Exercise and sport after organ transplantation

Transplantation for the treatment of end stage organ failure has been one of the major medical advances of the last 20–30 years. The success of this form of treatment has improved dramatically with better understanding of the rejection process and introduction of more effective immunosuppressive regimens so that patients now live longer. Their quality of life can be further enhanced with regular exercise, which is also important as it lowers the risk of cardiovascular disease and diabetes. This is especially important in transplant recipients as many immunosuppressive drugs can be atherogenic and diabetogenic.

By the time of organ transplantation, patients have suffered a period of chronic ill health leading to end stage organ failure and accompanied by severe deconditioning and exercise intolerance. There may often be psychological disturbance with little motivation for exercise and sport. End stage organ failure affects the whole body, with patients exhibiting severe exercise intolerance, weakness, dyspnoea on exertion, and fatigue.

After organ transplantation the underlying pathophysiological process returns towards normal. The extent of this recovery depends on the function of the transplanted organ, which in turn is determined by the quality of the organ donated (young or old donor, any significant pre-morbid pathology), the quality of organ retrieval, and the occurrence or not of any rejection. With a well functioning organ, factors that may remain include residual sequelae of the underlying disease process and the complications of long term immunosuppressive therapy. Psychological factors can also cause problems.

The kind of organ that has failed—that is, kidney, heart, lung, or liver—will determine some of the problems that the individual may suffer in relation to sporting activity. Renal failure and long dialysis can cause renal osteodystrophy, decreased bone density, osteoporosis, reduced peak cardiac output (because of the arteriovenous fistula required for vascular access), neuropathies, and myopathies. In association with diabetes, a potent cause of renal failure, there are also problems of visual and vascular disorder. Cardiac failure due to ischaemic cardiomyopathy may well be associated with other ischaemic conditions—for example, claudication. The transplanted heart is denervated and thus there is loss of vagal response. There may also be allograft vasculopathy, a manifestation of chronic rejection, which will cause increasing ischaemia of the transplanted heart. In patients with severe pulmonary disease necessitating heart/lung transplantation, there is often malnutrition and muscle wasting. Liver failure can cause abnormalities of lung function including ventilation-perfusion mismatching and loss of oxygen diffusing capacity. The degree of secondary organ involvement is dependent on the course of the illness. The patient who undergoes emergency liver transplantation for acute liver failure will have relatively little secondary damage.

Exercise involves two sorts of risk in transplant recipients, that dependent on the exercise and that dependent on the disease. In normal individuals, exercise is healthy and relatively safe, although there is potential for injury from acute trauma or overuse syndrome determined by the demands of the sport. These risks are present for any participant, and transplantees are no exception. It is common to think that the principal risk is cardiovascular, but this applies generally to the high risk population. In addition to these exercise related risks, transplantees have additional risks related to the organ transplanted, the period of chronic organ insufficiency, and long term immunosuppressive therapy.

Organ specific risks include fractures, particularly of the weight bearing bones and ribs, in renal transplantees as a result of a combination of renal osteodystrophy and corticosteroids. Myopathies constitute a limiting factor to aerobic activity. Transplant trauma is a theoretical possibility, so recipients are advised not to participate in body contact sports. Much research shows that renal transplantees are at high risk of developing cardiovascular disease. In heart transplantees with loss of vagal innervation, hypotension can be a problem, especially if there has been inadequate warming up or cooling down. Glucose homeostasis during exercise with a denervated liver after transplantation could be a problem; however, it has been shown that these patients do maintain normal glucose levels throughout periods of intense exertion. In the same study, hepatic blood flow was also maintained. Serum cholesterol, lactate dehydrogenase, and triglycerides are elevated, so these patients should be screened for cardiovascular disease. There are also risks related to medications, which include exaggerated hypertensive response, myopathies, and fractures, the last of these being the most common.

The benefits of exercise in maintaining a healthy lifestyle and sense of wellbeing are much greater than the risks imposed by organ transplantation. The fitness of transplantees can be illustrated by the Transplant Games, a multidisciplinary sporting event akin to the Olympic and Commonwealth Games for recipients of organ transplants. These games were started in 1978 to demonstrate the benefits of organ transplantation and hopefully increase the public awareness of the need for organ donation. Since then games have been held nationally in many countries and also internationally. The last World Games were held in Sydney, Australia in 1997 where over 50 countries were represented and over 1200 competitors participated. The fitness that can be achieved by transplant athletes was demonstrated at the US Transplant Games in Salt Lake City during August 1996 where a group of the more motivated patients were studied and found to achieve near age-predicted cardiorespiratory fitness. Their health related quality of life assessments were also near normal. In addition, the more active patients had higher peak VO2 and lower percentage body fat than the inactive ones. There have been very few injuries or significant medical problems at either the United States or United Kingdom national transplant games.

In conclusion, transplant recipients can return to a normal life, and, despite some additional risks, can participate in sporting activity and exercise with considerable safety.

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