Arthroplasty of the spine

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Spinal surgeons treating degenerative low back pain have become increasingly dissatisfied with the clinical results of fusion, which, despite the use of internal fixation, cages, and simultaneous anterior and posterior fusion, have remained unchanged since the middle of the last century, when the standard operation was posterolateral fusion without implants. Hence, there is a great interest in the concept of spinal arthroplasty. This term encompasses all surgical methods of treating low back pain, which allow movement to continue. They are alternatives to fusion.

This book is a comprehensive review by various authors who are experts in their own fields, dealing with total disc replacement, replacement of the disc nucleus alone and devices which control the range of movement at specified segments. It also deals briefly with the future possibility of reversing disc degeneration by biological methods, methods of testing spinal implants designed to preserve movement, rather than fuse the spine, and the principles underlying the concept of motion preserving surgery, other than disc replacement. In addition to the papers on specific subjects, there are a number of valuable review articles dealing with wider aspects.

The historical review by the editors is a fascinating account of the enormous number of patent applications related to total disc replacement that have been filed since the 1950s. Some 103 devices are briefly described and many illustrated, none of which mercifully were used clinically. But some 12 devices have been used clinically since Fernstrom inserted steel balls between vertebral bodies in the late 1950s in some 250 patients. For anyone planning to design a new disc replacement, this chapter is essential reading.

In a review article, Mayer and Korge suggest that the main reason for considering arthroplasty is to avoid the complications of fusion. I believe most surgeons are interested in spinal arthroplasty because they hope it will achieve better overall outcomes than fusion. Clinical results are presented in these papers but none were randomised and the follow-up is only two years. There is one paper on the development of the Charite prosthesis, which alludes to published papers dealing with results of ten years or more follow-up, but does not specify what these results

are. Another paper deals with a current prospective, randomised, multicentre, FDA-supported study, comparing fusion with disc replacement. This paper in fact deals only with the results of disc replacement in the first 22 patients at one centre. The results show that an artificial disc yields a significant clinical improvement in patients at 12 months. Further reports of this study have now been made available (ISSLS 2004 Porto) and there appears to be no significant clinical advantage of disc replacement over fusion, apart from somewhat fewer surgical complications when compared with an anterior and posterior fusion.

There are four papers dealing with nucleus replacement, two concerned with the Ray prosthesis, the PDN, and two with devices yet to be used clinically. For the PDN prosthesis, surgical success rates of 88% are reported, but again only with a two-year follow-up of just 46 patients of 456. The PDN disc nucleus is designed to 'fill the therapy gap between discectomy and fusion'. One has the uneasy feeling that a significant proportion of the patients are those with disc protrusions causing sciatica and that they have had a simultaneous decompression procedure, which might alone be expected to produce an 88% success rate. There is a lack of any clinical data to support or refute this impression and so far there has not been a prospective randomised study for this prosthesis.

The Dynesys flexible stabilisation system was introduced as a treatment for back pain. The paper dealing with this device comes to the conclusion, again in a single cohort study, that it is 'a safe and efficient procedure for the stabilisation of unstable conditions of the lumbar spine presenting with neurocompression'. For stabilisation to be successful requires a considerable period of post-operative time.

The clinical papers in this book are somewhat disappointing in that while they enthuse about disc replacement, they do not present good scientific evidence to justify its use. The review and scientific articles are valuable, especially those dealing with surgical approaches, biomechanical testing and the possibilities of biological treatment of disc degeneration.

Surgeons considering disc replacements for low back pain should read this book and study it carefully as it covers the field very fully. They will appreciate that the available clinical evidence does not justify the current enthusiasm for disc replacement. Fusion is unsatisfactory, but is disc replacement any better? They may then wonder why disc replacement has become so popular in Europe and America. At a recent meeting of the new Spine Arthroplasty Society it was revealed that the 'market' regards disc replacement as the financial bonanza of the future for spine implant manufacturers. So perhaps the popularity is driven more by industry than by critical, time-tested, clinical results?

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