Prospective Evaluation of 2,549 Morse Taper Connection Implants: 1- to 6-Year Data

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Background: The aim of this study is to evaluate the implant survival, the implant–crown success, and the prosthetic complications of 2,549 Morse taper interference–fit connection implants.

Methods: A total of 2,549 Morse taper connection implants were inserted in 893 patients from January 2003 until December 2008. At each annual recall, clinical, radiographic, and prosthetic parameters were assessed. The implant–crown success criteria included the absence of pain, suppuration, and clinical mobility; an average distance between the implant shoulder and the first visible bone contact <2 mm from initial surgery; and the absence of prosthetic complications at the implant–abutment interface. Prosthetic restorations were fixed partial prostheses (462 units); fixed full-arch prostheses (60 units); single crowns (531 units); and overdentures (93 units).

Results: The cumulative implant survival rate was 98.23% (97.25% maxilla, 99.05% mandible). The implant–crown success was 92.49%. A few prosthetic complications at implant–abutment interface were reported (0.37%). After 6 years, distance between the implant shoulder and the first visible bone contact was 1.10 mm (± 0.30 mm).

Conclusion: The use of Morse taper connection implants represents a successful procedure for the rehabilitation of partially and completely edentulous arches. *J Periodontol 2011; 82:52-61.*

KEY WORDS

Bone resorption; dental abutment; dental implants; endosseous; implant interface; survival.

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Dental implants are a predictable and successful solution for the rehabilitation of partially or totally edentulous arches, with over 30 years of scientific evidence and excellent long-term results.[1-4] In a 5-year study on 1,583 implants with different prosthetic indications, such as single-tooth replacements, short-span and long-span fixed prostheses, and overdentures (OD), Davarpanah et al.[3] reported a cumulative implant survival rate of 96.5%, with a mean crestal bone loss of 0.2 ± 1.7 mm. In another study on implant-supported fixed partial prostheses (FPP), with a mean follow-up period of 6 years, Naert et al.[2] reported a cumulative implant success rate up to 95% for freestanding or tooth-connected implant prostheses. In a 10-year follow-up study on implant-supporting mandibular OD, Heckmann et al.[4] reported similar success rates, with a mean distance between the implant shoulder and the first visible bone contact of 3.19 ± 0.95 mm.

The mechanical stability of the implant–abutment connection is certainly an important issue in modern implantology,[5] but problems related to the implant–abutment connection remain unsolved.[6] Currently, the most commonly used systems for securing the abutment to the implant involve screw-type connections. In these systems, the effectiveness of solidification between the abutment and the implant depends on the screw

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preload, which is generated by applying a specific amount of torque during installation.[6,7] Maintenance of screw tightening is accomplished when the force exerted by the abutment screw exceeds the separating forces generated by occlusal contacts acting on the assembly.[8] However, dynamic loading forces during physiologic function that do not exceed the maximum resistance of an implant–abutment connection or even that are far below can loosen the implant–abutment connection gradually or make it fail suddenly because of fatigue.[6-10] When exceeding the preload, moreover, eccentric occlusal loads can lead to plastic deformation of the screw.[7] The immediate consequence of these phenomena is the occurrence of mechanical complications, such as the loss of connection between the implant and the abutment.[1,6-8] These complications are certainly a nuisance and a waste of time for clinicians and their patients,[1] but they are also a biologic problem because micromovements at the implant–abutment interface can stimulate, as suggested by some authors, crestal bone resorption.[11] Implants featuring an external hexagon at the connection with the abutment are still widespread in the market, and seem to be more easily affected by these mechanical complications, with a high incidence of abutment screw loosening.[12-14] To overcome these problems, implant manufacturers have introduced different systems, using screw-type internal connections. In general, the highest percentages of prosthetic complications affect single-tooth restorations, in the posterior regions of both maxillae, where the mechanical load is higher, with screw loosening percentages between 6% and 48%.[15-20] A literature review of clinical complications of osseointegrated implants has reported these findings, showing a percentage between 2% and 45% of screw loosening or screw fracture of implant restorations, with the highest amount in single crowns (SCs).[21] These data were confirmed by a meta-analysis on implant-supported FPP complications, in which a cumulative incidence of connection-related complications (e.g., screw loosening or fracture) of 7.3% after 5 years of function was observed.[22]

Finally, a recent systematic review on single-tooth implant restorations has reported a 5-year cumulative incidence of screw loosening and screw–abutment fracture of 12.7% and 0.35%, respectively.[23] The most recent screw-type connections with an internal hexagon are now associated with various forms of taper. The concept of the coupling between conical abutment and implant, however, is not new.

