Aesculap® Targon® FN

Head Preserving Solution for Medial Femoral Neck Fractures

Aesculap Orthopaedics

B BRAUN
SHARING EXPERTISE

Targon® FN

Martyn J. Parker, MD, FROS
Department of Orthopaedics and Trauma, Peterborough, United Kingdom

Hans-Werner Stedtfeld, MD
University of Rostock, Germany

A fracture of the hip is the most common reason for an elderly patient to be admitted to an acute orthopaedic ward. Half of these fractures are intracapsular.
This particular fracture has been termed the "unsolved fracture", because of this continuing controversy between preserving the femoral head using internal fixation or replacing the head with a prosthesis.
Internal fixation is clearly indicated for all undisplaced fractures and for those aged less than about 60-70 years with a displaced intracapsular fracture in which preservation of the femoral head is desired.

Displacement of the fracture is the main complication associated with fixation of an intracapsular fracture. This occurs in about 5 % of undisplaced fractures and up to 30 % of displaced fractures that have been treated by reduction and fixation.

This complication is essentially mechanical, with the traditional implants failing to hold the fracture in a stable configuration.
Multiple parallel screws have inadequate purchase on the lateral femoral cortex so that the forces acting around the hip cause the fracture to tilt into a varus position, and the fixation fails.

Further problems with this method of fixation are that the screws back out laterally as the fracture consolidates, causing irritation of the local tissues.
The sliding hip screw may also be used to fix this fracture. Whilst this implant has good lateral fixation and allows the fracture to consolidate by collapsing along the line of the femoral neck, it lacks rotational stability.

The Targon® FN has been designed with these specific problems in mind. The TeleScrews allow a controlled collapse of the fracture along the line of the femoral neck without any backing out of the screws into the soft tissues. Linking these distal and proximal screws with a locking plate gives a much more stable construction with superior rotational stability than would be found with either method of fixation.
Specific instruments have been designed to make the procedure easier to undertake using minimally invasive surgery.
The surgical technique allows the surgeon to achieve an easy fixation whilst at the same time avoid potential complications such a bending of the guide wires or pushing of the guide wires into the pelvis.
Our initial positive experience with the Targon® FN suggests this implant may be a major advance in the management of the intracapsular fracture and a possible solution to the dilemma of the "unsolved fracture".

January, 2011

Dynamic Fixation with Stability

Targon® FN
The System

- Minimally invasive surgery
- Simple surgical technique
- Rotationally stable proximal fixation
- Solid distal fixation
- Early mobilisation
- Very promising first clinical results[1,2]

Implant material:
Titanium alloy Ti6Al4V

TeleScrews

- 6.5 mm cancellous screws
- Sliding capacity within the screw
- 10 mm minimum sliding capacity
- Extension to maximum 20 mm slide

Femoral Neck Plate

- Anatomically shaped
- Angled locking side plate
- Up to 4 proximal screw sites for TeleScrews
- 130 degree angle for TeleScrews
- Two distal screw sites

Locking Screws

- 4.5 mm bicortical screws
- Self tapping
- Angle-stable locked into the side plate

- No lateral backing out because of angle stable TeleScrew fixation to the plate.

- Controlled TeleScrew sliding prevents cranial migration.
- 10 mm standard slide preset.

- Adjustable slide to maximum 20 mm.

[1] Parker M. Internal fixation for femoral neck fractures – a new dynamic plate-screw system. Jatros Orthopädie. 2008; 2:46-8 (article in German).

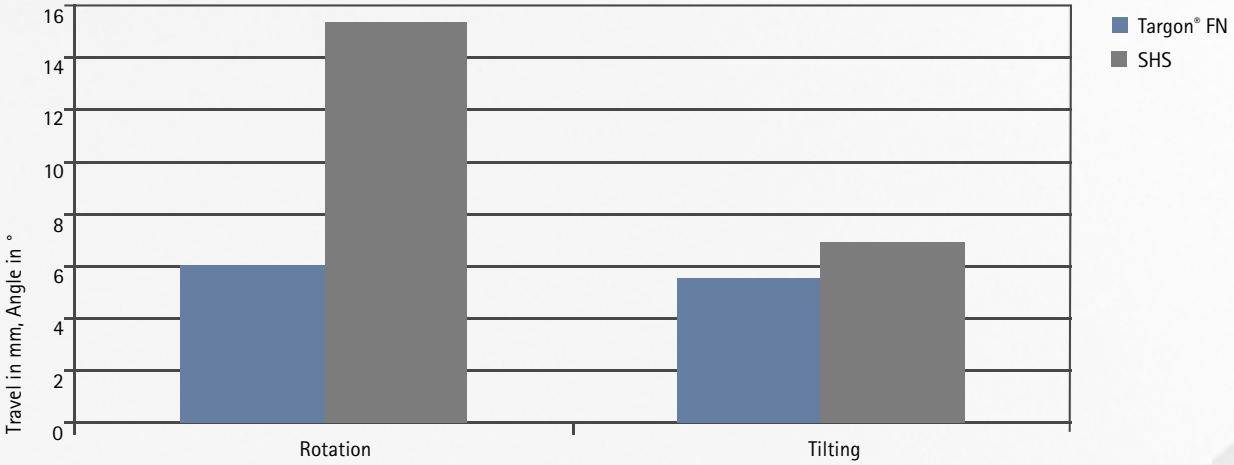
[2] Parker MJ, Stedtfeld HW. Internal fixation of intracapsular hip fractures with a dynamic locking plate: initial experience and results for 83 patients treated with a new implant. Injury. 2010 Apr;41(4):348-51.

Targon® FN Biomechanics

Comparison Targon® FN vs. SHS (Sliding Hip Screw)

Measurement of stability of fracture fixation in a simulated lateral femoral neck fracture (osteotomy).

Average of Total Movements



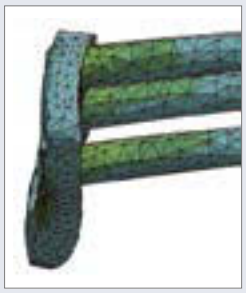
Results

- Targon® FN showing superior rotational stability than SHS[3]
- Targon® FN with less tilting of the proximal head fragment under cyclic load than SHS

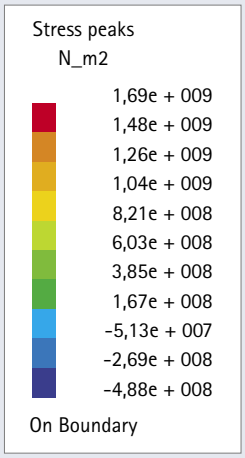
[3] Lustenberger A, Bekic J, Ganz R. Rotational instability of trochanteric femoral fractures secured with the dynamic hip screw. A radiologic analysis. Unfallchirurg. 1995 Oct;95(10):514-7.

