Lower Limb Alignment Evaluation. Are We Getting This Wrong? We Walk on Our Heel Not Our Ankle

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All Authors:
Mark G. Clatworthy FRACS NEW ZEALAND
Nicola Blucher BA MA MBBS FRCS UNITED KINGDOM
J Donald Hansom FRCS, MD UNITED KINGDOM
Jérôme Murgier MD FRANCE
Felix Humphries MBChB NEW ZEALAND

Summary:
Navigation and Robotic technologies use the hip to ankle mechanical axis measurement to determine the alignment of a TKA. This study demonstrates that 80% of the time this will result in more valgus alignment of the lower limb.

Data:
Introduction: Total Knee Arthroplasty surgeons have traditionally aimed for a neutral mechanical axis to enable equal load sharing through the TKA with the aim of prolonging implant survival. This is measured on a weight bearing long leg Xray with the mechanical axis determined by measuring the angle between the center of the femoral head / center of the tibial plateau and the center of the tibial plateau / center of the ankle. However we don’t walk on our ankle we walk on our heel which is typically in more valgus than the ankle Method Long leg X-rays were performed on 543 patients one year after a Total Knee Replacement performed by a single surgeon using a Patient Specific Balanced TKA technique using Brainlab 3. A metal disc was taped to the center of the heel and the patient stood on a wooden box to enable the mechanical axis to be collected from hip to ankle and hip to heel Results The hip to heel mechanical axis ranged from 6.1 degrees more valgus to 4.1degrees more varus compared to the hip to ankle mechanical axis. The hip to heel mechanical axis was more valgus 80% of the time with a mean 1.6 degrees more valgus (range 1degree – 6.1degrees), more varus in 9.5% (range 1degrees-4.1degrees) and 10.5% of patients had the same mechanical axis. There was a statistical difference between the hip to heel mechanical axis and the hip to ankle mechanical axis (p<0.001). Preop varus knees (>5 degrees) had a valgus TKA (>1degrees) in 18% of patients with a hip to ankle mechanical alignment. In comparison 39.2% had a varus TKA with a hip to heel mechanical alignment.

Conclusion: Navigation and Robotic technologies use the hip to ankle mechanical axis measurement to determine the alignment of a TKA. This study demonstrates that 80% of the time this will result in more valgus alignment of the lower limb.