

INTRABONY DEFECTS AND NON-SURGICAL TREATMENT

LUIGI NIBALI

Prim Dent J. 2014;3(3):48-50

ABSTRACT

Periodontitis can lead to vertical bone loss with the creation of 'intrabony defects', associated with higher risk of progression if left untreated. Intrabony defects are considered candidates for periodontal surgical procedures, in order to arrest disease progression and achieve bone regeneration. This paper brings forward anecdotal and scientific evidence from the literature to describe how even non-surgical periodontal treatment can result in clinical and radiographic resolution of periodontal intrabony defects.



Figure 1: Baseline clinical presentation of a chronic periodontitis patient. The periapical radiograph of tooth LR7 shows evidence of an intrabony defect on LR7 mesial reaching the apex of the mesial root. The treatment plan includes oral hygiene instructions and non-surgical periodontal treatment

Periodontitis affects the supporting apparatus of the teeth, leading to apical migration of the epithelial attachment and resorption of connective tissue and alveolar bone, often resulting in early tooth loss. Periodontal osseous destruction can result in horizontal or vertical bony defects, depending on the direction and extent of the apical propagation of the plaque-induced lesion¹ as a result of local and subject factors. Vertical (also known as 'infrabony' or 'intrabony') periodontal defects are defined as those interproximal bony lesions where the most apical aspect of the bone resorption is apical to the most coronal aspect of the alveolar crest (this definition usually requires the distance between coronal and apical bone level to be at least 3mm). In other words, in intrabony defects an oblique bone line between a tooth and the adjacent tooth can be seen radiographically, rather than a horizontal bone border (see Figure 1). Such defects have been associated with periodontal disease progression in untreated populations.² In the past, the treatment of vertical bony defects traditionally aimed to surgically eliminate the defect through ostectomy³ or later by open flap surgery, famously leading to radiographic bone fill in a landmark study.⁴ More recently, these defects have been considered suitable for periodontal regeneration.^{5,6} Regeneration of the attachment apparatus with the use of guided tissue regeneration (GTR) is

considered the gold standard for the treatment of these cases, often leading to new attachment formation or at least considerable reduction of the vertical bone loss, thus improving long-term tooth prognosis.

Non-surgical periodontal therapy (NSPT) combined with appropriate oral hygiene instructions is considered the standard initial periodontal treatment and a plethora of studies have shown its efficacy in reducing probing pocket depths (PPD) and improving clinical attachment levels (CAL).^{7,8} However it is often assumed that intrabony defects would not respond favorably to NSPT, owing to the difficulty of access for cleaning or to other local factors. It is interesting that the question 'Periodontal intrabony defects: to instrument non-surgically or not?' is still discussed at periodontal scientific meetings and conference presentations. Along the same lines, some scientific papers on GTR exclude subgingival instrumentation from the pre-surgical protocol.^{9,10} The rationale for this is presumably to avoid causing gingival recession, which would

compromise the amount of soft tissue available for membrane coverage during regenerative surgery.

The questions that need to be asked are:

- What is the effect of nonsurgical therapy in periodontal intrabony defects?
- Should we treat intrabony defects non-surgically?
- Should we just debride them in preparation for regenerative surgery?

The last of these issues is implied in most papers on periodontal regeneration.

In the hunt for the best way forward to provide guidelines for the treating periodontist, hygienist or general dentist,

AUTHOR

Luigi Nibaldi PhD

Clinical Lecturer, Periodontology Unit and Division of Clinical Research, UCL Eastman Dental Institute. Specialist in Periodontics, private practice, London and Hertfordshire

KEY WORDS

Periodontitis, Bone Loss, Regeneration, Intrabony Defect, Non-surgical Therapy

we must rely on the existing periodontal literature. Overall, the evidence in the literature on the effect of NSPT on clinical and radiographic response in infrabony defects following non-surgical therapy is quite limited but it is reviewed here, along with the author's own experience and some case reports.

In 1985, Isidor and co-workers compared the radiographic changes in infrabony defects in 16 patients 12 months after treatment with three different modalities: modified Widman flap surgery, reverse bevel surgery and NSPT. The authors reported that the radiographic bone level was essentially unchanged following non-surgical therapy.¹¹ On the other hand, a split-mouth design study showed 'positive changes' (no linear measurements performed) to alveolar bone levels when NSPT was associated with topical subgingival antimicrobial treatment in periodontitis patients.¹²

Renvert and co-workers (1985)¹³ followed up 21 pairs of infrabony defects treated with either NSPT or flap surgery for five years. Sites exhibited an average 1.2mm CAL gain and 0.3mm PPD reduction at one year. However, no radiographic data were presented. Other studies on combinations of periodontal defects (infrabony and suprabony) treated with NSPT showed minimal changes in bone height.^{14,15}

Approximately 20 years ago, a review of studies on non-surgical periodontal therapy concluded that NSPT has minimal potential for osseous repair of infrabony defects.¹⁶ But does this conclusion still hold true to this day?

