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EVALUATING PROBLEMS AND FUNCTION OF COMPLETE DENTURE PROSTHESES IN ARDABIL CITY, IRAN, 2017

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ABSTRACT

Objective: there is an increasing use of complete dentures with increasing age average in communities. However, patients who use denture report numerous problems when using complete dentures. This study aimed to evaluate problems and function of complete dentures among patients living in Ardabil, Iran.
Methods: 138 patients who had received denture 1 year ago were examined in Ardabil during 2017. Evaluated oral lesions consisted of ulcer, angular cheilitis, Stomatitis, and Epulis fissuratum. Denture function was evaluated using self-assessment questionnaire of PDA (Patient's Denture Assessment); moreover, impaction distribution, occlusion, occlusal plane and vertical dimension of occlusion in patients were assessed. Data were analyzed through SPSS19 Software.
Results: respondents consisted of 55 (39.3%) women and 83 (59.3%) men. Age average of patients was 64.8±9.3. Age average of denture was 12.1±6.8. Mean score of denture function in terms of esthetic and speaking was 2.8±0.9, function of lower jaw (mandible) denture was 2.9±0.8, patients' expectations was 3.7±0.7, upper jaw (maxilla) denture was 2.5±0.7, and denture importance was 2.7±0.7. Values related to prevalence of stomatitis, ulcer, angular cheilitis, and epulis fissuratum obtained to 12.3%, 9.4%, 16%, and 7.2%, respectively. There were 73 (52.9%) cases of false denture occlusion. Centric jaw relation was false 56.5%. Vertical dimension of occlusion was low in 66.6% of cases and high in 10.9% of cases. Prevalence of no retention of denture was observed in 125 cases (45.2%), and prevalence of denture base fracture and artificial teeth fracture obtained to 10.2% and 10.95, respectively.
Conclusion: a considerable number of denture wearer in this study suffered from lips and mucosal lesions and patients gave an average score to denture function. Most of the patients complained about lack of denture retention. Seemingly, better design of denture and replacement of worn denture could reduce denture's problems and improved its function.

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Introduction

Despite the reduction in edentulous adult population, there are increasing edentulous patients who need to receive prosthesis due to the world's increasing population [1]. Nowadays, people who lose their tooth are decreasing because of progressive preventive dentistry. On the other hand, there is considerable increase in number of edentulous patients due to the expanded life expectancy and the quality of life [2, 3].

Loss of natural teeth results in various functional and psychological outcomes for patients and these problems can be somewhat treated by dentures. Nevertheless, results of denture replacement are different depending on some factors such as ability and skill of dentist, laboratory technician, and factors associated with patients [4].

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Success or failure in treatment with complete prosthesis is predictable. Majority of patients' complaints are caused by lack of their readiness for physical, oral, and mental problems and inaccurate knowledge about the nature of complete prosthesis. Complete prosthesis support means resistance of remained ridges (bone-mucus) against vertical pressures of prosthesis toward the ridge [5]. Prosthesis bases should be completely compatible with their underlying tissues in order to have a desirable support so that occlusion surfaces will be placed on each other properly. A suitable support guarantees prosthesis retention and stability.

Denture is defined as a set of artificial teeth replaced for lost natural teeth providing convenience, beauty and health of patient. Although removable prosthesis invented several years ago and some progresses occurred in this field, sometimes some of dental prostheses may cause problem in patient's convenience, instable occlusion, and esthetics issue harming underlying tissue so that patient cannot use denture anymore. Moreover, complications caused by denture are severe in patients with some disease such as diabetes [6].

Although denture helps an edentulous patient, who has lost some of teeth with chewing and food digestion and guarantees beauty and convenience of patient, inappropriate denture may cause severe harms to health oral tissues. For instance, physical harm caused by dental prostheses, accumulation of bacterial plaque on denture or allergic and toxic reaction to constituents of acrylic materials of denture may stimulate mucus reaction producing lesions in underlying tissue [7].

