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Research Article

## AN OVERVIEW OF DIFFERENT MATERIAL AND ADVANTAGES USED IN DENTAL HYBRID PROSTHESIS

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### Abstract:

*The replacement of missing teeth has been a medical and cosmetic necessity for human kind. Nowadays, middle-aged population groups have experienced improved oral health, as compared to previous generations, and the percentage of edentulous adults can be expected to further decline. The long-term success of any kind of dental or dental implant restoration depends on practical stability with very little bone loss gradually. To achieve this, implants need to be placed into ample bone and stay clear of maintenance concerns. For maxillary full arch fixed restorations, the clinician needs to establish prior to surgical treatment which prosthetic layout will enable the patient to function without compromise and preserve gingival health and wellness to maintain bone. Gingival inflammation additional to plaque is well recorded and must be thought about with full arch restorations. the replacement of missing teeth has been a medical and cosmetic necessity for human kind. Nowadays, middle-aged population groups have experienced improved oral health, as compared to previous generations, and the percentage of edentulous adults can be expected to further decline.*

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**INTRODUCTION:**

Today dental implants have become one of the most exciting and rapidly developing aspects of dental practice. The rapid increase in the acceptability of dental implants as regular treatment in the late 20th and early 21st centuries is largely attributable to Swedish Professor Per-Ingvar Brånemark during the 1950's, an orthopedic surgeon who turned an accidental discovery into a dental revolution [1]. To acquire adequate functional and esthetic results, it is essential to achieve osseointegration and the ideal location of implants to support the designated restoration [2]. The major goal in implant therapy is either to avoid complete removable dentures by positioning of implant-supported fixed prostheses or to improve the retention and stability of removable full dentures [3]. Generally, two methods for an implant-supported fixed prosthesis exist. The fixed-removable prosthesis resembles a flangeless denture that is retained solely by several osseointegrated implants. There is no contact between the prosthesis and the tissues of the alveolar ridge. The original design of the fixed-removable prosthesis was developed by Swedish investigators using the two-stage endosseous implant system developed by Brånemark. The prosthesis consisted of a gold alloy framework attached to the copings of the implant. Acrylic resin denture teeth were arranged on the framework and secured with acrylic resin [3]. An option to this sort of fixed prosthesis is an implant-supported hybrid prosthesis [2]. Implant supported metal-acrylic resin complete fixed dental prosthesis, originally described as a hybrid prosthesis was presented to attend to the issues brought on by unstable and unpleasant mandibular dentures. The

primary factor that establishes the restoration type is the quantity of intra-arch space [2]. On top of that, other patient-relevant medical parameters such as lip support, high maxillary lip line throughout grinning, a low mandibular lip line throughout a speech or the patient's greater esthetic demands ought to be examined [2]. Hybrid prostheses have a great number of advantages consisting of reducing the influence force of dynamic occlusal loads, being less expensive to make and highly esthetic restorations [2]. Moreover, they may be successfully utilized by a combination of tilted and axially put implants in partial edentulism in the posterior part of resorbed maxillae [3]. Nevertheless, food impaction, speech problems or difficulties in dealing with health were reported by authors [2].

**DISCUSSION:**

Accurate and precise planning in dental implantology includes detecting any existing clinical difficulties prior to the treatment and foreseeing the final results before the treatment. Planning for esthetic cases requires different diagnostic perspective; it should include additional factors such as smile patterns and lip size, etc. In addition, the restorative space for the prostheses, which is measured from the platform of the implant to the opposing occlusion, is often overlooked when implant positions are planned [4]. The fixed-removable prosthesis stood for a special facet of prosthodontics restoration for edentulous arches, since implants were situated in the anterior area and the posterior areas of the structure were cantilevered from the former portion of the framework (**Fig. 1**). The length, height, and width of the cantilever are important in minimizing the amount of deformation of the prosthesis (**Fig.2**).



