

3.5mm Locking Proximal Humeral Plate

Surgical Technique

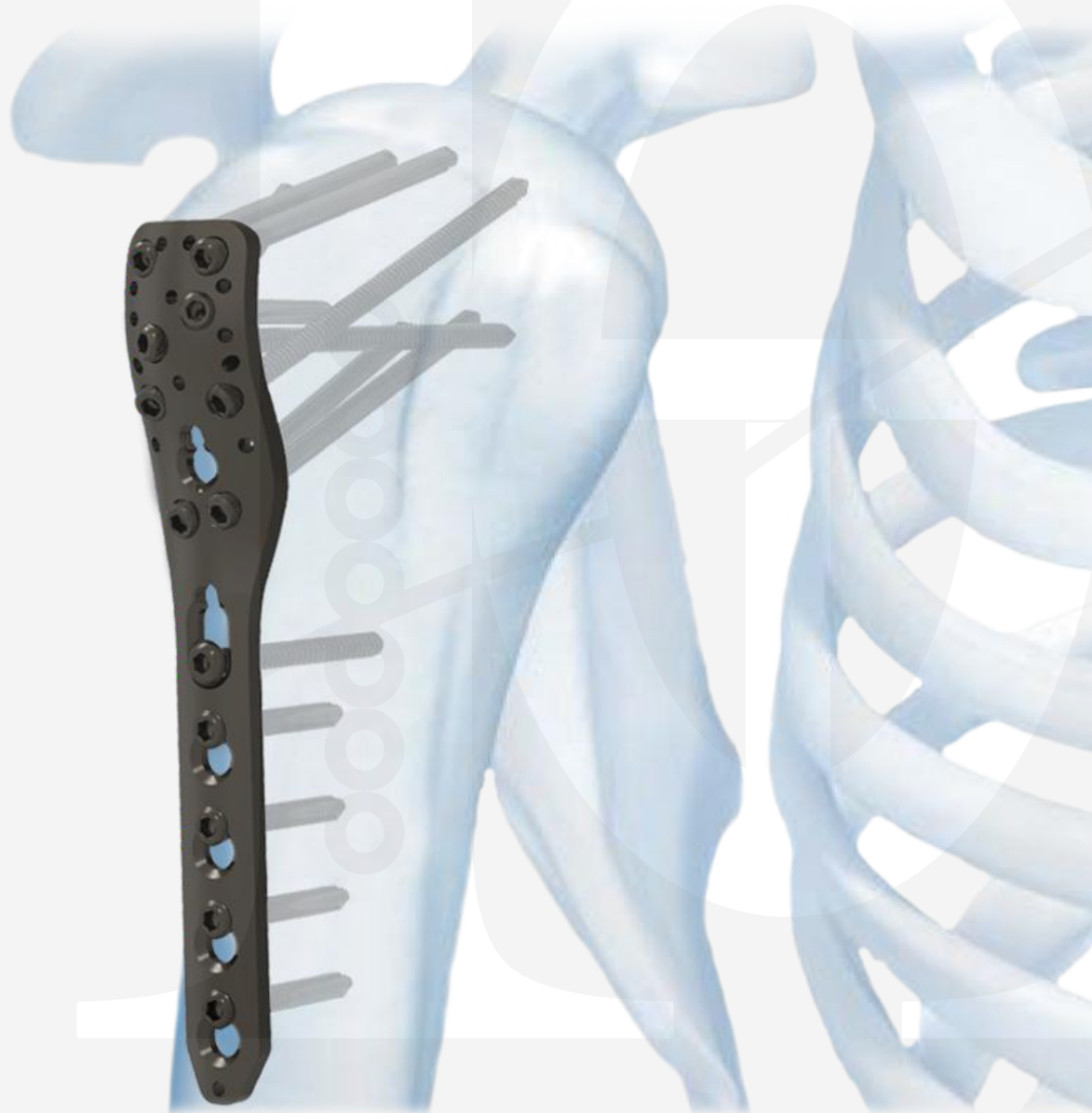


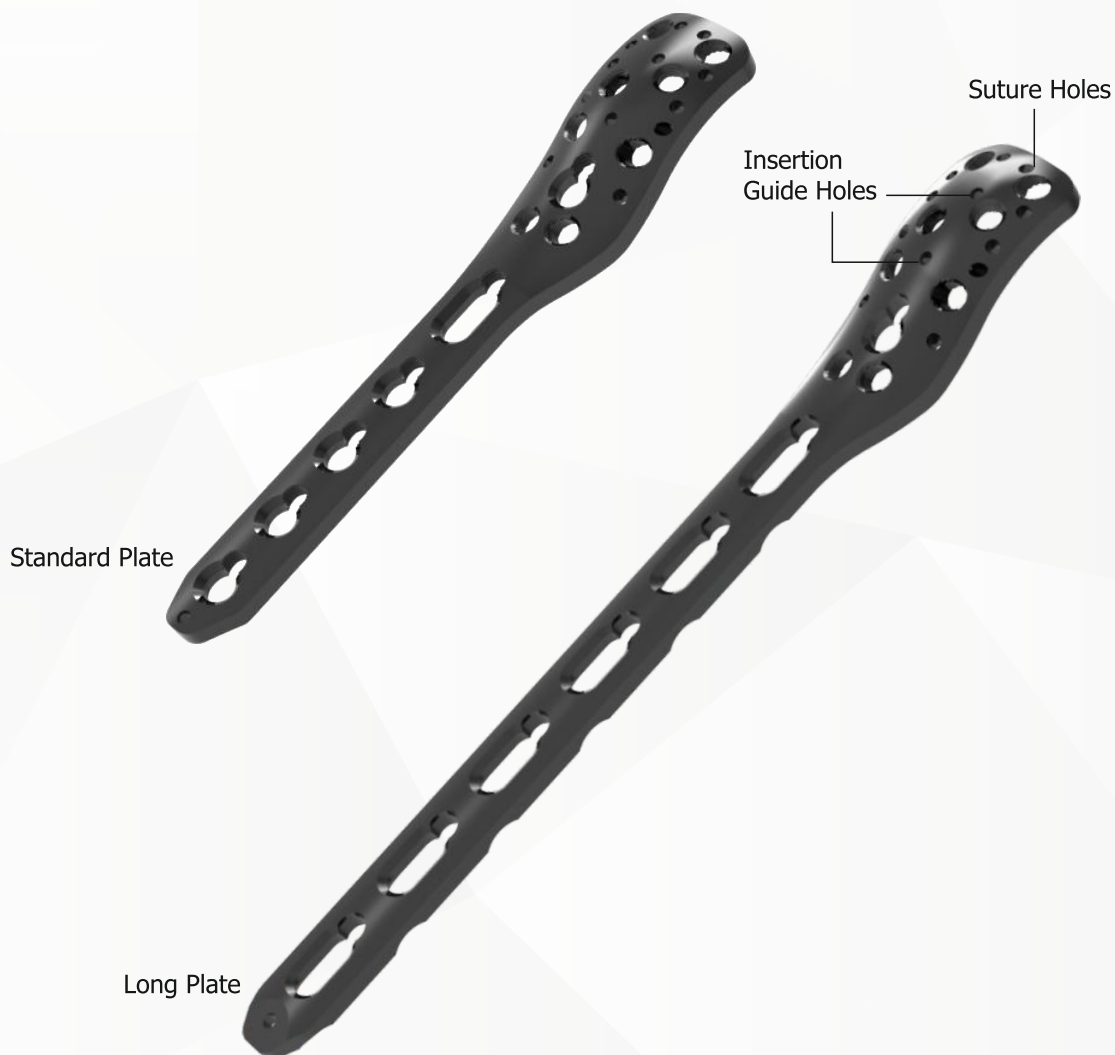
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3.5MM LOCKING PROXIMAL HUMERAL PLATES

Plate Features:

- ▶ Anatomically shaped.
- ▶ Same plate for right or left humerus.
- ▶ Locked construct humeral head (levels A-E).
- ▶ Proximal locking holes accept 3.5mm locking screws.
- ▶ Distal hole accept 3.5mm locking screw in the locking portion and 3.5mm cortex screw in the dynamic portion.
- ▶ Ten suture holes around the perimeter of the proximal end.
- ▶ Distal shaft of standard plate consists of three or five Combi holes, including one elongated hole to aid in plate positioning.
- ▶ Distal shaft of long consists of 5-12 elongated Combi holes, contains limited-contact undercuts, and is thicker for additional strenght.
- ▶ Available in stainless steel or titanium.



