

Integral 180 Surgical Technique



BIOMET
ORTHOPEDICS, INC.

The Integral 180 and 225 are part of the Alliance™ Family Total Hip System.

The Integral 225 femoral component is marketed for use with bone cement in the United States.

Biomet markets porous plasma sprayed components for non-cemented use in skeletally mature patients undergoing primary hip replacement surgery as a result of non-inflammatory degenerative joint disease.

This brochure is presented to demonstrate the surgical technique utilized by David R. Mauerhan, M.D. Biomet, as the manufacturer of this device, does not practice medicine and does not recommend this or any other surgical technique for use on a specific patient. The surgeon who performs only implant procedure is responsible for determining and utilizing the appropriate techniques for implanting the prosthesis in each individual patient. Biomet is not responsible for selection of the appropriate surgical technique to be utilized for an individual patient.

Pre-Operative Planning - Integral 180

Preoperative planning can easily be performed with templates for both acetabular and femoral sizing. It is recommended that a radiographic marker be used to assess X-ray magnification on an individual basis so that the proper templates can be selected. First, the acetabular shell template that best fills the acetabulum without excessive subchondral bone removal is positioned in the anatomic location (referenced off the tear drop) with an abduction or inclination angle of approximately 45 to 50 degrees, thus maximizing superolateral bone coverage. The center of rotation of the hip joint can then be marked off the template. Next, the appropriate femoral template which best fills the canal both proximally and distally on both the A/P and lateral projections is chosen. It is important to obtain true A/P and lateral X-rays with enough femoral shaft length to accommodate the full length of the template. As a point of reference, the position of the neck cut is placed to allow the use of a standard neck prosthesis. Reference for the cut can also be based off the anatomic center of the patient's femoral head. The longitudinal axis can also be used to allow for correction of appropriate lateral offset. The perpendicular distance from the axis to the center of the patient's femoral head can be used to determine proper offset which can then be recreated intraoperatively.

In the vast majority of cases the line drawn perpendicular to the femoral shaft axis through the tip of the greater trochanter will intersect the center of the femoral head. In cases of coxa vara or coxa valga, this may vary and either the level of the neck cut, or selection of neck length can be varied to achieve the desired leg length equalities. Using the technique of varying the level of neck cut in combination with the selection of appropriate neck length, correct leg length and normal lateral offset can be re-established.

