CONSERVE® PLUS

TOTAL SURFACE ARTHROPLASTY

SURGICAL TECHNIQUE

WRIGHT.

As Described By: HARLAN AMSTUTZ, MD
Los Angeles, California

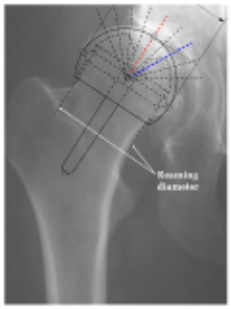
CONSERVE® PLUS
Surgical Technique

as described by

HARLAN AMSTUTZ, M.D.
Los Angeles, California

CONSERVE® Plus
total surface ARTHROPLASTY SYSTEM

As Described By
Harlan Amstutz, MD



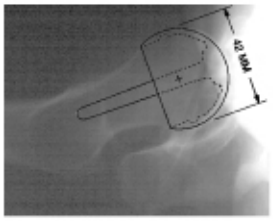


FIGURE 1

FIGURE 3

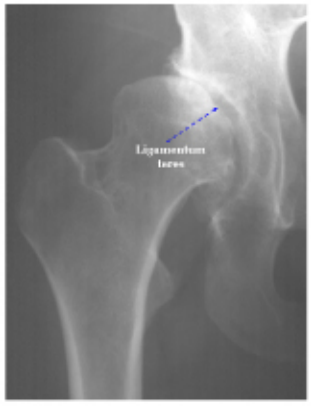


FIGURE 2

TEMPLATING

Preoperative planning is essential to assess the approximate size and orientation of the surface arthroplasty on the AP pelvis and true lateral (Johnson or shoot-through "crosstable") | **FIGURE 1.** Using the scaled x-ray templates provided, the approximate size of the femoral component is first assessed. It is recommended to take an AP pelvis with the tube to cassette distance of 40 inches (1 meter). This will give a magnification of approximately 20%± 6% (the magnification is greater in large patients and less in thin patients). The Johnson lateral is essential to evaluate anteversion, the size and structure of the anterior osteophyte. The femoral head is generally posterior to the central axis. Use the anterior cortex and position the short stem slightly anterior to avoid reaming into the anterior osteophyte but parallel to the central axis | **FIGURE 2.** The posterior cortex is semi-circular and hence a poor reference at surgery for the correct component orientation.

In order to save bone on the acetabular side, it is necessary to ream the femoral head close to the diameter of the neck. Minimize notching of the structural cortical bone. It may be necessary to remove osteophytes if there is impingement but this should be done carefully and preferably near the end of the procedure. The dotted lines on the templates indicate the reamed head size and should be used for sizing. You may use the central axis line and hatch marks to measure the distance from the ligamentum teres more superiorly on the femoral head to the entry point for Steinmann Pin at 140 degrees to the neck shaft axis | **FIGURE 3.**

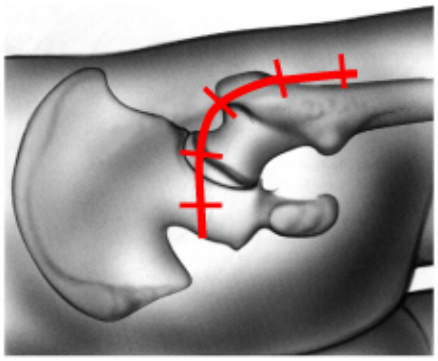


FIGURE 4

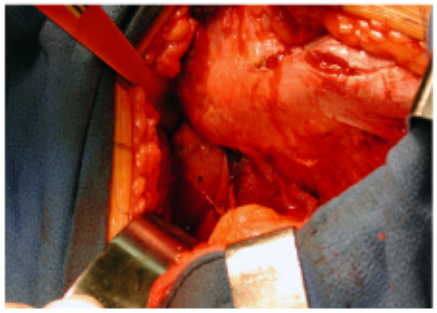


FIGURE 5

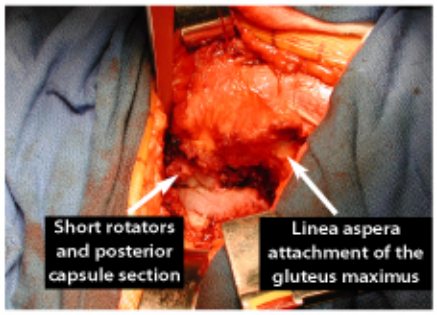


FIGURE 6

SURGICAL APPROACH

The patient is positioned lateral with an anterior pelvic stabilizer pressed against the pubis so that the leg can be flexed beyond 90 degrees and adducted so that the femoral head can be delivered between the gluteus maximus split. It is also helpful to support the thorax anteriorly and posteriorly with the table tilted anteriorly and the body neutral, which will enable the maximum roll back of the patient to facilitate acetabular reaming.

