

Impact of Altered Consciousness on the Risk of Fasciotomy for Acute Compartment Syndrome Following Traumatic Tibial Fracture

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Department of
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de chirurgie

Disclosure

- **Philippe Poirier, B.Sc.** : No relevant financial relationships to disclose
- **Yasser Bouklouch, PharmD, MPH** : Research Associate MY01 Inc
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- **Sahel Jahangiri Esfahani** : No relevant financial relationships to disclose
- **Edward J. Harvey, MD, MSc** : Stock ownership in MY01 Inc.; Editor-in-Chief Canadian Journal of Surgery.

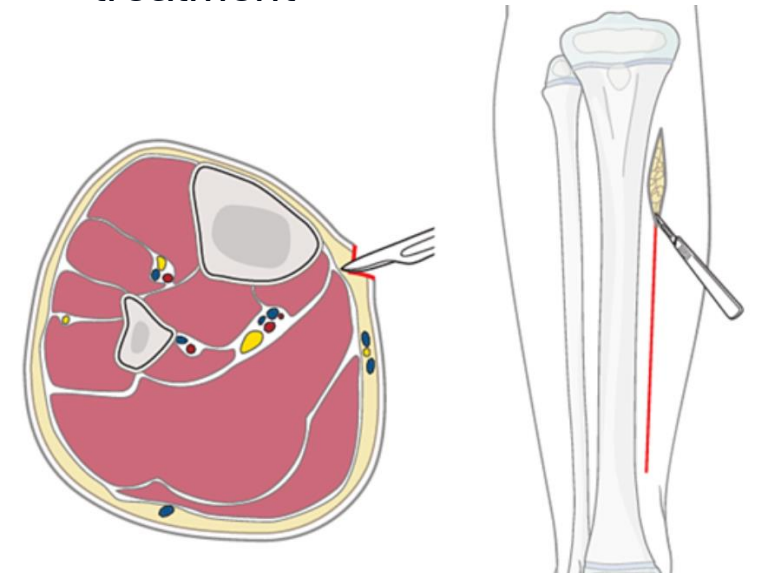
Background

- Acute compartment syndrome (ACS) is limb-threatening
- Diagnosis relies heavily on clinical assessment despite unreliability
- In obtunded patients - pain and symptoms cannot be assessed reliably



**Tibial fractures are high-risk
Injuries for ACS**

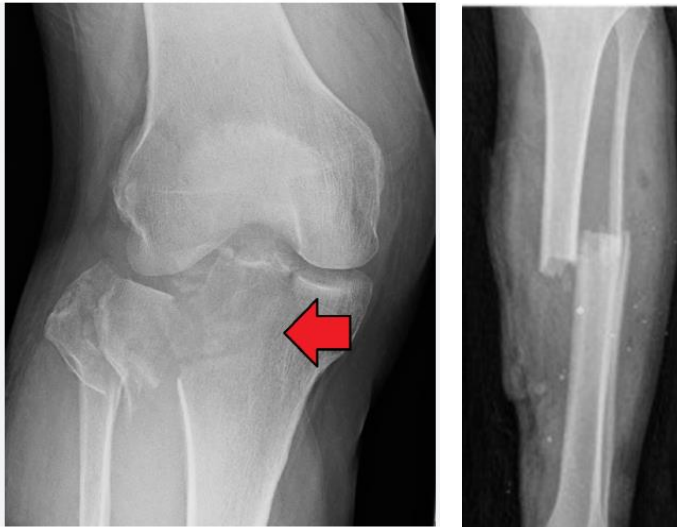
Fasciotomy is the only effective
treatment



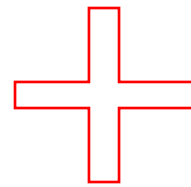
Harvey EJ, Sanders DW, Shuler MS, Lawendy AR, Cole AL, Alqahtani SM, et al. What's new in acute compartment syndrome? *J Orthop Trauma*. 2012;26(12):699–702.
Mauffrey C, Hak DJ, Martin III MP, editors. *Compartment Syndrome: A Guide to Diagnosis and Management*. Cham: Springer; 2019
Sheridan GW, Matsen FA. Fasciotomy in the treatment of the acute compartment syndrome. *J Bone Joint Surg Am*. 1976;58(1):112–115.

Objective

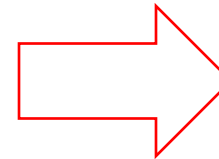
- Determine whether obtunded status is independently associated with fasciotomy for suspected ACS after traumatic tibial fracture.



At Risk Tibial fracture



**Altered
consciousness**



**Fasciotomy for
suspected ACS**

Heilman J. *TibPlateauBadMark.png*. Wikimedia Commons; 2016. Licensed under Creative Commons Attribution-ShareAlike 4.0 International. Accessed July 1, 2026.

