

Treatment Outcomes Of Implant Therapy For Partial Edentulism, Including Maxillary Anterior Tooth Replacement: A Review

Dr. Pradeep Shukla, Professor & HOD of Periodontics & Implantology (D. J. College of Dental Sciences & Research, Modinagar (UP), Dr. Ajay Gupta, Professor & HOD of Prosthodontics (D.J College Of Dental Sciences & Research, Modinagar (UP), Dr. Minni Chadha, Professor Department Of Periodontics & Implantology (D. J. College Of Dental Sciences & Research, Modinagar (UP), Dr. Chetan Ghiyal P.G. Student Department of Prosthodontics (D. J. College Of Dental Sciences & Research, Modinagar (UP), Dr. Deepak Grover, P.G. Student, Department Of Periodontics & Implantolog (D. J. College Of Dental Sciences & Research, Modinagar (UP)

PURPOSE

To document the literature regarding the outcomes of the implant restorations in the anterior maxilla or mandible to formulate consensus statements with regard to esthetics in implant dentistry, to provide guidelines to clinicians, and to articulate remaining questions in this area to be addressed in future research.

MATERIAL AND METHODS

Treatment outcomes of implant therapy for partial edentulism (including maxillary anterior tooth replacement); anterior maxillary anterior tooth replacement; effect of implant design; diameter, and the surface characteristics; soft tissue stability/contours around anterior implant restorations; ceramic abutments; influence of surgical techniques; and finally , evaluation of patient satisfaction—these are the areas of concern in this review article.

From a retrospective study comprising 1,920 IMZ implants (Interpore International, Irvine, CA), Haas and associates (12) reported a significantly lower cumulative survival rate for maxillary implants (37.9% at 100 months of follow-up) than for mandibular implants (90.4% at 100 months of follow-up). Implants placed in the anterior region of the maxilla failed significantly more often than those placed in the posterior region. Length and diameter of the implants had no significant influence on the cumulative survival rate.

Strategies for the replacement of missing or

nonrestorable teeth have changed significantly over the last few decades. To avoid traumatic and cost-intensive failure of already restored teeth, endosseous dental implants have become the treatment of choice in many clinical situations. Numerous clinical investigations with a large number of cases and long-term follow-up have proven the clinical efficacy and safety of implant supported restorations.(1)The original protocol as described by Brånemark and coworkers has been modified and continues to evolve . The original guidelines for the achievement of osseointegration invariably called for a submerged implant placement into healed bone and a load-free healing period prior to second-stage surgery and abutment connection.(6) The development and successful use of one-stage transmucosal implant systems have

demonstrated that a submerged healing period is not necessary for the achievement of histologic osseointegration.(9)

In numerous prospective long-term studies, implant survival rates comparable to those seen with two-stage protocols have been achieved. (12)

Eckert and Wollan (13) published a retrospective evaluation of up to 11 years of a total of 1,170 implants placed in partially edentulous patients and found no differences in survival rates related to the anatomic location of the implants. A meta-analysis concerning implants placed for the treatment of partial edentulism was carried out by Lindh and coworkers (14). The 6- to 7-year survival rate for single-implant crowns was 97.5%, while the survival rate of implant-supported

fixed partial dentures (FPDs) was 93.6%.

Davarpanah and coworkers(1) carried out a prospective controlled multicenter clinical trial comprising 1,583 3i implants (Implant Innovations, Palm Beach Gardens, FL) with a 1- to 5-year observation period. With a cumulative implant survival rate of 96.5%, their data confirmed the high overall degree of predictability of implant therapy in partially edentulous jaws. More specifically, they found a slightly higher survival rate in the maxilla (97.2%) than the mandible (95.8%), but a similar survival rate in anterior (96.7%) and posterior (96.5%) segments. In addition, this clinical study gives evidence of high success

rates using different threaded implant designs.

