

Leo Pharma - Merit Award Winner

Treatment of edentulous patients using implant supported mandibular overdentures improves quality of life

Sarah Enright, 5th year Dentistry

CLINICAL POINTS

- The standard of care for the edentulous patient has been the provision of a complete denture, however a large proportion of patients have problems with the retention and stability of the mandibular complete denture
- Pre-prosthetic surgery(PPS) has a history of poor prognosis
- The McGill Consensus states that the two implant mandibular overdenture should be considered as a first choice standard of care
- Compared to complete dentures and PPS, improvements have been demonstrated in areas such as patient satisfaction, nutrition, and quality-of-life
- Quality-of-life is a useful method to demonstrate treatment success, however, the use of individualized quality-of-life measures may prove more relevant in the future

INTRODUCTION

An overdenture (OD) is defined as a prosthesis that covers and is partially supported by natural teeth, tooth roots, and/or dental implants¹.

Tooth loss is a serious life event². According to the WHO criteria edentulism is a form of physical impairment,³ the loss of all teeth causes a disability for most people who wear conventional dentures (CD) as they may have difficulty in performing two essential tasks; eating and speaking.

Quality of life (QOL) is defined as an individual's perception of their position in life, in the context of the culture and value systems in which they live, and in relation to their goals, expectations, standards and concerns⁴. The impact of health and disease on QOL is known as health-related QOL. Another dimension of QOL is Oral health-related QOL. This is defined as an individual's assessment of how the following affect his or her well-being: functional factors, psychological factors, social factors, and experience of pain or discomfort in relation to orofacial concerns⁵.

QOL is established as an important outcome for evaluating the impact of disease and for assessing the efficacy of treatments⁶. QOL in denture wearers is

measured by socio-dental indicators. Locker defined these indicators as; measures of the extent to which dental and oral disorders disrupt normal social role functioning and bring about major changes in behaviour such as an inability to work or attend school, or undertake parental or household duties⁷. Therefore QOL affects denture wearers with regard to patient satisfaction, nutrition and psycho-social aspects of life. QOL is, however, adversely affected by tooth loss.

The sequelae of tooth loss

The effects of tooth loss are two-fold which may affect the patient psychologically and clinically.

Psychologically, edentulism has been quoted as having characteristics of a chronic illness as it is incurable and functionally and physiologically disruptive⁸. Reduced self confidence, taboo and the feeling of premature ageing have also been reported by patients⁸.

Clinically the effects of tooth loss are important. Alveolar bone resorption could be considered as a pathological condition and can pose a prosthodontic dilemma for the restoration of the edentulous mandible. There has been extensive research regarding this aspect and its clinical sequelae. Tallegren reported that the mean decrease in anterior mandibular ridge height was 4 times greater than that of the maxilla⁹.

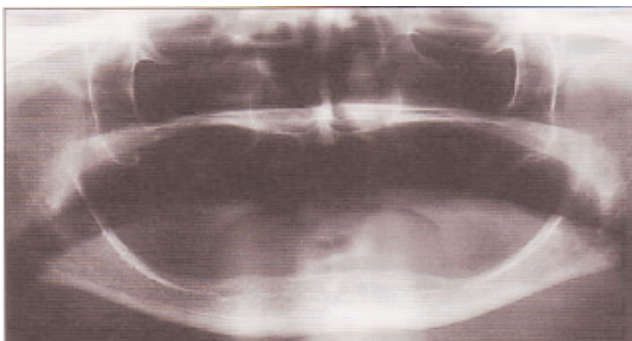


Image 1 & 2: Progression of alveolar bone resorption in the mandible over a 15 year period¹⁰

Crum and Rooney found that retaining mandibular canines and providing an OD resulted in 0.6mm of alveolar bone loss¹¹. Provision of a CD resulted in 5.2mm of bone loss¹². Therefore preserving teeth and providing an OD can preserve bone not only local to the teeth, but also in adjacent areas.

