

SKIN GRAFTING AND THE "THREE-QUARTER"-THICKNESS SKIN GRAFT FOR PREVENTION AND CORRECTION OF CICATRICAL FORMATION*

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THE FREE GRAFTING OF SKIN has a great utility in the general scheme of beneficent surgical therapy, after gross skin and subcutaneous tissue removal, for the purpose of correcting disfiguring blemishes or after gross skin and subcutaneous tissue loss due to traumatic, thermal, or chemical agents. Familiarity with the modern technic of skin grafting will allow the surgical craftsman to largely prevent scarring and cicatricial contraction, as well as to correct such lesions after their final development.

Fundamental to the resurfacing of a large granulating surface is the careful preparation of the granulating area by means of repeatedly changed gauze dressings which are kept saturated with an appropriate antiseptic solution. At intervals, supplementary complete immersion in salt or mild antiseptic solution may also be advantageous.¹ Attention also must be given to the correction of the general deleterious constitutional factors such as anemia, dehydration, alkalosis, hypoproteinemia, and avitaminosis. Finally, the skin graft should not be cut more than and often less than 0.012 of an inch in thickness.²

Essential to the correction of various large blemishes and large healed scar contractures is complete release and excision of all limiting scars so that overcorrection is obtained if possible (Fig. 1 a, b, c, d). As an aseptic denuded base follows such excision, a thick graft may be applied with a practical certainty of a complete "take." The "three-quarter"-thickness skin graft—a skin graft cut at a level of from 80 to 90 per cent of the thickness of the skin—in our experience has proved the most efficient graft.³ The objective of the "three-quarter"-thickness skin graft is directed toward obtaining a graft of such thickness as to assure successful transplantation, leave the donor area capable of spontaneous regeneration and yet of such thickness as to afford adequate protection, minimum contraction, and at the same time match the surrounding skin relatively satisfactorily insofar as texture and color are concerned. The results that have been obtained following the use of the "three-quarter"-thickness skin graft on an aseptic denuded surface very nearly fulfill the preceding criteria.

Material.—For the purpose of making a comparison of the properties and results that may be obtained following the application of the various types of skin grafts, I have available two series of cases. The first and older series⁴ of

* Read before the American Surgical Association, White Sulphur Springs, W. Va., April 28, 29, 30, 1941.

171 patients runs up to May, 1936. On 104 of these patients, Thiersch⁶ and "split"¹ skin grafts were used which were cut by hand with the large knife. On 59 patients of this series, thin grafts were used to cover a granulating surface, which as a rule was caused by a burn. In 45 patients, thin skin grafts were used to alleviate a cicatrix following a burn. On 67 patients, full-thickness skin grafts^{5, 6, 7} were applied to correct a scar or contracture caused by a burn. The second series of 206 patients started January 1, 1938 and runs up to February 1, 1941. On these patients, Thiersch,⁶ intermediate¹



FIG. 1.—(a) and (b) Medial and lateral views of a nearly healed cicatrix of the popliteal space. In such a case, the scar has to be cross-cut. The uneven scarred areas are removed. The leg is completely extended as the various bands of scar tissue are removed. In this patient, two drums of skin from the abdomen were removed and applied to the leg. The thickness was about 0.018 of an inch. It was judged that this boy's skin was about 0.022 of an inch thick. (c) and (d) Result after several months.

and the "three-quarter"-thickness skin grafts, as cut with the dermatome,* were applied (Fig. 2 a, b). The reason for eliminating the patients operated upon from May, 1936 to January, 1938, is that our technic and results in no way changed during this interval, until a new technic² was adapted in January, 1938. That is, a stationary period had been reached.

Comparison of Properties and Results Obtained after Thin and Superficial Intermediate Skin Grafts as Cut with the Large Knife and the Dermatome when Applied to a Granulating Surface.—The most striking point noted in comparison with the first and last series of patients alluded to above, upon whom thin skin grafts were placed, was that in the latter series an average of 357 sq. cm. of skin was applied at one sitting, while in the first series the average was 89.6 sq. cm.

* The dermatome alluded to and shown in Fig. 2 is one conceived by the author and developed and designed with the joint mechanical aid of Professor George J. Hood, Professor of Mechanical Engineering at the University of Kansas.

In the early series, 59 patients who had one or more granulating areas were skin grafted with thin-cut skin grafts; 93 areas were skin grafted at 80 operations. Of 93 grafts applied to cover a granulating surface, in 43, there occurred a "take" of 90 per cent, which may be considered as practically perfect; in 13, there occurred a "take" of over 80 per cent, which may be considered as "good," and in 30 there occurred a "take" of over 70 per cent, which was usually sufficient, so that further grafting to the granulating surface was not necessary. In eight, the loss ranged from 30 per cent to the entire graft. The usual cause of loss was infection developing beneath the graft.

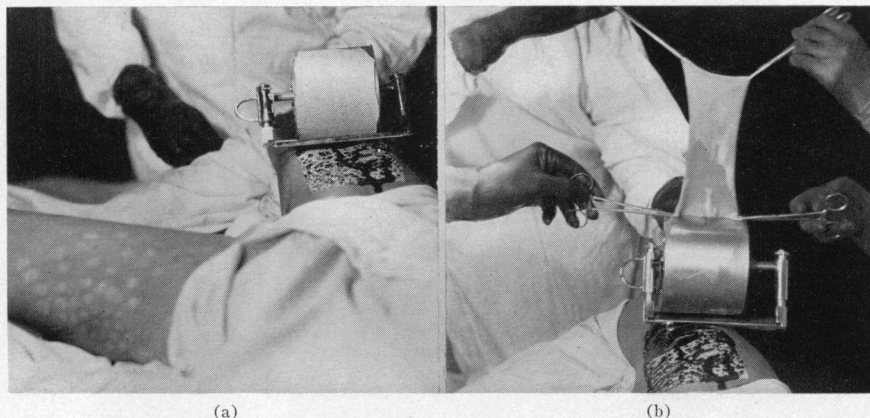


FIG. 2.—(a) A "three-quarter"-thickness skin graft is being removed from the inner side of the thigh with the dermatome. The skin graft is attached to the drum of the dermatome after it is almost entirely cut. (b) Removal of the skin from the drum. This graft is 4x8 inches in size. It was taken from the thigh of a young woman, age 24, and was cut 0.020 of an inch thick. It was placed on a large denuded aseptic area on the neck.

