I have chosen this subject for several reasons. In the first place it has been one of special interest to me, both as regards the subject and my own practical observations upon it, ever since I had charge, when at Edinburgh, of my first case, a boy six years old, who had been ill for ten years and which I met with as a doctor under Professor Annandale in the winter of 1873-4. Another reason for choosing this subject is that I have had numerous and, I may say, unusual opportunities of performing the operation upon all kinds of cases and have been able to observe their course afterwards. The majority of the cases referred to have come under my observation among the patients treated at two provincial hospitals, the Dewsbury and District General Infirmary and Dispensary and the Claye Hospital and Wakefield General Dispensary. I was the house-surgeon of the former of these institutions for more than a year and am at present the house-surgeon of the latter. My experience as house-surgeon of one or the other of these hospitals extends over a period of nearly three years, and during this time I have been in the habit of skin-grafting all the ulcers admitted into both.
the cases in which any considerable portion of the skin has been destroyed by injury. The visiting surgeons have always kindly left the engrafting to me, as both the above mentioned hospitals are situated in the densely populated West Riding of Yorkshire, where accidents from machinery are very common; — Dewsbury is the centre of the heavy woollen district and Wakefield five miles from Dewsbury —; patients suffering from large lacerted wounds with great destruction of the integument are frequently brought to the hospitals for treatment. Thus the number of cases of this kind treated in which skin-grafting was advisable has been large. Numerous patients with ulcers and wounds have also been treated by skin-grafting as out-patients, whilst others have been treated at their own homes throughout. As both these classes of cases were placed under different conditions from the in-patients and from each other, they have afforded evidence upon points connected with treatment, which could not easily have been obtained from the in-patients alone.

Original investigations upon the different steps of the treatment, e.g. the preparation of the wound, the operation and the after-treatment, have also been carried out with the object of arriving at a conclusion as to the most suitable and successful of the different methods of carrying out each of them. Finally, I have, in recent cases obtained results so greatly superior to former ones by the careful observance of a certain routine throughout the treatment that I think the plan pursued to be of value. It is the offspring
in great measure of my own personal observations. A very careful review may be confidently ex-
pected, if the plan, which is fully described below, be carefully carried out. On the other hand, by
not paying proper attention to any one point, the
success of the case under treatment may be very much
impaired. Thin-painting, though it do not involve
grave issues, is an operation requiring delicate man-
ipulation and judicious management.

The operation was first performed by M. Reverdin
of Paris in October 1869 and to him alone is due
the honour of bringing it into use. The credit of
introducing it into England must be given to Mr.
Pollock of St. George's Hospital. It is rather
singular that it was not practised before 1869,
as John Hunter years before had demonstrated
the principle upon which it depends and had illustrated
it by removing costo-tracheal granular masses
from their tops and
inducing them to grow upon their combs.

All the British medical periodicals contain a great
deal of information upon the subject in the numbers
published from the beginning of the year 1870 to
the end of 1873 and articles upon it may occa-
 tionally be met with in their columns up to the
present time. The Transactions of various learned
societies of medical men, after the year 1870, also
contain papers and accounts of discussions upon it,
including a paper by Mr. Pollock. (Transactions of
The Clinical Society of London for 1871).

A small work has been published upon it by John
Woodman F.R.C.S. and an account of it may be
found in Bryant's Surgery Vol I. p. 160 to
165.

With the object of making myself acquainted with
The literature of the subject, I have read the articles and works referred to above. The undertaking has required some time and attention.

Of these contributions to the subject, not two the work by John Woodman, which is only a pamphlet and which I believe to be the only published work on it, contain anything like an exhaustive account of it. By going through the whole of them I think I have however obtained a good knowledge of the subject.

