

# INFORMATION SHEET SKIN GRAFTS

## INTRODUCTION

A skin graft is a layer or sheet of skin which has been shaved or cut from one part of the body so that it can be laid onto another part. I hope that this information sheet may help you understand some of the common features of skin grafting. It is an enormous subject and some of the details are quite complicated, and so this information sheet cannot be comprehensive. The subjects which will be discussed are:

1. Types of skin graft  
Commonest: SSG (split thickness skin grafts)  
Less common: Full thickness grafts  
Rare: Composite grafts
  
2. Techniques of application meshed and unmeshed  
(stitched, glued, taped, quilted, stapled)
  
3. Donor sites  
(position of donor site, scarring, over-grafting, healing time and appearance)
  
4. Results of skin grafting  
(colour, feel, texture, thickness, contour, final appearance, sensibility)
  
5. Complications  
(loss of skin graft, infection, haematoma, hypertrophic scarring)

## THE USE OF SKIN GRAFTS

Skin grafts are used to heal a gap in the skin. If one can join the edges of a wound together without too much tension by stitching or stapling, then so much the better, but the size of the wound is often so great that it is impossible to join the edges of the wound together and if left to heal by itself it would heal very slowly. When a wound heals first time without any delays it is known as primary healing, but when it is left to heal by itself this is known as secondary healing. A skin graft is one way of achieving primary healing or closing a wound which has failed to heal by secondary healing.

When a skin graft is put onto a wound it first sticks to the wound because of the stickiness of blood (fibrinogen turning to fibrin which is like human glue). This glue bonds the skin graft to the bed quite effectively for several hours but is not enough by itself to make the graft stick forever, because blood vessels in the skin graft have to link up with blood vessels in the bed onto which the skin graft is placed. This link up of blood vessels starts within about 24 hours but only a small amount of friction on the skin graft will be enough to break these bonds, and so the skin graft has to be protected from too much movement or friction for several days. The skin graft will have achieved its own new circulation of blood in an immature way within 3-5 days and will then become progressively stronger with time. By 2-3 weeks it will be difficult to pull the skin graft away. After that the skin graft becomes more solidly fixed in place and it is often only the edges which are still a little bit unstable where the skin graft joins the normal skin. One often sees crusts and small bleeding points around the edges of a skin graft. Most crusting would have stopped however by 2-3 weeks and can be assisted by the application of ointments or creams. Most skin grafts can stand modest amounts of friction, normal washing and don't need special dressings by about 3-4 weeks.

Patients and nurses, who are not familiar with seeing grafts, are often very afraid of disturbing a graft for many weeks and allow the build-up of enormous numbers of crusts and debris on the surface. However, this in fact only interferes with natural healing and so it is worth checking with the surgeon about this if specific instructions are not given about the care of the skin graft. In the long term skin grafts often feel and look rather dry because they lack the moisture and oily secretions to keep the skin comfortable. It is often, therefore, worth applying moisturisers to a skin grafted area particularly if it is large to stop the graft feeling too dry or itchy. This may be necessary for months or sometimes years if the skin graft areas are very extensive (after burns for example).

Grafts continue to soften and mature in terms of their colour and contour and texture over a 12-18 month period but one doesn't usually expect much change after that.

### **DIFFERENT TYPES OF SKIN GRAFTS**

Different types of skin grafts are used in different situations and the skill of a plastic surgeon is to know which type of graft is most appropriate for which type of wound.

Surgeons have been using skin grafts for 150 years or so. It was soon realised that very thin skin grafts had a better chance of sticking to a wound bed than skin which is thick or which had fat still attached to its underside. This gave rise to two common types of skin graft and one relatively uncommon one. The two common types are called "split skin grafts and full thickness skin grafts". They are sometimes given the names of the surgeons who first described and used them (Thiersche and Wolfe).

The third type of skin graft is known as a composite graft because it contains not only skin but fat and/or cartilage and is used only in very special circumstances. (For example using part of an earlobe to reconstruct the tip of the nose or nostril.)

One of the advantages of a full thickness skin graft is that it mimics the colour and texture of the skin very much better than a split thickness graft which often appears rather thin, tight and shiny and of a different colour from the area onto which it is applied.

