



Zimmer®
Segmental System
Proximal Femoral
Components and
Intercalary Segments

Surgical Technique



Introduction

The Zimmer® Segmental System is designed to address significant bone loss resulting from oncology, trauma, and/or the salvage of previously failed arthroplasty.

Proximal Femoral Replacement Options

The system offers three solutions for proximal femoral replacement (Fig. 1) with various tissue attachment options (Fig. 2a, 2b & 2c), including Tissue Attachment Washers for the Trabecular Metal™ Material components.

The Trabecular Metal Proximal Femoral component offers solutions for attaching both trochanteric bone and/or soft tissue to the prosthesis. Multiple Tissue Attachment Washer options are available depending on the type and thickness of remaining tissue. Soft tissue may also be attached to the prosthesis via suture holes.

Intercalary Segments

The Zimmer Segmental System also offers intercalary segments to provide a means for reconstructing a mid-shaft defect or tumor in the femur.

System Compatibility

The Segmental Proximal Femoral Component may be implanted with the Segmental Distal Femoral Component, Segmental Stems, Segmental Stem Collars, and Segmental Segments as well as the VerSys® Hip System 12/14 Heads and the Legacy 12/14 Heads (Fig. 3).

The Segmental Proximal Femoral Components and Intercalary Segments may be used with both Fluted Stems (cemented) and Variable Stiffness Stems (press-fit) in many stem lengths and diameters. All Stems are compatible with both Trabecular Metal Collars and Titanium® Ti-6Al-4V Alloy Collars (Fig. 3).



Fig. 1



Fig. 2a



Fig. 2b



Fig. 2c

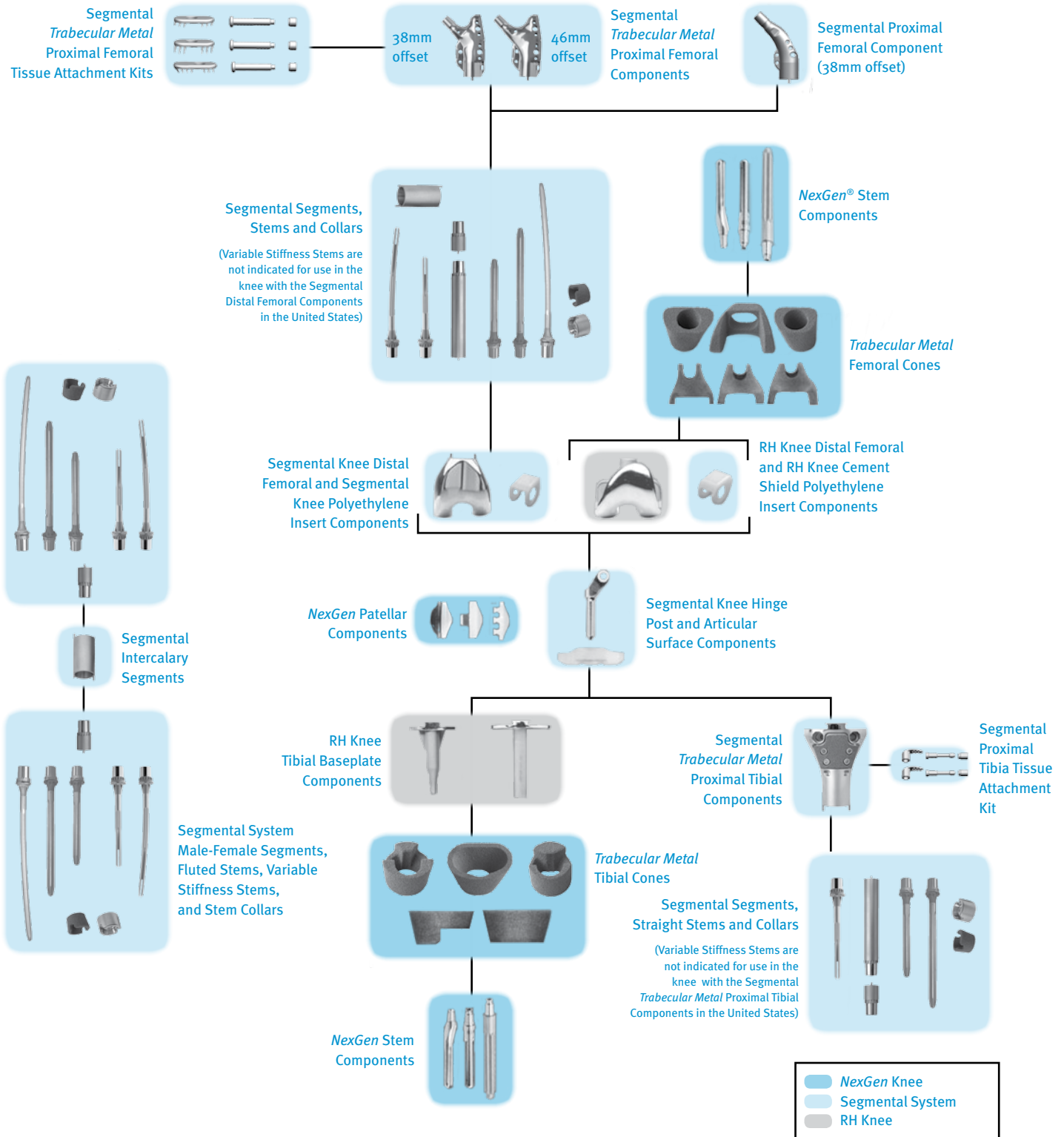




Fig. 3


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Step 1: Femoral Preparation

1.1 Resect Proximal Femur

The minimum resection length of the proximal femur is first determined by pre-operative imaging. The optimal resection length is then determined by selecting the implant configuration and segment length (Table 1 & Fig. 4).

Note: Both the Proximal Femur and the Trabecular Metal Proximal Femur have the same resection level.

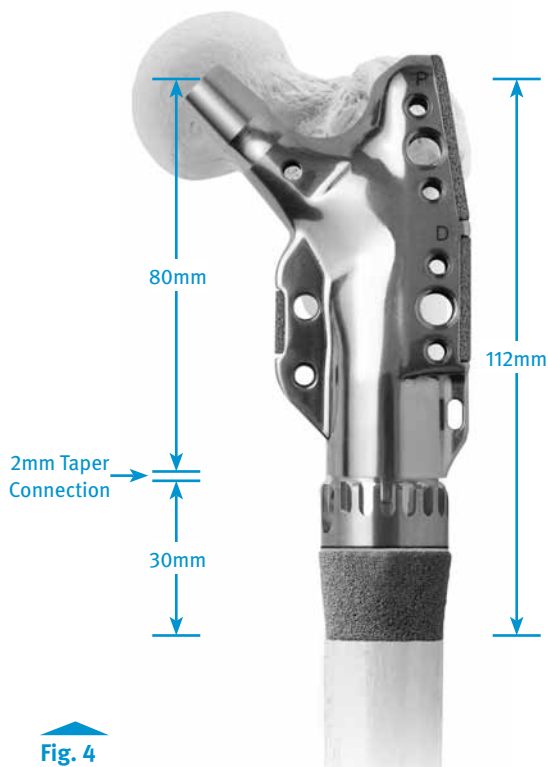


Fig. 4

| Proximal Femur | Stem/Collar | Segments | Total Length* |
|----------------|-------------|----------|---------------|
| 80mm | 30mm | None | 112mm |
| | | 30mm | 144mm |
| | | 35mm | 149mm |
| | | 40mm | 154mm |
| | | 45mm | 159mm |
| | | 50mm** | 164mm |
| | | 55mm** | 169mm |
| | | 60mm | 174mm |
| | | 35+30mm | 181mm |
| | | 40+30mm | 186mm |
| | | 40+35mm | 191mm |
| | | 80mm | 194mm |
| | | 40+45mm | 201mm |
| | | 60+30mm | 206mm |
| | | 60+35mm | 211mm |
| | | 100mm | 214mm |
| | | 60+45mm | 221mm |
| | | 80+30mm | 226mm |
| | | 80+35mm | 231mm |
| | | 120mm | 234mm |
| | | 80+45mm | 241mm |
| | | 100+30mm | 246mm |
| | | 100+35mm | 251mm |
| | | 140mm | 254mm |
| | | 100+45mm | 261mm |
| | | 120+30mm | 266mm |
| | | 120+35mm | 271mm |
| | | 160mm | 274mm |
| | | 120+45mm | 281mm |
| | | 140+30mm | 286mm |
| 140+35mm | 291mm | | |
| 180mm | 294mm | | |
| 140+45mm | 301mm | | |

Table. 1

Proximal Femoral Resection Length with Stems, Collars, and Segments

*Each large taper connection adds 2mm to the total length

**Available Soon

TECHNIQUE TIP

1.A

If planning to suture the iliopsoas muscle to the Trabecular Metal pad, tag the muscle with a suture before resecting the femur to facilitate identification and access.

- Extend the leg in a reproducible position.
- Use the Proximal Femoral Templates and Ruler, if necessary, to select the component (Fig. 5).
- Determine the appropriate resection level based on the desired construct length (Fig. 5).
- Make a horizontal line at the proposed resection level based on the appropriate segment length.

TECHNIQUE TIP

1.B

To compensate for slightly oblique cuts and femoral planing, resect the femur approximately 0.5mm to 1.0mm proximal to the marked level (Fig. 5).

- Make a vertical mark on the bone based on the natural femoral version.
- Resect the proximal femur.

Notes:

- Unique templates are available for each type of proximal femoral replacement. Be sure to select the template that matches the desired prosthesis before identifying the offset (Fig. 6).
- For the **Trabecular Metal Proximal Femoral Components**, the template has a groove that indicates the location of the +0 head center on the bone (Fig. 6).
- The minimum resection required to implant either type of proximal femoral component is 112mm.
- In oncology cases, a decision to under resect must take into account the safe margin for tumor removal.
- The vertical mark can be used as a reference to assess rotational alignment during the trial reduction and final component implantation.

