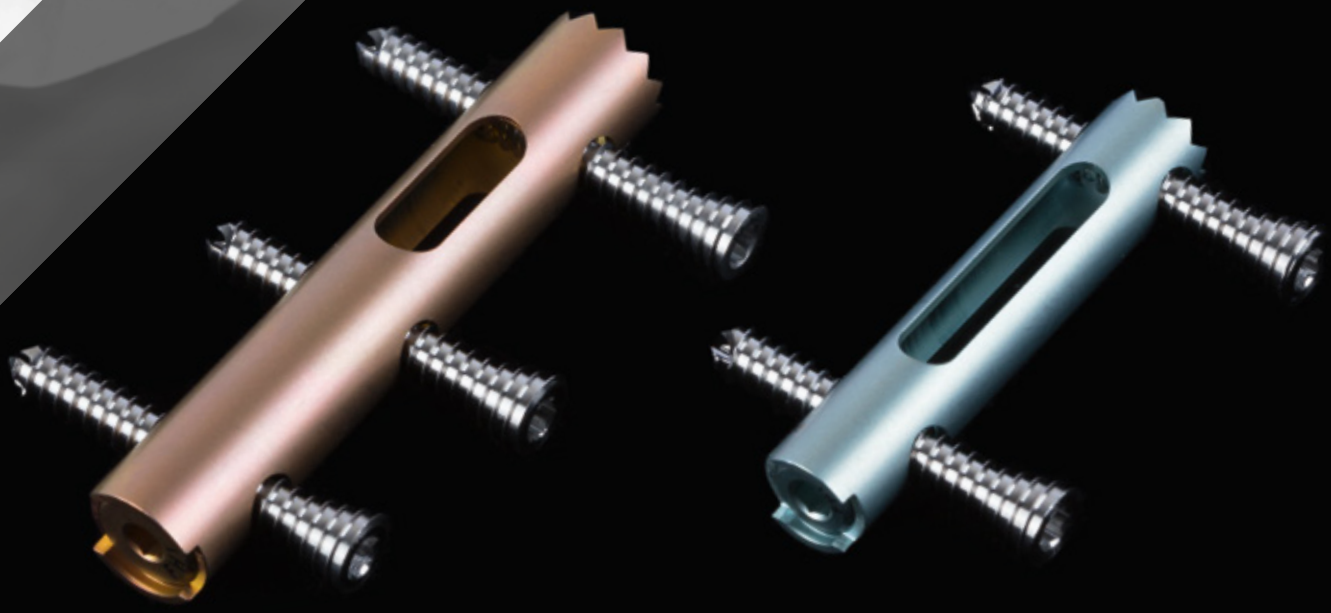
FOOT

HINDFOOT SURGERY

SURGICAL TECHNIQUE

CALCAnail

CALCANEAL FRACTURES



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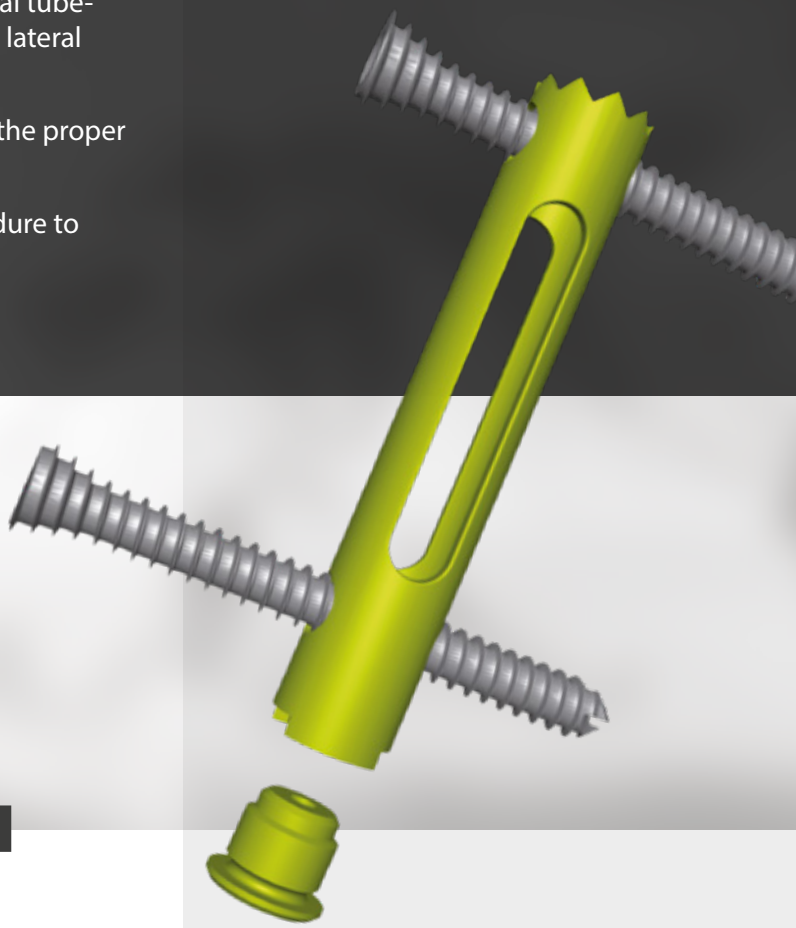
GROUP FH ORTHO™

CALCAnail

CALCANAIL TECHNIQUE: FRACTURE

- Minimally invasive approach at the posterior calcaneal tuberosity avoids complications associated with standard lateral approach;
- Locking nail holds posterior talar articular surface in the proper position after intrafocal reduction;
- Option to convert easily from internal fixation procedure to subtalar fusion.



SURGICAL TECHNIQUE

FOR FRACTURES

Anatomopathology of posterior facet fractures of the calcaneus

Calcaneal fractures can be easily understood and analysed on the preoperative CT-scan once the position of the Palmer's fundamental fracture line has been located.
When the shear line is medial, a large lateral articular fragment will tilt and pivot, pushing into the calcaneal body behind the angle of Gissane or «crucial angle», just behind the sinus tarsi. This is a vertical fracture **(Fig.1a)**.
When the shear line is lateral, there is a large medial fragment that may or may not push down: most often the posterior calcaneal tuberosity and the rest of the calcaneus are moved up and displaced in a varus, flexed position. This is a horizontal fracture **(Fig.1b)**. When the shear line is located in the middle of the dorsal side of the talar articular surface, the lateral fragment tilts and the medial fragment pushes down to create a double contour. This is a mixed fracture **(Fig.1c)**.
The posterior ending of the fracture line must also be analysed: if the retrothalmic line is located on the upper cortex of the fractured calcaneum, it is a tongue-type fracture; if the line goes toward the posterior facet of the posterior calcaneal tuberosity, it is a joint depression-type fracture, or a duckbill fracture.

fig.1a *vertical fracture*

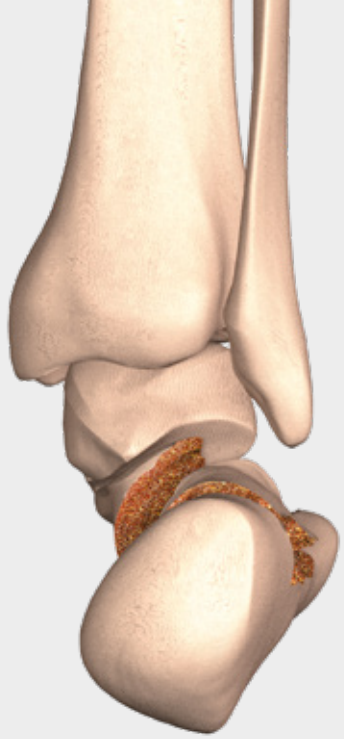
fig.1b *horizontal fracture*

fig.1c *mixed fracture*

Tongue Type fracture particular case, see page 9.

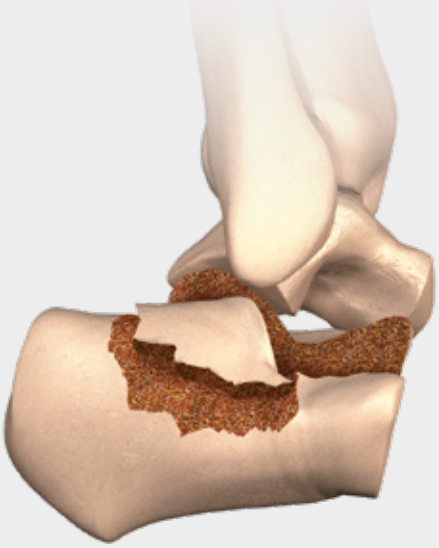
Preoperative planning

Preoperative CT scans for articular fractures of the calcaneus have become routine. Thin, contiguous slices must be made, at least 250 images of the calcaneus in order to obtain volume rendering reconstructions. Simple sagittal and horizontal reconstructions are not, in fact, sufficient for a quality analysis. Radiology station software or the software Osirix for Mac make it possible to create the reconstructions on one's own. The bones surrounding the calcaneus must be removed step-by-step by rotating the calcaneus on its axis. This may take 5 to 15 min. depending on practice. At the end of the procedure, the superior, lateral, medial, and anterior views will make it possible to closely analyse the type of fracture, the exact position of the separation line, and the size of the depressed fragment(s).



Surgical indications

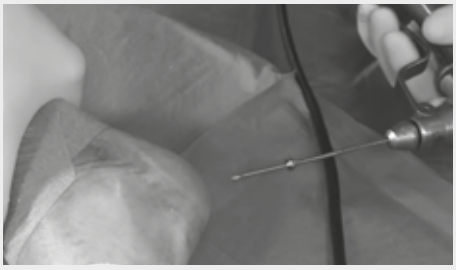
Vertical and mixed fractures are incongruent, so surgical indications are logical. Fractures with a horizontal depression should be operated if the loss of height assessed with the Böhler angle is significant, or roughly <10°.
Horizontal and vertical fractures, which affect the whole joint unit, are easy to reduce. Whether the line is medial (vertical fractures) or lateral (horizontal fractures), a large, intact articular fragment only needs to be repositioned under the talus.
Mixed fractures are more difficult to treat. First the medial fragment must be reduced to correct the overlap on the medial cortex which is very visible on the CT scan, then the lateral fragment is reduced without a step between these two fragments.



Patient positioning

Two positions are possible:

- The patient is usually placed on his/her side with the flexed limb resting on a pad and the foot off the table. Lateral and retrotibial fluoroscopy views are taken by externally rotating the foot and tipping the C-arm along the table axis.
- Alternatively, the patient can be placed prone with the knee flexed so the leg is placed at 45° relative to the table, particularly if it is a bilateral fracture.



STEP 1

Placement of K-wire in posterior tuberosity

At the junction between the posterior and plantar aspect of the heel, use a scalpel to perform a posterior incision down to the bone. The incision starts from the lowest part of the posterior calcaneal tuberosity and goes up in a posterior direction for 20 mm.

The Ø10 K-wire with stopper ***(ref. 265 570)*** is inserted with a motor drive; it must be placed in the correct position as this determines the orientation of the work chamber and later on, the nail position.

• On the lateral view, the K-wire must be aligned with the posterior calcaneal bone trabeculae, about 45° top to bottom and back to front. Its proximal end must be placed under the displaced talar fragments over the lower third of the posterior talar articular surface **(Fig.2a)**.

• On the retrotibial view, the K-wire must be aligned with the middle of the calcaneal tuberosity axis; this roughly corresponds to the axis of the 4th interdigital space. At this point, the varus displacement of the posterior tuberosity can be ignored as it will be automatically corrected when the distractor is added later on **(fig.2b)**.

fig.2a
Lateral view

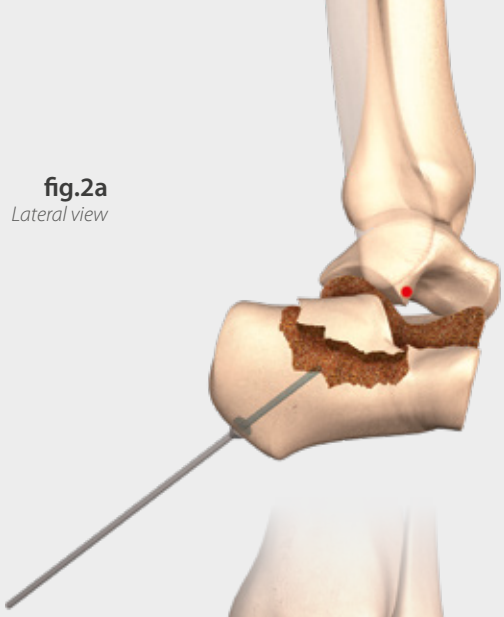
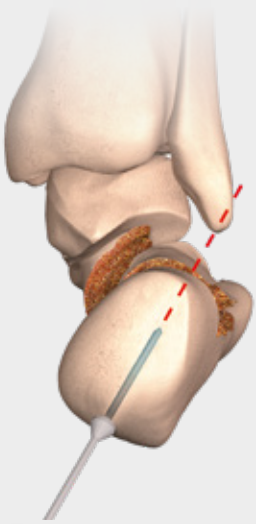


fig.2b
Retrotibial view



STEP 2

Placement of subtalar distractor

The second surgical step consists of placing a Caspar-type subtalar distractor on two K-wires, one in the talus and one in the posterior calcaneal tuberosity. This distractor ***(ref. 265 599)*** is used to correct the varus deformity of the posterior tuberosity and to distract the subtalar joint so the depressed articular surface can be reduced. Two 3.2 mm K-wires ***(ref. 265 668)*** will be placed across the foot axis. They cross the talus and the calcaneum, must be palpable under the medial aspect of the foot, and must not breach the skin.