One cannot afford to take away large areas of full thickness skin without suffering another very large wound which would then have to be skin grafted with a split thickness graft itself. Full thickness grafts, therefore, are usually small and are most often used on the face or head and are taken from a part of the face or the head where the resulting scar is relatively inconspicuous, ie the back of the ear or the lower part of the neck. Another common donor site for full thickness grafts is the groin because one can close the wound directly leaving a scar in a relatively inconspicuous area of the body.

With split thickness grafts one is only taking away part of the thickness of the skin and so one is leaving behind sufficient skin capable of healing by itself. Split thickness grafts are, therefore, used when large areas of graft are needed. The donor site for a split thickness graft can be expected usually to heal in 7-14 days, depending on the age of the patient, and where it is located on the body and lots of other factors, such as the general health of the patient.

The donor sites for split thickness grafts are usually covered with a special dressing to assist them to heal as quickly as possible. The right dressing cannot make a graft heal at

a super normal rate but certainly there are some dressings that were used in the past which have been now shown to slow down the rate of healing.

-4-

Many dressings now incorporate either a seaweed type gel or some kind of membrane under which the cells responsible for healing can spread easily and quickly.

If a donor site becomes infected this may delay the healing for several days or sometimes weeks. The donor sites in elderly patients heal more slowly than in fit young people and so the surgeon may recommend a technique of re-grafting the donor site with so-called expanded skin graft from the same place. Expansion of a skin graft is achieved by meshing.

### **MESHED SKIN GRAFTS**

Meshing means that a graft has a lot of holes made in it by passing the graft through a special machine which cuts slits in it. It is then possible to pull the edges of the graft away from each other converting a sheet of skin into what looks like a string vest or piece of netting. These mesh grafts can cover three times the area of the original donor site. Therefore, in these special situations when a skin graft has been taken it can then be cut into two halves one half being used to resurface the donor site and the other half being used to cover the wound which needs skin grafting. This then means that both areas should heal at the same rate usually within 10-12 days or so.

### **THE "TAKE" OF THE GRAFT**

There are many things which influence the take of a skin graft. This is a very big subject and so I cannot include every factor here but there are several important points to understand.

The graft has to make a sticky contact with its wound bed. If the bed bleeds after the graft has been placed onto it a blood clot may form which prevents the graft from sticking to the bed and this is known as a haematoma. It can be very small or very large and by itself it isn't dangerous but it will result in a failure of the skin graft to achieve a circulation and so the skin graft will probably die in the part where it covers the haematoma. Similarly a collection of fluid, like a big blister, can do just the same.

If the bonding of the graft to its bed is dissolved by the bacteria of an infection the graft will simply slide around on the surface and fail to stick and will fail to get the

circulation of blood within it necessary to keep it alive. It is, therefore, important to try and eliminate infection before the graft is put onto the bed.

-5-

There are certain types of infection which are much more serious than others and the types of infection which a plastic surgeon fears most include haemolytic streptococci, staphylococcus aureus (of which the notorious MRSA is one example), Pseudomonas and various other rarer organisms. Skins grafting is often delayed when it is known that the person has one or more of these organisms in the wound bed because the surgeon knows that the chances of take are so poor when these organisms are present that it is not worth taking the risk of operating.

If movement or friction is applied accidentally to the skin graft it may slide off at any time in the first 24 hours before it becomes firmly stuck. It can, therefore, end up rather wrinkled or rucked, like a loose sheet on a bed. It is the job of the surgeon and the nurses to try and make sure that the patient can rest the area which has been skin grafted and does not move it excessively in order to avoid the skin graft being sheared away from its bed.

If the bed for the graft has very few blood vessels in its surface there will be less chance of the blood vessels in the graft linking up with the blood vessels in the bed and so the graft may not take satisfactorily. We can, therefore, not expect a skin graft to take onto bare bone or bare cartilage or bare tendon because none of these have many blood vessels in their outer surface. Radiotherapy often damages skin such that there is a very poor blood supply in the skin surface and in fact this is one of the ways that radiotherapy kills cancer by depriving it of blood supply. This means that a skin graft won't take very well on an area which has had radiotherapy.

