

Keloids and Hypertrophic Scars

Keloids are benign, raised, fibrous growths that develop at the site of a skin injury or incision. Unlike typical scars, keloids extend beyond the boundaries of the original wound and continue to proliferate due to excessive fibroblast activity, which results in the accumulation of collagen and extracellular matrix components. Although keloids are considered non-cancerous, they can be a significant cosmetic concern, particularly when they form on visible or sensitive areas of the body.

Pathophysiology of Keloids

Keloid formation begins with the normal wound-healing process, where skin cells and fibroblasts proliferate to repair damaged tissue. Fibroblasts are responsible for synthesizing collagen, a key component of connective tissue. In typical wound healing, the fibroblasts gradually cease their activity once the wound is closed, and the scar tissue remains flat. However, in keloids, fibroblasts continue to proliferate excessively, producing an overabundance of collagen and other extracellular matrix components, leading to a raised, thickened scar that extends beyond the original wound boundaries.

Keloids are characterized by an overactive inflammatory response, dysregulated growth factor signaling, and aberrant fibroblast differentiation. These factors contribute to the excessive deposition of collagen in the extracellular matrix, which results in the characteristic appearance of keloids as large, raised nodules or plaques.

Clinical Presentation

Keloids can develop anywhere on the body but are most commonly found on areas with high skin tension, including the upper chest, shoulders, and upper back. They are typically reddish, pinkish, or darker in color and may present as firm, rubbery nodules or plaques. Keloids may be accompanied by symptoms such as itching, pain, or a sensation of tightness at the site of the scar. Although keloids are generally benign, they can cause significant cosmetic and psychological distress due to their conspicuous appearance.

Risk Factors

Several factors increase the likelihood of keloid formation:

- *Genetic Predisposition:* A family history of keloids is a major risk factor. Inherited genetic mutations affect collagen production and wound healing, making individuals more susceptible to keloid formation.
- *Ethnicity:* Keloids are more common in individuals with darker skin tones, particularly those of African, Hispanic, or Asian descent. This may be due to genetic differences in fibroblast function and collagen synthesis.

- **Age and Gender:** Keloids are most commonly seen in young adults, typically between the ages of 10 and 30. Both men and women are equally affected, though males may be more prone to keloids on the chest and shoulders.
- **Minor Injuries:** Keloids can form after minor injuries, such as insect bites, acne, or body piercings. Even small wounds or surgical incisions may result in keloid formation in predisposed individuals.

Distinguishing Keloids from Hypertrophic Scars

Keloids and hypertrophic scars share similar characteristics but differ in several important aspects. Both are the result of abnormal wound healing, characterized by the excessive deposition of collagen. However, hypertrophic scars typically remain confined to the boundaries of the original wound and may gradually regress over time. In contrast, keloids extend beyond the wound site and persist or even grow over time, often becoming more prominent. Keloids are more likely to recur after treatment, while hypertrophic scars tend to resolve spontaneously.

Treatment Options

While complete resolution of keloids is challenging, several treatment options can help reduce their size, symptoms, and cosmetic impact. Treatment selection depends on the size, location, and severity of the keloid, as well as the patient's preferences and response to previous therapies.

- **Prevention**
 - **Pressure Therapy:** Pressure dressings, silicone gel sheets, or paper tape applied to the affected area for 23 hours a day can help prevent the formation of keloids after healing of the wound. These treatments are most effective when initiated soon after the injury and continued for several months.
- **Corticosteroid Injections**
 - **Intralesional Steroids:** The first-line treatment for keloids often involves monthly injections of corticosteroids, such as triamcinolone. These injections help to flatten the keloid by reducing inflammation and collagen production. While this approach is effective for many patients, keloids tend to recur after cessation of treatment, and repeated injections may be necessary.
- **Cryotherapy**
 - **Freezing:** Cryotherapy, or the use of liquid nitrogen to freeze the keloid, is particularly effective for small lesions on lighter skin tones. It works by causing necrosis of the fibroblasts, reducing their ability to produce collagen. Cryotherapy is often combined with corticosteroid injections for enhanced results.
- **Laser Therapy**
 - **Laser Treatment:** Laser therapy can improve the appearance of keloids by reducing redness and improving skin texture, although it is less effective in flattening the scar tissue. Fractional CO2 lasers and pulsed dye lasers are commonly used to target

- vascularity and promote collagen remodeling. Laser therapy may be used in conjunction with corticosteroid injections to optimize outcomes.
- **Surgical Excision**
 - *Excision with Adjunctive Therapy:* In cases of large or bothersome keloids, surgical excision may be performed. However, surgery alone is often insufficient, as it can stimulate further keloid formation. To minimize recurrence, excision is typically followed by corticosteroid injections, cryotherapy, or radiotherapy.
 - **Radiotherapy**
 - *X-ray or Electron Beam Radiation:* For severe cases, particularly in patients with recurrent keloids, radiation therapy can be used after surgical excision to reduce the risk of recurrence. Low-dose X-rays or electron beam radiation can be effective in preventing the reformation of keloids, with approximately 85% efficacy in severe cases. However, the use of radiation is not without risks, including potential long-term effects like skin aging or, rarely, the development of malignancies.
 - **Other Medical Treatments**
 - *Interferon Therapy:* Alpha-interferon injections have shown promise in reducing keloid size and recurrence, particularly when used after excision. This treatment works by inhibiting collagen production and fibroblast proliferation.
 - *Topical Treatments:* Over-the-counter silicone gels and sheets can help reduce the size of hypertrophic scars and may offer some benefit in keloid management, particularly in terms of reducing pain, swelling, and itching. However, they do not fully resolve established keloids.

Conclusion

Keloids are abnormal scars resulting from excessive fibroblast proliferation and collagen deposition. While they do not pose a malignant risk, they can cause significant cosmetic and psychological distress. Management of keloids is complex and requires individualized treatment approaches, with options ranging from preventive measures to surgical and adjuvant therapies. Advances in steroid injections, laser treatments, and radiotherapy have improved outcomes, although recurrence remains a significant challenge. Continued research into novel therapies, including genetic interventions and targeted molecular treatments, may offer new hope for patients with persistent keloid scars.

References

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