THE EFFECT OF SMOKING ON SURVIVAL AND BONE LOSS OF IMPLANTS WITH A FLUORIDE-MODIFIED SURFACE: A RETROSPECTIVE ANALYSIS OF 1106 IMPLANTS PLACED IN DAILY PRACTICE

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INTRODUCTION:

Smoking is known to affect implant treatment outcomes. A recent systematic review reported lower survival rates and more bone loss of implants installed in smokers[1].

The last decade, most of the implant companies changed the implant surface to a moderately rough surface in order to enhance the osseointegration process. Fluoride-modified implants (Osseospeed™, Astra Tech®, Möldahl, Sweden) are grit-blasted with titanium dioxide particles followed by an additional treatment with diluted fluoride acid, which results in a nanoscale surface topography[2]. Results from experimental studies suggest that osseointegration is enhanced around these implant surfaces, especially during the first weeks of healing[2,3,4].The aim of this study was to compare survival and peri-implant bone loss of implants with a fluoride-modified surface in smokers and nonsmokers with respect to the jaw.

MATERIALS AND METHODS:

Patient files of all patients referred for implant treatment from november 2004 to 2007 were scrutinized. All implants were placed by the same experienced surgeon (BC) using the same implant system. The only inclusion criterion was a follow-up time of at least 2 years. After implant treatment all patients were invited for professional maintenance including radiographic follow-up. Implant survival and bone loss were assessed by an external calibrated examinator (SV) comparing digital peri-apical radiographs taken during recall sessions with the post-operative ones. Marginal bone level height was determined both at the mesial and distal site of the implant by measuring the distance between a reference point (Figure1) and the marginal bone to implant level. Statistical analysis was performed using SPSS 17 for windows.

RESULTS:

1106 implants in 300 patients (186 females, 114 males; mean age 56 years, SD 12.05, range 17-82) with a mean follow-up of 31 months (SD = 7.15; range 24-58) were included. 19 implants in 17 patients failed, resulting in an overall survival rate of 98.3% and 94.6% with the implant and patient as statistical unit respectively. Implant survival was significantly higher for nonsmokers compared to smokers both on implant level (98.7 % vs 96.7 %; p = 0.025; Figure 2) and patient level (95.7 % vs 88.3 %; p = 0.016; Figure 3).

The overall mean bone loss was 0.34 mm (n = 1076; SD = 0.65; range 0.00-7.10). Smokers lost significantly more bone compared to nonsmokers in the maxilla (0.74 mm, SD 1.07 vs 0.33 mm, SD 0.65; p < 0.001). The latter could not been found in the mandible (0.25mm, SD 0.65 vs 0.22mm, SD 0.50; p = 0.298). Implants installed in the maxilla showed significantly more bone loss compared with implants installed in the mandible both in smokers (0.74 mm, SD 1.07 vs 0.25 mm, SD 0.65; p < 0.001; Figure 4) and nonsmokers (0.33 mm, SD 0.65 vs 0.22 mm, SD 0.50; p < 0.001). All data are summarized in Figure 4.

CONCLUSION:

The present study is the first to compare peri-implant bone loss in smokers and nonsmokers from the time of implant insertion (baseline) to at least 2 years of follow-up. Implants with a fluoride-modified surface demonstrated a high survival rate and limited bone loss but smokers have more failures than non-smokers. Additionally, smokers are more prone for peri-implant bone loss in the maxilla. Whether this bone loss is predicting future biological complications remains to be evaluated.

References

1. *Strietzel, F.P., Reichart, P.A., Kale, A., Kulkarni, M., Wegner, B. & Küchler, I. (2007) Smoking interferes with the prognosis of dental implant treatment: a systematic review and meta-analysis. Journal of Clinical Periodontology 34: 523-544.*
2. *Ellingsen, J.E., Johansson, C.B., Wennerberg, A. & Holmén, A.(2004) Improved retention and bone-to-implant contact with fluoride-modified titanium implants. International Journal of Oral and Maxillofacial Implants 19: 659-66.*
3. *Cooper, .LF., Zhou, Y., Takebe, J., Guo, J., Abron, A., Holmen, A. & Ellingsen, J.E. (2006) Fluoride modification effects on osteoblast behavior and bone formation at TiO2 grit-blasted c.p. titanium endosseous implants. Biomaterials 27: 926-36.*
4. *Berglundh, T., Abrahamsson, I., Albouy, J.P. & Lindhe, J. (2007) Bone healing at implants with a fluoride-modified surface: an experimental study in dogs. Clinical Oral Implants Research 18: 147-52.*

