

CORAIL[®] HIP SYSTEM



SURGICAL TECHNIQUE

CORAIL[®]
HIP SYSTEM

THE SCIENCE OF SIMPLICITY

With 2,000,000 stems provided for patients worldwide¹ and thirty years of clinical history, the CORAIL® Total Hip System now has a very extensive experience with a hydroxyapatite (HA) coated stem.

Combining basic design features, including shape, surface finish and extensive hydroxyapatite coating, with a simple compaction broach-only surgical technique, the CORAIL Total Hip System has demonstrated reproducible results and long-term biomechanical joint restoration.

Advancing science, enhancements were made to the original CORAIL Hip to provide options for orthopaedic surgeons treating today's patients.

Enhancements to the CORAIL System include:

- Neck geometry designed for broad range of motion
- High offset option to treat increased femoral offset patients
- Coxa vara stem option to treat varus neck angled patients

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- 1 Three offset options aiming to restore hip biomechanics
- 2 Tapered neck geometry and ARTICUL/EZE® Hip Taper designed to increase range of motion
- 3 Low-profile lateral shoulder design enables easy insertion in reduced incision techniques, including the anterior approach
- 4 Available in collared or non-collared options
- 5 Step geometry is designed to convert hoop stresses to compressive loads
- 6 Vertical/horizontal grooves designed to provide rotational and axial stability
- 7 Proprietary HA coating

Simple Surgical Technique: Reproducible surgical results with minimal instrumentation, broach-only technique

Compaction Broaching Technique: Preservation of endosteal blood supply and cancellous bone structures

Dual Offset Options: Designed to accommodate a variety of patient anatomies to restore hip biomechanics

Thirty Years of Clinical History: Trust for the surgeon and for the patient

PREOPERATIVE PLANNING

The CORAIL Stem may be implanted using any of the contemporary less invasive approaches as well as the traditional surgical techniques for total hip arthroplasty. The goal of any technique selected is adequate visualization of both the acetabulum and the proximal femur so that a direct view down the femoral canal can be gained and the entire rim and depth of the acetabulum visualized.

Preoperative planning enables the surgeon to prepare for the case and anticipate situations that may arise during surgery. A thorough preoperative plan incorporates elements from the patient's history, physical examination and radiographic analysis.

Preoperative planning goals

1. Determine preoperative leg length discrepancy
2. Assess acetabular component size and placement
3. Determine femoral component, size, position and fit
4. Assess femoral offset

Radiographs

The first step in accurate templating is obtaining high-quality radiographs using a standardized protocol with known magnification. Use magnification markers attached to the patient leg at the level of the greater trochanter to verify magnification.

The CORAIL Total Hip System incorporates 20% magnification.

Obtain an anterior/posterior (A/P) view of the pelvis with both extremities in 15 degrees of internal rotation to position the head and neck parallel to the coronal plane. A direct lateral radiograph should also be obtained and used to determine femoral fixation.

Determination of leg length discrepancy

Perform a clinical evaluation in conjunction with a radiographic analysis to determine preoperative leg length discrepancy and use both to determine intraoperative leg length management.

To estimate leg length discrepancy radiographically, draw a reference line through the bottom of the ischium (Figure A). Measure the distance from the lesser trochanter landmark to the reference line on each side. The difference between the two is the radiographic leg length discrepancy. Clinical examination should help determine the actual leg length irregularity.

The tip of the greater trochanter may be used as an alternative reference mark in conjunction with the lines through the obturator foramina.

