Multi-Center, Non-Controlled, Prospective Radiostereometric Analysis of the PINNACLE® Dual Mobility Construct

SHORT TITLE: PINNACLE® DM RSA Study

Protocol Number: DSJ_2019_02

Version Rev 3: 4 MAR 2022

Clinical Sponsor:

DePuy Synthes Joint Reconstruction
700 Orthopaedic Drive
Warsaw, IN 46581

Signature:

PPD

Digitally signed by PPD
PPD
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DePuy Synthes
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Table of Contents

1 Responsible Parties Involved in the Study

1.1 Location of Information

Investigator and Responsible Party information for this multi-center clinical investigation is on file at the operating company

2 Investigator Signature Page

Multi-Center, Non-Controlled, Prospective Radiostereometric Analysis of the PINNACLE® Dual Mobility Implant

Document Type	Revision	Effective Date
Original	1	12 November, 2020
Amendment	2	25 January, 2022
Amendment	3	10 March, 2022

I have read this protocol and agree to conduct this clinical investigation in accordance with the design and specific provisions outlined herein. I understand the protocol and I understand I am solely responsible to ensure the investigation is conducted in accordance with Good Clinical Practices (GCP), applicable country regulations, the Declaration of Helsinki, the signed clinical study contract with the Sponsor and with the protocol outlined herein. I will conduct this study as outlined therein and will make reasonable effort to complete the study within the time period designated by the Sponsor.

I will provide copies of the protocol and all pertinent information to all individuals responsible to me who will assist in the conduct of this study. I will discuss this material with them to ensure they are fully informed regarding the device and the conduct of the study.

I will fulfill the requirements of my Research Ethics Board (REB)/Ethics Committee (EC), or other oversight committee(s), to ensure complete and continual oversight of this clinical investigation. I will use an Informed Consent Document approved by the Sponsor and my reviewing REB/EC (where required).

I agree to report all information or data in accordance with the protocol and, in particular, I agree to report any serious adverse events, device related adverse events, or procedure related adverse events as defined in this protocol to the Sponsor, and comply with all adverse event reporting requirements of my reviewing REB/EC. I agree to permit he Sponsor, its authorized representatives, my reviewing REB/EC, and any regulatory authority/body access to all records relating to the clinical investigation.

The below signature confirms I have read and understood this protocol and its associated amendments or attachments and will accept respective revisions or amendments provided by the Sponsor.

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Signature of Principal Investigator: **Date**

Printed Name and Title

Site Identification Number

3 STUDY SUMMARY

3.1 Protocol Synopsis

Clinical Sponsor	DePuy Synthes Joint Reconstruction
Title	Multi-Center, Non-Controlled, Prospective Radiostereometric Analysis of the PINNACLE® Dual Mobility Construct
Short Title	PINNACLE® DM RSA Study
Protocol Number	DSJ 2019 02
Indication	Total Hip Arthroplasty (THA)
Study Article Description	PINNACLE® Acetabular Cup, PINNACLE® CoCrMo Dual Mobility Metal Liner, a BI-MENTUM™ ALTRX® Dual Mobility Polyethylene Liner, a DePuy femoral stem with a polished femoral neck and a DePuy modular, femoral head PINNACLE® Dual Mobility Metal Liners and Porous-coated PINNACLE® Acetabular Cups are intended for cementless applications.
Study Design	Multi-Center, Non-randomized, Non-Controlled, Prospective
Study Population	Males and Females aged 21 or older, who are undergoing primary, unilateral THA or revision THA and who may have, in the opinion of the Investigator, a risk of dislocation in the operative joint.
Number of Subjects	N = a minimum of 30 and up to 45
Number of Sites	3 (all Canadian)
Enrollment Timeframe	12 months
Subject Follow-Up	Subjects will be seen at the following intervals: Preoperative, operative, 6 weeks, 3 months, 6 months, 1 year and 2 years postoperatively
Study Objectives	• To establish the mean subsidence profile of the PINNACLE® Acetabular Shell and Dual Mobility Metal Liner construct using model-based RSA over the first two years post-implantation • To compare study results from this trial to historical PINNACLE® data obtained from DSJ 2018 02.
Endpoints	Primary: • RSA measured mean superior cup migration (subsidence: Y translation in mm) at 2 years Secondary: • Comparison of mean superior cup migration at 2 years to historical PINNACLE® data • RSA measured subsidence of the PINNACLE® Acetabular Shell at 3 months, 6 months and 1 year and compare to historical PINNACLE® data

	• Other RSA measurements (X and Z translations in mm, X, Y, and Z rotations in degrees, and maximal total point motion in mm) at all time points and compare to historical PINNACLE® data • Linear head penetration at 6 weeks, 1 year and 2 years and compare to historical PINNACLE® data • Functional and health status as measured with Harris Hip Score, HOOS Jr. and Forgotten Joint Score (FJS-12) and compare to historical PINNACLE® data at baseline and 3 months, 6 months and 1 and 2 years post-operative <u>Exploratory:</u> • Subsidence for subset of Subjects where RSA data was obtained prior to discharge and compare to historical PINNACLE® data • Analyses to examine the correlation of functional and health status outcomes vs. RSA observations may be explored • Incidence of intraprosthetic dislocation (IPD) • Incidence of intraoperative complications <u>Safety:</u> • The type and frequency of any serious and non-serious device or procedure-related AEs across all study intervals will be summarized
Inclusion Criteria	1. Individuals requiring THA for a severely painful and/or disabled joint (typically due to non-inflammatory degenerative joint disease); failed previous hip surgery; or dislocation risks. 2. Individuals who are able to speak, read and comprehend the informed patient consent document and willing and able to provide informed patient consent for participation in the study and have authorized the transfer of his/her information to DePuy Synthes 3. Individuals who are willing and able to return for follow-up as specified by the study protocol 4. Individuals who are a minimum age of 21 years at the time of consent 5. Individuals who are willing and able to complete the Subject Hip Outcomes questionnaires as specified by the study protocol
Exclusion Criteria	1. Individuals who have an active local or systemic infection

	2. Individuals who have loss of musculature, neuromuscular compromise or vascular deficiency in the affected limb rendering the procedure unjustified. 3. Individuals with poor bone quality, such as osteoporosis, where, in the surgeon's opinion, there could be considerable migration of the prosthesis or a significant chance of bone fracture and/or the lack of adequate bone to support the implant(s) 4. Individuals with Charcot's or Paget's disease 5. Individuals who, in the judgement of the investigator, would not be a candidate for protocol allowable components to be used for their THA 6. Women that are pregnant or lactating 7. Individuals who have had a contralateral hip that was implanted less than 6 months prior to the time of consent into this study or individuals that expect to have a contralateral hip implanted in the 6 months following the time of consent into this study 8. Individuals that have amputations in either leg that would impact rehabilitation following surgery 9. Individuals who are bedridden per the Investigators determination. 10. Individuals that have participated in a clinical investigation with an investigational product (drug or device) in the last three months 11. Individuals currently involved in any personal injury litigation, medical-legal or worker's compensation claims 12. Individuals, in the opinion of the Investigator, who are drug or alcohol abusers or have psychological disorders that could affect their ability to complete patient reported questionnaires or be compliant with follow-up requirements 13. Individuals diagnosed and taking prescription medications to treat a muscular disorder that limits mobility due to severe stiffness and pain such as fibromyalgia or polymyalgia 14. Subject has a medical condition with less than 2 years life expectancy 15. Individual has a BMI $\geq$45 kg/m^2. 16. Individuals who require revision arthroplasty and have a well-fixed non-DePuy Synthes femoral stem or a well-fixed DePuy Synthes femoral stem that does not have a polished neck

Safety Assessments	Type and frequency of device or procedure related Adverse Events will be collected. The Site Ethics Committee/Research Ethics Board (REB) will provide oversight for study Subject safety.
Sample Size	The purpose of this study is to summarize the mean subsidence (superior cup migration) of the acetabular shell as measured with RSA. Mean subsidence will be summarized at all time points; there are no hypotheses in this study. The standard deviation in observed migration values at 2 years post-op is anticipated to be approximately 0.2 mm. Based upon this standard deviation, a sample size of N=30 is anticipated to provide a 95% confidence interval for comparison with historical PINNACLE® data with a margin of error of approximately $2(0.2/\sqrt{30}) = 0.073$ mm, which is deemed to be an adequate level of precision by the Sponsor. Up to 45 Subjects may be enrolled to offset pre and post-operative attrition.
Statistical Analysis	There are no formal hypothesis tests for this study. Summary statistics of primary, secondary and exploratory outcomes will be provided, along with 95% confidence intervals. Comparisons of the primary and secondary endpoints with historical PINNACLE® data will be conducted using the t-test and the Fisher's exact test. Those comparisons will only be provided to facilitate clinical judgement.
Interim Analysis	An interim analysis will be conducted when all Subjects have reached 1-year post-op in order to give product development an understanding of acetabular cup subsidence that might be expected for future product development purposes and support regulatory submissions. There is no intention to utilize this interim analysis as a means to justify stopping the study early.
Determination if DMC/CEC required	Not Required
Time and Events Schedule	See below

