Impingement with bone and/or cement after TKA

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Disclosures

- Consultant : SBM, Smith & Nephew
- Royalties : SBM, SERF

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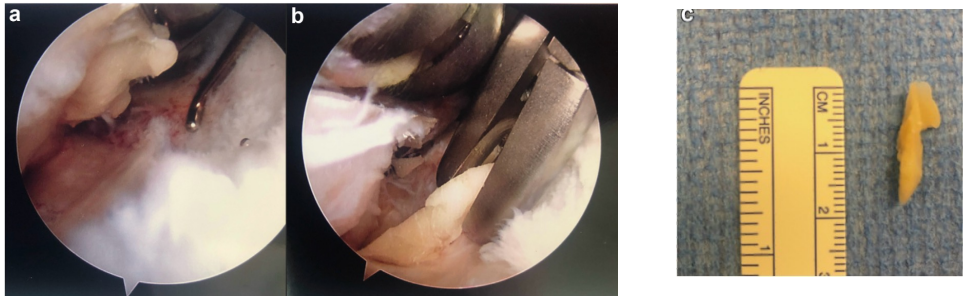
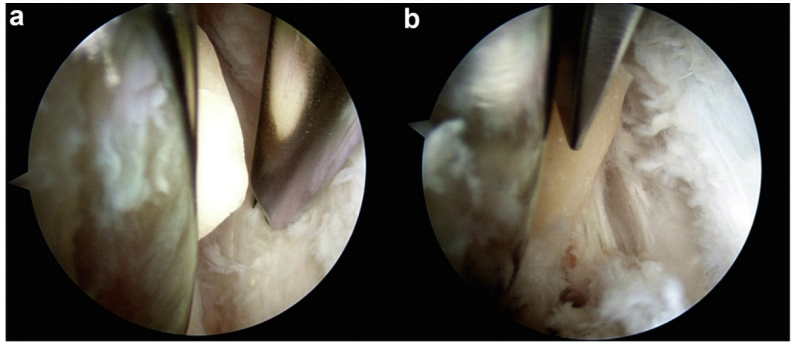
CEMENT PROTRUSION AFTER TKA

Three cases of persistent pain post-TKA caused by **lateral cement extrusion**

- All cases involved **lateral knee pain** post-TKA
- 2\3 patients had a **ROM of 0-110°**
- Cement extrusion identified near the **lateral femoral component**.
- Diagnosis confirmed with X-rays and transient relief with local anesthetic injections.





Arthroscopic cement excision performed using osteotomes and graspers one year after the TKA

Complete pain relief in all cases after surgery.

Case report

Persistent Pain due to Cement Protrusion After Total Knee Arthroplasty: A Report of Three Cases

Nawaf Alamiri, MD[a], Justin-Pierre Lorange, MDCM[b,*], Ron Dimentberg, MDCM, FRCSC[a,c]

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CEMENT PROTRUSION AFTER TKA

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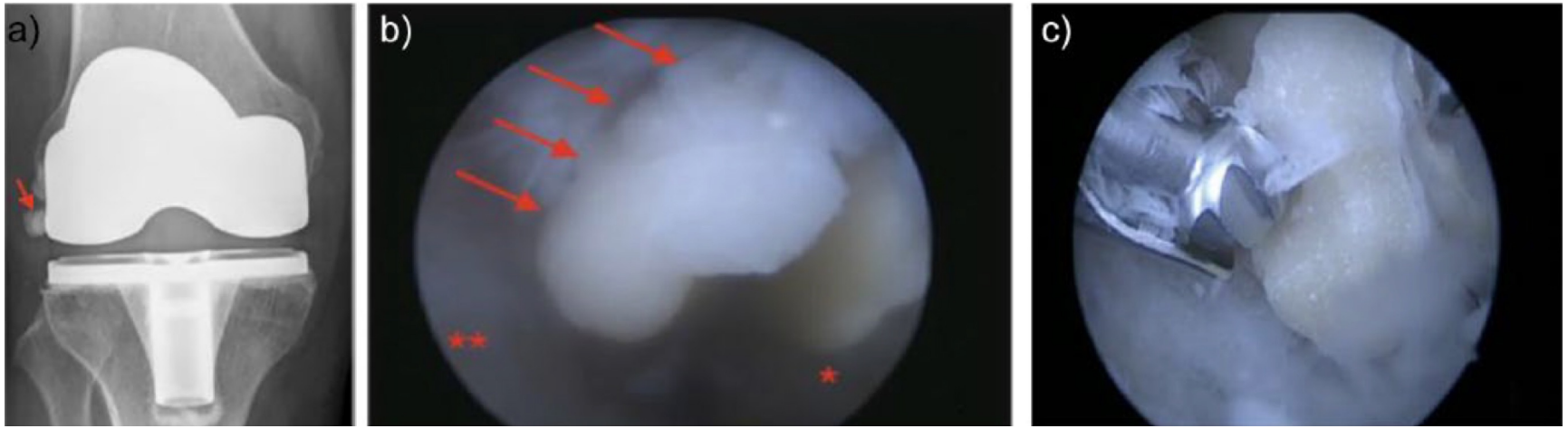

Patient with iliotibial band syndrome caused by a fragment of cement retained in the lateral femoral condyle

ARHTROSCOPY procedure

Abundant wash of the joint must be made to eliminate all the cement particles.

EFORT open reviews

Arthroscopic treatment of total knee arthroplasty complications

Carlos A. Encinas-Ullán[1]
E. Carlos Rodríguez-Merchán[1]

CEMENT PROTRUSION AFTER TKA

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Lateral cement extrusion is a rare but treatable cause of persistent knee pain post-TKA

HOW TO AVOID IT →

Meticulous visualization around the implant before closing the knee

HOW TO MANAGE IT

- Accurate diagnostic process
- X-rays
- Local anesthetic injections
- **ARTHROSCOPY** for refractory pain when conservative treatments fail

