Dental Implants in Patients with Oral Lichen Planus: A Cross-Sectional Study

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ABSTRACT

Purpose: The main aim of this study was to evaluate the patients with oral lichen planus (OLP) and dental implants.

Material and Methods: Three groups of 16 patients took part in the study. Group I patients had received dental implants and been diagnosed with OLP; Group II had not received implants but were diagnosed with OLP; Group III had implants but not OLP. Clinical observations and OLP symptoms were registered in each case. Periodontal pocket depth, implant mobility, bleeding upon probing, erythema, pain, and radiolucency around implants were measured. Patient quality of life was evaluated using OHIP 14.

Results: Peri-implant mucositis and peri-implantitis were detected in 17.86% and 25% of the OLP-implant group, while the control group with implants showed 18% and 16%. The implant survival rate in patients treated for OLP did not appear to differ from the survival rate among the general population. Quality of life was better among patients with implants and without OLP ($p = .001$).

Conclusions: The results of the present study suggest that implants do not influence manifestations of OLP. OLP is not a risk factor for peri-implantitis.

KEY WORDS: dental implants, oral lichen planus, oral mucosa, periodontitis

INTRODUCTION

Oral lichen planus (OLP) is a chronic inflammatory disease of uncertain etiology. It is considered to be a cell-mediated immunological process, probably occurring in a predisposed population.[1–3] However, specific antigens evoking the immune response have not yet been defined. The mean prevalence of OLP in reports from different countries is 1.27%, with a prevalence of 0.96% in men and 1.57% in women.[4,5]

Oral rehabilitation using dental implants is a well-established and widely used procedure all over the world. Tooth loss is accompanied by functional, esthetic and speech problems, occlusal alterations, as well as psychological problems, and restoration with dental implants is an option that offers numerous benefits.[6,7]

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Dental implants are increasingly used to replace missing teeth, and offer a success rate of around 90–95% after 10 years.[7–11] Most of the contraindications for implant placement relate to the quantity and quality of alveolar bone present, systemic diseases, and environmental problems such as smoking. To date, clear guidelines regarding the placement of implants in patients suffering from oral mucosal diseases such as OLP have never been clearly established.[7–11] Although, the literature contains many references to contraindications of implant treatment in patients with systemic diseases, in some instances such contraindications appear to be only theoretical. The current literature only includes a few comprehensive studies or case reports of patients with both OLP and dental implants.[8,12,13]

While in the past, OLP was considered a contraindication for the placement of implants, one case study reports that the implants all osseointegrated successfully and that the manifestations of OLP did not worsen.[14] Furthermore, two of the cases showed significant improvement in terms of clinical symptoms and patient satisfaction.[15] Czerninski et al.[12] claim that implant success rates among patients with OLP are no different

from the rest of the population, while Hernández et al.[13] performed a study including 18 patients with OLP, finding an implant success rate of 100% among these patients.

The main aim of this study was to evaluate the patients with OLP and dental implants.

MATERIALS AND METHODS

Patients

All patients were seen at the Department of Oral Medicine of Murcia University between January 2005 and December 2010. Informed consent was obtained from each patient. The University of Murcia Ethics Committee approved the study protocol and all procedures were carried out following principles outlined in the Helsinki Declaration for experimentation involving human subjects.

OLP diagnosis was based on a thorough clinical examination and the histopathology of the lesions.

Of 350 patients with OLP examined, a total of 16 patients with OLP had received dental implants, loaded at least 1 year prior to participation in the study. These were recruited consecutively to form the study group (Group I). All prosthetic placements among these patients had been performed at the University Dental Clinic.

Group II control subjects were selected randomly from among 300 patients with OLP without dental implants. The random allocation sequence used for selecting the control group was generated using software available online http://graphpad.com/quickcalcs/.

Group III control patients, those with dental implants but without OLP were selected randomly from a total of 300 patients attending the clinic (Recurrent herpes labialis, oral candidiasis; oral fibroma) these had received implants loaded at least 1 year prior to participation in the study.

Inclusion and exclusion criteria were as follows:

Inclusion Criteria (Groups I and II)

Presence of OLP, according to the modified WHO diagnostic criteria for OLP and oral lichenoid lesions, as proposed by van der Meij and van der Waal.[16]

Inclusion Criteria group III patients, those with dental implants but without OLP.

Exclusion Criteria (All Groups)

A previous history of radiotherapy, immunosuppression, severe or uncontrolled metabolic disorders.

