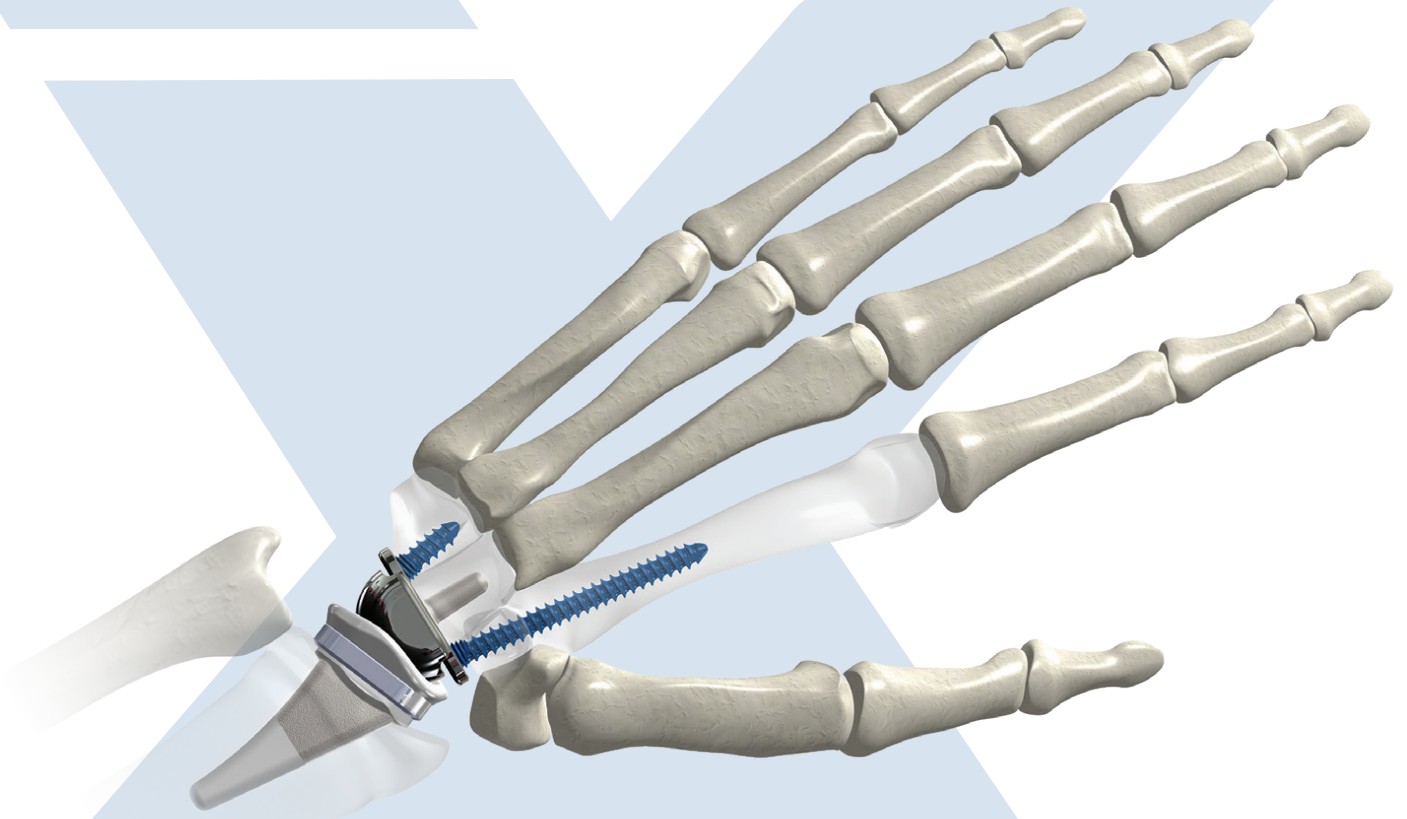


# KinematX<sup>®</sup>

Total Wrist Arthroplasty



## Modular Wrist Arthroplasty System Surgical Technique

**EXTREMITY<sup>®</sup>**  
MEDICAL

Real change *starts* here<sup>™</sup>

# KinematX<sup>®</sup>

## Total Wrist Arthroplasty

### Indications for use

The KinematX Total Wrist Arthroplasty System is indicated for the replacement of wrist joints disabled by pain, deformity, and/or limited motion caused by:

1. Non-inflammatory degenerative wrist disease of the radiocarpal joint including osteoarthritis, post-traumatic arthritis, and Kienbock disease
2. Revision where other devices or treatments have failed
3. Scapholunate Advanced Collapse (SLAC)
4. Rheumatoid Arthritis

The device is intended to be implanted with bone cement.



Customer Service: 888.499.0079  
[www.extremitymedical.com](http://www.extremitymedical.com)

## Implants



Radial Tray Assembly



Radial Stem



Carpal Cap



Carpal Baseplate

### 4.75mm Locking Screws



15mm



20mm



25mm



30mm



35mm



40mm



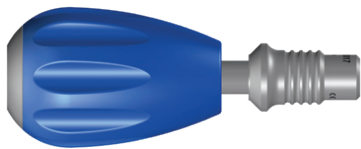
45mm



50mm

Real change *starts* here™

Instruments



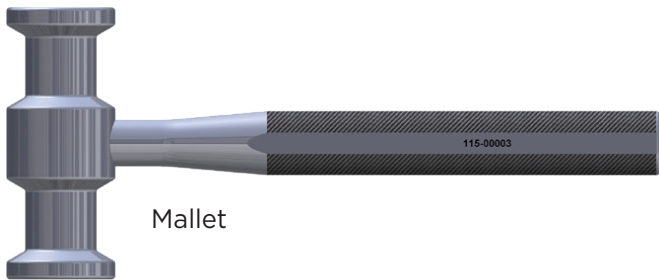
Palm Handle



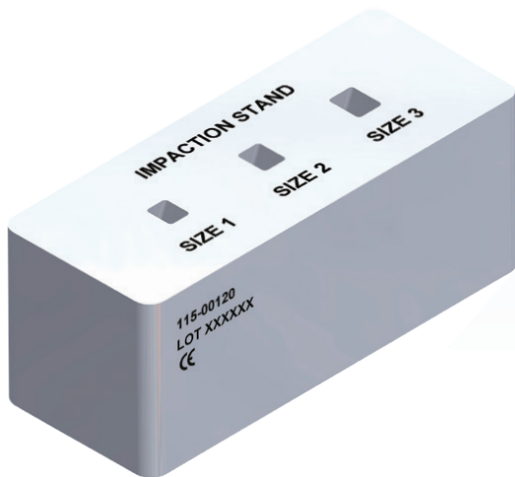
Ratcheting Handle



Slap Hammer



Mallet



Impaction Stand



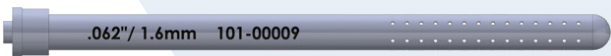
Depth Gauge



1.6mm Olive Wire, Smooth, Short



1.6mm Guidewire



1.6mm Guidewire Holder



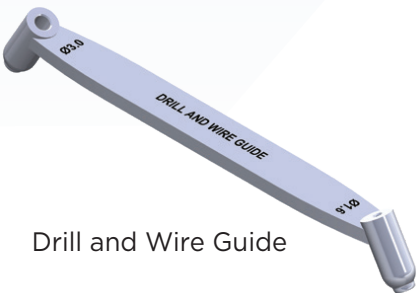
Radial Box Chisel



Broach Handle



Stem Inserter



Drill and Wire Guide





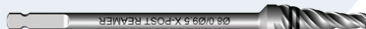
3.0mm Drill



Capitate Reamer



Carpal Extractor



Post Reamer



T20 Driver



Molt Elevator



Carroll Elevator



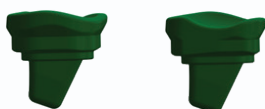
Baseplate Counter-Torque



Metacarpal Alignment Guide



Carpal Resection Guide



+2 Radial Trial  
Left / Right



Standard Radial Trial  
Left / Right



+4 Radial Trial  
Left / Right



+6 Radial Trial  
Left / Right



Size 1



Size 2



Size 3

Radial Cartilage Removal Tool

Carpal Cap  
Impactor Tip



Radial Tray  
Impactor Tip



Impactor



Cap holder



Size 1



Size 2



Size 3

Broaches

## Step 1. Exposure

Utilizing a dorsal approach to the carpus, create a longitudinal incision approximately 5-7cm long in line with the third metacarpal beginning at the base of the third metacarpal.

### Extensor Retinaculum

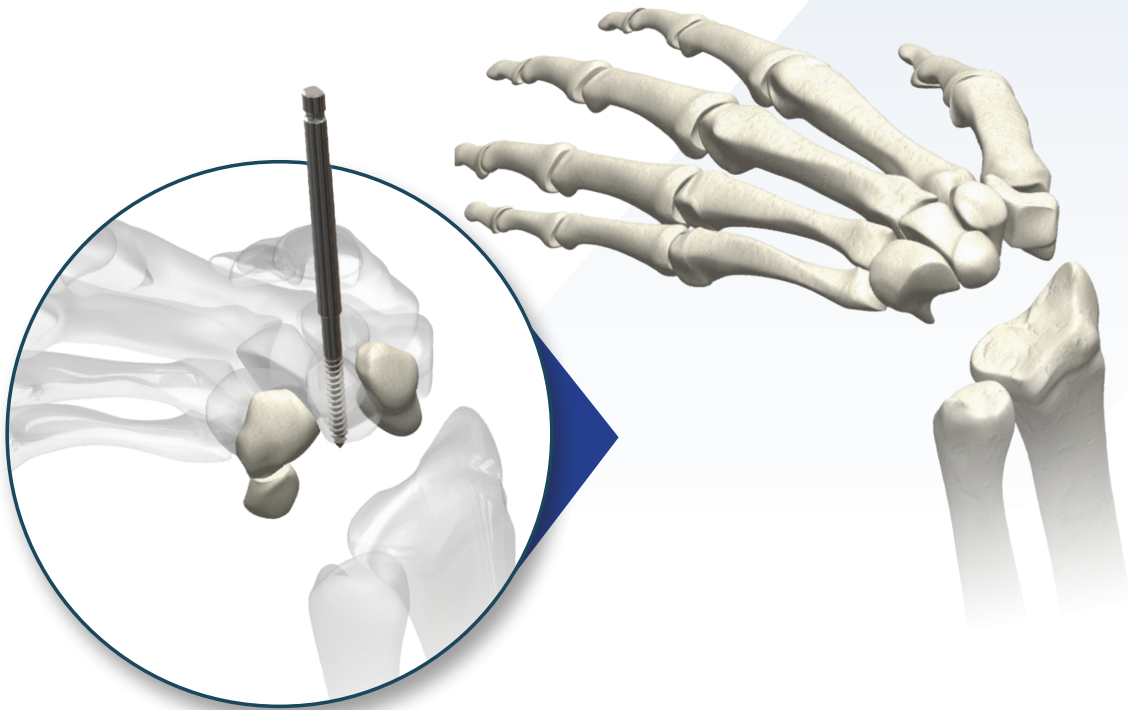
Incise and reflect a portion of the extensor retinaculum over the third and fourth dorsal compartments but leave the proximal 1-2cm of the retinaculum intact. Reflect the extensor tendons radially and ulnarwards to expose the wrist capsule. The approach allows preservation of the posterior interosseous innervation of the wrist, at the surgeon's discretion.

