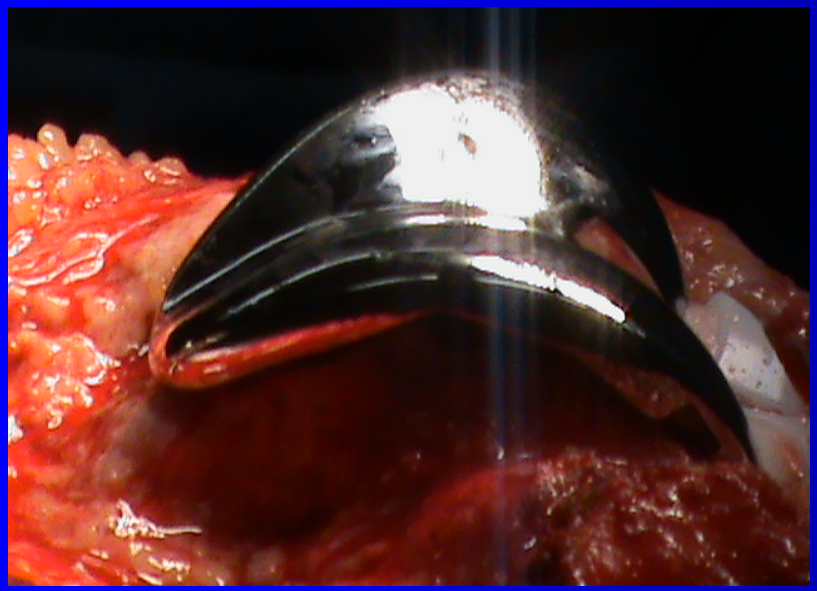
LE BLOC OPERATOIRE DU FUTUR:

les nouvelles technologies

M. Didier BERTRAND

La navigation dans la mise en place d'une prothèse totale de genou.



Travail réalisé et présenté par:

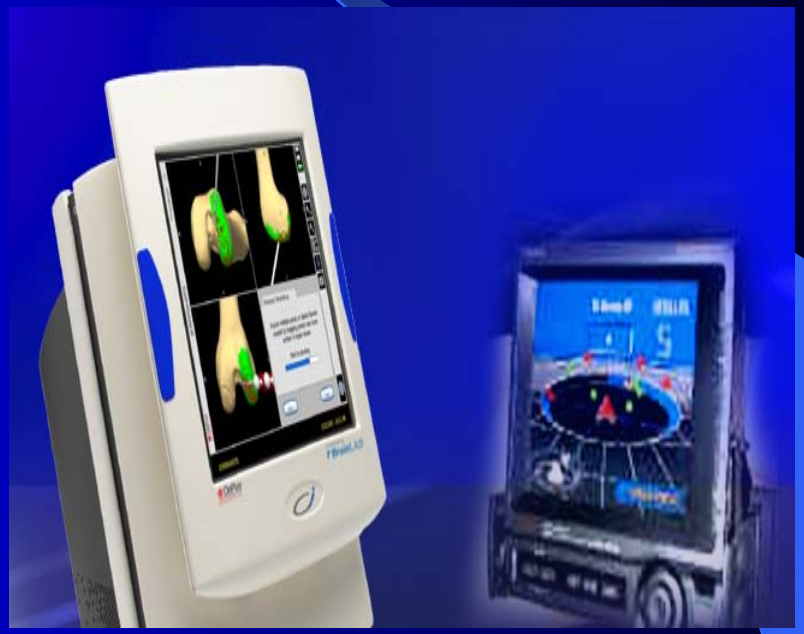
- Didier BERTRAND; étudiant spécialisation 4éme salle d'op, Haute École André Vésale.
- Dr H. CHARLIER; chirurgien orthopédiste au CHBAH.

introduction

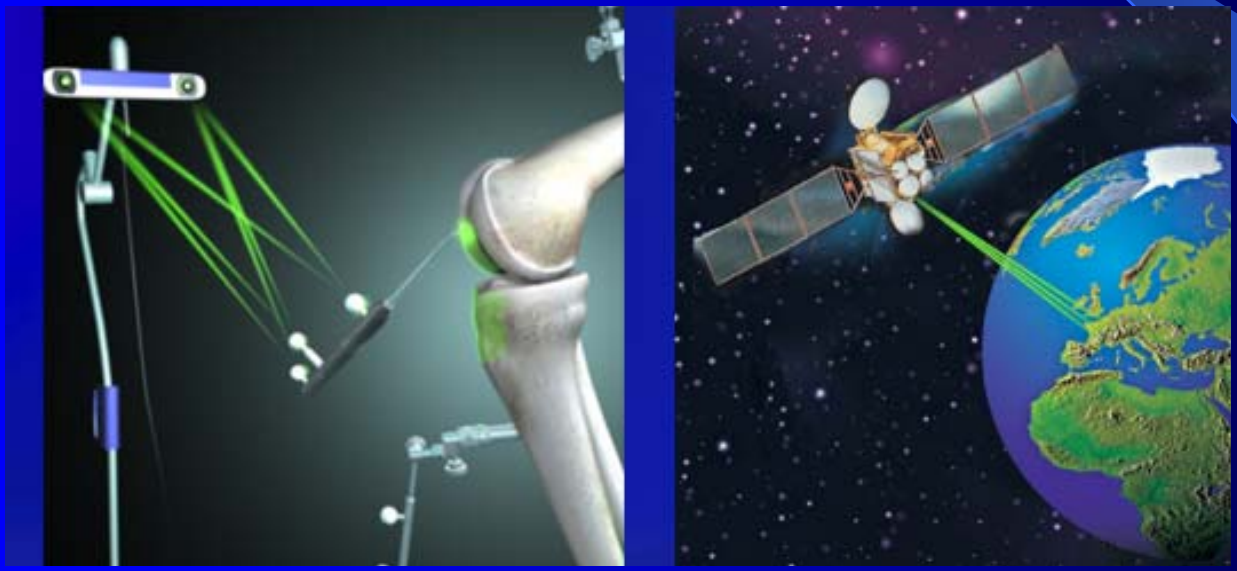
- pose d’une PTG ⟶ intervention fréquente.
- Naviguer une PTG ⟶ utiliser un ancillaire informatique

- A travers une vision améliorée et un contrôle précis, la navigation permet la pose d’une prothèse total du genou fiable avec un acte chirurgical invasif minimum.

- La navigation peut être comparé à un GPS pour la navigation automobile.



- La caméra remplace le satellite.



- Les instruments chirurgicaux remplacent la voiture.

- Et l’anatomie du patient peut être comparée à une carte routière.

Historique de la navigation

- En 1985, intérêt des images numériques pour guider le positionnement d'outils chirurgicaux.
- En 1988-1991, les premières applications en neurochirurgie.

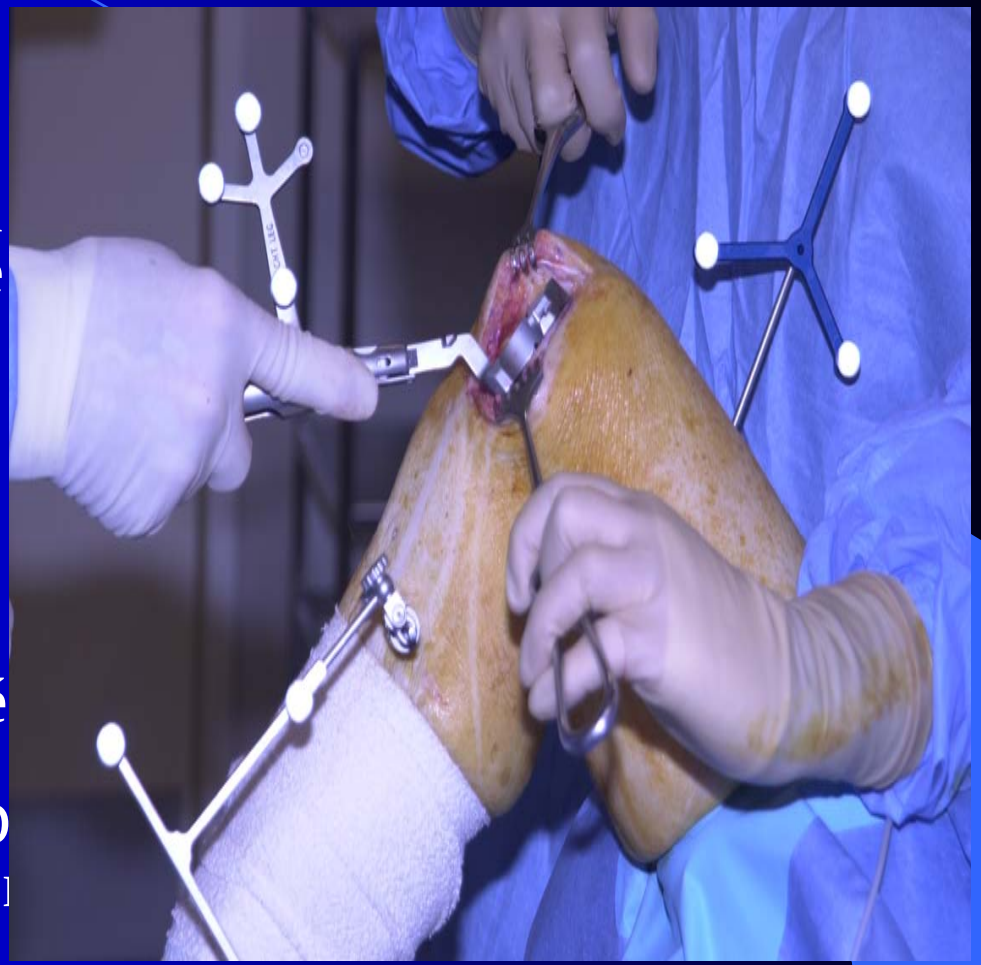
- En 1991, premières applications en orthopédie.
- A partir de 1996, premières applications extra rachidiennes.
- En 2001, Naissance du concept *imageless ou bone morphing*.

