Less Invasive Stabilisation System LISS. Distal Femur.

Surgical Technique
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### Warning
This description is not sufficient for an immediate application of the instrumentation. An instruction by an experienced surgeon in handling this instrumentation is highly recommended.
Introduction

Foreword

Distal femoral fractures can lead to complex tissue injuries. Conservative treatment often results in malalignment or non-unions as well as stiffness of the knee. To reduce the occurrence of these problems, open reduction and internal fixation of the bone can be carried out. The AO/ASIF has developed the techniques and defined the following principles of internal fixation:

- Anatomical reduction
- Stable internal fixation
- Preservation of the blood supply
- Early active pain-free mobilization

Combined with these principles, internal fixation with plates and screws has been a very successful technique for the treatment of fractures. However, additional vascular trauma resulting from extensive surgical exposure was usually caused by the necessity of achieving precise reduction as well as for implant placement and fixation. Fracture fragments were also often stripped of their soft tissue envelope. As a result, bone healing was impaired and the risk of infection increased.

In the treatment of diaphyseal fractures, fracture healing and the clinical outcome was dependent on obtaining correct length, axis, and rotation of the fractured bone rather than on precise anatomical reduction and absolute stability.

Intramedullary nails used in a closed technique in combination with indirect visualization (image intensifier) minimize the amount of additional vascular trauma and have been shown to represent the current treatment of choice for diaphyseal fractures of femur and tibia. For the treatment of articular fractures however, the anatomical reduction is of paramount importance to ensure congruity of the articulating surfaces and prevent post-traumatic arthritis. Usually, open reduction is performed and followed by internal fixation with plates and screws.

The combination of these two requirements, i.e. anatomical reduction of articular fractures and obtaining correct length, axis, and rotation with minimal additional vascular trauma, has led to the development of a new generation of implants and instruments for the treatment of meta- and epiphyseal fractures. Since it preserves bone perfusion much better than conventional plates and since it can be inserted in a closed way, it is called the Less Invasive Stabilisation Systems (LISS).
The Less Invasive Stabilisation Systems


The implant consists of a plate-like device and locking screws which together act as an internal fixator. An internal fixator is a construct where the screws (pins), which are the principal load-transferring elements, are locked in the plate (or frame). The forces are transferred from the bone to the fixator across the screw neck. Therefore, the blood supply of the bone under the plate is preserved as basically no (or only little) contact between the plate and the bone is needed.

For stability and soft tissue reasons, the internal fixator will be placed very close to the bone. The plates are therefore pre-shaped. Special instruments and insertion guides allow the plates to be slid under the muscle. The screws are inserted percutaneously via small stab incisions, in a technique similar to that used for Bridge Plating and for Minimally Invasive plate Osteosynthesis (MIPO).

Fracture reduction and fixation proceed in two distinct steps. First, the reduction of the fracture has to be performed. Anatomical reduction is mandatory in articular fractures. In the metaphysis and shaft area, the indirect reduction is preferred. However, care has to be taken to ensure that length, rotation, and axial alignment of the main fragments are correct. The reduction must then be securely held to allow the reduced fragments to be bridged with the LISS fixator.

The first LISS was developed for the treatment of distal femoral fractures (LISS-DF). The angle of the screws and the shape of the fixator were designed following anatomical studies and assessed on approximately 50 pairs of bones and their CT data.

Besides important benefits in high-energy injuries, a multicentre clinical study has shown that the features of LISS become particularly beneficial in osteoporotic bone and for periprosthetic fractures.
Indications

The Less Invasive Stabilisation System for Distal Femur (LISS-DF) is indicated for the stabilisation of fractures of the distal femur.

