Auxein

Surgical Technique

3.5mm Wise-Lock Periarticular Proximal Humerus plate

3.5 mm Wise-Lock Periarticular Proximal Humerus Plate. Part of the Auxein Locking Compression Plate (Wise-Lock) System.

The 3.5 mm Wise-Lock Periarticular Proximal Humerus Plates feature locking screw technology combined with conventional plating techniques.

The plates feature Combi holes that allow fixation with either locking screws in the threaded section for angular stability or cortex screws in the dynamic compression unit (DCU) section for compression.

A fixed angle construct provides advantages in osteopenic bone where screws do not rely on bone to plate compression to resist patient load, but function similarly to multiple, small angled blade plates.

Features

– Plate head sits approximately 15 mm distal to rotator cuff to avoid acromial impingement
– Plate shaft sits slightly anterior to reduce need for deltoid elevation
– Posterior sweep of head buttresses greater tuberosity
– Anatomically contoured left and right plates, available in 2 to 14 holes
– Available in stainless steel or titanium

Indications

Auxein 3.5 mm Periarticular Proximal Humerus Plates are indicated for fractures, fracture dislocations, osteotomies, and nonunions of the proximal humerus, particularly in osteopenic bone.

Position patient

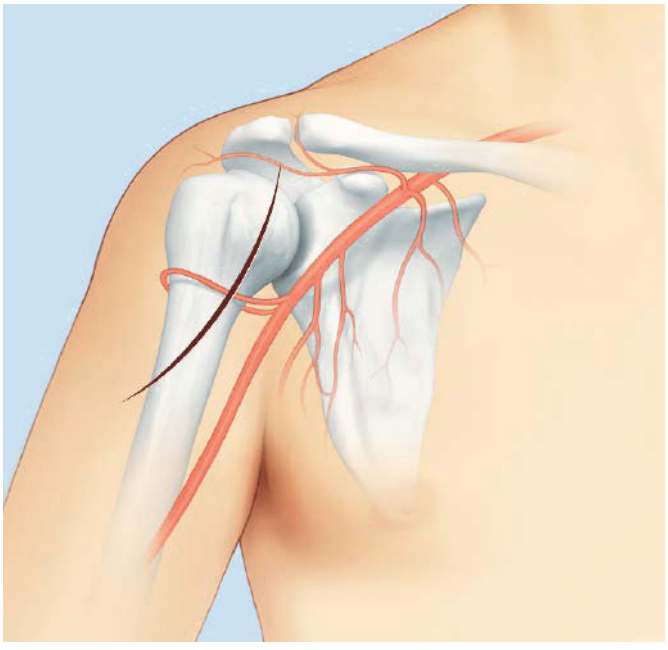
A beach-chair position is recommended to provide easy access to the shoulder with imaging equipment.

Approach

The standard surgical approach for internal fixation of proximal humerus fractures is the interval between the deltoid and pectoral muscles. 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, proceeding distally between the biceps and the brachialis, and then down the anterolateral aspect of the arm to just above the elbow flexion crease.

During the dissection, avoid damaging the vasculature of the bone fragments. Avoid ligation or coagulation of the anterior circumflex humeral artery. This can normally be ensured by keeping all dissection lateral to the intertubercular groove.

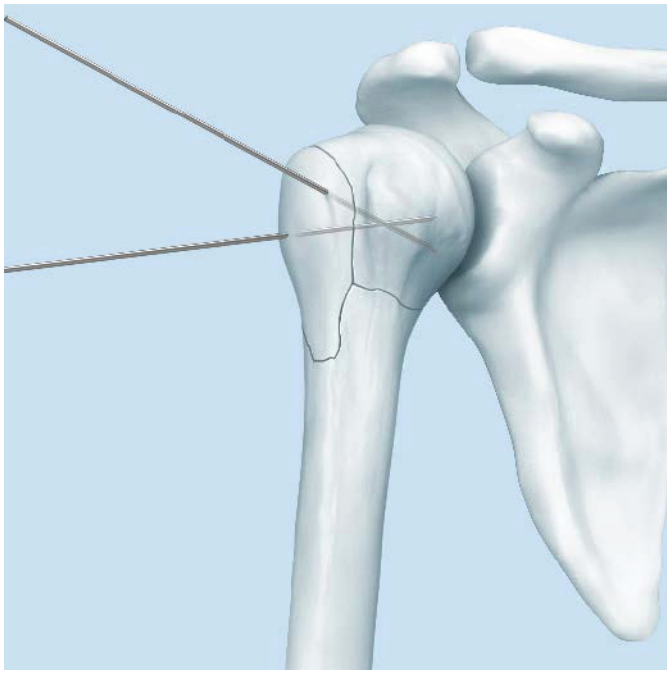


Warnings:
Do not injure the axillary nerve. The axillary nerve can be palpated at the lower margin of the incision.