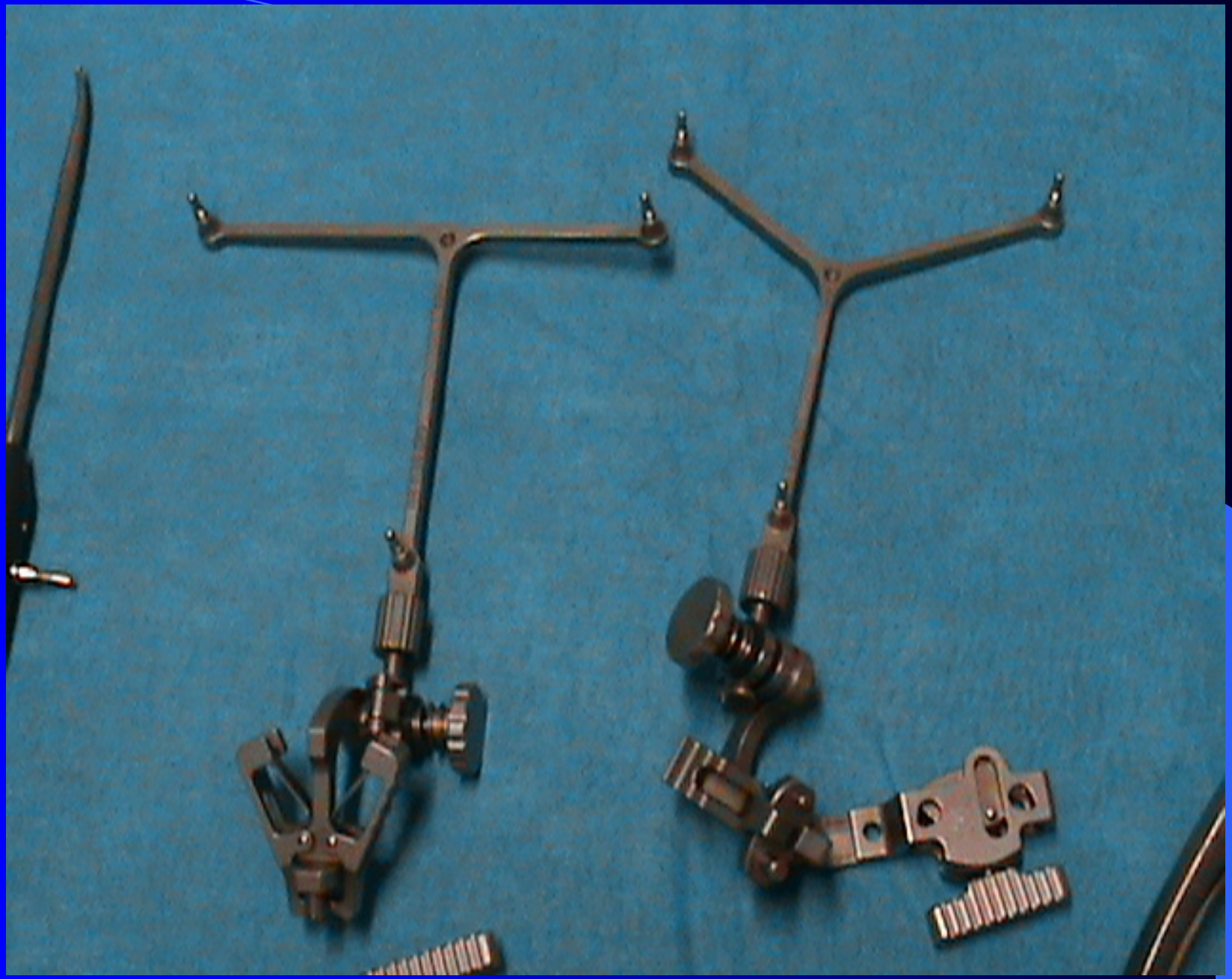
Principes généraux

améliorer ou restituer une fonctionnalité

- La chirurgie assistée par ordinateur apporte une valeur ajoutée certaine ⟶ 3D

- Il est nécessaire pour cela d'attacher à chaque partie du patient que l'on souhaite décrire comme une entité indépendante, un repère appeler corps rigide. Ce corps rigide muni de diode réfléchissante, sera repéré en temps réel par une caméra de localisation 3D qui en calculera la position spatiale en temps réel.





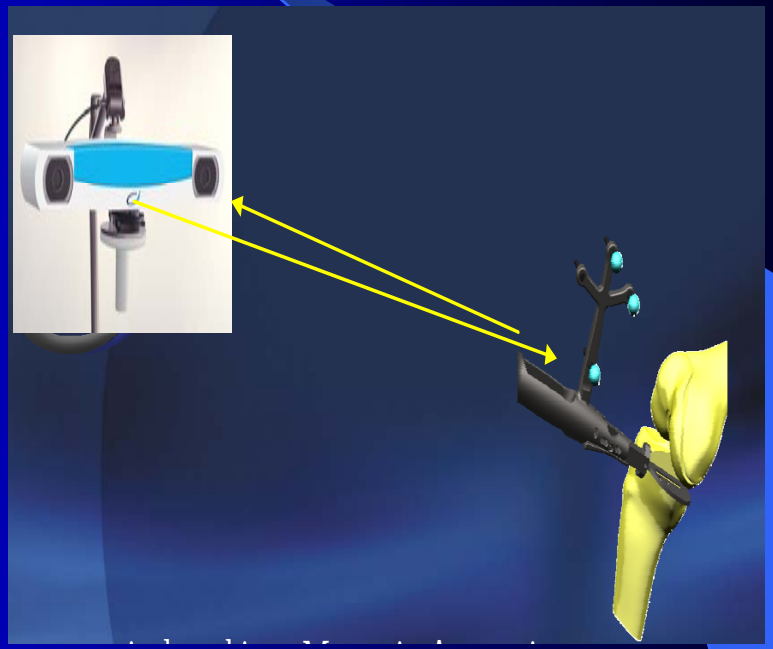
- Dans le cadre de la chirurgie assistée par ordinateur, il faut décrire chaque point physique du patient sous la forme d’un nuage de points.

- De même, les outils chirurgicaux que l’on souhaitera utiliser, seront localisés dans l’espace en leurs associant un repère spécifique.

- Bone morphing

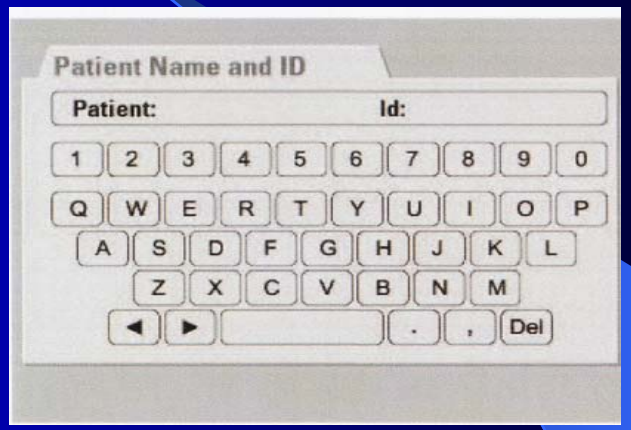
- Connaissant la position du patient et des outils dans l’espace, il est alors possible de visualiser leurs positions relatives, guidant ainsi l’acte chirurgical.

- Le système fonction avec un tracé optique / infra rouge.
- Le patient n’est pas la source.
- Le logiciel calcule les positions données et les transmet à l’écran.

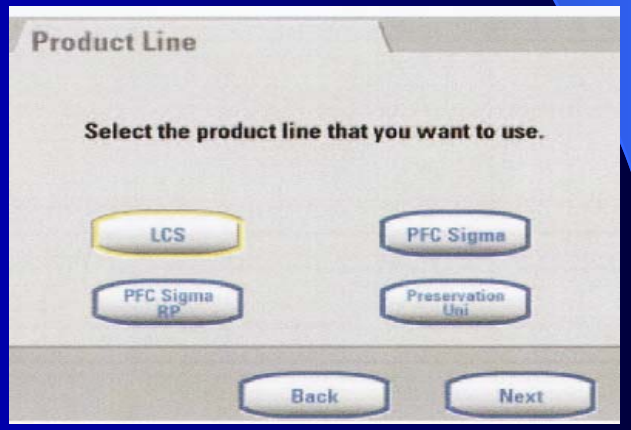


Étapes principales de la navigation

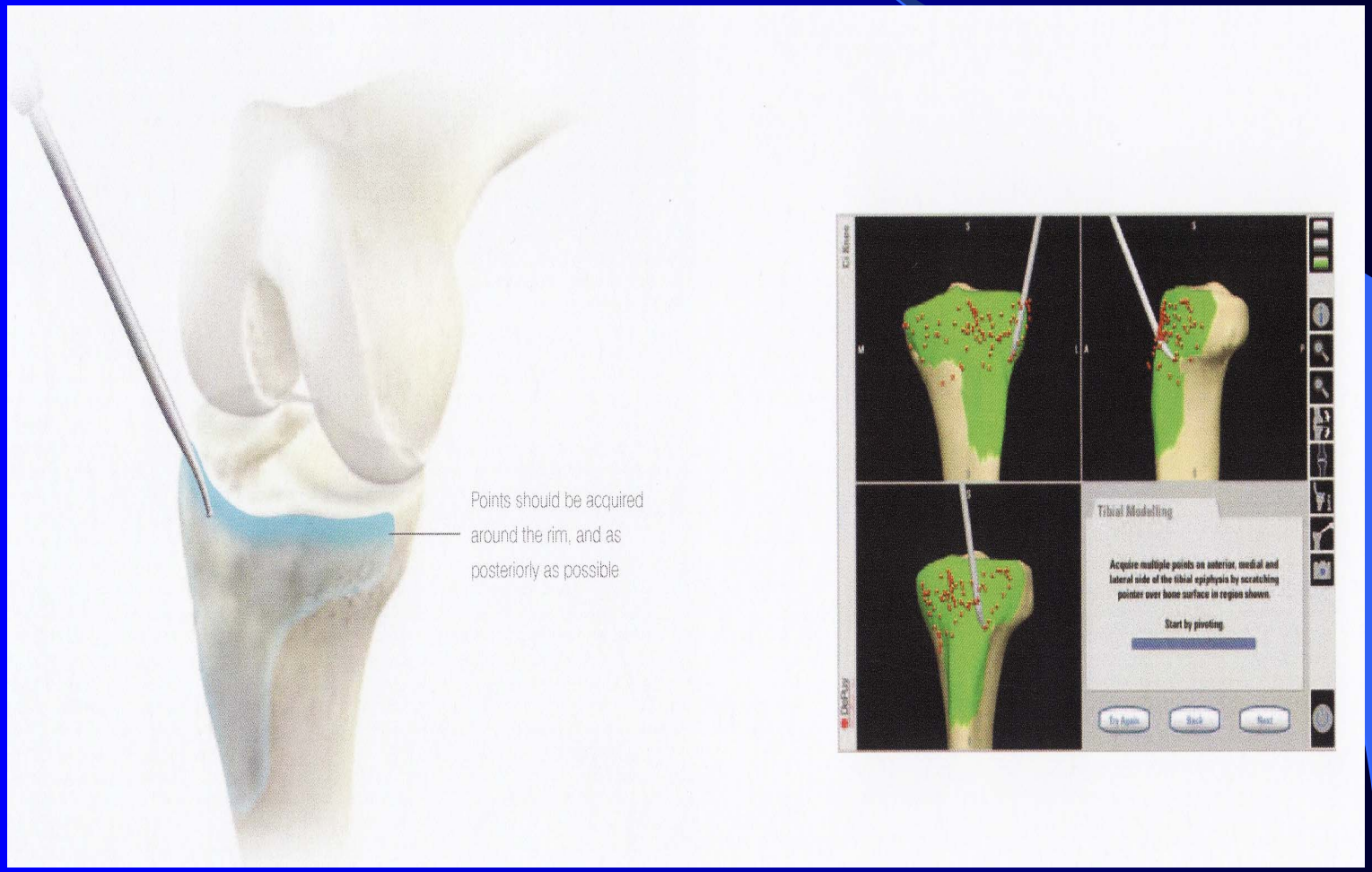
- Informations du patient .



