

An Analysis of Dental Implants Survival and Success

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Osseointegration of a dental implant may encounter a variety of problems caused by various factors, as prior health-related problems, patients' habits and the technique of the implant inserting. Retrospective cohort study of 70 patients who received implants between January 2011- April 2016 in one dental unit, with Kaplan-Meier method to calculate the probability of implants's survival at 60 months. The analysis included demographic data, age, gender, medical history, behavior risk factors, type and location of the implant. For this cohort the implants' survival for the first 6 months was 92.86% compared to the number of patients and 97.56% compared to the number of total implants performed, with a cumulative failure rate of 2.43% after 60 months. Failures were focused exclusively on posterior mandible implants, on the percentage of 6.17%, odds ratio (OR) for these failures being 16.76 ($P = 0.05$) compared with other localisations of implants, exclusively in men with median age of 42 years.

Keywords: implant failure, Kaplan-Meier method, Relativ Risk

A lot of meta-analyses show that survival rates reach 93% of dental implants [1]. There is evidence that the most successful dental implants are the mandible compared to the maxilla [2]. It is also proved that the success of a dental implant is greater if the patient's bone was used and no bone graft. Losing screw's implants appears frequently, especially in one tooth restoration [3]. An implant is considered successful if: there is no pain, no mobility, no radiolucent, and loss of bone is smaller, about 1 mm to 2 mm after the first year [4]. Early complications appear before the implant's integration and often there are due to intraoperative or postoperative short term problems like: bleeding, damage on the adjacent teeth, fractured jaw, violated sinuses, excessive or insufficient osteotomy, bacterial contamination of the surgical wound, the absence of primary stability of the implant in the socket, loss of the implant attachment due to its fixation to the fibrous tissue instead of bone [5,6]. Late complications as peri-implantitis occur between 11- 47% of implants [7]. Identified risk factors for failure in dental implantology are: age over 60, smoking, estrogen therapy, head and neck irradiation. The most serious risk factor is diabetes. The persistence of hyperglycemia in diabetics inhibits the osteoblastic activity and increases osteoclastic activity by persistent inflammatory response, leading to diminishing bone formation in the healing process [8]. Most studies show a slight increase in the percentage of early failures of dental implants in diabetics compared with late failures in their case [9]. These failures mostly occur in the first year after the dental implant.

Experimental part

Material and method

Retrospective cohort study was made on 70 patients who received dental implants during January 2011-January 2016. All of these implants were performed as two-stage procedure with only two cases where one-stage procedure was chosen. The processed data were: age, gender, behavior risk factors as smoking and alcohol, single

or multiple implant, site of the implant, complications, failure, to establish correlations between these data and dental implant survival, calculating the relative risk RR. The dental implants were performed in patients with good bone offer, except one who required bone augmentation and complications were resolved favorably after 1 week. The most common medical history were caries or periodontal disease and behavior risk factors as smoking.

Inclusion and exclusion criteria

The only one inclusion criterion was that the patients had dental implants and restored in an unique medical unit between January 2011 and January 2016. Exclusion criteria consisted in unavailable patient records or absence in maintenance frequency more than 6 months.

Study variables

General Health Status Variables included: smoking habits, alcohol consumption and medical conditions as diabetes mellitus, high blood pressure and related diseases, allergies/Atopic syndrome. Implant and abutment-specific variables as the number of placed implants and the dimensions of the implant and abutment (length and diameter) were recorded. Clinical events as lack of primary stability and cover screw loosening were also recorded.

Statistical analyses. Data were processed with the *IBM SPSS Statistics 20* and *MedCalc*. Descriptive statistics (frequency distribution, cross tabulations, and 2 x2 tests) were used to produce a table of frequency counts and percentages for all values and to examine the association between variables. Associations between implant failure, number of required implants and age categories were evaluated by fitting an univariate logistic regression model for each variable. Risk factors based on univariate analyses were then entered into a multivariate logistic regression model that was adjusted for inclusion of age, sex, number of implants, to estimate relative risk and corresponding 95% confidence intervals for each variable.

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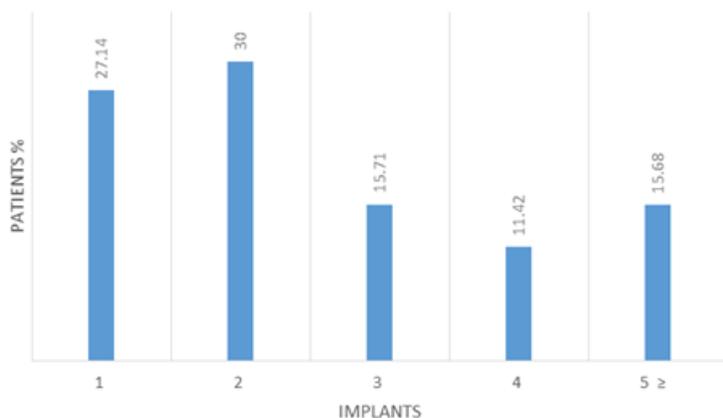


Fig. 1. Data regarding the number of implants

Results and discussions

Between January 2011 and April 2016, a total of 70 patients were provided with a total of 205 dental implants at the same medical unit, and 5 patients (7.14%) whom had failed implants were identified. Of these, 5 (7.14%) implants were lost, 4 in over 40-year-old patients whereas in the under 40-year-old patient category was only one failure. Of 70 patients included in the study, the gender ratio was 1.16:1; namely 36 (51.4%), male and 34 (48.6%) female. The patients' average age was 42 years, (standard deviation: 15.44; age range: 18–55 years). The age category ratio was 1.25:1, namely 39 (55.71%) under 40-year-old and 31 (44.28%) over 40-year-old. Behavioural risks were alcohol intake in 5.71% and smoking in 24.28%.

