ray were partially or totally luxated. We have, therefore included only those cases which had broken free from both the astragaloid and cuneiform articulations —the "luxations doubles" or "totales" of the French.

SUMMARY

1. Dislocation of the tarsal scaphoid is very rare.
2. It is nearly always caused by severe trauma.
3. Predisposing causes are previous sprains, tarsal fractures and flatfoot.
4. The tubercle of the scaphoid is an important landmark in diagnosis.
5. The maneuvers in manual reduction are plantar flexion, abduction, and direct pressure on the scaphoid.
6. The treatment of choice is immediate manual reduction. If this is not successful, open reduction is advisable or, as a last resort, scaphoidectomy.
7. The chief complication is flatfoot, which can be prevented in part by giving support to the longitudinal arch during the convalescence, and by prescribing exercises to strengthen the foot muscles.
8. Of the twenty-seven cases compiled, including ours, sixteen were dorsal; eight, mesial; two, plantar, and one, lateral. Eight were reduced by manipulation, four by open reduction, and four by scaphoidectomy. Eight were not reduced; in two cases, the foot was amputated, and in one, no record can be found.

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PRINCIPLES OF THE FOUR TYPES OF SKIN GRAFTING

WITH AN IMPROVED METHOD OF TREATING TOTAL AVULSION OF THE SCALP *

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Perhaps no procedure in surgery is more useful than a well conducted and successful skin grafting. By it a permanent granulating surface may be made to heal or a hideous deformity may be transformed into a scarcely noticeable disfigurement. Much depends on the condition of the surface to be grafted, the type of skin grafting chosen, and the technic of its accomplishment. My purpose is to make clear some of the most important points in skin grafting, obtained in an extended experience with all methods. When one considers various hospital services, one is astounded at the waste of time consumed in dressing granulating wounds, and the countless visits that are made subsequently to the outpatient departments. These could all be avoided, as well as the later contraction of old wounds, by the immediate resort to any one of the various methods of epithelial covering of the wound.

To clear the atmosphere at once, let us dispose of homografts, or isografts, that is, grafts taken from another individual. Surgeons have had the hope that such grafts would succeed, and some have maintained that their success is assured if the blood of the donor groups the same as that of the recipient, asserting that identical grouping is as necessary in skin grafting as in blood transfusion. Masson of the Mayo Clinic still maintains this view; while Ingebrigsten,[1] of the Rockefeller Institute, made fourteen isoplastic transplantations of arteries in cats, and concluded that the results of the group in which there was interagglutination differ in no striking way from those obtained in the group in which there was no interagglutination, and that, between animals of the same species, there are unknown biologic differences that prevent, in most instances, the survival of isoplastic arteries, although a survival does occur in some cases. The same results obtain, whether one grafts skin or the organs of the body from one individual to the other. There are no more successes with iso-skin grafts than with transplantations of iso-organs. Carrel found that organs, such as the kidneys, when transplanted from one animal to another, always eventually became mere fibrous masses.

The reason that these iso-skin grafts or iso-organ grafts disappear has been clearly stated by Holman.[2] He brought out the possibility of the recipient's being sensitized by the foreign protein of the graft, regardless of blood groupings, and of a reaction being produced comparable, but not identical, with that of anaphylaxis. This reaction manifests itself in one of two ways: (1) by a general, quick reaction that produces an immediate disappearance of the grafts, or (2) by a gradual disintegration after a number of weeks of the foreign transplants, which at first seemed to have taken. In the case to be reported of total avulsion of the scalp (Figs. 6, 7, and 8), two separate iso-Thiersch graftings were made, the grafts being taken from the mother, whose blood was of the same grouping as that of the recipient. In this case there was the first reaction, namely, immediate disappearance of the grafts. An instance of the second type, gradual disintegration of iso-skin grafts, was shown by a patient of Dr. William H. Bishop, of New York; I had the privilege of seeing the patient about one month after the grafting. To cover a very large traumatic, raw area on the back of the thigh, Dr. Bishop took Thiersch skin grafts from five different donors, all of whom showed different blood groupings from that of the recipient. For four weeks after the grafting, it looked as though the grafts had taken; then all of a sudden, almost over night, there was an entire disappearance of all the grafts, and when I saw the area there was not a vestige of any of these grafts left. Consequently, not a single graft taken from any of these five various donors found biologic conditions present in the host that made them capable of living.

Fig. 2.—At left, roentgen-ray burn of abdomen, the result of treating fibroids of the uterus. At right, lateral incisions (*A, B*), internal to which the tissues were undermined and brought together in the median line; these flap edges sloughed and there was no improvement in the condition; final cure was wrought by covering the entire raw areas with Thiersch grafts. *A* and *B* were also covered with Thiersch grafts. The best way to cure roentgen-ray burns is not by pedicled flaps, but by a wide excision and Thiersch grafts.

* Read before the Section on Surgery, General and Abdominal, at the Seventy-Fifth Annual Session of the American Medical Association, Chicago, June, 1924.