### Radiocarpal Exposure

Create a proximally-based rectangular dorsal capsular longitudinal flap by incising the capsule transversely at the CMC joints and along its most radial and ulnar margins. Raise the capsular flap from distal to proximal to expose the distal carpal row and midcarpal joint. Using a 7mm osteotome, raise a 1-2mm thick dorsal wafer of the triquetrum in continuity with the capsule in order to preserve the attachments of the dorsal radiocarpal and dorsal intercarpal ligaments.

### Proximal Row Carpectomy

Remove the scaphoid, lunate, and remainder of the triquetrum, taking care to preserve the capitate head and volar wrist ligaments. A Carpal Extractor instrument is provided with the system to assist with this process. The Carpal Extractor instrument can be inserted into each of these bones and act as a joy-stick to apply traction while employing elevators as the surgeon carefully divides the capsular and ligamentous attachments required for carpal extraction.



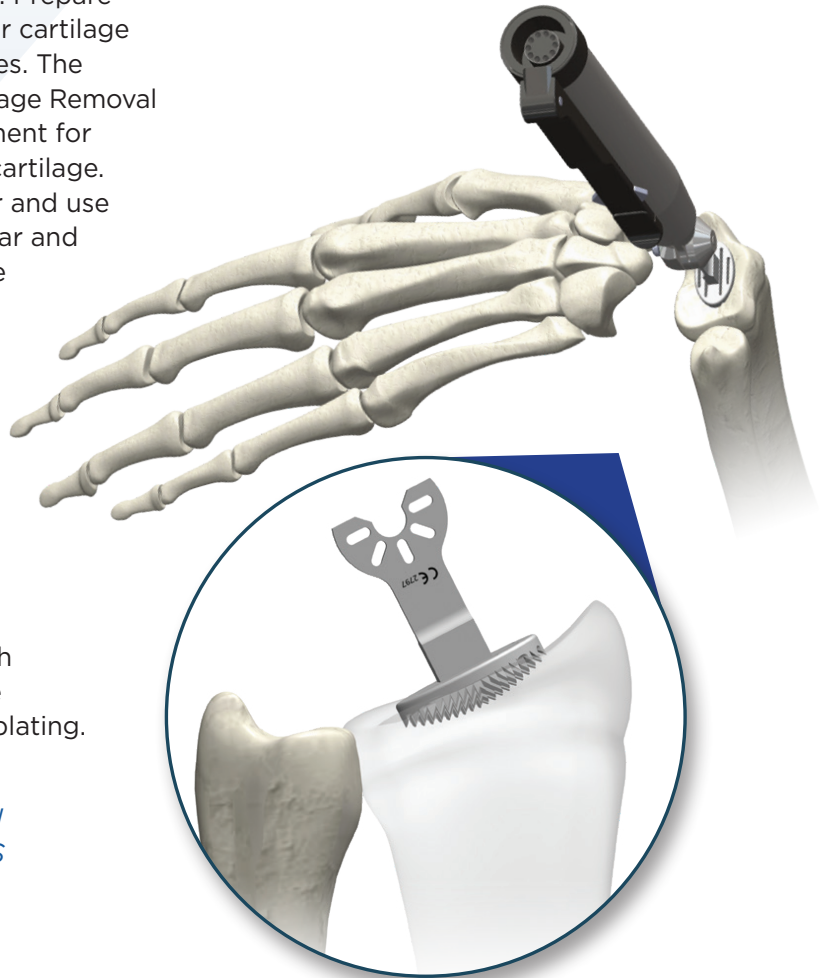
## Step 2. Radius Preparation: Denude the Articular Cartilage

This KinematX Total Wrist does not require any resection of the radius and thus preserves the length and inclination of the radius. Prepare the radius by removing the articular cartilage in the standard fashion with curettes. The system does provide a Radial Cartilage Removal Tool which can be a helpful instrument for the removal of the radial articular cartilage. If desired, attach this tool to power and use in a sweeping motion (radial to ulnar and dorsal to volar). Take care to create a smooth elliptical surface while preserving the subchondral bone along the with the dorsal and volar extrinsic capsular ligaments.

Ensure the entire surface of the radius including the dorsal and ulnar rim of bone of the articular surface is prepared.

The Radial Cartilage Removal Tool is available in three sizes which correspond to the Radial Stem size selected during pre-operative templating.

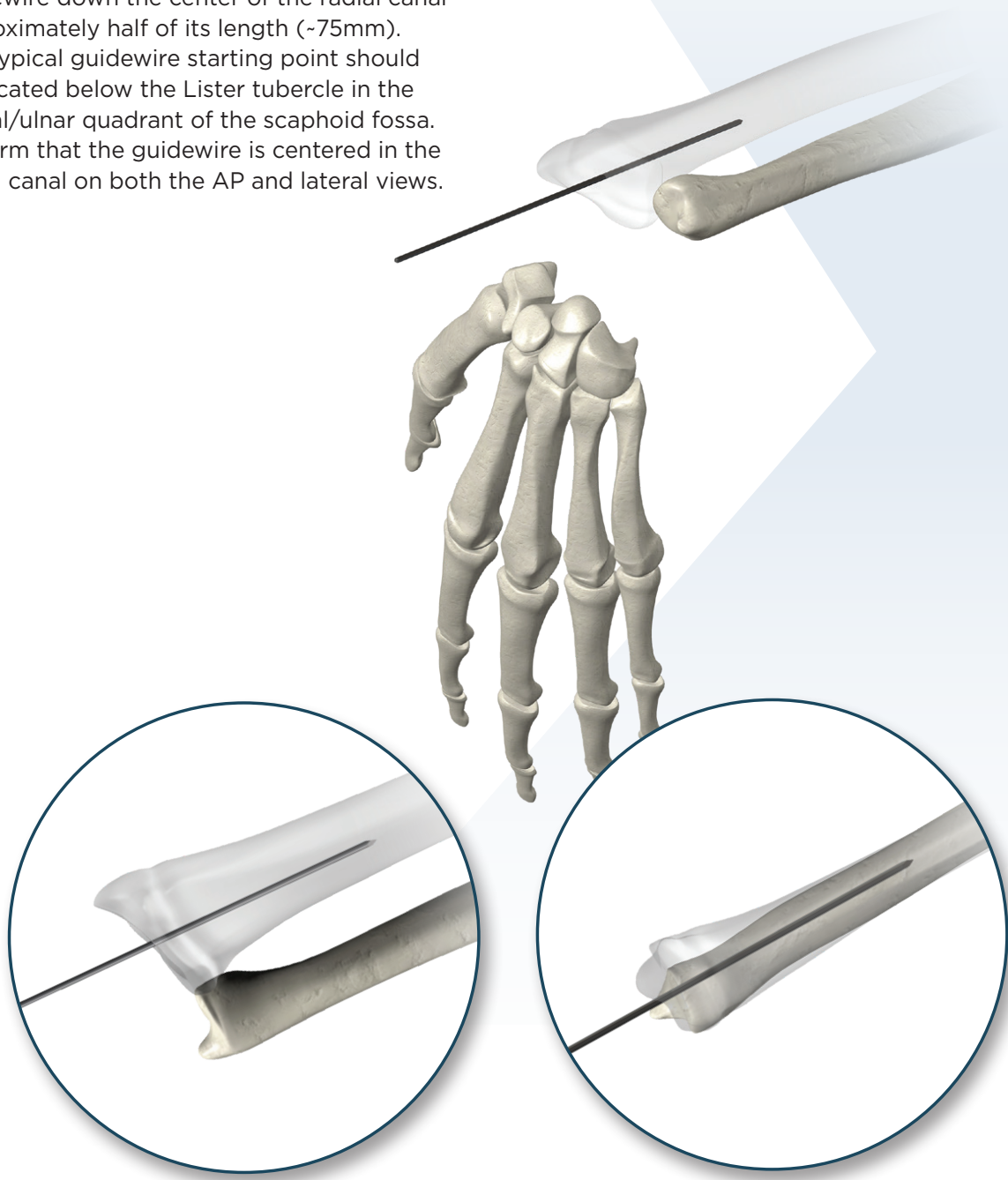
*Note: The Radial Cartilage Removal Tool is compatible with Stryker TPS and Command II, and Conmed power-saws.*



### Step 3. Radial Guidewire

#### Position/Placement

Utilizing fluoroscopy, insert the 1.6mm guidewire down the center of the radial canal approximately half of its length (~75mm). The typical guidewire starting point should be located below the Lister tubercle in the dorsal/ulnar quadrant of the scaphoid fossa. Confirm that the guidewire is centered in the radial canal on both the AP and lateral views.

