Acumed® is a global leader of innovative orthopaedic and medical solutions.

We are dedicated to developing products, service methods and approaches that improve patient care.

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Acumed® is committed to keeping pace with the ever-changing needs of orthopaedic surgeons. As surgeons develop new methods of fracture fixation and rehabilitation, we continue to develop new advancements in our orthopaedic implants and technology. One of these advancements, the Elbow Plating System, has revolutionized the way orthopaedic surgeons treat and manage elbow fractures. Designed in conjunction with Shawn W. O’Driscoll, Ph.D., M.D., the Elbow Plating System is designed to address fractures of the distal humerus, olecranon and coronoid.

The Elbow Plating System offers precontoured, indication specific plates and includes an innovative low-profile Olecranon Plate design with increased anatomic features and instrumentation to ease plate and screw insertion. This system also features the Hexalobe Screw System with variable angle Tap-Loc® Technology for the Medial and Lateral Distal Humerus Plates. An innovative line of Posterolateral Plates are offered in addition to our Medial and Lateral Distal Humerus Plates to make this system a comprehensive solution for elbow fracture management.

The Elbow Plating System exemplifies our dedication to designing implants and instrumentation that maximizes the capabilities of current and new fixation techniques and provides the best possible outcome for the patient.
**Precontoured Plate** design eliminates the need for surgeons to bend the plates to match the anatomy of the patient. For complex fractures, the plates act as a template to restore the natural anatomic geometry of the distal humerus and proximal ulna.

**Parallel Plate Placement** provides a more stable construct than plates placed at a 90° orientation\(^1,2\). Biomechanical data shows that parallel plate placement has greater strength and stability, especially when the elbow is subjected to A/P and torsional forces\(^3\). In addition, a Posterolateral Distal Humerus Plate family is available to make this a fully comprehensive system.

**Hexalobe Screw System** was designed specifically for fractures of the elbow. Variable Angle Tap-Loc\(^\circ\) Technology allows up to 20° screw angulation, providing flexibility when capturing fracture fragments while maintaining the benefits of a traditional locking screw.
Olecranon Plates

Locking Olecranon Plates provide excellent fixation in the proximal ulna for both fractures and osteotomies. The plates feature an advanced anatomic design which contours proximally and along the shaft to provide a precise anatomic fit as well as a lower profile design than previous generation plates.

Left and right-specific plates greatly improve anatomic fit proximally and distally along the ulnar shaft. An improved locking screw trajectory allows screws to capture fracture fragments without interference with other locking screws. Increased plate length range makes this the most comprehensive plate offering on the market.

Prongs on the proximal tip of the Standard Plates provide provisional fixation into the triceps tendon, assisting with reduction and improving final stability. The plate is placed directly over the triceps tendon, eliminating the need for a triceps split. A 3-hole plate is included for osteotomies and more proximal olecranon fractures that do not require a longer plate length. A radiolucent targeting guide for the proximal 2.7 mm screw cluster eases the surgical technique and may help to save valuable procedure time. K-wire holes facilitate provisional plate fixation.

The Extended Plate family does not have prongs and is offered for the treatment of fractures that extend proximally. The proximal three holes are threaded to allow locking screws to be utilized. With the Extended Plates, the surgeon may choose several proximal locking screw options depending on the fixation needed for the particular fracture pattern. An angled “home run” screw in hole #3 or a long intramedullary screw in hole #2 may be utilized along with smaller fragment screws in the other proximal holes.

Optional Narrow Plates provide a more precise fit for patients under 120lbs (54 kg). They are specifically designed to fit a smaller bone geometry. An optional 15-hole plate is available for the treatment of segmental fractures or where comminution extends distally along the ulnar shaft.

Olecranon Plate lengths range from 65 mm to 190 mm.

Coronoid Plates

Designed specifically for fractures of the anteromedial facet of the coronoid, Coronoid Plates act as a buttress to the coronoid and counteracts the tendency of the elbow to subluxate. Threaded .035” and .062” titanium wires are included for supplementary fixation of the small coronoid fragments if necessary.
Distal Humerus Plates

Precontoured in three planes, the Locking Distal Humerus Plates offer multiple lengths and sizes to treat a wide variety of fractures. Both parallel and Posterolateral Plate options are available to make this a fully comprehensive system for distal humerus fractures.

Lateral Column Plates

These plates improve upon posterior plating biomechanically by enabling the use of longer screws that interdigitate with screws coming from the medial side. The Lateral Plates are offered in both left (blue) and right (green) and are 11 mm in width and 2.0 mm at the thickest point. Lengths range from 58 mm to 206 mm.

Medial Column Plates

Distally these plates extend down to, or wrap around the medial epicondyle or even extend down onto the medial trochlea. Extending up the condylar ridge, these locking plates offer solid fixation and compression. This fixation is maximized when the screws in the articular fragments can interdigitate with those coming from the lateral side. The Medial Plates are 11 mm wide and 2.0 mm at the thickest point and offer 2-4 screw holes for fixation of the articular fragments. Lengths range from 84 mm to 175 mm.

Posterolateral Plates

These plates are designed for isolated capitellar fractures and for surgeons who prefer a 90-90 plate application. The precise anatomic curvature of the plate ensures the proper fit for the patient. The diverging screw geometry in the distal cluster allows for the maximum amount of fixation at the fracture site. The Posterolateral Plates are offered in both left (blue) and right (green) and are 10.7 mm in width and 4.6 mm at the thickest point. Plate lengths range from 80 mm to 205 mm.
These plates are designed for isolated capitellar fractures and for surgeons who prefer a 90-90 plating technique. These plates make the Acumed® Elbow Plating System a comprehensive solution for distal humerus, olecranon and coronoid fractures.

