SATURDAY, JUNE 23, 2012

7:00 – 7:40 am

Symposium #4:
2nd MTP Instability

Moderator:

Michael J. Coughlin, MD
Boise, Idaho

7:00 am

Clinical Perspective: Anatomy and Treatment Options
Charles L. Saltzman, MD
Salt Lake City, Utah

Summary
A better understanding of the relative contributions of individual anatomic structures to the overall biomechanics of the metatarsophalangeal joint (MTPJ) may aid clinicians in matching the best repair technique to any given pathology. To that end a cadaveric and computer model investigation was undertaken to explore the biomechanical suitability of different treatment options for different pathologies.

Great toe hypermobility, hallux valgus and/or an elongated second metatarsal all have the potential to alter second ray MTPJ biomechanics. Resulting degenerative changes in the collateral ligaments, joint capsule and plantar plate often lead to chronic instability. Outcome data indicate the potential for improvements in current surgical repair options. The specific aim of this study was to evaluate the biomechanical performance of a novel MTPJ repair technique relative to the current standards of surgical care, namely flexor tendon transfer (FDL) and Weil osteotomy (WO) with direct plantar plate repair. The objective of the new surgery is to restore the native MTPJ biomechanics through direct soft tissue repair and anatomic reconstruction techniques that do not require an osteotomy.

CT and MRI data were used to construct a computer model of the second MTPJ. Mechanical properties for each tissue were assigned based upon literature values and cadaveric data was used to validate the model’s behavior. Simulations were performed to characterize multiple biomechanical metrics for the intact, injured and repaired conditions. The injured conditions consisted of an isolated plantar plate (PP) tear, a PP tear with lateral collateral ligament tears and a PP tear with bilateral collateral ligament tears.

The computer model demonstrated the ability of the new technique to restore the injured joint’s biomechanics back to the intact condition while elucidating some of the deficiencies present in current techniques. The FDL repair demonstrated stiffness in dorsiflexion and the iatrogenic sacrifice of the collateral ligaments may be the cause of dorsal laxity seen in the WO repair.
Plantar plate repair without osteotomy in conjunction with anatomic reconstruction of the collateral ligaments holds significant promise for improved MTPJ biomechanical performance. Additional clinical study work is needed to assess ultimate the impact of these findings on patient outcomes.