UP. EXTREMITY

SURGICAL TECHNIQUE

TELEGRAPH

EVOLUTION®

Cannulated humeral nail

GROUP FH ORTHO™

1. FEATURES

Nails
- Long or short nail: Lateralised right and left.
- Right.
- Cannulated for a sterile single-use pin (or non-sterile) of diameter 2.5 mm and length 750 mm.
- Ti6Al4V (anodized titanium alloy type II).
- Short: 4 diameters of 7 - 10 mm and a single length: L150 mm.
- Long: 4 diameters of 7 - 10 mm and lengths: L210, 230, 250, 270 and 290 mm.
- Proximal diameter: Ø9 for the 7, 8 and 9mm nails, Ø10 for the 10 mm nail.

Screws
- The proximal and distal screws are self-tapping.
- Proximal screws: Ø4 mm, threaded to 2.5 mm and lengths: L25, 30, 35, 40, 45, 50, 55 mm
- Distal screws: Ø4 mm, threaded to 3.1 mm and lengths: L20, 24, 28, 32 mm.

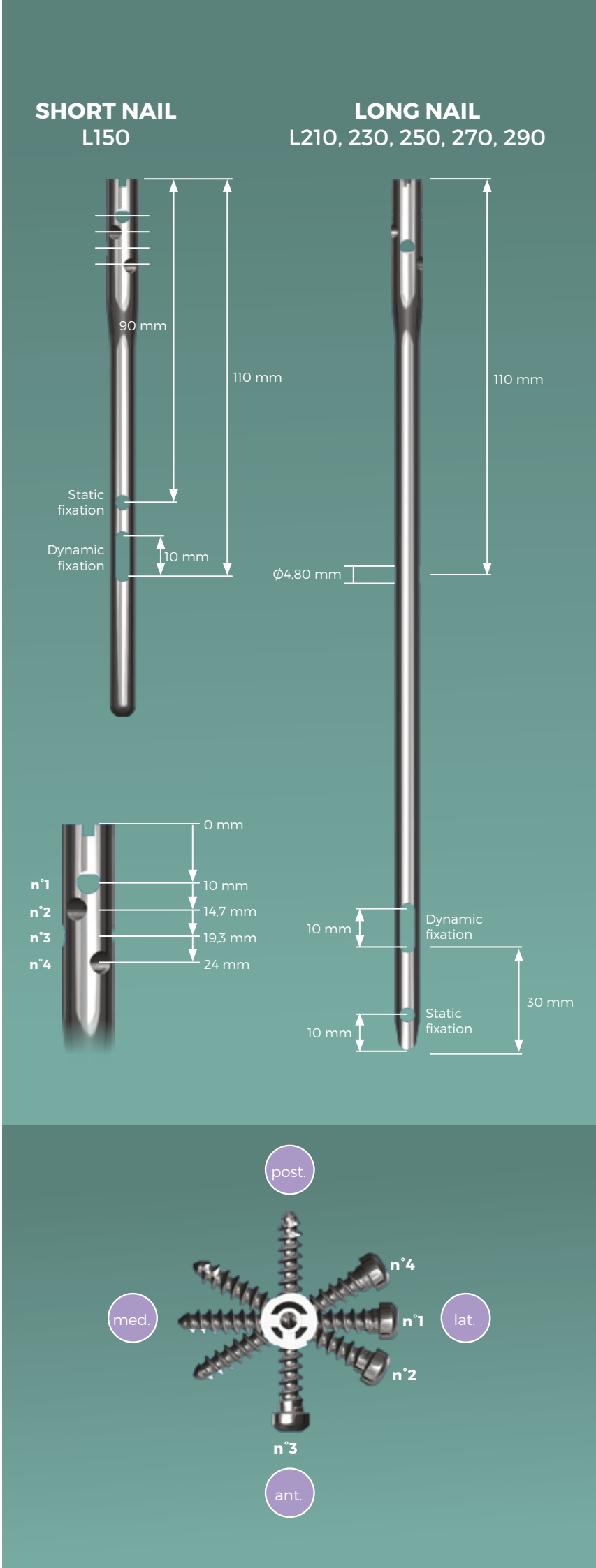
Orientation of screws for proximal fixation

Screw 1:
Transverse to secure the greater tubercle and the humeral head;

Screw 2:
Oblique, from front to back, from outside to inside, to secure the greater tubercle and the head;

Screw 3 (optional):
Anteroposterior, to secure the lesser tubercle and the head;

Screw 4:
From outside to inside, back to front: to secure the greater tubercle and the humeral head.



1.1. Indications

The TELEGRAPH® nail was developed to treat fractures of the proximal humerus and/or humeral diaphysis.
The TELEGRAPH EVOLUTION® cannulated nail, used in these same indications, is a reliable and accurate means of internal fixation that is simple to implement.

1.2. Implants references

TELEGRAPH EVOLUTION®
Short cannulated humeral nail - left

Ref.	Designation
270 141	Ø7 L150
270 142	Ø8 L150
270 143	Ø9 L150
270 144	Ø10 L150

TELEGRAPH EVOLUTION®
Short cannulated humeral nail - right

Ref.	Designation
270 145	Ø7 L150
270 146	Ø8 L150
270 147	Ø9 L150
270 148	Ø10 L150

TELEGRAPH EVOLUTION®
Proximal screw

Ref.	Designation
270 169	Ø4 L25
270 170	Ø4 L30
270 171	Ø4 L35
270 172	Ø4 L40
270 173	Ø4 L45
270 174	Ø4 L50
270 175	Ø4 L55

TELEGRAPH EVOLUTION®
Long cannulated humeral nail - left

Ref.	Designation
270 149	Ø7 L210
270 150	Ø7 L230
270 151	Ø7 L250
270 152	Ø7 L270
270 153	Ø7 L290
270 154	Ø8 L210
270 155	Ø8 L230
270 156	Ø8 L250
270 157	Ø8 L270
270 158	Ø8 L290
270 159	Ø9 L210
270 160	Ø9 L230
270 161	Ø9 L250
270 162	Ø9 L270
270 163	Ø9 L290
270 164	Ø10 L210
270 165	Ø10 L230
270 166	Ø10 L250
270 167	Ø10 L270
270 168	Ø10 L290

TELEGRAPH EVOLUTION®
Long cannulated humeral nail - right

Ref.	Designation
270 350	Ø7 L210
270 351	Ø7 L230
270 352	Ø7 L250
270 353	Ø7 L270
270 354	Ø7 L290
270 355	Ø8 L210
270 356	Ø8 L230
270 357	Ø8 L250
270 358	Ø8 L270
270 359	Ø8 L290
270 360	Ø9 L210
270 361	Ø9 L230
270 362	Ø9 L250
270 363	Ø9 L270
270 364	Ø9 L290
270 365	Ø10 L210
270 366	Ø10 L230
270 367	Ø10 L250
270 368	Ø10 L270
270 369	Ø10 L290

TELEGRAPH EVOLUTION®
Distal screw

Ref.	Designation
270 176	Ø4 L20
270 177	Ø4 L24
270 178	Ø4 L28
270 179	Ø4 L32

TELEGRAPH EVOLUTION®
Washer
Internal diameter 4
External diameter 11

Ref.	Designation
270 180	Washer

OPTIONAL

2. GENERAL RULES AND TECHNIQUES

2.1. Patient positioning

- The patient is in a beach chair position.
- The forearm rests on an armrest.
- The arm is in retropulsion of 25 - 30° in relation to the chest to expose the point of entry.
- The C-arm is placed longitudinally at the patient's head **(fig. 1)**.

Before the beginning the procedure, check that the humerus is clearly visible with the image intensifier.

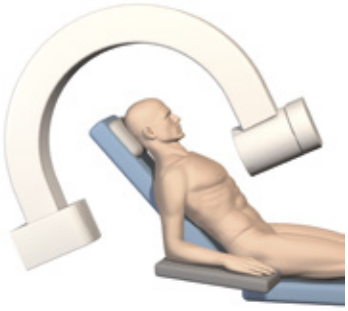


fig. 1

2.2. Approach and entry point

Different approaches are possible depending on the type of fracture and the reduction technique **(see section 6)**.

