

For Osteotomies and Fracture Fixation of the Proximal and Distal Femur

# Pediatric LCP<sup>®</sup> Plate System

Surgical Technique



# TABLE OF CONTENTS

SYSTEM OVERVIEW	Indications	3
	Pediatric LCP® Plates	4
	AO Principles	7
2.7 MM HIP PLATES: VARUS	Clinical Cases	9
	Preoperative Planning	11
	Patient Positioning and Approach	15
	Guide Wire Insertion	16
	Kirschner Wire Insertion	21
	Perform Osteotomy	23
	Proximal Fixation	24
	Reduction	29
	Distal Fixation	30
	Postoperative Treatment	31
3.5 MM & 5.0 MM HIP PLATES: VARUS	Clinical Cases	33
	Preoperative Planning	39
	Patient Positioning and Approach	44
	Guide Wire Insertion	45
	Kirschner Wire Insertion	48
	Perform Osteotomy	50
	Proximal Fixation	52

---

3.5 MM & 5.0 MM HIP PLATES: VARUS	Reduction	58
	Distal Fixation	59
	Medialization	62
	Alternative Surgical Technique	66
	Considerations for Fracture Treatment	70

---

3.5 MM & 5.0 MM HIP PLATES: VALGUS	Clinical Cases	71
	Preoperative Planning	73
	Patient Positioning and Approach	78
	Guide Wire Insertion	79
	Kirschner Wire Insertion	82
	Perform Osteotomy	84
	Proximal Fixation	85
	Reduction	91
	Distal Fixation	92
	Alternative Surgical Technique	95

3.5 MM & 5.0 MM CONDYLAR PLATES: VARUS	Clinical Cases	101
	Preoperative Planning	103
	Patient Positioning and Approach	105
	Guide Wire Insertion	106
	Kirschner Wire Insertion	109
	Perform Osteotomy	112
	Distal Fixation	114
	Reduction	120
	Proximal Fixation	121
	Medialization	127
	PRODUCT AND SET INFORMATION	Implants
Instruments		132
Set Lists		142
Bibliography		149

**MR Information**

The Pediatric LCP® Plate System has not been evaluated for safety and compatibility in the MR environment. It has not been tested for heating, migration or image artifact in the MR environment. The safety of the Pediatric LCP® Plate System in the MR environment is unknown. Scanning a patient who has this device may result in patient injury.

# SYSTEM OVERVIEW



# INDICATIONS

---

The Synthes Pediatric LCP® Plate System is indicated for fixation of fractures (including pathologic and impending pathologic fractures) and osteotomies of the femur in infants, children, adolescents, and small statured adults.

Specific indications for the 100°, 110°, 120°, 130°, 140°, 150° plates include:

- Varus, valgus, rotational, and/or shortening osteotomies
- Femoral neck and/or pertrochanteric fractures
- Proximal metaphyseal fractures
- Diaphyseal fractures
- Pathologic fractures
- Prophylactic use for impending pathologic fractures

Specific indications for the 90° plates include:

- Varus, valgus, rotational, and/or shortening osteotomies
- Femoral neck and/or pertrochanteric fractures
- Proximal and distal metaphyseal fractures
- Diaphyseal fractures
- Pathologic fractures
- Prophylactic use for impending pathologic fractures

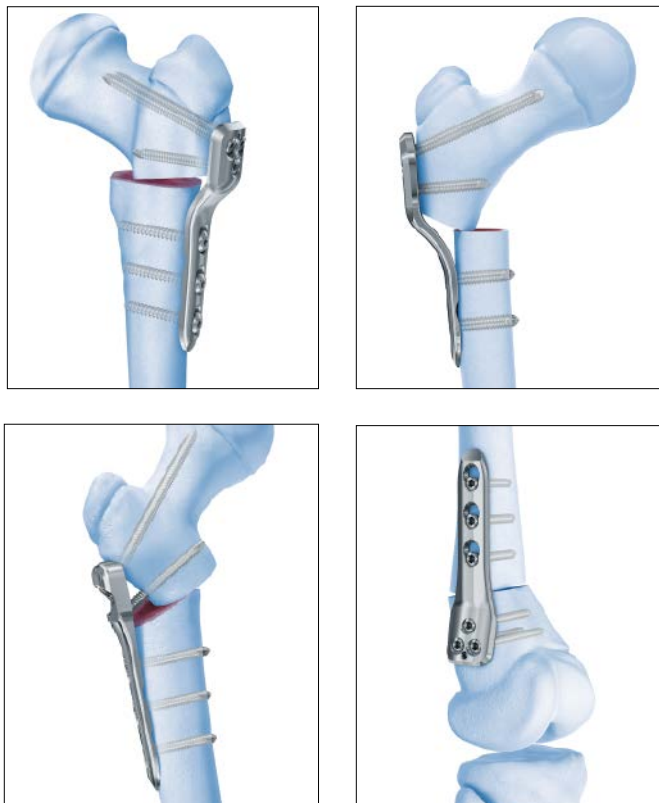
# PEDIATRIC LCP® PLATES

The Pediatric LCP Plate System is designed for stable fixation of varus, valgus, or rotational osteotomies and trauma applications in pediatric orthopaedics and is designed to meet the specific requirements of pediatric orthopaedic surgery.










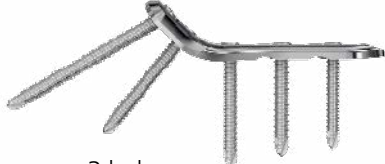
The Pediatric LCP Plate System offers a wide range of locking compression plates along with a surgical technique specifically developed for the pediatric patient. The Pediatric LCP Plates have a universal design for the left and right femur. The head of the plate features threaded holes for locking screws that either angle into the femoral neck in the proximal femur or parallel to the growth plate in the distal femur in place of the traditional angled blade.

In the proximal femur plates, an additional diverging calcar screw ensures increased fixation in the bone. The 100° and 110° plates are designed with an offset for osteotomies. The 2.7 mm plates have a 6 mm offset; the 3.5 mm plates have an 8 mm offset and the 5.0 mm plates have a 10 mm offset.

Plate shafts feature limited-contact profiles and Combi holes. The Combi hole combines a dynamic compression unit (DCU) hole with a locking screw hole. Combi holes provide the choice of axial compression and locking capability throughout the length of the plate shaft.



Pediatric LCP Plates are available in the following sizes and angles.\*

Angle	Recommended Use	2.7 mm Plates	3.5 mm and 5.0 mm Plates
90° (Condylar)	Distal femur osteotomies and fractures		 3, 5, or 7 holes
100°	Varus osteotomies	 2 holes	 3 holes
110°	Varus osteotomies	 2 holes	 3 holes
120°**	Fractures		 4 holes
130°	Fractures	 2 holes	 3, 5, 7 or 9 holes
140°	Valgus osteotomies		 3 holes
150°**	Valgus osteotomies		 3 holes

\*Screws sold separately  
 \*\*Additionally available.



### **Angular stability**

Angular stability reduces the risk of primary and secondary loss of correction. Improved connections between screw and plate, as well as within the cortical bone, make casting unnecessary in the majority of cases.

**Note: When using 2.7 mm plates, external splintage such as spica is recommended for osteoporotic or young (noncompliant) patients.**

### **Intraoperative correction and flexibility**

Initial plate positioning with Kirschner wires allows for intraoperative flexibility and correction. The range of plate sizes, angles, and screw lengths allows optimal patient fit.

### **Medialization**

Additional medialization can be obtained using the 3.5 mm and 5.0 mm Pediatric LCP Plates, requiring one offset for each plate size.

### **Low-profile design**

Plate design and locking construct helps reduce muscle disruption and soft tissue irritation.

### **Precautions:**

- **Make sure to choose the appropriate plate corresponding to age, size, and bone quality of the patient.**
- **Ensure that the plate selected has a neck/screw angle which corresponds to preoperative planning.**

# AO PRINCIPLES

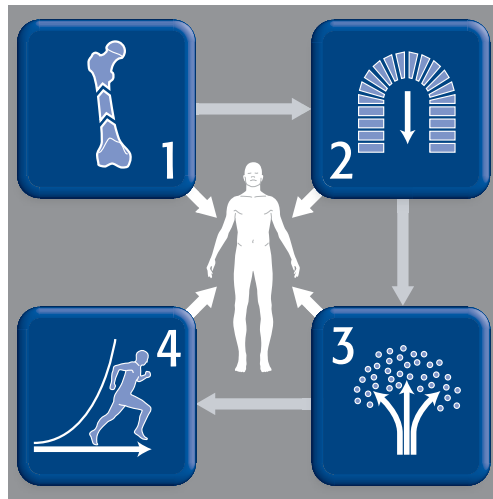
In 1958, the AO formulated four basic principles, which have become the guidelines for internal fixation.<sup>1,2</sup>

## Anatomic reduction

Fracture reduction and fixation to restore anatomical relationships.

## Early, active mobilization

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



## Stable fixation

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

## Preservation of blood supply

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

1. Müller ME, Allgöwer M, Schneider R, Willenegger H. *Manual of Internal Fixation*. 3rd ed. Berlin, Heidelberg, New York: Springer-Verlag; 1991.  
2. Rüedi TP, RE Buckley, CG Moran. *AO Principles of Fracture Management*. 2nd ed. Stuttgart, New York: Thieme; 2007.

# 2.7 MM PEDIATRIC LCP HIP PLATES: VARUS OSTEOTOMY



# CLINICAL CASES

## Case 1\*

18-month-old girl with severe dysplasia and subluxation of the right hip. Intraoperative arthrogram in AP view and abduction with 35° internal rotation shows good head positioning.



Preoperative, AP view

An intertrochanteric osteotomy was performed with a 110° 2.7 mm Pediatric LCP Hip Plate. Postoperative x-rays show good containment after correction of varisation and 30° external rotation. External splintage was applied as the plate is small and the infant noncompliant.



Postoperative, AP view



Postoperative, lateral view

Note: Results from case reports are not necessarily predictive of results in other cases. Results in other cases may vary.

\*Images courtesy of: Theddy F. Slongo, MD, Children's University Hospital, Bern, Switzerland.

**Case 2\***

18-month-old girl with neglected dislocation of the left hip. The left hip had a 150° preoperative CCD angle. An open reduction was performed in combination with an intertrochanteric osteotomy, which reduced the femoral-neck shaft (CCD) angle to 115° (34° correction angle) in combination with 30° external rotation correction. The osteotomy was fixed using a 110° 2.7 mm Pediatric LCP Hip Plate.



Preoperative, AP view



Preoperative, AP view, in abduction

Postoperative x-rays show good correction and centralization of the hip in AP and lateral views.

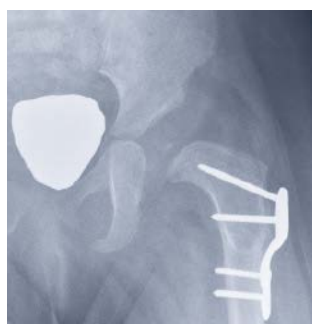


Postoperative, AP view

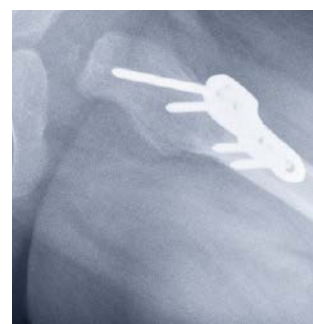


Postoperative, lateral view

Postoperative follow-up at 6 weeks shows no loss of reduction, no plate or screw loosening and good callus formation.



6-week follow-up, AP view



6-week follow-up, lateral view

\*Images courtesy of: Dr. Geoff Donald, MD, Royal Children's Hospital, Brisbane, Queensland, Australia.

# PREOPERATIVE PLANNING

---

## 1

### **Determine correction angle**

The surgical procedure described on the following pages uses positioning Kirschner wires (K-wires) to help plate placement. These K-wires are inserted with the help of a guiding block. In order to set the correct angle of the guiding block, the correction angle has to be determined first.

The angle of the guiding block can be calculated on the basis of the plate/screw angle and the desired correction angle. The correction angle can be established using one of the planning methods described below:

#### **Functional aspect: The functional abduction view on the x-ray shows the amount of correction**

This technique is based on the optimal anatomical position of the femoral head in the acetabulum (containment) and is not focused on an anatomical calculated correction angle. The pathological neck/shaft (CCD) angle is not relevant to determine the correction angle.

#### **Anatomical aspect: The planning is based on the actual pathological neck/shaft angle (CCD)**

This technique is used when the desired final neck shaft angle is not one of the plate/screw angles and is derived from the original osteotomy technique described by Müller (1971).

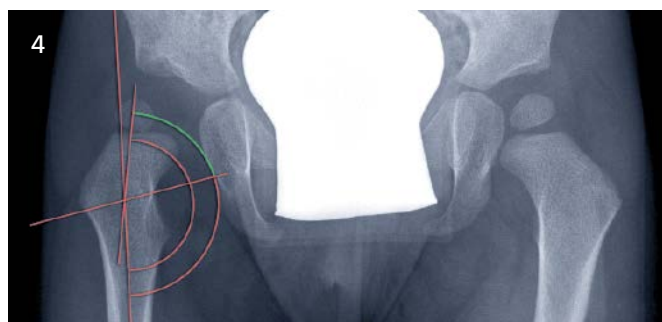
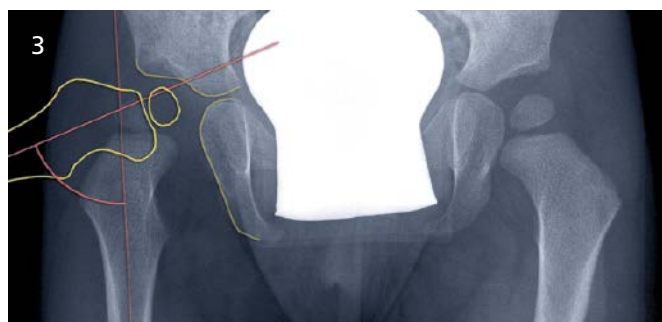
Preoperative planning is vital for proximal femoral osteotomies. Although there are different ways of planning, they are all designed to achieve the same result.

### Functional aspect

- The functional planning is based on a clear AP pelvis x-ray. To calculate the correction angle, there are two options:
  1. Produce functional, abduction x-rays until there is an optimal containment of the femoral head.
    - AP pelvis x-ray (1)
    - AP pelvis x-ray in abduction and with internal rotation to assess the coverage (2)
  2. Create a template of the proximal femur on the AP pelvic x-ray, rotate this template around the center of the femoral head until you have a satisfactory containment.
    - Assess the correction that will achieve coverage (3)
    - Choose a target neck/shaft angle based on patient pathology (4)

**Calculate the correction angle:** The angle between the anatomical axis of the femur in the AP x-ray and the abduction x-ray or the AP x-ray and the template, respectively, determine the correction angle.

**Note:** Use of the template technique may reduce x-ray exposure.



## 2 Select plate

The angle of the plate should be close to that of the desired neck/shaft angle. The 100° and 110° Pediatric LCP Plates each have an offset; therefore, they are recommended for varus osteotomies.

### 3

#### Determine point of reference

The femoral shaft or neck can be used as a reference while planning and later inserting the positioning Kirschner wire.

#### Shaft referencing

To determine the correction angle, subtract the desired neck/shaft angle from the initial pathological neck/shaft angle.

Example:

Current pathological neck/shaft angle: 150°

Desired neck/shaft angle: 120°

Correction angle: 30°

To determine the insertion angle of the positioning Kirschner wire using the guiding block and the positioning device for guiding block on the shaft, add the newly calculated correction angle to the plate angle.

Example:

110° plate angle + 30° correction angle = 140°

Insert positioning Kirschner wire at 140° to the shaft

#### Neck referencing

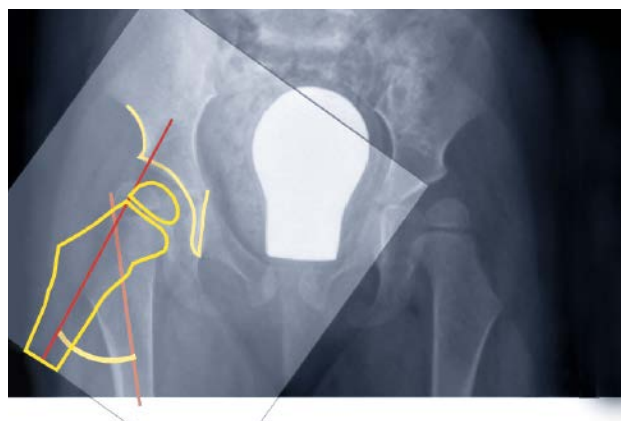
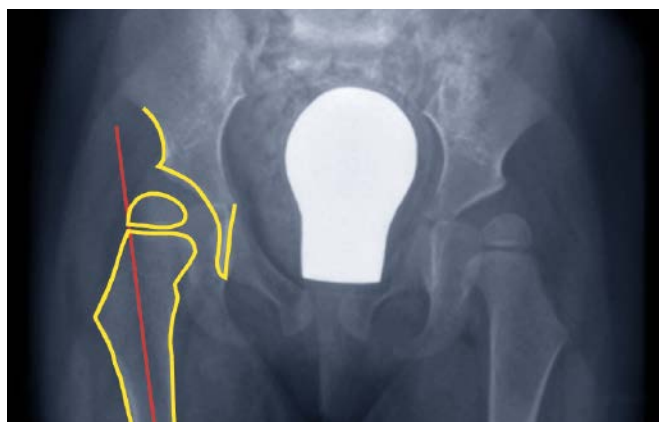
The positioning Kirschner wire is inserted at an angle to the femoral neck. To determine the insertion angle of the positioning Kirschner wire using the guiding block and positioning device for guiding block, subtract the plate angle from the desired neck/shaft angle.

Example:

Desired neck/shaft angle: 130°

Plate angle: 110°

Insert positioning Kirschner wire at 20° to the femoral neck





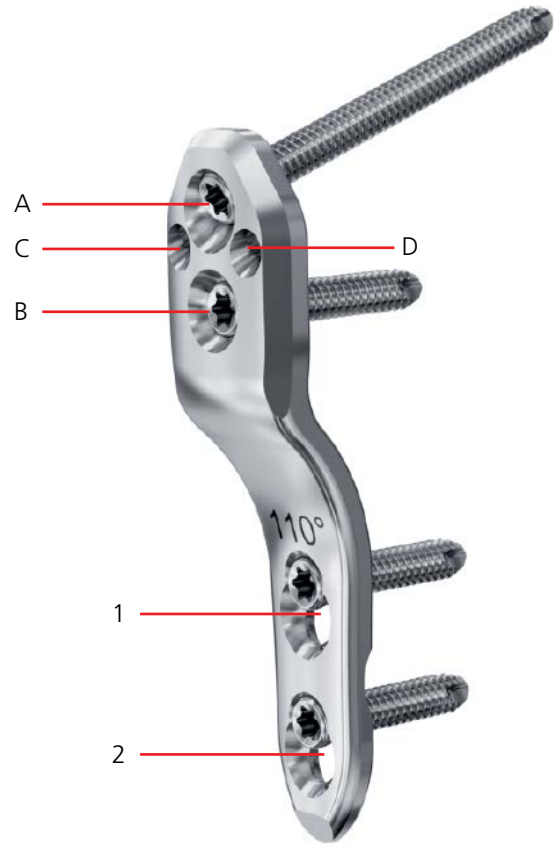
**4**

**Technique using 2.7 mm Pediatric LCP Hip Plates**

Varus osteotomy of the proximal femur 110° plate (02.108.301).

The surgical technique refers to screw holes where applicable.

Please see the designation of each hole as indicated.



- A: Neck screw
- B: Calcar screw
- C and D: Guide wires
- 1 and 2: LCP Locking Screws or Cortex Shaft Screws

# PATIENT POSITIONING AND APPROACH

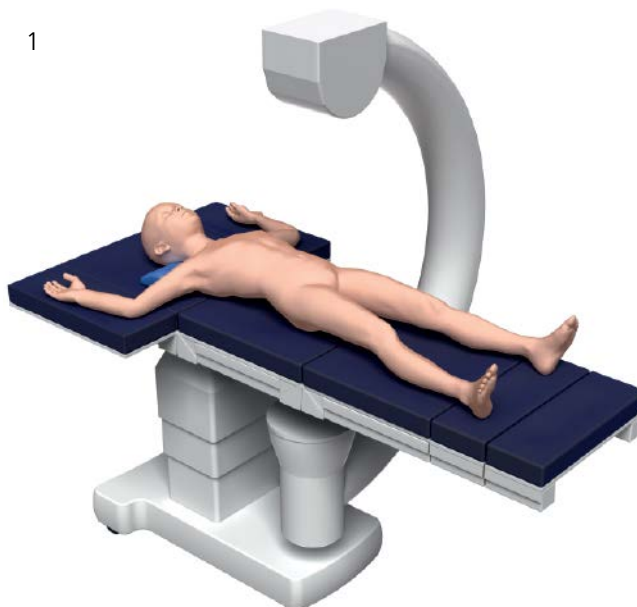
---

## 1

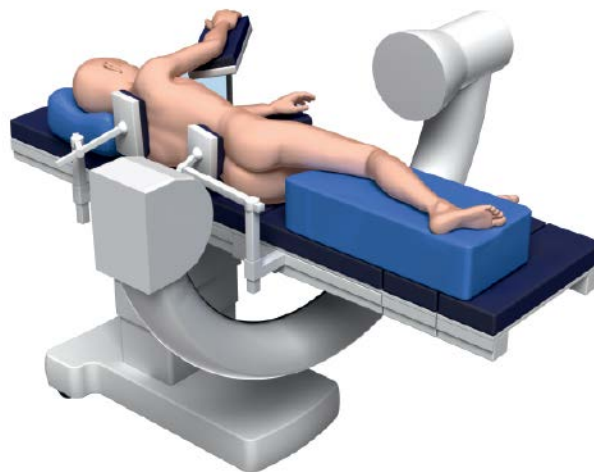
### Position patient

Position the patient either in the supine (1) or lateral (2) position. A radiolucent table is recommended when placing the patient in the supine position.

1



2



---

## 2

### Approach

Use a standard lateral approach to the proximal femur.

# GUIDE WIRE INSERTION

## 1

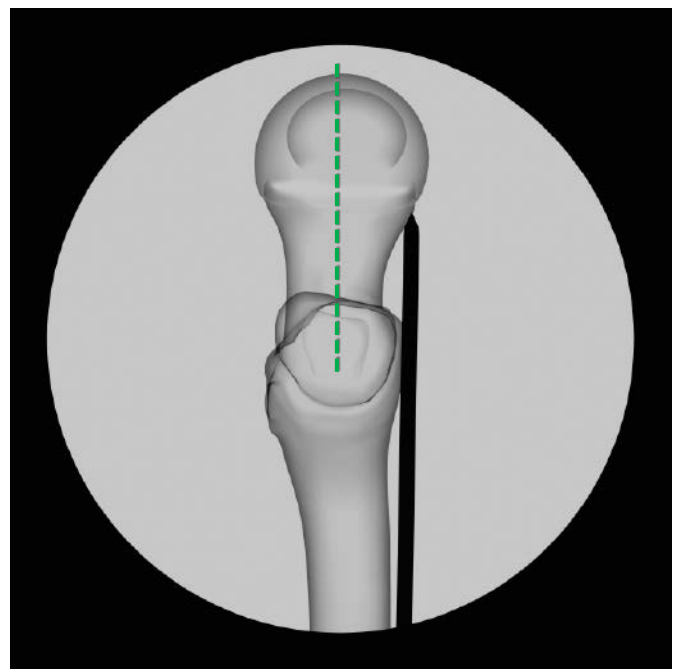
**Locate trochanteric epiphysis and determine anteversion**

### Instrument

292.79      2.0 mm Kirschner Wire with Thread,  
150 mm, trocar point, 15 mm thread  
length

- Place the Kirschner wire on the ventral aspect of the femoral neck to determine the anteversion. Align the K-wire with the central line of the femoral neck under the image intensifier.

**Note: Position the K-wire at a downward angle to avoid interference with the instruments.**



**2**

**Insert positioning guide wires in holes C and D**

**Instruments**

03.108.033	Pediatric LCP Hip Plate Guiding Block, for 2.7 mm screws
03.108.034	Positioning Device for Guiding Block, for 2.7 mm screws
03.110.007	StarDrive Screwdriver T8
292.65	2.0 mm Threaded Guide Wire, 230 mm, spade point
or	
292.652	2.0 mm Non-colored Threaded Guide Wire, 230 mm, spade point

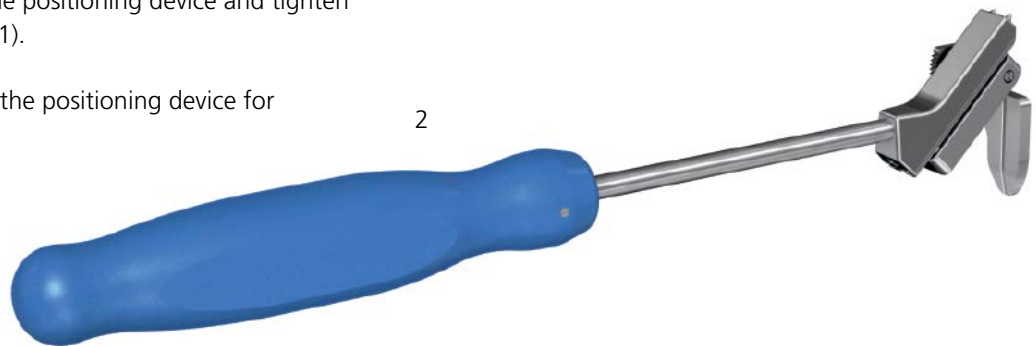
1



Set the calculated guide wire angle (see "Preoperative Planning" on page 13) on the positioning device and tighten the StarDrive™ Screwdriver (1).

Slide the guiding block over the positioning device for guiding block (2).

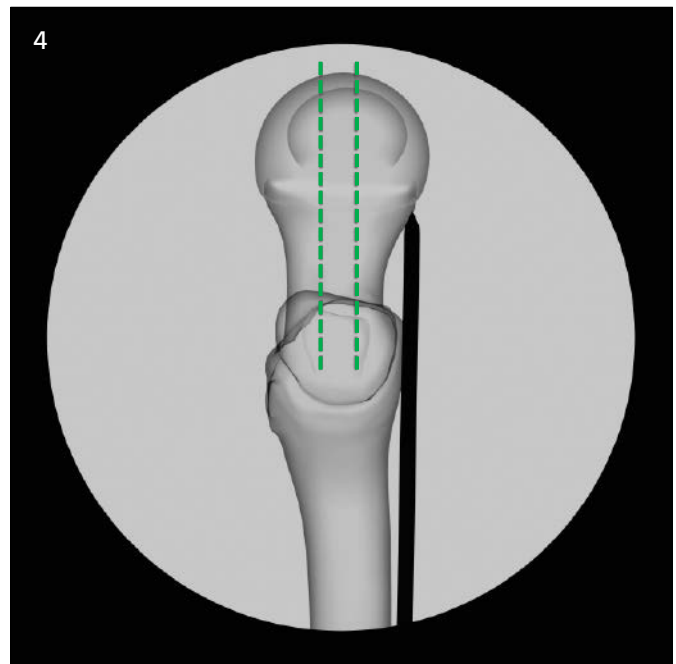
2



- The wing of the guiding block must be placed parallel to the proximal femoral shaft in AP and lateral views. The positioning device and the two front spikes of the guiding block must be in contact with the femur (3).
- The entry points for the positioning guide wires are 10 mm–15 mm distal to the trochanteric epiphysis in AP view.

**Precaution:** If there is extreme coxa valga, the positioning device for guiding block must be placed more distally to prevent the neck screw from perforating the piriformis fossa.

- Insert the guide wires in holes C and D parallel to the initially positioned anteversion K-wire in the lateral/axial view, in the middle third of the femoral neck (4).



Begin with the posterior guide wire to avoid interference with the anteversion wire (5). Once this wire is in place the anteversion wire can be removed. Insert a guide wire in the anterior hole (6).

To avoid slippage of the positioning device, do not remove the guide wires until the top neck screw is in place.

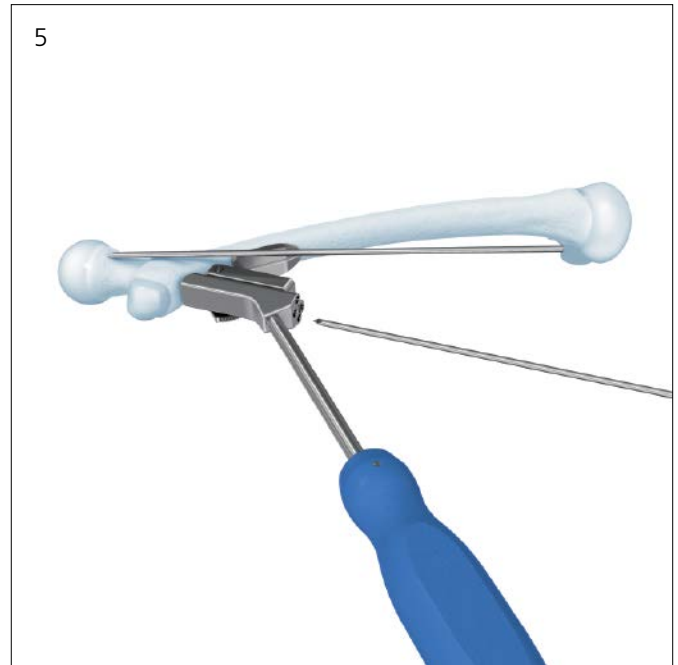
**Precautions:**

- The following positioning steps refer to the guide wires; therefore, their exact position is crucial.
- Use the 230 mm wire to reduce the risk of interference with the power tool.

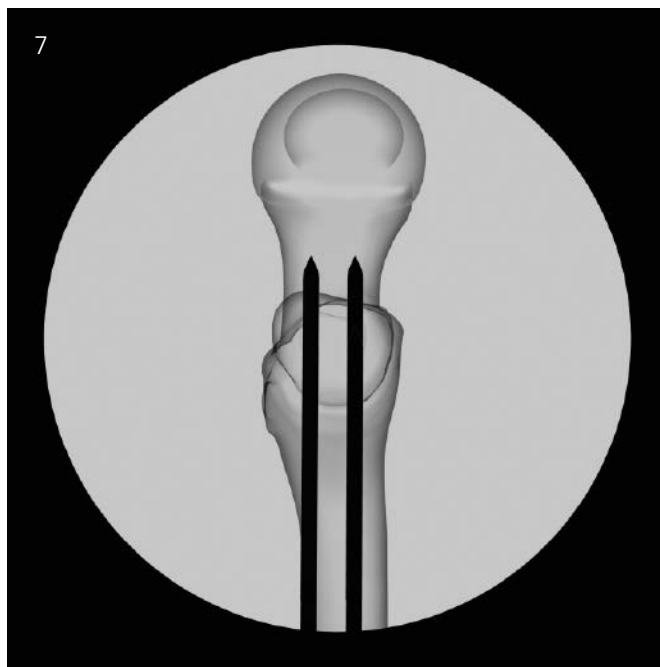
**Note:** To facilitate insertion, center-punch the surface of the bone at the entry point before inserting positioning device and wire.

**Precautions:**

- Do not bend the guide wires during insertion as this may result in correction errors. This can occur when flexing the hip in lateral/axial view.
- If extension or flexion is required at the osteotomy, the guiding block with the positioning device has to be rotated accordingly before insertion of the second guide wire.



**Precaution:** Verify optimal placement of the guide wires with the image intensifier in AP and lateral view (7).



# KIRSCHNER WIRE INSERTION

## 1

### Insert Kirschner wires for proximal screw

#### Instruments

03.108.033	Pediatric LCP Hip Plate Guiding Block, for 2.7 mm screws
03.108.034	Positioning Device for Guiding Block, for 2.7 mm screws
03.110.007	StarDrive Screwdriver T8
292.79	2.0 mm Kirschner Wire with Thread, 150 mm, trocar point, 15 mm thread length

Use the guiding block to insert the K-wire in hole A (1). To ensure an optimal screw length, place the K-wire to within 5 mm of the femoral head growth plate (2).





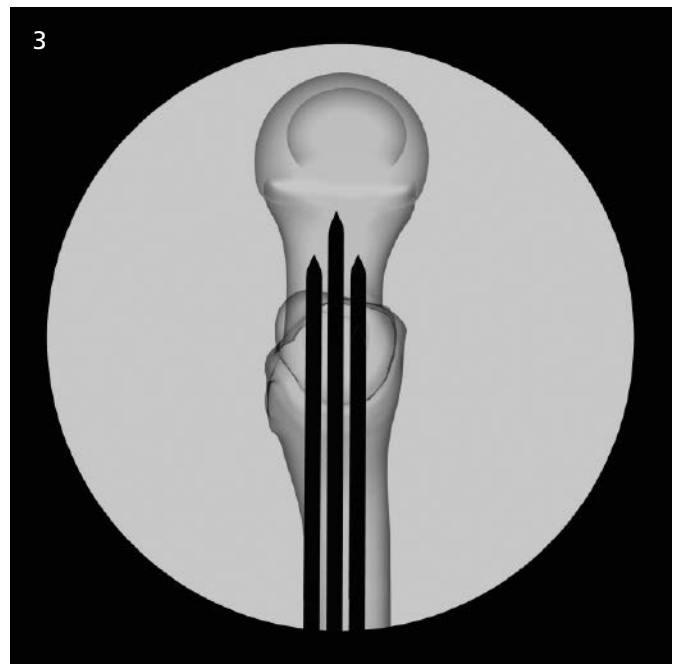
- With the K-wires for holes A and B, the position and length of the screws are defined; at the same time, the holes are predrilled for the 2.7 mm screws.

**Precaution:** Do not bend wires with the guiding block while inserting the K-wire as this may result in failed correction.

After inserting the K-wire in hole A, remove the positioning device and the guiding block.

**Note:** To remove the positioning device and the guiding block, loosen the StarDrive Screwdriver on the positioning device.

**Precaution:** Verify the position of the K-wire with the image intensifier in the AP and axial (2, 3) views. Do not penetrate the epiphysis.