These include:
- Distal shaft fractures
- Supracondylar fractures
- Intra-articular fractures

Bibliography

3. T.J. Hockertz et al. „Die Versorgung von periprothetischen Femurfrak- turen bei liegender Kniegelenkprothese mit dem LIS-System“ [Use of the LISS to treat periprosthetic femoral fractures with implanted knee prosthesis], Der Unfallchirurg 10 (1999), 811–814
4. P. Schandelmaier et al. „Stabilisation of distal femur fractures using the LISS“, Techniques in Orthopaedics, 14 (3) (1999), 230–246
6. Injury, Int. J. Care Injured 32 (2001), S-C
7. P. Schandelmaier et al. „Internal Fixation of Distal Femur Fractures with the Less Invasive Stabilizing System (LISS)“, Orthopedics and Traumatology 9 (2001), 166–184
Case examples

Case 1: male, 20 y, polytrauma, AO 33 C3

Preoperative

Follow-up after 6 weeks

Follow-up after 3 months

Follow-up after 5 months
Case 2:
female, 70 y,
multiple fracture,
AO 33 C3

Preoperative

Postoperative

Follow-up after 3 months

Follow-up after 1 year
Case examples

Case 3:
Male, 76 y, isolated fracture,
AO A33 B2

Preoperative
Postoperative

Follow-up after 4 weeks
Surgical technique

Preoperative selection of the implants

Use the AO/ASIF Preoperative Planning Template (item nos. 034.000.235 and 034.000.236) to determine the length of the LISS plate and the position of the screws. Note that all template images are 10% enlarged to account for average radiograph magnification. However, magnification may vary.

If required, preoperative planning of lag screws should be done.
Preoperative screw-length selection using an AP radiograph

To select the proper screw length for the condyle, it is possible to perform a preoperative x-ray with the 50mm wide calibrator and to use the table below.

1. Place the x-ray calibrator medially or laterally at the height of the condyle.
2. Take an AP radiograph of the distal femur.
3. Measure the width of the x-ray calibrator (XRC) on the radiograph.
4. Measure the maximum condyle width (MCW) on the radiograph.
5. Determine the real condyle width (RCW).

\[ RCW = \frac{50}{XRC} \times MCW \]

6. Go down the column to the appropriate condyle size.
7. Read the corresponding screw length for the screw holes A to G. The positions A to G are indicated on the preoperative planning template and on the LISS DF insertion guide.

<table>
<thead>
<tr>
<th>Width of the femoral condyles</th>
<th>Hole A</th>
<th>Hole B</th>
<th>Hole C</th>
<th>Hole D</th>
<th>Hole E</th>
<th>Hole F</th>
<th>Hole G</th>
</tr>
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<tbody>
<tr>
<td>60–80mm</td>
<td>65</td>
<td>40</td>
<td>40</td>
<td>55</td>
<td>65</td>
<td>65</td>
<td>55</td>
</tr>
<tr>
<td>81–87mm</td>
<td>75</td>
<td>40</td>
<td>55</td>
<td>65</td>
<td>75</td>
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<td>65</td>
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<tr>
<td>88–95mm</td>
<td>75</td>
<td>55</td>
<td>65</td>
<td>65</td>
<td>75</td>
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<tr>
<td>96–110mm</td>
<td>85</td>
<td>65</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>85</td>
<td>85</td>
</tr>
</tbody>
</table>
Example

- The length of x-ray calibrator on the radiograph is 55mm (magnification 1.10)
- The condyle width on the radiograph amounts to 91mm. Consequently, the screw lengths are as follows:

<table>
<thead>
<tr>
<th>Screw hole</th>
<th>Screw length</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>75mm</td>
</tr>
<tr>
<td>B</td>
<td>40mm</td>
</tr>
<tr>
<td>C</td>
<td>55mm</td>
</tr>
<tr>
<td>D</td>
<td>65mm</td>
</tr>
<tr>
<td>E</td>
<td>75mm</td>
</tr>
<tr>
<td>F</td>
<td>75mm</td>
</tr>
<tr>
<td>G</td>
<td>65mm</td>
</tr>
</tbody>
</table>

The proper placement of the LISS on the condyle is essential for the correct length of the screw.

Positioning of the patient

Position the patient supine on a radiolucent table. The leg should be freely movable. The contralateral leg can be placed in an obstetric leg holder. Place the knee joint line slightly distal to the hinged part of the table to allow flexion of the knee during surgery.

Avoid too strong a traction and a fully extended knee, as the forces of the gastrocnemius muscle would draw the distal fragment into recurvatum. This not only makes the reduction of the fracture difficult, but also endangers the popliteal artery and vein.

