Acta orthop. scand. 48, 394–399, 1977

THE MONK HIP ARTHROPLASTY

Preliminary Report on the Uncemented Standard Monk Prosthesis

F. WANG HANSEN & K. RECHNAGEL

Department of Orthopaedic Surgery, Frederiksborg County Hospital, Hillerød, Denmark.

The Monk hip prosthesis is a one-piece block prosthesis consisting of a metal femoral component with the head enclosed in a polyethylene cup. The standard type is fixed without cement. Most of the hip movements take place between the metal and the polyethylene cup. 104 Monk arthroplasties were performed. 95 hips in 84 patients have been available for regular examination and follow-up. The follow-up period was from 12 to 30 months, an average of 19 months. Out of the 95 cases, 72 were classified as excellent, 10 as good and 13 as unchanged. The results obtained during the first year were comparable to those obtained with the Ring prosthesis, but during the following 1½ years eight revisions had to be performed. The main reason for the deterioration was loosening of the femoral component, probably because in the standard type it is too short and the neck has too great a varus inclination, resulting in a rather strong tilting force. Because no cement has been used the revisions have been quite easy to perform. Another reason for failure has been wear of the polyethylene cup, in one case with a massive foreign body reaction. In spite of a short follow-up period this report illustrates the failures due to the design of the prosthesis, and therefore an improved construction is now in use.

Key words: bipolar system; block-prosthesis; Monk arthroplasty; Ring arthroplasty; total hip replacement; uncemented hip prosthesis

Accepted 2.iii.77

The use of acrylic cement has created many problems and complications. This fact has initiated many attempts to construct an uncemented total hip prosthesis. One of the best known uncemented hip prostheses is the Ring prosthesis, introduced by Ring in 1964 (Ring 1974). We have used it for some years, and an assessment made together with several other Danish orthopaedic departments revealed results similar to those obtained with the various cemented types (Paaby 1974).

In February 1974 we started to use the prosthesis developed by Monk in Liverpool, for several reasons: The Monk prosthesis has a metal-to-polyethylene articulation, it is constructed as a one-piece block prosthesis which is quite easy to handle, and the operative procedure causes less trauma than the Ring operation.

The Monk prosthesis consists of a metal femoral component shaped somewhat like the well-known Moore prosthesis, but with a smaller head. The head

is enclosed in a polyethylene cap. When placed in the acetabulum most of the movement takes place between metal and polyethylene.

After the first year the results were comparable to those obtained with the Ring arthroplasty (Hansen 1975), and compared to the Ring operation the need for blood transfusion was diminished to about half.

The follow-up has been continued with regular x-ray examinations and clinical evaluation. This has revealed that the satisfying primary results are not long-lasting in many cases. So we find it mandatory to publish this report in order to warn against the use of the short stemmed type of prosthesis although the observation period is still quite short. We are aware that the Monk prosthesis is in wide-spread use, but we have not been able to find any other publication on this subject.

PATIENTS AND METHODS

In the period from February 1974 to September 1975, 104 Monk arthroplasties were performed on 94 patients. One patient moved to another county and could not be followed up. Eight patients died in the follow-up period. Ninety-five arthroplasties in 84 patients remained for final evaluation; 45 were women.

Out of 10 bilateral operations five were done in one stage. Two other patients had a Ring total hip on the other side. Symptoms had lasted on an average 6.7 years. Seventy-one of the operations were performed on patients over the age of 60 years and 31 operations on patients over 70 years. The age distribution is shown in Figure 1.

Six operations were performed for recent femoral neck fractures. Fifty-four had osteoarthrosis, ten rheumatoid arthritis and two sequels to congenital dislocation. The remaining 23 had developed painful necrosis of the femoral head after femoral neck fracture.

The main indication for the operation has been intolerable pain in the hip. In 37 cases there have been other major illnesses with an influence on the walking ability.

The operative procedure was the same as we have used for the Moore arthroplasty with some small modifications ("southern approach") (Jensen & Holstein 1975). In 37 cases the acetabular bed was prepared with a spherical reamer of the same size as the prosthetic cup. In six cases a completely new acetabular bed was prepared with the reamer because of marked deformation of the region. In fresh femoral neck fractures no reaming was done.