* Owing to lack of space, this article is abbreviated in THE JOURNAL by the omission of several illustrations. The complete article appears in the Transactions of the Section and in the author's reprints. A copy of the latter may be obtained on request.

1. Ingebrigsten: J. Exper. Med. **16**: 169 (Aug.) 1912.
2. Holman, E.: Surg., Gynec. & Obst. **38**: 100 (Jan.) 1924.

Hence, with all these isolated, multipled failures, a surgeon should not waste time and energy with iso-skin grafts or iso-organ grafts when the results will most certainly be nil. For every rare case that succeeds, there will be at least twenty-five failures. I emphasize this point because surgical textbooks are very uncertain in

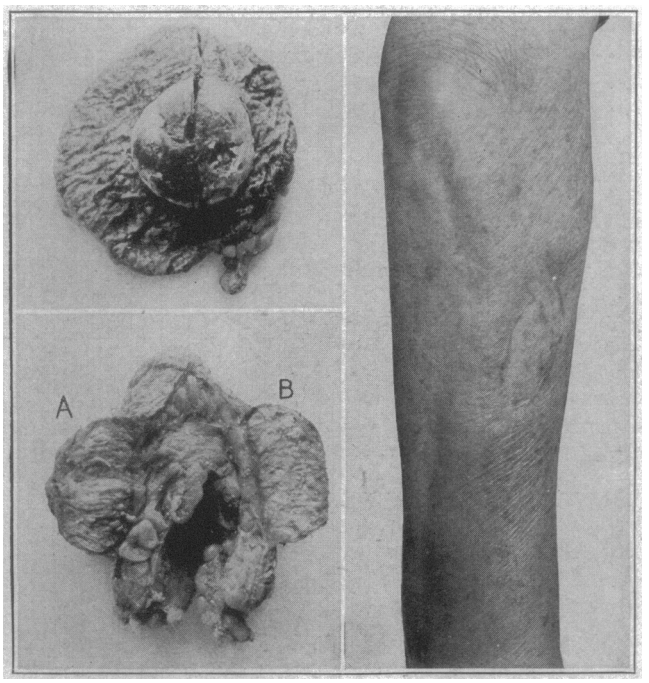

Fig. 5.—At left, prickle cell epithelioma, removed from forearm with wide excision locally and dissection of axilla; *A, B*, tumor cut open. At right, result of grafting free, full-thickness skin graft into defect.

their conclusions as to the probable success or failure of isografts, and because of this surgeons are tempted to try something that is almost certain to result in failure. Never have I had any success with isografts. Holman says that successful iso-skin grafts exist only in fable and not in fact, and this is confirmed by Schoene, Gatch, Perthes and Lexer, the latter emphatically stating that the success of isografts may be relegated to mythology. Possibly many of the reported successful iso-skin grafts may be explained by substitution; that is, by the epithelium creeping in under the grafts from the edge of the wound.

We may also relegate to the limbo of mythology the alleged permanence of transplanted "monkey glands"; i. e., testes, into man.[3] That the psychic influence of such a procedure may be very great there can be no doubt, and there may also be some temporary benefit from the secretion of the transplant; but the permanence of the graft may be relegated to the domain of fable, as judged by all surgical experience. Consequently, we are compelled to maintain that all skin grafts should always be autogenous; i. e., should always be taken from the patient himself, and it would be an error ever to take skin from another individual, no matter how closely they are related, even though the blood groupings are the same. The great utility of coincident immunity, even in plastic surgery, recently has been demonstrated by Katzenstein.[4] When skin grafts or flaps are rendered immune by preoperative infection with the proper bacteria, they may be transplanted to infected surfaces, in spite of the most unfavorable conditions, with every prospect of primary union. In this way can be cured old ulcers of the leg and of amputation stumps, even though connected with the bone, while without this preliminary preparation failure is the usual outcome. Katzenstein produces this local immunity by applying, for a week before the grafting, gauze soaked in the discharge from the granulating wound, on the surface of the flaps to be transplanted.

There are four types of skin graftings, as follows:

1. Thiersch grafts (Ollier, independent, codiscoverer).
2. Reverdin's minute plugs of full-thickness skin.
3. Free, full-thickness, nonpedicled grafts.
4. Pedicled flaps, though these are not true grafts.

THIERSCH GRAFTS

Thiersch grafts are almost 100 per cent. successful when applied on fresh, sterile operative wounds, such as the wounds after breast amputations. They should be applied immediately after the operation, and there should be no waiting for the granulating of the wound because of the danger of infection. With moderate infection of the base (Fig. 7), about 60 per cent. of such graftings will be successful; with severe infection, none of the grafts will take because they will be immediately floated off the raw surface by the profuse discharge, and they will speedily disintegrate. Consequently, the keynote of success in Thiersch skin grafting is to take autogenous grafts, applied on a more or less sterile surface.

