

# Biomechanical Comparison of Double Grasping Repair Versus Cross-Locked Cruciate Flexor Tendon Repair

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## Disclosures

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## Purpose

-To examine the Biomechanical properties of a novel Double Grasping Loop (DGL) Flexor Tendon Repair method:  
+Tensile Strength: Load to 2-mm gapping & Load to failure  
+Gap Resistance

-Compare Biomechanical properties with proven 4-strand Cross Locked Cruciate (CLC) Flexor tendon repair method, both with an Interlocking Horizontal Mattress Suture (IHM)

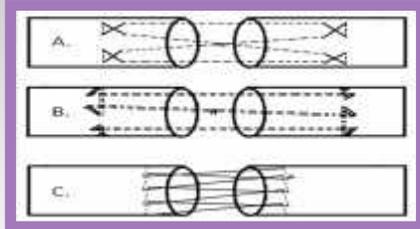


Figure 1: Schematic representation of CLC core suture (A), double grasping loop core suture (B), and IHM circumferential suture (C).

## Hypothesis

-The DGL-IHM method which utilizes two looped core sutures in a "3-double-stranded" configuration that incorporates both grasping loops and locked loops with a single intralesional knot will have a greater strength and increased gap resistance than the proven CLC-IHM method.

## Methods

-Forty Porcine Flexor Digitorum Profundus Tendons, evenly assigned to one of two groups:  
+the experimental DGL-IHM group +the control CLC-IHM group

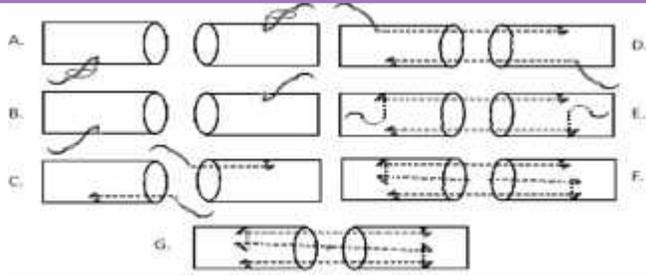


Figure 2: DGL Flexor Tendon Repair Method:  
(A) Looped Suture is initiated at lateral point of tendon ~10mm from laceration site emerging volarly ~33% across tendon width and passed through suture loop.  
(B) Suture is tightened, grasping 33% of tendon width.  
(C) Suture is advanced longitudinally toward laceration site through the grasped tendon portion.  
(D) Suture crosses laceration site to attain ~10mm purchase length of opposite segment emerging volarly at ~33% width point.  
(E) Suture is passed from lateral wall from a point closer to the laceration site than the emerging point to a volar central (~50% width) point.  
(F) Tendon is locked as the suture inserted centrally (away from laceration site) returning to the mid-point (~50% width) at the laceration site.  
(G) Suture is knotted within the repair site with the mirrored suture of opposite segment.

Measurements:  
+Tendon repair strength: 2-mm gap force & load to failure  
\*Measured as a constant rate of distraction  
+Stiffness  
\*Calculated based on resistance to gapping  
+Method of repair failure: Analyzed under microscope

## Results

Tendon Repair Strength  
+2-mm gap force \* CLC-IHM: 62.0N DGL-IHM: 37.1N  
+Load to failure \* CLC-IHM: 99.7N DGL-IHM: 75.1N

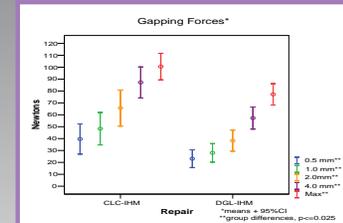


Figure 3: Mean loads with 95% confidence intervals at 0.5, 1.0, 2.0, 4.0 mm gapping levels and at loads to failure for both CLC-IHM and DGL-IHM repair methods (p <= 0.025).

Stiffness \* CLC-IHM: 16.9 MPa DGL-IHM: 12.9 MPa  
Method of repair failure \*  
CLC-IHM: 90% knot failure, 10% suture pullout  
DGL-IHM: 30% knot failure, 70% suture pullout  
\*: signifies that results are Statistically Significant

## Conclusion

-The proven Cross Locked Cruciate-Interlocking Horizontal Mattress (CLC-IHM) Flexor Tendon Repair method is overall a stronger repair that better resists gapping when compared to the novel Double Grasping Loop-Interlocking Horizontal Mattress (DGL-IHM) Flexor Tendon Repair Method.  
-The CLC-IHM group, which had greater stiffness, required a greater load to 2mm gapping and a greater load to ultimate failure than the DGL-IHM group.  
-The CLC-IHM group failed primarily by knot failure. This is consistent with this repair's superior maintenance of tendon end approximation during healing.  
-It is suspected that because the DGL-IHM group failed to maintain its position within the tendon under load, as demonstrated by the high percentage of suture pullout, it was unable to tolerate loads as high as the CLC-IHM group.