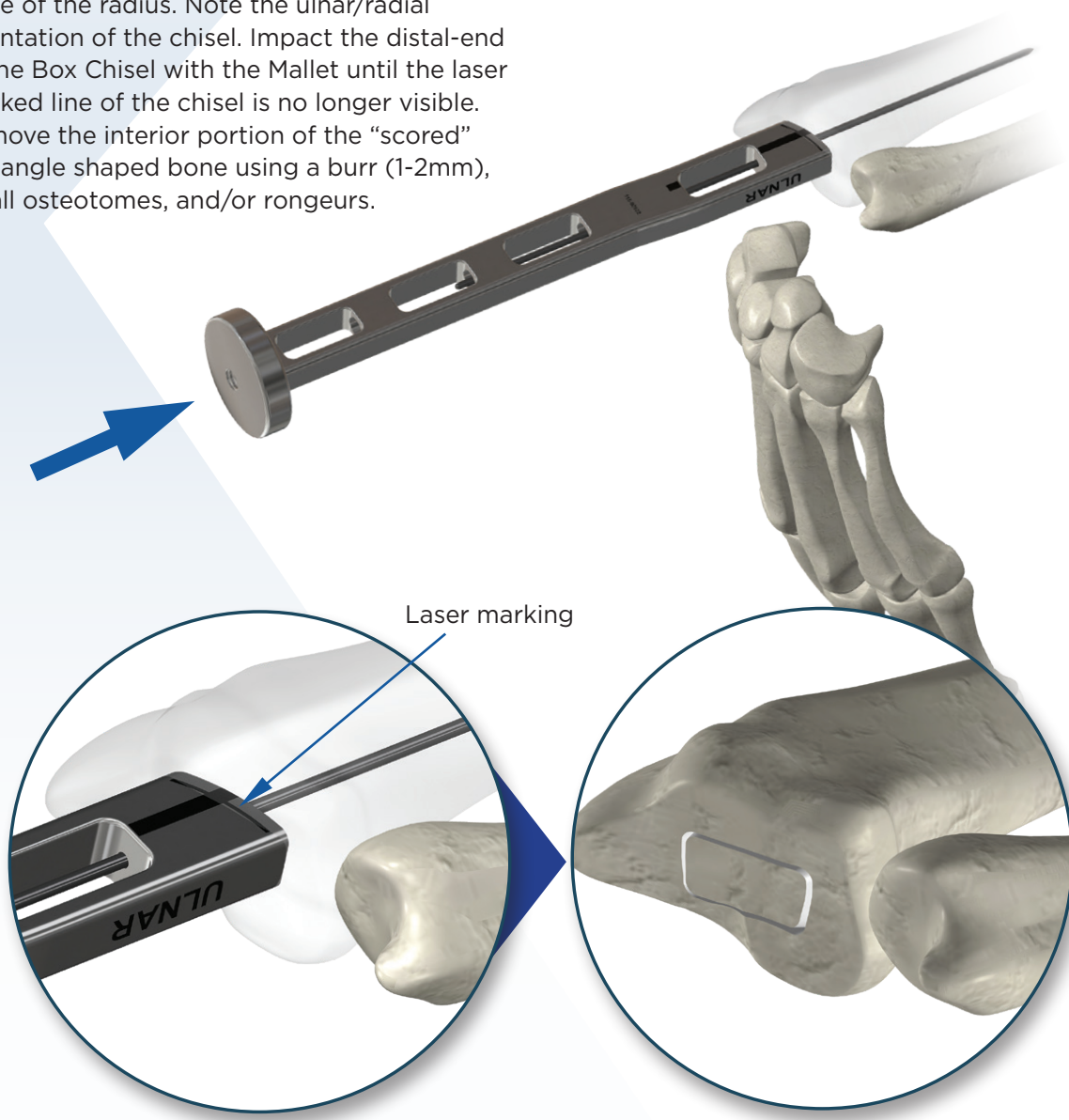


#### Step 4. Preparation for Broaching

As a preparatory step for broaching for the Radial Stem implant, the Cannulated Box Chisel is used to score the subchondral bone of the radius.

Slide the Cannulated Box Chisel over the 1.6mm Guidewire and down to subchondral bone of the radius. Note the ulnar/radial orientation of the chisel. Impact the distal-end of the Box Chisel with the Mallet until the laser marked line of the chisel is no longer visible. Remove the interior portion of the “scored” rectangle shaped bone using a burr (1-2mm), small osteotomes, and/or rongeurs.

*Note: If utilizing a burr, run the burr around the edges created by the Box Chisel to remove the cortical bone. The remaining bone can remain in-situ for impaction grafting when the Radial Broaches are used in the next step.*

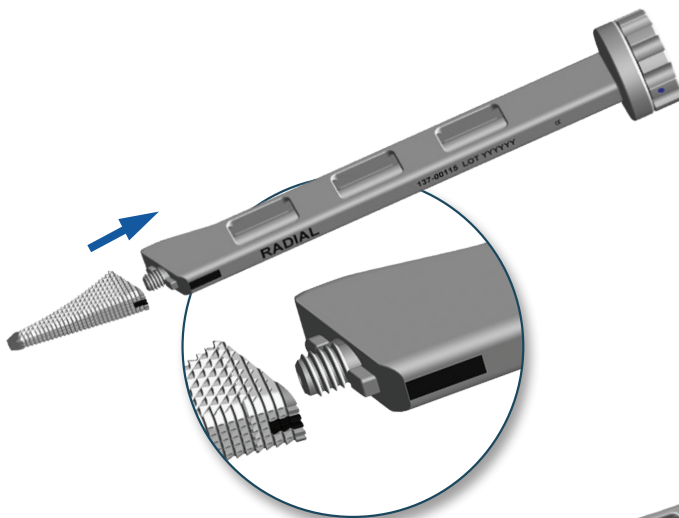




## Step 5. Radial Broaching

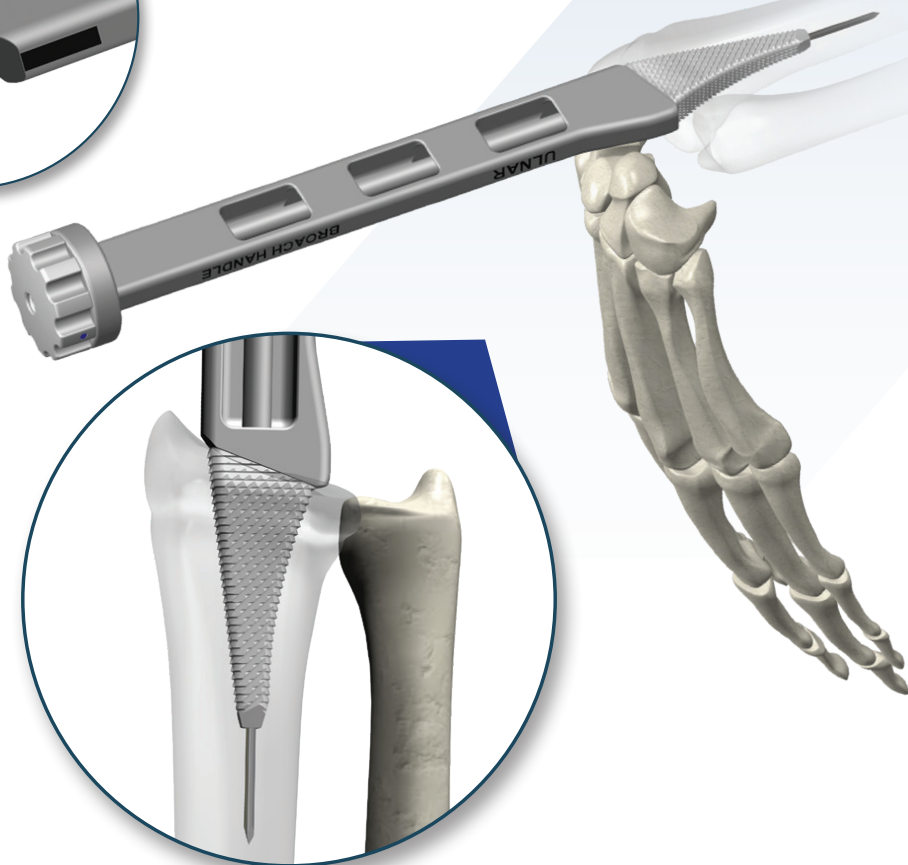
It is recommended to sequentially broach the radial canal. Attach the Size 1 Radial Broach to the Broach Handle by inserting the threaded shaft from the handle into the female thread in the Radial Broach while tightening the thread engagement by turning the knob at the top of the broach handle in the clockwise direction.

*Note: line up the black laser marking on the Broach Handle to the line on the broach.*



Advance the Radial Broach over the guidewire taking care to orient the Broach Handle so that the ulnar and radial markings on the Broach Handle are in the proper orientation for the anatomy. Also, ensure that the Radial Broach and Radial Handle are in correct longitudinal alignment with the radius prior to impacting the Broach Handle with a Mallet. Impact the Broach Handle with the Mallet until the flange comes in contact with the prepared radius. Sequentially broach up to the size of the Radial Stem which achieves the best radial canal fit and fill. Verify the Broach fit in the radial canal using fluoroscopy.

*Note: If the Broach does not advance upon impaction, verify the position of the Broach and Guidewire under fluoroscopy prior to further impaction.*





## Step 6. Radial Trialing

Place the Trial assembly into the cavity created in the distal radius by the broach. Gently reduce the carpus onto the bearing surface of the Radial Trial. Assess and verify the implant size for fit and wrist range of motion. Substitute the initial Radial Trial for other size trials until satisfactory fit and range of motion are achieved. When satisfactory fit and ROM are achieved, remove the trial.

*Note: If insufficient laxity is present while trialing with size STD, the Carpal Resection Guide (next step) should be set to the +2 position.*