• Place the calcaneal K-wire in the posterosuperior part of the posterior tuberosity at least 10 mm ✕ above the future tunnelling point in the tuberosity. For a tongue-type fracture ● ; place the wire in the inferior part. A positioning square is available ***(ref. 266 147)*** to position this wire perpendicularly to the previously implanted K-wire with stopper **(Fig. 3a)**.

• Place the talar K-wire on the lateral aspect of the talus, in the lateral tubercle at the centre of the talar dome, making sure not to injure the lateral peroneal tendons **(Fig. 3b)**.

• Fix the Caspar distractor onto the K-wires (non-distracted position). Before starting the distraction, tighten the key locks to make sure the distractor does not recoil **(fig. 4)**.

fig.3a

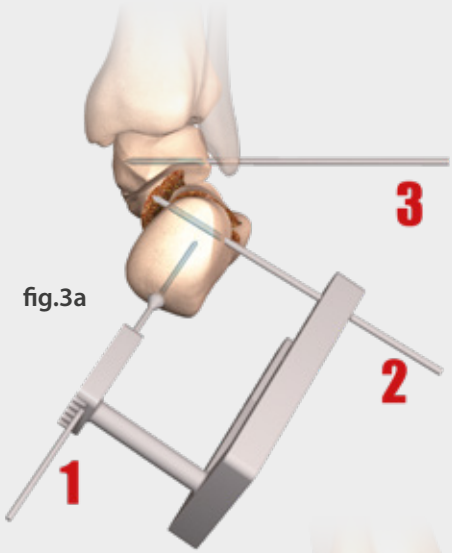
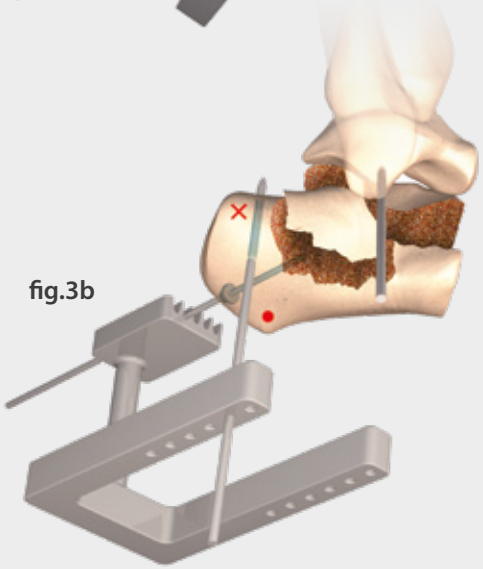


fig.3b



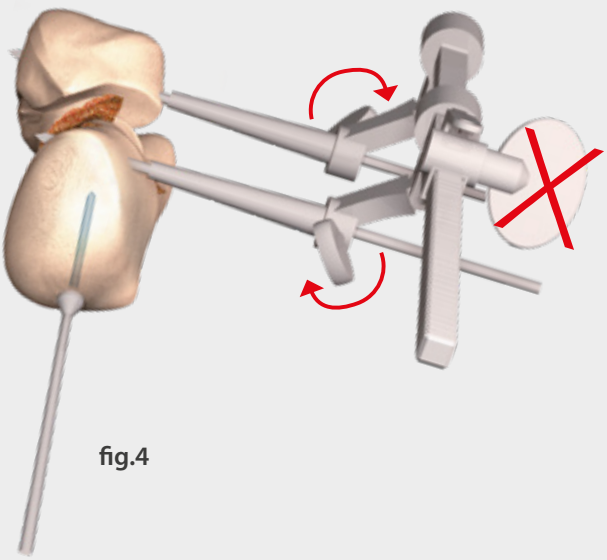


fig.4

STEP 3

Preparation of work chamber

The third step consists of introducing the 10 mm hollow reamer ***(ref. 265 572)*** over the first K-wire with stopper **(Fig. 5)**. Make sure the K-wire does not poke out of the reamer windows. Aim the hollow reamer below the depressed articular fragments, without making them more fragile, and above the critical angle (Angle of Gissane). Remove the hollow reamer and the K-wire with stopper; a 2-3 cm bone plug can then be removed and may be used at the end of the procedure **(Fig. 6)**.

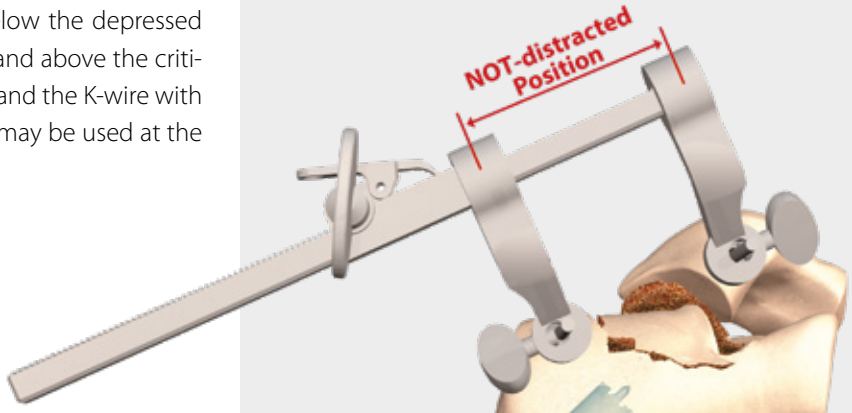


fig.5

SURGICAL TIPS AND TRICKS

To remove the bone plug, grip it with a Kelly or Kocher clamp and slowly remove the K-wire with stopper using a motor drive.

fig.6

STEP 4

Fracture reduction

To correct the posterior tuberosity varus and loss of calcaneal height, turn the butterfly handle on the distractor several turns to gradually distract the bones.

The distractor can be used with some force, even if it causes minor damage to the skin near the K-wires which can be sutured when the incision in closed (fig. 6a).

Use the specific curved tamp ***(ref. 265 575)***, straight tamp ***(ref. 265 576)***, spatula ***(ref. 265 586)***, and light mallet taps to free up the fragments and push them towards the talus into the empty space created by the distractor. Begin by pushing the medial fragment to correct the overlap of the medial cortex **(Fig. 6b and 6c)**, then reduce the lateral fragment by changing the orientation of the curved tamp **(fig. 6d and 6e)**. Use lateral fluoroscopy views to track the reduction until the subtalar joint line is congruent and the critical angle of Gissane is restored. **(Fig. 7)**. At the end of the procedure, verify the reduction on the retrotibial view.

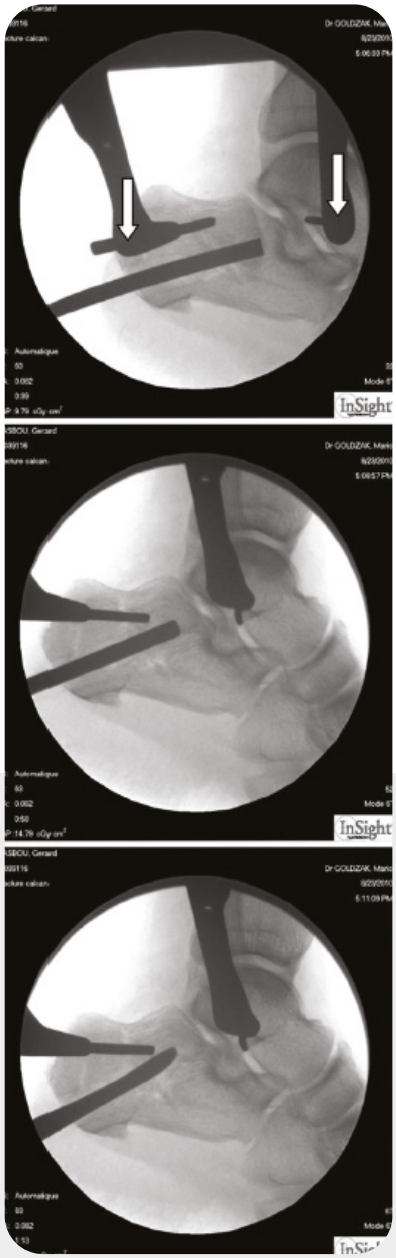


fig.7

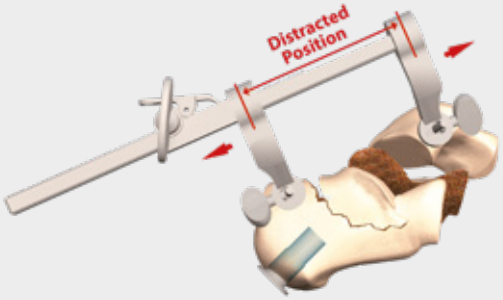


fig.6a

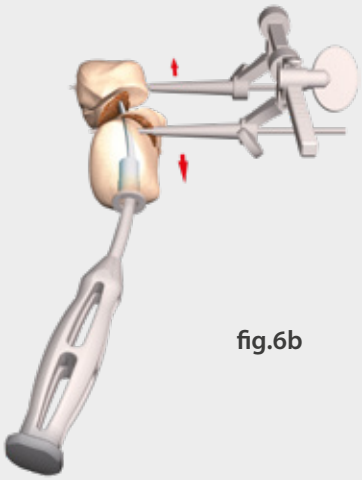


fig.6b

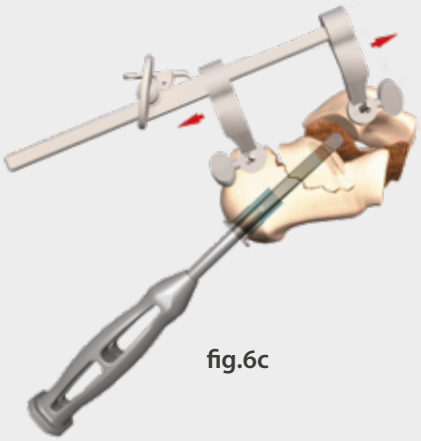


fig.6c

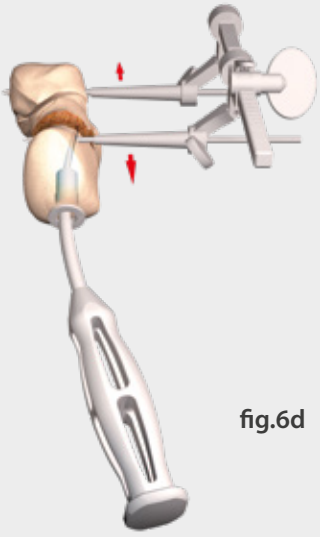


fig.6d

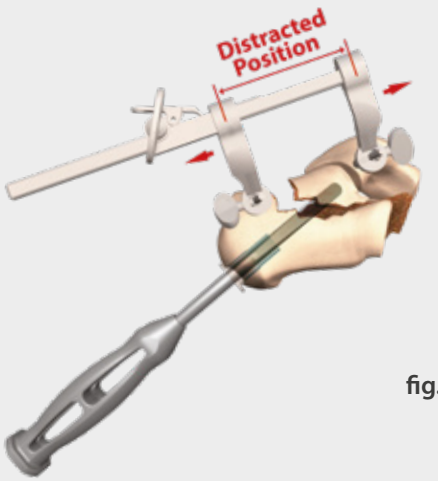


fig.6e

STEP 5

Nail introduction

The length of nail required is determined after placing the nail guide *(ref. 266 291)* and the nail length gauge *(réf. 266 340)*.

The nail length gauge must be pushed in until it is against the cortex.

The nail is available in three lengths: 45, 50 and 55 mm (see the reference table ❶). Place the selected nail onto the nail holder and make sure the indicator notches are aligned **(Fig. 8a)**, using the handle-nail connector screw (10 mm diam).

- ***Handle-nail connector Ø10: ref. 265 568***
- ***Nail holder Ø10: ref. 265 579***

If desired, slide the reamer-harvested cancellous bone plug into the nail and position it over the nail windows. Alternatively, all or part of the bone plug can be used to graft the underside of the articular surface before the nail is introduced.

