A SUGGESTED USE OF HOMOGRAFTS

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This suggestion for the concomitant use of skin homografts and autografts is given with diffidence, based as it is on the experience of only three cases, but we feel that others will welcome the opportunity to test something that promises to help in the speedy recovery of the badly burned patient. This is the main reason for offering these notes.

Considerable literature has grown up around the subject of skin homografts, and this has been well reviewed by several authors in recent years.

All will agree that the replacement of lost skin is urgent in these cases and that our ideal should be to have the burned areas completely covered with skin by the end of the third or fourth week. The best dressing for any burn with skin destruction is skin itself; it is the only dressing that will stop the 'white bleeding' and 'chronic shock', the infection, fever, painful dressings and subsequent contractures, and its need is urgent, especially in important areas such as the hand and face and flexures of the body. Skin-covering gives the patient time to recover and, if it is given by the fourth week, we shall not have to face later problems of scars and contractures. By modern supportive measures, together with blood replacement, most of these patients can be built up to stand some operative treatment by the 20th day.

During the third week the burn will be divided into those areas where the skin has been destroyed and those where it is regenerating. Hitherto the tendency has been to wait too long for separation of sloughs in the destroyed area; these sloughs can only be cast off by the growth of a bed of granulation tissue underneath, and this may take up to 6 weeks for deeper sloughs! By this time the granulation tissue will be a bed full of young fibrous tissue, with future contractures inevitable. Successful grafting can be done when granulations are almost invisible, as we have often seen when grafting is carried out about the 10th day after excision of a varicose ulcer.

All this means that if grafting is to be done by the 20th day, we cannot wait for deeper sloughs to be cast off — they must be excised and the area grafted at once. Even the presence of bare tendons is no contraindication to early grafting; many instances of good takes have occurred in our experience. In fact, the longer a tendon is left uncovered, the more certain it is that no free graft will take on it.

SOURCES OF SKIN

Where can sufficient skin be found to replace the skin destroyed? In burns of large areas it is inadvisable and often quite impossible to take skin from the patient in any amount adequate to cover the denuded areas. How then is this problem of skin coverage to be overcome? One method is to use autografts (the patient's skin) as scattered postage-stamp grafts, but this has many disadvantages. It involves painful messy dressings for weeks while the islands of skin are growing over to join up, especially if the stamps are rather scattered; the seams become hypertrophied and hard, and when healed form fibrous bands criss-crossing the grafted area to make it look like crocodile skin. The only other solution is to use homografts (donor skin).

Leaving aside any discussion about the ultimate fate of homografts, we can say that they will last 5 - 10 weeks and will provide the patient with a protective coat that gives him time to grow his own skin covering, underneath or alongside.

McCoy[1] reported a case in which 23 drums of skin from 16 donors were used to cover a burned area of 60% of the body surface. After 6 weeks, one-third of the homografts were still viable or had been replaced by epithelization, and 2 weeks later autografting was begun. McCoy stated that homografts may be selected at random as regards age, sex, race, blood grouping, etc., but others hold that maternal skin gives the best take. Several authors have reported and advocated mixing patches or strips of homograft and autograft, and have frequently concluded that by the time the homografts have melted away the patient's condition would warrant grafting of his own skin for replacement.

The great disadvantage of homografting is that the grafts have a life of 5 - 10 weeks and sooner or later the problem must be faced of replacing them with the patient's own skin. It is this prospect that causes the surgeon to procrastinate. McCoy[1] said that ultimately most of the burned area must be re-covered with autografts, and he considered homografting should be contemplated only as a life-saving expedient. All surgeons will agree with total covering in one stage, remembering the difficulty and uncertainty of second and third plantings. Several authors have spoken of the persistence of the dermis portion of the homograft, even though its epithelium disappears, and it is possible that the dermis is not cast off, but survives long enough to become covered by the host's epithelium. Others have noted that the thicker the homograft the longer its survival.

We feel unqualified to comment on the academic views on homografts, but clinically it seems that these can quickly be replaced or rendered viable by the host epithelium and, if so, the surgeon need no longer feel the hopelessness of covering the burned area with skin that will disappear within a few weeks and leave him face-to-face with the same problem of skin cover. It may be that we can save life and coincidentally save time in the total healing of burns.

