8%–10% magnification of portable anteroposterior radiographs (8). The length of catheter insertion at the time of the radiograph was determined by subtracting the length of catheter external to the point of insertion from the known length of the catheter. The position of the SVC/RA junction was determined by adding the length of CVC insertion to the distance of the CVC tip above the atrium, or subtracting the distance of the CVC tip below the atrium. All data were collected prospectively, and included patient height and weight. Plots of distance from the CVC insertion site to the SVC/RA junction versus patient height and weight were made, and regression lines and equations, correlation coefficients, and exact confidence intervals based on the binomial distribution for placement above the RA were calculated by using Sigma Stat 2.03, Sigma Plot 2000, and SPSS 10.0 (SPSS, Chicago, IL).

**Results**

A total of 456 CVC were studied: 330 RIJ and 126 right subclavian CVC. Four of 126 (3.2%) right subclavian catheter tips were located across the midline in the left brachiocephalic vein, and were not analyzed. All CVC inserted via the RIJ vein were located in the SVC or RA. Data from both RIJ and right subclavian sites were combined for calculating regression equations and formulae. The plot of the distance from insertion site to SVC/RA junction patient height for RIJ and right subclavian veins is presented in Figure 2. The regression equation describing the distance from the insertion site to the SVC/RA junction for patients ≤100 cm is:

\[
\text{Distance to SVC/RA junction (cm)} = 1.75 + (0.09 \times \text{height}); r^2 = 0.65
\]

For patients taller than 100 cm:

\[
\text{Distance to SVC/RA junction (cm)} = -1.3 + (0.11 \times \text{height}); r^2 = 0.80
\]

For all patients combined:

\[
\text{Distance to SVC/RA junction} = 1.54 + (0.09 + \text{height}); r^2 = 0.88
\]

Simple formulae were developed to predict placement of CVC in the SVC above the RA. These were developed by plotting (with Sigma Plot 2000) a