In very short distal fragments, it is recommended to flex the lower leg to approximately 60°. This also reduces the traction force of the gastrocnemius muscle.
Instruments for the insertion of LISS

1. Insertion Guide...........................................324.011 (left) and 324.012 (right)
2. Pin Wrench.........................................................321.170
3. Fixation Bolt .......................................................324.043
4. Stabilisation Bolt..............................................324.044
5. Drill Sleeve .......................................................324.022
Assembly of the insertion instruments

1. Insert the fixation bolt in hole A (see page 14) of the insertion guide.
2. Place the insertion guide on the three-point locking mechanism of the LISS.

1. Insert the fixation bolt into the LISS and slightly tighten it using the pin wrench.
2. Thread the nut of the fixation bolt in direction of the insertion guide and slightly tighten it with the pin wrench.
3. For a more stable fixation of the LISS to the insertion guide during insertion, introduce the stabilisation bolt with the drill sleeve in hole B (see page 14) and thread it into the LISS.

To prevent tissue ingrowth and facilitate implant removal, close the unoccupied screw holes by means of screw hole inserts prior to inserting the internal fixator. Use the torque-limiting screwdriver until clicking occurs.
Reduction

In an intra-articular fracture, first reconstruct and stabilise the entire joint. The figure shows the possible positioning sites for lag screws in the condyles.

Take care to ensure that these lag screws will not collide with the screws inserted through the insertion guide.

The fracture can be aligned manually by traction using a temporary knee-bridging external fixator or a distractor.

Intraoperative x-ray or image-intensifier control is recommended to check the reduction.

The anteromedial insertion of a Schanz screw can be very helpful in distal fragment manipulation.

Possible positioning sites for lag screws are indicated in blue.
Surgical approaches

The recommended approach for extra- and intra-articular fractures is different.
In extra-articular fractures, perform a skin incision from Gerdy’s tubercle about 80mm in proximal direction. Split the iliotibial tract in the direction of the fibres. Open the space between the lateral vastus and the periost. Distally, the lateral vastus muscle inserts mainly on the femoral ridge. There are no muscle insertions on the lateral periost or bone. The internal fixator can be inserted into the space between the periost and the muscle. In intra-articular fractures, an anterolateral arthrotomy providing good control of the reduction is recommended. This arthrotomy also allows a subsequent insertion of the fixator and can be used to insert lag screws from medially.
Insertion of LISS

Use the assembled insertion guide to insert the LISS plate between the lateral vastus muscle and the periost.

Slide the LISS plate proximally and ensure that its proximal end remains in constant contact with the bone. Position the distal end of the fixator against the lateral condyle. To find the correct position, move the LISS plate proximally and then back distally until the plate fits the condyle. Should the proximal end of the handle and the soft tissues impair the insertion of the plate, it is possible to remove the radiolucent proximal part of the handle for insertion.

Due to its weight, the insertion guide tends to tilt dorsally. If the insertion guide points parallel to the floor with the patient in supine position, the fixator is externally rotated and no longer lies flat up against the lateral condyle. The fixation bolt must be oriented parallel to the patello-femoral joint. Consequently, the insertion guide shows an internal rotation of about 10°. This occurrence is also visible in the AP view of an image intensifier. The fixator must lie flat up against the condyle to ensure an optimal fit on the bone (see picture on page 24).

Once the LISS is properly aligned with the bone, remove the drill sleeve and stabilisation bolt from hole B. Insert the trocar through the drill sleeve in the most proximal hole of the plate (5, 9 or 13). Perform a stab incision and push the drill sleeve and the trocar down to the LISS plate. Check the correct position of the proximal part of the LISS plate on the bone, either using a Kirschner wire or direct palpation. Secure the position of the drill sleeve with the lateral screw on the insertion guide. Replace the trocar by the stabilisation bolt. To close the frame, thread the stabilisation bolt into the LISS plate. Due to soft tissues around the stabilisation bolt, it will be difficult to change the position of the plate/handle assembly once the bolt has been inserted.
Preliminary fixation of LISS

For preliminary fixation of the internal fixator, use 2.0mm Kirschner wires through the fixation and stabilisation bolts. Carefully check the position of the LISS plate and the length of the reduced injured limb.

