Arthrex®

Percutaneous Pinning

Percutaneous Humeral Fracture Repair

Surgical Technique

Percutaneous Humeral Fracture Repair

Closed reduction followed by percutaneous fixation reduces risk from soft tissue dissection and may reduce the fracture indirectly, achieving provisional fixation for anatomic healing. This technique requires meticulous attention to detail and teamwork among the surgeon, surgical assistants, nursing staff, and anesthesia staff.[3]

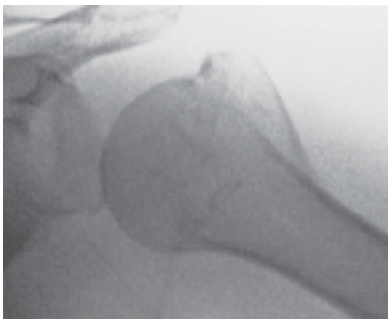
The specific indications for closed reduction and percutaneous pinning include proximal humerus fractures without significant comminution in patients with good quality bone who are willing to comply with the postoperative care plan.[3] Percutaneous treatment of selected proximal humeral fractures results in predictable union and good clinical results with a low rate of complications.[4]

Setup and Patient Positioning

Patients are positioned in a beach chair sitting position, with the arm draped free. Prior to draping, the fluoroscope should be positioned in a manner which allows orthogonal intraoperative fluoroscopic assessment of the fracture reduction and pin placement, including AP, Scapular Lateral, and Axillary Lateral views.

Once positioned, the affected arm is draped free, with the osseous landmarks marked on the skin surface. In most two, three and valgus-impacted four-part fractures the standard portals will include an anterolateral reduction portal, distal pin portals, and accessory high tuberosity reduction portals. The initial reduction portal is placed 2 cm distal to the anterolateral acromion. Distal pin portals are placed between 6-7 cm distal to the reduction portal, to allow for percutaneous 2.8 mm pin placement in a retrograde fashion from the humeral shaft into the humeral head. Care should be taken to keep these portals away from the course of the axillary nerve, typically found approximately 5 cm distal to the acromial edge.

In three and four-part fractures with greater tuberosity displacement requiring fixation, a high lateral portal, along the acromial margin is also often necessary to achieve screw fixation of the tuberosity into the head or anteromedial humeral calcar. Additional anteromedial portals may be necessary for displaced lesser tuberosity fragments.

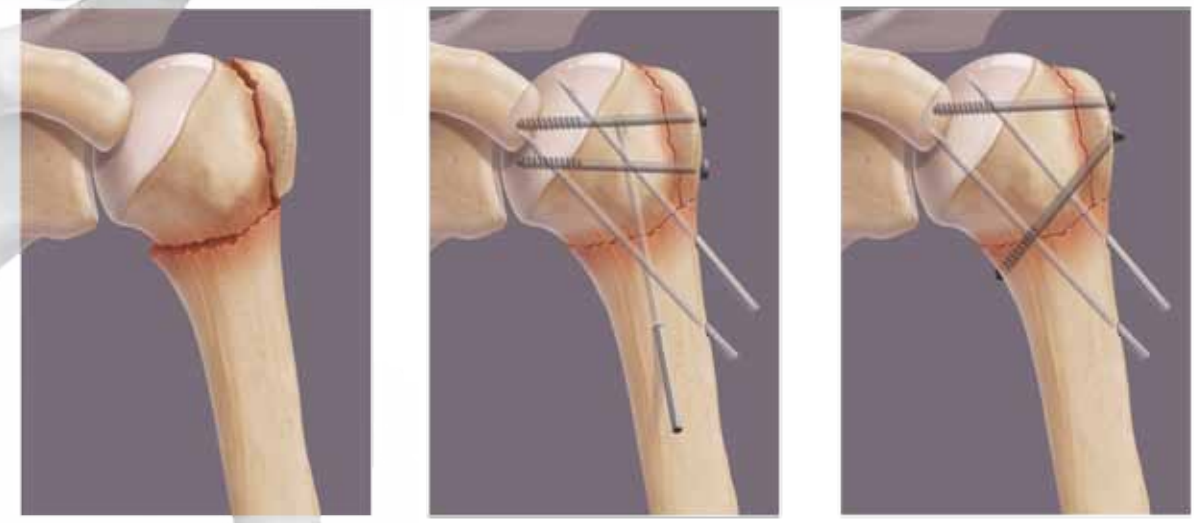


Pre-op

Displaced Two-Part Surgical Neck Fracture

The displaced two-part surgical neck fracture is an ideal indication assuming it can be reduced with closed manipulation. Apply longitudinal traction with the arm in minimal abduction and some flexion to reduce both displacement and angulation between the shaft and the humeral head fragments.[3] Once the fracture has been reduced, two 2.8 mm Terminally Threaded Pins are inserted through a small stab incision from inferior and lateral up into the articular fragment. A third 2.8 mm Terminally Threaded Pin is placed from a more anterior stab incision from inferior into the humeral head.[1,3]

