Medium-Term Results of Thrust Plate Prostheses for Osteoarthritis of the Hip

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Abstract
We retrospectively evaluated the results of 61 patients (67 hips) who underwent total hip arthroplasty using the thrust plate prosthesis (TPP) for osteoarthritis of the hip joint. All patients were followed-up at least two years (mean: 37.2 months). Mean preoperative Harris hip score improved from 45.8 (SD: 13.5) to 94.9 (SD: 5.4) points postoperatively. Revision was performed in five cases. Medium-term results of TPP are promising.

Thrust plate prosthesis (TPP), chiefly implanted in Europe, is a relatively new implant with cementless fixation in the metaphysis of the proximal femur. The aim is to provide a physiological force transmission into the calcar area in order to prevent stress shielding and subsequent aseptic loosening. Biomechanical studies, as well as the finite element analysis, have supported the concept that TPP transmits forces to femoral cortex identical to intact bone. Similar results were also obtained with other types of extramedullary hip prostheses. Additionally, clinical results with TPP were also promising. The aim of the present study was to evaluate medium-term results of our TPP patients.

Patients and Methods
The series consisted of 67 hips of 61 patients who were followed-up at least 24 months postoperatively. There were 38 female and 23 male patients with a mean age of 59.5 years (range: 25 to 79 years). The diagnosis was primary osteoarthritis of the hip in 47 patients. Of the 20 hips with secondary osteoarthritis, the etiology was trauma in 12, dysplasia of the hip in five, slipped capital femoral epiphysis in two, and coxa valga in one. Patients with osteoarthritis secondary to osteonecrosis of the hip or high dislocation of the hip were not included in the study. The mean preoperative Harris hip score of the patients was 45.8 (SD: 13.5; range: 15 to 72).

While the femoral component was a third generation TPP in all patients, the acetabular component was an expansion cup in 47, screw-fixed cup in 16, and cemented cup in four. Of the six bilateral cases, both hips were replaced at the same session in four patients and with two- and four-month intervals in two patients.

Although all patients underwent an accelerated rehabilitation program in the postoperative period, full weightbearing was allowed in the second day in some patients and at 6 to 8 weeks in the others because they were enrolled in a study comparing the time of full weight-bearing. Additionally, some patients received 8 weeks of physiotherapy and education preoperatively also due to their participation in aforementioned study.

Results
The patients were followed-up for a mean of 37.2 months (range: 24 to 72 months) postoperatively. At the latest follow-up, the mean Harris score improved from 45.8 (SD: 13.5) to 94.9 (SD: 5.4) (Fig. 1).

Revision was performed in five cases. In three, periprosthetic fracture occurred; one was detected the day after the operation and two resulted after a fall six and thirteen months after the operation. Two of them were replaced with a long-plate TPP (Fig. 2) and the remaining with a conventional intramedullary prosthesis. Screw loosening and screw breakage occurred in two patients; although both were asymptomatic, screws were replaced in these cases.
**Figure 1**

A, 73-year-old male with primary coxarthrosis. B, Harris hip score is 100, four years after the operation.

**Figure 2**

A, A 68-year-old male. Harris hip score is 53 for the left side and 56 for the right side. B, Bilateral implantation of TPP with four months interval. C, Periprosthetic fracture following a fall, two months after the operation. D, After revision with a long plate TPP, Harris scores are 92 and 90 for the left and right sides respectively, two years after the operation.
Discussion

Despite the advances in the design and technique of implantation, aseptic loosening still remains the major problem in total hip arthroplasty and seems to be the cause of 80% of revision procedures.\textsuperscript{16} It is well known that mechanical factors are responsible for loosening of femoral components\textsuperscript{17} because of the exposure of the host bone to un-physiological loads.\textsuperscript{1,3} The biomechanical concept of the TPP is direct load transfer to the cortical bone in order to prevent stress shielding effects of conventional intramedullary hip prostheses.

In the present study, no aseptic loosening of the prosthesis was detected over the course of the 72-month follow-up (mean follow-up: 37.2 months). Although we had mechanical problems in five cases (7.4%), in our opinion, these cases should not be considered as aseptic loosening; three of them occurred in the first six months, probably due to improper application of the procedure. There was a definite history of a fall in the remaining two patients. Two of these cases were revised with long-plate TPP and only the screws were replaced in the other two cases after which no further problems were detected. The revision rate in our series is comparable to that in previous reports about TPP in which 6.9% to 21% revision rates have been reported.\textsuperscript{7,9,11,13}

Although the first implantation of TPP was in 1978, the current design (third generation) has been available since 1992, so TPP is a relatively new concept and the current series reported in the literature include small numbers of patients. To our knowledge, the largest series were reported by Huggler and colleagues\textsuperscript{1} and Fink and associates\textsuperscript{2} with 162 and 72 hips, respectively. However, these series include first and second generation TPP, so the series presented in this report seems to be one of the largest series in the literature devoted solely to the new TPP design.

In the present series, the patients are relatively older (mean: 59.5 years) than those in previous reports. In these articles, the mean age was between 40 to 50 years.\textsuperscript{8,12} Due to its uncemented nature, TPP is generally recommended for younger patients. In our opinion, TPP is a different concept and can be applied to older patients. Our results confirm this statement and we have previously shown that TPP was suitable for full weightbearing on the second postoperative day.\textsuperscript{14}

Our results, in addition to the other biomechanical\textsuperscript{3,5,6} and clinical studies,\textsuperscript{7,13} are promising. However, we certainly believe that prospective randomized clinical trials comparing TPP with conventional intramedullary hip prostheses are mandatory for more strict conclusions.

References