**Figure 1.** Conventional design for hybrid prosthesis with long distal cantilevers <sup>[5]</sup>.



**Figure 2.** Catastrophic fracture of distal extension due to extensive cantilever [5].

### **BENEFITS OF THIS METHOD:**

These dental bridges are a good alternative for any person that has shed teeth to trauma, or that has struggled with periodontal disease resulting in the loss of bone and tissues. They are also a very good option for patients who may have put on conventional dentures for many years, and who have lost substantial amounts of jawbone because of this.

Once teeth are removed from the jaw, the bone no longer gets the needed stimulation to maintain it healthy and balanced and strong, and is progressively reabsorbed, causing the bony ridge to become flatter. This creates a great deal of troubles for denture wearers, as this ridge is necessary for retention [2]. Dentures can become extra uncomfortable as they shift about, and extra unstable, producing problems with eating and speaking.

Hybrid dental bridges are securely fixed in position, and are shaped to replace lost tissue and bone, offering an extra youthful appearance by effectively sustaining the cheeks and lips. They allow wearers to take pleasure in a much greater variety of foods, providing improved nourishment, and can lead to a boost in self-confidence as worries over loose dentures are gotten rid of. Implant supported hybrid prosthesis can supply adequate results where esthetic and useful requirements are requiring and challenging as in increased intra-arch area that remains following standard implant replacements, the dentist needs to prepare for an alternative treatment procedure that finest fits the circumstance [2].

The patients' approval of the prosthetic treatment plan and corrective remedy were absolutely advertised by

the fabrication of dental implant supported hybrid prosthesis. The various other crucial element to take into consideration is the maintenance of prosthetic rehabilitation as well as the implants by sustaining the structure [2]. Regular checks are advised every 6 or 12 months to prevent problems and to analyze the standing of the peri-implant tissue [2]. Moreover, the dimension of radiographic peri-implant limited bone loss throughout the follow-up period is likewise recommended. Professional evaluations, in accordance with a previous record, [2] were made 1, 2, 6, and 12 months after the distribution of the prostheses and afterwards every year with aesthetic and radiographic evaluations

### **COMPLICATIONS:**

Hybrid prosthesis often refers to fixed recovery made up of a metal-based foundation covered with acrylic resin. With the advancement in dental implantology over the years, hybrid prosthesis has been efficiently used to rehabilitate completely edentulous ridges [8]. Generally, an edentulous arch could be rehabilitated in this method, making use of four to eight endosseous dental implant fixtures with screw retained hybrid restoration [9], [10]. In those cases, a one-piece full-arch hybrid prosthesis consisting of a metal framework, acrylic base and denture teeth is fabricated and screwed onto the implants [9], [10]. This treatment method permits patients to have a totally fixed prosthesis, which can only be gotten rid of by the dental expert [7]. Furthermore, by typically making use of a distally cantilevered prosthesis and angulated dental implant fixtures, it may need reduced number of implant fixtures and complicated operations such as maxillary sinus enhancement and led bone regrowth, contrasted to a standard technique (i.e. rehabilitating

with full-arch ceramo-metal implant supported fixed partial dentures) [10]. Previous research studies have actually reported high success rates of the prosthesis as well as sustaining dental implants utilizing this concept; however, most of these researches had actually reported minimal-short-term interventions with follow-up of less than 5 years [11]. Additionally, to the very best of authors' expertise, there may be no available literature, systemically examining the lasting results of this specific therapy modality.

The occurrence of difficulties after the oral restoration with implant supported hybrid prostheses is high. Nonetheless, there are few articles in the literary works regarding this sort of difficulties, making it difficult to contrast outcomes and analyze whether the existence of prosthetic troubles is frequent or not.

In Jemt's work the main issues discovered were the break of the acrylic teeth and difficulties in the diction, both referred primarily to the maxilla [12]. On the other hand, he observed that the extra constant difficulties created in the jaw were the injuries because of the lips and the cheeks biting. Purcell et al. valued the prosthetic problems that were created after the laying a total removable prosthesis in the maxilla and a hybrid mandibular prosthesis [13]. The troubles that affected the prosthetic fixed restoration were the break or the sweeping of the resin teeth and the loss, the wear or break of the prosthetic screw. Authors as Carlson and Carlson located a large fan of issues after the oral restoration with dental implant supported prostheses, whose resolution was going from the requirement to execute a small final touch to the dressmaking of a new prosthetic structure [14]. In the Goodacre's et al. meta-analysis one of the most constant problem referred to the implant supported prosthesis was the break of the resin teeth [15].