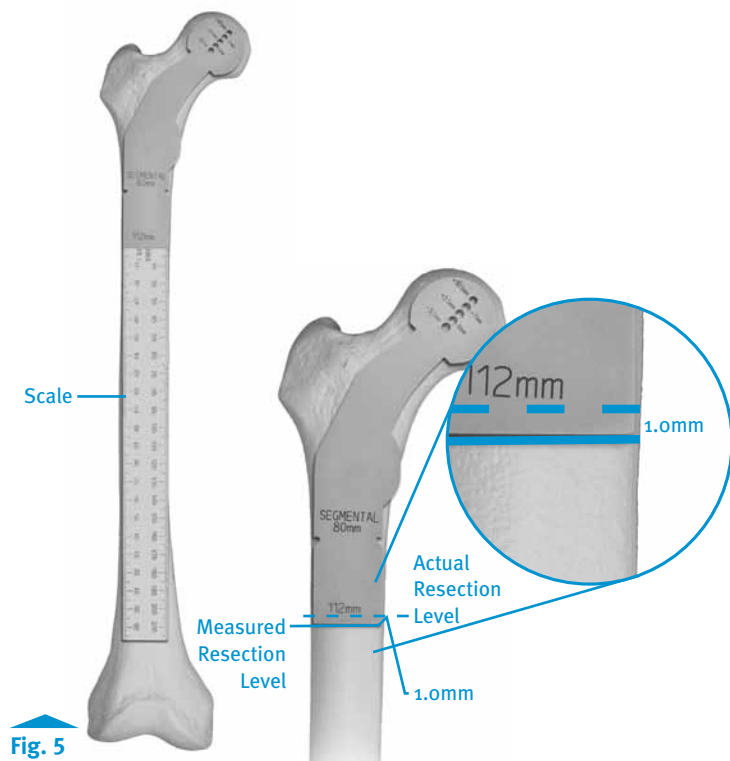


Fig. 5

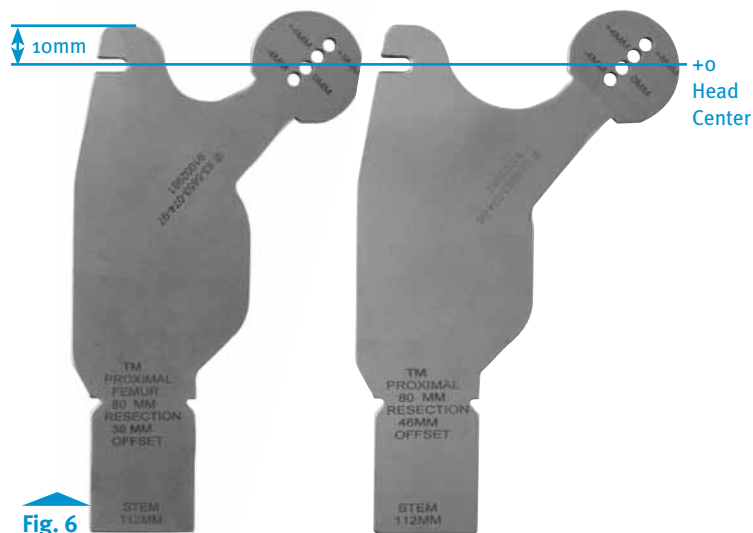
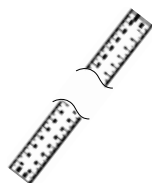


Fig. 6

Instruments



Ruler
5100-03-030



Proximal Femoral
Template
(38mm offset)
00-5851-074-96



TM Proximal
Femoral Template
(38mm offset)
00-5851-074-97



TM Proximal
Femoral Template
(46mm offset)
00-5851-074-98

1.2 Ream Canal

- Select the desired Stem type and length ([Table 2](#)).
- Ream the proximal femoral canal until the reamer contacts cortical bone in the isthmus.

Reaming Considerations

Straight Stems

- Start with straight reamers from the *VerSys* Hip System.

Bowed Stems

- Flexible reamers are recommended (*Pressure Sentinel*® Intramedullary Reaming System Expanded Hip Set or *ZMR*® Hip System Flexible Reamer Set).

Variable Stiffness Bowed Stems

- It may be necessary to ream to a diameter equal to or slightly greater than the diameter of the Stem to accommodate any difference between the bow of the Stem and the anatomy of the patient.

Variable Stiffness Straight Stems

- For optimal fit, the Segmental 3/4mm Reamers may be used.
- Flexible reamers may be used to allow for point contact in the canal.
- If insertion is difficult, consider reaming an additional time with the final reamer diameter used.

Notes:

- The diameter indicated for a Stem represents the actual outer diameter (including the height of the splines for a Variable Stiffness Stems).
- Fluted Stems require a different reamed diameter than Variable Stiffness Stems to account for the cement mantle; therefore, determine reamer diameter from [Table 3](#).
- The straight reamers from the *VerSys* Hip System have 0.5mm increments. Do not use the straight reamers from the *NexGen* Knee System, as they are available only in 1mm increments.

| | | Stem Diameter (mm) | | | | | | | | | |
|----------------|-----------|--|----|----|----|----|----|----|----|----|----|
| | | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| Stem IM Length | Stem Type | 130mm Straight (Fluted & Variable Stiffness) | | | | | | | | | |
| | | 190mm Straight (Fluted) | | | | | | | | | |
| | | 190mm Bowed (Variable Stiffness) | | | | | | | | | |
| | | 250mm Bowed (Fluted) | | | | | | | | | |

Table. 2

Stem Types and Lengths

| Stem Size (mm) | Min. Ream Diameter for Fluted Stems (mm) | Min. Ream Diameter for VS Stems (mm) |
|----------------|--|--------------------------------------|
| 9 | 11 | 8.5 |
| 10 | 12 | 9.5 |
| 11 | 13 | 10.5 |
| 12 | 14 | 11.5 |
| 13 | 15 | 12.5 |
| 14 | 16 | 13.5 |
| 15 | 17 | 14.5 |
| 16 | 18 | 15.5 |
| 17 | 19 | 16.5 |
| 18 | 20 | 17.5 |
| 19 | 21 | 18.5 |

Table. 3

Minimum Reamer Diameters

Instruments



VerSys Hip Reamer
(See ZSS Profiler)
KT-5853-013-00
00-7899-073-00



Pressure Sentinel IM Reamer
(See ZSS Profiler)
00-2228-000-03



ZMR Hip System Flexible Reamer
(See ZSS Profiler)
00-9975-000-11



Segmental 3/4mm Reamer
(See ZSS Profiler)
KT-5853-014-00

1.3 Plane Proximal Femur

- Thread the Segmental Planer Pilot (130mm long) for the stem diameter selected onto the Femoral/Tibial Planer (**Fig. 7**).

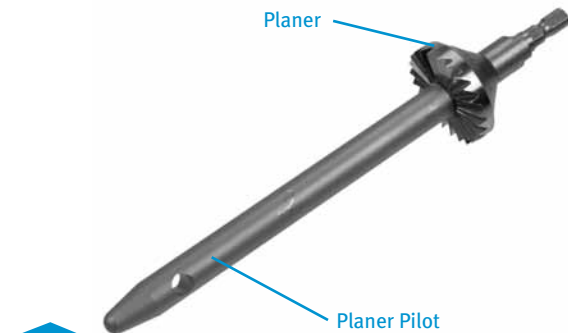


Fig. 7

TECHNIQUE TIP

1.C

To facilitate insertion in a curved medullary canal, use a Planer Pilot 1mm-2mm smaller than the stem diameter chosen (**Table 4**).

TECHNIQUE TIP

1.D

If the canal is bowed, use the shorter Planer Pilots from the Segmental Variable Stiffness Stem Instrument Kit (KT-5853-008-00).

- Attach the assembly to a drill/driver with a *Zimmer* adapter.
- Plane the proximal femur until the bone is smooth and flat.
- Remove the Planer Pilot from the planer by inserting the pin on the Segmental Collar Provisional Sizer through the cross-hole and, while securing the non-cutting end of the planer, turning the shank counterclockwise (**Fig. 8**).

Note: If the anatomy requires the use of a shorter Planer Pilot, use the 75mm Segmental Planer Pilots.

| Stem Size | Planer Pilot Diameter (Fluted) | Planer Pilot Diameter (Variable Stiffness) |
|-----------|--------------------------------|--|
| 9mm | 9mm | 8mm |
| 10mm | 10mm | 9mm |
| 11mm | 11mm | 10mm |
| 12mm | 12mm | 11mm |
| 13mm | 13mm | 12mm |
| 14mm | 14mm | 13mm |
| 15mm | 15mm | 14mm |
| 16mm | 16mm | 15mm |
| 17mm | 17mm | 16mm |
| 18mm | 18mm | 17mm |
| 19mm | 19mm | 18mm |

Table. 4

Recommended Planer Pilot Diameters



Fig. 8

Instruments



Segmental Planer Pilot
(See ZSS Profiler)
00-5851-070-XX



Segmental Planer
5100-00-052



Segmental Collar Provisional Sizer
00-5853-056-10

1.4 Counterbore Proximal Canal (Variable Stiffness Stems Only)

Counterboring the proximal portion of the canal is required because the full diameter of a Variable Stiffness Stem proximal to the splines is 0.25 to 0.5mm greater than the reamed diameter of the canal.

- Thread the Counterbore Reamer Tip into the Counterbore Reamer Stop Plate (**Fig. 9**).
- Insert the assembly into a drill/driver.

Counterbore
Reamer Stop Plate

Counterbore
Reamer Tip

Fig. 9

- Insert the pin on the Segmental Collar Provisional Sizer through the cross-hole of the reamer tip and turn the Collar tightly to secure it to the stop plate (**Fig. 10**).

Counterbore Reamer Tip

Segmental Collar
Provisional Sizer

Fig. 10

- Insert the assembly into the reamed canal and counterbore the proximal canal (**Fig. 11**).

Note: The Counterbore Stop Plate will serve as a stop when the appropriate depth is achieved.

Fig. 11

Instruments



Counterbore
Reamer Tip
(See ZSS Profiler)
00-5851-073-XX



Counterbore
Reamer Stop Plate
00-5851-073-01



Segmental Collar
Provisional Sizer
00-5853-056-10

Step 2: Trial Reduction

2.1 Prepare Stem Provisional

- Use the Segmental Collar Provisional Sizer to select the Collar size that provides the best coverage of the bone surface (Fig. 12).



Fig. 12

- Confirm that the Stem and Collar sizes are compatible (Table 5).

Note: The Collar sizer may be threaded onto the Planer Pilot to facilitate Collar selection.

| Stem Diameter | Smooth Collar (Item #) (Dimension A) | Trabecular Metal Collar (Item #) (Dimension A) |
|---------------|---|--|
| 9-16mm | 30mm for 9-16mm Stems (00-5852-042-09) | 25mm for 9-16mm Stems (00-5852-040-25) |
| | | 30mm for 9-16mm Stems (00-5852-040-30) |
| | | 35mm for 9-16mm Stems (00-5852-040-35) |
| 17-19mm | 30mm for 17-19mm Stems (00-5851-042-17) | 30mm for 17-19mm Stems (00-5852-041-30) |
| | | 35mm for 17-19mm Stems (00-5852-041-35) |

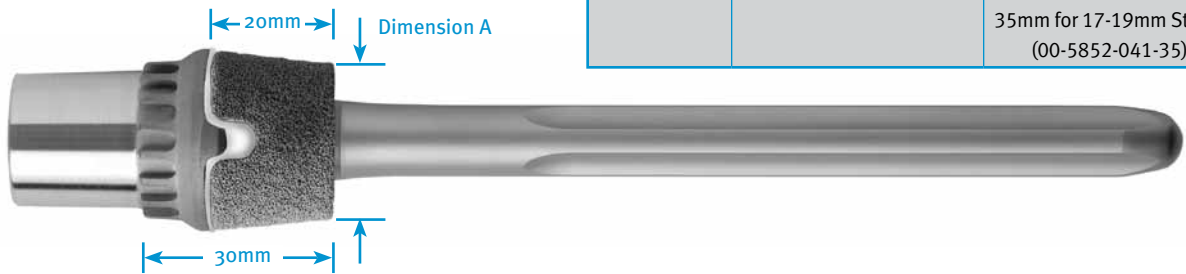


Table 5

Stem Collar Compatibility Chart

Instruments



Segmental Collar Provisional Sizer
00-5853-056-10



Segmental Planer Pilot
(See ZSS Profiler)
00-5851-070-XX

- Select the appropriate Segmental Stem Provisional (**Table 6**).
- Thread the Collar Provisional onto the Stem Provisional (**Fig. 13**).
- Insert the assembly into the femoral canal.

TECHNIQUE TIP

2.A

- If the provisional assembly does not easily fit into a bowed canal, it may be necessary to perform additional reaming or to use the next smaller size Stem Provisional (**Table 6**).
- For Variable Stiffness Stems, if the provisional size that matches the Stem size fits in the canal, there will likely not be enough press fit. Consider preparing for a larger stem diameter, or consider cementing a Fluted Stem.