Set-up for biomechanical Targon® FN lab testing

Finite element analysis of Targon® FN (prototype) in view of testing and improving implant stability



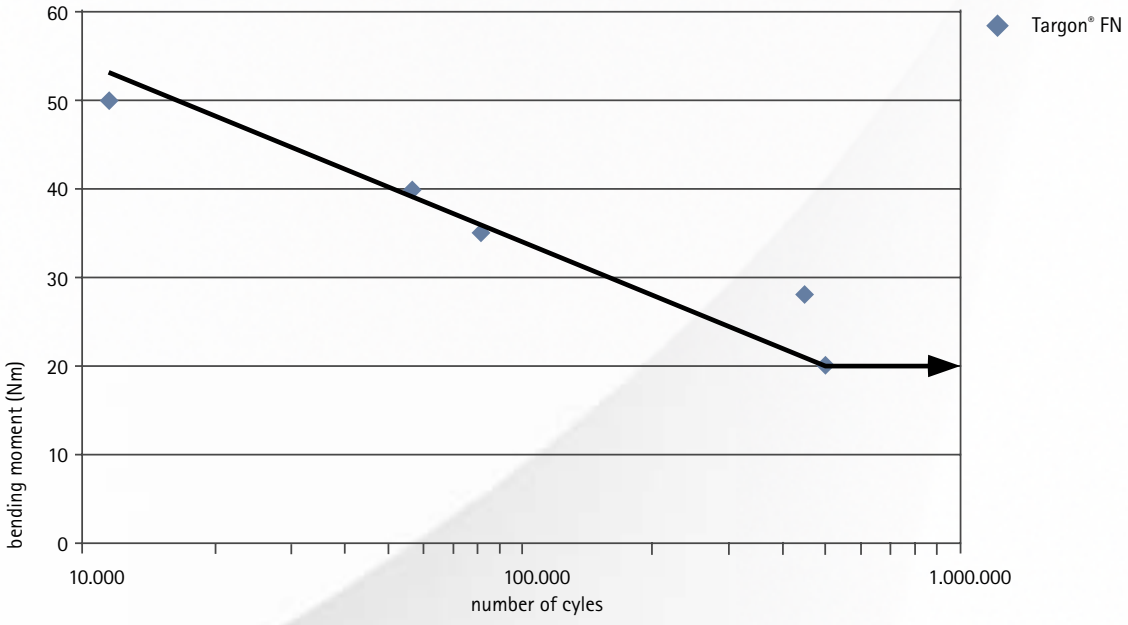
stress peaks in plate and sleeves



Source: Aesculap AG, Research and Development

Fatigue strength of Targon® FN in dynamic biomechanical testing

Dynamic fatique strength



Targon® FN

Advantages of Targon® FN Fixation

Rotational Stability

The use of two, three or four proximal screws secured laterally to the plate provides a firm fixation on the femoral head with rotational stability. The screw tips can be inserted precisely within the femoral head to enhance hold onto the proximal side of the fracture.

Minimally Invasive Operation

The alignment jig with the Targon® FN enables fixation to be achieved with minimal exposure of the lateral femoral cortex just below the greater trochanter. The jig guides the drilling for both of the proximal TeleScrews and two distal screws.

Dynamic Capacity

The proximal screws (TeleScrews) have a sliding capacity to allow for up to 20 mm of slide to occur within the screws. This allows for fracture consolidation to occur along the line of the femoral neck as the fracture heals. Because the sliding occurs within the screws there is no backing out of the implant laterally which would otherwise cause irritation of the soft tissues. The TeleScrews are secured to the plate and there is no risk of the screw migrating either medially or laterally.

Secure Distal Fixation

Two distal screws secure the side plate to the distal femur. These utilise the locking plate concept to provide additional strength in the fixation.

Early Mobilisation After Surgery

Because of the improved stability of the fixation most patients should be allowed to mobilise, as soon as able after surgery, with no restriction on hip movements or weight bearing. Routine removal of the implant is not necessary.

MRI Compatible

The implant is constructed from titanium alloy and should the later fracture healing complications of fracture non-union or avascular necrosis be suspected, a MRI scan can be undertaken without removal of the implant.

Reduced Radiation Exposure

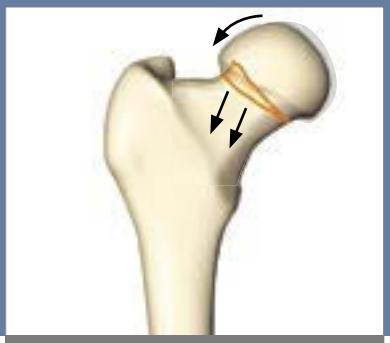
Once the alignment jig and plate are in the required position, the drilling and insertion of both the proximal TeleScrews and distal screws can be undertaken using the jig and measuring devices with minimal radiographic exposure.

Safe and Quick Operating Technique

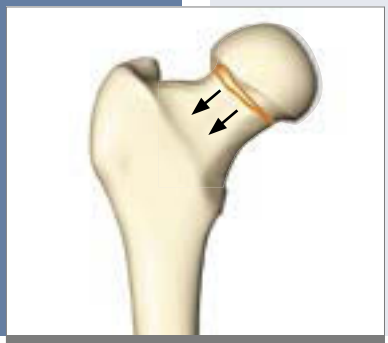
The Kirschner guide wires are inserted through the jig. Once the correct position of these is achieved the plate can be secured to the femur. Drilling for the proximal TeleScrews is done sequentially without the need to drill over the guide wire, thereby avoiding any penetration of the guide wires medially into the hip joint.

