

LCP™ Clavicle Hook Plate

Surgical Technique



 Image intensifier control

This description alone does not provide sufficient background for direct use of DePuy Synthes products. Instruction by a surgeon experienced in handling these products is highly recommended.

Processing, Reprocessing, Care and Maintenance

For general guidelines, function control and dismantling of multi-part instruments, as well as processing guidelines for implants, please contact your local sales representative or refer to:

<http://emea.depuysynthes.com/hcp/reprocessing-care-maintenance>

For general information about reprocessing, care and maintenance of DePuy Synthes reusable devices, instrument trays and cases, as well as processing of DePuy Synthes non-sterile implants, please consult the Important Information leaflet (SE_023827) or refer to:

<http://emea.depuysynthes.com/hcp/reprocessing-care-maintenance>

Table of Contents

Introduction	LCP Clavicle Hook Plate	2
	The AO Principles of Fracture Management	4

Surgical Technique	Lateral Clavicle Fractures	6
	Dislocation of the Acromioclavicular Joint	13
	Implant Removal	20

Ordering Information	Plates	21
	Screws	22
	Instruments	23

MRI Information		24
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- Notes
- ▲ Precautions
- ▲ WARNINGS

LCP™ Clavicle Hook Plate

Overview

Anatomically contoured

The plate design facilitates implant placement.



- Posterior hook offset
- Rounded shaft profile



Intra-operative choice of hook size

6 trial implants help determine the proper hook size.

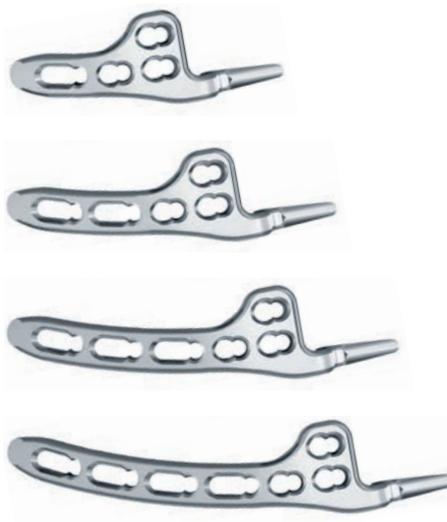
- Hook depths 12, 15 and 18 mm
- Left and right version



The LCP™ Clavicle Hook Plate is available in different lengths and hook sizes with a left and right version.

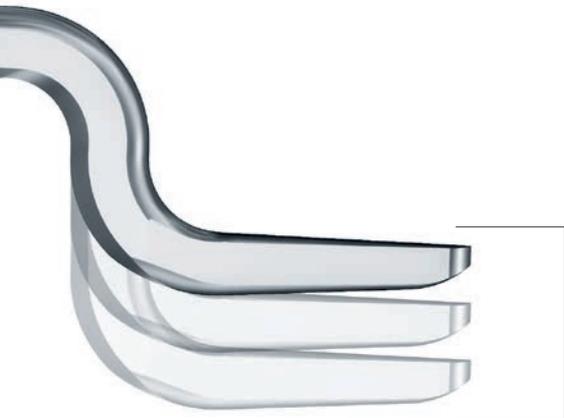
4 different lengths

4–7 holes



3 different hook depths

12, 15 and 18 mm



Please refer to the corresponding Instructions for Use for specific information on Intended use, Indications, Contraindications, Warnings and Precautions, Potential Adverse Events, Undesirable Side Effect and Residual Risks.

Instruction for Use are available at www.e-ifu.com and/or www.depuysynthes.com/ifu



LCP combi-hole

Intraoperative choice between compression and angular stable locking

With standard screws:
interfragmental or dynamic-axial compression

With locking screws:
plate-screw connection

The AO Principles of Fracture Management

Mission

The AO's mission is promoting excellence in patient care and outcomes in trauma and musculoskeletal disorders.

AO Principles^{1,2}

1.



Fracture reduction and fixation to restore anatomical relationships.

2.



Fracture fixation providing absolute or relative stability, as required by the “personality” of the fracture, the patient, and the injury.

3.



Preservation of the blood supply to soft-tissues and bone by gentle reduction techniques and careful handling.

4.



Early and safe mobilization and rehabilitation of the injured part and the patient as a whole.

