

# Rockwood Clavicle Pin



THE NATURAL  
ALTERNATIVE TO  
NONOPERATIVE  
TREATMENT

**D**ePuy's intramedullary Rockwood Clavicle Pin is for use in the treatment of midshaft clavicle fractures, nonunions and malunions. Use of an intramedullary pin helps avoid issues such as:

- Impaired blood supply related to soft tissue stripping
- Presence of painful, prominent hardware
- Stress risers in the clavicle related to removal of plates and screws

The Rockwood Clavicle Pin fits into the intramedullary canal of the clavicle through a small incision over the fracture site with minimal soft-tissue dissection. The device, specially designed to allow natural compression at the fracture site, minimizes hardware migration. It can also be easily removed in an outpatient or clinic setting under local anesthesia.



SURGICAL TECHNIQUE BY  
 Carl Basamania, MD  
 Kirk Jensen, MD  
 Charles Rockwood Jr., MD

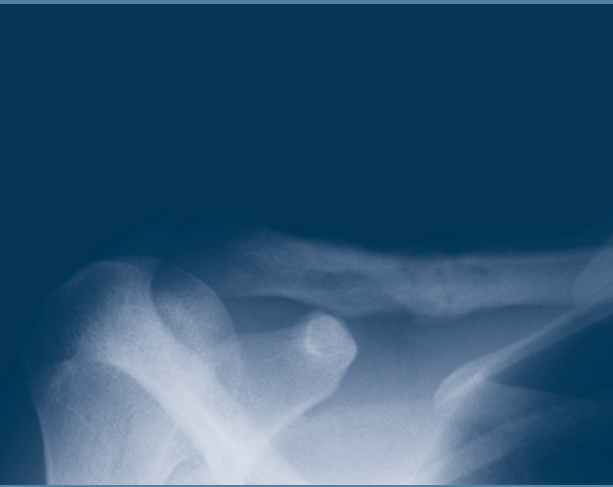
ILLUSTRATIONS BY  
 Steve Lippitt, MD

## BACKGROUND

Clavicle fractures account for 40 percent of all shoulder girdle fractures and about 10 percent of all fractures. Many of these fractures occur in young, athletic patients. Traditionally, nonoperative treatment has been accepted as the standard of care, likely the result of earlier studies showing unsatisfactory outcomes with operative treatment.

In the past, poor operative results related more to the technique used than the concept of treating these fractures operatively. Recent studies show significant **risks with nonoperative treatment**, including:

- chronic pain
- weakness
- a higher nonunion rate<sup>1</sup>



Although various techniques have been tried, plate and screw fixation is most commonly used. However, placement of plate and screws on the clavicle requires significant soft tissue stripping, which may compromise blood supply to the bone and subsequent healing.

Furthermore, this treatment creates multiple stress risers in the clavicle, due to the use of several bicortical screws in the plate.

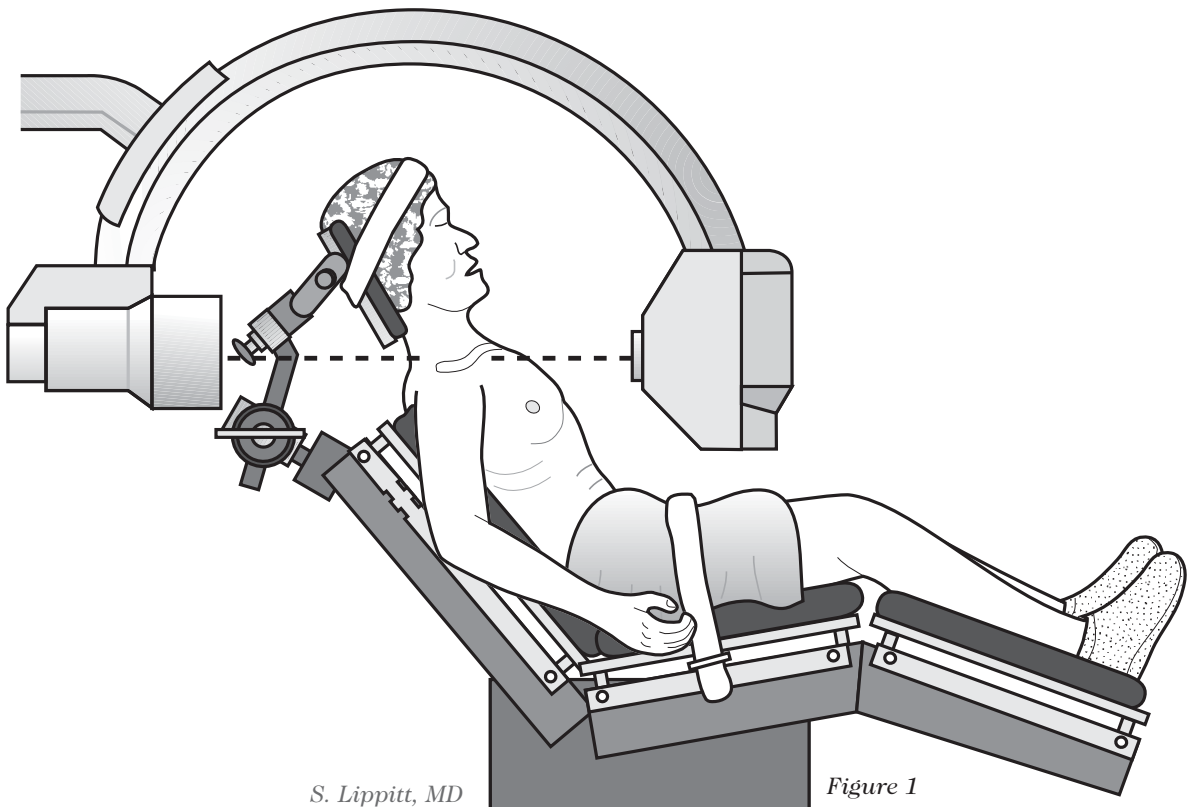
Another technique, smooth pin fixation, presents possible pin migration problems.

**STEP 1 Positioning the Patient**

Place the patient in beach chair position on the operating table. Facilitate clavicle and shoulder access using a radiolucent shoulder-positioning device (*Figure 1*). An image intensification device or C-arm guides pin placement. Bring the C-arm base in from the head of the bed with the C-arm gantry rotated slightly away from the operative shoulder

and oriented with a cephalic tilt. Drape the C-arm with standard split sheets.

*Note: The procedure may also be done without C-arm equipment. If a C-arm is not available, an X-ray cassette can be placed posterior to the shoulder prior to prepping and draping. X-rays can then be taken during the procedure to verify pin position.*



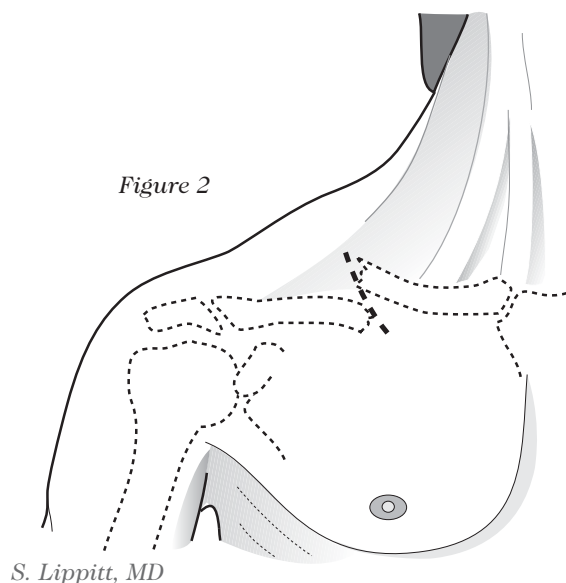
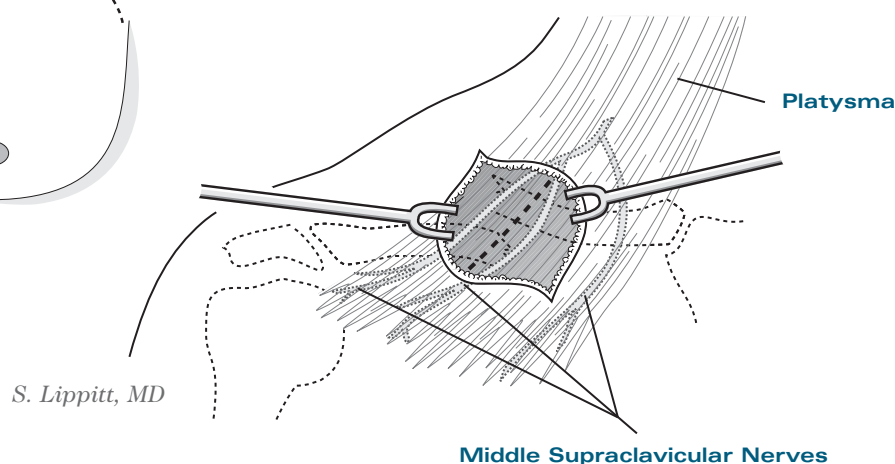
**STEP 2** Incision

Make a 2-3 cm incision in Langer's lines over the distal end of the medial fragment (*Figure 2*). This is done because the clavicle skin is moved medially more easily than laterally. Most patients have a deep skin crease in the same area where the incision is made. Placing the incision in this crease results in a more cosmetically pleasing scar.

