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Therapy of hopeless teeth – a case of long-term tooth preservation in a patient with generalised aggressive periodontitis

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Background and aim: Aggressive periodontitis is a critical disease with a poor prognosis for long-term tooth preservation. Extractions of several 'hopeless teeth' are often necessary with subsequent extensive prosthetic reconstruction. The authors aimed to determine whether or not the preservation of 'hopeless teeth' can stabilise periodontal conditions over time.

Case report: A 32-year-old female was first examined in the authors' department in 1993 with the diagnosis of generalised severe aggressive periodontitis. Her external treatment plan included several tooth extractions, bone augmentations, implants, and an extensive prosthetic reconstruction. In accordance with the patient's choice, all hopeless teeth were preserved. Non-surgical treatment was performed on all teeth, surgical treatment was performed on teeth without regenerative potential and with pockets over 6 mm, and surgical regenerative treatment with non-bioresorbable expanded polytetrafluoroethylene (ePTFE) membranes was performed on sites with regenerative potential. After surgical therapy, supportive treatment was carried out four times a year to date. Due to the teeth preservation treatments, no prosthetic treatment was necessary, but a gingiva mask was used for the wide exposed roots of the maxillary anterior teeth.

Results and conclusions: This case shows that periodontal stabilisation and long-term preservation of even hopeless teeth is possible. The radiographic re-evaluation in 2007 showed bone gain at sites treated with ePTFE membranes and small bone gain or stabilisation of the bone level in all other treated sites. The treatment increased the bone level of the hopeless teeth and these teeth have been preserved for 14 years.

■ Introduction

Aggressive periodontitis is considered a multi-factorial disease, comprising a heterogeneous group of infectious diseases characterised by a complex host–microbial interaction in the periodontal ligament[1]. Aggressive periodontitis (formerly referred to as rapid progressive periodontitis) often occurs in people under 35 years.

The aggressive nature of this disease, the early onset, and the high yearly bone loss confer a high risk for early tooth loss[2].

Fig 1a to d Clinical frontal views of the patient: (a) periodontal treatment began in 1993, (b) 1996 image shows the same patient 3 years after non-surgical and surgical therapy. Recessions of about 4 to 5 mm occurred at the upper front teeth, and the same patient 6 (c) and 14 years (d) after treatment with no remarkable changes.

Aggressive periodontitis commonly leads to a rapid loss of attachment and of adjacent supporting bone. Although it can affect young, otherwise healthy individuals, this disease is often associated with severe congenital defects of haematological origin, alterations in neutrophil chemotaxis, and systemic conditions, including metabolic disorders[3-8].

The disease is classified by whether it begins before or after puberty. Immune deficiencies and a genetic link have been identified as contributing factors for all types of aggressive periodontitis[3,8,9]. Individuals with generalised severe aggressive periodontitis are at high risk for tooth loss[10].

The combination of tooth loss and advanced bone defects is problematic for subsequent prosthetic rehabilitation; the absence of sufficient bone makes implant therapy difficult, and long teeth result in poor aesthetics. The patients are often under 30 years old and conventional crown and fixed dental prosthesis (FDP) reconstructions cause damage to the predominantly unfilled, intact, neighbouring teeth. In addition, prosthetic rehabilitations for patients with severe aggressive periodontitis are seldom satisfactory. Therefore, the primary goal of systematic periodontal therapy in young patients with aggressive periodontitis should be to preserve the affected teeth for as long as possible.

■ Case presentation and phase I therapy

This clinical study describes a female patient with generalised severe aggressive periodontitis. The patient first came to the author's clinic at the age of 32 in 1993. Prior to 1993, the disease progression had led to extensive horizontal bone loss in the maxillary teeth and several intrabony defects in the premolar and molar regions (Figs 2 and 4). The patient had been referred with an external treatment plan for implant and prosthetic therapy with estimated costs of about € 30,000.