Alveolar bone loss can be reduced by the provision of implants; studies have shown that implant-supported mandibular overdentures (ISMOVDs) can preserve bone height in areas where the implants are located¹². Mericske-Stern also concluded that there is a higher probability of success in the mandible when ODs are supported by implants rather than tooth roots¹³.

Treatment modalities for the edentulous mandible

Treatment modalities for the restoration of the edentulous mandible include: a mandibular CD, pre-prosthetic surgery (PPS) with a mandibular CD, an ISMOVD and an implant-supported fixed bridge.

Much of the literature focuses solely on the comparison of the ISMOVD with the CD, with or without PPS. This section will, therefore, compare and contrast these treatments by analysis of current literature and, thus, show how the restoration of the edentulous mandible with an ISMOVD should be considered as a first choice standard of care.

The classic treatment for the edentulous mandible is a mandibular CD. However the pattern of bone loss associated with the CD can result in the denture-bearing area becoming compromised. Redford demonstrated that more than 50% of CD wearers have problems with the retention and stability of their mandibular CD¹⁴. When the patient experiences poor denture retention and stability, patient satisfaction, confidence and comfort will suffer.

The rate of resorption of the mandibular alveolar bone is greater than that of the maxilla⁹. PPS (ridge augmentation or vestibuloplasty) has, therefore, been advocated in certain clinical circumstances. There is, however, mixed long-term success rates associated with PPS; complications and morbidity are also associated^{15, 16}.

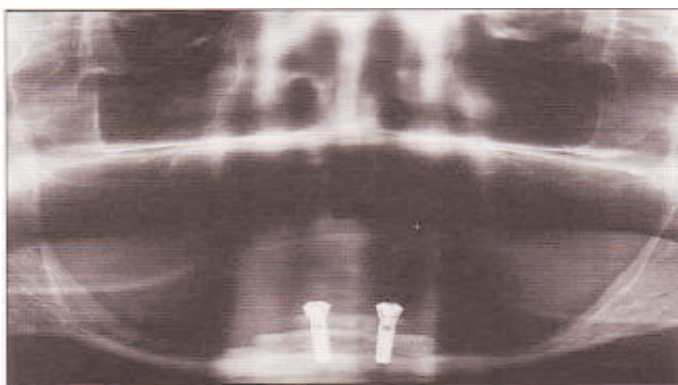


Image 3: The use of 2 implants in the anterior mandible to support an OVD¹⁰

A symposium was held at McGill University where a panel of experts concluded that a 2 implant overdenture (OVD) should be considered as a first choice standard of care for the edentulous mandible¹⁷.

The ISMOVD has been investigated since 1987, with Van Steenberghe¹⁸ being one of the first authors to propose the placement of 2 implants in the mandible to support an OVD. Within 52 months, a 98% success rate was achieved¹⁸. Albrektsson et al. have argued that a state of almost, "restitution ad integrum," can be achieved with dental implants¹⁹.

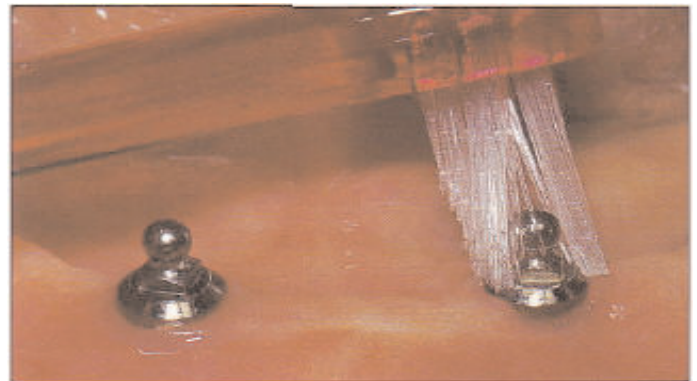


Image 4: Patients should be instructed to remove their prosthesis at night. A soft single-tufted brush is indicated to keep attachments free from plaque and calculus²²

ISMOVDs require frequent maintenance, especially during their first year²⁰. Attard et al. concluded that the cumulative survival rate of the OD was 100%, at 15 years, with the longevity of this prosthesis being 10.39+/-5.59 years²⁰. Relines were required every 4-5 years for both the OD and opposing CD²⁰. However, less after-care was associated with surface treatment of the implants and the use of Dolder bars²¹. Patients must be informed that regular maintenance will be required. Also, this will give the clinician the opportunity to regularly review the patient and detect possible pathology which may otherwise have adversely affected them.

