

UP. EXTREMITY

BEHAC[®]

DYNAMIC HUMERAL NAIL

Supple
pinning
of humeral
fractures



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FH ORTHOPEDICS

BEHAC[®] nail

Surgical Technique



1. PRINCIPLE :

Behac nails apply the principle of elastic osteosynthesis using a cluster of ascending pins as described by Hackethal. The technique's simplicity and positioning speed, its safety thanks to the distal surgical approach, and its low cost resulting from the simplicity of the range of implants and the absence of any ancillary devices, account for this technique's appeal.

To undertake flexible pinning successfully, however, the procedure must be closely heeded and precise positioning of the implants must be strictly adhered to.

Two surgical approaches are possible:

- either the external lateral approach via the external humeral shaft;
- or the posterior approach via an orifice just above the olecranon fossa.

We prefer using the lateral approach as it allows patients to be positioned on their back (described below).

If the posterior approach is selected, the patient must be lying in the dorsal decubitus or ventral position accordance with the principles of Hackethal's method.



2. INDICATIONS CONTRA-INDICATIONS :

Indications :

Proximal metaphyseal fractures :

- Surgical neck fractures
- Simple two or three-fragment fractures (Neer)

Fractures Diaphyseal fractures :

- Transversal fractures
- Oblique fractures
- Spiral fractures
- Bifocal or comminutive fractures

The lower limit is situated 4 to 5 cm above the olecranon fossa.

Choice of implants based on the indication (Fig.1 & Fig.2) :

Proximal metaphyseal fractures:
SHORT LOOP

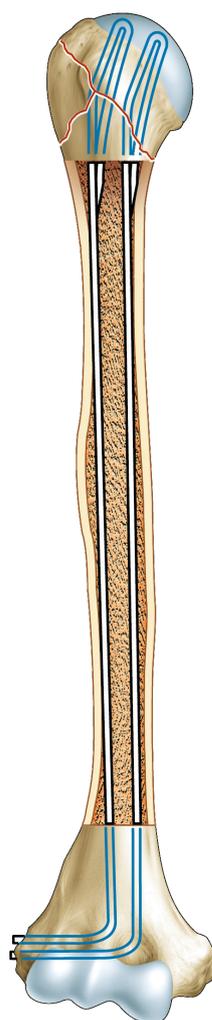


Figure 1

Diaphyseal fractures:
LONG LOOP

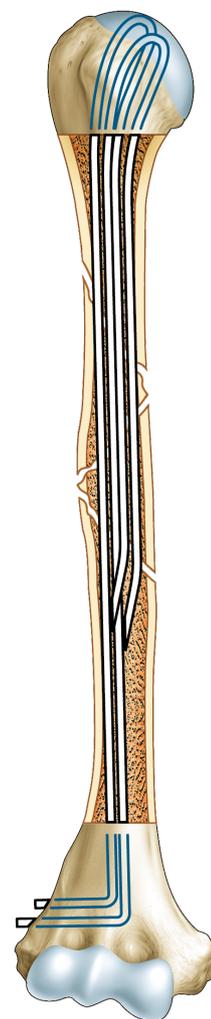


Figure 2

Contra-indications :

- Cephalotubercular fragmentation
- Very severe osteoporosis
- Pseudarthrosis



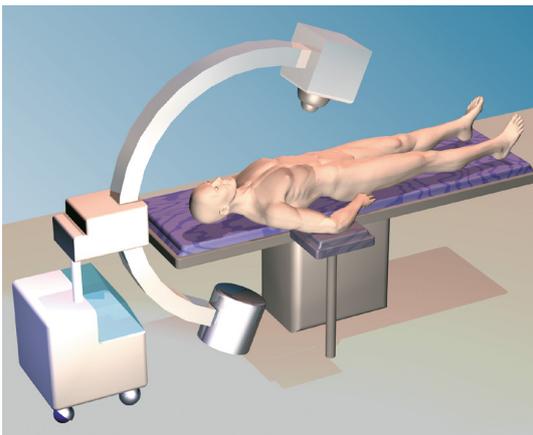
3. METHOD :

Positioning (Fig.3) :

The patient is installed on a simple table lying in the strict dorsal decubitus; the shoulder must be free and off the table. The elbow rests on a platform and the patient's head is immobilised by a head-rest or strapping with an elastoplast bandage.