In the second series of 70 patients upon whom thin skin grafts, cut by the dermatome, were applied, an average area of 357 sq. cm. was covered at one sitting. From three patients, six drums of skin were removed at one operation. Eighty-one operations were performed.

An average of 80 per cent of skin "took" in the 81 operations. After four operations, not more than 25 per cent of the skin "took." After six operations, most of the skin was lost due to infection developing beneath the graft.

Early in the first series, it was noted that in patients upon whom thin skin grafts were applied to a granulating surface, if the hemoglobin was below 65 per cent of normal the chance of a successful "take" was decreased from one-third to one-half because of the greater tendency for the graft to be destroyed by infection. Later, in the second series, the deleterious effects of an unexplained temperature of over 101° F., an improper electrolyte balance, a hypoproteinemia, or an avitaminosis, insofar as a good "take" was concerned, were noted.

As a general rule, thin skin grafts were applied to granulating surfaces with the idea of obtaining early coverage to lessen functional disability about such locations as the hands and fingers, or to get earlier healing of the granulating area so the period of hospitalization could be reduced to a minimum

SKIN GRAFTING

(Fig. 3 a, b). In some cases, however, even after complete resurfacing, especially when the denudation had occurred about a joint, a contracture developed in the bed beneath the graft which later had to be corrected by cross-



FIG. 3.—A large granulating area on the leg caused by a burn. On the inner side, the area runs up above the level of the lower end of the femur. The skin graft was cut 0.012 of an inch in thickness. A good “take” was obtained so that later skin grafting after the first period in the hospital was not necessary. (b) Result one year later. By this time, a good subcutaneous tissue had formed. The graft had the appearance and pliability of normal skin. There is no tendency to ulceration. The scarring between the graft and the normal skin is minimal.

cutting the cicatrix and applying a “three-quarter”-thickness skin graft on the resultant aseptic denuded surface.

In the second series, it was noted that when the condition of the patient was good and the condition of the granulating surface was above reproach, one could apply, in the adult, a superficial intermediate dermatome-cut skin graft of about 0.012 of an inch in thickness, *i.e.*, a skin graft somewhat thicker than the so-called Thiersch graft (about 0.008 of an inch in thickness) with the idea of preventing some of the subsequent contracture which is likely to

occur after the application of a thin skin graft. This idea, it was observed, could not be carried too far, however, as the chances of obtaining a good "take" were diminished proportional to the increased thickness of the graft when it was applied to a granulating surface. This was found to be true, especially if there was any question concerning the cleanliness of the granulating recipient area or the general condition of the patient.

Caution was found to be necessary when using the dermatome-cut² skin graft so the graft would not be too thick. It must be remembered that the most important factor in grafting with thin skin on a granulating surface is to get a good "take" and early healing.

No new factor was found to be involved, and there was no essential difference between the superficial intermediate calibrated skin grafts as cut with the dermatome and those cut by hand save that one could select a pre-determined thickness and cut the graft with the dermatome at a uniform level. It was found that a graft of much larger size could be taken from locations not previously available when the dermatome was used. Satisfactory skin grafts were often obtained from the pectoral, scapular, lumbar, the posterior gluteal regions, from relaxed, pendulous abdomens, from babies, and even over the ribs when the patient was not too emaciated. As a rule, it was found that to take a satisfactory skin graft from the preceding regions with the skin-graft knife was very difficult or impossible. The increased area of skin available allowed us, in the latter series of patients, to successfully skin graft many difficult areas in a fewer number of operations than was possible in the first series of patients. For example, the type of patient with a large denuded surface covering both thighs and legs, where most of the remaining skin was on an emaciated trunk, usually succumbed in the first series because of our inability, at the proper time, to get sufficient skin to cover the denuded areas. Later, the lives of several such patients undoubtedly were saved because it was possible to quickly remove from four to six drums of skin at one sitting, *i.e.*, from 325 to 488 sq. cm. of skin. Moreover, after a period of from three to four weeks, it was found possible to remove a similar quantity of skin from the same donor site. In the latter series of patients, from whom thin skin grafts were removed with the dermatome, the number of operations required to resurface the granulating areas was reduced by about 50 per cent (first series, 59 patients, 80 operations; second series, 70 patients, 81 operations). Also, the operating time was considerably reduced—a factor of some value when the patient was not in the best of condition.

Thin Skin Grafts on Aseptic Denuded Surfaces.—On certain surfaces, where contracture is not likely to occur because the bony framework beneath the area prevents contracture or where overcorrection may be made as about the eyelids or eye socket, it is often advisable to use a comparatively thin skin graft on what is at least a relatively aseptic denuded surface. Provided one uses, with efficiency, the known prerequisites such as good hemostasis, adequate pressure, and fixation, it has long been known that thin skin grafts on such a surface usually "take" nearly 100 per cent.

