Application of Physical Properties of Purple Sea Urchin Barb Structure to Medical Suture Devices

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While feeling the need for a new suture device to cope with frequent suture medical accidents every year, we learned from the barb structure of the purple sea urchin (Heliocidaris Crassispina) and saw the possibility of applying it to medical staples by mimicking the barb structure. The barb structure mimicked model was made by the 3D printer. We made two variables the angle and number of barbs. The angle was given the intervals of 5 degrees, from 10 to 20), and the number of barbs had the variable of one to three. The model was inserted into artificial skin and pulled by a device that applies a constant force, to measure the fixed force through MBL Force sensor. Compared to the commercial suture devices that had the fixed force of 6.125N, the model which had the fixed force of 11.581N(3barb, 20°). Like to our hypothesis, the model with more barbs made the force increase 6.793N(2barb, 15°), 8.909N(3barb, 15°). Also, the increase of angles made the force increase 6.793N(2barb, 15°), 9.577N(2barb, 20°). The experiment proved the correlation between the increase of scales and the force that, as the number and angle of barb increase the fixed force also increases. The medical safety development was promoted by producing a suture medical device that can enhance the fixed force of the surgical site in medical suture surgery. Through checking the physical quantity of barb structure and imitating we anticipate thereby to reduce the frequency of suturing accidents. Further experiments will focus on the purple sea urchins chemical properties to develop the medical suture device to minimize skin necrosis and scarring. Keywords: physical properties, purple sea urchin, barb structure, medical suture device, fixed force

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