

## Scar management of cultured epithelial autograft\*

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*Since the introduction of cultured epithelial autograft (CEA) for the treatment of burns wounds, the resulting scar has caused a great deal of concern. When CEA is applied to a deep wound the resulting scar is subject to breakdown with minimal trauma. It takes a considerable period of time, in some instances years, before the dermal-epidermal junction matures and the skin is able to endure the wear and tear of normal existence. Therefore it is understandable that the introduction of pressure garments for treating into these scars has been somewhat delayed. However, we believe that early aggressive pressure therapy is the treatment of choice in those cases where there is a strong chance of the scar becoming hypertrophic. This paper presents an approach to the problems of scar management with CEA, not only for the case of a major full-thickness burn, but also for a lesser burn injury. The concept of a hydrophobic fabric as a lining garment is introduced. The garment design has been changed, to pay particular attention to reduction of shearing forces and dissipation of pressure. The development of our hydrophobic pressure garment is beneficial, as it both reduces surface maceration and shearing injury. Since it protects the fragile CEA, formal pressure management can be instituted early in the treatment programme. Copyright © 1996 Elsevier Science Ltd for ISBI.*

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### Introduction

As burn care evolves, victims with large surface area burns are surviving. This requires the exploration of new techniques of healing to parallel the advances in systemic supportive care. The initial motivation in the development of the cultured epithelial autograft (CEA) was in the treatment of massive body surface area burns<sup>1</sup>. The concept of in vitro tissue expansion has considerable appeal, with the skin being grown in the laboratory parallel to the patient who is being resuscitated, debrided and prepared for skin cover.

In Perth, CEA has been added to our range of skin grafting techniques for the treatment of our burns patients since 1990. Initially the laboratory work was performed in the Alfred Hospital in Melbourne. Since February 1993 a facility has been developed in Western Australia to

perform the culture of keratinocytes. During this time the range of patients in the CEA program has been extended. Of 106 patients, 93 were diagnosed as partial-thickness burn injuries and 36 as full-thickness burn injuries. It is our belief that CEA has a part to play in the management of a range of burn injuries.

In addition, it is our belief that early aggressive treatment of hypertrophic scarring with pressure therapy has a positive role<sup>2</sup>. Therefore, we have a potential problem when combining the pressure therapy and the wound healed with CEA. It is well known that the cultured keratinocytes have a fragile hold on the underlying wound bed in the initial stages. It may take years for the dermal-epidermal junction to develop normal morphology<sup>3</sup>. Therefore, the wounds are susceptible to shearing forces. In addition, until the keratinocytes have differentiated sufficiently to form an established layer of keratin, the surface is vulnerable to maceration.

Initially, pressure therapy was delayed in order to protect the keratinocytes. However, it was felt that this had the potential to compromise the overall results. Additionally, where a combination of surgical techniques had been used to achieve wound healing, e.g. split-skin graft in addition to CEA, it was necessary to treat the split-skin graft area as would be conventionally done with pressure management.

As a potential solution to the problem, a hydrophobic fabric inner garment has been introduced, to protect the surface of the skin and allow application of formal power-net at a time compatible with our routine, that is 2 weeks post skin grafting.

