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Provisional dental Restorations from foundation to advanced materials and techniques in modern prosthodontics

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التركيبات السنية المؤقتة من الأساسيات الى المواد والتقنيات الحديثة في طب الأستعاضة السنية الحديثة

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Abstract:
Provisional restorations are an essential component of contemporary restorative and implant dentistry extending beyond their traditional role as temporary replacements to become a critical factor in achieving successful treatment outcomes. It contributes to protecting prepared teeth and implant sites, preserving periodontal and peri-implant soft tissues, maintaining occlusal stability, restoring function and esthetics and allowing clinicians to evaluate treatment outcomes before placement of the definitive restoration. Recent advances in restorative materials and digital technologies including computer-aided design/computer-aided manufacturing (CAD/CAM) systems and three-dimensional (3D) printing have significantly improved the precision, mechanical performance and clinical efficiency of provisional restorations. This review literature demonstrates the current evidence regarding the clinical significance of provisional restorations their biological, functional and esthetic roles, provisional restorative materials from conventional and digital fabrication techniques and their applications in implant dentistry when well-designed enhance soft tissue management, improve patient comfort, facilitate treatment planning and contribute to the long-term success of definitive restorations. Furthermore, digital fabrication techniques have shown superior accuracy and clinical performance compared with conventional methods. Overall, provisional restorations should be considered an integral therapeutic phase that plays a pivotal role in achieving predictable and successful restorative and implant treatment outcomes. The aim of this study is presence the impact of digital technologies, particularly CAD/CAM systems and digital workflows on the fabrication, accuracy and clinical performance of provisional restorations and summarize the current evidence regarding the influence of provisional restorations on the success and long-term outcomes of restorative and implant-supported treatments.

Key words: Provisional restorations, Implant dentistry, Tissue conditioning, CAD/CAM, 3D printing, Immediate implant placement, Fixed prosthodontic.

الملخص:
تُعدّ الترميمات المؤقتة عنصرًا أساسيًا في طب الأسنان الترميمي وزراعة الأسنان الحديث، إذ يتجاوز دورها التقليدي كبدائل مؤقتة لتصبح عاملًا حاسمًا في تحقيق نتائج علاجية ناجحة. فهي تُسهم في حماية الأسنان المُحضّرة ومواقع الزرع، والحفاظ على الأنسجة الرخوة المحيطة بالزرعة ولثة الأسنان، والحفاظ على استقرار الإطباق، واستعادة الوظيفة والجمال، وتمكين الأطباء من تقييم نتائج العلاج قبل وضع الترميم النهائي. وقد ساهمت التطورات الحديثة في مواد الترميم والتقنيات الرقمية، بما في ذلك أنظمة التصميم والتصنيع بمساعدة الحاسوب (CAD/CAM) والطباعة ثلاثية الأبعاد (D3)، في تحسين دقة الترميمات المؤقتة وأدائها الميكانيكي وكفاءتها السريرية بشكل ملحوظ. تستعرض هذه الدراسة الأدلة الحالية المتعلقة بالأهمية السريرية للترميمات المؤقتة، وأدوارها البيولوجية والوظيفية والجمالية، ومواد الترميم المتاحة، وتقنيات التصنيع التقليدية والرقمية، وتطبيقاتها في طب زراعة الأسنان. تُظهر الدراسات المنشورة أن الترميمات المؤقتة المصممة جيدًا تُحسّن إدارة الأنسجة الرخوة، وتُعزز راحة المريض، وتُسهّل تخطيط العلاج، وتُسهم في نجاح الترميمات النهائية على المدى الطويل. علاوة على ذلك، أظهرت تقنيات التصنيع الرقمي دقةً وأداءً سريريًا فائقين مقارنةً بالطرق التقليدية. وبشكل عام، ينبغي اعتبار الترميمات المؤقتة مرحلة علاجية أساسية تلعب دورًا محوريًا في تحقيق نتائج علاجية ناجحة ومتوقعة في مجال الترميم وزراعة الأسنان. تهدف هذه الدراسة إلى تحديد تأثير التقنيات الرقمية، وخاصة أنظمة CAD/CAM وسير العمل الرقمي، على تصنيع ودقة وأداء الترميمات المؤقتة، وتلخيص الأدلة الحالية المتعلقة بتأثير الترميمات المؤقتة على نجاح ونتائج العلاجات الترميمية والعلاجات المدعومة بالزرعات على المدى الطويل.

