Surgical Technique

smith&nephew

R3◇

Acetabular System

Poly
Anteverted Liners

Design surgeon list

Smith & Nephew thanks the following surgeons for their participation as part of the R3◇ system design team:

Robert Barrack, MD
St. Louis, Missouri

Robert Bourne, MD
London Health Sciences Center
London, Ontario, Canada

Jonathan Garino, MD
University of Pennsylvania
School of Medicine
Philadelphia, Pennsylvania

Wayne M. Goldstein, MD
Clinical Professor of Orthopaedics
University of Illinois at Chicago
Illinois Bone and Joint Institute
Chicago, Illinois

Richard Kyle, MD
Minneapolis, Minnesota

Stephen J. McMahon, MB, BS, FRACS(Orth), FA(Orth)A
Senior Lecturer Monash University
Malabar Orthopaedic Clinic
Melbourne, Australia

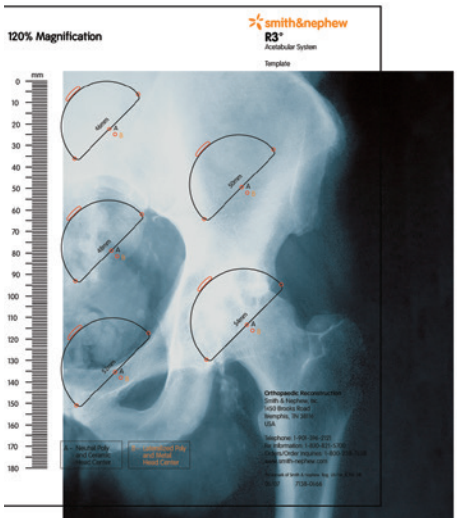
John L. Masonis, MD
OrthoCarolina
Hip & Knee Center
Charlotte, North Carolina

Henrik Malchau, MD
Associate Professor, Harvard Medical School
Co-Director, The Harris Orthopaedic Biomechanics
and Biomaterials Laboratory
Massachusetts General Hospital
Boston, Massachusetts

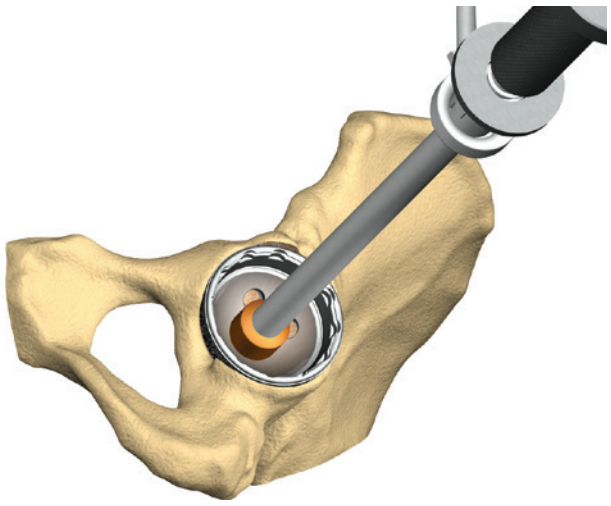
Michael Ries, MD
University of California
San Francisco, California

Cecil Rorabeck, MD
Professor of Orthopaedic Surgery
University of Western Ontario
London, Ontario, Canada