Many years ago, the principle of Morse taper implant–abutment connection was introduced in oral implantology. Morse taper implant–abutment connection is based on the principle of "cold welding" obtained by high contact pressure and frictional resistance between the surfaces of the implant and the abutment.[1,7] The connection is called "self-locking" if the taper angle is <5°. Recent studies have clearly demonstrated that the Morse taper implant–abutment connection can resist eccentric loading complexes and bending moments, ensuring an absolute mechanical stability and significantly reducing the incidence of prosthetic complications at the implant–abutment interface.[7,24-27]

The aim of this prospective study is to evaluate the implant survival, the implant–crown success, and the prosthetic complications of 2,549 Morse taper connection implants used in different clinical applications, such as FPPs, SCs, fixed full-arch prostheses (FFAs), and bar-supported ODs.

MATERIALS AND METHODS

Patient Population

From January 2003 to December 2008, a total of 911 patients (488 males and 423 females) in six different clinical centers were considered for inclusion in our prospective clinical study. Inclusion criteria were adequate bone height and width to place an implant of ≥3.3 mm in diameter and 8 mm in length. Exclusion criteria consisted of poor oral hygiene, active periodontal infections, uncontrolled diabetes, bruxism, or heavy smoking habit (>10 cigarettes/day). With regard to all these criteria, 18 patients could not take part in the study (six for inadequate bone height and width, four for poor oral hygiene, four for active periodontal infections, one for bruxism, and three for heavy smoking habits). Eight hundred ninety-three patients (476 males and 417 females, aged 22 to 78 years; average 53.6 years) fulfilled the inclusion criteria, presenting no conditions listed in the exclusion criteria. The study protocol was explained to each subject, and signed informed consent was obtained from all patients. The study protocol was approved by the University of Varese Review Board, Varese, Italy.

Implant Design and Surface Characterization

Screw-shaped implants, made of grade-5 titanium alloy[#] were used. The surfaces were blasted with 50 μm Al_3O_2 particles and acid-etched with HNO_3 (Fig. 1), after which the average of roughness (i.e., the mean of the peak-valley distance on surface irregularities) was 0.5 μm. This implant system uses a cone Morse taper-interference–fit locking taper combined with an internal hexagon. The Morse taper presents a taper angle of 1.5° (Fig. 2).

Preoperative Work-Up

A complete examination of the oral hard and soft tissues was carried out for each patient. Panoramic

Leone Implant System, Florence, Italy.

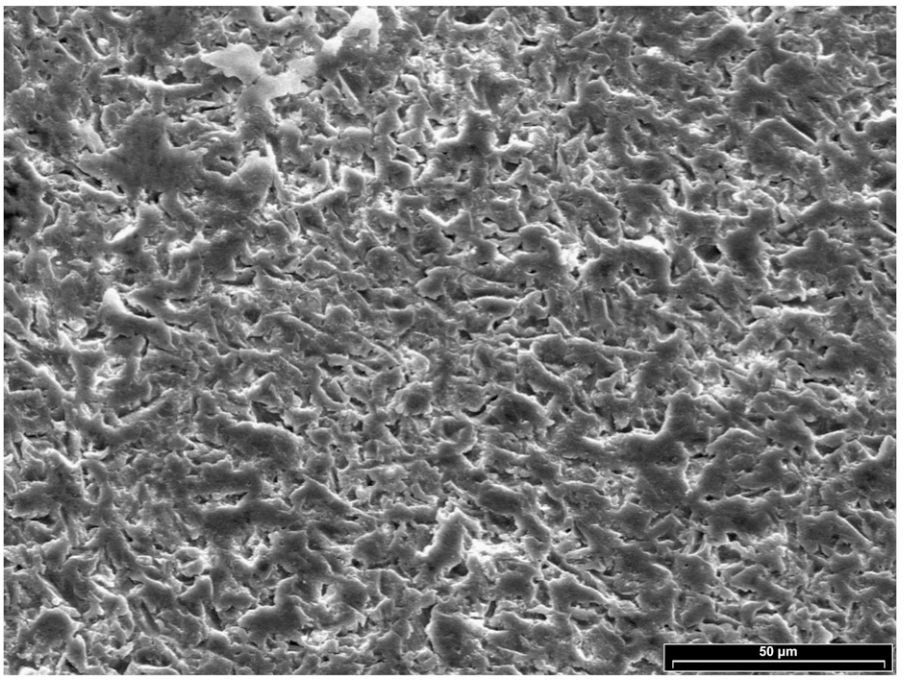

Figure 1.
Scanning electron microscopy of the implant surface (bar = 50 µm).