A posterior approach facilitates visualization of the entire circumference of the femoral head and neck and the acetabulum. The incision is a hockey stick commencing about 6-8 centimeters distal to the top of the trochanter over the center of the shaft extending proximally just above the tip of the greater trochanter and angling sharply posteriorly for about 4-6 centimeters | **FIGURE 4.** If the hip cannot be flexed to at least 90 degrees use the more traditional slightly curved posterior approach. With straighter approach the hip will have to be internally rotated more than 90 degrees and the procedure will be more difficult in large or heavily muscled individuals than with the hockey stick and the hip flexed more. A Charnley self retaining retractor is highly recommended.

The skin, subcutaneous and fascia lateralis are divided. The gluteus maximus fibers are bluntly separated. The gluteus maximus tendon is completely sectioned as it inserts into the linea aspera | **FIGURE 5.** The short rotators including pyriformis and short rotator tendons and the quadratus femourus muscle fibers are divided and suture tagged for reattachment | **FIGURE 6.** Hammer in a sharp Hohman to reflect the abductor muscles. Excise or release the capsule circumferentially. I prefer to entirely excise the capsule although the posterior capsule can be preserved if desired and use Steinman-like pins or a retractor to reflect the capsule. To release the superior capsule, place a Hohman retractor under the abductor muscles and continue to adduct and flex the hip. Excise the superior and anterior capsule Deep retractors are extremely helpful.

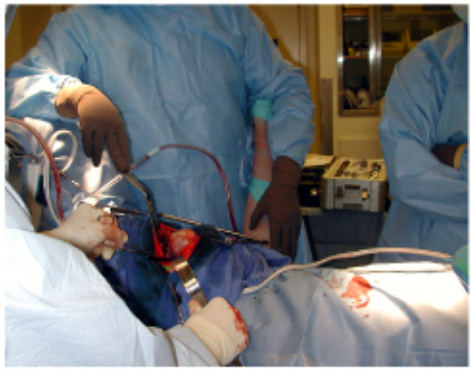


FIGURE 7

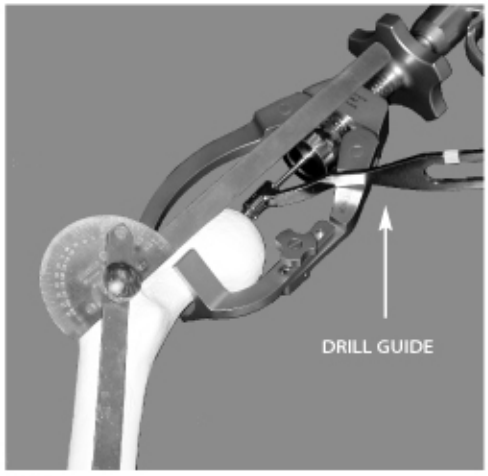


FIGURE 8

HIP DISLOCATION

Dislocate the hip by flexion, adduction and internal rotation and then release the entire capsule to mobilize the head and neck sufficiently to insert the neck elevator so that the pin-centering guide (PCG) can be placed around the neck with the mobile arm inferiorly | FIGURE 7. Measure the neck width with a caliper to assess the smallest possible reamer size.

