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:

\[ s = \text{bedding-in time (yr)}, \ t = \text{creep + wear (mm)}, \ p = \text{slope (mm/yr)} \]

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: \[ y = px - ps + t \]

parabola: \[ y = x \times \frac{(2sx - x^2 + xsp - s^2p)}{s^2} \]