There is no application that will sterilize a granulating surface so quickly as sterile gauze soaked in surgical solution of chlorinated soda (Dakin's solution), changed once or twice daily. One can tell the degree of sterility of a raw surface by subjecting it to a course of such wet dressings, and then changing these to dry, sterile gauze. The amount of subsequent discharge will indicate the degree of infection. No grafting should be done until the discharge is minimal in amount. The day before the grafting, the granulations should be cut down closely with scissors, as this eliminates a certain amount of infection.

Fig. 6.—Total avulsion of scalp after removal of the necrotic, replaced scalp, with loss of left ear and both eyebrows, and part of skull laid bare by avulsion of the pericranium. This bared bone area was drilled in numerous places into the diploe, which hastened granulation so that the entire bare skull area was covered with granulations in five weeks.

It is very important to stop all oozing before applying the grafts, conveniently accomplished by a current of

3. Belfield, W. T.: Some Phases of Rejuvenation, J. A. M. A. **82**: 1237 (April 19) 1924. Mauclaire (Arch. d. mal. d. reins et d. org. gén.-urin. **1**: 513, 1923) says that testicular grafts survive for only a short time, though autoplastic, homoplastic and certain heteroplastic testicular graftings give immediate results which cannot be doubted.

4. Katzenstein, M.: Deut. Sch. med. Wchnschr., April 4, 1918, p. 372.

warm air supplied by an electrical hairdrying apparatus. The grafts should be smoothly laid on; and all air bubbles beneath the grafts should be expressed. To eliminate subsequent connective tissue ridges between the grafts, it is advisable to overlay the edges of the individual grafts. The parts should afterward be immobilized, as a movable base will certainly dislocate the grafts. The dressing to be subsequently applied to Thiersch grafts is entirely of secondary importance, since no antiseptic that one can apply to the outside of the graft can affect the surface beneath the graft.

Whatever dressing the surgeon has found efficacious will be in order, and they are many; namely, dry, sterile gauze, adhesize plaster, silverfoil, rubber tissue strips or paraffined mesh gauze. I prefer silverfoil. There is no advantage in applying dressings wet in salt solution, since a dry graft will by osmosis soak up underlying serum better than a sodden, wet one, and will adhere more firmly. Whatever dressing is used, very firm pressure should be applied over the dressings, as this tends to cause the grafts to adhere more firmly, which is a point often overlooked; for this reason, for a week it is better not to leave the grafts exposed to the air under a wire cage, but to apply a firm dressing.

It must be remembered that Thiersch grafts do not prevent subsequent contraction beneath the grafts (Figs. 3 and 14); hence, this type of grafting should be avoided when it is desirable to prevent contraction, as in the neck, axilla, over the cubital fossa, and in the popliteal space. Full-thickness grafts, whether pedicled or not, should be used when contraction must be avoided. As a result of sad experiences (Figs. 1 and 2), I have come to the definite conclusion that the most successful method of closing an old, sluggish, roentgen-ray burn is not to reflect from the neighborhood pedicled, full-thickness flaps, because these will slough or not heal on account of the deficient blood supply, due to the surrounding endarteritis, which exists for a long distance outside the visible ulcer. The only way to cure these intractable ulcers is to curet thoroughly all the sloughy tissues, under a general anesthetic, since these ulcers are exquisitely sensitive and will not bear the slightest manipulation. The raw area will then require sterilization for a few days with gauze wet in surgical solution of chlorinated soda, changed daily. After thorough sterilization, the tissues surrounding the ulcer should be widely trimmed away until the tissue cuts softer, indicating less connective tissue, and until the edges ooze. After drying the ulcer, autogenous Thiersch grafts should be applied to the whole raw area (Figs. 1 and 2).

A very useful procedure is the Lanz accordion modification of the Thiersch graft, in which the total graft is cut into two equal halves. In the sides of each half are made a series of two lateral parallel incisions, and between each pair of lateral incisions a median one is made. Then each half is drawn out like an accordion, one being placed on the surface to be grafted and the other on the freshly denuded area.

TREATMENT OF A PATIENT WITH TOTAL AVULSION OF THE SCALP

One of the most typical uses of Thiersch grafts is seen in cases of total avulsion of the scalp, as in the case of a girl of 12 (Figs 6, 7 and 8), reported here. To have obtained from the girl herself sufficient free, full-thickness grafts (autogenous) to cover the huge, raw skull would have been impossible. The child was not brought to me until the seventh day after the avulsion, when the replaced scalp was necrotic and bathed in pus. This had to be removed, and the raw area had to be sterilized before the grafting. With regard to replacing the completely torn off scalp, experience has shown that this procedure is never successful. There have been 173 instances of total avulsion reported in the literature with fourteen, or 8 per cent., deaths. The scalp was replaced in forty patients; in not a single instance did the replaced scalp live.