COMBINED HOMOGRAFTS AND AUTOGRAFTS

The problem of surgical replacement of homografts by autografts may be evaded in two ways. Both methods were used in the cases described below. One method is to plant the homografts and autografts alternately in the hope that the patient's own skin would replace the homo-

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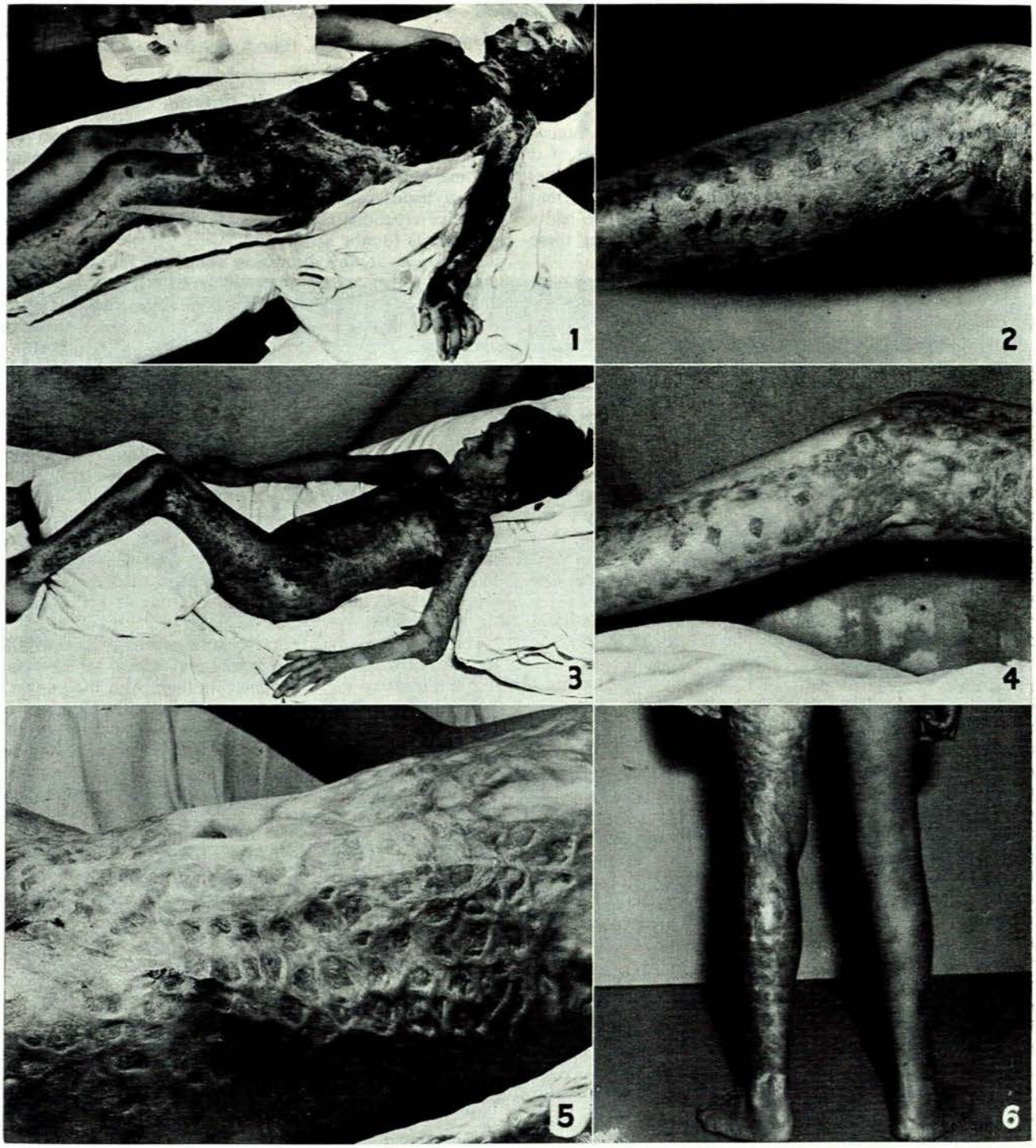


Fig. 1. Case 1 — 19 days after burning. *Fig. 2.* Case 1 — left leg 10 days after mixed grafting. *Fig. 3.* Case 1 — 78 days after main grafting. *Fig. 4.* Case 1 — left leg 6½ months after mixed grafting. *Fig. 5.* Case 1 — trunk 6½ months after mixed grafting. *Fig. 6.* Case 1 — legs 4 years after mixed grafting. (Grafting done on 8 August 1953.)

grafts before they could be cast off. The second method is to plant small 'stamps' of autografts very scantily and to cover the whole of the burned area (including the autografts) with sheets of donor skin.