SKIN GRAFTING

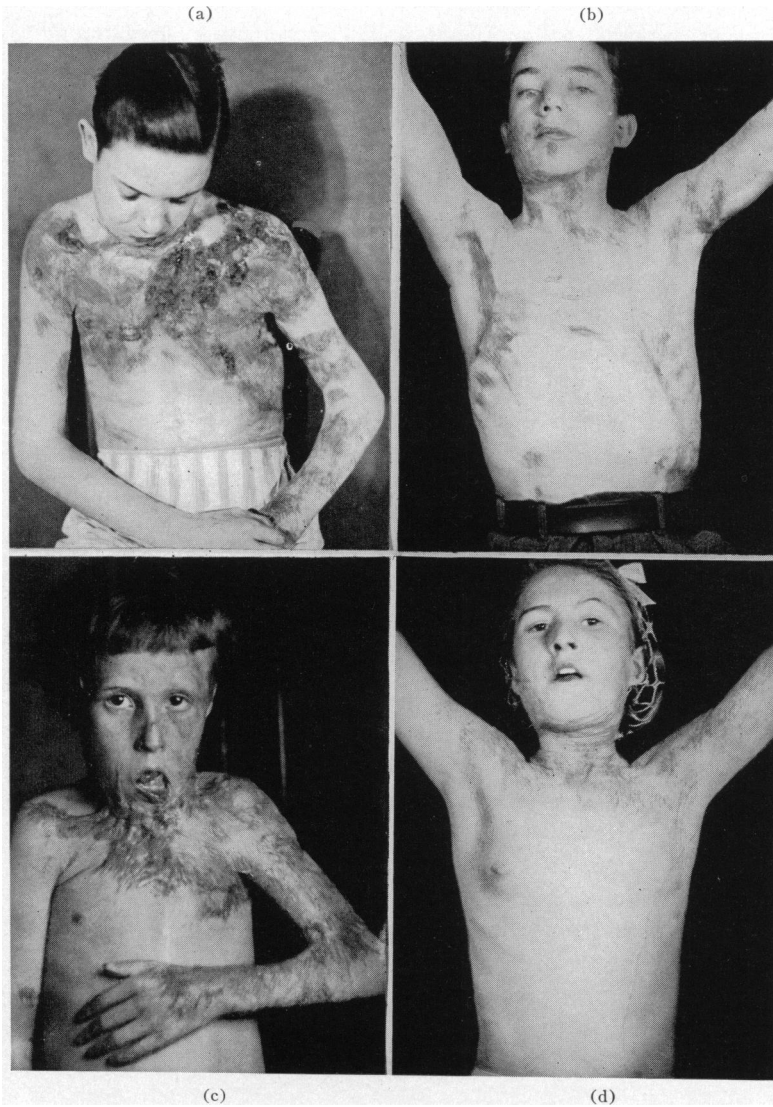


FIG. 4.—(a) This boy had suffered a very severe burn of the neck, anterior and lateral chest, and the left arm. The correction of this case required three operations. At the first operation, the granulating area was covered. At the other two operations, the contractures were released. At the two last operations, six drums of skin were removed from the patient at each sitting. The grafts were taken from the thigh, lower abdomen, right and left buttocks, and from the back. (b) Final result. He still has slight scarred ridges which, probably, after a few years should be alleviated by excision and careful resuturing. His functional result now is good. The first grafts were cut 0.010 of an inch thick to cover the granulating area. Later, we covered the aseptic denuded surface with "three-quarter"-thickness skin grafts which were cut 0.020 of an inch in thickness. (c) Example of a very severe cicatricial contracture of the neck and arm which was corrected by means of "three-quarter"-thickness skin grafts, of about 0.016 of an inch in thickness, in three operations. This case was published in *Surg., Gynec., and Obstet.*, 69, 789, 1939 (Fig. 19 a), but since that time a small operation has been performed beneath the chin to eliminate a defect in that region. The first photograph was taken October 18, 1936, when she was age eight. (d) Final result, April 20, 1941 (age 13). Both the functional and cosmetic results are good.

In the early series, on 45 patients, thin grafts of one type or another were applied to a comparatively aseptic, freshly denuded surface to alleviate a scar, a contracture, or to line a cavity. In this group, an average area of 29.5 sq. cm. was covered. To give the amount of correction deemed necessary, 58 operations were required. The final average contracture was estimated at 37 per cent.

In the latter series, unless the indication was definite for a very thin graft, our tendency was to use at least a deep intermediate graft or a "three-quarter"-thickness skin graft for the purpose of covering aseptic denuded surfaces. In the second series, therefore, very few really thin skin grafts were used. Usually, intermediate and so-called "three-quarter"-thickness skin grafts were judged to be the type of skin most applicable.

Although, in many instances, it was found that one could cut the thin graft by hand just as satisfactorily or even in some instances more so than one could cut with the dermatome, when it was deemed desirable to vary the thickness at will, depending upon the region to which the graft was to be applied and the lesion to be corrected, or when a large perfect sheet of skin was advantageous, the dermatome-cut thin graft was used. Thus, when it proved desirable for various lesions in different locations to lean toward thinness or thickness, as indicated, the machine-cut graft proved to have definite advantages. The ability to call one's "shots," so to speak, was especially valuable when removing skin from babies, children, and from such areas as the inner side of the thigh in certain fat, thin-skinned women.

The Full-Thickness Skin Graft Versus the "Three-Quarter"-Thickness Skin Graft to Cover Aseptic Denuded Surfaces.—A comparison of the results of the full-thickness skin graft as cut with the scalpel and the "three-quarter"-thickness skin as cut with the dermatome brings out some rather striking differences in properties.