Figures 1 to 5 show the clinical and radiographic records of the patient before treatment (1993) and 14 years later (2007). The maxillary anterior teeth had sustained extremely advanced bone loss up to the apical region (Fig 2), indicated clinically by high tooth mobility. To stabilise the maxillary anterior teeth, an adhesive composite splint was immediately applied.

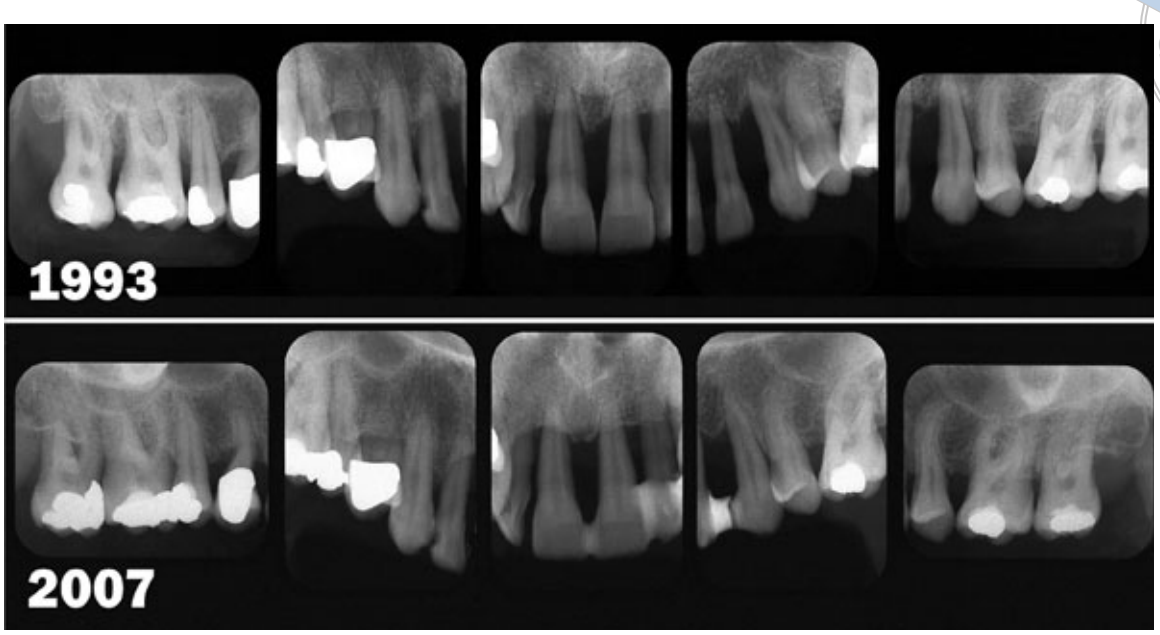

Fig 2 Radiograph comparison of the maxilla in 1993 and 2007. The main difference is the clear cortical bone layer visible in 2007. Slight regenerations of about 1 or 2 mm of bone gain are visible in the maxillary anterior teeth.

