Patient-reported outcomes of implant-assisted removable partial denture with magnetic attachments: A 3-year progress report

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I. Introduction

In traditional free-end edentulous partial dentures, sinking of the denture base or insufficient retention of the denture often leads to pain and discomfort, making it difficult to achieve patient satisfaction. In recent years, the effectiveness of implant-assisted removable partial dentures (IARPD) which implants are placed at the free-end edentulous area to support and stabilize the denture, has been suggested. By placing implants behind the free-end edentulous area, the free-end is transformed into an intermediate edentulous, which can prevent denture sinking and improve stability.

Previous studies have utilized different implant systems and attachments, and various patterns of edentulous. In those studies, patient satisfaction has been suggested to improve. However, there have been few studies utilizing magnets attachments.

II. Objective

Aim of this study is to evaluate patient-reported outcomes in IARPD using short implants and magnetic attachments through a prospective intervention study.

III. Materials and Methods

1 Recruitment of participants

Patients were recruited from who visited Tokyo medical and dental university hospital or Showa university hospital between 2016 and 2019. Several inclusion and exclusion criteria were applied (Table1.), and a total of 30 patients which mandibular Kennedy Class I or II and distal extension defects of three or more teeth were included in the study.

Table1. Inclusion and exclusion criteria

Inclusion	・Age from 45 to 85.
	・Kennedy Class I or II and distal extension defects of three or more teeth.
	・At least one remaining tooth with crown and mobility one or less.
	・Sufficient bone volume for the insertion of short implants.
	・No considering the condition in maxilla.
Exclusion	・Uncontrolled systemic diseases.
	・Infectious diseases (HIV, HBV, HCV) or mental disorders.
	・Temporomandibular joint disorders.
	・Xerostomia (dry mouth).
	・Oral motor disorders.
	・Dementia.

2 Clinical procedures

First, a proper removable partial denture for participants was fabricated by prosthodontist. After the surgery, a 6-week unload period has been required before the attachment of healing cap. 10 weeks after surgery, stage 1 assessment has been carried out. Subsequently, 14 weeks after surgery, stage 2 assessment has been conducted. (Figure 1.)

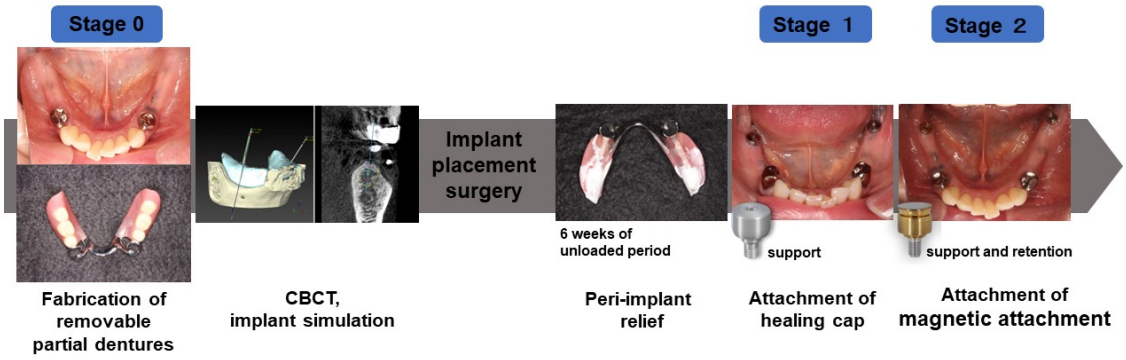

Figure 1. Clinical procedures

3 Outcomes

1) Assessment periods

The assessment periods were as follows: Before implant placement as Stage 0, after healing cap attached as Stage 1, after magnetic attachment attached as Stage 2. Following with the assessment at 1-year, 2-year and 3-year after implant placement surgery. (Figure 2.)

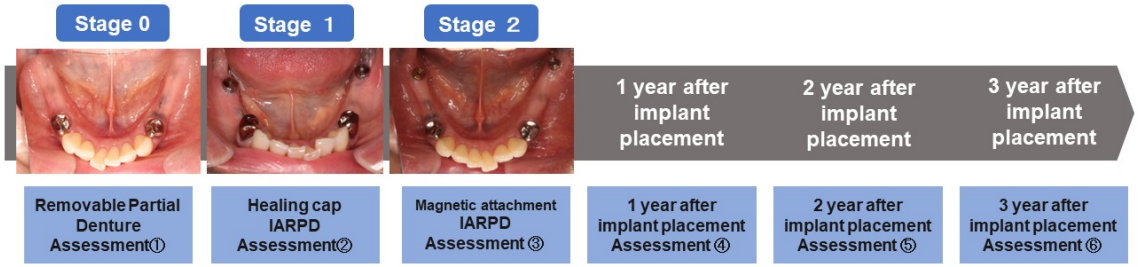

Figure 2. Assessment periods

2) Assessment methods

Based on patient-reported outcomes (PRO), patient satisfaction been assessed using a 100mm visual analogue scale and oral health related quality of life (OHRQoL) using Oral Health Impact Profile-Japanese version (OHIP-J) score. Additionally, the OHIP was divided into four subdomains established by JOHN et al. in 2014, and analyses were conducted for each of these subdomains. (Figure 3.)