¹ Müller ME, Allgöwer M, Schneider R, Willenegger H. Manual of Internal Fixation. 3rd ed. Berlin, Heidelberg New York: Springer 1991.

² Buckley RE, Moran CG, Apivatthakakul T. AO Principles of Fracture Management: 3rd ed. Vol. 1: Principles, Vol. 2: Specific fractures. Thieme; 2017.

▲ WARNING:

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.

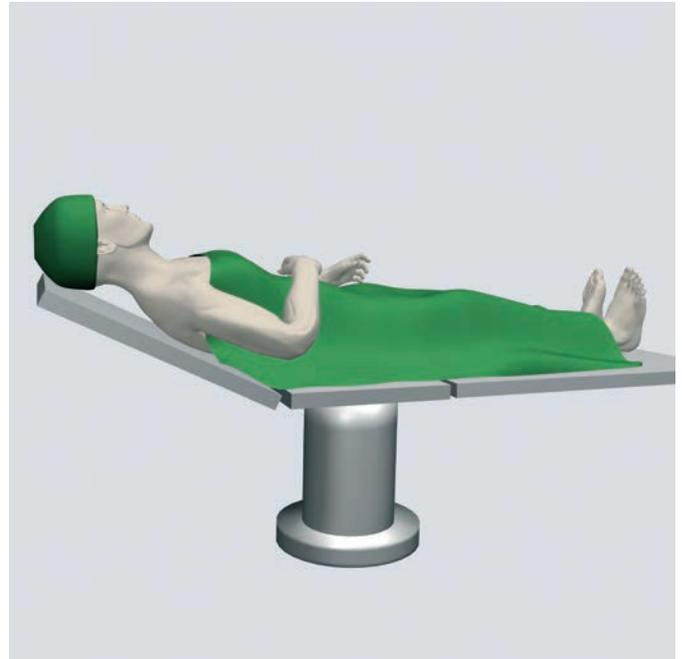


Lateral Clavicle Fractures

Experience in the use of LCP plates or instruction from an experienced surgeon is recommended (see DePuy Synthes application notes for LCP plates).

1. Position the patient

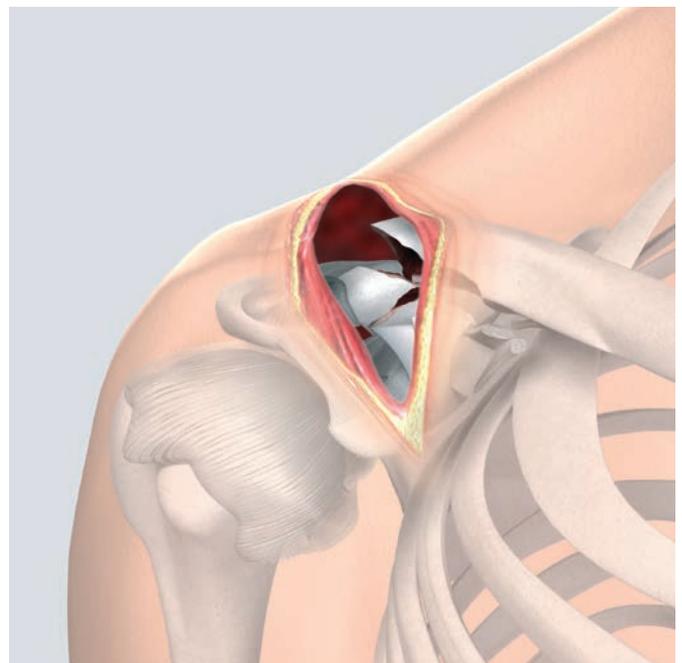
Place the patient in the beach-chair position. Tilt the head away from the operated side, with care for the position of the neck. A sandbag under the thoracic spine allows the scapula to fall backwards: this aids realignment and reduction of the fracture. Excessive extension of the neck should be avoided.



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.

