Advanced restorative techniques and the full mouth reconstruction: part eight – the periodontal prosthesis

In part eight of the series, **Paul Tipton** explores the periodontal prosthesis or, as it's also commonly known, the Lindhe/Nyman bridge

Introduction

The periodontal prosthesis (or as it's also commonly known, the Lindhe/Nyman bridge) is a technique developed by the two leading periodontists of the 1970s, Jan Lindhe and Stu Nyman in Gothenburg. Their technique allows multiple pontic replacement in fixed bridgework often on severely mobile, compromised and reduced number of abutment teeth. The science is overwhelmingly in favour of this type of bridge in certain situations where conventional dentures and implants are not possible for whatever reasons.

The technique relies on good oral hygiene, a reduced but healthy periodontal condition, multiple cantilevers often with three pontics cantilevered off the last remaining abutment, supra gingival margins, acrylic or composite veneering material on a metal framework and with a balanced form of occlusion (with non-working side interferences deliberately placed).

In effect the bridgework acts as a 'living denture' and the balanced occlusion stabilises the mobile bridgework. This type of bridge has increased (but not increasing) mobility and excellent long-term success rates. Bridge design can vary from end abutment bridges to cantilevered bridges and often with a 12-unit bridge supported only by two mobile canine abutments.

Figure 1: Initial smile

Figure 2: Inter-cuspal position

Figure 3: Upper arch

Figure 4: Lower arch

Figure 5: Upper diagnostic wax-up

Figure 6: Lower diagnostic wax-up

Figure 7: Upper prototypes

Figure 8: Lower prototypes

Figure 9: Tooth preparations

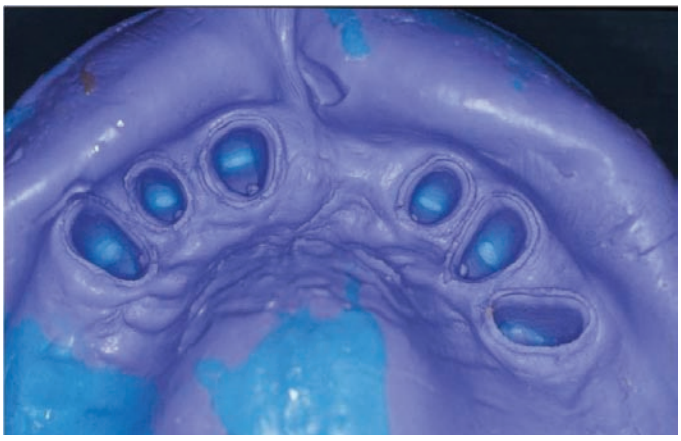

Figure 10: Initial Impressions

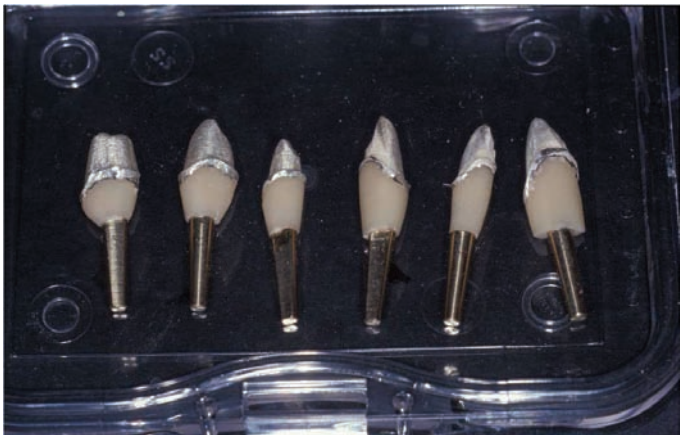

Figure 11: Upper silver dies

Clinical studies

The clinical studies date back to articles published in the *Journal of Periodontology* in April 1979. The material consisted of 299 individuals (aged 23-72 years, mean age 48.7 years) who were referred to the Department of Periodontology, University of Gothenburg, for periodontal treatment from 1969 to 1973.

The limiting criterion for acceptance of patients for this study was that their dentition had lost 50% or more of the periodontal tissue support.

In addition, they had to be:

- Willing to accept periodontal treatment including tooth extractions, periodontal surgery and, if indicated, prosthetic treatment
- Capable of maintaining optimal plaque control
- Willing to appear for regular appointments for additional maintenance care.