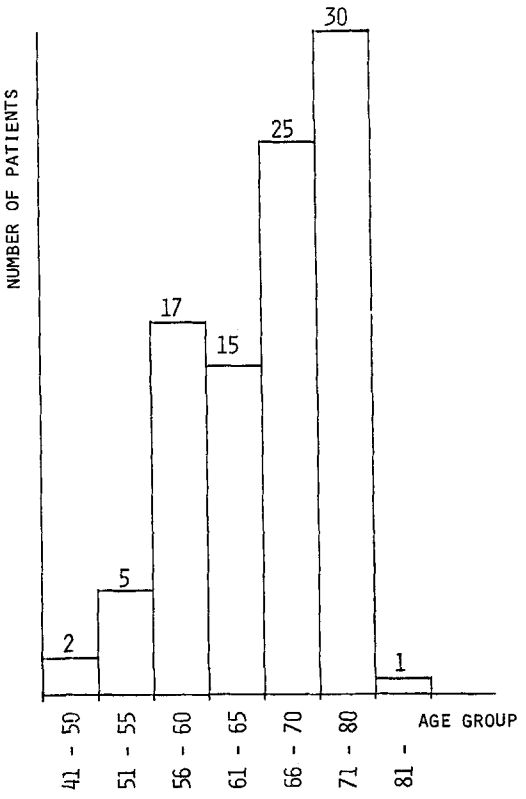

Figure 1. Age distribution of patients having 95 hip operations (52 women, 43 men).

In five instances adductor longus tenotomy was performed percutaneously. No systemic antibiotics were used, but in 64 operations the wound was irrigated with nebacetin-containing saline solution. No routine anticoagulants have been used.

In all cases presented in this material the rather short stemmed standard Monk prosthesis was used. The fixation has in all cases been mechanical. No cement was used.

On the second postoperative day the patients were allowed to sit in a chair, and they started full weight-bearing 10–12 days after surgery.

The observation time has been from 1 year to 2½ years, on average 1.6 years.

RESULTS

Mortality. Two patients died because of pulmonary embolism, one 16 days, and the other 17 days, after surgery. Both were suffering from complicating illnesses preoperatively. A third patient, an 87-year-old female with a femoral neck fracture and severe heart disease, died 2 months postoperatively. Five other patients died 6 to 26 months after the operation from diseases unrelated to the operation.

Local complications at surgery: Two minor fractures occurred, one in the trochanteric region and one in the neck of the femur. Full weightbearing was delayed 4 and 6 weeks in these cases. Otherwise the fractures had no influence on the postoperative course. In one case a spiral fracture occurred in the femoral shaft during the attempt to disarticulate the femoral head. This fracture was treated immediately with osteosynthesis, and weightbearing had to be delayed 8 weeks.

There has been no dislocation postoperatively.

Superficial wound infection occurred in three cases, which all healed, one after debridement and re-suture. No deep infections were detected.

Besides the two fatal pulmonary embolisms there have been five thrombo-embolic complications which all responded well to treatment with anticoagulants and there have been no sequels.

Osteolysis seems to be the main problem. We have seen 20 cases, three without symptoms. In nine cases the osteolysis was associated with pain during walking. The lower tip of the femoral stem invaded the lateral cortex of femur in three of these (Figure 2). In one the symptoms are so severe that revision may be the end-result. In eight cases with no improvement a revision has already been performed: in one with a Ring arthroplasty, in four with a cemented Monk prosthesis and in three cases the prosthesis was removed. At revision no positive cultures for bacteria were found, yet one of the Girdlestone hips still has a fistula.

Figure 2. The standard Monk prosthesis in a case needing revision. The prosthesis has tilted, the tip of the femoral stem has invaded the lateral cortex and there has been considerable resorption of the calcar.

The overall results have been classified according to the code given by Merle d'Aubigné & Postel (1954). In this code score points for *pain, movement* and *walking* are recorded. "0" stands for a very poor condition and "6" for a normal condition.

