Intralesional excision with topical intralesional cryotherapy improves the treatment of keloid scarring in a paediatric patient

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ABSTRACT

Recurrent keloid scarring has a significant impact on quality of life. Management is complex, particularly for scars resistant to conventional treatments and in paediatric cases where radiotherapy is not a suitable adjunct to surgical excision. We present the case of a nine-year-old African Caribbean girl with multiple large and recurrent keloid scars on both ears and bilateral sensorineural deafness. Following repeated intralesional excisions, corticosteroid and botulinum toxin injections, she continued to experience rapid recurrence of her keloids, worsening pain and pruritus. She was no longer able to wear her hearing aids because of the large size of the keloids. We employed a novel technique using topical intralesional cryotherapy, applying liquid nitrogen intraoperatively to the inside of the skin flaps immediately post-intralesional keloid excision and before wound closure. At 26-month follow-up a good aesthetic and symptomatic result was achieved, with minimal hypopigmentation, significantly reduced scar volume and significantly slowed recurrence. We discuss this case and review the current literature on the use of topical intralesional cryotherapy for keloid scarring.

KEYWORDS

Cryotherapy – Intralesional cryotherapy – Keloid

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Introduction

Keloid scarring can cause significant functional, aesthetic and psychological symptoms for patients. Despite multiple therapeutic options, including silicone gel, pressure garments, corticosteroid injections, botulinum toxin injections, cryotherapy, radiotherapy, laser therapy and surgical excision, keloids often recur and are difficult to manage.¹ Particular problems arise for paediatric patients, who may require multiple injections and surgical excisions under general anaesthesia, without the possibility of adjuvant radiotherapy.

Use of cryotherapy has increased over the past two decades. Traditionally, topical liquid nitrogen is used to freeze keloid scars externally. However, numerous adverse effects have been reported, such as pain, hypopigmentation, blistering, delayed healing and infection.² Intralesional cryotherapy is another option, whereby the cryogen is injected directly into subcutaneous tissue using a needle, sparing the overlying epidermis. This partially reduces blistering, pain and hypopigmentation but significant recurrence rates and difficulty achieving complete scar eradication remain.^{2,3}

This case demonstrates a novel technique for administering topical intralesional cryotherapy immediately after intralesional excision, with positive results in a child with previously large and rapidly recurring keloid scars.

Case history

A nine-year-old African Caribbean girl was referred with bilateral large, recurrent keloid scars of the earlobes and post-auricular regions. This patient had idiopathic bilateral sensorineural hearing loss, requiring bilateral hearing aids. The ear keloids developed secondary to bilateral ear piercings at two years of age and surgery for a right cochlear implant at four years. Her hearing aids would not fit because of the size of the recurring auricular keloids. She also had seven other keloids on her trunk secondary to chicken pox scars. There was a family history of keloid scarring.

Between the ages of nine years and eleven years, she underwent three debulking excisions of each ear keloid. On each occasion, the excised tissue was sent for histology, which consistently showed areas of hypertrophic and keloid scarring with no evidence of dysplasia or malignancy. She was also treated with multiple repeated corticosteroid and botulinum toxin injections, each requiring general anaesthesia. In total she was given five separate corticosteroid injections of adacortyl (10 mg/ml), with a total dose of 49 mg to the right ear keloid and 29 mg to the left ear keloid over a three-year period. On one occasion, 66 units of botulinum toxin were also injected around the edge of the right ear keloid and 30 units of botulinum toxin around the edge of

the left ear keloid. Despite these treatments, her keloids continued to rapidly recur and grow larger (Fig 1a,b). Over the following year, she had four sessions of topical liquid nitrogen cryotherapy to each ear keloid. These partially reduced the size of each keloid, although she developed blistering and the rapid recurrence continued.

A novel approach was tried using topical intralesional cryotherapy immediately following intralesional excision. No further steroid injections were used on this patient. The keloid scar tissue was excised down to normal underlying tissue with the overlying skin retained. After haemostasis, liquid nitrogen was applied topically to the inside of the skin flaps and base of the wound. This was performed using a roll of gauze soaked in liquid nitrogen and insulated in a syringe (Fig 2a,b,c). This technique allowed the surgeon to administer the liquid nitrogen accurately to precise areas of the wound, without the patient or the surgeon sustaining cold burns. Three freeze–thaw cycles were applied to the tissue treated each time. The liquid nitrogen-soaked gauze roll was applied until the tissues went white and then removed. The liquid nitrogen-soaked gauze was reapplied once the tissues had recovered to a normal colour. The wounds were then closed primarily to reconstruct the ear shape and further topical liquid nitrogen applied to the suture line. In the immediate postoperative period there was mild pain and superficial blistering. This resolved with re-epithelialisation after three weeks. Hypopigmentation was apparent initially but almost completely resolved by six weeks. A significant reduction in scar volume was achieved after the first treatment.

