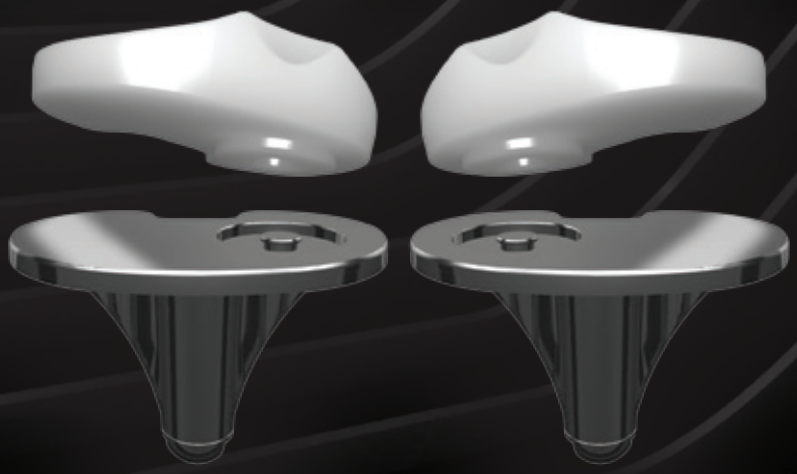
KNEE

SURGICAL TECHNIQUE

FHK®

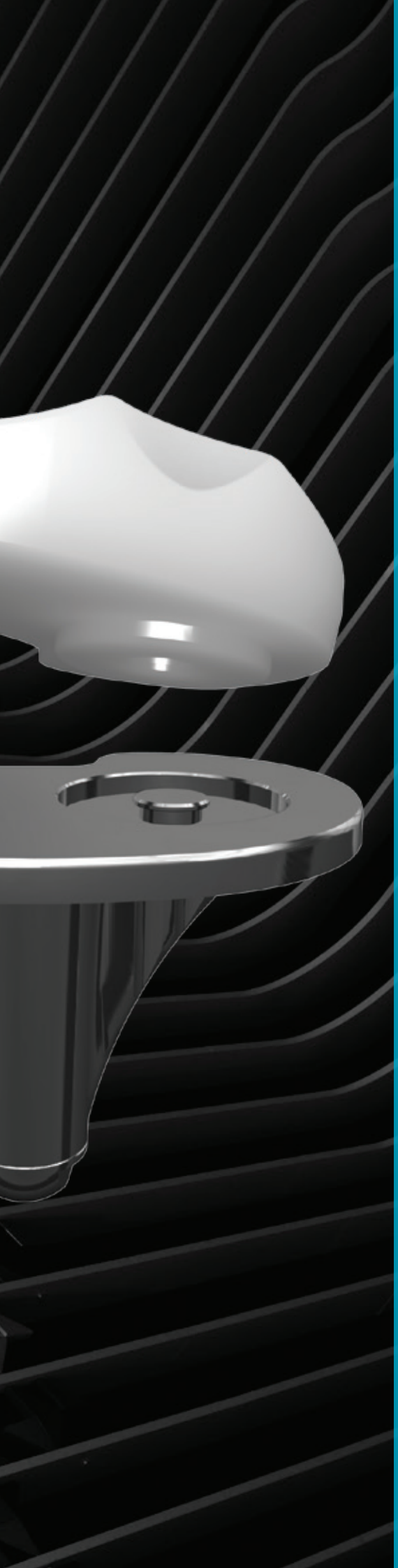
Range of primary knee prostheses



Asymmetrical

mobile bearing prosthesis

GROUP FH ORTHO™



FHK®
ASYMMETRICAL

The FHK® Asymmetrical total knee prosthesis is indicated for the treatment of painful and debilitating gonarthrosis caused by arthritis, rheumatoid arthritis, post-traumatic arthritis, with or without axial deviation.

This total knee prosthesis is contraindicated for patients with a significant axial deviation, in excess of 10°, and for patients with a high BMI (Body Mass Index).
For such indications, the FHK® posterior stabilising total knee prosthesis may be recommended.

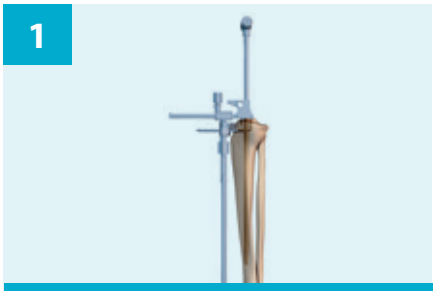
IMPLANTATION TECHNIQUE
Installation of the asymmetrical total knee prosthesis requires compliance with four imperatives:

- Get as close as possible to the mechanical axis of the normal lower limb (hip knee ankle angle 180°);
- Joint stability is obtained by carefully checking ligament tension in flexion and in extension, use of a ligament balancer is recommended;
- Good freedom of functional range of motion;
- Restoration of joint space height.

Reliable instrumentation should enable you to achieve this result easily in most cases. It is based on the implementation of orthogonal cuts in the frontal plane with respect to the mechanical axis of the femur and tibia, and satisfactory ligament balancing in extension and flexion.

SEQUENCE OF OPERATING STEPS

1



Intramedullary tibial alignment

2

Extramedullary tibial alignment

3

Tibial cut

4

Femoral distal cut

5

Positioning of the cutting guide

6

Femoral cuts

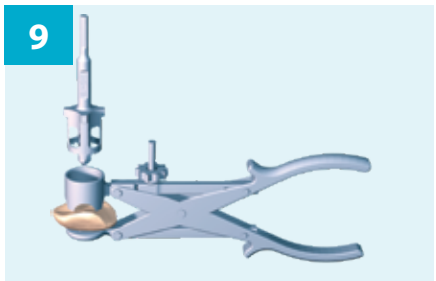
7

Ligament balancing

8

Preparation of the throchlear groove

9



Preparation of the patella

10

Preparation of the tibia

11

Positioning of the asymmetrical tibial baseplate

12

Positioning of the asymmetrical polyethylene insert

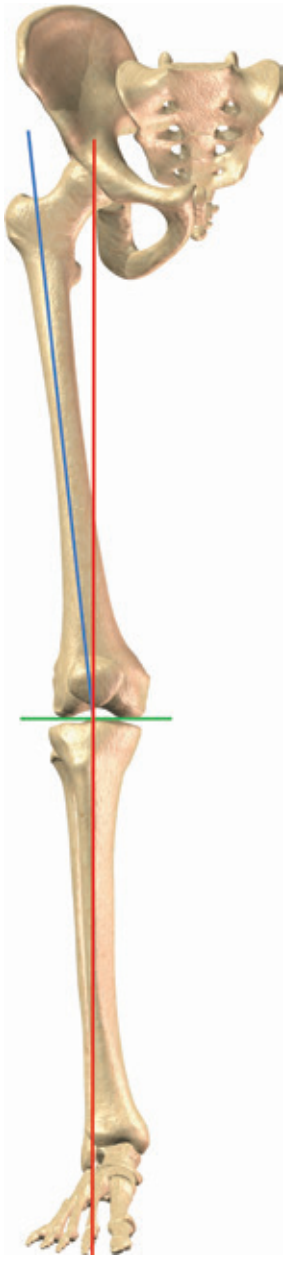
13

Positioning of the femoral insert

PRE-OPERATIVE PLANNING

This must consist of:

- frontal and profile X-rays with monopodal support;
- an axial image of the two knee joints, with the knee bent at 30°;
- a frontal image in stress on the healthy compartment to assess the degree of bone wear in the concavity and the reducibility proportion of the deformation associated with this wear. One can also assess the relative proportions of the deviation due to the actual morphological deformation and to the ligament retraction;
- a goniometry under loading enabling the assessment of the overall mechanical axis of the lower membrane, as well as the angle formed by the diaphyseal axes of the femur and of the tibia with this mechanical axis.



INSTALLATION AND APPROACH

The intervention is generally performed with a mechanical tourniquet, but the choice will depend upon operating practices and upon the existence of any circulatory contraindications. Installation on a table laying down should enable easy movement from full extension to full, stable flexion of the knee.

The approaches will depend upon each individual surgeon, but the instrumentation enables all the known variants to be used.
The small size of the instruments enables an approach to be used in minimally invasive surgery.
In the case of significant valgus deformity, another approach may be selected.

Although the technique was designed to begin with the tibial cut, the instrumentation enables either a tibial cut or a femoral cut to be performed first. While this order is of little significance for arthrosis indications with little or no deformity, although this should not prevent certain stages of validation or verification, it is preferable to perform the tibial cut first in cases of significant deformities and it is highly recommended to do so in the case of the implantation of a posterior stabilised prosthesis.