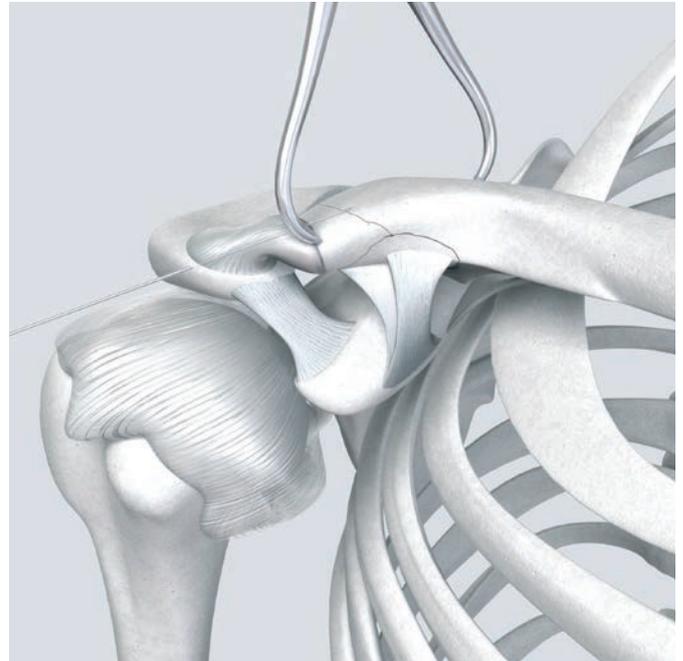
Through either a superior (saber cut) or transacromial incision, the delto-trapezial fascia is exposed. Care is taken not to injure the lateral supraclavicular nerves. The fracture is usually marked by bruising and a rent in the deltoid fascia and/or trapezius. The acromioclavicular joint may be identified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

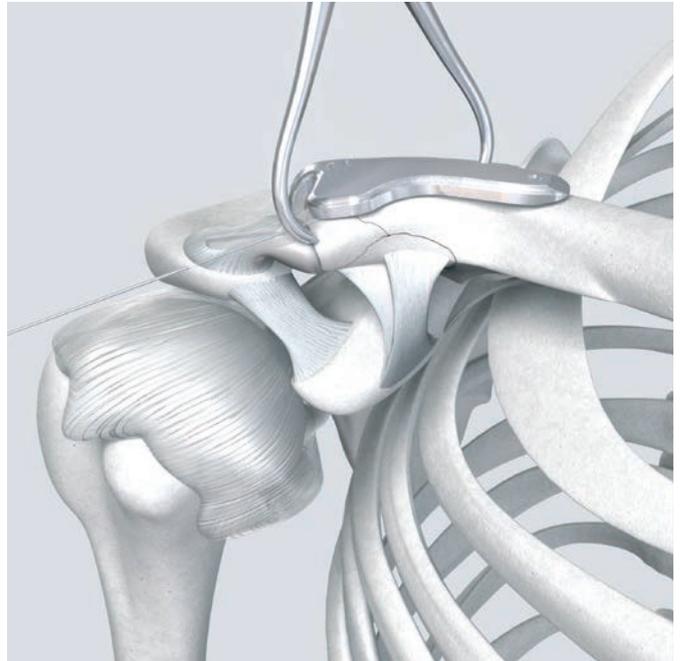
The posterior aspect of the acromioclavicular joint capsule is identified and a 5 mm detachment of the extracapsular fibres of the trapezius from the medial border of the acromion is performed, to allow passage of the hook of the plate under the acromion.



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.

- ① 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.

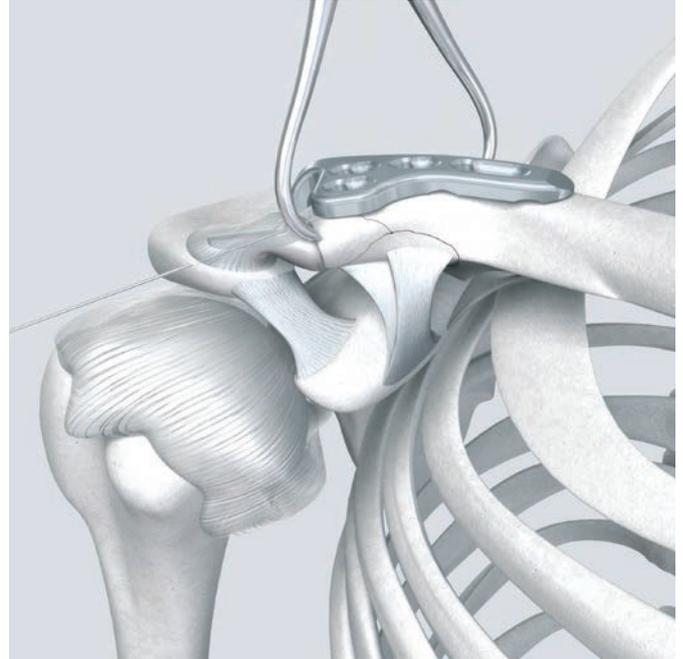
■ Note:

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

■ Note:

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

If needed, contour the plate using the appropriate bending instruments (as with standard plates).

