$D_o(x)$ and $D_i(x)$ are outer-diameter and inner-diameter function through the engaged part to compensate for variation through the cross-sectional area along the shaft. Besides pitch and depth characteristic of threads, there are several other properties that have influence effect on the screw and the peripheral bone stresses such as flutes, degree of taper, thread type, top radius curvature, flank angle, bottom radius of curvature, length of the straight part at the bottom of the thread, and length of threaded part (Hansson and Werke, 2003; Wu *et al*., 2011). Hence, the modified version still lacks considerations for many of these designation variations. The miniscrews that Migliorati *et al*. used in their work were not all cylindrical, in addition to other dissimilarities; therefore the original formula would not be the best option. I believe that according to such dissimilarities between applied materials, the results may not be feasibly generalized. Moreover, controlling for other variables would better elucidate the pure effect of a specific miniscrew character in both numerical and experimental studies.

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Reply

Sir,

We would like to thank A and M Poorsattar Bejeh Mir for their comments on our article. We appreciated the appropriate and consistent comments on the use of Chapman formula (1996) and the modifications suggested by Tsai *et al.* (2009) later.

The aim of our research (Migliorati *et al.*, 2012) was to evaluate if orthodontic miniscrew geometrical characteristics can affect primary stability. In particular, we measured and analysed three components of the thread of the screws: the depth of the thread, the pitch and the relationship between these two components, also called Thread Shape Factor (TSF). The setting of the *in vitro* test was designed to avoid as much as possible bias due to heterogenous parameters, such as organic bone, external conditions, length of the threaded part of the screw within the bone. We found a statistical correlation between TSF and both maximum insertion torque and pull out value. This correlation underlines how geometrical features of miniscrews plays a key role in the mechanical interlock with the bone. Thus the aim of our research was not to validate the TSF as predictable factor to predict experimental pull out strength. Tsai's research provided an experimental test to compare six different pedicle screws pull out value, verify the accuracy of Chapman's formula, and finally produce a new formula that resulted in more correlation with experimental test values. Two significant aspects should be underlined: 1) the synthetic bone sample was homogenous: no stratification of cortical and marrow bone was provided, in fact, Tsai *et al.* (2009) stated: 'the applicability of the new formula should be further investigated for predicting the pullout strength of the inserted screw within the cancellous bone. For

example, the ultimate shear strength of the squeezing effect bone chips with the higher porosity might be reformulated' 2) the engaged length of the screws within the bone sample was 30 mm for all the screws, even if this didn't result in an equal portion of threaded part among the pedicle screws.

We agree with their comments regarding the shape of the miniscrew: cylindrical and conical forms should carefully be considered and separately investigated. As Tsai reported, 'pullout strength of pedicle screw was the result of a number of varying parameters, not only the conical- and cylindrical- shaped profile'. Furthermore, it is necessary to specify that an appropriate mathematical evaluation of the pull out strength of the miniscrews should consider the self-tapping and self-drilling properties of these devices and not the use of pilot holes.

We deem that a comprehensive evaluation of clinical primary stability of temporary anchorage devices should include not only all the factors related to the miniscrew as they stated but also all the characteristics of a bilayer viscous-elastic material such as the alveolar bone, and, lastly, the relationship between these two materials during the placement phase.

The TSF we mentioned in our articles described a little part of this whole array, and as a limit we can affirm, it is strictly related to the bone sample properties; therefore, we can agree with the authors that the TSF should be further investigated.

We want to sincerely thank the authors of the letter for their steady and in-depth observations on this subject.

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