3.2 TIME AND EVENTS SCHEDULE

Event / Visit	Pre-op		Operative	Prior to Discharge	6 Weeks	3 Months	6 Months	1 Year	2 Years
	-270 to DOS	-90 to DOS	Day 0	Day 1 to Discharge	28-56 d	60-120 d	135-225 d	275-455 d	640-820 d
Complete Screening Log		✓							
Obtain Informed Subject Consent		✓							
Verify Inclusion / Exclusion Criteria		✓							
Subject History		✓							
Harris Hip		✓			✓*	✓	✓	✓	✓
Hip Evaluation		✓			✓	✓	✓	✓	✓
HOOS Jr.		✓			✓	✓	✓	✓	✓
Forgotten Joint Score (FJS-12)					✓	✓	✓	✓	✓
Operative Details			✓						
Device Log			✓						
Unscheduled Visit Report ** (Interim Visit)					✓	✓	✓	✓	✓
Adverse Event			✓	✓	✓	✓	✓	✓	✓
End of Study (Withdrawal (W/D)) Form***			If W/D	If W/D	If W/D	If W/D	If W/D	If W/D	If W/D
AP View	✓				✓	✓	✓	✓	✓
Lateral View	✓				✓	✓	✓	✓	✓
RSA Exam (supine)				✓ ^ (dbl exam)	✓ ^^ (dbl exam)	✓	✓	✓	✓

* ROM optional at 6 weeks only
** As Needed, ^ At able center(s) only, *** As Applicable, ^^ Double exam obtained if not prior

4 INTRODUCTION

4.1 Background

Hip replacement, or arthroplasty, is a surgical procedure in which the diseased or damaged parts of the hip or hip joint are removed and replaced with prosthetic implants in the proximal femur (stem) and the acetabulum (cup or shell). The most common reason that people have hip replacement surgery is the wearing out of the hip joint as a result of osteoarthritis. Other conditions, such as rheumatoid arthritis (a chronic inflammatory disease that causes joint pain, stiffness and swelling), avascular necrosis (loss of bone caused by insufficient blood supply), injury (such as fracture), and bone tumors also may lead to breakdown of the hip joint and the need for hip replacement surgery.

4.2 Radiostereometric Analysis (RSA)

Radiostereometric Analysis is an accurate method of determining the migration of orthopaedic implants following surgical procedures such as total hip arthroplasties. RSA is able to measure early micromotion of the hip implant which is predictive of long-term fixation.

There are no RSA evaluations of the PINNACLE® Dual Mobility Metal Liner. Therefore, in order to evaluate future dual mobility hip replacement products, baseline migration values for the PINNACLE® Dual Mobility Implant will be determined; in addition, PINNACLE® Dual Mobility RSA data will allow for comparison with historical RSA data obtained using standard PINNACLE® acetabular constructs in study DSJ_2018_02.

4.3 Study Article Description

The PINNACLE® Dual Mobility Metal Liner is intended to be used in total hip arthroplasty with a PINNACLE® Acetabular Cup, a BI-MENTUM™ ALTRX® Dual Mobility Polyethylene Liner, a DePuy femoral stem with a polished neck and a DePuy modular, femoral head. The dual mobility liner is a CoCr device that forms a modular connection with the acetabular shell and serves an articular surface for the polyethylene liner. PINNACLE® Dual Mobility Metal Liners and Porous-coated PINNACLE® Acetabular Cups are intended for cementless applications. All Subjects will receive a PINNACLE® Dual Mobility metal liner and a BI-MENTUM™ ALTRX® Dual Mobility Polyethylene Liner in this study.

4.4 Benefits/Risks

4.4.1 Benefits

The primary goal of total hip arthroplasty is the anatomic reconstruction of the hip joint, resulting in favorable prosthetic joint load and function. Mechanically, the goals are to create a stable articulation with an optimized range of motion, restore biomechanics for muscular efficiency and equalize limb lengths.

4.4.2 Risks

As specified in the Instructions For Use (IFU-0902-00-898 and IFU-78410403 included in the implant packaging), the following are generally the most frequently encountered adverse events and complications in total hip arthroplasty, including the study devices:

GENERAL

- Change in position of the prosthetic components
- Early or late loosening of the prosthetic components
- Fatigue fracture of the femoral stem
- Excessive wear or fracture of the bearing components
- Early or late infection
- Peripheral neuropathies. Subclinical nerve damage may also occur as a result of surgical trauma
- Tissue reactions, osteolysis, and/or implant loosening caused by metallic corrosion, allergic reactions, wear or particulate debris
- Pain

INTRAOPERATIVE

- Acetabular fracture
- Femoral shaft perforation, fissure or fracture, which may require the use of internal fixation
- Trochanteric fracture
- Damage to blood vessels
- Temporary or permanent nerve damage
- Subluxation or dislocation of the hip joint due to implant size or configuration selection, positioning of components and /or muscle and fibrous tissue laxity
- Lengthening or shortening of the affected extremity
- Breakage or chipping of the ceramic femoral head

EARLY POSTOPERATIVE

- Cardiovascular disorders including venous thrombosis, pulmonary embolism and myocardial infarction
- Hematoma and/or delayed wound healing
- Subluxation or dislocation

LATE POSTOPERATIVE

- Trochanteric avulsion from excessive muscular tension, weight-bearing, or inadvertent intraoperative weakening of the trochanter
- Aggravation of problems in the ipsilateral or contralateral knee and ankle joints due to leg length discrepancy, femoral medialization and/or muscular deficiencies.

- Femoral or acetabular fracture due to trauma or excessive loading particularly in the presence of poor bone stock caused by severe osteoporosis, bone defects from previous surgery, intraoperative reaming procedures, or bone resorption.
- Bone resorption which may contribute to the deterioration of fixation and eventual loosening of the implant
- Periarticular calcification or ossification which may lead to a decrease in joint mobility and range of motion
- Traumatic arthrosis of the ipsilateral knee secondary to intraoperative positioning of the extremity during surgery
- Subluxation or dislocation

5 PURPOSE

5.1 Primary Objective and Endpoint

The primary objective is to establish the mean superior cup migration of the PINNACLE® Dual Mobility Construct using model-based RSA over the first two years post-implantation. The primary endpoint is the mean vertical subsidence (Y translation, also known as superior cup migration) at 2 years as measured with RSA. Additionally, the data from this study will be compared to historical PINNACLE® data obtained in study DSJ_2018_02.

5.2 Secondary Objectives and Endpoints

Secondary objectives are:

- To establish the subsidence profile of the PINNACLE® Dual Mobility construct; this will be accomplished by determining the mean subsidence at 3 months, 6 months and 1 year as measured with RSA. This endpoint will be compared to historical PINNACLE® data.
- Other RSA measurements (X and Z translations in mm, X, Y, and Z rotations in degrees, and maximal total point motion in mm) at all time points. These endpoints will be compared to historical PINNACLE® data.
- Linear head penetration (in mm) at 6 weeks, 1 year and 2 years. This endpoint will be compared to historical PINNACLE® data.
- Functional and health status will be measured with Harris Hip Score, HOOS Jr. and Forgotten Joint Score (FJS-12) at baseline and 3 months, 6 months and 1 and 2 years post-operative. These endpoints will be compared to historical PINNACLE® data.

5.3 Exploratory Objectives and Endpoints

The following will be summarized as exploratory analyses:

- Subsidence for subset of Subjects where RSA data was obtained prior to discharge. This endpoint will be compared to historical PINNACLE® data.
- Analyses to examine the correlation of functional and health status outcomes vs. RSA observations may be explored. This endpoint will be compared to historical PINNACLE® data.
- Incidence of intraprosthetic dislocation (IPD)
- Incidence of intraoperative complications

5.4 Safety Endpoints

The type and frequency of serious, non-serious, and device or procedure related Adverse Events across all study intervals will be summarized.

5.5 Device Description

The PINNACLE® Dual Mobility Metal Liner and BI-MENTUM™ ALTRX® Dual Mobility Polyethylene Liner are commercially available in Canada. All PINNACLE® Acetabular Cups, DePuy femoral stems and DePuy modular, femoral heads used in this clinical investigation are commercially available. The PINNACLE® Dual Mobility Metal Liner and Porous-coated PINNACLE Acetabular Cups are intended for cementless applications. Please refer to Table 1 below for implant compatibility. The part numbers allowed by this protocol are listed in Appendix A.

PINNACLE® Acetabular Shell
The shells are designed to assemble with the PINNACLE® Dual Mobility metal liner insert.

PINNACLE® Dual Mobility Metal Liner
The dual mobility liner is a CoCr device that forms a modular connection with the acetabular shell and serves an articular surface for the polyethylene liner.

BI-MENTUM™ ALTRX® Polyethylene Liner
The liner is attached to the femoral head and then the liner/head construct is impacted onto the femoral stem. The BI-MENTUM™ ALTRX® Polyethylene Liner is then reduced into the dual mobility liner.