Since patients have high expectations from treatment, it is essential to warn them about possible problems post-treatment. In this case, dentist can give patients beneficial and perfect teachings to solve post-treatment problems [3].

To achieve a successful treatment, materials affecting the quality of denture should be tested perfectly. Quality of denture depends on various factors such as retention, stability, vertical dimension, occlusion, esthetic, food impaction under the denture, speaking, and chewing. In majority of cases, treatment is not matched with patient's expectations. On the other hand, patient's complaints about denture are related to lack of retention and stability, pain, food impaction under the denture, difficulty in speaking, bone loss and growth of soft tissue under the denture. Of mentioned problems, more complains were about pain. Some cases such as systematic problems and use of various drugs may cause such problems [5].

Therefore, when visiting edentulous patients the dentist should plan a suitable treatment and use a correct method based on accurate examination, testing physical and psychological modes of patient, paying attention to logical and illogical demands of patients, predicting possible outcomes of treatment, and considering all of patient's oral conditions. In this regard, dentist should be aware of patients' expectations making them aware of possible problems and solve the upcoming problems [8, 9].

Since removable dental prosthesis are more used than implant due to their inexpensive cost that is matched with economic status of the most patients and with consideration of a wide range of the mucosal lesions caused by denture, this study was conducted to examine reasons for failure in complete dentures. Findings of this study can give extra information about complications of complete denture to be used when giving advice to patients [10, 11].

Materials and Methods

This was a cross-sectional and retrospective study conducted in Ardabil during 2017. Studied patients were selected as consecutive selection based on the date of complete prosthesis receipt in 2017 considering the study metrics. Sample size was calculated based on the prevalence of problems caused by denture such as problematic application, eating and social relationships at least in 90% of patients [9, 12] and dependence of complications with older ages; accordingly sample size obtained to n=138 based on the following formula (z=1.96) and error interval (e) of 5%.

Sample members were evaluated after authenticating necessary metrics. The study was implemented like other similar studies based on the examination and filling out questionnaire [13, 14].

Patients were asked to refer to dental clinics of Ardabil city regarding free oral-dental examination. Some questions were asked about possible complications of prosthesis during examinations (questionnaire). The asked items were based on the questionnaire applied in similar studies. These questions were related to problems caused by use of denture such as placing and removing the prosthesis and pain, eating problems (chewing problems, pouring food from the mouth, displacement of denture, and food accumulation under the denture), problems related to social relationships (disturbed speaking and laughing), problems related to beauty (satisfaction with color and shape of denture), and problems related to quality of life (bad smell of mouth, sleep disorder and self-confidence level). Some explanations were given to patients about how to answer questions.

In this research, 2 questionnaires were employed; a questionnaire adapted from similar studies and a questionnaire obtained from dentist's examinations. To check complications and outcomes of complete denture, self-assessment questionnaire of PDA was employed; this questionnaire consisted of 22 items in 6 scopes to evaluate, function, speaking and esthetic, complete mandibular denture, complete maxillary denture, patients' expectations, and prosthesis necessity. This questionnaire was revised in 2014 by Kamagramine et al. and designed in two English and Japanese languages [12]; validity, internal consistency, and reliability of this questionnaire have been proved [15]. Questions and scoring method were modified in present study to determine validity of questionnaire simply. In this regard, questions were measured based on the 5-point Likert Scale (from strongly high [5] to strongly low [1]) instead of scoring range of 0-100 of pain visual analog scale (VAS). In this case, higher scores indicated the worsen status of complete denture and lower scores indicated better status (reverse case in some questions). This questionnaire was translated to Persian language by an English translator. After

modifications, validity of questionnaire was approved by 3 dentists, its reliability was measured using Cronbach's alpha coefficient, and pretest posttest on 15 patients who had complete denture within a 2-week interval and the reliability value of 0.74 was obtained indicating acceptable level.

Inclusion metrics of study were as follows: 1) wearers of complete removable prosthesis 2) informed consent of patients for participation 3) at least one-year wearing of denture. Exclusion metrics consisted of 1) patients with systematic and chronic diseases such as diabetes, immune deficiency, rheumatoid arthritis, salivary gland disorders and malignancy, 2) receptor of oral and topical antifungals and corticosteroids 3) patients with Mental and physical disabilities, 4) pregnant and lactating women, 5) smokers.

