• TITANIUM ALLOY CONSTRUCTION
• FASTER INSERTION WITH PATHFINDER TIPS
• SIMPLE, ACCURATE INSTRUMENTATION
• CONVENIENT STERILE PACKAGING

This Arthrodesis Nail brochure is presented to demonstrate the surgical technique utilized by Michael O. Williams, M.D., Baptist Medical Center, Oklahoma City, Oklahoma. 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 any procedure is responsible for determining and utilizing the appropriate technique for such procedure for each individual patient. Biomet is not responsible for selection of the appropriate surgical technique for an individual patient.
INDICATIONS
- Failed external fixation
- Aseptic failed total knee arthroplasty
- Periarticular fractures where repair is not possible
- Limb salvage in tumor treatment

PREOPERATIVE PLANNING
The desired position of the knee is 5° of valgus and 15° of flexion with the leg 1 cm shorter than the opposite side. This degree of placement will allow for a normal gait and foot clearance when walking. If increased bone loss is present and shortening is greater than 3 cm, position the knee in full extension, which should not significantly affect gait function.

To identify the correct diameter and length of the nail required, take full A/P and lateral X-rays of the affected leg. When possible, take full A/P and lateral X-rays of the unaffected leg for comparison. The correctly sized nail will extend from the tip of the greater trochanter to just above the tibial plafond. Final determination of nail size must be made intraoperatively.

PATIENT POSITIONING
The patient is placed on the operating table in the supine position with a hip roll under the affected buttock (Figure 1). This allows for access to the greater trochanter and the surgeon may operate on the knee from either side of the table. Place the unaffected leg in a position that will allow for visualization with image intensification in both the A/P and lateral views. A sterile thigh tourniquet may be used to obtain hemostasis at the knee. Drape the leg from just above the ankle to well above the iliac crest.

SURGICAL APPROACH: Canal Location
An anterior longitudinal incision is used unless there are previous incisions about the knee, in which case the previous incision should be used (Figure 2). Total knee arthroplasty instruments are used to achieve flat symmetric surfaces at the tibial and femoral ends. With the knee joint exposed, care should be taken to obtain a true mechanical axis in all planes. Use of some of the initial total knee instruments can make this more exact. The patella may be used for bone graft.
Once the knee surfaces are prepared, the focus shifts to the hip. The incision starts at the tip of the greater trochanter and extends proximally in line with the femoral shaft axis (Figure 3). Split muscles and identify the A/P margins of the greater trochanter. Insert a sharp awl into the medullary canal in the region of the piriformis fossa (Figure 4). Check position with the image intensifier. Insertion point is just medial to the greater trochanter and posterior to the central axis of the femoral neck (Figure 5). Avoid anterior portals of entry.

A corresponding spot is then selected on the anterior central medial aspect of the tibia, using the tibial tubercle as a guide to the medullary canal (Figure 6). Remove the awl and insert a 160cm ball tip guide wire, advancing across the knee into the tibial medullary canal.

**BALL TIP GUIDE INSERTION**

Bend the special (3.2mm x 160mm) guide wire approximately 5–7° 2cm from its tip to facilitate passage across the joint (Figure 7). Advance the ball tipped guide wire to the fusion site with a rotating motion using a guide pin hand grip. Pass the wire across the joint using the bi-plane image control. The bent tip is turned posteriorly and advanced to the tibial plafond (Figure 8).
**CANAL REAMING**
Both bones are reamed in an antegrade fashion over the guide wire in 1.0mm increments. Use the special 80cm long flexible reamers starting with an 8mm end-cutting reamer. Ream progressively in 1.0mm increments until appropriate canal diameter is reached (Figure 9). Reaming the femoral canal diameter 1–2mm larger than the nail to be implanted will reduce the driving force onto the nail, the potential risk of nail damage, and the chance of splitting the femur.

**NOTE:** When using 10–13mm nails, ream the first 8cm proximally to 14mm to accept the larger diameter proximal end of the nails. The tibia is reamed to the nail size, which provides rotational stability in the tibia.