I propose firstly to describe as briefly as possible the investigations and observations I have made and to draw attention to the routine of treatment which I have found essential to success. I have become fully convinced of the truth of what is stated by personal observation at the bedside. Some of these statements will be but verifications of the observations of others but others will be original. I may add that the management of a case indicated and which, after the due of each detail, I prefer, viewed as a whole, will be found to differ considerably from that indicated by any of the writers on the subject. After this, I shall give a brief account of some cases and I shall quote one more fully both as an illustration of the treatment and as an evidence of its success.

I shall treat of the first of these sections under the following heads:

1. The selection of suitable cases;
2. The operation;
3. The dressing and after-treatment and
4. The character of and power of resisting distinction possessed by the resulting cicatrix.
1. The selection of suitable cases.

Patients should never be selected for the operation unless they can be kept constantly in bed. Where the operation has been performed on hospital out-patients, the result has never been quite satisfactory, though it has sometimes been partially successful. In the case of one or two intelligent hospital patients visited at their own homes, however, who could be depended on to keep in bed, the result has been satisfactory enough.

The suitability of the operation, except in cases prevented from healing only by the state of severity of the parts involved, bears a proportion to the size of the ulcer.

In cases, in which it is desirable from any circumstance to curtail the duration of the treatment, skin grafting becomes of much value.

The operation is quite justifiable and often advised in the treatment of any ulcer that has a diameter of an inch and a half or more, provided that the ulcer can be brought into a healthy state before the conjunctive is performed. It is desirable to have the ulcer at this time, moderately well covered with florid, firm granulations and not affected to any appreciable extent by inflammation. It is of no use to place grafts upon an unhealthy surface with the object of inducing healthy action and of causing the margins of the ulcer in nearest proximity to the graft to send off processes to meet it, as is maintained by some. The truth is that a graft will not grow upon an unhealthy surface and that the degree of its vitality and growth is, ceteris paribus, in direct proportion to the degree of healthiness existing in the ulcer at the time of the conjunctive.
and subsequently to it. On a healthy surface, however, a graft has a well marked power of inducing the margin of the ulcer most contiguous to it to spread out to meet it.

There are cases, however, to which what has been mentioned above as influencing the selection of sites and cases does not in great measure apply. I mean those in which the ulcer is prevented from healing by the severity of the parts involved. This is generally due to cicatricial contraction, though it may be caused in other ways. An ulcer of this kind is often at first of large size and heals readily up to a certain point, when it becomes most obstinately stationary. Such an ulcer, if thin translucent granulations, is characterized by deficient action and is often the result of extensive burns. In an ulcer of this type, however small or how so large it may be, thin grafting is most beneficial. In the case of the larger ulcers, however, a good many grafts must be induced to grow in a group, and especially near the margins of the ulcer, in order to experience the full benefit of the operation. There is considerable difficulty in inducing the growth of grafts on such an ulcer and, unless a fair number of grafts are put on and great care exercised at first to ensure their growth, no perceptible benefit will follow the operation. One or two isolated grafts may "take" and grow until they are about the eighth of an inch in diameter, but after that, unless several have taken in close proximity to each other or to the margins of the wound, they invariably cease growing. If, however, a cluster of grafts grow, the wound heals...
be expected to heal where the grafts are. By repeated essaying large ulcers of the kind described may be thus healed and as it is next to impossible to form a number of such ulcers to heel without essaying, the operation is here of great value.

The operation.

