



READER'S FORUM

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Comparison of the predicted and achieved labiolingual inclinations of the maxillary central incisors in adult Class II division 2 malocclusions treated with clear aligners.

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I would like to express my sincere appreciation to you for your dedicated contributions to this study. I have several questions regarding the research and would be grateful if you could provide further clarification or insights.

Q1. Although the mean torque error in your study ranged from 3.74° to 4.51°, you did not define whether this level of error falls within a clinically acceptable range. Could you clarify the criteria by which you considered this error acceptable? If available, please provide any relevant literature or clinical guidelines that support your assessment.

Q2. As presented in Table 2, the standard deviations (SDs) were 3.17° for attachments and 2.75° for Power Ridges® (Align Technology, Santa Clara, CA, USA), which are relatively large in relation to the corresponding mean differences (3.74° and 4.51°, respectively). I would appreciate it if you could elaborate on the clinical implications of this level of variability, particularly in relation to how you interpret these findings with respect to clinical reliability.

Q3. As aligner wear time and patient compliance are known to directly influence torque expression, I was

wondering how you defined non-compliance in the five excluded patients. Could you also elaborate on whether differences in wear time among the included patients might have affected your results regarding torque predictability?

Questioned by

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A1. Thank you for this important point. Small angular discrepancies of 3–5° in anterior torque are generally considered clinically tolerable for two reasons:

1. Benchmark from fixed-appliance biomechanics (torsional play). Even with full-size rectangular wires, conventional edgewise systems exhibit engagement angles (i.e., torsional play) on the order of ~4.6° in 0.018-slot appliances with 0.018 × 0.025-inch (in) wires and ~6° in 0.022-slot appliances with 0.021 × 0.025-in wires.¹ Thus, deviations of this magnitude are inherent to routine clinical mechanics and are typically accommodated during finishing without compromising function or esthetics. Our mean absolute torque differences (3.74–4.51°) fall at or below these well-documented ranges.
2. Finishing standards set by the American Board of Orthodontics Cast–Radiograph Evaluation grades buccolingual inclination in millimetres of crown displacement (penalizing ≥ 0.5–1.0 mm), not degrees of “perfect” torque, reflecting that small angular deviations are acceptable when overall occlusion, overbite/overjet and contacts are satisfactory. This supports interpreting minor torque

discrepancies as clinically acceptable provided functional/esthetic goals are met.

In our sample of Class II division 2 cases, the mean absolute torque differences were $4.51 \pm 2.75^\circ$ (Power Ridges[®]) and $3.74 \pm 3.17^\circ$ (attachments), values consistent with the above benchmarks.

A2. We appreciate this observation. The relatively large SDs reflect between-case heterogeneity in how torque is expressed with clear aligners rather than measurement imprecision. At the population level, torque predictability with both Power Ridges[®] and attachments is moderate, with mean absolute errors centered around $4-5^\circ$. At the individual case level, variability is clinically relevant: while many patients fall within a $3-5^\circ$ band, some may approach $\sim 10^\circ$, particularly when larger torque corrections are prescribed. We therefore recommend (and have clarified in the Discussion): (1) plan modest overcorrections for maxillary incisor torque in Class II division 2, (2) monitor early response and employ targeted refinements if needed, and (3) consider auxiliaries in cases requiring larger or more controlled torque.

A3. Thank you for raising this point. In our dataset, the five excluded patients were classified as non-compliant based on documentation in the clinical notes showing self-reported wear substantially below the prescribed 22

hr/day and/or poor aligner fit requiring backtracking multiple stages specifically attributed to under-wear. These criteria reflect standard clinical markers of poor compliance.

For the included patients, charts did not document non-compliance by these criteria. All were instructed to wear aligners 22 hr/day and change aligners every two weeks. While small differences in day-to-day wear are inevitable in any real-world sample, this will be equally occurring in both groups. This likely diluted the observed torque expression (increasing absolute error and SDs). Therefore, our results are best viewed as a conservative estimate of torque predictability under routine clinical conditions.

Replied by
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Reference

1. Archambault A, Lacoursiere R, Badawi H, Major PW, Carey J, Flores-Mir C. Torque expression in stainless steel orthodontic brackets. A systematic review. *Angle Orthod* 2010;80:201-10. <https://doi.org/10.2319/080508-352.1>

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