RISK RELATED WITH ARTHROSCOPY AFTER TKA

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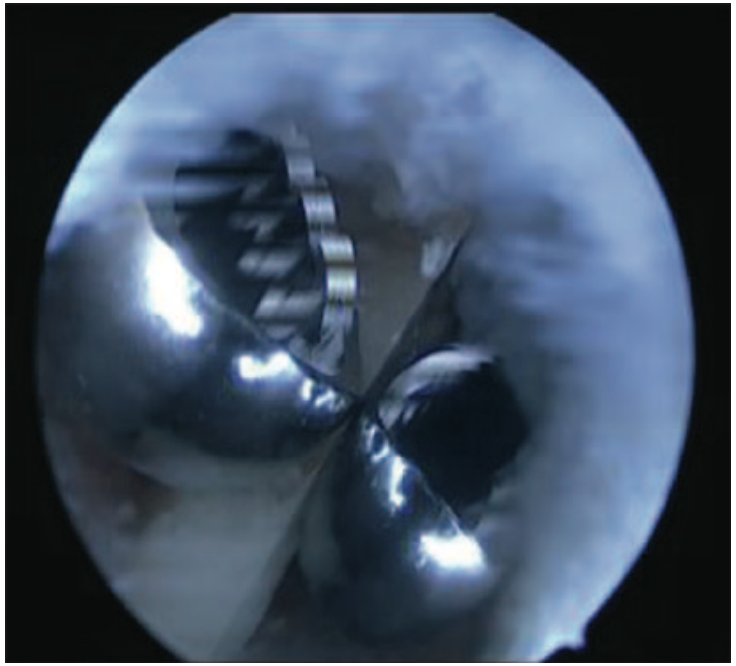
In a systematic review of arthroscopies in symptomatic patients after TKA, the complication rate was only 0.5%*

TECHNICAL DIFFICULTY

ACUTE INFECTION

LATE INFECTION

MIRROR PHENOMENON



*Lovro LR, J Arthroplasty 2020

EFORT open reviews

Arthroscopic treatment of total knee arthroplasty complications

Carlos A. Encinas-Ullán[1]
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BONE IMPINGEMENT AFTER TKA

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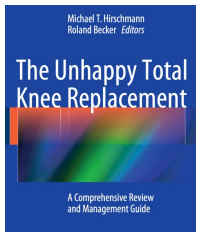
IMPINGEMENT AFTER TKA

SOFT TISSUE IMPINGEMENT

BONE IMPINGEMENT

IMPLANT IMPINGEMENT

- POSTERIOR FEMORAL BONY IMPINGEMENT
- BONY PATELLO FEMORAL IMPINGEMENT
- PATELLO TIBIAL IMPINGEMENT
- FABELLA IMPINGEMENT



POSTERIOR FEMORAL BONY IMPINGEMENT

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IMPINGEMENT OCCURS WITH THE TIBIAL INLAY DURING DEEP KNEE FLEXION

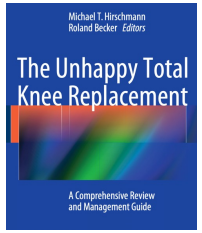
Caused by:

- Residual osteophytes *
- Exposed bone proximal to the posterior shield of the femoral implant
- Small femoral implants **

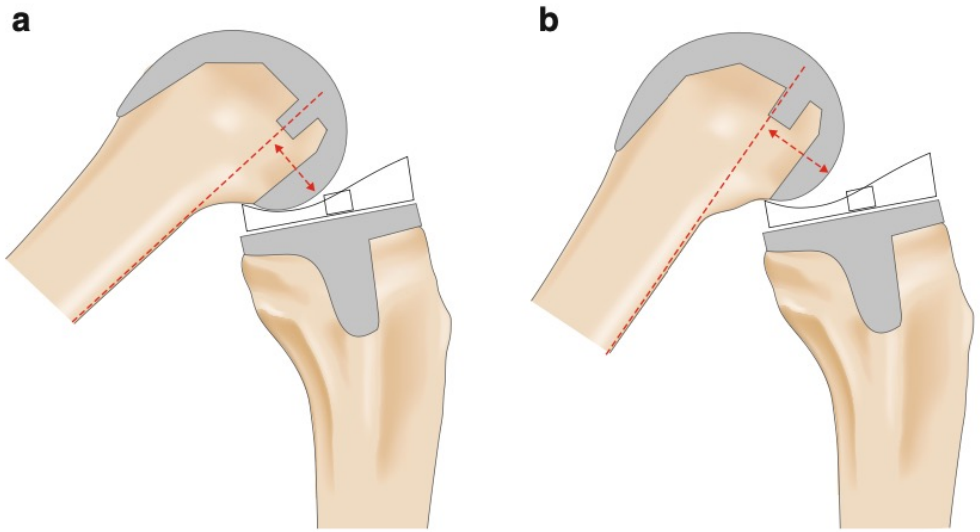
*The size of the posterior osteophytes it is correlated with the decrease of maximum knee flexion **

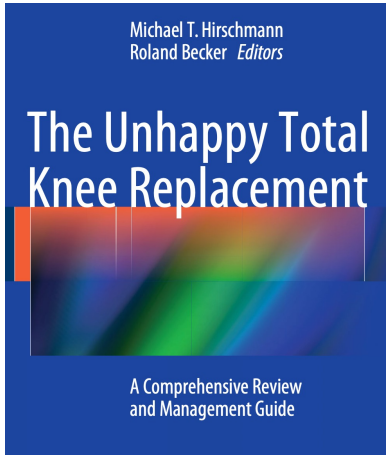
*Mizu-Uchi H J Arthroplasty. 2012

** Goldstein WM J Bone Joint ; 2006



POSTERIOR FEMORAL BONY IMPINGEMENT





Using CR design, decreased Posterior Condylar Offset leads to earlier impingement and less range of motion

One millimeter less PCO resulted in a reduction of 6° of flexion

WHAT ABOUT THE SIZE OF THE COMPONENT…

SIZING THE TIBIAL COMPONENT

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Sizing of the tibial component is particularly important for **load transfer to cortical bone** and avoid the potential complications

Achieving **optimal tibial coverage** and **rotational alignment** is critical for implant longevity and patient satisfaction * **

Not all the tibia are the same

Not all the implants fit the anatomy of the patient

Is it better symmetrical or asymmetrical tibial baseplate?