STANDARD TECHNIQUE SMALL FRAGMENT LCP INSTRUMENTS AND PROXIMAL HUMERAL INSTRUMENT SET



1. Preparation

Required sets

AGC.16A Small Fragment Locking Instrument and Universal Implant Set

AGC.61 Locking Proximal Humeral Plate 3.5mm Set

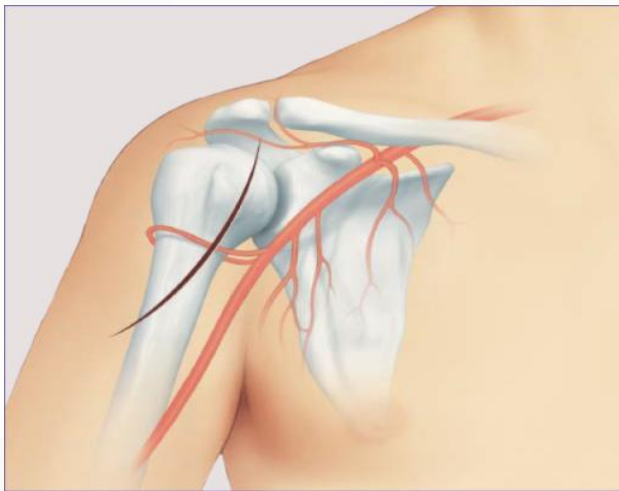
Instruments

- 601.005 Drill Bits 1.8mm x 125mm for Quick Coupling T Handle
- 601.031 Drill Bits 2.0mm x 145mm for Quick Coupling T Handle
- 601.021 Drill Bits 2.3mm x 130mm for Quick Coupling T Handle
- 601.023 Drill Bits 2.5mm x 165mm for Quick Coupling T Handle
- 601.024 Drill Bits 2.7mm x 165mm for Quick Coupling T Handle
- 601.019 Drill Bits 2.8mm x 165mm for Quick Coupling T Handle
- 603.001 Quick Coupling T Handle
- 603.027 Tap 2.7mm Cortex Screw For Quick Coupling
- 605A.024 Universal Drill And Tap Sleeve 2.4/1.8mm
- 605A.027 Universal Drill And Tap Sleeve 2.7/2.0mm
- 605A.035 Universal Drill And Tap Sleeve 3.5/2.5mm
- 606.035 Counter Sink for 3.5mm
- 607.035 DCP Drill Sleeve 3.5mm for use 2.5mm Drill
- 609.002 Depth Gauge For 3.5mm To 4.0mm Screw Length 80mm
- 609.004 Depth Gauge For 2.4mm To 2.7mm Screw Length 60mm
- 609.008 Open Measuring Device
- 610.002 Screw Forceps Self Holding
- 612.011 Quick Coupling Stright Handle
- 614.025 Shaft Small Hexagonal Screw Driver 2.5mm Tip
- 616.013 Universal Plate Bender
- 617.001 Sharp Hook
- 619.035 Screw Remover With Quick coupling 2.5mm Hex
- 655.006 Bone Curette Small 4mm x 6mm
- 660.010 Triple Drill Guide 2.0mm with 3hole Opposite side 1hole
- 660.013 K Wire Bender Iron
- 660.014 Universal Wire Cutter/Bender/Pilers
- 687.144 Self-centering Bone Holding Forceps Length 144mm
- 687.191 Self-centering Bone Holding Forceps Length 191mm
- 688.146 Reduction Forceps Serrated jaws Length 146mm
- 689.126 Reduction Forceps With Points Length 126mm
- 689.140 Reduction Forceps With Points Length 140mm
- 689.205 Reduction Forceps With Points Length 205mm
- 706.008 Retractor 8mm wide
- 706.015 Retractor 15mm wide
- 711.001 Periosteal Elevator Curved Blade 6mm wide
- 733.020 LCP Drill Sleeve For variable angle plate 2.4mm, For Drill Bits 1.8mm
- 733.021 Outer Sleeve 6.0/5.0 for Plate
- 733.022 Drill Sleeve 2.8mm
- 733.023 Sleeve for K Wire 1.6mm
- 733.024 LCP Drill Sleeve 2.4mm, For Drill Bits 1.8mm
- 733.027 LCP Drill Sleeve 2.7mm, For Drill Bits 2.3mm
- 733.035 LCP Drill Sleeve 3.5mm, For Drill Bits 2.8mm
- 734.024 Tap 2.4mm Locking Screw For Quick Coupling
- 734.027 Tap 2.7mm Locking Screw For Quick Coupling
- 734.035 Tap 3.5mm Locking Screw For Quick Coupling
- 735.06 Torque Limit Adapter 0.8 Nm
- 735.07 Torque Limit Adapter 1.5 Nm
- 738.035 LCP Plate Holder 3.5mm Length 100mm
- 603A.035 Tap 3.5mm x 110mm for Quick Coupling
- 603A.040 Tap 4.0mm x 110mm for Quick Coupling
- 612A.025 Screw Driver for Holding Sleeve
- 613A.025 Holding Sleeve for Locking screws 3.5/4.0mm
- 613B.025 Holding Sleeve for Non Locking screws 3.5/4.0mm
- 614.T08 Shaft for Star Screw Driver T08 Tip for 2.4/2.7mm screws
- 614.T15 Shaft for Star Screw Driver T15 Tip for 3.5/4.0mm screws
- 614.020 Shaft for Hexagonal Screw Driver 2.0mm Tip for 2.4/2.7mm screws
- 616A.002 Bending Iron Small for Plates 2.7 and 3.5mm
- 616B.002 Bending Iron Small for Plates 2.7 and 3.5mm
- 805.007 4mm Tommy Bar
- 328B.15 K Wire (Double Side Trocar Tip) 1.5mm x 150mm
- 328B.18 K Wire (Double Side Trocar Tip) 1.8mm x 150mm
- 328B.20 K Wire (Double Side Trocar Tip) 2.0mm x 150mm
- 613C.027 Holding Sleeve for Locking screws 2.4/2.7mm
- 613D.027 Holding Sleeve for Non Locking screws 2.7mm