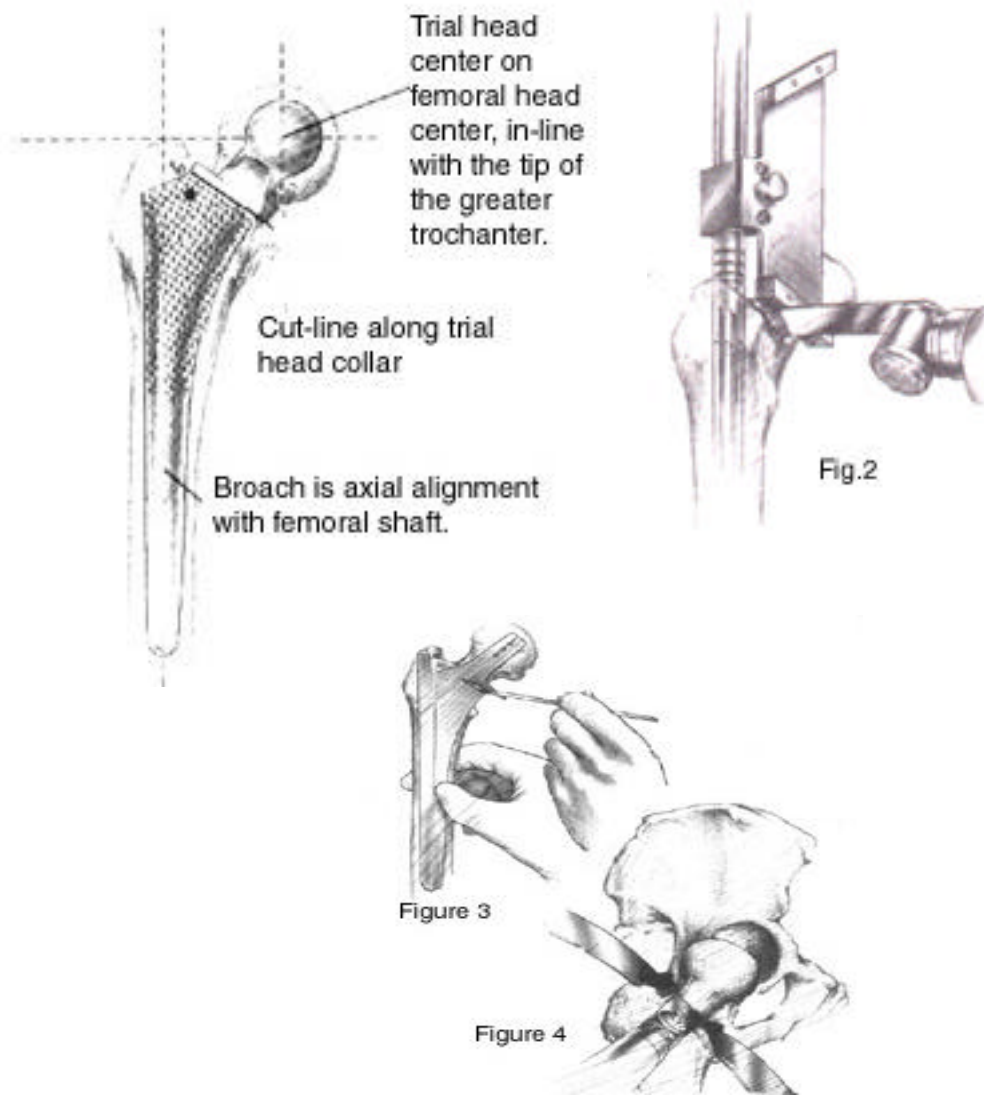
Surgical Approach

The recommended surgical exposure is a posterolateral approach as it affords excellent exposure of the femoral shaft for canal preparation. Generally, any commonly employed surgical approach can be utilized with the Integral 180 component.

Step 1 - Integral 180

Resection Level for the Integral 180

Once the hip is dislocated, the level of the neck resection can be measured proximally from the lesser trochanter based on the preoperatively templated measurement. In addition, the center of the femoral head can be approximated and marked (Fig. 1). An additional mark can be made on the greater trochanter with electrocautery, so that the appropriate lateral offset can be reconstituted. A right angle retractor can be used to judge this anatomic relationship for later restoration of leg length and offset. The femoral neck cut can be made by either using the femoral broach as a template (Fig. 1), by using the femoral neck cutting guide (Fig. 2) or by using the femoral resection templates (Fig. 3). The neck cut (Fig. 4) is made slightly horizontal, which allows use of the calcar planer to obtain a smooth surface for eventual flush collar-calcar seating.



Step 2 - Integral 180

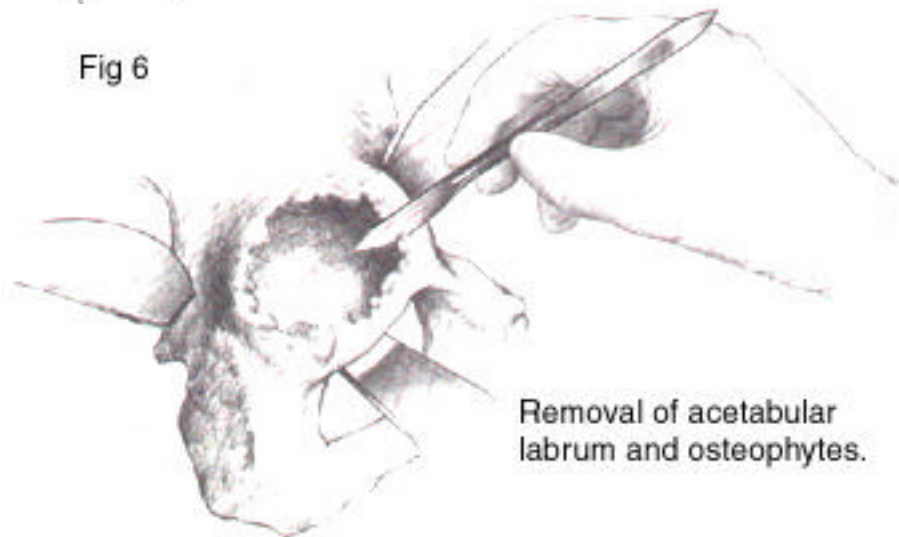
Acetabular Exposure

Following removal of the femoral head, a partial superior and anterior capsulectomy is performed to allow exposure of the anterior acetabular rim. Hohmann (or similar retractors) are placed over the anterior rim for retraction of the shaft anteriorly. If the shaft cannot be easily displaced anteriorly, then division of the gluteus maximus tendon will facilitate this maneuver. Posterior and superior Charnley pin retractors (or similar retractors) are placed in the interval between the capsule and the labrum to allow complete exposure (Fig. 5). The acetabular rim is then completely exposed by thorough removal of the acetabular labrum inferiorly, a majority of the transverse acetabular ligament and acetabular fat pad is removed to allow complete visualization of the acetabular rim and the inferior margin of the true acetabulum. If there are significant central osteophytes, they should be removed to allow visualization of the true acetabular floor in the acetabular fossa (Fig. 6). This step will then allow identification of the medial and inferior acetabular floor and help determine the extent of the reaming process.



