Tibial slope and bone corrections

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Andrea DE FAZIO, David DEJOUR
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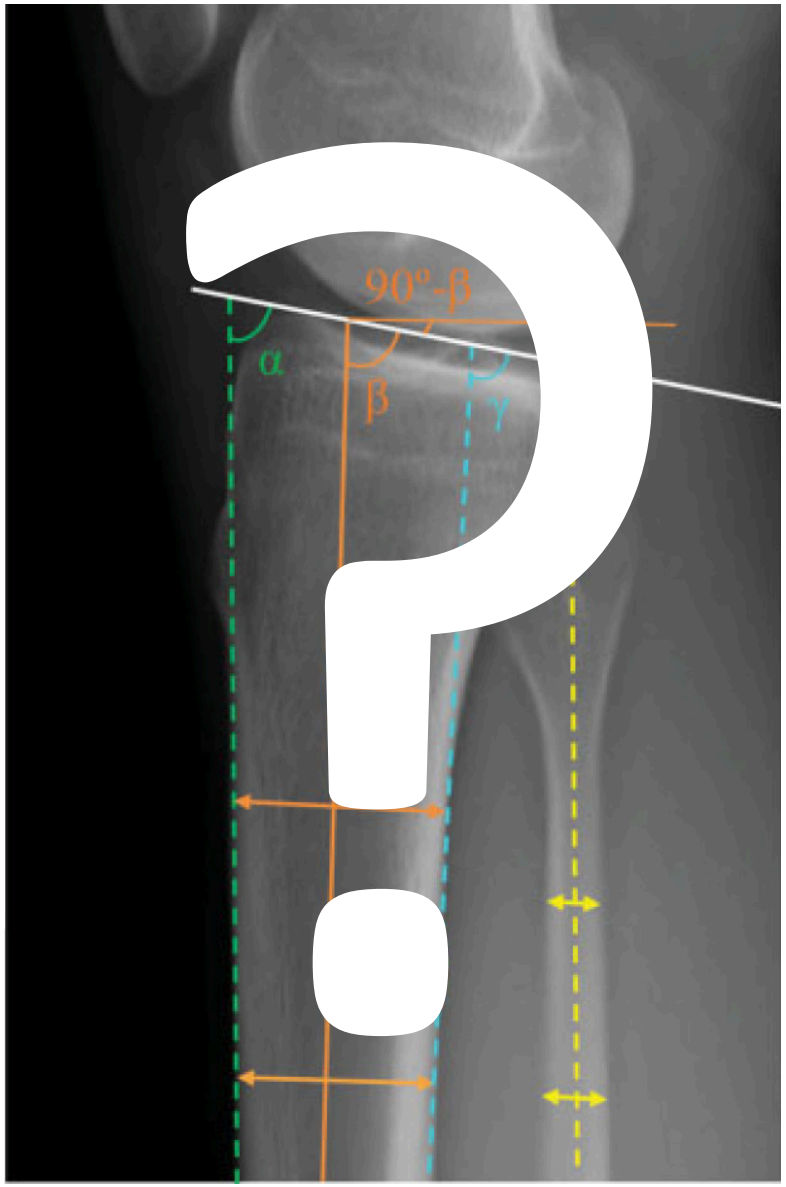
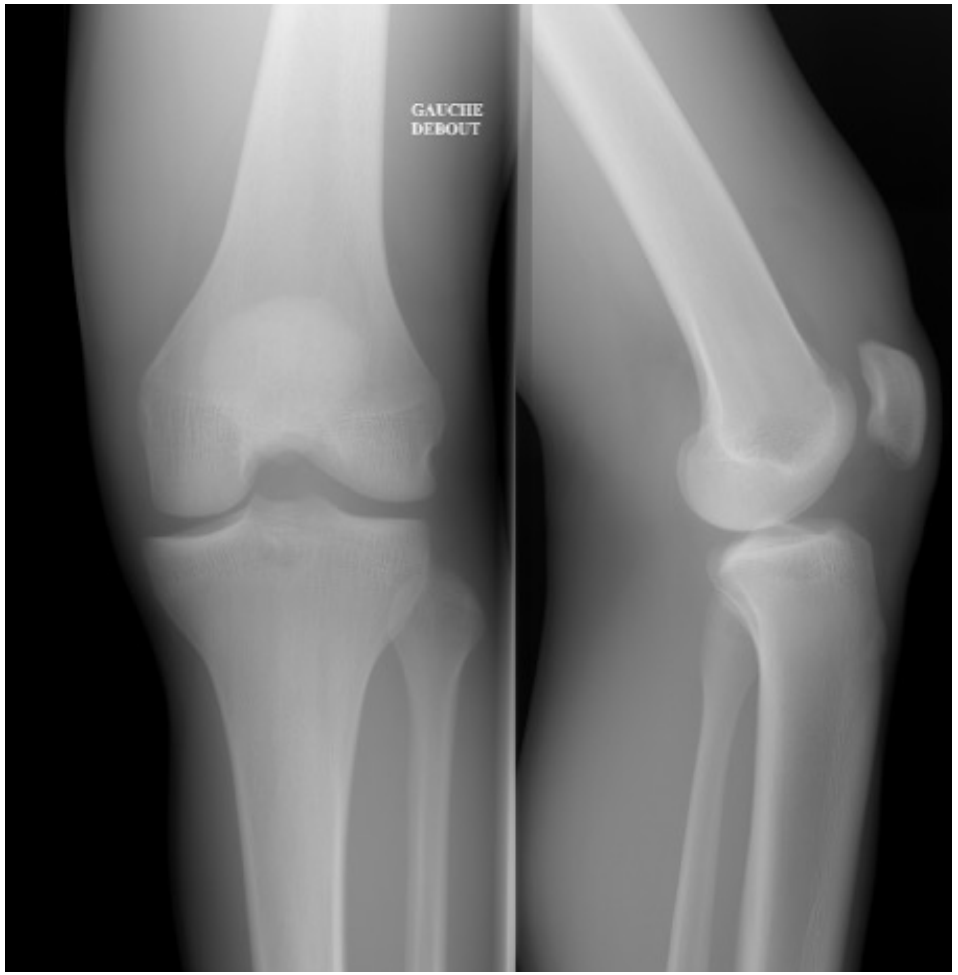
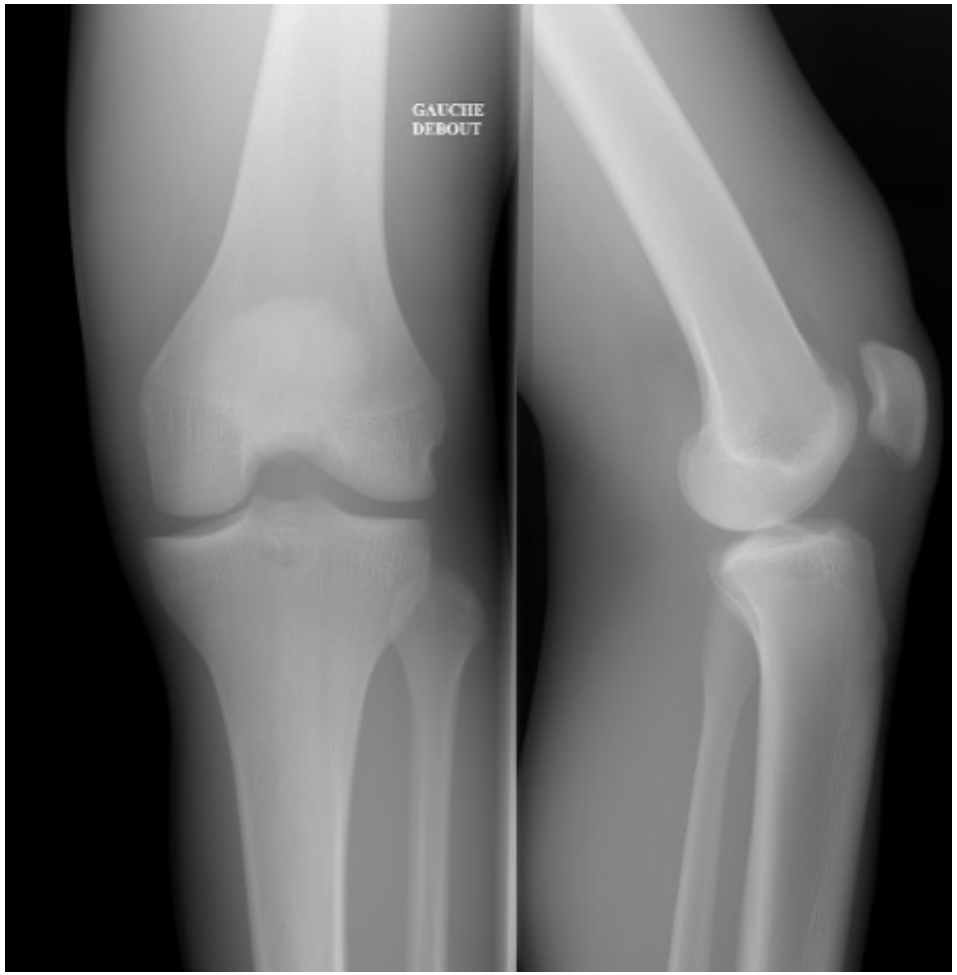


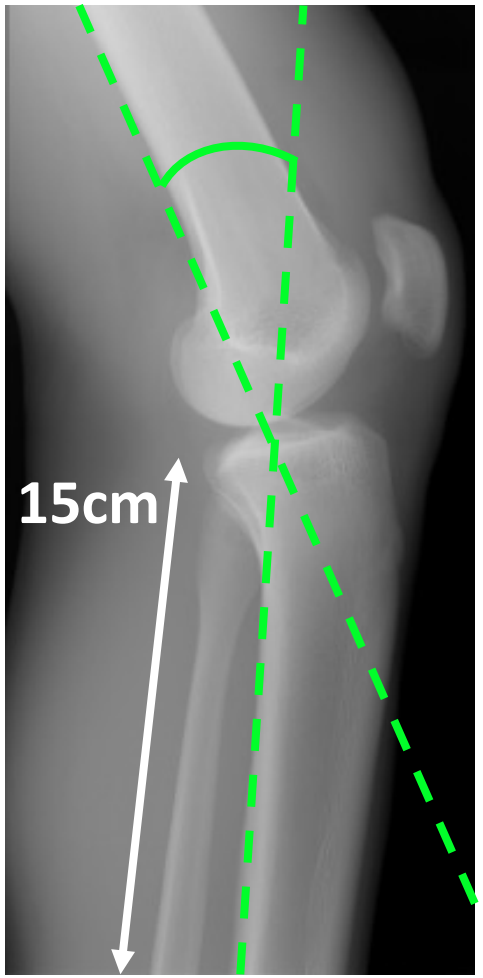
How to measure the tibial slope ?

