Genu Arthro

Biomechanics – Gait analysis

**Major Findings**

With Genu Arthro:

- **Faster walking speed by 7.1%** (Schmalz et al., 2010)
- **Cadence (steps/min) increased by 2.8%** (Schmalz et al., 2010)
- **Genu Arthro raises the first vertical force maximum while walking by 4.8%** (Schmalz et al., 2010)
- **Knee lever arm with Genu Arthro at 20-30% and 70-80% of the stance phase was**
  - 9-12% shorter than without orthosis (20-30% of the stance phase)
  - 19-21% shorter than without orthosis (70-80% of the stance phase)

  The effect was twice to three times bigger than with the lateral wedge insoles.

- **If a valgus moment is applied to the knee:**
  - External knee adduction moments are reduced up to 21% in walking (compared to wearing no orthosis) and up to 15% (compared to wearing insoles) (Fantini Pagani et al., 2012)

  Net knee adduction moments are reduced up to 36.3% in walking and up to 23% in running (Fantini Pagani et al., 2010a)

- **Greater valgus adjustments of the orthosis produce greater valgus moments** (Fantini Pagani et al., 2010a)

**Reduction of the net peak adduction moments**

![Graph showing reduction of net peak adduction moments](image)

**Fantini Pagani, 2010a.**

**Clinical Relevance**

Osteoarthritis (OA) is characterized by irreversible damage to joint structures, including cartilage, bone, and joint capsule (Felson et al., 2004). Non-pharmacological therapies or mechanical interventions, such as use of knee orthoses and laterally wedged insoles, act on the underlying disease mechanisms to decrease or redistribute the mechanical load in the musculoskeletal system (Pollo et al., 2002).
Knee braces (such as Genu Arthro) are designed to reduce the loading of an affected knee compartment by application of a valgus moment directly to the knee through a three point bending system (Pollo et al., 1998).

**Summary**

Compared to walking without orthosis, the walking speed as well as the cadence increased significantly by 7.1% or 2.8% (Schmalz et al., 2010), respectively. Fantini Pagani et al. (2010a) reported a significant difference in gait velocity only between the neutral and no orthosis condition.

With respect to the forces occurring during gait, Schmalz et al. (2010) documented an increase in the first vertical force maximum by 4.8%. As opposed to this, Kutzner et al. (2011) recorded a slight, but not significant decrease (up to 3%) in the vertical force with Genu Arthro (8° valgus). Furthermore, a reduction of the medial force by 7% was measured in this condition.

The knee lever arm with Genu Arthro at 20-30% and 70-80% of the gait cycle was 9-12% and 19-21% shorter than without orthosis. Compared to lateral wedge insoles, the effect was two to three times bigger (Fantini Pagani et al., 2012).

With a valgus moment applied to the knee, the external knee adduction moments are reduced by up to 21% in walking (compared to wearing no orthosis) and by up to 15% (compared to wearing insoles) (Fantini Pagani et al., 2012). Two other studies of Fantini Pagani et al. support these results for walking, with increases by up to 18.6% (2010a) and 16.7% (2010b), respectively.

Also, the net knee adduction moments are reduced by up to 36.6% in walking and by up to 23% in running (Fantini Pagani et al., 2010a). These results are again supported by the two other studies of Fantini Pagani et al. (2010b & 2012).

All results of Fantini Pagani et al. (2010a, 2010b, 2012) showed, that greater valgus adjustments of the orthosis produce greater valgus moments.

**References of summarized studies**


**Other References**