الكلمات المفتاحية: التعويضات المؤقتة، طب زراعة الأسنان، تهيئة الأنسجة، التصميم والتصنيع بواسطة الحاسوب، الطباعة الثلاثية الأبعاد، الزراعة الفورية للأسنان، تركيبات الأسنان الثابتة.

Introduction:

Provisional restorations also referred as an interim restorations or provisional prostheses which are temporary dental restorations designed to replicate the form, function and esthetics of the planned definitive prosthesis during the treatment period. They serve as an essential transitional phase, allowing clinicians to evaluate the proposed treatment outcome before placement of the final restoration while maintaining the integrity of the prepared teeth and surrounding oral tissues [1]. Temporary restorations are essential to the success of restorative dentistry and implant dentistry. Biologically, they protect prepared teeth from thermal, mechanical, and chemical irritation, reduce bacterial contamination, and promote healing of the surrounding soft tissues. Functionally, they maintain occlusion relationships, stabilize tooth position, and enable proper chewing and articulation throughout the treatment period. Temporary restorations also provide valuable diagnostic information by allowing for the assessment of aesthetics, occlusion, patient comfort, and soft tissue profiles before the fabrication of the final prosthesis. In implant dentistry, temporary restorations are particularly important for maintaining and shaping the soft tissues surrounding the implant [2]. Recent advancements in digital dentistry have revolutionized the fabrication of temporary restorations. The integration of computer-aided design and manufacturing (CAD/CAM) technology with digital workflows has enabled dentists to produce highly precise, aesthetically pleasing, and functional temporary restorations with greater efficiency and effectiveness. Compared to traditional fabrication techniques, digital workflows reduce in-office and laboratory time, improve the accuracy of restoration edges, enhance patient comfort, and facilitate communication between the dentist and the dental laboratory [3]. These technological advancements have expanded the role of temporary restorations in implant dentistry. The combination of cone-beam computed tomography (CBCT), digital intraoral scanning, and virtual implant planning software allows dentists to fabricate temporary restorations prior to implant placement. This digital approach supported by prosthetics, improves implant positioning accuracy during surgically guided procedures, facilitates immediate temporary fitting, preserves surrounding soft tissues and contributes to superior functional and aesthetic outcomes. CAD/CAM-fabricated temporary restorations have become an integral part of modern restorative and implant dentistry. Despite the widespread use of temporary restorations in restorative dentistry and implantology significant advancements in restorative materials, digital workflows, and computer-aided manufacturing (CAD/CAM) techniques have led to a wide range of clinical options with varying indications, advantages, and limitations. Furthermore, the growing body of evidence regarding the biological, mechanical, functional, and aesthetic performance of temporary restorations has yielded diverse, and sometimes conflicting, results. Therefore, a comprehensive review of the current literature is essential to synthesize the available evidence, highlight recent technological developments, and provide clinicians with an up-to-date understanding of the role of temporary restorations in achieving successful and predictable treatment outcomes. The rapid evolution of restorative materials, CAD/CAM technologies and digital workflows has introduced numerous fabrication techniques and clinical protocols, resulting in variability in treatment approaches and reported outcomes.

Although a substantial body of literature has evaluated different aspects of provisional restorations, the available evidence remains dispersed across various clinical applications and materials. Therefore, a comprehensive review is needed to integrate current evidence and clarify the role of provisional restorations as a cornerstone for achieving predictable biological, functional and esthetic treatment outcomes in contemporary restorative and implant dentistry.