The plates were specifically designed to have a precise anatomic fit and to include a unique screw geometry that ensures the maximum amount of fixation at the fracture site. The cluster of distal screws are angled distally and divergent from one another to allow the plate to sit more proximally in order to avoid potential impingement on the olecranon and to best capture the fracture fragments.

These plates have a proximal taper to reduce stress concentrations, K-wire holes for provisional fixation and a limited contact design to maintain blood flow to the periosteum.
The parallel placement option for our Locking Distal Humerus Plates provides a strong, stable construct which may reduce the need for immobilization of the elbow for an extended postoperative period. The strength of the plates, along with the parallel application and locking technology, greatly reduces the chance of hardware failure. The patient may be able to begin rehabilitation and range of motion exercises immediately after surgery.

Because screws come from opposing sides of the condyles, long screws are able to interdigitate in the distal fragments, creating an “arch” construct. The interdigitating screws provide the keystone to the arch, creating a stable construct to facilitate with immediate, aggressive rehabilitation.

We also offer a Posterolateral Plate family for surgeons who prefer the 90-90 technique. These plates are particularly helpful for treating isolated capitellar fractures.

A comprehensive study proved that plates placed in a parallel configuration on the medial and lateral columns were stronger than 90° plating when a gap was present between the articular fragments and the shaft, as when the humerus is severely fractured. An earlier study compared 90° plating to a Y-plate and crossed screws, but did not compare “perpendicular” to “parallel” plating. The newer study found “parallel” plating to be the best construct for reconstruction of a comminuted distal humerus. Both studies were written before the introduction of the Elbow Plating System which optimizes the biomechanics even further with locking capability, plate placement and plate strength.

Finite element analysis testing at Acumed indicated significant advantages of parallel plating versus 90° plating. For this study, a computer modeled a distal humerus fracture and assumed equivalent plate fixation and strength (two areas in which the Acumed Locking Elbow Plates are significantly better than 90° plating with reconstruction or tubular plates). The program simulated a load of 50lbs in three different planes: A/P, M/L, and Torsion. The results supported parallel plating, especially in torsional loads.

90° Plating Displaced:

Anterior/Posterior: 53% more

Medial/Lateral: 5% less

Torsion: 80% more
Results of a biomechanical study tested perpendicular 3.5 mm LCP Distal Humerus Plates (316L) versus parallel Locking Distal Humerus Plates (titanium) for stiffness in compression and internal/external rotation, plastic deformation and failure in torsion. Both systems were utilized for fixation of a distal intra-articular humerus fracture with a metaphyseal comminution in osteoporotic bone. Results showed that the Acumed® "parallel locking system showed improved stability compared with the perpendicular locking system, and therefore may be more indicated:"

Locking Distal Humerus Plates provided a significantly higher stability in compression and external rotation, and a greater ability to resist axial plastic deformation.

- Axial compressive stiffness of our plates was 2.3 times GREATER than the perpendicular locking system.
- The perpendicular locking plates experienced an average of 2.9 times GREATER axial plastic deformation than the Acumed® plates.

The Acumed® Locking Olecranon Plates are Grade 4 unalloyed titanium. Our previous generation Olecranon Plates are Grade 2 unalloyed titanium. Because Grade 4 unalloyed titanium has higher yield strength, the plates are able to be lower profile than our previous generation of plates without compromising strength.

Mechanical testing of our Locking Olecranon Plates versus previous generation Olecranon Plates was performed utilizing two separate loading scenarios for metaphyseal and diaphyseal plate strength. Both scenarios investigated direct load to failure of the plate. Failure of the plate was considered to have occurred when permanent plastic deformation of the plate occurred.

The Acumed® Grade 4 unalloyed titanium Olecranon Plates have a 6% lower profile than our Grade 2 unalloyed titanium Olecranon Plates. Testing results showed mean failure load of the Grade 4 unalloyed titanium plate is statistically equal to the mean failure load of the existing the Grade 2 unalloyed titanium plate in proximal cantilever bending. Results of the second loading scenario showed mean failure load of the Grade 4 unalloyed titanium plate is statistically greater by 16% than the mean failure load of the existing Grade 2 unalloyed titanium plate in diaphyseal four-point bending.
The Elbow Plating System offers a comprehensive range of precontoured plates that maximize fixation in the articular fragments, contributing to the stability of the entire reconstruction.

- Plates are precontoured to match the natural anatomy of the elbow, minimizing the need for surgeons to bend the plates prior to application.
- For complex fractures, the plates act as a template for anatomic restoration of the elbow.

Traditional straight plates weaken with repeated bending. Our precontoured plates offer a stronger alternative while maintaining a low-profile. This precontoured design also allows for maximum fixation and stability in the distal humerus and proximal ulna.

In addition, the plates are designed to maximize stability of peri-articular fragments and facilitate rehabilitation. Clustered screw holes in the articular region increase stability and strength of the reconstruction. This improved stability allows the plates to compress these articular fragments with the shaft to achieve union of the fracture fragments. Plate profile and screw/plate interface were designed with the soft tissues in mind. The plates thin down in the peri-articular region and the screw heads are recessed within the low-profile plates.

Plate thickness is optimized for each region of the bone. Continuous change in thickness provides strength along the metaphysis/diaphysis where it is needed, while maintaining a low profile in the peri-articular areas with limited soft tissue coverage.

In addition to the innovative features of the implants, Acumed® designed the system for ease of use by providing all surgical instrumentation in a well-organized tray.

- The Osteotomy Cutting Jig is an instrument unique to the Acumed® Elbow Plating System. The Cutting Jig provides four location options to start the chevron osteotomy of the olecranon and also provides pre-drilling capability for future Olecranon Plate application.