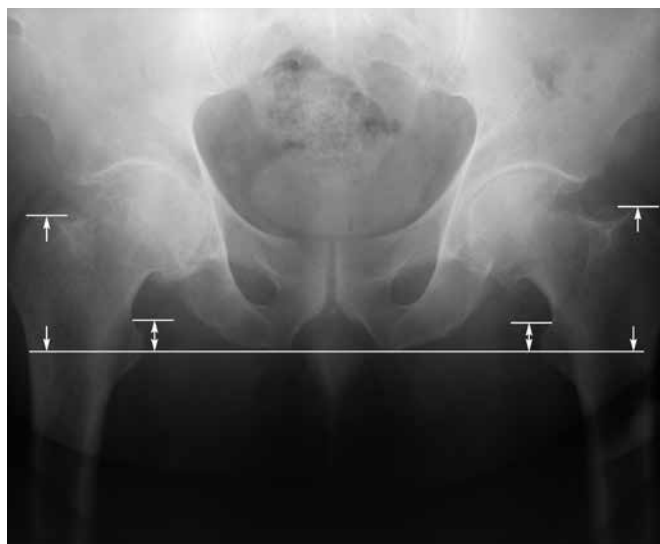


Figure A

Acetabular cup size and position

Most sizing determinations are made using the A/P radiograph of the hip. Determine the optimal position for the acetabular component and estimate the size using the PINNACLE® Acetabular Cup System template overlays. The acetabular teardrop can be referenced as the interior margin of the acetabular reconstruction.

The goal in cementless acetabular fixation is to optimize position and bone contact. Once this is determined, mark the intended center of rotation of the bearing surface on the A/P radiograph (Figure B).

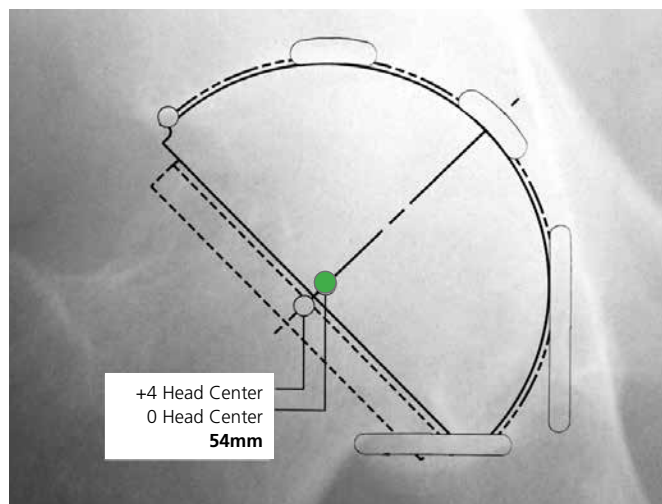


Figure B ● Cup center of rotation

Cementless femoral component selection

The CORAIL Stem is designed to seat in cancellous bone, and cortical contact should be avoided when templating. Select the appropriate template size that is smaller than the cortex in the proximal femur. The femoral template should be in line with the long axis of the femur and the neck resection line drawn at the point where the selected stem provides the desired amount of leg length.

The vertical distance between the planned center of rotation of the acetabular component and the center of rotation of the femoral head constitutes the distance the leg length will be adjusted.

The level of neck osteotomy depends on the stem size and the desired leg length, with the goal of using a non-skirted modular head to optimize range of motion prior to prosthetic impingement. To help properly position the template on the lateral radiograph, estimate the distance between the tip of the greater trochanter and the lateral shoulder of the prosthesis using the A/P radiograph (Figure C).

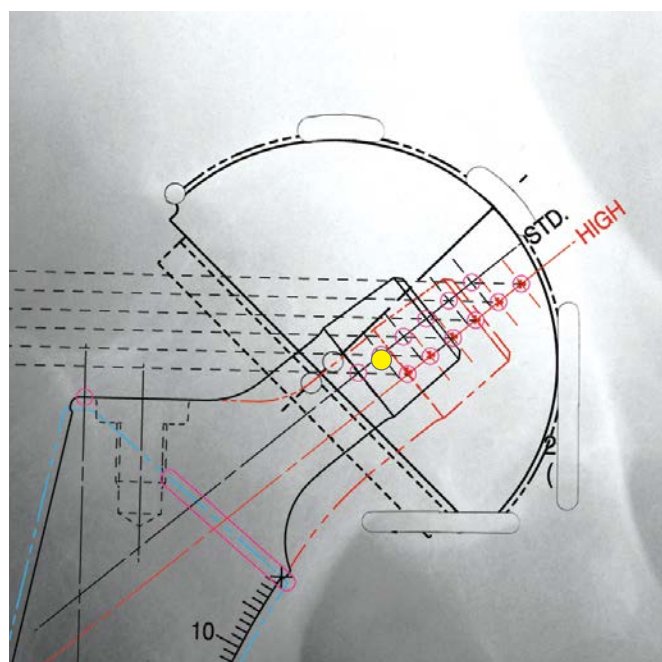


Figure C ● Head center of rotation

Verify that the stem size chosen in the A/P plane also fits in the lateral plane. The lateral radiograph of a properly sized CORAIL Implant will not exhibit cortical contact.