PIN CENTERING

Align the guide with a goniometer so that the direction of the pin will be superior to the central axis of the neck at a 140° pin shaft angle. The distance from ligamentum teres to the entry point position (10-15 mm. lateral) | FIGURE 8. Accurate placement of the pin down the central axis of the neck in the AP plane rotating the dislocated hip 90° in either direction is achieved by obtaining a 360° circumferential visual assessment of the head and neck. The axis of the neck is generally parallel to the relatively flat surface of the anterior cortex of the femoral neck. Since the neck is generally narrower in the AP plane, it is possible to translate the pin slightly more anteriorly to the central axis and still avoid notching. This will provide desirable anterior offset to facilitate more flexion before neck-pelvis impingement. With the posterior approach, the pin-centering guide often must be forced anteriorly to correct against the tendency to retrovert the pin. Adjust as necessary by holding the PCG and insert a 3.2 mm Steinmann pin through the PCG to a depth of approximately 40 to 50mm. A drill guide is occasionally helpful to guide the pin if it moves offline during insertion.

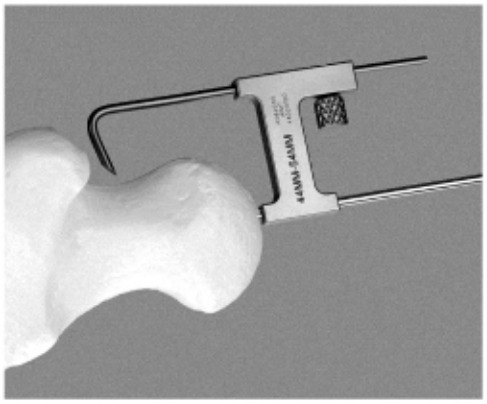


FIGURE 9

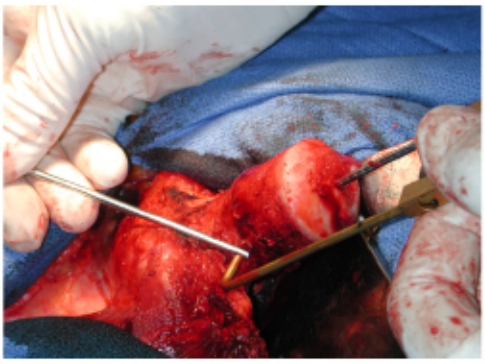


FIGURE 10

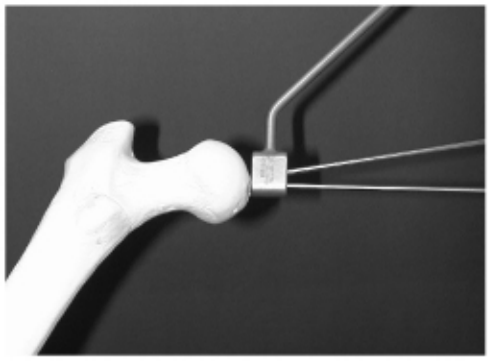


FIGURE 11

CYLINDRICAL REAMER GAUGE (CRG)

Loosen the locking knob and remove the PCG, leaving the Steinmann pin in place. The accuracy of pin alignment is assessed relative to the central axis of the neck by using the cylindrical reamer or CRG for the anticipated final size | **FIGURE 9.**

Rotate the CRG around the neck to assess the clearance | **FIGURE 10.** If the tip of the CRG impinges against the femoral neck inferiorly and there is a wide gap superiorly, then the pin is not centered. The guide pin has to be repositioned. However, if the correction is about the width of the pin, do not remove the pin. Depending on the angle and position, use the relocator guide to place a new pin in the optimal position | **FIGURE 11.**

With the relocator you are able to move one pin width within the slot or with the slot and the hole, two or three pin widths for correct angulation. Often it is necessary to make several adjustments. A quick disconnect power inserter is extremely useful.

FIGURE 12

FIGURE 13

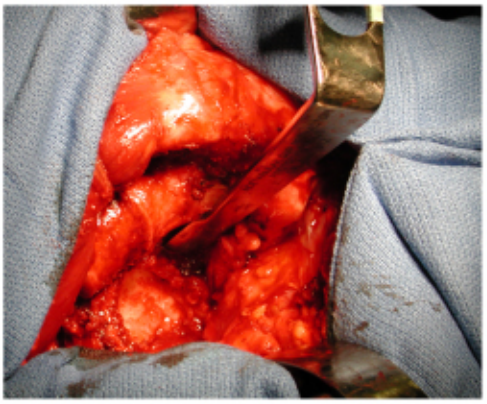


FIGURE 14

CYLINDRICAL REAMING

Proper pin placement and use of the reamer gauge should prevent selecting a reamer that is smaller than the femoral neck, which could notch the neck during the reaming process.