Introduce the nail into the work chamber using small rotating motions, and then bring it up to the underside of the previously raised articular fragments. **(fig. 8b and 8c)**. Make sure the teeth on the nail make contact with the cancellous bone in the articular fragments to support them.

The nail holder is positioned so that the arm with the openings is on the medial side.

Once the nail is in place, put the Ø10 fracture nail alignment frame *(ref. 265 577)* onto the nail holder to perform the locking step using the Alignment frame-nail holder connecting screw *(ref. 265 581)*. After placement of the drill guide for K-wires *(ref. 266 148)*, the K-wires for cannulated screws Ø1.6 Lg 200 mm *(ref. 266 158)* are introduced with a motor drive until their tip can be felt under the skin on the medial side **(fig. 9a and 9b)**.

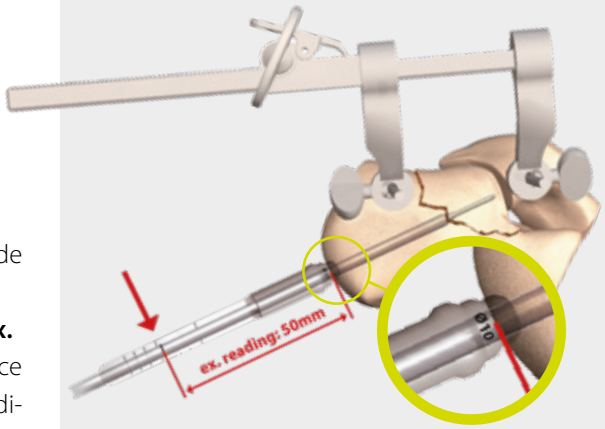


fig. 8a

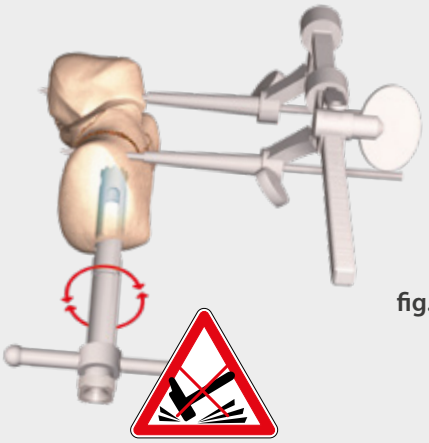


fig.8b

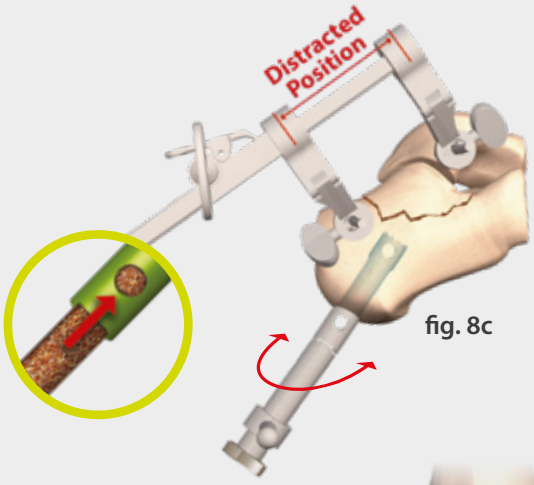


fig. 8c

SURGICAL TIPS AND TRICKS:

positioning the K-wires for screws

Take care, the K-wires can accidentally go through the skin and cause the measuring to be wrong.

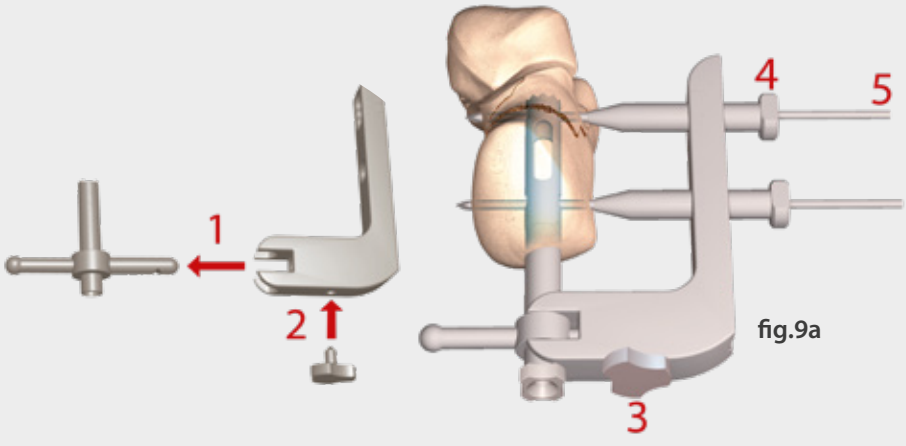


fig.9a

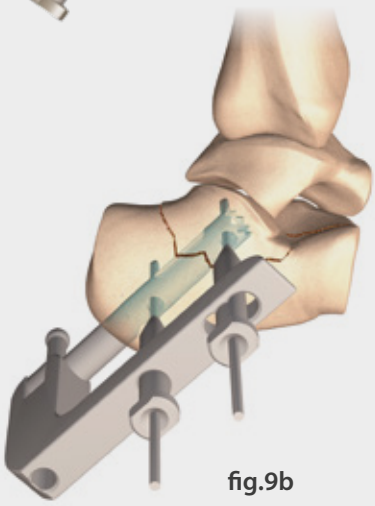


fig.9b

Use the cannulated screw length gauge ***(ref. 266 146)*** to measure the required screw length. Typically, 30 to 32 mm screws are used (see the reference table ❷). After removing the drill guide for K-wires, use the Ø3.7 mm cannulated drill bit ***(ref. 265 587)*** **(Fig. 10a)**. The screws are placed using a cannulated screwdriver ***(ref. 254 599)*** and tightened enough to compress the bones and reduce the calcaneus transversely **(Fig. 10b and 10c)**.
On the axial view, check that the screws are well inserted. Furthermore, if the interfragmentary gap needs to be reduced at the separation line, the screw can be tightened until it makes contact with the nail, which will provide excellent interfragmentary compression.

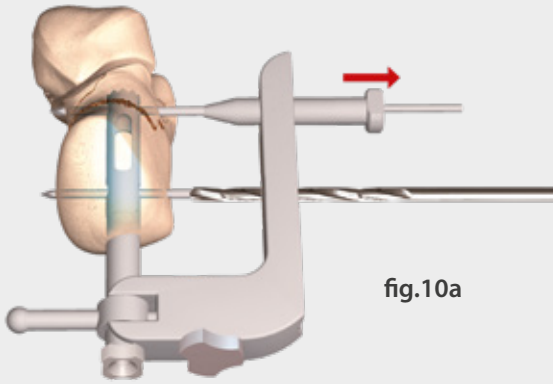
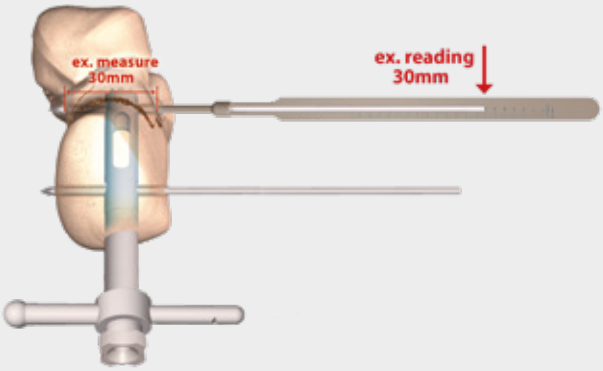


fig.10a

Once the locking step is completed, the distractor can be withdrawn.



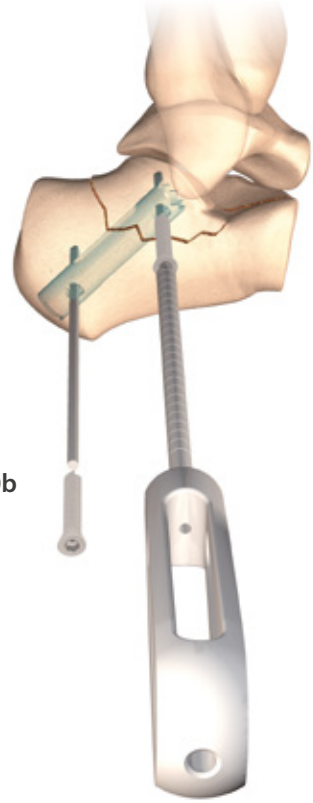


fig.10b

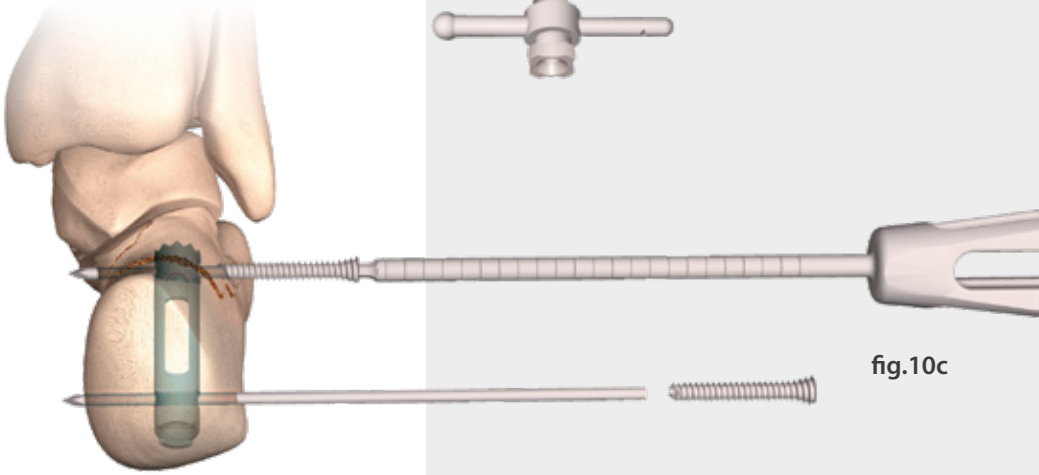


fig.10c

Depending on the distance between the end of the nail and posterior tuberosity cortex, a cap can be placed on the nail to make it easier to remove later on. The cap is positioned with the screwdriver. The threading can be found easily with several back-and-forth motions of the screwdriver **(fig. 10d)**.

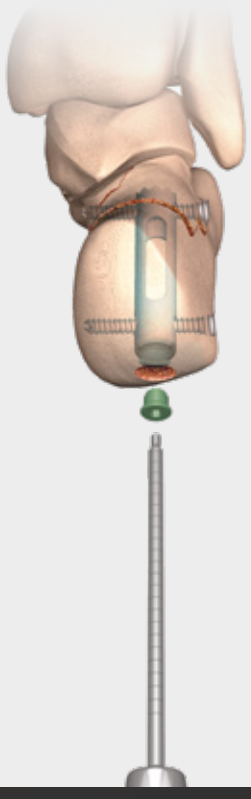


fig.10d

SPECIFIC CASE

Tongue Type fracture

Tongue Type fractures require a few adaptations to the standard technique described above.
Firstly, it is important remember that the distractor K-wire must be placed in the inferior part of the tuberosity below the posterior extension of the fracture line **(fig. 11)**.

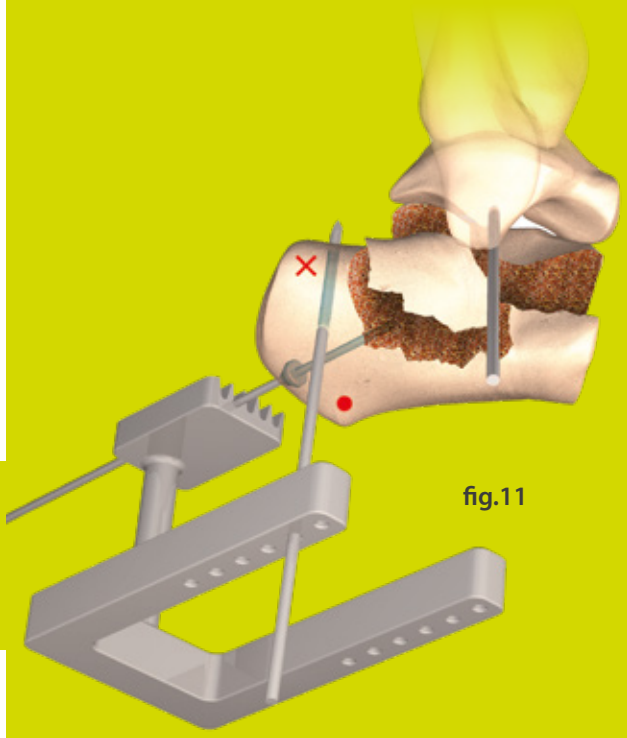


fig.11

NB:

If the K-wire is placed in the superior part of the tuberosity it will be impossible to reduce the opening of the duckbill fracture.

