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CASE STUDY

Periodontal regeneration risk assessment in the treatment of intrabony defects

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Abstract

Background: Regenerative approaches performed in periodontics seems to be efficient in treating intrabony defects. There are, however, many factors that may affect the predictability of the regenerative procedures. The present article aimed to propose a new risk assessment tool for treating periodontal intrabony defects by regenerative therapy.

Methods: Different variables that could affect the success of a regenerative procedure were considered based on their impact on (i) the wound healing potential, promoting wound stability, cells, and angiogenesis, or (ii) the ability to clean the root surface and maintain an optimal plaque control or (iii) aesthetics (risk for gingival recession).

Results: The risk assessment variables were divided into a patient, tooth, defect, and operator level. Patient-related factors included medical conditions such as diabetes, smoking habit, plaque control, compliance with supportive care, and expectations. Tooth-related factors included prognosis, traumatic occlusal forces or mobility, endodontic status, root surface topography, soft tissue anatomy, and gingival phenotype. Defect-associated factors included local anatomy (number of residual bone walls, width, and depth), furcation involvement, cleansability, and number of sides of the root involved. Operator-related factors should not be neglected and included the clinician's level of experience, the presence of environmental stress factors, and the use of checklists in the daily routine.

Conclusions: Using a risk assessment comprised of patient-, tooth-, defect- and operator-level factors can aid the clinician in identifying challenging characteristics and in the treatment decision process.

KEYWORDS
evidence-based dentistry, guided tissue regeneration, periodontal diseases, reconstructive surgical procedures, regeneration

INTRODUCTION

Regenerative approaches for the treatment of intrabony defects aim to restore cementum, periodontal ligament, and alveolar bone, appropriately sealed by the gingival tissue.[1,2] Nevertheless, the predictability of these procedures can be affected by a plethora of variables, including the morphology of the defect, surgical technique, selection of biomaterials, and clinicians' experience.[2–4] As well as any wound, the healing potential of the intrabony defect

may vary according to its ability to provide wound stability, cells, and blood supply.[5,6] Most importantly, clinicians should bear in mind that the root surface acts as a wound margin during regeneration and, thus, the ability/access to clean the wound (root surface) is pivotal for the success of the therapy. Therefore, different aspects must be addressed by the clinician when planning for a regenerative approach.

Checklists and risk assessment tools are aimed to standardize the diagnosis of different clinical situations, precisely predict prognosis, and reduce human error.[7–10] The concept of risk assessment is not new to the dental field. In Periodontology, several risk assessment tools were developed to assess patient- and tooth-based risk levels for periodontal disease progression.[11–15] Similarly, in Implant Dentistry, the International Team for Implantology (ITI) developed a classification system named in 2009 as the "SAC Classification in Implant Dentistry."[16] The purpose of this tool was to classify the patient's implant therapy as Straightforward, Advanced, or Complex, from both a surgical and restorative aspect.[16] For periodontal regeneration, different flowcharts have been proposed combining site characteristics with a surgical approach.[1,2,4] Nevertheless, flowcharts are usually focused on the treatment decision and may not give the clinician a complete view of the patient to be treated. A risk assessment would help the clinician to understand different aspects that could have an impact on the outcome of the regenerative therapy. Therefore, the aim of the present article was to propose a new risk assessment tool for the regeneration of periodontal intrabony defects.

MATERIALS AND METHODS

Periodontal regeneration risk assessment (PRRA) for intrabony defects

Rationale

The success of regenerative procedures in intrabony defects begins with comprehensive planning prior to the surgical intervention. Patient- and tooth-related factors, as well as the defect morphology that may influence the likelihood of achieving periodontal regeneration and should be carefully evaluated.[4] The clinician, that is, the operator, plays a major role in the success of the treatment and must be considered in a risk analysis. Based upon the Esthetic Risk Assessment (ERA)[16] developed by the ITI, the Periodontal Risk Assessment by Lang and Tonetti for Periodontitis,[12] and previous decision trees for the treatment of intrabony defects,[1,2] a simplified risk assessment was proposed in the present article (Table 1).