Targon® FN
Operating Technique

Indications for Targon® FN



AO 31 B1.1



AO 31 B1.2

AO 31 B1.3

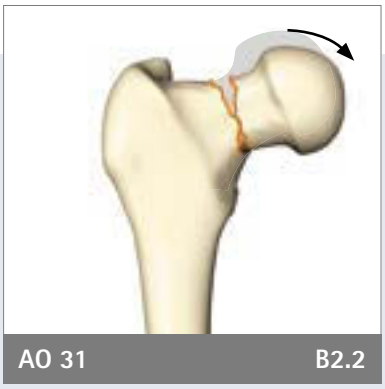
Undisplaced intracapsular fractures:

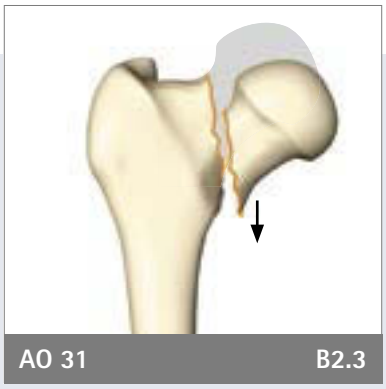
- AO 31B1.1, 31B1.2 and 31B1.3
- Garden classification grades 1 and 2

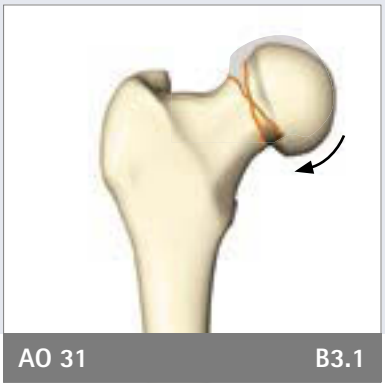
Undisplaced Intracapsular Fractures

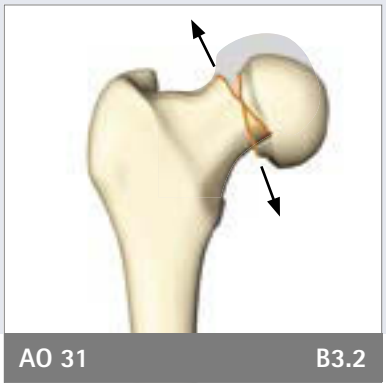
All undisplaced (impacted) intracapsular fractures should be considered for internal fixation with the Targon® FN. Conservative treatment of these fractures carries a high risk of fracture displacement and is generally not recommended.

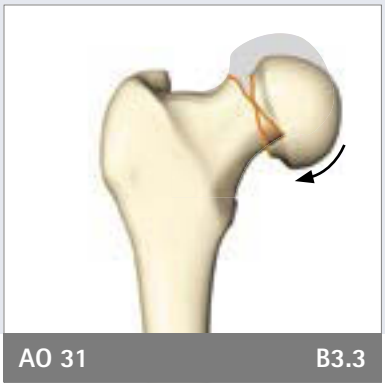
Replacement arthroplasty is a more extensive procedure with a higher risk of complications than that of fixation and is therefore inappropriate for this fracture.











Displaced intracapsular fractures:

- AO 31B2.2, 31B2.3
- AO 31B3.1, 31B3.2, 31B3.3
- Garden classification grades 3 and 4
- Pauwels classification type 1-3

Displaced Intracapsular Fractures

Any displaced intracapsular fracture in which preservation of the femoral head is felt desirable should be considered for internal fixation with the Targon® FN. This includes younger patients in which preservation of the femoral head is advantageous and those patients in which the more extensive procedure of arthroplasty needs to be avoided. Individual surgeons may also prefer to use the Targon® FN for displaced intracapsular fractures in the elderly as an acceptable alternative to replacement arthroplasty.

Targon® FN
Operating Technique

- Patient Positioning
- Preoperative Planning

Positioning

Avoid sudden or excessive movements when positioning the patient because this might cause a disruption of the blood supply of the femoral head.

Fig. 2: Radiograph AP view
Fig. 3: Radiograph axial view

Fracture Reduction

Undisplaced fractures and those fractures which are impacted on the AP radiograph and undisplaced on the lateral radiograph (Garden grade 1) require no reduction (Fig. 1).
Displaced fractures (Fig. 2) are first reduced by applying gently longitudinally traction with the fracture table, whilst screening on the anterior-posterior (AP) radiograph to reduce the fracture. The aim should be to reduce the fracture to either an anatomical position or a slight valgus position as determined by the alignment of the trabeculae of the femoral head with the shaft of the femur. (Fig. 3 reduced)
Then the fracture is reduced on the axial (lateral) view by internal rotation of the limb (full internal rotation may be necessary for fully displaced fractures). (Fig. 4 before reduction, Fig. 5 reduced)

Fig. 1

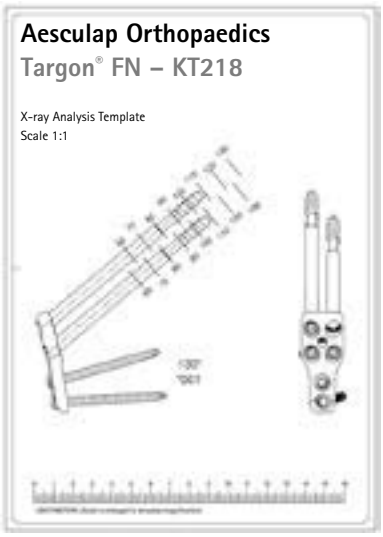
Fig. 2

Targon® FN X-ray Template – KT218

The X-ray template shows the implant in the real size and takes into consideration a magnification of 10 %. The X-ray templates should have the same magnification to match the templates.

Please verify all measurements determined by this template intraoperatively to ensure a correct choice of your implant. If needed, this X-ray template can also be supplied in digital form.

