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A Review of the Literature on Fit-Producing Techniques in Implant Prosthodontics

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ABSTRACT:

Purpose : This research is to evaluate the literature on cutting-edge methods for enhancing fit in implant prosthodontics with reference to the notion of the 'distortion equation.'ATID. **Materials & Methods:** The bulk of the studies under consideration recommended methods to enhance fit in implant prosthodontics and were either clinical or technique articles. As they relevant to the subject, a select few retrospective and prospective clinical trial studies were included. Only papers that discussed cutting-edge techniques to enhance fit were included in the reviews. This review's scientific studies all employed in vitro experimental methods. The more sophisticated techniques were divided into approaches that deal with intraoral indexing and approaches that make use of the implant master cast. **Results**: Only a few number of techniques have been scientifically shown to enhance success rates in implant prosthodontics. Despite this, the majority of the evaluated solutions still led to a modest misfit between the frameworks and the implant abutments/analogs. **Conclusion:** Even with the use of cutting-edge techniques, the idea of "passive fit" cannot be attained in implant prosthodontics. The suggested method for achieving a precise fit of the implant prosthesis to the intraoral abutments continues to be the use of diligent, correct implant prosthodontic procedures and the proper application of advanced methods.

Keywords*:* Literature, Fit-Producing Techniques, Prosthodontics

INTRODUCTION:

Clinical outcomes for osseointegrated titanium implants utilised in the t'ixed, detachable hybrid prosthesis are consistently positive[1-4]. Prosthetic and biologic issues still arise,

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nevertheless.Loss of osseointegration and crestal bone loss around implants are examples of biologic complications,[5-8]Prosthetic difficulties can include fracturing or locking of abutment-retaining screws as well as the loosening of prosthetic-retaining screws. Additionally, implant fracture and prosthesis fracture continue to provide therapeutic challenges. One theory for biologic problems and/or delayed component failure has been a nonpassive fit of the prosthetic framework to the implant abutments[9–12].

Numerous and meticulous clinical and laboratory tests are involved in implant prosthodontics,[13–18] The positional distortion of the gold cylinders to the implant abutments may result from any step in the fabrication process of the implant prosthesis.

"The relative movement of a single point, or a group of points, away from a previously stated reference position such that permanent deformation is obvious," according to Nicholls'[15–17] definition, is considered distortion.

It lists the manufacturing-related factors that affect the implant prosthesis's ultimate distortion. Even though the combined effect of all the errors may result in distortion that significantly increases internal stress in the implant-prosthesis complex, each individual factor's distortion may be clinically negligible. The system may be able to endure functional stress added on top of internal stress, or it may result in biologic and/or mechanical difficulties . Although not supported by science, the idea that problems could arise from a framework misfit seems logical in principle.

Limited clinical studies and animal testing The possibility of no biologic or mechanical difficulties developing with a "non-passive" implant framework was implied by jg546-i9),)aye. One study made the tenuous claim that improperly fitting faulty frameworks might be the cause of delayed component failure.

According to White, if certain procedures are followed, it is routinely achievable to obtain precise framework castings of the fixed detachable hybrid prosthesis. The "Sheffield fitting test" was used to gauge how well White's implant frameworks fit. At a terminal abutment, a gold screw held the framework to the implant master cast. At the opposite terminal abutment, a visual check was done to determine the distance between the gold cylinder and the laboratory analogues.White's [17]claim hasn't been subjected to any scientific investigation to determine its veracity.

This article's goal was to evaluate cutting-edge methods for enhancing fit in implant prosthodontics with reference to the distortion equation. The usage of 'implanf master casts' and advanced solutions that address intraoral indexing are both discussed.

METHODS AND MATERIALS:

The positional accuracy of the gold cylinders with respect to the implant ahutments in the mouth is checked using intraoral indexing techniques at various phases of the production process. To check for distortion throughout the entire fabrication process, these techniques focus on the implant master cast, implant framework, and final implant prosthesis stages.

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Intraorai indexing techniques include implant cast verification, soldering/"cast-to" procedures, and luting of the implant framework to implant components.

Implant Master Cast Verification

It has been advised to verify the implant cast using a verification index in order to build the implant prosthesis on a solid foundation. An index, often manufactured with autopolymerization acrylic resin, is made on the implant cast to verify the implant casf. Additionally advised is the use of heavy-gauge wire bonded to transfer impression copings. The verification index is then placed in the mouth for an assessment of its fit using the various techniques outlined in the literature.