The image intensifier should be installed beside the head and must enable front views to be taken; the glenohumeral articulation and entire humeral shaft should be visualised at all times.

The x-ray unit must also be able to tip 45° forward and backward to allow the head of the humerus to be clearly visualised.

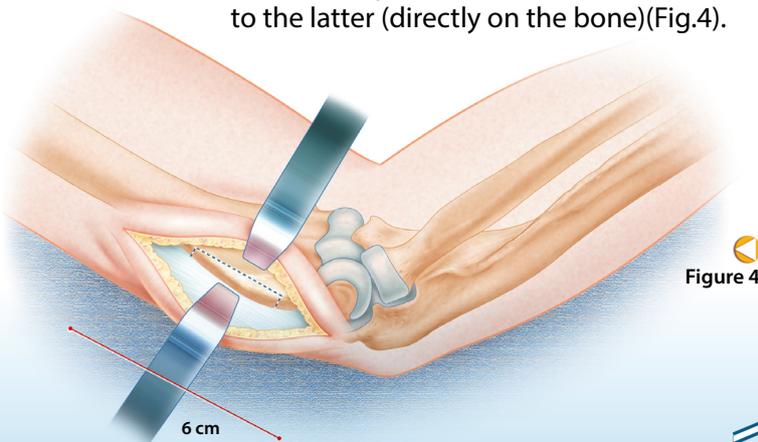


▲ Figure 3

Approach :

The surgical approach is through the lateral supracondylar ridge at the base of the humeral shaft.

The incision is made at a point located 6 cm above the epitrochlea and it extends down to the latter (directly on the bone)(Fig.4).



▲ Figure 4

A 4-cm section is lopped off the cortex using fine or medium-sized gouge forceps (Fig.5); it is then bored in three places using a square bit; a 2.5-mm diameter bit, then a 5-mm bit can be used if the bone is very hard.

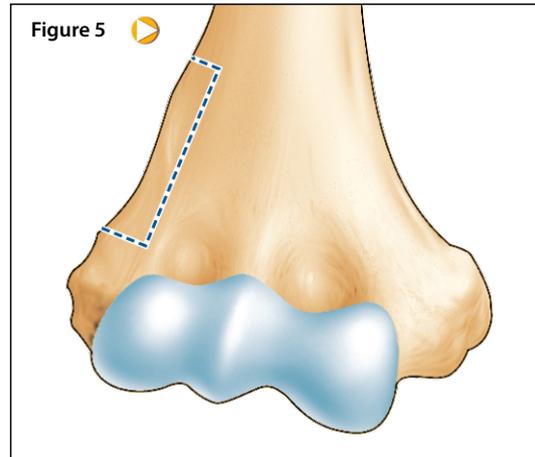


Figure 5 ▶

The holes made with the gouge forceps are then enlarged to open a 5-mm wide by 4 cm long window.

Closed curved Mayo scissors are introduced into the spongy bone, with their curve turned towards the patient's shoulder to prepare the way for the pins right up to the opposite cortex.

Introduction of the nails :

A Behac nail is inserted using an American handle. The nail is fitting in the handle so that only a 10 cm section, loop included, emerges from the chuck (Fig.6).

