Effect of dentist’s clinical experience on treatment satisfaction of a complete denture

S. KIMOTO*, K. KIMOTO†, A. KITAMURA‡, M. SAITA†, M. IIJIMA* & Y. KAWAI*

*Department of Removable Prosthodontics, Nihon University School of Dentistry, Matsudo, †Division of Fixed Prosthodontics, Department of Oral & Maxillofacial Rehabilitation, Kanagawa Dental College, Yokosuka, and ‡Nihon University Graduate School of Dentistry at Matsudo, Removable Prosthodontics, Matsudo, Japan

SUMMARY The relationship between the prosthodontic experience of dentists and satisfaction of complete denture wearers remains unknown. To investigate whether a prosthodontist’s clinical experience affects treatment satisfaction of a complete denture wearer. From April 2004 to July 2006, we conducted a randomised controlled trial at two centres, including 74 edentulous patients; of these, 32 and 30 were randomly allocated to the ED or ID group, respectively. All the patients rated their satisfaction with dentures, including general satisfaction and satisfaction of chewing ability, speaking, cleaning, stability, retention, comfort and aesthetics. These satisfaction ratings were measured by a 100-mm visual analog scale (VAS). Perceived chewing ability to foods, divided into five grades, was measured using a questionnaire. The mastication index (MI) was calculated for each grade. General satisfaction and satisfaction of speaking, stability and retention were significantly higher in the ED than in the ID group ($P = 0.049$, $0.003$, $0.019$ and $0.041$, respectively). No significant difference existed between the MI of the ED ($71.3 \pm 18.4$) and ID group ($64.1 \pm 16.3$). However, the perceived chewing ability of grade 5 food, whose texture was the hardest among all the grades, was significantly higher in the ED group than in the ID group. Within its limitations, this study showed that a clinician’s prosthodontic experience affects a complete denture wearer’s satisfaction ratings.

KEYWORDS: complete denture, edentulous patient, satisfaction rating, randomised controlled trial, prosthodontic experience, visual analog scale

Accepted for publication 5 October 2013

Introduction

A patient undergoing surgery must be aware of the surgeon’s surgical experience, because surgical experience affects treatment results. Several studies have shown that mortality rates vary widely across hospitals and that the survival rate of patients undergoing cardiac, brain or cancer surgeries depends on the institution where the surgery is performed and the experience of the operating surgeon (1–5). Therefore, studies investigating the relationship between treatment outcomes and surgical experience are socially significant.

Several clinicians and patients believe that the success of dental treatment is also affected by the experience of a dentist. Evans et al. (6) investigated whether patient-centred scores after the removal of a third mandibular molar correlated with the experience of the surgeon; his study showed no significant correlation between the treatment outcomes and the experience of the surgeon. Guéders and Geerts investigated the influence of operator experience on microleakage in class V composite restorations and concluded that the experience of the operator has a significant influence on microleakage (7). A randomised controlled trial revealed that the number of complete denture adjustments required after denture delivery is more in the case of junior clinicians than in the case of senior clinicians (5). These reports suggest that certain dental treatments are affected by the dentist’s experience.
Do experienced dentists (ED) provide more treatment satisfaction to edentulous patients wearing a complete denture than do inexperienced dentists (ID)? Occasionally, the high-quality complete dentures provided by ED may not lead to patient satisfaction; therefore, it is difficult to evaluate the significance of experience in the field of denture treatment. However, the relationship between patient satisfaction with dentures and a dentist’s experience is unclear because patient satisfaction depends on multiple factors such as denture quality (8–10). This may be further understood on the basis of Carlsson’s suggestion that patient-centred outcome scores are affected by not only dentists’ technical skills but also patient-related psychological and emotional factors (11). Several studies have investigated denture functions and patient satisfaction ratings (12, 13); however, to our knowledge, no study has investigated the relationship between the prosthodontic experience of dentists and satisfaction of complete denture wearers.

Therefore, we conducted this study to determine whether clinicians’ experience of complete denture treatment affected the satisfaction ratings of complete denture wearers. The null hypothesis was that no difference existed in the satisfaction ratings between complete denture wearers treated by ED with over 10 years of experience who were also certified by the Japan Prosthodontic Society and those treated by ID with <3 years of experience.

