ORAL REHABILITATION WITH IMPLANT SUPPORTED FIXED DANTURES IN PERIODONTITIS SUBJECTS.
A 5-YEAR RETROSPECTIVE STUDY

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Abstract

Background: Few comparative studies, with at least 5 years of follow-up, describing the use of implants in prosthetic rehabilitation of partially edentulous patients, are available. There are a few randomized, controlled clinical studies that evaluated the effect of different surface designs of screw-shaped implants on the outcome of the treatment.

Objective: A prospective, randomized, clinically-controlled trial aimed at assessing the outcome of restorative therapy in periodontitis-susceptible patients who, following basic periodontal therapy, had restorations with implants with either machined- or rough surface topography.

Materials and Method: Fifty-one subjects (average age: 59.5 years), 20 males and 31 females who, following treatment of moderate-to-advanced chronic periodontitis, required implant therapy for prosthetic rehabilitation, were chosen. Seventeen of the patients were current smokers. Following the active treatment, all subjects were included in an individually-designed maintenance program. A total of 56 fixed partial dentures (FPDs) and a total of 149 screw-shaped and self-tapping implants (Astra Techs implants) – 83 in the maxilla and 66 in the mandible – were performed in a two-stage procedure. Each patient received a minimum of two implants and, by randomization, every second implant inserted was designed with a machined surface, and the remaining one - with a roughened Tioblasts surface. Abutment connection was performed 3–6 months after implant insertion. Clinical and radiographical examinations were performed following FPD connection, once a year, during the 5-year follow-up period. Analysis of the peri-implant bone-level alterations was performed for each subject, at FPD and at the level of the implant.

Results: Four patients and four FPDs were lost during the 5-year surveillance. One implant (machined surface) did not properly integrate (early failure), and was removed at the time of the abutment connection. Three implants were lost during function and further eight implants could not be accounted for at the 5-year follow-up examination. The overall failure rate after 5 years was 5.9% (subject level), 5.3% (FPD level) and 2.7% (at implant level). Radiographic signs of osseo-integration loss were not found at any of the implants during the 5-year follow-up. During the first year in use, there was recorded an average 0.33 (SD, 0.61) mm loss of marginal peri-implant bone at patient and FPD levels, and 0.31 (0.81) mm, at the level of the implant. During the following 4 years, the peri-implant bone-level alterations were not numerous.

Conclusion: The present randomized, clinically-controlled trial, performed on partially edentulous periodontitis-susceptible subjects, demonstrated that: bone loss (i) during the first year of functioning, as well as annually thereafter, was small, and (ii) there were not significant differences between implants with machined-surfaces and those with rough surface.

Key words: bone loss; clinical trial; dental implants; radiology; smoking; surfaces

The literature of the field provides a considerable number of longitudinal studies, describing the utilization of endo-bone implants for the prosthetic rehabilitation of partially edentulous patients. The result of the implant therapy in this group of patients was assessed in both prospective and retrospective studies (1,2) (only 14 clinical trials carried out over the a 5 year follow-up period were identified).

Nevertheless, there are only a few clinical studies to describe the results of the restoring therapy through fixed, partial prostheses (PFP) with implants inserted in partially edentulous patients (3,4), on whom several implant systems and/or various modifications of implant surfaces had been applied.

The original Astra Techs System (Astra Tech, Möln达尔, Sweden) implant was created mechanically, being subsequently modified to create a rough surface, which involved covering of the implant endo-bone surface with titanium particles.

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The prognosis of the implant therapy on patients with different extents of damaged periodontal tissue was discussed in only few studies (5,6). The results obtained were interpreted in view of a more successful implant therapy in correctly-treated patients susceptible to periodontitis, as well.

Materials and method

The sample group of patients included partially edentulous patients, with no other health problems, subjected to a 3 year-long treatment for moderate-to-chronic periodontitis. A thorough dental/periodontal examination, including assessment of the plaque, gingivitis, PFP and of the radiographic bone loss for all restant teeth was performed (7). All patients received a comprehensive periodontal treatment – oral hygiene indications were given, combined with non-surgical and surgical therapy of the pockets, as well as their inclusion in a periodontal therapy program for individualized maintenance (SPT).

