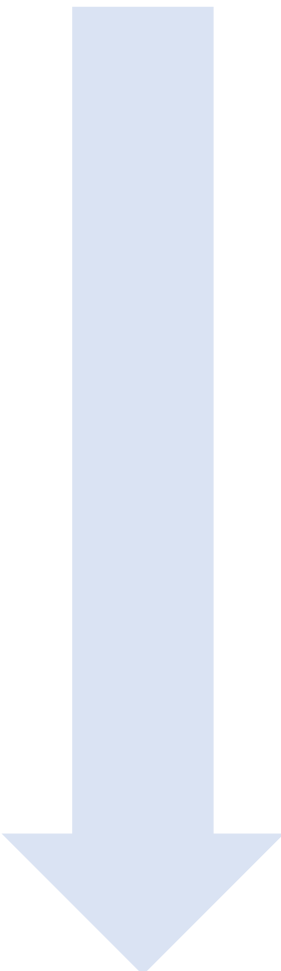


10 points to improve primary TKA

M Bonnin, MD, PhD

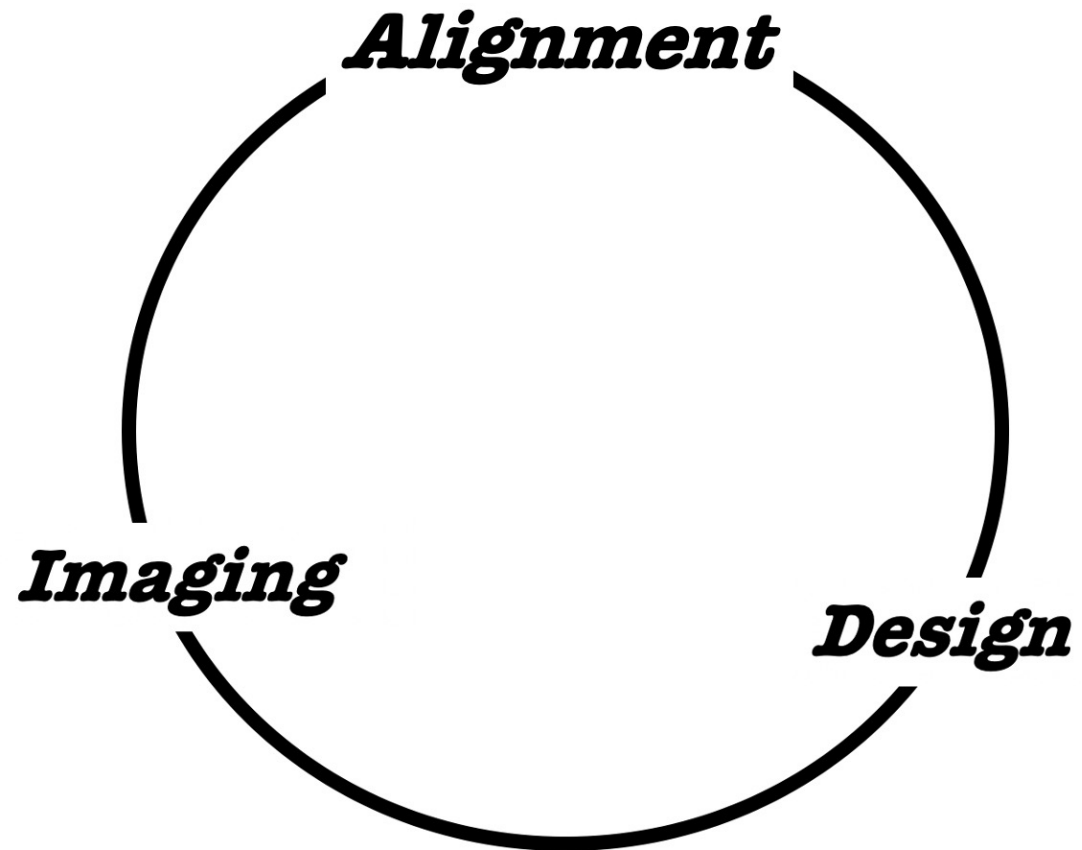
Centre Orthopedique Santy, Lyon, France

TKA is not just an “implant” it is a “process”

