

Student Clinical Chair Time for Complete Dentures at a South African Dental School

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Abstract

Introduction: Complete denture fabrication conventionally requires 4 to 5 visits. Few studies have investigated the treatment time for complete dentures. It is widely recognised that the clinician's experience plays a significant role on chair time required for complete denture treatment. Silversin and Shafer (1978) compared the time and methods used for complete denture construction by dental students and general dental practitioner. They found that there were differences between the time taken and number of stages employed.

Aims and objectives: This study seeks to investigate the amount of time and number of visits that are required for complete denture construction by senior dental students at a dental school in South Africa. Demographic factors associated with receiving dentures in six visits or less were investigated using a multiple variable logistic regression model.

Design: This was a cross-sectional descriptive study

Methods: Treatment records of sixty two patients treated by 31 senior dental students were reviewed. Each student consecutively treated two patients who were separated into two groups corresponding to the A and B groups. Data related to demographic characteristics, clinical steps of denture construction, dates and duration of visits were acquired and then captured in Microsoft excel software.

Results: The gender distribution was similar in both patient groups. Less than twenty percent (16.1%) of the patients were younger than 54 years. A statistically significant mean difference of 54 minutes to complete the Bite registration step was observed between the groups. Students took about 11hours spaced over 5-6 visits to construct dentures. None of the demographic variables was independently associated with receiving dentures in six visits or less.

Conclusion: Students are inefficient at constructing dentures.

Key Words: Chair time; Complete dentures; Dental school

Abbreviations: MOHC: Medunsa Oral Health Centre

Introduction and Background

The clinical and laboratory aspects, including associated problem solving, of complete dentures have been comprehensively researched. [1] Complete denture fabrication conventionally requires 4 to 5 visits. [2,3] The two most common ways of fabricating complete dentures are the traditional method and the simplified method. [4,5]

The traditional method, which uses more complex techniques, is taught in most dental schools. [6] It involves the following clinical stages: an anatomic and functional impression, the use of a semi-adjustable articulator with a face bow, wax evaluation, and occlusal adjustment in a semi-adjustable articulator. [4]

The simplified method is any alternative method that eliminates any of the stages of the traditional method. [4] Simplified methods are used by most general dentists to treat patients who are edentulous as they reduce the number of visits and the time required to make the prostheses. [7,8] The simplified method for complete denture fabrication has been found to restore masticatory function to a level comparable to a conventional protocol, both physiologically and according to patient's perceptions. [8]

Few studies have investigated the treatment time for complete dentures. [9-11] It is widely recognised that the clinician's experience plays a significant role on chair time required for complete denture treatment. Sato and colleagues studied the effects of the clinician's experience on chair time required for complete denture treatment in Japan. [12] They found that chair time required by prosthodontic specialists was shorter than that required by non-prosthodontic specialists. Furthermore, Silversin and Shafer compared the time and methods used for complete denture construction by dental students and general dental practitioners. They found that there were differences between the time taken and the number of stages employed by students and practitioners. [9]

Techniques to minimize complete denture procedures to four visits or less have been described. These include a three-visit technique utilising visible light-cured resin for tray and base plate construction. [13]

At Medunsa Oral Health Centre (MOHC), a dental school and referral hospital, in Garankuwa on the outskirts of Pretoria, South Africa, dental students are assigned complete denture patients under faculty supervision according to the degree of difficulty of treatment from the third-year level onwards. In the fifth year of study, students are required to construct a minimum of two sets of complete dentures in the comprehensive care clinic. They do not do the laboratory work.

This study seeks to investigate the amount of time and number of visits that are required for complete denture construction by senior dental students at Medunsa Oral Health Centre.

Objectives of the Study

To determine the time taken for complete denture fabrication by senior dental students at MOHC

To determine the mean number of visits necessary to obtain a set of complete dentures from senior dental students at MOHC and compare this to the conventional mean of 4 to 5 visits

To identify demographic factors associated with receiving dentures in six visits or less

Materials and Methods

Study design.

This was a cross-sectional descriptive study

Target population

The study population consisted of treatment records of adult patients who received a set of complete dentures at Medunsa Oral Health Centre following treatment by senior dental students in the 2015 academic year.

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Study sample

Treatment records of convenient sample of sixty two patients were studied.

Measurements

Medical records

Treatment records of sixty two edentulous adult patients treated by 31 final year dental students during the 2015 academic year were reviewed. Each student treated two patients who were separated into two groups corresponding to the A and B groups. Data related to demographic characteristics, clinical steps of denture construction, dates and duration of visits were acquired and then captured in Microsoft excel software.

