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PROSPECTIVE DATA

Prospective mid-term results of a consecutive series of a short stem

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A large number of short stem prostheses for hip arthroplasty have been introduced in the past years. Although there is a large increase of publications about short stems, there is still little data available about survival and revision rates. We report prospectively on the outcome of 84 consecutive NANOS® short stem prostheses in 81 patients. We have included 37 female patients and 44 male patients with an average age of 61.6 ± 9.2 years. The main diagnoses were osteoarthritis in 67 patients, dysplastic osteoarthritis in 8 patients and avascular necrosis of the femoral head in 6 patients. Along with demographic data and co-morbidities, the Harris Hip Score was recorded preoperatively and at follow-up. The Harris Hip Score increased from 36.6 ± 14.5 preoperatively to 94.5 ± 8.8 at the final follow-up. During the main follow-up time (27.7 months ± 5.7) none of the 84 stems were revised, intraoperatively three fissure fractures occurred.

Keywords : hip ; short stem ; arthroplasty ; bone stock ; minimally invasive approach.

INTRODUCTION

There is an increase in young and active patients in total hip arthroplasty, which is why it is important to consider minimally invasive, muscle-considering procedures. Short stems allow for easier minimally invasive approaches and improve the biomechanical reconstruction. The number of young adults who have received an uncemented hip arthroplasty have increased in the past years (*1,10*). Diaphyseal or metaphyseal anchorage may lead to stress shielding, which is why this concern had led to more bone-preserving implants in order to provide a good proximal bone stock for revisions for the aging target population in the future. Short stems can be divided into three categories : stems engaging the lateral cortex, femoral neck implants and stems which utilize the lateral trochantic flare (*8*). This kind of implant is made for resections in the neck in order to preserve enough bone in the neck and the diaphysis area (*4*).

It is important to take care of the biomechanical reconstruction because it has an impact on the survival of the prosthesis (*3,9,11*). There are also concerns about the possible resorption of proximal bone stock and the possible negative effects on stability and the survival of the femoral component (*5,17*).

Short stems allow for easier minimally invasive approaches (*10*) ; however, Schmidutz *et al* have shown that the restoration of the limb length ap-

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pears more difficult in short stem hip arthroplasty and has a tendency to prolong limb length which could be related to the higher femoral resection level (*14*).

Although there are already a large number of short stems available, we still know so little about the survival rates. That is why our purpose was to collect prospective data about Nanos® short stems.

PATIENTS AND METHODS

We have implanted a total number of 84 (in 81 patients) uncemented total hip prostheses using the Nanos® short stem (Smith and Nephew, Marl, Germany). The main indication was an adequate bone stock. We also included elderly patients in our study. Exclusion criteria were a severe hip dysplasia and poor bone stock.

The Nanos® Short stem is made of titanium-plasma alloy, is covered with Calcium-Phosphat (Bonit®) and is available in 10 sizes (0-9). In all patients, the minimally invasive, Watson-Jones approach was used in order to allow a quicker rehabilitation in the immediate post-operative period due to a reduced soft tissue-damage. After the neck osteotomy and the preparation of the acetabulum, the original cup was implanted. As the next step, the femoral canal was prepared and the short stem implanted. Three small fissure fractures occurred intraoperatively, two of them were fixed with cerclage wires.

Our patients were allowed full weight-bearing from the operative day. For safety reasons, we recommended two crutches for 4 weeks. They were trained by our physiotherapists to avoid a flexion over 90° and to avoid abduction. Most of our patients underwent a further in-patient rehabilitation program for 3 weeks.

As previously mentioned, all demographic data, comorbidities and the Harris Hip Score preoperatively and at the follow-up were recorded. Preoperative and at the follow-up, a standardized standing anterior-posterior (AP) and axial x-ray were taken. On the first postoperative day, a standardized AP radiograph was taken. Discrepancies in the leg-length were measured clinically and in the standing AP radiograph.

RESULTS

We report on the outcome of 84 Nanos® short stems in 81 patients. The mean follow-up time was 27.7 months ± 5.7 months. The average age of the patient was 61.6 ± 9.2 years. The oldest patient was

Fig. 1. — X-ray preoperative ap

Fig. 2. — X-ray preoperative axial

78 years old and our youngest patient was 41 years old. The main diagnoses were osteoarthritis in 67 patients, dysplastic osteoarthritis in 8 patients and avascular necrosis of the femoral head in 6 patients. We have included 37 female patients and 44 male patients. 3 patients had the surgery on both sides. The average operating time was 75.2 min ± 20.1 min and the average grading of patients for surgical procedures of the American Society of Anesthesiolo-

Fig. 3. — X-ray 13 months postoperative ap

Fig. 4. — X-ray 13 months postoperative axial

gists (*12*) was 1.8 ± 0.7. The patients were hospitalized 9.6 days ± 2.9 days. The average BMI was 28.4 ± 5.2. Along with demographic data and comorbidities, the Harris Hip Score was recorded preoperatively and at follow-up. The Harris Hip Score increased from 36.6 ± 14.5 preoperatively to 94.5 ± 8.8 at the final follow-up.

None of the 84 stems was revised ; this corresponds to a survival rate of 100%. Three fissure fractures occurred intraoperatively, two of them were fixed with cerclage wires. Two of the patients suffered from a hip dislocation (one of them traumatically) which was treated in both cases conservatively. As further consequence, one of those patients unfortunately thrombosed and suffered from a pulmonary embolism. The x-rays have not shown any radiolucent lines in any patients.

All in all, our patients reported a high postoperative satisfaction. The clinical and radiographic results encouraged us to continue to use short stems with metaphyseal anchorage. However, there must be more long-term results to confirm our excellent mid-term results.

DISCUSSION

The Nanos® short stem was produced in order to preserve the femoral neck. The system has a metaphyseal anchorage and load distribution. The titanium plasma coating allows for increasing the surface area and ensuring superior primary stability. The long-term fixation is induced by additional calcium phosphate for the osteointegration. Considering that most patients are active and highly demanding, it is important that there is a safe high range of motion and a maximum of the head:neck ratio (*6,13,15,16*). The part of the femoral neck of the Nanos® short stems below the conus which has been tapered, provides a high range of motion.

In order to facilitate the minimally invasive procedure by limiting the potential damage of soft tissues, special instruments have been produced. The preparation of the femoral neck of the Nanos® prosthesis is started with a curved universal rasp followed by forming rasps and cancellous compactors. The surgeon should use the instruments in a slightly curved motion and the preparation is carried out in stages until the planned size is reached and until the compactor is in cortical contact in the load-bearing zones. For the trial 3 heads (28, 32, 36) are available. Although there was concern about the tendency to prolong the leg-length in short stem hip

arthroplasty, Amenabar *et al* have recently published their retrospective study about 147 patients, evaluating the vertical centre of rotation, femoral offset, and leg length after total total hip arthroplasty. They have figured that the Nanos® short stem prosthesis enabled the restoration of hip anatomy in terms of VCR, HCR, femoral offset and leg-length (*2*). Our results correlate with the early clinical results of Kaipel *et al* who have revised none of their short stems in 2 years (*7*).

All in all, considering all these arguments, short stems in hip arthroplasty usher in a new era by conserving the bone stock, and by using minimally invasive approaches, it is possible to provide a protection of the soft tissues and therefore enable a rapid recovery. For us, it is clear that there is a learning curve associated with this new device. It is essential that future studies provide data about the bone remodelling and the survival rate of femoral neck preserving implants. We conclude that our mid-term results encourage us to continue to use short stems in order to preserve the proximal bone stuck and to make recovery faster.

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