Fig. 5

Fig 6

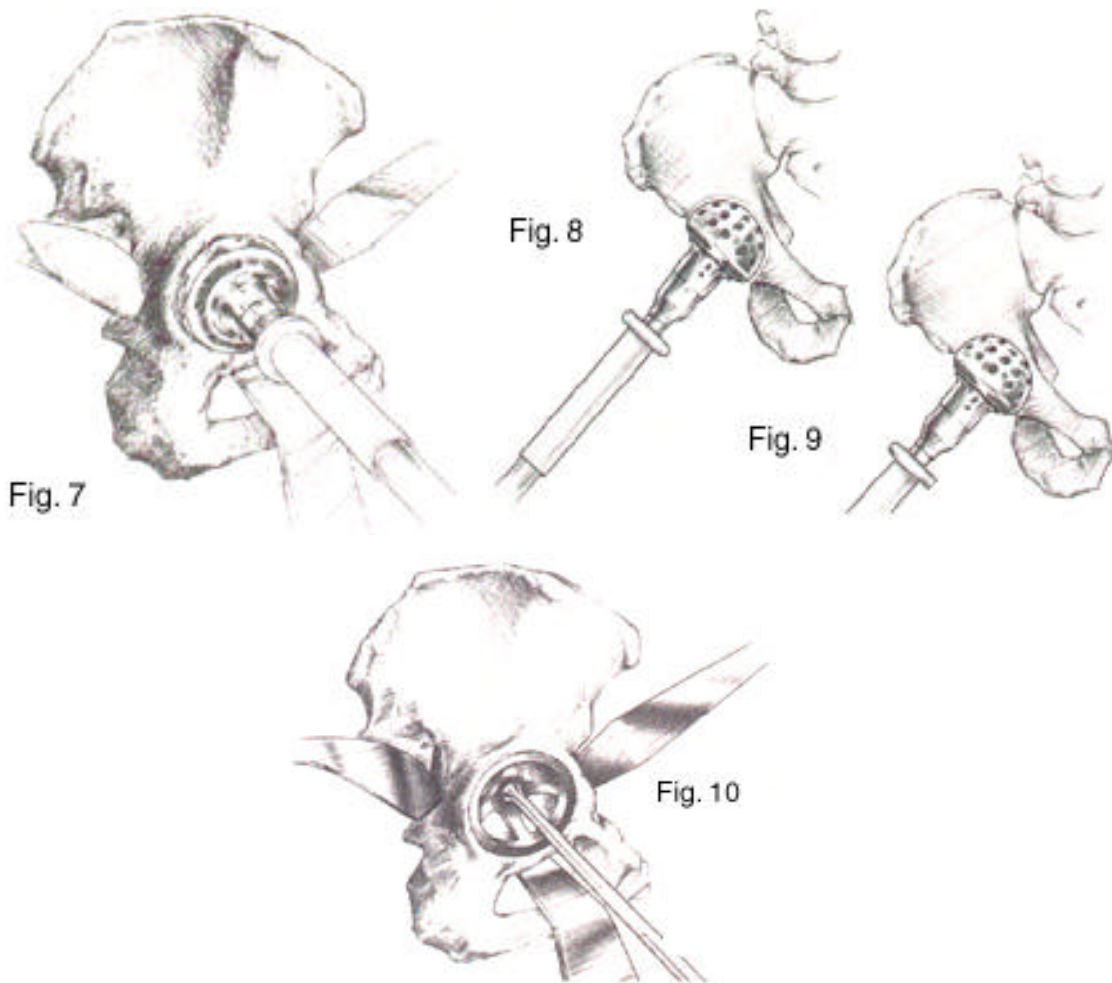


Removal of acetabular labrum and osteophytes.

Step 3 - Integral 180

Reaming the Acetabulum

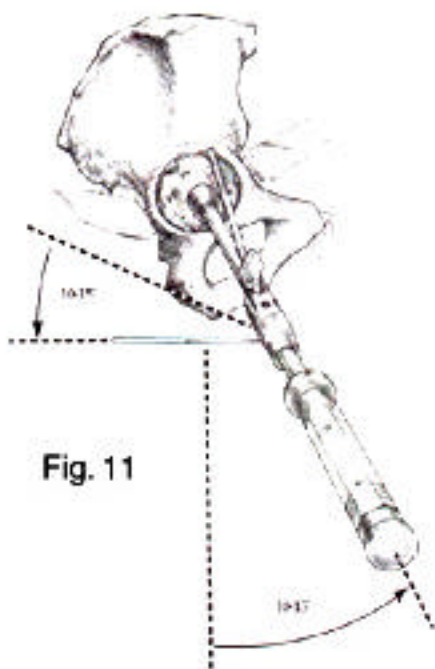
Once acetabular exposure has been accomplished, reaming can be initiated. The largest reamer that easily fits the acetabulum is selected (Fig. 7). This allows reaming based on the anatomic center of the acetabulum. If too small a reamer is chosen to begin with, the reaming process may begin eccentrically, thus removing excessive anterior or posterior wall bone stock with resultant nonanatomic placement of the acetabular component. Reaming is then continued until concentric removal of all remaining acetabular cartilage and the exposure of punctate bleeding in the subchondral plate is achieved (Fig. 8 and 9). Again, the medial landmark for correct depth is the acetabular floor visualized through the acetabular fossa. The acetabular sizer corresponding to the last reamer used is placed on the handle and inserted into the acetabulum (Fig. 10). The acetabular sizers are the same size as the actual implant and should fit snugly into the acetabulum. If the sizer seats fully into the acetabulum and is freely moveable, the next larger size acetabular sizer should be chosen. One should have to lightly impact the cup trial into a fully seated position and not be able to significantly it to assure a good fit of the corresponding acetabular shell. Once the trial is fully seated, it may be helpful to make a mark on the inside of the peripheral rim of the bone with methylene blue to provide a reference for final shell insertion depth.