The oversized reamer is selected for initial reaming and is advanced over the Steinmann pin using battery or nitrogen gas for power | **FIGURE 12.** More bone is removed medial and posterior to the center of the head.

Ream the femoral head with cylindrical reamers. Apply pressure in bursts to cut the eccentric hard or dense medial bone to avoid eccentric pressure on the pin which may bend it. If the reamer fails to advance easily, the pin may be bent. Remove and insert a straight one. Rough cut the head to within one size of final templated size (i.e., ream to 48 when your final size will be 46) until after the acetabulum component insertion is complete.

As the reamer is advanced irrigation is advised. It is desirable to stop reaming at the femoral head/neck junction. If the reaming is close to the neck, complete the cut with a curved osteotome to be sure that the neck is not notched. Then proceed with pin placement readjustment with the relocator guide.

As the cylindrical reamer advances, the surgeon should use his free hand to palpate the location of the vibrations of the cylindrical reamer at its exit point to prevent notching the neck. With a scalpel or rongeur, pull back on the reamer to clear bone debris from the teeth and to prevent the reamer from seizing. Successive reamings are made with appropriate, smaller size reamers reducing the head size | **FIGURE 13.**

Leave the dome bone on the head and displace the femur into the muscle pocket anteriorly using the hip dislocator hook to displace the hip superiorly with the hip in extension and insert the right angle Hohman retractor to displace it slightly anterior to the acetabulum | **FIGURE 14.**

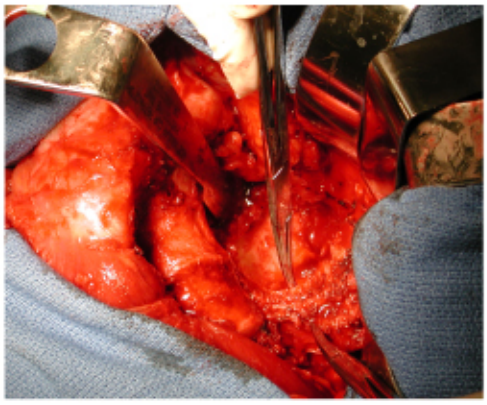


FIGURE 15

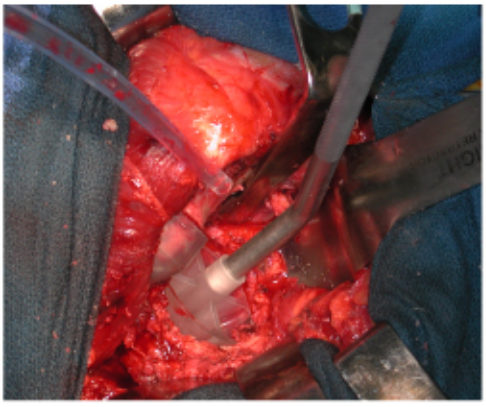


FIGURE 16

ACETABULAR ASSESSMENT

Next proceed to ream the acetabulum while carefully assessing the thickness of the anterior and posterior walls | **FIGURE 15.**

ACETABULAR PREPARATION

The acetabulum is then prepared with increasing diameter hemispherical reamers to remove soft tissue and cartilage from the floor of the cotyloid foramen, exposing some cancellous bone. Acetabular reaming is facilitated with rough "bear claw" reamers and then use cheese graters for fine reaming. If reamers are only in two mm increments stop 2 less than the socket OD and carefully check with metal ring gauges so the cavity is round and exactly 1mm smaller that the component. If more reaming is necessary ream a little more carefully or go to the odd size reamer and ream straight in taking care not use circular motion which may ream too much bone. If the acetabulum is deep check to make sure that there is no prominent bone at the rim.