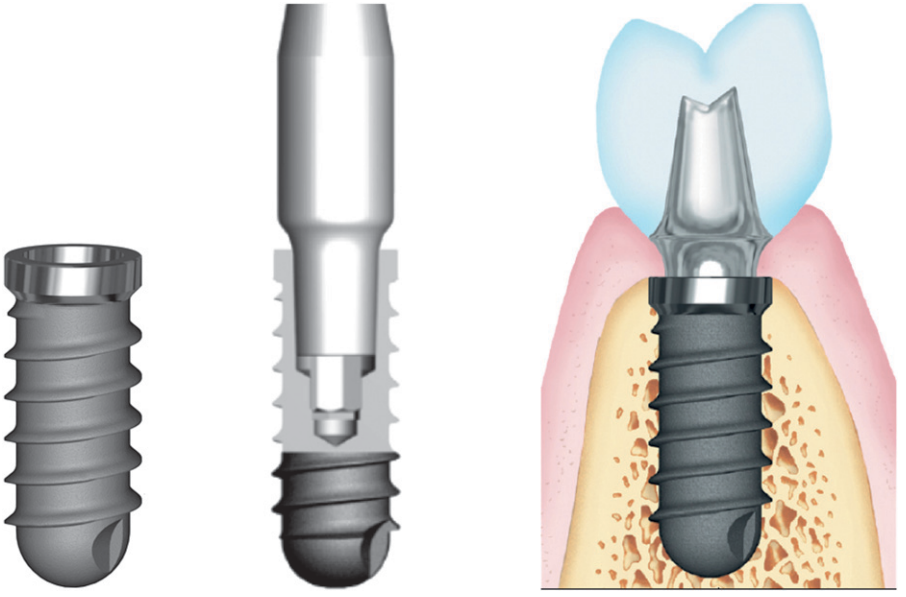

Figure 2.
Schematic drawing of the implant system evaluated. The implant presents a cone Morse taper-interference–fit locking taper combined with an internal hexagon. The Morse taper presents a taper angle of 1.5°.

radiographs formed the basis for the primary investigation. Where necessary, computed tomography scans were used as the final investigation. Computed tomography datasets were acquired using a cone beam scanner and then transferred in the DICOM format to specific implant navigation software, to perform a three-dimensional reconstruction of the jaws. With this navigation software, it was possible to assess correctly the width of each implant site, the thickness and density of the cortical plates and the cancellous bone, and the ridge angulations. On the basis of this information, surgical templates were manufactured. Preoperative work-ups included an assessment of the edentulous ridges using casts and diagnostic wax-up.

Implant Placement

After local anesthesia, a midcrestal incision was made at the sites of implant placement. The mesial and distal aspects of the crestal incision were connected to two releasing incisions. Full-thickness flaps were reflected exposing the alveolar ridge, and preparation of implant sites was carried out with spiral drills of increasing diameter (2.8 mm to place an implant with 3.3 mm diameter; 2.8 and 3.5 mm to place an implant with 4.1 mm diameter; an additional 4.2-mm drill was used to prepare the site for 4.8 mm diameter implants) under constant irrigation. Implants were positioned at the bone crest level.

Postoperative Treatment

All patients received oral antibiotics,** 2 g each day for 6 days. Postoperative pain was controlled by administering 100 mg nimesulide every 12 hours for 2 days, and detailed instructions about oral hygiene were given, including mouth rinses with 0.12% chlorhexidine administered for 7 days. Suture removal was performed at 8 to 10 days.

Healing Period

A two-stage technique was used to place the implants. The healing time was 2 to 3 months in the lower jaw and 4 to 5 months in the upper jaw. Second-stage surgery was conducted to gain access to the underlying implants, and healing

** Augmentin R, Glaxo-Smithkline Beecham, Brentford, UK.

abutments were placed. In all fixed prosthetic rehabilitation protocols (FPPs, FFAs, and SCs), the abutments were placed and activated 2 weeks after the second surgery, so that acrylic interim restorations could be provided. Acrylic resin provisional restorations were used to monitor implants' stability under a progressive load and to obtain good soft-tissue healing around the implant before fabrication of the definitive restorations. The temporary restorations remained in situ for 3 months, and after this period definitive restorations were placed.