2. Patient position

A beach-chair position is recommended to provide easy access to the shoulder with imaging equipment.



3. Approach

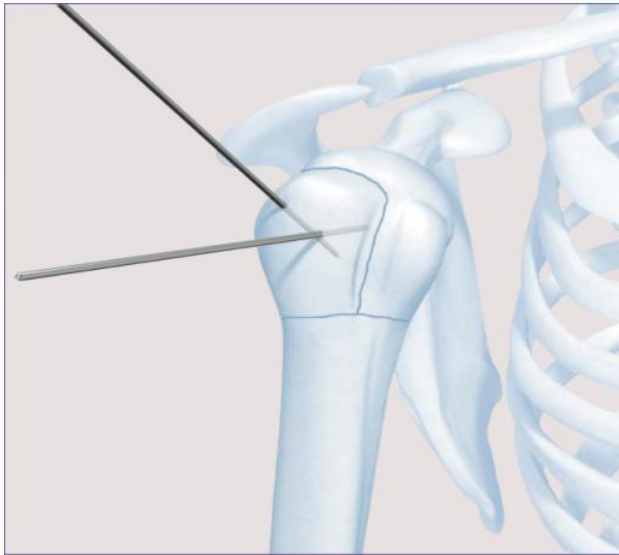
The standard surgical approach for internal fixation of proximal humerus fractures is the interval between the deltoid and pectoral muscles proximally. The skin incision starts from the coracoid process and is slightly convex toward the medial side, extending distally as far as the insertion of the deltoid muscle on the lateral humeral shaft.

For long plates, the incision may be extended as an anterior approach to the humeral shaft, which proceeds distally between the biceps and the brachialis, and then down the anterolateral aspect of the arm to just above elbow flexion crease.

During the dissection, care should be taken to avoid damaging the vasculature of the bone fragments. Care should also be taken to avoid ligation or coagulation of the anterior circumflex humeral artery. This can normally be assured by keeping all dissection lateral to the intertubercular groove.

Warnings:

- ▶ Do not injure the axillary nerve. The axillary nerve can be palpated at the lower margin of the incision.
- ▶ To avoid damaging the axillary nerve, do not split the deltoid more than 4 cm distal to its origin.



4. Reduce fracture

Instrument

328 K Wire (Double Side Trocar Tip) 150mm

Reduce the fracture fragments and confirm the reduction under image intensification.

The humeral head and tuberosity fragments may be manipulated and provisionally fixed with sutures and K wires. However, K wires should be placed where they will not interfere with plate application.

Note:

The locking screws do not provide any compression for a lag screw effect. Therefore, humeral head fragments must be reduced, and any desired inter fragmentary compression must be obtained prior to applying the 3.5mm LCP Proximal Humerus Plate with locking screws.