# PERFORM OSTEOTOMY

## Instrument

03.108.039 Osteotomy Measuring Device, for 2.7 mm Pediatric LCP Hip Plates

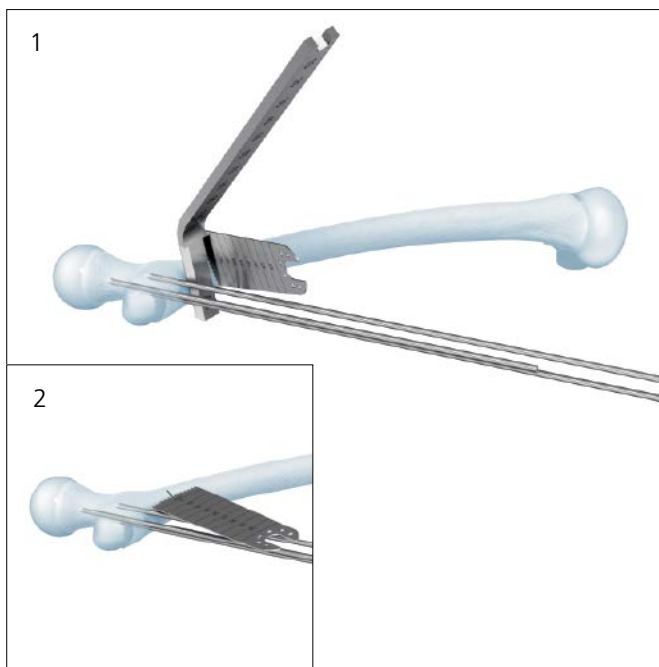
Optimal positioning of the osteotomy when using a 2.7 mm plate is 9 mm distal to the guide wires in holes C and D. Determine the distance with the corresponding end of the osteotomy measuring device (1).

Hold the osteotomy measuring device against the two guide wires and mark the distance on the bone with the oscillating saw or another sharp instrument (2).

**Precaution:** Prior to performing the osteotomy, insert K-wires into the greater trochanter and the distal fragment (either the shaft or the knee) to control the rotation. Even if no rotation is planned, it is recommended to insert the two K-wires or to make a mark on the bone, to ensure rotational alignment is maintained.

**Note:** In cases of extreme coxa valga, the osteotomy cut should be 3 mm–4 mm farther distal. Otherwise, the distance for the calcar screw is too short.

Perform the osteotomy in one cut perpendicular to the femoral shaft with an oscillating saw (3). Use constant irrigation and cooling.



# PROXIMAL FIXATION

## 1

### Position plate

#### Instruments

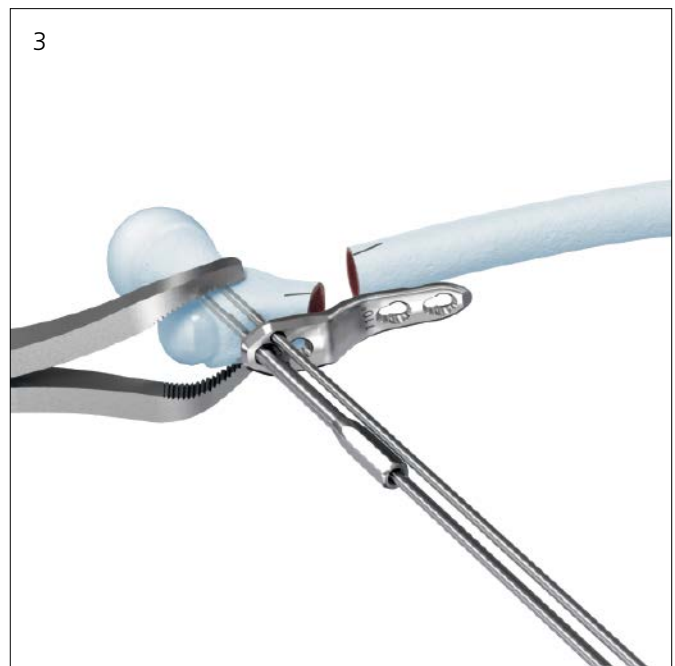
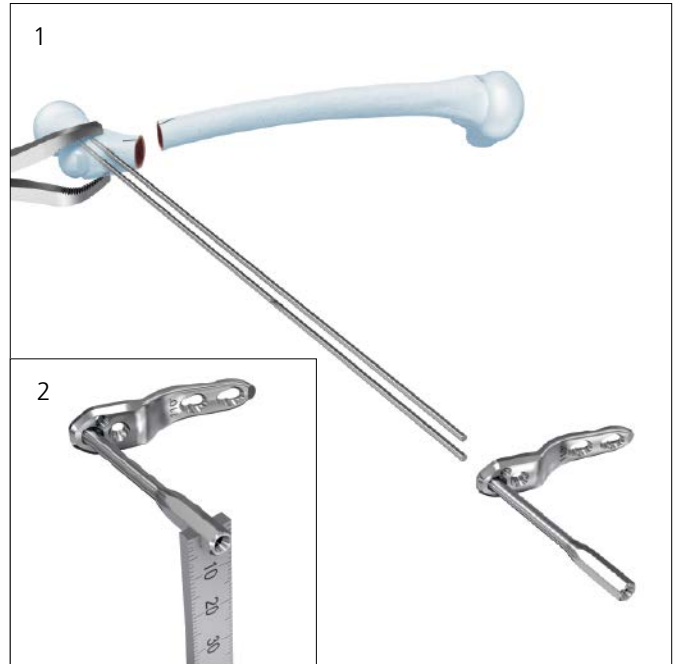
03.108.036	2.0 mm Threaded Drill Guide, for 2.7 mm Pediatric LCP Hip Plates
03.108.037	Direct Measuring Device, for 2.0 mm Kirschner Wires
03.108.039	Osteotomy Measuring Device, for 2.7 mm Pediatric LCP Hip Plates

Fixation in the proximal neck/head fragment must be performed with locking screws. Ensure the locking screws are at least 5 mm away from the growth plate of the femoral head.

Insert the drill sleeve into hole A. Tighten the drill sleeve with the wrench of the osteotomy measuring device (2). Slide the plate over the K-wires (1).

#### Notes:

- If the plate stands too far off the proximal fragment, it is acceptable to remove a small bone wedge from the lateral cortex near the osteotomy.
- Hold the proximal fragment (femoral neck/head fragment) with forceps taking care not to disturb the plate positioning or manipulate the wires. This provides improved handling of the proximal fragment and greater rotational stability (3).



## 2

### Determine femoral neck screw length

---

#### Instrument

---

03.108.037	Direct Measuring Device, for 2.0 mm Kirschner Wires
------------	--

---

Use the direct measuring device over the wire against the drill sleeve, to determine the screw length by measuring the insertion depth of the K-wire.

Remove the drill sleeve and the K-wire from hole A. If necessary, use the wrench end of the osteotomy measuring device.

Insert a screw in hole A as described in Step 3.

**Note:** In order to determine the correct screw length, use the direct measuring device with the 150 mm length K-wire.



### 3

#### Insert femoral neck screw in hole A

##### Instruments

03.110.005	Handle for Torque-Limiting Attachment
03.110.007	StarDrive Screwdriver T8
313.304	StarDrive Screwdriver Shaft, T8, cylindrical, with groove
511.776	Torque-Limiting Attachment, 0.8 Nm, quick coupling

##### Option A: Manual insertion

To manually insert a locking screw, connect the 0.8 Nm Torque-Limiting Attachment (TLA) to the blue handle for torque-limiting attachment by pressing the button marked "PRESS" on the back of the handle (1). Use this assembly, along with a StarDrive Screwdriver shaft, to insert the screw (2).

**Note:** The screw is securely locked to the plate when a click is heard.

##### Option B: Insertion under power

Locking screws may be partially inserted using the 0.8 Nm TLA and StarDrive Screwdriver shaft.

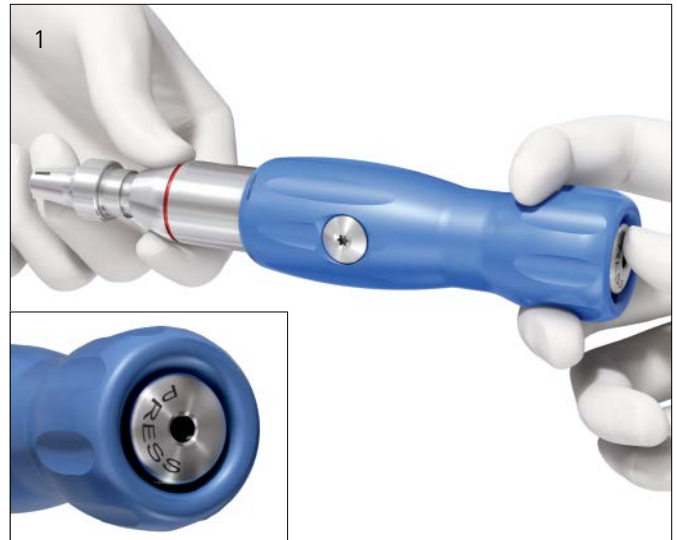
The torque-limiting attachment controls the tightening torque to:

- Ensure that enough torque is used to minimize the risk of the locking screw backing out of the plate; and
- Avoid locking the screw to the plate at full speed, thus minimizing the risk of cold-welding the screw to the plate.

**Precaution:** Do not fully tighten the screws with the power tool.

**Note:** Always perform final tightening by hand.

**Precaution:** Do not remove the positioning wire until proximal fixation is achieved.



**4**

**Insert calcar screw in hole B**

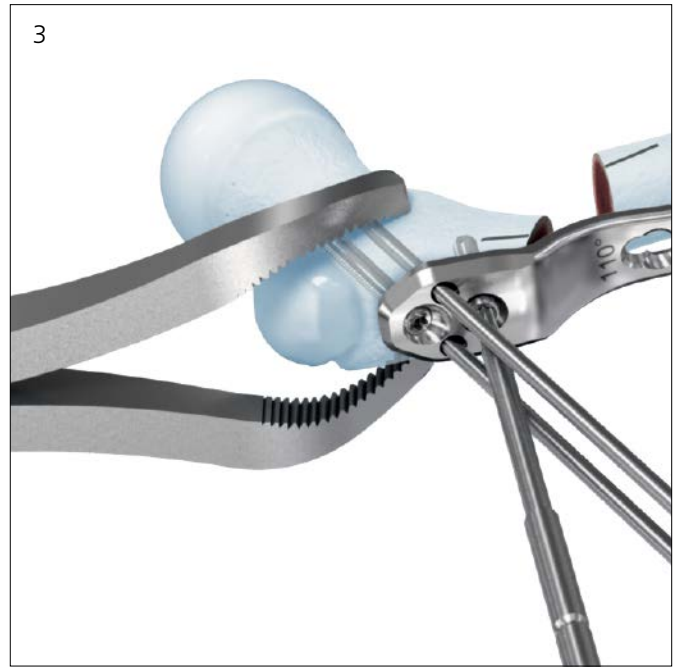
**Instruments**

03.108.036	2.0 mm Threaded Drill Guide for 2.7 mm Pediatric LCP Hip Plates
03.110.007	StarDrive Screwdriver T8
03.503.036	MatrixMANDIBLE Depth Gauge
313.304	StarDrive Screwdriver Shaft, T8, cylindrical, with groove
314.467	StarDrive Screwdriver Shaft, T8, 105 mm
323.062	2.0 mm Drill Bit with depth mark, quick coupling, 140 mm
511.776	Torque-Limiting Attachment, 0.8 Nm, quick coupling

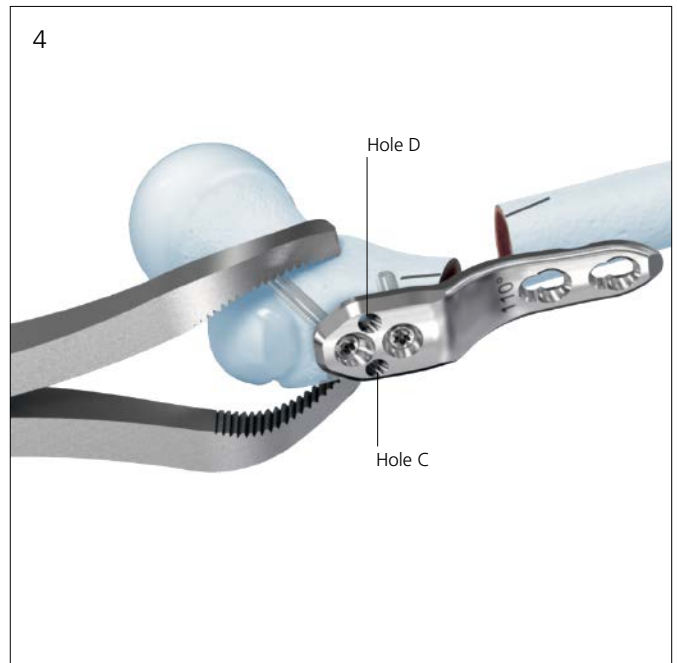
Attach the drill sleeve to hole B. Using the 2.0 mm drill bit, drill a bicortical hole for the calcar screw (1). Remove the drill sleeve and determine screw length with the depth gauge (2).



Insert the screw in hole B as previously described for hole A.



Remove the guide wires in holes C and D (4).



# REDUCTION

---

## Instrument

---

399.098      Reduction Forceps with serrated jaw, medium handle, soft ratchet

---

- For optimal fixation, align the plate parallel with the femoral shaft axis in AP and lateral views. Once the plate is aligned, secure the plate with reduction forceps.

### Precaution:

- If the plate is not aligned parallel to the femoral shaft axis in the AP view, it can lead to variations of the planned neck/shaft (CCD) angle.
- In case of a planned internal or external rotation osteotomy, the plate is fixed with the forceps and the distal part of the femur rotated (in this case laterally) until the two rotation wires are parallel in axial view. Obtain definitive fixation with the forceps and final fixation of the plate by inserting screws in holes 1 and 2. Afterwards, the rotation wires can be removed (2).

**Note:** If the achieved rotation correction is too little or too much, the wires should be left in the bone for another rotation correction.

If additional extension or flexion is required, the plate will no longer be aligned with the femoral shaft, making fixation more difficult due to the skewed position of the plate.

### Notes:

- Alignment can be facilitated with LCP Drill Guide in the distal part of the plate and/or with a forceps fixed on the proximal part. These instruments serve as handles during the repositioning of the osteotomy.
- Check whether medialization is required under the image intensifier. If so, follow the steps described on page 62.





# DISTAL FIXATION

## Instruments

03.108.036	2.0 mm Threaded Drill Guide, for 2.7 mm Pediatric LCP Hip Plates
03.108.037	Direct Measuring Device for 2.0 mm Kirschner Wires
03.503.036	MatrixMANDIBLE Depth Gauge
311.43	Handle with quick coupling
313.304	StarDrive Screwdriver Shaft, T8, cylindrical, with groove
323.062	2.0 mm Drill Bit with depth mark, quick coupling, 140 mm
323.26	2.7 mm Universal Drill Guide
511.776	Torque-Limiting Attachment, 0.8 Nm

The 2.7 mm pediatric LCP Hip Plate is an LCP Plate; therefore, either locking or cortex screws can be used in the shaft. To achieve compression, always insert a cortical screw prior to any locking screws.

To insert locking screws, screw the LCP Drill Guide into the locking portion of hole 1. Drill the screw hole through both cortices using the 2.0 mm drill bit (1). Remove the drill sleeve. Determine the screw length with the depth gauge and insert the screw.

**Precaution: Do not fully tighten the screws with the power tool.**

**Note: Always perform final tightening by hand.**

**Precaution: Do not remove the positioning wire until proximal fixation is achieved.**

**Note: The screw is securely locked to the plate when a click is heard.**

Repeat this step for screw insertion in hole 2 (2).

**Note: The universal drill guide can be used when inserting cortex screws. Drill holes with the 2.0 mm drill bit and measure the screw length with the depth gauge.**



**Precaution: Cortical screws cannot safely be inserted after a locking screw has been used in the distal fragment.**

# POSTOPERATIVE TREATMENT

---

External splintage, such as a spica, is recommended as the plate is small and the infant noncompliant. This plate may be used in combination with other procedures that require immobilization, such as open fracture reduction.

**Note: In osteoporotic bone, external splintage must be used.**

# 3.5 MM AND 5.0 MM PEDIATRIC LCP® HIP PLATES: VARUS OSTEOTOMY



3.5 mm and 5.0 mm  
Pediatric LCP Hip Plates:  
Varus Osteotomy

# CLINICAL CASES

## Case 1

11-year-old female with severe in-toeing. Anteroposterior (AP) and abduction internal rotation (AIR) views demonstrate coxa valga with poor coverage of the femoral heads. Varus rotational intertrochanteric osteotomies were performed using 110° 5.0 mm Pediatric LCP® Hip Plates. Full weight bearing was allowed 6 weeks postoperatively.



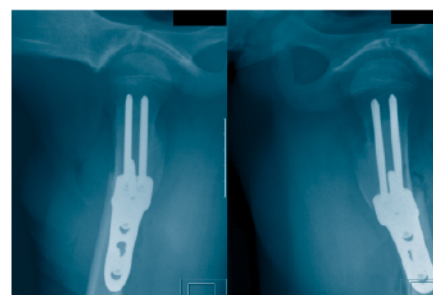
Preoperative AP pelvis



Preoperative functional abduction view



Initial postoperative AP and lateral radiographs demonstrating 30° varus correction bilaterally



6-month follow-up



Plates removed at 8 months postoperatively

Note: Results from case reports are not necessarily predictive of results in other cases. Results in other cases may vary.

**Case 2**

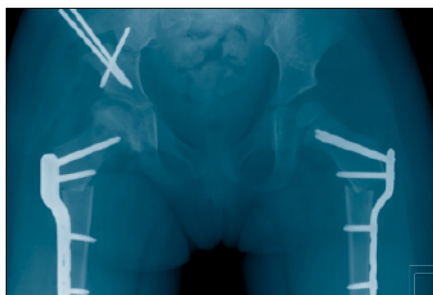
3-year-old female with progressive hip subluxation secondary to a neuro-muscular condition. Radiographs show bilateral acetabular dysplasia, subluxation of the femoral head, and marked femoral neck valgus. Bilateral varus osteotomies were performed with 110° 3.5 mm Pediatric LCP Hip Plates, combined with a triple osteotomy of the right pelvis. No hip spica was used and full weight bearing was allowed 5 weeks postoperatively.



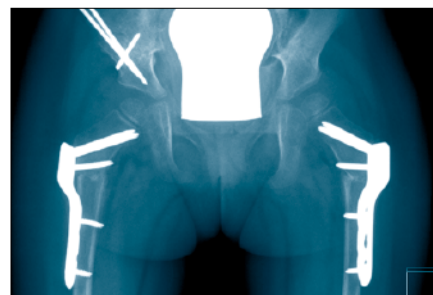
Preoperative AP pelvis



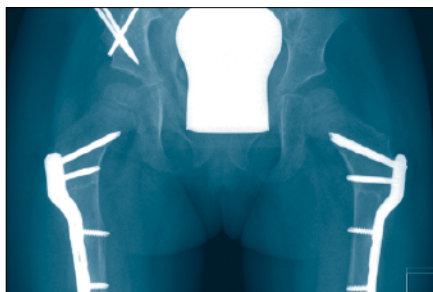
Preoperative functional abduction view shows concentric reduction bilaterally



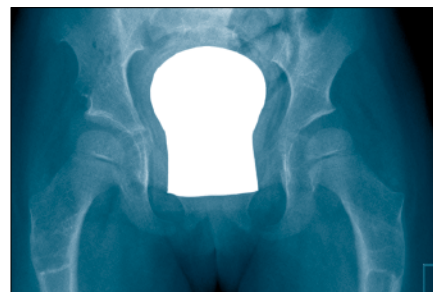
Initial postoperative



5-week follow-up, weight bearing allowed



7-month follow-up, complete healing and remodeling of the osteotomy



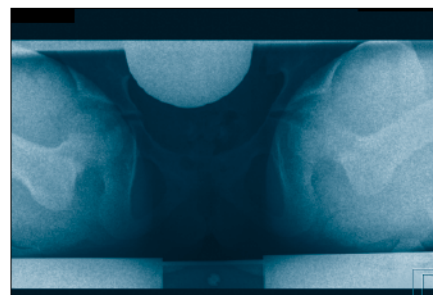
Plates removed at 14 months postoperatively

**Case 3**

8-year-old female with severe in-toeing and difficulty with ambulation secondary to increased femoral anteversion. Internal rotation was 100° bilaterally, with 0° external rotation on the right and 10° on the left. The parents requested correction of the rotation. Bilateral rotational intertrochanteric osteotomies were performed with 120° 3.5 mm Pediatric LCP Hip Plates.



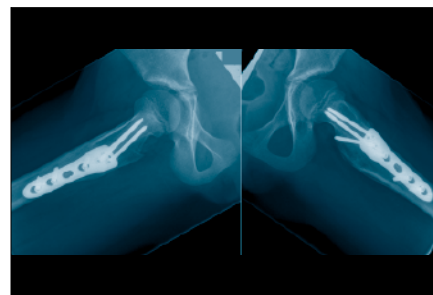
Preoperative AP pelvis



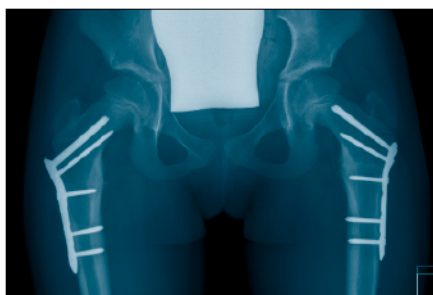
Dunn projection shows high anteversion of the femoral neck



Postoperative shows normal projection of the femoral neck



Postoperative laterals show good alignment of the plate and neck screws



5-month follow-up, good healing and complete remodeling of the osteotomy



Plates removed at 9 months postoperatively

**Case 4**

6½-year-old male with congenital coxa vara and pseudarthrosis of the right femoral neck. The functional adduction radiograph demonstrates appropriate correction of the deformity. A valgus intertrochanteric osteotomy was performed with the 150° 3.5 mm Pediatric LCP Hip Plate. No hip spica was used and partial weight bearing was allowed postoperatively.



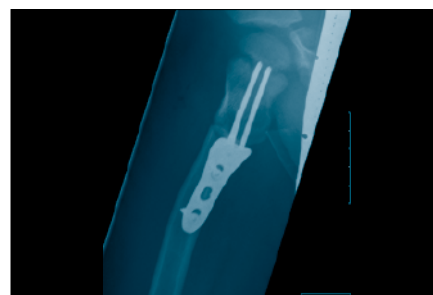
Preoperative AP pelvis



Preoperative adduction view



Initial postoperative AP and lateral radiographs show good alignment of the plate and neck screws



7-month follow-up, complete healing and remodeling of the pseudarthrosis



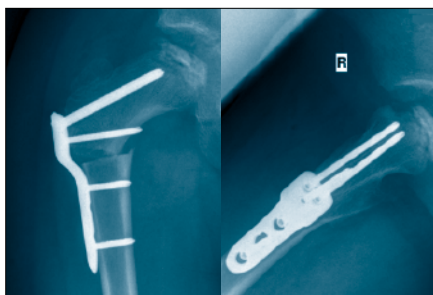
Plates removed at 9 months postoperatively

**Case 5**

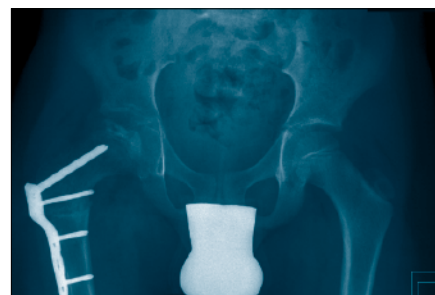
8-year-old male with Legg-Calvé-Perthes disease, collapse of the lateral pillar, and loss of containment. A 25° varus intertrochanteric osteotomy was performed with a 110° 3.5 mm Pediatric LCP Hip Plate. No hip spica was used and partial weight bearing (20 kg) was allowed postoperatively.



Preoperative AP pelvis



Initial postoperatives



7-week follow-up, complete healing and remodeling of the osteotomy, good containment



6-month follow-up



Plates removed at 9 months postoperatively

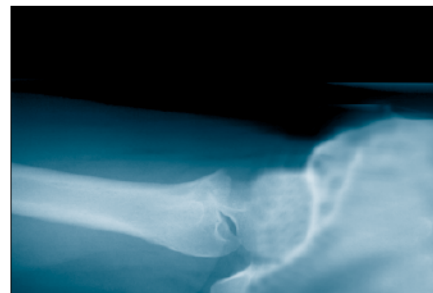


**Case 6**

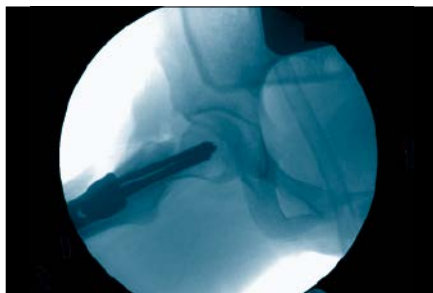
15-year-old female with femoral neck fracture, displaced with lateral angulation, from a snowboarding accident. Open reduction and internal fixation were performed with a 120° 5.0 mm Pediatric LCP Hip Plate. For better alignment of the calcar, the distal portion of the plate stands off of the shaft.



Preoperative AP pelvis



Preoperative lateral radiograph with fragments rotated 60°



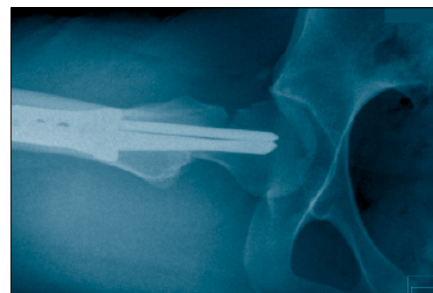
Intraoperative lateral



Intraoperative AP



Postoperative AP pelvis



Postoperative lateral

# PREOPERATIVE PLANNING

---

## 1

### **Determine correction angle**

The surgical procedure described on the following pages uses positioning Kirschner wires to help plate placement. These K-wires are inserted with the help of a guiding block. In order to set the correct angle of the guiding block, the correction angle has to be determined first.

The angle of the guiding block can be calculated on the basis of the plate/screw angle and the desired correction angle. The correction angle can be established using one of the planning methods described below:

#### **Functional aspect: The functional abduction view on the x-ray shows the amount of correction**

This technique is based on the optimal anatomical position of the femoral head in the acetabulum (containment) and is not focused on an anatomical calculated correction angle. The pathological neck/shaft (CCD) angle is not relevant to determine the correction angle.

#### **Anatomical aspect: The planning is based on the actual pathological neck/shaft angle (CCD)**

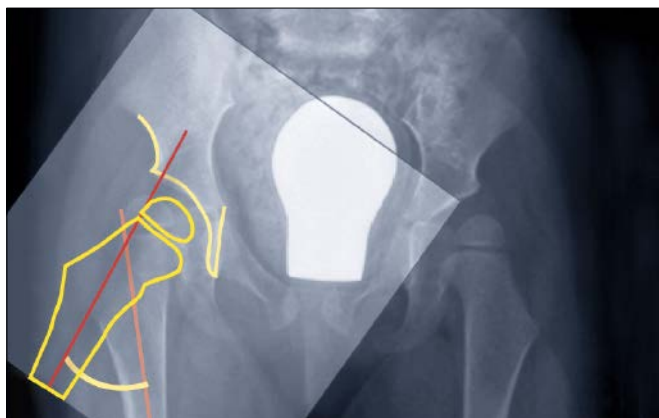
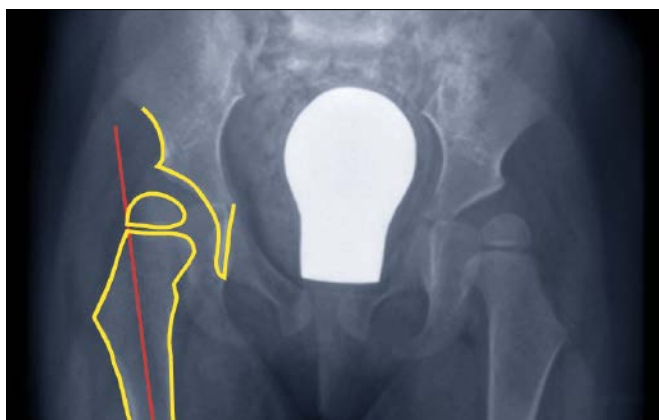
This technique is used when the desired final neck shaft angle is not one of the plate/screw angles. The technique is derived from the original osteotomy technique described by Müller (1971).

**Functional aspect**

- The functional planning is based on a clear AP pelvis x-ray. To calculate the correction angle, there are two options:
  1. Produce functional, abduction x-rays until there is an optimal containment of the femoral head.
    - AP pelvis x-ray (1)
    - AP pelvis x-ray in abduction and with internal rotation to assess the coverage (2)
  2. Create a template of the proximal femur on the AP pelvic x-ray, rotate this template around the center of the femoral head until you have a satisfactory containment.
    - Assess the correction that will achieve coverage (3)
    - Choose a target neck/shaft angle based on patient pathology (4)

**Calculate the correction angle:** The angle between the anatomical axis of the femur in the AP x-ray and the abduction x-ray or the AP x-ray and the template, respectively, determine the correction angle.

**Note:** Use of the template technique may reduce x-ray exposure.



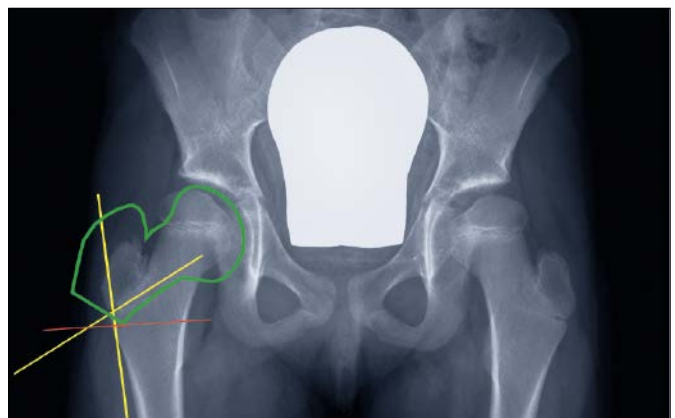
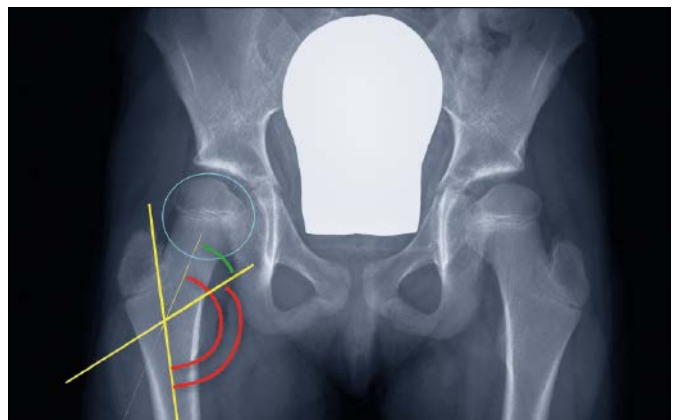
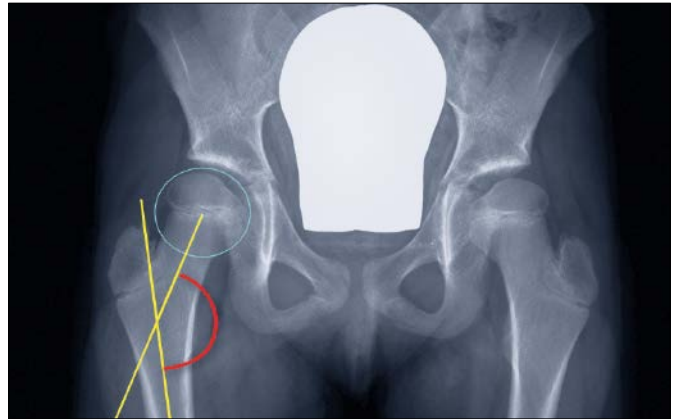
**Anatomical aspect**

● Anatomical planning is based on a clear AP pelvic x-ray with at least 30° of internal rotation of both legs. This guarantees the correct projection of the real femoral neck/shaft (CCD) angle.

1. Measure the pathological neck/shaft angle.
2. Determine the desired neck/shaft angle.

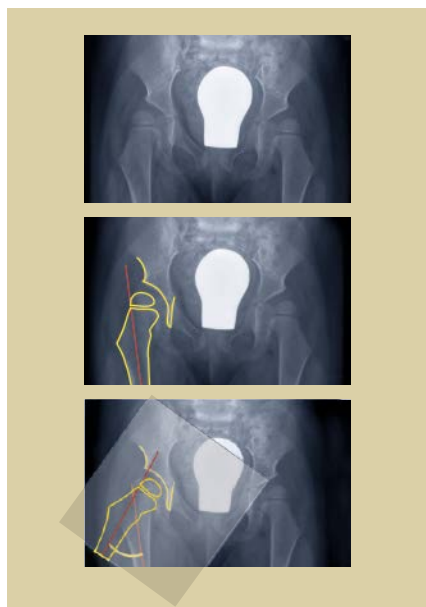
**Note:** To control the planned correction, a blueprint of the proximal femur on the AP pelvic x-ray can be performed. Rotate this blueprint around the planned osteotomy of your planned CCD angle and control the position of the femoral head.

**Calculation of the correction:** The angle between the initial axis of the femoral neck in the AP x-ray and the planned neck/shaft angle determine the correction angle.