The score points for pain improved from 1.6 before the operation to 5.1 after, for movement from 3.5 to 5.2 and for walking from 2.6 to 4.0. These assess-

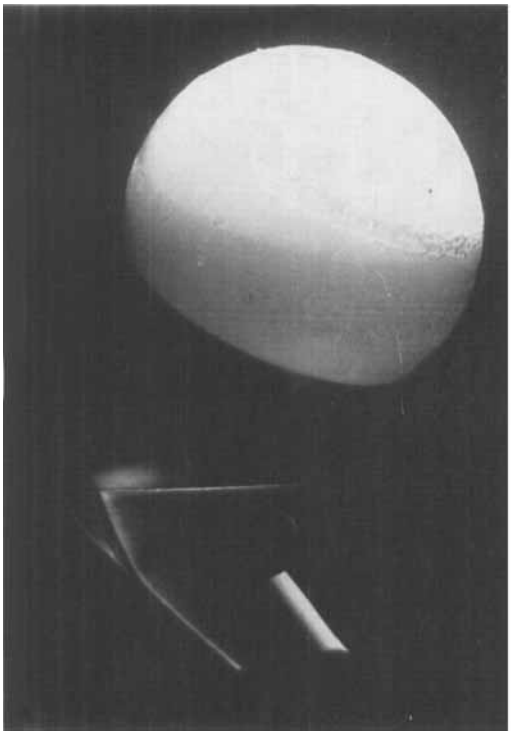

Figure 3. Circular lines of wear on the polyethylene cup of a prosthesis removed after 1 year.

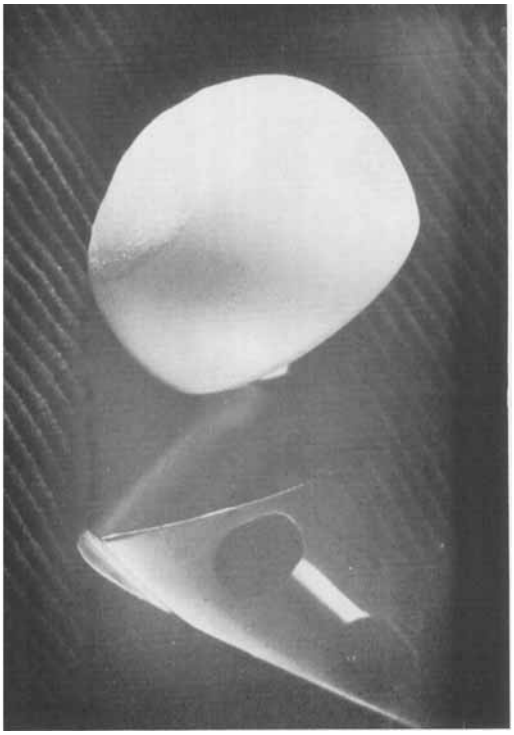

Figure 4. Severe wear of a cup, removed after 2 years.

ments include the eight re-operated cases *before* the revision.

At the final follow-up the patients were asked for their opinion. Accordingly, 72 cases (= 76 per cent) were classified as excellent, 10 (= 10.5 per cent) as improved and 13 (= 13.5 per cent) as unchanged. In no case was the condition considered to be deteriorated after the operation.

The prostheses removed all had some kind of wear visible on the polyethylene cup, some of them demonstrating that some movement must have taken place between the cup and the acetabulum (Figures 3 and 4). So far we have not seen any migration of the prosthetic head into the pelvic bone, but in one case with very severe wear on the polyethylene cup (Figure 4) there was a massive foreign body reaction in the surrounding tissues.

DISCUSSION

After only 1 year of experience with the standard Monk prosthesis we were optimistic about the results (Hansen 1975). However, a longer observation period has revealed that 8 out of 95 hips required revision, and furthermore the condition in a few other cases is deteriorating.

The main reason is osteolysis with loosening of the femoral stem. Considering the development of the Moore and Ring prostheses, where longer stems are now available, it seems obvious that the femoral stem of the standard Monk prosthesis is too short to secure a stable fixation. Furthermore the neck of the Monk prosthesis has too great a varus inclination resulting in a strong tilting force which a short stem especially is unable to counteract. As shown in Figure 5, the short Ring prosthesis has a better

Figure 5. The short Ring prosthesis has the neck in a valgus position, in contrast to the standard Monk prosthesis giving a direct transmission of the load and a weak tilting force on the femoral component.