Data collected for each patient consisted of demographic and medical characteristics including age, gender, medication, medical history, smoking and alcohol consumption, and frequency of teeth brushing. All patients underwent a thorough clinical, periodontal, and radiographic examination.

Patients with OLP were examined to determine the type of lichen planus present (reticulo-papular or atrophic-erosive, according to Bagan-Sebastian et al.'s classification[17] and the number of oral sites involved). Any desquamative gingivitis (DG) accompanying the OL lesions was diagnosed according to criteria established by the American Academy of Periodontology position paper (2003),[18] determining the presence of epithelial desquamation, erythema, ulceration, and/or the presence of vesiculobullous gingival lesions. Patients' comments, a visual analog scale (VAS) score for pain or discomfort, and any treatment received for OLP were also registered.

Clinical and Radiological Assessment

Dental evaluation using a periodontal probe (PCP-UNC 15, Hu-Friedy, Chicago, IL, USA) evaluated probing pocket depths, the presence of bleeding on probing and peri-implant erythema at four sites (mesial, labial, distal, and lingual). The Modified Gingival Index devised by Lobene et al. was registered for each patient.[19]

Implant failure was defined by modified criteria according to Alsaadi et al.,[9] which includes the presence of peri-implant radiolucency on intraoral radiographs, mobility during tactile assessment, or whether the patient showed objective signs of pain percussion-induced pain or infection and bone loss.

All clinical parameters were assessed by a single trained specialist in periodontitis, and a calibration exercise was performed to ensure acceptable inter-examiner reproducibility. This parameter was recorded as a binary variable as follows: 0 = presence of a completely healed mucosa around the implants with no signs of inflammation; 1 = presence of some sign of inflammation, such as redness, altered shape, dehiscence, or lack of uniformity on the surface of the mucosa around the implant.

Radiographic Analysis

Digitally obtained images were analyzed using the Digoras system (Soredex, Tuusula, Finland). Radiolucency around the implants was assessed by a standardized parallel technique using the ring device (Dentsply International Inc., Elgin, IL, USA).

Oral Health Impact Profile[20]

This questionnaire, in its short version, was applied to detect changes in oral quality of life. It consists of 14 items that explore different aspects of oral function and quality of life. Patients are questioned about problems relating to speaking, taste perception, eating discomfort, and problems with dentures. The score ranges from 0 to 70, where higher scores correspond to poorer oral quality of life.

Statistical Analysis

Data were analyzed using the SPSS 12.0 statistics program (SPSS® Inc., Chicago, IL, USA). A descriptive study was made for each variable. The Kolmogorov–Smirnov normality test and Levene variance homogeneity test were applied, and the data showed a skewed distribution, and so was analyzed using a nonparametric ranking test. The associations between the different qualitative variables were studied using Pearson's chi-square test. For quantitative variables, the Kruskal-Wallis test (for more than two samples) and the Mann-Whitney *U* test (for two independent samples) were applied. A bivariate analysis was also performed considering the binary "presence of peri-implantitis" as the outcome variable. Odds, ratios, and confidence intervals were calculated with exact conditional logistic regression. Probability of less than 5% ($p < .05$) was accepted as significant.

RESULTS

The three study groups each consisted of 16 patients as follows: Group I – OLP and dental implants; Group II – OLP without implants; Group III – patients with implants but without OLP. The three groups were homogenous with regard to age, sex, and frequency of tooth brushing (Table 1). In the present study, proximity of the OLP lesions to the implants was seen in only two patients

Table 2 shows the clinical characteristics of the lichen planus observed; the reticular type was found to be the most frequent, but without statistical significance between the two groups with OLP. Nor were significant differences found with regard to the number of sites and the presence of DG. When OLP treatment was analyzed,

TABLE 1 Homogeneity of the Study Groups in Terms of the Demographic Characteristics, Toxic Habits, and Dental Hygiene (Kruskal-Wallis and Pearson's χ^2 Tests)

Characteristics	OLP + Implants Group (*n* = 16)	OLP without Implants Group (*n* = 16)	Control + Implants Group (*n* = 16)	*p* Value
Age: median (range)	64.50 (44–76)	63 (53–71)	42 (29–79)	.174
Sex: *n* (%)				.543
Male	6 (37.50)	5 (31.25)	8 (50)	
Female	10 (62.50)	11 (68.75)	8 (50)	
Smoking behavior: *n* (%)				.663
Yes	3 (18.75)	2 (12.50)	4 (25)	
No	13 (81.25)	14 (87.50)	12 (75)	
Alcohol consumption: *n* (%)				.904
Yes	5 (31.25)	4 (25)	5 (31.25)	
No	11 (68.75)	12 (75)	11 (68.75)	
Tooth-brushing frequency: *n* (%)				.192
1 time each day	1 (6.25)	0 (0)	2 (12.50)	
2 times each day	7 (43.75)	3 (18.75)	7 (43.75)	
3 times each day	8 (50)	13 (81.25)	7 (43.75)	

OLP, oral lichen planus.