▲ Precautions:

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.

- 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 or	Screwdriver Shaft, hexagonal
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

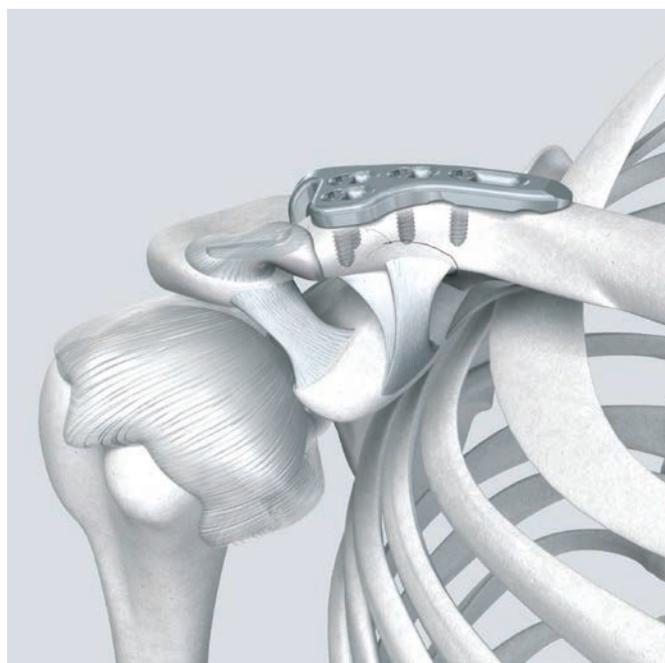
Once the hook size is determined, remove the trial implant and position the implant. After confirmation of the correct plate position under the image intensifier, start definitive fixation with screws.

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. 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.

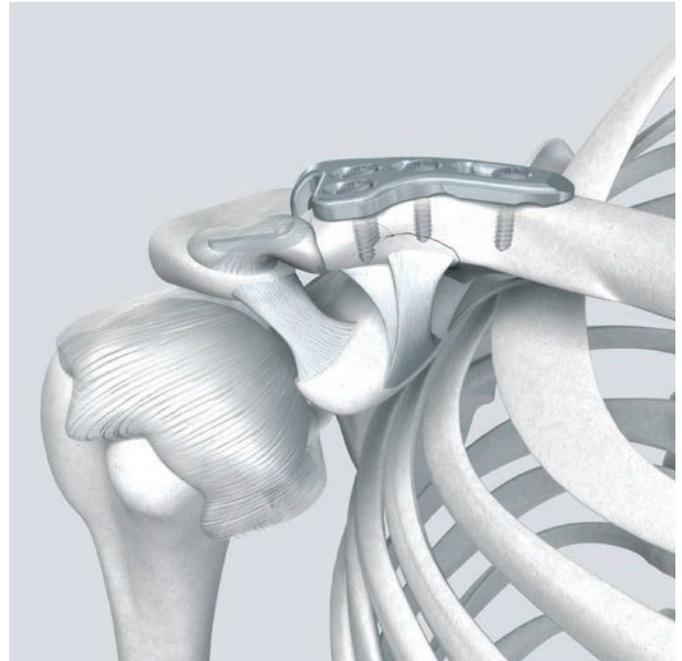
Determine the required length of the cortex screw with the depth gauge.

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. 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 Acromioclavicular Joint

Experience in the use of LCP plates or instruction from an experienced surgeon is recommended (see DePuy Synthes application notes for LCP plates).