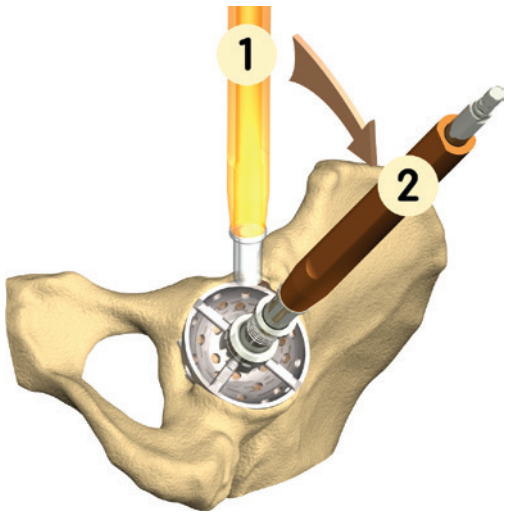
Short technique



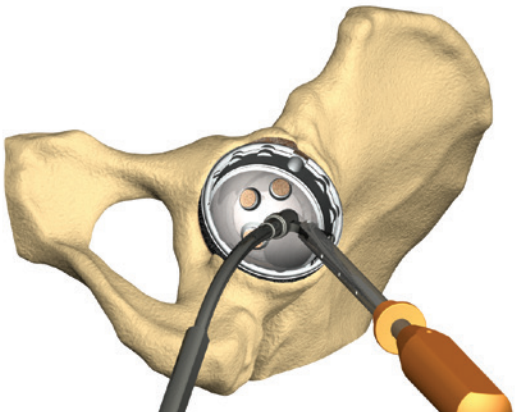
1. Preoperative planning



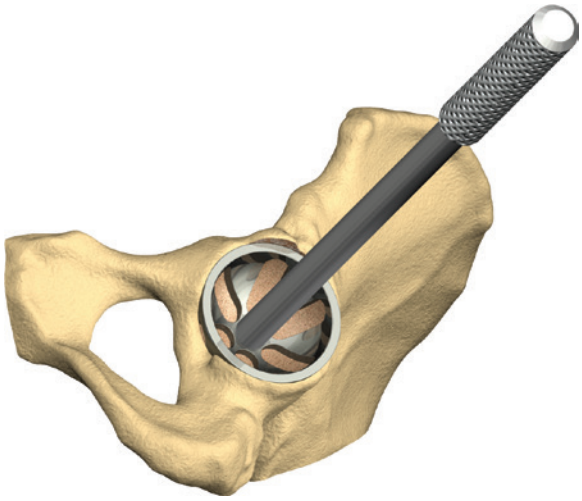
4.Shell insertion



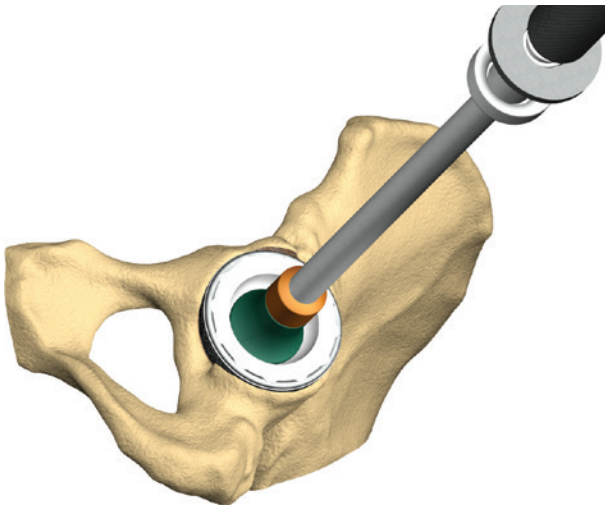
2.Acetabular reaming



5.Acetabular screw insertion



3.Acetabular trialing



6.Acetabular poly liner insertion

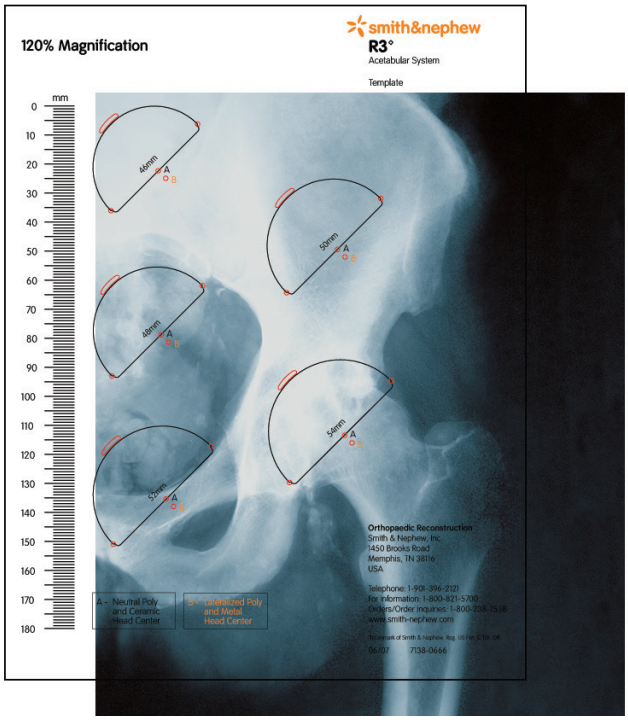
Preoperative planning

Preoperative X-Rays should include an A/P of the pelvis centered over the symphysis and an A/P and lateral of the affected hip.

Templating can be done on the affected side, but it is important that the contralateral hip also be templated to verify the size.

To ensure a congruent fit, the acetabular component should be medialized to the medial aspect of the acetabulum, as indicated by the teardrop.

The center of rotation also should be marked for subsequent reference.



Acetabular exposure

Complete exposure of the acetabulum is required, regardless of the type of approach. Use the approach with which you are most familiar and achieve the best surgical results.