Offset requirements

The CORAIL Total Hip System implants are available with standard, high offset and varus options for all stem body sizes (except 6 and 8). Through templating and intraoperative trialing, determine which option restores proper offset by matching the cup's center of rotation with the desired head center of rotation (Figure E).

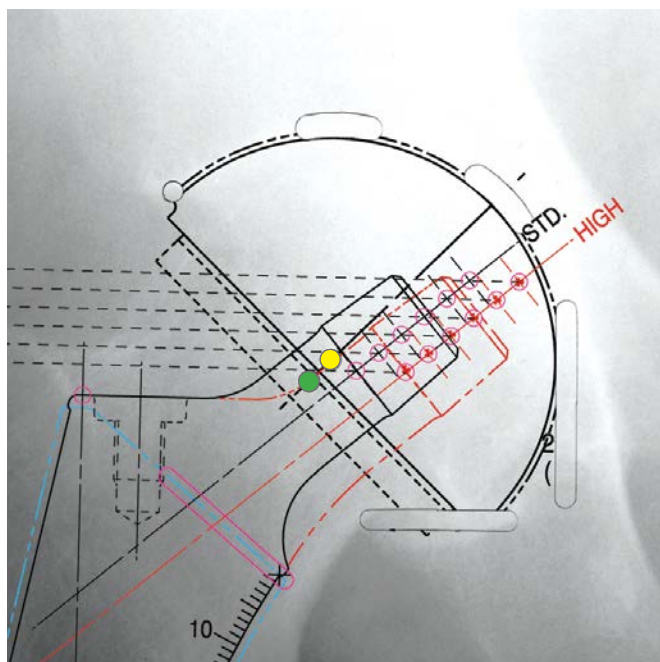


Figure E ● Head center of rotation
 ● Cup center of rotation

SURGICAL TECHNIQUE

1 Neck Osteotomy

The level of the neck resection is determined during preoperative templating. The cut will be approximately 1 cm above the lesser trochanter. Center the resection guide along the neutral axis of the femur and mark the resection line. Perform the osteotomy, taking care to maintain the correct angle (Figure 1).



Figure 1

2

Reaming and alignment

Make sure that the acetabulum is fully exposed and remove soft tissue from the acetabular rim.

Progressively ream the acetabulum until bleeding subchondral bone is reached and a hemispherical dome is achieved (Figure 2A).

Using the cup impactor, place a trial cup sizer into the reamed acetabulum and assess its position and cortical bone contact.

The inferior rim of the trial cup should typically be level with the bottom of the teardrop. The trial cup angle of orientation should match that recorded during preoperative templating, which is normally 40–45 degrees of lateral opening (abduction) and 15–20 degrees of anteversion. Confirm this using the external alignment instrumentation (Figures 2B and 2C).

Remove the cup impactor from the trial shell and place the desired liner trial into the cup trial.



