

Patient Denture Satisfaction at One Month Follow-up:
Digital Versus Conventional

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Hypothesis and Specific Aims:

We hypothesize that digital dentures will perform better with respect to fit, retention, patient satisfaction and comfort in comparison to traditional dentures.

If this study determines that digital dentures are repeatedly rated higher in patient and clinical outcomes, this study may provide the clinical evidence necessary to pave the way for the future of digital dentures.

Background and Significance:

For decades, complete dentures have been fabricated in a traditional fashion. In light of recent technological development of scanners, impressions can be scanned and steps taken to virtually set teeth to fabricate dentures using CAD/CAM technology. The denture is then milled from of a highly compressed, bio-hygenic base material.

A study by Bidra and Taylor stated, 'A body of scientific literature related to computer-aided technology for complete dentures is emerging. Significant advancements in this technology have now resulted in their commercial availability with shorter clinical protocols.' However, there remains a need for clinical trials to analyze the outcome of digital dentures.

Dental School Clinical Administrations along with the Restorative Departments across the country are investigating the incorporation of digital dentures in their curriculum. The University of Detroit Mercy School of Dentistry will use this study to evaluate the modality of incorporating this treatment into the DS4 clinics.

Participants:

This study involved six fully edentulous, adult patients requiring maxillary and mandibular complete dentures. There was no preference for gender.

Two sets of complete dentures were fabricated for each patient. Three patients first received one set of dentures which were computer designed and digitally manufactured, followed by a traditionally set of dentures. The other three patients first received traditionally processed dentures followed by a set of dentures with a digitally designed and processed denture base and traditionally set teeth, processed to this base.

One patient was dropped midway through the study due to non-compliance and is not included in the final results.

Research Plan and Methodology:

There were three types of dentures fabricated for this study:

1. Two Appointment Digital Dentures: Using the AvaDent system (Global Dental Sciences), this involved the use of heat malleable custom trays with border molding and impressions completed with polyvinyl siloxane (PVS) followed by a manufactured gothic arch tracing device. Impressions were made during the first appointment. The impressions were then digitally scanned at the dental lab and the complete dentures were designed on the computer, milled and delivered to the patient during the second appointment.
2. Multiple Appointment Digital Dentures: This involved the previously mentioned heat malleable custom trays and PVS border molding and impressions. The impressions were then digitally scanned and a denture base was designed and milled. Vertical Dimension of Occlusion (VDO) was then established using wax rims and teeth were manually set followed by an anterior try in and posterior try in. The teeth set-up was then processed to the digital denture base through Ivocap injection processing.
3. Traditional Dentures: This involved custom fabricated impression trays which were border molded with compound material and final impressions made with PVS. A master cast was then made from the final impressions and base plates were fabricated. VDO was then established using wax rims and teeth were manually set followed by an anterior try in and posterior try in. These dentures were then processed through Ivocap injection processing.

All dentures were evaluated for retention, function, and esthetics one month after delivery of their first set of dentures before continuing onto their second set

After the patient used both sets of dentures the patient was asked to compare the overall experience of both procedures through the use of a questionnaire. These outcomes were evaluated by the same individuals to eliminate sources of bias.

One-way repeated-measures ANOVA was used to identify significant differences in the responses between traditional and digital dentures ($\alpha=0.05$).



Fig. 1 Intraoral Digital Dentures



Fig. 2 Intraoral Traditional Dentures

Results:

In the one month surveys, the patients were generally very satisfied with their dentures, either traditional or digital. Responses ranged from 7.2 to 10, with most above 8, on the 1-10 Bad to Excellent Scale. Most patients rated the digital dentures higher than traditional ones for most questions; however, the differences were only statistically significant for question 2: retention of mandibular denture ($p=0.01$). P values for the other questions ranged from $p=0.10$ to $p=0.37$. The responses for question 7: rate esthetic appearance of maxillary denture, were excellent and the same for both traditional and digital dentures. The only question that showed less favorable results for the digital dentures was question 8: rate esthetic appearance of mandibular denture (again, note that the differences were not statistically significant, in this case $p=0.37$).

In the comparison survey no respondents picked the traditional denture as being better than digital; however, a number were undecided to which was best. Most respondents (4/5) indicated that they thought that the digital denture had the best retention or fit (question 1). With question 2, two thought that the digital denture was most comfortable with three being undecided. Question 3 asked about function – three thought digital was best, two were undecided. As far as esthetics (question 4), two thought digital better, three were undecided. The same distribution was found with their office experience (question 5) – two thought digital better, the rest undecided. The last question asked the patients to rate the convenience of having a digital denture impression on record. Here almost all rated it very convenient (average 9.8, $SD=0.45$).

Conclusion:

- In general the patients were very satisfied with all dentures fabricated, whether fabrication was done digitally or in a traditional fashion.
- Patients found retention was the most advantageous property that digital dentures offered, in particular the mandibular denture when compared to traditional dentures.
- In the one month surveys most patients preferred the digital dentures although differences in most survey questions were not statistically significant.
- In the comparison survey patients either preferred the digital dentures or were undecided as to which was best; however, no patients indicated that they preferred the traditional dentures.



Fig. 3 Mand. Intaglio Digital Dentures



Fig. 4 Mand. Intaglio Traditional Dentures



Fig. 5 Digitally Fabricated Denture

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