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Chapter 5

Dental implants: a good treatment option in patients with Sjögren's syndrome

Abstract

Background
Limited evidence is yet available for applying dental implants in SS patients.

Purpose
To retrospectively assess clinical outcome of dental implant therapy in a cohort of well-classified patients with Sjögren's syndrome (SS).

Materials and Methods
All SS patients attending the University Medical Center Groningen for follow-up (n=406) were asked whether they had dental implants. In SS patients with implants peri-implant health and implant survival was recorded and compared with data from matched healthy controls. Patients' symptoms, health-related quality of life, oral functioning and satisfaction were assessed using validated questionnaires.

Results
Of the responding SS patients (n= 335), 21% was provided with dental implants. In 50 SS patients peri-implant health was good with minor marginal bone loss and was comparable to those of healthy controls. Implant survival was 97% (median follow-up 46 months (IQR 26-73) and patients' satisfaction was high in most SS patients. Peri-implantitis was observed in 14% of the SS patients. Oral functioning correlated negatively with dryness, patients' satisfaction and chewing ability in SS patients.

Conclusions
Implant therapy is common in our cohort of SS patients. Considering the good peri-implant health, limited prevalence of peri-implantitis, high implant survival and patients' satisfaction, dental implants are a good treatment option.

Introduction

Sjögren's syndrome (SS) is a chronic autoimmune disorder of the exocrine glands with associated lymphocytic infiltrates in the affected glands. Involvement of the salivary glands results in progressive dryness of the mouth, difficulties with chewing, swallowing and speech, reduced oral clearance and a shift in oral flora[1]. As a result of the reduced saliva production, patients with SS are likely to have progressive caries and erosion of the teeth, and are prone to develop oral infections[2]. SS has a large impact on health-related quality of life (HR-QoL)[3] and the oral condition contributes to this[4,5]. E.g., early loss of teeth results in a need of treatment with (partial) dentures, but patients with SS often experience functional problems and pain when wearing (partial) dentures because of the dry, sensitive oral mucosa.

Dental implants to retain prostheses are known to improve oral function in edentulous healthy subjects[6-10]. Dental implants can also be used in dentate patients as support for crowns or bridges to replace missing teeth. Implant survival rates are up to 98% with 10 years follow-up[8-12].

Currently, systemic conditions and their therapy, e.g., rheumatoid arthritis (RA), systemic lupus erythematosus (SLE), osteoporosis and corticosteroid therapy, are no longer considered as risk factors for successful osseointegration of the implants[13,14]. Despite the severe oral complaints, limited evidence is yet available for applying dental implants in SS patients. The available support for using dental implants in SS patients is mainly from case-reports and small case-series[15-19]. While most reports show favorable results, one small study showed that marginal peri-implant bone loss and bleeding was higher in secondary SS (sSS) patients compared with patients with RA without sSS[19]. Therefore, the aim of this retrospective study was to assess clinical outcome of dental implant therapy in our cohort of well-classified SS patients. Results were compared to data from matched healthy controls obtained from other dental implant studies at our department.

Patients and methods

Patients

All patients with SS (n=406) attending the Department of Rheumatology and Clinical Immunology and the Department of Oral and Maxillofacial Surgery of the University Medical Center Groningen (UMCG) for standardized routine follow-up in a multidisciplinary setting were sent a questionnaire by regular mail regarding their dental status and whether or not they had dental implants inserted. All patients were over 18 years of age and were classified according to the revised American European Consensus Group criteria for primary SS (pSS) or sSS[20]. All patients who reported to have been treated with dental implants were invited by a prosthodontist (AK) for assessing peri-implant health at their next scheduled follow-up visit between February 2012 and September 2013. Implant survival was recorded from patient recordings and by patient interview.
Data from previous studies[8,9,11,21-27] was used to randomly select healthy controls that matched our SS patients with regard to sex, age, position and follow-up of the implants and number of implants and implant system used.
The study was extinct of ethical approval according to the local institutional review board (Medisch Ethische Toetsingscommissie of the UMCG, the Netherlands, letter M11.110548).

Peri-implant indices

During the next follow-up visit, clinical screening was performed to assess peri-implant mucosal health. Peri-implant indices included plaque index and bleeding index[28], gingival index[29], calculus score and probing depth. Probing depth was measured at four sites of each implant (mesially, labially, distally and lingually) using a periodontal probe (Merit B, Hu Friedy, Chicago, IL, USA) with a standardized pressure. The distance between the marginal border of the mucosa and the tip of the periodontal probe was scored as the probing depth. The highest peri-implant scores per patient (plaque-index, gingiva-index and calculus) and the highest probing depth per implant were used for analysis.

