

For Osteotomies and Fracture Fixation of the Proximal and Distal Femur

Pediatric LCP[®] Plate System

Surgical Technique





PEDIATRIC LCP® PLATES

INDICATIONS

The Pediatric 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

The Pediatric 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 Plate System offers a wide range of locking compression plates along with a surgical technique specifically developed for the pediatric patient. The Pediatric 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 Plates

Pediatric 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	 3H	 3 holes
110°	Varus osteotomies	 3H	 3 holes
120°**	Fractures		 4 holes
130°	Fractures	 3H	 3, 5, 7 or 9 holes
140°	Valgus osteotomies		 3 holes
150°**	Valgus osteotomies		 3 holes

*Screws sold separately

**Additionally available.

2.7 MM PEDIATRIC LCP HIP PLATES: VARUS OSTEOTOMY



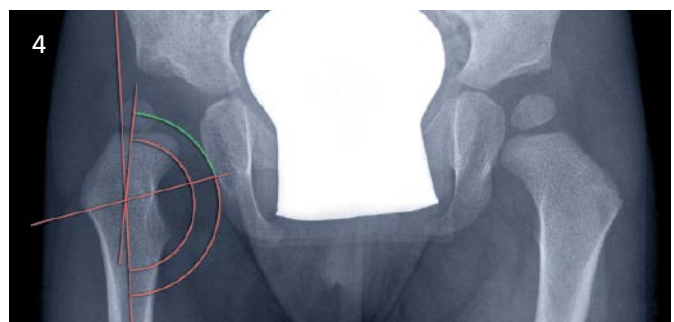
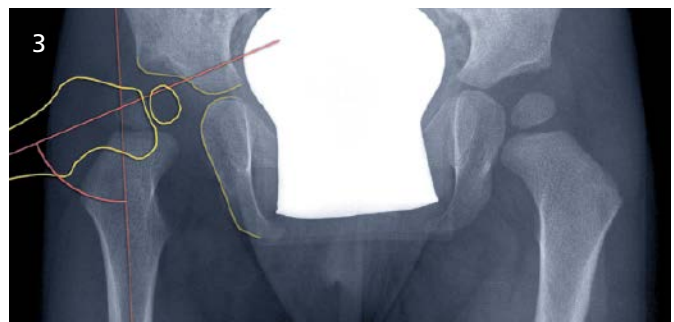
Preoperative planning is vital for proximal femoral osteotomies. Although there are different ways of planning, they are all designed to achieve the same result.

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

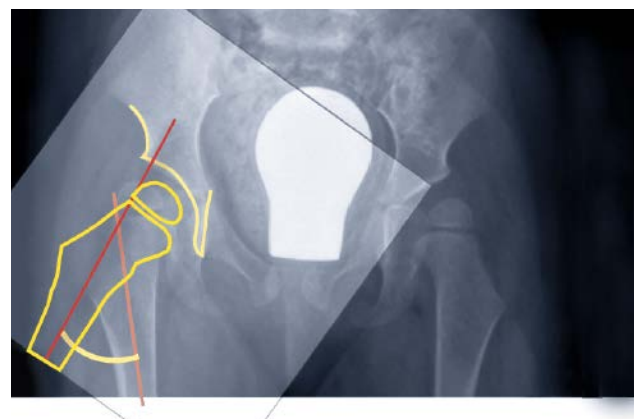
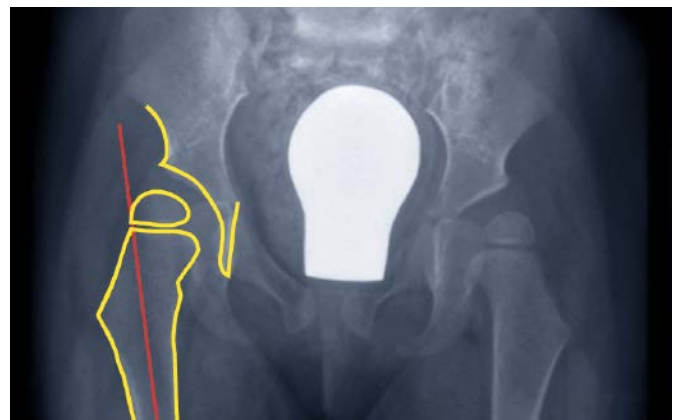
The positioning Kirschner wire is inserted at an angle to the femoral neck. To determine the insertion angle of the positioning Kirschner wire using the guiding block and positioning device for guiding block, subtract the plate angle from the desired neck/shaft angle.

Example:

Desired neck/shaft angle: 130°

Plate angle: 110°

Insert positioning Kirschner wire at 20° to the femoral neck



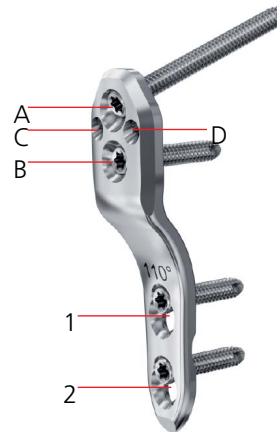
4

Technique using 2.7 mm Pediatric LCP Hip Plates

Varus osteotomy of the proximal femur 110° plate

The surgical technique refers to screw holes where applicable.

Please see the designation of each hole as indicated.



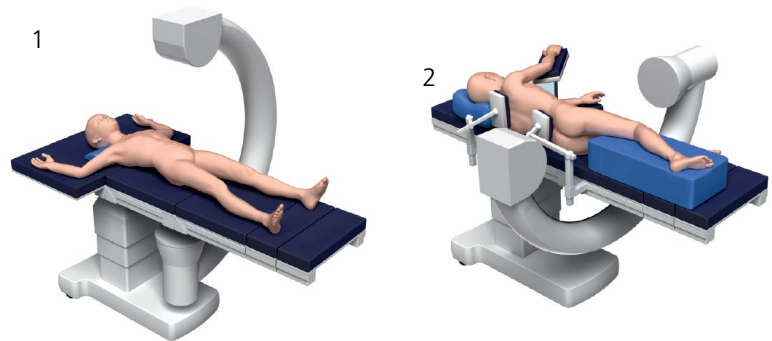
A: Neck screw
B: Calcar screw
C and D: Guide wires
1 and 2: LCP Locking Screws or
Cortex Shaft Screws

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.



2

Approach

Use a standard lateral approach to the proximal femur.

GUIDE WIRE INSERTION

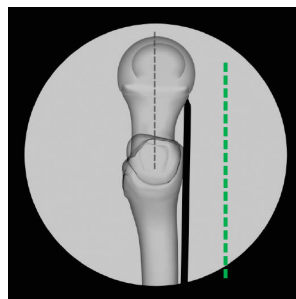
1

Locate trochanteric epiphysis and determine anteversion

Instrument

5900020150 Kirschner Wire Trocar Tip 2x150mm

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.



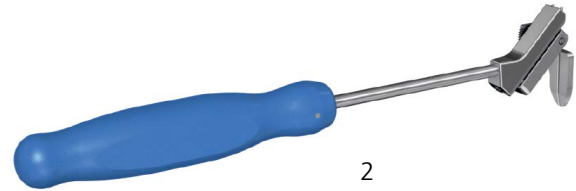
Note: Position the K-wire at a downward angle to avoid interference with the instruments.

2 Insert positioning guide wires in holes C and D

Instruments

5711000127	Pediatric LCP Hip Plate Guiding Block, for 2.7 mm screws
5711000227	Positioning Device for Guiding Block, for 2.7 mm screws
5900020230	Guide Wire Threaded Tip Trocar 2x230mm

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



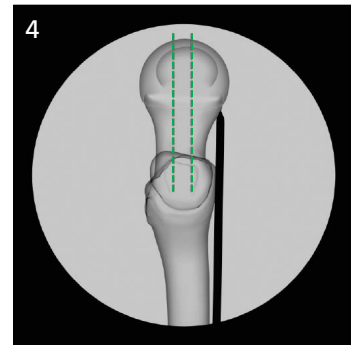
Guide Wire Insertion

- 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).



5



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.

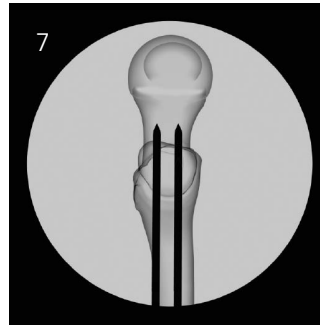
Precautions:

- 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.

6



- ⓘ **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

5711000127 Pediatric LCP Hip Plate Guiding Block for 2.7 mm Screws

5711000227 Positioner for Aiming Block 2.7

5901520150 Kirschner Wire Threaded Tip 2x150/15mm

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).

1



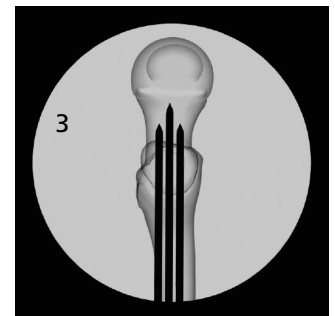
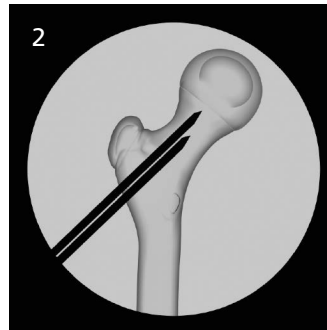
- ⓘ With the K-wires for holes A and B, the position and length of the screws are defined; at the same time, the holes are predrilled for the 2.7 mm screws.

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

5711000327 Osteotomy Measuring Device, for 2.7 mm

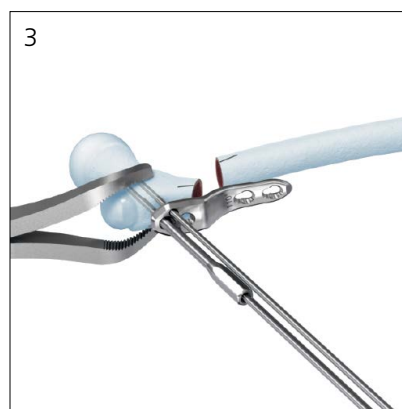
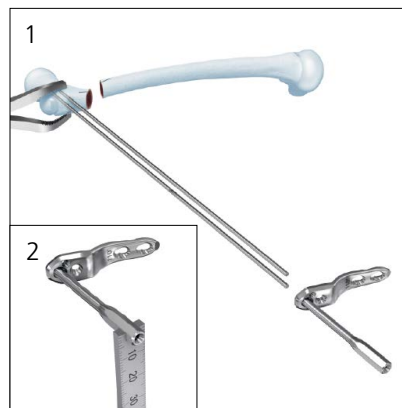
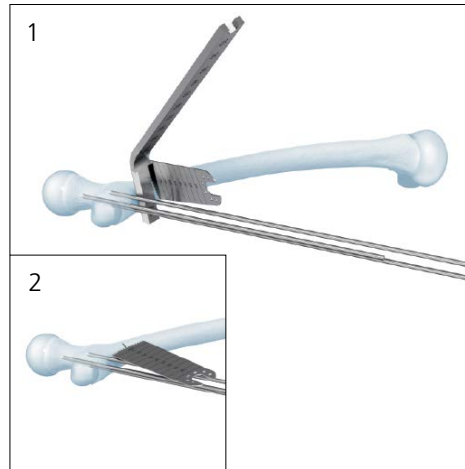
Optimal positioning of the osteotomy when using a 2.7 mm plate is 9 mm distal to the guide wires in holes C and D. Determine the distance with the corresponding end of the osteotomy measuring device (1).

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

5713000027 Threaded sleeve for Plate 2,7mm

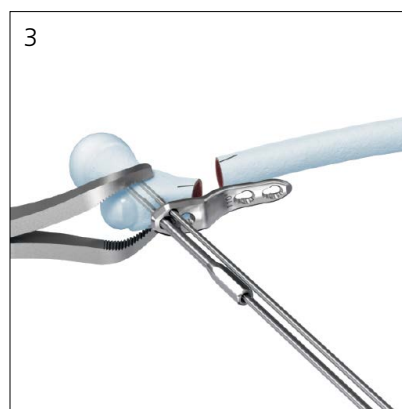
5711000327 Osteotomy Measuring Device, for 2.7

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

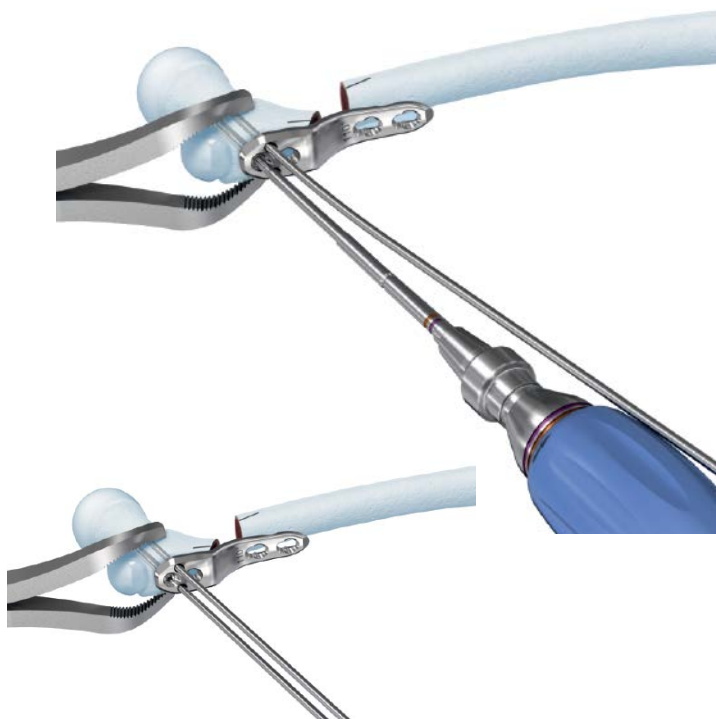
5711000280 Direct Measuring Device, for 2.8 mm
Kirschner Wires 200mm

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.

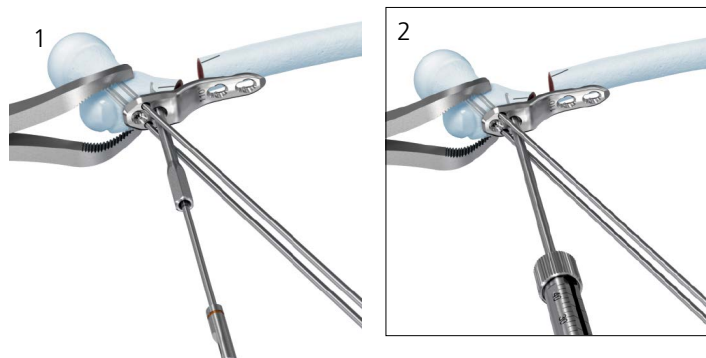
Note: In order to determine the correct screw length, use the direct measuring device with the 150 mm length K-wire.