The subjects were 20 men and 31 women, with an average age of 59.5 years (SD, 9,7, between 36 and 80 years). 17 of them were current smokers, the average number of restant teeth being of 18.5.

Bone level. Prior to the treatment, panoramic radiographic images were taken from each patient. Bone height at the level of the restant teeth was assessed by Björn method (7). Scale measuring the bone level was divided into 10 segments, as follows: segment 1 indicates that the marginal bone was localized in the 10% apical part of the tooth, while segment 10 indicates the peak of the crown. The mean value of the bone level (%) was calculated separately for each patient, the mean score obtained being 43.9%.

Treatment with implants

The surgical treatment was performed under local anaesthesia, according to the instructions of the producer. Crest incision was made and the total thick flaps were removed, to provide bone exposure. Following implants loading, the flaps were closed with interrupted sutures. The patients were given 2 g penicillin an hour before the surgery, and 1 g twice a day, for 7 days. The sutures were removed after 7-10 days.

The quantity and quality of the bone was appreciated in relation with implant loading. Most of the used sites showed a severe bone resorption (score B and C), the bone quality being equivalent to a score of 2 or 3 (4,6). The insertion depth of the implants was equal to the level of the proximal bone, which frequently led to bone dehiscence at vestibular and/or oral level of the implants, as a result of the reduced bone vestibule-oral size. No attempt was made towards bony augmentation in the dehiscence areas.

149 screw-type, self-guided Astra (Astra Techs Implant Systems, Mölndal, Sweden) implants were inserted – 83 in maxilla and 66 in the mandible – and the covering screws were mounted. In the maxillary premolar region, 47 implants were applied, and other 15 in the molar one. The implants were 3.5 mm in diameter, of variable length, between 8 and 19 mm. Each patient received at least 2 implants and, randomly, the surface of each second implant was mechanically treated; for the rest, the surface was made rough with Tioblast. The abutment connections were obtained by a second surgical procedure, 3 (mandible) or 6 months (maxilla) after implant insertion. The final PFP with screws was completed and brought to examination 4 weeks after abutment connection. All PFPs were provided with a porcelain occlusal surface.

Fig.1.Clinical and radiographic image of a patient with a bone amount about 36% in the moment of implant surgery
Fig. 2 5 years after implant insertion, maintenance of the peri-implant bone level is evidenced

Maintenance treatment

All patients were subjected to a surveillance period by an individualized SPT program (4) including teeth, implants and soft tissues examination, every 4 or 6 months. The areas bleeding during probing (positive BoP) were carefully handled and smoothed with rubber cups and slightly abrasive pastes. More than that, fixing the prosthesis on the implants was carefully evaluated during annual examinations and – when necessary - adjusted (Figs. 1 and 2).

Clinical examinations

Basic and annual examinations assessed the following clinical parameters: pain in the implant region, presence of the plaque (mesially, distally, vestibularly and orally), probing depth and BoP (probing pressure – 0.25N) at 4 different points for each implant (mesially, distally, vestibularly and orally), and width of the keratinized mucous membrane (vestibular units).

Radiographic examinations

Post-surgical radiographic examinations were performed both at PFP insertion and during the annual exams. Standard individual radiographic images were obtained for each implant or pair of implants (8). For each implant, the height of the marginal bone, the time modifications and the bone-implant contact zone were recorded, for detecting the osteo-integration loss. The height of the marginal bone and the modifications in time of the bone level were examined mesially and distally for each implant (Fig. 3).

Data analysis

All statistical analyses considered the subject as a statistical unit. Intra-individual comparisons were performed between the types of implants (mechanical versus Tioblast), by applying test t for the pair samples. All other statistical analyses made use of test t with two samples.

Results

4 patients and 4 PFPs were lost during the 5-year surveillance. 1 implant (with mechanically-treated surface) was not correctly integrated (early failure), being removed in the second surgical stage. Nevertheless, the loss of the implant did not modify the projected PFP extension. 3 implants were lost during their being in use (one was removed after 2 years and other 2 after 4 years, as a result of implant fracture).

