EDITORIAL : VAN DIE REDAKSIE

NEW HEARTS FOR OLD?

It is less than 20 years since Gross and Hubbard[1] reported their first successful closure of a patent ductus arteriosus and cardiac surgery has come a long way since then. Congenital as well as acquired cardiac lesions are now tackled in centres all over the world. The techniques are becoming refined, especially since time is no longer the limiting factor it used to be. Induced hypothermia occupied the centre of the stage for a brief period but it is now giving way to the use of an artificial extracorporeal circulation. These 'artificial hearts' take over the circulation for a period long enough to enable the surgeon to work in a relatively bloodless field and to plan definitive and potentially curative (as distinct from palliative) operations. The development of the artificial kidney is an example of similar progress in a different field of medicine. By its use patients with temporary renal insufficiency have been granted a few additional days—sufficient to keep them alive until their own kindeys were able to take up their usual function again.

Human kidneys have even been successfully transplanted from one person to another. At present this can only be done in identical twins. One quails at attempting to assess the rarity of the occurrence of chronic renal disease in one of a pair of identical twins, the other being alive and well and willing to part with one of his kidneys. Yet such operations have already been done.[2] The difficulties of the surgical technique are not insuperable; wide applicability of the method is precluded by immunological obstacles. It is in this field where the most exciting things to happen in medicine for many a year are now taking place—curiously enough with almost a minimum of publicity. The implications of these advances are breath-taking.

The beginnings of these stories were very simple. In 1943 Medawar and Gibson[3] demonstrated that grafts from one individual to another were sloughed with increasing rapidity as the size and frequencies of the grafting was increased. The accelerated reaction to a second graft from the same donor demonstrated an underlying immunological mechanism. Ferrebee and Thomas[4] in a review of this subject point out that there appear to be two ways of avoiding these reactions of immunity. The first is embryological and the second radiological. The embryological mechanism is operative in identical twins. It is also applicable to inbred strains of animals. It occurs when, in cattle, vascular anastomoses exist between the placentae of non-identical twins. A somewhat similar state of affairs with the production of a human chimera has occurred in man.[5] It can be induced artificially in many species by the injection of cells into the embryo or, in the rodent, even during the first few hours of post-natal life. In these animals tolerance to the foreign antigens develop and permits successful transplants of other organs from the donor to the recipient animal.[6] A similar tolerance can, in some instances, be induced by radiation. The work is still in its infancy but in brief it implies giving potentially lethal doses of total body radiation adequate to destroy the mechanism for antibody production. At this stage the animal is injected intravenously with foreign bone-marrow cells. Incredible as it may seem, these foreign erythropoietic, myelopoietic and to some extent lymphopoietic cells 'homed' to their appropriate sites—bone marrow, spleen and lymph nodes. Here they multiplied and replaced the animal's bone marrow previously destroyed by radiation and now allowed the animal not only to survive but to take grafts from the donor animal. It was adequately demonstrated that the proliferating bone-marrow cells originated from the donor and were not the regenerating cells of the recipient.[7,8] Splenectory and the use as ACTH may also assist in promoting acceptance of the 'transplanted marrow'. Grafts may also take in individuals who have afibrinogenaemia or even hypofibrinogenaemia.[9]

It was fairly logical to attempt a cure of leukaemia by this means.[10,11] Mice have been irradiated with a dose sufficient to destroy both the leukaemic and the normal cells. A proportion of the animals survived without evidence of leukaemia. Myleran has also been used. Bone marrow is not difficult to obtain, for even cadaver marrow may be used provided there is no more than 2 hours' delay after death of the donor before the marrow is collected. It can be stored in glycerol at $-70^{\circ}C$, to be used later after removal of the glycerin ('marrow banks'). The method has been tried in man and primates with only partial success. A limiting factor is the tolerance of the gastro-intestinal tract to irradiation.[11]

Once these immunological problems can be overcome, the field will be wide open. Aplastic and hypoplastic anaemias may become curable, as may leukaemia and many varieties of malignant disease. But, more important still, organ transplantation on a vast scale will be feasible and one has only to let one's imagination wander to see where this may lead. No longer will one need to try to patch diseased organs—we can remove them and replace them with others. For so convinced are workers in this field that organ transplantation is virtually around the corner that they are already practising the techniques of the operations. The supply of organs will probably present little difficulty, particularly if organs can be 'stored'. People killed in accidents may perhaps not have died in vain. With a good supply of organs available for transplantation we might be entering an era of surgery as different from the preceding one as that which followed the introduction of anaesthesia. Far-fetched? Maybe; but by no means impossible.