- Visually and/or with radiographic guidance locate the entry point which is at the humeral head apex **(fig. 2)**.
- Open the rotator cuffs through the muscle area (rather than tendons) at the supraspinatus, either using an open or percutaneous technique.

Option: to avoid incision of the rotator cuffs, you can also go through the rotator interval.

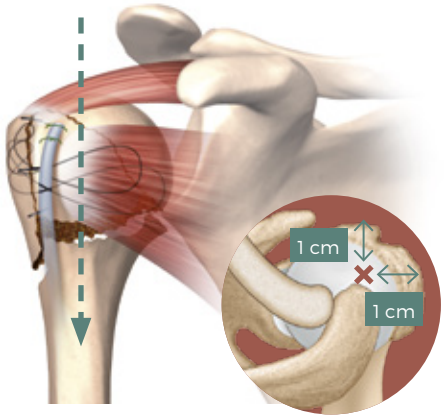


fig. 2

Use the cannulated square awl **(ref. 270 806)** to bore the humeral head around 1 cm behind the bicipital groove (under radiographic guidance), +/- protection sleeve **(ref. 270 807)** **(fig. 3a)**.

Option: to make the entry point at the humeral apex, a pin and 9 mm diameter cannulated drill bit can be used.

- Insert the nail guide (sterile single-use pin **ref. 271 179** or non-sterile pin **ref. 271 326**) into the orifice of the cannulated square awl then advance into the medullary cavity once the fracture has been reduced **(fig. 3b)**.

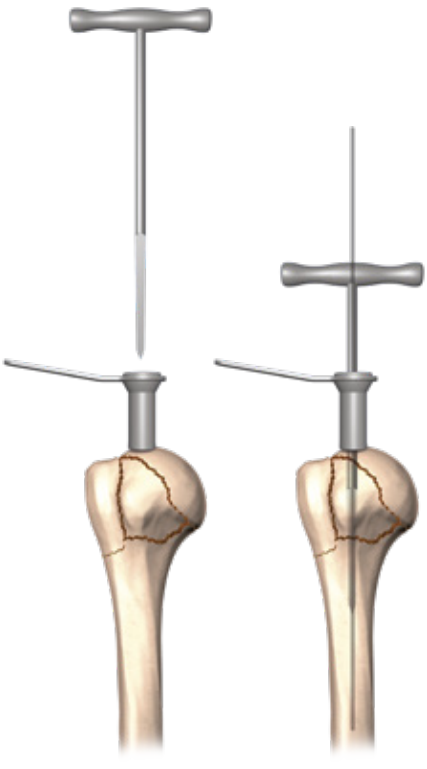


fig. 3a **fig. 3b**

- Gradually prepare the medullary cavity with rigid hand reamers with a diameter of 7, 8 or 9 mm (10 mm optional) **(ref. 270 808, 270 809, 270 810, 270 811)**, depending on the final diameter of the chosen intramedullary nail **(fig. 4a)**.
- The proximal humerus must be reamed to 9 mm diameter for 25 mm to fit the nail **(fig. 4b)**.

Remember that all the nails in the TELEGRAPH EVOLUTION® range have a proximal diameter of 9 mm, except for the 10 mm nails, which are an optional extra (10 mm proximally and distally).

Measurement of the long nail

The measurement is read directly on the hand reamers.
If the protection sleeve **(ref. 270 807)** is still in place, its height of 40 mm must be subtracted from the result.

Tips and tricks for fracture reduction:
The 7 mm diameter rigid reamer can be used to help reduce the fracture and to guide the insertion of the nail guide (sterile single-use pin **ref. 271 179** or non-sterile pin **ref. 271 326**) in complex diaphyseal fractures.

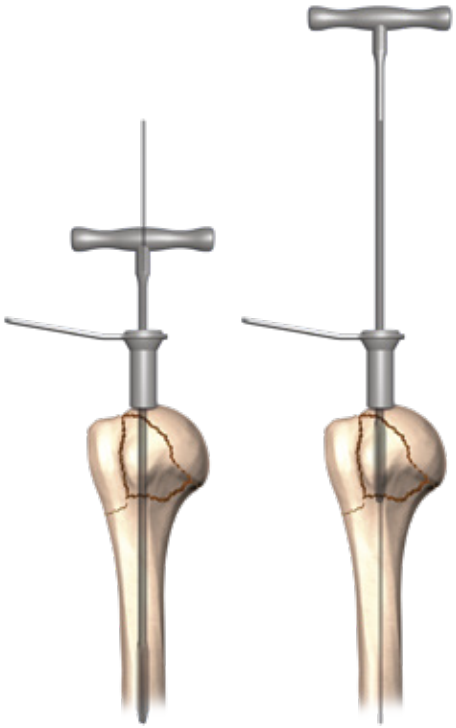


fig. 4a fig. 4b

2.3. Nail fitting and positioning

NB:
When mounting the nail on the nail holder **(ref. 264 201)** with the cannulated connecting screw **(ref. 270 812)** make sure that the nail is pointing in the correct direction ("MED" and "LAT" are engraved on it).

- Check that the sleeves and drill bits are correctly aimed in the nail locking holes.
- The nail is advanced on the nail guide (sterile single-use pin **ref. 271 179** or non-sterile pin **ref. 271 326**) to 5 mm below the joint surface.
- The nail holder has a laser mark (notch) **(fig. 5)** for easy radiographic identification.
- Remove the nail guide (sterile single-use pin **ref. 271 179** or non-sterile pin **ref. 271 326**).