Figure 6. The Monk prosthesis with a Thompson stem for fixation with cement transmits the forces more directly than the standard type.

design. Also the Monk prosthesis with a Thompson stem for cementing has a better design than the standard type (Figure 6). As stressed by Brunelli (1977) this "medialization" diminishes muscular contracture and forcing of the stem onto the lateral cortex of the femur.

The problem of wear of the polyethylene has previously been reported by several authors. Especially the Oscobal prosthesis has shown severe wear after a very short time, probably because this construction necessitates a great deal of movement between the polyethylene cup and the acetabulum (Dahl & Mikkelsen 1976).

In the Christiansen replacement system with trunnion bearing it has been necessary to give the polyethylene a metal cover (Christiansen 1974). Recently the Monk prosthesis has been available with a similar metal cover. This may possibly lead to an increased risk of migration into the acetabulum as has been seen with the Moore prosthesis in some cases. Because of the rather small movements between the cup and the acetabulum this risk is not considered to be very high.

Although many of the problems regarding the use of acrylic cement seem largely to have been solved, many efforts

are still being made all over the world to develop better uncemented types of hip prostheses. In the United States the Giliberty prosthesis utilizes exactly the same bi-polar principle as the Monk prosthesis. The Sivash prosthesis can be fixed either with or without cement (Radulovic et al. 1972). In Switzerland Mathys has developed an iso-elastic plastic material, which works well in finger joint prostheses, but is too weak for hip reconstruction as yet (Mathys 1973). The new total Judet prosthesis utilizes a very rough surface for fixation into the bone. It still remains to be proved which principle is the best.

The advantages of the Monk prosthesis are the comparatively atraumatic operative procedure (very similar to the insertion of the well-known Moore prosthesis), the short recovery period after the operation and the quite good possibilities for revision, should this be found necessary.

However, the results must be long-lasting and comparable to other types of prostheses and according to our results we cannot recommend the standard Monk prosthesis.

We have therefore changed to the new Monk prosthesis with a long straight femoral stem, like the Ring and Moore prostheses, and a metal-covering on the polyethylene, as used in the Christiansen prosthesis. Time will tell if this construction solves the mechanical problems or if in addition the neck has to be made shorter and with a greater valgus inclination as in the design by Brunelli (1977).

REFERENCES

Brunelli, G. (1977) A new square-contoured acetabulum and straight stem hip replacement. *Int. Orthop.* **1**, 36–38.

Christiansen, T. (1974) A combined endo- and total hip prosthesis with trunnion-bearing. *Acta chir. scand.* **140**, 185–188.

Dahl, E. & Mikkelsen, Otto A. (1976) Wear of the polyethylene head of the Oscobal prosthesis. *Acta orthop. scand.* **47**, 643–647.

Hansen, F. Wang (1975) The first years experience with the Monk prosthesis. Proceedings of the Danish Orthopaedic Society. *Acta orthop. scand.* **46**, 867.

Jensen, J. Steen & Holstein, P. (1975) A long-term follow-up of Moore arthroplasty in femoral neck fractures. *Acta orthop. scand.* **46**, 764–774.

Mathys, R. (1973) Current use of plastics in artificial joints. *Aktuel. traumatologie* **4**, 3–7.

Merle d'Aubigné, R. & Postel, M. (1954) Functional results of the hip arthroplasty with acrylic prosthesis. *J. Bone Jt Surg.* **36**-A, 451.

Paaby, H. (1974) Follow-up of results from 11 orthopaedic departments of 400 cases of hip arthrosis, treated with Ring's total plasty. Proceedings of the Danish Orthopaedic Society. *Acta orthop. scand.* **45**, 798.

Radulovic, B., Kenig, I. & Radovanovic, M. (1972) Indications for Sivash type total hip prosthesis: one piece "block" prosthesis. *Arthroplasty of the hip*, ed. Chapchal, G. pp. 74–79. Georg Thieme, Stuttgart.

Ring, P. A. (1974) Total replacement of the hip joint. *J. Bone Jt Surg.* **56**-B, 44–58.

Correspondence to: K. Rechnagel, Department of Orthopaedic Surgery, Frederiksborg County Hospital, DK-3400 Hillerød, Denmark.