1147 '04 MAR 31 10:20

March 30, 2004

Food and Drug Administration
Office of Device Evaluation
Division of Dockets Management (HFA-305)
5630 Fishers Lane, Room 1061
Rockville, MD 20852

Re: Guidance Document Submission – Clinical Trial Design for Hip Replacement Systems

Ladies and Gentlemen:

Please find in triplicate, the enclosed above-referenced draft guidance submitted by the Orthopaedic Surgical Manufacturers Association (OSMA).

We look forward to any feedback you have prior to the Panel meeting where this document will be considered. If you have any questions in the meantime, please do not hesitate to contact Joel Batts at 813-877-4469.

Sincerely,

William Christianson
President, OSMA

BC/ejwg

Enclosure (3)

~~2003D-0561~~
2004D-0210

GDL1

ORTHOPEDIC SURGICAL MANUFACTURERS ASSOCIATION
An Association of Manufacturers Devoted to the Interest of the Surgical Patient
1962 Deep Valley Cove
Germantown, TN 38138 • Phone/Fax: 901-754-8097
e-mail: rgames@bellsouth.net

Clinical Trial Design for Hip Replacement Systems

INTRODUCTION

The purpose of this document is to propose a standardized method for designing clinical trials intended to measure the safety and efficacy of hip replacement systems (HRS). A standardized method of study design will provide a least burdensome approach to designing, reviewing, and acceptance of study protocols for both Sponsors and the FDA. The goal of the guidance is to provide consistency in the study design, review, and approval process and to speed up introduction of new devices to market. This document is not intended to address the reclassification of HRS devices. The terms "patient(s)" and "subject(s)" are used interchangeably throughout.

SCOPE

For the purpose of this document, an HRS is any device that is intended to replace the hip joint, in part or in total, as a treatment for joint disease, trauma, or dysfunction, where functional restoration and pain relief are the desired outcomes. HRS classifications include:

21 CFR 888.3353	Hip joint metal/ceramic/polymer semi-constrained cemented or nonporous uncemented prosthesis
21 CFR 888.3310	Hip joint metal/polymer constrained cemented or uncemented prosthesis
21 CFR 888.3320	Hip joint metal/metal semi-constrained, with a cemented acetabular component, prosthesis
21 CFR 888.3330	Hip joint metal/metal semi-constrained, with an uncemented acetabular component, prosthesis
21 CFR 888.3340	Hip joint metal/composite semi-constrained cemented prosthesis
21 CFR 888.3350	Hip joint metal/polymer semi-constrained cemented prosthesis
21 CFR 888.3358	Hip joint metal/polymer/metal semi-constrained porous-coated uncemented prosthesis
21 CFR 888.3410	Hip joint metal/polymer semi-constrained resurfacing cemented prosthesis
Not Classified	Hip joint metal/metal semi-constrained resurfacing cemented prosthesis (Device name - no description given in regulation)
Not Classified	Prosthesis, hip, semi-constrained, metal/polymer, uncemented (Device name - no description given in regulation)

CONSIDERATIONS FOR HRS CLINICAL STUDIES

Goals

The broad goal of clinical studies involving HRS is to generate safety and efficacy data for evaluating the use of HRS in treatment of damaged and diseased hip joints. Safety is defined on the basis of the number of adverse events relative to the number of subjects in

the study. Efficacy is defined on the basis of the extent to which function is restored and pain is relieved.

Variables

Other than HRS, few surgical options exist that both restore joint function and provide pain relief. Arthrodesis (fusion) may provide pain relief, but cannot restore joint function. Osteotomies around the hip joint may restore function and provide pain relief, yet the orientation of the joint surfaces are only shifted so that areas with less disease progression are in contact; the joint is not replaced.

HRS devices, on the other hand, have a clinically established, long-term record of safety and efficacy (see Appendices II and III). Sufficient information is available about the performance of these devices to allow for alternative study designs to randomized controlled trials. Because of this information and because of limitations in the other types of surgical treatment, safety and efficacy of new HRS devices are best established through comparison with other existing HRS devices.

This comparison should take place within the context of standardized measures for safety and efficacy, including at a minimum, *device-related complications, Harris Hip Scores (HHS), and revision surgeries.*

A. Device Related Complications

Complications are a measure of safety of the HRS device. All complications must be recorded, but only those possibly or probably related directly to the HRS should be included in the calculation (see Appendix IV).

Examples of device related complications include:

- Loss of function as might occur through subluxation or dislocation of the hip joint any time post-operatively.
- Excessive wear, migration, or breakage of any component of the HRS, even if such failure does not lead immediately to revision surgery **or** symptoms.

B. Harris Hip Score

The Harris Hip Score[1] has been the most widely used physician-generated scoring system in HRS studies in the United States. A rating of excellent, good, fair, or poor is generated based upon factors such as pain, range of motion, and ability to perform activities of daily living. The score reflects efficacy and correlates significantly with patient-derived scoring systems. Allowance can be made for using instruments other than HHS, but the sponsor must document comparability to the HHS and establish appropriate benchmarks.

[1] Harris W. JBJS(Am). 51-A(4):737-55. June 1969

C. Revision Surgeries
A revision is defined as a procedure that is performed on the replaced hip to remove and/or replace any component(s) that were implanted at the index operation. The percentage of revision surgeries should be calculated as the number of revisions divided by the number of subjects.

Standardized benchmarks

Disagreement exists within the orthopaedic community over what precisely constitutes a "successful" HRS patient outcome. On the one hand, objective measures, such as those obtained from analyzing device failures, can be used to assess safety of HRS components. On the other hand, subjective measures, such as pain severity, indicate the patient's own assessment of the result of their HRS. Objective and subjective measures can produce contradicting depictions of HRS performance. Nonetheless, a combination of these two types of measures provides clinicians with the most comprehensive view of the success of the patient's treatment.

Patient success

When quantitative values are applied to these variables, "patient success" can be determined. Patient success is attained when a subject meets the quantities defined in all variables. The standardized quantities for the variables are:

A. Device related complications = 0 %
B. HHS at 12 months greater or equal to 80
C. Revision surgeries = 0 %

For secondary endpoint considerations, radiographic analysis should also be conducted. Measurements made on radiographs to determine implant position/migration are fairly standardized in the literature (e.g., Gruen zones and DeLee/Charnley zones). However, some HRS designs may not conform well to these measurement techniques. In such situations, the measurement techniques should be proposed by the Sponsor. In either case, the Sponsor should also propose the definition of "radiographic failure" and report the number of failures.

A quality of life measure may be used as well as a further measure of outcome, but is not required.

Study success

Based on the above criteria for patient success, each patient can be deemed either a "success" or "failure". Study success is achieved when at least 95% of patients are deemed patient successes.

Number of subjects needed and data gathering intervals

In order to detect a difference between the HRS study device group and the 95% study success definition, the sample size should be no less than 239 subjects (see Appendix V). This number of subjects permits detection of any difference between the HRS device

study success and 95% study success definition, from 91% to 95%. In other words, this protocol is setup to indicate whether or not the HRS study device is at least within 4% of the 95% study success definition. Accordingly, the 95% C.I is 91.7% - 97.5% and the 90% C.I. is 90% - 97%.

Bilateral patients and attrition considerations may result in a different number of subjects needed depending on sponsor's device, indications for use, and overall goals of the study.

Data for HRS clinical studies should be gathered (at a minimum) preoperatively, at 6 weeks, 6 months and 12 months postoperatively.

Appendix I

Method of Defining Standardized Benchmarks

The development of standardized benchmarks was accomplished by clinical consensus. The consensus was determined by a group of orthopaedic surgeons specializing in hip replacement surgery. This group was assembled with the approval of the leadership and the members of the Hip Society. The Society exists to advance knowledge of the hip joint in health and in distress and to provide a forum to stimulate the exchange of knowledge concerning education, research, and treatment of disorders of the hip. The members of the team were:

William Bargar, MD	Joint Surgeons of Sacramento
Thomas Bauer, MD	Cleveland Clinic
David Blaha, MD	University of Michigan
Roger Emerson, MD	Private Practice, Plano, TX
Seth Greenwald, DPhil	Cleveland Clinic Health System
Michael Huo, MD	University of Kansas
Brian Kavanagh, MD	Private Practice, Greenwich, CT
Richard Kyle, MD	University of Minnesota
Adolph Lombardi, MD	Ohio State University
Michael Mont, MD	Johns Hopkins University
Philip Noble, PhD	Baylor College of Medicine
Steven Woolson, MD	Stanford University
Bernard Stulberg, MD	Cleveland Ct for Joint Reconstruction
Timothy Wright, PhD	Hospital for Special Surgery

This consensus team considered the 3 variables in the guidance document and reached conclusions on the minimum benchmark for each when determining "patient success".

To aid the team in arriving at their conclusions, a literature search was performed aimed at discovering the failure modes of *total* hip replacement devices recorded in clinical studies of various HRS designs. The literature search was conducted using MeSH headings and sorted by the Levels of Evidence, described in Appendix II, as established by the Journal of Bone and Joint Surgery (Wright, et al. Vol. 85-A, 1-3, 2003). The sorted literature is shown in Appendix III.

The Team also compiled a comprehensive list of systemic and local (hip site) complications, described in Appendix IV. The Team also evaluated any other data within the articles that helped define the benchmarks.

The following questionnaire was used to facilitate the arrival at the benchmarks:

1. Please provide as comprehensive a list as possible of complications that can be attributed to HRS devices themselves.

2. What is the minimum acceptable change in Harris Hip Score at the final postoperative endpoint versus preoperative?

3. What is the minimum acceptable Harris Hip Score at the final postoperative endpoint?

4. What measures should be performed on postoperative radiographs and what are the minimum acceptable quantities of those measures?

5. What is the minimum percent difference in "clinical success" as defined in the draft guidance, between an HRS composite under study and the consensus benchmark composite?

6. What should the final postoperative endpoint be for HSR studies in terms of time?

Appendix II

Levels of Evidence for Primary Research Question

Level I	1. Randomized controlled trial a. Significant difference b. No significant difference but narrow confidence intervals 2. Systematic review [1] of Level-I randomized controlled trials (studies were homogeneous)
Level II	1. Prospective cohort study [2] 2. Poor-quality randomized controlled trial (e.g., <80% follow-up) 3. Systematic review [1] a. Level-II studies b. nonhomogeneous Level-I studies
Level III	1. Case-control study [3] 2. Retrospective cohort study [4] 3. Systematic review [1] of Level-III studies
Level IV	Case series (no, or historical, control group)
Level V	Expert opinion

1. A study of results from two or more previous studies. The study was initiated after treatment was performed
2. Patients were compared with a control group of patients treated at the same time and institution.
3. Patients with a particular outcome ("cases" with, for example, a failed total arthroplasty) were compared with those who did not have the outcome ("controls" with, for example, a total hip arthroplasty that did not fail).
4. The study was initiated after treatment was performed.

Appendix III

Literature Review for Hip Studies Guidance Document

A. *JBJS* Level of Evidence I
Search strategy – Limits: English language publications, MeSH terms "Arthroplasty", "Replacement" and "Hip", Randomized Control Trials

Results: 246 citations found; exclusion criteria are any articles that are not using prosthesis/patient outcome as primary variable (i.e., articles looking at different DVT prophylaxis drugs, different preoperative education techniques, etc.)