After the ulcer has been brought into a healthy condition, the dressings are removed and the ulcer and surrounding parts thoroughly cleansed by using first a lotion of equal parts of warm water and one to one hundred of carbolic lotion and afterwards warm water alone. The parts surrounding the ulcer are then dried and all superficial moisture removed from the ulcers itself by using a piece of dry lint, until it presents only a moderate and equally distributed degree of humidity. It is advisable to keep the lint from getting chilled during the few moments necessary for this and the other preparations. The operation is then to be proceeded with. It is important that everything which comes in contact with the grafts during its performance should be warmed and slightly moistened by immersion in warm water. This may not be necessary when a piece of skin is removed and immediately placed upon the ulcer; but when as is described below, the graft is repeatedly subdivided, if this precaution be not taken, the ultimate sub-divisions of the graft are shrivelled and dried up and destitute of vitality. On the other hand, it is necessary to keep the pieces of skin at the time they are placed upon the ulcer not too much saturated with moisture. Such a state would be very detrimental to the establishment of the nutrition of the graft by endo
and exorcese between it and the granulations, which is the cause of its continued vitality at the first and most critical period of its life in its new situation. During the process of the sub-division of the graft, it may be allowed to take up as much moisture as it can, without any interference with its subsequent vitality, provided that it be deprived of this superfluous moisture before its final application to the ulcer. This is most easily effected by holding it, on the point of the scalpel with which it has been removed, and with which it is laid upon the ulcer, in direct contact with a sheet of blotting-paper for a few seconds.

The skin required is taken from the flexor aspect of the patient's arm, or forearm, in preference to the extensor aspect. The skin thus obtained is more delicate, and consequently more easily removed and perhaps more likely to grow. It can be obtained, with least pain to the patient, by taking up a small portion with scissors or forceps, and severing it with a sharp scalpel. The points of these forceps are better adapted for securely holding a small bit of skin than the points of direct cutting or dressing forceps. With the latter the skin is apt to slip from the grasp of the forceps in being divided. I have never used Cripps' skin-grafting scissors described in The Lancet of June 3d, 1871, and think they are utterly useless. The piece of skin removed should be about the eighth or tenth inch in diameter. The wound left on the arm by the removal of such a piece is nearly twice this size. The piece of skin thus obtained should be divided as rapidly as possible upon a piece of car
on the back of a sheet of soft wood, which has been
kept warm and moist in warm water, into a number
of smaller pieces. The number of pieces, thus obtained,
may be extended up to twenty or thirty, by repeated sub-
divisions, without destroying the vitality of the grafts,
if the operation be performed under the conditions
mentioned. It is advisable to put the grafts upon
the ulcer at a distance of two-thirds of an inch from
each other and to plant the whole surface of the ulcer
in this way at once. In treating very large ulcers, it
is sometimes necessary to remove two pieces of skin
from the arm of the patient, in order to obtain the
requisite number of grafts. As each graft is
obtained, it is laid upon the surface of the gran-
ulations in the site where it is required. When
all the grafts have been thus put on, each of
them is slightly pressed into its bed with the
point of a probe. Then each graft is covered
with a piece of gutta-percha tissue or oil-cloth, preferably
the former, a quarter of an inch square, which has
been cut obliquely, moistened with water. Next
very narrow strips of strapping, about a quarter
or sixth of an inch across, are warmed and applied
over the ulcer and bed of gutta-percha tissue in three
directions in which they will come directly over the
greater number of grafts. Care must be taken in
doing this, to avoid disturbing the grafts by any
lateral motion of the strips of strapping on the surface
of the ulcer. When all the grafts are thus secured
the dressing is applied. Care must be taken in
applying the strips of strapping, to have the margin
of the ulcer quite dry and the strips themselves well
warmed and of sufficient length to get a very
secure hold of the surrounding inclusions.
The reason why the bits of tissue and strapping used are of such small dimensions is that, if they were larger, they would entirely cover over the surface of the ulcer and, by preventing the free escape of pus, would cause the parts to float out of their beds. The strips of strapping are not so necessary to the success of the case, as we might imagine, but they give considerable additional security.

The multiplication of the number of grafts is of importance as greatly accelerating the cure and also for the reason stated below in treating of the durability of the cicatrix.

I may mention that I have used pieces of skin taken from the margins of wounds in cases, in which they could be obtained more easily by this than by the other method; as, for instance, where small processes of skin at the margins of lacerated wounds, have retained their vitality and projected loosely as small flaps. I find skin thus obtained less painful to raise and to its density. It has a semi-cartilaginous section, due to evagination into its tissue, and establishes endermose and exo-méso with the granulations on with great difficulty.