1. Position the patient

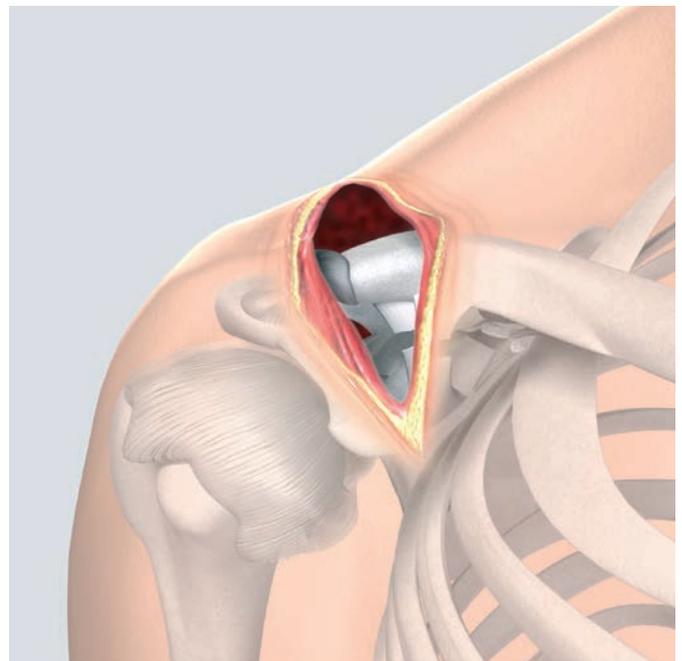
Place the patient in the beach-chair position. Tilt the head away from the operated side, with care for the position of the neck. A sandbag under the thoracic spine allows the scapula to fall backwards: this aids realignment and reduction of the acromioclavicular joint. Excessive extension of the neck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



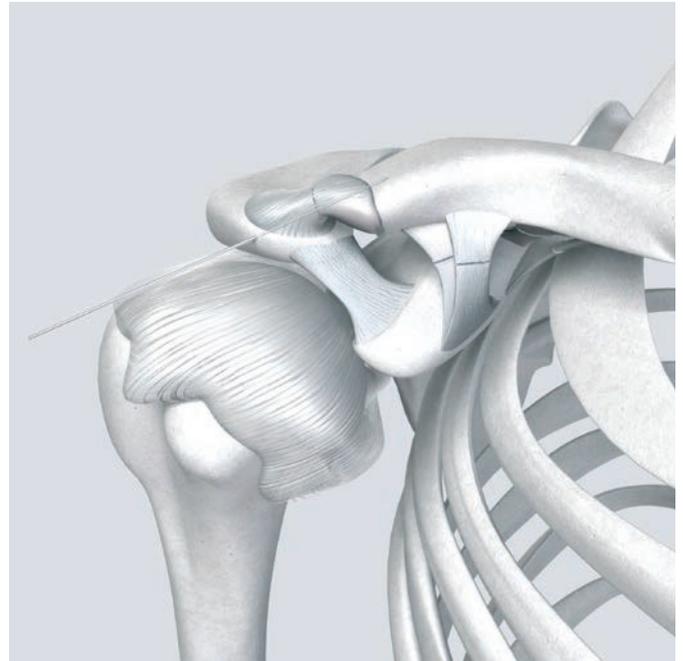
3. Reduce the dislocation and fixate it temporarily

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 extra-capsular 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.

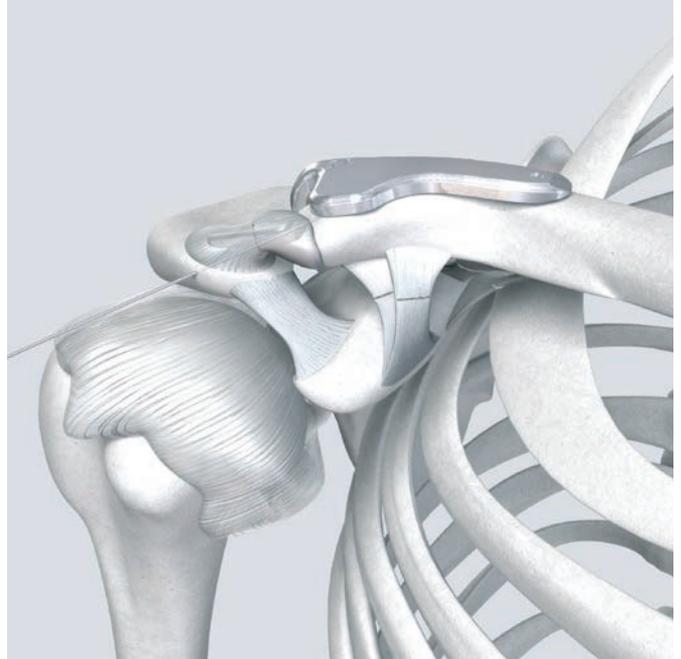
In the chronic dislocation repair of the ligaments is generally impossible; reconstruction is necessary. A transfer of the coraco-acromial ligament to the distal clavicle, and augmentation of scapuloacromial suspension by autogenous ligament grafts (plantaris, palmaris longus, or hamstring tendons) or 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:

