Blocking Wire Technique for Femur and Tibia Shaft Fracture Reduction has Similar Radiographic Outcomes to Blocking Screws

Corey Thomas Bindner[1], Abdullah Ghali, Neal Mody-Bailey, John Rapier Dawson, Christopher H Perkins[1], Omar Hammad Atassi
[1]Baylor College of Medicine

INTRODUCTION:

The use of blocking, or Poller, screws is a well-established technique for achieving and maintaining reduction of long bone fractures treated with intramedullary devices. There are several authors that make mention of the blocking wire technique, but insufficient literature exists to support the effectiveness of the technique in achieving and maintaining fracture reduction. In this study, we compare a method of long bone fracture reduction using blocking wires which are subsequently removed, with the standard blocking screw technique.

METHODS:

We performed a retrospective cohort study, with a control group, of patients older than 18 years presenting to our Level 1 county trauma hospital or private community hospital from August 2013 through June 2022. The study group was obtained retrospectively by compiling patients with a femur or tibia fracture (AO-32 and AO-42) treated with an intramedullary nail and utilizing the blocking-wire technique, and also the control group with the traditional blocking screw technique. The primary outcome of this study was change in coronal and sagittal alignment at final follow up. T-test for independent samples was used for comparison of numerical data between groups when the normality of the distribution was confirmed using the Shapiro-Wilk Test. If not normally distributed, the Mann-Whitney U Test was used to compare numerical data. For categorical data, groups were compared using Pearson's Chi-squared test, or Fisher's Exact test if any of the group sizes were 5 or fewer patients.

RESULTS:

A total of 1,040 tibia and femur fractures that underwent intramedullary nailing. Of these, 15 patients treated with the blocking wire technique and 16 patients treated with blocking screws met all inclusion criteria and had appropriate length of radiographic follow up for analysis. Age, gender, and fracture characteristics did not differ significantly between the groups (Table 1). There was no significant difference in length of clinic follow up between the blocking wire and blocking screw groups (5.7 weeks vs. 7.6 weeks, p=.49). The average change in coronal alignment and sagittal alignment in the blocking wire group was 0.6 +/-0.8o and 0.4 +/-0.7o, respectively, at final follow up (Table 2). In the blocking screw group, the average change in coronal alignment and sagittal alignment was 0.8 +/-0.9o and 0.8 +/-1.1o, respectively, at final follow up. There was no significant difference noted in change in coronal alignment (p=.28) or sagittal alignment (p=.66) between the two groups (Table 3). There was no significant difference in total complications including nonunions between the groups (p=.12).

DISCUSSION AND CONCLUSION:

In this study, we describe a surgical technique using percutaneously placed, large diameter wires as blocking devices to aid in the reduction of tibia and femoral shaft fractures treated with intramedullary nailing. The average age of patients was less than 40 years old and all injuries were the result of high energy mechanisms. This technique allows for easier placement and replacement of wires compared to blocking screws and benefits from the flexibility of wires. Additionally, Steinmann pins may cost less than the interlocking bolts of nailing systems. The initial concern for this technique was a compromise of fracture stability and alignment after removal of wires. This study did not show any significant difference in change of sagittal or coronal alignment at final follow up. This suggests that the blocking wire method is non-inferior to the use of standard blocking screws with regards to maintaining radiographic alignment without an increase in complications.

		Blocking wire n=15		Blocking screw n=16		P-Value
Age at Surgery (mean, years)		39.7	SD=15.1	37.5	SD=11.3	.64
Gender	F	4	26.6%	4	33.3%	.92
	M	11	73.4%	12	66.7%	
Tibia vs Femur	Tibia	7	46.6%	9	56.3%	.59
	Femur	8	53.4%	7	43.4%	
Follow-up (mean, months)		5.7	SD=4.0	7.6	SD=8.1	.49
Complication	Yes	2	13.3%	6	37.5%	.12
	No	13	86.7%	10	62.5%	

	Blocking Wire (n=15, mean +/-SD)	Blocking Screw (n=16, mean +/-SD)	P-Value
Initial Coronal (°)	1.3 +/-1.4	1.4 +/-1.7	.98
Initial Sagittal (°)	2.7 +/-2.6	2.0 +/-2.2	.39
Final Coronal (°)	1.6 +/-1.5	1.5 +/-2.5	.33
Final Sagittal (°)	3.0 +/-2.5	2.2 +/-1.7	.38

	Blocking Wire (n=15, mean +/-SD)	Blocking Screw (n=16, mean +/-SD)	P-Value
Change Coronal (°)	0.6 +/-0.8	0.8 +/-0.9	.28
Change Sagittal (°)	0.4 +/-0.7	0.8 +/- 1.1	.66