- Color-coded instrumentation allows for quick identification of proper drills, taps, driver tips and drill guides in the system for each screw diameter. An improved screw caddy design provides a durable all metal design, a removable caddy lid and user friendly handles for quick removal from the system tray. All screw diameters are bordered by colors that correspond with the color bands on the appropriate instrumentation. The Elbow Plating System features a user friendly depth gauge design as well as “Tri-Flat” Locking Drill Guides that allow one-step drilling and depth measurement.

- The Targeted Drill Guide enables surgeons to drill and position the distal screws in the Medial and Lateral Distal Humerus Plates with confidence and accuracy. The drill guide cannula is placed in the appropriate plate hole and the tip of the guide is positioned in the desirable location of the screws’ ending point.
Hexalobe Screw System

Hex Versus Hexalobe
Comparison of Acumed® Hex and Hexalobe Screws

The Elbow Plating System features the Hexalobe Screw System. The Hexalobe Screws were designed specifically with elbow fractures in mind. These screws have maximized strength and a Hexalobe drive interface to optimize performance in dense bone, especially when longer length screws are necessary.

Sleeveless “Stick-Fit” Screw/Driver Interface
The design of the Hexalobe driver allows the driver to stick in the screw, obviating the need for a screw sleeve and reducing procedure time.

Modified Screw Root and Taper
Additional material on the screw root diameter and a larger wall thickness around the screw head gives the modified driver/screw interface additional strength to reduce breakage.

Additional Cutting Flutes
Acumed® Hex Screws only have one cutting flute to aid insertion. The Hexalobe System provides three cutting flutes on our longer screws (34 mm and up) to help ease screw insertion.

<table>
<thead>
<tr>
<th>Screw Diameter</th>
<th>Increased Torque Strength*</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5 mm Hex</td>
<td>-</td>
</tr>
<tr>
<td>3.5 mm Hexalobe</td>
<td>+23%</td>
</tr>
<tr>
<td>2.7 mm Hex</td>
<td>+58%</td>
</tr>
<tr>
<td>3.0 mm Hexalobe</td>
<td>+19%</td>
</tr>
<tr>
<td>2.7 mm Hex</td>
<td></td>
</tr>
<tr>
<td>2.7 mm Hexalobe</td>
<td></td>
</tr>
</tbody>
</table>

*Testing on file

<table>
<thead>
<tr>
<th>Screw Diameter</th>
<th>Increased Root Diameter of Screws</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5 mm Hex</td>
<td>+23%</td>
</tr>
<tr>
<td>3.5 mm Hexalobe</td>
<td>+23%</td>
</tr>
<tr>
<td>2.7 mm Hex</td>
<td>+17%</td>
</tr>
<tr>
<td>3.0 mm Hexalobe</td>
<td>+17%</td>
</tr>
</tbody>
</table>

Sleeveless “Stick-Fit” Driver Interface:
Eliminates the need for a screw sleeve. The driver interfaces with the screw and “sticks”.

Hexalobe Drive Interface:
Reduces the chance of stripping the screw.

Type II Anodize:
Material properties may aid implant removal.

Modified Shape and “Transition” of Screw Head:
Reduces screw breakage.

3.0 mm Screw Diameter Added:
Improves torque strength 58% over 2.7 mm Hex Screws.

Cutting Flute Design:
Improves screw insertion.
Acumed® believes that surgeons should have the ability to determine the trajectory of the locking screws in the distal humerus. Our Medial and Lateral Distal Humerus Plates offer patented Tap-Loc® Technology, allowing surgeons to choose the optimal locking screw trajectory in the distal fragments. This provides surgeons with the ability to maximize fixation in the distal fragments, providing the best possible fixation of the fracture. It also offers multidirectional screw angles to give surgeons the freedom to angle the distal locking screws up to 20° in each direction. This provides flexibility when capturing fracture fragments while maintaining the benefits of a traditional locking screw.

Dr. O’Driscoll’s goal was to combine his principles for distal humeral fracture fixation with variable angle locking technology. Because anatomy and fracture patterns in the distal humerus vary from patient to patient, he saw the importance of allowing the surgeon to choose the angle of the distal locking screws for both our Medial and Lateral Plates. In addition, the locking threads of each locking screw should accurately coincide with the threads in the plate to ensure maximum locking strength and stability and avoid cross-threading screws into plates like other variable angle locking methods.

Mechanical testing was performed to provide a comparative strength analysis of Acumed® Locking Hexalobe Screws used in pre-threaded holes, holes tapped at 0° from the centerline of the hole using Tap-Loc® Technology, and holes tapped at 20° from the centerline of the hole using Tap-Loc® Technology. Results showed that a Hexalobe Screw installed using Tap-Loc® Technology at 20° can sustain a load up to 90% of the failure load of a screw installed in a pre-threaded hole and Hexalobe Screws installed using Tap-Loc® Technology at 0° were equal in strength to the pre-threaded holes.

To learn more about the full line of innovative solutions from Acumed®, including our Elbow Plating System, visit www.acumed.net.
Tapping Threads allow surgeons to tap the plate after drilling, creating threads in the plate and bone for locking screw insertion.

Tapping Instructions:
- Do not tap deeper than the start of the laser line
- Clean debris from tap after tapping each hole
- Irrigate hole prior to tapping
- Do not tap a slot
- Do not re-tap a hole (use a nonlocking screw)
- Tap by hand, not under power
- Angle of tapped hole must not exceed 20°

Quick Release instrumentation provides an efficient way to switch from 3.5 mm to 3.0 mm plate taps.

3.5 mm and 3.0 mm Plate Tap Sizes Color coded taps accommodate the screw diameters provided in the system.

Laser Mark indicates maximum tapping depth.

