

## **“THE CHALLENGE OF THE AGEING SKELETON”**

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The lecture was presented by two orthopaedic surgeons and an engineer, respectively Professor David Hamlin CBE Emeritus Professor of Orthopaedic Surgery, University of Glasgow, Professor Hamish Simpson, Professor of Orthopaedic Surgery and Trauma, University of Edinburgh, and Professor Joe McGeough, then Regius Professor of Engineering, University of Edinburgh. The former two first presented the clinical background to the ageing skeleton that they encounter orthopaedic surgery. With increasing need for manufacture of prostheses the engineer can complement the work of surgeons.

An outline of the anatomy and structure of the failing arthritic joint provided the basis to understanding the history of its surgical treatment. The evolution of joint replacement was traced through its beginnings in the interposition arthroplasty and hemiarthroplasty to the present day success of total joint arthroplasty based on the engineering principles developed by John Charnley. This required the introduction of new inert biomaterials for the bearing surfaces, both metals and polymers, with low friction and wear rates. It also necessitated new methods for fixing these artificial materials to bone using either methylmethacrylate cement or textured surfaces to allow macro or micro-interlock. The successful results with conventional hip and knee replacements now exceed 90% after 10 years. Despite this work continues to improve on these with improved materials for the articulation, such as ceramic-on-ceramic, and the re-introduction of metal-on-metal surface replacements to minimise bone removal.

Bone porosity increases with age for both males and females, with a significant rise occurring in women over the age of about 70. Bone fracture mainly arises road traffic accidents (about 58%), with simple falls accounting for 19% were for women above the age of 70 there is a dramatic rise in the likelihood of wrist fractures, compared to men. 6,500 hip fractures per year occur in Scotland, 80% occurring in women over 70 years of age; about 10% of hip replacements require revision surgery within ten years. Loosening of bone contacting implant is a major problem. New coating technology is needed for hip prostheses, which can promote adhesion between living tissue cells of the human bone and the implant. Computer-aided design and manufacture can be used to produce design the prostheses needed. The average age for total knee arthroplasty (TKA) is 68 years: 5 to 10 per cent require revision surgery within 10 years. Long term biological stability is achieved from initial mechanical stability, by press-fit or cementing of the knee replacement.

The final part of the lecture dealt with sheltered housing and nursing homes and the introduction of Smart technology. Research into Intelligent flooring, that is non-obtrusive floor based was described. It gives position, and direction of movement and can detect heart-beats.

In summary, engineers working with orthopaedic surgeons can provide cross-disciplinary solutions to questions posed by the latter. These solutions can be based on existing technology.