Monopodal weightbearing lateral x-ray



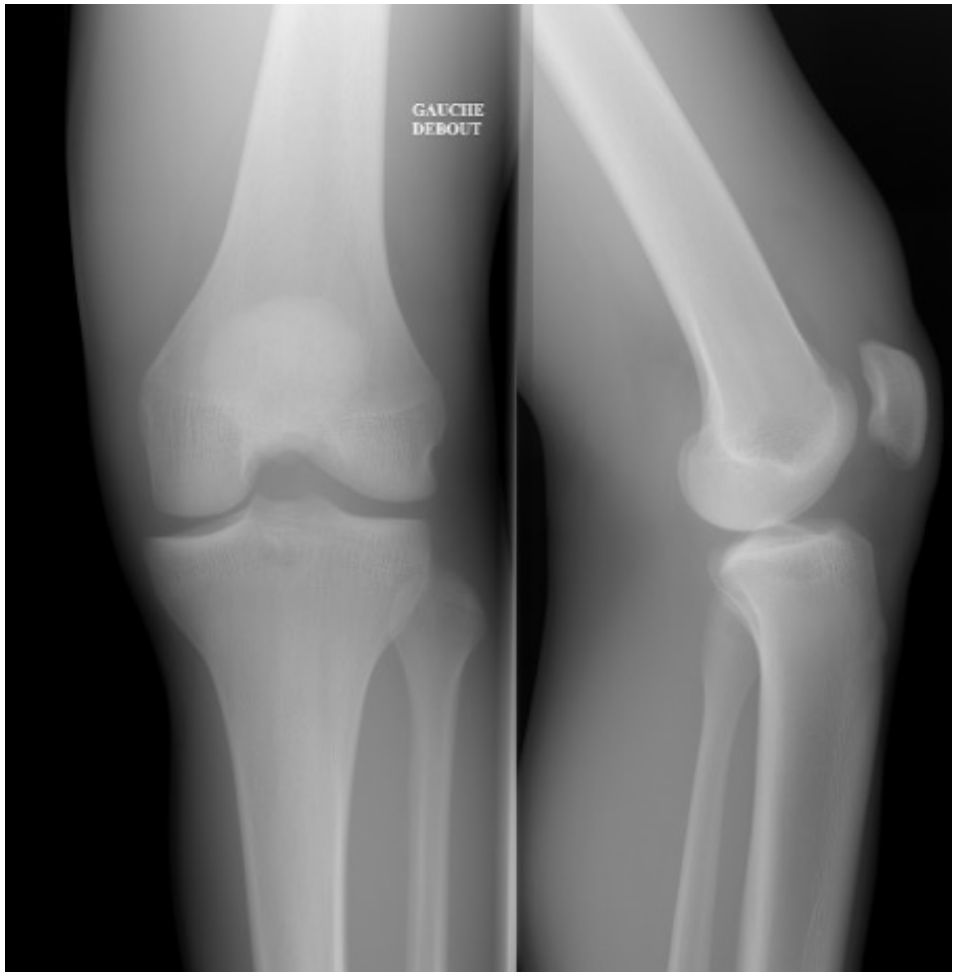
Monopodal weightbearing lateral x-ray

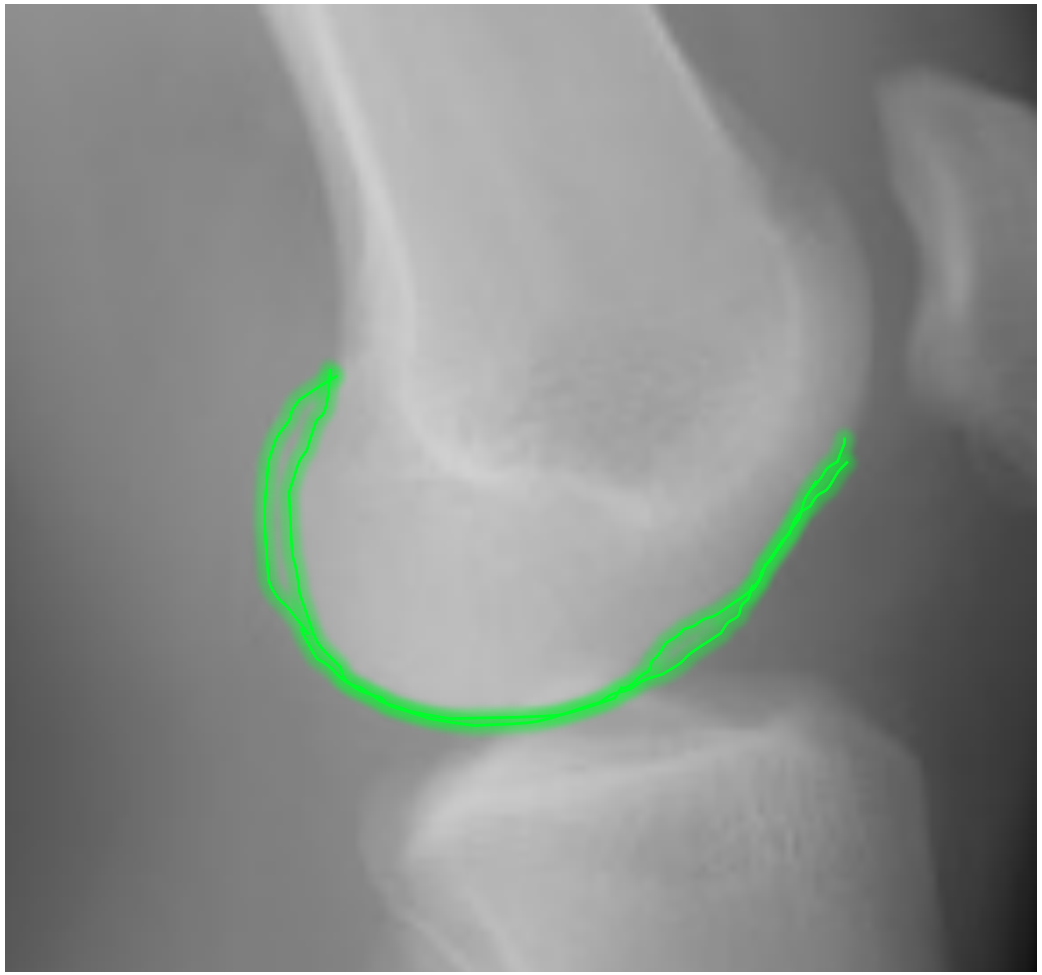




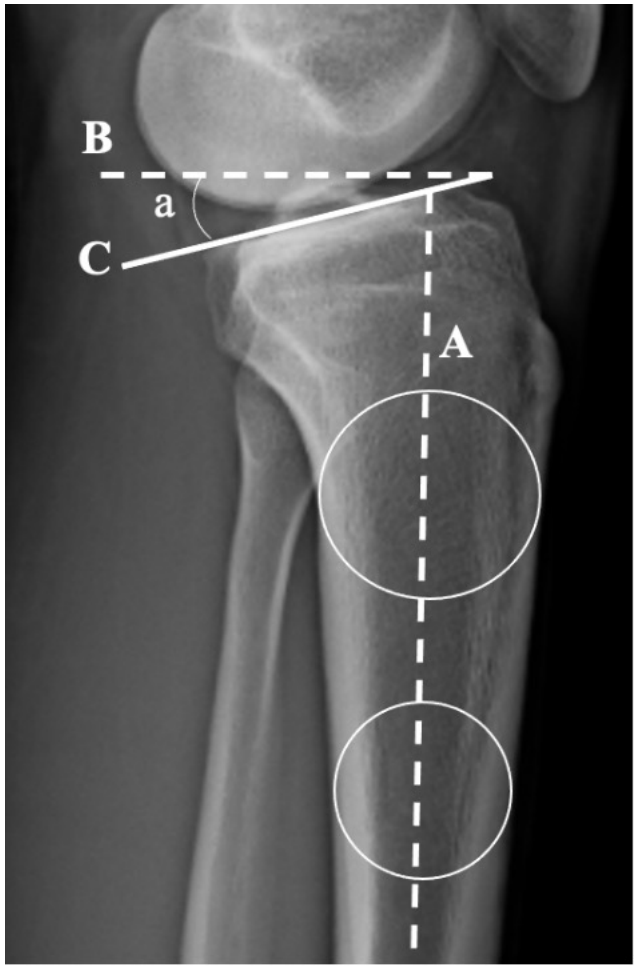
20-30° flexion

Monopodal weightbearing lateral x-ray

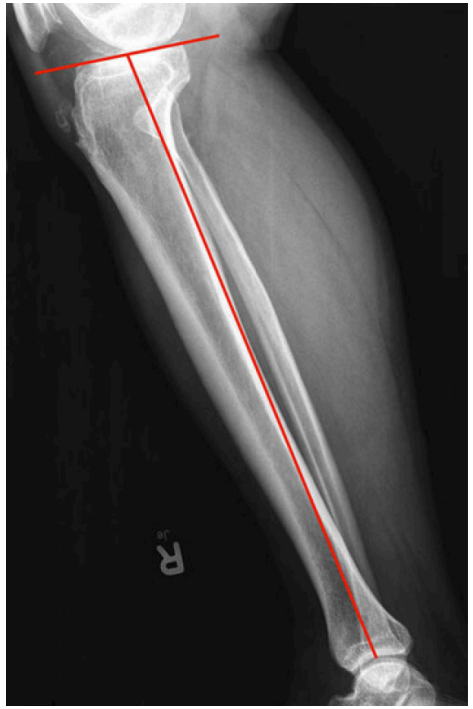


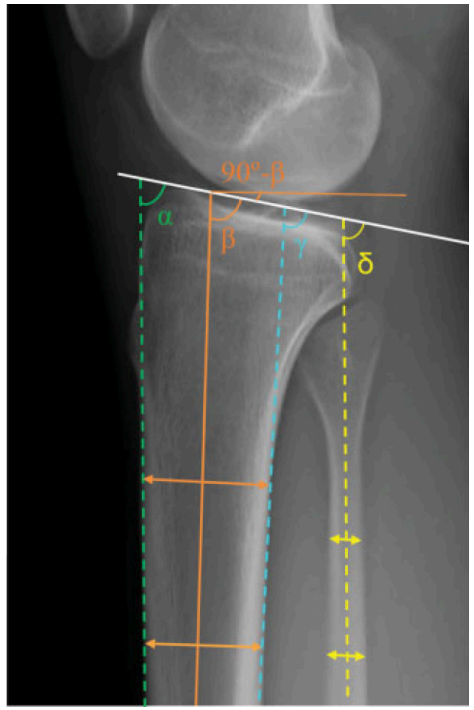


Posterior tibial slope



What is the normal value?





Method	Tibial Slope value
Anterior Tibial cortical	11.44 ± 3.61
Proximal Anatomical Axis (Dejour)	**9.16 ± 3.71**
Long Anatomical Axis	10.39 ± 3.72
Post cortical	6.96 ± 3.28
Fibula Short	9.54 ± 3.62
Fibula Long	8.23 ± 3.51

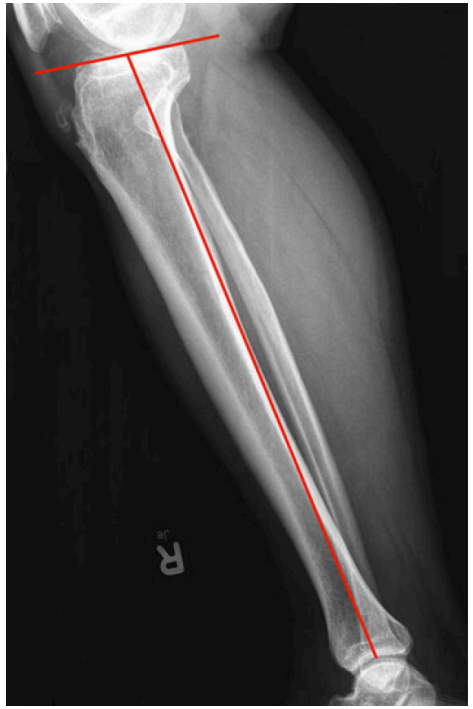
Comparative Study > Rev Chir Orthop Reparatrice Appar Mot. 1996;82(3):195-200.

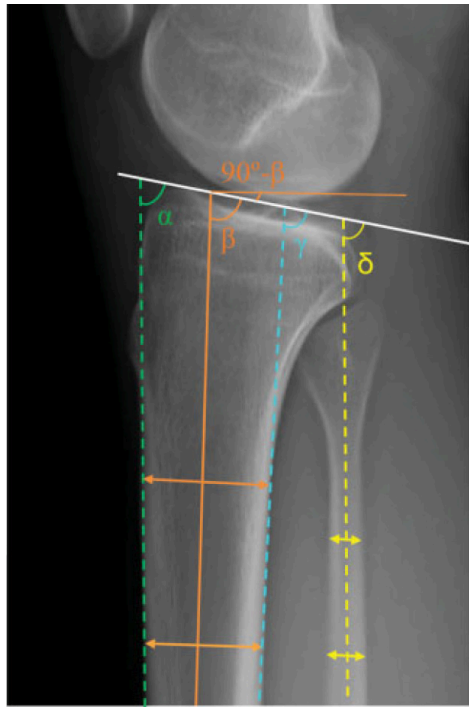
[Evaluation of methods for radiographic measurement of the tibial slope. A study of 83 healthy knees]

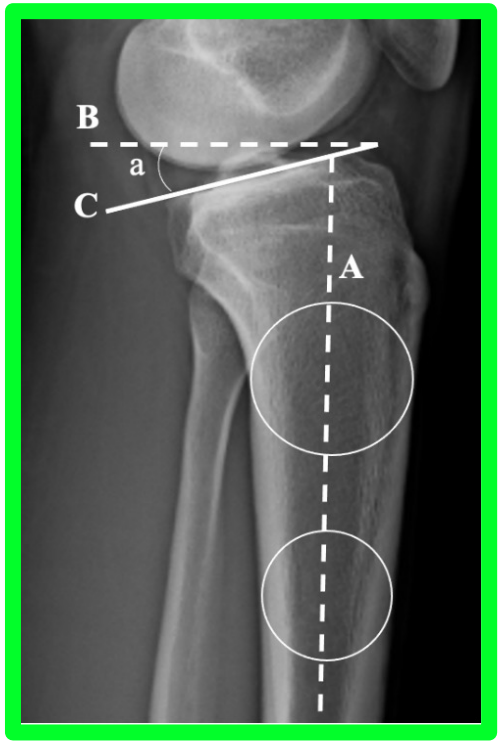
[Article in French]
J Brazier [1], H Migaud, F Gougeon, A Cotten, C Fontaine, A Duquennoy

What is the normal value?

Proximal anatomical axis
Normal value = 9°







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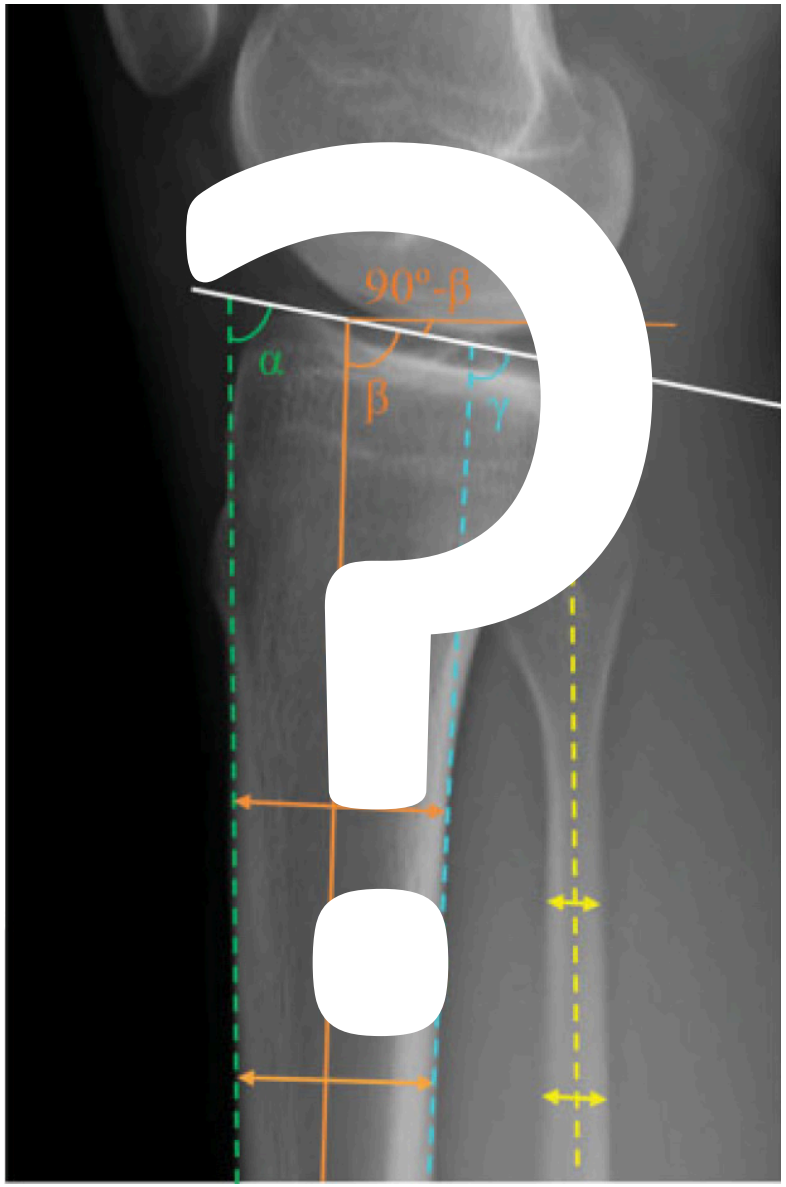


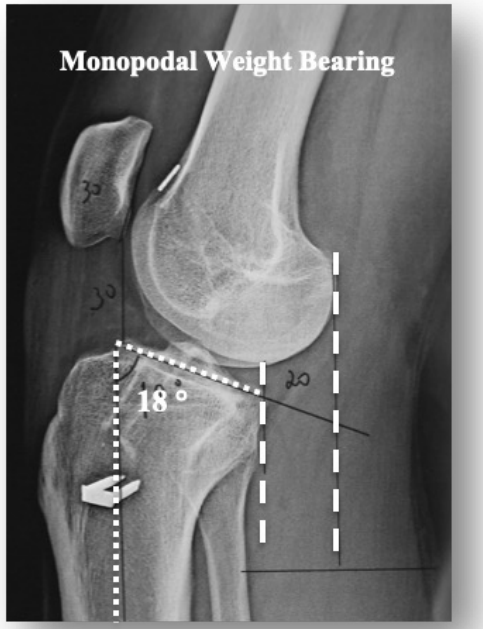
Why measure the tibial slope?

Intrinsic factor of failure after ACLr

> Am J Sports Med. 2013 Dec;41(12):2800-4. doi: 10.1177/0363546513503288. Epub 2013 Sep 13.

Posterior tibial slope and further anterior cruciate ligament injuries in the anterior cruciate ligament-reconstructed patient

Justin M Webb [1], Lucy J Salmon, Etienne Leclerc, Leo A Pinczewski, Justin P Roe



Comparative Study > Am J Sports Med. 2018 Mar;46(3):531-543. doi: 10.1177/0363546517741497. Epub 2017 Dec 15.

