

Introduction

This risk of impingement, instability and edge loading after a total hip replacement (THR) can be minimised by considering a patient's spinopelvic mobility during planning of component alignment, Fig 1. However, the question of whether the pre-operative, arthritic mobility represents the post-operative mobility has been raised. Thus, the aim of this study was to investigate the relationship between the pre-operative and post-operative pelvic mobility, one year after THR.

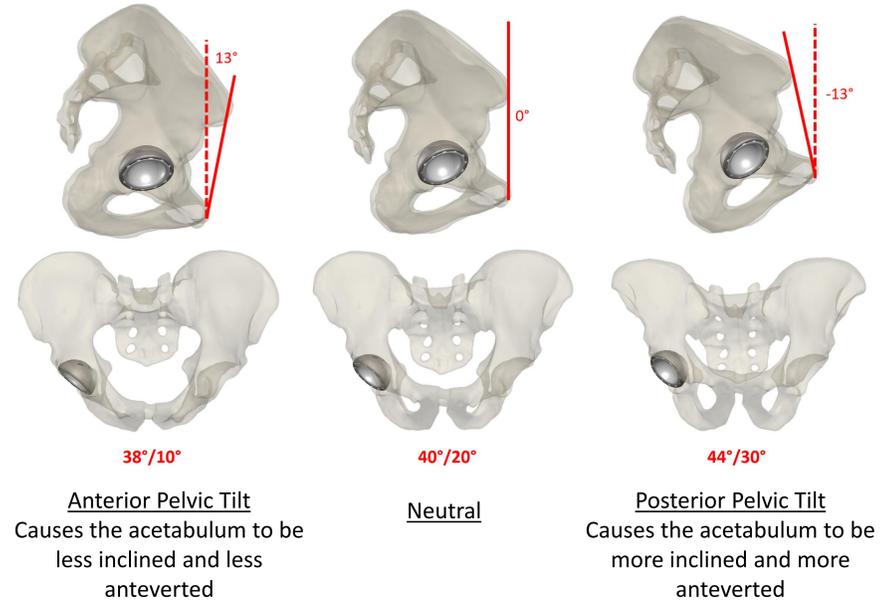


Fig 1. Change in functional cup orientation with change in pelvic tilt

Methods

- Pre-operatively, 342 patients received lateral standing and flexed seated radiographs as part of routine planning for THR.
- In both positions, the patient's pelvic tilt (PT) and lumbar lordotic angle (LLA) were measured, Fig 2.
- At a mean of 12 months (10 to 14) post-operatively, the same two functional radiographs were taken and PT and LLA measured.

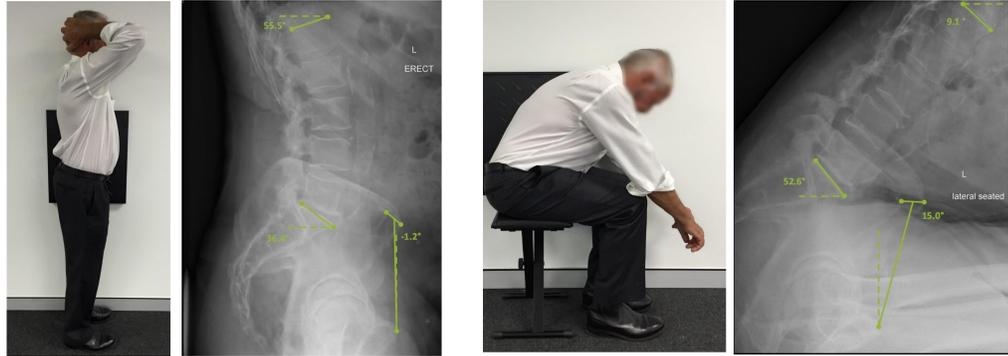
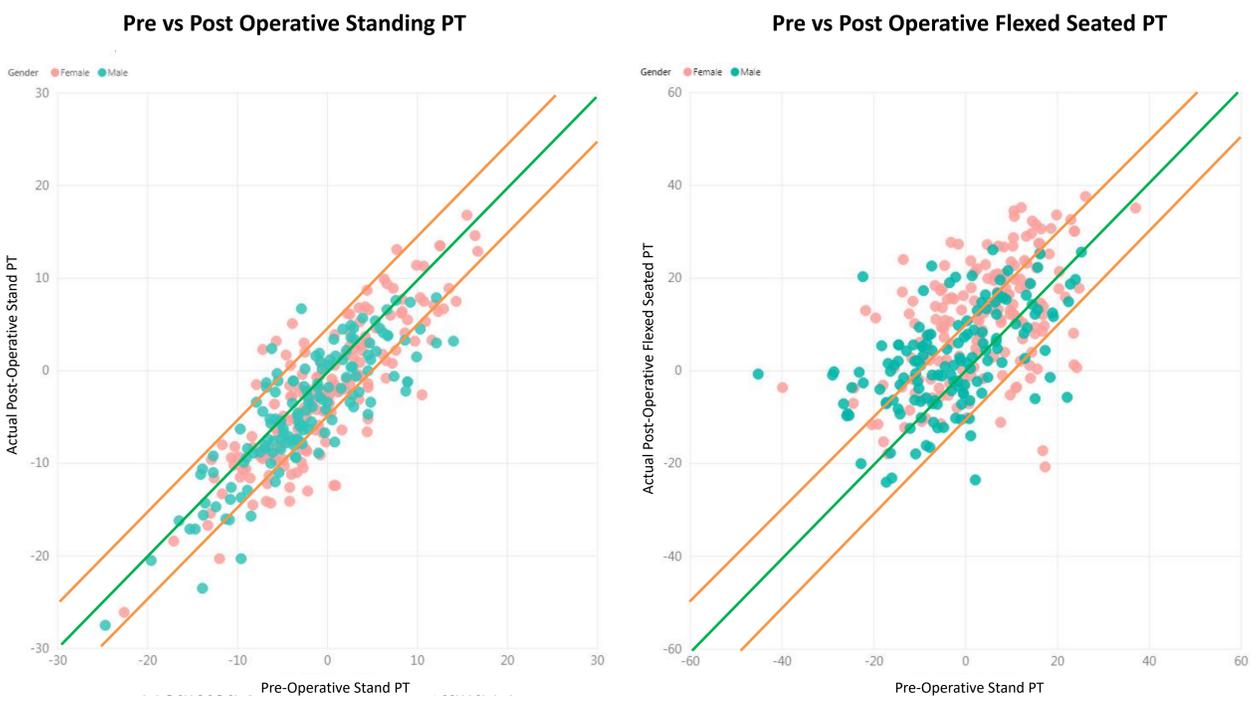