The patient had some mild recurrence of both ear keloids at 16 months, for which she requested further surgery and topical intralesional cryotherapy. This was performed on the right ear 16 months after the previous surgery, with topical

Figure 1 Preoperative view of postauricular keloid scar in 11-year-old girl, following repeated steroid, botulinum toxin injection and intralesional excisions: (a) left and (b) right earlobe.

Figure 2 Intraoperative set-up: (a) Close-up image demonstrating the rolls of gauze placed inside and insulated in a syringe to allow safe and accurate administration of the liquid nitrogen intraoperatively; (b) liquid nitrogen (canister) and a roll of gauze inserted into a syringe. The liquid nitrogen is sprayed on to and absorbed by the gauze, which is kept insulated from the patient and surgeon inside the syringe for safe topical administration to the wound; (c) topical intralesional cryotherapy being applied directly to the inside of skin flaps prior to wound closure, during a revision procedure to the left earlobe.

Figure 3 Postauricular keloid scar at 26-month follow-up following treatments with the novel method of intralesional excision of the keloid scar tissue with topical intralesional cryotherapy with liquid nitrogen: (a) left and (b) right earlobe.

cryotherapy to the left ear. At 19 months after the previous surgery, she underwent further intralesional excision of the left ear keloid and topical intralesional cryotherapy, with topical cryotherapy only to the right ear. At 22 months, she had a minor recurrence of the keloid on the right ear and had further surgery and topical intralesional cryotherapy to this ear, with topical cryotherapy to the left ear. At 26 months there was minimal hypopigmentation, reduced pruritus, significantly reduced size and significantly slowed recurrence of both keloid scars (Fig 3a,b). She is now able to wear her hearing aids comfortably and exhibits increased confidence and engagement at school.

Discussion

Recurrent keloid scarring has a significant impact on quality of life. Management is complex. There are numerous treatment options, each with limited effectiveness.² This case illustrates the novel use of topical intralesional cryotherapy immediately following intralesional excision to treat recurrent keloid scarring which was refractory to traditional management.

Conventional intralesional cryotherapy provides limited benefit for patients. A 2015 systematic review demonstrated an average reduction in keloid scar volume of 51–63%, with reduced pain and pruritus.⁵ However, the rate of recurrence was up to 24%, hypopigmentation occurred particularly in Fitzpatrick skin types 4–6 and no complete scar eradication was achieved in any study. Furthermore, intralesional cryotherapy has been shown to be more useful for small and new keloids, as opposed to large, recurrent scars.⁴

To our knowledge there is no published experience using the topical intralesional cryotherapy technique described in this case. We propose this technique as a potential treatment for paediatric patients with large, recurrent keloid scars.

Following intralesional keloid excision, the benefits of directly freezing the deep dermal tissue in the wound and skin flaps are significant. The liquid nitrogen targets the abnormal fibroblasts more precisely and uniformly than with conventional injection techniques for intralesional cryotherapy.⁵ An increased proportion of abnormal keloidal fibroblasts will therefore undergo freezing and potential differentiation back to normal phenotype with normalised synthetic activity. As demonstrated in vitro, the transformation of type-III to type-I collagen may also be increased by direct application of cryotherapy.⁵

Clinically, this topical intralesional cryotherapy technique has achieved significantly slowed keloid regrowth in a paediatric patient, without using steroid injections. Persistent hypopigmentation has not occurred despite her Fitzpatrick 6 skin type. There was also significantly improved pain and pruritus compared with previous therapies. In our experience it is a safe and simple procedure, which adds only five minutes to the surgical excision and expedites both postoperative recovery and keloid resolution.

Conclusions

This novel technique using topical intralesional cryotherapy immediately post-intralesional excision has achieved a significantly more normal appearance for this patient at 26 months follow-up. Further research is needed to determine the efficacy of this technique and to inform patient selection.

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