

Effect of posture-associated mechanical strain on body sites that have a predilection for keloids

Teruyuki Dohi^{1,2}, Jagannath Padmanabhan¹, Satoshi Akaishi², Peter A. Than¹, Masao Terashima³, Rei Ogawa², and Geoffrey C. Gurtner¹

¹Department of Surgery, Stanford University School of Medicine, Stanford, California, United States

²Department of Plastic, Reconstructive and Aesthetic Surgery, Nippon Medical School, Tokyo, Japan

³Department of Civil & Environmental Engineering, Stanford University School of Engineering, Stanford, California, United States

Keloid scars present a significant clinical burden. Effective treatments that control scar progression are not available. A unique and poorly understood feature of keloid disease is the progression of the scar beyond the original site of injury and into a linear shape that is often different from the original shape of the wound. It has been previously suggested that certain body regions show a high predilection for keloid disease because they are under significant mechanical loading due to human movement. However, this association was not observed for all keloid-prone body regions. Therefore, we assessed the effect of changes in human posture (standing, sitting, and supine positions) on the mechanical loading on skin tissue in various keloid-prone anatomic locations ($n=10$). Changing human posture conferred significant and sustained multidirectional mechanical loading on the cutaneous tissue in the keloid-prone body areas. In other words, changing human positions can lead to high mechanical loading in all body regions that show a high predilection for keloid disease. Thus, position-associated mechanical loading on cutaneous tissue is a strong predictor of keloid formation and progression.