1. Minimum 30-Year Follow-Up of Charnley Total Hip Arthroplasty: A Standard for Future Arthroplasty

John J. Callaghan, M.D.
Iowa City, IA
*Jesse E. Templeton, B.S.
Iowa City, IA
(a,b,c,e-DePuy; a-NIH)
Steve S. Liu, M.D.
Iowa City, IA
Devon D. Goetz, M.D.
West Des Moines, IA
Patrick M. Sullivan, M.D.
West Des Moines, IA
Richard C. Johnston, M.D.
Iowa City, IA

PURPOSE: The objective of this paper is to report the long-term durability of cemented total hip arthroplasty. We evaluated the minimum 30-year follow-up of a consecutive series of Charnley total hip replacements performed by a single surgeon.

METHODS: 330 Charnley total hip replacements were performed in 262 patients between 1970 and 1972. Living patients were evaluated clinically using a standard terminology questionnaire and with WOMAC scores and all hips were evaluated for the need of revision and radiographic loosening of the components.

RESULTS: Only one hip has been lost to follow-up. The present status or the status at the time of patient death of all other hips was recorded. 80% of living patients had minimum 30-year radiographic follow-up. The prevalence of revision was 13% for all hips and 25% for hips of patients living 30 years. 7.3% of all hips and 24% of living hips required a revision for aseptic loosening, and only 4% of living hips required more than one revision. In the evaluation of specific component revisions for loosening, 6.4% of all acetabular components and 24% of acetabular components in living patients have been revised and for the femoral component 1.2% of all femoral components and 8.8% of components in living patients have been revised.

DISCUSSION: This study demonstrates the remarkable durability of cemented Charnley total hip replacement over a 30-year follow-up period. It should provide a comparison for long-term follow-up studies of total hip arthroplasty performed with other devices and techniques.

2. Minimum 20-Year Follow-Up of Cemented Total Hip Arthroplasty Performed for Severe Dysplasia of the Hip: Is Bone Grafting Necessary?

John J. Callaghan, M.D.
Iowa City, IA
*Aimee S. Klapach, M.D.
Iowa City, IA
(a,b,c,e-DePuy; a-NIH)
Kristin A. Miller, M.D.
Iowa City, IA
Devon D. Goetz, M.D.
West Des Moines, IA
Patrick M. Sullivan, M.D.
West Des Moines, IA
Richard C. Johnston, M.D.
Iowa City, IA

Dr. Klapach is the recipient of the E. W. Johnson, Jr., M.D. Prize for Excellence in Medical Writing.

PURPOSE: The purpose of the present study is to report the 20-30 year results of cemented total hip replacement performed in Crowe Type II, III, and IV subluxation associated with congenital hip dysplasia. No bone grafting was utilized in these cases.

METHODS: Between 1970 and 1982, 71 cemented total hip replacements were performed in 52 patients who had congenital dysplasia of the hip and Crowe Type II, III, or IV subluxation. The average age of the patients at the time of surgery was 53 years (23 to 73 years). The patients were evaluated for aseptic revision of the acetabular and femoral component, radiographic loosening of the acetabular and femoral component as well as the clinical results. The results were compared to the senior author's experience with cemented total hip arthroplasty in patients with other etiologies of their hip arthritis.

RESULTS: At 20-30 year follow-up, 32 patients in 46 hips were still living. No patients were lost to follow-up. Revision was performed for aseptic loosening in 13% (acetabular component 10%, femoral component 3%). Radiographic acetabular loosening, including those cases revised, occurred in 23% of hips and femoral radiographic loosening, including those hips revised, occurred in 7%. Compared to the senior author's experience with cemented total hip arthroplasty performed for other diagnoses and followed for a similar time interval, there was no significant difference in radiographic loosening (femoral [6%] or acetabular [22%]).

DISCUSSION: Excellent long-term results can be obtained using cemented total hip arthroplasty in patients with congenital dislocation of the hip. In this series all hips were placed at the anatomic position which probably optimized joint reactive forces to the hip. In addition, 22 mm heads were utilized which contributed to the relatively low wear rate. This series should provide a benchmark comparison for total hip replacement performed in cases of CDH where both autografts and cement were used for acetabular reconstruction and in cases where cementless fixation was utilized on either the acetabular or femoral side of the construct.

3. Progression of Peri-Acetabular Lysis Over Time: Serial Analysis Using Computed Tomography

*Raju S. Ghate, M.D.
Chicago, IL
S. David Stulberg, M.D.
Chicago, IL
Richard L. Wixson, M.D.
Chicago, IL
Ronald Hendrix, M.D.
Chicago, IL

BACKGROUND: Since acetabular osteolytic lesions following total hip arthroplasty (THA) may be asymptomatic until extensive bone loss occurs, early detection and monitoring the progression of these lesions is important. The purpose of this study was to use high resolution helical CT to determine the progression of the osteolytic lesions over time by comparing serial studies.