Radial Trials

## Step 7. Carpal Bone Preparation

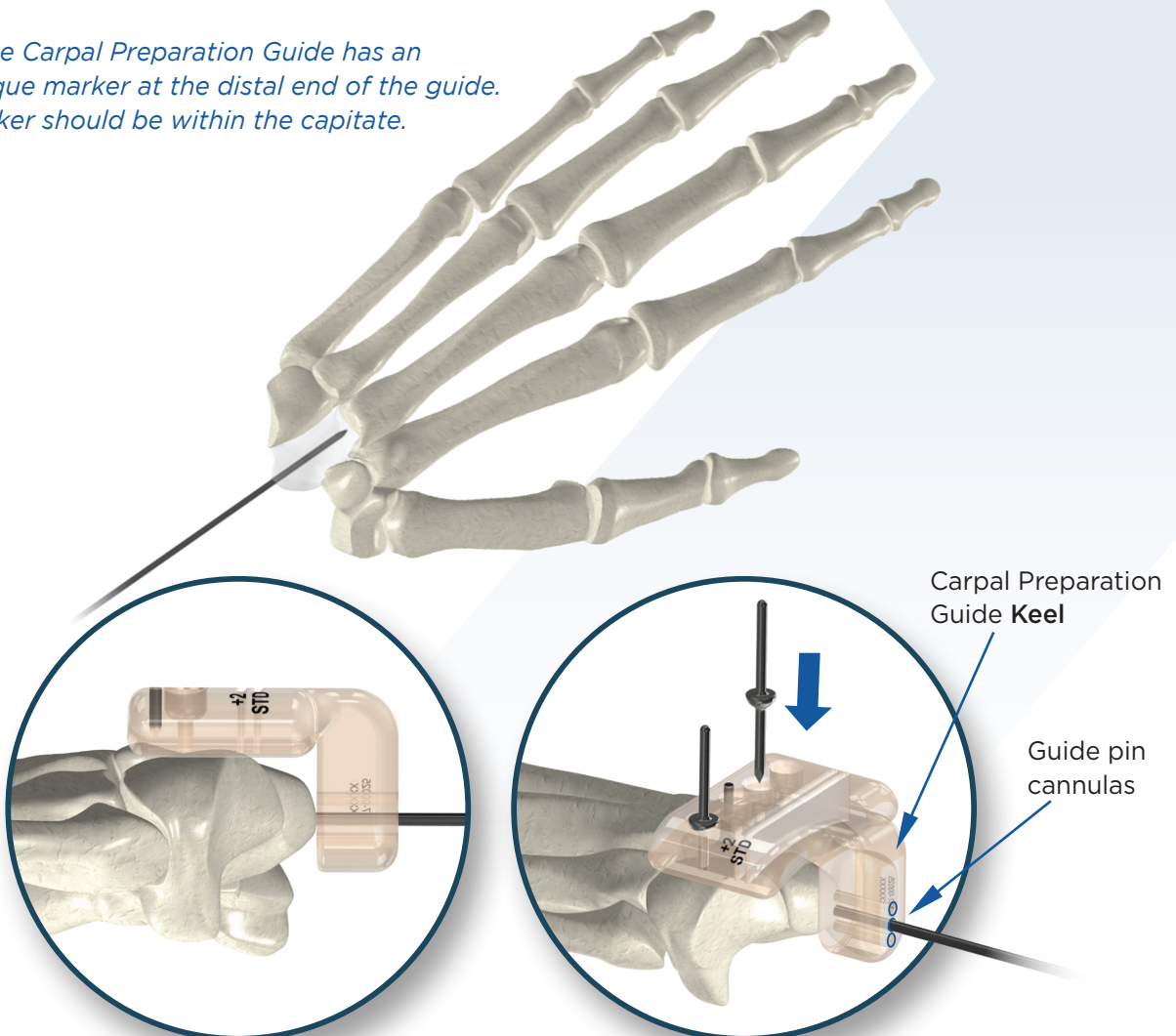
Place a 1.6mm Guidewire into the capitate stopping short of the CMC joint. Advance the wire to the isthmus. Verify positioning with fluoroscopy. This wire should be placed center-center in the capitate.

Place the Carpal Resection Guide over this Guidewire taking care to advance it so that it is contact with the capitate. The keel of the Carpal Resection Guide has several hole options. Dock the Carpal Resection Guide with the top-most hole on the keel that allows

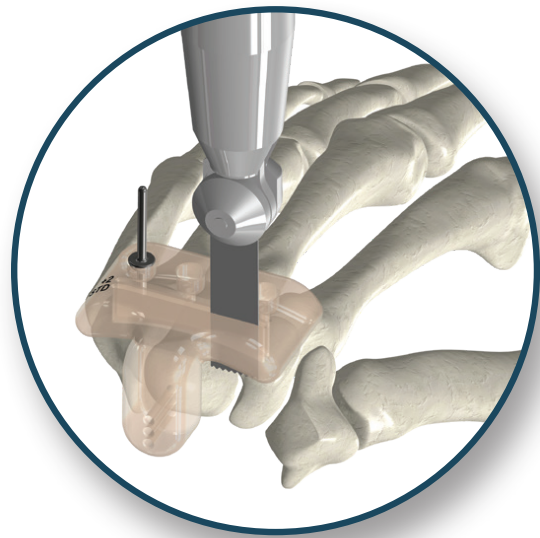
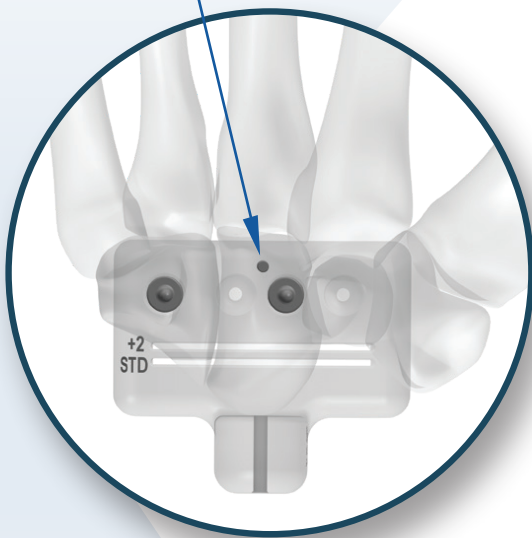
for an unrestricted abutment of keel to the capitate.

Pin the Carpal Resection Guide dorsally with two Olive Wires. Resect the proximal aspect of the capitate and hamate. The STD marking represents the standard anatomic alignment. The surgeon has the option to excise +2mm if the STD trial demonstrates excess tension when articulating with the native capitate as demonstrated in the previous Radial Trial step.

*Note: The Carpal Preparation Guide has an radiopaque marker at the distal end of the guide. The marker should be within the capitate.*



Radiopaque Marker

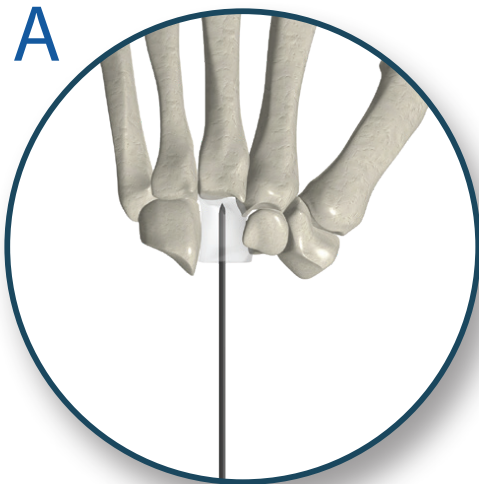


## Step 8. Carpal Bone Preparation

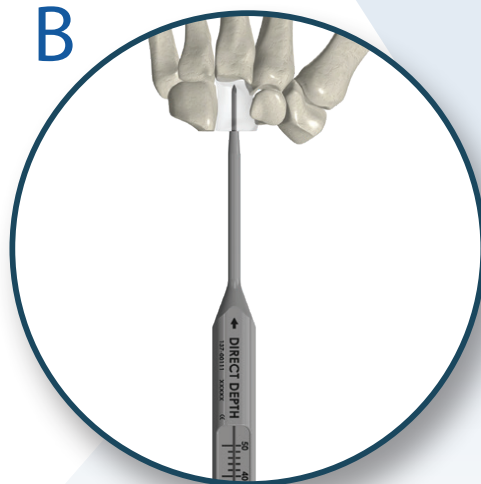
Using the previous wire hole, place a 1.6mm guidewire in the center of the capitate taking care not to violate the third metatarsal/capitate joint. The Carpal Preparation Guide can be used to reinsert the wire orthogonal to the prepared capitate. Confirm wire placement using fluoroscopy.

Measure the guidewire with the cannulated depth gauge (direct depth) to determine the appropriate sized Stem for the Baseplate.

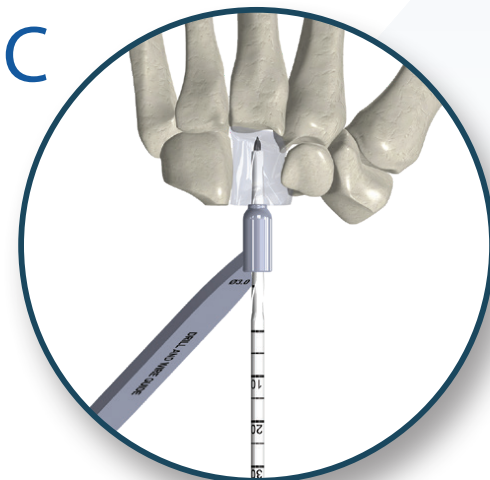
Drill with the 3.0mm Drill, and then ream over the wire with the Reamer to prepare for the stem of the baseplate. Note, the first line on the Reamer is for the 12mm stem and the second line is for 15mm. Advance the Reamer until the laser marking is below the end of the resected capitate. This will ensure enough space has been created to fully seat the stem of the Baseplate. Remove bone within the reamed space to allow for proper seating of the Baseplate.



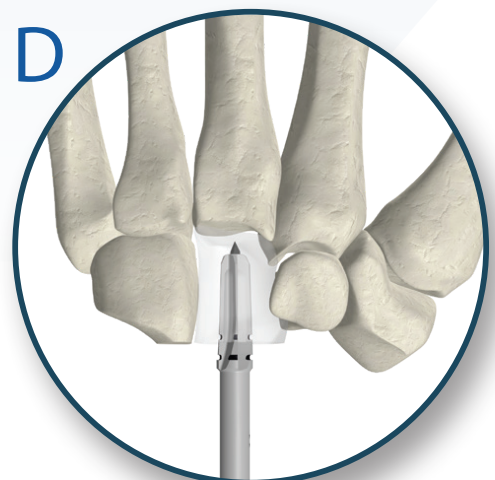
K-wire



Measure



Drill



Ream

### Step 9. Baseplate Insertion

The 2nd CMC joints should be prepared for a fusion prior to placing the Baseplate. For cementing the Baseplate - it is recommended to prepare the holes for the screws prior to injecting the bone cement.

Orient the Baseplate ensuring that the Dorsal side (curved side) is aligned dorsally. Insert the Baseplate by pressing the stem into the capitate and the plate against the distally resected carpus using the T20 driver. The driver can be impacted to fully seat the plate.