The rationale for each variable to be included was its impact (i) on the wound healing potential, promoting wound stability, cells, and angiogenesis,[6] or (ii) on the ability to clean the root surface and keep an optimal plaque control or (iii) on aesthetics (risk for gingival recession). This risk assessment tool can be used for treatment planning; to discuss with the patient chairside "knee-knee and eye to eye," for communication and relationship building[17]; as well as a reference for medicolegal documents.

RESULTS

Different variables were considered based on their impact on wound healing potential, cleansability, and aesthetics. They were divided into patient, tooth, defect, and operator levels.

Patient-related factors

The patient's presurgical assessment should comprise an evaluation of the medical status, smoking habit, compliance, as well as expectations. Uncontrolled systemic conditions, such as diabetes mellitus, as well as smoking habits, might negatively affect wound healing and increase the risk for periodontal breakdown after treatment.[4,13] Stress should be considered in the patient's medical status since emerging evidence has suggested that pathological levels of stress may be different among individuals, but irrespective of the cause, they can trigger combinatorial physiological changes to neural, humoral, and immunological pathways/systems that ultimately challenge the wound healing process.[18,19]

Patient compliance with oral hygiene procedures and supportive care is critical to achieving and maintaining therapeutic success following regenerative therapy. Because the root surface acts as a wound margin during regeneration, plaque accumulation in the early stages of the healing can impair the results of the treatment. Previous studies have shown that poor plaque control, high levels of bleeding on probing (BOP), and poor compliance with supportive care are associated with poorer clinical outcomes.[20,21]

In addition, patients' expectations, including their desire to keep the tooth or not, the invasiveness and cost of a regenerative procedure must also be taken into consideration.[2,22,23] A realistic/unrealistic expectation based on the review of PRRA helps both the patient and the clinician in the decision process and aids in the patient's understanding of the predictability of the regenerative procedure.

Tooth-related factors

Tooth-related factors for successful periodontal regeneration should include the assessment of the periodontal chart at the reevaluation appointment and the periapical radiograph or cone beam computed tomography (CBCT) scan of the tooth in question. Residual pockets with inflammation (e.g., BOP) following the initial periodontal therapy should

TABLE 1 Periodontal regeneration risk assessment (PRRA) for intrabony defects.

		Low	Medium	High
Patient factors	Medical status	Healthy, uneventful healing		Compromised healing
	Smoking habit	Nonsmoker	Light smoker (≤ 10 cig/day)	Heavy smoker (>10 cig/day)
	Plaque control	FMPS ≤15%	FMPS 16–24%	FMPS ≥25%
	Patient's compliance to SPC	Compliant	Erratic	Poor compliance
	Patient's expectations	Realistic		Unrealistic
Tooth factors	Site-specific periodontal prognosis based on Periodontal Risk Score (PRS)	PRS 1–4	PRS 5–7	PRS 8–11
	Occlusal trauma/mobility management	Controllable		Uncontrollable
	Endodontic condition	Vital with perio defect not involving apex Adequate endodontic treatment	Existing root canal therapies should be carefully evaluated	Vital with perio defect involving apex Inadequate endodontic treatment Nonvital
	Status of the root surface	Flat	Concave	2 fused roots
	Soft tissue anatomy	Soft tissue intact		Soft tissue defects
	Gingival phenotype: GT and KTW	Thick	Thin with a ≥2 mm-wide band of KTW	Thin without/with a narrow band of KTW
Defect factors	Defect anatomy	3-wall Narrow Deep	2-wall	1-wall Wide Shallow
	Furcation involvement	None	Class I or II	Class III
	Cleansable through surgical access	Yes Anterior region	Yes Posterior region	No
	Contained defect	Yes 1–2 sides of the root involved		No ≥ 3 sides of the root involved
Operator factors	Level of experience	Experienced		Beginner
	Environmental stress factors	Low	Medium	High
	Using checklist	Yes		No

