Precision Oblique Ulnar Shortening Surgical Technique Manual

Rayhack Osteotomy System™
# Table of Contents

**RAYHACK OSTEOTOMY SYSTEM™**

**PRECISION OBLIQUE ULNAR SHORTENING OSTEOTOMY SURGICAL PROTOCOL**

**STEP 1** Placement of the Ulnar Saw Guide ........................................................................... page 1

**STEP 2** Positioning of the Straight Drill Guide ........................................................................... page 2

**STEP 3** Performing the Oblique Ulnar Shortening Osteotomy .................................................. page 3

**STEP 4** Ulnar Bone Plate Fixation ........................................................................................... page 4

**STEP 5** Application of the Compression-Distraction Device and Compression of the Osteotomy .......................................................................................................................... page 5

**STEP 6** Drilling the 22 Degree Interfragmentary Screw Hole ..................................................... page 6

**STEP 7** Oblique 2.7mm Interfragmentary Screw Application ...................................................... page 7

**STEP 8** Final Fixation of the Osteotomy ...................................................................................... page 8

**STEP 9** Osteotomies in excess of 5.25mm ............................................................................. page 9 & 10

**STEP 10** Care and Cleaning of the Instruments .......................................................................... page 10

---


**DISCLAIMER** The RAYHACK OSTEOTOMY SYSTEM™ has been carefully designed to ensure a precision osteotomy when used properly. Failure to carefully follow directions and to use the appropriate equipment in the prescribed manner may result in an unsatisfactory outcome. Creative Medical Designs, Inc., cannot be held responsible for inappropriate use of the RAYHACK OSTEOTOMY SYSTEM™ or for failure to adequately protect soft tissues and surrounding bones at all times.
Placement of the Ulnar Saw Guide

The ulna is approached through a 10cm incision along the medial side of the forearm. The saw guide should be placed on the subcutaneous border of the ulna. The three counter sunk holes of the saw guide are always placed proximally. The distal end of the saw guide should be approximately 2.0cm from the end of the ulna. Dorsal placement is not recommended due to the inability of the saw guide to fit between the radius and the ulna.

The three counter sunk holes are always placed proximally.

The distal end of the saw guide should be approximately 2.0cm from the end of the ulna.
While manually holding the saw guide centered over the ulna, first drill hole #2 with a 2.5mm drill bit through the straight drill guide. The proximal portion of the straight drill guide has a small prong proximally and a larger prong distally to allow proper positioning on the saw guide.

Remove the drill guide and tap the hole with a 3.5mm tap after measuring the screw depth. Place the appropriate size screw in hole #2. (This avoids shifting of the saw guide.) Reapply the drill guide and drill hole #4. Be sure that the saw guide remains centered on the ulna. Once the saw guide is firmly attached, drill, and tap screws #1 and #3 and apply the appropriately sized screw.

---

**FIG. 2**

2.5mm drill bit

Straight drill guide
Performing the Oblique Ulnar Shortening Osteotomy

The osteotomy is most easily performed by flexing the elbow 110° with the forearm held vertically while aiming the saw blade at a 45° angle toward the ceiling. Once the amount of bone to be removed is determined, the appropriate slots to be used are chosen according to the following chart:

**Width of Cuts**

- Slot 1-2 equals 2.5mm
- Slot 2-3 equals 3.5mm
- Slot 1-3 equals 5.25mm

For osteotomies greater than 5.25mm, please see page 9. **It is imperative that the distal osteotomy cut is made first, then the proximal. Failure to follow this order may result in non-parallel bone cuts.**

**CAUTION:** It is important to protect all soft tissues from the cutting area. Periosteum must be stripped circumferentially at the osteotomy site only. It is important to irrigate with sterile slush to cool the bone during the cutting procedures in order to minimize bone necrosis.

**CAUTION:** Slots are numbered from proximal to distal.

**CAUTION:** Never pass the saw blade beyond the marked line. Failure to pay strict attention to this detail, may result in soft tissue and bone damage.

Once both osteotomy cuts are made, all screws are removed and placed in the appropriately numbered temporary holding slots in the tray.