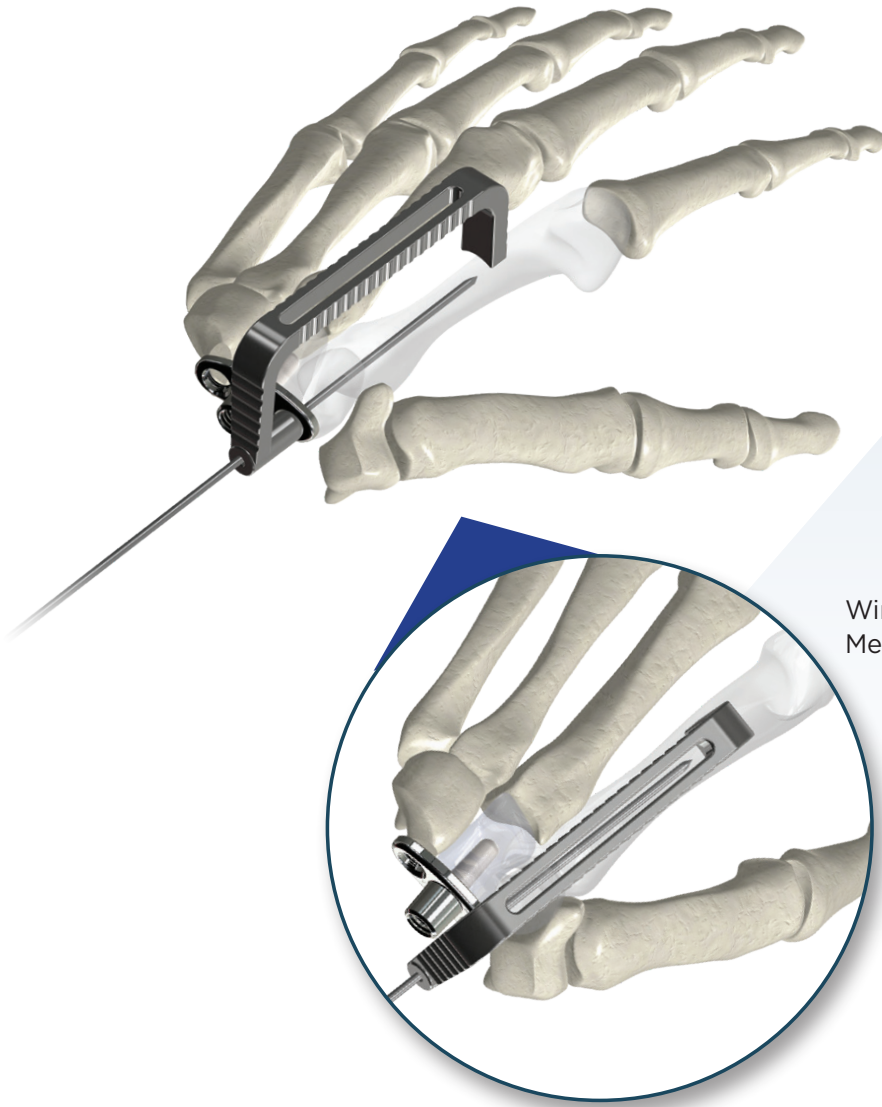




## Step 10. Carpal Plate Fixation

Two Locking Screws will be placed in the Baseplate— the first past the 2nd CMC joint into the Metacarpal, and the other into the Hamate.

Advance a 1.6mm guidewire through the trapezoid into the center of the index metacarpal adjacent to the isthmus. To assist with the placement of this wire, align the distal end of the Metacarpal Alignment Guide with the second metacarpal.

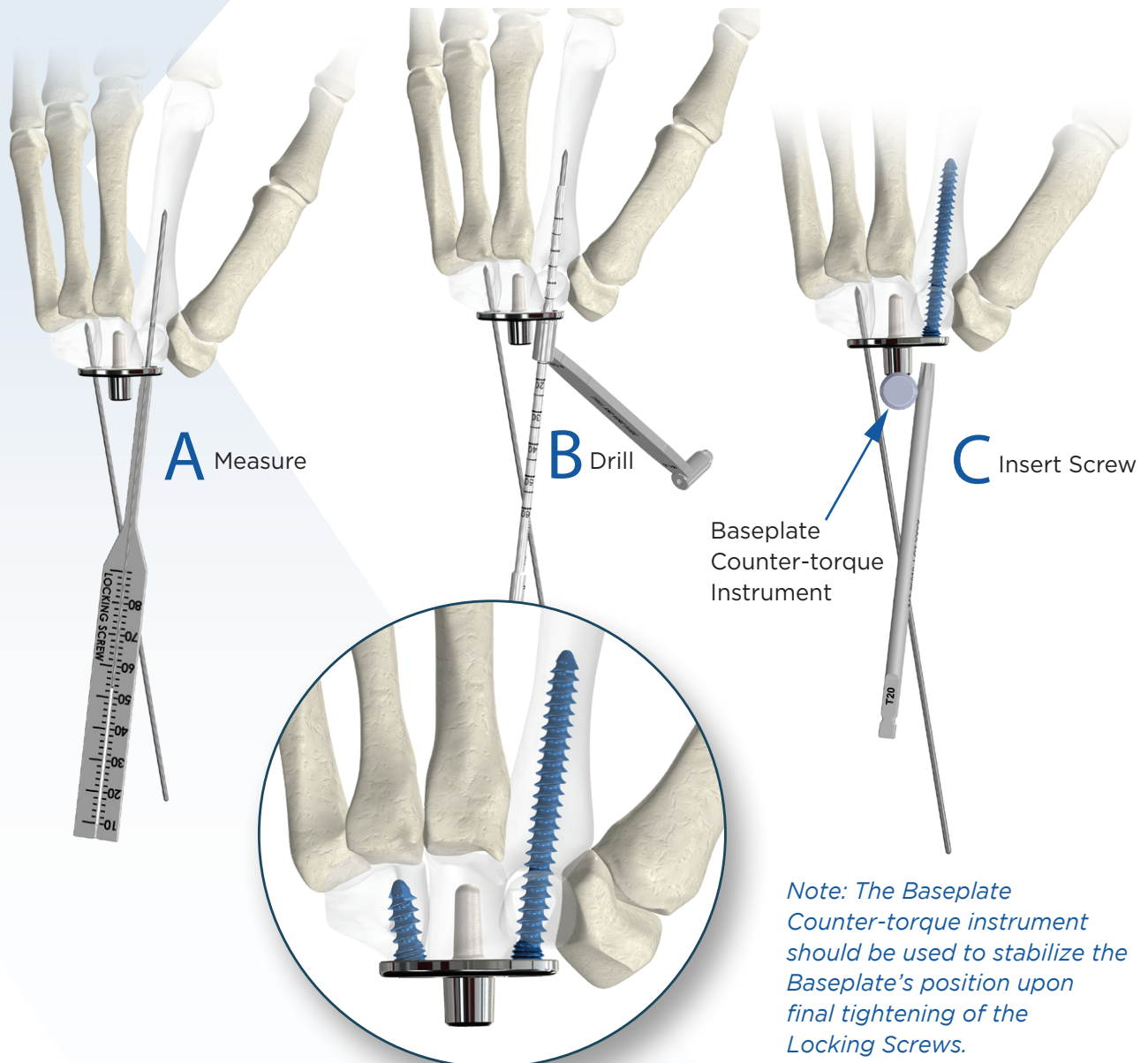


Wire placement with the Metacarpal Alignment Guide



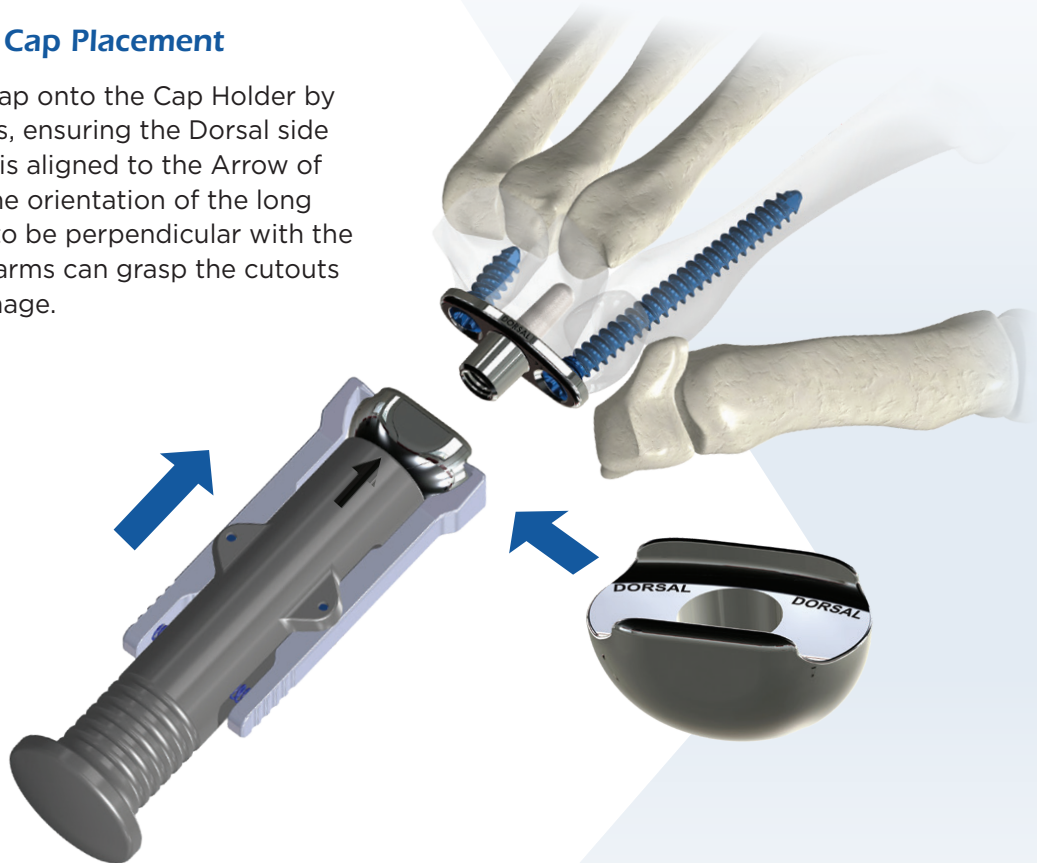
Measure the wire with the cannulated depth gauge (locking screw side) to determine the appropriate screw length. Drill over the wire with a 3.0mm Cannulated Drill to prepare for screw insertion. Repeat with the same wire placement and drilling steps on the ulnar side into the hamate. Utilize fluoroscopy to take care not to violate the CMC joint.

Remove the Baseplate and inject cement into the prepared holes. Reinsert the Baseplate and insert the Locking Screws with the T-20 Driver. It is recommended to place both screws prior to final tightening.