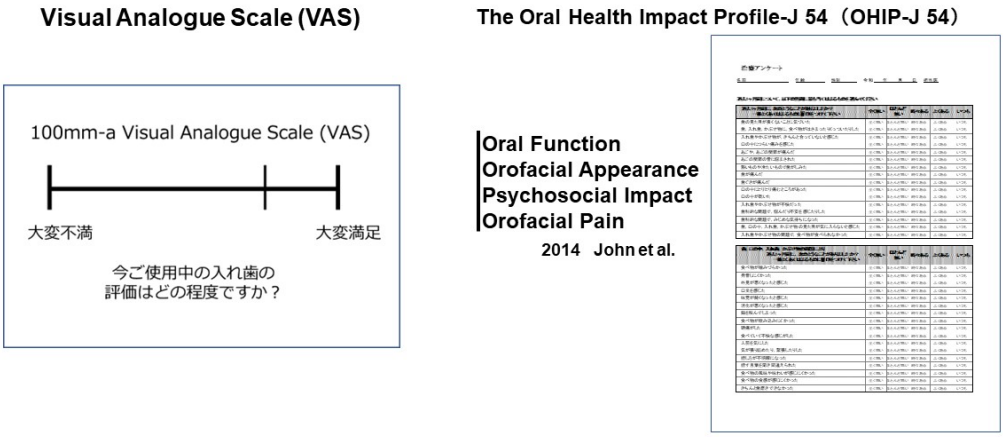

Figure 3. Assessment methods

3) Statistical analysis

To compare the PRO before implant placement (Stage 0) with each assessment period's outcome after implant placement, Steel's test was used. The statistical analysis was conducted using JMP Pro 17, with a significance level at 0.05.

IV. Results

Compared to Stage 0, patient satisfaction showed a significant improvement since IARPD with magnetic attachments at Stage 2, as well as at 1 year, 2 years, and 3 years after implant placement. (Figure 4.)

Summary score of OHIP-J54 showed a significant improvement at 2 years and 3 years after implant placement. (Figure 5.)

Following up with each of the four subdomains of OHIP:

a. Oral function and orofacial appearance showed a significant difference at 2 years and 3 years after implant placement. (Figure 6. 7.)
b. Orofacial pain exhibited a significant at 2 years after implant placement. (Figure 8.)
c. However, there was no significant difference observed in psychosocial impact. (Figure 9.)

