

Highly variable coronal tibial and femoral alignment in osteoarthritic knees: a systematic review

Silvan Hess, Lukas B Moser, Felix Amsler, Henrik Behrend & Michael T Hirschmann

PURPOSE

There is a lack of knowledge about coronal alignment variability in osteoarthritic knees. Therefore, the purpose of this article was to systematically review the literature and collect data about the lower limb alignment including hip-knee-ankle angle (HKA), femoral mechanical angle (FMA), tibial mechanical angle (TMA) and the joint line convergence angle (JLCA) in osteoarthritic knees.

METHODS

A systematic review was performed using the electronic databases MEDLINE (PubMed), EMBASE and Google Scholar. The following keywords were used: (morphology OR geometr* OR anatomy OR alignment OR phenotypes), (coronal OR neutral OR varus OR valgus), (knee OR lower limb OR femur OR tibia) and (osteoarthritis OR arthritis). Out of 110 full-text articles retrieved, 15 studies were included. Demographic information included author's names, year of publication, imaging modality, sample size and patient demographics (i.e. sex, age, etc.). Descriptive statistics, such as means, ranges, and measures of variance [e.g. standard deviations, 95% confidence intervals (CI)] for all angles (HKA, FMA, TMA, JLCA) are presented.

RESULTS

Thirteen studies reported mean overall HKA angles ranging from $163.5^{\circ} \pm 2.3^{\circ}$ to $179.9^{\circ} \pm 4.8^{\circ}$. The mean HKA angles in females were between $164.1^{\circ} \pm 7.2^{\circ}$ and $178.8^{\circ} \pm 4.8^{\circ}$, and in males between $163.4^{\circ} \pm 5.5^{\circ}$ and $177.4^{\circ} \pm 3.9^{\circ}$. The lowest and highest reported HKA angles were -27.7° and $+22.0^{\circ}$, respectively. Seven studies reported mean FMA angles. Mean values ranged from $92.7^{\circ} \pm 2.7^{\circ}$ valgus to $88.6^{\circ} \pm 2^{\circ}$ varus. The reported mean FMAs for male were $87.9^{\circ} \pm 0.5^{\circ}$ to $90.7^{\circ} \pm 3^{\circ}$ and for female $89.91^{\circ} \pm 2.8^{\circ}$ to $92.9^{\circ} \pm 3.1^{\circ}$. Six studies reported mean TMA values. TMA ranged from $81.7^{\circ} \pm 3.9^{\circ}$ varus to $87.7^{\circ} \pm 4.1^{\circ}$ varus. Only three studies reported mean JLCA angles, which ranged from -4.3° to $-6.4^{\circ} \pm 3.8^{\circ}$.

CONCLUSION

Osteoarthritic knees showed a huge variation in overall coronal limb alignment as well as in femoral and tibial coronal alignment. Current total knee arthroplasty (TKA) alignment philosophies and preoperative planning do not sufficiently consider these variation, which might be one reason for unhappy knees after TKA.

LEVEL OF EVIDENCE
IV, systematic review.

type	journal paper/review (English)
date of publishing	15-04-2019
journal title	Knee Surg Sports Traumatol Arthrosc (27/5)
ISSN electronic	1433-7347
pages	1368-1377