Objective: To determine the efficacy of excision with primary closure in the treatment of extensive and refractory acne keloidalis nuchae (AKN).

Design: Intervention before-after trial. Duration of follow-up ranged from 1 to 5 years.

Setting: University-based ambulatory outpatient dermatologic surgery unit.

Patients: Referred sample of 25 patients with extensive AKN that was refractory to medical management. All patients were healthy, young black men who had no medical problems and were not taking any medications. No other eligible patients refused to be included in the study. All 25 patients completed the study.

Interventions: All 25 patients underwent surgical excision of AKN. Twenty of the 25 underwent excision with layered closure in 1 stage. Four patients underwent 2-stage excisions with layered closure. One patient underwent excision with second-intention healing.

Main Outcome Measure: A test of the following hypothesis: excision with primary closure is a successful treatment modality with little risk of recurrence for extensive cases of AKN.

Results: The author and all 25 patients rated the cosmetic result of surgery as good to excellent. No patients experienced complete recurrence of their acne keloids. Fifteen patients developed tiny pustules and papules within the surgical scar. Five patients developed hypertrophic scars. Papules, pustules, and hypertrophic scars were all successfully treated with high-potency topical and intralesional steroids.

Conclusions: Excision with primary closure is an excellent surgical treatment modality for the management of extensive cases of AKN. Extremely large lesions should be excised in multiple stages. The surgeon should carefully assess each patient to determine whether AKN should be excised in 1 or multiple stages.

Arch Dermatol. 2000;136:1376-1379
PATIENTS AND METHODS

Twenty-five patients with AKN were included in the study. All the patients were young (21 to 45 years old) black men with extensive, coalescent keloidal plaques on the nuchal portion of the scalp that had been present at least 1 year. Eighteen of the patients related the onset of the condition to a haircut that caused excessive irritation. Treatment with various medical therapies, including topical (eg, clobetasol propionate twice a day) and intraliesional (triamcinolone acetonide suspension, 40 mg/mL injected once a month) steroids, topical and systemic antibiotics, and topical retinoids, had failed in all 25 patients. None of the patients had undergone prior surgical treatment. Each patient was counseled preoperatively on the risks, benefits, and postoperative course of excision with primary layered closure. Five patients had keloidal plaques that were so large that the resulting postsurgical defect could not be closed primarily without producing excessive tension on the incision line. Such patients were offered staged surgical excision with primary layered closure or excision of the entire keloid in 1 procedure with second-intention healing. After informed consent was obtained from each patient, the area to be excised was outlined with a surgical pen in the shape of a horizontal ellipse, which, when possible, included the posterior region of the hairline. When a 2-stage excision was planned, the horizontal ellipse typically was designed to include the inferior half of the acne keloid. Three to six months later, the superior half of the lesion was removed, with care being taken to design the closure such that the scar from the first excision represented the inferior border of the horizontal ellipse of the second excision. Local anesthesia was instilled with 1% lidocaine hydrochloride with 1:100000 epinephrine, with care being taken not to exceed the toxic dose of lidocaine (7 mg/kg). The surgical site was sterilly prepared and draped, and the keloids were excised with a No. 10 scalpel blade to a depth below that of the bulbs of the hair follicles (to fascia or deep subcutaneous fat). The scalpel blades had to be changed frequently, since they quickly became dull during the cutting of the tough, sclerotic, keloid tissue. Four patients underwent excision with an electrocautery device using the cutting current (ie, electrosection). Hemostasis was obtained by electrocoagulation and/or vessel ligation. Decreased wound-edge bleeding was noted in patients who underwent electrocautery excision. The resulting defects were closed in a layered fashion with 2 to 4 absorbable 3-0 vicryl subcutaneous sutures and a running superficial suture of 3-0 polypropylene (Prolene). Wounds were dressed with topical petroleum jelly, a nonadherent dressing, and gauze. Patients were provided with soft surgical collars to prevent sudden flexion of the neck and were given explicit written instructions regarding pain medication and dressing changes. Each patient returned to the office in 14 days for suture removal and every 3 to 4 months for 1 year. One year after surgery, each patient and I rated the success of surgery on a scale of 1 to 4 (1, poor; 2, fair; 3, good; and 4, excellent).

RESULTS

Twenty of the 25 patients underwent complete excision of their keloids with layered closure of the resulting defects in 1 stage (Figure 1). Of the 5 patients with keloids large enough to require a multistage procedure, only 1 elected to undergo excision with second-intention healing. This individual’s postoperative surgical defect measured 9.0 × 8.0 cm and required 9 weeks for complete closure. The scar after complete healing measured only 6.0 × 2.0 cm. The patient was pleased with the cosmetic result and decided not to undergo excision with layered closure of the second-intention scar. The other 4 patients with large keloids chose to undergo 2-stage excisions with layered closures 3 to 6
months apart (Figure 2). No patients required more than a 2-stage excision. Duration of follow-up ranged from 1 to 5 years. The surgical scar could usually be hidden in the new hairline, because the inferior margin of the horizontally oriented elliptical excisional specimen had, when possible, been designed to include the original posterior region of the hairline. Good range of movement was obtained in all patients within 3 to 5 days.