*Namba R, J Arthroplasty 2013
**Berhouet J, Orthop Traumatol Surg , 2011

ALIGNMENT OF TIBIAL COMPONENT ROTATION

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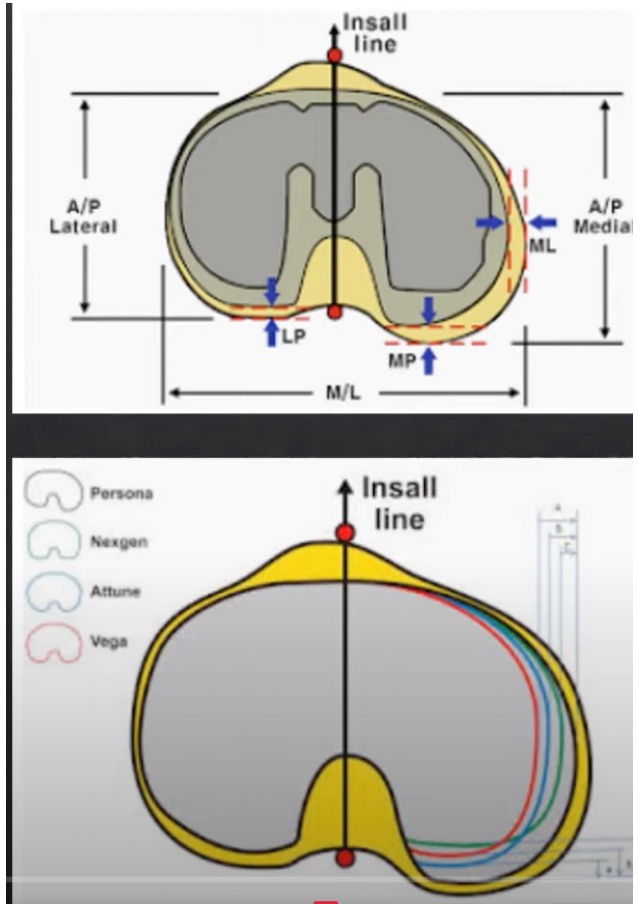
TIBIAL TUBERCLE LANDMARK TECNIQUE

- Tibial component centered **over the medial third of the tibial tubercle (junction of the medial third of the tibial tubercle with the lateral 2/3)**
- This may leave a portion of the posteromedial tibia uncovered and some overhang of the prosthesis over the posterolateral aspect of the tibia
- **In order to achive a correct rotation alignment, a posterolateral overhang <2mm can be necessary with the use of symmetrical baseplate**
- External rotation of the tibial component was found to reduce retropatellar pressures and correlate with longer implant survivorship*



Steinbrück A et al. KSSTA 2016
Kim YH et al. Int Orthop. 2014

SIZING THE TIBIAL COMPONENT

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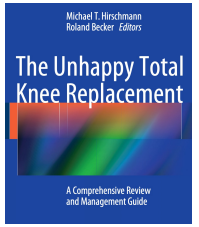
COMPLICATIONS RELATED TO UNDER-OVER SIZING THE TIBIAL COMPONENT

		Problem	Solution
Oversizing	Medial overhang	Irritation of medial capsule and/or MCL	1. Downsize component 2. Use same size and shift component laterally
	Lateral overhang	Irritation of lateral retinaculum, IT band and/or LCL	1. Downsize component 2. Use same size and shift component medially
Undersizing		Early migration or loosening of tibial component due to missing cortical coverage	Upsize tibial component, accept <2 mm posterolateral overhang



SIZING THE TIBIAL COMPONENT

114 TKA (HLS-Noetos fixed-bearing TKA)

Pre- and postoperative KOOS (pain, function)

Maximum Passive Flexion (MPF) measured at 1 year.

- **Purpose of the study:**

- **Assess the incidence of anteroposterior and mediolateral oversizing**.

-Evaluate its impact on clinical outcomes (pain, function, flexion)

- Identify risk factors for oversizing

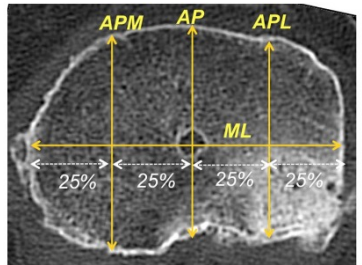
- **Anteroposterior Oversizing:**
- Lateral Plateau: 87% (3.2 ± 2.7 mm)
- Central Plateau: 88% (2.8 ± 2.7 mm)
- Medial Plateau: 25% (-1.6 ± 2.3 mm)

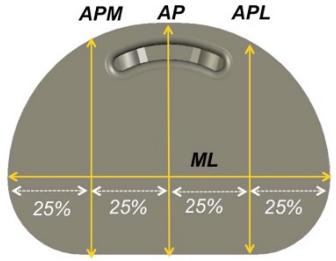
- **Mediolateral Oversizing:**

Overall: 61% (mean: 0.9 ± 2.9 mm).

Higher incidence in **females** (81%) than males (40%)

Fig. 1 Measurements of the ML, AP, APM and APL dimensions done on the CT scan with the corresponding dimensions of the implanted tibial component





Oversizing the tibial component in TKAs: incidence, consequences and risk factors

Michel P. Bonnin · Mo Saffarini · David Shepherd · Nadine Bossard · Emmanuelle Dantony

2014

SIZING THE TIBIAL COMPONENT

-Evaluate its impact on clinical outcomes

Table 4 Effect of size variation in each zone on post-operative pain score, KOOS score and knee flexion

	Undersized		Oversized		*p* value*
	Mean ± SD	Range	Mean ± SD	Range	
Pain score					
APL	84.4 ± 13.6	56–100	78.4 ± 18.3	28–100	n.s.
APM	79.5 ± 18.1	28–100	78.2 ± 17.1	39–100	n.s.
AP	88.8 ± 12.2	61–100	77.8 ± 18.1	28–100	0.012
ML	81.1 ± 18.4	36.1–100	77.3 ± 17.8	27.8–100	n.s.
KOOS score					
APL	69.4 ± 18.3	33–98	63.9 ± 17.0	24–97	n.s.
APM	65.3 ± 16.9	24–97	62.7 ± 18	25–98	n.s.
AP	72.9 ± 14.2	54–98	63.5 ± 17.3	24–97	0.059
ML	67.7 ± 16.8	32.6–97.9	62.3 ± 17.3	24.3–97.0	n.s.
Knee Flexion					
APL	124.3 ± 10.3	100–140	122.1 ± 9.8	95–140	n.s.
APM	122.6 ± 9.5	100–140	121.7 ± 10.9	95–140	n.s.
AP	123.9 ± 9.2	110–140	122.2 ± 9.9	95–140	n.s.
ML	124.7 ± 8.6	100–140	121.0 ± 10.3	95–140	0.034

Mean pain score, mean KOOS score and mean maximum flexion are reported in oversized patients and undersized patients for each dimension studied. The *p* value resulting from the comparison of the two groups (unilateral Mann–Whitney test) is also reported for each dimension

* Between undersized and oversized

- **Pain**

Anteroposterior oversizing in the central plateau significantly associated with higher pain scores (**p = 0.012**)

Mediolateral oversizing linked to reduced flexion (**p =0.024**).

- **Impact on Function:**

Lower KOOS scores in oversized tibial components (central plateau, **p = 0.006**).