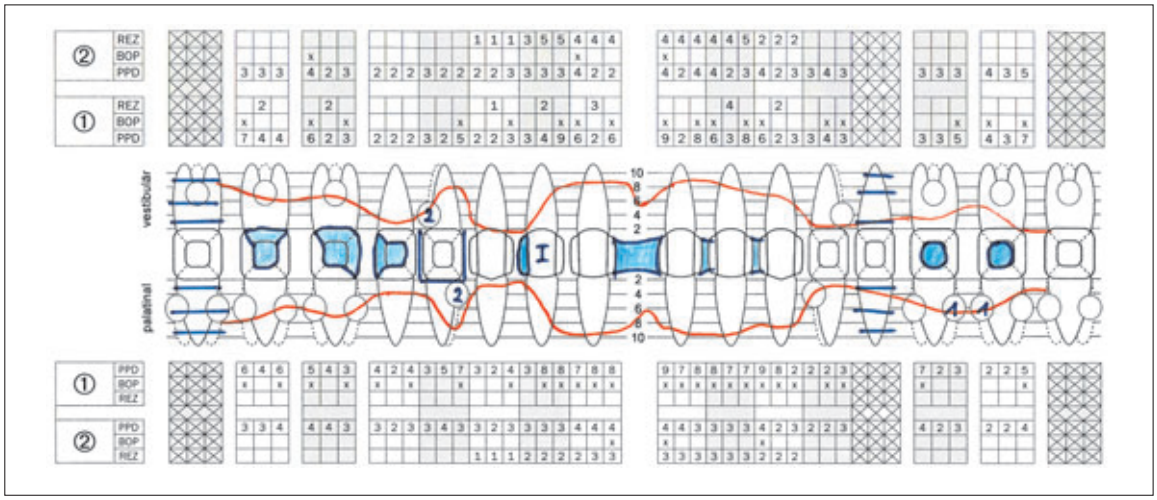

Fig 3 Clinical parameters (maxilla): probing pocket depth (PPD), bleeding on probing (BOP) and recessions (REZ) observed in 1993 (1) and 2007 (2). In 2007 no pockets over 5 mm were observed, and bleeding was found only at isolated sites.

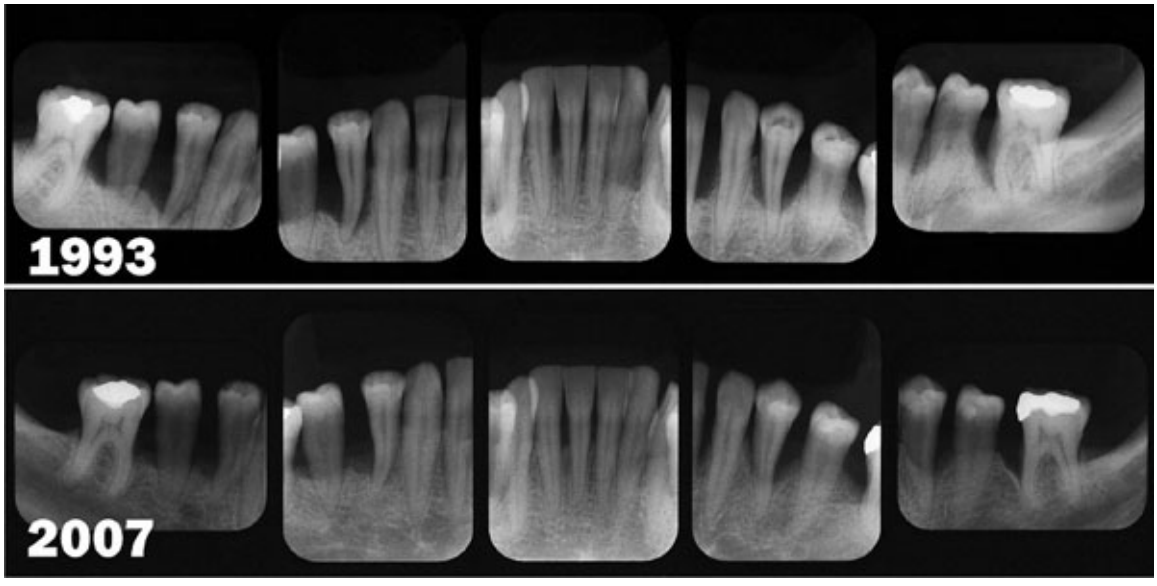

Fig 4 Radiograph comparison of the mandible in 1993 and 2007. The main difference is the compact demarcating bone layer in 2007. Slight regenerations of about 2 to 4 mm of bone gain at sites with intrabony defects were observed after the regenerative surgical procedure.

