

# Advantage of the “Locking S” Construction using a Tibial RetroScrew for BTB Graft ACL Fixation: A Biomechanical Study

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## Objective

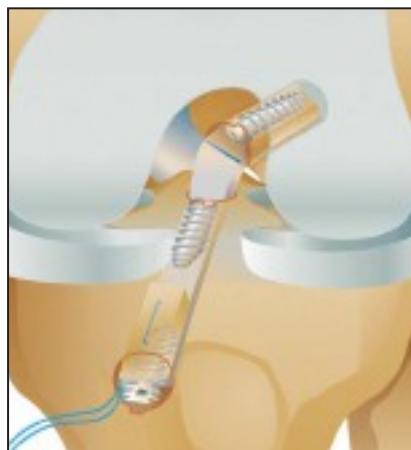
The objective of this study was to evaluate the biomechanical properties of a “Locking S” BTB graft construct, comprised of a Tibial RetroScrew combined with a distal titanium interference screw. This fixation technique was compared to distal titanium interference screw fixation. Stiffness, yield load and ultimate load-to-failure were compared between the two techniques.

## Methods and Materials

Fourteen matched pairs of 10 mm diameter human patella BTB allografts were fixed in porcine tibial models using two fixation methods. Group one consisted of a bioabsorbable RetroScrew inserted anteromedial to the graft with a backup titanium interference screw inserted distally and posterior to the graft to create a “Locking S” configuration. The RetroScrew construct was fixed such that the RetroScrew was in contact with the patella tendon and proximal to the bone block. The “Locking S” construct can be seen in Figure 1.

Group two consisted of a titanium interference screw inserted distally and anterior to the graft. The RetroScrews used were 8 mm in diameter and the distal titanium screws used were 9 mm in diameter. Insertion torque was measured and recorded during insertion of all screws. The constructs were precycled then pulled to failure at 20 mm/min. Direction of loading was in line with the tibial tunnel, in order to test “worst case”.

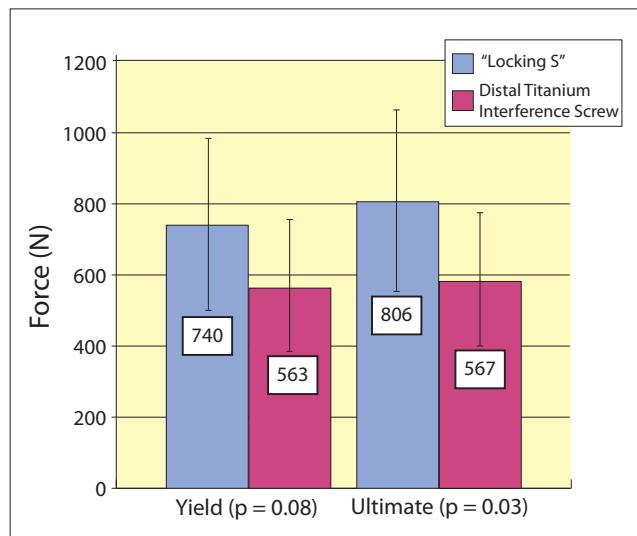
**Figure 1:**  
Illustration of  
the “Locking S”  
configuration.



## Results

Screw insertion torque between the two groups was statistically equivalent. The average ultimate load of the “Locking S” RetroScrew construct was significantly greater than the distal-only screw group ( $806 \pm 267$  vs.  $567 \pm 189$ N,  $p=.03$ ). There was no significant difference between the average stiffness of the two groups. The average yield load for the RetroScrew group was greater than the distal-only group, but not significant ( $740 \pm 239$  N vs.  $563 \pm 181$  N,  $p=.08$ ). Graft slippage past the screw was the primary mode of failure for both groups. The yield and ultimate load can be seen graphically in Figure 2.

**Figure 2:** Yield and ultimate load data for “Locking S” construct vs. distally placed titanium interference screw.



## Conclusion

Addition of a Tibial RetroScrew to a distal titanium screw to create a “Locking S” construct significantly enhances the strength of a BTB graft fixation by locking the bone block in place. In addition, orifice fixation with the RetroScrew has been shown to reduce fluid proliferation in the tibial tunnel, which may reduce tunnel widening and bone necrosis.