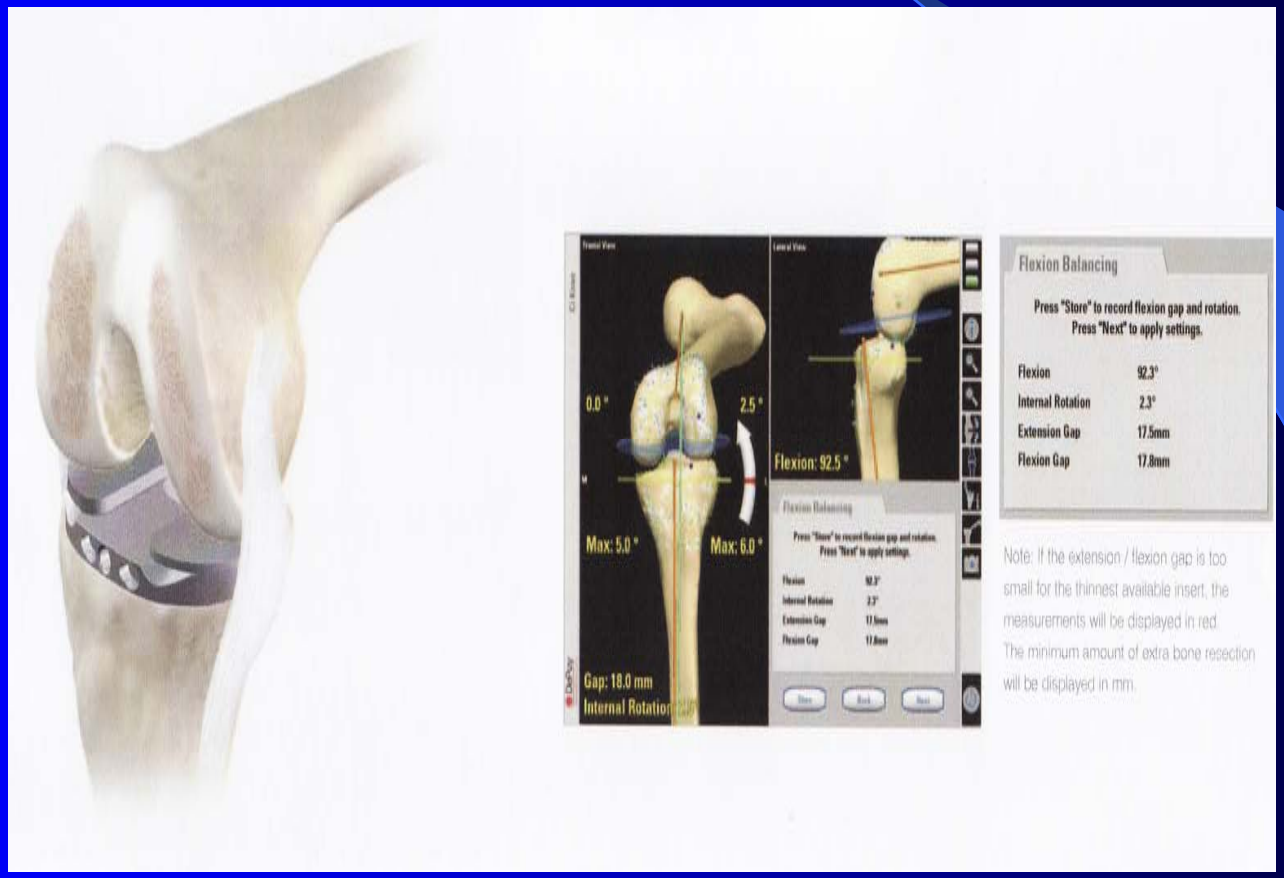
- Choix de l’implant.

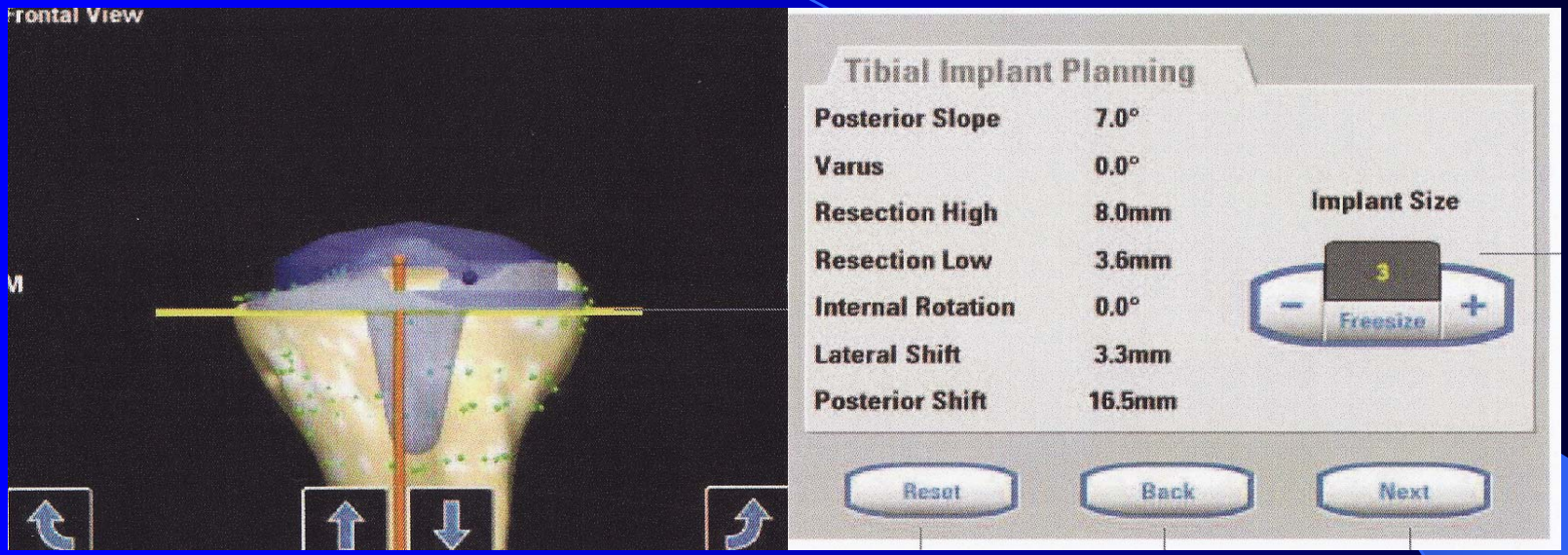


Acquisition des points (pour acquisition des dimensions, axes et modèles).



Calcul de la balance ligamentaire et de l’axe naturel.





- Planification et vérification de la taille, orientation des implants et niveau de coupe fémur / tibia.
- Navigation des étapes de la PTG

Pourquoi la navigation dans la mise en place d’une prothèse totale de genou

Dr CHARLIER Hervé CHBAH Seraing

The Perfect TKJR

- Neutral mechanical axis
- Neutral rotation
- Restoration of joint line
- Rectangular balanced and equal flexion extension gap throughout a full ROM
- Normal patella tracking

