Clinical and Radiographic Differentiation of Pediatric Patellar Sleeve Fractures and Other Inferior Pole Pathologies (165)

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Objectives: Inferior pole patellar sleeve fractures (PSF) are rare injuries that occur in skeletally immature patients with sparse literature on the diagnosis, management, and outcomes of this injury. Diagnosis of PSF can be difficult based on radiographs alone, as only a small bony fragment is often seen. Consequently, PSFs may be missed or falsely diagnosed as an inferior pole fracture (IPF) or Sinding-Larson-Johansson syndrome (SLJS) possibly leading to improper treatment and poor outcomes (Figure 1). The objective of this study was to evaluate and compare clinical and radiographic features of patients with PSF, IPF and SLJS to help improve diagnostic accuracy.

Methods: This was a retrospective review of skeletally immature patients diagnosed with inferior pole patellar pathology between 2011-2019 at a single urban academic center. Patients were identified using both International Classification of Diseases 9th and 10th edition (ICD-9 and ICD-10) codes and Current Procedural Terminology (CPT) codes. Data from medical records (demographics, injury mechanism and physical exam) and lateral knee radiographs (fragment size, fragment displacement, number of fragments, Insall-Salvati, Caton-Deschamps, pre-patellar effusion, intra-articular effusion) was collected. ANOVA, Student's t-test and Fisher's exact test were used for comparisons between the three groups. Statistical significance was determined at $p < 0.05$. This study was approved by our institutional review board.

Results: A total of 125 patients were included: 82% male, average age 10.7 years (SD 2), 16 PSF, 51 IPF, 58 SLJS patients. There were no significant differences in patient demographics between the three groups (Table 1). Only 24% of SLJS patients presented with acute trauma compared to 100% of the PSF and IPF patients. Fewer PSF patients had an intact straight leg raise (37.5%) compared to IPF (94.1%) and SLJS (98.3%) ($p < 0.001$). SLJS patients were less likely to present with knee swelling (41.4%) compared to PSF (93.8%) and IPF (94.1%) ($p < 0.001$). Knee effusion was more frequently seen in PSF (81.2%) compared to IPF (37.3%) and SLJS (3.4%) ($p < 0.001$). More patients with SLJS were able to bear weight (87.9%) compared to IPF (11.8%) and PSF (0%) ($p < 0.001$) (Table 2). Radiographically, compared to those with IPF and SLJS, patients with PSFs had increased mean prepatellar swelling (6.1 and 6.5 versus 12.9mm, $p < 0.001$), intra-articular effusion (6.1 and 4.9 versus 9.2mm, $p < 0.001$), maximum fragment size (26 and 17.7 versus 45.3mm, $p < 0.001$) and maximum fragment displacement (1.24 and 1.45 versus 13.30mm, $p < 0.003$) respectively. Compared to SLJS, PSF and IPF patients had higher patella alta with mean Insall-Salvati ratios > 1.2 (Table 3).

Conclusions: Differences in clinical features such as straight leg raise, knee swelling, knee effusion, ability to bear weight and radiographic features such as prepatellar swelling, intra-articular effusion, fragment displacement/size/shape/location can all be helpful in improving the accuracy of diagnosing inferior pole injuries in pediatric patients.

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