Fundamentals of Provisional Restorations:

Temporary restorations also known as interim restorations, are restorations designed to mimic the form, function, and appearance of the planned final restoration during the transition period between tooth preparation and the fabrication of the final restoration. These restorations are an integral part of restorative and orthodontic treatments, serving not only as temporary replacements but also as essential therapeutic and diagnostic tools [4]. According to the Dictionary of Prosthodontics, a temporary restoration aims to provide aesthetic appearance, function, and stability for a limited period before being replaced by the final restoration. Similarly, Schillingberg's "Fundamentals of Fixed Prosthodontics" describes temporary restorations as those that protect prepared teeth from damaging thermal, chemical, and mechanical factors, maintain occlusion relationships, and preserve gingival health throughout the treatment period. In addition to protecting the pulp and reducing dentin sensitivity, temporary restorations maintain the position of adjacent and opposing teeth, support soft tissue healing, and allow dentists to assess occlusion, articulation, form, and aesthetics before fabricating the final restoration. Temporary restorations should be viewed not only as transitional restorations, but as essential therapeutic components that contribute significantly to the predictability, effectiveness, and long-term success of restorative and implant dental treatments.

Provisional restorations can be classified according to their method of fabrication into chairside-fabricated (direct) and laboratory-fabricated (indirect) provisional restorations. The selection of the appropriate technique depends on several factors including the number of teeth involved, the complexity of the case, esthetic requirements, treatment duration and available clinical resources.

Chairside-Fabricated (Direct) Provisional Restorations:

Chairside-fabricated provisional restorations are fabricated and delivered during the same clinical appointment immediately after tooth preparation. They are widely used because they provide immediate protection for prepared teeth while maintaining function, esthetics, and periodontal health throughout the treatment period. Several techniques are commonly employed for the direct fabrication of provisional restorations [5].

Matrix (Copy) Technique:

A preoperative matrix is fabricated using materials such as alginate, silicone putty, or vacuum-formed thermoplastic sheets. The matrix is filled with provisional restorative material and positioned over the prepared tooth to reproduce the original tooth morphology. This technique is particularly suitable for single-unit or short-span restorations because of its simplicity, speed, and satisfactory anatomical accuracy.

Shell (Direct–Indirect) Technique:

This hybrid technique combines laboratory and chairside procedures. A preformed acrylic or resin shell is fabricated on a diagnostic cast before tooth preparation and is subsequently relined intraorally with autopolymerizing resin to achieve precise adaptation. It is particularly indicated for multiple-unit restorations and cases with high esthetic demands, as it reduces chairside adjustments while improving fit and contour.

Laboratory-Fabricated (Indirect) Provisional Restorations:

which are fabricated entirely outside the oral cavity using definitive impressions or digital scans and working casts. After fabrication, the restorations are adjusted, finished, polished, and cemented during a subsequent clinical appointment. Compared with chairside-fabricated restorations, indirect provisional restorations generally exhibit superior marginal adaptation, anatomical contour, surface finish, mechanical strength, and esthetic quality. Consequently, they are the preferred choice for complex restorative cases, including multiple-unit prostheses, full-mouth rehabilitation, and implant-supported provisional restorations.

Provisional restorations have main importance to get successful treatment planning by Biological importance which play a fundamental biological role during the interim phase of restorative treatment by protecting prepared teeth and maintaining the health of the surrounding oral tissues. They act as a protective barrier that isolates the prepared tooth from the oral environment, thereby minimizing bacterial contamination, reducing pulpal irritation, and preventing thermal, chemical, and mechanical insults. Properly fabricated provisional restorations help preserve pulp vitality while promoting favorable healing of the periodontal tissues. In addition, accurate marginal adaptation minimizes plaque accumulation, food impaction, and gingival inflammation, thereby maintaining periodontal health throughout the treatment period. When fabricated using indirect techniques, provisional restorations

further reduce tissue exposure to residual resin monomers and polymerization heat, decreasing the risk of chemical irritation and improving overall biocompatibility**.** Functional importance from a functional perspective the provisional restorations are essential for maintaining normal oral function throughout the restorative treatment period. They preserve occlusal relationships, maintain tooth position, and prevent undesirable tooth movement, extrusion of opposing teeth, or drifting of adjacent teeth. Furthermore, well-adapted provisional restorations facilitate efficient mastication, support normal speech, and ensure appropriate distribution of occlusal forces, thereby improving patient comfort and functional stability. In addition to their protective function, provisional restorations serve as valuable diagnostic tools by allowing both clinicians and patients to evaluate occlusion, esthetics, phonetics, and overall function before the fabrication of the definitive prosthesis. This evaluation enables necessary modifications, ultimately contributing to greater predictability and long-term success of the final restorative treatment [6].