Definition of variables and terms

Age and Gender refer to patient age and sex as recorded in treatment records. Senior dental students refer to final year dental students. Chair time is the amount of time a patient spends in the dental chair for treatment. Chair time was measured from when the session started until a clinical step was completed. A visit refers to a two hours long clinic session. Hospital classification system is a system of classifying patients based on individual or household annual income for the determination of fees. Patients qualifying for full subsidisation: H0. Patients qualifying for partial subsidisation: H1, H2 &H3. [14]

Ethical considerations

Ethical approval for the study was granted by the Ethics Committee of the Sefako Makgatho Health Sciences University. Permission to conduct the study was granted by the Chief Executive Officer (CEO) of Medunsa Oral Health Centre.

Statistical Analysis/Hypothesis Testing

Collected data was subjected to univariate, bivariate and multivariate analysis in Statistical Analysis Software (SAS) software. Frequencies, proportions and means were calculated. The one sample t-test was performed to test whether the mean number of visits necessary to obtain a conventional complete set of dentures from senior dental students at MOHC was equal to the conventional mean of 4 to 5 visits in any of the groups.

The unpaired (two sample) t-test was performed to test whether the mean number of visits necessary to obtain a conventional complete set of dentures from senior dental students at MOHC in the two groups was equal.

A logistic regression model was used to identify demographic factors associated with receiving dentures in five visits or less. The binary outcome of interest was receiving dentures in five visits or less (Yes/No). The factors investigated included gender, age, marital status, hospital classification (a proxy for socioeconomic status) and province of residence.

Results

Data of a convenient sample of 62 recipients of a set of complete conventional dentures was analysed.

Demographic characteristics of the patient groups

Age groups	Gender			
	Female n (%)		Male n (%)	
	Group A	Group B	Group A	Group B
25-34	0(0)	1(6.7)	0(0)	1(6.3)
35-44	0(0)	0(0)	1(6.3)	1(6.3)
45-54	0(0)	2 (13.3)	2(12.5)	2(12.5)
55-64	4(26.7)	1(6.7)	4(25)	5(31.3)

65-74	9(60)	7(46.7)	7(43.8)	5(31.3)
75+	2(13.3)	4 (26.7)	2(12.5)	2(12.5)
Total	15(100)	15(100)	16(100)	16(100)

The gender distribution was similar in both patient groups. Less than twenty percent (16.1%) of the patients were younger than 54 years. Twenty percent of Group B female patients were younger than 55 years.

Table 1: Distribution of patient groups by age groups and gender.

Province of residence	Patient groups n (%)		Total
	Group A	Group B	
Gauteng	19(43.2)	25(56.8)	44(100)
Mpumalanga	3(100)	0(0)	3(100)
North West	9(60)	6(40)	15(100)
Total	31(50)	31(50)	62(100)

The bulk of patients in both groups (61.3% in group A and 80.7% in group B) resided in Gauteng province. Approximately one in ten (9.7%) of group A patients resided in Mpumalanga province.

Table 2: Frequency distribution of patient groups by province of residence.

Marital status	Patient groups n (%)		Total
	Group A	Group B	
Divorced	2(66.7)	1(33.3)	3(100)
Married	18(60)	12(40)	30(100)
Single	8(34.8)	15(65.2)	23(100)
Widow	3(50)	3(50)	6(100)
Total	31(50)	31(50)	62(100)

Just less than half (48.4%) of the study sample were married. Single patients constituted 37.1%.

Table 3: Frequency distribution of patient groups by marital status.

Hospital classification	Patient groups n (%)		Total
	Group A	Group B	
H1	7(50)	7(50)	14(100)
H2	4(80)	1(20)	5(100)
H0	20(48.8)	21(51.2)	41(100)
P (Correctional services)	0(0)	2(100)	2(100)
Total	31(50)	31(50)	62(100)

Just less than two thirds (66.1%) of the patients were exempted from paying user fees.

Table 4: Frequency distribution of patient groups by hospital classification.

Total Visits	Patient groups n (%)		Total
	Group A	Group B	
3	2(100)	0(0)	2(100)
4	4(44.4)	5(55.6)	9(100)
5	11(52.4)	10(47.6)	21(100)
6	7(53.8)	6(46.2)	13(100)
7	2(33.3)	4(66.7)	6(100)
8	2(100)	0(0)	2(100)
9	1(50)	1(50)	2(100)
10	2(50)	2(50)	4(100)
11	0(0)	2(100)	2(100)
12	0(0)	1(100)	1(100)
Total	31(50)	31(50)	62(100)

A little more than half (51.6%) of the patients visited the clinic five times or less. Similar numbers of patients from both groups (14 in group A and 13 in group B) made between six and ten visits to the clinic. Just less than ten percent (3/31) of group B patients visited the clinic eleven times or more.

