



INTRODUCTION

- With the increasing incidence of periprosthetic femur fractures secondary to both an aging population as well as the rise in number of total hip arthroplasties, it is paramount to determine biomechanically and clinically strong fixation methods that stabilize the femur-prosthesis complex while allowing for fracture healing.
- While biomechanical and clinical studies detailing the equivalence and sometimes superiority of cerclage wiring fixation compared to plate fixation in select fractures (Vancouver B1 and C) exist, no studies detail clinical outcomes after cerclage wiring fixation in all Vancouver B fracture types.

OBJECTIVES

- To compare whether there is a difference in clinical outcomes between Vancouver B fractures fixed with cerclage wiring and those without.

METHODS

- This retrospective multi-center study reviewed 295 patients from 2007 to 2018 with periprosthetic femur fractures.
- Inclusion Criteria:** Vancouver B periprosthetic femur fractures, underwent surgical stabilization of their periprosthetic fracture, and at least 6 months of post-operative follow-up.
- Exclusion Criteria:** Vancouver A or C fractures (35 patients), had fractures that were treated non-operatively (19 patients), or did not have adequate follow-up (151 patients)
- Ninety Vancouver B periprosthetic fractures were identified, with 33% being B1, 48.4% B2, and 18.6% B3 fractures.
- Demographics, injury details, fracture classification, surgical details, fracture union, and post-operative complications were recorded for each patient.

RESULTS

		No Cerclage Fixation	Cerclage Fixation Only	Cerclage and Plate Fixation	Total
Gender	Male	11 (12.2%)	10 (11.1%)	10 (11.1%)	31 (34.4%)
	Female	11 (12.2%)	14 (15.6%)	34 (37.8%)	59 (65.6%)
Age	≤60 years	5 (5.6%)	4 (4.4%)	5 (5.6%)	14 (15.6%)
	61 years-70 years	7 (7.8%)	6 (6.7%)	4 (4.4%)	17 (18.9%)
	71 years-80 years	6 (6.7%)	10 (11.1%)	7 (7.8%)	23 (25.6%)
	≥81 years	4 (4.4%)	4 (4.4%)	28 (31.1%)	36 (40.0%)
Smoking	Yes	2 (2.2%)	2 (2.2%)	3 (3.3%)	7 (7.8%)
	No	20 (22.2%)	22 (24.4%)	41 (45.6%)	83 (92.2%)
Osteoporosis	Yes	20 (22.2%)	3 (3.3%)	12 (13.3%)	35 (38.9%)
	No	2 (2.2%)	21 (23.3%)	32 (35.6%)	55 (61.1%)
Diabetes	Yes	20 (22.2%)	6 (6.7%)	7 (7.8%)	33 (36.7%)
	No	2 (2.2%)	18 (20.0%)	37 (41.1%)	57 (63.3%)
Total		22 (24.4%)	24 (26.7%)	44 (48.9%)	90 (100.0%)

Table 1. Demographic Breakdown of our Sample Population. No Cerclage Fixation includes those with fractures stabilized using revision arthroplasty, plate fixation, or a combination of the two, all without cerclage fixation.

		Fixation Types		Total	p-value
		Fixation Including Cerclage	Fixation Without Cerclage		
B1	Union	27 (84.4%)	0 (0.0%)	32	N/A
	Nonunion	4 (12.5%)	1 (3.1%)		
B2	Union	18 (42.9%)	16 (38.1%)	42	0.43
	Nonunion	6 (14.3%)	2 (4.8%)		
B3	Union	6 (37.5%)	1 (6.25%)	16	1.00
	Nonunion	7 (43.8%)	2 (12.5%)		

Table 2. Comparison of Union Rates Between Surgical Fixation That Utilizes Cerclage and Fixation Without Cerclage. Statistical Analysis Performed Using Fischer's Exact Test. Fixation without cerclage includes revision arthroplasty alone or revision arthroplasty with plate osteosynthesis.