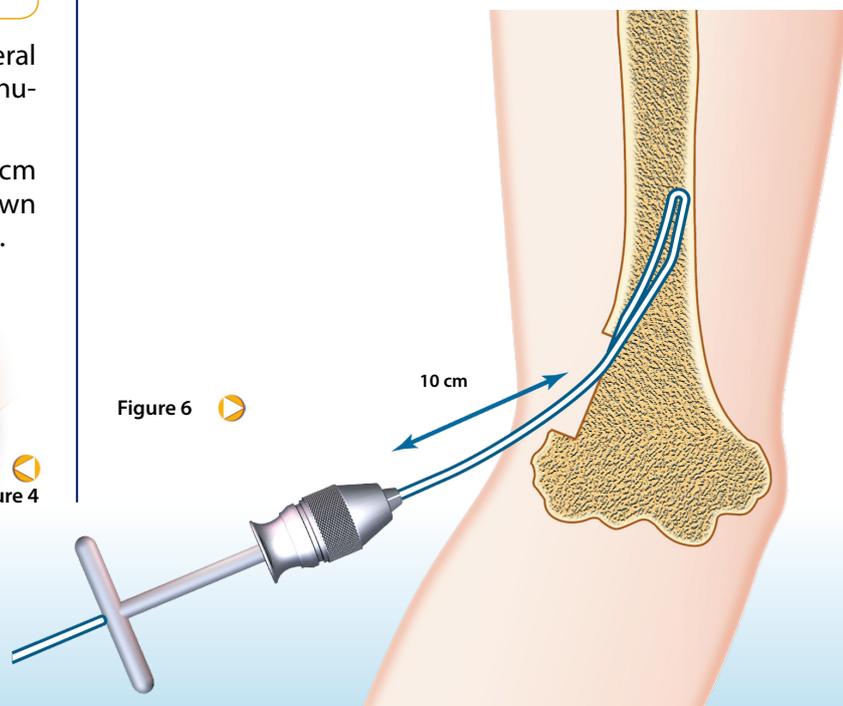


Figure 6 ▶

The nail is slid into the window ensuring that the concave side of the loop slides along the outer wall of the humerus, and the whole is pushed in manually with the loop gliding up into the diaphysis along the shaft. When the chuck comes into contact with the lateral cortex, it should be retracted by approximately 10 cm to be able to manoeuvre the Behac nail into position.

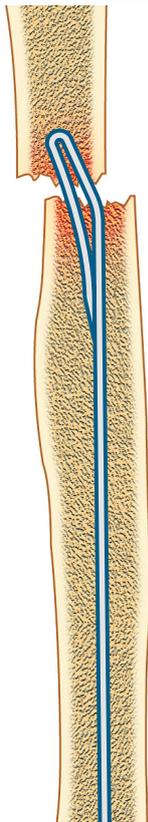


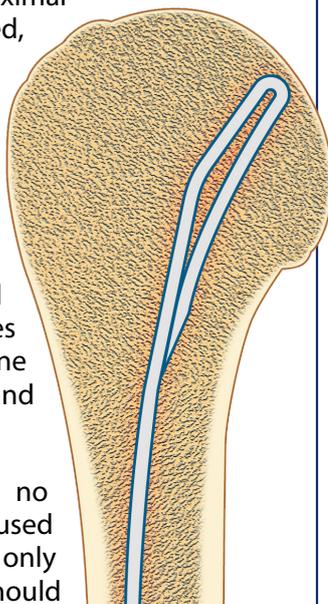
Figure 7

The nail's insertion into the diaphysis is monitored by an image intensifier. It is important to guide the nail in by pivoting the loop to the left and then to the right (Fig.7); when this manoeuvre is not enough, a few light taps with a mallet can be used.

In order to cross the fracture site, x-ray monitoring provides guidance and there should be no reluctance to rotate the elbow externally or internally to find a passage through the various increments.

Figure 8

When the proximal metaphysis is reached, the nail must be turned so that the loop can slide along the internal cortex and face towards the socket. It is then pushed up into the humeral head until it comes up against hard bone when pushed by hand alone (Fig.8).



A mallet must in no circumstances be used at this point and only manual pressure should be applied to press the loop into the head – this pressure must be halted as soon as the nail ceases to progress.

The image verifier is used to obtain front and side views to check that the loop is properly positioned.

Radiological verification :

An external rotation of the elbow is conducted to ensure that the loop is properly positioned in the head (Fig.9); one should monitor that the humeral head follows the motion, with the loop serving as an anchor within the spongy bone.

One is thus able to check whether the pin is positioned in more of an anterior or posterior position; the second nail will be placed on the other side of the first one.

