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Medial Opening Wedge High Tibial Osteotomy Affects More than Just the Knee: A Study Looking at Changes in the Knee, Hip and Ankle Joints During Gait

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Disclosures

- Dr Sarah Bolton: Sydney Orthopaedic Research Institute, Fellow. Nil
- Dr Myles Coolican: Landmark Orthopaedics, Consultant. Received royalties from S&N, Done consulting work for S&N, ZB, Given paid presentations for S&N, J&J DePuy, Medacta, Receives institutional support from S&N, Corin, ZB
- Dr Brett Fritsch: Landmark Orthopaedics, Consultant. Holds shares in 360 knee system, Trium, Personalised surgery, Jointli. Done consulting work for Athrex, 360 knee systems, Omni, De Puy, ExacTech, Corin. Given paid presentations for Athrex, S&N. Received institutional support from S&N.
- Dr Alexander Nicholls: Landmark Orthopaedics, Consultant. Given paid presentations for S&N
- Dr Yoong Lim: Sydney Orthopaedic Research Institute, Research Associate. Nil
- Dr David Parker: Landmark Orthopaedics, Consultant. Holds shares in 360 knee system, DBD, Personalised surgery, Ganymed Robotics. Done consulting work for S&N, Given paid presentations for Arthrex, S&N. Received institutional support from S&N, Corin, ZB, Arthrex & Friends of the Mater.

Background

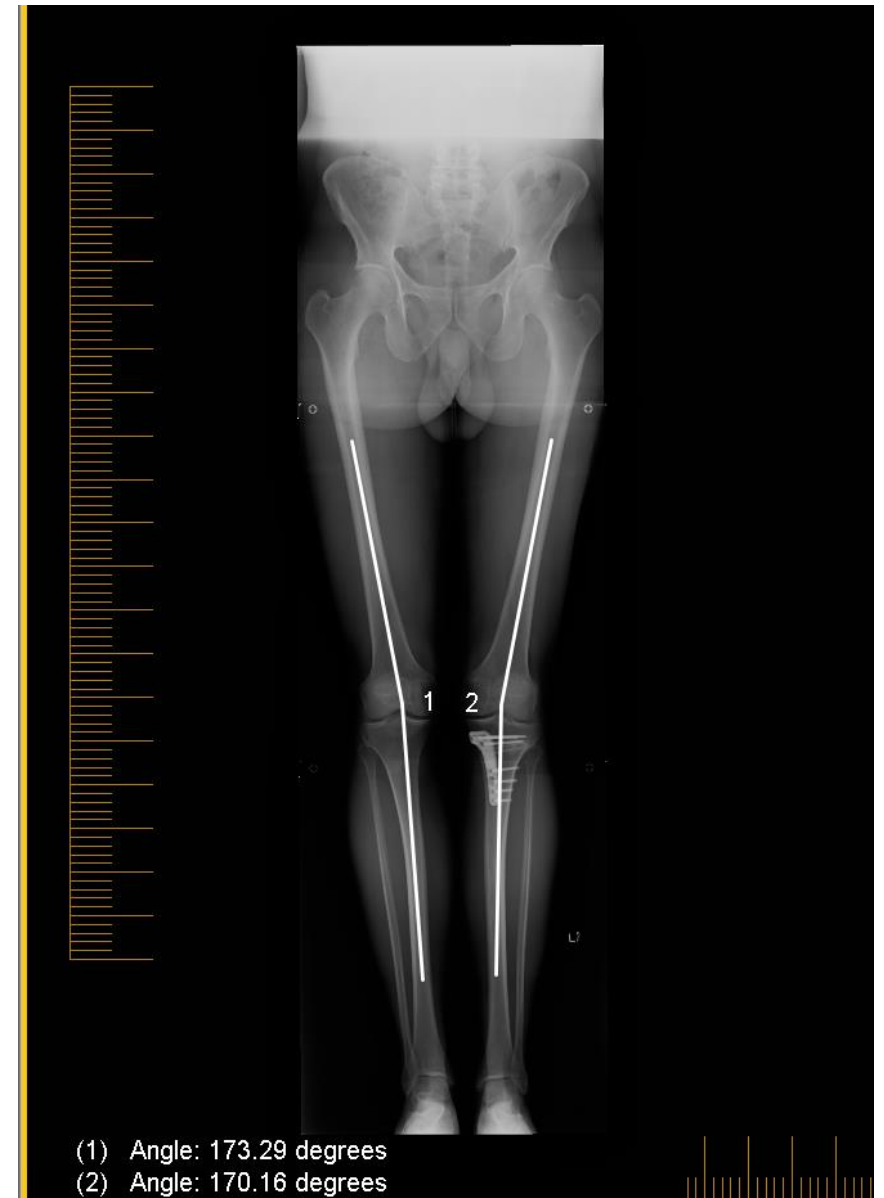
- Inconsistencies exist with current data on changes in gait after medial opening wedge high tibial osteotomy (MOWHTO). (1-3)
- In the sagittal plane, patients with knee OA have increased femoral posterior tilt, hip flexion, and anterior spinal inclination as shown (4)
- Some studies suggest that the hip and ankle biomechanics will be altered following osteotomies around the knee (5,6)