To avoid damaging the axillary nerve, do not split the deltoid more than 4 cm distal to its origin.

Surgical Technique

Reduce fracture



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/or Kirschner wires. When using K-wires, place where they will not interfere with plate application.

Note: Locking screws do not provide any compression for a lag screw effect. Therefore, humeral head fragments must be reduced, and any desired interfragment compression obtained before applying the 3.5 mm Wise-Lock Periarticular Proximal Humerus Plate with locking screws.

Attach insertion guide to plate

To facilitate insertion of the proximal locking screws, place 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.

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

Position plate on bone

Positioning from AP view
The superior edge of the plate should be placed approximately 15 mm distal to the insertion of the rotator cuff.

Position the plate low enough to allow locking screws in the two distal head holes to be placed into the calcar of the proximal humerus. To avoid subacromial impingement, do not place the plate too high.

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.

Positioning from lateral view
Position the plate's anterior edge immediately lateral to the bicipital groove.

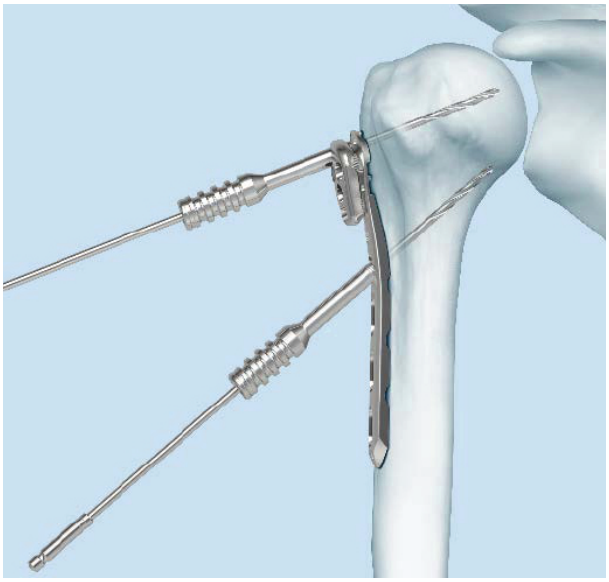
To check final placement of the plate, use a 2.8 mm threaded drill guide and 2.8 mm drill bit in the most proximal and the most distal (into the calcar) screw hole in the head of the plate.

Additional consideration for long plates
The additional length of long plates will usually require a plan for handling the deltoid insertion.

Warnings:
Do not penetrate the joint surface with the Kirschner wires.

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.



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.

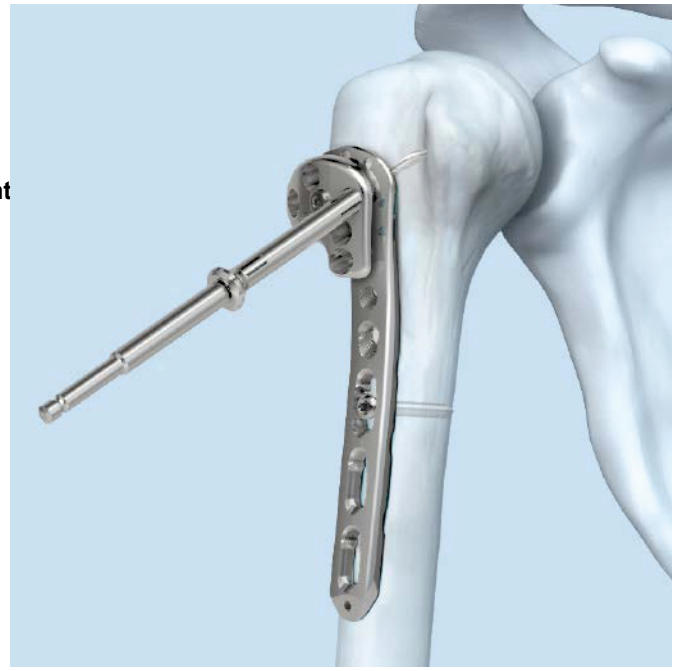
Insert a locking screw in one of the two neck holes in the head of the plate. Control the height of the plate in the AP view under image intensification before insertion of the screw.