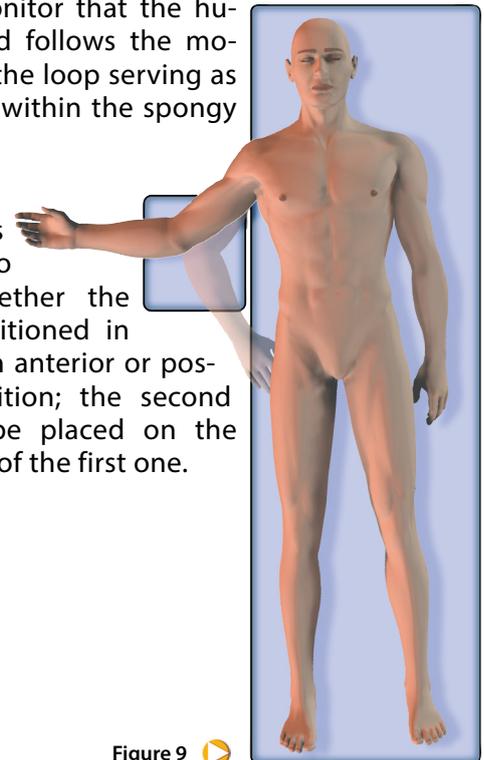


Figure 9

Ascension of the second nail :

When the first nail has been properly positioned, the second nail is inserted in the same way; it is important to introduce the second nail by passing it under the first one and again seeking contact with the internal cortical (Fig.10). The pin ascends in an identical manner.

Figure 10



It is absolutely essential to avoid one loop entering the other as this is a technical error; the two loops must always be separated one from the other. To bypass the fracture threshold, it is sometimes possible to “wrap” the second nail around the first one.

The nail’s progress comes to a halt when the loop touches the subchondral bone in the head, by simply using manual force.

Care should be taken to ensure that the two loops diverge in the humeral head (Fig.11).

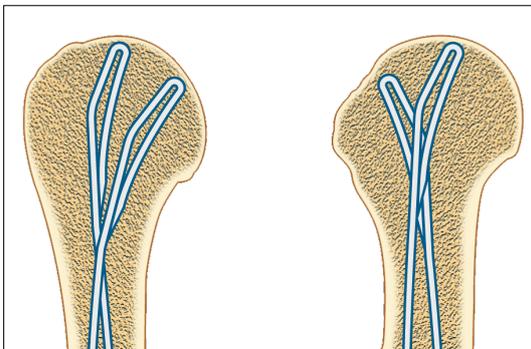


Figure 11

Site Impaction :

The operator lays one hand on the shoulder and the other on the elbow, exercising moderate

compression on the fracture site; the distal extremity of the nails may sometimes retract by 1 or 2 cm.

Check that the loops have remained in place in the head.

Distal fixation :

If the patient is young and the cephalic cortex of good quality, the nails are bent at 90° at their distal extremity.

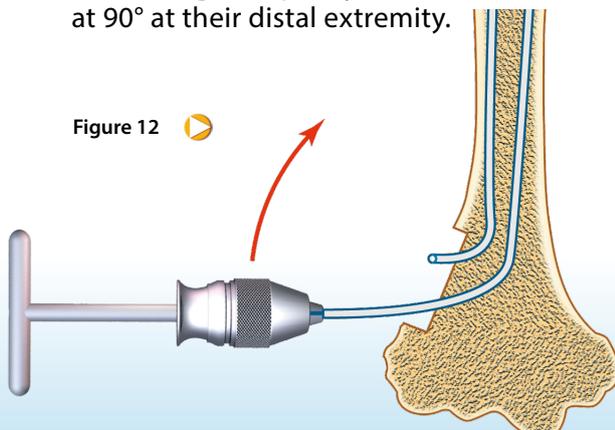


Figure 12

They are cut at 3 cm and are pushed into the medullar cavity so that only 0.5 cm emerge. (Fig.13).

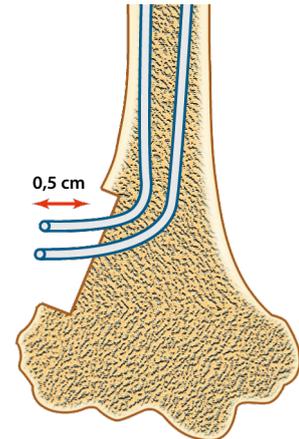


Figure 13

If the patient is elderly and the head cortical is thin and osteoporotic, the nails are not bent at an angle but cut at 0.5 cm.

