VA-LCP® CLAVICLE HOOK PLATE 2.7 SYSTEM

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 Synthes reusable devices, instrument trays and cases, as well as processing of Synthes non-sterile implants, please consult the Important Information leaflet (SE_023827) or refer to:

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

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VA-LCP[®] Clavicle Hook Plate 2.7 System

System Overview

The VA-LCP[®] Clavicle Hook Plate 2.7 System provides solutions for lateral clavicle fractures with associated acromioclavicular (AC) ligament and coracoclavicular (CC) ligaments injuries. Literature shows that several factors including severity of displacement, instability, and injury to the surrounding ligaments contribute to the need for operative treatment due to high rates of nonunion and delayed union when treated conservatively.¹

The DePuy Synthes VA-LCP Hook Plate 2.7 System also provides a solution for ligamentous injuries without a clavicle fracture. Literature shows that higher grade ligamentous injuries of the AC joint should be treated operatively to prevent persistent instability causing pain.²

In operatively treated lateral clavicle fractures and isolated ligamentous injuries, a mismatch between the hook plate and the diverse anatomy of the acromion and the lateral clavicle can lead to short-term complaints including impingement, acromial osteolysis, and subacromial bursitis leading to patient pain.¹

The DePuy Synthes VA-LCP Clavicle Hook Plates 2.7 have enhanced hook depths and angulations based on an extensive analysis of shoulder morphology.³ The system can be used to treat simple and complex fractures including malunions, nonunions, and ligamentous injuries of the AC joint.

The system consists of three plate types; button hook plates for isolated ligamentous injuries and short and long hook plates for lateral clavicle fractures with an associated ligament injury. Each plate type is available in 3 hook depths to fit the subacromial space in a wide variety of patients.^{3,4} Each plate is available in left and right.



- mid-term results and a brief literature overview. *J Orthop Surg Res.* 2012;7:2.
- Tauber, M. Management of acute acromioclavicular joint dislocations: current concepts. Arch Orthop Trauma Surg. 2013;133(7):985-95.

 Compared to Stryker VariAx 2 Clavicle System and DePuy Synthes 3.5 LCP[®] Clavicle System. DePuy Synthes. Hook Shape Verification, Windchill #0000290741, 2020.

4. Engineering Memo Optimization of Subacromial Hook Parameters, Windchill #0000277700, 2020.

Hook angulation and depth, enhanced from an analysis of more than 120 shoulder CT scans, are designed to reduce pin point contact of the hook on the underside of the acromion.⁵ The shaft of the long and short hook plates was designed to accommodate the shape of the clavicle at the location of the corresponding fracture and ligament injury.⁵ The button hook plate is designed to treat isolated ligament injuries without unnecessarily spanning the clavicle shaft.⁶ Screw hole positioning in all plates has been designed based on fracture pattern and location.⁵







- Compared to Stryker Variax 2 Clavicle System and DePuy Synthes 3.5 LCP[®] Clavicle System. DePuy Synthes. Hook Shape Verification, Windchill #0000290741, 2020.
- 6. DePuy Synthes. Competitive Analysis, Windchill #0000294554, 2020.

DePuy Synthes Clavicle Portfolio

DePuy Synthes offers a full portfolio of complementary plating systems for clavicle fractures and AC joint injuries. In addition to the VA-LCP[®] Clavicle Hook Plate 2.7 system described in this surgical technique guide, DePuy Synthes offers the VA-LCP[®] Clavicle Plate 2.7 system and the VA-LCP[®] Anterior Clavicle Plates 2.7/3.5.

VA-LCP Clavicle Plate System

- Plate shapes match the bow and contour of the clavicle for low construct prominence and enhanced plate-to-bone fit⁷
- Plate selection based on correlation between patient height and clavicle size
- System includes a dedicated plate designed to treat medial clavicle fractures



Medial Plate, right

7. Compared to Stryker VariAx 2 Clavicle System and Acumed Clavicle System. DePuy Synthes. Shape Verification Analyses. Windchill #0000290902, 0000295170, 0000290186, 2020.

VA-LCP Anterior Clavicle Plates

- Plates designed to fit on the anteroinferior aspect of the clavicle
- VA locking holes in the lateral portion of the plate allow for screw targeting of lateral bone fragments
- Combi holes allow fixation with locking screws in the threaded section for angular stability and cortex screws in the DCU section for compression

For more information about these systems contact your DePuy Synthes sales consultant or access information on-line at <u>https://www.depuysynthes.com</u>.

to create a low-profile construct.



Lateral extension Features distal variable angle locking holes that accept 2.7 mm variable angle locking, 2.7 mm locking, 2.7 mm cortex, and 2.4 mm cortex screws. Combi holes Combi holes Combi holes Accept 3.5 mm locking, 3.5 mm cortex, and 4.0 mm cancellous bone screws. Fatible angle screw holes Recess for screwhead designed to minimize screw prominence

The AO Principles of Fracture Management

Mission

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



9. Rüedi TP, RE Buckley, CG Moran. AO Principles of Fracture Management. 2nd ed. Stuttgart, New York: Thieme. 2007.

^{8.} Müller ME, Allgöwer M, Schneider R, Willenegger H. Manual of Internal Fixation. 3rd ed. Berlin, Heidelberg New York: Springer 1991.