First, resect the acetabular labrum and place a blunt retractor anteriorly.

After identifying the transverse acetabular ligament, place a blunt retractor around the inferior margin of the acetabulum.

Depending on the exposure, a third retractor can be placed posteriorly following the excision of the labrum.

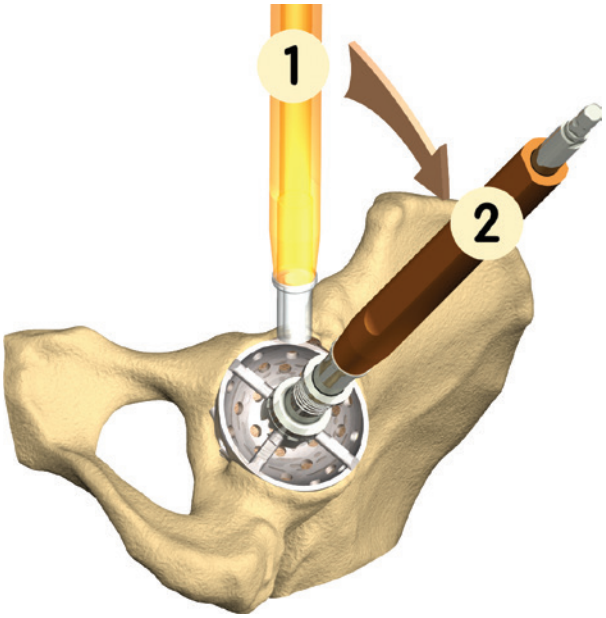
Remove all overhanging soft tissue and osteophytes in order to visualize the entire acetabular socket.

The acetabulum should be medialized to restore the normal center of hip rotation.

Surgical tips:

- To minimize the need of assistance, each of the acetabular retractors can be tied directly to a Charnley retractor.
- Dividing the transverse acetabular ligament will allow reaming to begin inferiorly, preventing the tendency of the reamer to migrate superiorly.
- Removal of soft tissue and overhanging osteophytes from the foveal notch aids visualization of the quadralateral plate and the depth that the acetabulum should be reamed.

Acetabular reaming



Select an acetabular reamer that is considerably smaller than the templated size of the cup. Generally, reaming 6-8mm lower than the templated size is suitable.

Position the initial reamer in a vertical direction (1) to ensure the reamer is taken down to the medial wall.

Direct the second reamer and all subsequent reamers in approximately 45° of abduction and 20° of anteversion for final position of the acetabular component (2).

Preserve subchondral bone to provide good support for the prosthesis. This might mean the reamer will not be medialized all the way to the inner wall. One might suggest leaving some remaining subchondral bone and removing the medial bone that is osteophyte and is covering fatty tissue.

Frequently palpate the posterior and anterior walls of the acetabulum during the reaming process as these walls will determine the largest acetabular size that can be accommodated. Avoid allowing the reamer to drift posteriorly where the bone might be less dense and the path of least resistance for the reamer.

To press-fit an R3◇ acetabular shell the acetabulum can either be under-reamed by 1mm or may be reamed line-to-line depending on the bone quality and size of the acetabulum.

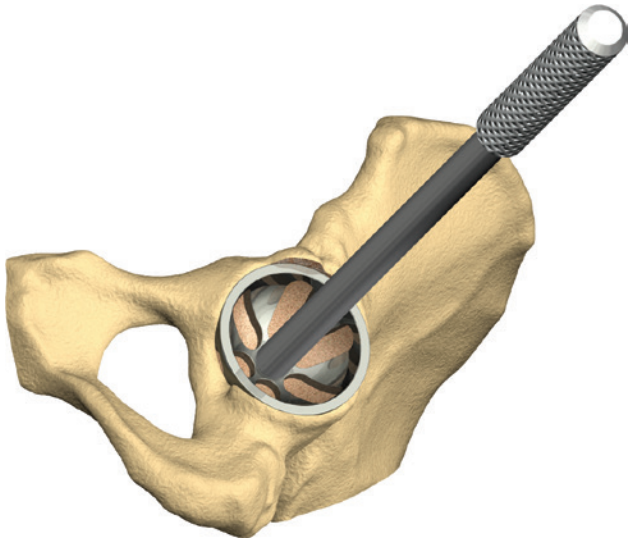
Surgical tips:

- Each successive reamer must be fully seated within the acetabulum. Failure to do so will result in lateralization of the trial and exposure of the porous coating. If lateralization occurs, go back to a smaller reamer and begin again, checking each size to ensure that the reamers are fully seated.
- Increasing the reamer size by 2mm is recommended, although in smaller patients 1mm increments may be preferred.
- Mark the medial wall with an electrocautery prior to using the last reamer. If the last reamer does not remove the mark, repeat reaming, dropping back a size if necessary.

