INTRODUCTION
Approximately 1% of all primary hip replacements become infected within one year of surgery; most of these eventually require revision [1]. Attempts have been made to reduce the risk of early infection by adding antibiotic powder to the bone cement at the time of surgery [2-4]. Large cohort studies have shown this technique to be associated with a lower risk of revision [2, 5]. Unfortunately, not only are these cohort studies subject to confounding, but the outcome measure of revision may in fact reflect the sum of a decreased revision rate for infection combined with an increased revision rate for aseptic loosening because of unrecognized changes in cement properties induced by the antibiotics. The purpose of this study is to determine if the addition of tobramycin antibiotic powder to cement for primary hip replacement surgery increases the risk of long term aseptic loosening as predicted by implant micromotion detected by radiostereometric analysis (RSA).

METHODS
Thirty-one patients requiring 33 primary total hip arthroplasties for osteoarthritis, and over the age of 60 years, were consented and enrolled in this study. The hip prostheses consisted of cemented Exeter femoral stems in combination with uncemented Trident acetabular components. To cement each femoral stem, either Simplex P or Simplex T was used; the former a popular cement with an excellent clinical track record [2], and the latter a pre-mixed version of Simplex P containing 1 g of tobramycin per 40 g of polymer. The type of cement used for each patient was assigned in a randomized manner via sequential envelope selection during surgery. Tantalum beads of 1 mm diameter were injected into the greater trochanter, lesser trochanter, and femoral shaft distal to the tip of the prosthesis of each patient in order to serve as reference points for RSA measurements. A single tantalum bead was also fixed to the shoulder of the femoral stem so that the centroid of the stem could be calculated via combination with the femoral head and tip of the stem.

RSA examinations were taken post-operatively at six weeks, six months, one year, and two years; the six week examinations were used as the index examinations for kinematic analysis. Stereo radiographs were obtained from patients lying in the supine position. Although this study initially comprised 33 hips, 11 of these had to be excluded: the six week and/or two year follow-up examinations were missed by six patients, bead loosening occurred in four patients, and the stem shoulder bead could not be visualized in the index radiographs of one patient. Of the remaining 22 hips, 11 had tobramycin cement. The remaining group of patients consisted of 11 females and ten males, with an average at time of surgery of 71 (range, 63-81) years.

Radiographic measurements and analyses were performed with the UmRSA software suite version 6.0 (RSA Biomedical, Umeå, Sweden). The tantalum markers were used in conjunction with femoral head edge-detection algorithms to determine the migration of the stem relative to the bone at each of the follow-up periods. Distal migration of the stem centroid was measured at each follow-up period and the mean migration rates for both groups were determined and used as the basis for detecting risk for aseptic loosening. Non-inferiority testing of stem migration in Simplex T compared to Simplex P was accomplished using a one sided t-test, with the significance level set at 0.05. A clinically inferior additional amount of distal migration was set at 0.150 mm/yr compared to 0.4 mm/yr [6].

RESULTS
As shown in Figure 1 and in Table 1, the mean total distal migration and migration rate of the stem appear to be quite similar between the non-tobramycin and tobramycin cement groups. Indeed, the differences at two years did not reach statistical significance based on the unpaired t-test P value of 0.08 and the 95% upper confidence limit being well below the distal migration rate that is associated with a higher risk of aseptic loosening (0.150 mm/yr compared to 0.4 mm/yr).

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