Indications/Contraindications

Indications

VA-LCP Clavicle Hook Plates 2.7 long and short

• Fixation of lateral clavicle fractures and dislocations of the acromioclavicular joint

VA-LCP Clavicle Button Hook Plates 2.7

• Fixation of acromioclavicular joint dislocations

Contraindications

VA-LCP Clavicle Hook Plates 2.7 long and short

- Stable lateral clavicle fractures
- Fixation of sternoclavicular joint
- Systemic infection or infection localized to the site of the proposed implantation

VA-LCP Clavicle Button Hook Plates 2.7

- Fixation of sternoclavicular joint
- Systemic infection or infection localized to the site of the proposed implantation







Surgical Technique Preparation

1. Preparation

Patient positioning

Patient positioning is based on surgeon preference. A supine position on a radiolucent operating table or a beach chair position with 30°-45° of tilt can be used to provide appropriate access to the clavicle.

A small rolled towel placed under the thoracic spine allows the scapula to fall backwards. This aids in realignment and reduction of the fracture and assists in regaining length. The head of the patient should be turned away from the operative side and may be supported with a head rest, but excessive extension of the neck should be avoided.

Anteroposterior and axial visualization of the clavicle with fluoroscopy is recommended. It is recommended to check access with the c-arm and take trial images prior to draping to ensure accurate views can be obtained.





Approach

2. Approach

Determine the most appropriate incision based on the fracture pattern, ligamentous injury, and planned fixation method. The fracture or dislocation is usually marked by bruising and a rent in the deltoid fascia and/ or trapezius. It is recommended to draw the anatomic landmarks; as by doing so the AC joint is identified correctly.

A saber cut incision may be used for the button hook plate and a superior longitudinal incision for the short or long hook plates. Expose the deltotrapezial fascia. Take care to avoid injury to the lateral supraclavicular nerves, which run laterally at the level of the posterior margin of the distal clavicle.

Dissection should be epiperiosteal to preserve the periosteum. Minimal periosteal dissection of the lateral clavicle fracture is carefully done to allow exposure of the fracture.

A Precaution:

The periosteum of bone fragments must not be completely detached in order to preserve available bony blood supply thus enabling proper bone healing. It is critical not to strip any comminuted fragments.







Surgical Technique

Preparation of Hook Tunnel and Preliminary Reduction of the AC Joint and/or Lateral Clavicle

3. Preparation of the Hook Tunnel and Preliminary Reduction of the AC Joint and/or Lateral Clavicle

Instruments

292.200.01	Kirschner Wire Ø 2.0 mm, w/trocar tip, L 150 mm
292.160.01	Kirschner Wire Ø 1.6 mm, w/trocar tip, L 150 mm
03.112.810-	Templates for VA-LCP Clavicle Hook
03.112.815	Plate 2.7, Long
03.112.820-	Templates for VA-LCP Clavicle Hook
03.112.825	Plate 2.7, Short
03.112.910-	Templates for VA-LCP Clavicle Hook
03.112.915	Plate 2.7, Button

Identify the posterior aspect of the AC joint capsule. Perform a 5 mm detachment of the extracapsular fibers of the trapezius from the medial border of the acromion to allow insertion of the hook under the acromion. Use the template or an elevator to create space for the hook under the acromion.

Perform temporary reduction of the lateral fracture with 1.6 mm K-wires and/or pointed reduction forceps.

Reduce the scapula to the clavicle, thereby closing the gap of the AC joint. Temporarily fixate the AC joint with a transacromial 2.0 mm K-wire, crossing the AC joint.







Surgical Technique

Determine Hook Depth and Plate Shape

4. Determine Hook Depth and Plate Shape

Instruments	
03.112.810-	Templates for VA-LCP Clavicle Hook
03.112.815	Plate 2.7, Long
03.112.820-	Templates for VA-LCP Clavicle Hook
03.112.825	Plate 2.7, Short
03.112.910-	Templates for VA-LCP Clavicle Hook
03.112.915	Plate 2.7, Button

Use templates to determine the appropriate plate shape and hook depth.

Each template and corresponding plate are available in 3 shapes and each shape is offered with 3 hook depths.



			Hook Depths	
		9 mm Hook Depth	12 mm Hook Depth	15 mm Hook Depth
Plata	Button			
Shapes	Short		5	
	Long	5		

4. Determine Hook Depth and Plate Shape continued

Shapes: Select the appropriate template shape based on the presence and location of a fracture in the lateral clavicle. For isolated ligamentous injuries of the AC joint, the Button Hook plate is recommended. Templates and the corresponding plates are designed to accommodate the shape of the subacromial space and the curvature of the lateral clavicle.^{10,11}

Hook Depth: To determine hook depth, first reduce the AC joint dislocation. With the joint and fractured segments in anatomic alignment, pass the hook portion of a 12 mm hook depth template under the acromion. Press the shaft of the template onto the superior aspect of the clavicle. The plate shaft must be able to be levered to the bone without much force. If it is difficult to lower the plate shaft onto the reduced clavicle, repeat the same steps with the 15 mm hook depth template; if the construct seems too loose, use the 9 mm hook depth template.

Technique Tip:

The depth of the hook can be estimated preoperatively by measuring the clavicle or acromion height on the x-ray.

The optimal position of the clavicle hook plate is achieved when the full length of the upper surface of the hook contacts the underside of the acromion. The Button Hook plate may be rotated to achieve the optimal position of the hook.



10. Design Verification Analysis – Hook Shape Verification, Windchill #0000290741, 2020.

11. Engineering Memo Optimization of Subacromial Hook Parameters, Windchill #0000277700, 2020.

4. Determine Hook Depth and Plate Shape continued

The screw hole positions of the corresponding plate are marked on the template. It is recommended to plan for the following number of screws:

Important:

The recommended number of screws depends on the plate shape.

