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"Prosthetic condition" and patients' judgment of complete dentures

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Purpose. This study introduces the concept "prosthetic condition", which combines the quality of complete dentures and residual alveolar ridges.

Material and methods. A pilot study was performed to select quality criteria with an acceptable interobserver agreement. With these criteria, a clinical examination was performed to assess the quality of the existing complete dentures and the residual alveolar ridges of 397 complete denture wearers. During clinical examination, the interobserver agreement of the selected criteria was retested. The "prosthetic condition" was assessed by combining the scores for denture quality and quality of the residual alveolar ridges. Subsequently, participants' satisfaction with and complaints about their dentures were scored according to their answers to specific questions.

Results. Logistic regression analysis demonstrated that no variable of the "prosthetic condition" proved to explain the denture satisfaction. Some variables of the "prosthetic condition" had a significant but not relevant correlation with some denture complaints.

Conclusions. More research is necessary to substantiate the concept "prosthetic condition" as an acceptable measure of professionally quality assessment of dentures and denture-bearing surfaces. However, in determining the treatment need of community-dwelling groups, this concept seems a more realistic measure than denture quality only. (J Prosthet Dent 1997;78:472-8.)

CLINICAL IMPLICATIONS

In this study the concept "prosthetic condition," combining the quality of complete dentures and residual alveolar ridges, was introduced. In determining the treatment need of community-dwelling groups, this concept seems a more realistic measure than denture quality only; however, no variable of the "prosthetic condition" proved to explain denture satisfaction.

The professionally assessed quality of complete dentures does not agree with the subjective judgment of the patients. In some studies, it has been demonstrated that no statistically significant positive correlations between the two variables have been recorded;¹⁻⁴ in other studies, weak or moderately significant positive correlations were found.⁵⁻¹⁰ Prosthodontic and surgical treatments are developed to improve patients' denture satisfaction.¹¹⁻¹⁷ However, in complete denture treatment, the delivery of technically and biologically acceptable dentures should not be the only goal; psychologic factors should also be considered. Psychological assessments of patients have been found to be without influence on patients' judgment of dentures,^{1-3,18-21} whereas others have been reported to distinguish significantly between satisfied and dissatisfied denture wearers.²²⁻²⁷ Several stud-

ies demonstrated that patients' judgment can be predicted by information related to patient perceptions, expectations, and prior experiences.^{8,28-32}

Denture quality is defined in relation to a number of factors, such as retention, stability, fit, vertical dimension, occlusion, and esthetics. All these factors are difficult to assess and no generally accepted standards exist.³³⁻³⁴ Accordingly, the validity and reliability of recordings of the quality of complete dentures are often doubtful.³⁵⁻³⁶ This problem could be one cause of the discrepancy between the professionally assessed denture quality and the subjective judgment of the patients. Another cause may be that professionally assessed denture quality assessment does not consider an important aspect of the intraoral condition: the quality of the denture-bearing surfaces, the residual alveolar ridges. In other words, it is quite possible that professionally acceptable complete dentures do not satisfy the wearer because of the quality of the denture-bearing surfaces.

The first aim of this study was to introduce the concept "prosthetic condition." In this concept, only criteria with an acceptable interobserver agreement are used

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and complete dentures quality is assessed in combination with the quality of the residual alveolar ridges. The purpose of this study was to investigate the relationship between (the variables of) the "prosthetic condition" and the patients' subjective judgment (satisfaction and complaints) of complete dentures.

MATERIAL AND METHODS

This study is based on some data of a nationwide dental survey among a nonproportional stratified cluster sample of the Dutch population aged 15 to 74 years ($n = 3526$). The aims of the survey were to assess the prevalence of oral diseases, need and demand for dental care, and oral self-care.³⁷ The population of the current study consisted of 397 complete maxillary and mandibular denture wearers, 194 men and 199 women, who were participants of the nationwide survey. Their ages varied between 35 and 74 years. A clinical examination was performed in a mobile dental clinic to assess the quality of the participants' complete dentures and residual alveolar ridges. Subsequently, the participants' satisfaction with and complaints of their dentures were scored according to their answers to specific questions.

Selection of criteria for the professionally quality assessment

A pilot study was performed in the Nijmegen University Clinic among 84 complete maxillary and mandibular denture wearers, 30 men and 54 women. Three dentists explored a wide range of complete dentures and residual alveolar ridge quality criteria, for instance, denture design, vertical and sagittal dimension, occlusion, articulation, border extension, retention, stability, anatomy, traumatic ulceration, palatal hyperaemia, fibrous hyperplasia, and hypermobile residual ridge.