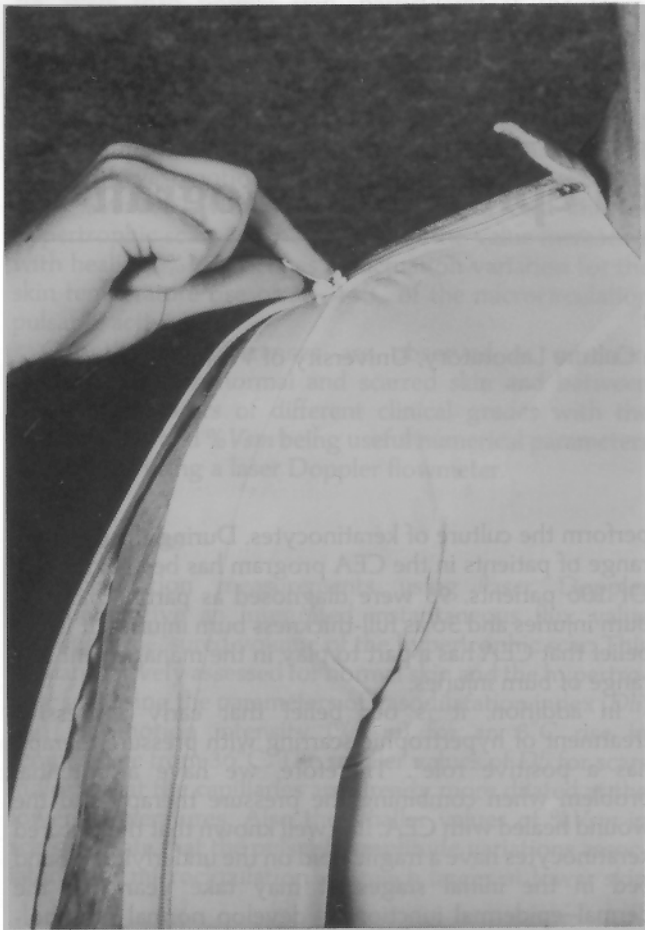
### Methods

The fabric used as a lining garment is hydrophobic. This fabric has a wick-like action. It is an elastic fabric but does not afford any pressure to the wound intrinsically. Therefore, it is easy to get over the area without shearing and provides a comfortable interface. The wick-like action protects the surface from maceration by removing moisture from the area.

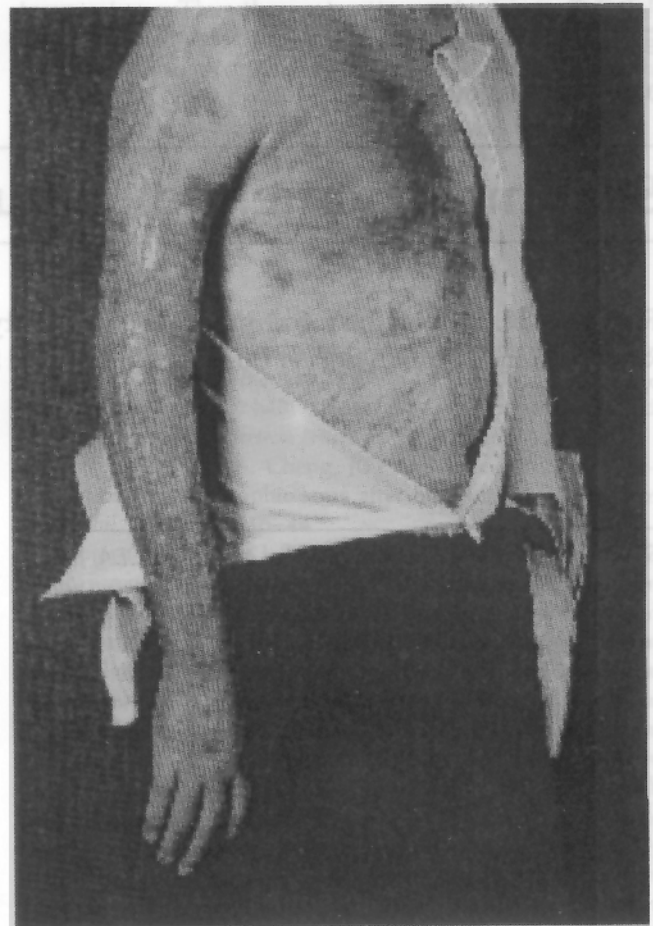
The design of the femoral power-net garment has been adjusted to reduce the difficulties of putting the garment on, by introducing more zips and by conforming the garment to reduce point pressure over vulnerable areas (Figure 1).

The following cases illustrate how the above system is effective clinically.

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**Figure 1.** The pressure garment access is improved using zips.



**Figure 2.** Case 2: patient with 90 per cent BSA burns treated with CEA, demonstrating how full pressure garments are used.