TABLE 2 Patients' Characteristics for Both Groups with Oral Lichen Planus (Pearson's χ^2 Test)

Characteristics	OLP + Implants Group (n = 16)	OLP without Implants Group (n = 16)	p Value
Clinical forms: n (%)			.465
Reticular-papular	11 (68.75)	9 (56.25)	
Atrophic-erosive	5 (31.25)	7 (43.75)	
Number of locations: n (%)			.710
2–4	11 (68.75)	10 (62.50)	
≥5	5 (31.25)	6 (37.50)	
Presence of DG: n (%)			.710
Yes	5 (31.25)	6 (37.50)	
No	11 (68.75)	10 (62.50)	
OLP in treatment: n (%)			.723
Yes	7 (43.75)	8 (50)	
No	9 (56.25)	8 (50)	

OLP, oral lichen planus; DG, desquamative gingivitis.

it was seen that treatment consisted of topical corticosteroids (0.01% triamcinolone acetonide) three times a day, received by 43.7% of Group I patients with OLP and implants and 50% of Group II patients with OLP but without implants (see Table 2). No patient received systemic corticosteroid treatment for OLP.

No statistically significant differences were found for implant characteristics (number of implants, follow-up, prosthetic type or occlusion) between Groups I and III (Table 3). Nor were statistically significant differences found in implant distribution, the prevalence of peri-implantitis, bone loss, percussion-induced pain, mobility or bleeding between the two groups (Table 4).

Regarding implant mobility among patients with OLP, two were registered in Group I and four in the Control Group III but without significant difference; these represented success rates of 96.42% and 92%, respectively. The incidence of peri-implantitis mucositis

TABLE 3 Patients' Characteristics for Both Groups with Implants (Mann-Whitney U and Pearson's χ^2 Tests)

Characteristics	OLP + Implants Group (n = 16)	Control + Implants Group (n = 16)	p Value
Number of placed implants: median (range)	3.50 (1–9)	3.00 (1–9)	.527
Follow-up (months): median (range)	42 (12–120)	48 (24–48)	.975
Oral irrigator use: n (%)			1.000
Yes	1 (6.25)	1 (6.25)	
No	15 (93.75)	15 (93.75)	
Prosthesis type: n (%)			1.000
Overdentures	3 (18.75)	3 (18.75)	
Partial fixed	13 (81.25)	13 (81.25)	
Occlusion (antagonist tooth): n (%)			.569
Natural teeth	7 (43.75)	10 (62.50)	
Metal-ceramic fixed prostheses	6 (37.50)	4 (25)	
Resin prostheses	3 (18.75)	2 (12.50)	

OLP, oral lichen planus.

TABLE 4 Implant Distribution and Prevalence of Peri-Implantitis, Bone Loss, Precussion-Induced Pain, Mobility, and Bleeding in Both Groups with Implants (Pearson's χ^2 Test)

Characteristics	OLP + Implants Group ($n = 56$)	Control + Implants Group ($n = 50$)	p Value
Maxilla/mandible: *n* (%)			.200
Maxilla	20 (35.75)	24 (48)	
Mandible	36 (64.28)	26 (52)	
Anterior/posterior: *n* (%)			.109
Anterior	12 (21.43)	5 (10)	
Posterior	44 (78.57)	45 (90)	
Length: *n* (%)			.163
10 mm	5 (8.92)	4 (8)	
11.5 mm	27 (48.21)	30 (60)	
13 mm	19 (33.95)	8 (16)	
14.5 mm	5 (8.92)	8 (16)	
Diameter: *n* (%)			.129
3.5 mm^2	26 (46.43)	16 (32)	
4.5 mm^2	30 (53.57)	34 (68)	
Peri-implant mucositis: *n* (%)			.985
Yes	10 (17.86)	9 (18)	
No	46 (82.14)	41 (82)	
Peri-implantitis: *n* (%)			.254
Yes	14 (25)	8 (16)	
No	42 (75)	42 (84)	
Bone loss: *n* (%)			.799
Yes	10 (17.86)	8 (16)	
No	46 (82.14)	42 (84)	
Percussion-induced pain: *n* (%)			.131
Yes	0 (0)	2 (4)	
No	56 (100)	48 (96)	
Mobility: *n* (%)			.325
Yes	2 (3.58)	4 (8)	
No	54 (96.42)	46 (92)	
Bleeding: *n* (%)			.943
Yes	12 (21.43)	11 (22)	
No	44 (78.57)	39 (78)	

OLP, oral lichen planus.

was 17.8% in Group I and 18% in control Group III. Peri-implantitis was present in 25% among Group I patients with OLP and 16% in Group III without OLP.

