THE EFFECT OF SKIN TENSION ON THE FORMATION OF KELOID SCARS
Edna Suarez PhD,1,2 Teresa Alonso Rasgado PhD2 and Ardeshir Bayat MBBS, PhD1,2,3

1 Plastic & Reconstructive Surgery Research, Manchester Institute of Biotechnology, University of Manchester, United Kingdom. 2 Bioengineering Group, School of Materials, University of Manchester, United Kingdom. 3 University Hospital of South Manchester NHS Foundation Trust, Faculty of Medical and Human Sciences, Institute of Inflammation and Repair, Manchester Academic Health Science Centre, University of Manchester, Manchester, United Kingdom.

Keloid scars (KS) are a type of abnormal scarring which is unique to humans; they extend beyond the confines of the original wound margins, do not regress over time and invade the surrounding unaffected skin. Currently, the mechanisms involved in the formation of KS remain largely unknown. Clinical observation has shown that in areas where increased tension occurs, such as the sternum, there is a greater propensity for developing KS. However, the precise relationship between skin tension and KS development is yet to be identified. Therefore, the objective of this research was to investigate the effect of skin tension in the formation of KS. To achieve these aims, samples from normal skin and KS were used to perform qRT-PCR screening in tissue and cells; in addition, protein analysis by Western and In-cell Western blot was also undertaken. siRNA knockdown technique was employed to evaluate the functional role of the tension-related markers in keloid fibroblasts. Whereas, a photogrammetry technique was employed to evaluate skin tension in-vivo; the results from this evaluation were used in the development and design of a novel in-vitro 3D model. Using the newly created 3D model, it was shown that mechanical tension significantly induces the expression of Hsp27, PAI-2 and β2?1-Integrin as well as ECM components such as Collagen I. Furthermore, the results showed that the knockdown of the expression of Hsp27, PAI-2 and β2?1-integrin in fibroblast populated collagen lattices subjected to tension influenced not only the ECM synthesis but also adhesion and spreading genes in keloid and normal fibroblasts. In summary, this research convincingly shows that skin tension alters keloid fibroblast behaviour, morphology, mechano-responsive gene expression and extracellular matrix production. The findings from the research offer insight into keloid pathobiology and provide options for targeted treatment of specific genes affected in keloids by biomechanical stress.

Keywords: Skin-tension, Keloid scars, wound healing

Presenting author’s email: teresa.rasgado@manchester.ac.uk