Abbreviations: FMPS: full-mouth plaque score; GT: gingival thickness; KTW: keratinized tissue width; SPC: supportive periodontal care.

be managed with additional root debridement prior to the regenerative procedure.[23]

Tooth prognosis

The prognosis of the tooth to be treated must be addressed before considering any treatment. The Periodontal Risk Score (PRS, formerly known as the MMPPI) should serve as an indispensable means for estimating tooth prognosis at this stage of treatment.[13,15,24] The PRS is suggested to be discussed with all patients for a better understanding of the long-term periodontal prognosis of their teeth as well as the need to make lifestyle changes to improve the surgical outcome (diabetes control, smoking cessation, improved compliance to periodontal maintenance or additional periodontal treatment needed prior to surgery).

Tooth mobility

The effect of tooth mobility on periodontal regeneration is still somewhat controversial.[4] Cortellini et al. demonstrated that tooth hypermobility is negatively and dose-dependently associated with the clinical outcomes of regeneration.[23] Generally, studies suggested that teeth with greater mobility responded less favorably to regenerative therapy,[25] because it directly impaired the stability of the wound. Hence, teeth with Miller grade II or III mobility should be splinted (or significantly occlusally corrected for interferences) before the regenerative surgical procedure.[2] Though presplinting is highly recommended, if splinting was not done before treatment and only occlusal adjustment was performed, the need for splinting after treatment should be assessed.

Tooth vitality

The endodontic condition of the tooth is a relevant factor in periodontal therapy. Endodontically treated teeth with no evidence of periapical pathology respond favorably to regenerative therapy.[26] Thus, prior to the regenerative procedure, vital teeth should be kept vital if the periodontal defect does not involve its apex. Existing root canal therapies, however, should be carefully evaluated. It can be assumed that a periapical pathology would contaminate the wound; thus, nonvital teeth must be successfully treated, and inadequate root canal treatments should be redone.[26] A referral to an endodontist would be appropriate to aid in the team's decision regarding treating the tooth.

Root surface topography

The anatomy of the root is also an important factor for regenerative therapy and, thus, should be considered in treatment planning.[1] For example, concave root anatomy is more difficult to access than flat root anatomy. Fused roots can also be very difficult to access and detrimental to plaque or calculus removal at the time of surgical access. The presence of concavities, as seen in premolars, can be challenging to clean.

Soft tissue anatomy

Intrabony defects are occasionally associated with mucogingival defects. Tissue recession, particularly interproximal recession, often complicates periodontal-regenerative surgeries because it has a direct impact on the stability of the wound. Tension-free flap closure over the surgical defect and the entire graft (if placed) is key for successful regeneration.[27]

Gingival phenotype

The soft tissue anatomy needs to be assessed in relation to the gingival phenotype (gingival thickness and keratinized tissue width), especially in the anterior region. A thin gingival phenotype appears to be at greater risk of exhibiting recession in response to regenerative procedures than a thick phenotype.[28] The keratinized tissue width also appears to play a role in flap stability and the ability to prevent flap micromotion with exposure of the bone graft.

Defect-related factors

Defect anatomy

The defect anatomy is of the utmost importance in periodontal-regenerative procedures of intrabony defects. The depth and width of the intrabony component, as well as the number of residual bony walls (1-, 2- or 3-wall defects) should be carefully evaluated, taking into consideration the architectural support, vascular ingrowth potential, cellular recruitment potential, and clot stability of each site. The deeper the defect, the greater the amount of clinical improvement. The wider the width of the intrabony component, that is, the wider the angle between the bony wall of the defect and the long axis of the tooth, the poorer the outcomes.[28,29] With the increasing loss of the remaining bony walls (noncontained defects), there is a greater need for combined approaches to aid in structural support, that is, stability of the wound, to achieve predictable periodontal regeneration.[30–32] Thus, narrow and deep 3-wall intrabony defects provide an environment with the greatest inherent potential for periodontal regeneration. For this reason, bone sounding before surgery or 3-dimensional imaging with a cone beam computed tomography is of prime importance to accurately assess the defect morphology before surgical intervention is recommended.[1]

