

**Initial Evaluation of a Novel 6D QA Phantom (HexaCheck) for Daily 6D Couch Correction Assessment**  
**JE Roring\*, D Stanley , N Papanikolaou , AN Gutierrez , University of Texas HSC SA, San Antonio, TX**  
**Presentations**

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Purpose: Treatment couches with 6D correction capabilities have become a regular part of IGRT. While 6D couches have been shown to function mechanically well, phantoms for daily angular QA accuracy assessment have yet to be commercially available. Standard Imaging™ has developed a phantom designed for daily verification of pitch, roll, and yaw corrections. In this study, the mechanical integrity, reproducibility, and daily 6D correction stability of the phantom using both volumetric (Elekta™ XVI kV-CBCT) and orthogonal kV (Brainlab ExacTrac) imaging was evaluated.

Methods: The HexaCheck is a rotating base that works in conjunction with the MIMI imaging phantom. The MIMI is placed inside the HexaCheck and secured to prevent motion. The HexaCheck has screws in each rotational direction (pitch, roll, and yaw) along with a spring-loaded peg to lock each direction firmly. When a peg is released, the HexaCheck rotates 2.5° solely in that direction. Mechanical integrity was assessed using a level with 0.05° precision. For daily 6D corrections, a high resolution reference CT (0.59 X 0.59 X 1.25 mm<sup>3</sup>) of the HexaCheck was acquired. Ten (n=10) independent, daily acquisitions using both the ExacTrac with the 6D Brainlab™ couch and the Elekta XVI kV-CBCT with the HexaPOD™ couch were acquired to test detection and positioning accuracy.

Results: Physical measurements show that the HexaCheck rotations for pitch, roll, and yaw were 2.43±0.05 deg, 2.50±0.05 deg, and 2.62±0.05 deg, respectively. Maximum mean values for the imaging registration accuracy were 0.2° and 0.3° for ExacTrac and XVI, respectively. Maximum mean values for the couch positioning accuracy were 0.1° and 0.2° for the Brainlab couch and HexaPOD, respectively.

Conclusion: The HexaCheck performance yields consistent results for daily testing in all three rotational directions using both 2D and 3D imaging modalities and also appears to be a simple method for daily 3D rotational testing.