Figure 2A

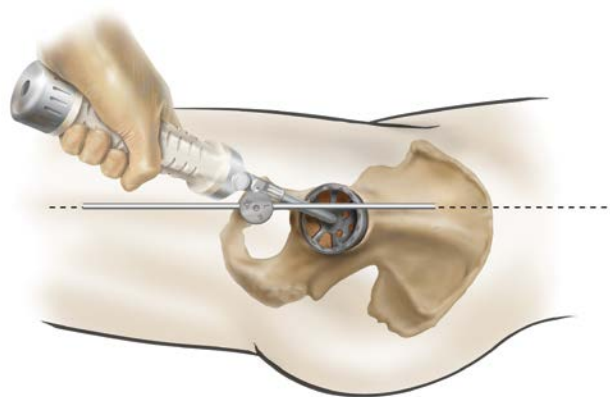


Figure 2B

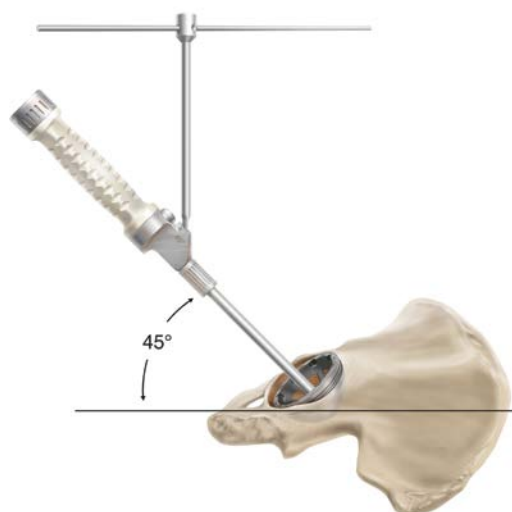


Figure 2C

3 Metaphyseal preparation

It is important to select a point of entry posterolaterally to the Piriformis Fossa to avoid varus positioning. Use a curette or general instrument to indicate the direction of the canal. To prevent under-sizing or varus positioning, the greater trochanter may be prepared with a Modular Box Osteotome to allow better insertion of the broaches and accomodate multiple approaches to the hip (Figure 3).

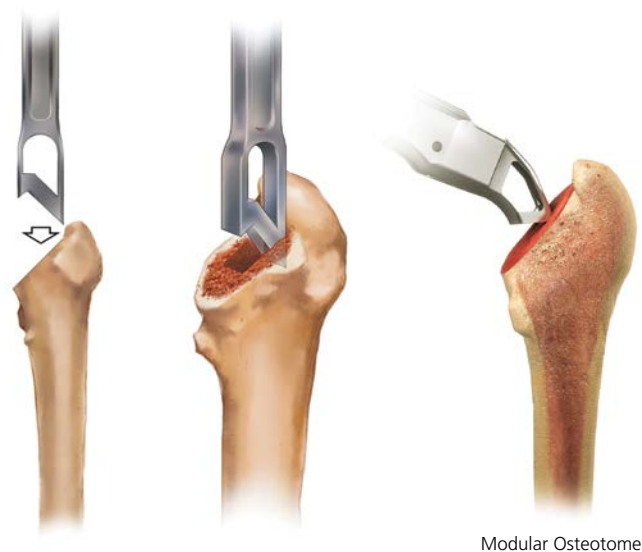


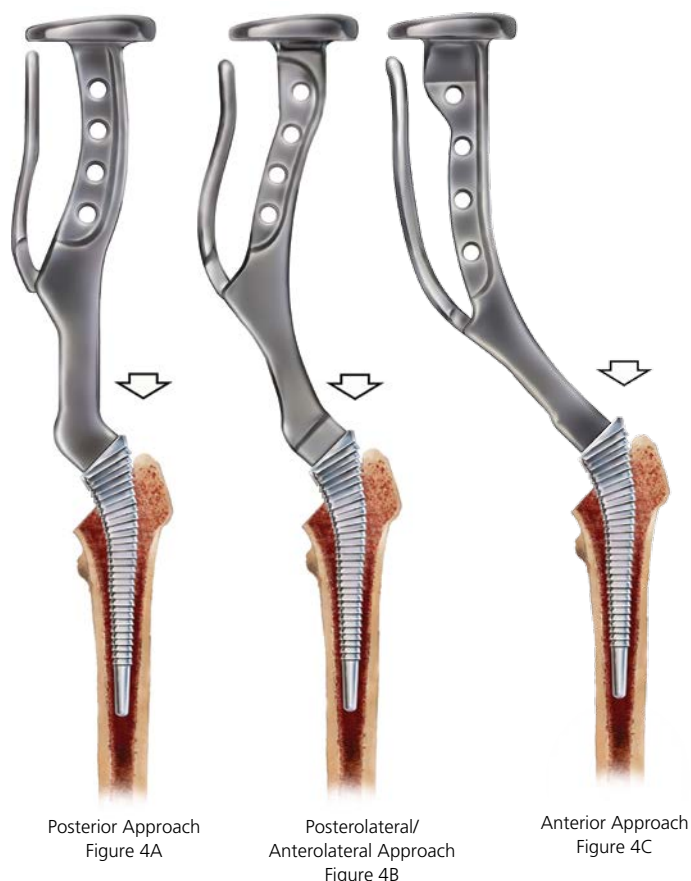
Figure 3

4 Femoral canal preparation

The CORAIL Broach is available with several broach handle options depending on the surgical approach (Figures 4A, 4B, 4C); dual-offset handle also available, but not shown. Select the appropriate handle for the surgical approach.