There are various options if reduction is incomplete:

- Use a K-wire (type Steinmann nail) in the superior fragment, inserted from back to front, to enable direct manipulation and thus close the fracture.
- Use the distractor placed on one K-wire inserted into the tibia and the other in the superior fragment; gradual distraction will enable closure of the duckbill.
- After positioning the nail, use an additional screwing guide to screw in the nail window **(see technique below)**.

This technique involves inserting an oblique screw from top to bottom through the nail window as far as the plantar cortical.
Gradual tightening of the screw will enable the duckbill to be closed.

To help place this screw, the screwing guide with window ***(ref. 268 771)*** is positioned on the nail holder and locked in place with the locking screw ***(ref. 265 581)*** **(fig. 12)**.

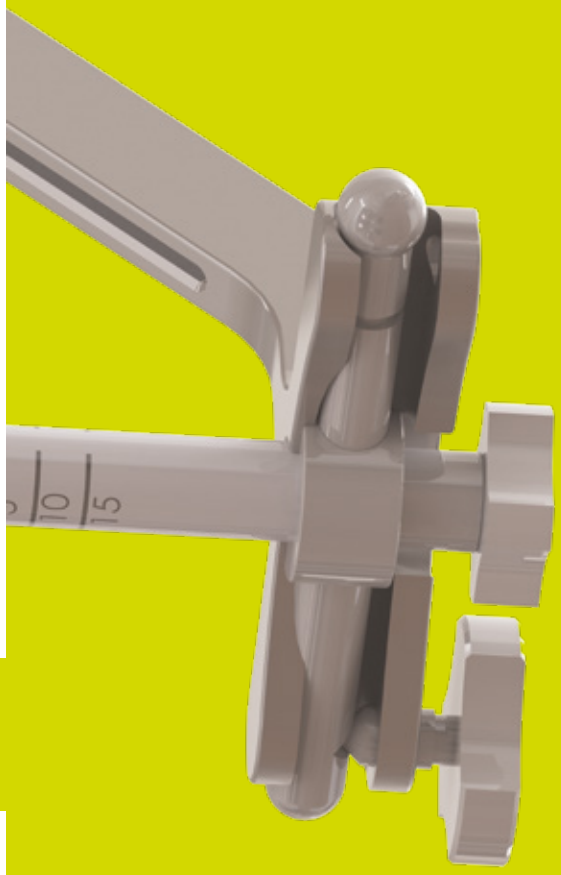
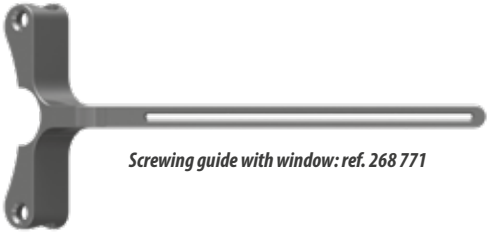


fig.12

SURGICAL TIPS AND TRICKS

2 locking screws can be used for improved stability.



Screwing guide with window: ref. 268 771

Once the guide is in place, a K-wire can be inserted through the slot in the guide **(fig. 13)**.

Under radiographic guidance, the guide is passed through the nail window to the plantar cortical.
The screw measurement is obtained by subtraction, bearing in mind the fracture reduction, which will reduce its length accordingly.

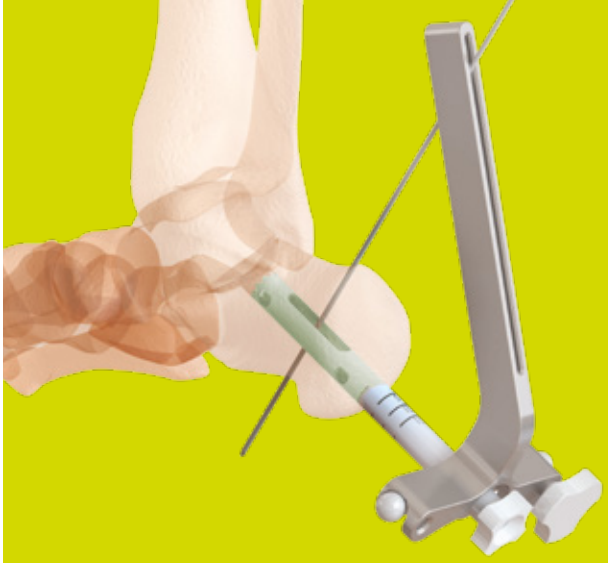


fig.13

The cannulated screw is inserted into the guide and tightened as required **(fig. 14)**.

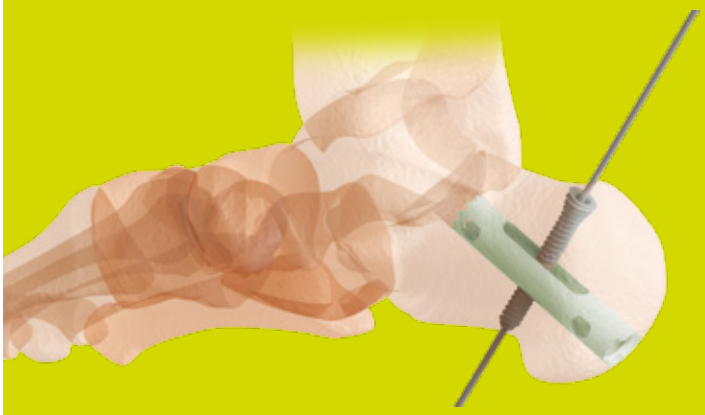


fig.14

If placed on the plantar side, the guide also enables the "inferosuperior" nail to be screwed into place **(fig. 15)**.

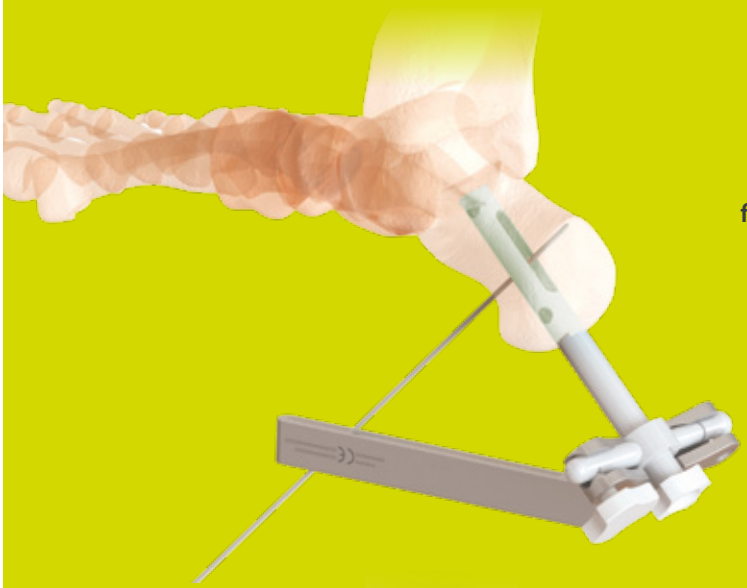


fig.15

The screw is thus inserted via the plantar cortical and pushed to the posterosuperior angle of the calcaneal tuberosity **(fig. 16)**.

fig.16

1

REF.	FRACTURE NAIL Ø10
265 546	Calcanail® Nail Ø10 L 45 + cap
265 547	Calcanail® Nail Ø10 L 50 + cap
265 548	Calcanail® Nail Ø10 L 55 + cap

2

REF.	SCREW
267 264	Cannulated screw Ø5 L 24
267 265	Cannulated screw Ø5 L 26
267 266	Cannulated screw Ø5 L 28
265 552	Cannulated screw Ø5 L 30
265 553	Cannulated screw Ø5 L 32
265 554	Cannulated screw Ø5 L 34
265 555	Cannulated screw Ø5 L 36
265 556	Cannulated screw Ø5 L 38
265 557	Cannulated screw Ø5 L 40

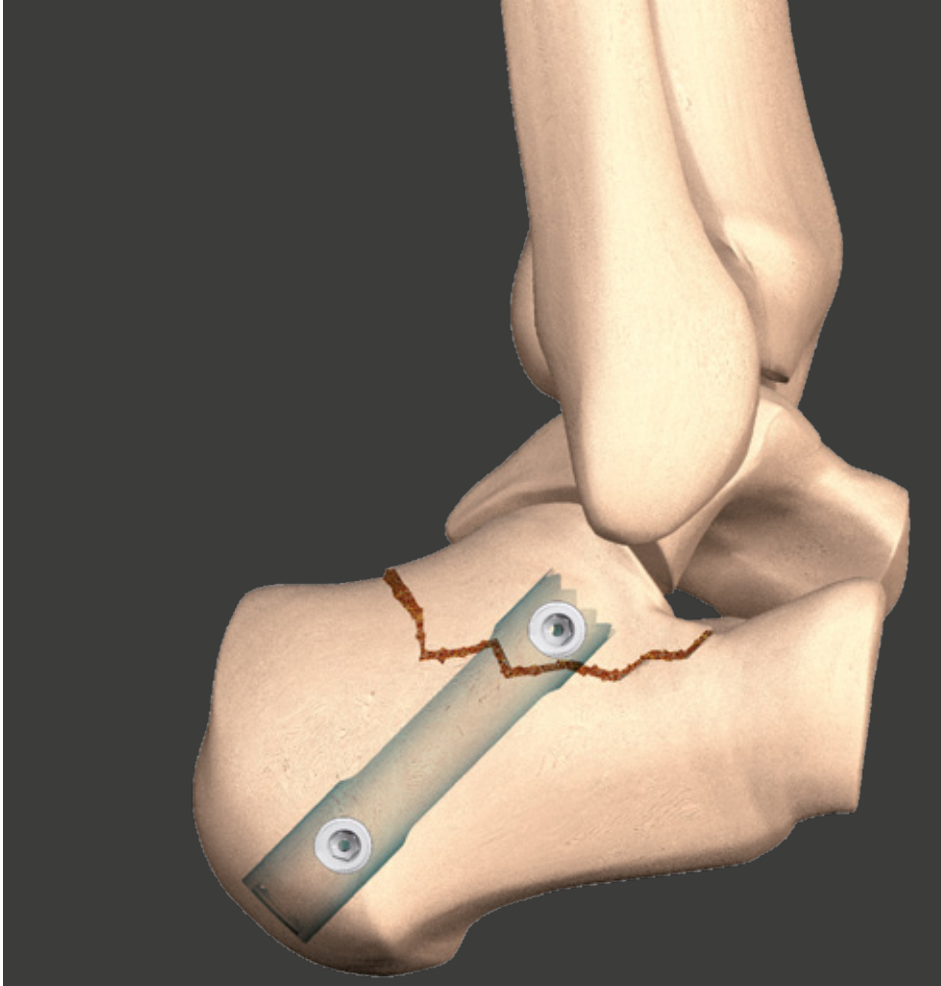
Complement for Tongue Type fracture

3

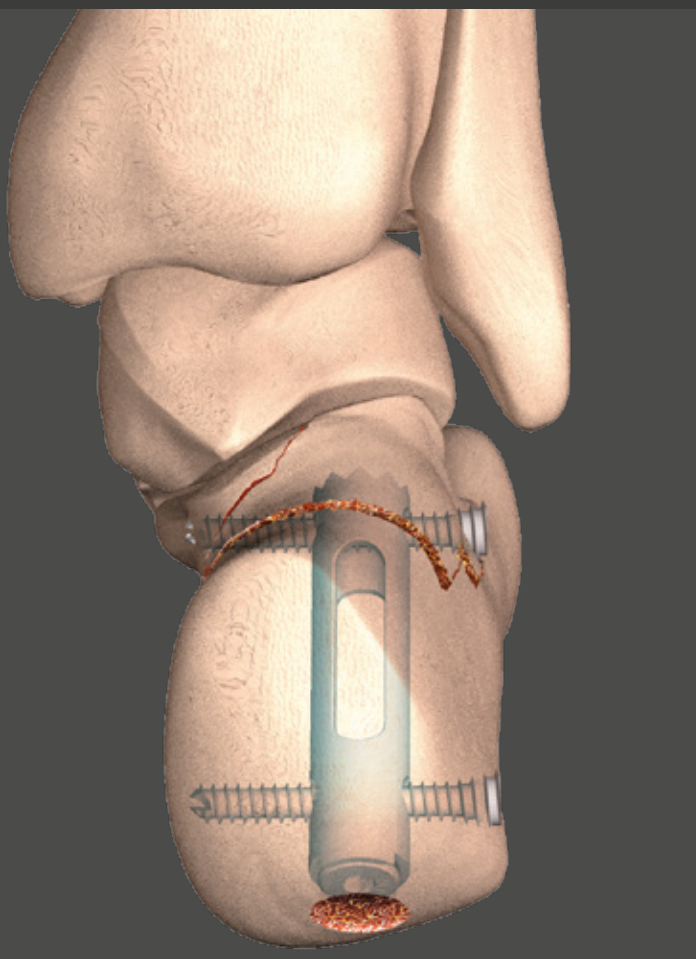
REF.	HIGH LENGTH SCREW
265 558	Lg 45 cannulated screw
265 559	Lg 50 cannulated screw
265 560	Lg 55 cannulated screw
265 561	Lg 60 cannulated screw
265 562	Lg 65 cannulated screw
265 563	Lg 70 cannulated screw
265 564	Lg 75 cannulated screw
265 565	Lg 80 cannulated screw

Post-operative care

The patient may begin moving around immediately after surgery using crutches with no weight on the foot, on the condition of wearing a pain relieving foot brace and that there is good wound healing, for the first fifteen days. The patient may then begin walking using two crutches and a heel rest for the following 3 weeks. After the fifth week, the patient can soon be walking in normal shoes and subtalar physical therapy is started.



