Original Article

Evaluation of Satisfaction Perceived by Prosthetic Patients Compared to Clinical and Technical Variables

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ABSTRACT

Objectives: The purpose of this study is to relate the clinical quality of the complete denture and specific anamnestic factors to the level of satisfaction perceived by patients. Also identifying possible prognostic parameters that could be predictive of future satisfaction.

Materials and Methods: On the basis of a substantial existing literature, the most appropriate parameters to determine the prosthetic quality have been determined to evaluate the satisfaction perceived by patients about their denture; a completely new questionnaire has been drawn up. Ninety-eight patients have been included in the research, they have undergone a clinical examination, and they have filled out the questionnaire anonymously. The ANOVA test and Pearson correlation test have been employed to relate clinical and anamnestic factors to the overall satisfaction score.

Results: The average level of patients' satisfaction was between "quite satisfied" and "very satisfied." There is no significant variability of satisfaction related to the type of prosthesis. The ANOVA test did not verify relationships between the overall satisfaction score and the anamnestic data examined. Pearson linear correlation coefficient between the overall prosthetic quality and the general satisfaction perceived by patients is 0.493 ($P < 0.01$). Extension of the prosthetic body ($r = 0.478$; $P < 0.01$) and retention ($r = 0305$; $P < 0.05$) are in correlation with the overall patients' satisfaction.

Conclusion: there is a moderately strong relationship between the overall prosthetic quality and the general satisfaction perceived by patients. Particularly, the retention and the adequate extension of the prosthetic body appear to be factors that are most associated with satisfaction. Instead, the anamnestic factors are not related to overall satisfaction score.

KEYWORDS: *Clinical examination, complete dentures, denture quality, patient satisfaction, subjective evaluation*

INTRODUCTION

Despite the various therapies available for the overcoming of total edentulous, a considerable number of patients is rehabilitated with a conventional removable prosthesis.[1] However, a part of patients with removable prostheses are disappointed by the rehabilitation therapy.[2] This is probably because prosthetic treatments of this type are considered a success by clinicians when manufactured articles meet only certain quality and clinical standards. However, the evaluation method used by patients is based on daily life parameters, totally different from clinical ones such as the ability to chew certain more or less solid foods, the ability to pronounce words or support speech, esthetic considerations, and the comfort of their denture.[3] Therefore, the satisfaction perceived by

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Access this article online

Quick Response Code:

Website: www.jispcd.org

DOI: 10.4103/jispcd.JISPCD_27_18

patients is probably one of the most important parameters for deciding the actual success of a medical treatment, and it should be taken into greater consideration.[4] Most of the literature takes into account only the oral health and satisfaction perceived by the patient's prosthetic carrier without, however, an investigation of the causes and major failure factors. Conversely, a small number of researchers sought a relationship between prosthetic quality and patient satisfaction. Some of these authors found a remarkable correlation between clinical evaluation and patient acceptance level.[5-7] Different researches, on the other hand, have found weak[8-10] or absolutely null relations.[2,11-14] Scientific evidence of the relationship between medical assessments and patients' evaluations about complete total prostheses is not conclusive, and further investigations are needed. The purpose of this study is therefore to relate certain clinical and technical variables with subjective patient satisfaction, ascertaining whether and how such data affect the perception that patients have of their quality of life and the acceptance of removable complete denture. We'll also try to identify predictive prognostic factors that can help the clinician, to fully inform the patient about the risks of dissatisfaction with prosthetic treatment.

MATERIALS AND METHODS

The study was conducted at the University of Naples "Federico II", Naples, IT, after approval from ethics committee "Università Federico II" (protocol no: 332/17).

At a preliminary stage of the study, a thorough investigation of the present literature has been carried out on the most reliable and certified methods for evaluating clinical prosthetic quality and subjective satisfaction of patients. Based on this research, the most appropriate parameters and the practical procedures for evaluating the two variables covered by this study were determined.