METHOD: Fifty patients (58 hips) with primary, cementless THA done between 1984-1996 with a history of high levels of activity were evaluated as part of an ongoing prospective study. The area of the maximum size osteolytic lesions on axial images were measured on the initial scan and compared at the same level on the subsequent study.

RESULTS: The mean age was 51 years, 55% male:45% female. The average time from date of surgery to initial scan was 8.0 years (4.7-16.6). The interval between scans averaged 15 months (10-27). Progression was noted on 87% hips. The mean initial area was 328 mm^2 (40-1084) with the follow-up area of 386 mm^2 (46-1344) with a mean of progression of 15.7%.

CONCLUSIONS: Once established, peri-acetabular lysis appears to be a slowly progressive, relentless process. Analyzing changes on serial CT provides an additional important tool to evaluate the need for surgical intervention.

4. Outcome of Unicameral Bone Cysts Treated with Percutaneous Bone Grafting

*Bruce T. Rougraff, M.D.
Indianapolis, IN

MATERIALS: Between May 1993 and January 2002, 83 patients were seen by the author for the treatment of unicameral bone cyst. Twenty-six (31%) have been treated with splinting and observation (no injection or surgery). Fifty-seven patients demonstrated active behavior with progressive lytic changes, recurrent fractures, or impending fracture of the proximal femur. Forty-one were proximal humerus, 11 proximal femur, 2 calcaneus, 1 each tibia, fibula, and radius. All 57 patients were treated with percutaneous injection of allogeneic demineralized bone matrix and autologous bone marrow. Follow-up averaged 38 months after procedure.

RESULTS: The success rate after a single injection was 47/57 (81%). Cyst recurrence occurred in 11 patients between 8 and 13 months after the index procedure despite an initial good radiographic and clinical response. Of 11 patients with recurrent cysts that underwent a second injection, 9/11(82%) healed the cyst and never required further treatment. Two patients required three injections, and one had four injections, both with good outcome at most recent follow-up. Recurrent cysts developed more often in younger patients. Patients that required a second injection average age 7.1 years versus 11.3 years in those who did not require a repeat injection ($p<0.05$). No late cyst recurrences (i.e., after 13 months) were identified.

CONCLUSION: Allogeneic demineralized bone matrix with autologous bone marrow is a highly successful percutaneous procedure in the treatment of active unicameral bone cysts.

5. **Improving Follow-Up of Indigent Patients – A Comparison of Methods in Studies which Achieved 100% Follow-Up**

*Tyler Goldberg, M.D.
Chattanooga, TN
Thomas W. Currey, M.D.
Chattanooga, TN
Joseph N. Rudd, Ph.D.
Chattanooga, TN

Dr. Goldberg is the recipient of the J. Albert Key, M.D. Prize for Excellence in Medical Writing.

INTRODUCTION: Follow-up of indigent patients is difficult. Demographics collected at initial hospitalization change often.

This paper compares two methodologies for obtaining follow-up from the indigent population and suggests a protocol that will most efficiently bring patient compliance.

MATERIAL AND METHODS: In a boxer fracture study, patients gave standard demographics. Due to the indigent lifestyle, many information points were variables. Patients were offered $20.00/visit to promote follow-up. At one year, 3/100 were available for follow-up.

This poor performance prompted investigation of new methods for intake/ongoing care, which led to great improvement.

Direct comparison of the two most successful subsequent studies was conducted.

Study 1: (Tibia investigation) Demographics obtained per standard hospital procedure from six patients. Patients were paid $50.00/visit incentive.

Study 2: (Nonunion/delayed union study) Demographics gathered on 34 patients using police investigation techniques. Related contacts were identified/credibility verified. Rapport established with the patient/family.

RESULTS: 100% follow-up was obtained at one year in both studies.

Significant difficulty was experienced obtaining follow-up in study 1. Patients used failure to keep appointments as a bargaining point to renegotiate compensation. Follow-up was not perceived as necessary or a pleasant experience.

Study 2 patients kept appointments, expressed comfort during follow-up, felt that the physicians/staff were allies, and felt in control of their own care.

DISCUSSION/CONCLUSION: In both cases, availability of patients for follow-up increased dramatically. Financial compensation, while effective, was troublesome. Providing direct access to an interested, personable study coordinator was much less cumbersome, provided superior results, provided patients with perceived advocate.