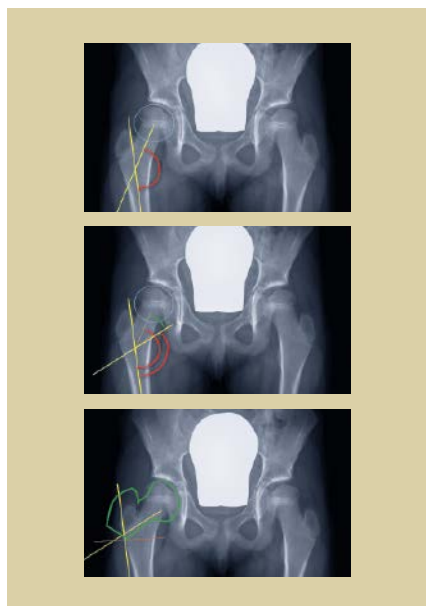


**Formula**

**Positioning K-wire angle =**                      **correction angle (results from the functional or anatomical aspects)**                      **+ plate/screw angle**



=                      **or**                      +



Example:  
 Current CCD: 165°  
 Rotation: 65°  
 Desired CCD: 130°  
 Plate/screw angle: 110°

Positioning Kirschner wire angle = 35°  
 (correction angle)  
**plus** 110° (plate/screw angle) = 145°

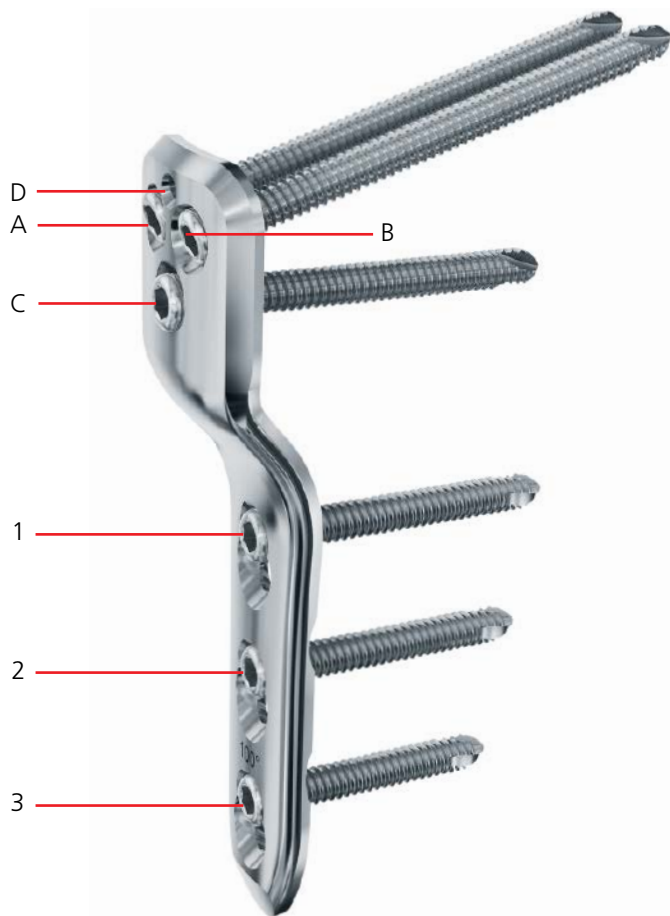
**2**

**Technique using 3.5 mm or 5.0 mm LCP Pediatric Hip Plates**

Varus osteotomy of the proximal femur using a 110° 3.5 mm or 5.0 mm plate.

The surgical technique refers to screw holes where applicable.

Please see the designation of each hole as marked.



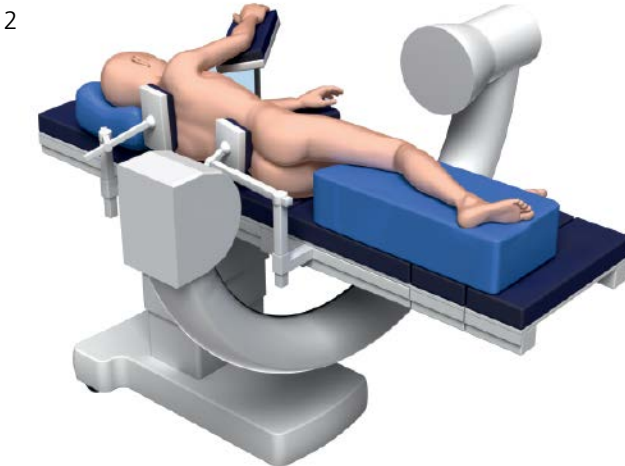
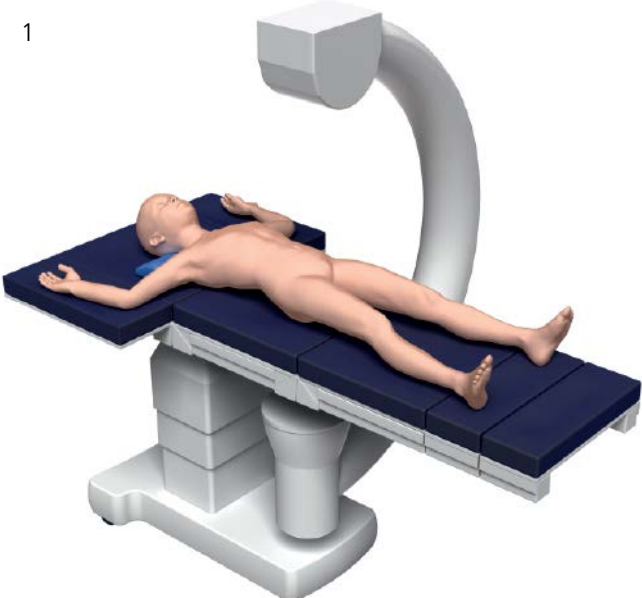
A, B: Neck screws  
C: Calcar screw  
D: Positioning Kirschner wire  
1, 2 and 3: LCP Locking Screws or  
Cortex Shaft Screws

# PATIENT POSITIONING AND APPROACH

---

## 1 Position patient

Position the patient either in the supine (1) or lateral (2) position. A radiolucent table is recommended when placing the patient in the supine position.



---

## 2 Approach

Use a standard lateral approach to the proximal femur.

# GUIDE WIRE INSERTION

---

## 1 Locate trochanteric epiphysis and determine anteversion

---

### Instrument

---

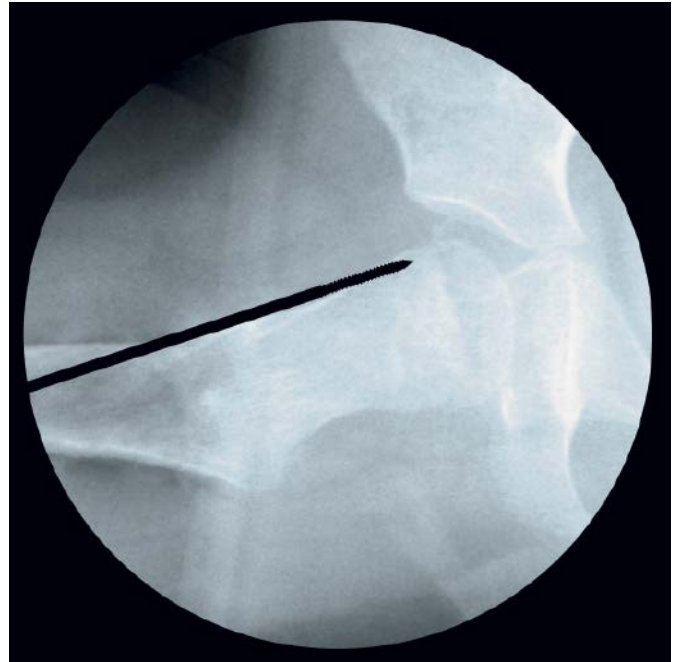
292.79	2.0 mm Kirschner Wire with Thread, 150 mm, trocar point, 15 mm thread length
--------	--

---



- Place the Kirschner wire on the ventral aspect of the femoral neck to determine the anteversion. Align the K-wire with the center line of the femoral neck under the image intensifier.

**Note:** Position the wire at a downward angle to avoid interference with the instruments.



Axial AP view



**2**

**Insert positioning Kirschner wire in hole D**

**Instruments for 3.5 mm plate**

03.108.001	Pediatric LCP Hip Plate Guiding Block for 3.5 mm Screws
03.108.006	Positioning Device for Guiding Block
292.79	2.0 mm Kirschner Wire with Thread, 150 mm, trocar point, 15 mm thread length
314.070	Small Hexagonal Screwdriver, 2.5 mm width across flats

**Instruments for 5.0 mm plate**

03.108.002	Pediatric LCP Hip Plate Guiding Block for 5.0 mm Screws
03.108.006	Positioning Device for Guiding Block
292.79	2.0 mm Kirschner Wire with Thread, 150 mm, trocar point, 15 mm thread length
314.070	Small Hexagonal Screwdriver, 2.5 mm width across flats

Set the calculated positioning guide wire angle (see “Preoperative Planning” section) on the positioning device and tighten the hex screw (1).

Slide the guiding block over the positioning device for guiding block (2).

1



2



- 1 The wing of the guiding block must be placed parallel to the proximal femur shaft in the AP and lateral views. The positioning device and the two front spikes of the guiding block must be in contact with the femur (3).
- 2 The entry point for the positioning guide wire is 5 mm to 6 mm distal to the trochanteric epiphysis in the AP view.

Insert the positioning K-wire parallel to the initially positioned anteversion K-wire, in the lateral/axial view, in the center of the femoral neck. Remove the anteversion wire.

**Note:** To facilitate insertion, center-punch the surface of the bone at the entry point before inserting positioning device and wire.

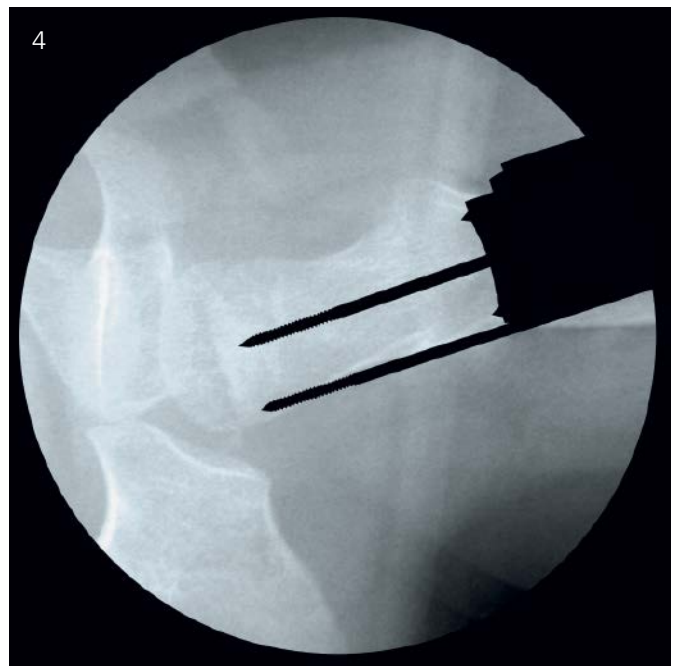
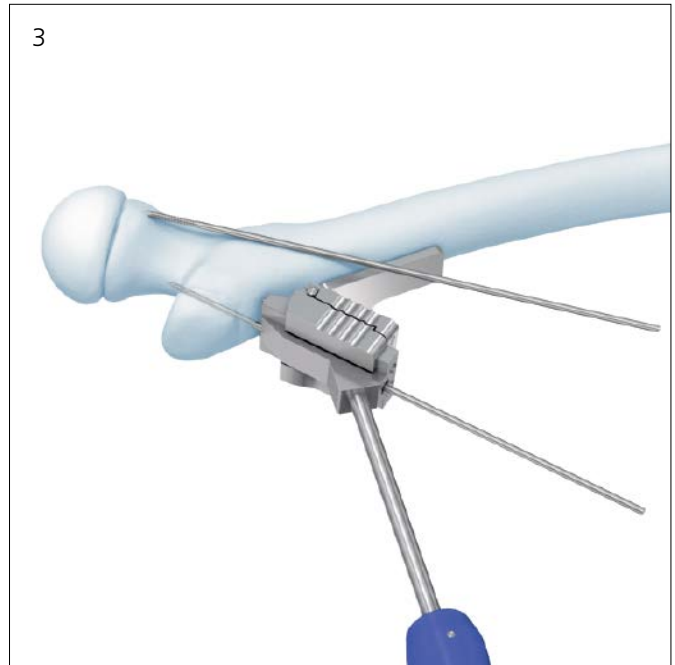
**Note:** If there is extreme coxa valga, the positioning device for guiding block must be placed more distally to prevent the neck screw from perforating the piriformis fossa.

**Precaution:** The following steps refer to the positioning guide wire; therefore, its exact position is crucial for a successful surgery.

To avoid slippage of the positioning device, do not remove the guide wire until the two neck screws are in place.

**Precautions:**

- Do not bend the Kirschner wire while drilling as this may result in failed correction.
  - If extension or flexion is required at the osteotomy, the guiding block with the positioning device has to be rotated accordingly before insertion of the Kirschner wires.
- 3 Verify optimal placement of the positioning wire with the image intensifier (4).



Axial AP view

# KIRSCHNER WIRE INSERTION

## Insert Kirschner wires for proximal screws

### Instruments for 3.5 mm plate

03.108.001	Pediatric LCP Hip Plate Guiding Block for 3.5 mm Screws
03.108.005	2.8 mm Kirschner Wire Spade Point, 200 mm
03.108.006	Positioning Device for Guiding Block
03.108.040	K-Wire Adaptor, for 2.8 mm K-wires (03.108.005)
314.070	Small Hexagonal Screwdriver, 2.5 mm width across flats

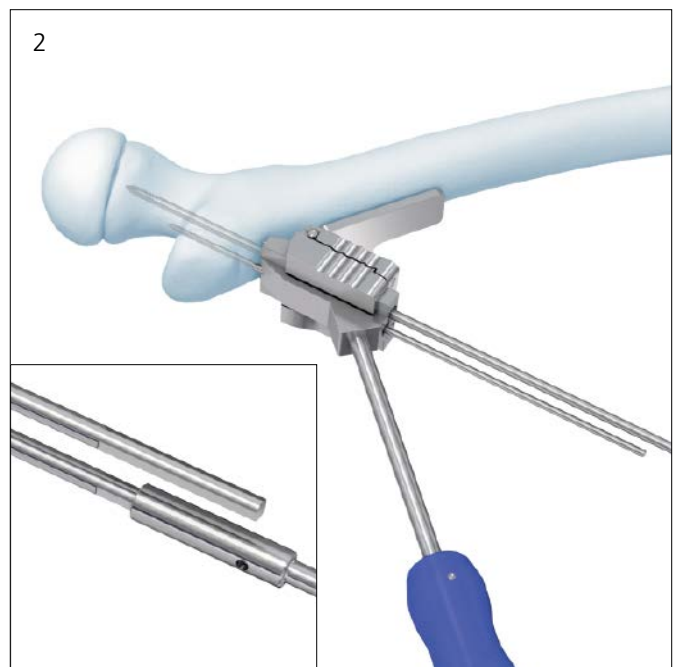
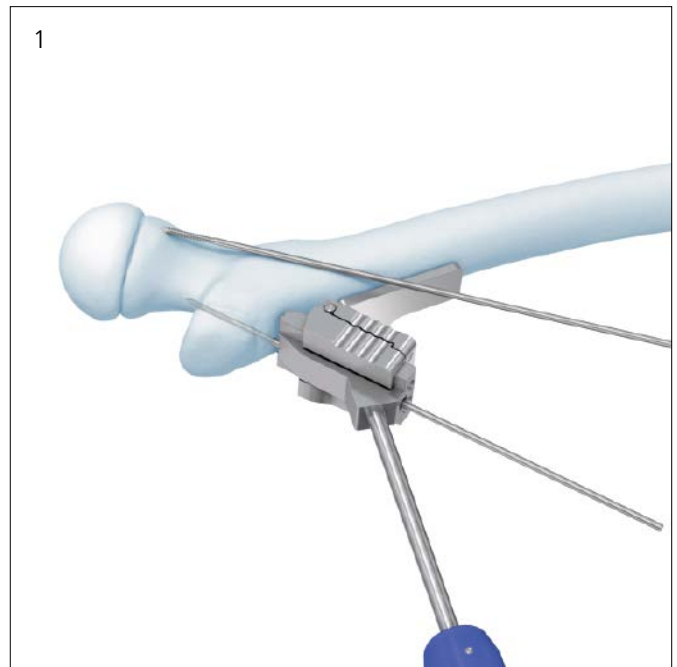
### Instruments for 5.0 mm plate

03.108.002	Pediatric LCP Hip Plate Guiding Block for 5.0 mm Screws
03.108.005	2.8 mm Kirschner Wire Spade Point, 200 mm
03.108.006	Positioning Device for Guiding Block
03.108.040	K-Wire Adaptor, for 2.8 mm K-wires, (03.108.005)
314.070	Small Hexagonal Screwdriver, 2.5 mm width across flats

Use the guiding block to insert the K-wires for holes A and B (1). To prevent interference with other wires, place the K-wire adaptor on the K-wires before insertion (2).

To ensure optimal screw lengths, place the K-wires to within 5 mm of the femoral head growth plate.

If extension or flexion is required, the guiding block has to be rotated accordingly around the positioning K-wire (hole D) before inserting the K-wires for the proximal screws.



With the K-wires for holes A and B, the position and length of the screws are defined while, at the same time, the holes are predrilled for the 3.5 mm screws.

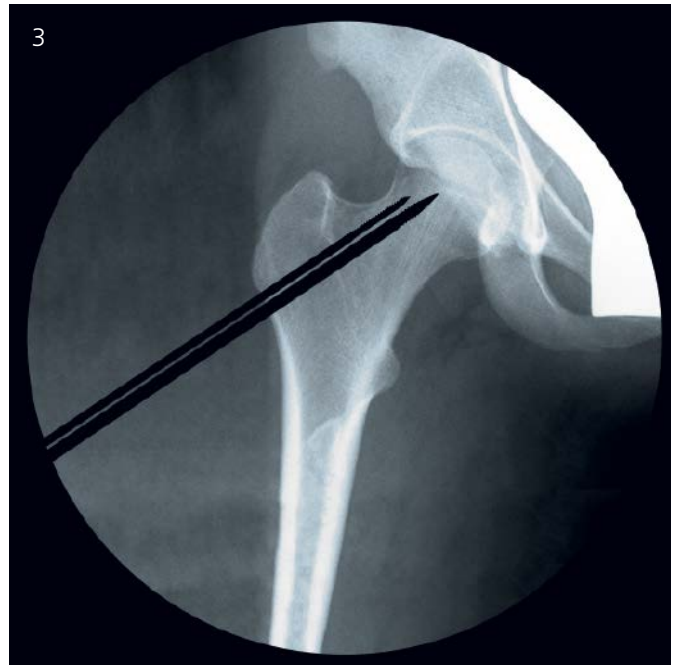
**Precaution: Do not bend the wires with the guiding block while inserting as this may result in failed correction.**

**Once a wire is inserted, flexion or extension correction can no longer be achieved.**

After inserting the K-wires for holes A and B, remove the guiding block and positioning device.

**Note: To remove the positioning device and guiding block, loosen the hex screw on the positioning device.**

**ⓘ Precaution: Verify the position of the K-wires with the image intensifier in the AP and axial views (3,4). Do not penetrate the epiphysis.**



AP view



Axial AP view

# PERFORM OSTEOTOMY

## Instruments

03.108.008	Osteotomy Measuring Device
292.79	2.0 mm Kirschner Wire with Thread, 150 mm, trocar point, 15 mm thread length
333.060	90°/50°/40° Triangular Positioning Plate
333.070	80°/70°/30° Triangular Positioning Plate
333.080	100°/60°/20° Triangular Positioning Plate

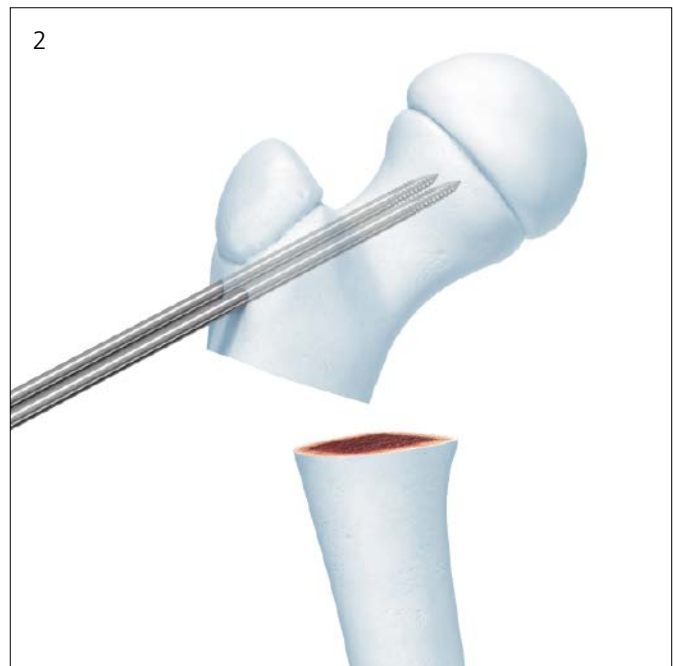
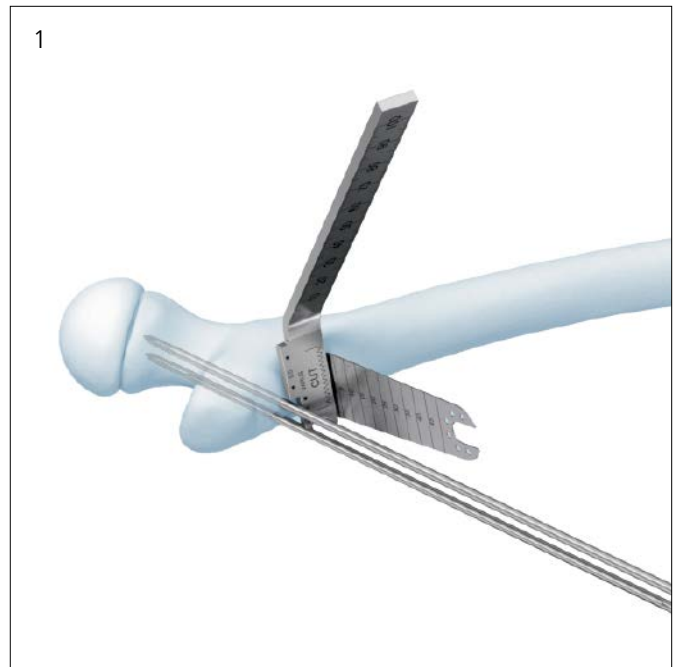
Optimal position of the osteotomy when using a 3.5 mm plate is 10 mm distal to the K-wires in holes A and B. Determine the distance with the corresponding end of the osteotomy measuring device (1).

Hold the osteotomy measuring device against the two wires and mark the distance with the oscillating saw or another sharp instrument on the bone.

**Note: In cases of extreme coxa valga, the osteotomy cut has to be 3 mm–4 mm further distal, otherwise the distance for the calcar screw is too short.**

**Note for 5.0 mm plate: The optimal position of the osteotomy is 13 mm distal to the K-wires.**

Perform the osteotomy in one cut perpendicular to the femoral shaft with an oscillating saw (2). Use constant irrigation and cooling.



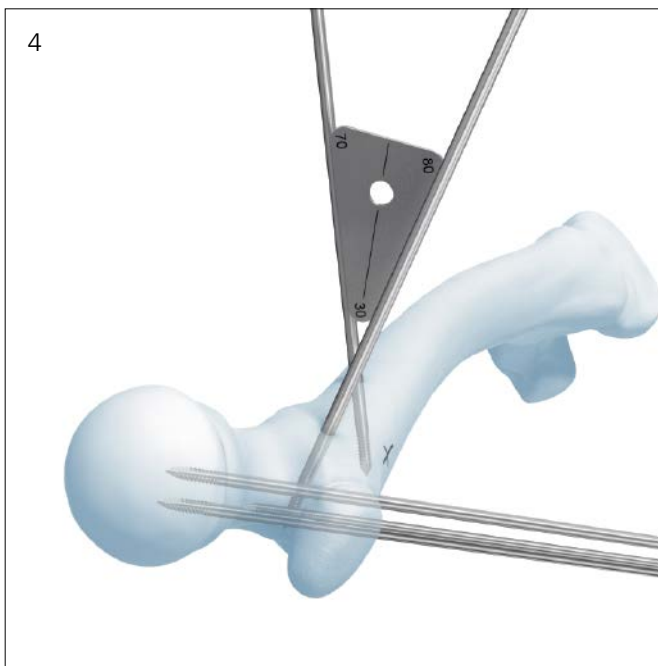
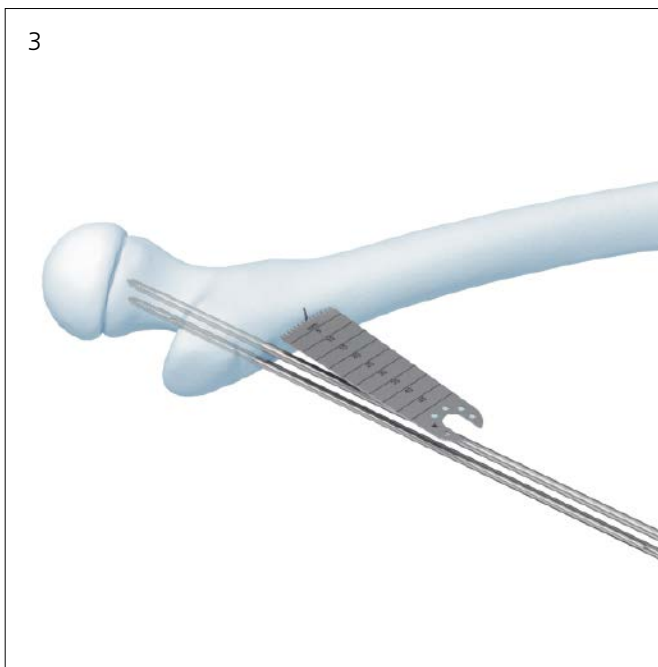
**Considerations for external/internal rotation osteotomy**

**Note:** In case of a planned internal or external rotation osteotomy, insert K-wires bicortically into the greater trochanter and the distal fragment (either the shaft or the knee) to control the internal or external rotation.

**Precaution:** The positioning plates are used to adjust the correction angle of internal or external rotation. Even if no internal or external rotation is planned, it is recommended to insert the two K-wires or to make a mark onto the bone to ensure that rotational alignment is maintained (3, 4).

The proximal wire should be inserted slightly anteriorly, slightly below the proximal screw wires in order to avoid interference later with the calcar screw. The distal wire should be positioned preferably medial to avoid collision with the plate later.

In a case where the K-wires have a divergent angle of 35° (4), and the angle is defined by the distal wire, the distal fragment will be rotated (30° angle + 5°). This has the advantage that without future measuring the wires can be aligned in axial view.



# PROXIMAL FIXATION

## 1

### Position plate

#### Instruments for 3.5 mm plate

03.108.008	Osteotomy Measuring Device
03.108.009	2.8 mm Threaded Drill Guide, for 3.5 mm Pediatric LCP Hip Plate

#### Instruments for 5.0 mm plate

03.108.004	Reduction Sleeve 4.3 mm/2.8 mm
03.108.008	Osteotomy Measuring Device
03.108.010	4.3 mm Threaded Drill Guide, for 5.0 mm Pediatric LCP Hip Plate

Fixation in the proximal neck/head fragment must always be performed with locking screws. Ensure the locking screws are at least 5 mm away from the growth plate of the femoral head.

Insert drill sleeves into plate holes A and B. Tighten the drill sleeves with the wrench of the osteotomy measuring device. Slide the plate over the K-wires.

#### Notes:

- **If the plate stands too far off the proximal fragment, it is acceptable to remove a small bone wedge from the lateral cortex near the osteotomy.**
- **Hold the proximal fragment (femoral neck/head fragment) with forceps, taking care not to disturb the positioning of the plate or manipulate the wires. This improves handling of the proximal fragment and provides rotational stability.**

**Note for 5.0 mm plate: Reduction sleeves must be inserted in each LCP Drill Guide before sliding the plate over the wires.**



**2**

**Determine screw length and insert femoral neck screws A and B**

**Instrument**

03.108.003	Direct Measuring Device, for 2.8 mm Kirschner Wires
------------	---

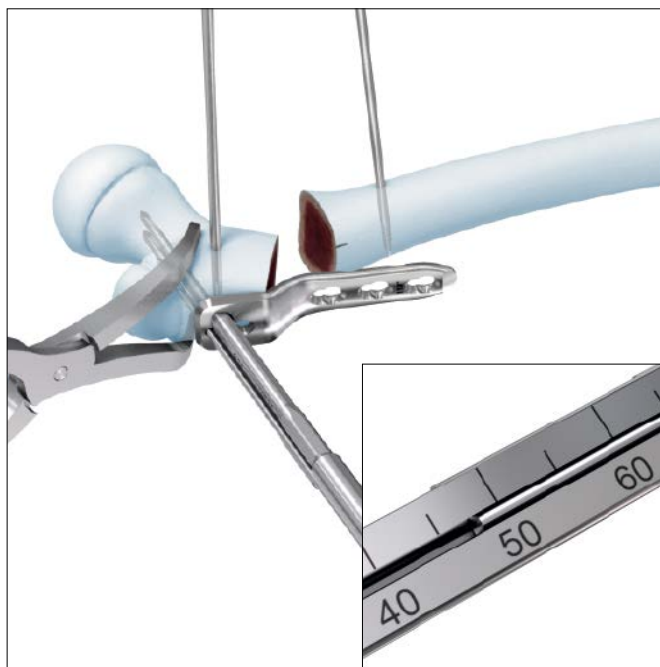
Slide the appropriate end of the measuring device over the wire against the LCP Drill Guide and determine the proper screw length, which will typically be the next size smaller than what was measured. Remove the LCP Drill Guide and the K-wire in hole A.

If necessary, use the wrench end of the osteotomy measuring device.

Insert the screw in hole A as described in the next step.

**Note: If the positioning K-wire has already been removed, reinsert it in hole D to protect against rotation during screw insertion.**

**Note for 5.0 mm plate: Remove the reduction sleeve and then measure the K-wire length over the drill sleeve. Enlarge the hole from 2.8 to 4.3 mm with the LCP Drill Bit. Then remove the drill sleeve and insert the screw as described in Step 3.**





---

**Instruments for 3.5 mm plate**

---

314.03	Small Hexagonal Screwdriver Shaft, quick coupling
--------	--

---

314.116	StarDrive Screwdriver Shaft, T15, self-retaining, quick coupling
---------	---

---

397.705	Handle, quick coupling
---------	------------------------

---

511.770	Torque-Limiting Attachment, 1.5 Nm
---------	------------------------------------

---

**Instruments for 5.0 mm plate**

---

310.430	4.3 mm Drill Bit, quick coupling, 221 mm
---------	--

---

314.152	3.5 mm Hexagonal Screwdriver Shaft, self-retaining
---------	---

---

314.164	StarDrive Screwdriver, T25, with groove, 240 mm
---------	--

---

397.705	Handle, quick coupling
---------	------------------------

---

511.771	Torque-Limiting Attachment, 4 Nm
---------	----------------------------------

---

**Option A: Manual insertion**

Insert a locking screw manually using the screwdriver handle, torque-limiting attachment (TLA) and StarDrive Screwdriver shaft.

Use the 1.5 Nm TLA for 3.5 mm screws and the 4.0 Nm TLA for 5.0 mm screws.

**Note:** The screw is securely locked to the plate when a click is heard.

**Option B: Insertion under power**

Locking screws may be partially inserted using the appropriate TLA and StarDrive Screwdriver shaft.

The TLA controls the tightening torque to:

- Ensure that enough torque is used to minimize the risk of the locking screw backing out of the plate; and
- Avoid locking the screw to the plate at full speed, thus minimizing the risk of cold-welding the screw to the plate.

**Precaution:** Do not fully tighten the screws with the power tool.

**Note:** Always perform final tightening by hand.

**Precaution:** Do not remove the positioning wire until proximal fixation is achieved.

**Note:** The screw is securely locked to the plate when a click is heard.

**Precaution:** Do not remove the positioning wire until proximal fixation is achieved.

Insert a screw in hole B as previously described for hole A.



---

**3****Insert calcus screw in hole C**

---

**Instruments for 3.5 mm plate**

---

03.108.009	2.8 mm Threaded Drill Guide, for 3.5 mm Pediatric LCP® Hip Plate
310.284	2.8 mm Drill Bit, quick coupling, 165 mm
314.03	Small Hexagonal Screwdriver Shaft, quick coupling
314.116	StarDrive Screwdriver Shaft, T15, self-retaining, quick coupling
319.01	Depth Gauge, measures up to 60 mm
511.770	Torque-Limiting Attachment, 1.5 Nm

---

**Instruments for 5.0 mm plate**

---

03.108.010	4.3 mm Threaded Drill Guide, for 5.0 mm Pediatric LCP Hip Plate
310.430	4.3 mm Drill Bit, quick coupling, 221 mm
314.152	3.5 mm Hexagonal Screwdriver Shaft, self-retaining
314.164	StarDrive Screwdriver, T25, with groove, 240 mm
319.10	Depth Gauge, measures up to 110 mm
511.771	Torque-Limiting Attachment, 4 Nm

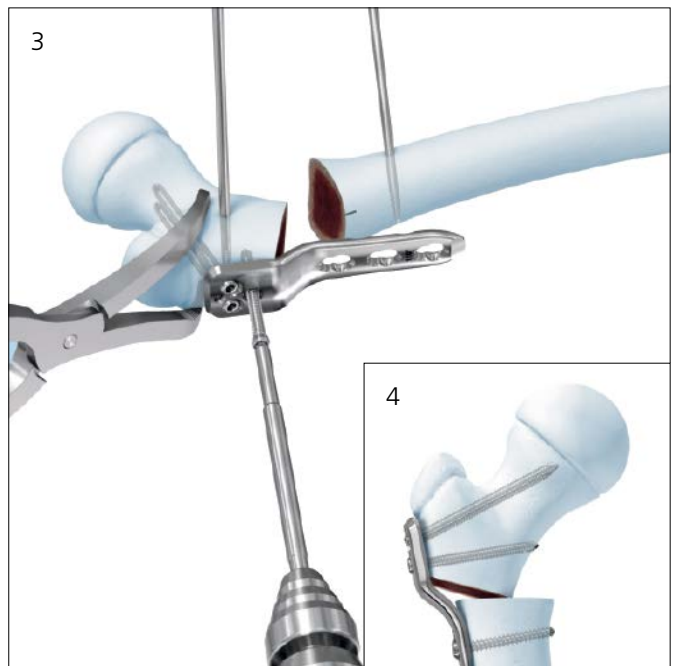
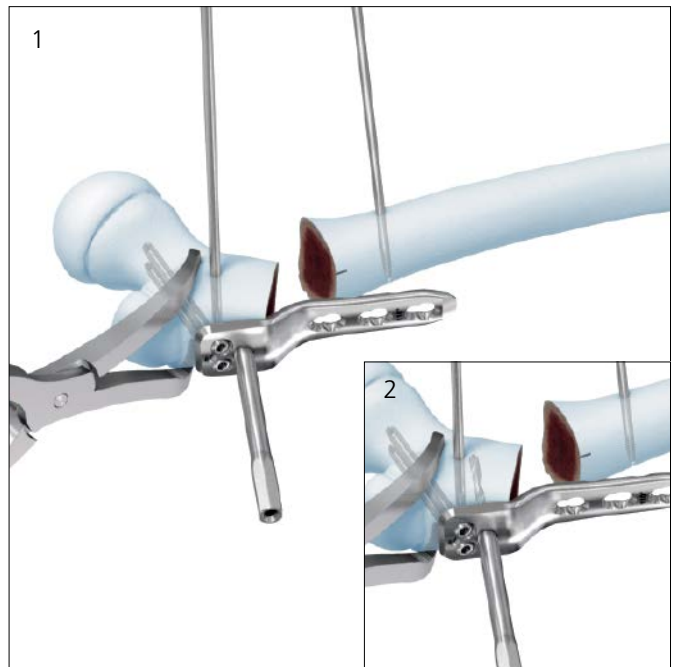
---

Attach the drill sleeve to hole C (1) and drill the hole for the calcar screw (2) with the LCP Drill Bit through both cortices.