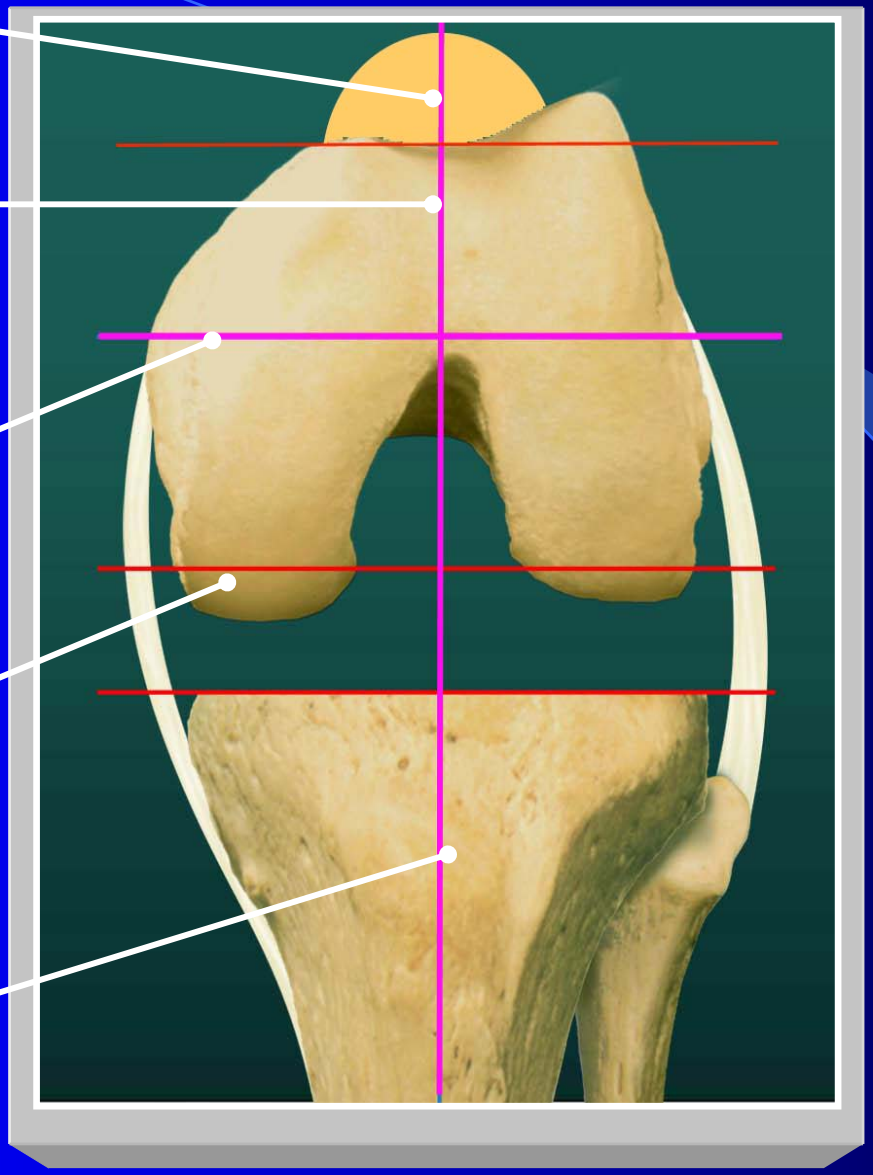
Centre femoral head

Whiteside's Line

Transepicondylar Axis

Posterior Condylar Axis

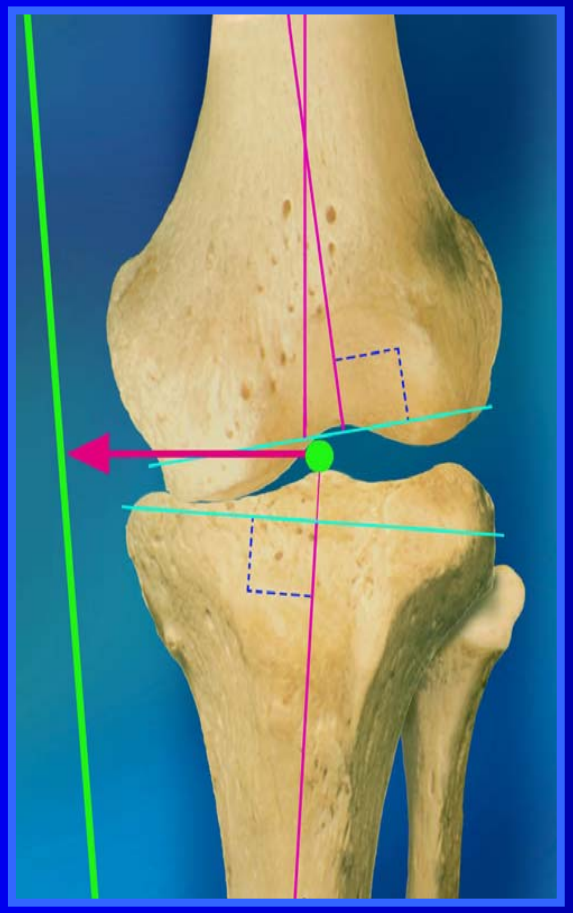
Mechanical Axis

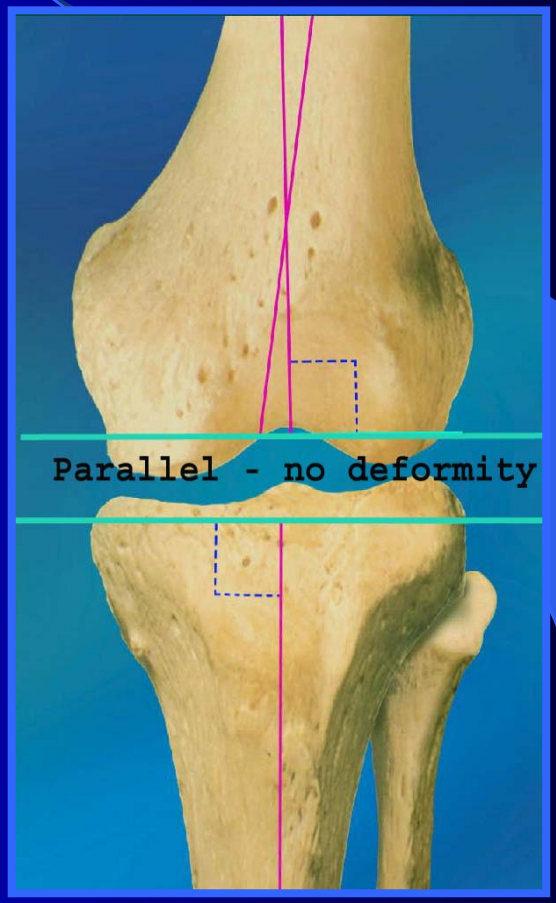


1: Mech axis√
2: Neutral rot'n√

In a perfect world !!

Ligament balancing





Goals of ligament balancing

Neutral mechanical axis

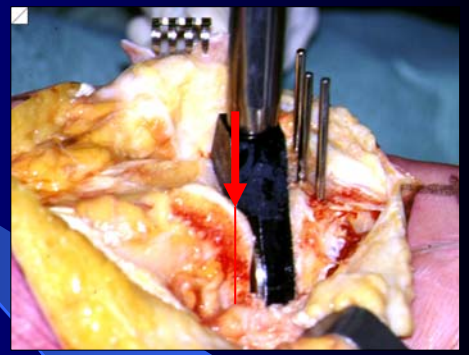
Neutral rotation

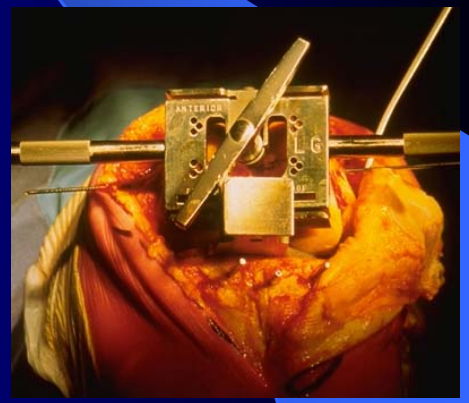
Restoration of joint line

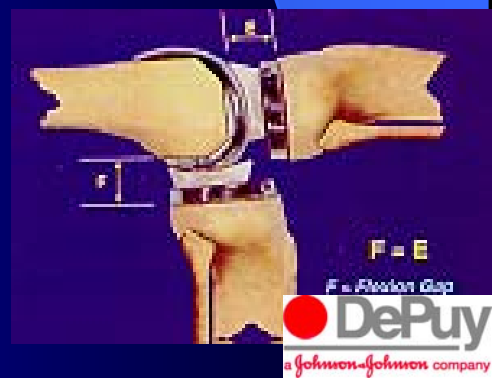
Balanced and equal flexion gaps throughout the ROM

LCS Philosophy

- 1 Tibial cut
- 2 Ligament balancing in extension with Half Spacer Bloc
  - representing tibial plateau
  - giving us the joint line in extension
- 3 A-P guide + femoral positioner external rotation
- 4 Distal cut level
  - Half Spacer Bloc giving distance
- 5 Ligament balancing similar in flexion and extension







DePuy
a Johnson & Johnson company

Difficulties

External condyle Hypoplasy

-Valgus knee

-Varus knee with “Oblique joint line”

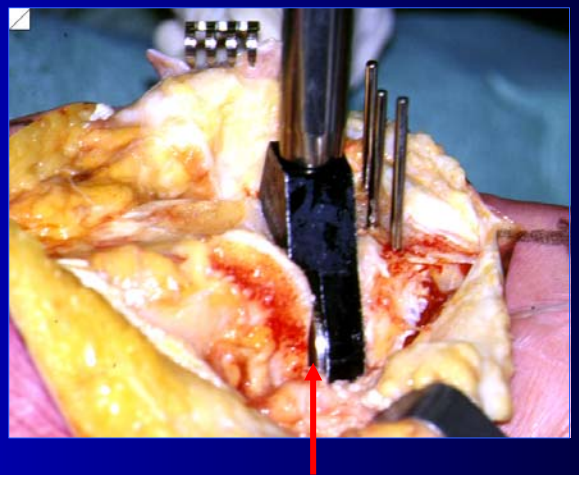
- Condyles necrosis

The condyles are not a good reference

DePuy
a Johnson-Johnson company

Possibilities

- 1 Planning the hypoplasy
  - restore that amount between bloc and external condyle (release)
- 2 In vivo estimation of the hypoplasy
  - distal guide aligned with internal condyle
- 3 Internal condyle Pre-cut
- 4 1/4 blocs after planning