Step 4 - Integral 180

Cup Insertion

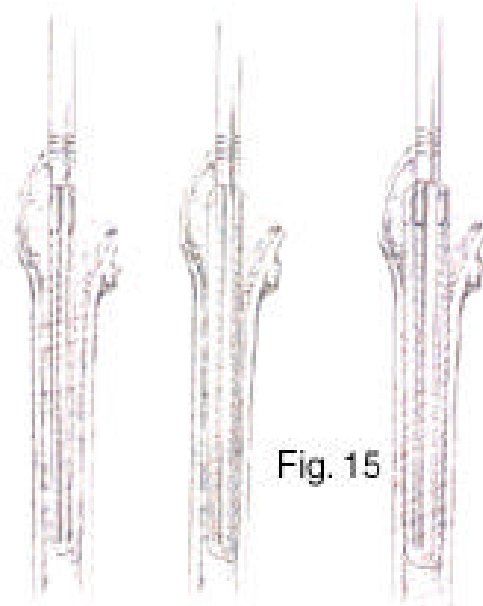
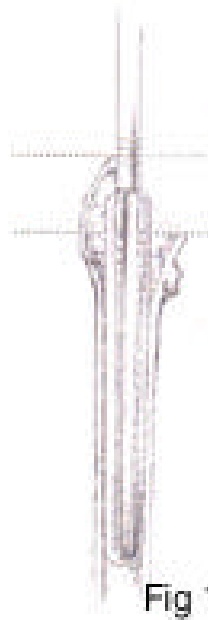
To correctly judge appropriate component position, the acetabular sizer can be inserted and positioned in the acetabulum allowing removal of any overhanging anterior, posterior, or superior osteophytes (Fig. 10). This technique is highly recommended to allow adequate and full exposure, as well as the correct position and placement of the solid shell. Once these steps have been completed, the correct acetabular shell is then locked onto the acetabular positioner with the appropriately sized insertion (rim) plate and driven into a fully seated position (Fig. 11). An optional angle guide may be used to determine the proper anteversion and inclination angle. The cup should be driven down to the same level as the final acetabular reamer or trial gauge, since screw holes are not available to check apposition. One should not be able to easily twist the shell within the bone with the acetabular inserter. This helps confirm a good fit. Following these steps, the correct acetabular liner can then be placed in the desired position of coverage and impacted into place (Fig. 12). Attention can now be turned to the femoral component.



Step 5 - Integral 180

Reaming the Femur For the Integral 180 Component

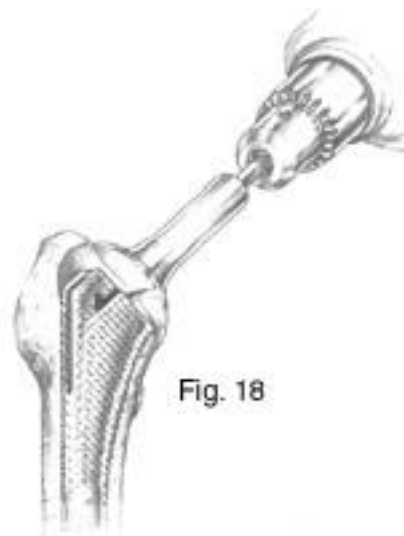
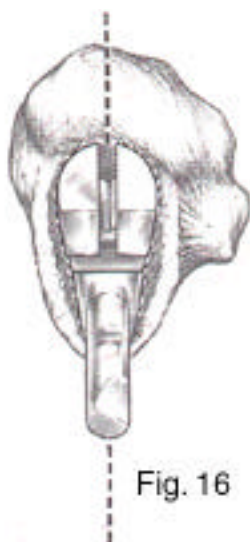
The femoral canal is identified with a hand-held starter reamer (Fig. 13). Power reaming can be initiated with a 10mm conical/ cylindrical reamer. The Integral 180 reamers are custom designed to account for the tapered portion as well as the cylindrical portion of the implant. This eliminates the need to separately ream the cylindrical and conical portions. The reamer is advanced slowly within the canal until the gold, nitrided portion of the reamer is at the level of the calcar or the appropriate depth groove on the reamer shank is to the level of the top of the greater trochanter (Fig. 14). As the reamer is withdrawn, lateral pressure is exerted to ensure proper lateralization within the canal. Reaming should proceed in 1 or 2mm increments depending on the bone density (Fig. 15). Care should be taken not to sacrifice healthy cortical bone stock. The side cutting feature of the reamers helps avoid notching of the endosteal cortical wall.



