

Reformatting of CT Scans Parallel to the S1 End Plate Increases Visualization of Transiliac Transsacral (TITS) Pathway in the First Sacral Segment, Especially with Dysmorphism

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Purpose: Percutaneous posterior pelvic ring fixation for fractures has increased significantly in the last 2 decades. Decisions regarding the ability to place screws percutaneously are made based upon evaluation of CT scans historically obtained with axial cuts oriented perpendicular to the axis of the body but usually oblique to the lumbosacral spinal elements. Prior work has demonstrated that when the axial image is formatted in relation to the plane of the sacrum, a larger safe zone for transsacral screw placement in the first sacral corridor can be appreciated. The purpose of this study was to investigate the change in understanding of safe corridors when using axial CT images in the plane of the sacrum as compared to the traditional axial CT images perpendicular to the body.

Methods: 50 pelvis CT scans without evidence of osseous pelvic injuries were deidentified and randomly placed on different PowerPoint slides. Each slide included a video of the axial CT along with the corresponding sagittal CT image. The axial CT included either an image created via traditional means (cuts perpendicular to the axis of the body) or through a reformat (cuts parallel to the S1 superior end plate). Both fellowship-trained orthopaedic trauma surgeons and orthopaedic residents reviewed each scan to determine whether a TITS screw could be placed in the first sacral segment safely. Patients were then grouped based on markers of sacral dysplasia. A conversion was defined as a patient deemed unable to have safe passage for a TITS screw on traditional axial cuts but safe with reformatted axial cuts.

Results: CT scans were reviewed by 9 attending surgeons and 5 residents. Overall, 58% of the patients were felt to have a safe corridor in the first sacral segment using traditional axial cuts whereas 68% were felt to have a safe corridor with the reformatted axial cuts. Attending surgeons felt 58% had a safe corridor on the axial scan and 67% on the reformats, while residents felt 58% and 70% had safe corridors, respectively. When grouped by dysplasia, those without signs of sacral dysplasia (n = 28) had a safe corridor 93% of the time on original scans and 93% of the time with reformatted CT scans. However, of those who had dysplasia (n = 22), only 12% were felt to have a safe corridor on original scans but 35% were felt to have a safe corridor on reformatted scans. The average conversion rate was 34% (range, 18%-75%) for attendings and 35% (range, 18%-50%) for residents.

Conclusion: Reformatting of CT scans parallel to the superior end plate of the S1 body increases the likelihood of identifying a safe corridor for a TITS screw, especially in patients with evidence of sacral dysplasia. We would recommend the routine use of reformatting CT scans in this manner to provide better understanding of the osseous fixation pathways of the upper sacral segment.

The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device he or she wishes to use in clinical practice.