Guest editorial

Arthroplasty of the elbow

13 years ago I had the pleasure of writing a guest editorial on arthroplasty of the elbow (Rydholm 1989). It is interesting to repeat the task; what has happened during these years?

Total elbow replacement (TER) has become increasingly popular despite the lack of long-term follow-up reports for many implants. The annual incidence of TER in Sweden has been estimated at 1/100,000 inhabitants, and rheumatoid arthritis remains the main indication (Rahme et al. 2001). It can be anticipated that more patients will want this operation in the future.

The number of elbow implants available on the market is limited and, unlike the shoulder, hip and knee most of the ones in use have at least mid-term published results (Mackay et al. 2001). Two basic types of implants are used: stemmed resurfacing prostheses and semiconstrained prostheses. The implants of today are mainly the same as those used during the last decade(s). The design has not changed substantially, neither in the resurfacing nor in the semiconstrained devices. The resurfacing prostheses all have a similar design with a more or less anatomic trochlear part connected to a humeral intramedullary stem, and a stemmed ulnar tray with a polyethylene inlay. The semiconstrained implants also have stems, but a sloppy hinge articulation which very much resembles all the other implants apart from the GSB elbow with its special coupling mechanism. The surgeon must have both types of implants available to be able to treat all types of patients needing a TER. An implant system that permits the surgeon to make a final decision on the need for coupling of the components intraoperatively seems ideal.

The weakness of the resurfacing implant is early instability, translocation or dislocation, while the weakness of the semiconstrained implants is late wear of the coupling mechanism. The rates of aseptic loosening and infection seem to be the same for all implants.

The orthopedic surgeons have learned that pain relief is the major benefit and that some increase in motion, especially in flexion, can be anticipated from resurfacing procedures, while improved motion is most predictably achieved after semiconstrained implants since the release of soft tissues can be more complete. The functional outcome of TER is on the whole satisfactory, and there seem to be no major differences in functional outcome between resurfacing and semiconstrained implants (Hildebrand et al. 2000, Wright et al. 2000).

Paradoxically, resurfacing implants are difficult to introduce and easy to revise for loosening because of their short intramedullary stems as compared to semiconstrained implants with longer stems for fixation that do not require balancing of the soft tissues and thus are easier to insert, but very difficult to revise. There is a risk that the less experienced elbow surgeon will prefer to use semiconstrained implants.

The choice of implant is not always based on clinical evidence. The Kudo prosthesis, which has been redesigned frequently during the years and has had no long-term follow-up reports until recently (Tanaka et al. 2001, Rahme 2002), has become the most popular one in Sweden. Frequent changes in the design of an implant make it impossible to perform long-term studies a reasonable number of patients. This is shown in the paper by Rahme (pages 251–256) in this issue, in which two versions of the implant have been used to collect 30 patients for mid-term evaluation.

Ikävalko et al. (2002a) have instead compared the radiographic results with 7 types of the Souter prosthesis in their survival study (pages 257–263) in this issue. They conclude that the use of a long-stemmed humeral component seems advisable also in primary operations and that coupling of the components surprisingly did not increase the risk of loosening of the humeral component.

During the past few years, data on survival with revision for loosening as endpoint have been presented for some implants. The 16-year survival for one design (type 3) of the Kudo prosthesis has been reported to be 90% (Tanaka et al. 2001). Similar survival figures have also been published about other types of resurfacing implants (Trail et al. 1999, Rozing 2000, Shah et al. 2000). Survival figures for semiconstrained implants are much the same and thus close to those for total hip and knee replacement (Gill and Morrey 1998, Gschwend et al. 1999). As revision TER is difficult to perform, the survival rates do not necessarily reflect the number of well-functioning implants.

With the Souter prosthesis, loosening seems to be a problem chiefly on the humeral side. Radiostereometry has become an almost obligatory method for evaluating early fixation of joint implants. In the study by Valstar et al. (pages 264–272) in this issue, 8/18 humeral components of the Souter prosthesis were judged to run a risk of aseptic loosening due to translation rates exceeding 0.4 mm along one or more coordinate axes and/or a rate of rotation exceeding 1° about one or more coordinate axes during the second postoperative year. None of the ulnar components ran a risk of aseptic loosening. On the other hand, radiolucent lines were evident proximally around the ulnar component in 18/26 Kudo implants in the paper by Rahme (2002), indicating that the ulnar component may be the weakest part of that implant. With the Roper-Tuke elbow, the risk of loosening of the humeral and ulnar components is about equal (Yanni et al. 2000).