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 in any of the elongated holes in the shaft of the plate. After making a final height adjustment, insert proximal locking screws.

Insert screws in plate head

Proximal locking screws in osteoporotic bone
The following technique is recommended for measuring screw length in osteoporotic bone. If normal bone is present use the alternative technique on page 14.



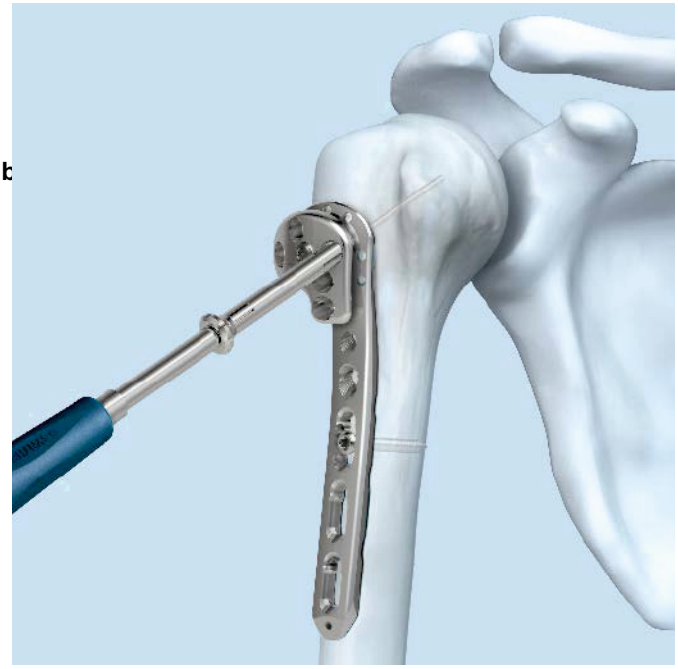
Insert the outer sleeve for insertion guide into the insertion guide with nose.

Precaution: Do not push the depth probe through the joint surface. Do not hammer on the length probe.

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

Warning: In porotic bone, only drill the lateral cortex.

Insert the depth probe through the outer sleeve. Stop when increased resistance from the subchondral bone is felt. Read the required screw length on the length probe.



Note: The depth probe tip should come as close as possib
to the subchondral bone, approximately 5 mm – 8 mm from the joint surface. Since it may not always be possible to feel the resistance from the subchondral bone, and the depth probe represents the final position of the locking screw, the use of image intensification is recommended.

Warning:
Do not push the depth probe through the joint surface.

Use the StarDrive™ 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.

Ensure that locking screws are not cross threaded in plate holes.

Technique tip: Inserting screws through outer sleeve helps
to direct the screw in correct orientation and reduces the likelihood of cross threading.

Proximal locking screws in normal bone
The following technique is recommended for measuring screw length in normal bone.

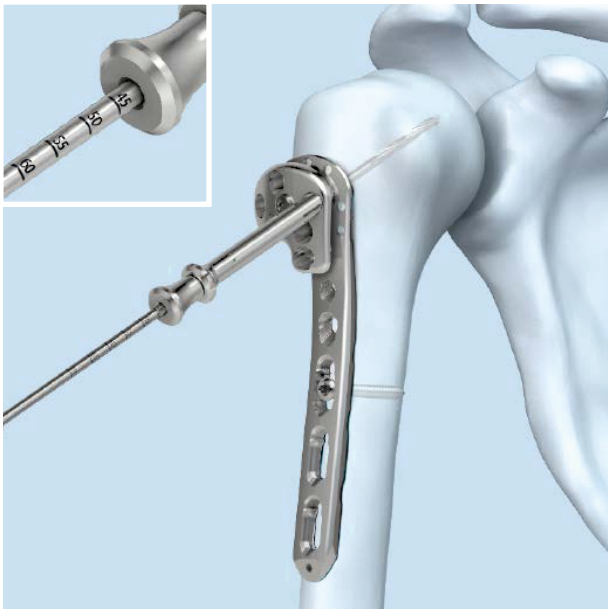
Insert the outer sleeve and 2.8 mm drill sleeve into the insertion guide with nose.

Using the 2.8 mm calibrated drill bit through the 2.8 mm drill sleeve, drill to the desired depth in the bone.

Read the measurement directly from the calibrated drill bit.

Note: The drill bit tip should come as close as possible to the subchondral bone, approximately 5 mm – 8 mm from the joint surface. Since it may not always be possible to feel the resistance from the subchondral bone, and the drill bit represents the final position of the locking screw, the use of image intensification is recommended.

