Multicenter Retrospective Study of ITI Implant-Supported Posterior Partial Prosthesis in Jordan

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ABSTRACT

Purpose: The aim of this multicenter study was to evaluate success and restorative problems of ITI (ITI Dental Implant System®, Straumann AG, Basel, Switzerland) implant-supported posterior partial prostheses in Jordan.

Materials and Methods: One-hundred forty-one ITI implants were placed in the posterior region of the mandible or the maxilla in 66 patients at multiple clinical practices in Jordan. The age of the patients ranged from 17 to 85 years. The implants were retrospectively analyzed from the first date of placement in September 1999 until May 2006. Eighty-three implants (58.87%) were placed in the mandible, and 58 (41.13%) in the maxilla. The implants were loaded with either cement-retained single- or multiple-tooth replacements.

Results: Three maxillary implants of two male patients have been lost (2.13% of the total and 5.12% of the maxillary implants). Failed implants were of wide-neck type with 6-mm lengths. Moreover, in another two male patients, two single implants at the maxillary premolar region exhibited significant bone loss from the buccal side of the implant surface (2-mm bone resorption). Those two implants are still functioning and were included in calculating the survival rate but not the success rate. Therefore, the cumulative survival rate for both arches and genders was 97.87% and that for male patients in the maxillary region was 94.88%. The cumulative success rate for both arches and genders was 96.45% and that for the maxillary region was 86.21%. The corresponding rates concerning implants in female patients and the posterior mandible of both genders were 100% for both survival and success rates. Only one crown (mandibular) and another two abutment bridge (maxillary) were decemented in different patients (2.13%).

Conclusions: The survival and success rates of implants placed in male patients and in the maxilla were lower than that of implants placed in female patients and in the mandible. Cement-retained restorations showed minimal complications.

KEY WORDS: ITI implant, implant-supported prosthesis, success rate, survival rate, restorative problems

INTRODUCTION

The use of osseointegrated dental implants has become a successful procedure for the treatment of complete and partial edentulism.[1–5] The presence of teeth might complicate the oral environment in which the implant prosthesis must function. Occlusal forces, tooth wear and abrasion resistance, differences in resiliency between teeth and implants,[6] and microbiologic flora are the major differences between partially and completely edentulous patients.[7]

In partial edentulism, the presence of adjacent teeth can help preserve the edentulous ridge width and height, which have a major determining factor in the placement of the implants and esthetics of the prosthesis.[8,9]

Recently, a multicenter report involved a retrospective analysis of 675 ITI implants for posterior single-tooth replacements. A cumulative survival rate of 99.1% was obtained for all sites. In the study just mentioned, the authors compared the coupled complication with the screw-retained and cement-retained restorations. Cement-retained restorations showed a very minimal incidence of complications (1.2%).[4]

The aim of this multicenter study was to evaluate success and restorative problems of ITI implant-

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TABLE 1 Year of Implant Placement, Number of Patients, and Number of Implants

Date of implant placement	No. of patients	No. of implants
September 1999	6	10
2000	7	18
2001	7	19
2002	8	16
2003	11	25
2004	15	35
May 2005	12	18
Total	66	141

supported posterior partial prostheses in Jordan from 12 to 69 months of follow-up.

MATERIAL AND METHODS

Sixty-six patients, 43 women and 23 men, underwent implant placement for premolar and molar region in the mandible or maxilla at multiple clinical practices in Jordan. The age of the patients ranged from 17 to 85 years. A total of 141 SLA-type ITI implants placed during the period from September 1999 to May 2005 (Table 1) were retrospectively analyzed from the date of placement until May 2006.

Eighty-three implants (58.87%) were placed in the mandible (Figure 1), and 58 (41.13%) in the maxilla (Figure 2). Of the placed implants, 59.57% were of the regular-neck type (RNI) and had lengths of 10 to 12 mm, while 40.43% were of the wide-neck implants (WNI) of 8- and 6-mm lengths. After a healing period of 3 to 4 months the implants were loaded with either cement-retained single- or multiple-tooth replacements. Polycarboxylate cement was used for all restorations. Metal ceramic restorations were used to restore all placed implants. Dental porcelain bonding alloy (Remanium 2000+, nickel- and beryllium-free, Co 61%, Cr 25%, Mo 7%, W5%, Dentarum, Ispringen, Germany) and Vita Omega ceramic (VITA Zahnfabrik, Bad Sackingen, Germany) were the materials of choice.