Table 5: Frequency and percentage of patient visits by group.

Conventional number of visits	Mean number of visits	Standard deviation	Test statistic, t	p-value	95% Confidence Interval of the Difference
$\mu = 4$	5.74	1.770	5.481	0.000	1.09-2.39
$\mu = 5$	5.74	1.770	2.334	0.026	0.09-1.39

There was substantial evidence ($p < 0.05$) to reject the null hypothesis that the mean number of visits to the hospital was equal to the conventional numbers of visits. The lower range of the confidence interval of the difference between the mean number of patient visits and the conventional mean number of five visits indicates that the true difference may be very small.

Table 6: Tests of whether the mean number of visits made by group A patients to the clinic was equal to the conventional numbers of visits.

Conventional number of visits	Mean number of visits	Standard deviation	Test statistic, t	p-value	95% Confidence Interval of the Difference
$\mu = 4$	6.35	2.288	5.730	0.000	1.52 - 3.19
$\mu = 5$	6.35	2.288	3.296	0.003	0.52 - 2.19

There was strong evidence ($p < 0.05$) to reject the null hypothesis that the mean number of visits to the clinic was equal to the conventional numbers of visits.

Table 7: Tests of whether the mean number of visits made by group B patients to the clinic was equal to the conventional numbers of visits.

Mean number of visits	Standard deviation	Test statistic, t	p-value	95% Confidence Interval of the Difference
5.74	1.770	-1.180	0.243	-1.652 - 0.426
6.35	2.288			

There was insufficient evidence ($p > 0.05$) to reject the null hypothesis that the population means of patient visits to the clinic were equal

Table 8: Tests of whether the mean number of visits to the clinic made by the two patient groups was equal.

Clinical step	Patient groups	Mean amount of time	Std. Deviation	Test statistic, t	p-value	95% Confidence Interval of the Difference
Examination and primary impression	Group A	2:29:01,94	1:08:50,438	0.035	0.984	-0:36:27,71 - 0:37:45,128
	Group B	2:28:23,23	1:16:59,992			
Secondary impression	Group A	1:54:19,35	0:57:45,258	1.198	0.252	-0:10:08,45 - 0:40:23,930
	Group B	1:39:11,61	0:40:08,855			
Bite registration	Group A	1:43:48,39	0:42:37,690	-2.927	0.001	-1:29:55,90 - -0:16:54,42
	Group B	2:37:13,55	1:32:15,515			
Try- in	Group A	2:09:19,35	1:22:57,913	-0.722	0.456	-1:02:03,68 - 0:29:09,483
	Group B	2:25:46,45	1:36:05,575			
Final fit	A	2:12:13,55	1:17:03,394	-1.030	0.275	-1:06:24,85 - 0:21:15,175
	B	2:34:48,39	1:34:35,810			

Table 9: Tests of whether the mean amount of time taken to complete clinical steps was equal in the two groups.

The mean amount of time taken to complete the Examination and primary impression and the Secondary impression clinical steps in group A patients was longer than that for group B patients. The differences were not, however, statistically significant. The mean amount of time taken to complete the Try- in and Final fit clinical steps in group B patients was longer than that for group A patients. The differences were not, however, statistically significant. A mean difference of 54 minutes in the amount of time taken to complete the Bite registration clinical step between the patients in groups A and B was observed. This mean difference was statistically significant ($p < 0.05$).

Patient groups	Mean overall time	Standard deviation	Test statistic, t	p-value	95% Confidence Interval of the Difference
Group A	10:28:42.58	3:28:32.738	-1.260	0.213	-3:18:24.670 - 0:45:03.379
Group B	11:45:23.23	4:27:03.772			

A mean overall time difference of 76 minutes for complete denture construction was observed between the patients in groups A and B. This mean difference was not, however, statistically significant ($p > 0.05$).

Table 10: Tests of whether the mean overall time taken for complete denture construction was equal in the two groups.

Variable	Parameter estimate	Standard error	Wald Chi-square	p-value	Estimated odds ratio	Odds Ratio (95% CI)
Intercept	222.393	90209.510	.000	.998	3.837E+96	
Gender (1)	-1.028	20888.347	.000	1.000	.358	.000
Age	-.509	1600.268	.000	1.000	.601	.000
Marital status			.000	1.000		
Marital status (1)	-16.759	61775.532	.000	1.000	.000	.000
Marital status (2)	-25.842	29625.001	.000	.999	.000	.000
Marital status (3)	-16.625	30497.033	.000	1.000	.000	.000
Hospital classification			.000	1.000		
Hospital classification (1)	-15.137	31269.950	.000	1.000	.000	.000
Hospital classification (2)	-30.254	43385.708	.000	.999	.000	.000
Hospital classification (3)	-10.510	31814.193	.000	1.000	.000	.000
Province of residence			.000	1.000		
Province of residence(1)	-6.439	26136.076	.000	1.000	.002	.000
Province of residence(2)	-21.410	34581.361	.000	1.000	.000	.000
Group(1)	12.464	17737.410	.000	.999	258725.046	.000

Table 11: Logistic regression analysis of factors associated with receiving dentures in six visits or less in the study population.