Studies where radiographs were analysed by digital subtraction radiography reported an increase in interproximal bone density following NSPT in periodontal defects, although sites were not specifically selected as 'infrabony'.^{17,18} In 2008, Hwang et al¹⁹ observed an increase in bone density in 39 sites treated with NSPT and reassessed 12-18 months later. A recent retrospective study on 68 periodontitis patients demonstrated that bone fill can occur in periodontal infrabony defects following oral hygiene instructions and NSPT.²⁰ The mean overall radiographic bone infill was 0.7mm, while complete resolution of the bony defect occurred in a small proportion of individuals. The bone fill was characterised by a reduction of defect depth associated with widening of the infrabony angle, likely to be due to the bone fill in the narrowest part of the defect. The amount of bone fill was particularly increased in nonsmoking individuals (approximately 1 mm overall), and smoking was significantly associated with reduced radiographic defect resolution. With histological data not available, we can only speculate on whether the attachment gain and radiographic bone gain reflected true regeneration of the attachment apparatus or merely bone remineralisation.

Recently, a Brazilian group investigated the effects of minimally-invasive surgical treatment (MIST) and minimally-invasive non-surgical treatment (MINST) on the healing of periodontal infrabony defects.²¹ MINST was defined as 'careful scaling and root planing with minicurets and ultrasonic devices with specific thin and

delicate tips...carefully inserted through the periodontal pocket with caution to preserve the stability of soft tissues'. Twenty nine patients were randomly assigned to receive either MIST or MINST and were then reassessed up to six months after treatment. Patients had received oral hygiene instructions before treatment and were seen monthly after treatment until the six-month review, for periodontal maintenance and further oral hygiene instructions. Both treatment modalities resulted in significant PPD reductions and CAL gain, with no concomitant significant increase in gingival recession. No differences were detected between groups for patient-centred or clinical outcomes, with the exception of treatment time, which was considerably less in the MINST group.

Although only a few studies have considered the effects of NSPT on infrabony periodontal defects, these recent reports may lead to a paradigm shift that emphasises the importance of oral hygiene instructions and non-surgical periodontal

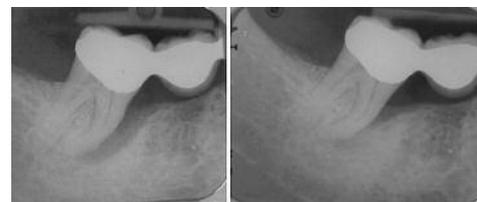


Figure 2: Pre- and post-NSPT periapical radiograph of tooth LR7 (case from Figure 1, treated by the author). The second radiograph was taken 12 months after NSPT and shows considerable bone fill in the defect

REFERENCES

- Papapanou PN, Tonetti MS. Diagnosis and epidemiology of periodontal osseous lesions. *Periodontol 2000*. 2000;22:8-21.
- Papapanou PN, Wennström JL. The angular bony defect as indicator of further alveolar bone loss. *J Clin Periodontol*. 1991;18:317-22.
- Schluger S. Osseous resection; a basic principle in periodontal surgery. *Oral Surg Oral Med Oral Pathol*. 1949;2:316-25.
- Rosling B, Lindhe J, Nyman S. Influence of professional tooth cleaning on bone regeneration following periodontal surgery. *J Dent Res*. 1975;54:211-17.
- Nyman S, Lindhe J, Karring T, Rylander H. New attachment following surgical treatment of human periodontal disease. *J Clin Periodontol*. 1982;9:290-6.
- Cortellini P, Tonetti MS. Focus on infrabony defects: guided tissue regeneration. *Periodontol 2000*. 2000;22:104-32.
- Badersten A, Nilveus R, Egelberg J. Effect of nonsurgical periodontal therapy. II. Severely advanced periodontitis. *J Clin Periodontol*. 1984;11:63-76.
- Cobb CM. Clinical significance of nonsurgical periodontal therapy: an evidence-based perspective of scaling and root planing. *J Clin Periodontol*. 2002;29:6-16.
- Dörfer CE, Kim TS, Steinbrenner H, Holle R, Eickholz P. Regenerative periodontal surgery in interproximal infrabony defects with biodegradable barriers. *J Clin Periodontol*. 2002;27:162-8.
- Browning ES, Mealey BL, Mellonig JT. Evaluation of a mineralized cancellous bone allograft for the treatment of periodontal osseous defects: 6-month surgical reentry. *Int J Periodontics Restorative Dent*. 2009;29:41-7.
- Isidor F, Attström R, Karring T. Regeneration of alveolar bone following surgical and non-surgical periodontal treatment. *J Clin Periodontol*. 1985;12:687-96.
- Rosling BG, Slots J, Webber RL, Christersson LA, Genco RJ. Microbiological and clinical