Since little subcutaneous fat is in this region, take care to prevent injury to the underlying platysma muscle. Use scissors to free the platysma muscle from the overlying skin. Once the platysma muscle has been identified, split its fibers in line with the muscle (*Figure 3*).

**Take care to prevent injury to the middle branch of the supraclavicular nerve, usually found directly beneath the platysma muscle near the midclavicle.**

Identify and retract the nerve to prevent injury. With acute fractures, the periosteum over the fracture site is disrupted and usually requires no further division. In most cases, there will be interposed muscle and soft tissue. Carefully remove them with an elevator or curette. Leave small butterfly fragments, usually found anteriorly, attached to their soft tissue envelope.

*Figure 2**Figure 3*

### STEP 3 Drilling and Tapping the Intramedullary Canal

Elevate the proximal end of the medial clavicle through the incision using a towel clip, elevator or bone-holding forceps (*Figure 4*). Since the drills, taps and intramedullary pins are in sets, use either the smooth end of the taps or the drills to size the canal. Taking care not to penetrate the anterior cortex, attach the appropriate sized drill to the ratchet T-handle and drill the intramedullary canal (*Figure 5*).

The fit should not be too loose as this may compromise fixation or too tight as this may split the bone. A C-arm can be used to check orientation of the drill. Then, remove the drill from the medial fragment and attach the appropriate sized tap to the T-handle and tap the intramedullary canal to the anterior cortex (*Figure 6*). Hand tapping is highly recommended, especially for more slight patient anatomies and smaller diameter-sized clavicle pins.

*NOTE: The drills are slightly larger than the corresponding clavicle pins and taps. Each tap is approximately 0.2 mm larger than its respective clavicle pin.*

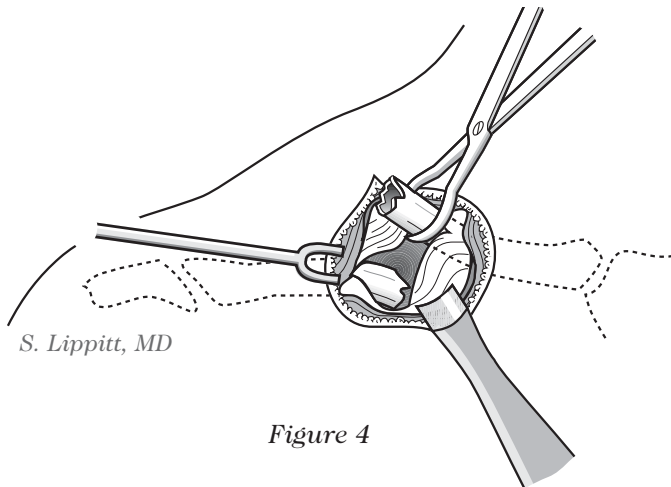


Figure 4

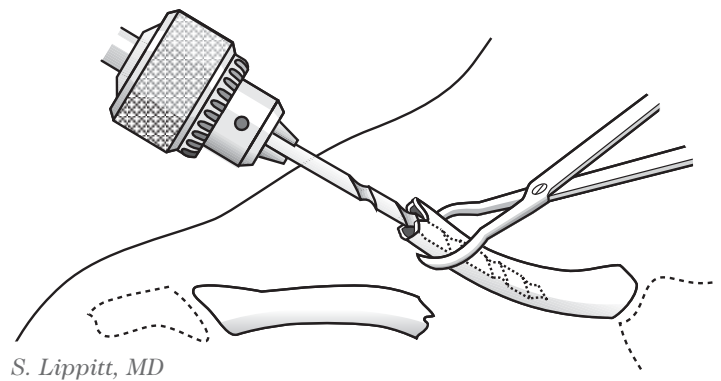


Figure 5

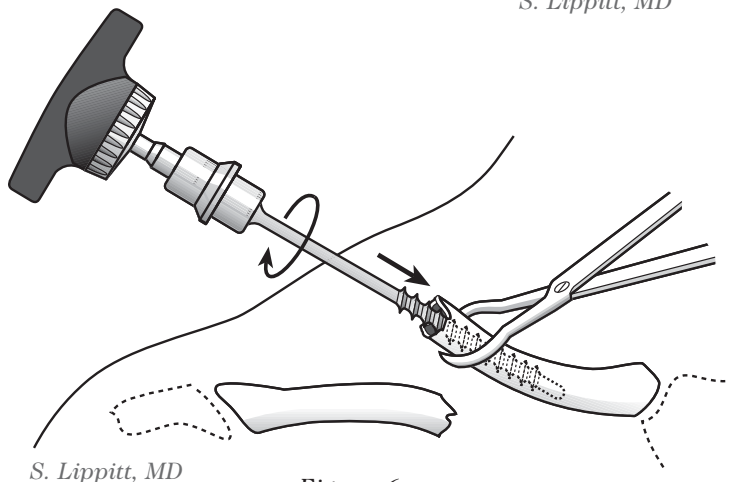


Figure 6

**STEP 3** Drilling and Tapping the Intramedullary Canal continued

Next, elevate the lateral fragment through the incision. Access and visualization of the lateral fragment can be improved by externally rotating the arm and shoulder (*Figure 7*). Connect the same sized drill used in the

medial fragment to the ratchet T-handle and drill the intramedullary canal (*Figure 8*). Under the C-arm guidance, pass the drill out through the posterolateral cortex of the clavicle (*Figure 9*). The drill position should be posterior and medial to the acromioclavicular joint (*Figure 10a & 10b*) around the level of the coracoid. Allow the drill to exit no higher

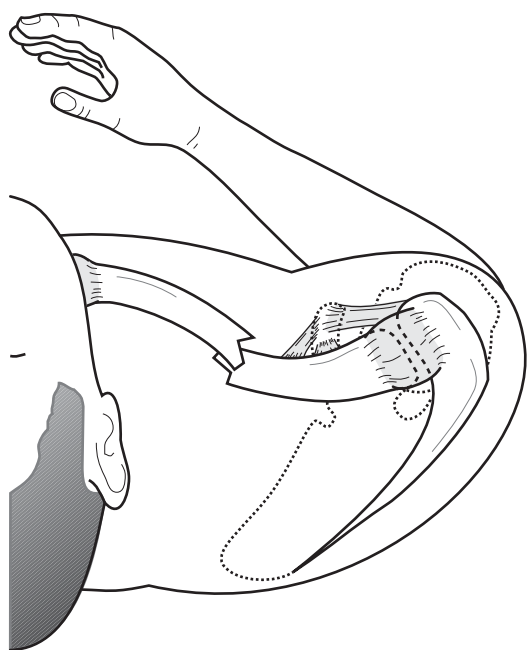
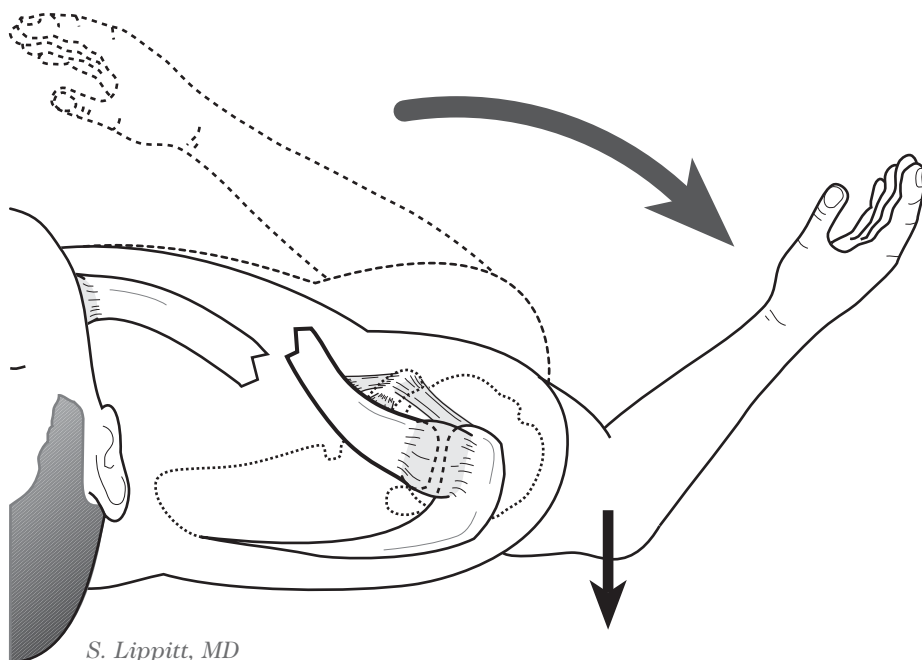