Forty-eight of these patients (22 males and 26 females), namely those who participated in the controlled oral hygiene programme eight years following initial treatment and appeared at the eight-year follow-up re-examination, constituted the 'non-bridge treatment group' (Group I).

The remaining 251 patients displayed a similar degree of periodontal disease at the initial examination as the patients of Group I but, in addition, the breakdown of the periodontal tissues around certain teeth had reached a level where tooth extractions and subsequent prosthetic replacement were required.

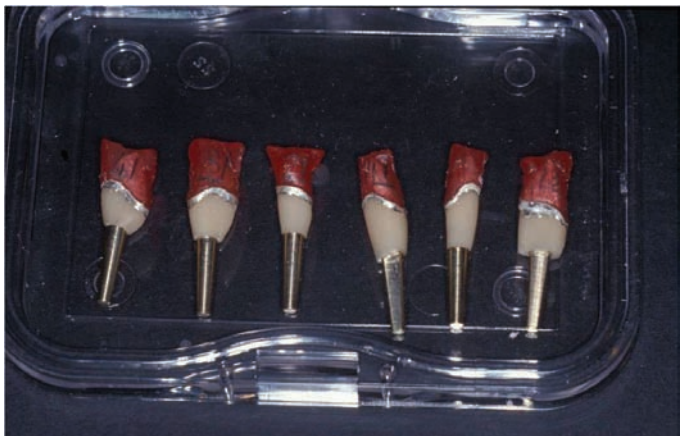

Figure 12: Upper silver dies and duralay bonnets

Figure 13: Lower silver dies

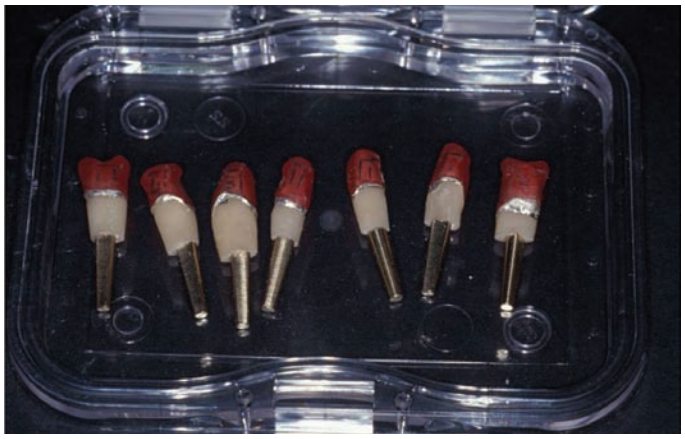

Figure 14: Lower silver dies and duralay bonnets

Figure 15: Upper duralay bonnets and coat-hanger wire

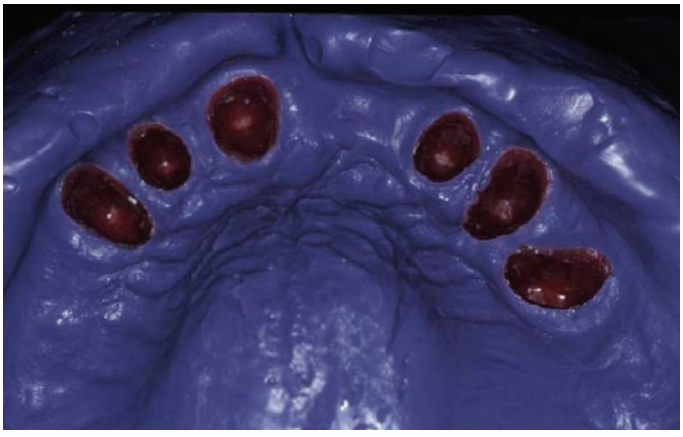

Figure 16: Upper impregum pick up impression

Figure 17: Lower duralay bonnets and coat-hanger wire

Out of these 251 individuals, every fifth (in consecutive order according to date of start of treatment), were selected to form the 'bridge treatment group' (Group II). In these 50 patients, 74 fixed bridges were placed.

According to the design of the bridgework, the 'bridge treatment group' was divided into three subgroups:

- Group IIa: 21 bridges of cross-arch extension with abutment teeth present at the distal termination of the bridges. In this bridgework, the number of pontics between two neighbouring abutments ranged from one to eight
- Group IIb: 39 bridges of cross-arch extension with distal cantilever segments in one or both sides of the jaw. In this bridgework, the mean number of free-end pontics per cantilever segment was 2.3 (range one to seven)
- Group IIc: 14 bridges of unilateral extension.

