DePuy Orthopaedics, Inc.
700 Orthopaedic Drive
Warsaw, IN 46582
Telephone 1-800-366-8143

DePuy Ceramax™ Ceramic Total Hip System

CAUTION: FEDERAL LAW (USA) RESTRICTS THIS DEVICE TO SALE BY OR ON THE ORDER OF A PHYSICIAN

INFORMATION FOR PRESCRIBERS

How Supplied
Implant Components: Sterile **Surgical Instruments: Non-Sterile Unless Otherwise Specified (Refer To Device Package Label)**

DESCRIPTION

The DePuy Ceramax™ Ceramic Total Hip System is a modular system consisting of a ceramic on ceramic acetabular bearing couple (alumina composite matrix ceramic femoral head and alumina composite ceramic matrix acetabular liner) combined with a compatible metal shell (cup) and screws and titanium alloy femoral stems identified below. Both the femoral heads and acetabular liner components are manufactured from BIOLOX *delta* alumina (Al_2O_3) matrix composite ceramic by CeramTec AG. All implantable devices are supplied sterile (see sterilization section) for single use.

BIOLOX® *delta* ceramic femoral heads
The alumina composite matrix ceramic heads have a 11/13 taper and are offered with outside diameters of 28mm in three (+0 mm, +3 mm and +6 mm) neck lengths. DePuy BIOLOX® *delta* ceramic femoral heads are only compatible with the DePuy femoral prostheses identified below.

BIOLOX® *delta* ceramic liner (insert)
The alumina composite matrix ceramic acetabular liners are offered in ten sizes with an internal diameter of 28mm. The ten sizes are offered in outer diameters of 48-66 mm in 2 mm increments. A taper-fit connection allows assembly into the mating metal acetabular shell components.

Pinnacle acetabular cups
The Pinnacle 100 acetabular cups are hemispherical type replacement prostheses with a single apex hole. The metal outer acetabular shell component is manufactured from Ti-6Al-4V (ASTM F620). A porous coating of commercially pure (CP) titanium beads

(ASTM F1580) covers the outer surface of the shell. The metal outer shells have 48, 50, 52, 54, 56, 58, 60, 62, 64, 66 mm outer diameters.

Bone Screws
The DePuy 6.5mm diameter cancellous bone screws are optional, and are available in titanium alloy (ASTM F136) in sizes ranging in lengths from 15-70 mm.

DePuy Femoral Stems
The DePuy Ceramax™ Ceramic Total Hip System uses the commercially available DePuy S-ROM titanium alloy (ASTM F136) femoral stem components.

The S-ROM titanium alloy femoral stems are for cementless use and are available in standard and lateralized versions with 11/13 trunnions. The stems are partially coated with a commercially pure titanium porous coating.

Table 1: Component Compatibility

Femoral Stem	BIOLOX delta femoral head	Ceramax™ acetabular insert (ID X OD)	Pinnacle 100 acetabular shell	6.5 Pinnacle Cancellous Bone Screws
S-ROM Modular Hip	28mm +0, +3, and +6 (11/13 taper)	28 x 48, 28 x 50, 28 x 52, 28 x 54, 28 x 56, 28 x 58, 28 x 60, 28 x 62, 28 x 64, 28 x 66mm	48 – 66mm	15-70mm

INDICATIONS FOR USE

The DePuy Ceramax™ Ceramic Total Hip System is indicated for noncemented use in skeletally mature individuals undergoing primary total hip replacement surgery for rehabilitation of hips damaged as a result of noninflammatory degenerative joint disease (NIDJD) or any of its composite diagnoses of osteoarthritis, avascular necrosis, and post-traumatic arthritis.

NOTE

DePuy Ceramax Ceramic Total Hip System inserts are only intended for use with DePuy femoral and acetabular components having matching outer and inner diameters.

THE DEPUY CERAMAX™ ACETABULAR INSERTS ARE INTENDED FOR USE ONLY WITH DEPUY BIOLOX® DELTA CERAMIC HEADS.

CONTRAINDICATIONS

Use of the DePuy Ceramax™ Ceramic Total Hip System is contraindicated in the following situations:

- Skeletally immature patients (tibial and femoral epiphyses not closed);

- Evidence of active infections that may spread to other areas of the body (e.g., osteomyelitis, pyogenic infection of the hip joint, overt infection, urinary tract infection, etc.);

- The presence of any known neoplastic (tumor-causing) or metastatic (spread of cancerous cells) disease;

- Significant neurologic or musculoskeletal disorders or diseases that may adversely affect gait, weight bearing or postoperative recovery (e.g., muscular dystrophy, multiple sclerosis);

- Presence of highly communicable disease(s) that may limit follow-up (e.g., immuno-compromised conditions, hepatitis, active tuberculosis, etc.);

- Any condition that may interfere with postoperative recovery (e.g., Paget's disease, Charcot's disease);

- Inadequate bone stock to support the device (e.g., severe osteopenia or osteoporosis)

- Poor skin coverage around the hip joint;

- Use in patients with known allergies to the implant materials;

- Marked atrophy (muscle and/or tissue loss) or deformity in the upper femur such as a birth defect affecting the leg bones.

- Inflammatory degenerative joint disease (like rheumatoid arthritis)

- Joint instability

INFORMATION FOR USE

The DePuy instrumentation system, as well as DePuy's system of trial components, must be used to assure proper fit and alignment of the prosthesis. Correct fit and alignment will reduce stresses at interface surfaces to enhance implant fixation. The surgeon should refer to the appropriate surgical technique manual on use of the instrument system and implantation of the prosthesis. A special instrument is provided to enable the surgeon to remove the insert once it has been fitted in place.

WARNINGS AND PRECAUTIONS

Warnings:

WARNING

If postoperative chipping or breakage of one or both of the ceramic device components is confirmed, surgery for their removal must be performed as soon as reasonably possible.

Only physicians who are familiar with the implant components, instruments, procedure, clinical applications, adverse events, and risks associated with the DePuy Ceramax™ Ceramic Total Hip System should use this device.

Improper prosthesis selection or alignment, inadequate fixation, use where contraindicated or in patients whose medical, physical, mental or occupational conditions will likely result in extreme stresses to the implant may result in premature failure due to loosening, fracture or wear. Postoperative care is extremely important. The patient should be instructed on the limitations of the device and should be cautioned regarding load bearing, ranges of motion and activity levels permissible. Early motion and load bearing should be carefully monitored.

The Ceramax ceramic inserts are intended for use only with BIOLOX *delta* ceramic femoral heads in corresponding diameter sizes. The inner diameter of the ceramic insert must correspond to the hip head size. Use of a ceramic insert with a non-matching hip head size will result in higher stresses, accelerated wear and early failure.

This implant should not be used with other manufacturers' components or instruments. Use of components or instruments other than those recommended could lead to loosening, wear, fracture and premature failure.

- Do not mix inserts and shells from different systems. Ceramax ceramic inserts can be used only with Pinnacle acetabular shells.
- Implants are for single use only. Do not reuse an implant in order to ensure there has been no damage to the implants.
- Do not allow damage to the polished bearing surfaces or taper locking surfaces. Any alteration, damage, contour or bend to these surfaces will reduce the fatigue strength of the prostheses and may result in failure under load. Any prostheses so damaged must not be used.
- Replace both the ceramic liner and the metal acetabular shell if the ceramic liner is chipped, cracked, or otherwise damaged during shell/liner assembly. Once the acetabular shell taper has been assembled to a ceramic liner, it should not be reassembled to another ceramic liner. A deformed metal taper could significantly affect the locking mechanism between the new liner and shell and increase the risk of ceramic liner fracture.
- Do not scratch or dent the rim or internal taper of the acetabular shells. If the rim or taper joint is damaged during implantation, the acetabular shell should be

replaced, as the deformation of the shell taper may affect the locking mechanism between the liner and shell and increase the risk of ceramic liner fracture.

- Do not implant in pregnant patients as the extra weight and exposure to radiation may be harmful to the implant and fetus.
- Do not implant in obese patients because overloading the component may lead to fracture or loss of fixation.

When used with multiple components of a total replacement system, the MR compatibility and safety of the entire system of implants has not been evaluated and the entire system of implants has not been tested together for heating or migration in the MR environment.

Precautions:

Pre-operative

- The patient should be informed of all potential risks and adverse effects contained in this package insert. The patient should be warned that the implants can break or become damaged as a result of strenuous activity or trauma.

- Preoperative planning provides essential information regarding the appropriate prosthesis and likely combinations of components. If, during preoperative planning, an appropriately sized component is not available, the procedure should not take place. An appropriate range of implant sizes should be available prior to performing the surgical procedure.

- To prevent contamination of this prosthesis, keep free of lint and powders. Do not open the package until surgery.

- Diabetes, at present, has not been established as a contraindication. However, because of increased risk for complications such as infection, slow healing, slow wound healing, etc., the physician should fully consider the advisability of hip arthroplasty in the severely diabetic patient.

- When assembling the acetabular components, first place the ceramic liner into the metal shell by hand. Prior to impacting, confirm that proper seating of the ceramic liner has occurred by palpating the shell/liner assembly. It is critical that the ceramic liner is stable within the shell prior to impacting with the ceramic liner driver instrument. Impaction should not occur and the ceramic liner should be removed if it becomes mal-aligned within the shell. Repeated impaction of the liner in the shell when the initial attempt at seating the liner is unsuccessful is not recommended and may lead to early failure. If the ceramic liner and shell are not fully seated or are aligned incorrectly after final impaction, it will be necessary to revise the shell and liner with new components.

- After the liner has been inserted, the liner should be examined in-situ for evidence of chipping (visible evidence of ceramic fracture). If chipped, scratched, or otherwise damaged during the implant procedure, replace both the ceramic liner and the acetabular shell.

- Once the femoral stem taper has been assembled to a ceramic head, it should not be reassembled to another ceramic head. If the ceramic head is chipped, cracked, or otherwise damaged during head /stem assembly, replace both the ceramic head and the femoral stem.

Intra-operative

- Use the recommended trial components for size determination, trial reduction and range of motion evaluation. To prevent contamination of this prosthesis, keep free of lint and powders. Do not place the implant in contact with prepared bone surface before the final decision to implant has been made; thus preserving the integrity of the actual implants and their sterile packaging.

- The trial prostheses should not be implanted.

- Examine instruments for wear or damage before use. Instruments that have experienced excessive use or force may be susceptible to breakage.

- Carefully examine each component and its packaging for any signs of damage that may have occurred during shipping or handling. Do not implant components if the packaging is damaged or if the implant shows signs of damage. Due to the brittle nature of the material, ceramic components are particularly susceptible to premature failure when scratched, cracked or otherwise damaged. Likewise, a new implant should be handled carefully to avoid damage that could compromise the mechanical integrity of the device and cause early failure or loosening.

- Implants should be accepted by the hospital or surgeon only if received with the factory packaging and labeling intact. If the sterile barrier has been broken, return the component to DePuy Orthopaedics, Inc.

- An implant should never be re-used. Any implant, once used, should be discarded. Even though it appears undamaged, it may have small defects and internal stress patterns that may lead to failure. DePuy's Single Use devices have not been designed to undergo or withstand any form of alteration, such as disassembly, cleaning or re-sterilization, after a single patient use. Reuse can potentially compromise device performance and patient safety.

- The bore of the ceramic insert should not come into contact with abrasive surfaces, as this may damage the bore and affect performance. In addition, all mating surfaces should be clean before assembly to ensure proper seating. Incorrect seating and/or alignment may result in suboptimal contact between the femoral head and insert resulting in the potential for increased wear, chipping or damage.

- Do not scratch acetabular shells and femoral components to prevent damage to the articulation surfaces. Replace any component that has been scratched or otherwise damaged during the implant procedure.

- Ensure that the inner diameter of the acetabular shell/cup matches the outer diameter of the ceramic insert. Ensure that the outer diameter of the femoral head matches the inner diameter of the insert.

- Always ensure proper alignment and seating of the acetabular and femoral components. Malalignment of the components and/or soft tissue imbalance may cause excessive wear and early implant failure.

- Avoid impacting the taper region and the insert face to adjust the insert position. As with any ceramic insert, damage to the taper or the adjacent insert face may increase the risk for fracture and/or chipping of the insert upon its engagement with the acetabular shell.

- Care should be taken to remove bone chips and metallic debris from the implant site to reduce the risk of debris induced accelerated wear of the articular surfaces of the implant.

- Care should be taken to avoid damage to the soft tissue and blood supply during dissection of the capsular tissue.

In order to prevent sepsis, the physician is advised to follow the following recommendations:

- Consistent use of prophylactic antibiotics.
- Utilizing a laminar flow clean air system.
- Having all operating room personnel, including observers, properly attired.
- Protecting instruments from airborne contamination.
- Impermeable draping.

Post-operative

- Excessive physical activity levels and trauma to the joint replacement may cause early failure of the implant
- Loosening of the components may increase production of wear particles and accelerate damage to the bone
- Periodic, long-term follow-up is recommended to monitor the position and state of the prosthetic components, as well as the condition of the adjoining bone.
- All patients should be instructed on the limitations of the prosthesis and the possibility of subsequent surgery. The patient should be cautioned to monitor activities and protect the replaced joint from unreasonable stresses, and follow the written instructions of the physician with respect to follow-up care and treatment. The patient should be warned against unassisted activity, particularly use of toilet facilities and other activities requiring excessive motion of the hip. Patients should be informed that their weight and activity level may affect the longevity of

the implant. Patients should be advised to report any pain, decrease in range of motion, swelling, fever, or unusual sounds (e.g., clicking or squeaking) as this may indicate positional changes in the implant that could lead to premature failure.

Patient Education

- Warn the patient of the surgical risks, possible adverse effects, and possible operative complications that may occur with joint arthroplasty.