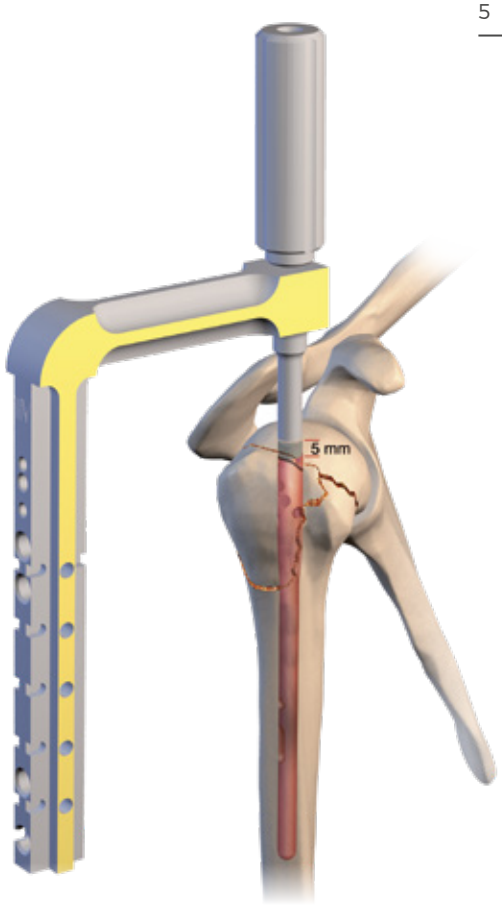
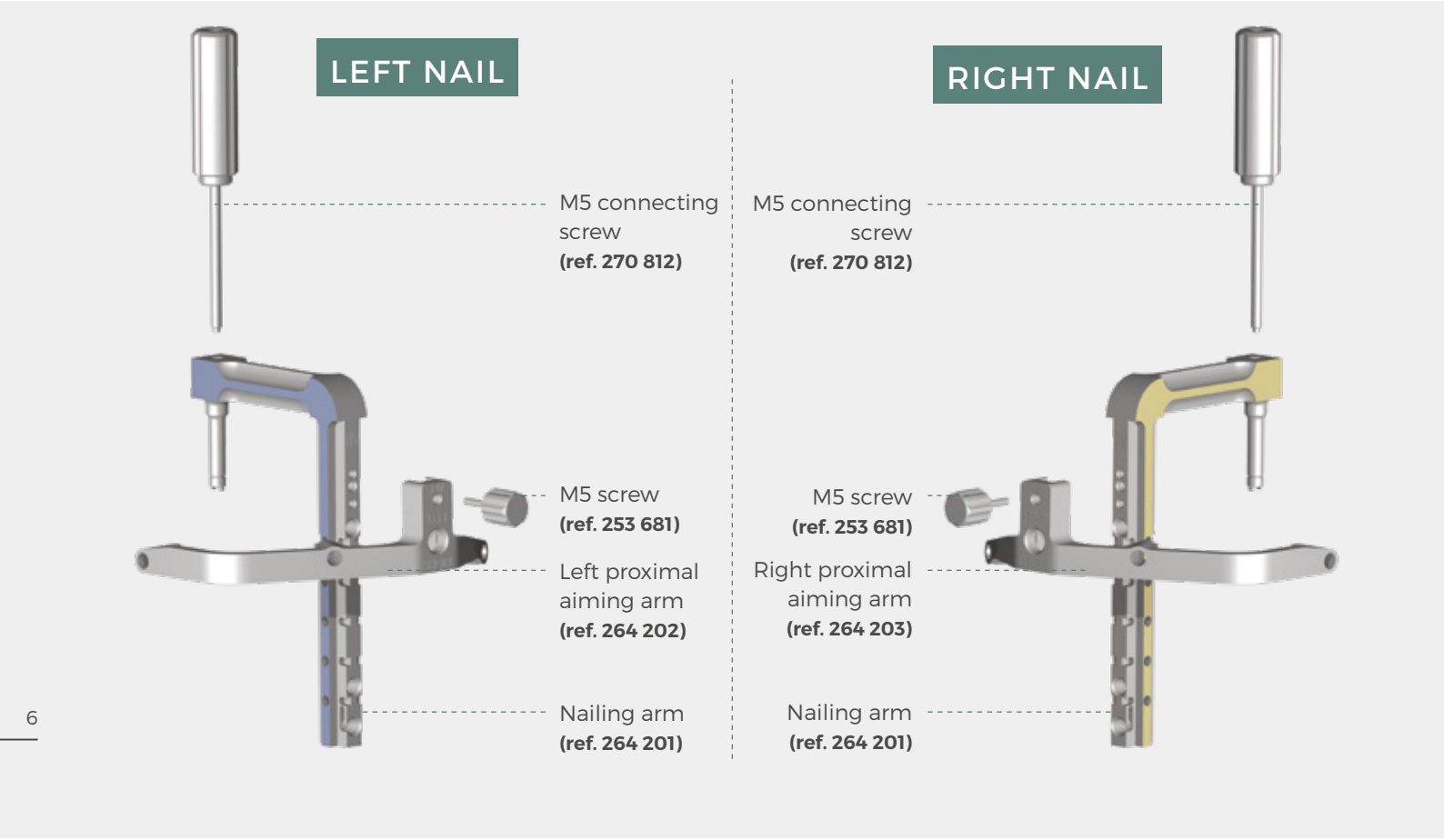


fig. 5

2.4. Proximal locking for both short and long nails

Assemble the insertion handle **(ref. 264 201)** and the left **(ref. 264 202)** or right proximal guide **(ref. 264 203)** with the M5 screw **(ref. 270 812)** (fig.6).



Step n°1: Using the aiming sleeves **(drill sleeve ref. 253 677 and drill guide sleeve ref. 253 678)**, perform the preparatory drilling **(Ø2.5 mm drill bit ref. 250 855)** for the first screw 1. Leave the drill bit in place to stabilise the fixation.

Step n°2: Preparatory drilling for the second screw (optional), the length can be read directly on the drill bit. Remove the drill guide then fit the screw using the screwdriver **(ref. 233 339)**.

Step n°3: Continue with drilling and fitting the subsequent screws then finish with screw 1.

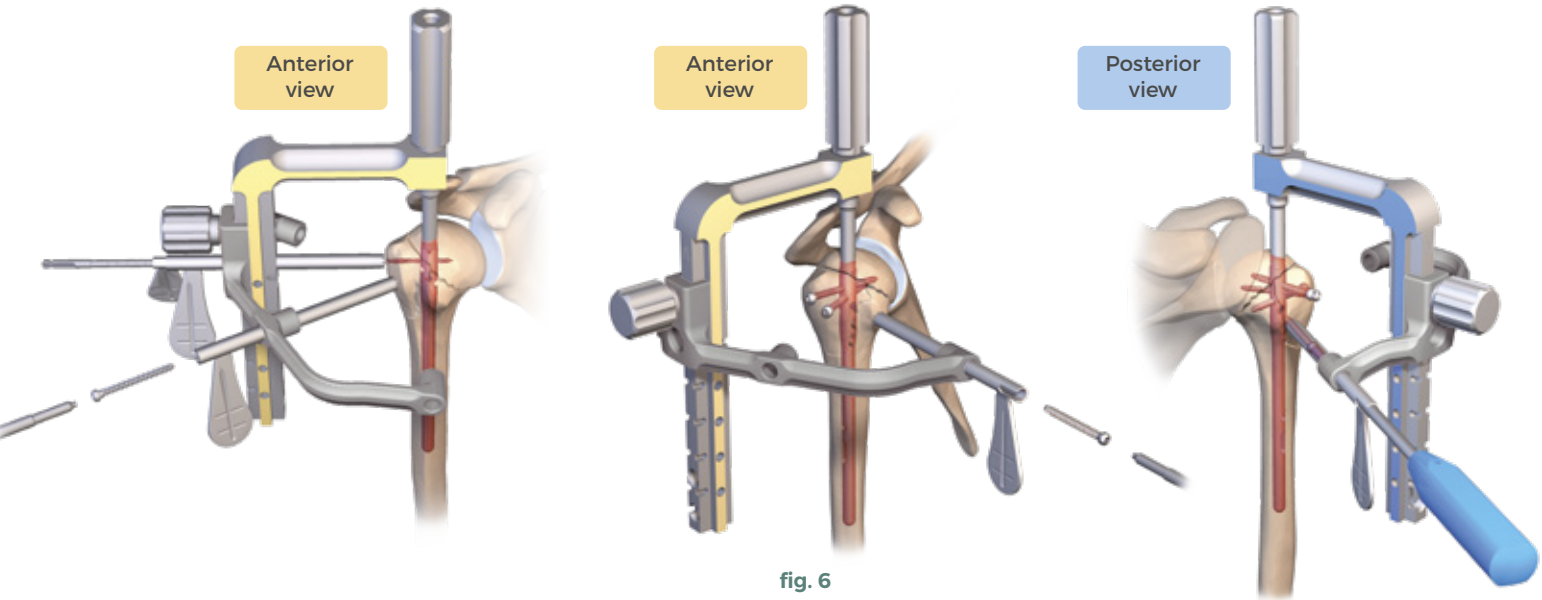


fig. 6

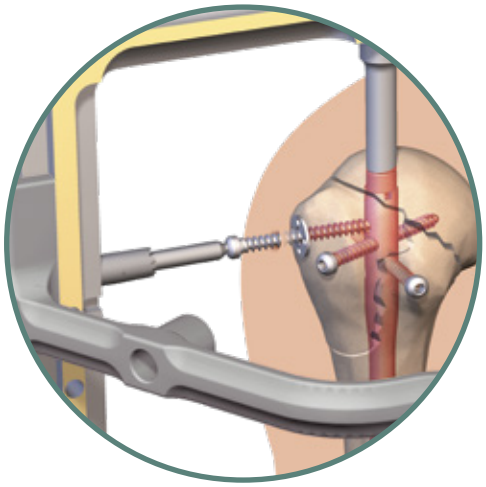


fig. 7

Option: A washer **(ref. 270 180)** can be used on each proximal screw in order to optimise compression of the bone fragment and/or to allow osteosuturing **(FH Link ref. 271 203)**.
The washer is fitted once the aiming sleeve has been partially removed by about 1 cm from the skin **(fig.7)**.

3. DISTAL LOCKING

3.1. Short nail

NB:
- Dynamic nailing is recommended for stable fractures (choose the most distal hole on the nailing arm).
- For complex or unstable fractures, use static nail locking.