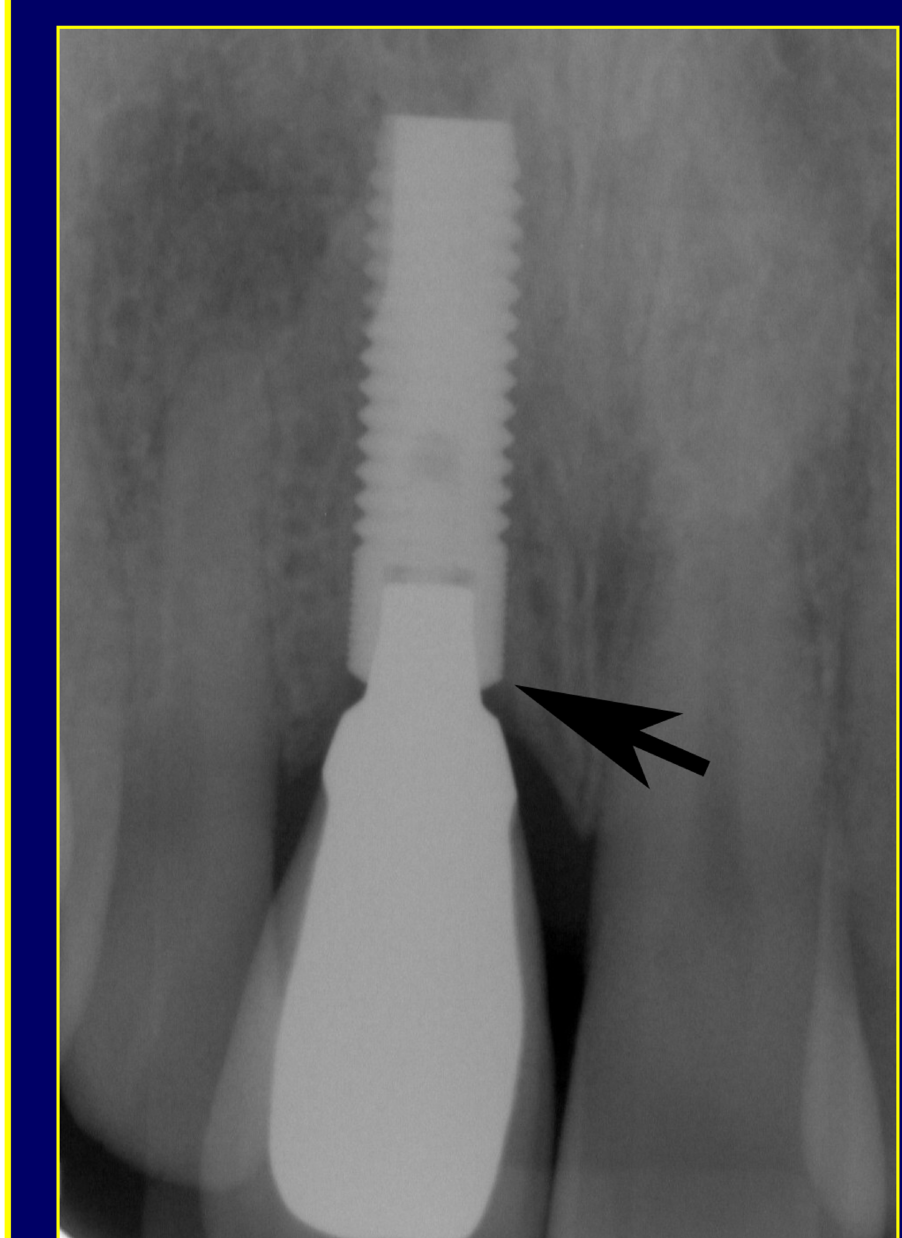

Figure 1: Reference point (lower border of the smooth implant collar or the uppermost point of the microthreaded part) indicated by black arrow.