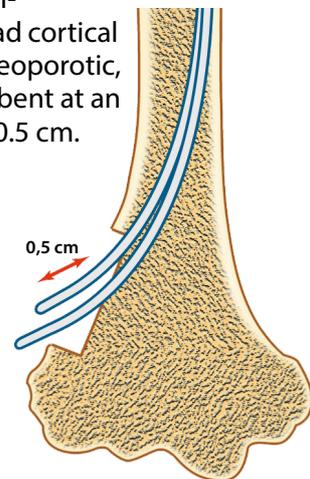


Figure 14

Closing and postoperative care :

The incision is closed in one plane, or sometimes in two if the patient’s skin is thick enough. No drainage. The arm is secured with an elbow-to-body sling for three full weeks, followed by two weeks intermittently. Physiotherapy begins at three weeks post-op, avoiding rotational solicitations.

Removal of implants :

After locating the bony window incised to insert the implants, the extremity of the nails are disengaged using a curette.

The extremity of the nail is then fitted into the Jacob chuck; one should not initially attempt to straighten the nail; the 90° angle should be maintained.

It may be necessary to use a mallet to exercise the required axial pressure needed for extraction.

BEHAC®

DYNAMIC HUMERAL NAIL

The BEHAC® humeral nail was designed to facilitate resorting to fixation via pinning in treating humeral fractures:

- thanks to its finesse and flexibility, it can be positioned easily in the frequently narrow humeral shaft.
- thanks to the quality of its proximal, distal and diaphyseal seating, it ensures good fracture stabilisation.

The BEHAC® humeral nail allows dynamic pinning that is perfectly stable and effectively withstands rotation and telescoping.

Characteristics

The BEHAC® humeral nail is a supple non-perforating nail thanks to its proximal loop design.

I. DIAPHYSEAL FRACTURES

Large loop BEHAC® nail



Bifocal fracture: pre-op and 2 months post-op



Fig. 1

- **Proximal fixation:**

Because of its loop, the nail offers an extensive contact surface and does not have the disadvantages of traditional nails and pins (see comparison fig.1).

Fixation is stable: the loop opposes rotational forces.

- **Distal fixation:**

After proximal positioning, the nail is blocked distally by bending it (fig 2b and fig 3c).

- **Selection available:**

The BEHAC® nail is available in 2 versions:

Large loop: for diaphyseal fractures

Small loop: for two or three-fragment fractures

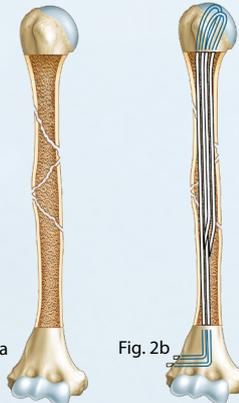


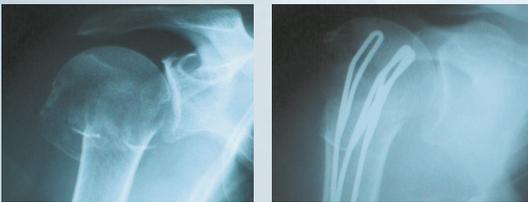
Fig. 2a

Fig. 2b

II. PROXIMAL METAPHYSEAL FRACTURES

Small loop BEHAC® nail

The principle of BEHAC® dynamic pinning can also be applied to proximal fractures, but these require pre-operative percutaneous reduction of the humeral head. In this case, nails with small loops are used.



Surgical neck fracture: pre-op and 3 months post-op



Fig. 3a

Fig. 3b

Fig. 3c

Value of dynamic nails

As compared to the lower limbs, dynamic osteosynthesis proves to be primordial for humeral fractures to compensate for the lack of gravitational compression and to encourage the formation of bony callous. The dynamic nail actually allows the transmission of compressive forces resulting from muscular activity.

Advantages

- Minimal bone incision
- Stable nail
- Closed incision site
- Ascending osteosynthesis (no approach impinging on the rotator cuff)
- No countering of natural compression forces on the fracture area
- Broad range of indications
- Confirmed reliability over 7 years of experience.

REF. 232319 Small Loop BEHAC® Humeral Nail

REF. 232320 Large Loop BEHAC® Humeral Nail

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