

## Advanced surgical strategies of keloids to minimize skin tension

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Keloid is an intractable skin fibroproliferative disease. These lesions grow both vertically and horizontally into the surrounding normal skin. They are most likely to occur on body sites that are characterized by high mechanical forces such as skin tension. These mechanical forces promote chronic inflammation of the dermis, which in turn stimulate local fibroblasts to lay down excessive amounts of collagen. This causes the scar to grow in the predominant direction of the tension. It also stiffens the lesion, thus generating a vicious circle where the fibroblasts in the stiff lesion become ever more sensitive and reactive to the mechanical forces on the scar. Therefore, surgery for keloids should aim to release and reset the stress and strain on these scars, for example by removing their hard and elevated parts. Resection surgery should also include appropriate suturing methods. In recent years, we used a reduced tension suturing method where the deepest sutures are placed in a membrane-like structure such as the deep fascia or/and the superficial fascia, which are located below the dermis. Moreover, the surgeon should ensure as much as possible that the suture lines are perpendicular to the direction of predominant skin tension. If that is not possible, tension reduction techniques such as multiple small Z-plasties should be used. Furthermore, all cases should undergo postoperative radiotherapy, tape fixation, and close follow-up. If the postoperative scar develops small areas of stiffness with redness, the tape fixation therapy should be replaced immediately with daily steroid plaster application. This multidisciplinary approach has allowed us to reduce the postoperative recurrence rate of keloids to less than 10%. The body-site specificity of keloids suggests that this multidisciplinary approach might be even more effective if it was tailored according to the local mechanical characteristics of each site. To further develop body-site-specific treatment guidelines for abnormal scars, we are currently optimizing the suture methods for each site.