Remove the LCP Drill Guide and determine the screw length with the depth gauge.

Insert a screw in hole C (3, 4).

**Note: DO NOT fully insert the locking screws by power. Always perform final tightening by hand using the screwdriver handle, torque-limiting attachment, and screwdriver shaft. The screw is securely locked to the plate when a click is heard.**



# REDUCTION

## Instrument

399.121 Bone Holding Forceps, soft ratchet, for plates to 14 mm wide

- For optimal fixation, align the plate parallel with the femoral shaft axis in AP and lateral views. Once the plate is aligned, secure the plate with reduction forceps (1).

### Precaution:

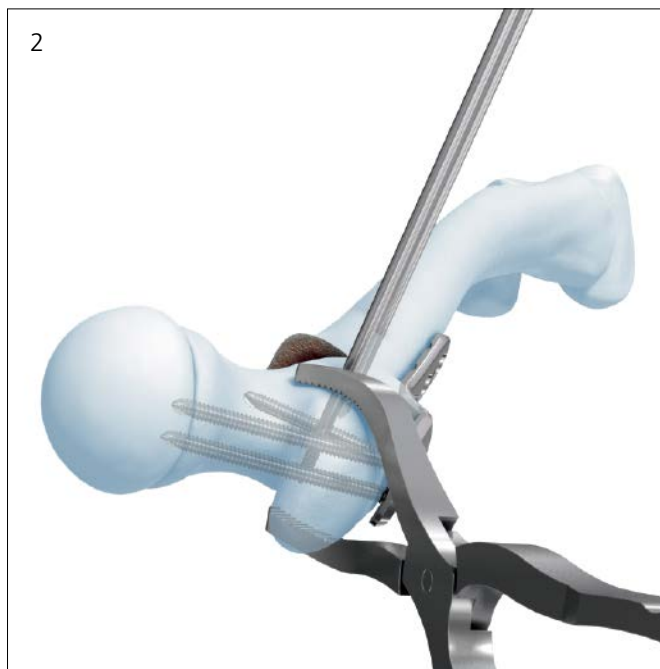
- If the plate is not aligned parallel to the femoral shaft in the AP view, it can lead to variations of the planned neck/shaft (CCD) angle.
- In case of a planned internal or external rotation osteotomy, the plate is fixed with the forceps and the distal part of the femur rotated (in this case laterally) until the two rotation wires are parallel in axial view. Obtain definitive fixation with the forceps and final fixation of the plate by inserting screws in holes 1 and 3. Afterwards, the rotation wires can be removed (2).

**Note:** If the achieved rotation correction is too little or too much, the wires should be left in the bone for another rotation correction.

If additional extension or flexion is required, the plate will no longer be aligned with the femoral shaft, making fixation more difficult due to the skewed position of the plate.

**Note:** Alignment can be facilitated with LCP Drill Guide in the distal part of the plate and/or with a forceps fixed on the proximal part. These instruments serve as handles during the repositioning of the osteotomy.

- Note:** Check whether medialization is required under the image intensifier. If so, follow the steps described on pages 62–65.



# DISTAL FIXATION

---

Since this plate is an LCP Plate, either locking or cortex screws can be used in the shaft. To achieve compression, always insert a cortical screw prior to any locking screws.

## **Option A: Distal fixation with locking screws**

Insert screws in holes 1, 2 and 3.

---

### **Instruments for 3.5 mm plates**

---

03.108.009	2.8 mm Threaded Drill Guide, for 3.5 mm Pediatric LCP Hip Plate
310.284	2.8 mm Drill Bit, quick coupling, 165 mm
314.03	Small Hexagonal Screwdriver Shaft, quick coupling
314.116	StarDrive Screwdriver Shaft, T15, self-retaining, quick coupling
319.01	Depth Gauge, measures up to 60 mm
397.705	Handle, quick coupling
511.770	Torque-Limiting Attachment, 1.5 Nm

---

---

### **Instruments for 5.0 mm plates**

---

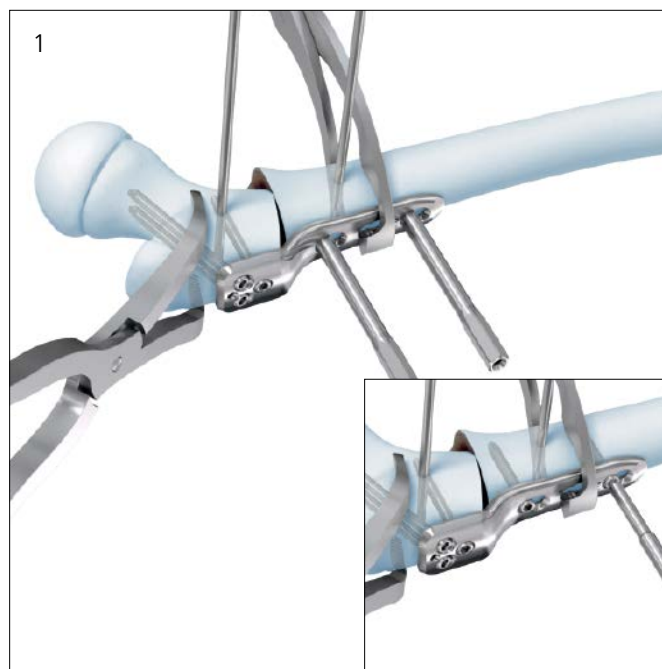
03.108.010	4.3 mm Threaded Drill Guide, for 5.0 mm Pediatric LCP Hip Plate
310.430	4.3 mm Drill Bit, quick coupling, 221 mm
314.119	StarDrive Screwdriver Shaft, T25, self-retaining, quick coupling
314.152	3.5 mm Hexagonal Screwdriver Shaft, self-retaining
319.10	Depth Gauge, measures up to 110 mm
397.705	Handle, quick coupling
511.771	Torque-Limiting Attachment, 4 Nm

---

Insert the LCP Drill Guide into the locking portion of Combi holes 1, 2 and 3 (1).

Drill screw holes through both cortices using the appropriate drill bit. Determine the screw length from the calibrated drill bit or by using the depth gauge. Insert screws (2).

**Note: DO NOT fully insert the locking screws by power. Always perform final tightening by hand using the screwdriver handle, torque-limiting attachment and screwdriver shaft. The screw is securely locked to the plate when a click is heard.**



**Option B: Distal fixation with cortex screws**

Insert screws in holes 1, 2 and 3.

**Instruments for 3.5 mm plate**

310.284	2.8 mm Drill Bit, quick coupling, 165 mm
312.28	3.5 mm/2.5 mm Double Drill Sleeve
314.03	Small Hexagonal Screwdriver Shaft, quick coupling
314.041	3.5 mm StarDrive Screwdriver, T15, with groove, 200 mm
314.070	Small Hexagonal Screwdriver, 2.5 mm width across flats
314.116	StarDrive Screwdriver Shaft, T15, self-retaining, quick coupling
319.01	Depth Gauge, measures up to 60 mm

**Instruments for 5.0 mm plate**

310.430	4.3 mm Drill Bit, quick coupling, 221 mm
312.46	4.5 mm/3.2 mm Double Drill Sleeve
314.152	3.5 mm Hexagonal Screwdriver Shaft, self-retaining, quick coupling
314.164	StarDrive Screwdriver, T25, with groove, 240 mm
314.119	StarDrive Screwdriver Shaft, T25, self-retaining, quick coupling
314.27	Large Hexagonal Screwdriver
319.10	Depth Gauge, measures up to 110 mm

Using the appropriate drill bit and drill sleeve, pre-drill in plate hole 1. Measure for screw length using the depth gauge and insert a self-tapping cortex screw in hole 1.

Repeat steps for screw insertion in holes 2 and 3.





# MEDIALIZATION

**Note: Medialization is only possible if the distal part is fixed with locking screws.**

## Instruments for 3.5 mm plate

03.108.007	Medialization Guide, for 3.5 mm and 5.0 mm LCP Plates
03.108.009	2.8 mm Threaded Drill Guide, for 3.5 mm Pediatric LCP Hip Plate
310.284	2.8 mm Drill Bit, quick coupling, 165 mm
314.03	Small Hexagonal Screwdriver Shaft, quick coupling
314.116	StarDrive Screwdriver Shaft, T15, self-retaining, quick coupling
319.01	Depth Gauge, measures up to 60 mm
397.705	Handle, quick coupling
511.770	Torque-Limiting Attachment, 1.5 Nm

## Instruments for 5.0 mm plate

03.108.007	Medialization Guide, for 3.5 mm and 5.0 mm LCP Plates
03.108.010	4.3 mm Threaded Drill Guide, for 5.0 mm Pediatric LCP Hip Plate
310.430	4.3 mm Drill Bit, quick coupling, 221 mm
314.119	StarDrive Screwdriver Shaft, T25, self-retaining, quick coupling
314.152	3.5 mm Hexagonal Screwdriver Shaft, self-retaining, quick coupling
319.10	Depth Gauge, measures up to 110 mm
397.705	Handle, quick coupling
511.771	Torque-Limiting Attachment, 4 Nm

# 1

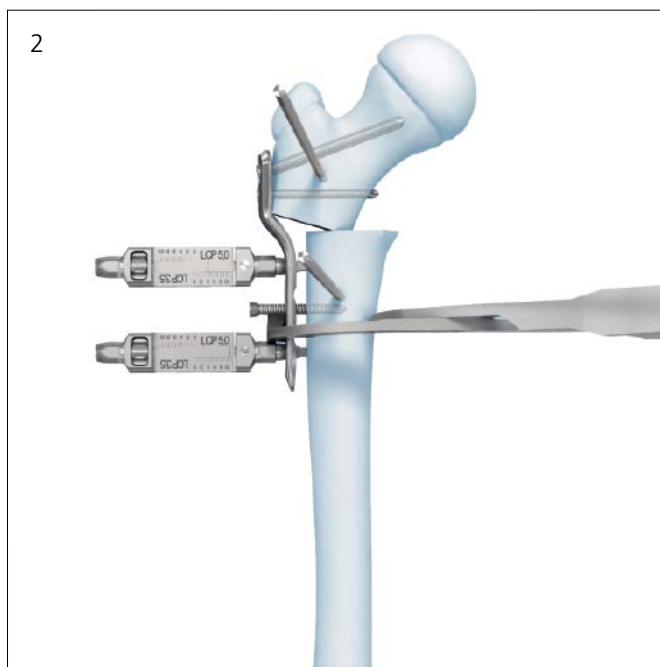
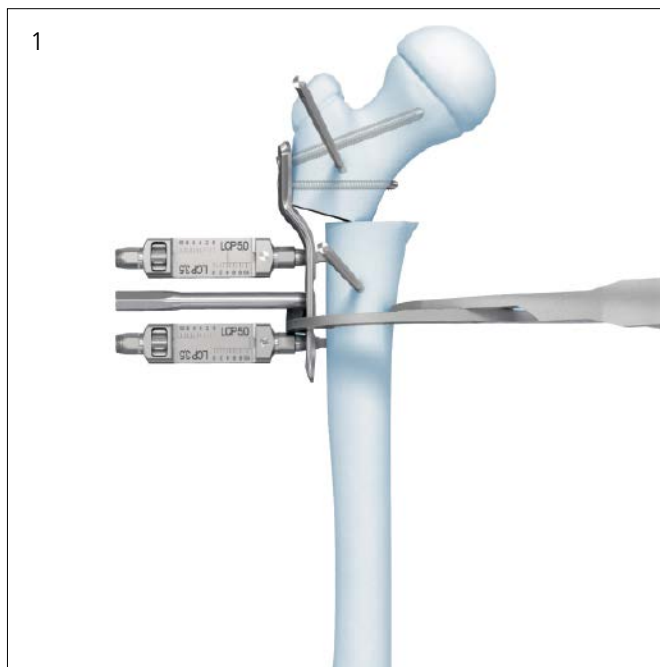
## Planned medialization

Adjust the desired medialization with the medialization guide. Screw the corresponding end of the instrument into the locking portion of Combi holes 1 and 3 until they are firmly gripped. Then screw an LCP Drill Guide into the locking portion of Combi hole 2 (1).

The plate must be adjusted and aligned distally to the axis of the femoral shaft. When the plate is aligned, fix it with the reduction forceps.

Drill the screw hole and remove the drill sleeve. Determine the screw length with the depth gauge and insert a locking screw (2).

- Control the mechanical axis and check under the image intensifier. If the mechanical axis is correctly aligned, follow Step 2, if not, follow either the steps for additional medialization or varus/valgus correction.

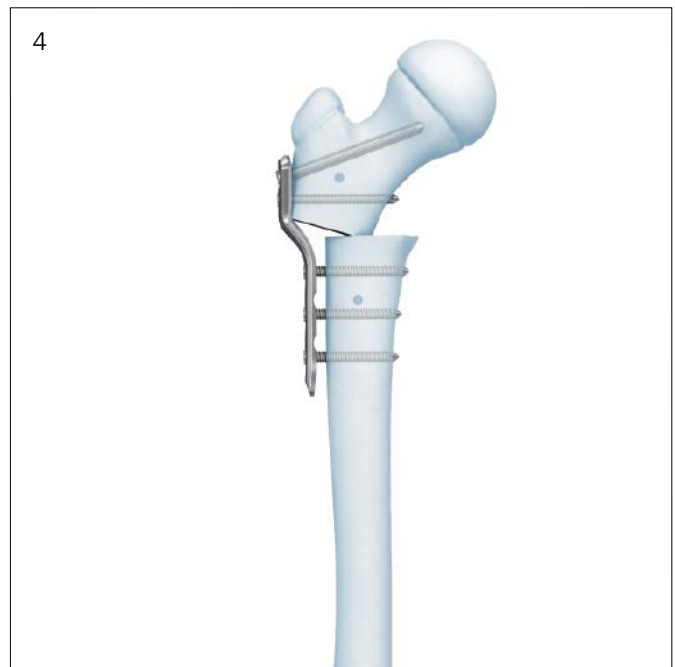
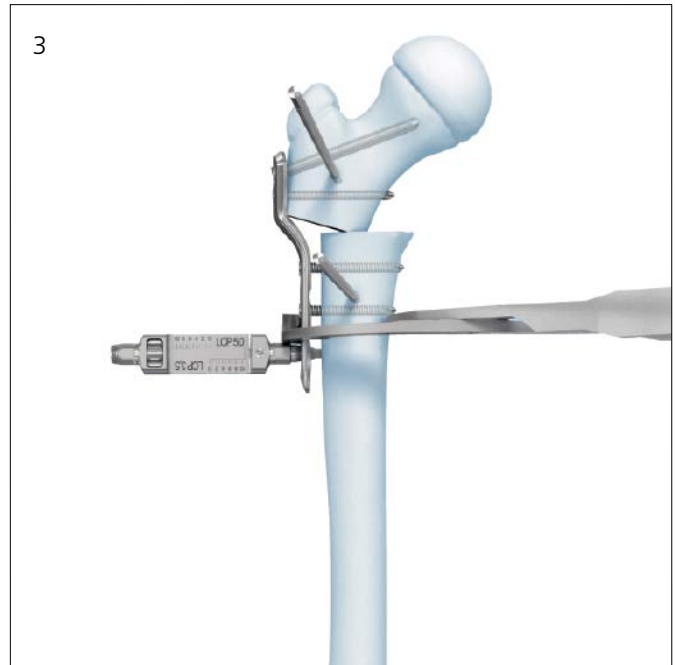


**2**

**Insert locking screw**

Remove the medialization guide in hole 1 and insert a drill sleeve. Pre-drill the screw hole and remove the drill sleeve. Determine the screw length with the depth gauge and insert a locking screw (3). Repeat Step 2 for hole 3 (4).

**Note: Tighten the screws manually with the torque limiter.**

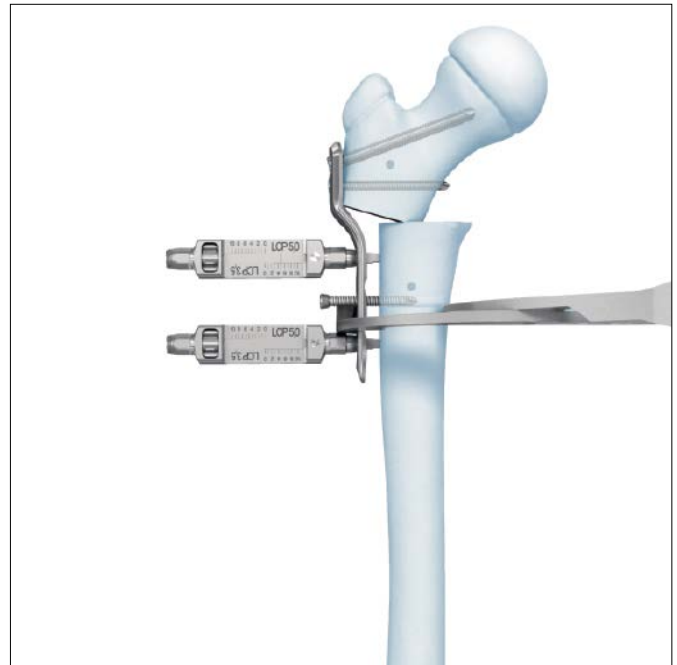


**Additional medialization (following planned medialization)**

If the mechanical axis is not in line, additional medialization is required.

1. If already inserted, loosen the screw in hole 2.
2. Adjust the desired medialization with both instruments for medialization to the same correction level.
3. Tighten the screw in hole 2.

If the mechanical situation is satisfactory, follow Step 2 on page 64. If not, repeat additional medialization.



# ALTERNATIVE SURGICAL TECHNIQUE

## 1

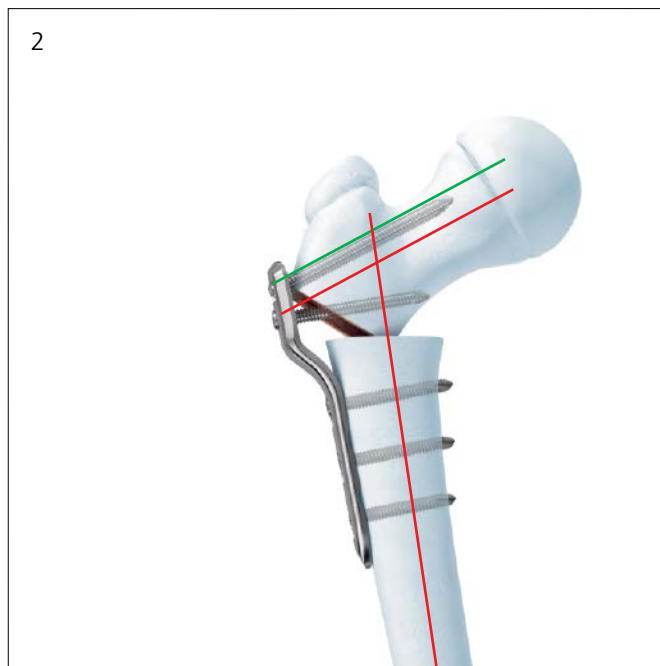
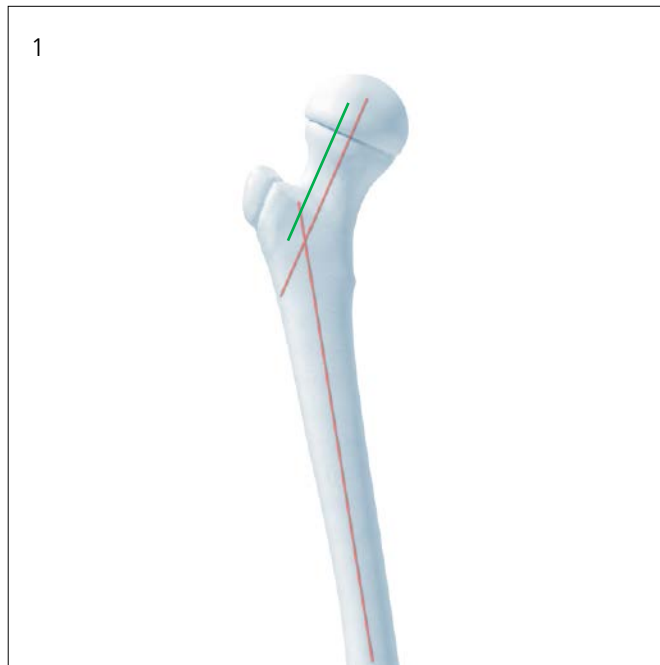
### Preoperative planning

#### Surgical technique based on the plate/screw angle

In this technique the plate/screw angle defines the final neck shaft angle as the screws are inserted along the axis of the femoral neck in the AP view (1). It is suitable when the final desired angle conforms to one of the plate angles. The plate angle defines the final correction angle (2).

#### Determine the final neck/shaft angle

Prior to surgery the surgeon determines which neck/shaft angle given by the plates (100° and 110°) has to be achieved after surgery. Further calculations are not necessary.



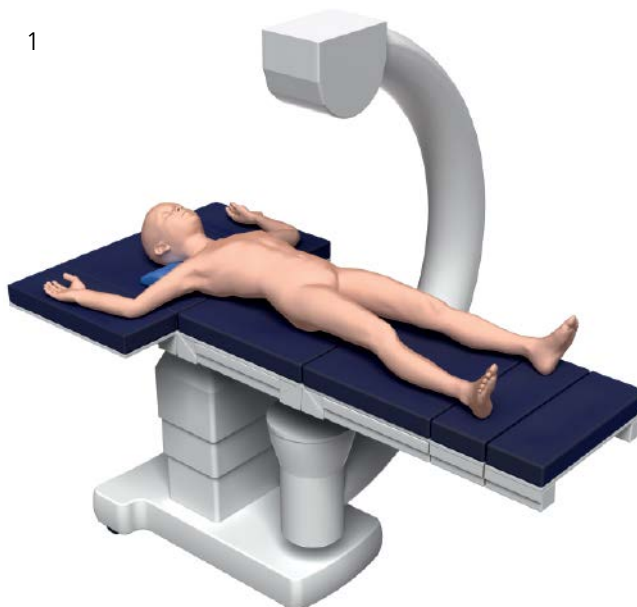
---

**2**

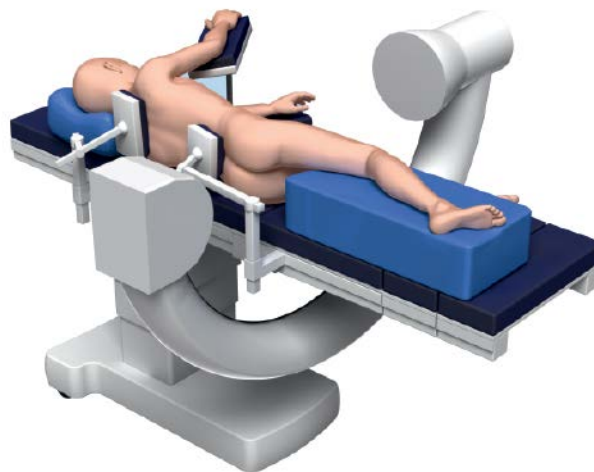
**Position patient**

Position the patient in the supine (1) or lateral (2) position on the radiolucent table. Then position the image intensifier so that the visualization of the hip is possible in AP and axial views.

1



2



---

**2**

**Approach**

Use a standard lateral approach to the proximal femur.

---

**4**

**Guide wire insertion**

**Locate trochanteric epiphysis and determine anteversion**

---

**Instrument**

---

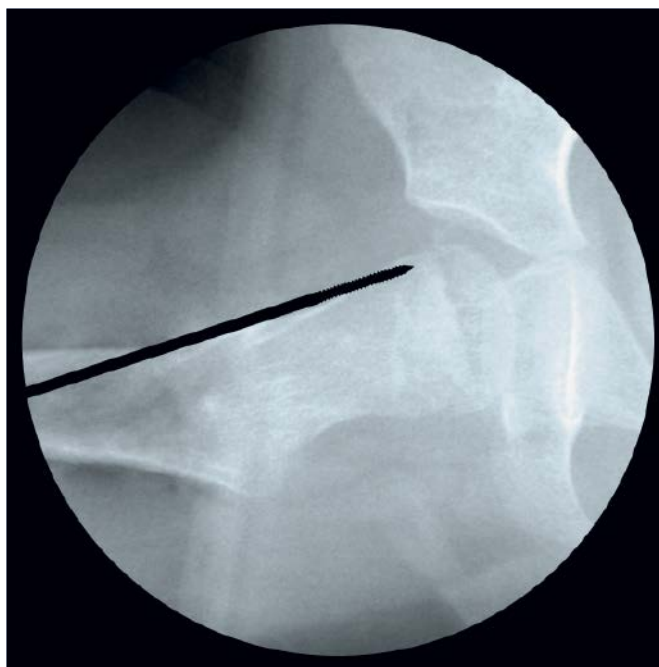
292.79	2.0 mm Kirschner Wire with Thread, trocar point, 150 mm, 15 mm thread length
--------	--

---



- Place the Kirschner wire on the ventral aspect of the femoral neck to determine the anteversion. Align the K-wire with the center line of the femoral neck under the image intensifier.

**Note: Position the wire at a downward angle to avoid interference with the instruments.**



Axial AP view

**Insert positioning Kirschner wire in hole D**

**Instruments for use with the 3.5 mm plate**

03.108.001	Pediatric LCP Hip Plate Guiding Block for 3.5 mm Screws
03.108.006	Positioning Device for Guiding Block
292.79	2.0 mm Kirschner Wire with Thread, 150 mm, trocar point, 15 mm thread length

**Instruments for use with the 5.0 mm plate**

03.108.002	Pediatric LCP Hip Plate Guiding Block for 5.0 mm Screws
03.108.006	Positioning Device for Guiding Block
292.79	2.0 mm Kirschner Wire with Thread, 150 mm, trocar point, 15 mm thread length

Assemble the positioning device and the guiding block. Do not tighten the hex screw (1).

Insert the positioning Kirschner wire parallel to the initially positioned anteversion guide wire and absolutely parallel to the femoral neck axis so that the K-wire corresponds exactly with the neck/shaft and the femoral antetorsion (AT) angles. The entry point is 4 mm–5 mm distal to the trochanteric physis in AP view and centered in the femoral neck in the lateral view (2).



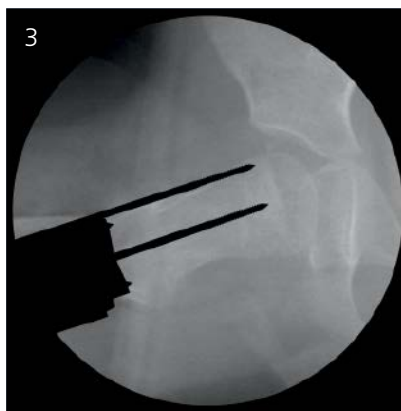


**Precaution:** All of the following steps refer to the positioning wire, therefore the exact position is crucial for a successful surgery.

- Verify the optimal placement of the positioning Kirschner wire with the image intensifier (3, 4).

**Notes:**

- If additional extension or flexion is required, the aiming block has to be positioned accordingly.
- The two front spikes of the aiming block must be in contact with the femur.
- The positioning K-wire stays inserted until the two neck screws are fixed.



Axial AP view



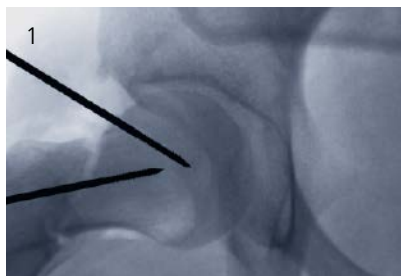
AP view

**Precaution:** Do not bend the K-wire while drilling as this may result in correction mistakes.

If the insertion of the positioning K-wire is satisfactory, follow Step 3 on page 48.

## CONSIDERATIONS FOR FRACTURE TREATMENT

- An open approach, including open fracture reduction, is necessary (1).
- Before inserting the positioning Kirschner wire in plate hole D, use temporary Kirschner wire fixation to reduce the fracture (1).
- Insert the positioning Kirschner wire using the assembled positioning device and guiding block at a fixed angle: 130° for the 130° plate; 120° for the 120° plate (2).\*



**Note on achieving compression:**

Insert a cortex screw as a lag screw in plate hole C. The insert locking screws in plate holes A and B and replace the lag screw in plate hole C with a locking screw.

\*The alternative surgical technique section (above) is used as a basis for these considerations.

# 3.5 MM AND 5.0 MM PEDIATRIC LCP® HIP PLATES: VALGUS OSTEOTOMY



3.5 mm and 5.0 mm  
Pediatric LCP Hip Plates:  
Valgus Osteotomy

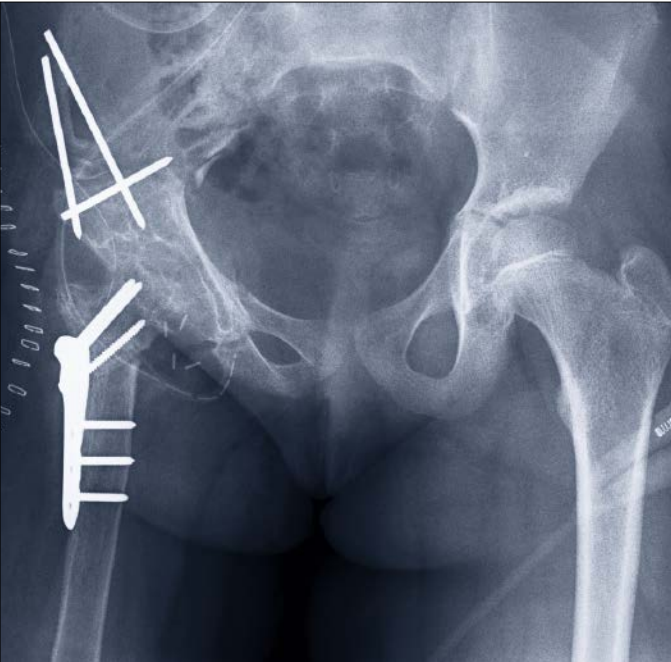
# CLINICAL CASES

**Case 1\***

9-year-old girl; destroyed femoral neck after a plasmacellular osteomyelitis; healed in a 90° varus position and 40° retroversion of the rest of the femoral head.



Preoperative



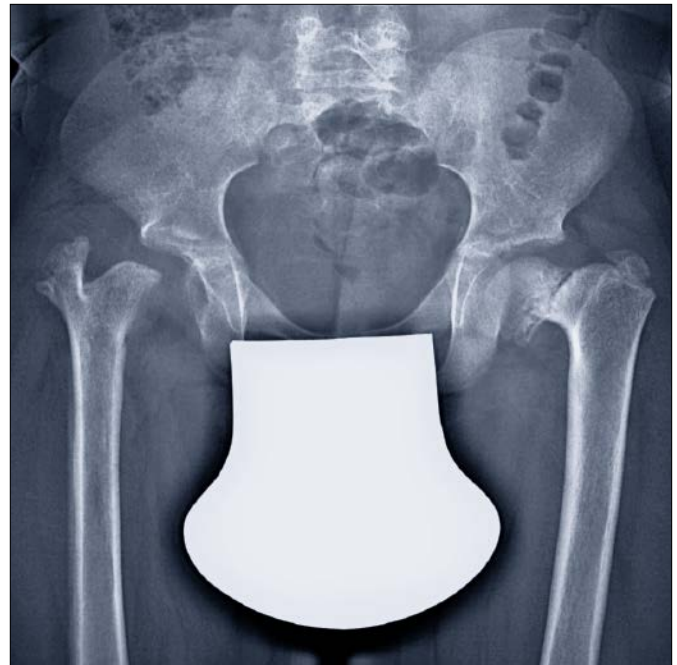
Postoperative



Note: Results from case reports are not necessarily predictive of results in other cases. Results in other cases may vary.  
\*Acknowledgement: Theddy F. Slongo, MD Chirurgische Universitäts-Kinderklinik, Kinderspital Bern

**Case 2\***

9-year-old boy, situation 8½ years after bilateral osteoarthritis in both hips; right hip fully destroyed; left 90° varus hip with pseudarthrosis of the femoral neck.



preoperative



postoperative



3 months postoperative



\*Acknowledgement: Theddy F. Slongo, MD Chirurgische Universitäts-Kinderklinik, Kinderspital Bern

# PREOPERATIVE PLANNING

---

## 1

### **Determine correction angle**

The surgical procedure described on the following pages uses positioning Kirschner wires to help plate placement. These K-wires are inserted with the help of a guiding block. In order to set the correct angle of the guiding block, the correction angle has to be determined first.

The angle of the guiding block can be calculated on the basis of the plate/screw angle and the desired correction angle. The correction angle can be established using one of the planning methods described below.

#### **Functional aspect: The functional abduction view on the x-ray shows the amount of correction**

This technique is based on the optimal anatomical position of the femoral head in the acetabulum (containment) and is not focused on an anatomical calculated correction angle. The pathological neck/shaft (CCD) angle is not relevant to determine the correction angle.