Most of our surgical texbooks say that the totally avulsed scalp may be replaced with some hope that it may live. This is false teaching, as it simply wastes valuable time and pulls the patient down with the resulting subsequent profuse suppuration. Only a partially avulsed scalp with a pedicle may be replaced. The most

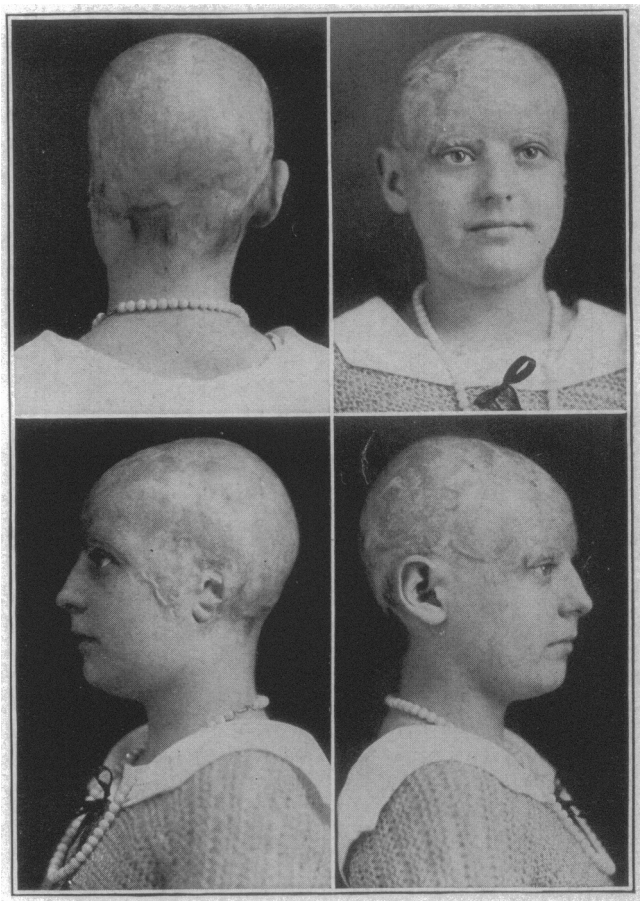

Fig. 7.—Healing in four months, the result of six Thiersch graftings; two being iso-graftings, and four autogenous. None of the former took, but all of the latter did.

efficient method of treating this severe lesion, provided the patient is treated within twenty-four hours of the accident, is to sterilize the raw skull and, at the same time, drill holes into the diploe in that part of the skull that is bare of all soft parts, so as to hasten its granulation; then to shave the avulsed scalp, saving the hair for a future wig; to take Thiersch grafts from its surface at once, and to transplant these grafts to the denuded, raw skull area. Many of the grafts will take when transplanted after twenty-four hours or even after thirty-six hours, since thin skin strips have been proved to live even as long as forty-eight hours after their removal. By this procedure, the resulting raw area left to suppurate will be reduced very materially. This is the plan of procedure I shall adopt hereafter in any case of total avulsion that comes to me immediately.

In this particular case of total avulsion of the scalp, it took twenty-five days after the removal of the necrotic replaced scalp to sterilize the raw area sufficiently to permit Thiersch graftings; then there were performed six Thiersch graftings before the skull was healed. Of these six graftings, two consisted of isografts taken from the mother, whose blood grouping was the same

Fig. 8.—All the defective areas are covered by a wig.

as the child's. Not a single graft of these two isograftings took, which was to have been expected. All the other four, autogenous, grafts lived, and the child's head was entirely covered with healed skin within a space of 104 days, or a little more than three months. At the inception of the treatment, there was a bone area, the size of one's palm, over the right parietal region, which was denuded of all soft parts. This area was drilled into the diploe in various places. This raw area became entirely covered with granulations, springing out from each of the drill holes, within five weeks after the borings were made. This bears out the striking result of such a procedure carried out by Dr. James Robinson, who, in 1769, successfully bored the bare skulls of six patients scalped by Indians. This procedure has lately also been advocated by Dr. Will Mayo. Finally, there were made three futile attempts to graft small strips of free, full-thickness, hair-bearing grafts, taken from a small fringe of hair on the back of the neck, into the position of the eyebrows; but these were all failures, as the grafts slowly necrosed away.

This child was anesthetized seven times by Gwathmey's colonic anesthetic method, 3¼ ounces (96.5 c.c.) of ether being given each time, each being most successful. The child approached the successive operations without that terrible fear that inhalation anesthesia causes, owing to the choking and subsequent vomiting. I cannot recommend too highly colonic anesthesia. In the Skin and Cancer Hospital, it is used as a matter of routine in all face, lip and tongue operations in which tedious neck dissections have to be performed; but it should be used exactly as Dr. Gwathmey recommends, and surgeons should not experiment with modifications of the method. The child was discharged four months after admission with the skull entirely covered with healthy skin. Subsequently, I have grafted two eyebrows, the strips of free, full-thickness, hair-bearing skin being taken from the neck. These were finally successful.