DePuy Femoral Head
Ceramic and metal heads are allowed for this clinical investigation. The inner diameter of the polyethylene liner bearing surface must correspond to the femoral head size. **Please note the Biolox Delta TS femoral head +12 is not intended for use with dual mobility liners.**

DePuy Femoral Stem
A variety of femoral stems may be used in this investigation, however, only those stems with polished necks are indicated for use with the PINNACLE® Dual Mobility construct. Please refer to Table 1 below for a listing and Appendix A for implant part codes.

Table 1. Implants compatible with the PINNACLE® Dual Mobility Liner

Device	Features
PINNACLE® acetabular shells (primary and revision)	**Size** Primary:48-66mm: Revision 54-72mm **Accessories** screws
Bi-MENTUM™ ALTRX®polyethylene (PE) liners	**Size** 22.225mm head diameter: ø 41-45 28mm head diameter: ø 47-55
12/14 Femoral heads	• M-Spec Metal Heads: 28mm • Standard Metal Heads: 22.225mm, 28mm • Delta Heads: 28mm • Delta TS Heads: 28mm
Femoral stems (polished)	• Corail AMT Stems • Corail Cemented Stems • Corail Revision Stems • C-Stem AMT Stems • Actis Stems • SUMMIT Porous Stems • SUMMIT Porous HA Stems • SUMMIT Cemented Stems • Reclaim Stems • Tri-lock BPS Stems

6 SUBJECT DEFINITION

This study will include male and female Subjects, aged 21 or older, who are undergoing primary, unilateral THA, revision and who may have, in the opinion of the Investigator, a risk of dislocation in the operative joint. Subjects who do not meet all inclusion criteria or who meet any of the exclusion criteria will be excluded from study consideration and participation. Subjects who meet all entry criteria and are properly consented may be excluded from further participation due to study withdrawal, see Section 10 for details.

6.1 Inclusion Criteria

Subjects meeting all the following specific criteria will be considered for participation in the study:

1. Individuals requiring THA for:
    a. a severely painful and/or disabled joint (typically due to non-inflammatory degenerative joint disease).
    b. failed previous hip surgery.
    c. or dislocation risks.
2. Individuals who are able to speak, read and comprehend the informed patient consent document and willing and able to provide informed patient consent for participation in the study and have authorized the transfer of his/her information to DePuy Synthes.
3. Individuals who are willing and able to return for follow-up as specified by the study protocol.
4. Individuals who are a minimum age of 21 years at the time of consent.
5. Individuals who are willing and able to complete the Subject Hip Outcomes questionnaires as specified by the study protocol.

6.2 Exclusion Criteria

Subjects will be excluded from participation in the study if they meet any of the following criteria:

1. Individuals have active local or systemic infection.
2. Individuals who have loss of musculature, neuromuscular compromise or vascular deficiency in the affected limb rendering the procedure unjustified.
3. Individuals with poor bone quality, such as osteoporosis, where in the surgeon's opinion, there could be considerable migration of the prosthesis or a significant chance of bone fracture and/or the lack of adequate bone to support the implant(s).
4. Individuals with Charcot's or Paget's disease.
5. Individuals who, in the judgement of the investigator, would not be a candidate for protocol allowable components to be used for their THA.
6. Women who are pregnant or lactating.
7. Individuals who have had a contralateral hip that was implanted less than 6 months prior to the time of consent into this study or individuals that expect to have a contralateral hip implanted in the 6 months following the time of consent into this study.
8. Individuals that have amputations in either leg that would impact rehabilitation following surgery.
9. Individuals who are bedridden per the Investigators determination
10. Individuals that have participated in a clinical investigation with an investigational product (drug or device) in the last three months.
11. Individuals currently involved in any personal injury litigation, medical-legal or worker's compensation claims.

12. Individuals, in the opinion of the Investigator, who are drug or alcohol abusers or have a psychological disorder that could affect their ability to complete patient reported questionnaires or be compliant with follow-up requirements.
13. Individuals diagnosed and taking prescription medications to treat a muscular disorder that limits mobility due to sever stiffness and pain such as fibromyalgia or polymyalgia.
14. Subject has a medical condition with less than 2 years life expectancy.
15. Individual has a BMI $\geq$45 kg/m^2.
16. Individuals who require revision arthroplasty and have a well-fixed non-DePuy Synthes femoral stem or a well-fixed DePuy Synthes femoral stem that does not have a polished neck

6.3 Definition of Subject Enrollment

A patient will be considered enrolled when they have provided signed Informed Consent Document (ICD) to participate in this Investigation, which includes authorization of the release of his/her Protected Health Information (PHI).

7 STUDY DESIGN

This study is designed as a prospective, multi-center, non-randomized, non-controlled study. This study does not limit the surgical approach involved in the treatment of the Subject as long as the protocol specified products are utilized.

7.1 Subject Enrollment

A minimum of 30, and up to 45, Subjects will be enrolled at 3 Investigational sites. No protocol specified activities can be completed until written Informed Consent is obtained for a Subject. Standard of care radiographs that have been taken prior to consent may be used for the purposes of the protocol as long as they were taken within 270 days of surgery.

7.2 Subject Screening and Informed Consent

As patients are being scheduled for primary or revision unilateral THA, the Principal Investigator or a trained designee at each of the sites will conduct a preliminary screen to determine if the patient meets general requirements for the study. If a patient appears to be eligible, delegated staff will offer study participation to those patients. Having explained the study purpose to the Subject, the Investigator or trained designee shall offer to answer any of the Subject's questions and confirm the Subject understands the following points of the study:

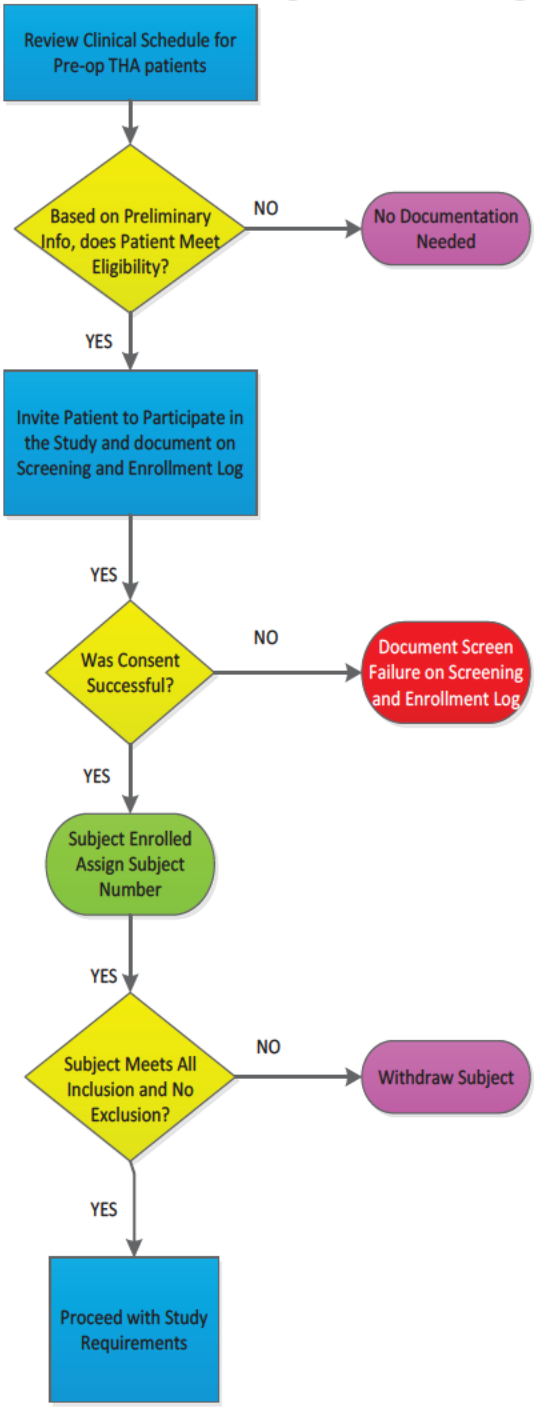
- The purpose of the study
- The potential risks or adverse events that are posed by their treatment
- The potential risks or adverse events related to study participation
- Possibility of failure and the need for subsequent treatment(s)
- Alternative procedures/treatments available to the Subject
- Requirements of the study including rehabilitation and follow-up visits
- All the Subject's rights as a participant in the clinical investigation

If the Subject then agrees to participate, his or her willingness must be documented via his/her name, signature and date on the REB's approved ICD and this document countersigned and dated by the person taking consent. The signed ICD will then be placed into the Subject's Medical Record, or study file. Screening, consenting and enrollment are illustrated in Figure 7-1.

The Principal Investigator is responsible for ensuring that no Subject will be included in the study without adequate informed consent. Failure to obtain and properly document this process is in violation of applicable regulations, the Declaration of Helsinki and this study protocol. All ICDs must have approval by the responsible REB. Consent of a Subject needs to come from the Subject themselves and be documented on an ICD.