The provisional restorations have main roles to success treatment planning:

- **Firstly: The effect of provisional restorations on Peri-restorative tissue health and tooth stability** provisional restorations play a fundamental role in ensuring the success of restorative and implant treatments by protecting prepared teeth and preserving the health of the surrounding oral tissues throughout the treatment period. Rather than serving merely as temporary replacements, they function as biologically active restorations that maintain the integrity of the prepared teeth until placement of the definitive prosthesis. One of the primary biological functions of provisional restorations is to provide an effective seal over prepared teeth, thereby minimizing bacterial contamination, reducing dentinal hypersensitivity, and protecting the dental pulp from thermal, chemical, and mechanical irritation. Well-adapted provisional restorations also preserve periodontal health by maintaining proper marginal adaptation and emergence profile, reducing plaque accumulation, minimizing gingival inflammation, and supporting the healing and maturation of surrounding soft tissues.

Provisional restorations contribute significantly to tooth stability during treatment by maintaining the position of prepared teeth, preventing undesirable tooth migration or supra-eruption of opposing teeth, and preserving proximal contacts and occlusal relationships. These functions are essential for ensuring accurate seating of the definitive restoration and minimizing the need for additional clinical adjustments [7]. Current evidence also indicates that indirectly fabricated and digitally manufactured provisional restorations generally provide superior marginal adaptation, dimensional accuracy and surface quality compared with conventionally fabricated restorations, thereby enhancing biological compatibility and improving the predictability of restorative treatment outcomes.

- **Secondly: The role of provisional restorations in maintaining function and esthetics during treatment** provisional restorations play an essential role in maintaining oral function and esthetic appearance throughout the restorative treatment process. Functionally, they preserve normal mastication, phonetics, vertical dimension of occlusion, and occlusal stability, enabling patients to perform daily oral functions comfortably while definitive restorations are being fabricated. They also allow clinicians to evaluate occlusal contacts, mandibular movements, and functional adaptation before final prosthesis delivery, reducing the risk of occlusal discrepancies. From an esthetic perspective, provisional restorations serve as an indispensable diagnostic and therapeutic tool. They enable evaluation of tooth morphology, contour, incisal edge position, smile line, gingival architecture, emergence profile, lip support, facial harmony, and phonetics before definitive treatment. This provisional phase provides an opportunity to modify the restoration according to both clinician and patient expectations, thereby improving treatment predictability and patient satisfaction [8].

In implant dentistry, provisional restorations are particularly valuable for sculpting the peri-implant soft tissues and developing an ideal emergence profile, both of which are critical for achieving optimal esthetic outcomes. Contemporary digital technologies, including CAD/CAM systems and digital smile design, have further enhanced the precision and efficiency of provisional restorations by improving restoration accuracy, reducing clinical chairside time, and facilitating communication between clinicians and dental laboratories. Overall, the available literature consistently demonstrates that provisional restorations are indispensable therapeutic and diagnostic components of restorative and implant dentistry, contributing significantly to biological protection, functional stability, esthetic optimization, and the long-term success of definitive restorative treatment.

As previously mentioned stable, attractive, cozy and well-fitting contribute the secret to success whereas ineffective temporary care might make therapy more stressful and uncertain, the following are provided by high-quality temporaries they make it possible to see the desired aesthetic result, this enables the patient and dentist to voice any concerns they may have, directing the dental technician

and preventing aesthetic surprises in the finished restoration, the best tissue health and support required for excellent impressions are produced by temporary restorations with well-fitting margins, without it impressions are frequently erratic and of worse quality and endangering the restorations' final fit. Finally**,** the patient's and dentist's expectations are raised by aesthetic temporaries, which also motivate the technician to produce a more attractive outcome than the temporaries.

Recently numerous materials widely used to fabricate and manufacture the recommended provisional restorations Polymethyl methacrylate (PMMA) is widely used in the manufacture of temporary restorations, the thermopolymerized PMMA is commonly known as conventional acrylic resin is preferred due to its availability, low cost and relative ease of repair. However, the quality of PMMA restoration production is difficult to control through laboratory procedures and the durability of temporary acrylic resin restorations is affected by several factors including the type of material used, the manufacturing method, the patient's oral environment and the pressure applied during use. The heat generated during PMMA polymerization can damage soft tissues and produce an unpleasant odor, causing discomfort to the patient [9].