PATIENT'S SATISFACTION

The tools available in the literature developed to measure the quality of life of patients in relation to their oral health are reduced to more or less comprehensive and complex questionnaires that authors provided to patients such as Oral Health Impact Profile (OHIP),[15] Geriatric Oral Health Assessment Index,[16] visual analog scales,[17] and satisfaction scores.[18] These items are consolidated in literature in terms of quality of life but refer to the assessment of the quality of life of patients in relation to oral health in the global sense, not specifically structured for complete dentures' problems. Based on the existing questionnaires[15-20] and above all on the criteria defined by Kressin *et al*.,[21] which are fundamental for the creation of a valid and meaningful

Figure 1: Questionnaire for the evaluation of the satisfaction perceived by the patients

tool, a new questionnaire [Figure 1] has been drawn up, consisting of eight variables such as ability to chew hard foods; the ability to chew soft foods; the perception of retention; the stability of the prosthesis during chewing or phonetics; the patient's ability to insert or remove the denture; ability to speak; esthetic satisfaction; and general satisfaction. At these 8 canons, patients could attribute a personal and subjective assessment that ranged from 1 to 5 (where 1 is "for nothing satisfied" and 5 for "totally satisfied"). All individuals were kept obscured by the clinician's judgment of their prosthesis to prevent their responses from being influenced by the outcome of the examination. From the analysis of the individual points considered and their associated responses, it will be possible to evaluate the major difficulties encountered by the patients and to obtain a general satisfaction score by adding individual judgments.

EVALUATION OF PROSTHETIC QUALITY

The Academy of Prosthodontics[22] in 1995 described the criteria that prosthetists should pursue for making any prosthetic artifact that can be considered as of good quality. At the same time, Woelfel *et al*.[23] reported the influence of dimensional and occlusion changes, retention and stability, condition of tissue supporting dentures, patients' and dentists' opinions, analyzing 11 different types of complete denture, different for materials and design, and determining optimal and reproducible parameters and the rules to be followed for their qualitative evaluation. The analysis of these led to the extrapolation of four major clinical parameters considered appropriate to determine the quality of the patient's prosthesis. These criteria are good or poor retention of the prosthesis, balanced or unbalanced occlusion, proper extension of the prosthetic body, and presence/absence of parafunctions. In addition, the precise instructions to be followed during the visit were

drawn up to seek the greatest possible objectivity of the qualitative clinical judgment.

The instructions given to the dentist are as follows:

Retention

The retention of the denture is considered good when there are no apparent dislocations from the anatomical support during physiological chewing and phonetic movements. Different conditions will result in a poor retention.

Occlusion

Occlusion is defined as balanced when there are bilateral contacts (working and balancing) in the molar/premolar area in both centric and eccentric movements. If detection reveals lack of contact on multiple surfaces, unilaterally, occlusion should be considered unbalanced.

Extension of the prosthetic body

The appropriate deepening of the vestibular flanges; the correct extension of the lingual flanges; the adequate distal extension in the neutral zones of retromolar trigone and maxillary tuberosities (biostatic areas); correct extension of the palate; and adequate housing for muscle frenula are essential elements to consider the extension of the prosthetic body sufficient. If some of these criteria are to be defective, then this parameter must be shown as inadequate.

Parafunction

Indicate, if present, the patient's parafunctional habits or movements (e.g., bruxism, diurnal tooth grinding, tooth clenching, and fingernail biting). Otherwise indicate as absent.

Dentures were evaluated by three independent calibrated observers in double blind in accordance with the abovementioned instructions.

The judgments which, based on the instructions received, were considered more appropriate, were included in a dichotomous scale [Figure 2]. This table allows to assign a score of 0 if the parameter is considered unsatisfied and a score of 1 when the evaluation is considered satisfactory. In this way, it was possible to assign a total qualitative evaluation of the prosthesis under consideration, ranging from 0 to 4. The higher the score, the higher the quality of the article.

OPERATIONAL PHASES

Of the more than 150 visited patients, only 102 respected the inclusion criteria and agreed to submit anonymously to the visit and fill in the questionnaire. These criteria included all patients with complete prostheses (whether superior, inferior or both) and capable of communicating clearly with the clinician.

