

Research Article

Evaluation of Periodontal Parameters in Patients Peritoneal Dialysis, Hemodialysis and Renal Transplantation

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Objectives: Chronic renal failure (CRF) is defined as a progressive decline in renal function associated with a reduced glomerular filtration rate. Treatment of this failure consists of hemodialysis (HD), peritoneal dialysis (PD) and renal transplantation (Tx). Periodontal diseases are the most common bacterial infections in humans. In our study, we aimed to compare the periodontal parameters of HD, PD and Tx patients.

Materials and Methods: Total 121 (38 HD, 42 PD ve 41 Tx) patients were included in our study. Plaque index (PI), gingival index (GI), probing pocket depth (PPD), clinical attachment levels (CAL), calculus index values and decayed, missing, filled teeth index (DMFT) of these patients were recorded.

Results: Tx group has statistically significant lower DMFT, PI, GI, calculus index values and PPD than PD group (respectively; $p=0.0001$, $p=0.0001$, $p=0.0001$, $p=0.017$ and $p=0.0001$). Tx group has statistically significant lower DMFT, PI, GI, calculus, values and PPD than HD group ($p=0.0001$ for all). There was no statistically significant difference according the groups in the evaluation of CAL values ($p>0.05$).

Conclusions: The results of this study suggested that Tx patients has a better level of oral hygiene and periodontal parameters than PD and HD patients.

INTRODUCTION

Chronic renal failure (CRF) can be described as functional loss of kidneys and generally decreases the number of nephrons in a short time. When most of nephrons are lost and kidneys can not provide needs of metabolic requirement of human body enough patients develop end-stage renal disease (ESRD). At this stage, to supply the cessation of effective kidney function and to protect patients from uremia, which threat life, patients can be subjected to life-saving medical procedures as dialysis, or renal transplantation (Tx) procedures. Dialysis therapies provide the cleaning of blood by purifying nitrogen waste and other toxic products of metabolism [1]. In peritoneal dialysis (PD), the patients' healthy peritoneal membrane is used. In hemodialysis (HD), a semipermeable membrane is used and blood filtration is carried out by a machine (dialyzer). In Tx, a healthy kidney is

transplanted to the patients. This treatment is choice of majority of the patients, but it can be difficult to find a suitable donor. Also in Tx patients, to avoid acute rejection an immunosuppressive therapy is necessary.

In recent years, to enhance the quality of life and meet the expectations of the affected patients, improvements in treatment modalities of CRF patients were supported [2]. In this context, dental and periodontal health appears to be yet another area where attention has been focused. Periodontal diseases are bacterial infectious disease of tooth supporting tissues. Primary etiologic factor of periodontal infectious is dental plaque. Also some systemic disease and situations can increase the host response to periodontal inflammation; such as diabetes, obesity and renal diseases. Several studies have been published, providing evidence for an increased prevalence of

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periodontal diseases in patients with renal disease, especially in dialysis patients and Tx recipients [3-5]. Patients using immunosuppressants for Tx are at risk of infections, and oral infections of these patients can have a severe course. This can cause the rejection of the transplanted kidney [6]. Patients under dialysis are more susceptible to infections, because of general debilitation and depression of the immunologic response [7]. Furthermore oral and periodontal examinations of these patients are very important for maintenance of systemic and oral health.

The studies of periodontal status of patients with ESRD performed in patients of HD and PD [7-9]. But there is no study which evaluated and compared the periodontal parameters of HD, PD and TX patients all together. In the present study we aimed to compare the periodontal status of three groups; HD, PD and Tx.

MATERIALS AND METHODS

Participants

Total of 121 patients (38 HD, 42 PD ve 41 Tx) were recruited from the Department of Nephrology, Faculty of Medicine, Atatürk University, Turkey. Means of age for HD, PD and Tx were 51.94±16.38, 49.34±18.5, 35.67±13.23 and female/male were 18/20, 22/20, 19/22 respectively. Before enrollment, each patient consented to a treatment protocol. All procedures followed the tenets of the Declaration of Helsinki and the study protocol was approved by the Local Ethics Committee of Atatürk University.

The etiology of renal failure in the PD group was included hypertension (36.2%), chronic interstitial nephritis (22.4%), glomerulonephritis (18.9%), amyloidosis (8.2%), polycystic kidney disease (5.5%), and unknown (8.8%). The HD group consisted of hypertension (26.4%), chronic interstitial nephritis (25.4%), glomerulonephritis (20.7%), amyloidosis (11.2%), polycystic kidney disease (5.7%), and unknown (8.6%). The etiology of renal failure in the PD group was included hypertension (30.6%), chronic interstitial nephritis (23.3%), glomerulonephritis (19.4%), amyloidosis (9.5%), polycystic kidney disease (7.2%), and unknown (9.8%).

