DOCTORS TEST IMPROVED SKIN GRAFT TECHNIQUE ON THEMSELVES

John Nevell

Doctors at the Odstock hospital in Salisbury, southern England, are developing an implant material which improves skin grafting and tissue repair techques and so helps to reduce disfigurement after severe burning and other injuries.

As a safety precaution the doctors first tested the new technique, which involves the use of specially treated skin material, by implanting samples of the new material into their own bodies for periods of more than two years.

A major limitation of skin grafting is that the skin used for the graft is very thin and the damage to be repaired by covering with the graft may be deep. This often means that after skin grafting the areas which have been treated do not have the same contours as before, and this is particularly noticeable on the face.

If it were possible to graft the full thickness of skin to repair damage, this change of contour would seldom be a problem. But at present only the thin outer layer of the skin, the so-called epidermis, can be grafted.

Craters Left In Skin

Below the epidermis is the much thicker inner layer of the skin, the dermis, consisting mainly of the tough, elastic protein collagen which also contains many living cells. Ideally, deep burns and other injuries should be repaired by grafting both dermis any epidermis.

But if areas of dermis are removed from a patient's own body to repair damage to another part then, unlike the epidermis, new dermis does not grow to fill the gap. And dermis cannot be taken from another person because it will be recognised as foreign tissue and rejected.

For these reasons Dr. Roy Oliver of Dundee University, Scotland, has been working for several years to develop a means of treating collagen, taken either during surgery or from a cadaver (a newly dead body), so that it can be transplanted without causing rejection. His work reached the point where animal experiments suggested that collagen treated by the means he has developed will not cause rejection. But the crucial test of implanting collagen treated in such a way in humans still remained to be carried out.

Overcoming Rejection

This final obstacle has now been overcome by biochemist Dr. Peter Shakespeare and plastic surgeon Mr. Richard Griffiths of the Odstock Hospital in Salisbury.

Dr. Shakespeare took collagen from human tissue removed during surgery in the hospital, which is one of the principal British centres for plastic surgery and the treatment of burns. He treated the collagen with the enzyme trypsin to remove all living cells from it, and with glutaraldehyde to toughen it. Next the collagen was irradiated to kill any bacteria or viruses which might lurk in it.

Then small strips of the treated collagen, 1.5 x 0.5 x 0.33 cm, were implanted in Dr. Shakespeare's arm and Mr. Griffiths' abdomen—the abdomen being chosen in the case of the surgeon because of his frequent need to scrub his arms for the operating theatre.

That was in May 1978. Since then tiny samples of the implants (biopsies) have been removed at intervals and examined microscopically. No signs of rejection have appeared and the implants have become colonised by cells from the doctors' own bodies. This proves that it is safe to use treated collagen in long-term implants to help to repair damaged tissue.

Dr. Shakespeare and Mr. Griffiths think that the way is now clear for large scale trials of treated collagen in skin grafting.

Making A Start

They hope shortly to start using it in this way at the Odstock hospital. One fear which has been expressed is that in spite of chemical treatment and irradiation, so-called "slow" viruses might still survive in the collagen to cause infection in the person receiving it. But Dr. Shakespeare points out that all the evidence suggests that slow viruses are found only in nervous tissue and never occur in collagen.

Now Shakespeare and Griffiths plan to experiment with ways of treating collagen so as to vary its properties to match the parts of the body where it is to be grafted. They will also carry out laboratory experiments to find the best way in which to implant collagen and to cover it with epidermis to recreate the full thickness of the skin.

At present, it looks as though one way to do this might be to pack the damaged area with collagen to completely restore the original contours, and then to seed only a small area of this collagen with epidermal cells which will, it is hoped, spread over the whole surface. The doctors also hope that other skin grafting centres elsewhere in the world will be encouraged to take up and develop collagen grafting.

John Nevell works at the BBC Science Unit.