CLINICAL EVALUATION		
RETENCION OF DENTURE	☐ POOR	☐ GOOD
OCCLUSION	☐ UNBALANCED	☐ BALANCED
EXTENSION OF PROSTHETIC BODY	☐ INADEQUATE	☐ SUFFICIENT
PARAFUNCTION	☐ PRESENT	☐ ABSENT

Figure 2: Dichotomy chart for clinical evaluation of prosthetic quality

Important physical dysmorphisms or neuropsychological disorders that prevented normal oral function, difficulty in understanding and responding to questions, and inability to communicate determined *a priori* the exclusion from the research for some individuals. The prosthetic artifacts were made by several dentists, not associated with the study, and commonly used by the patients examined. Population selection has been quite casual since this is the most effective method to avoid having a partial or nonrepresentative sample. Thus, all individuals who came to our attention and who met the inclusion criteria had an equal chance of being selected. The first clinical step included the collection of various anamnestic data of greater interest such as age, sex, education degree, type of prosthesis possessed (higher or lower), and the time of denture wearing. Second, the objective examination was carried out by evaluating the clinical factors of the prosthesis and indicating the judgment on the card. Subsequently, patients were given the subjective assessment questionnaire for satisfaction.

STATISTICAL ANALYSIS OF DATA

At the end of the operational phases, all the data collected were first analyzed using the IBM, SPSS statistical software (Armonk, New York, USA). Preliminarily, an analysis of the mean and frequency of the anamnestic data was presented, as number and percentage. The univariate variance test (ANOVA) was used to testify an association between the scores of the satisfaction scale and the detected anamnestic data. Subsequently, Bonferroni's multiple comparison process determined differences between the groups according to the type of prosthesis possessed. Finally, Pearson's linear correlation coefficient was used to determine the associations of interest between the various clinical variables, the total qualitative score, and overall satisfaction score. The same index was then used to correlate the quality parameters with each of the measured satisfaction items.

RESULTS

Of a total of 102 sampled patients, two did not fully complete the questionnaire provided, one had included more than one answer to some satisfaction questions, making it impossible to identify the one actually wanted and another being inadequately filled in by the clinician

in the corresponding entries to the anamnestic data. Such motivations have led to the exclusion of four patients from the study. In the remaining 98 individuals, actually included in the statistical analysis, the average age was 67 years, while 7 were the years that, on average, patients had their prostheses but no less than a month. Figure 3 summarizes the frequencies of other anamnestic data. In terms of overall clinical quality of the prostheses, no artifact has obtained a total score of zero, having all met at least one of the parameters analyzed. The evaluation of the overall satisfaction score has underlined an average of 26.43 and a median satisfaction score of 3.30. This indicates that the patient's level of satisfaction was on average between "quite" and "very." The satisfaction of the patients wearing only the upper prosthesis (mean = 27.76) was greater than the satisfaction of those who only carried the lower (mean = 22.79) but slightly lower than those who owned both (mean = 28.20). Despite these averages, Bonferroni's multiple comparison process has shown that this variability is not statistically significant. A repeated analysis of the univariate variance (ANOVA) between the various anamnestic factors considered in the study and the overall satisfaction score showed that sex, age, degree of education, and time spent from the prosthesis delivery did not change the level of satisfaction and are therefore not suitable parameters to predict the outcome of prosthetic treatment as shown in Table 1. Overall, the results obtained by the Pearson linear correlation coefficient showed a correlation of moderate but statistically significant strength between overall prosthetic quality and patient satisfaction in relation to their dental prostheses ($r = 0.493$; $P < 0.01$). Based on this result, the relationship between the individual parameters of quality and general satisfaction was investigated with the same system. The results, shown in Table 2, underline that retention and extension of the prosthetic body play a positive and significant role in achieving total patient satisfaction. On the other hand, the balance of occlusion and the presence or absence of parafunctions don't have
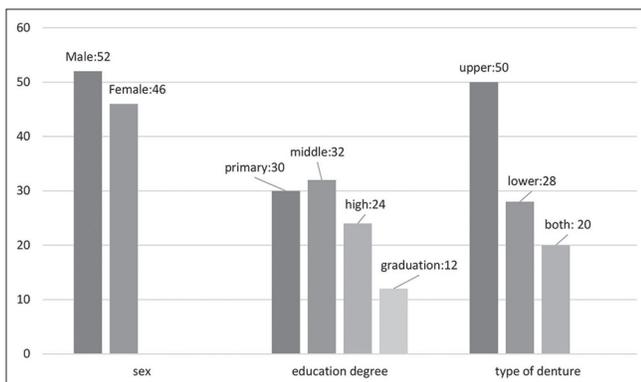
the same importance. Ultimately, the individual quality parameters were compared with all the elements of satisfaction in the questionnaire, to determine any model of associations. Table 3 shows the strength and direction of the associations, revealing numerous correspondences. Of particular note is the ascendant that the extension of the prosthetic body has on the stability of the product perceived by the patient during chewing and phonetics ($r = 0.523$; $P < 0.01$) and consequently also on his ability to pronounce words or make a speech without difficulty ($r = 0.313$; $P < 0.056$). It is also interesting to note that this same extension parameter, if adequately satisfied, affects the susceptible retention perceived by patients ($r = 0.49$; $P < 0.01$). Another important result is the importance that qualitative parameters such as