- Insert the blunt tip drill guide sleeve D3.1 mm **(ref. 270 822)** into the aiming sleeve **(ref. 253 678)**, until contact is made with the diaphyseal cortical bone **(fig.8)**.

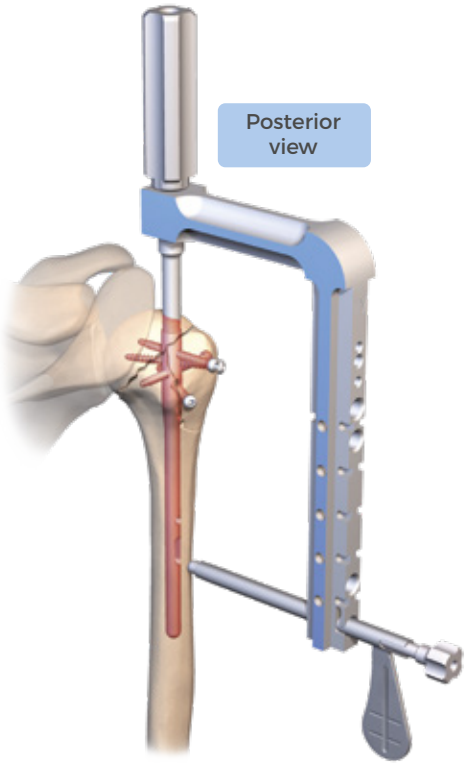


fig. 8

- Drill with the D3.1 mm bit **(ref. 270 821)** **(fig.9)** and read the screw length directly on the drill bit.

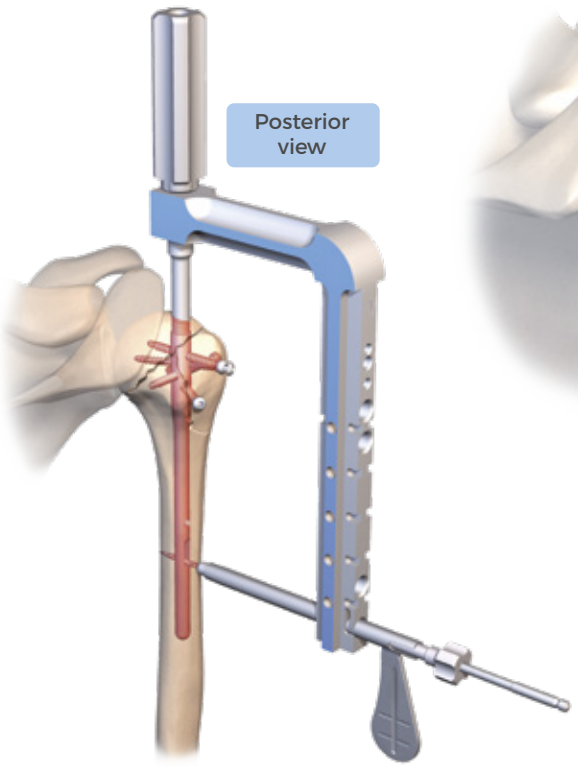


fig. 9

- Remove the blunt tip drill guide sleeve **(ref. 270 822)** and fit the distal screw using the 2.5 screwdriver **(ref. 233 339)** **(fig.10)**.

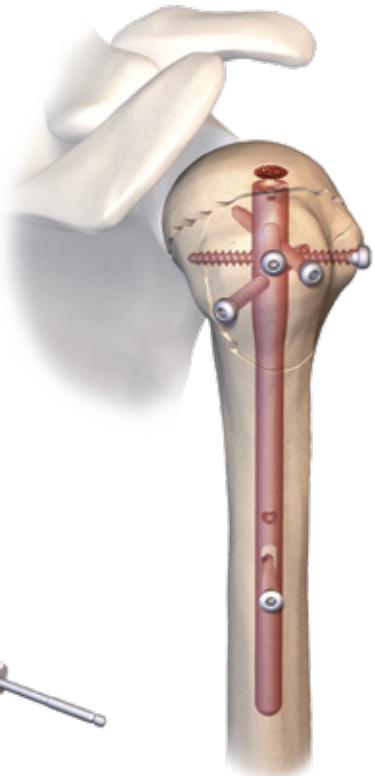


fig. 10

2.4. Long nail

Fitting the intermediary positioner

NB:
This step is **indispensable** to anchor the nail holder for distal aiming and successful distal drilling.

- Insert the blunt tip eyelet handle **(intermediary obturator ref. 253 676)** into the aiming sleeve **(blue with notch ref. 257 010 or ref. 253 679)** until contact is made with the humerus **(fig.11)**.
- Drill the outer cortex with the grey drill bit with stop **(ref. 266 428)** **(fig.12)**.
- Fit the intermediary positioner **(ref. 253 675)** in its notch, leaving the small aiming sleeve in place **(fig.13)**.

