Editorial

What price progress?

Failed innovations of the knee prosthesis

Recently problems with silicon breasts and heart valves have focused public attention on the unregulated use of implants which is particularly serious in view of the rigid laws that control the introduction of medical drugs. This issue of *Acta Orthopaedica Scandinavica* presents several examples of problems with knee prosthesis (Blunn et al. 1992, Goodman and Lidgren 1992, Lindstrand and Stenström 1992, Lindstrand et al. 1992, Tulp 1992).

It is now clear that certain new knee prostheses have a staying power far less than that of earlier designs. For example, in a 1–6 year follow-up the Swedish multicenter study found a revision rate of the PCA uniknee three times higher than that of the Marmor or St. George knees. Some of the problems with the PCA knee may be attributed to a design focused on fixation without cement, but clearly a major difficulty has been deficient polyethylene in the tibial component (Blunn et al. 1992, Goodman and Lidgren 1992), and the constrained design.

In a historic perspective the introduction of plastic materials has had a dual impact. The successful hips and knees which caused a revolution in orthopedics in the 1970s were based on the polyethylene articular surface and fixation of the prostheses with plastic cement. On the other hand, polymers have also caused serious setbacks in the quest for durable arthroplasties. The Judet hemiarthroplasty swept the world for a few years in the mid 1950s until it became clear that the acrylic femoral head broke, disintegrated and caused severe inflammatory reactions. Charnley had serious early failures with his teflon acetabular cup (Waugh 1990). The Christiansen hip failed, partly because of design problems but mainly because of breakage and disintegration of the delrin component; about half of 5000 Christiansen hips used in Sweden have had to be replaced (Herberts et al. 1990). Some of the Marmor uniknees had a tibial polyethylene component that was too thin, and this has been a problem also with tibial and patellar metal-backed components. Polyethylene at the convex femoral component rather than in the tibia also failed.

The early failures in the new era of arthroplasty need no defence. We shall be for ever grateful to the brothers Judet who showed that an artificial hip joint could provide normal function, and to Charnley for the metal-polyethylene total hip, fixed to bone with plastic cement and protected against infection by the aseptic principle. Walldius (1957) became an important pioneer when he demonstrated the feasability of an artificial knee, although it had a too restrained design and was made of fragile plexiglass. Thereafter Burstein and Insall designed their bicompartmental knee and Marmor his uniknee. Both designs have proved to be as successful as the Charnley hip.

However, after Charnley, Insall and Marmor, nothing much has happened: cementless osseointegration has largely failed to develop, and literally hundreds of new hip and knee designs have been unable to beat the archetype prostheses. In large multicenter studies these three designs have all provided a more than 90 percent problem-free survival. These are formidable results. Herberts et al. (1989) pointed out that an unbroken series of not less than 3000 cases would be needed to document significantly better results than those of the Charnley hip.

Does this mean that it is unethical to try a new prosthesis concept? The answer is yes, it probably is, unless the innovation is aimed at a subset of the population in whom the established types of prostheses have been less successful than in the majority of elderly patients patients with arthrosis or rheumatoid arthritis. These subsets are, first, the relatively young, and, second, those with a failed arthroplasty (Herberts et al. 1992). The cementless mode of fixation must still be regarded as experimental and evaluated accordingly in clinical research programs. Also, for the knee we may well expect still unknown long-term failure patterns; few reliable series reach even 10 years.

The arthroplasty saga of the 1970s and the 1980s has thus come to an impasse. The average orthopedic surgeon dealing with arthrosis of the hip or the knee in patients over 65 should not use anything but well

established types of prostheses. Relatively young hip patients and many of the failed arthroplasties probably should not be handled by non-experts. Most of the young knee patients, on the other hand, have no better alternative than an osteotomy; correctly performed osteotomies for gonarthrosis have outlived all their contemporary arthroplasties.

Indeed, individual orthopedic surgeons can still improve their results substantially by careful selection of cases and improved surgical technique (Knutson et al. 1992). For the young patients a change of lifestyle is probably as important as it is for a smoker facing a cardiac by-pass operation. Knee patients need surgeons who can handle an osteotomy, a uniknee and a total knee with equal dexterity.

Does all this mean the end of innovation in an important sector of orthopedics? By no means, but the price of progress must not be "one step forward, two steps back", as pointed out in an editorial by Goodfellow (1992). After a century of arthroplasty research the potential of further innovations is squeezed between established success and the asymptot of Utopia.

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