Furcation involvement

The combination of furcation involvement and wide defects might be another complicating factor.[29] Deep probing depths at molars are frequently a combination of horizontal furcation defects, craters, and intrabony defects at one or more of the roots. Thus, the combination of furcation involvement to the intrabony defect must be assessed. Evidence has suggested that regeneration of maxillary class II furcation and maxillary/mandibular class III furcation defects is unpredictable. On the other hand, clinical improvements are expected for mandibular class II furcations.[33,34]

Cleansability

Another important clinical consideration is the access to the defect. It will determine the incision design and flap elevation. If the defect cannot be cleaned well through a buccal flap only, a larger flap extending to the neighboring teeth should be utilized as opposed to a minimal papilla preservation flap.[35,36] Besides, most molars with poor surgical access will deem to be less than ideally cleansable, resulting in a contaminated wound surface.

Contained versus noncontained defects

The number of sides of a root involved in the defect as well as the interdental space width will determine the choice of surgical technique because it can influence wound stability and availability of cells and angiogenesis. The number of sides involved may also have an indirect effect on how cleansable the defect is, which in turn may result in a dramatic change in the flap design. In instances where defects involve 3 or 4 sides of the root, larger flaps with a periosteal incision and/or vertical releasing incisions are utilized to provide sufficient visibility for instrumentation, and the use of grafting materials are necessary to offer satisfactory space maintenance and stability to the wound.[27]

Operator-related factors

Recently, there has been an increasing interest in "human factors" as sources of error in different fields. Therefore, operator-related factors must be considered before periodontal-regenerative interventions, including the clinician's experience and surgical skills, the presence of environmental stress events, and also if checklists for the surgical procedure are being used or not.[2,7,37]

Different abilities in soft tissue management, membrane manipulation, attention to the blood supply, suturing technique, and other factors play a major role in a guided tissue regeneration procedure.[37] Although in the literature, there seems to be no consistent relationship between the clinician's experience and postoperative outcomes, the available evidence suggests that surgeons with a level of experience below the expected have a higher incidence of complications, indicating the influence of a "learning curve" for most surgical procedures.[38]

A surgeon's performance is defined as the ability to use knowledge and experience in a specific environment at a specific moment in time. Despite their experience and skills, performance may be impaired by tiredness, stress, or distractions due to personal issues.[7] Thus, stress factors such as time pressure, interoperative pressure, staff problems, and interpersonal friction between the dentist and the patient can all have a negative effect on clinical performance. Typically, in the presence of stress factors, clinicians are driven to use automatic responses rather than thinking rationally through a problem.

To counter these "human factor" issues, techniques that have been developed for the airline industry to address safety problems can be applied.[7–9,39] One of the most useful tools for understanding the real etiology of a serious adverse event is to take situational awareness into account.[8] This allows the perception of important information, understanding its meaning, and also anticipating and knowing how to adapt itself when there is a change in the situation. Whatever the reason for the change of context, the clinician must have the mental resources to be able to analyze the situation, anticipate alternative solutions, evaluate the relevance of each of these solutions, and take the most appropriate decision.[8] Checklists are very useful to avoid stress factors, especially in highly complex tasks.