- Warn the patient of the limitations of artificial joint replacement devices.

- Caution the patient to protect the joint replacement from unreasonable stresses and to follow the treating physician's instructions. In particular, warn the patient to strictly avoid high impact activities, such as running and jumping, during the first post-operative year while the bone is healing.

- Warn the patient that artificial joint replacement devices can wear out over time and may require replacement.

- All patients should be instructed on the limitation of the prosthesis and the possibility of subsequent surgery. The patient should be cautioned to monitor activities and protect the replaced joint from unreasonable stresses and follow the written instructions of the physician with respect to follow-up care and treatment. Patients should be informed that their weight and activity level may affect the longevity of the implant. Patients should be advised to report any pain, decrease in range of motion, swelling, fever, etc. as this may indicate positional changes in the implant that could lead to premature failure.

Potential adverse Effects of the Device on Health

The following adverse effects may occur with any hip replacement surgery, including the DePuy Ceramax Ceramic Total Hip System:

Complications Associated with the DePuy Ceramax™ Ceramic Total Hip System

The most commonly reported adverse events related to the DePuy Ceramax Ceramic Total Hip System are:

1. Wear of the ceramic acetabular components has been reported following total hip replacement. Higher rates of wear may be initiated by particles of cement, metal, or other debris that can cause abrasion of the articulating surfaces. Higher rates of wear may shorten the useful life of the prosthesis, and lead to early revision surgery to replace the worn prosthetic components.
2. While rare, fatigue fracture of the prosthetic component can occur as a result of improper assembly, trauma, strenuous activity, improper alignment, or duration of service.

3. Component dissociation.
4. Breakage or chipping of the ceramic femoral head and/or ceramic acetabular insert.

Complications Generally Associated with Total Hip Arthroplasty

5. Excessive wear of the ceramic components secondary to damage of mating wear surfaces or debris particles;
6. Metal sensitivity reactions;
7. Possible detachment of the coating(s) on the femoral stem or acetabular shell components, potentially leading to increased debris particles;
8. Device related noise such as, clicking, popping, squeaking or grinding;
9. Pain;
10. Femoral or acetabular perforation, or bone fracture while seating the device;
11. Damage to blood vessels resulting in hematoma;
12. Temporary or permanent nerve damage resulting in pain or numbness of the affected limb;
13. Undesirable shortening or lengthening of the limb;
14. Traumatic arthrosis of the hip from intraoperative positioning of the extremity;
15. Cardiovascular disorders including venous thrombosis, pulmonary embolism, or myocardial infarction;
16. Temporary or permanent neuropathies;
17. Delayed wound healing;
18. Infection;
19. Osteolysis;
20. Fracture, migration, loosening, subluxation, or dislocation of the prosthesis or any of its components, any of which may require a second surgical intervention or revision;
21. Periarticular calcification or ossification, with or without impediment to joint mobility;
22. Inadequate range of motion due to improper selection or positioning of components, by femoral impingement, and periarticular calcification; and
23. Death.

Any of these adverse effects may necessitate surgical intervention. The potential long-term biological effects of metal wear debris and metal ion production are not known.

SUMMARY OF CLINICAL INVESTIGATIONS

The clinical investigation of the DePuy Ceramax™ Ceramic Total Hip System was conducted under an approved IDE (G030075). The study was a prospective, multi-center, randomized (2 to 1), single-blind, controlled clinical investigation comparing the 28mm ceramic-on-ceramic hip system to a conventional 28mm ceramic-on-polyethylene articulation hip system (COC28) in 264 cases.

The study enrollment period was October 2003 to December 2005. The first surgery occurred on October 28, 2003 and the last surgery on December 28, 2005. Data collected during the period from October 2003 to February 2008 was used for the approval of the DePuy Ceramax™ Ceramic Total Hip System. There were eight investigational sites and 13 surgeons.

Clinical Inclusion and Exclusion Criteria

Enrollment in the DePuy Ceramax™ Ceramic Total Hip System investigational study was limited to patients who met the following inclusion criteria:

- Cementless total hip replacement in skeletally mature (tibial and femoral epiphyses are closed) individuals 20 to 75 years of age at the time of surgery undergoing primary hip surgery for noninflammatory degenerative joint disease (NIDJD)
- Composite diagnoses of NIDJD include osteoarthritis, avascular necrosis, posttraumatic arthritis, slipped capital femoral epiphysis (SCFE), fracture of the pelvis, and developmental dysplasia
- Patients with a previous total hip replacement of the contralateral leg that has a pain rating of none or slight and who are at least one year post arthroplasty are eligible for participation in the study
- Preoperative Harris Hip Total score of less than or equal to 70
- Preoperative Harris Hip Total Pain score at least Moderate
- Radiographic evaluation confirms the presence of NIDJD
- Radiographic evaluation confirms that there is sufficient femoral and acetabular bone stock, regarding strength and shape, and is suitable to receive the implants

Patients were not permitted to enroll in the DePuy Ceramax™ Ceramic Total Hip System investigational study if they met any of the following exclusion criteria:

- Presence of a previous prosthetic hip replacement device (any type, including surface replacement arthroplasty, endoprosthesis, etc.) in the hip joint to be operated
- Previous Girdlestone procedure (resection arthroplasty) or surgical fusion of the hip to be operated
- Acute femoral neck fracture
- Above knee amputation of the contralateral and/or ipsilateral leg
- Patients with bilateral degenerative joint disease requiring staged or simultaneous hip replacements
- Patients with an existing total hip arthroplasty in the contralateral hip with a Harris Hip pain rating of mild, moderate marked or totally disabled

- Patients who have undergone total hip arthroplasties in their contralateral hips within the past 12 months
- Patients with a known allergy to metal (e.g., jewelry)
- Skeletally immature patients (tibial and femoral epiphyses are not closed)
- Evidence of active infections that may spread to other areas of the body (e.g., osteomyelitis, pyogenic infection of the hip joint, overt infection, urinary tract infection, etc.)
- The presence of highly communicable disease or diseases that may limit followup (e.g., immuno-compromised conditions, hepatitis, active tuberculosis, etc.)
- Presence of known metastatic or neoplastic disease
- Significant neurologic or musculoskeletal disorders or disease that may adversely affect gait or weight bearing, (e.g., muscular dystrophy, multiple sclerosis)
- Conditions that may interfere with the total hip arthroplasty's survival or outcome, (e.g., Paget's disease, Charcot's disease)
- Any patient believed to be unwilling or unable to comply with a rehabilitation program for a cementless total hip replacement or who indicates difficulty or inability to return for follow-up visits prescribed by the study protocol
- Patient is known to be pregnant, a prisoner, mentally incompetent, and/or alcohol or drug abuser
- Any systemic steroid therapy, excluding inhalers, within three months prior to surgery
- Patients carrying the diagnosis of inflammatory degenerative arthritis (IDJD) to include the following composite diagnoses: rheumatoid arthritis, systemic lupus erythematosus, pigmented villonodular synovitis, juvenile rheumatoid arthritis and other arthritic processes of inflammatory or autoimmune etiology
- Patients requiring structural bone grafts in order to support the prosthetic component(s) or to shape the bone to receive the implant(s)
- Patients who refuse to provide consent to participate in the clinical investigation

Follow-up Schedule

All patients were scheduled to return for follow up examination at 6-weeks, 6-months, 12-months, 24-months and then annually following their surgeries. (Table 1) In addition, beginning at 12-months postoperatively patient reported satisfaction outcomes were collected.

Table 1: Protocol Interval Windows

Interval	Days
6 weeks = 6 weeks ± 2 weeks	28 – 60
6 months = 6 months ± 4 weeks	150 – 210
12 months = 12 months ± 8 weeks	300 – 420
2 years = 24 months ± 12 weeks	630 –810
3 years* = 36 months ± 16 weeks	960 –1200
4 years* = 48 months ± 20 weeks	1290 - 1590

** After 2-year follow-up, patientss continue to be evaluated clinically and radiographically on an annual basis until all available study subjects have achieved a minimum 2-year follow-up.*

An Interim Visit Evaluation was completed any time a patient was seen outside of the defined evaluations.

Preoperatively, all patients were clinically evaluated by the following: medical history and physical examination, Harris Hip Score, and VAS pain scale. .

Postoperatively, all patients were clinically evaluated at each interval by objective parameters to measure the clinical effectiveness of the device. Clinical effectiveness of this device was measured by Harris Hip Score, VAS pain scale, subjective self-report questionnaire, and radiographs. Adverse events and complications were recorded at all visits. (Table 2)

Table 2: Study Evaluation Tools

Evaluation Tool	Details	Interval					
		Preop	Oper-ative	6 W	6M	12M	24M
Medical History	Collects patient contact information, demographics, preoperative medical history including concomitant medical conditions, medications, allergies. This information provided baseline data.	X					
Harris Hip Score	Hips were evaluated using the modified Harris Hip Score to allow an assessment of pain, function, activities, deformity and range of motion. Range of motion was measured with a goniometer. Range of motion was not collected at the 6-week interval to protect against dislocation in the immediate postoperative period.	X		X	X	X	X
VAS Pain Scale	Patients self-reported their pain at each interval using a 100mm visual analog scale (VAS) in which 0 indicated "No Pain" and 100 indicated "Severe Pain". The subjects placed a mark on the scale to indicate their level of pain.	X		X	X	X	X
Operative Detail	Information regarding the devices used, surgical technique, intraoperative complications and hip randomization were recorded.		X				
Patient Self-Reported Data	Patients self-reported their satisfaction (on a CRF) with hip function.					X	X
Radio-graphic Data	No radiographic data were collected preoperatively. Three radiographic views (anteroposterior pelvis, anteroposterior femur and lateral femur) were collected postoperatively. An independent radiographic reviewer reviewed the images to assess radiographic outcomes. The independent radiographic reviewer reviewed the acetabular component position, cup migration, polyethylene liner wear, and bone-implant interface at all intervals.			X	X	X	X
Adverse Events	Postoperatively, all adverse events, device-related or not, were collected.			X	X	X	X
Interim Visits	Interim Visits were documented and included the reason for the visit. These visits included the spectrum from routine postoperative visits to visits where a subject was evaluated and/or treated for adverse events.			X	X	X	X

The key timepoints are shown above in Tables 1 and 2 summarizing safety and effectiveness.

Clinical Endpoints

ClinicalEndpoints

The primary endpoint in this study was the Harris Hip Score at 24 months or more (24+ Month). The primary analysis for demonstrating device efficacy was a non-inferiority test of investigational vs. control Harris Hip score means under a non-inferiority margin of five (5) points.

A patient was considered to be a composite success at 24 months or more if:

- the most recent 24+ Month Harris Hip Score was greater than or equal to 80;
- the patient was a radiographic success:
  - no radiolucencies greater than 2 mm in any zone;
  - no acetabular cup migration greater than 4 mm;
  - no change in inclination greater than 40 degrees;
  - no osteolysis;
- no revision or removal occurred.

In addition to the primary analysis non-inferiority test for demonstrating device efficacy, study success for determining device safety and efficacy was based upon demonstrating:

- no differences across treatment groups with respect to complication or adverse event rates;
- no difference in the percentage of patients who were composite successes at 24+ Months.

Secondary efficacy analyses included comparisons of Harris Hip subscores, a Harris Hip longitudinal analysis, and comparison of pain visual analog scale (VAS, 100mm scale). A Kaplan-Meier survivorship analysis was carried out to compare revision rates across treatment groups.

Subset Cohort of S-ROM Femoral Stems and Pinnacle 100 Acetabular Cups:

Marketing approval was obtained for the S-ROM femoral stem and Pinnacle 100 acetabular cup as components for the DePuy Ceramax™ Ceramic Total Hip System. Among the 264 patients enrolled in the IDE study, 69 received an S-ROM/Pinnacle 100 combination. Various analyses were carried out on this Subset Cohort in addition to analyses on all enrolled subjects.

A. Accountability of PMA Cohort

At the time of database lock, of 264 patients enrolled in this PMA study, 85% (148/177) of the investigational patients and 86% (71/87) of the control patients were available for

analysis at the completion of the study, the 24-month postoperative visit for the evaluation of the safety and effectiveness of this device. This is summarized in **Table 3** below.