It should also be specified that the instrumentation is designed in order to achieve either an anterior or a posterior reference.

In this case:

- The posterior cut presents the same thickness as the size of the implant;
- The distal cut (except for a per-operative decision to the contrary) is similar to the posterior cut.

In consequence, the spaces allowed for in flexion and in extension are equivalent, and equal to the thickness of the implants that will be installed. The ligament tension will automatically be correct, so long as it was correct before the cuts.

PREPARATION OF THE TIBIA

LOCATION OF THE MEDULLARY CANAL

The entry hole of the alignment is located at the tibial insertion of the ACL. In fact this should be more or less lateralised according to the status of the mechanical axis and curve of the tibia, the ideal being to determine this precisely on the preoperative X-ray.

Preoperative location of the precise entry point enables avoidance of axial errors that would lead to an oblique cut (either in the frontal plane or in the sagittal plane). A preliminary hole is made with a square point, then drilling to a diameter of 8 mm *(Fig. 1)*.
The 8 mm diameter intramedullary stem is put in place *(Fig. 2 & 3)*.

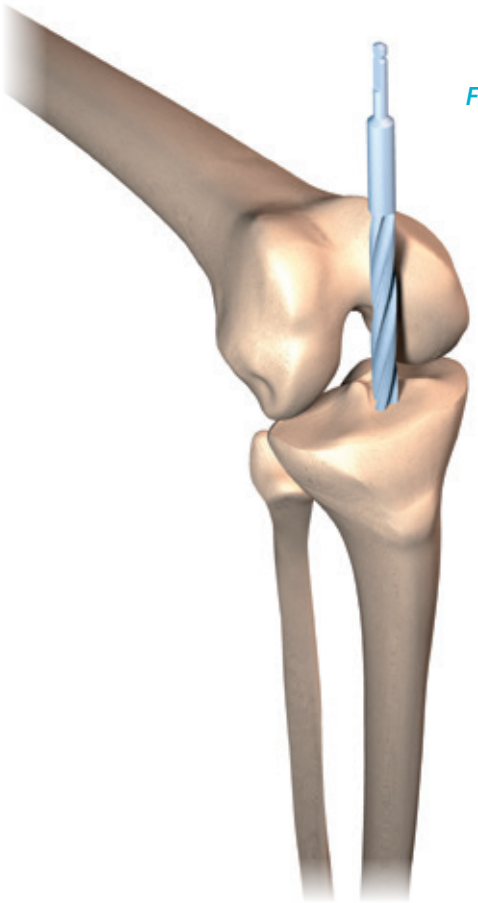


Fig. 1

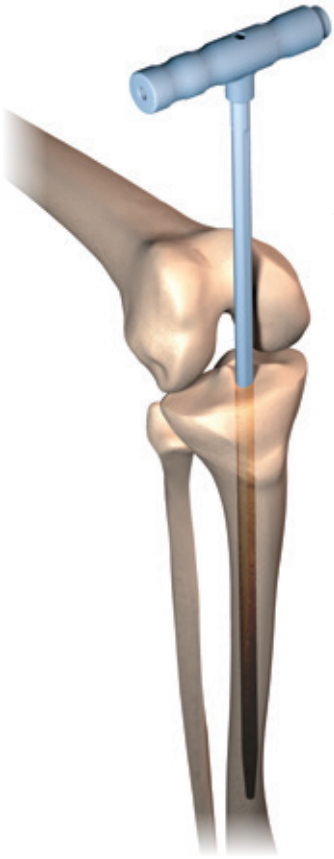


Fig. 2

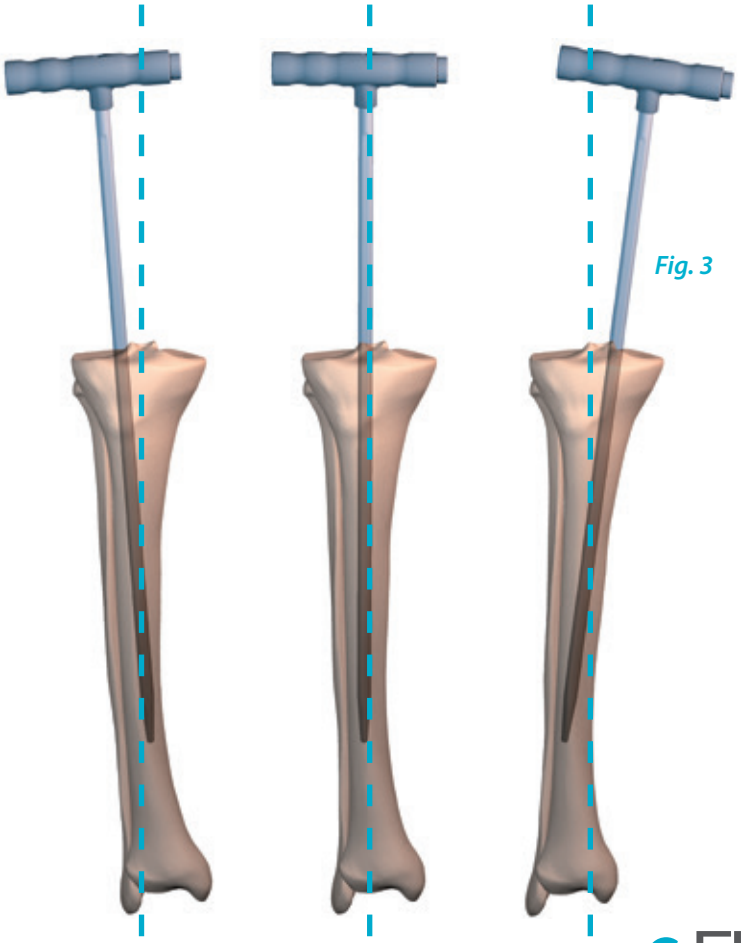


Fig. 3

POSITIONING OF THE TIBIAL CUTTING GUIDE

• Intramedullary alignment

The tibial guide is placed on the centromedullary stem. This consists of an upper frame terminating in two points intended to penetrate the tibia bone, and a proximal extramedullary stem on which the cutting guide slides *(Fig. 4)*.

The points of the frame are lowered as far as possible and inserted in two stages with a hammer into the anterior intercondylar area of the tibial PE insert: the stem of the alignment is carefully positioned at the centre of the pin. This position should bring the proximal stem in line with the internal third of the anterior tibial tuberosity. The rotation of the entire guide is then locked by the impaction of the second point.

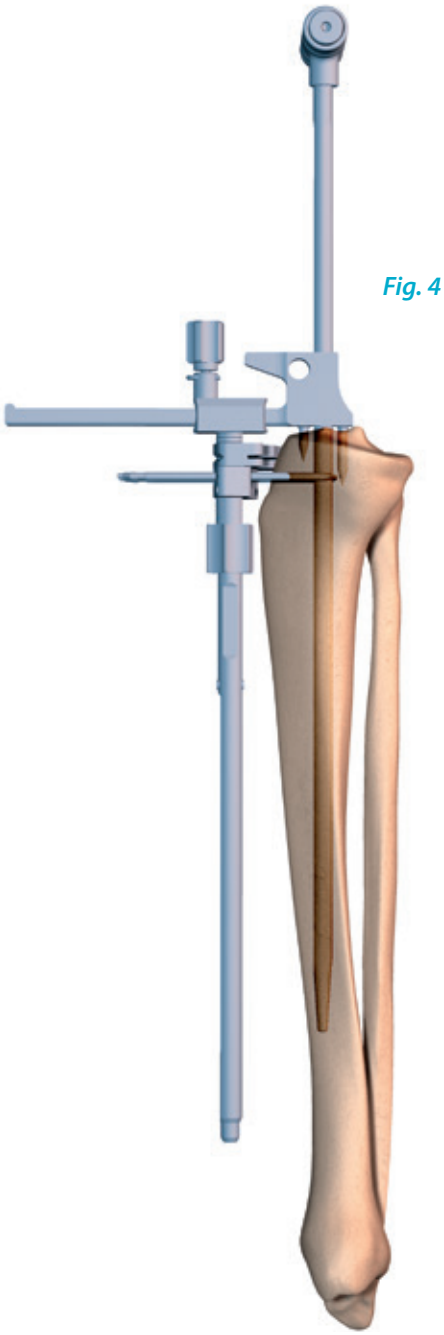


Fig. 4

• Extramedullary alignment

An extramedullary alignment is also possible (using the same assembly, but without the intramedullary stem), as well as the combined use of both types of alignment.