Cysts should have contents evacuated with curettes and a high-speed burr (sebatome or Midas Rex) and then grafted. Use the translucent acetabular gauges to assess the size, roundness and depth of the reamed cavity | **FIGURE 16.**

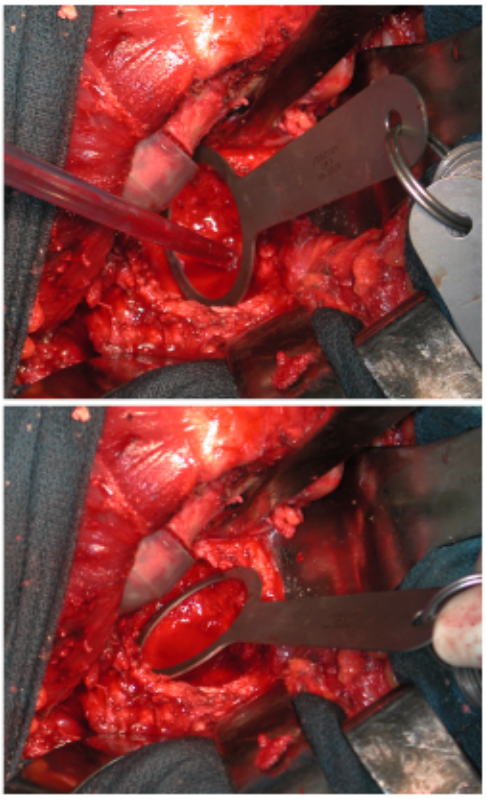


FIGURE 17

The depth of the translucent gauge, one size below the final size, is the same as the 170° socket (i.e., use the size 56 mm translucent gauges to assess the depth for the 58mm implant) The handle of the socket holder is designed so that it will be vertical at 42° lateral opening with the patient in the lateral decubitis position. By holding the gauge into the reamed cavity, the osteophytes and acetabular wall can be osteotomized if desired prior to component insertion.

A final check is made with the ring gauges inserted in three planes to assess roundness and size | **FIGURE 17.** The one millimeter under the component OD should just bottom out with pressure. Since the CONSERVE® PLUS cup is spherical and has no rim flare, we recommend under ream the acetabulum precisely by 1mm for optimal press-fit.

FIGURE 18

FIGURE 19

ACETABULAR IMPACTION

The acetabular component holder is attached using the bayonet couplers and tightened | **FIGURE 18.** The outriggers are set for 42° lateral and 15° anteverted | **FIGURE 19.** Perform final pulse lavage and antibiotic irrigation.

The component is vigorously impacted into place with a 1-kg or 2-lb. mallet. There is generally an audible sound change when full seating has occurred. We suggest placing the coupler arms anteriorly at 7 and 11 and posteriorly at 3 o'clock for easier re-attachment should socket removal be necessary. If desirable the socket acetabulum can be 10mm uncovered laterally or posteriorly. If positioned incorrectly the socket can be removed with a slap hammer, washed thoroughly to remove all debris, and reinserted. Remove projecting walls with osteotome and/ or chamfer them with a burr.

FIGURE 20

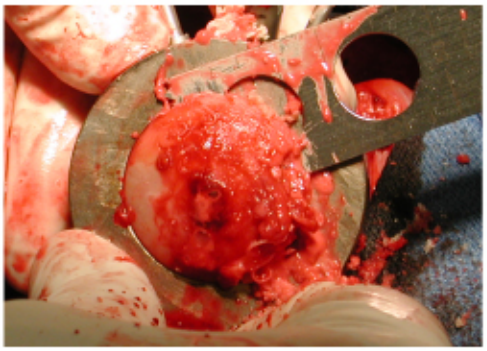


FIGURE 21

FIGURE 22

RETURN TO FEMORAL PREPARATION

Complete final cylindrical reaming by reinserting the pin through the last cylindrical reamer used and proceed with downsizing Relocate the pin if it is not centered, However it is possible to alter the reamer direction very slightly after the reaming has begun by removing the pin and applying eccentric pressure to the reamer.

