

Influence of Stress Relaxation and Hysteresis Effect for Pressure Garment Design

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Abstract : Pressure garment has been used to prevent and treat the hypertrophic scars following serious burns since 1970s. The use of pressure garment is believed to hasten the maturation process and decrease the highness of scars. Pressure garment is custom made by reducing circumferential measurement of the patient by 10%~20%, called Reduction Factor. However the exact reducing value used depends on the subjective judgment of the therapist and the feeling of patients throughout the try and error process. The Laplace Law can be applied to calculate the pressure from the dimension of the pressure garment by the circumferential measurements of the patients and the tension profile of the fabrics. The tension profile currently obtained neglects the stress relaxation and hysteresis effect within most elastic fabrics. The purpose of this study was to investigate the influence of the tension attenuation, from stress relaxation and hysteresis effect of the fabrics. Samples of pressure garment were obtained from Sunshine Foundation Organization, a nonprofit organization for burn patients in Taiwan. The wall tension profile of pressure garments were measured on a material testing system. Specimens were extended to 10% of the original length, held for 1 hour for the influence of the stress relaxation effect to take place. Then, specimens were extended to 15% of the original length for 10 seconds, then reduced to 10% to simulate donning movement for the influence of the hysteresis effect to take place. The load history was recorded. The stress relaxation effect is obvious from the load curves. The wall tension is decreased by 8.5%~10% after 60mins of holding. The hysteresis effect is obvious from the load curves. The wall tension is increased slightly, then decreased by 1.5%~2.5% and lower than stress relaxation results after 60mins of holding. The wall tension attenuation of the fabric exists due to stress relaxation and hysteresis effect. The influence of hysteresis is more than stress relaxation. These effect should be considered in order to design and evaluate the pressure of pressure garment more accurately.

Keywords : hypertrophic scars, hysteresis, pressure garment, stress relaxation

Conference Title : ICBPS 2015 : International Conference on Biomedical and Pharmaceutical Sciences

Conference Location : Tokyo, Japan

Conference Dates : May 28-29, 2015