QOL-Patient Satisfaction

It is accepted in the literature that satisfaction in denture wearers depends upon the ability of the patient to chew and speak, and also on the appearance of the prosthesis^{23, 24, 25}. Berg et al. found that 66% of patients were dissatisfied with their CDs due to discomfort, sub-optimal retention and fit, and/or pain associated with the lower CD^{26, 27}.

Many studies have assessed patient satisfaction with ISMOVDs²⁷⁻³⁶. Wismeijer et al. carried out a randomized controlled trial (RCT) where patients were provided with ISMOVDs with either ball attachments, an interconnecting bar, or 4 interconnected implants³⁷. Sixteen months after treatment almost all of the patients were satisfied with treatment irrespective of attachment system used³⁷.

Boerringer et al. assessed patient satisfaction in a RCT³¹. This study compared the CD with an ISMOVD. Satisfaction was measured with a validated questionnaire which assessed: esthetics, retention, comfort, and function of the upper and lower denture. The majority of the ISMOVD group (85%) had a score of 8 or more (score 1=very dissatisfied, score 10=very satisfied)³¹. Results showed that the ISMOVD group was more satisfied 1 year post-treatment. Dissatisfaction in the CD group was due to the poor retention of the lower CD; only 27% were satisfied post-treatment³¹. The design of this study shows a high degree of validity, however, a longer follow-up is required.

The first prospective RCT with a 10 year follow-up was carried out by Raghoeber et al.³⁷. Patients were randomized as follows: a) CD (control group); b) PPS with a CD; and, c) ISMOVD. Within 1 year, the PPS and ISMOVD group experienced better chewing ability than the CD group. The PPS group was satisfied in the short-term. The ISMOVD group experienced long-term satisfaction (10 years.)

From the above evidence it can be concluded that patient satisfaction is improved with the provision of an ISMOVD compared to a CD, with or without PPS. Patients were not only satisfied in the short-term but also at a 10 year recall.

QOL-Nutrition

As tooth number decreases, mastication is more difficult; patients are also more likely to practice forms of food avoidance and dietary restriction.

Morais et al. revealed that patients provided with an ISMOVD reported an increased ability to bite, eat and chew, without losing their dentures, 6 months post-treatment³⁸. This group also showed improvements in anthropometric data and blood nutrient data. Serum albumin concentration increased by 1.4g/l (a recognized indicator of good general health)³⁹. Serum B12 concentrations also increased. These findings, however, should be supported by a larger RCT with a longer follow-up in the future.

The process of dietary restriction amongst edentulous patients has also been studied. Allen and McMillan found that subjects who received ISMOVDs altered their food choices, including, "hard to chew foods"⁴⁰.

From the literature it can be concluded that the ISMOVD offers the patient significant improvements in nutritional status. The ISMOVD will not necessarily result in the patient eating a more balanced diet of their own accord. Thus, in order to allow patients benefit most from their improved masticatory function, dietary advice should be given^{40, 41, 42}.

QOL-Psychosocial effects of ISMOVDs

Blomberg stated that teeth do not function just as a part of the masticatory system; the oral region is also a speech and a psycho-sexual centre⁴³. The success of denture treatment is not solely based upon functional parameters.

The effects of denture wearing on social activities have been studied by Heydecke et al. who carried out a 2 month follow-up RCT comparing CDs and ISMOVDs⁴⁴. Many studies use scales such as the Oral Health Impact Profile (OHIP) to measure QOL. Unlike the Social Impact Questionnaire (SIQ), the OHIP does not take into account social or sexual activities. This study concluded that the ISMOVD had a positive effect on social activities 2 months post-treatment. Conversely, the instability of the CD was shown to adversely affect social activities and interpersonal relationships. Unease in interpersonal relationships was reduced by 32% 2 months post-treatment with the ISMOVD⁴⁴. The SIQ scale showed a high level of reliability. However a longer follow-up period is still required.

