

The Bone and Joint Decade 2000-2010

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Abstract

The World Health Organisation has declared the period 2000 to 2010 the Bone and Joint Decade. This is indeed timely and appropriate. Hundreds of millions of people in the world today are beset with a host of disabilities caused by trauma, ageing and degeneration and other affections of the musculo-skeletal system. With the state of art of orthopaedic surgery and rheumatology, sufferers of bone and joint disabilities have benefited a great deal from advances in pharmacology, newer techniques of imaging, surgery and man-made materials to replace diseased or damaged bone and cartilage. However, man-made materials, being non-living, are subject to wear and tear and loosening in the host bone. As we advance into the Bone and Joint Decade, further improvement in the treatment of bone and joint diseases lies in more basic cartilage and bone research. The Human Genome Project has provided us with a better understanding of disease genes and the possibility of gene manipulation to prevent and treat specific diseases. Cartilage cells culture and transplant are already a reality. Tissue engineering, i.e. growing cells in three-dimensional substrates of collagen or synthetic biodegradable polymers, started in the 1980s, will in future be used to replace damaged bone and cartilage parts with living and bone and cartilaginous tissues, respectively. The first steps have been taken; more research needs to be done. And it is not unreasonable to expect a significant breakthrough in the treatment of bone and joint diseases at the end of this decade.

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With the ageing population, degeneration of joints and osteoporosis and the resultant disability pose big public health problems in many countries of the world. These, together with the more disabling infective and inflammatory diseases of joints and the all-pervasive trauma damage joints in hundreds of millions of people in the world today. Therefore, it is most appropriate that the World Health Organisation had inaugurated and declared in Geneva on 13 January 2000, the Bone and Joint Decade 2000 to 2010. This Bone and Joint Decade movement is supported and endorsed by Mr Kofi A. Annan, Secretary-General of the United Nations, and practically all nations and national and international bodies committed to improving the welfare and quality of life of the musculoskeletally disabled.

The last decade has seen great advances in the imaging and treatment of bone and joint diseases. Orthopaedic surgeons, with the aid of advanced imaging techniques like computerised tomography and magnetic resonance imaging, have excised bone and joints affected by cancer and other diseases and replace them with allografts or prostheses made of metals, plastics and ceramics. Total hip and knee

replacements have been exceptionally successful in relieving pain and restoring function of diseased joints.

Millions of arthritic patients have benefited from these procedures. They will continue to be the mainstays of treatment for some time yet, indeed right through this Bone and Joint Decade. Allografts, harvested from cadavers, have built-in disadvantages like immunogenicity, absence of viable osteoblasts, disease-transmission and fatigue fracture. On the other hand, prostheses when implanted properly have a longevity of 15 years or more. These, being of man-made materials, however, will eventually fail because of toxicity, wear and tear, fracture and loosening. Results of revision surgery for a total joint replacement are not so good. Therefore, new avenues must be explored in this brave new world of the Bone and Joint Decade.

Hyaline cartilage on joint surfaces provides the smoothness, mobility and durable and resilient weight-bearing properties of the joint. Damage of articular cartilage results in pain, stiffness and instability and the spectre of osteoarthritis. It is common knowledge for over 250 years that damaged adult articular cartilage does not regenerate

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to produce normal hyaline cartilage. This is due to the fact that articular cartilage is relatively avascular and to the paucity of cells within a dense extracellular matrix. With the present conventional surgical treatment like abrasion chondroplasty, drilling, débridement, and microfracture, healing only takes the form of fibrocartilage. And newer techniques like perichondral and periosteal grafting, osteochondral autografts and allografts have limited success in producing hyaline cartilage.

Presently, we have the technology to grow bone, cartilage and other cells in the laboratory. Autologous chondrocyte implantation is the present craze in the treatment of cartilage defects in joints. Peterson and colleagues reported in 1984 of chondrocyte transplantation in rabbit patellar cartilage defects. Swedish investigators from the University of Goteborg and Sahlgrenska University Hospital extracted cartilage cells from 23 patients and multiplied them in a bioreactor for a few weeks. The laboratory-grown cartilage cells were then transplanted to repair the defects in the cartilage of the femoral condyles and the patellae. They reported good to excellent results for 14 out of 16 patients with cartilage cell implants in the femoral condyles (New England Journal of Medicine, 6 October 1994). Patients with cartilage defects in the patellae fared less well. The above and other advances have paved the way to tissue engineering, a term which was coined in 1988. Tissue engineering is still in its infancy. Using biological techniques and engineering processes, it is hoped that we could grow cells in complex three-dimensional constructs. In the near future, we can expect to replace defects in bone and cartilage and other tissues with live three-dimensional laboratory-grown composite tissues.

With the completion of the Human Genome Project and the gradual unravelling of the mystery of genes and genetic diseases, there are many interesting possibilities. With genetic counseling and the manipulation of genes, we may rid ourselves of common heritable musculo-skeletal diseases. Hopefully, there might be less need for operations to correct congenital deformities.

But Utopia is still very far away. In the meantime, we will continue to explore and exploit better and longer lasting biomaterials for our implants and joint prostheses which are still improving the quality of life for our patients suffering from bone and joint diseases.

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