Case 1 (*Figs. 1 - 6*)

In the first case both methods were used. The first was used over the thorax and left thigh, the father's skin being planted in 'postage stamps' between the stamps of the

boy's own skin. The result was satisfying and at the first dressing practically all the stamps had taken; from then on these areas were fairly soon epithelized and the seams covered in (Figs. 1 - 3).

At the same operation, the second method was used in the lower leg. Here the autografts were cut into very small stamps, placed at wide intervals (Fig. 2), and the whole area was completely covered by the father's skin, so that no granulating areas at all were exposed; this gave an even better result and the whole area remained dry and completely epithelized from the very first dressing and has remained so ever since. It did not break down at all and when seen 8 months after operation, the skin here was smooth, supple, and of good thickness and excellent texture.

It may be that covering the autografts completely with homografts created conditions favourable to the autografts, allowing them to grow so fast that they joined up before the homografts could be cast off. If this is so, then in those areas where the patient could not stand the taking of even the most sparse autografts, the burned areas could be covered with homograft skin and a week or so later, small pieces of homograft could be excised and small stamps of the patient's skin used to fill in these created defects or just inserted under the homograft covering through slits cut in it.

This first case is far from ideal in that the grafting was unduly delayed, but it does show the unexpectedly pleasing result of covering the homografts with autografts. It was not until the 30th day that a first grafting was undertaken, when Thiersch grafts were taken from the back of the thigh and applied as stamps to the left side of the trunk and the left arm. The abdomen and chest were not considered 'satisfactory' granulating surfaces by our standards at that time. It was only at the 40th day that the grafting, with mixed grafts, of the thorax, abdomen and left leg was undertaken. When the dressings were removed on the 8th postoperative day, it was clear that the main replacement of skin was complete.

We feel sure that most surgeons on reviewing their cases will be surprised to find how long it has taken them to bring these severely burned patients to completed convalescence and will welcome any means of shortening this period.

Case 2 (Figs. 7 - 9)

Our second case was a 6-year-old girl with deep burns of the abdomen and the front of both thighs. On the 21st day some residual sloughs were excised from the lower chest and abdomen, and scattered autografts taken from the back of both thighs were applied to the burned areas and completely covered with strips of the mother's skin. This was really an attempt at a once-for-all skin coverage to avoid repeated painful dressings and prolonged convalescence. Although the photograph (Fig. 8) on the 31st day would seem to indicate that on the upper abdomen the maternal grafts were being cast off, there was never any real breakdown, and the reappearing pigmented islands of the child's own skin in the photograph (Fig. 9) taken on the 40th day after grafting show complete epithelial covering. The dressings were never at any time distressing or painful.

Case 3 (Figs. 10 - 19)

Our third case was that of a boy who had been caught in a bush fire. He was admitted to a Provincial hospital and kept alive until he could be admitted 3½ months later to the Red Cross War Memorial Children's Hospital. His face, chest and hand burns had healed, but both legs from the knees to near the toes were septic, granulating areas with dirty sloughs on the dorsa of the feet and in the popliteal areas. The anaesthetists insisted on a 2-week