In any case, the extramedullary stem must be parallel to the axis of the tibia in both planes, to ensure the orthogonality of the cut *(Fig. 5 & 6)*.

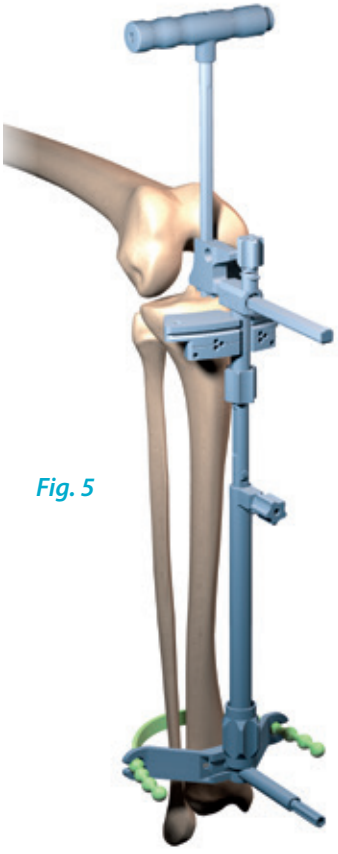


Fig. 5

Fig. 6

In the case of pre-existing anatomical deformity of the tibia (valgus), it is recommended that only the extramedullary alignment should be used.

CUT LEVEL DETERMINATION

The probe, marked at 10 mm, is placed on the cutting guide on the clean side and the assembly lowered until it enters into contact with the medial part of the tibia *(Fig. 7)*. A control feeler slide into the opening of the cut will enable verification of the quantity of bone resected. The marked side "2" of the probe can also be used to perform a measurement of the amount of compartment used. In this case the cut will be made 2 mm under the cup.
The cut made will be orthogonal with the axis of the tibia, but this will not indicate the thickness of insert to be used.

TIBIAL CUT LEVEL VALIDATION

If the verification of the cut shows an insufficient or excessive bone resection, it is possible to raise or lower the cutting guide as the operator wishes, according to guide graduation (in 2 mm steps). Two parallel pins are put in place at the level of the carved out holes "0", then the alignment guide is delicately removed, having untightened the locking screw, carefully avoiding any movement involving force that could move the pins and the guide. The guide is moved as close as possible to the bone surface and a pin placed in the most lateral hole in order to stabilise the cutting guide.

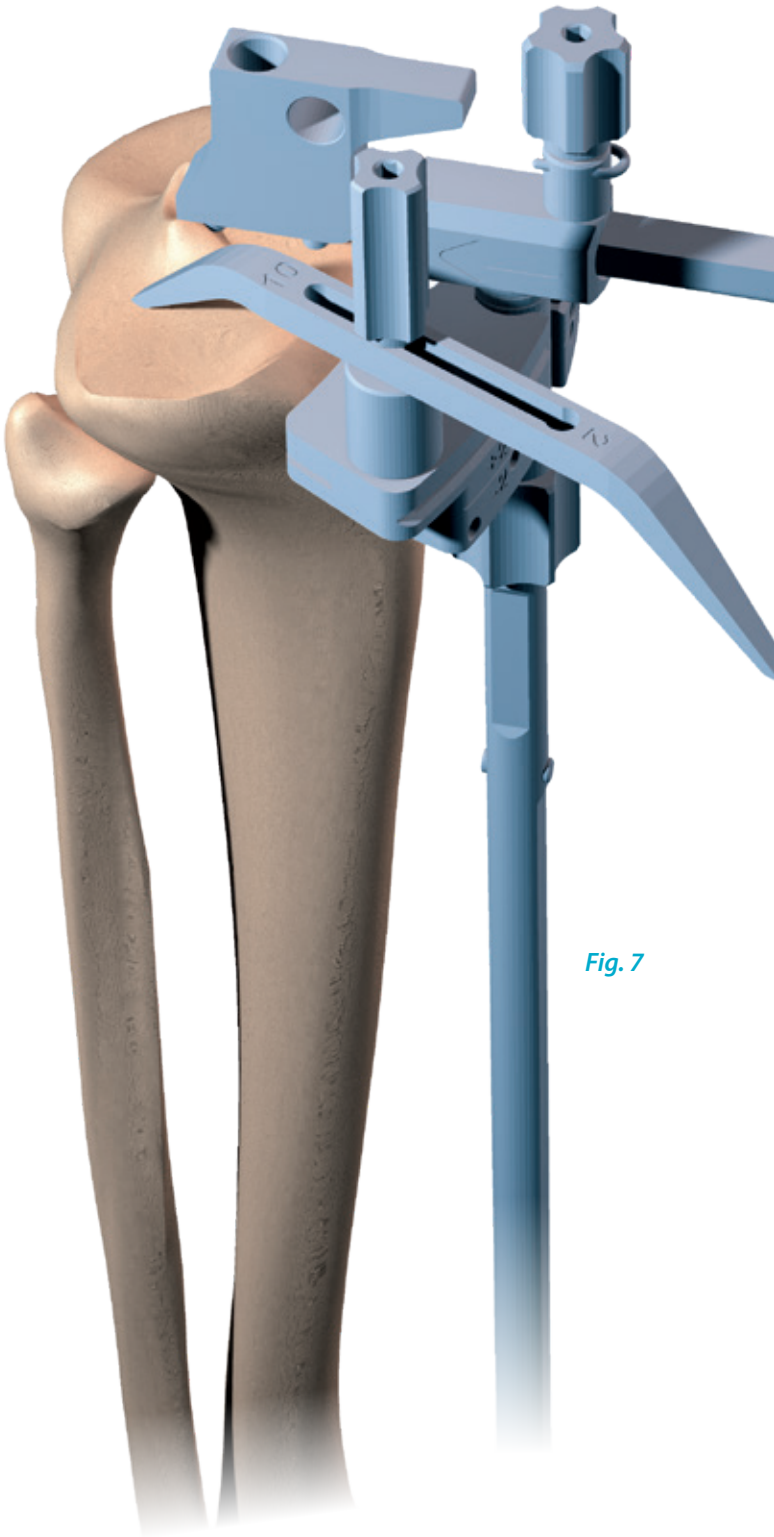


Fig. 7

TIBIAL CUT

The cut is then made with an oscillating saw with a blade of thickness 1.27 mm, and at the same time protecting the medial and lateral capsular ligament planes ***(Fig. 8)*** .
The cutting block is provided to produce a cut that is orthogonal with the tibial axis in both planes.
The lateral pin is removed as well as the cutting guide.

