

INTRODUCTION

- **Background**:
 - Olecranon fracture and osteotomy fixation comprise a significant portion of upper extremity orthopaedic procedures.
 - Historically, the most common fixation strategies have been plate (e.g. pre-contoured anatomic locked plate) and tension band with K-wire constructs.
 - Intramedullary (IM) screw fixation, although underreported in the literature, is another fixation strategy that offers theoretical advantages due to its simplicity and low-profile design.
- **Purpose**: The purpose of this study is to assess these olecranon fixation strategies by comparing their rates of unplanned reoperation.
- Hypothesis: We hypothesized that IM screw fixation carries a lower risk of unplanned reoperation compared to the more common plate and tension band strategies.

METHODS

- **Design**: retrospective cohort study.
- Setting: two Level I trauma centers.
- **Population:** patients who underwent open reduction and internal fixation of an olecranon fracture or osteotomy from 2007 to 2018.
- Primary outcome measure: the rate of unplanned reoperation.
- Secondary outcome measures: the rates of unplanned reoperation due to stiffness, wound complications, and hardware prominence.
- Analysis:
 - A total of 927 patients were identified.
 - The three most common fixation strategies (plate, tension band, and IM screw) yielded 880 patients to be included in the analysis.
 - A time-to-event analysis was used to compare the study outcomes between treatment groups.
 - Hazard ratios are reported with the 95% confidence interval and p-value.
 - Results were adjusted for patient age, sex, and trauma center.

Olecranon Fixation Strategies: A Multicenter Review of 880 Patients

Zachary D Hannan, BS*; Christopher T Johnson, PhD⁺; Logan Reitz, BS⁺; Alexandra Mulliken, BS*; Nathan N O'Hara, MHA*; Clifton Meals, MD[†]; Raymond Pensy, MD*

*R Adams Cowley Shock Trauma Center, Department of Orthopaedics, University of Maryland School of Medicine, Baltimore, MD [†]Grady Memorial Hospital, Department of Orthopaedics, Emory University School of Medicine, Atlanta, GA