Radiographic assessments

Marginal bone resorption around the implants was assessed radiographically using panoramic radiographs made during the current visit and, when available, from previous recordings. On these radiographs, the mesial and distal marginal bone levels were determined in relation to the implant shoulder. Marginal bone loss was calculated as the difference in peri-implant bone level between the first (i.e., the radiograph at the time the suprastructure was placed) and the last radiograph (i.e., the radiograph made during the recall visit). The highest scores per implant were used for analysis. In patients in whom no radiographs were available from the period the suprastructure was made, the marginal bone level was compared to the expected bone level at implant insertion.

Peri-implant mucositis and peri-implantitis

Peri-implant mucositis and peri-implantitis were defined according to the criteria proposed by Linde & Meyle[30]. Acceptable bone loss was set at 1.0 mm the first year and not exceeding further annual loss of 0.2 mm[31,32] combined with a threshold of detectable bone loss of 1.0 mm according to Sanz et al.[33] In patients without previous radiographic records, a threshold vertical distance of 2 mm from the expected marginal bone level following remodelling post-implant placement was applied[33] .

Questionnaires

All patients completed a set of validated questionnaires regarding their Sjögren-related symptoms, HR-QoL, oral functioning and patients' satisfaction with the prosthetic device.
The European League Against Rheumatism Sjögren's Syndrome Patient Reported Index (ESSPRI), a patient administered questionnaire, was used to assess patients' symptoms[34].
ESSPRI total score is the mean of three sub scores: dryness, fatigue and pain, 0 being no symptoms, 10 being the worst possible symptoms. Oral dryness specifically was assessed using the sub score for oral dryness that was part of the early version of ESSPRI.
HR-QoL was assessed using the Short Form-36 (SF-36)[35]. The SF-36 is a questionnaire consisting of 36 items, with eight scales assessing two dimensions, viz. physical and mental health functioning. Scales and summary scores vary from 0 to 100, with 0 being the worst possible health status and 100 representing the best possible health status.
Social impact of oral disorders on well being was assessed using the short version of the Oral Health Impact Profile (OHIP14) [36]. OHIP 14 consists of 14 items, with a 5-point scale from 'very often' (score of 4) to 'never' (score of 0). Total score ranged from 0-56.
Subjective chewing ability was assessed using a nine-item questionnaire on which patients could rate their ability to chew different kinds of food on a three-point scale[7] from 0 (good) to 2 (bad). Total score ranged from 0-18.
Overall satisfaction with the implant-retained prosthetic device (e.g., crown or prosthesis) was expressed on a 10-point rating scale (0– 10); "0" being completely dissatisfied and "10" being completely satisfied.

Statistical analysis

Data were analyzed using IBM SPSS Statistics 22 (SPSS, Chicago, IL, USA). Results were expressed as mean ± SD or median (interquartile range; IQR) for normally distributed and non-normally distributed data, respectively. Independent samples t test, Mann-Whitney U test, and Chi-Square or Fisher's exact test were used to compare differences in patient characteristics between subgroups. Wilcoxon signed rank test and McNemar test were used to compare differences in clinical outcome of dental implant therapy between SS patients and matched healthy controls. Correlations between questionnaires were analyzed using the Spearman's correlation coefficient. P values <0.05 were considered statistically significant.

Results

Patients

In total, 335 of the 406 SS patients responded to the mail survey regarding dental implants (response rate 83%). In 21% of these respondents (n= 69) dental implants were inserted. These 69 SS patients were invited to the hospital for clinical assessments and completion of questionnaires. In 19 patients implant indices could not be assessed as they were currently visiting other hospitals because of travelling distance (n=6), they were too ill (n=5) or refused to participate (n=8). From 50 patients clinical data could be collected.
The 50 included patients were a representative sample of the 69 SS patients with implants inserted considering no significant differences were found in sex, age and disease duration between these 50 patients and the 19 patients without clinical data. Patients' characteristics of the 50 SS patients with dental implants and the 50 matched healthy controls are presented in Table 1.

Peri-implant indices

In total 140 implants were available for clinical assessments in the 50 SS patients (Table 1). Peri-implant indices are shown in Table 2. Bleeding index, gingival index and probing depth were slightly, though significantly higher in SS patients compared with healthy controls. Furthermore, plaque-index and gingiva-index were slightly higher and probing depth was slightly lower in edentulous SS patients compared with dentate SS patients, although again statistically significant. Peri-implant indices did not differ between patients with pSS or sSS and were independent of the use of NSAIDs, corticosteroids, hydroxychloroquine or other immunosuppressives.