For the clinical examination, the criteria selected for the professionally quality assessment were those in the pilot study explored criteria that fulfilled the following requirements: (1) acceptable interobserver agreement in the pilot study ($\kappa \geq 0.3$); and (2) not included in one of the other criteria. For example, although the criteria "denture design" and "border extension" of the maxillary denture fulfilled the first two requirements, these were not used because of their logical correlation with the much more important criterion "denture retention." The criteria selected were optimally defined and applied in the same way by 10 skilled and calibrated dentists. Calibration was carried out in 10 clinical sessions in the Nijmegen University Clinic with 10 complete denture-wearing patients.

During the clinical examination in the mobile clinic, the interobserver agreement of the selected criteria was retested among 76 of the 397 participants. In these 76 participants, another calibrated dentist repeated the assessments of the complete dentures and the residual alveolar ridges. The kappa values for interobserver agree-

Table 1. Kappa values for interobserver agreement of the criteria used for complete dentures and residual alveolar ridges quality assessment in the pilot study and in the retest

Criteria	Kappa value	
	Pilot study	Retest
Occlusion	0.33	0.29
Retention maxillary denture	0.33	0.30
Retention mandibular denture	0.33	0.30
Stability maxillary denture	0.49	0.02
Stability mandibular denture	0.33	0.32
Anatomy residual alveolar ridges	0.64	0.63
Fibrous hyperplasia	0.35	0.37
Hypermobile residual ridge	0.51	0.59

ment were reassessed and these values were compared with those of the pilot study. All criteria were scored dichotomously (0 = satisfactory, 1 = unsatisfactory).

Complete dentures quality assessment

For the quality assessment of the complete dentures, the following five criteria fulfilled the criteria requirements in the pilot study: occlusion, retention of the maxillary denture, retention of the mandibular denture, stability of the maxillary denture, and stability of the mandibular denture (Table I). Afterward, the criterion "stability of the maxillary denture" was eliminated, because of the surprising and inexplicable extremely low kappa value in the retest of interobserver agreement among the 76 participants (Table I).

The occlusion was registered "satisfactory" if maximal contact between maxillary and mandibular denture was found in centric relation position. The maxillary denture had a satisfactory retention if good resistance existed against a horizontal pulling force by finger pressure on the cervical portion of the left and right canines. The retention of the mandibular denture was registered "satisfactory" if good resistance existed against a vertical pulling force by finger pressure on the facial aspect of the incisors. Stability of the mandibular denture was scored "satisfactory" if good resistance existed against a lateral rotating force by finger pressure on the molar section of the denture.

The quality assessment of the dentures (maxillary and mandibular dentures combined) was rated as "acceptable" if the sum score was 0 or 1, "minimally acceptable" if the sum score was 2, and "poor" if the sum score was 3 or 4. On the basis of the two criteria for retention and stability of the mandibular denture, the mandibular denture was rated "acceptable" if the sum score was 0, "minimally acceptable" if the sum score was 1, and "poor" if the sum score was 2. Because only one criterion covered the maxillary denture, it was impossible to give a separate quality assessment for the maxillary denture.

Table II. Questionnaire concerning satisfaction with and complaints of complete dentures*Overall satisfaction with the total (maxillary and mandibular combined) denture*

1 Are you satisfied with your dentures?

Complaints of retention

2/3 Does your maxillary/mandibular denture come loose while you are eating/chewing hard food?

4/5 Does your maxillary/mandibular denture come loose while you are eating/chewing soft food?

6/7 Does your maxillary/mandibular denture come loose while you are speaking?

8/9 Does your maxillary/mandibular denture come loose while you are swallowing?

10/11 Does your maxillary/mandibular denture come loose while you are singing or shouting?

12/13 Does your maxillary/mandibular denture come loose while you are yawning?

14/15 Does your maxillary/mandibular denture come loose while you have a cough or sneeze?

16/17 Does your maxillary/mandibular denture have a good retention?

Complaints of esthetics

18 Are you happy with the appearance of your dentures?

Which of the following esthetic problems do you experience:

19 sunken face or mouth

20 ulcers in the angle of the mouth

21 ugly looking dentures

22 something else

Complaints of function

23 Do your maxillary/mandibular dentures fit well with each other?

24 Can you swallow normally with your dentures?

25 Can you eat and chew food normally with your dentures?

26 Can you laugh normally with your dentures?

27 Can you speak normally with your dentures?

Complaints of pain

28/29 Does your maxillary/mandibular denture hurt when you laugh?

