Mandibular Two-Implant Overdentures: Three-Year Prosthodontic Maintenance Using the Locator Attachment System

Andrew Mackie, BDS, MFGDP, DClinDent, MRACDS[a]/Karl Lyons, BDS, MDS, FRACDS[b]/
W. Murray Thomson, BSc, BDS, MA, MComDent, PhD[c]/Alan G.T. Payne, BDS, MDent, DDSc, FCD[d]

Limited clinical research identifies prosthodontic maintenance requirements of mandibular overdentures using the Locator attachment system. Sixty-five edentulous participants received complete maxillary dentures opposing mandibular two-implant overdentures with either Locator nylon (n = 21), Southern plastic (n = 24), or Straumann gold (n = 20) matrices. Prosthodontic maintenance was recorded prospectively for 3 years using defined categories. Over the 3-year period, a mean 3.52 ± 4.8, 2.08 ± 1.9, and 5.5 ± 4.2 maintenance events occurred for Locator, Southern, and Straumann participants, respectively. Prosthodontic success rates of 90% in the Locator nylon group, 88% in the Southern plastic group, and 75% in the Straumann gold group were achieved. *Int J Prosthodont 2011;24:328–331.*

Despite its widespread use, including promotion by leading implant companies, there is a notable absence of longitudinal clinical studies on the prosthodontic maintenance requirements of the Locator attachment system (Zest Anchors) for mandibular two-implant overdentures. Early case reports proposed advantages of this system with limited interarch space,[1] while in vitro studies[2,3] indicated satisfactory retention and wear properties. Originally consisting of three matrices with different retentive values (clear: 5 lb, pink: 3 lb, and blue: 1.5 lb), they are all composed of 4.7-mm-diameter resilient nylon inserts attached to 4.0-mm-diameter titanium alloy, titanium nitride–coated abutments (Figs 1a and 1b). Southern Implants produces polyoxymethylene copolymer plastic cap matrices, which attach to 3.95-mm titanium nitride–coated ball abutments (Figs 1c and 1d). Straumann produces original Dalla Bona–type gold matrices, which attach to titanium alloy 2.25-mm retentive anchors (Figs 1e and 1f).

[a]*Private Practice, Hamilton, New Zealand; Graduate Student of Prosthodontics, Oral Implantology Research Group, Sir John Walsh Research Institute, School of Dentistry, University of Otago, Dunedin, New Zealand.*
[b]*Senior Lecturer and Prosthodontist, Department of Oral Rehabilitation, School of Dentistry, University of Otago, Dunedin, New Zealand.*
[c]*Professor, Department of Oral Sciences and Oral Implantology Research Group, Sir John Walsh Research Institute, School of Dentistry, University of Otago, Dunedin, New Zealand.*
[d]*Prosthodontist, Private Practice, Whangarei, New Zealand.*

Correspondence to: *Dr Andrew Mackie, Anglesea Clinic, P.O. Box 228, Hamilton, New Zealand. Fax: +64 7 838 2824. Email: pros@angleseamds.co.nz*

The research hypothesis was that there would be no difference in the prosthodontic maintenance requirements over 3 years for mandibular two-implant overdentures opposing complete maxillary dentures using the Locator attachment system compared to the Southern plastic cap and Straumann gold matrix attachment systems.

Materials and Methods

Sixty-nine participants from an original cohort of 106 edentulous participants randomly allocated to one of four different implant systems for mandibular two-implant overdentures were selected. Twenty-one participants (mean age: 65 ± 6 years) found their Steri-Oss attachment system (rubber matrix) obsolete with excessive prosthodontic maintenance after the 5-year recall. Participants were offered conversion to the Locator attachment system from the beginning of year 6. Locator abutments were secured to 20 Ncm, and implant overdentures were relined to incorporate the Locator housings and nylon inserts on their intaglio surfaces. All participants were given pink (3 lb) inserts, which were changed to clear (5 lb) inserts if additional retention was subjectively requested. Data were documented for the first 3 years of Locator use, which correlated with years 6, 7, and 8 in the clinical trial. The other 48 participants were those with Southern plastic caps (n = 24; mean age: 66 ± 6 years) and Straumann original Dalla Bona–type gold matrices (n = 24; mean age: 67 ± 7 years), with data from a period of prosthodontic maintenance also across their own first 3 years of service.