INTRABONY DEFECTS AND NON-SURGICAL TREATMENT



Figure 3: Pre- and post-NSPT periapical radiograph of tooth UR2 (case treated by the author), evidencing an intrabony defect affecting the mesial surface of UR2. The second radiograph was taken 12 months after NSPT and shows radiographic bone fill



Figure 4: Pre- and post-NSPT periapical radiograph of tooth LR7 (case treated by the author), showing a deep intrabony defect affecting the distal surface of LR7 and reaching the apex. The second radiograph was taken 12 months after NSPT and shows considerable bone fill in the defect



Figure 5: UR1 on presentation and three years later after NSPT alone (Illustrations courtesy of Philip Ower)

treatment not just as a preparatory treatment for periodontal regenerative surgery, but perhaps as a definitive treatment for the intrabony defect. This has been shown particularly by the clinical and radiographic evidence in the studies by Nibali (2011)²⁰ and Ribeiro (2011).²¹ The ability of NSPT to achieve clinical and radiographic intrabony defects resolution is illustrated in Figures 2, 3 and 4 (cases treated by the author, Luigi Nibali). In these cases, a considerable reduction in the radiographic bone loss can be appreciated by comparing baseline radiographs with follow-up radiographs

(taken 12 months after NSPT). Clearly, long-term data on stability of radiographic gains obtained non-surgically are needed. Anecdotally, however, in well-supported and compliant periodontal patients, such gains achieved through NSPT alone can be maintained in the longer term (see Figures 5 and 6, cases treated by Philip Ower).

The use of novel non-surgical techniques and instruments such as minicurettes and thin ultrasonic inserts, associated with the use of magnification loupes, may prove useful tools in the treatment of difficult-to-access areas such as intrabony defects and furcations. It is suggested therefore that we should revisit our thoughts on the effect of NSPT on intrabony defects and not consider NSPT as simply a presurgical intervention. Thoroughness in subgingival debridement is essential, as well as respect for the soft tissues and stability of the blood clot in the pocket, in order to obtain attachment gain, radiographic bone gain and often resolution of the bone defect, thus avoiding unnecessary surgical interventions.

Figure 6: LR6 on presentation, after nine months of NSPT alone and after nine years of supportive periodontal care (Illustrations courtesy of Philip Ower)



- effects of topical subgingival anti-microbial treatment on human periodontal-disease. *J Clin Periodontol.* 1983;10:487-514.
- 13 Renvert S, Nilveus R, Egelberg J. Healing after treatment of periodontal intraosseous defects. 5. Effect of root planing versus flap surgery. *J Clin Periodontol.* 1985;12:619-29.
 - 14 Schmidt EF, Webber RL, Ruttimann UE, Loesche WJ. Effect of periodontal therapy on alveolar bone as measured by subtraction radiography. *J Periodontol.* 1988;59:633-8.
 - 15 Machtei EE, Hausmann E, Schmidt M, Grossi SG, Dunford R, Schifferle R, et al. Radiographic and clinical responses to periodontal therapy. *J Periodontol.* 1998;69:590-5.
 - 16 Greenstein G. Periodontal response to mechanical non-surgical therapy: a review. *J Periodontol.* 1992;63:118-30.
 - 17 Dubrez B, Graf JM, Vuagnat P, Cimasoni G. Increase of interproximal bone-density after subgingival instrumentation: a quantitative radiographical study. *J Periodontol.* 1990;61:725-31.
 - 18 Okano T, Mera T, Ohki M, Ishikawa I, Yamada N. Digital subtraction of radiograph in evaluating alveolar bone changes after initial periodontal therapy. *Oral Surg Oral Med Oral Pathol.* 1990;69:258-62.
 - 19 Hwang YJ, Fien MJ, Lee SS, Kim TI, Seol YJ, Lee YM, et al. Effect of scaling and root planing on alveolar bone as measured by subtraction radiography. *J Periodontol.* 2008;79:1663-9.
 - 20 Nibali L, Pometti D, Tu YK, Donos N. Clinical and radiographic outcomes following non-surgical therapy of periodontal infrabony defects. *J Clin Periodontol.* 2011;38:50-7.
 - 21 Ribeiro FV, Casarin RCV, Palma MAG., Junior FHN, Sallum EA, Casati MZ. Clinical and patient-centered outcomes after minimally-invasive surgical and non-surgical approaches for the treatment of intrabony defects: a randomized clinical trial. *J Clin Periodontol.* 2011;82:1256-66.