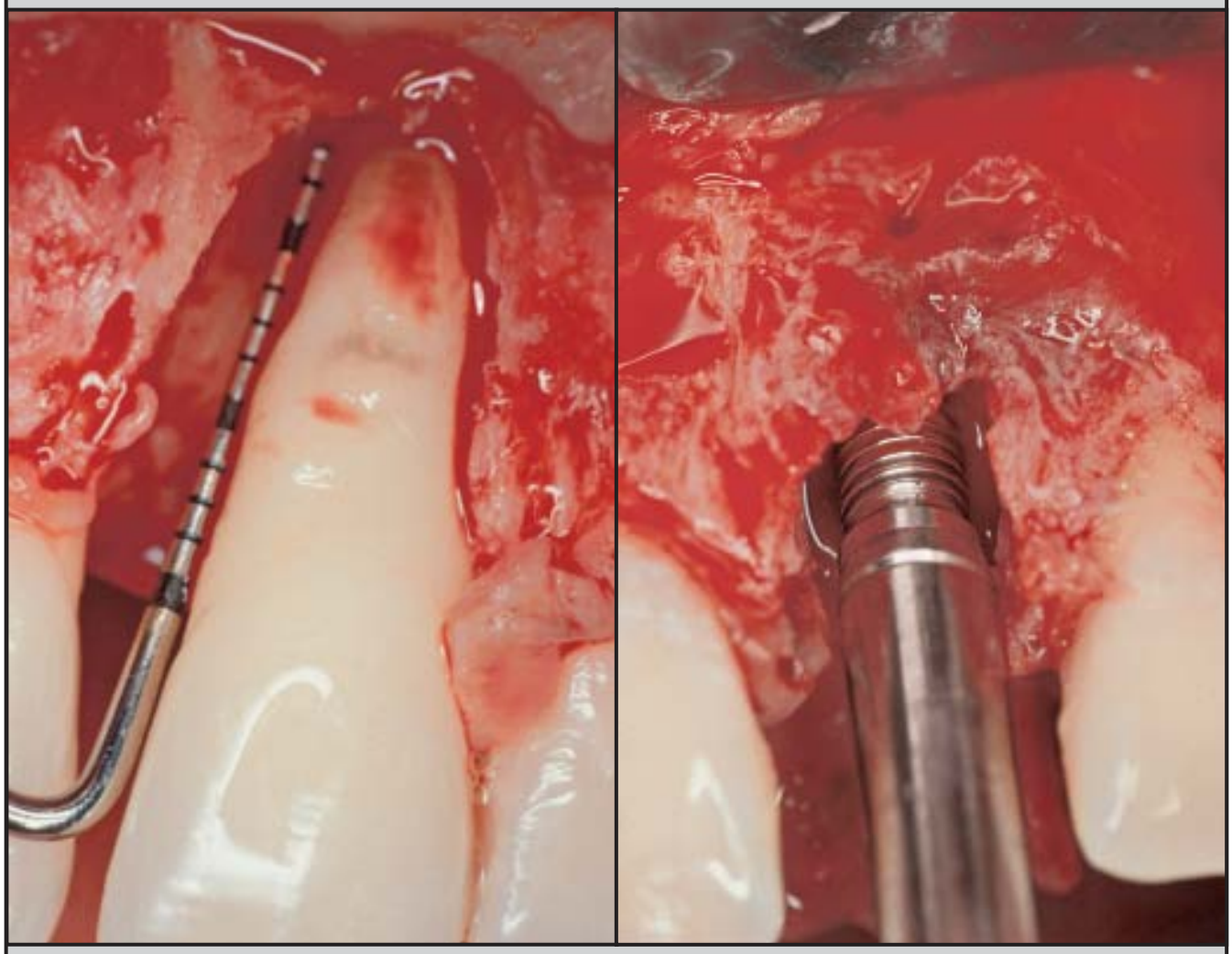

Save the Natural Tooth or Place an Implant? Three Periodontal Decisional Criteria to Perform a Correct Therapy

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To perform advanced periodontal therapy to save a natural tooth or to extract it and place an implant—which is best? Several considerations need to be made to make the proper decision. Endodontic conditions, proper reconstruction of a devitalized tooth, and the possibility of correct prosthetic treatment are all factors to be considered. From a strictly periodontal point of view, in the presence of a stable, vital, intact, periodontally involved, single-rooted tooth, a few fundamental criteria need to be considered to make the proper decision. These criteria will be discussed through analysis of therapy outcomes over a period of at least 10 years. (Int J Periodontics Restorative Dent 2011;31:29–37.)