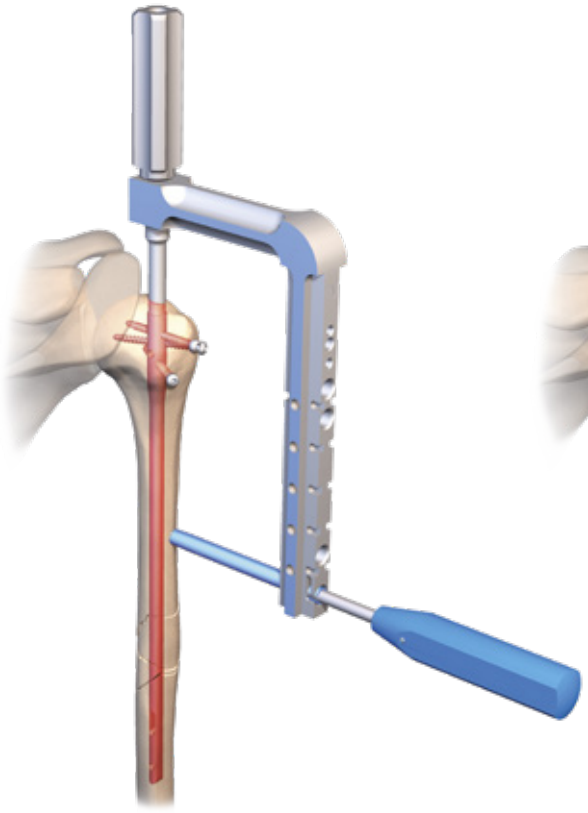


fig. 11

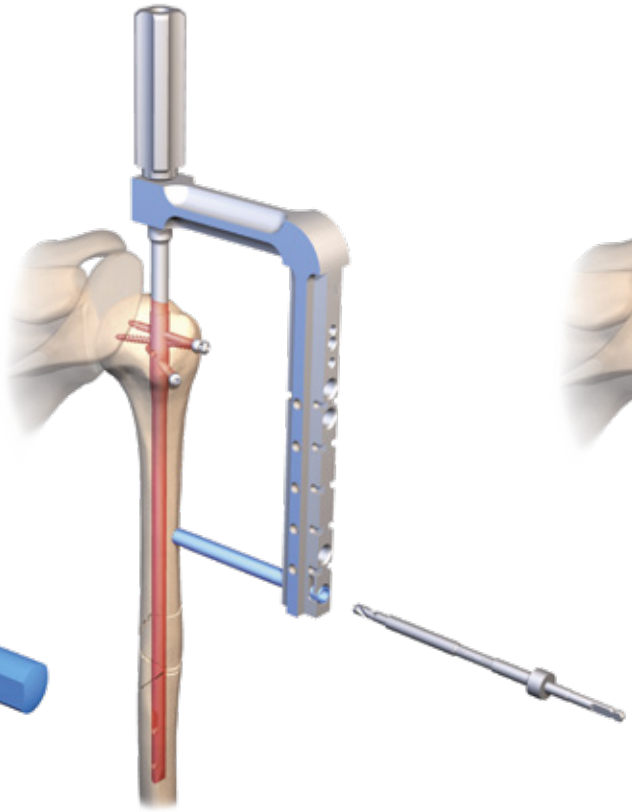


fig. 12

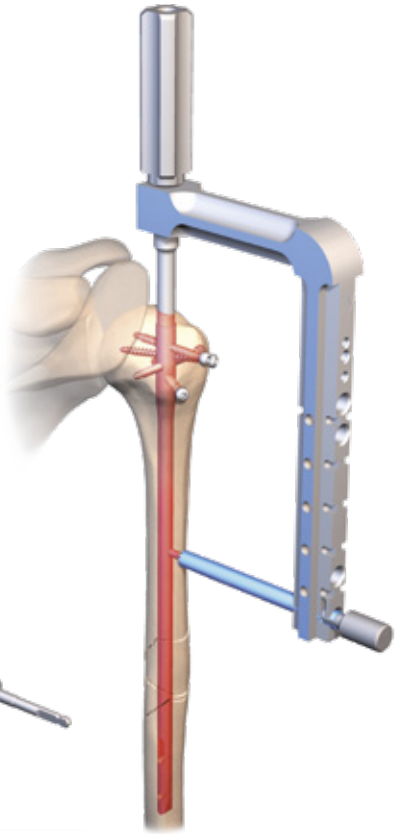


fig. 13

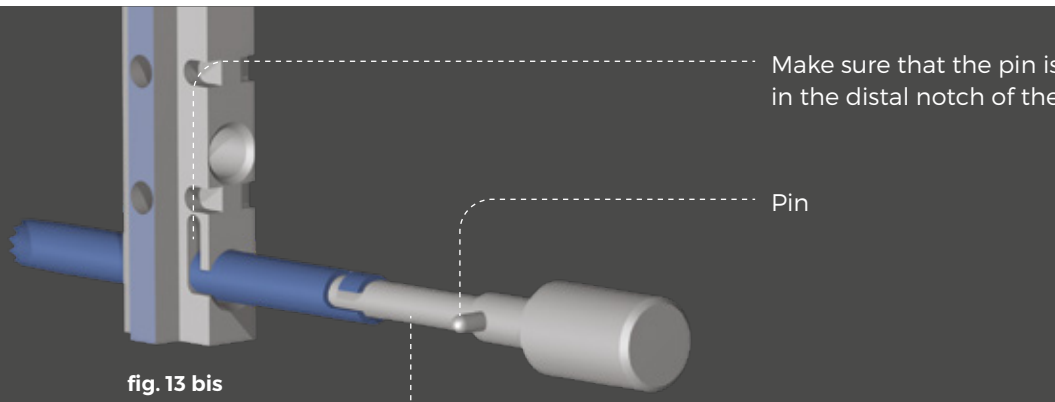
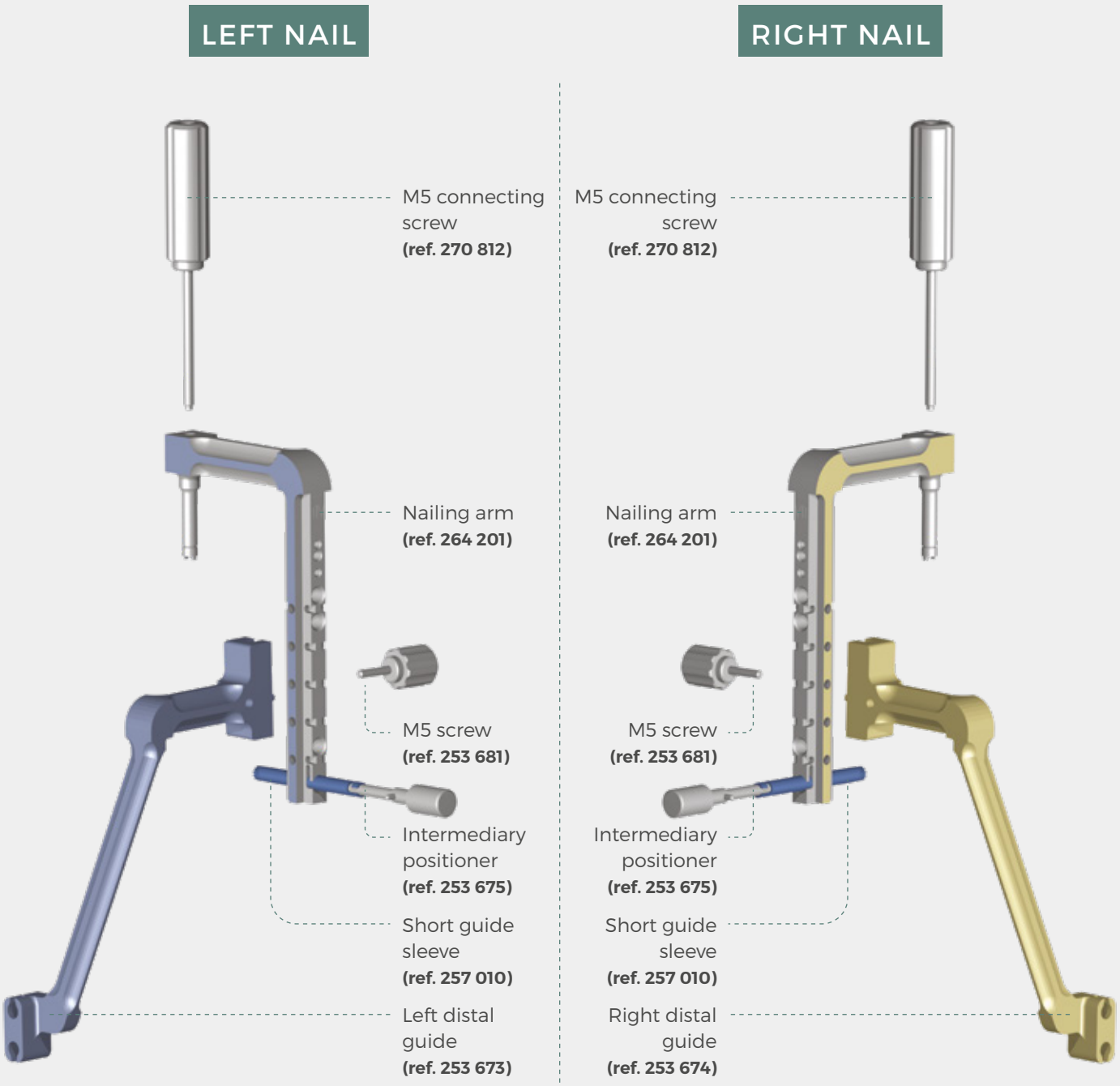


fig. 13 bis

Distal locking

Assemble the insertion handle **(ref. 264 201)** and the blue left **(ref. 253 673)** or yellow right distal guide **(ref. 253 674)** with the M5 screw **(ref. 270 812)**.



NB:
Dynamic nailing is preferred except in unstable fractures (most proximal hole of the distal guide).

· Insert the D3.1 mm blunt tip drill guide sleeve **(ref. 270 822)** into the aiming sleeve **(ref. 253 678)**, until contact is made with the diaphyseal cortical bone and checking for an absence of stress on the soft tissue from the sleeve **(fig.14)**.

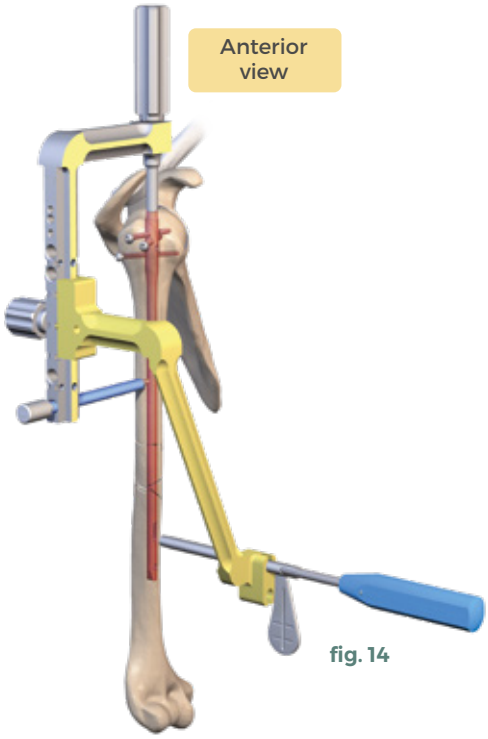


fig. 14

NB:
Before drilling, check that alignment is correct and the aiming sleeve is centred on the nail using radiographic guidance (oblique view) **(fig.15)**.