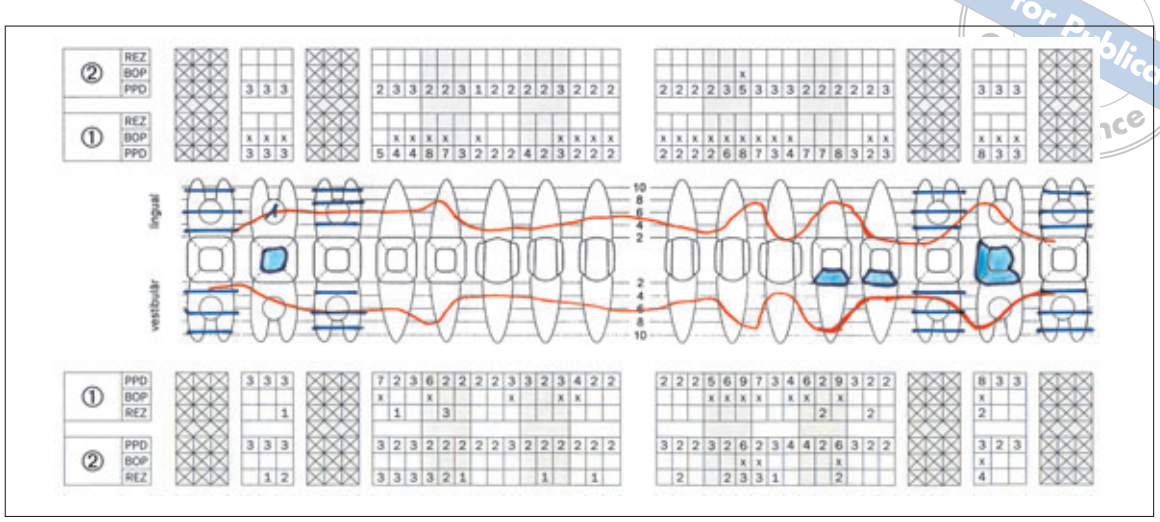

Fig 5 Clinical parameters (mandible): probing pocket depth (PPD), bleeding on probing (BOP), and recessions (REZ) in 1993 (1) and 2007 (2). In 2007, pockets were found at two sites that were deeper than 5 mm with localised bleeding.

Wide interdental spaces within the maxilla and mandible were clinically conspicuous. In the radiographs, teeth that were missing proximal contact showed advanced periodontal attachment and bone loss. Intrabony defects were found at teeth 14, 26, 36, 34, 32, 44, 45, and 46 with localised bone loss (up to 90% of the root length). Disease progression led to horizontal bone defects at teeth 12, 11, 21, 22, 23, 41, and 42. According to Machtei et al, teeth with bone loss at either of the proximal sites of more than 70% of the bone height were considered hopeless[11]. These included teeth 12, 11, 21, 22, 34, 44, and 45.

Due to the high number of intrabony defects, the advanced state of periodontal disease, and the age of the female patient, the condition was diagnosed as rapid progressive periodontitis (currently known as generalised severe aggressive periodontitis).

At the first visit to the authors' clinic in 1993, the known facts about the disease and disease progression were explained to the patient, and it was pointed out that the possibility of preserving the maxillary anterior teeth was unlikely due to the advanced bone loss and high tooth mobility. The treatment modalities, including non-surgical phase I therapy, re-evaluation, tooth extractions, and surgical regenerative phase-II-therapy, followed by implant and prosthetic therapies were explained to the patient. Despite the low chance of success, the patient wished to try to preserve the maxillary anterior teeth due to the high costs of implants and prosthetic reconstruction. A decision was made to try to preserve the maxillary anterior teeth if the patient complied with intensive oral prophylaxis and personal oral hygiene. The initial sulcus bleeding and proximal plaque indices were high, about 80% each. Due to the lack of a commercial test for periodontal pathogens at that time, it was not attempted to identify the specific periodontal pathogens involved.