After Informed Consent, study Subjects will be defined as 'enrolled'. Each enrolled Subject will be assigned a unique Subject identification number by the database. Each Subject will be identified by site or surgeon number (e.g. 01, 02) followed by -001 for the first Subject, -002 for the second Subject and so on. Together the site/surgeon number and the Subject number will comprise the unique Subject ID. This unique identifier will be recorded in the Subject's ICD, medical record and the Screening and Enrollment Log.

Figure 7-1 Screening and Enrollment Process



8 STUDY PROCEDURES

8.1 Pre-Operative (-90 days to Day of Surgery)

Following informed consent and eligibility verification, the Subject will have the following pre-operative health and functional status evaluations:

The Subject's orthopaedic medical history and current diagnoses will be documented. Data collected will include but is not be limited to:

- Age, gender, height and weight
- History of concurrent or previous medical issues
- History of previous treatment to the index hip
- Harris Hip Score
- HOOS Jr.
- Radiographs
    - AP Femur*
    - Lateral

*The AP Femur is the preferred view at all time points; however, an AP Pelvis will also be accepted.

The information collected from the 'Pre-Op' visit will be populated on the appropriate eCRFs as indicated in the Time and Events Table (Section 3.2). If pre-operative radiographs of sufficient quality were obtained within 270 days of surgery, then they do not need to be repeated just for the purpose of this study.

8.2 Operative (Day 0)

Each Subject will receive a DePuy femoral stem with a polished neck in combination with a DePuy PINNACLE® acetabular cup. All Subjects will receive a PINNACLE® DM metal liner and a BI-MENTUM™ ALTRX® Dual Mobility Polyethylene Liner. Either metal or ceramic heads may be used; however, compatibilities must align with product labeling. Please note since revisions of existing THAs are acceptable to enroll into this study, variations in what is implanted will occur, however Subjects must receive the PINNACLE® DM metal liner and a BI-MENTUM™ ALTRX® Dual Mobility Polyethylene Liner. If the surgeon determines intraoperatively that there exists insufficient bone quality to support the implantation of the construct that Subject will be withdrawn from the study. Subjects that are withdrawn pre-operatively or intra-operatively will be replaced in order to have a minimum of 30 and up to 45 Subjects implanted with the study devices.

Each surgeon shall perform the surgical approach they are most comfortable with and have the greatest expertise.

Implant sizing shall be performed as per the surgeon's discretion for each individual Subject and will not be standardized between sites. Approximately 5-10 tantalum beads will be placed into the

acetabulum. Bead placement will be standardized across study sites to reduce the possibility of un-useable RSA exams resulting from poor bead spacing or bead occlusion.

Any intra-operative adverse events will be captured as well as details of the surgery and implants/components used. The information collected from the 'Operative' time-point will be populated on the appropriate eCRFs as indicated in the Time and Events Table (Section 3.2).

8.3 Prior to Discharge (Day 1 to Discharge)

Subjects will undergo the standard of care for total hip arthroplasty at the participating sites, including bandaging, anti-coagulation, antibiotic and/or physiotherapy protocols. Device and procedure-related adverse events will be collected.

For clinical sites with the ability to perform immediate post-operative RSA exams, Subjects at these sites will undergo a model-based RSA examination prior to discharge from the hospital. RSA radiographs shall be obtained with Subjects in a supine position. A duplicate RSA exam will be conducted at this time to calculate intra-Subject measurement error.

The information collected from the 'Prior to Discharge' time-point will be populated on the appropriate eCRFs as indicated in the Time and Events Table (Section 3.2).

8.4 6 Weeks (Day 28-56)

All Subjects will undergo a model-based RSA examination. For all sites, the 6-week exam will be used as the reference examination. RSA radiographs will be obtained with Subjects in a supine position. If not performed earlier, a duplicate RSA exam will be conducted at this time-point to calculate the intra-Subject measurement error.

Additionally, the Subject will have the following health and functional status evaluations:

- Harris Hip Score; ROM optional
- Hip Evaluation
- HOOS Jr.
- Forgotten Joint Score
- Adverse Events (if applicable)
- Radiographs
    - AP Femur
    - Lateral

The information collected from the '6 Week' visit will be populated on the appropriate eCRFs as indicated in the Time and Events Table (Section 3.2).

8.5 3 Month, 6 Month, 1 Year and 2 Year Visits

The Subject will have the following health and functional status evaluations:

- Harris Hip Score
- Hip Evaluation
- HOOS Jr.
- Forgotten Joint Score
- Adverse Events (if applicable)
- Radiographs
    - AP Femur
    - Lateral
- RSA Exam (supine position)

The information collected from these visits will be populated on the appropriate eCRFs as indicated in the Time and Events Table (Section 3.2).

8.6 Unscheduled Visit

An unscheduled visit is to be documented on an Unscheduled Visit eCRF/CRF when:

1. A Subject returns for an additional visit during a study visit interval as described in **Table 3.2 - Time and Events**.
2. A Subject returns between study visit intervals

If a Subject requires an additional visit during a study interval, and is seen by one or more persons listed on the Delegation of Authority Log, then the following information shall be repeated:

- Harris Hip Score
- Hip Evaluation
- HOOS Jr.
- Forgotten Joint Score
- Adverse Events (if applicable)

If a Subject has an unscheduled visit after the 6 week interval (outside defined protocol window), with one or more persons listed on the Delegation of Authority Log then the following information shall be collected:

- Harris Hip Score
- Hip Evaluation
- HOOS Jr.
- Forgotten Joint Score

- Adverse Events (if applicable)
- Radiographs
    - AP Femur
    - Lateral
- RSA Exam (supine position) if RSA Exam was not conducted in-window for previous visit. If Subject is seen multiple times outside of the same defined protocol window, only one RSA Exam is required.

8.7 Radiostereometric Analysis (RSA)

The RSA analysis will be the responsibility of the Canadian RSA Network. In summary, model based RSA software (RSAcore, Leiden, Netherlands) will be used for analysis, employing computer-models of the DePuy Synthes implants and inserted beads representing the bone rigid body. A central analysis service will be employed to analyze anonymized radiographs in a standard manner. DePuy Synthes will provide production CAD models as required for this analysis.

Three-dimensional migration measurements will be made of the acetabular shell relative to the bone beads. The 6-week examination will be used as reference against which the 3-month, 6-month, 1-year and 2-year post-operative exams will be compared. Results obtained from the model based RSA software will be changes from the 6-week (baseline) examination and will report the following at 3 months, 6 months, 1 year and 2 years:

- X, Y and Z translation measurements in mm from baseline;
- X, Y and Z rotation measurements in degrees from baseline;
- Maximal total point motion (one measurement in mm of maximal migration).

In a subgroup of Subjects, a second baseline will be defined as the result collected prior to discharge. For these Subjects, the translation, rotation and maximal total point motion will be reported at 6 weeks, 3 months, 6 months, 1 year and 2 years. This sub-analysis will determine the approximate magnitude of migration that occurs between the time of surgery and 6-weeks post-operative. Three-dimensional migration of the PINNACLE® Acetabular Shell shall be determined from the software.

Linear head penetration (in mm) will be performed by examining the change in distance between the center of the femoral head and the center of the acetabular shell between the 6-week (baseline) exam and the 1 year and 2 year exams. The femoral head center is determined by fitting a CAD sphere to the articular region of the femoral head (ignoring the trunnion area). The acetabular shell center is determined in a similar manner but also uses the silhouette of the cup face to determine its' center point.

9 ADVERSE EVENT REPORTING

9.1 Adverse Events

An Adverse Event is any untoward medical occurrence in a Subject, regardless if there is a relationship between the adverse event(s) and the study device(s).

At each evaluation of the Subject enrolled in a clinical investigation, the Investigator determines whether any adverse events (AE) have occurred and determines their relationship to the study devices or procedure. For the purposes of this study, only serious adverse events (see Section 9.2), device and/or procedure related adverse events will be reported to the Sponsor.

All non-serious reportable adverse events, study device malfunctions and other product issues must be recorded in the medical records and entered into electronic Case Report Forms (eCRFs) as soon as possible but no later than two weeks after awareness of the AE having occurred. Upon entry of an AE into the eCRF, designated members of the DePuy Synthes clinical team will receive an email alert describing the AE.

9.2 Serious Adverse Events

Serious Adverse Events (SAEs) are defined as any adverse event that:

1. Led to a death,
2. Led to a serious deterioration in the health of the Subject that,
   a. Resulted in life-threatening illness or injury,
   b. Resulted in permanent impairment of a body structure or a body function,
   c. Required in-patient hospitalization or prolongation of existing hospitalization
   d. Resulted in medical or surgical intervention to prevent life threatening illness or injury or permanent impairment to a body structure or a body function,
3. Led to fetal distress, fetal death or a congenital abnormality or birth defect
4. Led to chronic disease

A planned hospitalization and/or medical intervention for pre-existing conditions documented in the study records that have not changed in severity, or a procedure required by the protocol, without serious deterioration in health, is not considered to be a serious adverse event.