1. Gross, R. E. and Hubbard, J. P. (1939): J. Amer. Med. Assoc., **112**, 729.
2. Merrill, J. P., Murray, J. E., Harrison, J. H. and Guild, W. R. (1956): *Ibid.*, **160**, 277.
3. Medawar, P. B. (1945): J. Anat., **79**, 157.
4. Ferrebee, J. W. and Thomas, E. D. (1958): Amer. J. Med. Sci., **235**, 369.
5. Dunsford, I., Bowley, C. C., Hutchison, A. M., Thompson, J. S., Sanger, R. and Race, R. R. (1953): Brit. Med. J., **2**, 81.
6. Billingham, R. E., Brent, L. and Medawar, P. B. (1956): Phil. Trans., **239**, 357.
7. Nowell, P. C., Cole, L. J., Roan, P. L. and Habermeyer, J. G. (1957): J. Nat. Cancer Inst., **18**, 127.
8. Ford, C. E., Hamerton, J. L., Barnes, D. W. H. and Loutit, J. F. (1956): Nature, **177**, 452.
9. Good, R. A. (1955): Amer. J. Dis. Child., **90**, 577.
10. Barnes, D. W. H., Corp, M. J., Loutit, J. F. and Neal, F. E. (1956): Brit. Med. J., **2**, 626.
11. *Transplantation of Bone Marrow* (1958): Blood, **13**, 266.

VERBINDINGSTELSELS

Die studie van die mens se pogings om afstande te oorbrug en met medemense deur spraak in verbinding te tree, is op sigself reeds interessant. Ons dink in dié verband byvoorbeeld aan die lang en moeisame pad wat die mensdom moes aflê van die primitiewe tom-tom af tot by die hedendaagse radio- en telekommunikasie met televisietelefone en radiofotos.

Die belang van 'n bevredigende hospitaal-interkommunikasiestelsel blyk uit 'n spesiale artikel onlangs in die *Lancet* gepubliseer.[1] Daar is 'n menigte besware teen bestaande stelsels wat hoofsaaklik luidsprekers, klokkies, gekleurde ligte of verligte nommers behels. Op voorstel van prof. C. F. W. Illingworth het genoemde skrywers 'n studie gemaak van radioverbindings in hospitale, en die ideale kenmerke van 'n hospitaal-verbindingstelsel is as volg gedefinieer: (1) Dit moet stil wees, (2) dit moet die aandag van die gesogte persoon trek, maar van niemand anders nie, (3) dit moet by elke punt in die gebou funksioneer en (4) dit moet geen aandag of konsentrasie verg van die persone wat dit gebruik nie.

Die bestaande telefoondiens is bestudeer en daar is gevind dat 44% van die oproepe vir sale bestem was, 44% vir departemente en 12% vir spesifieke persone. Tydens die drukste tye is 1,700 oproepe gehanteer. Die tyd wat in beslag geneem is gedurende 200 oproepe, was 335 minute, bestaande uit 62 minute lui-tyd, 148 minute wag vir persone om na 'n telefoon toe te kom, en 125 minute is aan die gesprekke gewy; m.a.w. 63% van die tyd wat deur telefoonoproepe in beslag geneem is, is nuttelose wagtyd.

Die radiostelsel lui 'n klokkie of gonsklokkie in die sak van die persoon wat die ontvangstelsel dra. Elkeen het sy eie spesifieke frekwensie en die frekwensiesiklusse in 4 verskillende industriële toestelle varieer van 2-15 kilosiklusse per sekonde tot 465 megasiklusse per sekonde. Die koste (in Engeland) van 'n eenheid varieer van £125 tot £475, en die koste van ontvangstoestelle van £18 18s. 0d. tot £25 elk.

In 'n vergelyking tussen die ou metode en radioverbinding, vind die skrywers dat waar slegs 30% van die oproepe binne 0-½ minute gelokaliseer kon word, byna 60% in hierdie tyd per radio-oproep gelokaliseer kon word. Alle geneeshere hoef nie met die stelsel geroep te word nie, bv. hoofde van departemente en diegene wie se bewegings voorspelbaar is, kan per gewone telefoon effektief gesoek word. Huisdokters, narkotiseurs, ongevallebeamptes en saalsusters (wat dikwels vanweë werk in die sykamers, teaters of onbereikbare plekke te vinde is) is die persone wat so 'n ontvangtoestel die nodigste het.

'n Mens hoef slegs in enige hospitaal hier in Suid-Afrika 10 minute lank naby 'n telefoon te sit om die bekende ‚is dr. X daar', of, ‚het u netnou gevra na dr. Y', te hoor. ‚Saans as alles stil is . . . ' is sekerlik nie van toepassing op die meeste hospitale nie.

1. Elliot, H. C. en Lenihan, J. M. A. (1958): Lancet, **1**, 1329.