Table 3: Patient Accounting for the All Enrolled Cohort

IDE Study Cohort	Pre-Op		6 Week		6 Month		12 Month		24 Month		24 Month+	
	I	C	I	C	I	C	I	C	I	C	I	C
Theoretical Due	177	87	177	87	177	87	177	87	177	87	177	87
Expected Due	177	87	177	86	177	85	176	85	174	83	174	83
Withdrawn: Deaths (Cumulative)	0	0	0	0	0	1	0	1	1	2	1	2
Withdrawn: Components Removed/Revised (Cumulative)	0	0	0	1	0	1	1	1	2	2	2	2
Withdrawn: Consent (Cumulative)	0	0	0	0	1	0	1	0	2	0	3	0
Actual	173	87	156	82	154	78	162	79	148	71	158*	76
%Follow-up = Actual / Expected Due	98%	100%	88%	95%	87%	92%	92%	93%	85%	86%	91%	92%

Theoretical Due: **The number of implants that have entered the beginning of each interval window at the time of database lock.**

Expected Due: **Theoretical due patients with complete follow-up minus study withdrawals for death or revision.**

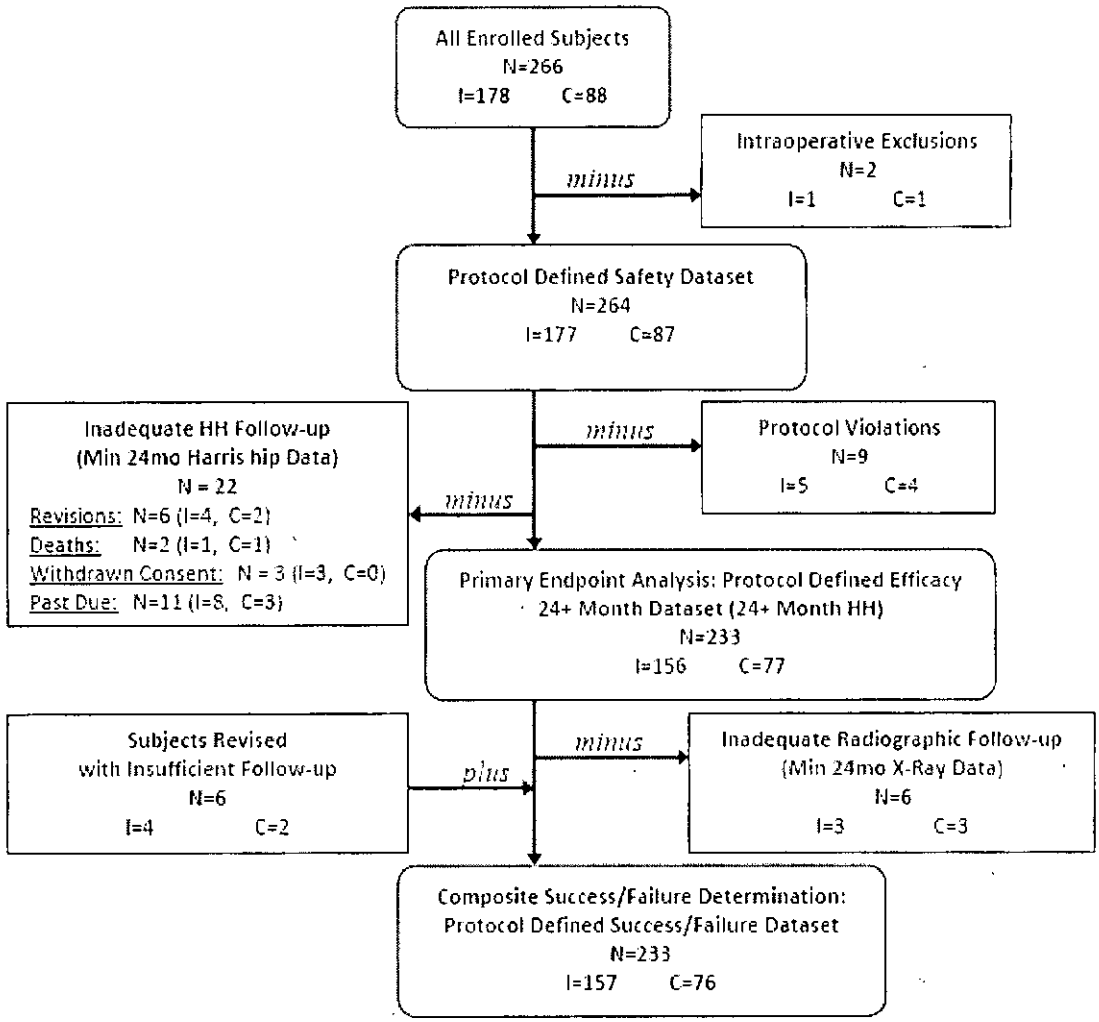
% Follow-up: **% of hips with radiographs, a scorable (complete) Harris Hip CRF and a complete radiographic CRF.**

Withdrawn: Consent (Cumulative): **does not include patients who withdrew consent after complete 24 Month+ data had been obtained.**

***2 patients were revised prior to 24 months, but continued for follow-up.**

Figure 1 below is a dataset flowchart which shows all 264 patients in the Safety Dataset, and the order in which they were excluded, from top to bottom, in order to obtain the Efficacy 24+ Month and the 24 + Month Success/Failure datasets; revisions were retained for composite success analysis regardless of exclusion criteria. The primary endpoint non-inferiority test of 24+ Month HH mean scores was carried out on the Efficacy 24+ Month Dataset.

Figure 1: Patient Accounting Dataset Flowchart: All Enrolled Cohort



Subset Cohort of Patients with S-ROM Femoral Stems and Pinnacle 100 Acetabular Cups

The primary analysis was based on five femoral stem types and three acetabular cup types. Marketing approval was obtained for the S-ROM femoral stems and Pinnacle 100 acetabular cups as components for the DePuy Ceramax™ Ceramic Total Hip System. At the time of database lock, complete 24 + Month postoperative data (study endpoint) was available on 42 investigational and 23 control patients in the Subset Cohort who received the S-ROM femoral stem and Pinnacle 100 acetabular cup. This is summarized in **Table 4** below.

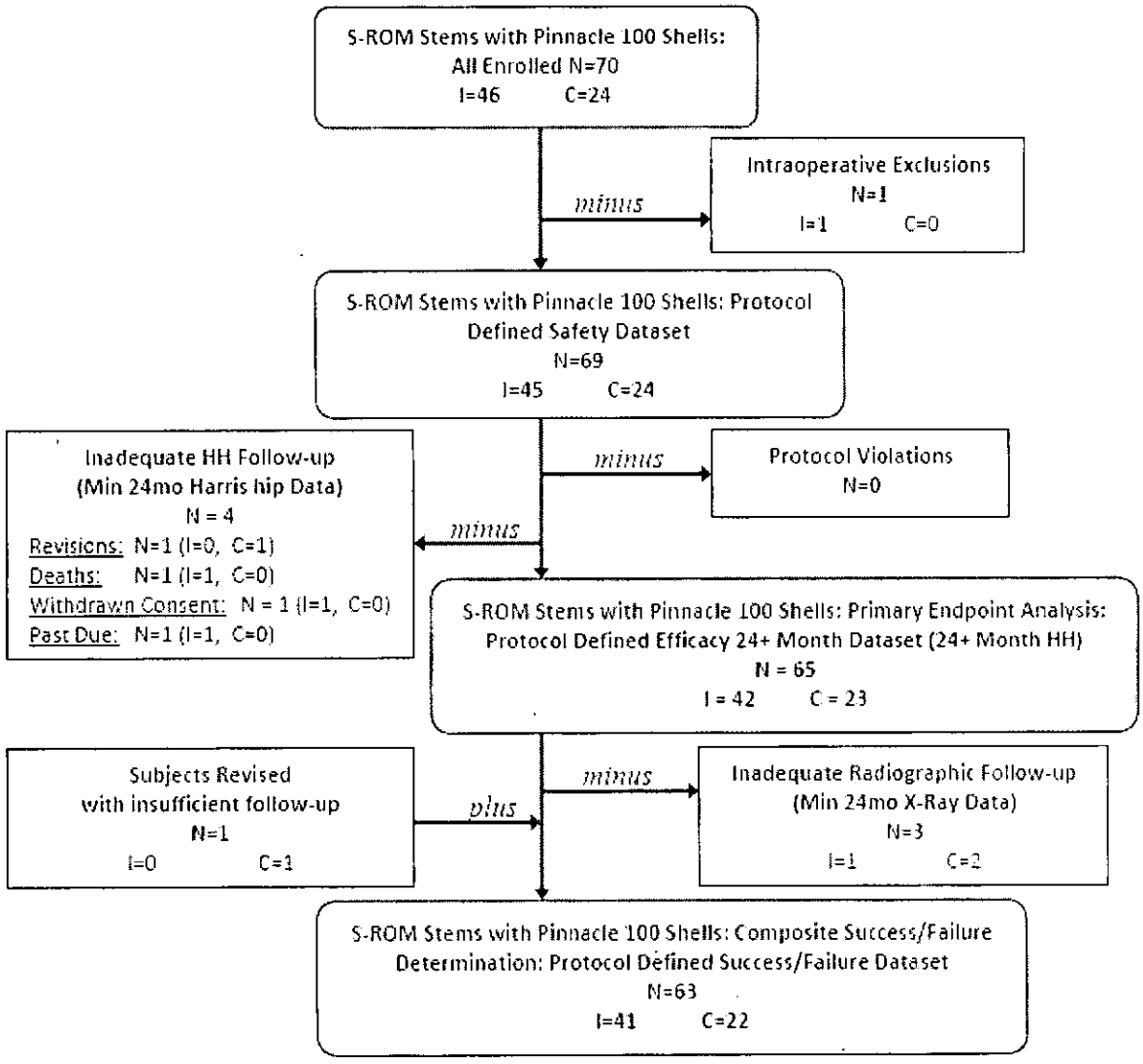
Table 4: Patient Accounting for the Subset Cohort

Subset Cohort	Pre-Op		6 Week		6 Month		12 Month		24 Month		24 Month+	
	I	C	I	C	I	C	I	C	I	C	I	C
Theoretical Due	45	24	45	24	45	24	45	24	45	24	45	24
Expected Due	45	24	45	23	45	23	45	23	44	23	43	23
Withdrawn: Deaths (Cumulative)	0	0	0	0	0	0	0	0	1	0	1	0
Withdrawn: Components Removed/Revised (Cumulative)	0	0	0	1	0	1	0	1	0	1	0	1
Withdrawn: Consent (Cumulative)	0	0	0	0	0	0	0	0	0	0	1	0
Actual	45	24	40	22	35	21	41	22	34	18	40	21
%Follow-up = Actual / Expected Due	100%	100%	89%	96%	78%	91%	91%	96%	77%	78%	91%	91%

Theoretical Due: **The number of implants that have entered the beginning of each interval window at the time of database lock.**
Expected Due: **Theoretical due patients with complete follow-up minus study withdrawals for death or revision.**
% Follow-up: **% of hips with radiographs, a scorable (complete) Harris Hip CRF and a complete radiographic CRF.**
Withdrawn: Consent (Cumulative): **does not include patients who withdrew consent after complete 24 Month+ data had been obtained.**

Figure 2 below is a dataset flowchart which shows all 69 S-ROM and Pinnacle 100 subjects in the Safety Dataset, and the order in which they were excluded, from top to bottom, in order to obtain the Subset Cohort of patients in the Efficacy Dataset and the Success/Failure Dataset; revisions were retained for composite success, regardless of exclusion criteria.

Figure 2: Patient Accounting Dataset Flowchart: Subset Cohort



B. Study Population Demographics and Baseline Parameters

The demographics of the study population are typical for a total hip replacement study performed in the U.S. Clinical study data was collected on 264 hips implanted. There were 177 investigational hip implantations and 87 control hip implantations in the Protocol Defined Safety Dataset for the All Enrolled Cohort.

Comparisons were performed to determine whether the patient populations for the treatment groups were equivalent prior to study treatment. Comparisons were conducted using the Safety Dataset: means were compared with a t-test, and proportions were compared with Fisher's exact test. Results of these analyses are provided in **Table 5** below.

Table 5: Baseline Demographics for the All Enrolled Cohort

Demographic Element		Investigational N=177	Control N=87	Investigational vs. Control p-values
Enrollment	Number of procedures	177	87	-
	Number of patients	177	87	-
Age in years	Mean Age	56.4	57.3	0.537
	Minimum Age	20	29	
	Maximum Age	75	77	
Gender	Females	87 (49%)	40 (46%)	0.695
	Males	90 (51%)	47 (54%)	
Body Mass Index [kg / m^2]	Mean BMI	30.1	29.8	0.787
	Minimum BMI	18.5	18.2	
	Maximum BMI	53.1	51.0	
Primary Diagnosis	Avascular Necrosis	12 (7%)	4 (5%)	0.591
	Developmental Dysplasia	5 (3%)	1 (1%)	0.667
	Epiphyseal Defect	0 (0%)	2 (2%)	0.108
	Osteoarthritis	155 (88%)	78 (90%)	0.689
	Post Traumatic Arthritis	5 (3%)	2 (2%)	1.000
Harris Hip Score	Mean Pre-Op HH Score	50.6	50.7	0.960
	Minimum Pre-Op HH Score	21.0	26.0	
	Maximum Pre-Op HH Score	71.0	76.0	
Harris Hip Pain Category (Range 0-44)	Mean Pre-op HH Pain	14.3	13.6	0.265
	Minimum Pre-op HH Pain	10.0	10.0	
	Maximum Pre-op HH Pain	20.0	30.0	
Harris Hip Function Score (Range 0-33)	Mean Pre-op HH Function	20.0	19.8	0.785
	Minimum Pre-op HH Function	0.0	5.0	
	Maximum Pre-op HH Function	30.0	30.0	
Harris Hip Activity Score (Range 0-14)	Mean Pre-op HH Activity	8.2	8.7	0.127
	Minimum Pre-op HH Activity	2.0	1.0	
	Maximum Pre-op HH Activity	12.0	14.0	
Harris Hip Deformity Score (Range 0-4)	Mean Pre-op HH Deformity	3.5	3.8	0.107
	Minimum Pre-op HH Deformity	0.0	0.0	
	Maximum Pre-op HH Deformity	4.0	4.0	
Harris Hip Range of Motion Score (Range 0-5)	Mean Pre-op HH ROM	4.6	4.6	0.223
	Minimum Pre-op HH ROM	3.4	3.4	
	Maximum Pre-op HH ROM	5.0	5.0	

The demographics of the subset cohort (patients who received an S-ROM femoral stem and Pinnacle 100 acetabular cup) study population are typical for a total hip replacement study performed in the U.S. and consistent with the demographics of the All Enrolled Cohort.

Comparisons were performed to determine whether the patient populations for the treatment groups were equivalent prior to study treatment. Comparisons were conducted using the Safety Dataset: means were compared with a t-test, and proportions were compared with Fisher's exact test. Results of these analyses are provided in **Table 6** below.

