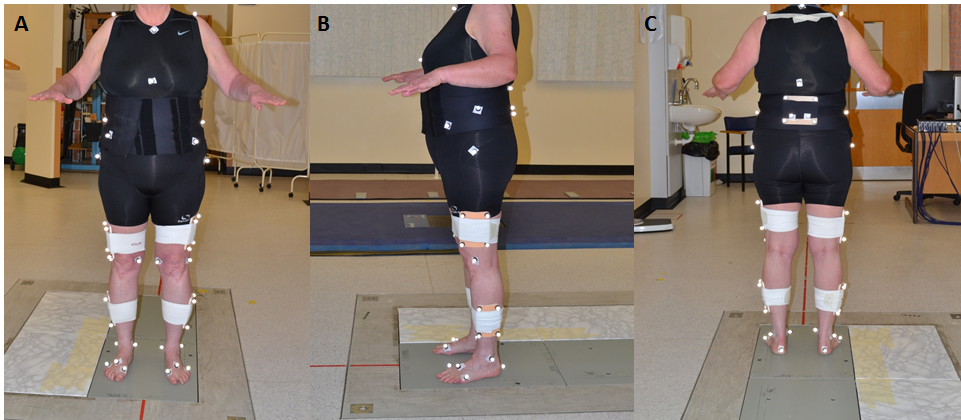
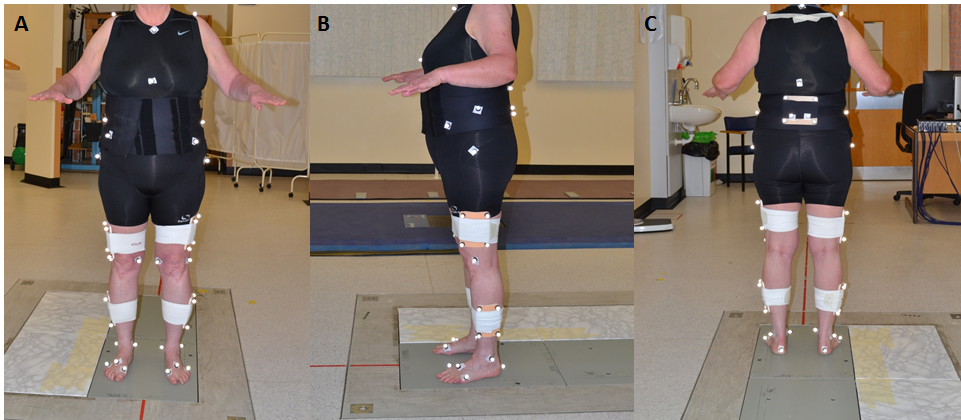
## Method and Marker Protocol

## Patients

Total hip replacement (THR) patients were recruited into the project through a clinical database of surgical cases. Inclusion criteria for the hip replacement group were; between 1-5 years THR post-surgery, older than 18 years of age, no lower limb joint replaced other than hip joint(s), fully pain free and not suffering from any other orthopaedic or neurological problem which may compromise gait. Ethical approval was obtained via the UK national NHS ethics (IRAS) system and all participants provided informed, written consent.

## Data Capture and Marker Protocol

Each patient undertook one session of motion analysis. Lower limb kinematics and kinetics were collected using a ten camera Vicon system (Vicon MX, Oxford Metrics, UK) sampling at 100Hz, integrated with two force plates (AMTI, Watertown, MA, USA) capturing at 1000Hz. The CAST marker set was used to track lower limb segments kinematics in six degrees of freedom, with five non-orthogonal marker clusters positioned over the lateral thighs, lateral shanks and sacrum. Retroflective markers were bilaterally positioned on the first, second and fifth Metatarsophalangeal joints as well as the Malleoli, Calcanei, Femoral epicondyles, Greater Trochanter, Iliac Crest, ASIS and PSIS. A further six markers were used to track trunk movement, these were placed at the Acronium process, Sternoclavicular, Xiphoid process, spinous processes C7 and T10. Participants wore a pair of tight fitting shorts and vest onto which reflective markers were affixed at bony anatomical landmarks using double-sided tape.



|  |  |
| --- | --- |
| Marker Name | Marker Definitions |
| CLAV | Sternoclavicular joint |
| STRN | Xiphoid Process |
| T10 | Spinous Process T10 |
| C7 | Spinous Process C7 |
| RACR | Acronium Process |
| RPSIS | Posterior Superior Illiac Spine |
| RASIS | Anterior Superior Illiac Spine |
| R\_HJC | Illiac Crest |
| R\_GTROC | Greater Trochanter |
| L\_PEL\_U, L\_PEL\_L, R\_PEL\_U, R \_PEL\_L | Sacrum Cluster |
| R\_THI\_1, R\_THI\_2, R\_THI\_3, R\_THI\_4 | Thigh Cluster |
| R\_MKNEE | Medial Epicondyle |
| R\_LKNEE | Lateral Epicondyle |
| R\_LEG\_1, R\_LEG\_2, R\_LEG\_3, R\_LEG\_4 | Shank Cluster |
| R\_MMAL | Medial Malleolus |
| R\_LMAL | Lateral Malleolus |
| RCALC | Calcaneus |
| RMT1 | First Metatarsophalangeal |
| RMT2 | Second Metatarsophalangeal |
| RMT5 | Fifth Metatarsophalangeal |

## Activities of Daily Living

Walk

Fast Walk

STS- Sit to stand & stand to sit

Ascent

Descent

Lunge

Squat