C A S E
OF
EXTREME DEFORMITY OF THE NECK
AND FOREARM

FROM THE
CICATRICES OF A BURN,

CURED BY
EXTENSION, EXCISION, AND TRANSPLANTATION OF SKIN,
ADJACENT AND REMOTE.

EXHIBITED BY
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L— W—; æt. 8 years, admitted into King's College Hospital under Mr. Bowman, January, 1862, for an extensive burn of the neck and both arms.

A great portion of the skin covering the front and left side of her neck and chin was completely destroyed. On the left forearm, the whole skin except a small strip on the radial side; and on the right arm, a less extensive portion in front of the elbow were damaged. The child was in hospital many months, and notwithstanding the most careful attention the healing of the sores was so slow, and the following contraction of the cicatrices so great, that when

discharged, a great portion of the sore on the neck, and still more of that on the left forearm, remained unhealed.

On the 24th of September, 1862, she was again admitted under my care. During the interval, the sore in the neck had healed, that on the left arm had diminished a little in size, while the contraction of the cicatrices had so much increased as to give rise to frightful deformity of the neck, left arm and hand.

In front of the neck was a thick, hard, and callous cicatrix, an inch wide, extending from the top of the sternum to the left side of the chin. It was raised about two inches above the level of the skin of the neck, projecting in a thick, hard ridge laterally, and drawing the skin on each side into a puckered pouch, larger on the right side than on the left. The head was drawn forward and downward toward the left side, the movement of the jaw being greatly impeded. The left corner of the mouth was drawn downwards so as to permit the escape of the saliva. Extending along the base of the jaw, on the left side, was a white, puckered cicatrix, reaching as far as the lobe of the ear; much tension existed in the integuments over the breastbone and jaw.

To a still greater degree had increased the deformity of the left arm and hand. On the back of the wrist, extending from the base of the fourth finger as high as the lower third of the forearm, was a thick, tough, projecting and fal-ciform cicatrix. The wrist-joint was completely reversed; the hand drawn backwards upon the forearm; the metacarpo-phalangeal and finger-joints curved backwards. The little and fourth fingers were drawn to within an inch of the back surface of the arm; the first and second fingers projected at diminishing angles; the thumb was placed at a right angle to the axis of the forearm. The whole hand was also considerably adducted upon the forearm. On the back and outer side of the arm was a large oval sore, reaching to the elbow, with pale fungoid granulations, and a dense, thick, cicatrizing margin. This had long been stationary in size. The inner side of the upper arm, and the whole surface of the forearm, with the exception of an elongated patch on

the outer side, was seamed with cicatrices, and extremely tight and tense. This tension seemed to be the chief reason why the sore had not healed. Above and behind the inner condyle is another ulcer about the size of a shilling.

In front of the right elbow is a puckered cicatrix, which has contracted the joint to an angle of about 125° ; and on the back of the hand is another, drawing the little finger away from the rest.

The girl, though almost completely incapacitated from helping herself by these extensive deformities, was in good health, and seemed to be in a most favorable condition for any auto-plastic operation which might be considered eligible.

The treatment was commenced by gradual extension of the right elbow, by the application of a straight well-padded splint in front of the arm. This was continued during the whole progress of the case, and was perfectly successful in straightening the limb.

On the 4th of October, I operated upon the neck of the patient by the following steps. First:—The fold of skin behind the prominent cicatrix was transfixed a little above the middle by a scalpel, with the edge directed downwards and forwards. The cicatrix itself was then divided, so as to separate it from the sternum close to the surface, and detaching it as a V-shaped flap with the apex downward. An extremely hard resisting tissue under the cicatrix was freely divided, so as to give the head free play. Next:—From the point of the V an incision was made, vertically downwards, for an inch and a half, so as to make a Y. From the lower extremity of this, a curved incision was carried to the right. The skin forming the pouch here was then lifted, so as to form a flap large enough to cover, when slightly turned to the left, nearly the whole of the wound. The half detached cicatrix was then pushed well up under the jaw, and the flap of skin spread out below it and secured by fine silver sutures to the margins of the wound. The wound was simply dressed, with the head well thrown back.

On the 13th the sutures had ulcerated through at the

margin of the wound, remaining still attached to the flap itself. This marginal skin being impaired by the old cicatrices, proved less tenacious in holding the sutures than the more healthy flap. The wounds healed rather slowly by granulations proceeding mainly from the flap, which retained its place very well, becoming adherent over the greater part of its deep surface.