Three and Four-Part Valgus Impacted Humeral Fracture

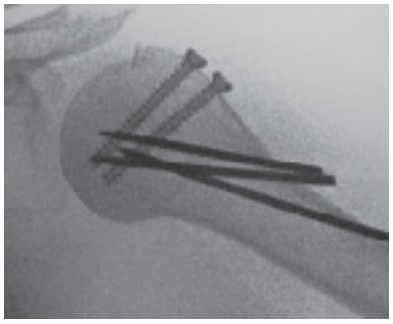


Valgus impacted three and four-part fractures are ideal for percutaneous repair as they have little or no medial displacement, preserving the medial periosteal hinge that allows sufficient blood supply to maintain the viability of the articular surface.[2] Percutaneous reduction is easily accomplished in acute fractures to allow fixation with 2.8 mm pins and 4.5 mm cannulated screws.[1]

A Tamp or Cobb Elevator is placed under the head to restore alignment and retroversion to the articular fragment. Extension and posterior translation of the arm will help reduce the shaft to the head. The tuberosities are often anatomically reduced with alignment of the articular fragment. The shaft and articular fragment are fixated using two to three 2.8 mm Terminally Threaded Pins inserted distal to proximal. The greater tuberosity is then reduced using a Curved Curette or a chondral pick and cannulated screw guide pins are placed. Two divergent screws are inserted to secure the tuberosity in place. If reduction of the displaced lesser tuberosity is required, fixation can be achieved using cannulated screws.

Final Assessment

After anatomic reduction and fixation with pins/cannulated screws, final orthogonal fluoroscopic views are obtained to insure no articular penetration is present, and confirm fixation. 2.8 mm pins are then cut as deep as possible under the skin.



Post-op

Postoperative Management

Postoperatively, the arm is placed in a sling. Formal therapy does not begin until the 2.8 mm pins are removed from the shaft, typically around 3-4 weeks postoperatively. Surgeon directed therapy is then started to regain motion as fracture healing occurs.

References cited and for more information:

1. Iannotti JP, Ramsey ML, Williams GR Jr, Warner JJP, Nonprosthetic Management of Proximal Humeral Fractures, *Journal of Bone and Joint Surgery, American Volume*, 85:1578-1593, 2003.

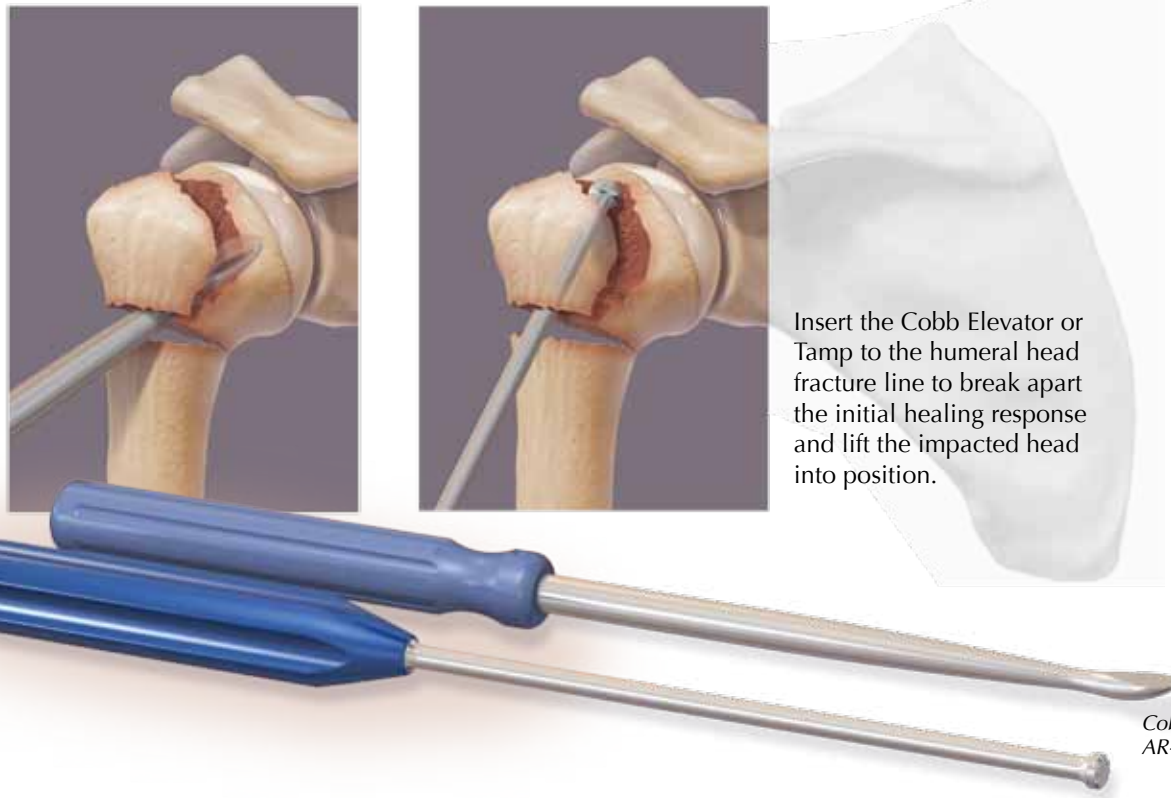
2. Braman JP, Flatow EL, How to Transition to Percutaneous Pinning for Proximal Humerus Fractures, *Techniques in Shoulder & Elbow Surgery*, 6(3):171-177, Sept 2005.