1: Kim YH, Oh SH, Kim JS, Koo KH. Contemporary total hip arthroplasty with and without cement in patients with osteonecrosis of the femoral head. J Bone Joint Surg Am. 2003 Apr;85-A(4):675-81.
PMID: 12672844 [PubMed - indexed for MEDLINE]

2: MacDonald SJ, McCalden RW, Chess DG, Bourne RB, Rorabeck CH, Cleland D, Leung F. Metal-on-metal versus polyethylene in hip arthroplasty: a randomized clinical trial. Clin Orthop. 2003 Jan;(406):282-96.
PMID: 12579029 [PubMed - indexed for MEDLINE]

3: D'Antonio J, Capello W, Manley M. Alumina ceramic bearings for total hip arthroplasty. Orthopedics. 2003 Jan;26(1):39-46.
PMID: 12555833 [PubMed - indexed for MEDLINE]

4: Laupacis A, Bourne R, Rorabeck C, Feeny D, Tugwell P, Wong C. Comparison of total hip arthroplasty performed with and without cement : a randomized trial. J Bone Joint Surg Am. 2002 Oct;84-A(10):1823-8.
PMID: 12377914 [PubMed - indexed for MEDLINE]

5: Pitto RP, Blanquaert D, Hohmann D. Alternative bearing surfaces in total hip arthroplasty: zirconia-alumina pairing. Contribution or caveat? Acta Orthop Belg. 2002 Jun;68(3):242-50.
PMID: 12152371 [PubMed - indexed for MEDLINE]

6: Rasquinha VJ, Ranawat CS, Mauriello AJ Jr. Hydroxyapatite: catalyst or conjuror? J Arthroplasty. 2002 Jun;17(4 Suppl 1):113-7.
PMID: 12068419 [PubMed - indexed for MEDLINE]

7: D'Antonio J, Capello W, Manley M, Bierbaum B. New experience with alumina-on-alumina ceramic bearings for total hip arthroplasty. J Arthroplasty. 2002 Jun;17(4):390-7.
PMID: 12066265 [PubMed - indexed for MEDLINE]

8: Settecerri JJ, Kelley SS, Rand JA, Fitzgerald RH Jr. Collar versus collarless cemented HD-II femoral prostheses. Clin Orthop. 2002 May;(398):146-52.
PMID: 11964644 [PubMed - indexed for MEDLINE]

9: Lombardi AV Jr, Mallory TH, Alexiades MM, Cuckler JM, Faris PM, Jaffe KA, Keating EM, Nelson CL Jr, Ranawat CS, Williams J, Wixson R, Hartman JF, Capps SG, Kefauver CA. Short-term results of the M2a-taper metal-on-metal articulation. J Arthroplasty. 2001 Dec;16(8 Suppl 1):122-8.
PMID: 11742463 [PubMed - indexed for MEDLINE]

10: Tanzer M, Kantor S, Rosenthall L, Bobyn JD. Femoral remodeling after porous-coated total hip arthroplasty with and without hydroxyapatite-tricalcium phosphate coating: a prospective randomized trial. J Arthroplasty. 2001 Aug;16(5):552-8.
PMID: 11503113 [PubMed - indexed for MEDLINE]

11: Sharp RJ, O'Leary ST, Falworth M, Cole A, Jones J, Marshall RW. Analysis of the results of the C-Fit uncemented total hip arthroplasty in young patients with hydroxyapatite or porous coating of components. J Arthroplasty. 2000 Aug;15(5):627-34. Review.
PMID: 10960002 [PubMed - indexed for MEDLINE]

12: Thanner J, Karrholm J, Herberts P, Malchau H. Hydroxyapatite and tricalcium phosphate-coated cups with and without screw fixation: a randomized study of 64 hips. J Arthroplasty. 2000 Jun;15(4):405-12.
PMID: 10884197 [PubMed - indexed for MEDLINE]

13: Yee AJ, Kreder HK, Bookman I, Davey JR. A randomized trial of hydroxyapatite coated prostheses in total hip arthroplasty. Clin Orthop. 1999 Sep;(366):120-32.
PMID: 10627726 [PubMed - indexed for MEDLINE]

14: Garellick G, Malchau H, Regner H, Herberts P. The Charnley versus the Spectron hip prosthesis: radiographic evaluation of a randomized, prospective study of 2 different hip implants. J Arthroplasty. 1999 Jun;14(4):414-25.
PMID: 10428221 [PubMed - indexed for MEDLINE]

15: Garellick G, Malchau H, Herberts P. The Charnley versus the Spectron hip prosthesis: clinical evaluation of a randomized, prospective study of 2 different hip implants. J Arthroplasty. 1999 Jun;14(4):407-13.
PMID: 10428220 [PubMed - indexed for MEDLINE]

16: Meding JB, Ritter MA, Keating EM, Faris PM, Edmondson K. A comparison of collared and collarless femoral components in primary cemented total hip arthroplasty: a randomized clinical trial. J Arthroplasty. 1999 Feb;14(2):123-30.
PMID: 10065715 [PubMed - indexed for MEDLINE]

17: Bourne RB, Rorabeck CH. A critical look at cementless stems. Taper designs and when to use alternatives. Clin Orthop. 1998 Oct;(355):212-23.
PMID: 9917606 [PubMed - indexed for MEDLINE]

18: Kelley SS, Lachiewicz PF, Hickman JM, Paterno SM. Relationship of femoral head and acetabular size to the prevalence of dislocation. Clin Orthop. 1998 Oct;(355):163-70.
PMID: 9917601 [PubMed - indexed for MEDLINE]

19: Middleton RG, Howie DW, Costi K, Sharpe P. Effects of design changes on cemented tapered femoral stem fixation. Clin Orthop. 1998 Oct;(355):47-56.
PMID: 9917590 [PubMed - indexed for MEDLINE]

20: Incavo SJ, Schneider R, Elting J. The effect of surface coating of femoral prostheses implanted without cement: a 2- to 4-year follow-up study. Am J Orthop. 1998 May;27(5):355-61.
PMID: 9604107 [PubMed - indexed for MEDLINE]

21: D'Lima DD, Oishi CS, Petersilge WJ, Colwell CW Jr, Walker RH. 100 cemented versus 100 noncemented stems with comparison of 25 matched pairs. Clin Orthop. 1998 Mar;(348):140-8.
PMID: 9553546 [PubMed - indexed for MEDLINE]

22: Onsten I, Carlsson AS, Besjakov J. Wear in uncemented porous and cemented polyethylene sockets: a randomised, radiostereometric study. J Bone Joint Surg Br. 1998 Mar;80(2):345-50.
PMID: 9546474 [PubMed - indexed for MEDLINE]

B. *JBJS* Levels of Evidence II or III

Search strategy – Limits: English language publications, MeSH terms "Arthroplasty", "Replacement", "Hip", and "Cohort Studies"

Results: 970 citations found; exclusion criteria are any articles that are not using prosthesis/patient outcome as primary variable (ie, articles looking at different DVT prophylaxis drugs, different preoperative education techniques, etc.)

[Still reviewing the results list for this search. 260 citations searched thus far.]

1: Jacobsen S, Jensen FK, Poulsen K, Sturup J, Retpen JB. Good performance of a titanium femoral component in cementless hip arthroplasty in younger patients: 97 arthroplasties followed for 5-11 years. Acta Orthop Scand. 2003 Jun;74(3):248-52. No abstract available.
PMID: 12899542 [PubMed - indexed for MEDLINE]

2: Reikeras O, Gunderson RB. Excellent results of HA coating on a grit-blasted stem: 245 patients followed for 8-12 years. Acta Orthop Scand. 2003 Apr;74(2):140-5.
PMID: 12807319 [PubMed - indexed for MEDLINE]

3: Bojescul JA, Xenos JS, Callaghan JJ, Savory CG. Results of porous-coated anatomic total hip arthroplasty without cement at fifteen years: a concise follow-up of a previous report. J Bone Joint Surg Am. 2003 Jun;85-A(6):1079-83.
PMID: 12784006 [PubMed - indexed for MEDLINE]

4: Keener JD, Callaghan JJ, Goetz DD, Pederson DR, Sullivan PM, Johnston RC. Twenty-five-year results after Charnley total hip arthroplasty in patients less than fifty years old: a concise follow-up of a previous report. J Bone Joint Surg Am. 2003 Jun;85-A(6):1066-72.
PMID: 12784004 [PubMed - indexed for MEDLINE]

5: Skinner JA, Kroon PO, Todo S, Scott G. A femoral component with proximal HA coating. An analysis of survival and fixation at up to ten years. J Bone Joint Surg Br. 2003 Apr;85(3):366-70.
PMID: 12729111 [PubMed - indexed for MEDLINE]

6: Pieringer H, Auersperg V, Griessler W, Bohler N. Long-term results with the cementless Alloclassic brand hip arthroplasty system. J Arthroplasty. 2003 Apr;18(3):321-8.
PMID: 12728424 [PubMed - indexed for MEDLINE]

7: Meneghini RM, Feinberg JR, Capello WN. Primary hybrid total hip arthroplasty with a roughened femoral stem: integrity of the stem-cement interface. J Arthroplasty. 2003 Apr;18(3):299-307.
PMID: 12728421 [PubMed - indexed for MEDLINE]

8: Capello WN, D'Antonio JA, Feinberg JR, Manley MT. Ten-year results with hydroxyapatite-coated total hip femoral components in patients less than fifty years old. A concise follow-up of a previous report. J Bone Joint Surg Am. 2003 May;85-A(5):885-9.
PMID: 12728040 [PubMed - indexed for MEDLINE]

9: Aldinger PR, Breusch SJ, Lukoschek M, Mau H, Ewerbeck V, Thomsen M. A ten- to 15-year follow-up of the cementless spotorno stem. J Bone Joint Surg Br. 2003 Mar;85(2):209-14.
PMID: 12678354 [PubMed - indexed for MEDLINE]

10: Kim YH, Oh SH, Kim JS, Koo KH. Contemporary total hip arthroplasty with and without cement in patients with osteonecrosis of the femoral head. J Bone Joint Surg Am. 2003 Apr;85-A(4):675-81.
PMID: 12672844 [PubMed - indexed for MEDLINE]

11: Franklin J, Robertsson O, Gestsson J, Lohmander LS, Ingvarsson T. Revision and complication rates in 654 Exeter total hip replacements, with a maximum follow-up of 20 years. BMC Musculoskelet Disord. 2003 Mar 25;4(1):6.
PMID: 12659648 [PubMed - indexed for MEDLINE]

12: Floren M, Lester DK. Outcomes of total hip arthroplasty and contralateral bipolar hemiarthroplasty: a case series. J Bone Joint Surg Am. 2003 Mar;85-A(3):523-6. No abstract available.
PMID: 12637441 [PubMed - indexed for MEDLINE]

13: Epinette JA, Manley MT, D'Antonio JA, Edidin AA, Capello WN. A 10-year minimum follow-up of hydroxyapatite-coated threaded cups: clinical, radiographic and survivorship analyses with comparison to the literature. J Arthroplasty. 2003 Feb;18(2):140-8.
PMID: 12629602 [PubMed - indexed for MEDLINE]

14: Korovessis P, Petsinis G, Repanti M. Zweymueller with metal-on-metal articulation: clinical, radiological and histological analysis of short-term results. Arch Orthop Trauma Surg. 2003 Feb;123(1):5-11. Epub 2002 Dec 19.
PMID: 12582789 [PubMed - indexed for MEDLINE]

15: Garcia-Cimbrelo E, Cruz-Pardos A, Madero R, Ortega-Andreu M. Total hip arthroplasty with use of the cementless Zweymuller Alloclassic system. A ten to thirteen-year follow-up study. J Bone Joint Surg Am. 2003 Feb;85-A(2):296-303.
PMID: 12571308 [PubMed - indexed for MEDLINE]

16: Katsimihas M, Taylor AH, Lee MB, Sarangi PP, Learmonth ID. Cementless acetabular replacement in patients with rheumatoid arthritis: a 6- to 14-year prospective study. J Arthroplasty. 2003 Jan;18(1):16-22.
PMID: 12555177 [PubMed - indexed for MEDLINE]

17: Lachiewicz PF, Messick P. Precoated femoral component in primary hybrid total hip arthroplasty: results at a mean 10-year follow-up. J Arthroplasty. 2003 Jan;18(1):1-5.
PMID: 12555174 [PubMed - indexed for MEDLINE]

18: Phillips CB, Barrett JA, Losina E, Mahomed NN, Lingard EA, Guadagnoli E, Baron JA, Harris WH, Poss R, Katz JN. Incidence rates of dislocation, pulmonary embolism, and deep infection during the first six months after elective total hip replacement. J Bone Joint Surg Am. 2003 Jan;85-A(1):20-6.
PMID: 12533567 [PubMed - indexed for MEDLINE]

19: Engh CA Jr, Ellis TJ, Koralewicz LM, McAuley JP, Engh CA Sr. Extensively porous-coated femoral revision for severe femoral bone loss: minimum 10-year follow-up. J Arthroplasty. 2002 Dec;17(8):955-60.
PMID: 12478503 [PubMed - indexed for MEDLINE]

20: Teloken MA, Bissett G, Hozack WJ, Sharkey PF, Rothman RH. Ten to fifteen-year follow-up after total hip arthroplasty with a tapered cobalt-chromium femoral component (tri-lock) inserted without cement. J Bone Joint Surg Am. 2002 Dec;84-A(12):2140-4.
PMID: 12473700 [PubMed - indexed for MEDLINE]