**CAUTION:** In removing the ulnar saw guide there may be a great deal of tension on the screws. Be sure to carefully apply the screwdriver to avoid stripping of the 2.5mm hexagonal slot in the screw head.

**STEP 3**
STEP 4 Ulnar Bone Plate Fixation

- In most cases the ulna will be slightly convex and, the specialized plate should be pre-bent prior to application on the ulna. Bending of the plate is facilitated by using the specialized RYHACK OSTEOTOMY SYSTEM™ plate benders. The unique "pass through" slots in the plate benders will help minimize plate scratching.
- The mid portion of the plate should be 1 to 2mm off of the ulnar surface once the bending has been accomplished.
- Pre-bending the plate in this manner will help to avoid separation due to a "tension effect" on the osteotomy surfaces which are closest to the interosseous membrane.

**Note:** The elongated slot in the plate is positioned distally.

- Fix the plate by reapplying screws #1 and #2 respectively taken from the temporary holding slots in the tray.

**FIG. 4**
STEP 5 Application of the Compression-Distraction Device and Compression of the Osteotomy

- Locate the compression-distraction device on the plate over the osteotomy site. Using two additional 3.5mm cortical screws, fix the compression device through holes #3 and #4 as shown.
- These two additional temporary screws are 4.0mm longer than the measured length of screws #3 and #4 that were used to hold the saw guide.
- It may be easier to apply the screw in hole #4 first and then apply screw #3.
- Observe the osteotomy surface while tightening the adjusting screws. Alternate between the two adjusting screws to provide even compression.

Once the osteotomy surfaces are visually well approximated on both sides, stop further compression.

**CAUTION** Over compression will only bend the temporary screws in holes #3 and #4 and will not further compress the osteotomy surfaces.

---

**Note:** Make sure that the screw at the distal end of the elongated slot of the plate is slightly loose and is free to move proximally along the slot.

---

**FIG. 5** Compression-Distraction Device  
U.S. Patent # 4,929,247

Observe the osteotomy for proper anterior-posterior angulation while tightening the compression screws in a clockwise direction. If dissatisfied, back up the adjusting screws counterclockwise and repeat the procedure.

If the osteotomy appears to be separating on the opposite cortex (interosseous surface), loosen the adjusting screws in the compression-distraction device and try loosening cortical screw #4 in the slotted hole and recompress the osteotomy.

If this still results in separation of the osteotomy, consider prebending the plate an additional small amount.
STEP 6
Drilling the 22 Degree Interfragmentary Screw Hole

Place the angled drill guide on the fixed proximal block of the compression-distraction device once the osteotomy surface has been compressed. Press the drill guide firmly onto the fixed block to ensure that the guide is in position prior to drilling the interfragmentary screw hole. It should be seated down on the plate.

1. Drill the first cortex with a 2.7mm drill bit.
2. Apply the drill sleeve through the angled drill guide and first cortex, and drill the opposite cortex with the 2.0mm drill bit.

Measure the depth of the hole.

3. Reapply the angled drill guide and tap the far cortex with a 2.7mm tap—(reapplication of the angled drill guide helps guide the tap to the opposite cortex).

(A) 2.7mm drill bit (B) 2.0mm drill bit (C) 2.7mm tap

FIG. 6
**STEP 7**

**Oblique 2.7mm Interfragmentary Screw Application**

Insert the appropriately sized 2.7mm interfragmentary cortical screw and gently tighten.

**CAUTION** Do not over tighten as this may crack the cortical bone.

Complete the fixation of the plate by drilling the two distal screws (#5 and #6) using the Rohack Osteotomy System™ hand-held drill guide. Measure and tap the holes and insert two 3.5mm cortical bone screws of appropriate size.
STEP 3
Final Fixation of the Osteotomy

Remove the compression-distraction device by loosening the compression screws and then removing temporary screws #3 and #4. Replace the appropriate original cortical screws #3 and #4 from the temporary holding slots in the tray. Do not reinsert the temporary fixation screws that were used to hold the compression-distraction device (these temporary screws are 4mm longer than the measured hole and were used solely to fix the compression-distraction device). Make sure all screws are tight.