3. Millett PJ, Warner JJP, Percutaneous Treatment of Proximal Humerus Fractures, Monograph Series 30, Ed. Michael A. Wirth, MD., Proximal Humerus Fractures, *American Academy of Orthopaedic Surgeons*,Rosemont, IL. Chapter 2, pp. 15-26, 2005.

4. Keener JD, Parsons BO, Flatow EL, Rogers K, William GR, Galatz LM, Outcomes After Percutaneous Reduction and Fixation of Proximal Humeral Fractures, *Journal of Shoulder and Elbow Surgery*, 16:330-338, 2007.

Percutaneous Fracture Reduction

Position Humeral Head out of Valgus

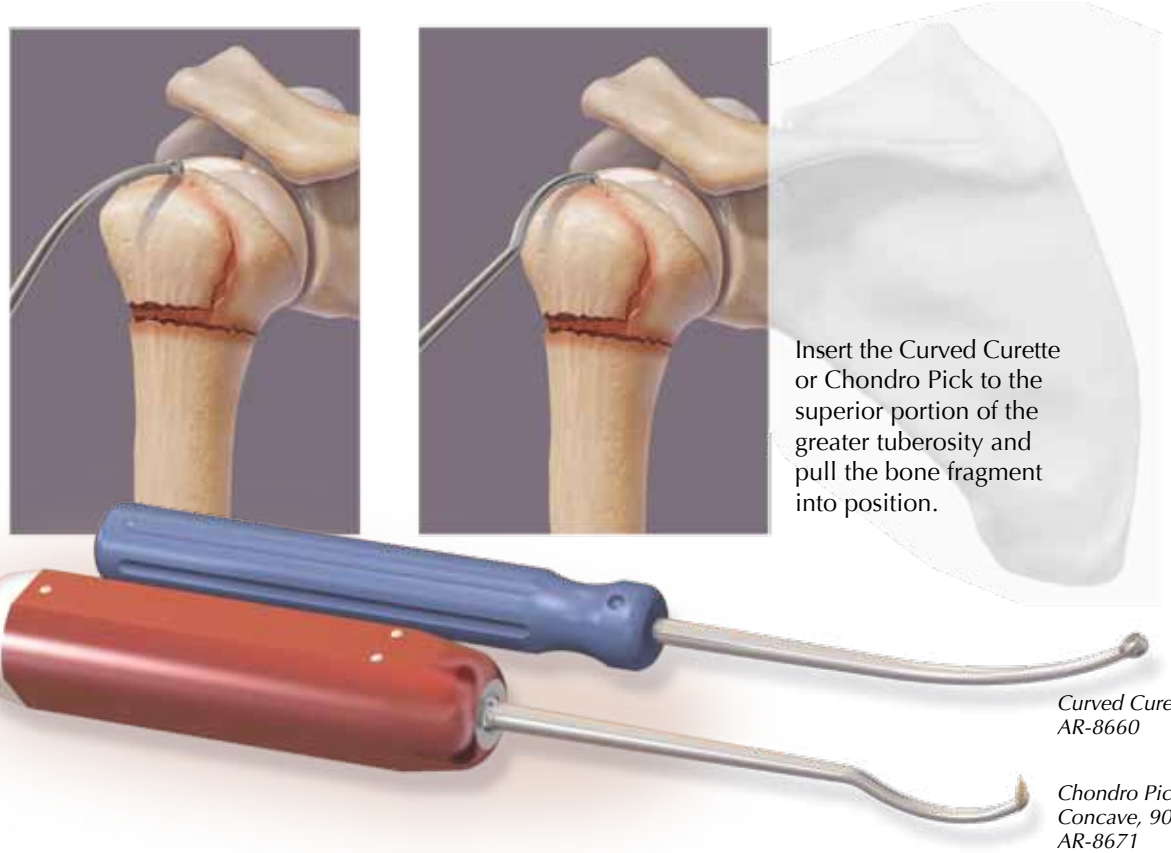


Insert the Cobb Elevator or Tamp to the humeral head fracture line to break apart the initial healing response and lift the impacted head into position.

Cobb Elevator
AR-8640

Tamp
AR-2518

Position Greater Tuberosity



Insert the Curved Curette or Chondro Pick to the superior portion of the greater tuberosity and pull the bone fragment into position.