21: Meek RM, Michos J, Grigoris P, Hamblen DL. Mid-term results and migration behaviour of a ti-alloy cemented stem. Int Orthop. 2002;26(6):356-60. Epub 2002 Jul 17.
PMID: 12466868 [PubMed - indexed for MEDLINE]

22: Healy WL, Casey DJ, Iorio R, Appleby D. Evaluation of the porous-coated anatomic hip at 12 years. J Arthroplasty. 2002 Oct;17(7):856-63.
PMID: 12375243 [PubMed - indexed for MEDLINE]

23: Mann CJ, McNally S, Taylor E, Shepperd JA. A retrospective clinical and radiographic review of 173 hydroxyapatite-coated screw cups with 5- to 10-year follow-up, showing low revision rates for fixation failure. J Arthroplasty. 2002 Oct;17(7):851-5.
PMID: 12375242 [PubMed - indexed for MEDLINE]

24: Kim YH. Cementless total hip arthroplasty with a close proximal fit and short tapered distal stem (third-generation) prosthesis. J Arthroplasty. 2002 Oct;17(7):841-50.
PMID: 12375241 [PubMed - indexed for MEDLINE]

25: Roy N, Hossain S, Ayeko C, McGee HM, Elsworth CF, Jacobs LG. 3M Capital hip arthroplasty: 3-8-year follow-up of 208 primary hip replacements. Acta Orthop Scand. 2002 Aug;73(4):400-2.
PMID: 12358111 [PubMed - indexed for MEDLINE]

26: Brown SR, Davies WA, DeHeer DH, Swanson AB. Long-term survival of McKee-Farrar total hip prostheses. Clin Orthop. 2002 Sep;(402):157-63.
PMID: 12218479 [PubMed - indexed for MEDLINE]

27: Sanchez-Sotelo J, Berry DJ, Harmsen S. Long-term results of use of a collared matte-finished femoral component fixed with second-generation cementing techniques. A fifteen-year-median follow-up study. J Bone Joint Surg Am. 2002 Sep;84-A(9):1636-41.
PMID: 12208922 [PubMed - indexed for MEDLINE]

28: Lai KA, Shen WJ, Chen CH, Yang CY, Hu WP, Chang GL. Failure of hydroxyapatite-coated acetabular cups. Ten-year follow-up of 85 Landos Atoll arthroplasties. J Bone Joint Surg Br. 2002 Jul;84(5):641-6.
PMID: 12188477 [PubMed - indexed for MEDLINE]

29: Fyda TM, Callaghan JJ, Olejniczak J, Johnston RC. Minimum ten-year follow-up of cemented total hip replacement in patients with osteonecrosis of the femoral head. Iowa Orthop J. 2002;22:8-19.
PMID: 12180617 [PubMed - indexed for MEDLINE]

30: Jergesen HE, Karlen JW. Clinical outcome in total hip arthroplasty using a cemented titanium femoral prosthesis. J Arthroplasty. 2002 Aug;17(5):592-9.
PMID: 12168175 [PubMed - indexed for MEDLINE]

31: Emerson RH Jr, Head WC, Emerson CB, Rosenfeldt W, Higgins LL. A comparison of cemented and cementless titanium femoral components used for primary total hip arthroplasty: a radiographic and survivorship study. J Arthroplasty. 2002 Aug;17(5):584-91.
PMID: 12168174 [PubMed - indexed for MEDLINE]

32: Hsieh PH, Shih CH, Lee PC, Chen CH, Yang WE. Primary total hip arthroplasty without the use of bone cement: a 10-year follow-up of 157 hips. Chang Gung Med J. 2002 May;25(5):298-305.
PMID: 12141702 [PubMed - indexed for MEDLINE]

33: Ravasi F, Sansone V. Five-year follow-up with a ceramic sandwich cup in total hip replacement. Arch Orthop Trauma Surg. 2002 Jul;122(6):350-3. Epub 2002 Feb 02.
PMID: 12136301 [PubMed - indexed for MEDLINE]

34: Udomkiat P, Dorr LD, Wan Z. Cementless hemispheric porous-coated sockets implanted with press-fit technique without screws: average ten-year follow-up.
J Bone Joint Surg Am. 2002 Jul;84-A(7):1195-200.
PMID: 12107321 [PubMed - indexed for MEDLINE]

35: Wingstrand I, Persson BM, Wingstrand H. Total hip replacement with second generation cementing technique and the monobloc ScanHip: a 10-year follow-up.
Int Orthop. 2002;26(2):69-71.
PMID: 12078879 [PubMed - indexed for MEDLINE]

36: Benko TZ, Santiago-Martin A, Ruddlesdin C, Selzer G. Aseptic loosening of 2 rim-fix, hydroxyapatite-coated acetabular cups. J Arthroplasty. 2002 Jun;17(4):519-23.
PMID: 12066288 [PubMed - indexed for MEDLINE]

37: Khalily C, Lester DK. Results of a tapered cementless femoral stem implanted in varus. J Arthroplasty. 2002 Jun;17(4):463-6.
PMID: 12066277 [PubMed - indexed for MEDLINE]

38: Kim YH. Bilateral cemented and cementless total hip arthroplasty. J Arthroplasty. 2002 Jun;17(4):434-40.
PMID: 12066272 [PubMed - indexed for MEDLINE]

39: Trudelle-Jackson E, Emerson R, Smith S. Outcomes of total hip arthroplasty: a study of patients one year postsurgery. J Orthop Sports Phys Ther. 2002 Jun;32(6):260-7.
PMID: 12061707 [PubMed - indexed for MEDLINE]

40: Wroblewski BM, Siney PD, Fleming PA. Charnley low-frictional torque arthroplasty in patients under the age of 51 years. Follow-up to 33 years. J Bone Joint Surg Br. 2002 May;84(4):540-3.
PMID: 12043775 [PubMed - indexed for MEDLINE]

41: Pitto RP, Schramm M, Hohmann D, Schmidt R. Clinical outcome and quantitative evaluation of periprosthetic bone-remodeling of an uncemented femoral component with taper design. A prospective study. Chir Organi Mov. 2001 Apr-Jun;86(2):87-97.
PMID: 12025051 [PubMed - indexed for MEDLINE]

42: Toni A, Sudanese A, Paderni S, Guerra E, Bianchi G, Antonietti B, Giunti A. Cementless hip arthroplasty with a modular neck. Chir Organi Mov. 2001 Apr-Jun;86(2):73-85.
PMID: 12025050 [PubMed - indexed for MEDLINE]

43: Ong A, Wong KL, Lai M, Garino JP, Steinberg ME. Early failure of precoated femoral components in primary total hip arthroplasty. J Bone Joint Surg Am. 2002 May;84-A(5):786-92.
PMID: 12004022 [PubMed - indexed for MEDLINE]

44: Crowther JD, Lachiewicz PF. Survival and polyethylene wear of porous-coated acetabular components in patients less than fifty years old: results at nine to fourteen years. J Bone Joint Surg Am. 2002 May;84-A(5):729-35.
PMID: 12004013 [PubMed - indexed for MEDLINE]

45: Williams HD, Browne G, Gie GA, Ling RS, Timperley AJ, Wendover NA. The Exeter universal cemented femoral component at 8 to 12 years. A study of the first 325 hips. J Bone Joint Surg Br. 2002 Apr;84(3):324-34. Erratum in: J Bone Joint Surg Br 2002 Sep;84(7):1091.
PMID: 12002487 [PubMed - indexed for MEDLINE]

46: Reikeras O, Gunderson RB. Failure of HA coating on a gritblasted acetabular cup: 155 patients followed for 7-10 years. Acta Orthop Scand. 2002 Jan;73(1):104-8.
PMID: 11928902 [PubMed - indexed for MEDLINE]

47: Kalairajah Y, Molloy S, Patterson M. The effect of femoral stem size on failure rates in total hip replacement cemented with Boneloc. Acta Orthop Belg. 2002 Feb;68(1):33-6.
PMID: 11915456 [PubMed - indexed for MEDLINE]

48: Hernandez Cortes P, Najera Sagastume OO, Mesa Ramos F, Pajares Lopez M, Hernandez Hernandez MA. Hydroxyapatite-coated stems with metaphyseal and diaphyseal press-fit. Eleven-year follow-up results. Acta Orthop Belg. 2002 Feb;68(1):24-32.
PMID: 11915455 [PubMed - indexed for MEDLINE]

49: Grubl A, Chiari C, Gruber M, Kaider A, Gottsauner-Wolf F. Cementless total hip arthroplasty with a tapered, rectangular titanium stem and a threaded cup: a minimum ten-year follow-up. J Bone Joint Surg Am. 2002 Mar;84-A(3):425-31.
PMID: 11886913 [PubMed - indexed for MEDLINE]

50: Yates P, Gobel D, Bannister G. Collarless polished tapered stem: clinical and radiological follow-up over 5 years. J Arthroplasty. 2002 Feb;17(2):189-95.
PMID: 11847618 [PubMed - indexed for MEDLINE]

51: Takatori Y, Nagai I, Moro T, Kuruta Y, Karita T, Mabuchi A, Ninomiya S. Ten-year follow-up of a proximal circumferential porous-coated femoral prosthesis: radiographic evaluation and stability. J Orthop Sci. 2002;7(1):68-73.
PMID: 11819135 [PubMed - indexed for MEDLINE]

52: Kubo T, Inoue S, Maeda T, Arai Y, Hirakawa K, Wu Y, Suehara H, Ogura T, Hirasawa Y. Cementless Lord total hip arthroplasty: cup loosening common after minimum 10-year follow-up of 103 hips. Acta Orthop Scand. 2001 Dec;72(6):585-90.
PMID: 11817872 [PubMed - indexed for MEDLINE]

53: Thompson R, Kane RL, Gromala T, McLaughlin B, Flood S, Morris N, Borbas C. Complications and short-term outcomes associated with total hip arthroplasty in teaching and community hospitals. J Arthroplasty. 2002 Jan;17(1):32-40.
PMID: 11805922 [PubMed - indexed for MEDLINE]

54: Spicer DD, Schaper LA, Pomeroy DL, Badenhausen WE Jr, Curry JI, Suthers KE, Smith MW. Cementless cup fixation in total hip arthroplasty after 5-8 years. Int Orthop. 2001;25(5):286-9.
PMID: 11794260 [PubMed - indexed for MEDLINE]

55: Hamadouche M, Boutin P, Daussange J, Bolander ME, Sedel L. Alumina-on-alumina total hip arthroplasty: a minimum 18.5-year follow-up study. J Bone Joint Surg Am. 2002 Jan;84-A(1):69-77.
PMID: 11792782 [PubMed - indexed for MEDLINE]

56: Bourne RB, Rorabeck CH, Patterson JJ, Guerin J. Tapered titanium cementless total hip replacements: a 10- to 13-year followup study. Clin Orthop. 2001 Dec;(393):112-20.
PMID: 11764339 [PubMed - indexed for MEDLINE]

57: Kirsh G, Roffman M, Kligman M. Hydroxyapatite-coated total hip replacements in patients 65 years of age and over. Bull Hosp Jt Dis. 2001;60(1):5-9.
PMID: 11759578 [PubMed - indexed for MEDLINE]

58: Duffy GP, Berry DJ, Rowland C, Cabanela ME. Primary uncemented total hip arthroplasty in patients <40 years old: 10- to 14-year results using first-generation proximally porous-coated implants. J Arthroplasty. 2001 Dec;16(8 Suppl 1):140-4.
PMID: 11742466 [PubMed - indexed for MEDLINE]

59: Tanzer M, Chan S, Brooks CE, Bobyn JD. Primary cementless total hip arthroplasty using a modular femoral component: a minimum 6-year follow-up. J Arthroplasty. 2001 Dec;16(8 Suppl 1):64-70.
PMID: 11742453 [PubMed - indexed for MEDLINE]

60: Wroblewski BM, Siney PD, Fleming PA. Triple taper polished cemented stem in total hip arthroplasty: rationale for the design, surgical technique, and 7 years of clinical experience. J Arthroplasty. 2001 Dec;16(8 Suppl 1):37-41.
PMID: 11742449 [PubMed - indexed for MEDLINE]