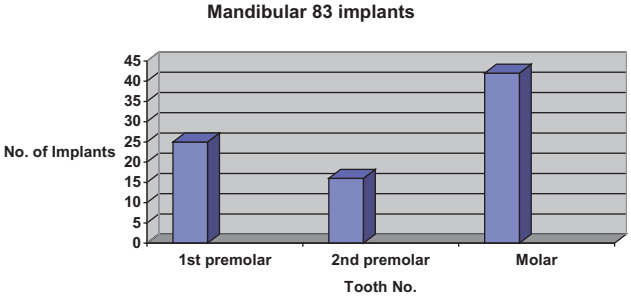

Figure 1 Distribution of implants in the mandible.

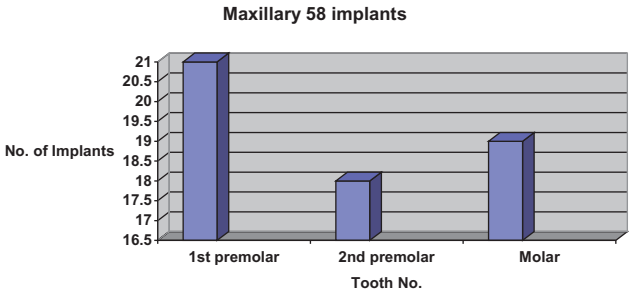

Figure 2 Distribution of implants in the maxilla.

The selected patients for implant treatment at the participating clinics were of short edentulous span (one or two missing teeth), adequate inter-arch space for abutments, prosthetic components and prosthesis, and sufficient bone dimensions.

The edentulous areas that were to receive the implants as well as the adjacent structures were evaluated using an appropriately prescribed combination of periapical, occlusal, or panoramic radiographs. Furthermore, radiographs were obtained at the following times: immediately after surgery, 3 to 6 months later, and yearly after the surgical placement.

The condition of the prosthesis, the implant's stability, and adjacent mucosa were all evaluated at each recall appointment. Patient symptoms were also recorded and used along with clinical and radiographic signs to diagnose problems. Soft tissue health assessment was achieved by examining the redness, swelling, and bleeding based on the technique of Ramfjord.[10]

In this study, the success rate was recorded according to the criteria suggested by Albrektsson and colleagues[11] as follows: the unattached implant is immobile when tested clinically; no evidence of radiographic periimplant radiolucency; vertical bone loss is less than 0.2 mm annually after the implant's first year of service; absence of persistent and/or irreversible signs and symptoms such as pain, infection, neuropathies, paresthesia, or violation of the mandibular canal; and finally a success rate of 85% at the end of a 5-year observation period.

Patient satisfaction (completely satisfied, moderately satisfied, or unsatisfied) was assessed by questioning patients in a short questionnaire on recall or check-up visits.

RESULTS

From 12 to 69 months of clinical examination, three maxillary implants of two male patients have been lost (2.13% of the total and 5.12% of the maxillary implants). Failed implants were in the maxillary molar region of WNI type with a 6-mm length. One of the failed maxillary implants was lost 1 week after surgical placement, while the other two maxillary and the mandibular implants were lost at approximately 6 months of abutment connection. Moreover, in the other two male patients, two single implants (RNI) at the maxillary premolar region exhibited significant bone loss from the buccal side of the implant surface (2-mm bone resorption), so that the complete integration was only remaining on other surfaces. Those two implants are still functioning until the time of preparing this report and thus were included in calculating the survival rate but not the success rate.[11] Therefore, the cumulative survival rate for both arches and genders was 97.87% and that for male patients in the maxillary region was 94.88%. The cumulative success for both arches and genders rate was 96.45% and that for the maxillary region was 86.21%. The corresponding rates concerning implants in female patients and the posterior mandible of both genders were 100% for both survival and success rates.

About the restorative complications, only one crown (mandibular) and another two abutment bridge (maxillary) were decemented in different patients (2.13%). The bridge was recemented two times during this period of follow-up.

Radiographically, the radiographic results were based on the available longitudinal standardized radiographs of the majority of the implants monitored for 1 to 7 years of implant loading. In general, all implants were free of radiographic signs of morbidity, a very minimal marginal bone loss was noticed, but it was less than 0.2 mm after the first year of service.

For the soft-tissue complications, gingival inflammation and mucosal irritations were within the controlled conditions during the period of observation.

All the patients, except the two with lost implants (98.58%), were completely satisfied with their prosthesis as there were no complications regarding the implant itself or the prosthesis.