The effect of the ISMOVD on social activities was also studied by Melas et al. who carried out a retrospective cohort study based upon the Oral Impacts on Daily Performances (OIDP) sociodental indicator⁴⁵. The OIDP measured psycho-social variables such as: smiling, clear speech, emotional status, social contact and, "going out." Results showed that patients with ISMOVDs were more satisfied with the comfort of their dentures. Sizable percentages (66%) of CD wearers were dissatisfied with the comfort of their prostheses⁴⁵. The main limitation of this study was its design. The groups were also not comparable on the basis of age; however, from previous literature it seems that there is no relationship between age and patient satisfaction⁴⁶. Thus, age is unlikely to have confounded the above results.

From the literature, patients restored with ISMOVDs experience less discomfort and improved psychosocial function. Studies with longer follow-up periods are required.

DISCUSSION & CONCLUSIONS

The standard treatment of the edentulous patient has, for many years, been a CD. Many CD wearers have significant problems in adapting to their mandibular prosthesis. The widespread use and abuse of denture adhesives is a good indication that these prostheses are inadequate in relation to retention and stability. CDs have many disadvantages such as: continual ridge resorption with fibrous replacement, instability of the CD, displacement of the CD, variable levels of acquired muscular control, changes in facial support, reduced masticatory efficacy and emotional distress from tooth loss⁴⁷. PPS has also been associated with poor results^{15, 16}.

Treatment of the edentulous mandible with an ISMOVD has been advocated by Mericske-Stern in elderly patients, who require stabilization of their mandibular CD, and in patients with congenital or acquired maxillofacial defects which require oral rehabilitation⁴⁸.



Image 5 & 6: Placement of implants in a 90 year old patient with a cleft palate, right: Fabrication of a complete denture with full palatal coverage and obturator¹⁰

However a panel of experts (The McGill Consensus)¹⁷ agreed due to overwhelming evidence that the 2-implant OD should be considered as a first choice standard of care for the edentulous mandible¹⁷.

As with any treatment modality, the commitment to after-care and maintenance is vital if the OD is to be successful. The patient must be advised of this and reviewed regularly. As previously mentioned, this may give the clinician the chance to regularly review the patient and detect possible pathology which may then be treated in a timely fashion.

From the evidence presented in this paper it can be concluded that the edentulous patient restored with an ISMOVD (rather than with a CD with or without PPS) experiences more satisfaction with their prosthesis, improved masticatory ability and nutrition, along with improvements in psycho-social aspects of life. However, prospective randomized studies with longer follow-up periods are required. It can also be concluded that patients restored with ISMOVDs will experience improvements in QOL with regard to oral health-related QOL.