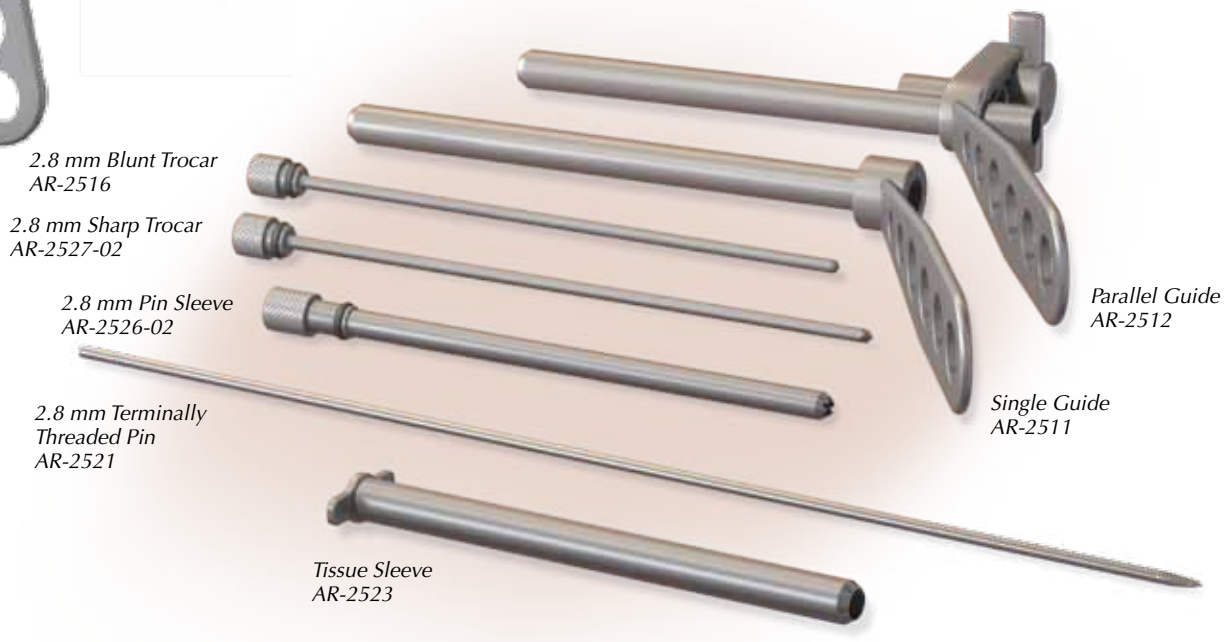
Curved Curette
AR-8660

Chondro Pick,
Concave, 90˚ Tip
AR-8671

Percutaneous Fixation with Pins

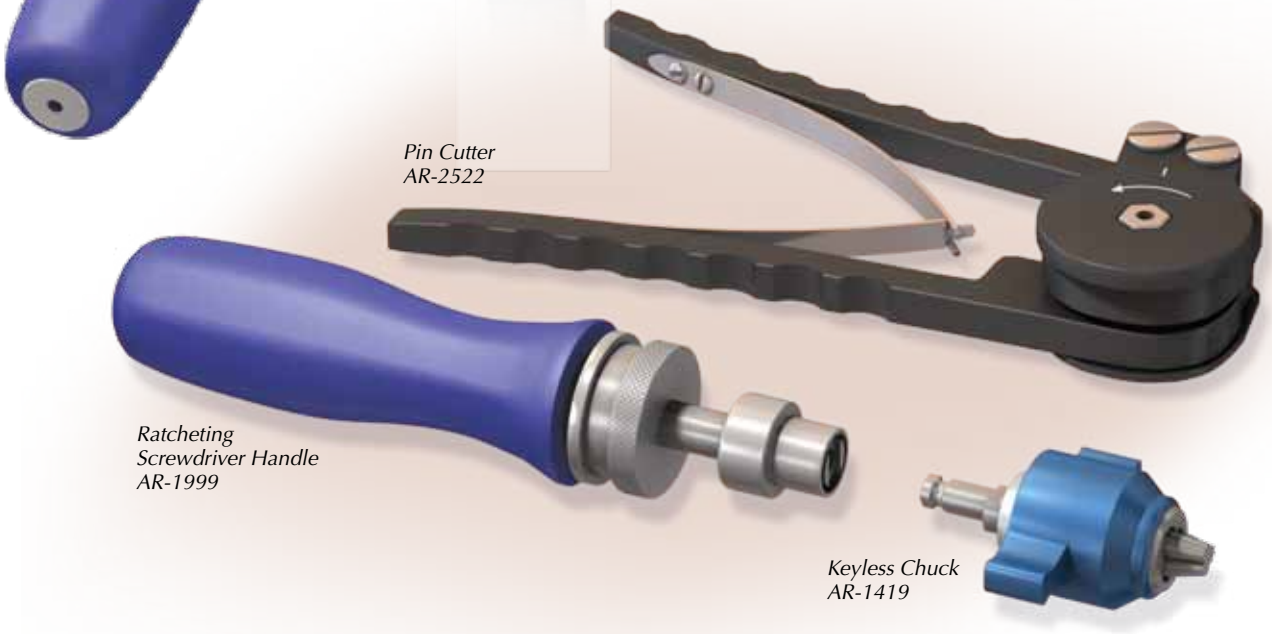
The Parallel Guide can be adjusted to space the pins from 10-20 mm apart.

The Single or Parallel Guide is introduced through a percutaneous incision assembled together with the Pin Sleeve and Trocar. The Terminally Threaded Pin is inserted through the Pin Sleeve for fracture fixation. A parallel pin can be inserted through the Parallel Guide by inserting the assembled Tissue Sleeve, Pin Sleeve, and Trocar through the Parallel Guide.



The Ratcheting Screwdriver Handle and Keyless Chuck can be attached to the pins to manually advance the pin into position.

The pins are cut by positioning the Pin Cutter over the pin down to skin level. Squeeze the handles multiple times, until the pin is cut. The cut line provides a reference to where the pin will be cut. Align the white line on the dial with the white line on the handle to reset instrument.