Tap Trajectory Guide follows the drill path for accurate tap angle and screw placement.

T-Handle provides control when tapping plate holes.

Tap-Loc® Technology
1 FRACTURE REDUCTION AND PLATE PLACEMENT
Attach the proximal targeting guide (80-0654) to the plate with the locking bolt (80-0652). Flex the elbow 90°, reduce the fracture and apply the plate. The prongs in the proximal end of the plate should penetrate the triceps tendon and provide provisional fixation. These prongs do not compress the tendon and a gap between the plate and the bone should be visible on X-ray.

2 PROVISIONAL WIRE PLACEMENT
If a locking screw is to be utilized in the most proximal hole of the plate, thread the 2.3 mm locking drill guide (80-0622) into the plate hole. A 2.0 mm wire (WS-2009ST) is drilled through the locking drill guide and across the fracture site, penetrating the anterior metaphyseal cortex. Do not remove this wire until Step 6. Alternatively, two .062” wires (WS-1607ST) can be placed across the fracture, one on each side of the plate.

3 NONLOCKING DISTAL SCREW PLACEMENT
With provisional reduction confirmed, drill with the 2.8 mm drill (80-0387), measure depth (80-0623) and insert a 3.5 mm nonlocking screw through the slotted hole distal to the fracture site and into the ulnar shaft. Connect the T15 Hexalobe Driver (80-0760) to the ratcheting driver handle (80-0663) and tighten the screw partially to allow for later compression. Bone taps are provided and recommended for patients with dense bone.

4 PROXIMAL LOCKING SCREW PLACEMENT
Insert two 2.7 mm locking screws into the proximal holes on either side of the 2.0 mm wire, using the 2.0 mm locking drill guide (80-0621). When drilling with the 2.0 mm drill (80-0318), be careful not to exit the bone. Drill depth may be read directly off of the laser line on the drill or with the 2.0 mm depth probe (80-0643). The T8 Hexalobe Driver (80-0759) is used to insert the 2.7 mm screws. When using the T8 Driver, care should be taken to not “overtighten” the screw or apply more torque than necessary to seat the locking screw into the plate. Screws should be tightened by hand and not under power. The fixed angle locking screw trajectory is meant to create maximum fixation in the small proximal fragments.
FRACTURE SITE COMPRESSION

If the plate length selected has two or more compression slots, the fracture site is compressed in the following manner. Insert a 3.5 mm nonlocking screw in dynamic compression mode into a distal slot along the ulnar shaft using the offset drill guide (PL-2095). The proximal shaft screw must be slightly loosened to allow for compression. If a longer plate is used and further compression is required, partially insert another nonlocking screw into a distal slot in dynamic compression mode and then loosen the first two screws to allow for plate movement.

FINAL SCREW PLACEMENT

Remove the 2.0 mm wire from the most proximal plate hole and insert a locking 3.5 mm screw: attach the 2.8 mm locking drill guide (80-0668) and use the 2.8 mm drill (80-0387) in the path of the wire. Measure depth and insert the screw. If a 3.0 mm “home run” screw is desired, the 2.3 mm locking drill guide (80-0622) and drill (80-0627) are utilized. The proximal targeting guide may be removed at this time. The remaining locking screws are then inserted at the surgeon’s discretion.

POSTOPERATIVE PROTOCOL BY SHAWN W. O’DRISCOLL PH.D., M.D.

Immediately after closure, the elbow is placed in a bulky non-compressive Jones dressing with an anterior plaster slab to maintain the elbow in extension. The initial rehabilitation is planned according to the extent of soft-tissue damage. When the fracture is associated with severe soft-tissue damage, the extremity is kept immobilized with the elbow in extension for three to seven days postoperatively. If the fracture is closed and there is no severe swelling or fracture blisters, the Jones dressing is removed after two days and an elastic non-constrictive sleeve is applied over an absorbent dressing placed on the wound. A physical therapy program including active and passive motion is then initiated.

Technical Objectives for Locking Olecranon Plates:

- Each screw should be as long as possible
- Locking screws should interlock to provide a stable “fixed angle” structure inside the bone fragment
- Plate should buttress against anterior pull of elbow flexors
- Plate should provide stable fixation of the ulnar shaft
- Plate should be applied with compression across the fracture
- Plate must be strong and stiff enough to resist bending before union occurs
1 **PROVISIONAL FIXATION**
Place the Olecranon Osteotomy Cutting Jig (80-0653) onto the proximal portion of the olecranon with the elbow flexed at 90°. The jig is designed to sit on top of the triceps tendon. Secure the jig provisionally by placing a plate tack (PL-PTACK) into the plate tack holes in the jig. A .062” K-wire (WS-1607ST) may also be placed in the small K-wire hole between the cutting slots.

2 **PRE-DRILL SCREW HOLES**
The Olecranon Osteotomy Cutting Jig allows pre-drilling of the screw holes that will be used with future placement of the Olecranon Plate. Use a 2.8 mm drill (80-0387) to drill the slot for future placement of a 3.5 mm screw. The 2.0 mm drill (80-0318) is utilized to drill the two smaller, proximal holes for future placement of the 2.7 mm screws.

3 **CREATE OSTEOTOMY**
Select the cutting slot that provides the most optimal position for the chevron osteotomy. Using a thin-bladed oscillating saw (.025" in thickness), create an osteotomy about 1/3 of the way through the olecranon. Remove the Osteotomy Cutting Jig. Use the oscillating saw to join the two sides of the provisional cut. A thin-bladed osteotome is used to complete the osteotomy.
1 ARTICULAR FRAGMENT REDUCTION
The articular fragments, which tend to be rotated toward each other in the axial plane, are reduced anatomically and provisionally held with .045” smooth K-wires (WS-1106ST). It is essential that these wires be placed close to the subchondral level to avoid interference with later screw placement, and away from where the plates will be placed on the lateral and medial columns (see Step 2). One or two strategically placed wires can then be used to provisionally hold the distal fragments in alignment with the humeral shaft.

