Functional differences between unicondylar and total knee arthroplasty using flexible electrogoniometry

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Total knee arthroplasty (TKA) has been established as a successful procedure for relieving pain and improving function in patients suffering from severe knee osteoarthritis for several decades now. It involves removing bone from both the medial and lateral compartments of the knee and sacrificing one or both of the cruciate ligaments. This in turn is likely to have an impact on the patients’ functional outcome. In fact it has been reported that for at least seven years after arthroplasty, TKA patients remain significantly limited compared to control subjects with no history of knee osteoarthritis\(^1\). The introduction of computer navigation has resulted in improved radiological outcomes compared to TKA using conventional instrumentation\(^2\). However, this has been reported to have no statistical improvement on functional outcome\(^3\).

In subjects where only one compartment of the knee joint is affected with osteoarthritis then unicondylar knee arthroplasty (UKA) has been proposed as an alternative procedure to TKA. This operation preserves the cruciate ligaments and removes bone only from the affected side of the joint. As a result there is the possibility of an improved functional outcome post surgery. The ideal patient criteria for UKA is over 60, sedentary life style, normal weight, range of knee motion greater than 90\(^\circ\), flexion contracture less than 10\(^\circ\), varus deformity less than 10\(^\circ\) or valgus deformity less than 15\(^\circ\), and patella femoral degeneration should be asymptomatic. UKA has been associated with faster recovery, good functional outcome in terms of range of motion and it is bone sparing compared to TKA\(^4\). However, the biggest obstacle to UKA success is the high failure rates\(^5\).

The aim of this study was to compare the functional outcome of computer navigated TKA (n=60) and UKA (n=42) patients 12 month post operation using flexible electrogoniometry. An electrogoniometer was attached to the lateral border of each knee joint while the subject stood with fully extended knee joints. One end block was attached to the thigh and the other was attached to the shank so that the device straddled the knee joint. Flexible electrogoniometry was used to investigate knee joint kine- matics during gait, slopes walking.

![Figure 1: Mean downstairs gait cycle for the UKA group (black line) and the TKA group (grey line).](image-url)
stair negotiation, and when using standard and low chairs. Maximum, minimum and excursion knee joint angles were calculated for each task.

The biomechanical assessment showed statistically significant improvements in the knee kinematics in terms of maximum ($p<0.0004$) and excursion ($p<0.026$) knee joint angles in the UKA patient group compared to the navigated TKA group for each of the functional tasks. There was no statistically significant difference between the minimum knee joint angles during these functional tasks ($p>0.05$). Figure 1 illustrates the knee kinematic function cycle for downstairs for the navigated TKA and UKA groups.

Therefore, UKA patients were showed to have a significantly better functional outcome in terms of the maximum knee joint angle during daily tasks. A study by Willis Owen found that of a consecutive series of 200 knees listed for knee arthroplasty, 47.6% of the knees were potential candidates for UKA. Another 31.4% were classed as ‘debatable’ UKA candidates. However, UKA only accounts for around 8% of knee arthroplasty surgery. A limitation of this study is that it compares two cohorts rather than two randomised groups. It is expected that UKA patients will have a better functional outcome. Our results suggest that for patients with less severe knee osteoarthritis, UKA may offer a better functional outcome than the more common surgical option of TKA. The recent advancements in computer assisted and robotic assisted knee arthroplasty has the possibility to improve the accuracy of UKA and therefore led to the increase in confidence and in usage in a procedure which has the potential to give patients a superior functional outcome.

References