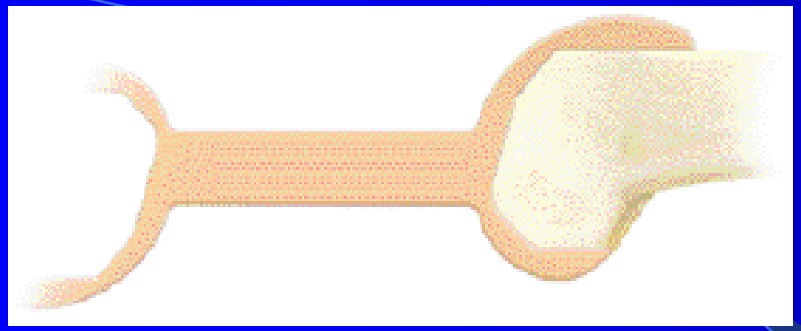


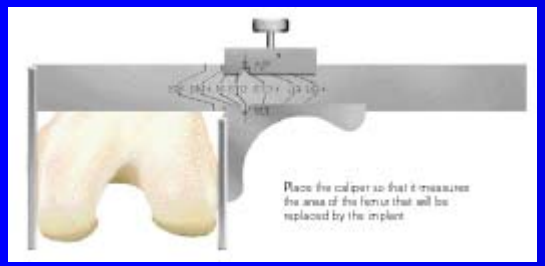
DePuy
a Johnson&Johnson company

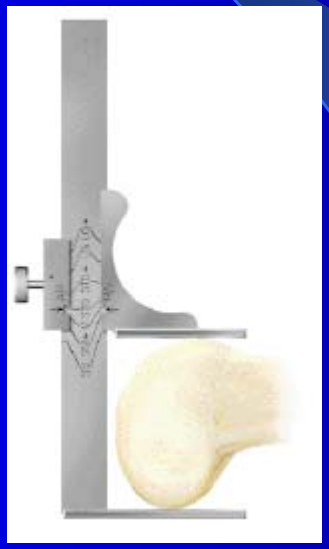
Completion Femur Preparation

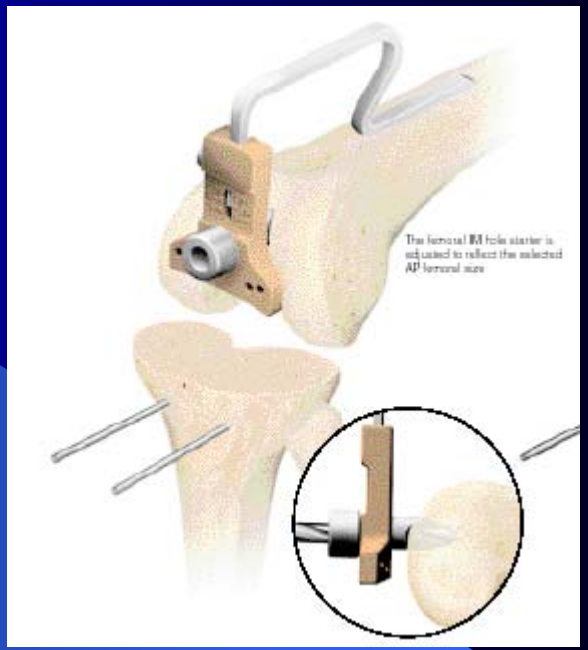
DePuy
a Johnson & Johnson company

Femoral Size / Yoke fixation



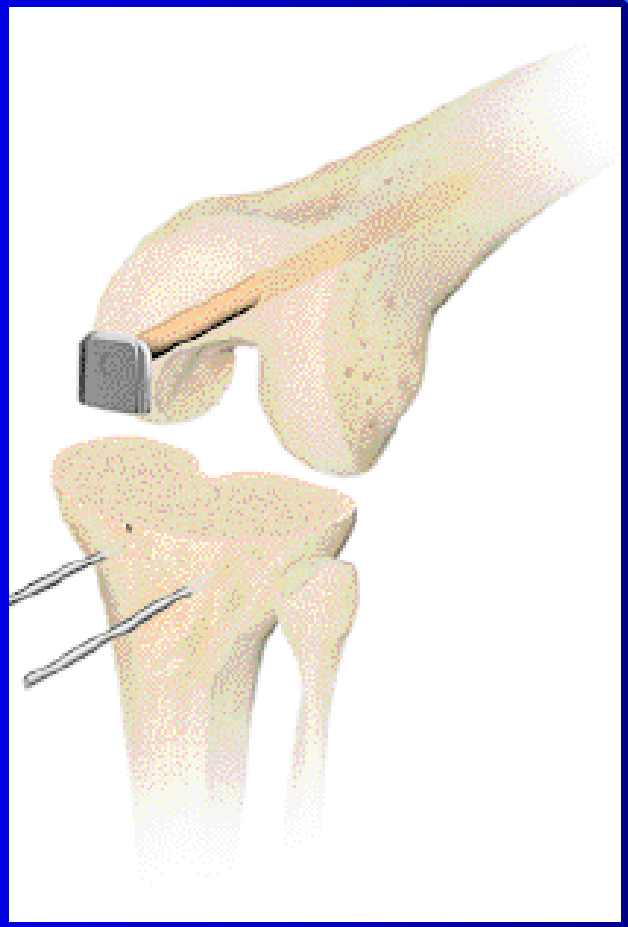







Guide yoke fixation
more stable
-2 teeth for distal bone
-additional pins
FEMORAL
HOLE
LOCATOR

IM Plate
4°/ 5° / 6°

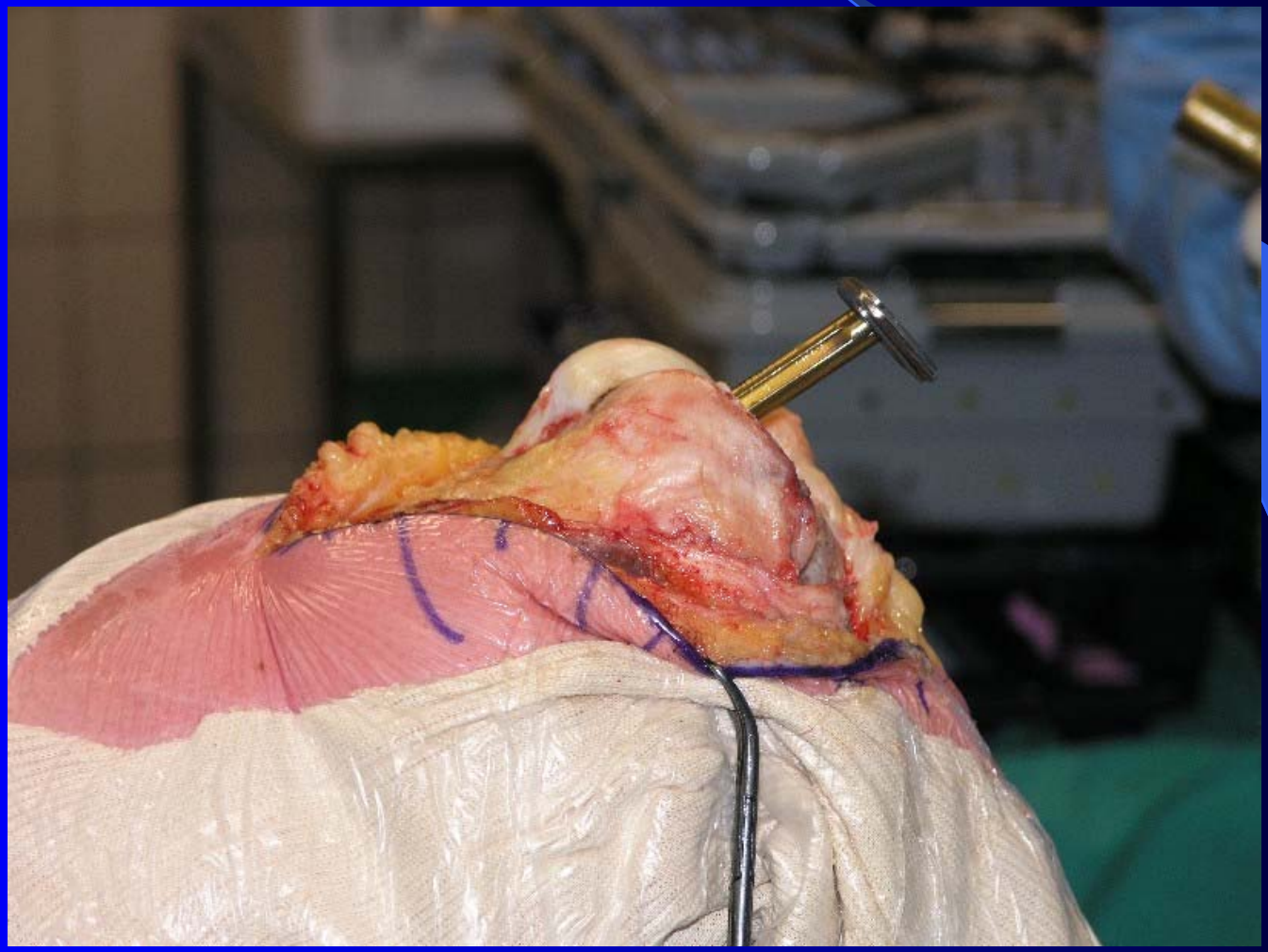


IM Plate 3° to 7°

Rail to connect -Spacer

-A-P Cutting blocks

IM Plate
4°/ 5° / 6°



Balancing in extension

Extension spacer
10 mm
4mm (flexum contracture)

Ligament balancing in extension

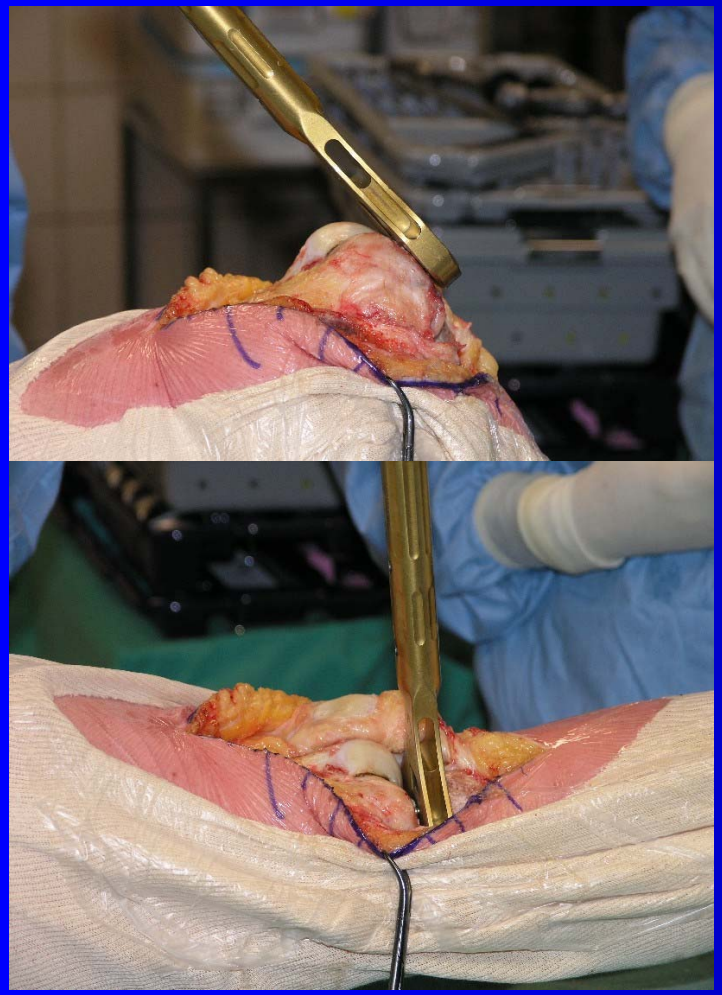
Spacer (+shims) mounted on IM Plate

+ more stable

+more precise

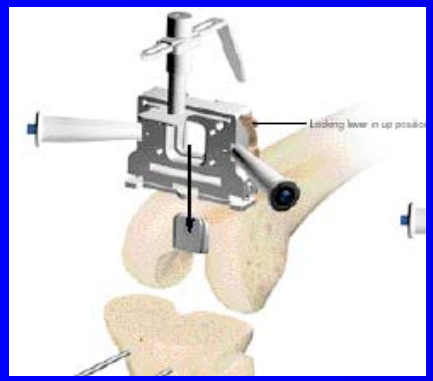
(taking eventual femoral hypoplasy in account)

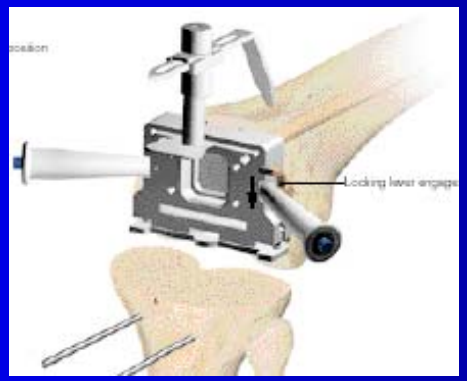
Balancing in extension

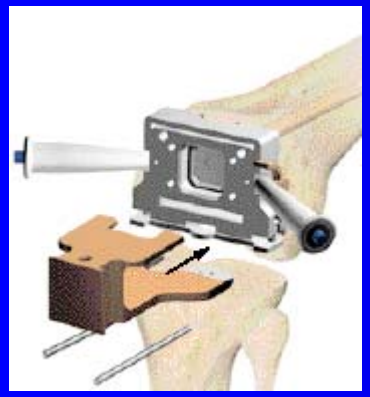


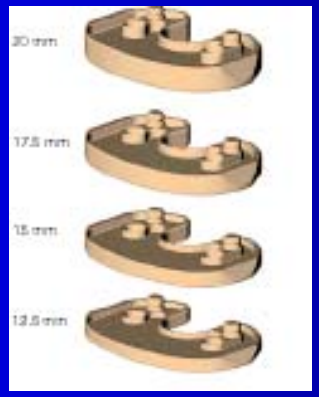
Extension spacer
10 mm
4mm (flexum contracture)