- Identify risk factors for oversizing

- **Smaller tibial dimensions** → higher mediolateral oversizing risk (**p < 0.001**)
- **Asymmetric tibial plateaus** → higher anteroposterior oversizing risk (**p < 0.0001**)

Oversizing the tibial component in TKAs: incid consequences and risk factors

Michel P. Bonnin · Mo Saffarini · David Shepherd · Nadine Bossard · Emmanuelle Dantony

2014

SYMMETRICAL VS ASYMMETRICAL TIBIAL BASEPLATE

MALROTATION

Lower malrotation with the ATC compared to the STC

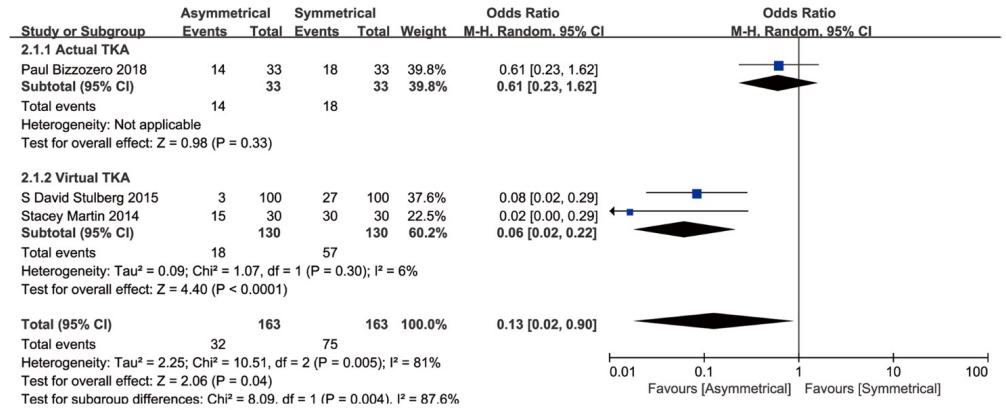


Fig. 6 Meta-analysis and forest plot for malrotation

Zhang et al. BMC Musculoskeletal Disorders (2024) 25:336
https://doi.org/10.1186/s12891-024-07466-2

BMC Musculoskeletal Disorders

RESEARCH Open Access

Comparison of the coverage and rotation of asymmetrical and symmetrical tibial components: a systematic review and meta-analysis

Ziming Zhang[1,2†], Tiantian Zhang[1†], Le Zhang[2†], Zehua Chen[3†], Haoming Zhao[2], Jianjun Kuang[1*] and Liang Ou[1*]

CLINICAL OUTCOMES

Only two studies examined KSS Score, and **no significant difference** was found between the two tibial components

According to this meta-analysis ATC can significantly improve coverage and rotation and reduce the underhang rate without increasing overhang

SIZING THE FEMORAL COMPONENT

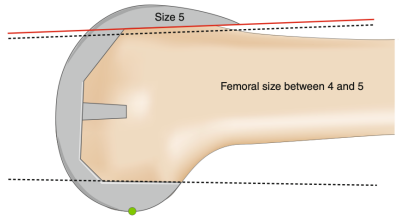
Femoral size is determined by the antero-posterior dimension

Reconstruction of the posterior condylar offset is important for reconstructing knee kinematics*

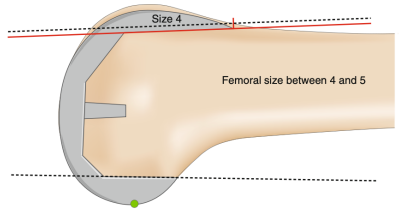
Influenced by:

1. Anterior or posterior referencing
2. Flexion space balancing or sized matched resection

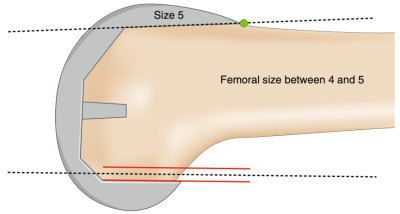
Oversizing the femoral component in a posterior referenced system → Overstuffing of patellofemoral joint



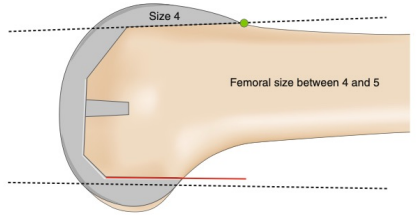
Undersizing the femoral component in a posterior referenced system anterior notching → Anterior notching

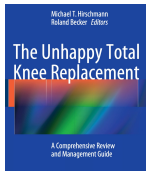


Oversizing the femoral component in an anterior referenced system → Tightness of flexion gap



Undersizing the femoral component in an anterior referenced system → Flexion gap instability





*Jia YT, Chin J Traumatol, 2012

SIZING THE FEMORAL COMPONENT

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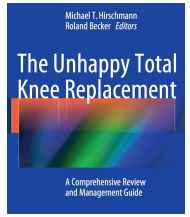
			Problem	Solution
Oversizing	ap	Anterior referencing	Overstuffing of flexion gap, reduced ROM, stiffness	Downsize femoral component 1. Add more flexion to fill flexion gap 2. Recut distal femur 2 mm, and use thicker PE
	ap	Posterior referencing	Overstuffing of patellofemoral joint, increased patellofemoral pressure, increased pain, decreased ROM	Downsize femoral component 1. With anterior notching <3 mm 2. Shift femoral component 2 mm anterior, recut distal femur 2 mm and use thicker PE
	ml		Irritation of capsule and collateral ligaments	Downsize femoral component, additional measures as above
Undersizing	ap	Anterior referencing	Instability of flexion gap, increased wear	Use same size femoral component 1. Add more flexion to fill flexion gap 2. Recut distal femur 2 mm and use thicker PE
	ap	Posterior referencing	Notching of anterior cortex, increased fracture risk if >3 mm	Use same size femoral component 1. With anterior notching <3 mm 2. Shift femoral component 2 mm anterior, recut distal femur 2 mm and use thicker PE
	ml		Possible medialisation of trochlea	Place femoral component as lateral as possible