Table 1: Correlation between anamnestic factors and overall satisfaction

Parameters	F	P
Sex	0.110	0.742
Age	0.802	0.698
Education degree	0.155	0.926
Time of denture wearing	0.874	0.610

No parameter is statistically significant in correlation with patient satisfaction

Table 2: Correlation between quality parameters and overall satisfaction

Parameters	r	P
Retention	0.305	0.033*
Occlusion	0.104	0.477
Extension of the prosthetic body	0.478	0.001**
Parafunction	0.197	0.174

*Statistically significant for *P*<0.05, **Statistically significant for *P*<0.01

Table 3: Correlation between each quality parameter and the satisfaction items

Satisfaction's items	Clinical parameters			
	Retention	Occlusion	Extension	Parafunction
Chewing hard foods	0.257	−0.026	0.287*	0.314*
Chewing soft foods	0.086	0.026	0.199	0.033
Perceived retention	0.483**	0.159	0.491**	0.088
Perceived stability	0.432**	0.185	0.523**	0.074
Insert or remove	−0.055	0.162	0.196	0.190
Ability to speak	0.082	−0.101	0.313*	0.216
Esthetics	0.304*	0.173	0.398**	0.154
Overall satisfaction	0.180	0.039	0.469**	0.139

*Statistically significant for *P*<0.05, **Statistically significant for *P*<0.01

Figure 3: Frequency of anamnestic data

retention of the prosthesis and once again the extension of the prosthetic body have on the perception that the individuals possess of their esthetic appearance. All this is also reflected in the general judgment of the patients for the treatment to which they are undergoing because an adequate extension of the prosthesis base results in a better patient opinion ($r = 0.469$; $P < 0.01$).

DISCUSSION

The results determined in this study showed moderately positive and significant correlations between the quality of a prosthetic artifact and patient satisfaction. Specifically, an adequate extension of prosthetic tissue has proved to be particularly important to improve the stability and comfort that patients perceive during phonetics and chewing. This condition, according to Awad and Feine,[24] is necessary to achieve a high degree of satisfaction by making this qualitative criterion, among all the considered ones, the most important. These results agree with those reported in the literature by other researchers.[5-10] For example, Alfadda[5] examined a sample of 33 patients with total removable protests based on many objective clinical criteria and a questionnaire that evaluated the subjective perception of the patient, finding that certain quality parameters of the prosthesis such as stability and retention were important in determining an increase in the satisfaction of the treatment. In contrast, Fenlon and Sherriff[2] analyzed 363 patients with complete denture using a questionnaire created by them to investigate the effect that new implants, made following rigid quality criteria, have on patients' satisfaction at 3 months and 2 years. The results have led to the conclusion that the initial clinical quality of the prosthesis was not a significant factor in patient satisfaction 2 years after completion of the treatment. In agreement to this study, Berg[13] attributed to elements such as age, sex, or degree of education a scarce, if not existing, predictive power. On the contrary, instead, Erić *et al.*[14] attribute to them a high correlation. Aarabi *et al.*[25] consider the time factor (understood as the time passed by the delivery of the prostheses and their actual use) of fundamental importance in the adaptation process. In fact, their research has shown that at least 2 years are needed to achieve a high level of oral health-related quality of life. Conversely, the results of the study so far do not give this parameter the same relevance. John *et al.*,[26] however, say that only 1 month from treatment is sufficient for the OHIP to reach the average level of the general population and patients adapt to their prosthetic artifact. This supports the results obtained in this study because no time-consuming persons had been found in less than a month; the time factor may have been eliminated by the parameters relevant to overall satisfaction. Moreover,