2 PLATE PLACEMENT AND PROVISIONAL FIXATION
The selected Medial and Lateral Plates are placed and held apposed to the distal humerus, while one smooth 2.0 mm K-wire (WS-2009ST) is inserted through hole #2 (numbered from distal to proximal) of each plate through the epicondyles and across the distal fragments to maintain provisional fixation. These 2.0 mm wires are left in place until Step 7 to simplify placing the locking screws in the distal fragments.

Note: The Medial and Lateral Distal Humerus Plates are designed to accept 3.0 mm and 3.5 mm Hexalobe Screws. The 2.7 mm Hexalobe Screws have a smaller head diameter and should NOT be used with the Medial and Lateral Distal Humerus Plates.

3 INITIAL PROXIMAL SCREW PLACEMENT
With provisional reduction confirmed, drill with the 2.8 mm drill (80-0387), measure depth (80-0623) and insert a 3.5 mm nonlocking screw into a slotted hole of each plate proximal to the fracture site. Connect the T15 Hexalobe Driver (80-0760) to the ratcheting driver handle (80-0663) and tighten the screw partially, allowing some freedom for the plate to move proximally during compression later. (Because the undersurface of each plate is tubular in the metaphyseal and diaphyseal regions, the screw in the slotted hole only needs to be tightened slightly to provide excellent provisional fixation of the entire distal humerus.) Bone taps are recommended for patients with dense bone.

4 NONLOCKING DISTAL SCREW PLACEMENT
Drill and insert screws through hole #1 on both the medial and lateral side. The targeted drill guide cannot be used in hole #1 of the Medial Plate if the angle of the nonlocking screw exceeds 20°. After drilling, measure depth and insert the appropriate size 3.5 mm nonlocking screw. The 3.0 mm screws may be used in osteoporotic bone to enable more screws to be placed in the distal fragments to maximize stability.
COMPRESS LATERAL COLUMN
Using a large tenaculum (MS-1280) to provide interfragmentary compression across the fracture at the supracondylar level, the lateral column is first fixed. A screw is inserted in the Lateral Plate in dynamic compression mode in a slotted hole proximal to the fracture site using the offset drill guide (PL-2095). Tightening this screw further enhances interfragmentary compression at the supracondylar level to the point of causing some distraction at the medial supracondylar ridge. The .045” wires used for provisional fixation may be removed at this point.

COMPRESS MEDIAL COLUMN
The medial column is then compressed in a similar manner using the large tenaculum (MS-1280), and a 3.5 mm nonlocking screw is inserted in the Medial Plate in dynamic compression mode in a slotted hole proximal to the fracture site, using the offset drill guide (PL-2095). If the plates are slightly under contoured, they can be compressed against the metaphysis with a large bone clamp, giving further supracondylar compression. Remove the 2.0 mm wires that were inserted in Step 2.

TAP DISTAL PLATE HOLES
If using a 3.5 mm screw, use the 2.8 mm drill in the path of the wire. If using a 3.0 mm screw (osteoporotic bone), the 2.3 mm drill is utilized. Measure drill depth (80-0623) to determine screw size. Connect the plate tap (80-0661 or 80-0659) to the T-Handle (MS-T1212) and tap the plate. The front end of the tap will act as a guide to ensure that the locking screw follows the correct trajectory. Turning the tap one-half turn at a time, tap the plate taking care not to insert the tap further than the start of the laser line on the tap threads (See Tapping Instructions). The T-Handle should only be used with the plate taps and not for locking or nonlocking screw insertion. The proximal slotted holes are NOT to be tapped.

INSERT DISTAL LOCKING SCREWS
Insert the appropriate size locking screws. Care should be taken to not overtighten the screw. The #3 holes on both the medial and lateral columns are optional. If these holes are used, be sure to use locking screws if locking screws have already been inserted in previous steps.
**Technical Objectives Checklist:**

- Every screw should pass through a plate
- Each screw engages a fragment on the opposite side that is also attached to a plate
- Each screw should be as long as possible
- Each screw should engage as many fragments as possible
- The screws in the distal fragments should lock together by interdigitation, creating a “fixed angle” structure
- Plates should be applied such that compression is achieved at the supracondylar level for both columns
- Plates must be strong and stiff enough to resist breaking or bending before union occurs.

<table>
<thead>
<tr>
<th>Screw Diameter</th>
<th>Drill Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0 mm</td>
<td>2.3 mm</td>
</tr>
<tr>
<td>3.5 mm</td>
<td>2.8 mm</td>
</tr>
</tbody>
</table>

**Insert Proximal Locking Screws**

9 The remaining locking shaft screws may be inserted at the surgeon’s discretion. Note that the plate holes in the humeral shaft are pre-threaded, fixed angle screws. To insert the 3.5 mm or 3.0 mm locking screws, thread the appropriate size locking drill guide (80-0668 or 80-0622) into the locking hole in the plate. Drill with the appropriate size drill (80-0387 or 80-0627). Drill depth may be read directly off of the laser line on the drill or with the 2.3 mm depth probe (80-0664). Insert the appropriate size locking screws.

**Postoperative Protocol by Shawn W. O’Driscoll, Ph.D., M.D.**

10 Immediately after closure, the elbow is placed in a bulky non-compressive Jones dressing with an anterior plaster slab to maintain the elbow in extension. The initial rehabilitation is planned according to the extent of soft-tissue damage. When the fracture is associated with severe soft-tissue damage, the extremity is kept immobilized with the elbow in extension for three to seven days postoperatively. If the fracture is closed and there is no severe swelling or fracture blisters, the Jones dressing is removed after two days and an elastic non-constrictive sleeve is applied over an absorbent dressing placed on the wound. A physical therapy program including active and passive motion is then initiated.