Patients who have a periodontal treatment in the last 6 months and a change in the medication prior to the study for at least 3 months were not included to this study.

Clinical examination and indices

Prior to clinical examination, a detailed medical history was recorded for all the participants. Periodontal examinations were performed at 10:00–11:00 a.m. before a midweek HD session in the HD group and in the same time period in the PD and Tx groups. Dental examinations were performed using a mouth mirror and a Williams's periodontal probe, to determine the periodontal index. One examiner, who had been trained for caries and periodontal assessment, performed all the examinations (G.E.D.).

The thickness of microbial dental plaque on the tooth surface near the marginal gingiva was assessed using PI of Silness and Løe [10]. After the teeth were dried, the microbial dental plaque was scraped by a periodontal probe and evaluated by unaided eye. Gingival condition was evaluated using GI of Løe and Silness [11].

The amount of calculus accumulation was evaluated by the calculus index, 0= No calculus present, 1= Supragingival calculus covering less than third of the exposed tooth surface, 2= Supragingival calculus covering more than one third but not more than two thirds of the exposed tooth surface or the presence of subgingival calculus around the cervical portion of the tooth or both, 3= Supragingival calculus covering more than two third of the exposed tooth surface or a presence heavy band of subgingival calculus around the cervical portion of the tooth or both. Periodontal condition was examined using the PPD and CAL. For PPD, measured and calculated the means of the distance between the bottom of the pocket and the margin of the gingiva from six sites of each tooth (mesiovestibule, midvestibule, distovestibule, distolingual, midlingual, and mesiolingual).

For CAL, measured and calculated the means of the distance between the bottom of the pocket and the cemento enamel junction level from six sites of each tooth (mesiovestibule, midvestibule, distovestibule, distolingual, midlingual, and mesiolingual). Assessment of dental health consisted of DMFT index for the incidence of dental status. For the examination of DMFT index, the examiner recorded sum of the teeth as decayed (D), missing (M), and filled (F) according to the WHO criteria for each patient.

Statistical analyses

Statistical analyses were performed using software (SPSS for Windows Software Package, Version 11.5.0; SPSS Inc., Chicago, IL, USA).

The difference between the distribution of the gender of the PD, HD, and Tx patients was analyzed with Pearson chi-squared test. Evaluation of periodontal parameters (PI, GI, PPD, CAL, Calculus) and DMFT between groups was made by one way ANOVA analysis. The level of significance was set at $p < 0.05$.

RESULTS

Means of age for HD, PD and Tx were 51.94±16.38, 49.34±18.5, 35.67±13.23 and female/male were 18/20, 22/20, 19/22 respectively. No statistically significant differences were found between distributions of age or gender among HD, PD, and Tx groups.

Mean levels of PI, GI, PPD, CAL, Calculus index and DMFT values of PD, HD and Tx groups are shown in Table 1. Tx group has, statistically significant lower DMFT ($p=0.0001$), PI ($p=0.0001$), GI ($p=0.0001$), calculus ($p=0.017$) values and PPD ($p=0.0001$), than PD group ($p<0.05$). Tx group has, statistically significant lower DMFT ($p=0.0001$), PI ($p=0.0001$), GI ($p=0.0001$), calculus ($p=0.0001$), values and PPD ($p=0.0001$), than HD group. CAL values was lower in Tx group, but not statistically significant than PD and HD groups ($p>0.05$).

PI, GI, PPD, CAL, Calculus index and DMFT values were lower in PD group according to HD group but there is no statistically significant for all of these parameters between two groups ($p>0.05$).

p values of between three groups; HD, PD and Tx groups, for all parameters PI, GI, PPD, CAL, Calculus index and DMFT values are shown in Table 1.

Table 1: Periodontal parameters in peritoneal dialysis, hemodialysis and transplantation groups.

	PD	HD	Tx	p values		
				Tx vs PD	Tx vs HD	PD vs HD
PI	1.9±0.9	2.0±0.9	0.9±0.4	0.000	0.000	0.675
GI	1.6±0.7	1.8±0.7	1.0±0.4	0.000	0.000	0.240
PPD	3.0±0.4	3.1±0.4	2.3±0.5	0.001	0.000	0.187
CAL	1.0±1.2	1.0±0.9	0.8±0.9	0.421	0.342	0.867
Calculus	1.3±1.1	1.6±0.6	0.9±0.7	0.017	0.000	0.153
DMFT	13.4±8.6	13.4±9.2	6.1±6.0	0.000	0.000	0.996

Abbreviations: CAL: Clinical Attachment Levels; Calculus Index. DMFT: Decayed Missing Filled Teeth Index; GI: Gingival Index; PI: Plaque Index; PPD: Probing Pocket Depth

DISCUSSION

The findings of this study presented that Tx patients have attention to support their oral care. The results further show that, Tx patients have better periodontal parameters than PD and HD patients.