Proctitis is a very rare sequela after colonic anesthesia, so much so that it is negligible as a contraindication.

REVERDIN'S GRAFTS

Reverdin's grafts need not be dwelt on. They are obtained by thrusting a needle in the skin, which is lifted up, and the prominence snipped off with scissors. These pinch grafts are placed on the raw area, forming islands, between which connective tissue must fill in the gaps, the epithelium creeping across this connective tissue from the minute grafts. I see very little use for these grafts. They leave a permanent, bad scar, which is irregular and subject to great contraction subsequently (Fig. 14). They have no advantage over Thiersch grafts, and will usually take no better than these. I rarely use them; hence, I will spend no time on them. Their subsequent treatment is the same as Thiersch grafts.

FREE, AUTOGENOUS, FULL-THICKNESS NONPEDICLED GRAFTS

The third method, which I particularly desire to emphasize, has not been generally used because of the numerous failures with it, which are to be attributed more to improper technic than to the inherent nonsuccess of the method. Consequently, the surgeon who attempts this valuable type of skin grafting should weigh carefully all the minutiae of its proper technic (Figs. 4, 5 and 13).

Fig. 11.—Old burn contraction of neck: Tubed flap taken from the left arm, raised up and sewed back in place. The advantage of this procedure is shown by the fact that one inch of its lower extremity has become gangrenous. When finally transplanted into the neck, freed of this gangrenous area, the flap is assured of good vitality throughout. The raw area behind the tube was covered with Thiersch grafts at the time the flap was raised up and the tube made.

The essentials of success in grafting free, full-thickness, nonpedicled grafts are as follows:

1. Clean operative wounds are best of all, though sterile granulations are not unfavorable.

2. The base must be smooth and, best of all, muscle or fascia. In some cases they have been successful on the skull bones, the dura mater, the periosteum and the tendons, such as the Achilles.

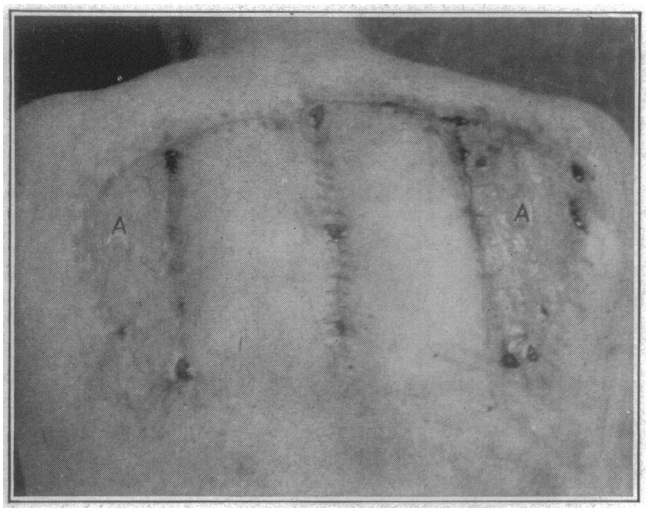

Fig. 12.—Excision of an epithelioma in the middle of the back, cured by reflecting two lateral flaps from the positions *A-A*, pedicled below. The raw areas that resulted, *A, A*, were covered with Thiersch grafts.

3. No fat should be on the under surface of the graft (Davis, Blair, New), this being trimmed off with scissors. Gillies says that fat on the under surface of the graft makes no difference in its viability(?).

4. The base must be perfectly dry without any oozing.

5. There should be just as little handling and pinching of the grafts with the forceps as possible, sharp hooks being used to lift the graft.

6. The graft should be perforated in a number of places, to allow the blood or secretions to escape from under them (Davis). I use Carrel's punch. In addition, these perforations afford an increased means of entry of serum into the graft for its nourishment.

7. The graft should be transplanted to its new bed as quickly as possible after its excision, so as not to compromise its nutrition, and it is advisable to transfer it dry without immersion in salt solution, to favor more securely its adhesion.

8. The most unfavorable base on which to place a free, full-thickness graft is fresh fat, as through this fat very little blood can pass. In such a case, the fat should be allowed to granulate before grafting on its surface.

9. Gillies makes the point that it is well to put some tension on the graft, equal to that in the position from which it was removed, since this stretching favors easier absorption of serum from the bed; hence the graft should not be cut any larger than the space to be filled.

10. Most essential of all is to apply very firm, even pressure on the graft, and to keep the parts absolutely immobile, and not to disturb the dressing for about seven days. Davis uses a sea sponge for this purpose, as I do also, most successfully.

11. The epithelial layer of the graft may slough, but this does not injure the deeper skin layers.

12. Free, full-thickness grafts, taken from hair-bearing areas, may be successfully transplanted into eyebrow defects, with a subsequently resulting growth of hair in the graft.[5] In such hair-bearing grafts, a very thin layer of fat should be left on the graft, since the hair follicles project into the fat.