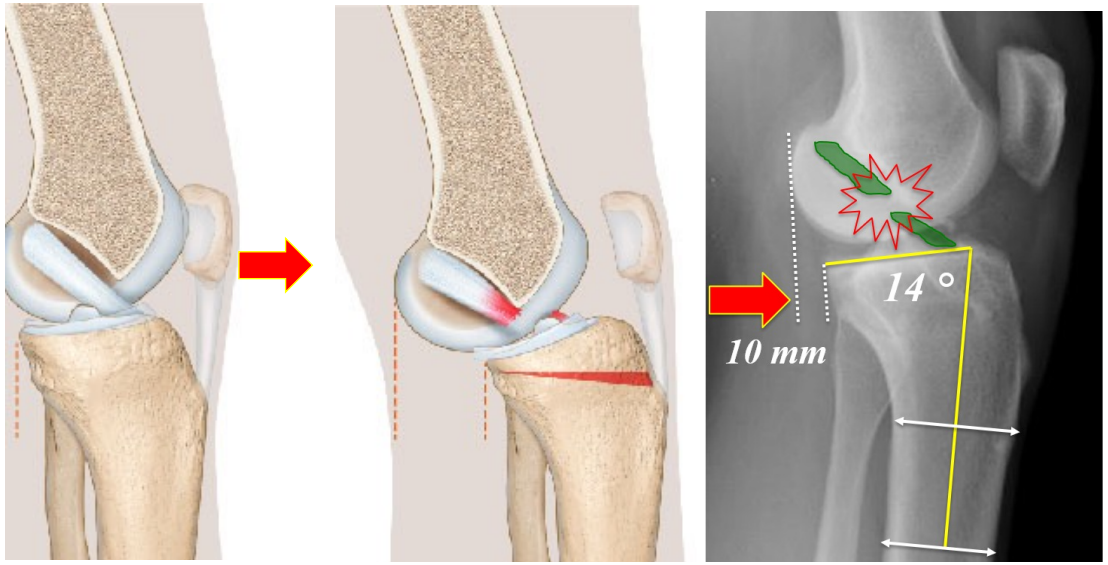
20-Year Outcomes of Anterior Cruciate Ligament Reconstruction With Hamstring Tendon Autograft: The Catastrophic Effect of Age and Posterior Tibial Slope

Lucy J Salmon [1], Emma Heath [1], Hawar Akrawi [1], Justin P Roe [1], James Linklater [2], Leo A Pinczewski [1 3]

Slope > 12°

= 22% failure rate @ 20y FU

Intrinsic factor of failure after ACLr

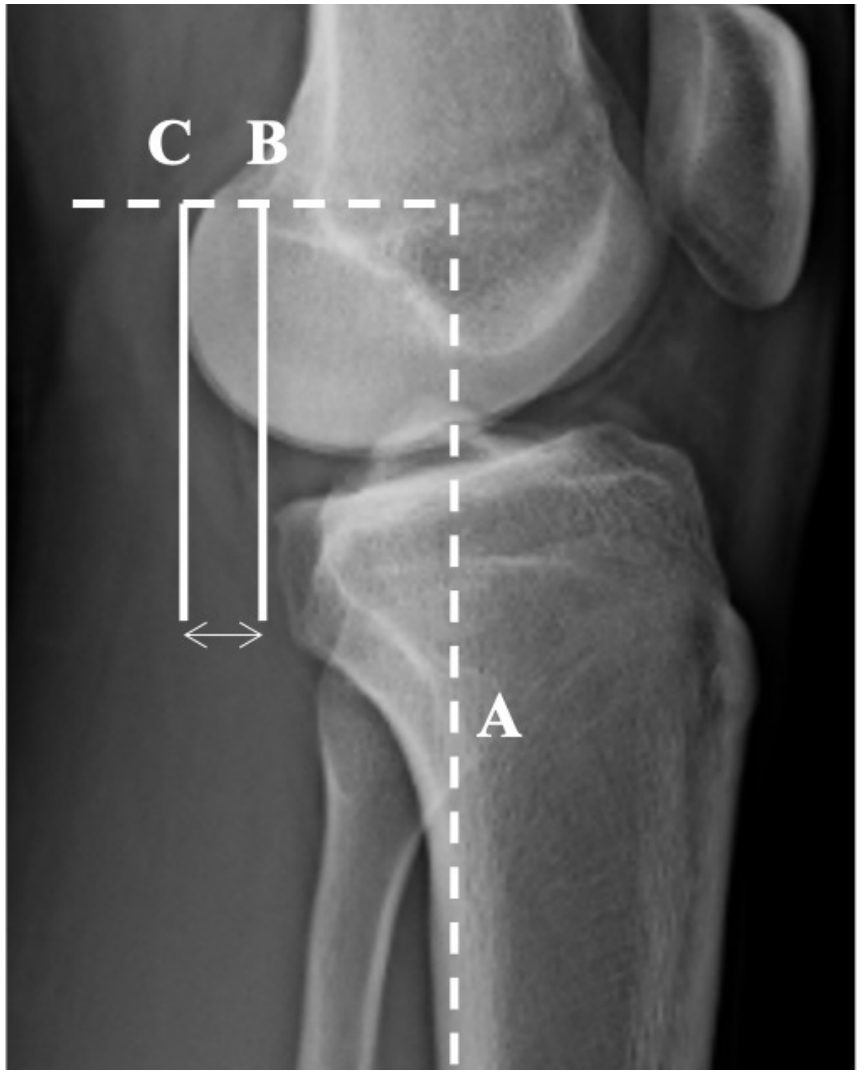


“Graft failure due to fatigue”
Biological failure…

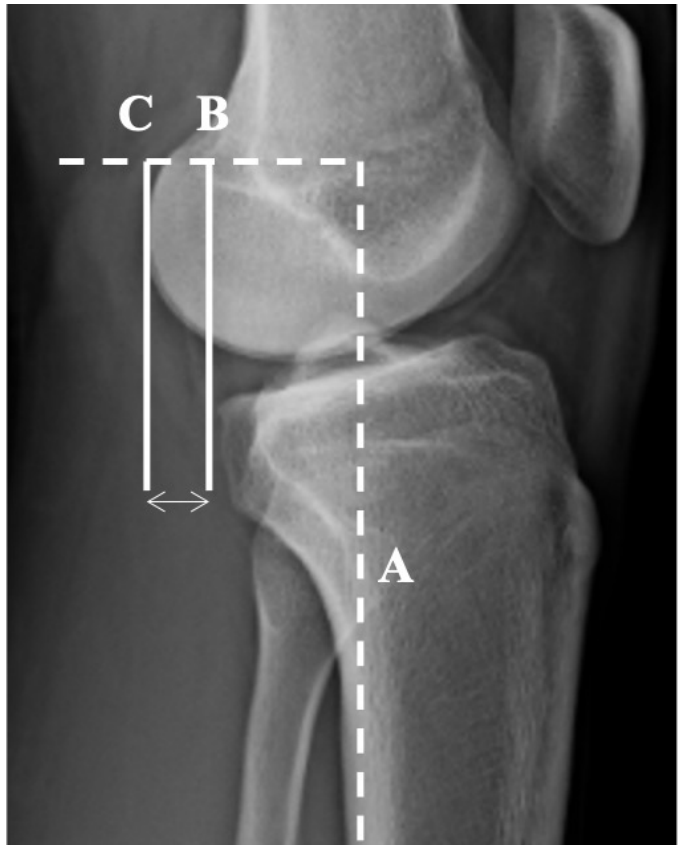
Static Anterior Tibial Translation is larger and is more affected by slope in ACL patients compared to controls

Cance N, Dan MJ, Pineda T, Demey G, Dejour DH

Static anterior tibial translation



Static anterior tibial translation



Normal value = 1.3mm

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La translation tibiale antérieure statique est plus importante et plus affectée par la pente chez les patients atteints de rupture du LCA que chez les témoins

Static anterior tibial translation is larger and is more affected by slope in ACL patients compared to controls

N. CANCE, M. J. Dan, T. Pineda, G. Demey, D. H. Dejour

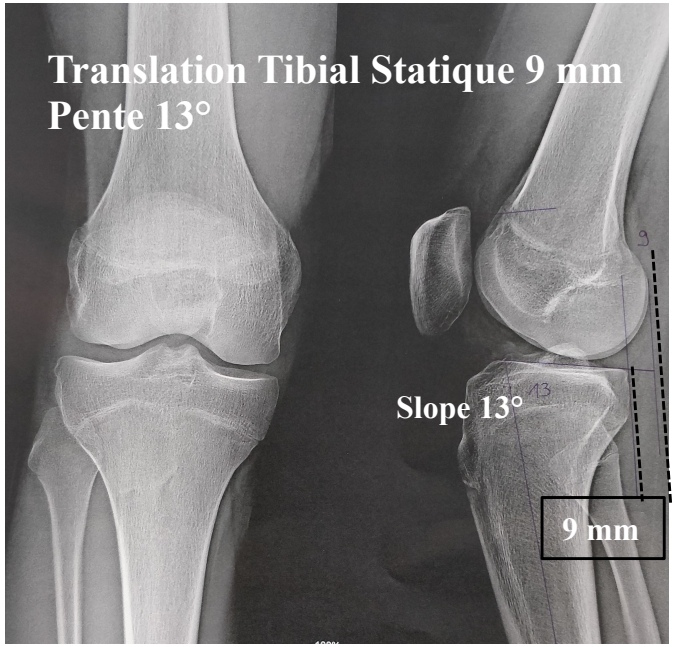
Lyon – Ortho – Clinic
Clinique de la Sauvegarde, LYON

The American Journal of Sports Medicine

LYON ORTHO CLINIC

LYON KNEE SCHOOL OF SURGERY

Static anterior tibial translation



With slope

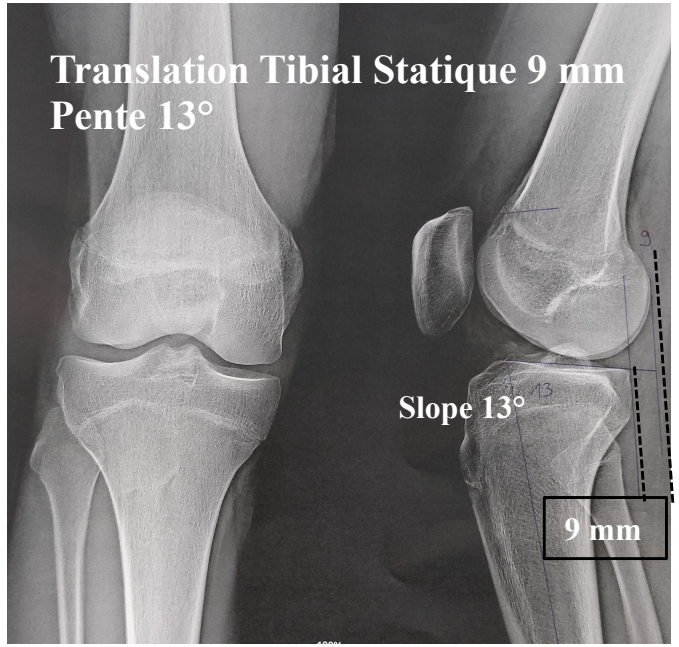
+10° slope = +2.4 to +6mm of translation

> Knee Surg Sports Traumatol Arthrosc. 2019 Nov;27(11):3481-3489.
doi: 10.1007/s00167-019-05435-0. Epub 2019 Feb 26.

Tibial slope and medial meniscectomy significantly influence short-term knee laxity following ACL reconstruction

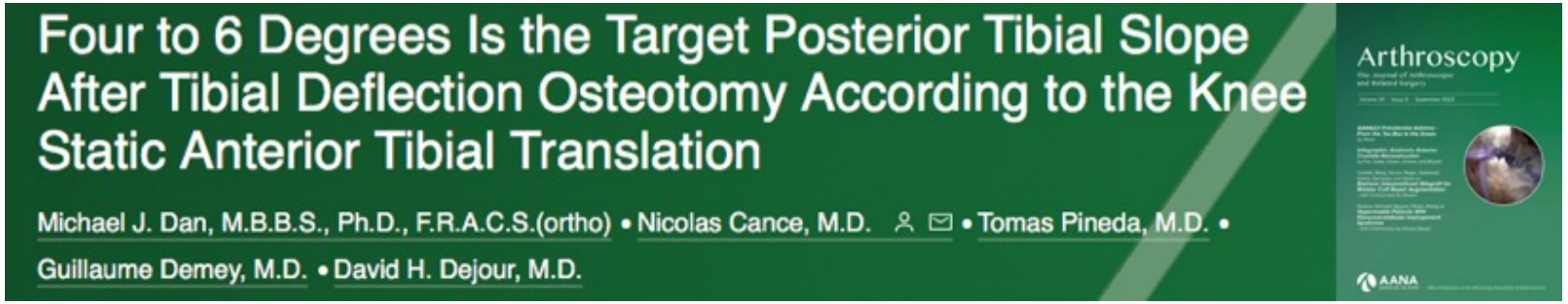
David Dejour [1], Marco Pungitore [1], Jeremy Valluy [2], Luca Nover [2], Mo Saffarini [3], Guillaume Demey [1]

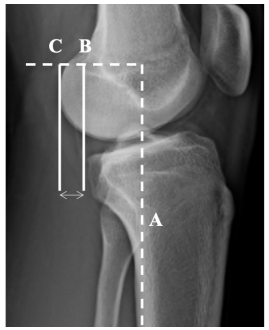
Static anterior tibial translation



With slope

Target slope = between 4° and 6°





Static anterior tibial translation

Risk of ACL rupture or meniscal injury

Cut-off value : > 5mm

> Knee Surg Sports Traumatol Arthrosc. 2019 Nov;27(11):3481-3489.
doi: 10.1007/s00167-019-05435-0. Epub 2019 Feb 26.

Tibial slope and medial meniscectomy significantly influence short-term knee laxity following ACL reconstruction

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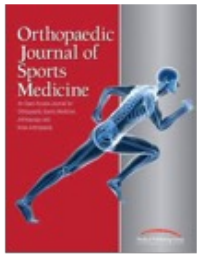
> Am J Sports Med. 2020 Oct;48(12):2954-2961. doi: 10.1177/0363546520949212.
Epub 2020 Aug 31.

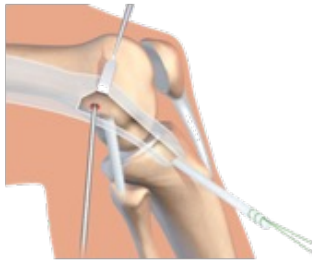
Steep Posterior Tibial Slope and Excessive Anterior Tibial Translation Are Predictive Risk Factors of Primary Anterior Cruciate Ligament Reconstruction Failure: A Case-Control Study With Prospectively Collected Data

Qian-Kun Ni [1], Guan-Yang Song [1], Zhi-Jun Zhang [1], Tong Zheng [1], Zheng Feng [1], Yan-Wei Cao [1], Hua Feng [1], Hui Zhang [1]

The static anterior tibial translation is not improved by the addition of a lateral tenodesis

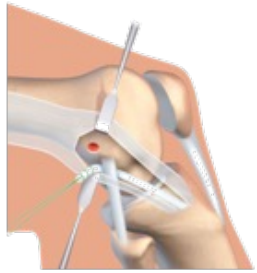


La ténodèse latérale extra-articulaire ne modifie par la translation tibiale antérieure statique ou dynamique lors d'une reconstruction du LCA