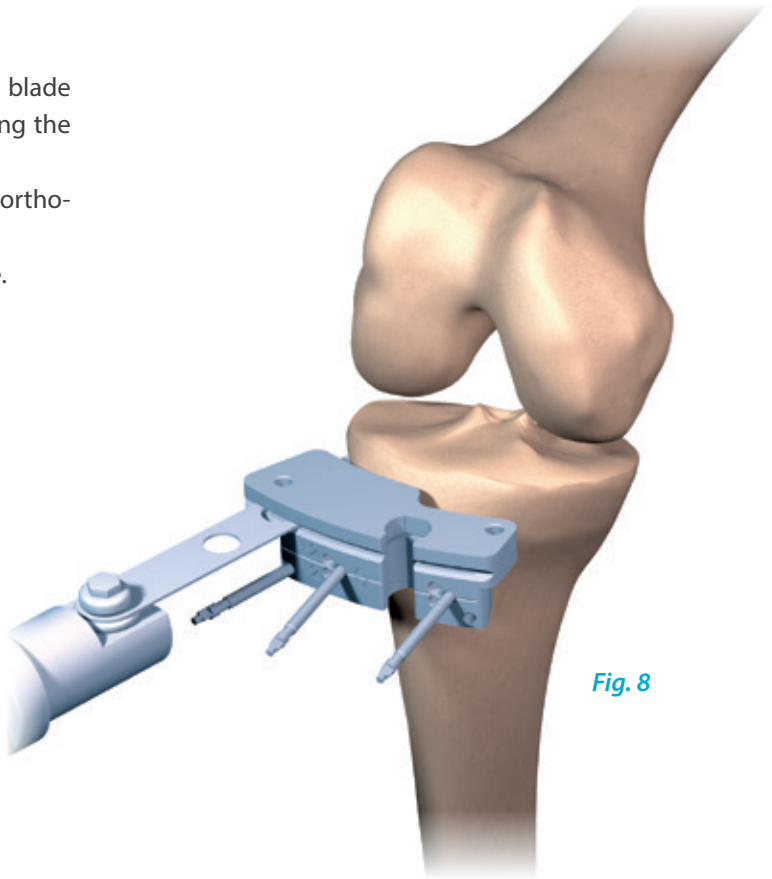
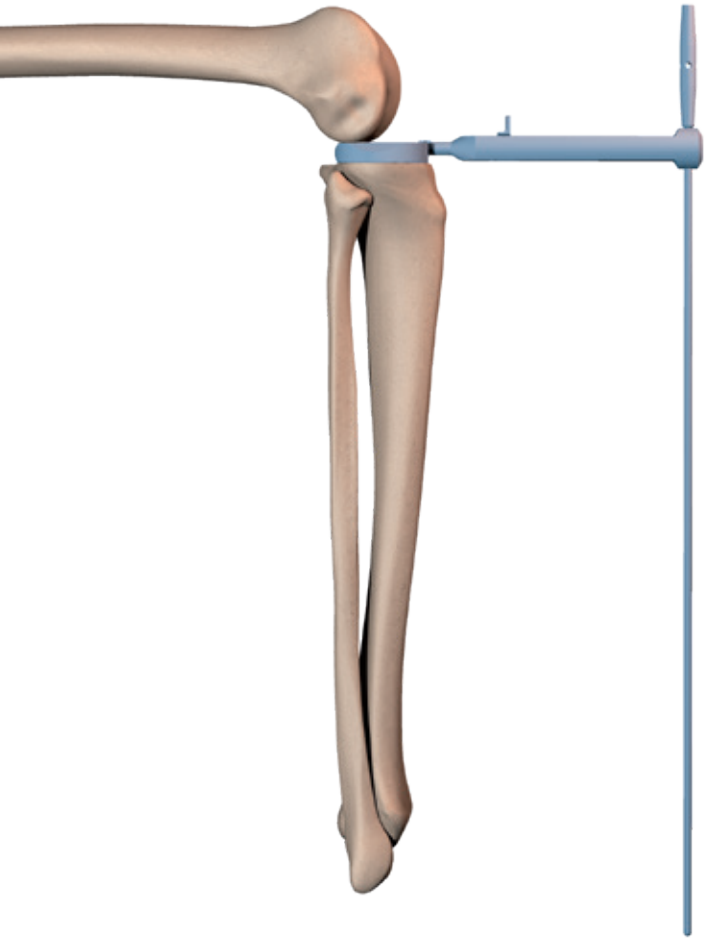


Fig. 8

Fig. 9a



VALIDATION OF THE FLEXION SPACE

At this stage we can validate the flexion space using the 10 mm spacer mounted on the handle of the external alignment stem: this must be strictly parallel to the tibia (or better still, to the axis of the fibula which can be viewed using the other extramedullary stem joining the centre of the tibial PE insert to the external malleolus) ***(Fig. 9a)***.
The size of the tibia can also be evaluated by positioning tibial trial.
The size of the base must in general be immediately inferior, equal to or immediately superior to that of the femoral component.

PREPARATION OF THE FEMUR

CENTROMEDULLARY PREPARATION

The intercondylar notch is cleaned of any osteophytes *(Fig. 10)*, as is the external part of the condyles.

The posterior cruciate ligament/PCL is resected.

The intercondylar point of entry must be located facing and within the medullary canal, a few millimetres above the notch.
In the first place we begin by locating the position of the pilot hole using a square awl. The same care with location must be taken as in the tibial phase in order to avoid piercing the femur too far forward or backwards and causing errors in assessment of the size and positioning of the implants.

The hole is drilled with a diameter of 8 *(Fig. 11)*, with the maximum depth possible.
The centromedullary stem is put in place, and the removable handle is removed.

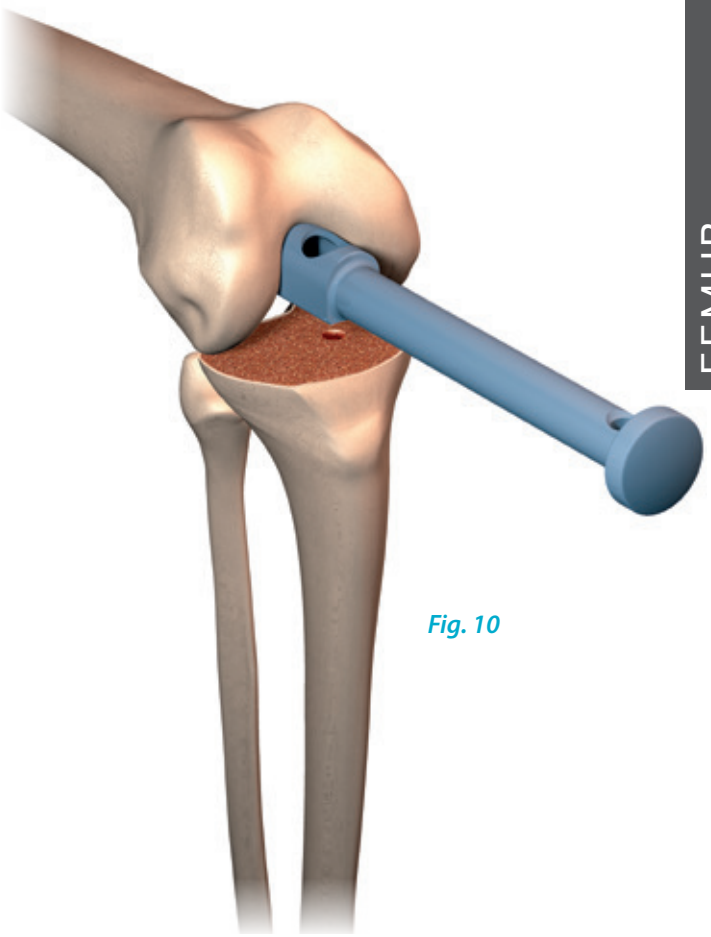


Fig. 10

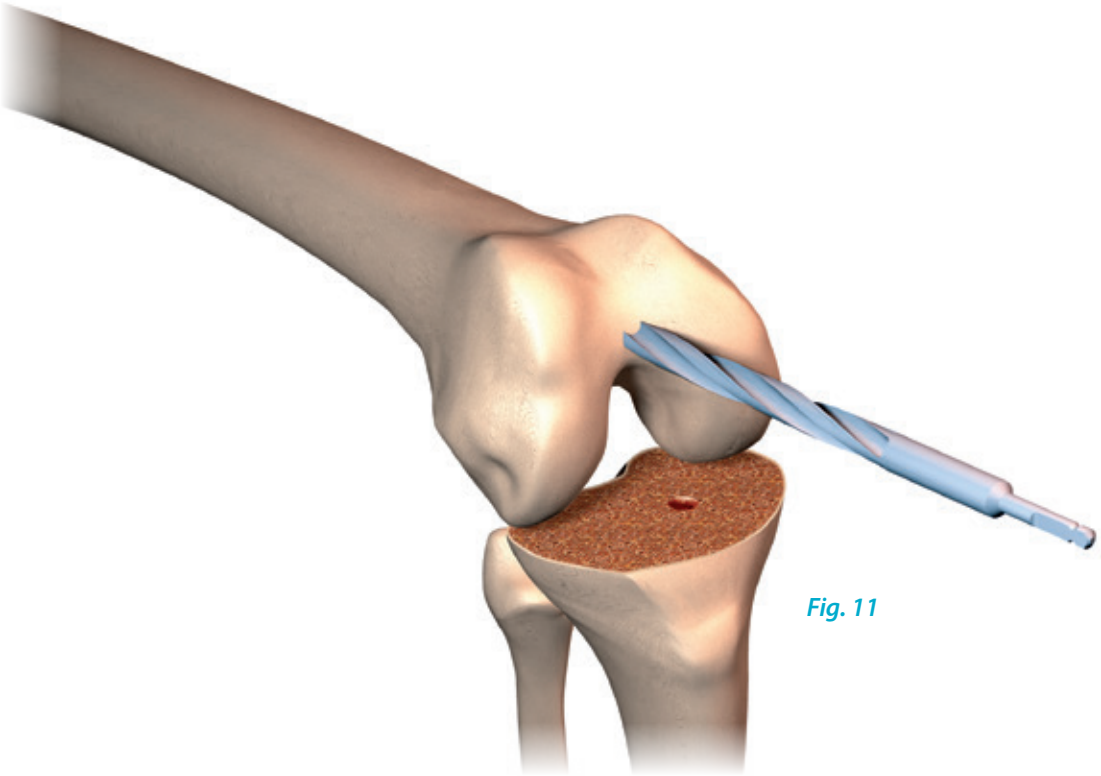


Fig. 11

CHOICE OF FEMORAL CUTS

DISTAL FEMORAL CUT

The cutting guide support, the distal cutting guide, and the angle reference trial are assembled.

