The Rx90 Total Hip System was developed by Stanley Asnis, M.D., in conjunction with David Dines, M.D. and Micheal Errico M.D., Co-Section-Chiefs of the North Shore University Hospital - Cornell University Medical College - Center for Joint Replacement, Manhasset, NY. The Rx90 System also received development contributions by John Evans, M.D., Associate Professor of Orthopaedics - UT Health Science Center, San Antonio, TX.
Pre-Operative Planning

Rx90 Titanium Porous Acetabular Component

The designing surgeons prefer placing the patient in a lateral position on the operating table and using a posterior exposure to the hip, retaining the greater trochanter. The hip is dislocated posteriorly and the femoral neck osteotomy performed at a level previously determined by preoperative templating. The labrum is removed from the acetabular edge. The Haversian fat pad is excised so the medial acetabular wall can be visualized. The depth of reaming can now be accurately assessed as reaming proceeds.

Step 1

Rx90 Titanium Porous Acetabular Component

The smallest hemispherical reamer is used to establish the center of the acetabulum and the desired position of the cup (Figure 1). Reaming is advanced with increasing diameter bone retention reamers (Figure 2). If femoral head subluxation and superior acetabular wear have been present, the initial reaming will start at the center of the horseshoe. It is common that the superior acetabulum will not be reamed until very late in reaming. The anterior and posterior acetabular walls must be carefully examined in the deformed acetabulum. Radiographs are not as accurate in allowing the surgeon to evaluate eccentric wear in the anterior-posterior axis. Eccentric reaming in a worn acetabulum in this plane can cause the loss of a portion of the very important circumferential support for the porous shell.

The power reamers are held steady and are used in the position of the desired cup orientation (Figure 2). Sequential reaming progresses until bleeding subchondral bone is obtained. The cortical bone of the medial wall should be left intact. All acetabular cysts are curetted of soft tissue and packed with autologous bone. The authors prefer cancellous bone from the femoral neck or head rather than acetabular reamings.

The goal of reaming is to obtain a hemispherical bleeding corticocancellous surface which will maintain excellent peripheral primary acetabular bone support to the shell.
Step 1 cont.

The metal frame shell gauge that corresponds to the last reamer is placed into the acetabulum (Figure 3). A good fit should be present. Additional reaming and a larger trial shell fitting is done if indicated.

The titanium porous Rx90 acetabular shell 2mm larger than the last reamer and/or trial gauge is selected and fixed to the inserter handle. The acetabulum is thoroughly irrigated with pulsatile irrigation containing an antibiotic (bacitracin and polymyxin) saline solution. All soft tissue and debris are removed from the acetabulum and its rim. The retractors are repositioned if necessary for clear exposure of the entire acetabulum (Figure 4). The transverse acetabular ligament is trimmed or removed if necessary.
Step 3

Rx90 Titanium Porous Acetabular Component

The selected titanium porous Rx90 shell is placed into the acetabulum with care exercised to avoid any interposing soft tissue. The position of the screw holes vary according to the surgeon’s preference. Those surgeons who desire parallel screw placement or multiple screws into the ilium should position the cluster of holes superiority under the dome of the acetabulum (Figure 5). Those surgeons who do not usually use screws or limit screws to a minimum may want to maximize the titanium porous surface superiority. In this case, the shell is oriented with the cluster of holes inferiorly over the acetabular fossa. In either case, the shell is impacted in a position of 40-45 degrees of inclination from the horizontal axis of the pelvis (Figure 6) and 15 degrees of anteversion (Figure 7). A change in the sound produced by the mallet is often the best indicator of complete impaction. The hooked tip of the depth gauge is then used to examine each of the screw holes to confirm bone apposition (Figure 9).

Note: If the surgeon desires to make a change in either the antversion or inclination, an impactor is not to be used against the rim of the titanium shell. This can damage the groove for the locking ring and cause the locking mechanism not to function properly. A set of shell impactor plates is available. The appropriate impactor plate is placed over the orifice of the titanium shell to protect the shell’s rim. Impaction to allow minor changes in antversion or inclination can now proceed safely.
Step 4

Rx90 Titanium Porous Acetabular Component

If additional fixation is desired, cancellous 6.5mm low profile screws are used. These are placed superiorly and in the axis of the major bone configuration of the ilium. Unicortical screw placement is preferred. The subchondral bone of the acetabular roof and the cancellous bone of the ilium will usually provide excellent fixation for the 6.5mm self tapping cancellous screws. Bicortical screw fixation may be used posteriosuperiorly where the tip of the screw can be readily palpated assuring that appropriate screw length is used. Bicortical screws should be avoided anteriorly and medially to avoid vascular injury. Drilling is started with the 3.2mm x 20mm drill bit on a flexible drive shaft. The drill guide is always used to center the drill in the shell's hole and prevent the screw from altering the position of the cup when homing the screw (Figure 8).