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In the recent literature, many papers have compared the longevity of treated natural teeth versus implants. Kinsel et al,[1] in a review article on the treatment of furcated molars comparing root resection versus single-tooth implants, suggested that surgical and restorative procedures related to implant placement may be less difficult than management with root resective therapy, and long-term results with this type of therapy require a high level of periodontal, endodontic, and restorative expertise. Thomas and Beagle[2] compared the outcome of endodontic therapy and tissue-supported complete dentures with implant restoration, reporting that the latter may have a level of predictability equal to or greater than "traditional" dental treatment. De Moor and De Bruyn[3] discussed the choice between conservation of a tooth through endodontic treatment and crown restoration versus extraction of the tooth and its replacement by an implant, and reported long-term success of endodontically treated teeth in more than 90% of patients. A conservative approach using more endodontics and less implant therapy was recommended.

Holm-Pedersen et al[4] reported in a systematic review that periodontally compromised teeth treated and maintained regularly had a survival rate of 92% to 93%, while the survival of oral implants after 10 years varied between 82% and 94%. Therefore, it was concluded that oral implants, when evaluated after many years, do not surpass the longevity of even compromised but successfully treated natural teeth. Gotfredsen et al[5] reported the results of a consensus conference on the topic of implants versus natural teeth to answer the question: Do implants have a better prognosis than teeth with reduced marginal bone support? The conclusion reached was that the survival rates of teeth in periodontally well-maintained patients were generally higher than those of implants.

According to Brägger et al,[6] from an economic point of view comparing the cost of a three-unit fixed dental prosthesis (FDP) to an implant to replace a single tooth, the implant reconstruction demonstrates a better cost/effectiveness ratio. Pjetursson et al[7] discussed the results of FDPs on implants, reporting that after 5 years, only 61.3% of patients were free of any problems considering both biologic complications, such as peri-implantitis and soft tissue alterations, and technical complications, such as screw loosening, acrylic/ceramic chipping, and implant fracture.

In a more recent systematic review by the same group of authors[8] that analyzed the outcome of tooth-supported FDPs, implant-supported FDPs, and implant-supported single crowns after 5 years, a survival rate of 93.8% was found for tooth-supported FDPs, 95.2% for implant-supported FDPs, and 94.5% for implant-supported single crowns. After 10 years, however, the percentages decreased to 89.2%, 86.7%, and 89.4%, respectively. Concerning the complication rate, tooth-supported FDPs presented a 15.7% failure rate because of caries and endodontic therapy, whereas implant-supported FDPs presented a 38.7% failure rate because of fractures, abutment or screw loosening, or loss of retention. Similar conclusions were drawn by Jung et al[9] in a recent systematic review to describe the survival rate and incidence of biologic and technical complications of implant-supported single crowns after 5 years. They reported a survival rate of 94.5%, peri-implantitis and mucositis in 9.7% of crowns, screw and abutment loosening in 12.7% of crowns, and screw and abutment fracture in 0.35% of crowns, concluding that biologic and technical complications are frequent. Finally, Zitzmann and Berglundh,[10] referring to a consensus report on peri-implant diseases, reported an incidence of mucositis in 80% of subjects and peri-implantitis in 28% to 56% of subjects after a period of 5 years. Kao,[11] in a recent paper, suggested that the decision to extract or preserve a tooth should be based on knowledge of the literature, an accurate collection of clinical parameters, clinical experience, and consideration of the patient's values.