		000				
Overall		n = 880				
A	Age (mean, SD)	45.0, <i>18.4</i>				
	Male	603 (68.5%)				T I
	Female	277 (31.5%)			•	I he overa
Avg. follow-up	length (weeks)	31.3				(161/880)
	Treatment:	Plate	Tension band	IM screw		•
Combined		n = 299	n = 153	n = 428		•
A	Age (mean, SD)	41.4, 16.0	44.7, 18.9	47.6, 19.2		•
	Male	218 (72.9%)	98 (64.1%)	287 (67.1%)	•	The overa
	Female	81 (27.1%)	55 (35.9%)	141 (32.9%)		•
Avg. follow-up	length (weeks)	21.0	30.4	38.9		•
Center 1		n = 260	n = 48	n = 26		
A	Age (mean, SD)	40.3, 15.1	37.2, 14.4	46.7, 19.9		
	Male	196 (75.4%)	35 (72.9%)	20 (76.9%)	•	IIVI SCIEW
	Female	64 (24.6%)	13 (27.1%)	6 (23.1%)		times as I
Avg. follow-up	length (weeks)	18.3	14.8	25.6		reoperatio
Center 2		n = 39	n = 105	n = 402		0.84 - 2.5
A	Age (mean, SD)	48.7, 19.8	48.1, <i>19</i> .7	47.7, 19.2	•	For reope
	Male	22 (56.4%)	63 (60.0%)	267 (66.4%)		2.35 (95%
	Female	17 (43.6%)	42 (40.0%)	135 (33.6%)		plate patie
Avg. follow-up	length (weeks)	39.1	37.5	39.8	•	For reone
						nationts w
Fable 2 : Unplanned rec	operation rates					moro likol
Treatment	Unplanne	d Reoperation Rate (%) (95% CI, p-value)		Hazard Ratio CI, p-value)		more likel
Overall		18.3				
Plate		11.4	R	ef (1.0)		
Tension band		23.5	5 $1.46 (0.84 - 2.52, p = .18)$			
IM screw		21.3	0.95 (0.56	-1.60, p = .84)		
IM screw	operation rates due	21.3 to stiffness	0.95 (0.56	-1.60, p = .84)		
IM screw Table 3 : Unplanned rec Treatment	operation rates due Unplani	21.3 to stiffness ned Reoperation Rate,	0.95 (0.56 Adjusted	- 1.60, p = .84) Hazard Ratio	•	Adjusting
IM screw Fable 3 : Unplanned rec Treatment	operation rates due Unplant	21.3 to stiffness ned Reoperation Rate, Stiffness (%)	0.95 (0.56 Adjusted (95%)	– 1.60, p = .84) Hazard Ratio CI, p-value)	•	Adjusting no statisti
IM screw Fable 3 : Unplanned rec Treatment Overall	operation rates due Unplant	21.3 to stiffness ed Reoperation Rate, Stiffness (%) 4.8	Adjusted (95%)	– 1.60, p = .84) Hazard Ratio CI, p-value)		Adjusting no statistic reoperatio
IM screw Fable 3: Unplanned rec Treatment Overall Plate	operation rates due Unplant	21.3 to stiffness ed Reoperation Rate, Stiffness (%) 4.8 1.3	0.95 (0.56 Adjusted (95%)	– 1.60, p = .84) Hazard Ratio CI, p-value) ef (1.0)	•	Adjusting no statistic reoperation Looking a
IM screw Fable 3: Unplanned rec Treatment Overall Plate Tension band	operation rates due Unplant	21.3 to stiffness ed Reoperation Rate, Stiffness (%) 4.8 1.3 5.9	Adjusted (95%) R 2.72 (0.53	- 1.60, p = .84) Hazard Ratio CI, p-value) ef (1.0) - 13.91, p = .23)	•	Adjusting no statistic reoperatio Looking a
IM screw Table 3: Unplanned rec Treatment Overall Plate Tension band IM screw	operation rates due Unplant	21.3 to stiffness ed Reoperation Rate, Stiffness (%) 4.8 1.3 5.9 6.8	0.95 (0.56 Adjusted (95%) R 2.72 (0.53 2.35 (0.50)	-1.60, p = .84) Hazard Ratio CI, p-value) ef (1.0) -13.91, p = .23) -11.05, p = .28)	•	Adjusting no statistic reoperatio Looking a
IM screw Fable 3 : Unplanned rec Treatment Overall Plate Tension band IM screw Fable 4 : Unplanned rec	operation rates due Unplant	21.3 to stiffness ed Reoperation Rate, Stiffness (%) 4.8 1.3 5.9 6.8	R 2.72 (0.53 2.35 (0.50	-1.60, p = .84) Hazard Ratio CI, p-value) ef (1.0) -13.91, p = .23) $-11.05, p = .28)$		Adjusting no statistic Looking a
IM screw Table 3: Unplanned rec Treatment Overall Plate Tension band IM screw Treatment	operation rates due Unplant	21.3 to stiffness ned Reoperation Rate, Stiffness (%) 4.8 1.3 5.9 6.8 to wound problems ned Reoperation Rate,	0.95 (0.56 Adjusted (95%) R 2.72 (0.53 2.35 (0.50) Adjusted	-1.60, p = .84) Hazard Ratio CI, p-value) ef (1.0) - 13.91, p = .23) - 11.05, p = .28) Hazard Ratio		Adjusting no statistic Looking a
IM screw Fable 3: Unplanned rec Treatment Overall Plate Tension band IM screw Fable 4: Unplanned rec Treatment	operation rates due Unplant	21.3 to stiffness ed Reoperation Rate, Stiffness (%) 4.8 1.3 5.9 6.8 to wound problems ed Reoperation Rate, and Problems (%)	Adjusted (95%) R 2.72 (0.53 2.35 (0.50) Adjusted (95%)	-1.60, p = .84) Hazard Ratio CI, p-value) ef (1.0) - 13.91, p = .23) - 11.05, p = .28) Hazard Ratio CI, p-value)		Adjusting no statistic Looking a
IM screw Table 3: Unplanned rec Treatment Overall Plate Tension band IM screw Table 4: Unplanned rec Treatment Overall	operation rates due Unplant	21.3 to stiffness hed Reoperation Rate, Stiffness (%) 4.8 1.3 5.9 6.8 to wound problems hed Reoperation Rate, and Problems (%) 5.7	Adjusted (95%) R 2.72 (0.53 2.35 (0.50) Adjusted (95%)	-1.60, p = .84) Hazard Ratio CI, p-value) ef (1.0) - 13.91, p = .23) - 11.05, p = .28) Hazard Ratio CI, p-value)		Adjusting no statistic Looking a
IM screw Fable 3: Unplanned red Treatment Overall Plate Tension band IM screw Fable 4: Unplanned red Treatment Overall Plate Plate	operation rates due Unplant	21.3 to stiffness ed Reoperation Rate, Stiffness (%) 4.8 1.3 5.9 6.8 to wound problems ed Reoperation Rate, ind Problems (%) 5.7 4.7	0.95 (0.56 Adjusted (95%) R 2.72 (0.53 2.35 (0.50) Adjusted (95%) R	-1.60, p = .84) Hazard Ratio CI, p-value) ef (1.0) - 13.91, p = .23) - 11.05, p = .28) Hazard Ratio CI, p-value) ef (1.0)		Adjusting no statistic coperatio Looking a
IM screw Table 3: Unplanned rec Treatment Overall Plate Tension band IM screw Table 4: Unplanned rec Treatment Overall Plate Tension band	operation rates due Unplant	21.3 to stiffness red Reoperation Rate, Stiffness (%) 4.8 1.3 5.9 6.8 to wound problems red Reoperation Rate, Ind Problems (%) 5.7 4.7 4.6	Adjusted (95%) R 2.72 (0.53 2.35 (0.50 Adjusted (95%) R 0.77 (0.31	-1.60, p = .84) Hazard Ratio CI, p-value) ef (1.0) -13.91, p = .23) -11.05, p = .28) Hazard Ratio CI, p-value) ef (1.0) -1.90, p = .58)		Adjusting no statistic coperatio Looking a