T. Pineda, N. Cance, M. J. Dan, G. Demey, D. H. Dejour

Lyon Ortho Clinic
Clinique de la Sauvegarde, LYON



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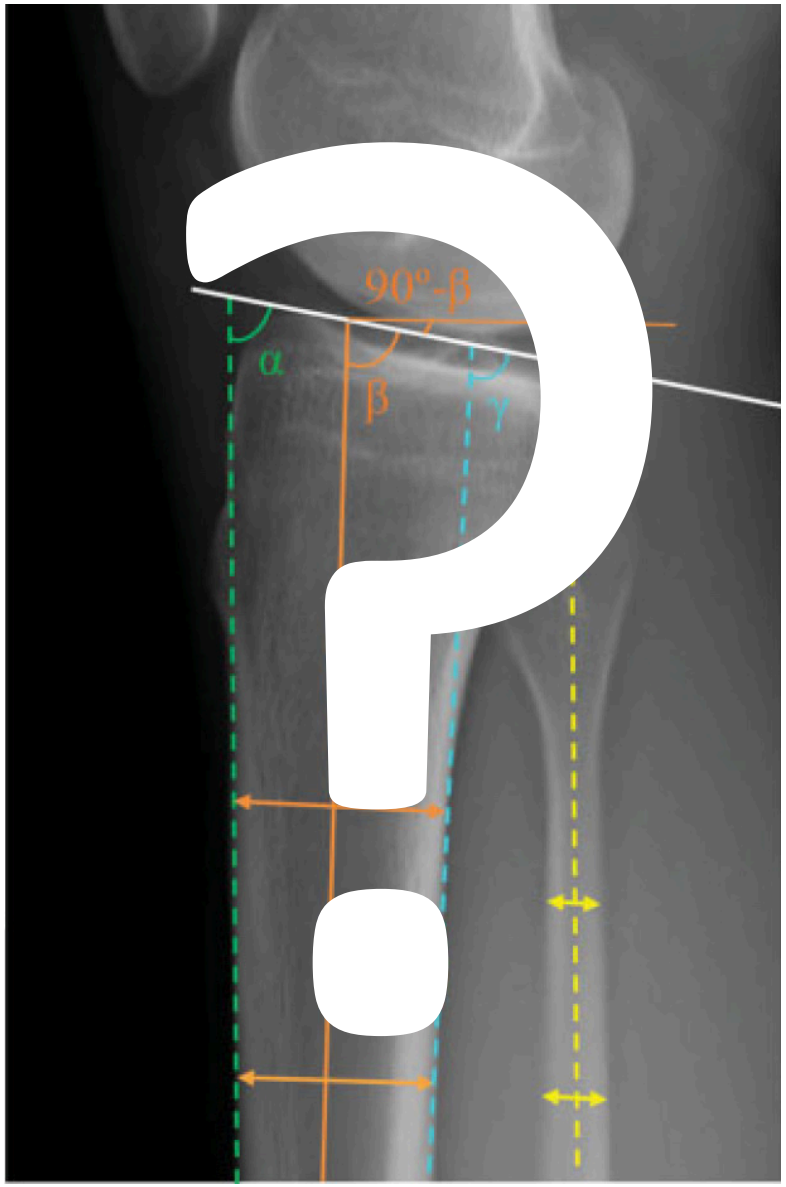
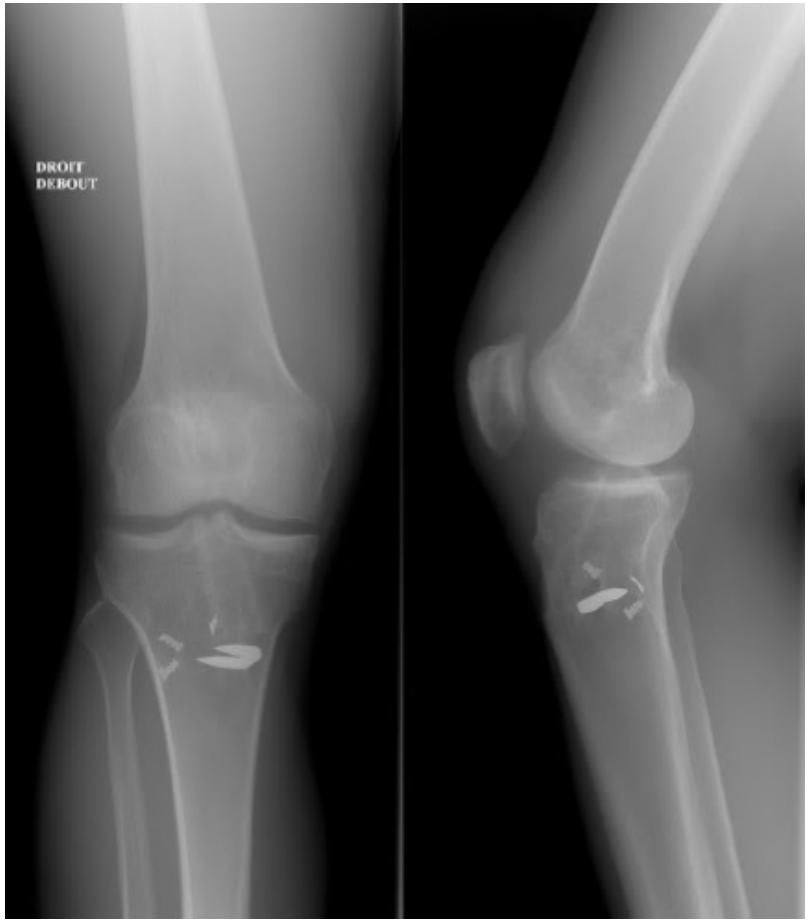
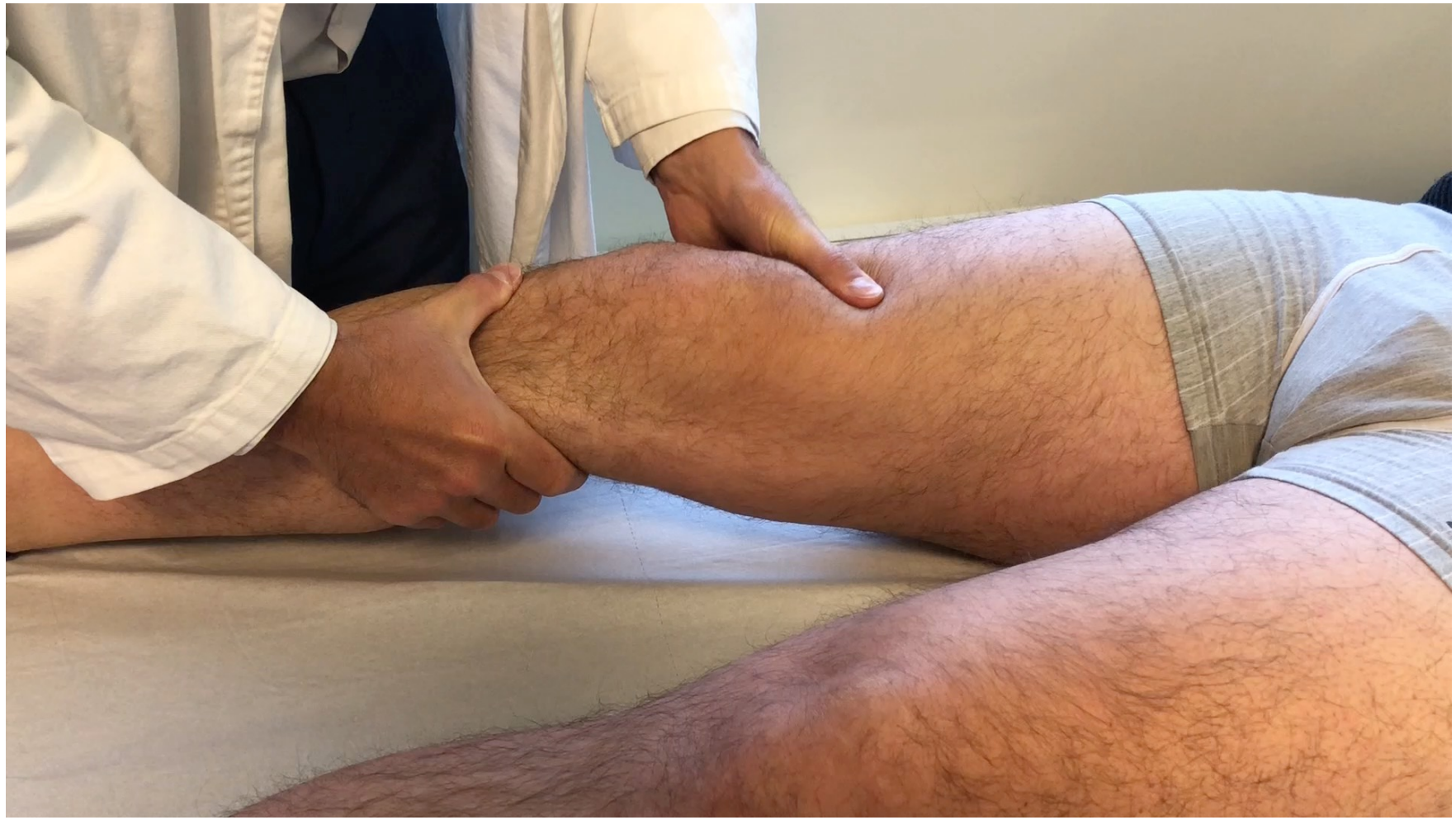
LYON KNEE SCHOOL of SURGERY



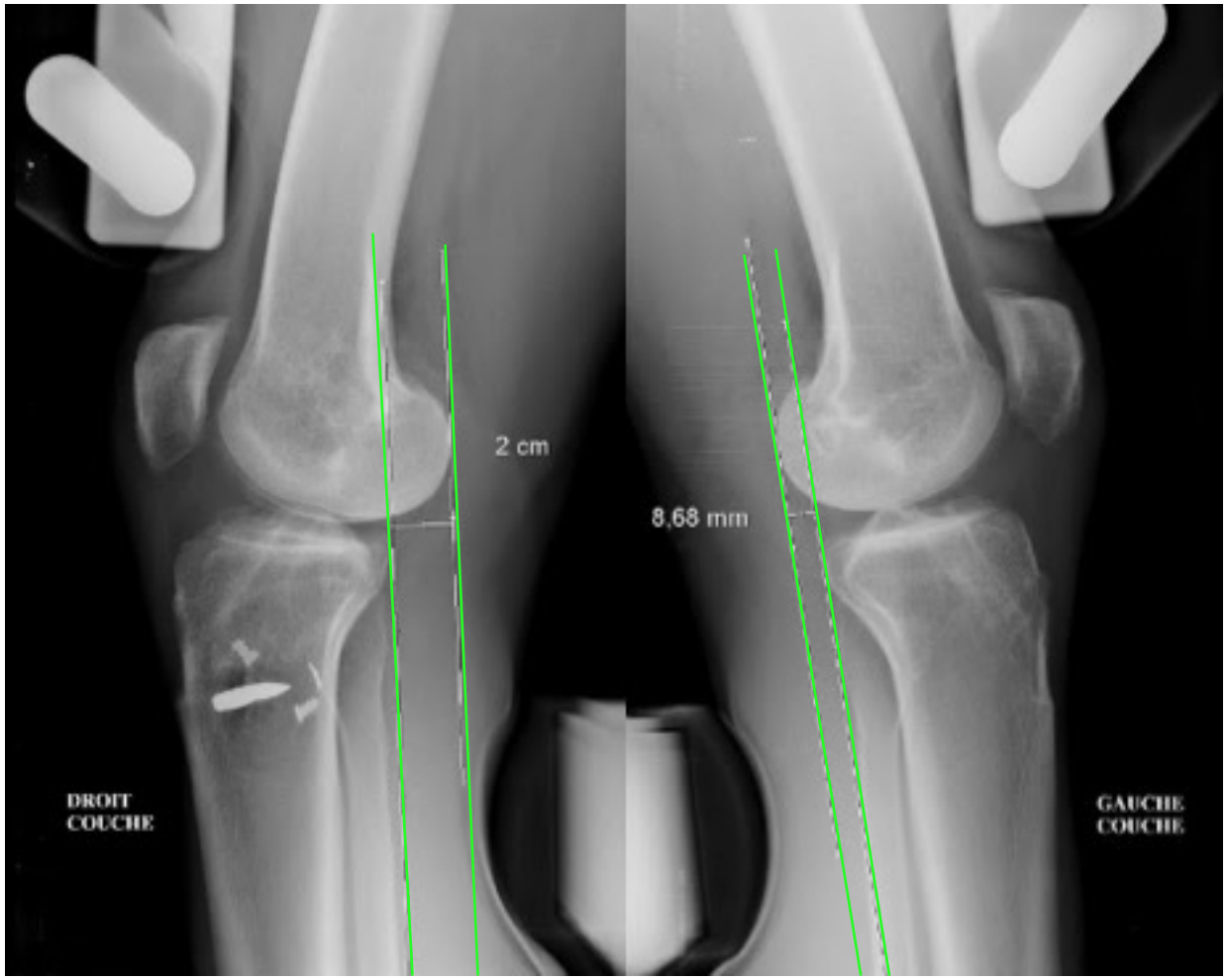
When should we correct the tibial slope?

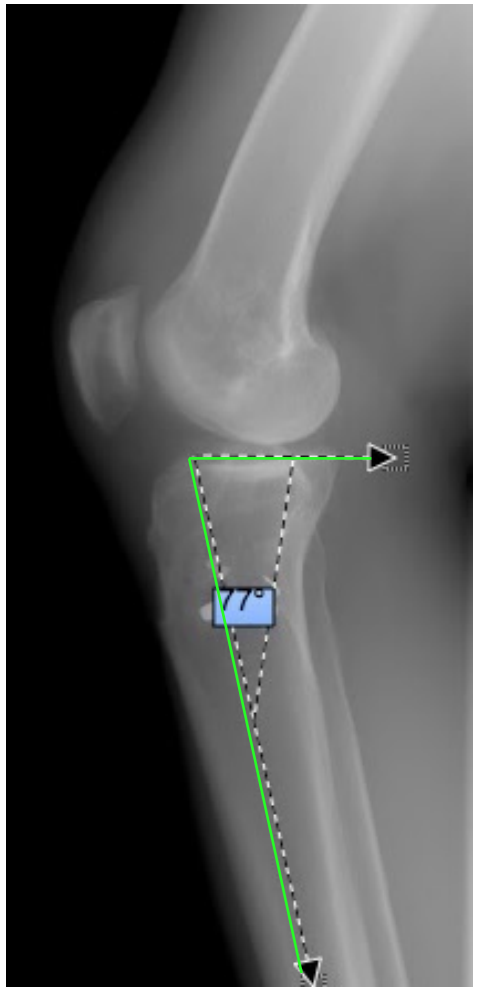
Second revision of the ACL with a slope >10°

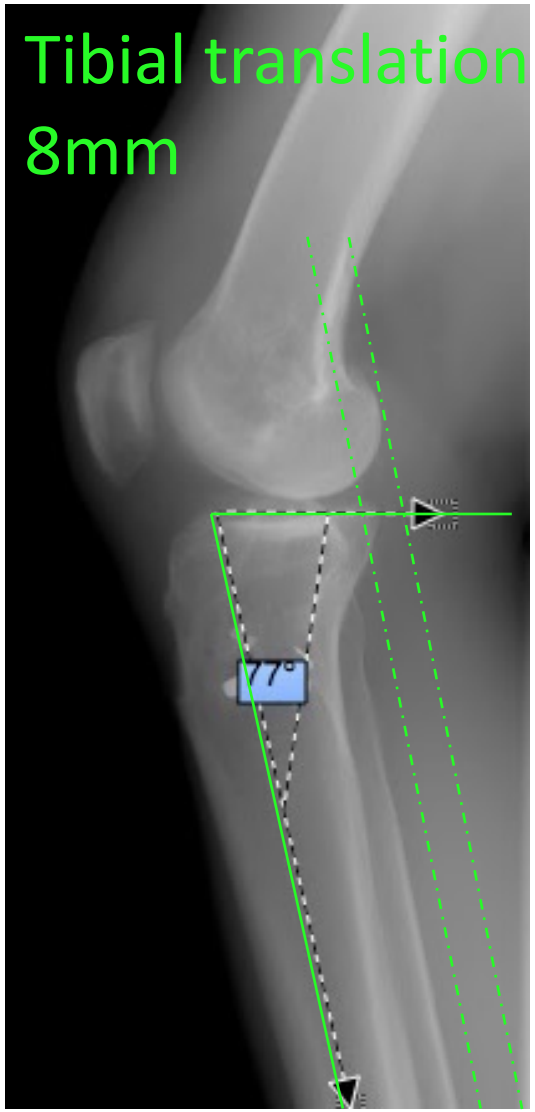




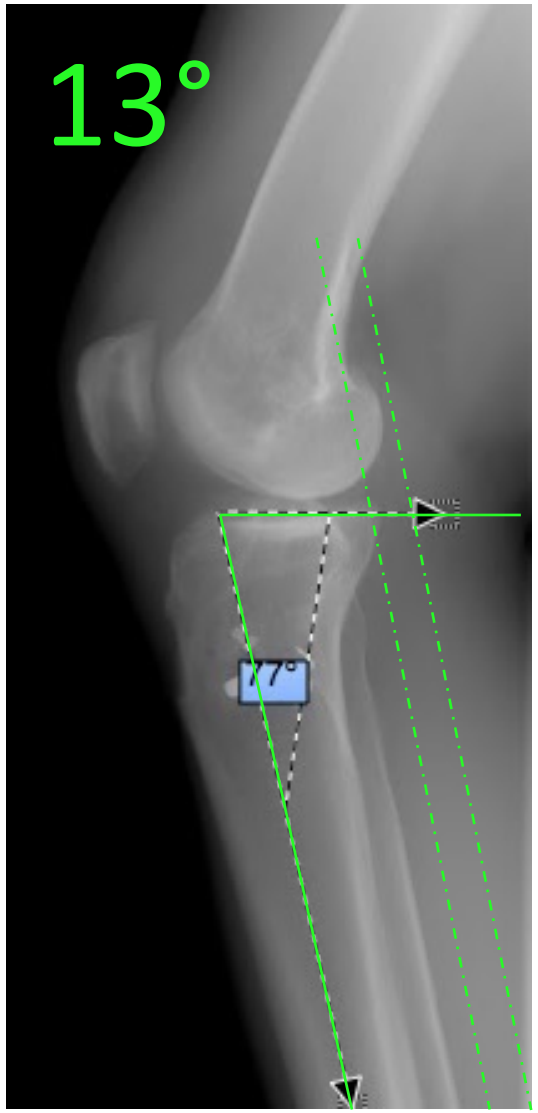
Differential anterior drawer (Telos®) = 12mm Tibial slope = 13°