Figure 18: Lower impregum pick up impression

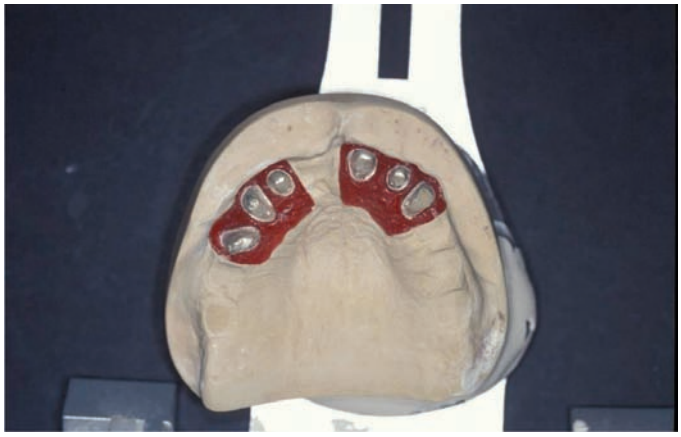

Figure 19: Upper master model

Figure 20: Lower master model

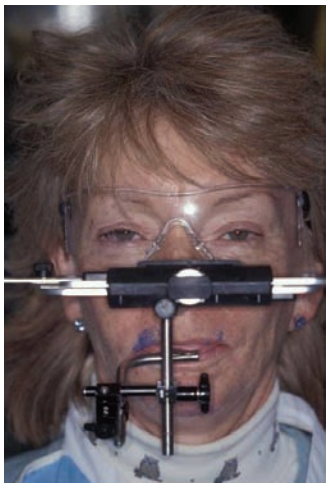

Figure 21: Facebow

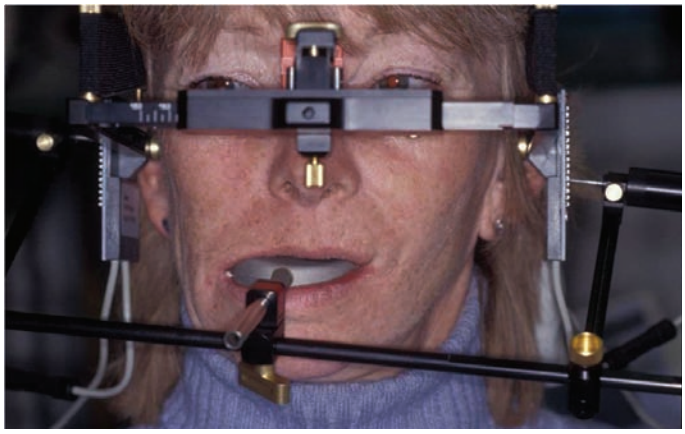

Figure 22: Cadiax recording of right lateral

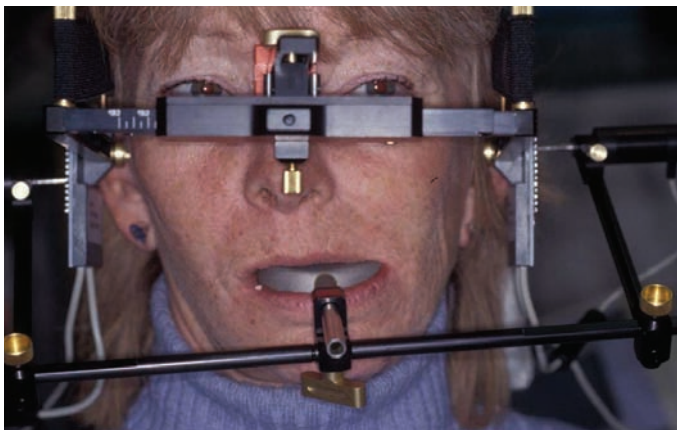

Figure 23: Cadiax recording of left lateral

Success rates

The overall success rates for this extreme style of bridgework was over 92% success after the eight years of the study.