Fig 1 Locator, Southern, and Straumann attachment systems.

Fig 1a Locator abutments (reprinted from Ma et al[4] with permission).

Fig 1b Locator inserts (reprinted from Ma et al[4] with permission).

Fig 1c Southern 3.95-mm ball abutments (reprinted from Watson et al[5] with permission).

Fig 1d Southern plastic matrices (reprinted from Watson et al[5] with permission).

Fig 1e Straumann 2.25-mm retentive anchors (reprinted from Payne et al[6] with permission).

Fig 1f Straumann gold matrices (reprinted from Watson et al[5] with permission).

Table 1 No. and Distribution of Maintenance Events for the Locator Nylon Attachment System over 3 Years in 21 Participants

	Matrix			Overdenture			Patrix	
Year	Activate	Replace	D/W	Reline	Remake	Fracture	Replace	Total
1	0	18	0	0	0	0	0	18
2	0	36	0	1	3	0	2	42
3	0	22	0	3	0	0	0	25
Total	0	76	0	4	3	0	2	85

D/W = dislodged and worn.

Table 2 No. and Distribution of Maintenance Events for the Southern Plastic Attachment System over 3 Years in 24 Participants

	Matrix			Overdenture			Patrix	
Year	Activate	Replace	D/W	Reline	Remake	Fracture	Replace	Total
1	0	20	0	6	0	0	0	26
2	0	4	4	5	0	3	6	22
3	0	14	2	6	0	0	6	28
Total	0	38	6	17	0	3	12	76

D/W = dislodged and worn.

Table 3 No. and Distribution of Prosthodontic Maintenance Events for the Straumann Gold Attachment System over 3 Years in 24 Participants

	Matrix			Overdenture			Patrix	
Year	Activate	Replace	D/W	Reline	Remake	Fracture	Replace	Total
1	33	0	2	7	1	1	0	44
2	22	3	4	2	0	2	2	35
3	32	0	4	2	0	0	0	38
Total	87	3	10	11	1	3	2	117

D/W = dislodged and worn

Prosthodontic maintenance events were prospectively recorded according to defined categories over 3 years.[7] After all maintenance events were analyzed, each participant's implant overdenture was allocated to a six-field table analysis of success.[7] Associations with categoric variables were tested for significance using the chi-square test. Analysis of variance was used to test for significance between multiple groups.

Results

Of 42 Locator abutments, 76 nylon matrices required replacement, which was the only matrix event recorded for 3 years in the Locator group (Table 1). Southern plastic caps recorded 38 matrix replacements with 6 dislodged or worn matrices (Table 2), while the Straumann gold group required 87 activations but only 3 replacements (Table 3). Combining all maintenance events over the 3-year period, a mean 3.52 ± 4.8 events were required for the Locator system, whereas a mean 2.08 ± 1.9 events were required for the Southern plastic cap, and 5.5 ± 4.2 events were required for Straumann gold matrices. Significant differences were absent between Locator and Southern plastic matrices but present between Southern plastic and Straumann gold matrices.

The six-field table analysis[7] revealed prosthodontic success rates of 90% in the Locator nylon group, 88% in the Southern plastic group, and 75% in the Straumann gold group over 3 years of service (Table 4).

Table 4 Prosthodontic Success over 3 Years: Six-Field Table Analysis

	Matrix		
	Locator nylon	Southern plastic	Straumann gold
No. of participants	21	24	24
Success	19	21	18
Surviving	0	0	0
Deceased	0	0	1
Unknown	0	0	3
Retreatment (repair)	1	3	2
Retreatment (replace)	1	0	0

Fig 2 Food impaction into Locator abutments.