Data analysis

The gathered data were coded then inserted into SPSS19 Software and analyzed using analytical methods of T-test and Chi-square besides descriptive statistics in frame of tables and charts. Significance level was considered lower than 0.05 in all of mentioned tests.

Ethical considerations

All of information related of personal document of patients was confidential under the control of dentist and project executor and patients remained anonymous.

Results

Of evaluated 138 patients, 55 members (41.7%) were women and 83 members (59.3%) were men. Minimum and maximum age of patients was 45 and 89 and average age of patients was 64.8. 21% were 45-55 years old, 23.2% 56-65, 39.1% 66-75, and 10.1% 76-84. There was not any difference between average age of men and women in this research (P=0.09).

The range of denture use was 1- 31 years. 44.2% of respondents have been using denture for 1-5 years, 13.8% 6-10 years, 16.7% 11-15 years and the rest (25.3%) have been using denture more than 15 years.

Results obtained from 22-item questionnaire showed the average satisfaction of patients with complete denture in relation with function, esthetic and speaking. Moreover, patients reported more problems in lower jaw compared to upper jaw such as food impaction under the prosthesis and displacement of denture. Patients had relative high expectations from denture. In case of necessities such as denture care, patients scored relevant questions at average level. In addition, there was not any significant difference between men and women in terms of questionnaire scopes (P=0.09).

125 cases (45%) of lack of retention of denture was reported by respondents; of that, 29 cases (23.2%) were related to lack of retention in maxillary denture and 96 cases (76.8%) to mandibular denture.

Mucosal complications of patients consisted of denture stomatitis, inflammation of the lips, ulcer, and Epulis fissuratum; of 138 members, 62 patients (44.9%) had mucosal lesions, 17 patients (12.3%) suffered from denture stomatitis, 13 patients (9.4%) had inflammation of the lips, 22 patients (16%) had ulcer and 10 patients (7.2%) suffered from Epulis fissuratum. There was not any relationship with mucosal lesions expect for Epulis fissuratum (P>0.05).

Among 62 members with lesions, 9 members (14.52%) had more than one lesion; there were 22 maxillary lesions (35.5%), 27 mandibular lesions (43.54%), and 13 lesions in corner of lips (20.96%). There was a significant relationship between prevalence of Epulis fissuratum and female sex (P=0.04, R=0.2), while this difference was significantly more in women (P=0.045).

In case of dentures, there were 14 cases (10.2%) of denture base fracture; of that, 6 cases were in maxillary denture and 8 cases were in mandibular denture.

In case of dentures, there were 15 cases (10.9%) of artificial teeth fracture; of that, 7 cases were in maxillary denture and 8 cases were in mandibular denture. There were two cases of simultaneous base denture and artificial teeth fracture.

In case of patients' occlusion, 68 members (47.1%) had proper occlusion and the rest of patients had false occlusion. Appraisal of vertical dimension of occlusion was high in 15 members (10.9%), normal in 31 members (22.5%) and low in 92 members (66.6%).

Average angle between fox plane and the interpupillary line was 2.74° and average angle of posterior occlusal plane was equal to 8.54, 4.94, and 1.74° for superior, middle and inferior points of tragus, respectively. Positive angle shows low fox plane versus Ala-tragus and negative angle showed higher fox plane angle versus Ala-tragus.

Evaluation of centric jaw relation showed 78 (56.5%) correct cases and 60 (43.5%) false cases.

Following findings were obtained from Spearman test:

- There was not any significant relationship between gender and studied variable (P>0.05).
- There was not any significant relationship between the age of participants and studied variables except for the age of denture (P=0.00, R=+1).
- There was a direct relationship between lack of retention and low vertical dimension of occlusion (P=0.04, R=+0.2), higher age of denture (P=0.02, R=-0.2), and false occlusion (P=0.04, R=-0.2).
- There was a significant relationship between female gender and Epulis fissuratum (P=0.04, R=0.2).
- There was a direct relationship between teeth fracture and false occlusion (P=0.01, R=+0.41).