Step 6 - Integral 180

Broaching the Proximal Femur for the Integral 180

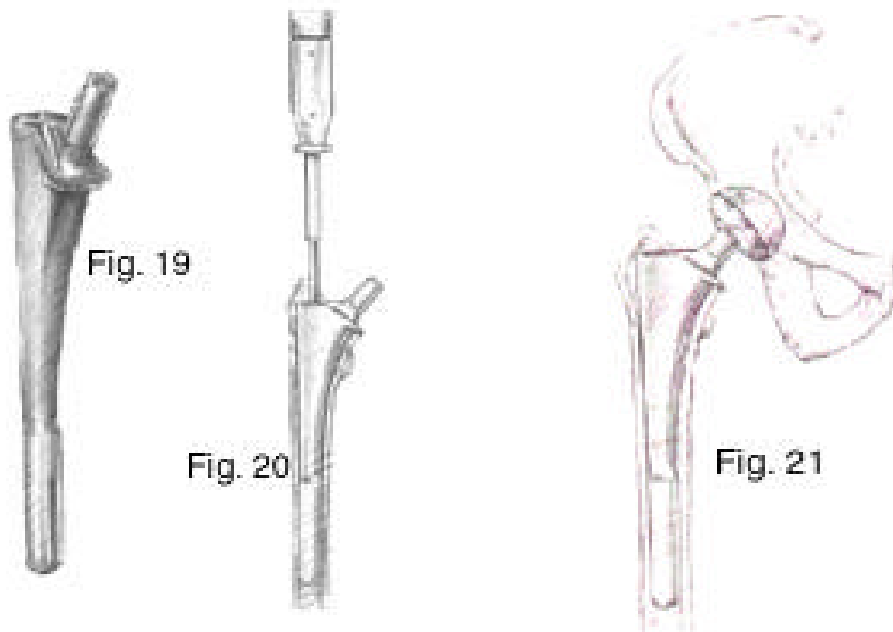
Once the appropriate reamer has been passed, broaching can be initiated. If a 13mm reamer was the last size used, begin broaching with an 11mm broach. It is important that the broach is oriented so that the mediolateral axis of the broach is parallel to the anatomic mediolateral axis of the femoral neck (Fig. 16). This will help to ensure maximum proximal canal fill. The broach is impacted until it is slightly below the level of the initial calcar cut (Fig. 17). Sequentially, larger broaches are used until the final broach size that corresponds to the final reamer size is selected. With the proper size broach in place, the calcar is planed flush by using the calcar trimmer (Fig. 18). If a question arises as to whether appropriate fill has been obtained, an intraoperative X-ray is taken to assure proper fill. If trouble is encountered in fully seating the appropriate broach, the corresponding reamer can be passed with an increase in the amount of lateral reaming. This will allow the broach to be fully seated.



Step 7 - Integral 180

Trial Reduction for the Integral 180

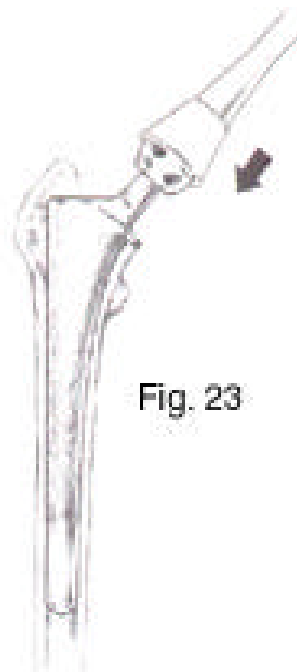
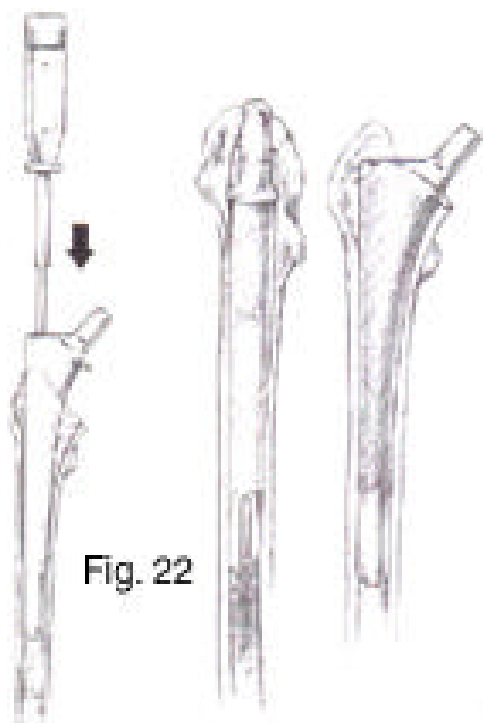
The Integral 180 system provides titanium, coronal slotted implant trials that match the implant dimensions minus the porous coating (Fig. 19). This allows seating of the trial prosthesis without the worry of the trial becoming fixed in the femur. After extracting the final broach from the femur, select the corresponding size trial prosthesis and insert with threaded inserter/ extractor (Fig. 20). Example: Final broach size and reamer size is 15mm; select 15mm trial. The collar should seat flush against the medial calcar and the lateral shoulder should seat against the greater trochanter. With the trial in place, provisional heads are selected to determine the appropriate neck length and lateral offset (Fig. 21).



