The Distal Aiming Device (DAD) for Simplified Universal Nails (S.U.N.) 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.

DAD = Distal Aiming Device
S.U.N. = Simplified Universal Nail
**Surgical Technique**

**Intra-operative calibration and preparation of the DAD**

After reaming and determination of the nail length, the selected nail has to be calibrated with the DAD for S.U.N. (356.651). Both the Simplified Universal Tibial Nail as well as the Simplified Universal Femoral Nail can be locked with the DAD.

Prepare the S.U.N. for calibration.

**Femur**

Use the knurled Nut (355.570) to mount the S.U.N. with the Threaded Conical Bolt (355.530) together with the Insertion Handle (355.490), and tighten it with the Pin Wrench (321.170) (see illustrations below).
Distal Aiming Device (DAD) for the Simplified Universal Nail (S.U.N.)

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The same system can also be used for the tibia. In that case, make the preparations for an intramedullary nailing of the tibia.

**Preparation for the locking of the tibia**

Connect the Threaded Conical Bolt (355.440) through the Insertion Handle (355.410) with the S.U.N. Tibia, and tighten using the knurled Nut (355.470) and the Pin Wrench (321.170).

The assembly and surgical technique for an intramedullary nailing of the femur with the DAD for S.U.N. Femur are shown below.

After the assembly, push the insertion handle including the nail onto the holding block of the Sterilizing Tray (300.529).
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For calibration, prepare the single parts of the DAD as follows:

As a rule, assemble the following parts after washing, but before starting the sterilisation process. After surgery, it is strongly recommended to dismount them for cleaning and washing.

Use the adjusting screw (8) to mount the holding part (6) onto the handle (5). Thread the wing nut (12) into the holding part (6).

Mounted handle with holding part. To prepare for calibration, insert the adjusting screw (8) and wing nut (12) by hand and without force.
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Use the locking screw (4) to mount the complete handle (5) with locking disk (2) on the arm (1).

Tightening by hand of the locking screw (4) on the arm (1) is sufficient for the preparation for calibration.

Push the set screw with holding part (11) onto the feeler hook (14) and assemble it, as shown on the illustration. Tightening by hand is sufficient prior to calibration.

Note

For easier identification, the feeler hook (14) (no. 356.651.014) bears a laser mark “For calibration only” on the shaft. The feeler hook’s properties differ from those of the very similar looking curette hooks used later. The curette hooks are hardened and designed for the removal of cancellous bone. Never use the feeler hook instead of the curette hook for calibration – it could bend and the calibration may be lost.
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Surgical Technique

Connect the DAD and the insertion handle of the S.U.N. over the guide pin (9). Secure this connection with the safety device (13).

**Note**
Depending on whether the right or the left leg has to be treated, the insertion handle and the DAD have to be appropriately placed or prepared laterally. Position the handle (5) of the DAD on the S.U.N. from the anterior side. If, by mistake, the handle is placed on the nail from the posterior side, bring the handle (5) to the distal end of the arm (1) and turn it around the end of the arm to the anterior side.

Loosen the locking screw (4) to adjust the distance to the distal locking holes, so that the handle (5) moves freely on the arm (1). Introduce the first positioning bolt (18a) through the most proximal of the two holes of the guiding part (3) into the most proximal of the two distal locking holes of the S.U.N.
Bringing the second locking hole in the correct position by swivelling the handle and the guiding part (3) allows introducing the second positioning bolt (18b).

Tightening the locking screw (4) with the Combination Wrench 11mm (321.160) concludes the adjustment of length.
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For the adjustment of height, insert the feeler hook (14) laterally or from below in the holding part (6), and fix it with the wing screw (12). Check whether the L-shaped part at the end of the feeler hook (14) is situated exactly above the nail.

If this is not the case, loosen the adjusting screw (8) to allow the holding part (6) to be moved until the feeler hook (14) is situated exactly above the nail. After this mediolateral movement, use the 3.5mm Hexagonal Screwdriver (314.270) to refasten the holding part (6) by tightening the adjusting screw (8).

The detailed picture of the connection between the feeler hook and the holding part of the handle clearly shows the correct position of the feeler hook's (14) wing nut (12) and set screw (11).

Use the 3.5mm Hexagonal Screwdriver (314.270) to tighten the set screw (11) fixing the feeler hook (14) in this position.
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Note
If the height has been set correctly, the feeler hook (14) touches the S.U.N. in the centre of its anterior curvature.

Check again whether all screws are firmly tightened. The DAD is now calibrated and ready for use.

Loosen the wing screw (12) to remove the calibrated feeler hook (14) from the DAD. Pull the two positioning bolts (18) out of guiding part. Loosen the safety device (13), and carefully remove the DAD from the insertion handle.

Put all parts carefully aside to ensure that no maladjustment of the calibration occurs.
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Surgical Technique

Distal locking with the DAD

Distal locking with the DAD is independent of proximal locking. It is recommended, however, to start with distal locking, and then to proceed with proximal locking. After distal locking, this offers the possibility to compress the fracture gap or achieve a correct fracture reduction by driving the nail further back.

In line with the surgical technique for S.U.N., start to manually insert the intramedullary nail over the guide wire as far as possible into the reamed medullary cavity. Then thread the threaded conical bolt over the guide wire into the proximal end of the S.U.N. Push the insertion handle and the knurled nut over the guide wire, and mount them onto the threaded conical bolt or S.U.N. Use the pin wrench to tighten the knurled nut. See also the specific surgical technique for S.U.N.