CAUTION: Do not over-tighten to avoid thread stripping of the tapped bone hole.

FIG. 8

Note that the 2.7 mm interfragmentary screw head does not project above the plate.
Occasionally an ulna may be excessively long and require an osteotomy in excess of 5.25mm. It is possible to use the RAYHACK OSTEOTOMY SYSTEM™ to perform this osteotomy, although this requires slightly more time and continued strict adherence to specific details. As the osteotomy becomes larger, the technical demands of approximating the osteotomy become even greater with the excessive tension exerted by the soft tissues attached to the distal fragment. Use of the compression-distraction device to approximate the osteotomy is particularly helpful in this regard.

**NOTE:** The procedure is performed as described above with the exception that initially, the saw guide should be placed 1cm more proximally on the ulna. Be sure to center the saw guide on the ulna. Using the straight drill guide, screw holes #1, #2, and #3 are drilled. The depth should be measured and the hole should be tapped and the appropriately sized cortical screw should be inserted. Next, the saw guide is removed and screws #1, #2, and #3 are placed in a temporary holding slots in the tray. The guide is then shifted distally by one screw hole. Screw #3 is then used to secure the saw guide proximally through the saw guide hole #2.

**REMEMBER:** The saw guide was shifted distally. Likewise screw #2 is placed through saw guide hole #1.

Once the guide has been shifted, screw hole #4 should be drilled, measured and tapped and an appropriately sized screw applied. The straight drill guide is used for this purpose. The specific saw slot is then chosen depending on the desired width of the osteotomy according to the chart below.

<table>
<thead>
<tr>
<th>Width</th>
<th>Saw Slot</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5mm</td>
<td>1</td>
</tr>
<tr>
<td>3.5mm</td>
<td>2</td>
</tr>
<tr>
<td>5.25mm</td>
<td>3</td>
</tr>
<tr>
<td>6.96mm</td>
<td>4</td>
</tr>
<tr>
<td>8.69mm</td>
<td>5</td>
</tr>
<tr>
<td>9.68mm</td>
<td>6</td>
</tr>
<tr>
<td>11.4mm</td>
<td>7</td>
</tr>
<tr>
<td>13.13mm</td>
<td>8</td>
</tr>
<tr>
<td>14.12mm</td>
<td>9</td>
</tr>
<tr>
<td>15.8mm</td>
<td>10</td>
</tr>
</tbody>
</table>

**FIG. 9**

![Diagram of standard osteotomy widths](image_url)
The saw guide is then removed and replaced in its original position on the proximal fragment. The appropriate slot is then selected and the proximal osteotomy cut is made. After removing the fragment, the surgeon continues the procedure as before. It may be necessary to grasp the distal fragment with a standard reduction clamp to overcome the tension of the soft tissues as the osteotomy is closed. Although applying the saw guide three times appears cumbersome, it is the only way to ensure that the saw cuts will be parallel given the shifting of the saw guide. If the proximal osteotomy is made first and then the saw guide is shifted, the saw guide could be angled slightly and this could lead to an uneven osteotomy and angulation of the distal ulna when the two bone ends are compressed. Once the osteotomy is completed, compression of the bone ends and plate fixation is completed as in osteotomies less than or equal to 5.25mm.

**Care and Cleaning of the Instruments**

Care and cleaning are important steps to maintain the effectiveness and longevity of medical instruments. Here are some guidelines for cleaning and maintaining the instruments:

1. **Clean and Thoroughly Dry All Instruments Before Replacing in the Tray:** Any rust spots that may appear should be lightly buffed using Scotch-Brite™.

2. **Discard the Used Saw Blade in an Appropriate Biohazardous Container:**

3. **Discard the Temporary Screws Used to Fix the Compression-Distraction Device Through Holes #3 and #4.**

4. **For More Information Contact:**

   **Creative MD Medical Designs, Inc.**

   13914 Shady Shores Drive
   Tampa, Florida 33613
   Phone (813) 875-9999
   Fax (813) 879-9999