

The Utility of Multidimensional Fluoroscopy in the Treatment of Pelvis and Acetabular Fractures

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Purpose: Multidimensional fluoroscopy has gained popularity in the treatment of pelvis and acetabular fractures due to its ability to generate intraoperative cross-sectional imaging. Previous studies have demonstrated its ability to reliably determine iliosacral screw placement. However, its use comes with increased radiation exposure as well as surgical time. This study sought to explore the utility of multidimensional fluoroscopy in the treatment of pelvis and acetabular fractures, the rates at which it affects treatment, and the radiation costs.

Methods: All patients who underwent operative management of a pelvic ring injury or acetabular fracture from December 1, 2021 to November 30, 2022 were reviewed. Patients were included if both multidimensional fluoroscopy and postoperative CT scans were available for review. Injury pattern, multidimensional fluoroscopy dose, total operative dose, number of spins, change in management, and postoperative CT dose were recorded. Multidimensional fluoroscopy cross-sectional imaging times were prospectively collected for 25 patients.

Results: 214 patients were included in final analysis. 194 patients (91%) received 1 spin, 19 (9%) received 2 spins, and 1 received 3 spins. Intraoperative multidimensional scan changed management in 26 patients (12%), of whom 14 (54%) were considered major changes. 133 patients were treated for a pelvic ring injury and 81 patients for an acetabular fracture. Patients with an acetabular fracture were more likely to experience a change in management (20% vs 8%, $P = 0.01$) based on intraoperative multidimensional fluoroscopy, but patients with a pelvic ring injury were more likely to experience a major change (90% vs 31%, $P = 0.005$). Multidimensional fluoroscopy made up a higher proportion of the total operative dose in acetabular fractures (54% vs 25%, $P < 0.001$), but remained low for both patient groups compared to postoperative CT dosing (12% vs 11%, $P = 0.38$). Total mean increase in inoperative time for multidimensional fluoroscopy cross-sectional imaging was 365 (± 39) seconds.

Conclusion: Multidimensional fluoroscopy provides significant utility during the treatment of pelvis and acetabular fractures. Intraoperative cross-sectional imaging changes surgical management in a high proportion of patients, while maintaining an acceptable amount of increased radiation exposure and operative time. The impact of changes was more frequent in patients undergoing acetabular surgery, but more significant in patients undergoing treatment of a pelvic ring injury.

	Pelvic Ring Injury (n = 133)	Acetabular Fracture (n = 81)	P-value
Number of Spins			
1	117	77	0.10
2 or more	16	4	
Intraoperative Spin Altered Management	10 (8%)	16 (20%)	0.01
Clinical Significance of Altered Management			
Major	9 (90%)	5 (31%)	0.005
Minor	1 (10%)	11 (69%)	
Multidimensional Fluoroscopy Dose (mGy)	39.9 (19.1)	38.6 (18.7)	0.71
Total Operative Dose (mGy)	159.8 (93.7)	88.0 (70.1)	<0.001
Multidimensional Fluoroscopy Dose Proportion	25% (9)	54% (20)	<0.001
Postoperative CT Radiation Dose (mGy*CM)	412.4 (260)	437.7 (317)	0.60
Multidimensional/CT Dose Percentage	12% (6)	11% (6)	0.38
<i>P-value ≤ 0.05 considered statistically significant.</i>			

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