## Case reports

### Case 1

This patient had 30 per cent mixed electrical and flame injury. Surgical debridement of all areas was performed using a combination of SSG and CEA. At 15 days postgrafting pressure was applied using a hydrophobic liner. When the liner was removed at 60 days postgrafting the surface of the areas which healed with CEA became oedematous and hyperaemic. Small areas of breakdown required dressings. When the lining garment was reintroduced the surface stabilized with no further tissue loss. The areas healed by secondary intention have gone on to have a thicker area of scar than the surrounding areas.

### Case 2

This patient had a burn of 90 per cent body surface area mixed partial-thickness and full-thickness injury. Due to the extensive burn area CEA was used for wound cover. In order to introduce pressure the garment was zipped to reduce sheering overlying the hydrophobic garment. In this way a scar was achieved which is pliable, as would be expected with conventional split skin graft therapy (Figures 2-4).

### Case 3

This 3-year-old girl sustained a scald to the left leg. At 12 days postinjury the wounds were debrided and CEA applied to the lower leg and split skin graft to the thigh (Figure 5). Pressure commenced at 2 weeks postsurgery (Figure 6). There was an area of hypertrophy on the lower leg associated with delayed healing. This area and the split-skin graft area were treated



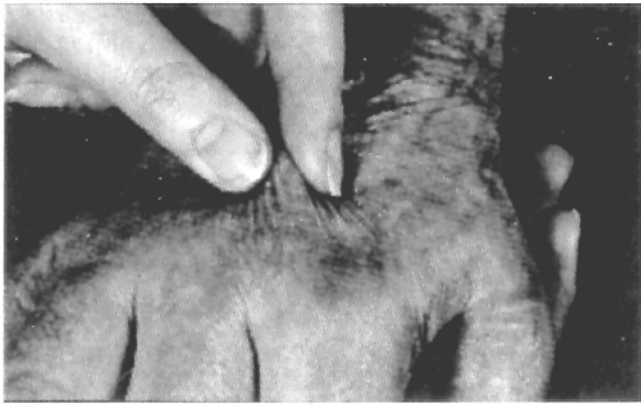
**Figure 3.** Case 2: burn on dorsum of hand preoperatively, showing a full-thickness area of injury.

effectively with the pressure garments over a 6-month period (Figure 7).

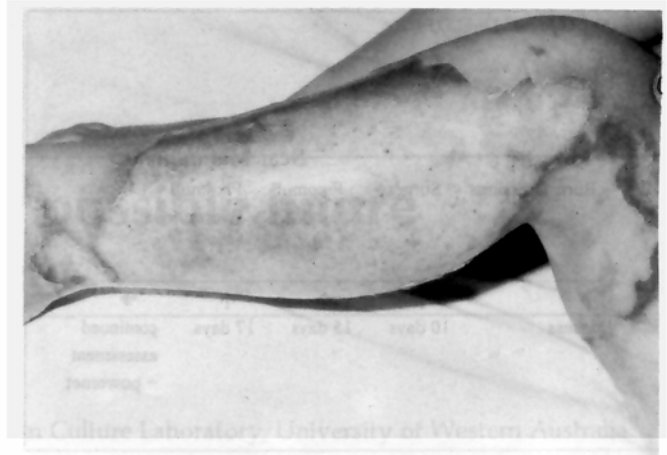
## Discussion

The purpose of this paper is to demonstrate how a clinical scar management programme has been developed for our patients where cultured epithelial autograft (CEA) has been used.