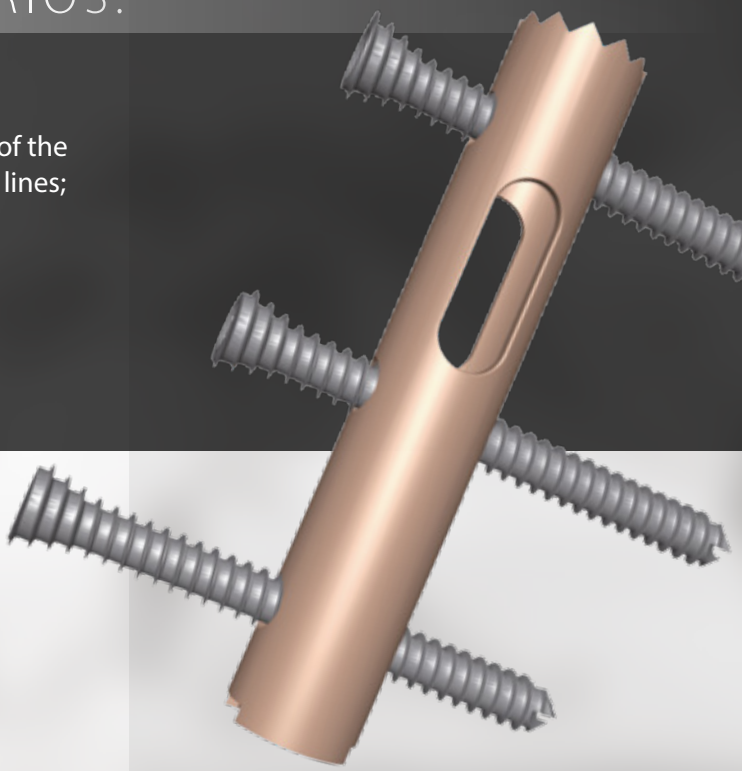
Final view



CALCAnail

THE ARTHRODESIS VERSION OF THE CALCANAIL IS USED IN THE FOLLOWING SCENARIOS:

SUBTALAR ARTHRODESIS



- Recent comminuted fractures where internal fixation is impossible or destined to fail because of the seriousness of the cartilage injuries (mixed fractures with 2 or more fracture lines; comminuted fractures) ;
- Calcaneal fracture sequelae in cases with post-traumatic osteoarthritis and/or poor functional results.

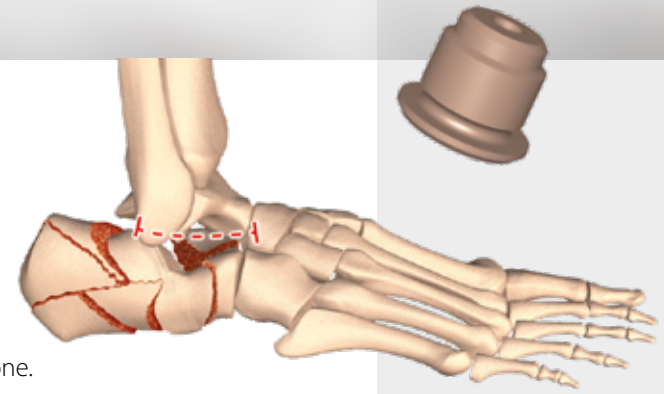
SURGICAL TECHNIQUE

FOR SUBTALAR ARTHRODESIS

Indications

Calcanail is indicated in the following problems affecting the hindfoot:

• Calcaneal fractures.



Patient positioning

Two positions are possible: side-lying or prone.

• The patient is usually placed on his/her side with the flexed limb resting on a pad and the foot off the table. Lateral and retrotibial fluoroscopy views are taken by externally rotating the foot and tipping the C-arm along the table axis.

• Alternatively, the patient can be placed prone with the knee flexed so the leg is placed at 45° relative to the table, particularly if it is a bilateral fracture.

STEP 1

Placement of K-wire in posterior tuberosity

At the junction between the posterior and plantar aspect of the heel, use a scalpel to perform a posterior incision down to the bone. The incision starts from the lowest part of the posterior calcaneal tuberosity and goes up in a posterior direction for 20 mm.
The Ø12 K-wire with stopper ***(ref. 265 571)*** must be placed in the correct position as this determines the orientation of the work chamber and later on, the nail position **(fig. 1a, 1b and 1c)**.

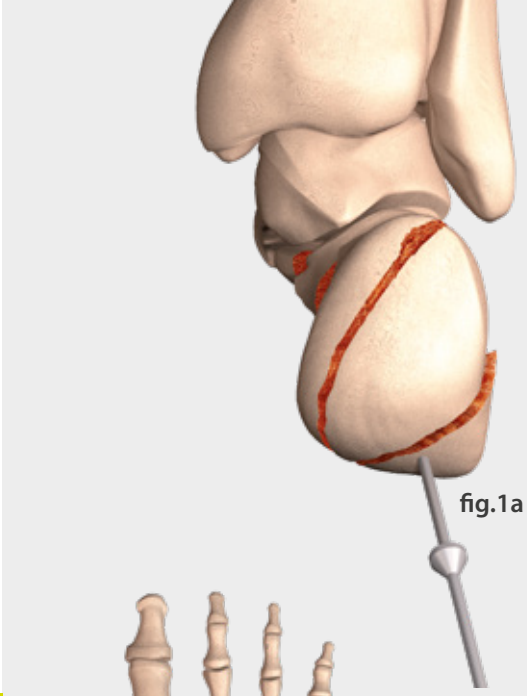


fig.1a

PATHOLOGIES: IN CASE OF VERY DENSE BONE

Position a Ø10 K-wire with stopper *(ref. 265 570)* instead of a Ø12 pin.

- On the lateral view, the K-wire should be positioned in the direction of the lower portion of the posterior talar articular surface.
- On the retrotibial view, K-wire placement must take into account the subtalar angle; this roughly corresponds to the axis of the first interdigital space.

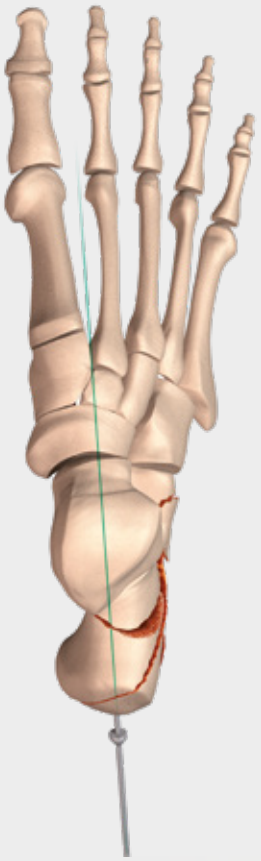


fig.1b

STEP 2

Placement of subtalar distractor

The second surgical step consists of placing a Caspar-type subtalar distractor ***(ref. 265 599)*** onto two K-wires, one in the talus and one in the posterior calcaneal tuberosity. If needed, these Ø3.2 K-wires ***(ref. 265 668)*** are used with the distractor to correct the varus deformity of the posterior tuberosity and distract the subtalar joint so the depressed articular surface can be reduced. Conversely, they can be used with the compressor ***(ref. 266 353)*** to remove the joint space and bring the freshened talar and calcaneal articular surfaces together.

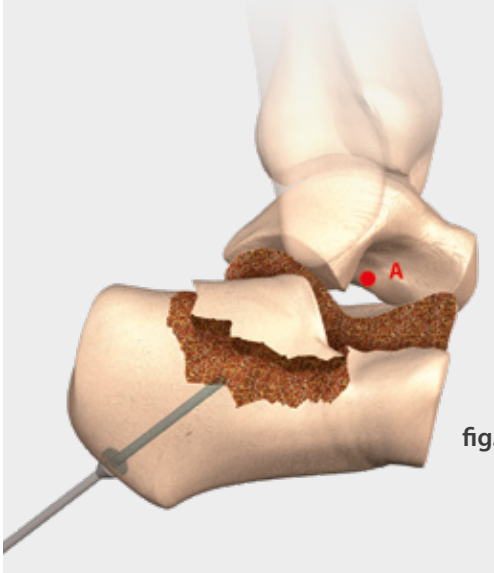


fig.1c

Two 3.2 mm K-wires ***(ref. 265 668)*** will be placed across the foot axis.

- Place the calcaneal K-wire in the posterosuperior part of the posterior tuberosity at least 10 mm above or below the future tunnelling point in the tuberosity. A positioning square is available ***(ref. 266 147)*** to position this wire perpendicularly to the previously implanted K-wire with stopper.
- Place the talar K-wire on the lateral aspect of the talus, in the lateral tubercle at the centre of the talar dome, making sure not to injure the lateral peroneal tendons.
- Palpate the medial aspect of the foot to locate the K-wires crossing the talus and calcaneus and make sure they do not perforate the skin. Fix the distractor or compressor onto the K-wires. Before starting the distraction, tighten the key locks to make sure the distractor does not recoila **(fig. 2)**.

NB:

In cases of malunion, subtalar arthritis or orthopaedic deformation, the hindfoot must first be reoriented by implementing closing wedge or multiple osteotomies.

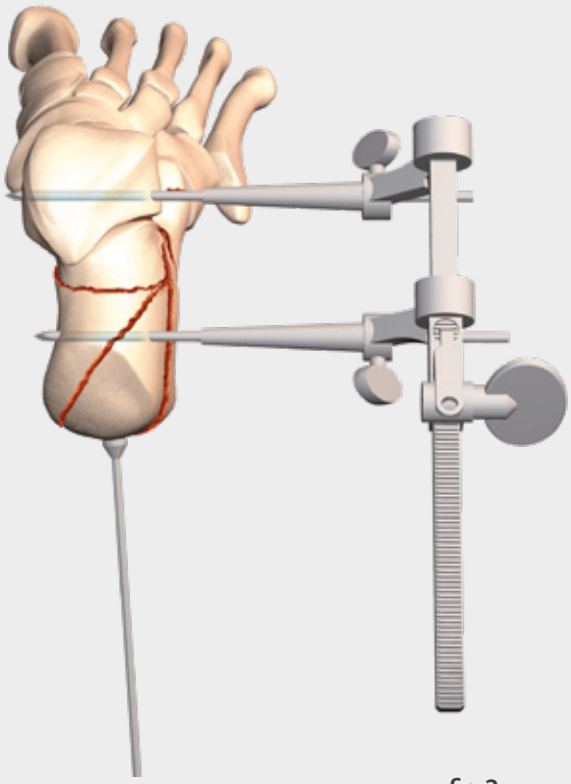


fig.2

STEP 3

Preparation of work chamber

The third step consists of introducing the 12 mm hollow reamer ***(ref. 265 573)*** over the first K-wire with stopper. Make sure the K-wire does not poke out of the reamer windows. Ream until the articular surface of the calcaneus is crossed; remove the reamer and bone plug. Reintroduce the reamer into the body of the talus and ream until the posterior surface of the talus is crossed. This reaming must be performed in two steps, as too much heat would be created if it was performed in a single step **(fig. 3)**.