In the first series of cases, full-thickness skin grafts were used upon 67 patients who suffered from scars or contractures due to burns. After excision, the aseptic denuded surfaces averaging 26.4 sq. cm. were covered with 155 full-thickness skin grafts. Ninety-one operations were required to obtain the maximum correction deemed possible. Of the 155 full-thickness skin grafts, 130 showed from 90 to 95 per cent "takes." At that time, although the grafts showed in many instances some superficial blistering or small areas of necrosis, if the majority of the graft "took" the "take" was listed as good. This meant that the "take" was sufficient to largely cover the denuded area. In three instances, the whole graft was lost. In 25 instances, the loss was partial and ranged from 10 to 90 per cent. The causes of the loss were judged to be infection of all or some part of the grafted area in 12 cases, lack of adequate pressure in 12, too much pressure in one, blood clot in two, and improper splinting, which allowed muscular movement beneath the graft, in one. Provided a good "take" occurred, the most important influence on the functional result was the final amount of contracture of the grafted area. The subsequent contracture of these full-thickness skin grafts averaged about 17

per cent. In other words, when the full-thickness skin graft was applied to an aseptic, denuded surface about a 20 per cent chance was run of not getting a sufficient "take" to correct a contracture, and in from 40 to 50 per cent the areas of blistering and superficial necrosis compromised the cosmetic appearance sufficiently to make the graft of questionable value when applied to such exposed areas as the cheek or neck. A good "take" with a full-thickness skin graft on an uneven concave surface, such as the axilla or neck or cheek, was particularly uncertain.

In the second series, either deep intermediate or "three-quarter"-thickness skin grafts were applied to aseptic denuded surfaces. In 137 patients, the denuded area averaged 188 sq. cm. The largest areas covered—four cases—were 488 sq. cm.—six drums (4x8 inches) of skin (Fig. 4 a, b, c, d). The percentage of "take" averaged 96. On an average, the percentage of contracture was somewhat less than after the use of a full-thickness skin graft. This would seem, at first glance, to be paradoxical. It is probably due to the rapidity and completeness of take usually obtained after the use of the "three-quarter"-thickness skin graft. The underlying anatomy of the region and the type of bed upon which a skin graft was placed, influenced the degree of contracture. In certain situations, as on the anterior neck, these grafts, as a rule, contracted one-third or more.

With the "three-quarter"-thickness skin graft, as cut with the dermatome, it was found that if properly cut, provided other factors such as proper fixation, tension, hemostasis, pressure, and a clean field were obtained, the chances of failure to "take" were nearly eliminated. Because of the certainty of "take," the magnitude of the reconstruction could be extended to limits not advisable previously. Difficult areas to graft with thick grafts, such as the lateral cheek, the neck, and the axilla (Fig. 5 a, b), and dorsum of the hand (Fig. 5 c, d) became acceptable cases in which successful repair was to be expected and not just hoped for.

The protection given also compared favorably with that given by the full-thickness skin graft after a good "take" was obtained. For example, adequate protection was given over the palm and back of the hand. It will be noted that the number of times two skin grafting operations were required, when the "three-quarter"-thickness skin graft was used, was reduced over those required, when the full-thickness skin graft was used, more than one-half. When full-thickness skin grafts were used on 67 patients, 91 operations were required. When the "three-quarter"-thickness skin graft was used in 183 patients, 203 operations were required. This was due to two reasons, namely, the quantity of skin that could be removed was greater and the percentage of "take" was higher when the "three-quarter"-thickness skin grafts were selected (Fig. 6 a, b, c, d).

The "three-quarter"-thickness skin graft also had the advantage that it could be taken from almost any part of the body (chest, abdomen, thigh, buttocks, and back). On babies, small children, and the emaciated, it was possible to easily obtain the proper amount and thickness of skin.

The fact that this type of graft showed very little blistering or areas of necrosis caused the final appearance to approach that of normal skin. The appearance was as good as that of a full-thickness graft after a perfect "take." The fact that the donor area did not have to be sutured and that it healed in from 14 to 18 days also was in its favor.

Occasionally (in about 5 per cent of the patients), after removal of a "three-quarter"-thickness skin graft, a tendency to heavy scarring of the donor area developed. In practically all instances, control of this situation was given by excision of the scar when the heavy scarring was at one side of the donor area, or if distributed diffusely, proper roentgenotherapy was advantageous.

To recapitulate, the "three-quarter"-thickness skin graft, as cut with the dermatome, is comparatively certain to "take." The new graft shows practically no blistering or areas of necrosis. The ultimate contraction is reduced to a minimum. Good protection is offered. The appearance, as a rule, approaches that of normal skin. The donor area heals quickly. The postoperative period of care is relatively short. Finally, as a rule, the usual run of lesions may be corrected in one operation.

TECHNIC

The following operative and postoperative technic has become more or less routine:

Thin Skin Graft Applied to a Granulating Surface.—The skin graft (0.008 to 0.012 of an inch in thickness) is laid on the undisturbed granulating bed. The edges of the skin graft are stitched with running silk suture to the skin, circumferentially. When more than one graft is necessary to cover the surface, one graft is stitched to the other in quilt-fashion (Fig. 7 a, b, c). Here and there small holes are then cut in the graft in pie-crust fashion. A thick roller gauze dressing saturated in boric acid solution is then snugly applied. Above this, cotton pads are laid to hold the moisture. If necessary, a splint is used to prevent movement. This gauze dressing is kept saturated for four days.

On the fourth day, the first dressing is removed and reapplied. The stitches are removed within five days. The moist dressings are then changed daily until the graft is healed—a period of from 12 to 14 days after application.