**Acumed® Single Use Tapping Instrument Precautions:**

Tapping a plate using a plate tap will cause titanium debris to be generated, which should be removed. Failure to remove the plate debris can cause, among other complications, inflammation, cartilage damage and patient discomfort. The taps are single surgery use and should be discarded after each surgery or if the tap becomes dull or damaged. If the resistance increases while using a tap, discard the tap immediately. Breakage to the tap can occur due to excessive torque or levering and care should be taken to avoid such conditions. Should breakage occur, carefully remove all tap pieces.

**Tapping Instructions:**

- Do not tap deeper than the start of the laser line
- Clean debris from tap after tapping each hole
- Irrigate hole prior to tapping
- Do not tap a slot
- Do not re-tap a hole (use a nonlocking screw)
- Tap by hand, not under power
- Angle of tapped hole must not exceed 20°
ARTICULAR FRAGMENT REDUCTION:
Following exposure, the articular fragments are reduced anatomically and provisionally held using .045” K-wires (WS-1106ST). It is essential that these wires be placed close to the subchondral level to avoid interference with later screw placement, and away from where the plate will be placed on the posterolateral column. The pointed forceps (MS-45300) and the 8” reduction forceps (MS-1280) are provided in the system to aid in fracture reduction.

PLATE PLACEMENT AND PROVISIONAL FIXATION:
Apply the selected plate to the bone. K-wire holes are included on the plate for provisional fixation and accept .062” K-wires (WS-1607ST). Plate Tacks (PL-PTACK) may also be used through the plate holes to aid in provisional fixation.

INITIAL PROXIMAL SCREW PLACEMENT:
With provisional reduction confirmed, drill with the 2.8mm drill (80-0387), measure depth (80-0623) and insert a 3.5mm nonlocking Hexalobe Screw through the slotted hole that is located proximally on the plate. Connect the T15 Hexalobe Driver (80-0760) to the ratcheting driver handle (80-0663) and insert the screw. Bone taps are provided and recommended for patients with dense bone.
DISTAL SCREW FIXATION AND SUPRACONDYLAR COMPRESSION:
The three most distal locking screws are inserted first by threading the 2.0mm locking drill guide (80-0621) into a plate hole. Select the 2.0mm drill (80-0318) and drill to the desired depth through the 2.0mm locking drill guide. Drill depth may be read directly off of the laser band on the drill or with a 2.0mm depth probe (80-0643). The most proximal of the four distal screws may be inserted for additional fixation of the distal fragments (shown in the illustration).

Connect the T8 Hexalobe Driver (80-0759) to the ratcheting driver handle (80-0663) and insert a 2.7mm locking Hexalobe Screw until it is fully seated in the plate. Care should be taken to not over-tighten the locking screws. Repeat this step for the remaining distal screws.

To achieve supracondylar compression, the screw in the slotted hole should be loosened and the fracture compressed at the supracondylar level.

INSERT PROXIMAL LOCKING SCREWS:
The remaining locking shaft screws may be inserted at the surgeon's discretion. To insert the 3.5mm or 3.0mm locking screws, thread the appropriate size locking drill guide (80-0668 or 80-0622) into the locking hole in the plate. Drill with the appropriate size drill (80-0387 or 80-0627). Drill depth may be read directly off of the laser band on the drill or with the 2.3mm depth probe (80-0664). Insert the appropriate size locking screws.

POSTOPERATIVE PROTOCOL BY SHAWN W. O’DRISCOLL PH.D., M.D.:
Immediately after closure, the elbow is placed in a bulky noncompressive Jones dressing with an anterior plaster slab to maintain the elbow in extension, and the upper extremity is elevated. The arm should be brought down from the elevated position frequently enough (perhaps once per hour) to minimize the likelihood of compartment syndrome. The initial rehabilitation is planned according to the extent of soft-tissue damage. When the fracture is associated with severe soft-tissue damage, the extremity is kept immobilized and elevated with the elbow in extension for three to seven days postoperatively. If the fracture is closed and there is no severe swelling or fracture blisters, the Jones dressing is removed after three days and an elastic non-constrictive sleeve is applied over an absorbent dressing placed on the wound. A physical therapy program including active and passive motion is then initiated.
FRACUTRE FRAGMENT FIXATION:
Expose the coronoid through an anteromedial approach. Reduce and provisionally hold the fragments with threaded titanium wires (WT-xxSTT) drilled from posterior to anterior. These are best placed when retracting the coronoid fragments so that you can see the wires emerge into the fracture surface. They are then backed past the fracture site to allow for reduction. Once proper reduction is achieved, re-advance the wires past the fracture site and into the fragments.

PLATE PLACEMENT
Apply the Coronoid Plate so that the two prongs grasp and buttress the section of the coronoid between its tip and its sublime tubercle on which the anterior bundle of the MCL inserts. The plate should wrap around the brachialis tendon insertion onto the medial side of the ulna distally.

Note: The Coronoid Plates are designed to accept 3.0 mm and 3.5 mm Hexalobe Screws. The 2.7 mm Hexalobe Screws have a smaller head diameter and should NOT be used with the Coronoid Plates.

INITIAL SCREW PLACEMENT
While holding the plate reduced, drill the middle hole with the 2.3 mm drill (80-0627) and insert a 3.0 mm nonlocking screw. Connect the T15 Hexalobe Driver (80-0760) to the ratcheting driver handle (80-0663) and insert the screw. Do not tighten the screw.