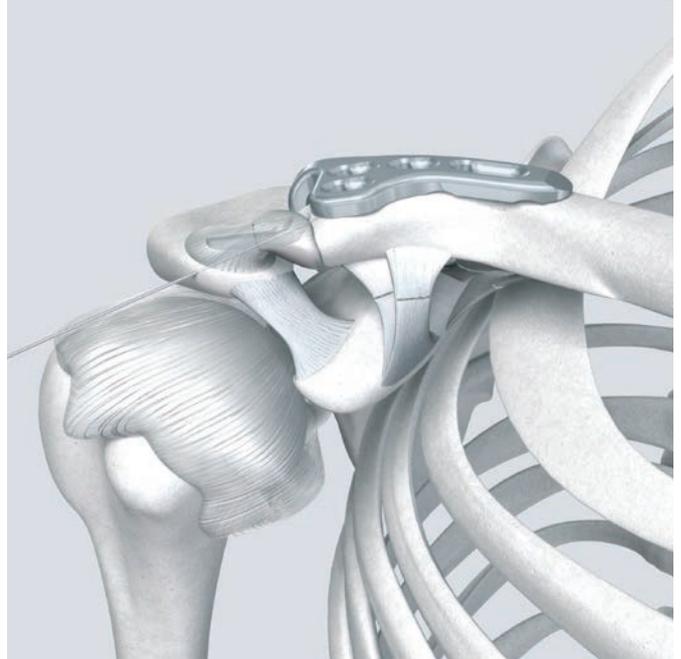
Do not bend or implant the trial implants.



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

■ Note:

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

If needed, contour the plate using the appropriate bending instruments (as with standard plates).

▲ Precautions:

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.

- 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 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.

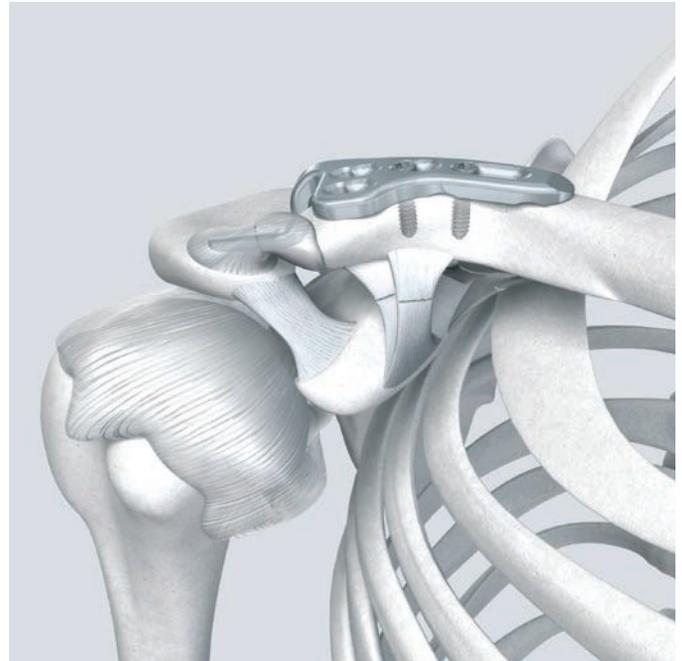
Carefully screw the LCP drill sleeve into the threaded central hole of the plate.

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.



■ Note:

The screw length should be carefully observed in order to avoid neurovascular injuries.

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.