DISCUSSION

The results of this study demonstrate favorable survival and success rates and patient satisfaction when the ITI system was used to replace missing teeth.[12–14] The survival rate of 141 implants loaded from 12 to 69 months was 97.87%.

The three failed implants (2.13% of the total and 5.12% of the maxillary implants) were all in the maxillary molar areas. Failure could be related to the quality of bone, as all were of short type and had been placed close to the maxillary sinus. One of these implants initially showed radiographically good integration around the implant surface. Later, when abutment was connected using the torque gauge to tighten it to a 32 Ncm torque, the implant screw rotated. Therefore, that necessitated its removal, which was 3 days later.

Previous studies identified higher failure rates when implants were placed posteriorly in the maxilla or in the type 4 (IV) bone.[15–19] This study showed that with proper surgical planning and implementation, high success rates, even with implants in the maxillary tuberosity, might be obtained. The reasons for the observed failures might be related mainly to the bone quality and the use of short implants. However, in this study, 83 implants were inserted in the maxillary posterior area, and four of these implants were 6 mm in length. The final outcome was of having three implants lost in the maxilla. This should reveal that there is a difference in survival rates between implants placed in the maxilla (5.12% of 58 implants) and those placed in the mandible (0% of 83 implants) and that shorter implants had lower survival rates than did longer implants.

In the two implants that have exhibited significant bone loss from the buccal side, a bone defect was found at the site of the implant noted during implant surgery. Afterward, this was treated by curettage to remove all fibrous tissues, and bone substitute material was used to fill the defect; these two implants are still functioning.

One recent retrospective report showed a cumulative survival rate of 99.1% for all sites (6 failures among 675). The survival rates were 98.4% for the mandibular and 100% for the maxillary regions. Five implants were considered "at-risk" because of 1 to 2 mm of radiographic bone loss.[4] The results of the present study were better in the mandibular posterior region and

worse in the maxilla. These differences might be related primarily to the smaller number of implants that were followed in this study, in addition to the type of bone and implant length.

A recent retrospective study of 441 ITI implants in 114 patients followed up during an average of 2.3 years showed no relationship between implant failure and patient sex.[20] In the present study, all failures occurred in male patients. Although this might not be related to gender, further studies should be designed to clarify the relation between the patient's gender and implant success.

Concerning restorative complications, the results of this report showed that one maxillary implant-supported bridge was decemented twice during the follow-up period. The bridge-supporting implants were placed at the upper jaw over the crest of the ridge, and the lower natural opposing teeth were away buccally from the crest of the ridge. Therefore, the bridge was made to meet the lower natural teeth and away from the center of the implant buccally, and this should produce a higher bending effect on the implant-prosthesis assembly. The present problem was solved by fabricating prostheses for both the maxillary and the opposing mandibular segment to achieve a more balanced occlusion with centric loading points over the supporting implants. It could be postulated that restorative complications were minimal with the use of cement-retained prostheses. The minimal restorative complications of the cement-retained restorations obtained in this study (2.13%) were comparable to those found in another recent study that used cement-retained restorations with ITI implants.[4] In that study, 1.20% of 600 cemented-implant restorations had restorative problems.

Soft-tissue complications such as gingival inflammation or mucosal irritation were observed in the present study and in other studies.[18,19] Usually, these complications were easily resolved with oral hygiene instruction and practice, and without any compromise in osseointegration.

Patient satisfaction among the patients of this study (98.58%) was higher than that of another study (97.40%) where ITI implants of both screw-retained and cemented restorations were used.[4] In the other report, although the cumulative survival rate was higher than this study (99.10%), the patients had more restorative complications in the screw-retained restorations (19.70%). This might be the major reason behind the difference in patient satisfaction between the two reports.

Finally, the results of the present study of a single- and multiple-tooth replacement with implant indicate satisfactory outcome and promising performance in different locations. However, extensive long-term studies with a greater number of implants are needed to determine which specific criteria comprise optimal functional and esthetic results with minimum risk of morbidity.

CONCLUSIONS

Based on the results of this study, it was concluded that the ITI implant might be an adequate choice for posterior single- and multiple-tooth replacement. The survival and success rates of implants placed in male patients and in the maxilla were lower than that of implants placed in female patients and in the mandible. Shorter implants, especially those of 6-mm lengths, had low survival rates. Furthermore, restorative complications were minimal with the use of cement-retained prostheses.

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