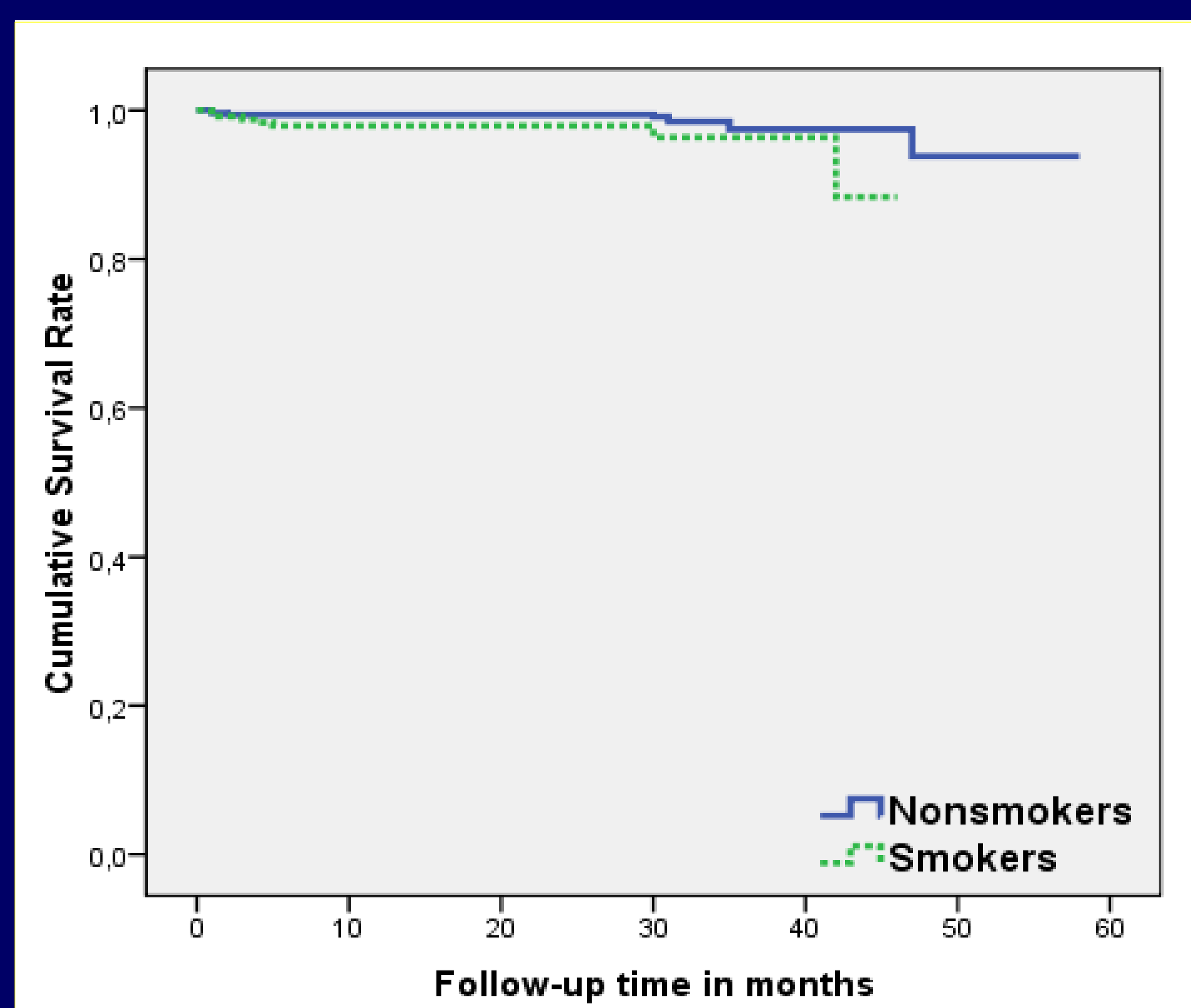

Figure 2: Kaplan-Meier Survival Curve showing implant failures in function of time for smokers and nonsmokers with the implant as statistical unit.

