and enhance esthetics .[8]

The CAD/CAM workflow not only ensures high accuracy and reproducibility but also reduces the time required for fabrication, enabling clinicians to deliver same-day restorations in some cases.[7]

Conventional Lab Techniques

For practices without access to CAD/CAM systems, conventional lab techniques can be employed to fabricate PEEK crowns. These techniques typically start with **impression procedures** using traditional impression materials to capture the pediatric dentition. The impressions are then poured to create dental casts, which serve as models for the fabrication process .[8]

A **wax-up** is created on the cast to design the crown's shape and dimensions. The wax pattern is then used in the **pressing process**, where the PEEK material is heated and pressed into the desired form. After cooling, the crown undergoes **polishing steps** to ensure a smooth and aesthetic finish.[9]

While conventional techniques are more labor-intensive and time-consuming compared to CAD/CAM workflows, they remain a viable option for fabricating PEEK crowns in settings with limited technological resources .[11]

3D Printing Possibilities and Future Innovations

Recent advances in **additive manufacturing** have introduced the possibility of using 3D printing for fabricating PEEK crowns. Unlike subtractive methods such as milling, 3D printing involves building the crown layer by layer, allowing for intricate details and minimal material wastage .[9]This technology offers greater flexibility in designing custom restorations, particularly for unique pediatric cases where precise fits and esthetics are critical.[8]

The adoption of 3D printing has the potential to significantly reduce **fabrication costs** and **chairside time**, as multiple restorations can be printed simultaneously. Additionally, it allows for improved **customization**, enabling clinicians to quickly adapt the design based on specific patient requirements.[11]

As 3D printing technology continues to advance, it is expected to play a pivotal role in the widespread adoption of PEEK crowns in pediatric dentistry. Ongoing research and development are likely to further optimize the materials and processes involved, ensuring enhanced performance and accessibility for both clinicians and patients .[7]

5.CLINICAL PROTOCOL FOR PEEK CROWN PLACEMENT

Case Selection and Treatment Planning

The successful placement of PEEK crowns begins with meticulous **case selection and treatment planning**. Indications for PEEK crowns in pediatric patients include severe carious lesions, teeth with large restorations, and those requiring long-term full-coverage protection due to developmental defects such as enamel hypoplasia or dentinogenesis imperfecta .[8]PEEK crowns are particularly suitable for patients with aesthetic concerns, as they offer a tooth-colored alternative to traditional stainless steel crowns .[9]

Contraindications include cases where there is insufficient tooth structure to retain the crown or excessive bruxism that could compromise the longevity of the restoration.[11]During treatment planning, the clinician must assess the **tooth structure**, **occlusion**, and

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patient habits such as thumb-sucking or bruxism, which may influence the choice of material and crown design.[7]

Tooth Preparation Guidelines

Tooth preparation for PEEK crowns follows **minimal reduction protocols**, aimed at preserving as much of the natural tooth structure as possible. This is particularly important in pediatric patients to avoid unnecessary trauma and maintain the integrity of primary teeth, which serve as space maintainers for permanent dentition .[1]

The preparation typically involves creating **feather-edge margins** or **chamfer margins**, depending on the crown design and the extent of retention required. Feather-edge margins are preferred for their conservative approach, as they require less reduction of tooth structure while still ensuring a good fit for the crown .[9] The occlusal reduction should be sufficient to accommodate the thickness of the PEEK crown, ensuring durability without compromising esthetics .[8]

Bonding/Cementation Protocols

Proper **bonding and cementation** are critical for the success of PEEK crowns. The surface of the PEEK material needs to be treated to improve its bonding capability. This often involves **sandblasting** with aluminum oxide to create a rough surface, followed by the application of a **chemical primer** containing phosphate or silane coupling agents to enhance adhesion .[7]

The choice of **cement** is equally important. Dual-cure resin cements are commonly recommended for PEEK crowns due to their superior bond strength and ability to set in areas with limited light penetration .[11]Self-adhesive resin cements can also be used, particularly in cases where simplicity and ease of application are priorities .[8] The bonding process must ensure a secure fit while avoiding excess cement around the margins, which could irritate the gingival tissue .[9]