Instrument tips:

- The acetabular reamer has an open back, which helps visualize reaming and allows easy access to bone chips. This style of reamer is hemispherical and when fully seated it should be covered by the rim of the acetabulum.
- Gently rock reamer handle back and forth approximately 5° for last size used only to ensure rim is accurate for the desired press-fit.

Acetabular trialing



After preparing the acetabulum, the trial shell should be inserted to verify size and position of the cup. The surgeon should note the appropriate orientation of the acetabular trial to position the cup correctly.

A trial liner insert cannot be inserted into a trial shell for trial reduction.

If trial reduction using a trial insert is desired at this time, then the preparation of the femur should occur up until the trial reduction stage. The surgeon then has the option of inserting a trial acetabular liner (preferred) in the acetabular implant for subsequent leg length, offset and stability assessments or the real acetabular insert.

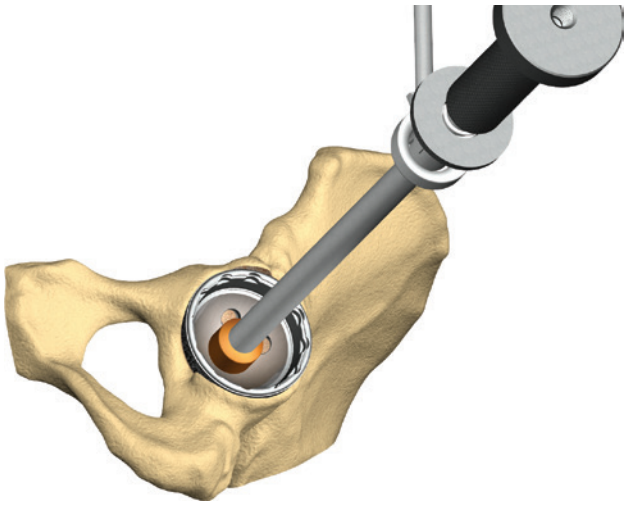
Surgical tip:

- The bone at the edge of the trial shell can be marked with an electrocautery to help in final component positioning.

Instrument tip:

- The trial shells are the exact size specified. They can be used to assess the accuracy of reaming or can be press-fit into the acetabulum if using a larger size than the final reamer.

Acetabular shell insertion



Select the appropriate acetabular implant, attach the shell to the cup positioner/impactor and insert it into the acetabulum.

Rotate the X-Bar shaft so that it is in line with the liner removal slot. For the THREE HOLE cup, this positions the three holes in the superior direction. When implanting a MULTI HOLE shell, future access to the liner removal slot should be considered.

Position the X-Bar so that the vertical bar is perpendicular to the long axis of the body and the appropriate crossbar (left or right) aligns with the long axis of the body.

Firmly tap the inserter with a mallet until the cup is fully seated.

Gently toggle the impactor handle to assess the stability and contact of the shell.

Remove the X-Bar, then disengage the impactor handle and look through the impactor hole to judge the distance between the medial wall and the shell.

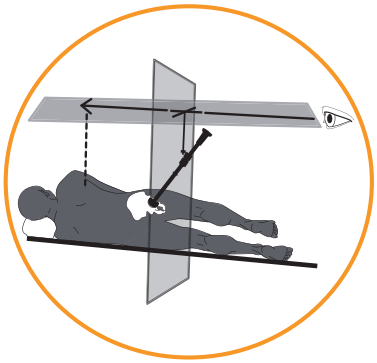
If the cup is firmly seated, there should be no gap between the shell and the medial wall and no apparent movement in the component.

Surgical tips:

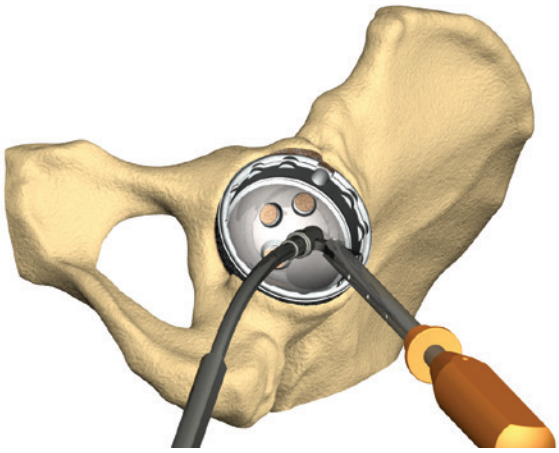
- The change in pitch that occurs as the shell is seated against the medial wall is often audible. A depth gauge can be inserted through the screw holes and apex hole to determine the adequacy of shell seating.
- Close attention should be paid to initial positioning of the R3° shell. However, the use of the slap hammer may be helpful in extracting the shell for repositioning.

