



Correction Correction: Antonelli, A., et al. Can Bone Compaction Improve Primary Implant Stability? An In Vitro Comparative Study with Osseodensification Technique. *Applied Sciences* 2020, *10*, 8623

Alessandro Antonelli ^{1,*}^(D), Francesco Bennardo ¹^(D), Ylenia Brancaccio ¹, Selene Barone ¹^(D), Felice Femiano ²^(D), Ludovica Nucci ², Giuseppe Minervini ²^(D), Leonzio Fortunato ¹^(D), Ferdinando Attanasio ¹^(D) and Amerigo Giudice ¹^(D)

- ¹ Department of Health Sciences, School of Dentistry, Magna Græcia University of Catanzaro, 88100 Catanzaro, Italy; fbennardo92@gmail.com (F.B.); ybrancaccio@gmail.com (Y.B.); barone.selene19@gmail.com (S.B.); leo@unicz.it (L.F.); ferdinando.attanasio@gmail.com (F.A.); a.giudice@unicz.it (A.G.)
- ² Multidisciplinary Department of Medical-Surgical and Dental Specialties, University of Campania, Luigi Vanvitelli, 80138 Naples, Italy; femiano@libero.it (F.F.); ludovica.nucci@unicampania.it (L.N.); minervinigiuseppe@hotmail.it (G.M.)
- * Correspondence: antonellicz@gmail.com; Tel.: +961-712-446

check for updates

Citation: Antonelli, A.; Bennardo, F.; Brancaccio, Y.; Barone, S.; Femiano, F.; Nucci, L.; Minervini, G.; Fortunato, L.; Attanasio, F.; Giudice, A. Correction: Antonelli, A., et al. Can Bone Compaction Improve Primary Implant Stability? An In Vitro Comparative Study with Osseodensification Technique. *Applied Sciences* 2020, *10*, 8623. *Appl. Sci.* 2021, *11*, 3427. https://doi.org/ 10.3390/app11083427

Received: 15 March 2021 Accepted: 26 March 2021 Published: 12 April 2021

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2021 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https:// creativecommons.org/licenses/by/ 4.0/). The author wishes to make the following corrections to this paper [1].

1. Change in Figure

In the original article, there was a mistake in Figure 1 as published. During the check of the manuscript the authors observed that an incorrect picture was uploaded during the submission phases. The corrected Figure 1 appears below. The authors apologize for any inconvenience caused and state that the scientific conclusions are unaffected. The original article has been updated.



2. Text Correction

The authors provide some additional necessary information about the limitations of the study and the conclusion section.

"Moreover, the use of manual bone spreaders preserves a significant amount of bone, exploiting the elastic feature of the soft bone, positively improving the implant primary stability. Nevertheless, several in vivo studies are required to analyze any possible difference between the surgical techniques (BC and OD) performed in this study, in terms of histological healing and long- term clinical data with success rates".

Many sentences in the Discussion section have been modified in part to making sure that the readers could better understand the manuscript's aim:

"According to the literature, there is no clear correlation between PIT and ISQ. Furhermore, ISQ is not an effective one-time measurement parameter, however it is designed to be a time-related parameter [31]". "Clinical data and reviews have shown the effectiveness of the osseodensification procedure in improving primary and secondary stability in medullary bone [32,33]; as evidenced in several experimental in vivo and clinical studies, the osseodensification procedure have been proved to obtain the implant osseointegration from a biomechanical and histological point of view, using many implant microgeometry [34–36].

This concept, supported by histomorphometric and clinical analysis, showed how performing this surgical technique in soft bone can increase the primary implant stability values promoting new bone formation around the fixture, providing greater stability [36–41]".

"Removal torque does not provide data on implant stability directly, but rather represents a parameter indicating the relationship between bone and implant surface, especially for in vitro and ex vivo studies [44]. In fact, the removal torque testing is not a welldocumented clinical stability parameter in the literature."

"Both BC and OD are bone preservation methods. They are vastly different than under preparation standard drilling to create a misfit method. In our study, both groups osteotomies were not undersized and were within 0.2 to 0.3 mm smaller than the implant major diameter.

As recently assessed in a preclinical study implant site under-preparation with standard extraction drilling to create a misfit would lead to osteodestruction and the stress/strain linked to the severe downsized osteotomy could affect BIC and implant stability [29]. In fact, the micro-fractures performed in the peri-implant bone can cause a huge zone of dying osteocytes [48]. High interfacial pressures and mechanical under-preparation seem to produce a pro-resorptive environment as indicated by the lack of alkaline phosphatase activity and collagen I. Several authors assessed as the osseodensification technique produces bone chips usable as autografts during implant site preparation [49]. This phenomenon could play a main role in the implant site healing thanks to the osteogenesis and osteoconductive properties own of the autologous bone chips."

"The analysis of the values recorded in our study showed an excellent primary stability can be achieved performing both techniques; Although the ISQ measurement did not reflect any significance value specially in none human clinical oral sites [50,51], the high values recorded suggest a favourable condition to the osseointegration phenomenon. Moreover, the PIT values represent a more predictive parameter for the evaluation of the relationship between the implant surface and the surrounding bone during the implant placement, especially in clinical situations [52]. Furthermore, insertion torque and ISQ are assessed as independent and incomparable methods of measuring PS [53]. Primary implant stability could be underestimated, mostly in the presence of medium or low values of PIT and ISQ, showing insufficient in preventing errors when an immediate loading technique is performed [54]".