#### **Anatomical aspect: The planning is based on the actual pathological neck/shaft angle (CCD)**

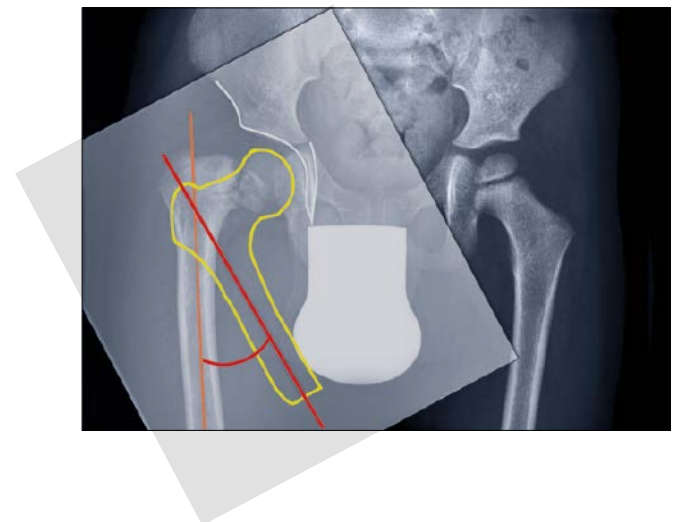
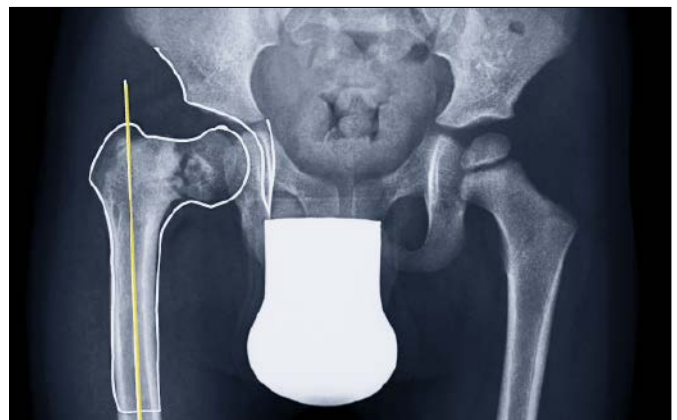
This technique is used when the desired final neck shaft angle is not one of the plate/screw angles. The technique is derived from the original osteotomy technique described by Müller (1971).

**Functional aspect**

- The functional planning is based on a clear AP pelvis x-ray. To calculate the correction angle, there are two options:
  1. Produce functional, abduction x-rays until there is an optimal containment of the femoral head.
    - AP pelvis x-ray (1)
    - AP pelvis x-ray in abduction and with internal rotation to assess the coverage (2)
  2. Create a template of the proximal femur on the AP pelvic x-ray, rotate this template around the center of the femoral head until you have a satisfactory containment.
    - Assess the correction that will achieve coverage (3)
    - Choose a target neck/shaft angle based on patient pathology (4)

**Calculate the correction angle:** The angle between the anatomical axis of the femur in the AP x-ray and the abduction x-ray or the AP x-ray and the template, respectively, determine the correction angle.

**Note:** Use of the template technique may reduce x-ray exposure.



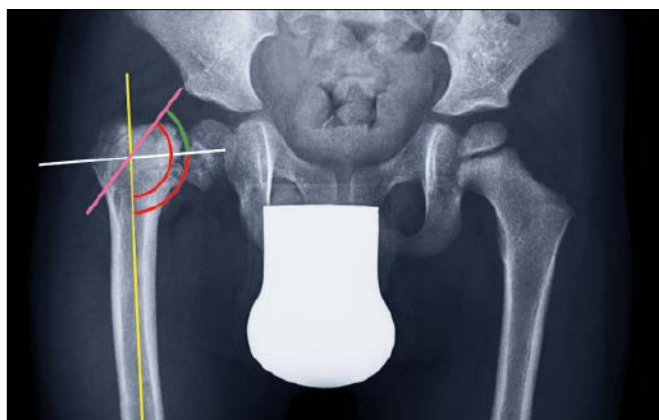
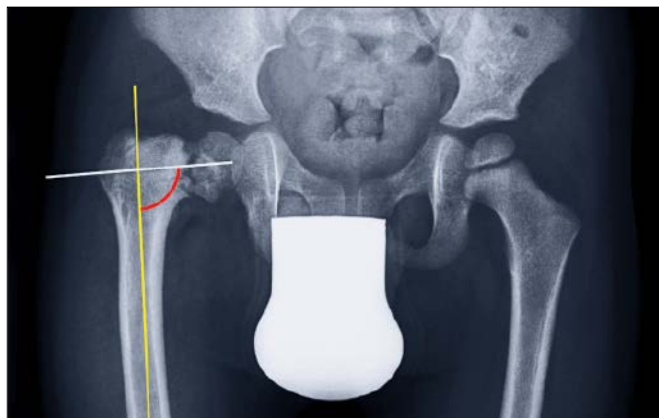
**Anatomical aspect**

Anatomical planning is based on a clear AP pelvic x-ray with at least 30° of internal rotation of both legs. This guarantees the correct projection of the real femoral neck/shaft (CCD) angle.

1. Measure the pathological neck/shaft angle.
2. Determine the desired neck/shaft angle.

**Note:** To control the planned correction, a blueprint of the proximal femur on the AP pelvic x-ray can be performed. Rotate this blueprint around the planned osteotomy of your planned CCD angle and control the position of the femoral head.

**Calculation of the correction:** The angle between the initial axis of the femoral neck in the AP x-ray and the planned CCD angle determine the correction angle.



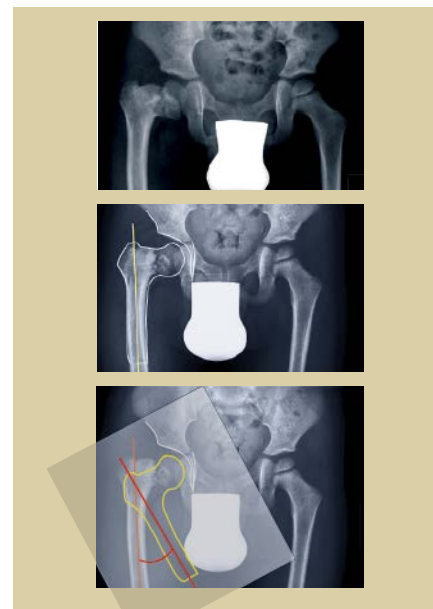
**Formula**

**Positioning K-wire angle = plate/screw angle**

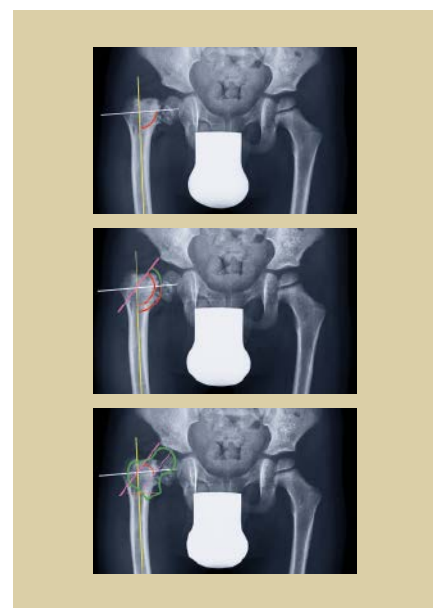
**- correction angle (results from the functional or anatomical aspects)**



=



or



Current CCD: 95°  
 Rotation: 35°  
 Desired CCD: 130°  
 Plate/screw angle: 140°

Positioning wire angle = 140°  
 (plate/screw angle) **minus**  
 35° (correction angle) = 105°



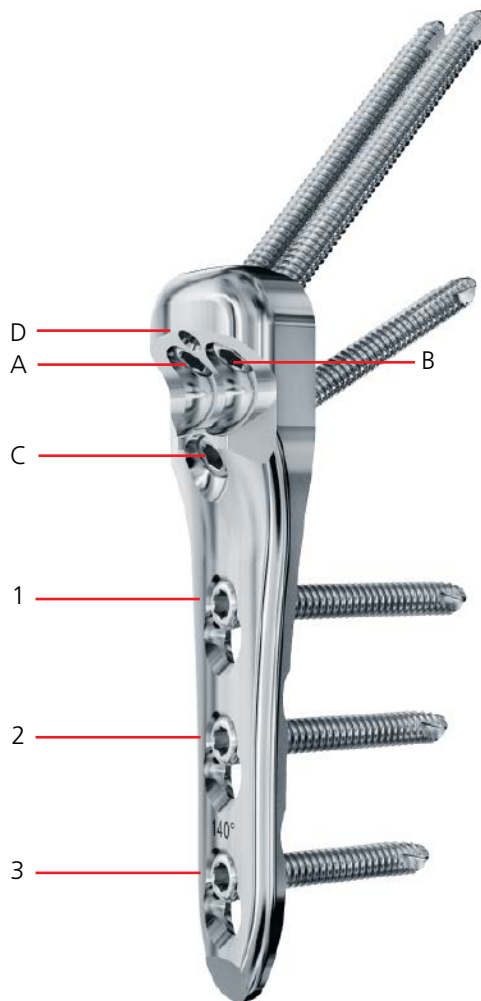
**2**

**Technique using 3.5 mm/5.0 mm LCP Pediatric Hip Plates**

Valgus osteotomy of the proximal femur using a 140° straight valgus plate (02.108.316).

The surgical technique refers to screw holes where applicable.

Please see the designation of each hole as indicated.



- A, B: Neck screws
- C: Calcar screw
- D: Positioning Kirschner wire
- 1, 2 and 3: LCP Locking Screws or Cortex Shaft Screws

# PATIENT POSITIONING AND APPROACH

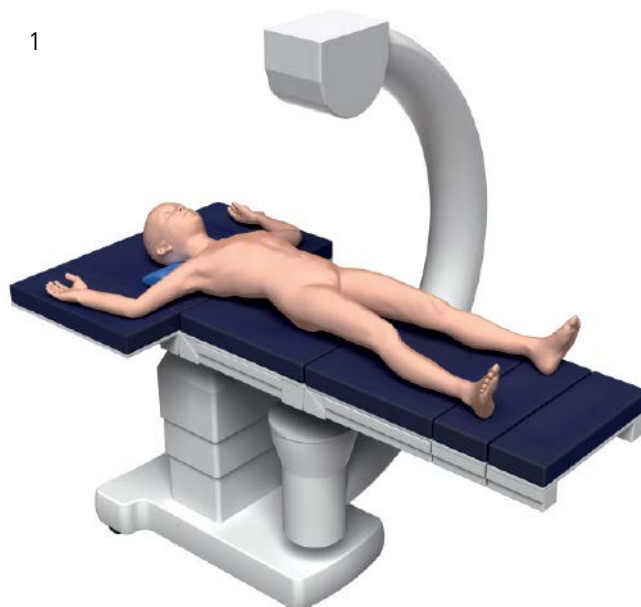
---

## 1

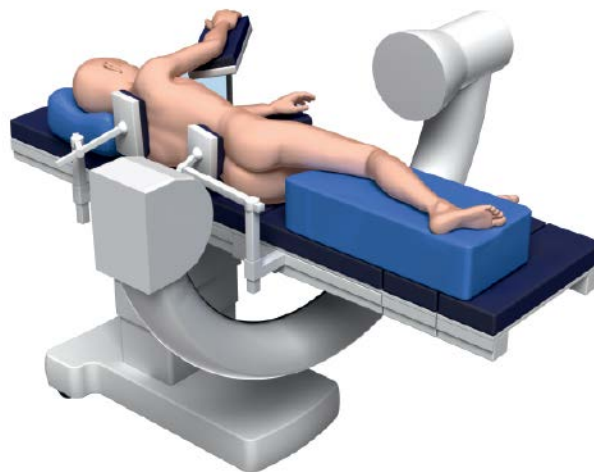
### Position patient

Position the patient either in the supine (1) or lateral (2) position. A radiolucent table is recommended when placing the patient in the supine position.

1



2



---

## 2

### Approach

Use a standard lateral approach to the proximal femur.

# GUIDE WIRE INSERTION

---

## 1 Locate trochanteric epiphysis and determine anteversion

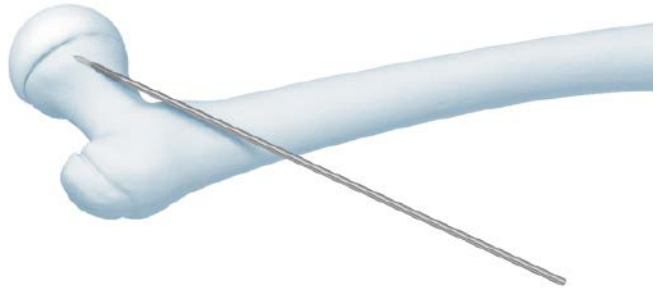
---

### Instrument

---

292.79	2.0 mm Kirschner Wire with Thread, trocar point, 150 mm, 15 mm thread length
--------	--

---



- Place the K-wire on the ventral aspect of the femoral neck to determine the anteversion. Align the K-wire with the center line of the femoral neck under the image intensifier.

**Note:** Position the K-wire at a downward angle to avoid interference with the instruments.



Axial AP view

**2**

**Insert positioning Kirschner wire in hole D**

**Instruments for 3.5 mm plate**

03.108.001	Pediatric LCP Hip Plate Guiding Block for 3.5 mm Screws
03.108.006	Positioning Device for Guiding Block
292.79	2.0 mm Kirschner Wire with Thread, trocar point, 150 mm, 15 mm thread length
314.070	Small Hexagonal Screwdriver, 2.5 mm width across flats

**Instruments for 5.0 mm plate**

03.108.002	Pediatric LCP Hip Plate Guiding Block for 5.0 mm Screws
03.108.006	Positioning Device for Guiding Block
292.79	2.0 mm Kirschner Wire with Thread, trocar point, 150 mm, 15 mm thread length
314.070	Small Hexagonal Screwdriver, 2.5 mm width across flats



Set the calculated positioning guide wire angle (see “Preoperative Planning” section) on the positioning device and tighten the hex screw (1).

Slide the guiding block over the positioning device for guiding block (2).

- ① The wing of the guiding block must be placed parallel to the proximal femur shaft in the AP and lateral views. The positioning device and the two front spikes of the guiding block must be in contact with the femur (3).
- ① The entry point for the positioning guide wire is 5 mm to 6 mm distal to the trochanteric epiphysis in the AP view.

Insert the positioning K-wire parallel to the initially positioned anteversion K-wire, in the lateral/axial view, in the center of the femoral neck. Remove the anteversion wire.

**Note:** To facilitate insertion, center-punch the surface of the bone at the entry point before inserting positioning device and wire.

**Precautions:**

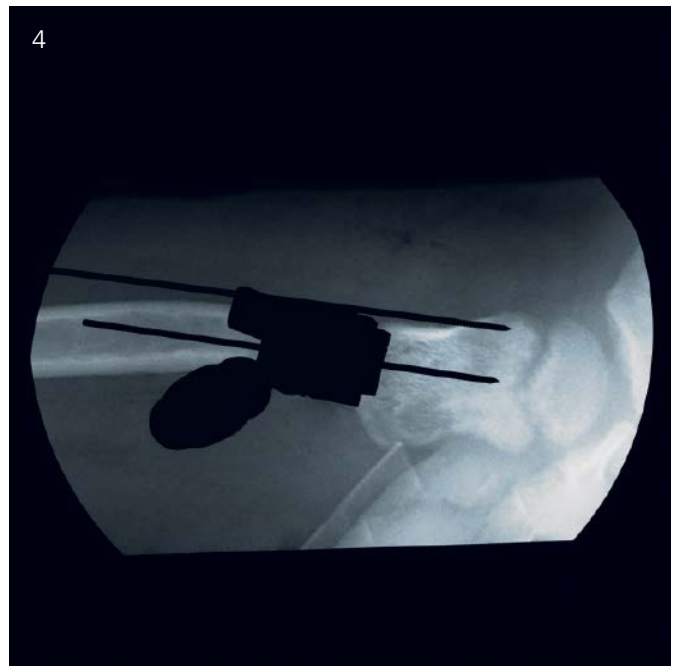
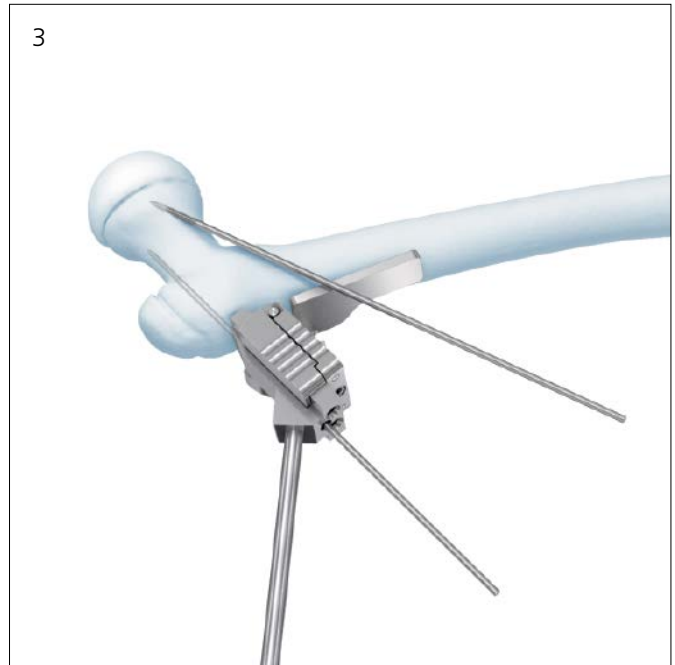
- If there is extreme coxa valga, the positioning device for guiding block must be placed more distally to prevent the neck screw from perforating the piriformis fossa.
- The following steps refer to the positioning guide wire; therefore, its exact position is crucial for a successful surgery.

To avoid slippage of the positioning device, do not remove the guide wire until the two neck screws are in place.

**Precautions:**

- Do not bend the Kirschner wire while drilling as this may result in failed correction.
- If extension or flexion is required at the osteotomy, the aiming block with the positioner has to be rotated accordingly before insertion of the K-wires.

- ① Verify optimal placement of the positioning wire with the image intensifier (4).



Axial AP view

# KIRSCHNER WIRE INSERTION

## Insert K-wires for proximal screws

### Instruments for 3.5 mm plate

03.108.001	Pediatric LCP Hip Plate Guiding Block for 3.5 mm Screws
03.108.005	2.8 mm Kirschner Wire Spade Point, 200 mm
03.108.006	Positioning Device for Guiding Block
03.108.040	K-Wire Adaptor, for 2.8 mm K-wires (03.108.005)
314.070	Small Hexagonal Screwdriver, 2.5 mm width across flats

### Instruments for 5.0 mm plate

03.108.002	Pediatric LCP Hip Plate Guiding Block for 5.0 mm Screws
03.108.005	2.8 mm Kirschner Wire Spade Point, 200 mm
03.108.006	Positioning Device for Guiding Block
03.108.040	K-Wire Adaptor, for 2.8 mm K-wires (03.108.005)
314.070	Small Hexagonal Screwdriver, 2.5 mm width across flats

Use the guiding block to insert the K-wires for holes A and B (1). To prevent interference with other wires, place the K-wire adaptor on the K-wires before insertion (2).

In order to ensure optimal screw lengths, place the K-wires to within 5 mm of the femoral head growth plate.

**Precaution:** If extension or flexion is required, the guiding block has to be rotated accordingly around the positioning K-wire (hole D) before inserting the K-wires for the proximal screws.



With the K-wires for holes A and B, the position and length of the screws are defined while, at the same time, the holes are predrilled for the 3.5 mm screws.

**Precaution:** Do not bend the wires with the guiding block while inserting as this may result in failed correction.

**Once a wire is inserted, flexion or extension correction can no longer be achieved.**

After inserting the K-wires for holes A and B, remove the guiding block and positioning device.

**Note:** To remove the positioning device and guiding block, loosen the hex screw on the positioning device.

**Precaution:** Verify the position of the K-wires with the image intensifier in the AP and axial views (3, 4). Do not penetrate the epiphysis.



AP view



Axial AP view

# PERFORM OSTEOTOMY

## Instruments

03.108.008	Osteotomy Measuring Device
333.060	90°/50°/40° Triangular Positioning Plate
333.070	80°/70°/30° Triangular Positioning Plate
333.080	100°/60°/20° Triangular Positioning Plate

The optimal position of the osteotomy when using a 3.5 mm plate is 18 mm distal to the wires. Determine the distance with the corresponding end of the osteotomy measuring device (1).

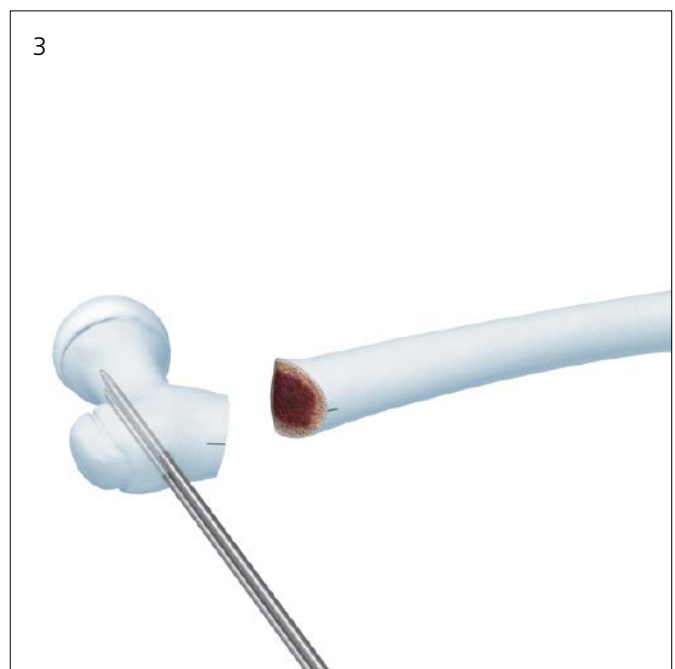
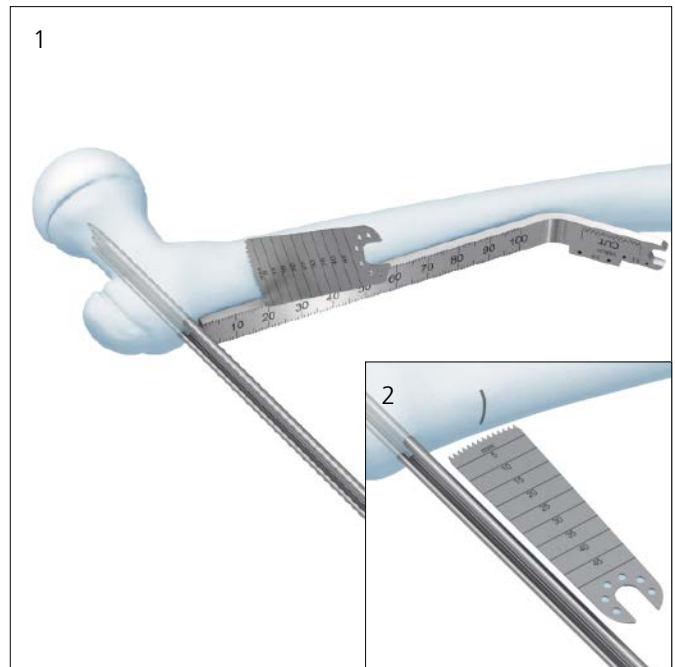
Hold the osteotomy measuring device against the two K-wires and mark the distance with the oscillating saw or another sharp instrument on the bone.

**Note:** In cases of extreme coxa vara, the osteotomy cut has to be 3 mm–4 mm further distal, otherwise the distance for the calcar screw is too short.

**Note for 5.0 mm plate:** The optimal position of the osteotomy is 23 mm distal to the wires.

**Precaution:** In case of a planned internal or external rotation osteotomy, insert K-wires bicortically into the greater trochanter and the distal fragment (either the shaft or the knee) to control the internal or external rotation.

Perform the osteotomy in one cut perpendicular to the femoral shaft with an oscillating saw (2). Use constant irrigation and cooling.





# PROXIMAL FIXATION

## 1

### Position plate

#### Instruments for 3.5 mm plate

03.108.008	Osteotomy Measuring Device
03.108.009	2.8 mm Threaded Drill Guide, for 3.5 mm Pediatric LCP Hip Plate

#### Instruments for 5.0 mm plate

03.108.004	Reduction Sleeve 4.3 mm/2.8 mm
03.108.008	Osteotomy Measuring Device
03.108.010	4.3 mm Threaded Drill Guide for 5.0 mm Pediatric LCP Hip Plate

Fixation in the proximal fragment must always be done with locking screws. Ensure the locking screws are at least 5 mm away from the growth plate of the femoral head.

Insert drill sleeves into plate holes A and B. Tighten the drill sleeves with the wrench of the osteotomy measuring device. Slide the plate over the wires (1).

#### Notes:

- In cases where there is a slight misfit of the proximal fragment, it is acceptable to remove a small bone wedge.
- Hold the proximal fragment (femoral neck/head fragment) with forceps, taking care not to disturb the positioning of the plate or manipulate the wires. This provides better handling of the proximal fragment and improves rotational stability (2).

**Note for 5.0 mm plate:** Reduction sleeves must be inserted in each LCP Drill Guide before sliding the plate over the wires.



---

## 2

### Determine screw length and insert femoral neck screws A and B

---

#### Instrument

---

03.108.003	Direct Measuring Device, for 2.8 mm Kirschner Wires
------------	---

---

Slide the appropriate end of the measuring device over the wire against the drill sleeve and determine the proper screw length, which will typically be the next size smaller than what was measured. Remove the LCP® Drill Guide and the wire in hole A. If necessary use the wrench end of the osteotomy measuring device.

Insert the screw in hole A as described on the following pages.

**Note:** If the positioning wire has already been removed, reinsert it in hole D to protect against rotation during screw insertion.

**Note for 5.0 mm plate:** Remove the reduction sleeve and enlarge the hole from 2.8 mm to 4.3 mm with the LCP Drill Bit. Then follow the instructions as described in Step 2 on page 88.



**Instruments for 3.5 mm plate**

314.03	Small Hexagonal Screwdriver Shaft, quick coupling
314.116	StarDrive Screwdriver Shaft, T15, self-retaining, quick coupling
397.705	Handle, quick coupling
511.770	Torque-Limiting Attachment, 1.5 Nm

**Instruments for 5.0 mm plate**

310.430	4.3 mm Drill Bit, quick coupling, 221 mm
314.152	3.5 mm Hexagonal Screwdriver Shaft, self-retaining
314.164	StarDrive Screwdriver, T25, with groove, 240 mm
397.705	Handle, quick coupling
511.771	Torque-Limiting Attachment, 4 Nm



---

**Option A: Manual insertion**

Insert a locking screw manually using the torque-limiting handle, torque-limiting attachment (TLA) and StarDrive Screwdriver shaft.

Use the 1.5 Nm TLA for 3.5 mm screws and the 4.0 Nm TLA for 5.0 mm screws.

**Note: The screw is securely locked to the plate when a click is heard.**

**Option B: Insertion under power**

Locking screws may be partially inserted using the appropriate TLA and StarDrive Screwdriver shaft.

The torque-limiting attachment controls the tightening torque to:

- Ensure that enough torque is used to minimize the risk of the locking screw backing out of the plate; and
- Avoid locking the screw to the plate at full speed, thus minimizing the risk of cold-welding the screw to the plate.

**Precaution: Do not fully tighten the screw with the power tool.**

**Note: Always perform final tightening by hand. Uncouple the power tool, mount the handle, torque-limiting attachment, screwdriver shaft and manually tighten the screw. The optimum torque is reached after one click.**

Insert a screw in hole B as described for hole A.

**3****Insert calcar screw in hole C****Instruments for 3.5 mm plate**

03.108.009	2.8 mm Threaded Drill Guide, for 3.5 mm Pediatric LCP Hip Plate
310.284	2.8 mm Drill Bit, quick coupling, 165 mm
314.03	Small Hexagonal Screwdriver Shaft, quick coupling
314.116	StarDrive Screwdriver Shaft, T15, self-retaining, quick coupling
319.01	Depth Gauge, measures up to 60 mm
511.770	Torque-Limiting Attachment, 1.5 Nm

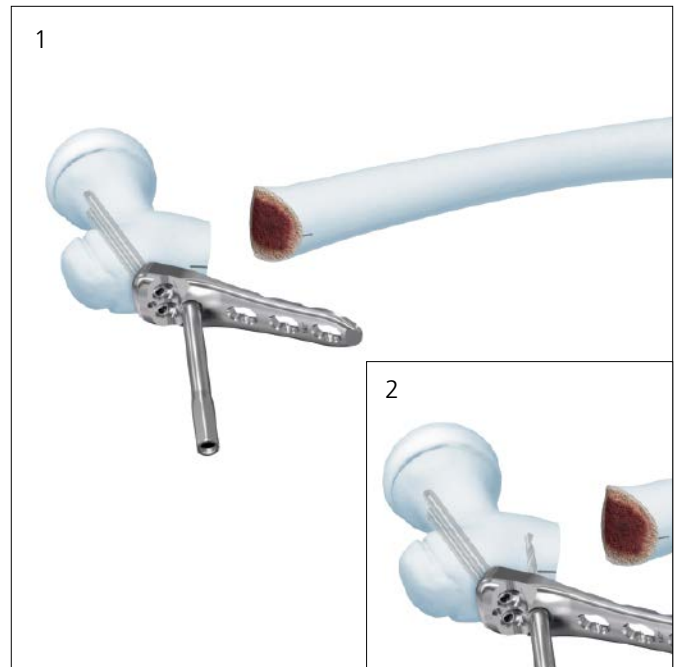
**Instruments for 5.0 mm plate**

03.108.010	4.3 mm Threaded Drill Guide, for 5.0 mm Pediatric LCP Hip Plate
310.430	4.3 mm Drill Bit, quick coupling, 221 mm
314.152	3.5 mm Hexagonal Screwdriver Shaft, self-retaining
314.164	StarDrive Screwdriver, T25, with groove, 240 mm
319.10	Depth Gauge, measures up to 110 mm
511.771	Torque-Limiting Attachment, 4 Nm

Attach drill sleeve to hole C (1) and drill the hole for the calcar screw (2) through both cortices. Remove the LCP Drill Guide and determine the screw length with the depth gauge.

Insert the screw in hole C (3, 4).

**Note: DO NOT fully insert the locking screws by power. Always perform final tightening by hand using the screwdriver handle, torque-limiting attachment, and screwdriver shaft. The screw is securely locked to the plate when a click is heard.**



# REDUCTION

---

## Instrument

---

399.121 Bone Holding Forceps, soft ratchet, for plates to 14 mm wide

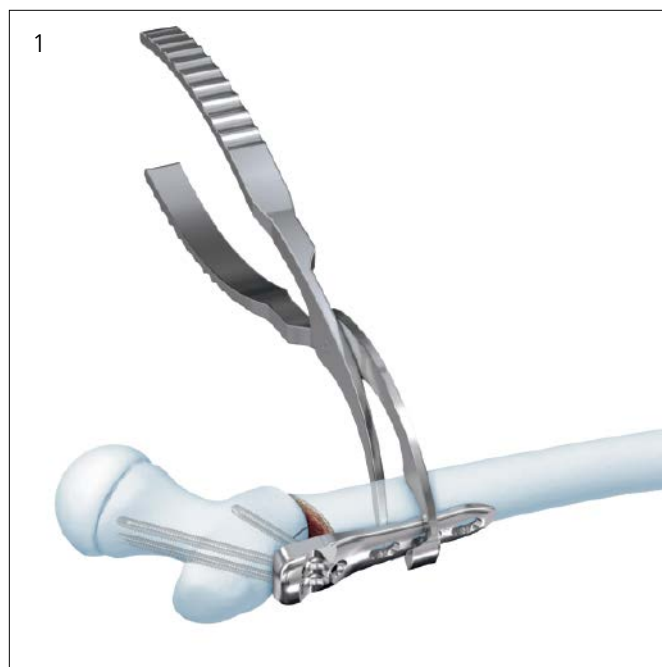
---

- For optimal fixation, align the plate parallel with the femoral shaft axis in AP and lateral views. Once the plate is aligned, secure the plate with reduction forceps.

**Precaution:** If the plate is not aligned parallel to the femoral shaft in the AP view it can lead to variations of the planned neck/shaft (CCD) angle.

If additional extension or flexion is required, the plate will no longer be aligned with the femoral shaft, making fixation more difficult due to the skewed position of the plate.

**Note:** Alignment can be facilitated with LCP Drill Guide in the distal part of the plate and/or with a forceps fixed on the proximal part. These instruments serve as handles during the repositioning of the osteotomy.



# DISTAL FIXATION

---

Since this plate is an LCP Plate, either locking or cortex screws can be used in the shaft. To achieve compression, always insert a cortical screw prior to any locking screws.

## **Option A: Distal fixation with locking screws**

Insert screws in holes 1, 2, and 3.

