A new mathematical model of keloids that shows that mechanical forces and inflammation act together to shape keloid morphology over time

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Mathematical models can be very useful for understanding the pathogenesis of keloids and the efficacy of various treatments for these lesions. Indeed, such a model has recently confirmed other research findings that suggest that mechanical forces such as tension play an important role in the development of keloids. However, heavy inflammation is also a key feature of keloids: it at least partially mediates the effect of mechanical forces and is also promoted by other factors, including genetics and systemic conditions such as hypertension. Thus, an accurate mathematical model of keloids should consider inflammation as well as mechanical forces. In this presentation, we propose such a mathematical model. It is based on the vertex model, which is generally accepted in mathematical biology and biophysics, and it examines how the interactions between inflammation and mechanical forces change the morphology of keloids. The model shows that both factors play key and interactive roles in the growth of keloids. Thus, this model unifies existing concepts about keloids in the literature and will be useful for exploring the role of biological and mechanical interactions in pathological scarring.