Bis-acryl:

Diacrylic resin is one of the most preferable used materials in temporary restorations due to its superior mechanical, physical and aesthetic properties. This resin is supplied with a two-paste automated mixing system which minimizes manual mixing errors reduces air entrapment and produces restorations with fewer voids and improved surface quality.

Compared to conventional polymethyl methacrylate (PMMA) the diacrylic resin exhibits less shrinkage during polymerization, reduced exothermic reaction during curing, superior color stability and improved marginal accuracy. These properties contribute to better patient comfort and a more comfortable fit for temporary restorations.

Furthermore, diacrylic materials offer satisfactory compressive and flexural strength for short-term clinical applications, making them particularly suitable for single crowns, short-term fixed partial dentures and temporary anterior restorations where aesthetics is paramount. However, despite their ease of use and excellent aesthetic appearance, diacrylate resins generally exhibit less fracture resistance compared to PMMA, and are more difficult to repair after breakage [10]. On other hand the Fabrication technique to using previous materials widely available from conventional fabrication techniques to more advanced techniques to get the best resulting restoration

Direct provisional fixed partial denture:

the patient's prepared teeth and gingival tissues directly form the restoration surface, eliminating the need for all intermediate laboratory procedures. This is suitable when assistant training and laboratory equipment are insufficient for efficiently producing indirect restorations. However, the direct technique has significant drawbacks such as the potential for tissue damage due to resin hardening and poor edge accuracy. Therefore, the routine use of directly formed temporary restorations is not recommended when indirect techniques are feasible.

Indirect provisional fixed partial denture:

this technique involves fabricating temporary restorations outside the mouth. Fabricating these restorations using the indirect method avoids the problems associated with the direct method and allows for the delegation of some tasks to dental assistants. The indirect method utilizes fast-setting plaster to fabricate the temporary restorations.

This technique offers several advantages over direct procedures, as there is no contact between the free monomer and the prepared teeth or gums, which can cause tissue damage or allergic reactions. It also avoids exposing the prepared tooth to the heat generated by the hardening of the resin. The indirect method produces a restoration with more precise edges, and because the dental assistant participates in the fabrication of the restoration in the laboratory, it saves valuable time for both the patient and the dentist [6].

Indirect-direct provisional fixed partial denture:

this technique produces a custom-designed external abutment, while the internal tissue surface is shaped using diagnostic templates that are not adequately prepared. This indirect-direct procedure offers several advantages. Thanks to this combined technique, session time can be reduced as the temporary abutment is fabricated prior to the patient's appointment. Improved control over the shape of the abutment also reduces the time required for lateral adjustments. Furthermore, less acrylic resin is used on the fabricated abutment, which reduces heat generation, chemical exposure, and polymerization shrinkage compared to the direct technique [11].

CAD/CAM milled provisional restorations:

CAD/CAM-fabricated temporary restorations have become a significant advancement in restorative dentistry and implantology due to their superior precision, excellent mechanical performance, and high clinical efficacy compared to traditional fabrication methods. In subtractive fabrication, temporary restorations are made from prefabricated polymethyl methacrylate (PMMA) molds, which are synthetically polymerized under controlled conditions, resulting in highly bonded materials with enhanced physical and mechanical properties. Compared to conventionally fabricate temporary restorations, CAD/CAM-fabricated restorations offer greater flexural strength, improved surface hardness, superior marginal adaptability, and enhanced dimensional stability. These properties reduce the risk of fracture, wear, and bacterial adhesion, while improving the lifespan and clinical performance of temporary restorations. The digital working mechanism enables precise data storage and reproduction, a feature particularly beneficial for patients undergoing total oral rehabilitation or long-term temporary prostheses. Although the milling process using CAD/CAM generates more material waste than additive manufacturing techniques and requires specialized equipment, its high accuracy, repeatability, and excellent aesthetic and mechanical results have made it one of the most reliable methods for manufacturing contemporary temporary restorations [12].