Instrument tips:

- The plastic tip on the cup impactor is removable for cleaning, or replacement if damaged.
- The X-Bar references 45° of abduction and 20° of anteversion .



Acetabular screw insertion



Screw fixation is simple, fast and the most common method of assuring additional fixation. Acetabular screws work in compression, which allows the shell to fully seat in the acetabular cavity.

For screw fixation, each screw hole must be predrilled. Using the variable angle drill guide, adjust the angle of the tip to align with the selected screw hole and **press firmly in the shell**. After drilling the hole, use the depth gauge to verify appropriate screw length(s).

Use the screw forceps to hold the screw. Attach the ball-joint or flexible screwdriver shaft to the end of the screw. Then introduce the screw into the hole and screw it into place using the ratcheting screwdriver handle. Make sure the screw is fully seated within the screw hole so that it will not impinge on the acetabular shell/liner.

Surgical tip:

- Screws have been shown to be a reliable method of assuring fixation; however, it is important to avoid neurovascular complications by proper screw placement, avoiding the anterior/superior or anterior/inferior quadrants.

R3◇ acetabular liner insertion

A trial reduction should be performed with the final shell and broach in place to appropriately assess head length, stem offset, liner style and position. With XLPE liners, use of 'skirted' modular heads should be avoided when possible to maximize range of motion.

XLPE Liners may be used with CoCr, OXINIUM◇ and ceramic heads. Constrained Liners may be used with CoCr, and OXINIUM heads. Ceramic liners may only be used with ceramic heads.

Before inserting the R3 acetabular liner, lavage any unused holes and insert the hole covers, if desired. Using the angled hole cover inserter, place screw hole covers over any remaining screw holes and then impact with the peg impactor. Cover the apex hole with the threaded hole cover. Using the straight screwdriver, screw in the hole cover until it stops and is flush with the inner diameter of the shell.

For XLPE liner insertion, screw the appropriate sized liner impactor head on the end of the cup impactor handle and ensure that the tabs on the liner are aligned with the indentions in the shell. Ensure all soft tissue and osteophytes have been removed from the periphery of the shell to avoid interference with the liner lock.

Wipe the shell ID with a lap sponge or gauze until clean and dry. **Press the liner impactor firmly** until liner is partially locked. Then use light, repetitive impacts with the mallet until the liner is fully seated.

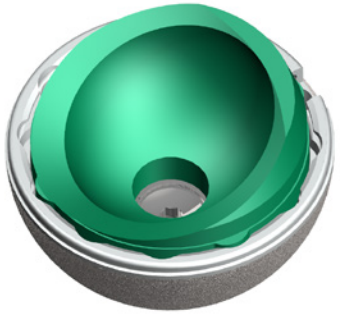
Inspect the liner/shell interface for proper seating. The liner should sit flush with the face of the shell.

Surgical tips:

- Running a finger around the circumference of the shell and a visual check will help determine if the liner is flush with the shell face.
- The XLPE liner requires an impaction force between 60 and 120 pounds, increasing with the diameter of the shell.
- The XLPE liner can be removed and repositioned once without compromising the locking mechanism of the liner. To remove R3 liners, insert the liner removal tool fully into the removal slot and pry or impact the liner loose.
- All R3 Anteverted XLPE Liners are lateralized **+4mm**

Instrument tips:

- The anteverted liner trials are designed with a central screw to facilitate placement. The central screw is tightened into the apex hole of the R3 shell. When using anteverted trial liners it is important that the trial be held firmly in place while using the screwdriver to tighten the screw in the anteverted trial liner into the apex hole of the R3 shell to maintain proper alignment of the anteverted trial liner Align tabs with indentions and tighten into position. **Do not force trial.**



Shell and R3◇ Anteverted liner offerings

	XLPE			
Shells	28	32	36	40
44	●			
46	●	●		
48	●	●		
50	●	●	●	
52	●	●	●	
54	●	●	●	●
56	●	●	●	●
58	●	●	●	●
60	●	●	●	●
62		●	●	●
64			●	●
66			●	●
68			●	●
70			●	●
72			●	●
74			●	●
76			●	●
78			●	●
80			●	●