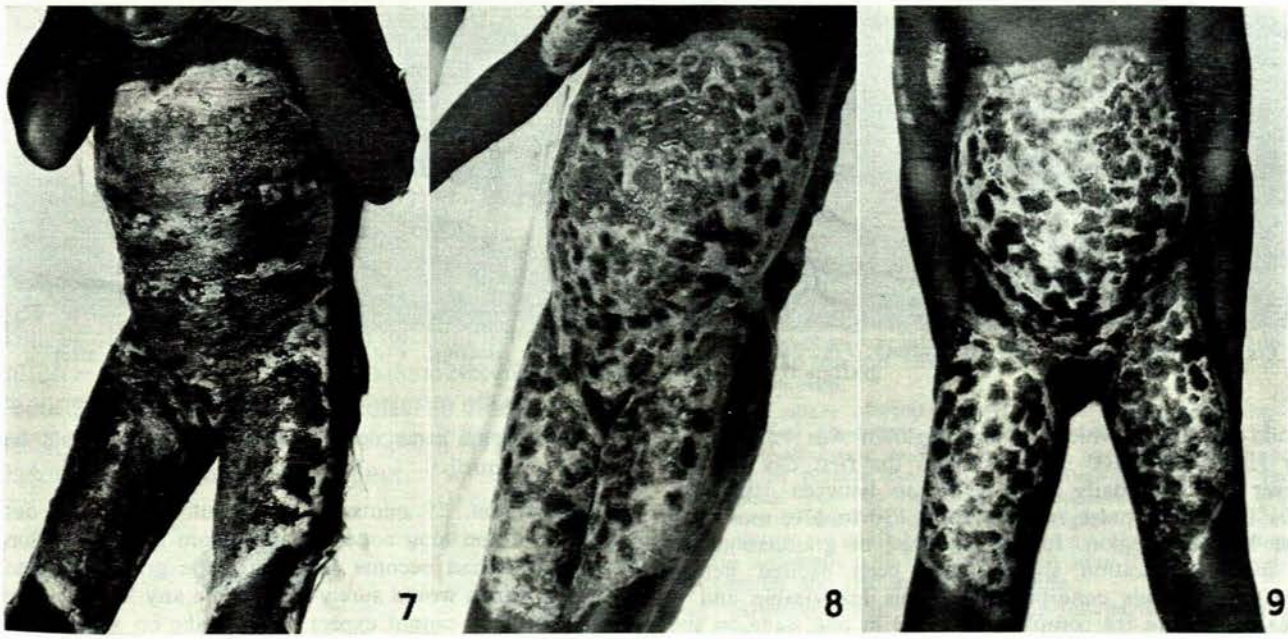
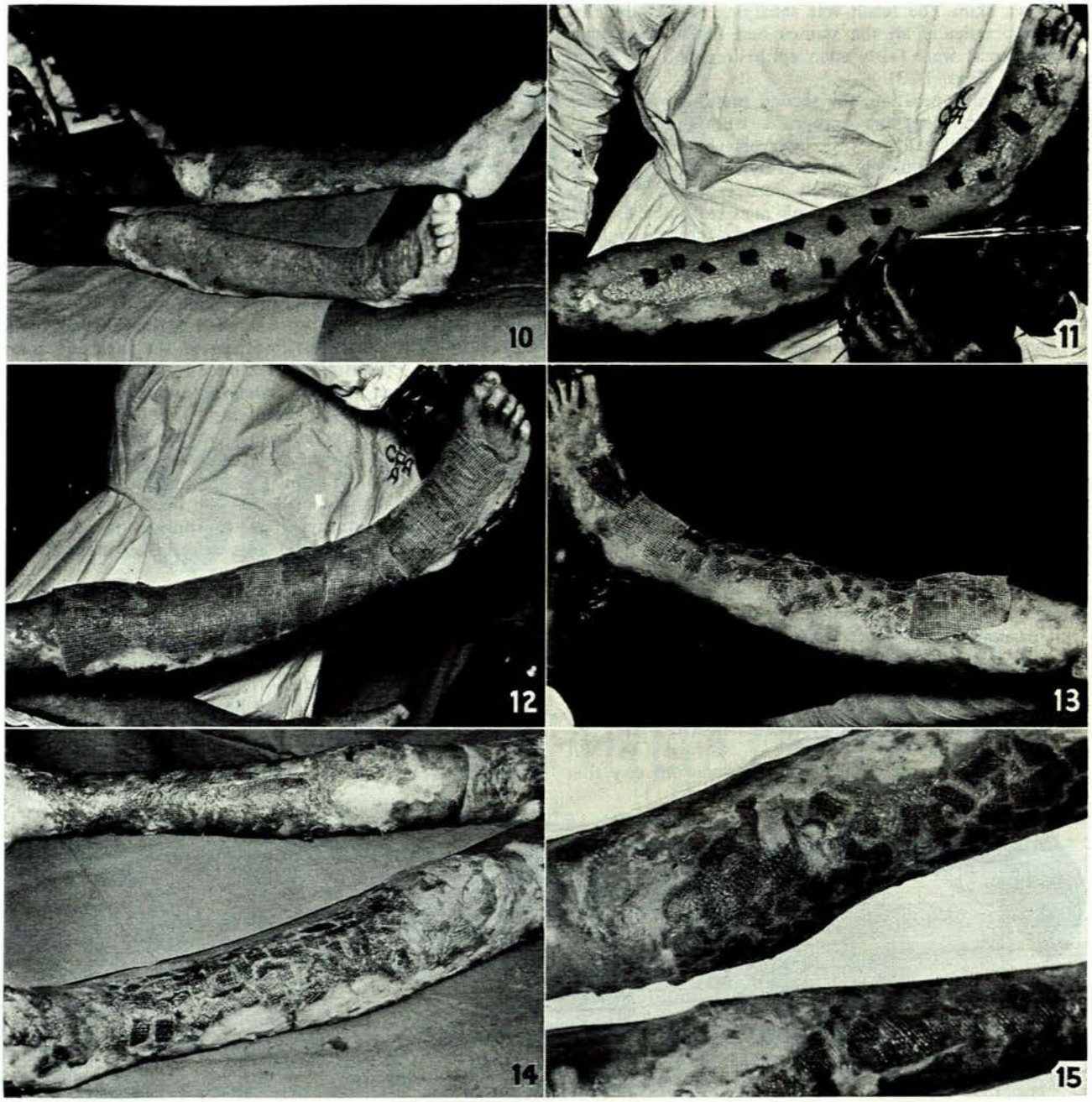