Computer-aided design and manufacturing (CAD/CAM) technology has introduced two distinct approaches to the fabrication of temporary restorations: subtractive manufacturing (milling) and additive manufacturing (3D printing). While milling removes unwanted material from pre-cured resin molds, additive manufacturing builds the restorations layer by layer using printable resin materials. The use of artificially hardened, high-density polymethyl methacrylate (PMMA) molds in CAD/CAM milling has demonstrated improved mechanical performance of temporary restorations compared to conventionally chemically hardened materials. Furthermore, several studies have reported that CAD/CAM milled PMMA exhibits superior strength compared to self-hardening PMMA and conventional diacrylate materials, even after artificial aging processes such as thermal cycling [13].

3D-Printed Provisional Restorations:

Three-dimensional (3D)-printed provisional restorations represent one of the most recent advancements in digital restorative dentistry. Unlike subtractive CAD/CAM milling additive manufacturing constructs restorations layer by layer using light-polymerized resin materials allowing the fabrication of complex geometries with minimal material waste and improved production efficiency. Among the available additive manufacturing technologies, the Digital Light Processing (DLP) and Stereo-lithography (SLA) are the most commonly used for producing provisional restorations because they provide high printing accuracy and facilitate the integration of digital workflows into routine clinical practice. Despite these advantages several factors continue to influence the clinical performance of 3D-printed provisional restorations. Their mechanical properties esthetic outcomes and biocompatibility are affected by the resin composition, filler characteristics, photoinitiator system, printing orientation, layer thickness, washing procedures and post-curing protocols. In particular, the post-curing process plays a critical role in achieving an adequate degree of polymerization which directly influences flexural strength, surface hardness, color stability, and the long-term durability of the restoration. Insufficient post-curing may result in incomplete polymerization reduced mechanical performance and inferior color stability whereas optimized post-curing protocols significantly enhance the physical and mechanical properties of 3D-printed provisional restorations. Although recent studies have demonstrated that 3D-printed provisional restorations exhibit satisfactory clinical performance and offer significant advantages in terms of digital workflow, customization, and manufacturing efficiency, further research is still required to establish standardized printing and post-processing protocols that ensure consistent mechanical properties, esthetic quality, and long-term clinical success [14].

Clinical applications of provisional restorations in implant dentistry:

The role of provisional restorations in immediate implant placement and immediate loading which has become one of the most widely accepted treatment protocols in contemporary implant dentistry because it reduces treatment time, preserves alveolar bone architecture and improves patient satisfaction. An important advancement of this protocol is immediate implant placement with provisionalization (IIPP) in which a provisional restoration is delivered immediately after implant placement. This approach allows patients to maintain esthetics and function throughout the healing period while supporting favorable biological and prosthetic outcomes [15]. Provisional restorations play a pivotal role in immediate implant therapy by protecting the surgical site, preserving peri-implant soft tissue architecture and guiding the development of an ideal emergence profile. It also provides support

for the interdental papillae and facial gingival contour thereby contributing to superior esthetic outcomes, particularly in the anterior maxillary region. In addition, immediate provisional restorations enhance patient comfort, maintain phonetics, masticatory function and reduce the psychological impact associated with tooth loss during treatment [16]. Despite these advantages successful immediate provisionalization requires careful case selection and meticulous treatment planning. Several factors influence the predictability of this approach including primary implant stability, bone quality and quantity, soft tissue biotype, occlusal loading and esthetic requirements. Inadequate implant stability or excessive functional loading may result in implant micromovement, potentially compromising osseointegration and increasing the risk of treatment failure. Therefore, immediate provisional restorations should be designed to minimize occlusal forces during the healing phase while maintaining optimal soft tissue support. Overall, the current evidence suggests that implant-supported provisional restorations are not merely temporary prostheses but essential therapeutic components that contribute significantly to the biological, functional and esthetic success of immediate implant placement and immediate loading protocols.