Table 1. Characteristics of Sjögren's patients with dental implants and matched healthy controls included in this study

	Sjögren's patients	Healthy controls
Number of patients	50	50
Age (mean±SD, years)	67± 8	66 ± 9
Gender (n, %):		
female	46 (92%)	46 (92%)
male	4 (8%)	4 (8%)
SS (n, %):		
primary SS (n, %)	41 (82%)	NA
secondary SS (n. %)	9 (18%)	NA
Disease duration (years, range)	9 (4-14)	NA
ESSPRI	6.3 (4.7-7.3)	NA
Serological characteristics:		
ESR (mm/hour)	22.0 (14.0-40.5)	NA
IgG (g/l)	14.4 (11.9-16.3)	NA
rheumatoid factor (kIU/L)	26.0 (14.5-116.0)	NA
C3 (g/l)	1.1 (1.0-1.2)	NA
C4 (g/l)	0.2 (0.1-0.3)	NA
anti-Ro/SSA positive (n, %)	41 (82%)	NA
anti-La/SSB positive (n, %)	27 (54%)	NA
Medication:		
NSAIDs (n, %)	13 (26%)	0 (0%)
corticosteroids (n, %)	8 (16%)	0 (0%)
hydroxychloroquine (n, %)	14 (28%)	0 (0%)
other immunosuppressives (n, %)	5 (10%)	0 (0%)
Smoking (n,%)	1 (2%)	0 (0%)
Dental implants:		
maxillary implants (n, %)	20 (14%)	24 (19%)
mandibular implants (n, %)	120 (86%)	101 (81%)
follow-up of implants (years)	3.8 (2.2-6.1)	5.0 (1.0-.0.5)
Implant-retained prosthodontics:		
single crown (n)	27	14
overdenture (n)	36	37
fixed partial denture (n)	2	7
fixed full-arch denture (n)	1	0

Variables are presented as medians (IQR) unless stated otherwise; NSAIDs= non-steroidal anti-inflammatory drugs; ESSPRI= EULAR Sjögren's Syndrome Reported Index; NA: not applicable/not assessed

Table 2. Implant loss, peri-implant indices (highest scores per patient) and peri-implant bone loss (highest scores per implants) in patients with Sjögren's syndrome (SS) for the total group, for edentulous patients and for dentate patients compared with matched healthy controls

	Total group Sjögren's patients	Healthy controls	Edentulous Sjögren's patients	Edentulous controls	Dentate Sjögren's patients	Dentate controls
Patients	n=50	n=50	n=35	n=35	n=15	n=15
Implants	n=140	n=125	n=109	n=96	n=31	n=29
Lost implants	4 (3%)	0 (0%)	4 (4%)	0	0	0
(in patients, %)	2 (4%)	0 (0%)	2 (6%)	0	0	0
Peri-implant indices						
Plaque index (0-3)	1.0 (0.0-1.0)	1.0 (0.0-1.0)	1.0 (0.0-2.0)	1.0 (0,0-1.0)	0.0 (0.0-1.0)[a]	0.0 (0.0-1.0)
Calculus (0-1)	0.0 (0.0-0.0)	0.0 (0.0-1.0)*	0.0 (0.0-0.0)	0.0 (0.0-1.0)*	0.0 (0.0-1.0)	0.0 (0.0-0.0)[c]
Bleeding index (0-3)	1.5 (1.0-2.0)	1.0 (0.0-1.0)***	1.0 (0.0-2.0)	1.0 (0.0-1.0)***	2.0 (1.0-2.0)	1.0 (0.0-1.0)**
Gingival index (0-3)	0.5 (0.0-1.0)	0.0 (0.0-1.0)**	1.0 (0.0-1.0)	0.0 (0.0-1.0)**	0.0 (0.0-1.0)[a]	0.0 (0.0-0.0)
Probing depth (mm)	3.5 (3.0-4.0)	3.0 (2.5-3.1)**	3.3 (3.0-3.5)	3.0 (2.5-3.0)**	4.0 (3.2-5.0)[b]	3.0 (2.5-4.0)
Marginal bone loss	0.89 (0.25-1.56)	0.66 (0.25-1.03)	0.90 (0.50-1.55)	0.85 (0.36-1.27)	0.69 (0.0-2.44)	0.28 (0.0-0.90)
Peri-mucositis						
(patients, %)	47 (94%)	31 (62%)[#]	32 (91%)	22 (63%)[##]	15 (100%)	9 (60%)
(implants, %)	102 (73%)	NA	75 (69%)	NA	27 (87%)	16 (55%)
Peri-implantitis						
(patients, %)	7 (14%)	6 (12%)	4 (11%)	5 (14%)	3 (20%)	1 (7%)
(implants, %)	16 (11%)	11 (9%)	10 (9%)	10 (11%)	6 (19%)	1 (3%)
Prosthesis satisfaction						
General	NA	NA	2.0 (2.0-2.5)	1.1 (1.0-1.3)***	NA	NA
Upper denture	NA	NA	2.0 (2.0-2.5)	1.1 (1.0-1.3)***	NA	NA
Lower denture	NA	NA	2.0 (1.0-2.0)	1.2 (1.1-1.5)**	NA	NA
Satisfaction (0-10)	8.0 (7.0-9.0)	NA	8.0 (7.0-9.0)	NA	8.0 (6.5-9.0)	9.5 (8.0-10.0)*