Note

If the S.U.N. has not been positioned and mounted in single steps over the guide wire, as described above, but in the assembled state, as shown in the second picture on page 4, there is a risk that the S.U.N. cannot be completely pushed over the guide wire into the medullary cavity. The end of the guide wire could get stuck on the threaded conical bolt. If this occurs, remove the assembled S.U.N.-insertion handle unit, dismount it, and assemble it individually over the guide wire, as described above.

After insertion of the S.U.N. and removal of the guide wire use the DAD to start the distal locking.

Connect the DAD again over the guide pin (9) with the insertion handle of the S.U.N. Secure this connection again with the safety device (13).
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Push the protection sleeve 11.0/8.0 (355.700) together with the 8.0mm Trocar (355.750) into the holding part (6) and secure it with the wing screw (12).

Swivelling the DAD allows marking of the incision point on the skin with the tip of the trocar. Swing the DAD back to proximal, and make a stab incision at the marked point. Return the DAD to its original position, and puncture the bone with the tip of the trocar.

Replace the trocar with the Drill Sleeve 8.0/6.0 (356.668). Use the 6.0mm Drill Bit (310.600) to carefully drill the cortex, without touching the nail.

Remove the 6.0mm Drill Bit (310.600) and the Drill Sleeve 8.0/6.0 (356.668). Loosen the wing screw (12) and remove the Protection Sleeve 11.0/8.0 (355.700). Then swing the DAD back to proximal.
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Use either the short curette hook (356.651.015) or the long one (356.651.016) to clear the bone space, so that the surface of the nail can be touched.

Be careful to use only the curette hooks and not the calibrated feeler hook to clear the bone space. See note on page 7.

Carry out a tapping up-and-down movement with the curette hook to check whether the nail surface can be touched. Nail contact will be recognized by a metallic sound.
Distal Aiming Device (DAD) for the Simplified Universal Nail (S.U.N.)

Surgical Technique

Once there is contact with the S.U.N., replace the curette hook with the calibrated feeler hook (14). Instead of the curette hook, insert the feeler hook into the bone opening.

Once the nail can be touched, swing the arm (1) of the DAD toward the feeler hook (14). Insert the feeler hook in the holding part (6), and fix it with the wing screw (12).
Continuous pressure on the handle of the feeler hook (14) ensures the contact with the nail during the following operations.

Push the Protection Sleeve 11.0/8.0 (355.700) together with the 8.0mm Trocar (355.750) into the most proximal of the two holes of the guiding part (3). Use the tip of the trocar to mark the incision point on the skin, and make a stab incision. Carefully guide the trocar through the soft tissues to the bone, and puncture the bone.

Replace the trocar with the Drill Sleeve 8.0/4.5 (355.710). To drill the first locking hole in the nail with the 4.0/4.5mm Drill Bit (355.900), place continuous pressure on the feeler hook.
Distal Aiming Device (DAD) for the Simplified Universal Nail (S.U.N.)

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Drill through both cortices of the bone, and leave the drill bit in the bone.

Repeat the same procedure for the second locking hole. Use again a combination consisting of protection sleeve, trocar and drill sleeve.
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Surgical Technique

After removing the 4.0/4.5mm Drill Bit (355.900) and the Drill Sleeve (355.710), determine the length of the locking bolts using the Depth Gauge for Locking Bolts (355.790). Select bolts that are 2 to 4mm longer than the measured length of the locking hole. This ensures good engagement of the bolt's self-tapping threaded tip in the far cortex.

This picture shows the flute of the depth gauge in the far cortex (L) and the tip of the drill bit (S).
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Insert the 4.9mm Locking Bolt of appropriate length directly through the Protection Sleeve 11.0/8.0 (355.700).

Repeat the same procedure for the second locking hole. Remove the Protection Sleeves 11.0/8.0 (355.700).

This concludes distal locking. Dismounting of the Distal Aiming Device: loosen the wing screw (12) and remove the feeler hook (14). Swing back the DAD, loosen the safety device (13), and remove the DAD from the insertion handle.

A possible driving back of the nail for fracture reduction is followed by the proximal locking over the standard insertion handle, in line with the surgical technique for S.U.N.
**Distal Aiming Device (DAD) for the Simplified Universal Nail (S.U.N.)**

**Surgical Technique**

**Instruments of DAD for S.U.N.**

DAD for S.U.N. (356.651)

Legend

1. Arm
2. Locking disk
3. Guiding part
4. Locking screw
5. Handle
6. Holding part
8. Adjusting screw
9. Guide pin
11. Set screw with holding part
12. Wing nut
13. Safety device
14. Feeler hook (no. 356.651.014); marked “For calibration only”
15. Curette hook, short (no. 356.651.015)
16. Curette hook, long (no. 356.651.016)
18. Positioning bolt (a and b)
21. Calibration block (to renew the calibration lost during surgery)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>355.700</td>
<td>Protection Sleeve 11.0/8.0</td>
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<td>355.710</td>
<td>Drill Sleeve 8.0/4.5</td>
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<tr>
<td>355.900</td>
<td>Drill Bit, 4.0/4.5mm dia.</td>
</tr>
<tr>
<td>356.668</td>
<td>Drill Sleeve 8.0/6.0</td>
</tr>
<tr>
<td>310.600</td>
<td>Drill Bit, 6.0mm dia.</td>
</tr>
<tr>
<td>300.529</td>
<td>Sterilizing Tray for DAD, for S.U.N., without contents</td>
</tr>
</tbody>
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