Beginning with the smallest CORAIL Compaction Broach attached to the selected broach handle, progressively enlarge the metaphyseal cavity by compacting and shaping the cancellous bone until the level of the neck resection is reached. Broaching should continue until complete stability is achieved with the last size broach used without reaching cortical contact in the femoral canal, ensuring cancellous bone preservation. The size of each broach is the same as the corresponding implant without HA (hydroxyapatite) coating (155 microns).

If you impact a broach and it does not fully seat in the canal, it is recommended to go back to the previous size broach and re-establish the broach envelope of cancellous bone to accept the smaller size implant. The CORAIL Implant's design allows you to go back to the smaller size.



5 Calcar Preparation

Place the calcar planer onto the broach stud and mill the calcar to the broach face, allowing the implant collar (if used) to seat flush against the calcar. Make certain the calcar planer is rotating before engaging calcar to prevent the planer from binding on the calcar.

6

Trial Reduction

Trial neck segments and trial modular heads are available to assess proper component position, joint stability, range-of-motion and leg length (Figures 5A, 5B and 5C). The CORAIL Hip is available in three stem options, a standard collarless/collared stem, a high offset collarless stem, and a coxa vara collared stem and offers the appropriate neck segment to match up with the stem option.

With the CORAIL Broach in situ, attach one of the three neck segment options. Perform a trial reduction with a +5 ARTICUL/EZE Head trial to allow for one up or down adjustment in neck length without using a skirted femoral head (see stem specifications chart in back of the technique for adjustment measurements). Reduce the hip and assess stability through a full range of motion, and check for impingement. Leg length and offset may be adjusted by varying the neck length with the appropriate femoral head. Alternatively, leg length may be reduced with a lower neck cut and advancing the broach or alternatively driving the broach and repeating the calcar milling.



Standard offset collarless/collared (KA/KS)
Figure 5A

High offset collarless (KHO)
Figure 5B



Coxa vara collared (KLA)
Figure 5C

7

Acetabular Shell Insertion

Remove the trial acetabular components and implant the desired acetabular shell (Figure 6). Take care to ensure cup orientation mimics the orientation of the trial component. Insert a trial liner into the shell implant.



Figure 6



8 Femoral Component Insertion

CORAIL Total Hip System implants can be inserted with either a threaded retaining inserter or a non-threaded inserter. Both inserters provide rotational control during stem implantation.

A new modular inserter system further enables multiple approaches (see ordering information).

Prior to using either inserter, the CORAIL Stem should be inserted by hand into the femoral canal with 1.5 to 2.0 cm of HA showing above the resection.

If the retaining inserter is chosen, verify that it is assembled with the inserter shaft threaded into the inserter handle (Figure 7A). Ensure the tines on the inserter are aligned with the recesses of the inserter platform on the top of the implant (Figure 7B). Fully engage the threads of the inserter into the implant to ensure the inserter is securely attached to the implant.

If the non-retaining inserter is chosen, introduce stem by hand into femoral canal (Figure 8A). Ensure the tines of the inserter are aligned with the recesses of the inserter platform on the top of the implant (Figure 8B).

With the taper protected by the cover, gently introduce the implant and impact it in the central axis of the femur, to the level of the HA coating (or the collar) (Figures 7C and 8C). With the prostheses in situ, remove the taper cover and add the trial head and acetabular trial liner to assess implant stability and leg length.

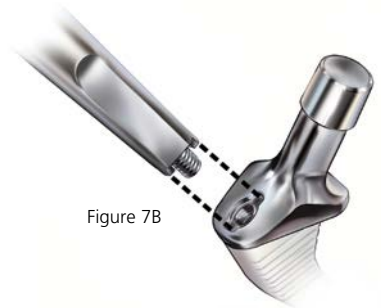


Figure 7B



Figure 7A



Figure 7C



Figure 8A



Figure 8B



Figure 8C

9

Acetabular Insert Implantation

Following the final trial reduction, remove the trial acetabular liner and insert the appropriate acetabular liner (Figure 9).



