

Lateral Hinge Screw Significantly Increases Resistance to Varus Stress in Medial Closing Wedge Distal Femoral Osteotomy



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Distal Femoral Osteotomy

- OA with valgus deformity
 - 10–15% of arthritic knees
 - Less data available for DFO than for modern day HTO
- Systematic Review: Wylie et al. Arthroscopy 2016
 - Sixteen studies reporting on 372 osteotomies with mean follow-up of 45 to 180 months.
 - 9% complication rate
 - 3.2% Nonunion and
 - 3.8% Delayed union rates
 - 34% reoperation rate
 - 15% were converted to arthroplasty



Distal Femoral Osteotomy

- MCW-DFO is our procedure of choice for Valgus LUCOA
 - **MCW**
 - Enhanced Stability
 - Obviates need for bone grafting to stabilize the osteotomy
 - Allows immediate weight bearing
 - **LOW**
 - More delicate
 - Relying on a much smaller volume of host bone to provide stability
 - Can overtighten the ITB



Hinge Fracture

- Significant destabilizing effect of hinge fracture in closing wedge DFO that can result in delayed healing, loss of correction, malunion and nonunion
 - Peez et al AJSM 2023
 - >70% decrease in rotational stiffness when hinge fracture present in CWDFO
 - MC Rupp et al KSSTA 2022
 - 48% Incidence of HF in CWDFO
 - 14% Malunion



MedStar DFO Study:

- Question: Does placement of a lateral hinge screw significantly increase resistance to forces imparted to the lateral femoral hinge following biplanar MCWDFO?



MedStar DFO Study

- Materials and Methods:
 - 12 left femur sawbones (Generation 4)
 - 6 biplanar DFCWO with no hinge screw
 - 6 biplanar DFCWO with addition of a 4.5mm cortical screw
 - 5mm correction, fixated with NewClip Activmotion DFO plate and screws filling 3 proximal and 3 distal holes



MedStar DFO Study

- Mechanical Testing
 - The distal aspect of the femur Sawbone was embedded into a resin mold with K-wires holding it in place
 - A varus stress was applied
 - An MTS Mini Bionix was used, with displacements of 10mm/min until failure of the lateral hinge
 - Failure was defined as the point where a significant drop occurred in the force versus the displacement curve



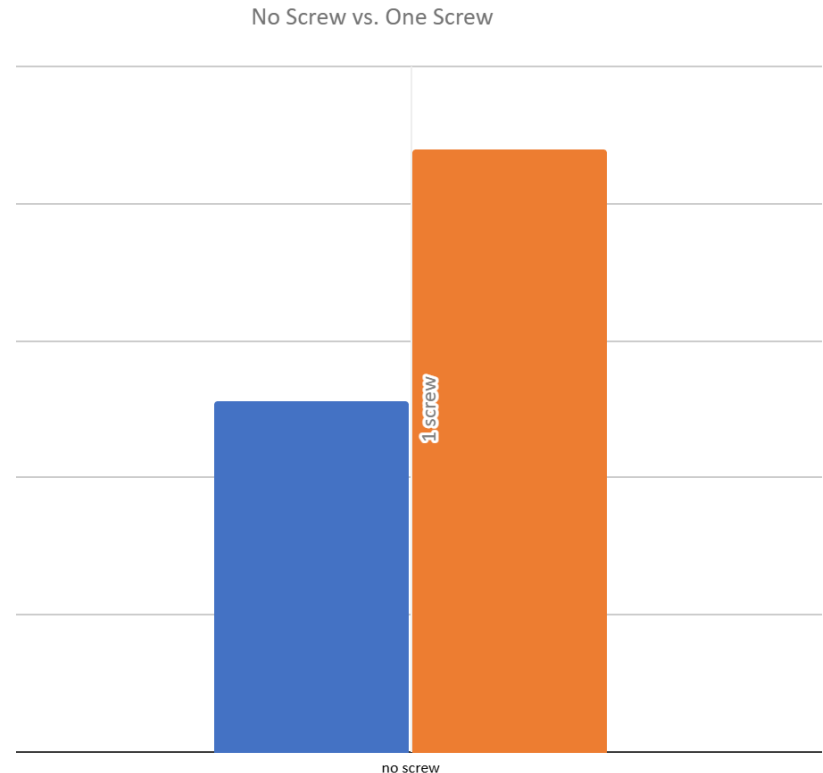
MedStar DFO Study

- Results
 - Hinge Screw
 - 439.7 +/- 64.3 N
 - No Hinge Screw
 - 255.6 +/- 97.9 N

HINGE SCREW		NO HINGE SCREW	
Max Force (N)	Stiffness (N/mm)	Max Force (N)	Stiffness (N/mm)
554.6	10.3	266.1	14.7
428.3	6.6	227.8	16.2
391.8	40.3	203.6	24.7
403.8	38.7	153.9	35.5
367.8	19.3	461.5	38.2
491.9	24.7	221.0	37.3

Conclusions

- The addition of a hinge screw to a biplanar DFCWO resists varus stress
 - 72% increase in resistance to varus stress
 - Findings statistically significant
 - $p=0.005$



References

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