Warning: Do not push the drill bit through the joint surface.



Remove the 2.8 mm drill sleeve. Use the StarDrive 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.

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

Precaution: When selecting the appropriate screw length, the possibility of bone resorption at the fracture site must be taken into account. Ensure that the screw tip is at sufficient distance from the joint surface. Check that the plate supports the lateral aspect of the greater tuberosity.

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

Alternative technique: Proximal locking screws in normal bone

Insert a 2.8 mm threaded drill guide into a hole in the head of the plate.

Using the 2.8 mm calibrated drill bit through the 2.8 mm threaded drill guide, drill to the desired depth in the bone.

Read the measurement directly from the calibrated drill bit.

Note: The drill bit tip should come as close as possible to the subchondral bone, approximately 5 mm – 8 mm from the joint surface. Since it may not always be possible to feel the resistance from the subchondral bone, and the drill bit represents the final position of the locking screw, the use of image intensification is recommended.

Warning: Do not push the drill bit through the joint surface.

Remove the 2.8 mm threaded drill guide.

Use the StarDrive Screwdriver to insert the appropriate length locking screw

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Warning: 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

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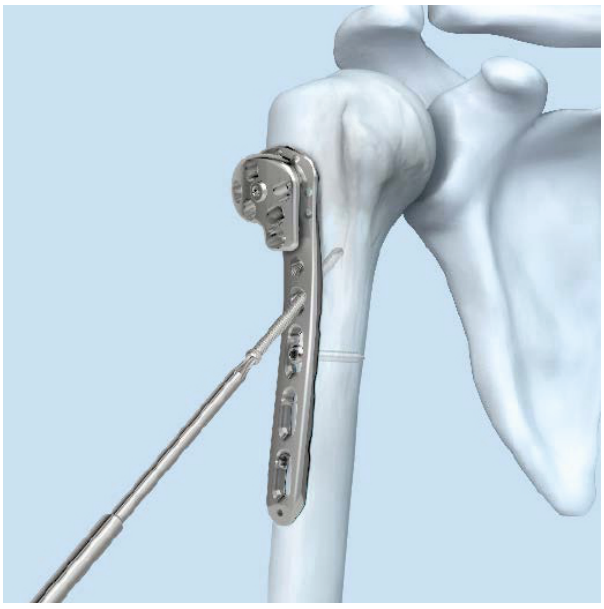


Insert screws in plate shaft

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

Thread the drill guide into the threaded portion of the elongated shaft hole.

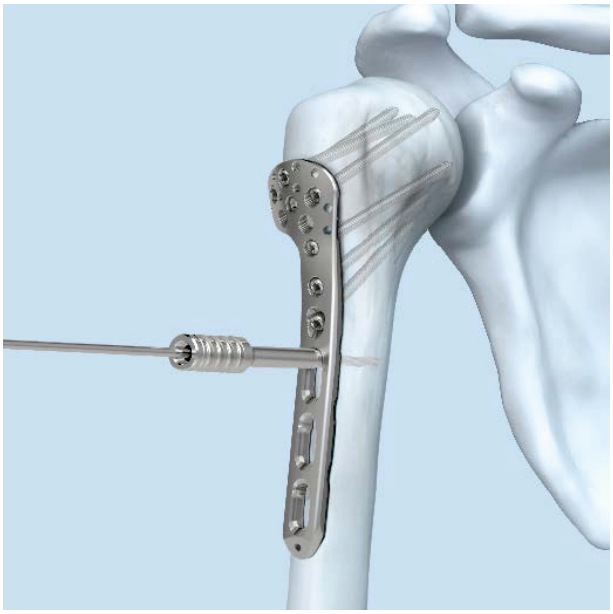
Drill with the 2.8 mm drill bit and read the measurement directly from the calibrated drill bit.

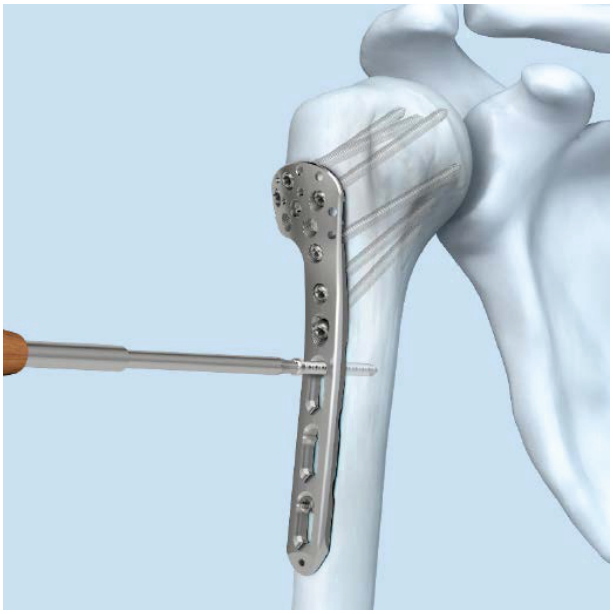
Remove the drill guide and insert the appropriate screw, using the torque limiting attachment (TLA) and the StarDrive Screwdriver shaft.