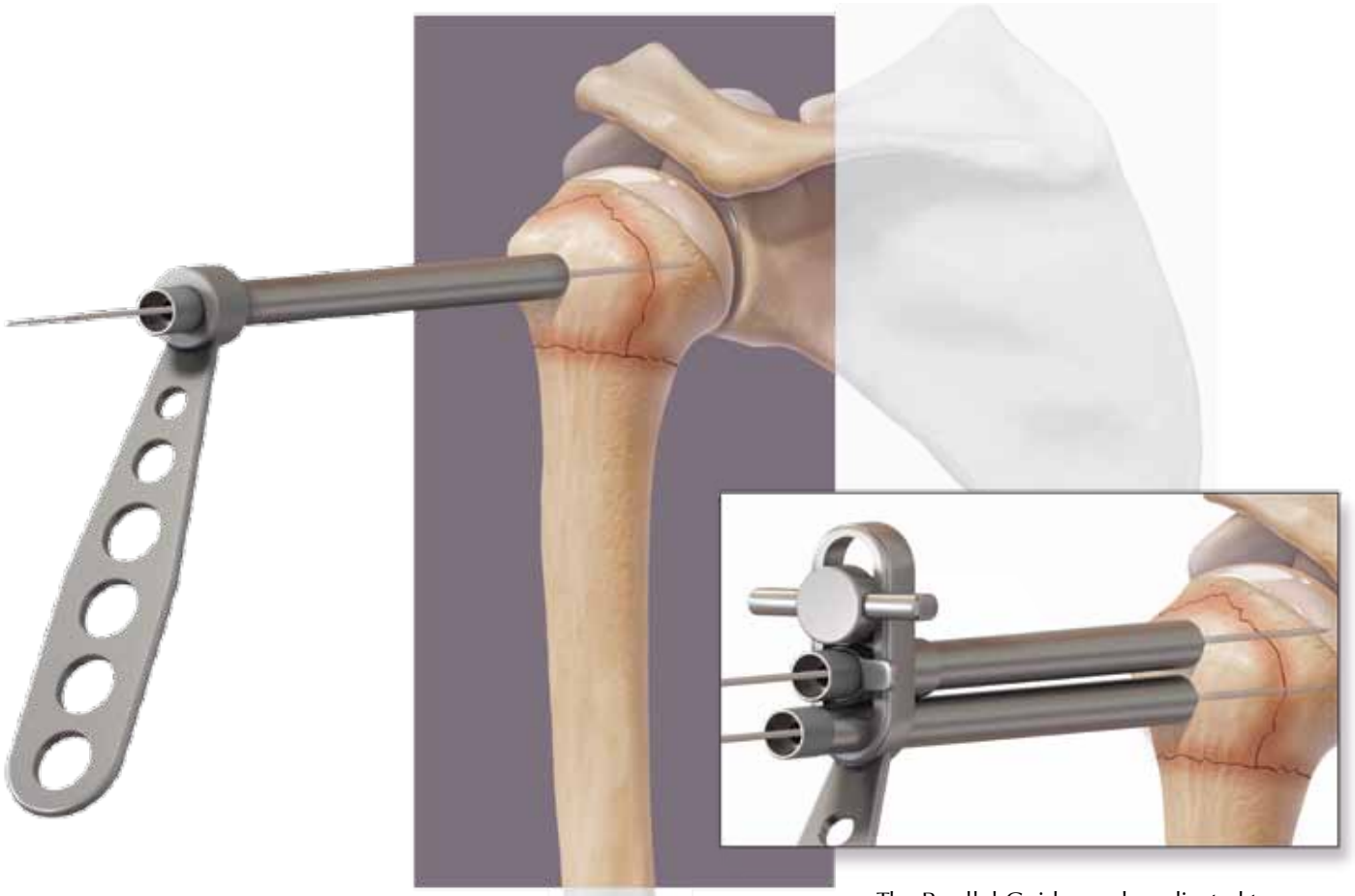


Pin Cutter
AR-2522

Ratcheting
Screwdriver Handle
AR-1999

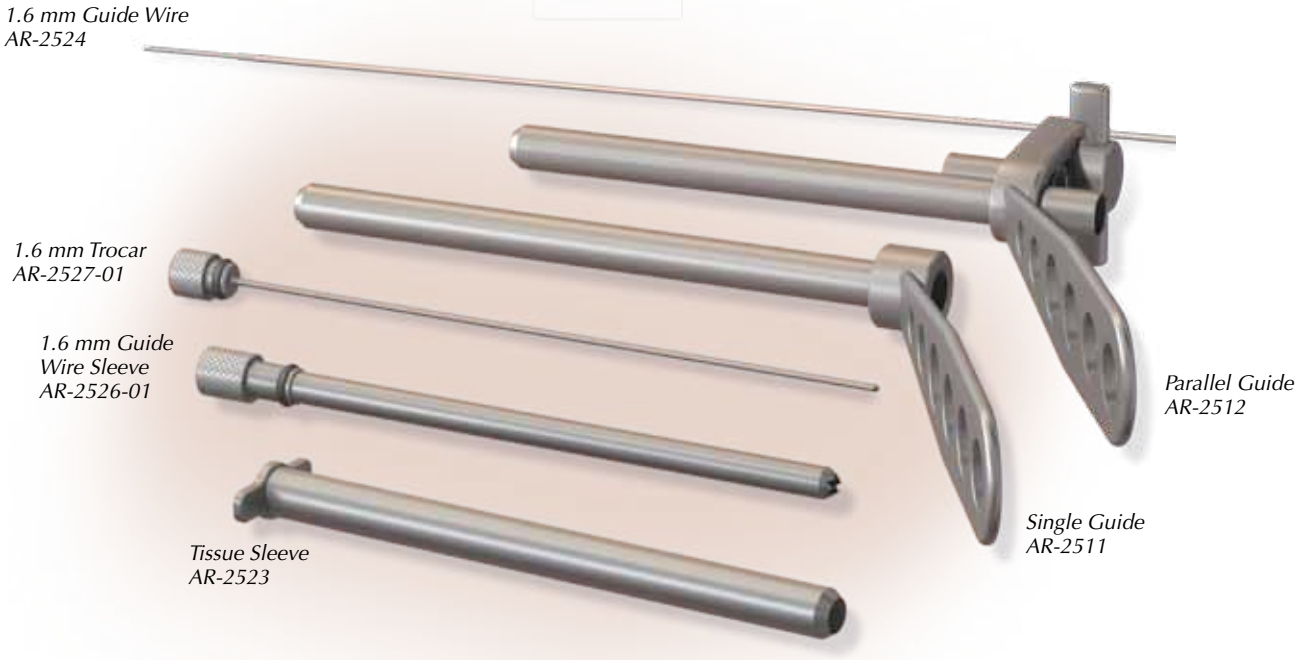
Keyless Chuck
AR-1419

Percutaneous Fixation with Cannulated Screws

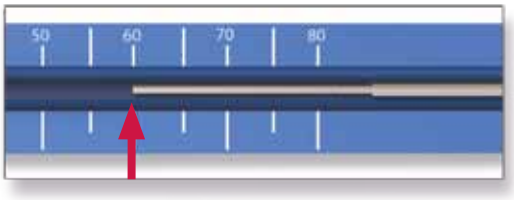


The Parallel Guide can be adjusted to space the Guide Wires from 10-20 mm apart.

The Single or Parallel Guide is introduced through a percutaneous incision assembled together with the Guide Wire Sleeve and Trocar. The Guide Wire is inserted through the Guide Wire Sleeve. A parallel Guide Wire can be inserted through the Parallel Guide by inserting the assembled Tissue Sleeve, Guide Wire Sleeve, and Trocar through the Parallel Guide.

