

New hope for scar revision with a modified skin culture technique: a case report

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Summary

Cultured epidermal autografts (CEA) are seldom used in scar revision despite evidence of favourable outcomes. We report a case using a modified technique, Kleintjes Cultured Skin (KCS), for revision of childhood burn scars on the lower legs. Keratinocytes were enzymatically isolated, seeded onto the dressing, and incubated for two weeks. KCS was applied directly onto the excised scars. Scar appearance, assessed with the Vancouver Scar Scale, improved from 4 preoperatively to 2 at a follow-up of two and six years, with progressive re-pigmentation, softness, and pliability. The biopsy site also healed favourably. This case supports the potential role of KCS in cosmetic scar revision.

Keywords: cultured epidermal autografts, Kleintjes cultured skin, scar revision, cosmetic outcomes, Vancouver scar scale

Case report

A 56-year-old woman presented with long-standing, unsightly hypopigmented scars on the anterior aspects of both lower legs (Figure 1A and B) that were sustained during childhood burn injuries. She expressed significant distress regarding the appearance of the scars, reporting that embarrassment had prevented her from wearing dresses for years. She was a non-smoker with no chronic ailments or medication use and had no abnormal systemic findings on examination. Clinically, the scars were hypopigmented, with overlying skin that appeared rough and slightly firmer than the surrounding skin tissue. The KCS technique, along with its experimental nature, was explained in detail to the patient. Informed consent was obtained, with assurances that she could withdraw at any time without consequence, and that treatment would be halted in the event of any severe complications. A full-thickness skin biopsy (3 x 2 cm) was harvested under local anaesthesia from the right inguinal region, and the donor site defect was closed with subcuticular sutures primarily in two layers (Figure 1C). Concurrently, 6 ml blood was collected in citrate-dextrose tubes which was used for the preparation of platelet-rich plasma (PRP) necessary for supplementation during the cultivation period. PRP was then prepared by centrifuging and aspirating the supernatant into sterile bottles, followed by transferral into the paediatric incubator. Optimal culture conditions of the incubator included disinfecting, maintenance of temperature at 37 °C and daily humidification. The KCS technique was previously described in detail.¹ Briefly, the biopsy tissue layers were separated using a 15/0 blade and optical loupes, and the epidermal layer further fragmented. The keratinocytes were enzymatically obtained by immersing the epidermal fragments in trypsin solution for 2 hours, followed by rinsing and then transferral of these fragments

onto standard dressing material. The dressing-containing the keratinocytes were then incubated in paediatric incubators for a period of two weeks (Figure 1D). Supplementation during this period occurred daily with fresh PRP and every third day with hydrogel. The resulting confluent KCS grafts (indicated by colour and viscosity change: from an initial pale grey/white and fluidic appearance to brown and gelatinous with dressing shrinkage) were then transplanted directly on to the excised scars during a second procedure. Postoperative follow-up occurred at 1 and 2 weeks, 1 and 3 months, and again at 2 and 6 years. The Vancouver scar scale (VSS)² was used to assess scar appearance which focused on assigning scores based on vascularity, pigmentation, pliability and scar height. At the 6-year follow-up, the treated areas demonstrated sustained improvement in scar appearance (Figures 1E–H). The larger inferior scar on the left leg showed reduced hyperpigmentation, while the smaller, superior lesion displayed minor residual hypopigmentation (Figures 1F and H). On the lower right leg, improved skin pliability was evident (proximal to the thumb), with visible soft wrinkling and decreased hypopigmentation (Figure 1E). The preoperative VSS score was 4. This improved to 2 at both the 2-year and 6-year evaluations, with persistent but reduced hyperpigmentation (Table I).

Discussion

The use of KCS for scar revision in this case demonstrated clear improvement in overall scar appearance, most notably through reduction of hypopigmentation and the progressive emergence of hyperpigmentation. Scar height and vascularity showed no significant long-term alterations. The most prominent improvement was observed in scar pliability. Whereas the preoperative scar was firm and coarse, the postoperative scar treated with KCS exhibited excellent