Postoperative Care and Follow-Up

After placement, comprehensive **postoperative care** is essential to ensure the longevity of the PEEK crowns and the overall oral health of the pediatric patient. Parents should be instructed on proper oral hygiene practices, including regular brushing with fluoride toothpaste and flossing to maintain gingival health around the crown margins.[1]

Periodic follow-ups are crucial for **monitoring crown integrity** and **gingival health**, as well as for detecting any signs of wear, marginal gaps, or recurrent caries.[11]Regular dental check-ups also provide an opportunity to reinforce oral hygiene education for both the child and the parents. In cases of bruxism or other habits that may impact the crown's performance, the use of a nightguard may be recommended to protect the restoration .[7]

By adhering to these clinical protocols, PEEK crowns can serve as a durable, aesthetic, and biocompatible solution for pediatric restorative needs, offering long-term benefits for both the patient and clinician.

6.CLINICAL PERFORMANCE AND OUTCOMES

Longevity and Survival Rates

The longevity and survival rates of PEEK crowns have been increasingly evaluated in clinical studies, showcasing their potential as durable restorations in pediatric dentistry. Current literature suggests that PEEK crowns exhibit excellent wear resistance and fracture toughness, making them suitable for the high masticatory forces associated with pediatric patients .[8]Their modulus of elasticity, which closely resembles natural dentition, helps in distributing occlusal forces more evenly, thereby reducing the risk of crown failure .[7]

When compared to traditional stainless steel crowns (SSCs), PEEK crowns demonstrate comparable durability, with the added advantage of superior esthetics. Unlike SSCs, which are prone to gingival irritation due to their metallic margins, PEEK crowns exhibit improved gingival compatibility, contributing to their longer-term success .[9]Similarly, compared to zirconia crowns, PEEK crowns offer greater flexibility and reduced risk of fracture, especially in cases where occlusal adjustments are required .[11]

Patient Satisfaction and Aesthetics

Patient and parental satisfaction is a critical aspect of evaluating the success of pediatric restorations. PEEK crowns, being tooth-colored and customizable, cater to the increasing demand for aesthetically pleasing restorations among parents .[7]Their natural appearance significantly enhances the child's confidence and reduces the psychological stigma associated with metal crowns, especially in anterior regions .[8]

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Children also tend to accept PEEK crowns better due to their lightweight nature and lack of metallic taste, which are common concerns with SSCs. This improved acceptance contributes to a positive overall dental experience, which is crucial in pediatric dentistry .[11]Furthermore, the ability to match the crown shade to the child's natural teeth adds to parental satisfaction, as it provides a restoration that is not only functional but also visually harmonious .[9]

Periodontal Health and Soft Tissue Response

One of the most significant advantages of PEEK crowns is their favorable impact on periodontal health. Studies have demonstrated that PEEK crowns exhibit lower **plaque accumulation** compared to stainless steel and zirconia crowns, which is attributed to their smooth surface and low surface energy .[7]Reduced plaque retention minimizes the risk of gingival inflammation and secondary caries, promoting better long-term oral health .[8]

Additionally, PEEK's biocompatibility ensures minimal irritation to the gingival tissues, as it does not release harmful ions or cause allergic reactions, unlike metal-based crowns.[9] Findings from clinical trials also indicate that PEEK crowns are associated with lower gingival index scores, reflecting healthier soft tissue responses around the crowns .[11] These properties make PEEK crowns an excellent choice for children, where maintaining gingival health is paramount to the success of restorations.

In summary, the clinical performance of PEEK crowns in terms of longevity, aesthetics, and biocompatibility highlights their potential as a next-generation restorative solution in pediatric dentistry. With ongoing advancements and clinical trials, their adoption is likely to expand further in the coming years.