4

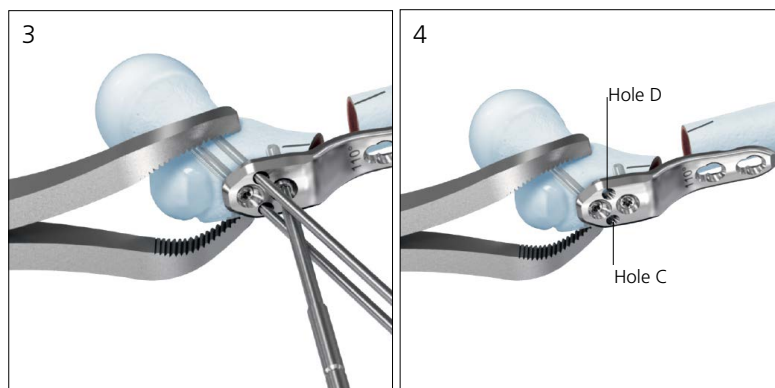
Insert calcar screw in hole B

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

- 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).



DISTAL FIXATION

Instruments

5713000027 Threaded sleeve for Plate 2,7mm

5711000200 Direct Measuring Device, for 2.0 mm Kirschner Wires for 2.7mm Plate

5711000027 Depth gauge for 2,7 screw 8-60

5910020140 Drill Bit 2.0mm length 140mm

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.



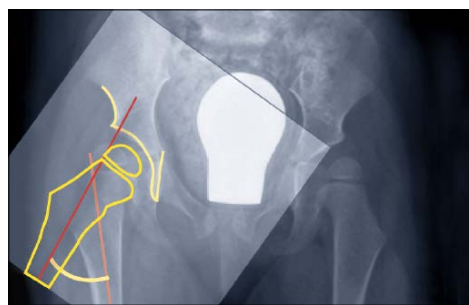
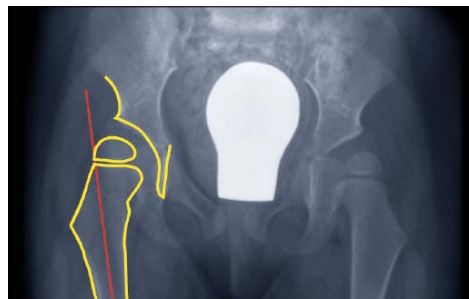
Precaution: Cortical screws cannot safely be inserted after a locking screw has been used in the distal fragment.

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



Functional aspect

- ① 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)

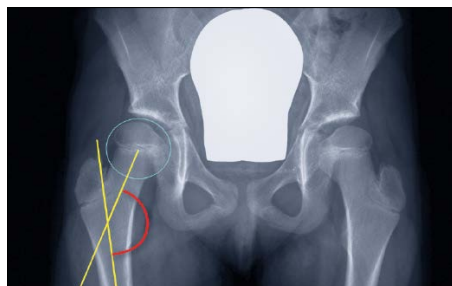


Calculate the correction angle: The angle between the anatomical axis of the femur in the AP x-ray and the abduction x-ray or the AP x-ray and the template, respectively, determine the correction angle.

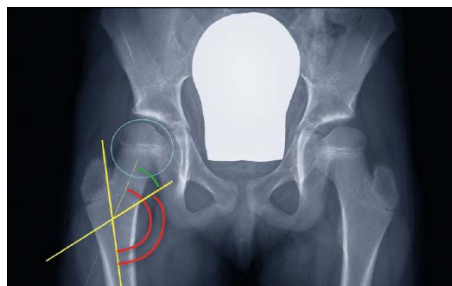
Note: Use of the template technique may reduce x-ray exposure.

Anatomical aspect

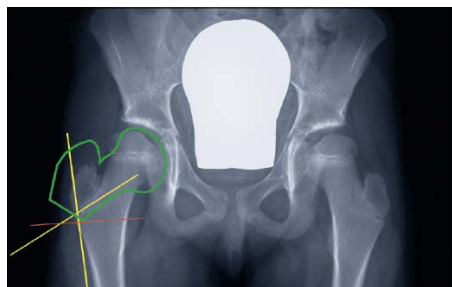
- ① Anatomical planning is based on a clear AP pelvis x-ray with at least 30° of internal rotation of both legs. This guarantees the correct projection of the real femoral neck/shaft (CCD) angle.
 1. Measure the pathological neck/shaft angle.
 2. Determine the desired neck/shaft angle.



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.

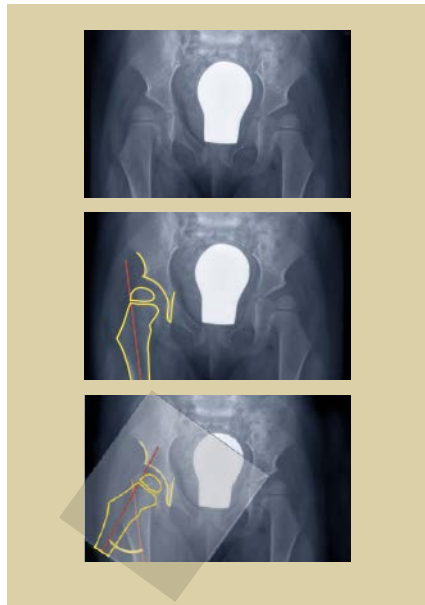


Calculation of the correction: The angle between the initial axis of the femoral neck in the AP x-ray and the planned neck/shaft angle determine the correction angle.



Formula

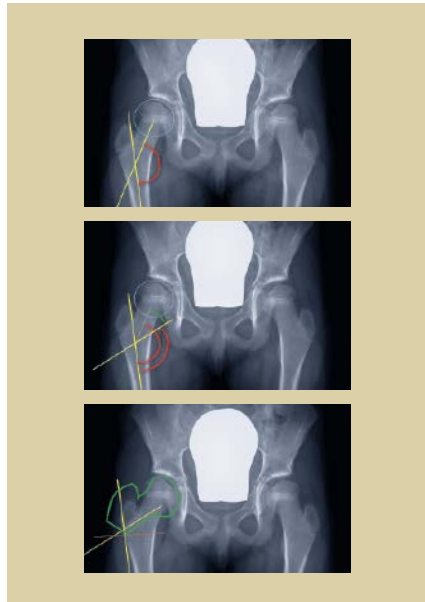
Positioning K-wire angle = **correction angle (results from the** **+ plate/screw angle**
functional or anatomical aspects)



=

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°

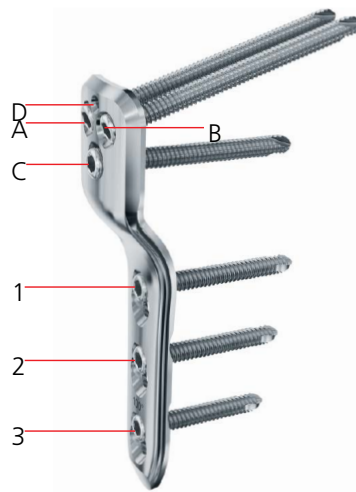
2

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.



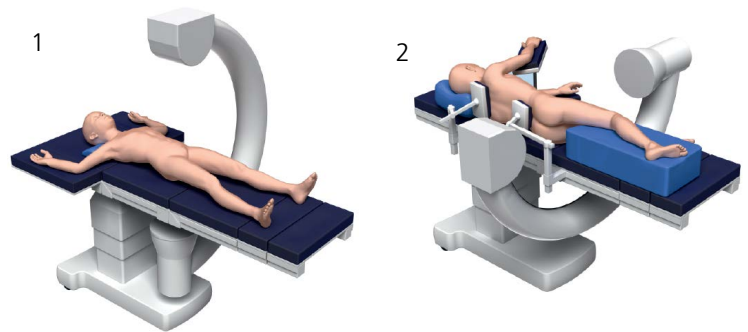
A, B: Neck screws
C: Calcar screw
D: Positioning Kirschner wire
1, 2 and 3: LCP Locking Screws or Cortex Shaft Screws

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.

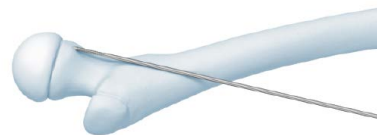
GUIDE WIRE INSERTION

1

Locate trochanteric epiphysis and determine anteversion

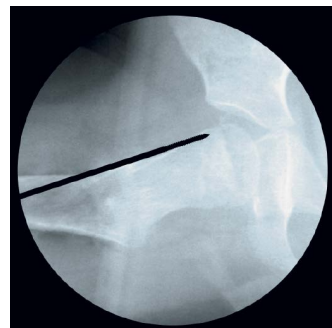
Instrument

5901520150	Kirschner	Wire	Threaded	Tip
	2x150/15mm			



- 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

5711000135	Pediatric LCP Hip Plate Guiding Block for 3.5 mm Screws
5711000235	Positioner for Aiming Block 3.5-5.0
5901520150	Kirschner Wire Threaded Tip 2x150/15mm

Instruments for 5.0 mm plate

5711000150	Pediatric LCP Hip Plate Guiding Block for 5.0 mm Screws
5711000235	Positioner for Aiming Block 3.5-5.0
5901520150	Kirschner Wire Threaded Tip 2x150/15mm

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).

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).

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.

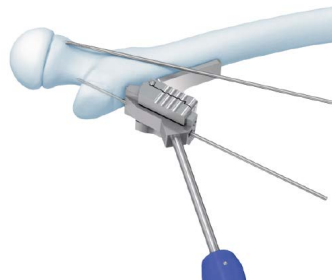
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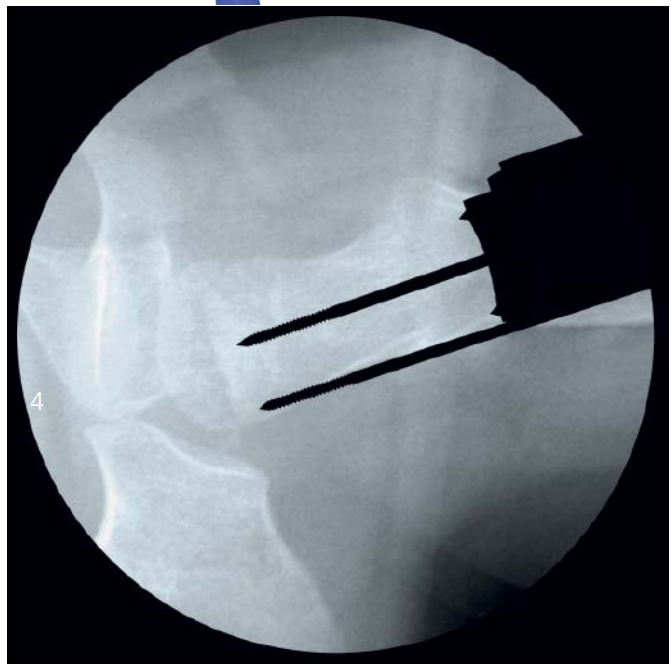
2



3



4



KIRSCHNER WIRE INSERTION

Insert Kirschner wires for proximal screws

Instruments for 3.5 mm plate

5711000135	Pediatric LCP Hip Plate Guiding Block for 3.5 mm Screws
5900028230	Kirschner Wire Threaded Tip 2.8x230
5711000235	Positioner for Aiming Block 3.5-5.0
5711000105	Kirschner Wire Adaptor for 2.8 K-Wires

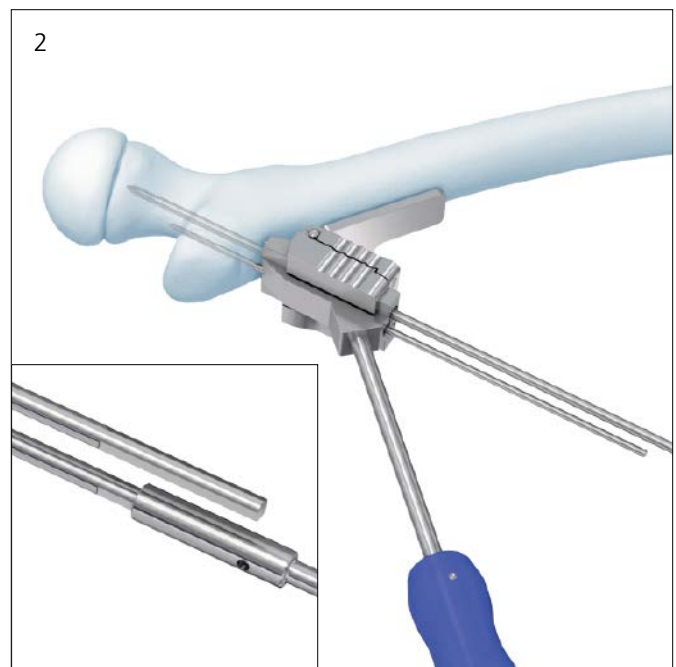
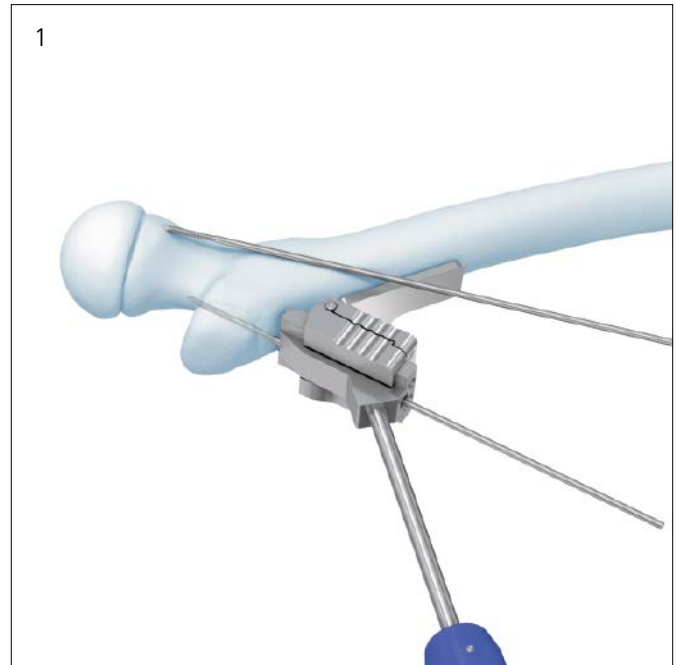
Instruments for 5.0 mm plate

5711000150	Pediatric LCP Hip Plate Guiding Block for 5.0 mm Screws
5900028230	Kirschner Wire Threaded Tip 2.8x230
5711000235	Positioner for Aiming Block 3.5-5.0
5711000105	Kirschner Wire Adaptor for 2.8 K-Wires

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.

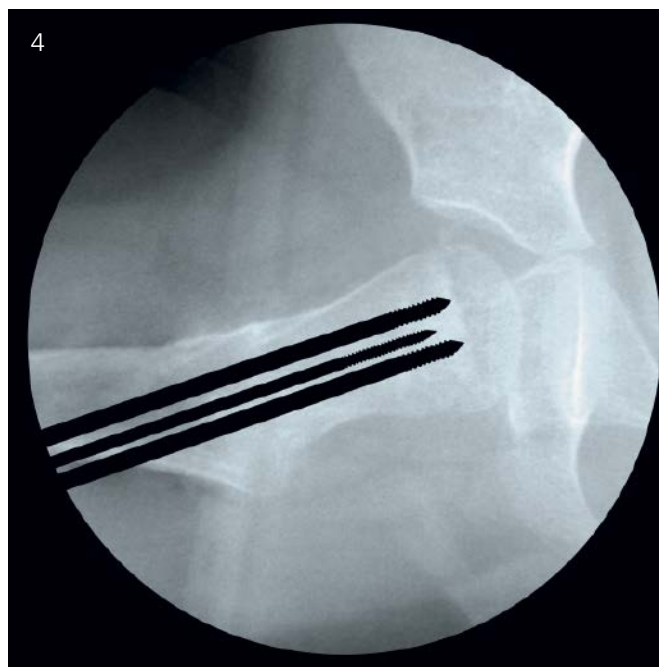
After inserting the K-wires for holes A and B, remove the guiding block and positioning device.

