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Treatment of Local, Persistent Cutaneous Atrophy Following Corticosteroid Injection with Normal Saline Infiltration

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BACKGROUND. Injections of corticosteroids are commonly used for a variety of dermatologic conditions but may cause local, persistent cutaneous atrophy, with few therapeutic options.

OBJECTIVE. To determine the effectiveness of bacteriostatic normal saline infiltration on the improvement of corticosteroid-induced cutaneous atrophy.

MATERIALS AND METHODS. Four patients with corticosteroid-induced cutaneous atrophy of the skin, two caused by acneiform cysts and one from intramuscular steroid injection, were treated with weekly injections of normal saline directly into the atrophic site.

RESULTS. All four patients demonstrated complete resolution of skin atrophy and restoration of surface contour within 4 to 8 weeks of initial presentation. Injected volumes of normal saline ranged from 5 to 20 cm³ per treatment session and three to six weekly treatments. The patients were completely satisfied with these results.

CONCLUSION. Normal saline infiltration offers a safe, tolerable, relatively rapid, and effective treatment for local, persistent corticosteroid-induced atrophy.
amount of injected steroid were unknown. Treatment with tazarotene cream 0.1% applied nightly for 3 months duration was not effective and was therefore discontinued 1 month prior to presentation. Examination revealed an 8 mm, asymptomatic, 2 to 3 mm deep, round, gently sloped indentation of the right medial forehead. The diagnosis of CS-induced atrophy was made. Five mL of bacteriostatic normal saline was injected directly into the dermis of the affected area using a 5 cm³ syringe and a 30-gauge half-inch needle. Resultant skin blanching and edema resolved within 2 hours without sequelae. The procedure was repeated each week for 3 additional weeks.

Five weeks after presentation, the patient returned to the clinic for evaluation. At this time, the indentation had completely resolved with full restoration of the surface contour of the skin. No further saline injections were administered.

Case 3
A 31-year-old woman presented to our office with a depression on her right cheek that resulted from cyst injection with CS performed 8 months previously. She had received three injections of an unknown concentration and volume of CS to reduce the size of the cyst but developed the depression approximately 2 weeks after the last treatment. Examination revealed an 18 mm, asymptomatic, round, gently sloped, 2 to 3 mm deep depression of the central right cheek. The diagnosis of CS-induced atrophy was made. Five milliliters of bacteriostatic saline was injected with a 5 cm³ syringe and a 30-gauge half-inch needle directly into the deep dermis of the depressed region. This resulted in localized edema and soft tissue blanching that extended to a 1 cm radius beyond the injection site but reportedly resolved without sequelae within 2 hours of administration. This procedure was repeated weekly for four additional sessions.

At the 5-week follow-up, the patient demonstrated clearance of the depression and restoration of surface contour at the treatment site. No further saline treatments were performed.

Case 4
A 27-year-old woman presented with a depression of the skin on her hip. This formed approximately 1 week after a single intramuscular injection of an unknown concentration and amount of CS administered for the treatment of asthma. She had received no treatment of the subsequent surface contour irregularity but was told that it would resolve spontaneously within a few weeks. After over 6 months with no improvement, she presented to our center for correction. Examination revealed a 4 cm, asymptomatic, round, gently sloped, 3 mm deep depression of the left lateral hip. The diagnosis of CS-induced...
lipotrophy was made. The patient was then administered 10 cm³ of bacteriostatic normal saline injected directly into the dermis and superficial subcutaneous tissue of the depressed skin. The region became edematous and blanched, which subsided within a few hours after the procedure without sequelae. She returned to clinic on five additional visits, each separated by a week, for similar treatments ranging from 5 to 20 cm³ of normal saline. Notably, a stepwise improvement was seen within a day of each treatment date. At follow-up 8 weeks after the first treatment, the patient demonstrated full restoration of the surface contour with no evidence of the previous depression. No further treatments were given, and she continued to be inden
tation free at the 3-month follow-up.