From the literature, it appears that complications are very frequent in implant therapy. Therefore, in the best interest of the patient, it is

imperative to try to save the natural dentition. Many of the papers, however, deal with prosthetically involved teeth with either FDPs or single crowns. Very few compare the outcome of single-rooted, vital, intact, periodontally treated teeth with the outcome of implant-supported single crowns. The purpose of this paper is to present and analyze the long-term outcome of a case series of single-rooted, vital, intact teeth treated with advanced regenerative periodontal therapy over a period of at least 10 years and to give simple but efficient criteria to decide how and when to save the single-rooted natural tooth versus implant placement.

Method and materials

Nineteen healthy, nonsmoking adults (10 women, 9 men; age range, 25 to 60 years) with 19 infrabony defects and probing depths ≥ 7 mm were treated with regenerative procedures. Osseous defects consisted of combinations of one, two, or three walls and circumferential defects. Ten patients were missing the buccal plate of bone but presented high interproximal peaks, and teeth were contained within the envelope of the bone. All teeth were stable and vital despite the severe attachment loss. After the initial phase of therapy, full-mouth plaque and full-mouth bleeding scores were < 15%.

Data collection

Baseline measurements were taken on the day of surgery; final measurements were taken at 1 year and at different time intervals after that in the range of 1 to 28 years. Measurements were recorded to the nearest millimeter using a UNC-15 probe (Hu-Friedy). Soft tissue measurements included probing depth, clinical attachment level, and recession.

Hard tissue measurements were performed in 14 defects, which were reopened, and the distance from the cementoenamel junction to the alveolar crest (CEJ–AC), the distance from the CEJ to the base of the defect (CEJ–BD), and the distance AC–BD were measured. Tooth mobility was also recorded as a fundamental parameter to decide whether to keep teeth with such advanced attachment loss (Table 1).

Surgical procedures

Surgical procedures consisted of split-thickness flaps buccally and full-thickness flaps lingually to properly expose the infrabony defect and gain the possibility of total debridement of the root surface. All granulation tissue was removed and careful decontamination of the root surfaces was obtained with the use of ultrasonic instruments, Gracey curettes, and application of tetracycline (50 mg/mL for 3 minutes).

After careful rinsing of the surgical area with sterile saline, different regenerative treatment modalities were carried out.

Flaps were sutured to obtain primary closure of the wound with a combination of sling and single sutures using 4-0 expanded polytetrafluorethylene sutures (Goretex, W.L. Gore). A periodontal dressing was placed in all defect sites.

Patients were given 875 mg of amoxicillin and 100 mg clavulanic acid (Augmentin, GlaxoSmithKline) each day and 100 mg nimesulide twice a day for 5 days.

Postsurgical care

Patients were instructed to avoid brushing at the surgical site and to rinse the area with 0.12% chlorhexidine digluconate solution 3 times a day for 10 days. Suture removal was done 10 days postsurgery, and patients continued rinsing with the chlorhexidine mouthrinse for 10 more days. After this initial period, very gentle tooth brushing was initiated.

Patients were recalled for prophylaxis every week for the first 4 weeks and then every 3 months thereafter.

