Clinical Outcome of Total Hip Arthroplasty Using the Normalized and Proportionalized Femoral Stem With a Minimum 20-Year Follow-Up

Sathappan S. Sathappan, MD, Matthew L. Teicher, BS, Craig Capeci, BS, Michelle Yoon, BS, Bradley R. Wasserman, MD, and William L. Jaffe, MD

Abstract: Currently, there are several femoral stem designs available for use, but few have an extended track record. We have previously reported on 10- and 15-year outcome studies of total hip arthroplasty (THA) using a cemented normalized and proportionalized femoral stem from a single surgeon series. This is a follow-up study reporting the minimum 20-year outcome of this femoral stem design. The study began with THA performed in a consecutive series of 184 patients; stem fixation was achieved using first-generation cementing techniques. The overall early complication rate was 10%. There were 23 patients (31 hips) who had been followed-up for a minimum 20-year period (average 21.3 years). Mean d'Aubigne and Postel scores improved from 5.9 to 11.3; mean Harris hip scores improved from 43.8 to 92.8. Kaplan-Meier survivorship was 93% at 20 years (95% confidence interval); there were no stem failures. The use of a cemented normalized and proportionalized femoral stem in primary THA provides satisfactory long-term clinical and radiological outcomes in patients. **Key words:** total hip arthroplasty, femoral stem, cemented, normalized and proportionalized.

In this era of modern technology, there are new innovations and surgical modifications being made available in the field of arthroplasty [1,2]. Currently, there are numerous femoral stem designs available for performing total hip arthroplasty (THA). These can be broadly divided into cemented and cementless subtypes [3,4]. Cemented femoral stems have a proven track record [5-7]. In the published literature, although there are various survivorship reports on different components, the presence of multiple variables makes data interpretation difficult. For optimal comparison, it would be ideal to analyze a single surgeon series consisting of cemented THA with long-term outcomes [8,9]. Although there are various long-term reports on cemented THA, only a few indicate a minimum 20-year follow-up period [10-12].

We have previously reported on all primary cemented THAs using the Omnifit (HS1& HS2 Osteonics, Allendale, NJ) femoral stem, which were performed by the senior author (WLJ), with a 10- and 15-year follow-up [7,13]. This is a continued report on the same cohort of patients with a minimum 20-year follow-up. This study was approved by the Institutional Review Board.

Materials and Methods

From January 1980 to 1984, 215 consecutive cemented total hip arthroplasties were performed

From the NYU-Hospital for Joint Diseases Department of Orthopedic Surgery, Musculoskeletal Research Center, New York.
Submitted July 27, 2005; accepted April 13, 2006.
No benefits or funds were received in support of the study.
Reprint requests: William L. Jaffe, MD, Hospital for Joint Diseases, 301 East 17th Street, Suite 1500, New York, NY 10003.

0883-5403/07/1906-0004$32.00/0
doi:10.1016/j.arth.2006.04.004

using the Omnifit femoral stem in 184 patients. The femoral component is manufactured from matte-finished cobalt-chrome and is characterized by normalized (stepped taper) and proportionalized dimensions (Fig. 1). All patients were preoperatively evaluated and scored using the d'Aubigne and Postel [5,14] and Harris hip score (HHS) rating systems [15]. The d'Aubigne and Postel rating system, which was subsequently modified by Charnley, allows the variables of pain, function, and motion to be scored from 0 to 6 points for each category; other authors have cited this to be a reliable index [5,16,17].

The senior author who had trained with Sir John Charnley, followed similar surgical and cementing techniques [16,18]. All surgical procedures were performed by the senior author or by a senior resident under the direct supervision of the senior author. All procedures were performed in laminar-flow operating rooms, and patients were administered broad-spectrum cephalosporins for prophylaxis. Patients were placed in a supine position, and procedures were performed through a transtrochanteric, lateral approach. First-generation femoral cementing technique was used in all cases; this consisted of finger-packing the cement without the use of canal restrictors. In most patients, an all-polyethylene, flanged acetabular component (Charles F. Thackray, Leeds, UK) was cemented into the pelvis. In all cases, the femoral head diameter was small (22 and 26 mm). Postoperatively, intravenous dextran was administered for thromboembolic prophylaxis. Closed suction drain and antibiotic prophylaxis were discontinued after 24 and 48 hours, respectively.

