

Retrospective observational study of the survival rate of SLActive® surface implants

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Introduction: Dental implants have a prominent role in the rehabilitation of edentulous patients, with satisfactory and predictable clinical outcomes, especially in relation to its survival rate over time. The need for high levels of success and survival rates, even in situations with reduced amount and quality of bone, coupled with the increasing demand for aesthetic and fast case resolution, has led to the development of surfaces that provide faster

osseointegration. **Objective:** To verify the survival rate of SLActive® surface implants. **Methods:** An observational retrospective study was performed through the analysis of the data registered in the medical records of 17 subjects who received SLActive® surface implants. The implant was included in the survival rate when it was considered as stable, asymptomatic and in function. **Results:** The data of 40 SLActive® implants, installed in 17 individuals with

different prosthetic planning (unitary, partial fixed and total fixed prosthesis) were assessed and resulted in a 100% survival rate in the studied control periods. The average control period was 46.6 months for the installed implants. **Conclusion:** The SLActive® surface showed a high implant survival rate, presenting itself as an excellent option for rehabilitation treatment in the daily dental practice. **Keywords:** Dental implants. Surface properties. Survival rate.

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INTRODUCTION

The discovery of osseointegration¹ have made dental implants important in the rehabilitation of total or partial edentulous patients, due to their expressive clinical results,² even after long follow-up periods.^{3,4} Primary stability is essential for the survival of dental implants and it is obtained at the time of their installation. Secondary stability develops during osseointegration⁵ and can be defined as a direct connection between the vital bone and the surface of implants subject to functional load.⁶

Osseointegration is dependent on factors such as biocompatibility, implant design, health of the individual receiving the implant, surgical technique, load control after installation and surface characteristics.¹ To increase the survival rates, a great variety of surface treatments, implant designs and materials –aiming at improving the primary and secondary stability, increasing bone-implant contact (BIC) and decreasing osseointegration time– have been developed.⁷

Titanium is the material of choice for dental implants due to its high degree of biocompatibility.⁸ Its surface, which was initially smooth (only machined), evolved to rough (treated) and is especially indicated for critical areas that have reduced bone amount and density, presenting the best survival rates.⁹ Dental implants with surface treatment have a higher surface roughness, which improves the contact between the bone cells and the implant,¹⁰ thus enhancing secondary stability.¹¹ In this context, it is argued that the implant surface topography has a fundamental role in the cellular and molecular mechanism of bone formation surrounding dental implants, favoring osseointegration.⁷

Many surface modifications have been proposed in search of better and faster osseointegration.¹² SLActive® surface implants are packed in

a nitrogen environment and preserved in isotonic solution, which increases their surface energy and makes them hydrophilic,¹³ which allows for cellular and tissue reactions that increases in 60% osseointegration in the first two weeks,¹⁴ promoting greater secondary stability in the initial stages¹⁵. Thus, the aim of the present study was to verify the survival rate of SLActive® implants, used in several types of prosthetic planning and control periods.

MATERIAL AND METHODS

The present retrospective and observational study was approved by FOB-USP ethics committee (process #1198771, August 25, 2015), being conducted by the analysis of medical records of individuals who received SLActive® implants between the years 2008 and 2011. The analysis of medical records was limited to verifying survival of the installed implants, in different follow-up periods, by adapting the survival criteria recommended by Misch et al:¹⁶ absence of implant mobility, painful symptoms in function or exudate. Thus, implants that were osseointegrated, asymptomatic and in function were considered as successful. Data was also collected regarding the type of prosthesis and the postoperative control period. It should be noted that clinical and radiographic examination of individuals was not performed, only data collection from the records.

RESULTS

Dental records of 17 patients who received 40 SLActive® implants were evaluated: 12 individuals received one implant, while the other individuals received two or more implants; one individual received 12 implants, being 8 in the maxilla and 4 in the mandible. Implants were used only in situations in which clinical and imaging examinations showed appropriate receptor sites,

Table 1: Type and amount of prostheses, and number of individuals and SLActive® implants used.

Type of prosthesis	Number of prosthesis	Number of Individuals	Number of implants
Unitary	13	12	13
Two elements fixed	1	1	2
Three elements fixed	5	1	9
Four elements fixed	1	1	3
Six elements fixed	1	1	1
Total fixed	2	1	12
Total	23	17	40

Table 2: Control times and number of implants.

Months	Number of implants
30.6	1
33.7	1
35.2	1
40.3	4
42.2	3
42.7	1
43.8	2
44.8	1
46.8	2
47.3	1
47.8	1
47.9	2
50.7	2
51.1	2
52.3	1
53.8	4
56.5	1
57.2	8
58.7	1
60.67	1

regarding height, width and bone quality; except in the case of 8 implants in the maxilla, because this had been previously reconstructed with autogenous iliac crest graft. Prosthetic and surgical planning was made according to the needs of each patient, as well as surgical technique and pharmacological treatment.