Table 1 Clinical measurements of sites at different time intervals

		Infrabony defects at surgery				1-y follow-up					Final follow-up	
Patient/ defect	PD baseline (mm)	PD (mm)	Type of defect	Type of regenerative procedure	PD at reopening (mm)	PD (mm)	Recession (mm)	CAL gain (mm)	Mobility	Vital	PD (mm)	Year
1	9	7	3W	ABG + NRM	0	2	1	6	No	Yes	3	10
2	9	7	3W	ABG + NRM	2	2	2	5	No	Yes	2	10
3	9	7	BBM, HIBP, RC	ABG + NRM	ND	2	1	6	No	Yes	3	20
4	7	5	3W	ABG + NRM	0	2	1	4	No	Yes	4	24
5	11.5	9	1-2-3W	ABG + NRM	0	3	2	4	Yes	Yes	2	5
6	11	9	1-2-3W, RC	ABG + NRM	2	3	2	6	No	Yes	4	23
7	10	8	BBM, HIBP, RNC	ABG + NRM	0	2	4	4	No	Yes	2	21
8	11	9	1-2W, large 3W (lingual)	ABG + NRM	0	3	1	5	No	Yes	3	28
9	9	7	1-2-3W	ABG + NRM	0	3	1	5	No	Yes	3	24
10	9	7	Circ	ABG + NRM	2	2	2	5	No	Yes	4	10
11	10	8	BBM, HIBP, RC, 1W (inter-proximal)	DFDBA + NRM	ND	2	3	5	No	Yes	3	15
12	12	8	1-2-3W	DFDBA + NRM	0	3	2	6	No	Yes	3	17
13	11	11	BBM, HIBP, RC	DFDBA + NRM	0	3	2	6	No	Yes	3	17
14	11	9	BBM, HIBP, RC	DFDBA + NRM	2	2	4	5	Yes	Yes	3	25
15	11	9	BBM, HIBP, RC	DFDBA + RM	ND	3	1	7	No	Yes	3	23
16	9	7	Large 3W, HIBP	DFDBA + RM	0	2	1	6	No	Yes	3	25
17	14	12	BBM, HIBP, RC, large 3W (palatal)	BX + EM + RM	ND	5	2	7	No	Yes	5	10
18	12	10	BBM, UIBP, large 3W (palatal), RNC	BX + EM + RM	0	2	3	6	No	Yes	3	5
19	10	7	1W	BX + EM + RM	ND	2	3	5	No	Yes	4	24

PD = probing depth; CAL = clinical attachment level; ND = not done; W = wall; ABG = autologous bone graft; NRM = nonresorbable membrane; DFDBA PD = probing depth; CAL = clinical attachment level; ND = not done; W = wall; ABG = autologous bone graft; NRM = nonresorbable membrane; DFDBA = decalcified freeze-dried bone allograft; RM = resorbable membrane; BX = bovine xenograft; EM = enamel matrix derivative; BBM = buccal bone missing; HIBP = high interproximal bone peaks; UIBP = uneven interproximal bone peaks; RC = root contained; RNC = root not contained; Circ = circumferential.

Results

Nineteen patients with 19 different infrabony defects were treated with different types of regenerative procedures (Table 1). Despite the different materials used, clinical measurements after therapy at 1 year and different time intervals thereafter showed success of the regenerative treatment, even in the most advanced defects, namely the 8 defects where the buccal bone was missing but the roots were contained within the envelope of bone and the interproximal peaks of bone were high. The success rates were excellent in the long term for these defects (Table 1).

Discussion

The analysis of this case series demonstrates that the biologic principles of wound healing will work with different types of materials and that with regenerative therapy, an apparently hopeless tooth can be transformed into a healthy one that will have a high long-term survival rate, provided that a few fundamental biologic principles and diagnostic criteria are followed.

Tooth stability

The first criterion is called the *SVI rule* (stable, vital, intact tooth). From a periodontal point of view, stability, vitality, and integrity of a tooth are definitive indications to maintain it and to proceed with regenerative therapy, even in a very compromised situation. A periodontally involved but stable tooth may have a good prognosis. If the periodontal lesions are properly treated, the prognosis can be favorable and the tooth may last the lifetime of the patient. Vitality and integrity are also major indications to preserve the natural dentition. Therefore, if a tooth is vital, intact with no fillings, and stable, to extract it to place an implant has to be considered an unethical procedure (Fig 1).

Type of osseous defect

The second criterion is to analyze the type of defect to decide whether it is better to save a tooth or place an implant. Indeed, the prognosis will be good if the tooth is contained within the envelope of the residual bony walls. The same good prognosis will apply to an immediate implant placed within the envelope of bone in an extraction socket, as pointed out by Tinti and Parma-Benfenati[12] (Fig 2).