R3 Anteverted Tray Layouts

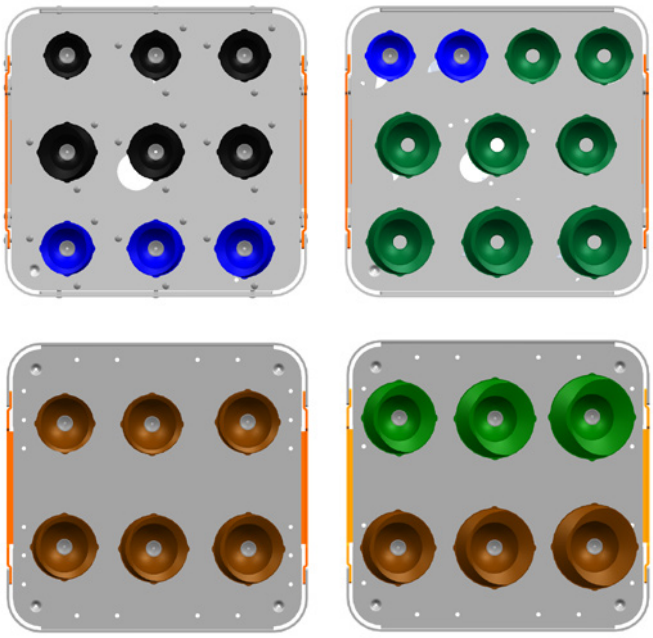
	XLPE				
Shells	28mm	32mm	36mm	40mm	44mm
44					
46					
48					
50					
52					
54					
56					
58					
60					
62					
64					
66-70mm					
72-74mm					
76-80mm					

Small Outlier Tray

Core Tray

40mm Tray

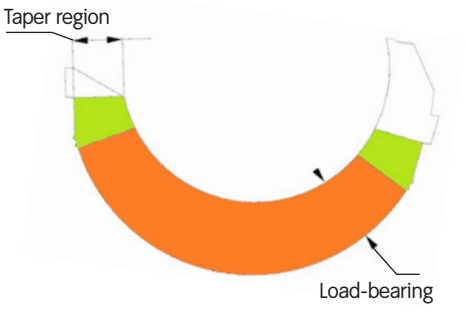
Large Outlier Tray



Poly thickness chart

Shell OD	Poly ID	Poly Thickness Taper Region mm	Poly Thickness Load-Bearing Region mm
44	28	5.9	8.1
46	28	6.8	9.1
46	32	4.8	7.1
48	28	7.7	10.1
48	32	5.7	8.1
50	28	8.6	11.1
50	32	6.6	9.1
50	36	4.6	7.1
52	28	9.5	12.1
52	32	7.5	10.1
52	36	13.3	16.1
54	28	10.5	13.1
54	32	8.5	11.1
54	36	6.5	9.1
54	40	4.5	7.1
56	28	11.4	14.1
56	32	9.4	12.1
56	36	7.4	10.3
56	40	5.4	8.3
60	28	13.3	16.1
60	32	11.3	14.1
60	36	9.3	12.1
60	40	7.3	10.1
60	44	5.3	8.0
62	32	12.2	15.1
62	36	10.2	13.1
62	40	8.3	11.0

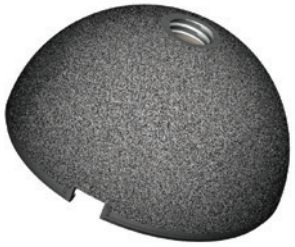
Shell OD	Poly ID	Poly Thickness Taper Region mm	Poly Thickness Load-Bearing Region mm
62	44	6.2	9.0
64	36	11.2	14.1
64	40	9.2	12.0
64	44	7.2	10.0
66-70	36	12.1	15.1
66-70	40	10.2	13.0
66-70	44	8.2	11.0
72-74	36	14.5	17.1
72-74	40	12.6	15.0
72-74	44	10.6	13.0
76-80	36	16.5	19.1
76-80	40	14.5	17.0
76-80	44	12.5	15.0



Catalog

R3° NO HOLE Acetabular Shells

Small Size Shells		Standard size shells		Large size shells	
Cat. no.	**ODmm**	**Cat. no.**	**ODmm**	**Cat. no.**	**ODmm**
71331840	40*	71331846	46	71331866	66
71331840	42*	71331848	48	71331868	68
71331844	44	71331850	50		
		71331852	52		
		71331854	54		
		71331856	56		
		71331858	58		
		71331860	60		
		71331862	62		
		71331864	64		