The phase I treatment consisted of intensive quadrant-wise subgingival scaling and root planing (four appointments) without local anaesthesia. At the same time, the patient was instructed in intensive oral care, including basic brushing for 4 minutes three times a day to completely clean all tooth surfaces, and special brushing once a day using different sized brushes to clean the proximal spaces. During the phase I treatment, the proximal plaque decreased to 45% and the bleeding index decreased to 30%. An antibiotic treatment was not performed during the non-surgical phase I treatment, because at that time the treatment regime did not include antibiotic treatments (except in combination with surgical regenerative treatments using periodontal membranes).

■ Phase II treatment

The authors planned to perform surgical treatments after a healing phase of 6 weeks. The decision depended on the improvements gained with oral hygiene (reductions were found in approximal plaque index [API] to be 18% and sulcus bleeding index [SBI] to 5%) and the regenerative potential for each surgical site. The primary aim was to improve the periodontal situation in sites with intrabony defects. In

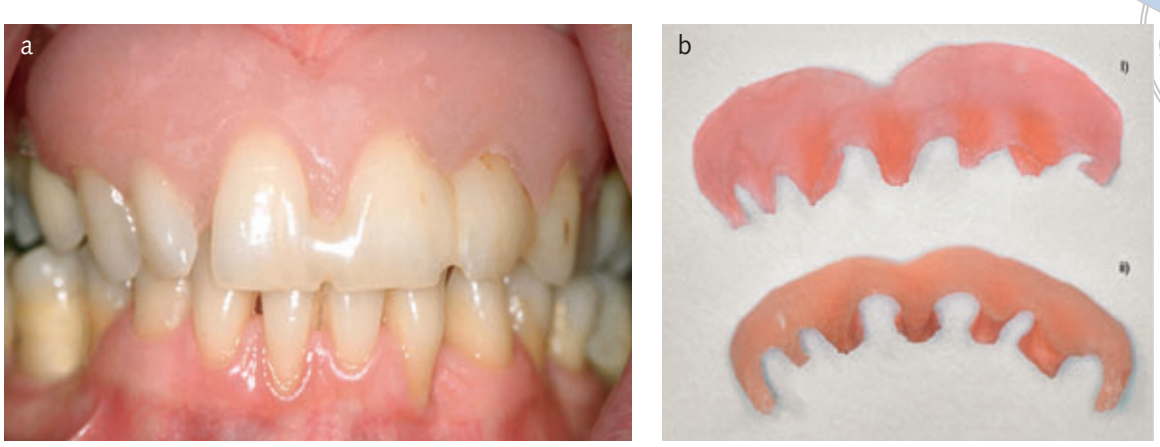

Fig 6a and b Clinical frontal view with a gingiva mask, in situ. 6b shows two gingiva masks. A new gingiva mask prior to insertion (i) and a gingiva mask 1 year after insertion (ii). The discolouration is clearly visible.

the lower left and right sextants, the authors planned two surgical procedures (over 3 months) using non-bioresorbable expanded polytetrafluoroethylene (ePTFE) membranes (GoreTex, WL Gore & Associates, Flagstaff, Arizona, USA) to promote periodontal reattachment and bone regeneration. For 10 days after surgery, 400 mg Clont (metronidazole, Infektopharm, Heppenheim, Germany) was prescribed three times a day to prevent membrane infections, as recommended by the ePTFE membrane manufacturer. For 14 days after surgery, the patient was advised not to clean the teeth in the surgical area. During the first week after surgery, a 0.1% chlorhexidine digluconate (CHX, Chlorhexamed® Fluid 0.1%, GlaxoSmithKline Consumer Healthcare, Bühl, Germany) solution was prescribed for mouth rinsing, and for up to 6 weeks after surgery, a 1% CHX gel (Chlorhexamed® 1% gel, GlaxoSmithKline Consumer Healthcare) was prescribed to be applied locally. The membranes were removed 6 weeks later in a second surgery. To stabilise and preserve the maxillary anterior teeth (13 to 23), a surgical treatment without the regenerative procedure was performed; this involved surgical scaling and root planing to eliminate the biofilm and deposits on the roots in this sextant.