IM screw Table 3: Unplanned rec Treatment Overall Plate Tension band IM screw Table 4: Unplanned rec Treatment Overall Plate Tension band IM screw	operation rates due Unplant	21.3 to stiffness ed Reoperation Rate, Stiffness (%) 4.8 1.3 5.9 6.8 to wound problems ed Reoperation Rate, ind Problems (%) 5.7 4.7 4.6 6.8	Adjusted (95%) R 2.72 (0.53 2.35 (0.50) Adjusted (95%) R 0.77 (0.31 0.95 (0.50)	-1.60, p = .84) Hazard Ratio CI, p-value) ef (1.0) -13.91, p = .23) -11.05, p = .28) Hazard Ratio CI, p-value) ef (1.0) -1.90, p = .58) -1.78, p = .87)		Adjusting no statistic reoperatio Looking a • •
IM screw Table 3: Unplanned rec Treatment Overall Plate Tension band IM screw Table 4: Unplanned rec Treatment Overall Plate Tension band IM screw Table 5: Unpland	operation rates due Unplant	21.3 to stiffness red Reoperation Rate, Stiffness (%) 4.8 1.3 5.9 6.8 to wound problems red Reoperation Rate, and Problems (%) 5.7 4.7 4.7 4.6 6.8	Adjusted (95%) R 2.72 (0.53 2.35 (0.50) Adjusted (95%) R 0.77 (0.31 0.95 (0.50)	-1.60, p = .84) Hazard Ratio CI, p-value) ef (1.0) -13.91, p = .23) -11.05, p = .28) Hazard Ratio CI, p-value) ef (1.0) -1.90, p = .58) -1.78, p = .87)		Adjusting no statistic reoperatio Looking a • •
IM screw Fable 3: Unplanned record Treatment Overall Plate Tension band IM screw Fable 4: Unplanned record Treatment Overall Plate Tension band IM screw Fable 5: Unplanned record	operation rates due Unplant	21.3 to stiffness ned Reoperation Rate, Stiffness (%) 4.8 1.3 5.9 6.8 to wound problems ned Reoperation Rate, ind Problems (%) 5.7 4.7 4.6 6.8 to hardware prominence	Adjusted (95%) R 2.72 (0.53 2.35 (0.50) Adjusted (95%) R 0.77 (0.31 0.95 (0.50)	-1.60, p = .84) Hazard Ratio CI, p-value) ef (1.0) -13.91, p = .23) -11.05, p = .28) Hazard Ratio CI, p-value) ef (1.0) -1.90, p = .58) -1.78, p = .87)		Adjusting no statistic reoperatio Looking a • • •
IM screw Fable 3: Unplanned record Treatment Overall Plate Tension band IM screw Overall Plate Tension band IM screw Coverall Plate Tension band IM screw Table 5: Unplanned record Treatment	operation rates due Unpland Operation rates due Unpland Woo	21.3 to stiffness ed Reoperation Rate, Stiffness (%) 4.8 1.3 5.9 6.8 to wound problems ed Reoperation Rate, ind Problems (%) 5.7 4.7 4.6 6.8 to hardware prominence ed Reoperation Rate, are Prominence (%)	Adjusted (95%) R 2.72 (0.53 2.35 (0.50 Adjusted (95%) R 0.77 (0.31 0.95 (0.50 Adjusted (95%)	-1.60, p = .84) Hazard Ratio CI, p-value) ef (1.0) - 13.91, p = .23) - 11.05, p = .28) Hazard Ratio CI, p-value) ef (1.0) - 1.90, p = .58) - 1.78, p = .87) Hazard Ratio CI, p-value)		Adjusting no statisti reoperatio Looking a • • • •
IM screw Fable 3: Unplanned rec Treatment Overall Plate Tension band IM screw Treatment Overall Plate Tension band IM screw Table 5: Unplanned rec Treatment Overall Plate Tension band IM screw	operation rates due Unplant operation rates due Unplant Wot	21.3 to stiffness ed Reoperation Rate, Stiffness (%) 4.8 1.3 5.9 6.8 to wound problems ed Reoperation Rate, ind Problems (%) 5.7 4.7 4.6 6.8 to hardware prominence ed Reoperation Rate, are Prominence (%) 3.8	Adjusted (95%) R 2.72 (0.53 2.35 (0.50 Adjusted (95%) R 0.77 (0.31 0.95 (0.50 Adjusted (95%)	-1.60, p = .84) Hazard Ratio CI, p-value) ef (1.0) $-13.91, p = .23)$ $-11.05, p = .28)$ Hazard Ratio CI, p-value) ef (1.0) $-1.90, p = .58)$ $-1.78, p = .87)$ Hazard Ratio CI, p-value)		Adjusting no statisti reoperatic Looking a • • • • •
IM screw Table 3: Unplanned record Treatment Overall Plate Tension band IM screw Treatment Overall Plate Tension band IM screw Treatment Overall Plate Tension band IM screw Fable 5: Unplanned record Treatment Overall Plate Tension band IM screw Fable 5: Unplanned record Treatment Overall Plate Teatment Diverall Plate	operation rates due Unplant operation rates due Unplant Wot	21.3 to stiffness ed Reoperation Rate, Stiffness (%) 4.8 1.3 5.9 6.8 to wound problems ed Reoperation Rate, ind Problems (%) 5.7 4.7 4.6 6.8 to hardware prominence ind Reoperation Rate, 3.8 2.3	Adjusted (95%) R 2.72 (0.53 2.35 (0.50 Adjusted (95%) R 0.77 (0.31 0.95 (0.50 Adjusted (95%) R	-1.60, p = .84) Hazard Ratio CI, p-value) ef (1.0) -13.91, p = .23) -11.05, p = .28) Hazard Ratio CI, p-value) ef (1.0) -1.90, p = .58) -1.78, p = .87) Hazard Ratio CI, p-value) ef (1.0)		Adjusting no statisti reoperatic Looking a • • • • •
IM screw Table 3: Unplanned record Treatment Overall Plate Tension band IM screw Treatment Overall Plate Teatment Overall Plate Tension band IM screw Treatment Overall Plate Tension band IM screw Table 5: Unplanned record Treatment Overall Plate Tension band IM screw Table 5: Unplanned record Treatment Overall Plate Tension band IM screw	operation rates due Unplant Operation rates due Unplant Wot	21.3 to stiffness Ted Reoperation Rate, Stiffness (%) 4.8 1.3 5.9 6.8 to wound problems Ted Reoperation Rate, and Problems (%) 5.7 4.7 4.6 6.8 to hardware prominence Ted Reoperation Rate, are Prominence (%) 3.8 2.3 7.2	Adjusted (95% (2.72 (0.53 2.35 (0.50 Adjusted (95% (R 0.77 (0.31 0.95 (0.50 Adjusted (95% (R 2.55 (0.84	-1.60, p = .84) Hazard Ratio CI, p-value) ef (1.0) -13.91, p = .23) -11.05, p = .28) Hazard Ratio CI, p-value) ef (1.0) -1.90, p = .58) -1.78, p = .87) Hazard Ratio CI, p-value) ef (1.0) -7.74, p = .10)		Adjusting no statistic reoperatio Looking a • • • • • • •