Long and Short Hook Plates: The recommended construct will achieve fixation with four 2.7 mm screws placed bicortically in the medial main fragment.

Button Hook Plate: The recommended construct will achieve fixation with four 2.7 mm screws placed bicortically within the medial screw holes, comprised of 3 VA locking screws and 1 cortex screw. It is recommended to place additional screws in the two lateral screw holes if the plate is not well supported to increase construct stability.

▲ Warning:

Avoid penetration of the vital neurovascular structures that lie posterior to the clavicle. Perforation of these structures with any instrument or fixation device can lead to major complications including death.

A Precaution:

Do not bend or implant the templates.

Templates can be temporarily fixed to the lateral clavicle by using clamps or inserting compression wire or K-wire (up to \emptyset 2.0 mm) through the K-wire hole in the template. The K-wire hole should not be used for definitive fixation.





4. Determine Hook Depth and Plate Shape continued

Use x-ray or fluoroscopy in AP and axial views to confirm reduction of the AC joint and appropriate position of the template. Confirm planned screw positioning. After confirmation of correct alignment and implant size, remove the template.

Technique Tip:

The hook direction can be determined by aligning straight forceps with the center of the two posterior screw holes.





Select Hook Depth and Plate Shape

5. Select Hook Depth and Plate Shape

Instruments

03.211.001* Holding Pin for VA Locking Plates 2.4/2.7 mm

Select the plate shape and hook depth that corresponds to the template that was used.

If templates were not used, measure the thickness of the clavicle or acromion using imaging. Select a hook depth and plate length based on the clavicle and acromion size, the fracture location, and AC joint dislocation/separation. See pages 11-14 for plate options and instructions on hook depth and shape of the plate.

With the fractured bone segments and/or dislocation in proper anatomic alignment, position the implant and confirm that the plate fits the clavicle and acromion.

To aid insertion and positioning of the clavicle hook plate, two holding pins can be inserted into the screw holes and used to position the plate in the desired location.

Note:

Hook plates are available in both stainless steel and titanium.





Surgical Technique Adapt Plate to Bone (Optional)

6. Adapt Plate to Bone (optional)

Instruments	
03.133.200	Bending Iron f/Plates, closed, f/Plates 2.7/3.5 mm
03.133.201	Bending Iron f/Plates, open, f/Plates 2.7/3.5 mm
329.291	Bending Pliers f/Clavicular Plates, L 227 mm

A Precautions:

- Do not bend more than 10° as it may impact the mechanical performance of the plate. Excessive bending may weaken the plate and lead to premature plate failure.
- Avoid reverse bending (i.e., bending and then straightening the plate) as it may compromise the strength of the plate or cause it to break.
- Do not make an acute bend directly over a screw hole as it may damage the thread. Check the VA portion of the VA Combi holes adjacent to the bending site with a variable angle drill guide after bending to ensure holes have not been deformed.
- Nominal screw angle is determined by plate design and screw length. If the plate is contoured and/or a screw longer than 40 mm is selected, take care to ensure that screws do not collide with one another. The use of image intensification is recommended.

Check if the plate shape and hook depth are satisfactory. Due to the high degree of variability of the acromioclavicular anatomy, plate bending may be necessary. Use bending pliers or bending irons for outof-plane bending and bending irons for torsional bending.

Plates may be contoured up to 10°.



6. Adapt Plate to Bone continued

Hook Bending: Using bending irons, the hook inclination angle can be adapted as needed so the hook sits along the posterior aspect of the acromion, away from the area of impingement. Position the middle slot of the open bending iron on the lateral portion of the plate to hold the plate. Insert the hook in the middle slot of the closed bending iron and bend the hook as needed. The full length of the upper surface of the hook should contact the underside of the posterior slope of the acromion.

Plate hooks may be contoured up to 10°.

Correct handling

Correct handling of the implant is extremely important. If the shape of the implant must be altered, the device should not be bent sharply, bent backwards, notched, or scratched. Such manipulations, in addition to all other improper handling or use, can produce surface defects and/or concentrate stress in the core of the implant. This, in turn, may eventually cause the product to fail.







Superior Hook Bending



Inferior Hook Bending



7. Plate Insertion

Instruments	
292.160.01	Kirschner Wire Ø 1.6 mm, w/trocar tip, L 150 mm
03.211.410.01	Compression Wire Ø 1.6 mm, L 150 mm, thread length 10 mm
03.211.415.01	Compression Wire Ø 1.6 mm, L 150 mm, thread length 15 mm

Insert the hook under the acromion and position the plate on the superior aspect of the lateral clavicle. Attach it temporarily using any of the following techniques.

- A. Cortex screw or metaphyseal screw
- B. Reduction forceps/serrated clamps
- C. Compression wire
- D. K-wire in suture hole

It is important to center the compression wire within the plate holes to minimize shifting of the plate position as the wire pulls the plate to the bone.

A K-wire up to Ø 2.0 mm can be inserted in the lateral suture hole or K-wire hole as a reference to visualize the lateral aspect of the clavicle and aid in proper plate placement.

▲ Warning:

Avoid penetration of the vital neurovascular structures that lie posterior to the clavicle. Perforation of these structures with any instrument or fixation device can lead to major complications including death.

After plate insertion, confirm fit and alignment of the bone using fluoroscopy.

Technique tip:

The suture holes are designed with an undercut to allow for suture needle passage (see page 32). However, depending on the individual patient's anatomy, the undercut may be blocked and no needle passage possible. In this case, insert the suture through the suture holes before starting with final plate fixation.





Surgical Technique

Screw Configuration

8. Screw Configuration

All screw holes in the VA-LCP Clavicle Hook Plates 2.7 accept 2.7 mm screws.