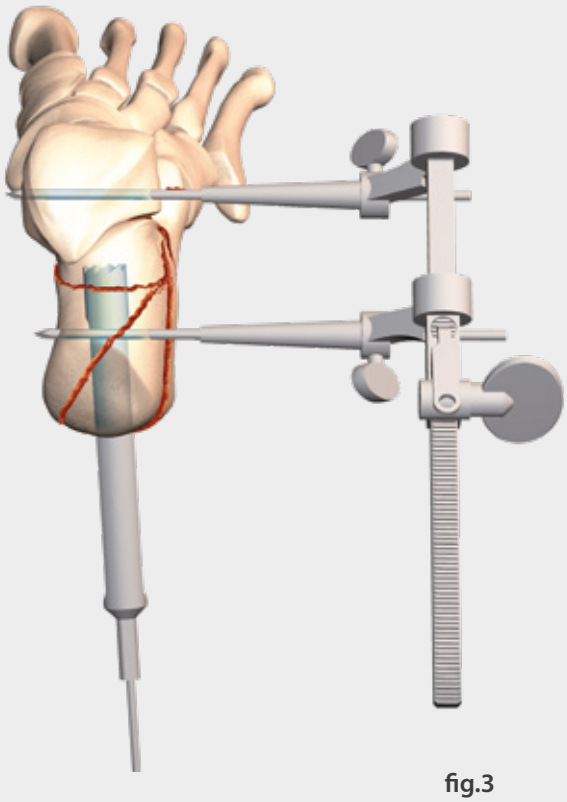


fig.3

OPTION:
IN CASE OF HARD BONE

To realize the work chamber

To avoid any material breakage, it is very important to strictly follow the technique described step by step.

In the fisrt instance, reaming of the calcaneus tuberosity with the 10 mm hollow reamer ***(ref. 265 572)*** axed on the stop k-wire diameter 10 mm ***(ref. 265 570)***. Stop a little bite before the articular surface. The back out of the hollow reamer provides a bone graft **(fig. 3a)**.

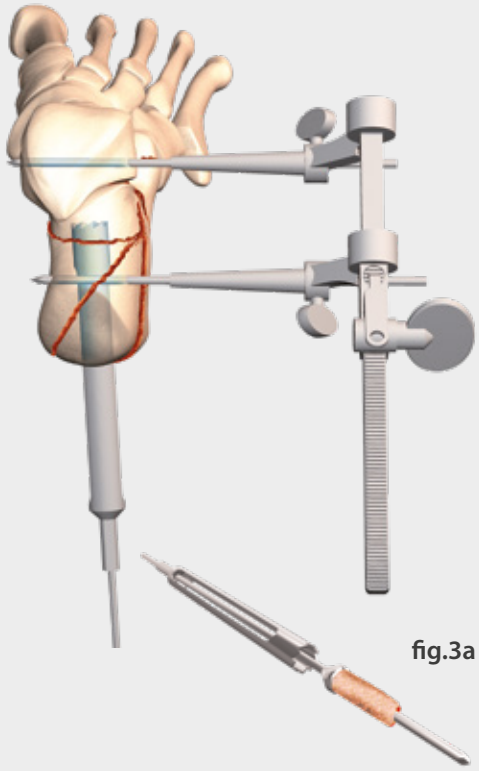


fig.3a

In second time, the 2.4 mm pin without stop ***(ref. 264 586)*** is repositionned until 10 mm of the anterior talar cortex. Its positionning should be carefully checked in the lateral and axial views in the middle of the tibial Pilon **(fig. 3b)**.

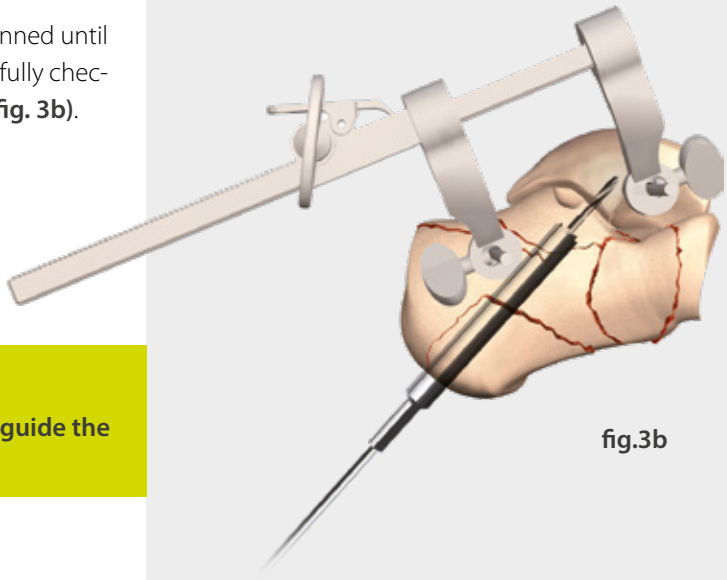


fig.3b

TIPS AND TRICKS

You can reposition the 10 mm hollow reamer to guide the placement of the threaded pin.

The last step is the slowly driling with a cannulated 12 mm drill bit (cannulation 2.4 mm) ***(ref. 271 315)*** with back and forth motions without forcing **(fig. 3c)**.

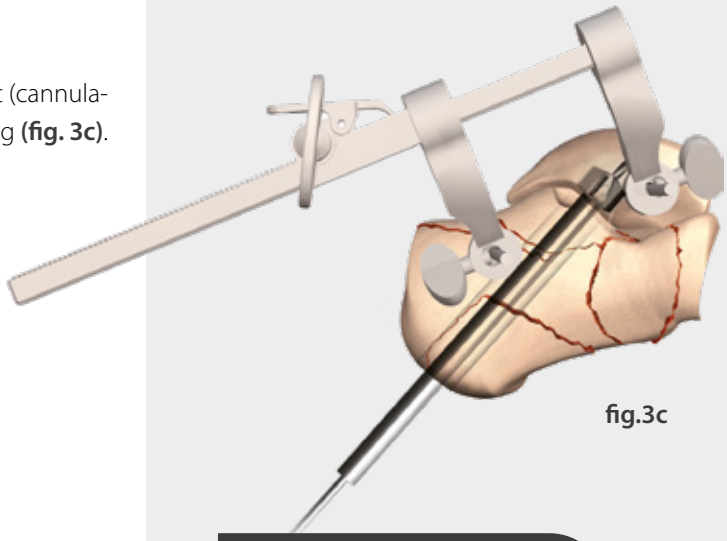


fig.3c

STEP 4

Freshening of articular surfaces

This surgical step is very important as it will determine the success of the fusion. Depending on the patient's case and surgical indication, bone freshening can be performed either by the work chamber or more commonly and more easily, by a small incision on the lateral aspect of the calcaneus below the tip of the lateral malleolus. Reflect the lateral peroneal tendons, then use a motorized burr and/or the 10 mm hollow reamer ***(ref. 265 572)*** to carefully remove the talar cartilage **(fig. 4)**.
The intact or fractured posterior talar articular surface must also be freshened.

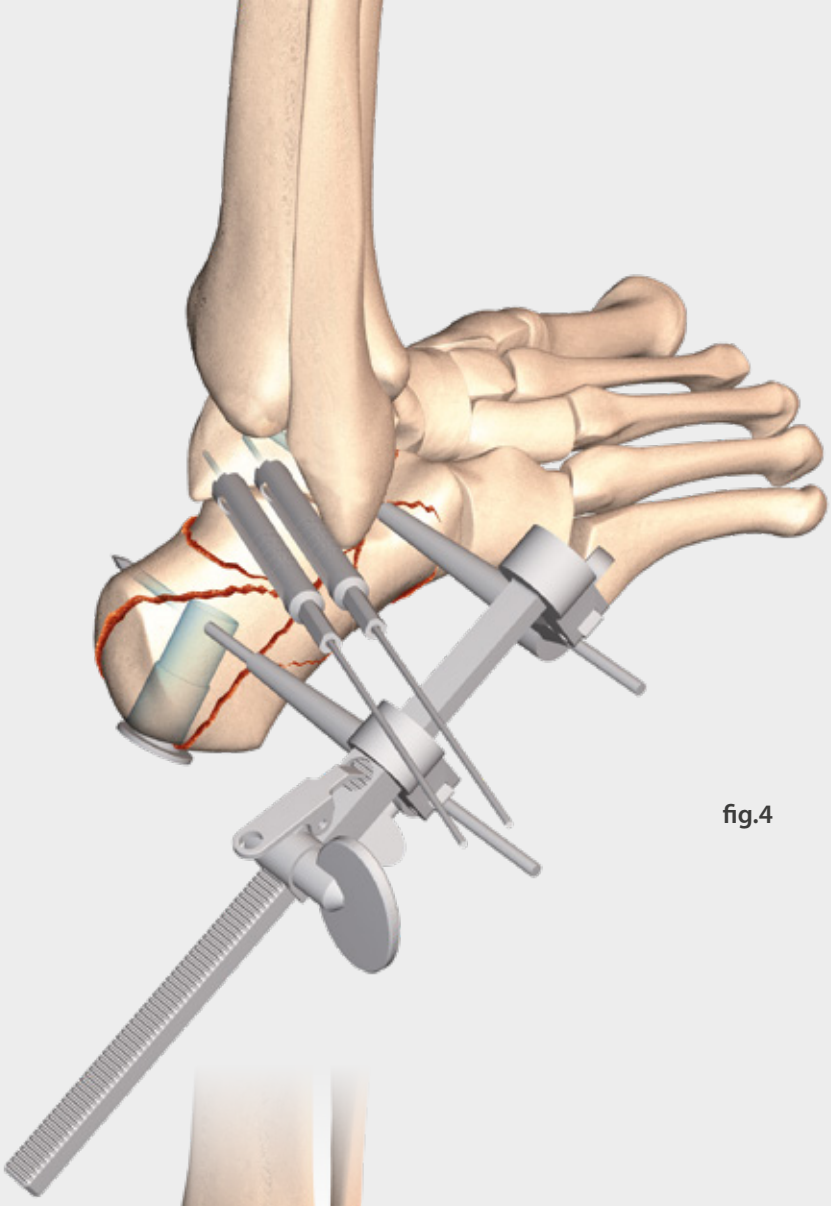


fig.4

STEP 5

Bone graft

Depending on the surgical indication, a bone graft may be necessary. It isn't always necessary for comminuted fractures. The bone plug removed at the beginning of the surgery may be sufficient. Care must be taken to release the distractor before introducing the nail, and always before the locking step.
For secondary arthrodesis after malunion or an orthopaedic indication, bone grafts are common practice. Compression may be useful after placing the bone graft. The distractor must be withdrawn and the compressor ***(ref. 256 353)*** assembled on the same talar and tuberosity K-wires **(fig. 5)**.

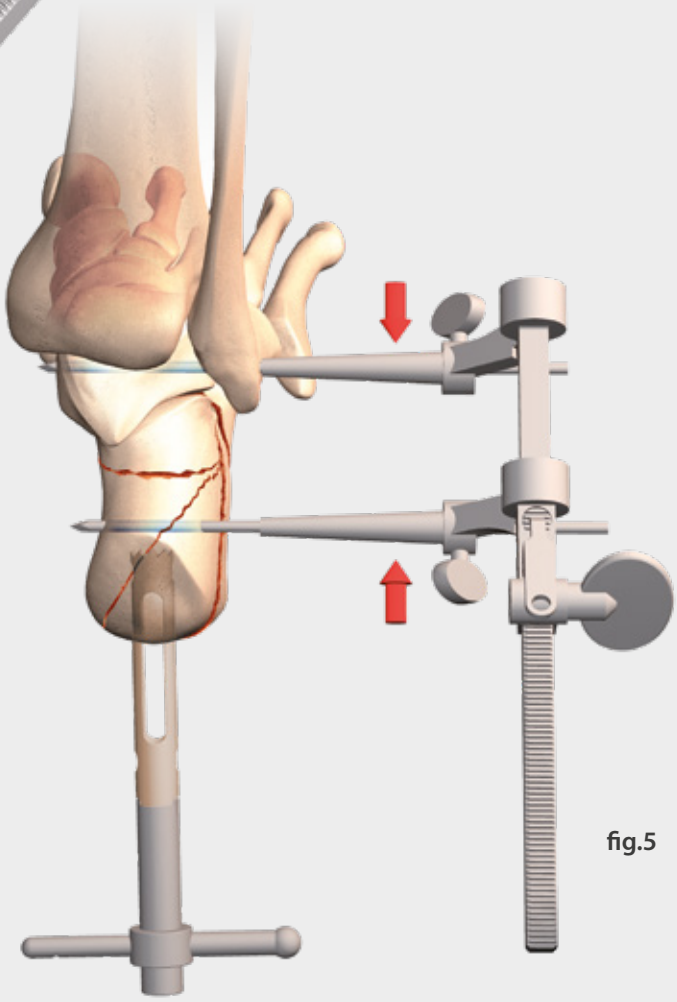


fig.5

STEP 6

Nail placement

The length of nail required is determined after again placing the nail guide ***(ref. 266 291)*** and the nail length gauge ***(ref. 266 340)*** and a guide (***ref. 266 291)***.