Challenges of implant-supported provisional restorations:

Implant-supported provisional restorations are an essential component of implant therapy; however, their clinical success depends on appropriate material selection, fabrication technique, prosthetic design and careful case management. Despite their numerous biological, functional and esthetic benefits, several clinical and mechanical challenges may compromise treatment outcomes if they are not properly addressed. One of the most common challenges is achieving accurate marginal adaptation and an optimal emergence profile. Poor adaptation of the provisional restoration may facilitate plaque accumulation, increase bacterial colonization and compromise peri-implant soft tissue health which leading to mucosal inflammation and unfavorable esthetic outcomes. Material-related factors including polymerization shrinkage and dimensional changes associated with acrylic resins such as polymethyl methacrylate (PMMA) may reduce marginal accuracy and negatively affect the fit of the restoration. Therefore, maintaining precise marginal integrity is essential for protecting peri-implant tissues and promoting long-term implant success [17]. another important challenge concerns the biocompatibility of provisional restorative materials residual monomers released from acrylic-based materials and the heat generated during polymerization may cause irritation to the surrounding soft tissues. Consequently, selecting highly biocompatible materials and appropriate fabrication techniques is essential to minimize tissue irritation and promote healthy peri-implant tissue healing. In addition, provisional restorations should possess adequate mechanical strength, dimensional stability, wear resistance, and acceptable esthetic properties to withstand functional demands throughout the healing period.

The fabrication technique also has a considerable influence on the clinical performance of implant-supported provisional restorations, although direct fabrication techniques are simple and require less chairside time, they may be associated with reduced accuracy, contamination by saliva or blood and limited control over restoration contours. In contrast, indirect and CAD/CAM fabrication techniques generally provide superior marginal adaptation, improved emergence profile design, enhanced dimensional stability and greater reproducibility, thereby improving the predictability of clinical outcomes. Mechanical complications remain another significant concern. Fracture of provisional restorations may occur during fabrication, adjustment, removal, or functional loading. These failures are commonly associated with insufficient material thickness, internal porosities, fatigue, excessive occlusal forces or parafunctional habits such as bruxism. In implant-supported restorations, fracture or inadequate occlusal adjustment may also result in excessive loading of the implant, increasing the risk of implant micromovement during the osseointegration phase and potentially compromising implant stability. Therefore, careful occlusal adjustment and the use of high-strength provisional materials are essential to minimize these complications [9]. maintaining peri-implant soft tissue architecture throughout the provisional phase presents an additional clinical challenge. Improper contouring of the provisional restoration may impair the development of an ideal emergence profile, reduce papillary support and compromise the final esthetic result. Regular clinical follow-up, relining or contour modification when necessary and meticulous oral hygiene instructions are therefore essential for preserving peri-implant tissue health and ensuring predictable functional and esthetic outcomes.

Materials and Methods:

This study employs a descriptive and analytical literature review methodology to examine the current evidence regarding the role of temporary restorations in achieving successful outcomes in restorative and implant dentistry. This review critically designed as narrative literature analyzes and synthesizes

findings from previously published scientific literature to provide a comprehensive understanding of the biological, functional, aesthetic and clinical significance of temporary restorations. This review relies exclusively on secondary data from reputable scientific sources which including articles published in peer-reviewed journals, International scientific databases (e.g., PubMed, Scopus, ScienceDirect and Google Scholar), Text books in prosthodontics and restorative dentistry, clinical guidelines and compatibility data and Recent systematic reviews and meta-analyses.

Results:

The study concluded that provisional restorations are essential components of restorative dentistry not merely temporary replacements. They significantly contribute to protecting prepared teeth, maintaining gingival health, preserving pulp vitality and ensuring occlusion stability throughout the treatment period which enhances patient satisfaction and psychological acceptance.

Furthermore, digital technologies particularly (CAD/CAM) systems have significantly improved the fabrication of temporary restorations by improving accuracy, strength, surface quality and aesthetic performance while reducing clinic and laboratory time in implant dentistry, ttemporary restorations facilitate soft tissue contouring and optimize aesthetic results in selected cases.

The review also highlights that CAD/CAM-fabricated PMMA materials generally exhibit superior mechanical properties, dimensional stability and color stability compared to temporary restorations fabricated using traditional methods. overall, appropriate treatment planning, careful material selection and suitable fabrication techniques are critical factors influencing the long-term success of final restorations.

Recommendations:

Further research is recommended to develop advanced provisional materials with improved strength, aesthetics, and biological compatibility.

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