Table 6: Baseline Demographics for the Subset Cohort

Demographic Element		Investigational N=45	Control N=24	Investigational vs. Control p-values
Enrollment	**Number of procedures**	**45**	**24**	-
	Number of patients	**45**	**24**	-
Age in years	**Mean Age**	**58.7**	**57.6**	**0.607**
	Minimum Age	**33**	**45**	
	Maximum Age	**75**	**75**	
Gender	**Females**	**19 (42%)**	**11 (46%)**	**0.803**
	Males	**26 (58%)**	**13 (54%)**	
Body Mass Index [kg / m^2]	**Mean BMI**	**27.3**	**27.8**	**0.683**
	Minimum BMI	**18.5**	**18.8**	
	Maximum BMI	**36.2**	**38.7**	
Primary Diagnosis	**Avascular Necrosis**	**1 (2%)**	**0 (0%)**	**1.000**
	Developmental Dysplasia	**1 (2%)**	**0 (0%)**	**1.000**
	Epiphyseal Defect	**0 (0%)**	**0 (0%)**	-
	Osteoarthritis	**43 (96%)**	**24 (100%)**	**0.540**
	Post Traumatic Arthritis	**0 (0%)**	**0 (0%)**	-
Harris Hip Score	**Mean Pre-Op HH Score**	**52.0**	**48.8**	**0.100**
	Minimum Pre-Op HH Score	**36.0**	**34.0**	
	Maximum Pre-Op HH Score	**66.0**	**63.0**	
Harris Hip Pain Category (Range 0-44)	**Mean Pre-op HH Pain**	**14.2**	**12.1**	**0.077**
	Minimum Pre-op HH Pain	**10.0**	**10.0**	
	Maximum Pre-op HH Pain	**20.0**	**20.0**	
Harris Hip Function Score (Range 0-33)	**Mean Pre-op HH Function**	**21.1**	**20.1**	**0.291**
	Minimum Pre-op HH Function	**10.0**	**7.0**	
	Maximum Pre-op HH Function	**27.0**	**24.0**	
Harris Hip Activity Score (Range 0-14	**Mean Pre-op HH Activity**	**8.9**	**8.3**	**0.161**
	Minimum Pre-op HH Activity	**5.0**	**3.0**	
	Maximum Pre-op HH Activity	**12.0**	**10.0**	
Harris Hip	**Mean Pre-op HH Deformity**	**3.1**	**3.5**	**0.333**

Demographic Element		Investigational N=45	Control N=24	Investigational vs. Control p-values
Deformity Score (Range 0-4)	**Minimum Pre-op HH Deformity**	**0.0**	**0.0**	
	Maximum Pre-op HH Deformity	**4.0**	**4.0**	
Harris Hip Range of Motion Score (Range 0-5)	**Mean Pre-op HH ROM**	**4.6**	**4.6**	**0.465**
	Minimum Pre-op HH ROM	**3.5**	**3.8**	
	Maximum Pre-op HH ROM	**5.0**	**5.0**	

C. Safety and Effectiveness Results

1. Safety Results

The analysis of safety was based on the following:

- Adverse Events
- Kaplan-Meier survivorship analysis of revisions

The analysis of safety was based on all 264 enrolled patients (177 investigational and 87 control cohorts) followed over the 24+ Month evaluation.

The key safety outcomes for this study are presented below in **Tables 7** through **20**.

Adverse events that occurred in the clinical study:

The Safety Dataset was used to compare:

1) Revisions,
2) Intraoperative complications,
3) Postoperative, systemic adverse events and
4) Postoperative, operative site adverse events

between investigational and control treatment groups.

a. Adverse Events by Patient

1. Revisions

Revision was defined as a reoperation where any component (acetabular or femoral) was removed or replaced. There were a total of 4 revisions (2.3%) reported out of 177 procedures in the investigational cohort and 2 revisions (2.3%) reported out of 87 procedures in the control cohort at 24+ months. **Table 7** provides a summary of the revision procedure, treatment group, age, gender, primary diagnosis, duration of implantation and reason for revision for each patient. There appears to be no clinically meaningful difference in rates of revision between the investigational and control treatments.

Table 7: Investigational and Control Device Revisions

Revision Procedure(s): F = Femoral Stem S = Acetabular Shell H = Femoral Head I = Acetabular Insert	Treatment Group	Age / Gender	Primary Diagnosis	Duration of Implantation	Reason for Revision / Removal
S,I	Investigational	70 / M	Osteoarthritis	9 months	Deep infection diagnosed in operative hip
S, H, I	Investigational	57 / F	Osteoarthritis	18 months	Acetabular liner failure
F, H	Investigational	53 / M	Osteoarthritis	12 months	Femoral component loosening
F, H	Investigational	41 / M	Post-traumatic Arthritis	22 months	Stem revision due to patient fall
H, I	Control	68 / F	Osteoarthritis	20 months	Recurrent dislocations
H, I	Control	62 / M	Osteoarthritis	13 days	Recurrent dislocations

Kaplan-Meier Survivorship Analysis

Kaplan-Meier analyses were carried out to determine the expected rate of revision for any reason for both treatment groups. Revision was defined as a reoperation where any component (acetabular or femoral) was removed or replaced. The 'years' variable was calculated using time from surgery to revision for any reason. Patients not having a revision had their time calculated one of two ways: 1) time from surgery to last clinical or radiographic evaluation, or 2) time from surgery to death. Patients not having a revision had their time variable censored.

The results are presented graphically in **Figure 3** and in tabular form across time in **Table 8.** When revision was defined as the endpoint for survivorship, the results demonstrated a 97.6 % survivorship (95% confidence interval: 93.7%-99.1%) for the investigational patients at 3.2 years and a 97.6% survivorship (95% confidence interval: 90.9%-99.4%) for the control hips at 2.9 years. There was no clinically or statistically significant difference between investigational and control patients (log-rank p-value =0.992).

Figure 3: Kaplan-Meier Survivorship Estimates: All Enrolled Cohort

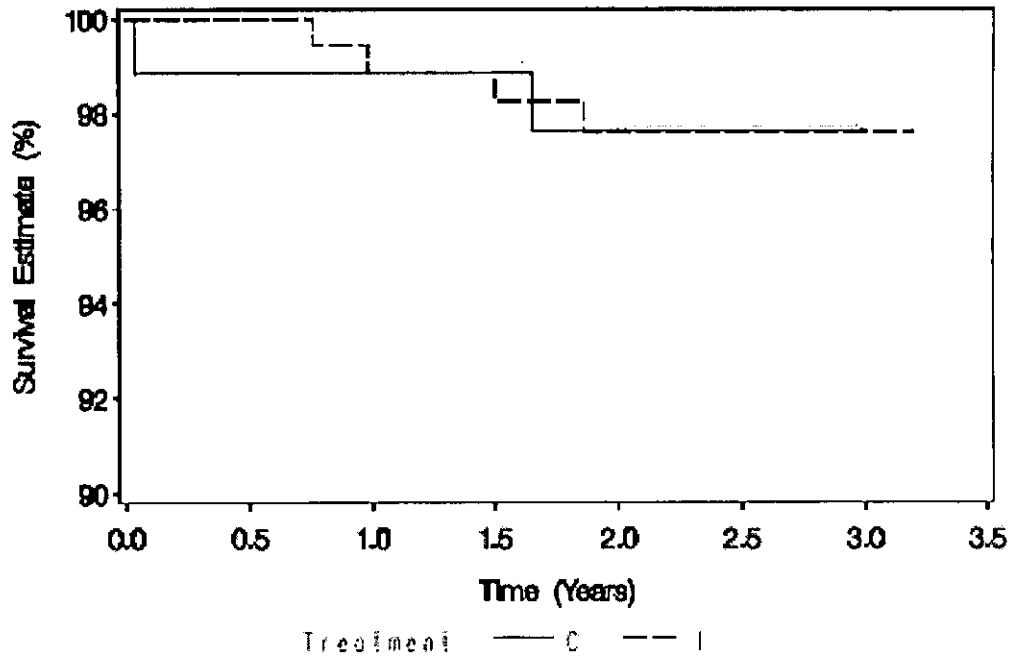
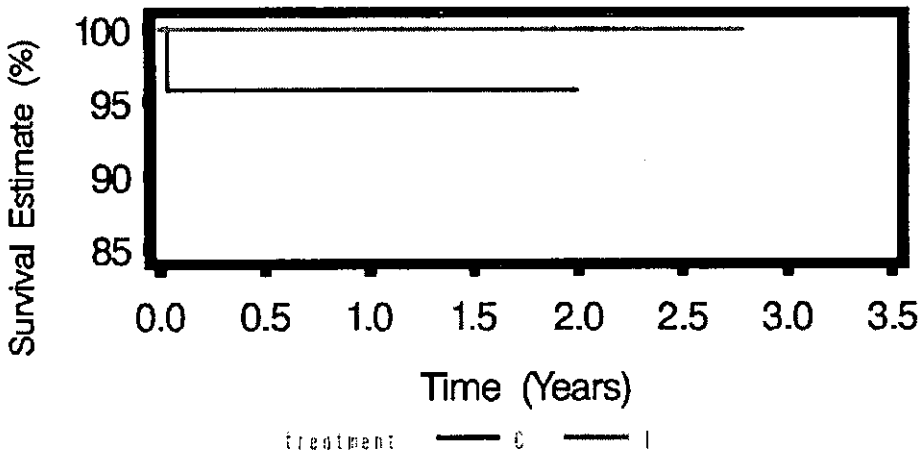


Table 8: Safety Dataset - Survival Estimates Across Time: All Enrolled Cohort

	Timecourse						
Treatment	**0 months**	**6 months**	**1 year**	**1.5 years**	**2 years**	**2.5 years**	**3 years**
Investigational: Survival Estimate	100%	100%	98.9%	98.2%	97.6%	97.6%	97.6%
Investigational: # Hips Remaining	177	175	171	161	126	82	57
Control: Survival Estimate	100%	98.9%	98.9%	97.6%	97.6%	97.6%	97.6%
Control: # Hips Remaining	87	84	83	81	65	42	23

Survivorship analyses for the Subset Cohort (patients who received S-ROM and Pinnacle 100 components only) are presented graphically in **Figure 4** and in tabular form across time in **Table 9**. Results for the Subset Cohort demonstrated a 100% survivorship (95% confidence interval: not evaluable because of no observed failures) for the investigational patients at 2.8 years and a 95.8% survivorship (95% confidence interval: 73.9%-99.4%) for the control hips at 2.0 years. There was no clinically or statistically significant difference between investigational and control patients (log-rank p-value =0.171). Note that the curves were terminated at the point where evaluable hips were equal to 20, due to the inaccuracy of survivorship beyond this point.

Figure 4: Kaplan-Meier Survivorship Estimates: Subgroup Cohort



Event=Revision for any reason

Table 9: Safety Dataset - Survival Estimates Across Time: Subset Cohort

	Timecourse					
Treatment	**0 months**	**6 months**	**1 year**	**1.5 years**	**2 years**	**2.5 years**
Investigational: Survival Estimate	100%	100%	100%	100%	100%	100%
Investigational: # Hips Remaining	45	45	44	42	34	22
Control: Survival Estimate	100%	95.8%	95.8%	95.8%	95.8%	95.8%
Control: # Hips Remaining	24	23	23	23	20	15

Adverse events reported from the clinical study of 264 hip procedures are listed in **Tables 7, 10, 12, 14, 16,** and **18-20** below.

In **Tables 10** through **15** below, every unique adverse event was reported once per patient, regardless of whether a single patient reported more than one instance of a particular adverse event.

2. Intraoperative Complications

The most common intraoperative complication was femoral bone fracture, which was observed in 2.8% of investigational patients (5/177). There was no statistically or clinically meaningful difference in the proportions of observed intraoperative adverse events across treatment groups (see **Table 10** below). Fisher's exact test was used to compare proportions across the two treatment groups.

Table 10: Comparison of Frequency of Intraoperative Adverse Events for the All Enrolled Cohort

	Investigational N=177		Control N=87		
Adverse Events at the 24+ Endpoint	**AEs, (%)**	**95% Confidence Levels**	**AEs, (%)**	**95% Confidence Levels**	**p-value**
Fracture of Femur	5 (2.8%)	0.9 – 6.5	1 (1.1%)	0.0 – 6.2	0.667
Difficulty Seating Femoral Component	1 (0.6%)	0.0 – 3.1	1 (1.1%)	0.0 – 6.2	0.551
Nerve Damage	1 (0.6%)	0.0 – 3.1	0 (0.0%)	-	1.000
Hematological	1 (0.6%)	0.0 – 3.1	0 (0.0%)	-	1.000
Genitourinary	1 (0.6%)	0.0 – 3.1	0 (0.0%)	-	1.000
Musculoskeletal*	1 (0.6%)	0.0 – 3.1	0 (0.0%)	-	1.000
Liner Fracture During Surgery**,†	2 (1.1%)	0.1 – 4.0	0 (0.0%)	-	1.000
Difficulty Seating Liner w/o Fracture**	1 (0.6%)	0.0 – 3.1	0 (0.0%)	-	1.000
Difficulty Seating Liner**,†,‡	3 (1.7%)	0.3 – 4.8	0 (0.0%)	-	0.553
Dermatological	0 (0.0%)	-	1 (1.1%)	0.0 – 6.2	0.330
Blemish on Ceramic Component	0 (0.0%)	-	1 (1.1%)	0.0 – 6.2	0.330
Total	12 (6.8%)	-	4 (4.6%)	-	-

** One investigational patient had related intraoperative complications reported: difficulty in broaching the femoral canal (musculoskeletal) and difficulty seating the femoral component.*

***Three patients experienced difficulty seating the liner; 2 of these experienced a ceramic liner fracture upon attempted removal of the mal-positioned liner.*

† N = 178 for the investigational group, consisting of 177 enrolled investigational patients + 1 intent to treat patient who received a polyethylene liner subsequent to intraoperative ceramic liner fracture.

