



The Estimated Sensitivity and Specificity of Compartment Pressure Monitoring for Acute Compartment Syndrome

McQueen MM, Duckworth AD, Aitken SA, Court-Brown CM. *J Bone Joint Surg Am.* 2013; 95(8):673-677. doi: 10.2106/JBJS.K.01731

Each month, this column summarizes a Level I article and provides a thought-provoking review on how the treatment in the article has either stood the test of time or serves as an example of how conventional wisdom has changed.

In the diagnosis of acute compartment syndrome in tibial fractures, researchers have demonstrated high estimated sensitivity and specificity of intracompartmental pressure measurement, according to recent study results. For patients at risk for acute compartment syndrome, researchers recommend continuous intracompartmental pressure monitoring.

Researchers included 1184 consecutive patients aged 12

years or older with a fracture of the tibial diaphyseal admitted to the Edinburgh Orthopaedic Trauma Unit between January 1998 and December 2007. A retrospective analysis recorded and analyzed the documented use of continuous intracompartmental pressure monitoring and the use of fasciotomy.

Patients were diagnosed with acute compartment syndrome if escape of muscles occurred at fasciotomy or if

color change in the muscles or muscle necrosis was found intraoperatively. However, if it was possible to close the fasciotomy wounds primarily at 48 hours, researchers considered the diagnosis of acute compartment syndrome as incorrect. At the time of the latest follow-up, the absence of neurological abnormality or contracture confirmed the absence of acute compartment syndrome.

Of the 152 (17.9%) patients who underwent fasciotomy for the treatment of acute compartment syndrome, 141 had acute compartment syndrome, 6 did not, and 5 underwent fasciotomy despite having a normal

differential pressure reading with subsequent operative findings consistent with acute compartment syndrome, according to study results. At a mean follow-up time of 59 weeks, study results showed that 689 of 698 patients who did not undergo fasciotomy had no evidence of late sequelae of acute compartment syndrome.

Researchers found that intracompartmental pressure monitoring for suspected acute compartment syndrome had an estimated sensitivity of 94%, an estimated specificity of 98%, an estimated positive predictive value of 93%, and an estimated negative predictive value of 99%. ■



REVIEW

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Consistent and accurate diagnosis of acute compartment syndrome continues to be a challenging issue in the trauma population. Although extensive education of the orthopedic community has dramatically increased awareness of compartment syndrome, occasional cases of this condition are missed until after permanent soft tissue injury has occurred. As leaders in trauma, orthopedic surgeons must continue to advocate for consistent modalities that will decrease the rate of missed compartment syndromes.

The study by McQueen et al promotes the use of a slit catheter placed into the anterior compartment of the leg in an attempt to effectively diagnose acute compartment syndrome after tibial fracture. The data for this study were extracted from the extensive prospective Edinburgh Trauma Database. They comment on the actual presence of compartment syndrome of the leg associated with tibial fracture in 1184 patients. Every patient in this series had a slit catheter placed in the anterior compartment shortly after presentation to the hospital. Their definition of a true compartment syndrome was confirmed if there was “escape of the muscles at fasciotomy...along with color change in the muscles or muscle necrosis.” They also decided that the diagnosis of compartment syndrome was incorrect if the fasciotomy wounds could be closed primarily at 48 hours. The positive predictive value of intracompartmental monitoring was 93%, whereas the negative predictive value was 99%.

This study brings up some interesting considerations. Many believe that compartment syndrome is a clinical diagnosis and that intracompartmental pressures are just part of the entire scenario. In studies by Harris et al¹ and Prayson et al,² many patients had ΔP values in the diagnostic range of compartment syndrome who actually never developed a clinical compartment syndrome. McQueen et al stated that criteria had not been met for compartment syndrome until pressure measurements were found in the diagnostic range for more

than 2 hours, but the point is that patients can manifest high compartment pressures without having true compartment syndrome. Without question, the measurement of compartment pressures is an integral step in decision making in certain situations, but it should not be considered as the only variable that is considered.

McQueen et al’s study confirms that pressure measurements are excellent in their negative predictive value (ie, confirming that a compartment syndrome is not there). The positive predictive value (ie, confirming that compartment syndrome does exist) is less definitive. The authors state that this may often be due to compartment syndrome affecting the posterior compartments, which they were not actively measuring. Nonetheless, the authors’ technique of measuring pressures is to be commended as consistently having protocols in place to effectively record information for clinical decision making after acute tibial fracture.

In the current age of health care reform, cost must always be taken into account. I am not sure how much this monitoring costs in Scotland, but in the United States, all additive expenses need to be validated for usefulness. Comparative effectiveness research may have to consider whether this monitoring adds enough value to be used in the routine management of patients with tibial fractures. Certainly, this technology needs to be considered in patients who are unable to communicate the symptoms of compartment syndrome, such as those with head injuries or on pulmonary ventilation.

McQueen et al’s study adds significant information to the orthopedic literature in our quest to achieve perfection in confirming or excluding the diagnosis of compartment syndrome. Their findings should not be taken in isolation, but we must consider this study as we move forward.

REFERENCES

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