■ Phase III treatment

After completing the above procedures, the patient received maintenance therapy 4 times a year. This included non-surgical scaling and root planing of all the remaining sites that had periodontal pockets deeper than 3mm. Due to the recession of the gingiva at sites that formerly had deep pockets (Fig 1), the patient developed hypersensitivities in teeth with exposed root surfaces. These hypersensitivities persisted over a period of about 1 year after the systematic periodontal phase I and II treatments. In addition, the patient requested an aesthetic correction of the maxillary anterior teeth due to the widely exposed root surfaces. An artificial gingiva was created (Fig 6a and b) to improve the aesthetic appearance. The functional and aesthetic results of this minimal prosthetic treatment were very good. Due to the tea drinking habits of the patient, the artificial gingiva discoloured after about 1 year; thus, it was replaced every year.

In 2005, the patient experienced increased bleeding at localised sites. A DNA test (micro-Ident®, Hain Diagnostika, Reutlingen, Germany) was performed to identify the specific periodontal pathogens associated with the bleeding periodontal sites. The results showed high concentrations of *Aggregatibacter actinomycetemcomitans* (10^5), *Porphyromonas gingivalis* (10^6), *Tannerella forsythensis* (10^6), and *Treponema denticola* (10^5). Retreatment began with an anti-infective full-mouth disinfection therapy[12] combined with a systemic antibiotic regime (previously described by Van Winkelhoff et al)[13]. This procedure stabilised the periodontal conditions within a few weeks, and the bleeding stopped.

■ Treatment outcome

Figures 1 to 5 show the clinical and radiographic findings at the beginning of the treatment in 1993 compared with the long-term results after a period of 14 years. The periodontal treatment procedure

significantly reduced the vertical height of the gingiva (Fig 1). Comparing the clinical anterior views over the years, it is remarkable that there were no tooth movements. The proximal gap between teeth 11 and 12 was closed by the adhesive widening of tooth 11. The course of the gingival margin changed from 1993 to 1996, but after that, no further change could be detected.

Furthermore, no further bone loss was observed after treatment. Sites with localised intrabony defects that underwent the surgical regenerative procedure gained about 2 to 3 mm of bone. The reappearance of the cortical bone structure was a sign of stable periodontal conditions (Figs 2 and 4). The teeth in the maxillary anterior sextant that had sustained horizontal bone loss of about 80 to 90% of the root length showed some bone regeneration (1 to 2 mm) after treatment. The surrounding alveolar bone showed all the signs of a stable periodontal condition (Fig 2).

The maxillary anterior teeth required restabilisation over time, and broken proximal composite splints were frequently repaired. From the aesthetic point of view, the results were not optimal, due to the large number of front teeth with widely exposed root surfaces. The artificial gingiva was, therefore, a good solution for improving the aesthetics of the anterior teeth. The patient showed extremely good compliance and excellent manual deftness in cleaning the interproximal spaces (the approximal plaque and bleeding indices decreased around 5 to 10%). This, along with the periodical periodontal supportive therapy, extended the success of the treatment for a long period of time and prevented further bone or tooth loss.

■ Discussion

This long-term case provides valuable support of the notion that tooth preservation should always be a treatment option, especially for patients that have aggressive periodontitis. These patients are usually under 40 years old, and commonly have complete dentitions prior to the diagnosis of the disease. It is associated with high bone loss and often results in one or more hopeless teeth, with bone height losses greater than 70% of the root length at the proximal surface, and increased tooth mobility[11]. The extraction of hopeless teeth must be followed by an implant or prosthetic therapy, with all the associated problems.

This case is an excellent example of the successful preservation of hopeless teeth and even slight bone gain 14 years after therapy. Other studies have shown that at an average of 4 to 8 years after therapy, no bone loss was observed in the teeth and bone adjacent to 'hopeless teeth'[11,14]. Thus, the assumption that further bone loss will occur at 'hopeless tooth' sites or at neighbouring sites is not always justified and should not constitute the sole reason for the extraction of those teeth.