Heo Y-M, Roh J-Y, Kim S-B, et al. Contracture of extensor hallucis longus tendon occurring after intramedullary nailing for a tibial fracture. *Journal of the Korean Orthopaedic Association*. 2010;45(5):399. doi:10.4055/jkoa.2010.45.5.399.



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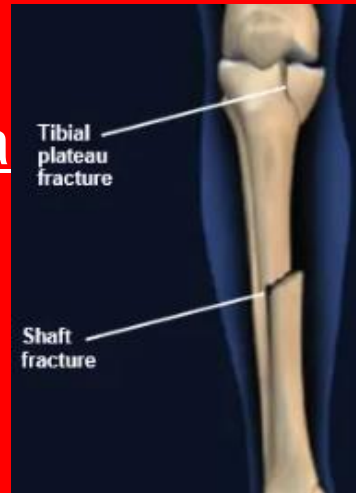
Methods

Data Source:

NTDB 2016–2018

Population :

Only Tibial plateau
shaft fractures



Exposure :

Obtunded status defined as:
sedation/intubation
severe intoxication
 $GCS < 9$

Outcome :

fasciotomy during hospitalization

Analysis:

1. Crude fasciotomy rate (N=186,535)
2. Multivariable logistic regression (N= 68,827)

Study Cohort

- 186,535 traumatic tibial fracture cases identified in NTDB 2016–2018
- 8,401 patients underwent fasciotomy - **4.5%**
 - Patients with tibial plateau and tibial shaft fractures included
 - Pilon fractures excluded
- Final multivariable model used complete cases: N = 68,827
 - * Complete-case model included patients with available data for model covariates

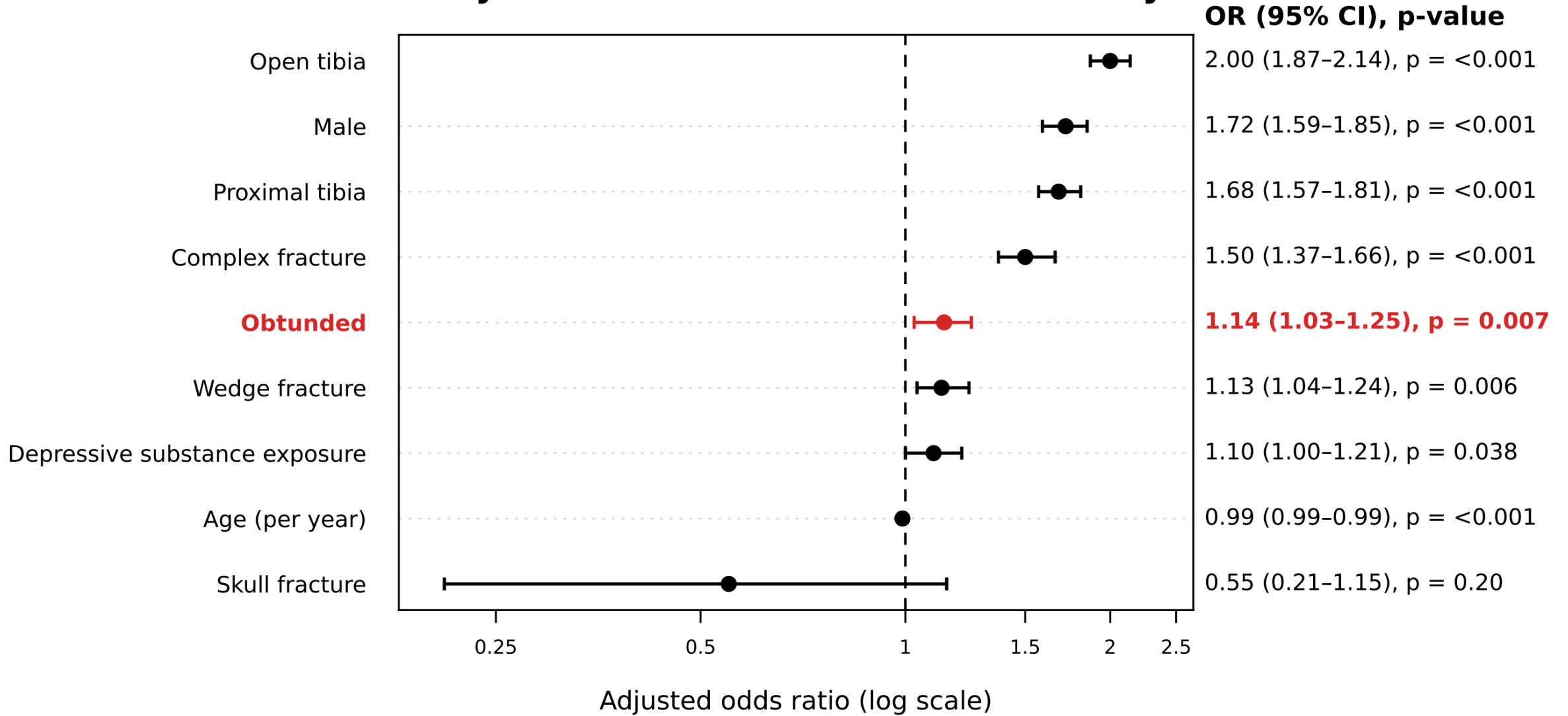
Descriptive Results : Crude Fasciotomy Rates