The nail length gauge must be pushed in until it is against the cortex (fig. 6a).

The nail is available in three lengths: 65, 75, and 85 mm (see the reference table ❹). Place the selected nail onto the nail holder and make sure the indicator notches are aligned, using the handle-nail connector screw Ø12 mm.

- ***Handle-nail connector Ø12: ref. 265 569***
- ***Nail holder Ø12 ref. 265 580***

At this stage, it is important to slide the spongy bone plug(s) that was/were removed with the hollow reamer inside the nail and to position it/them against the nail opening. This will help the arthrodesis to fuse together.
The nail is then introduced into the work chamber with small rotating motions, then pushed up until it reaches the talar body. Its proximal tip must be at least 10 mm from the anterior cortex of the talus.

Once the nail is in place, put the Ø12 arthrodesis nail alignment frame ***(ref. 265 578)*** onto the Ø12 mm nail holder ***(ref. 265 580)***, using the alignment frame-nail holder connecting screw ***(ref. 265 581)***, in order to complete the locking step. After placement of the drill guide for K-wires ***(ref. 266 148)***, the narrow K-wires Ø1.6 Lg 200 mm ***(ref. 266 158)*** are introduced with a motor drive until their tip can be felt under the skin on the medial side. Use the cannulated screw length gauge ***(ref. 266 146)*** to measure the required screw length. Typically, 30 to 32 mm screws are used (see the reference table ❺).
A screw is placed in the talar body and one or two screws in the calcaneus using the cannulated screwdriver ***(ref. 254 599)*** **(fig. 6b and 6c)**.

Depending on the distance between the end of the nail and posterior tuberosity cortex, a cap can be placed on the nail to make it easier to remove later on.

For secondary fusion indications (malunion with posterior tuberosity varus), a corticocancellous bone graft can be used. Once the graft is positioned between the talus and calcaneus, the nail can be placed through the graft **(fig. 7)**.

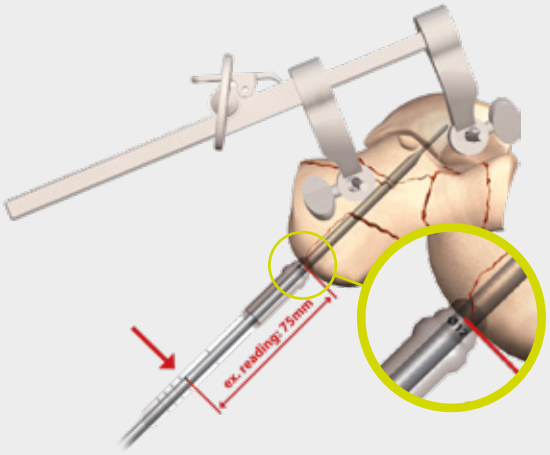


fig.6a

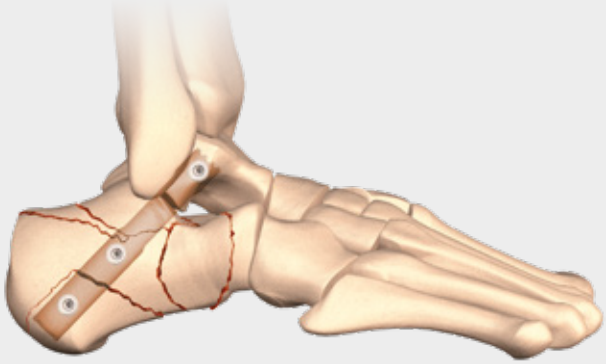


fig.6b

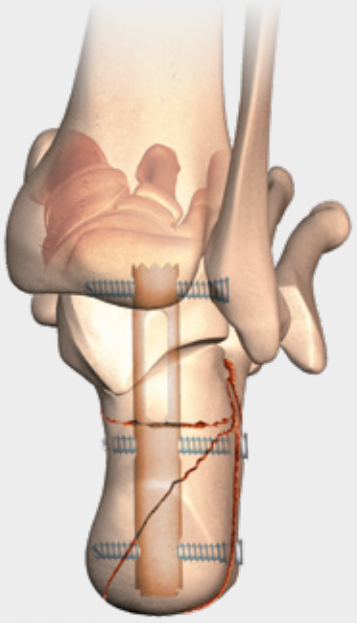


fig.6c

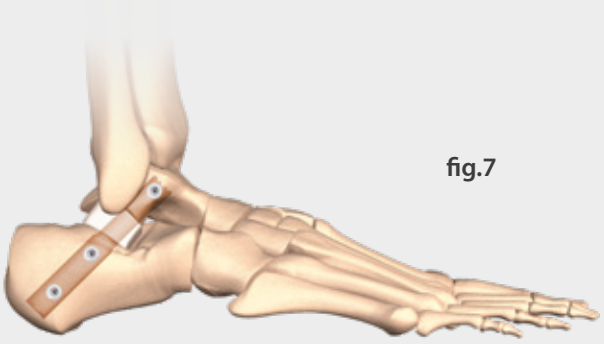


fig.7

4

REF.	ARTHRODESIS NAIL Ø12
265 549	Calcanail® Nail Ø12 L 65 + cap
265 550	Calcanail® Nail Ø12 L 75 + cap
265 551	Calcanail® Nail Ø12 L 85 + cap

5

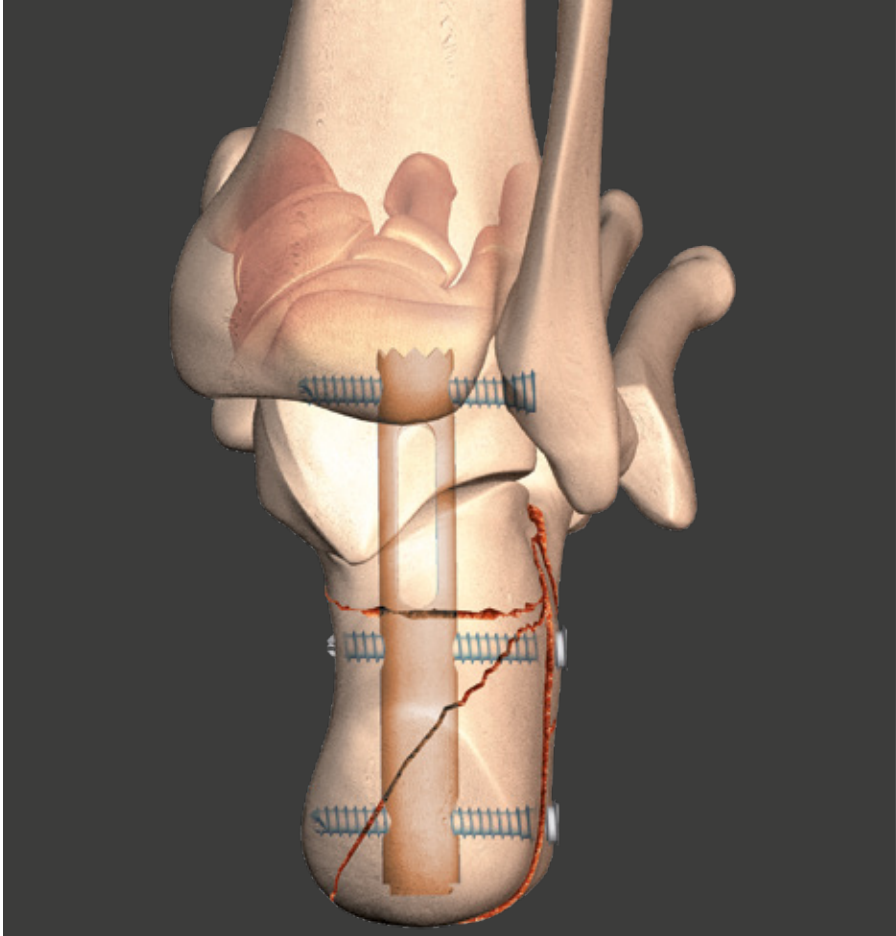
REF.	SCREW
267 264	Cannulated screw Ø5 L 24
267 265	Cannulated screw Ø5 L 26
267 266	Cannulated screw Ø5 L 28
265 552	Cannulated screw Ø5 L 30
265 553	Cannulated screw Ø5 L 32
265 554	Cannulated screw Ø5 L 34
265 555	Cannulated screw Ø5 L 36
265 556	Cannulated screw Ø5 L 38
265 557	Cannulated screw Ø5 L 40

Post-operative care

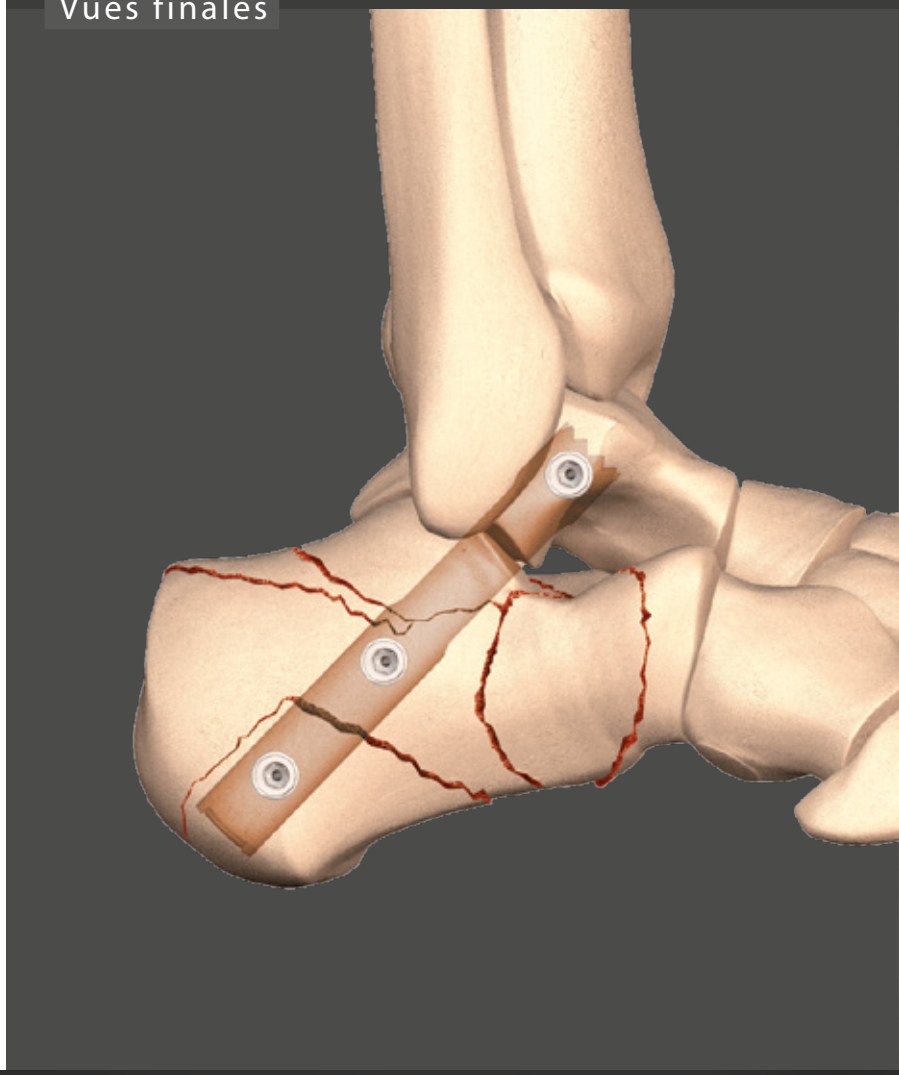
The patient may begin moving around immediately after surgery using crutches with no weight on the foot, on the condition of wearing a pain relieving cast and that there is good wound healing, for the first fifteen days. After verifying that the wound is healing, a new cast is applied for a month. After the sixth week, depending on the indication of the surgery, walking with progressive weight-bearing using crutches may resume; a walking cast may also be used for added support. Physical therapy is usually unneeded.

