Clues include displacement, severity in tibial plateau fractures

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Compartement syndrome is a serious condition that is difficult to diagnose; typically, orthopaedic surgeons must rely on clinical assessment and compartment pressure measurements. Study data presented at the 2012 AAOA Annual Meeting, however, indicate that lateral and medial displacement of the femur and increased fracture severity are strong predictors of compartment syndrome in tibial plateau fractures.

The researchers sought to determine the prognostic value of radiographic measurements with regard to compartment syndrome. “We believe that this information would be especially useful when evaluating patients who are obtunded, intubated, or otherwise unable to communicate,” said Stephen J. Becher, MD, presenter and coauthor of “Radiographic Predictors of Compartment Syndrome in Tibial Plateau Fractures.”

Collecting the data
Dr. Becher and his fellow researcher, Bruce Ziran, MD, performed a retrospective review of 240 patients with tibial plateau fractures who had been treated at a single institution between February 2006 and September 2010. They identified 159 patients (162 fractures) whose proximal femoral shaft and distal tibial shaft were intact and whose posteroanterior (AP) radiographs. Most of the injuries (42 percent) were the result of motor vehicle collisions.

The cohort was divided into the following two groups:
- Tibial plateau fractures with compartment syndrome (n = 18; 13 males, 5 females; mean age = 42 years)
- Tibial plateau fractures without compartment syndrome (n = 141; 84 males, 57 females; mean age = 48 years)

Using the index AP radiographs, Drs. Ziran and Becher measured the tibial widening at the level of the joint, calculated as a ratio of the femoral width over tibial width (Fig. 1); the medial to lateral displacement of the femur relative to the tibia, calculated as a ratio of the displacement over the femoral width (Fig. 2); and fracture severity in both groups. To account for differences in size and magnification, the intact width of the femoral condylar region served as a normalization parameter.

The researchers hypothesized that the risk of compartment syndrome would be increased when the femur was displaced medially relative to the tibia, stretching the vascular architecture. They also thought that certain radiographic measurements, including Schatzker grade, would be more pronounced on higher energy injuries that disrupted the soft tissues more than lower energy injuries. Schatzker is a grading system that classifies tibial plateau fractures into six types (Table 1).

Results
Multivariate analysis revealed that higher femoral displacement ratio (>10 percent, \( P = 0.004 \)) and higher Schatzker fracture grade (IV–VI, \( P = 0.031 \)) were strongly associated with compartment syndrome. Although the tibial widening ratio was significant in univariate analysis, the authors noted, “Contrary to our initial hypothesis, we found that displacement of the femur in both the lateral and medial directions, as well as increasing fracture severity, were strongly predictive of compartment syndrome,” said Dr. Ziran. “Now physicians have two additional methods to determine the amount of soft-tissue injury on the index AP radiograph. This can raise suspicion of an impending compartment syndrome if clinical evaluation is impossible.”

Dr. Becher added, “By knowing which fractures have the highest likelihood of developing compartment syndrome, orthopaedic surgeons can focus their diagnostic efforts where they are most needed.”

What’s your diagnosis?
This month’s challenge appears on page 12. According to Brian Norton, MD, who submitted the case, the diagnosis is a Morton’s neuroma.

Do you have a challenging case you’d like to submit for publication? Email a short case description and any accompanying images to aaoscomm@aaos.org.