R3 THREE HOLE Acetabular Shells

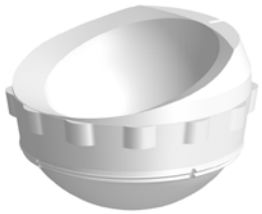
Small size shells		Standard size shells		Large size shells	
Cat. no.	**ODmm**	**Cat. no.**	**ODmm**	**Cat. no.**	**ODmm**
71335540	40*	71335546	46	71335566	66
71335542	42*	71335548	48	71335568	68
71335544	44	71335550	50		
		71335552	52		
		71335554	54		
		71335556	56		
		71335558	58		
		71335560	60		
		71335562	62		
		71335564	64		

R3 MULTI HOLE Acetabular Shells

Standard size shells		Large size shells	
Cat. no.	**ODmm**	**Cat. no.**	**ODmm**
71338663	48	71338673	66
71338664	50	71338674	68
71338665	52	71338675	70
71338666	54		
71338667	56	**Jumbo size shells**	
71338668	58	**Cat. no.**	**ODmm**
71338669	60	71338676	72
71338671	62	71338677	74
71338672	64	71338678	76
		71330009	78
		71330010	80

*Not compatible with anteverted liners

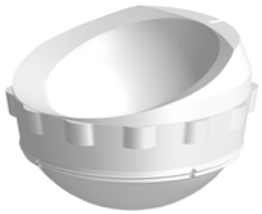
R3° XLPE Anteverted Liners



ID	OD	20°+4 XLPE anteverted liner Cat. no.
28	44	71332371
28	46	71332372
28	48	71332373
28	50	71332374
28	52	71332375
28	54	71332376
28	56	7137-7756
28	58	7137-7758
28	60	7137-7760
32	46	71332497
32	48	71332381
32	50	71332382
32	52	71332383
32	54	71332384
32	56	71332385
32	58	71332386
32	60	71332387
32	62	71332388
36	50	71332498
36	52	71332401
36	54	71332402
36	56	71332403
36	58	71332404
36	60	71332405
36	62	71332406
36	64	71332407
36	66-70	71332408
36	72-74	71332409
36	76-80	71332411

R3° XLPE Anteverted Liners (continued)

ID	OD	20°+4 XLPE anteverted liner Cat. no.
40	54	71332499
40	56	71332412
40	58	71332413
40	60	71332414
40	62	71332415
40	64	71332416
40	66-70	71332417
40	72-74	71332418
40	76-80	71332419



R3° Trial Shells

Standard size trial shells

Cat. no.	ODmm
71360745	45
71360746	46
71360747	47
71360748	48
71360749	49
71360750	50
71360751	51
71360752	52
71360753	53
71360754	54
71360755	55
71360756	56
71360757	57
71360758	58
71360759	59
71360760	60
71360761	61
71360762	62
71360763	63
71360764	64

Small size trial shells

Cat. no.	ODmm
71360739	39
71360740	40
71360741	41
71360742	42
71360743	43
71360744	44

Large size trial shells

Cat. no.	ODmm
71360765	65
71360766	66
71360767	67
71360768	68
71366524	69
71366525	70

Jumbo size trial shells

Cat. no.	ODmm
71366526	71
71366527	72
71366528	73
71366529	74
71366530	75
71366531	76
71362019	77
71362020	78
71362021	79
71362022	80

R3° Anteverted Trial Liners

ID	OD	20°+4 Anteverted trial liner Cat. no.
28	44	71332427
28	46	71332428
28	48	71332429
28	50	71332431
28	52	71332432
28	54	71332433
28	56	71332434
28	58	71332435
28	60	71332436
32	46	71332430
32	48	71332437
32	50	71332438
32	52	71332439
32	54	71332440
32	56	71332442
32	58	71332443
32	60	71332444
32	62	71332445
36	50	71332440
36	52	71332471
36	54	71332472
36	56	71332473
36	58	71332474
36	60	71332475
36	62	71332476
36	64	71332477
36	66-70	71332478
36	72-74	71332479
36	76-80	71332481

R3° Anteverted Trial Liners (continued)

ID	OD	20°+4 Anteverted trial liner Cat. no.
40	54	71332460
40	56	71332482
40	58	71332483
40	60	71332484
40	62	71332485
40	64	71332486
40	66-70	71332487
40	72-74	71332488
40	76-80	71332489

R3 Liner Impactor Heads

Cat. no.	Size mm
71366428*	28
71366432*	32
71366436*	36
71366438*	38-42
71366444*	44-48
71366451*	50-54