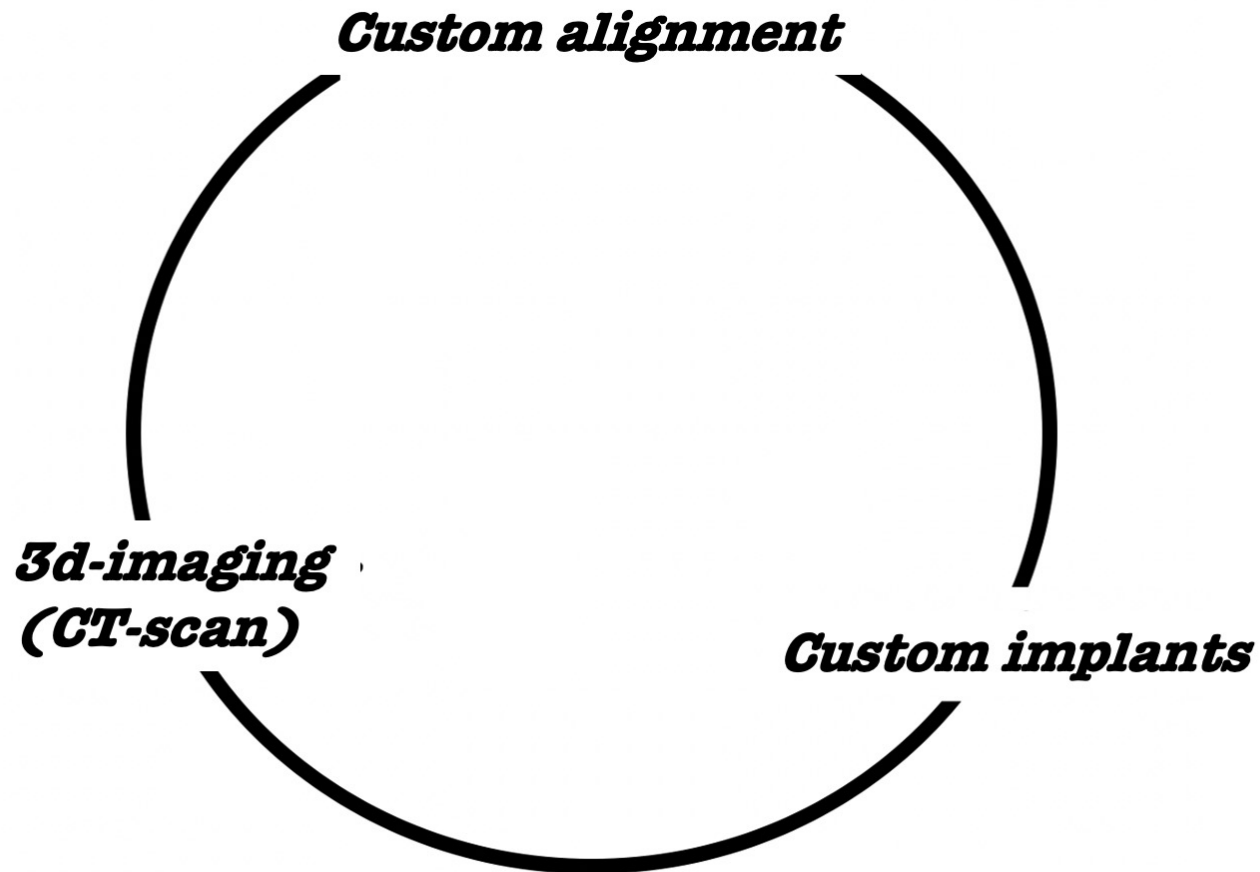
- 
- 1- Indication**
 - 2- Strategy**
 - 3- Preop planning**
 - 4- Patient's education**
 - 5- Workflow in hospital**
 - 6- Implant**
 - 7- Instrumentation**
 - 8- Lig^t tension**
 - 9- Rehab**
 - 10- Evaluation**

CUSTOMIZED “PROCESS”