A-P guide / External rotation









A-P Cutting block

•mounted onto IM Plate

•anterior feeler

determines the height

•fixation to the plate

(only rotation possible)

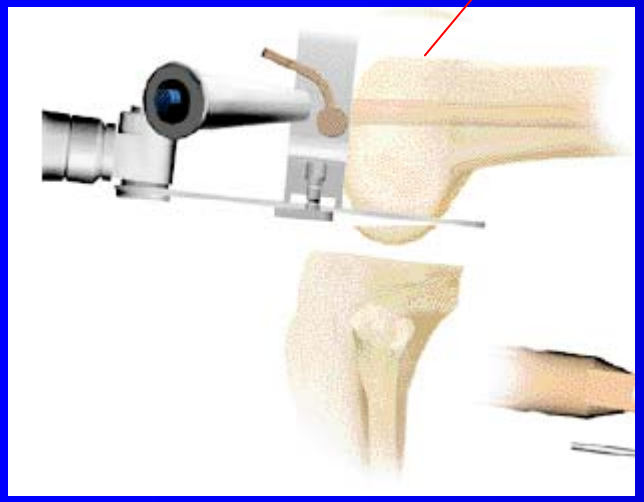
•modular handles

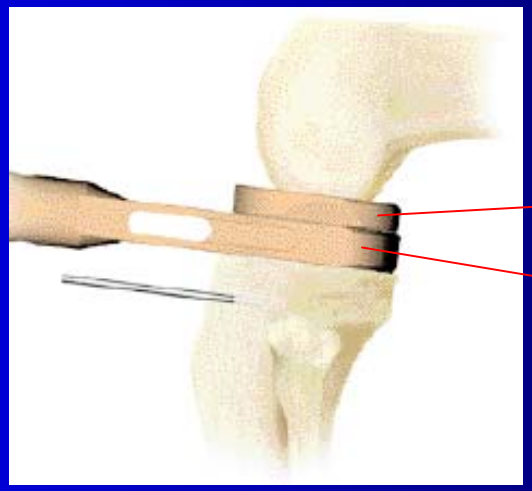
• femoral positioner

A-P guide / External rotation

A-P Cut / Flexion gap

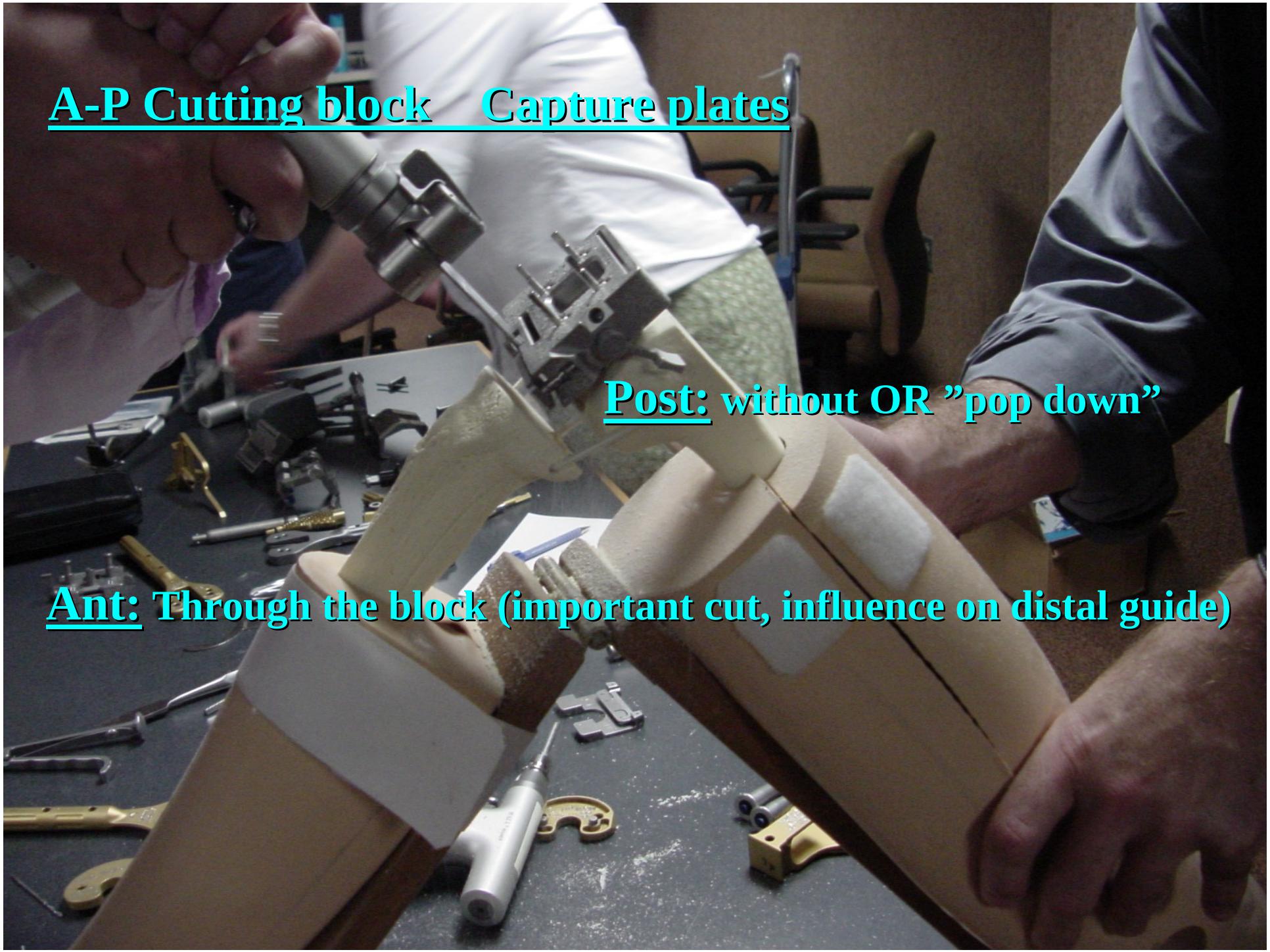
Anterior Rough Cut (Pre-cut 1.5mm anterior)



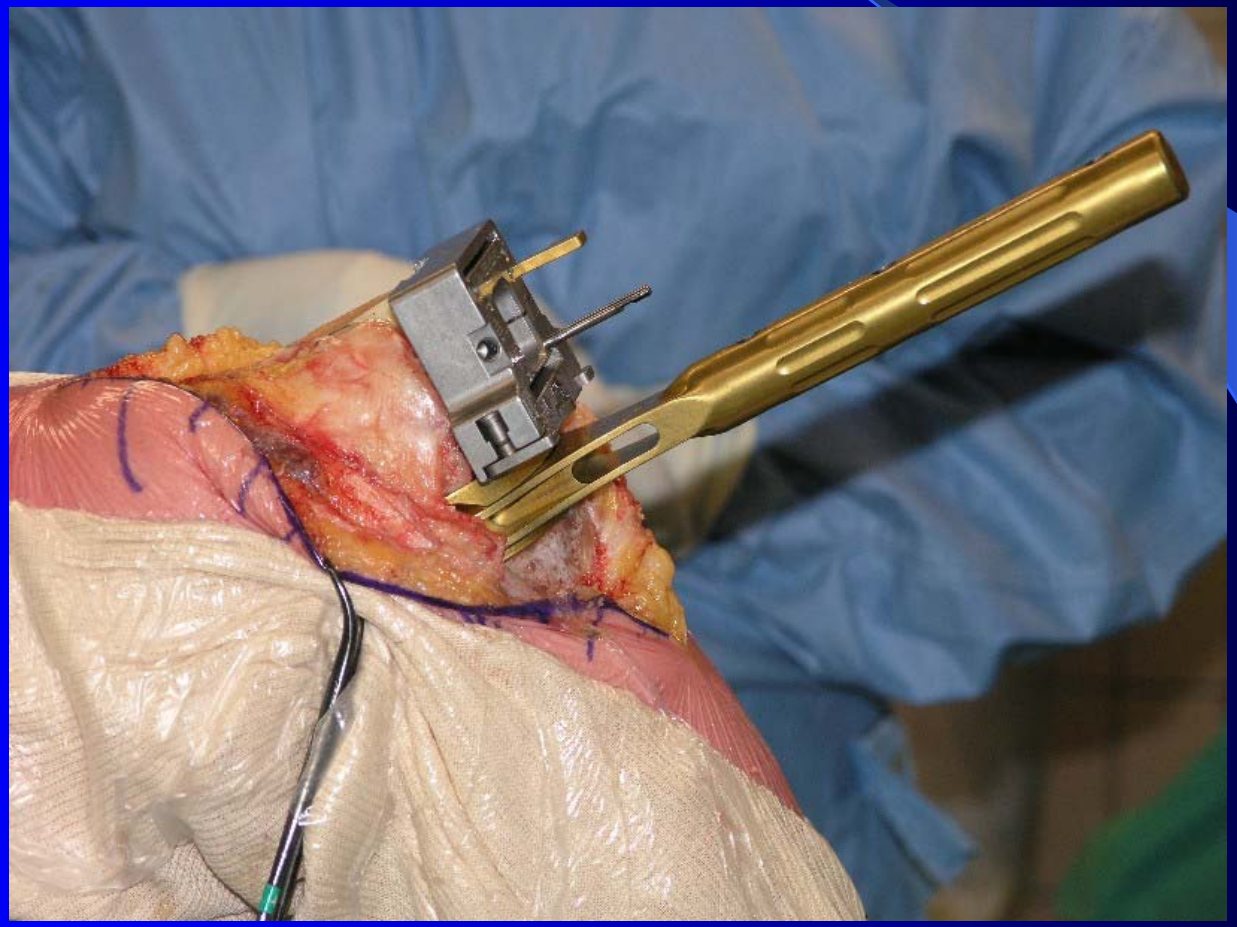


Femoral shim

Tibial spacer

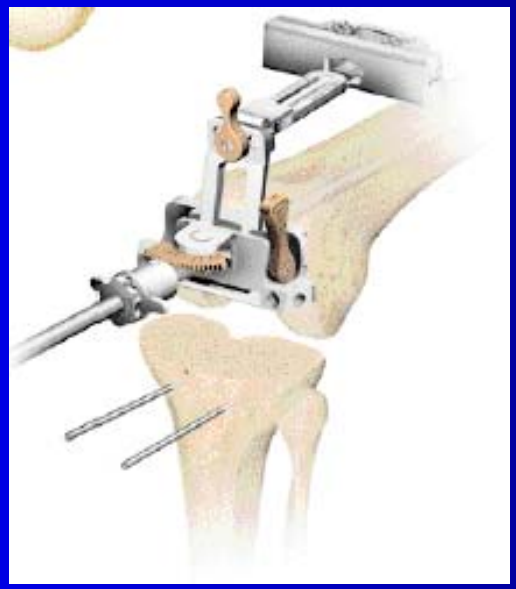

A-P Cutting block Capture plates
Post: without OR ”pop down”
Ant: Through the block (important cut, influence on distal guide)