The analysis of the total material (332 bridges in 251 patients), regarding frequency of and reasons for technical failures that were encountered in the various bridgework after placement, gave the following result:

1. Loss of retention of retainer crowns from abutment teeth (11 bridges, 3.3%). This failure occurred in six bridges of cross-arch extension with distal abutment teeth present, and in five bridges of cross-arch extension with distal cantilever segments
2. Fracture of bridgework (seven bridges, 2.1%). Such fractures were noted in one bridge of unilateral extension, in three bridges of cross-arch extension with distal

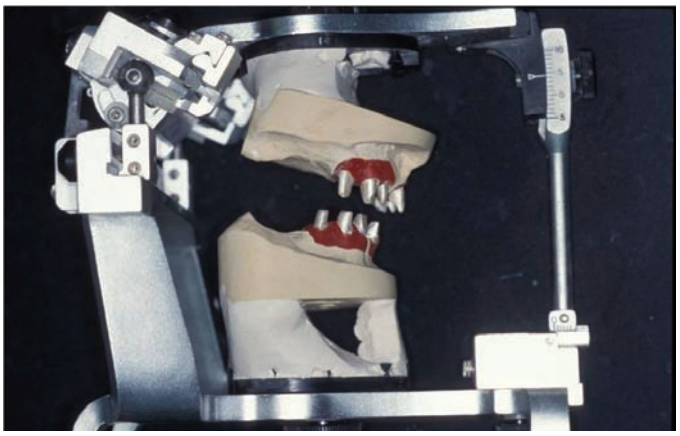

Figure 24: Fully adjustable articulator right-view

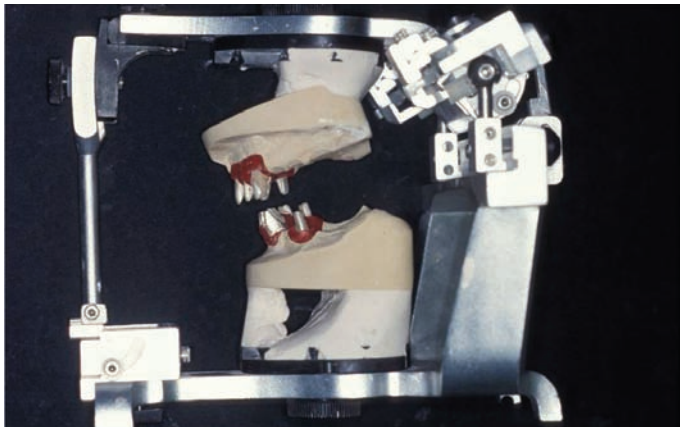

Figure 25: Fully adjustable articulator left-view

Figure 26: Metal try-ins

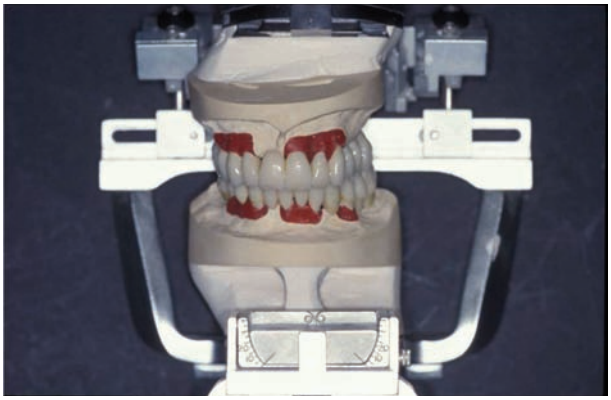

Figure 27: Full arch restorations on the articulator

Figure 28: Lower arch restorations on the articulator

Figure 29: Balancing side contacts in R-lateral movements

abutment teeth, and in three bridges of cross-arch extension involving cantilever units

3. Fracture of abutment teeth (one tooth in each of eight bridges, 2.4%) occurred in three bridges of cross-arch extension with distal abutment teeth present and in five cross-arch bridges with cantilever segments. Four of these fractures occurred in the abutment tooth adjoining free-end units. Of a total of eight fractured teeth, six were non-vital but root-filled, and two were vital.

Conclusions

The results showed that following a combined prosthetic/periodontal treatment, periodontal health can be

Figure 30: Working side contacts in R-lateral movements

Figure 31: Balancing side contacts in L-lateral movements

Figure 32: Working side contacts in L-lateral movements

Figure 33: Upper arch completed

maintained in patients enrolled in a controlled oral hygiene programme. The type of maintenance care exercised in the present study was equally effective in patients for whom fixed bridgework was part of the initial treatment. Severe reduction of periodontal support around the abutment teeth and differences in design of the bridgework did not influence the periodontal status or longevity of the bridgework during the observation period. However, failures of technical nature occurred in 26 out of the 332 bridges. These failures appeared as:

1. Loss of retention of retainer crowns from abutment teeth in 11 bridges
2. Fracture of bridgework in seven bridges
3. Fracture of abutment teeth in eight bridges.