Note: Tapping the bone prior to screw insertion with the bone tap (80-0626) is recommended for patients with dense bone.

BUTTRESS FRAGMENTS WITH PLATE
Push the distal tip of the plate anteriorly, applying a lever force against the coronoid fragments, and insert a 3.0 mm screw through the distal hole. Do not tighten the screw.
TIGHTEN SCREWS AND CUT THREADED WIRES

Tighten the proximal screw to bring the midsection of the plate to the bone and fully secure the buttress against the coronoid fragments. Tighten the distal screw. The plate will flex and contour to follow the line of the bone as this final screw is tightened.

Cut the threaded titanium wires flush with the ulna, eliminating soft tissue irritation. If buttressing is excellent, the wires can be removed. If they are to be left in they must be titanium and threaded (WT-xx0xSTT), not smooth.

POSTOPERATIVE PROTOCOL BY SHAWN W. O’DRISCOLL PH.D., M.D.

Immediately after closure, the elbow is placed in a bulky non-compressive Jones dressing with an anterior plaster slab to maintain the elbow in extension. The initial rehabilitation is planned according to the extent of soft tissue damage. When the fracture is associated with severe soft tissue damage, the extremity is kept immobilized with the elbow in extension for 3-7 days postoperatively. If the fracture is closed and there is no severe swelling or fracture blisters, the Jones dressing is removed after two days and an elastic non-constrictive sleeve is applied over an absorbent dressing placed on the wound.

In cases in which fracture stability is not a concern, a program of continuous passive motion begins within the limits of motion determined by soft tissue compliance, which itself is diminished due to fluid accumulation at the elbow region. Edema control is important postoperatively, as swelling limits elbow motion. It is essential that gravitational varus stresses are avoided, as these will result in displacement of the medial coronoid fracture fragment. Therefore, the arm is maintained in a vertical plane when the elbow is being moved and supporting the wrist whenever the arm is moved away from the body and loads the weight of the forearm. Both active and passive motion is permissible in most coronoid fractures treated with the described technique.

If by 4-6 weeks motion is not returning satisfactorily, a program of patient-adjusted static flexion and extension splinting should be commenced to assist with regaining motion. If heterotopic ossification is forming, the splinting program should still be used. The forces generated are small and not a risk of worsening the heterotopic ossification.
### Olecranon Plates
- Olecranon Plate, Standard, 3-hole, Left (65 mm) 70-0302
- Olecranon Plate, Standard, 3-hole, Right (65 mm) 70-0303
- Olecranon Plate, Standard, 5-hole, Left (90 mm) 70-0304
- Olecranon Plate, Standard, 5-hole, Right (90 mm) 70-0305
- Olecranon Plate, Standard, 7-hole, Left (110 mm) 70-0306
- Olecranon Plate, Standard, 7-hole, Right (110 mm) 70-0307
- Olecranon Plate, Standard, 11-hole, Left (150 mm) 70-0308
- Olecranon Plate, Standard, 11-hole, Right (150 mm) 70-0309
- Olecranon Plate, Extended, 5-hole, Left (90 mm) 70-0312
- Olecranon Plate, Extended, 5-hole, Right (90 mm) 70-0313
- Olecranon Plate, Extended, 9-hole, Left (130 mm) 70-0314
- Olecranon Plate, Extended, 9-hole, Right (130 mm) 70-0315

### Optional Olecranon Plates
- Olecranon Plate, Standard, 15-hole, Left (190 mm) 70-0310
- Olecranon Plate, Standard, 15-hole, Right (190 mm) 70-0311
- Olecranon Plate, Narrow, 5-hole, Left (85 mm) 70-0316
- Olecranon Plate, Narrow, 5-hole, Right (85 mm) 70-0317

### Distal Humerus Plates
- Locking Medial Plate, 7-Hole (84 mm) PL-LEM7
- Locking Medial Plate, 8-Hole (88 mm) PL-LEM8
- Locking Medial Plate, Long, 9-Hole (96 mm) PL-LEM9L
- Locking Medial Plate, Short, 9-Hole (95 mm) PL-LEM9S
- Locking Medial Plate, 12-Hole (130 mm) PL-LEM12
- Locking Medial Plate, 16-Hole (175 mm) PL-LEM16
- Locking Lateral Plate, 6-Hole, Left (58 mm) PL-LEL6L
- Locking Lateral Plate, 6-Hole, Right (58 mm) PL-LEL6R
- Locking Lateral Plate, 10-Hole, Left (100 mm) PL-LEL10L
- Locking Lateral Plate, 10-Hole, Right (100 mm) PL-LEL10R
- Locking Lateral Plate, 14-Hole, Left (142 mm) PL-LEL14L
- Locking Lateral Plate, 14-Hole, Right (142 mm) PL-LEL14R
- Locking Lateral Plate, 20-Hole, Left (206 mm) PL-LEL20L
- Locking Lateral Plate, 20-Hole, Right (206 mm) PL-LEL20R
- Posterolateral Distal Humerus Plate, 5 Hole, LT (78 mm) 70-0374
- Posterolateral Distal Humerus Plate, 5 Hole, RT (78 mm) 70-0375
- Posterolateral Distal Humerus Plate, 7 Hole, LT (103 mm) 70-0376
- Posterolateral Distal Humerus Plate, 7 Hole, RT (103 mm) 70-0377
- Posterolateral Distal Humerus Plate, 11 Hole, LT (152 mm) 70-0378
- Posterolateral Distal Humerus Plate, 11 Hole, RT (152 mm) 70-0379

### Optional Posterolateral Distal Humerus Plates
- Posterolateral Distal Humerus Plate, 15 Hole, Left (203 mm) 70-0380
- Posterolateral Distal Humerus Plate, 15 Hole, Right (203 mm) 70-0381