Investigator must submit to DePuy Synthes any SAEs occurring during the study as soon as possible, but within 72 hours, after becoming aware of the event and provide additional information if required by DePuy Synthes. All SAEs need to be followed until the event is resolved (with or without sequelae), additional information is located in Section 9.3. The Study Safety Lead of this study will decide if more follow-up information is needed (via electronic queries) in case the event is not resolved at study completion.

The Investigator notifies his/her REB of all SAEs as required by REB policy (and any additional information as required by REB).

9.3 Duration of Follow-up After Adverse Events

The Investigator should ensure that adequate medical care is provided to any Subject for any adverse events related to the study.

Only SAEs, device and/or procedure related Adverse Events will be collected for the purposes of this study. All device or procedure adverse events should be followed until the condition has resolved, or in the case of permanent impairment until the condition stabilizes and clinical outcome has been ascertained, or the study has been completed.

9.4 Reporting an Adverse Event

Adverse events are reported from the time of surgery until the Subject's study participation has ended (i.e. completion of study or withdrawal of consent). All reported AEs must be followed until the AE has resolved, stabilized, or the study has been completed. Any medical event, that if it had occurred post-operatively would be considered a serious adverse event, that occurs prior to surgery is to be reported as history on the Medical History eCRF.

The Investigator will record the nature, severity, treatment and outcome of the AE, and will determine its relationship to the investigational products or any protocol mandated procedures involved in the clinical study.

The determination whether the AE is related to the device and/or procedure will be based upon whether a causal relationship between the device and/or procedure and the AE is at least a reasonable possibility, i.e. the relationship cannot be ruled out. A causal relationship cannot be ruled out if, in the medical judgment of the Investigator, the effect follows a reasonable temporal association with the use of the device and/or is confirmed by the improvement of the effect upon discontinuation of the clinical use of the device, and/or the effect is not reasonably explained by the Subject's clinical state.

Relationship to study device or procedure should be rated as follows:

1) Not related (definitely not related): there is no relationship between study device and/or procedure and the event.

2) Possibly related (remote possibility, possibly, or probably related): the relationship between study device and/or procedure could exist if there is no contradicting evidence that can reasonably explain the Subject's condition.

3) Definitely related (definitely related): the relationship between study device and/or procedure and event does exist and is confirmed upon further investigation by the Investigator.

The following categories of adverse event severity are to be used:

Mild	Awareness of sign or symptom that does not interfere with the Subject's usual activity or is transient, resolved without treatment and with no sequelae,
Moderate	Interferes, but does not hinder, the Subject's usual activity and may require treatment,
Severe	Symptom(s) causing severe discomfort and significant impact on the Subject's usual activity and requires treatment or intervention.

For all serious and device/procedure-related adverse events, the Investigator is responsible for determining whether the adverse events are anticipated or unanticipated. This determination is based on whether the severity, type and frequency of the adverse event is consistent with the Instructions for Use (IFU) in the opinion of the Investigator.

Adverse events will be reported by the Investigator to DePuy Synthes via the Adverse Events eCRF.

NOTE: Please refer to Appendix B (Anticipated Adverse Events) where a listing of common surgical adverse events is listed. These adverse events are anticipated and assuming the events are consistent with the normal postoperative course, then they do not have to be reported as adverse events.

10 EARLY DISCONTINUATION

10.1 Reasons for Early Discontinuation

Possible reasons for early discontinuation may include, but are not limited to the following:

- Withdrawal of consent: Subject decides to withdraw from the study. This decision must be an "independent decision" that is documented in the patient study files;
- Adverse event: Adverse event or serious adverse event may not lead to Subject discontinuation from the study. If the Investigator decides to discontinue further study related procedures, the Subject must still be followed until the adverse event resolves or until a stable clinical endpoint is reached, or the Subject withdraws consent (i.e., the Subject will continue to be followed for safety);
- Revision of any component;
- Death, and/or
- Early study termination: DePuy Synthes can decide to discontinue the study prematurely for various reasons.

10.2 Subject Early Discontinuation

Every Subject should be encouraged to remain in the study until they have completed the protocol-required 2-year follow-up period. If the Subject discontinues prematurely from the study, the reason for discontinuation must be documented in the source documents and site files and submitted via eCRF.

Data which have been received on Subjects who discontinue prematurely will be included in the analysis of results. Subjects who discontinue prematurely, excluding those withdrawn pre-operatively, intra-operatively or those Subjects who were unable to complete their 6 week visit due to the COVID-19 Pandemic, will not be replaced.

10.3 Study Early Discontinuation

DePuy Synthes reserves the right to temporarily suspend or prematurely discontinue this study either at a single site, multiple sites, or at all sites at any time for reasons including, but not limited

to, safety or ethical issues, inaccurate or incomplete data recording, non-compliance, or unsatisfactory enrollment with respect to quality or quantity.

If the study is prematurely terminated or suspended, DePuy Synthes or its representatives will inform the Investigators/institutions of the termination or suspension and the reason(s) for the termination or suspension, in accordance with applicable regulatory requirement(s). The REB should also be informed and provided with reason(s) for the termination or suspension by DePuy Synthes or by the Investigator/institution, as specified by the applicable regulatory requirement(s). In addition, arrangements will be made for the return of all study material in accordance with Sponsor procedure for the study.

11 STATISTICAL METHODOLOGY

The following sections provide a general description of the statistical plan for the analysis of study data. A separate Statistical Analysis Plan (SAP) document that provides greater detail on data derivations and the analyses to be performed will be finalized prior to database lock. The SAP will reflect the protocol and any amendments that have been implemented at the time the SAP is finalized. Any deviations from the final SAP will be noted in the final clinical summary report.

11.1 Study Design

This is a prospective, multi-center, non-randomized, non-controlled study designed to establish the 2-year migration profile of the PINNACLE® DM Construct.

11.2 Treatment Assignment

Subjects enrolled will undergo THA using the study devices listed in Section 5.5.

11.3 Randomization and Blinding Procedures

Not applicable.

11.4 Interval Windows

Data collected throughout the study will be assessed for compliance with the protocol-specified visit schedule. Six windows are defined based on the number of days prior to or after surgery, Day 0. Visits conducted within the intervals shown in Table 11-1 will be assessed for compliance with the protocol. If multiple visits fall into the pre-operative window, or into the 6 Week post-operative window, the result collected most proximate to surgery will be utilized. If multiple measurements fall into the 3 Month, 6 Month, 1 Year, or 2 Year window, the last value (furthest from surgery) will be utilized for the analysis. All safety data will be included in the Safety analysis.

Table 11-1 Study Visit Interval Windows per Time and Events Table

Study Visit	Study Interval Window (days)
Pre-Op	-90 to DOS*
Operative	0
Prior to Discharge	Day 1 to Discharge
6 Weeks	28 to 56

3 Months	60 to 120
6 Months	135 to 225
1 Year	275 to 455
2 Years	640 to 820

* For radiographs Pre-Op study film window is from -270 days to date of surgery (DOS).

11.5 Analysis Sets

Safety Analysis Set

The Safety Analysis Set consists of all enrolled Subjects who receive THA surgery. Subjects will be analyzed according to the surgical approach applied during of the study.

Per Protocol (PP) Analysis Set

The Per Protocol (PP) Analysis Set will be a subset of Safety Set Subjects who have no major protocol violations that exclude them from analyses, and who have a baseline RSA exam and at least one post-baseline RSA exam. Subjects will be analyzed according to the actual treatment (surgical approach) received during of the study.

11.6 Primary and Secondary Endpoints and Associated Hypotheses

There are no hypotheses associated with the primary or secondary endpoints; endpoints appear below.

11.6.1 Primary Endpoint

The primary endpoint is the RSA-measured mean superior cup migration (Y translation in mm) at 2 years.

11.6.2 Secondary Endpoints

The secondary endpoints are the following:

- RSA measured subsidence (superior cup migration) at 3 months, 6 months and 1 year.
- Other RSA measurements (X and Z translations in mm, X, Y, and Z rotations in degrees, and maximal total point motion in mm) at all time points
- Linear head penetration at 6 weeks, 1 year and 2 years;
- Harris Hip Score at 6 weeks, 3 months, 6 months, 1 year and 2 years;
- HOOS Jr. at 6 weeks, 3 months, 6 months, 1 year and 2 years;
- Forgotten Joint Score (FJS-12) at 6 weeks, 3 months, 6 months, 1 year and 2 years.

11.6.3 Exploratory Endpoints

The following will be summarized as exploratory analyses:

- Mean subsidence for the subset of Subjects where RSA data was obtained prior to discharge at 6 Weeks, 3 months, 6 months and 1 year and 2 years;
- Correlation of functional and health status outcomes (Harris Hip Score, HOOS Jr, and FJS-12) vs. RSA observations may be explored.
- Incidence of intraprosthetic dislocation (IPD)
- Incidence of intraoperative complications

11.7 Levels of Significance

There are no specific hypotheses being tested in this study. To facilitate clinical interpretation, confidence intervals will accompany primary and secondary endpoint estimates and will be 2-sided 95% confidence intervals; these confidence intervals are considered to be exploratory.

