INTRODUCTION: Rigid locked plating constructs can suppress fracture healing, particularly at the near cortex adjacent to the plate where interfragmentary motion is minimal. Dynamic fixation with far cortical locking (FCL) screws reduces construct stiffness and permits axial interfragmentary motion known to stimulate symmetric callus formation and healing. While FCL screws have become available for clinical use, their clinical performance has not been documented to date. This prospective multi-center observational study documented our early clinical experience with FCL screws to assess their durability and potential complications.

METHODS: Thirty-one consecutive patients with 33 distal femur fractures (AO/OTA types 33-A,C) were prospectively enrolled at three trauma centers. Fractures were stabilized by plate osteosynthesis, using FCL screws for diaphyseal fixation, and standard locking screws for metaphyseal fixation. No supplemental bone graft or bone morphogenic proteins were administered to enhance healing. Follow-up visits at six, 12, 24 and 48 weeks comprised functional and radiographic assessment of fracture healing, including computed tomography scans at week 12. Periosteal callus size was objectively measured at the medial, anterior and posterior cortices using a validated computational algorithm with an error of less than 5%. Callus measurements were compared to a published series of historic control data from 66 distal femur fractures that were treated with standard locked plating constructs and that were analyzed with the same callus size algorithm.

RESULTS: Thirty-one fractures were available for evaluation with a minimum follow up of one year. None of the 125 FCL screws used for diaphyseal fixation broke and there was no diaphyseal fixation failure. After an average follow up of 17±4 months, one of 31 fractures displaced into varus (ΔVarus=5.8°). Thirty of 31 fractures healed within 15.6±6.2 weeks. In 23 fractures (74%), periosteal callus formed circumferentially, extending to the lateral cortex under the plate. Two fractures exhibited complications requiring revision. One revision was performed at five days post surgery to correct a mal-rotation. The second revision was performed at six months post surgery to treat a non-union. During revisions, all FCL screws could be removed without complications. Compared to historic control data from a previous study on 66 distal femur fractures treated with locked plating constructs using standard locking screws, dynamic fixation in the present study yielded on average an increase in periosteal callus size of 48% at week 6 (p=0.12), 72% at week 12 (p=0.02) and 113% at week 24 (p=0.001).

DISCUSSION AND CONCLUSION: Absence of implant and diaphyseal fixation failure demonstrated that
FCL screws delivered safe and reliable stabilization. Moreover, comparing periosteal callus size and distribution to historic control data suggests that dynamic plating may improve fracture healing over rigid plating with standard locking screws.