NA= data not available, *p<0.05, **p<0.01, ***p<0.001 (Wilcoxon signed ranks tests) compared with Sjögren's patients, [a] p<0.05, [b] p<0.01 compared with edentulous Sjögren's patients (Mann-Whitney tests), [c] p<0.01 compared with edentulous controls (Mann-Whitney test), [#] p<0.001, [##] p<0.05 compared with Sjögren's patients (McNemar test)

Radiographic assessments

Rotational radiographs (orthopantomograms) at baseline (i.e., around the period the suprastructure was made) were available for 26 patients (71 implants), either because the implants were inserted in our hospital or radiographs could be obtained from the dentist who inserted the implants or made the prosthetic device. Median bone loss around the implants in SS patients was 0.89 (0.25-1.56) with a median time between the baseline and radiograph made at the recall visit of 42 months (IQR 22-69) (Table 2). There was no significant difference in bone loss between SS patients and healthy controls.

Peri-implant mucositis and peri-implantitis

Peri-implant mucositis, defined as bleeding on probing at one or more sites around one or more implants, was seen in 94% of the SS patients and in 62% of the healthy controls. Peri-implantitis around one or more implants was seen in 14% of the SS patients (11% of the implants) and 12% of the healthy controls (Table 2).
There was no significant difference in the prevalence of peri-implant mucositis and peri-implantitis between patients with pSS an sSS. Prevalence of peri-implantitis and peri-implant mucositis were also independent of disease duration and the use of NSAIDs, corticosteroids, hydroxychloroquine and other immunosuppressives when in SS patients.

Implant survival

Based on patients' interview and patients' records, four out of 142 inserted implants had been lost in two patients during the first three months after insertion, resulting in an overall survival rate of 97% (median follow up after implant insertion 46 months (IQR 26-73); Table 2). All four implants had been inserted in the edentulous mandible. Two of these four failing implants had been replaced in these patients. These two replaced implants were in function for 66 and 36 months at last follow-up, respectively.
In total 125 implants were inserted in the 50 matched healthy controls. No implants were lost during a comparable follow-up period (Table 2).

Oral functioning and patients' symptoms

No significant differences were found in HR-QoL, oral functioning, satisfaction and chewing between patients with a fixed superstructure on the implants and patients with a prosthesis. Patients' satisfaction with the prosthetic device was high (Table 2).
OHIP14 scores correlated positively with ESSPRI dryness ($\rho = 0.393$), ESSPRI oral dryness ($\rho = 0.407$) and chewing scores ($\rho = 0.521$), and negatively with VAS satisfaction ($\rho = -0.452$). Worse oral functioning was thus associated with more dryness complaints, lower patient satisfaction and worse subjective chewing ability. In addition, ESSPRI oral dryness correlated positively with chewing score ($\rho = 0.403$) indicating that the dryer the mouth, the worse the subjective chewing ability.

