

Early Head CT Reveals Distinct Structural Injury Patterns in Civilian and Combat-Related Penetrating Brain Injury

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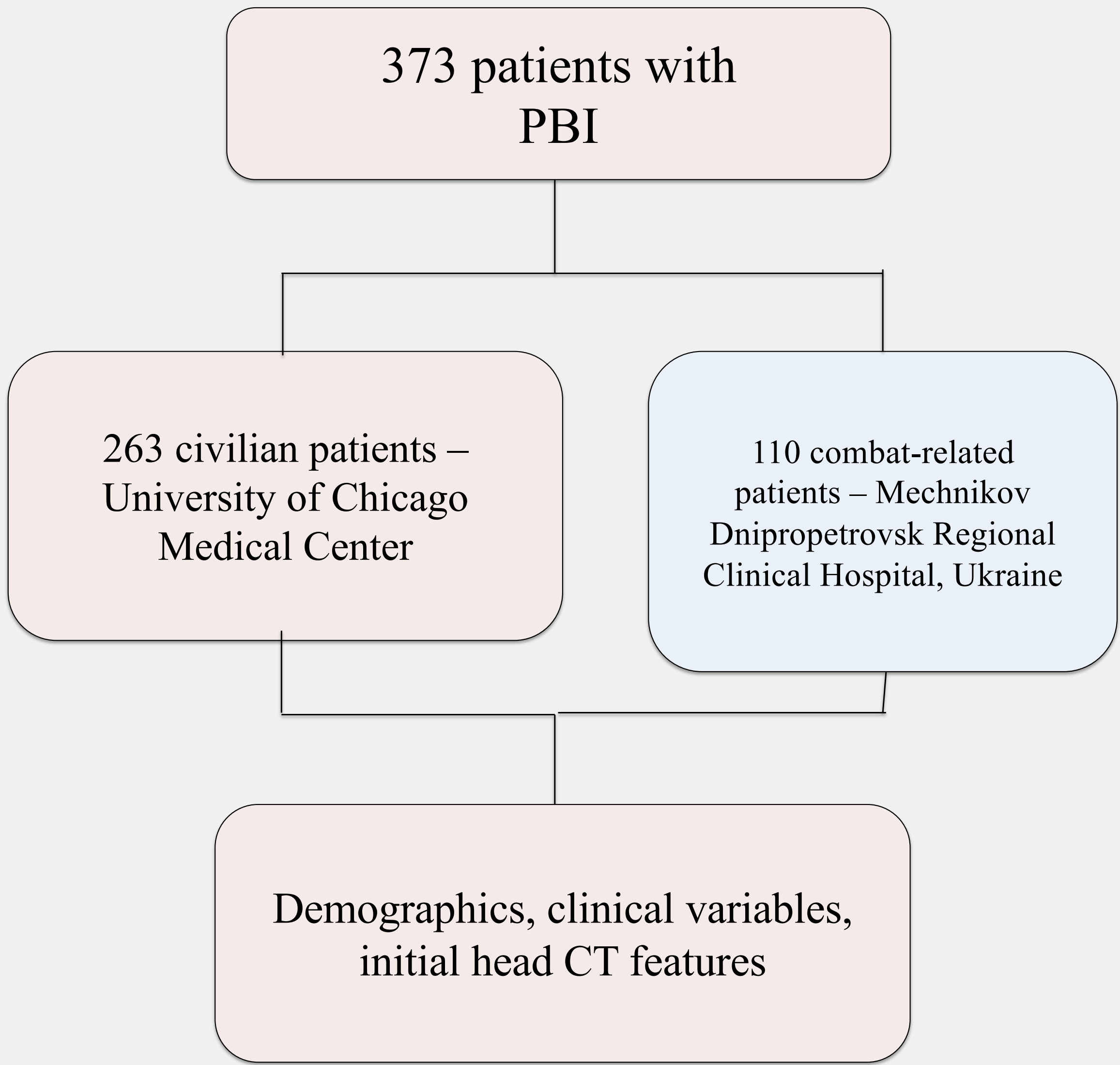


Introduction

- Civilian and combat-related PBI differ in mechanism, care setting, and outcomes; these distinctions are often oversimplified as “civilian versus military.”
- Combat-related PBI involves high-energy fragments, blast mechanisms, and increasingly drone-delivered munitions that may produce distinct early head CT patterns.
- We aim to determine whether early CT features are independently associated with cohort of origin after adjustment for age, sex, and presenting GCS.

