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난치성 켈로이드 치료에서 선행 5-플루오로우라실/트리암시놀론 병변내 주사 후 절제술 및 수술 후 방사선치료를 병합한 상승적 다중모달 치료 전략

Synergistic Multimodal Therapy for Refractory Keloids: Neoadjuvant 5-Fluorouracil/Triamcinolone Injections Followed by Excision and Postoperative Radiotherapy



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Purpose : Keloids are associated with high recurrence rates, particularly when treated with surgical excision alone. Large or refractory lesions are characterized by increased mechanical tension, a key factor contributing to recurrence. Although intralesional 5-fluorouracil (5-FU) and triamcinolone acetonide (TAC) are effective in reducing scar volume, their role as neoadjuvant therapy before surgery has not been standardized. This study evaluates a multimodal protocol incorporating neoadjuvant 5-FU/TAC injections, surgical excision, and postoperative radiotherapy (RT).

Methods : Patients with large or refractory keloids underwent three sessions of intralesional 5-FU/TAC injections at four-week intervals. Surgical excision was performed four weeks after the final injection to enable tension-free primary closure. Postoperative electron-beam RT was initiated within 24 hours, followed by a total of three sessions. Clinical outcomes were assessed using the Vancouver Scar Scale (VSS), Patient and Observer Scar Assessment Scale (POSAS), and recurrence rates during a 12-month follow-up.

Results : Neoadjuvant treatment reduced mean keloid volume by 30–50%, facilitating surgical excision and minimizing reconstructive complexity. At 12 months, recurrence was less than 10%, lower than historical controls treated with surgery and RT alone. Significant improvements were observed in scar height, erythema, and density, with corresponding VSS and POSAS score reductions. The combined use of 5-FU with reduced-dose TAC minimized corticosteroid-related adverse effects.

Conclusion : Neoadjuvant 5-FU/TAC combined with excision and RT is a safe and effective strategy for refractory keloids. Preoperative volume reduction and tension modulation appear to enhance surgical outcomes and reduce recurrence, supporting this multimodal protocol as a practical clinical framework.

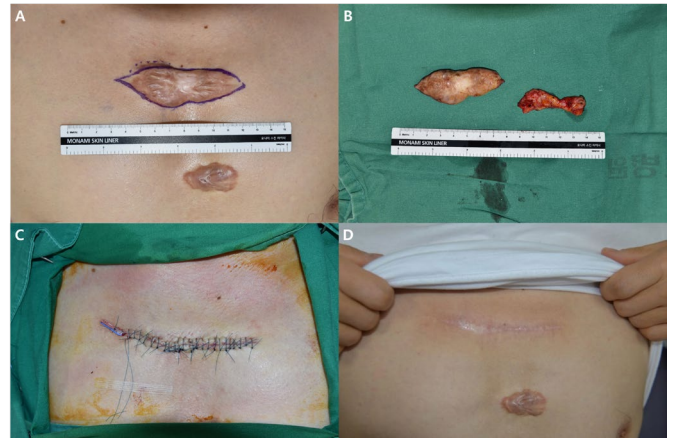


Fig. 1. Clinical photographs of multimodal treatment for the keloid on anterior chest. (A) Preoperative surgical design outlining a 7 × 3 cm keloid on the anterior chest. (B) Excised keloid specimen following complete removal. (C) Immediate postoperative appearance after primary closure. (D) Five-month postoperative photograph showing a stable scar without recurrence.

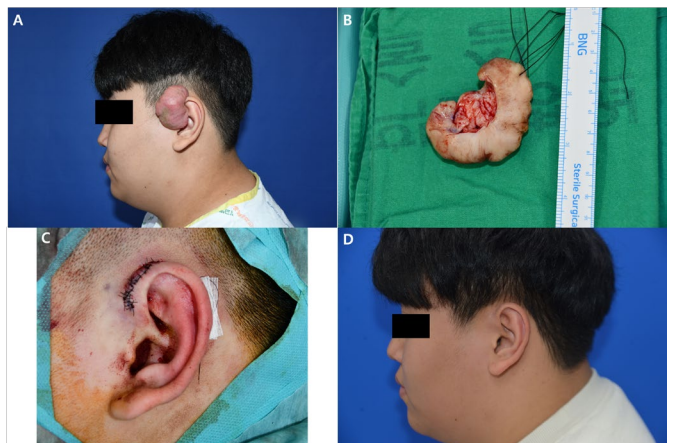


Fig. 2. Clinical photographs of multimodal treatment for left auricular keloid. (A) Preoperative photograph demonstrating a large keloid involving the left auricular helix. (B) Excised keloid specimen measuring 6.5 × 4.5 cm. (C) Immediate postoperative appearance after primary closure. (D) Nine-month postoperative follow-up showing satisfactory contour restoration without recurrence.