The plan of scraping epidermic scales off the skin and scattering them over the ulcer is of no use at all.

Large pieces of skin, obtained from amputated limbs, the skin of various animals, (a practice in Walshefield skin-plastered an ulcer under this care from a young pig.), the roots of human hairs, the skin of the nape and other varieties and appendages of skin have been used with but very indifferent success.

It is best to take the skin required from the patient and not from some other person's body. It should be borne in mind that the object of
Thin grafts should be, to form the greatest number of centres of cicatrisation at least cost to the patient. The size of the centres, when first cut out, does not being immaterial.

I have employed other methods, than that above described, of conducting some of the steps of the operation, which it would be tedious to describe.

The dressing of the ulcer and after-treatment. The dressing of the ulcer for the first two days after the operation, is of great importance. Water-dressing is used during the first forty-eight hours and during this time the dressing, when once it has been applied, is not meddled with. The dressing of lint used consists of two thicknesses cut so as to overlap the margins of the wound for two or three inches. These are wrung out of warm water and applied to the ulcer with the wrong side of the lint next to it. The fluffy material on the right side of the lint is apt to get entangled with the grafts, if this side is applied next the ulcer. Over the lint, some cotton-wool or, what is better, some of the recently introduced absorbent cotton-wool is applied and made to envelop the circumference of the limb, if the ulcer is situated on one of the limbs. In all cases, it is made to extend considerably beyond the margins of the lint. The cotton-wool is used chiefly in order to prevent lateral shifting of the dress dressing. It is most efficacious in securing this essential point. The cotton-wool is also of use in distributing the pressure of the bandage, which is used, equally over the ulcer. The bandage is put on rather firmly and, when the ulcer is under the cup, the limb is bandaged from the toes upwards to some distance above.
The ulcer.

When two days have elapsed the dressing, the strips of strapping and the pieces of gutta percha in the or oil-silk are all removed. If the wound has been well cleansed at first only, a slight odour will be now perceptible. It is now sufficiently cleansed by squeezing drop by drop, a lotion composed of equal parts of warm water and one to two hundred of carbolic lotion out of a piece of absorbent cotton wool or lint on it. The grafts still in situ will now be seen, either in the same condition as when they were first put on, or as greyish black spots. The former of these are in a flourishing condition and the latter though they appear like ulcers are not really such, for in nearly all the deeper layer of the graft has lived and adhered to the granulations. The ulcer is always cut off in the first four days from the operation and then such a graft becomes almost invisible but it always becomes apparent again in a few days more. There will probably be no sign at all of some of the grafts, when the ulcer is first opened out. It is quite problematical whether anything further will be seen of these missing grafts. Some few do reappear in time, but of the majority nothing further is seen.

The ulcer is now dressed with red lotion (From a grain of naphthaline zinc dissolved in one ounce of water and coloured with compound tincture of lavender). A single thickness of lint, rather larger than the ulcer, soaked in the lotion and covered with gauze a piece of gauze, is the form of dressing used. Most cases are dressed with red lotion daily until the ulcer has healed. After the first week the form of dressing made early is decided by the same rules as would apply in the
case of an ordinary ulcer. The patient is never allowed to get out of bed for any purpose during the treatment. If a second set of grafts are put on, as is sometimes advisable, the course pursued is similar to that already described.

I may mention that I have tried the plan of changing the dressing first at the end of twenty-four hours and found it out to answer. Among the dressings I have tried, at the time of the operation, are red lotion, carbolic lotion (1:100 and 1:50), lead lotion, vaseline, zinc ointment, boracic ointment and carbolic oil (1:20). Lead lotion is the mostuitable of these and carbolic oil the least. Oils and emulsions generally have a bad effect at first. Boracic ointment answers pretty well; it does not adhere to the ulcer like other ointments but is apt to adhere to the dressing and margin of the wound in cakes, which can however be peeled off. Water dressing is the best form of dressing for the first two days. Many of the other dressings mentioned have a direct destructive effect upon the graft.