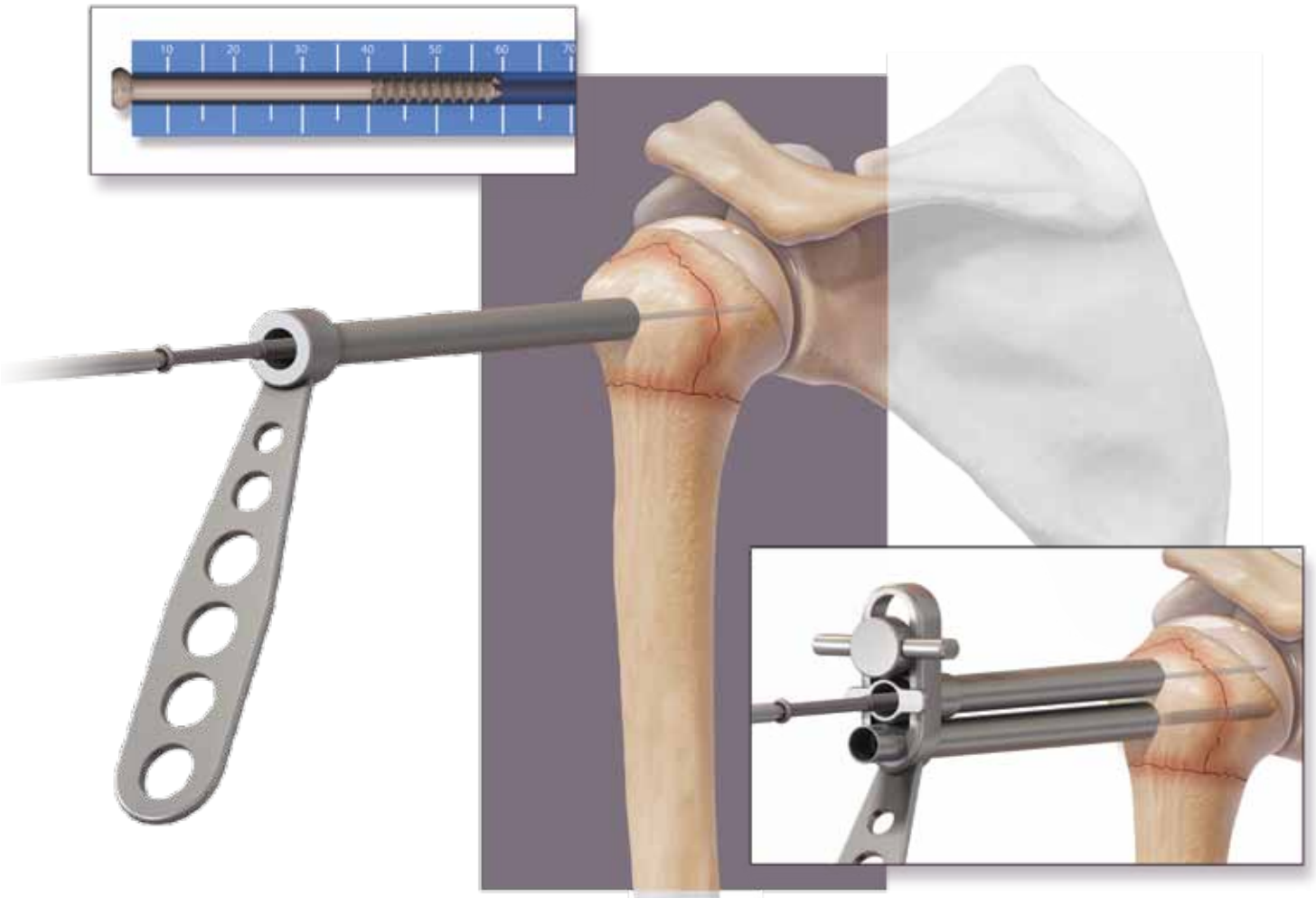


Remove the Guide Wire Sleeve and insert the Screw Selection Guide over the Guide Wire down to bone. The required length screw is identified off the back of the Guide Wire.



The bone can be drilled using the Cannulated Drill and Drill Sleeve. A Quick Connect Hudson Adapter, is provided for easy connections to the drill.

Percutaneous Fixation with Cannulated Screws



The length of the selected screw can be verified with the back end of the Screw Selection Guide. Remove the Guide Wire Sleeve or Drill Sleeve from guide and insert the screw over the Guide Wire. A parallel screw can be inserted through the Tissue Sleeve on the Parallel Guide.

Ordering Information

Disposables:

Low Profile Screw, 4.5 mm x 30 mm, cannulated, partially threaded	AR-8945-30PT
Low Profile Screw, 4.5 mm x 35 mm, cannulated, partially threaded	AR-8945-35PT
Low Profile Screw, 4.5 mm x 40 mm, cannulated, partially threaded	AR-8945-40PT
Low Profile Screw, 4.5 mm x 45 mm, cannulated, partially threaded	AR-8945-45PT
Low Profile Screw, 4.5 mm x 50 mm, cannulated, partially threaded	AR-8945-50PT
Low Profile Screw, 4.5 mm x 55 mm, cannulated, partially threaded	AR-8945-55PT
Low Profile Screw, 4.5 mm x 60 mm, cannulated, partially threaded	AR-8945-60PT
Low Profile Screw, 4.5 mm x 65 mm, cannulated, partially threaded	AR-8945-65PT
Low Profile Screw, 4.5 mm x 70 mm, cannulated, partially threaded	AR-8945-70PT
Low Profile Screw, 4.5 mm x 75 mm, cannulated, partially threaded	AR-8945-75PT