When the characteristics of patients with natural teeth were analyzed in relation to patients with implants, it was found that patients with OLP without implants had greater numbers of natural teeth and a lesser probe depth than other groups (Table 5) (Figure 1).

VAS for the evolution of pain among patients with OLP produced similar scores for both groups, an average of 2.7 in OLP-implant Group I patients and 2.1 in patients with OLP without implants (Group II)

Oral quality of life among patients with OLP was found to be worse for the group without implants with significant difference (Table 6).

When regression analysis was performed, it was seen that for peri-implantitis there was a tendency toward statistical significance with regard to the site of the dental implants, peri-implantitis being more

TABLE 5 Periodontal Characteristics (in Natural Teeth and Dental Implants) of the Study Groups (Kruskal-Wallis and Mann-Whitney U Tests)

Periodontal Characteristics	OLP + Implants Group (n = 16)	OLP without Implants Group (n = 16)	Control + Implants Group (n = 16)	p Value
Number of teeth: median (range)	18 (0–26)	23.50 (17–29)	19 (6–27)	.008
Bleeding index: median (range)				
Natural teeth	47.05 (0–83.33)	8.20 (0–33.33)	40.61 (0–65.78)	.001
Gingival index: median (range)				
Natural teeth	1.02 (0.29–1.71)	0.78 (0.28–1.80)	0.78 (0–1.19)	.265
CAL (mm): median (range)				
Natural teeth	2.69 (0–4.50)	2.29 (1.33–3.50)	1.87 (0–4.67)	.335
PD (mm): median (range)				
Natural teeth	3.32 (1.14–4.79)	2.09 (1.59–2.93)	3.00 (2.63–4.17)	<.001
Dental implants	3.00 (1.12–4.90)		3.00 (2–5)	.654
Number of pockets ≥ 4 mm: median (range)				
Natural teeth	5.00 (0–24)	0.50 (0–10)	4.00 (0–10)	.053
Dental implants	0 (0–9)		0 (0–5)	.752
Number of pockets ≥ 6 mm: median (range)				
Natural teeth	0 (0–17)	0 (0–6)	0 (0–8)	.354
Dental implants	0 (0–3)		0 (0–2)	.644

OLP, oral lichen planus; CAL, clinical attachment level; PD, probing depth.

Figure 1 A patient with oral lichen planus and implants supporting an overdenture.

frequent in the mandible, and there was a significant difference between anterior and posterior regions (Table 7).

DISCUSSION

It is a well-known fact that osseointegration failure is multifactorial, dependent on anatomic conditions, systemic health, genetic disposition, immune function, and behavioral factors.[18] Research into implant design and surface microtopography has led to increases in the success rate of dental implants in recent years. Although much is known about the factors that influence these success rates,[7,11] the impact of systemic conditions and medications on implant outcomes is much less well understood.

TABLE 6 Comparison of Quality of Life (OHIP-14) in the Study Groups (Kruskal-Wallis Test)

Quality of Life	OLP + Implants Group (n = 16)	OLP without Implants Group (n = 16)	Control + Implants Group (n = 16)	p Value
OHIP-14: median (range)	7.00 (0–22)	13 (1–23)	0.50 (0–14)	<.001

OLP, oral lichen planus.

TABLE 7 Analysis of Potential Risk Indicators for the Outcome Event "Peri-implantitis"

Variables	Odds Ratio	95% Confidence Interval	*p* Value
Age	0.41	0.15–1.07	.070
Sex	1.00	0.39–2.55	1.000
Smoking	2.25	0.81–6.23	.118
Alcohol	1.10	0.40–3.09	.852
Maxilla/mandible	0.33	0.11–1.01	.051
Anterior/posterior	3.45	1.13–10.52	.029
OLP	1.32	0.81–2.14	.257

OLP, oral lichen planus.

It has been suggested that for patients with OLP the capacity of the epithelium to adhere to the titanium surface of the implant might be affected.[8,12]

Esposito et al.[15] published a study of two patients who had the erosive type of OLP and dental implants used to stabilize mandibular overdentures. Occasional erosive exacerbations of OLP were successfully treated with topical steroids. There was no evidence of potential implant failure as a result of these eruptions.