Figure 7



S. Lippitt, MD

STEP 3 Drilling and Tapping the Intramedullary Canal continued

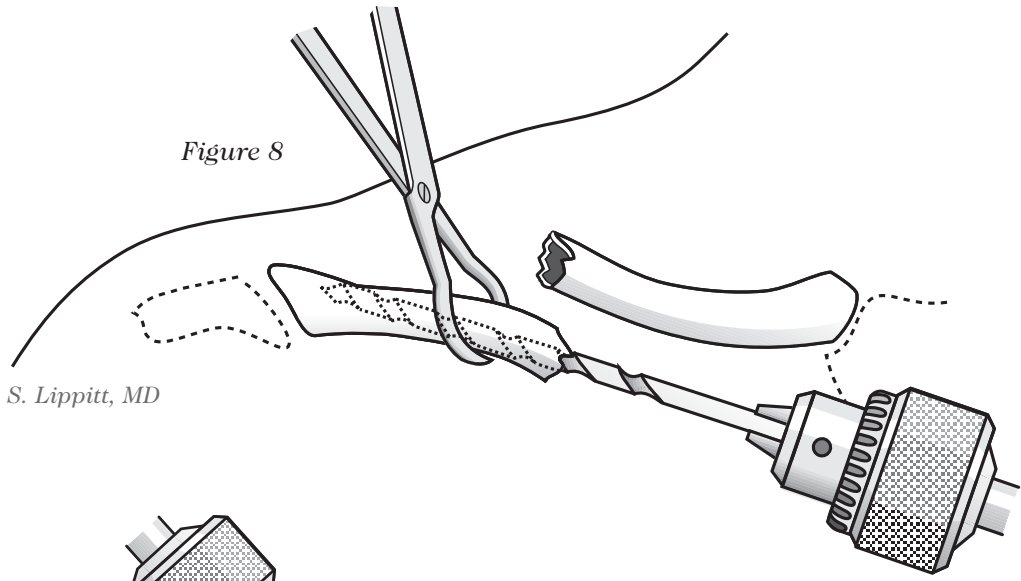


Figure 8

S. Lippitt, MD

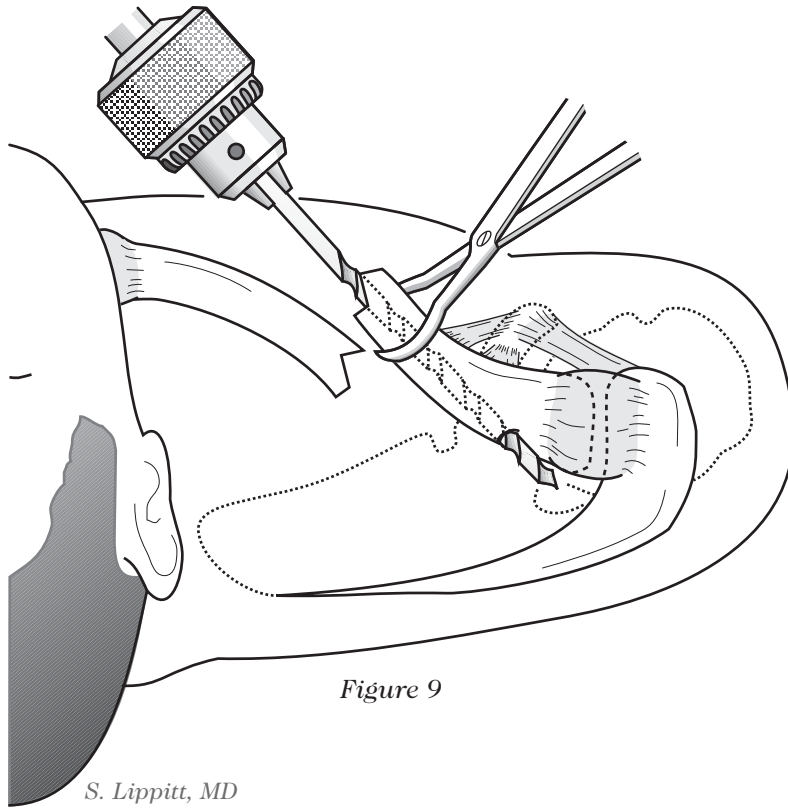


Figure 9

S. Lippitt, MD

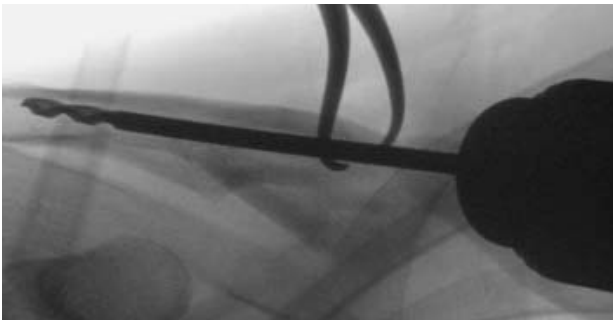


Figure 10a

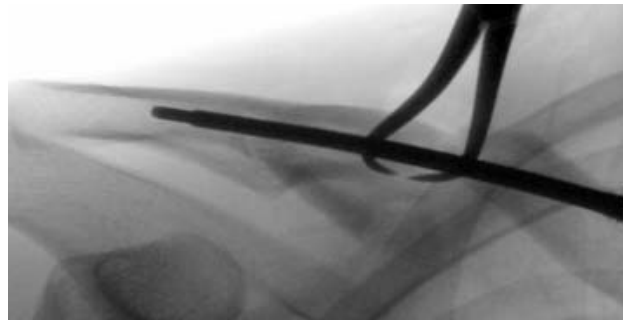


Figure 10b



**STEP 3** Drilling and Tapping the Intramedullary Canal continued

than the equator of the posterolateral clavicle (*Figure 11*). This will allow the pin nuts to be less prominent.

Then, remove the drill from the lateral fragment, attach the appropriate sized tap to the T-handle and tap the intramedullary canal so that the large threads are advanced fully into the canal (*Figure 12*). Should the tap be a tight fit, consider re-drilling with the next larger drill size. Again, hand tapping is highly recommended, especially for more slight patient anatomies and smaller diameter-sized clavicle pins.

*NOTE: Tapping reduces the torque required to insert the pin and reduces the possibility of pin failure.*

