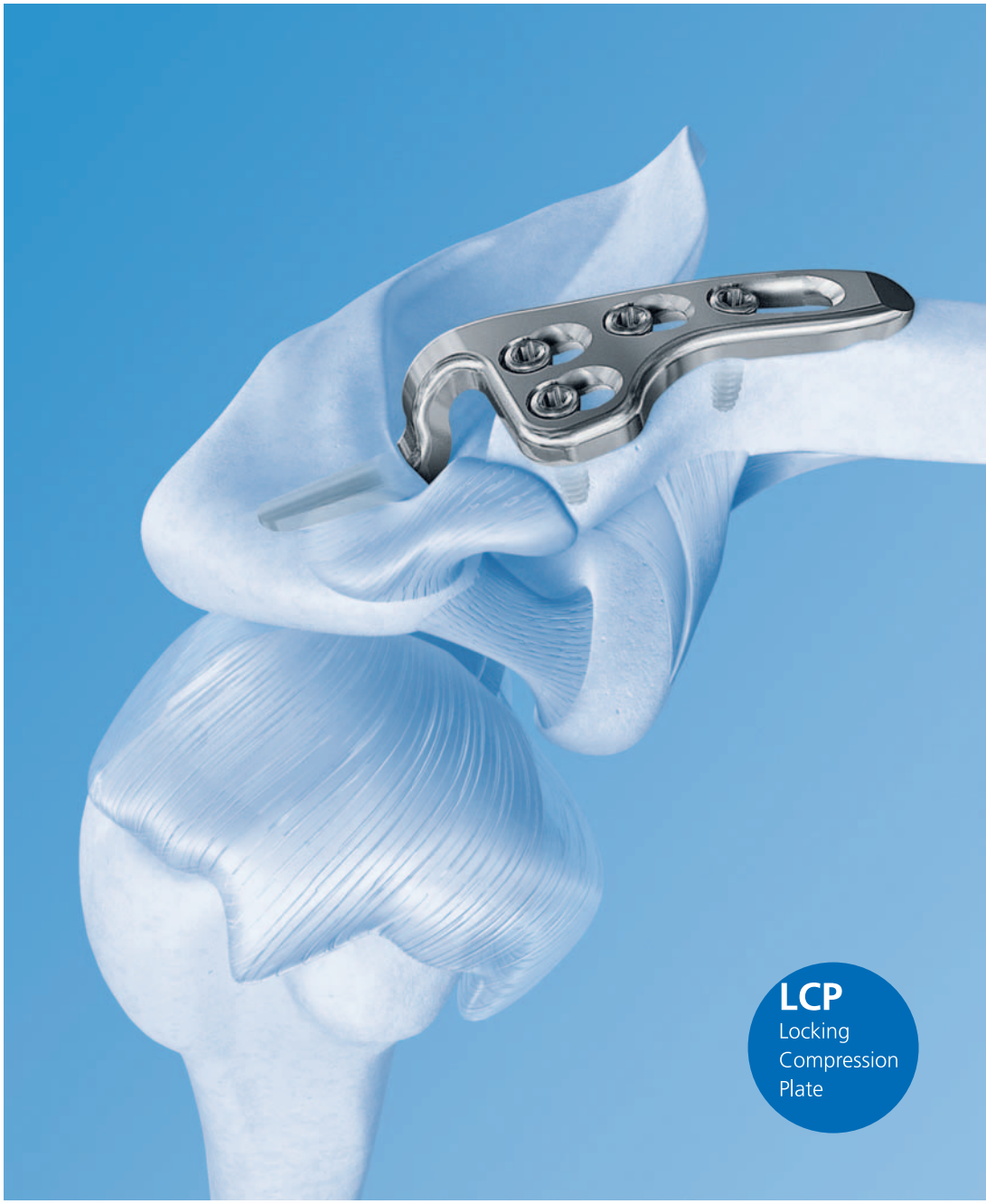
# **LCP Clavicle Hook Plate.** The Fixation System with Angular Stability for Lateral Clavicle Fractures and Acromioclavicular Joint Injuries.

Technique Guide




SYNTHES®
Original Instruments and Implants of the Association for the Study of Internal Fixation – AO ASIF

# Table of Contents


| | | |
|---|---|---|
| **Introduction** | Features and Benefits | 2 |
| | AO ASIF Principles | 4 |
| | Indications | 5 |
| **Surgical Technique** | Lateral Clavicle Fractures | 7 |
| | Dislocation of the Acromioclavicular Joint | 14 |
| | Implant Removal | 21 |
| **Ordering Information** | Plates | 22 |
| | Screws | 23 |
| | Instruments | 24 |



Stardrive


Hex drive


Image intensifier control

**Warning**
This description is not sufficient for immediate application of the instrumentation. Instruction by a surgeon experienced in handling this instrumentation is highly recommended.

# Features and Benefits

### One solution for two indications

The LCP Clavicle Hook Plate provides a single solution for fixation of both lateral clavicle fractures and acromioclavicular joint injuries.



Lateral clavicle fracture



Acromioclavicular joint dislocation

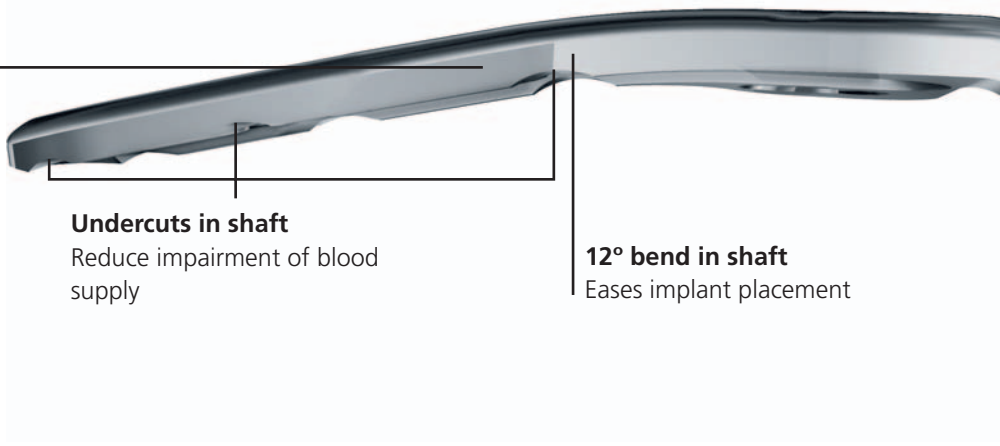
### Anatomically pre-contoured

The plate design facilitates optimal implant placement and surgery in order to provide an improved outcome.