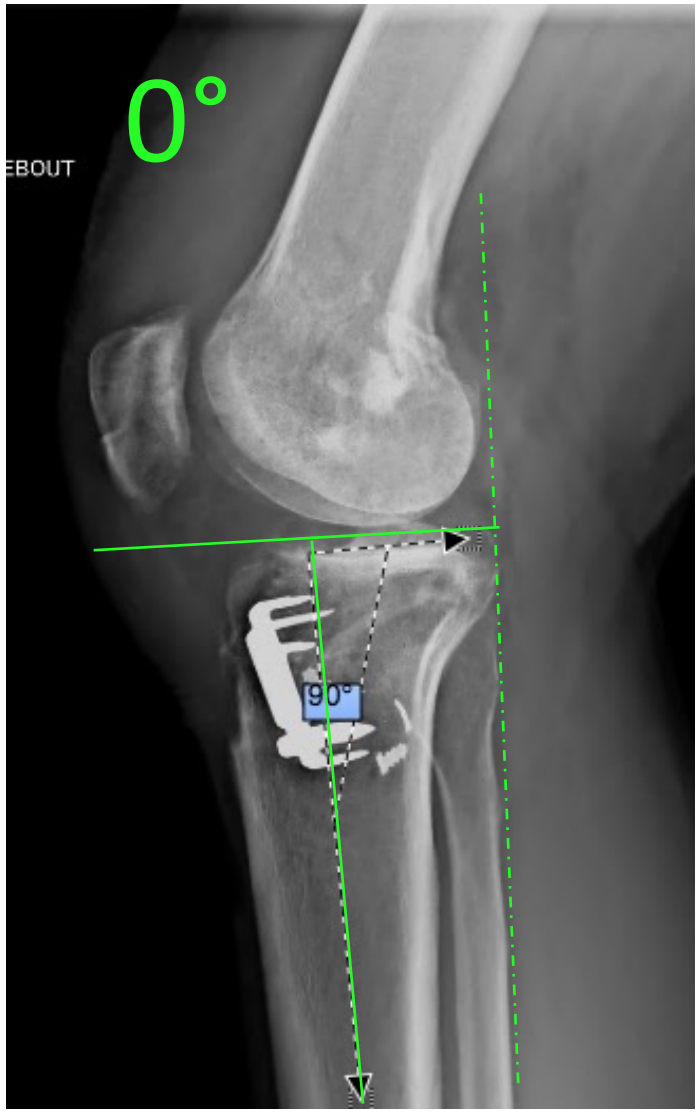




Static anterior tibial translation 8mm



Static anterior tibial translation 0mm



First failure

If primary surgery was done well :
+ Posterior Tibial Slope >10°
+ Anterior Tibial Translation >5mm

Knee Surgery, Sports Traumatology, Arthroscopy (2023) 31:4467–4473
https://doi.org/10.1007/s00167-023-07493-x

KNEE

Check for updates

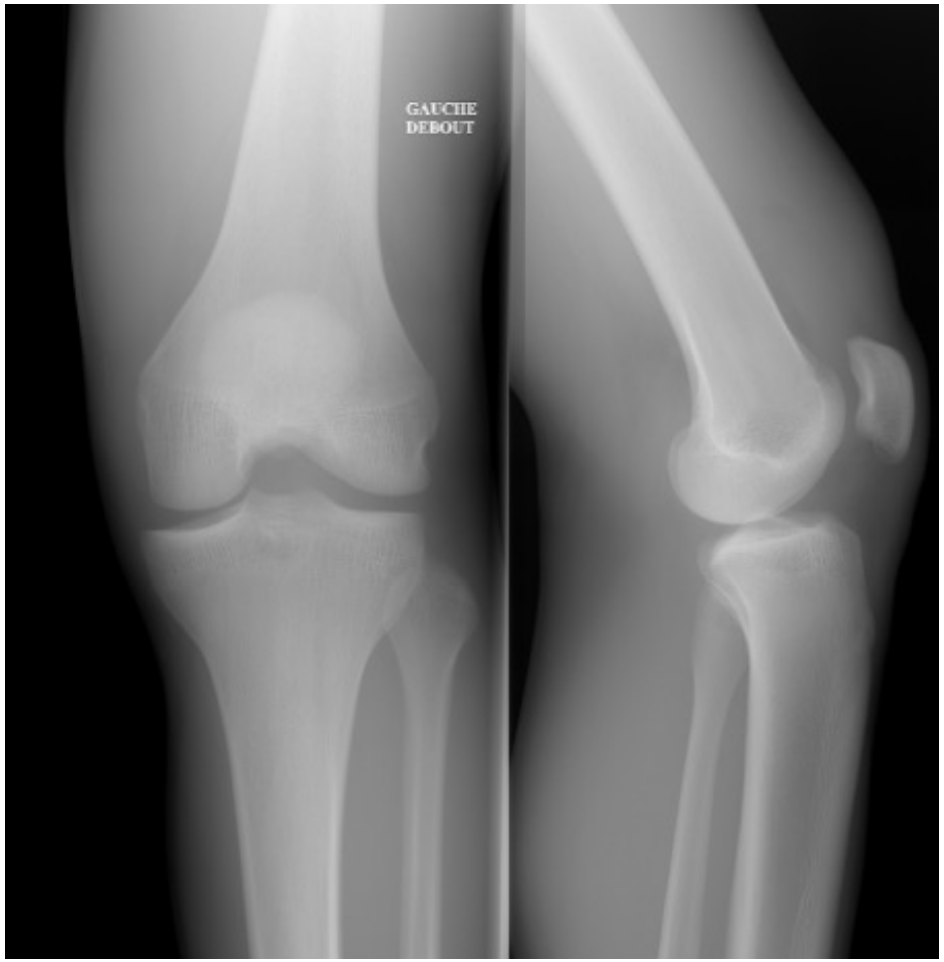
First revision ACL reconstruction combined with tibial deflexion osteotomy improves clinical scores at 2 to 7 years follow-up

David Dejour[1] · Anouk Rozinthe[1] · Guillaume Demey[1] · ReSurg[2]

Received: 22 March 2023 / Accepted: 12 June 2023 / Published online: 29 July 2023

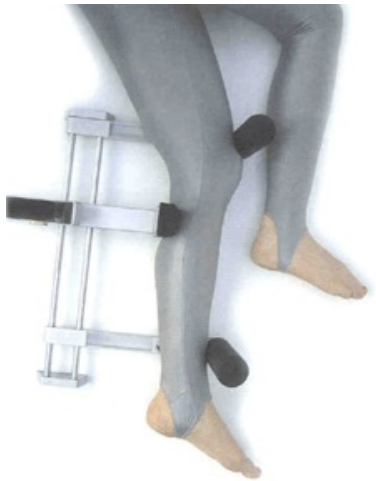
Primary ACL reconstruction?

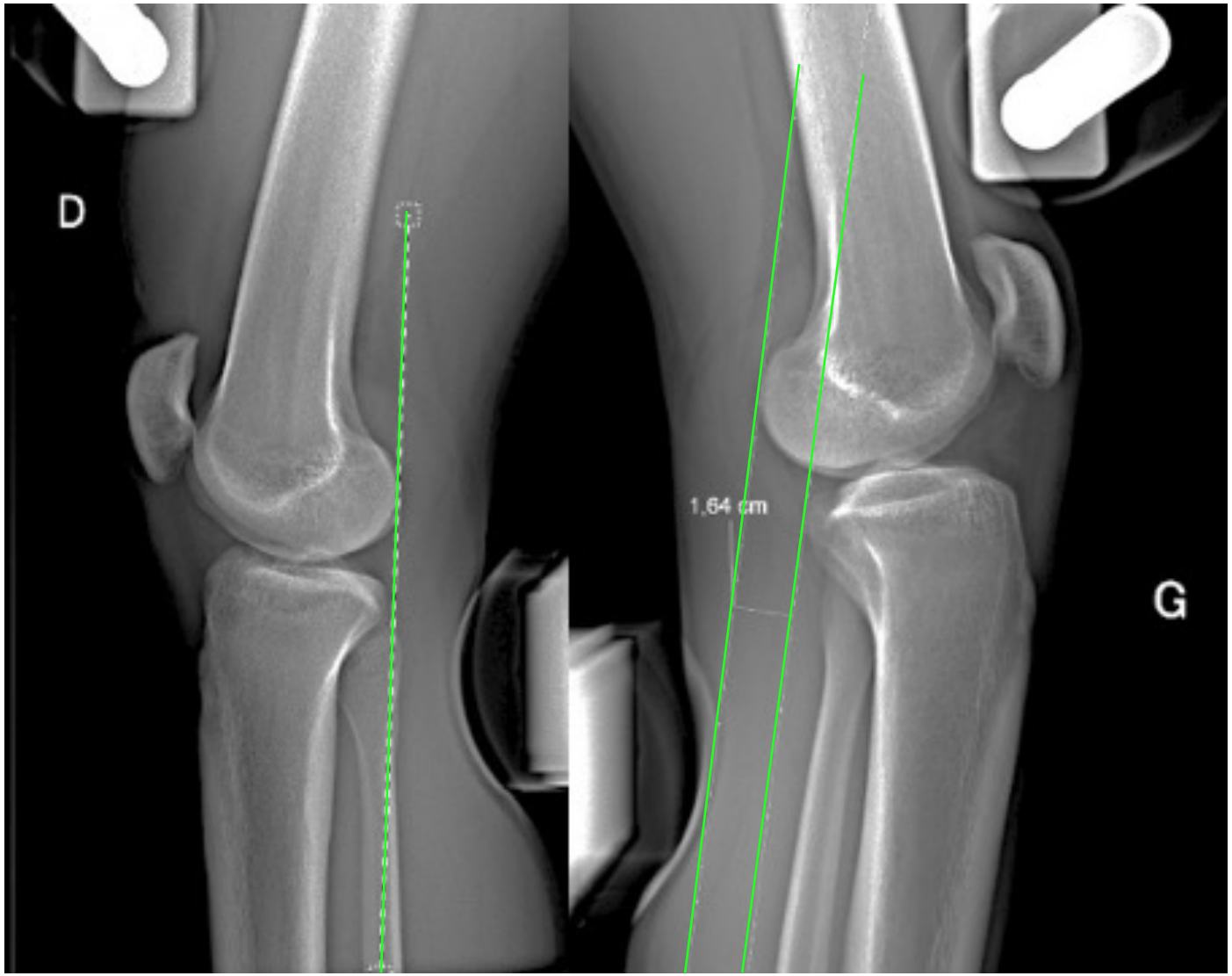
- Male 18 yo
- Soccer player
- ACL rupture 6 months ago
- Non-contact pivot injury
- Instability
- Clinical examination...