‡Difficulty Seating Liner includes 1 patient without fracture, which is also listed separately in this table.

There were three (3) intraoperative complications among patients in the S-ROM/Pinnacle 100 Subset Cohort, as presented in **Table 11** below. There appears to be no clinically meaningful difference in rates of intraoperative adverse events between the investigational and control treatments.

Table 11: Comparison of Frequency of Intraoperative Adverse Events for the Subset Cohort

	Investigational N=45		Control N=24		
Adverse Events at the 24+ Month Endpoint	**AEs, (%)**	**95% Confidence Levels**	**AEs, (%)**	**95% Confidence Levels**	**p-value**
Dermatological	0 (0.0%)	-	1 (4.2%)	0.1 – 21.1	0.348
Liner Fracture During Surgery*,†	1 (2.2%)	0.1 – 11.5	0 (0.0%)	-	1.00
Difficulty Seating Liner*,†	1 (2.2%)	0.1 – 11.5	0 (0.0%)	-	1.00
Total	2(4.4%)	-	1 (4.2%)	-	-

One patient experienced difficulty seating the liner, and also experienced a ceramic liner fracture upon attempted removal of the mal-positioned liner.

†N = 46 for the investigational group, consisting of 45 enrolled patients and 1 intent to treat patient who received a polyethylene liner subsequent to intraoperative ceramic liner fracture.

3. Postoperative-Systemic Adverse Events

For both the investigational and control treatments the most commonly reported postoperative systemic complication was musculoskeletal. Frequently reported adverse events also included: cardiovascular, genitourinary, gastrointestinal, respiratory, and dermatological.

There was no statistically or clinically meaningful difference in the proportion of postoperative systemic adverse events (see **Table 12** below).

Although no patient complaints about audible 'squeaking' throughout the 24+ months time course were reported, this study did not directly address this issue; therefore, this clinical concern cannot be reported on at this time.

Table 12: Comparison of Frequency of Postoperative Systemic Adverse Events: All Enrolled Cohort

	Investigational N=177			Control N=87			
Adverse Events at the 24+ Month Endpoint	**AEs**	**%**	**95% Confidence Levels**	**AEs**	**%**	**95% Confidence Levels**	**p-value**
Cancer	5	2.8	0.9 – 6.5	2	2.3	0.3 – 8.1	1.000
Cardiovascular	12	6.8	3.5 – 11.5	6	6.9	2.6 – 14.4	1.000
Central Nervous System	3	1.7	0.3 – 4.9	3	3.4	0.7 – 9.8	0.339
Dermatological	7	4.0	1.6 – 8.0	2	2.3	0.3 – 8.1	0.722
Endocrine/Metabolic	4	2.3	0.6 – 5.7	5	5.7	1.9 – 12.9	0.161
Gastrointestinal	9	5.1	2.3 – 9.4	5	5.7	1.9 – 12.9	0.779
Genitourinary	14	7.9	4.4 – 12.9	7	8.0	3.3 – 15.9	1.000
Heent	2	1.1	0.1 – 4.0	2	2.3	0.3 – 8.1	0.600
Hematological	3	1.7	0.3 – 4.9	4	4.6	1.3 – 11.4	0.223
Musculoskeletal	84	47.5	44.9 – 60.1	43	49.4	38.5 – 60.4	0.794
Neurological	2	1.1	0.1 – 4.0	0	0.0	-	1.000
Other*	13	7.3	4.0 – 12.2	7	8.0	3.3 – 15.9	0.810
Peripheral Nervous System	4	2.3	0.6 – 5.7	1	1.1	0.0 – 6.2	1.000
Psychological	1	0.6	0.0 – 3.1	0	0.0	-	1.000
Respiratory System	9	5.1	2.3 – 9.4	4	4.6	1.3 – 11.4	1.000
Thrombosis / Thrombophlebitis	2	1.1	0.1 – 4.0	1	1.1	0.0 – 6.2	1.000

Every unique adverse event was reported once, regardless of whether a single hip reported more than one instance of a particular adverse event. For example, if a hip reported 'musculoskeletal', then 'musculoskeletal' was listed once for that hip. However, if that same hip also reported 'cancer', then that adverse event was listed in addition to the 'musculoskeletal' adverse event.

Additional Notes:

* **Frequency of Systemic AEs reported as "Other", Investigational:** Papular red erythema treated with hydrocortisone-1; Non-displaced patella treated with knee immobilizer-1; Bursitis treated with anti-inflammatories-2; ENNT (Pre-Glaucoma) treated with eye drops-1; Prophylactic antibiotics for dental procedure- 2; Fever that delayed discharge from hospital- 1; Weak and wobbly needing reassurance- 1; Cellulite left tibia prescribed antibiotic-1; Mild leg pain- 1; Non cardiac chest pain & degenerative disc disease- 1; Leakage of silicone breast implants and surgical removal of breast implants- 1. **Frequency of Systemic AEs reported as "Other", Control:** Prophylactic antibiotics for dental procedure- 4; Bursitis- 1; Lumbar spine and left knee pain/left knee arthroscopy and subject fall- 1; and Spider bite- 1.

For the Subset Cohort, the most frequent postoperative systemic adverse events were musculoskeletal, cardiovascular, genitourinary, and respiratory. There appears to be no clinically meaningful difference in rates of postoperative systemic adverse events between the investigational and control treatments (see **Table 13** below).

Table 13: Comparison of Frequency of Postoperative Systemic Adverse Events: Subset Cohort

	Investigational N=45		Control N=24	
Adverse Events at the 24+ Month Endpoint	**AEs**	**%**	**AEs**	**%**
Cardiovascular	2	4.4	1	4.2
Dermatological	0	0.0	1	4.2
Gastrointestinal	1	2.2	1	4.2
Genitourinary	2	4.4	2	8.3
HEENT	1	2.2	0	0.0
Hematological	0	0.0	2	8.3
Musculoskeletal	14	31.1	9	37.5
Neurological	1	2.2	0	0.0
Peripheral Nervous System	1	2.2	0	0.0
Psychological	1	2.2	0	0.0
Respiratory System	3	6.7	1	4.2

Every unique adverse event was reported once, regardless of whether a single hip reported more than one instance of a particular adverse event. For example, if a hip reported 'musculoskeletal', then 'musculoskeletal' was listed once for that hip. However, if that same hip also reported 'cardiovascular', then that adverse event was listed in addition to the 'musculoskeletal' adverse event.

4. Postoperative Operative Site Adverse Events

The most commonly reported postoperative operative site complications for investigational and control patients were wound problems and bursitis, respectively. Other complications included dislocation, muscle weakness, and end of stem pain. There appear to be no statistically or clinically meaningful differences in the proportions of postoperative operative site adverse events (see **Table 14** below).

Table 14: Comparison of Frequency of Postoperative Operative Site Adverse Events: All Enrolled Cohort

	Investigational N=177			Control N=87			
Adverse Events at the 24+ Month Endpoint	**AEs**	**%**	**95% Confidence Levels**	**AEs**	**%**	**95% Confidence Levels**	**p-value**
Acetabular Liner Failure [1]	1	0.6	0.0 – 3.1	0	0.0	-	1.000
Bone Lysis [2]	1	0.6	0.0 – 3.1	0	0.0	-	1.000
Component Fracture [1]	1	0.6	0.0 – 3.1	0	0.0	-	1.000
Deep Infection [2,3]	2	1.1	0.1 – 4.0	0	0.0	-	1.000
Dislocation [4]	5	2.8	0.9 – 6.5	4	4.6	1.3 – 11.4	0.483
Femoral Component Loosening [5]	3	1.7	0.3 – 4.9	0	0.0	-	0.553
Fracture [6]	2	1.1	0.1 – 4.0	0	0.0	-	1.000
Heterotopic Bone Formation	1	0.6	0.0 – 3.1	0	0.0	-	1.000
Muscle Weakness	5	2.8	0.9 – 6.5	0	0.0	-	0.175
Other [7]	16	9.0	5.3 – 14.3	12	13.8	7.3 – 22.9	0.288
Other – Neurological [8]	1	0.6	0.0 – 3.1	0	0.0	-	1.000
Other - Bursitis	6	3.4	1.3 – 7.2	5	5.7	1.9 – 12.9	0.513
Other – End Of Stem Pain	4	2.3	0.6 – 5.7	0	0.0	-	0.306
Other - Iliopsoas Tendonitis	1	0.6	0.0 – 3.1	0	0.0	-	1.000
Wound Problem [9]	9	5.1	2.4 – 9.4	2	2.3	0.3 – 8.1	0.349

	Investigational. N=177			Control N=87			
Adverse Events at the 24+ Month Endpoint	**AEs**	**%**	**95% Confidence Levels**	**AEs**	**%**	**95% Confidence Levels**	**p-value**

Every unique adverse event was reported once, regardless of whether a single hip reported more than one instance of a particular adverse event. For example, if a hip reported 'deep infection', then 'deep infection' was listed once for that hip. However, if that same hip also reported 'bone lysis', then that adverse event was listed in addition to the 'deep infection' adverse event.

Additional Notes:

1 This investigational patientwas seen more than one time and the adverse event was initially reported as a component fracture and at the time of revision surgery was confirmed as an acetabular liner failure.

2 Bone lysis was reported secondary to deep infection for onepatient.

3 Two investigational patients had deep infections. One patient had a resection arthroplasty. In the other subject, an I&D was performed and the components were retained.

4 Two control hips were revised to treat recurrent dislocations.

5 Two investigational hips were revised for loose femoral components. The acetabuli were retained.

6 **A greater trochanter fracture was reported for 1 investigational patient secondary to recurrent dislocations and this patient was treated with open reduction internal fixation.**

7 Frequency of Operative Site AEs reported as "Other", Investigational: **Blister treated with tagaderm-1; Groin pain secondary to slipping treated conservatively-1; Hematoma secondary to fall and trochanteric bursitis-1; Groin tendonitis treated with medications-1; muscle pain treated with medication- 1; leg swelling-1; general musculoskeletal treated with medications and hip pain after a fall-2; patient fell- 1; hip/thigh pain -1; adductor strain treated conservatively-1; patient trauma treated with reduced weight bearing and medications-1; warm incision-1; Hamstring tendonitis treated with physical therapy-1; calf pain, twisted knee and thigh/buttock pain treated with NSAIDs-1; and thigh pain treated with NSAIDS-1.** Frequency of Operative Site AEs reported as "Other", Control: **Mild serous drainage treated with dressing-1; patient trauma treated with reduced weight bearing-1; trochanteric tenderness treated with injection-1; hip pain-2; trochanteric bursitis treated with multiple injections-1; and thigh pain treated with continued strengthening-1; uneven leg length treated by reassuring patient-1; leg/calf pain-1; mid thigh pain treated with medications-1; one episode of clicking-1, iliopsoas tendonitis-1.**

8 **Frequency of Operative Site AE reported as "Other- Neurological",: Investigational: nerve damage causing footdrop treated with physical therapy, medications and a foot orthothic-1.**

9 **Wound problems were observed in the immediate postoperative period (0-6 weeks) except for 1 investigational case where the AE was observed between 12 and 24 months. All wound problems were treated conservatively with superficial treatment and/or antibiotics with the exception of 1 investigational patient that required a superficial I&D.**

For the Subset Cohort, the most frequent postoperative operative site adverse events were dislocation, muscle weakness and wound problems. There appear to be no clinically meaningful difference in rates of postoperative operative site adverse events between the investigational and control treatments (see **Table 15** below).

Table 15: Comparison of Frequency of Postoperative Operative Site Adverse Events: Subset Cohort

	Investigational N=45		Control N=24	
Adverse Events at the 24 month+ Endpoint	**AEs**	**%**	**AEs**	**%**
Dislocation[1]	2	4.4	1	4.8
Muscle Weakness	1	2.8	0	0.0
Other[2]	0	0.0	3	12.5
Wound Problem[3]	3	6.7	2	8.3

Every unique adverse event was reported once, regardless of whether a single hip reported more than one instance of a particular adverse event. For example, if a hip reported 'deep infection', then 'deep infection' was listed once for that hip. However, if that same hip also reported 'bone lysis', then that adverse event was listed in addition to the 'deep infection' adverse event.

Additional Notes:
1 One control hip was revised to treat recurrent dislocations.

2 **Frequency of Operative Site AEs reported as "Other", Control:** Mid thigh pain treated with medications-1; one episode of clicking-1, iliopsoas tendonitis-1.

3 Wound problems were observed in the immediate postoperative period (0-6 weeks). All wound problems were treated conservatively with superficial treatment and/or antibiotics.

b. Complications Grouped by Type of Adverse Event

There were no statistically or clinically meaningful significant differences in the proportions of adverse events grouped by type of AE (intraoperative, postoperative operative site, or systemic) or overall across investigational and control treatment groups in the All Enrolled Cohort (see **Table 16** below). Similarly, there appears to be no clinically meaningful differences in the AE rates for the Subset Cohort (see **Table 17** below). The total number of AEs grouped by type of AE (intraoperative, postoperative, operative site, or systemic) for the All Enrolled Cohort are reported in **Table 18**.

Table 16: Comparison of Frequencies of Any Adverse Event (Per Hip Basis): All Enrolled Cohort

	Investigational N=177			Control N=87			
Adverse Events at 24+ Endpoint	**AEs**	**%**	**95% Confidence Levels**	**AEs**	**%**	**95% Confidence Levels**	**p-value**
Any Complication	125	70.6	63.3 – 77.2	63	72.4	61.8 – 81.5	0.885
Intraoperative	10	5.6	2.7 – 10.1	3	3.4	0.7 – 9.8	0.555
Operative Site	38	21.5	15.7 – 28.3	19	21.8	13.7 – 32.0	1.000
Systemic	112	63.3	55.7 – 70.4	57	65.5	54.6 – 75.4	0.786

Adverse events are reported on a per hip basis. Regardless of how many times a single hip had an intraoperative complication, for example, it was only counted once.