Decontamination of the natural root

This third criterion is fundamental to obtain new attachment formation, as it compares with the use of a sterile implant in implant therapy. This is critical and will determine the success of the regenerative procedure. If the criteria usually followed in immediate implant placement are listed and compared to those followed to decide whether to proceed with advanced regenerative therapy, it should be noted that they are basically the same. In immediate implant placement, primary stability must be obtained. Stability is also important for a natural tooth. In implant therapy, a sterile implant must be used; in periodontal therapy, a decontaminated root surface must be obtained. In implant therapy, the implant should preferably sit within the envelope of bone; in advanced regenerative therapy, the tooth should preferably be located within the envelope of bone.

As a consequence, there is no reason to proceed with placement of an artificial tooth, such as an implant, as a substitute for a natural tooth if the potential for repair and the surgical treatment of the site are the same for both procedures (Table 2).

Figs 1a and 1b *A 13-mm circumferential infrabony defect was noted around the maxillary left central incisor, which was vital and stable.*

Figs 1c and 1d *Regenerative procedures using enamel matrix derivative, bovine bone, and a resorbable membrane.*

Fig 1e *Final radiograph taken after orthodontic tooth movement. The natural tooth was stable, vital, and intact (SVI rule). Extracoronal splinting was performed to prevent orthodontic relapse.*

Fig 1f *Final probing depth achieved after surgery and orthodontic tooth movement.*

Fig 2a *Baseline radiograph of a maxillary left central incisor.*

Fig 2b *Immediate implant placement after tooth extraction. The implant was placed within the bony envelope and buccal bone was missing.*

Figs 2c and 2d (c) *Bovine bone and* (d) *collagen membrane were positioned around and over the implant.*

Figs 2e and 2f *The final* (e) *clinical and* (f) *radiographic results 10 years after treatment.*

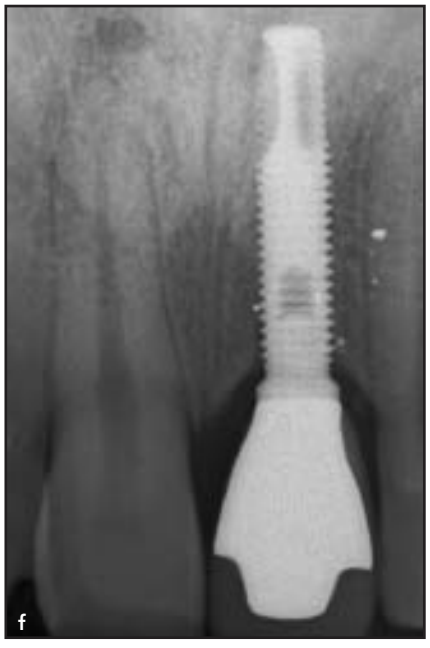

Table 2 **Requirements for regenerative periodontal therapy on natural teeth vs requirements for immediate implant placement**

Tooth	Implant
Stable	Primary stability
Contained within envelope of bone	Contained within envelope of bone
Decontaminated	Sterile implant

Conclusions

The every-day dilemma for the ethically oriented professional is whether to save the natural dentition or to replace it with an implant. In this paper, three diagnostic criteria for single-rooted teeth have been suggested from a periodontal point of view to solve this problem and direct the clinician toward the proper biologically and ethically oriented treatment.

Implant therapy can be more appealing to the clinician because, apparently, if an adequate amount of bone is present, it is easier and faster to perform, requires less knowledge in anticipating the prognosis, is more lucrative, and may seem to have a better prognosis compared to advanced periodontal therapy.

It must be stressed that, today, too many teeth are extracted. Indeed, it may be easier to remove a tooth, wait a few months, and then place an implant or even place an immediate implant instead of delivering a sophisticated periodontal therapy, but implant therapy should be considered a treatment modality rather than a discipline by itself. What does it mean to be "an implantologist"? It means nothing if the clinician does not fully diagnose and plan the patient's treatment properly. In partially edentulous patients, implants should be placed as an adjunct to a comprehensive type of therapy. Furthermore, it is important to bear in mind that in implant therapy, the survival rates can be reassuring, but the probability of having complications is very high after a period of 7 to 8 years, as observed in the literature.

It must also be stressed that if patients are properly informed about the therapeutic possibilities, in most cases, they will be more inclined to save their natural teeth instead of placing implants.

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