Valgus angle is selected according to preoperative planning and respecting knee side (R or L). Assembly of distal palette and intermedullary rod introduced in angle report. The whole assembly is introduce into intramedullary canal and handle is removed.
Distal palette is in contact with distal condyle, 2 pins are put in place in the holes corresponding to the line marked "0", a third, central, diverging pin can also be put in place to stabilise the assembly *(Fig. 12)*.

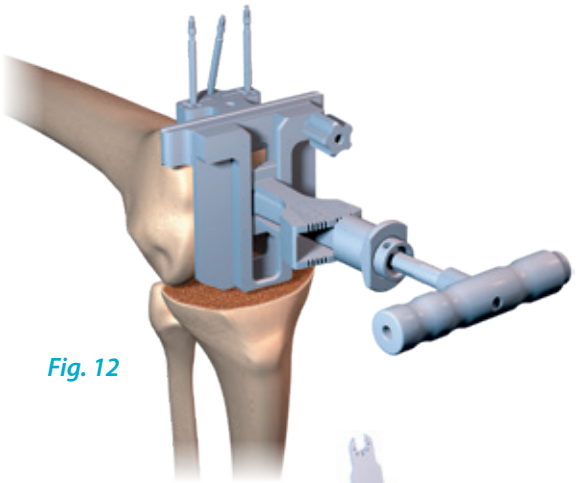


Fig. 12

The centromedullary stem is removed, the angle reference trial is separated from the assembly and the cut made using an oscillating saw *(Fig. 13)*.

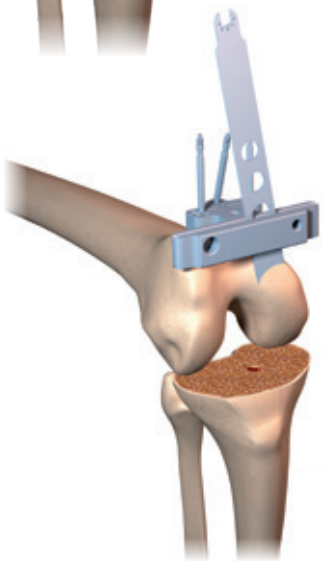


Fig. 13

At this stage, the space in extension can be verified by assembly of the spacer (thickness 8 mm) and the spacer of 10 mm thickness *(Fig. 13b)*.

Fig. 13b

The sizer is put in place, the knee moved back to 90° flexion *(Fig. 14)*. The use of the control probe slid into the opening corresponding to the selected size will enable visualisation of the exit of the saw blade above the trochlea, thereby ensuring the correct selection of size.

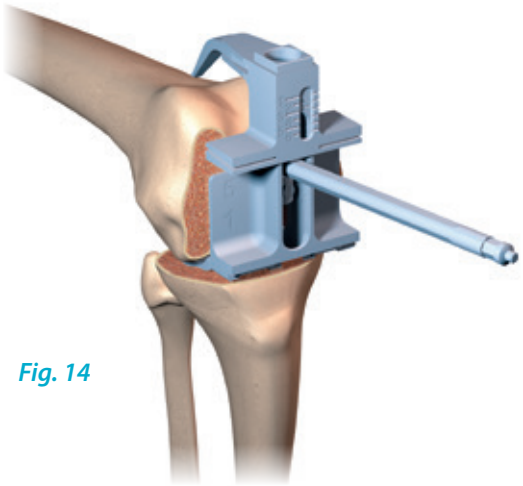


Fig. 14

FHK®
Ligament balancer

The FHK® ligament balancer enables the bone cuts to be secured within a balanced casing of ligaments through all motion.

Ref. A 267 556 (V1) or 269 317 (V2)

The FHK® balancer is composed of two palettes: one fixed lower palette and one mobile upper palette articulated around a central compass.

A notched wheel enables the millimetric spacing of these palettes against the femoral (distal / posterior) and superior tibial bone cuts, between the collateral ligaments that are gradually tightened.

The height of the space thus created represents the addition of the tibial and femoral bone resections plus collateral ligament laxity.

It is read from the graduated rule to determine the prosthetic size (addition of the thickness of the prosthetic condyles: 8mm for the FHK® prosthesis and the polyethylene of the tibial liner: At least 10mm for a fixed platform prosthesis or a mobile platform prosthesis).

The angular value read from the central compass indicates the asymmetry of the space created.

- IN EXTENSION:
the balancer is introduced between the distal femoral and superior tibial bone cuts.

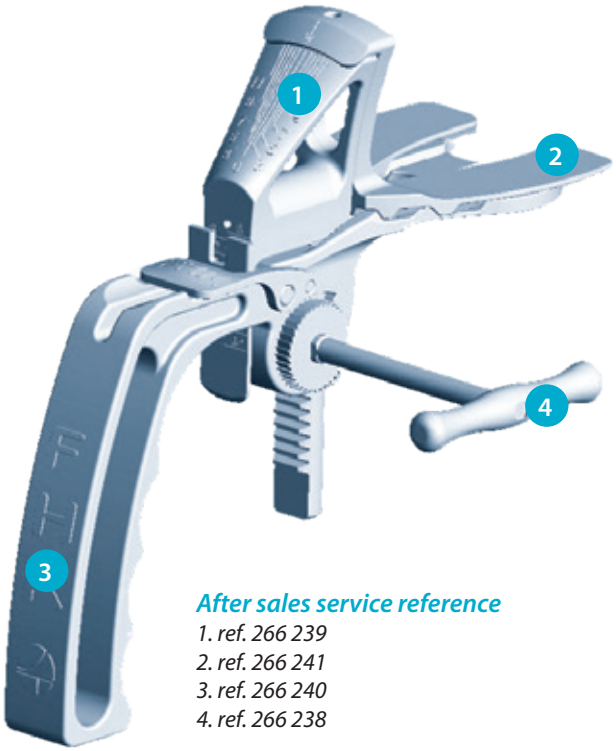
- IN FLEXION:
the balancer is introduced between the posterior femoral condyles and proximal tibial cut.

The balancer wheel is gradually adjusted to tighten the collateral ligaments.

The height of the space created is read from the central rule, enabling configuration of the prosthetic size thus selected.

The balancer assesses the quality of the collateral ligament balancing. If obtained, the space is rectangular and the angular value read from the central compass is 0° or close to 0°. A different angular value indicates an asymmetrical space: tight on one side, lax on the other. In this case, an additional release can be carried out on the tighter side until a value of or close to 0° is read, confirming that the space between the bone cuts and the collateral ligaments is parallel.

The FHK® balancer thus enables the cuts to be secured within a tight and balanced casing of ligaments, by determining the degree of femoral rotation that can ensure a symmetrical space.



After sales service reference
1. ref. 266 239
2. ref. 266 241
3. ref. 266 240
4. ref. 266 238

SURGICAL TIPS AND TRICKS FOR LIGAMENT BALANCING

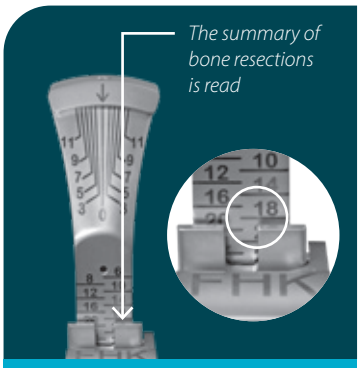
FHK®
Ligament balancer

IN EXTENSION

The balancer is introduced between the distal femoral and proximal tibial bone cuts.

The collateral ligaments are gradually tightened.

The bone cuts will show a rectangular gap in extension



Reminder: the minimum space taken up by the FHK® prosthesis is 18 mm (8 mm femur + 10 mm tibia)

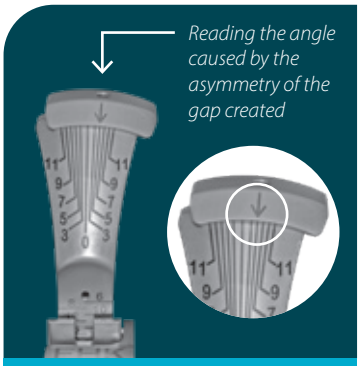
IN FLEXION

The balancer is introduced between the posterior femoral condyles and proximal tibial cut.