Fig. 7. Case 2 — 7 days after mixed grafting. *Fig. 8.* Case 2 — 31 days after mixed grafting. *Fig. 9.* Case 2 — 40 days after mixed grafting. (Grafting done on 28 April 1954.)



Figs. 10 - 13. Case 3 — day of grafting. *Fig. 14.* Case 3 — 7 days after grafting. *Fig. 15.* Case 3 — 14 days after grafting (Grafting done on 4 February 1959.)

build-up during which his haemoglobin was brought up to 13·9 G. per 100 ml., but from the first day he had fever swinging daily from 99°F. to between 102° and 104°F., with a pulse running from 130 to 170, mostly in the 150 - 160 region. Ideally, the bed of granulations of 3 months' duration should have been excised before grafting, but his condition made this inadvisable and it was decided to try complete coverage in one stage on the very poor soil presented. It was felt that the unfavourable conditions would be a real test for the method, and with both legs in the same deplorable state, one leg could be used as a control.

At operation, 25 minutes were spent in scraping out cotton-wool and long cotton threads from the granulation tissue. These had become felted into the granulations to an extent which would surely have made any 'take' purely temporary. One cannot expect skin to take on a carpet of cotton-wool and threads. The condition drove home the lesson that no dressings other than 'tullegras' or similar

Fig. 16. Case 3 — 21 days after grafting. *Fig. 17.* Case 3 — 7 weeks after grafting. *Fig. 18.* Case 3 — 9 weeks after grafting. *Fig. 19.* Case 3 — 1 year after grafting.

fabric should be in actual contact with the granulating area.

It was decided that the left leg would be covered chiefly with the patient's own skin, especially around the knee and ankle joints, while on the right leg the autografts would be scattered very sparsely, as can be seen on the photographs (Figs. 10 - 13). Both legs with their autografts would then be covered as completely as possible with grafts taken from the boy's mother.

This was done and the clinical result was immediate and dramatic. Except for 3 occasions in the 4th week after grafting, the temperature remained normal. The pulse fell at once to 140 and, with only 2 rises to 160 - 170 in the first week, it settled to 120 - 130 a minute by the 34th day after grafting. The operation was meant to be life-saving, and the clinical effect was just this. We wanted this to be a once-for-all graft and at the same time to see how scantily we could put autografts under the homografts and still succeed in getting complete and permanent epithelization. It is obvious that the left leg, with the more abundant autografts, healed more quickly, but when one notices how scantily the autografts were placed on the right leg, the result was not unsatisfactory. The maternal epithelium was certainly shed before healing had taken place, but the dermis may have persisted because the raw areas did not look like granulation tissue, dressings were painless and no further skin grafting had to be done.

CONCLUSION

What may one justifiably deduce from these few cases? Firstly, that homografts are more than a life-saving measure; that they may and should be used to avoid painful and tedious dressings; that the cosmetic result is better; and that they allow healing to take place even with dermis by the autografts is taking place?

Does the steady increase in size of the islands of pigmentation mean that slow replacement of the parent's dermis by the autografts is taking place?

Does the loss of pigmentation of the homografts mean that the epidermis is shed leaving the dermis?

In case 3 some small breakdown occurred in a few places between the autograft islands where the islands were especially far apart, and this might indicate that spread from the islands had not yet had time to cover the intervening homograft residue completely.

We feel that we may reasonably conclude that homografts should be used in the manner suggested wherever the burned area is large and that the results are far quicker and better than would be obtained by the use of autografts only.

REFERENCE

1. McCoy, F. J. (1949): Plast. Reconstr. Surg., **4**, 389.