SAW CUT-OFF GUIDE

The saw cutoff guide is positioned so that its inferior margin covers the reamed portion of the head at the head-neck junction. The cut-off guide should be stabilized by inserting two short pins into the cylindrically reamed portion of the neck through the guide hole and slot | **FIGURE 20.** The dome of the femoral head is then resected with a saber or oscillating saw | **FIGURE 21.**

Remove all interposed debris from the surface of the saw cut off guide so that the tower alignment guide will be flush with the top of the guide and firmly seated | **FIGURE 22.**

FIGURE 23

FIGURE 24

FIGURE 25

STEM HOLE AND CHAMFER PREPARATION

The starter drill for the tapered stem reamer is used to initiate an accurate entry | **FIGURE 23.** The stem reamer is then introduced and advanced into the head and neck to the appropriate level for the final component size or alternatively one or two sizes deeper if the short stem is to be cemented in and one size under if it is to be press-fit | **FIGURE 24.**

The chamfer guide is inserted into the head to guide the appropriate size chamfer reamer to obtain the final shape | **FIGURE 25.** The chamfered surface significantly increases the available fixation area at the femoral head.

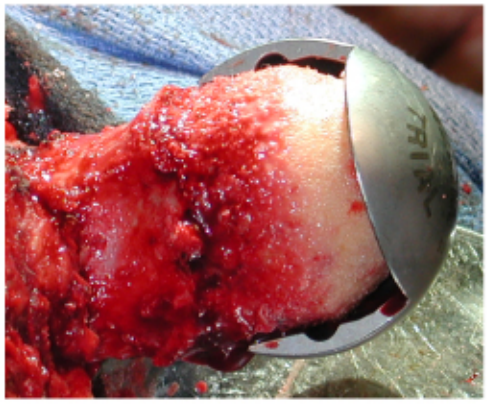


FIGURE 26

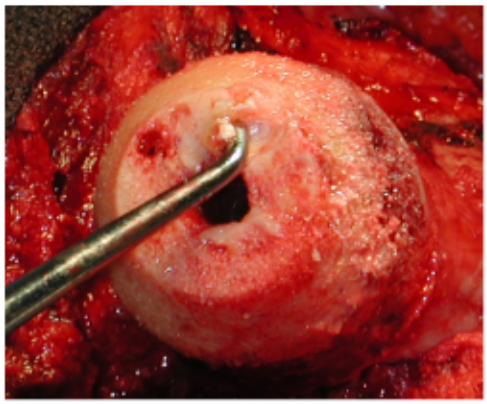


FIGURE 27

FINAL FEMORAL HEAD PREPARATIONS

The thickness of the femoral head cement mantle thickness is confirmed by rotating the femoral trial, which matches the internal dimensions of the femoral component | **FIGURE 26.** Template should easily rotate 360°. If there is impingement then reinsert the chamfer guide and use the last cylindrical reamer to shave off a small amount of bone and recheck with the template. It is possible to insert the implantable component and do a trial reduction if for example it was desirable to check a range of motion to see if there was any impingement. Remove all cyst and soft tissue with sharp curette and burr | **FIGURE 27.** The bone at the distal tip of the trial component may be marked with methylene blue or the electric cautery to indicate complete seating of the femoral component during impaction.

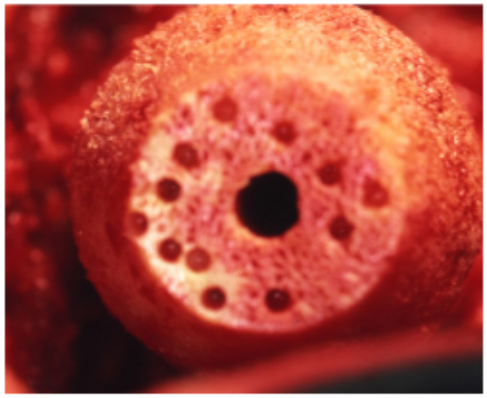


FIGURE 28

Additional fixation holes are made using a 1/8" or 3.5mm drill into the reactive dense sclerotic bone in the dome and chamfered areas **| FIGURE 28.**

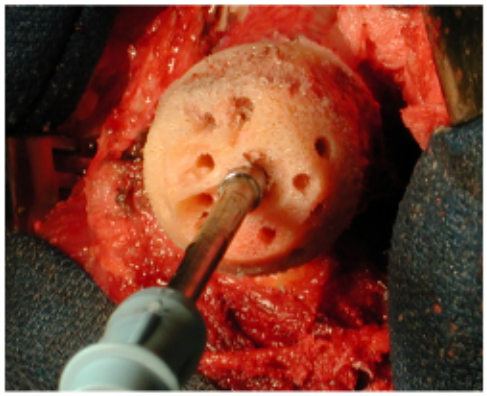


FIGURE 29

Jet lavage to clean the bone and then insert the suction tip (Femsuck) **| FIGURE 29.** If the suction does not keep the surface absolutely dry then add a suction canulla to the lesser trochanter.