Sometimes the blood pressure in the wound bed on the lower limb, particularly in the ankle area, is so much that a skin graft cannot withstand the pressure in the blood vessels as soon as they link up and the graft is, so to speak, blown off by the high pressure of blood within it. The only way to stop this is for the patient to elevate the leg to reduce the blood pressure in the small blood vessels. The patient may well have to lie in bed for a day or two or sometimes for longer until the graft has stabilised and can then withstand the hydrostatic pressure that will occur as soon as he or she stands up. The hydrostatic pressure can sometimes be counter-acted by very firm bandaging around the ankle area and this may well have to be continued for a week or more. If the

skin grafting is being done for venous ulceration it may well have to be continued for many months and sometimes permanently.

-6-

The problem of bleeding from the wound bed can be so troublesome that some surgeons have adopted a policy of delayed skin grafting. The graft is then taken on one day but not applied immediately but is kept cool in a 'fridge at 4° Centigrade and then applied a day or so later when the risk of bleeding will be very much less.

### **FIXING THE GRAFT IN PLACE**

A skin graft is usually stitched into place around its edges with either dissolving or non-dissolving stitches. Sometimes it is quilted across its centre to try and prevent a haematoma from forming. Sometimes the graft is glued into place to avoid the use of stitches but only if there is enough skin graft available to be able to overlap it across the margins of the wound bed.

There are advantages and disadvantages to gluing. Sometimes both stitching and glue are used.

Sometimes staples are used because they can be used extremely quickly and it may take only half a minute to put in 30 staples as opposed to 20 minutes to put in the same number of stitches.

The staples will need to be removed just like non-dissolving stitches. This is usually done at any stage after 4 or 5 days when it is thought that the graft has stabilised.

The removal of the stitches or staples is usually painless but sometimes a stitch or staple goes through or close to a nerve and so the odd twinge of pain may be experienced.

### **MONITORING OF THE GRAFT**

The skin graft is monitored for take in various ways. Sometimes no dressing is put onto the graft at all, for example on the face where it may merely be stitched into place and left open to the air with the application of ointment around its edges once or twice a day. Not only the doctors and nurses but the patient can, therefore, check the progress of the graft and report any problems if they are worried. If a dressing has been put on it is usually left intact for a minimum of two days and in the majority of cases it is left intact for 5 or 6 days.

Sometimes the dressing is tied into place using the same stitches as were used to fix the edge of the graft to the sides of the wound. This is known as a "tie-over dressing".

These tie-over stitches, therefore, have to be cut to remove the dressing. It does not hurt at all to remove these stitches.

A skin graft applied to a limb is usually bandaged firmly in place but due to movement of the limb may slip down the leg or the arm and is, therefore, sometimes held more firmly by adding adhesive plasters. If it does become loose it is sensible to ask a nurse or your surgeon to check it and if necessary renew the bandaging. It is important that the patient does not interfere with the dressing unless directed to do so. The reason for this is that the graft sometimes sticks almost better to the dressing than it does to the bed around the margins and in the early stages of healing it is still possible to pull the graft off with the dressing unless one takes care. If, however, the graft has failed to take due to infection, bleeding or some other cause, the graft may in any case come off with the dressing or sometimes part of the graft looks very satisfactory and has taken securely while other parts look messy with only partial take.

Plastic surgeons often anticipate less than 100% take of a graft and, therefore, if there is any skin graft left over from the donor site when it is being applied to the wound it is stored in the 'fridge, so that spare bits of skin can be applied to any area which has failed to take, provided of course the reason for failure is not gross infection.

Usually if bits of skin are put on to replace areas where there has been failure of take it is not necessary to stitch them into place because they are relatively small and can be stuck down with Steri-strips or glue.

Sometimes it is necessary to apply antiseptic creams or ointments to try and reduce any sign of infection.

It is not sensible to generalise too much about how successful skin grafting is because every case is different. However, one can expect satisfactory take of a skin graft in about 90% of cases where there was no infection known at the time of the operation, and where one is not applying the skin graft to an open wound caused by trauma, burns,

etc. Thus, in the common situations of having to put a skin graft to release a patch of very tight scarring, one can expect that 9 out of 10 cases will get very satisfactory take of the skin graft.

-8-

The rate of success, however, for burn wounds or infected wounds due to ulceration and other causes may be only 60-70% in the sense that there will be 60-70% take of the graft.