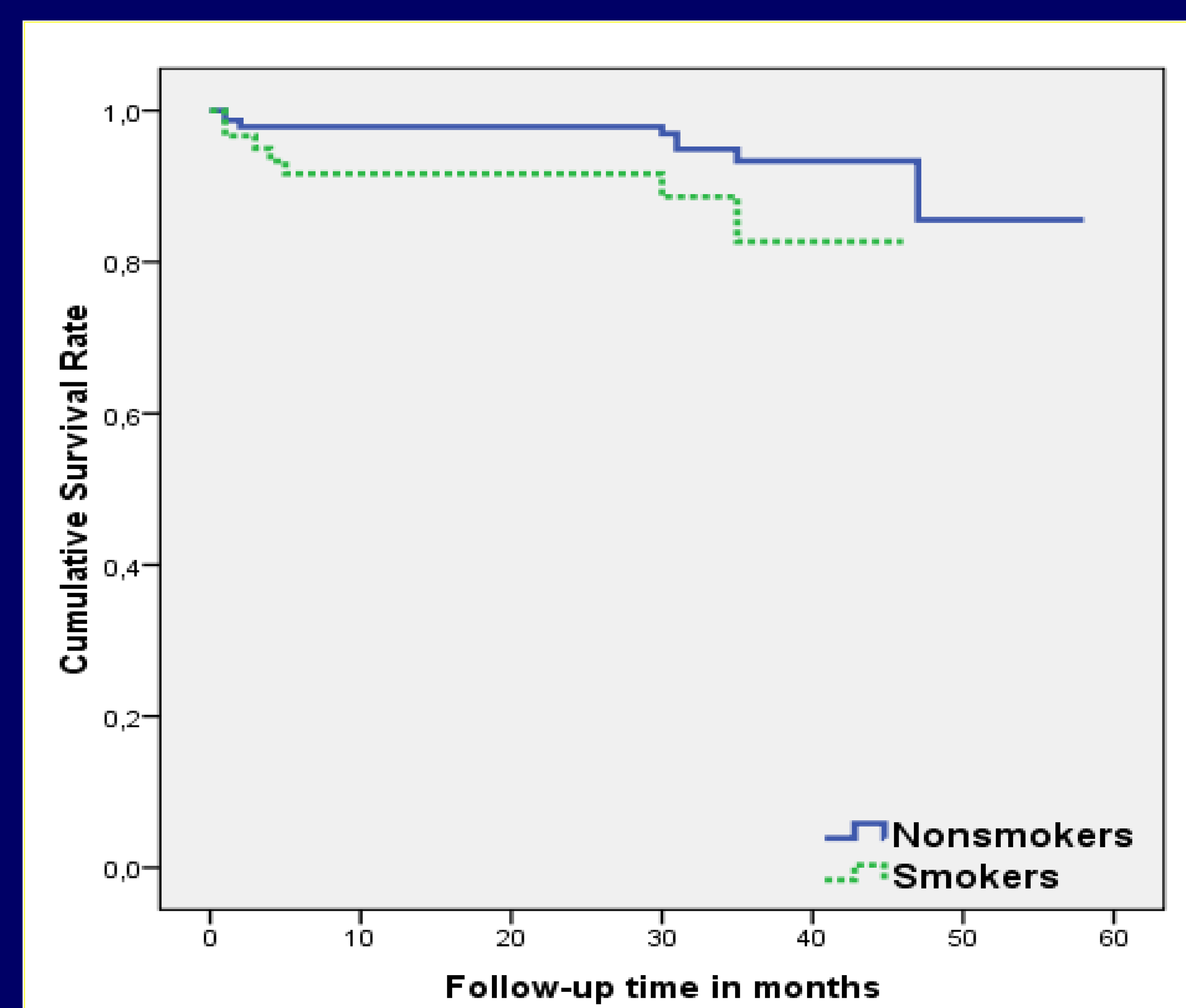

Figure 3: Kaplan-Meier Survival Curve showing implant failures in function of time for smokers and nonsmokers with the patient as statistical unit.