Low Profile Screw, 4.5 mm x 80 mm, cannulated, partially threaded	AR-8945-80PT
Washer, 10 mm	AR-8945W
1.6 mm Guide Wire	AR-2524
2.8 mm Terminally Threaded Pin	AR-2521
3.2 mm Cannulated Drill	AR-2528

Reusable Instruments:

Parallel Guide	AR-2512
Single Guide	AR-2511
Tissue Sleeve	AR-2523
3.2 mm Drill Sleeve	AR-2514
1.6 mm Guide Wire Sleeve	AR-2526-01
1.6 mm Trocar	AR-2527-01
2.8 mm Pin Sleeve	AR-2526-02
2.8 mm Sharp Trocar	AR-2527-02
2.8 mm Blunt Trocar	AR-2516
Modular Cannulated Screwdriver	AR-1998
Ratcheting Screwdriver Handle	AR-1999
Hudson Adapter, Quick Connect	AR-1416
Keyless Chuck	AR-1419
Tamp	AR-2518
Cobb Elevator	AR-8640
Curved Curette	AR-8660
Chondro Pick, Concave, 90˚ Tip	AR-8671
Screw Selection Guide	AR-2519
Pin Cutter	AR-2522
Percutaneous Pinning Case	AR-2519RC

This description of technique is provided as an educational tool and clinical aid to assist properly licensed medical professionals in the usage of specific Arthrex products. As part of this professional usage, the medical professional must use their professional judgment in making any final determinations in product usage and technique. In doing so, the medical professional should rely on their own training and experience and should conduct a thorough review of pertinent medical literature and the product's directions for use.

This surgical technique has been developed in cooperation with Bradford O. Parsons, M.D., New York, NY and Peter J. Millett, M.D., Vail, CO.