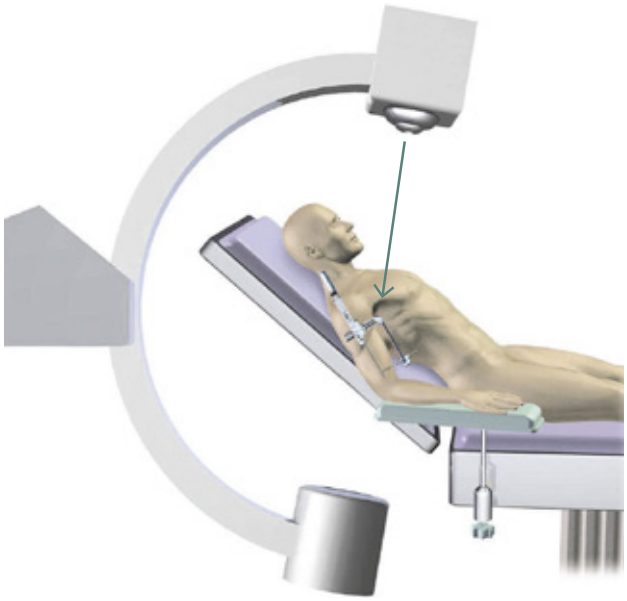


fig. 15

· Bicortical drilling with the D3.1 mm bit **(ref. 270 821)** **(fig.16)** and read the screw length directly on the drill bit.

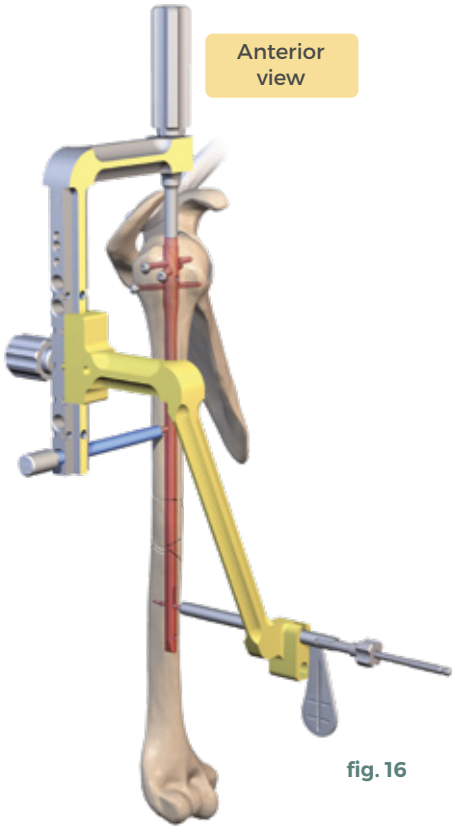


fig. 16

· Remove the blunt tip drill guide sleeve **(ref. 270 822)** and fit the distal screw using the 2.5 mm screwdriver **(ref. 233 339)** **(fig.17)**.

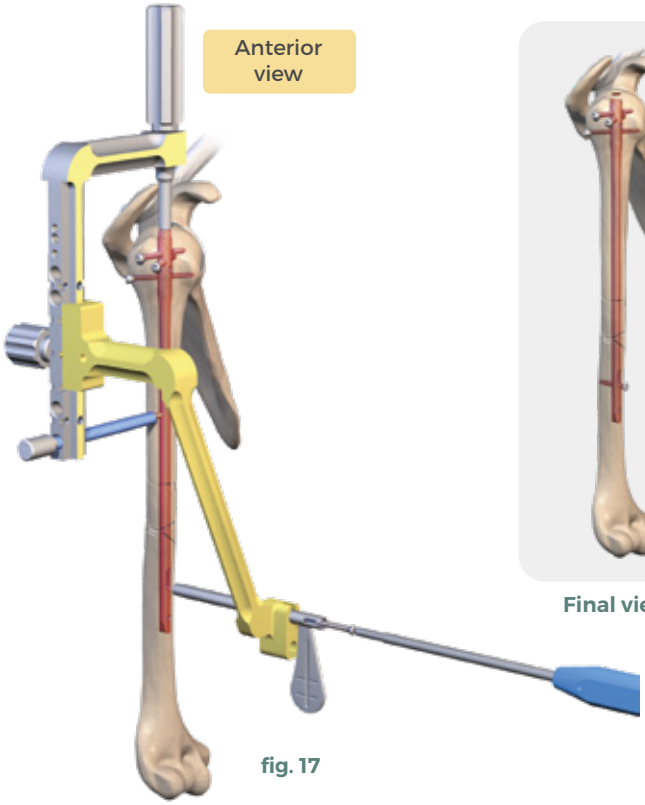


fig. 17

· Remove the instrumentation and suture the muscle incision at the rotator cuffs.

4. POSTOPERATIVE CARE

- The type and duration of immobilisation, ranging from 2 to 6 weeks, must be appropriate for the type of fracture and the stability of the fixation.
- Rehabilitation should also be chosen according to fracture type.
- Immediate post-operative rehabilitation should be preferred where possible with weight-bearing, even if this is passive.

5. REMOVING THE HARDWARE

Removal of TELEGRAPH EVOLUTION® is not routinely recommended. This procedure must be discussed in terms of the risk-benefit balance for every patient.

However, removal may be necessary in two situations:

- **The screws and/or nail protrude, causing discomfort.**
- **Young patient.**
  Removal may be difficult if material is embedded. The proximal end must be identified: this is achieved using a metal pin and the C-arm. The nail holder is then positioned on the nail. The drill guides can be used to find the screws.

The nail holder must not be used to remove the nail. The cannulated connecting screw **(ref. 270 812)** should be used.

6. DIFFERENT REDUCTION TECHNIQUES BY FRACTURE TYPES

6.1. Percutaneous technique

Extra-articular fracture with two or three fragments

Prior reduction is essential, either by external manipulation or percutaneously using a plate or pin - the joystick technique **(fig. 18)**.
A short pre-acromial incision enables insertion of the blunt tip of the scissors as far as the humeral head.
The entry point at the top of the humeral head is marked using the square awl under radiographic guidance. This bores the humeral head.
The soft tissue retractor **(ref. 236 844)** enables access to the epiphysis for percutaneous fitting of the screws.
The next stages are those set out in **paragraph 2**.

fig. 18

6.2. Standard technique

Fractures with 3 fragments that cannot be reduced percutaneously and articular fractures with 4 fragments

The anterolateral approach involves the incision and creation of the digastric trapezius-deltoid muscle flap **(fig. 19 and 20)**.
The incision measures 8 - 10 cm. It is centred on the anterolateral angle of the acromion, 1/3 proximal, 2/3 distal, following the direction of the fibres of the deltoid.
The trapezius-deltoid digastric flap is created by dissection between the middle and anterior deltoid fibres with periosteal stripping of the acromion in the same direction. The digastric muscle is reflected forwards, along with the coracoacromial ligament. The various fragments and in particular the tuberosities can be approached directly.
Reduction of bone fragments is achieved using a plate, a hook or external manipulation.
The head is generally tipped backwards. The fracture must be reduced.
If reduction is difficult, the "crucifixion" technique can be used **(fig. 21)**. This involves pinning the humeral head in the anatomical position and against the glenoid with a K-wire.

After reduction, the nail is fitted as usual **(paragraph 2)**.