Important:

The recommended number of screws depends on the plate shape.

Long and Short Hook Plates: The recommended construct will achieve fixation with four 2.7 mm screws placed bicortically in the medial main fragment.

Button Hook Plate: The recommended construct will achieve fixation with four 2.7 mm screws placed bicortically within the medial screw holes, comprised of 3 VA locking screws and 1 cortex screw. It is recommended to place additional screws in the two lateral screw holes if the plate is not well supported to increase construct stability.

Determine the combination of 2.7 mm screws required for fixation. Any of the screws listed on the reference chart can be used with the corresponding instrumentation.

When planning screw location, angulation, and length, consider screw collision and over-penetration.

▲ Warning:

Avoid penetration of the vital neurovascular structures that lie posterior to the clavicle. Perforation of these structures with any instrument or fixation device can lead to major complications including death.

Screw Reference Chart				
Screw Size (mm)	Screw Type	Drill Bit (mm)	Torque Limit (Nm)	Driver Options
	Variable Angle Locking		1.2	{} Т8
2.7	Metaphyseal	2.0	Do Not Use	{} Т8
	Cortex		Do Not Use	{;} Т8





8. Screw Configuration continued

Note:

If a combination of VA locking, cortex or metaphyseal screws will be used, it is recommended to insert cortex or metaphyseal screws first, next to the fracture. This will pull the plate to the bone to ensure that the plate sits flush on the clavicle and enhance construct stability.



8. Screw Configuration continued

Cortex Screws

Cortex screws can be used in the non-threaded DCU portion of the VA Combi hole (1) (Figure 1) in the neutral/centered position or in the eccentric position for compression. Cortex screws can be used in VA locking holes (2) in the nominal position only. If a cortex screw is placed in a VA locking hole, it cannot be placed in an eccentric position and the screw head will not sit flush with the plate surface. A cortex screw can also be used in the plate positioning hole (3) in the center of the Button Hook plate to adjust the position of the hook in the subacromial space.

VA Locking Screws

VA locking screws can be used in VA locking holes (2) (Figure 1) at either a nominal angle or at variable angles (Figure 2). VA locking screws can also be used in the threaded portion of the VA Combi hole (Figure 1). VA locking screws cannot be used in the non-threaded DCU portion of the VA Combi hole.

Metaphyseal Screws

Metaphyseal screws provide compression with a low-profile screw head that sits flush with the plate. Metaphyseal screws have the same screw shaft thread as the VA locking screws and can be used in VA locking holes (2) (Figure 1) and the threaded portion of VA Combi holes (1) at the nominal angle. They cannot be used in the non-threaded DCU portion of the VA Combi hole.

Note:

2.7 mm standard locking screws are not compatible with the VA locking holes of the DePuy Synthes VA-LCP Clavicle Hook Plate 2.7 System.





8. Screw Configuration continued

		Application Options		Drill Sleeve			
Screw Type	Plate Hole Type	Angulation	Reduction Plate to Bone	DCU Options	Universal Small Fragment	Additional	Torque Limiter
	VA Locking in VA Combi hole	Variable	No	No	03.133.007 VA Drill Guide, 2.7 mm	03.211.002* Universal Variable Angle Locking Drill Guide	03.110.002 Torque Limiter,
Variable Angle Locking	VA Locking	Fixed (nominal angle)	No	No	03.133.008 Threaded Drill Guide 2.0 mm, f/Screw 2.7 mm, f/VA and LCP	03.211.002* VA-LCP Drill Sleeve 2.7, f/Drill Bits Ø 2.0 mm 03.211.004 VA-LCP Drill Sleeve 2.7, coaxial, f/Drill Bits Ø 2.0 mm	1.2 Nm, w/AO/ ASIF Quick Coupling
Metaphyseal	VA Locking in VA Combi hole VA Locking	Fixed (nominal angle)	Yes	No	03.133.008 Threaded Drill Guide 2.0 mm, f/Screw 2.7 mm, f/VA and LCP	03.211.002* VA-LCP Drill Sleeve 2.7, f/Drill Bits Ø 2.0 mm 03.211.004 VA-LCP Drill Sleeve 2.7, coaxial, f/Drill Bits Ø 2.0 mm	Do not use
	Plate Positioning Hole		Yes	Axial Compression	03.133.006 Non-Locking Drill Guide, 2.7 mm		
Cortex	DCU of VA Combi Hole	Yes	Yes	Neutral No compression	03.133.006 Non-Locking Drill Guide, 2.7 mm + 03.133.005 Neutral Sleeve Adapter, 2.7 mm	323.260* Universal Drill Guide 2.7	Do not use
	VA Locking	No	Yes	No	03.133.008 Threaded Drill Guide 2.0 mm, f/Screw 2.7 mm, f/VA and LCP	03.211.004 VA-LCP Drill Sleeve 2.7, coaxial, f/Drill Bits Ø 2.0 mm	

*Also available. Not included in set 01.133.273/01.133.473. Not all 2.7 mm VA compatible instruments shown in this table.

Screw Insertion – 2.7 mm Cortex Screws

9. Screw Insertion – 2.7 mm Cortex Screws

Screw Hole Preparation

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Instruments	
03.133.005	Neutral Sleeve Adapter 2.7 mm, f/Non-Locking Drill Guide 2.7 mm
03.133.006	Non-Locking Drill Guide, 2.7 mm
03.133.100*	Drill Bit Ø 2.0 mm, QC, L 110 mm, Calibration 30 mm
323.260 ⁺	Universal Drill Guide 2.7
310.534 ^{†‡}	Drill Bit Ø 2.0 mm, w/marking, L 110/85 mm, 2-flute, f/Quick Coupl.
323.062 ^{†‡}	Drill Bit Ø 2.0 mm, w/double marking, L 140/115 mm, 3-flute, f/Quick Coupl.