Step 8 - Integral 180

Inserting 180 Porous Component

The stem corresponding to the size of the final broach and reamer used is threaded onto the stem inserter/extractor and impacted into a fully seated position with the distal slot aligned in the coronal plane (Fig. 22). The collar should seat flush against the medial calcar and the lateral shoulder should seat against the greater trochanter. Rotational stability is ensured with the broad lateral shoulder, collar and extended porous coating. After fully seating the femoral component, the appropriate modular head is impacted onto the femoral neck (Fig. 23). The hip is now ready to be reduced. If desired, another trial reduction can be accomplished after implantation of the stem and prior to impacting the modular head. Provisional heads in seven neck lengths allow trial reductions to be performed, using the actual femoral component, to again assure proper leg length and stability. Closure Drains are placed deep in the joint and the capsule and short external rotators can be repaired. The remaining closure can be done in a routine fashion.



Pre-Operative Planning - Integral 225

Preoperative planning can easily be performed with templates for both acetabular and femoral sizing. It is recommended that a radiographic marker be used to assess X-ray magnification on an individual basis so that the proper templates can be selected. First, the acetabular shell template that best fills the acetabulum without excessive subchondral bone removal is positioned in the anatomic location (referenced off the tear drop) with an abduction or inclination angle of approximately 45 to 50 degrees, thus maximizing superolateral bone coverage. The center of rotation of the hip joint can then be marked off the template. Next, the appropriate femoral template which best fills the canal both proximally and distally on both the A/P and lateral projections is chosen. It is important to obtain A/P and lateral X-rays that allow visualization of the isthmus and below to confirm accommodation of the anterior bow of the implant. In the vast majority of cases, the line drawn perpendicular to the femoral shaft axis through the tip of the greater trochanter will intersect the center of the femoral head. In cases of coxa vara or coxa valga, this may vary so selection of one of Biomet's seven neck lengths can be varied to achieve the desired leg length equalities.

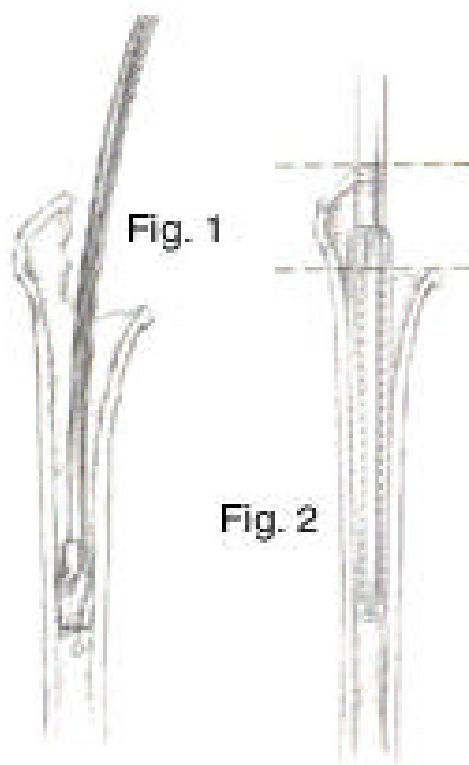
Surgical Approach

The recommended surgical exposure is a posterolateral approach as it affords excellent exposure of the femoral shaft for canal preparation. Generally, any commonly employed surgical approach can be utilized with the Integral 225 component. Femoral and acetabular components are removed in standard fashion. The Integral 225 is compatible with all Biomet RingLoc shells.