The collateral ligaments are gradually tightened.

The resulting angle will be set using the femoral indexation guide: this is the external femoral rotation.

The asymmetry of the posterior condyles leads to a trapezoidal flexion gap



Reminder: the height must be around 10 mm (minimum tibial space occupied by FHK®)

An additional release can also be carried out on the tightest side until a value of/or close to 0° is seen on the ligament balancer.

13

FEMORAL ANTEROPOSTERIOR AND CHAMFER CUTS

The cutting guide of the determined size and adjustment index are assembled.

The adjustment of the femoral rotation is performed according to the user's choice according to the graduations of the positioning index (from 3° to 11°) respecting the direction (R or L) marked on the instrument *(Fig. 15a & 15b)*.

Fig. 15a

Fig. 15b

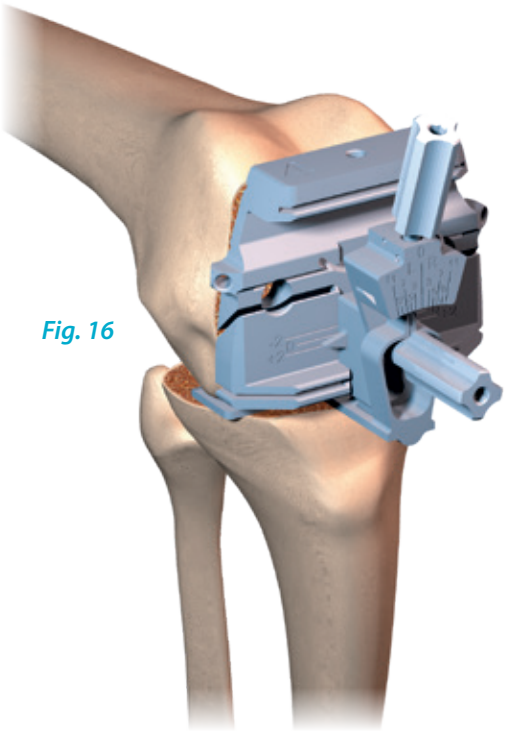


Fig. 16

The positioning index of the posterior pallet is locked on the line "0" (in this case, the posterior cut will correspond to the prosthetic thickness of 8 mm).
In the case where an extension has been measured with a different value (greater or less than 18 mm), this index may be positioned on the line "+2" or "-2" in order to carry out the corresponding posterior cut. The assembly is applied to the bone cut, and the posterior pallets placed in contact with the posterior condyles *(Fig. 16)*.

The fixation of the guide is performed using 6.5 mm diameter cancellous screws, after a centring hole has been made using a centring rod and drilled to a 3.2 mm diameter *(Fig. 17)*.
The choice of a different (or additional) fixation is possible using 3.2 mm pins placed in lateral holes of the cutting guide located on its sides.
The rotation index is unscrewed from the guide, and the cuts performed *(Fig. 18)*.

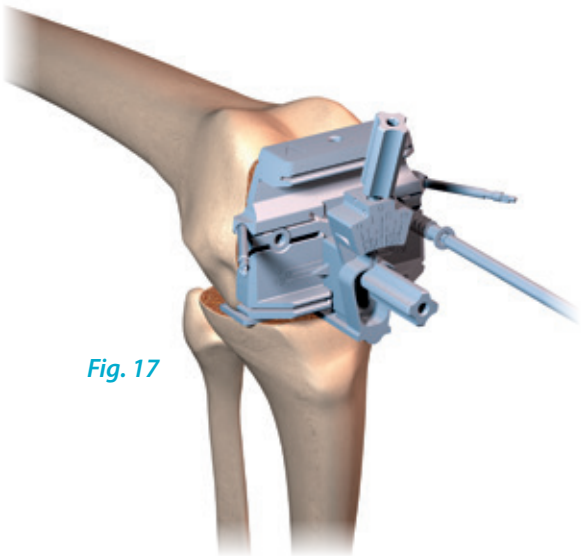


Fig. 17

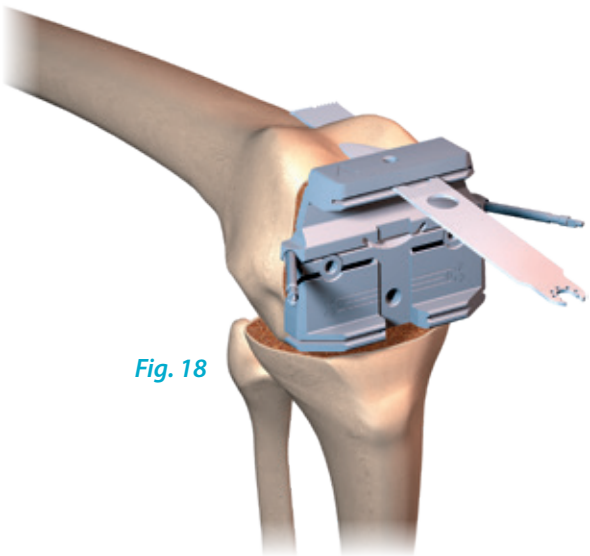


Fig. 18

PREPARATION OF THE TROCHLEA

The cutting guide is left in place, and the trochlea Preparation chisel is presented and introduced into the curved opening. It is carefully driven in with a hammer until complete separation of the bone fragment *(Fig. 19)*.
The guide fixation screws are removed using the motor end piece.

N.B.: it is possible to carry out the preparation of the trochlea at the time of the trial, on the trial condyle *(Fig. 28)*.

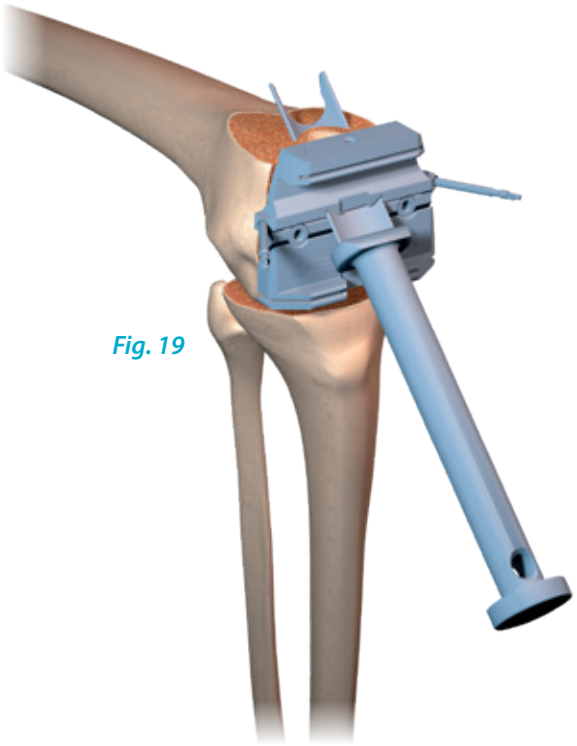


Fig. 19

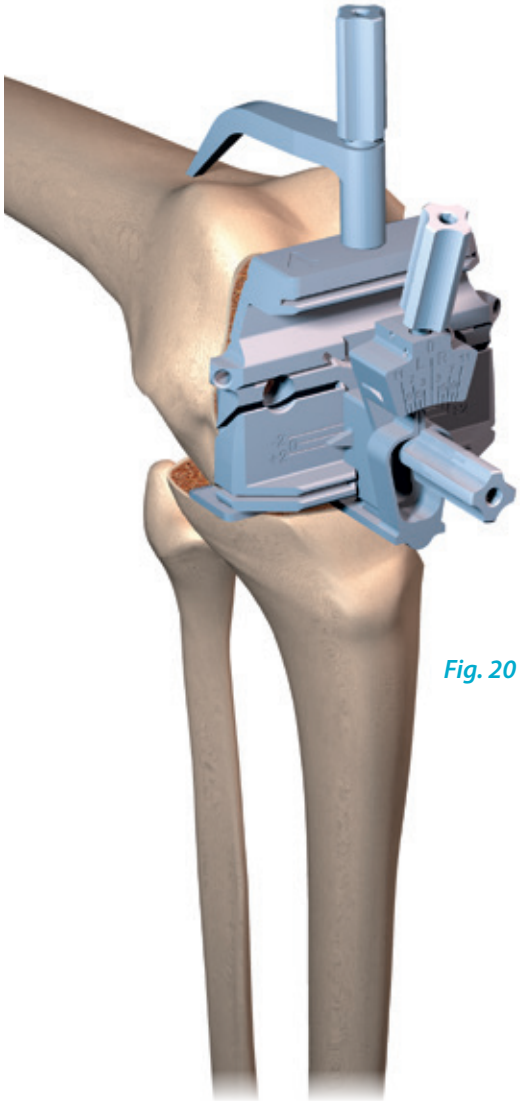


Fig. 20

ANTERIOR FEMORAL REFERENCING OPTION

The instrumentation offers the possibility of performing femoral cuts in anterior referencing.