A-P Cut / Flexion gap

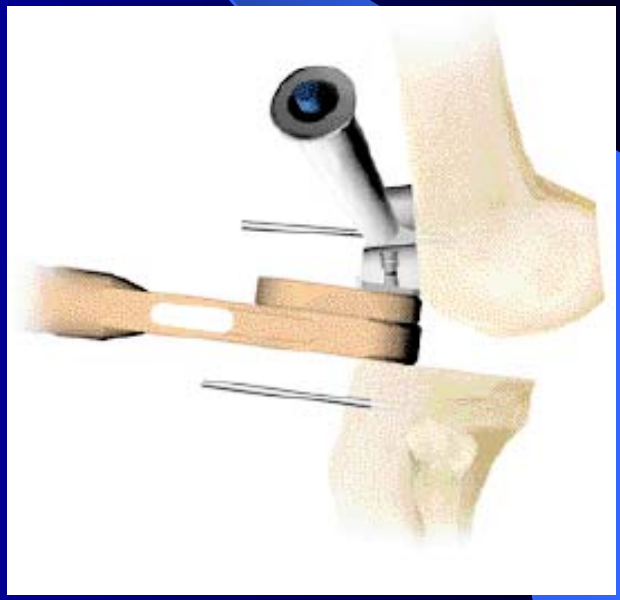


Distal cutting guide

Angle



Connector

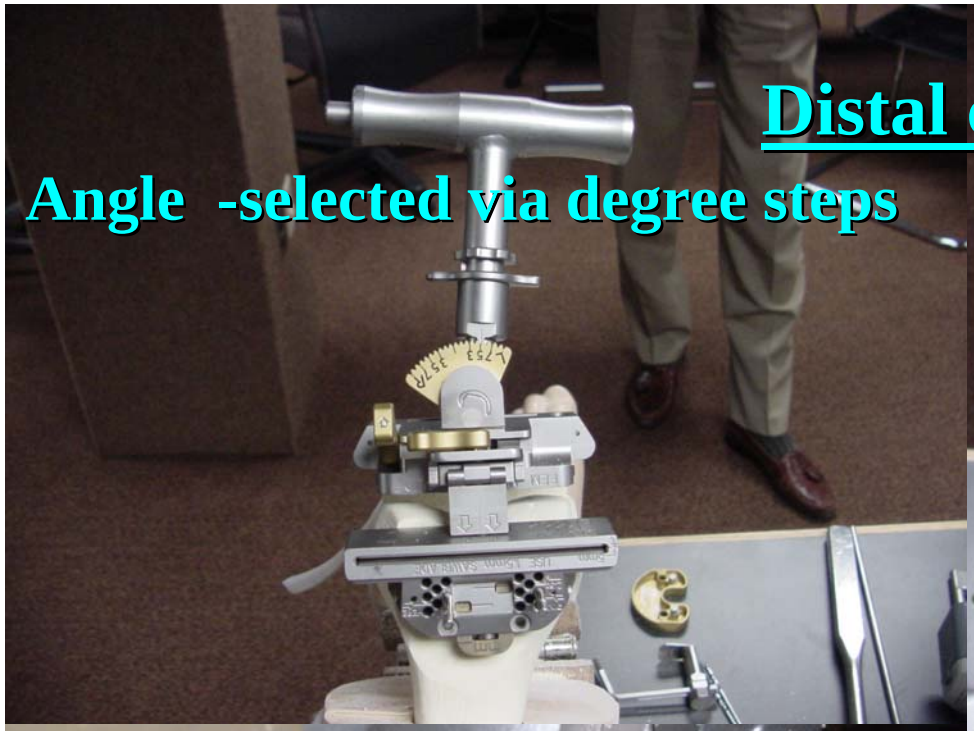


Distance check

Distal cut

Angle -selected via degree steps

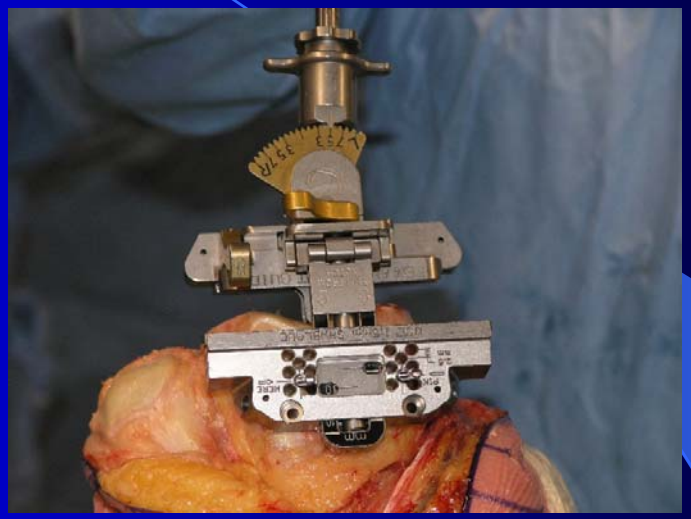
-than locked

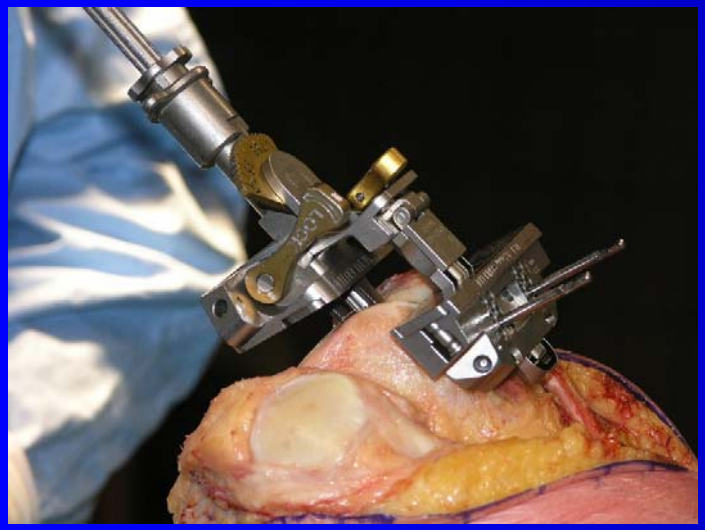


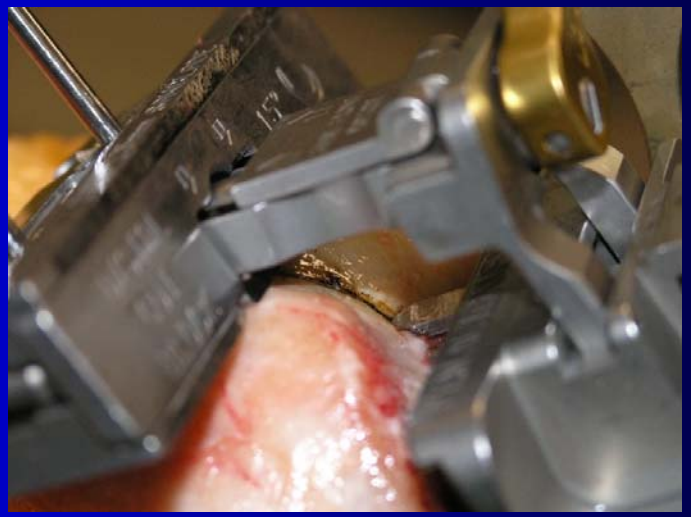
Referenced from intercondylar notch

Through the block

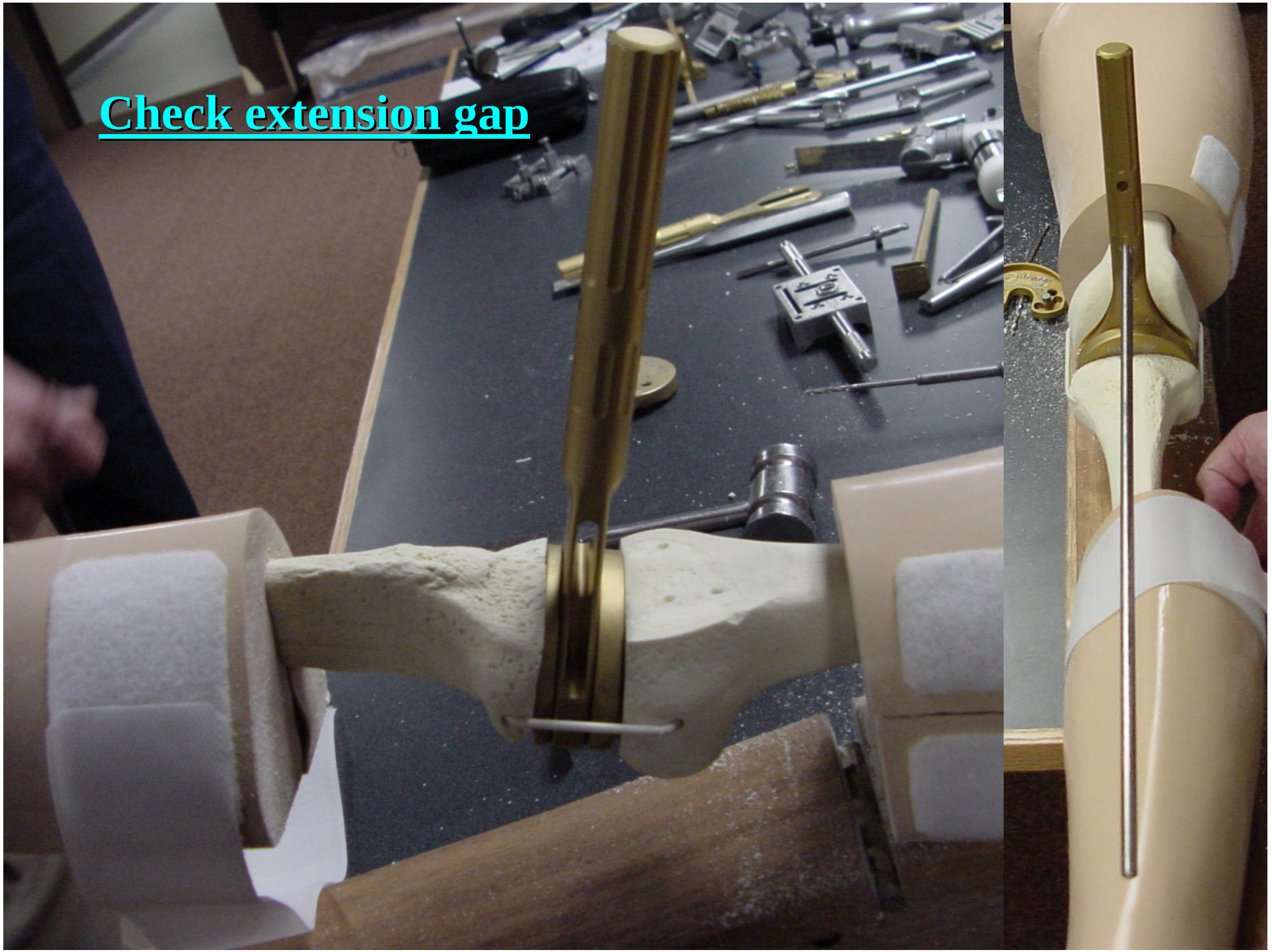
Distal cutting guide



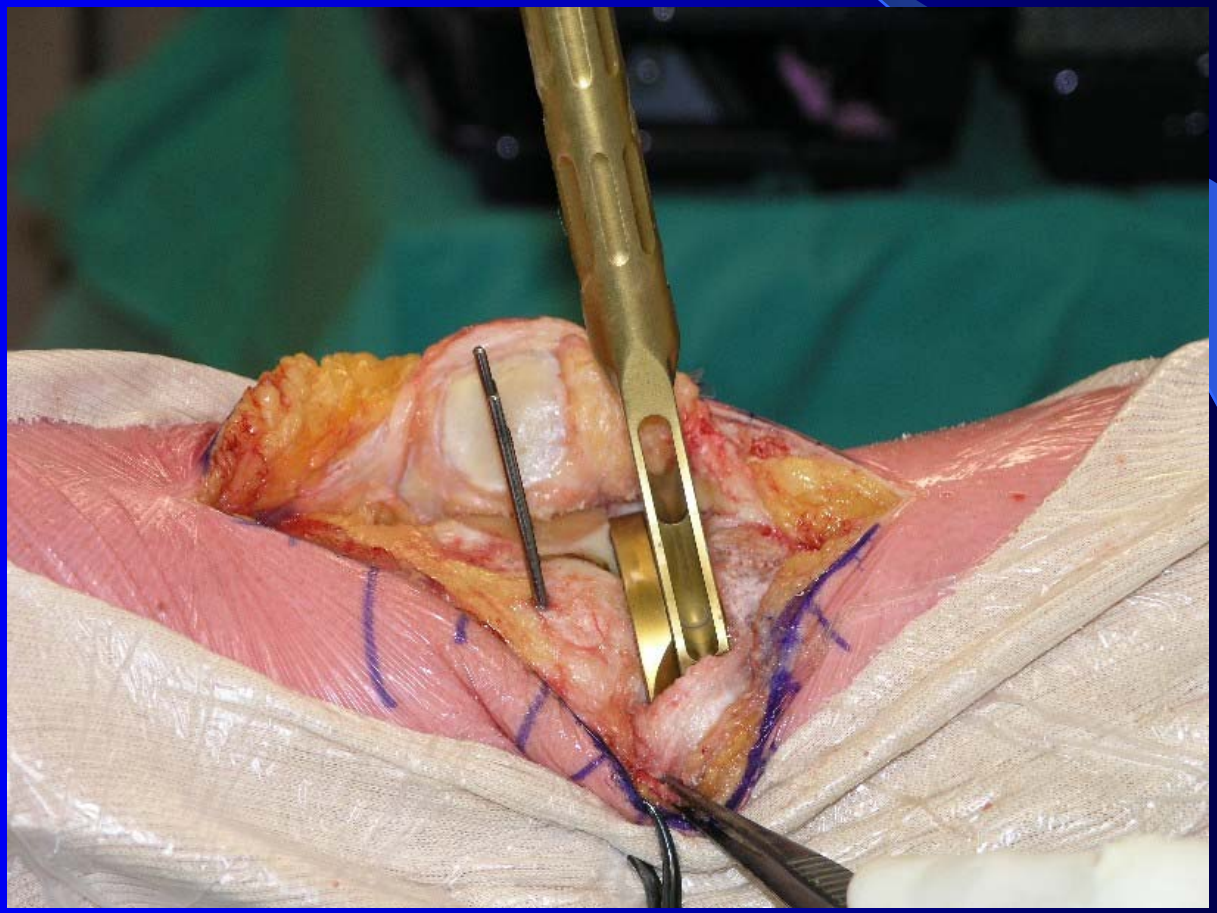




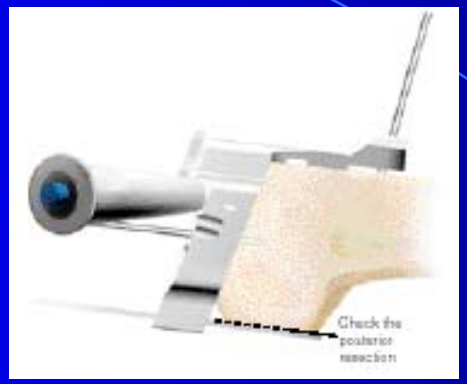