61: Klapach AS, Callaghan JJ, Goetz DD, Olejniczak JP, Johnston RC. Charnley total hip arthroplasty with use of improved cementing techniques: a minimum twenty-year follow-up study. J Bone Joint Surg Am. 2001 Dec;83-A(12):1840-8.
PMID: 11741064 [PubMed - indexed for MEDLINE]

62: Mella-Sousa M, Aguilar-Cortes F, Bocanegra E, Domecq G, Moleon M. Mid-term results in total hip arthroplasty with the basic noncemented hip prosthesis. Orthopedics. 2001 Nov;24(11):1053-6.
PMID: 11727801 [PubMed - indexed for MEDLINE]

63: Archibeck MJ, Berger RA, Jacobs JJ, Quigley LR, Gitelis S, Rosenberg AG, Galante JO. Second-generation cementless total hip arthroplasty. Eight to eleven-year results. J Bone Joint Surg Am. 2001 Nov;83-A(11):1666-73.
PMID: 11701789 [PubMed - indexed for MEDLINE]

64: Rai NN, Siney PD, Fleming PA, Wroblewski BM.
Incidence of loose bodies in an osteoarthritic hip.
J R Coll Surg Edinb. 2001 Oct;46(5):274-6.
PMID: 11697694 [PubMed - indexed for MEDLINE]

65: Schwarzer G, Schumacher M, Maurer TB, Ochsner PE.
Statistical analysis of failure times in total joint replacement.
J Clin Epidemiol. 2001 Oct;54(10):997-1003.
PMID: 11576810 [PubMed - indexed for MEDLINE]

66: Tanzer M, Kantor S, Rosenthall L, Bobyn JD.
Femoral remodeling after porous-coated total hip arthroplasty with and without hydroxyapatite-tricalcium phosphate coating: a prospective randomized trial.
J Arthroplasty. 2001 Aug;16(5):552-8.
PMID: 11503113 [PubMed - indexed for MEDLINE]

67: Delaunay C, Kapandji AI.
Survival analysis of cementless grit-blasted titanium total hip arthroplasties.
J Bone Joint Surg Br. 2001 Apr;83(3):408-13.
PMID: 11341429 [PubMed - indexed for MEDLINE]

68: Keisu KS, Orozco F, Sharkey PF, Hozack WJ, Rothman RH, McGuigan FX.
Primary cementless total hip arthroplasty in octogenarians. Two to eleven-year follow-up.
J Bone Joint Surg Am. 2001 Mar;83-A(3):359-63. Erratum in: J Bone Joint Surg Am 2002 Jan;84-A(1):100.
PMID: 11263639 [PubMed - indexed for MEDLINE]

69: Inoue S, Kubo T, Suehara H, Yamazoe S, Nakamura M, Miyaoka H, Hirasawa Y.
A 10- to 13-year follow-up study of Harris-Galante type prosthesis in total hip arthroplasty.
J Orthop Sci. 2000;5(6):561-6.
PMID: 11180919 [PubMed - indexed for MEDLINE]

70: Joshi A, Ilchmann T, Markovic L.
Socket wear in bilateral simultaneous total hip arthroplasty.
J Arthroplasty. 2001 Jan;16(1):117-20.
PMID: 11172281 [PubMed - indexed for MEDLINE]

71: Chiu KY, Ng TP, Tang WM, Poon KC, Ho WY, Yip D.
Charnley total hip arthroplasty in Chinese patients less than 40 years old.
J Arthroplasty. 2001 Jan;16(1):92-101.
PMID: 11172277 [PubMed - indexed for MEDLINE]

72: Delaunay C, Bonnomet F, North J, Jobard D, Cazeau C, Kempf JF.
Grit-blasted titanium femoral stem in cementless primary total hip arthroplasty: a 5- to 10-year multicenter study.
J Arthroplasty. 2001 Jan;16(1):47-54.
PMID: 11172270 [PubMed - indexed for MEDLINE]

73: Havinga ME, Spruit M, Anderson PG, van Dijk-van Dam MS, Pavlov PW, van Limbeek J.
Results with the M. E. Muller cemented, straight-stem total hip prosthesis: a 10-year historical cohort study in 180 women.
J Arthroplasty. 2001 Jan;16(1):33-6.
PMID: 11172268 [PubMed - indexed for MEDLINE]

74: White LM, Kim JK, Mehta M, Merchant N, Schweitzer ME, Morrison WB, Hutchison CR, Gross AE.
Complications of total hip arthroplasty: MR imaging-initial experience.
Radiology. 2000 Apr;215(1):254-62.
PMID: 10751496 [PubMed - indexed for MEDLINE]

75: Keisu KS, Mathiesen EB, Lindgren JU.
The uncemented fully textured Lord hip prosthesis: a 10- to 15-year followup study.
Clin Orthop. 2001 Jan;(382):133-42.

PMID: 11153981 [PubMed - indexed for MEDLINE]

76: Keisu KS, Orozco F, Sharkey PF, Hozack WJ, Rothman RH, McGuigan FX.
Primary cementless total hip arthroplasty in octogenarians. Two to eleven-year follow-up.
J Bone Joint Surg Am. 2001 Mar;83-A(3):359-63. Erratum in: J Bone Joint Surg Am 2002 Jan;84-A(1):100.
PMID: 11263639 [PubMed - indexed for MEDLINE]

77: Delaunay C, Kapandji AI.
Survival analysis of cementless grit-blasted titanium total hip arthroplasties.
J Bone Joint Surg Br. 2001 Apr;83(3):408-13.
PMID: 11341429 [PubMed - indexed for MEDLINE]

78: Hamadouche M, Kerboull L, Meunier A, Courpied JP, Kerboull M.
Total hip arthroplasty for the treatment of ankylosed hips : a five to twenty-one-year follow-up study.
J Bone Joint Surg Am. 2001 Jul;83-A(7):992-8.
PMID: 11451967 [PubMed - indexed for MEDLINE]

79: Eingartner C, Volkmann R, Winter E, Maurer F, Ihm A, Weller S, Weise K.
Results of a cemented titanium alloy straight femoral shaft prosthesis after 10 years of follow-up.
Int Orthop. 2001;25(2):81-4.
PMID: 11409457 [PubMed - indexed for MEDLINE]

80: Keisu KS, Orozco F, McCallum JD 3rd, Bissett G, Hozack WJ, Sharkey PF, Rothman RH.
Cementless femoral fixation in the rheumatoid patient undergoing total hip arthroplasty: minimum 5-year results.
J Arthroplasty. 2001 Jun;16(4):415-21.
PMID: 11402402 [PubMed - indexed for MEDLINE]

81: Oosterbos CJ, Rahmy AI, Tonino AJ.
Hydroxyapatite coated hip prosthesis followed up for 5 years.
Int Orthop. 2001;25(1):17-21.
PMID: 11374261 [PubMed - indexed for MEDLINE]

82: Kirsh G, Kligman M, Roffman M.
Hydroxyapatite-coated total hip replacement in Paget's disease: 20 patients followed for 4-8 years.
Acta Orthop Scand. 2001 Apr;72(2):127-32.
PMID: 11372942 [PubMed - indexed for MEDLINE]

83: Xenakis TA, Gelalis J, Koukoubis TA, Zaharis KC, Soucacos PN.
Cementless hip arthroplasty in the treatment of patients with femoral head necrosis.
Clin Orthop. 2001 May;(386):93-9.
PMID: 11347854 [PubMed - indexed for MEDLINE]

84: Siguier T, Siguier M, Judet T, Charnley G, Brumpt B.
Partial resurfacing arthroplasty of the femoral head in avascular necrosis. Methods, indications, and results.
Clin Orthop. 2001 May;(386):85-92.
PMID: 11347853 [PubMed - indexed for MEDLINE]

85: Delaunay C, Kapandji AI.
Survival analysis of cementless grit-blasted titanium total hip arthroplasties.
J Bone Joint Surg Br. 2001 Apr;83(3):408-13.
PMID: 11341429 [PubMed - indexed for MEDLINE]

86: Kobayashi S, Eftekhar NS, Terayama K, Iorio R, Takaoka K.
Primary Charnley total hip arthroplasty: a comparison of American and Japanese cohorts followed for 10-20 years.
J Arthroplasty. 2001 Apr;16(3):340-50.
PMID: 11307133 [PubMed - indexed for MEDLINE]

87: Nercessian OA, Wu WH, Sarkissian H.
Clinical and radiographic results of cementless AML total hip arthroplasty in young patients.
J Arthroplasty. 2001 Apr;16(3):312-6.
PMID: 11307128 [PubMed - indexed for MEDLINE]

88: Taylor AH, Shannon M, Whitehouse SL, Lee MB, Learmonth ID.
Harris Galante cementless acetabular replacement in avascular necrosis.
J Bone Joint Surg Br. 2001 Mar;83(2):177-82.
PMID: 11284560 [PubMed - indexed for MEDLINE]

89: Keisu KS, Orozco F, Sharkey PF, Hozack WJ, Rothman RH, McGuigan FX.
Primary cementless total hip arthroplasty in octogenarians. Two to eleven-year follow-up.
J Bone Joint Surg Am. 2001 Mar;83-A(3):359-63. Erratum in: J Bone Joint Surg Am 2002 Jan;84-A(1):100.
PMID: 11263639 [PubMed - indexed for MEDLINE]

90: Raber DA, Czaja S, Morscher EW.
Fifteen-year results of the Muller CoCrNiMo straight stem.
Arch Orthop Trauma Surg. 2001;121(1-2):38-42.
PMID: 11195116 [PubMed - indexed for MEDLINE]

91: Inoue S, Kubo T, Suehara H, Yamazoe S, Nakamura M, Miyaoka H, Hirasawa Y.
A 10- to 13-year follow-up study of Harris-Galante type prosthesis in total hip arthroplasty.
J Orthop Sci. 2000;5(6):561-6.
PMID: 11180919 [PubMed - indexed for MEDLINE]

92: Joshi A, Ilchmann T, Markovic L.
Socket wear in bilateral simultaneous total hip arthroplasty.
J Arthroplasty. 2001 Jan;16(1):117-20.
PMID: 11172281 [PubMed - indexed for MEDLINE]

93: Chiu KY, Ng TP, Tang WM, Poon KC, Ho WY, Yip D.
Charnley total hip arthroplasty in Chinese patients less than 40 years old.
J Arthroplasty. 2001 Jan;16(1):92-101.
PMID: 11172277 [PubMed - indexed for MEDLINE]

94: Delaunay C, Bonnomet F, North J, Jobard D, Cazeau C, Kempf JF.
Grit-blasted titanium femoral stem in cementless primary total hip arthroplasty: a 5- to 10-year multicenter study.
J Arthroplasty. 2001 Jan;16(1):47-54.
PMID: 11172270 [PubMed - indexed for MEDLINE]

95: Havinga ME, Spruit M, Anderson PG, van Dijk-van Dam MS, Pavlov PW, van Limbeek J.
Results with the M. E. Muller cemented, straight-stem total hip prosthesis: a 10-year historical cohort study in 180 women.
J Arthroplasty. 2001 Jan;16(1):33-6.
PMID: 11172268 [PubMed - indexed for MEDLINE]

96: White LM, Kim JK, Mehta M, Merchant N, Schweitzer ME, Morrison WB, Hutchison CR, Gross AE.
Complications of total hip arthroplasty: MR imaging-initial experience.
Radiology. 2000 Apr;215(1):254-62.
PMID: 10751496 [PubMed - indexed for MEDLINE]

97: Keisu KS, Mathiesen EB, Lindgren JU.
The uncemented fully textured Lord hip prosthesis: a 10- to 15-year followup study.
Clin Orthop. 2001 Jan;(382):133-42.
PMID: 11153981 [PubMed - indexed for MEDLINE]

98: Jazrawi LM, Adler EM, Jazrawi AJ, Jaffe WL.
Radiographic comparison of grit-blasted hydroxyaptite and arc-deposited hydroxyapatite acetabular components. A four-year follow-up study.
Bull Hosp Jt Dis. 2000;59(3):144-8.
PMID: 11126716 [PubMed - indexed for MEDLINE]

99: Saleh KJ, Jaroszynski G, Woodgate I, Saleh L, Gross AE.
Revision total hip arthroplasty with the use of structural acetabular allograft and reconstruction ring: a case series with a 10-year average follow-up.
J Arthroplasty. 2000 Dec;15(8):951-8.
PMID: 11112186 [PubMed - indexed for MEDLINE]

