



Research Week 2020

Overcoming technical hurdles in intramuscular pH monitoring for acute compartment syndrome: A pilot study

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Keywords

Compartment Syndrome, Orthopaedic Surgery

Abstract

Purpose

One promising technology to diagnose compartment syndrome is intramuscular pH monitoring. In 2019, we began a prospective pilot investigating anterior tibialis intramuscular pH, with a transcutaneous probe, in patients with tibial shaft and plateau fractures. One technical challenge remains probe stability and "pH drift" (Fig 1A) as described by Elliott, in which intramuscular pH values increase with time during monitoring. The purpose of this study is to explore whether a portion of this drift can be explained by systemic factors, including changes in venous pH after surgical management of a fracture of the tibial plateau or shaft.

Methods

All adults ages 18-89 presenting to a single Level 1 academic trauma center (2019-20) with fractures of the tibial plateau and/or shaft (AO/OTA 41 and 42) were considered. After obtaining informed consent, patients received standard fracture care. During surgery, the probe was placed into the anterior tibialis percutaneously, remaining for 48 hours with continuous monitoring. Data was collected and analyzed by a separate research team; no study data was available to the treating orthopaedic traumatologist. Association between intramuscular and venous pH measurements was assessed via Pearson coefficient, significance set at $p < 0.05$.

Results

The pH probe was implanted in eight subjects. Venous and intramuscular pH were correlated, with a Pearson coefficient of 0.734 ($p < 0.01$, Fig 1B), indicating a strong correlation.

Conclusion

A significant component of the variation in anterior tibialis intramuscular pH in the 48 hours after fracture of tibial plateau and/or shaft appears to be explained by systemic changes in venous pH, rather than an artifact intrinsic to the probe such as sensor oxidization. This may be a critical finding. The pilot study remains ongoing.