If there is complete failure of the graft to take it will usually be due to infection or some other condition of the skin, such as a vasculitis or some other problem already mentioned. Fortunately, this is relatively rare and is usually very unexpected.

If the surgeon knows that there is likely to be a problem he will normally warn the patient of this.

### **APPEARANCE OF THE GRAFT**

The colour of the skin graft changes dramatically with time. At first it usually appears purplish. This continues for a few days and then it starts to appear pinker or redder as the blood supply improves and a more normal circulation occurs inside the graft. With the further passage of time better control of flow of the blood through the graft occurs and it takes on a more mauve or pale appearance. One can usually expect the colour of the graft on the face to look almost normal within 6 months but in a few patients it takes longer. On the rest of the body it may take a lot longer and usually the colour of the graft appears paler than the surrounding skin, particularly on the limbs or the trunk, but this may take two years or more, particularly in young people.

Eventually a full thickness graft on the face should blend fairly well with the surrounding skin but a split thickness graft on the face will appear as a distinct patch with a different colour and texture to the surrounding skin. A split thickness graft on the other parts of the body will usually appear paler than the surrounding skin and will remain so.

If a meshed graft has been used it appears very much like a lattice or string vest appearance. This is its major disadvantage and the problems of the appearance of a meshed graft have to be balanced against the many advantages of using it because a meshed graft will often take much better under adverse circumstances than an unmeshed

skin graft. Thus, one can improve the chances of take by using a meshed graft which might save the person from having more than one operation.

-9-

One can often get a meshed graft to take where an ordinary graft will not take, either because of infection or the contour of the deformity or because of inherent movement of that part. A meshed graft will often adapt to irregular contours very much better than an ordinary graft will.

Fortunately in the long term, ie after 2 or 3 years the lattice appearance fades and looks less peculiar.

The appearance of a skin graft in someone with coloured skin, ie very pigmented skin, is less predictable and sometimes it appears darker and sometimes lighter than the surrounding area. The colour of the donor site is also a bit unpredictable. In a pale skinned individual the donor site often fades very well indeed, particularly if the thickness of the skin graft was very thin originally. However, if a thick split thickness graft was taken the donor site may appear purplish for a year or more and fade only slowly and eventually become mauve in colour. Similarly if the skin graft taken was relatively thick there may be some damage to the hair, and hair growth may be a bit sparse.

The colour of a donor site in a dark skinned person is even less predictable but quite frequently it ends up as being darker than the skin which had been there. This can be a source of embarrassment and so one has to be cautious in selecting the area for the donor site in someone who is naturally dark skinned.

It should be realised that a skin graft at best looks reasonably similar to the skin around it but it can never have exactly the same texture or colour or feel or sensation or contour as the skin it has replaced. At worst it may continue to appear distinctly obvious like an isolated spare patch, as in a patchwork quilt, which is very noticeable, rather dry and itchy and something which the person would rather hide and cover with clothing.

I hope that this information sheet makes you now realise that a skin graft is seldom a good substitute for an existing scar. A lot of people believe that one can cut out a scar, put a skin graft in its place and make it look better but this is seldom in fact true.

There is one last complication which needs to be discussed. This is known as hypertrophic or keloid scarring.

-10-

Hypertrophic and keloid scarring basically means an overgrown, thickened, hard, unsightly scar. The body has failed to control the mechanism by which a wound heals and there is an overgrowth of scar tissue. There is a separate information sheet written on this subject because it is a fairly complicated matter.

It is difficult to give statistics about this in a meaningful way but very generally about 5% of people suffer this problem to a greater or lesser degree. People of African origin suffer it much more commonly than people with white or Asian skin. Hypertrophic scarring or keloid scarring seldom occurs in the actual area of the skin graft but it may well arise where the skin graft joins the normal skin, and special measures may need to be taken if it occurs or if it is known that it is likely to occur.

### **CONCLUSIONS**

Skin grafting has evolved over 150 years. Further advances will be made in the future I am sure. We still have much to learn. I have purposely avoided talking about skin culture because it is very highly specialised and only used by highly specialised units centred on the care of very severely burned patients. It is not something used in routine plastic surgery practice.

I hope you have found this information sheet useful and hope that if you have to have a skin graft that it takes 100% first time and that you have none of the complications I have described.

If you want the information sheet about hypertrophic and keloid scarring please ask my secretary for these.

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