As in the hip and knee the longevity of cemented implants is probably related to the surgical (Shah et al. 2000) and cementing techniques (Schneeberger et al. 2000). Modern advanced cement techniques should be used (Faber et al. 1997). The indication for uncemented implants has so far not been established.

It is important to realize that survival rates do not tell the whole truth. Apart from aseptic loosening, complications after TER are fairly common. Thus Ikävalko et al. (2002b) reported 108 more operations were required in 82/525 patients with primary Souter arthroplasties. The incidence of complications was higher during the early years, showing that the learning curve is flat.

Instability occasionally occurs after surface replacement. Attempts to reconstruct the ligaments are probably worthwile (O'Driscoll and King 2001) since conversion of a cemented, well-fixed resurfacing prosthesis to a hinged implant is a challenge (Ring et al. 2001).

The ulnar nerve is always in danger in TER. Transient nerve palsy is common (in part depending on the surgical approach), but irreversible nerve damage is uncommon. A high percentage of patients with RA have ulnar neuropathy before surgery, but the presence of such signs does not seem to predispose them to develop postoperative ulnar nerve dysfunction (Spinner et al. 2000).

We are now starting to realize how many patients need a revision of TER. In patients without an infection, exchange of the prosthesis seems to be the best solution (Dent et al. 1995, Redfern et al. 2001) despite a fairly high incidence of adverse events associated with this procedure. Staged reimplantation can be successful in those with infections, at least when the infecting organism is not Staphylococcus epidermidis. Reimplantation of a new implant is possible in patients treated for an infection with a resection arthroplasty (Yamaguchi et al. 1999), but a relatively good outcome obtained with resection arthroplasty suggests that this procedure remains the procedure of choice, at least in medically frail patients (Yamaguchi et al. 1998).

Prosthetic replacement has perhaps become the most frequent surgical procedure on the rheumatoid elbow. Synovectomy is performed less frequently, probably because of the good and long-lasting effects of intraarticular steroids. Synovectomy with or without radial head excision also gives worse clinical results than TER (Woods et al. 1999). Althouh excison of the radial head is an effective method for treating a painful rheumatoid elbow, conversion to a TER may be more difficult and the clinical results may be worse than those after primary replacement (Schemitsch et al. 1996).

Primary osteoarthrosis of the elbow is an uncommon condition typically managed by some type of debridement (Oka 2000), and TER in patients with this condition should probably not be done (Kozak et al. 1998). Posttraumatic arthrosis is a much more uncommon reason for loss of elbow function than

rheumatoid arthritis. Not much has been reported in the literature on TER in these patients. Semi-constrained implants should probably be preferred, and good short-term results have been published (Moro and King 2000, Morrey 2000). The long-term results, however, are known to be worse than those obtained in rheumatoid arthritis.

TER with semiconstrained implants may also be used to treat ankylosed and unstable elbows (Baksi 1998, Ramsey et al. 1999, Mansat and Morrey 2000), although complications are common.

Clinical practice during the last decade has shown that TER provides an alternative to open reduction and internal fixation in the management of compound elbow fractures in the elderly (Cobb and Morrey 1997, Ray et al. 2000, Gambirasio et al. 2001), especially in patients with rheumatoid arthritis (Ikävalko and Lehto 2001) in whom the bone quality makes osteosynthesis impossible. Semiconstrained implants for these patients are probably better (Ray et al. 2000).

Apart from more experience during the last decade with TER in certain patients with elbow fractures, my conclusions 13 years ago remain true:

"current clinical experience makes it reasonable to offer the patient with an arthritic elbow, who has pain, loss of function and mild-to-moderate bone loss, the possibility of a stemmed surface replacement arthroplasty. The patient with severe bone loss can be offered a semi-constrained implant, if necessary, custom-designed. Therefore, both types of patients can expect relief of pain and unchanged or slightly improved motion. However, the patient and the surgeon should be aware of the comparatively high risk of initial complications. The surgeon should know that his learning curve is fairly flat, and he should give the patient realistic information regarding the uncertain long-term function. At present, primary and revision total elbow replacement should be done in specialized centers by experienced surgeons with adequate and complete instrumentation and a full range of prostheses."

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