DISCUSSION

Predictability when performing periodontal regeneration of intrabony defects remains an important task in the management of periodontitis. Multiple regenerative approaches have shown optimal clinical outcomes.[3,4,40] Humans, however, are fallible and human errors should be expected, even from experienced individuals.[33]

Interestingly, the causes of errors are not necessarily lack of knowledge. In periodontal regeneration, the number of parameters that may influence the treatment outcome is fairly high.[1,2,4] In that sense, a risk assessment could be an aid for consistently achieving positive clinical and patient-reported outcomes. Periodontal regeneration certainly "works" without applying many of these systems. But the extraordinary variability in the outcomes from one clinician to another (so-called the "center-effect") proves the opposite.[2,4,37,40] If predictability of regeneration is sought, the use of a risk assessment tool, building a defense system against errors, and honing the situational awareness of the clinician are essential. To the best of the authors' knowledge, this is the first time a risk assessment was proposed for the regenerative treatment of intrabony defects. In addition, the consideration of operator-related factors in the predictability of the procedure was addressed.

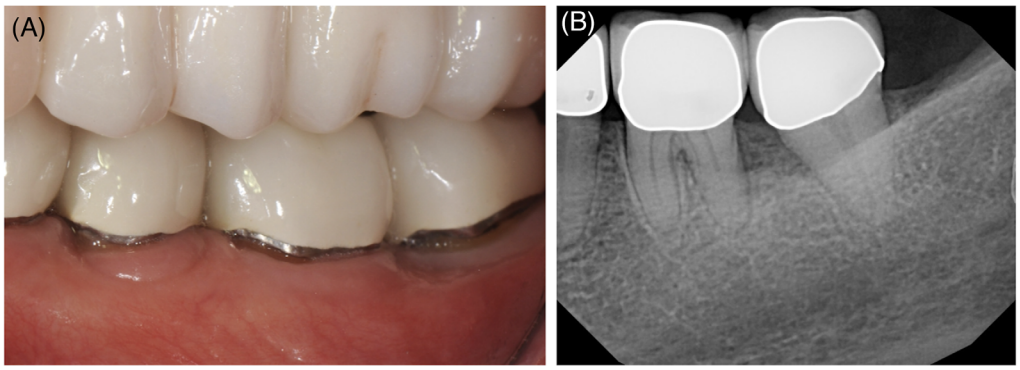
Different case scenarios were illustrated in Figures 1–3 with low- to high-risk patients, and by recognizing its particularities in the risk assessment, it is possible to compensate

(C)		Low	Medium	High
Patient factors	Medical status	Healthy, uneventful healing		Compromised healing
	Smoking habit	Non-smoker	Light smoker (≤ 10 cig/day)	Heavy smoker (>10 cig/day)
	Plaque control	FMPS ≤15%	FMPS 16-24%	FMPS ≥25%
	Patient's compliance to SPC	Compliant	Erratic	Poor compliance
	Patient's expectations	Realistic		Unrealistic
Tooth factors	Site-specific periodontal prognosis based on Periodontal Risk Score (PRS)	PRS 1-4	PRS 5-7	PRS 8-11
	Occlusal trauma/mobility management	Controllable		Uncontrollable
	Endodontic condition	Vital with perio defect not involving apex Adequate Endodontic treatment	Existing root canal therapies should be carefully evaluated	Vital with perio defect involving apex Inadequate Endodontic treatment Non-vital
	Status of the root surface	Flat	Concave	2 fused roots
	Soft-tissue anatomy	Soft tissue intact		Soft-tissue defects
	Gingival phenotype: GT and KTW	Thick	Thin with a ≥ 2mm-wide band of KTW	Thin without/with a narrow band of KTW
Defect factors	Defect anatomy	3-wall Narrow Deep	2-wall	1-wall Wide Shallow
	Furcation involvement	None	Class I or II	Class III
	Cleansable through surgical access	Yes Anterior region	Yes Posterior region	No
	Contained defect	Yes 1-2 sides of the root involved		No ≥ 3 sides of the root involved
Operator factors	Level of experience	Experienced		Beginner
	Environmental stress factors	Low	Medium	High
	Using Checklist	Yes		No