Were statistically significant differences in implant failure between under 40-year-old and over 40-year-old age categories patients, aged patients presenting 2.90 risk for failure compared to those under 40-year-old, ($P = 0.0437$) only for those who had both maxillary and mandibular implantation procedures, with no differences between males and females ($P = 0.1457$). Most subjects were healthy, with no illnesses or medical conditions noted in the medical records. High blood pressure and related diseases were present in 7.14%, allergies/Atopic syndrome in 7.14%. There is a significant relation between number of dental implants and age category ($P = 0.001$) in favor of the over 40-year-old patients, where seven and more implants were placed. Jaw site (maxilla and mandible in their anterior and posterior sectors) was significantly related to implant failure as failure was considered per implant (Pearson r correlation coefficient = 0.456). Most patients received double implant/30%, single/27.14%, triple/quadruple 15.71% and 11.42%, total 59 patients meaning 84.27% and 11 patients suffered 5 and over 5 implantations meaning 15.68% (fig. 1). Average number for implants in one patient was 2.95, considering that the average age for patients having already three dental implants worldwide is 55.5 years [10].

The number of placed implants did influence implant failure ($P = 0.0329$, 95% CI 1.2003 to 75.1909), relative risk being 9.50 for failure in more than seven placed implants compared to one. Of the total 205 dental implants, 107 were located on maxilla (52.19%) and 98 on mandible (47.81%). In 9 patients (3.38%) who required both maxillary and mandibular implantation, procedures were conducted in two sessions at weekly intervals. For four of them explantation has occurred, involving mandibular implants. The fifth failure also occurred at a mandibular implant, applied in a single session. This risk increases with age, being in our study 2.90 higher for patients over 40-year-old compared to those under 40-year-old, $P = 0.0437$. Reported to gender, explantation occurred

exclusively in men with median age of 42. We found a strong correlation with hypertension, where relative risk for explantation was 20 compared to others ($P < 0.0001$, 95% CI 4.7057 to 85.0029). All failures have been successfully corrected and completed. Kaplan-Meier estimator showed that all five failures occurred 3 months after implantation (95% CI for the median, 3.000 to 6.000). Implant survival over 60 months was not a problem for those five male patients, being obtained the same dental implant survival trend after restoring. The results show that older age is correlated with the failure of the implant as described also in the literature [11], with smoking and maxillary implant up to 4.87%.

Conclusions

The objective of this study was to identify risk indicators associated with implant failure in a sample of patients treated at one dental clinic. There were only early failure at a median of 3 months with excellent evolution at 60 months, after restauration. No statistically significant difference among patients was observed for age, except in multiple implants. Few medical conditions that were recorded, such as diabetes mellitus and Atopic syndrome did not play an important role in early implant failure, which is in accordance with the findings of other studies.

References

- GOODACRE, C. J., BERNAL, G., RUNGCHARASSAENG, K., KAN, J. Y. *J Prosthet Dent.*, 90, 2003, p. 121.
- LINDH, T., GUNNE, J., TILLBERG, A., MOLIN, M. *Clin Oral Implants Res.*, 9, 1998, p. 80.
- JIVRAJ, S. A., CHEE, W. W. *J Prosthet Dent.*, 93, 2005, p. 13.
- ALBREKTSSON, T., ZARB, G., WORTHINGTON, P. *Int J Oral Maxillofac Implants*, 1, 1986, p.11.
- *** Implant complications: multiple treatment modalities; few financial options, Scott Froum, DDS, and Kyle L. Summerford, October 15, 2014, <http://www.dentaleconomics.com/articles/print/volume-104/issue-10/features/implant-complications-multiple-treatment-modalities-few-financial-options.html>
- BRUNSKI, J.B. *Clin. Materials*, 10, 1992, p. 153.
- KOLDSLAND, O. et al. *J Perio Feb.* 81(2), 2010, p. 231.
- KAYAL, R.A., TSATSAS, D., BAUER, M.A., ALLEN, B., AL-SEBAEI, M.O., KAKAR, S., et al. *J Bone Miner Res.*, 22, 2007, p. 560.
- PELED, M., ARDEKIAN, L., TAGGER-GREEN, N. *Implant Dent.* 12, 2003, p. 116.
- Clifford, B., Starr, D.M.D., Mohamed, A., Maksoud, D.M. *J Oral Implantol.*, 32(3), 2006, p. 142.
- MOY, P.K., MEDINA, D., SHETTY, V., AGHALOO, T.L. *Int J Oral Maxillofac Implants.*, 20(4), 2005, p. 569.

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