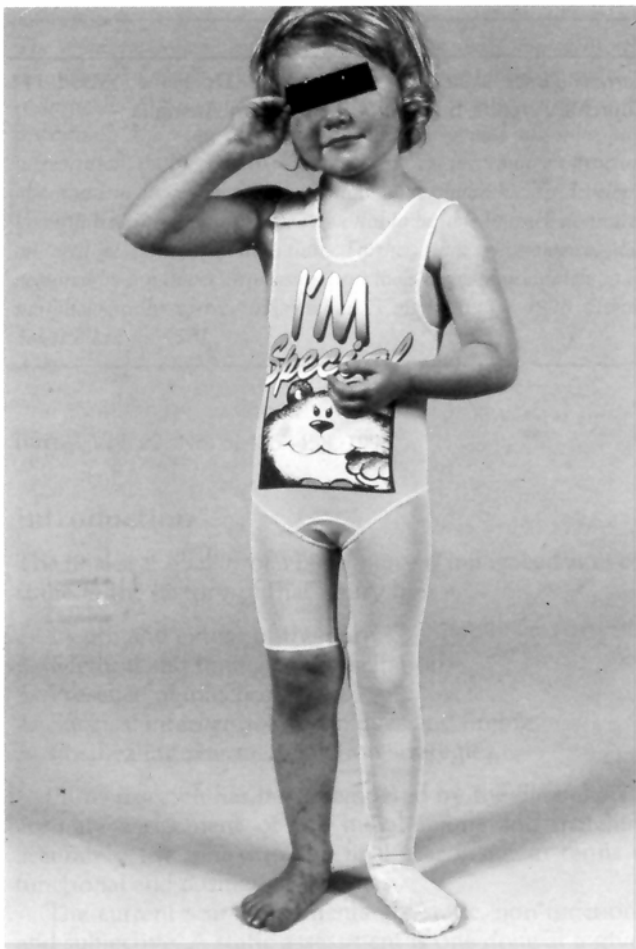
All patients with CEA are assessed initially at 5 days postgrafting, when the outer dressings are removed and



**Figure 4.** Case 2: the hand with a soft pliable scar treated as outlined with hydrophobic and power-net garments.



**Figure 5.** Case 3: scald injury to left leg grafted with CEA (lower leg) and split-thickness skin graft (thigh).



**Figure 6.** Case 3: patient in full power-net garment.



**Figure 7.** Case 3: early scar results at 3 months.

Fixomull retention dressing is applied over any adherent dressing areas. At 1 week postgrafting the Fixomull dressing is oiled to neutralize the adhesive when the dressing is removed for further assessment. At that time any unhealed areas will be subject to regrafting. In the healed areas Fixomull will be re-applied to protect the surface, and in some cases a Tubigrip applied over the area until a hydrophobic garment if available – in those cases developing hypertrophy or those expected to require scar

manipulation due to the depth of injury and skin grafting techniques. Patients are measured conventionally as for the pressure garment and a power-net outer garment applied (Figure 8).

The burn which is partial thickness, not healed at 10 days postinjury, surgically treated with CEA, healed at 7 days postsurgery, will require protection of the surface for 2–3 weeks but no formal pressure therapy.

The burns which are deep are at risk of developing scar

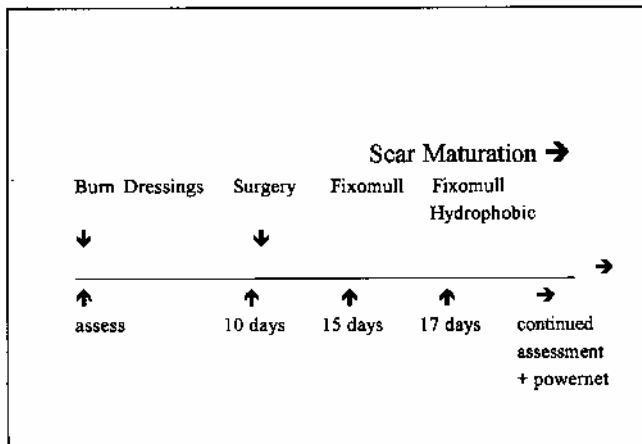


Figure 8. Treatment plan.

hypertrophy, the hydrophobic garment protects the surface and reduces sheer forces between the scar and the pressure garment. In this way we can treat patients who have deep burns and those with a combination of CEA and

split skin grafts. With the introduction of the hydrophobic liner to protect the skin we consistently apply power net pressure garments in this way at two weeks post grafting.

## References

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