

Incidence rate of Fracture-Related Infections after Internal Fixation: Insights from civilian patients with war-related and civilian trauma in Afghanistan

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Introduction & Aim: Fracture-related infection (FRI) rates range from 1–2% in closed fractures to up to 30% in severe open injuries; however, these estimates are largely based on civilian trauma (CT) data. Evidence of war-related trauma (WRT) injuries primarily comes from military sources, despite the fact that civilians may account for up to 87% of casualties in modern conflicts, depending on the context. This study aimed to determine the incidence rate of FRI after internal fixation in fractures caused by WRT and CT in a Non-Governmental Organization (NGO) hospital in Afghanistan.

Methods: This retrospective study reviewed medical records of civilian patients treated with internal fixation, either as primary fixation or following initial external fixation, between January 2020 and December 2023. Patients treated exclusively with external fixation were excluded. Reoperations for FRI within 12 months after fracture fixation were recorded and analyzed. Diagnosis followed the 2018 International Consensus Definition, relying on clinical signs, radiography, and suggestive biomarkers (elevated ESR/WBC) due to laboratory constraints. Infections were classified as early, delayed, or late based on the Willenegger and Roth criteria.

Results: The study included 2,502 patients with 2,720 fractures: 284 (10.4%) WRT and 2,436 (89.6%) CT cases. The overall FRI incidence was 2.2% (59/2,720). WRT showed a trend toward higher rates compared to CT (3.5% vs. 2.0%; $p=0.09$). Late infections predominated (57.6%) but represented a significantly higher proportion in the WRT group (90% vs. 51%; $p=0.02$). In the CT group, 42.9% of infections were pediatric ($p=0.009$) and 46.9% were associated with K-wires ($p=0.03$).

Conclusions: Although WRT showed a trend for higher FRI incidence, its most defining characteristic was a significantly higher proportion of late-onset infections, necessitating long-term surveillance protocols. Clinical Implication: High K-wire-related infection rates suggest that technical optimization is essential to minimize the infectious burden in resource-limited settings, such as bi-cortical purchase or burying K-wires and prioritizing a meticulous serial dressing plan.

References:

Metsemakers WJ et al. Fracture-related infection: A consensus on definition from an international expert group. *Injury*. 2018;49(3):505-510.
Belmont et al. The nature and incidence of musculoskeletal combat wounds in Iraq and Afghanistan (2005–2009). *J Orthop Trauma*. 2013;27(5):e107–e113.
Khorram-Manesh A et al. Estimating the number of civilian casualties in modern armed conflicts—a systematic review. *Front Public Health*. 2021;9:765261.
Tribble DR et al. Impact of operational theater on combat and noncombat trauma-related infections. *Mil Med*. 2016;181(10):1258–1268.
Willenegger H, Roth B. Treatment tactics and late results in early infection following osteosynthesis. *Unfallchirurgie*. 1986 Oct;12(5):241-6.

