Peiqiong Li

DEN 1200 OL20

08/07/2021

Analysis of Research: “An 11-Year Retrospective Research Study of the Predictive Factors of Peri-Implantitis and Implant Failure: Analytic-Multicentric Study of 1279 Implants in Peru”

Summary:

Frank Mayta-Tovalino, Yens Mendoza-Martiarena, Percy Romero-Tapia, et al, conducted a quantitative analysis of 1279 dental implants for 11 years in Peru. The research was published in the International Journal of Dentistry in June 2019 (https://www.hindawi.com/journals/ijd/2019/3527872/). The research aims to analyse the risk factors of implant failure and analyse the survival rate of osseointegrated dental implants that involved 22 covariates obtained from the clinical records, which included gender, systemic diseases, oral conditions, smokers, and treatment plan design and implementation, and took place in 5 public and private institutions. Shapiro–Wilk test was used to determine normality, and the Kaplan–Meier method was used to establish the statistical model. The research shows 5 aspects results, systemic risk factors, surgical risk factors, multivariate logistic regression, implant failure and survival rate, and distribution of implant survival according to headquarters. The failure rate of osseointegrated implants among the 5 institutions during 11 years is 17.98% and survival rate is above 96.5%. In conclusion, the variables preserve stable relation to the results included age, osteoporosis, bisphosphonates, history of periodontitis, bone quality, bone graft, connection, number of implants, GBR, and follow-up.

Article Information:

1. Title of the article: “An 11-Year Retrospective Research Study of the Predictive Factors of Peri-Implantitis and Implant Failure: Analytic-Multicentric Study of 1279 Implants in Peru”
2. Authors of the study: Frank Mayta-Tovalino, Yens Mendoza-Martiarena, Percy Romero-Tapia, et al
3. Publish: The research was published in the International Journal of Dentistry

https://www.hindawi.com/journals/ijd/2019/3527872/

4. Publish date: June 24th 2019
5. Link to the PubMed: https://pubmed.ncbi.nlm.nih.gov/31341478/
   PMID: 31341478 PMCID: PMC6612967 DOI: 10.1155/2019/3527872
6. Conflicts of interest: Authorization and permission were requested to carry out the collection of the clinical histories. And the authors state that there is no risk or conflicts of interest involved in the research since the study was retrospective.

Study Analysis:

Study type: The study type of the research is meta analyses and systematic reviews. Five private and public institutions in Peru, the Central Hospital of the Peruvian Air Force (HCFAP), Naval Medical Center (CMNAVAL), Universidad Peruana Cayetano Heredia at its headquarters San Martin de Porres (UPCH-SM),and San Isidro (UPCH-SI), and Universidad Privada San Juan Bautista (UPSJB) were involved in the research from January 2006 to October 2017.

Study purpose: The goal of the study is to analyse the risk factors that result in implant failure and osseointegrated dental implants contribute to survival rate by logistic regression statistical implants placed in private and public institutions.

Experiential design:

1. 1279 dental implants in humans were observed in UPCH-SI, HCFAP, CMNAVAL, UPCH-SM, and UPSJB. There was no control group since the study is retrospective. The criteria of the study participants to be selected included both sex, male and female, age from 18 to 80 years old, well controls systemic diseases, patients authorized the study and they are from hospitals of the armed forces and private universities, and patients have clinical histories that qualified the primary variables. However, patients with illegible clinical histories or with clinical histories and implants placed last less or longer than a year are excluded. Pre-clinical examination of all participants included pre-implant health status evaluated by radiographs, probing records, and collect covariate information through clinical records of 22 variables: [sex (X1), location (X2), hypertension (X3), antibiotic prophylaxis (X4), diabetes (X5), osteoporosis (X6), bisphosphonates (X7), history

of periodontitis (X8), hypercholesterolemia (X9), bone quality (X10), bone quantity (X11), design (X12), smoker (X13), connection (X14), edentulism type (X15), staging (X16), 3D guided surgery (X17), load (X18), bone graft (X19), peri-implantitis (X20), mucositis (X21), and guided bone regeneration (GBR) (X22)].

2. The study was conducted over time and observed for 11 years from January 2006 to October 2017.
3. The researchers used the measurement of mean and standard deviation of quantitative and qualitative variables to acquire univariate analysis which meant to explore each variable into a group of data. To detect the normality, the researchers used the Shapiro–Wilk test that tested the frequentist statistics. At last, the researchers combined each group of data to proceed with logistic regression to set up the analysis model to present the effectiveness of risk factors, and used the Kaplan–Meier method which analyzes the time of event to present the survival and failure of the implants.
4. The researchers analyzed all their findings by using statistical tables to represent the different effects of surgical and general risk factors.
5. The study was calibrated inter-examiner reliability since the study was conducted 11 years and in 5 private and public institutions by different specialists. Through the mean and standard deviation, the researchers obtain one variable quantity of frequency and percentage to perform descriptive statistics.

Results:

1. A. General risk factors indicate that females are predominant at UPCH-SM headquarters with 111 (50.9 %), and 431 (100%) antibiotic prophylaxis risk presented at all five institutions. Relatively, diabetes and osteoporosis only present 3 (20%) and 1 (1.8%) at UPCH-SM headquarters while some other institutions even have no case present. Only 5 patients (100%) presented with bisphosphonate consumption as risk factor at the UPCH-SI headquarters while other 4 institutions have no case present. History of periodontitis and hypercholesterolemia presented 49 (43.3%) and 21 (50%) at CMNAVAL with increasing risk compared to the other institutions.