11.8 Sample Size Justification

This study sample size was established to provide adequate precision on the mean subsidence estimate at 2 years. A common standard deviation of 0.2 mm is anticipated. Based upon this standard deviation and a sample size of N=30, a 2-sided 95% confidence interval is anticipated to have a margin of error equal to approximately $2\text{SE} = 2 \times \frac{\text{SD}}{\sqrt{n}} = 2 \times \frac{0.2}{\sqrt{30}} = 0.073$ mm. This margin of error was deemed to be an adequate level of precision by the Sponsor.

11.9 General Conventions

All statistical analysis will be performed using SAS® Version 9.3 or higher, unless otherwise noted. A separate Statistical Analysis Plan (SAP) will provide detail on data derivations and the analyses to be performed for the final study report. It will be approved prior to database lock.

Descriptive statistics for continuous variables will include the number of Subjects with an observation, mean, standard deviation (SD), median, minimum, and maximum. Descriptive statistics for dichotomous/categorical variables will include the count and percentage of Subjects in each category.

Unless specifically stated otherwise, all endpoints will be analyzed by surgical approach and overall, pooling all surgical approaches.

11.10 Disposition of Study Subjects

An overall summary of the number of Subjects in each analysis set (Safety and Per Protocol) who had major protocol deviations, who withdrew before study completion, and who completed the study will be tabulated for all surgical approaches combined.

A patient accounting table to present the number of Subjects in the Safety Analysis Set at each visit interval will be summarized: theoretical due, deaths, withdrawn, and expected due in the interval.

11.11 Demographic and Baseline Characteristics

Descriptive statistics summarizing demographics and baseline characteristics will be displayed for both the Safety Analysis Set and the Per Protocol Analysis Set. These summaries will include, but are not limited to, age, gender, BMI, general medical conditions, Harris Hip Score, Hoos Jr. and Forgotten Joint Score.

11.12 Primary, Secondary, and Safety Endpoint Analyses

11.12.1 Primary Endpoint Analysis

RSA Measured Subsidence at 2 years

The primary endpoint of RSA measured subsidence (Y translation, also known as superior cup migration) results in the 2-year visit window will be summarized on the subset of Subjects in the Per Protocol Analysis Set (primary analysis) who have 6 week and 2 year data for the analysis. The analysis will also be conducted on the subset of Subjects in the Safety Analysis Set (supportive analysis) who have 6 week and 2 year data for the analysis. Standard continuous summaries will be provided along with 95% confidence intervals.

11.12.2 Secondary Endpoint Analysis

RSA Measured Subsidence at 3 months, 6 months and 1 year

The analysis for this secondary endpoint will be identical to the analyses described for the primary endpoint except conducted on the results in the 3 month, 6 month, and 1 year visit windows, respectively, using the Per Protocol Analysis Set and the Safety Set.

Linear Head Penetration at 6 weeks, 1 year and 2 years

Linear head penetration will be assessed at 6 weeks, 1 year and 2 years. Results within each visit window will be summarized and changes from baseline will be provided using the Per Protocol Analysis Set.

Harris Hip Score at 6 weeks, 3 months, 6 months, 1 year and 2 years

Harris hip scores are assessed at the Pre-Op visit and at 6 weeks, 3 months, 6 months, 1 year and 2 years. Results within each visit window will be summarized and changes from baseline will be provided using the Per Protocol Analysis Set. Standard continuous summaries will be supplemented with 95% confidence intervals. The ROM at 6 weeks is considered optional; the score will be missing for Subjects for whom ROM was not performed.

HOOS Jr. Score at 6 weeks, 3 months, 6 months, 1 year and 2 years

HOOS Jr. Score are assessed at the Pre-Op visit and at 6 weeks, 3 months, 6 months, 1 year and 2 years. Results within each visit window will be summarized and changes from baseline will be provided using the Per Protocol Analysis Set. Standard continuous summaries will be supplemented with 95% confidence intervals.

Forgotten Joint Score (FJS-12)

FJS-12 are assessed at the 6 week visit and at 3 months, 6 months, 1 year and 2 years. Results within each visit window will be summarized and changes from baseline will be provided using the Per Protocol Analysis Set. Standard continuous summaries will be supplemented with 95% confidence intervals.

11.12.3 Exploratory Endpoint Analysis

Exploratory analyses will include the following:

- Summaries of RSA measured subsidence at 6 Weeks, 3 months, 6 months and 1 year and 2 years will be conducted on the subset of Subjects where RSA data was obtained prior to discharge.
- Correlation of functional and health status outcomes (Harris Hip Score, HOOS Jr, and FJS-12) vs. RSA observations may be explored.
- Summaries of incidence of intraprosthetic dislocation
- Summaries of incidence of intraoperative complications

11.12.4 Comparisons to Historical PINNACLE® Data

All primary, secondary, and exploratory endpoints will be compared to their counterparts in the DSJ_2018_02 (PINNACLE® RSA) study for the visits at which those endpoints are assessed using the t-test if the endpoint is continuous or Fisher's exact if the endpoint is categorical. The mean difference (PINNACLE® – PINNACLE® DM), the 2-sided 95% confidence interval for the difference, and the p-value for the test of equality will be presented. There are no formal hypotheses associated with those tests and the p-values and confidence intervals are only presented to facilitate clinical judgment.

11.13 Safety Endpoint Analysis

Adverse Events will be coded according to the Medical Dictionary for Regulatory Activities (MedDRA) version 21.1. Analyses will be conducted for all Subjects in the Safety Analysis Set.

An overall summary of the AE incidence will be presented and will include the number and percentage of Subjects having one or more:

- Serious adverse event (SAE)
- Device related AEs
- Procedure related AEs
- Withdrawals due to AE
- Deaths

The number (%) of Subjects with adverse events will be presented by MedDRA system organ class (SOC) and preferred term (PT) for all device related AEs, procedure related AEs and SAEs. A Subject-level listing will be provided to display details of all reported AEs.

11.14 Plans for Interim Analysis

There are no formal interim analyses that are designed to potentially stop or change the study design. A planned interim summary analysis will take place after all Subjects have completed the 1

year visit in order to support regulatory submissions and give product development an understanding of acetabular cup subsidence that might be expected for future product development purposes.

11.15 Handling of Missing Data

Only Subject data which is collected in the study will be utilized in analyses; there will be no imputation of missing data.

12 STUDY MANAGEMENT AND ADMINISTRATION

12.1 Investigator Responsibilities

In conducting this clinical study, the Investigator is responsible for:

- Ensuring that the clinical study is conducted according to the Declaration of Helsinki, applicable local regulations, the clinical study agreement and the protocol;
- Protecting the rights, safety and welfare of Subjects under the Investigator's care; and
- Ensuring the integrity of the data.

Prior to the initiation of this clinical study at each site, the responsible Principal Investigator will approve this protocol by signing the signature page. This signature confirms that the clinical study will be performed in compliance with the protocol.

12.2 Good Clinical Practice

The study will be conducted in accordance with the GCP and the appropriate regulatory requirement(s). The Investigator will be thoroughly familiar with the appropriate use of the study device as described in the Instructions for Use. Essential clinical documents will be maintained to demonstrate the validity of the study and the integrity of the data collected. The Investigator Site files should be established at the beginning of the study, maintained for the duration of the study and retained according to the appropriate regulations.

12.3 Ethical Considerations

The study will be conducted in accordance with ethical principles founded in the Declaration of Helsinki. The REB will review all appropriate study documentation in order to safeguard the rights, safety, and well-being of the Subjects. The study will only be conducted at sites where initial and annual REB approval has been obtained. In addition, a copy of the REB approval letter must be filed on site in the Investigator's study files.

The protocol, Instructions for Use, ICD, advertisements (if applicable), written information given to the Subjects, safety updates (per local policy), annual progress reports (per local policy), and any revisions to these documents will be provided to the REB by the Investigator. When applicable, amendments to the protocol will be submitted for REB review before implementation.

12.4 Subject Information and Informed Consent

After the study has been fully explained, written informed consent will be obtained from either the Subject or his/her guardian or legal representative prior to study participation. The method of obtaining and documenting the informed consent and the contents of the consent will comply with GCP and all applicable regulatory requirement(s), which at a minimum include:

- The most current, approved ICD is completed by the Subject prior to the start of study specific procedures;
- The Subject personally signed and dated the ICD;
- The investigator or designated study personnel has also signed and dated the ICD;
- The Subject's source describes the consent process, including date, by whom, that the Subject had an opportunity to ask questions, and that they were offered a copy of their signed ICD; and
- The signed ICD(s) are retained by the investigator and are available for inspection.

12.5 Subject Confidentiality

In order to maintain Subject privacy, all eCRFs, study device accountability records, study reports and communications will identify the Subject by the assigned Subject number. The Investigator will grant monitor(s) and auditor(s) from the Sponsor or its designee and regulatory authority(ies) access to the Subject's original medical records for verification of data gathered on the eCRFs and to audit the data collection process. The Subject's confidentiality will be maintained and will not be made publicly available to the extent permitted by the applicable laws and regulations.