---

### **Instruments for 3.5 mm plate**

---

03.108.009	2.8 mm Threaded Drill Guide, for 3.5 mm Pediatric LCP Hip Plate
310.284	2.8 mm Drill Bit, quick coupling, 165 mm
314.03	Small Hexagonal Screwdriver Shaft, quick coupling
314.116	StarDrive Screwdriver Shaft, T15, self-retaining, quick coupling
319.01	Depth Gauge, measures up to 60 mm
397.705	Handle, quick coupling
511.770	Torque-Limiting Attachment, 1.5 Nm

---

---

### **Instruments for 5.0 mm plate**

---

03.108.010	4.3 mm Threaded Drill Guide, for 5.0 mm Pediatric LCP Hip Plate
310.430	4.3 mm Drill Bit, quick coupling, 221 mm
314.119	StarDrive Screwdriver Shaft, T25, self-retaining, quick coupling
314.152	3.5 mm Hexagonal Screwdriver Shaft, self-retaining
319.10	Depth Gauge, measures up to 110 mm
397.705	Handle, quick coupling
511.771	Torque-Limiting Attachment, 4 Nm

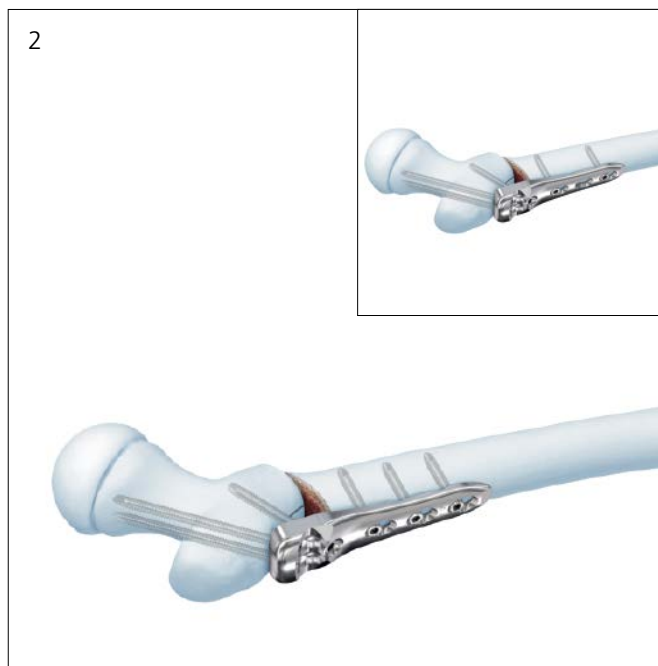
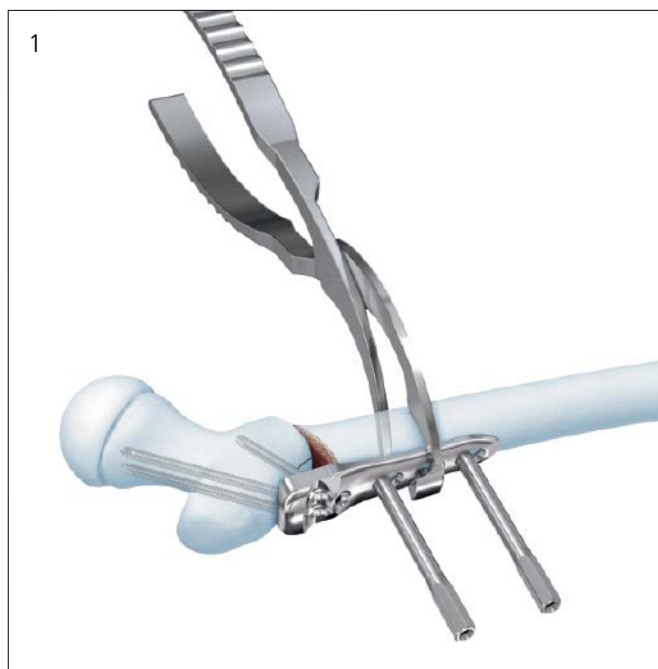
---



Insert the LCP Drill Guide into the locking portion of Combi holes 1, 2 and 3 (1).

Drill screw holes through both cortices using the appropriate drill bit. Determine the screw length from the calibrated drill bit or by using the depth gauge. Insert the screws (2).

**Note: DO NOT fully insert the locking screws by power. Always perform final tightening by manual use of the screwdriver handle, torque-limiting attachment and screwdriver shaft. The screw is securely locked to the plate when a click is heard.**



**Option B: Distal fixation with cortex screws**

Insert screws in holes 1, 2, and 3.

**Instruments for 3.5 mm plate**

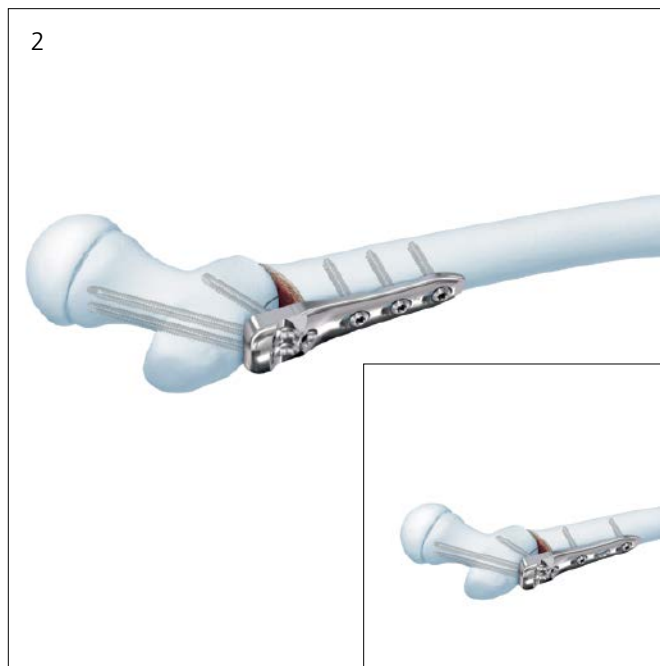
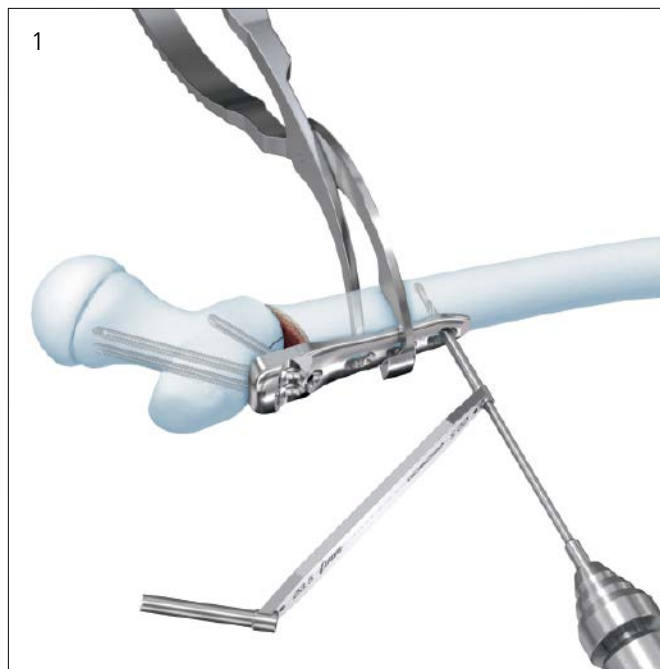
312.28	3.5 mm/2.5 mm Double Drill Sleeve
314.030	Small Hexagonal Screwdriver Shaft, quick coupling
314.070	Small Hexagonal Screwdriver, 2.5 mm width across flats
314.115	StarDrive Screwdriver, T15, self-retaining
314.116	StarDrive Screwdriver Shaft, T15, self-retaining, quick coupling
319.01	Depth Gauge, measures up to 60 mm

**Instruments for 5.0 mm plate**

312.46	4.5 mm/3.2 mm Double Drill Sleeve
314.119	StarDrive Screwdriver Shaft, T25, self-retaining, quick coupling
314.152	3.5 mm Hexagonal Screwdriver Shaft, self-retaining
314.164	StarDrive Screwdriver, T25, with groove, 240 mm
314.27	Large Hexagonal Screwdriver
319.10	Depth Gauge, measures up to 110 mm

Using the appropriate drill bit and drill sleeve, pre-drill in plate hole 1. Measure for screw length using the depth gauge and insert a self-tapping cortex screw in hole 1.

Repeat steps for screw insertion in holes 2 and 3.



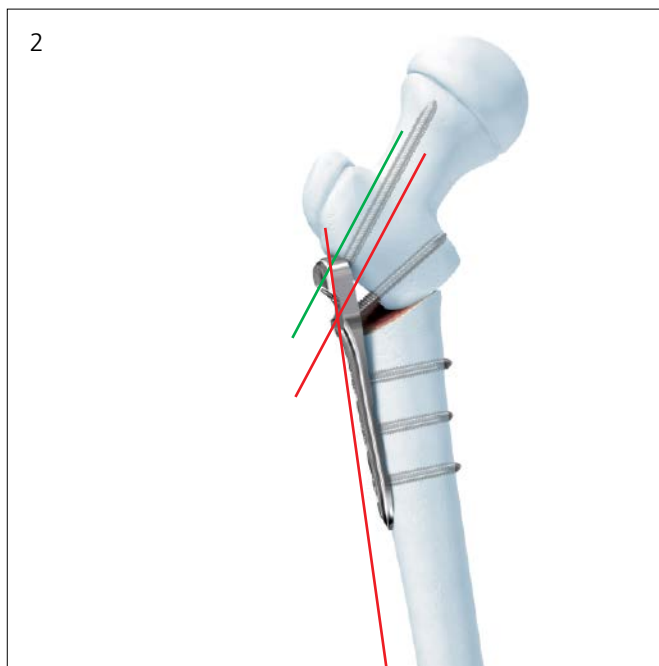
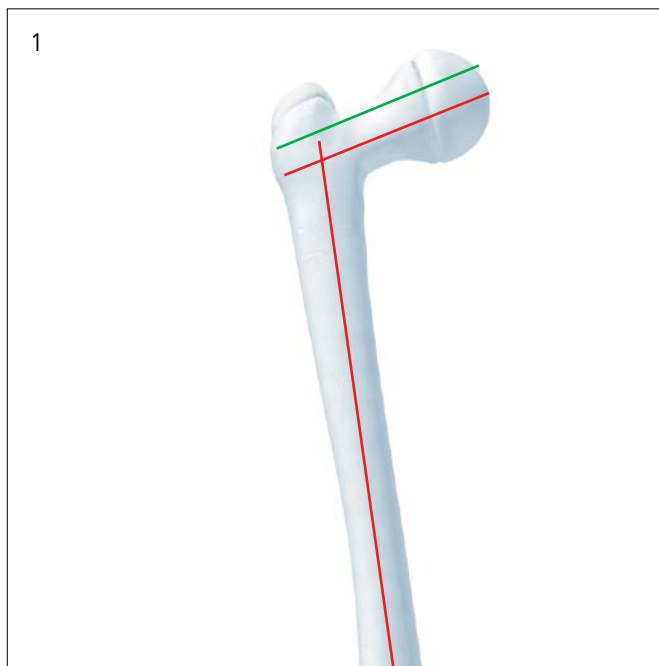
# ALTERNATIVE SURGICAL TECHNIQUE

## 1

### Preoperative planning

#### Surgical technique based on the plate/screw angle

In this technique the plate/screw angle defines the final neck shaft angle as the screws are inserted along the axis of the femoral neck in the AP view (1). It is suitable when the final desired angle conforms to one of the plate angles. The plate angle defines the final correction angle (2).



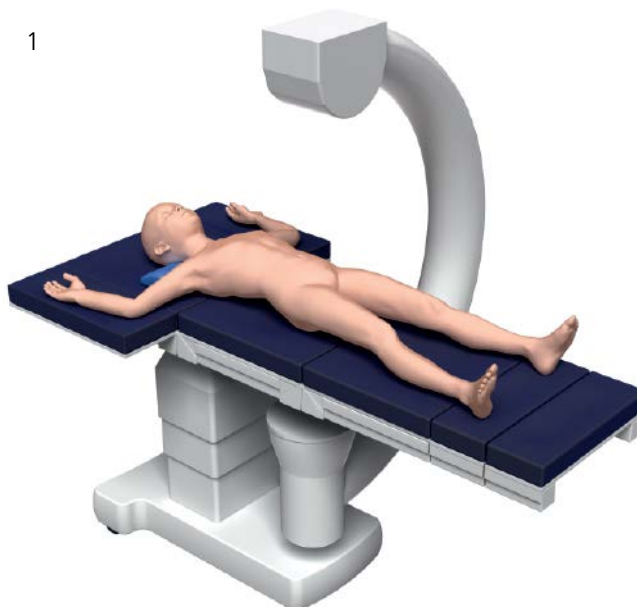
---

**2**

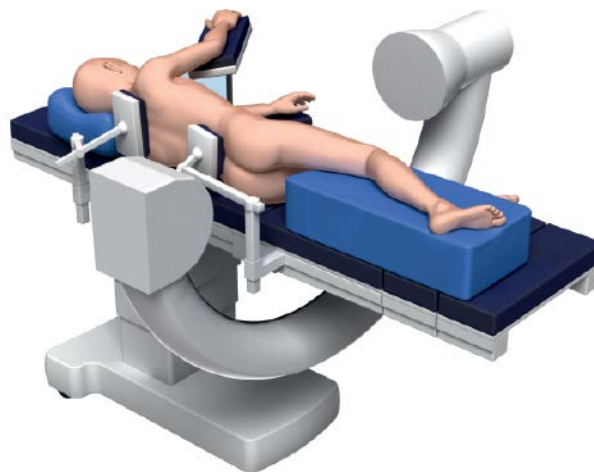
**Position patient**

Position the patient in the supine (1) or lateral (2) position on the radiolucent table. Then position the image intensifier so that the visualization of the hip is possible in AP and axial views.

1



2



---

**2**

**Approach**

Use a standard lateral approach to the proximal femur.

---

**4**

**Guide wire insertion**

**Locate trochanteric epiphysis and determine anteversion**

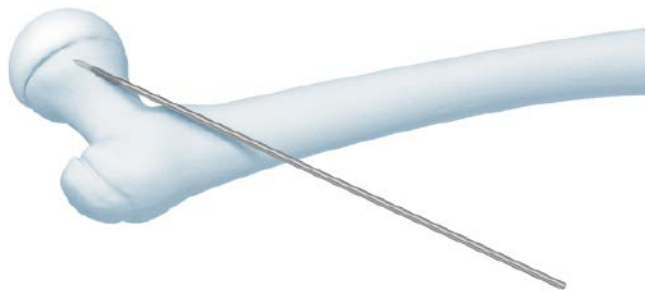
---

**Instrument**

---

292.791	2.0 mm Kirschner Wire with Thread, 150 mm, trocar point, 15 mm thread length
---------	--

---



- 1 Place the K-wire on the ventral aspect of the femoral neck to determine the anteversion. Align the K-wire with the center line of the femoral neck under the image intensifier.

**Note: Position the K-wire at a downward angle to avoid interference with the instruments.**



Axial AP view

**Guide wire insertion: Insert positioning Kirschner wire in hole D**

**Instruments for 3.5 mm plate**

03.108.001	Pediatric LCP Hip Plate Guiding Block for 3.5 mm Screws
03.108.006	Positioning Device for Guiding Block
292.79	2.0 mm Kirschner Wire with Thread, 150 mm, trocar point, 15 mm thread length

**Instruments for 5.0 mm plate**

03.108.002	Pediatric LCP Hip Plate Guiding Block for 5.0 mm Screws
03.108.006	Positioning Device for Guiding Block
292.79	2.0 mm Kirschner Wire with Thread, 150 mm, trocar point, 15 mm thread length

Assemble the positioning device and the guiding block. Do not tighten the hex screw (1).

Insert the positioning K-wire parallel to the initial positioned anteversion guide wire in the axial view so that the K-wire corresponds with the anti-torsion (AT) angle in line with the intermediary femoral neck (2).



**Precaution:** All of the following steps refer to the positioning Kirschner wire; therefore, the exact position is crucial for a successful surgery.

- Verify the optimal placement of the positioning K-wire with the image intensifier (3, 4).

**Notes:**

- If additional extension or flexion is required, the guiding block has to be positioned accordingly.
- The 2 front spikes of the guiding block must be in contact with the femur.
- The positioning K-wire stays inserted until the 2 neck screws are fixed.

**Precaution:** Do not bend the K-wire while drilling as this may result in correction mistakes.

If the insertion of the positioning K-wire is satisfactory, follow the technique beginning with Step 1 on page 82.



Axial AP view



AP view

# 3.5 MM AND 5.0 MM CONDYLAR PLATES: VARUS OSTEOTOMY





# CLINICAL CASES

## Case 1\*



**Preoperative, AP**  
10-year-old male with spastic diplegia.



**Preoperative, lateral**  
Fracture of the inferior pole of the patella as a sign of high stress caused by fixed flexion contracture of 30°.



**Postoperative, AP and lateral**  
Anatomical position of the plate in AP view following supracondylar extension osteotomy with 30° of extension and 15° of external rotation shown in lateral view. This procedure was combined with patellar tendon shortening.

## Case 2\*



**Preoperative, AP and lateral**  
8-year-old girl with arthrogryposis multiplex congenita and bilateral severe, fixed knee flexion deformity.



**Postoperative, AP and lateral**  
Eight weeks after bilateral supracondylar 25° extension osteotomy with complete consolidation.

Note: Results from case reports are not necessarily predictive of results in other cases. Results in other cases may vary.

\*Images provided with permission from Prof. Dr. Reinald Brunner and Dr. Erich Rutz, MD, Children's University Hospital of Basel, UKBB, Switzerland

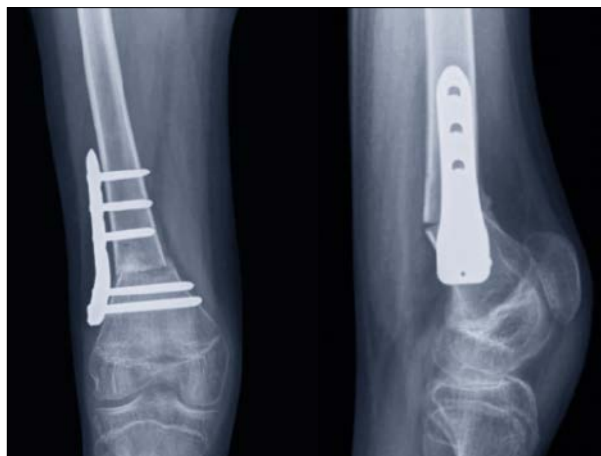
---

**Case 3\***



**Preoperative, AP and lateral**

17-year-old male with spastic diplegia and fixed flexion contracture of 25°.



**Postoperative, 6 weeks, AP and lateral**

After bilateral supracondylar extension osteotomy of 25° and 20° of external rotation, stable correction is shown.



**Postoperative, 1 year, AP and lateral**

Complete consolidation.

\*Images provided with permission from Prof. Dr. Reinald Brunner and Dr. Erich Rutz, MD, Children's University Hospital of Basel, UKBB, Switzerland

# PREOPERATIVE PLANNING

---

Preoperative planning of osteotomies of the distal femur is somewhat different from that for hip osteotomies.

The principles, however, are identical:

1. Decide what corrections in what planes are required.  
This may be achieved by a combination of clinical examination, x-rays (for example long leg views for alignment), CT scans (to assess femoral torsion) or frequently through examination under anesthesia.
2. Decide how the implant should be placed to achieve the correction, eg, bone wedges to be excised, opening wedges to be created (unusual in the distal femur due to the neurovascular structures), shortening of the femur required to relax soft tissues (common in neurological disease with contracture).

**Note: The condylar plate is contoured such that distal screws will be at 90° to the midline of the shaft if the plate is fitted on the surface of the bone. Generally, the distal screws should be parallel to the growth plate in the coronal plane, although care must be taken to establish that there is no deformity of the distal fragment that would negate this assumption.**

---

**Plate type**

This technique guide focuses on the LCP Pediatric Condylar Plates 3.5 mm and 5.0 mm and describes the options of axial corrections in the distal femur.

The images represent the 3.5 mm LCP Pediatric Condylar Plate (02.108.410). The surgical technique involves the use of screw holes where applicable. Please see the designation of each hole as indicated.

The surgical technique described is based on a 30° extension and 30° external rotation osteotomy.



A, B, C: Distal locking screws  
D: Positioning Kirschner wire  
1, 2, and 3: Locking or cortical screws

# PATIENT POSITIONING AND APPROACH

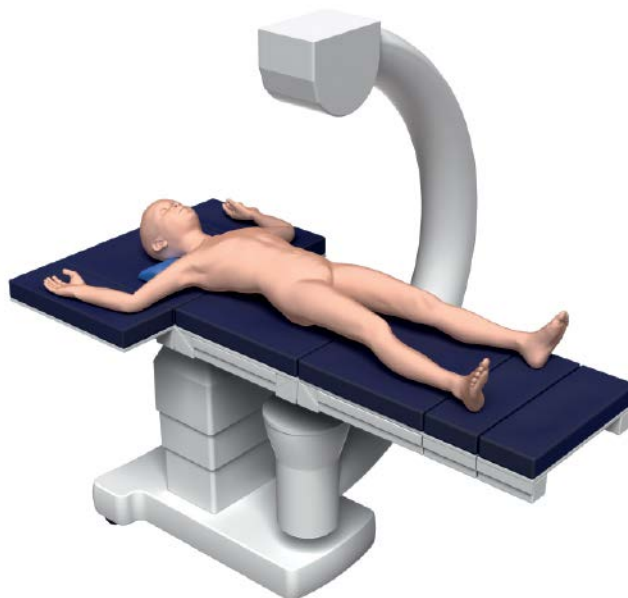
---

## 1

### Position and prepare

The operation is performed with the patient supine on a radiolucent table. The whole leg is prepared up to the inguinal region.

**Note:** In difficult cases, it may be advisable to prepare both legs to allow a visual check of both legs.



---

## 2

### Approach

- A standard lateral approach to the distal femur reflecting the vastus lateralis anteriorly should be used. The level of the incision should be determined under image intensifier control.

**Note:** The use of a sterile tourniquet may facilitate the approach.

# GUIDE WIRE INSERTION

## 1

### Locate the frontal plane of the distal femur

---

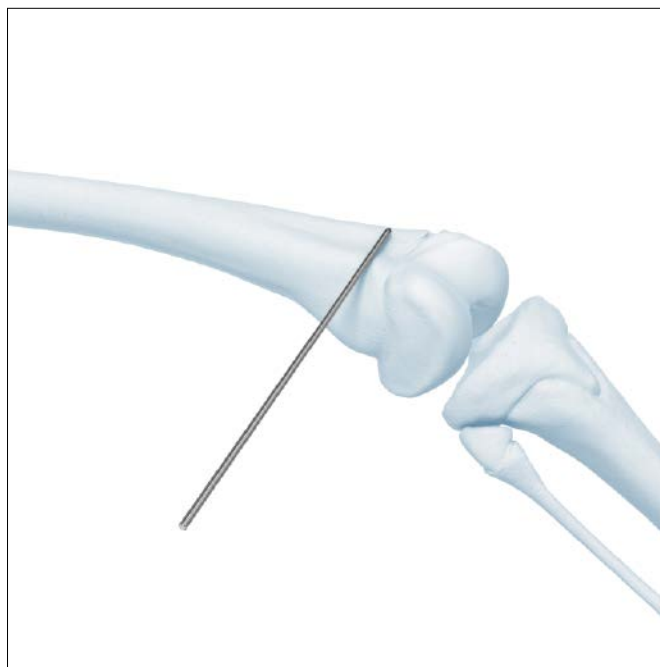
#### Instrument

---

292.79	2.0 mm Kirschner Wire with thread, 150 mm, trocar point, 15 mm thread length
--------	---

---

- After subperiosteal preparation of the distal femur, place a K-wire extraperiosteally over the front of the femur 1 cm above the physis, or by rotating the leg under image intensifier control until the patella is perfectly anterior and in the midline. Check the alignment of the K-wire in the frontal plane.



**2**

**Insert positioning Kirschner wire in hole D**

**Instruments for 3.5 mm plate**

03.108.001	Pediatric LCP Hip Plate Guiding Block for 3.5 mm Screws
03.108.006	Positioning Device for Guiding Block
292.79	2.0 mm Kirschner Wire with Thread, 150 mm, trocar point, 15 mm thread length

**Instruments for 5.0 mm plate**

03.108.002	Pediatric LCP Hip Plate Guiding Block for 5.0 mm Screws
03.108.006	Positioning Device for Guiding Block
292.79	2.0 mm Kirschner Wire with Thread, 150 mm, trocar point, 15 mm thread length

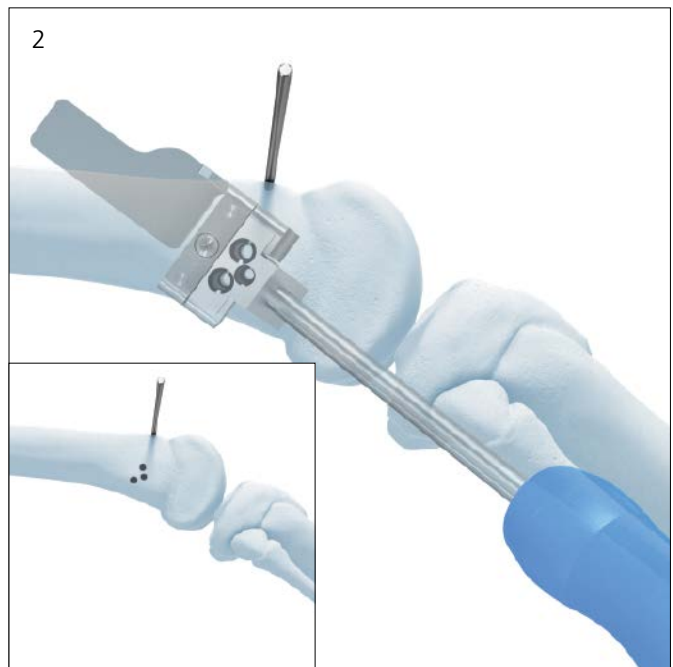


Assemble the positioning device and the aiming block accordingly (1).

Locate the distal femoral growth plate under image intensifier control.

- ⦿ The insertion point for the positioning K-wire depends on the age and size of the patient. For the 3.5 mm plate insertion is 1.0 mm–2.0 cm and the 5.0 mm plate 1.5 mm–2.5 cm above the distal physis.

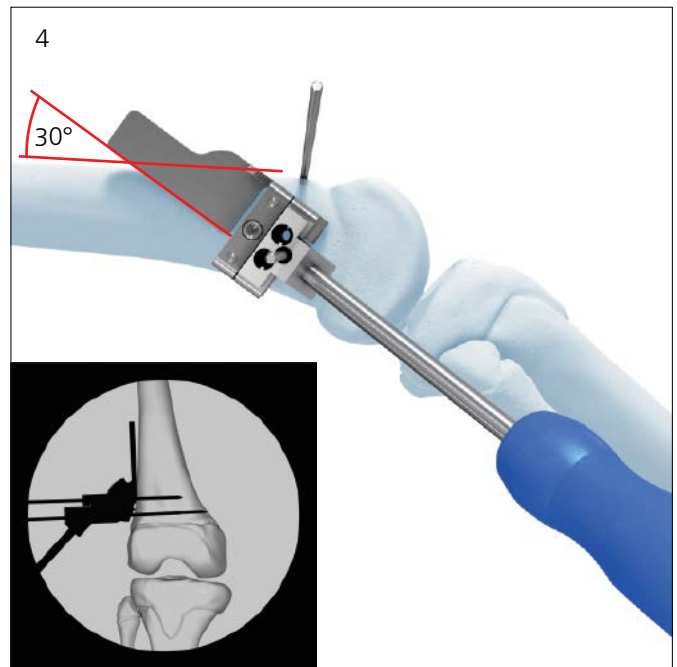
**Note:** In an extension osteotomy the insertion point will need to be more proximal and more posterior as the plane of the 2 distal screws will not be parallel to the physis in the sagittal view (2).



Using the device to determine the angle for correction in the coronal (frontal) plane may prove difficult. This is because the cortex of the distal femur is at an angle to the line of the shaft due to the supracondylar flare. In the coronal (frontal) plane, the positioning wire is therefore inserted parallel to the physis and the positioning device is used to determine the angle of correction in the sagittal plane.

Insert the positioning K-wire in the appropriate hole in the guiding block (hole D) so that it is parallel to the anterior surface orientation K-wire and such that when the block is rotated for the correction in the sagittal plane there will be space for the main K-wires that correspond to the screws (3, 4).

When the positioning K-wire is correctly positioned, remove the anterior orientation K-wire.





# KIRSCHNER WIRE INSERTION

---

## Insert Kirschner wires for distal screws

---

### Instruments for 3.5 mm plate

---

03.108.001	Pediatric LCP Hip Plate Guiding Block for 3.5 mm Screws
03.108.005	2.8 mm Kirschner Wire Spade Point, 200 mm
03.108.006	Positioning Device for Guiding Block
03.108.040	K-Wire Adaptor, for 2.8 mm K-wires (03.108.005)
314.070	Small Hexagonal Screwdriver, 2.5 mm width across flats
333.060	90°/50°/40° Triangular Positioning Plate
333.070	80°/70°/30° Triangular Positioning Plate
333.080	100°/60°/20° Triangular Positioning Plate

---

---

### Instruments for 5.0 mm plate

---

03.108.002	Pediatric LCP Hip Plate Guiding Block for 5.0 mm Screws
03.108.005	2.8 mm Kirschner Wire Spade Point, 200 mm
03.108.006	Positioning Device for Guiding Block
03.108.040	K-Wire Adaptor, for 2.8 mm K-wires (03.108.005)
314.070	Small Hexagonal Screwdriver, 2.5 mm width across flats
333.060	90°/50°/40° Triangular Positioning Plate
333.070	80°/70°/30° Triangular Positioning Plate
333.080	100°/60°/20° Triangular Positioning Plate

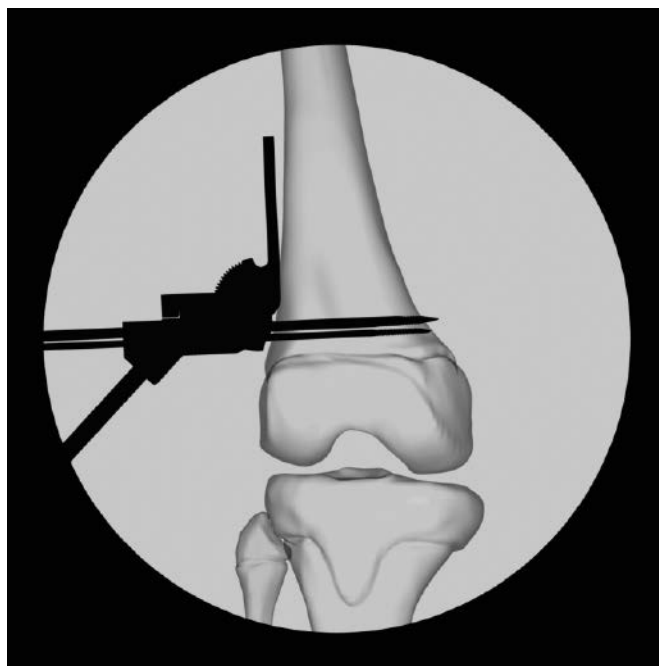
---

Rotate the guiding block and positioning device into the correct position for the sagittal plane correction. This can be done by calculation but is more commonly achieved by placing the positioner in line with the tibia in the position of maximum achievable extension.

Insert the 2.8 mm K-wires for plate holes A and B through the guiding block (1).



To prevent interference with the other wires, place the K-wire adapter on the K-wire before inserting it in hole B. (Insertion of wire for hole B shown in red in Figure 2).



# PERFORM OSTEOTOMY

---

## Osteotomy

---

### Instrument

---

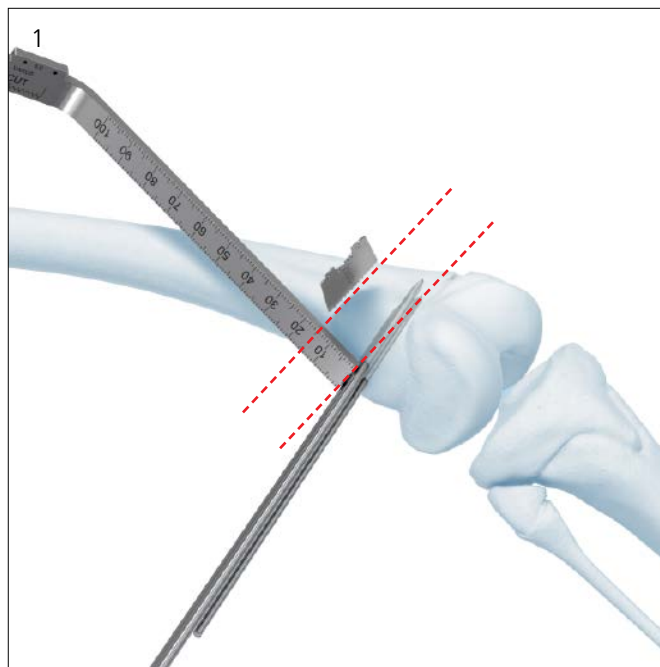
03.108.008      Osteotomy Measuring Device

---

### Level of the osteotomy

The osteotomy should be at least 15 mm proximal to the K-wires for the 3.5 mm plate and 20 mm for the 5.0 mm plate. Make a mark with an oscillating saw (1).

**Precaution:** Prior to cutting, reference wires should be inserted to allow assessment and control of rotation. In the distal fragment the initial positioning wire is adequate. In the proximal fragment, a bicortical wire should be inserted such that it does not interfere with the osteotomy. It is helpful to calculate the rotational correction before inserting this wire so that after the osteotomy is fixed the wire lies parallel to the positioning wire in the distal fragment (2). If no rotational correction is planned, then clearly marking the femur with the saw may adequately control rotation.



The first cut of the osteotomy should be parallel to the wires and sufficiently proximal to allow the third screw in hole C to gain adequate purchase (3).

If considerable sagittal plane correction is planned, then that must be taken into account. If the osteotomy measuring device is laid against the wires, this gives the minimum distance that will allow insertion of the screw in hole C.