Step 1 - Integral 225

Reaming the Femur For the Integral 225

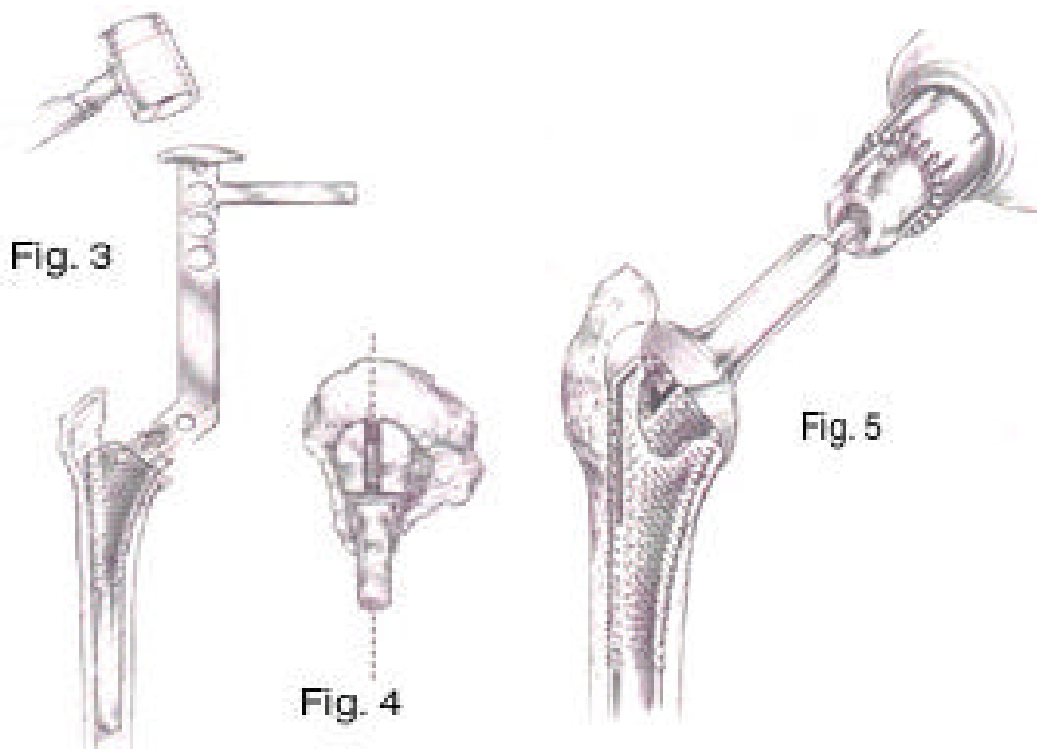
Flexible wire reamers are advanced in 1mm increments until templated size or cortical chatter is obtained (Fig. 1). Always utilize a guide wire for guidance of flexible reamers and for removal in the event that the reamer becomes lodged. Care should be taken not to sacrifice healthy cortical bone stock. After flexibly reaming to 225mm in depth, select the Alliance tapered reamer that is two to three sizes smaller than the last size flexible reamer. The tapered reamer is advanced slowly within the canal until the gold, nitrided portion of the reamer is at the level of the calcar or the appropriate depth groove on the reamer shank is to the level of the top of the greater trochanter (Fig. 2). Ream to the same size as the last flexible reamer used. Note: With the Integral 225 implant there is no need to over ream distally to insert the stem around the bow of the femur. The stem has been engineered so that when the femur is flexibly and conically reamed to 15mm, for example, a 15mm Integral 225 component is selected and implanted.



Step 2 - Integral 225

Broaching the Proximal Femur for the Integral 225

Once the appropriate reamers have been passed, broaching can be initiated. If a 13mm tapered reamer was the last size used, begin broaching with a 11mm broach. It is important that the broach should be oriented so that the mediolateral axis of the broach is parallel to the anatomic mediolateral axis of the femoral neck (Fig. 3 & 4). This will help to ensure maximum proximal canal fill. The broach is impacted until it is at the medial bone level or preoperatively templated position. Sequentially, larger broaches are used until the final broach size that corresponds to the final reamer size is selected. With the proper size broach in place, the calcar if present, is planed flush by using the calcar trimmer (Fig. 5). If a question arises as to whether appropriate fill has been obtained, an intraoperative X-ray is taken to assure proper fill. If trouble is encountered in fully seating the appropriate broach, the corresponding tapered reamer can be passed with an increase in the amount of lateral reaming. This will allow the broach to be fully seated.