**– Soft radius, smooth hook design and posterior hook offset**

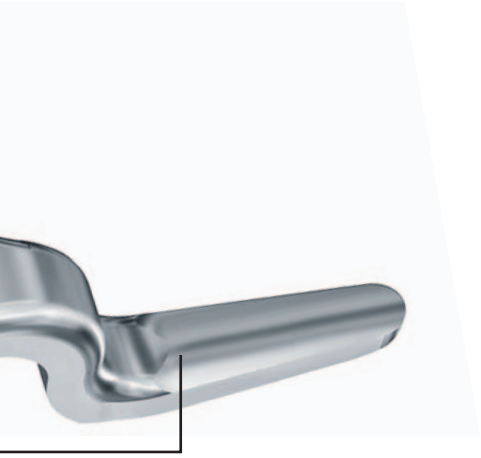
**– Rounded shaft profile**
Minimize the risk of conflicts between the plate and surrounding soft tissue, the acromioclavicular joint and the rotator cuff.

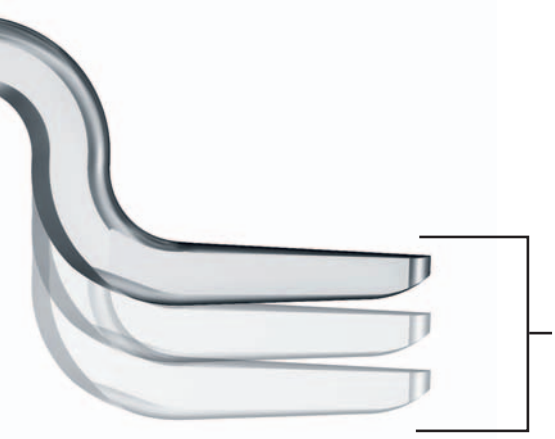


**Intra-operative choice of hook size**

6 trial implants help determine the proper hook size.
– Hook depths 12, 15 and 18 mm
– Left and right version





**3 different hook depths**
12, 15 and 18 mm

**Optimized size matching**

The LCP Clavicle Hook Plate is available in different lengths and hook sizes with a left and right version for optimal sizing and screw positioning for each individual patient.

**4 different lengths**
4–7 holes







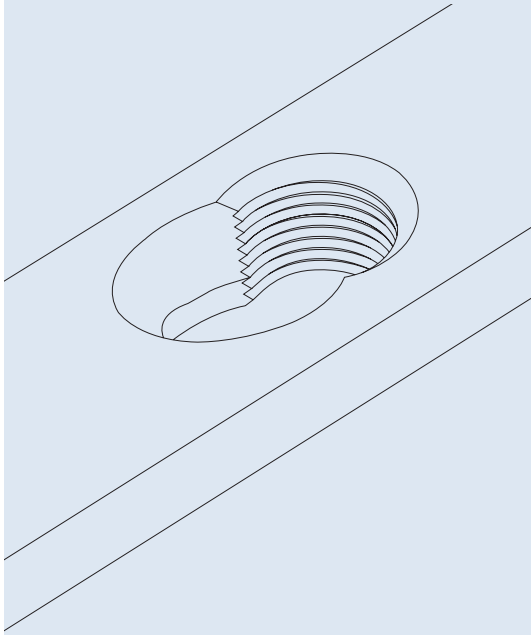


**LCP Locking Compression Plate**
Angular stable fixation of fragments regardless of bone quality

Minimised risk of primary and secondary loss of reduction, even under high dynamic loading

Reduced impairment of periosteal blood supply due to the limited plate contact

Good purchase also in osteoporotic bone and in multifragment factures



**LCP combi-hole**
Intraoperative choice between compression and angular stable locking

With standard screws:
interfragmental or dynamic-axial compression

With locking screws:
stable plate-screw connection without loss of reduction, regardless of plate modelling

# AO ASIF Principles

In 1958, the AO ASIF (Association for the Study of Internal Fixation) formulated four basic principles[1], which have become the guidelines for internal fixation.

**Anatomic reduction**
Fixation of lateral clavicle fractures and dislocations with the anatomically pre-contoured LCP Clavicle Hook Plate allows for anatomic reduction.

**Stable fixation**
The anatomically pre-contoured shaft with a 12° bend eases implant placement. The LCP Clavicle Hook Plate is available in 4 different lengths and 3 different hook sizes for optimal sizing and screw positioning for each individual patient.

**Preservation of blood supply**
The well-proven LCP concept and the undercuts on the shaft of the LCP Clavicle Hook Plate allow preservation of the blood supply through minimal bone-to-plate contact. The rounded shaft profile, soft radius, smooth hook design and posterior hook offset minimize the risk of conflicts between the plate and surrounding soft tissue, the acromioclavicular joint and the rotator cuff.

**Early, active mobilization**
The LCP Clavicle Hook Plate, combined with AO technique, provides stable fracture fixation with minimal trauma to vascular supplies. This helps create an improved environment for bone healing, accelerating the patient's return to previous mobility and function.

1 M.E. Müller, M. Allgöwer, R. Schneider, and R. Willenegger (1991) AO Manual of Internal Fixation, 3rd Edition. Berlin: Springer.

# Indications

**Indications**
Lateral clavicle fractures: Neer type II or Jäger and Breitner type II



Acromioclavicular joint dislocation type: Tossy III or Rockwood III to V



**Not indicated**
Stable lateral clavicle fractures
Tossy Type I and II
Rockwood Type I and II
Acute infection

**Caution:** It is recommended that the LCP Clavicle Hook Plate is removed after healing to prevent potential irritation of the acromion or impinging on the rotator cuff.

