

The Appropriate Choice of Data Analysis in Split-Mouth Randomized Controlled Trial

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Effect of Micro-Osteoperforations on the Rate of Orthodontic Tooth Movement: A Randomized Controlled Trial

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DEAR EDITOR-IN-CHIEF

We have read with great interest the original article entitled “Effect of Micro-Osteoperforations on the Rate of Orthodontic Tooth Movement: A Randomized Controlled Trial” by Amish Mehta et al. published in the Journal of Contemporary Orthodontics [2020; 4(1):12-20]. We want to congratulate the authors for their fruitful original article and make some contributions.

In the original article, the study design was a prospective randomized controlled trial with split-mouth design in which 13 subjects provided 26 maxillary canines which were randomly assigned into two groups, where Group 1(control-side quadrant) received only orthodontic treatment and Group 2 (the experimental-side quadrant) received both the orthodontic treatment and micro-osteoperforations. In the statistical analysis, it was mentioned that they performed an independent t-test to compare the a) Mean distal movement of canine every month in control and experimental groups and b) Rate of distal movement of canine in the experimental and control groups. We would like to bring to the esteemed attention of the authors that the choice of a statistical test which assumes independence may prove erroneous in the context of this split mouth design. For split-mouth studies, statistical analyses that take into account the paired nature of the data must be considered, and the appropriate statistical test will depend on the nature of the outcome, either categorical or quantitative.¹ An erroneous choice of statistical test provides

incorrect type I and type II error rates, which can lead to misleading conclusions. When the paired nature of the data is not considered, the resulting variance is higher than the actual variance, and an erroneous standard error will be obtained with underestimated p values.² On the other hand, in split-mouth studies, the observations on the control and experimental group are not independent which results in the large degrees of freedom, which ultimately results in a smaller critical value for the t-test, and increases a chance of finding statistically significant results.

Employing inappropriate statistical methods bears the negative consequence of leading the reader into an unwarranted confidence in discerning the common conclusions of “no statistically significant difference between two treatment groups”. This can be due to three reasons: 1) Truly no difference exists, 2) Possibility of a real type II error which may be due to inadequate sample size, and 3) Inappropriately applied test statistics³ However, the inappropriate usage of tests does not necessarily mean erroneous conclusions were reached, but it indicates that the analysis had an unnecessarily low level of power, resulting in an increased probability of making ‘no significant difference’ conclusions. Given the complexity of split-mouth designs, it is advisable to seek statistician’s consultation when such designs are implemented.

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