"Moreover, this research presents all the limitations of an in vitro study such as the absence of the implant osseointegration and the evaluation of the BIC (bone-implant contact) at the end of the healing process".

In the original article, many studies were not cited.

- 34. Lahens, B.; Neiva, R.; Tovar, N.; Alifarag, A.M.; Jimbo, R.; Bonfante, E.A.; Bowers, M.M.; Cuppini, M.; Freitas, H.; Witek, L.; et al. Biomechanical and histologic basis of osseodensifi-cation drilling for endosteal implant placement in low density bone. An experimental study in sheep. J. Mech. Behav. Biomed. Mater. 2016, 63, 56–65, doi:10.1016/j.jmbbm.2016.06.007.
- 35. Alifarag, A.M.; Lopez, C.D.; Neiva, R.F.; Tovar, N.; Witek, L.; Coelho, P.G. Atemporal osse-ointegration: Early biomechanical stability through osseodensification. J. Orthop Res. 2018, 36, 2516–2523, doi:10.1002/jor.23893.
- 36. Koutouzis, T.; Huwais, S.; Hasan, F.; Trahan, W.; Waldrop, T.; Neiva, R. Alveolar Ridge Expansion by Osseodensification-Mediated Plastic Deformation and Compaction Autografting: A Multicenter Retrospective Study. *Implant. Dent.* 2019, 28, 349–355, doi:10.1097/ID.00000000000898.

- 37. Lopez, C.D.; Alifarag, A.M.; Torroni, A.; Tovar, N.; Diaz-Siso, J.R.; Witek, L.; Rodriguez, E.D.; Coelho, P.G. Osseodensifica-tion for enhancement of spinal surgical hardware fixation. J. Mech. Behav. Biomed. Mater. 2017, 69, 275–281, doi:10.1016/j.jmbbm.2017.01.020.
- 38. Huwais, S.; Mazor, Z.; Ioannou, A.L.; Gluckman, H.; Neiva, R. A Multicenter Retrospective Clinical Study with Up-to-5-Year Follow-up Utilizing a Method that Enhances Bone Density and Allows for Transcrestal Sinus Augmentation Through Compaction Grafting. *Int. J. Oral. Maxillofac. Implants.* **2018**, *33*, 1305–1311, doi:10.11607/jomi.6770.
- 39. Tanello, B.; Huwais, S.; Tawil, I.; Rosen, P.; Neiva, R. Osseodensification protocols for enhancement of primary and secondary implant stability–A retrospective 5-year follow-up multi-center study. *Clin. Oral Implant. Res.* **2019**, *30*, 414.
- 40. Gaspar, J.; Esteves, T.; Gaspar, R.; Rua, J.; João Mendes, J. Osseodensification for implant site preparation in the maxilla-a prospective study of 97 implants. *Clin. Oral Implant. Res.* 2018, 29, 163.
- 41. Kumar, B.; Narayan, V. Minimally invasive crestal approach sinus floor elevation using Densah burs, and hydraulic lift utilizing putty graft in cartridge delivery. *Clin. Oral Implant. Res.* 2017, 28 (Suppl. 14), 203.
- 50. González-García, R.; Monje, F.; Moreno-García, C. Predictability of the resonance frequency analysis in the survival of dental implants placed in the anterior nonatrophied edentulous mandible. Med. Oral Patol. Oral Cir. Bucal 2011, 16, e664–e669, doi:10.4317/medoral.16982.
- 51. Bischof, M.; Nedir, R.; Szmukler-Moncler, S.; Bernard, J.P.; Samson, J. Implant stability measurement of delayed and im-mediately loaded implants during healing. Clin. Oral Im-plants Res. 2004, 15, 529–39, doi:10.1111/j.1600-0501.2004.01042.x.
- 52. Greenstein, G.; Cavallaro, J. Implant Insertion Torque: Its Role in Achieving Primary Stability of Restorable Dental Implants. Compend. Contin. Educ. Dent. 2017, 38, 88–95, PMID: 28156122.
- 53. Lages, F.S.; Douglas-de Oliveira, D.W.; Costa, F.O. Relationship between implant stability measurements obtained by in-sertion torque and resonance frequency analysis: A systematic review. Clin. Implant. Dent. Relat. Res. 2018, 20, 26–33, doi:10.1111/cid.12565.
- 54. Degidi, M.; Daprile, G.; Piattelli, A. Determination of primary stability: A comparison of the surgeon's perception and ob-jective measurements. Int. J. Oral Maxillofac. Implants 2010, 25, 558–561, PMID: 20556255.

The authors are sorry for any inconvenience caused and state that the scientific conclusions are unaffected. The original article has been updated.

Conflicts of Interest: The authors declare no conflict of interest.

Reference

 Antonelli, A.; Bennardo, F.; Brancaccio, Y.; Barone, S.; Femiano, F.; Nucci, L.; Minervini, G.; Fortunato, L.; Attanasio, F.; Giudice, A. Can Bone Compaction Improve Primary Implant Stability? An In Vitro Comparative Study with Osseodensification Technique. *Appl. Sci.* 2020, 10, 8623. [CrossRef]