On the 5th of November the sore was entirely closed, and the patient could then throw her head well back and move it freely laterally. When the neck was stretched, however, the old cicatrix which had been left at the upper part of the wound became raised above the surface, and showed an evident tendency to contract.

It now became a question as to whether anything should be attempted to remedy the deformity of the left wrist. Gradual extension had been perseveringly tried, and failed to accomplish any result, except an aggravation of the ulcerating process in the extensive sore remaining at the back of the forearm. There was no healthy skin on the fore- or upper arm, which could be made available for such adjacent transplantation as had been accomplished in the neck. To meddle with any of the cicatrized skin, would, in all probability, result in sloughing, and an increase of deformity. I ultimately determined to attempt an operation of remote transplantation from some other part of the body, upon the Taliacotian principle.

The first thing was to find some part of the body upon which the arm could be kept immoveably fixed and in close contiguity for a sufficient length of time, and with as little discomfort to the patient as to give a reasonable chance of a successful issue. The arm rested most easily, in the recumbent posture, upon the anterior abdominal walls. But these are in constant respiratory motion. At first, this seemed to constitute an obstacle to success in an operation where so much depends upon absolute rest.

It occurred to me, however, that the arm might be so fixed upon the belly as to rise and fall with it in respiration, and so we might obtain, if not absolute rest, so much rela-

tive immobility as would permit adhesion between the opposed raw surfaces. Accordingly, I had constructed a breastplate, of gutta-percha, to fit upon the front and sides of the chest, reaching from the armpits to the umbilicus. Attached to its lower border was a splint for the forearm and hand, placed at an oblique angle, and above this, to the left side, a scroll-shaped splint for the upper arm. This prevented the weight of the arm (sinking downwards in the recumbent position), from dragging asunder the applied surfaces of the wound after operation. The whole was riddled with holes for ventilation, well padded with cotton wool, covered with wash leather, and fastened with pieces of bandage round the neck and body.

Next, as to the choice of the part from whence the flap should be taken. The cutaneous vessels of the abdominal surface pass generally through the subjacent aponeurosis, and almost directly at right angles towards the surface. At certain points, however, superficial vessels from neighbouring parts pass more or less parallel with the surface of the skin. The largest and most important of these, are the superficial epigastric vessels proceeding from the common femoral, across Poupart's ligament, upwards and inwards towards the umbilicus. It is evident that if a flap were raised so completely as is necessary for the purpose of remote transplantation, without regard to the arrangement of the vessels supplying it, the greater part of its vascular connections with the body might be severed, and the flap would probably slough wholly or in part, or at all events would not readily institute the adhesive process. It became a matter of importance, then, to choose such a position as would leave in the base of the flap the greatest amount of blood-vessels running parallel to its surface. The most eligible part for this purpose was a little below and to the left side of the navel, leaving the base of the flap downward to receive the above-mentioned epigastric vessels as its chief source of vascular supply. This region had the additional advantage of lying in convenient relation to that part of the arm where the flap was required.

On the 5th of November, 1862, the patient was again placed under chloroform in the theatre of the hospital. First, the outline of the flap was marked out in ink, of a lancet-shape, with the point directed upwards and inwards, and the base as broad as the widest part of the flap itself, directed towards the left groin. The cicatrix on the left wrist was then divided by a transverse incision, carried far enough to permit of complete straightening of the wrist, and the edges of the incision were also a little detached. The extensor tendons and their sheaths were found to be quite unaffected, playing freely over each other when the hand was moved. The flap was next dissected up from the abdomen, its thickness being made to increase towards the base, a considerable quantity of subcutaneous tissue being raised with it. The deeper layer of the abdominal fascia was left untouched, for the purpose of forming granulations, and also to permit a free gliding of the resulting cicatrix over the subjacent aponeurosis. The flap was then held up by an assistant, and the sides of the wound from which it was taken drawn together and held by two long pins and wire sutures. Pledgets of lint and a thick layer of simple dressing were fixed upon it by long strips of adhesive plaster. Upon this the left wrist was then placed, with the transverse cut opposite to the flap; the breast-plate carefully adjusted, well padded with cotton wool, and held firmly in place by long and broad straps of adhesive plaster passed round arm, splints, and body. The surfaces of the flap and its bed were then washed with lukewarm water, till all bleeding had ceased, and the point of the flap was placed in the upper or radial angle of the cut on the wrist. Two rectangular pins, such as I usually employ for the compression of varicose veins, were then applied to hold the centre of the flap firmly upon the raw surface of the wrist. These were passed in opposite directions, about an inch apart from each other, transfixing the middle of the flap, and including a deep and extensive hold upon the skin of the forearm at the upper margin of the incision. The pins, when locked together, formed a sort of wire parallelogram, with a