Markers of altered consciousness were associated with higher unadjusted fasciotomy rates

Characteristic	Group	Fasciotomy n / total (%)	p-value
GCS	>12	6,203 / 110,417 (5.6%)	<0.001
	9-12	144 / 2,098 (6.9%)	
	<9	507 / 6,878 (7.4%)	
Sedated or intubated	No	6,281 / 111,611 (5.6%)	<0.001
	Yes	573 / 7,782 (7.4%)	
Severe alcohol intoxication	No	6,686 / 117,187 (5.7%)	<0.001
	Yes	168 / 2,206 (7.6%)	

Note. Rates are crude/unadjusted. Denominators are category totals: non-fasciotomy + fasciotomy. GCS = Glasgow Coma Scale. p-values from Wilcoxon rank-sum test or Fisher exact test with simulated p-value based on 2,000 replicates, as appropriate.

Adjusted Odds Ratios for Fasciotomy



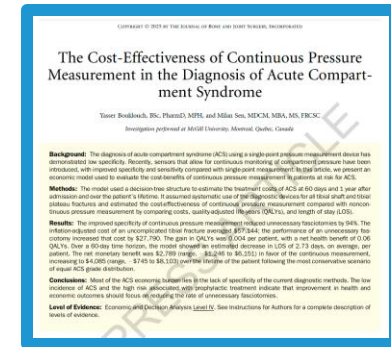
Discussion

- Obtunded status was independently associated with fasciotomy
 - Effect size was modest
- Fracture characteristics remained the dominant predictors
- This suggests obtunded status likely lowers the intervention threshold when clinical examination is unreliable

We Know the Price to Treat ACS with a Tibia FX

TQIP data , NHS Data multiple pubs

(YHEC – Pub Economics)
(Sen et al – JBJS 2025)
(Duckworth et al – Injury 2026)
(Van Lancker – submitted)



<u>American</u> average total costs per outcome	Clinical event costs
Standard of care - standard fracture care – no ACS	\$57,144
Gr 1. Incorrect ACS diagnosis and fasciotomy	\$84,933
Gr 2. Minimal necrotic muscle - DPC	\$94,105
Gr 3. Minimal necrotic muscle with complicated closure	\$127,321
Gr 4. Complex and extensive muscle necrosis	\$261,883
Gr 5. Amputation	\$276,662 +

Bouklouch Y, Sen M. The cost-effectiveness of continuous pressure measurement in the diagnosis of acute compartment syndrome. J Bone Joint Surg Am. 2025;107(16):1787–1797. doi:10.2106/JBJS.24.00009.

Fasciotomies are unwanted

JOINT TRAUMA SYSTEM CLINICAL PRACTICE GUIDELINE		
 Acute Extremity Compartment Syndrome (CS) and the Role of Fasciotomy in Extremity War Wounds Guide providers in the evaluation and treatment of patients with extremity war wounds, including the role of prophylactic and therapeutic fasciotomy.		
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Previous contributors: LTC Gordon Wade USAF, MC; LCol Max Talbot RCMS, CAF; John Shero MHA, FACHE; LTC Anthony Johnson MC, USA; CDR Luke Balsamo MC, USN; CAPT Zsolt Stockinger MC, USN		
Original publication date: 30 Apr 2009	Publication Date: 21 May 2026	Supersedes: 25 Jul 2016

- Unfortunately, at current time we have a white paper from the military saying just perform fasciotomies

Joint Trauma System. Acute Extremity Compartment Syndrome (CS) and the Role of Fasciotomy in Extremity War Wounds. Clinical Practice Guideline ID 17. Published May 21, 2026.

Poor outcomes with fasciotomy

- Frink et al Injury 2007

- Victims had a significant impairment in sports and activities of daily living
- Long-term pain in 15% of patients

- **Hospital costs**

Fasciotomy increases length of stay by 8 days

add ~ \$10-50,000

Vascular surgery - increases length of stay by 16 days!!