Clinical and Radiographic Evaluation

At each annual follow-up session, for each single implant, the following clinical parameters were investigated: 1) presence or absence of pain or sensitivity; 2) presence or absence of suppuration or exudation; and 3) presence or absence of implant mobility, tested manually using the handles of two dental mirrors.[28]

Moreover, intraoral periapical radiographs were taken for each implant, using a Rinn alignment system with a rigid film-object x-ray source coupled to a beam-aiming device to achieve reproducible exposure geometry. Customized positioners, made of polyvinyl siloxane, combined with a Rinn alignment system with a rigid film-object x-ray source coupled to a beam-aiming device, were used for precise repositioning and stabilization of the radiographic template.

Radiographs were taken at the baseline (immediately after implant insertion) and at each annual follow-up session for two purposes: to evaluate the presence or absence of continuous peri-implant radiolucencies; and to measure the distance between the implant shoulder and the first visible bone contact (DIB) in millimeters at the mesial and distal implant site.[29]

For the second measurement, crestal bone level changes were recorded as changes in the vertical dimension of the bone around the implant, so that an evaluation of peri-implant crestal bone stability was gained with time. To correct for dimensional distortion in the radiograph, the apparent dimension of each implant (directly measured on the radiograph) was compared to the true implant length, and the following equation

$$\text{Rx implant length} : \text{True implant length} = \text{Rx DIB} : \text{True DIB}$$

was used to establish, with adequate precision, the eventual amount of vertical bone loss at the mesial and distal site of the implant.[30]

Prosthesis Function

To test prosthesis function at each annual scheduled check, static and dynamic occlusion were evaluated using standard occluding papers. Careful attention was dedicated to the analysis of prosthetic complications at the implant–abutment interface (abutment loosening, abutment fracture), which were considered as primary endpoints of this study, and consequently registered. All the other potential complications (e.g., ceramic fractures or OD-related problems) were also reported, even if they did not represent primary endpoints of this work.

Implant Survival and Implant–Crown Success Criteria

The evaluation of implant survival and implant–crown success was performed according to modern clinical, radiographic, and prosthetic parameters.[31]

Implants were divided into two categories: "surviving" and "failed" implants. An implant was classified as a "surviving implant" when it was still in function at the last follow-up control session. Implant losses and implants presenting pain on function or clinical mobility were all failure categories. The conditions for which implant removal could be indicated included failure of osseointegration or infection, recurrent peri-implantitis, or implant loss caused by mechanical overload. Statistical analysis was carried out with life-table analysis as previously described.[32]

Among "surviving" implants, with regard to the collected clinical and radiographic parameters, three different groups were distinguished:

Group 1: Implant success (optimum health)

- Absence of pain or tenderness on function
- Absence of suppuration
- Absence of clinical mobility
- DIB <2 mm
- No exudate history

Group 2: Satisfactory survival

- Absence of pain on function
- Absence of suppuration
- Absence of clinical mobility
- DIB 2 to 4 mm
- No exudates history

Group 3: Compromised survival

- Sensitivity on function
- Absence of clinical mobility
- DIB >4 mm
- Possible exudate history

Finally, prosthesis function was taken into account, with particular attention to the implant–abutment connection. The absence of prosthetic complications at the implant–abutment interface (e.g., abutment loosening or abutment fracture) was considered of primary importance in this study. For this reason, implant–crown success was defined as the condition of the implants belonging to Group 1 (implant success, optimum health), presenting in addition

no prosthetic complications at the implant–abutment interface.

RESULTS

Patient Population and Implant-Supported Restorations

A total of 1,137 implants were inserted in the maxilla, and 1,412 implants were inserted in the mandible. Three hundred seventy-seven implants were placed in the maxillary anterior region, and 760 implants were placed in the maxillary posterior region; 357 implants were placed in the mandibular anterior region and 1,055 in the mandibular posterior region. The distribution of implants by length and diameter is shown in Table 1. The most frequent indication was the restoration of partially edentulous patients (1,166 implants), whereas the least frequent indication was the treatment of single tooth gaps (531 implants). A total of 852 implants were inserted to restore fully edentulous patients. The prosthetic restorations comprised 462 FPPs, 531 SCs, and 60 FFAs. Each FFA was supported by eight implants. SCs, FPP, and FFA were ceramo-metallic; all of these prosthetic rehabilitations were cemented with zinc phosphate cement.†† Ninety-three ODs were fabricated with acrylic resin with a metal framework. The ODs were fabricated with bar retention systems, and were supported by four implants.

