ABSTRACT

Vocal cord is one of the important organs in the sound production process. The fundamental frequency is one of the parameters that can be used to see the difference between male and female vocal cord. The fundamental frequency of the male vocal cord has a range of 80-170 Hz, while the female vocal cord has a range of 180-270 Hz.Vocal cord modeling is needed to identify the effect of changes in structure, shape, and size on the resulting fundamental frequency. The benefit doing simulation of vocal cord is to reduce the failure during the making of biomechanics vocal cord. In this study the fundamental frequencies of various vocal cord structures are simulated using solid mechanics module in software COMSOL 4.3 We used two materials in the modeling, which are silicone rubber material for the robotic biomechanics and the original parameters of human vocal cord. In the modeling of silicone rubber material was modeled with circle and oval membrane form, while the membrane with the original parameters of the human vocal cords was modeled with modification of the base of the vocal cords and the depth of the vocal cord cover. The simulation shows that the fundamental frequency of silicone rubber membranes decrease when the membrane diameter, thickness, and gap increase. For membrane with human parameter material, the fundamental frequency decreases when the cover depth, the body length, the body width, and the thickness decreases. In case of membrane with an extra base layer on the bottom, the body dimension is kept constant and the thickness as well as the depth of the cover are varied in the simulation. The fundamental frequencies increases with the increasing of cover depth whereas it increases with the increasing of the thickness. In this simulation, the dysphonia is represented by various oval-shape noduls. The fundamental frequency increases when the nodul dimension increases and covers up to 75% of vocal cord. However this value decreases when the nodul is more than this dimension.

Keywords: vocal cords, fundamental frequency, COMSOL*, and silicone rubber*