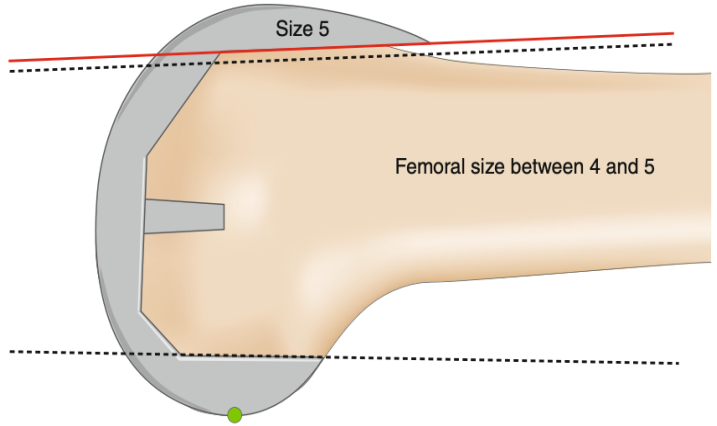


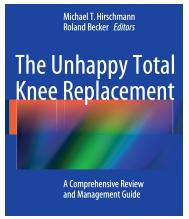
SIZING THE FEMORAL COMPONENT

POSTERIOR REFERENCED TKA

Change of size → Change of the anterior bone cut

OVERSIZING the femoral component → Overstuffing of PF → Increased patellofemoral pressure \ Pain





SIZING THE FEMORAL COMPONENT

POSTERIOR REFERENCED TKA

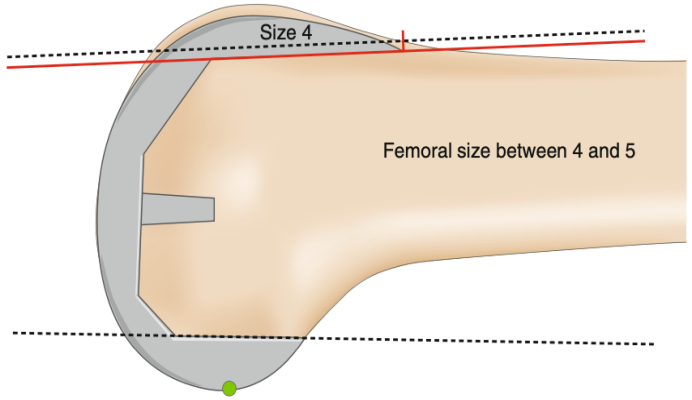
UNDERSIZING the femoral component

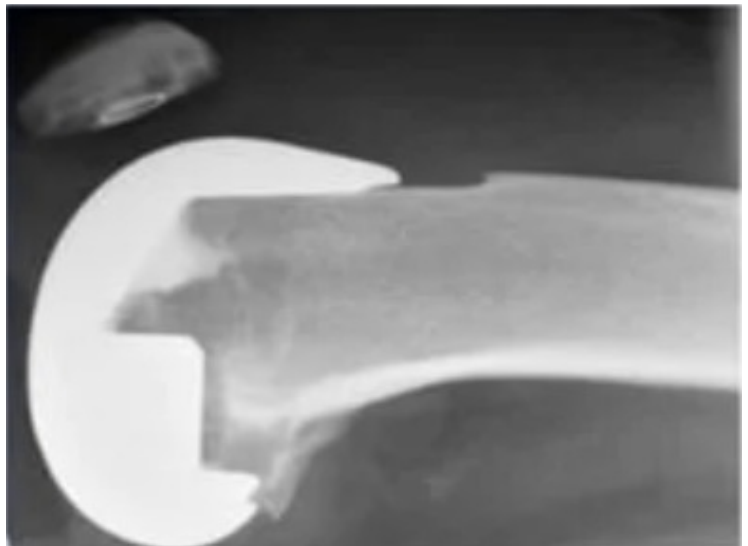
↓

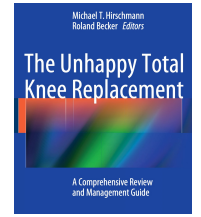
Anterior notching

↓

Risk of fracture







SIZING THE FEMORAL COMPONENT

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ANTERIOR REFERENCED TKA

Change of size → Change of the posterior bone cut

OVERSIZING the femoral component

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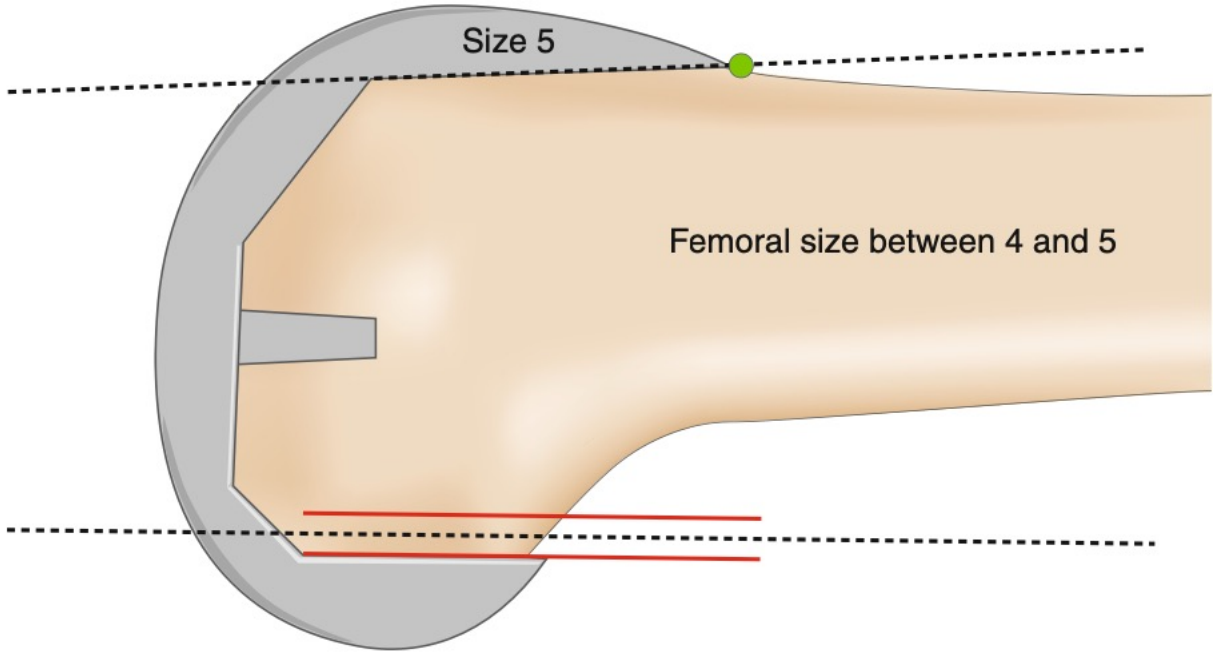
Overstuffing of the flexion gap
and a reduced ROM