6. Clinical Utility of Intraoperative Cultures of Allograft Bone

*Brett Barnhart, M.D.
Springfield, IL
Joan Barenfanger, M.D.
Springfield, IL
Nancy Khardori, M.D.
Springfield, IL
Termkiat Kanchanapom, M.D.
Springfield, IL
D. Gordon Allan, M.D.
Springfield, IL

INTRODUCTION: The standard protocol for utilization of commercial bone allografts at our institution includes routine intraoperative bacterial cultures of the allograft. This is performed even though a rigorous evaluation, including multiple bacterial cultures, is performed by the commercial supplier prior to release for clinical use. The goal of this study was to determine the clinical efficacy of this protocol.

METHODS: Hospital and clinical charts of 205 patients, representing 282 cultures of allograft bone, were retrospectively reviewed. Data collection included type of allograft, procedure, preoperative wound status, culture results, and presence of post-operative infection.

RESULTS: Of the 282 cultures sent for evaluation, 8 were found to have bacterial growth. Seven of the eight patients with positive allograft cultures had no hospital infection, no record of infection in outpatient follow-up, and no record of hospital readmission related to infection of the surgical site. One of these eight patients was found to have a clinical postoperative infection. However, the culture results of the infecting organism obtained at surgical debridement did not correlate to the organism grown in the original allograft cultures.

CONCLUSION: These results indicate that routine intraoperative cultures of allograft bone do not help to predict clinical infection and are not clinically useful.

7. A Biomechanical Comparison of PLIF versus TLIF Under Physiologic Compressive Follower Load

*Stanley S. Lee, M.D.
Chicago, IL
(a-DePuy, Acromed)
Alexander J. Ghanayem, M.D.
Maywood, IL
Leonard Voronov, M.D., Ph.D.
Maywood, IL
Avinash Patwardhan, Ph.D.
Maywood, IL

We set out to compare the stability of posterolateral lumbar interbody fusion (PLIF) and transforaminal lumbar interbody fusion (TLIF) under flexion/extension and lateral bending forces and to verify the importance of achieving physiologic compressive forces when assessing construct stability.

Ten fresh cadaveric human spines (L1-S1) were randomized to PLIF or TLIF. Using variable follower compressive loads (ON-1200N), segmental ROM of the intact spines was recorded under flexion/extension moment (8N/6N) and lateral bending moment (3N). PLIF specimens were instrumented at L4-5 with two interbody spacers and bilateral pedicle screws. TLIF specimens were instrumented at L4-5 with one interbody spacer and ipsilateral pedicle screws (uTLIF). Specimens were retested. Finally, contralateral pedicle screws were added to uTLIF specimens (bTLIF) and then tested again. ROM reduction (%) from intact was calculated for PLIF, uTLIF, and bTLIF. Statistical analysis (ANOVA) and power analysis was performed.

At 1200N, L4-5 PLIF, uTLIF, and bTLIF reduced flexion/extension ROM 83%, 80%, and 89%, respectively. At 300N, L4-5 PLIF, uTLIF, and bTLIF reduced lateral bending ROM 84%, 70%, and 89%, respectively. These results were statistically similar. Our study had power to detect a 27% difference in ROM with 85% confidence. Increasing compressive preload made a statistically significant difference in flexion/extension ROM but not in lateral bending ROM.

These three constructs have similar stability in flexion/extension, however, uTLIF is less stable under lateral bending. Compressive load has a significant impact on interbody fusion stability.

8. Progression of Scoliosis in Spastic Quadriplegic Patients After the Insertion of Intrathecal Baclofen Pump

*Anthony J. Lauder, M.D.
Omaha, NE
Glen M. Ginsburg, M.D.
Omaha, NE

PURPOSE: To document the magnitude and rate of scoliosis progression after administration of intrathecal baclofen (ITB) via subcutaneous pump in spastic nonambulatory quadriplegic patients.

METHODS: Charts and radiographs were reviewed for 23 patients with at least one pre- and post-pump insertion spinal radiograph. Eighteen of the 23 patients had at least two pre- and two post-pump radiographs.

RESULTS: Median average Cobb angles were 9.2º before insertion and 22º at an average of 20.9 months after pump insertion. This was statistically significant (Wilcoxon signed-rank test, p=0.0001). The 18 patients with at least two pre- and post-pump insertion radiographs had a median rate of change of their Cobb angles of 1.825º/year before pump insertion and 10.95º/year at an average of 23.9 months after pump insertion. This was statistically significant (p=0.024).

DISCUSSION: These results represent a six-fold increase in the curve progression rate after pump insertion. In published data, the rate of progression of scoliosis in skeletally mature bed-ridden patients with cerebral palsy was 2.4º/year. Our comparable rate of change in skeletally mature (Risser 5) wheelchair bound patients (n=5) was 28.4º/year.

CONCLUSION: This study demonstrates a significant increase in the rate of scoliotic curve progression after ITB when compared with natural history data.