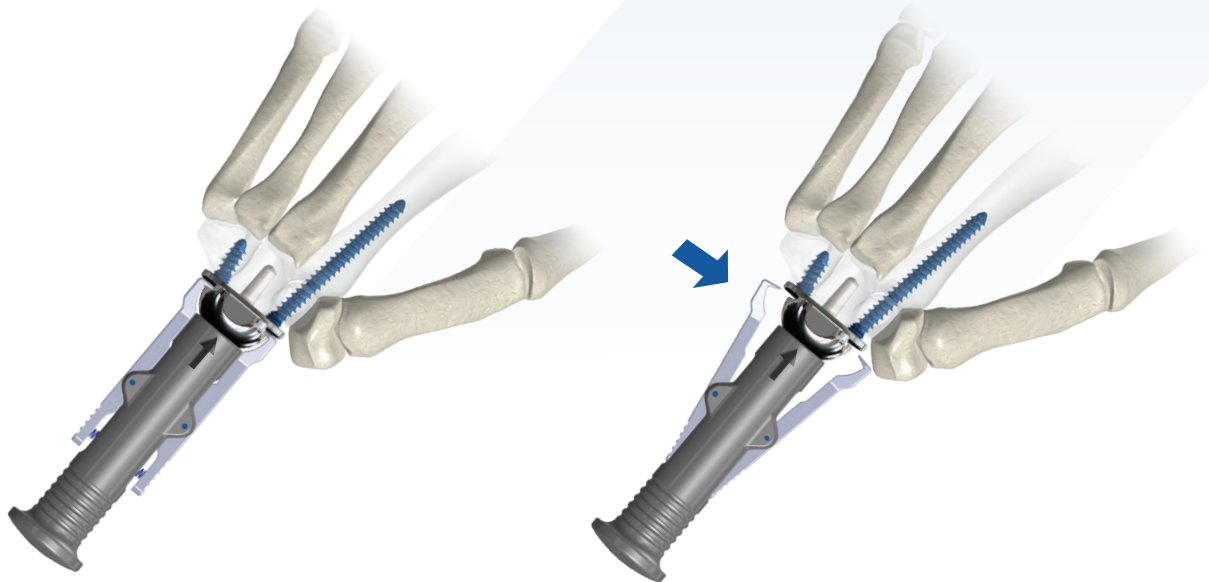


### Step 11. Carpal Cap Placement

Load the Carpal Cap onto the Cap Holder by squeezing the tabs, ensuring the Dorsal side of the Carpal Cap is aligned to the Arrow of the Cap Holder. The orientation of the long side of the cap is to be perpendicular with the arrow so that the arms can grasp the cutouts as shown in the image.

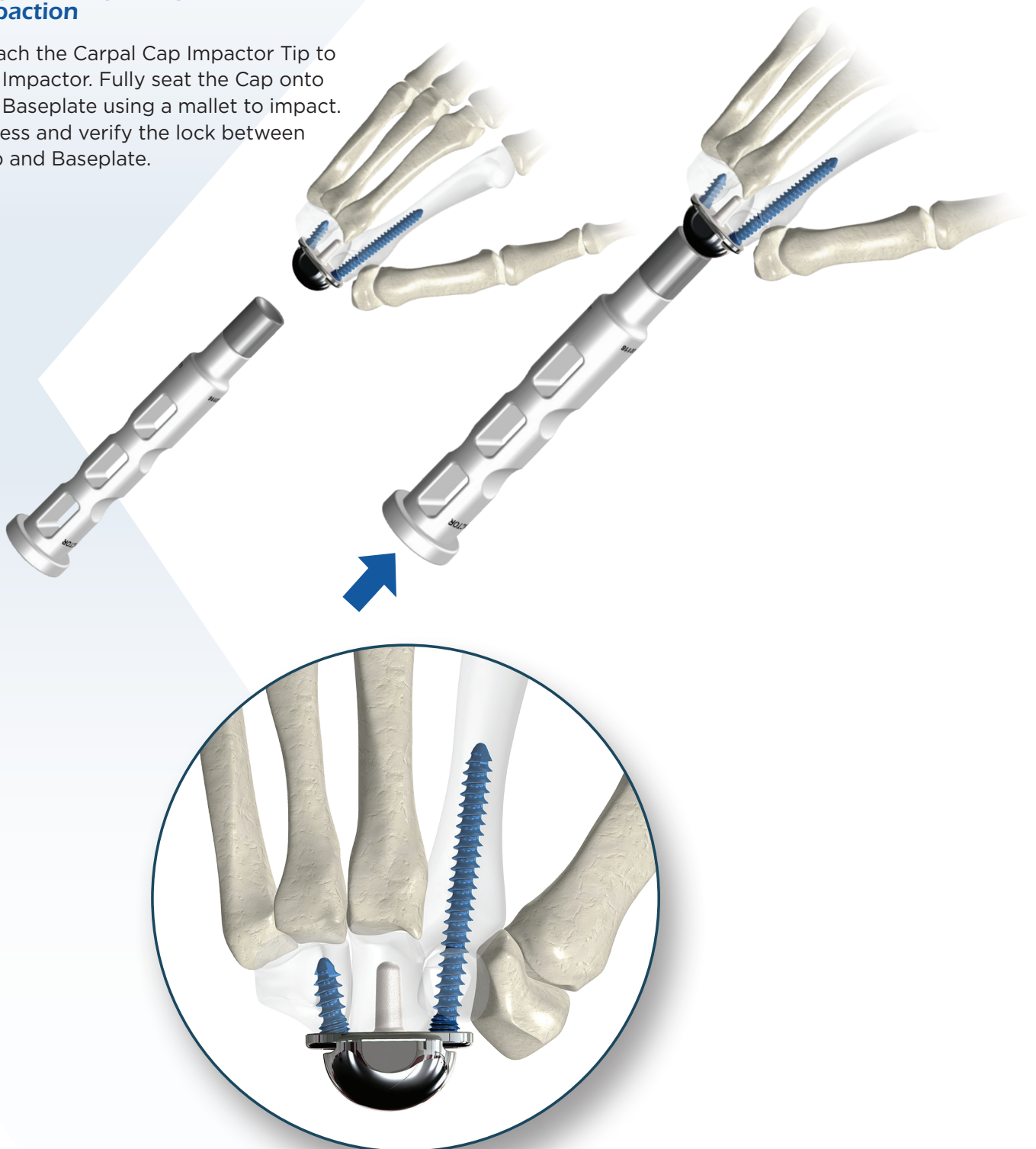


Place the Cap onto the taper and squeeze the tabs on the sides of the Cap Holder to release the Cap as you tamp it into place.



## Step 12. Carpal Cap Placement: Impaction

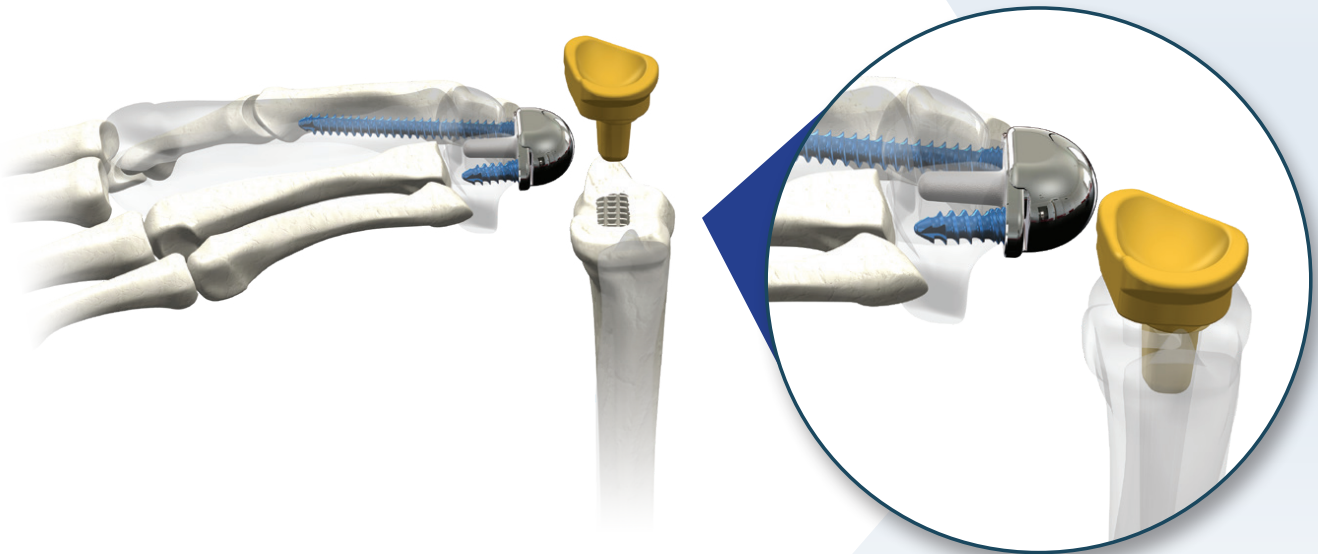
Attach the Carpal Cap Impactor Tip to the Impactor. Fully seat the Cap onto the Baseplate using a mallet to impact. Assess and verify the lock between Cap and Baseplate.



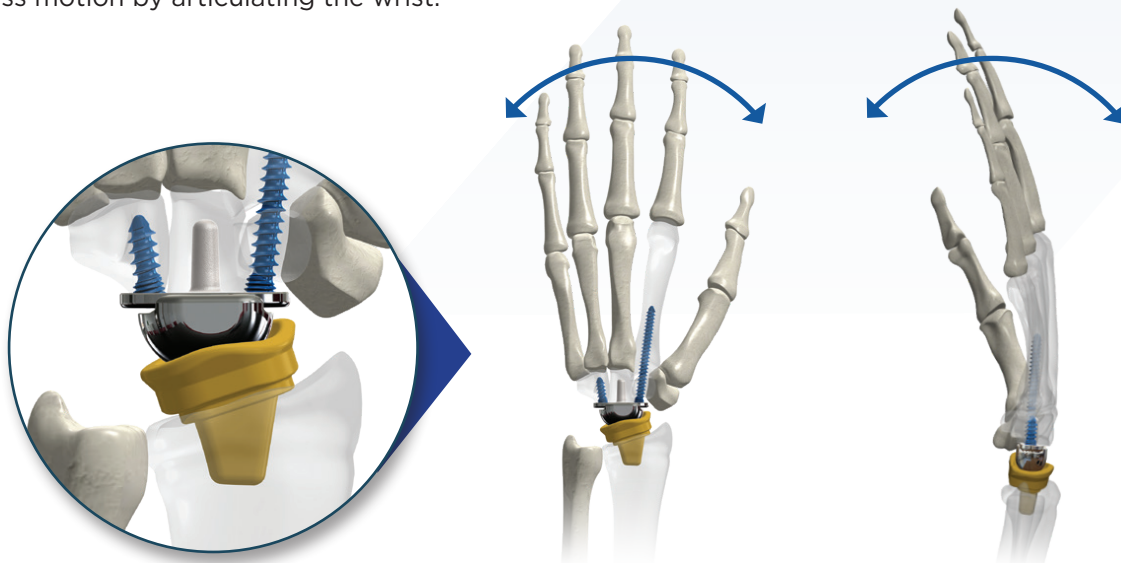
### Step 13. Tray Assembly

Confirm the Radial size by placing the Radial Trial size determined in the earlier trial step into the radial canal. Gently reduce the Carpal Cap with the surface of the Radial Trial. Assess and verify fit and wrist range of motion.

