Is osteoporosis a risk factor for implant survival or failure?

Abstracted from

de Medeiros FCFL, Kudo GAH, Leme BG, Saraiva PP, Verri FR, Honório HM, Pellizzer EP, Santiago Junior JF.

Dental implants in patients with osteoporosis: a systematic review with meta-analysis. *Int J Oral Maxillofac Surg* 2018; **47:** 480-491. pii: S0901-5027(17)31484-4. doi: 10.1016/j.ijom.2017.05.021.[Epub ahead ofprint] Review. PubMed PMID: 28651805

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Question: Is there a difference in survival rate between implants placed in patients with osteoporosis compared to patients without osteoporosis?

Data sources An electronic search was performed in PubMed, Web of Science and the Cochrane Library and SciELO databases up to September 2016. References of included studies were also searched. English language restriction was applied.

Study selection Clinical monitoring studies with at least six months of follow-up, including retrospective studies, prospective studies, and controlled and randomised clinical trials. Clinical case studies were excluded from the sample and only studies with a minimum of five patients were considered. Adults with osseointegrated implants were considered for these studies. Exclusion criteria encompassed studies performed *in vitro*, animal studies, non-controlled clinical cases, studies with incomplete data or those unsuitable for data collection.

Data extraction and synthesis Four reviewers were involved in the research and screening process and disagreements were resolved by discussion. The quality of the studies was analysed using the bias scale from the Australian National Health and Medical Research Council (NHMRC). Data extracted from the studies included, when available: author, year of publication, study country of origin, number of patients, number of implants and sites, implant type, implant length and diameter, oral rehabilitation installation time, peri-implant bone loss rate, survival rate of implants in each situation analysed, follow-up time of each study, study type and drugs administered for the treatment of osteoporosis. For binary outcomes (implant failure) the estimate of the intervention effect was expressed in the form of a relative risk (RR) with the confidence interval (CI) of 95%. For continuous outcomes (marginal bone loss) the average and standard deviation (SD) were used to calculate the standardised mean difference with a 95% CI. A statistical test was used to express the heterogeneity among the studies. Publication bias was explored as well.

Results A total of 15 observational studies were included in the review. The total number of patients involved was 8859 (29,798 implants) and the average age was 63.03 years.

The follow-up period ranged from 0.75 to 22 years with a mean of 5.85 years. The smallest diameter used was 3.3 mm and the shortest implant length was 7 mm.

The relative risk (RR) of implant failure and mean marginal bone loss were analysed within a 95% confidence interval (CI). The main outcome of the meta-analysis indicated that there was no difference in implant survival rate between patients with and without osteoporosis, either at the implant level (RR 1.39, 95% CI 0.93–2.08; P = 0.11) or at the patient level (RR 0.98, 95% CI 0.50–1.89; P = 0.94). However, the meta-analysis for the secondary outcome revealed a significant difference in marginal bone loss around implants between patients with and without osteoporosis (0.18 mm, 95% CI 0.05–0.30, P = 0.005). Data heterogeneity was low. An increase in peri-implant bone loss was observed in the osteoporosis group.

Conclusions The implant survival rate in bone tissue with osteoporosis was similar to that of the control group at the implant level (P = 0.11) and at the patient level (P = 0.94). In conclusion, implants placed in patients with systemic osteoporosis did not present higher failure rates than those placed in patients without osteoporosis.

Commentary

Osteoporosis is a skeletal condition characterised by low bone mass and deterioration of the microstructure of bone, most often the spine, ribs, and hips.[1] The International Osteoporosis Foundation estimates that osteoporosis affects more than 200 million individuals worldwide.[2] The disease process in osteoporosis leads to defective bone formation and consequently weakening in the microstructure of trabecular bone, an increase in cortical porosity, bone fragility and the possibility of fracture. All of these raise concern for dental implant placement which is the topic of the systematic review. The PICO concepts in the review are incorrect. The intervention/exposure in this case is not the implants, but rather having or not having osteoporosis and what will affect the outcome of implant survival.

The review appropriately followed the methodology suggested and adapted the PRISMA statement to conduct the systematic review, searching several databases (four) to look for articles that met their inclusion criteria. Studies included in the search strategy were prospective, retrospective, cohort type/multicentre, case-control, cohort type/prospective and cross-sectional to assess osteoporotic and non-osteoporotic groups. As expected, the search strategy produced observational studies that were accepted for the review, 15 in total, of which six were retrospective cohort studies, five were prospective cohort studies, two were case-control studies and one was a cross-sectional study. A quality assessment was carried out using a level of evidence bias scale proposed by the

Australian National Health and Medical Research Council. Most of the included studies were classified as low level of evidence.

The overall results were presented in the narrative section of the published article and were represented in a forest plot figure (meta-analysis).

The results for failure rate at the implant level included ten studies in the meta-analysis, the overall result is not statistically significant p-value: 0.11(RR 1.39, 95% CI 0.93-2.08).

A different meta-analysis was done for the outcome of implant failure at the patient level; the meta-analysis included six studies and the overall results concluded with no statistically significant results (p-value 0.94, RR 0.98, 95% CI 0.50-1.89) and the third forest plot examined marginal peri-implant bone loss and included five studies. This was the only meta-analysis where the results were statistically significant favouring bone loss for the osteoporosis group with a marginal bone loss around implants between patients with and without osteoporosis (0.18 mm, 95% CI 0.05–0.30, P = 0.005).

From the conclusions, it seems that having or not having osteoporosis does not affect dental implant outcome. A modest peri-implant bone loss may be associated.

Another issue to discuss is the use of the outcome survival and failure, the first outcome proposed was survival rate, the results reported and the meta-analysis used failure as the outcome. Survival implies the technique may still be in function; failure is a different complication that implies that the technique was completely unsuccessful.

Overall, the results should be interpreted with caution due to the possible bias of the available evidence.

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1. DeShields SC Cunningham TD. Comparison of osteoporosis in US adults with type 1 and type 2 diabetes mellitus. *J Endocrinol Invest* 2018; doi:10.1007/s40618-018-0828-x. [Epub ahead of print]
2. Available at https://www.iofbonehealth.org/references-facts-and-statistics#ref_240 Kanis JA (2007) WHO Technical Report, University of Sheffield, UK: 66. (accessed February 2018)

Evidence-Based Dentistry (2018) **19**, 51-52. doi:10.1038/sj.ebd.6401307