Materials and methods

Study design and participants

This randomised controlled parallel clinical trial recruited edentulous patients from Nihon University School of Dentistry at Matsudo Affiliated Hospital and Kanagawa Dental College Affiliated Hospital between 15 April 2004 and 20 July 2006. The recruitment was originally held for a previous study that investigated differences in clinical outcomes between patients who wear complete dentures with a conventional acrylic resin (CAR) and those who wear complete dentures with an acrylic-based resilient denture liner (ARL) (14–16). The permuted block method, which was used for allocation in that study, could randomise recruited patients into either the ED or ID group, with parallel allocation into either the ARL or CAR group. In this study, the permuted block method could simultaneously allocate a pair of clinician type (ID or ED) and denture-base type (ARL or CAR) in the following four patterns: denture with CAR by ED, that with CAR by ID, that with ARL by ED and that with ARL by ID (14). As these four patterns could exist in 24 different permutations (4 × 3 × 2 × 1 = 24), the random number table consisted of 24 numbers, and one of the 24 numbers was randomly selected for allocation. Each random number represented four combinations with equal number of clinician and denture-base type, one block was available for four participants; this ensured a balance in clinician and denture-base type. Following allocation to four participants, the next block was selected according to the random number table. Consequently, blocking ensured a nearly numeric balance for each type of treatment and clinician at any given time during the study.

After block randomisation, the number of participants for each type of denture base and clinician was equalised. One computer-generated random number table each was prepared for Nihon University School of Dentistry at Matsudo Affiliated Hospital and Kanagawa Dental College Affiliated Hospital. In this study, we analysed the differences between the ED and ID groups to determine the effect of dentists’ experience of complete denture treatment on the satisfaction rating of complete denture wearers.

The participants were recruited regardless of their gender, age, adaptive or maladaptive experience while wearing mandibular hard dentures, and the height of the alveolar ridge, which was measured on a panoramic radiograph and was classified according to the system of the American College of Prosthodontists (17). Patients were not included in the study if they met either one of the following two exclusion criteria: (i) lack of physical strength to participate in the trial due to systemic disease and/or ageing and (ii) lack of understanding of written or spoken Japanese. Each patient received oral and written information about the study.

Sample size calculation

The appropriate sample size was estimated using the general satisfaction rating as the primary outcome for
this trial. A between-group difference of 10 mm on the 100-mm visual analog scale (VAS) ratings of general satisfaction during the initial adjustment session was sought, using a variance of 15 mm for ARL and 10 mm for CAR, based on the data obtained from a previous study (18). To fulfil the criteria of 80% power with a two-sided alpha level of 5% and to factor in potential participant dropouts, 74 subjects were enrolled in this study.

Measurement outcomes

Baseline characteristics. The assessors noted the baseline characteristics of the patients, such as gender, age, edentulous period, age of existing denture, number of previous dentures and height of the alveolar ridge. Based on the classification of complete edentulism, as specified by the American College of Prosthodontists, the heights of the alveolar ridges of the mandibles were measured on the radiograph at the least vertical height portion of the mandibles, so as to minimise any variations while measuring using the radiographic techniques (17).

Patients’ satisfaction ratings to dentures. Patients’ satisfaction ratings to dentures were measured by the 100-mm VAS. The general satisfaction and satisfaction with respect to denture functions such as chewing ability, speaking, cleaning, stability, retention, comfort and aesthetics were measured. The left-side anchor on the VAS of satisfaction ratings was ‘not at all satisfied’, and the right-side anchor was ‘extremely satisfied’.

Perceived chewing ability to foods. A valid questionnaire developed by Hirai et al. (19) was used for assessing the perceived chewing ability. Each of the 35 foods listed in the questionnaire (Table 1) was assessed by participants as per the following criteria: 0 = cannot eat; 1 = can eat with difficulty and 2 = can eat easily. If participants had no will to eat the listed food, the foods were assessed as score 0. The 35 foods were categorised into grades between 1 and 5, in the order of increasing food hardness. Food in the same grade had similar rheological texture. The total score of each grade was substituted in the following equation to calculate the mastication score (MI): 

\[ MI = \left\{ \left[ \frac{(\text{grade } 1 \times 1) + (\text{grade } 2 \times 1.14) + (\text{grade } 3 \times 1.30) + (\text{grade } 4 \times 1.52)}{100} \right] \times 100 \right\} / 111.4. \]

The coefficient for each grade was used for weighting to adjust the food texture.

Schedule for measurement of outcomes. The outcomes were measured 2 months after the completion of the denture adjustments. Based on the patients’ complaints after denture delivery, the dentists decided when denture adjustment was completed.