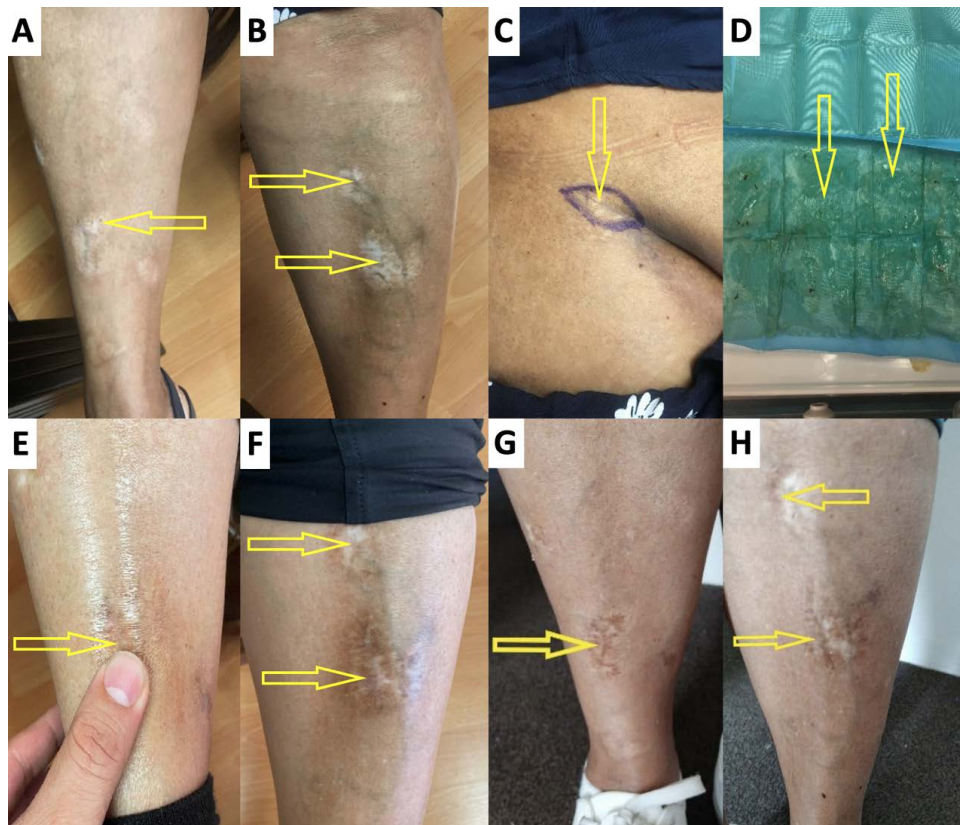


Figure 1: Pre- and postoperative appearance following scar revision with KCS on the anterior lower legs. Preoperative childhood scars on the (A) right and (B) left leg. (C) Groin donor-site biopsy. (D) KCS cultivated on standard dressing material in paediatric incubators. Post-operative scar appearance and pliability on the (E) right and (F) left leg at 2 years, on the (G) right and (H) left leg at 6 years (KCS – Kleinjies cultured skin)

Table I: VSS score criteria before and after (2- and 6-year review) CEA transplant

VSS criteria and score		Preoperative	2-year review	6-year review
Vascularity	Normal = 0	0	0	0
	Pink = 1			
	Red = 2			
	Purple = 3			
Pigmentation	Normal = 0	1	2	2
	Hypopigmentation = 1			(but less)
	Hyperpigmentation = 2			
Pliability	Normal = 0	3	0	0
	Supple = 1			
	Yielding = 2			
	Firm = 3			
	Ropes = 4			
	Contractures = 5			
Height	Flat = 0	0	0	0
	< 2 mm = 1			
	2–5 mm = 2			
	< 5 mm = 3			

VSS – Vancouver scar scale, CEA – Cultured epidermal autograft

pliability and a soft texture. These findings suggest that KCS may provide superior cosmetic outcomes, particularly in terms of pigmentation restoration and normalisation of skin texture. Similar international reports have described favourable aesthetic results with CEA treatment in scar management.³⁻⁶ In line with these observations, we previously documented improved cosmesis in critically injured burn patients treated with KCS, with long-term outcomes showing pliability and pigmentation return that closely resembled normal skin, even though cosmesis was not the primary treatment goal.^{7,8} Stoner and Wood⁹ attributed re-pigmentation after CEA to the presence and activity of melanocytes. A comparable mechanism may underlie the outcomes achieved with KCS, as melanocytes have also been observed alongside all epidermal layers and the dermis.¹⁰ While there is potential merit to the cosmetic application of CEA, its widespread use remains limited by significant cost and logistical constraints. Consequently, its primary role is reserved for life-saving wound closure in critically injured patients. With this in mind, KCS may represent not only a viable alternative for achieving improved cosmetic outcomes but also a more cost-effective option compared with commercially available CEAs.¹

Despite these promising findings, several limitations must be considered when interpreting the cosmetic outcomes of KCS, particularly in the context of its application beyond this single case.

This report represents a single patient without a control group, and quantitative assessments of scar colour or elasticity were not performed, limiting objective comparison.

Additionally, the technique involves two separate procedures: first, harvesting a skin biopsy and collecting blood samples, and second, performing scar excision and KCS application. This may increase procedural complexity and limit broader applicability. The biopsy site may result in a donor scar; however, positioning it within a natural groin fold makes it easily concealed. Given the low psychological burden associated with the donor site, this trade-off may be justified when weighed against the substantial psychosocial impact of disfiguring scars. Encouragingly, the positive cosmetic results observed in burn patients treated with KCS appear generalisable to scar revision. Nonetheless, as this is a single-case, single-centre report, findings must be interpreted with caution, and the use of KCS in this context considered preliminary. Larger cohort studies are needed to corroborate these initial observations and validate the broader applicability and utility of KCS. Additionally, its potential role in treating pigment-related skin disorders such as vitiligo remains an intriguing avenue for future exploration. Incorporating objective scar and wound assessment tools in subsequent studies may also further strengthen the reliability and precision of outcome evaluations.

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Conflict of interest

The skin culture technique is patented and owned by Stellenbosch University (SU, Stellenbosch, Cape Town, South Africa). Dr Wayne George Kleintjes is the founder of the modified technique. For the remaining author, none is declared.


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Ethical approval

Ethical approval was not required in this instance, as the procedure was performed in a private hospital without an institutional ethics oversight committee, in accordance with national and institutional guidelines. However, the Head of the Bioethics of the Faculty of Medicine and Health Sciences, SU, was consulted. Accordingly, the procedure was explained in detail to the patient and written informed consent was obtained for both the surgical intervention and the publication of anonymised clinical details and images.

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