Optional technique:

tension band with sutures The stability of the construct can be increased with the insertion of sutures. Use sutures attached to the tuberosity fragments to manipulate them until provisional fixation is obtained. The sutures can later be attached to the plate by passing them through the suture holes with undercuts.

Note:

If the insertion guide is attached to the plate while passing the sutures, remove the insertion guide so that the sutures can be attached to the plate.



Insertion guide: top view (left) and bottom view (right).

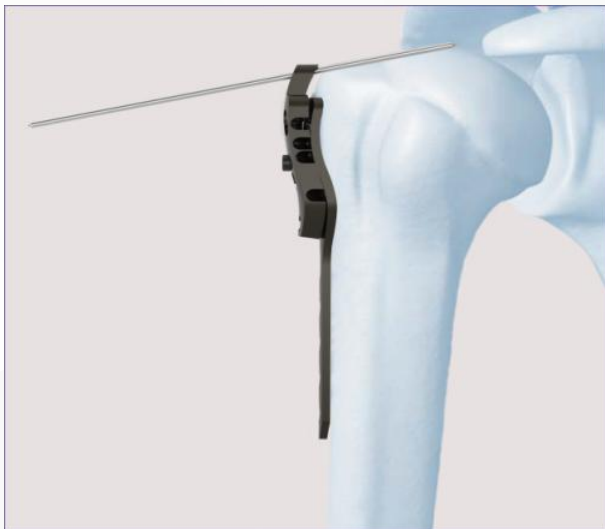
5. Attach insertion guide to plate

Instruments

- | | |
|---------|--|
| 733.018 | Block For Locking Long Head Proximal Humeral Plate 3.5mm |
| 613.025 | Small Hexagonal Screw Driver With Holding Sleeve 2.5mm Tip |

To facilitate insertion of the proximal locking screws, plate the insertion guide against the plate and tighten the guide's attachment screw with the small hexagonal screwdriver, to lock the guide against the plate.





6. Position plate on bone

Instruments

733.021	Outer Sleeve 6.0/5.0 for Plate
733.022	Drill Sleeve 2.8mm
733.023	Sleeve for K Wire 1.6mm
328	K Wire (Double Side Trocar Tip) 150mm

Positioning from AP view

The plate should be placed approximately 8mm distal to the rotator cuff attachment on the upper edge of the greater tuberosity.

Determine plate position by placing a 1.6mm K-wire through the proximal guide hole of the insertion guide so that the K-wire rests on top of the humeral head and aims at the proximal joint surface.

Precaution:

Placing the plate too high increases the risk of subacromial impingement. Placing the plate too low can prevent the optimal distribution of screws in the humeral head.

Warnings:

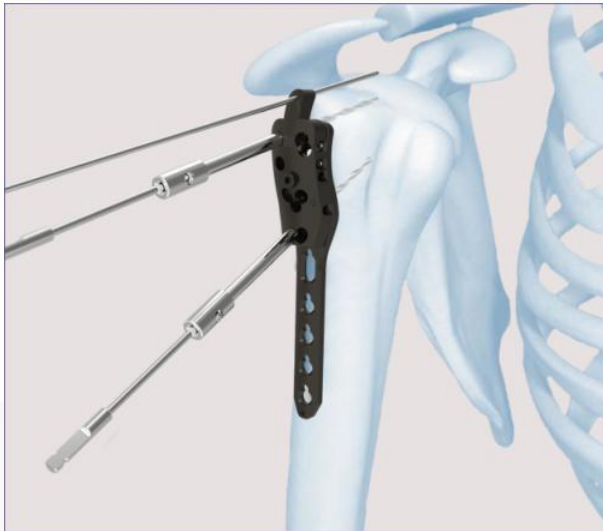
- ▶ Do not injure the axillary nerve. The axillary nerve can be palpated at the lower margin of the incision.
- ▶ To avoid damaging the axillary nerve, do not split the deltoid more than 4 cm distal to its origin.



Positioning from a lateral view

The plate should be centered against the lateral aspect of the greater tuberosity, ensuring that a sufficient gap is maintained between the plate and the long biceps tendon (to avoid interfering with arterial blood supply).