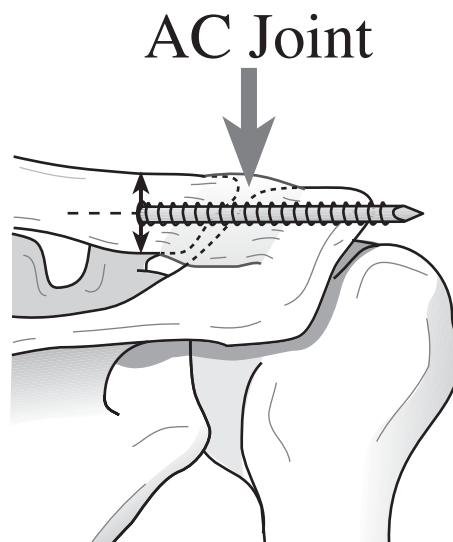


Figure 11

S. Lippitt, MD

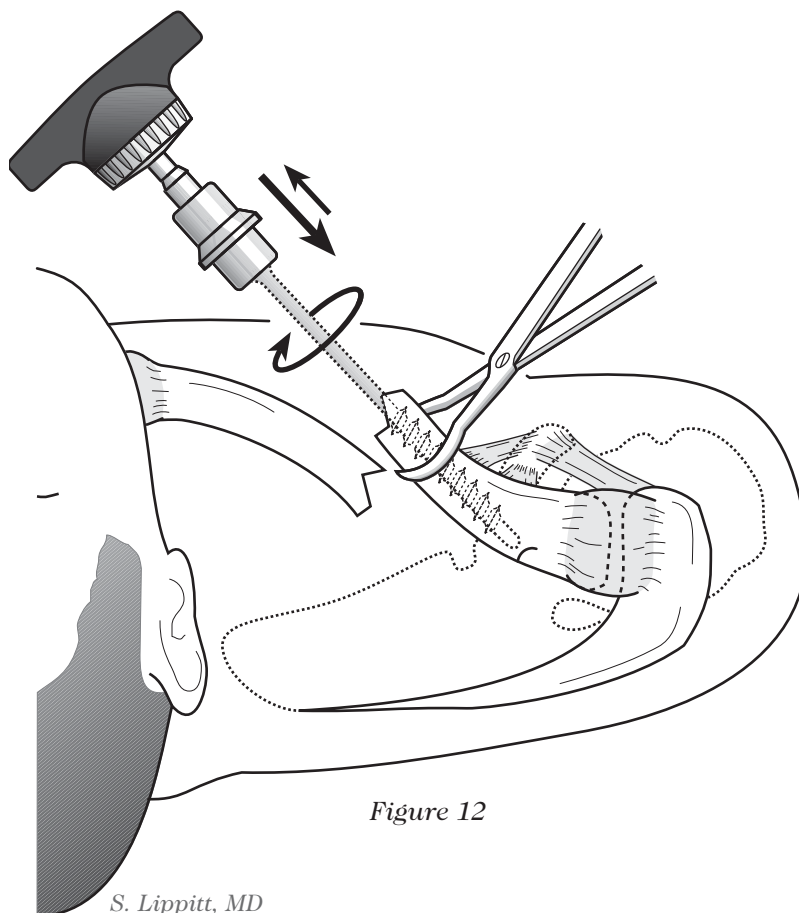


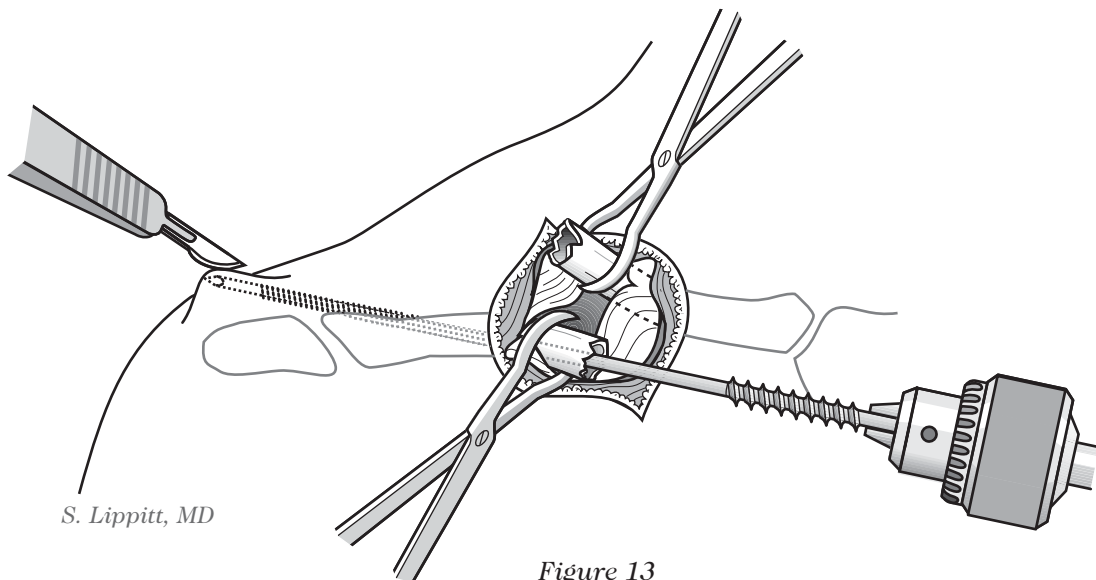
Figure 12

S. Lippitt, MD

**STEP 4** Inserting the Clavicle Pin

While holding the distal fragment with a bone clamp, remove the nuts from the pin assembly and pass the trocar end of the Rockwood Clavicle Pin into the medullary canal of the distal fragment. The pin should exit through the previously drilled hole in the posterolateral cortex. Once the pin exits the clavicle, its tip can be felt subcutaneously. Make a small incision over the palpable tip and spread the subcutaneous tissue with a hemostat (*Figure 13*). Place the tip of the hemostat under the tip of the clavicle pin to facilitate its passage through the incision. Then, drill the pin out laterally until the large, medial threads start to engage the cortex. Attach the Jacobs chuck and T-handle to the end of the pin (take care to not place chuck over the machined threads, both lateral and medial, of the pin)

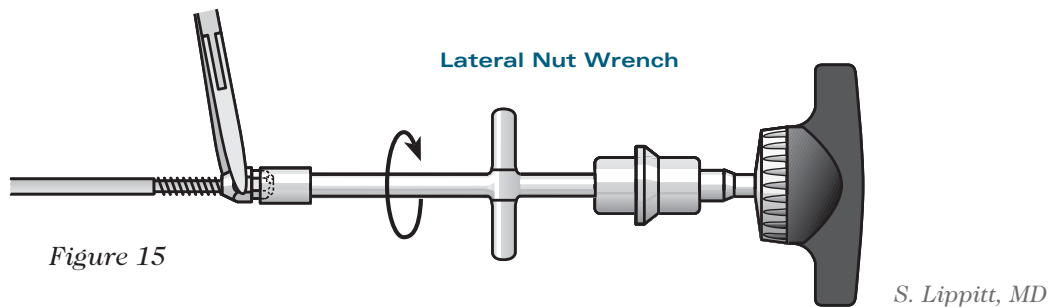
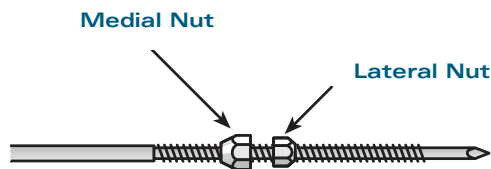
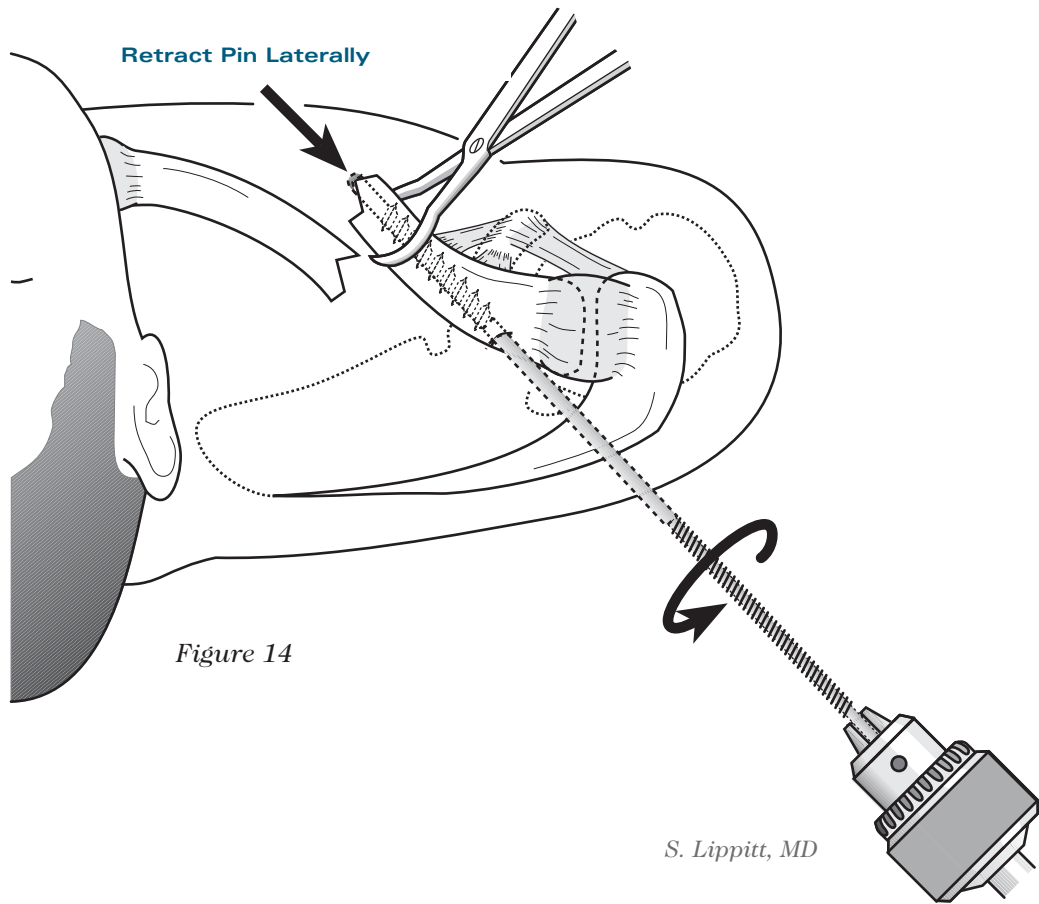
protruding laterally and carefully retract the clavicle pin into the lateral fragment (*Figure 14*). Assure that the pin is inserted correctly. Inserting the pin too superior and anterior instead of down the line of the clavicle leads to the clavicle pin tip proximated too superficially. Rather, inserting the pin inferior and posterior can yield a more anatomic reduction. Reduce the fracture and pass the pin into the medial fragment. Advance the pin until all medial threads are across the fracture site. The weight of the arm usually pulls the arm downward; therefore, the shoulder needs to be lifted up to facilitate pin passage into the medial fragment. Place the medial nut on the pin, followed by the smaller lateral nut. Cold weld the two nuts together by grasping the medial nut with a needle driver

*Figure 13*

**STEP 4** Inserting the Clavicle Pin continued

or needle nose pliers and tightening the lateral nut against the medial nut using the lateral nut wrench (Figure 15). Then, use the T-handle and wrench on the lateral nut to medially