100: Diekerhof CH, Barnaart LF, Rozing PM.
Long-term clinical results of cemented revision of primary cemented total hip arthroplasties.
Acta Orthop Belg. 2000 Oct;66(4):376-81.
PMID: 11103490 [PubMed - indexed for MEDLINE]

101: Christie MJ, DeBoer DK, Tingstad EM, Capps M, Brinson MF, Trick LW.
Clinical experience with a modular noncemented femoral component in revision total hip arthroplasty: 4- to 7-year results.
J Arthroplasty. 2000 Oct;15(7):840-8.
PMID: 11061443 [PubMed - indexed for MEDLINE]

102: Garcia-Cimbrelo E, Cruz-Pardos A, Cordero J, Sanchez-Sotelo J.
Low-friction arthroplasty in patients younger than 40 years old: 20- to 25-year results.
J Arthroplasty. 2000 Oct;15(7):825-32.
PMID: 11061441 [PubMed - indexed for MEDLINE]

103: Morrey BF, Adams RA, Kessler M.
A conservative femoral replacement for total hip arthroplasty. A prospective study.
J Bone Joint Surg Br. 2000 Sep;82(7):952-8.
PMID: 11041581 [PubMed - indexed for MEDLINE]

104: Hostin E, Mont MA, Mayerson JA, Jones LC, Hungerford DS.
Total hip arthroplasty in patients receiving Workers' Compensation.
Clin Orthop. 2000 Oct;(379):161-8.
PMID: 11039803 [PubMed - indexed for MEDLINE]

105: Wagner M, Wagner H.
Medium-term results of a modern metal-on-metal system in total hip replacement.
Clin Orthop. 2000 Oct;(379):123-33.
PMID: 11039799 [PubMed - indexed for MEDLINE]

106: Boehler M, Plenk H Jr, Salzer M.
Alumina ceramic bearings for hip endoprostheses: the Austrian experiences.
Clin Orthop. 2000 Oct;(379):85-93.
PMID: 11039796 [PubMed - indexed for MEDLINE]

107: Bizot P, Banallec L, Sedel L, Nizard R.
Alumina-on-alumina total hip prostheses in patients 40 years of age or younger.
Clin Orthop. 2000 Oct;(379):68-76.
PMID: 11039794 [PubMed - indexed for MEDLINE]

108: Garino JP.
Modern ceramic-on-ceramic total hip systems in the United States: early results.
Clin Orthop. 2000 Oct;(379):41-7.
PMID: 11039791 [PubMed - indexed for MEDLINE]

109: Schmale GA, Lachiewicz PF, Kelley SS.
Early failure of revision total hip arthroplasty with cemented precoated femoral components: comparison with uncemented components at 2 to 8 years.
J Arthroplasty. 2000 Sep;15(6):718-29.
PMID: 11021447 [PubMed - indexed for MEDLINE]

110: Dudkiewicz I, Salai M, Chechik A, Ganel A.
Total hip arthroplasty after childhood septic hip in patients younger than 25 years of age.
J Pediatr Orthop. 2000 Sep-Oct;20(5):585-7.
PMID: 11008736 [PubMed - indexed for MEDLINE]

111: Kim YS, Callaghan JJ, Kwon SY, Kim KW, Han CH, Woo YK.
Arthroplasty of the hip in patients with aplastic anemia.
J Bone Joint Surg Am. 2000 Sep;82(9):1231-9.
PMID: 11005514 [PubMed - indexed for MEDLINE]

112: Pace TB.
Clinical evaluation of a new total hip prosthetic design: 100 consecutive cementless total hip arthroplasties using Sulzermedica's "Natural Hip" with two- to six-year clinical and radiographic follow-up.
Crit Rev Biomed Eng. 2000;28(1-2):3-6.
PMID: 10999357 [PubMed - indexed for MEDLINE]

113: Weber D, Schaper LA, Pomeroy DL, Badenhausen WE Jr, Curry JI, Smith MW, Suthers KE.
Cementless hemispheric acetabular component in total hip replacement.
Int Orthop. 2000;24(3):130-3.
PMID: 10990381 [PubMed - indexed for MEDLINE]

114: Dunkley AB, Eldridge JD, Lee MB, Smith EJ, Learmonth ID.
Cementless acetabular replacement in the young. A 5- to 10-year prospective study.
Clin Orthop. 2000 Jul;(376):149-55.
PMID: 10906870 [PubMed - indexed for MEDLINE]

115: Thanner J, Karrholm J, Herberts P, Malchau H.
Hydroxyapatite and tricalcium phosphate-coated cups with and without screw fixation: a randomized study of 64 hips.
J Arthroplasty. 2000 Jun;15(4):405-12.
PMID: 10884197 [PubMed - indexed for MEDLINE]

116: Dorr LD, Wan Z, Longjohn DB, Dubois B, Murken R.
Total hip arthroplasty with use of the Metasul metal-on-metal articulation. Four to seven-year results.
J Bone Joint Surg Am. 2000 Jun;82(6):789-98.
PMID: 10859098 [PubMed - indexed for MEDLINE]

117: Tonino AJ, Rahmy AI.
The hydroxyapatite-ABG hip system: 5- to 7-year results from an international multicentre study. The International ABG Study Group.
J Arthroplasty. 2000 Apr;15(3):274-82.
PMID: 10794221 [PubMed - indexed for MEDLINE]

118: Smith SE, Estok DM 2nd, Harris WH.
20-year experience with cemented primary and conversion total hip arthroplasty using so-called second-generation cementing techniques in patients aged 50 years or younger.
J Arthroplasty. 2000 Apr;15(3):263-73.
PMID: 10794220 [PubMed - indexed for MEDLINE]

119: Callaghan JJ, Albright JC, Goetz DD, Olejniczak JP, Johnston RC.
Charnley total hip arthroplasty with cement. Minimum twenty-five-year follow-up.
J Bone Joint Surg Am. 2000 Apr;82(4):487-97.
PMID: 10761939 [PubMed - indexed for MEDLINE]

120: Lee PC, Shih CH, Yen WL, Yang WE, Tu YK, Tai CL.
Complications of liner locking system in Micro-structured Omnifit acetabular components: a radiographic evaluation of 887 hips followed for 5-10 years.
Acta Orthop Scand. 2000 Feb;71(1):31-3.
PMID: 10743989 [PubMed - indexed for MEDLINE]

121: Tauber C, Kidron A.
Total hip arthroplasty revision using the press-fit CLS Spotorno cementless stem. Twenty-four hips followed between 1987 and 1998.
Arch Orthop Trauma Surg. 2000;120(3-4):209-11.
PMID: 10738886 [PubMed - indexed for MEDLINE]

122: Walczak JP, D'Arcy JC, Ross KR, James SE, Bonnici AV, Koka SR, Morris RW.
Low-friction arthroplasty with Boneloc bone-cement: outcome at 2 to 4 years.
J Arthroplasty. 2000 Feb;15(2):205-9.
PMID: 10708087 [PubMed - indexed for MEDLINE]

123: Kale AA, Della Valle CJ, Frankel VH, Stuchin SA, Zuckerman JD, Di Cesare PE.
Hip arthroplasty with a collared straight cobalt-chrome femoral stem using second-generation cementing technique: a 10-year-average follow-up study.
J Arthroplasty. 2000 Feb;15(2):187-93.
PMID: 10708084 [PubMed - indexed for MEDLINE]

124: Ricci WM, Westrich GH, Lorei M, Cazzarelli JF, Pellicci PM, Sculco TP, Wilson PD Jr.
Primary total hip replacement with a noncemented acetabular component: minimum 5-year clinical follow-up.
J Arthroplasty. 2000 Feb;15(2):146-52.
PMID: 10708077 [PubMed - indexed for MEDLINE]

125: Soto MO, Rodriguez JA, Ranawat CS.
Clinical and radiographic evaluation of the Harris-Galante cup: incidence of wear and osteolysis at 7 to 9 years follow-up.
J Arthroplasty. 2000 Feb;15(2):139-45.
PMID: 10708076 [PubMed - indexed for MEDLINE]

126: Gerritsma-Bleeker CL, Deutman R, Mulder TJ, Steinberg JD.
The Stanmore total hip replacement. A 22-year follow-up.
J Bone Joint Surg Br. 2000 Jan;82(1):97-102.
PMID: 10697323 [PubMed - indexed for MEDLINE]

127: Rahimtoola ZO, Finger S, Imrie S, Goodman SB.
Outcome of total hip arthroplasty in small-proportioned patients.
J Arthroplasty. 2000 Jan;15(1):27-34.
PMID: 10654459 [PubMed - indexed for MEDLINE]

128: Yee AJ, Kreder HK, Bookman I, Davey JR.
A randomized trial of hydroxyapatite coated prostheses in total hip arthroplasty.
Clin Orthop. 1999 Sep;(366):120-32.
PMID: 10627726 [PubMed - indexed for MEDLINE]

129: Loehr JF, Munzinger U, Tibesku C.
Uncemented total hip arthroplasty in patients with rheumatoid arthritis.
Clin Orthop. 1999 Sep;(366):31-8.
PMID: 10627715 [PubMed - indexed for MEDLINE]

130: Paprosky WG, Greidanus NV, Antoniou J.
Minimum 10-year-results of extensively porous-coated stems in revision hip arthroplasty.
Clin Orthop. 1999 Dec;(369):230-42.
PMID: 10611878 [PubMed - indexed for MEDLINE]

131: Maloney WJ, Galante JO, Anderson M, Goldberg V, Harris WH, Jacobs J, Kraay M, Lachiewicz P, Rubash HE, Schutzer S, Woolson ST.
Fixation, polyethylene wear, and pelvic osteolysis in primary total hip replacement.
Clin Orthop. 1999 Dec;(369):157-64.
PMID: 10611870 [PubMed - indexed for MEDLINE]

132: Lee WS, Han CD.
The hemispherical porous acetabular component fixed by press-fit technique and additional screws.
Yonsei Med J. 1999 Oct;40(5):467-71.
PMID: 10565258 [PubMed - indexed for MEDLINE]

133: Han CD, Choe WS, Yoo JH.
Effect of polyethylene wear on osteolysis in cementless primary total hip arthroplasty: minimal 5-year follow-up study.
J Arthroplasty. 1999 Sep;14(6):714-23.
PMID: 10512444 [PubMed - indexed for MEDLINE]

134: Rokkum M, Reigstad A.
Total hip replacement with an entirely hydroxyapatite-coated prosthesis: 5 years' follow-up of 94 consecutive hips.
J Arthroplasty. 1999 Sep;14(6):689-700.
PMID: 10512441 [PubMed - indexed for MEDLINE]

135: Head WC, Mallory TH, Emerson RH Jr.
The proximal porous coating alternative for primary total hip arthroplasty.
Orthopedics. 1999 Sep;22(9):813-5. No abstract available.
PMID: 10507334 [PubMed - indexed for MEDLINE]

136: Kim YH, Kim JS, Cho SH.
Primary total hip arthroplasty with a cementless porous-coated anatomic total hip prosthesis: 10- to 12-year results of prospective and consecutive series.
J Arthroplasty. 1999 Aug;14(5):538-48.
PMID: 10475551 [PubMed - indexed for MEDLINE]

137: Rokkum M, Brandt M, Bye K, Hetland KR, Waage S, Reigstad A.
Polyethylene wear, osteolysis and acetabular loosening with an HA-coated hip prosthesis. A follow-up of 94 consecutive arthroplasties.
J Bone Joint Surg Br. 1999 Jul;81(4):582-9.