"Three-Quarter"-Thickness Skin Graft Applied to a Relatively Aseptic Denuded Area.—In this situation, one either has a clean field because the lesion is a healed one or else centrally located, or there may be present an old ulcer with a thick fibrotic base. In the former cases, the cicatrix is cross-cut and removed, as indicated. In the latter case, the surrounding scar is circumscribed with a scalpel within the normal subcutaneous level without touching or cutting into the base of the ulcer. That is, the unhealed area is excised deeply below its fibrotic base. This gives a relatively aseptic denuded base. The "three-quarter"-thickness skin graft is now stitched to the skin circum-

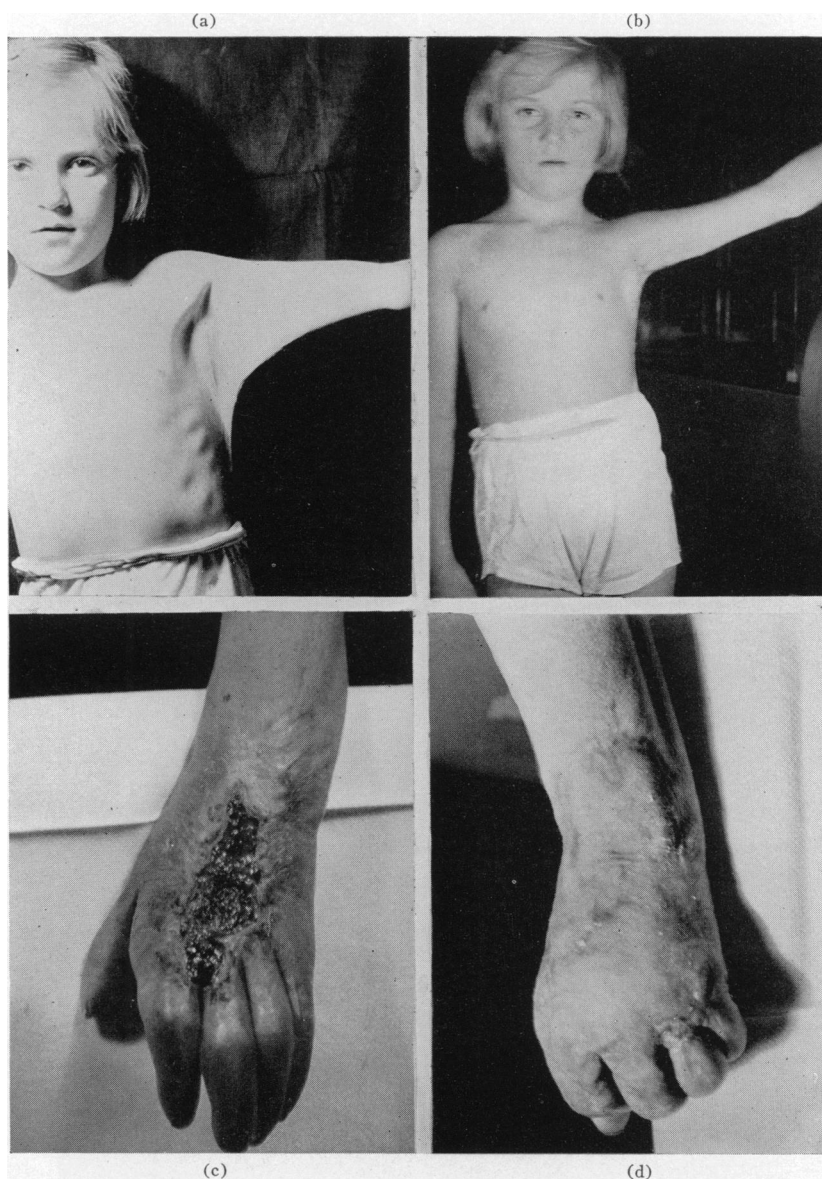


FIG. 5.—(a) An axillary contracture corrected, in one operation, by the application of "three-quarter"-thickness skin graft cut 0.016 of an inch in thickness. The graft was removed from the abdomen. (b) Result one month later. (c) Granulating wound of the hand corrected by the application of a "three-quarter"-thickness skin graft cut 0.020 of an inch in thickness. The graft was removed from the abdomen. The scar and granulating area was excised by cutting beneath the granulating bed. This patient should have been grafted within the first three or four weeks after the injury instead of five months, as was the case here, if the maximal functional preservation of the extensor tendons was to be obtained. (d) Final result.