REFERENCES

1. The Glossary of Prosthodontic terms, edition 6. J Prosthet Dent 1994; 71: 89
2. Bergendal B. The relative importance of tooth loss and denture wearing in Swedish adults. Community dental health 1989; 06;103-111
3. The World Health Organization. International classification of functioning, disability and health: ICF. Geneva: World Health Organization, 2001
4. Study Protocol for the World Health Organization project to develop a quality of life assessment instrument (WHOQOL). Quality of life Res 2 1993; 2: 153-159
5. Inglehart MR, Bagramian RA (2002) Oral health related quality of life: an introduction. Inglehart MR, Bagramian RA eds, Quintessence Publishing, Chicago, 1-6
6. Locker D. An Introduction to Behavioral Science and Dentistry. London. Routledge. 1989
7. Locker D. Disability and Disadvantage: The Consequences of Chronic Illness. London. Tavistock Publications, 1983
8. J.Fiske, D.M.Davis, C.Frances, S.Gelbier. The emotional effects of tooth loss in edentulous people. Br Dent J 1998; 184: 90-93
9. Tallegren A. The continuing reduction of the residual alveolar ridges in complete denture wearers: a mixed longitudinal study covering 25 years. J Prosthet Dent 1972; 27: 120-32
10. Feine S, Carlsson GE. Implant Overdentures The Standard of Care for Edentulous Patients. Quintessence books. Chapter 10
11. Crum R.J, Rooney G.E, Alveolar bone loss in overdentures-5 year study. J Prosthet Dent 1978; 40: 610-613
12. Jacobs R, Schotte A, Van Steenberghe D, Quirynen M, Naert I. Posterior jaw bone resorption in osseointegrated implant-supported overdentures. Clin Oral Impl Res 1992; 3: 63-70
13. Mericske-Stern R. Overdentures with roots or implants for elderly patients: A comparison. J Prosthet Dent 1994; 72: 543-550
14. Redford M, Drury TF, Kingman A, Brown LF. Denture use and the technical quality of dental prostheses among persons 18-74 years of age: United States, 1988-1991 (Special Issue) J Dent Res 1996; 75: 714-25
15. Jennings DE. Treatment of the mandibular compromised ridge: a literature review. J Prosthet Dent 1989; 61(5): 575-9
16. Matras H. A review of surgical procedures designed to increase the functional height of the resorbed alveolar ridge. Int Dent J 1983; 33(4): 332-8
17. The McGill Consensus Statement on Overdentures. Int J Prosthodont 2002; 15(4): 413-414
18. Van Steenberghe D, Quirynen M, Calberson L, Demanet M. A prospective evaluation of the fate of 697 consecutive intra-oral fixtures modum Brannemark in the rehabilitation of edentulism. J Head Neck Pathol 1987; 6: 53-58
19. Albrektsson T, Blomberg S, Brannemark A, Carlsson G. Edentulousness-an oral handicap. Patient reactions to treatment with jawbone anchored prostheses. J oral rehabilitation 1980; 14: 503-11
20. Attard et al. Long-Term Treatment Outcomes in Edentulous Patients with Implant Overdentures: The Toronto Study. Int J Prosthodont 2004; 17: 425-433
21. Visser et al. Implant-Retained Mandibular Overdentures Versus Conventional Dentures: 10 Years of Care and Aftercare. Int J Prosthodont 2006; 19: 271-278
22. Feine S, Carlsson GE. Implant Overdentures The Standard of Care for Edentulous Patients. Quintessence books. Chapter 13
23. Carlsson GE, Otterland A, Wennstrom A. Patient factors in appreciation of complete dentures. J Prosthet Dent 1967; 17: 322-28
24. Bergman B, Carlsson GE. Review of 54 complete denture wearers. Patient's opinions 1 year after treatment. Acta Odontol Scand 1972; 30: 399-414
25. Awad MA, Locker D, Korner-Bitensky N, Feine JS. Measuring the effect of intra-oral implant rehabilitation on health-related quality of life in a randomized controlled clinical trial. J Dent Res 2000; 79: 1659-1663
26. Berg E. The influence of some anamnestic, demographic, and clinical variables on patient acceptance of new complete dentures. Acta Odontol Scand 1984; 42: 119-127
27. Pietrokovski J, Harfin J, Mostavoy R, Levy F. Oral findings in elderly nursing home residents in selected countries: Quality of and satisfaction with complete dentures. J Prosthet Dent 1995; 73: 132-135