Implant Survival

At the end of the study, the overall cumulative implant survival rate was 98.23%, with 2,506 implants still in function (Table 2). Forty-three implants failed and had to be removed. In the maxilla, the cumulative survival rate was 97.25%, with 30 implants failed and removed (Table 3). In the mandible, the survival rate was 99.05%, with 13 implants failed and removed (Table 4).

With regard to the position of the failed implants, 20 were in the posterior maxilla, 10 in the anterior maxilla, and 13 in the posterior mandible. Thirty-three implants were classified as "early failures," showing clinical mobility caused by lack of osseointegration (15 implants) or recurrent infections with pain and suppuration (18 implants) before the connection of the abutment. Ten implants were classified as "late failures" because after the abutment connection, five showed untreatable recurrent peri-implant infections and five failed because of progressive bone loss caused by mechanical overloading, without clinical signs of peri-implant infection (Table 5).

Table 1.

Distribution (number) of the Implants by Length and Diameter

	Length (mm)				
Diameter (mm)	8	10	12	14	Total
3.3	8	169	257	124	558
4.1	191	314	368	335	1,208
4.8	141	292	240	110	783
Total	340	775	865	569	2,549

Implant–Crown Success

Two thousand five hundred six implants were still in function at the end of the study. Among these implants, 2,318 (92.49%) were classified in the implant–crown success group. All of these implants did not cause pain or exhibit clinical mobility, suppuration, or exudation, with a DIB <2 mm, and did not have any prosthetic complication at the implant–abutment interface. One hundred seventy-eight implants (7.10%) were classified in the second group, among the satisfactory survival implants. These implants did not cause any pain or clinical mobility, suppuration, or exudation, but they had a DIB between 2 and 4 mm. Only 10 implants (0.39%) were placed in the third group, compromised survival. Although these implants did not have clinical mobility or suppuration, some kind of sensitivity or pain on function was evidenced, and an exudate history was present. Moreover, these last implants showed a DIB >4 mm with significant crestal bone resorption. At the end of the study, the radiographic evaluation of the implants revealed a mean distance from the implant shoulder to the first crestal bone to implant contact (DIB) of respectively 0.89, 0.91, 0.95, 0.99, and 1.03 mm at 12, 24, 36, 48, and 60 months after implant insertion. At the 6-year examination, the mean bone level of the fixture was situated 1.10 mm from the reference point (Table 6). Minimal changes were seen in the bone level between the 1- and 6-year examinations. Two prosthetic abutments became loose during the first year of loading in two SCs situated in the posterior area of the mandible. These abutments were reinserted and no further loosening was observed in the period of this study. These abutment disconnections were reported in two implants belonging to the second group (satisfactory survival). The incidence of abutment loosening was 0.37% for single tooth replacement only. No complications were observed at the implant–abutment connection for FPPs and FFAs and no abutment fractures were seen. The incidence of prosthetic complications was greater for ODs than for any other type of prostheses. These problems were, however, related to the weakness of the

†† Harvard R, Richter & Hoffmann, Berlin, Germany.

Table 2.

Overall Cumulative Implant Survival Rate

Time Interval (months)	Implants at the Start of the Interval	Drop-Outs During the Interval*	Implants at Risk	Failures During the Interval	Survival Rate Within the Period (%)	Cumulative Survival Rate (%)
0 to 12	2,549	6	2,543	35	98.63	98.63
12 to 24	2,276	4	2,272	5	99.78	98.41
24 to 36	1,920	5	1,915	2	99.90	98.31
36 to 48	1,216	5	1,211	1	99.92	98.23
48 to 60	676	1	675	0	100	98.23
60 to 72	256	2	254	0	100	98.23

* Reasons for drop-outs: 12 patients moved to other cities or countries; six patients had serious health problems, not related to the dental implant therapy, and were hospitalized; five patients died. All of these patients could not come to scheduled follow-up examinations.

Table 3.