Restoring native alignment

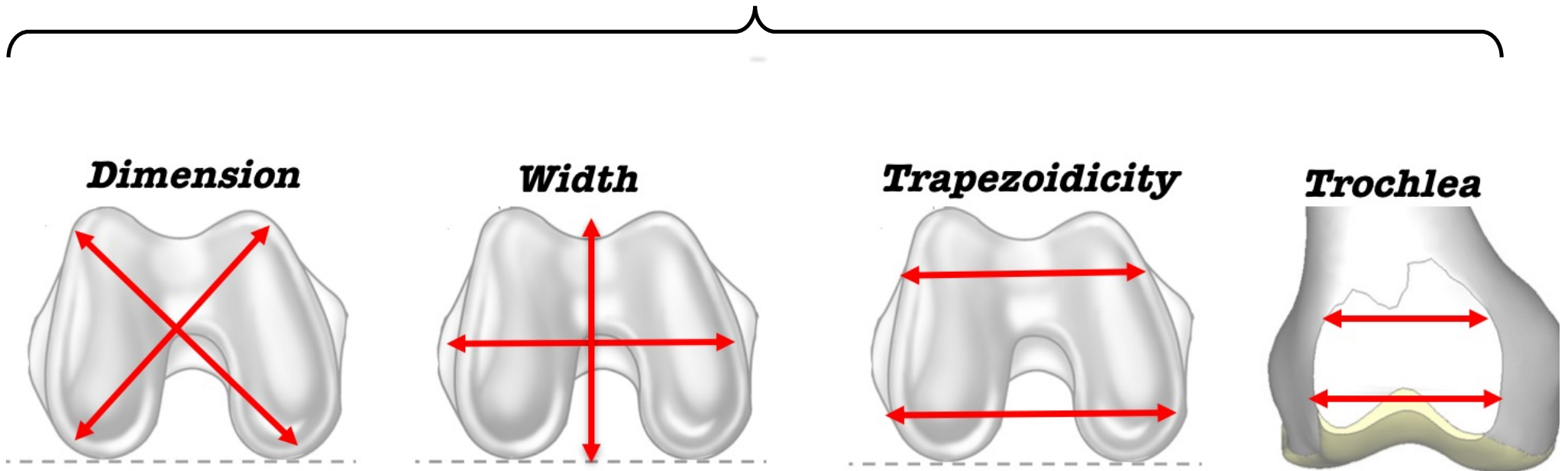


Restoring native alignment



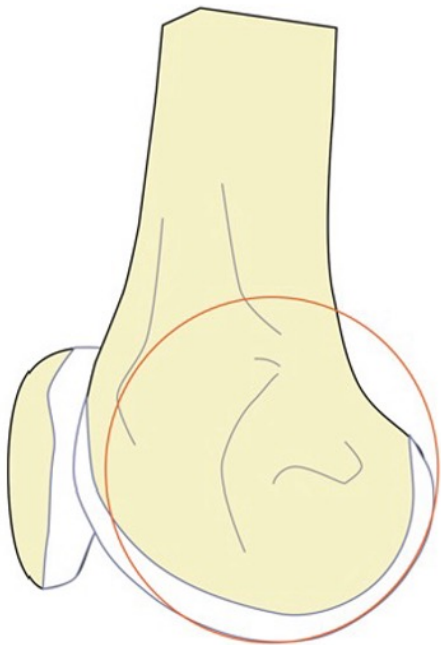
ANATOMY: human variability is greater than what we thought