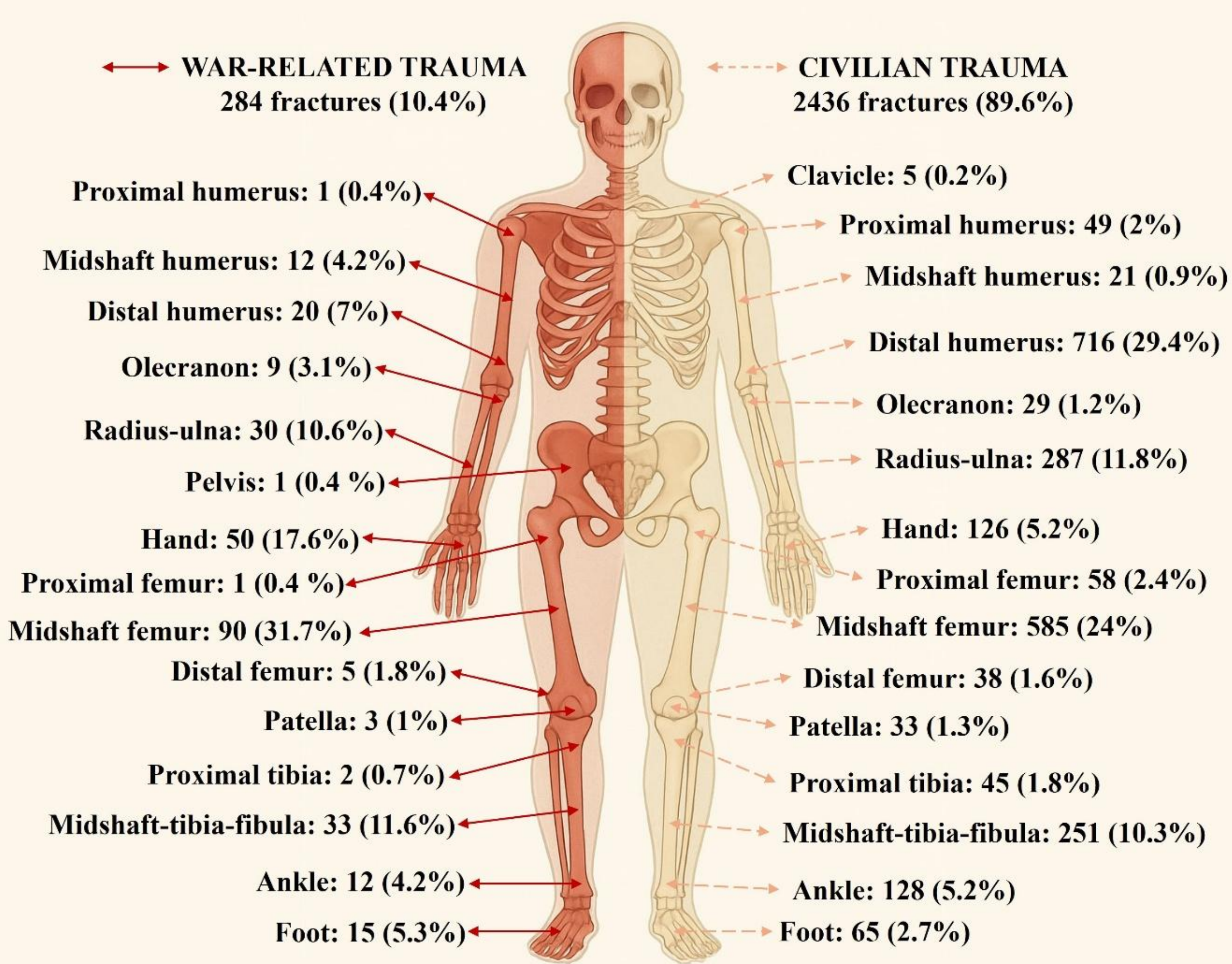


Figure 1: Anatomical distribution of fractures according to the trauma mechanism.