Aim: To use gait analysis to examine the effects MOWHTO has on the hip, knee & ankle joints.

Hypothesis: MOWHTO does not adversely affect joint reaction force at the hip and ankle joints when measured using motion capture gait analysis.

Aim & Method

- 25 Patients with symptomatic medial compartment varus knee osteoarthritis were recruited.
- Lower-limb weightbearing radiographs were taken pre & post operatively to determine alignment correction.
- All cases were planned & performed using computer assisted surgery.
- Gait lab motion analysis was recorded pre & post operatively (average 9 months post op)



Gait Analysis

- Kinematic, force-plate and muscle electromyographic data was recorded simultaneously for each walking trial.



Results : Radiographic

	Pre Op	Post Op
LDFA	89.3±1.5 degrees	89.0±2.1 degrees (p>0.05)
MPTA	84.4±2.8 degrees	93.1±2.3 degrees (p<0.001)
JLO (LDFA + MPTA)	173.7 ±2.9 degrees	182.0 ±3.9 degrees (p<0.001)
HKA	7±3.8 degrees	-2.4±1.6 degrees (p<0.001)

Take home point:

As expected MPTA& JLO increase.

Alignment / HKA goes from an average varus of 7 degrees

to a valgus of 2.4 degrees

Average change in alignment : 9.4 degrees



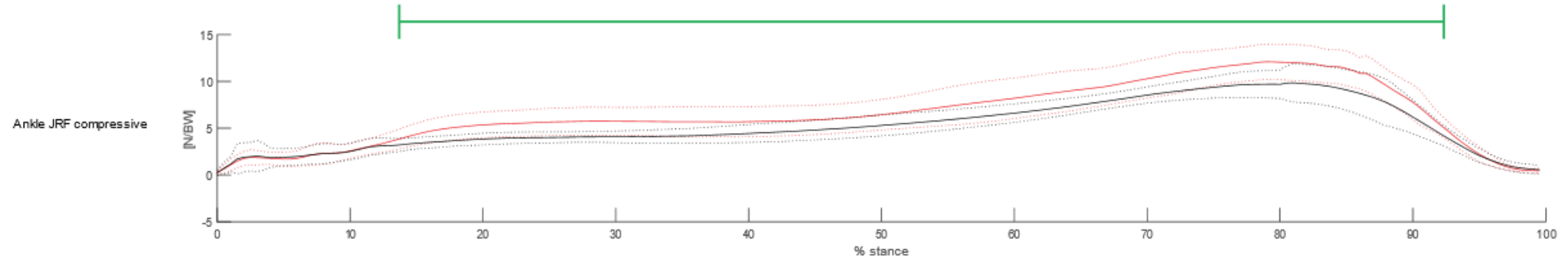
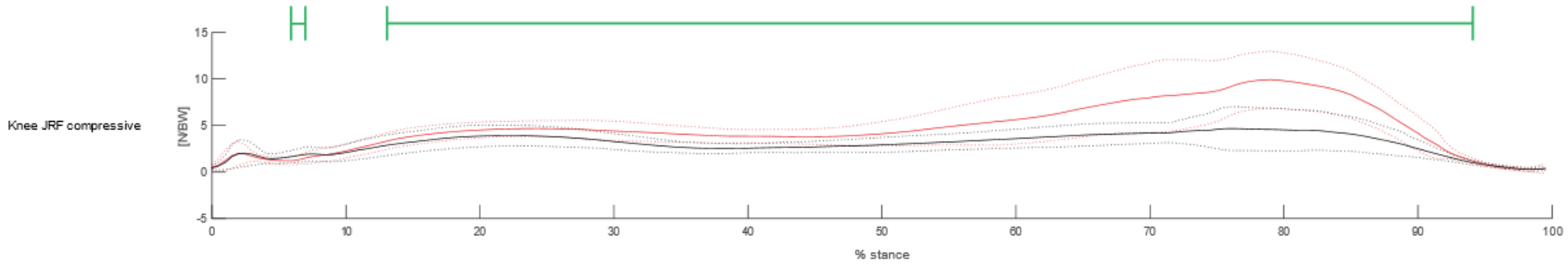
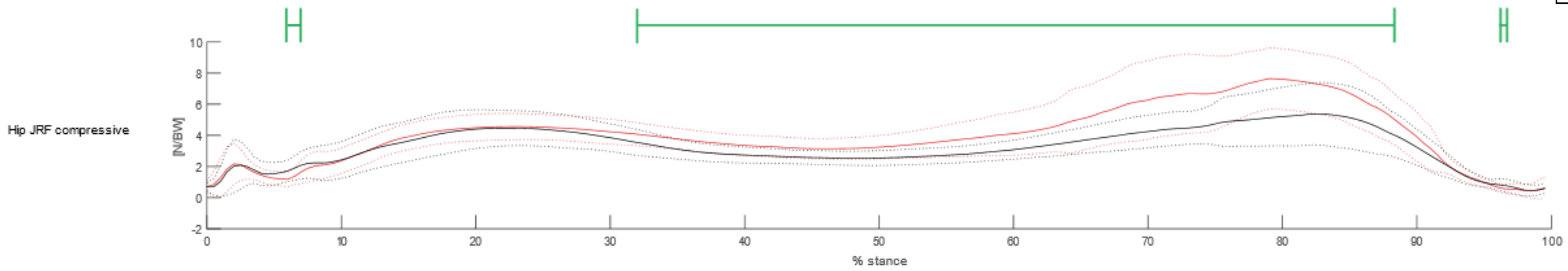
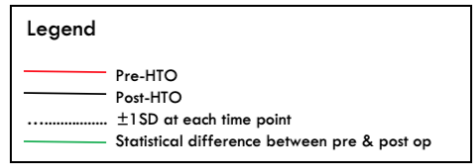
Results : Gait

	Pre Op	Post Op
Walking speed (m/s)	1.1±0.1	1.1±0.1m/s (p>0.05)
Stride length (cm)	66.2±6.5	66.2±4.6cm (p>0.05)
Stride frequency (steps/s)	1.63±0.15	1.66±0.17 (p>0.05)
Step width (m)	0.12±0.03	0.14±0.04 (p<0.05)

Take home message:

There was no change in walking speed, stride length or frequency after HTO. Step width was shown to increase after HTO.