Fig. 3



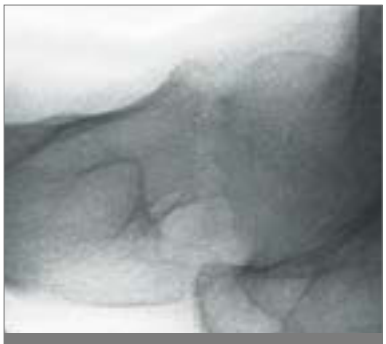


Fig. 4

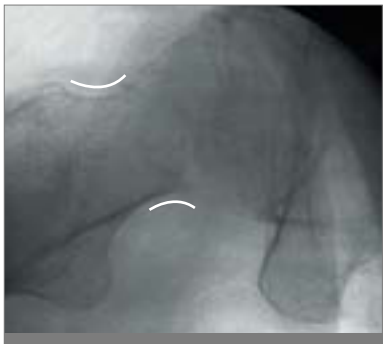
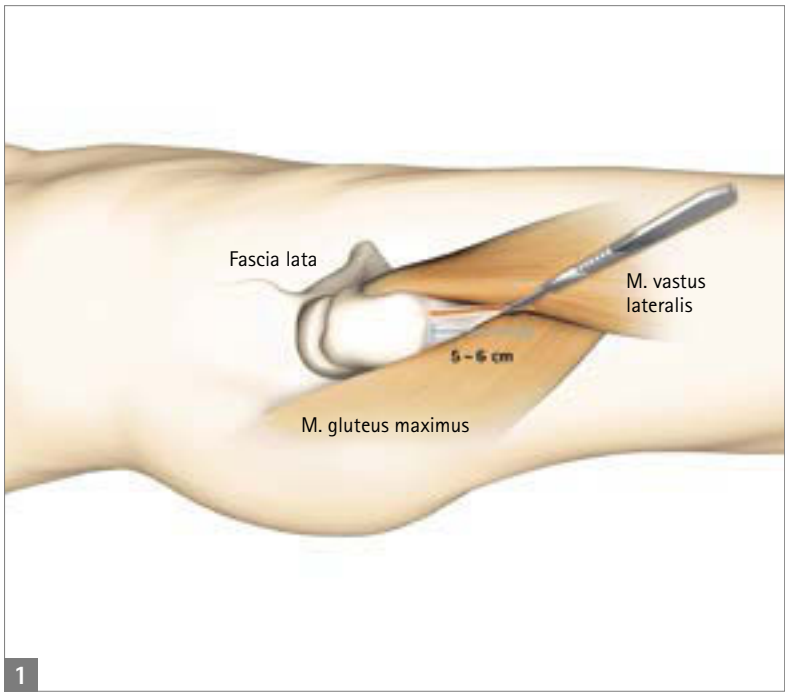


Fig. 5

Targon® FN
Operating Technique

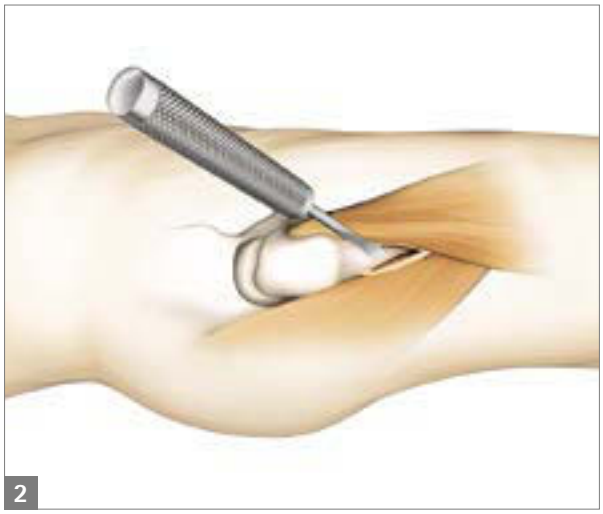
Approach

1



1

- COBB Elevator – FK147R


2

C-arm view of the proximal femur in axial projection. The incision line (5-6 cm) is marked on the skin in the central femoral neck plane.
The incision and separation of the fasci lata follow; approach to the lateral femur at the dorsal margin of the M. vastus lateralis, just below the tuberculum innominatum and immediately in front of the femoral base of the M. gluteus maximus at the gluteal tuberosity. The shape of the plate anatomically adapts to this area.

Optional:

With the COBB elevator, space can be created at the base of the gluteal muscle if necessary (Fig. 2).

Mounting the Aiming Jig

2

1

A – Fixing the Plate

- Targon® FN plate – KO802T
- Targeting device – KT220P
- Holding screw – KT221R
- Screwdriver ø 3.5 mm – KT226R

The Targon® FN plate is fastened to the targeting device by means of the plate holding screw.

The plate holding screw occupies the central hole of the targeting device.

2

Targon® FN
Operating Technique

B – Attaching the Handle

- Handle – KT219P
- Targeting device – KT220P
- Connection screw – KT228P

The connection screw is screwed into the handle (Fig. 1a). Attach the handle to the targeting device so that the connection screw engages (Fig. 1b).

Fasten the connection screw by a firm rotation (Fig. 1c). For adipose patients, the handle can be mounted on the opposite side of the targeting device (Fig. 2).

To dismante the handle, slightly unscrew the connection screw and then pull it out (Fig. 3).

Implantation of the Targon® FN Plate

3


1

Placing the Central Guide Wire

- Guide wire ø 2.5 x 310 mm – KT234S
- Drill aiming guide – KT232R

Use the alignment jig with the attached plate.
Position a guide wire centrally in the lateral femoral cortex to pass up the middle of the femoral neck to lie centrally in the femoral head on both the AP and axial radiographs. (Fig. 1)
This guide wire should be in the central hole of the alignment jig.

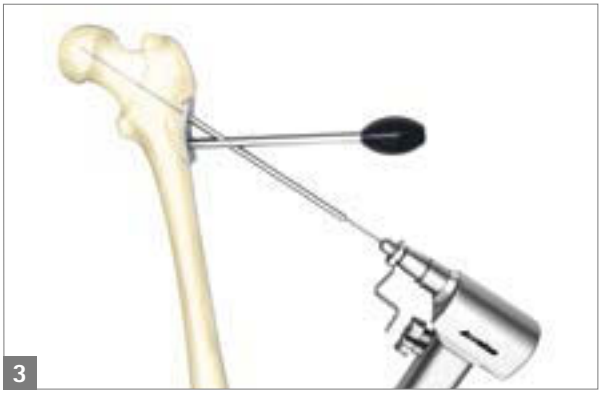

2

Optional:

The drill aiming guide might be used instead of the alignment jig to place the central guidewire. (Fig. 3)

Attention:

Tilting of the targeting device is still possible.


3

Targon® FN
Operating Technique

Implantation of the Targon® TeleScrews

4

A – Placing the Guide Wires

- Guide wire ø 2.5 x 310 mm – KT234S
- Drill sleeve – KT223R

The green drill sleeves are inserted into the alignment jig up to the stop and slightly tightened by a turn.
A sharp guide wire is drilled into the cortex of the femoral head.

Wires for up to four TeleScrews are inserted through the guide sleeves. If three TeleScrews are used in an L-configuration, it is recommended to apply two screws in lower positions. The third TeleScrew could find best anchoring at the position closest to the center of the femoral head.

The position of these guide wires should be checked on the AP and axial views and adjusted so the guide wire tips are in the subchondral bone at the position where the tips of the TeleScrews are to be placed. This should be approximately 5 mm from the joint line.

The lower guide wires should lie just above the calcar on the AP X-ray.