7.ADVANTAGES OF PEEK CROWNS IN PEDIATRIC DENTISTRY

Biocompatibility

One of the most significant advantages of PEEK crowns in pediatric dentistry is their superior biocompatibility. Unlike metal-based crowns, PEEK does not cause allergic reactions or irritations, making it a safe option for children with sensitivities to metals commonly found in stainless steel crowns .[9This] characteristic is especially important in pediatric patients, where maintaining the health of oral tissues is critical for long-term oral development.

Additionally, PEEK exhibits a favorable tissue response, with studies showing minimal inflammatory reactions and reduced plaque accumulation around the crown margins .[7] This not only enhances the overall health of the surrounding gingiva but also reduces the likelihood of complications such as gingivitis or secondary caries, making PEEK a reliable and patient-friendly option for pediatric restorations .[8]

Aesthetic and Functional Benefits

PEEK crowns offer a **natural tooth-like appearance** that meets the growing aesthetic demands of parents and children alike. The material's inherent translucency and ability to mimic the shade of natural teeth provide a highly aesthetic solution for anterior and posterior restorations .[9]This aesthetic advantage is particularly critical in pediatric dentistry, where restorations must blend seamlessly with the child's existing dentition to maintain confidence and self-esteem.

Functionally, PEEK crowns possess **high strength and durability**, making them suitable for the high masticatory forces in pediatric patients. Unlike zirconia crowns, which are rigid and prone to chipping, PEEK offers sufficient flexibility to withstand functional stresses without compromising its structural integrity .[11]Moreover, PEEK's low abrasiveness ensures minimal wear on opposing dentition, further preserving the child's natural teeth .[8]

Lightweight and Comfortable

Another notable advantage of PEEK crowns is their lightweight nature, which contributes to enhanced comfort for pediatric patients. Unlike metal-based crowns that may feel bulky or heavy, PEEK crowns are well-tolerated by children, improving overall acceptance of the restoration. [7]The absence of a metallic taste, often associated with stainless steel crowns, further adds to their comfort and appeal .[11]

This ease of acceptance is crucial in pediatric dentistry, as it minimizes anxiety and fosters a positive dental experience for young patients, encouraging better compliance with oral health treatments .[8]

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Potential for Customization

PEEK crowns are highly customizable, allowing clinicians to modify their **shade and shape** to achieve optimal aesthetics and functionality. The material can be fabricated in various shades to match the child's natural tooth color, ensuring a harmonious and natural appearance.[9] Additionally, PEEK's compatibility with CAD/CAM technology allows for precise customization of crown shapes and sizes to fit the unique dental anatomy of pediatric patients .[11]

This ability to tailor restorations to individual needs not only enhances their esthetic appeal but also ensures better fit and function, making PEEK crowns a versatile option for a wide range of clinical scenarios in pediatric dentistry .[8]

In conclusion, the biocompatibility, aesthetic superiority, functional resilience, lightweight design, and customizability of PEEK crowns position them as an advanced and effective restorative option for pediatric patients, addressing both clinical and aesthetic challenges in modern pediatric dentistry.

8.LIMITATIONS AND CHALLENGES

Initial Cost and Accessibility

One of the primary limitations of PEEK crowns in pediatric dentistry is their **high initial cost**. The requirement for advanced equipment such as CAD/CAM systems or 3D printing technology adds significantly to the upfront investment for dental practices .[9]Unlike traditional stainless steel crowns (SSCs), which are mass-produced and readily available at a lower cost, PEEK crowns necessitate a more complex fabrication process, leading to higher material and production expenses .[8]

This cost disparity can limit the accessibility of PEEK crowns, particularly in regions where financial constraints are a concern. While their long-term benefits may justify the expense, the high initial investment remains a barrier to widespread adoption .[11]

Technique Sensitivity

The placement of PEEK crowns requires **specialized training** and lab support, which can pose challenges for clinicians unfamiliar with the material. The bonding protocols for PEEK are more sensitive than those for traditional materials, as the material's low surface energy necessitates specific surface treatments such as sandblasting and the use of chemical primers to ensure adequate adhesion.[7]

