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Retrospective study of 15 years of survival rate of ATLAS® dental implant in 60 fully and partially edentulous patients

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Abstract

Introduction: This retrospective cohort study evaluates the 15-year survival rate of the microthread collar and platform switching structured Atlas dental implant ® of which the surface is treated with the anodic spark deposition method for micro-pore surface in fully and partially edentulous patients..

Material and Methods: Patients who had dental implant surgery in the period between November 1997 and November 2001, with a follow-up of at least 15 years, were investigated for clinical and radiological examination. A total of 357 implants were placed in the healed ridge and extraction socket with periodontal and periapical lesion of 60 patient. The data was evaluated to acquire implant survival rates, gender, implant diameter, length, shape, implant placement time, loading time, adjacent tooth, opposing tooth and kind of prosthesis. Panoramic X-rays were analyzed for marginal bone loss.

Results: Average 65.5 years old patient of male 32 and female 28 person were checked at 15-year follow-up. Two among 357 implants were lost (0.6%) 2 months after implant surgery due to insufficient osseointegration. Survival rate was 99.4% (2 implants were lost in 2nd surgery). All of 107 implants placed immediately in extraction socket were successful. All of 194 implants loaded immediately at implant placement surgery were successful. The gender, implant size, diameter, length and shape were not significantly different. The present of adjacent tooth, the kind of prosthesis (crown/splinted crown/bridge) and the opposing teeth/implant were also not significantly different. The marginal bone was not changed after functional loading. The soft tissue was maintained without swelling and inflammation.

Conclusion: In this retrospective study, the 10-year survival rate at implant and patient level was 99.4%. This study shows that Atlas® implants offer predictable long-term results as support in the treatment of fully and partially edentulous patients.

Forty years ago, the first dental implant to replace a missing tooth in human oral cavity was reported.[1] It was a sensational break thorough in dentistry as it marked a new era to restore chewing function and aesthetics.

The technique of placing titanium oral implants in healed edentulous sites and subsequently restoring the implant with prosthesis has been recognized to be a high predictive treatment for fully and partially edentulous patients. Previously, practitioners allowed a socket healing time of 12 months or longer before placing dental implants to restore an edentulous space.[2] The lag time brought the patient compromised comfort, function, and aesthetics. In 1978, the first report of a situation, in which the extraction followed by the placement of an implant into the fresh socket at the same appointment, was described as the "Tübingen immediate implant".[3] This method reduced the number of dental appointments, the time of treatment and the number of surgeries required. Short implants (10 mm) are another interesting alternative to avoid difficult tilted implant placement and advanced surgical bone augmentation in atrophic jaws.[4]

The implant-abutment configuration itself is also thought to affect peri-implant remodeling of bone. In so-called platform-switched implants, the diameter of the abutment is less than the diameter of the implant, resulting in a horizontal offset at the top of the implant that separates the crestal bone and the connective tissue from the interface. Early results of these platform switched implants showed no changes in peri-implant bone levels, contrary to standard platform-matched implants.[5] Atieh et al. concluded that marginal bone loss around platform-switched implants were significantly less compared to platform-matched implants (0.021–0.99 mm for platform-switched and 0.101–1.67 mm for platform-matched implants).[6]

Microthread collar structure when compared with non-microthread collar structure decreases the stress values in the cortical bone and implant-abutment complex in 3D FEA.[7] In this analysis, the stress value in the oblique force was significant difference between microthread and non-microthread structures at cortical bone in which the highest bone stresses have been reported to be concentrated.[8] In this study, Panoramic X-rays for survival rate calculation was evaluated.

Materials and Methods

A retrospective clinical study was made in the Cowell implant clinic center between November 1997 and November 2001 from patients with a follow-up of at least 15 years. The patient inclusion criteria were:1) patients with single missing teeth programmed for restoration with dental implants; 2) partially edentulous patients with free extremities programmed for restoration with dental implants; 3) patients requiring dental implant restoration of the entire dental arch; and 4) patients with sufficient bone width (minimum 6.75 mm) and height (minimum 8.5 mm). The exclusion criteria were: 1) patients with systemic diseases contraindicating any type of surgery; 2) patients with active disease of the implant bed (e.g., residual cysts); and 3)patients with bone atrophy requiring bone regeneration in both width and height.

The mean age of the patients was 67.5 years with a range from 38 to 91 years. The average loading time was 15 years 5 months and the shortest time period was 15 year and 1 month with 2 patients and the longest time was 16 years 3 months with 1 patients.

A total 357 dental implants were evaluated in 60 patients (28 females with 134 implants and 32 males with 223 implants) in molars (95 implants), premolars (52 implants), and the anterior tooth site (54 implants) of the maxilla (201 implants) and in molars (91 implants), premolars (37 implants), and the anterior tooth site (28 implants) of the mandible (156 implants). The short 8 mm implant (88 implants) and the longer 10 mm (196 implants), 12 mm implants (59 implants), 14 mm implants (11 implants), 16 mm implants (3 implants), of diameter 3.5 mm (3 implants), 3.7 mm (14 implants), 4 mm (209 implants), 4.5 mm (27 implants), 5 mm (95 implants) and 6 mm (8 implants) were placed in the healed ridge (250 implants) and the extraction socket (107 implants) which were positioned in the site of adjacent tooth (115 implants) and the teeth (179 implant) and the implant (176 implants) opposed with fixed prosthesis (44 crowns, 299 splinted crown and 12 bridges 2). The immediate loading (194 implants) was done in molars (23 implants), premolars (26 implants), and the anterior tooth site (51 implants) of the maxilla (100 implants) and in molars (41 implants), premolars (26 implants), and the anterior tooth site (27 implants) of the mandible (94 implants). (Table 1).