Step 3 - Integral 225

Trial Reduction for the Integral 225

The Integral 225 system provides titanium, coronal slotted implant trials that match the implants dimensions minus the porous coating (Fig. 6). This allows seating of the trial prosthesis without the worry of the trial becoming fixed in the femur. The trials also incorporate an extended 6mm neck length which match the final implants. After extracting the final broach from the femur, select the corresponding size trial prosthesis and insert with threaded inserter/ extractor (Fig. 7). Example: Final broach and reamer sizes are 15mm; select 15mm trial. The collar should seat flush against the medial calcar if present or to the level which was preoperatively templated. Important: If the trial implant does not fully seat, select the flexible reamer that is .5mm larger than trial implant and ream to 225mm in depth. If trial still does not seat, select last tapered reamer used and ream again to confirm proper depth and lateralization of the reamer. If at this point the trial still does not seat, select the next larger size tapered reamer and advance until the appropriate depth groove on the reamer shank is to the level of the top of the greater trochanter. Seat trial again so that the collar rests flush on the medial calcar if present or to the level which was preoperatively templated. Example: Final flexible and tapered reamer and broach size is 15mm When inserting the 15mm trial, resistance is encountered, preventing the 15mm trial from seating. Select the 15.5mm flexible reamer and advance it 225mm in depth. Select 15mm trial and seat again. If resistance is still encountered, select 15mm tapered reamer and advance it again down the canal, confirming proper depth and lateralization. Select 15mm trial and seat. If resistance is still encountered, select 16mm tapered reamer and advance it down the canal again confirming proper depth and lateralization. Seat 15mm trial. With the trial in place, provisional heads are selected to determine the appropriate neck length and lateral offset (Fig. 8).



Fig. 6



fig. 7

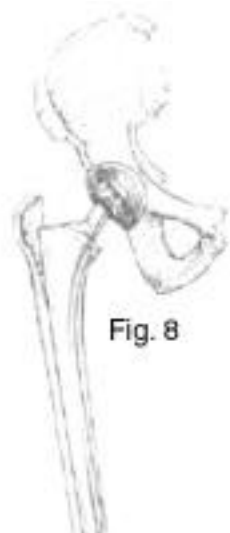
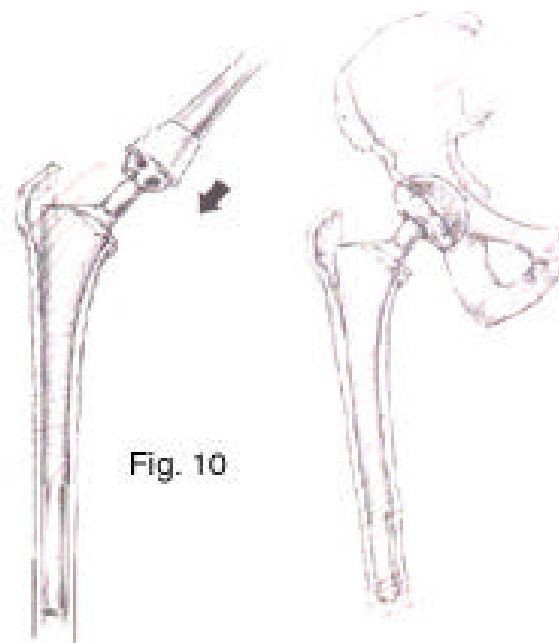
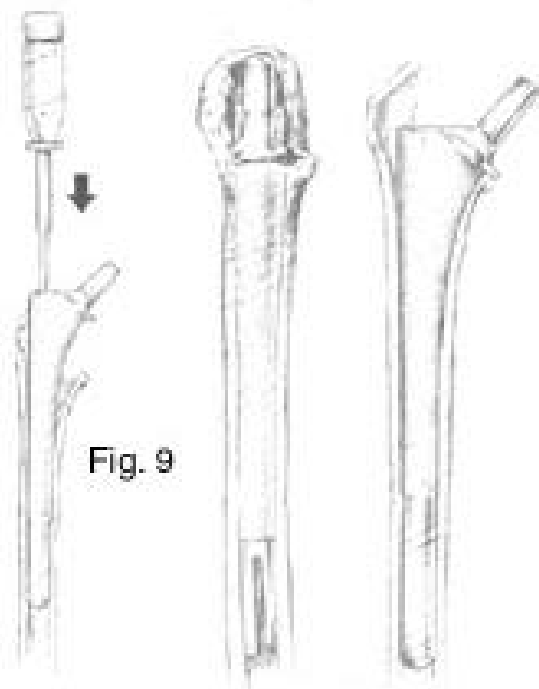


Fig. 8

Step 4 - Integral 225

Inserting 225 Porous Component

The stem corresponding to the size of the final broach used is threaded onto the stem inserter/ extractor and impacted into a fully seated position with the distal slot aligned in the coronal plane (Fig. 9). The collar should seat flush against the medial calcar if present and the lateral shoulder should seat against the greater trochanter. Rotational stability is ensured with the broad lateral shoulder, collar and extended porous coating. After fully seating the femoral component, the appropriate modular head is impacted onto the femoral neck (Fig. 10). The hip is now ready to be reduced. If desired, another trial reduction can be accomplished after implantation of the stem and prior to impacting the modular head. Provisional heads in seven neck lengths allow trial reductions to be performed, using the actual femoral component, to again assure proper leg length and stability.



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