Table 17: Comparison of Frequencies of Any Adverse Event (Per Hip Basis): Subset Cohort

24+ Months	Investigational N=45		Control N=24	
Adverse Events	**AEs**	**%**	**AEs**	**%**
Any Complication	24	53.3	15	62.5
Intraoperative	0	0.0	1	4.2
Operative Site	5	11.1	6	25.0
Systemic	20	44.4	12	50.0

Adverse events are reported on a per hip basis. Regardless of how many times a single hip had an intraoperative complication, for example, it was only counted once.

Table 18: Comparison of Frequencies of Any Adverse Event (All events): All Enrolled Cohort

Adverse Events (distinct events)	Investigational N=177	Control N=87
Any Complication	342	162
Intraoperative	12	4
Operative Site	78	28
Systemic	252	130

Adverse events are reported on a per hip basis. Regardless of how many times a single hip had an intraoperative complication, for example, it was only counted once.

c. Distribution of Adverse Events over Time

In **Tables 19** and **20**, a time course of the occurrence of post-operative systemic and operative site adverse events is displayed. An adverse event may be reported more than once per patient in these tables if the adverse event occurred more than once across time.

Table 19: Time Course Occurrence of Postoperative Systemic Adverse Events: All Enrolled Cohort

	Interval																	
	0D-5W		6 Week		5W-6M		6 Month		6M-12M		12 Month		12M-24M		24 Month+		Total	
	C	I	C	I	C	I	C	I	C	I	C	I	C	I	C	I	C	I
Complication	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
CANCER						1				1	2				1	5	3	7
CARDIOVASCULAR	1	4				1	1	2			2	2		2	3	1	7	12
CENTRAL NERVOUS SYSTEM	1				1	1	1					1		1			3	3
DERMATOLOGICAL	2	1				4			1			2		2		1	3	10
ENDOCRINE/METABOLIC	1					1		1			1		1	1	2	2	5	5
GASTROINTESTINAL	2	4	1			3	1		1			2				2	5	11
GENITOURINARY	4	5				2	2	3		1		3		4	2	1	8	19
HEENT	1			1							1	1		1			2	3
HEMATOLOGICAL	3	1		1		1											4	3
MUSCULOSKELETAL	2	5	5	9	9	16	12	18	4	9	7	14	10	34	23	39	72	144
NEUROLOGICAL						1								1				2
PERIPHERAL NERVOUS SYSTEM						2							1	1		1	1	4
PSYCHOLOGICAL																1		1
RESPIRATORY SYSTEM	3	4				3	1	2		1				1			4	11
THROMBOSIS/THROMBOPHLEBITIS	1	1		1													1	2
OTHER	2	4	3	1	3		1	1			1	1	1	2	1	6	12	15
Total	24	29	9	13	13	36	19	27	6	12	14	26	13	50	32	59	130	252

Table 20: Time Course Occurrence of Postoperative Operative Site Adverse Events: All Enrolled Cohort

Complication	Interval																Total	
	0D-6W		6 Week		6W-6M		6 Month		6M-12M		12 Month		12M-24M		24 Month+			
	C N	I N	C N	I N	C N	I N	C N	I N	C N	I N	C N	I N	C N	I N	C N	I N	C N	I N
ACETABULAR LINER FAILURE														1				1
BONE LYSIS														1				1
COMPONENT FRACTURE														1				1
DEEP INFECTION		1								1								2
DISLOCATION	1	2	2	3		4			2			1	2		1	1	8	11
FEMORAL COMPONENT LOOSENING												1		1		2		4
FRACTURE				2				1										3
HETEROTOPIC BONE FORMATION								1										1
MUSCLE WEAKNESS		1		1		1		1						1				5
OTHER - BURSITIS						1	2			2	1	2	1		2	1	6	6
OTHER - END OF STEM PAIN				1				2		1								4
OTHER - ILIOPSOAS TENDONITIS																1		1
WOUND PROBLEM	2	7		3										1			2	11
OTHER	2	6	2	2	3	6	2	3	1		1	5		1	1	4	12	27
Total	5	17	4	12	3	12	4	8	3	4	2	9	3	7	4	9	28	78

2. Effectiveness Results

The primary analysis was a non-inferiority test of the Harris Hip Score means as assessed at the minimum 24+ Month interval, with a 5 point non-inferiority margin, as defined in the study protocol. This primary analysis non-inferiority test was carried out on the 233 patients in the 24+Month dataset of the All Enrolled Cohort.

Marketing approval is for the S-ROM femoral stem and Pinnacle 100 acetabular cup as components for the DePuy Ceramax™ Ceramic Total Hip System, information is presented for the All Enrolled Cohort as well the Subset Cohort (subjects who received the S-ROM/Pinnacle 100).

Primary Analysis

The Harris Hip Score mean in the All Enrolled Cohort for the investigational group was 94.4 while the Harris Hip Score mean for the control group was 93.8. The standard error of difference was 1.31, and the non-inferiority p-value was less than 0.001. These results are summarized in **Table 21** below.

Table 21: Comparison of 24+ Month Harris Hip Score Means: All Enrolled Cohort

Parameter	Treatment	N	Least Square Means	Standard Error of Difference	Non-inferiority P-value
Harris Hip Score	I	152†	94.4	1.31	<0.001
	C	77	93.8		

† *This analysis was carried out using an ANCOVA model where preoperative Harris Hip score was a significant covariate; 4 patients did not have a preoperative Total Harris Hip score on file, so the investigational group had a sample size of 152 in the final analysis. Non-inferiority results were similar (p-value < 0.001) when carried out with a t-test and full sample sizes of 156 in the investigational group and 77 in the control group.*

The Harris Hip Score mean in the Subset Cohort for the investigational group was 97.5 while the Harris Hip Score mean for the control group was 94.7. The standard error of the difference was 1.99, and the non-inferiority p-value was less than 0.001. These results are summarized in **Table 22** below.

Table 22: Comparison of 24+ Month Harris Hip Score Means: Subset Cohort

Parameter	Treatment	N	Least Square Means	Standard Error of Difference	Non-inferiority P-value
Harris Hip Score	I	42	97.5	1.99	<0.001
	C	23	94.7		

The primary analysis for the All Enrolled Cohort (and *post hoc* primary analysis for the Subset Cohort) demonstrate that the investigational group 24+Month Harris Hip score mean is non-inferior to the control group 24+Month Harris Hip score mean with a five (5) point non-inferiority margin.

Harris Hip Scores

In **Tables 23** and **24**, Harris Hip Scores at different time points are presented for the All Enrolled and Subset Cohorts, respectively.

Table 23: Timecourse of Harris Hip Scores and Subscores: All Enrolled Cohort

	Interval																					
	Pre Op				6 Week				6 Month				12 Month				24 Month				24+ Month			
	I		C		I		C		I		C		I		C		I		C		I		C	
Total Score	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Excellent (91-100)	0	0	0	0	14	8.4	2	2.4	118	76.6	57	73.1	127	78.4	62	78.5	129	85.4	61	82.4	134	81.7	64	79
Good (81-90)	0	0	0	0	49	29.5	23	27.4	18	11.7	13	16.7	16	9.9	10	12.7	8	5.3	4	5.4	11	6.7	9	11.1
Fair (71-80)	2	1.1	1	1.1	48	28.9	33	39.3	7	4.5	4	5.1	10	6.2	2	2.5	5	3.3	3	4.1	5	3	5	6.2
Poor (<71)	171	96.6	86	98.9	48	28.9	25	29.8	11	7.1	4	5.1	9	5.6	5	6.3	9	6	6	8.1	13	7.9	3	3.7
Missing	4	2.3	0	0	7	4.2	1	1.2	0	0	0	0	0	0	0	0	0	0	0	0	1	0.6	0	0
Total	177	100	87	100	166	100	84	100	154	100	78	100	162	100	79	100	151	100	74	100	164	100	81	100

Table 24: Timecourse of Harris Hip Scores and Subscores: Subset Cohort

	Interval																					
	Pre Op				6 Week				6 Month				12 Month				24 Month				24+ Month			
	I		C		I		C		I		C		I		C		I		C		I		C	
Total Score	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Excellent (91-100)	0	0	0	0	3	7	1	4.5	28	80	17	81	36	87.8	19	86.4	30	85.7	15	83.3	38	90.5	20	87
Good (81-90)	0	0	0	0	16	37.2	8	36.4	4	11.4	2	9.5	3	7.3	1	4.5	2	5.7	1	5.6	3	7.1	1	4.3
Fair (71-80)	0	0	0	0	15	34.9	10	45.5	3	8.6	1	4.8	2	4.9	1	4.5	1	2.9	1	5.6	0	0	1	4.3
Poor (<71)	45	100	24	100	7	16.3	3	13.6	0	0	1	4.8	0	0	1	4.5	2	5.7	1	5.6	1	2.4	1	4.3
Missing	0	0	0	0	2	4.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	45	100	24	100	43	100	22	100	35	100	21	100	41	100	22	100	35	100	18	100	42	100	23	100

Secondary endpoint analyses related to radiographic assessment, revision rate, and Visual Analog Scale (VAS) scores. A patient was considered to be a composite success at 24+Months if the patient's 24+Month Harris Hip Score was greater than or equal to 80, if the patient was a radiographic success, and if the patient had not had a revision. The radiographic success, absence of revision, and overall success rates are reported for the All Enrolled Cohort in **Table 25**. The results demonstrate no clinically or statistically significant differences between investigational and control hips for radiographic success, absence of revision, or overall success in the All Enrolled Cohort.

Table 25: Comparison of Clinical Success, Radiographic Success and Revision: All Enrolled Cohort

Patient Success Criteria	(I) 157 subjects	(C) 76 subjects	Fishers Exact p-value
Clinical Success	138 / 157 (87.9%)	67 / 76 (88.2%)	1.000
Total Harris Hip Score >= 80	138 / 157 (87.9%)	67 / 76 (88.2%)	1.000
Mild - Slight - No Pain	148 / 157 (94.3%)	71 / 76 (93.4%)	0.776
Radiographic Success	153 / 157 (97.5%)	74 / 76 (97.4%)	1.000
Radiolucencies <= 2mm	153 / 157 (97.5%)	74 / 76 (97.4%)	1.000
Acetabular Migration <= 4mm	153 / 157 (97.5%)	74 / 76 (97.4%)	1.000
Acetabular Inclination <= 4 Degrees	153 / 157 (97.5%)	74 / 76 (97.4%)	1.000
Osteolysis None	153 / 157 (97.5%)	74 / 76 (97.4%)	1.000
Absence of Revision	153 / 157 (97.5%)	74 / 76 (97.4%)	1.000
OVERALL SUBJECT SUCCESS RATE	138 / 157 (87.9%)	67 / 76 (88.2%)	1.000

There were 6 revisions (4I,2C) that did not meet the minimum 24-month follow-up criteria; these 6 revisions were counted as failures in all categories (clinical, radiographic, revision, and overall).

Similarly, the radiographic success, absence of revision, and overall success rates are reported for the Subset Cohort in **Table 26**. The results demonstrate no clinically or statistically significant differences between investigational and control hips for radiographic success, absence of revision, or overall success in the Subset Cohort.

Table 26: Comparison of Clinical Success, Radiographic Success and Revision at 24+ Months: Subset Cohort

Patient Success Criteria	(I) 41 subjects	(C) 22 subjects
Clinical Success	40 / 41 (97.6%)	19 / 22 (86.4%)
Total Harris Hip Score >= 80	40 / 41 (97.6%)	19 / 22 (86.4%)
Mild - Slight - No Pain	40 / 41 (97.6%)	19 / 22 (86.4%)
Radiographic Success	41 / 41 (100.0%)	21 / 22 (95.5%)
Radiolucencies <= 2mm	41 / 41 (100.0%)	21 / 22 (95.5%)
Acetabular Migration <= 4mm	41 / 41 (100.0%)	21 / 22 (95.5%)
Acetabular Inclination <= 4 Degrees	41 / 41 (100.0%)	21 / 22 (95.5%)
Osteolysis None	41 / 41 (100.0%)	21 / 22 (95.5%)
Absence of Revision	41 / 41 (100.0%)	21 / 22 (95.5%)
OVERALL SUBJECT SUCCESS RATE	40 / 41 (97.6%)	19 / 22 (86.4%)

There was 1 revision (0I,1C) that did not meet the minimum 24-month follow-up criteria; this 1 revision was counted as a failure in all categories (clinical, radiographic, revision, and overall).

Patients were asked preoperatively and at follow-up visits to identify their level of pain on a visual analog scale. Specifically, a mark was placed on a line where one end denoted "NO PAIN" and the other denoted "SEVERE PAIN". The location of the mark on the line was proportionately converted to a 100 point scale with 0 denoting "NO PAIN" and 100 denoting "SEVERE PAIN". A presentation of VAS pain score means for the All Enrolled Cohort by treatment group over time is given in **Table 27**. The difference in means at 24+ Months was not significant (p = 0.324) as presented in **Table 28**.

Table 27: Timecourse of Visual Analog Scale Means: All Enrolled Cohort

	Event Interval											
	Pre Op		6 Week		6 Month		12 Month		24 Month		24+ Month	
	VAS		VAS		VAS		VAS		VAS		VAS	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
Treatment Type												
C	65.5	87	10.4	83	8.94	77	8.64	77	5.21	73	6.11	80
I	63.6	177	9.65	161	9.7	152	7.28	159	6.62	150	7.87	164

Table 28: Comparison of 24+ Month Visual Analog Scal Means: All Enrolled Cohort

Parameter	Treatment	N	Least Square Means	Standard Error of Difference	Non-inferiority P-value
24+Month VAS Score	C	80	6.11	2.10	0.324
	I	164	7.87		

A presentation of VAS pain score means for the Subset Cohort by treatment group over time is given in **Table 29**. The difference in means at 24+ months was not significant (p=0.727) as presented in **Table 30**.

