

TRANSPLANTATION—2

Other Tissues and Organs

By Grant Williams, M.Sc., FRCS

(1) Heart

It is not long ago that the world was surprised to hear of the first heart transplantation in a human being. Since then there have been over 100 more heart transplants performed but recently these seem to be performed less frequently.

There are a number of problems peculiar to heart transplantation, which are not the same for kidney transplantation. These include donor and recipient selection, the transplant immunology of the heart, and the finality of this procedure.

RECIPIENT SELECTION

There are certain conditions where there is no treatment available apart from transplantation. These include the cardiomyopathies, some of the rhabdomyosarcomata, the recurrent myocardial infarctions seen in comparatively young men, certain types of cardiac trauma, and certain congenital defects.

It would be unwise to consider a patient for a cardiac transplant if life expectancy from infection or malignant disease was short. Similarly, some cardiac patients have irreversible damage to their lungs or liver secondary to the heart condition, and no heart transplant can be expected to put these right.

DONOR SELECTION

While it is fairly easy to say that certain recipients will die if they don't have a heart transplant, there are certain emotions in most of us which prevent us saying that a potential donor is dead and his heart should be removed.

Ideally, the best donors are young people who have suffered irreversible brain damage as a result of cerebral trauma or haemorrhage. These patients are often kept alive indefinitely on a respirator when in fact their brains are dead.

Such potential donors must have demonstrably normal hearts which are capable of full recovery after transplantation. They should also be free of infections or extracranial malignant disease.

It has been estimated that only about one quarter or less of potential recipients would receive heart transplants if these criteria are adhered to, as there are not enough donors to go round.

THE OPERATION

Ideal, the heart should be removed while it is still beating from a patient with brain death. Usually one team is doing this while the second team is putting the recipient on total cardiac by-pass with the heart-lung machine, and excising the recipient's heart. The recipient's heart is usually excised first, leaving the clamped aorta and pulmonary arteries and the posterior walls of both atria with their venous inflow.

This technique not only reduces the need for numerous venous anastomoses, but also leaves intact the recipient's own nerve supply to the heart aortic arch and pulmonary vessels.

The excised heart similarly leaves behind the aortic arch and pulmonary trunk, and the posterior walls of the atria with the venae cavae and pulmonary veins.

The atrial septum is reconstituted by sewing the donor septum to the recipient with a 4/0 continuous non-absorbable suture. This is then carried round to the left, sewing the left atrial walls together. At this point the supra-aortic aorta of the donor heart is anastomosed to the base of the recipient's aortic arch and even though the complete suturing in of the heart is not yet finished, the aortic clamps can be released allowing perfusion of the coronary arteries. There is obviously a number of variations of this technique.

It is wise to have the time from excision of the heart to re-establishment of coronary artery perfusion as short as possible (30-40 minutes). Under these conditions, the operation can be done in a normothermic recipient without producing irreversible myocardial damage. The rest of the arterial suturing is now completed so that the venae cavae can now drain into the donor right atrium.

A unique feature of the heart as a transplant organ is its ability to function automatically once coronary perfusion is restored. There is no equivalent in the heart transplant of the acute tubular necrosis seen in the kidney. It may need defibrillating before it starts contracting normally, it may need some digitalis, isoprenaline, or calcium—but by and large it either contracts or doesn't contract.

AFTER OPERATION

The postoperative care of these patients not only includes the normal care of any patient who has had a bilateral thoracotomy, but it will also involve immuno-suppression and prevention of infection.

Unfortunately there is no specific way of measuring threatened rejection. Most of the changes in tests, such as ECG, lactic dehydrogenase estimations and haematological tests occur either not at all or after rejection has started. It is possible that refined methods of measuring the electrical activity of the endocardium may help here. Unfortunately so many transplants have initially done well, only to deteriorate suddenly and die, because it is difficult to monitor their immuno-suppressive regime.

OTHER PROBLEMS

Apart from the problems of rejection, there are two further difficulties to be conquered in the field of cardiac transplantation.

(Contd. on page 417)