Results: Joint Reaction Force

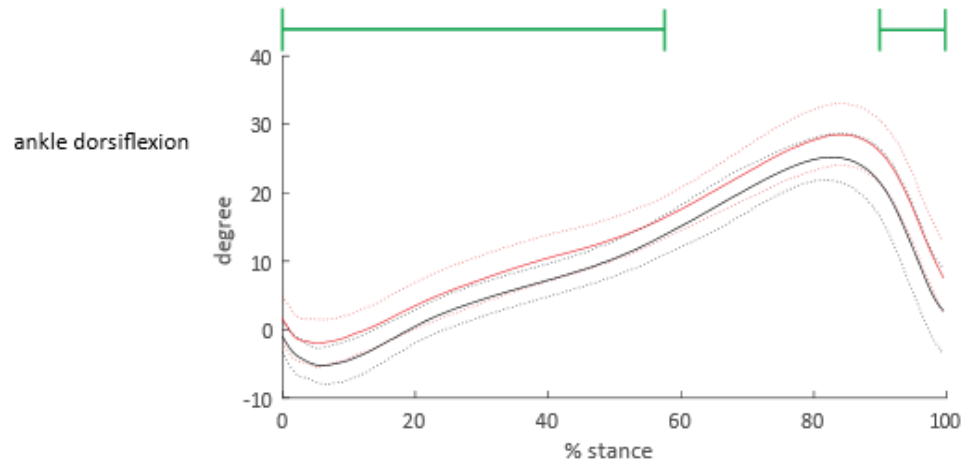
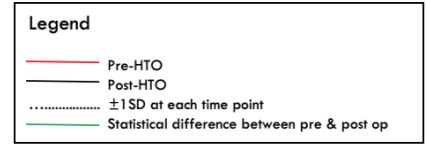
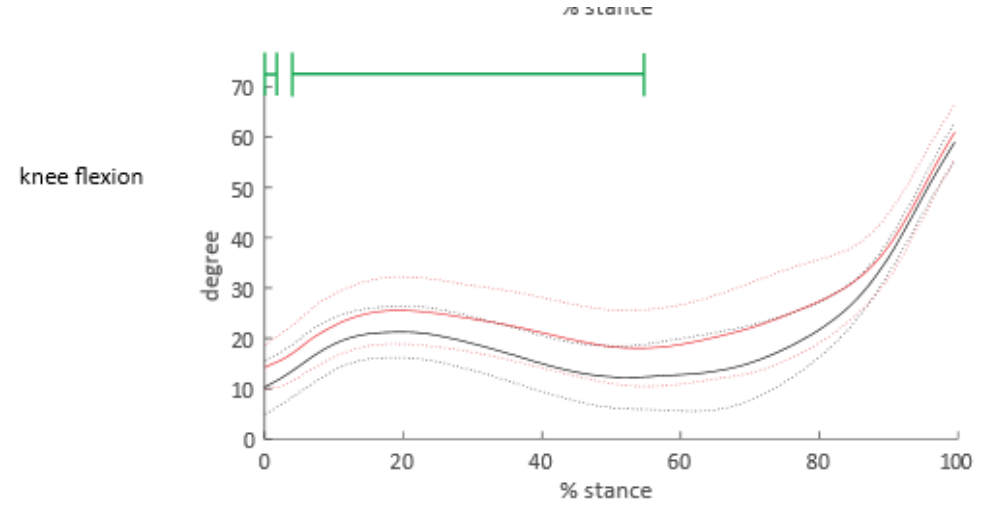
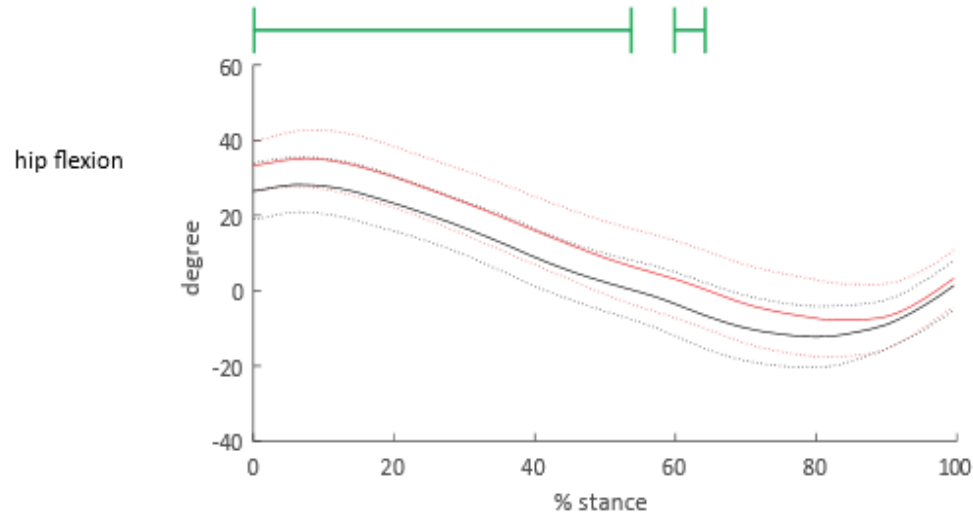


Graphs showing the joint reaction force during stance phase of gait across the lower limb.

Take home message:

There is a statistically significant reduction in joint reaction force during the majority of stance phase at the hip, knee and ankle joint after MOWHTO.

Results: Joint angles in the sagittal plane



Take home message:

After MOWHO there is a reduction in hip & knee flexion as well as ankle dorsiflexion.

Conclusion

- Prior to this study there was little data on the compressive forces and motion of the hip and ankle joints after MOWHTO
- Our data suggests that after MOWHTO, as well as an improved coronal and sagittal plane alignment, there is a reduction in not only the knee compressive forces but also at the hip and ankle joints.
- Further studies need to be carried out to assess whether this provides a long term benefit to the joint above and below the knee.

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