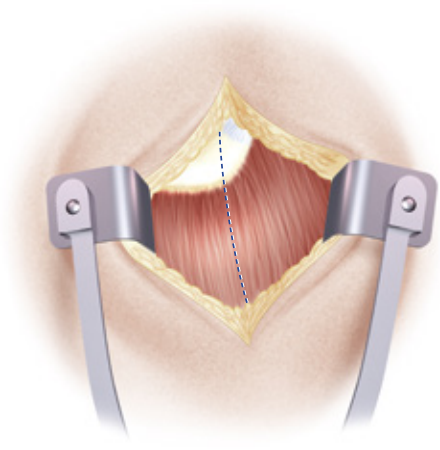


fig. 19

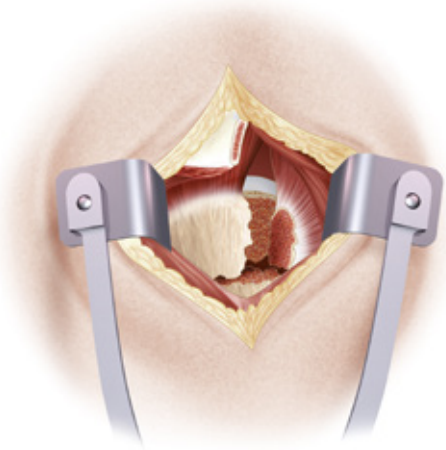


fig. 20

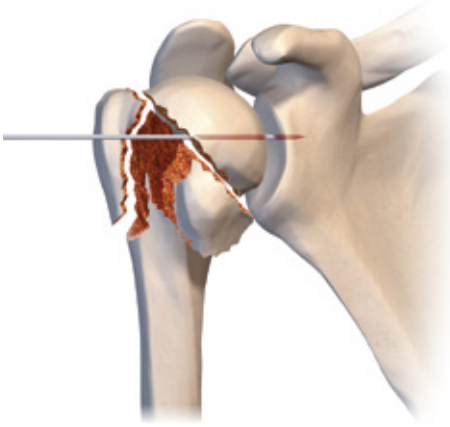
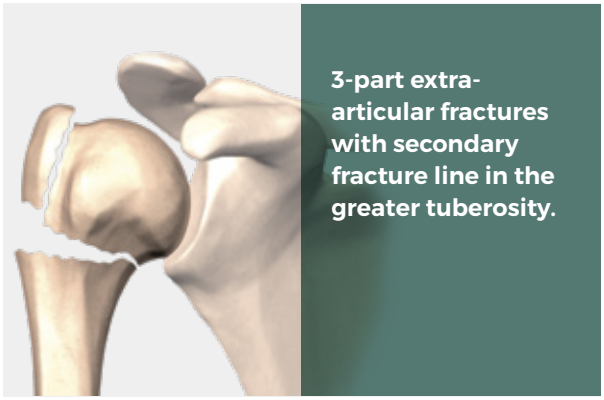


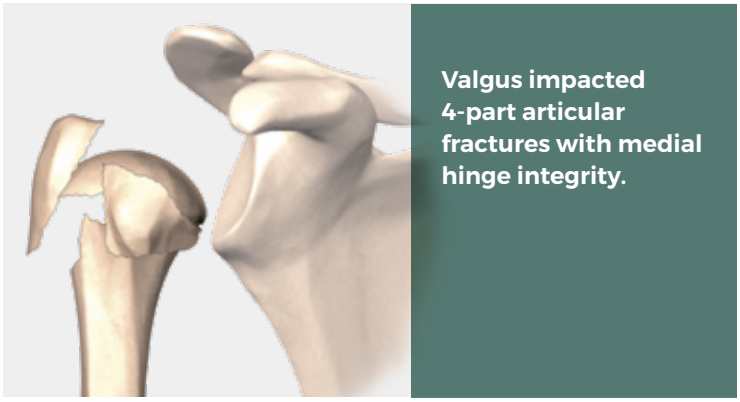
fig. 21

6.3. Treatment of 3- & 4-part fractures by osteosuture

Indication



3-part extra-articular fractures with secondary fracture line in the greater tuberosity.



Valgus impacted 4-part articular fractures with medial hinge integrity.

Reduction and osteosuture

Reduce the humeral head via the inter-tuberosity fracture using a bone impactor applied to the superior edge of the humeral head, generally displaced into a valgus, posterior tilt position.
This manoeuvre is performed under radiographic guidance **(fig. 22)**.
Once the criteria for tuberosity reduction have been identified, this is performed and held by forceps **(fig. 23)**.

fig. 22

fig. 23

TWO OPTIONS

1 Osteosuture without biceps tenotomy

Three transosseous wires are passed through the greater tubercle and lesser tubercle before reduction on both sides of the tuberosity fracture. The tuberosities are then reduced, held by forceps and the wiring is knotted. In this case, the bicipital groove is left free **(fig. 24)**.

2 Osteosuture with biceps tenotomy & tenodesis

Suturing of the greater and lesser tuberosities is carried out by transtendon stitching at the «bone-tendon» junction. The bicipital groove is bridged, thus achieving tenodesis of the long head of the biceps. A tenotomy is necessary via a limited exposure incision through the rotator interval **(fig. 25 and 26)**.

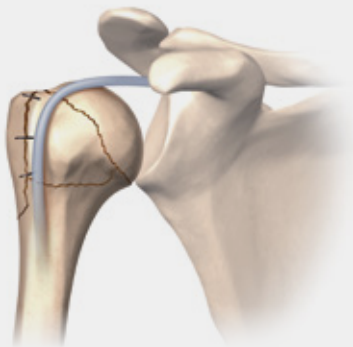


fig. 24

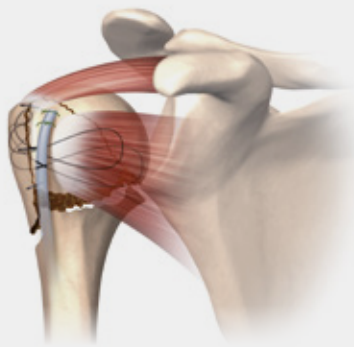


fig. 25

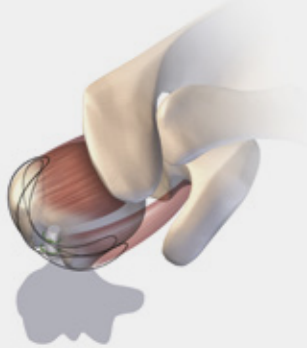


fig. 26

6.4. The Bilboquet

Complex articular fractures

Difficult surgery. Only to be performed after having gained experience with the equipment. The conventional patient positioning and anterolateral approach are used **(paragraph 2)**.
The nail is fitted, along with its nail holder, without fragment reduction. It is locked distally **(fig. 27)** by a static screw.
The nail holder is removed.
The next stage consists of reducing the humeral head directly on the proximal part of the nail. It is screwed **(fig. 28)** to the nail using two screws. The tuberosities, marked on the wires, are reduced and sutured to the humeral head, the nail and the proximal diaphysis **(fig.29)**. They can also be stabilised with screws no. 3 and 4.