Discussion

To the best of our knowledge, this is the first study on the prevalence of the use of dental implants, peri-implant health, prevalence of peri-implant mucositis and peri-implantitis, implant survival as well as HR-QoL and oral functioning in a large cohort of well-classified patients with SS. Major findings are the high percentage of patients with implants installed, the rather good peri-implant health not withstanding the high prevalence of peri-implant mucositis, the limited prevalence of peri-implantitis, the high implant survival (97%) and the high satisfaction of patients with their implant-retained prosthetic rehabilitation.
In 21% of the respondents implants had been inserted. In the Netherlands in 2009, 8.0% of the population between 60-70 and 7.0% of the population of 70 years and older had implants inserted (Statistics Netherlands, www.cbs.nl). Apparently, there is a large demand for inserting implants in patients with SS, but not much is known whether this treatment is successful or not. This large demand can be explained by the early loss of teeth in patients with SS and the inability to wear (partial) dentures because of the dry, sensitive oral mucosa. Moreover, to our experience, SS patients have a rather high dental awareness and are thus more demanding regarding optimal dental care including insertion of dental implants to solve dental problems.
SS patients had more signs of soft tissue infection compared with the healthy controls. Care must be undertaken when interpreting these results. The healthy controls were obtained from previous prospective randomized trials, with long follow-up. In SS patients the implants had been inserted in routine dental care settings by several dentists and oral surgeons reflecting common dental care in the Netherlands. As a result, not all SS patients had been subjected to strict, standardized follow-up and oral hygiene measures as usually is the case in well controlled clinical studies. Furthermore, salivary secretion is reduced in SS patients as well as the related self- clearance of the oral cavity. As a result, debris will collect more quickly and remain on the implant surfaces in SS subjects than in healthy controls. This is reflected by the slightly higher gingival health indices and pocket probing depth values in our SS subjects than in their matched controls. As a result the marginal peri-implant tissue is more prone to continuous inflammatory insults than the peri-implant tissue in healthy controls. This will probably have resulted in more gingival swelling, bleeding and increased pocket probing depths in SS patients.
Although probably not clinically relevant as the observed differences were on the healthy end of the peri-implant health spectrum, peri-implant mucosa was healthier for dentate SS patients compared with edentulous SS patients. Dentate SS patients need to have better oral hygiene compared with edentulous patients as their natural teeth are prone to decay as they are exposed to an oral environment with a high risk of dental caries and oral infections. This better oral hygiene need is reflected in a lower gingiva-index and plaque-index. Remarkably, a comparable difference has also been observed in healthy patients supplied with removable or fixed implant-based prosthodontics[37].

Some marginal bone loss was observed in our cross-sectional cohort. The median marginal bone loss seems to be well within the range that is considered as normal in healthy subjects[8,9,11,31,32]. It has to be mentioned, however, that in our study rotational radiographs were used in the evaluation of bone around the implants. This is not optimal, as preferably standardized intra-oral dental radiographs are used for evaluation of peri-impant bone loss as was used for assessing peri-implant bone loss in our healthy controls. Contrary to our results, in one small study it was suggested that marginal peri-implant bone loss was higher in sSS patients compared with patients with RA without sSS[19]. This topic needs further study, but it seems that the difference between healthy patients and SS patients has limited clinical relevance as the prevalence of peri-implantitis showed no difference between the two groups.

Overall implant survival in this cohort was 97% with a median follow-up of 46 months, which is comparable to the implant survival in our matched healthy controls and the previously reported implant survival in healthy patients[8-11]. All 4 lost implants were lost within 3 months after insertion, comparable with the timing of implant loss in healthy patients[8-11]. In two other studies on implant survival in SS patients reported in literature, implant survival in SS patients was 84% and 100%, respectively[16,19].

The findings of the oral functioning questionnaires in our study are consistent with the results from previous studies in SS patients[2,4,5,38]. Oral functioning is impaired in patients with SS and continues to be impaired in patients with implant-retained prosthetics. Subjective chewing ability with implant-based prosthetics did not reach the same level as reported for healthy subjects[7]. SS patients with implant-retained prosthetics report difficulty chewing tough and hard food, although there is a large variety in results. These problems can be due to the sicca component of SS, as shown by the direct correlation between severity of reported oral dryness (ESSPRI dryness) and chewing ability. This could also explain why SS patients were less satisfied with their implant-retained prosthetics than non-SS patients.

Based on the present analysis, we conclude that dental implants are a good treatment option in the prosthetic treatment of patients with SS, although there are more signs of peri-implant mucositis in SS subjects than in healthy controls. Implant survival is high, prevalence of peri-implantitis is comparable to healthy patients, no excessive bone loss was seen and patients were satisfied with their implant-retained prosthetic devices. Dentist, implantologists, rheumatologist and other health care workers should encourage SS patients with dental problems to discuss the possibilities to treat dental problems with implant-retained prosthetics.

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