SIZING THE FEMORAL COMPONENT

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ANTERIOR REFERENCED TKA

UNDERSIZING the femoral component

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Decreased posterior condylar offset

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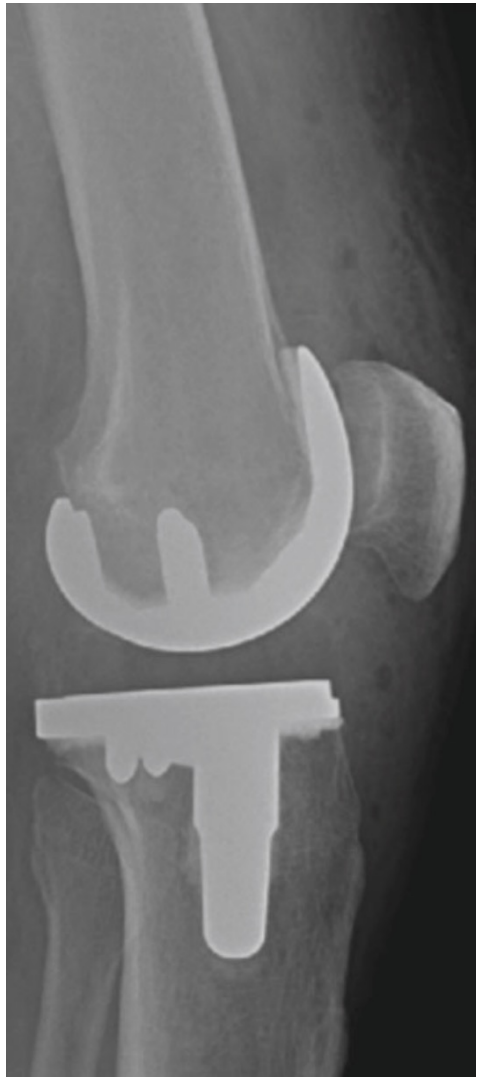
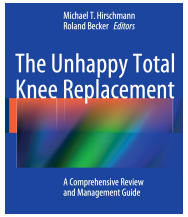
Flexion instability, increased polyethylene (PE) wear and decreased flexion





SIZING THE FEMORAL COMPONENT

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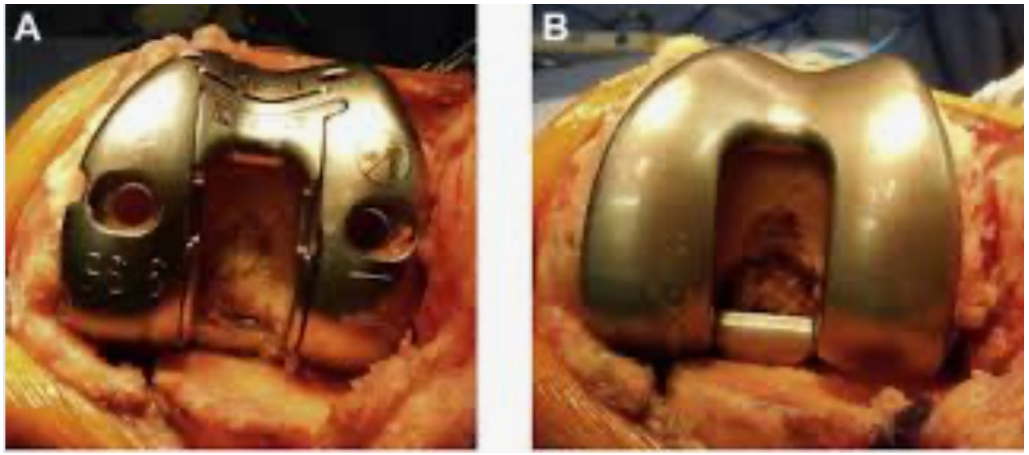
HOW TO MANAGE THE MEDIO-LATERAL SPACE

M-L Overhang >3mm → Irritation the capsule, the ITB or collateral ligaments and causes pain []

HOW TO SOLVE IT?

Gender implants → No differences in clinical outcome[]

Narrow femoral component →



SIZING THE FEMORAL COMPONENT

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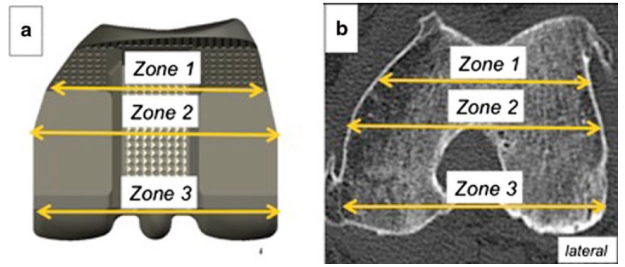
Retrospective analysis of 114 knees in 112 patients undergoing primary TKA

Femoral overhang in 66% of knees



Outcomes assessed 1 year post-operatively :

- **KOOS** (Knee Injury and Osteoarthritis Outcome Score)
- **Pain improvement**
- **Knee flexion angle**

Groups comparison

	Under-sized		Over-sized		*p* value
	Mean ± SD	(Range)	Mean ± SD	(Range)	
Pain score					
Zone 1	82.5 ± 17.4	(27.8–100)	76.9 ± 18.1	(36.1–100)	0.034
Zone 2	79.8 ± 18.7	(27.8–100)	76.3 ± 16.4	(38.9–100)	n.s.
Zone 3	79.5 ± 18.7	(27.8–100)	76.2 ± 15.8	(44.4–100)	n.s.
Zone 4	81.1 ± 18.4	(36.1–100)	77.3 ± 17.8	(27.8–100)	n.s.
KOOS score					
Zone 1	67.6 ± 18.0	(31.3–97.0)	62.8 ± 16.7	(24.3–97.9)	n.s.
Zone 2	65.5 ± 17.5	(24.3–97.9)	61.7 ± 16.7	(25.0–94.1)	n.s.
Zone 3	64.8 ± 17.8	(24.3–97.9)	62.9 ± 15.4	(32.6–94.1)	n.s.
Zone 4	67.7 ± 16.8	(32.6–97.9)	62.3 ± 17.3	(24.3–97.0)	n.s.
Knee flexion					
Zone 1	124.6 ± 8.3	(105–135)	121.3 ± 10.4	(95–140)	n.s.
Zone 2	123.2 ± 9.1	(95–140)	120.6 ± 11.2	(100–140)	n.s.
Zone 3	123.4 ± 9.3	(95–140)	119.0 ± 11.0	(100–135)	0.038
Zone 4	124.7 ± 8.6	(100–140)	121.0 ± 10.3	(95–140)	0.034