Table 1 : Patient characteristics						
Overall		n = 880				
Age (mean	, <i>SD</i>)	45.0, 18.4				
	Male	603 (68.5%)				
Fe	male	277 (31.5%)				 The overa
Avg. follow-up length (w	eeks)	31.3				(161/880)
Treatn	nent:	Plate	Tension band	IM screw		•
Combined		n = 299	n = 153	n = 428		•
Age (mean	, <i>SD</i>)	41.4, 16.0	44.7, 18.9	47.6, 19.2		•
	Male	218 (72.9%)	98 (64.1%)	287 (67.1%)		 The overa
Fe	male	81 (27.1%)	55 (35.9%)	141 (32.9%)		•
Avg. follow-up length (w	eeks)	21.0	30.4	38.9		•
Center 1		n = 260	n = 48	n = 26		•
Age (mean	, <i>SD</i>)	40.3, 15.1	37.2, 14.4	46.7, 19.9		
	Male	196 (75.4%)	35 (72.9%)	20 (76.9%)		• IIVI SCIEW
Fe	male	64 (24.6%)	13 (27.1%)	6 (23.1%)		times as ii
Avg. follow-up length (w	eeks)	18.3	14.8	25.6		reoperatio
Center 2		n = 39	n = 105	n = 402		0.84 – 2.5
Age (mean	, <i>SD</i>)	48.7, 19.8	48.1, 19.7	47.7, 19.2		 For reope
	Male	22 (56.4%)	63 (60.0%)	267 (66.4%)		2.35 (95%
Fe	male	17 (43.6%)	42 (40.0%)	135 (33.6%)		plate patie
Avg. follow-up length (w	eeks)	39.1	37.5	39.8		 For reoperation
						natients w
Table 2: Unplanned reoperation r	ates					more likely
Treatment U	nplanned Reoperation Rate (%)		Adjusted Hazard Ratio (95% CI, p-value)			
Overall		18.3				
Plate		11.4	F	Ref (1.0)		
Tension band		23.5	1.46 (0.84	4 - 2.52, p = .18)		
IM screw	21.3		0.95 (0.56 - 1.60, p = .84)			
Table 3: Unplanned reoperation r	ates due	to stiffness	A 1º 4			 Adjusting
Treatment	Unplann	Stiffness (%)	(95% CI, p-value)			no statistic
Overall		4.8				reoperatio
Plate	1.3		Ref (1.0)			 Looking a
Tension band		5.9	2.72 (0.53 – 13.91, p = .23)			•
IM screw	6.8		2.35 (0.50 – 11.05, p = .28)			
	. 1	. 1 11				
1 able 4 : Unplanned reoperation r	linnlor	ad Deeperation Data	A al:	Hozard Datio		•
Treatment	Wou	ind Problems (%)	Aujusted (95%	Ijusted Hazard Ratio (95% CI, p-value)		
Overall		5.7				
Plate		4.7	F	Ref (1.0)		
Tension band	4.6		0.77 (0.31 – 1.90, p = .58)			 Although v
IM screw		6.8	0.95 (0.50	0 - 1.78, p = .87)		up rate be
						presumed
Table 5: Unplanned reoperation r	ates due	to hardware prominence				• Further an
Treatment	Unplanned Reoperation Rate, Hardware Prominence (%)		Adjusted Hazard Ratio			severity of
Overall		3.8		· • /		thomalle
Plate		2.3	R	Ref (1.0)		inem, allo
Tension band		7.2	2 55 (0 84	4 - 7.74, n = 10)		in patient
IM screw		3.5	0.89 (0.28	8 - 2.86, $p = .85$)		strategies