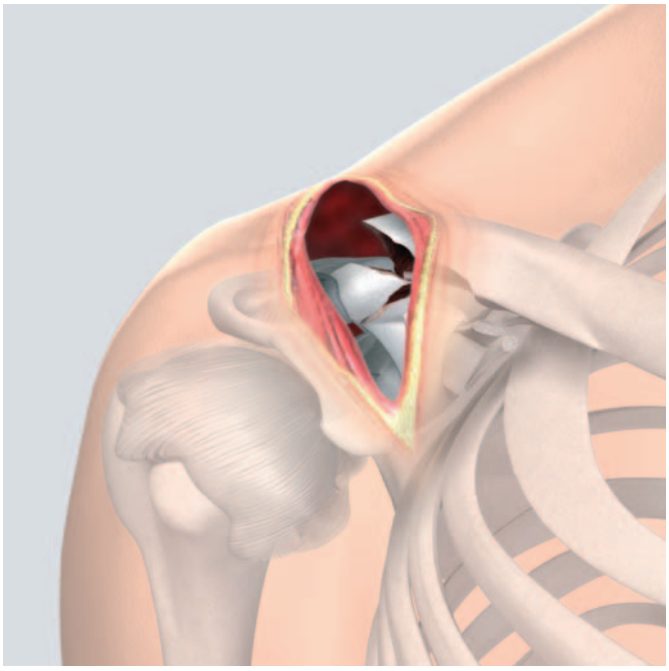
Experience in the use of LCP plates or instruction from an experienced surgeon is recommended (see Synthes application notes for LCP plates, Art. No. 036.000.019)



## 1

**Position the patient**

Place the patient in the beach-chair position. Tilt the head away from the operated side, with care for the position of the neck. A sandbag under the thoracic spine allows the scapula to fall backwards: this aids realignment and reduction of the fracture. Excessive extension of the neck should be avoided.



## 2

**Access to fracture**

If image intensification is to be used, determine that access for the C-arm is sufficient for the anteroposterior and cephalic tilt views.

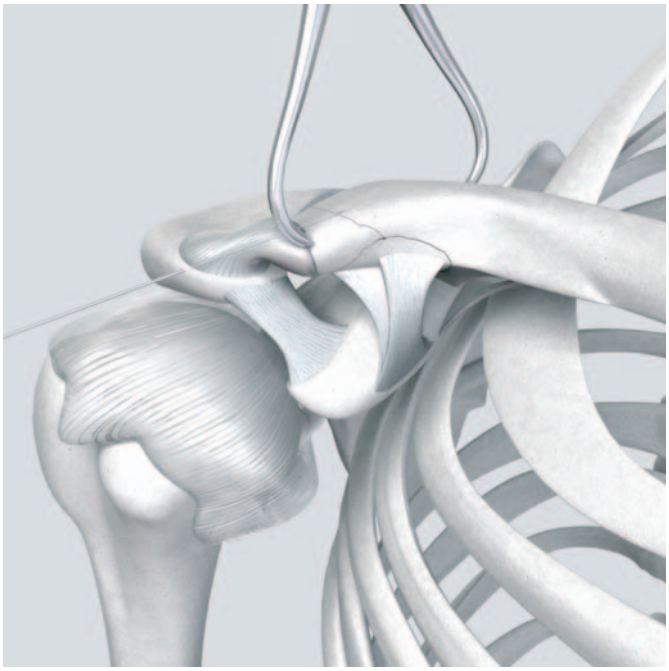
Through either a superior (sabre cut) or transacromial incision, the delto-trapezial fascia is exposed. Care is taken not to injure the lateral supraclavicular nerves. The fracture is usually marked by bruising and a rent in the deltoid fascia and/or trapezius. The acromioclavicular joint may be identified with a needle.

## 3

**Reduce the fracture and provide temporary fixation**

Temporary fixation of the fracture with Kirschner wires or the pointed reduction forceps may be undertaken.

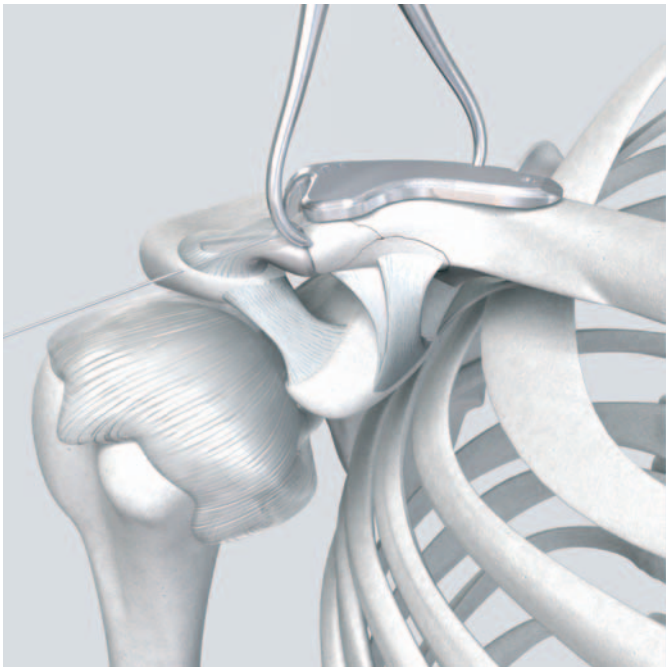
The posterior aspect of the acromioclavicular joint capsule is identified and a 5 mm detachment of the extracapsular fibres of the trapezius from the medial border of the acromion is performed, to allow passage of the hook of the plate under the acromion.



## 4

### Determine hook size and plate length

| Required instruments | |
|---|---|
| 329.930 | Trial Implant for LCP Clavicle Hook Plate, Hook depth 12 mm, left |
| 329.931 | Trial Implant for LCP Clavicle Hook Plate, Hook depth 12 mm, right |
| 329.932 | Trial Implant for LCP Clavicle Hook Plate, Hook depth 15 mm, left |
| 329.933 | Trial Implant for LCP Clavicle Hook Plate, Hook depth 15 mm, right |
| 329.934 | Trial Implant for LCP Clavicle Hook Plate, Hook depth 18 mm, left |
| 329.935 | Trial Implant for LCP Clavicle Hook Plate, Hook depth 18 mm, right |



Trial implants are provided to aid in determining the appropriate hook size.