Table 29: Timecourse of Visual Analog Scale Means: Subset Cohort

	Event Interval											
	Pre Op		6 Week		6 Month		12 Month		24 Month		24+ Month	
	VAS		VAS		VAS		VAS		VAS		VAS	
	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
Treatment Type												
C	60.3	24	8.73	22	7.52	21	8.18	22	5.94	17	8.32	22
I	63.7	45	8.16	38	11.7	33	4.59	41	9.62	34	9.95	42

Table 30: Comparison of 24+Month VAS Score Means: Subset Cohort

Parameter	Treatment	N	Least Square Means	Standard Error of Difference	Non-inferiority P-value
24+Month VAS Score	C	22	8.32	4.66	0.727
	I	42	9.95		

Conclusions Drawn from the Study Data

The clinical data support the reasonable assurance of safety and effectiveness of the DePuy Ceramax™ Ceramic Total Hip System when used in accordance with the indications for use and indicated population. It is reasonable to conclude that the benefits of the use of the DePuy Ceramax™ Ceramic Total Hip System for the target population outweighs the risk of surgery when used in accordance with the direction of use.

Sterility and Handling

- The implants described in this package insert are provided sterile as indicated on the individual product's label.
- **DO NOT RESTERILIZE**
- Implants are for single use only. Components may not be resterilized by the hospital because of the possibility of damaging the articulating and interfacing surfaces of the implant
- The implants should be opened using aseptic OR techniques. The package should be opened only after the correct size has been determined, as opened packages may not be returned for credit.
- Implants in sterile packaging should be inspected to ensure that the packaging has not been damaged or previously opened. **DO NOT USE if the package is damaged or broken as sterility may be compromised.**

DePuy Orthopaedics, Inc.
700 Orthopaedic Drive
Warsaw, IN 46581-0988
USA
Tel: +1 (800) 366-8143

DePuy International, Ltd.
St. Anthony's Road
Leeds LS11 8DT
England
Tel: +44 (113) 270 0461
Fax: +44 (113) 272 4101

DePuy
a Johnson & Johnson company

Patient Guide
DePuy Ceramax™
Ceramic Total Hip System

89

Table of Contents

Glossary of Terms

Acetabulum: Hip socket.

Adverse: Harmful or unfavorable.

Anesthetic: Drug used to eliminate the feeling of pain.

Anesthetist: A physician who is specialized in the practice of anesthesiology, the branch of medicine involving the use of drugs or other agents that cause insensibility to pain.

Arthroplasty: Surgical replacement of a damaged joint with artificial parts generally made of metal and plastic, to restore the function of the joint.

Arthrosis: An arthrosis is a joint, an area where two bones are attached for the purpose of motion of body parts. An arthrosis (joint) is usually formed of fibrous connective tissue and cartilage.

Avascular Necrosis: A condition that results in death of the bone in the femoral head due to loss of blood supply. A decay of the bone in the femoral head (the bone below the hip ball) because of too little blood flowing to it or lack of blood flow.

Bearing: The bearing is the area of interaction between the moving parts of the hip implant (where the ball and the liner meet). Bearing materials can be made out of metal, ceramic or plastic.

Bilateral: The right and left sides of a structure (e.g., the right and left hips).

BIOLOX® *delta*: A highly durable zirconia-alumina, ceramic engineered to resist cracks and fractures.

Buttock: The rear pelvic area of the human body.

Calcification: Hardening of the tissue.

Degenerative hip disease: A condition that causes the loss of cartilage and bone in a hip joint that eventually leads to increased hip joint pain and reduced hip joint function.

Dislocation: When the hip ball comes out of the socket.

Femoral: Related to the thighbone (femur).

Femoral Neck Fracture: A break or fracture of the bone below the hip ball (femoral head).

Femoral Head Collapse: A breakage or collapse of the bone within the hip ball (femoral head).

Femur: Thighbone.

Fixation: The stabilization (connection) of an implant to surrounding bone or cement.

Hematoma: A localized swelling filled with blood.

Heterotopic Ossification: Deposits of bone in soft tissues around the hip joint. It usually does not affect how well the hip works, but it may decrease the range of motion at the hip. The condition needs surgery only if it causes pain or greatly limits motion.

Hip Dislocation: A problem resulting from a separation of the ball from the socket in a hip replacement device.

Hip Dysplasia: An abnormally shaped hip joint.

Hip Replacement: When an artificial or man-made ball and socket device replaces the natural hip joint.

Hip Revision: Replacement of an artificial hip device with a new artificial hip device (this may be required for a broken or failed device or an infection).

Immunosuppressed: A condition where the patient's immune system is not as effective as normal.

Impingement: Excessive pressure is placed on the tissue around the hip device.

Migration: A hip complication resulting from a movement of the device out of its original position.

Myocardial Infarction: heart attack.

Natural Hip Joint: A rounded head or "ball" fits into a cup or "socket" to allow movement between the thigh bone (femur) and the hip bone (pelvis).

Neuropathic: Any diseased condition of the nervous system.

Osteoarthritis: A slow loss of bone and cartilage in the hip joint that may include the abnormal formation of bone and cartilage around the joint, leading to pain and stiffness.

Osteolysis: The dissolving of bone especially the loss of the calcium of the bone.

Osteomalacia: Softening of the bones.

Osteomyelitis: Inflammation of the bone due to infection; can be a complication of surgery or injury, although infection can also reach bone tissue through the bloodstream. Both the bone and the bone marrow may be infected.

Osteonecrosis: A loss of blood supply to the hip bones characterized by changed shape and increased thickness of the bone, a flattening of the joint surface (See also **Avascular Necrosis).**

Osteoporosis: A loss or weakening of bone.

Physiotherapy: Therapy that uses physical agents such as exercise, massage.

Post-traumatic Arthritis: Arthritis caused by a serious hip or knee injury.

Pyogenic: Producing pus (commonly a site of infection or foreign material in the body).

Pulmonary Embolism: Blood clot in the lung.

Rehabilitation: Exercise that is prescribed by a doctor following hip surgery to help improve the healing process and overall function of the hip.

Revision: Replacement of a failed device with a new device.

Rheumatoid arthritis: A condition in which the body's immune system begins to attack the tissue surrounding the hip joint leading to joint pain, stiffness and inflammation.

Slackness: Not tight, taught, firm or tense; looseness or laxity.

Subluxation: Partial dislocation of a joint.

Traumatic arthritis: A condition that results in loss of bone and cartilage in the hip joint after a physical injury.

Traumatic Wound: An injury caused by something outside the body.

Trochanteric Bursitis: Swelling of the large sacs that separate the hip bones from the muscles and tendons of the thighs and buttocks. This results in tenderness on the upper, outside portion of the thigh bone.

U.S. Food and Drug Administration (U.S. FDA): The government agency that regulates medical devices in the United States.

Venous Thrombosis: Blood clot in the veins.

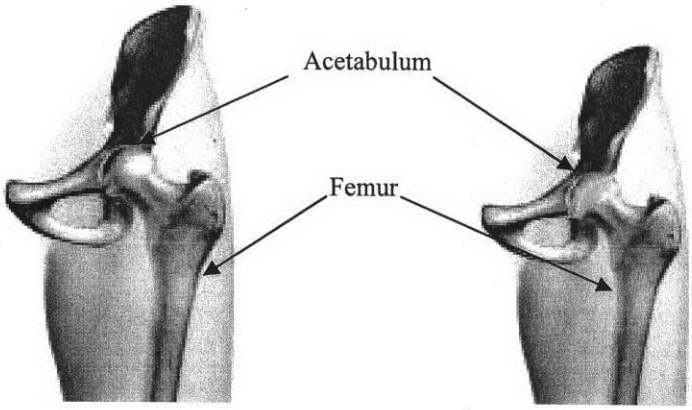
Wear resistance: Ability to withstand or resist wear.

Important Note: This brochure should be read in its entirety BEFORE the patient has his or her surgery.

What Is the DePuy Ceramax™ Ceramic Total Hip System?

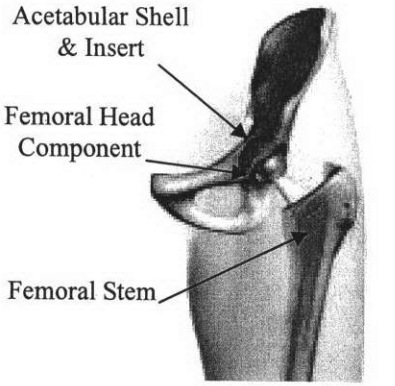
The hip joint allows movement to occur between the thigh bone (femur) and the hip bone (pelvis). The pelvis contains a "socket", which is called the acetabulum. The ball-shaped head of the femur fits into the acetabulum, forming a "ball and socket joint" that enables the leg to have a wide range of movements such as walking and squatting. The DePuy Ceramax™ Ceramic Total Hip System is a new artificial "ball-and-socket" hip replacement system.

The DePuy Ceramax™ Ceramic Total Hip System consists of four parts: a femoral head component made from a ceramic material called BIOLOX® *delta* that replaces the top of your thigh bone, a ceramic insert called Ceramax™ (made from the same BIOLOX® *delta* ceramic) for the femoral head to move against; the ceramic insert that locks into a metal acetabular cup to fit into your hip bone, and a metal stem that fits the femoral head and fits into your thigh bone without the use of bone cement (non-cemented fixation). The components are available in different sizes.



Healthy Hip

Arthritic Hip



Hip Replacement Components

The DePuy Ceramax™ Ceramic Total Hip System is the only hip system currently available in the U.S that utilizes BIOLOX® *delta* for the ceramic femoral heads and the acetabular liners.

What type of patient is right for the DePuy Ceramax™ Ceramic Total Hip System?

(Indications for Use)

The DePuy Ceramax™ Ceramic Total Hip System is indicated for noncemented use in skeletally mature individuals undergoing primary total hip replacement surgery for rehabilitation of hips damaged as a result of noninflammatory degenerative joint disease (NIDJD) or any of its composite diagnoses of osteoarthritis, avascular necrosis, and post-traumatic arthritis.

What type of patient is not indicated for the DePuy Ceramax™ Ceramic Total Hip System?

(Contraindications)

You should not receive a DePuy Ceramax™ Ceramic Total Hip System if you have any of the following:

- Active or recent infections that may spread to other areas of the body (e.g., osteomyelitis [inflammation of bone and bone marrow, usually caused by bacterial infection], pyogenic infection [producing pus] of the hip joint, overt [open or exposed] infection, urinary tract infection, dental infection, etc.)
- Inadequate bone stock that may not support hip implant components (a test such as DEXA scan may be needed to determine your level of bone loss)
- Rapid spreading of disease, seen on x-rays as joint damage or loss of bone
- Skeletally immature patients (patients whose bones have not stopped growing)
- Marked atrophy (muscle and/or tissue loss) or deformity in the upper femur such as a birth defect affecting the leg bones.
- Loss of musculature (cases where muscles may be too weak to work properly), neuromuscular (nerve) disease, or vascular disease that may prevent the artificial hip joint device from remaining stable
- Any nerve or muscle disease that may have a negative effect on walking or weight bearing

- Inflammatory degenerative joint disease (like rheumatoid arthritis)
- Joint instability
- The presence of any known neoplastic (tumor-causing) or metastatic (spread of cancerous cells) disease;
- You have a suppressed immune system due to diseases such as AIDS or you are receiving high doses of corticosteroids
- Known allergies to metal or metal hypersensitivity,

Your doctor will need complete information about your overall health to determine whether the DePuy Ceramax™ Ceramic Total Hip System is right for you. Inform your doctor about any health problems you have, even if it is not related to your hip, because some medicines as well as diseases (such as diabetes) can affect your kidney or bone strength in the future.

What Are Potential Benefits of the DePuy Ceramax™ Ceramic Total Hip System?

Hip replacement can help people resume routine movements of everyday life, like climbing stairs, tying shoes and getting up from a chair. While there is no guarantee of success, benefits of hip replacement may include pain reduction and regaining motion. Each device type may decrease hip pain and improve function.

Your surgeon has decided that you will benefit from hip replacement surgery. The three most common materials used in artificial hip replacement devices are Ceramic-on-Ceramic (ceramic ball with a ceramic liner), Metal-on-Plastic (metal ball with a plastic liner) and Metal-on-Metal (metal ball with a metal liner).

The DePuy Ceramax™ Ceramic Total Hip System is an option for patients that may allow for their return to activities in their everyday lives. It has been engineered with materials to optimize strength and durability and has been extensively tested in the lab and in clinical trials.

You should compare the possible risks and benefits of the DePuy Ceramax™ Ceramic Total Hip System to the risks and benefits of other types of artificial hip replacement devices.

What are Risks with the DePuy Ceramax™ Ceramic Total Hip System?