Surgical techniques

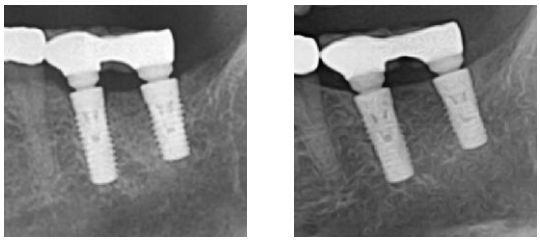
The ATLAS® dental implant (Cowellmedi Co. Ltd, Pusan, Korea) were placed using the same surgical protocol in all cases. Anesthesia was provided in the form of 2% lidocaine with epinephrine 1:100,000.A crestal incision was made with the raising of a full thickness mucoperiosteal flap. The surgical zone was subjected to curettage before the drilling

Table 1. Baseline characteristics of the patients

Variables	Value
Mean age (years)	63.5
Implant position:	
Maxillary Ant./P /M	54/52/95
Mandibular Ant./P /M	28/37/91
Implant Diameter(mm):	
3.5/3.7/4.0/4.5/5.0/6.0	3/14/209/27/95/8
Implant length(mm):	
8/10/12/14/16	88/196/59/11/3
Immediate loading position	
Maxillary Ant./P /M	51/26/23
Mandibular Ant./P /M	27/26/41
Site	
Extraction socket/healed ridge	107/250
With adjacent tooth /Without	115/240
Prosthesis	
Crown/Splinted Crown/ Bridge/ Full anchorage bridge	44/299/3/12
Opposing to site	
Tooth/Implant	179/115

phase, according to the recommendations of the manufacturer. The drill speed was reduced from 1200 to 60 rpm as the drill diameter was increased in order to reduce heating of the bone at the implant site. Drilling was carried out under irrigation with saline solution, and the implant was placed with a 25 rpm and 45N of torque. The space between extraction socket wall and implant was filled with CowellBMP® bone graft (Cowellmedi, Pusan, Korea) which are composed of the rhBMP-2 and HA/TCP biphasic particles. Suturing was carried out with 4/0 silk. All surgeries were completed in two staged surgery, except to immediate loading. A standard non-submerged healing abutment was used. All implants were loaded in the conventional healing period after implant placement. Panoramic X-rays (Vatec, Anseong, Korea) were made at the appointment of before surgery, after surgery and follow-up visit after loading (Figure 1).

Figure 1 Panoramic X-ray at first loading and last visit



Results

Implant survival

Two of 357 ATLAS® dental implants were lost at the healed ridges, resulting in a survival rate of 99.4 %. Any implant was not lost after loading.

Discussion

Implant survival

Long-term studies on survival and success rates of dental implants with a SLA surface are scarce, but recently two retrospective studies on 10-year survival and success rates of SLA-surfaced implants have been published (Buser et al. 2012; Fischer & Stenberg 2012). The first study reported a 10-year implant survival of 98.8% and a success rate of 97%, according to Buser's criteria (Buser et al. 1997, 2012). The second recent long-term controlled study on 10- year survival of SLA-surfaced dental im plants in edentulous patients showed a survival rate of 95.1% (Fischer & Stenberg 2012).

Two of 357 ATLAS® dental implants were lost at the healed ridges, resulting in a survival rate 99.4 % of 15 years follow-up, based on the Buser's success criteria (Buser et al. 1997), and therefore provides comparable results to the recent reports of Buser et al. (2012) and Fischer & Stenberg (2012).. The survival rate of two studies was the same. Two failed implants were placed in the soft bone of maxilla. These implants were not supported by the incomplete osseointegration.

Implant survival of immediate implantation in extraction socket

Clementini et al. (2013) concluded that Success rates for implants placed using a

simultaneous approach ranged from 61.5% to 100%; success rates for implants placed using a staged approach ranged from 75% to 98% in 13 studies.[10] Lang et al. (2012) concluded that the annual failure rate of immediate implants was 0.82% (95% CI: 0.48–1.39%), translating into the 15-year survival rate of 87.7% after implant placement in a total of 46 prospective studies.[11] In this study, Any implant of 107 implant was not failed after implant loading and the survival rate was 100 %. In comparison of this survival rate and the conclusion of Lang et al., Our survival rate 100 % is better than the 10 year survival rate after implant placement.

Implant survival of immediate loading

In this study, the immediate loading (194 implants) was done in molars (23 implants), premolars (26 implants), and the anterior tooth site (51 implants) of the maxilla (100 implants) and in molars (41 implants), premolars (26 implants), and the anterior tooth site (27 implants) of the mandible (94 implants). Any implant of 194 implants was not failed after implant loading and the survival rate was 100 %.

Implant survival of short 8 mm length implant

One of short 8 mm implant (88 implants) and one of the longer 10 mm (269 implants) were failed. There was no significant difference between 8 mm length implant and the other longer implants($p>0.05$). ,

Implant survival of extraction socket

Two failed implant of 357 implants were done in healed ridge with soft bone quality. All of 107 implant placed in the extraction socket were survived in follow-up period.

Conclusion

In this retrospective study, the 15-year survival rate at implant and patient level was 99.4%. This study shows that Atals implants offer predictable long-term results as support in the treatment of fully and partially edentulous patients.

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