PEDIATRIC ACL RECONSTRUCTION: DOES THE FEMORAL PEEK IMPLANT CAUSE TUNNEL WIDENING?

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Background
Because of their strength, inertness and biocompatibility, polyetherketone (PEEK) implants have been increasingly used in orthopedics, especially trauma and spine surgeries. Their mechanical and chemical properties have been widely studied and compared to other materials since their accelerated development in the 1980s. Their use is relatively new in anterior cruciate ligament reconstructions (ACLR), and there is little literature to document their effect on tunnel widening in these procedures. Bone tunnel enlargement following ACLR is a widely reported phenomenon that has been negatively correlated with clinical outcome scores. A recent prospective study reiterated its stronger association with suture discs compared with methods using interference screws, cross-pins and buttons. There is only one paper that specifically reports the results of a study on PEEK implants in relation with tunnel widening and it did not demonstrate significant association. PEEK polymer has not yet been studied in pediatric knees, in which tunnel widening has more than the usual residual laxity and re-tear implications, as it can also cause physeal damage.

The purpose of this study was to investigate the use of a femoral PEEK implant in ACLR performed on skeletally immature patients and to determine if it is associated with tunnel widening. As a secondary objective, this study aimed to assess the risk of growth complications associated with the use of PEEK.

Methods
All patients who underwent all-epiphyseal ACLR surgery in a pediatric university hospital between March 2015 and January 2017 were included in this retrospective study. The all-epiphyseal ACL reconstruction procedures were done using a new instrumentation system that includes a titanium tibial anchor fixation and a femoral PEEK screw system. Femoral bone tunnel diameters were measured on postoperative lateral knee radiographs. The widest tunnel measurements were taken using the sclerotic tunnel margins as reference points and compared to the known sizes of the drill bits retrieved from operative protocols. Paired t tests were performed to assess bone tunnel widening. P-values <0.05 were considered significant. SPSS 25.0 was used for statistical analysis.

Results
Eighteen (19 knees) arthroscopic ACL reconstruction patients were included. Of the 18 all-epiphyseal ACL reconstruction patients, 4 (22.2%) were female and 14 (77.8%) were male. The chronological and bone ages at time of surgery (mean ± SD) were respectively 13.5 ± 1.6 and 13.3 ± 1.0 years. At a mean follow-up of 17.1 months, average tunnel enlargement was 1.8± 1.4 (0.0-4.2) mm at the femur and was found to be statistically significant (P<0.001). There were no symptomatic growth abnormalities requiring intervention, but 2 unilateral early physeal closures at the distal femur (10.5%) were noted. These patients had notable femoral tunnel enlargement. One had a 3.0 mm of femoral tunnel widening and no observable growth disturbance. The other had an asymptomatic and non-progressive unilateral knee valgum of 5 degrees and 3.5 mm of femoral tunnel widening.

Conclusions/significance
This study showed that the largest tunnel increase at a mean follow up of 17.1 months was 4.2 mm. It is not clear that this widening is clinically significant even though it is statistically significant. Also, association between femoral tunnel widening and physeal closure could not be formally established. Thus, further research on this potential risk factor is needed.