30/31 Does your maxillary/mandibular denture hurt when you eat/chew hard food?

32/33 Does your maxillary/mandibular denture hurt when you eat/chew soft food?

34/35 Does your maxillary/mandibular denture hurt when you speak?

36/37 Does your maxillary/mandibular denture hurt when you swallow?

38/39 Does your maxillary/mandibular denture hurt when you sing or shout?

40/41 Does your maxillary/mandibular denture hurt when you yawn?

42/43 Does your maxillary/mandibular denture hurt when you put it in or out?

Vague complaints

Do you experience any of the following complaints?

44 People cannot understand you while you are speaking

45 You need to soften your food for eating

46 Pronouncing certain words or letters is difficult

47 In presence of other people you do not dare to laugh

Other difficulties

Which of following difficulties do you experience?

48 Ulcers underneath your dentures

49 Restricted space for your tongue

50 Shrinking of your gums

51 Sensation of full mouth

52 Sensation of "burning" mouth

53 Decreased or increased salivary flow

54 Impairment in tasting

55 Reduced sensitivity of your underlip or chin

56 Vomiting

57 Queasiness

58 Jaw-weary

59 Head- or earache

60 Food gets under your dentures

Table III. Crosstable of the quality of the dentures and the residual alveolar ridges; combination of the scores leads to acceptable(***), minimally acceptable (**), or poor (*) "prosthetic condition"

Quality dentures	Quality residual alveolar ridges			Total
	Acceptable (0-1)	Minimally acceptable (2-3)	Poor (4-6)	
Acceptable (0-1)	108 (27%)***	74 (19%)***	11 (3%)*	193 (49%)
Minimally acceptable (2)	43 (11%)***	38 (9%)*	19 (5%)*	100 (25%)
Poor (3-4)	32 (8%)*	55 (14%)*	17 (4%)*	104 (26%)
Total	183 (46%)	167 (42%)	47 (12%)	397 (100%)

Residual alveolar ridges quality assessment

For the quality assessment of the residual alveolar ridges three criteria fulfilled the criteria requirements in the pilot study, as well as afterward in the retest of interobserver agreement among the 76 participants: anatomy of the maxillary and mandibular residual alveolar ridges, fibrous hyperplasia in maxilla and/or mandible, and hypermobile maxillary and/or mandibular residual alveolar ridge(s) (Table I). The anatomy of the residual alveolar ridges was scored through the method that used a standard set of casts for classification of the degree of alveolar bone resorption.³⁸ Fibrous hyperplasia and hypermobile residual ridges were only scored if clearly noticeable.

Both residual alveolar ridges were rated "acceptable" if the sum score was 0 or 1, "minimally acceptable" if the sum score was 2 or 3, and "poor" if the sum score was 4, 5, or 6. The mandibular residual alveolar ridge was rated "acceptable" if the sum score was 0, "minimally acceptable" if the sum score was 1 or 2, and "poor" if the sum score was 3. Because a separate quality assessment for the maxillary denture was not given, it was not practical to give a separate quality assessment for the maxillary residual alveolar ridge.

"Prosthetic condition"

The "prosthetic condition" was assessed by combining the scores for the denture quality and the quality of the residual alveolar ridges. The overall "prosthetic condition" (maxillary and mandibular combined) and the mandibular "prosthetic condition" were scored "acceptable" for the score combinations acceptable/acceptable, acceptable/minimally acceptable, and minimally acceptable/acceptable; the qualification "minimally acceptable" was assigned for the score combinations acceptable/poor, poor/acceptable, and minimally acceptable/minimally acceptable. The "prosthetic condition" was scored "poor" for the score combinations poor/minimally acceptable, minimally acceptable/poor, and poor/poor.

Participants' subjective judgment (satisfaction and complaints) of complete dentures

During the interview, the participants answered questions concerning the overall satisfaction with the total

(maxillary and mandibular combined) denture and complaints of retention, esthetics, function, pain, vague complaints, and other difficulties related to denture wearing (Table II). The answers were also scored dichotomously (0 = satisfactory or not present, 1 = unsatisfactory or present).

Statistical analyses

First the possible confounding effect of the variables age, gender, socioeconomic status (educational level and income), and residential area was investigated. With logistic regression analysis, a possible influence of variables of the overall and mandibular "prosthetic condition" on the denture satisfaction was explored. Six explanatory variables were used in two logistic regression analyses: (1) overall denture quality, quality of the residual alveolar ridges, and overall "prosthetic condition" and (2) mandibular denture quality, quality of the mandibular residual alveolar ridge, and mandibular "prosthetic condition."