12.6 Direct Access to Source Data

The study will be monitored by DePuy Synthes or its designee. Monitoring procedures and frequency will be conducted throughout the course of the study according to the Clinical Monitoring Plan. Qualified site personnel are expected to meet with the clinical monitor to resolve queries and review action items at any onsite monitoring visits. During any monitoring visit the Sponsor and authorized Sponsor representatives shall be given access to all study records, including the medical records.

12.7 Case Report Form Completion

An electronic data capture system, compliant to applicable regulations, will be used to collect data from this study.

eCRFs will be completed for each study Subject. It is the Investigator's responsibility to ensure the accuracy, completeness, and timeliness of the data reported in the Subject's eCRF. Source documentation supporting the eCRF data should indicate the Subject's participation in the study and should document the dates and details of study procedures, adverse events, and Subject status. The Investigator, or designated representative, should complete the eCRF pages as soon as possible after information is collected, preferably on the same day that a study Subject is seen for an examination, treatment, or any other study procedure. Any outstanding entries must be completed immediately after the final examination. An explanation should be given for all missing data.

12.8 Record Retention

The Investigator will maintain all study records according to GCP and applicable regulatory requirement(s). Records will be retained for at least 2 years after the completion of the clinical study, according to site procedures or according to applicable regulatory requirement(s) (whichever is longest). If the Investigator withdraws from the responsibility of keeping the study records, custody must be transferred to a person willing to accept the responsibility. The Sponsor must be notified in writing if a custodial change occurs.

Study documentation includes, but is not limited to, the following:

- Source data/medical records, informed consents and completed Patient Reported Outcome tools
- Correspondence with the REB, DePuy Synthes, the site monitor, or other Investigators
- Study protocol and any amendments issued
- Protocol and Informed Consent approvals from the REB

12.9 Investigator agreements and curricula vitae of Investigator(s), Delegation Log, and Investigator Reports

The Investigator(s) is required to complete the following reports:

1. Withdrawal of REB Approval – Notification must be sent to the Sponsor within 5 working days
2. Protocol Deviations –Any departures from the protocol must be fully documented in the eCRF and source documentation and reported to the EC/REB per local policy.
3. Progress Reports – Annual progress reports must be forwarded to the REB and the Sponsor
4. Final Report – A final report/closure submission must be filed with the REB and the Sponsor within 3 months of the Investigator's completion of study site closure.
5. Principal Investigator(s) may delegate a qualified associate(s) to complete study responsibilities. However, the Principal Investigator retains the overall responsibility for Subject safety and proper conduct of the study.

13 SPONSOR OBLIGATIONS

13.1 Investigator(s) Training

DePuy Synthes will select only Investigator(s) with extensive experience in THA. The protocol will be reviewed with the Investigator(s) and their study personnel at the Site Initiation Visit. Furthermore, they will be instructed on how to complete the study documentation.

14 RESEARCH ETHICS BOARDS AND REGULATORY REQUIREMENTS

14.1 REBs

The protocol, informed consent form and other applicable study-related documents must be submitted to the appropriate REB and written approval must be obtained and submitted to DePuy Synthes prior to enrolling any Subjects.

14.2 Protocol Amendments

As appropriate, DePuy Synthes will submit changes in the protocol to the investigators and the appropriate regulatory authorities. REB approval is required for all substantial amendments prior to implementation of any changes to study procedures.

An amendment is regarded substantial when they are likely to have a significant impact on:

- The safety or physical or mental integrity of the Subjects;
- Scientific value of the trial;
- Conduct or management of the trial;
- Quality or safety of an investigational medical product used in the trial.

14.3 Protocol Deviations

A protocol deviation is defined as a divergence from a specific element of a protocol (e.g., missed test or procedure, visit out of window, non-adherence to inclusion/exclusion criteria, improper informed consent process) or other GCP requirements.

Investigators may not deviate from the protocol except where necessary to protect the life or physical well-being of a Subject in an emergency.

Any deviations shall be reported to DePuy Synthes regardless of whether medically justifiable or taken to protect the Subject in an emergency. Subject specific deviations will be reported in the eCRFs. Investigators will also adhere to procedures for reporting study deviations to their REB in accordance with their specific REB reporting policies and procedures.

15 PUBLICATION POLICY

At the conclusion of the study, a multicenter manuscript will be prepared for publication in a reputable scientific journal. The publication of the principal results from any single-site experience within the study is not allowed until the preparation and publication of the multi-center results. Exceptions to this rule require the prior approval of DePuy Synthes. The analysis of other pre-specified and non-pre-specified endpoints will be performed by Data Management. Such secondary analyses, as well as other proposed investigations, will require the approval of DePuy Synthes. For purposes of timely abstract presentation and publication, secondary publications will be delegated to the appropriate principal authors, and final analyses and manuscript review for all multi-center data will require the approval of DePuy Synthes.

16 Appendix A

Part Codes

PINNACLE™ DM Metal Liners		
Liner Size (mm)	ID mm	Product Code
48/41	35	1218-48-041
50/43	37	1218-50-043
52/45	39	1218-52-045
54/47	41	1218-54-047
56/49	43	1218-56-049
58/49	43	1218-58-049
60/51	45	1218-60-051
62/53	47	1218-62-053
64/53	47	1218-64-053
66/55	49	1218-66-055
BI-MENTUM ALTRX® Polyethylene Liners		
Liner Size (mm)	OD mm	Product Code
22 × 41	35	1221-22-041
22 × 43	37	1221-22-043
22 × 45	39	1221-22-045
28 × 47	41	1221-28-047
28 × 49	43	1221-28-049
28 × 51	45	1221-28-051

28 × 53	47	1221-28-053
28 × 55	49	1221-28-055

Description – Femoral Stems		Size	Finished Good Number
C-Stem AMT	C-Stem AMT STD	1	157004070
		2	157004085
		3	157004090
		4	157004100
		5	157004110
		6	157004120
		7	157004135
		8	157004150
	C-Stem AMT HO	1	157014070
		2	157014085
		3	157014090
		4	157014100
		5	157014110
		6	157014120
		7	157014135
		8	157014150
	C-stem AMT Long HO	2	157024085
		3	157024086
	C-stem AMT Long STD	2	157024087
		3	157024088
	C-stem AMT XL205 STD	3	157024089
	C-stem AMT ASIAN	1A	157024091
		2A	157024092
		3A	157024093
	C-stem AMT XL240 STD	3	157024094
	C-stem AMT CDH	CDH	157024095
Corail AMT	Corail Collared STD Stems	8	3L92498
		9	3L92499
		10	3L92500
		11	3L92501
		12	3L92502

		13	3L92503
		14	3L92504
		15	3L92505
		16	3L92506
		18	3L92508
		20	3L92521
	Dysplasia Collarless	6	L20106
	Corail Collarless STD Stems	8	3L92507
		9	3L92509
		10	3L92510
		11	3L92511
		12	3L92512
		13	3L92513
		14	3L92514
		15	3L92515
		16	3L92516
		18	3L92518
		20	3L92520
	Corail Coxa Vara (135)	9	3L93709
		10	3L93710
		11	3L93711
		12	3L93712
		13	3L93713
		14	3L93714
		15	3L93715
		16	3L93716
		18	3L93718
		20	3L93720
	Corail Collarless High Offset	9	L20309
		10	L20310
		11	L20311
		12	L20312
		13	L20313
		14	L20314
		15	L20315
		16	L20316
		18	L20318
		20	L20320

Corail AMT 135 Low Offset Collarless Referred to as Standard in SERF report	7	L981307
	8	L981308
	9	L981309
	10	L981310
	11	L981311
	12	L981312
	13	L981313
	14	L981314
	15	L981315
	16	L981316
Corail AMT 125 Standard Collarless	7	L981207
	8	L981208
	9	L981209
	10	L981210
	11	L981211
	12	L981212
	13	L981213
	14	L981214
	15	L981215
	16	L981216
Corail AMT 135 Low Offset Collared. Referred to as Standard in SERF report	7	L971307
	8	L971308
	9	L971309
	10	L971310
	11	L971311
	12	L971312
	13	L971313
	14	L971314
	15	L971315
	16	L971316
Corail AMT 125 Standard Collared	7	L971207
	8	L971208
	9	L971209
	10	L971210
	11	L971211
	12	L971212
	13	L971213
	14	L971214
	15	L971215

		16	L971216
	Corail AMT 135 High Offset Collared	9	L971109
		10	L971110
		11	L971111
		12	L971112
		13	L971113
		14	L971114
		15	L971115
		16	L971116
		18	L971118
		20	L971120
	Corail AMT 125 High Offset Collarless	9	L971009
		10	L971010
		11	L971011
		12	L971012
		13	L971013
		14	L971014
		15	L971015
		16	L971016
		18	L971018
		20	L971020
Corail cemented	Corail Cemented Stems Standard	8	L96408
		9	L96409
		10	L96410
		11	L96411
		12	L96412
		13	L96413
		14	L96414
		15	L96415
		16	L96416
		18	L96418
		20	L96420
	Corail Cemented Stems High Offset	9	L96509
		10	L96510
		11	L96511
		12	L96512
		13	L96513
		14	L96514
		15	L96515