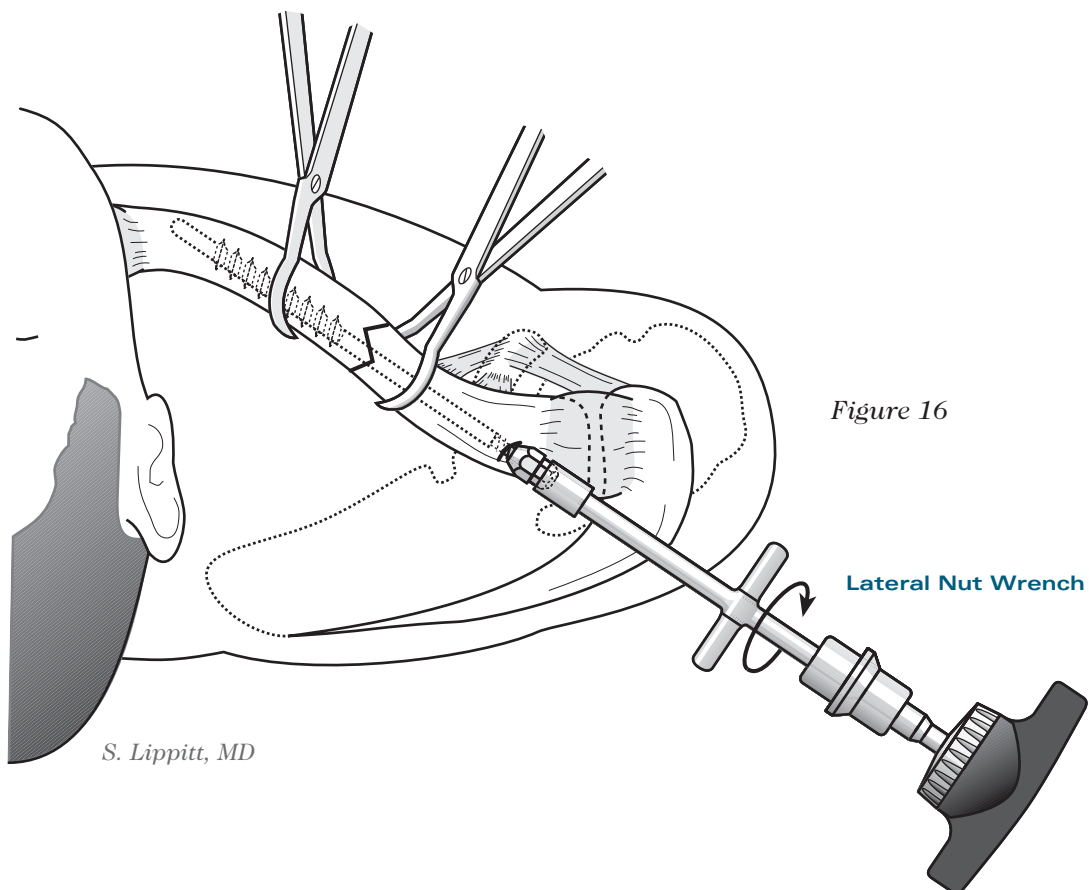
advance the pin down into the medial fragment until it comes in contact with the anterior cortex. This position can be verified by the C-arm or by taking an X-ray.



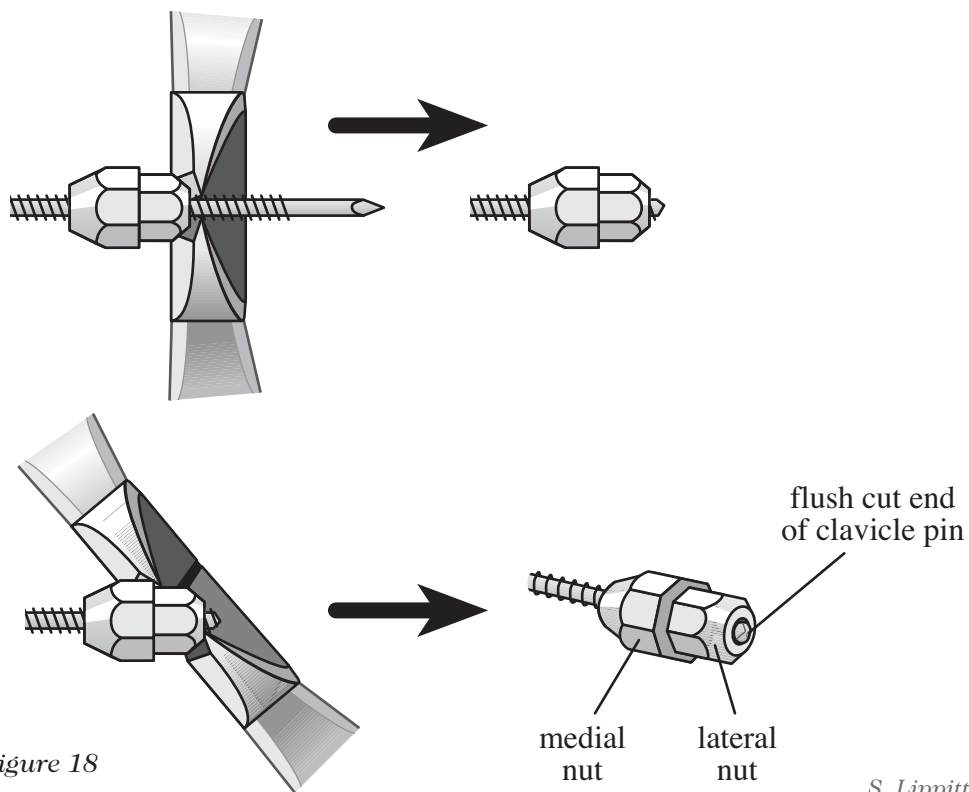
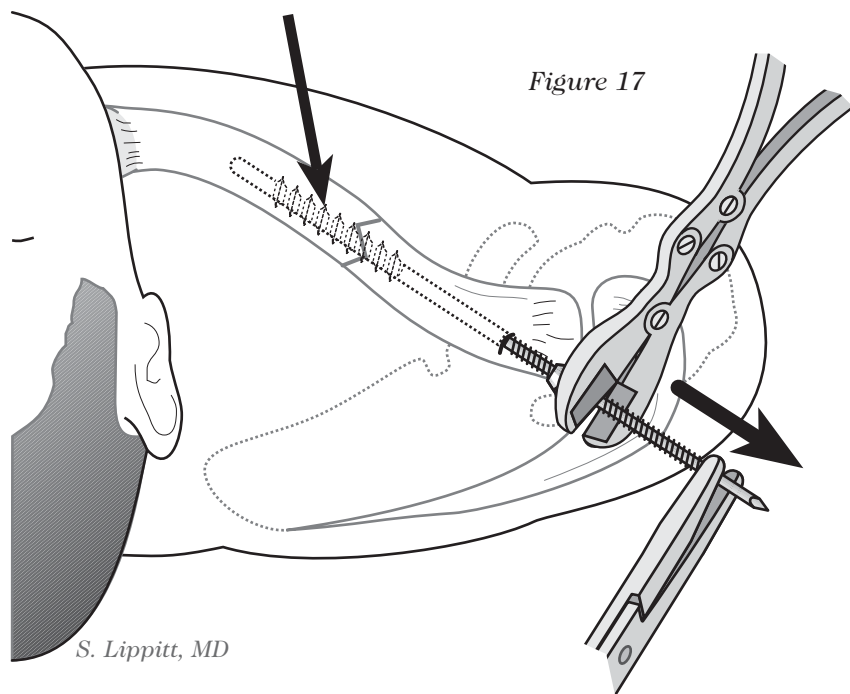
**STEP 5** Securing the Pin

Break the cold weld between the nuts by grasping the medial nut with a needle driver or pliers and quickly turning the lateral nut counterclockwise with the insertion wrench. Advance the medial nut until it is against the lateral cortex of the clavicle. Then, tighten the lateral nut until it engages the medial nut (*Figure 16*). Use the medial wrench to back out the pin about 1 cm or more to expose the nuts from the soft tissue. Assure the clavicle threads are still engaged on the cortical bone of the medial fragment while doing this. A side cutting pin cutter is recommended over an end cutting pin cutter to cut the pin as

close to lateral nut as possible (*Figure 17*). If necessary, turn the pin an additional 90 degrees and skive the lateral pin to achieve a cleaner cut (*Figure 18*). Re-advance the clavicle pin using the lateral nut wrench (*Figure 19a & 19b*). Different pin diameters may require different pin cutters. Most end cutting pin cutters such as the ACE Nancy nail cutter (Cat. No. 8206-03-000), or Junior Jaws pin cutter (Cat. No. 2167-12-000), can cut pins in 2.5 and 3.0 mm diameters. Larger pin or wire cutters are necessary for larger diameter pins, i.e. - 3.8 and 4.5 mm. Please see the following suggested examples of pin cutters and associated pin diameters.