The contingency coefficient (Pearson chi-square) was used for investigating a possible correlation between the variables of the "prosthetic condition" and the participants' denture complaints. The level of significance was chosen at $p \leq 0.05$.

RESULTS

Professional quality assessment

In 151 (38%) of the 397 participants the occlusion of the dentures was not satisfactory. Unsatisfactory retention of the maxillary and mandibular denture was found in 175 (44%) and 234 (59%) participants, respectively; 115 (29%) participants had unstable mandibular dentures.

A severe resorption of the maxillary and mandibular residual alveolar ridges was found in 71 (18%) and 270 (68%) of the participants, respectively; 32 (8%) participants had fibrous hyperplasia in the maxilla and 71 (18%) in the mandible. A hypermobile maxillary residual ridge was observed in 95 (24%) participants and a hypermobile mandibular residual ridge in 159 (40%) participants.

Tables III and IV present the results of the quality assessment of the dentures (maxillary and mandibular

Table IV. Crosstable of the quality of the mandibular denture and the mandibular residual alveolar ridge; combination of the scores leads to acceptable (***), minimally acceptable (**), or poor (*) mandibular "prosthetic condition"

Quality mandibular denture	Quality mandibular residual alveolar ridge			Total
	Acceptable (0)	Minimally acceptable (1-2)	Poor (3)	
Acceptable (0)	38 (10%)*	88 (22%)*	7 (2%)*	133 (34%)
Minimally acceptable (1)	29 (7%)*	130 (33%)*	14 (3%)*	173 (43%)
Poor (2)	11 (3%)*	61 (15%)*	19 (5%)*	91 (23%)
Total	78 (20%)	279 (70%)	40 (10%)	397 (100%)

Table V. Crosstable showing the relevant significant correlations (contingency coefficient: Pearson chi-square) between the variables of the "prosthetic condition" and the participants' denture complaints

Overall "prosthetic condition"	Participants' denture complaints					
	Retention maxillary denture	Retention mandibular denture	Esthetics	Pain mandibular denture	Vague complaints	Other difficulties
Occlusion				0.14 $p = 0.01$ $n = 376$	0.11 $p = 0.04$ $n = 374$	0.12 $p = 0.02$ $n = 381$
Retention maxillary denture	0.13 $p = 0.01$ $n = 390$					
Retention mandibular denture		0.18 $p = 0.00$ $n = 387$		0.10 $p = 0.04$ $n = 389$		
Stability mandibular denture		0.13 $p = 0.01$ $n = 387$		0.10 $p = 0.04$ $n = 389$		
Anatomy mandibular residual alveolar ridge				0.14 $p = 0.03$ $n = 389$	0.19 $p = 0.00$ $n = 387$	0.16 $p = 0.01$ $n = 394$
Fibrous hyperplasia in maxilla	0.14 $p = 0.05$ $n = 390$		0.16 $p = 0.02$ $n = 392$			
Fibrous hyperplasia in mandible						0.16 $p = 0.00$ $n = 394$
Hypermobility maxillary residual ridge	0.12 $p = 0.02$ $n = 390$					

dentures combined) and both residual alveolar ridges. The overall "prosthetic condition" was "acceptable" for 225 (57%) participants, "minimally acceptable" for 81 (20%), and "poor" for 91 (23%). The mandibular "prosthetic condition" was "acceptable" for 155 (39%) participants, "minimally acceptable" for 148 (38%), and "poor" for 94 (23%).

Participants' subjective judgment

A total of 297 (75%) participants responded that they were satisfied with their dentures. The analysis of the answers to all questions regarding one specific complaint of the dentures showed that the internal consis-

tency was substantial (Cronbach's alpha ≥ 0.68). For denture retention, 253 (65%, $n = 390$) and 112 (29%, $n = 387$) participants claimed that their maxillary and mandibular denture had a satisfactory retention respectively. As many as 338 (86%, $n = 392$) participants rated the esthetics of their dentures with a score "satisfactory" and 306 (77%, $n = 395$) participants experienced satisfactory denture function. Eighteen (5%, $n = 393$) participants experienced related maxillary denture and 98 (25%, $n = 389$) related mandibular denture pain. Vague complaints were mentioned by 247 (64%, $n = 387$) participants and 90 (23%, $n = 394$) had other difficulties.

Statistical analyses

The variables age, gender, socioeconomic status, and residential area did not reveal any confounding factors. None of the six variables used in the logistic regression analysis (overall denture quality, quality of the residual alveolar ridges, overall "prosthetic condition," mandibular denture quality, quality of the mandibular residual alveolar ridge, and mandibular "prosthetic condition") explained the denture satisfaction.