PMID: 10463725 [PubMed - indexed for MEDLINE]

138: Garellick G, Malchau H, Herberts P.
The Charnley versus the Spectron hip prosthesis: clinical evaluation of a randomized, prospective study of 2 different hip implants.
J Arthroplasty. 1999 Jun;14(4):407-13.
PMID: 10428220 [PubMed - indexed for MEDLINE]

139: Love BR.
A femoral component inserted without cement in total hip arthroplasty. A study of the Tri-Lock component with an average ten-year duration of follow-up.
J Bone Joint Surg Am. 1999 Jul;81(7):1044-5. No abstract available.
PMID: 10428138 [PubMed - indexed for MEDLINE]

140: Brown EC 3rd, Lachiewicz PF.
Precoated femoral component in total hip arthroplasty. Results of 5- to 9-year followup.
Clin Orthop. 1999 Jul;(364):153-9.
PMID: 10416404 [PubMed - indexed for MEDLINE]

141: Hellman EJ, Capello WN, Feinberg JR.
Omnifit cementless total hip arthroplasty. A 10-year average followup.
Clin Orthop. 1999 Jul;(364):164-74.
PMID: 10416406 [PubMed - indexed for MEDLINE]

142: Llinas A, Sarmiento A, Ebramzadeh E, Park SH, Campbell P, McKellop HA.
Mechanism of failure in hips with an uncemented, all polyethylene socket.
Clin Orthop. 1999 May;(362):145-55.
PMID: 10335293 [PubMed - indexed for MEDLINE]

143: Sakalkale DP, Eng K, Hozack WJ, Rothman RH.
Minimum 10-year results of a tapered cementless hip replacement.
Clin Orthop. 1999 May;(362):138-44.
PMID: 10335292 [PubMed - indexed for MEDLINE]

144: Kaufman JD.
Charnley total hip arthroplasty in patients less than fifty years old. A twenty to twenty-five-year follow-up note.
J Bone Joint Surg Am. 1999 Mar;81(3):437. No abstract available.
PMID: 10199283 [PubMed - indexed for MEDLINE]

145: Anderson MJ, Harris WH.
Total hip arthroplasty with insertion of the acetabular component without cement in hips with total congenital dislocation or marked congenital dysplasia.
J Bone Joint Surg Am. 1999 Mar;81(3):347-54.
PMID: 10199272 [PubMed - indexed for MEDLINE]

146: Yang WE, Shih CH.
Porous coated anatomic total hip arthroplasty: 5- to 10-year follow up.
Changgeng Yi Xue Za Zhi. 1998 Dec;21(4):397-402.
PMID: 10074724 [PubMed - indexed for MEDLINE]

147: Clohisy JC, Harris WH.
Primary hybrid total hip replacement, performed with insertion of the acetabular component without cement and a precoat femoral component with cement. An average ten-year follow-up study.
J Bone Joint Surg Am. 1999 Feb;81(2):247-55.
PMID: 10073588 [PubMed - indexed for MEDLINE]

148: Ragab AA, Kraay MJ, Goldberg VM.
Clinical and radiographic outcomes of total hip arthroplasty with insertion of an anatomically designed femoral component without cement for the treatment of primary osteoarthritis. A study with a minimum of six years of follow-up.
J Bone Joint Surg Am. 1999 Feb;81(2):210-8.
PMID: 10073584 [PubMed - indexed for MEDLINE]

149: Wroblewski BM, Siney PD, Fleming PA.
Low-friction arthroplasty of the hip using alumina ceramic and cross-linked polyethylene. A ten-year follow-up report.
J Bone Joint Surg Br. 1999 Jan;81(1):54-5.
PMID: 10068003 [PubMed - indexed for MEDLINE]

150: Meding JB, Ritter MA, Keating EM, Faris PM, Edmondson K.
A comparison of collared and collarless femoral components in primary cemented total hip arthroplasty: a randomized clinical trial.
J Arthroplasty. 1999 Feb;14(2):123-30.
PMID: 10065715 [PubMed - indexed for MEDLINE]

151: Xenos JS, Callaghan JJ, Heekin RD, Hopkinson WJ, Savory CG, Moore MS.
The porous-coated anatomic total hip prosthesis, inserted without cement. A prospective study with a minimum of ten years of follow-up.
J Bone Joint Surg Am. 1999 Jan;81(1):74-82.
PMID: 9973057 [PubMed - indexed for MEDLINE]

152: Clohisy JC, Harris WH.
The Harris-Galante porous-coated acetabular component with screw fixation. An average ten-year follow-up study.
J Bone Joint Surg Am. 1999 Jan;81(1):66-73.
PMID: 9973056 [PubMed - indexed for MEDLINE]

153: Capello WN, D'Antonio JA, Manley MT, Feinberg JR.
Hydroxyapatite in total hip arthroplasty. Clinical results and critical issues.

Clin Orthop. 1998 Oct;(355):200-11.
PMID: 9917605 [PubMed - indexed for MEDLINE]

154: Collis DK, Mohler CG.
Loosening rates and bone lysis with rough finished and polished stems.
Clin Orthop. 1998 Oct;(355):113-22.
PMID: 9917596 [PubMed - indexed for MEDLINE]

155: Imamura K, Black N.
Outcome of total hip replacement in Japan and England. Comparison of two retrospective cohorts.
Int J Technol Assess Health Care. 1998 Fall;14(4):762-73.
PMID: 9885465 [PubMed - indexed for MEDLINE]

156: Fye MA, Huo MH, Zatorski LE, Keggi KJ.
Total hip arthroplasty performed without cement in patients with femoral head osteonecrosis who are less than 50 years old.
J Arthroplasty. 1998 Dec;13(8):876-81.
PMID: 9880179 [PubMed - indexed for MEDLINE]

157: Chen FS, Di Cesare PE, Kale AA, Lee JF, Frankel VH, Stuchin SA, Zuckerman JD.
Results of cemented metal-backed acetabular components: a 10-year-average follow-up study.
J Arthroplasty. 1998 Dec;13(8):867-73.
PMID: 9880177 [PubMed - indexed for MEDLINE]

158: Bourne RB, Rorabeck CH, Skutek M, Mikkelsen S, Winemaker M, Robertson D.
The Harris Design-2 total hip replacement fixed with so-called second-generation cementing techniques. A ten to fifteen-year follow-up.
J Bone Joint Surg Am. 1998 Dec;80(12):1775-80.
PMID: 9875935 [PubMed - indexed for MEDLINE]

159: Wu CC, Shih CH.
Cementless ceramic total hip arthroplasty: a 5 to 16 year follow-up.
Changgeng Yi Xue Za Zhi. 1998 Sep;21(3):300-5.
PMID: 9849011 [PubMed - indexed for MEDLINE]

160: McAuley JP, Moore KD, Culpepper WJ 2nd, Engh CA.
Total hip arthroplasty with porous-coated prostheses fixed without cement in patients who are sixty-five years of age or older.
J Bone Joint Surg Am. 1998 Nov;80(11):1648-55.
PMID: 9840634 [PubMed - indexed for MEDLINE]

161: Hungerford MW, Mont MA, Scott R, Fiore C, Hungerford DS, Krackow KA.
Surface replacement hemiarthroplasty for the treatment of osteonecrosis of the

femoral head.
J Bone Joint Surg Am. 1998 Nov;80(11):1656-64.
PMID: 9840635 [PubMed - indexed for MEDLINE]

162: Ohsawa S, Fukuda K, Matsushita S, Mori S, Norimatsu H, Ueno R.
Middle-term results of anatomic medullary locking total hip arthroplasty.
Arch Orthop Trauma Surg. 1998;118(1-2):14-20.
PMID: 9833098 [PubMed - indexed for MEDLINE]

163: Kawamoto K, Hasegawa Y, Iwase T, Iwasada S, Kanamono T, Iwata H.
Failed cementless total hip arthroplasty for osteoarthrosis due to hip dysplasia. A minimum five-year follow-up study.
Bull Hosp Jt Dis. 1998;57(3):130-5.
PMID: 9809177 [PubMed - indexed for MEDLINE]

164: Harris WH.
Average 12-year outcome of a chrome-cobalt, beaded, bony ingrowth acetabular component.
J Arthroplasty. 1998 Oct;13(7):846. No abstract available.
PMID: 9802678 [PubMed - indexed for MEDLINE]

165: Van Flandern GJ, Bierbaum BE, Newberg AH, Gomes SL, Mattingly DA, Karpos PA.
Intermediate clinical follow-up of a dual-radius acetabular component.
J Arthroplasty. 1998 Oct;13(7):804-11.
PMID: 9802669 [PubMed - indexed for MEDLINE]

166: Dorr LD, Wan Z, Song M, Ranawat A.
Bilateral total hip arthroplasty comparing hydroxyapatite coating to porous-coated fixation.
J Arthroplasty. 1998 Oct;13(7):729-36.
PMID: 9802657 [PubMed - indexed for MEDLINE]

167: Yoon TR, Rowe SM, Jung ST, Seon KJ, Maloney WJ.
Osteolysis in association with a total hip arthroplasty with ceramic bearing surfaces.
J Bone Joint Surg Am. 1998 Oct;80(10):1459-68.
PMID: 9801214 [PubMed - indexed for MEDLINE]

168: Jacobs JJ, Skipor AK, Patterson LM, Hallab NJ, Paprosky WG, Black J, Galante JO.
Metal release in patients who have had a primary total hip arthroplasty. A prospective, controlled, longitudinal study.
J Bone Joint Surg Am. 1998 Oct;80(10):1447-58.
PMID: 9801213 [PubMed - indexed for MEDLINE]

169: Creighton MG, Callaghan JJ, Olejniczak JP, Johnston RC.
Total hip arthroplasty with cement in patients who have rheumatoid arthritis. A minimum ten-year follow-up study.
J Bone Joint Surg Am. 1998 Oct;80(10):1439-46.
PMID: 9801212 [PubMed - indexed for MEDLINE]

170: Delaunay CP, Kapandji AI.
Survivorship of rough-surfaced threaded acetabular cups. 382 consecutive primary Zweymuller cups followed for 0.2-12 years.
Acta Orthop Scand. 1998 Aug;69(4):379-83.
PMID: 9798445 [PubMed - indexed for MEDLINE]

171: Karrholm J, Frech W, Nivbrant B, Malchau H, Snorrason F, Herberts P.
Fixation and metal release from the Tifit femoral stem prosthesis. 5-year follow-up of 64 cases.
Acta Orthop Scand. 1998 Aug;69(4):369-78.
PMID: 9798444 [PubMed - indexed for MEDLINE]

172: Pritchett JW.
Success rates of the TARA hip.
Am J Orthop. 1998 Oct;27(10):658. No abstract available.
PMID: 9796707 [PubMed - indexed for MEDLINE]

173: Huo MH, Zurauskas A, Zatorska LE, Keggi KJ.
Cementless total hip replacement in patients with developmental dysplasia of the hip.
J South Orthop Assoc. 1998 Fall;7(3):171-9.
PMID: 9781892 [PubMed - indexed for MEDLINE]

174: Manley MT, Capello WN, D'Antonio JA, Edidin AA, Geesink RG.
Fixation of acetabular cups without cement in total hip arthroplasty. A comparison of three different implant surfaces at a minimum duration of follow-up of five years.
J Bone Joint Surg Am. 1998 Aug;80(8):1175-85.
PMID: 9730127 [PubMed - indexed for MEDLINE]

175: Sharkey PF, Barrack RL, Tvedten DE.
Five-year clinical and radiographic follow-up of the uncemented long-term stable fixation total hip arthroplasty.
J Arthroplasty. 1998 Aug;13(5):546-51.
PMID: 9726320 [PubMed - indexed for MEDLINE]

176: Knight JL, Atwater RD, Guo J.
Clinical results of the midstem porous-coated anatomic uncemented femoral stem in primary total hip arthroplasty: a five- to nine-year prospective study.
J Arthroplasty. 1998 Aug;13(5):535-45.

PMID: 9726319 [PubMed - indexed for MEDLINE]

177: Kennedy JG, Rogers WB, Soffe KE, Sullivan RJ, Griffen DG, Sheehan LJ.
Effect of acetabular component orientation on recurrent dislocation, pelvic osteolysis, polyethylene wear, and component migration.
J Arthroplasty. 1998 Aug;13(5):530-4.
PMID: 9726318 [PubMed - indexed for MEDLINE]

178: Sporer SM, Callaghan JJ, Olejniczak JP, Goetz DD, Johnston RC.
Hybrid total hip arthroplasty in patients under the age of fifty: a five- to ten-year follow-up.
J Arthroplasty. 1998 Aug;13(5):485-91.
PMID: 9726311 [PubMed - indexed for MEDLINE]

179: Jadhav AP, Kulkarni SS, Vaidya SV, Divekar MM, Suralkar SP.
Results of Austin Moore replacement.
J Postgrad Med. 1996 Apr-Jun;42(2):33-8.
PMID: 9715296 [PubMed - indexed for MEDLINE]

180: Bauer TW.
Severe osteolysis after third-body wear due to hydroxyapatite particles from acetabular cup coating.
J Bone Joint Surg Br. 1998 Jul;80(4):745. No abstract available.
PMID: 9699850 [PubMed - indexed for MEDLINE]

181: Joshi RP, Eftekhar NS, McMahon DJ, Nercessian OA.
Osteolysis after Charnley primary low-friction arthroplasty. A comparison of two matched paired groups.
J Bone Joint Surg Br. 1998 Jul;80(4):585-90.
PMID: 9699816 [PubMed - indexed for MEDLINE]

182: Sochart DH, Hardinge K.
Comparison of the Wrightington FC hip with the Charnley low-friction arthroplasty. 10- to 15-year results and survival analysis.
J Bone Joint Surg Br. 1998 Jul;80(4):577-84.
PMID: 9699815 [PubMed - indexed for MEDLINE]

183: Howie DW, Middleton RG, Costi K.
Loosening of matt and polished cemented femoral stems.
J Bone Joint Surg Br. 1998 Jul;80(4):573-6.
PMID: 9699814 [PubMed - indexed for MEDLINE]

184: Burt CF, Garvin KL, Otterberg ET, Jardon OM.
A femoral component inserted without cement in total hip arthroplasty. A study of the Tri-Lock component with an average ten-year duration of follow-up.
J Bone Joint Surg Am. 1998 Jul;80(7):952-60.