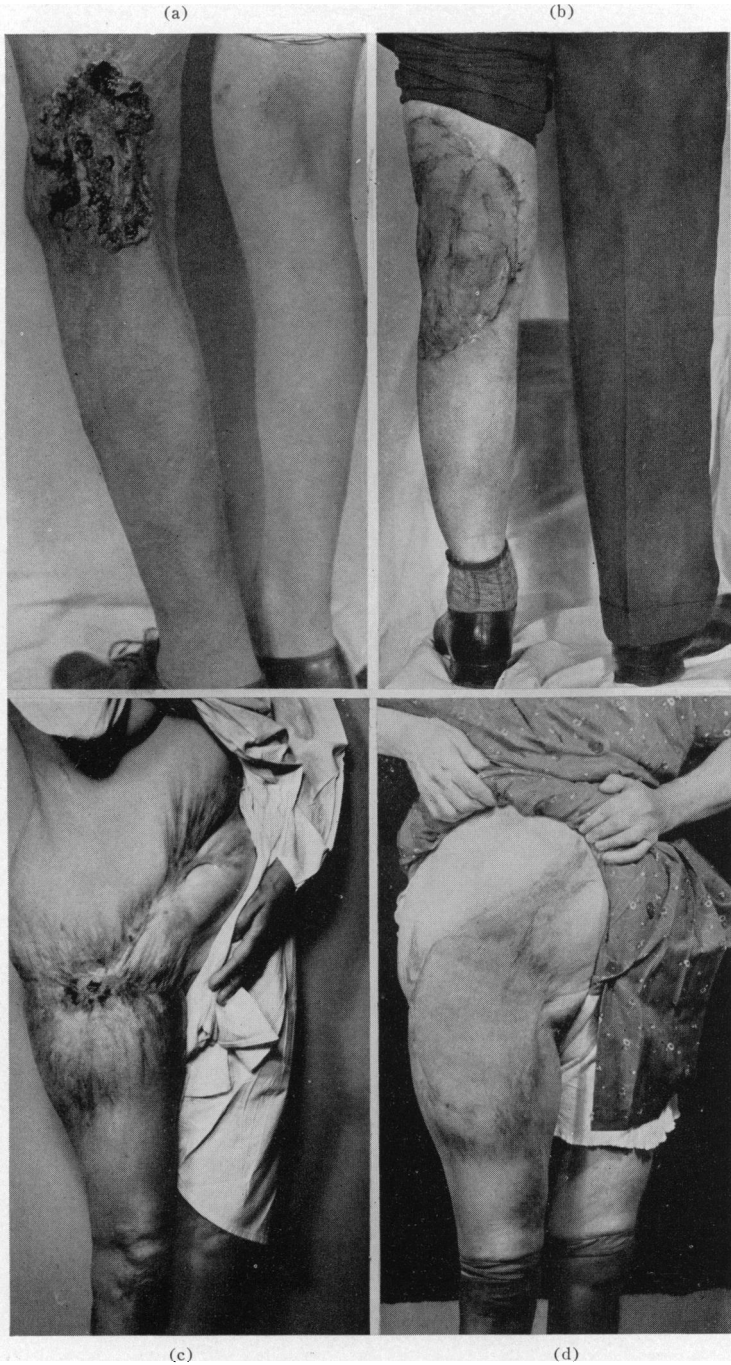


FIG. 6.—(a) A large cancerous ulcer which developed in a cicatrix in the popliteal space, several years after the infliction of the original burn. This ulcer was excised, radically, along with the scar, down to the muscle layer. Two 4x8 drums of "three-quarter"-thickness skin, about 0.022 of an inch in thickness, were removed and applied over the large aseptic denuded area in the popliteal space. (b) Result one month later. Corrected in one operation. (c) An old cicatricial contracture of the groin which prevented complete extension of the thigh. To correct this lesion, all of the scar in the groin was excised so the leg could be extended. "Three-quarter"-thickness skin grafts from the buttocks and the back, cut about 0.020 of an inch in thickness, were applied. (d) Final result one year later. Two and one-half drums of skin were applied. (This patient was operated upon by my associate, Dr. N. B. Soderberg.)

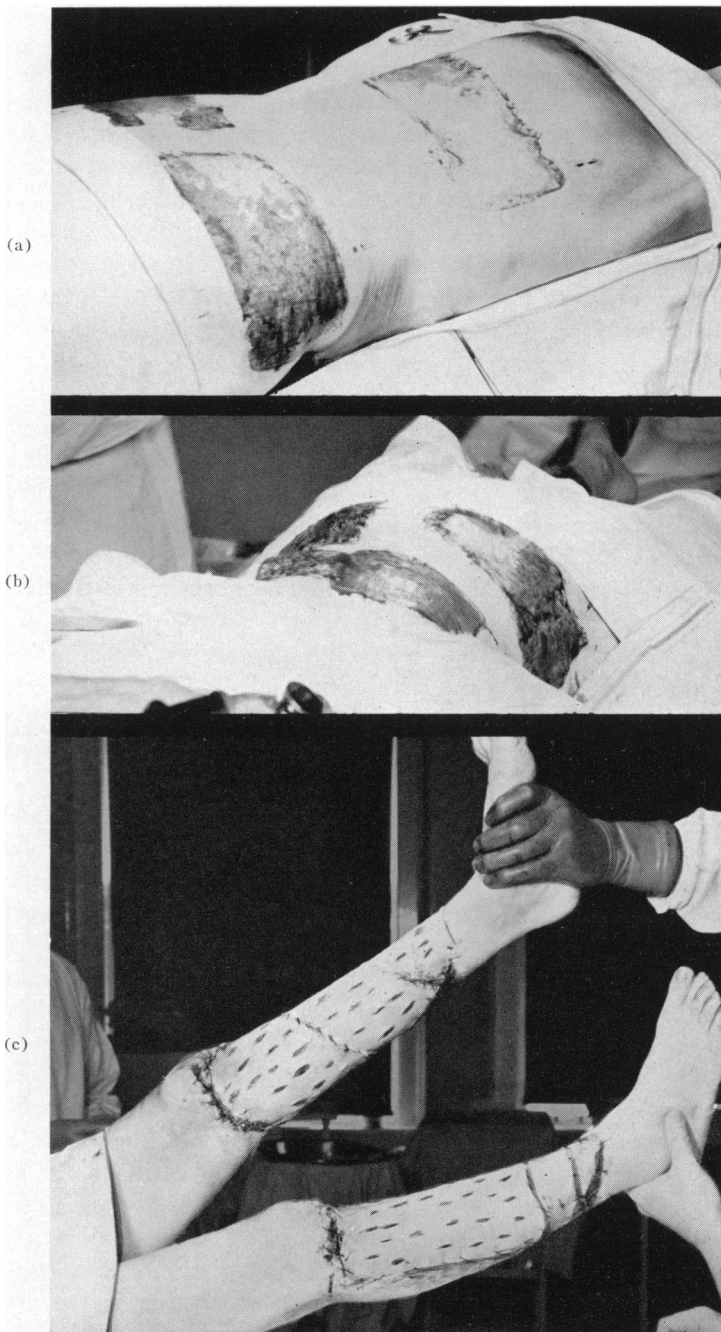


FIG. 7.—From this patient, six drums of skin—a total of 488 sq. cm.—cut 0.010 of an inch in thickness, were removed from the trunk. Three drums were taken from the back and three from the abdomen and lower chest. (a) Shows back view after removal of three drums of skin. (b) Shows front view after removal of three drums of skin. The skin was stitched over the granulating areas which completely encircled the whole of the circumference of both legs. (c) The skin graft was stitched over the granulating area in quilt fashion. The graft was perforated in pie-crust fashion to promote drainage. This photograph was taken immediately following completion of the operation. Some idea of the technic of the operation is depicted.