Alternatively, use the aiming device for Kirschner wires (see page 26) to insert the wires on the ventral and dorsal side of the fixator.

Once the reduction has been successfully completed and the LISS plate has been positioned correctly, the LISS screws can be inserted.

Instruments to determine screw length

1. Compact Air Drive II .......................................................... 511.701
2. Quick Coupling for Kirschner Wires ................................. 511.790
3. Drill Sleeve ......................................................................... 324.022
5. Measuring Device ............................................................. 324.037
6. Kirschner Wire, 2mm dia. x 280mm .............................. 292.699
Instruments for screw insertion

1. Compact Air Drive II ................................................................. 511.701
2. Quick Coupling ...................................................................... 511.750
3. Torque-limiting Hexagonal Screwdriver ............................. 324.052
4. Drill Sleeve ........................................................................ 324.022
5. Trocar .................................................................................. 324.027
6. Screwdriver Shaft ............................................................... 324.050
Insertion of the self-drilling screws

Screw placement depends on the type of fracture. The position of the screws should be chosen in accordance with established biomechanical principles for internal fixation. The screws should be inserted close to and remote from the fracture gap in the main fragments. Use at least four screws per fracture side.

Start making a stab incision and insert the trocar through the drill sleeve.

The length of the condylar screws can be deduced from the table on page 10. It is also possible to use the measuring device with a 2.0mm Kirschner wire, length 280mm, placed through the guide sleeve. Using image intensification, push the Kirschner wire to the desired depth leaving at least 5mm between the tip of the Kirschner wire and the medial cortex. Measure the screw length over the Kirschner wire using the measuring device for K-wires, leaving the guide sleeve in place, and round down to the nearest screw length. This will ensure that the tip of the screw will not protrude through the medial cortex.

Use the screws of 26mm length in the diaphyseal region. In case of very thick cortex, pre-drill by using the pulling device (see page 25) or special locking head screws of 35mm length with long drilling tip (422.398).

The insertion of the initial screw tends to push the bone medially, especially in cases of dense bone and/or unstable reductions. The pulling device helps to solve this problem. Insert the pulling device without the knurled nut through the drill sleeve into the neighbouring hole of the first permanent screw. Stop the power tool before the entire screw length of the pulling device is inserted. Remove the power tool and the drill sleeve. Screwing the knurled nut onto the pulling device allows pulling the bone towards the LISS plate (see page 28). Since the tip of this instrument has a diameter of 4.0mm, replacing it by a 5.0mm LISS screw still ensures good purchase in the bone.

Use tools driven by battery or compressed air to insert the self-drilling and self-tapping screw.
Insertion of the self-drilling screws

In order to achieve an excellent interface between screw and bone and to prevent a medial migration of the bone, use the power tool without high axial forces (3 to 5kg). To prevent heat necrosis, it is important to cool the screw with saline solution during the drilling procedure through the drill sleeve.

Note that once the initial screw has been inserted in each main fragment, length and rotation are defined. Ante and recurvatum deformities can still be manipulated relatively well, whereas there are only limited correction possibilities or varus/valgus deformities. Therefore, it is recommended to insert the first screw in the distal fragment. The distal screws should be placed parallel to the knee joint. Then insert a screw in the proximal fragment. If a screw has to be removed and reinserted, then this should be done using the hand screwdriver and not the power tool.

Advance the screws into the bone until the second guide of the screwdriver sinks into the drill sleeve. Use the torque-limiting screwdriver for final tightening until clicking occurs at 4 Nm. Check that the screw head is completely seated into the LISS plate.

Should the screwdriver be difficult to remove after insertion, disconnect it from the power tool and remove the drill sleeve. After reconnecting the screwdriver to the power tool, withdraw the screwdriver from the screw.
Postoperative treatment

Postoperative treatment should follow the principles of conventional internal fixation procedures; basically functional with free mobilization of the knee joint and partial weight-bearing. Physical rehabilitation should be started immediately post-operative including range-of-motion exercises. Restrictions may be appropriate in special cases.