Discussion

Prosthodontic maintenance for mandibular overdentures is a manifestation of the design of the attachment system components. This research found that the resilient Locator nylon matrix loses retention frequently but is easily replaced, incurring minimal clinical time. Specific to the Locator attachment system was the "nuisance factor" of the regular packing of food debris or plaque accumulation within the undercut of the occlusal rim of the abutment (Fig 2). This often prevented complete seating of the overdenture and was identified as a significant problem for elderly patients with limited manual dexterity. This actually compounded over time, with nearly half of the patients (9 of 19, 47%) having this nuisance factor after 7 years. By contrast, the Southern plastic matrix is a relatively nonresilient system, which hypothetically may place greater forces on the surrounding components (patrix and matrix housing). Although needing less frequent replacement of the matrices, a greater number of relines were required compared with the Locator system. These relines potentially increase laboratory and clinical costs. The Straumann gold matrices, although superseded by elliptical gold matrices, still had their maintenance easily controlled by their simple activation.

Conclusions

No significant differences were found between the overall numbers of prosthodontic maintenance events required for mandibular two-implant overdentures using either the Locator or Southern attachment systems over 3 years. Prosthodontic success rates were 90% in the Locator nylon group, 88% in the Southern plastic group, and 75% in the Straumann gold group.

Acknowledgments

The authors would like to thank all the participants and staff of the Oral Implantology Research Group, Sir John Walsh Research Institute, School of Dentistry, University of Otago, Dunedin, New Zealand. They thank Assoc Prof Rohana K. DeSilva for his surgical expertise; Mr Neil Waddell, Senior Lecturer, for performing all related laboratory procedures; and Dr Sunyoung Ma, Senior Lecturer, for her valuable comments on the manuscript. Thanks are extended to Innova Corporation (Asia-Pacific) for supplying the Locator components as well as to Zest Anchors for support. In addition, Institut Straumann, the International Team for Implantology (ITI) Research Foundation, and Southern Implants are acknowledged for their support. Radiographic Supplies, Colgate Professional Oral Care, Ivoclar Vivadent, and Henry Shalfoons are also acknowledged for their generous support of this research.

References

1. Pasciuta M, Grossmann Y, Finger IM. A prosthetic solution to restoring the edentulous mandible with limited interarch space using an implant-tissue-supported overdenture: A clinical report. J Prosthet Dent 2005;93:116–120.
2. Chung KH, Chung CY, Cagna DR, Cronin RJ Jr. Retention characteristics of attachment systems for implant overdentures. J Prosthodont 2004;13:221–226.
3. Rutkunas V, Mizutani H, Takahashi H. Influence of attachment wear on retention of mandibular overdenture. J Oral Rehabil 2007; 34:41–51.
4. Ma S, Tawse-Smith A, Thomson WM, Payne AGT. Marginal bone loss with mandibular two-implant overdentures using different loading protocols and attachment systems: 10-year outcomes. Int J Prosthodont 2010;23:321–332.
5. Watson GK, Payne AGT, Purton DG, Thomson WM. Mandibular overdentures: Comparative evaluation of prosthodontic maintenance of three different systems during the first year of service. Int J Prosthodont 2002;15:259–266.
6. Payne AGT, Tawse-Smith A, Thomson WM, Duncan WD. Loading strategies for implant overdentures. In: Feine JF, Carlsson G (eds). Mandibular Implant Overdentures: The Standard of Care for Edentulous Patients. Chicago: Quintessence, 2003:111–128.
7. Payne AGT, Walton TR, Walton JN, Solomons YF. The outcome of implant overdentures from a prosthodontic perspective: Proposal for a classification protocol. Int J Prosthodont 2001;14: 27–32.