Fig 2. Pelvic tilt and lumbar lordotic angle measurement in standing and seated lateral radiographs

- An ensemble of neural network models was developed to predict post-operative pelvic tilt from four inputs: standing and flexed seated pelvic tilt, and standing and flexed seated LLAs.
- The model was trained with 75% of the cases. The remaining 25% of cases were withheld in order to benchmark the accuracy of the model on unseen scenarios.

Results

- The mean change in standing pelvic tilt from pre to post-operative was -2° (-13° to 9°)
- The mean change in flexed seated pelvic tilt from pre to post-operative was $+7^\circ$ (-38° to 45°)
- The Pearson correlation coefficient between pre and post-operative standing PT was 0.84.
- The Pearson correlation coefficient between pre and post-operative flexed seated PT was 0.54.



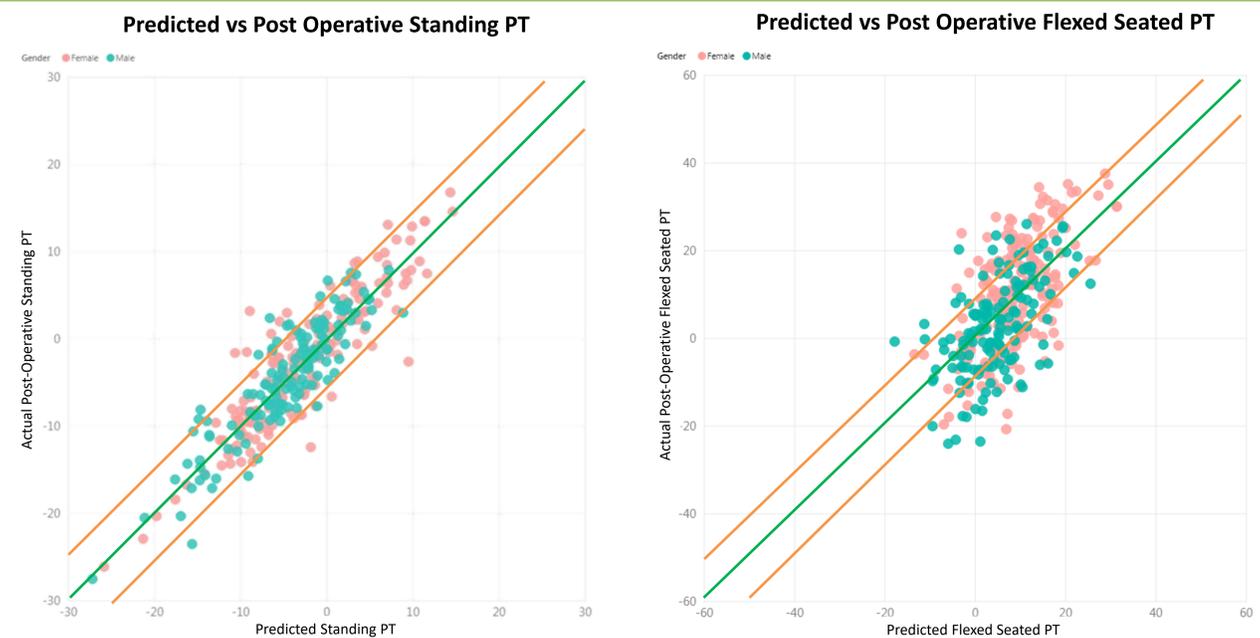
Predictive Model

Standing PT

- The test accuracy of the model was 0.91, and predicted 92% of patients within 5° of their actual standing post-operative PT

Flexed seated PT

- The test accuracy of the model was 0.71, and predicted 73% of patients within 10° of their actual flexed-seated post-operative PT



Conclusions

- The best predictor of post-operative spinopelvic mobility is the patient's pre-operative spinopelvic mobility.
- The predictive model will continue to improve in accuracy as more data and more variables (contralateral hip pathology, pelvic incidence, age and gender) are incorporated into the model.