FIGURE 1 Low- to medium-risk periodontal regeneration patient. A 52-year-old healthy male, nonsmoker, presented with clinical and radiographic evidence of a deep intrabony defect in the mesial aspect of the maxillary right canine (A and B). Gingival tenderness, a deep probing pocket depth (10 mm) that bled on probing, and grade 1 mobility were observed. He was diagnosed with generalized stage II grade B periodontitis, with a PRS of 4* for tooth #6. The operator was experienced, with no environmental stress, and used to checklists. Therefore, considering all factors, the patient was classified as a low- to medium-risk PRRA due to the presence of a gingival recession in the buccal aspect of the tooth and the 2-wall defect anatomy (C). Grade 1 mobility was considered controllable, and, although the presence of a gingival recession was not an esthetic complaint and the patient presented a low lip line, treatment approaches to avoid increasing the recession and to provide stability to the wound (in light of the 2-wall defect) were considered.
**PRS = 4 [Periodontal Risk Score: Age > 40 (score 1) + 10 mm probing depth (score 2) + Grade 1 mobility (score 1)].*

(C)		Low	Medium	High
Patient factors	Medical status	Healthy, uneventful healing		Compromised healing
	Smoking habit	Non-smoker	Light smoker (≤ 10 cig/day)	Heavy smoker (>10 cig/day)
	Plaque control	FMPS ≤15%	FMPS 16-24%	FMPS ≥25%
	Patient's compliance to SPC	Compliant	Erratic	Poor compliance
	Patient's expectations	Realistic		Unrealistic
Tooth factors	Site-specific periodontal prognosis based on Periodontal Risk Score (PRS)	PRS 1-4	PRS 5-7	PRS 8-11
	Occlusal trauma/mobility management	Controllable	Grade 2 mobility	Uncontrollable
	Endodontic condition	Vital with perio defect not involving apex Adequate Endodontic treatment	Existing root canal therapies should be carefully evaluated	Vital with perio defect involving apex Inadequate Endodontic treatment Non-vital
	Status of the root surface	Flat	Concave	2 fused roots
	Soft-tissue anatomy	Soft tissue intact		Soft-tissue defects
	Gingival phenotype: GT and KTW	Thick	Thin with a ≥ 2mm-wide band of KTW	Thin without/with a narrow band of KTW
Defect factors	Defect anatomy	3-wall Narrow Deep	2-wall	1-wall Wide Shallow
	Furcation involvement	None	Class I or II	Class III
	Cleansable through surgical access	Yes Anterior region	Yes Posterior region	No
	Contained defect	Yes 1-2 sides of the root involved		No ≥ 3 sides of the root involved
Operator factors	Level of experience	Experienced		Beginner
	Environmental stress factors	Low	Medium	High
	Using Checklist	Yes		No

FIGURE 2 Medium- to high-risk periodontal regeneration patient. A 39-year-old healthy female, nonsmoker, presented with clinical and radiographic evidence of a deep intrabony defect in the mesial aspect of the maxillary right central incisor (A and B). She presented gingival tenderness, a deep pocket (>10 mm), and grade 2 mobility. She was diagnosed with generalized stage III grade B periodontitis. The operator was experienced, with no environmental stress, and used to checklists. Therefore, considering all factors, the patient was classified as a medium- to high-risk PRRA due to a high full-mouth plaque score, a PRS of 7* for tooth #8, grade 2 mobility, and the 2-wall defect anatomy (C). Access to clean a maxillary central incisor is great. However, the high FMPS could impair the outcomes considering plaque accumulation on the root surface. Therefore, in such case, oral hygiene measures needed to be reinforced and improved before the surgical procedure. The presence of a grade 2 mobility and a 2-wall bone defect has a negative impact on wound stability, and thus, measures to provide stability to the wound needed to be considered. **PRS = 7 [Periodontal Risk Score: HbA1c levels unknown (score 2) + >10 mm probing depth (score 3) + Grade 2 mobility (score 2)]*.