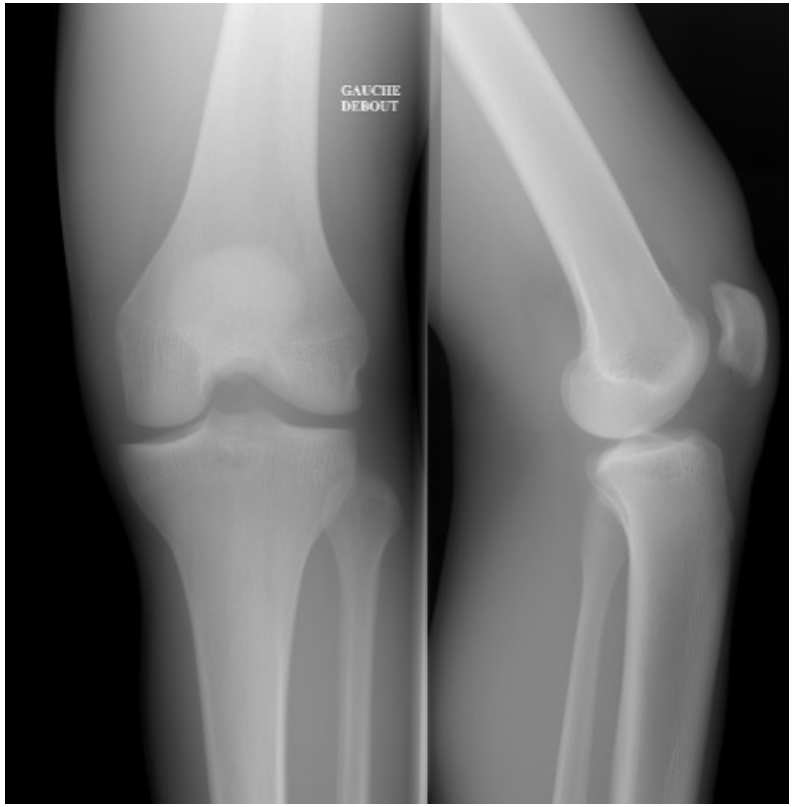


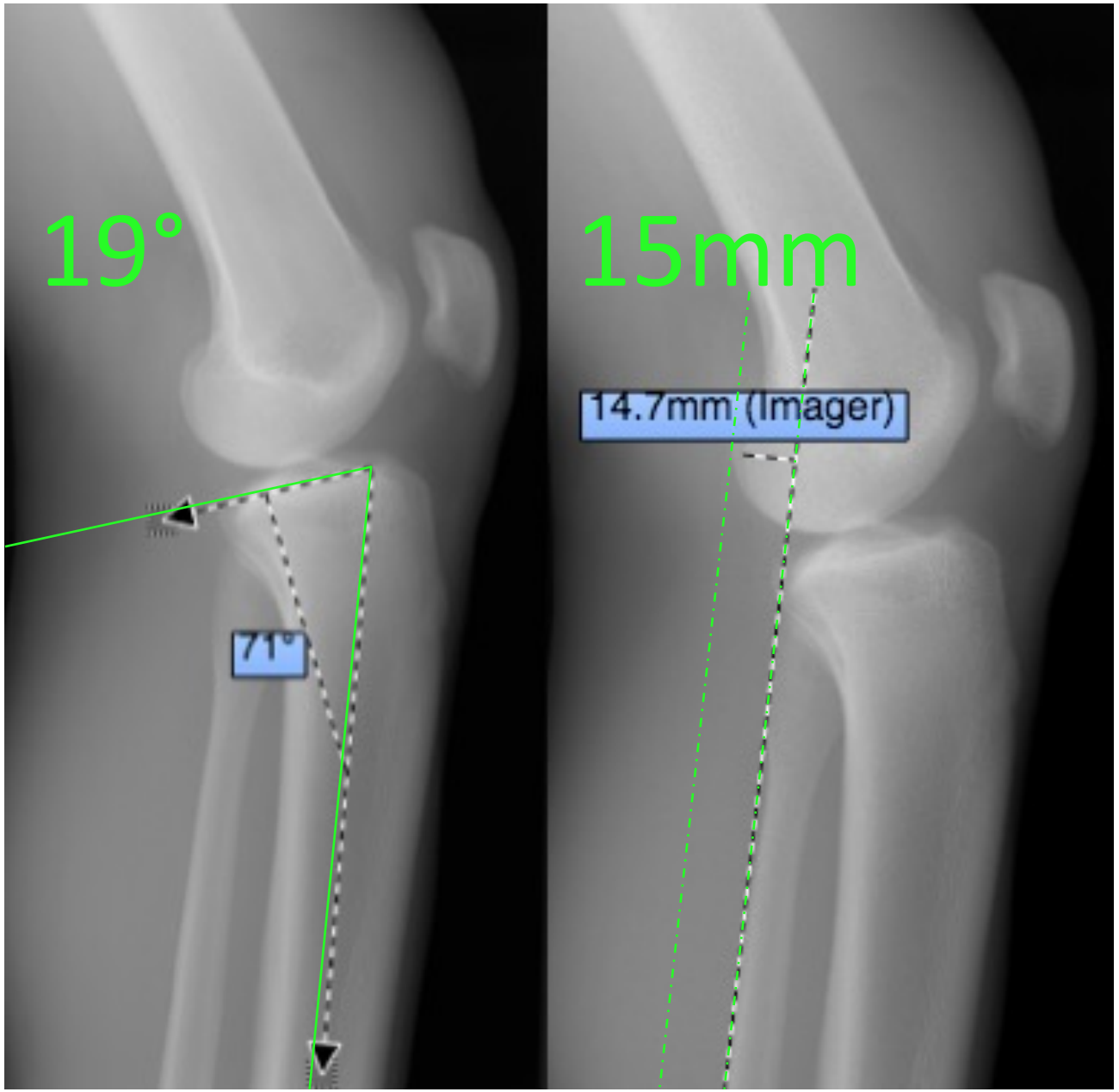
Primary ACL reconstruction

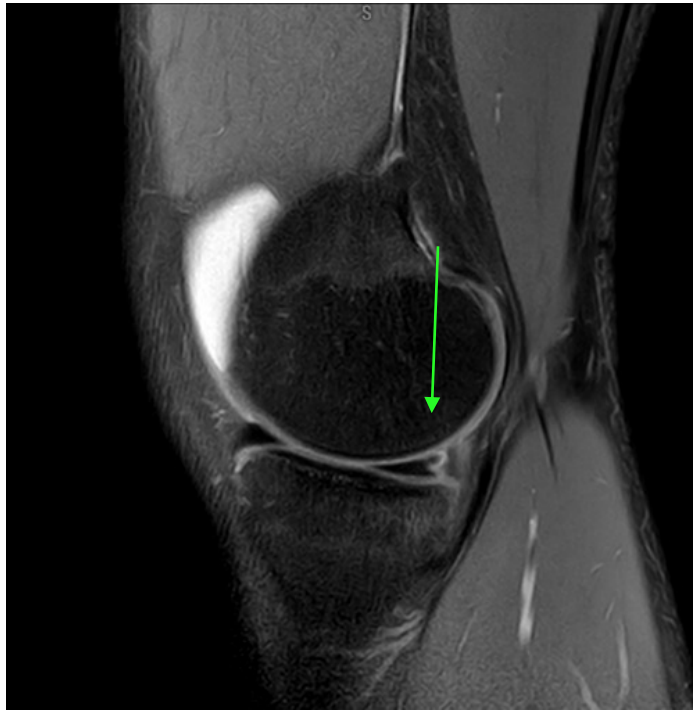
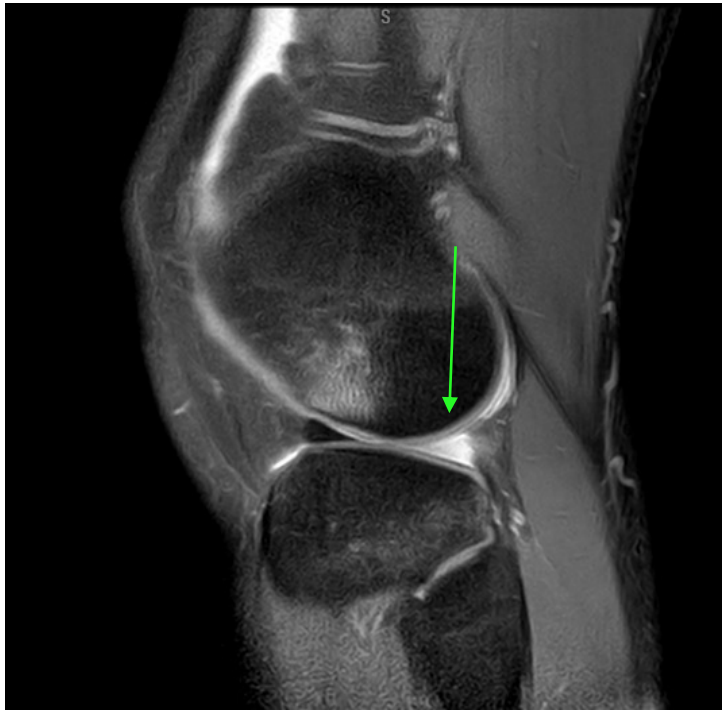
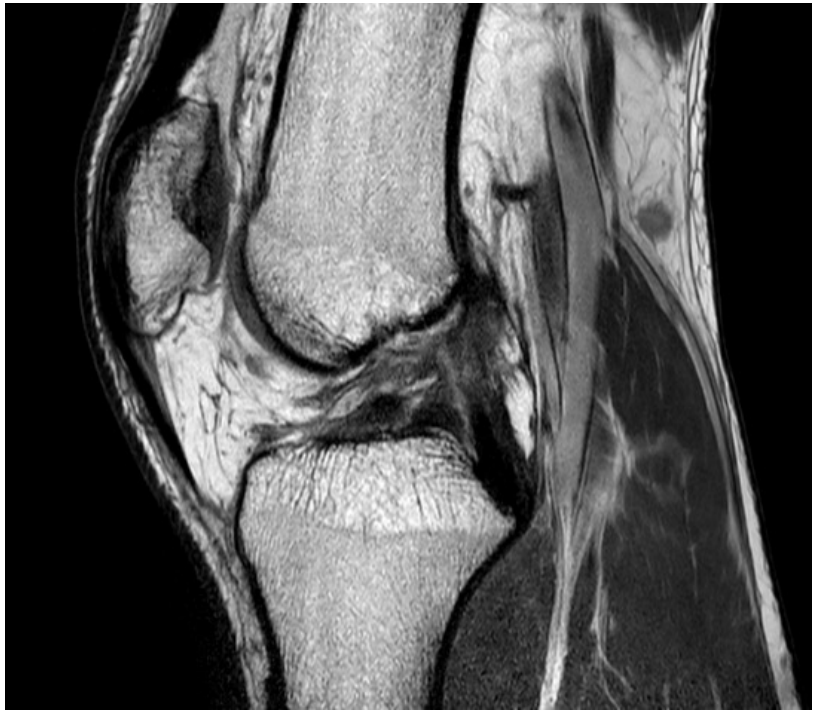
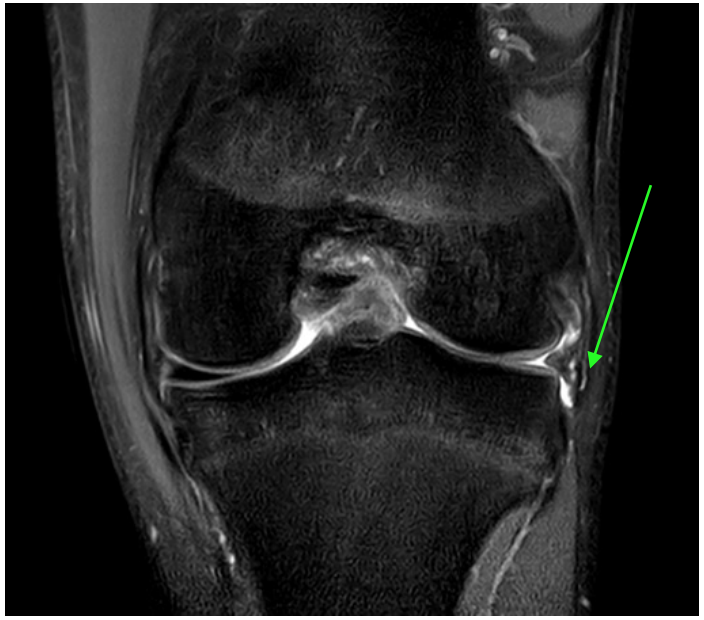
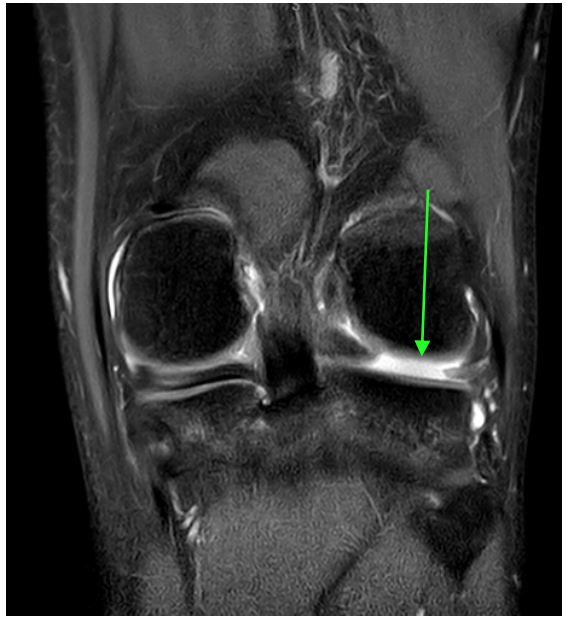
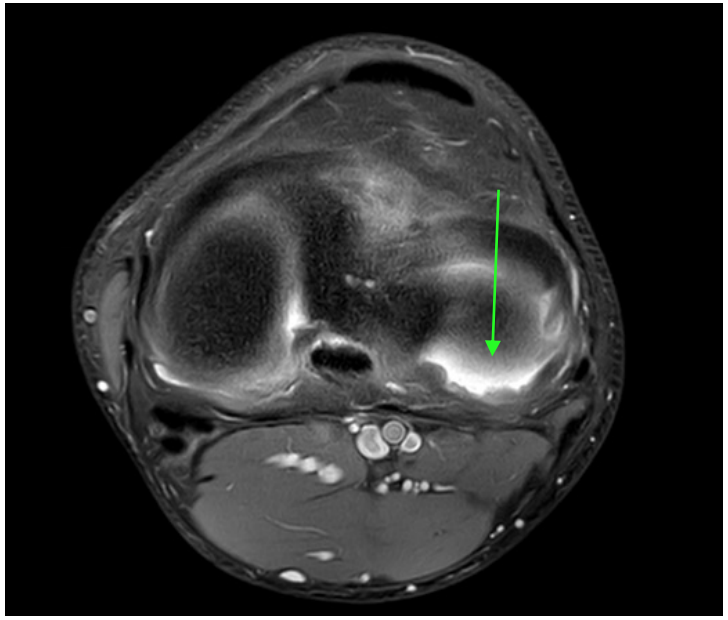
Anterior drawer (Telos®) side to side difference = 16mm

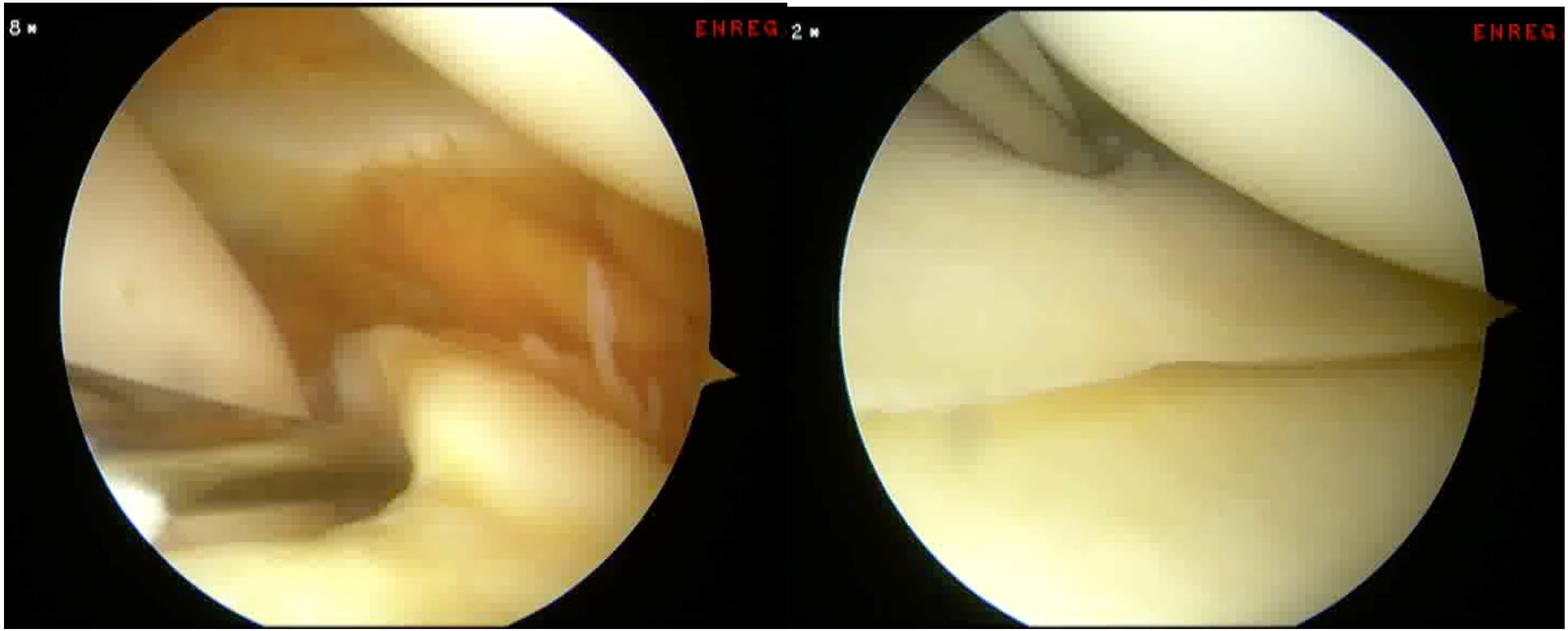





GAUCHE
DEBOUT


19°
71°
15mm
14.7mm (Imager)


8 ✖
ENREG 2 ✖
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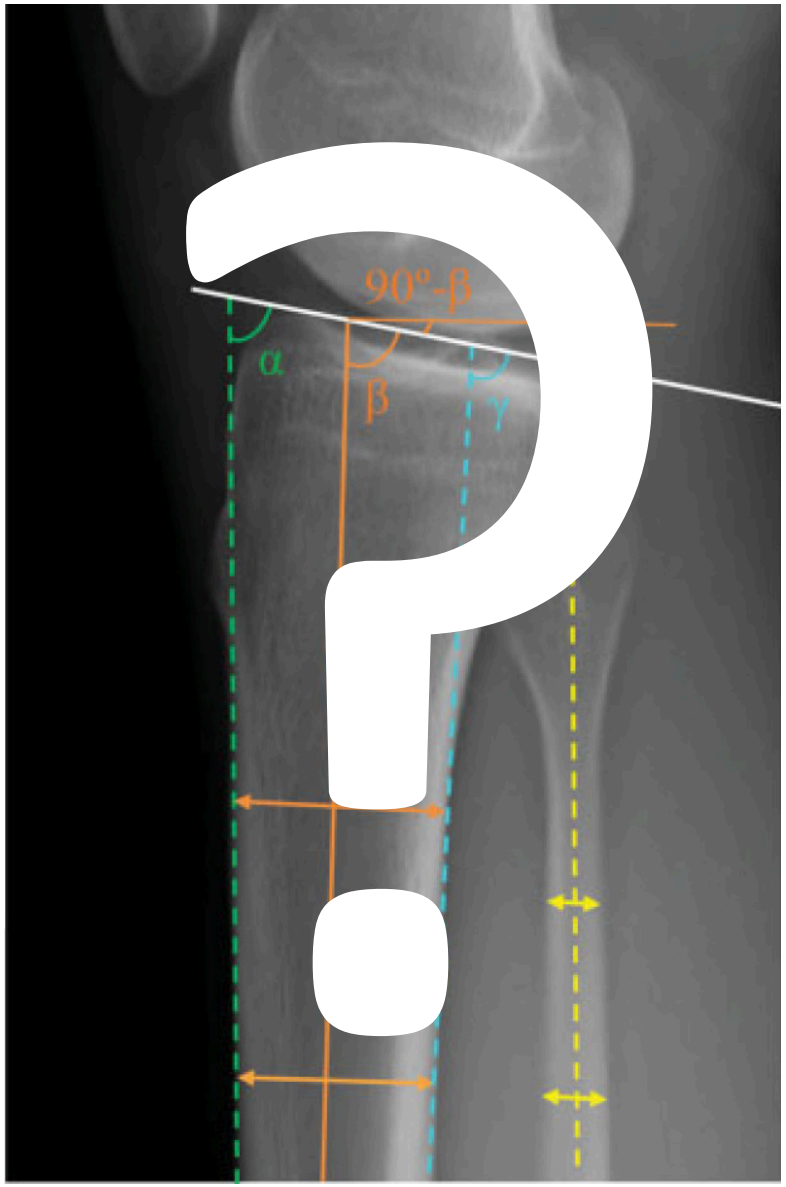
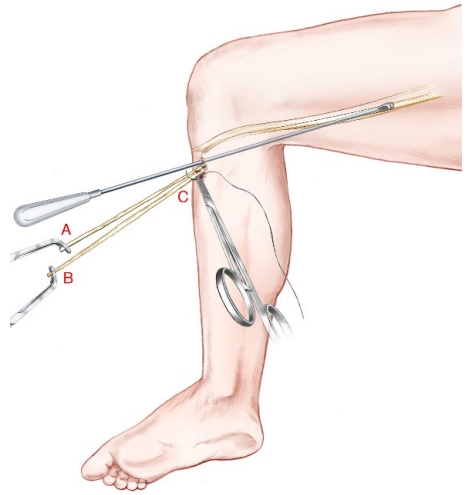


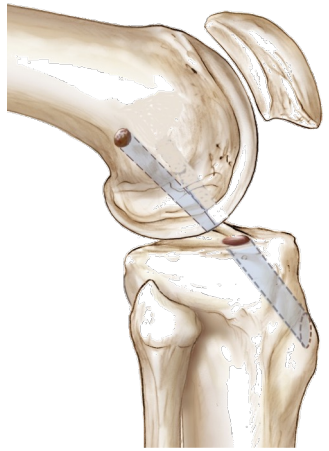
How to correct the tibial slope?