Notes:

- If using a Smooth Collar, only the 30mm diameter collar is available.
- The diameters of the Segmental Stem Provisionals represent the actual diameters of the Stems, eg, a 14mm Stem Provisional has a nominal 14mm outer diameter.
- The same set of provisionals are used for both the 130mm Fluted Straight Stems and the 130mm Variable Stiffness Straight Stems. Refer to **Table 6** for provisional diameter recommendations per Stem type.
- Anterversion pockets allow for adjustment in 20 degree increments.

| Stem Size | Provisional Stem Diameter (Fluted) | Provisional Stem Diameter (Variable Stiffness) |
|-----------|------------------------------------|--|
| 9mm | 9mm | 8mm |
| 10mm | 10mm | 9mm |
| 11mm | 11mm | 10mm |
| 12mm | 12mm | 11mm |
| 13mm | 13mm | 12mm |
| 14mm | 14mm | 13mm |
| 15mm | 15mm | 14mm |
| 16mm | 16mm | 15mm |
| 17mm | 17mm | 16mm |
| 18mm | 18mm | 17mm |
| 19mm | 19mm | 18mm |

Table 6

Recommended Stem Provisional Diameters

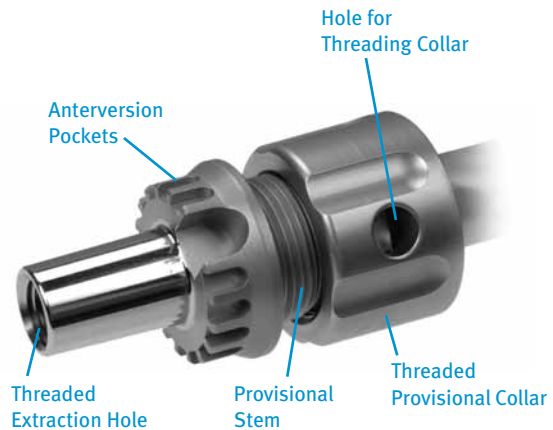


Fig. 13

Instruments

Segmental Stem
Provisional Bowed
(See ZSS Profiler)Segmental Stem
Provisional Straight
(See ZSS Profiler)Collar Provisional
(See ZSS Profiler)
00-5853-056-XX

2.2 Prepare Proximal Femoral Provisional

- Select the type of proximal femoral replacement component based on the patient's anatomy (**Fig. 14a, 14b & 14c**).
- Select the corresponding Proximal Femoral Provisional (**Fig. 14a, 14b & 14c**).
- Attach the Proximal Femoral Provisional to the Stem Provisional assembly, using the appropriate combination of Segment Provisionals to achieve the desired leg length.
- Ensure that all tabs on the provisional components are properly engaged in the corresponding pockets.

Notes:

- It is not necessary to impact the provisional components together as they are not designed to fit flush with each other. However, light impaction may be used to prevent the components from separating.
- Unique provisionals are available for each type of Proximal Femoral Component. Be sure to select the provisional that matches the desired prosthesis (**Fig. 14a, 14b & 14c**).

Fig. 14a

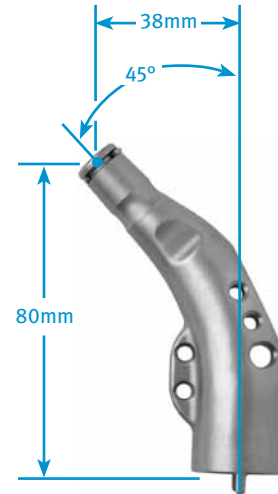


Fig. 14b

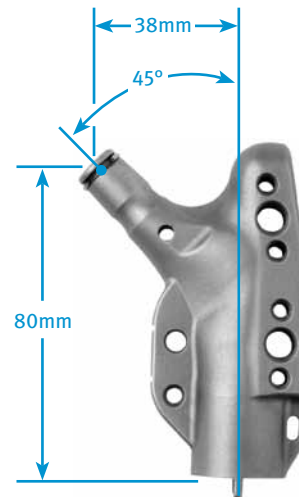
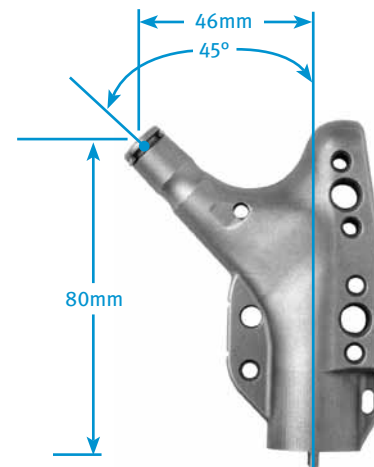


Fig. 14c



Instruments



Proximal Femoral Provisional
(38mm offset)
00-5851-030-38



TM Proximal Femoral Provisional
(38mm offset)
00-5851-032-38



TM Proximal Femoral Provisional
(46mm offset)
00-5851-032-46



Segmental Stem Provisional Bowed
(See ZSS Profiler)



Segmental Stem Provisional Straight
(See ZSS Profiler)



Collar Provisional
(See ZSS Profiler)
00-5853-056-XX



Segment Provisional
(See ZSS Profiler)
KT-5853-004-00

2.3 Trial Proximal Femoral Component

- Select the appropriate femoral head provisional and acetabular provisional.
- Insert the Femoral Provisional assembly into the femoral canal by hand and perform a trial reduction. Check stability while externally and internally rotating the limb (**Fig. 15**).
- Check the fit of the Stem Collar on the bone surface to determine if the Stem is fully seated.
- Assess the version of the Proximal Femoral Provisional and determine whether a rotation adjustment is necessary.
- If a version adjustment is necessary, use the Segmental Taper Separator to disassemble the provisional taper (**Fig. 16**) (See Appendix A).

Notes:

- See the **Zimmer Compatibility Website** at www.productcompatibility.zimmer.com for components compatible with the *Zimmer Segmental System Proximal Femoral Components*.
- With a straight Stem, the implant may rotate during trialing, therefore ensure that rotation is occurring at the anatomical joint and not at the bone-stem interface.

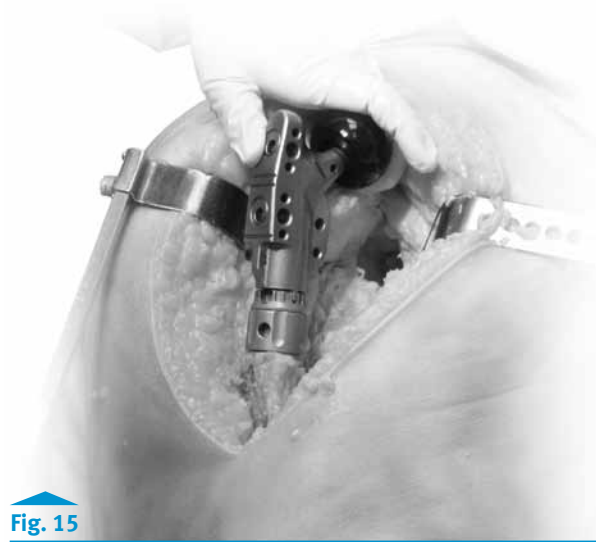


Fig. 15



Fig. 16

Instruments



Femoral Head Provisional
(See ZSS Profiler)



Segmental Stem Provisional Bowed
(See ZSS Profiler)



Segmental Stem Provisional Straight
(See ZSS Profiler)



Collar Provisional
(See ZSS Profiler)
00-5853-056-XX



Segment Provisional
(See ZSS Profiler)
KT-5853-004-00



Proximal Femoral Provisionals
(See ZSS Profiler)



Segmental Taper Separator
00-5851-020-00

- If the joint is tight at full extension or during push-pull, try one of the following options:
 - use a shorter offset head provisional
 - recheck the cuts and remove bone from the femur as necessary
 - use the next shorter segment.
- If the joint is loose at full extension or during push-pull, try one of the following options:
 - use the longer offset head provisional
 - recheck the cuts and try the next longer Segment Provisional.
- For a Bowed Stem, mark the lateral femoral bone in line with the mark on the Bowed Stem Provisional to provide a reference point for proper orientation of the implant (Fig. 17).

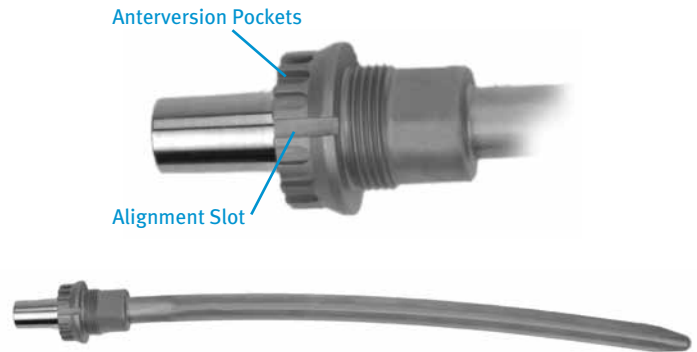


Fig. 17

Notes:

- Anteversión pockets allow for adjustment in 20 degree increments (Fig. 17).
- Be careful not to overlengthen the reconstruction to achieve longitudinal stability as overlengthening may place undue stress on vital nerve or vascular structures.
- To reduce the risk of anterior dislocation, consider decreasing the amount of anteversion. Also, consider preserving as much capsule as possible. The capsule can be tightened around the neck of the prosthesis in a purse-string fashion using heavy suture to reduce the risk of dislocation.

Instruments



Femoral Head Provisional
(See ZSS Profiler)



Segmental Stem Provisional Bowed
(See ZSS Profiler)



Segmental Stem Provisional Straight
(See ZSS Profiler)



Collar Provisional
(See ZSS Profiler)
00-5853-056-XX



Segment Provisional
(See ZSS Profiler)
KT-5853-004-00



Proximal Femoral Provisionals
(See ZSS Profiler)



Segmental Taper Separator
00-5851-020-00

2.4 Assess Tissue Attachment

There are multiple options for attaching tissue to the prosthesis (**Tables 7 & 8**).













- Determine if bone and/or soft tissue will be attached to the proximal femoral component (**Table 7**).

Note: If only suture attachment is desired, consider using the *Zimmer Segmental System Proximal Femoral Component without Trabecular Metal Material*.

| Pad Location | Potential Tissue To Attach |
|----------------------|--|
| Proximal Lateral Pad | Abductors |
| Distal Lateral Pad | Vastus Lateralis and Tensor Fascia Latae |
| Medial Pad | Iliopsoas |

Table. 7

Possible Tissues to Attach to the *Trabecular Metal* Pads on the Segmental Proximal Femoral Component

| | | Proximal Femoral Replacement Options | | |
|---------------------------|---|---|---|---|
| | | Proximal Femoral Component (38mm offset) | <i>Trabecular Metal</i> Proximal Femoral Component (38mm offset) | <i>Trabecular Metal</i> Proximal Femoral Component (46mm offset) |
| Tissue Attachment Options |  Suture Only |  |  |  |
| |  One Tissue Attachment Washer |  |  |  |
| |  Two Tissue Attachment Washers |  |  |  |

* See Table 9 for Washer Options

Table. 8

2.5 Prepare for Tissue Attachment Washer (Optional)

There are three Tissue Attachment Washers available with the Segmental *Trabecular Metal* Proximal Femoral Component (Tables 8 & 9).

The *Trabecular Metal* Proximal Femoral Component can be used in combination with:

- a proximal Tissue Attachment Washer
- a distal Tissue Attachment Washer, or
- both proximal and distal Tissue Attachment Washers.
- Using the Femoral Caliper, measure the thickness of the tissue or bone to determine whether the appropriate washer size (tooth height) is available and to select the washer style (Fig. 18).
- Place the Tissue Washer Provisional over the Segmental *Trabecular Metal* Proximal Femoral Provisional to determine washer selection and position, and tissue preparation (Fig. 19).

Caution: Be aware of the maximum height of tissue that can be attached (Table 9). If an attempt is made to capture a thicker amount of tissue, the Washer Bolt threads will not be sufficiently engaged to hold the tissue in place. If the bone or soft tissue is greater than the maximum height allowed (Table 9), adjustments must be made to decrease the thickness or the Tissue Attachment Washer must not be used.

Notes:

- Do not use the curved washer in the distal area, as the curved portion will be prominent.
- If using trochanteric bone, a minimum thickness of 8mm is required underneath the washer to prevent drilling *Trabecular Metal* Material through the Counter-torque Base/ Arm assembly.
- The tip of the Tissue Washer Provisional matches the dimensions of the Tissue Attachment Washer, including tooth height.
- Tissue Attachment Washers and provisionals have an arrow pointing toward the proximal end of the washer to assist with orientation when placing them on the *Trabecular Metal* Proximal Femoral Provisional. The arrow orientation is important to help ensure correct washer placement for maximum holding power of the washer teeth in soft tissue.

Instruments



Femoral Caliper
00-5903-030-00



Provisional
Tissue Washer
00-5851-032-14
00-5851-032-17
00-5851-032-19




| Tissue Attachment Washer | Maximum Height of Washer Above Prosthesis (mm) |
|--|--|
|  <p>Curved 4mm (Proximal only)</p> | 12mm* |
|  <p>Flat 4mm</p> | 12mm* |
|  <p>Flat 7mm</p> | 15mm* |

Table 9

Tissue Attachment Washer Options

* Washer teeth should be fully seated into bone, if bone is used.



Fig. 18



Fig. 19

Step 3: Provisional Components Disassembly

- Use the Segmental Taper Separator to disengage the provisional taper connections, if necessary (Fig. 20). (See Appendix A for Taper Separator instructions).



Fig. 20

- Thread the Provisional Slaphammer Adapter (Fig. 21) onto the Slaphammer and thread it into the Stem Provisional.
- Impact the Slaphammer to remove the Stem Provisional.

Notes:

- To protect the taper integrity of the Proximal Femoral Provisionals, use only the Segmental Taper Separator with the turning handle when disassembling the provisional construct.
- A different Slaphammer Adapter is used for the provisional component and the final implant. The Provisional Slaphammer Adapter has two grooves at the top, while the Implant Slaphammer Adapter has only one groove at the top (Fig. 21).

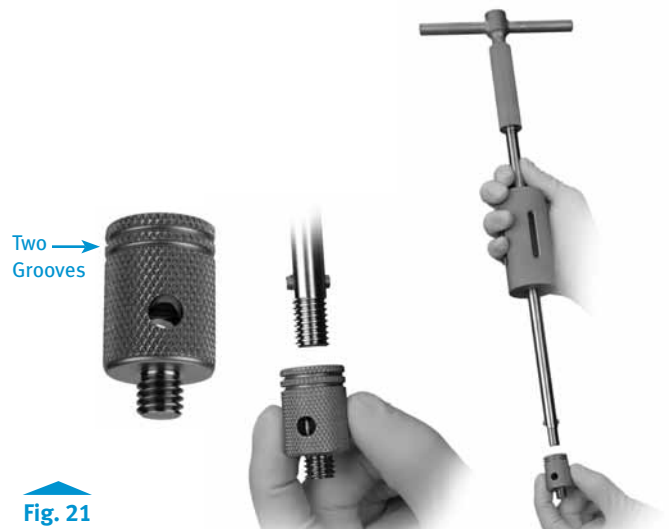


Fig. 21

Instruments



Segmental Taper Separator
00-5851-020-00



Provisional Slaphammer Adapter
00-5851-097-12



Slaphammer
00-6551-006-00

Step 4: Final Assembly & Implantation

4.1 Assemble & Implant Proximal Femoral Component (Fig. 22)

There are two options for assembling and inserting the final implants.

- Back Table Assembly: The final construct can be completely assembled on the back table and inserted as a single unit (common when using Fluted Stems).
- **OR** –
- In Vivo Assembly: The Stem and Collar can be assembled and inserted first, and then the Segment and Proximal Femoral Component can be assembled and impacted onto the implanted Stem (common when using Variable Stiffness Stems).

TECHNIQUE TIP

4.A

If cementing a Segmental Fluted Stem or Zimmer Acetabular Component, consider using two batches of bone cement. Use the first batch to cement the Collar to the Stem, and the second batch for the Stem and/or Acetabular Component.

Notes:

- All Segmental Stems must be used with Collars, and all Collars must be cemented to the Stems.
- If implanting the complete construct as a single unit, all components of the construct must be assembled and impacted together before cementing the Collar to the Stem. This prevents the impaction force from being placed directly onto the cemented Collar.
- Avoid notching, scratching, or directly striking implants during assembly.
- A space will exist between the components when the tapers are fully seated.
- Before opening the implant packages, verify that the Collar is compatible with the Stem size on the label.



Fig. 22

Back-Table Assembly (Recommended for Cemented Stems)

- Place the Proximal Femoral implant into the Segmental Proximal Femoral Impactor or Segmental *Trabecular Metal* Proximal Femoral Impactor on the back table (**Table. 10**).
- Thoroughly clean and dry the tapers of all components.

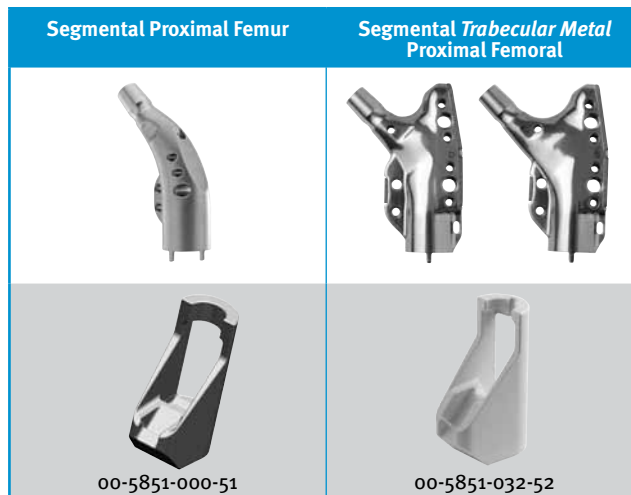


Table. 10

Male-Female Segment Assembly

- Insert the Segmental Male-Female Segment into the Proximal Femoral Implant.
- Attach the Universal Impactor Handle to the Segment Impactor.
- Apply the impactor assembly to the Segment and impact it with a two-pound Mallet.

TECHNIQUE TIP**4.B**

Position the anteversion tabs in either the direct A/P or M/L orientation to facilitate access for the Segmental Taper Separator should future disassembly be required (**Fig. 23**).

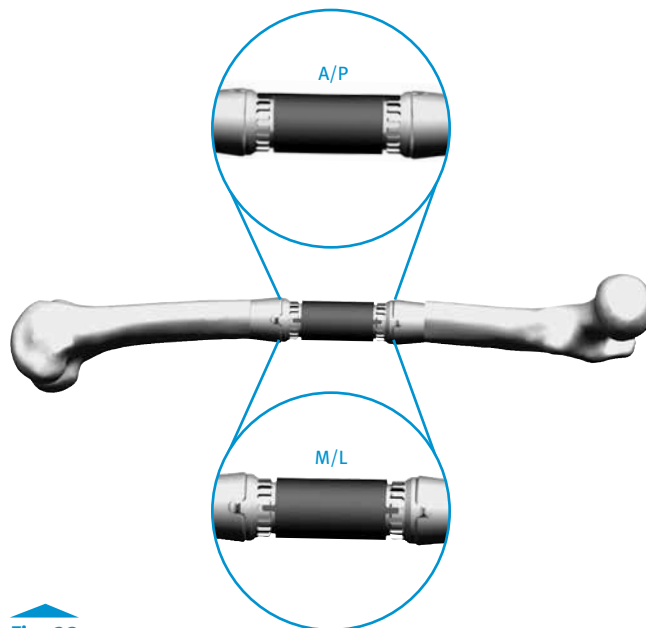


Fig. 23

Instruments

Segmental Proximal
Femoral Impactor
00-5851-000-51



Segmental TM
Proximal Femoral
Impactor
00-5851-032-52



Segmental
Taper Separator
00-5851-020-00



Segmental Implant/
Provisional Female
Taper Impactor
(Segment Impactor)
00-5851-074-02



Universal Handle
6216-01-125



Mallet
00-0155-002-00

Stem Assembly

- Insert the Stem into the Proximal Femoral Implant or Segment with the anteversion tabs aligned.
- If using a Bowed Stem, ensure that the stem tip will extend posteriorly with respect to the Proximal Femur when implanted.
- For a Fluted Stem, protect the end of the Stem with gauze, and use a two-pound Mallet to solidly impact the Stem.
- For a Variable Stiffness Stem, slide the Variable Stiffness Stem Impaction Sleeve over the Stem until the notches on the sleeve capture the collar alignment tabs on the stem base (Fig. 24).
- Solidly strike the impaction head of the sleeve with a two-pound Mallet.

Notes:

- The **Segmental Proximal Femoral Component** and the **Segmental Trabecular Metal Proximal Femoral Component** are used with different Impactors. Each Impactor is located in its respective instrument tray.
- Impacting the **Variable Stiffness Stem Impaction Sleeve** more than once may loosen the taper connection.
- Do not strike the tip of the **Variable Stiffness Stem** with any instrument, as this may damage the prongs created by the slots.

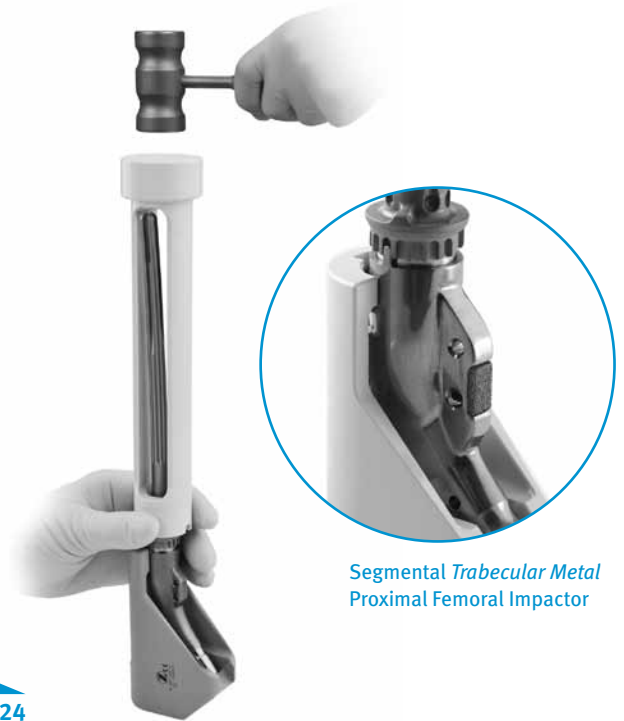


Fig. 24

Instruments

Segmental Proximal
Femoral Impactor
00-5851-000-51



Segmental TM
Proximal Femoral
Impactor
00-5851-032-52



Variable Stiffness
Stem Impaction
Sleeve
00-5853-074-05



Mallet
00-0155-002-00

Stem Collar Attachment

- Apply cement in the doughy state to the base/taper end of the Stem.
- With the pockets toward the anatomical joint, slide the Stem Collar over the Stem.
- Clean off excess cement while advancing the Collar to the shank area where cement was applied.
- Ensure that the Collar is fully aligned with the tabs on the stem (**Fig. 25**).
- Allow the cement to fully harden before inserting the construct into the canal.

Note: Be careful to prevent cement from contacting the taper, the anteversion adjustment pockets, and the external surfaces of *Trabecular Metal* Material specifically where the Collar will contact the cortical bone.

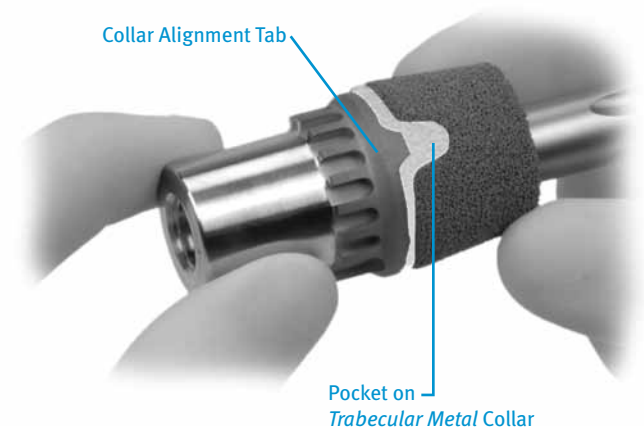


Fig. 25

Femoral Component Implantation with Fluted Stem

- Inject cement into the medullary canal.
- Apply cement to the shank of the Stem and, if using a Smooth Collar, to the base of the Collar.
- Insert the implant into the canal and use the Segmental Proximal Femoral Impactor or the Segmental *Trabecular Metal* Proximal Femoral Impactor and a Mallet to tap it until fully seated, cleaning off excess cement as the implant advances.

TECHNIQUE TIP

4.C

A Bigliani/Flatow® *Pressurizer Sponge* may be used to prevent cement from extruding out of the femoral canal and onto the face of the *Trabecular Metal* Collar that contacts the planed surface of the femoral cortex (Fig. 26). If using this technique, slide the sponge onto the Stem until it contacts the base of the Collar.

Notes:

- If desired, use a plastic cement restrictor for manual cement pressurization.
- Be careful to keep cement off of the external surfaces of the *Trabecular Metal* Collar, the entire surface of the tapers, and the crevices of the anteversion adjustment pockets.
- If using the *Bigliani/Flatow* *Pressurizer Sponge*, remove the sponge just before the Collar sits flush with the prepared cortex and before the cement cures. Do not implant the sponge.
- Be careful not to leave any foam material in the wound or on the *Trabecular Metal* Material.

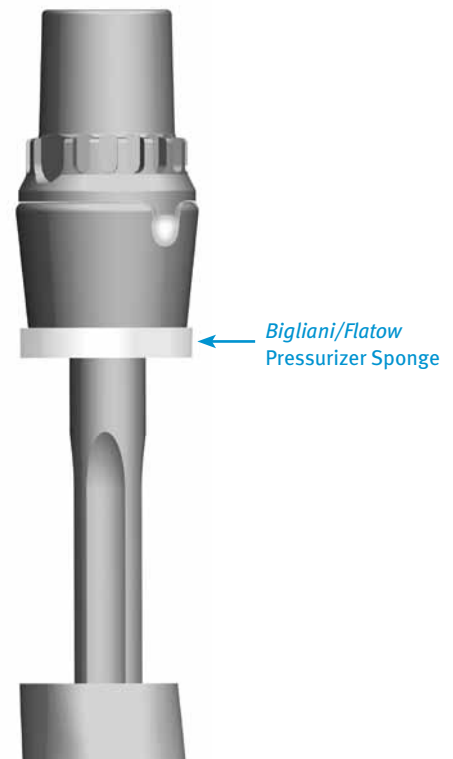


Fig. 26

Instruments



Segmental Proximal
Femoral Impactor
00-5851-000-51



Segmental TM
Proximal Femoral
Impactor
00-5851-032-52



Mallet
00-0155-002-00



Bigliani/Flatow
Pressurizer Sponge
00-4301-035-01

Femoral Component Implantation with Variable Stiffness Stem

- If using a Smooth Collar, apply cement to the base of the Collar.
- Insert the femoral construct into the canal.
- Attach the Universal Handle to the Segmental Proximal Femoral Impactor or Segmental *Trabecular Metal* Proximal Femoral Impactor (Fig. 27).
- Use the impactor assembly and a Mallet to tap the construct until fully seated while observing the vertical mark on the bone to assess the rotational alignment.

TECHNIQUE TIP**4.D**

If the Stem fits too tightly in the bone, remove it and pass the last Reamer used through the canal several more times. This can increase the hole diameter slightly, which will permit the Stem to be more easily impacted into the bone. The Segmental 3/4mm Reamers can also be used for optimal fit for the 130mm Straight VS Stems.

Note: The Stem Driver may also be used to insert the assembly into the canal. Insert the tip of the Impactor into the female slot in the proximal shoulder of the Femoral Component and impact with modest blows of the Mallet (Figs. 28 & 29).



Fig. 27



Fig. 28



Fig. 29

InstrumentsUniversal Handle
00-6216-01-125Segmental Proximal
Femoral Impactor
00-5851-000-51Segmental TM
Proximal Femoral
Impactor
00-5851-032-52Mallet
00-0155-002-00Stem Driver
00-7896-052-00

In Vivo Assembly (Recommended for Variable Stiffness Stems)

- Attach the Stem Collar as detailed in the previous section, “Stem Collar Attachment,” and allow the cement to fully harden before inserting the construct into the canal.
- Thoroughly clean and dry the tapers of all components.
- Insert the stem/collar assembly into the femoral canal.
- Attach the Universal Impactor Handle to the Stem Impactor.
- Apply the impactor assembly to the stem construct and tap the handle with a Mallet until fully seated, using the vertical mark on the bone to assess the rotational alignment (Fig. 30).

Fig. 30

**TECHNIQUE TIP**


4.E

If the Stem fits too tightly in the bone, consider removing it and passing the last Reamer used through the canal several more times. This can increase the hole diameter slightly, which will permit the Stem to be more easily impacted into the bone. The Segmental 3/4mm Reamers can also be used for optimal fit for the 130mm Variable Stiffness Stem.

Male-Female Segment Assembly

- Place the Proximal Femoral Implant into the Segmental Proximal Femoral Impactor or Segmental *Trabecular Metal* Proximal Femoral Impactor on the back table (Table 11).
- Insert the Male-Female Segment into the Proximal Femoral Implant.
- Attach the Universal Impactor Handle to the Segmental Implant/Provisional Female Taper Impactor.
- Apply the impactor assembly to the Segment and impact it with a two-pound Mallet (Fig. 31).

Table 11

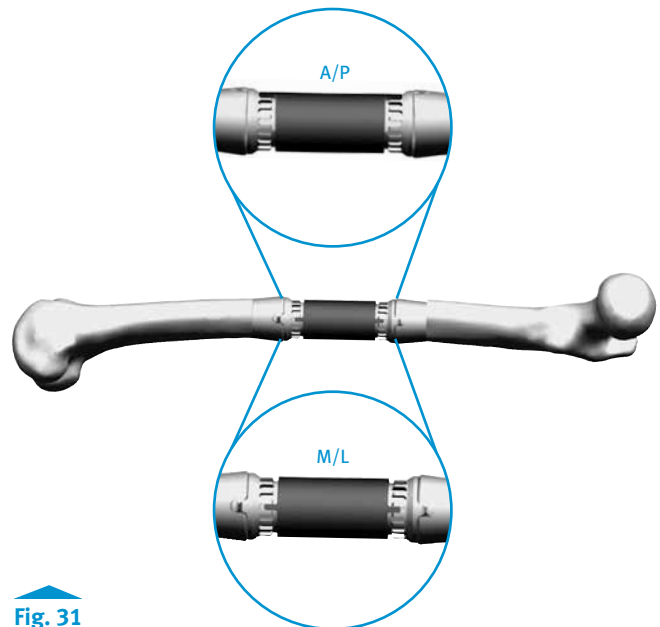
| Segmental Proximal Femur | Segmental <i>Trabecular Metal</i> Proximal Femoral |
|---|--|
|  |  |
|  |  |
| 00-5851-000-51 | 00-5851-032-52 |

TECHNIQUE TIP

4.F

Position the anteversion tabs in either the direct A/P or M/L orientation to facilitate access for the Segmental Taper Separator should future disassembly be required (Fig. 31).

Fig. 31

**Instruments**Segmental Proximal Femoral Impactor
00-5851-000-51Segmental TM Proximal Femoral Impactor
00-5851-032-52Mallet
00-0155-002-00Universal Handle
6216-01-125Segmental Implant/Provisional Male Taper Impactor (Stem Impactor)
00-5851-080-00Segmental Implant/Provisional Female Taper Impactor (Segment Impactor)
00-5851-074-02

Stem Assembly

- Place the proximal femoral assembly onto the stem taper.
- Use the appropriate Segmental Proximal Femoral Impactor or *Trabecular Metal* Proximal Femoral Impactor with the Universal Handle to impact the components with a Mallet (Fig. 32), while noting the proper rotation to the alignment mark scribed on the bone in Step 1.1.



Fig. 32

Notes:

- Be sure to use the proper impactor when impacting the selected Proximal Femoral Component. Use of the Segmental Proximal Femoral Impactor to impact the *Trabecular Metal* femoral component may damage the *Trabecular Metal* material.
- The Stem Driver may also be used to insert the assembly into the canal. Insert the tip of the Impactor into the female slot in the proximal shoulder of the Femoral Component and impact with modest blows of the Mallet (Fig. 33).

Intraoperative Disassembly

If disassembly is necessary during surgery, the Segmental Taper Separator can be used to separate the junctions between Segments, Stems, and Femoral Implants without damaging the tapers. See Appendix A for complete instructions.



Fig. 33

InstrumentsUniversal Handle
6216-01-125Segmental Proximal
Femoral Impactor
00-5851-000-51Segmental TM
Proximal Femoral
Impactor
00-5851-032-52Stem Driver
00-7896-052-00Mallet
00-0155-002-00Segmental
Taper Separator
00-5851-020-00

4.2 Implant Acetabular Components & Attach Femoral Head

- If necessary, implant the Acetabular Component and Liner per applicable Zimmer surgical technique (Fig. 34).
- Place the Femoral Head Provisional onto the taper of the implant.
- Reduce the joint and assess offset, leg length, joint stability, and range of motion.
- Remove the Femoral Head Provisional, and thoroughly clean and dry the taper of the Proximal Femoral Implant.
- Place the Femoral Head on the taper and twist slightly to secure it.
- Apply the Head Impactor and strike it with one sharp blow of a two-pound Mallet.
- Test the security of the Head fixation by trying to remove it by hand.
- Reduce the hip and assess offset, leg length, joint stability, and range of motion.



Fig. 34

Note: See the Zimmer Compatibility Website (www.productcompatibility.zimmer.com) for details on which Acetabular Components are compatible with Zimmer Segmental System Proximal Femoral Components.

Instruments



Femoral Head Provisionals
(See ZSS Profiler)



Femoral Head Impactor
00-9027-058-00



Mallet
00-0155-002-00

4.3 Repair Capsule and Attach Iliopsoas

- Use heavy suture to tighten the capsule around the neck of the prosthesis in a purse-string fashion.
- If attaching the iliopsoas, suture via the two medial suture holes (Fig. 35).
- When using the *Trabecular Metal* Proximal Femoral Component, secure the tissue to the medial *Trabecular Metal* Material pad.

Warnings:

- Avoid placing the suture in direct contact with the *Trabecular Metal* Material pad, as it may weaken the suture.
- Be careful not to overtighten the sutures. This may compromise circulation or lead to tissue necrosis.



Fig. 35

4.4 Attach Tissue

Sutures may be used alone or in conjunction with the proximal and/or distal Tissue Attachment Washer(s) according to the tissue attachment options (Tables 12 & 13).

Suture Only Attachment

For suture attachment only, consider using the suture holes in the *Zimmer* Segmental System Proximal Femoral Component without *Trabecular Metal* Material. The Segmental *Trabecular Metal* Proximal Femoral Component can be used with sutures only (without Tissue Attachment Washers) by securing the tissues to the *Trabecular Metal* Material pad via the suture holes.

Warnings:

- Avoid placing the suture in direct contact with the *Trabecular Metal* Material pad as it may weaken the suture.
- Be careful not to overtighten the sutures. This may compromise circulation or lead to tissue necrosis.

| | | Proximal Femoral Replacement Options | | |
|---------------------------|-------------------------------|--|--|--|
| | | Proximal Femoral Component (38mm offset) | <i>Trabecular Metal</i> Proximal Femoral Component (38mm offset) | <i>Trabecular Metal</i> Proximal Femoral Component (46mm offset) |
| Tissue Attachment Options | Suture Only | | | |
| | One Tissue Attachment Washer | | | |
| | Two Tissue Attachment Washers | | | |

* See Table 14 for Washer Options

Table. 12

| Pad Location | Tissue To Attach |
|----------------------|--|
| Proximal Lateral Pad | Abductors |
| Distal Lateral Pad | Vastus Lateralis and Tensor Fascia Latae |
| Medial Pad | Iliopsoas |

Table. 13

Possible Tissues to Attach to the *Trabecular Metal* Pads on the Segmental Proximal Femoral Component with Tissue Attachment Kits

Tissue Attachment Washers (Optional)

- There are three different Tissue Attachment Washers available with the Segmental *Trabecular Metal* Proximal Femoral Component (Table 12). The *Trabecular Metal* Proximal Femoral Component can be used in combination with:
 - a proximal Tissue Attachment Washer
 - a distal Tissue Attachment Washer, or
 - both proximal and distal Tissue Attachment Washers
- If attaching soft tissue only, proceed to the next section, “Soft Tissue Only Attachment.”

- Use the Femoral Caliper to measure the thickness of the tissue or bone (Fig. 36). Then select the washer based on the appropriate tooth height and style (Table 12).
- Consider using a Rongeur to reduce the thickness of the prepared bone if the thickness exceeds the maximum height allowed.

Warning: Do not exceed the maximum tissue height. If an attempt is made to capture a thicker amount of tissue, the Washer Bolt threads will not be sufficiently engaged to hold the tissue in place. If the bone or soft tissue is greater than the maximum height allowed, adjustments must be made to decrease the thickness or the Tissue Attachment Washer must not be used (Fig. 37).

Notes:

- The Curved Tissue Attachment Washer can be used only on the proximal pad.
- If using trochanteric bone, a minimum thickness of 8mm is required underneath the washer to prevent drilling *Trabecular Metal* Material through the Counter-torque Base/Arm assembly.

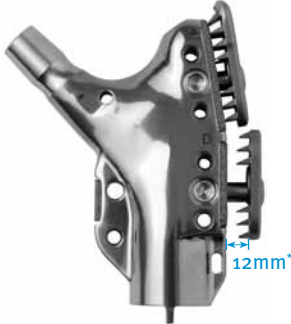
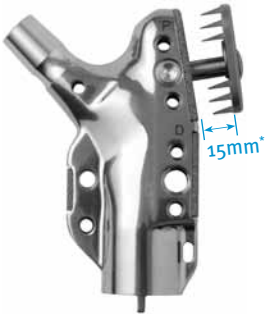



| 4mm Washers: | | 7mm Washer: |
|--|--|---|
|  | |  |
| Tissue Attachment Washer | Maximum Height of Washer Above Prosthesis (mm) | |
|  Curved Curved 4mm (Proximal only) | 12mm* | |
|  Flat 4mm | 12mm* | |
|  Flat 7mm | 15mm* | |

Table. 14

Tissue Attachment Washer Options

* Washer teeth should be fully seated into bone, if bone is used.



Instruments



Femoral Caliper
00-5903-030-00

- Place the Provisional Tissue Washer over the Segmental *Trabecular Metal* Proximal Femoral Component to select and position the washer (**Fig. 38**).
- Suture the tissues as necessary.

Warnings:

- Do not use the curved washers in the distal area, as the curved portion will be prominent.
- Avoid placing the suture in direct contact with the *Trabecular Metal* Material pad as it may weaken the suture.
- Be careful not to overtighten the sutures. This may compromise circulation or lead to tissue necrosis.

Notes:

- The tip of the Provisional Tissue Washer matches the dimensions of the Tissue Attachment Washer, including tooth height.
- Tissue Attachment Washers and provisionals have an arrow pointing toward the proximal end of the washer to assist with orientation when placing them on the *Trabecular Metal* Proximal Femoral Provisional. The arrow orientation is important to help ensure correct washer placement for maximum holding power of the washer teeth in soft tissue.
- Do not route suture through the threaded holes, as the sutures may be damaged by the threads (**Fig. 39**).



Fig. 38



Fig. 39

Instruments

Provisional
Tissue Washers
00-5851-032-14
00-5851-032-17
00-5851-032-19

Soft Tissue Only Attachment

- Prepare the tissue for attachment.
- Push the Tissue Washer Guide through the tissue to make a hole for the Washer Bolt (Fig. 40).
- Place the Tissue Attachment Washer over the Tissue Washer Guide and press it into the tissue.

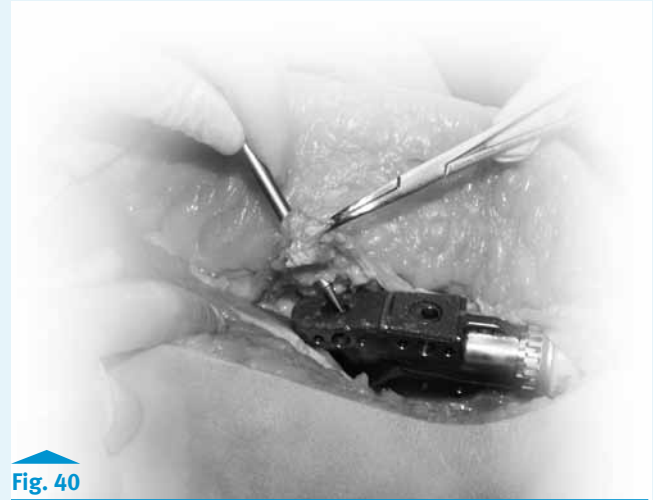


Fig. 40

- While maintaining the tissue location and tension, remove the Tissue Washer Guide and insert the Washer Bolt (Fig. 41).
- Counter-Torque Arm and base can be used to align washer with implant during tightening - see next section for more details (Fig. 41).

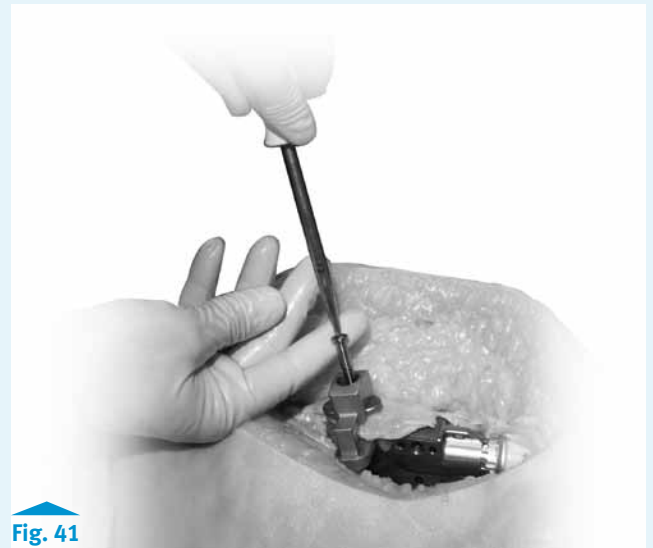


Fig. 41

- Torque the Bolt with the 3.5mm Hex Head Screwdriver, using the Washer Forceps to provide counter-torque resistance (Fig. 42).

Notes:

- The tissue hole can be started with a scalpel, if desired.
- The amount of tissue compression is based on the tension applied to the Bolt. Once the desired compression is reached, the Bolt position is locked in place via the Set Screw.



Fig. 42

Instruments

Tissue
Washer Guide
00-5851-032-15



Proximal Femoral
Washer Forceps
00-5851-032-02



3.5mm Hex Head
Screwdriver
00-5120-087-00

Bone/Soft Tissue Attachment

The Counter-torque Base/Arm assembly prevents the *Trabecular Metal* Material and implant body from being damaged by the drill.

- Prepare the tissue for attachment.
- Insert the Proximal or Distal Counter-Torque Base into the suture/set screw holes (**Fig. 43**).

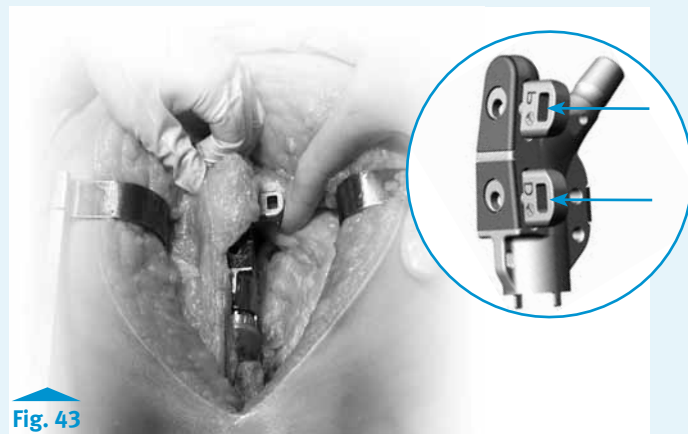


Fig. 43

- Insert the Counter-Torque Arm over the washer and into the base (**Fig. 44**).
- Ensure that the washer hole is aligned with the Counter-Torque Arm and the washer body is aligned with the prosthesis.

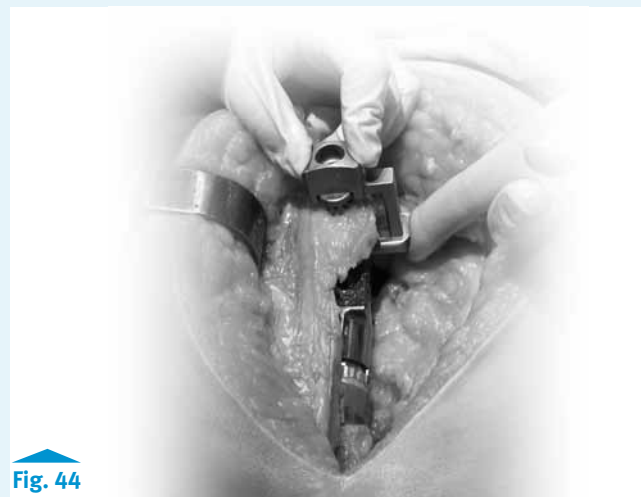


Fig. 44

- Insert the Tissue Washer Drill through the Counter-Torque Arm and drill through the cortical bone (**Fig. 45**). Apply pressure on the Counter-Torque Base with thumb if necessary.

Notes:

- If tissue is less than 8mm thick, use caution when drilling to avoid damage to the prosthesis.
- If the Counter-Torque Arm does not fit over the bone, it may be necessary to remove more bone to ensure adequate thread engagement on the Washer Bolt. Use the Femoral Caliper to check tissue thickness.
- If desired, two counter-torque assemblies can be used simultaneously for tissue attachment to the proximal and distal *Trabecular Metal* Material pads.



Fig. 45

InstrumentsProximal Counter-Torque Base
00-5851-032-20Distal Counter-Torque Base
00-5851-032-21Counter-Torque Arm
00-5851-032-22Tissue Washer Drill
00-5851-052-01Femoral Caliper
00-5903-030-00

- If necessary, insert the Tissue Washer Guide through the remaining bone/soft tissue.
- Slide the Proximal Femoral Washer Impactor over the Counter-Torque Arm (Fig 46).
- Lightly impact the Proximal Femoral Washer Impactor with a Mallet to compress the washer down into the trochanter bone on the implant

Fig. 46



- Remove the Proximal Femoral Washer Impactor and Tissue Washer Guide, and insert the Bolt, leaving the counter-torque assembly in place (Fig. 47).
- Torque the Bolt with the 3.5mm Hex Head Screwdriver.
- Remove the counter-torque assembly.

Fig. 47

**Notes:**

- Do not turn on the drill until the drill bit tip has been placed in the hole in the washer implant.
- Do not drill the hole through the washer implant without using the Counter-Torque Arm. Without this instrument, the hole may not be properly centered on the implant and the drill may damage the *Trabecular Metal Material* or the bore above the internal thread.
- Use only the Tissue Bolt packaged with the Tissue Attachment Washer. Tissue Bolts come in two lengths corresponding to the tooth height of the Tissue Attachment Washer (Fig. 48).
- The amount of tissue compression is based on the tension applied to the Bolt. Once the desired compression is reached, the Bolt position is locked in place via the Set Screw.

Fig. 48

**Instruments**

4.5 Assess Stability & Assemble Final Components

- Assess joint stability and range of motion.

Warning: Do not advance the Bolt after torquing the Set Screw, even after loosening the Set Screw, as this may damage the internal threads of the Femoral Component. If it is necessary to advance the Bolt after the Set Screw has been torqued, use a new Bolt and new Set Screw.

- Insert the Set Screw(s), using the Hinge Post Extension Extractor (Fig. 49). The Set Screw can be put in from either side, only one is required.



Fig. 49

- Torque Set Screw to 130 in-lbs using the Screw Driver (4.5mm) and Torque Wrench (blue handled) (Fig. 50).

Notes:

- The Set Screws should not be proud of the implant surface.
- Do not torque the Set Screw with the Hinge Post Extension Extractor, as this driver is for insertion only.
- Only one Set Screw is required for each Bolt.



Fig. 50

Instruments



Hinge Post
Extension Extractor
00-5881-052-00



Torque Wrench
00-5881-027-00



Screw Driver
(4.5mm)
00-5881-026-00

Step 5: Closure

- Perform the appropriate soft tissue closure (**Fig. 51**).
- Thoroughly clean the surgical site of bone chips, bone cement, and any other debris.
- Perform final closure.

Warnings:

- Avoid placing the suture in direct contact with the *Trabecular Metal Material* pad as it may weaken the suture.
- Be careful not to overtighten the sutures. This may compromise circulation or lead to tissue necrosis.

Notes:

- Foreign particles at the articulating interface may cause excessive wear.
- The suture holes in the prosthesis may be used for additional tissue attachment.

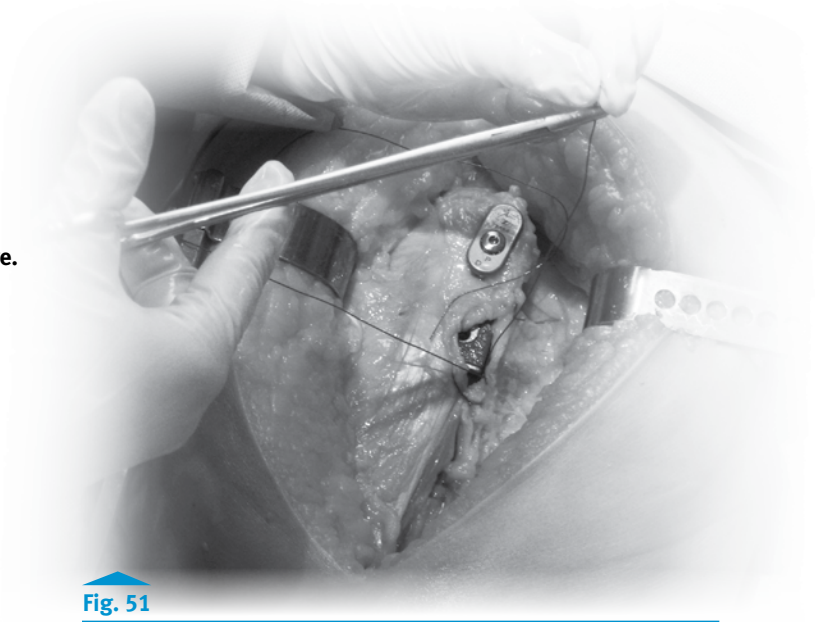


Fig. 51

Appendix A: Component Disassembly

Using the Taper Separator

The Segmental Taper Separator is designed to enable separation of the junctions between Segments, Stems, and Femoral Implants without damaging the tapers.

- Ensure that the inside wedging portion of the separator is fully retracted and centered within its housing.
- Insert the tabs of the separator into the anteversion pockets with the flat of the separator toward the Proximal Femur as etched on the instrument (**Fig. 52**).
- Slowly turn the handle clockwise until the tapers disengage, taking care not to pinch fingers against the rotating impactor cap.
- If necessary, lightly tap the impactor cap on the instrument to facilitate taper disassembly.

TECHNIQUE TIP

A.1

If additional force is needed to disengage the taper, use two Segmental Taper Separators, one on each side (**Fig. 53**).

Note: To protect the taper integrity of the provisional components, use only the Segmental Taper Separator with the turning handle when disassembling the femoral provisional construct.

Using the Femoral Stem Extractor

The Segmental Proximal Femoral assembly can also be removed with the Femoral Stem Extractor threaded onto the Slaphammer.

- Insert the Femoral Stem Extractor through the most distal hole on the lateral shoulder of the Proximal Femoral Implant (**Fig. 54**).
- Use the Slaphammer to remove the component, taking care not to damage the surrounding bone.

Note: The Femoral Stem Extractor should be used only when disassembly is not possible with the Segmental Taper Separator for the *Trabecular Metal Proximal Femoral Component*. Removal of the implant with the Femoral Stem Extractor will damage the set screw threads on the most distal hole, thereby requiring a new implant.



Fig. 52

Note: Provisionals shown for illustration purposes only.



Fig. 53



Fig. 54

Instruments



Segmental
Taper Separator
00-5851-020-00



Femoral Stem
Extractor
00-6601-002-00



Slaphammer
00-6551-006-00

Appendix B: Revising a Tissue Attachment Washer

- Use the Screw Driver (4.5mm) and Torque Wrench (blue handled) to loosen and remove the Set Screw (Fig. 55).
- Use the 3.5mm Hex Head Screwdriver to unscrew the Bolt. Do not remove the Bolt until the Set Screw is removed.



Fig. 55

- Remove the surrounding tissue and grasp the washer with the Proximal Femoral Washer Forceps (Fig. 56), or slide a 0.25in osteotome under the washer and pry it out of the surrounding tissue (Fig. 57).

Warnings:

- When revising the tissue washer mechanism, use a new Bolt and Set Screw from a Proximal Femoral Tissue Attachment Kit.
- Do not advance the Bolt after torquing the Set Screw, even after loosening the Set Screw, as this may damage the internal threads of the Femoral Component. If it is necessary to advance the Bolt after the Set Screw has been torqued, use a new Bolt and new Set Screw.

Notes:

- If any visible damage is present or if the new bolt assembly will not advance, revise the washer and/or Trabecular Metal Proximal Femoral Component.
- If disassembly of the entire femoral construct is necessary, refer to “Appendix A - Taper Separation.”



Fig. 56

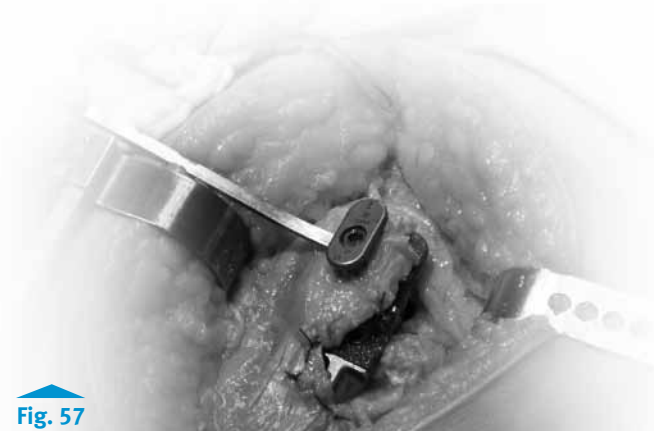


Fig. 57

Instruments



3.5mm Hex Head
Screwdriver
00-5120-087-00



Proximal Femoral
Washer Forceps
00-5851-032-02



Torque Wrench
00-5881-027-00



Screw Driver
(4.5mm)
00-5881-026-00

Appendix C: Mid-shaft Femur Replacement Using the Segmental Intercalary Segment

The *Zimmer* Segmental System Intercalary Segments are designed for reconstructing a midshaft defect or tumor in the femur (Fig. 58). They can be used in conjunction with Segmental Male-Female Segments, or as Female-Female Segments in other Segmental System applications. Intercalary Segments can be used with both Segmental Fluted and Variable Stiffness Stems.

Notes:

- Because preoperative planning cannot always predict the extent of a defect or tumor, the surgery may be changed to a distal, proximal, or total femur replacement if the condition of the bone dictates a resection that is too far proximal and/or distal to accept the length of the Stems (minimum intramedullary length on either side of the Intercalary Segment and Stem Collar is 130mm).
- Do not use a Segmental Intercalary Segment with *MOST Options*® Stems, as they are not compatible.



Fig. 58

Step 1: Femoral Preparation

1.1 Excise Defective Femoral Bone

- With the leg in a reproducible position, check leg length and alignment.
- Determine the implant configuration and select the component.
- Measure the anticipated resection length across the bone defect/tumor that is appropriate for the implant configuration (**Table 15**).
- Make horizontal lines on the bone to indicate the proposed resection space.
- Make a vertical mark on the bone above and below the resection space to help assess the rotational alignment of the components.

TECHNIQUE TIP

C.1

Resecting slightly more than the length of the assembled implants will make assembling the Intercalary Component easier and reduce the amount of distraction necessary; however, it will also cause the limb to be shortened and could reduce tissue tension.

TECHNIQUE TIP

C.2

Mark horizontal lines at a predetermined distance above and below the resection levels for use in assessing leg length during trial reduction.

Notes:

- Each large taper connection adds approximately 2mm to the total length.
- The minimum resection is 109mm.

1.2 Finish Femoral Preparation

To complete femoral preparation, follow the procedure for reaming, planing, and counterboring in Step 1 (page 1) of the main body of this technique.



| Intercalary Segments (mm) | Stem/Collar (Two Stems Required) (mm) | Male-Female Segments (mm) | Resection Length* (mm) |
|---------------------------|---------------------------------------|---------------------------|------------------------|
| 45 | 30+30 | 0 | 109 |
| | | 30 | 141 |
| | | 35 | 146 |
| 55 | 30+30 | 0 | 119 |
| | | 30 | 151 |
| | | 35 | 156 |
| 65 | 30+30 | 0 | 129 |
| | | 30 | 161 |
| | | 35 | 166 |
| | | 40 | 171 |
| | | 45 | 176 |

Table. 15

Measuring resection length

* Denotes the length of the implants (includes the 2mm added by each taper junction)

Step 2: Trial Reduction

2.1 Prepare Stem Provisional

- Refer to Step 2.1 of the main body of this technique.

2.2 Prepare Intercalary Segment Provisional

- Select the Intercalary Segment Provisional and Male-Female Segment Provisional
- If required, place the Male-Female Segment Provisional onto the base of one of the two Stem Provisionals and use the Stem Impactor with the Universal Handle to impact the taper.
- Connect the two halves of the Provisional Intercalary Segment Assembly together (Fig. 59).
- Place one end of the Intercalary Provisional onto the base of one of the Stem Provisionals, or the Male-Female Segment Provisional.
- Place the other end on the base of the other Stem Provisional, being careful to avoid distracting the leg more than necessary.
- Ensure that all tabs on the provisional components are properly engaged in the corresponding pockets.
- Evaluate the fit of the provisionals and make adjustments as necessary
- Check the leg length, alignment, and stability.
- If the soft tissues are too tight and the construct cannot be shortened, consider a soft tissue release or additional bone resection
- If additional bone is resected, ream the canal to ensure that the reaming depth is adequate

Caution: Do not overlengthen the construct in an effort to achieve longitudinal stability

Notes:

- To facilitate disassembly, the Segmental Intercalary Segment Provisionals are not designed for a taper fit with the mating provisionals.
- One of the two Intercalary Provisional halves is designed with a slight boss to fit inside the other half (Fig. 59).
- This intercalary trialing technique provides a similar amount of distraction as the intercalary implantation would require.
- It is not necessary to impact the provisional components together.



Fig. 59

Instruments



Intercalary
Universal End
00-5851-044-12



Intercalary
Segment Provisional
00-5851-044-45
00-5851-044-55
00-5851-044-65



Male-Female
Segment Provisional
(See ZSS Profiler)



Segmental Stem
Provisional Bowed
(See ZSS Profiler)



Segmental Stem
Provisional Straight
(See ZSS Profiler)



Collar Provisional
(See ZSS Profiler)
00-5853-056-XX



Universal Handle
6216-01-125



Segmental Implant/
Provisional Male
Taper Impactor
(Stem Impactor)
00-5851-080-00

Provisional Intercalary Segment Spacer Option

To perform the trial reduction with minimal distraction, a Provisional Intercalary Segment Spacer (Fig. 60) is available as an alternative to the Intercalary Segment Provisional when a Male-Female Segment Provisional will not be part of the construct. The spacers are available in three sizes: 45mm, 55mm, and 65mm.

- Slide the boss on the Provisional Intercalary Segment Spacer into the threaded hole on the end of one of the Stem Provisionals in the canal.
- Slide the other boss into the hole on the end of the other Stem Provisional (Fig. 61).
- Note the tissue tension, as the amount of distraction required to assemble this provisional construct will be less than that required to assemble the final implants.
- Continue with the trial reduction as described above.



Fig. 60



Fig. 61

TECHNIQUE TIP

C.3

To facilitate the assembly, use the Segment Inserter/Remover to insert the spacer.

Note: This trialing option will not work if a Male-Female Segment Provisional is used in the construct as it does not have a threaded hole at the end of the male taper.

2.3 Disassemble Provisional Components

- Refer to Appendix A

Instruments



Segment Spacers
00-5851-043-45
00-5851-043-55
00-5851-043-65



Segmental Stem
Provisional Bowed
(See ZSS Profiler)



Segmental Stem
Provisional Straight
(See ZSS Profiler)



Collar Provisional
(See ZSS Profiler)
00-5853-056-XX

Step 3: Implant Assembly & Insertion

3.1 Prepare Stems

To attach the Stem Collars, refer to “Stem Collar Attachment” in Step 4 of the main body of this technique.

3.2 Implant Stems

Variable Stiffness Stems

TECHNIQUE TIP

C.4

In some applications, particularly in cases with thin cortical walls, it can be beneficial to use cerclage wires to reduce the possibility of damaging the bone.

- If using a Smooth Collar, apply cement to the base of the Collar.
- Insert each Stem by hand into the corresponding medullary canal.
- Attach the Universal Handle to the Stem Impactor.
- Use the impactor assembly and a Mallet to impact each Stem.

TECHNIQUE TIP

C.5

If the Stem fits too tightly in the bone, remove it and pass the last Reamer used through the canal several more times. This can increase the hole diameter slightly, which will permit the Stem to be more easily impacted into the bone. The Segmental 3/4mm Reamers can also be used for optional fit for the 130mm Straight VS Stems.

Notes:

- **The Variable Stiffness Stems are indicated for uncemented use only.**
- **Avoid notching, scratching, or directly striking the implants during assembly.**

Instruments



Universal Handle
6216-01-125



Segmental Implant/
Provisional Male
Taper Impactor
(Stem Impactor)
00-5851-080-00



Mallet
00-0155-002-00

Fluted Stems

- Inject cement into the medullary canal.
- Apply cement to the shank of the Stem and, if using a Smooth Collar, to the base of the Collar.
- Insert the implant into the canal and use the Stem Impactor and a Mallet to tap it until fully seated, cleaning off excess cement as the implant advances.

Notes:

- If desired, use a plastic cement restrictor for manual cement pressurization. A *Bigliani/Flatow Pressurizer Sponge* may be used to prevent cement from extruding out of the femoral canal and onto the face of the *Trabecular Metal Collar* that contacts the planed surface of the femoral cortex. If using this technique, slide the sponge onto the Stem until it contacts the base of the Collar (**Fig. 62**).
- Be careful to keep cement off of the external surfaces of the *Trabecular Metal Collar*, the entire surface of the tapers, and the crevices of the anteversion adjustment pockets.
- If using the *Bigliani/Flatow Pressurizer Sponge*, remove the sponge just before the Collar sits flush with the prepared cortex and before the cement cures. Do not implant the sponge.
- Be careful not to leave any foam material in the wound or on the *Trabecular Metal Material*.

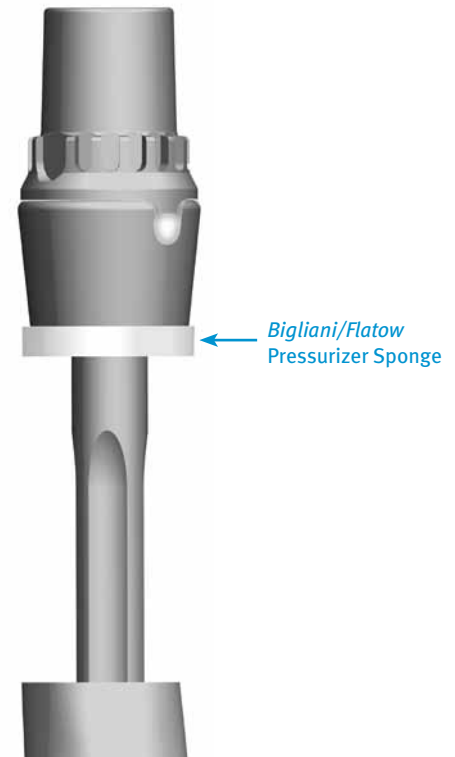


Fig. 62

Instruments



Segmental Implant/
Provisional Male
Taper Impactor
(Stem Impactor)
00-5851-080-00



Bigliani/Flatow
Pressurizer Sponge
00-4301-035-01

3.3 Assemble/Insert Intercalary Segment

- Determine the appropriate size Intercalary Segment and Male-Female Segment, if used.
- Place the Male-Female Segment onto the base of one of the Stems.
- Use the Segment Impactor with the Universal Handle to impact the taper.
- Distract the leg and use the Segment Inserter/Remover to insert the end of the Intercalary Segment onto the taper of the distal Stem or Segment, ensuring that the vertical marks made earlier on the bones are rotationally aligned.
- Insert the other end of the Intercalary Segment onto the taper of the proximal Stem or Segment.
- Extend the leg, and push and/or gently strike the patient's heel with a hand to seat the final taper connections.

Notes:

- If the Intercalary Segment assembly is being positioned near key anatomical structures, it may be necessary to insert the implant by hand.
- Excessive distraction of the limb may cause damage to surrounding soft tissue structures.
- The Segment Inserter/Remover will facilitate the assembly by providing leverage to manipulate the femur.
- The segment anteversion tabs must be positioned in either the direct A/P or M/L direction to facilitate access for the Segmental Taper Separator (Fig. 63).
- Tissue tension and the rotational tabs will help to ensure that the components do not separate during final seating of the components.

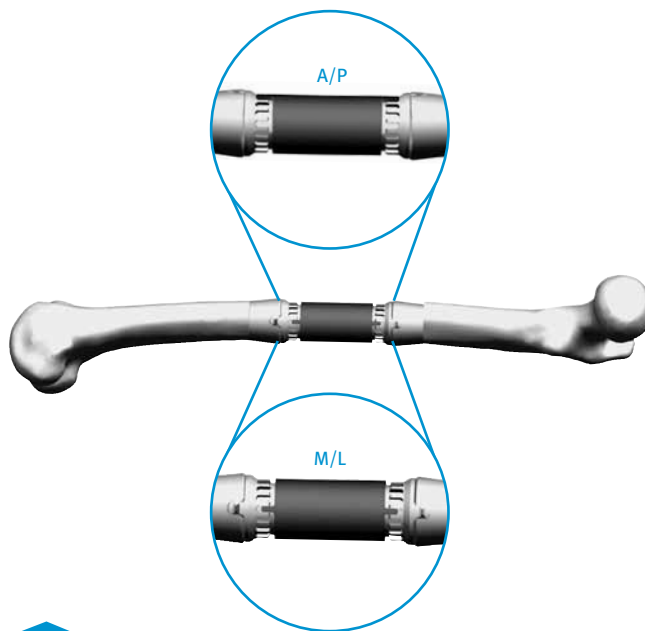


Fig. 63

Instruments



Segment
Inserter/Remover
00-5851-044-05



Segmental Implant/
Provisional Female
Taper Impactor
(Segment Impactor)
00-5851-074-02

3.4 Adjust Rotation

- If rotational adjustment is necessary after the components are completely seated, use the Segmental Taper Separator to disassemble the taper.

Note: The anteversion pockets and tabs on the components allow the component rotation to be adjusted in a controllable manner in 20 degree increments.

3.5 Component Disassembly

- Apply the Segment Inserter/Remover to the Intercalary Segment.
- Use the Segmental Taper Separator to disengage the taper as explained in Appendix A, and pull the Segment Inserter/Remover in the direction necessary to separate the components.

3.6 Stem Removal

- Thread the Implant Slaphammer Adapter onto the Slaphammer (Fig. 64).
- Thread the other end of the adapter into the Stem.
- Impact the Slaphammer to remove the Stem.



Fig. 64

Instruments



Implant
Slaphammer
Adapter
00-5851-097-11



Slaphammer
00-6551-006-00



Segmental Taper
Separator
00-5851-020-00



Segment
Inserter/Remover
00-5851-044-05

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