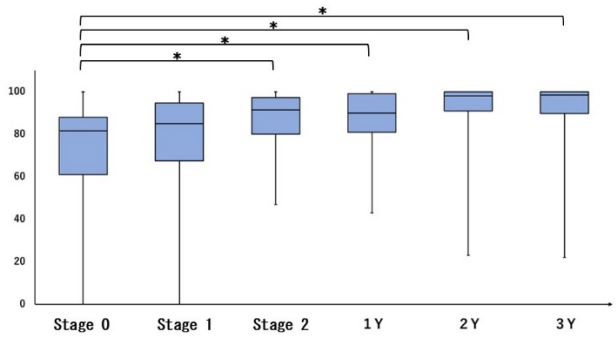

Figure 4. Patient satisfaction

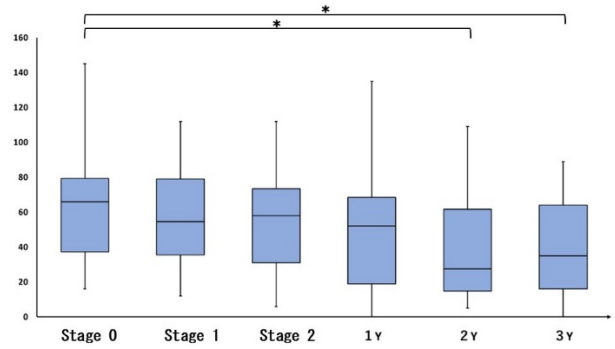

Figure 5. Summary score of OHIP-J54

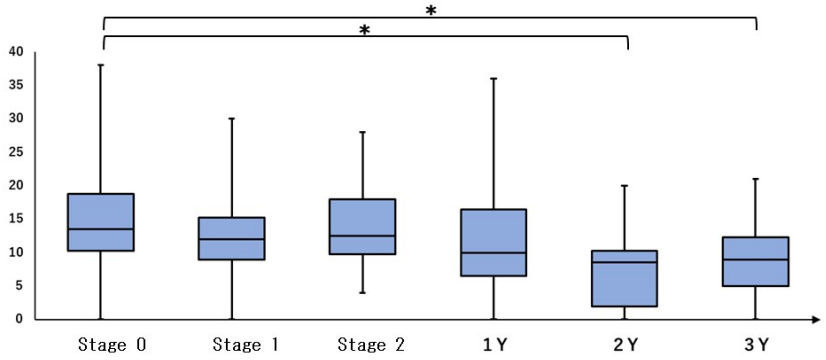

Figure 6. Oral Function

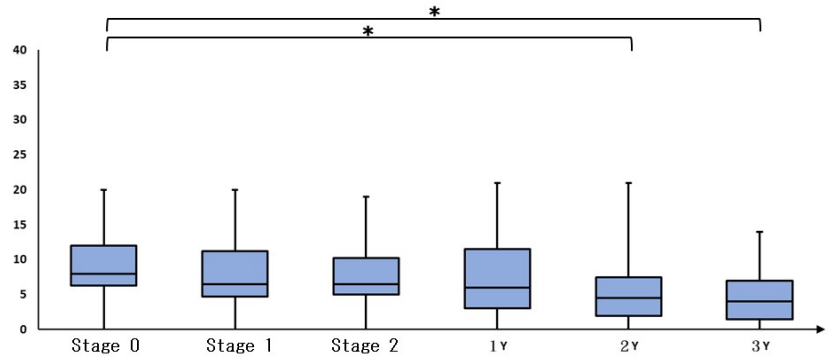

Figure 7. Orofacial Appearance

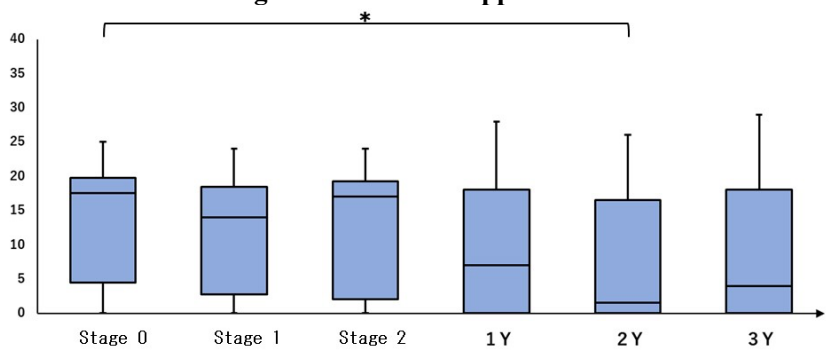

Figure 8. Orofacial Pain

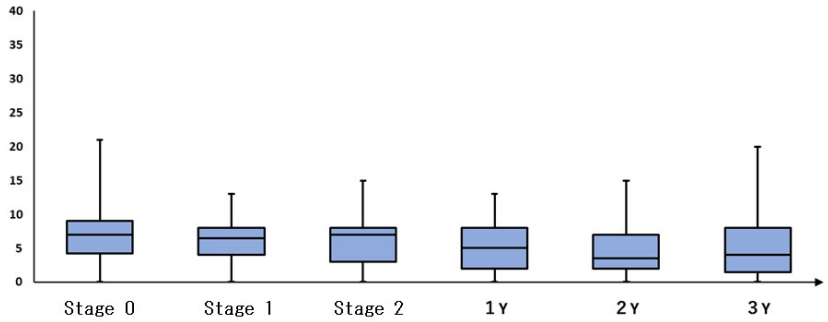

Figure 9. Psychosocial Impact

V. Discussions

1) Improvement of Patient Satisfaction

Studies by Gates et al. in 2014 and Jensen et al. in 2016, suggested that IARPD resulted in higher patient satisfaction compared to traditional removable partial dentures, when the support force increased.

However, the results in this study showed no significant improvement in patient satisfaction while IARPD using a healing cap. In other hand, after magnetic attachments been attached, there was a significant increase in patient satisfaction.

This suggests that the improvement of patient satisfaction is not only attributed to support force but also to the increased retention force provided by magnetic attachments.

2) Improvement of OHRQoL

Summary score of OHIP-J54 and three subdomains: Oral function, Orofacial appearance, and Orofacial pain. IARPD showed a significant decrease compared to traditional removable partial dentures.

The use of magnetic attachments in IARPD suggested the potential for long-term maintenance of (OHRQoL).

VI. Conclusions

Despite the limitations of this study, the use of short implants and magnetic attachments in IARPD:

1) There were significant improvements in patient satisfaction, from immediately after magnetic attachments was attached to 3 years after implant placement.
2) Oral health-related quality of life (OHRQoL) showed significant improvements at 2 and 3 years after implant placement.

References

1) John MT, Feuerstahler L, Waller N, et al. Confirmatory factor analysis of the Oral Health Impact Profile. J Oral Rehabil. 2014;41(9):644-652.
2) Gates WD 3rd, Cooper LF, Sanders AE, Reside GJ, De Kok IJ. The effect of implant-supported removable partial dentures on oral health quality of life. Clin Oral Implants Res. 2014;25(2):207-213.
3) Jensen C, Meijer HJA, Raghoebar GM, Kerdijk W, Cune MS. Implant-supported removable partial dentures in the mandible: A 3-16 year retrospective study. J Prosthodont Res. 2017;61(2):98-105.

4) Negoro M, Kanazawa M, Sato D, et al. Patient-reported outcomes of implant-assisted removable partial dentures with magnetic attachments using short implants: A prospective study. J Prosthodont Res. 2021;65(4):554-558.