Overall $n = 880$		
Age (mean, <i>SD</i>) 45.0, 18.4		
Male 603 (68.5%)		
Female 277 (31.5%)		 The overa
Avg. follow-up length (weeks)31.3		(161/880)
Treatment:PlateTension band	IM screw	•
Combined n = 299 n = 153	n = 428	•
Age (mean, SD) 41.4, 16.0 44.7, 18.9	47.6, 19.2	•
Male 218 (72.9%) 98 (64.1%)	287 (67.1%)	The overa
Female81 (27.1%)55 (35.9%)	141 (32.9%)	•
Avg. follow-up length (weeks)21.030.4	38.9	
Center 1 $n = 260$ $n = 48$	n = 26	
Age (mean, SD) 40.3, 15.1 37.2, 14.4	46.7, 19.9	
Male 196 (75.4%) 35 (72.9%)	20 (76.9%)	• IIVI SCIEW
Female 64 (24.6%) 13 (27.1%)	6 (23.1%)	times as li
Avg. follow-up length (weeks)18.314.8	25.6	reoperatio
Center 2 $n = 39$ $n = 105$	n = 402	0.84 - 2.5
Age (mean, SD) 48.7, 19.8 48.1, 19.7	47.7, 19.2	• For reope
Male 22 (56.4%) 63 (60.0%)	267 (66.4%)	2.35 (95%
Female 17 (43.6%) 42 (40.0%)	135 (33.6%)	plate patie
Avg. follow-up length (weeks)39.137.5	39.8	For reope
		natients w
Table 2: Unplanned reoperation rates		more likely
TreatmentUnplanned Reoperation Rate (%)Adjusted I (95% C	Adjusted Hazard Ratio (95% CI, p-value)	
Overall 18.3		
Plate 11.4 Ref	f(1.0)	
Tension band 23.5 1.46 (0.84 -	- 2.52, p = .18)	
IM screw 21.3 0.95 (0.56 -	0.95 (0.56 – 1.60, p = .84)	
Table 3. Unplanned reconstruction rates due to stiffness		
Linnlanned Reoneration Rate	Hazard Ratio	 Adjusting
Treatment Stiffness (%) (95% C	I, p-value)	no statistic
Overall 4.8		reoperatio
Plate 1.3 Re ⁻	f(1.0)	• Looking a
Tension band 5.9 $2.72(0.53 - $	2.72 (0.53 - 13.91, p = .23)	
$\frac{2.72}{0.55} = \frac{2.35}{0.50} = \frac{2.35}{0.50} = \frac{2.35}{0.50} = \frac{100}{0.50} = $	2.35 (0.50 - 11.05, p = .28)	
Table 4: Unplanned reoperation rates due to wound problems		•
TreatmentUnplanned Reoperation Rate, Wound Problems (%)Adjusted I (95% C	Adjusted Hazard Ratio (95% CI, p-value)	
Overall 5.7		
Plate 4.7 Re:	f(1.0)	
Tension band 0.77 (0.31 -	-1.90, p = .58)	 Although v
IM screw 6.8 0.95 (0.50 -	-1.78, p = .87)	up rate be
		presumed
Table 5: Unplanned reoperation rates due to hardware prominence		• Further an
TreatmentUnplanned Reoperation Rate,Adjusted IUnplanned Reoperation Rate,(95% C	Adjusted Hazard Ratio	
Overall 38	/ L · · · · · · · · · · · · · · · · · ·	unplanned
Plate 23	f(10)	tnem, allo
Tension hand 2.3 100 Tension band 7.7 $2.5 (0.94)$	-7.74 n - 10	in patient
$\frac{12}{12} = \frac{2.33}{0.04} = \frac{1.2}{0.04}$	-2.86 n10)	strategies
	2.00, p = .00)	



