Ten year RSA measured 3D migration of the Exeter femoral stem

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INTRODUCTION
Roentgen Stereophotogrammetric Analysis (RSA) can predict long-term outcome of prostheses by measuring migration over time. The Exeter femoral stem is a double-tapered highly polished implant and has been shown to subside within the cement mantle in RSA studies with a 2 year follow-up. It has a proven track record in terms of long-term survivorship and low revision rates. Several studies have demonstrated excellent clinical outcomes following its implantation. This is the first study to assess stem migration at 10 years using RSA.

METHODS
This is a single-centre study involving 16 patients (mean age at the time of surgery: 63 years, SD:7 years) undergoing primary total hip replacement for degenerative osteoarthritis using the lateral (Hardinge) approach.

The three-dimensional migration of the Exeter femoral stem was determined. Our RSA system can measure three-dimensional movements of a marker with an accuracy of 0.1 mm and the limit for marker migration was 0.01 mm [1].

RSA radiographs were taken with the patient bearing full weight post-operatively, at 3, 6, 12 and 24 months and subsequently at 10 years. The overall migration of the implant head and the tip was calculated for each patient. This migration was calculated in the femoral coordinate system and was also transformed into the anatomical coordinate system (antero-posterior, medio-lateral & supero-distal). A one-sample t-test was used to detect significant deviations of the mean movement from the zero. Statistical significance was taken at the 5% level (p < 0.05). The clinical outcome of each patient was assessed using the Oxford Hip Score (OHS).

RESULTS
The overall migration at 10 years was 1.93 mm for the head and 1.41 mm for the tip. The mean migrations at ten years of the femoral stem in all three anatomic directions (antero-posterior, medio-lateral & supero-distal) were 1.24 mm posterior (SE: 0.26), 0.30 mm lateral (SE: 0.22) and 1.44 mm (SE: 0.22) distal for the head and 0.24 mm posterior (SE: 0.15), 0.41 mm lateral (SE: 0.15) and 1.33 mm distal (SE: 0.17) for the tip (Figures 1 and 2). These were not significant at any of the time points for the antero-posterior and medio-lateral directions. However, there was a significant subsidence of both the head and the tip of the implant at 10 years (p<0.001 respectively).

There was very little further posterior head migration than that observed during the first two years (Figure 1) and after the initial subsidence in the first two years of implantation; the further subsidence was only 0.03 mm per year. The mean OHS at 10 years was 16.6 (SD=4.6) and there were no revisions.

DISCUSSION:
The Exeter stem’s rotational stability is an important factor contributing to its clinical success [2,3]. The amount of posterior head migration and the distal subsidence reduces after the first two years, but the stem continues to slowly subside at 10 years. This subsidence is probably responsible for the continued rotational stability of the Exeter stem, and maintains the cement/bone interface integrity. This study shows that the cement mantle continues to function well with the Exeter stem in the mid-term, indicating that the stress relaxation behavior continues into the mid-term life of the device.

REFERENCES: