Dall-Miles® Cable System
Surgical Protocol

- Dall-Miles® Trochanter Grip and Trochanter Grip Plate.
- Trochanteric Reattachment and Cerclage.
Introduction

This surgical technique is designed to provide the experienced surgeon with guidance for performing Trochanteric Reattachment in Total Hip Arthroplasty using either the Dall-Miles Trochanter Grip or Trochanter Grip Plate. It should be read in conjunction with the operative technique for the Dall-Miles Recon & Trauma Cable System.

System Overview

The Dall-Miles Recon & Trauma Cable System provides the surgeon with a means of achieving trochanteric reattachment and a variety of methods of cerclage fixation.

Indications

• The Trochanter Grip is used to reattach the greater trochanter, in primary or revision Total Hip Arthroplasty when a trochanteric osteotomy or trochanteric slide has been used.

• The Trochanter Grip Plate is indicated when an extended trochanteric osteotomy is used, or to augment fixation of peri-prosthetic proximal femoral fractures.

Contraindications

(Trochanter Grip & Grip Plate)

Absolute contraindications include:

• Overt infection.
• Distant foci of infections (which may cause hematogenous spread to the implant site).
• Skeletally immature patients.
• Cases where there is a loss of abductor musculature, poor bone stock or poor skin coverage around the hip joint.
• Compromised vascularity that would inhibit adequate blood supply to the fracture or operative site.

The Grip Plate is not to be used on its own as a primary fixation device in peri-prosthetic proximal femoral fractures. It should be used to augment other fixation devices (for example a femoral stem, which is well fixed distally, augmented with cortical allograft struts, secured with cerclage cables, and/or the Trochanter Grip Plate).

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This publication sets forth recommended procedures for using Stryker Orthopaedics devices and instruments. It offers guidance that you should heed, but, as with any such technical guide, each surgeon must consider the particular needs of each patient and make appropriate adjustments when and as required.
Trochanter Grip Surgical Protocol

NOTE: The following technique assumes that the acetabular component has been implanted and that the femur has been prepared for the selected femoral prosthesis.

Technique for Total Hip Arthroplasty

A trial reduction is carried out to check stability of the hip. The trial reduction will also allow determination of the optimal position of the trochanter for reattachment.

Location of Trochanteric Cables

Using a Dall-Miles Femoral Cable Passer, two cables are sequentially passed distal to the lesser trochanter. The tip of the cable passer should stay in close contact to the bone to ensure that the soft tissue surrounding the femur is not compromised by the cables. The cables should be parallel to one another and should not be overriding one another.

Alternatively, two 2.7mm drill holes are made in the area of the lesser trochanter. A cable is then passed through each hole.

NOTE: The Grips accept 2.0mm Dall-Miles Cables. It is recommended that Non-Beaded Cables are used to ensure even tensioning of the Grip with the Double-Sided Tensioner device.

2.0mm Non-Beaded Cables are available in either Stainless Steel or Vitallium® and should be used with either the Stainless Steel or Vitallium® Grip respectively.

Application of Trochanter Holding Forceps

The hip is now reduced. The forceps should be applied as distally as possible on the detached trochanter (Figure 1) to allow room on the trochanter for placement of the Trochanter Grip.

Passing Cables Under the Abductor Muscles

Utilizing a Dall-Miles Trochanter Cable Passer, the anterior end of the proximal cable is passed near the tip of the trochanter as close to the anterior surface of the trochanter as possible (Figure 2a).

The distal cable is then passed in a similar fashion approximately halfway along the anterior surface of the trochanter; again as close to the anterior surface of the trochanter as possible. Proper placement of the cables is essential for minimizing soft tissue inter–position between the cables and bone (Figure 2b).

Positioning the Trochanter

The trochanter should be placed back on the bed of the trochanteric osteotomy. The amount of trochanteric advancement should now be...
Trochanter Grip Surgical Protocol

Passing the Cables Through the Trochanter Grip

The Grip is secured to the Grip introducer and the free cable ends passed through the holes in the bridges of the Grip.

The proximal cable should be passed through the proximal bridge and the distal cable should be passed through the distal bridge (Figure 3).

Seating the Trochanter Grip

The Dall-Miles Trochanter Grip has two longer proximal hooks and two smaller distal teeth. The proximal hooks must be engaged just over the top of the trochanter. Because the insertion of the abductor muscles makes it impossible to visualize the top of the trochanter, it must be carefully palpated through the muscles. The hooks are passed through the abductor muscle insertions and engaged as close as possible to bone. Cable slack is taken up manually at the same time (Figure 4).

Once the proximal hooks of the Grip are properly positioned, the distal teeth can then be driven into the bone using a mallet. The Grip introducer may be removed now, or alternatively, can be left in situ to assist in positioning the trochanter.

Positioning of the Trochanter and Application of Tensioners

Two Double-Sided Tensioners are now applied to the proximal and distal cables.

Utilizing the Trochanter Holding Forceps or Grip introducer, position the trochanter into the desired position on the trochanteric osteotomy bed. The position of the trochanter should be maintained while the cables are tensioned. The cables may be tensioned simultaneously or sequentially to capture the trochanter in the desired position. Remove the Trochanter Holding Forceps or Grip introducer.

Trochanter Grip Impaction and Final Cable Tensioning

The Trochanter Grip should be impacted with the Impactor to drive the distal teeth firmly into the bone (Figure 5). The Grip should sit flat on the trochanter. The cables should again be tightened. Impaction of the Grip and further tightening of the cables can be carried out if necessary (Figure 6).

NOTE: Over-tensioning should be avoided. The Dall-Miles Double-Sided Tensioner is a powerful instrument and can damage the cables or cut through the bone if extensive force is applied.

Check manually for secure fixation. If the position or fixation of the trochanter is not satisfactory, release the tensioners and repeat the procedure as described above.

NOTE: When not in use, the Double-Sided Tensioners should be stored with the cams fully released. A lubricant for surgical instrument care should be used regularly on the threaded portion to keep the tensioner mechanism from binding.
Crimping

The bridges of the Dall-Miles Trochanter Grip are crimped individually using the Crimp Tool to secure the cables (Figure 7). The order of crimping is not important. It may be necessary to remove soft tissue adjacent to the bridges in order to ensure proper location and seating of the Crimp Tool’s jaws.

Before placing Crimp Tool on bridge of Grip, be sure the ratchet mechanism is disengaged. If it is not, squeeze the handles slightly and push the release lever to disengage the ratchet and open the handles fully.

The ratchet mechanism will engage as crimping starts. The ratchet will hold the tool in place if it is necessary to reposition the hands.

Squeeze the handles until the ratchet mechanism disengages. At that point, release the handles and the crimp is complete. Once both bridges have been thoroughly crimped, the tensioners are removed.

Cutting the Free Cable Ends

Use the Dall-Miles Cable Cutter to cut the free ends of the cable.

The free end of each cable is passed through the Cutter tip, introducing it on the side with the laser mark that reads: “CUT THIS SIDE” (Figure 8a).

While applying longitudinal tension on the cable, advance the Cutter tip over the cable and push it as flush against the Grip as possible (Figure 8b). This is important in order to leave as short a tag as possible. Pull the Cutter handle to cut the cable.

An ordinary wire cutter should not be used as it will result in a poor cut and splay the cable filament ends which may cause soft tissue irritation. With the cable cut, further trimming of the cable should be AVOIDED, to prevent introduction of cable filaments into the wound and surrounding soft tissue area.
Trochanter Grip Plate Surgical Protocol

The Surgical Technique for implanting the Trochanter Grip Plate follows a similar protocol to the Trochanter Grip, please refer to previous section. A trial reduction is carried out to check stability of the hip and the optimal position of the osteotomized portion of the trochanter – proximal femur.

Grip Plate sizing

The size (medium or large) and length of Grip Plate to use is dependent on the shape of the proximal femur and length of the extended trochanteric osteotomy. The trial template can be used to assess the proximal femoral size and length of the shortest Grip Plate, prior to implant selection (Figure 9).

Proximal Cables

Two proximal Non-Beaded 2.0mm Cables are positioned below or through the lesser trochanter, as described in the Trochanter Grip protocol (Figure 1). These cables are then passed under the abductor muscles and through the Grip portion as described in the previous section. (Figures 2 & 3). Usually it is easier to perform this part of the procedure with the hip reduced, but occasionally it is preferable to locate all cables prior to reduction.

Distal Cables

The distal part of the Grip Plate can be fixed with up to 1, 3 or 5 additional cables depending on the length of implant chosen.

Either Beaded or Non-Beaded 2.0mm Cables may be used. Beaded are preferable as, in conjunction with tension-retaining devices, they enable the surgeon to tension all the cables fully with Single-Sided Tensioners (and Tension Retaining Devices), prior to crimping.

The plate section should be pre-loaded with Beaded Cables before passing them around the femur. Some prior thought should be given to which side of the plate the beads should be positioned. This will be dictated by the chosen surgical approach and the lie of the soft tissues.

If the easiest access for the Tensioners is anterior to the plate, the beads should be positioned posterior and vice-versa.

Using the Femoral Cable Passer the cables are passed at appropriate positions around the proximal femur.

If Beaded Cables/Single-Sided Tensioners are not available, Non-Beaded Cables with Double-Sided Tensioners may be used.

With the implant in position and cables in place, tension and re-tension the cables until the Grip Plate is securely fixed (Figure 10). The bridges are now crimped, tensioners removed and free cable ends cut off.

The timing of the final tensioning and crimping of the cables passed through the proximal grip portion of the implant is dependent on the surgical circumstances and the surgeon’s preference.

This can be done before or at the same time as the distal cables are finally tensioned and crimped.

NOTE: For Beaded Cables, the Single-Sided Tensioner is required. Depending on the number of Tensioners that are available, these may be used with or without the Tension Retaining Device. (Please refer to pages 8, 9 & 10).
Screw Fixation

It is possible to augment the fixation of the Trochanter Grip Plate with Stryker® SPS cortical bone screws, to provide additional rotational stability. A range of 4.5mm Ø screws commencing with 14mm length are available in both Stainless Steel and also Titanium (for Vitallium® implants).

A 3.2mm Ø drill bit should be used.
Cerclage Protocol Using Beaded Cables

Dall-Miles Beaded Cables are recommended for use with the Single-Sided Tensioner for cerclage; while Dall-Miles Non-Beaded Cables are recommended for use with the Double-Sided Tensioner.

**Step 1**
Position the sleeve at the beaded end of the cable (Figure 1).

**Step 2**
Once the Cable Passer is positioned, insert the cable through the end of the passer farthest from the passer handle (Figure 2). Remove the passer.

Pass the free end of the cable through the sleeve and always position the sleeve with the narrow side with the laser markings facing the bone (Figure 3).

Manually tighten sleeve against the bone (Figure 4 inset). If necessary, the Sleeve Holding Forceps can be used to position the sleeve (Figure 4).

**Step 3**
With the Single-Sided Tensioner in the fully open position (tensioner knob turned fully counter-clockwise), insert the cable end through the nozzle tip; position the tip flush against the side of the sleeve. Turn knob clockwise until desired tension is achieved (do not exceed 150lb tension) (Figure 5).
Optional Technique Using Tension Retaining Devices

An optional technique is to use the Dall-Miles Tension Retaining Device to hold a tensioned cable in place while additional cables are placed using the same Single-Sided Tensioner. Once several cables are in place and sequentially tensioned, the Tension Retaining Devices enable the surgeon to go back and retension cables as needed before final crimping.

Step 1
Turn winged screw on the Tension Retaining Device counter clockwise until it is opened.

Step 2
Insert the free cable end through the long nozzle tip of the Tension Retaining Device. Advance the Tension Retaining Device along the cable until the long nozzle tip is flush against the sleeve.

Step 3
With the Single-Sided Tensioner knob in the fully opened position, insert the free cable end through the curved Tensioner nozzle tip. While advancing, take up any cable slack and position the Tensioner tip inside the recessed body of the Tension Retaining Device (Figure 6).

Step 4
Turn the Single-Sided Tensioner knob clockwise until desired tension is achieved (do not exceed 150lb of tension). Turn winged screw on Tension Retaining Device clockwise until it is tightened (Figure 7). Remove the Tensioner by turning knob counterclockwise until it releases. Each cable can then be incrementally tensioned before final crimping (Figure 8).
Retensioning with Tension Retaining Device Already Applied

In order to achieve satisfactory retensioning, the following steps must be taken:

**Step 1**
Follow instructions in Step 3, page 9.

**Step 2**
Release the tensioned cable in the Tension Retaining Device by turning the winged screw counterclockwise. Once released, the cable is now ready to be re-tensioned.

**Step 3**
Follow instructions in Step 4, page 9.

Crimping

**Step 4**
Before placing the Crimp Tool on the sleeve, be sure the ratchet mechanism is disengaged. If it is not, squeeze the handles slightly and push the release lever to disengage the ratchet and open the handles fully.

Place the Crimp Tool on the sleeve and squeeze the handles (Figure 9). The ratchet mechanism will engage as crimping starts. The ratchet will hold the tool in place if it is necessary to reposition the hands.

Squeeze the handles until the ratchet mechanism disengages. At that point, crimping is complete.

Remove the Single-Sided Tensioner or Tension Retaining Device (whichever is applicable) by turning the knob or winged screw counterclockwise until it releases.

Cutting the Free Cable Ends

Use the Dall-Miles Cable Cutter to cut the free ends of the cable.

The free end of the cable is passed through the Cutter tip, introducing it on the side with the laser mark that reads: “CUT THIS SIDE.”

While applying longitudinal tension on the cable, advance the Cutter tip over the cable and push it as flush against the Sleeve as possible (Figure 10). This is important in order to leave as short a tag as possible. Pull the Cutter handle to cut the cable.

Do not use an ordinary wire cutter because a long tag may be left and may cause soft tissue irritation.
Instrument Use & Cleaning Instructions

NOTE: Improper cleaning and maintenance may impair the normal function of an instrument.

Double-Sided Tensioner
(6704-9-350)

Use
Turn knob counter clockwise until the cross-head seats fully on the lower body of the Tensioner. Some resistance will be felt as the head engages the studs on the body. Continue turning the knob even when this resistance is encountered.

Once fully seated, the cable can be threaded around the pulleys through the holes in the lower body, up through the tensioner heads.

Pull the cable as tight as possible by hand and then turn the knob clockwise to tension the cable. The Tensioner is equipped with self gripping heads.

After crimping the implant, turn the knob counterclockwise and fully seat the cross-head to release the cable. The cable can then be drawn out of the tensioner and the tensioner removed.

Cleaning/Maintenance
Flush the wheels, threads and Tensioner heads thoroughly with plenty of water and cleaning agent.

Turn knob counterclockwise to fully seat the cross-head. Flush Tensioner heads from the top to clear any debris from the jaws mechanism.

Prior to autoclaving, apply a lubricant or instrument milk to the threads and the jaw mechanism within the heads. Be sure that the lubricant penetrates the mechanism fully.

NOTE: The Tensioner heads are replaceable but do not need to be removed when cleaning or as a routine procedure when used. These heads need to remain tight for the instrument to function correctly.

Tensioner Head Replacement
(6704-9-351)

Turn Tensioner head counterclockwise until it is removed from device. Take Replacement Head and turn it clockwise until it is fully seated. A wrench may be used to provide a more snug fit.

Single-Sided Tensioner
(6704-9-320)

Use
Turn knob counterclockwise until it stops. Some resistance will be felt as the head engages the stud on the inside of the instrument. Continue turning the knob even when this resistance is encountered. The threaded shaft will be recessed inside of the knob when the jaws are fully open.

Once the knob is turned as far as it can go, the cable can be threaded through the nose and up through the Tensioner.

Pull the cable as tight as possible by hand and the turn the knob clockwise to tension the cable. The Tensioner is equipped with a self gripping head.

After crimping the implant, turn the knob counterclockwise to release the cable. The cable can then be drawn out of the Tensioner and the tensioner removed.

Cleaning/Maintenance
Turn the knob counterclockwise, as described by the arrow indicating "loosen", until it stops.

Flush instrument from the knob end, through the cannulated nozzle until the passage is cleared. A small brush may be used to dislodge any debris.

Flush area inside of the outer cylinder and flush again from the knob end.

Turn knob counterclockwise to advance the jaws within the cylinder and add an instrument lubricant or instrument milk to the mechanism prior to autoclave sterilization. Be sure that the lubricant fully penetrates the jaw mechanism.

Flush area inside of the outer cylinder and flush again from the knob end.

Apply lubricant to the threaded stud/knob interface prior to autoclave sterilization as well.
**Instrument Use & Cleaning Instructions**

**NOTE:** Improper cleaning and maintenance may impair the normal function of an instrument.

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**Grip Introducer**  
*(6704-9-715)*

**Use**  
Turn knob counterclockwise to fully retract the tip of the instrument.

Place the square-shaped tip through the central window in the Grip or Grip Plate.  
Turn knob clockwise until tight.  
To disengage the instrument from the Grip, turn knob counterclockwise and remove the instrument.  

**Cleaning/Maintenance**  
Flush the tip thoroughly with plenty of water to remove all contaminants.  
Ensure that the entire tip is clean.  
Apply a lubricant or instrument milk to the underside of the knob prior to autoclave sterilization.

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**Trochanter Forceps**  
*(6704-9-550)*

**Use**  
To open jaws, turn nut counterclockwise on threaded stud to allow jaws to fully open. Squeeze handles to close jaws to desired position. To hold jaws in desired position, turn nut clockwise on threaded nut to tighten.  

**Cleaning/Maintenance**  
No special cleaning is required. However, apply a lubricant or instrument milk to the pinned joint and threaded stud prior to autoclave sterilization.

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**Sleeve Holding Forceps**  
*(6704-9-520)*

**Use**  
To release the teeth, separate the handles by pulling them apart. Grasp the sleeve and then squeeze handles together to lock sleeve in position.  

**Cleaning/Maintenance**  
With the forceps handles in the fully open position, thoroughly flush the pivoting point with water prior to autoclave sterilization.

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**Grip Impactor**  
*(6704-9-720)*

**Use**  
To release the teeth, separate the handles by pulling them apart. Grasp the sleeve and then squeeze handles together to lock sleeve in position.  

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**Cable Passers**  
*(6704-9-760/770/800/820)*

**Cleaning/Maintenance**  
Flush the cannulated body until the passage is cleared. A small brush may be used to dislodge any debris.

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**Head Replacement**  
*(6704-9-721)*

Turn Impactor Head counterclockwise until it is removed from the device. Take Replacement Head and turn it clockwise until it is fully seated.
Instrument Use & Cleaning Instructions

NOTE: Improper cleaning and maintenance may impair the normal function of an instrument.

Tension Retaining Device
(6704-9-250)

**Use**

Turn winged screw on the Tension Retaining Device counterclockwise until it is opened.

Insert the free cable end of the Beaded Cable through the long nozzle tip of the Tension Retaining Device.

Advance the Tension Retaining Device along the cable until the long nozzle tip is flush against the sleeve.

With the Single-Sided Tensioner knob in the fully opened position, insert the free cable end through the curved Tensioner nozzle tip. While advancing, take up any cable slack and position the tip inside the recessed body of the Tension Retaining Device.

Turn knob clockwise on the Single-Sided Tensioner until desired tension is achieved (do not exceed 150lbs. of tension). Turn winged screw clockwise on Tension Retaining Device until it is tightened. Remove the Tensioner by turning the knob counterclockwise until it releases. Each cable can then be incrementally tensioned before final crimping.

Cleaning/Maintenance

Flush the tube and threads thoroughly with plenty of water and cleaning agent.

Turn winged screw clockwise to engage inner clamp. Flush tube once again with plenty of water and cleaning agent to clear any debris from inner clamp.

Turn winged screw counterclockwise to disengage the inner clamp and do a final rinse over the entire instrument.

Prior to autoclaving, apply a lubricant or instrument milk to the threads.

Be sure the lubricant or milk penetrates the threads fully.

Crimp Tool
(6704-9-150)

**Use**

Before placing instrument on the implant to be crimped, be sure the ratchet mechanism is disengaged. If it is not, squeeze the handles slightly and push the release lever to disengage the ratchet and open the handles fully.

Crimp implant asusual. The ratchet mechanism will engage as crimping starts. The ratchet will hold the tool in place if it is necessary to reposition the hands.

Squeeze the handles until the ratchet mechanism disengages. At that point, release the handles and crimping is complete.

If a crimp less than the full throw of the handles is needed, squeeze to the appropriate point. While holding the handles, squeeze slightly and push the release lever to disengage the ratchet mechanism and open the handles.

Cleaning/Maintenance

Standard cleaning procedures can be used. Ensure that the ratchet mechanism is cleaned thoroughly before sterilizing.

Prior to autoclaving, apply a lubricant or instrument milk to all of the pinned joints and to the ratchet mechanism.

Be sure the lubricant penetrates the joints fully.

After each use, the jaws of the Crimp Tool should be tested using the Crimp Tool Gauge (6704-9-130).

To test the jaws, squeeze the Crimp Tool handles together to engage the ratchet on the last tooth. Try to insert the edge of the Gauge between the jaws:

• If Gauge fully seats in the jaws, Crimp Tool needs to be replaced.

• If Gauge does not fully seat, the Crimp Tool is good for next use.
**Instrument Use & Cleaning Instructions**

**NOTE:** Improper cleaning and maintenance may impair the normal function of an instrument.

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**Cutter**
(6704-9-420)

**Use**
The free end of the cable is passed through the Cutter tip, introducing it on the side with the laser mark that reads: "CUT THIS SIDE."

While applying longitudinal tension on the cable, advance the Cutter tip over the cable and push it as flush against the implant as possible. Pull the Cutter handle to cut the cable.

**Cleaning/Maintenance**
Flush the handles out through the slots in the body of the Cutter. Be sure all contaminates are removed and the instrument flushes clean.

Flush the tip thoroughly and pull handle frequently until the instrument is flushed out.

Prior to autoclaving, apply a lubricant or instrument milk to the handle joint and Cutter tip and work lubricant into the mechanism.

**NOTE:** The tip of the Cutter is removable for replacement only. To replace the tip, follow the instructions provided below.

**Tip Replacement**
(for 6704-9-420) (6704-9-421)

Using a wrench, turn the retaining nut loose and remove.

Twist tip counterclockwise to unthread the plunger and outer sleeve from the Cutter.

To replace the tip, remove the retaining nut from the new Cutter tip and thread tip into Cutter. Thread the tip down far enough that the outer tube body can sit flush against the Cutter body.

To ensure Cutter tip is at the correct depth, place Cutter tip in the right most or 0 degree position when holding as if aiming a gun. The hole should be clear when handles are in the released position and fully blocked by the outer tube when the handles are squeezed completely. If the hole is not fully blocked when the handles are squeezed, turn the tip one complete revolution clockwise and retest. If the hole is not completely clear when handles are in the released position, turn tip one full revolution counterclockwise and retest.

With the tip in any position, perform the same tests. In any position, the hole should be clear when the handles are fully released and completely blocked when the handles are squeezed completely.

When adjustments are complete, thread the retaining nut into the tip and wrench tighten.

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**Cable Removal Cutter**
(6704-9-460)

**Use**
The Cable Removal Cutter is ONLY to be used for cable removal and NOT for trimming cable ends.

Position cable between tips of Cutter and squeeze the Cutter handles together to cut the cable.

**Cleaning/Maintenance**
Standard cleaning procedures can be used.

Prior to autoclaving, apply a lubricant or instrument milk to the pinned joint. Be sure the lubricant penetrates the joint fully.
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