In this case, the extraction of the 'hopeless teeth' would have resulted in a small alveolar bone ridge that was unsuitable for immediate implant insertion. A stable implant insertion and good aesthetic clinical results would have required extensive bone augmentation or a surgical maxillary sinus augmentation[15,16]. These implant procedures are often necessary for prosthetic treatments with fixed crowns and FDPs.

There are many studies regarding implant treatments under healthy periodontal conditions, but there are only a limited number regarding patients with advanced aggressive periodontitis[17]. Little is known about disease progression and the potential impact on adjacent teeth, on implants, or on the risk of developing peri-implantitis[18]. In patients with treated aggressive periodontitis, implants have only been successful under conditions where patients strictly maintained healthy periodontal conditions[19-21].

In this case study, an alternative treatment could have been the extraction of the 'hopeless teeth' followed by an exclusively prosthetic treatment without implants. Due to the high vertical bone loss in the anterior maxillary region, this conventional prosthetic treatment would have been aesthetically comparable to the option we chose with no extraction. The pontics would have been rather long, but the critical deciding point was the high risk of endodontic complications involved in the crown preparation of elongated non-carious teeth. Moreover, it would not have provided a satisfactory long-term treatment. Thus, it was decided not to perform an exclusive prosthetic treatment due to the doubtful aesthetic outcome due to this solution, combined with the additional endodontic risk.

Teeth were preserved that had a maximum bone height of 20 to 30% of the root length. There was some uncertainty at the beginning of the treatment as to whether or not this solution would last and be stable and acceptable to the patient. Our results showed that the bone level was stable over 14 years and, even in sites that did not receive the surgical regenerative procedure, the bone height slightly increased 1 or 2 mm above the levels before treatment.

The prescription of metronidazole for 10 days after each surgical regenerative procedure was a common treatment option in the mid 90s to prevent membrane infections, after surgical regenerative procedures using non-bioresorbable membranes. Nowadays the antibiotic treatment would precede the surgical treatment and would be carried out during the phase I therapy according the full-mouth disinfection concept. For regeneration of intrabony defects, membranes as well as enamel matrix proteins could be used. Due to the high complication rate using non-bioresorbable membranes, surgical regenerative procedures are usually done with enamel matrix proteins. When using these proteins an accompanying antibiotic treatment is not necessary.

One unanswered question is how long will this situation remain stable? Although certainty cannot be achieved without data, in the authors' experience, the periodontal situation will remain stable and free of inflammation with continuous oral hygiene and periodical maintenance therapy. Any slackening of oral hygiene will result in inflammation with bleeding on probing; these signs of disease activity are monitored at every maintenance session. A second factor that might limit long-term tooth preservation is the occurrence of caries at the root surfaces. Caries often occur on proximal sites or in furcations, and under these conditions, tooth preservation becomes limited or impossible.

Tooth preservation of even heavily periodontally affected teeth is a viable treatment decision for patients with a low budget. Systematic periodontal treatment followed by maintenance therapy is inexpensive compared with implant surgery and prosthetic rehabilitation. This case study showed that systematic non-surgical and surgical treatments can preserve even hopeless teeth and stabilise or improve bone levels over a period of 14 years.

■ Conclusions

In conclusion, the authors propose the following guidelines for treating patients under 40 years with advanced aggressive periodontitis and hopeless teeth.

- If dentition is complete, preservation of teeth with advanced bone loss is possible.
- If oral hygiene is acceptable, further disease progression in the affected teeth can be prevented and formerly 'hopeless teeth' can be preserved over a long time period.
- The bone levels on adjacent teeth and on 'hopeless teeth' can show small bone gains over time.