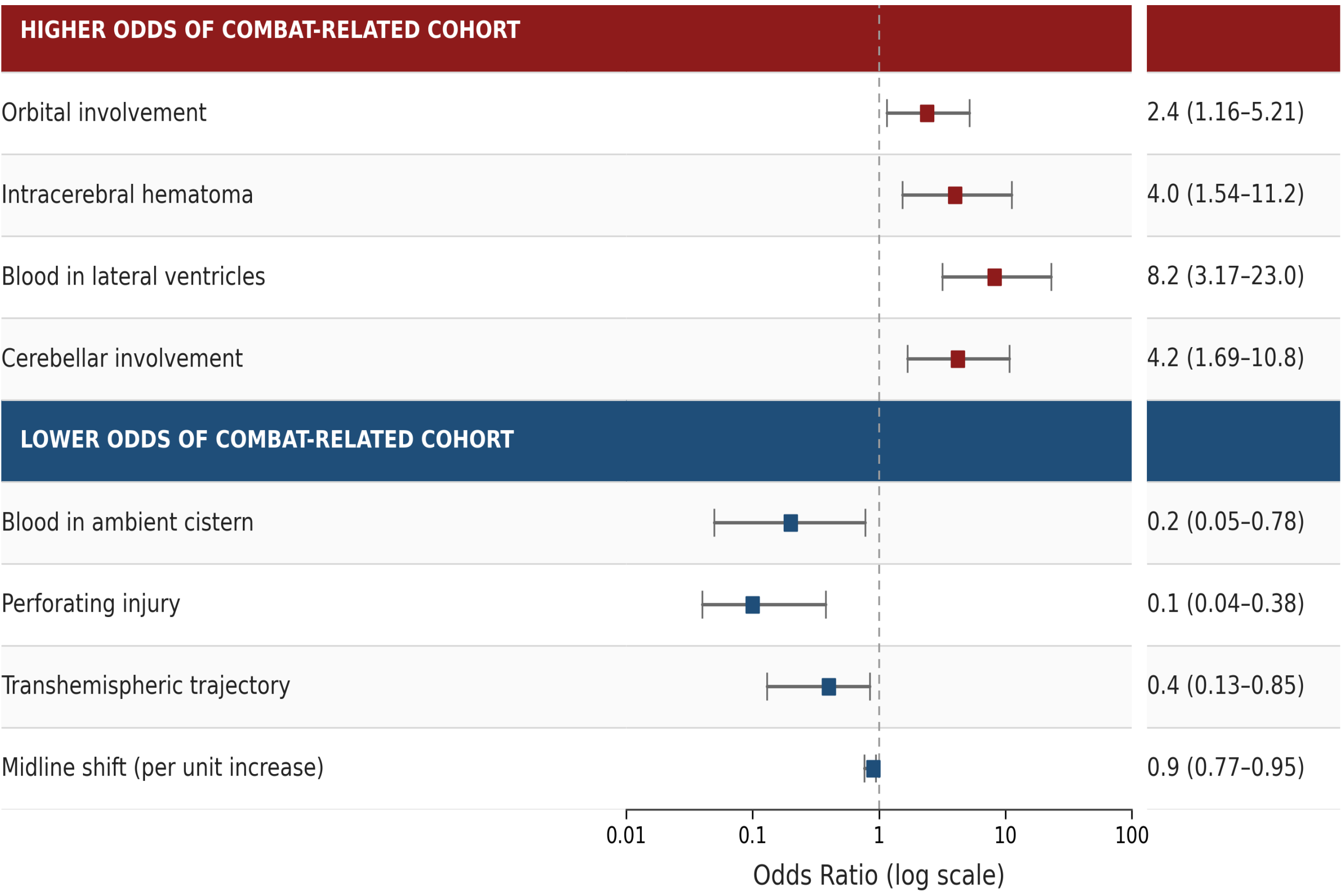
Methods

- Retrospective study of 373 patients with PBI from two cohorts: civilian and combat-related.
- Demographic, clinical, and initial head CT variables were collected.
- Multivariable logistic regression evaluated whether imaging features were independently associated with cohort membership after adjustment for age, sex, and initial GCS.



Results

- The combat-related cohort was older, had higher presenting GCS, and showed higher hospital survival.
- After adjustment, CT features associated with the combat-related cohort included orbital involvement, intracerebral hematoma, blood in the lateral ventricles, and cerebellar involvement.
- Features associated with lower odds of combat-related cohort included blood in the ambient cistern, perforating injury, transhemispheric trajectory, and midline shift.
- Findings remained significant after correction for multiple testing



Conclusion

- Civilian and combat-related PBI differ not only in severity but also in mechanism-driven injury phenotype, with distinct early CT patterns.
- These differences likely reflect underlying injury mechanisms and may have important implications for battlefield triage, prognostic modeling, and clinical decision-making.
- Direct extrapolation of civilian-derived imaging frameworks to combat populations may be inappropriate.
- Recognizing these phenotypes may help optimize care in current conflicts and prepare systems for future large-scale combat operations.