Step 5

Rx90 Titanium Porous Acetabular Component

The designing surgeons prefer to make a hole approximately 20mm then use the depth gauge to confirm that the hole is unicortical to this depth (Figure 9). The 2.8mm x 30mm drill is then often used to deepen the hole to 30-35mm. The appropriately sized self-tapping 6.5mm screw is held with the screw forceps and inserted with the universal hex screwdriver (Figure 10). Screws longer than 35mm are used only in rare situations.

The Rx90 shell is thoroughly cleaned with pulsatile irrigation. The low profile screw heads are examined to assure that they are well below the inner shell surface.
Step 6

Rx90 Titanium Porous Acetabular Component

The Rx90 trial Hi-Wall Liners are then positioned. The "trial" liners are readily removable and not locked by the locking ring of the titanium shell. The Standard Hi-Wall Liner will be used in the majority of cases. For a very deep acetabulum, protrusio configuration, or in some revisions the +5mm Hi-Wall Liner will give a superior acetabular fit. The Hi-Wall of the cup is usually positioned posteriorly or posteriorly (Figure 11). Surgery can then proceed for the femoral components. A trial reduction and evaluation of motion can be performed with the trial components.

The appropriately sized Standard Hi-Wall or +5mm Hi-Wall Liner is obtained. The outer dimension of the polyethylene rim is always slightly smaller than that of the titanium shell to decrease the risk of soft tissue impingement. Check the outer rim for soft tissue and debris. The metal locking ring should be inspected to ensure that it is located properly in its groove in the titanium shell. This ring locks the liner in its permanent position (Figure 12). The cup is oriented with the Hi-Wall Liner in the desired position and assembling begun with manual pressure.
Step 1

Rx90 All Polyethylene Cemented Acetabular Component

The same exposure and acetabular reaming is used as that for the Rx90 Titanium Porous Acetabular Component. Reaming is progressed until a satisfactory corticocancellous hemispherical surface is obtained. All acetabular cysts are cleaned of their soft tissue content with a curette. Multiple 0.25 inch (6.4mm) unicortical drill holes are made through the subchondral plate in the dome of the acetabulum. One 0.25 inch hole is made into the ischial ramus and another into the ischial ramus and another into the pubic ramus. The rami holes are then enlarged slightly with a small Charnley Curette (Figure 15).

The "trial" Standard Hi-Wall and +5mm Hi-Wall Cups (liners) are placed in the acetabulum to determine best fit (Figure 16). The outer rim diameter of the polyethylene should be 1 to 2mm smaller than the last reamer. In most patients, the Standard Hi-Wall Cup may fit best in the very deep, protrusio or revision acetabulum.
Step 2

Rx90 All Polyethylene Cemented Acetabular Component

Since the trial liners come with a central hole instead of a nipple, a plug is available (individually packaged) to fill the hole and extend 2mm simulating the true polyethylene cups (Figure 18). The orientation of the Hi-Wall should be planned. A posterior or posteriosuperior position is most common.

The acetabulum is thoroughly irrigated with pulsatile lavage using an antibiotic (bacitracin and polymyxin) saline solution. The acetabulum is then thoroughly dried and packed with gauze.

Two packages of methylmethacrylate are mixed in a vacuum mixing bowl. The packing is removed and half of the cement is placed in the acetabulum, then pressurized. The authors utilize plastic hemispherical impactors for pressurization. The impactor is removed and the remaining half batch of cement placed.
Step 3

Rx90 All Polyethylene Cemented Acetabular Component

The +5mm Hi-Wall Cups (lines) are manufactured with a titanium radiographic marking ring already in place. The Standard Hi-Wall Cup requires the placement of the appropriate size titanium ring to be placed into the groove in the polyethylene directly beneath rim (Figure 19). (This is the same titanium ring that is used in the metal shell for locking the liner.) This serves as its radiographic marker.

The all polyethylene cup (liner) is placed on its impactor, Hi-Wall area of the cup positioned, then the cup is impacted into place. The central nipple and peripheral cup rim center the cup and ensure at least a 2mm cement mantle (Figure 20). (Occasionally the polyethylene nipple is trimmed or removed to improve the cup's fit in the more shallow acetabulum.) The expanded rim pressurizes the cement as it centralizes the cup. The cup is impacted into position.

An osteotome is used to remove any osteophytes that project beyond the polyethylene.