RESULTS

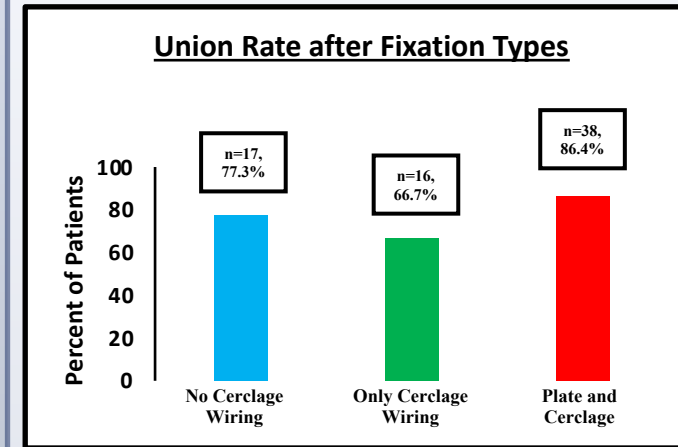


Figure 1. Union Rate Based on Fixation Types. There was no statistically significant difference seen in union rates between groups, whether this was analyzed using all 3 fixation groups (p=0.38) or 2 fixation groups (p=0.83).

Time to Union Based on Fixation Types

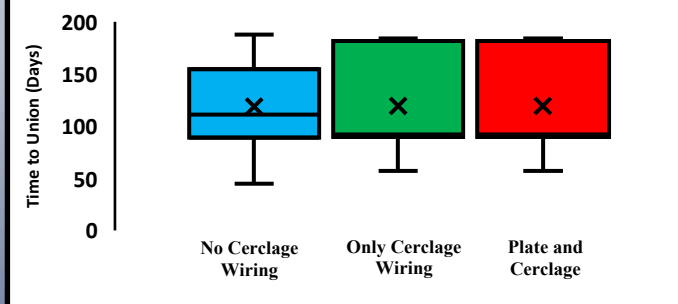


Figure 2. Time to Union Based on Fixation Types. Statistical analysis performed with ANOVA test. There was no statistically significant difference seen in time to union between groups, whether this was analyzed using all 3 fixation groups (p=0.91) or 2 fixation groups (p=0.98).

RESULTS

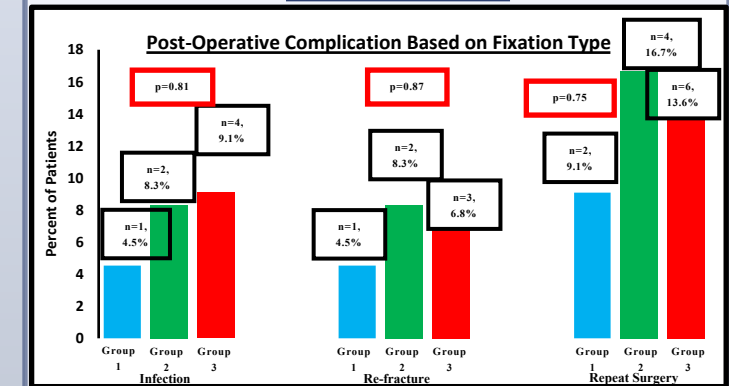


Figure 3. Post-operative Complications Based on Fixation Types. Group 1=No Cerclage Wiring; Group 2=Only Cerclage Wiring; Group 3=Cerclage Wiring and Plate Fixation

	Union	Delayed Union/Nonunion	P-value
Fracture Type	B1	4	0.07
	B2	4	
	B3	5	
Osteoporosis	Yes	8	0.93
	No	13	
Diabetes	Yes	8	0.88
	No	13	
Current Smoker	Yes	3	0.34
	No	18	
Gender	Male	12	0.01
	Female	9	
Implant Type	THA	19	0.09
	Hemi	2	
Cemented	Yes	6	0.72
	No	15	
Age	76.8 years	67.1 years	<0.01

Table 3. Risk Factors for Nonunion of Periprosthetic Femur Fractures. All values reported are absolute counts other than age, which is reported as a mean.

CONCLUSIONS

- While the Vancouver fracture pattern helps to guide the surgical fixation construct, the use of cerclage wires does not impact bony union in these injuries.
- Surgeons should individually consider each fracture type when deciding which construct will achieve stable fixation that allows for fracture healing.