The results indicated that none of the demographic variables investigated was independently associated with receiving dentures in six visits or less

Discussion

This study set out to determine the chair time for complete denture fabrication by senior dental students and to test the hypothesis that the mean number of patient's visits required was equal to the conventional mean number of visits i.e. 4 to 5 visits.

Demographic characteristics

The results of this study indicate that patient groups were similar in terms of gender distribution. This result differ from some published studies which found that edentulism is more prevalent in women. [15,16] A possible explanation for this result might be that students were assigned patients in a non-random manner.

The current study found that less than twenty percent (16.1%) of all patients were younger than 54 years. The study has been unable to demonstrate that edentulism is a serious problem in the 35 – 44 years age group in contrast to the findings of the latest national oral health survey which reported a prevalence of 12.6%. [17] The overall prevalence of edentulism in South Africa has been reported to range between 8.5% and 10.3%. [16,18] The level of edentulism in adults younger, and those older than 50 years, was found to be 8.2% and 15.3% respectively. [18] A possible explanation for the low number of edentulous patients younger than 54 years of age at MOHC might be the fact that the provincial government subsidises a denture service for poor adults sixty years and older. [14] The results of this study show that patients who visit MOHC are drawn from the adjacent provinces of Gauteng, North West, and Mpumalanga. This is not unexpected as MOHC is a dental school and referral hospital.

The current study found that a little under half (48.4%) of the study sample were married. Single patients constituted 37.1%. These results differ from those reported by Riberio and colleagues. [19] They found that edentulism was more prevalent among widowed elderly patients aged sixty years and older in Brazil.

The results of this study show that just less than two thirds of the patients were exempted from paying user fees. This is not surprising considering the fact that government hospitals exempt the elderly from paying user fees. User fees have been shown to deter utilisation of public sector health services when needed, particularly among the poorest in African countries. [20]

Number of visits necessary to obtain complete dentures

The most interesting finding was that just less than half (48.4%) of the patients visited the clinic six times or more which was significantly higher than the highest conventional number of visits taken by a dentist to complete a set of dentures. This finding was not unexpected. Dental school clinics are generally recognised to be inefficient: Treatment is provided by students according to their level of training under faculty supervision, and treatment times are longer than would be experienced in private dental practices. [21]

Another important finding was that the difference in the mean number of visits between the groups was not statistically significant. These results are consistent with other research which found that students took 5-6 visits to complete a set of dentures. [9]

The time taken for complete denture fabrication

There is a dearth of literature on the topic of time and methods used for complete denture construction by dental students. This is an important issue for future research. The results of the current study were compared to the seminal work by Silverson and colleagues. [9]

The results of this study show that students took about 11 hours to fabricate dentures. This result differs substantially from previous research which found that students in Great Britain took about 4½ hours. [9] The reason for this is not clear but it may have to do with the generally recognized nonproductive clinical activity due to such limitations as lengthy waits for instructors and materials, lack of auxiliary staff, poor scheduling systems, and general red tape built into the teaching system. [21] These results therefore need to be interpreted with caution.

The average time that students take in the clinical steps of denture fabrication has not previously been described. The current study found that with the exception of impressions, students took longer to complete clinical steps in group B patients compared with group A patients. The differences in the average time for most clinical steps were not, however statistically significant. The most interesting finding was that the difference in the average time to complete bite registration step was statistically significant. This finding was contrary to expectations. One would expect that with the experience gained from fabricating dentures for patients at the same level of difficulty, the students would take a short amount of time to complete the bite registration step for group B patients.

Demographic variables associated with receiving dentures in six visits or less

The results of this study indicate that none of the investigated demographic variables was independently associated with receiving dentures in six visits or less. A possible explanation for this might be that the variables are highly correlated. As a consequence, whilst each variable may be significantly associated with the dependent variable in a univariable model, they are not significantly associated with it when they are all included in a multivariable model. The substantially large standard errors of regression coefficients in the multivariate model suggest collinearity. [22]

Limitations of the study

The amount of time wasted in nonproductive clinical activity was not measured.

Conclusion

Students are inefficient at constructing dentures.

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