Use the trial implant with a 12 mm hook, and pass the hook under the acromion. Place the shaft of the trial implant onto the superior aspect of the clavicle. If it is difficult to lower the shaft onto the reduced clavicle, then use an implant with 15 mm or 18 mm hook size. Once the plate shaft is placed on the clavicle, the end of the hook should be in contact with the underside of the acromion.



Confirm that the correct anatomic alignment of the clavicle and acromion has been restored without impinging on the rotator cuff. Use the C-arm to verify that full shoulder motion, particularly in abduction and external rotation, can be achieved without impinging on the humeral head by the hook.

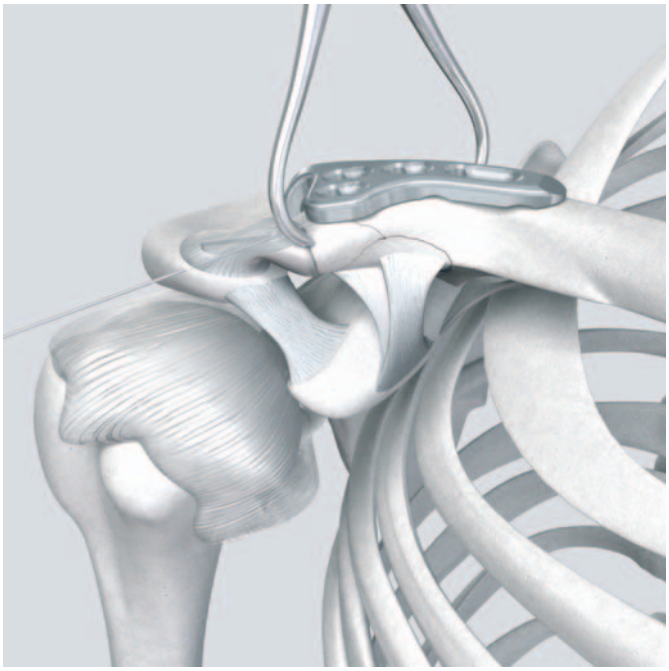
The plate length must ensure appropriate fixation on the medial side of the fracture.

**Note:** Do not bend or implant the trial implants.

## 5

**Option: Fixate the plate temporarily**

Once the hook size is determined, remove the trial implant and position the implant. After confirming the correct plate position under the image intensifier, the plate can be fixed temporarily using a Kirschner wire. Drill the wire through the drill sleeve in the distal hole to fix the distal part of the plate.



## 6

**Option: Adapt plate to the patient's anatomy**

| Possible instruments | |
|---|---|
| 329.040/050 | Bending Iron |
| 329.150 | Bending Pliers, length 230 mm |

**Important:** Since the plate shaft is anatomically pre-contoured (12°), bending of the plate is not necessary, but can be done if required.

Contour the plate using the appropriate bending instruments (as with standard plates). The combi-holes should not be deformed excessively during bending, as this may hinder the subsequent insertion of locking screws. If possible, bend the plate between the combi-holes.

**Notes**
Do not bend the shaft between the holes more than 20 to 25°.
Do not bend the hook more than 10 to 15°.
Do not bend the plate and hook back and forth.
Take care that the plate surface does not get scratched.
Sharp edges can irritate soft tissue.

If only non-locking cortex screws are used, the plate needs to be congruent with the surface of the bone, and bending or twisting may be required.

It is recommended that the most proximal plate hole is aligned over the axis of the shaft of the clavicle and provisional cortical screw fixation using either a locking screw or cortical screw is performed first. By alignment of the medial and lateral fracture fragments with the plate using reduction forceps, the fracture is indirectly reduced and definitive fixation can then be carried out.

## 7a

**Fixation with Locking Screws ∅ 3.5 mm**

| Required instruments | |
|---|---|
| 310.284 | LCP Drill Bit ∅ 2.8 mm |
| 311.431 | Handle with Quick Coupling |
| 314.030 | Screwdriver Shaft, hexagonal<br>or |
| 314.116 | Screwdriver Shaft Stardrive T15 |
| 319.010 | Depth Gauge for Screws ∅ 2.7 to 4.0 mm |
| 323.027 | LCP Drill Sleeve 3.5 for Drill Bits ∅ 2.8 mm |
| 323.360 | Universal Drill Guide 3.5 |
| 397.705 | Handle for Torque Limiter 1.5 Nm |
| 511.770/773 | Torque Limiter 1.5 Nm |

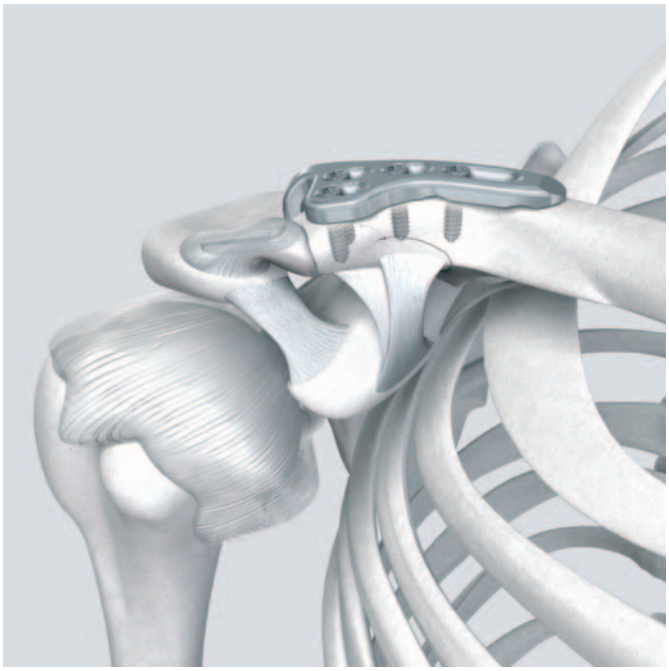
Once the hook size is determined, remove the trial implant and position the implant. After confirmation of the correct plate position under the image intensifier, start definitive fixation with screws.