The character of and power of resisting destruction possessed by the resulting cicatrix. I have found the cicatrix similar to that obtained by the healing of ulcers in the ordinary way, except in the immediate vicinity of each graft. In this locality, the cicatrix has a much greater power of resisting destruction than that at a distance from the graft. This beneficial effect of the graft seems to extend to about a quarter of an inch from them. We must bear in mind that each graft is a portion of true skin. It is no doubt due to the immediate vicinity of this true skin that the cicatrix...
in the neighbourhood has more vitality than would otherwise be the case. There are many facts in medicine and surgery, which bear an analogy to this Tendency of cicatrix to become more like skin and more capable of discharging its functions the nearer it approaches to it. &q. The tendency of malignant growths to convert the tissues around them into their own proper structure; for though it is true that this tendency of malignant growths to spread is due to their infiltrating the surrounding tissues with new material and subsequently destroying the original texture, yet there is a similarity in this; that is, both cases, there is an influence exercised over the surrounding tissues, though it is of a different kind. Thus one thing has such an influence over the cicatrix in its immediate vicinity, as to render it capable of better fulfilling the functions of skin and malignant growths have such an influence over the tissues around them as to render them incapable of resisting the spread of the growths. A proof of the influence exercised by the graft upon the cicatrix is seen in the healing down of cicatrix formed by thin grafting, in which a small island of cicatrix will remain intact around each graft and will continue to cleave to life long after every vestige of cicatrix has vanished from parts more distant from the skin. In this fact, there is an additional and very powerful inducement to multiply the number of grafts originally put on.

In consequence of the rapidity with which the cicatrix is formed by thin grafting, the ulcer is covered over before cicatricial contraction takes place to any extent. Consequently the cicatrix covers a larger area than it otherwise would do.
and there is less dressing or surrounding texture and less ensuing deformity. Of course, contraction eventually takes place, but still there is a distinct gain remaining, because the amount of cicatrix originally formed has been more ample.

Cases.

The following eight cases are all illustrations of the treatment I have described. I may as well state now to spare the repeated statement of the fact in describing each individual case, that the mode of performing the operation in and, in short, the whole treatment of each case, has been exactly according to the rules previously given.

The cases are of comparatively recent date. In many other cases, I have tried various methods, but latterly I have treated almost all cases by the method of which the cases given are illustrative.

I.

H. T. aged twenty-five, collier, admitted Jan. 7th 1880. On admission, besides other slight injuries, the patient was found to be suffering from a lacerated wound of the right leg of very great extent. The patient stated that it was caused by a fall of the roof in the pit where he was at work. The wound extended from half a foot above the knee joint to the ankle and was situated on the outer aspect of the limb. Transversely, the wound extended from a line in front roughly corresponding to the anterior border...
of the fibia to the middle line of the calf behind. At some points it extended considerably beyond this line. The bones of the leg were not fractured and the muscles were only slightly and superficially lacerated. The skin and subcutaneous cellular tissues had been stripped off backwards and were hanging in a flap from the back of the leg. The whole of the flap mentioned subsequently slipped off, perhaps from being thoroughly chilled at this time the patient was brought to the hospital. For some time the patient was in a critical state but eventually became convalescent. Two weeks after his admission, the wound had assumed the character of a healthy healing one. It now measured eighteen inches in length and nine and a half in breadth. Two pieces of tissue were removed from the arm and subdivided into thirty smaller pieces. These were placed on the wound chiefly round its margins. Fourteen of these grafts were never lost sight of and rapidly increased in size. One other grafts, which were not at first visible, subsequently made their appearance. Fourteen days after the first set were engrafted, a second set of grafts, numbering twenty-four, were put on. Of these fourteen took and spread as rapidly as the others had done. The grafts nearest the margins of the wound soon became joined to each other and to the margins of the wound by cicatrices and the two, at the same time, became divided into sections by bands of cicatrices stretching across it. A third set of twelve grafts were afterwards put on, of which eight took.
time, besides several grafts situated in continuos cicatrix round the margins of the wound and consequently not clearly distinguishable, about six different islands of cicatrix might be counted in the wound. The process of healing was completed and the patient discharged cured, three months after his admission.