Implant removal

Remove the implant only after complete consolidation of the fracture. Remove it in reverse order to the implantation. First, make the incision for the insertion guide in the path of the old scar, and mount the insertion guide. Make stab incisions and use the torque-limiting hexagonal screw-driver to remove the screws by hand. Complete the removal of the screws with a power tool.

The cleaning tool (see page 25) helps to clean the hexagonal recess of the screw head. After removal of all screws, remove the LISS plate. Should the plate remain stuck when all screws have been removed, take the insertion guide away, and use the fixation bolt only for the subsequent loosening of the LISS plate.
Less Invasive Stabilization System LISS
Surgical Technique – Distal Femur

Product information

Set overview

LISS DF Plates and Insertion Guide in Syncase
171.280

LISS DF Screws and additional instruments in Syncase
171.270
### Implants

<table>
<thead>
<tr>
<th>LISS Plates DF</th>
<th>Length (mm)</th>
<th>Holes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right</td>
<td>422.340</td>
<td>156</td>
</tr>
<tr>
<td>Left</td>
<td>422.341</td>
<td>156</td>
</tr>
<tr>
<td>Right</td>
<td>422.342</td>
<td>196</td>
</tr>
<tr>
<td>Left</td>
<td>422.343</td>
<td>196</td>
</tr>
<tr>
<td>Right</td>
<td>422.344</td>
<td>236</td>
</tr>
<tr>
<td>Left</td>
<td>422.345</td>
<td>236</td>
</tr>
<tr>
<td>Right</td>
<td>422.346</td>
<td>276</td>
</tr>
<tr>
<td>Left</td>
<td>422.347</td>
<td>276</td>
</tr>
<tr>
<td>Right</td>
<td>422.348</td>
<td>316</td>
</tr>
<tr>
<td>Left</td>
<td>422.349</td>
<td>316</td>
</tr>
</tbody>
</table>

### 5.0mm Locking Head Screws

<table>
<thead>
<tr>
<th>Screw Hole Insert</th>
<th>422.390</th>
<th>L 5mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>LISS Screw</td>
<td>422.392</td>
<td>L 26mm</td>
</tr>
<tr>
<td>LISS Screw</td>
<td>422.393</td>
<td>L 40mm</td>
</tr>
<tr>
<td>LISS Screw</td>
<td>422.394</td>
<td>L 55mm</td>
</tr>
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<td>422.395</td>
<td>L 65mm</td>
</tr>
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<td>422.396</td>
<td>L 75mm</td>
</tr>
<tr>
<td>LISS Screw</td>
<td>422.397</td>
<td>L 85mm</td>
</tr>
</tbody>
</table>
Less Invasive Stabilization System LISS  
Surgical Technique – Distal Femur

The threaded connection between the screw head and the LISS plate ensures angular stability for an improvement of the biomechanical characteristics.

Optimised anatomical screw position avoiding the intercondylar fossa. Note the approximately 10° angle between the lateral condylar surface and the sagittal plane.

The anatomical shape of LISS with the specific angulation of the screws.
Less Invasive Stabilization System LISS  
Surgical Technique - Distal Femur