Nedir et al. carried a contrast between the fixed prosthesis and the detachable prosthesis on implants [16]. They observed that the detachable prosthesis

existed a major number of complications than the fixed prosthesis and that these incidences were emerging again later. The research of Aglietta et al. evaluated the survival rates of fixed prostheses on implants with cantilever and the incidence of biological difficulties or those concerning the medical strategy after an observation period of 5 years [17]. The most prevalent problem relative to the prosthesis were the fracture of teeth or loss of the prosthetic screw.

#### ORIGINAL OF FIXED HYBRID PROSTHESES:

Zarb and Jansson specified that frameworks (fixed prostheses) could be created in one of two means: where steel frameworks made up the mass of the prostheses [18]. Artificial teeth and very little denture bases were the only nonmetallic elements or implant fixed prostheses which was composed mainly of acrylic resin denture bases (wrap around design) and artificial teeth, with minimally sized metal structures (**Figure 3**) Implant therapy was based on fundamental prosthodontic principles that included preliminary and definitive impressions, jaw relationship records, wax try-in, metal framework try-in (with and without the artificial teeth), and insertion of definitive prostheses. Structures were fabricated according to the following standards: bulk for strength, sufficient accessibility for oral hygiene procedures, marginal display of metal on the facial and occlusal surface areas, and strategic thinning of implant frameworks to permit retention of acrylic resin denture teeth and denture bases. In removable partial denture (RPD) design, it was noted that the retentive portions of RPD frameworks must enable 1.5 mm density of resin. Density was additionally necessary to decrease the possible fracture of the acrylic resin base material surrounding the metal frameworks [19]. These principles have been extrapolated to fixed dental implant framework design. It is interesting to note that in a very early implant textbook, no reference was made about the lengths of the cantilevered segments [18].



**Figure 3.** Clinical image of an acrylic resin wrap around the mandibular, fixed implant hybrid prosthesis. The metal framework was completely enveloped within the hybrid prosthesis.

Frameworks for the original fixed, hybrid prostheses were waxed with gold alloy cylinders, cast with silver palladium alloys, and screwed right into place with little keeping screws [20]. Fixed hybrid prostheses splinted implants together using a solid, rigid metallic unit that fulfilled the purposes of strength, support, nontissue impingement, and noninterference in order to obtain the preferred cosmetic results [18].

#### **TYPES AND PHYSICAL PROPERTIES:**

##### **Cast Noble Alloys:**

Noble metals have been specified based on their chemical and physical features; noble alloys stand up to oxidation and corrosion by acids. There are four noble metals utilized in dental alloys: gold, palladium, silver, and platinum. These steels offer noble metal alloys their inert intraoral properties. Alloys which contain greater than 6% palladium are generally white/silver colored [21].

There has been raised use of palladium/silver alloys in dental implant prosthodontics. These alloys supply mechanical characteristics that are like type III gold alloys, however at lowered expense. Boosted quantities of silver boost ductility and reduced hardness; silver additionally lowers tarnish resistance. Alloys with high palladium materials normally consist of limited quantities of other noble metals.

Physical properties such as yield strength, Vickers hardness, and ductility (% elongation) are several of the features, clinicians and dental research laboratory technicians think about when making a decision which

alloy should be utilized for dental structures [21]. Reproducible procedures that result in constant, accurate, strong castings with high yield strengths are critical for long-term effective metal frameworks. Stress and anxiety resistance of alloys has an impact on the minimal measurements in important locations such as connector locations and cantilevers. Elastic modulus is likewise vital since it figures out the adaptability of steel frameworks. Adaptability is inversely proportional to the elastic modulus - an alloy with a high flexible modulus will certainly flex less under load than an alloy with a reduced elastic modulus. Casting accuracy is likewise crucial in order to produce scientifically appropriate frameworks.

