

Appendix

Formulas Used to Calculate Creep and Polyethylene Wear Rate

Regression analysis was used to find 3 variables for each patient: the time taken for the femoral head to bed in (s value); amount of combined creep and wear in millimeters (t value); and the slope of the straight line (p value), which represents the rate of polyethylene wear (Fig. 2). If a wear point lies to the left of the x value being tested, its vertical distance to the parabola equation is measured; if the wear point lies to the right of the x value, its vertical distance to the straight line is measured. An algorithm alters the 3 variables:

s = bedding-in time (yr), t = creep + wear (mm), p = slope (mm/yr)
to minimize the sum of the vertical distances between head-displacement data points and the line shown in Figure 2, using the following equations:

straight line: $y = p \times x - p \times s + t$

parabola: $y = x \times ([2 \times s \times t - x \times t + x \times s \times p - s^2 \times p]/s^2)$