13. The healthy prepuce, removed by circumcision, portions of the scrotum and the eyelids make very successful free, full-thickness skin grafts, since they do not contain fat.

5. Lehrbuch der Chirurgie operative **1**: 145, Fig. 117; Abbe, two successful cases; Wheeler, a number of successes; Gillies, Staige Davis, McWilliams and others.

14. Free, full-thickness grafts should not be cut larger than 3 inches long by 1½ inches wide. A large area should be covered by such individual segments, each being stretched and sewed in place.

Staige Davis writes that he uses a great many more free, whole-thickness grafts than Thiersch grafts, because the result is more satisfactory. Dr. New,[6] of the Mayo Clinic, reports a high percentage of successes with these grafts, and says that the essential points in their successful application are to apply the grafts without fat, to put firm, even pressure on the grafts, and to keep the parts absolutely immobile. Dr. Vilray Blair of St. Louis writes that he has had probably fifty free, full-thickness skin grafts, and that about 75 per cent. of these were successful. He says that in his very early cases, he lost most of some grafts for want of proper pressure, and then swung round and lost a considerable part of a few other grafts from too much pressure. Gillies, Krause and Wolfe are enthusiastic adherents of this method. These grafts may be used about the face and neck when there is sufficient supporting tissue to allow subsequent firm pressure, as in the correction of ectropion of the lids, the excision of scars about the face, chin and neck, and following the removal of an inactive basal cell epithelioma, when a plastic closure is impossible. They have been successfully used over the cubital fossa of the elbow.

The results of a questionnaire of the members of the New York Surgical Society showed that twenty-six members had had no experience with these grafts; nineteen had had failures after trials, while twenty had had success with it. I now can say that I have had about 60 per cent. of successes with it, and these successes have increased as my experience has grown. I would warn others, however, not to attempt the method without a thorough study of all its details. Failure means a faulty technic, which is not due to the method itself. I had the same experience as Dr. Blair. I lost most of my first grafts; hence, the method was discarded, since I erroneously thought that the type of grafting was impossible. Instead, my failures were due simply to the fact that my technic was wrong. I soon learned that I had not used sufficient pressure. When very firm pressure was applied on them in the after-

Fig. 14.—Poor result of Reverdin's grafting of traumatic, raw area of elbow: The beginning contraction of the scar necessitates removal of the scar, and grafting, either with free, full-thickness grafts, or a pedicled flap from arm or abdomen. This should have been done originally instead of using Thiersch or Reverdin's grafting.

treatment, the results were surprisingly good. Pressure is the keynote of success in using free, full-thickness grafts, being next to asepsis in importance.

PEDICLED FLAPS

The use of a pedunculated flap of skin, with a considerable layer of attached fat, is one of the most dependable methods that the surgeon has for the repair of tissue defects, and by it cosmetic results may be

6. New, Gordon: Personal communication to the author.

obtained, which are, in many cases, impossible by any other surgical procedure (Figs. 10, 11 and 12).

There are three general methods of utilizing pedicled flaps:

1. The French method of sliding flaps from neighboring tissue, in which procedure there is no twisting of the pedicle.
2. The Indian method, in which the flap is obtained from the adjacent neighborhood of the defect, and is shifted into its new position by twisting of its pedicle, as in the formation of a new nose from a forehead flap.
3. The Italian method, in which the flap is obtained from a distant part, usually the arm.

In general, the pedicle may be single or double. Davis [7] presents two very useful full-page illustrations of the body, showing the various skin regions supplied by the different arteries; and in making a pedicled flap, attention should be paid, if possible, to having the flap supplied by a well defined artery, though this is not absolutely essential.

Pedicled flaps may be transferred by (*a*) sliding; (*b*) twisting of its pedicle; (*c*) combined sliding and twisting, and (*d*) jumping over sound tissue.