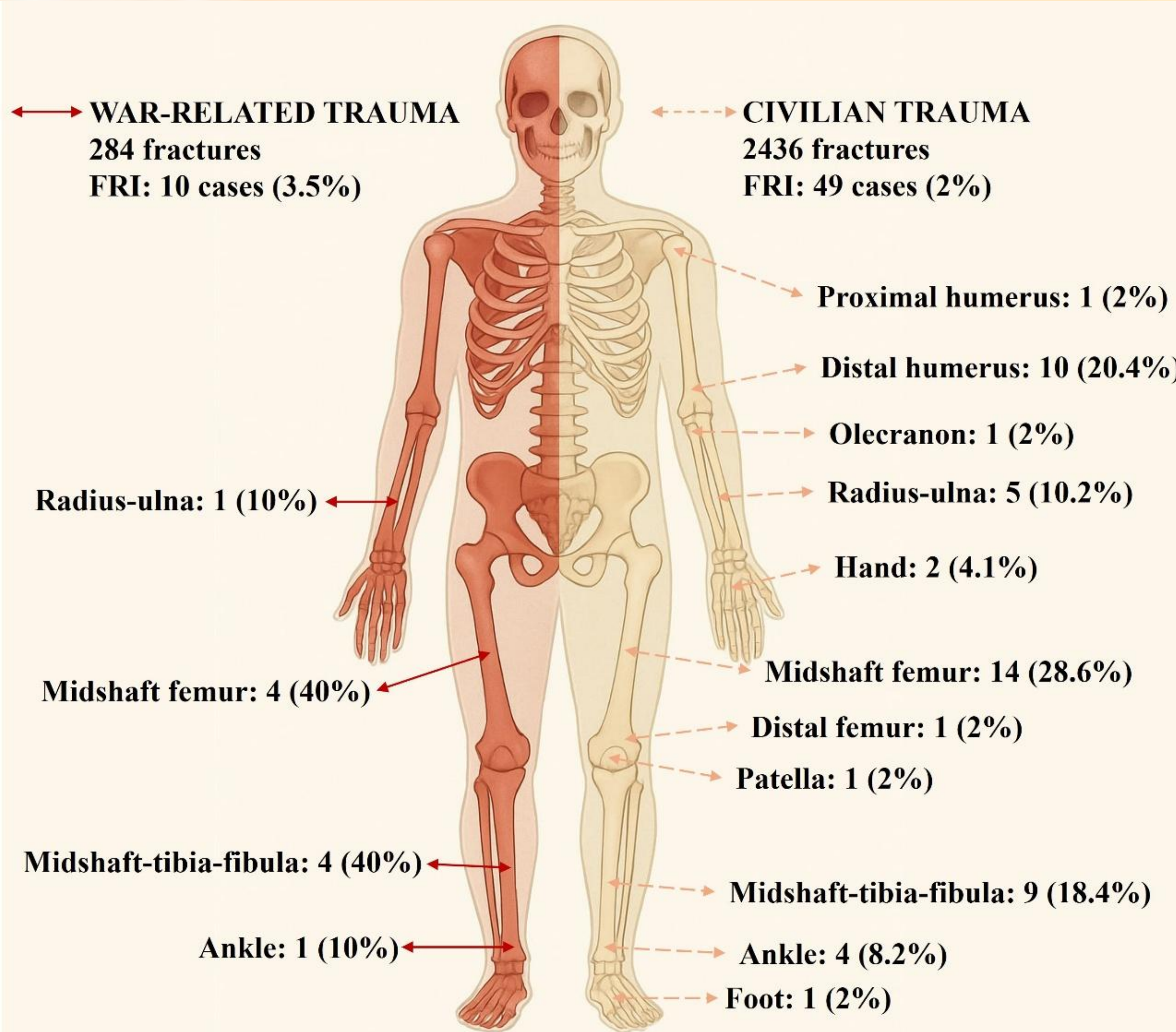


Figure 2: Anatomical distribution of FRI cases according to the trauma mechanism.

Variable	All patients n = 59 (100%)		War-Related Trauma n = 10 (16.9%)		Civilian Trauma n = 49 (83.1%)		p-value
	n	%	n	%	n	%	
Mean time in months (SD) to onset of FRI	4.7	(3.2)	6	(3.6)	4.5	(3.2)	0.18
Classification of FRI:							
Early infections	8	13.6	1	10	7	14.3	0.71
Delayed Infections	17	28.8	0	0	17	34.7	0.02
Late infections	34	57.6	9	90	25	51	0.02
Age:							
< 15 years	21	35.6	0	0	21	42.9	0.009
> 15 years	38	64.4	10	100	28	57.1	
Gender:							
Female	10	16.9	2	20	8	16.3	0.77
Male	49	83.1	8	80	41	83.7	
Type of fractures:							
Closed fractures	35	59.3	1	10	34	69.4	0.0004
Open Gustilo I	3	5.1	1	10	2	4.1	0.43
Open Gustilo II	5	8.5	1	10	4	8.2	0.84
Open Gustilo III A	5	8.5	2	20	3	6.1	0.15
Open Gustilo III B	4	6.8	1	10	3	6.1	0.65
Open Gustilo III C	7	11.8	4	40	3	6.1	0.002
Type of infected implant:							
K-wires	24	40.7	1	10	23	46.9	0.03
Plates	10	16.9	5	50	5	10.2	0.002
ESIN	9	15.3	0	0	9	18.4	0.14
Interlocking intramedullary nails	16	27.1	4	40	12	24.5	0.31

Table 1: Demographics data of FRI cases.