Cumulative Implant Survival Rate in the Maxilla

Time Interval (months)	Implants at the Start of the Interval	Drop-Outs During the Interval	Implants at Risk	Failures During the Interval	Survival Rate Within the Period (%)	Cumulative Survival Rate (%)
0 to 12	1,137	2	1,135	26	97.71	97.71
12 to 24	1,002	1	1,001	2	99.81	97.52
24 to 36	822	3	819	1	99.88	97.40
36 to 48	655	2	653	1	99.85	97.25
48 to 60	315	0	315	0	100	97.25
60 to 72	178	2	176	0	100	97.25

Table 4.

Cumulative Implant Survival Rate in the Mandible

Time Interval (months)	Implants at the Start of the Interval	Drop-Outs During the Interval	Implants at Risk	Failures During the Interval	Survival Rate Within the Period (%)	Cumulative Survival Rate (%)
0 to 12	1,412	4	1,408	9	99.37	99.37
12 to 24	1,274	3	1,271	3	99.77	99.14
24 to 36	1,098	2	1,096	1	99.91	99.05
36 to 48	561	3	558	0	100	99.05
48 to 60	361	1	360	0	100	99.05
60 to 72	78	0	78	0	100	99.05

Table 5.

Implant Failures

Time Interval (months)	Implant Mobility	Recurrent Peri-Implant Infections	Progressive Bone Loss	Total
0 to 6	15	18	0	33
6 to 12	0	2	0	2
12 to 24	0	3	2	5
24 to 36	0	0	2	2
36 to 48	0	0	1	1
48 to 60	0	0	0	0
60 to 72	0	0	0	0
Total	15	23	5	43

Table 6.

Distance Between the Implant Shoulder and the First Visible Bone Contact

Months	Mean DIB ± SD (mm)
12	0.89 ± 0.29
24	0.91 ± 0.28
36	0.95 ± 0.29
48	0.99 ± 0.30
60	1.03 ± 0.31
72	1.10 ± 0.30

anchorage components used for connecting the implants to the prosthetic framework. Five patients with maxillary ODs (5.37%) showed clip fractures or loosening; in three patients (3.22%) a gold-bar fracture occurred.

DISCUSSION

The Morse taper lock guarantees a superior mechanical stability compared to the external hexagonal connections, or butt joint design.[25,27] This results in a better short- and long-term clinical performance.[5,33-36] In a recent 4-year prospective clinical study on 1,920 Morse taper connection implants used in different prosthetic applications (e.g., FFA or FPP, SC restorations, and ODs) high survival (97.5%) and success rates (96.6%) were reported, with a mean DIB of 1.07 mm and very few prosthetic complications at the implant–abutment interface (0.65%).[5] In an 8-year study on 275 single-tooth restorations on Morse taper connection implants, Doring et al.[33] reported an implant survival rate of 98.2%, with no mechanical complications associated with the prosthetic components at the implant–abutment interface. In another similar study on single-tooth Morse taper connection implants with a mean follow-up period of 6.3 years, Weigl[34] found a very low percentage (1.3%) of abutment loosening. These results were confirmed by a recent study on 307 SC Morse taper connection implants, with a 4-year follow-up, where high survival (98.4%) and success rates (97.07%) were reported, with a mean DIB of 1.14 mm and a very low incidence of mechanical complications (0.66% abutment loosening).[35] The results of these studies are in accordance with previous work on Morse taper connection implants,[36,37] in which the use of tapered abutment connection, providing high resistance to bending and rotational forces during clinical function, reduced the risk of abutment loosening at the implant–abutment interface.

In the present study, only two prosthetic abutments became loose (0.37%) over a period of 6 years, in two SCs located in the posterior area of the mandible. No other complications occurred at the implant–abutment connection of FPPs or FFAs. In accordance with previous clinical studies on Morse taper connection implants,[33-37] this study has indicated that the pure taper interface-fit Morse taper connection can provide a very low incidence of prosthetic failures or biomechanical complications at the implant–abutment interface over a 6-year period. Features of the implant–abutment connection were considered to influence not only the mechanical behavior, but also the biologic behavior of implants.[37] Stability of the implant–abutment connection has been addressed to eliminate screw loosening, but also to distribute load more favorably in bone.[25,27,37] The effect of implant–abutment design on marginal bone level is, however, highly debatable.[37,38] Some authors have suggested that micromovements at the implant–abutment interface could lead to bone resorption.[11,39] This hypothesis still has to be tested, but Morse taper connection implants can certainly avoid micromovements at the implant–abutment interface, preventing crestal bone loss around implants.[40] Marginal bone stability has always been considered one of the most important reference criteria to evaluate implant success over time.[41]