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

5711000335 Osteotomy Measuring Device for 3.5-5.0mm

5901520150 Kirschner Wire Threaded Tip 2x150/15mm

5711000101 Positioning Plate, triangular, length 45 mm, 90°/50°/40°

5711000102 Positioning Plate, triangular, length 45 mm, 80°/70°/30°

5711000103 Positioning Plate, triangular, length 45 mm, 100°/60°/20°

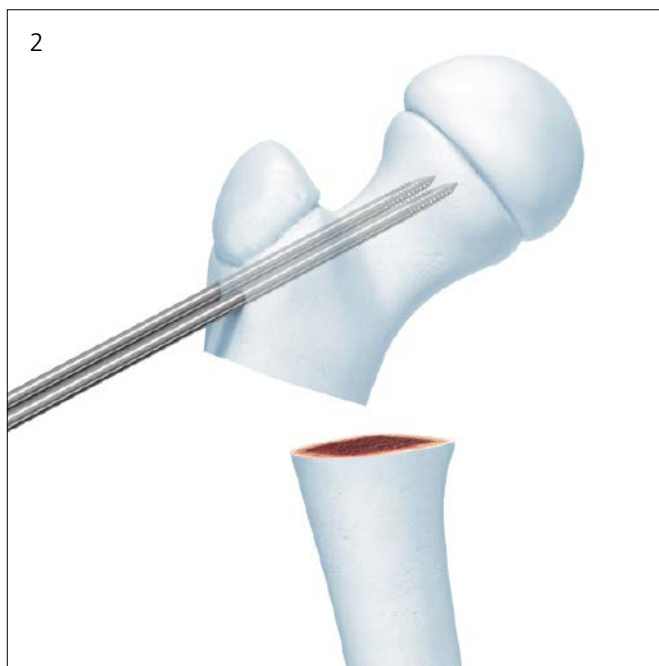
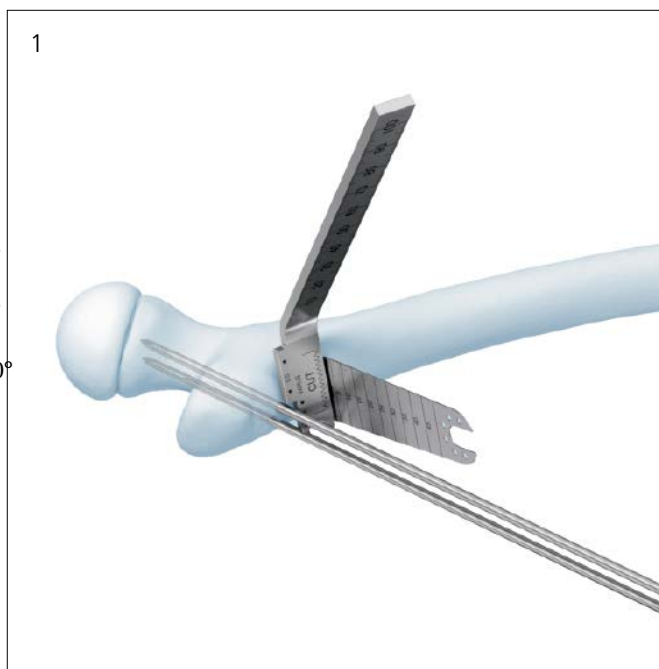
Optimal position of the osteotomy when using a 3.5 mm plate is 10 mm distal to the K-wires in holes A and B. Determine the distance with the corresponding end of the osteotomy measuring device (1).

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.



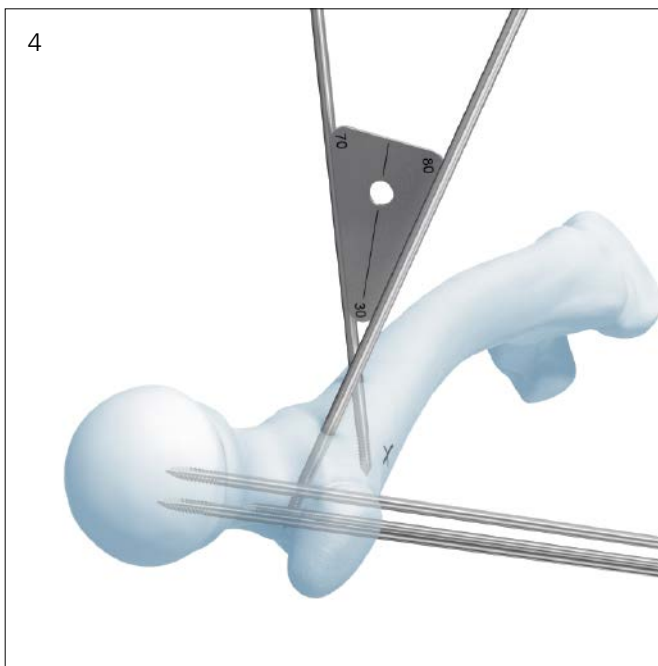
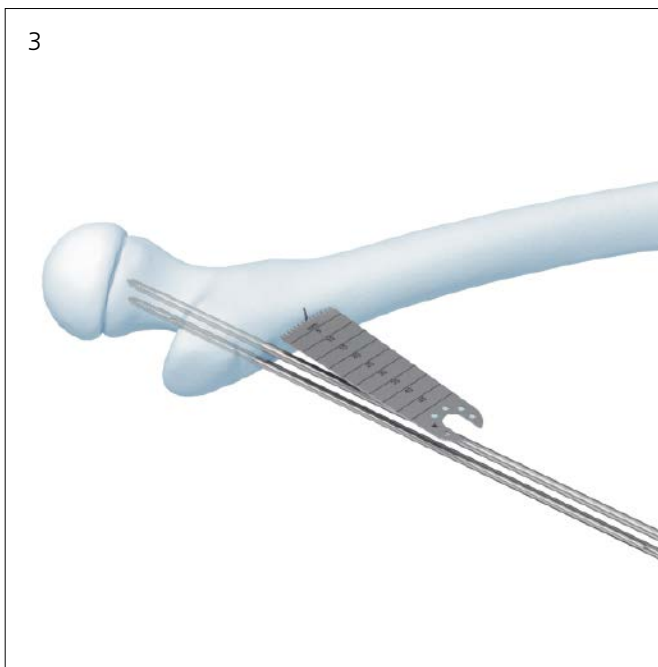
Considerations for external/internal rotation osteotomy

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

5711000335 Osteotomy Measuring Device for 3.5-5.0mm

5713000035 Threaded sleeve for Plate 3,5mm

Instruments for 5.0 mm plate

5711004328 Reduction Sleeve 4.3 mm/2.8 mm

5711000335 Osteotomy Measuring Device for 3.5-5.0mm

5713000150 Threaded sleeve for Plate 5.0mm Long

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

5711000280	Direct Measuring Device, for 2.8 mm Kirschner Wires 200mm
------------	--

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.



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

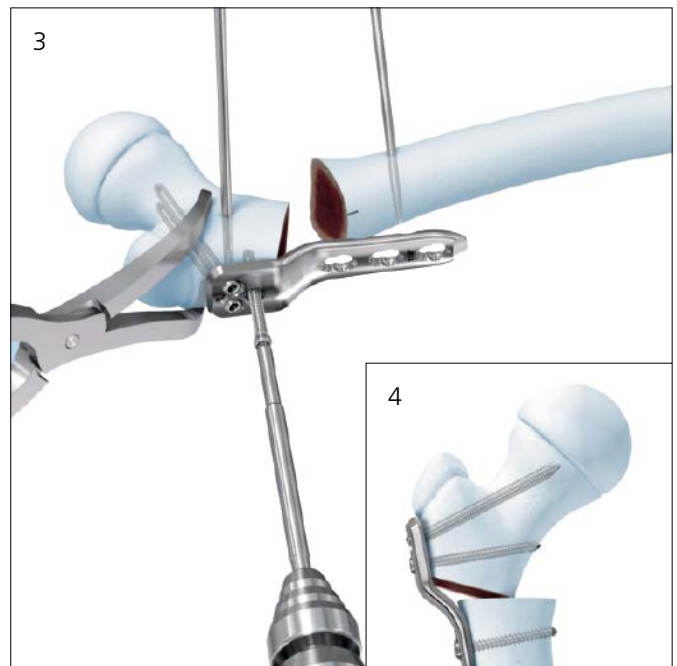
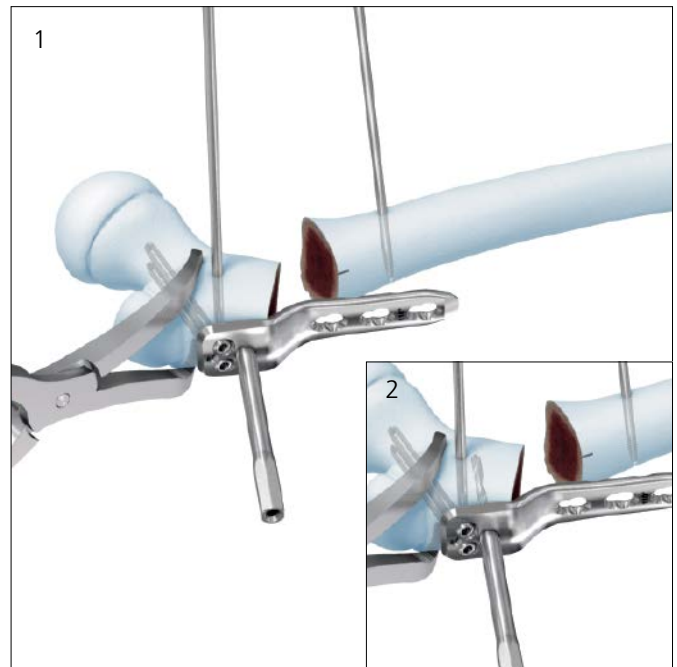


Attach the drill sleeve to hole C (1) and drill the hole for the calcar screw (2) with the LCP Drill Bit through both cortices.

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

- 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:

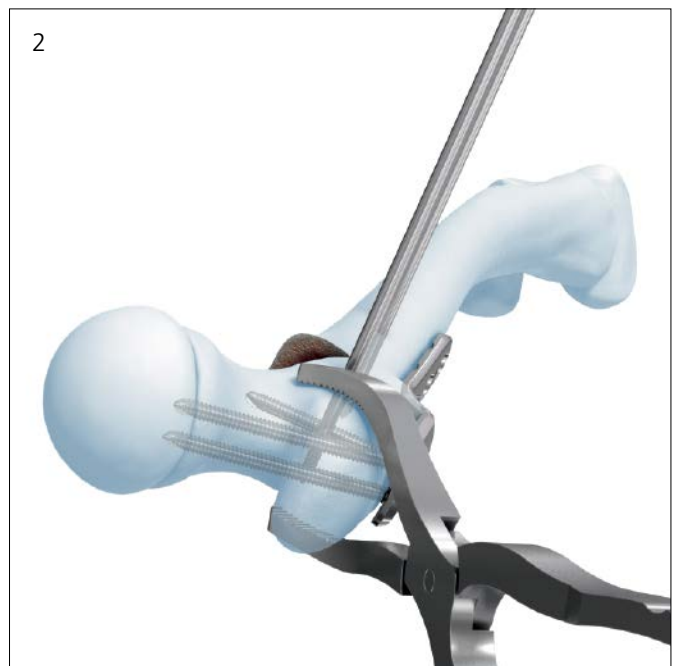
- If the plate is not aligned parallel to the femoral shaft in the AP view, it can lead to variations of the planned neck/shaft (CCD) angle.
- In case of a planned internal or external rotation osteotomy, the plate is fixed with the forceps and the distal part of the femur rotated (in this case laterally) 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

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.



MEDIALIZATION

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

Instruments for 3.5 mm plate

5711000104	Medialization Guide for 3.5 mm and 5.0 mm LCP Plates
5713000035	Threaded sleeve for Plate 3,5mm
5910028165	Drill Bit 2.8mm length 165mm
5711000035	Depth gauge for 3.5mm screw 8-80

Instruments for 5.0 mm plate

5711000104	Medialization Guide for 3.5 mm and 5.0 mm LCP Plates
5713000150	Threaded sleeve for Plate 5.0mm Long
5910043221	Drill Bit 4.3mm length 221mm
5711000050	Depth gauge for 5mm screw 10-120mm

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.

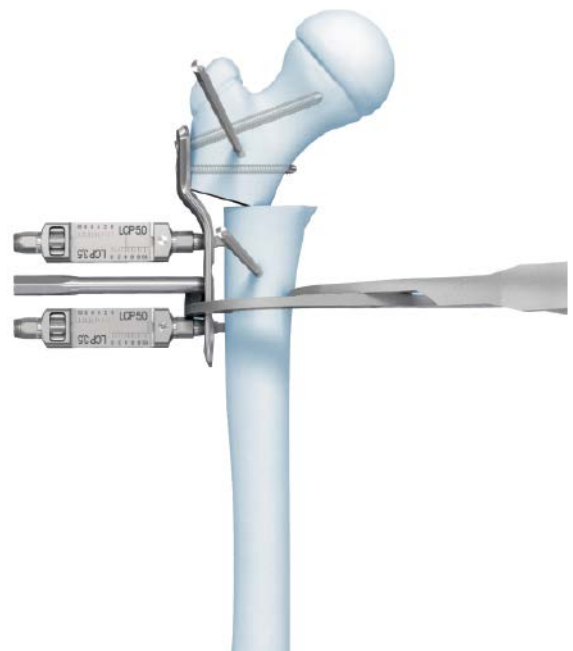
2

Insert locking screw

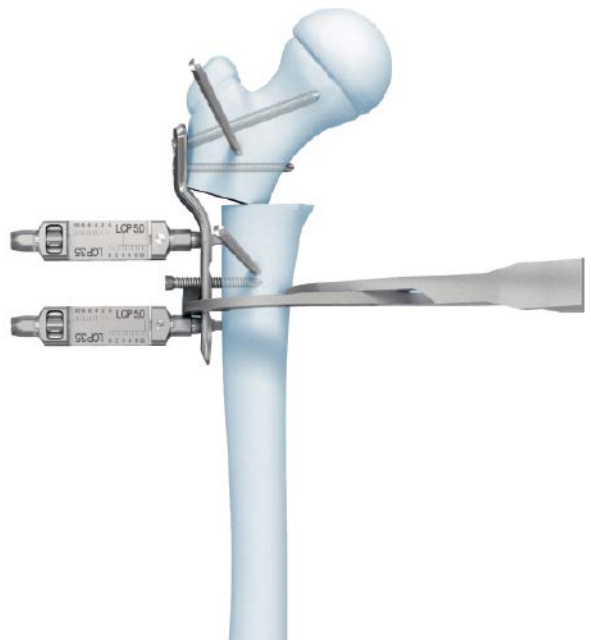
Remove the medialization guide in hole 1 and insert a drill sleeve. Pre-drill the screw hole and remove the drill sleeve. Determine the screw length with the depth gauge and insert a locking screw (3). Repeat Step 2 for hole 3 (4).

Note: Tighten the screws manually with the torque limiter.