The verification index is utilised to visually identify the erroneous abutment replica on the master cast if implant cast modification is the method of choice. The incorrect abutment replica is taken out, and the correct replica is then put back into the incorrect cast with the use of the verification index and gypsum material.

Following intraorai indexing, the cast-to procedure has also been suggested as a way to precisely join sections of large multiimplant frameworks. With base metal alloys, this technique has been utilised to unite parts and repair traditional fixed partial denture casts.

Sprues made of 10-gauge plastic or wax are fastened to the connecting joint after the sectioned framework has been coated with autopolymerization resin. The same alloy that was utilised to create the implant framework is invested, burnt off, and cast into the complex. On a 2-implant in vitro model, the cast-to approach was found to generate a fit for implant bars that was more accurate than the fits produced by soldering and electrowelding techniques.

Luting Framework to Implant Components

Another method is to implant the components of the final prosthesis or implant framework intraorally. The fabrication of the gold cylinders or implant components that will be connected to the intraoral abutments does not begin until either the framework or the final prosthesis has been created . The framework or final prosthesis is then connected intraorally to the implant components using one of the techniques described below.[19]

Clelland and van Putten examined frameworks that used composite resin to bind the framework parts together. Clelland and van Putten analysed strains produced by comparing therapeutically acceptable, conventional frameworks and abutment-luted frameworks to a bone-simulated model. Voitik originally named this approach the Kulzer Abutment Luting or KAL technique (Attachments International).[20] In this investigation, the frameworks were luted to the abutments using the KAL approach. It was discovered that the primary strain was statistically significantly reduced for the resin-luted frameworks.

DISCUSSION:

Although the proponents of cutting-edge tactics have claimed that the fit of implant frameworks will improve after using their procedures, very few techniques have undergone

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scientific evaluation (Table 2). 26-"[.16,18].Bü9fi However, one of the investigations found that using the suggested advanced method improved the fit of the implant framework. Using the photogrammetric measurement approach, Jemt observed no statistically significant difference between gold alloy-cast frameworks and frameworks made of titanium using a laser. Jemt's findings were different from those of Riedy et al " The latter claimed that compared to the cast one-piece frameworks, the laser-welded titanium frameworks were more precise.

The laser videography method, utilised by Riedy et al., was equivalent to the photogrammetric method (within 40 yim). In order to assess the implant framework fit, both investigations used a three-dimensional coordinate system with values that were converted into linear and angular data. Since the cast implant frameworks used in Lemt's trial were more accurate than those used in Riedy et alinvestigation, .'s there may be a difference in the outcomes. The polishing process, spruing method, type/method of investment, and type/manipulation of metal for casting are some of the variables that affect the lost-wax method utilised to create massive implant frameworks. [19] It is unclear if Jemt's frameworks were modified in any way following the clinical try-in process.

CONCLUSION:

Only a small number of the cutting-edge techniques that have been discussed and advocated in the literature have been shown to improve fit in implant prosthodontics. The majority of these tried-and-true advanced solutions nonetheless cause a minimal mismatch between the framework and the implant abutments or analogues. Despite the fact that the majority of the research are in vitro in nature, only 50% of them (EDM and titanium laser welding technique) have offered any additional evaluation of how well the framework fits in a hypothetical clinical scenario.[21] Inaccuracies of the finai implant prosthesis to the intraoral abutments are incorporated into their procedures by the use of a supposedly accurate implant master cast.

Numerous criteria suggest that even with the use of these more sophisticated techniques, the notion of passive fit can be realised in implant prosthodontics. To achieve the best possible fit of the implant prosthesis to the intraorai abutments, the use of rigorous and accurate implant prosthodontic treatments is still advised. With so many techniques available, it is up to the individual clinician to choose the best ones in order to get the greatest implant prosthesis fit for each unique clinical circumstance.[22] The reduction in distortion that results from using the procedures, the accessibility of tools and materials, expertise in using different tactics, convenience, and time efficiency are all factors that could affect this choice.

These variables include the distortion equation's individual component errors, advanced strategy errors, inaccurate manufacturing tolerances, and machine flexure. Long-term prospective clinical trials are required to correlate prosthesis misfit and delayed implant-component failure, despite the possibility of biochemical tolerance for prosthesis misfit raised by some investigations.

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