One year after surgery, the patients and I evaluated the cosmetic results of surgery. I gave fifteen patients an excellent score (4) and 10 patients a good score (3), for an average score of 3.6. Twenty patients rated the success of surgery as excellent (4), whereas 5 patients felt that they had achieved good (3) results, for an average score of 3.8. Neither 1 nor any of the patients rated the cosmetic results of surgery as poor (1) or fair (2).

None of the patients who underwent cold-steel excision experienced postoperative bleeding, infection, dehiscence, or pain that required oral analgesics that were stronger than acetaminophen. All 4 patients who had electrosurgical excision experienced significant postoperative pain that required narcotic analgesics. Two of the 4 patients also experienced slight dehiscence of their incisions within the first week after surgery. Fifteen patients had mild recurrences of tiny pustules and papules within the surgical scar during the first 4 months. Five patients developed hypertrophic scars within the incision site. All the patients who developed hypertrophic scars underwent single-stage excision of large acne keloids that resulted in a moderate amount of wound-edge tension after subsequent layered closure. The small recurrent papules and hypertrophic scars were treated successfully with twice-daily applications of high-potency topical steroids and monthly injections of intralesional steroids. No patients experienced complete recurrence of their acne keloids.

**COMMENT**

Surgical excision is the mainstay of treatment for extensive lesions of AKN. Kanthak and Cullen17 were the first to emphasize the importance of excising the keloidal tissue to a depth extending at least to the base of the hair follicles. Recurrences are more likely to occur if the surgeon fails to achieve subfollicular destruction during surgical excision.10,13,16 Thus, the excision must extend to the deep subcutaneous tissue or muscular fascia, since hair follicles typically penetrate the subcutaneous fat.

Closure options after the lesion has been excised include second-intention healing, split-thickness grafting, primary closure, or staged excision with primary closure. Second-intention healing, depending on the size of the keloid, may result in large defects that require 6 to 12 weeks of diligent wound care. Many patients do not want to care for such large, open wounds. Nevertheless, second-intention healing should be presented as a surgical option to all patients, because the wound often contracts to form a scar that is much smaller and flatter than the original keloid. Cosmesis after second-intention healing can be further improved if the excision is carried out as a horizontal ellipse, including the posterior hairline area, a technique that has been shown to result in more rapid healing and better contraction.13

Excision with subsequent split-thickness skin grafting has also been described in the treatment of AKN.5,12,14,16,17,19 Unfortunately, the cosmetic benefits of skin grafting are limited.15,16,18 Split-thickness skin grafts are often atrophic, smooth, and shiny, and do not match surrounding skin in color, texture, or thickness. Furthermore, the graft sites are significantly depressed below the level of the surrounding skin.

Excision with primary closure is an effective option in the treatment of extensive and refractory AKN. Previous articles have reported that excision with second-intention healing is more effective than primary closure, because primary closure scars frequently stretch to
a large area, often to the size of a scar produced by second-intention healing, and may restrict movement if the head has to be bent back during the suturing of the wound to accomplish closure.\textsuperscript{10,13} These complications may occur if the surgeon excises a large AKN in 1 stage and subsequently attempts to close the resulting defect under excessive tension. Spread scars and restricted movement may be avoided if large keloids are excised in 2 stages, thus allowing the surgeon to close the resulting defect without undue tension. Preoperatively, the surgeon must evaluate each patient in terms of the size of the keloid, as well as the laxity of nuchal skin, to determine whether the lesion should be excised in 1, 2, or even 3 stages.

In this study, only a few patients developed hypertrophic scars. These individuals had fairly large keloids that were excised and closed primarily in 1 stage. It is possible that the hypertrophic scars developed as the result of high wound-edge tension and could have been avoided if a multistage procedure had been attempted.

It is my opinion that cold-steel excision of acne keloids is preferable to electrosurgical excision using a cutting current (ie, electrosection). Although electrosection permits improved hemostasis, it also seems to result in increased postoperative pain and a greater risk of dehiscence, possibly owing to thermal injury of the adjacent skin.

None of the patients in this study had their keloids excised with a carbon dioxide laser, although Kantor and Ratz\textsuperscript{16} reported good results after carbon dioxide laser excision, without excessive postoperative pain. Dehiscence was not an issue in that study because all keloids were allowed to heal secondarily.

When possible, excision should be carried out as a horizontal ellipse, including the posterior hairline area. Consequently, the resulting primary closure scar will recreate a new hairline and greatly improve the cosmetic result. Unfortunately, this is not always possible, since some keloids are located several centimeters superior to the posterior region of the hairline. In such cases, excision with primary closure will result in a long, linear, horizontal scar in the middle of the posterior region of the scalp, with hair growing on either side. The scar will be more noticeable if it spreads with time, since hair will not grow within the scar. The patients in such cases should be encouraged to wear their hair longer so that it may be styled in a way that will cover the scar.

In summary, excision of AKN with primary closure is an excellent surgical option in the treatment of AKN provided that the surgeon carefully assesses each case (ie, the size of the keloid and the laxity of nuchal skin) to determine whether the keloid should be excised in 1 or multiple stages. Excision with primary closure typically yields good cosmetic results, without prolonged wound care, and there are minimal postoperative complications.

Accepted for publication July 10, 2000.

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REFERENCES