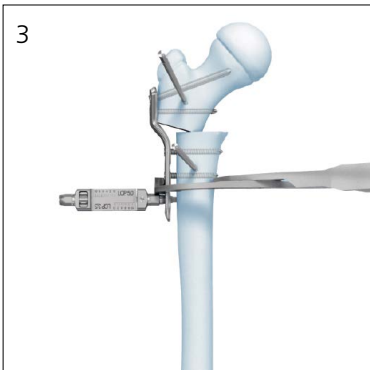
1



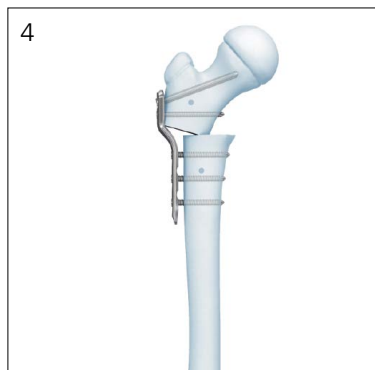
2



3



4



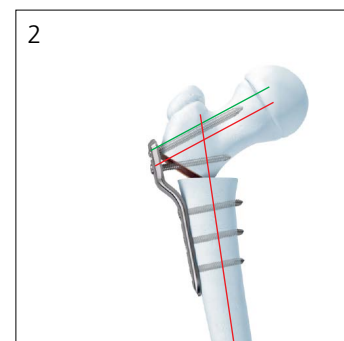
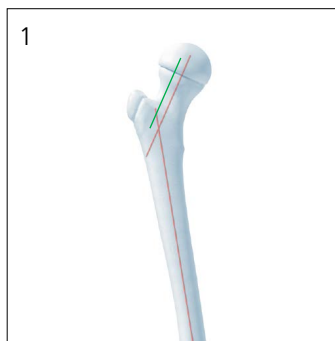
ALTERNATIVE SURGICAL TECHNIQUE

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).



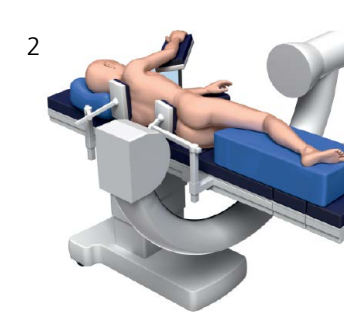
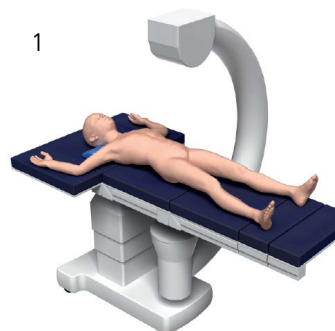
Determine the final neck/shaft angle

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.



3

Approach

Use a standard lateral approach to the proximal femur.

4

Guide wire insertion

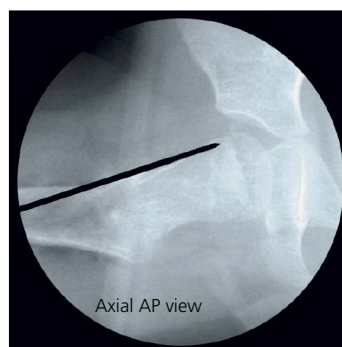
Locate trochanteric epiphysis and determine anteversion

Instrument

5901520150 Kirschner Wire Threaded Tip 2x150/15mm

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.



Insert positioning Kirschner wire in hole D

Instruments for use with the 3.5 mm plate

5711000135 Pediatric LCP Hip Plate Guiding Block for 3.5 mm Screws

5711000235 Positioner for Aiming Block 3.5-5.0

5901520150 Kirschner Wire Threaded Tip 2x150/15mm

Instruments for use with the 5.0 mm plate

5711000150 Pediatric LCP Hip Plate Guiding Block for 5.0 mm Screws

5711000235 Positioner for Aiming Block 3.5-5.0

5901520150 Kirschner Wire Threaded Tip 2x150/15mm

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).



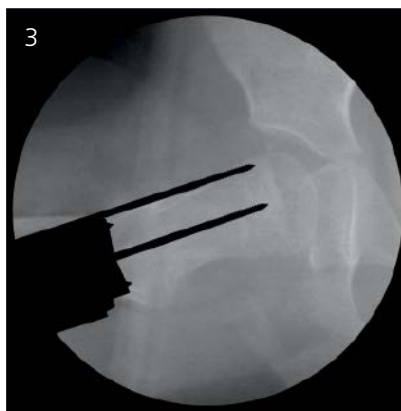
Precaution: All of the following steps refer to the positioning wire, therefore the exact position is crucial for a successful surgery.

- 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.

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



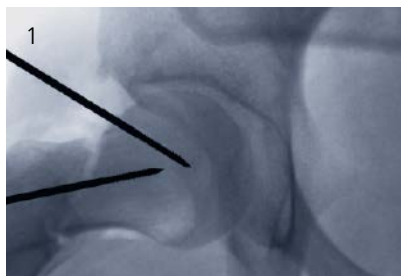
Axial AP view



AP view

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.

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

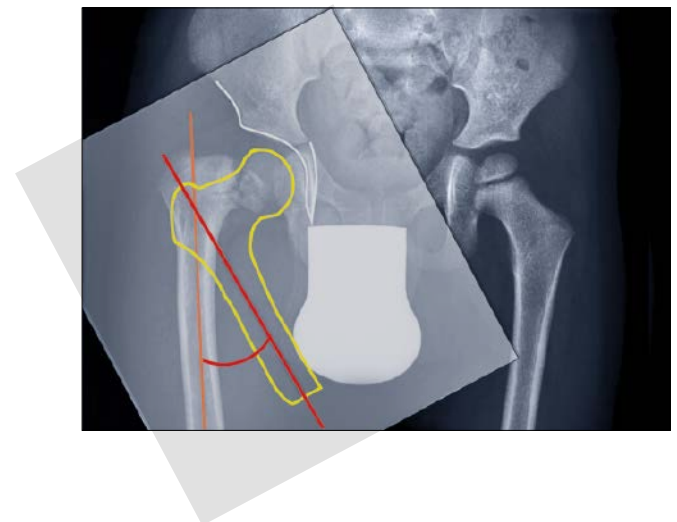


Functional aspect

- 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.



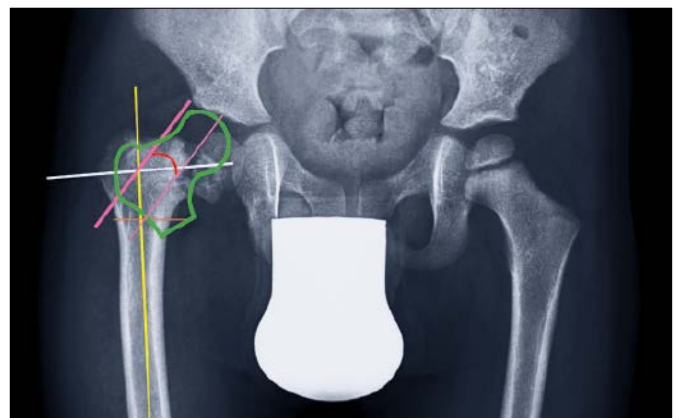
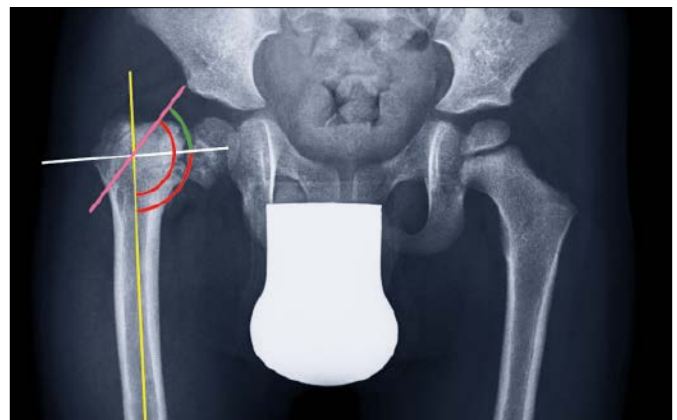
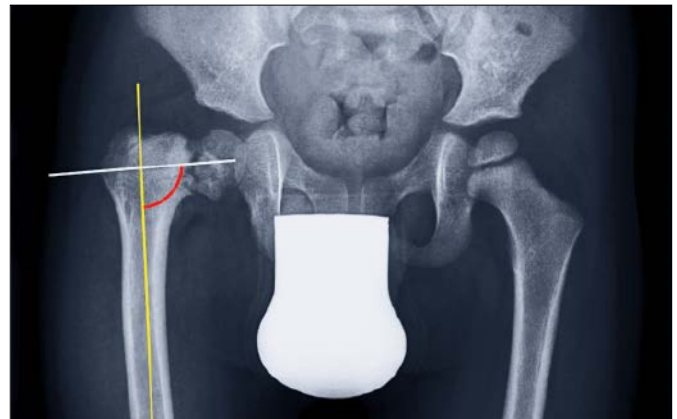
Anatomical aspect

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.



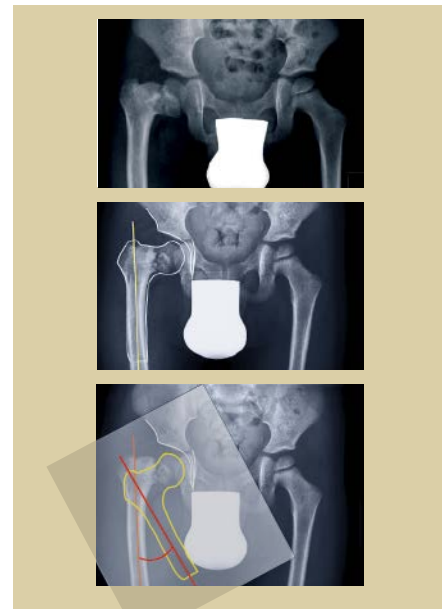
Formula

Positioning K-wire angle = plate/screw angle

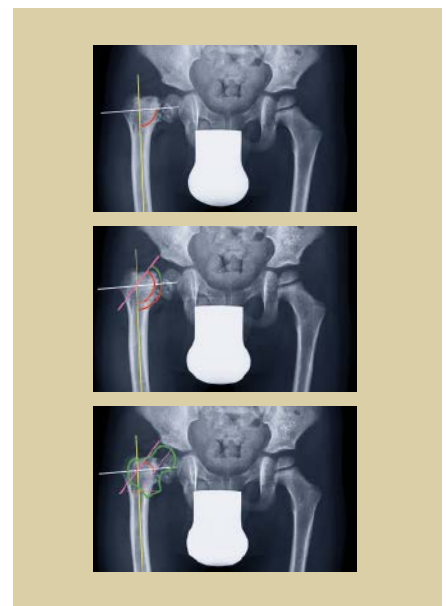
- correction angle (results from the functional or anatomical aspects)



=



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°

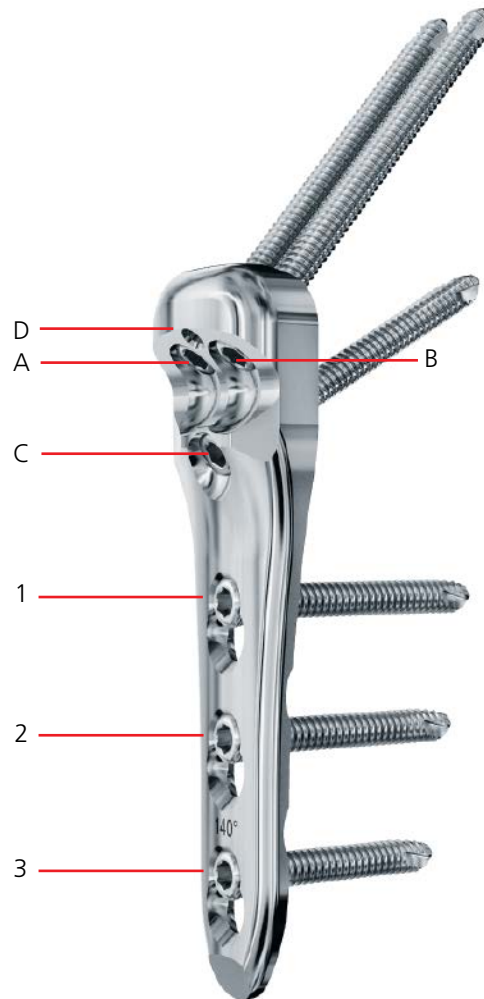
2

Technique using 3.5 mm/5.0 mm LCP Pediatric Hip Plates

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

The surgical technique refers to screw holes where applicable.

Please see the designation of each hole as indicated.



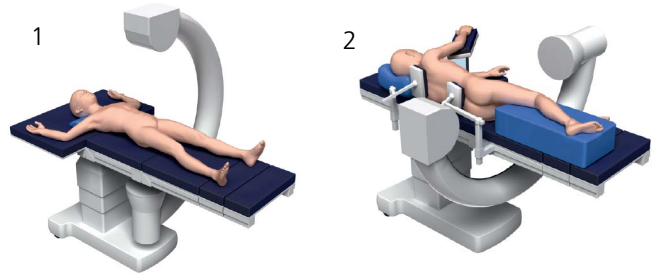
- A, B: Neck screws
- C: Calcar screw
- D: Positioning Kirschner wire
- 1, 2 and 3: LCP Locking Screws or Cortex Shaft Screws

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.



2

Approach

Use a standard lateral approach to the proximal femur.

GUIDE WIRE INSERTION

1

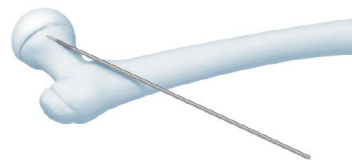
Locate trochanteric epiphysis and determine anteversion

Instrument

5901520150 Kirschner Wire Threaded Tip 2x150/15mm

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.



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).
- 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.