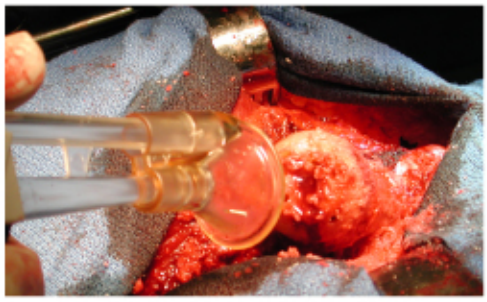


FIGURE 30

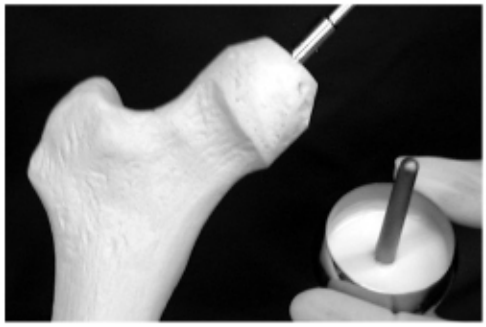


FIGURE 31

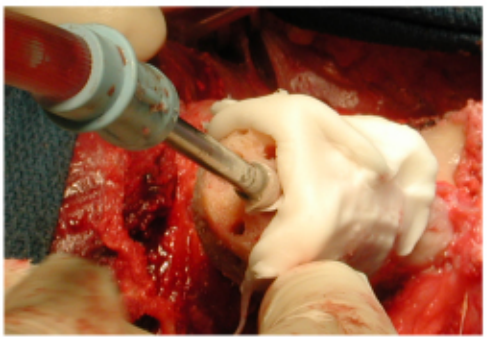


FIGURE 32

CEMENT PREPARATION

Before cement is applied, the areas are thoroughly water picked to make certain all bone fragments and soft tissue have been removed. In addition, the entire area is thoroughly irrigated and soaked with duo-biotic | FIGURE 30. The cancellous bone continues to be sucked dry by the femoral head suction tip and surface dried. One package of bone cement is mixed and poured into the femoral component up to the recessed groove | FIGURE 31. On large sizes 50-54 or where there are large bone defects due to cyst formations, mix a package and a half of acrylic cement to make sure there will be enough to optimize fixation | FIGURE 32.

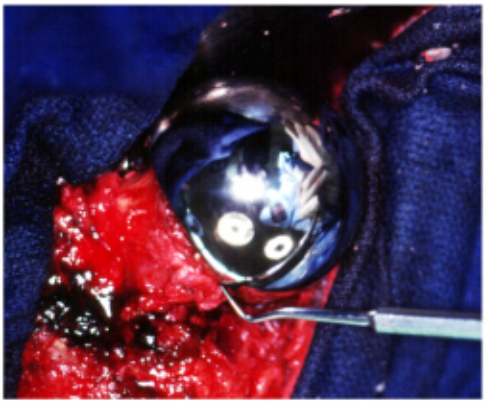


FIGURE 33

FIGURE 34

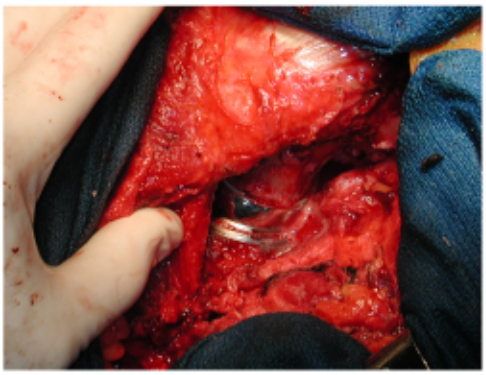


FIGURE 35

FINAL STAGES

Where there is good bone quality cementing the stem is optional. However if there is poor quality bone due to large cysts, osteopenia and small component size always cement the stem in.

