

INFIX versus Plating for Pelvic Fractures with Symphyseal Disruption

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Purpose: Unstable pelvic injuries with disruption of the symphysis pubis (SP) are traditionally fixed with anterior plates in conjunction with posterior fixation. The anterior subcutaneous internal fixator (INFIX) is a biomechanically sound method of fixation that is implanted using small incisions, even in obese patients. The purpose of this study is to compare INFIX to traditional symphyseal plating by assessing reductions, complications, and functional outcomes.

Methods: An IRB-approved retrospective cohort study was performed using our hospital's trauma database including 52 patients with unstable pelvic injuries who had SP disruptions. 24 patients who underwent implantation of INFIX with posterior fixation were compared to 28 patients who underwent SP plating with posterior fixation. INFIX: There were 13 AO/OTA type B and 11 C-type injuries. The fracture patterns seen were 13 (54%) APC (AP compression), 7 (29%) VS (vertical shear), and 4 (17%) LC (lateral compression). The average age of patients was 43.38 years (range, 21-86), 18 males and 6 females with an average ISS of 21.53 ± 8.71 . The average length of follow-up was 40 ± 26 months. Plates: There were 14 B and 14 C-type AO/OTA injuries. Fracture patterns seen were 17 (61%) APC type, 7 (25%) LC type, and 4 (14%) VS. The average age of patients was 39.6 years (range, 21-62), 25 males and 3 females with an average ISS of 22.48 ± 8.45 . The average length of follow-up was 51 ± 39 months. Reductions of the SP were measured using AP pelvis radiographs of the original injuries and the most recent AP Pelvis radiograph on file. The pelvic ring reduction was also measured using the Keshishyan cross method and reported as the pelvic deformity index (PDI). Functional outcomes were assessed using the score developed by Majeed. Complications were recorded, and heterotopic ossification (HO) was graded. Statistical analysis was completed in Excel using the Student t test.

Results: INFIX: Average reduction of the SP was 63.48% (range, 19.70-85.09%) of the original diastasis. Average reduction of the pelvic ring was 14.96% based on the PDI values. Five (21%) of the patients developed complications. We experienced 2 (8%) improper implantations, 1 (4%) case of pain associated with the device, 1 (4%) irritation to the lateral femoral cutaneous nerve, and 1 (4%) surgical site infection. The improper implantations occurred in the early cases and consisted of improper fixation of the caps and screws resulting in loss of reduction and in 1 case the construct was placed too deep requiring revision. 11 cases of HO (52.38%) were seen in our patients but had no sequelae. The average Majeed score was 84 (median, 89; range, 51-100). Plates: The average reduction in the SP injury was 75.25% (range, 9.68-90.00%) of the original diastasis. Average reduction of the pelvic ring was 54.15% based upon the PDI. Complications included 4 (14%) surgical site infections and 3 (11%) implant failures. The types of hardware failure seen were 1 broken plate and 2 cases of screw loosening. The average Majeed score was 73.77 (median, 79; range, 48-100).

	Patient	AO/OTA Fracture Classification	ISS	SP Reduction	PDI Reduction	Complications
INFIX	1	61-C1.2a2c5	18	66.22%	-	
	2	61-B2.2(1)c1	14	61.74%	68.77%	
	3	61C2.3a1.b1	34	50.68%	27.62%	LCFN irritation
	4	61B3.1c4	14	63.72%	-9.64%	Improper rod and cap fixation with loss of reduction
	5	61B3.2a4b1c8	22	80.95%	72.09%	Pain
	6	61C3.1a4b4c9	21	51.22%	7.04%	Infix bar placed too deep
	7	61C3.1a2b2c4	45	61.79%	86.48%	Expired
	8	61C3.1a2c4	18	70.10%	49.73%	
	9	61B3.1(1)c4	27	26.07%	-174.97%	Expired
	10	61B1(1)C4	13	53.94%	82.95%	
	11	61C3.1c4	21	72.43%	36.38%	
	12	61-B3.2(3)a3b1.1c7	41	32.30%	-42.10%	
	13	61-C1.2a3c1	9	74.47%	-63.90%	
	14	61-C1.2a2c9	9	58.51%	74.38%	
	15	61-B2.1(1)c8	27	69.74%	50.50%	
	16	61-C1.3a2c8	20	81.52%	-5.88%	
	17	61-B1.1(1)c5	20	85.09%	-589.48%	
	18	61-B1.1(1)4	21	31.86%	-44.25%	
	19	61-B3.1(1)a1b1.1c5	9	49.77%	-59.88%	
	20	61-B1.1c5	24	60.86%	56.83%	Expired
	21	61-C1.3a1c9	27	19.70%	-141.11%	
	22	61-C2.2a2b1.1c5	24	75.80%	-335.90%	
	23	61-B1.1(1)a1c7	34	66.44%	69.14%	
	24	61-B1.1(1)c5	18	65.70%	100.00%	Infection
Plates	1	61-C1.2a2c3	29	34.59%	51.14%	
	2	61-B3.2(2)a2b3c3	43	90.00%	396.70%	
	3	61-B1.1(1)c5	24	48.08%	87.24%	
	4	61-B1.1(1)c4	18	69.11%	77.80%	
	5	61-C1.3a1c5	24	75.89%	62.16%	
	6	61-C1.2a1c4	18	51.81%	88.22%	
	7	61-C2.1b1.1c5	18	80.52%	87.16%	
	8	61-B1.2c5	34	69.89%	62.37%	Hardware Loosening
	9	61-C1.2a3c4	20	72.65%	77.07%	
	10	61-C1.2a2c5	22	86.70%	27.60%	
	11	61-C1.3a2c2	33	46.03%	71.58%	
	12	61-C1.2(a2)c4	24	88.51%	36.54%	Infection
	13	61-C2.2a2b1.1c5	36	88.79%	270.30%	Infection
	14	61-C1.2a2c4	9	85.66%	76.82%	
	15	61-B1.1(1)c1	19	57.57%	771.52%	
	16	61-B1.1(1)c5	34	86.20%	1122.14%	
	17	61-B2.3(1)c5	18	62.67%	42.87%	
	18	61-B1.1(1)c1	27	71.06%	76.66%	
	19	61-C1.2a2c8	18	74.71%	378.63%	
	20	61-C1.2a3c5	14	56.19%	57.35%	
	21	61-C1.3a1c4	10	60.99%	75.46%	Plate failed resulting in loss of reduction, Infection
	22	61-B1.1(1)c4 OOP CT	9	9.68%	285.34%	
	23	61-B1.1(1)c5	29	79.05%	10.04%	
	24	61-B1.1c5	21	88.30%	197.33%	
25	61-B1.1c8	21	89.29%	83.10%		
26	61-B2.2(1)c5	17	83.46%	4.96%	Hardware Loosening, Infection	
27	61-C1.2a2c5	18	81.32%	94.64%		
28	61-B3.2(3)a1b3c0	27	26.34%	97.30%		

Conclusion: Plates provide superior reduction of the SP when compared to INFIX ($P = 0.036$). Plating also requires only 1 surgery compared to the 2 of INFIX. Complication rates were not significantly different between the methods ($P = 0.37$). There was no statistically significant difference in the Majeed outcomes scores ($P = 0.0774$). Fixation using INFIX may be preferred in obese patients due to ease of application and in young women of child-bearing age as there is no retained hardware.

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.