It is particularly important to consider the events that surround the healing of immediately loaded endosseous implants. Around implants placed with good primary stability, the surfaces in trabecular bone or bone marrow confront a process of woven bone formation, with new bone apposition observed within the first 2 weeks after implant placement.

The same implant's surfaces that are in contact with cortical bone confront the bone resorption process, evidenced at 3 to 4 weeks after implant placement. The early osteogenesis that occurs in the trabecular/medullary region contributes to implant stability and formation of an osseointegrated interface. However, the osteoclast- mediated resorption that occurs in cortical bone opposing the implant surface may reduce bone support at these early times. For the immediately loaded implant, incipient mechanical challenges are resisted by the implant's acquired primary stability. The implant's stability is changed as the combined result of bone formation in the trabecular/medullary compartment and bone resorption in the cortical compartment.

Another important factor in the immediate placement/provisionalization scenario is the choice of implant system. Considerable variations in implant surface and design (one-stage versus two-stage design) may also have a great impact on the definitive

result.

The survival rates of immediately restored single tooth implants, placed either immediately in fresh extraction sockets or in healed sites, were studied by Chaushu and coworkers in a controlled clinical trial. Twenty-eight immediately loaded implants, 19 placed in extraction sockets and 9 in healed sites, were followed for 6 to 24 months. The respective survival rates were 82.4% (extraction sockets) and 100% (healed sites). While the reported radiographic marginal bone loss after 3 to 6 months did not extend beyond the implant-abutment junction, no information related to soft tissue stability was provided.

Within the limits of this study, it was concluded that immediate loading of single-tooth implants placed in healed sites is a possible treatment alternative, whereas immediate loading of single-tooth implants placed in fresh extraction sockets carried a risk of failure of approximately 20% in this patient population. *Soft Tissue Stability And Contours Around Anterior Implant Restorations*

Scheller and associates addressed soft tissue stability in their 5-year prospective multicenter study of 99 implant-supported single-crown restorations. The authors reported overall cumulative success rates of 95.9% for implants and 91.1% for implant crowns. Soft tissue levels around implant restorations and adjacent teeth remained stable over the entire evaluation period.

Soft tissue stability around implant restorations and adjacent teeth is of paramount importance within the esthetic zone. In this context, in 1997 Jemt proposed a reproducible index to assess the size of the interproximal gingival papillae adjacent to single implant restorations. Preliminary testing of the index, performed retrospectively on 25 crowns in 21 patients, indicated a significant regeneration of papillae after a mean follow-up period of 1.5 years.

It was concluded that this index allows objective assessment of the soft tissue contour adjacent to single-implant restorations. In a clinical report, Wheeler and coworkers addressed the various parameters likely to have an impact on tissue preservation and maintenance of optimum esthetics.

The authors pointed out that recently developed tapered implants facilitate immediate implant placement, predictably preserving the osseous structure surrounding the extraction(1,3)

INFLUENCE OF SURGICAL TECHNIQUES

In a 5-year prospective study, Zitzmann and associates recently assessed whether guided bone augmentation performed simultaneously with implant placement had an adverse effect on long-term survival rates of the implants. The study involved 41 test implants (with GBR) and 112 control implants (without GBR). The cumulative implant survival rates reported were 93% (test group) and 97% (Control group). It was concluded that implants placed with or without GBR techniques have comparable survival rates after 5 years, but that bone resorption was more pronounced in GBR sites. Furthermore, the authors emphasized that the use of GBR was indicated when the initial defect size was larger than 2 mm in a vertical dimension.

CONCLUSION

The replacement of multiple adjacent missing teeth in the anterior maxilla with fixed implant restorations is poorly documented. In this context, restoring esthetics is not predictable, particularly regarding the contours of the inter implant soft tissue.

Controlled clinical trials show that the respective overall implant survival and success rates are similar to those reported for other segments of the jaws. However, most of these studies do not include well-defined esthetic parameters. With anterior single-tooth replacement in sites without tissue deficiencies, predictable treatment outcomes, including esthetics, can be achieved because of tissue support provided by adjacent teeth.

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