Carefully screw the LCP drill sleeve into the threaded central hole of the plate.

With an LCP drill bit ∅ 2.8 mm, predrill the screw hole through both cortices. Read the required screw length directly from the drill bit. Use the depth gauge to check the length of screw.

Insert the locking screw with the screwdriver (hexagonal or Stardrive recess) mounted on the torque limiter 1.5 Nm. Insert the screw manually or by power until a click is heard. If a power tool is used, reduce speed when tightening the head of the locking screw into the plate.

Repeat the procedure until all pre-determined shaft holes are used. Perform a final check to confirm all screws are locked.



It is recommended that the final turns are done manually.

**Notes**

The screw length should be carefully observed in order to avoid neurovascular injuries.
Do not mix titanium and steel implants (e.g. titanium plate with steel screws).
To ensure a stable fixation of the implant, use at least two screws in the medial part of the plate. One or two screws can be used to fix the lateral fragments.

# 7b

**Fixation with Cortex Screws ∅ 3.5 mm**

| Required instruments | |
|---|---|
| 310.250 | Drill bit ∅ 2.5 mm |
| 311.431 | Handle with Quick Coupling |
| 314.030 | Screwdriver Shaft, hexagonal |
| 319.010 | Depth Gauge for Screws ∅ 2.7 to 4.0 mm |
| 323.360 | Universal Drill Guide 3.5 |
| 397.705 | Handle for Torque Limiter 1.5 Nm |
| 511.770/773 | Torque Limiter 1.5 Nm |

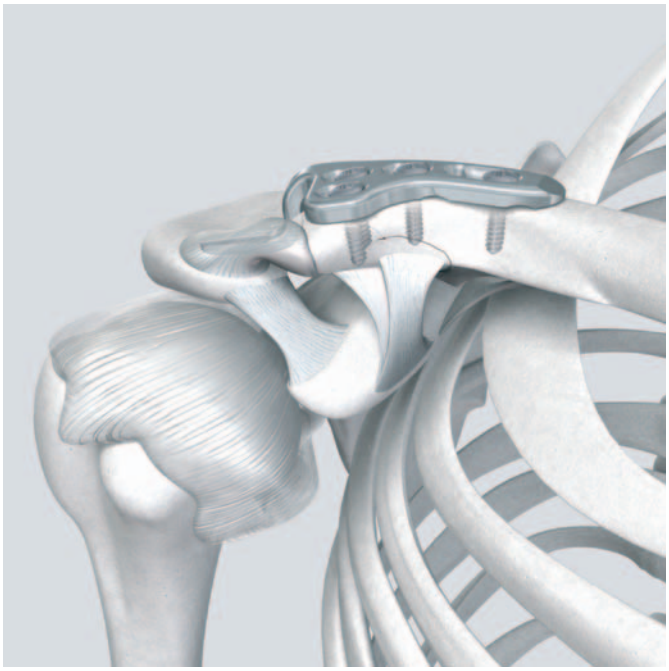
Once the hook size is determined, remove the trial implant and position the implant. After confirmation of the correct plate position under the image intensifier, start definitive fixation with screws.

Use the drill guide and the drill bit ∅ 2.5 mm to pre-drill both cortices.

Determine the required length of the cortex screw with the depth gauge.

Insert the self-tapping cortex screw ∅ 3.5 mm by using the screwdriver shaft mounted on a power tool or on a handle with quick coupling.

Repeat the procedure until all pre-determined shaft holes are used.



**Notes**

The screw length should be carefully observed in order to avoid neurovascular injuries.
Do not mix titanium and steel implants (e.g. titanium plate with steel screws).
To ensure a stable fixation of the implant, use at least two screws in the medial part of the plate. One or two screws can be used to fix the lateral fragments.

# Dislocation of the Acromio-clavicular Joint

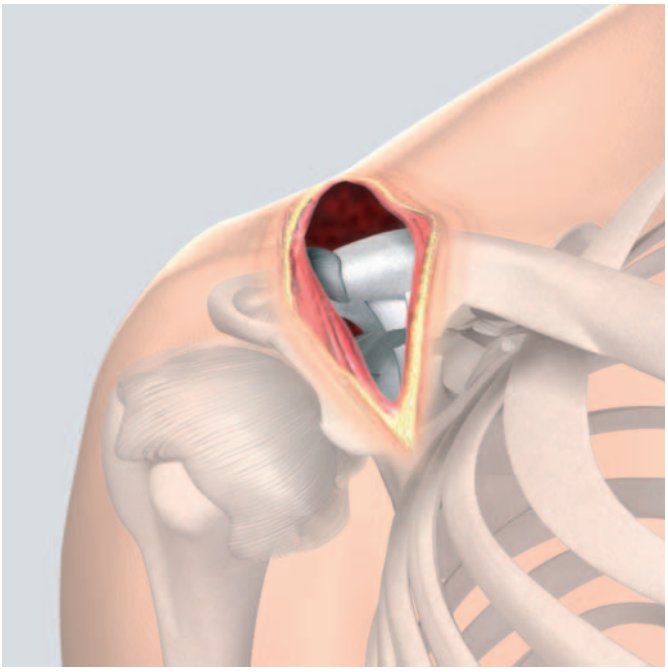
Experience in the use of LCP plates or instruction from an experienced surgeon is recommended (see Synthes application notes for LCP plates, Art.No. 036.000.019)



## 1

**Position the patient**

Place the patient in the beach-chair position. Tilt the head away from the operated side, with care for the position of the neck. A sandbag under the thoracic spine allows the scapula to fall backwards: this aids realignment and reduction of the acromioclavicular joint. Excessive extension of the neck should be avoided.



## 2

**Access**

If image intensification is to be used, determine that access for the C-arm is sufficient for the anteroposterior and cephalic tilt views.

Through either a superior (sabre cut) or transacromial incision, the delto-trapezial fascia is exposed. Care is taken not to injure the lateral supraclavicular nerves. The acute dislocation is marked by a rupture through the superior acromioclavicular ligament, with prolapse of the intra-articular disc remnants which usually remain partially attached to the clavicle, and incomplete rupture of the acromial fibres of the trapezius. The coracoclavicular ligaments and the periosteum are also ruptured in Rockwood Type V injuries.