1st steps

- ✓Graft harvest
- ✓Arthroscopy
  - Meniscal treatment
  - Creation of tunnels (positioning and reaming)

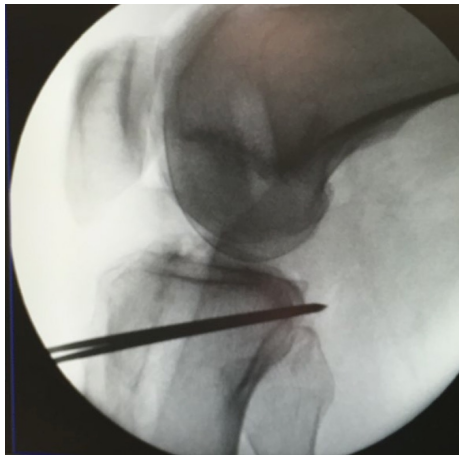


No graft passage: osteotomy is performed



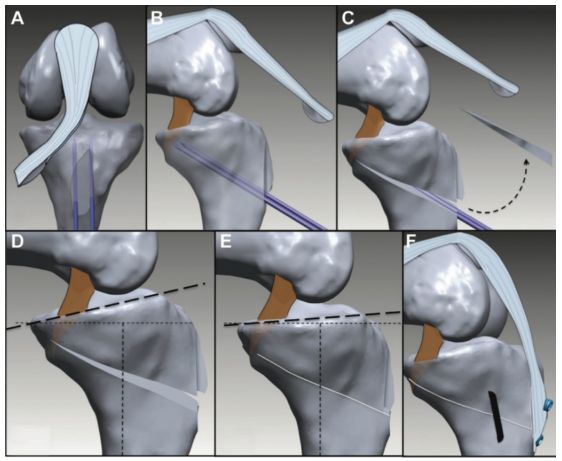
Slope correction osteotomy (anterior closing wedge)

Supra-tuberosity



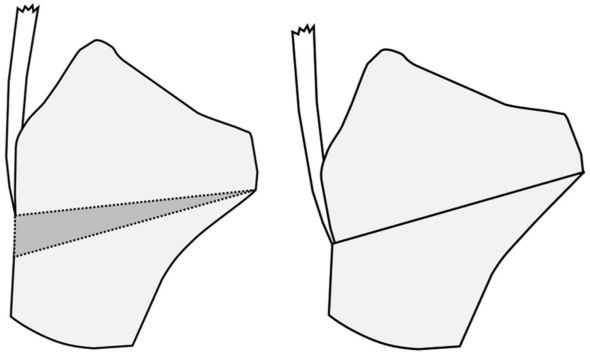
H Dejour Lyon knee meeting 1991
D Dejour RCO 1998
D Dejour et al, KSSTA 2015 2022

Trans-tuberosity



B Sonnery-Cottet et al, AJSM 2014

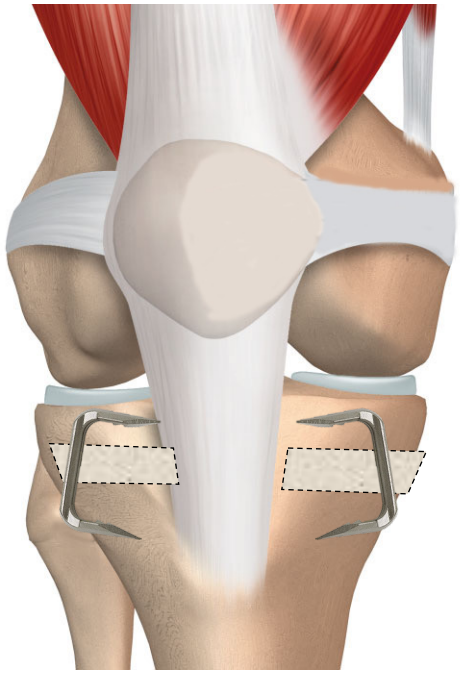
Infra-tuberosity



T Hees, W Petersen,
Arthrosc Tech 2018

"CLASSIC" SLOPE REDUCING TIBIAL OSTEOTOMY

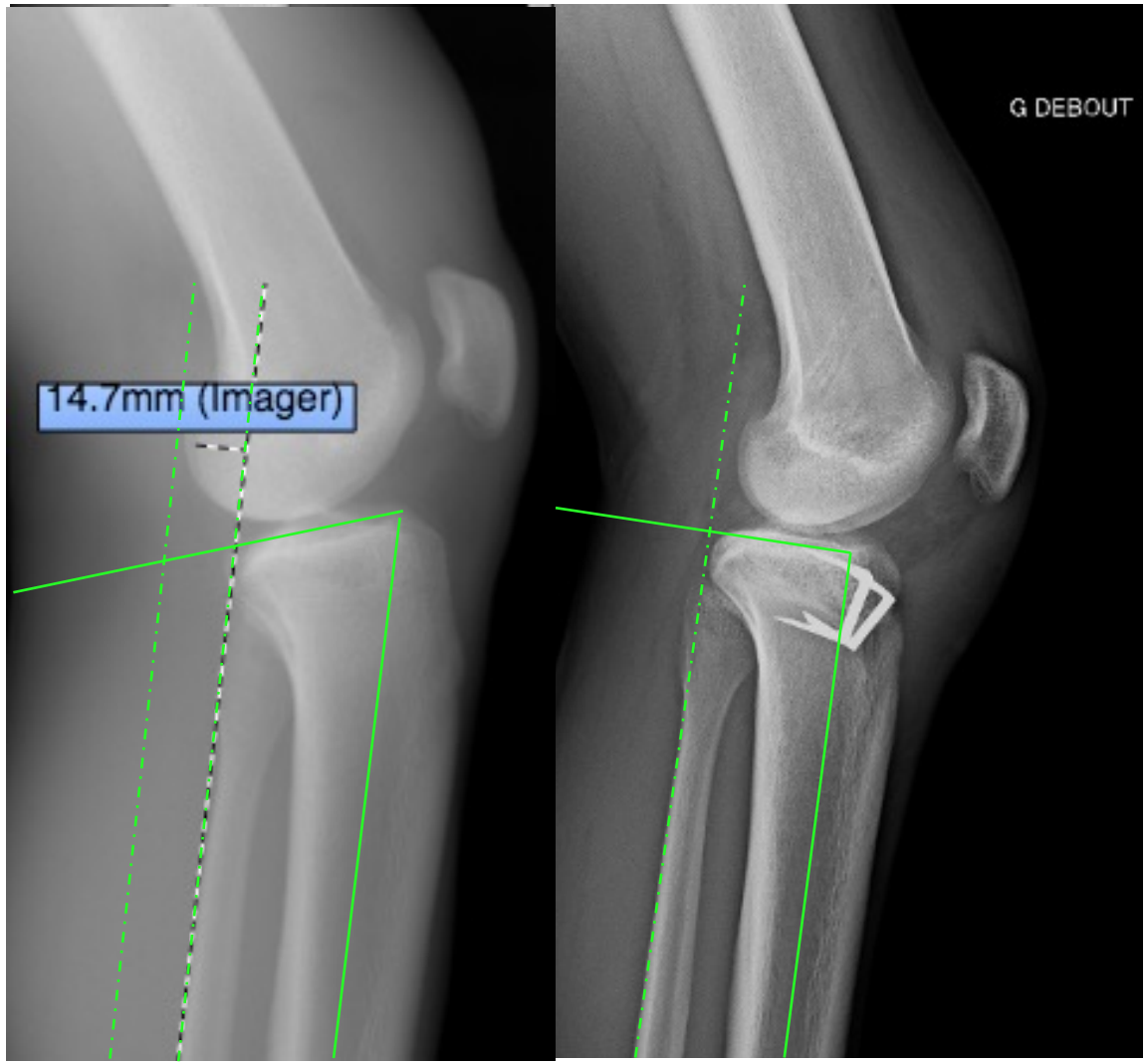
Postoperative follow-up



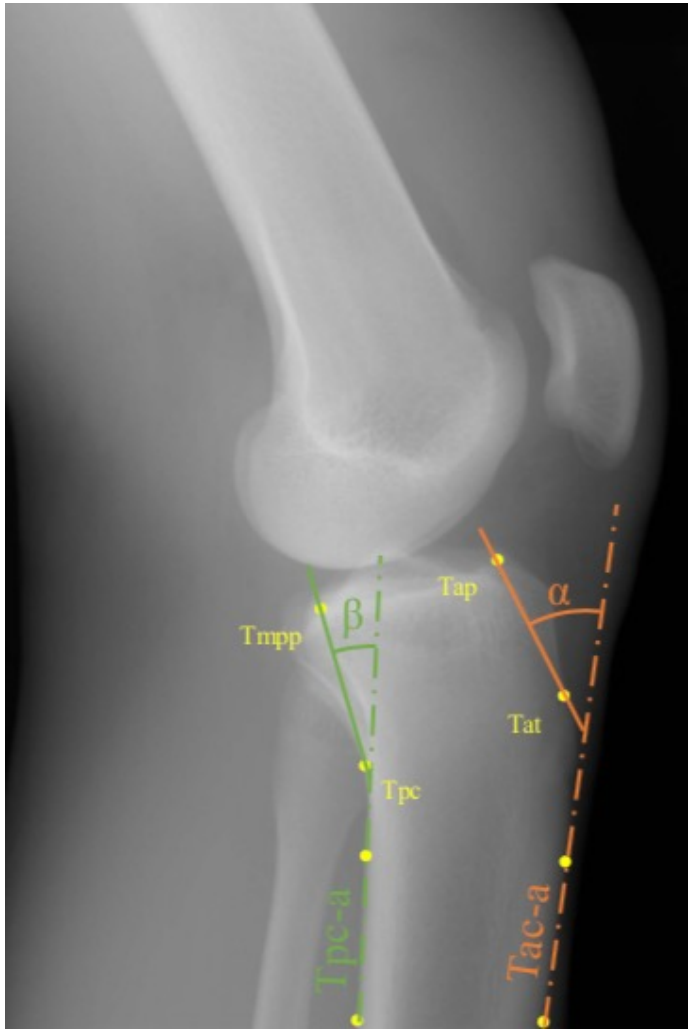
- Stable fixation
- Only compressive forces
- No weight-bearing for 3 weeks
- Partial weight-bearing between 3 and 6 weeks
- Full weight-bearing at 6 weeks

After 6 weeks: ACL rehabilitation program (phase 2)

4-year follow-up



Why a supratuberosity osteotomy?

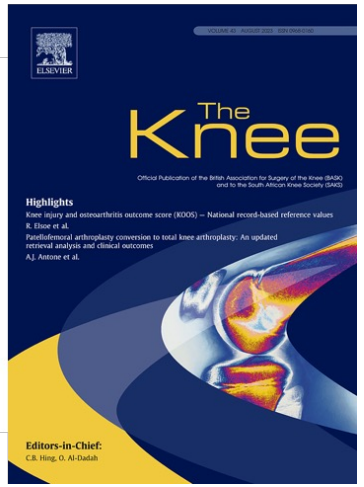


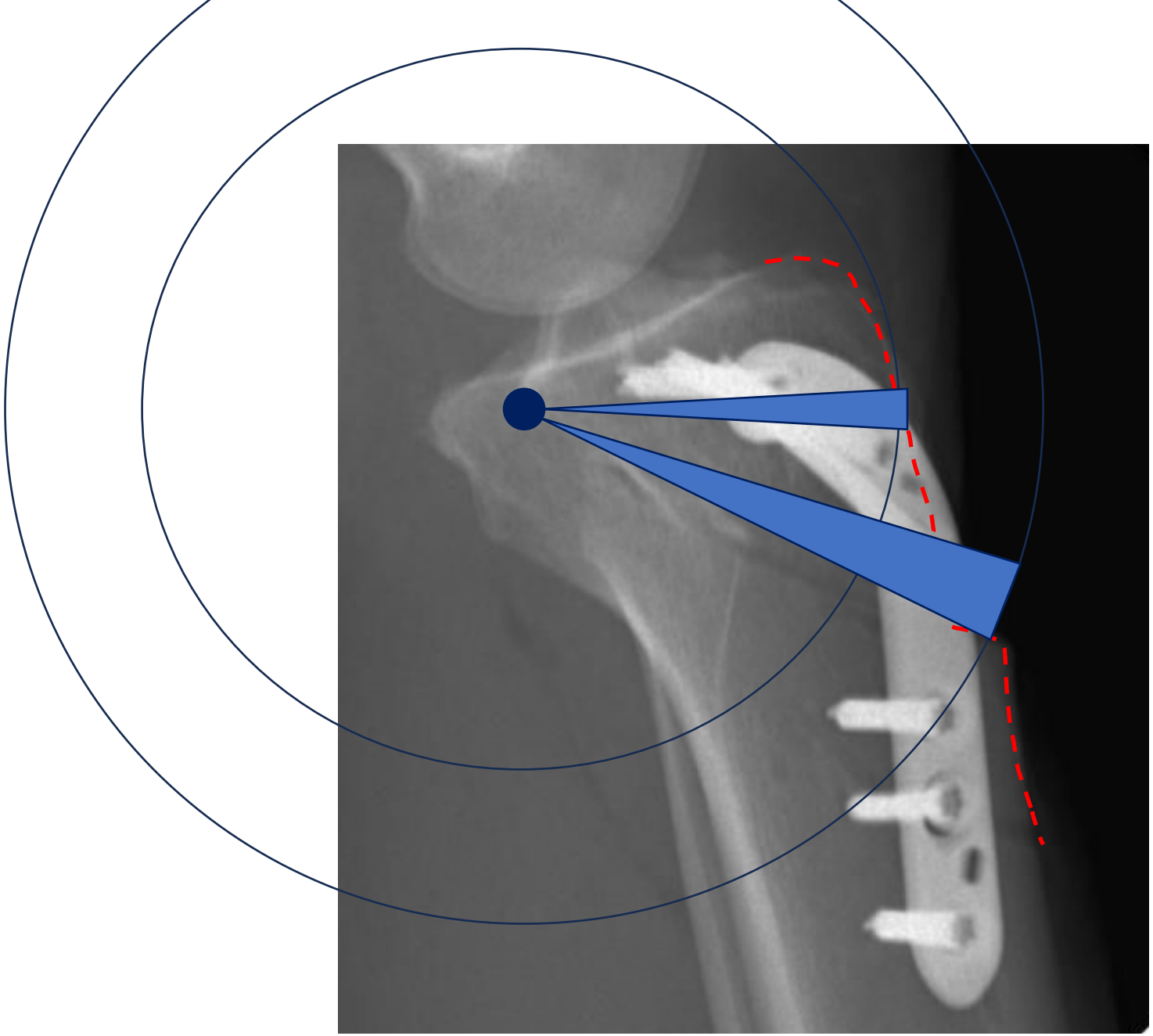
To correct the deformity where it is!