In this case the anterior probe is screwed to the upper part of the guide, the angle of axial rotation selected, and the screw tightened. The central screw is left free, the cutting guide is placed on the distal cut, with the probe in contact in contact with the anterior cortical, the posterior sliders are brought into contact with the posterior condyles and the central screw tightened.
The guide can then be fixed, and the cuts performed as shown *(Fig. 20)*.

TRIALS

ROTATION ADJUSTMENTS AND FINAL PREPARATION

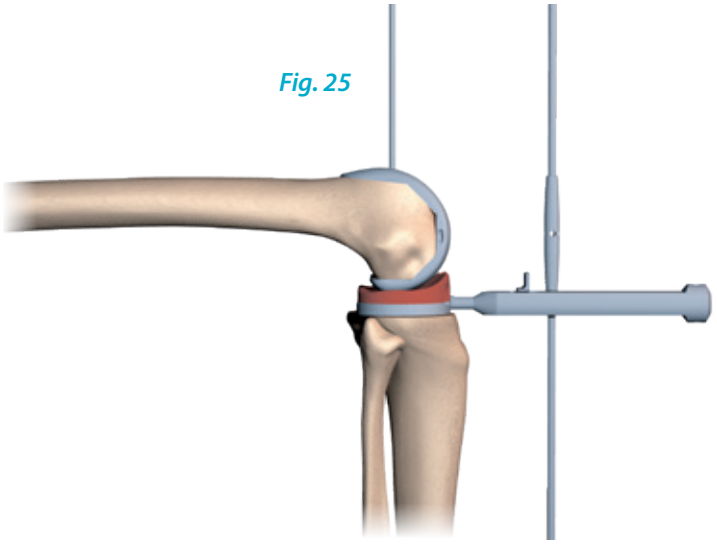


Fig. 25

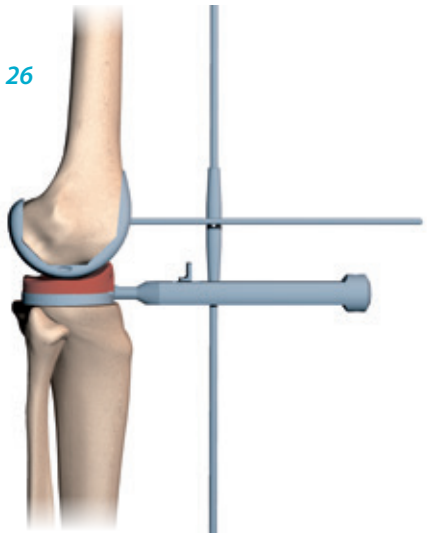


Fig. 26

Asymmetrical mobile bearing

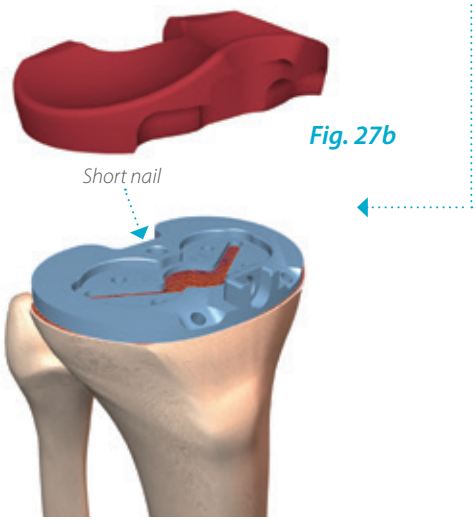


Fig. 27b

• Tibial plateau

The test tibial baseplate is placed in the optimal anterior-posterior and medial-lateral position and its rotation is evaluated with respect to conventional anatomical landmarks (internal third of the ATT). It is then blocked by a short nail, which stabilises it *(Fig. 27b)*.

The size of the baseplate is independent of the femur size; it can be one size larger, the same size, or one size smaller.

• Femoral component

A grip-extractor helps to position the femur. Be careful at this point to check the medial-lateral position, because this is used as the reference for drilling the centring holes.

PREPARATION OF THE TIBIAL STEM

Preparation of the tibial stem is performed by placing the perforation guide on the Trial base and by impacting the perforator of the corresponding size up to the end stop (there is a perforator for two sizes of base) ***(Fig. 31)***.

According to the operator's choice, the perforator enables the recovery of a bone core (which will seal off the entry hole of the femoral alignment) or compaction of the trabecular network ***(Fig. 32)***.

Fig. 31

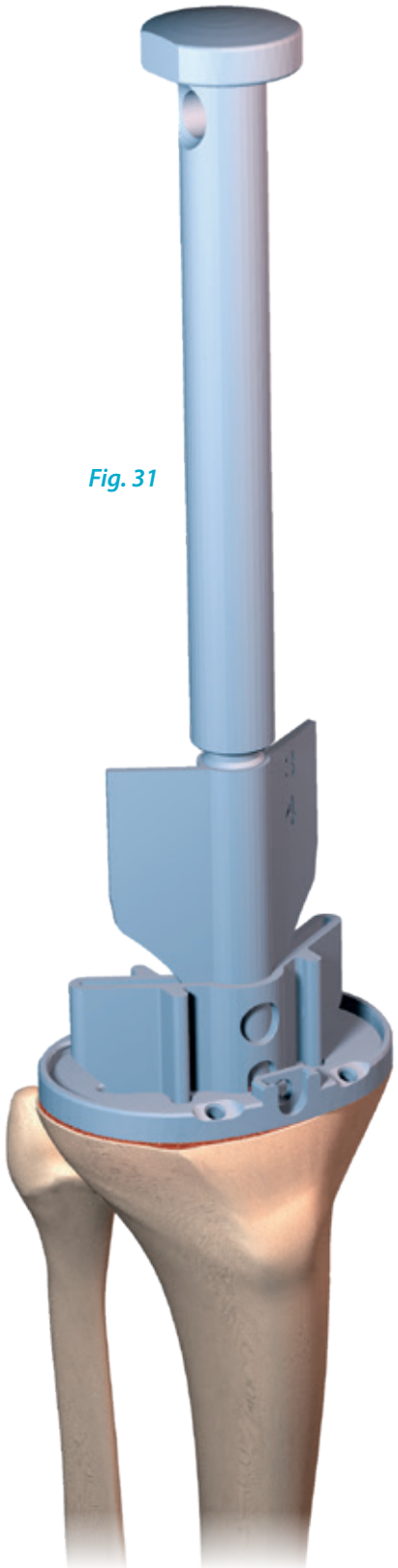
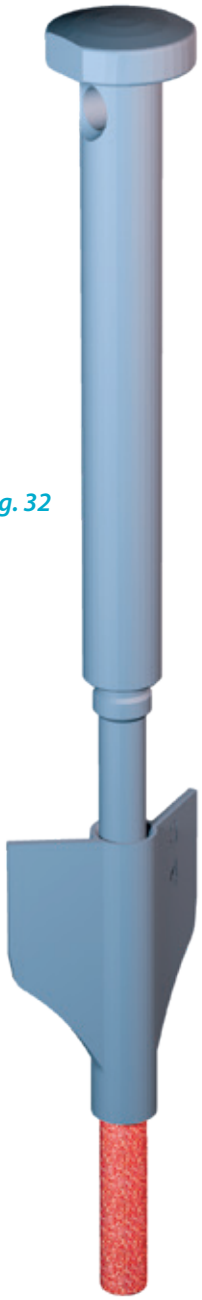


Fig. 32



In the case of preparation in dense bone, it is recommended to begin by using a 3.2 mm drill in the slots of the guide.

PATELLAR STEP

The size of the patellar implant is assessed using the trial.

The patellar cutting guide clamp is put in place taking care to use the probe of the desired thickness (8 or 10 mm) and corresponding to the selected size. The cut is performed using the blade through the slots *(Fig. 33)*.
The anchorage hole for the patella will be created using the drill with stop passed through a specific stemhead fitting *(Fig. 34)*.