## 3

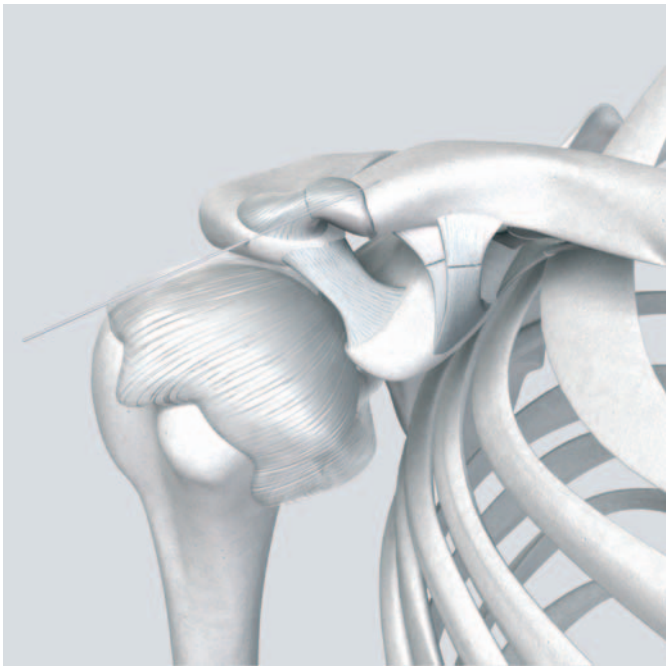
**Reduce the dislocation and fixate it temporarily**

The arm, and therefore the scapula, is elevated towards the clavicle and supported by the assistant or on a side table. The acromion is reduced to the clavicle in the horizontal and vertical planes. Temporary fixation of the acromioclavicular joint may be achieved by a transacromial Kirschner wire passed into the distal clavicle.

The posterior aspect of the acromioclavicular joint capsule is identified and a 5 mm detachment of the extracapsular fibres of the trapezius from the medial border of the acromion is performed, to allow passage of the hook of the plate under the acromion.

In the fresh dislocation the superior acromioclavicular and coracoclavicular ligaments may be repaired.

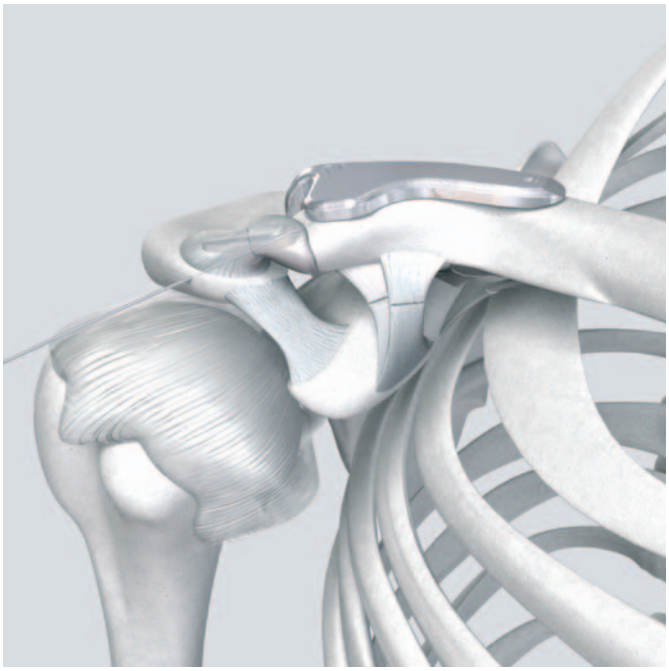
In the chronic dislocation repair of the ligaments is generally impossible; reconstruction is necessary. A transfer of the coraco-acromial ligament to the distal clavicle, and augmentation of scapuloclavicular suspension by autogenous ligament grafts (plantaris, palmaris longus, or hamstring tendons) or artificial ligaments should be considered at this stage. Preparation of the trapezial envelope for later reefed repair is undertaken.



## 4

### Determine hook size and plate length

| Required instruments | |
|---|---|
| 329.930 | Trial Implant for LCP Clavicle Hook Plate, Hook depth 12 mm, left |
| 329.931 | Trial Implant for LCP Clavicle Hook Plate, Hook depth 12 mm, right |
| 329.932 | Trial Implant for LCP Clavicle Hook Plate, Hook depth 15 mm, left |
| 329.933 | Trial Implant for LCP Clavicle Hook Plate, Hook depth 15 mm, right |
| 329.934 | Trial Implant for LCP Clavicle Hook Plate, Hook depth 18 mm, left |
| 329.935 | Trial Implant for LCP Clavicle Hook Plate, Hook depth 18 mm, right |



Trial implants are provided to help determine the proper hook size.

Use the trial implant with a 12 mm hook, and pass the hook under the acromion. Place the shaft of the trial implant onto the superior aspect of the clavicle. If it is difficult to lower the shaft onto the clavicle, then use an implant with 15 mm or 18 mm hook size. Once the plate shaft is placed on the clavicle, the end of the hook should be in contact with the underside of the acromion.



Confirm that the correct anatomic alignment of the clavicle and acromion has been restored without impinging on the rotator cuff. Use the C-arm to verify that full shoulder motion, particularly in abduction and external rotation, can be achieved without impinging on the humeral head by the hook.

The plate length must ensure appropriate fixation on the medial side of the reduced joint.