Precautions:

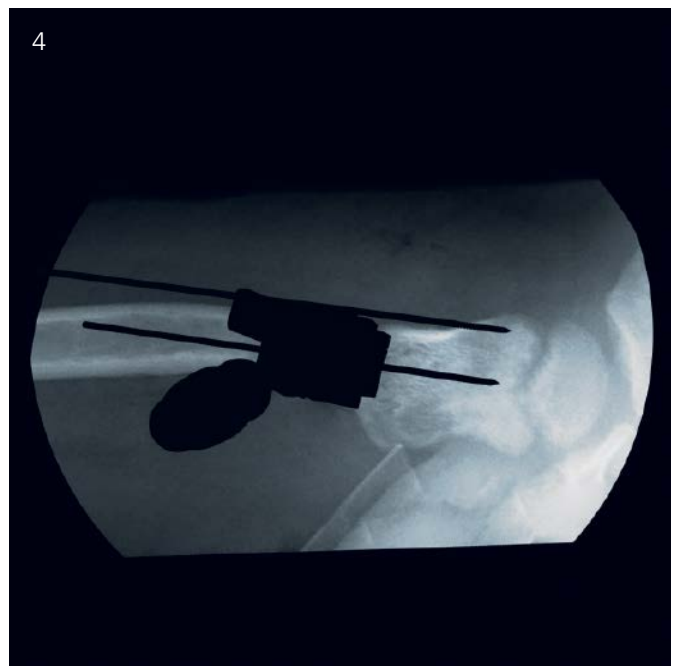
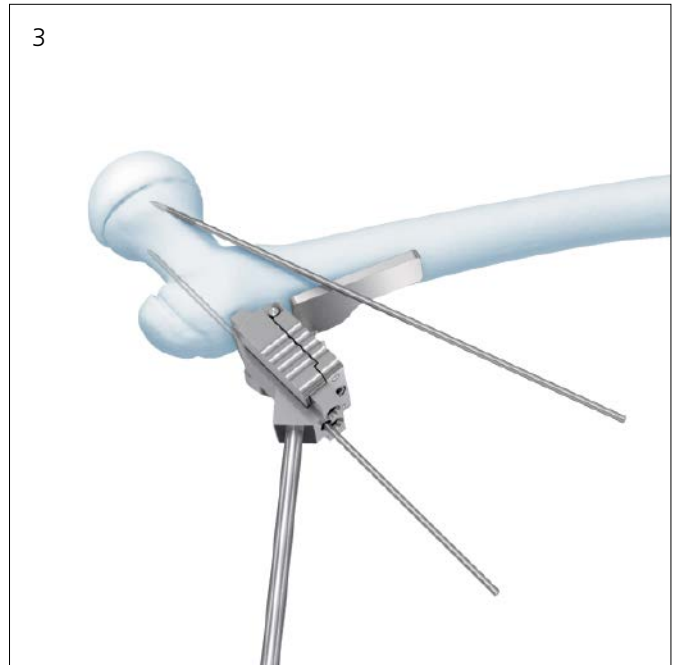
- If there is extreme coxa valga, the positioning device for guiding block must be placed more distally to prevent the neck screw from perforating the piriformis fossa.
- The following steps refer to the positioning guide wire; therefore, its exact position is crucial for a successful surgery.

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.

- 3 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

5711000135	Pediatric LCP Hip Plate Guiding Block for 3.5 mm Screws
5900028230	Kirschner Wire Threaded Tip 2.8x230
5711000235	Positioner for Aiming Block 3.5-5.0
5711000105	Kirschner Wire Adaptor for 2.8 K-Wires

Instruments for 5.0 mm plate

5711000150	Pediatric LCP Hip Plate Guiding Block for 5.0 mm Screws
5900028230	Kirschner Wire Threaded Tip 2.8x230
5711000235	Positioner for Aiming Block 3.5-5.0
5711000105	Kirschner Wire Adaptor for 2.8 K-Wires

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.

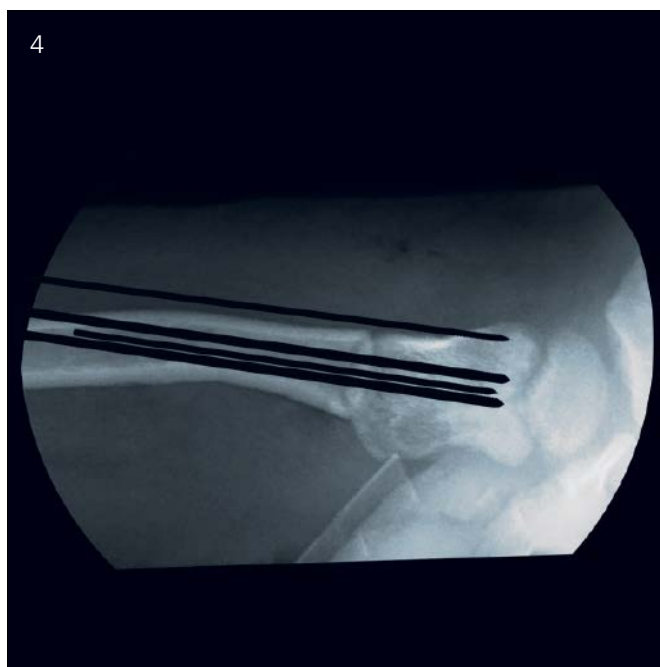
After inserting the K-wires for holes A and B, remove the guiding block and positioning device.

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

5711000335 Osteotomy Measuring Device for 3.5-5.0mm

5711000101 Positioning Plate, triangular, length 45 mm, 90°/50°/40°

5711000102 Positioning Plate, triangular, length 45 mm, 80°/70°/30°

5711000103 Positioning Plate, triangular, length 45 mm, 100°/60°/20°

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).

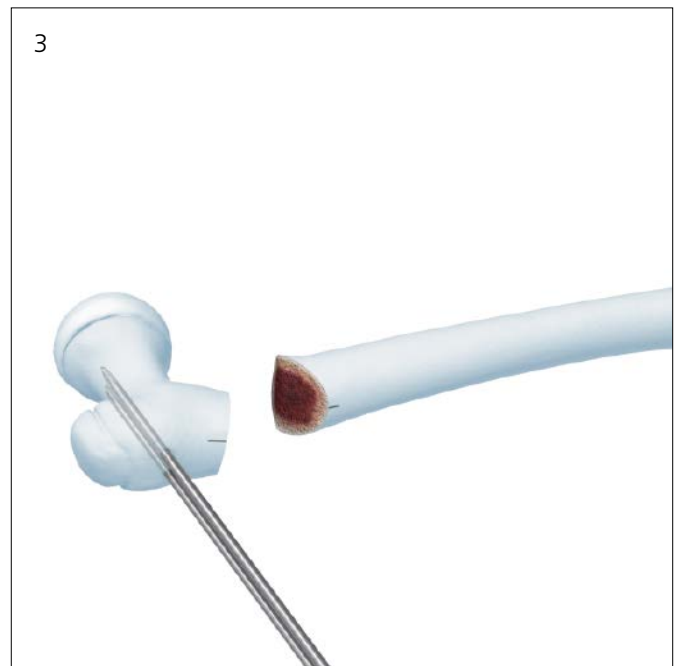
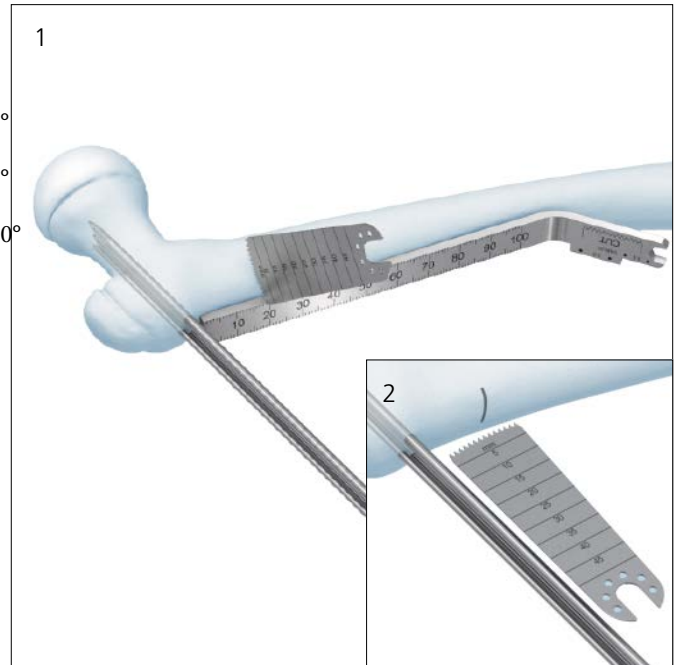
Hold the osteotomy measuring device against the two K-wires and mark the distance with the oscillating saw or another sharp instrument on the bone.

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

5711000335	Osteotomy Measuring Device for 3.5-5.0mm
5713000035	Threaded sleeve for Plate 3,5mm

Instruments for 5.0 mm plate

5711004328	Reduction Sleeve 4.3 mm/2.8 mm
5711000335	Osteotomy Measuring Device for 3.5-5.0mm
5713000150	Threaded sleeve for Plate 5.0mm Long

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

5711000280 Direct Measuring Device, for 2.8 mm
Kirschner Wires 200mm

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.

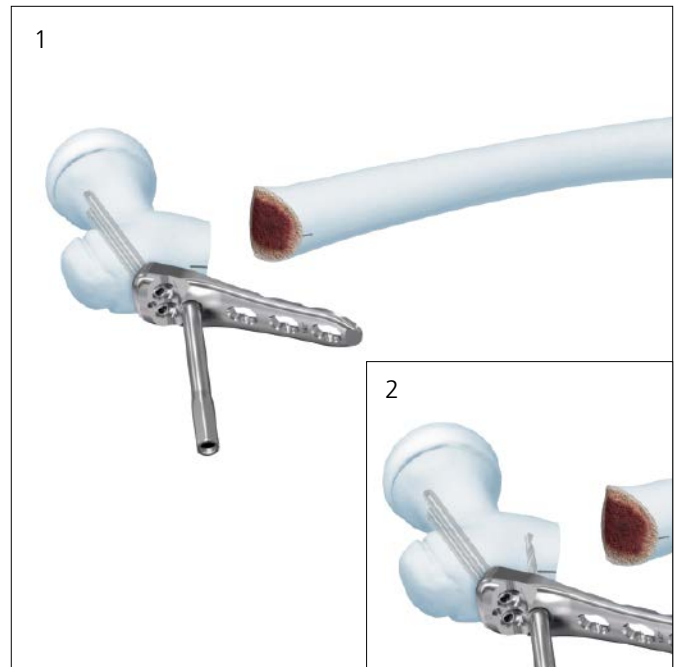
Note for 5.0 mm plate: Remove the reduction sleeve and enlarge the hole from 2.8 mm to 4.3 mm with the LCP Drill Bit.



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

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.

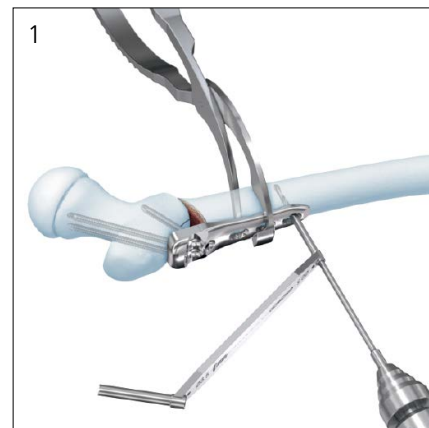
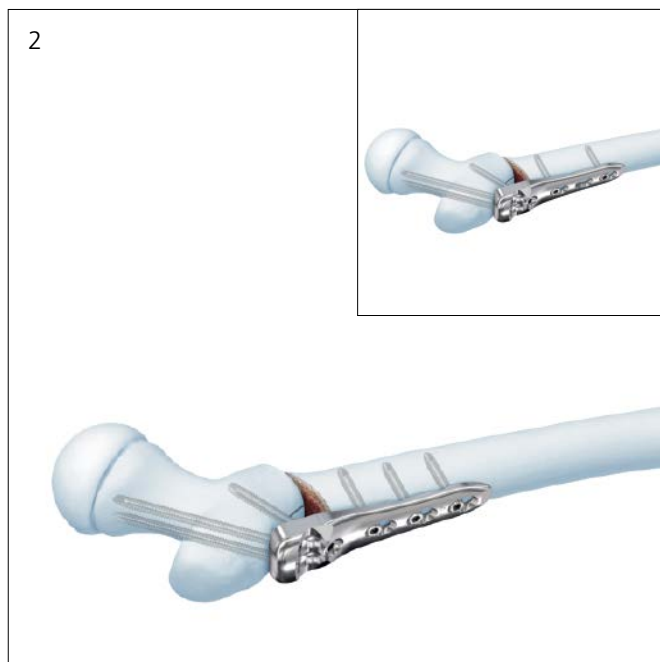
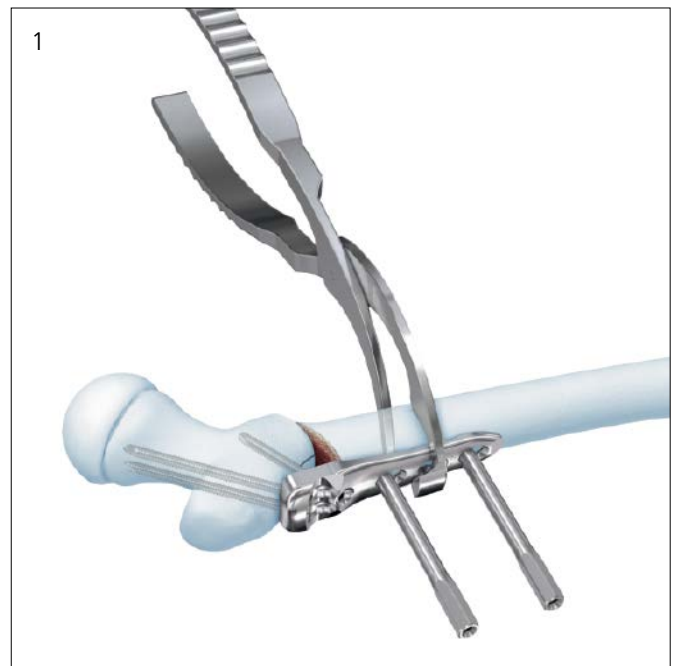
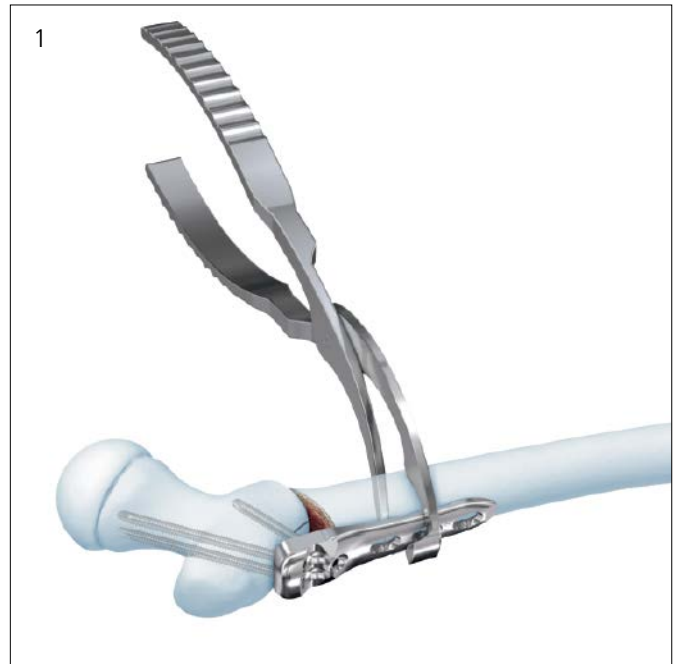
Note: Alignment can be facilitated with LCP Drill Guide in the distal part of the plate and/or with a forceps fixed on the proximal part. These instruments serve as handles during the repositioning of the osteotomy.

DISTAL FIXATION

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.