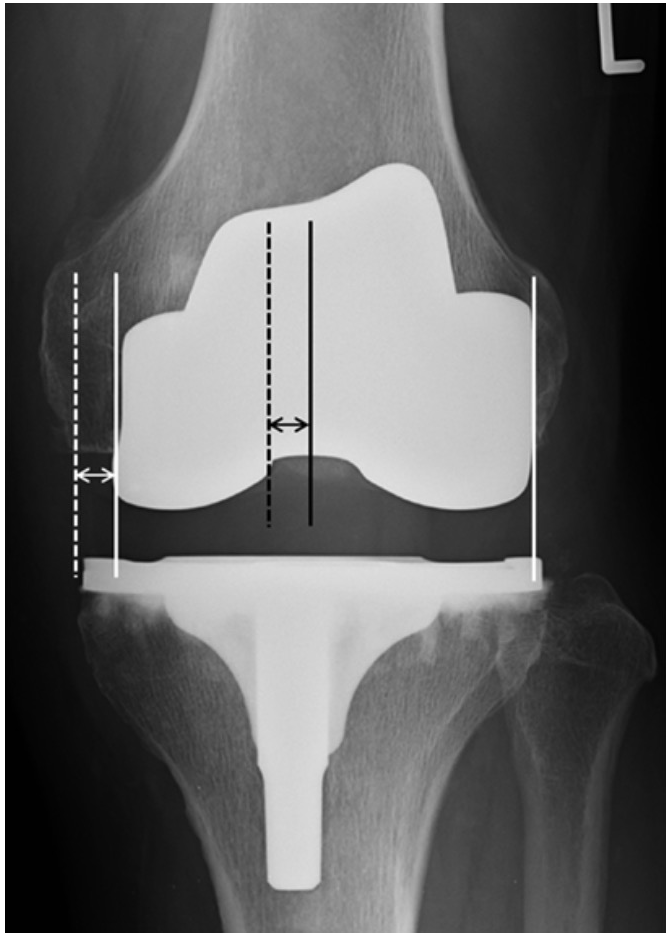
ML Oversizing **negatively impacts** post operative pain in femoral zones 1 and 2 and flexion reduction significant in femoral zones 2 and 3

Mediolateral oversizing influences pain, function, and flexion after TKA

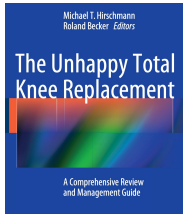
Michel P. Bonnin · Axel Schmidt · Luca Basiglini · Nadine Bossard · Emmanuelle Dantony

SIZING THE FEMORAL COMPONENT

If the FEMORAL COMPONENT doesn't cover the whole mediolateral width



Lateralization of the implant is recommended in order to improve patellar tracking



FEMORO TIBIAL COMPONENT SIZE MISMATCH

Val d'Isère

Retrospective study

- 332 patients
- IMPLANT: **Genesis II cruciate-retaining knee prosthesis** (cemented)

- **Groups:**

Group 1: Tibial component larger than femoral component (10%).

Group 2: Matched femoro-tibial components (45%)

Group 3: Femoral component one size larger (33%)

Group 4: Femoral component two sizes larger (12%)

Demographic variables in the four groups and the corresponding pre- and post-operative Oxford Knee Score (OKS) and improvement.

	Mean age	Mean Body Mass Index	Mean preoperative Oxford score	Mean five year postoperative Oxford score	Mean Oxford score improvement
Group 1	70.1 ± 7.4	30.9 ± 4.9	22.8 ± 8.6	34.8 ± 9.7	12 ± 9.1
Group 2	69.7 ± 11.5	30.4 ± 4.5	21.4 ± 7.2	36.3 ± 9.5	14.9 ± 9.5
Group 3	71.2 ± 7.4	30.1 ± 5.5	19.8 ± 7.1	36.7 ± 9.9	16.9 ± 10.2
Group 4	69.6 ± 15.1	30.8 ± 6.4	19.1 ± 7.4	35.4 ± 10.1	16.4 ± 10.5

66% of women had size mismatched compared to 40% of men

No statistically significant difference in post-operative OKS across the four groups

Effect of femoro-tibial component size mismatch on outcome in primary total knee replacement

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[c] Monica Orthopaedic Research Institute (MoRe Institute), Stervenlei 20, 2100, Deurne, Antwerp, Belgium
[d] Department of Electrical Energy, Systems and Automation, Ghent University, De Pintelaan 185, 9000 Ghent, Belgium

FEMORO TIBIAL COMPONENT SIZE MISMATCH

Val d'Isère

Prospective study on 13,776 TKA's of two designs.
Univariate and multivariate statistical analyses were conducted.

FAILURE

IMPLANT 1

"Matched sized TKA's " 4.2%
"Unmatched TKA's " 1.5% (p=0.0001, OR 2.9)

IMPLANT 2

" Matched sized TKA's " 1.7%
" Unmatched TKA's " 0.4% (p=0.002, OR 4.3)

RISK OF FACTOR

Age under 70 (OR 1.8),
BMI over 35 (OR 1.6),
Pre-op deformity greater than 11 degrees (OR 2.5),
Implant poly thickness greater than 12 mm (OR 2.4),
Postop alignment less than 2.5 degrees of valgus (OR2.4),
Female gender (OR 1.7).

Mode of failure was predominantly tibial loosening in both cohorts.

Small femur on big tibia was associated with lower risk of revision for both implant designs versus size matched implants
(Design 1, HR = 0.474, p=0.0007 - Design 2, HR = 0.136, p=0.0002).

