Haptically guided robotic technology in total hip arthroplasty: A cadaveric investigation

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This study sought to validate a haptically-guided robotic arm system in performing THA with the aim of comparing the accuracy of robotic-assisted acetabular cup placement to manual placement. The surgeon implanted 12 acetabular components in 6 cadaveric pelvises comparing robotic-assistance on one side with manual implantation on the other. The authors measured planned and actual center of rotation (COR), cup position, leg-length equalization and offset for each THA using computed tomography and the robotic platform.

The root-mean-square (RMS) error for the robotic-assisted system was within 3° for cup placement and within 1mm for leg-length equalization and offset when compared to computed tomography. The robotic-assisted system was significantly more accurate than manual implantation in reproducing the COR and cup orientation, as determined by a preoperative plan. The RMS error for manual implantation compared to robotic-assistance was 5 times higher for cup inclination and 3.4 times higher for cup anteversion ($p<0.01$).

Robotic-assistance is more accurate to plan than manual implantation in achieving optimal cup orientation. It has the ability to reduce human error from THA and should be considered in light of THA revisions due to component malposition

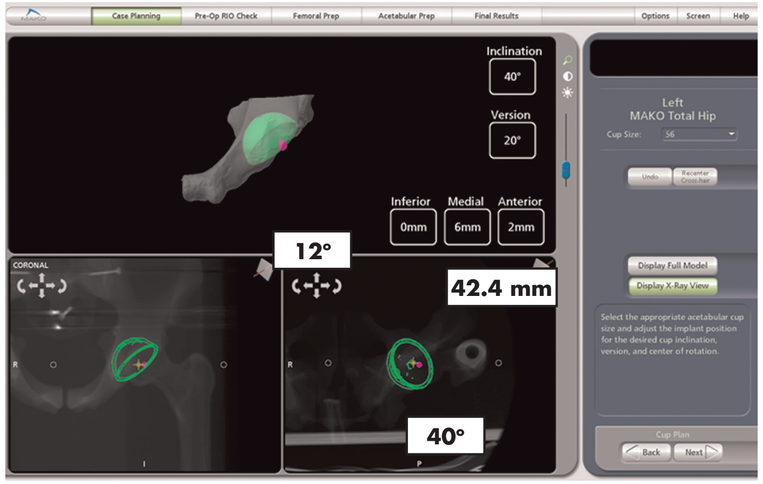

Fig. 1
Preoperative case planning on a computer screen showing positions of planned cup COR (green dot) and native hip COR (magenta dot). The CTngle (12).

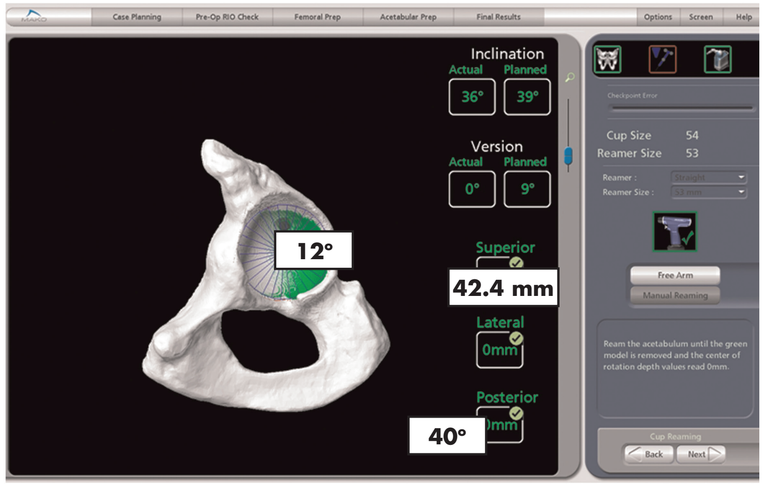

Fig. 2
Computer screen showing the completion of reaming with all COR numbers reading zero and the bone color changing from green to white. Source: MAKO Surgical Corp.

Reference:

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