Figure 9

10

Femoral Head Impaction

Irrigate, clean and dry the prosthesis to ensure the taper is free of debris. Place the appropriate femoral head onto the taper and lightly tap using the head impactor before reducing the hip (Figure 10).



Figure 10



5 years post-op

CORAIL AMT STEM SPECIFICATIONS

135° STANDARD (STD) – COLLARLESS

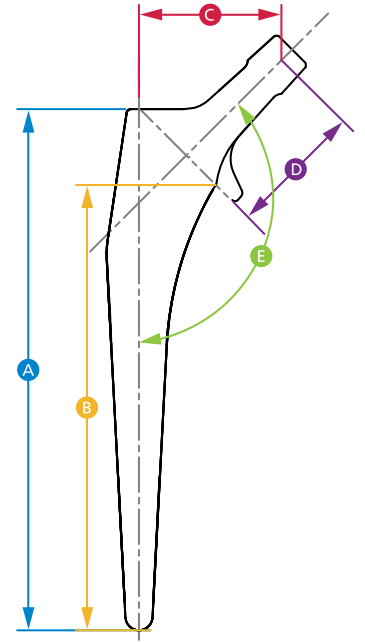
Size	Stem Length (mm) (A)	Stem Length (mm) (B)	Offset (mm) (C)	Neck Length (mm) (D)	Neck Shaft Angle (E)	Width (mm) (F)
8	115	93	38.3	39	135°	7
9	130	108	38.8	39	135°	8
10	140	118	39.5	39	135°	8
11	145	123	40.3	39	135°	9
12	150	128	41.0	39	135°	10
13	155	133	41.7	39	135°	10
14	160	138	42.3	39	135°	10
15	165	143	43.0	39	135°	10
16	170	148	43.8	39	135°	10
18	180	158	44.8	39	135°	11
20	190	168	45.8	39	135°	11

135° HIGH OFFSET (KHO) – COLLARLESS

Size	Stem Length (mm) (A)	Stem Length (mm) (B)	Offset (mm) (C)	Neck Length (mm) (D)	Neck Shaft Angle (E)	Width (mm) (F)
9	130	108	45.7	43	135°	8
10	140	118	46.4	43	135°	9
11	145	123	47.2	43	135°	9
12	150	128	47.9	43	135°	10
13	155	133	48.5	43	135°	10
14	160	138	49.2	43	135°	10
15	165	143	49.9	43	135°	10
16	170	148	50.7	43	135°	10
18	180	158	51.8	43	135°	11
20	190	168	52.9	43	135°	11

125° HIGH OFFSET (KLA)

Size	Stem Length (mm) (A)	Stem Length (mm) (B)	Offset (mm) (C)	Neck Length (mm) (D)	Neck Shaft Angle (E)	Width (mm) (F)
9	130	108	45.6	40	125	8
10	140	118	46.3	40	125	8
11	145	123	47.1	40	125	9
12	150	128	47.8	40	125	10
13	155	133	48.5	40	125	10
14	160	138	49.1	40	125	10
15	165	143	49.8	40	125	10
16	170	148	50.6	40	125	10
18	180	158	51.8	40	125	11
20	190	168	52.8	40	125	11



ORDERING INFORMATION

IMPLANTS

Standard Collarless (KS)

Cat. No.	Size
L20106	6†
3L92507	8
3L92509	9
3L92510	10
3L92511	11
3L92512	12
3L92513	13
3L92514	14
3L92515	15
3L92516	16
3L92518	18

Standard Collared (KA)

Cat. No.	Size
3L92498	8
3L92499	9
3L92500	10
3L92501	11
3L92502	12
3L92503	13
3L92504	14
3L92505	15
3L92506	16
3L92508	18
3L92521	20

High Offset Collarless (KHO)

Cat. No.	Size
L20309	9
L20310	10
L20311	11
L20312	12
L20313	13
L20314	14
L20315	15
L20316	16
L20318	18
L20320	20

Coxa Vara Collared (KLA)

Cat. No.	Size
3L93709	9
3L93710	10
3L93711	11
3L93712	12
3L93713	13
3L93714	14
3L93715	15
3L93716	16
3L93718	18

