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1: [J Spinal Disord Tech.](#) 2008 Aug; 21(6): 422-9.

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The effect of parallax on intraoperative positioning of the Charité artificial disc.

[Petilon J.](#) [Hardenbrook M.](#) [Sukovich W.](#)

Medical Corps, United States Navy, Portsmouth, Virginia, USA. juliopetilon@hotmail.com

STUDY DESIGN: Fluoroscopy imaging evaluation for total disc arthroplasty. OBJECTIVES: To describe the effect of fluoroscopic parallax on the relative position of the Charité and identify the most reliable method for evaluating intraoperative disc position. SUMMARY OF BACKGROUND DATA: Results of the Investigational Device Exemption study revealed that clinical outcomes of the Charité artificial disc correlated with accurate placement of the prosthesis. This is the first study to quantitatively evaluate the technique of intraoperative fluoroscopy during positioning of an artificial lumbar disc. METHODS: A Charité artificial disc (DePuy Spine, Raynham, MA) was implanted at the L5-S1 disc space of a radiopaque lumbar spine model in ideal position. A true anteroposterior fluoroscopic image of the L5-S1 disc space was obtained as were additional images as the central ray was moved to the left and right in 1 cm increments and with rotation at 1, 2, and 3 degrees. Images were also evaluated on a poorly placed and minimally displaced disc. Measurements of the distances from the middle tooth of the endplates to the anatomic center (spinous process) and alternative measurements for evaluating disc position were examined from computer-enhanced images. RESULTS: An ideally placed prosthesis appeared more displaced with increasing rotation and distance of the C-arm away from center when the spinous process was used as the midline reference. As little as 3 degrees of rotation of the fluoroscopic ray from the true anteroposterior image, made an ideally placed disc appear in poor position. Conversely, a poorly placed disc seemed to be in ideal position. Calculated displacement using measurements off the vertebral bodies remained more constant. Calculated displacement of an ideally placed prosthesis fell within 2 mm whereas all poorly placed discs had calculated differences greater than 4 mm. CONCLUSIONS: The spinous process is an unreliable anatomic midline marker. In contrast, the borders of the vertebral bodies can more reliably be used to calculate the displacement of the prosthesis from centerline to determine prosthesis position. Fluoroscopic parallax can cause an ideally placed prosthesis to appear more displaced with increasing rotation and distance away from the true anteroposterior image. The spinous process was determined to be an unreliable midline marker. The vertebral borders provided a more dependable anatomic reference point to establish the disc-space midline.

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