## LETTER TO THE EDITOR

## More about accuracy of peri-implant bone thickness and validity of assessing bone augmentation material using cone beam computed tomography

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Answer to the letter:

We appreciate the interest of Siamak Sabour, Elahe Vahid Dastjerdi and Maryam Moezizadeh [1], who read our paper 'Accuracy of peri-implant bone thickness and validity of assessing bone augmentation material using cone beam computed tomography' [2] and ask for additional statistical analysis, e.g. for weighted kappa and intra-class correlation coefficient (ICC). To our experience, the opinions of professional mathematicians about the mathematical methods to apply differ significantly

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D. Wang · Z. Chen Department of Oral Implantology, Guanghua School and Hospital of Stomatology and Institute of Stomatological Research, Sun Yat-sen University, Guangzhou, Guangdong, China and so we tend to follow the KISS principle. However, it is our pleasure to present more analysis data about our study. Table 1 shows the statistical results of qualitative evaluations of five observers who were asked for existence of bone augmentation material (BAM), for completed integration of BAM in bone and for completeness of hard tissue covering of the implant surface. Following the request of Sabour et al., we added positive and negative predictive value, likelihood ratio as well as odds ratio to Table 1. Furthermore, we added Fleiss' kappa. This is a modification of Cohen's kappa adequate to check overall agreements between more than two observers telling dichotomous answers. The intra-examiner reliability for the five observers for qualitative BAM evaluation (kappa) was 0.772, 0.787, 0.844, 0.481 and 0.747 (p=0.0001).

As for ICC, it is dedicated for data from more than two observers. We had only two observers for the quantitative measurements of bone thickness and therefore applied the 'Pearson product-moment correlation coefficient' (PPMCC or PCC), which is adequate to analyse the linear dependence between two variables. The PCC for intra-observer correlation of the radiological readings was 0.937 (observer D.W.) and 0.972 (observer A.K.), respectively. The PCC for the interobserver correlation was 0.936. If ICC is calculated

Table 1 Qualitative assessment of peri-implant bone and BAM in CBCT and in histology

BAM existence	BAM integration	Implant covered	
23/30 (76.7 %)	6/23 (26.1 %)	18/30 (60.0 %)	
205/300 (68.3 %)	60/177 (33.9 %)	106/300 (35.3 %)	
0.77	0.25	0.60	
0.77	0.59	0.39	
0.60	0.74	0.71	
0.86	0.43	0.67	
0.44	0.85	0.44	
1.92	2.31	1.35	
0.38	0.55	0.85	
5.01	4.21	1.58	
0.28	0.22	0.22	
0.47	0.25	0.25	
	BAM existence 23/30 (76.7 %) 205/300 (68.3 %) 0.77 0.77 0.60 0.86 0.44 1.92 0.38 5.01 0.28 0.47	BAM existence         BAM integration           23/30 (76.7 %)         6/23 (26.1 %)           205/300 (68.3 %)         60/177 (33.9 %)           0.77         0.25           0.77         0.59           0.60         0.74           0.86         0.43           0.44         0.85           1.92         2.31           0.38         0.55           5.01         4.21           0.28         0.22           0.47         0.25	

for these data, the result is close to the PCC, but it would not be adequate to report such a number for data based on only two observers. We might have recruited more observers for the bone measurement, but we doubt that this effort would have changed a lot.

Conflict of interest The authors declare that they have no conflicts of interest.

## References

- 1. Sabour S, Dastjerdi EV, Moezizadeh M (2013) Accuracy of periimplant bone thickness and validity of assessing bone augmentation material using cone beam computed tomography, is this correct? Clin Oral Investig. doi:10.1007/s00784-013-0944-0
- 2. Wang D, Künzel A, Golubovic V, Mihatovic I, John G, Chen Z, Becker J, Schwarz F (2012) Accuracy of peri-implant bone thickness and validity of assessing bone augmentation material using cone beam computed tomography. Clin Oral Investig. doi:10.1007/ s00784-012-0841-y

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