No relevant correlation was found between variables of the overall "prosthetic condition" and participants' denture complaints. Table V presents the combinations of variables with a significant but not relevant correlation (> 0.20).

DISCUSSION

Several studies found that the interobserver agreement of the criteria for the professionally assessed quality of complete dentures is weak, even when the observers are skilled.^{33,39} In the pilot study and the retest of interobserver agreement, the value of kappa = 0.3 was regarded as the minimal acceptable level of agreement. Nevertheless, this value contains "a poor agreement beyond chance."⁴⁰ However, the use of acceptable reliable criteria is not a guarantee that the concept "prosthetic condition" is a valid measuring instrument.^{33,34,39,41} Further inquiries into the validity and the reliability of the criteria are highly desirable if this concept is to be regarded as useful. An inexplicable fact is the change in the kappa values for the stability of the maxillary denture: 0.49 in the pilot study and 0.02 in the retest of interobserver agreement.

Participants' subjective judgment of complete dentures was assessed by one question. Recently, after the Dutch nationwide dental survey was carried out,³⁷ visual analog scales were introduced and recommended to measure patients' judgment.^{42,43} The fact that the overall denture satisfaction was derived from one question is questionable. It is unknown if dissatisfaction was caused by the mandibular or by the maxillary denture. However, other investigations suggested that overall satisfaction seems to be a reflection of satisfaction with the mandibular denture.^{44,45}

Another point of discussion is the choice of an equal value per criterion and per score (0 or 1). With this method, all scores and criteria had the same "weight." This choice was arbitrary and the decision was among "acceptable," "minimally acceptable," and "poor" quality of the dentures and the denture-bearing surfaces. Equally arbitrary was the qualification of the term *prosthetic condition*. However, the relation between the "prosthetic condition" and the participants' subjective judgment of the dentures was so poor that marginal alterations in the valuation of the criteria and the border limits had no strong implications for this relation. More

research is necessary to substantiate the concept "prosthetic condition" as an acceptable measure of professionally quality assessment of dentures and denture-bearing surfaces.

In this study, the overall "prosthetic condition" was "minimally acceptable" or "poor" for 43% of the participants. With respect to the mandibular "prosthetic condition," this percentage was 61%. If only denture quality was used, the percentages would be 51% and 66%, respectively (Tables III and IV). This difference is important for the assessment of treatment need.^{34,41} It seems acceptable that just for community-dwelling groups, the "prosthetic condition" is a more realistic measure for treatment need than denture quality only. Mojon and MacEntee⁴⁶ raised the same point in their study of institutionalized denture wearers, which had a different point of departure but the rest of the study is comparable to this study. They used the terms *theoretical treatment need* (quality of dentures) and *clinical treatment need* (quality of dentures and denture-bearing surfaces).

Because there is a lack of similar studies, the results of this study cannot be compared with others. Only a superficial comparison is possible with the results of the Mojon and MacEntee study,⁴⁶ in which similar criteria were used. They examined 269 institutionalized elderly complete denture wearers and found a "clinical treatment need" of almost 66% (43% in the current study).⁴⁶ They also found no relation between "clinical treatment need" and denture satisfaction in terms of absence of complaints.

The results of this study also demonstrated that the concept "prosthetic condition" has no relevant correlation with the patients' subjective judgment of the dentures. The hypothesis that the discrepancy between the professional denture quality and patients' subjective judgment of the dentures is due to an absence of consideration for the quality of the denture-bearing surfaces must be rejected.

Several studies demonstrated that patients' judgment of complete dentures can be predicted by information related to patient perceptions, expectations, and prior experiences,^{8,28-32} or can be improved by special prosthodontic and surgical treatments.¹¹⁻¹⁷ However, an important factor with a proven relation for the subjective judgment of complete dentures, which a dentist can have well in hand, is the dentist-patient relationship as experienced by the patients.^{18,30} This correlation is only in force in the 2-year period after denture treatment.³⁰ Dental practitioners should pay serious attention to their relation with the patient for a subjective acceptable result of their treatment. Possibly a professional "acceptable" result of complete denture treatment depends on "what" the dentist is doing, whereas the patient's short-term judgment may depend on "how" the patient perceives the dentist's treatment.

CONCLUSION

The hypothesis that the discrepancy between the professionally acceptable complete dentures do not satisfy the wearer because of the quality of the denture-bearing surfaces must be rejected.

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