All of these potential failures could be reduced by further adaptation of the bridge design and construction techniques.

Case study

This lady was referred to me by her GDP from Birmingham with severe mobility of her remaining teeth, an inability to wear a partial denture, aversion to dental implants and a request to fix her teeth (Figures 1-4).

On examination it was noted that there was grade 1-2+ on all of the teeth with a reduced periodontal support. After an initial phase of periodontal treatment, including visits with both hygienist and periodontist, she was declared sound and healthy but with increased mobility of her teeth.

Her response to periodontal therapy indicated a likely success for a periodontal prosthesis type of bridgework. Initial diagnostic work included full mouth diagnostic waxing and prototypes (Figures 5-8).

This was followed by initial tooth preparations and fitting of the prototypes to try out the new aesthetics and function.

At a later stage, further tooth preparations were completed and impressions taken using a polyvinyl siloxane material in a stock plastic tray (Figures 9 and 10).

As indicated in the last article, it is exceedingly difficult to take accurate impressions of mobile teeth. Hence the impressions were silver plated and silver dies prepared of the preparations in both the upper and lower jaws, and duralay bonnets fabricated (Figures 11-14).

At a second visit further impressions were completed by first placing the duralay bonnets on the teeth and then splinting them together with further duralay and coat-

Figure 34: Lower arch completed

Figure 35: Inter-cuspal position

Figure 36: Final smile

hanger wire using the 'bead-on technique' and then taking an overall impregum location impression in a custom-made tray (Figures 15-18).

Following this, the silver dies were placed back into the impressions and further stone models poured to produce the highly accurate master models (Figures 19 and 20).

Occlusal records were taken by using a facebow, measuring the inter-condylar distance and a cadiax recording (Figures 21-23) so as to programme the fully adjustable articulator (Figures 24 and 25).

Metal substrucures were then cast and tried in the mouth and the fit and accuracy verified (Figure 26).

Composite restorative material was veneered onto the metal subframes to produce the final definitive restorations (Figures 27 and 28).

Using the fully adjustable articulator, a balanced form of occlusion was achieved by placing non-working side interfences. In right lateral exclusion this was achieved by guiding contacts on UL4, LL4 on the balancing side (Figure 29), and with contacts on UR12345 and LR12345 on the working side (Figure 30). While moving into a left lateral excursion, the balancing side guiding contacts were achieved on UR4 and LR5 (Figure 31) and on the working side between UL123 and LL123 (Figure 32).

The restoration in the upper jaw was a 12-unit bridge on six mobile abutments with the three cantilever units on the upper left hand side, and one cantilever on the upper right hand side (Figure 33). In the lower jaw the bridge consisted of a 12-unit bridge on seven mobile lower teeth with one cantilever each side (Figure 34).

The final result can be seen in Figures 35 and 36. PD

Acknowledgements

The author would like to thank the following for help with this series of articles:

- Dr Ibrahim Hussain, BDS, M.Med.Sci.Implantology – implant surgeon
- Dr Andrew Watson, BDS, MSc, specialist in endodontics
- Dr Amit Patel, BDS, MSc, MClinDent, MFDS, RCSEd, MRD, RCSEng specialist in periodontics
- Mr John Wilbberley - dental technician - Waterside Dental Laboratory Lancashire.

Comments to pd@fmc.co.uk

Dr Paul A. Tipton BDS, MSc, DGDP UK is a specialist in prosthodontics, has written over 100 scientific articles in the dental press and is an expert lecturer in his field with Tipton Training Academies in Manchester, Leeds, London and Dublin. After gaining his Masters degree in Conservative Dentistry in 1989, he was awarded the Diploma in General Dental Practice by the Royal College of Surgeons four years later and received specialist status in Prosthodontics in 1999 from the GDC. An ex-professional cricketer with Lancashire County Cricket Club, he is currently the President of the British Academy of Implant Dentistry (www.baid.org.uk). He is a successful dental teacher in the fields of restorative, cosmetic and implant dentistry. Over the last 20 years more than 2000 dentists have completed a yearlong certificate course from one of the Tipton Training Academies (www.tiptontraining.co.uk). He takes referrals for advanced restorative dentistry, implant prosthodontics and cosmetic dentistry from his clinics in London, Leeds and Liverpool (0161 602 3132).