When cementing the stem always drill at least 2mm deeper to add room for cement. Leave the "Femsuck" in the dome hole for the stem during the initial application and finger pressurization of bone cement into the cancellous bone especially of the cylindrically reamed bone. If the stem is to be cemented in, pressurize some cement into the dome central hole. The femoral component containing the doughy cement is pressed onto the prepared femoral surface fully seated and held until the bone cement has cured | **FIGURE 33**. The component may be lightly impacted with the impactor and mallet.

All of the excess cement is carefully removed circumferentially initially by the use of a scalpel. To remove all excess acrylic, raise the table and tilt the opposite side to directly visualize the superior and anterior component-neck junction | **FIGURE 34**. A dental freerer is helpful to pack acrylic under the margins of the component.

The hip is reduced and range of motion is checked | **FIGURE 35**. Carefully check for any impingement. A portion of the greater trochanter anteriorly may be osteotomized and removed if there is impingement in external rotation. Also check for impingement with flexion and internal rotation. Final irrigation is performed. Use 2000cc of saline and 1000cc of an antibiotic solution to minimize heterotopic bone formation. The gluteus maximus tendon is reattached. The short rotators are repaired with sutures. The wound is then closed with one or more drains.

SPECIAL TECHNICAL CONSIDERATIONS FOR SPECIFIC ETIOLOGIC AND BONE STOCK REQUIREMENTS

With a Slipped Capital Femoral Epiphysis (SCFE) the head is usually retroverted and the neck dimensions wide. CT is advisable to evaluate the neck size and the acetabular bone stock. At surgery, ream as close as possible to the inferior neck and identify the inferior subcapital recess under neck osteophytes If the head is extremely large or eccentric, reduce the size of the femoral head medially gradually with an oscillating saw or osteotome so that the lateral neck can be protected. However, if a neck notch is necessary to fit the acetabular component in without sacrificing a large amount of anterior or posterior acetabular wall thickness and strength, consider notching medially where the cortex is generally thicker. It is important to have adequate exposure to be able to assess the head and neck and acetabular anatomy.

In Legg Perthes or DDH (Dysplasia) where the head neck segment is short or with limb length inequality or poor abductor lever arm, minimally resect the dome of the femoral head in order to preserve and restore as much length of the head and neck. It is always wise to proceed with downsizing very slowly. If there are large osteophytes around the base of the neck it may be impossible to attach the pin-centering guide. Use a large cylindrical reamer to estimate the location of the neck central axis to place a pin optimally and then use the cylindrical reamer feeler gauges on the pin to accurately access its location. If not centered, relocate the pin.

We do not generally recommend removing osteophytes anteriorly or laterally because the osteophyte often contains structural bone unless there is significant impingement after trial reduction. Further, if there is osteopenia of the lateral neck it is important to ream the head into some valgus to minimize the tensile stresses across the neck. If it is possible use a cylindrical reamer size large enough clear the osteophyte and this may be preferable to removing it assuming there is enough acetabular bone stock and you do not diminish the acetabular walls unnecessarily with reaming for the socket.

If the socket does not have enough stability after impaction remove and ream deeper with a 1mm smaller reamer. In general, one-millimeter interference fit is optimal especially in young patients with excellent bone quality but i f the bone quality softer, than 1.5 millimeters undersize may be appropriate.

In the (Crowe Class II) DDH, with the femoral head superiorly subluxed as a Crowe Class II, bring the acetabular component down to the anatomical acetabulum. In order to ream the acetabulum large enough hemispherically it may be necessary on occasion to ream to the medial wall. Occasionally the lateral acetabular wall may be eroded and it is possible to leave ~5 to 10 mm (depending on size) of socket uncovered and still obtain rigid initial fixation.

Wright Medical Technology, Inc.
5677 Airline Road
Arlington, TN 38002
901.867.9971 phone
800.238.7188 toll-free
www.wmt.co

Wright Cremascoli Ortho SA
Zone Industrielle la Farlede
Rue Pasteur BP 222
83089 Toulon Cedex 09
France
011.33.49.408.7788 phone

This device is restricted to investigational use only in the United States.
Covered by one or more of the following U.S. Patents: 6,063,124
CONSERVE® is a registered trademark of Wright Medical Technology, Inc.

MH332-301
Revised 2/03