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Hybrid Prosthesis - A Literature Review

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Abstract: ***Advancements in implant dentistry have considerably broadened the spectrum of fixed prosthetic options available for tooth replacement. These developments have contributed to enhanced functional performance and improved aesthetic outcomes, thereby offering patients more natural and durable restorative solutions. Furthermore, these innovations have been associated with increased treatment success rates and greater patient acceptance, primarily due to the improved stability and retention afforded by implant-supported restorations. Among the various rehabilitative approaches for edentulous patients, the implant-supported hybrid prosthesis has emerged as a notable solution. This type of prosthesis typically incorporates a combination of two or more materials, such as a metallic framework coupled with an acrylic or composite resin base, supporting artificial dentition. The hybrid design provides superior mechanical strength, durability, and esthetic qualities compared to conventional dentures, ensuring enhanced load distribution and patient comfort. Implant-supported hybrid prostheses are particularly beneficial in clinical situations characterized by limited bone volume or when economic constraints restrict the number of implants. These prostheses not only restore masticatory function but also contribute to the restoration of facial contours, significantly improving patients' quality of life and psychosocial well-being. Implant-supported hybrid dentures represent a reliable and effective modality for the rehabilitation of edentulous patients. By integrating the advantages of fixed implant-supported restorations with the adaptability and cost-effectiveness of removable prostheses, they constitute a valuable treatment option within contemporary implant dentistry.***

Keywords: hybrid prosthesis, dental implants, fixed restorations, esthetic restorations

1. Introduction

One of the established methods for replacing missing teeth is the fabrication of complete dentures. Nevertheless, removable complete dentures are often associated with significant functional limitations and aesthetic concerns. These issues are generally better addressed through fixed prosthetic treatment modalities, which offer superior functional stability and improved esthetic outcomes compared to their removable counterparts.

With the progressive advancements in implantology, the use of implant-supported prostheses has introduced a range of fixed treatment options for patients with complete edentulism. These implant-based solutions not only enhance functional performance and aesthetic appearance but also demonstrate higher success rates and greater patient acceptance. Consequently, the increased reliability and patient compliance have contributed significantly to the rising prominence and widespread adoption of dental implant therapy[1].

A hybrid prosthesis is a specific type of implant-supported prosthesis that obtains its primary support from dental implants surgically placed within the jawbone. This prosthesis is typically constructed over a robust metal framework that serves as a stable foundation, securely anchored to the implants. The design of the hybrid prosthesis combines the advantages of fixed restorations with the versatility of removable dentures, providing improved functional stability, durability, and enhanced aesthetic outcomes.

In addition to superior mechanical support, hybrid prostheses offer significant aesthetic benefits by restoring natural tooth appearance and facial contours. The prosthesis effectively compensates for lost soft tissue and bone volume, thereby improving lip support and overall facial profile. This restoration of facial harmony contributes to a more youthful and natural appearance, which positively impacts patient confidence and quality of life.

This treatment modality is particularly advantageous for patients with extensive tooth loss or compromised bone structure, as it offers improved retention and comfort compared to conventional dentures, ultimately enhancing both oral function and esthetics[2]

According to GPT 9 hybrid **prosthesis is** a nonspecific term applied to any prosthesis that does not follow conventional design; frequently used to describe a dental prosthesis that is composed of different materials, types of denture teeth (porcelain, plastic, composite resin), variable acrylic denture resins, differing metals or design, etc; may refer to a fixed dental prostheses, removable dental prostheses, or maxillofacial prostheses.[3]

History of Hybrid Prosthesis

Hybrid prosthesis was originally designed by Swedish researchers using two endosseous implants which was supported by a denture whose framework made of gold[4]. The removable part of the prosthesis consisted of gold and acrylic teeth. Because of the increased cost of the gold alloy used, this could not be used, which further lead to the discovery of other materials such as cobalt- chromium, silver palladium and titanium alloys. Later with advancements in digital dentistry, cad-cam could be used to fabricate prosthesis which had higher rate of accuracy and comparatively less cost[4].

With the advancements in CAD-CAM, we are able to make prosthesis which are more aesthetic and durable with materials such as PEEK and zirconia[4].

Hybrid prostheses are commonly known by several proprietary and descriptive terms, including:

- All-on-Four (Nobel Biocare)
- Teeth Express (BioHorizons)
- Revitalize (Zimmer)
- Fixed Hybrid
- Hybridge
- Screw-Retained Fixed Hybrid Denture

Different Prosthetic Treatment Options for Implant

There are various prosthetic treatment options available for implant-supported restorations (Table 1). These options can be broadly classified into two main categories: fixed and removable prostheses. The fixed prostheses can be further subdivided into three types [5], each designed to address specific clinical needs.

Fixed-prosthesis type 3 involves the replacement of missing natural teeth using crowns along with a pink-colored restorative material. This material is used to simulate the gingival soft tissue, especially the interdental papilla, which plays a critical role in esthetics. This type of prosthesis is predominantly indicated for patients with a high lip line, where the visibility of the gingival collar is increased during speech and smiling. In such cases, the pink restorative material effectively mimics the appearance of natural gingiva, thereby enhancing the overall esthetic outcome.

Fixed-prosthesis type 3 is commonly prescribed for patients who present with multiple adjacent missing teeth, where both tooth replacement and soft tissue simulation are necessary to restore function and appearance.

Within this category, there are two primary types of prostheses:

- **Hybrid restoration:** This type consists of artificial teeth set in an acrylic base, which is supported by a metal substructure. The combination provides strength, durability, and a natural-looking appearance, making it a popular choice for restoring multiple teeth.
- **Porcelain-fused-to-metal (PFM) restoration:** This prosthesis features porcelain teeth fused onto a metal framework, offering enhanced durability and superior esthetics, especially in cases requiring a more refined appearance.