To check final placement of the plate, 1.6mm K-wire and two sleeve assemblies can be used: one in the hole for the most proximal screw and one in the hole for the most distal screw to be placed in the humeral head. If possible, the distal K-wire should be positioned approximately 5mm above the calcar.

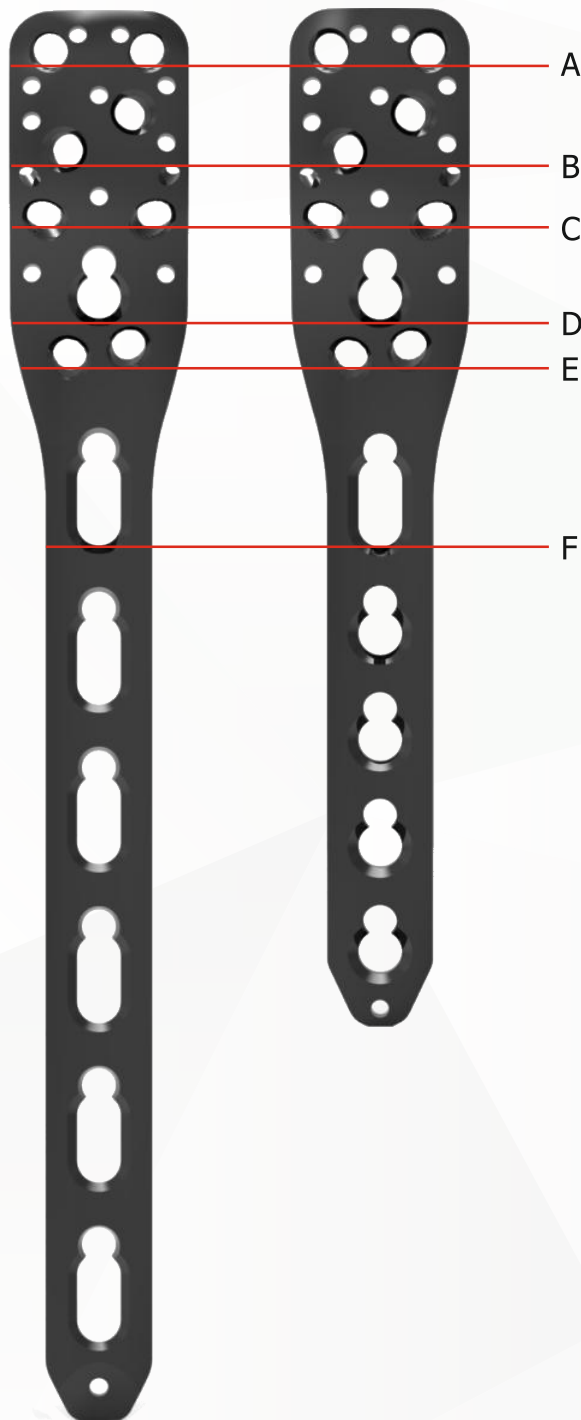


Additional considerations for long plates

The additional length of the long plates will usually require a plan for handling the deltoid insertion distally. Depending on the length of the plate used, a slightly anterior placement of the distal shaft, contouring of the plate shaft to wrap anteriorly around the humerus, or partial elevation of the deltoid insertion may be required.

Precaution:

To maintain proper alignment between the insertion guide and the plate, intraoperative bending of the proximal portion of the plate is not recommended.



7. Insert Screws

Determine the combination of screws to be used for fixation. If a combination of locking and cortex screws will be used, cortex screws should be inserted first to pull the plate to the bone.

The placement of the initial screw will depend on the fracture type and the reduction achieved. There are two options for the order of screw insertion.

Option 1

Insertion of a proximal screw first

This technique permits fixation of the proximal fragments first and then fixation with or without compression distally.

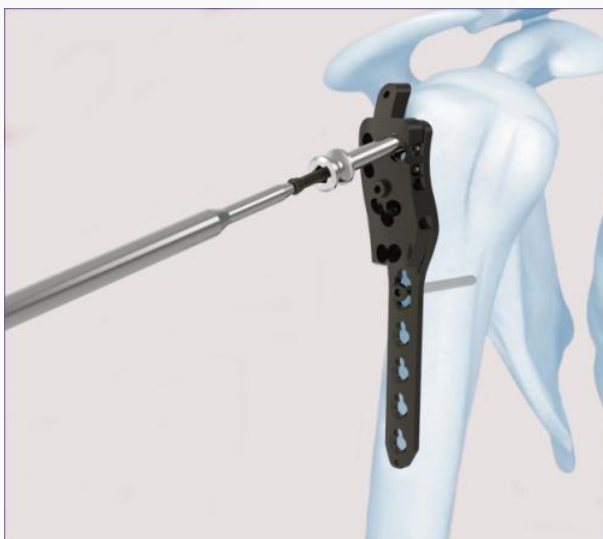
It is necessary to control the height of the plate in the AP view under image intensification before insertion of the screws.