PMID: 9697999 [PubMed - indexed for MEDLINE]

185: Kumar MN, Swann M.
Uncemented total hip arthroplasty in young patients with juvenile chronic arthritis.
Ann R Coll Surg Engl. 1998 May;80(3):203-9. Review.
PMID: 9682646 [PubMed - indexed for MEDLINE]

186: Matsui M, Nakata K, Masuhara K, Ohzono K, Sugano N, Ochi T.
The Metal-Cancellous Cementless Lubeck total hip arthroplasty.
Five-to-nine-year results.
J Bone Joint Surg Br. 1998 May;80(3):404-10.
PMID: 9619926 [PubMed - indexed for MEDLINE]

187: Bohm P, Bosche R.
Survival analysis of the Harris-Galante I acetabular cup.
J Bone Joint Surg Br. 1998 May;80(3):396-403.
PMID: 9619925 [PubMed - indexed for MEDLINE]

188: Ilchmann T, Markovic L, Joshi A, Hardinge K, Murphy J, Wingstrand H.
Migration and wear of long-term successful Charnley total hip replacements.
J Bone Joint Surg Br. 1998 May;80(3):377-81.
PMID: 9619922 [PubMed - indexed for MEDLINE]

189: Gramkow J, Petersen MB, Retpen JB, Rechnagel K, Solgaard S.
Evaluation of 100 Muller curved-stem and 276 Muller long-stem total hip arthroplasties after 10 to 15 years of follow-up.
Orthopedics. 1998 May;21(5):521-5.
PMID: 9606691 [PubMed - indexed for MEDLINE]

190: Incavo SJ, Schneider R, Elting J.
The effect of surface coating of femoral prostheses implanted without cement: a 2- to 4-year follow-up study.
Am J Orthop. 1998 May;27(5):355-61.
PMID: 9604107 [PubMed - indexed for MEDLINE]

191: Kesteris U, Robertsson O, Wingstrand H, Onnerfalt R.
Cumulative revision rate with the Scan Hip Classic I total hip prosthesis.
1,660 cases followed for 2-12 years.
Acta Orthop Scand. 1998 Apr;69(2):133-7. Erratum in: Acta Orthop Scand 1998 Jun;69(3):330.
PMID: 9602769 [PubMed - indexed for MEDLINE]

192: Dearborn JT, Murray WR.
Arthopor 2 acetabular component with screw fixation in primary hip arthroplasty: a 7- to 9-year follow-up study.

J Arthroplasty. 1998 Apr;13(3):299-310.
PMID: 9590642 [PubMed - indexed for MEDLINE]

193: Loupasis G, Morris EW, Hyde ID.
The Furlong hydroxyapatite-coated total hip replacement in patients under age 51. A 6-year follow-up study.
Acta Orthop Belg. 1998 Mar;64(1):17-24.
PMID: 9586246 [PubMed - indexed for MEDLINE]

194: Kindsfater KA, Spitzer AI, Schaffer JL, Scott RD.
Bipolar hemiarthroplasty for primary osteoarthritis of the hip: a review of 41 cases with 8 to 10 years of follow-up.
Orthopedics. 1998 Apr;21(4):425-31.
PMID: 9571676 [PubMed - indexed for MEDLINE]

195: Hartofilakidis G, Stamos K, Karachalios T.
Treatment of high dislocation of the hip in adults with total hip arthroplasty. Operative technique and long-term clinical results.
J Bone Joint Surg Am. 1998 Apr;80(4):510-7.
PMID: 9563380 [PubMed - indexed for MEDLINE]

196: D'Lima DD, Oishi CS, Petersilge WJ, Colwell CW Jr, Walker RH.
100 cemented versus 100 noncemented stems with comparison of 25 matched pairs.
Clin Orthop. 1998 Mar;(348):140-8.
PMID: 9553546 [PubMed - indexed for MEDLINE]

197: Egol KA, Lonner JH, Jaffe WL.
Simultaneous bilateral total hip arthroplasty with hydroxyapatite coated implants.
Bull Hosp Jt Dis. 1998;57(1):52-5.
PMID: 9553703 [PubMed - indexed for MEDLINE]

198: Stans AA, Pagnano MW, Shaughnessy WJ, Hanssen AD.
Results of total hip arthroplasty for Crowe Type III developmental hip dysplasia.
Clin Orthop. 1998 Mar;(348):149-57.
PMID: 9553547 [PubMed - indexed for MEDLINE]

199: Delaunay C, Cazeau C, Kapandji AI.
Cementless primary total hip replacement. Four to eight year results with the Zweymuller-Alloclassic prosthesis.
Int Orthop. 1998;22(1):1-5.
PMID: 9549574 [PubMed - indexed for MEDLINE]

200: Onsten I, Carlsson AS, Besjakov J.
Wear in uncemented porous and cemented polyethylene sockets: a randomised,

radiostereometric study.
J Bone Joint Surg Br. 1998 Mar;80(2):345-50.
PMID: 9546474 [PubMed - indexed for MEDLINE]

201: Morscher EW, Hefti A, Aebi U.
Severe osteolysis after third-body wear due to hydroxyapatite particles from acetabular cup coating.
J Bone Joint Surg Br. 1998 Mar;80(2):267-72.
PMID: 9546458 [PubMed - indexed for MEDLINE]

202: Vidalain JP.
HA coating. Ten-year experience with the CORAIL system in primary THA. The Artro Group.
Acta Orthop Belg. 1997;63 Suppl 1:93-5. No abstract available.
PMID: 9532859 [PubMed - indexed for MEDLINE]

203: Rorabeck CH, Bourne RB, Mulliken BD, Nayak N.
Acetabular osteolysis with cementless cups: a 5 to 7 year follow-up.
Acta Orthop Belg. 1997;63 Suppl 1:83-92.
PMID: 9532858 [PubMed - indexed for MEDLINE]

204: Geesink R, Hoefnagels N.
Eight years results of HA-coated primary total hip replacement.
Acta Orthop Belg. 1997;63 Suppl 1:72-5. No abstract available.
PMID: 9532856 [PubMed - indexed for MEDLINE]

205: Schroder HM, Kristensen PW, Petersen MB, Nielsen PT.
Patient survival after total knee arthroplasty. 5-year data in 926 patients.
Acta Orthop Scand. 1998 Feb;69(1):35-8.
PMID: 9524515 [PubMed - indexed for MEDLINE]

206: Sugimura T, Tohkura A.
THA revision with extensively porous-coated stems. 32 hips followed 2-6.5 years.
Acta Orthop Scand. 1998 Feb;69(1):11-3.
PMID: 9524508 [PubMed - indexed for MEDLINE]

207: Loupasis G, Hyde ID, Morris EW.
The Furlong hydroxyapatite-coated femoral prosthesis. A 4- to 7-year follow-up study.
Arch Orthop Trauma Surg. 1998;117(3):132-5.
PMID: 9521516 [PubMed - indexed for MEDLINE]

208: Smith SE, Estok DM 2nd, Harris WH.
Average 12-year outcome of a chrome-cobalt, beaded, bony ingrowth acetabular component.

J Arthroplasty. 1998 Jan;13(1):50-60.
PMID: 9493538 [PubMed - indexed for MEDLINE]

209: Perez RE, Rodriguez JA, Deshmukh RG, Ranawat CS.
Polyethylene wear and periprosthetic osteolysis in metal-backed acetabular components with cylindrical liners.
J Arthroplasty. 1998 Jan;13(1):1-7.
PMID: 9493531 [PubMed - indexed for MEDLINE]

210: Hastings DE, Tobin H, Sellenkowitsch M.
Review of 10-year results of PCA hip arthroplasty.
Can J Surg. 1998 Feb;41(1):48-52.
PMID: 9492747 [PubMed - indexed for MEDLINE]

211: Furnes O, Lie SA, Havelin LI, Vollset SE, Engesaeter LB.
Exeter and charnley arthroplasties with Boneloc or high viscosity cement. Comparison of 1,127 arthroplasties followed for 5 years in the Norwegian Arthroplasty Register.
Acta Orthop Scand. 1997 Dec;68(6):515-20.
PMID: 9462347 [PubMed - indexed for MEDLINE]

212: Dowdy PA, Rorabeck CH, Bourne RB.
Uncemented total hip arthroplasty in patients 50 years of age or younger.
J Arthroplasty. 1997 Dec;12(8):853-62.
PMID: 9458250 [PubMed - indexed for MEDLINE]

213: Hirota S, Takeuchi E, Fujita S, Inui H, Oda T, Fuji T.
Ectopic bone formation after total hip arthroplasty.
Bull Hosp Jt Dis. 1997;56(4):206-10.
PMID: 9438080 [PubMed - indexed for MEDLINE]

214: Nagano H, Inoue H, Usui M, Mitani S, Satoh T.
Long-term results of Charnley low-friction arthroplasty for coxarthrosis with congenital hip dysplasia. 15 year follow-up study.
Bull Hosp Jt Dis. 1997;56(4):197-203.
PMID: 9438078 [PubMed - indexed for MEDLINE]

215: Saito S, Ryu J, Oikawa H, Honda T.
Clinical results of Harris-Galante total hip arthroplasty without cement. Follow-up study of over five years.
Bull Hosp Jt Dis. 1997;56(4):191-6.
PMID: 9438077 [PubMed - indexed for MEDLINE]

216: Bear BJ, Laskin R, Higgins L.
Dissociation of a polyethylene liner in a nonmodular, cemented, metal-backed acetabular component.