For neutral/centered screw placement, thread the neutral sleeve adaptor 2.7 mm onto the 2.0 mm end of the non-locking drill guide 2.7 mm. Place the drill guide tip in the center of the DCU screw hole. Compression will not occur across the fracture.

Dynamic compression can be achieved by eccentric insertion of a cortex screw. To drill a hole for dynamic compression using a 2.7 mm cortex screw, do not use the neutral sleeve adapter. Place the 2.0 mm end of the drill guide tip eccentrically at the edge of the DCU portion of the screw hole away from the fracture.

Compression will occur as the cortex screw is inserted. Use the 2.0 mm drill bit to drill to the desired depth. The 2.0 mm drill bits are calibrated so the depth measurements can be read directly from the drill bit shaft.

Note:

Irrigate and apply suction for removal of debris potentially generated during implantation and to avoid heat generation during drilling.

▲ Warning:

Avoid penetration of the vital neurovascular structures that lie posterior to the clavicle. Perforation of these structures with any instrument or fixation device can lead to major complications including death.



Neutral/centered placement



Eccentric placement

*For use with 03.133.006/323.260. *Additionally available instruments. #For use with 323.260.

9. Screw Insertion – 2.7 mm Cortex Screws continued

Hole Depth Measurement

Instruments	
03.133.080	Depth Gauge 2.7/3.5 mm, 0 to 60 mm
03.111.005	Depth Gauge f/Screws Ø 2.0 to 2.7 mm, measuring range up to 40 mm

After drilling and removing the drill guide, insert the depth gauge tip through the drilled hole and measure. For bi-cortical measuring, insert the depth gauge tip through both cortices and hook onto the far cortical bone.

Using the depth gauge for 2.0-2.7 mm screws (03.111.005), slide the black portion of the gauge toward the bone until it stops. Length is read from the line marked on the silver slider.

Using the depth gauge 2.7/3.5 mm (03.133.080), pull the knob up until it stops. Depth marks are provided on both sides and length is read from the top edge of the metal sleeve.



03.111.005



03.133.080

9. Screw Insertion – 2.7 mm Cortex Screws continued

Screw Insertion

Instruments

03.133.150	Screwdriver Handle, Universal
314.467	Screwdriver Shaft, StarDrive™ T8, self-holding
314.453	Screwdriver Shaft StarDrive™ 2.4, short, self-holding, f/Quick Coupling
311.260*	Tap f/Cortex Screws, Ø 2.7 mm, L 100/33 mm

To manually insert a cortex screw, attach the T8 StarDrive screwdriver shaft onto the Screwdriver Handle, Universal (03.133.150). Insert the screwdriver (314.467) tip into the recess of the desired screw to retrieve it from the screw caddy. Advance the screw into the screw hole until it is fully seated in the plate. Cortex screws can also be inserted using power.

Optional Technique:

If inserting screws into very dense bone, use taps after drilling to facilitate screw insertion.



10. Screw Insertion – 2.7 mm VA Locking Screws and Metaphyseal Screws

Screw Hole Preparation

Instruments -	- Nominal Angle Drilling	
03.133.008	Threaded Drill Guide 2.0 mm, f/Screw 2.7 mm, f/VA and LCP (Figure 3)	
03.211.004	VA-LCP Drill Sleeve 2.7, coaxial, f/Drill Bits Ø 2.0 mm (Figure 4)	
03.133.100*	Drill Bit Ø 2.0 mm, QC, L 110 mm, Calibration 30 mm	
314.467	Screwdriver Shaft, StarDrive™ T8, self-holding	
314.453	Screwdriver Shaft StarDrive™ 2.4, short, self-holding, f/Quick Coupling	
03.211.002	VA-LCP Drill Sleeve 2.7, f/Drill Bits Ø 2.0 mm	
310.534**	Drill Bit Ø 2.0 mm, w/marking, L 110/85 mm, 2-flute, f/Quick Coupl.	
323.062 ^{+‡}	Drill Bit Ø 2.0 mm, w/double marking, L 140/115 mm, 3-flute, f/Quick Coupl.	

A Precaution:

Nominal screw angle is determined by plate design and screw length. If the plate is contoured and/or a screw longer than 40 mm is selected, take care to ensure that screws do not collide with one another. The use of image intensification is recommended.

▲ Warning:

Avoid penetration of the vital neurovascular structures that lie posterior to the clavicle. Perforation of these structures with any instrument or fixation device can lead to major complications including death.

*For use with 03.133.008 or 03.211.004. Depth marks on drill bit do not correspond to drill guide 03.211.004.

⁺Additionally available instruments.

[‡]For use with 03.211.002. Mates with scale on 03.211.002.

Nominal angle drilling

Screw the threaded guide 2.0 mm into the screw hole, perpendicular to the plate, until fully seated (Figure 3). To ease threading, engage the drill guide with the screw hole by making a quarter turn counterclockwise until the starting thread of the drill guide engage the threads of the screw hole. Turn clockwise once the threads are fully engaged.

The T8 StarDrive screwdriver shaft may be used to help insert the threaded drill guide into the screw hole. Insert the screwdriver shaft into the back of the threaded drill guide and rotate.