0019 - FEMORAL-TIBIAL COMPONENT SIZE "MISMATCH" IS ONE FACTOR IN ASEPTIC LOOSENING AFTER TKA. AN ANALYSIS OF 13,776 TKA'S
M.E. Berend[a], H.D. Clarke[c], J.B. Meding[b], J.L. Carter[a], K.E. Davis[b]
[a]*Midwest Center for Joint Replacement, Indianapolis, Indiana, USA*
[b]*Joint Replacement Surgeons of Indiana, Mooresville, Indiana, USA*
[c]*Mayo Clinic, Phoenix, Arizona, USA*

FEMORO TIBIAL COMPONENT SIZE MISMATCH

Val d'Isère

Australian Orthopaedic Association National Joint Replacement Registry (1999–2012)

21,906 fixed-bearing primary TKAs for osteoarthritis

- **Kaplan-Meier survival curves** for cumulative revision rates.
- **Hazard ratios (HRs)** via Cox proportional hazard models, adjusted for age and gender

- **Groups (Component Sizing):**

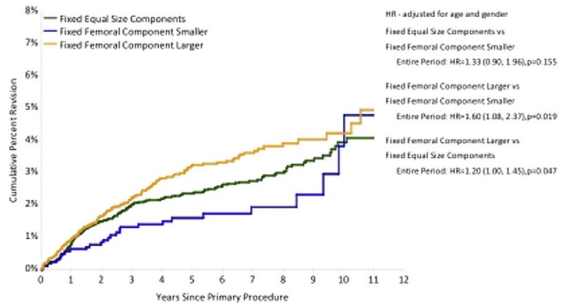
1. **Equal Size**: Femoral and tibial components matched (52%)
2. **Femoral Smaller than Tibial Component** (8%)
3. **Femoral Larger than Tibial Component** (40%)

Revision Rates:

4.1% (95% CI: 3.4, 4.9)

4.8% (95% CI: 2.6, 8.9)

4.9% (95% CI: 3.8, 6.4)



Increased Revision Risk:

F > T vs F=T HR = 1.6 (95% CI: 1.08, 2.37, p = 0.019)

F > T vs F<T HR = 1.2. (95%CI : 1.00, 1.45, p= 0.047)

Higher Rate of Revision in PFC Sigma Primary Total Knee Arthroplasty With Mismatch of Femoro-Tibial Component Sizes

Simon W. Young, FRACS [a], Henry D. Clarke, MD [a], Stephen E. Graves, FRACS [b], Yen-Liang Liu, M. App Stats [c], Richard N. de Steiger, FRACS [b]

[a] Mayo Clinic, Scottsdale, Arizona
[b] Australian Orthopaedic Association National Joint Replacement Registry, Discipline of Public Health, School of Population Health, University of Adelaide, Adelaide, SA, Australia
[c] Data Management and Analysis Centre, University of Adelaide, Adelaide, SA, Australia

FEMORO TIBIAL COMPONENT SIZE MISMATCH

Val d'Isère

Table 2
Revision Diagnosis of Fixed Bearing PFC Sigma Primary Total Knee Replacement by Component Size Match.

	Equal Size Components			Femoral Component Smaller			Femoral Component Larger		
Revision Diagnosis	Number	% Revision	% Primary	Number	% Revision	% Primary	Number	% Revision	% Primary
Infection	81	31.2	0.7	9	30.0	0.5	67	31.0	0.7
Loosening/lysis	60	23.1	0.5	9	30.0	0.5	48	22.2	0.5
Patellofemoral pain	38	14.6	0.3	3	10.0	0.2	29	13.4	0.3
Pain	25	9.6	0.2				31	14.4	0.3
Instability	13	5.0	0.1	3	10.0	0.2	10	4.6	0.1
Arthrofibrosis	8	3.1	0.1	2	6.7	0.1	6	2.8	0.1
Fracture	8	3.1	0.1				3	1.4	0.0
Patella erosion	7	2.7	0.1				8	3.7	0.1
Incorrect sizing	4	1.5	0.0	1	3.3	0.1	2	0.9	0.0
Malalignment	3	1.2	0.0				4	1.9	0.0
Wear tibial insert	4	1.5	0.0	1	3.3	0.1	3	1.4	0.0
Implant breakage tibial insert	3	1.2	0.0	1	3.3	0.1			
Patella maltracking	3	1.2	0.0						
Implant breakage patella							1	0.5	0.0
Metal related pathology							1	0.5	0.0
Osteonecrosis	1	0.4	0.0						
Prosthesis dislocation				1	3.3	0.1			
Synovitis							1	0.5	0.0
Wear tibial	1	0.4	0.0						
Other	1	0.4	0.0				2	0.9	0.0
N Revised	260	100.0	2.2	30	100.0	1.8	216	100.0	2.4
N Total	11687			1712			9082		

No significant differences in revision reasons between groups

- **Femoral components larger than tibial components lead to a significantly higher risk of revision**

- Potential mechanisms
  - Polyethylene edge loading
  - Increased tibial stresses
  - Soft tissue impingement

Higher Rate of Revision in PFC Sigma Primary Total Knee Arthroplasty With Mismatch of Femoro-Tibial Component Sizes

Simon W. Young, FRACS [a], Henry D. Clarke, MD [a], Stephen E. Graves, FRACS [b], Yen-Liang Liu, M. App Stats [c], Richard N. de Steiger, FRACS [b]

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CONCLUSION

Val d'Isère

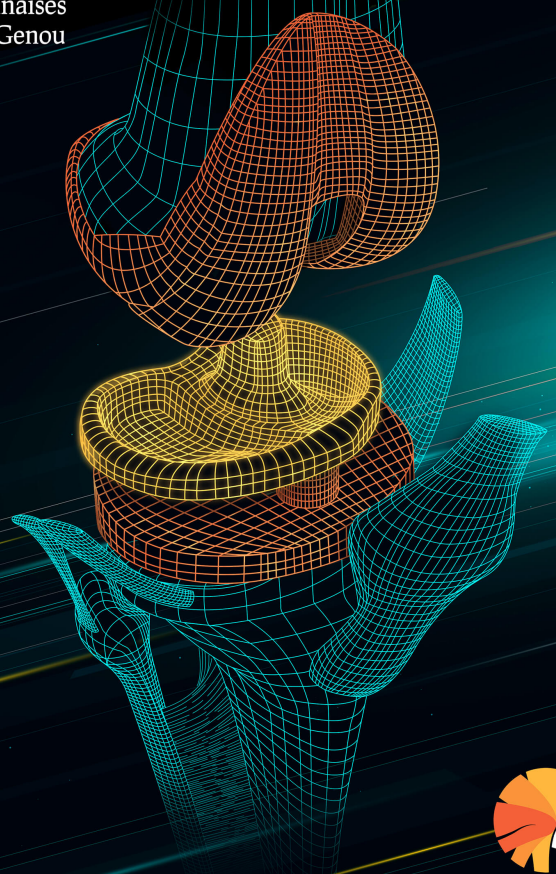
1. Cement : vizualization
2. Osteophytes should be removed
3. Size : preoperative 3D planning
4. Tibia : asymmetrical baseplate
5. Femur : off-the-shelf implant vs custom implant
6. Patient specific approach in 2025

THE TOTAL KNEE ARTHROPLASTY

24 - 26 SEPTEMBER 2026

LYON CONVENTION CENTRE

22èmes Journées Lyonnaises de Chirurgie du Genou



LYON KNEE SCHOOL of SURGERY