Discussion

This study was conducted to evaluate problems and function of removable complete prosthesis in patients who wear denture. According to the findings, function of denture obtained average score-lower than the score expected by patients- without significant relationship with sex of patients and maxillary or mandibular dentures based on the PDA questionnaire. There were more problems in lower jaw than upper jaw in case of food impaction under the prosthesis, and denture displacement. Patients had higher expectations from denture. In case of necessities such as denture care, patients gave average score. Pain, impaired swallowing and speech, lack of esthetic, noisy chewing, remained foods under the denture, lack of retention, and lack of denture adaptability with jaw were some factors asked from patients in PDA questionnaire; these factors were similar to problems among patients who worn denture in similar studies [8, 31]

Moreover, there was not any significant difference between men and women in case of questionnaire's scope; this finding was in line with results obtained by Gosavi et al. and Ogunrinde et al. [8,5]

The main reasons for problems among studied patients consisted of mucosal lesions, design and manufacturing of denture, and denture worn.

Mucosal lesions not only cause pain and inflammation but also may increase denture dysfunction. In this research, prevalence value of Stomatitis, ulcer, angular cheilitis, and Epulis fissuratum obtained to 12.3%, 16%, 9.4%, and 7.2%, respectively. Various rates of mucosal lesions caused by denture have been reported in similar studies [5, 8, 9, 11, 16, 20, 21].

There was a significant relationship between Epulis fissuratum prevalence and female sex and this result was in line with results obtained form study conducted by Dr. Zahra Tohidast Ekrad [2].

According to study conducted by Bilhan et al., there was 47.5% ulcer or inflammation, 9.1% stomatitis, and 5.1% angular cheilitis among patients who wear denture; in this study, stomatitis prevalence rate varied between 9 and 16.7% in different dentures [11]. Moreover, ulcer or mucosal inflammation had a negative effect on patients' speaking [11]. Singh et al. reported 56% stomatitis, 32% angular cheilitis, 58% ulcer in men (42%, 28% and 68%, respectively in women) as common mucosal lesions among denture wearers [8]; mucosal lesions were more prevalent in their study compared to present paper. Gosavi and colleagues reported ulcer and pain (29.9%) the most prevalent complaints of patients with complete denture; in this case older adults had more complains without any connection to their sex [8]. Tuominen and colleagues conducted a study on oral health of old Finnish men who were denture wearer and reported 66.9% of patients with mucosal harms [20]. In an Iranian research, Tohidest and colleagues reported prevalence rate of stomatitis, angular cheilitis, and Epulis fissuratum equal to 38.3%, 23.2%, and 55%, respectively [21] that these rates are higher than rates obtained in present study due to quality and quantity of denture manufacturing, oral-dental health level, studied population, time of denture wearing and entering to the study; respondents of present study had begun denture wearing at least one year ago while in mentioned study respondents entered to the study at the time of denture wearing beginning.

Although denture wearing can improve quality of life, its inefficiency may worsen quality of life of wearers [22]. Inappropriate design is accompanied with some cases such as food impaction, denture displacement, denture movement, impaired chewing and speaking, ulcer, noise, Vagus nerve stimulation, impaired tongue movement, face defamation, and bad smell of mouth [5, 11, 16, 17]. The most important evaluated factors about design consisted of retention rate, occlusion plane, and vertical dimension of occlusion, and centric jaw relation.

Prevalence of lack of retention reported to 45.2%; 76.8% lack of mandibular retention and 23.2% lack of maxillary retention. According to study conducted by Gosavi et al., most of the complaints related to lack of denture retention with 35.4% prevalence [8]. Findings obtained by Menon et al. showed optimal rate of 37.5% maxillary denture retention and 52.8% mandibular denture retention [23]. According to a study, suitable maxillary and mandibular lack of retention obtained to 24% and 65% [24]. Prevalence of suitable lack of retention in present study obtained higher than rates in mentioned studies; most of the problems of patients' denture related to lack of mandibular denture in present study. Similar to present study, three above-mentioned studies indicated higher prevalence of suitable maxillary retention. Suitable retention is one of the significant factors of patients' satisfaction with denture [25].