- ✗ **Surgical Site Infections post fasciotomy**

13-30% - Extra cost

Much higher in forward positions or austere environments

Military Experience is open wounds are an issue for infection

Higher fasciotomy SSI rates than civilian cases

Difficult for medics to perform

Time issue – care, monitoring, wound management

Extended time in austere environment increases problems

Technical knowledge is not in correct place

Should be trying hard not to cut anyone!

Crespo et al., J Orthop Trauma, 2015; Kauvar et al., J Surg Res, 2021.

Take Home messages

- Obtunded status was independently associated with a modest increase in fasciotomy after tibial fracture
- The findings support objective monitoring strategies in high-risk obtunded patients

Take Home messages

- Objective data is available
- We have new data from military missions

Military Medicine – Bridging Early Detection from Bench to Battlefield



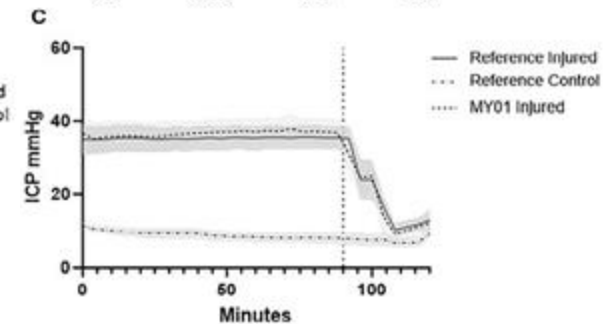
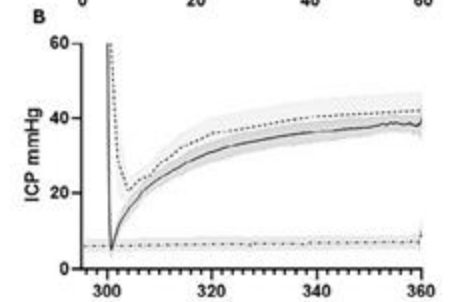
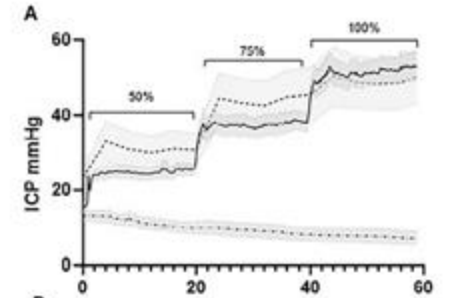
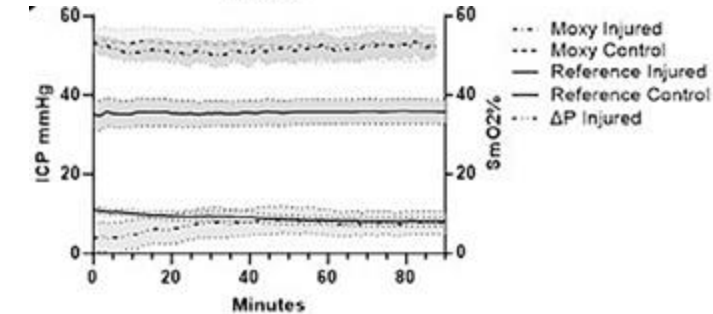
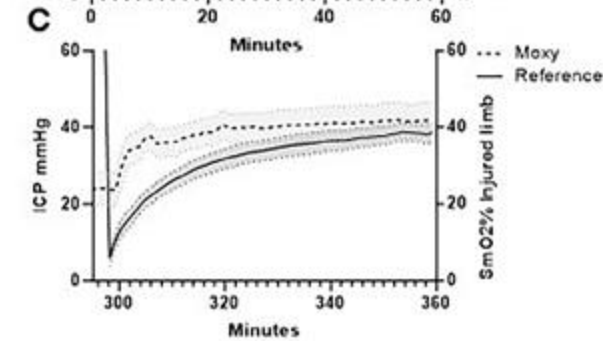
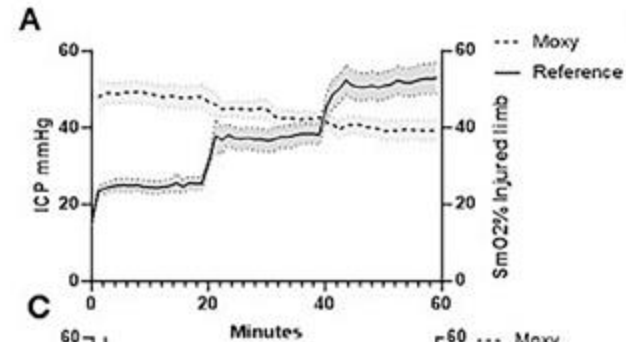
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Robert V. Hainline,

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refinement of non-invasive diagnostic adjuncts for this intended purpose.

MY01 Currently Deployed in Ukraine
25 Wounded Soldiers w/ Tourniquet Management
2 Wounded Soldier on ECMO



Questions ?