Reichart[14] described three clinical cases of implant-supported fixed prostheses placed in patients with OLP with complete success. Hernández et al.[13] made a study of 18 patients with OLP treated with implants, obtaining a 100% success rate, although peri-implantitis mucositis was detected in 66.6% of the patients and peri-implantitis in 27.7%.

Czerninski et al.[12] examined the correlation between OLP and rehabilitation with dental implants over 12–24 months with results that showed no contraindication for implant placement in patients with OLP.

The success of dental implants depends on establishing of a soft-tissue barrier that is able to shelter the underlying osseous structures and the osseointegration surrounding the implant body. When OLP lesions compromise the close contact between the oral epithelium and implant, this raises the question of whether titanium might trigger OLP. Biocompatibility is the ability of the scaffold to perform in a specific application without eliciting a harmful immune or inflammatory reaction.[6,7] In this way, implant material biocompatibility supports the assumption that there is a minimal chance of a lichenoid reaction to the implant materials. In the present study, proximity of the OLP lesions to the implants was seen in only two patients, an observation that coincides with Czerninski et al.[12] The most common OLP sites in both groups were the buccal mucosa and gingiva. These findings strongly suggest that dental implants have no influence on OLP distribution.

There is substantial evidence supporting the view that poor oral hygiene is a risk indicator for peri-implant diseases, including peri-implant mucositis and peri-implantitis.[21] Basically, the accumulation of bacterial plaque biofilms at submucosal aspects of the titanium surface can escape oral hygiene procedures and favor inflammatory reactions in the adjacent soft and hard tissues. The bleeding index was higher among patients with OPL and so was probe depth. Furthermore, none of the patients in any of the study groups were in any periodontal treatment program. Statistically significant differences were not found in perimucositis sites, peri-implantitis-related bone loss, mobility or bleeding between the two groups with implants (Groups I and II). When regression analysis was applied, an increase to the risk of peri-implantitis among patients with OLP was not found, with an odds ratio of 1.32 and a 95% confidence interval (0.81–2.14) ($p = .257$).

The study also considered various peri-implantitis parameters such as smoking. Although no association was detected, data should be regarded with caution due to the small sample size.

To improve epithelial sealing and thus minimize the risk of peri-implantitis, it is necessary to understand the histopathology and the mucosal-healing process surrounding adjacent teeth and the implant. In the present study peri-implantitis was associated with the posterior regions.

The reticular lesion is the most common form of OLP. It is often asymptomatic but the atrophic and ulcerative (erosive) forms of OLP can cause symptoms ranging from a burning sensation to severe pain.[22] In this study, discomfort was assessed by means of a VAS; levels of discomfort were found to be low perhaps because most of the patients had the reticular form of OLP.

In agreement with Czerninski et al.,[12] the presence of implants was not seen to influence the severity of OLP. Patient quality of life was measured using the OHIP-14, which revealed differences between the three groups, the worst quality of life being experienced by patients with OLP but without implants; this is

unsurprising as the presence of implants may improve mastication efficacy, function, and esthetics.[2]

Oral rehabilitation with implants is favorable for patients with OLP. The only risk one has to admit is that people developing OLP after the placement of dental implants tend to associate OLP with the metal of the implant

Patients in treatment for OLP received topical applications of corticosteroids (0.01% triamcinolone acetonide) three times a day. According to the guidelines put forward by González-Moles and Scully[23] OLP does not generally respond to topical treatment with systemic corticosteroids; prolonged corticosteroid therapy is one factor among others that can increase the risk of osteoporosis and should be noted in clinical histories; this may also influence implant success rates.

It should not be forgotten that OLP is a precancerous condition; although the malignant transformation rate generally varies from 0.4 to 5%, the possibility of malignization must be taken into account and so lesions deriving from OLP and the condition of dental implants must be monitored.[24–26] Abu El-Naaj et al. describes three such cases of squamous cell carcinoma located close to implants in patients with OLP.[27] Long-term follow-up of these patients was therefore a necessity to monitor the clinical behavior of dental implants in patients with OLP.

In the present study, implant types and the experiences of the clinicians placing the implants were not recorded.

Czerninski et al.[12] to examine the correlation between OLP and dental implants among a group of patients over a 12–24-month follow-up, however our study has limitations because there is no follow-up period.

Little research has been carried out to date into the patients with OLP and dental implants, and in those studies that do exist the follow-up periods have been limited. For this reason, well-designed prospective randomized clinical studies are required to clarify the issues involved.

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