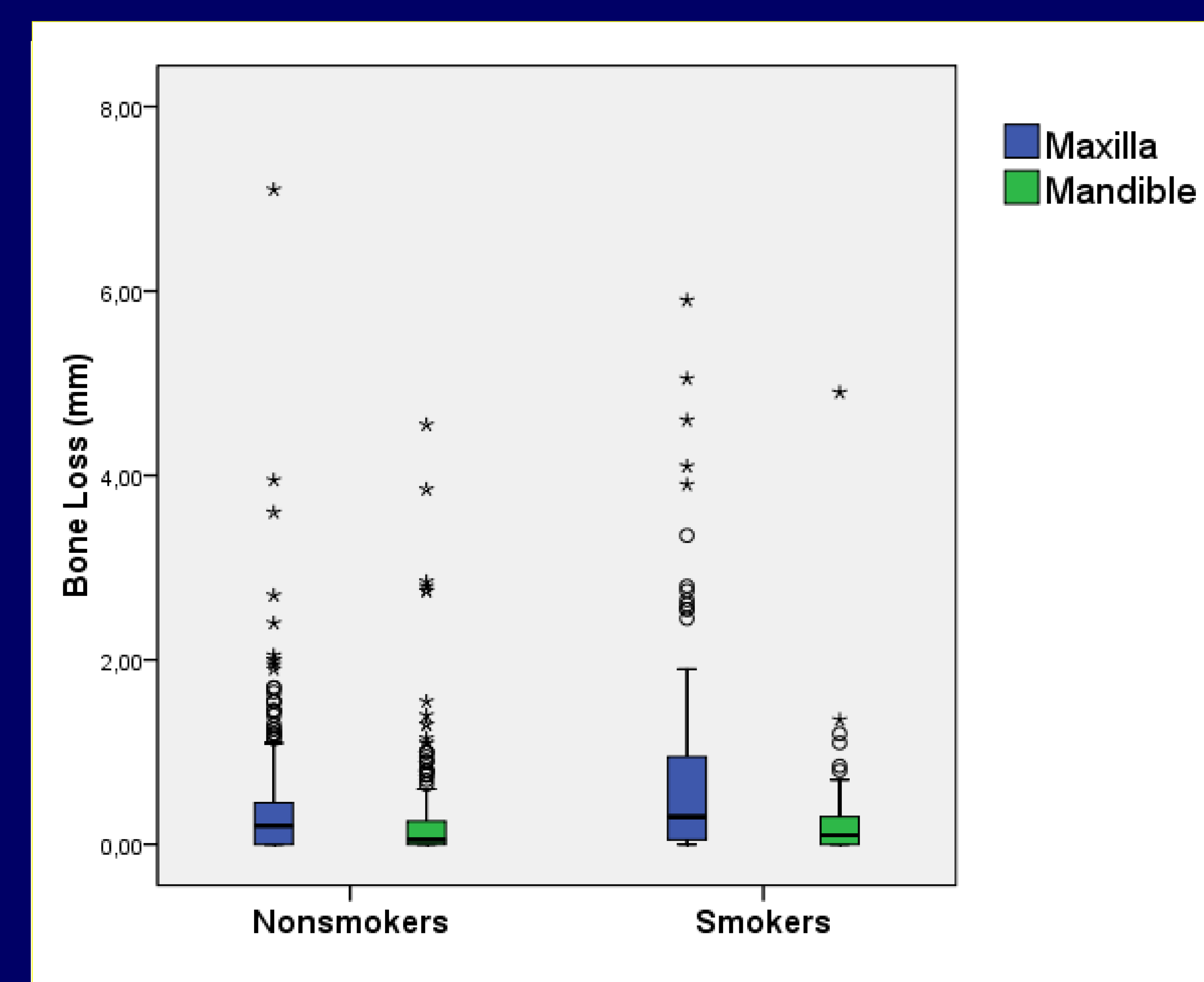

Figure 4: Boxplot presenting individual peri-implant bone loss in smokers and nonsmokers after at least 2 years, comparing maxilla (n = 492 in nonsmokers; n = 137 in smokers) and mandible (n = 337 in nonsmokers; n =97 in smokers).

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