Deviation of the guide wires is without consequence for the positioning of the TeleScrews, since they are independently inserted directly through the targeting device.


1


2


3

B – Measuring the Length and Drilling the Bone

- Screw scale – KT230R
- Stepped drill – KT224R
- Depth stop for drill KT224R – KT235P

Measure the length of the guide wires with the measuring scale by holding it against the drill sleeve. The total length is measured up to the tip of the guide wire (Fig. 1).

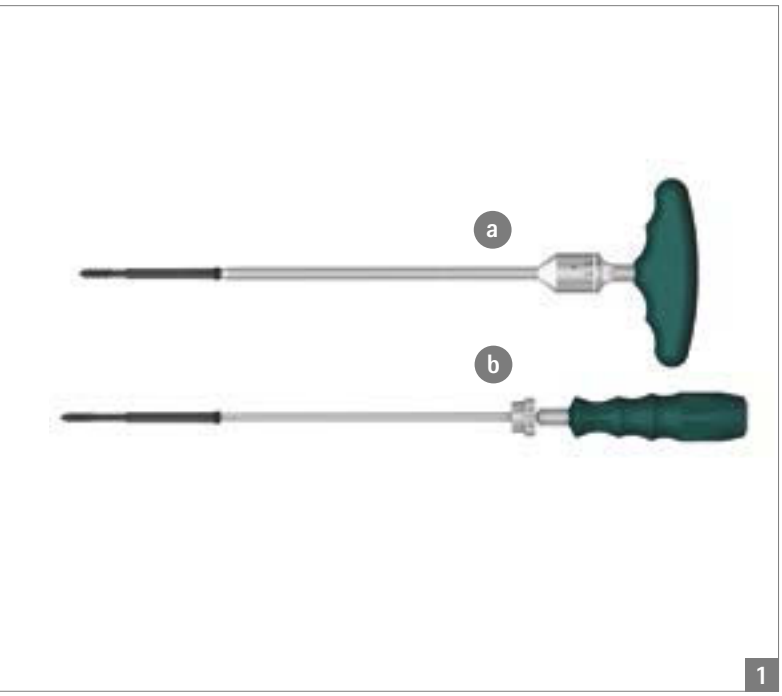
Attach the depth stop to the drill by turning it clockwise and adjust it to the measured length (Fig. 2).

One of the guide wires as well as one of the drill sleeves are removed now. These can be loosened either by hand or with the help of screwdriver KT226R. With the stepped drill, the screw channel is bored open to the measured depth (Fig. 3).

Attention:

Take care to introduce the stepped drill with depth stop only until the stop reaches the aiming jig with-out any additional force.
Choose the TeleScrew size that is the same as or just smaller than the distance measured on the scale. For example, if the screw measures 94 mm, choose a TeleScrew of 90 mm.

Targon® FN
Operating Technique



1


2


3

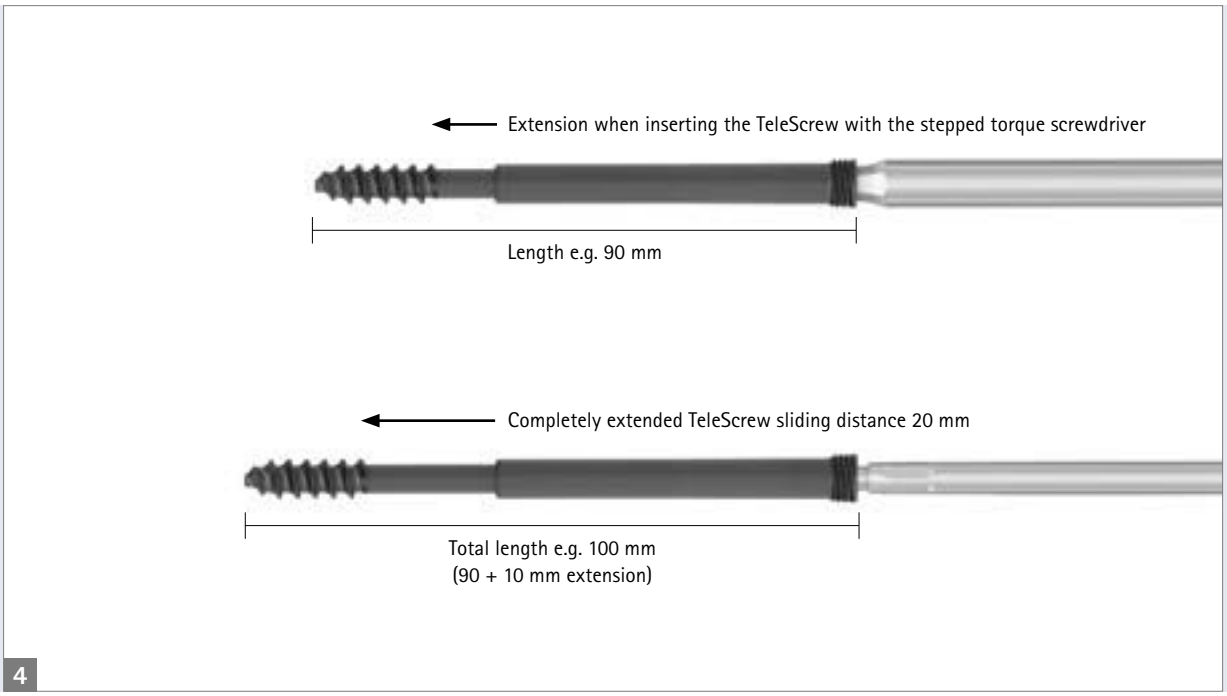
C – Inserting the TeleScrews

- Stepped screwdriver torque – KT225R (Fig. 1a)
  only to be used to insert and fasten the TeleScrews
- Screwdriver ø 3.5 mm – KT226R (Fig. 1b)
  to fine adjust the length of the TeleScrews

Push the socket of the support screw on the small hexagon of the screwdriver KT225R.
Connect the support sleeve and the large hexagon. Insert the TeleScrew of the selected length using the green stepped screwdriver and tighten the screw to the correct torque as marked (8 Nm) (Fig. 3).
Repeat this for the other TeleScrews to insert three or four TeleScrews.
A black ring on the stepped screwdriver marks the screwing distance in which the thread of the support sleeve connects to its counterpart on the plate.

Attention:

The stepped screwdriver KT225R is torque indicating, not limiting.
The required tightening torque can be achieved at different screw extensions of the TeleScrew.