At the time of his discharge, the cicatrix was quite sound and the leg could be freely used. It had been kept extended by a weight and pulley during the latter part of the treatment. I regret that I do not know whether the cicatrix is still enduring. It looked very like lasting at the time the patient was discharged. I have written twice to him to ascertain the state of the cicatrix and as, though he was very grateful when he left the hospital, I have not received any reply, I conclude he has left the neighbourhood.

Case 2.

S. R., aged 13, willhand, admitted March 25th, 1882. On admission, the patient had a lacerated wound of the arm five square inches in extent. Nine grafts were put on. First of these took and grew well. Some of the grafts disappeared for a time and then reappeared. The patient was discharged cured four weeks after admission.

Case 3.

D. P., aged 25, collier, admitted Jan. 28th, 1880 with a lacerated wound of the foot. Two laxes were amputated on admission. A fortnight after admission the wound measured six inches by four. At this time six grafts were engrafted. All of them dis-
appeared, but three reappeared in a day or two and grew well. The patient was detained in hospital a month longer than he otherwise would have been, and owing to recession of the fourth metatarsal bone and was discharged cured on April 9th 1886.

Case 4.

Mr. W. aged 38, housewife, came under notice as a home patient on April 27th 1886. On being visited, the patient was found to be suffering from a chronic ulcer of the leg of three years duration. The ulcer was about four inches in diameter. It was much inflamed and the surface was of a dirty grey colour. It was at first poulticed, the patient being confined to the recumbent posture. Lead lotion was subsequently used. On the 10th of May the ulcer had assumed a healthy aspect. Six grafts were now put on. All the grafts took and grew well. The patient was discharged cured on June 30th. The ulcer was healed some weeks before this time and the visits up to June 30th were paid only in order to see that the cicatrix did not break down. I saw this patient in February 1891 and the cicatrix was then as perfect as at first.

Case 5.

P. B. aged fourteen, admitted with mangled arm and shoulder. Amputation through severely bruised fracture was performed at the shoulder joint. After slapping and aspiring suspicion, the wound improved. A considerable surface was left uncovered by skin. Skin grafts were performed. The skin used was a coarse bit projecting from the margins of the wound. Fifteen grafts were
put on. Some of the grafts appeared to have taken at first, though one subsequently made itself visible.

Case 6.
6. P. aged nineteen, out-patient, had a large chronic ulcer on the back and also ulcers on the legs due to burns. Thin-grafting was performed on three different occasions and each time a considerable number of grafts were put on. Only one graft took and this remained as a small spot of cicatrix half an inch broad during the time (3 months) that the patient was under observation. It was one of the first set of grafts applied.

Case 7.
S. H. aged 17, admitted December 1880, with a large ulcer on the leg due to burns. Ten grafts were put on a few days after the patient's admission, of which eight took and grew well. The cicatrix ulcer was very large, because covered in places with a sticky discharge and kept breaking out again. Patient still in hospital Feb 14th.

Case 8.
T. M. aged 40, musician, admitted December 1880, with several ulcers on the leg. The largest measured five inches by three. Nineteen grafts were put on of which eleven took and grew well. The patient was discharged cured five weeks after his admission.

Lochley House, Perth.
April 27th 1881.
I hereby certify that the above thesis has been composed and written entirely by myself, partly at the Clifton Hospital, Wakefield, which I left on February 16th 1881 and partly at the above address.
R. L. Williamson.