Distal cut / Check extension gap

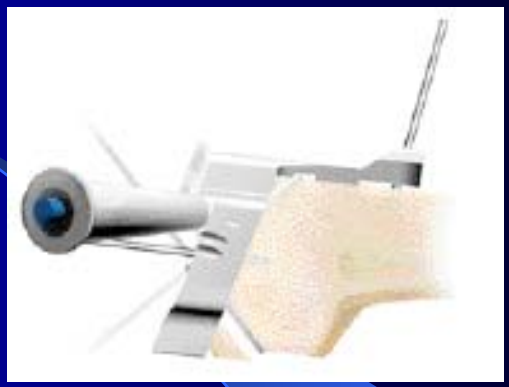

Check extension gap

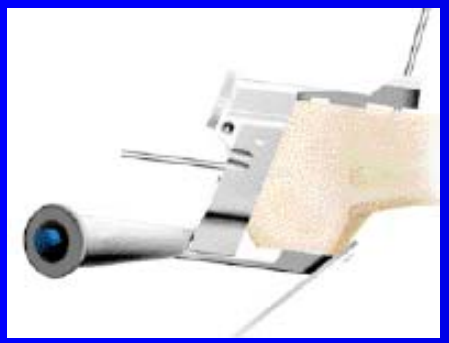
Check extension gap

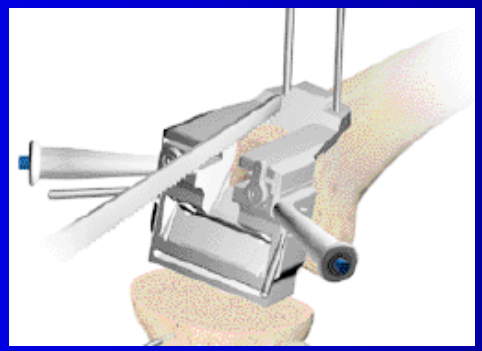


Finishing guide



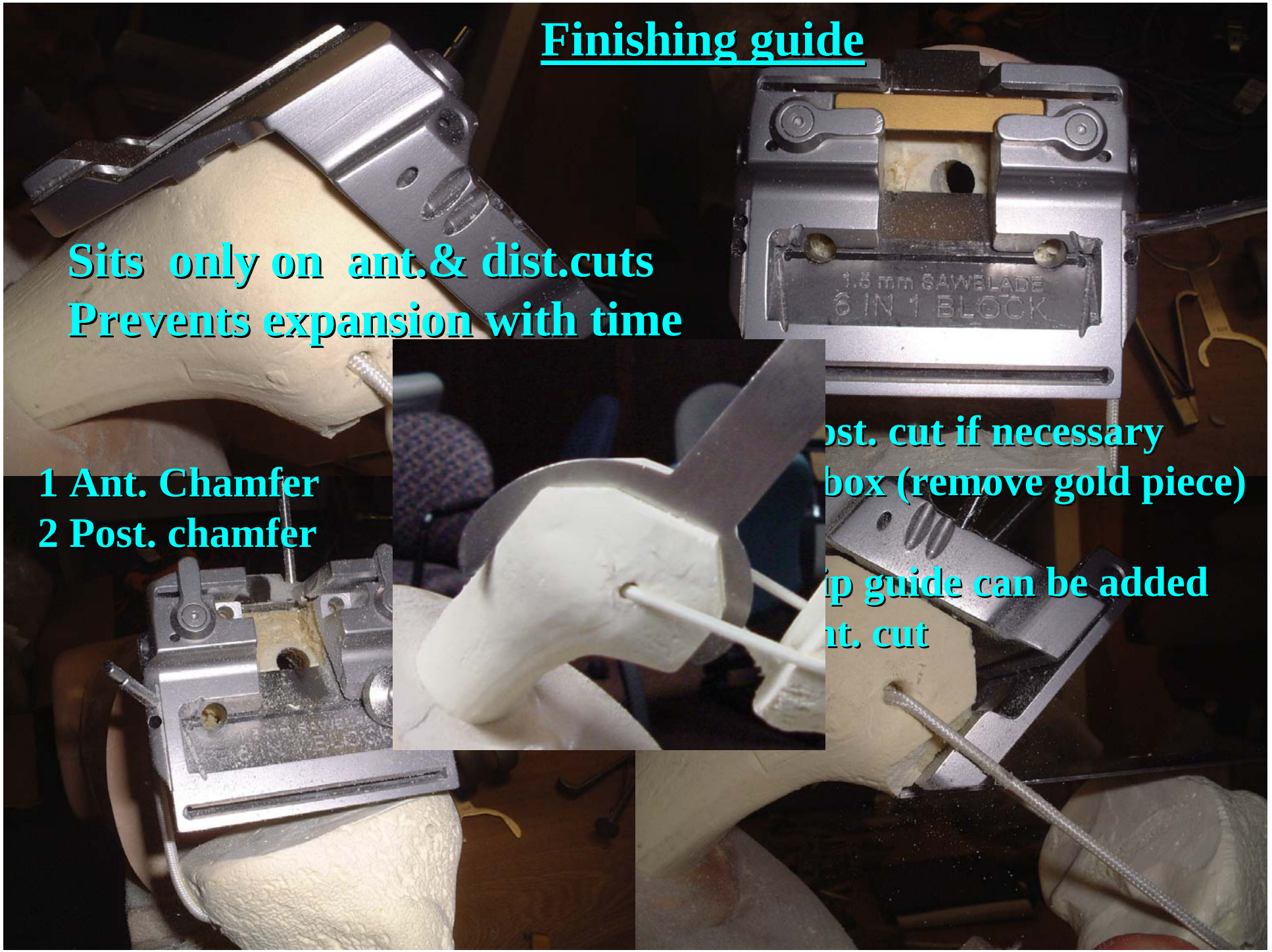






Definitive ant. cut

Finishing guide



Sits only on ant.& dist.cuts
Prevents expansion with time

1 Ant. Chamfer
2 Post. chamfer

ost. cut if necessary
box (remove gold piece)

ip guide can be added
nt. cut

Complete femur preparation

Cuts **Ligament balancing**

Precision improved!