4

The TeleScrews may be extended by up to 10 mm using the ø 3.5 mm green screwdriver KT226R.

Guided by the AP and axial X-ray, adjust each TeleScrew length so the tip of the screw is lying in the subchondral bone about 5 mm for the joint line.

The scale on the screwdriver indicates how much the screw has been advanced.

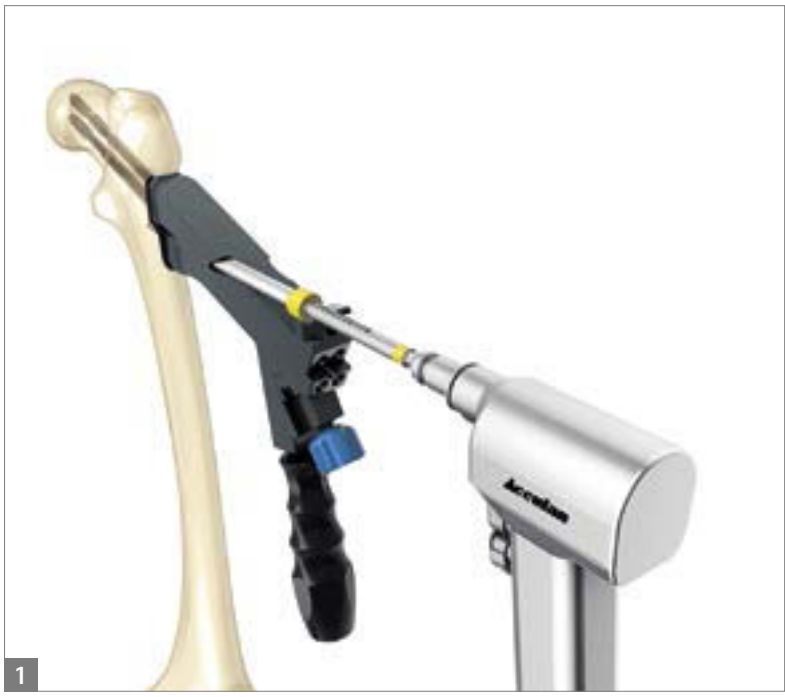
Attention:

Do not extend the screw past a maximum extension of 10 mm as this may reduce the strength of the fixation.

Targon® FN
Operating Technique

Insertion of Distal Screws

5


1

Inserting the Distal Screws

- Yellow tissue protection sleeve – KT231R
- ø 4.1 mm yellow drill – KT229R
- Depth gauge – KH274R
- ø 4.5 mm yellow screwdriver – KT236R

Insert the yellow tissue sleeve and drill the femur using the yellow drill KT229R (Fig. 1).

2

3

4

Once the drill has just penetrated the second cortex of the femur, read the screw length off the scale on the drill or measure the required screw length using the depth gauge (Fig. 2 + 3).

Using the ø 4.5 mm yellow screwdriver, insert a ø 4.5 mm distal screw of the appropiate length to just penetrate the medial cortex of the femur.
The screw is passed through the tissue sleeve and tightened into the plate (Fig. 4)

Repeat for the second distal screw.

Targon® FN
Operating Technique

Completion

6


1

- ø 3.5 mm green screwdriver – KT226R

The green screwdriver ø 3.5 mm is used to release the plate holding screw and with it the targeting device from the plate (Fig. 1).

Post-operative Care

7

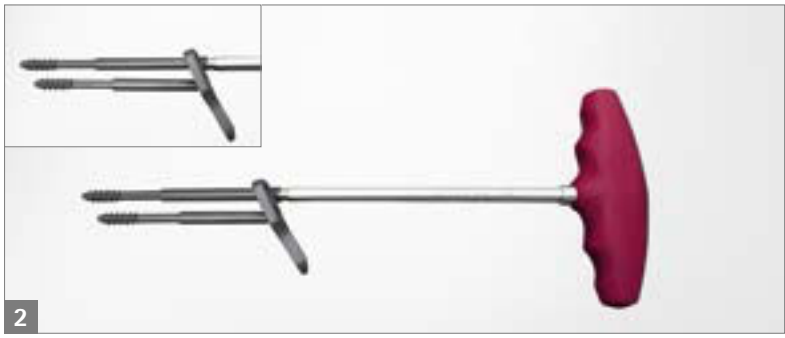
Generally patients with an undisplaced intracapsular fracture should be allowed to mobilise without any restriction on weight bearing or hip movements.

For the displaced fracture that has been reduced and fixed, then some physicians may prefer a period of protected weight bearing to reduce the risk of fracture re-displacement.

Targon® FN
Operating Technique

Implant Removal

8



- ø 3.5 mm green screwdriver – KT226R
- ø 5 mm red screwdriver – KT217R
- ø 4.5 mm yellow screwdriver – KT236R

First expose the plate and remove the screw heads from the ingrown tissue. Turn the internal screw part of the TeleScrew backwards by at least 0.5 cm (fig. 1) using the green 3.5 mm screwdriver KT226R so that sufficient length is created to pull the sheath out of the plate.
If the sliding distance of the TeleScrew was already clearly or fully used up radiologically, this step can be omitted.

Next, loosen the sheath part of the TeleScrew from the plate using the red 5.0 mm extractor KT217R until it is completely separated from the plate (fig. 2).

The TeleScrew can now be fully unscrewed and extracted with the utmost of care using the self-locking green 3.5 mm screwdriver KT226R (fig. 3).