28. Naert I, Gizani S, Vuylsteke M, van Steenberghe D. A 5-year prospective randomized clinical trial on the influence of splinted and unsplinted oral implants retaining a mandibular overdenture: prosthetic aspects and patient satisfaction. *J Oral Rehabil* 1999; 26: 195-202
29. Feine JS, de Grandmont P, Boudrais P, Brien N, LaMarche C, Tache R et al. Within-subject comparisons of implant-supported mandibular prostheses: the choice of prosthesis. *J Dent Res* 1994; 73: 1105-11
30. de Grandmont P, Feine JS, Tache R, Boudrais P, Donohue WB, Tanguay R et al. Within-subject comparisons of implant-supported mandibular prostheses: psychometric evaluation. *J Dent Res* 1994; 73: 1096-104
31. Boerringer E.M. et al. Patient satisfaction with implant-retained mandibular overdentures. A comparison with new complete dentures not retained by implants- a multi-centre randomized clinical trial. *Br J Oral and Maxillofacial Surg* 1995; 33: 282-288
32. Humphris GM, Healey T, Howell RA, Cawood J. The psychological impact of implant-retained mandibular prosthesis: a cross-sectional study. *Int J Oral Maxillofac Implants* 1995; 10: 437-44
33. Wismeijer D, Vermeeren IJ, van Waas MA. Patient satisfaction with overdentures supported by one-stage TPS implants. *Int J Oral Maxillofac Implants* 1992; 7: 51-5
34. Meijer HJ, Raghoeber GM, van't Hof MA, Geertman ME, van Oort RP. Implant-retained mandibular overdentures compared with complete dentures: a 5 year follow-up study of clinical aspects and patient satisfaction. *Clin Oral Implants Res* 1999; 10: 238-44
35. Harle TI et al, Patient satisfaction with implant supported prostheses. *Int J Prosthodont* 1993; 6: 153-62
36. Wismeijer D, van Waas MA, Vermeeren JI, Mulder J, Kalk W. Patient satisfaction with implant supported mandibular overdentures. A comparison of three treatment strategies with ITI-dental implants. *Int J Oral Maxillofac Surg* 1997; 26: 263-7
37. Raghoeber GM et al. A randomized prospective clinical trial on the effectiveness of three different treatment modalities for patients with lower denture problems. A 10 year follow-up study on patient satisfaction. *Int J Oral Maxillofac Surg* 2003; 32: 498-503
38. Morais J.A., Heydecke G., Pawlick J., Lund J.P., Feine J.S. The effects of Mandibular Two-implant Overdentures on Nutrition in Elderly Edentulous Individuals. *J Dent Res* 2003; 82(1): 53-58
39. de Jong N, Paw MJ, de Groot LC, de Graaf C, Kok FJ, van Staveren WA. Functional biochemical and nutrient indices in frail elderly people are partly affected by dietary supplements but not by exercise. *J Nutr* 1999; 129: 20
40. Allen F, McMillan A. Food selection and perceptions of chewing ability following provision of implant and conventional prostheses in complete denture wearers. *Clin Oral Implants Res* 2002; 13(3): 320-6
41. Hamada MO, Garrett NR, Roumananas ED, Kapur KK, Freymiller E, Han T. A randomized clinical trial comparing the efficacy of mandibular implant-supported overdentures and conventional dentures in diabetic patients. Part IV: Comparison of dietary intake. *J Prosthet Dent* 2001; 85: 53-60
42. Shinkai RSA, Hatch JP, Rugh JD, Sakai S, Mobley CC, Saunders MJ. Dietary intake in edentulous subjects with good and poor quality complete dentures. *J Prosthet Dent* 2002; 87: 490-498
43. Blomberg. Psychological Response. *Tissue-integrated prostheses. Osseointegration in Clinical Dentistry*. 1985
44. Heydecke G, Thomason MJ, Lund J, Feine JS. The impact of conventional and implant supported prostheses on social and sexual activities in edentulous adults. Results from a randomized trial 2 months after treatment. *J Dent* 2005; 33: 649-657
45. Melas F, Mercenes W, Wright P. Oral Health Impact on Daily Performance in patients with Implant-Stabilized Overdentures and Patients with Conventional Complete Dentures. *J Oral Maxillofacial Implants* 2001; 16: 700-712
46. Mersel A, Babayof I, Berkey D, Mann J. Variables affecting denture satisfaction in Israeli elderly: A one year follow-up. *Gerodontology* 1995; 12: 89-94
47. Hobkirk, Watson, Searson. *Introducing Dental Implants*. Churchill Livingstone. Chapter 6
48. Mericske-Stern. Treatment outcomes with implant-supported overdentures: Clinical considerations. *J Prosthet Dent* 1998; 79: 66-73