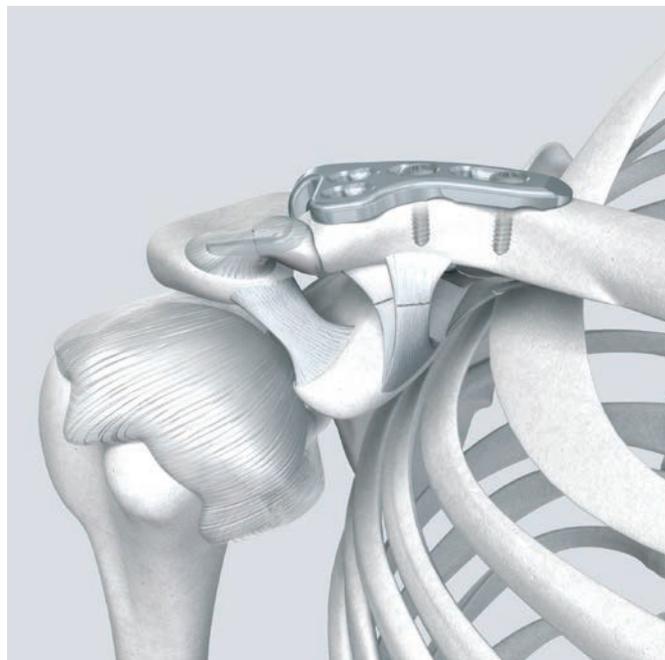
Determine the required length of the cortex screw with the depth gauge.

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.

■ Note:

The screw length should be carefully observed in order to avoid neurovascular injuries.



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.

▲ WARNING:

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.

■ Note:

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 “Screw extraction Set” Surgical Technique Guide).

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
X41.092*	X41.093*	6	12
X41.102*	X41.103*	6	12



Optional: LC-DCP Clavicula Hook Plate

Right	Left	Number of holes	Hook depth (mm)
X41.062	X41.063	6	15
X41.064	X41.065	6	18
X41.066	X41.067	8	15
X41.068	X41.069	8	18

■ Note:

For information on fixation principles using LC-DCP techniques, please refer to the “DCP™ and LC-DCP™ Systems” Technique guide.

X=2: stainless steel

X=4: titanium

All plates are available sterile packed, except 241.092, 241.093, 241.102, 241.103.

The article number of sterile packed implants is followed by (S)

*The stainless steel implants are non-sterile packed

Screws

Locking Screws \varnothing 3.5 mm, length 12-60 mm, self-tapping

-  • STARDRIVE (X12.102-124)*
-  • Hex drive (X13.012-060)

Cortex Screws \varnothing 3.5 mm, length 14-60 mm, self-tapping

-  • Hex drive (X04.814-860)



X=2: stainless steel

X=4: titanium

All screws are available sterile packed. The article number of sterile packed implants is followed by (S)

* Also available "TS" packed

Instruments

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
329.930	12	left
329.932	15	left
329.934	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 Surgical Technique, but are essential for the application of the plate.

MRI Information

Torque, Displacement and Image Artifacts according to ASTM F 2213, ASTM F 2052 and ASTM F 2119

Non-clinical testing of worst case scenario in a 3 T MRI system did not reveal any relevant torque or displacement of the construct for an experimentally measured local spatial gradient of the magnetic field of 3.69 T/m. The largest image artifact extended approximately 169 mm from the construct when scanned using the Gradient Echo (GE). Testing was conducted on a 3 T MRI system.

Radio-Frequency-(RF-)induced heating according to ASTM F 2182

Non-clinical electromagnetic and thermal testing of worst case scenario lead to peak temperature rise of 9.5 °C with an average temperature rise of 6.6 °C (1.5 T) and a peak temperature rise of 5.9 °C (3 T) under MRI Conditions using RF Coils (whole body averaged specific absorption rate [SAR] of 2 W/kg for 6 minutes [1.5 T] and for 15 minutes [3 T]).

▲ Precautions:

The above mentioned test relies on non-clinical testing. The actual temperature rise in the patient will depend on a variety of factors beyond the SAR and time of RF application. Thus, it is recommended to pay particular attention to the following points:

- It is recommended to thoroughly monitor patients undergoing MR scanning for perceived temperature and/or pain sensations.
- Patients with impaired thermoregulation or temperature sensation should be excluded from MR scanning procedures.
- Generally, it is recommended to use a MR system with low field strength in the presence of conductive implants. The employed specific absorption rate (SAR) should be reduced as far as possible.
- Using the ventilation system may further contribute to reduce temperature increase in the body.

Please refer to the corresponding Instructions for Use for specific information on Intended use, Indications, Contraindications, Warnings and Precautions, Potential Adverse Events, Undesirable Side Effect and Residual Risks. Instruction for Use are available at www.e-ifu.com and/or www.depuysynthes.com/ifu

Not all products are currently available in all markets.
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