Complete denture laboratory procedures

The dentures at each centre were fabricated by a dental technician in the dental laboratory of the centre. The following bilaterally balanced occlusal scheme was applied for the new dentures: the functional maxillary lingual cusps of the posterior teeth were set in the central groove of the mandibular teeth, and the maxillary buccal cusps were kept in contact with the mandibular buccal cusps. The buccal cusps and the lingual cusps were in articulation and functional in the bilateral and protrusive excursions. The teeth were arranged using the 20-degree semi-anatomical commercial teeth (Duracross*). The artificial teeth were arranged along an alveolar ridge such that the buccal cusp tip of the first premolar and the central fossae of the posterior teeth lay directly over the line describing the alveolar ridge crest (which can be approximated by the line joining the mandibular cuspid cusp tip to the medio-lateral centre of the retromolar...
Mandibular complete dentures for the CAR group were constructed using conventional heat-activated acrylic resin only (Physio Resin®); those for the ARL group were constructed using conventional heat-activated acrylic resin and a constructed 2-mm-thick permanent ARL (Physio Soft Rebase®). Participants of both groups wore conventional maxillary complete dentures using conventional heat-activated acrylic resin. The Physio Soft Rebase consisted of a polyethylmethacrylate powder, a non-phthalate plasticizer liquid and methacrylate ester derivatives. Maxillary complete dentures were also fabricated using heat-activated acrylic denture resin. According to the manufacturer’s instructions, conventional dough-stage heat-activated acrylic denture-base resin was packed against the master cast, which was covered with a 2-mm spacer. After removing the spacer, the resilient lining material in the dough stage was inserted to replace the spacer. The resin was then compression-moulded and processed. The curing cycle was as follows: 90 min at 70 °C followed by 30 min at 100 °C.

Statistical analysis

The baseline characteristics of the participants in the ID and ED groups were compared by the t-test and chi-square test. The t-test was used to compare the satisfaction ratings and perceived chewing ability between the ID and ED groups. P < 0.05 was considered to indicate statistical significance.

Results

Baseline characteristics

Seventy-four patients (mean age, 53.89 years) who had been consecutively sampled were randomised for this trial. The random permuted block within strata method assigned a nearly equal number of participants to both the groups: 36 to the ID group and 38 to the ED group, as well as, 37 to the CAR group and 37 to the ARL group. Table 2 provides the baseline characteristics of the 74 subjects. No significant differences were observed in any of the baseline characteristics between the ID and ED groups (P > 0.05, Student’s t-test and chi-square test). Figure 1 shows the course of the participants in this study. Of the 74 allocated subjects, 62 completed the trial, whereas 12 did not. These 12 participants withdrew from the trial due to unwillingness to complete the trial.
Furthermore, of the 74 participants, Nihon University and Kanagawa Dental College recruited 54 participants (27 to ID, 27 to ED) and 20 participants (10 to ID, 10 to ED), respectively. There were no differences between the baselines characteristics of the participants recruited at these two hospitals ($P > 0.05$).

Patients’ satisfaction ratings

The satisfaction ratings of the ED group were higher than those of ID group, and the general satisfaction, satisfaction of speaking, satisfaction of stability and satisfaction of retention were significantly different between the ED and ID groups (Fig. 2, $P = 0.049$, 0.003, 0.019 and 0.041, respectively). The ID group had higher coefficients of variation (CV) in satisfaction ratings than the ED group had, which implies that the satisfaction ratings of the ID group varied more widely across patients than did the ratings of the ED group (Table 3). Furthermore, no differences existed between the satisfaction ratings provided by the participants of the two hospitals ($P > 0.05$).

Perceived chewing ability

The MI of the ED group (71.3 ± 18.4) was not significantly different from that of the ID group (64.1 ± 16.53). No significant difference in chewing foods was observed in grades 1, 2, 3 and 4; however, perceived chewing ability with respect to grade 5 foods, whose texture was the hardest among all the grades, was significantly different between the ED and ID groups (Fig. 3, $P = 0.048$). Furthermore, no difference in MI was found between the participants of the two hospitals ($P > 0.05$).

Discussion

In this study compared with complete denture wearers in the ID group, those in the ED group showed higher overall satisfaction ratings, especially with respect to general satisfaction and satisfaction of speaking, stability and retention. These results suggest that the prosthodontic experience of a clinician affects the satisfaction ratings of complete denture wearers. The baseline characteristics of the two groups showed homogeneity, suggesting that the randomisation was properly performed and that the results of this randomised controlled clinical trial are valid. To our knowledge, this is the first study to examine the effects of a
dentist’s prosthodontic skills on the satisfaction ratings of a denture wearer.

What caused the differences in the satisfaction ratings between the ID and ED groups? Considering that this study was designed as a randomised controlled clinical trial to control any bias, the only difference between the groups was dentist skills, that is, a dentist’s communication skills; technical skills with regard to denture procedures such as taking impression, assessing jaw relationship and adjusting dentures; and skills to evaluate denture-related complaints of edentulous patients and the denture itself. Analysis of the CV value revealed that the ED were highly skilled. The CV value, which is calculated by dividing the standard deviation by the mean of the sample, can show a range of variation in the satisfaction ratings of each item. The CV value of all the satisfaction ratings in the ED group showed narrower variations than that in the ID group (see Table 3). The narrow variation may imply that ED who are highly experienced in prosthodontic techniques have the required knowledge of prosthodontics to consistently satisfy any type of patient, at least on an average level. Patients who are difficult to treat should thus be consulted by ED or prosthodontists; patients who are easy to treat can be easily satisfied, irrespective of the experience of the dentist.