The nominal angle of each screw hole is determined by the plate design. Cortex screw heads will not be flush with the plate when inserted in a locking hole. To reduce the screw head protrusion, a low-profile Metaphyseal screw may be used at a nominal angle.

Use the 2.0 mm drill bit to drill to the desired depth. The drill bit (03.133.100) is calibrated so that depth measurements can be read directly from the drill bit shaft when used with the corresponding drill guide (03.133.008).

Note:

Irrigate and apply suction for removal of debris potentially generated during implantation and to avoid heat generation during drilling.





Instruments – Variable Angle Drilling (VA locking screws only)

03.133.007	VA Drill Guide, 2.7 mm	
03.133.100*	Drill Bit Ø 2.0 mm, QC, L 110 mm, Calibration 30 mm	
03.211.002	VA-LCP Drill Sleeve 2.7, f/Drill Bits Ø 2.0 mm	
310.534 ^{†‡}	Drill Bit Ø 2.0 mm, w/marking, L 110/85 mm, 2-flute, f/Quick Coupl.	
323.062 ^{+‡}	Drill Bit Ø 2.0 mm, w/double marking, L 140/115 mm, 3-flute, f/Quick Coupl.	



A Precaution:

Verify the drill bit angle under image intensification to ensure the desired angle has been achieved. Drilling consecutive screw holes off-axis can cause screws to collide.

▲ Warning:

Avoid penetration of the vital neurovascular structures that lie posterior to the clavicle. Perforation of these structures with any instrument or fixation device can lead to major complications including death.

Variable angle drilling (VA locking screws only)

Insert the desired VA drill guide into the VA locking screw hole. The VA drill guide features a VA cone on one side and a VA spherical tip on the other side.

When using the cone end of the drill guide, press firmly to ensure the drill guide tip keys securely into the cloverleaf portion of the VA locking screw hole. The notches on top of the cone are visual markers for the drill guide tip orientation. The cone will provide +/-15° of angulation.

*For use with 03.133.008 or 03.211.004. Depth marks on drill bit do not correspond to drill guide 03.211.004.
*Additionally available instruments.
*For use with 03.211.002. Mates with scale on 03.211.002.

When using the spherical tip end for freehand drilling, gently press the instrument into the VA hole. The lip portion of the spherical tip end engages with the VA locking hole to provide tactile feedback of the angulation. Continue to provide light pressure while holding the drill guide at the desired angle. The spherical tip end of the drill guide provides freedom to choose angulation. To ensure a precise 15° angulation, use the cone end of the Variable Angle Drill Guide.

Reminder:

Metaphyseal screws can only be inserted in VA locking holes at the nominal angle.

Note:

Irrigate and apply suction for removal of debris potentially generated during implantation and to avoid heat generation during drilling.

Hole Depth Measurement

Instruments	
03.111.005	Depth Gauge f/Screws Ø 2.0 to 2.7 mm, measuring range up to 40 mm
03.133.080	Depth Gauge 2.7/3.5 mm, 0 to 60 mm

See Hole Depth Measurement section on page 24 for instructions on how to measure screw hole depth.

Important:

If using the depth gauge 2.7/3.5 mm (03.133.080) for 2.7 mm VA locking screws, subtract 2 mm from the indicated length on the depth gauge to obtain the correct screw length. The depth gauge for 2.0-2.7 mm screws (03.111.005) does not require subtraction from the reading.



Screw Insertion

Instruments			
03.133.150	Screwdriver Handle, Universal		
03.110.002	Torque Limiter, 1.2 Nm, w/AO/ASIF Quick Coupling		
314.467	Screwdriver Shaft, StarDrive™ T8, self-holding		
03.111.906*	Tap f/LCP Locking Screws Ø 2.7 mm, L 100/33 mm		

Instruments for shorter screwdriver construct with torque limiting attachment

03.110.005	Handle f/Torque Limiters, 0.4/0.8/1.2 Nm	
03.110.002	Torque Limiter, 1.2 Nm, w/AO/ASIF Quick Coupling	
314.453	Screwdriver Shaft StarDrive™ 2.4, short, self-holding, f/Quick Coupling	

To manually insert a VA locking screw, attach the 1.2 Nm torque limiting attachment (TLA) onto the universal screwdriver handle. Insert the screwdriver shaft tip into the recess of the desired screw to retrieve it from the screw caddy. Advance the screw into the screw hole.

A Precaution:

Nominal screw angle is determined by plate design and screw length. If the plate is contoured and/or a screw longer than 40 mm is selected, take care to ensure that screws do not collide with one another. The use of image intensification is recommended.



*Additionally available instruments.

Advance the screw and lock it in the plate. The TLA will provide an audible click once torque value is reached indicating that the screw is seated and locked.

To insert under power, use the T8 StarDrive screwdriver shaft attached to the 1.2 Nm TLA. Confirm screw position and length prior to final tightening. Final tightening must be done manually or at a low speed using the 1.2 Nm TLA.

Optional Technique:

If inserting screws into very dense bone, use taps after drilling to facilitate screw insertion.

Note:

VA locking screws will not be flush with the plate unless placed at a nominal angle.

A Precautions:

- Always use a 1.2 Nm torque limiting attachment (TLA) when inserting VA locking screws.
- Do not lock screws using power tools without the 1.2 Nm TLA or at high speeds as this may damage the screwdriver and cause the screw head to strip, making it difficult to remove the implant.





Surgical Technique Soft Tissue Attachment (Optional)

11. Soft Tissue Attachment (optional)

Hook plates have suture holes on the lateral aspects of the plate to reattach ruptured ligaments or muscles if necessary.