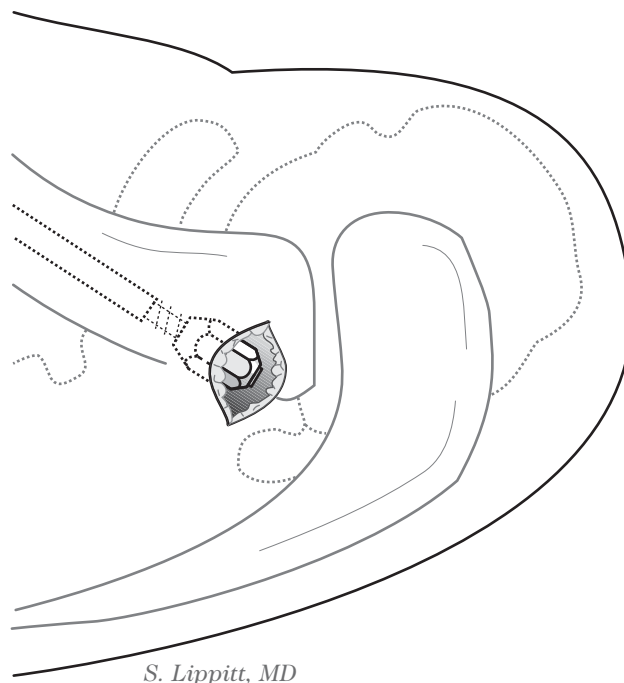
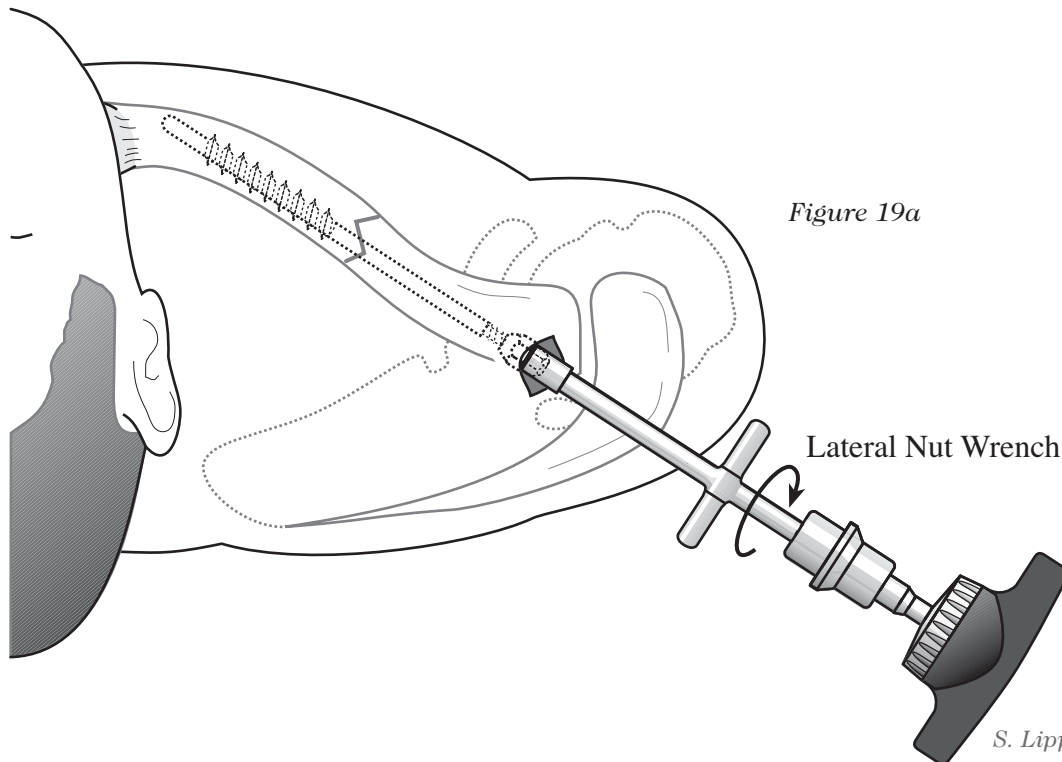
**STEP 5** Securing the Pin continued



**STEP 5** Securing the Pin continued

*NOTE: 4.5 mm pin sizes are seldom necessary and the 3.8 mm pin size is only occasionally needed in larger stature (males) and older patients, as their intramedullary canals tend to be bigger. Most (female)*

*anatomies or more slight anatomies would take a 2.5 mm pin and occasionally a 3.0 mm, while most (male) or average stature anatomies will need a 3.0 mm pin.*



**STEP 5** | **Securing the Pin continued**

**TIEMANN PIN CUTTER  
DOUBLE ACTION**

Code: 080-2723-1  
 George Tiemann & Co  
 Customer Service #: 1-800-843-6266  
 Website: [www.georgetiemann.com](http://www.georgetiemann.com)  
 Recommended for diameters  
 2.5 to 3.0 mm



**MILTEX**

Model: 27-161TC  
 Description: Double Action Pin Cutter, 15" (38.1 cm), heavy duty, with CARB-N-SERT cutting blades, will cut up to 4.8 mm (3/16") diameter, stainless  
 Specifications: carb-n-sert cutting blades, cuts up to 4.8 mm diameter  
 Material: Stainless Steel  
 Customer Service #: 866-854-8300  
 Website: [www.miltex.com](http://www.miltex.com)  
 Recommended for diameters  
 3.8 to 4.5 mm



**MEDICON**

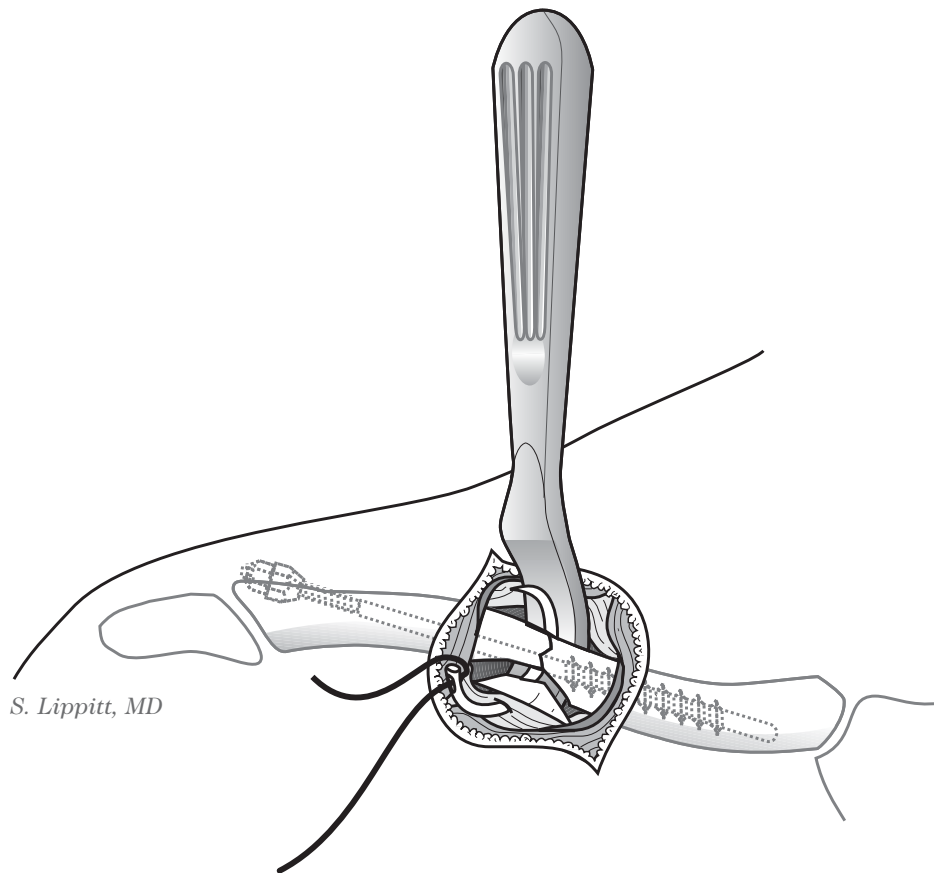
Model: 76.45.80  
 Description: Wire And Pin Cutting Pliers 45 cm  
 Material: Stainless Steel  
 Website: <http://www.medicon.de/jsp/language.jsp?id=2>  
 Recommended for diameters  
 3.8 to 4.5 mm



**STEP 6** Soft Tissue Closure

To reapproximate the anterior butterfly fragments, pass the Crego elevator beneath the clavicle in an anterior-to-posterior direction to protect the underlying structures. Use absorbable Ethicon #0 or #1 PDS® or Panacryl™ Sutures loaded on a CTX or CT1 needle and pass it through the periosteum attached to the butterfly fragment. Then, pass it around and beneath the clavicle (*Figure 20*). Carefully direct the needle toward the Crego elevator so it will be deflected by the

elevator. Retrieve the needle posteriorly. Pass the suture in a figure eight manner or use multiple simple sutures to cerclage the butterfly fragment to the main fracture fragments. Close the periosteum overlying the fracture with multiple figure eight sutures of #0 Vicryl™ absorbable suture. Reapproximate the platysma muscle with simple absorbable Ethicon #2-0 Vicryl sutures. Close both incisions with a running subcuticular suture.