lever-like action at each end, which could be regulated by padding, so as to increase or diminish the pressure upon the flap as the subsequent tension might require. The edges of the flap were also closely attached to the margin of the wound by fine wire sutures. A light simple dressing was used, and fastened so that it could be removed easily, without interfering with the rest of the arrangement.

After the operation, the girl continued in good health, and was very quiet and tractable. The splint was perfectly comfortable, and she had little or no pain in the parts. Next day, the flap was looking vascular and healthy.

On the 8th, three of the points of suture were removed, the edges at the same place had somewhat separated. The flap seemed to have become adherent by its deep surface.

10th.—About an inch of the edge of the flap near its base, towards the fingers, was found to have become cicatrized to the arm. The apex of the flap had become slightly retracted, and was held entirely by the pins; some discharge begun to appear under the arm, from the sore on the abdomen.

Nine days after the operation, the splint cuirass was detached and lifted at the right side, the arm and hand being fixed by straps of plaster, and carefully held by an assistant. This was necessary for the purpose of cleansing and examining the abdominal sore. It was granulating in a most healthy way. The pins and sutures were removed, the sore and skin well washed, dusted plentifully with oxide of zinc and dressed as before.

At the edges of the flap, two or three fresh points of adhesion had commenced, and nowhere was there the slightest appearance of sloughing. A few days afterwards the rectangular pins were removed, the points of adhesion having extended considerably in both directions.

21st.—The cicatrized points have now joined each other, and the safety of the flap seems insured. The flap is carefully supported by long narrow strips of adhesive plaster placed obliquely across arm, body, and splint in all directions.

The old sore below the elbow is now beginning to heal rapidly, and discharges healthily.

27th.—The flap has become thoroughly united, both by its deep surface and edges, close up to the base of attachment. The sore on the abdomen is much smaller, granulating above the level of the surrounding skin, and cicatrizing rapidly at the margins. The flap is healthy looking, vascular, and firm on pressure; its sense of touch somewhat indistinct, and still referred to the abdomen. Being anxious not to cut off the parent connection too rapidly, lest the newly formed vascular communications should fail in the demand too suddenly thrown on them, I postponed the commencement of the separation for some days, and determined to accomplish it by small instalments at distant intervals. It was rather with the object of preventing the shrivelling so often following transplantations, that I pursued this cautious course, than from any fear of direct sloughing, which the completeness of the new vascular union would at any rate have prevented.

On the 29th, I divided about half an inch on each side of the base of the flap, obliquely towards the abdomen, so as to include as much as possible of the abdominal integuments. These incisions, when finally extended to meet each other, will transform the lancet-shaped flap into a lozenge-shaped patch.

The pedicle left to the flap was about one and three-quarters inch wide. A strip of lint passed round the base prevented the cut surfaces becoming again adherent. The arm is now kept in position by straps of plaster and a roller only. The flexion of the wrist and finger-joints was now increased a little day by day, by the arrangement of the strapping, so as to make traction upon the pedicle of the flap, and to draw into it more of the abdominal skin to cover the wrist and hand when in a state of complete flexion. The hand was also gradually shifted over towards the opposite side of the body, so as to remove it from the surface of the abdominal sore, upon which it had hitherto more or less rested.

On the 6th of December an additional portion of the flap was severed ; the degree of flexion still more increased ; and the hand shifted completely over the navel.

After two more such operations at intervals of a week, reducing the width of the pedicle to about half an inch, each succeeded by complete union of its cut edges to the forearm, it was found that an obscure sense of touch, referred to the arm itself, had appeared in the semi-detached flap, indicating a satisfactory amount of vital connection. Accordingly, on the 3rd of January, 1863, the pedicle was completely detached. By this time, from the continued flexion and traction, the long diameter of the transplanted patch lay parallel to the forearm, instead of across it as originally placed. The sores on the arm and body were much diminished in size, the latter rapidly cicatrizing.

