INTRODUCTION:
Recent experience with bicondylar tibial plateau fractures has led to concern over the stability of the posteroomedial fragment when using standard lateral plating with anterior lag screws. Loss of reduction of this fragment has led to posterior subluxation of the femur in stance, and a stiff arthritic knee [1].
Historically fixation of these fragments has been performed with lateral plating combined with cannulated screws through a single anterior incision, or with combined medial and lateral plating [2-9]. In our hospital we have witnessed loss of fixation using these techniques resulting in posterior migration of the fragment which might have been avoided with more solid fixation. We have subsequently treated this fracture type using a posterior buttress plate with good results but data does not exists in the literature to show that this is better than anterior to posterior cannulated screws.
Bhatacharia [10] et al used posterior plating in a series of patients with posterior fragments and determined that posterior plating could be used with clinical success in these cases. Blokker et al [3] showed that quality of reduction was the dominant predictor of satisfactory outcome and that 5mm of articular step-off was associated with unsatisfactory results thus emphasizing the need for solid anatomic fixation that will resist postoperative forces.
In this study we compared a technique using a lateral locking plate in combination with anterior lag screws to a technique that used a lateral locking plate in combination with a posteromedial 'T' plate in composite bones. We hypothesized that the posteroomedial T plate would exhibit superior mechanical properties.

METHODS:
All tests were performed in 4 th Generation Sawbones tibias (Sawbones, Pacific Research, Vashon, Washington). A band saw was used to create a posteroemedial fragment by cutting along a line between the center of the posterior intercondylar area to the most medial point on the tibial plateau forming a plane at 70 degrees to the long axis of the tibia [1].
All specimens had the fragment secured using a 3.5mm LCP Proximal Tibia Plate (Synthes Inc, West Chester, PA) according to the technique recommended by the manufacturer. Half of the specimens were treated with two 3.5mm cannulated screws (Synthes Inc, West Chester, PA). Remaining specimens were treated using a 5-hole T plate which secured the fragment to the posterior cortex in standard surgical fashion with screws filling the bottom 4 holes on the vertical portion of the plate, but not in the cross bar portion of the plate.
The tibia was cut distally at a location 5cm from the plafond. The blunt end of the distal tibia was potted in dental cement (Biocryl, Great Lakes Orthodontics) and mounted in a specially designed mechanical testing fixture. The fixture was then secured into a load frame (MiniBionixII , MTS Corporation). The center of the fracture fragment was aligned directly beneath the MTS actuator. The compressive load from the actuator was evenly distributed across the fracture fragment by utilizing a pre-formed dental cement mold. The superior face of this mold was contoured to accept a spherical indenter attached to the actuator. The inferior face of this mold was formed to match the superior face of the fracture fragment.
The mechanical testing protocol consisted of a preload of 10N applied to the posteroemedial fragment followed by uniaxial displacement to failure at a loading rate of 100N/sec. Load and displacement data from the MTS actuator was collected using a PC computer and MTS data acquisition software. The reported outcomes include ultimate force, force at 5mm of fragment displacement, and the stiffness. Clinical failure of the construct was defined as 5mm of fragment displacement. Mann Whitney non parametric analysis determined whether a significant difference (p=0.05) existed between the repair methods for all measurable outcomes.
RESULTS:
The results of our study are detailed in Table 1. They show that the addition of a posterior plate created a construct that was significantly stronger, stiffer and required more force to displace the fragment to 5mm.

\begin{table}
\centering
\begin{tabular}{|c|c|c|}
\hline
 & T Plate & AP Screws & p \\
\hline
Ultimate Force (N) & 5426.2 ± 379.8 & 2217.9 ± 475.9 & 0.009 \\
Force to 5mm (N) & 2841.3 ± 763.3 & 1588.0 ± 533.6 & 0.016 \\
Stiffness (N/mm) & 660.1 ± 130.2 & 325.5 ± 82.8 & 0.001 \\
\hline
\end{tabular}
\caption{Results of mechanical testing}
\end{table}

DISCUSSION:
Our results have shown that the addition of a posteroomedial T Plate can improve the strength and stiffness of posteroemedial fragment fixation in tibial plateau fractures. It was observed that AP screws offered limited resistance to shear forces at the fracture site while the posteroomedial plate had a buttress effect preventing descent of the fragment under load.
While a posteromedial approach adds complexity to the operation, the added strength of the fixation may offset the added time and technical skill required to perform the procedure. The results of this study provide a rationale for undertaking a clinical study comparing the outcomes of the two fixation methods.

REFERENCES:

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Figure 1, A, Anterior view of tibia showing lateral locking plate in combination with two cannulated screws directed at the posteroomedial fragment. B, Posterior view showing lateral locking plate in combination with a posterior buttress plate.