ALTERNATIVE SURGICAL TECHNIQUE

1

Preoperative planning

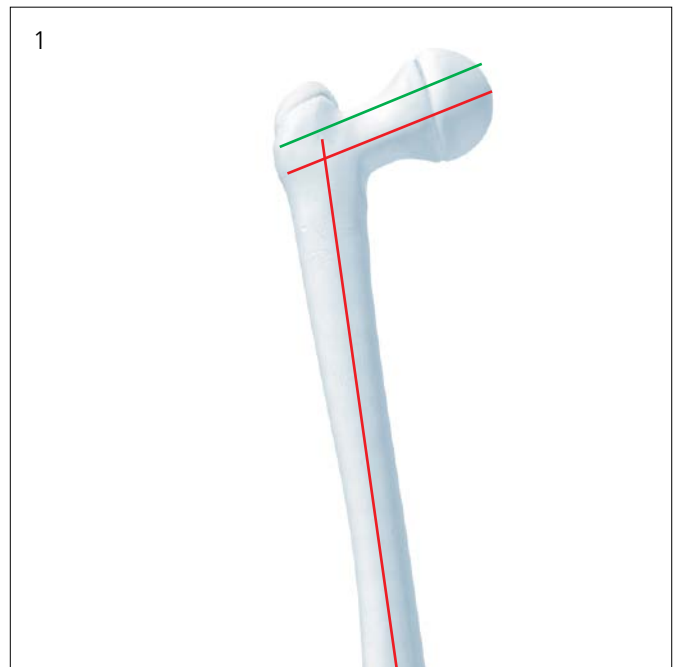
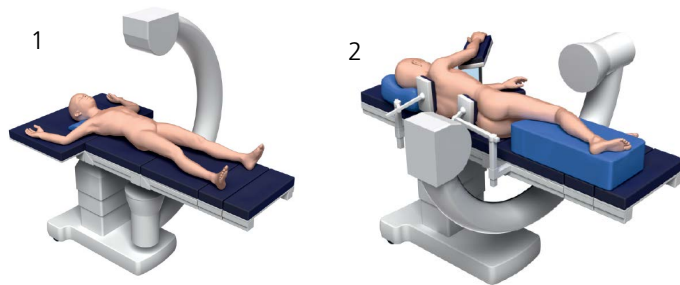
Surgical technique based on the plate/screw angle

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.



3

Approach

Use a standard lateral approach to the proximal femur.

4

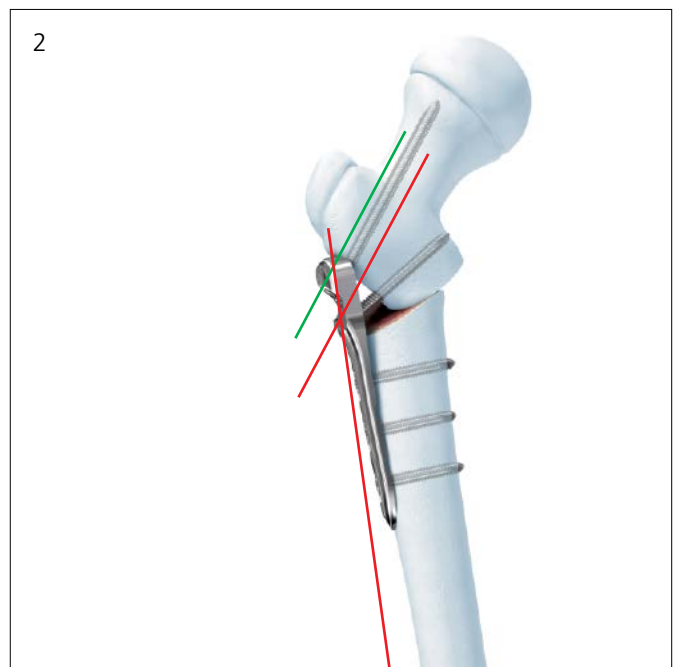
Guide wire insertion

Locate trochanteric epiphysis and determine anteversion

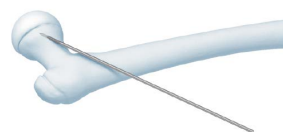
Instrument

5901520150 Kirschner Wire Threaded Tip
2x150/15mm

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

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).

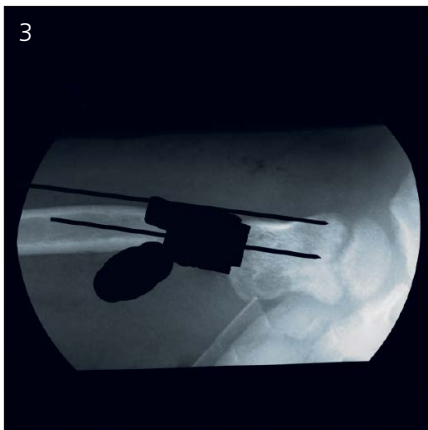
Precaution: All of the following steps refer to the positioning Kirschner wire; therefore, the exact position is crucial for a successful surgery.

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.



Axial AP view



AP view

3.5 MM AND 5.0 MM CONDYLAR PLATES: VARUS OSTEOTOMY



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 for soft tissues (common in neurological disease with contracture).

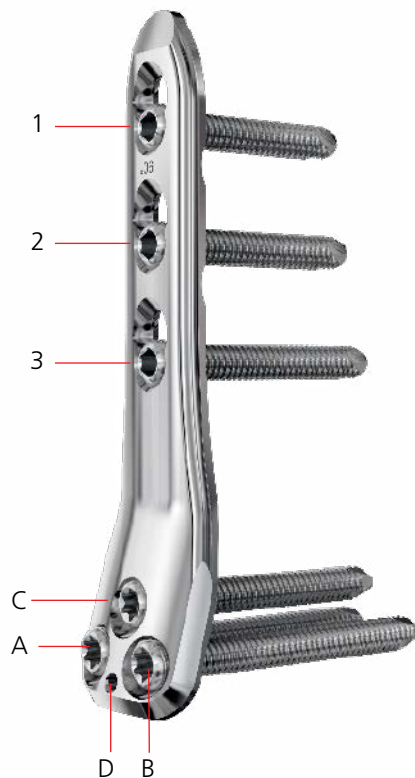
Note: The condylar plate is contoured such that distal screws will be at 90° to the midline of the shaft if the plate is fitted on the surface of the bone. Generally, the distal screws should be parallel to the growth plate in the coronal plane, although care must be taken to establish that there is 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. 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

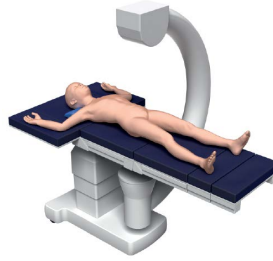
PATIENT POSITIONING AND APPROACH

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

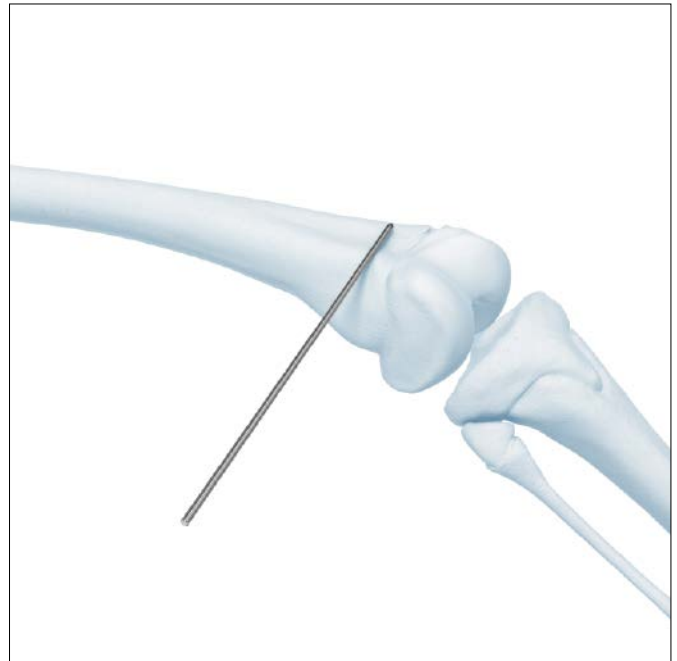
1

Locate the frontal plane of the distal femur

Instrument

5901520150 Kirschner Wire Threaded Tip 2x150/15mm

- 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

5711000135	Pediatric LCP Hip Plate Guiding Block for 3.5 mm Screws
5711000235	Positioner for Aiming Block 3.5-5.0
5901520150	Kirschner Wire Threaded Tip 2x150/15mm

Instruments for 5.0 mm plate

5711000150	Pediatric LCP Hip Plate Guiding Block for 5.0 mm Screws
5711000235	Positioner for Aiming Block 3.5-5.0
5901520150	Kirschner Wire Threaded Tip 2x150/15mm

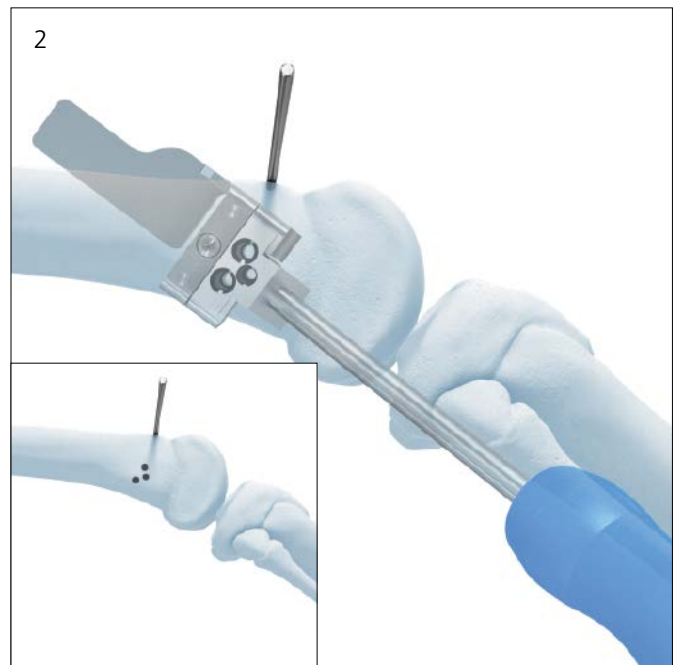


Assemble the positioning device and the aiming block accordingly (1).

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.

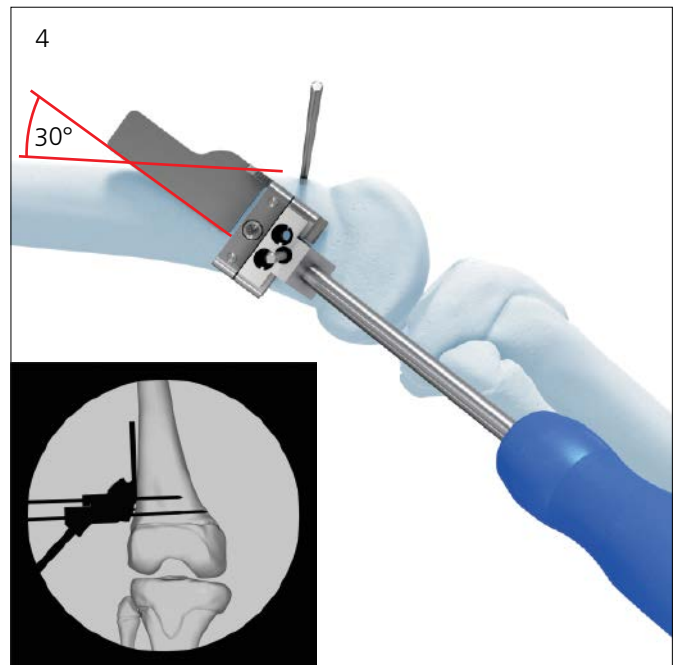
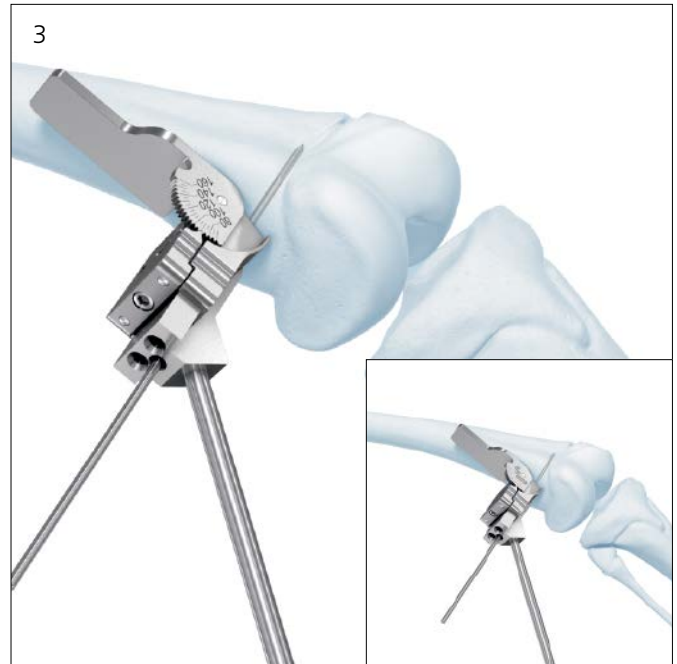
Note: In an extension osteotomy the insertion point will need to be more proximal and more posterior as the plane of the 2 distal screws will not be parallel to the physis in the sagittal view (2).



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

5711000135	Pediatric LCP Hip Plate Guiding Block for 3.5 mm Screws
5900028230	Kirschner Wire Threaded Tip 2.8x230
5711000235	Positioner for Aiming Block 3.5-5.0
5711000105	Kirschner Wire Adaptor for 2.8 K-Wires

Instruments for 5.0 mm plate

5711000150	Pediatric LCP Hip Plate Guiding Block for 5.0 mm Screws
5900028230	Kirschner Wire Threaded Tip 2.8x230
5711000235	Positioner for Aiming Block 3.5-5.0
5711000105	Kirschner Wire Adaptor for 2.8 K-Wires

5711000101 Positioning Plate, triangular, length 45 mm, 90°/50°/40°

5711000102 Positioning Plate, triangular, length 45 mm, 80°/70°/30°

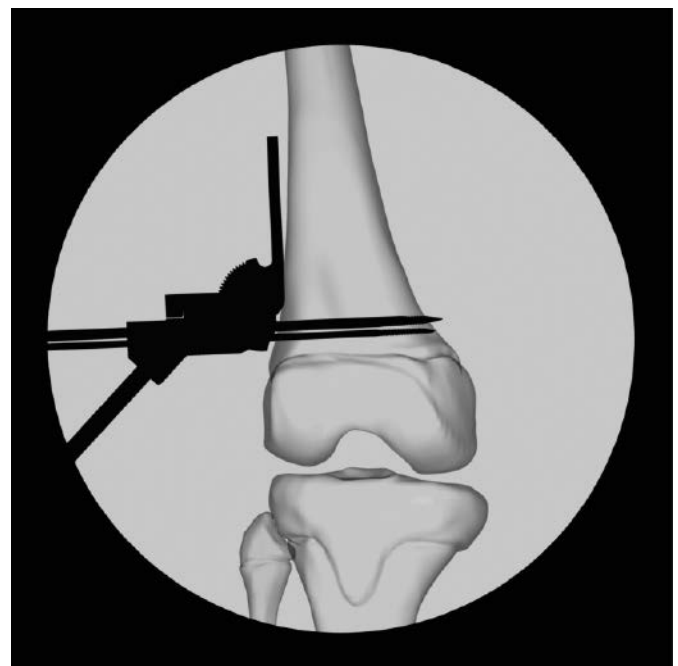
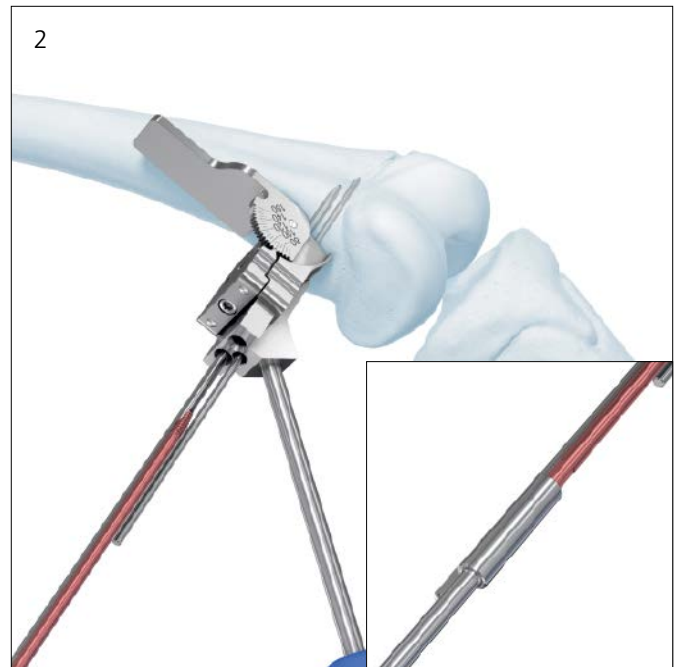
5711000103 Positioning Plate, triangular, length 45 mm, 100°/60°/20°