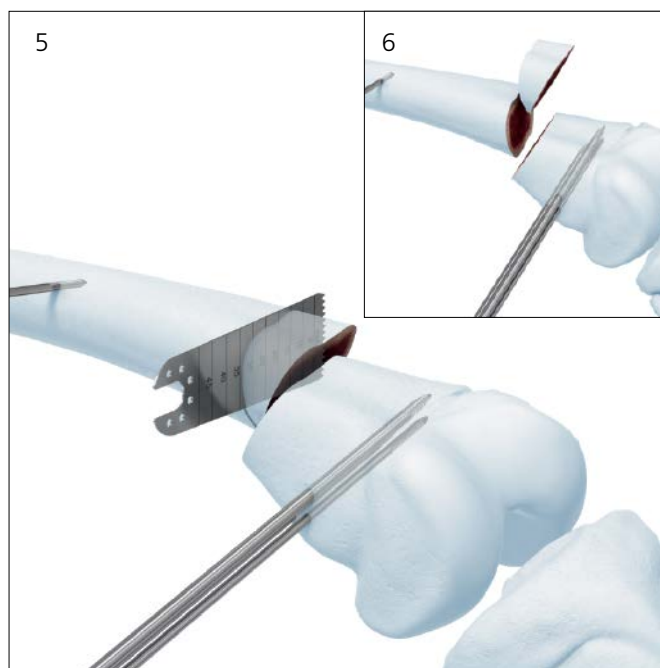
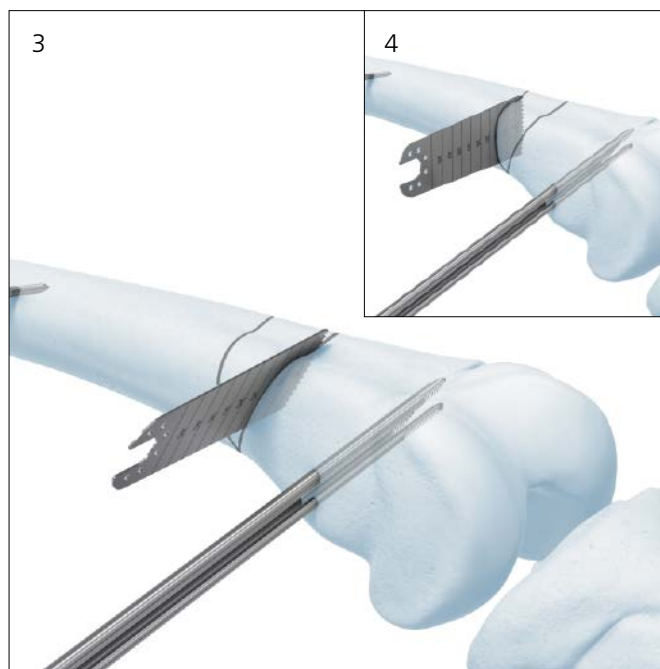
**Note:** The cut is best made freehand under image intensifier control, keeping the blade parallel to the wires in both planes.

Opening wedge osteotomy can be used in deformity correction. It is generally not recommended when treating contracture in neurological conditions. A second cut to the osteotomy is therefore recommended in this situation and this should be made in the proximal fragment at a right angle to the line of the shaft in all planes (5). The size of the wedge is determined by preoperative planning and depends on the clinical situation.

The resulting wedge is removed (6).

**Note:** Before completing the distal cut, it is recommended to make the proximal cut to half the diameter of the bone (4). This guarantees optimal fit of both fragments after reduction.

Frequently, some shortening is required, in which case the fragment of bone excised will be trapezoidal rather than wedge shaped.



# DISTAL FIXATION

## 1

### Position plate

#### Instruments for 3.5 mm plate

03.108.008	Osteotomy Measuring Device
03.108.009	2.8 mm Threaded Drill Guide, for 3.5 mm Pediatric LCP Hip Plate

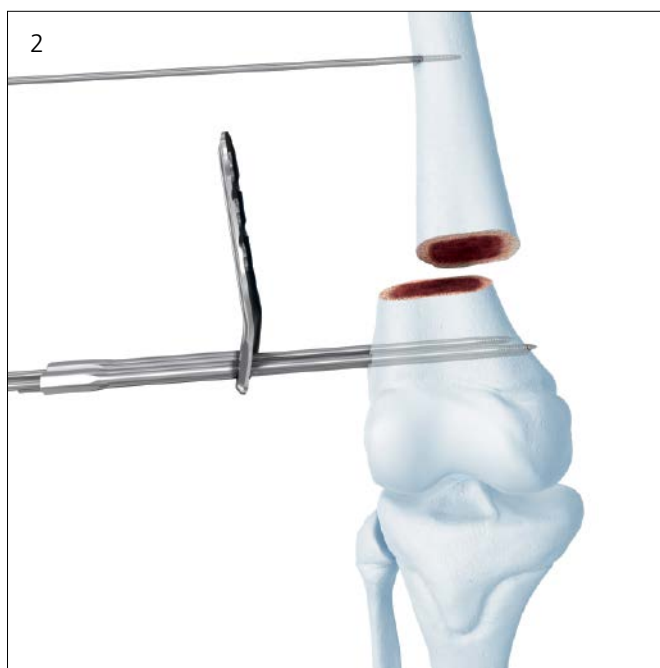
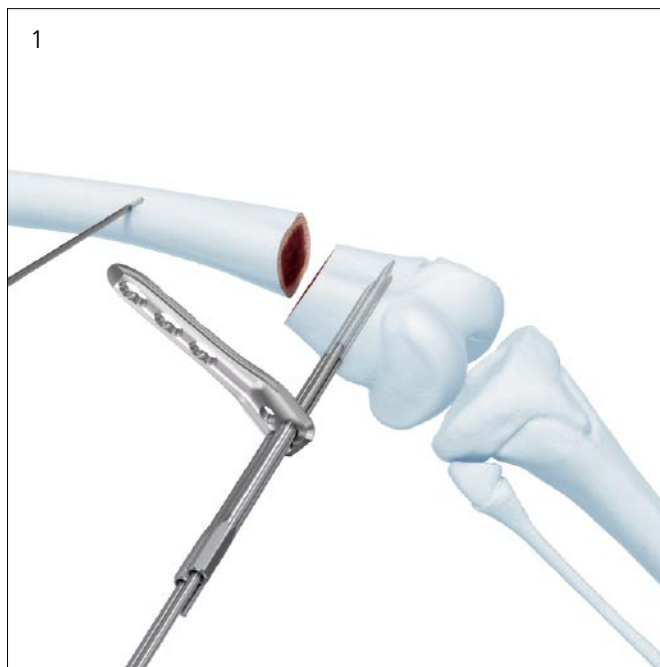
#### Instruments for 5.0 mm plate

03.108.004	Reduction Sleeve 4.3 mm/2.8 mm
03.108.008	Osteotomy Measuring Device
03.108.010	4.3 mm Threaded Drill Guide, for 5.0 mm Pediatric LCP Hip Plate

Fixation in the distal fragment must always be performed with locking screws.

Insert drill sleeves into plate holes A and B. Slide the plate over the K-wires (1, 2).

**Note for 5.0 mm plate:** Reduction sleeves must be inserted in each LCP Drill Guide before sliding the plate over the wires.



**2**

**Determine screw length and insert distal femoral locking screws A and B**

**Instruments for 3.5 mm plate**

03.108.003 Direct Measuring Device, for 2.8 mm Kirschner Wires

03.108.008 Osteotomy Measuring Device

**Instruments for 5.0 mm plate**

03.108.003 Direct Measuring Device, for 2.8 mm Kirschner Wires

03.108.004 Reduction Sleeve 4.3 mm/2.8 mm

03.108.008 Osteotomy Measuring Device

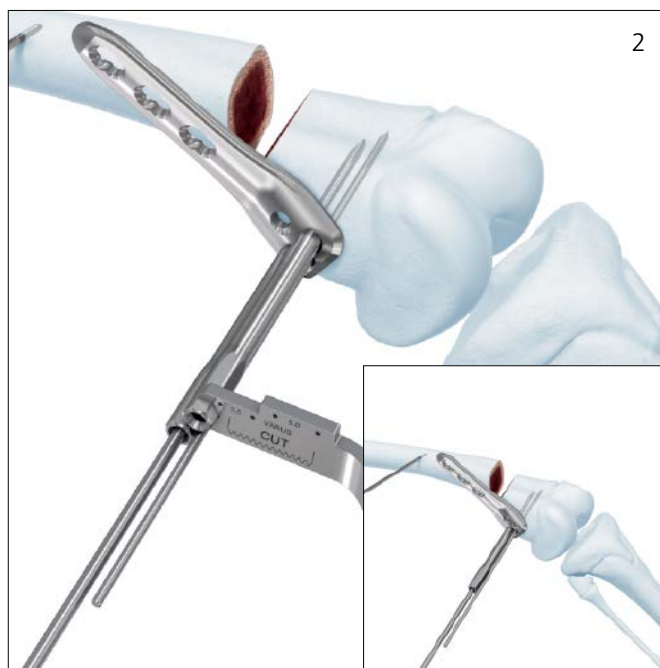
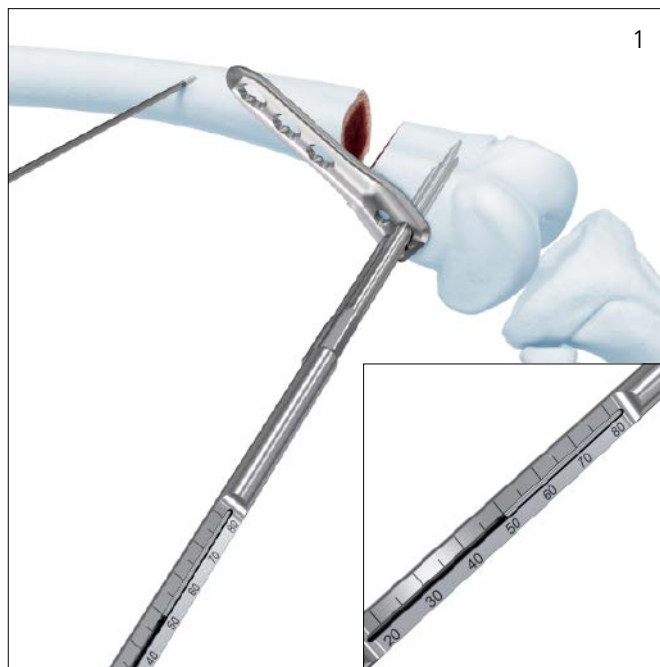
310.430 4.3 mm Drill Bit, quick coupling, 221 mm

Slide the appropriate end of the measuring device over the Kirschner wire against the drill sleeve and determine the proper screw length (1). Remove the Kirschner wire and the drill sleeve in hole A. If necessary, use the wrench end of the osteotomy measuring device (2).

Insert the screw in hole A, as described in the next step.

**Note for 5.0 mm plate:** Remove the reduction sleeve and then measure the K-wire length over the drill sleeve. Enlarge the hole from 2.8 to 4.3 mm with the LCP Drill Bit. Then remove the drill sleeve and insert the screw as described in Step 3.

**Note:** It is recommended to use a power tool to insert the self-tapping screw.



---

### 3

#### Insert locking screws

---

##### Instruments for 3.5 mm plate

---

314.03	Small Hexagonal Screwdriver Shaft, quick coupling
314.116	StarDrive Screwdriver Shaft, T15, self-retaining, quick coupling
397.705	Handle, quick coupling
511.770	Torque-Limiting Attachment, 1.5 Nm

---

##### Instruments for 5.0 mm plate

---

314.119	StarDrive Screwdriver Shaft, T25, self-retaining, quick coupling
314.152	3.5 mm Hexagonal Screwdriver Shaft, self-retaining
397.705	Handle, quick coupling
511.771	Torque-Limiting Attachment, 4 Nm

---



Two options are available:

**Option A: Manual insertion**

Insert a locking screw manually using the torque-limiting handle, torque-limiting attachment (TLA) and StarDrive Screwdriver shaft.

Use the 1.5 Nm TLA for 3.5 mm screws and the 4.0 Nm TLA for 5.0 mm screws.

**Note: The screw is securely locked to the plate when a click is heard.**

**Option B: Insertion under power**

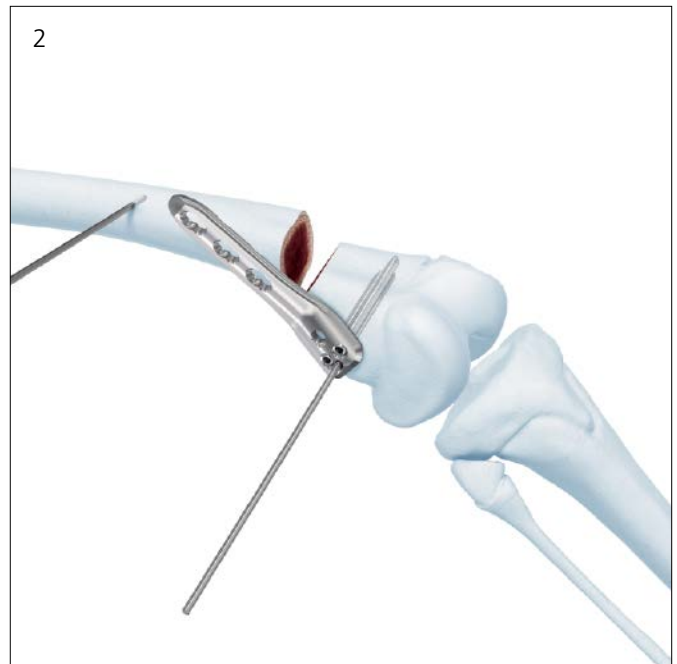
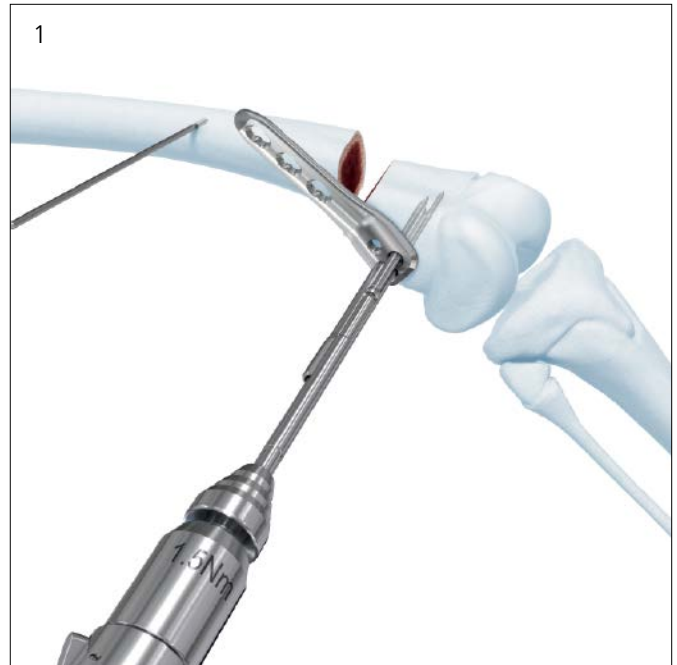
Locking screws may be partially inserted using the appropriate TLA and StarDrive Screwdriver shaft.

The torque-limiting attachment controls the tightening torque to:

- Ensure that enough torque is used to minimize the risk of the locking screw backing out of the plate; and
- Avoid locking the screw to the plate at full speed, thus minimizing the risk of cold welding the screw to the plate.

**Note: DO NOT fully insert the locking screws by power. Always perform final tightening by hand using the torque-limiting attachment. The screw is securely locked to the plate when a click is heard. Do not remove the positioning wire until proximal fixation is achieved.**

Insert a screw in hole B, as previously described for hole A.



**4**

**Insert locking screw in hole C**

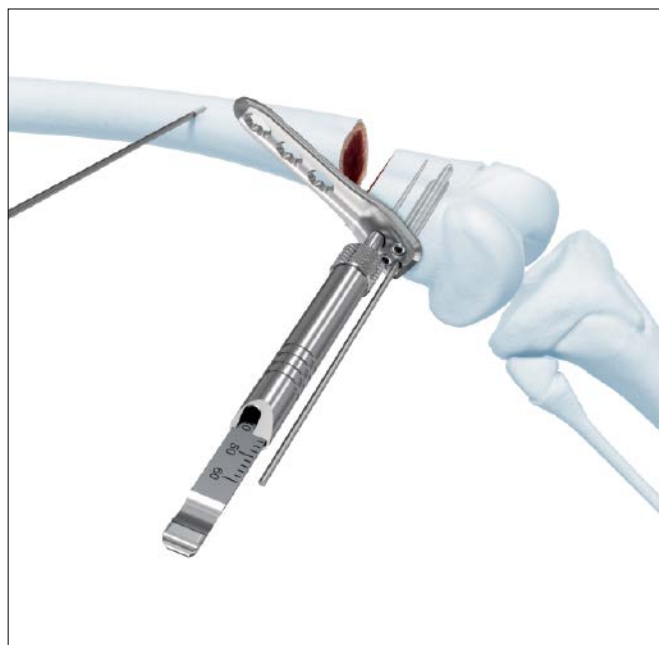
**Instruments for 3.5 mm plate**

03.108.009	2.8 mm Threaded Drill Guide, for 3.5 mm Pediatric LCP Hip Plate, 2 ea.
310.284	2.8 mm Drill Bit, quick coupling, 165 mm
314.03	Small Hexagonal Screwdriver Shaft, quick coupling
314.116	StarDrive Screwdriver Shaft T15, self-retaining, quick coupling
319.01	Depth Gauge, measures up to 60 mm
397.705	Handle, quick coupling
511.770	Torque-Limiting Attachment, 1.5 Nm

**Instruments for 5.0 mm plate**

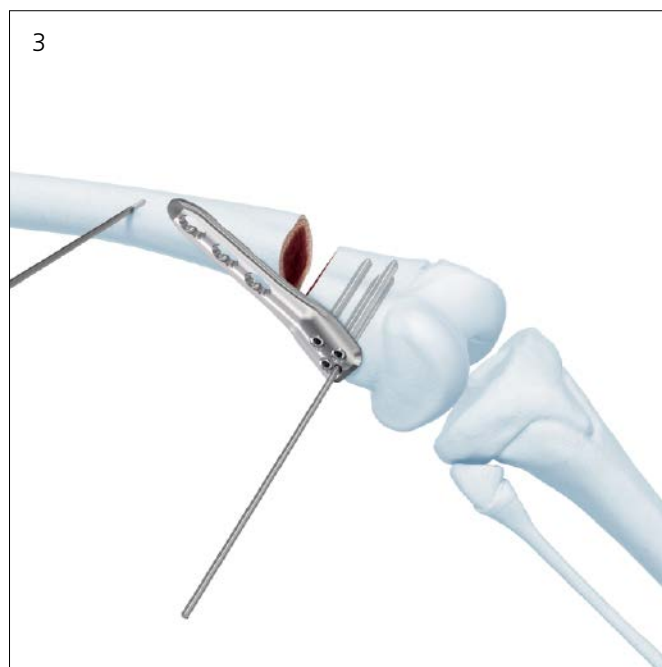
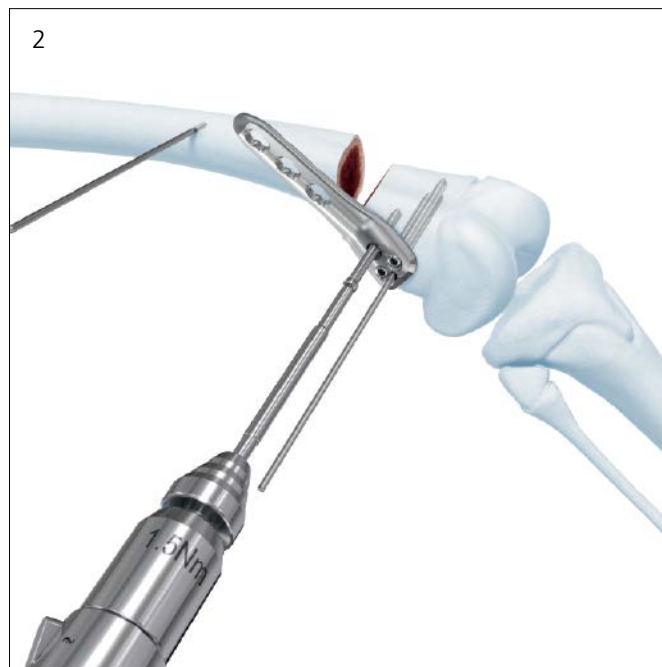
03.108.010	4.3 mm Threaded Drill Guide, for 5.0 mm Pediatric LCP Hip Plate
310.430	4.3 mm Drill Bit, quick coupling, 221 mm
314.152	3.5 mm Hexagonal Screwdriver Shaft, self-retaining
314.164	StarDrive Screwdriver, T25, with groove, 240 mm
319.10	Depth Gauge, measures up to 110 mm
397.705	Handle, quick coupling
511.771	Torque-Limiting Attachment, 4 Nm

Attach the drill sleeve to hole C and drill through both cortices. Read the screw length from the calibrated drill bit or determine the screw length with the depth gauge (1).



Insert the screw in hole C (2, 3).

**Note: DO NOT** fully insert the locking screws by power. Always perform final tightening by manual use of the screwdriver handle, torque limiting attachment, and screwdriver shaft. The screw is securely locked to the plate when a click is heard. Do not remove the positioning wire until distal fixation is achieved.



# REDUCTION

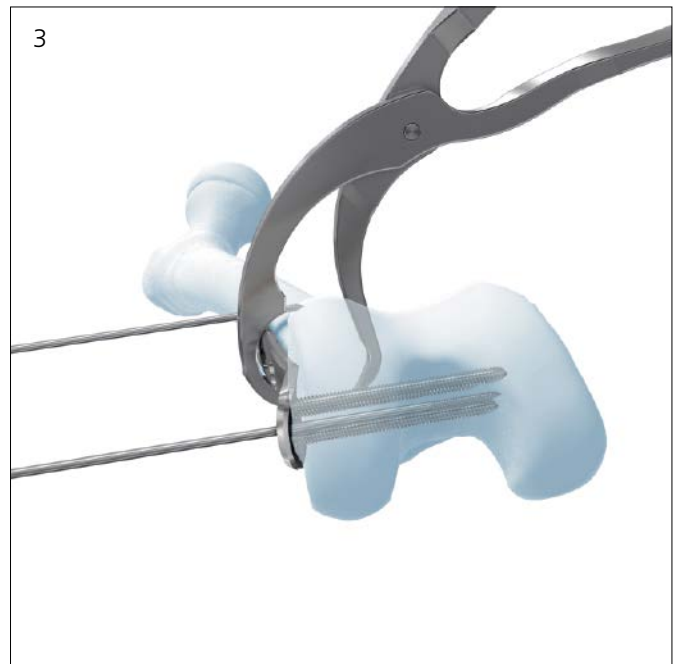
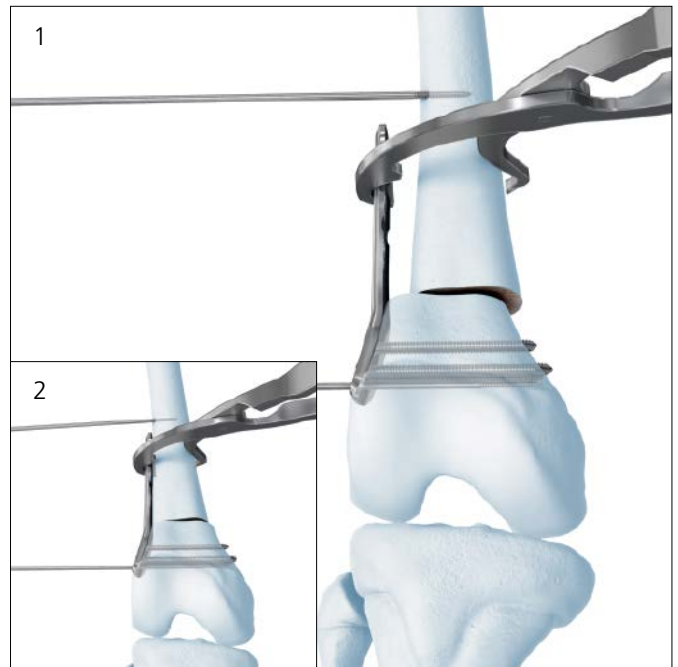
## Instruments

399.121	Bone Holding Forceps, soft ratchet, for plates to 14 mm wide
399.124	Reduction Forceps with serrated jaw, large handle, soft ratchet

- Reduce the plate onto the femoral shaft and check the alignment on the image intensifier (1, 2). Decide whether medialization will be required. Check visually that the plate is parallel to the shaft in the sagittal plane.

**Note:** After reduction, the initial positioning wire in the distal fragment lies parallel to the bicortical wire in the proximal part to achieve correct axial alignment (3).

**Note:** If medialization is required, follow the steps as described on pages 62–65.



# PROXIMAL FIXATION

---

Since this is an LCP Plate, either locking or cortical screws can be used in the shaft. To achieve compression, always insert a cortical screw prior to any locking screws.

## **Option A: Proximal fixation with locking screws**

Insert screws in holes 1, 2 and 3.

---

### **Instruments for 3.5 mm plate**

---

03.108.009	2.8 mm Threaded Drill Guide, for 3.5 mm Pediatric LCP Hip Plate
310.284	2.8 mm Drill Bit, quick coupling, 165 mm
314.03	Small Hexagonal Screwdriver Shaft, quick coupling
314.116	StarDrive Screwdriver Shaft, T15, self-retaining, quick coupling
319.010	Depth Gauge, measures up to 60 mm
397.705	Handle, quick coupling
511.770	Torque-Limiting Attachment, 1.5 Nm

---

---

### **Instruments for 5.0 mm plate**

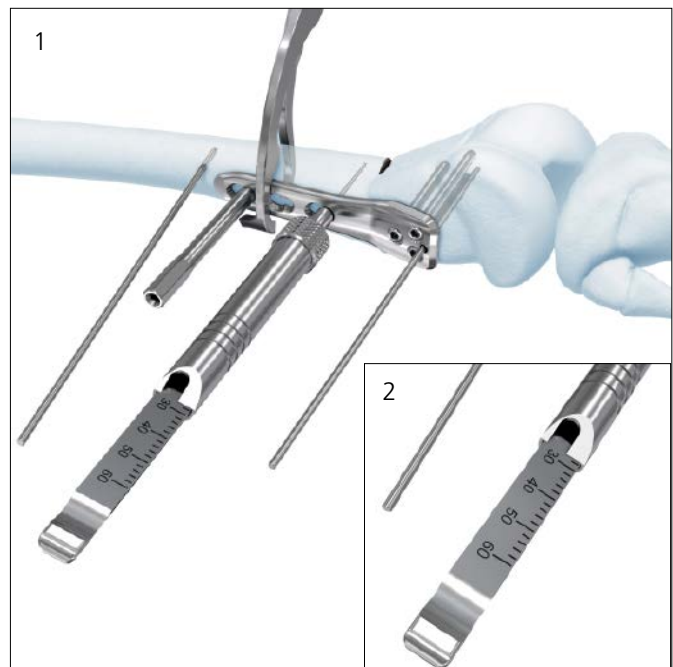
---

03.108.010	4.3 mm Threaded Drill Guide, for 5.0 mm Pediatric LCP Hip Plate
310.430	4.3 mm Drill Bit, quick coupling, 221 mm
314.119	StarDrive Screwdriver Shaft, T25, self-retaining, quick coupling
314.152	3.5 mm Hexagonal Screwdriver Shaft, self-retaining
319.100	Depth Gauge, measures up to 110 mm
397.705	Handle, quick coupling
511.771	Torque-Limiting Attachment, 4 Nm

---

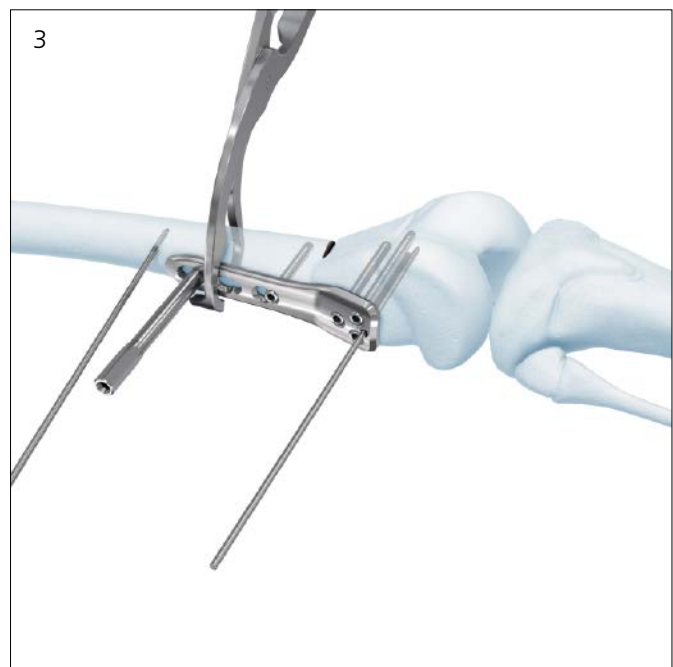
Insert the LCP Drill Guide into shaft holes 1 and 3.

Drill through both cortices of hole 3. Read the screw length from the calibrated drill bit or determine the screw length with the depth gauge (1, 2).



Insert a screw in hole 3 (3).

**Note: DO NOT fully insert the locking screws by power. Always perform final tightening by manual use of the torque-limiting attachment. The screw is securely locked to the plate when a click is heard. Do not remove the positioning wire until proximal fixation is achieved.**



Repeat this step for screw insertion in holes 1 and 2 (4).

Remove the initial positioning wire in the distal fragment and the bicortical positioning wire in the proximal part.



**Option B: Proximal fixation with cortical screws**

Insert screws in holes 1, 2 and 3.

**Instruments for 3.5 mm plate**

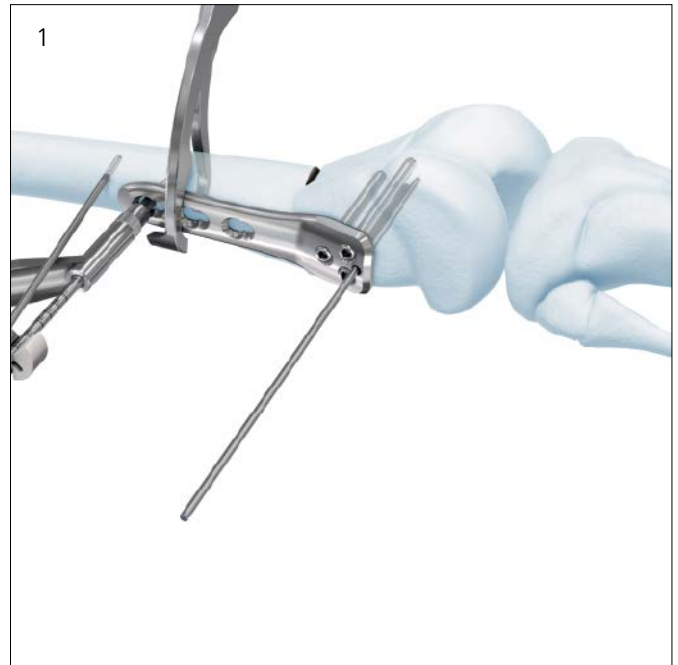
310.250	2.5 mm Drill Bit, quick coupling, 110 mm, gold
312.28	3.5 mm/2.5 mm Double Drill Sleeve
314.03	Small Hexagonal Screwdriver Shaft, quick coupling
314.070	Small Hexagonal Screwdriver, 2.5 mm width across flats
314.115	StarDrive Screwdriver, T15, self-retaining
314.116	StarDrive Screwdriver Shaft, T15, self-retaining, quick coupling
319.01	Depth Gauge, measures up to 60 mm
323.36	3.5 mm Universal Drill Guide

**Instruments for 5.0 mm plate**

310.310	3.2 mm Drill Bit, quick coupling, 145 mm
312.46	4.5 mm/3.2 mm Double Drill Sleeve
314.119	StarDrive Screwdriver Shaft, T25, self-retaining, quick coupling
314.152	3.5 mm Hexagonal Screwdriver Shaft, self-retaining
314.164	StarDrive Screwdriver, T25, with groove, 240 mm
314.270	Large Hexagonal Screwdriver
319.10	Depth Gauge, measures up to 110 mm
323.460	4.5 mm Universal Drill Guide



If cortical screw fixation is selected, this is generally because compression at the osteotomy site is desired. Using the spring-loaded drill guide without pressing the guide down on the plate, place the drill hole as proximally as possible in the Combi hole to achieve compression when the screw is tightened (1).



Choose the appropriate size drill bit. Measure the screw length with the depth gauge and place a self-tapping cortex screw in hole 1.

Repeat this step for screw insertion in holes 2 and 3. Then, remove the initial positioning wire in the distal fragment and the bicortical positioning wire in the proximal part (2).



# MEDIALIZATION

**Note: In order to facilitate medialization, locking screws must be used throughout.**

## Instruments for 3.5 mm plate

03.108.007	Medialization Guide for 3.5 mm and 5.0 mm LCP Plates
03.108.009	2.8 mm Threaded Drill Guide, for 3.5 mm Pediatric LCP Hip Plate
310.284	2.8 mm Drill Bit, quick coupling, 165 mm
314.03	Small Hexagonal Screwdriver Shaft, quick coupling
314.116	StarDrive Screwdriver Shaft, T15, self-retaining, quick coupling
319.010	Depth Gauge, measures up to 60 mm
397.705	Handle, quick coupling
399.098	Reduction Forceps, with serrated jaw, medium handle, soft ratchet
399.124	Reduction Forceps, with serrated jaw, large handle, soft ratchet
511.770	Torque-Limiting Attachment, 1.5 Nm

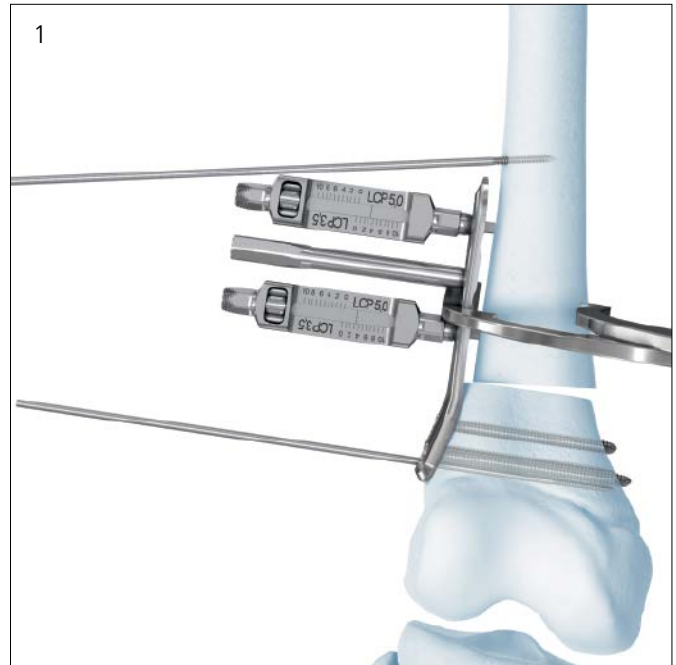
## Instruments for 5.0 mm plate

03.108.007	Medialization Guide for 3.5 mm and 5.0 mm LCP Plates
03.108.010	4.3 mm Threaded Drill Guide, for 5.0 mm Pediatric LCP Hip Plate
310.430	4.3 mm Drill Bit, quick coupling, 221 mm
314.119	StarDrive Screwdriver Shaft, T25, self-retaining, quick coupling
314.152	3.5 mm Hexagonal Screwdriver Shaft, self-retaining
319.100	Depth Gauge, measures up to 110 mm
397.705	Handle, quick coupling
511.771	Torque-Limiting Attachment, 4 Nm

**1**

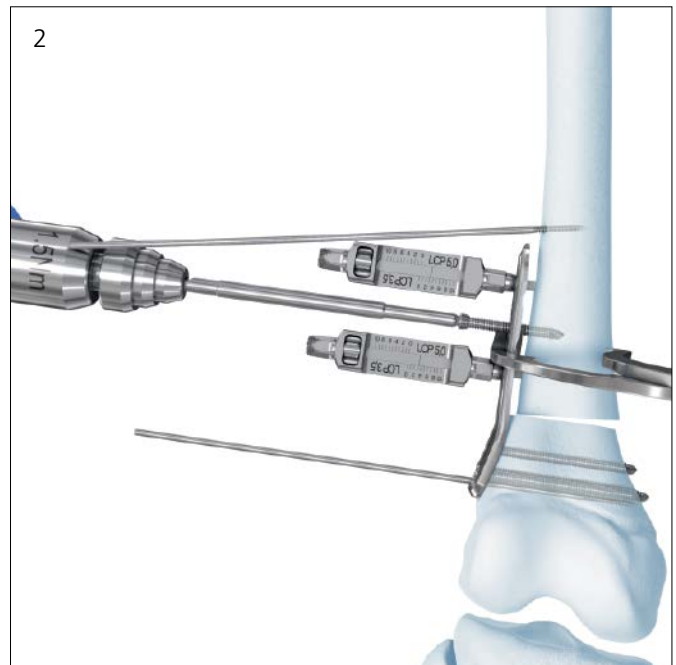
**Planned medialization**

Adjust the desired medialization with the medialization guide. Screw the corresponding end of the instrument into the locking portion of Combi holes 1 and 3 until they are firmly gripped. Then screw an LCP Drill Guide into the locking portion of Combi hole 2 (1).



