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Has the Predictability of "Osseointegration" Eclipsed That of Advanced Periodontal Treatment?

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The long-term outcome of dental prostheses is dependent on the continuing integrity of the supporting structures, be they teeth, implants, or tissues. The challenge for the clinician is to predict this outcome on an individual patient basis. However, this is just one of several patient, prosthesis, and operator parameters that will determine the overall success of the treatment.

Up to 12% of the general population are susceptible to a moderate or severe form of periodontal disease requiring advanced periodontal treatment (initial and ongoing). Many of these patients with a preference for a fixed prosthesis to replace lost teeth have potential abutments that have compromised periodontal support. Following the introduction of implant dentistry, "heroic" efforts to save these teeth are no longer considered appropriate. They are now often extracted and replaced with implants. This changed paradigm has resulted in less periodontally compromised abutments being used and an improved 5- to 10-year outcome of tooth-supported fixed dental prostheses (FDPs).[1]

However, conclusions from recent systematic reviews are confusing for the clinician. Oral implants, when evaluated after 10 years of service, do not surpass the longevity of compromised but successfully treated natural teeth[2]; the outcome of FDP tooth abutments with severely reduced but healthy periodontal support compares favorably with periodontally intact abutments.[3]

The dilemma then becomes, what is the predictability of the success of advanced periodontal treatment and how does it compare with the predictability of osseointegration over the long term?

Predictability of Advanced Periodontal Treatment

The outcome of advanced periodontal therapy measured by the number of lost teeth in 600 periodontal patients over a minimum treatment time of 15 years (median treatment time: 20 years) was reported.[4] At initial presentation, 16.5% were classified as moderate in severity (pocket depths 4 to 7 mm) and 76.5% as advanced in severity (pocket depths $>$ 7 mm). Although only 12.6% of patients lost 4 to 9 teeth and 4.2% lost 10 to 23 teeth, the predictability of this response to therapy was poor. This "disconnect" between the predictability of the prognosis and the actual outcome has been confirmed, and other than loss of first molars at presentation, no other clinical or genetic predictability factor has been identified.

Advanced periodontal therapy involves considerable costs (eg, financial, esthetic, comfort, morbidity). The favorable outcome of periodontally compromised teeth reported in systematic reviews[2,3] was contingent on highly motivated patients willing to participate in an accepted protocol of "supportive periodontal therapy" involving efficient oral hygiene, regular professional prophylaxis and review, and where indicated, follow-up surgical debridement and pocket reduction procedures. It has also been argued that retaining peridontally compromised teeth over an extended period to ascertain their long-term prognosis will subsequently complicate implant placement because of a deficiency in bone quantity.

Thus, advanced periodontal therapy can be successful in the majority of susceptible and highly motivated patients, especially in regions involving single-rooted teeth. However, this outcome is not predictable at initial presentation (Figs 1 to 3).

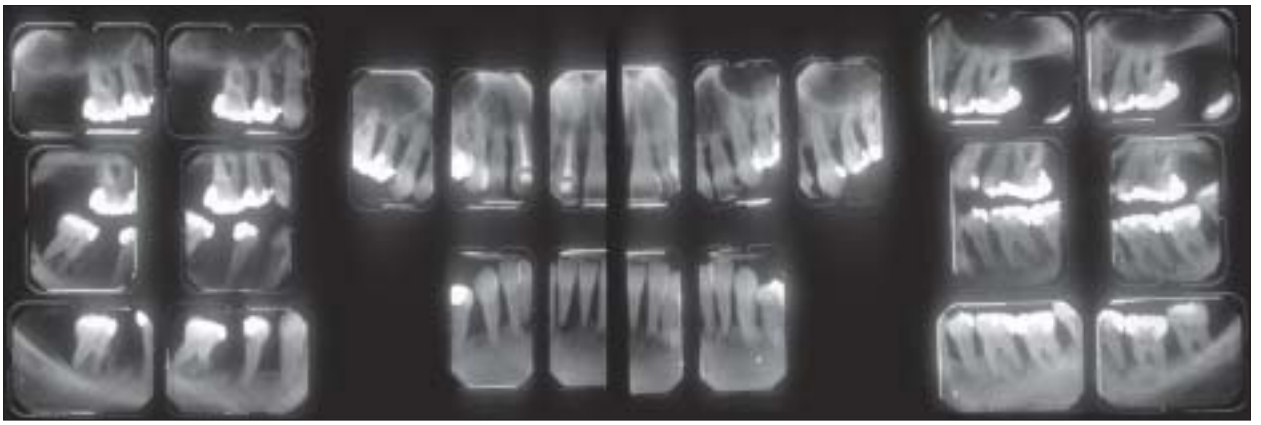

Fig 1 Periapical radiographs of a 31-year-old female patient taken in 1989 showing extensive vertical bone loss as a result of advanced periodontal disease.

