Circulating markers of immune function and tissue damage are associated with operative delay and mortality among severely injured orthopaedic polytrauma patients

Stephen P Canton, Joshua B Brown, Francis X Guyette, Yoram Vodovotz, Par I Johansson, Jakob Stensballe, Timothy R Billiar, Gary S Gruen, Jason L Sperry, Danielle S Gruen

BACKGROUND

- Optimizing surgical timing for severely injured orthopaedic polytrauma patients is challenging, and the decision to delay surgical fixation may impact outcomes.
- Injury severity score (ISS) often fails to predict survival
- Markers of immune function and tissue damage may better reflect the underlying physiology or response to interventions.
- **Purpose:** Evaluate the association between inflammatory mediators, orthopaedic fixation time, and mortality among severely injured polytrauma patients.
- **Hypothesis:** Inflammatory mediators would not differ based on time of definitive orthopaedic fixation.

METHODS

Population: severely injured polytrauma patients enrolled in PAMPer who sustained orthopaedic fractures and were transported to UPMC.

Design:
- Secondary analysis of pragmatic, multicenter, cluster-randomized trial
- Sampled circulating markers of immune function and tissue damage at (1) hospital admission, (2) 24 hrs and (3) 72 hrs **(Fig 1)**

Outcome measures:
- Patient and injury characteristics
- Surgical procedures
- Circulating markers of immune function in patients who received orthopaedic fixation and those who died prior to definitive orthopaedic surgery

Analysis:
- **Linear Mixed Effect Models**
  - Association between inflammatory mediator trends over 72h and orthopaedic fixation, controlling for injury characteristics and operative procedures

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A second look at the "second hit" in severely injured orthopaedic trauma patients

Do markers of immune function and tissue damage inform damage control orthopaedics?

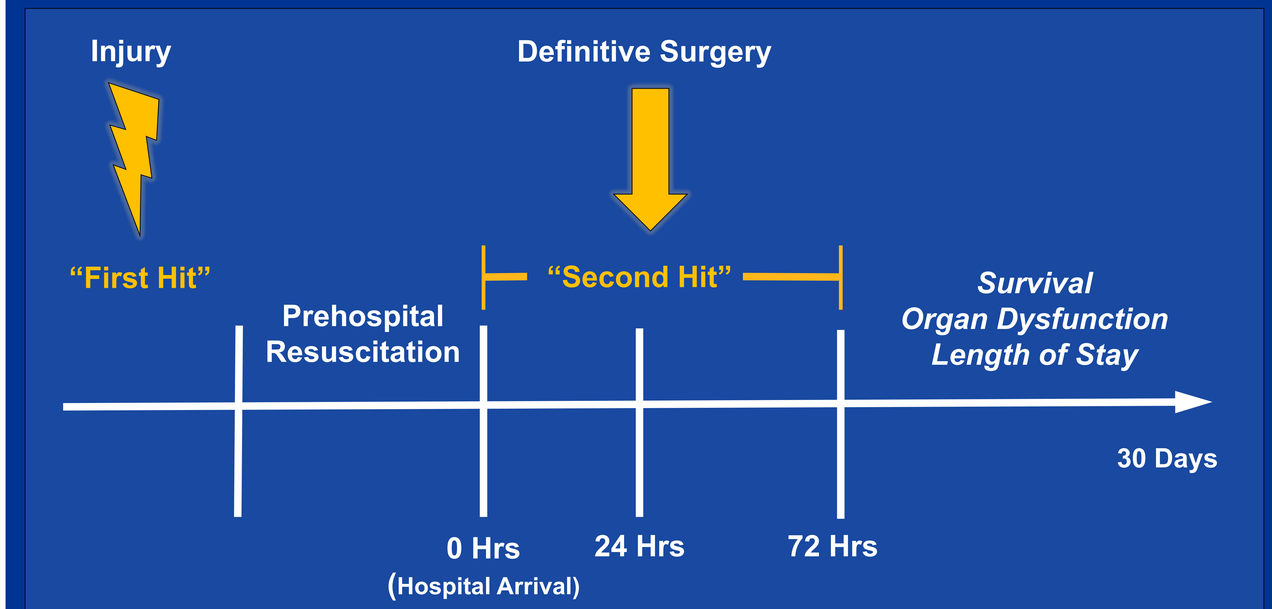

Figure 1

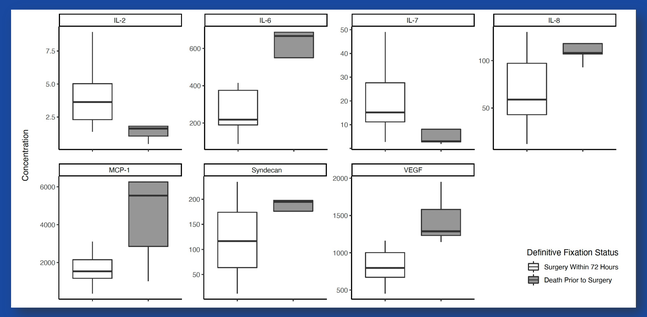

Figure 2

Every hour delay in definitive orthopaedic fixation was associated with **IL-6** ↓

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RESULTS

- 40 patients (78% M, 100% blunt injuries, median ISS of 22)
  - 23 received early fixation (<72h),
  - 11 received delayed fixation (>72h),
  - 6 died prior to definitive orthopaedic surgical intervention.
- Although ISS was similar between surgical patients and nonsurvivors (22 [17, 30] vs. 22 [17, 33], p=0.98), **several admission parameters stratified patients who died prior to definitive fixation (Fig 2)**.
- Among patients who received early orthopaedic fixation, every hour delay in definitive surgery was associated with a 5.2 pg/mL decrease in IL-6 (p=0.04) even after controlling for injury and surgical characteristics.

CONCLUSIONS

- **Circulating immune and tissue damage markers** measured upon admission **were associated with mortality prior to definitive surgery**.
- These markers may **inform the appropriate timing** of operative interventions or **further reveal the burden of a "second hit"** to the body incurred by surgery following traumatic injury.

REFERENCES

- Roberts et al., 2005 PMID: 15948472
- McKinley et al., 2022 DOI: 10.1097/BOT.0000000000002289

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