Regardless of the surgical technique (submerged or non-submerged), it has been widely described in the literature that the marginal bone crest level around two-piece dental implants, with screw-type implant–abutment connections, is generally located 1.5 to 2 mm below the implant–abutment connection

after the first year of functional loading.[42,43] Even if the etiologic factors associated with early crestal bone loss have not been completely clarified,[44] the main factors hypothesized to be involved in the process of bone loss include surgical trauma, the formation of a biologic distance,[45] micromovements of the abutment,[11,45] and the presence and size of a microgap between the implant and the abutment.[46-48] It is perceived that initial bone turnover around an implant after establishment of biologic contact with bone results in a certain amount of bone loss.[45] However, scientific evidence supports the fact that bone loss is caused by combined and sustained activation of inflammatory cells that appear with the microgap at the bone level.[46-48] In implants with screw-retained abutments, this microgap of variable dimensions (40 to 100 μm) is colonized by bacteria.[48] The bacterial leakage and colonization of the microgap at the implant–abutment interface are responsible for generating a chemotactic stimulus, which stimulates the recruitment of inflammatory cells.[49,50] This finally results in the development of inflammatory reactions in the peri-implant soft tissues and bone loss.[48-50]

Some authors have advocated that a higher bacterial contamination may be related to a misfit at the implant–abutment interface caused by screw loosening.[6,8] Screw loosening can damage interfaces in implant components, favoring contamination of their internal parts by microorganisms. Bacterial leakage between implants and abutments occurs and this leakage is higher when the abutment screw is tightened and loosened repeatedly.[6,8] For these reasons, the Morse taper implant–abutment connection could provide an efficient seal against microbial penetration, significantly reducing the microgap (1 to 3 μm) dimensions at the implant–abutment interface, and contributing to a minimal level of peri-implant tissue inflammation.[51] With Morse taper connection implants, the gap is closed so tightly that the abutment and the fixture behave like a single piece; for this reason, there is effectively no microgap and no bacterial leakage.[51] With the tapered interference fit, moreover, the abutment emergence geometry leads to "platform-switching" advantages.[52,53] Lazzara and Porter[52] were the first authors to discover that the placement of platform-switched implants resulted in a smaller vertical change in the crestal bone level than was typically seen when restoring conventional implants with abutments of matching diameter.[52] The biologic rationale of the platform-switching design or horizontal set-off at the implant–abutment interface is actually explained as the consequence of the horizontal repositioning of the microgap.[53,54] Basically, the principle involved is to distance the abutment–fixture microgap away from the bone as far as possible. This is very important, because the microgap harbors bacteria that produce toxins; if bacteria are more distant from the bone, it is subsequently possible to minimize bone loss.[52-56]

Another consequence of platform-switching design is the increased space for more connective tissue, to improve the biologic seal. This space can guarantee excellent soft-tissue healing, with a thicker and larger well-organized amount of peri-implant soft tissues, protecting the bone crest from resorption. In a recent 5-year study on 185 single tooth implants, implants restored with matching diameter prosthetic components showed more bone loss than implants restored with platform-switched components.[55] These findings were confirmed in a recent 2-year randomized prospective multicenter trial, where the platform-switching technique resulted in significantly less crestal bone loss and excellent bone stability over time compared to implants conventionally restored with abutments of matching diameter.[56] The present study seems to confirm this excellent bone stability because minimal changes have been observed between the mean distance from the implant shoulder to the first crestal bone-to-implant contact at 1- and 6-year examinations. The mean bone level of the fixture was situated 0.89 and 1.10 mm from the reference point, after the first and the sixth year of functional loading, respectively.

CONCLUSIONS

The results of the current study indicate that the use of Morse taper connection implants represents a successful procedure for the rehabilitation of partially and completely edentulous arches, with a cumulative implant survival rate of 98.23%. At the end of the study, among 2,506 implants still in function, 2,318 implants (92.49%) were classified in the implant–crown success group, whereas 178 implants (7.10%) were classified in the satisfactory survival group, and only 10 implants (0.39%) were classified in the compromised survival group, after 6 years of functional loading. The high mechanical stability of Morse taper connection implants significantly reduces prosthetic complications (with a percentage of 0.37% abutment loosening, with only two loosened abutments during the whole study, in SC applications).

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