Drill the screw hole and remove the drill sleeve. Determine the screw length with the depth gauge and insert a locking screw (2).

- Check the position throughout under image intensifier guidance to ensure satisfactory reduction and medialization.

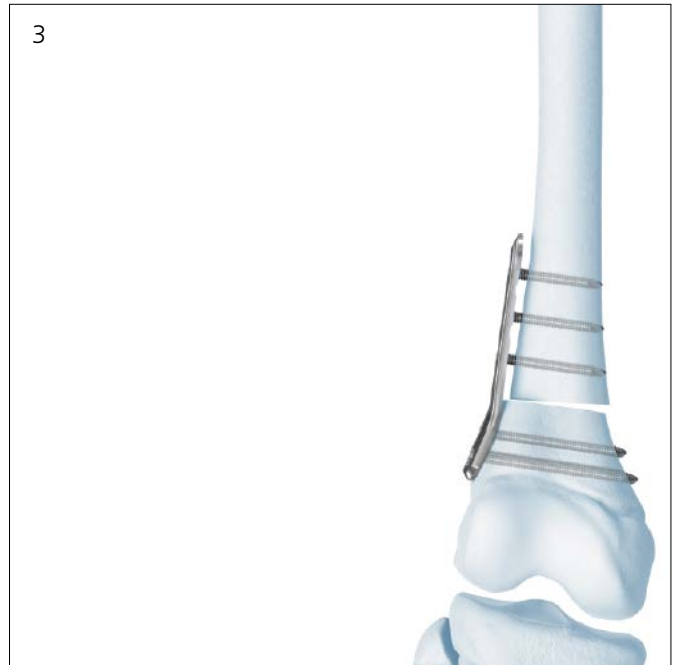


**2**

**Insert locking screw**

Remove the medialization guide in hole 1 and insert a drill sleeve. Pre-drill the screw hole and remove the drill sleeve. Determine the screw length with the depth gauge and insert a locking screw (3). Repeat Step 2 for hole 3 (4).

**Note: Tighten the screws manually with the torque limiter.**

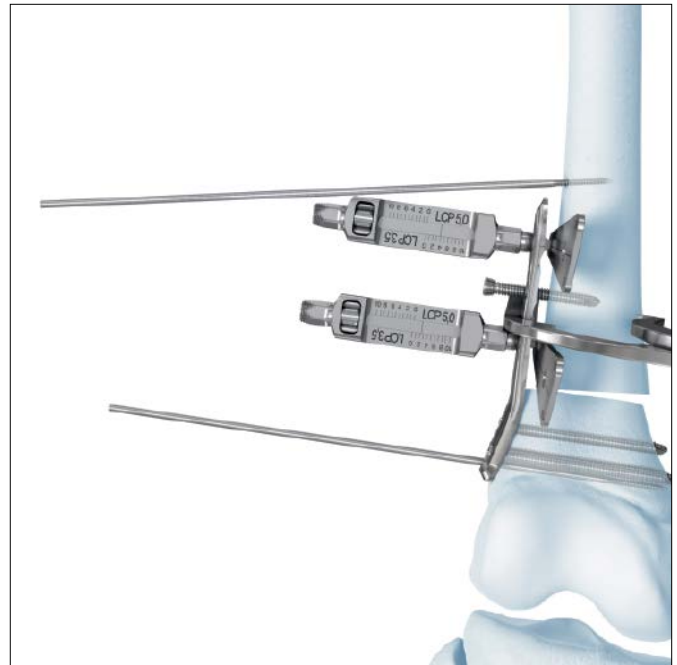


**Additional medialization (if required)**

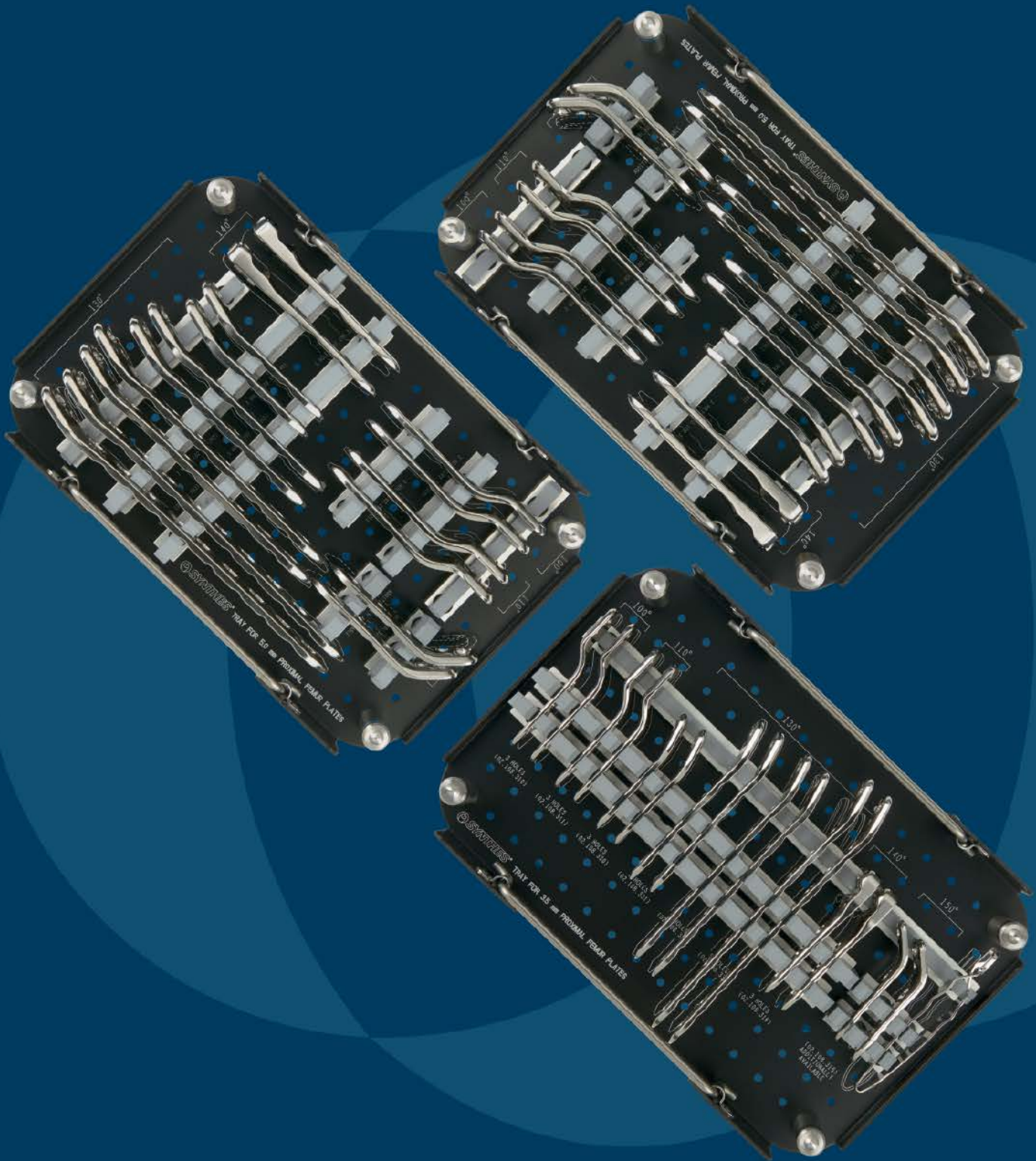
If the mechanical axis is not in line, additional medialization is required.

1. Remove screws in holes 1 and 3.
2. Loosen screw in hole 2 if already inserted.  
It may be necessary to use a longer screw.
3. Place positioning plates (triangles) over holes 1 and 3 to prevent protrusion of the bar into the pre-existing holes.
4. Further adjust the knob on both medialization instruments in holes 1 and 3 to the new correction level.
5. Tighten screw in hole 2.
6. Add screws 1 and 3.

**Note:** Should the correction not turn out as planned, further correction may be achieved by re-positioning locking screws in the proximal fragment to correct unintended deviation.



# PRODUCT AND SET INFORMATION



# IMPLANTS

## 2.7 mm Pediatric LCP Hip Plates ◊

	Angle	Shaft Holes	Length (mm)	Proximal/Distal Width (mm)
02.108.300	100°	2	46	12/8
02.108.301	110°	2	46	12/8
02.108.303	130°	2	46	12/8

## 3.5 mm Pediatric LCP Hip Plates ◊

	Angle	Shaft Holes	Length (mm)	Proximal/Distal Width (mm)
02.108.310	100°	3	73	19/12
02.108.311	110°	3	73	19/12
02.108.313*	120°	4	75	19/12
02.108.330	130°	3	62	19/12
02.108.331	130°	5	88	19/12
02.108.332	130°	7	114	19/12
02.108.333	130°	9	140	19/12
02.108.316	140°	3	70	19/12
02.108.315*	150°	3	58	19/12

## 5.0 mm Pediatric LCP Hip Plates ◊

	Angle	Shaft Holes	Length (mm)	Proximal/Distal Width (mm)
02.108.320	100°	3	90	23/15
02.108.321	110°	3	90	23/15
02.108.323*	120°	4	95	23/15
02.108.340	130°	3	79	23/15
02.108.341	130°	5	111	23/15
02.108.342	130°	7	143	23/15
02.108.343	130°	9	175	23/15
02.108.326	140°	3	90	23/15
02.108.325*	150°	3	74	23/15

## 3.5 mm Pediatric LCP Condylar Plates ◊

	Angle	Shaft Holes	Length (mm)	Proximal/Distal Width (mm)
02.108.410	90°	3	75	19/12
02.108.411	90°	5	101	19/12
02.108.412	90°	7	127	19/12

## 5.0 mm Pediatric LCP Condylar Plates ◊

	Angle	Shaft Holes	Length (mm)	Proximal/Distal Width (mm)
02.108.420	90°	3	95	23/15
02.108.421	90°	5	127	23/15
02.108.422	90°	7	159	23/15

These implants are available nonsterile or sterile-packed.

◊ Add "S" to product number to order sterile product.

\*Additionally available



# INSTRUMENTS

---

## Guiding Blocks

---

03.108.001 Pediatric LCP Hip Plate Guiding Block for 3.5 mm Screws



---

03.108.002 Pediatric LCP Hip Plate Guiding Block for 5.0 mm Screws



---

03.108.033 Pediatric LCP Hip Plate Guiding Block, for 2.7 mm Screws



## Positioning Devices for Guiding Blocks

---

03.108.006 Positioning Device for Guiding Block



---

03.108.034 Positioning Device for Guiding Block, for 2.7 mm Screws



---

**Osteotomy Measuring Devices**

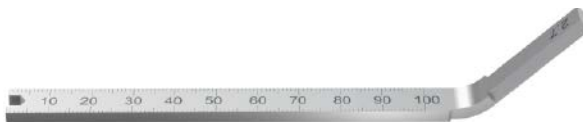
---

03.108.008 Osteotomy Measuring Device



---

03.108.039 Osteotomy Measuring Device, for 2.7 mm Pediatric LCP Hip Plates



---

**Kirschner Wires, Guide Wires and Adaptor**

---

03.108.005 2.8 mm Kirschner Wire Spade Point, 200 mm



---

03.108.040 K-Wire Adaptor, for 2.8 mm K-wires (03.108.005)



---

292.65 2.0 mm Threaded Guide Wire, 230 mm, spade point, black



---

292.79 2.0 mm Kirschner Wire with thread, 150 mm, trocar point, 15 mm thread length



---

**Drill Sleeves, Drill Guides, and Reduction Sleeve**

---

03.108.004      Reduction Sleeve 4.3 mm/2.8 mm




---

03.108.009      2.8 mm Threaded Drill Guide, for 3.5 mm Pediatric LCP Hip Plate




---

03.108.010      4.3 mm Threaded Drill Guide, for 5.0 mm Pediatric LCP Hip Plate




---

03.108.036      2.0 mm Threaded Drill Guide, for 2.7 mm Pediatric LCP Hip Plate




---

312.28            3.5 mm/2.5 mm Double Drill Sleeve




---

312.46            4.5 mm/3.2 mm Double Drill Sleeve




---

323.26            2.7 mm Universal Drill Guide



---

**Drill Bits**

---

310.25      2.5 mm Drill Bit, quick coupling, 110 mm, gold




---

310.28      2.7 mm Drill Bit, quick coupling, 125 mm




---

310.284      2.8 mm Drill Bit, quick coupling, 165 mm




---

310.31      3.2 mm Drill Bit, quick coupling, 145 mm




---

310.430      4.3 mm Drill Bit, quick coupling, 221 mm




---

323.062      2.0 mm Drill Bit with depth mark, quick coupling, 140 mm



---

**Depth Gauges and Measuring Devices**

---

03.503.036 MatrixMANDIBLE Depth Gauge



---

319.01 Depth Gauge for small screws, measures up to 60 mm



---

319.10 Depth Gauge for large screws, measures up to 110 mm



---

03.108.003 Direct Measuring Device, for 2.8 mm Kirschner Wires



---

03.108.037 Direct Measuring Device, for 2.0 mm Kirschner Wires



---

**Screwdrivers and Screwdriver Shafts**

---

03.110.007 StarDrive Screwdriver T8



---

313.304 StarDrive Screwdriver Shaft, T8, cylindrical, with groove



---

314.03 Small Hexagonal Screwdriver Shaft



---

314.070 Small Hexagonal Screwdriver, 2.5 mm width across flats



---

314.115 StarDrive Screwdriver, T15, self-retaining



---

314.116 StarDrive Screwdriver Shaft, T15, self-retaining, quick coupling



---

03.010.150 Star/HexDriver Screwdriver, T25, 3.5 mm  
hex, self-retaining



---

03.010.151 Star/HexDriver Screwdriver Shaft, T25,  
3.5 mm hex, self-retaining, 165 mm



---

314.03 Small Hexagonal Screwdriver Shaft,  
quick coupling



---

314.116 StarDrive Screwdriver Shaft, T15,  
self-retaining, quick coupling



---

**Handles and Torque Limiters**

---

03.110.005      Handle for Torque-Limiting Attachment



---

311.43          Handle with quick coupling, small



---

397.706          Handle for AO Reaming Coupler Connection



---

511.776          Torque-Limiting Attachment, 0.8 Nm



---

511.773          Torque-Limiting Attachment, 1.5 Nm, quick coupling



---

511.774          Torque-Limiting Attachment, 4 Nm, for AO reaming coupler





---

**Bone Holding Forceps and Reduction Forceps**

---

399.091 Bone Holding Forceps, soft ratchet for plates 9 mm wide



---

399.098 Reduction Forceps with serrated jaw, medium handle, soft ratchet



---

399.121 Bone Holding Forceps, soft ratchet, for plates to 14 mm wide



---

399.124 Reduction Forceps with serrated jaw, large handle, soft ratchet



---

**Positioning Plates**

---

333.060      90°/50°/40° Triangular Positioning Plate



---

333.070      80°/70°/30° Triangular Positioning Plate



---

333.080      100°/60°/20° Triangular Positioning Plate

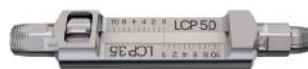


---

**Additional Instruments**

---

03.108.007      Medialization Guide for 3.5 mm and 5.0 mm LCP Plates



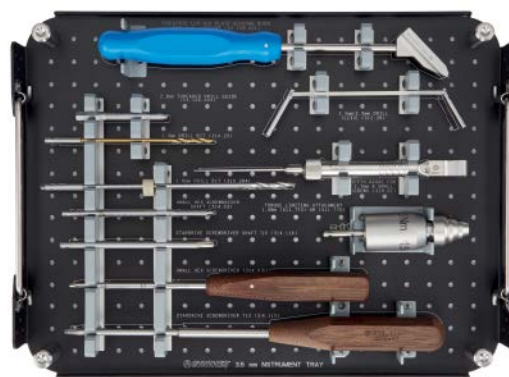
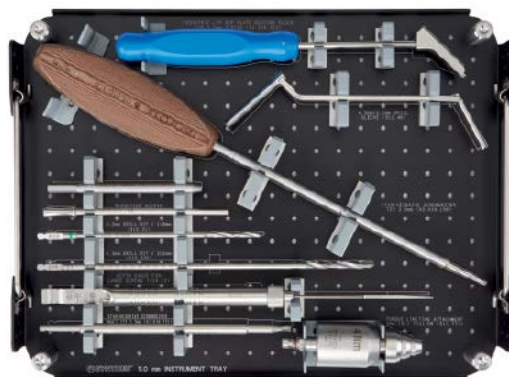
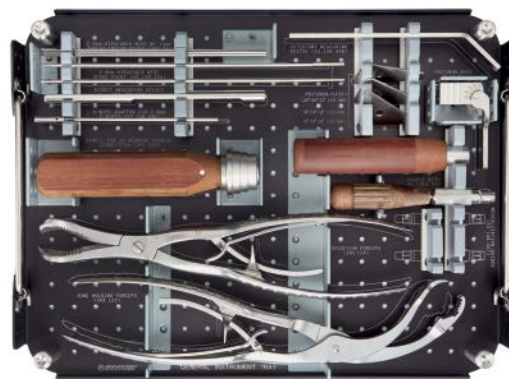
# PEDIATRIC LCP PLATE SYSTEM INSTRUMENT SET (01.108.004)

## Graphic Case

61.108.041 Pediatric LCP Plate System Instrument Set Graphic Case

## Instruments

- 03.010.150 Star/HexDrive Screwdriver, T25, 3.5 mm hex, self-retaining
- 03.010.151 Star/HexDrive Screwdriver Shaft, T25, 3.5 mm hex, self-retaining, 165 mm, 2 ea.
- 03.108.001 Pediatric LCP Hip Plate Guiding Block for 3.5 mm Screws
- 03.108.002 Pediatric CP Hip Plate Guiding Block for 5.0 mm Screws
- 03.108.003 Direct Measuring Device, for 2.8 mm Kirschner Wires
- 03.108.004 Reduction Sleeve, 4.3 mm/2.8 mm, 2 ea.
- 03.108.005 2.8 mm Kirschner Wire, spade point, 200 mm, 8 ea.
- 03.108.006 Positioning Device for Guiding Block
- 03.108.007 Medialization Guide, for 3.5 mm and 5.0 mm LCP Plates, 2 ea.
- 03.108.008 Osteotomy Measuring Device
- 03.108.009 2.8 mm Threaded Drill Guide, for 3.5 mm Pediatric LCP Hip Plate, 2 ea.
- 03.108.010 4.3 mm Threaded Drill Guide, for 5.0 mm Pediatric LCP Hip Plate, 2 ea.
- 03.108.040 K-wire Adaptor for 2.8 mm Kirschner Wires (03.108.005)
- 292.79 2.0 mm Kirschner Wire with 15 mm Thread, trocar point, 150 mm, 1 pkg. of 10
- 310.25 2.5 mm Drill Bit, quick coupling, 110 mm, gold, 2 ea.
- 310.284 2.8 mm Drill Bit, quick coupling, 165 mm, 2 ea.



Graphic case trays include color-coded posts:

- Instruments for use with 5.0 mm implants
- Instruments for use with 3.5 mm implants

Note: For additional information, please refer to the package insert or [www.e-ifu.com](http://www.e-ifu.com).

For detailed cleaning and sterilization instructions, please refer to [www.depuyorthopedics.com/hcp/cleaning-sterilization](http://www.depuyorthopedics.com/hcp/cleaning-sterilization) or sterilization instructions, if provided in the instructions for use.

---

310.31	3.2 mm Drill Bit, quick coupling, 145 mm, 2 ea.
310.430	4.3 mm Drill Bit, quick coupling, 221 mm, 2 ea.
311.43	Handle with quick coupling, small
312.28	3.5 mm/2.5 mm Double Drill Sleeve
312.46	4.5 mm/3.2 mm Double Drill Sleeve
314.03	Small Hexagonal Screwdriver Shaft, 2 ea.
314.070	Small Hexagonal Screwdriver, 2.5 mm width across flats
314.115	StarDrive Screwdriver, T15, self-retaining
314.116	StarDrive Screwdriver Shaft, T15, self-retaining, quick coupling, 2 ea.
319.01	Depth Gauge, for 2.7 mm and small screws
319.10	Depth Gauge, for large screws
333.060	90°/50°/40° Triangular Positioning Plate
333.070	80°/70°/30° Triangular Positioning Plate
333.080	100°/60°/20° Triangular Positioning Plate
397.706	Handle for AO Reaming Coupler
399.122	Bone Holding Forceps, soft ratchet, for plates to 19 mm wide
399.124	Reduction Forceps with serrated jaw, large handle, soft ratchet
511.773	Torque-Limiting Attachment, 1.5 Nm, quick coupling
511.774	Torque-Limiting Attachment, 4 Nm, for AO reaming coupler

**Also Available**

397.705	Handle, quick coupling, for Compact Air Drive
511.770	Torque-Limiting Attachment, 1.5 Nm
511.771	Torque-Limiting Attachment, 4 Nm

# PEDIATRIC LCP PLATE SYSTEM IMPLANT SET (01.108.005)

## Graphic Case

61.108.032 Pediatric LCP Plate System Implant Set  
Graphic Case

## Instrument

319.97 Screw Forceps

## Implants

3.5 mm Pediatric LCP Hip Plates, 2 ea.

	Angle	Shaft Holes
02.108.310	100°	3
02.108.311	110°	3
02.108.330	130°	3
02.108.331	130°	5
02.108.332	130°	7
02.108.333	130°	9
02.108.316	140°	3

5.0 mm Pediatric LCP Hip Plates, 2 ea.

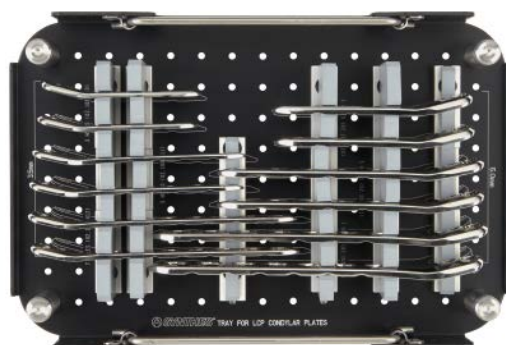
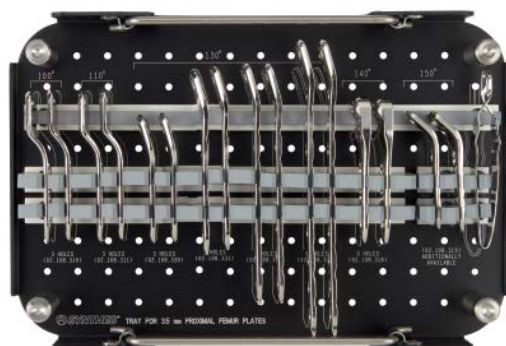
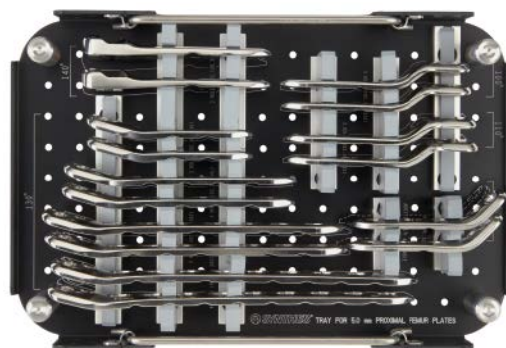
	Angle	Shaft Holes
02.108.320	100°	3
02.108.321	110°	3
02.108.340	130°	3
02.108.341	130°	5
02.108.342	130°	7
02.108.343	130°	9
02.108.326	140°	3

3.5 mm mm Pediatric LCP Condylar Plates, 2 ea.

	Angle	Shaft Holes
02.108.410	90°	3
02.108.411	90°	5
02.108.412	90°	7

5.0 mm Pediatric LCP Condylar Plates, 2 ea.

	Angle	Shaft Holes
02.108.420	90°	3
02.108.421	90°	5
02.108.422	90°	7



Graphic case trays include color-coded posts:

5.0 mm implants

3.5 mm implants

3.5 mm Cortex Screws, self-tapping, 4 ea.

	Length (mm)
204.820	20
204.822	22
204.824	24
204.826	26
204.828	28
204.830	30
204.832	32
204.834	34
204.836	36
204.838	38
204.840	40

3.5 mm Locking Screws, self-tapping, with T15 StarDrive Recess, 4 ea.

	Length (mm)
212.106	20
212.107	22
212.108	24
212.109	26
212.110	28
212.111	30
212.112	32
212.113	34
212.115	36
212.116	38
212.117	40
212.119	45
212.121	50
212.123	55
212.124	60

5.0 mm Locking Screws, self-tapping, with T25 StarDrive Recess, 4 ea.

	Length (mm)
212.205	22
212.206	24
212.207	26
212.208	28
212.209	30
212.210	32
212.211	34
212.212	36
212.213	38
212.214	40
212.215	42
212.216	44
212.217	46
212.218	48
212.219	50
212.221	60
212.223	70
212.224	75

4.5 mm Cortex Screws, self-tapping, 4 ea.

	Length (mm)
214.822	22
214.824	24
214.826	26
214.828	28
214.830	30
214.832	32
214.834	34
214.836	36
214.838	38
214.840	40
214.842	42
214.844	44

---

**Also Available**

- 02.108.313 3.5 mm Pediatric LCP Hip Plate, 120°,  
4 holes, 75 mm length, 19 mm
- 02.108.315 3.5 mm Pediatric LCP Hip Plate, 150°,  
3 holes, 58 mm length, 19 mm
- 02.108.323 5.0 mm Pediatric LCP Hip Plate, 120°,  
4 holes, 95 mm length, 23 mm
- 02.108.325 5.0 mm Pediatric LCP Hip Plate, 150°,  
3 holes, 74 mm length, 23 mm
- 61.108.036 Pediatric LCP Plates, Rack for 3.5 mm,  
4.5 mm and 5.0 mm screws

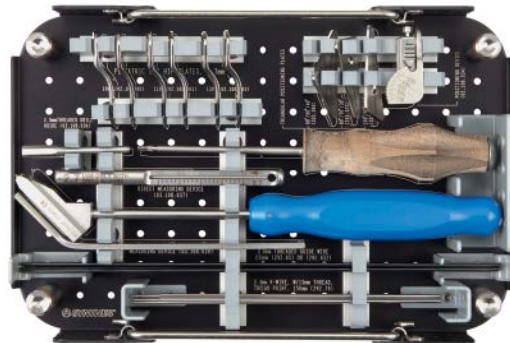
# PEDIATRIC LCP PLATE SYSTEM, 2.7 MM, IMPLANT AND INSTRUMENT SET (01.108.046)

## Graphic Case

61.108.037 2.7 mm Pediatric LCP Plate System  
Graphic Case

## Instruments

- 03.108.033 Pediatric LCP Hip Plate Guiding Block for 2.7 mm Screws
- 03.108.034 Positioning Device for Guiding Block for 2.7 mm Screws
- 03.108.036 2.0 mm Threaded Drill Guide for 2.7 mm Pediatric LCP Hip Plate, 2 ea.
- 03.108.037 Direct Measuring Device for 2.0 mm Kirschner Wires
- 03.108.039 Osteotomy Measuring Device for 2.7 mm Pediatric LCP Hip Plate
- 03.110.005 Handle for Torque-Limiting Attachment
- 03.110.007 StarDrive Screwdriver T8
- 03.503.036 MatrixMANDIBLE Depth Gauge
- 292.652 2.0 mm Non-colored Threaded Guide Wire, 230 mm, 8 ea.
- 292.79 2.0 mm Kirschner Wire with 15 mm thread, trocar point, 150 mm, 1 tp
- 314.467 StarDrive Screwdriver Shaft, T8, 105 mm, 2 ea.
- 314.468 Holding Sleeve for StarDrive Screwdriver Shaft, T8 (314.467)
- 315.26 2.7 mm Three-Fluted Drill Bit, quick coupling, 110 mm, 2 ea.
- 319.97 Screw Forceps
- 323.062 2.0 mm Drill Bit with depth mark, quick coupling, 140 mm, 2 ea.
- 323.26 2.7 mm Universal Drill Guide
- 333.060 90°/50°/40° Triangular Positioning Plate
- 333.070 80°/70°/30° Triangular Positioning Plate
- 333.080 100°/60°/20° Triangular Positioning Plate
- 399.091 Bone Holding Forceps, soft ratchet for plates 9 mm wide
- 399.098 Reduction Forceps with serrated jaw, medium handle, soft ratchet
- 511.776 Torque-Limiting Attachment 0.8 Nm, quick coupling



Graphic case trays include color-coded posts:

Instruments for use with 2.7 mm implants



**Implants**

2.7 mm Pediatric LCP Hip Plates, 2 ea. <sup>◇</sup>

	Angle	Shaft Holes
02.108.300	100°	2
02.108.301	110°	2
02.108.303	130°	2

2.7 mm Locking Screws, self-tapping, with T8 StarDrive Recess

	Length (mm)	Qty.
202.208	8	3
202.210	10	3
202.212	12	4
202.214	14	4
202.216	16	5
202.218	18	5
202.220	20	5
202.222	22	5
202.224	24	5
202.226	26	5
202.228	28	5
202.230	30	5
202.232	32	5
202.234	34	5
202.236	36	5
202.238	38	5
202.240	40	5
202.242	42	5
202.244	44	5
202.246	46	4
202.248	48	4
202.250	50	3
202.255	55	3
202.260	60	3

2.7 mm Cortex Screws, self-tapping, with T8 StarDrive Recess

	Length (mm)	Qty.
202.870	10	4
202.872	12	4
202.874	14	4
202.876	16	4
202.878	18	4
202.880	20	4
202.882	22	4
202.884	24	4
202.886	26	4
202.888	28	4
202.890	30	4
202.892	32	4
202.894	34	4
202.896	36	4
202.898	38	4
202.900	40	3
202.965	46	3
202.967	50	3
202.968	55	3
202.969	60	3

**Also Available**

- 61.108.038 Pediatric LCP Plate System, Rack for 2.7 mm Screws
- 292.65 2.0 mm Threaded Guide Wire, 230 mm

<sup>◇</sup> Available nonsterile and sterile-packed. Add "S" to product number to indicate sterile product.

# BIBLIOGRAPHY

---

Hefti F et al. (1998) *Kinderorthopädie in der Praxis*. Berlin Heidelberg New York: Springer

Müller ME (1971) *Die hüftnahen Femurosteotomien*. 2. Auflage. Stuttgart: Thieme

Müller ME, Allgöwer M, Schneider R, Willenegger H (1995) *Manual of Internal Fixation*. 3rd, expanded and completely revised ed. 1991. Berlin, Heidelberg, New York: Springer

Morrissy RT, Weinstein SL (2001) *Atlas of Pediatric Orthopedic Surgery*. Philadelphia: Williams & Wilkins

Rüedi TP, Buckley RE, Moran CG (2007) *AO Principles of Fracture Management*. 2nd expanded ed. 2002. Stuttgart, New York: Thieme

Limited Warranty and Disclaimer: DePuy Synthes products are sold with a limited warranty to the original purchaser against defects in workmanship and materials. Any other express or implied warranties, including warranties of merchantability or fitness, are hereby disclaimed.

Please also refer to the package insert(s) or other labeling associated with the devices identified in this surgical technique for additional information.

CAUTION: Federal Law restricts these devices to sale by or on the order of a physician.

Some devices listed in this technique guide may not have been licensed in accordance with Canadian law and may not be for sale in Canada. Please contact your sales consultant for items approved for sale in Canada.

Not all products may currently be available in all markets.



*Manufactured or distributed by:*

**Synthes USA Products, LLC**  
1302 Wrights Lane East  
West Chester, PA 19380

**Synthes USA, LLC**  
1101 Synthes Avenue  
Monument, CO 80132

**Synthes GmbH**  
Luzernstrasse 21  
4528 Zuchwil, Switzerland

To order (USA): 800-523-0322

To order (Canada): 844-243-4321

*Note: For recognized manufacturer, refer to the product label.*

[www.depuyssynthes.com](http://www.depuyssynthes.com)