After complete severance from the belly, not the slightest alteration was observable in the flap, and the small abdominal sore speedily healed. The limb was kept upon a splint with a hand-piece well bent forward. The elbow was, at the same time, extended to relax the skin at the back of the arm, and so to allow the sore to heal more readily. Every day the splint was removed, and the wrist and fingers well flexed, to effect the restoration of the normal condition of the distorted joints and tendons. At first, this gave rise to great pain, which became less as the treatment progressed. The joints became gradually more flexible ; the skin more pliable ; the sore contracted slowly, and finally healed altogether, and the patient began to take up things with the hand. Latterly, the fourth and little fingers could be made to close in upon the palm, and the patient can now voluntarily bring their tips to the surface.

The transplanted patch has retained its plumpness, and much of its original colour and appearance, affording a marked contrast to the ruddy colour of the skin of the arm. It glides easily over the subjacent tissues. Such resistance as still exists to flexion is felt to be placed, chiefly, in the cicatrix surrounding the patch. Though it cannot be said to assimilate, at present, very closely to the neigh-

bouring parts, yet, as they increase in plumpness by development, it may show, in adult life, as complete an improvement in appearance as it has already proved in usefulness.

In the meanwhile, the neck had been left without extending apparatus, with a view of affording the utmost ease to the patient while undergoing the treatment for the arm. As the small remaining sore closed, the old cicatrix left in the first operation resumed its tendency to contract, and rose above the surface of the skin. The cicatrix had been left from a disinclination to take away any portion of the tegumentary tissue, where the loss of it was so greatly felt. It became evident, that the advantage of leaving it with this view was rendered nugatory by its inveterate tendency to contract indefinitely. An attempt was made by gradual extension to restore its extensibility. This resulted always in a return of ulceration in some part of the cicatrix, necessitating a removal of the extending power.

Accordingly, I determined to dissect away the contracting portion of the cicatrix entirely. This was done on the 31st of January, 1863. An incision was made on each side of the projecting cicatrix, and carried deeply through the tough fibrous tissues. The incisions were made to join each other, above and below, and the intervening hard cicatrix dissected away entirely. The edges of the wound were then freed a little from their deep connections, and four double wires were drawn across the wound at equal distances, taking a deep hold of the tissues about an inch from the margin. Two pieces of gum elastic catheter were then cut to the length of the wound, and the wires twisted upon them as a quilled suture. Four points of interrupted wire suture were then placed close to the edges of the wound, each alternating with the points of quilled suture.

The whole was then supported by long strips of adhesive plaster, placed far round the neck, shoulders, and breast, to draw the neighbouring skin towards the wound in all directions, and so relieve the strain upon the sutures.

The interrupted sutures were removed as they became

useless ; the quilled suture being retained for about a week. Primary union to the extent of two inches took place in the middle of the wound, the adhesion extending to the deepest part of the incision. A small degree of gaping had taken place above and below the quilled suture.

These were dressed with water dressing, and drawn together by long strips of plaster. The sores finally closed, without any contraction of the cicatrix whatever. On the 10th of February, a gorget of gutta percha, covered with wash-leather, having a good purchase upon the shoulders, breastbone, and lower jaw, was applied, well padded with cotton wool, and kept sufficiently remote from the wound to prevent undue pressure. This kept the chin well upward, and prevented all motion during the healing of the sores. But the most influential agent in preventing a return of contraction, was the primary adhesion resulting in a thin linear cicatrix over the greater extent of the wound, just at the curve of the surface from the neck to the chin.

This point I have found in this and other cases, to be the most subject to continued ulceration, and to the most obstinate after-contraction. This results, probably, from its position at the most angular and most moveable part of the junction between the head and neck, subject alike to the motions of the jaws, head, neck, shoulders, the pharynx in swallowing, and chest in respiration, one or other of which must be at all times interfering with cicatrization, and keeping up that irritation of the sore, which results in a large deposition of the fibroid elements, of which the inveterate tendency to contract indefinitely is, under certain conditions, the best friend of the surgeon, and under others, his most persevering antagonist, in his efforts to remedy such deformities.¹

¹ After the reading of the paper the child was introduced to the Society, and examined by the Fellows.