

Janina Patricia Schickschneit
Dr. med.

Instrumented Gait Analysis for medial respectively lateral unicompartmental Knee Arthroplasty

Fach/Einrichtung: Orthopädie
Doktorvater: Prof. Dr. med. Holger Schmitt

This study demonstrates the progress of the patient's gait with medial and lateral gonarthrosis after the implantation of a medial Oxford mobile-bearing or an Oxford domed-lateral unicompartmental knee arthroplasty (UKA). Main advantages of the minimal invasive approach of the UKA versus TKA are less cost, better postoperative ROM and proprioception, less blood loss, complications and morbidity as well as faster rehabilitation without losing the opportunity of a TKA revision at a later stage.

21 patients with the diagnosis of varus gonarthrosis underwent an implantation of a medial UKA. Before and 7.4 months after surgery, the patient's gait pattern were examined on a treadmill with six infrared-cameras to identify changes (stride length, knee adduction and hip abduction). These gait characteristics showed significant improvements after implanting an UKA. The mean individual selected velocity increased from 0.61 m/s to 0.76 m/s.

In the other sample, 19 patients received a lateral UKA and were analyzed in their gait before and after an average of 7 months. Thereby, variances showed changes of the gait characteristics after implanting the Oxford domed-lateral UKA. The mean self-selected velocity rose from 0.58 m/s to 0.73 m/s and especially the knee abduction as well as hip adduction were statistically significant. Additionally, time and length of strides ascended. These results of both groups can be seen as positive effects from treatment in particular in comparison to patients not having surgery.

The smoothed gait mechanics after surgery enable the lateral patients to use 3.5 less strides and the medial patients two strides less per minute at the same speed of 5.5 m/s. As a result, the physiological gait of the treated patients evolved from a small step pattern. The knee postures improved in both groups by 5° to a normal abduction of 1°. The hip position for the medial sample improved by 2° and for lateral patients it enhanced by 3°. After surgery the leg axes were straightened due to the inverse improvement of knee and hip for every patient. Based on the UKA implantation, the varus or valgus effect of the gonarthrosis was reduced significantly. Moreover, the postoperative gait pattern became much closer to the ones of the healthy legs. Also, the gait pattern of all healthy legs in both groups enhanced since the healthy leg did not need to balance for the formerly restricted leg any more.

The useful clinical scores AKSS, Oxford-12, FFbH-OA and the activity Devane check the treatment progress of the postoperative mobility, treatment quality, morbidity and satisfaction. They underlined the success of the UKA in the medial or lateral part of the knee by their significant improvements.

The medial Oxford mobile-bearing and the Oxford domed-lateral UKA are attractive surgical solutions and satisfying treatment method for patients with the right indication criteria. The convincing clinical effects of the UKA are a matter the prosthesis design. The mobile bearing paired with the remaining proprioception due to the saved crucial ligaments inside the knee joint enable optimized kinematics with longer survival rates and less risk of revisions. The gait analysis evidences that the UKA benefits for the patient's gait pattern. The advantages of the gait analysis lie in the measurability of objective parameters. A fast generation of all parameters, clinical scores and charts in one software application would allow a faster gait assessment for even more patients and would enable the development of further prosthesis advancements from evaluation of results. Using the instrumented gait analysis particularly for patients with OA of the knee can help surgeons, patients and physiotherapists in their decision making to find the best treatment option. The patients of this study enjoyed and appreciated the gait analysis as an interesting and useful feature to track as well as control the success of their development. Many of them became highly motivated to train harder, continue longer in physiotherapy and being more disciplined in private exercises to have even better results in the next gait evaluation.

No other study had such a wide spectrum of analysis in respect to gait pattern and treatment progress. The combined use of instrumented gait analysis with clinical scores constitutes an eligible and useful diagnostic instrument to measure gait progress during treatment of OA patients and can be used to evaluate developing prostheses in research.