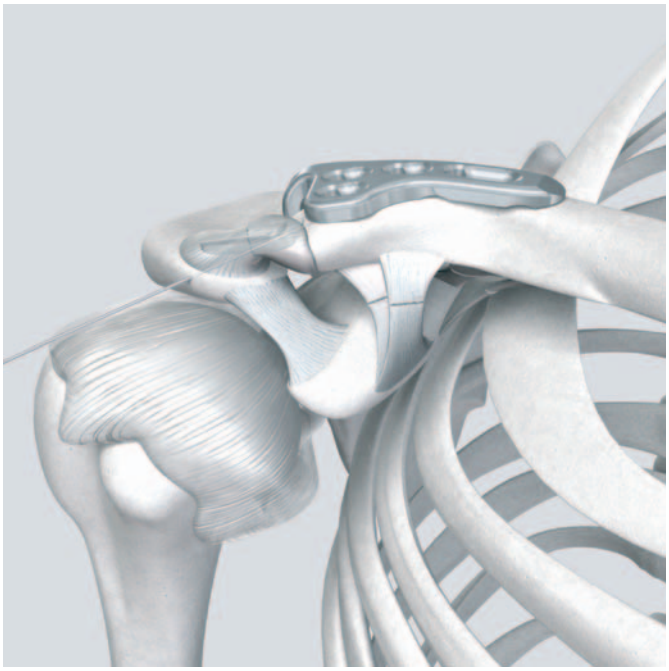
**Note:** Do not bend or implant the trial implants.

## 5

**Option: Fixate the plate temporarily**

Once the hook size is determined, remove the trial implant and position the implant. After confirmation of the correct plate position under the image intensifier, fixation can be achieved temporarily by using a Kirschner wire. Drill the wire through the drill sleeve in the distal hole to fix the distal part of the plate.

Fixation can also be achieved using a cortical screw in the most medial plate hole.



## 6

**Option: Adapt plate to the patient's anatomy**

| Possible instruments | |
|---|---|
| 329.040/050 | Bending Iron |
| 329.150 | Bending Pliers, length 230 mm |

**Important:** Since the plate shaft is anatomically pre-contoured (12°), bending of the plate is not necessary, but can be done if required.

Contour the plate using the appropriate bending instruments (as with standard plates). The combi-holes should not be deformed excessively during bending, as this may hinder the subsequent insertion of locking screws. If possible, bend the plate between the combi-holes.

**Notes**
Do not bend the shaft between the holes more than 20 to 25°.
Do not bend the hook more than 10 to 15°.
Do not bend the plate and hook back and forth.
Take care that the plate surface does not get scratched. Sharp edges can irritate soft tissue.

If only non-locking cortex screws are used, the plate needs to be congruent with the surface of the bone, and bending or twisting may be required.

It is recommended that the most distal plate hole is aligned over the axis of the shaft of the clavicle and provisional cortical screw fixation using either a locking screw or cortical screw is performed first.

# 7a

**Fixation with Locking Screws ∅ 3.5 mm**

| Required instruments | |
|---|---|
| 310.284 | LCP Drill Bit ∅ 2.8 mm |
| 311.431 | Handle with Quick Coupling |
| 314.030 | Screwdriver Shaft, hexagonal<br>or |
| 314.116 | Screwdriver Shaft Stardrive T15 |
| 319.010 | Depth Gauge for Screws ∅ 2.7 to 4.0 mm |
| 323.027 | LCP Drill Sleeve 3.5 for Drill Bits ∅ 2.8 mm |
| 323.360 | Universal Drill Guide 3.5 |
| 397.705 | Handle for Torque Limiter 1.5 Nm |
| 511.770/773 | Torque Limiter 1.5 Nm |

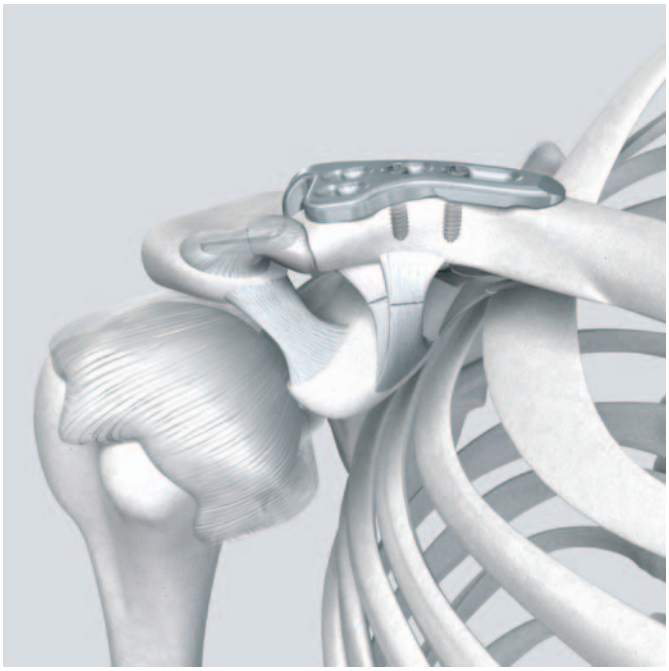
Once the hook size is determined, remove the trial implant and position the implant. After confirmation of the correct plate position under the image intensifier, start definitive fixation with screws.

Carefully screw the LCP drill sleeve into the threaded central hole of the plate.

Predrill the screw hole with an LCP drill bit ∅ 2.8 mm through both cortices. Read the required screw length directly from the drill bit. Use depth gauge to check the length of screw.

Insert the locking screw with the screwdriver (hexagonal or Stardrive recess) mounted on torque limited attachment 1.5 Nm. Insert the screw manually or by power until a click is heard. If a power tool is used, reduce speed when tightening the head of the locking screw into the plate.

To ensure a stable fixation of the implant, use at least two screws in the medial part of the plate. Perform a final check to confirm all screws are locked.



It is recommended that the final turns are done manually.

**Notes**

The screw length should be carefully observed in order to avoid neurovascular injuries.
Do not mix titanium and steel implants (e.g. titanium plate with steel screws).