*Figure 20*



## POSTOPERATIVE CARE OF ACUTE FRACTURES

Postoperative Care of Acute Fractures Allow the patient to resume daily living activities as soon as tolerated but avoid strenuous activities such as pulling, lifting or pushing, and arm elevation higher than face level for four to six weeks. Excessive arm motion, particularly forward flexion, may result in rotation of the fracture fragment, causing irritation of

the soft tissue by the lateral pin and nuts. Remove sutures at seven to 10 days. Take postoperative X-rays at the four to six week postoperative clinic visit. If the fracture is clinically healed (not tender, palpable callus) allow the patient to advance daily activities as tolerated. See the patient at eight to 12 weeks postoperatively. If repeat X-rays (AP and 45 degrees cephalic tilt AP radiographs) show healing of the fracture, remove the pin.

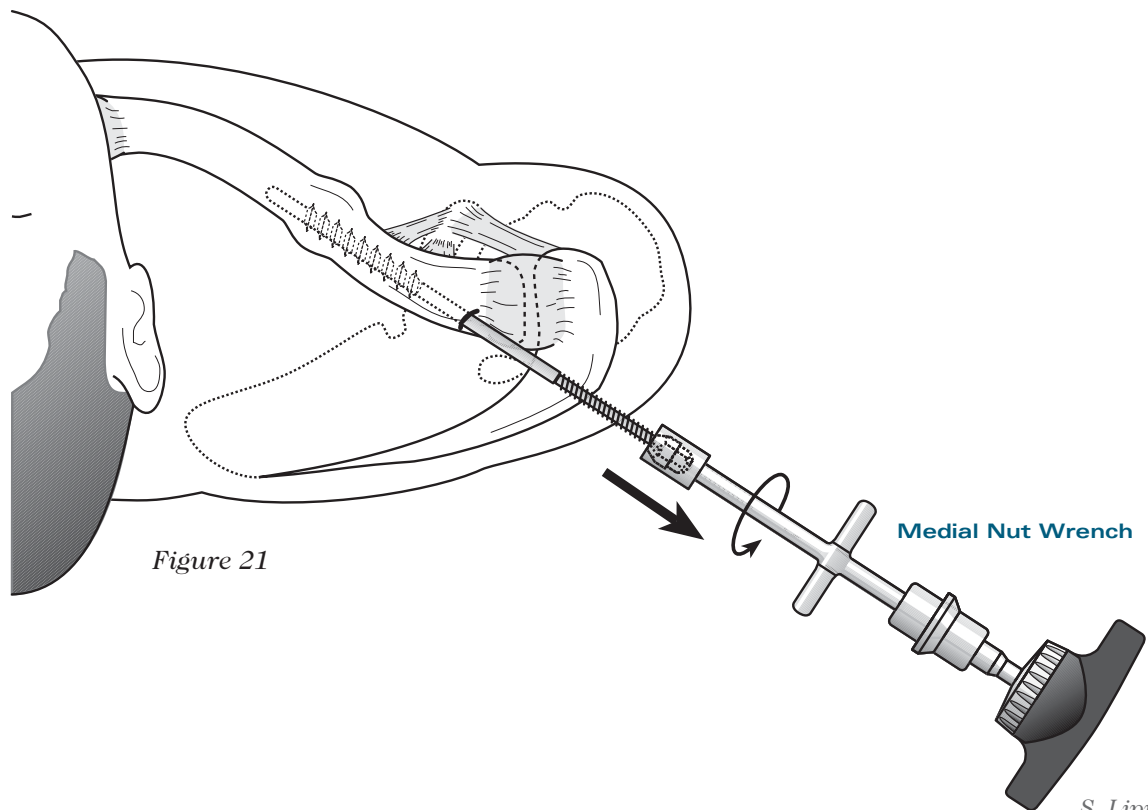
*NOTE: In post-op care, be cautious about removing the pin before twelve weeks.*



## POSTOPERATIVE CARE | PIN REMOVAL

Postoperative Care: Pin Removal Place the patient in a beach chair or lateral decubitus position. Sterilize the lateral pin site and administer local anesthesia. Open the incision and pass the extraction wrench over the pin until it engages the large medial nut and remove the pin (*Figure 21*). Take care to avoid removing the pin too quickly as this may cause the patient discomfort or pin

breakage. Patients can usually resume full, unrestricted activities after at least two to four weeks. With clavicle nonunions and malunions, leave the pin in place for a minimum of eight to twelve weeks or until there is evidence of good healing on radiographs. Then, remove the pin as previously described. Use both AP and 45 degree cephalic tilt AP radiographs to assess healing.



## DISTAL CLAVICLE FRACTURES

Treatment 15% of all clavicle fractures involve the distal third. Most nondisplaced fractures of the distal clavicle can be treated with a sling. Those that are displaced and include injury to the coracoclavicular (CC) and acromioclavicular ligaments, deserve more special attention and treatment as the high percentage of distal clavicle fractures associated with a rupture of the CC ligament can result in delayed union or nonunion. For distal clavicle fractures with associated rupture of the CC ligament, a coracoclavicular screw, the DePuy Rockwood A/C Screw, is the recommended mode of treatment (*Figure 22a & 22b*). Placement of the CC screw will reduce

the coracoclavicular interval and therefore bring the fragments into close proximity to allow healing. The DePuy Rockwood A/C Screw offers several advantages. The required exposure is small, and the fracture site does not necessarily require open exposure. The fixation is solid, and using C-arm guidance this procedure can be performed almost percutaneously. After fracture healing, the screw can be removed easily under local anesthesia, thereby avoiding breakage of the hardware.

Contact your local DePuy sales representative for additional information about the DePuy Rockwood A/C Screw.



*Figure 22a*



*Figure 22b*

## MALUNIONS AND NONUNIONS

Treatment Clavicle malunions and nonunions are also cases where the pin may be used. For clavicle malunions, the surgical approach and setup is the same as that described previously. The periosteum overlying the deformity is incised longitudinally. Once the periosteum is circumferentially elevated from the deformity, a small osteotome is used to remove the callus from the fracture site. This is best performed under C-arm guidance to assure adequate removal of fracture callus (*Figure 23*). Care must be taken when removing callus from the underside of the medial fragment due to the proximity of the underlying blood vessels and nerves.

A rongeur is then used to remove callus from the ends of the medial and lateral fracture fragments. Then, find the intramedullary canal with the smallest drill bit, verify its position with the C-arm and then drill the canal with the appropriate size drill (*Figure 24a & 24b*). Pass the Rockwood Clavicle Pin as previously noted. Use a small osteotome to "fish scale" or "rose petal" the cortical bone about the fracture site (*Figure 25*). Morsellize the previously removed callus and pack it about the fracture site (*Figure 26*). Use autologous bone graft when indicated. Then, close the periosteum as previously noted.



*Figure 23*

Treat hypertrophic nonunions the same as clavicle malunions. In the case of atrophic nonunions, remove any tapered ends of the clavicle fragments. Carefully remove the scar and fibrotic tissue about the nonunion site with a rongeur. Proceed with the treatment as described for the clavicle malunion, with the exception of using autologous or allograft bone. If allograft bone is used, consideration

should be given to adding platelet rich plasma to the morsellized cancellous bone. If there is a significant loss of bone once the ends have cut, consideration should be given to using an intercalary graft so as to avoid over shortening the clavicle. If this is necessary, a plate should be considered rather than the Clavicle Pin.