*Exclusively for liner impaction

R3 MIS Instruments

Cat. no.	Description
71368569	Offset Shell Impactor
71366052	Offset X-Bar
71363077	Offset Impactor Tip
71364073	Offset Reamer Handle

Catalog

R3° Straight Shell Impactor **Cat. no.** 71364450	
R3 Impactor Replacement Tip **Cat. no.** 71368570	
R3 Depth Gauge **Cat. no.** 71364451	
X-Bar **Cat. no.** MT-2201	
Screw Forceps **Cat. no.** 71362298	
Ball Joint Screwdriver **Cat. no.** 71362295	
R3 Variable Angle Drill Guide **Cat. no.** 71364477	
Reamer Handle **Cat. no.** 71362279	
Flexible Screw Drills **Cat. no.** **Length mm** 71362915 15 71362925 25 71362935 35 71362950 50	
Captured Flexible Screwdriver Shaft **Cat. no.** 71362291	
Captured U-Joint Screwdriver Shaft **Cat. no.** 71362292	
R3 Surgical Templates sizes 40-68 (not shown) **Cat. no.** 71380666	
R3 Surgical Templates sizes 70-80 (not shown) **Cat. no.** 71381508	

R3° Trial Liner Removal Tool **Cat. no.** 71364455	
R3 Liner Removal Tool **Cat. no.** 71366021	
Hole Cover Impactor **Cat. no.** 73-2117	
Trial Shell Handle **Cat. no.** 71362297	
Flexible Screwdriver **Cat. no.** 71362290	
Ratchet Handle **Cat. no.** 71362294	
Small Slap Hammer **Cat. no.** 71367541	
Hole Cover Inserter **Cat. no.** 73-2133	
Straight Screwdriver Shaft **Cat. no.** 71362293	
Power Adaptors (not shown) **Cat. no.** 71362781 71362782 71362783	

Reamer Domes

Small size		Standard size		Large size	
Cat. no.	**Size mm**	**Cat. no.**	**Size mm**	**Cat. no.**	**Size mm**
71362738	38	71362742	42	71362765	65
71362739	39	71362743	43	71362766	66
71362740	40	71362744	44	71362767	67
71362741	41	71362745	45	71362768	68
		71362746	46	71362769	69
		71362747	47	71362770	70
		71362748	48	71362771	71
		71362749	49	71362772	72
		71362750	50	71362773	73
		71362751	51	71362774	74
		71362752	52	71362775	75
		71362753	53	71362776	76
		71362754	54	71362777	77
		71362755	55	71362778	78
		71362756	56	71362779	79
		71362757	57	71362780	80
		71362758	58		
		71362759	59		
		71362760	60		
		71362761	61		
		71362762	62		
		71362763	63		
		71362764	64		

R3°/REFLECTION° Threaded Hole Cover
Cat. no. 71336500

Spherical Head Screws

Cat. no.	**Length mm**
71332515	15
71332520	20
71332525	25
71332530	30
71332535	35
71332540	40
71332545	45
71332550	50
71332555	55
71332560	60
71332565	65
71332570	70

R3 Screw Hole Cover
Cat. no. 71369894

Small Outer Case
Cat. no. 71129401 (not shown)

Lid for Outer Case
Cat. no. 71129402 (not shown)

R3 Trial Shell Tray
Cat. no. 71362213 (not shown)

R3 Jumbo Trial Liner Tray
Cat. no. 71361076 (not shown)

R3 Main Instrument Tray
Cat. no. 71362211 (not shown)

R3 MIS Instrument Tray
Cat. no. 71362219 (not shown)

R3 Primary Reamer Dome Tray
Cat. no. 71362212 (not shown)

R3 CDH Trial Tray
Cat. no. 71361077 (not shown)

R3 Disposable Trial Tote
Cat. no. 71360656 (not shown)

Catalog

Part	Cat. no.
R3 Anteverted Liner Core Trial Tray	71332461
R3 Anteverted Liner Small Outlier Trial Tray	71332467
R3 Anteverted Liner Large Outlier Trial Tray	71332463
R3 Anteverted Liner 40mm Trial Tray	71332464

Products may not be available in all markets because product availability is subject to the regulatory and/or medical practices in individual markets. Please contact your Smith & Nephew representative or distributor if you have questions about the availability of Smith & Nephew products in your area.

Smith & Nephew, Inc.
7135 Goodlett Farms Parkway
Cordova, TN 38016
USA

Telephone: 1-901-396-2121
Information: 1-800-821-5700
Orders and Inquiries: 1-800-238-7538

www.smith-nephew.com

15630 V2 71381778 REVA 11/22