### Coronoid Plates
- Coronoid Plate, Left PL-ELCOL
- Coronoid Plate, Right PL-ELCOR

### 3.5 mm Locking Hexalobe Screws
- 3.5 mm x 8 mm Locking Hexalobe Screw 30-0232
- 3.5 mm x 10 mm Locking Hexalobe Screw 30-0233
- 3.5 mm x 12 mm Locking Hexalobe Screw 30-0234
- 3.5 mm x 14 mm Locking Hexalobe Screw 30-0235
- 3.5 mm x 16 mm Locking Hexalobe Screw 30-0236
- 3.5 mm x 18 mm Locking Hexalobe Screw 30-0237
- 3.5 mm x 20 mm Locking Hexalobe Screw 30-0238
- 3.5 mm x 22 mm Locking Hexalobe Screw 30-0239
- 3.5 mm x 24 mm Locking Hexalobe Screw 30-0240
- 3.5 mm x 26 mm Locking Hexalobe Screw 30-0241
- 3.5 mm x 28 mm Locking Hexalobe Screw 30-0242
- 3.5 mm x 30 mm Locking Hexalobe Screw 30-0243
- 3.5 mm x 32 mm Locking Hexalobe Screw 30-0244
- 3.5 mm x 34 mm Locking Hexalobe Screw 30-0245
- 3.5 mm x 36 mm Locking Hexalobe Screw 30-0246
- 3.5 mm x 38 mm Locking Hexalobe Screw 30-0247
- 3.5 mm x 40 mm Locking Hexalobe Screw 30-0248
- 3.5 mm x 45 mm Locking Hexalobe Screw 30-0249
- 3.5 mm x 50 mm Locking Hexalobe Screw 30-0250
- 3.5 mm x 55 mm Locking Hexalobe Screw 30-0251
- 3.5 mm x 60 mm Locking Hexalobe Screw 30-0252
### 3.0 mm Locking Hexalobe Screws (Cont.)

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### Ordering Information
These implants are available nonsterile or sterile-packed. Add -S to product number for sterile products. To order, contact your local Acumed® Representative.

### 2.7 Locking Hexalobe Screws
- 2.7 mm x 8 mm Locking Hexalobe Screw 30-0324
- 2.7 mm x 10 mm Locking Hexalobe Screw 30-0325
- 2.7 mm x 12 mm Locking Hexalobe Screw 30-0326
- 2.7 mm x 14 mm Locking Hexalobe Screw 30-0327
- 2.7 mm x 16 mm Locking Hexalobe Screw 30-0328
- 2.7 mm x 18 mm Locking Hexalobe Screw 30-0329
- 2.7 mm x 20 mm Locking Hexalobe Screw 30-0330
- 2.7 mm x 22 mm Locking Hexalobe Screw 30-0331
- 2.7 mm x 24 mm Locking Hexalobe Screw 30-0332
- 2.7 mm x 26 mm Locking Hexalobe Screw 30-0333
- 2.7 mm x 28 mm Locking Hexalobe Screw 30-0334
- 2.7 mm x 30 mm Locking Hexalobe Screw 30-0335
- 2.7 mm x 32 mm Locking Hexalobe Screw 30-0336

### 2.7 Nonlocking Hexalobe Screws
- 2.7 mm x 8 mm Nonlocking Hexalobe Screw 30-0343
- 2.7 mm x 10 mm Nonlocking Hexalobe Screw 30-0344
- 2.7 mm x 12 mm Nonlocking Hexalobe Screw 30-0345
- 2.7 mm x 14 mm Nonlocking Hexalobe Screw 30-0346
- 2.7 mm x 16 mm Nonlocking Hexalobe Screw 30-0347
- 2.7 mm x 18 mm Nonlocking Hexalobe Screw 30-0348
- 2.7 mm x 20 mm Nonlocking Hexalobe Screw 30-0349
- 2.7 mm x 22 mm Nonlocking Hexalobe Screw 30-0350
- 2.7 mm x 24 mm Nonlocking Hexalobe Screw 30-0351
- 2.7 mm x 26 mm Nonlocking Hexalobe Screw 30-0352
- 2.7 mm x 28 mm Nonlocking Hexalobe Screw 30-0353
- 2.7 mm x 30 mm Nonlocking Hexalobe Screw 30-0354
- 2.7 mm x 32 mm Nonlocking Hexalobe Screw 30-0355

### Tension Band Pins
- 70 mm Non-Sterile Tension Band Pin 30-0098
- 90 mm Non-Sterile Tension Band Pin 30-0099

### Instrumentation
- T8 Stick-Fit Hexalobe Driver 80-0759
- T15 Stick-Fit Hexalobe Driver 80-0760
- 2.0 mm Quick Release Drill 80-0318
- 2.3 mm Quick Release Drill 80-0627
- 2.8 mm Quick Release Drill 80-0387
- 3.5 mm Quick Release Drill MS-DC35
- Bone Tap for 2.7 mm Hexalobe Screws 80-0625
- Bone Tap for 3.0 mm Nonlocking Screws 80-0626
- 3.5 mm Long Tap Tip MS-LTT35
- Plate Tap for 3.0 mm Screw 80-0659
- Plate Tap for 3.5 mm Screw 80-0661
- 2.0 mm x 9” Guide Wire, Single Trocar WS-2009ST
- .045” x 6” SS Guide Wire WS-1106ST
- .062” x 6” SS Guide Wire WS-1607ST
- .062” x 6” Titanium Guide Wire (threaded) WT-1606STT
- .035” x 6” Titanium Guide Wire (threaded) WT-0906STT
- Plate Tack PL-PTACK

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1. Data on file at Acumed®.

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