■ References

1. Tonetti MS, Mombelli A. Early-onset periodontitis. Ann Periodontol 1999;4:39-53.
2. Gunsolley JC, Califano JV, Koertge TE, Burmeister JA, Cooper LC, Schenkein HA. Longitudinal assessment of early onset periodontitis. J Periodontol 1995;66:321-328.
3. Cichon P, Crawford L, Grimm WD. Early-onset periodontitis associated with Down's syndrome. A clinical interventional study. Ann Periodontol 1998;3:370-380.
4. Kamma JJ, Nakou M, Baehni PC. Clinical and microbiological characteristics of smokers with early onset periodontitis. J Periodontal Res 1999;34:25-33.
5. Mooney J, Hodge PJ, Kinane DF. Humoral immune response in early-onset periodontitis: influence of smoking. J Periodontal Res 2001;36:227-232.
6. Oh TJ, Eber R, Wang HL. Periodontal diseases in the child and adolescent. J Clin Periodontol 2002;29:400-410.
7. Schenkein HA, Van Dyke TE. Early onset periodontitis: systemic aspects of etiology and pathogenesis. Periodontol 2000 1994;6:7-25.
8. Sigusch B, Klinger G, Glockmann E, Simon HU. Early-onset and adult periodontitis associated with abnormal cytokine production by activated T lymphocytes. J Periodontol 1998; 69:1098-1104.
9. Vandesteen GE, Williams BL, Ebersole JL, Altman LC, Page RC. Clinical, microbiological and immunological studies of a family with a high prevalence of early-onset periodontitis. J Periodontol 1984;55:159-169.
10. American Academy of Periodontology. Parameter on aggressive periodontitis. J Periodontol 2000;71:867-869.
11. Machtei EE, Hirsch I. Retention of hopeless teeth: the effect on the adjacent proximal bone following periodontal surgery. J Periodontol 2007;78:2246-2252.
12. Quirynen M, Mongardini C, Pauwels M, Bollen CM, Van EJ, van SD. One stage full- versus partial-mouth disinfection in the treatment of chronic adult or generalized early-onset periodontitis. II. Long-term impact on microbial load. J Periodontol 1999;70:646-656.
13. van Winkelhoff AJ, Rodenburg JP, Goene RJ, Abbas F, Winkel EG, de Graaff J. Metronidazole plus amoxycillin in the treatment of Actinobacillus actinomycetemcomitans associated periodontitis. J Clin Periodontol 1989;16:128-131.
14. Wojcik MS, DeVore CH, Beck FM, Horton JE. Retained hopeless teeth: lack of effect periodontally-treated teeth have on

the proximal periodontium of adjacent teeth 8-years later. J Periodontol 1992;63:663-666.
15. Hürzeler MB, Kirsch A, Ackermann KL, Quinones CR. Reconstruction of the severely resorbed maxilla with dental implants in the augmented maxillary sinus: a 5-year clinical investigation. Int J Oral Maxillofac Implants 1996;11:466-475.
16. Yang J, Lee HM, Vernino A. Ridge preservation of dentition with severe periodontitis. Compend Contin Educ Dent 2000;21:579-583.
17. Mengel R, Flores-de-Jacoby L. Implants in patients treated for generalized aggressive and chronic periodontitis: a 3-year prospective longitudinal study. J Periodontol 2005;76:534-543.
18. Meffert RM. Periodontitis and periimplantitis: one and the same? Pract Periodontics Aesthet Dent 1993;5:79-80, 82.
19. Carlsson GE, Hedegard B, Koivumaa KK. Late results of treatment with partial dentures. An investigation by questionnaire and clinical examination 13 years after treatment. J Oral Rehabil 1976;3:267-272.
20. Lang NP, Wilson TG, Corbet EF. Biological complications with dental implants: their prevention, diagnosis and treatment. Clin Oral Implants Res 2000;11(Suppl 1):146-155.
21. Nevins ML, Gartner-Sekler JL. Periodontal, implant, and prosthetic treatment for advanced periodontal disease. Compend Contin Educ Dent 1997;18:469.