## 7b

**Fixation with Cortex Screws ∅ 3.5 mm**

| Required instruments | |
|---|---|
| 310.250 | Drill bit ∅ 2.5 mm |
| 311.431 | Handle with Quick Coupling |
| 314.030 | Screwdriver Shaft, hexagonal |
| 319.010 | Depth Gauge for Screws ∅ 2.7 to 4.0 mm |
| 323.360 | Universal Drill Guide 3.5 |
| 397.705 | Handle for Torque Limiter 1.5 Nm |
| 511.770/773 | Torque Limiter 1.5 Nm |

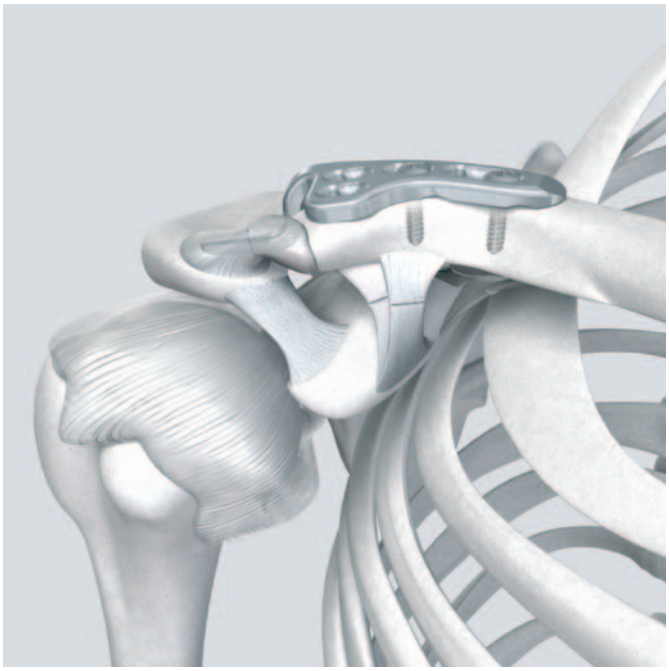
Once the hook size is determined, remove the trial implant and position the implant. After confirmation of the correct plate position under the image intensifier, start definitive fixation with screws.

Use the drill guide and the drill bit ∅ 2.5 mm to pre-drill both cortices.

Determine the required length of the cortex screw with the depth gauge.

Insert the self-tapping cortex screw ∅ 3.5 mm by using the screwdriver shaft mounted on a power tool or on a handle with quick coupling.

To ensure a stable fixation of the implant, use at least two screws in the medial part of the plate.



**Notes**

The screw length should be carefully observed in order to avoid neurovascular injuries.
Do not mix titanium and steel implants (e.g. titanium plate with steel screws).

# Implant Removal

**Required instruments**

| | |
|---|---|
| 309.521 | Extraction Screw |
| 311.430 | T-Handle |
| 314.030 | Screwdriver Shaft, hexagonal |
| or | |
| 314.116 | Screwdriver Shaft Stardrive T15 |

Implant removal is usually done 3 months after implantation.

**Caution:** It is recommended that the LCP Clavicle Hook Plate is removed after healing to prevent potential irritation of the acromion or impinging on the rotator cuff.

To remove the implants, unlock all locking screws before removing them completely. The plate may otherwise rotate while the last screw is being removed, which can damage the soft tissue.

If the locking screws cannot be removed with the screw driver (e.g. the recess of the screw is damaged or the locking screw is jammed in the plate), use an extraction screw with left-handed thread. Loosen the screw by turning the handle in a counter-clockwise direction.

**Important:** It is very important to have correct instrumentation to ensure trouble-free implant removal. The correct screwdrivers (hex or Stardrive) and the extraction screws are especially important (e.g. see brochure „Screw extraction Set“, Art. No. 036.000.917).

# Plates

**LCP Clavicle Hook Plate 3.5**
Available in:
– 4 different lengths
– 3 hook sizes
– left and right version
– titanium and stainless steel
– non-sterile and sterile packed











| Right | Left | Number of holes | Hook depth (mm) |
|---|---|---|---|
| X41.072 | X41.073 | 4 | 12 |
| X41.074 | X41.075 | 4 | 15 |
| X41.076 | X41.077 | 4 | 18 |
| X41.082 | X41.083 | 5 | 12 |
| X41.084 | X41.085 | 5 | 15 |
| X41.086 | X41.087 | 5 | 18 |
| X41.094 | X41.095 | 6 | 15 |
| X41.096 | X41.097 | 6 | 18 |
| X41.104 | X41.105 | 7 | 15 |
| X41.106 | X41.107 | 7 | 18 |

X=2: stainless steel
X=4: titanium
All plates are available sterile packed. The article number of sterile packed implants is followed by (S)

# Screws

**Locking Screws ∅ 3.5 mm, length 12-60 mm, self-tapping**

– Stardrive (X12.102-124)
– Hex drive (X13.012-060)



**Cortex Screws ∅ 3.5 mm, length 14-60 mm, self-tapping**

– Hex drive (X04.814-860)



X=2: stainless steel
X=4: titanium
All plates are available sterile packed. The article number of sterile packed implants is followed by (S)

### Trial Implant for LCP Clavicle Hook Plate




| Art. No. | Hook depth (mm) | Direction |
|---|---|---|
| 329.931 | 12 | right |
| 329.933 | 15 | right |
| 329.935 | 18 | right |
| | | |
| 339.930 | 12 | left |
| 339.932 | 15 | left |
| 339.934 | 18 | left |

### Available instrument sets

**Without screws**
– 182.460 LCP Small Fragment Instrument Set and Standard Instruments in Vario Case

**With hex screws**
– 182.466 LCP Small Fragment Instrument Set with Locking Screws 3.5 mm (Titanium Alloy) in Vario Case
– 182.467 LCP Small Fragment Instrument Set with Locking Screws 3.5 mm (Stainless Steel) in Vario Case

**With Stardrive screws**
– 182.468 LCP Small Fragment Instrument Set with Locking Screws 3.5 mm Stardrive (Titanium Alloy) in Vario Case
– 182.469 LCP Small Fragment Instrument Set with Locking Screws 3.5 mm Stardrive (Stainless Steel) in Vario Case

**Note:** The LCP Clavicle Hook Plate is compatible with 3.5 LCP instruments and standard small fragment instruments. These additionally required instruments are not explicitly shown in this technique guide, but are essential for the application of the plate.

Synthes GmbH
Eimattstrasse 3
CH-4436 Oberdorf
www.synthes.com

Presented by:

0123

036.000.473 SE_034295 AA 30050092 © Synthes 2006 LCP and Stardrive are trademarks of Synthes Subject to modifications