**MEASURING NAIL LENGTH**
With the end of the ball tip guide wire resting at the site of the nail end, use a second guide wire of equal length to measure the length of the medullary canal (Figure 10). For the nail driving guide, insert the second ball tip guide wire, with the **ball end out**, down the canal. Remove the first guide wire. Reversing the ball end will prevent the ball from catching on the nail end during guide wire removal (Figure 11).
**NAIL INSERTION: Standard Driver**

Insert driver bolt into driver handle. Slide driver bushing over end of driver bolt until flats line up. Lock assembly together by pushing tab on driver handle (Figure 12).

Before threading driver bolt into the nail, confirm direction of the driver handle for the right or left leg. With the bow and longitudinal slot of the nail facing anteriorly, thread the driver bolt into the end of the nail using either an end wrench or universal socket wrench. Engage the nail slots with tangs on the driver bushing to securely lock the assembly (Figure 13).

Thread the offset driver into the driver handle until fully seated. Place a nail over the nail driving guide. Drive the nail until the proximal end is even with the tip of the greater trochanter. If the offset driver handle should loosen slightly during insertion, tighten it down before continuing. The distal nail tip should lie just above the tibial plafond (Figure 14). Remove the nail driving guide. Unthread the offset driver using a lever bar.

**NAIL INSERTION: High Clearance Driver**

The High Clearance Driver was developed for use when more room is required between incision site and the head of the driver bolt. It also features a slender design and a radiolucent proximal target. This permits the use of an image intensifier for a lateral view to verify placement of proximal screws.

Before threading the driver bolt into the nail, confirm direction of driver handle for the right or left leg. With the bow and longitudinal slot of the nail facing anteriorly, thread the driver bolt into the end of the nail using either an end wrench or universal socket wrench. Engage nail slots with tangs on driver bushing to securely lock assembly (Figure 15).

Thread the offset driver into the driver handle until fully seated. Place a nail over the nail driving guide. Drive the nail until the proximal end is even with the tip of the greater trochanter. If the offset driver should loosen during insertion, tighten it down before continuing. The distal nail tip should lie just above the tibial plafond (Figure 16). Remove nail driving guide.
**PROXIMAL SCREW HOLE: Standard Driver**
Thread drill bushing A into guide tube A. Insert sleeves through proximal target on the driver handle. Tap lightly to rest against the bone. **NOTE:** For accurate screw length readings, drill sleeve must be against the greater trochanter. Place 5mm calibrated twist drill through the sleeves and advance through both cortices. Read screw length off calibrated drill shaft. Remove drill and bushing A (Figure 17).

Insert a 6.0mm diameter fully threaded screw through guide tube A and advance with a T-wrench until seated. Confirm screw placement with image intensifier before removing T-wrench and guide tube A (Figure 18).

**PROXIMAL SCREW HOLE: High Clearance Driver**
Slide the proximal target over driver handle until it rests against notch and tighten by turning the thumbscrew using T-wrench. Thread drill bushing A into guide tube A. Insert sleeves through most proximal hole in the proximal target arm. Tap lightly to rest against bone. **NOTE:** For accurate screw length readings, drill sleeve must be against the greater trochanter. Place a 5mm calibrated twist drill through the sleeves and advance through both cortices. Read screw length off calibrated drill shaft. Remove drill and bushing A (Figure 19).

Insert a 6.0mm diameter fully threaded screw through guide tube A and advance with T-wrench until seated. Confirm screw placement with image intensifier before removing T-wrench and guide tube A (Figure 20).

**END CAP PLACEMENT**
Following proximal screw insertion, the driver handle is removed using the universal socket wrench. Insert end cap with T-wrench into the proximal end of the nail (Figure 21). **NOTE:** It has been suggested that the end cap may be placed through the top of the driver handle after removing the driver bolt, while applying pressure to the driver handle.
DISTAL SCREW INSERTION: Using The Biomet® Radiolucent Targeting Device

The image intensifier is aligned with the more distal hole in the nail, such that the hole appears as a perfect circle (Figure 22). A knife blade is placed on the skin, with the incision point verified on the image intensifier, and a 1 cm stab incision is made over the hole in the nail. The appropriately sized drill bit is inserted into the targeting device. A 4.3 mm drill bit is used for 10 mm and 11 mm nails and a 5.0 mm drill bit is used for 12 mm or larger nails. The tip of the drill bit is placed into the stab incision such that the tip is centered on the hole in the nail, as visible on the image intensifier. The targeting device is tilted until the drill bit appears as a solid circle in the center of the screw hole, and the screw hole is centered in the outer ring of the targeting device (Figure 23). With the drill held firmly in this position, both cortices are drilled through (Figure 24). The position of the drill bit is confirmed on the intensifier before it is withdrawn.