Posterior tibial slope correlated with metaphyseal inclination more than metaphyseal height

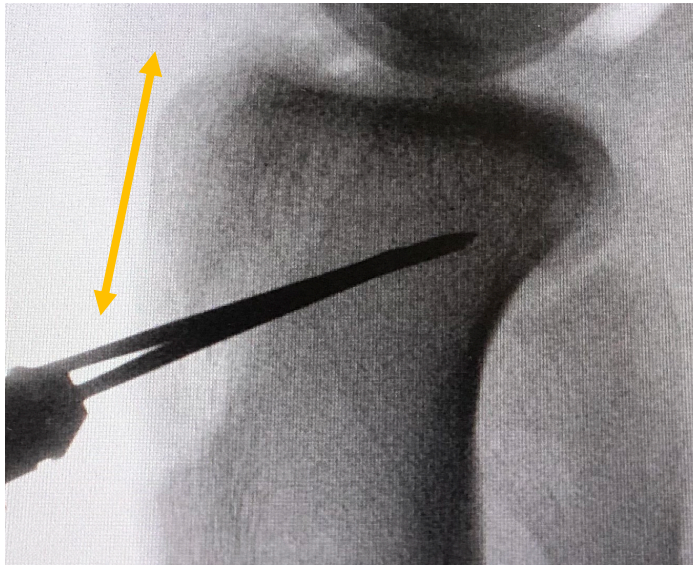
Guillaume Demey [a,*], Edoardo Giovannetti de Sanctis [a], Guillaume Mesnard [a], ReSurg [b,†], David H. Dejour [a]

[a] *Lyon-Ortho-Clinic, Clinique de la Sauvegarde, Lyon, France*
[b] *ReSurg SA, 1260 Nyon, Switzerland*





Why a supratuberosity osteotomy?

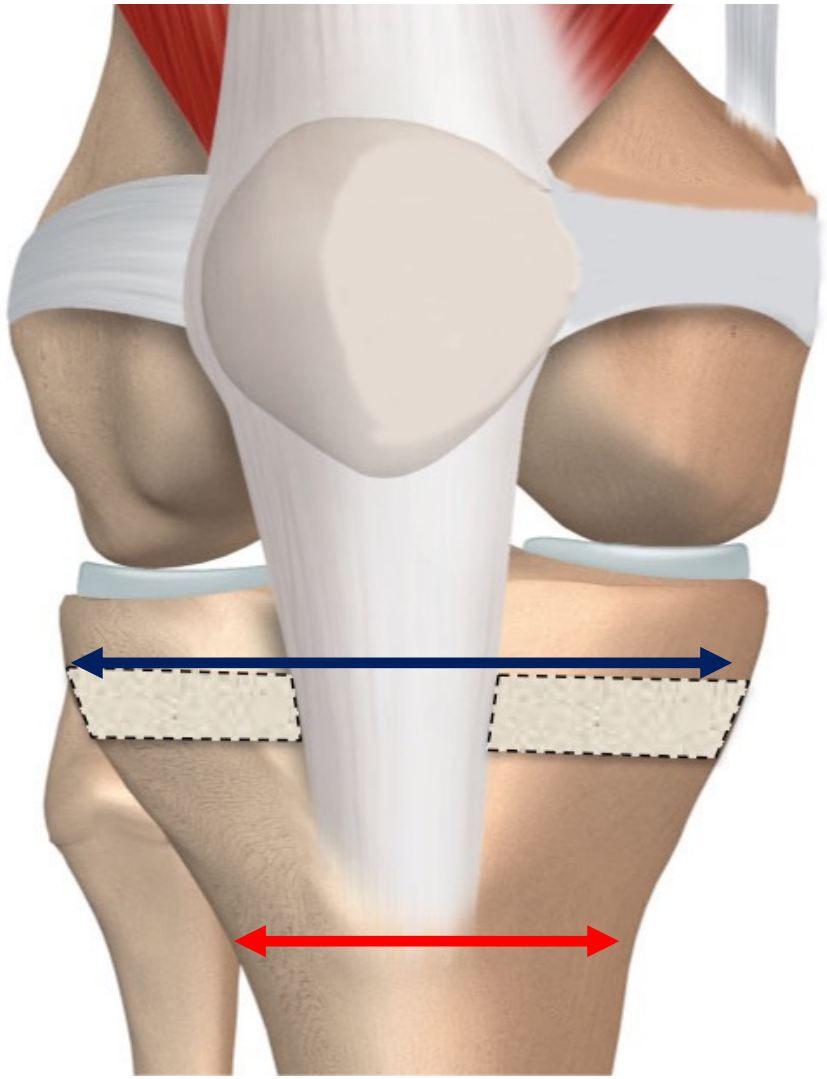


Because there is enough space!

Sufficient Metaphyseal Bone for Wedge Removal and Fixation Hardware During Supratuberosity Tibial Deflexion Osteotomy in Knees With Excessive Posterior Tibial Slope

Guillaume Demey,* MD, Edoardo Giovannetti de Sanctis,* MD, Guillaume Mesnard,* MD, Jacobus H. Müller,† MSc, PhD, Mo Saffarini,†‡ MSc, MBA, and David H. Dejour,* MD
Investigation performed at Lyon-Ortho-Clinic, Clinique de la Sauvegarde, Ramsay Santé, Lyon, France

Why a supratuberosity osteotomy?



Cancellous bone

Larger width (stability)

Control of the frontal plane

The American Journal of Sports Medicine

1972 • Celebrating

assm American Orthopaedic Society for Sports Medicine

Impact Factor: **4.8** / 5-Year Impact Factor: **6.1**

JOURNAL HOMEPAG

Restricted access | Research article | First published online January 29, 2024

Radiographic Investigation of Coronal Plane and Patellar Height and Changes Following Tibial Deflection Osteotomy for Correction of Tibial Slope in Combination With ACL Reconstruction

Nicolas Cance, MD ✉, Michael J. Dan, MBBS, PhD, FRACS(Orth), [...], and David H. DeJour, MD (+2) View all authors and affiliations

Volume 52, Issue 3 | https://doi.org/10.1177/03635465231222643

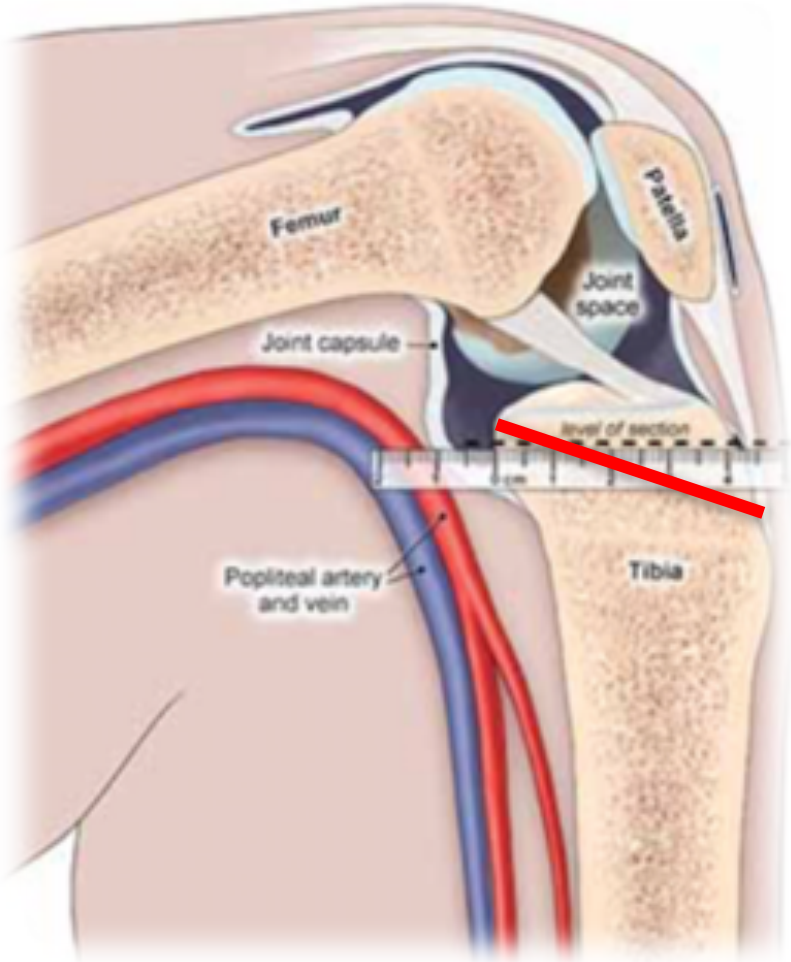
n=68

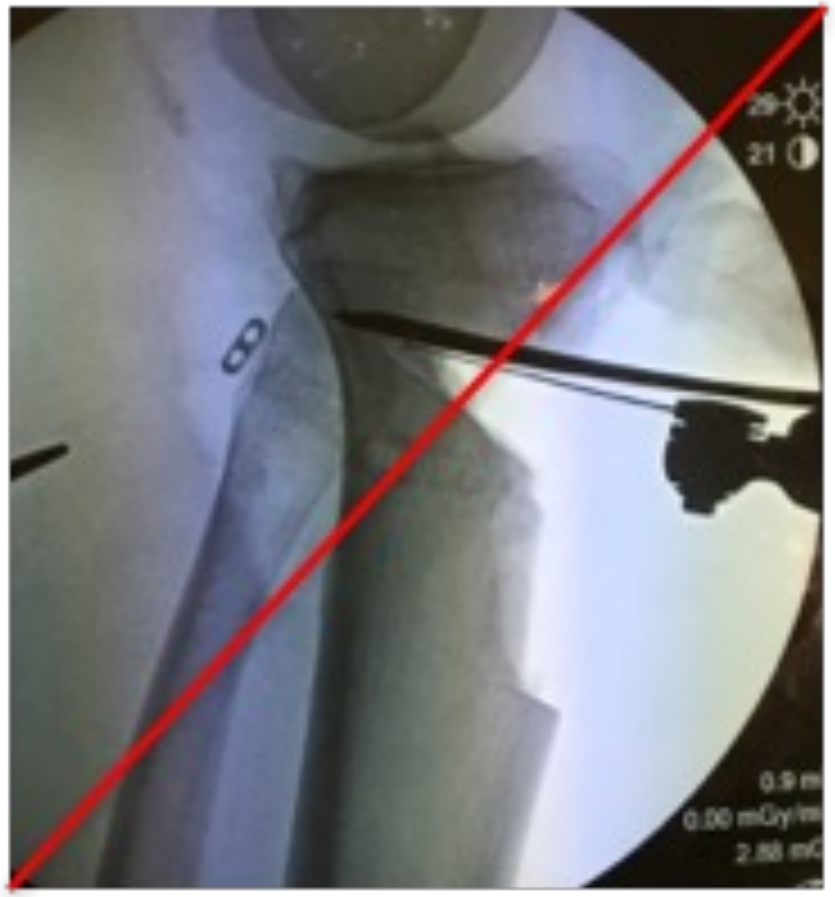
Consolidation rate 100%

Little to no iatrogenic effect on varus

Increase of Caton Deschamps Index by 0.1

Why a supratuberosity osteotomy?





Alternative : infratuberosity osteotomy

KSSTA Knee Surgery Sports Traumatology Arthroscopy
THE OFFICIAL CLINICAL JOURNAL OF ESSKA
esska.org

KNEE OSTEOTOMY

Infratuberositary slope-decreasing anterior closed wedge proximal tibial osteotomy is safe and shows rapid bone healing

Philipp Schuster ✉, Philipp Mayer, Ilona Schubert, Janina Leiprecht, Gregoire Micioi, Benoit Reuter, Jörg Richter, Jörg Dickschas

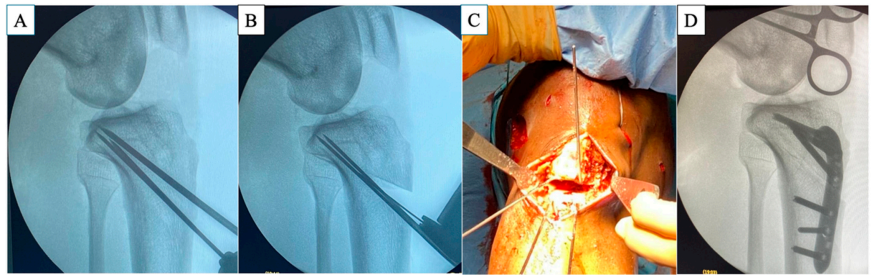
First published: 15 December 2024
https://doi.org/10.1002/ksa.12559

>30% partial healing at 6 weeks

1 non-union

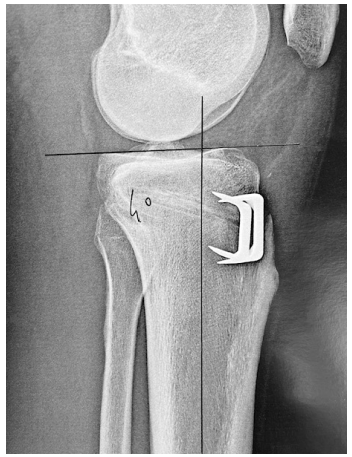
Secondary hardware removal ?

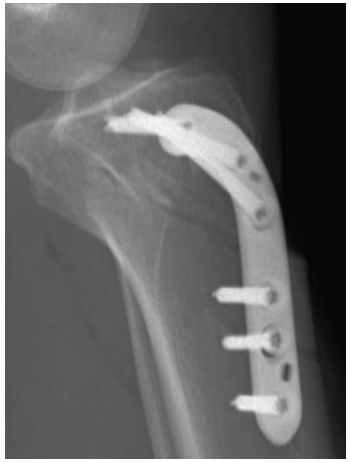
Effect on varus/valgus ?



Courtesy M Ollivier

+ = in favour of





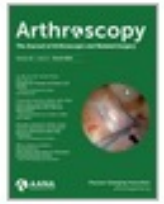
	SUPRA	INFRA
Fusion	+	
Hardware	+	
Correction of the deformity	+	
Alteration of patella height		+
Alteration of Varus/Valgus	+	
PSI	+	+
Risk of tunnel convergence		+

What is the target slope in 2025?

ELSEVIER

Arthroscopy: The Journal of Arthroscopic & Related Surgery

Volume 40, Issue 3, March 2024, Pages 846-854



Original Article

Four to 6° Is the Target Posterior Tibial Slope After Tibial Deflection Osteotomy According to the Knee Static Anterior Tibial Translation

Michael J. Dan M.B.B.S., Ph.D., F.R.A.C.S.(ortho) [a b], Nicolas Cance M.D. [a], Tomas Pineda M.D. [a c], Guillaume Demey M.D. [a], David H. Dejour M.D. [a]

between 4 et 6°

https://lyon-knee-congress.com

WEBCASTS

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21èmes Journées Lyonnaise de Chirurgie du Genou

Ligament Croisé Antérieur

« La rupture du ligament croisé antérieur du genou est une entorse grave »

Jeudi 03 Octobre 2024 après-midi | Vendredi 04 Octobre 2024 matin | Vendredi 04 Octobre 2024 après-midi | Samedi 05 Octobre 2024 matin

Jeudi 03 Octobre 2024

Après-midi

Modérateurs
Jean-Marie FAYARD, David DEJOUR

LE LCA POUR COMMENCER

La session portera sur la première rupture du Ligament Croisé Antérieur (LCA).
> OP : définir la sélection du patient à opérer ou non, la place des différentes techniques chirurgicales de reconstruction et de réparation du LCA ainsi que celle des plasties antérolatérales chez l'adulte, l'enfant et l'adolescent.

13:30-13:35 I Le mot des Présidents. JM. Fayard, C. Batailler, G. Demey

13:35-14:40 I Bilan de la rupture du LCA
13:35-13:43 I Examen clinique (vidéo). **C. Batailler**
13:43-13:53 I Analyse de la laxité.
13:43-13:48 I - Analyse statique. **D. Dejour**