In patients exhibiting an excessive vertical dimension, porcelain-fused-to-metal restorations were traditionally indicated as the preferred treatment option due to their strength and esthetic qualities.

FP-1	Fixed prosthesis; replaces only the crown; looks like a natural tooth
FP-2	Fixed prosthesis; replaces the crown and a portion of the root; crown contour appears normal in the occlusal half but is elongated or hyper- contoured in the gingival half
FP-3	Fixed prosthesis; replaces missing crowns and gingival color and a portion of the edentulous site; prosthesis most often uses denture teeth and acrylic gingiva but may be porcelain to metal
RP-4	Removable prosthesis; overdenture supported completely by implants (usually with a superstructure bar)
RP-5	Removable prosthesis; overdenture supported by both soft tissue and implants (may or may not have a superstructure bar)

Criteria for Selecting Case for Implant Hybrid Prosthesis:

To give hybrid dentures generally patients with following bone density is selected.

- For the anterior maxilla bone type of D2 or D3 is indicated[6].
- For posterior maxilla bone type of D3 or D4 is indicated[6].
- Similarly for anterior mandible and posterior mandible bone type of D1/D2 and D2/D3 is ideal respectively.[6]

Minimum interarch space of around 15 mm in each arches is required.

Materials Used in Fabrication of Hybrid Prosthesis

Hybrid prosthesis can be fabricated using four different materials: -

- Traditional Acrylic with Titanium Substructure.
- Composite Hybrid Prosthesis
- Metal Framework with Individual Porcelain Crowns
- A milled zirconia framework with full contour teeth, layered ceramics.

Figure 1: Traditional Acrylic with Titanium Substructure

Figure 2: Composite hybrid prosthesis

Figure 3: Metal Framework with Individual Porcelain Crowns

Figure 4: A Milled Zirconia Framework with Full Contour teeth and Layered Ceramics

Hybrid Prosthesis Versus Implant Supported Overdentures

Removable implant supported overdentures generally provide patients with better stability and retention compared to conventional complete dentures; but however, their maintenance in terms of removing the prosthesis and fixing can cause a problem to some patients [7] . In such patients implant supported hybrid prosthesis will be of better treatment option considering its fixture to the implant and better maintenance. Similarly implant supported hybrid prosthesis is recommended in patients with gag reflex as the borders of the maxillary prosthesis can be finished shorter compared to the conventional overdentures [7].

According to a study done by al-Asad et al on the effect of BioHPP prosthetic design, it was found that the mechanical retention, screw loosening, implant fractures and were seen more in patients with overdentures compared to patients using hybrid dentures.[6]

Implant supported hybrid prosthesis is generally indicated for patients who have problems associated with retention on usage of complete dentures or overdentures for long term.[7]

2. Framework Design

The implant framework for hybrid prostheses can be fabricated using two primary design approaches, each with distinct structural characteristics:

Metal-Dominant Design:

In this design, the prosthesis is predominantly composed of a metal framework that provides the main structural support. The artificial teeth and denture bases occupy relatively minimal space, allowing the metal to bear the majority of functional loads. This configuration enhances the overall strength and durability of the prosthesis, making it suitable for patients requiring high mechanical stability. The metal framework also allows for precise adaptation to the implant abutments, ensuring a secure and stable fit.

Wraparound Design:

Conversely, the wraparound design places the emphasis on non-metallic components, primarily utilizing an acrylic resin denture base and artificial teeth to form the bulk of the prosthesis. The metal framework in this design is minimal and serves mainly as reinforcement rather than the primary supporting structure. This approach allows for greater esthetic customization and ease of repair or modification. It also reduces the weight of the prosthesis, potentially improving patient comfort. The wraparound design is particularly advantageous in cases where esthetics are prioritized, or when the anatomical limitations dictate a more conservative metal framework.[8]

Figure 5: Figure showing wraparound design

Factors taken into consideration during the fabrication of the framework include:

1) Bulk for strength
2) Adequate access for oral hygiene procedures
3) Reduced display
4) Strategic thinning of implant frameworks to allow for retention of acrylic resin denture teeth and denture bases of metal on both facial and occlusal surfaces [10].

3. Occlusion in Hybrid Prosthesis

Bilateral balanced occlusion is widely recommended for patients receiving implant-retained hybrid prostheses[11]. This occlusal scheme plays a crucial role in preserving alveolar bone by distributing occlusal forces evenly across both sides of the arch. It is particularly beneficial in cases where a mandibular hybrid denture opposes natural maxillary teeth, as it helps minimize uneven loading that could accelerate bone resorption.

To maintain the longevity and functionality of the prosthesis, patients should be scheduled for regular follow-up appointments. During these visits, careful occlusal adjustments are necessary to alleviate excessive pressure at contact points and to ensure balanced force distribution. Timely intervention in managing occlusal discrepancies helps prevent mechanical complications and further bone loss, thereby enhancing patient comfort and the overall success of the implant-supported restoration.

4. Conclusion

The primary objectives in the rehabilitation of the dental structure extend beyond mere restoration of function; they also encompass psychological support and the achievement of optimal aesthetic outcomes[12]. Successful dental rehabilitation aims to improve the patient's masticatory efficiency, speech, and overall oral health while

simultaneously enhancing self-esteem and psychological well-being.

For completely edentulous patients, the use of implant-supported hybrid dentures represents a viable and effective treatment option for full-mouth rehabilitation[12]. These prostheses not only restore essential oral functions but also provide improved facial support and natural appearance, which are critical factors in patient satisfaction. By addressing both the physical and psychological needs of the patient, hybrid dentures contribute significantly to the enhancement of quality of life.

No Conflict of interest associated with the study.

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