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

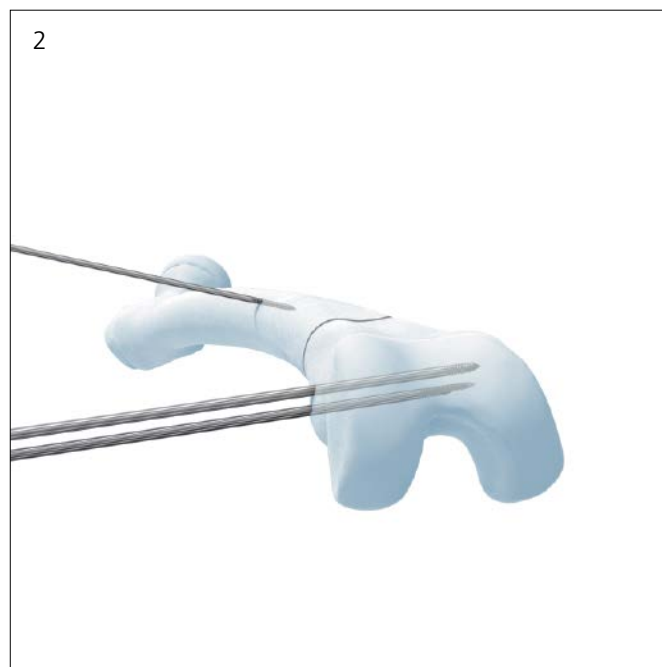
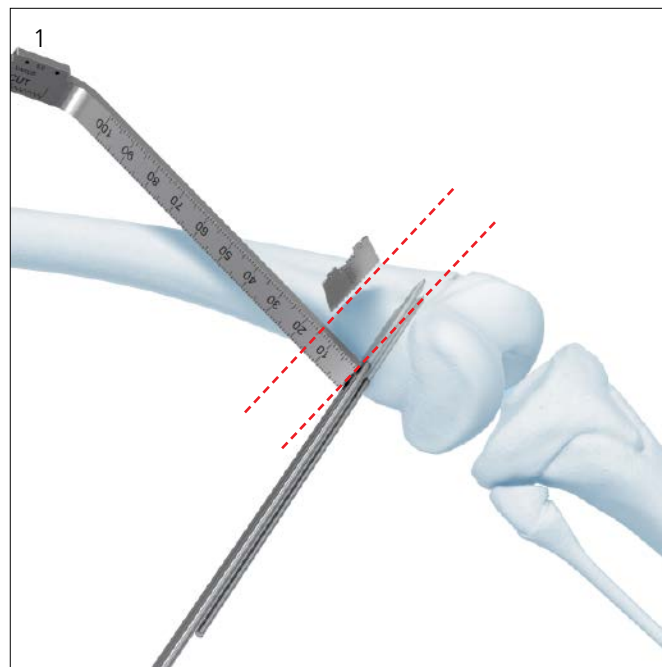
Instrument

5711000335 Osteotomy Measuring Device for 3.5-5.0mm

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.

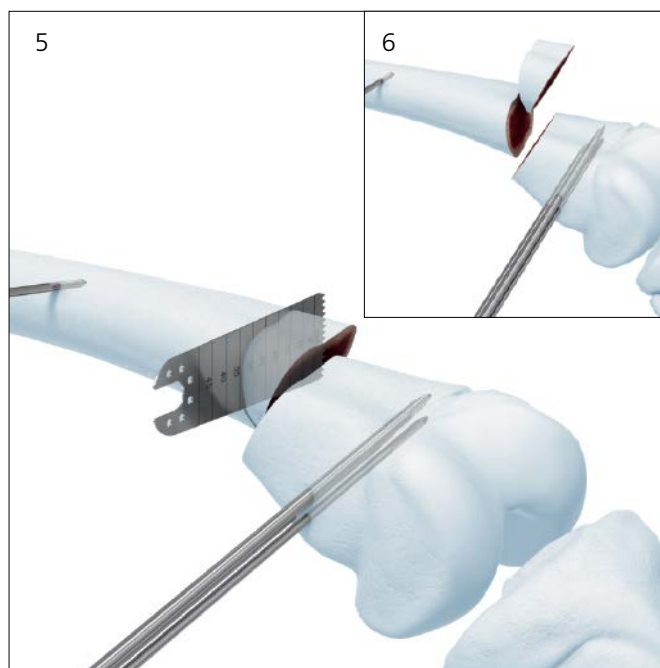
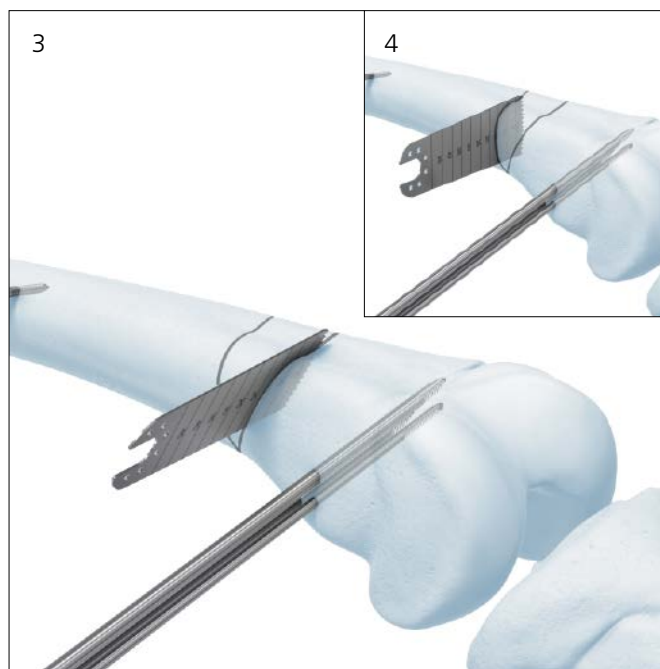
- **Note: The cut is best made freehand under image intensifier control, keeping the blade parallel to the wires in both planes.**

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

5711000335 Osteotomy Measuring Device for 3.5-5.0mm

5713000035 Threaded sleeve for Plate 3,5mm

Instruments for 5.0 mm plate

5711004328 Reduction Sleeve 4.3 mm/2.8 mm

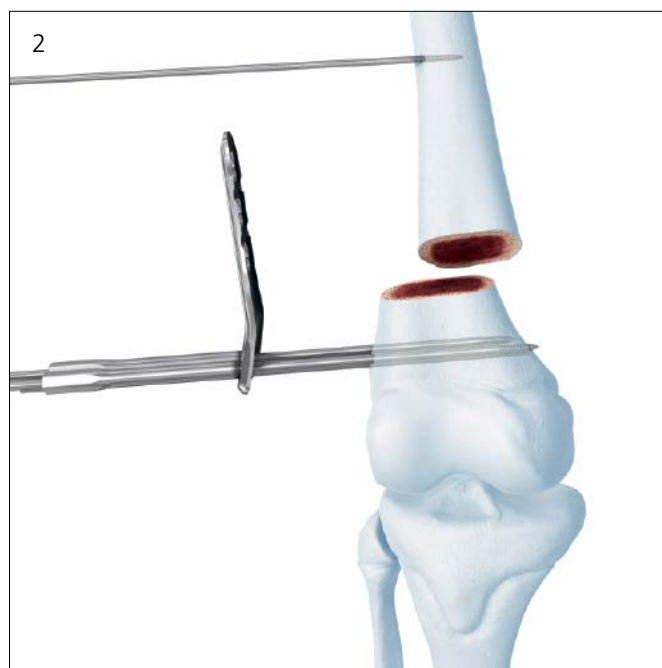
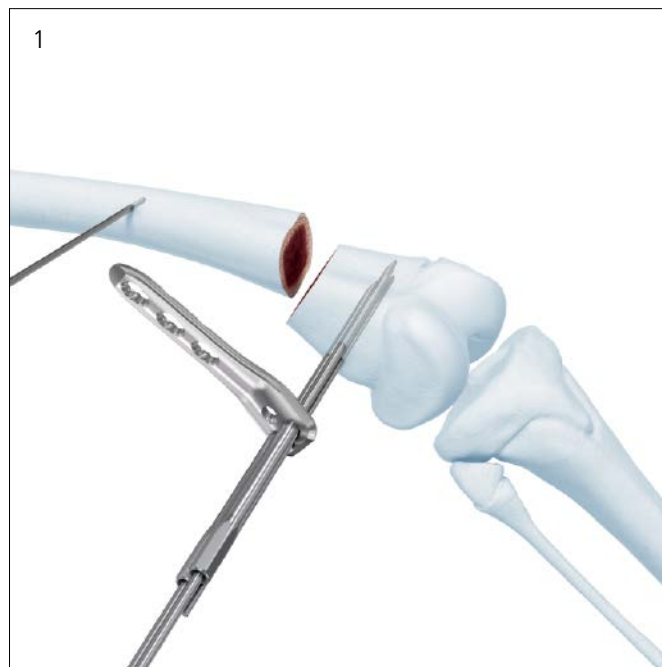
5711000335 Osteotomy Measuring Device for 3.5-5.0mm

5713000150 Threaded sleeve for Plate 5.0mm Long

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

5711000280	Direct Measuring Device, for 2.8 mm Kirschner Wires 200mm
5711000335	Osteotomy Measuring Device for 3.5-5.0mm

Instruments for 5.0 mm plate

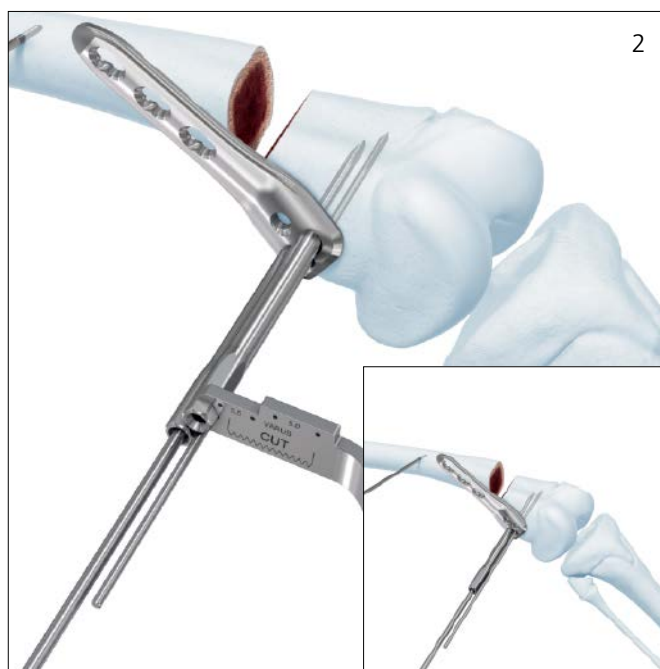
5711000280	Direct Measuring Device, for 2.8 mm Kirschner Wires 200mm
5711004328	Reduction Sleeve 4.3 mm/2.8 mm
5711000335	Osteotomy Measuring Device for 3.5-5.0mm
5910043221	Drill Bit 4.3mm length 221mm

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.



REDUCTION

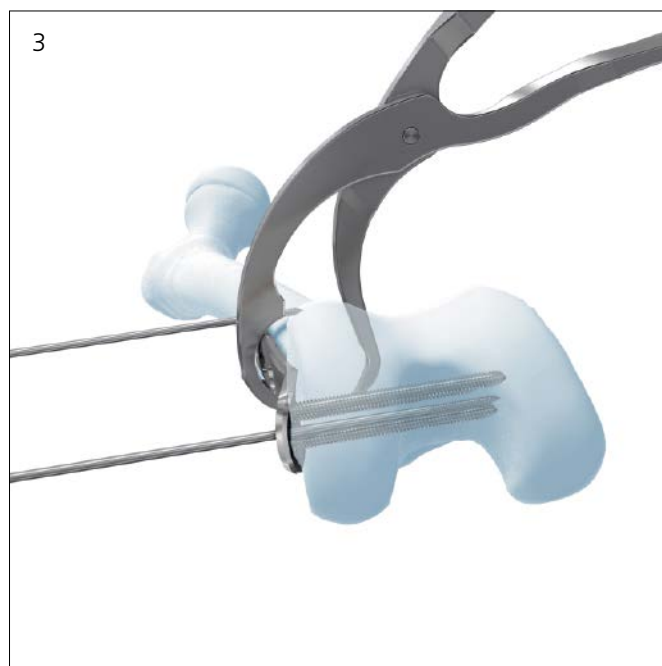
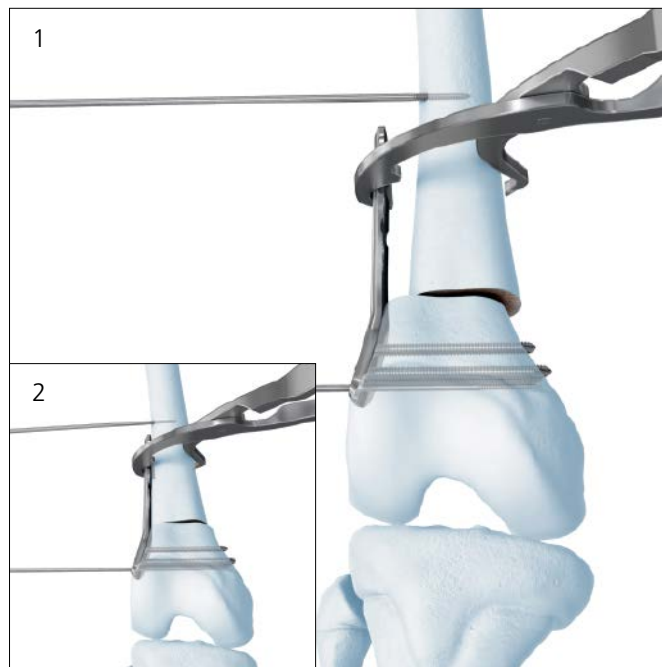
Instruments

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

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.