### Instruments

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Torque-limiting Hexagonal Screwdriver</td>
<td>324.052</td>
</tr>
<tr>
<td>2</td>
<td>Stabilisation Bolt for Insertion Guide</td>
<td>324.044</td>
</tr>
<tr>
<td>3</td>
<td>Aiming Device for 2.0mm Kirschner Wires</td>
<td>324.048</td>
</tr>
<tr>
<td>4</td>
<td>Guide Sleeve for Kirschner Wires</td>
<td>324.055</td>
</tr>
<tr>
<td>5</td>
<td>Trocar for 5mm Screws</td>
<td>324.027</td>
</tr>
<tr>
<td>6</td>
<td>Drill Sleeve for 5mm Screws</td>
<td>324.022</td>
</tr>
<tr>
<td>7</td>
<td>Screwdriver Shaft</td>
<td>324.050</td>
</tr>
<tr>
<td>8</td>
<td>Fixation Bolt for Insertion Guide</td>
<td>324.043</td>
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<td>9</td>
<td>Measuring Device for Kirschner Wires</td>
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<tr>
<td>10</td>
<td>Pin Wrench</td>
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<tr>
<td>11</td>
<td>Cleaning Tool for screw head</td>
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<tr>
<td>12</td>
<td>Pulling Device</td>
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<tr>
<td>13</td>
<td>Stopper for Insertion Guide holes</td>
<td>324.019</td>
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<tr>
<td>14</td>
<td>Insertion Guide for Distal Femur, right</td>
<td>324.012</td>
</tr>
<tr>
<td></td>
<td>Not illustrated: Insertion Guide for Distal Femur, left</td>
<td>324.011</td>
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<tr>
<td>15</td>
<td>X-ray Calibrator</td>
<td>324.056</td>
</tr>
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![Image of instruments]
Less Invasive Stabilization System LISS
Surgical Technique – Distal Femur

Additional features

Temporary fixation with Kirschner Wires

If necessary, it is possible to use 2.0mm Kirschner wires for the preliminary fixation along the full length of the plate. Use the aiming device for Kirschner wires to insert the wires on the ventral and dorsal side of the fixator. Note that the distance between bone and fixator should be kept as short as possible when inserting the wires, as they are arranged in a convergent way. After the insertion of the Kirschner wires, the distance between fixator and bone can no longer be reduced.

Instruments required for the placement of Kirschner wires

1. Compact Air Drive II .................................................................511.701
2. Quick Coupling for Kirschner Wires........................................511.790
3. Kirschner Wire, 2.0mm dia., length 280mm ..........................292.699
4. Aiming Device for 2.0mm Kirschner Wires..............................324.048
Temporary fixation with Kirschner Wires

The figure shows the aiming device for Kirschner wire positioned at the proximal end of the LISS plate. Note that the aiming device can be used from hole 3 to hole 13.

After removal of the Kirschner wire sleeves and the aiming device, proximal/distal displacement and adjustment of the position of the LISS plate can be carried out. At the same time, the lateral Kirschner wires prevent the internal fixator from migrating into the sagittal plane. Once the correct position is determined, the plate can be locked temporarily with a Kirschner wire through the fixation bolt.

Kirschner wire positioning in the condylar region
Use of the pulling device

The pulling device should be inserted without the knurled nut through the drill sleeve into the neighbouring hole of the first permanent screw.

Stop the power tool before the entire screw length of the pulling device has been inserted. Remove the power tool and the drill sleeve. Screwing the knurled nut onto the pulling device allows pulling the bone towards the LISS plate. Since the tip of this instrument has a diameter of 4.0mm, replacing it with a 5.0mm LISS screw still ensures good purchase in the bone.
Tips and Tricks

• If the reduction of the fracture causes difficulties, insert a Schanz screw antero-medially in the distal fragment, and use the screw as a joystick. The insertion of a Schanz screw or pulling device into the proximal fragment can also be very helpful. Should it still be impossible to perform a correct reduction, improve the access by enlarging the soft-tissue opening.

• It is important to monitor the advance of the screw tip carefully when inserting the pulling device. Stop the power tool before the pulling device is seated on the plate. Failure to do so may result in stripping the thread in the bone.

• Bending and twisting of the LISS plate is not recommended as it might result in a misalignment between the holes of the insertion guide and the corresponding plate holes.

• Should the fixator lie too ventral or too dorsal, the screws cannot be centred in the medullary canal. This position may compromise screw purchase.

![Drilling and Tapping Illustrations]

- Drilling
- Tapping
- Correct placement

- Drilling
- Tapping
- Compromised screw purchase
Less Invasive Stabilization System LISS
Surgical Technique – Distal Femur

Tips and Tricks

• Both the screwdriver shaft and the torque-limiting screwdriver are equipped with a self-holding mechanism. Apply slight pressure on pick-up to ensure that the screwdriver shaft penetrates the hexagonal recess of the screw head.

• Should the screwdriver be difficult to remove after insertion, disconnect it from the power tool and remove the drill sleeve. After reconnecting the screwdriver to the power tool, withdraw the screwdriver from the screw.