(C)		Low	Medium	High
Patient factors	Medical status	Healthy, uneventful healing		Compromised healing
	Smoking habit	Non-smoker	Light smoker (≤ 10 cig/day)	Heavy smoker (>10 cig/day)
	Plaque control	FMPS ≤15%	FMPS 16-24%	FMPS ≥25%
	Patient's compliance to SPC	Compliant	Erratic	Poor compliance
	Patient's expectations	Realistic		Unrealistic
Tooth factors	Site-specific periodontal prognosis based on Periodontal Risk Score (PRS)	PRS 1-4	PRS 5-7	PRS 8-11
	Occlusal trauma/mobility management	Controllable	Grade 2 mobility	Uncontrollable
	Endodontic condition	Vital with perio defect not involving apex Adequate Endodontic treatment	Existing root canal therapies should be carefully evaluated	Vital with perio defect involving apex Inadequate Endodontic treatment Non-vital
	Status of the root surface	Flat	Concave	2 fused roots
	Soft-tissue anatomy	Soft tissue intact		Soft-tissue defects
	Gingival phenotype: GT and KTW	Thick	Thin with a ≥ 2mm-wide band of KTW	Thin without/with a narrow band of KTW
Defect factors	Defect anatomy	3-wall Narrow Deep	2-wall	1-wall Wide Shallow
	Furcation involvement	None	Class I or II	Class III
	Cleansable through surgical access	Yes Anterior region	Yes Posterior region	No
	Contained defect	Yes 1-2 sides of the root involved		No ≥ 3 sides of the root involved
Operator factors	Level of experience	Experienced		Beginner
	Environmental stress factors	Low	Medium	High
	Using Checklist	Yes		No

FIGURE 3 High-risk periodontal regeneration patient. A 70-year-old healthy female, nonsmoker, presented with clinical and radiographic evidence of a deep intrabony defect in the distal aspect of the maxillary left first molar (A and B). She presented a deep pocket (8 mm) and grade 2 mobility. She was diagnosed with localized stage III grade B periodontitis. The operator was experienced, with no environmental stress, and used to checklists. Therefore, considering all factors, the patient was classified as a high-risk patient due to the periodontal risk score = 7*, grade 2 mobility, thin gingival phenotype with a narrow band of keratinized tissue, Class I furcation involvement, cleansable defect although in the posterior region and involvement of ≥3 sides of the root (C). In such case, access to clean the root surface in the posterior region can be challenging. The thin gingival phenotype increases the risk of recession and exposure to the furcation entrance. The extension of the defect and combination with furcation involvement reflects a wide surface to be cleaned and associated with mobility, a necessity for additional measures to promote wound stability. **PRS = 7 [Periodontal Risk Score: Age > 40 (score 1) + 8-10 mm probing depth (score 2) + two Class I furcations (score 2) + Grade 2 mobility (score 2)]*.

for its limitations and improve the clinical outcomes of the regenerative procedures. Further research may validate the impact of this tool on the outcomes of regenerative procedures for intrabony defects.

CONCLUSION

Periodontal regeneration approaches for the treatment of intrabony defects present a variability in the outcomes from one clinician to another, which could be explained because of different factors that have an impact on wound healing, including its cleansability. The use of a risk assessment comprised of patient-, tooth-, defect- and operator-level factors (PRRA) can aid the clinician in the identification of challenging characteristics and in the treatment decision process. The PRRA can also help explain the patient's problem and improve their understanding of the treatment predictability prior to surgery so a better decision can be made in considering all available information.

AUTHOR CONTRIBUTIONS

Conceptualization: Robert A. Levine; Muhammad H. A. Saleh; Debora R. Dias and Hom-Lay Wang. **Investigation**: Muhammad H. A. Saleh and Debora R. Dias. **Writing—original draft preparation**: Robert A. Levine, Muhammad H. A. Saleh, and Debora R. Dias. **Writing—review and editing**: Jeffrey Ganeles, Maurício G. Araújo, Franck Renouard, Harold M. Pinsky, Preston D. Miller, and Hom-Lay Wang.

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