National Databases Give New Insight Into Acute Compartment Syndrome (ACS)

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Purpose: A better understanding of the risk factors, demographics, and relationships with other comorbidities is needed. We have examined new information from multiple publicly collated databases available to investigators as well as published results from large studies with the methodology of systematic review. Annual data from the American College of Surgeons Trauma Quality Program (TQP) were obtained. Previously published papers and recent study data from the Major Extremity Trauma Research Consortium (METRC) were compared to the large comprehensive database from TQP. We hypothesize that there are misconceptions in the actual incidence and risk factors of ACS currently accepted in the literature.

Methods: We screened 2,880,390 trauma cases available in the 3 national databases and selected 195,164 tibial fractures. Other databases used for comparison were previously published prospectively, including the PACS (picture archiving and communication system) data and patient charts taken from a Level I trauma center data registry.

Results: New incidences and risk factors were noted, different from other smaller database studies and prospective cohorts. New ACS predictors include: proximal ($P<0.0001$) and midshaft tibial fractures ($P<0.0001$), open fractures (although a weaker association than thought previously), complex fracture ($P<0.0001$), substance abuse disorder ($P<0.0001$), cirrhosis ($P = 0.002$), or being a smoker ($P<0.0001$). We also noted that male subjects were 67% (odds ratio [OR] = 1.58-1.78, $P<0.0001$) more likely to develop ACS than females and that every additional year of age decrease the likelihood of ACS by 1% (OR = 0.99-0.993, $P<0.0001$). The ACS rate was consistent across the trauma center levels with an expected slight decrease in Level III trauma centers. The fasciotomy rate as well as the ACS rates were lower in the database cohort than any reported prospective study, and probably our reporting should reflect that new number: 9.5% of fasciotomy cases and 17.8% of ACS cases developing muscle necrosis. A multiple logistic regression model identified 4 major factors that increase the risk of muscle necrosis. Open fractures (OR = 1.03-1.40, $P = 0.023$) regardless of the tibial fracture location and complexity, being male, proximal tibia fractures, and comorbidities like cirrhosis were significantly associated with necrosis ($P<0.0001$). However, substance abuse disorder did not show a strong effect on necrosis ($P = 0.14$).

Conclusion: With the large number of patients in trauma registries we can shed new light on risk factors and the reasons for ACS. Several new risk factors have been found from examination through big data statistical analysis. Important questions are raised on whether large retrospective cohorts and prospective trials report on the same disease processes or can be used exclusively in scientific reporting.