3

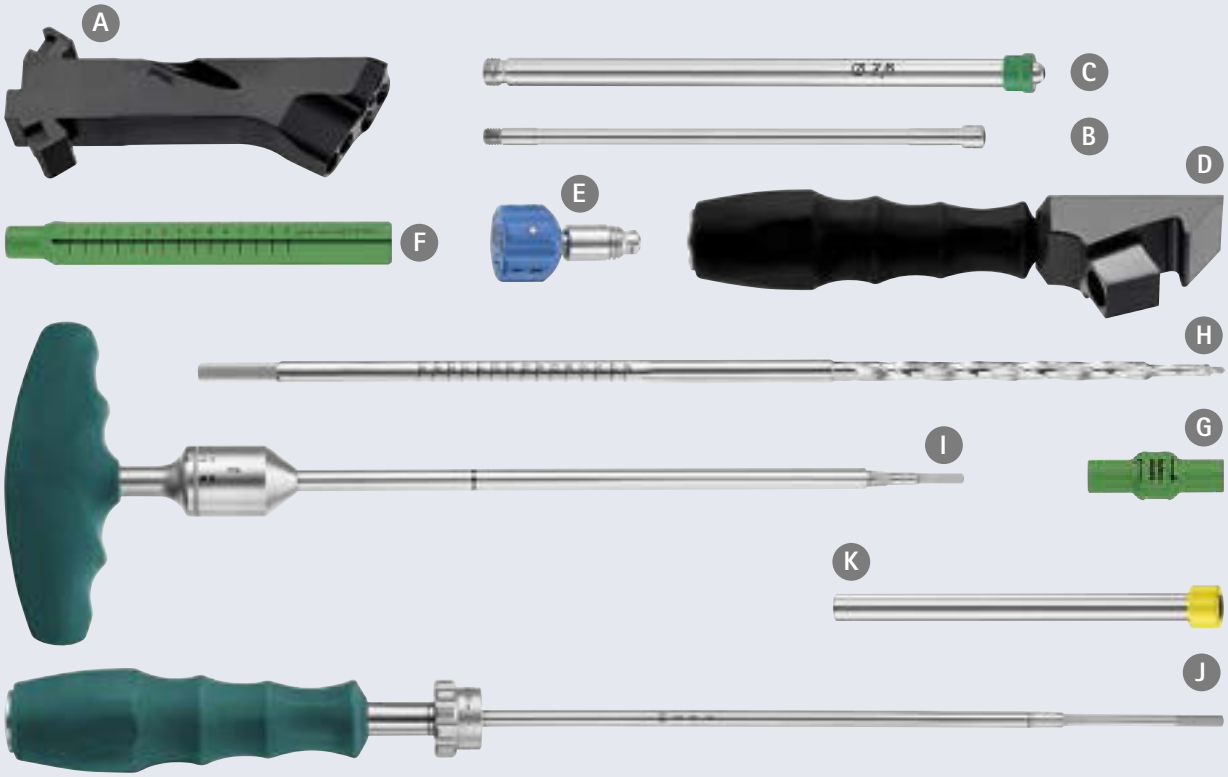
The yellow ø 4.5 mm screwdriver is then used to extract the distal screws. Care should be taken to ensure there is complete insertion of the screwdriver into the hexagon socket before turning the screw back.

In rare cases, a TeleScrew may jam in the plate. We recommend removing all the TeleScrews which can be loosened from the plate and all 4.5 mm distal screws first, and then turning back the TeleScrew which is jammed tight using the green 3.5 mm screwdriver. The plate and the TeleScrew will slowly move sideways, so that both of them can be removed together. If the threads of the screw no longer engage, it may be necessary to pull the plate out sideways.

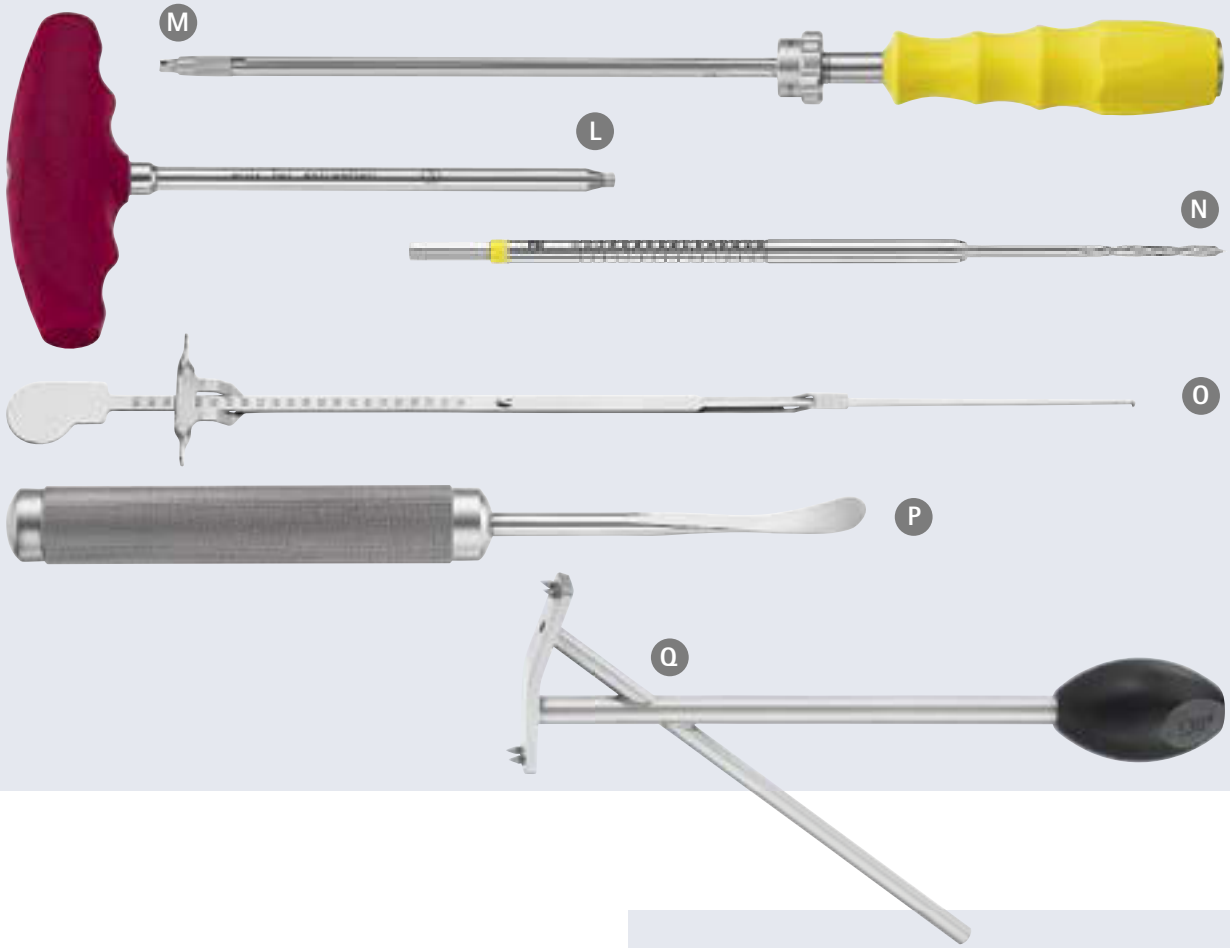
Attention:

The stepped screwdriver KT225R should not be used to remove the TeleScrews.

