OBJECTIVE: To develop a simulation model for dental arch shapes. DESIGN: Analysis of measurements of dental casts to determine a general second degree equation for the dental arches. SETTING: Department of Human Anatomy and School of Computing and Informatics, University of Nairobi. SUBJECTS: The measurement of dental casts, 30 (15M and 15F) each from three Kenyan ethnic groups (Maasai, Kalenjin, Kikuyu), aged 12 years. RESULTS: The arches change their shapes from a parabola to an ellipse, governed by the boundary conditions at the position of the canine tooth, based on the general second degree equation for the conic sections. CONCLUSION: The simulation model graphically confirms the change from parabolic to elliptic shapes of dental arches with boundary conditions at the canine. This could be used to show the changes in dental arches for other ethnic groups.