Proper vertical dimension of occlusion is an important step of prosthesis treatment for edentulous patients [26]. Inappropriate vertical height leads to oral-facial anomalies such as bruxism, painful chewing muscles and temporomandibular joint problems. In high vertical dimension of occlusion, teeth's blows cause continuous impact on tissue and prosthesis displacement. Hence, low vertical dimension of occlusion weakens chewing power leading to facial deformation that is not optimal aesthetically [27]. Evaluation of vertical dimension of occlusion indicated its rate 10.9% above normal level and 66.6% lower than normal level. According to studies conducted by Bilhan and colleagues[16], vertical dimension of occlusion was normal in 26.5% of cases, high in 3.1% of cases and low in 70.35 of cases; this result was somewhat matched with results of present study.

Denture base and artificial teeth fracture rates obtained to 10% and 10.9%, respectively in our research. In researches carried out by Bilhan et al., prevalence rate of complete denture base fracture obtained to 26.35 and 27.5% and artificial teeth fracture prevalence rate was equal to 31.4% [11, 16]; these rates are higher than rates obtained in present paper. There was not any significant relationship between vertical dimension of occlusion and artificial teeth fracture; this result is in line with study conducted by Bilhan et al. [16] in Turkey. In addition, there was a significant relationship between vertical dimension

of occlusion and lack of retention; in this case, patients with lower retention experience reduction in vertical dimension of occlusion. This finding was not matches with results obtained from study conducted by Bilhan et al. [16]. The reason for more cases of denture fracture in mentioned studies may be due to ignorance of fracture record in present paper.

According to results of occlusion appraisal, 49% of cases were correct occlusion and 51% false cases; Nevalainen et al. [24] reported 43% correct occlusion and 57% false occlusion that these rates are somewhat in line with our results.

According to evaluation of centric jaw relation in this research, 78 cases (56.5%) were correct and 60 cases (43.5%) were false. Results of study conducted by Bilhan and colleagues [16] showed that this relation was correctly designed for 64% of patients and false for 35.9% of patients indicating better outcomes than our study in this context. There was a significant relation between centric jaw relation and artificial teeth fracture in our findings matched with study by Bilhan et al. [16].

Suitable design of occlusal plane plays a vital role in efficiency or complications caused by denture such as chewing, stability and speaking; in this regard, proper landmarks for occlusal plane or hybrid use of landmarks contribute to better results [28]. Schema of occlusal plane indicated 2.74° angle average between fox plane and the interpupillary line.

Occlusal plane in half-faced view indicated the angle between fox plane and ala-tragus line equal to 8.54°, 4.94°, and 1.74° for superior point, middle point and inferior point, respectively. Therefore, there was higher parallelism between fox plane line and inferior point of ala-tragus. Sanja nayer (2014) reported angle values of 5.75, 4.78, and 3.91 for superior, middle and inferior points, respectively; therefore, fox plane angle between ala-tragus line and middle point obtained in our study is matched with study by Sanja nayer [29].

Higher age of denture can reduce quality of denture deforming it. In our study, increase in age of denture led to reduced occlusion within vertical dimension. It has been proved that poor vertical dimension is one of important complains of patients [24]. Vertical dimension of occlusion affects the face of patients aesthetically and functionally [30]. Moreover, lack of retention was one another substantial problem of patients that was related to lower vertical dimension in our research.

Conclusion

According to the findings of this study, efficiency rate of removable complete denture was at average level among edentulous adults living in Ardabil, Iran. Moreover, there were fewer mucosal lesions in these patients compared to other studies conducted inside and outside of Iran. Suitable design considering retention, occlusal plane, and vertical dimension besides worn denture replacement can solve problems of denture wearers.

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