Targon® FN
Instrument Overview



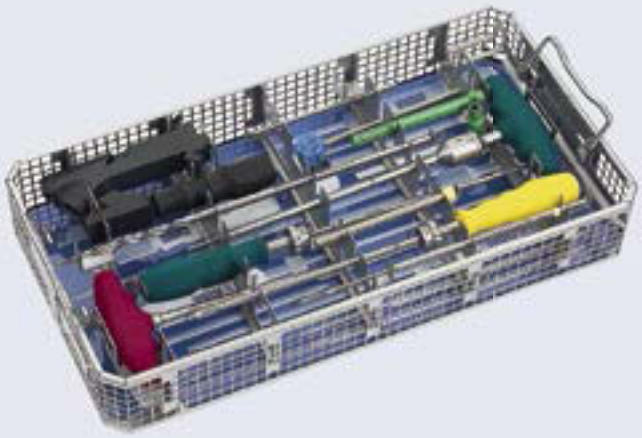
	Article no.	Description
A	KT220P	Aiming attachment
B	KT221R	Holding screw for aiming attachment
C	KT223R	Drill sleeve (3x)
D	KT219P	Handle
E	KT228P	Connecting screw
F	KT230R	Screw length gauge
G	KT235P	Depth stop for drill KT224R
H	KT224R	Step drill
I	KT225R	Stepped screwdriver, torque
J	KT226R	Screwdriver, ø 3.5 mm
K	KT231R	Tissue protecting sleeve distal
L	KT217R	Screwdriver, ø 5 mm
M	KT236R	Screwdriver, ø 4.5 mm
N	KT229R	Locking drill, ø 4.1 mm
O	KH274R	Screw length gauge (optional)
P	FK147R	COBB elevator (optional)
Q	KT232R	Drill aiming guide (optional)



Color Coding –
Organization of the Instrument Tray

- Approach
- TeleScrew
- Distal Locking
- General Instruments
- Explantation

Targon® FN – Ordering Information Instruments



Optional:

Article no.	Description	Quantity
KH274R	Screw length gauge	1
FK147R	COBB elevator	1
KT232R	Drill aiming guide	1

To be ordered separately:

Article no.	Description	Quantity
KT234S	Guide pin ø 2.5 x 310 mm sterile (4 pcs)	1

Recommended container:
JK440 Container base 592 x 285 x 108 mm
JP001 Primeline lid 1/1 red

Targon® FN KT240 Instrument Set

Article no.	Description	Quantity
KT217R	Screwdriver, ø 5 mm	1
KT218	X-ray template	1
KT219P	Handle	1
KT220P	Aiming attachment	1
KT221R	Holding screw for aiming attachment	1
KT223R	Drill sleeve	3
KT224R	Step drill	1
KT225R	Stepped screwdriver, torque	1
KT226R	Screwdriver, ø 3.5 mm	1
KT228P	Connecting screw	1
KT229R	Locking drill, ø 4.1 mm	1
KT230R	Screw length gauge	1
KT231R	Tissue protec. sleeve, distal	1
KT234S	Guide pin ø 2.5 x 310 mm sterile (4 pcs)	1
KT235P	Depth stop for drill KT224R	1
KT236R	Screwdriver, ø 4.5 mm	1
TA012039	Instructions for use Targon® instruments	1
KT241R	Tray for instruments	1
TE914	Template for KT241R	1
JF217R	Lid for KT241R	1

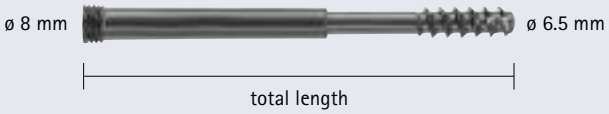
Targon® FN – Ordering Information Implants (in Sterile Packaging)

Targon® FN Femoral Plate

Article no.	Description
KO802T	Targon® FN femoral plate 130°

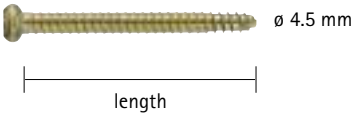
Targon® FN TeleScrew

Article no.	Description	Total length
KO820T	Targon® FN TeleScrew 70 + 10 mm	80 mm
KO822T	Targon® FN TeleScrew 80 + 10 mm	90 mm
KO823T	Targon® FN TeleScrew 85 + 10 mm	95 mm
KO824T	Targon® FN TeleScrew 90 + 10 mm	100 mm
KO825T	Targon® FN TeleScrew 95 + 10 mm	105 mm
KO826T	Targon® FN TeleScrew 100 + 10 mm	110 mm
KO828T	Targon® FN TeleScrew 110 + 10 mm	120 mm



Locking screw ø 4.5 mm

Article no.	Description
KB336TS	Locking screw ø 4.5 x 36 mm
KB340TS	Locking screw ø 4.5 x 40 mm
KB344TS	Locking screw ø 4.5 x 44 mm
KB348TS	Locking screw ø 4.5 x 48 mm
KB352TS	Locking screw ø 4.5 x 52 mm
KB356TS	Locking screw ø 4.5 x 56 mm
KB360TS	Locking screw ø 4.5 x 60 mm



Aesculap® Targon® FN

Operative procedure

Fixation of plate to aiming jig

Attach handle to aiming jig

Place guide wire in a central position in the femoral head

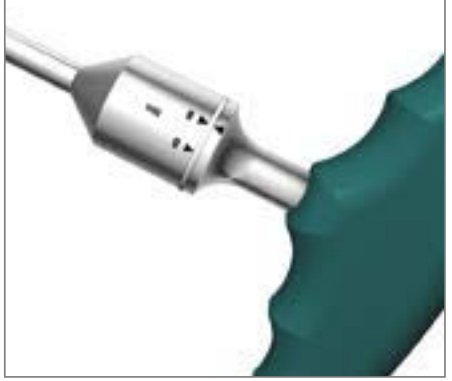
Place proximal sleeves and wires, measure length

Drill measured TeleScrew length

Insert TeleScrews

Tighten TeleScrews at 8 Nm

Manually extend TeleScrews



Drill for distal interlocking

Insert distal screws

051402

Aesculap AG | Am Aesculap-Platz | 78532 Tuttlingen | Germany | www.aesculap.com

Notes

Aesculap AG | Am Aesculap-Platz | 78532 Tuttlingen | Germany
Phone +49 7461 95-0 | Fax +49 7461 95-2600 | www.aesculap.com

Aesculap – a B. Braun company

Brochure No. 033902 0814/1/5