SCREW LENGTH/INSERTION

The length of the screw is measured with the depth gauge and the appropriate screw is inserted (Figure 25). A 5.0 mm diameter screw is used with 10 mm and 11 mm nails and a 6.0 mm diameter screw with 12 mm or larger nails.

NOTE: As an alternative, the distal screws may be inserted using a freehand technique with the distal target awl. A 3.6 mm awl is used with 8 mm and 9 mm nails and a 4.3 mm awl is used with 10 mm and larger nails.

NAIL REMOVAL

When a nail is to be removed, the distal locking screws should be left in place until the extractor adaptor is attached to the nail. The end cap is removed and the nail extractor adaptor is threaded into the proximal end of the nail (Figure 26). The screws are removed with the appropriate hex drive T-wrench. The slap hammer is threaded into the nail extractor adaptor and the nail is removed. NOTE: 6 mm screws require 5 mm Hex wrench and 5 mm screws require 3.5 mm Hex wrench.

POSTOPERATIVE CARE

Patients are started on range of motion exercises of the hip and ankle. Partial weight bearing is encouraged with rapid progression to full weight bearing being urged as stability and patient tolerance dictate.
### ORDERING INFORMATION

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10mm and 11mm diameter nails use 5mm diameter distal screws and are nonslotted.

**NOTE:** When implanting a 10–13mm Arthrodesis Nail, it is extremely important to ream the entry portal to 14mm in diameter to a depth of approximately 3” (8cm) below the entry portal.

**Titanium Low Profile End Cap**

345211

<table>
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<th>Titanium Fixation Screws</th>
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*5mm diameter screws are used only for the distal holes in the 10mm and 11mm diameter nails.

**NOTE:** 5mm screws require a 3.5mm Hex T-wrench and 6mm screws require a 5mm Hex T-wrench.

Screws are packaged sterile, one per package.
INSTRUMENTATION

Driver with Handle* 471720
Driver Bolt 471722
Driver Bushing 471723
Offset Driver 471730
Plain Bar 471731
Guide Tube A 471732
Trocar for Guide Tube A 471733
Drill Bushing A 471734 5mm
Calibrated Drill 471736 5mm x 254mm
Universal Hex Socket Wrench 471756 19mm (¾”)
Titanium End Wrench 471758 19mm (¾”)
Hex Drive T-wrench 471760 5mm x 280mm
Hex Drive Power Bit 471761 5mm
Nail Extractor with Slide Hammer 471764
Nail Extractor Adaptor 471768
Nail Extractor Adaptor with Hook 471770
Screw Depth Gauge 34-513646
Instrument Case 592024 Case 1
592025 Case 2
Radiolucent Targeting Device
471830 Device
471843 4.3mm drill bit
471851 5.0mm drill bit
Distal Targeting Awl
471794 4.3mm
471795 5.0mm
Guide Pin Handgrip 469675
Nail Driving Guide CP500303 3.2mm x 160cm
(see instructions for use, page 3 of surgical technique)
Skin Protector 476920
T-handle Reamer 468138 9mm
FOR 10MM AND 11MM NAILS (DISTAL HOLES ONLY):
Twist Drill 472255 4.3mm x 180mm
Hex Drive T-wrench 457118 3.5mm
HIGH CLEARANCE OPTION:
High Clearance Driver with Handle 471710
High Clearance Driver Bolt 471712
High Clearance Offset Driver 471714
High Clearance Proximal Target 471716
Flexible Reamers 80 cm length
467934 8mm
467938 9mm
467942 10mm
467946 11mm
467950 12mm
467954 13mm
467958 14mm
467962 15mm
467966 16mm
467970 17mm
467974 18mm
Ball Tip Guide Wire
CP-500303 3.2mm x 160cm
Note: 80cm length reamers require a 3.2mm x 160cm ball tip guide wire.