Does Acute Interpositional Adipose Autograft Protect Against Bar Formation In Physeal Fractures?

Mikhail Tretiakov, Christine L Farnsworth[1], Garrett Rupp, Kelly Boutelle[2], Eric William Edmonds
[1]Rady Children's Hospital and Health Ctr, [2]Rady Children's Hospital San Diego

INTRODUCTION:

Premature physeal closure after long bone fractures can lead to bar formation and unpredictable growth disturbance. Bar excision has been studied extensively, while data on preemptive tissue interposition into physeal fractures is very limited. A pilot study comparing periosteal and fat autograft interposition in a rabbit physeal fracture model resulted in a trend toward decreased bar formation with fat interposition. The current study evaluates bar formation and subsequent angular deformity with or without fat autograft interposition using this same rabbit model, powered for significant results.

METHODS:

Thirty 10-week-old New Zealand White rabbits underwent induced right proximal tibia physeal fractures. Twenty fractures had retropatellar fat autograft interposed into the physeal fracture (***Fat Group***, n=20) and the remaining fractures had no interposition performed (***Fracture Group***, n=10), then rabbits were casted for 10 days. The left legs served as a ***Control Group*** (n=30). Radiographs (PA, Lateral) were obtained of bilateral proximal tibiae preoperatively, immediately postoperatively, 10 days, and 6 weeks following surgery. Radiographs from ten days and six weeks post surgery were evaluated by two fellowship trained pediatric orthopaedists for physeal bar formation. Tibial medial-lateral side difference (TMLSD)(mm) and tibia plateau angle (TPA) were measured on all radiographs and compared between Fat, Fracture, and Control groups using repeated measures ANOVAs ($p<0.05$ was significant).

RESULTS:

There were no differences between Fat and Fracture groups when comparing age, weight, body length, surgical duration, weight increase, and body length increase over 6 weeks ($p>0.05$). The Fat group had higher blood loss compared to Fracture (1.9±0.9ml and 1.1±0.3ml, $p=0.035$).

No difference was seen in radiographic bar formation 6 weeks after surgery between Fat (12/20, 60%) and Fracture (7/10, 70%) groups ($p=0.702$).

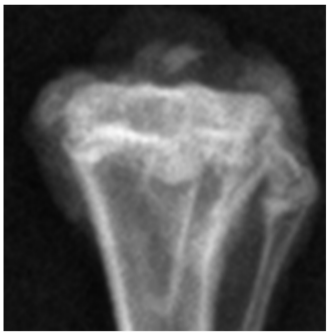
No differences were seen in 6-week TMLSD in Fat nor Fracture groups ($p>0.05$) when compared to their respective preoperative radiographs. No difference in TMLSD was seen at 6 weeks between Fat and Fracture groups ($p>0.05$), but both were increased compared to Controls ($p=0.002$, $p=0.04$).

The Fat group after 6 weeks had increased valgus in TPA compared to preoperative measurements (81±8.1° vs. 87.2±1.8°, $p=0.021$). Similarly, the TPA was more valgus in the Fracture group compared to Controls (80.6±6.1 vs. 86.1±2.5°, $p=0.005$), but these changes were not different from those seen between the Fat group and Controls ($p = 0.220$).

DISCUSSION AND CONCLUSION:

Fat autograft interposition did not reliably prevent radiographic bar formation nor angular deformity in an established rabbit physeal fracture model. Therefore, we do not advocate for routine fat interposition into physeal fractures as a preemptive modality to prevent bar formation.

Control Group proximal tibia with no physeal bar.



6 weeks following fracture. Physeal bar is visible.

Tibial medial-lateral side difference measurement

Tibial plateau angle