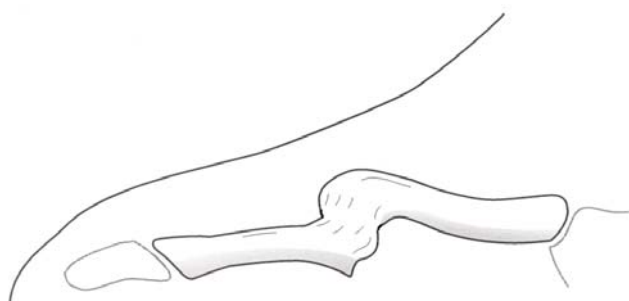


Figure 24a

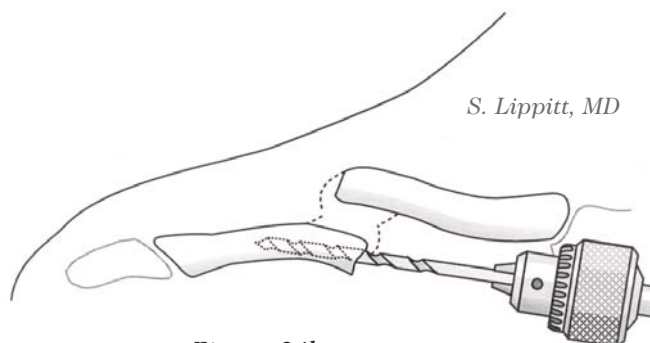


Figure 24b

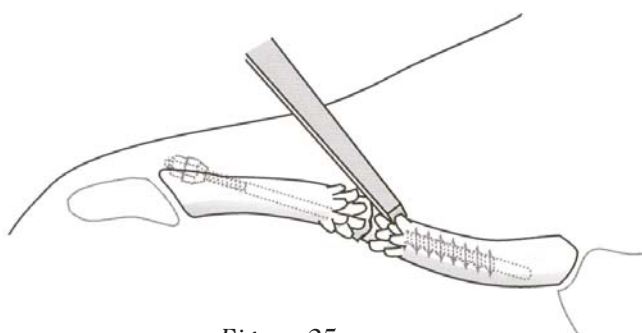


Figure 25

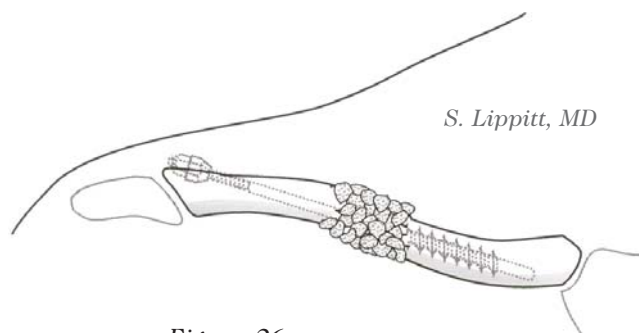
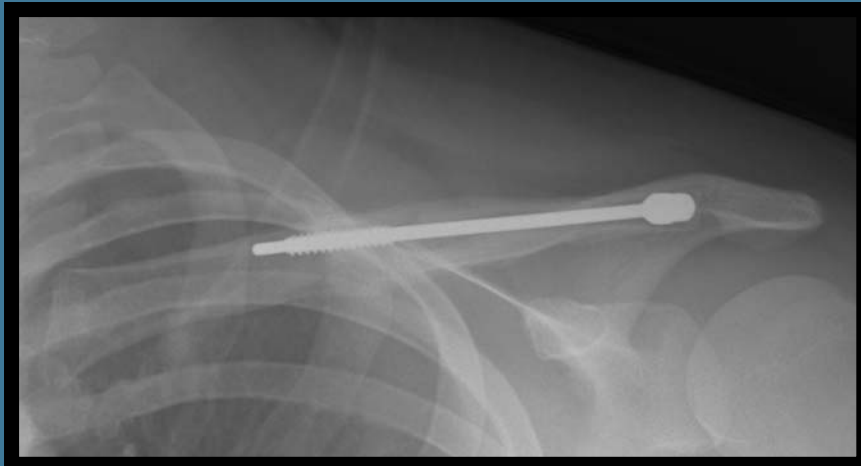


Figure 26



ACUTE fracture preoperative at 45 degrees.



ACUTE 45 degree tilt at postoperative.



ACUTE 45 degree cephalic tilt at 10 weeks postoperative.

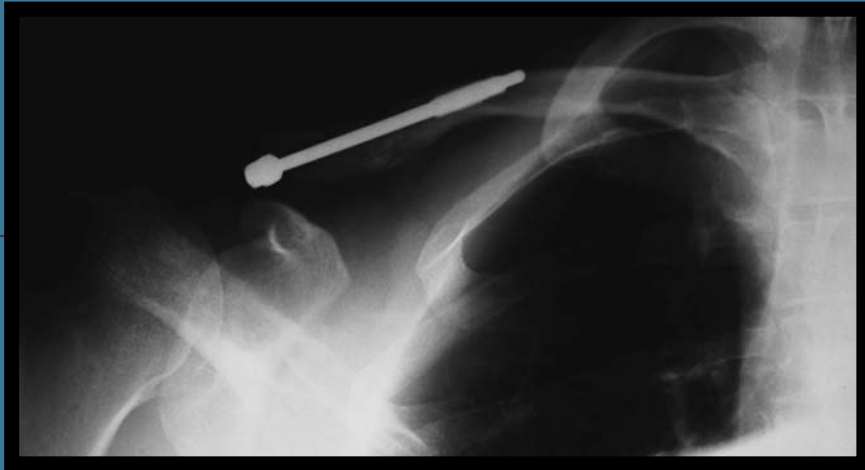
ACUTE FRACTURE

# CLAVICLE PIN

MALUNION FRACTURE



MALUNION 45 degree cephalic tilt A.



MALUNION at immediate postoperative.



MALUNION at 16 weeks postoperative.

DePuy Clavicle Pin		
Cat. No.	U/M	Description
1129-10-020	ea	Clavicle Pin Assembly 2.5 mm
1129-12-020	ea	Clavicle Pin Assembly 3.0 mm
1129-14-020	ea	Clavicle Pin Assembly 3.8 mm
1129-16-020	ea	Clavicle Pin Assembly 4.5 mm

Instruments in Case		
Cat. No.	U/M	Description
2128-61-070	ea	Ratchet T-Handle
2129-51-000	ea	Clavicle Lateral Nut Wrench
2129-53-000	ea	Clavicle Medial Nut Wrench
2129-55-000	ea	Keyless Chuck
2129-55-500	ea	Chuck Key
2129-58-010	ea	Clavicle Pin 2.5 mm Tap
2129-58-012	ea	Clavicle Pin 3.0 mm Tap
2129-58-014	ea	Clavicle Pin 3.8 mm Tap
2129-58-016	ea	Clavicle Pin 4.5 mm Tap
2129-60-000	ea	Clavicle Pin Case Assembly
2428-14-000	ea	Elev FL CV, <sup>9</sup> / <sub>16</sub> BL

Clavicle Pin Assembly  
3.0 mm



Additional Instruments		
Cat. No.	U/M	Description
2129-57-010	ea	2.8 mm Drill Bit for 2.5 mm Clavicle Pin, Sterile
2129-57-012	ea	3.2 mm Drill Bit for 3.0 mm Clavicle Pin, Sterile
2129-57-014	ea	4.0 mm Drill Bit for 3.8 mm Clavicle Pin, Sterile
2129-57-016	ea	4.8 mm Drill Bit for 4.5 mm Clavicle Pin, Sterile

**Important** This essential product information does not include all of the information necessary for selection and use of a device. Please see full labeling for all necessary information.

**Indications** Orthopaedic screws and pins are intended to provide the orthopaedic surgeon a means of bone fixation and help in the general management of fractures and reconstructive surgeries. These implants are intended as a guide to normal healing and are not intended to replace normal body structure or bear the weight of the body in the presence of incomplete bone healing.

**Contraindications** The Rockwood Clavicle Pin is contraindicated: in the presence of active infection; in cases with malignant primary or metastatic tumors which preclude adequate bone support or fixation unless supplemental means of fixation are used; in conditions that tend to retard healing such as blood supply limitations, previous infections etc.; if insufficient quantity or quality of bone does not permit stabilization of the fracture complex; in conditions that restrict the patient's ability or willingness to follow postoperative instructions; and in cases where material sensitivity is suspected.

**Warnings and Precautions** This device is intended for partial weight-bearing or non weight-bearing applications and cannot be expected to withstand the unsupported stresses of full weight bearing. This device is not approved for screw attachment or fixation to the posterior elements (pedicles) of the cervical, thoracic or lumbar spine.

**Adverse Events** The following are the most frequent adverse events after fixation with orthopaedic screws and pins: loosening, bending, cracking or fracture of the components or loss of fixation in bone attributable to nonunion, osteoporosis, markedly unstable comminuted fractures; loss of anatomic position with nonunion or malunion with rotation or angulation; infection and adverse reactions to the device material.

Contact your local DePuy sales representative for additional information about DePuy shoulder products, including the Global™ Total Shoulder System, the Global™ Advantage® Shoulder Arthroplasty System and the Global™ Fx Shoulder Fracture System. DePuy also offers an entire range of implants for both upper and lower extremity joint replacement and a complete line of bone cement products.

REFERENCES

- Hill, J.M., et al. "Closed Treatment of Displaced Middle-Third Fractures of the Clavicle Gives Poor Results." *Journal of Bone and Joint Surgery* May 1998: 537-539.
- Boehme, D., et al. "Non-Union of Fractures of the mid shaft of the clavicle: Treatment with a modified Hagie Intramedullary Pin and Autogenous Bone Grafting." *Journal of Bone and Joint Surgery* Sept. 1991: 1219-1226.

Consult the package insert for complete product information.  
For more information about the Clavicle Pin, visit our web site at [www.jnjgateway.com](http://www.jnjgateway.com).



**DePuy Orthopaedics, Inc.**  
700 Orthopaedic Drive  
Warsaw, IN 46581-0988  
USA  
Tel: +1 (800) 366 8143  
Fax: +1 (574) 371 4865

**DePuy International Ltd**  
St Anthony's Road  
Leeds LS11 8DT  
England  
Tel: +44 (113) 387 7800  
Fax: +44 (113) 387 7890