Pass suture through the holes on the lateral side to attach the superior acromioclavicular ligament or other soft tissue structures. For added stability use multiple suture holes.

Taper point suture needles sized 26 mm ½ C radius are recommended. Search Ethicon Wound Closure Resource Center for applicable suture options.

Note:

Use suture holes to reattach deltoid and accomplish deltoid stabilization. For added stability use multiple suture holes.

Technique tip:

The suture holes are designed with an undercut to allow for suture needle passage. However, depending on the individual patient's anatomy, the undercut may be blocked and no needle passage possible. In this case, insert the suture through the suture holes before starting with final plate fixation (see page 18).



Surgical Technique Reduction and Fixation Confirmation

12. Reduction and Fixation Confirmation

If a K-wire was inserted through the AC joint for preliminary reduction, remove it.

Carefully assess the final reduction and fixation by both direct visualization and image intensification. Inspect the construct by rechecking each screw before closing to verify that the screws are secure. AP and axial fluoroscopic visualization can be used to confirm reduction and appropriate positioning of plate and screws. Confirm full range of motion of the shoulder and check horizontal and vertical stability of the fixation.

Note:

VA locking screw will not be flush with the plate unless placed at a nominal angle. Cortex screw heads will not be flush with the plate when inserted into VA locking holes.





Surgical Closure

13. Surgical Closure

Thoroughly irrigate the wound prior to closure. A layered closure should be performed. The trapezial-deltoid fascia should be closed over the plate. The platysma and the subcutaneous tissue should be closed as separate layers.

Implant Removal

When bony and/or soft tissue union is confirmed clinically or radiographically, remove the clavicle hook plate.

Instruments	
03.133.150	Screwdriver Handle, Universal
314.467	Screwdriver Shaft, StarDrive™ T8, self-holding

Unlock all screws from the plate, then remove the screws completely from the bone. This prevents simultaneous rotation of the plate when unlocking the last locking screw.

If the screws cannot be removed with the screwdriver, insert the conical extraction screw with left-handed thread into the screw head using the handle with quick coupling and loosen the locking screw by turning it counterclockwise.

For additional instructions on screw removal consult the Operace Technique Guide 036.001.647 DSEM/TRM/1115/0546.

▲ Warning:

It is recommended that the VA-LCP Clavicle Hook plate 2.7 is removed after healing to prevent potential irritation of the acromion and impingement on the rotator cuff.

A Precaution:

Do not use the torque limiting attachment for screw removal.



Implants

Stainless Steel	Titanium	Plate Shape	Hook Depth	Left/ Right
02.112.810	04.112.810	Long	9 mm	Left
02.112.811	04.112.811	Long	9 mm	Right (shown)
02.112.812	04.112.812	Long	12 mm	Left
02.112.813	04.112.813	Long	12 mm	Right
02.112.814	04.112.814	Long	15 mm	Left
02.112.815	04.112.815	Long	15 mm	Right
02.112.820	04.112.820	Short	9 mm	Left
02.112.821	04.112.821	Short	9 mm	Right (shown)
02.112.822	04.112.822	Short	12 mm	Left
02.112.823	04.112.823	Short	12 mm	Right
02.112.824	04.112.824	Short	15 mm	Left
02.112.825	04.112.825	Short	15 mm	Right
02.112.910	04.112.910	Button	9 mm	Left
02.112.911	04.112.911	Button	9 mm	Right (shown)
02.112.912	04.112.912	Button	12 mm	Left
02.112.913	04.112.913	Button	12 mm	Right
02.112.914	04.112.914	Button	15 mm	Left
02.112.915	04.112.915	Button	15 mm	Right

VA-LCP Clavicle Hook Plates 2.7*







*Implants available non-sterile and sterile packed. Add "S" to the article number to order sterile products.

2.7 mm Variable Angle Locking Screws*

02.211.010- 02.211.040	VA Locking Screw StarDrive™ Ø 2.7 mm, self-tapping, Stainless steel Available in 10 mm−40 mm lengths, in 2 mm increments
04.211.010- 04.211.040	VA Locking Screw StarDrive™ Ø 2.7 mm, self-tapping, Titanium alloy Available in 10 mm−40 mm lengths, in 2 mm increments

For use in VA locking holes and the threaded portion of VA Combi holes.

2.7 mm Cortex Screws*

202.870-	Cortex Screw StarDrive™ Ø 2.7 mm,		
202.900	self-tapping, Stainless steel		
	Available in 10 mm–40 mm lengths, in		
	2 mm increments		
402.870-	Cortex Screw StarDrive™ Ø 2.7 mm,		
402.900	self-tapping, Titanium alloy		
	Available in 10 mm–40 mm lengths, in		
	2 mm increments		

For use in the non-threaded portion of VA Combi screw holes. If used in VA locking holes the screw head will not sit flush with the plate surface.

2.7 mm Metaphyseal Screws*

02.118.510-	Low Profile Metaphyseal Compression Screw,
02.118.540	StarDrive™ Ø 2.7 mm, self-tapping,
	Stainless Steel
	Available in 10 mm–40 mm lengths, in
	2 mm increments
04.118.510-	Low Profile Metaphyseal Compression Screw,
04.118.540	StarDrive™ Ø 2.7 mm, self-tapping,
	Titanium alloy
	Available in 10 mm–40 mm lengths, in

For use in VA locking holes and the threaded portion of VA Combi holes at the nominal angle. They cannot be used in the non-threaded portion of VA Combi holes.

2 mm increments













*Screws available non-sterile and sterile packed. Add "TS" to the article number to order sterile products.