ferentially, over the aseptic denuded area with a running silk suture. When more than one graft is used, each graft is sutured to the adjacent one. When the graft is placed elsewhere than on the face, usually, here and there small puncture holes are made to promote drainage. When the graft is applied to the face for cosmetic reasons, the puncture holes are dispensed with. Next to the graft is laid gauze treated with 5 per cent bismuth tribromphenate in petrolatum. Next to this are laid about two layers of wet gauze. An adequate number of wet (saline), fine marine sponges are next applied. Above this, a cotton pad is laid. The whole dressing is then securely bandaged in place. If necessary, a plaster encasement or a splint is applied to assure adequate fixation. This dressing is not changed for a week or ten days because there is little or no danger of infection. The dressing is not kept wet. It is allowed to dry so that the sponges will harden and form a type of splint. When the first dressing is removed, the stitches are removed. The graft is dressed with moist dressings until healed. This usually occurs within a period of a week. This dressing is no different than the sponge dressing originally described by Blair,⁷ and used by him as a dressing after the application of full-thickness skin grafts.

Skin Graft versus Skin-Flap.—When the surgeon is considering resurfacing many areas, not only do the advantages and disadvantages of the most appropriate skin grafts have to be weighed but also do the advantages and disadvantages in certain instances of a skin graft *versus* a skin-flap have to be considered.

In general, a skin-flap may have the following advantages: A fairly high resistance to infection; some thickness for the purpose of filling a contour defect; little subsequent contracture; trauma is fairly well withstood; the skin is soft and pliable; and the color is normal for the area from which the flap is removed.

One of the main disadvantages of the tubed skin-flap is the number of operations entailed in the transfer. In some instances, considerable damage is inflicted on the donor area.

For the building of organs requiring thickness, for filling a depression in the soft tissues (Fig. 8 a, b); for building a part requiring two soft pliable epithelial surfaces and some thickness such as the nose, the cheek, and the lip; and as a direct covering for bone (Fig. 8 c, d) or cartilage, the pedicled-flap has no substitute.

To correct wide areas that are denuded, wide scars, and blemishes or cicatricial contractures, unless a sliding flap from the immediate region can be utilized, generally a skin graft of one type or another is the preferable material for coverage. That is, where simple surface epithelial covering is the only indication, in my opinion, the proper type of skin graft, as a rule, will give the most acceptable and efficient result. For practically all contractures about the axilla, elbow, wrist, hand, groin or popliteal space, I believe the application of the proper skin graft is preferable to a skin-flap. As a rule, proper resurfacing of a denuded area may be obtained in one operation. This

fact allows this type of reparative surgery, as regards the length of time required for convalescence, to compare favorably with other major surgical operations.

SUMMARY

(1) The results obtained with skin grafts, as cut with the large knife and scalpel, are compared with the results obtained with skin grafts cut by a dermatome, when applied to both granulating (usually caused by a burn) and aseptic denuded surfaces resulting from excision of a scar, large blemish or contracture.

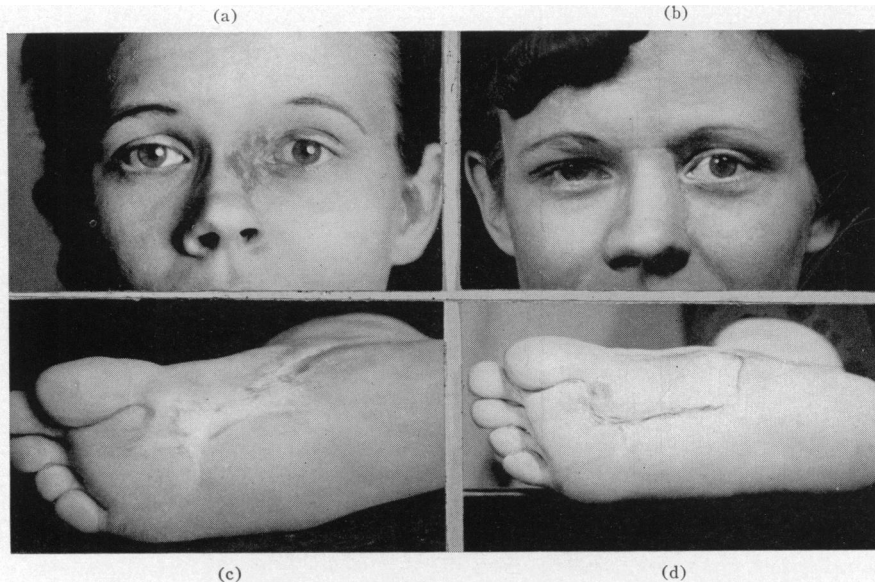


FIG. 8.—(a) This girl had been treated somewhat too thoroughly by radium in her childhood days for an hemangioma. Considerable scarring resulted with a depression along the lateral side of the nose. A flap from the forehead was turned down to fill out the contour of the nose. (b) Final result, 18 months later. (c) Example of a scar on the bottom of the foot which was attached directly to the underlying bony tissues. In such a case, it was considered that a skin-flap was much more applicable because of the trauma which the foot would have to withstand. (d) Final result, three months after transfer of a flap from the opposite calf.