In the present study PI of HD and PD patients were higher than Tx patients. This shows that Tx patients aware of oral hygiene care. PI of PD patients were not different than the HD patients. Bayraktar et al. [7] found, higher plaque accumulation in the HD group than the PD group, but no statistically significant as in our study. Although not as much as HD patients, the higher plaque levels in the PD group indicate the neglected oral self-care in PD patients.

In our study, HD and PD patients had significantly higher GI values than Tx patients. However GI values of HD patients were not different than PD patients. But Bayraktar et al. [7] found; GI values of the HD group was significantly higher than that of the PD group and suggested that higher plaque levels in the HD group as well as the increased bleeding index might be the result of the anticoagulant medication they have to take. Additionally this difference can be because of worse oral hygiene scores of PD group in our study when compared the study of Bayraktar et al. [7]. In our study Tx group had lower GI values than HD and PD patients. As known Tx patients use immunosuppressants to avoid rejection of transplanted kidneys. It maybe thought these drugs have some influences on periodontal inflammation and GI scores. The lower GI values found in Tx patients can be, associated with lower PI scores, which is accepted primary cause of periodontal inflammation.

Calculus accumulations were higher in PD and HD groups than Tx group. Bayraktar et al. [7] found, higher calculus accumulation in the PD and HD groups than that of the healthy control group. Epstein et al. [12] reported higher calculus levels in CRF patients receiving HD therapy than normal patients. It was suggested that the alterations in serum phosphorus-calcium levels in CRF patients and higher salivary urea levels creates an appropriate environment for calculus formation [6,12,13]. Also it can be suggested to PD and HD patients groups to should pay more attention to their oral hygiene and should more often brush their teeth to prevent calculus formation. As mentioned above, better results of Tx patients may be result of this attention.

PPD values of Tx patients were significantly lower than PD and HD patients. There was no difference between the groups, in the term of CAL values. Bayraktar et al. [7] found comparable

PPD findings in the PD and HD groups with the healthy control group. Thorman et al. [14] found, the loss of CAL in HD group were more than non ureamic controls. Another study on CRF patients, reported increased attachment loss when compared with healthy controls [4]. Saqman et al. [15] compared renal and cardiac transplantation patients with healthy controls and found no statistically significant differences in CAL values, but significantly important differences in PPD values. The result of our study is parallel with this study and may be associated with the effect of gingival inflammation on PPD values.

DMFT scores were higher in HD and PD groups than in Tx group. There were no differences between the HD and PD groups, when the DMFT scores were compared. Some studies reported no difference between HD and control groups [16-18]. Naugle et al. [9] found that HD patients have a high prevalence of caries. According to our results, it can be indicated that HD and PD patients need of comprehensive professional oral care and self-care instruction. Uremia, elevated pH, decreasing of salivary flow rate and bad oral hygiene care among these patients can cause of higher DMFT values for PD and HD patients.

The studied population presented low oral hygiene habits that may explain the high PI, GI, PPD, CAL, calculus values and DMFT found in this study. Also it can be said, HD and PD patients are more dependent on machine and health centers than Tx patients. HD patients to receive dialysis therapy bound to a machine for approximately 4 hours, several times in a week. Likewise Galili et al. [19] stated that patients on HD therapy would be depressed due to their more severe systemic condition and thus would show insufficient compliance during dental treatments and neglect oral health care. PD patients are usually capable of continuing dialysis therapy at home. So it can expected that they should be more aware of their oral health than HD patients. But in our study, PD group could not show a difference compared with HD patients. Thus it can be said in studied population, PD groups neglect their oral care as HD patients. Thus they had worse scores of periodontal parameters. Tx patients are not dependent a dialysis machine because they has a kidney which can provide the requirement of the human body. Additionally they are aware of challenges to find a suitable donor for kidney transplantation and infections can cause rejection of this organ. So that, they show more attention to their oral care and as a result have better periodontal parameters. Also as mentioned above, CRF resulting in the uremic syndrome, and uremia has been associated with immune dysfunction including defects in lymphocyte and monocyte function [20]. Thus uremia can be responsible for the increased gingival inflammation observed

in dialysis population; increased dialysis maintenance therapy should be associated with increased gingival inflammation and periodontitis incidence and severity. In several studies increased gingival inflammation and periodontitis has been reported in association with increased dialysis therapy [4,21,22].

The major limitation of this study was that there was no healthy control group. Another limitation is about the influence of some drugs these patients have to take, on their periodontal health status. However, this study aimed to evaluate and compare the clinical findings according to the current periodontal health status of these patients' together with the clinical outcomes of the medications that the dialysis patients have to take.

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