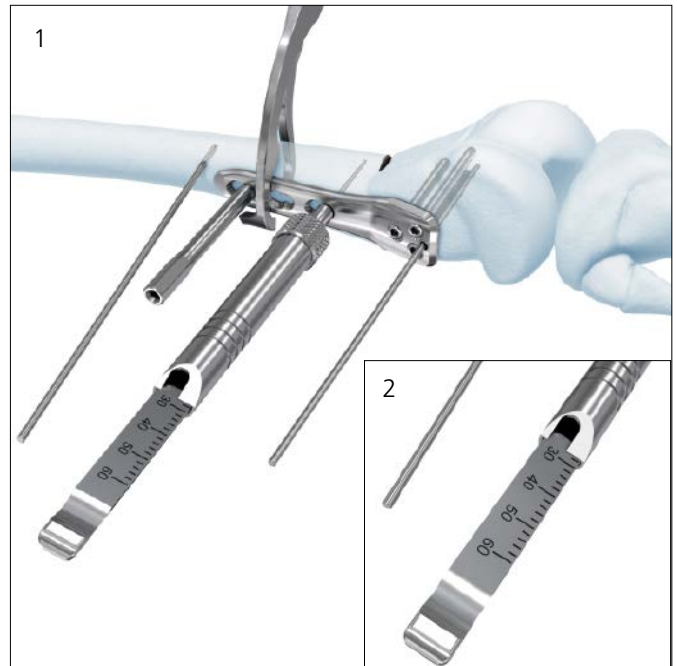
Note: After reduction, the initial positioning wire in the distal fragment lies parallel to the bicortical wire in the proximal part to achieve correct axial alignment (3).



PROXIMAL FIXATION

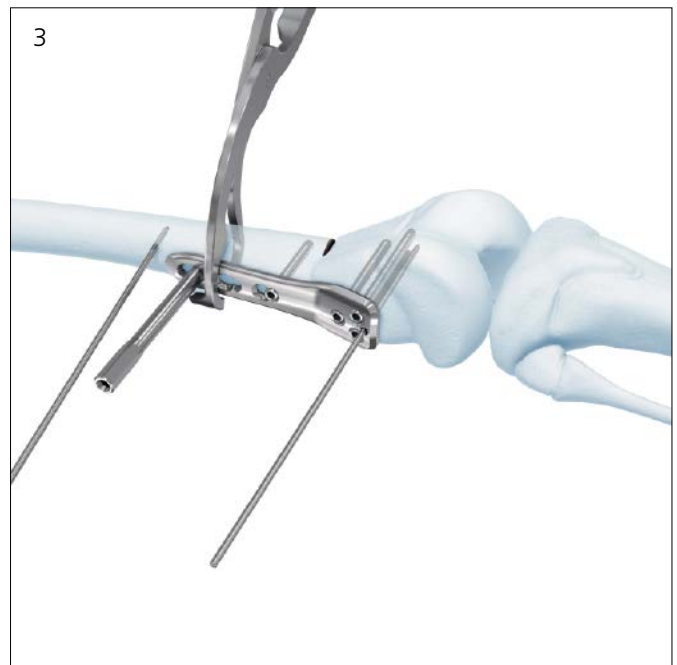
Insert the LCP Drill Guide into shaft holes 1 and 3.

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).

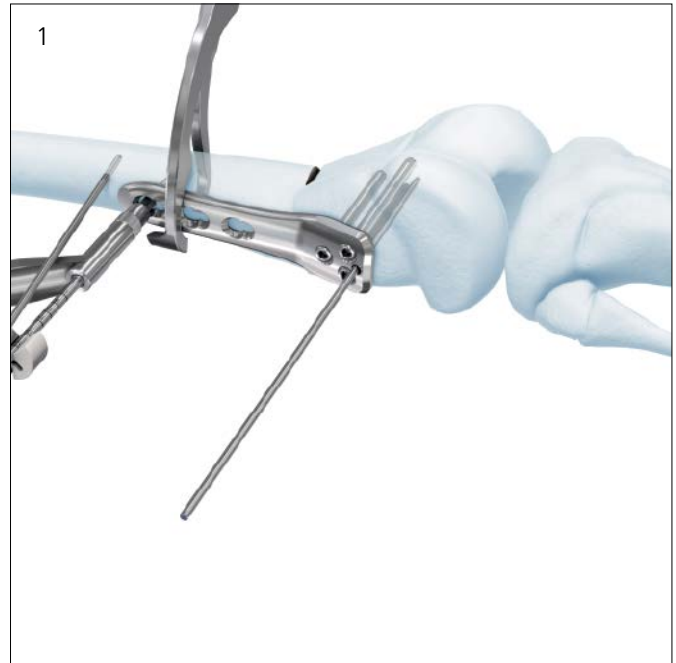
Remove the initial positioning wire in the distal fragment and the bicortical positioning wire in the proximal part.

4



Proximal Fixation

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

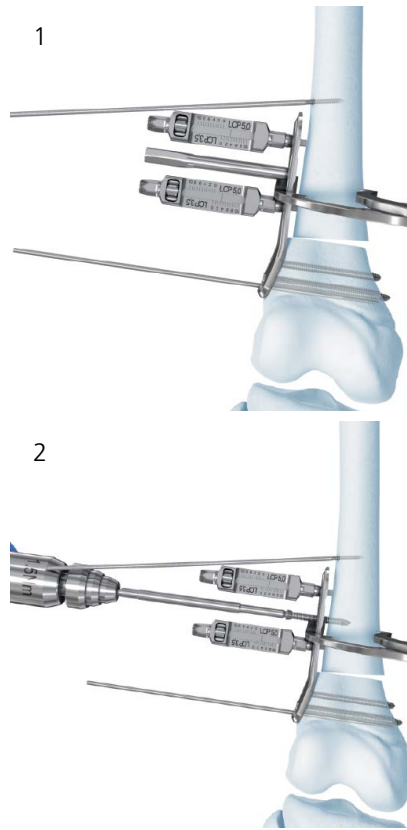
1

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).

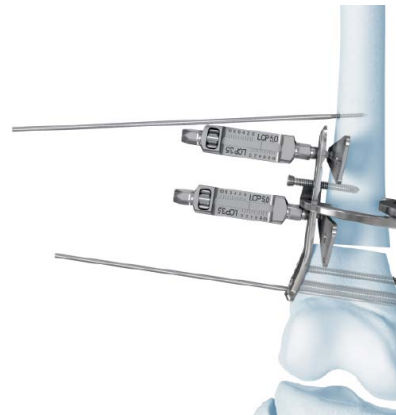
Note: Tighten the screws manually with the torque limiter.



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.

IMPLANTS

2.7 mm Pediatric Hip Plates

	Angle	Shaft Holes
3069427090	90°	3
3069427100	100°	3
3069427110	100°	3
3069427120	120°	3
3069427120	130°	3

2.7 mm Pediatric Hip Plates Offset

	Angle	Shaft Holes
3069627100	100°	3
3069627110	100°	3
3069627120	120°	3
3069627130	130°	3

3.5 mm Pediatric LCP Hip Plates ◊

	Angle	Shaft Holes	Length (mm)	Proximal/Distal Width (mm)
	100°	3	73	19/12
	110°	3	73	19/12
	120°	4	75	19/12
	130°	3	62	19/12
	130°	5	88	19/12
	130°	7	114	19/12
	130°	9	140	19/12
	140°	3	70	19/12
	150°	3	58	19/12

3.5 mm Pediatric LCP Condylar Plates ◊

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

5.0 mm Pediatric LCP Hip Plates ◊

	Angle	Shaft Holes	Length (mm)	Proximal/Distal Width (mm)
	100°	3	90	23/15
	110°	3	90	23/15
	120°	4	95	23/15
	130°	3	79	23/15
	130°	5	111	23/15
	130°	7	143	23/15
	130°	9	175	23/15
	140°	3	90	23/15
	150°	3	74	23/15

5.0 mm Pediatric LCP Condylar Plates ◊

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

INSTRUMENTS

Guiding Blocks

5711000135 Pediatric LCP Hip Plate Guiding Block for 3.5 mm Screws



5711000150 Pediatric LCP Hip Plate Guiding Block for 5.0 mm Screws



5711000127 Pediatric LCP Hip Plate Guiding Block, for 2.7 mm Screws



Positioning Devices for Guiding Blocks

5711000235 Positioning Device for Guiding Block



5711000227 Positioning Device for Guiding Block, for 2.7 mm Screws

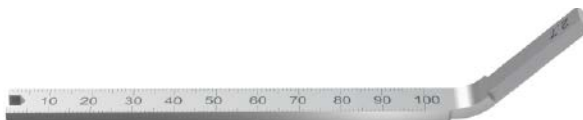


Osteotomy Measuring Devices

5711000335 Osteotomy Measuring Device



5711000327 Osteotomy Measuring Device, for 2.7 mm Pediatric LCP Hip Plates



Kirschner Wires, Guide Wires and Adaptor

5900028230 Kirschner Wire Threaded Tip 2.8x230



5711000105 Kirschner Wire Adaptor for 2.8 K-Wires



5901520150 Kirschner Wire Threaded Tip 2x150/15mm



Drill Sleeves, Drill Guides, and Reduction Sleeve

5711004328 Reduction Sleeve 4.3 mm/2.8 mm



5713000035 Threaded sleeve for Plate 3,5mm



5713000150 Threaded sleeve for Plate 5.0mm Long



5713000027 Threaded sleeve for Plate 2,7mm



5920003525 Double Drill Guide 3.5/2.5



5920004532 Double Drill Guide 4.5/3.2



5920002720 Double Drill Guide 2.7/2.0



Instruments

Drill Bits

5910025110 Drill Bit 2.5mm, length 110mm



5910027125 Drill Bit 2.7mm, length 125mm



5910028165 Drill Bit 2.8mm length 165mm



5910032145 Drill Bit 3.2mm, length 145mm



5910043221 Drill Bit 4.3mm length 221mm



5910020140 Drill Bit 2.0mm length 140mm



Depth Gauges and Measuring Devices

5711000027 Depth gauge for 2,7 screw 8-60



5711000035 Depth gauge for 3.5mm screw 8-80



5711000050 Depth gauge for 5mm screw 10-120mm



5711000280 Direct Measuring Device, for 2.8 mm Kirschner Wires 200mm



5711000200 Direct Measuring Device, for 2.0 mm Kirschner Wires for 2.7mm Plate



Screwdrivers and Screwdriver Shafts

5210720009 Screwdriver (T9) 2.7mm Screw



5210720015 Screwdriver (T15) 3.5mm Screw



5210720025 Screwdriver (T25) 5mm Screw



5920131001 Small Screwdriver Quickhandle



5711001108 Torque-Limiting Attachment, 0.8 Nm



5711001115 Torque-Limiting Attachment, 1.5 Nm, quick coupling

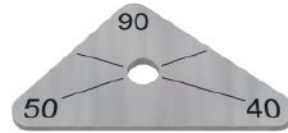


5711001140 Torque-Limiting Attachment, 4 Nm, for AO reaming coupler



Positioning Plates

5711000101 90°/50°/40° Triangular Positioning Plate



5711000102 80°/70°/30° Triangular Positioning Plate



5711000103 100°/60°/20° Triangular Positioning Plate



Additional Instruments

5711000104 Medialization Guide for 3.5 mm and
5.0 mm LCP Plates



PEDIATRIC PLATE SYSTEM INSTRUMENT SET

Graphic Case

Pediatric LCP Plate System Instrument Set Graphic Case

Star/HexDrive Screwdriver, T25, 3.5 mm hex, self-retaining
Star/HexDrive Screwdriver Shaft, T25, 3.5 mm hex, self-retaining, 165 mm, 2 ea.

Pediatric LCP Hip Plate Guiding Block for 3.5 mm Screws

Pediatric CP Hip Plate Guiding Block for 5.0 mm Screws

Direct Measuring Device, for 2.8 mm Kirschner Wires

Reduction Sleeve, 4.3 mm/2.8 mm, 2 ea. 2.8 mm Kirschner Wire, spade point, 200 mm, 8 ea.

Positioning Device for Guiding Block Medialization Guide, for 3.5 mm and 5.0 mm LCP Plates, 2 ea.

Osteotomy Measuring Device

2.8 mm Threaded Drill Guide, for 3.5 mm Pediatric LCP Hip Plate, 2 ea.

4.3 mm Threaded Drill Guide, for 5.0 mm Pediatric LCP Hip Plate, 2 ea.

K-wire Adaptor for 2.8 mm

Kirschner Wires

2.0 mm Kirschner Wire with 15 mm Thread, trocar point, 150 mm, 1 pkg. of 10

2.5 mm Drill Bit, quick coupling, 110 mm, gold, 2 ea.

2.8 mm Drill Bit, quick coupling, 165 mm, 2 ea.

3.2 mm Drill Bit, quick coupling, 145 mm, 2 ea.

4.3 mm Drill Bit, quick coupling, 221 mm, 2 ea.

Handle with quick coupling, small

3.5 mm/2.5 mm Double Drill Sleeve

4.5 mm/3.2 mm Double Drill Sleeve

Small Hexagonal Screwdriver Shaft, 2 ea. Small Hexagonal

Screwdriver, 2.5 mm width across flats

StarDrive Screwdriver, T15, self-retaining StarDrive Screwdriver Shaft, T15,

self-retaining, quick coupling, 2 ea.

Depth Gauge, for 2.7 mm and small screws Depth Gauge, for large screws

90°/50°/40° Triangular Positioning Plate

80°/70°/30° Triangular Positioning Plate 100°/60°/20° Triangular

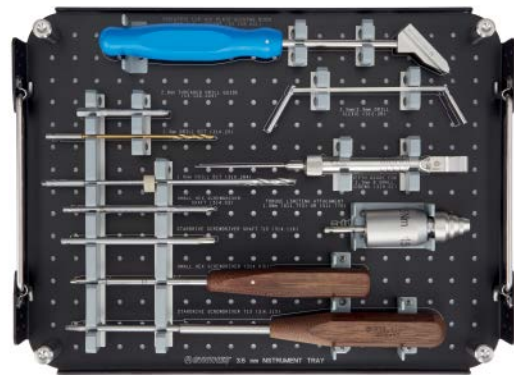
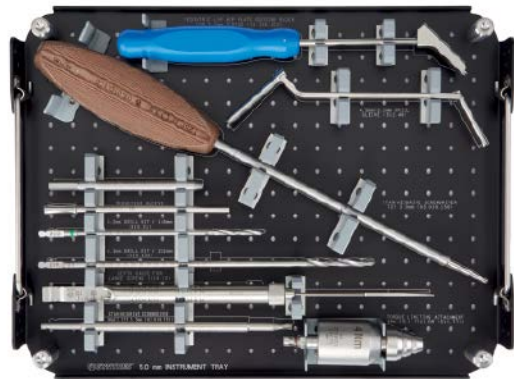
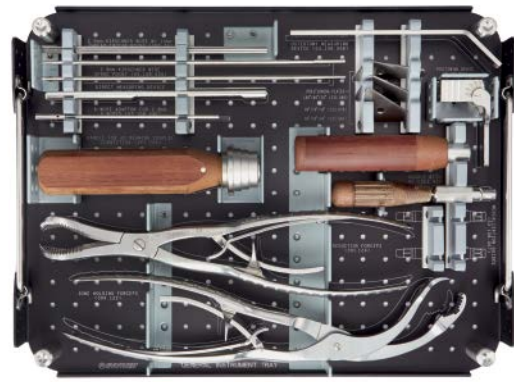
Positioning Plate Handle for AO Reaming Coupler

Bone Holding Forceps, soft ratchet, for plates to 19 mm wide

Reduction Forceps with serrated jaw, large handle, soft ratchet

Torque-Limiting Attachment, 1.5 Nm, quick coupling

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



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