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

Always use the StarDrive Screwdriver shaft with a TLA.

Use the standard AO screw insertion technique to insert a 3.5 mm cortex screw in the DCU portion of the Combi hole.

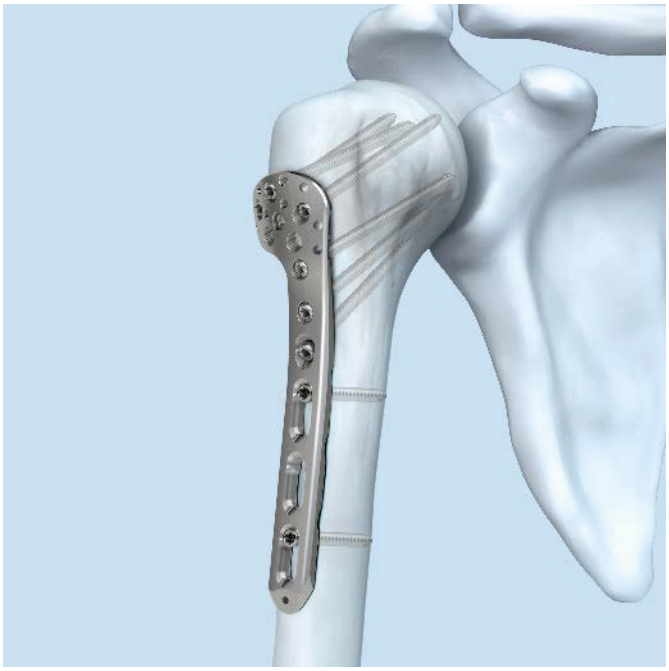




Confirm screw placement and suture stability

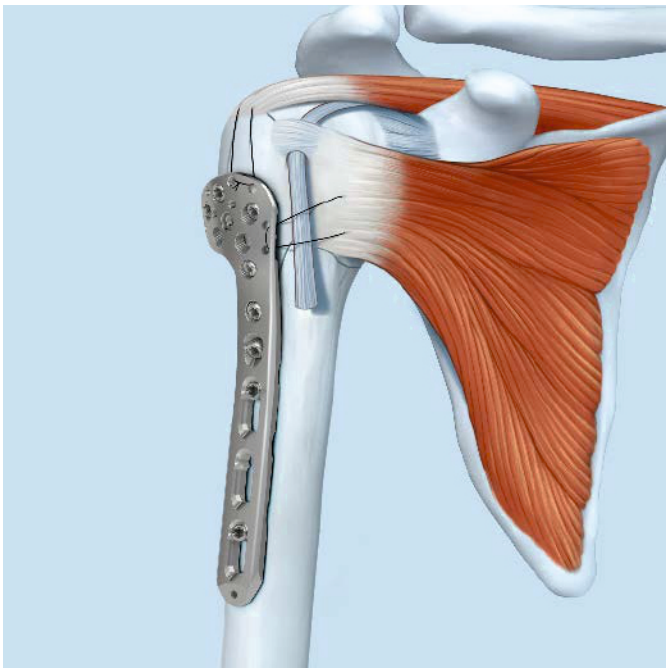
Before closing the incision, check the screw placement and the stability of the suture fixation. Check the screws, using image intensification, for control of the full range of glenohumeral motion and to ensure that the screws do not penetrate the articular surface.

Check the sutures to ensure that they are tightened to create a tension band and that the sutures do not rupture during motion.



Precautions:
It is important to check the screw placement in all planes as their angulation and direction may be difficult to visualize.

The plate should be secured with at least 4 proximal screws whereas in poor bone stock multiple fixation points using more screws is recommended.



Precaution: Remove the aiming device from the plate before closing the wound.

Implant Removal

Implant removal

To remove locking screws, first unlock all screws from the plate and then remove the screws completely from the bone. This will prevent rotation of the plate when removing the last locking screw.

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