RESULTS

Il unplanned reoperation rate was 18.3%

- Plate: 11.4% (34/299)
- Tension band: 23.5% (36/153)
- IM screw: 21.3% (91/428)
- all average follow-up length was 31.3 weeks.
- Plate: 21.0 weeks
- Tension band: 30.4 weeks
- IM screw: 38.9 weeks
- patients were 0.95 (95% CI: 0.56 1.60, p = .84) ikely as plate patients to have an unplanned
- on, and tension band patients were 1.46 (95% CI: (2, p = .18) times more likely.
- erations due to stiffness, IM screw patients were $_{0}$ CI: 0.50 – 11.05, p = .28) times more likely than ents to undergo this reoperation.
- rations due to hardware prominence, tension band vere 2.55 (95% CI: 0.84 - 7.74, p = .10) times than plate patients to undergo this reoperation.

CONCLUSION

for patient age, sex, and trauma center, there was cally significant difference in the rate of unplanned on between treatment groups.

- specific reoperation categories:
- Patients treated with an IM screw may have an increased risk of reoperation for stiffness
- compared to plate patients.
- Patients treated with the tension band and K-wire construct appear to have an increased risk of reoperation for both stiffness and hardware prominence.

we were able to adjust for the difference in followtween centers, we are unable to account for the differences in surgeon indication for reoperation. nalysis should account for any differences in the these complications by assessing the number of readmissions and reoperations required to treat wing surgeons to better understand the differences and health care burden between these fixation