Ablation of the material

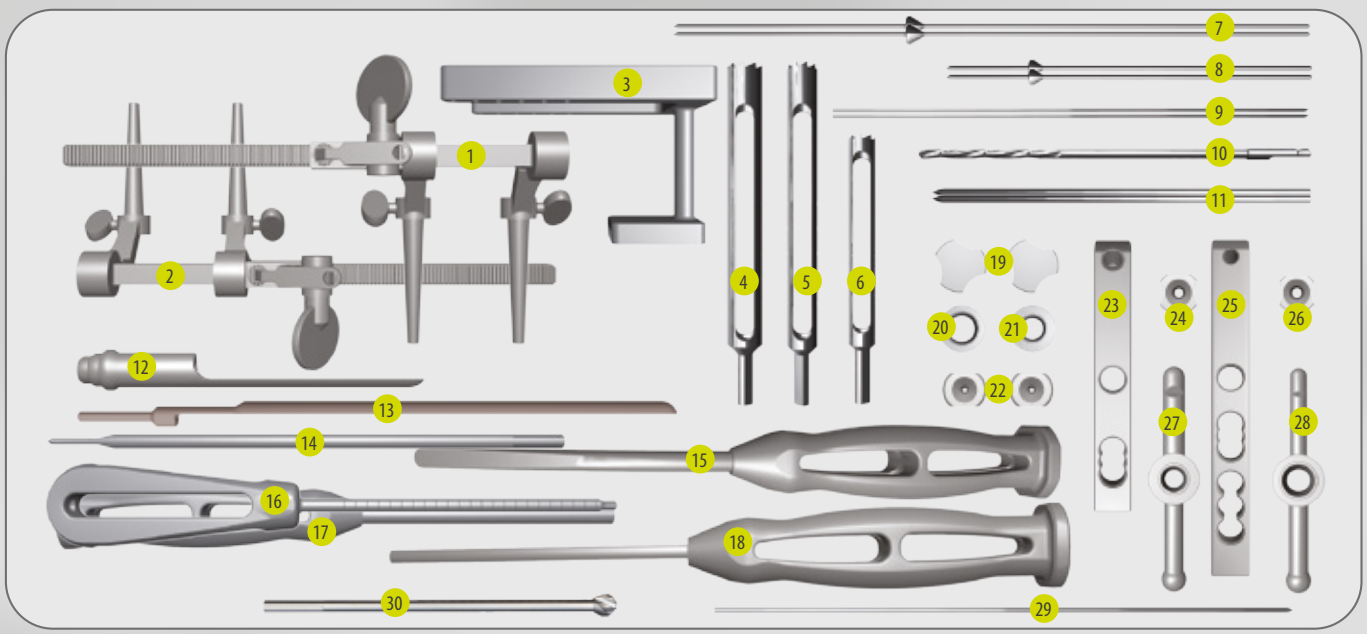
Ablation of material after a calcaneal fracture of subtalar arthrodesis is rarely indicated. If it proves to be necessary, ablation of the screws can be done easily by locating the screw heads on the lateral side of the heel and reinserting the narrow guide K-wires. The screwdriver guided by the K-wires will enable the screws to be extracted without difficulty. After making an incision in the heel, the cap can be removed (if one was placed). The nail holder is repositioned after cleaning the screw thread if needed. If the rotating motions of the nail holder are ineffective as a result of bone regrowth around the nail, the larger-sized hollow reamer should be used around the nail: the Ø12 mm reamer for the Ø10 mm fracture nail, the Ø14 mm reamer for the Ø12 mm arthrodesis nail. Ablation will then be very easy after reassembling the nail holder.



Vues finales

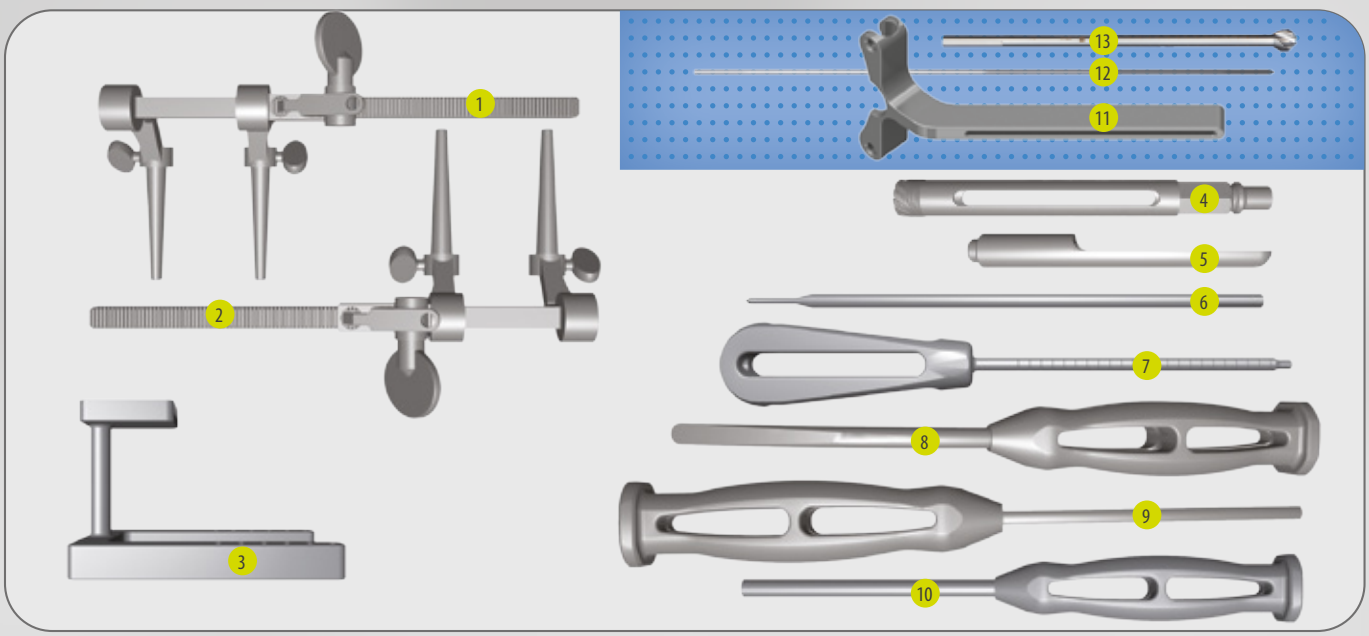


V2 INSTRUMENTATION

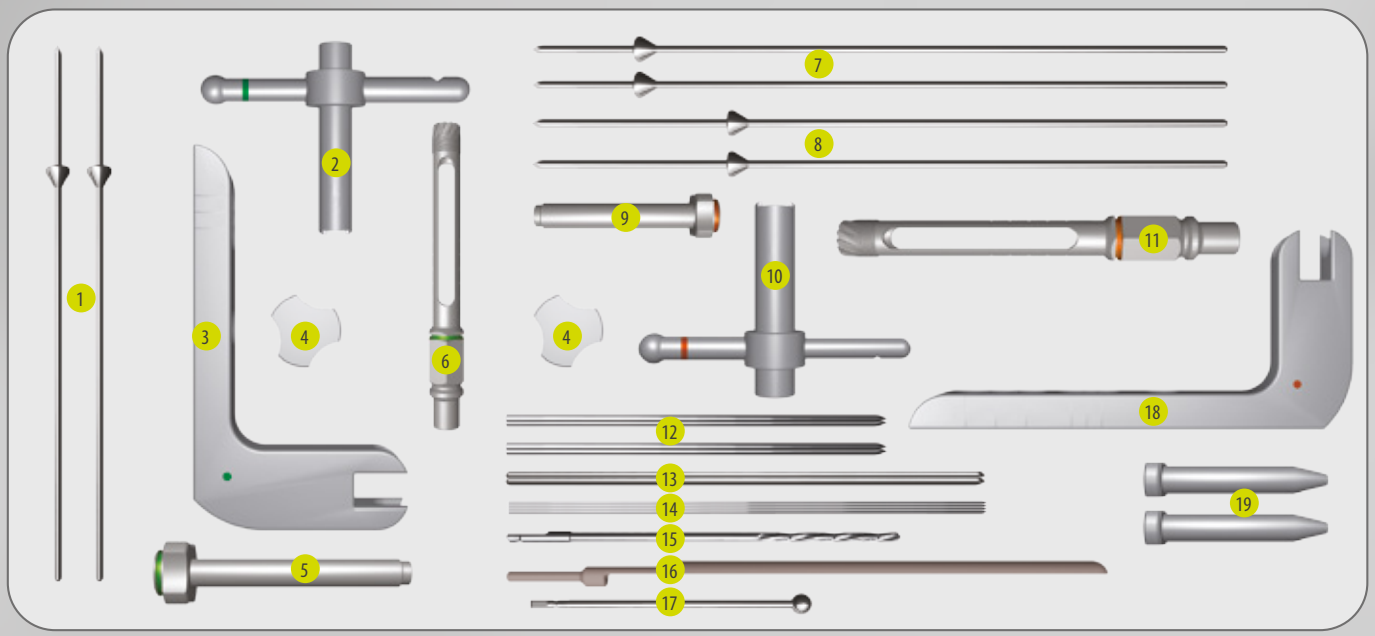


1.	Compressor	ref. 266 353
2.	Distractor	ref. 265 599
3.	Calcanail Positioning square	ref. 266 147
4.	Hollow reamer for fusion nail removal Ø14	ref. 265 598
5.	Calcanail Hollow reamer Ø12	ref. 265 573
6.	Calcanail Hollow reamer Ø10	ref. 265 572
7.	Calcanail K-wire with stopper Ø12 (x2)	ref. 265 571
8.	Calcanail K-wire with stopper Ø10 (x2)	ref. 265 570
9.	K-wire for cannulated screws Ø1.6 lg 200mm	ref. 266 158
10.	Ø3.7 Drill for cannulated screw	ref. 265 587
11.	K-wire for distractor Ø3.2 lg 150mm (x2)	ref. 265 668
12.	Nail length gauge	ref. 266 340
13.	Cannulated screw length gauge L150/200mm	ref. 266 146
14.	Calcanail Nail guide	ref. 266 291
15.	Spatula	ref. 265 586
16.	Cannulated 3.5 screwdriver Ø18	ref. 254 599
17.	Straight tamp	ref. 265 576
18.	Curved tamp	ref. 265 575
19.	Alignment frame - nail holder connecting screw	ref. 265 581
20.	Bone tunnel plug Ø12	ref. 265 584
21.	Bone tunnel plug Ø10	ref. 265 583
22.	Drill guide for K-wire Ø1.6 lg 200mm	ref. 266 148
23.	Alignment frame for Fracture Nail Ø10	ref. 265 577
24.	Calcanail Handle-nail connector Ø10	ref. 265 568
25.	Alignment frame for Arthrodesis Nail Ø12	ref. 265 578
26.	Calcanail Handle-nail connector Ø12	ref. 265 569
27.	Calcanail Nail holder Ø10	ref. 265 579
28.	Calcanail Nail holder Ø12	ref. 265 580
29.	Guide K-wire Ø2.4 Lg 250 (x2)	réf. 264 586
30.	Cannulated drill bit Ø12 Lg 180	réf. 271 315
31.	Case	ref. 266 351

V3 INSTRUMENTATION



1. Distractor ref. 265 599
2. Compressor ref. 266 353
3. Calcanail Positioning square ref. 266 147
4. Screwing guide with window ref. 268 771
5. Hollow reamer for fusion nail removal Ø14 L140 ref. 268 770
6. Nail lenght gauge ref. 268 772
7. Calcanail nail guide ref. 266 291
8. Ø18 Cannulated 3.5 screwdriver ref. 254 599
9. Spatula ref. 265 586
10. Calcanail curved tamp ref. 265 575
11. Calcanail straight tamp ref. 265 576
12. Guide K-wire Ø2.4 Lg 250 (x2) réf. 264 586
13. Cannulated drill bit Ø12 Lg 180 réf. 271 315



1. Calcanail Ø10 K-wire with stopper ref. 265 570
2. Calcanail nail holder Ø10 ref. 265 579
3. Alignment frame for fracture nail Ø10 ref. 265 577
4. Alignment frame-nail holder connecting screw (x2) ref. 265 581
5. Calcanail Handle-Nail connector Ø10 ref. 268 768
6. Calcanail hollow reamer Ø10 L105 ref. 267 055
7. Short K-wire with stopper Ø3,2 Calcanail Ø12 ref. 267 777
8. K-wire with stopper Ø3,2 Calcanail Ø12 (x2) ref. 267 259
9. Calcanail Handle-Nail connector Ø12 ref. 268 769
10. Calcanail nail holder Ø12 ref. 265 580
11. Calcanail hollow reamer Ø12 L140 ref. 267 056
12. K-wire for distractor Ø3.2 L 150 mm (x4) ref. 265 668
13. K-wire Ø3.2 L 200 mm (x2) ref. 267 527
14. K-wire for cannulated screws Ø1.6 L 200 mm ref. 266 158
15. Drill bit Ø3.7 for cannulated screw ref. 265 587
16. Cannulated screw length gauge L 150/200 mm ref. 266 146
17. Ball End Burr Ø7.9 L110 ref. 267 441
18. Frame for fusion nail Ø12 ref. 265 578
19. Drill guide for K-wire Ø1.6 L 200mm (x2) ref. 266 148

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