Palladium/silver alloys usually consist of concerning 50 - 60% palladium; a lot of the equilibrium is normally silver. They generally exhibit acceptable tarnish and corrosion resistance. The elastic modulus for this group of alloys is the most positive of all the noble metal alloys and cause the least flexible castings [21]. One drawback with this group of alloys does not element right into frameworks for implant hybrid prostheses - the tendency to alter to an eco-friendly shade with porcelain applications.

##### **Cast Base Metal Alloys:**

Nonprecious or base metal alloys are composed of non-noble metals, besides beryllium, a priceless but non-noble metal. A lot of base metal alloys are based upon mixes of nickel and chromium, although cobalt/chromium and iron-based alloys are also utilized. Rust resistance for base metal alloys depends



upon various other chemical characteristics. After casting, a slim chromium oxide layer provides an impervious film that passivates the alloy surface. The layer is so thin that it does not dull the alloy surface. These alloys vary substantially from noble alloys as they have significant hardness, high yield strengths, and high elastic moduli. Prolongation amounts the gold alloys however is responded to by the high yield strength. Base metal alloys are dramatically more economical than noble alloys, but this may be negated by greater labor costs connected with ending up and polishing procedures. Allergies connected with nickel and nickel-containing alloys have been documented [22]. Inhaling dust from grinding nickel- and beryllium-containing alloys must be avoided.

#### **Milled Titanium Frameworks:**

Titanium and titanium alloys are well suited for use in clinical dentistry due to the fact that they have superb corrosion resistance, low specific gravity, and excellent biocompatibility; are low-cost; and have mechanical properties that resemble cast gold alloys. Titanium and its alloys are difficult to cast due to their high melting points, low density, and reactivity with components in casting investments [23].

#### **Milled Zirconium Frameworks:**

Zirconia has been offered for usage in restorative dentistry as a dental ceramic replacement for metal frameworks in fixed and implant prosthodontics. The sort of zirconia utilized in dentistry is yttria tetragonal zirconia polycrystal (YTZP). YTZP is a monophasic ceramic material created by straight sintering crystals collectively with no type of stepping in matrix to create a dense, polycrystalline structure. Yttria is added to zirconia to support and keep the material's physical features at lower temperature levels than would otherwise take place without yttria.

The flexural strength of zirconia oxide materials has been reported to be 900 - 1100 MPa [24]. There are 3 main types of zirconia made use of in clinical dentistry: fully sintered or hot isostatic pressing (HIP), partially sintered zirconia, and non-sintered or green-state zirconia. The latter two types are softer than HIP zirconia and more cost efficient to mill. After milling, zirconia frameworks are sintered.

#### **CONCLUSION:**

Hybrid prostheses have a multitude of benefits including lowering the effect force of dynamic occlusal loads, being cheaper to make and highly aesthetic restorations. Additionally, they might be effectively utilized by a combination of tilted and axially put implants in partial edentulism in the

posterior part of resorbed maxillae. Nevertheless, food impaction, speech complications or complications in dealing with hygiene were reported by authors.

The long-term success of any kind of dental or dental implant restoration depends on practical stability with very little bone loss gradually. To achieve this, implants need to be placed into ample bone and stay clear of maintenance concerns. For maxillary full arch fixed restorations, the clinician needs to establish prior to surgical treatment which prosthetic layout will enable the patient to function without compromise and preserve gingival health and wellness to maintain bone. Gingival inflammation additional to plaque is well recorded and must be thought about with full arch restorations. If the specialist does not recognize the preoperative anatomy of the patient, the implants could be positioned to not permit enough upkeep and result in complications after the final restoration is positioned.

Regardless of the favorable long-lasting end results attained with prosthetic rehabilitations with implants, biological and technological difficulties such as surgical complications, dental implant loss, bone loss, peri-implant soft-tissue issues, mechanical complications, and aesthetic/phonetic issues are constant.

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