RULES FOR MAKING SINGLE, PEDICLED SKIN FLAPS

1. The flap must be well supplied with blood; therefore,
   (*a*) Its pedicle, if possible, should be made parallel to the direction of the blood supply and not transverse to it.
   (*b*) If the flap would be long and narrow, it is better to make two or more flaps rather than one.
   (*c*) The pedicle should be as broad as possible, in any case not narrower than one-third the greatest length of the flap.
   (*d*) A thick layer of fat must lie on the under surface of the graft, since in this layer course the blood vessels.
   (*e*) Too great twisting of the pedicle should be avoided, as this compromises the circulation through the pedicle.
2. The fatty layer in the separation should not be bruised, but should be cleanly divided with a sharp knife from the underlying fascia.
3. The flaps must lie in the defect without any dragging, and be fastened into it without stretching. No stitches should be tight, and there should be no blanching of the flap on their being tied.
4. If the wound is a granulating one, this must first be rendered aseptic by wet dressings of surgical solution of chlorinated soda changed twice a day. The day before the transplantation, the granulating tissue should be cut off flat with curved scissors, and the edges of the defect should be excised, and the whole wound made fresh.
5. The flap, particularly its pedicle, must be free from scar tissue.
6. The pedicle may be divided on the fourteenth day.
7. If the transplanted flap becomes markedly blue and swollen, indicating venous stasis, it should be punctured in numerous places by a knife.
8. To assure the operator of the viability of a long flap, Staige Davis has recommended that the flap be outlined and lifted up, and then sewed back in its original position. After a few days, one can tell of its viability, after which, if this is satisfactory, the flap may be transplanted to its new position with assurance of its viability; or, if a portion of its extremity has become gangrenous, this necrosed area should first be trimmed away before the transplantation (Fig. 11).
9. If a pedicle flap is to fill a defect entering into a cavity, such as the mouth or the nose, its under surface should be covered with a free full-thickness skin graft in situ, before the transplantation, since a raw surface will eventually contract to such a degree as to spoil the cosmetic result. The same is true also of a raw area covered simply with a Thiersch graft. Or the end of the flap may be folded on itself, causing the raw surfaces to heal together, after which the transfer is made in the customary way.
10. The flap should be cut at least one-third larger than the area it is to fill, as there is always immediate shrinkage in the direction of the elastic fibers.
11. A pedicle should never be notched at the time of implantation in order to make it fit better, as this may impair the circulation. Any resulting puckering can be remedied after the new circulation is assured.
12. Immobilization of the part is essential after the transplantation.
13. In contradistinction to free, full-thickness grafts, on which the firmest pressure is essential, pressure on pedicle flaps should be only moderate; otherwise necrosis will result, owing to the cutting off of the circulation through the pressure on the pedicle, since the underlying fat is a very poor conductor of blood from the base.

7. Davis, J. S.: Plastic Surgery, Philadelphia, P. Blakiston's Son & Co., 1919.

SUMMARY

1. The most efficient method of treating total avulsion of the scalp is: immediate surgical cleansing of the raw area; shaving and surgical cleansing of the avulsed scalp (the hair being saved for a future wig); drilling of the bare bone in numerous places into the diploe, followed immediately by the covering of the entire raw area with Thiersch grafts taken from the avulsed scalp. In this way time is saved, and suppuration is diminished. The totally avulsed scalp should never be replaced, since it never lives.

2. Of all types of skin grafting, antogenous Thiersch grafts are the most successful, and of the widest applicability. Their disadvantage is the subsequent contraction. Isografts should never be attempted, because they are usually unsuccessful.

3. Autogenous, free, full-thickness, nonpedicled flaps are somewhat less successful but well worth a trial, provided care is taken in selecting the case and the minutiae of the technic is studiously followed. Fresh operative wounds are most favorable, particularly if the base is muscle, while fat as a base is most unfavorable. Contraction of the graft is slight, but a disadvantage is the subsequent pigmentation. All subcutaneous fat should be carefully trimmed off the graft with scissors. The transplant should be punctured in numerous places with Carrel's punch, and very firm, even pressure (most important) should be applied to all the surface of the graft by the subsequent dressing.

4. Pedicled flaps are uniformly successful, provided there results no necrosis of the end of the flap. The flap may, at a preliminary operation, be elevated and freed and then sewed back in place, thus awaiting the onset or absence of necrosis before the flap is transplanted into its final position. These flaps should contain the subcutaneous fat on them.

5. One may graft eyebrows with permanence of their hair most successfully by taking half the opposite eyebrow and transplanting it with a pedicle. Slightly less successful are free, full-thickness slips taken from the hairy scalp.

6. It is very important to observe that, in contradistinction to free, full-thickness grafts, with which the firmest subsequent pressure is essential, pressure on pedicled flaps should be only moderate, as otherwise necrosis will result from the obstruction to the blood supply through the pressure on the pedicle.

7. Emphasis should be placed on the subsequent contraction that takes place after Thiersch and Reverdin's graftings; hence they should not be used to cover raw areas in the neck, the axilla, cubital fossa of the elbow, or the popliteal space. In these localities, free, full-thickness skin grafts, or pedicled flaps should be used, since with the two latter types of grafting, there is

no contraction. This is most important and is too often overlooked.

8. It should also be noted that free, full-thickness grafts should have no subcutaneous fat on them, since their circulation is obtained from the raw base, and fat is a poor conductor of the circulation; while in pedicled flaps the subcutaneous fat should remain on them, since the circulation is maintained through the pedicle, and the fat forms a good movable cushion on which the skin can move freely.

9. The only way to cure an old roentgen-ray burn is to excise widely the raw area, to sterilize it, and then to cover it with Thiersch grafts. Full-thickness grafts, whether pedicled or not, do not succeed because of the surrounding endarteritis, resulting in a deficient blood supply.

10. It should be noted that free, full-thickness grafts should not be cut larger than the area to be filled, which will necessitate some stretching of them when transplanted: this is in contradistinction to pedicled flaps, which should lie easily and not be stretched; hence, these pedicled flaps must be cut one-third larger than the area to be filled, to allow for shrinkage.