If the joint has too much laxity, switch-out the Radial Trial to one of the larger sizes and reassess for fit and ROM. Select the Radial Tray Assembly and Stem Implants that corresponds to this trial.



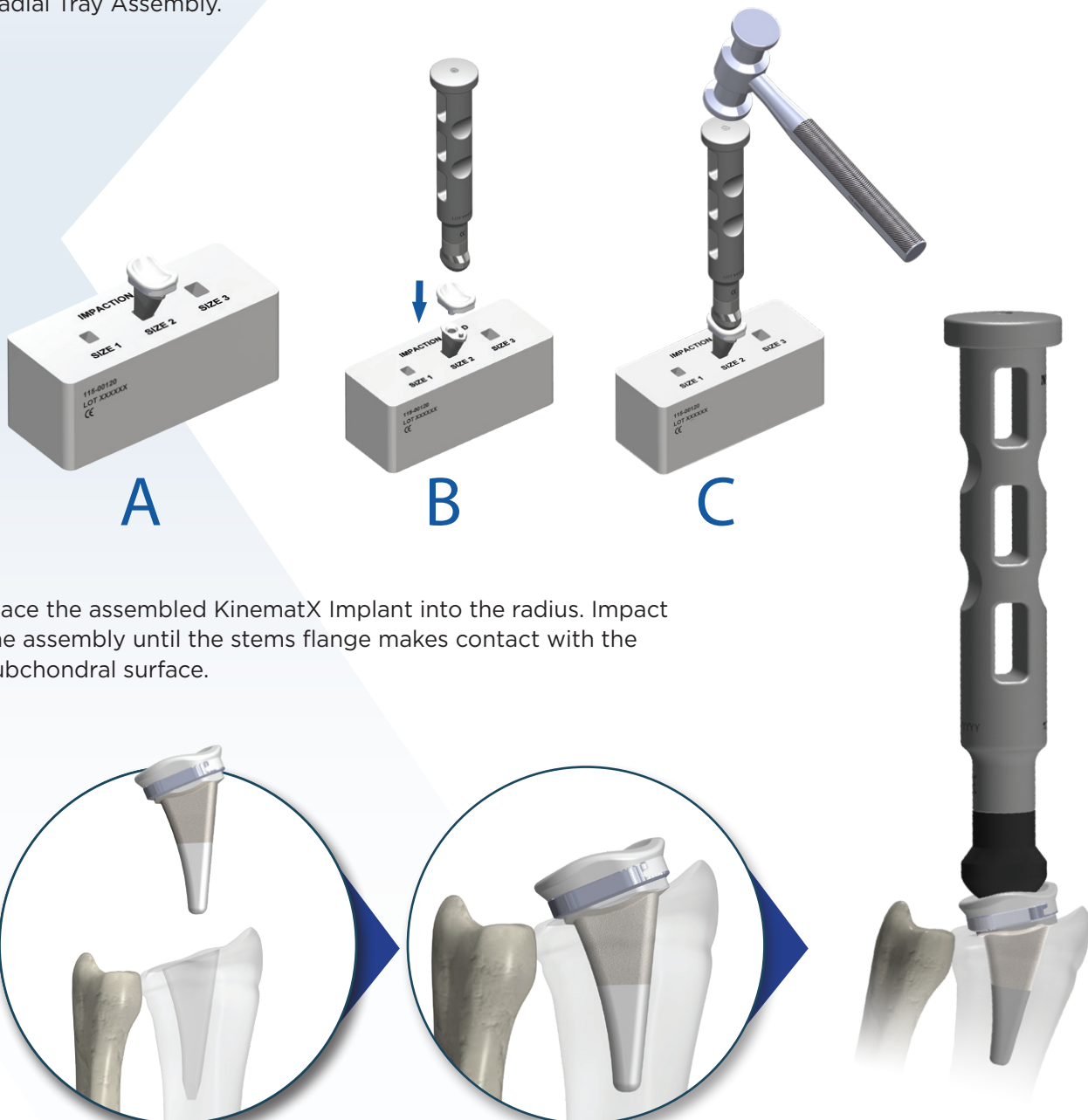
**Range of Motion:** After radial trial insertion, verify ROM and assess motion by articulating the wrist.



## Step 14. Radial Implant Assembly and Placement

Load the selected Radial Stem (size determined by the initial broaching step) into the corresponding pocket of the Impaction Stand. Align the taper and position the Stem with their mating features on the selected Radial Tray Assembly.

Attach the Radial Impactor Tip to the Impactor. Impact the Radial Tray Assembly with the Impactor and Mallet until it is fully seated onto the Stem. Assess and verify the lock between the Radial Tray Assembly and Stem.

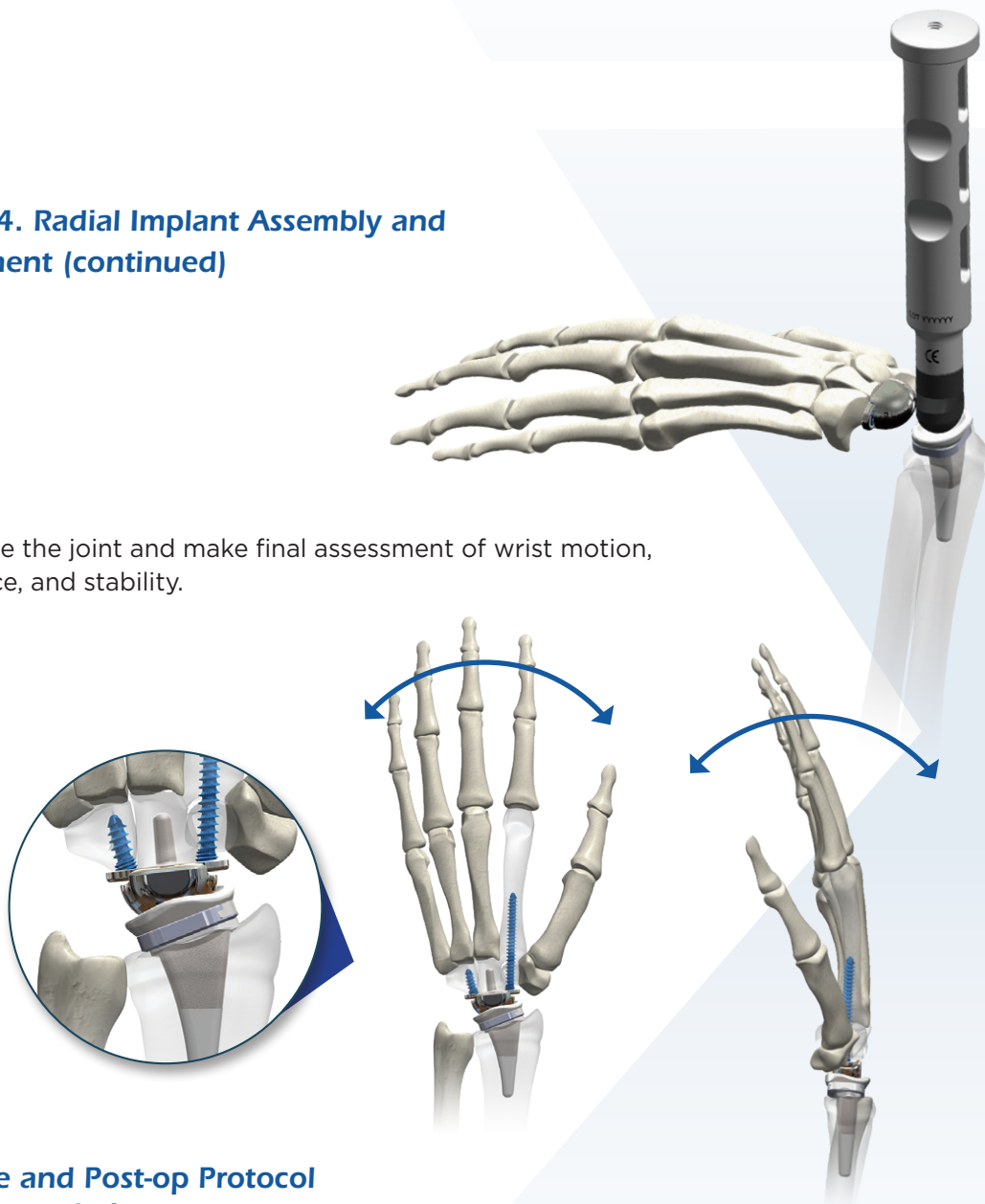


Place the assembled KinematX Implant into the radius. Impact the assembly until the stems flange makes contact with the subchondral surface.



## Step 14. Radial Implant Assembly and Placement (continued)

Reduce the joint and make final assessment of wrist motion, balance, and stability.