Among the denture functions, satisfaction ratings of speaking, stability and retention were significantly affected by the dentist’s prosthodontic experience. The stability and retention of a denture are mainly affected by the base form of a denture, which depends on the impression taken by the dentist (20). However, it is very difficult to master the procedure of obtaining an impression. We previously investigated the difficulty of the impression procedure and reported the time taken by the ID and ED (same as those in the current study) for a final impression; due to their novice border moulding technique, ID were found to spend more chair time to obtain a final impression than were the ED (5). This result suggests that the impression procedure is not only one of the most difficult steps to master for dentists but also one of the most remarkable procedures that could differentiate the skills of ED from those of ID. The difficulty faced by ID in acquiring an impression might explain why the satisfaction ratings of stability and retention were significantly affected by a dentist’s prosthodontic experience. With regard to speaking, proper retention and stability of a denture are essential for complete denture wearers to speak fluently (21). Thus, it is conceivable that the satisfaction rating of speaking was affected by the dentist’s prosthodontic experience. Surprisingly, it has been reported that due to the difficulty of the border moulding technique, several clinicians employ a simpler impression method in their private practices instead of the impression method taught during their graduate course (22). Educators, however, recognise the profound effect of the impression-taking procedure on treatment satisfaction of complete denture wearers and continue to teach their students the border moulding technique, even though the procedure is difficult to master.

The chewing satisfaction rating and the MI score of the ID group were not different from those of the ED group. Interestingly, however, a detailed analysis of food consumed in each grade revealed the different dietary characteristics of complete denture wearers treated by ED. Although there was no difference in dietary intake with regard to grades 1, 2, 3 and 4 between the 2 groups, complete denture wearers in the ED group consumed grade 5 food with more ease than did those in the ID group. Grade 5 contained the hardest foods among all the grades. Considering that hard food is more difficult to eat, ED appear to provide high-quality dentures suited to hard foods, even though complete denture wearers are not aware of the potential ability of chewing as a satisfaction measure. It has been reported that complete denture quality does not influence masticatory efficiency (23) or that edentulous subjects dissatisfied with their existing mandibular complete dentures reported significantly better chewing ability after receiving an implant over their dentures due to improved denture quality (24). The effect of denture quality on mastication is a subject of much controversy. The varied results obtained between chewing satisfaction rating and grade 5 food intake revealed an aspect of the controversy observed in perceived chewing ability and denture quality, thereby suggesting that the effect of denture quality on mastication depends upon what is measured as the final outcome.

The differences in satisfaction ratings of denture cleaning, aesthetics and comfort were not statistically significant between the two groups, although these satisfaction ratings were higher in the ED group than in the ID group. This may be due to the following: first, the rating may be affected by factors other than
the dentist factor such as the patient’s own ability to clean dentures and the dental technicians’ ability to arrange aesthetically appealing artificial teeth; second, the sample size was small for these three ratings. If the sample size were bigger than that used for this trial, it is possible that statistically significant differences between the two groups would be detected in the ratings of chewing, cleaning, comfort and aesthetics. However, the sample size was originally calculated to study the effects of denture-base material on the satisfaction ratings of complete denture wearers and not to study the effects of clinicians’ experience on complete denture wearers’ satisfaction ratings. Therefore, further studies that focus on clinicians’ experience are warranted.

Conclusion

Within the limitations of the current study, we found that the prosthodontic experience of a clinician affected the satisfaction ratings of a complete denture wearer.

Disclosure/Acknowledgments

This study has been conducted in accordance with the Declaration of Helsinki, and each subject received oral and written information about the study and provided informed consent. The study protocol was reviewed and approved by the Human Ethics Committees of Nihon University School of Dentistry at Matsudo (EC 02-036) and Kanagawa Dental College (#19). This study was supported by a Grant-in-Aid for Scientific Research (C19592262) from the Ministry of Education, Culture, Sports, Science and Technology, Japan. There are no conflict of interests to declare.

References

19. Hirai T, Ishijima T, Koshino H, Anzai T. Age-related change of masticatory function in complete denture wearers: evalu-


Correspondence: Suguru Kimoto, Department of Removable Prosthodontics, Nihon University School of Dentistry, 2-870-1 Sakaecho-nishi, Matsudo 271-8587, Japan.
E-mail: kimoto.suguru@nihon-u.ac.jp
This document is a scanned copy of a printed document. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material.