		16	L96516
		18	L96518
		20	L96520
Corail Revision	Corail Revision Stems Standard	10	L98010
		11	L98011
		12	L98012
		13	L98013
		14	L98014
		15	L98015
		16	L98016
		18	L98018
		20	L98020
	Corail Revision Stems High Offset	10	L98110
		11	L98111
		12	L98112
		13	L98113
		14	L98114
		15	L98115
		16	L98116
		18	L98118
		20	L98120
ACTIS	Actis Standard	0	101011005
		1	101011010
		2	101011020
		3	101011030
		4	101011040
		5	101011050
		6	101011060
		7	101011070
		8	101011080
		9	101011090
		10	101011100
		11	101011110
		12	101011120
	Actis Collared High Offset	0	101012005
		1	101012010
		2	101012020
		3	101012030
		4	101012040

		5	101012050
		6	101012060
		7	101012070
		8	101012080
		9	101012090
		10	101012100
		11	101012110
		12	101012120
TRI-LOCK	TRI-LOCK BPS Standard	0	101204005
		1	101204010
		2	101204020
		3	101204030
		4	101204040
		5	101204050
		6	101204060
		7	101204070
		8	101204080
		9	101204090
		10	101204100
		11	101204110
		12	101204120
	TRI-LOCK BPS High Offset	0	101214005
		1	101214010
		2	101214020
		3	101214030
		4	101214040
		5	101214050
		6	101214060
		7	101214070
		8	101214080
		9	101214090
		10	101214100
		11	101214110
		12	101214120
RECLAIM	Proximal bodies	20x75	197520075
		20x85	197520085
		20x95	197520095
		20x105	197520105
		24x75	197524075

		24x85	197524085
		24x95	197524095
		24x105	197524105
		28x75	197528075
		28x85	197528085
		28x95	197528095
		28x105	197528105
SUMMIT	Summit Porous Standard	1	157001070
		2	157001080
		3	157001090
		4	157001100
		5	157001110
		6	157001120
		7	157001135
		8	157001150
		9	157001165
		10	157001180
	Summit Porous HA Standard	1	157002070
		2	157002080
		3	157002090
		4	157002100
		5	157002110
		6	157002120
		7	157002135
		8	157002150
		9	157002165
		10	157002180
	Summit Porous High Offset	1	157011070
		2	157011080
		3	157011090
		4	157011100
		5	157011110
		6	157011120
		7	157011135
		8	157011150
		9	157011165
		10	157011180
	Summit HA High Offset	1	157012070
		2	157012080

		3	157012090
		4	157012100
		5	157012110
		6	157012120
		7	157012135
		8	157012150
		9	157012165
		10	157012180
	Summit Cemented Standard	2	157003080
		3	157003090
		4	157003100
		5	157003110
		6	157003120
		7	157003135
		8	157003150
	Summit Cemented High Offset	3	157013090
		4	157013100
		5	157013110
		6	157013120
		7	157013135
		8	157013150
	Summit Cemented Long Stem	4x180	157008410
		4x230	157008415
		5x180	157008510
		5x230	157008515
		5x280	157008520
		7x280	157008720

PINNACLE Primary Cups

	100 Series			Sector			Multihole		300
	POROCOAT	GRIPTION	DUOFIX	POROCOAT	GRIPTION	DUOFIX	POROCOAT	GRIPTION	POROCOAT
48 mm	1217-01-048	1217-31-048	1217-11-048	1217-22-048	1217-32-048	1217-12-048	1217-20-048	1217-30-048	1217-03-048
50 mm	1217-01-050	1217-31-050	1217-11-050	1217-22-050	1217-32-050	1217-12-050	1217-20-050	1217-30-050	1217-03-050
52 mm	1217-01-052	1217-31-052	1217-11-052	1217-22-052	1217-32-052	1217-12-052	1217-20-052	1217-30-052	1217-03-052
54 mm	1217-01-054	1217-31-054	1217-11-054	1217-22-054	1217-32-054	1217-12-054	1217-20-054	1217-30-054	1217-03-054
56 mm	1217-01-056	1217-31-056	1217-11-056	1217-22-056	1217-32-056	1217-12-056	1217-20-056	1217-30-056	1217-03-056
58 mm	1217-01-058	1217-31-058	1217-11-058	1217-22-058	1217-32-058	1217-12-058	1217-20-058	1217-30-058	1217-03-058
60 mm	1217-01-060	1217-31-060	1217-11-060	1217-22-060	1217-32-060	1217-12-060	1217-20-060	1217-30-060	1217-03-060
62 mm	1217-01-062	1217-31-062	1217-11-062	1217-22-062	1217-32-062	1217-12-062	1217-20-062	1217-30-062	1217-03-062
64 mm	1217-01-064	1217-31-064	1217-11-064	1217-22-064	1217-32-064	1217-12-064	1217-20-064	1217-30-064	1217-03-064
66 mm	1217-01-066	1217-31-066	1217-11-066	1217-22-066	1217-32-066	1217-12-066	1217-20-066	1217-30-066	1217-03-066

PINNACLE Revision Cups

	Standard Profile	Deep Profile DPX
	GRIPTION	GRIPTION
54 mm	1217-16-054	1217-17-054
56 mm	1217-16-056	1217-17-056
58 mm	1217-16-058	1217-17-058
60 mm	1217-16-060	1217-17-060
62 mm	1217-16-062	1217-17-062
64 mm	1217-16-064	1217-17-064
66 mm	1217-16-066	1217-17-066
68 mm	1217-16-068	1217-17-068
70 mm	1217-16-070	1217-17-070
72 mm	1217-16-072	1217-17-072

Compatible femoral heads	Description			Finished Good Number
	Brand	Diameter	Head Offset	
Std ARTICUL/EZE FEMORAL HEAD 12/14 TAPER	ARTICULEZE	22.225mm	+4	1365-29-000
	ARTICULEZE	22.225mm	+7	1365-30-000
	ARTICULEZE	28mm	+1.5	1365-11-000
	ARTICULEZE	28mm	+5	1365-12-000
	ARTICULEZE	28mm	+8.5	1365-13-000
	ARTICULEZE	28mm	+12	1365-14-000
M-Spec ARTICUL/EZE MOM FEMORAL HEAD 12/14 TAPER	ARTICULEZE M	28mm	+1.5	1365-11-500
	ARTICULEZE M	28mm	+5	1365-12-500
	ARTICULEZE M	28mm	+8.5	1365-13-500
BIOLOX DELTA CERAMIC FEMORAL HEAD 12/14 TAPER	DELTA CERAMIC	28mm	+1.5	1365-28-310
	DELTA CERAMIC	28mm	+5	1365-28-320
	DELTA CERAMIC	28mm	+8.5	1365-28-330
BIOLOX DELTA TS CERAMIC FEMORAL HEAD REVISION 12/14	DELTA TS CERAMIC	28mm	+1.5	1365-28-710
	DELTA TS CERAMIC	28mm	+5	1365-28-720
	DELTA TS CERAMIC	28mm	+8.5	1365-28-730
BIOLOX forte (Alumina) ARTICUL/EZE CER BALL	ARTICULEZE CERAMIC	28mm	+1.5	1365-73-000
	ARTICULEZE CERAMIC	28mm	+5	1365-74-000

17 Appendix B

Anticipated Adverse Events

In addition to the information provided in the Instructions for Use, included with the packaging for all implants, the following surgical adverse events are anticipated. **Assuming the following events are consistent with the normal postoperative course, then they do not have to be reported as Adverse Events.**

UP TO 24 HOURS POSTOPERATIVE	
Genitourinary	• Urinary retention
Cardiovascular	• Hypotension, not requiring treatment • Hypertension, not requiring treatment • Dysrhythmia (resolving within 36 hours post-op)
Central Nervous System	• Incisional pain • Post-op consequences of narcotics use • Fatigue
Integumentary	• Venous congestion without thrombosis (foot swelling alleviated with lower limb is raised)

PRIOR TO DISCHARGE	
Hematological	• Changes in lab values not resulting in clinical symptomatology (Electrolytes, CBC, BS, PT/PTT) • Anemia, not requiring treatment
Gastrointestinal	• Transitory: • Nausea • Vomiting • Constipation • Diarrhea
Central Nervous System	• Headache • Disorientation • Confusion • Dizziness • Incision/operative site pain
Respiratory	• Atelectasis, not requiring treatment
Integumentary	• Foot swelling, not requiring intervention • Surgical site ecchymosis • Sanguineous/serosanguinous drainage from incision • Skin blisters secondary to tape/adhesive • Suture granuloma not involving cellulitis or deeper infection ('spitting suture', abscess suture)
Constitutional	• Elevated temperature (no greater than 101°F)

If you have any questions about potential adverse events (or reporting), please contact DePuy Synthes Clinical Research.