In all 3 cases of implant fracture, the PFP was supported only by 2 implants, the PF being subsequently lost. Therefore, the gereral failure ratio at 5 years was of 5.9% (at subject level), of 5.3% (at PFP level) and of 2.7% (at implant level). If considering also the subject lost after the first year, the failure ratio was of 7.8, 7.1 and 4.0%, respectively.

Prosthetic complications

Apart from the loss of the 3 PFPs, as a result implant fracture, 6 prosthetic complications occurred during the 5-year observation period, could be solved. In 3 patients, the PFP - implant screws lost their retention capacity while, in 3 subjects, minor fractures of the porcelain were noticed.

Fig. 3 Radiological image representing the reference point used to assess bone in contact with implant

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Clinical observations

At a 5-year interval, 5.3% (SD, 16.5) of the surface of the implants presented plaque, 5% (10.6) of the periimplant areas bled during probing, while the mean probing depth was 3.1 mm (0.8). Almost 80% of the peri-implant areas had a probing depth of 43 mm, and only 5.3% showed a PFP value >6 mm. The mean width of the keratinized vestibular mucous membrane was 1.9 mm (1.3), 19% of the areas having <1 mm, 25% 1mm and 56% >2mm of keratinized mucous membrane.

Radiographic observations

Radiographic images were taken for all implants, no radiographic signs of losing the osteointegration of the implants being observed along the 5-year period considered in the study.

Maxillary versus mandibular implants. Modification of the bone level between the starting point and that at 5 years was more marked in the maxilla. Within this interval, an average bone loss was recorded in the 28 PFP of the remaining maxilla (2 were removed and one was not justified) having 0.61 mm (0.82) while, for the 22 PFP of remaining mandible (one removed and two not justified) - it was 0.15 mm (0.60).

Smokers versus non-smokers. At intervals of 1 and 5 years, the smokers showed a more considerable bone loss than the non-smokers (0.41 vs. 0.30 and 0.76 vs. 0.22 mm).

Discussion

The results of the clinical trial here discussed demonstrate that, in the first year, and each year after that, the bone loss was lower, not varying according to the different surface designs of the implants. As a matter of fact, about 78% of the implants with mechanically-processed surface and about 73% of those with Tioblast had a bone loss <1 mm in the 5 years considered. This observation agrees with some previous findings (8) of the clinical trials having used Astra Techs implants. The conclusion is that the design of the implant surface has no influence on the bone modifications produced during the functioning period, on condition that the implants should be inserted in intrabone position, during 3-6 month healing periods, prior to loading (9).

In the present study, the failure ratio at 5 years was of 5.9% at subject level, of 5.3% at PFP level and of 2.7%, respectively, at implant level. The sample group included patients treated previously for moderate-to-advanced chronic periodontitis. Prior to and after implant loading and prosthetic rehabilitation, all subjects had been included in a careful maintenance plan, based on self-control of the plaque and professional cleaning of teeth and implants. In this group of patients, the annual level of bone modification was low (0.02 mm/an, in the last 4 years), the rate of implant survival was higher (97.3%), only 15 implants (11%) showing a loss of over 42 mm during the 5 year period under analysis. Another observation was that the amount of peri-implant bone loss resulting in the 5 year time was much higher in the maxillary implants (0.61 mm versus 0.15 mm).

In the group of subjects suffering from chronic periodontitis here under investigation, extraction of one or more affected teeth caused intense vestibular and oral resorbtion of the cortical zone present in the edentulous area, and also led to the formation of a thin crest (10).

During surgery, the implants were loaded so that their marginal part should be at the level of the mezial and distal marginal bone. In the maxilla, insertion of an implant in an area with reduced vestibular and oral sizes led frequently to bone dehiscense of variable sizes, at vestibular and/or oral implant levels. It might be reasonably stated that, in time, this irregular contour of the marginal bone surrounding the maxillary implants appeared due to bone re-shaping, and also through reduction of the proximal bone height (9).

REFERENCES:


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