(2) The advantages of the “three-quarter”-thickness skin graft, as cut with a dermatome, for the coverage of an aseptic denuded surface is stressed.

(3) The operative and postoperative technic used in applying thin grafts to a granulating base and the “three-quarter”-thickness skin graft to a relatively aseptic denuded base is briefly described.

(4) An opinion is ventured concerning the position of skin grafts with relationship of skin-flaps where a simple epithelial coverage is the only indication.

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DISCUSSION.—DR. ROBERT H. IVY (Philadelphia, Pa.): I fully realize that there are others here who are far more competent to discuss this paper than I am, and Doctor Padgett's results present very few loopholes for discussion.

In presenting the dermatome, he has undoubtedly made one of the lasting contributions to plastic surgery, and his report clearly demonstrates that he is able to obtain results with it that are superior to freehand methods of skin grafting. In the hands of those practiced in its use, the dermatome will permit the cutting of the skin grafts of the dimension and controlled thicknesses possible to achieve in no other way. But, like everything else, its use has to be mastered.

Nothing looks simpler to one first observing the procedure than the apparently mechanical ease with which the practiced hand removes the graft by means of the dermatome. On the other hand, if the occasional user relies too much upon the mechanical features of the instrument and overlooks certain little details, such as proper consistence of the cement, application of the cylinder to the skin surface, *etc.*, he will show many disappointments. Again, just as much, if not more, of the success of the skin graft depends upon its application to the raw area and the after-care as upon the actual cutting.

It has long been generally recognized that the thicker the successful skin graft the better the result as to pliability, minimum contraction, and appearance. Doctor Padgett's chief contribution has been to evolve a technic which permits the use of the thickest uniform sheet of skin with the greatest percentage of takes.

Regarding the "three-quarter-thickness," I feel that this must be an aim to have in mind, rather than an actuality in every case, because there is no way of determining beforehand in every case just how thick the skin of an individual is, and therefore no way of knowing that setting the dermatome to cut off a given thickness will in that particular person take half the thickness of the skin, or three-quarters, or the full thickness.

My chief point in this discussion is that in this work we should stress the side of the individual skill and experience and not be carried away by overemphasis on the machine. I know Doctor Padgett does not do that, but others who have only occasionally had recourse to skin grafting might get the impression that all the difficulties about the art are now ended.

One of the chief things which I hope will be accomplished by these advances in technic is the elimination of the use of the small pinch grafts for covering raw areas on exposed parts of the body. As more and more surgeons become expert in the cutting and application of the large razor grafts, I feel sure that other easy but less satisfactory methods will be abandoned.

Doctor Padgett, in his original paper, which he did not mention, spoke about pedicle-flaps *versus* free skin grafts for covering raw surfaces. I feel that with movable parts, without a firm underlying base, such as the neck, axilla, *etc.*, personally I have had much better results with the Z-flap or two pedicle-flaps, rather than free grafts.

DR. VILRAY P. BLAIR (St. Louis, Mo.): Doctor Padgett also asked me to say something about this, but the others did not leave anything to say. I think the dermatome is one of the very, very few really new things that are put into the mechanics of surgery. The combination of a rocking plane and glue is something new.

Doctor Padgett compared his three-quarter graft to a full-thickness graft. I think,

probably, it is a compromise there between the amount of derma taken and the smoothness; that is, it gives enough derma to prevent contraction, and it takes better because it is more smooth and cleanly cut, and any clean-cut wound heals better than a roughly cut wound. You can hardly get that smooth cutting with a scalpel.

I don't know if I understood right or not about the appearance of those grafts. I never have the least idea what color a graft is going to be when it heals, no matter how it is cut, except that I am willing to bet it isn't going to be the right color.

DR. JEROME P. WEBSTER (New York, N. Y.): Doctor Padgett has definitely added a new principle to the procedure of removing large areas of skin from the body. Taking one instrument, putting a rubber cement on it and placing it on the skin, and then drawing it up and cutting it off with a knife gives an opportunity of cutting a graft which is of uniform thickness, and that is something which we may not be able to obtain by the ordinary cutting of a graft with a large knife. The edges on the thigh, or if it is attempted from the abdomen or back, are apt to be thin, and the rounded portion in the center is apt to be thicker.

I think one of the main advantages of the dermatome over freehand cutting is that you increase the number of donor areas. Ordinarily the free graft was taken from the thigh, as the most satisfactory site from which you could take the largest grafts. I have seen general surgeons take much larger grafts by freehand from the thigh than you can take from one drum of the dermatome, but that is largely only when you have a rather stout woman and you can take the full length from the knee up to the trochanter.

The big advantage of taking from the abdomen, the chest, or the back, to me, is that the patient donor area heals more rapidly than it does from the thigh, because you do not have the hypostatic congestion in getting up. The donor area is apt to have blood come out underneath the new epithelium; and for the same reason you are able to get your patient up much earlier if you take the graft from the trunk than if you take it from the thigh.

Another thing that must be considered is that the thighs or lower legs nowadays are more exposed in bathing suits and in the shorts that are worn, so that that does not give deforming scars.

To me the three-quarter-thickness graft, as a name, is illogical, as Doctor Ivy said. I think the thick skin graft is much more applicable.

I am, frankly, always skeptical about statistics, and I wish that, instead of giving the time from his early cases until 1936 and then jumping two years, he had given the years from 1936 until the time he used his dermatome, because, as he said, his practice was stationary, and I think those years for statistics will be much more applicable in comparison with the period used for the dermatome.

I do want to say that with practice I think the general surgeon is going to be able to take skin grafts in large areas to cover defects, either of burns, contractures, or operative defects for malignancy on the exterior of the body, which will give him much better success than if he only occasionally tries a free skin graft by hand.