The risks associated with this hip replacement are expected to be similar to those of other hip replacements. Each of these reactions or complications can arise during and after surgery and may require medical intervention (such as surgery) and removal of the implant. Once implanted, the functional life of any hip replacement system cannot be predicted. To reduce the risk for failure, please discuss with your doctor what you should do prior to surgery and carefully follow any instructions given to you. The risks and complications include:

- Chipping or cracking of the femoral head and insert ceramic components
- Femoral (thighbone) or acetabular (hip socket) bone fracture may occur while implanting the hip replacement device

- Particles of the hip replacement parts and bone may be generated by contact between the hip implant and bone. These particles may cause local responses such as bone breakdown, or they may move to other parts of the joint and cause painful tissue irritation. Particles in between the hip implant parts or between the hip implant and bone may cause more particles to form at an increasing rate and cause more breakdown of bone. Breakdown of bone can lead to having to remove or replace the hip implant parts.
- Chronic inflammatory response due to metal sensitivity
- Potential for post-operative and continued joint pain
- Reduced function at the hip
- Damage to blood vessels resulting in hematoma (a localized swelling filled with blood)
- Temporary or permanent nerve damage resulting in pain or numbness of the affected limb
- Undesirable shortening or lengthening of the treated leg (leg length inequality)
- Cardiovascular disorders including venous thrombosis (blood clot in the veins), pulmonary embolism (blood clot in the lung), or myocardial infarction (heart attack)
- Temporary or permanent nerve damage
- Delayed wound healing
- Infection
- Migration (movement) or loosening of the hip implant, or partial or complete dislocation of the hip implant can result from improper positioning of the components or trauma (accidents).
- Undesirable bone formation or changes (ossification or calcification), with or without affecting joint mobility
- Inadequate range of motion due to improper selection or positioning of hip implants
- Squeaking or other noises of the hip joint during activities such as walking. The significance of this occurrence is unknown.
- Risk of death

What do the clinical studies show?

A clinical study was performed to evaluate the safety and effectiveness of the DePuy Ceramax™ Ceramic Total Hip System. Two groups of patients were studied. Clinical trial data was collected on 177 hips implanted with the DePuy Ceramax™ Ceramic Total Hip System. Complication (safety) and effectiveness information was collected from all 177 procedures. These same data were also collected from a group of 87 patients that received a control device consisting of a ceramic-on-polyethylene (plastic) articulation. This means that a total of 264 patients were enrolled in the study and data collected through 24 months after surgery.

Safety Data
Complication (safety) information was collected from the entire group of 264 hips. There were no statistical differences in the proportions of adverse events (postoperative systemic or operative-site, or intraoperative complications) between the DePuy Ceramax™ Ceramic Total Hip System patients versus the conventional total ceramic-on-polyethylene hip system patients.

In other words, the overall complication rate and types of complications were similar to the types reported for a conventional total ceramic-on-polyethylene hip replacement system. The most common operative-site complications were trochanteric bursitis, wound problems, dislocations and musculoskeletal adverse events.

The revision rate between the DePuy Ceramax Ceramic Total Hip System and the conventional total ceramic-on-polyethylene hip system was also similar. Four patients out of 177 required revision of the DePuy Ceramax Ceramic Total Hip System and two patients required revision of the conventional total ceramic-on-polyethylene hip system. Reasons for revision in the DePuy Ceramax Ceramic Total Hip System patients were: 1) infection 2) acetabular liner failure 3) loosening and 4) patient fall. The reason for revision in both ceramic-on-polyethylene patients was recurrent dislocation of the prosthesis.

There were no deaths directly related to the use of the device in the study.

Effectiveness Data
Effectiveness information was collected at 24 months from 233 patients. Harris Hip Total Scores were used to summarize clinical outcome. The scoring system is used to tell doctors how well patients are functioning with their hip replacement device, including their ability to walk (with or without aid) and the patient's level of pain.

Preoperatively, 171 of the DePuy Ceramax™ Ceramic Total Hip System patients (96.6%) had a "Poor" Harris Hip Total Score. Post-operatively, after 24 months, 145 of the 164 DePuy Ceramax™ Ceramic Total Hip System patients (88.4%) that reported at this time had a "Good" or "Excellent" Harris Hip Total Score.

These same data were also collected from a group of patients that received a control device consisting of a ceramic-on-polyethylene articulation. Preoperatively, 86 of the

ceramic-on-polyethylene articulation patients (98.9%) had a "Poor" Harris Hip Total Score. Post-operatively, after 24 months, 73 of the 81 ceramic-on-polyethylene articulation patients (90.1%) that reported at this time had a "Good" or "Excellent" Harris Hip Total Score.

While the clinical study used different types of femoral stem and acetabular shell components, the DePuy Ceramax™ Ceramic Total Hip System now only includes 1 femoral stem type and 1 acetabular shell type. Within the clinical study, 45 patients were implanted with the DePuy Ceramax™ Ceramic Total Hip System as proposed, while 24 patients with the same femoral stem and acetabular shell were present in the control group. The complication rates, revision rate, and effectiveness results were comparable between these two groups.

What can you do to prepare yourself for surgery?

As with all surgery, there are a number of things which the hospital will ask you to do to help the operation be successful. If you have any questions or concerns, ask your doctor or hospital staff.

Your doctor may want you to meet the Physical Therapist (PT) even before surgery. The PT may give you some tips on preparing your house for rehabilitation and how you should sleep, get out of bed, sit, stand, and walk following surgery. In addition, before you go to the hospital, there are several things you can do before surgery to help make your recovery easier.

a.) Commit to the success of your surgery
Working as a team, you, your physician, physiotherapist and your family must adopt a positive attitude toward the success of your surgery. Together, you will gain a clear understanding of the common goals and expectations of the procedure.

b.) Remain as active as possible
Remaining active, while waiting for your surgery is an important key to the success of your surgery. Studies have shown that the stronger and more flexible you are before your operation, the quicker you will recover and more flexible you will be after the operation. Gentle exercise such as walking, range of motion exercises and swimming can help you to stay strong and flexible. Seek your doctor's advice before beginning any exercise.

c.) Stop smoking
If you have not already done so, you should stop smoking at least four weeks before your surgery. This will help reduce the risk of complications during and after your surgery.

d.) Make sure all infections are cleared up prior to the surgery
These include: tooth abscesses, bladder infections, infections such as leg ulcers, colds and the flu. This is because infections could spread through your body during the operation and infect your new replaced joint. Therefore, you must tell your surgeon immediately if you suspect you have an infection, as your surgery may have to be rescheduled.

e.) Rearrange your furniture
Rearrange your furniture to create wide traffic paths and remove obstacles. Make it as easy and safe as possible to move around your home during your recovery.

f.) Life after the operation
You will need to have someone available to drive you home after the surgery. Additionally, for the first few weeks following your surgery, you'll need some help with typical household chores like cooking, cleaning, shopping, bathing, and doing laundry. If you don't have a spouse, relative or friend who can help you with these tasks, your healthcare team can assist you in making arrangements (in advance) for someone to help you.

How is hip replacement surgery performed?

In preparation for surgery, your anesthetist (the person who puts you to sleep and provides drugs to dull pain) will examine you. This is an opportunity for you to ask any questions before the actual surgery. On the day of your surgery, it is usual for your doctor to ask you not to drink or eat anything. The area around your hip may be shaved of any hair to reduce the risk of infection. You may also be given tablets or an injection to relax you before the operation. This is known as a "pre-med". You will then be taken into the operating room where you will be given either a general or a regional anesthetic prior to your surgery. The surgery may take between 1-2 hours to complete.

The surgical procedure for a ceramic-on-ceramic total hip replacement involves removing your diseased hip bone and replacing it with an artificial ceramic ball on a metal stem. The metal stem is inserted into your thighbone. After a special instrument shapes the hip socket, a metal shell is placed into the socket. A ceramic liner is then inserted into the shell which provides the bearing surface. Finally, a ceramic ball is placed onto the metal stem which is placed into the new socket.

There are generally 6 steps to the hip replacement surgery. These include the following:

Step 1: After making an incision, the hip joint is exposed.

Step 2: Your surgeon will remove your femoral head from your acetabulum (hip socket). This is done so the surgeon has clear access to the hip joint.

Step 3: The damaged surfaces of the femoral head and acetabulum are then removed and the underlying bone is prepared to accept the artificial hip implants.

Step 4: The new hip implant components are placed into the femur and acetabulum.

Step 5: Once all the implant components are in place, your surgeon will place the new femoral head into the acetabular component and check that the movements are full, smooth and stable.

Step 6: Finally, the surgeon will close the incision (wound), dress it, and ensure you get bedrest.

The DePuy Ceramax™ Ceramic Total Hip System replaces both moving parts of the hip joint. All components of the DePuy Ceramax™ Ceramic Total Hip System are made of standard materials that have a history of use in the human body.

What problems may occur during your surgery?

While rare, problems can occur during surgery. Please also refer to the section in this brochure describing "what are the risks" and review these with your surgeon prior to surgery.

- Femoral or acetabular (related to the hip socket) perforation (hole) or broken bones
- Broken bone while seating or implanting the device
- Damage to blood vessels
- Temporary or permanent nerve damage resulting in pain or numbness of the affected limb
- Undesirable shortening or lengthening of the limb caused by improper selection of the implant size
- Traumatic wounds of the hip from positioning of the leg during surgery
- Cardiovascular disorders including blood clots in the veins or lungs, or heart attack
- Pocket of blood caused by bleeding from a broken blood vessel which appears "black and blue"

What can you expect after your operation?

Immediately after your surgery, you will be moved to a post-operative recovery room for close monitoring. You may have one or two intravenous drips in your arm to introduce fluids and/or medication into your body. When you wake up from surgery, your affected leg may be swollen and bruised and your muscles may be stiff and sore. You may be given pain medications to take regularly while you are recovering.

When you are fully conscious, breathing well and your blood pressure and pulse are

stable after surgery, you will be taken back to your hospital room. You may not feel like eating much at first, but it is important that you drink liquids.

Recovery from any operation varies from patient to patient and post-operative rehabilitation programs vary from hospital to hospital and surgeon to surgeon. The following is a general recovery timeline after surgery:

Day 1: Move about with physiotherapy and a walking frame

Day 2/3: Move about with physiotherapy and independently with crutches

Day 3/4: Move about with physiotherapy and independently with a cane

Day 4-6: Return home

Follow your surgeon's instructions carefully. You surgeon will give you detailed post-operative instructions before you leave the hospital. It is important to follow your surgeon's instructions so healing from surgery can occur as quickly as possible.

Ongoing Evaluation:
Follow your doctor's schedule for examinations after surgery. Routine examinations will include regular X-ray exams to look for any problems such as hip bone or implant breakage, implant position changes, or anything abnormal. X-rays will also check the progress of bone healing around the implants. Routine examinations may also include blood work and urine analysis.

What problems may occur after your surgery?

Infection:
Contact your doctor if you experience any of the following signs of infection:

- Drainage and/or unusual odor from the surgical incision
- Fever/temperature above 100.4° F for two consecutive days
- Redness, swelling or increased pain at or near the surgical incision

Infections can travel from other parts of your body to your new hip implants. If you have any infection in any part of your body, contact your doctor immediately.

Late Pain or Instability:
Some pain is normal and expected during your rehabilitation period, and the pain should slowly decrease in the weeks following surgery. If you experience any serious, immediate, or constant hip pain, pressure, feelings of unsteadiness, or if you are suddenly unable to put weight on your hip after the surgical pain has gone away, you should contact your doctor. These signs (symptoms) may be a signal of a serious problem (such as bone breakage, dislocation, infection, device loosening, movement, or breakage).

Delayed wound healing

Inadequate range of motion due to improper selection or positioning of hip parts

Undesirable shortening or lengthening of the limb caused by improper selection of hip implant size

Device-related noises, such as squeaking, clicking, popping or grinding

Cardiovascular disorders, including blood clots in the veins or lungs

What can you do to improve your recovery?

Always follow your surgeon's advice on hip precautions.

Be sure to protect the new hip implants from too much stress after surgery and always follow your surgeon's advice and instructions. To do this, you should avoid high level activity such as playing basketball or doing heavy physical work. **Do not participate in high impact activities such as running or jumping during the first year after your surgery.** These activities can cause broken bones, loosening of implant components, or early wear of the implants.

Generally, within 6 weeks after surgery, you may return to driving and work. You should be able to return to normal activities within a few months of the surgery, including gardening, and other low impact activities.

Please read and comply with the follow-up care and treatment instructions given by the physician.

Are there instructions for when you travel?

As with many other medical implants and devices, your hip replacement implants may activate metal detector alarms such as those at airport security checks. Tell the security attendant about your artificial hip. Ask your surgeon to provide you with a card that explains that you have had a hip replacement to present if a security device alarm is activated.

What alternatives do you have?

Depending on individual circumstances, alternative procedures may include the use of other commercially available total hip replacement parts already approved or cleared by the FDA; non-surgical treatment such as reduced activity and/or pain medication; or other surgical treatments that do not involve the use of an implant such as a hip fusion. Additionally, your doctor can recommend nonsurgical therapy such as weight loss, mild exercise programs, physical therapy, assistive devices (such as canes), and lifestyle modifications.

Important Safety Information

Every surgery has risks and benefits. The performance of total hip replacement depends on your age, weight, activity level and other factors. There are potential risks, and recovery takes time. People with conditions limiting rehabilitation should not have hip replacement surgery. Only an orthopaedic surgeon can tell if total hip replacement is right for you.

Any time after your operation, if a physician prescribes an MRI scan for you, inform your physician that the DePuy Ceramax™ Ceramic Total Hip System has not been evaluated for safety and compatibility in the MR environment. The DePuy Ceramax™ Ceramic Total Hip System has not been tested for heating or migration in the MR environment.

Other available information sources

Discuss any questions regarding your hip surgery and the DePuy Ceramax™ Ceramic Total Hip System with your surgeon. For further information regarding the DePuy Ceramax™ Ceramic Total Hip System, you may also contact the manufacturer:

DePuy Orthopaedics, Inc.
700 Orthopaedic Dr.
Warsaw, IN 46582
www.DePuyOrthopaedics.com
1-800-366-8143

For more information about hip replacement please visit www.hipreplacement.com

Rev. XXX