Discussion

In 1962, Goldman reported a 0.5% overall incidence of local reactions following intralesional CS.¹ These included pain, panniculitis, hemorrhage, secondary infection, pigment alteration, hypersensitivity, and atrophy. Fisherman and colleagues reported persistent local atrophy at the 3-month follow-up in 6 of 27 patients, all premenopausal females, following intramuscular or deep subcutaneous injection of CS for asthma and generalized atopic and contact dermatitis.²

Cutaneous atrophy is observed clinically as depressed areas of the skin surface, at times demonstrating a background of finely distended blood vessels, hypopigmentation, or alopecia. It generally begins within 2 to 3 months of injection and may resolve spontaneously within 1 to 2 years.³–⁶ However, atrophy persisting beyond 5 years has been reported.⁷ The extent and time course of cutaneous atrophy depend on the solubility and concentration of the CS preparation and the depth and anatomic location of injection.⁸ Compounds with low solubility, such as triamcinolone acetonide, injected at higher concentrations are associated with greater atrophogenic potential. Pariser and Murray noted a greater risk of cutaneous atrophy with concentrations above 5 mg/cm³ of triamcinolone acetonide.⁹ Injections into the superficial dermis can result in initial epidermal sloughing and persistent epidermal atrophy, whereas those in the deep dermis and subcutis may result in variable loss of fat with minimal epidermal change.⁸

The exact mechanism of cutaneous atrophy following injected CS is not fully understood but is likely due to several factors, most importantly decreased type I collagen and glycosaminoglycan synthesis.¹⁰ Several investigators have examined the histology of local cutaneous atrophy.⁸¹¹–¹³ One common finding includes the presence of a granular basophilic material in the dermis, thought to represent altered ground substance, associated with deposits of CS crystals.⁸¹²,¹³ Other significant findings include homogenization of collagen, degeneration of sebaceous glands, decreased elastin, epidermal atrophy, involution of subcutaneous fat lobules, and the presence of CS crystals on polarized microscopy.⁸¹²,¹³ Iuel and Kryger reported a case of persistent local cutaneous atrophy following a series of injections of prednisolone tert-butyl acetate to the metatarsophalangeal joint of the right great toe.¹⁰ Histologic examination 2 years after injection revealed crystals presumed to be CS in the area of atrophy. Goldman noted in his histologic studies that cutaneous atrophy disappears in parallel to the gradual disappearance of CS crystals from tissue.¹ This relationship may provide important insight into the pathogenesis of persistent local cutaneous atrophy following CS injection.

In this report, three patients with CS-induced atrophy were successfully treated with local infiltration of normal saline. Saline was chosen because it is a safe, nonallergenic solvent that is inexpensive and readily available. To our knowledge, there is no precedent in the use of saline or any other compound to treat this problem. A couple of theories may explain this effect. Based on the reports cited above, the efficacy of treatment may rely on the resuspension and redistribution of poorly soluble CS crystals by saline solution. This may explain the stepwise improvement rapidly observed after each weekly injection of saline. The frequency of injection was selected to be on a weekly basis mainly for the logistics in that it was convenient for patients to return to clinic at that interval. Also, it was felt that weekly visits would allow for sufficient time to assess the maximum benefit from the previous injection. For cases 1 to 3, all of which describe atrophy following CS injection to cysts, the pressure from the saline infiltration may have served to physically sever microscopic fibrous adhesions binding remnant cyst components to the underlying tissue. This can be thought of as a tumescent subcision, the result of which is the release of tethering forces binding down the superficial skin and restoration of the surface contour. The atrophy induced by intramuscular injection of CS in case 4 took longer to resolve than in cases 1, 2, and 3. This may be explained by the resuspension/redistribution concept, with gradual build-up of the dermis and subcutis following CS crystal disappearance. Technically, it is important to achieve tumescence and blanching but to stop infiltration just before the development of pain or intolerable discomfort. Although the photographs illustrate improvement with this procedure, the two-dimensional nature of film admittedly fails to demonstrate the incredible extent of contour restoration compared with live physical examination.

This report demonstrates that serial saline injections provide a safe, relatively rapid, cost-effective, and non-complicated solution to CS-induced atrophy of the skin. Three cases illustrating two different causes for persistent cutaneous atrophy were presented, all of which achieved satisfying results by this method. Although “time may heal
all wounds,” normal saline infiltration may reduce this wait to a reasonable period and obviate the desire for unnecessarily costly or complicated intervention.

References