Additionally, any deviation from the recommended protocols can compromise the bond strength, leading to potential failures such as debonding or marginal leakage. This level of technique sensitivity may deter some clinicians from incorporating PEEK crowns into their practice unless they receive proper training and support.[8]

Limited Long-Term Clinical Data

As a relatively new material in pediatric dentistry, **long-term clinical data** on the performance of PEEK crowns remains limited. While initial studies demonstrate promising outcomes in terms of durability, aesthetics, and biocompatibility, there is a lack of large-scale, long-term studies to validate these findings over extended periods .[11]

This limitation makes it challenging for clinicians to fully assess the longevity and cost-effectiveness of PEEK crowns compared to well-established alternatives such as SSCs and zirconia crowns. As more clinical trials and observational studies are conducted, a clearer picture of their long-term efficacy and reliability will emerge .[9]

Color Stability and Finishing

Achieving and maintaining the **color stability and polish** of PEEK crowns can be technically challenging. While the material offers an initial natural tooth-like appearance, its surface finish may degrade over time due to wear and exposure to dietary acids and pigments. Maintaining a durable polish and preventing discoloration require precise finishing techniques during fabrication and regular maintenance by the patient.[9]

This limitation is particularly relevant in pediatric patients, where poor oral hygiene practices may accelerate surface changes, impacting the crown's aesthetic appeal. Addressing these challenges involves developing improved finishing protocols and surface treatments to enhance the material's resistance to discoloration and wear .[8]

In summary, while PEEK crowns offer numerous advantages, their **high cost**, **technique sensitivity**, **limited long-term data**, and challenges with **color stability and finishing** represent barriers to their

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widespread adoption in pediatric dentistry. Overcoming these limitations will require advancements in technology, better training for clinicians, and further research to validate their long-term efficacy and cost-effectiveness.

9.FUTURE PERSPECTIVES

Technological Advancements

The future of PEEK crowns in pediatric dentistry is poised for growth through continuous **technological advancements**. Innovations in PEEK formulations, such as the incorporation of **modified fillers** and pigments, are being explored to enhance the material's mechanical properties and aesthetic appeal .[11]These improvements aim to address the current challenges of color stability and surface finish, making PEEK crowns even more suitable for pediatric applications.

Additionally, advancements in **digital workflows** and **chairside milling technology** are expected to revolutionize the fabrication process. The integration of high-speed milling machines and improved CAD software will enable clinicians to design and manufacture PEEK crowns in-office, significantly reducing chairside time and costs.[7] Such advancements will enhance accessibility and encourage broader adoption of PEEK crowns in daily clinical practice.[11]

10.CONCLUSION

Polyetheretherketone (PEEK) has emerged as a promising **next-generation solution** for pediatric crowns, offering a unique combination of biocompatibility, aesthetic appeal, and mechanical strength. Its **non-allergenic nature**, reduced plaque accumulation, and favorable tissue response make it particularly suitable for children, where oral health and comfort are paramount. PEEK's ability to mimic the natural appearance of teeth, coupled with its durability and low abrasiveness, ensures a functional and visually appealing restoration. Additionally, the success of PEEK crowns hinges on adhering to precise clinical protocols, including minimal tooth preparation, appropriate bonding techniques, and proper follow-up care.

Clinical Implications

PEEK crowns have the potential to **replace or supplement existing pediatric crown options** such as stainless steel and zirconia crowns. Their superior biocompatibility and customizable aesthetics position them as a viable alternative for parents seeking both functional and visually appealing restorations for their children.Furthermore, the lightweight and comfortable nature of PEEK crowns ensures better acceptance by pediatric patients, contributing to a positive dental experience.

The adoption of PEEK crowns can also enhance **parent satisfaction**, as these crowns address concerns about the visual impact of traditional metal crowns while maintaining long-term durability .For clinicians, PEEK represents a versatile material that combines the advantages of advanced technology with a minimally invasive approach, making it a valuable addition to pediatric restorative dentistry.

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