Templates

Stainless Steel	Plate Shape	Hook Depth	Left/Right
03.112.810	Long	9 mm	Left
03.112.811	Long	9 mm	Right
03.112.812	Long	12 mm	Left
03.112.813	Long	12 mm	Right
03.112.814	Long	15 mm	Left
03.112.815	Long	15 mm	Right (shown)
03.112.820	Short	9 mm	Left
03.112.821	Short	9 mm	Right
03.112.822	Short	12 mm	Left
03.112.823	Short	12 mm	Right
03.112.824	Short	15 mm	Left
03.112.825	Short	15 mm	Right (shown)
03.112.910	Button	9 mm	Left
03.112.911	Button	9 mm	Right
03.112.912	Button	12 mm	Left
03.112.913	Button	12 mm	Right
03.112.914	Button	15 mm	Left
03.112.915	Button	15 mm	Right (shown)

Templates for VA-LCP Clavicle Hook Plates 2.7*



*Templates available non-sterile only.

Product Information

Instruments

03.110.002	Torque Limiter, 1.2 Nm, w/AO/ASIF Quick Coupling	12 M
03.110.005	Handle f/Torque Limiters, 0.4/0.8/1.2 Nm	
03.111.005	Depth Gauge f/Screws Ø 2.0 to 2.7 mm, measuring range up to 40 mm	11111111111111111111111111111111111111
03.133.005	Neutral Sleeve Adapter 2.7 mm, f/Non-Locking Drill Guide 2.7 mm	2.7 NEUTRAL
03.133.006	Non-Locking Drill Guide, 2.7 mm	
03.133.007	VA Drill Guide, 2.7 mm	
03.133.008	Threaded Drill Guide 2.0 mm, f/Screw 2.7 mm, f/VA and LCP	
03.133.080	Depth Gauge 2.7/3.5 mm, 0 to 60 mm	A A A B

03.133.100	Drill Bit Ø 2.0 mm, QC, L 110 mm, Calibration 30mm	VIVI - YIIIIWIIIWI - 0020
03.133.101	Drill Bit Ø 2.0 mm, QC, L 140 mm, Calibration 60 mm	0111180111180111180111180111180111180
03.133.150	Screwdriver Handle, Universal	() DePuy Synthes
03.133.200	Bending Iron f/Plates, closed, f/Plates 2.7/3.5 mm	CLOSED SLOT
03.133.201	Bending Iron f/Plates, open, f/Plates 2.7/3.5 mm	OPEN SLOT
03.211.004	VA-LCP Drill Sleeve 2.7, coaxial, f/Drill Bits Ø 2.0 mm	02.0 COAXIAL
03.211.410.01	Compression Wire Ø 1.6 mm, L 150 mm, thread length 10 mm	
03.211.415.01	Compression Wire Ø 1.6 mm, L 150 mm, thread length 15 mm	

292.160.01	Kirschner Wire Ø 1.6 mm, w/trocar tip, L 150 mm	
292.200.01	Kirschner Wire Ø 2.0 mm, w/trocar tip, L 150 mm	
314.467	Screwdriver Shaft, StarDrive™ T8, self-holding	T8
314.453	Screwdriver Shaft StarDrive™ 2.4, short, self-holding, f/Quick Coupling	Тв
329.291	Bending Pliers f/Clavicular Plates, L 227 mm	

Product Information Instruments



03.111.906	Tap f/LCP Locking Screws Ø 2.7 mm, L 100/33 mm	en and a second and a second a
03.211.001	Holding Pin for VA Locking Plates 2.4/2.7 mm	
03.211.002	VA-LCP Drill Sleeve 2.7, f/Drill Bits Ø 2.0 mm	65.0
310.534	Drill Bit Ø 2.0 mm, w/marking, L 110/85 mm, 2-flute, f/Quick Coupl.	020
311.260	Tap f/Cortex Screws, Ø 2.7 mm, L 100/33 mm	
323.062	Drill Bit Ø 2.0 mm, w/double marking, L 140/115 mm, 3-flute, f/Quick Coupl.	
323.260	Universal Drill Guide 2.7	

MRI Safety Information

MRI Safety Information



Torque, Displacement and Image Artifacts according to ASTM F2213-17, ASTM F2052-15 and ASTM F2119-07 (2013)

Non-clinical testing of a worst-case scenario in a 3 T Magnetic Resonance Imaging (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 138 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 F2182-19

Non-clinical electromagnetic and thermal simulations of a worst case scenario lead to temperature rises of 12.1 °C (1.5 T) and 6.0 °C (3 T) under MRI conditions using RF Coils (whole body averaged specific absorption rate [SAR] of 2 W/kg for 15 minutes).

A 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 an MRI 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.

Instruments (including templates)

MR Safety Information is not applicable to instruments. Instruments are not intended to be used in an MR environment.

Cases & Trays

Stainless Steel Case Options

68.033.114	NTOC Cassette for Universal Small
	Fragment System
68.033.116	NTOC Cassette for USFS Reduction
	Instruments
68.033.119	NTOC Cassette for USFS Screw Racks
	68.100.101 & 68.100.102
68.033.121	NTOC Cassette for Trial Implants,
	1/2-size
68.100.101	NTOC Cassette for Screw Rack 2.7
68.133.007	NTOC Cassette for USFS VA-LCP
	Clavicle Instruments

Aluminum Case Options

dth
/
es
Rack







68.133.007



60.133.146



60.133.190

For full product details, including warnings and precautions, please consult the Instructions for Use.

Not all products are currently available in all markets.

This publication is not intended for distribution in the USA.

All surgical techniques are available as PDF files at www.depuysynthes.com/ifu



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