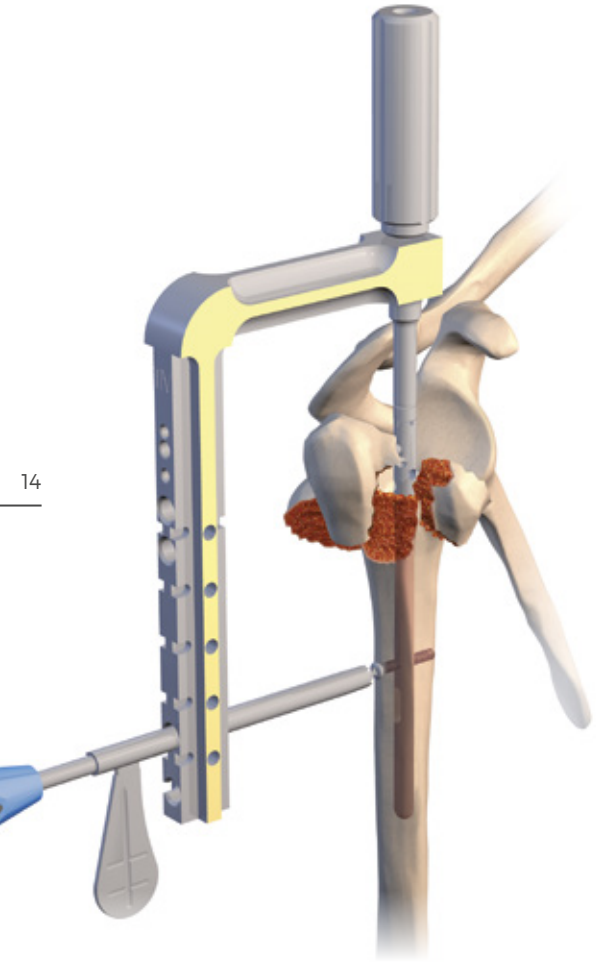


fig. 27

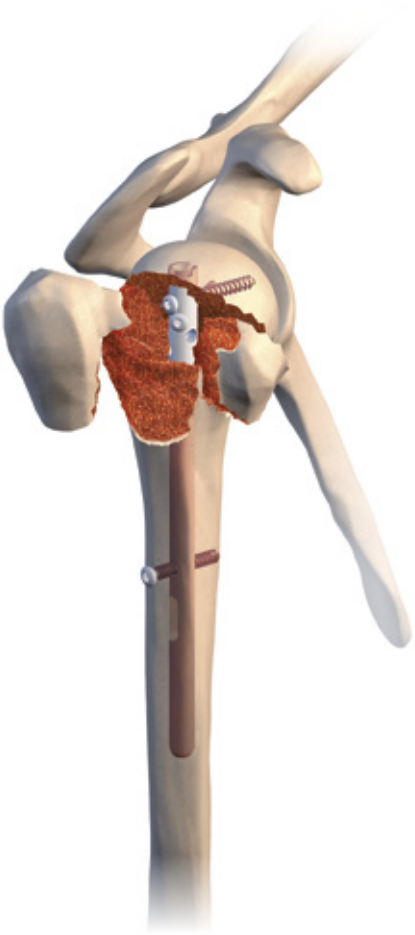


fig. 28

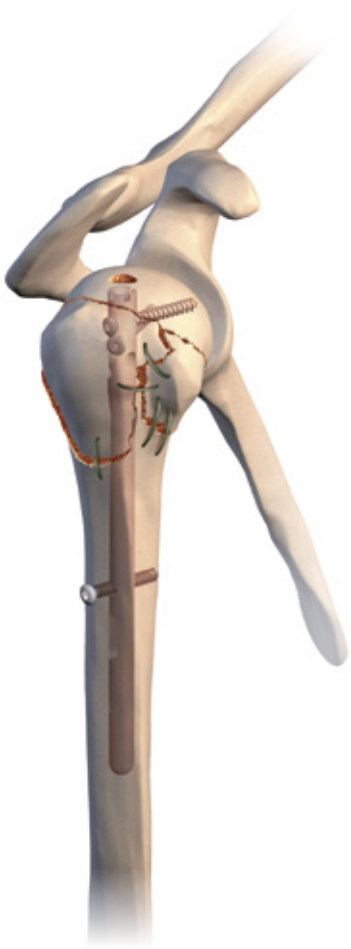


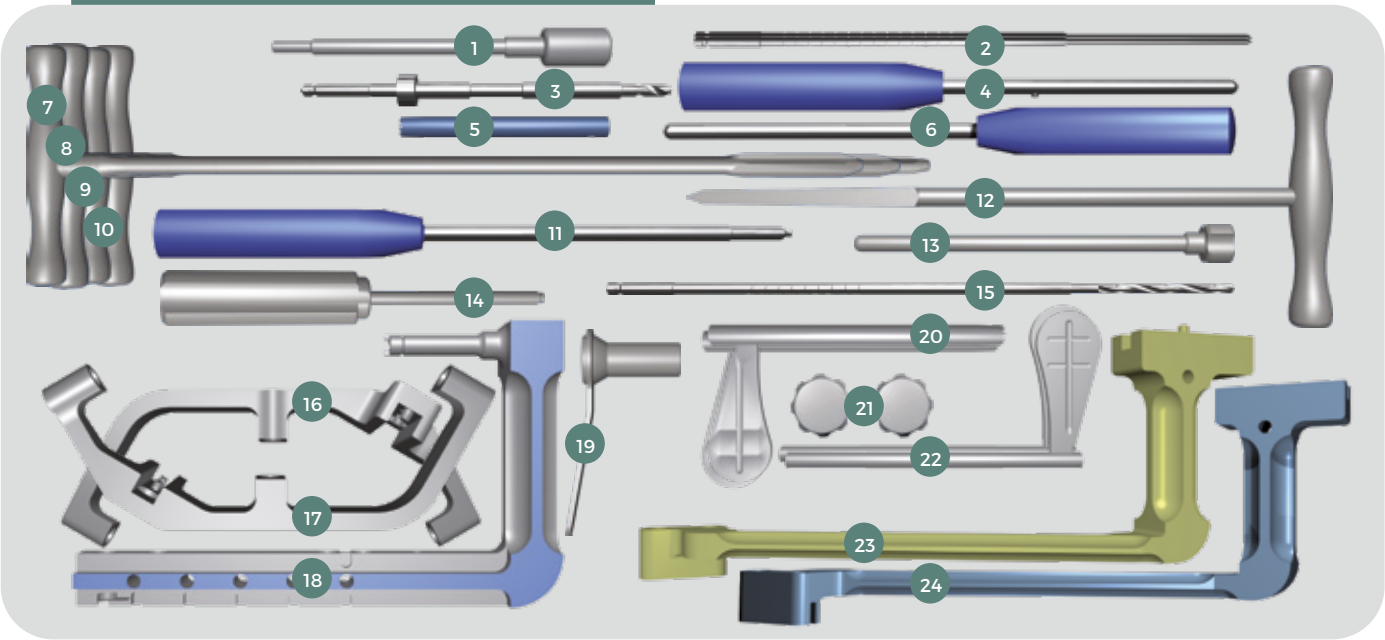
fig. 29

7. INSTRUMENTATION

ref. 270 803
Telegraph Evolution® case V1

ref. 270 805
Telegraph Evolution® lid

ref. 264 579
Telegraph IV case V1
(can replace case 270 803 + lid 270 805)



1. Telegraph intermediary positioner ..... ref. 253 675
2. Drill bit Ø2.5 L60 AO ..... ref. 250 855
3. Drill bit with stop Ø4.5 AO connector ..... ref. 266 428
4. Telegraph intermediary obturator with tab ..... ref. 253 676
5. Telegraph IV short guide sleeve ..... ref. 257 010
   or Short guide sleeve (can replace ref 257 010) ..... ref. 253 679
6. Obturator ..... ref. 236 844
7. Telegraph Evolution® rigid cannulated reamer Ø7 ..... ref. 270 808
8. Telegraph Evolution® rigid cannulated reamer Ø8 ..... ref. 270 809
9. Telegraph Evolution® rigid cannulated reamer Ø9 ..... ref. 270 810
10. Telegraph Evolution® rigid cannulated reamer Ø10 (option) ... ref. 270 811
11. Telegraph 2.5 screwdriver ..... ref. 233 339
12. Telegraph Evolution® cannulated trocar-tip awl ..... ref. 270 806
13. Telegraph Evolution® drill sleeve for Ø3.1 drill bit ..... ref. 270 822
14. Telegraph Evolution® cannulated connecting screw ..... ref. 270 812
15. Telegraph Evolution® drill bit Ø3.1 AO connector ..... ref. 270 821
16. Telegraph IV left proximal guide ..... ref. 264 202
17. Telegraph IV right proximal guide ..... ref. 264 203
18. Telegraph IV nailing arm ..... ref. 264 201
19. Telegraph Evolution® protection sleeve Ø11 ..... ref. 270 807
20. Guide sleeve for tap ..... ref. 253 678
21. Telegraph M5 screw ..... ref. 253 681
22. Drill sleeve for Ø2.5 drill bit ..... ref. 253 677
23. Telegraph right distal guide ..... ref. 253 674
24. Telegraph left distal guide ..... ref. 253 673

ref. 271 326
Non-sterile pin Ø2,5 LG 750 (x2)

Take note the instrument set is delivered with 2 non-sterile pins (above).
It is recommended to exchange the pin after each surgery.

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