Option 2

Insertion of a distal screw first

This technique permits reduction of the distal shaft fragment against the plate and a final height adjustment prior to the insertion of the other screws in the shaft.

Insert a standard cortex screw into the compression portion of hole F (elongated hole) of the standard plate, or in any of the elongated holes of a long plate. After making a final height adjustment, insert proximal locking screws.



Proximal locking screws in osteoporotic bone

The following technique is recommended for measuring screw length in osteoporotic bone. If normal bone is present.

Instruments

- | | |
|----------|--|
| 601.037 | Drill Bits 2.8mm x 160mm for Quick Coupling T Handle |
| 733.021 | Outer Sleeve 6.0/5.0 for Plate |
| 733.018 | Block For Locking Long Head Proximal Humeral Plate 3.5mm |
| 612A.025 | Screw Driver for Holding Sleeve 2.5mm Tip |
| 614.T15 | Shaft for Star Screw Driver T15 Tip for 3.5/4.0mm screws |
| 735.07 | Torque Limit Adapter 1.5 Nm |

Insert the outer sleeve for insertion guide into the insertion guide with nose.

Predrill the lateral cortex using the 2.8mm drill bit with stop.

Warnings:

- ▶ In porotic bone, only drill the lateral cortex.
- ▶ Do not drill through the joint surface.
- ▶ Do not insert overly long screws in order to prevent primary or secondary screw penetration.

Insert screws

Use the Star Drive Screwdriver to insert the appropriate length locking screw through the outer sleeve for insertion guide.

Warnings:

Locking screws should be inserted under power using the torque limiting attachment. The audible click will notify the surgeon that the maximum torque value has been reached and that power insertion is complete.



Distal locking screw

Instruments

733.035 LCP Drill Sleeve 3.5mm, For Drill Bits 2.8mm

For proper drilling of the shaft holes, the 2.8mm threaded drill guide must be used.

Thread the drill guide into the threaded part of the shaft hole.

Drill with the 2.8mm drill bit and remove the drill guide.

Measure screw length with the depth gauge.

Note:

For more stable fixation, insertion of the locking screw through both cortices is recommended.

Distal standard screw

For nonlocking screws, use the standard AO screw insertion technique.

Warnings:

Do not insert overly long screws in order to prevent primary or secondary screw penetration.

Note:

If a combination of cortex and locking screws is used, cortex screws must be inserted first to pull the plate to the bone.



4.0mm Cancellous Bone Screws

Found in the Small Fragment LCP Set

- ▶ Compress the plate to the bone or create axial compression
- ▶ Fully or partially threaded shaft



3.5mm Locking Screws

Found in the Small Fragment LCP Set

- ▶ Used in the locking portion of the Combi holes or in round locking holes
- ▶ Create a locked, fixed-angle screw/plate construct
- ▶ Self-tapping tip
- ▶ Stainless steel and titanium

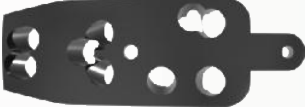


3.5mm Cortex Screws

Found in the Small Fragment LCP Set

- ▶ May be used in the DCU portion of the Combi holes
- ▶ Compress the plate to the bone or create axial compression

Instruments

329B 1.6mm Kirschner Wire with Thread, 150mm	613.035 Holding Screw Driver
	
609.002 Depth Gauge For 3.5mm To 4.0mm Screw Length 80mm	609.008 Open Measuring Device
	
733.018 Block For Locking Long Head Proximal Humeral Plate 3.5mm	601.037 Drill Bits 2.8mm x 160mm For Quick Coupling
	
733.023 Sleeve for K Wire 1.6mm	733.022 Drill Sleeve 2.8mm
	
733.021 Outer Sleeve 6.0/5.0 for Plate	733.035 LCP Drill Sleeve 3.5mm, For Drill Bits 2.8mm
	



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