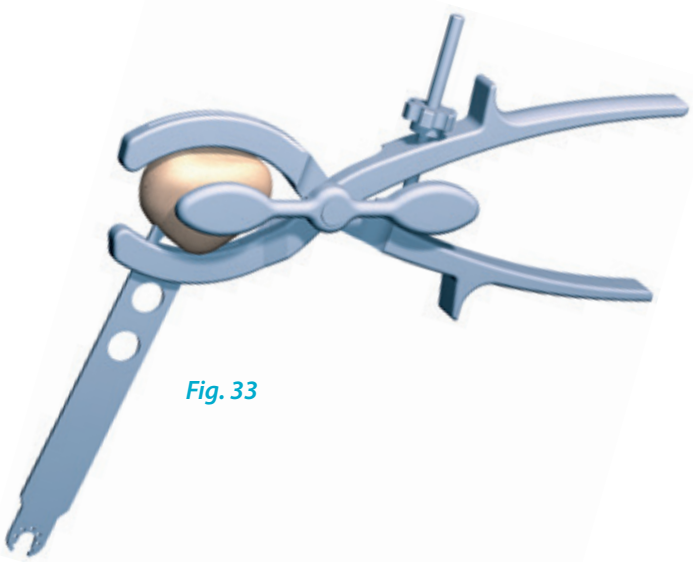


Fig. 33

Medialisation of the final implant is possible simply by off-setting the stemhead fitting.
The calliper trial will enable verification that the patella thickness has indeed been adhered to.

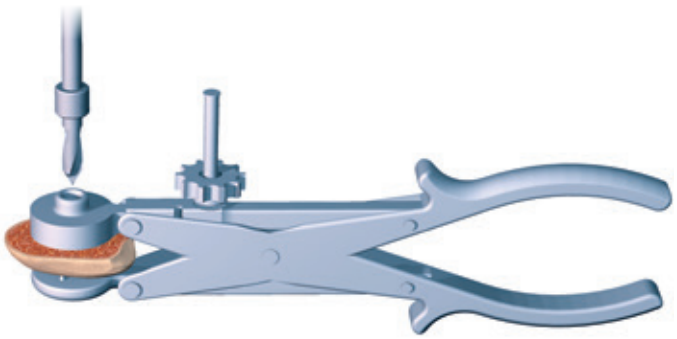


Fig. 34

PATELLA INLAY OPTION

Most appropriate implant diameter is selected by using 22 or 25 mm template. The specific stemhead is placed on the patella ensuring that it is centred, then the No. 1 drill bit creates the stud, and drill bit No. 2 provides preparation of the included flat surface **(Fig. 35 et 36)**.

WARNING
Preparation of the patella inlay must be performed using the motor at slow speed

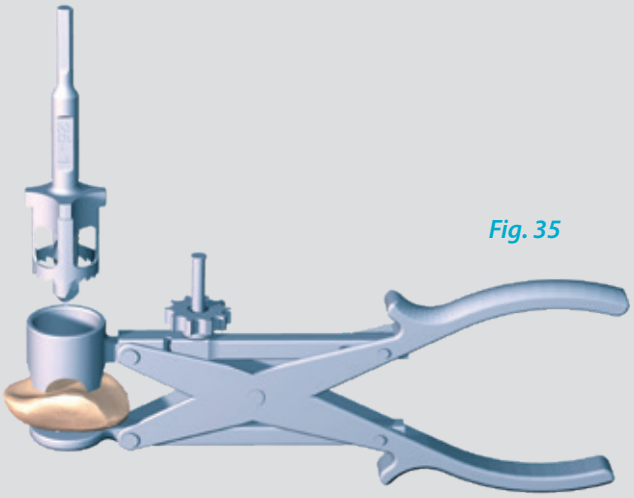


Fig. 35

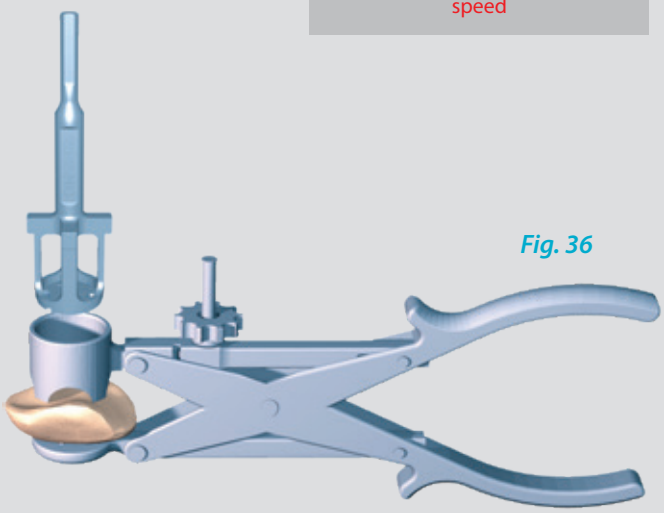


Fig. 36

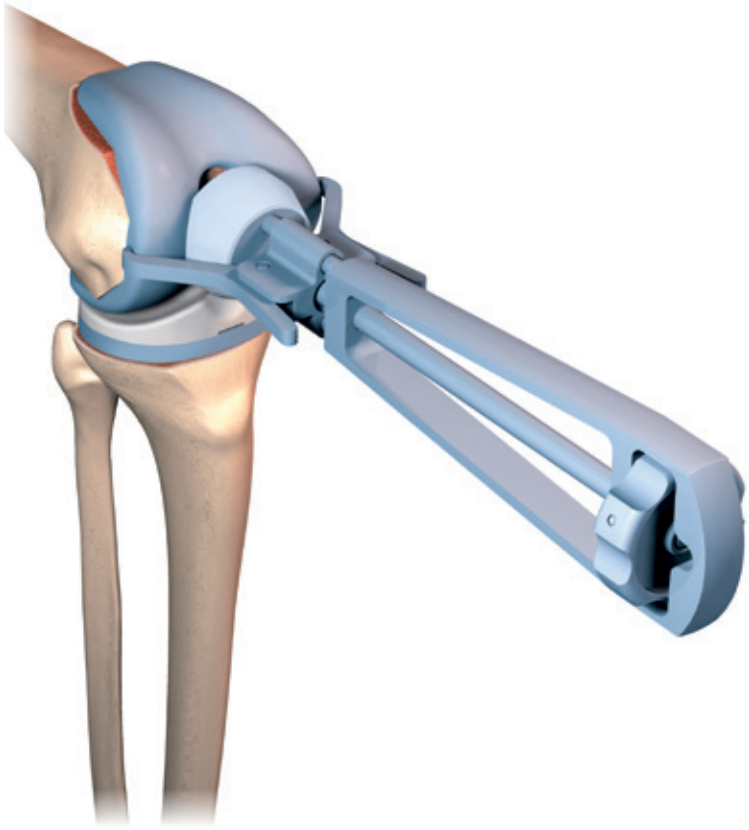
ORDER OF IMPLANTATION

The polyethylene insert is implanted just after the cemented baseplate, so it is prudent to wait until the cement is completely set; the femoral component is implanted last *(Fig. 37b, 38b, 39b et 40)*.

Fig. 37b

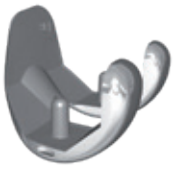
Fig. 38b

Fig. 39b

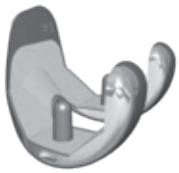


IMPLANTS REFERENCES

Femoral component



CEMENTED			CEMENTLESS	
Left	Right	SIZE	Left	Right
257714	257708	1	257726	257720
257715	257709	2	257727	257721
257716	257710	3	257728	257722
257717	257711	4	257729	257723
257718	257712	5	257730	257724
257719	257713	6	257731	257725



Asymmetric tibial insert

LEFT			
Size	Th. 10	Th. 12	Th. 14
1	265017	265018	265019
2	265027	265028	265029
3	265037	265038	265039
4	265047	265048	265049
5	265057	265058	265059
6	265067	265068	265069

RIGHT			
Size	Th. 10	Th. 12	Th. 14
1	265012	265013	265014
2	265022	265023	265024
3	265032	265033	265034
4	265042	265043	265044
5	265052	265053	265054
6	265062	265063	265064

Cemented asymmetric tibial tray

Size	LEFT
1	264994
2	264995
3	264996
4	264997
5	264998
6	264999

Size	RIGHT
1	264988
2	264989
3	264990
4	264991
5	264992
6	264993

Patella

Size	Th. 7	Th. 8	Th. 10
22	265951		
25	257737		
30		257733	
34		257734	257735
38			257736

Optional diaphyseal stems

Length	Ø 10	Ø 14
70	263381	263382
110	263383	263384

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