Table 1 presents the relationship between the types of prostheses (unitary, partial fixed and total fixed) and the number of patients and implants used. Table 2 illustrates the time from the installation of the implants until the last follow-up day, which was, on average, 46,6 months, ranging from 2.5 to 5 years. According to the data on the records, the survival rate was 100%, since there were no lost implants throughout the analyzed periods, as well as no implant mobility, painful symptoms in function or exudate in the implant surrounding areas. The data found in the records considered satisfactory the installed and in function prostheses.

DISCUSSION

The need of recovering aesthetics and dental function by replacing lost dental elements using osseointegrated implants –in small periods of time or even immediately after installation surgical procedure–, led to the development of surfaces that promote greater BIC in reduced time. In this context, it seems important to highlight that even for surfaces considered “faster”, the primary stability and absence of micromovements in the bone/implant interface are key for osseointegration.¹⁷

The modification of the SLA surface (SLActive surface) promotes greater surface energy and hydrophilicity, and has shown good clinical results,^{18,19} despite the short period for bone integration (21 days).²⁰ In a study with 276 SLActive implants® installed, the survival rate was 98.2%.¹⁸

The survival rate of the present retrospective observational study (100%) resembles the result of this study presented earlier, but is slightly better, probably due to the number of studied implants (40 implants).

The survival rate of SLActive surface implants was 97.9%, even for postoperative controls of 3¹⁹ and 12²¹ months post-immediate loading. In the present study, 10% of the implants (n = 4) were subjected to immediate loading and showed a 100% survival rate. It should be pointed out that these were part of a fixed lower complete denture, installed in the anterior mandible. Whereas in early loads, the survival rate up to 3 months and between 3 and 12 months was 98.2%, while between 13 and 24 months, it was 98.5%; and between 25 and 59 months, the survival rate has reached 100%.²² In the present study, a 100% survival rate was found regardless of the control time.

Chambrone et al.⁷ found that the average survival rate for SLActive® implants in their observational study was 97%, which is consistent, despite the slightly higher survival rates in the present results – which is believed to be due to the reduced number of implants used. However, in general, the survival rates found in the literature are quite satisfactory.

The influence of SLActive® surface in cellular and tissue immediate response during osseointegration seems to be the result of increased surface energy, which increases platelet and osteoblastic adhesion in the first hours²³. The increased regulation of osteoblasts differentiation and the decreased genesis of osteoclasts create a micro-environment that protects the bone around the implant and promotes an increase of osteogenesis and angiogenesis on the seventh day.^{24,25}

The increased expression of genes associated with TGFb-BMPs, as well as other relevant genes for bone repair, was considered a

response to the hydrophilic surface.²⁶ In comparison to the hydrophobic SLA surface, osseointegration presented bigger and better ossification within 2 to 4 weeks, indicating an early proliferation of vascular structures and migration of fibroblasts, which preceded the deposition of a thin layer of bone matrix.¹¹ The 100% survival rate in the present study is directly related to the better properties and effects on osseointegration of the SLActive® surface, even under adverse conditions. We highlight the fact that among the 40 implants analyzed in the present study, 8 (1 patient) were installed in the maxilla reconstructed with iliac bone graft, characterized by type IV bone. This fact confirms the indication, predictability and high survival rate of SLActive implants, even in critical areas. Similarly, we highlight that 13 implants were used for unitary prosthesis, which is considered a critical procedure when compared with implants installed for fixed partial or total prosthesis. The present study did not directly examine these effects, so we have no data to corroborate the above statement.

In a prospective multicenter study¹⁴ that evaluated 383 SLActive® implants installed in 266 patients, of which 197 were given immediate loading and 186 received early load (28 to 34 days after implant installation), the success rate after 1 year was 98% and 97%, respectively, and nearly half the patients had low quality bone (types III and IV). For the authors, the results indicate that this type of implant is safe and predictable, when used in immediate and early load procedures. In another prospective study,²⁷ 89 SLActive® implants were installed in 56 patients. The implants received load 21 days after the surgery, and clinical and radiographic criteria indicated a success rate of 97.7%. The observed survival rate is almost the same found in the present study.

A 95% survival rate was observed after two years control of 6-mm implants with SLActive® surface, in 40 implants installed in 35 individuals,²⁸ as well as a 92.3% survival rate in 100 implants (4-mm long) with SLActive® surface anchored in the severely reabsorbed mandible of 32 patients, at 2 years of post-operative control.²⁹ In low bone thickness cases, 48 SLActive® implants of reduced diameter (3mm) were installed in the severely reabsorbed posterior region of the mandible of 28 patients, achieving a 93.75% success rate after 5 years.³⁰ These survival rates reinforce the security and predictability of SLActive® implants, as noted in the present study. However, follow-up periods of 12 to 60 months^{19,22} showed no statistically significant difference between implants with SLA surface (95%) and SLActive® surface (97%), in medium and long term.

CONCLUSION

The use of SLActive® surface implants resulted in high survival rates, characterizing them as reliable and predictable implants.

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