INSTRUMENTS

CORAIL AMT Broach Case

L20440	Neck Resection Guide
L20408	Broach Size 8
L20409	Broach Size 9
L20410	Broach Size 10
L20411	Broach Size 11
L20412	Broach Size 12
L20413	Broach Size 13
L20414	Broach Size 14
L20415	Broach Size 15
L20416	Broach Size 16
L20418	Broach Size 18
L20420	Broach Size 20
L20431	CORAIL Standard Offset Neck Segment (STD)
L20432	CORAIL Coxa Vara Neck Segment (KLA)
L20433	CORAIL High Offset Neck Segment (KHO)
9522-11-500	CORAIL AMT Curved Handle
9522-10-500F	CORAIL AMT Straight Broach Handle
9522-12-500F	CORAIL AMT Extra Curved Handle
2002-31-000	Anteversio Osteotome
2570-04-100	Calcar Planer-Small
2665-99-000	Broach Case Complete

CORAIL AMT Core Case Complete

2354-10-000	Canal Probe
53-0360	T-Handle
2598-07-570	Retaining Implant Inserter (2 pcs)
2570-05-100	Standard Implant Inserter
2001-65-000	Head Impactor
2530-81-000	28 mm Articul/eze +1.5 mm Trial Head
2530-82-000	28 mm Articul/eze +5.0 mm Trial Head
2530-83-000	28 mm Articul/eze +8.5 mm Trial Head
2530-84-000	28 mm Articul/eze +12.0 mm Trial Head
2530-85-000	28 mm Articul/eze +15.5 mm Trial Head
2665-99-003	Core Case Complete

X-Ray Templates

2665-01-500	Collarless X-Ray Template
2665-02-500	Collared X-Ray Template
2665-03-500	Size 6 X-Ray Template

† Note: For size 6 instrumentation and implant ordering information, see the CORAIL Size 6 surgical technique - DSUS/JRC/0216/1413, available from your DePuy Synthes Joint Reconstruction Sales Consultant.

Instruments

TSS Femoral Core Case 1

2598-07-400	Base
2598-07-411	Tray
2598-07-410	Lid
2800-88-511	SE Set (includes all instruments)
2598-07-460	Universal Stem Inserter Handle Trial Heads – 2 Sets per Case <i>Note: accommodates up through size 44 mm</i>
2598-07-570	Retaining Stem Inserter (2 pcs)
2598-07-530	Modular Box Osteotome

Any two of the below handles accommodated:

2570-00-000	SUMMIT® Universal Broach Handle
2598-07-540	Long Posterior Broach Handle
2598-07-550	Extra Curved Broach Handle
2598-07-350	Anterior Dual Offset Broach Handle – Left
2598-07-360	Anterior Dual Offset Broach Handle – Right
9522-10-500F	CORAIL AMT Straight Broach Handle
9522-11-500	CORAIL AMT Curved Broach Handle
2598-07-470	CORAIL/TRI-LOCK® Posterior Stem Inserter Shaft
2598-07-480	SUMMIT Posterior Stem Inserter Shaft
2598-07-435	Bullet Tip Stem Inserter Shaft
2598-07-430	Standard Straight Stem Inserter Shaft
2598-07-440	CORAIL/TRI-LOCK Anterior Stem Inserter Shaft
2598-07-450	SUMMIT Anterior Stem Inserter Shaft

TSS Femoral Core Case 2

2598-07-421	Base
2598-07-422	Lid
2800-88-512	SE Set (includes all instruments)
2354-10-000	Muller Awl Reamer with Hudson End
2001-42-000	T-Handle
2001-80-501	IM Initiator Sized
9400-80-007	Shielded Calcar Planer
85-3927	Femoral Rasp
9400-80-001	Canal Finder
2001-65-000	Femoral/Humeral Head Impactor
2001-66-000	Replacement Tip Femoral Head Impactor

**Additional Instruments Compatible
with CORAIL Hip System**

L93205	CORAIL Bone Impactor
L93606	Bone Tamp
257004500	MI Calcar Reamer Shaft
200147000	Calcar Mill Small
200148000	Calcar Mill Medium
200149000	Excel Calcar Mill Large

References

1. 1986 - 2015 sales data on file, DePuy International Ltd

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WARNING: In the USA, this product has labeling limitations. See package insert for complete information.

CAUTION: USA Law restricts these devices to sale by or on the order of a physician.

Not all products are currently available in all markets.



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