B. Surgical risk factors indicate that bone quality was type II with 132 (38.2%) and the bone quantity was type B with 82 (33.7%) were predominant risk factors. Hybride design of dental implants was the most widespread with 123 (43.6%) compared to other two designs, conical and cylindrical. Bone grafts and GBR surgical risk factors were highly prevalent at UPCH-SI 86 (6.4%) and CMNAVAL 46 (36.5%). On the contrary, smoke habits, type of edentulism, and type of prosthetic load show low prevalence, and 3D guided surgery has no case present in all five institutions.

C. Multivariate logistic regression model reveals that variables age, osteoporosis, bisphosphonates, history of periodontitis, bone quality, bone graft, connection, number of implants, GBR, and follow-up were at more stable confidence intervals. Only the variables with odd ratio (OR) concern to be risk factors which included age, osteoporosis, history of periodontitis, bone quality, number of implants, GBR, and follow-up.

D. 23 Dental implant cases failure during 11 years study among 1279 total implants cases (17.98%). Thus, the authors deduced dental implant would be a great treatment for edentulous patients to alternate use for a long time. On the other hand, the survival rate is significantly reduced from 99.4% at the first to second year to 37.8% at the eleventh to twelfth year.

E. Overall survival rate within five institutions was above 96.5%. However, the survival rate will decrease as the continuous function of implants in the oral cavity over time.

2. The study shows that the authors statistically data in a meticulous way, especially the tables that organized all the data and showed the results of variables in a reliable and consistent pattern. Some results are sufficiently great to understand readily, whereas, some results are undefined. For instance, patients with bisphosphonate consumption, a drug that helps patients strengthen their bone and slow down the bone loss, have a significantly low present (5 present cases compared to 426 not present cases) of risk factor indication. The authors state that mandibular arch as risk factor was the primary presented with 77 cases (37.3%) at CMNAVAL headquarters. Whereas, the integrated data on the general

risk factors table indicated that the location of dental implants in maxillary and mandibular arch have similar considerations of risk, 225 maxillary implants vs 216 mandibular implants.

Conclusions:

The authors concluded several variables, age, osteoporosis, bisphosphonates, history of periodontitis, bone quality, bone graft, connection, number of implants, GBR, and follow-up, are in a relatively stable value, which means those variables have less effectiveness on osseointegrated implants. The number of failed dental implant cases within 11 years in all five institutions is 23, corresponding to the total size of the study objects, 1279, failure rate is 17.98%, that is to say, surgical osseointegrated implants treatments is advisable to most patients even though the patients with various risk factors or well controlled systemic diseases. In addition, the authors calculated the comprehensive survival rate among five institutions is above 96.5%. In other words, dental implants can be substitutes for natural teeth for edentulous patients in a successful outcome.

The authors mentioned there is a little research to analyze the survival rate of older patients with multiple chronic systemic diseases, smoking habits, and drugs that may affect osseointegration. Also, when the authors search for scientific evidence that is relevant to the topic, no studies or reports have been found. In that case, this statistical regression model of risk factors of dental implants initiated an opening of research to develop more excellence evidence to determine the influence of each risk factor. The researchers probably can investigate other difficult control influence factors, such as diet, race, and oral hygiene that they presume the possible effect on survival rate.

There are two main limitations that the authors indicate on the research. One is that the recent literature evaluated the risk factors of dental implant failure with confusing factors, and researchers or clinician’s extensive knowledge and understanding are essential requirements for other potential risk factors to be developed. Another one is, the research only analyzed each risk factor that affects the dental implant survival or failure rate separately. However, a patient might have several systemic diseases that all are risk factors of the implants, and the research did not analyze the combined risk factors.

Therefore, the authors bring a suggestion that more research could investigate long-term longitudinal studies of combined risk factors that truly affects implant survival or failure rate.

Impression:

I do think this study is important based on the findings. Even though the authors only analyzed each risk factor separately that influenced the survival or failure rate of dental implants, the results significantly expressed certain conditions that affected the dental implant survival or failure rate. Furthermore, the results in the research indicated what factors could be predictable, such as hypertension, and History of periodontitis. Hypertension as a risk factor presented in this study is 68 cases, compared to 363 not presented as risk factor cases, there still might be a chance of failure at some points. When we assess the patient's medical history and develop a treatment plan, we should inform the patient about the risks and benefits to avoid the patient's unrealistic expectations. There are 113 cases with history of periodontitis presented as a risk factor vs 318 cases not presented. Some patients with a history of periodontitis may have no confidence in the success of implant placement, they could be afraid that the dental implants will be lost with poor oral condition. We can use this information to educate patients about improvement of good oral hygiene will increase the dental implant survival rate.

After learning from this research, I was surprised about antibiotic prophylaxis as a risk factor that presented 100% effectiveness on all five institutions. As the authors mentioned, this study was to analyse each factor separately. I was wondering if antibiotic prophylaxis alone can have a great effect on implant failure. If I can explore more about this topic, I would like to learn more about the influence of combined risk factors on dental implant survival or failure rate.

One question about the implant failure rate calculation, total number of implant cases is 1279, loss case in the study is 23, the failure rate should be 1.798%, but the research says that the failure rate is 17.87%. If the failure rate is 17.98%, I personally think it is a little high. In addition, smoking habits only contribute to 7 out of 424 cases as a risk factor. I am curious about how many cigarettes they consume per day. Do one cigarette and one

pack of cigarettes consider the same effectiveness? If I can, I would like to learn more about this.