11. Surgical textbooks are too hazy about the results of iso-skin grafts, as well as the replacing of the totally avulsed scalp. The futility of each of these procedures cannot be two strongly emphasized. Only the partially avulsed scalp with a pedicle should be replaced.

12. The transplantation of sections of "monkey or other animal glands" (i. e., testes) is entirely without scientific basis, and has been exploited for commercial purposes only. This procedure, so far as its ultimate failure is concerned, is just as certain as when transplantation is made of iso-skin grafts. Both methods should be unhesitatingly condemned by conscientious surgeons.

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ABSTRACT OF DISCUSSION

DR. HARRY P. RITCHIE, St. Paul: The suggestion of Dr. McWilliams in regard of avulsion of the scalp and the taking of Thiersch grafts from the avulsed scalp indicates a method that is worth while. In the future we must make a keener distinction between the grafts and the flaps that are not free, for these are two distinct surgical procedures, different in their principles and different in their application. In the handling of these tissues, if it is possible to preserve any of the epithelial tissue, it must be done by means of a flap. As to avulsion of the scalp, there is nothing that can be preserved in the flap; but, with the wall preserved as a free graft, the principles are wrong. I think it is important to make a legitimate effort to obtain large grafts more in conformation with the surrounding tissues. The popular one has been the Thiersch graft, and the reason is that in the mere process of getting it, we get only one kind of tissue. The tendency is to take the deeper tissues with the small deep graft to which Dr. Davis called our attention a few years ago. Whether it is a Reverdin graft or a development of it, it is certainly not a pinched graft. It has been my custom to question whenever opportunity arises as to the experience with this graft. I think it is no exaggeration to say that it has fallen into disrepute. I have wondered why in following the publications of these gentlemen Dr. McWilliams has claimed that it gives such striking results.

DR. G. V. I. BROWN, Milwaukee: I have seen only one similar case of avulsion of the scalp, that of Dr. Sayle of Milwaukee, who treated his patient by piercing at different points the external skull plate and putting on grafts in the way Dr. McWilliams describes. To me the important thing is that this paper offers an opportunity of discrimination and differentiation on deciding on the different methods of skin grafting. We must begin with the idea that the skin has wonderful powers of reconstruction. If we give the skin half a chance it will grow on a proper surface without a great deal of trouble. The question then comes up as to what kind of a graft must we employ. Back of that should come the question of whether we should use a skin graft or not. That is a matter which time will not permit going into; but very often skin grafting is done when a good plastic operation might give a much better appearing result and also leave an opportunity for a later graft to finish up the case and improve the cosmetic appearance, which cannot always be done at the time of the initial skin grafting. I am largely interested in grafting bone cartilage or skin in the use of the autograft, provided I can find tissue on the patient to make the graft. Other grafts do not interest me. We have the dermal graft, the skin graft and the epidermal graft. I use the thickest skin grafts wherever I think subsequent operation necessary. I use the epidermal graft, suturing it into the tissues wherever possible.

RUPTURE OF AN AORTIC ANEURYSM INTO THE SUPERIOR VENA CAVA *

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The study of the termination of aortic aneurysms is always of interest. Rupture is one of the occasional methods that lead to the death of the patient. A very unusual and noteworthy variety of this method is rupture into the superior vena cava. In this paper I add two cases and discuss the more salient points of diagnosis.

It is interesting as the literature runs to note that the cases are bunched, the report of one case being quickly followed by several others.

The clinical notes with postmortem findings (made by Dr. Edwin F. Hirsch) of the first case are given in detail. The report of the second case is meager in details but accurate in its statements. The illustrations were made from the specimens, which are now preserved in the pathologic museum of Northwestern University.

REPORT OF CASES

CASE 1.—A widow, aged 52, previously in good health, awaking from a sound sleep, felt a rush of blood to her head. Her daughter, whom she summoned, found her mentally confused, dyspneic and extremely cyanotic. The attending physician obtained her history with difficulty, owing to the mental confusion and extreme dyspnea. Cardiac stimulants, which were administered, did not relieve her symptoms. A surgical consultant was called.

When I saw the patient for the first time, she presented a picture of extreme anxiety and mortal terror, indicative of intense alarm. Propped up in bed, thrashing from side to side, she seemed to be avoiding an object threatening to crash on her. The face and neck were cyanotic. The cyanosis extended down over the chest to the third rib, simulating a sharply defined cape. The cyanotic area was moist and cold. Pressure produced mottled dark red blotches. The skin over the rest of the body was of normal temperature and color. The eyeballs were not bulging. The pupils were small and reacted equally, but sluggishly, to strong light. The hearing was acute, and the patient did not complain of roaring in her ears. The mouth was dry, and she complained of intense thirst. Each sip of water increased to an alarming extent her cough and dyspnea, and all she had swallowed was promptly vomited. There was no edema or obstruction of the throat, and the

* Read before the Chicago Pathological Society.
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