Osteoarthritis (OA): A Total Knee Replacement Surgery

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Abstract : Introduction: Osteoarthritis (OA) is one of the leading causes of disability, and the knee is the most commonly affected joint in the body. The last resort for treatment of knee OA is Total Knee Replacement (TKR) surgery. Despite numerous advances in prosthetic design, patients do not reach normal function after surgery. Current surgical decisions are made on 2D radiographs and patient interviews. Aims: The aim of this study was to compare knee kinematics pre and post-TKR surgery using computer-animated images of patient-specific models under everyday conditions. Methods: 7 subjects were recruited for the study. Subjects underwent 3D gait analysis during 4 everyday activities and medical imaging of the knee joint pre- and one-month post-surgery. A 3D model was created from each of the scans, and the kinematic gait analysis data was used to animate the images. Results: Improvements were seen in a range of motion in all 4 activities 1-year post-surgery. The preoperative 3D images provide detailed information on the anatomy of the osteoarthritic knee. The postoperative images demonstrate potential future problems associated with the implant. Although not accurate enough to be of clinical use, the animated data can provide valuable insight into what conditions cause damage to both the osteoarthritic and prosthetic knee joints. As the animated data does not require specialist training to view, the images can be utilized across the fields of health professionals and manufacturing in the assessment and treatment of patients pre and post-knee replacement surgery. Future improvements in the collection and processing of data may yield clinically useful data. Conclusion: Although not yet of clinical use, the potential application of 3D animations of the knee joint pre and post-surgery is widespread.

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