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Biophysical and Material Analysis of the Anesthetic Needles to Reduce Nerve Tissue Damage YONGJAE RYU, YEONGHYEON LEE , JAE SUK PARK , Choice Research Group — Needle penetration of a nerve leads to a short or long-term dysesthesia such as paresthesia or permanent damage if it is not properly administered. Since the anesthetic needle cannula is long slender and thin-walled column, it is vulnerable to bending or fracture of the needle. Also plastic hypodermic needles, which are easy to adjust the ratio of synthetic polymers to increase the strength of material properties, found to be cost effective in manufacturing. This paper presents the study of the material properties and buckling behaviors of the needles using stability or safety analysis of needles fabricated by polymeric plastic materials and metals which enables doctors to carry out micro-injection. We considered penetration forces for diverse variables such as needle gauge size and needle penetration angles. Also, since the needle cannula is thin-walled column, such as 0.8mm outer diameter with a 0.2mm wall thickness, the material property and buckling behavior of the needles are analyzed by numerical and computational simulations. Also the mechanical property factors such as elastic modulus and brittleness of the needle are considered to determine how much pressure is required to barb each needle.

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