Orthopedics. 1997 Dec;20(12):1179-80. Review. No abstract available.
PMID: 9415913 [PubMed - indexed for MEDLINE]

217: Tankersley WS, Mont MA, Hungerford DS.
A second-generation cementless hip prosthesis: improved results over the first-generation prosthesis.
Am J Orthop. 1997 Dec;26(12):839-44.
PMID: 9413587 [PubMed - indexed for MEDLINE]

218: Ecker ML.
Porous-coated acetabular components with screw fixation. Five to ten-year results.
J Bone Joint Surg Am. 1997 Dec;79(12):1891-2. No abstract available.
PMID: 9409802 [PubMed - indexed for MEDLINE]

219: Smith SE, Harris WH.
Total hip arthroplasty performed with insertion of the femoral component with cement and the acetabular component without cement. Ten to thirteen-year results.
J Bone Joint Surg Am. 1997 Dec;79(12):1827-33.
PMID: 9409796 [PubMed - indexed for MEDLINE]

220: Hartofilakidis G.
Survival of the Charnley low-friction arthroplasty. A 12-24-year follow-up of 276 cases.
Acta Orthop Scand Suppl. 1997 Oct;275:27-9.
PMID: 9385260 [PubMed - indexed for MEDLINE]

221: Sochart DH, Porter ML.
The long-term results of Charnley low-friction arthroplasty in young patients who have congenital dislocation, degenerative osteoarthrosis, or rheumatoid arthritis.
J Bone Joint Surg Am. 1997 Nov;79(11):1599-617.
PMID: 9384419 [PubMed - indexed for MEDLINE]

222: Berger RA, Jacobs JJ, Quigley LR, Rosenberg AG, Galante JO.
Primary cementless acetabular reconstruction in patients younger than 50 years old. 7- to 11-year results.
Clin Orthop. 1997 Nov;(344):216-26. Review.
PMID: 9372773 [PubMed - indexed for MEDLINE]

223: McLaughlin JR, Lee KR.
Total hip arthroplasty with an uncemented femoral component. Excellent results at ten-year follow-up.
J Bone Joint Surg Br. 1997 Nov;79(6):900-7.
PMID: 9393901 [PubMed - indexed for MEDLINE]

224: Fender D, Harper WM, Thompson JR, Gregg PJ.
Mortality and fatal pulmonary embolism after primary total hip replacement.
Results from a regional hip register.
J Bone Joint Surg Br. 1997 Nov;79(6):896-9.
PMID: 9393900 [PubMed - indexed for MEDLINE]

225: Emery D, Britton A, Clarke H, Grover M.
The Stanmore total hip arthroplasty. A 15- to 20-year follow-up study.
J Arthroplasty. 1997 Oct;12(7):728-35.
PMID: 9355001 [PubMed - indexed for MEDLINE]

226: Gonzalez MH, Ortinau ET, Buonanno W, Prieto J.
Cementless total hip arthroplasty in patients with advanced avascular necrosis.
J South Orthop Assoc. 1997 Fall;6(3):162-8.
PMID: 9322194 [PubMed - indexed for MEDLINE]

C. *JBJS* Levels of Evidence IV or V

Search strategy – Limits: English language publications, MeSH terms "Arthroplasty", "Replacement" and "Hip", Publication type – Literature reviews, tutorial reviews

Results: 307 citations found; exclusion criteria are any articles that are not using prosthesis/patient outcome as primary variable (ie, articles looking at different DVT prophylaxis drugs, different preoperative education techniques, etc.) or those that do not discuss complications associated with the prosthesis.

1: Della Valle CJ, Momberger NG, Paprosky WG. Periprosthetic fractures of the acetabulum associated with a total hip arthroplasty. Instr Course Lect. 2003;52:281-90. Review.
PMID: 12690856 [PubMed - indexed for MEDLINE]

2: Barrack RL, Butler RA. Avoidance and management of neurovascular injuries in total hip arthroplasty. Instr Course Lect. 2003;52:267-74. Review.
PMID: 12690854 [PubMed - indexed for MEDLINE]

3: Ries MD. Complications in primary total hip arthroplasty: avoidance and management: wear. Instr Course Lect. 2003;52:257-65. Review.
PMID: 12690853 [PubMed - indexed for MEDLINE]

4: Mahoney CR, Pellicci PM. Complications in primary total hip arthroplasty: avoidance and management of dislocations. Instr Course Lect. 2003;52:247-55. Review.
PMID: 12690852 [PubMed - indexed for MEDLINE]

5: Barrack RL. Dislocation after total hip arthroplasty: implant design and orientation. J Am Acad Orthop Surg. 2003 Mar-Apr;11(2):89-99. Review.
PMID: 12670135 [PubMed - indexed for MEDLINE]

6: Bhinda HP, Sarkar SP. Dissociation of the S-ROM metal-backed polyethylene acetabular liner--a case report and literature review. Acta Orthop Belg. 2003;69(1):86-8. Review.
PMID: 12666298 [PubMed - indexed for MEDLINE]

7: Brown TE, Larson B, Shen F, Moskal JT. Thigh pain after cementless total hip arthroplasty: evaluation and management. J Am Acad Orthop Surg. 2002 Nov-Dec;10(6):385-92. Review.
PMID: 12470040 [PubMed - indexed for MEDLINE]

8: Neal B, Gray H, MacMahon S, Dunn L. Incidence of heterotopic bone formation after major hip surgery. ANZ J Surg. 2002 Nov;72(11):808-21. Review.
PMID: 12437693 [PubMed - indexed for MEDLINE]

9: Saleh KJ, Kassim R, Yoon P, Vorlicky LN. Complications of total hip arthroplasty. Am J Orthop. 2002 Aug;31(8):485-8. Review.
PMID: 12216974 [PubMed - indexed for MEDLINE]

10: Paprosky WG, Burnett RS. Extensively porous-coated femoral stems in revision hip arthroplasty: rationale and results. Am J Orthop. 2002 Aug;31(8):471-4. Review.
PMID: 12216970 [PubMed - indexed for MEDLINE]

11: Della Valle CJ, Di Cesare PE. Complications of total hip arthroplasty: neurovascular injury, leg-length discrepancy, and instability. Bull Hosp Jt Dis. 2001-2002;60(3-4):134-42. Review. No abstract available.
PMID: 12102400 [PubMed - indexed for MEDLINE]

12: Peters CL, Sullivan CL. Locking mechanism failure in the Harris-Galante porous acetabular component associated with recurrent hip dislocation. J Arthroplasty. 2002 Jun;17(4):507-15. Review.
PMID: 12066286 [PubMed - indexed for MEDLINE]

13: Dunlop DJ, Masri BA, Greidanus NV, Garbuz DS, Duncan CP. Tapered stems in cemented primary total hip replacement. Instr Course Lect. 2002;51:81-91. Review. No abstract available.
PMID: 12064151 [PubMed - indexed for MEDLINE]

14: Bono JV. The role and results of proximal modularity in primary total hip replacement. Instr Course Lect. 2002;51:75-80. Review. No abstract available.
PMID: 12064150 [PubMed - indexed for MEDLINE]

15: Nelson CL. Periprosthetic fractures of the femur following hip arthroplasty. Am J Orthop. 2002 Apr;31(4):221-3. Review.
PMID: 12008855 [PubMed - indexed for MEDLINE]

16: Schmidt AH, Kyle RF. Periprosthetic fractures of the femur. Orthop Clin North Am. 2002 Jan;33(1):143-52, ix. Review.
PMID: 11832318 [PubMed - indexed for MEDLINE]

17: Harris WH. Wear and periprosthetic osteolysis: the problem. Clin Orthop. 2001 Dec;(393):66-70. Review.
PMID: 11764372 [PubMed - indexed for MEDLINE]

18: Sanchez-Sotelo J, Berry DJ. Epidemiology of instability after total hip replacement. Orthop Clin North Am. 2001 Oct;32(4):543-52, vii. Review.
PMID: 11689368 [PubMed - indexed for MEDLINE]

19: Berry DJ. Unstable total hip arthroplasty: detailed overview. Instr Course Lect. 2001;50:265-74. Review.
PMID: 11372323 [PubMed - indexed for MEDLINE]

20: Dunbar MJ, Blackley HR, Bourne RB. Osteolysis of the femur: principles of management. Instr Course Lect. 2001;50:197-209. Review.
PMID: 11372315 [PubMed - indexed for MEDLINE]

21: Barrack RL. Early failure of modern cemented stems. J Arthroplasty. 2000 Dec;15(8):1036-50. Review.
PMID: 11112201 [PubMed - indexed for MEDLINE]

22: Eingartner C, Volkmann R, Winter E, Maurer F, Sauer G, Weller S, Weise K. Results of an uncemented straight femoral shaft prosthesis after 9 years of follow-up. J Arthroplasty. 2000 Jun;15(4):440-7. Review.
PMID: 10884203 [PubMed - indexed for MEDLINE]

23: Bauer TW, Schils J. The pathology of total joint arthroplasty. I. Mechanisms of implant fixation. Skeletal Radiol. 1999 Aug;28(8):423-32. Review.
PMID: 10486010 [PubMed - indexed for MEDLINE]

24: Nilsson OS, Persson PE. Heterotopic bone formation after joint replacement. Curr Opin Rheumatol. 1999 Mar;11(2):127-31. Review.
PMID: 10319216 [PubMed - indexed for MEDLINE]

25: Callaghan JJ, Kim YS, Pederson DR, Brown TD. Periprosthetic fractures of the acetabulum. Orthop Clin North Am. 1999 Apr;30(2):221-34. Review.
PMID: 10196424 [PubMed - indexed for MEDLINE]

26: Callaghan JJ. Periprosthetic fractures of the acetabulum during and following total hip arthroplasty. Instr Course Lect. 1998;47:231-5. Review. No abstract available.
PMID: 9571423 [PubMed - indexed for MEDLINE]

27: Bear BJ, Laskin R, Higgins L. Dissociation of a polyethylene liner in a nonmodular, cemented, metal-backed acetabular component. Orthopedics. 1997 Dec;20(12):1179-80. Review. No abstract available.
PMID: 9415913 [PubMed - indexed for MEDLINE]

28: Berger RA, Jacobs JJ, Quigley LR, Rosenberg AG, Galante JO. Primary cementless acetabular reconstruction in patients younger than 50 years old. 7- to 11-year results. Clin Orthop. 1997 Nov;(344):216-26. Review.
PMID: 9372773 [PubMed - indexed for MEDLINE]

29: Mont MA, Hungerford DS. Proximally coated ingrowth prostheses. A review. Clin Orthop. 1997 Nov;(344):139-49. Review.
PMID: 9372766 [PubMed - indexed for MEDLINE]

Appendix IV

Complications

Complications	Number found	Percent of total	Code
Dislocation	300	20.15	3
Femoral bone fracture - intraop	253	16.99	3
DVT	149	10.01	4
Pulmonary embolism	112	7.52	4
Femoral, greater troch osteotomy nonunion	64	4.30	1
UTI	58	3.90	4
Osteolysis - femur and/or acetabulum	56	3.76	2
Loosening, fem and/or acet component, septic or aseptic	52	3.49	3
Pain, thigh	44	2.96	3, 4
Infection, non-descript	42	2.82	1
Leg length discrepancy	34	2.28	1
Pain, non-descript	34	2.28	4
Infection, deep	26	1.75	4
Cardiovascular complications	25	1.68	4
Peroneal nerve palsy	24	1.61	1
Heterotopic ossification	23	1.54	1, 4
Femoral, greater troch fracture - intraop	17	1.14	1
Acetabular ceramic liner chipped - intraop	16	1.07	3
Sciatic nerve palsy	14	0.94	1
Femoral calcar fracture - intraop	13	0.87	3
Femoral nerve palsy	13	0.87	1
Neuropathy, non-descript	13	0.87	1, 4
Infection, superficial infection	12	0.81	1, 4
Hematoma	11	0.74	4
Femoral periprosthetic fracture	9	0.60	3
Gout	7	0.47	4
Urinary retention	7	0.47	4
Acetabular malposition - intraop	6	0.40	1
Pneumonia	6	0.40	4
Wound, delayed healing	6	0.40	1, 4
Femoral wall perforation - intraop	5	0.34	1
Wound drainage	5	0.34	1, 4
Acetabular liner dissociation	3	0.20	2
Acetabular wall perforation - intraop	3	0.20	3, 1
Femoral component subsidence	3	0.20	3
Intestinal ileus	3	0.20	4, 1
Acetabular ceramic liner fracture	2	0.13	2
Acetabular liner/head eccentricity	2	0.13	2
Enterocolitis	2	0.13	4
Acetabular poly liner fracture	1	0.07	2
Bursitis	1	0.07	4

Cholecystitis	1	0.07	4
Diarrhea	1	0.07	4
Femoral component fracture	1	0.07	2
Hepatitis	1	0.07	4
Impingement	1	0.07	3
Inguinal abscess	1	0.07	4
Jaundice	1	0.07	4
Leukaemic crisis	1	0.07	4
Metallosis - screw/screw contact	1	0.07	2
Paralytic ileus	1	0.07	4
Peptic ulcer	1	0.07	4
Seizure	1	0.07	4
Subluxation	1	0.07	3
TOTALS	**1489**	**100**	

Code Key	
Description	**Code**
1	Op technique only
2	Implant only
3	Op tech and implant
4	Systemic/unrelated
5	Other

The codes in the last column indicate the Clinician Team's judgment as to the general etiology of the complication. This was done in order to attribute the complication so that safety of the HRS device could be properly evaluated. Based on the coding system only complications designated as 2 or 3 would be deemed as possibly or probably device related.

Appendix V

Power Calculation

The following is the power calculation used on page 3 of this document:

Bioequivalence
Desired rate is 95%.
Alpha is set to 0.05, one outcome.

Observed rate 90%.
235 cases, gives a rate of 0.90 with a 95% C.I. of 85% - 93%, and a power of 0.8.

Observed rate 93%.
235 cases gives a rate of 0.93 with a 95% C.I. of 89% - 96%, and a power of 0.9.