• A standard 4.5mm cortex screw can be used through the fixator if required. Note, however, that the 4.5mm cortex screw cannot be inserted through the drill sleeve.

• Hole A serves to lock the insertion guide to the implant. This hole cannot be used for the insertion of a screw as long as the fixation bolt is attached. If a screw has to be inserted in hole A, remove the fixation bolt – with the stabilisation bolt still in place! – and refix it in an adjacent hole available. Place the drill sleeve in hole A and insert the appropriate screw.

  If all the holes are occupied by a screw, insert the screw in hole A by free-hand technique. Prior to removal, the fixation bolt or any other plate or screw can be used to determine the correct direction for insertion.

• To ensure stability of the construct, the most proximal screw of the fixator should be inserted last, just before removing the insertion guide. Remove the stabilisation bolt and insert the screw through the drill sleeve.

• If hole A is unoccupied, it must be closed with a screw hole insert to facilitate the application of the insertion guide while removing the implant.

• Should the cleaning tool be used for implant removal, use it in combination with the insertion guide.
Less Invasive Stabilization System LISS
Surgical Technique – Distal Femur

Additionally available

LISS Proximal Lateral Tibia Plates and Insertion Guide in SYCASE 171.290

5.0mm Locking Head Screw, L 35mm, with long drilling tip for particularly thick cortex 422.398.

Especially for periprosthetic fractures: Drill Bit, 4.3mm dia. 310.423.

Drill Guide 7.4 to Drill Bit, 4.3mm dia. 324.007, and 5.0mm Locking Head Screws for periprosthetic fractures, L 14mm and 18mm, 422.402 and 422.404.
The drill bit reaches the stop of the drill guide. The drilled hole is deep enough to accommodate a periprosthetic screw of 18mm length.

The drill bit does not reach the stop of the drill guide, but at least the 14mm calibration mark. The drilled hole is deep enough to accommodate a periprosthetic screw of 14mm length.

The drill bit does reach neither the stop of the drill guide NOR the 14mm calibration mark. The drilled hole is NOT deep enough to accommodate a periprosthetic screw.

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Notes for the application of periprosthetic screws

- Special screws for periprosthetic fractures have been developed for cases in which an intramedullary nail or a prosthesis could impair the drilling tip of the standard LISS locking head screws and prevent correct positioning and fixation of the LISS plate. These special periprosthetic screws are self-tapping but not self-drilling ensuring optimal fixation of the LISS plate on the diaphysis. They are available in two lengths of 14 and 18mm and allow engaging the thread in the proximal cortex and a good seat of the screw head in the LISS plate, without touching the intramedullary implant. The threaded conical head and the 5.0mm threaded shaft are identical to those of the standard LISS screws. The special periprosthetic screws are anodised in a golden colour to distinguish them from the blue standard LISS screws.

- Make a stab incision for plate holes requiring a periprosthetic screw, and insert the trocar and the drill guide. Remove the trocar and replace it by the Drill Guide (324.007) threading into the plate hole. Use the Drill Bit (310.423) to pre-drill the bone under image intensifier control. If possible, drill the bone until the drill bit reaches the stop of the drill guide. This ensures that the hole is long enough to accommodate a periprosthetic screw of 18mm length. Remove both drill bit and drill guide and use the torque-limiting screwdriver to insert the periprosthetic screw through the drill guide.

- Should the drill bit contact the medullary implant before reaching the 14mm calibration mark, the hole will not be deep enough to insert a periprosthetic screw at this place. Attention: when trying to insert a screw despite of this, stripping of the thread in the bone and loss of screw anchoring can result.

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Observations:

• Especially in bone of poor quality, the conical shape of the drill-bit tip allows even the insertion of a screw slightly longer than indicated by the drill bit. Proceed very carefully to avoid stripping of the bone thread.

• The surgeon should avoid inserting a screw to close to the tip of the intramedullary implant (prosthetic stem, intramedullary nail). A screw hole at this place would create a mechanical weak point in the bone and potentially increase the risk of a secondary fracture, particularly after implant removal.