Fig 2 Orthopantomogram taken in 1994 showing treatment of the patient involving an implant-supported FDP in the mandible and retention of teeth in the maxilla.

Fig 3 Status of the maxillary anterior teeth of the patient over 19 years. Bone levels have remained relatively stable. The four remaining posterior teeth were extracted after 15 years and replaced with a removable prosthesis.

Predictability of Osseointegration

The introduction of osseointegration was accompanied by a scientific rigor that documented outcomes of prostheses and their supporting implants for over 10 years. The subsequent development of implant-related dentistry has not always maintained such rigor. "Long term" is considered as being up to 5 years in the majority of currently published papers, with many reporting outcomes over even shorter periods. In addition, a myriad of new hardware and techniques have been introduced with the presumption that previous scientific evaluation retains currency.

Success of osseointegration has been defined and specifically related to the stability of bone levels. Yet, most papers report implant survival (which is independent of bone measurements) and mean marginal bone loss. However, this does relate closely to the common measure of success of advanced periodontal treatment—tooth retention verses tooth loss—irrespective of the quantity of bone support.

Clusters of patients experiencing delayed (secondary) implant loss or severe bone loss around surviving implants have been identified (Fig 4). However, no predictability factor has been identified and intense disagreement exists as to the etiology involved—peri-implantitis or overloading.

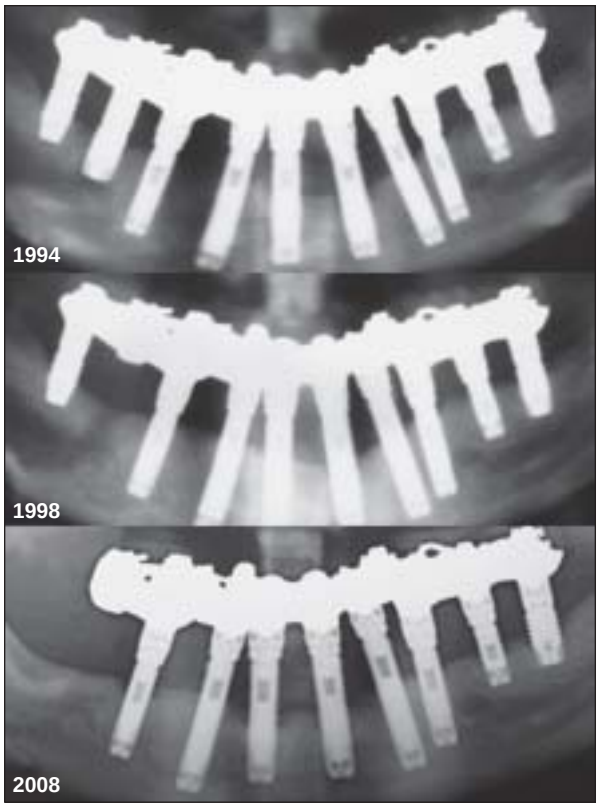

Fig 4 Implant outcome in the patient up to 18 years post-insertion. Between 1994 and 1998, one implant was lost. Between 1998 and 2008, two implants were lost and marginal bone levels decreased.

Attempts at correlating susceptibility to tooth loss through periodontal disease with implant loss have been restricted by the lack of identification of the cause of tooth loss in long-term studies. In periodontal disease–susceptible patients, an increase in both implant loss and mean marginal bone loss greater than 2 mm in posterior segments after 5 years has been shown compared to nonsusceptible patients.[5] It is the author's personal experience that between 1984 and 1995, only 18% of edentulous patients treated with implants due to an inability to tolerate tissue-supported dentures could be identified as having lost teeth through periodontal disease. Between 1996 and 2008, 70% of patients treated with full implant-supported prostheses could be identified as having lost teeth through periodontal disease.

Will this changed patient base affect the predictability of osseointegration in the long term? Should periodontally involved teeth be extracted to preserve bone and facilitate implant placement, or be retained to delay the bone loss that will subsequently occur around the implants? Even if there is an inevitable loss of bone around implants in "susceptible" patients in the long term, do other outcome parameters such as overall oral comfort and psychosocial benefits favor this therapeutic modality over the retention of significantly periodontally (and often esthetically) compromised teeth?

Conclusion

The question of whether the predictability of osseointegration has eclipsed that of advanced periodontal treatment for the 12% of the population who are susceptible to periodontal disease is currently unresolved.

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