this study found no differences in terms of satisfaction between the different types of prostheses. In fact, there is no difference between the patients who possess the upper rather than the lower prosthesis nor between those who possess both. This result, although it is in contrast with part of the literature, can be explained by the results obtained by Campos *et al.*,[27] which show that adaptation to mandibular complete dentures is dependent on patients' clinical conditions, subjective acceptance, and compliance. All the results discussed so far establish that prosthetic quality is a key element in determining clear and lasting satisfaction over time. However, an increasing number of evidence suggests that the acceptance of patients in their dentures is not exclusively based on quality technique in the manufacture of total prostheses. In fact, it is also necessary to consider different physical and psychological factors.

PHYSICAL FACTORS

The first element to consider is the physiological reabsorption of the alveolar ridges, since, in particular, the total length of the edges of the residual crest may become extremely irrelevant. According to Wolff *et al.*,[28] conditions of significant crestal reabsorption, especially the mandibular arch, make it more difficult to build comfortable artifacts. The same study found that the most significant parameter for correct retention of the total upper denture is represented by perioral musculature and its adaptation. The study of Doppalapudi *et al.*[29] showed that an increase in oral dryness was reflected in lowering the patient's assessment of the comfort and satisfaction they perceived.

PSYCHOLOGICAL FACTORS

Similarly, other parameters that should be evaluated at the first visit are psychological ones. Many researchers have in fact attributed dissatisfaction to the denture with psychological factors related to the patient's personality. This statement is particularly useful for neurotic patients, for whom Guckes *et al.*[30] have reported a significant reduction in total prosthetic satisfaction compared to results in patients with other personality traits. Silverman *et al.*[31] have shown, however, that patients with higher morals, a stronger self-image, and higher economic independence have also shown greater acceptance and faster adaptation to new total prostheses.

No less important to be identified at first are the expectations and the previous prosthetic experiences of the patients undergoing treatment. Often, as demonstrated by Davis *et al.*,[32] due to the increasingly frequent deception or misleading advertising in the modern dental panorama, people have high and unrealistic expectations about the esthetic and functional possibilities and results of a mobile prosthetic treatment.

A previous unsatisfactory experience, difficulties in chewing, and dissatisfaction with esthetics may, however, lead to higher acceptance if the new prosthesis is qualitatively superior and more comfortable.[33] According to Silverman,[34] psychological factors play a significant role in accepting the dentures and may also be a cause for treatment difficulties. On the basis of what has been said so far, we can say that the satisfaction of the patient with complete prosthesis is a multidimensional condition. Beyond the technical quality of the prosthesis, many factors, including mouth condition, patient personality and psychological state, aging process, and neuromuscular adaptation, can be variable in the satisfaction equation. Dentists should listen to oral health concerns and patient expectations and evaluate existing oral cavity conditions so that they can deal with these problems before starting treatment. They should also fully inform patients and family members about the constraints inherent to conventional total dentures to generate realistic expectations.

CONCLUSION

Based to the collected data and the results obtained, it can be concluded that

- Age, gender, degree of education, and time of denture wearing do not change acceptance and final satisfaction. The anamnestic data considered are therefore do not constitute a predicting factor of the outcome of the treatment
- There is no difference in satisfaction between those who have only the upper prosthesis, only the lower one, or those who have both
- There is a moderately strong and statistically significant relationship between overall prosthetic quality and overall satisfaction perceived by patients in relation to their dental prostheses
- The retention and proper extension of the prosthetic body have proved to be the parameters that play a more important role in achieving overall satisfaction.

FINANCIAL SUPPORT AND SPONSORSHIP
Nil.

CONFLICTS OF INTEREST
There are no conflicts of interest.

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