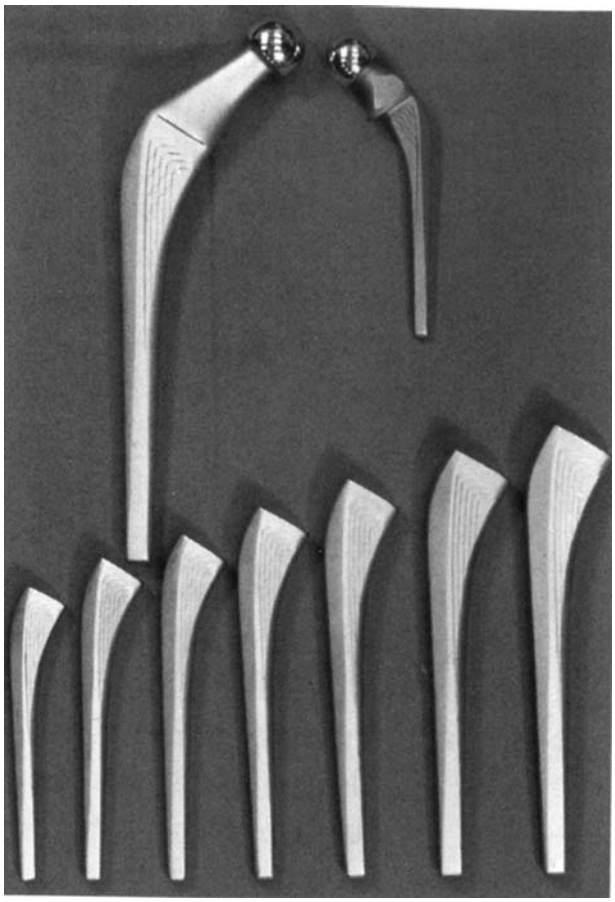

Fig. 1. Available sizes of the Omnifit normalized and proportionalized femoral stem.

After discharge, patients were reviewed at 6 weeks, 6 months, and 12 months. Thereafter, all patients were followed-up yearly, and components were assessed using anteroposterior and lateral radiographs.

For our study, patient bio-data (age, sex, diagnosis, side of surgery) were collected and entered into a standardized protocol form that was updated at subsequent reviews [7,13]. The primary surgical procedure was reviewed, and it was also determined if any subsequent revision surgeries were performed. All serial postoperative radiographs were evaluated for component position, status of trochanteric osteotomy, presence of cortical hypertrophy, and radiolucencies. Femoral stem alignment (varus, valgus, neutral) and acetabular abduction angle were measured. For the cementless cups done in the later part of the study period, we evaluated the anteversion angle using previously described methods [19]. Polyethylene linear wear rate was determined using the method described previously by Charnley and Cubic [18]. The smaller measurement is subtracted from the larger value, and this is divided by 2; this value is divided by the time period to attain polyethylene wear rate [20].

Radiolucent zones around the femoral stem and acetabular cup were graded using the Gruen [21] and the DeLee and Charnley [22] classification zones, respectively. The acetabular cup was considered definitely loose when there was migration greater than 2 mm in a vertical or horizontal direction and probably loose when there was a circumferential and progressive radiolucent line greater than 2 mm when there was no change in component position. Likewise, the femoral stem was classified as definitely loose when there was migration or a change in position or subsidence greater than 2 mm; it was classified as probably loose when it was surrounded by a continuous, progressive radiolucent line in the cement-bone interface without component migration [23,24].