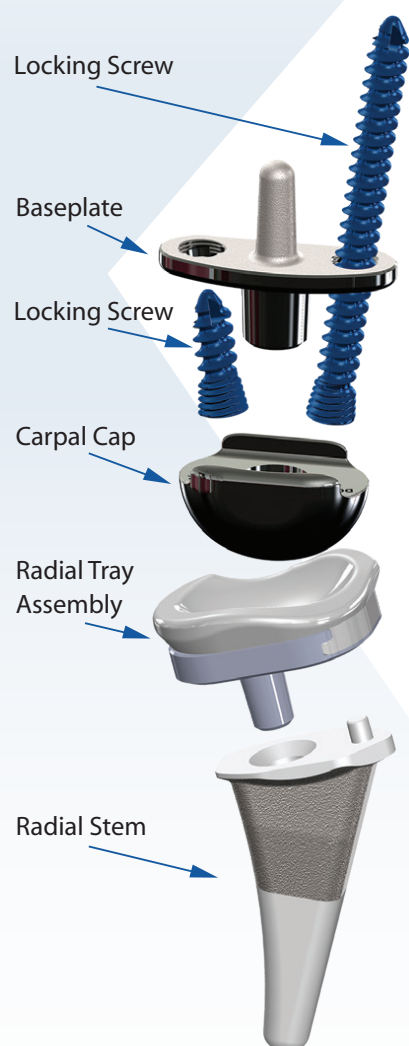
## Closure and Post-op Protocol Recommendations

After thorough irrigation, re-approximate the proximally-based capsular flap to the rim of capsular tissue on the ulnar, distal and radial aspects of the carpus, using a running or interrupted 3-0 nonabsorbable suture. Replace the tendons in their bed, and close the retinaculum as needed with a running or interrupted 2-0 absorbable suture. The surgeon may transpose the EPL out of the retinaculum at their discretion. The skin is closed routinely, and the wrist immobilized in a short arm splint with the digits and thumb free for 7-10 days. The patient is encouraged to perform supination and pronation exercises as well as digital

exercises during the immediate postoperative period. Further immobilization should be directed by the surgeon as indicated by the stability of the prosthesis at surgery. In most cases, it is advisable to begin range of motion exercises in all planes, including circumduction and dart-throwing motion immediately following removal of the postoperative splint. A resting orthosis is helpful for comfort and the patient should be advised to avoid weight bearing, resistance loading, strengthening or athletic activity for at least six weeks postoperatively. Gradual return to activities should be permitted as strength and flexibility permit.



The KinematX Total Wrist Arthroplasty System is a modular system which allows for the combination of its components. Below is a summary of the compatible combinations of these components.



#### Screw Compatibility

All locking screws provided in the system are compatible with all baseplates.

#### Baseplate and Cap Compatibility Matrix

|                               |                          |
|-------------------------------|--------------------------|
| Standard Baseplate, 12mm Stem | Carpal Cap<br>(one size) |
| Standard Baseplate, 15mm Stem |                          |

#### Radial Assembly and Cap Compatibility Matrix

|                                     |                          |
|-------------------------------------|--------------------------|
| Radial Tray Assembly, (L or R) Std  | Carpal Cap<br>(one size) |
| Radial Tray Assembly, (L or R) +2mm |                          |
| Radial Tray Assembly, (L or R) +4mm |                          |
| Radial Tray Assembly, (L or R) +6mm |                          |

#### Radial Stem and Radial Tray Assembly Compatibility Matrix

|                    |   |
|--------------------|---|
| Radial Stem Size 1 | All Radial Tray Assembly Sizes<br>(L or R), Std, +2mm, +4mm, +6mm |
| Radial Stem Size 3 |   |
| Radial Stem Size 5 |   |

# KinematX Implant Removal Instructions

## Proximal Components

Disassemble the Radial Assembly from the stem by wedging a straight osteotome between the two components on the dorsal side. Remove the Radial Assembly.

Attach the Stem Extractor to the Stem, and impact the underside of the Stem Extractor's impaction cap to back the Stem out of the radius. The Slap Hammer may also be attached to the impaction cap to remove the Stem.



### **Distal Components**

Separate the Cap from the Baseplate by wedging a straight osteotome between the Cap and the Baseplate. After removing the Cap, utilize the T20 driver to remove the Locking Screws in a counter-clockwise fashion.

A Slap Hammer can be attached to the thread inside the baseplate to facilitate removal of the baseplate from the capitate bone.

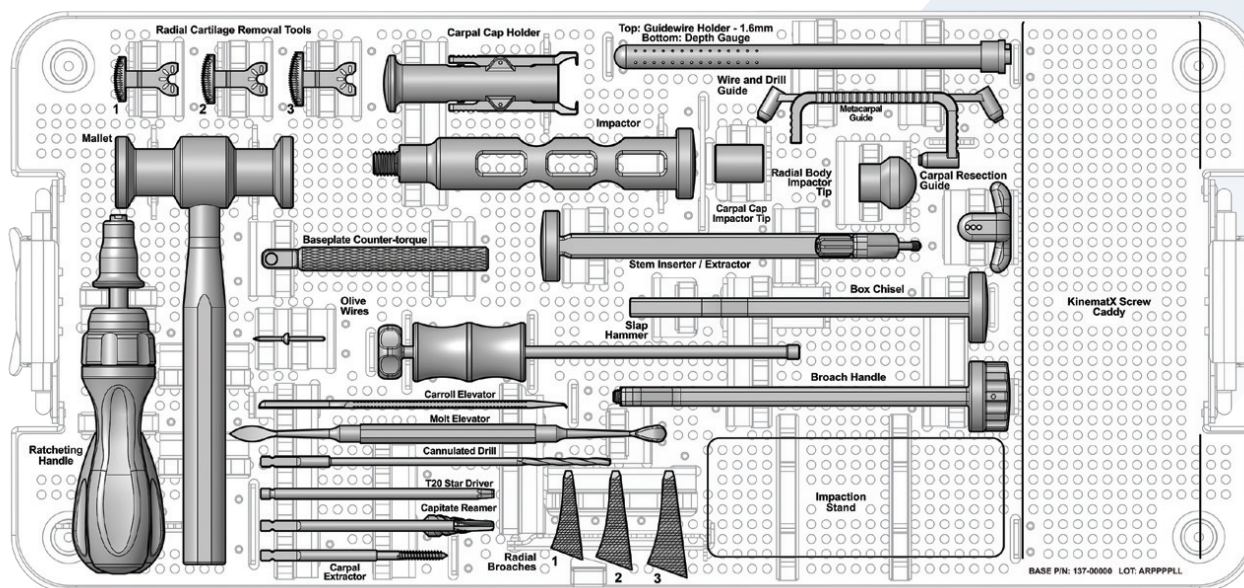
# KinematX Total Wrist System Implants and Instruments

## Implants (Sterile Packed)

| Part #      | Description                                       |
|-------------|---|
| 115-11000-S | Radial Stem - Size 1; Sterile Packed              |
| 115-21000-S | Radial Stem - Size 2; Sterile Packed              |
| 115-31000-S | Radial Stem - Size 3; Sterile Packed              |
| 137-30001-S | Radial Tray Assembly - LEFT, STD; Sterile Packed  |
| 137-30002-S | Radial Tray Assembly - RIGHT, STD; Sterile Packed |
| 137-30201-S | Radial Tray Assembly - LEFT, +2; Sterile Packed   |
| 137-30202-S | Radial Tray Assembly - RIGHT, +2; Sterile Packed  |
| 137-30401-S | Radial Tray Assembly - LEFT, +4; Sterile Packed   |
| 137-30402-S | Radial Tray Assembly - RIGHT, +4; Sterile Packed  |
| 137-30601-S | Radial Tray Assembly - LEFT, +6; Sterile Packed   |
| 137-30602-S | Radial Tray Assembly - RIGHT, +6; Sterile Packed  |
| 137-50012-S | Standard Baseplate, 12mm Stem; Sterile Packed     |
| 137-50015-S | Standard Baseplate, 15mm Stem; Sterile Packed     |
| 137-31000-S | Carpal Cap; Sterile Packed                        |

## Screws

| Part #    | Description               |
|-----------|---------------------------|
| 137-47515 | 4.75mm Locking Screw x 15 |
| 137-47520 | 4.75mm Locking Screw x 20 |
| 137-47525 | 4.75mm Locking Screw x 25 |
| 137-47530 | 4.75mm Locking Screw x 30 |
| 137-47535 | 4.75mm Locking Screw x 35 |
| 137-47540 | 4.75mm Locking Screw x 40 |
| 137-47545 | 4.75mm Locking Screw x 45 |
| 137-47550 | 4.75mm Locking Screw x 50 |



## Reusable Instruments

| Part #     | Description                |
|------------|----------------------------|
| 137-00015  | Carpal Extractor           |
| 137-00020  | Carpal Cap Holder          |
| 137-00025  | Carpal Preparation Guide   |
| 137-00110  | Baseplate Counter-torque   |
| 137-00111  | KinematX Depth Gauge       |
| 137-00115  | Broach Handle              |
| 137-00116  | Impactor                   |
| 137-00117  | Radial Impactor Tip        |
| 137-00118  | Carpal Cap Impactor Tip    |
| 137-01600  | Metacarpal Alignment Guide |
| 137-01630  | Wire and Drill Guide       |
| 137-03001  | Radial Trial- LEFT, STD    |
| 137-03002  | Radial Trial - RIGHT, STD  |
| 137-03201  | Radial Trial - LEFT, +2    |
| 137-03202  | Radial Trial - RIGHT, +2   |
| 137-03401  | Radial Trial - LEFT, +4    |
| 137-03402  | Radial Trial - RIGHT, +4   |
| 137-03601  | Radial Trial - LEFT, +6    |
| 137-03602  | Radial Trial - RIGHT, +6   |
| 148-00010  | T20 Star Driver            |
| 148-02039  | Ratcheting Handle          |
| GS-43.3680 | Carroll Elevator           |
| GS-43.3700 | Molt #9 Elevator           |
| 101-00009  | Guidewire Holder - 1.6mm   |
| 102-00017  | Palm Handle                |
| 102-00022  | Slap Hammer                |
| 115-00003  | Mallet                     |
| 115-00112  | Stem Insertor / Extractor  |
| 115-00120  | Impaction Stand            |

## Disposable Instruments

| Part #    | Description                            |
|-----------|--|
| 101-00006 | Trocar Guide Wire Dia = 1.6mm **       |
| 115-00102 | Radial Box Chisel                      |
| 118-00006 | Post Reamer                            |
| 118-02030 | Cannulated Drill                       |
| 137-00005 | Radial Cartilage Removal Tool - Size 1 |
| 137-00006 | Radial Cartilage Removal Tool - Size 2 |
| 137-00007 | Radial Cartilage Removal Tool - Size 3 |
| 137-00010 | Capitate Reamer                        |
| 137-01001 | Radial Broach Size 1                   |
| 137-01002 | Radial Broach Size 2                   |
| 137-01003 | Radial Broach Size 3                   |
| 144-61111 | Olive Wire 1.6mm, Smooth, Short        |

*(Stored w/in holder)\*\**

# KinematX<sup>®</sup>

Total Wrist Arthroplasty

**Delivering**

a smarter approach for total wrist

**Period.**

Real change ***starts*** here<sup>™</sup>

**EXTREMITY<sup>®</sup>**  
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