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Gait Analysis in Total Knee Arthroplasty

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Abstract : Introduction: Total knee arthroplasty is a common procedure. It is well known that the biomechanics of the knee do not fully return to their normal state. Motion analysis has been used to study the biomechanics of the knee after total knee arthroplasty. The purpose of this scoping review is to summarize the current use of gait analysis in total knee arthroplasty and to identify the preoperative motion analysis parameters for which a systematic review aimed at determining the reliability and validity may be warranted. Materials and Methods: This IRB-exempt scoping review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist strictly. Five search engines were searched for a total of 279 articles. Articles underwent a title and abstract screening process followed by full-text screening. Included articles were placed in the following sections: the role of gait analysis as a research tool for operative decisions, other research applications for motion analysis in total knee arthroplasty, gait analysis as a tool in predicting radiologic outcomes, gait analysis as a tool in predicting clinical outcomes. Results: Eleven articles studied gait analysis as a research tool in studying operative decisions. Motion analysis is currently used to study surgical approaches, surgical techniques, and implant choice. Five articles studied other research applications for motion analysis in total knee arthroplasty. Other research applications for motion analysis currently include studying the role of the unicompartmental knee arthroplasty and novel physical therapy protocols aimed at optimizing post-operative care. Two articles studied motion analysis as a tool for predicting radiographic outcomes. Preoperative gait analysis has identified parameters than can predict postoperative tibial component migration. 15 articles studied motion analysis in conjunction with clinical scores. Conclusions: There is a broad range of applications within the research domain of total knee arthroplasty. The potential application is likely larger. However, the current literature is limited by vague definitions of ‘gait analysis’ or ‘motion analysis’ and a limited number of articles with preoperative and postoperative functional and clinical measures. Knee adduction moment, knee adduction impulse, total knee range of motion, varus angle, cadence, stride length, and velocity have the potential for integration into composite clinical scores. A systematic review aimed at determining the validity, reliability, sensitivities, and specificities of these variables is warranted.

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