INDEPENDANT

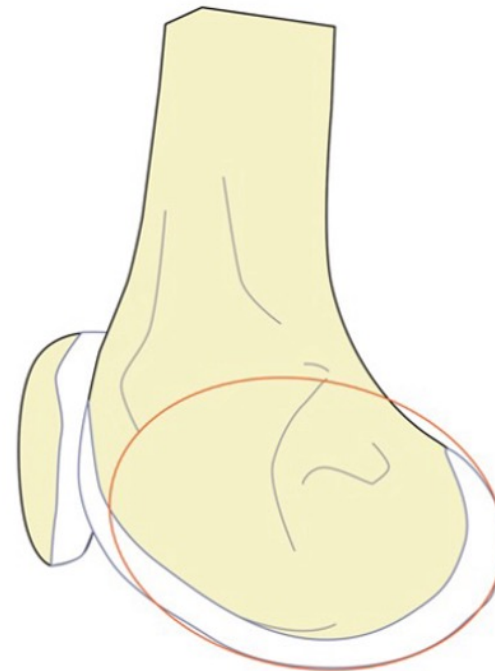


KINEMATICS: influence of radii of curvature

SPHERICAL CONDYLES
= SINGLE-RADIUS



OVOID CONDYLES
= MULTI-RADII

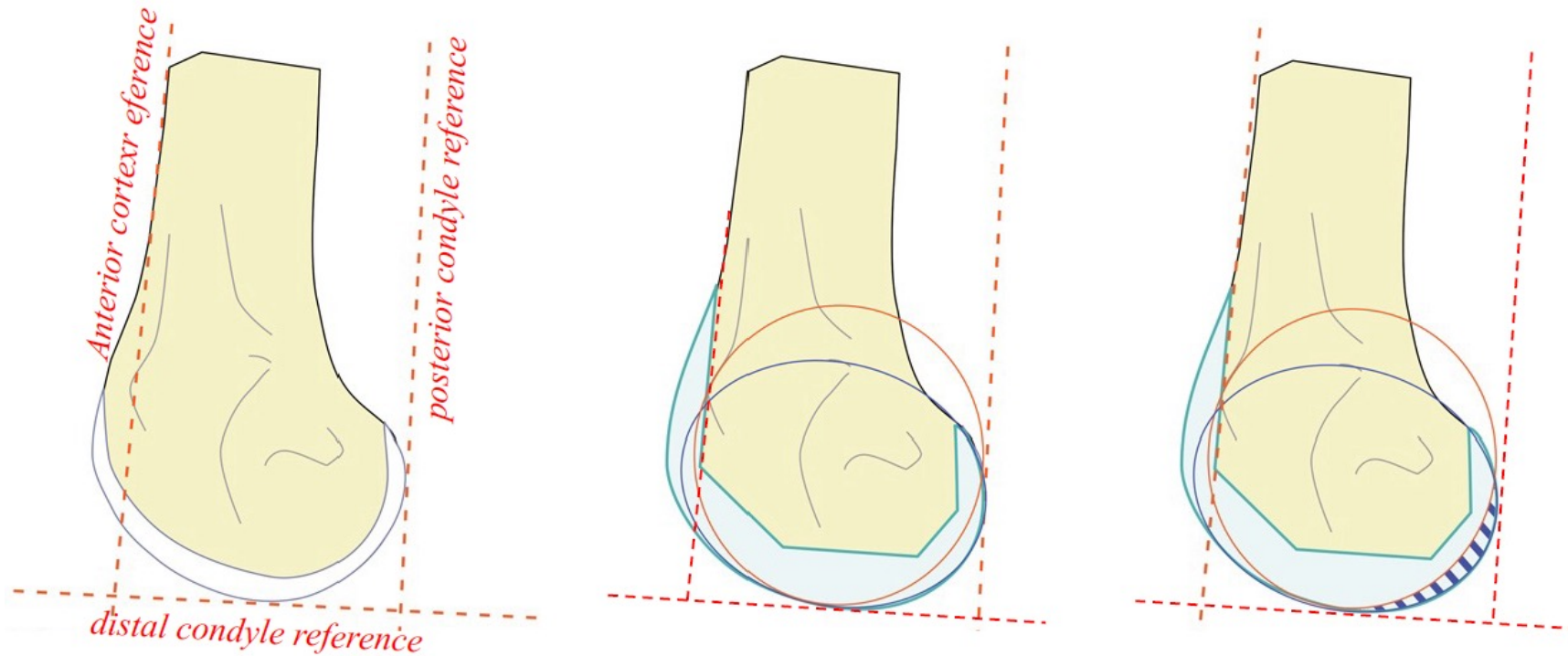


Multi-radii TKA in a single-radius knee

SURGICAL LANDMARKS

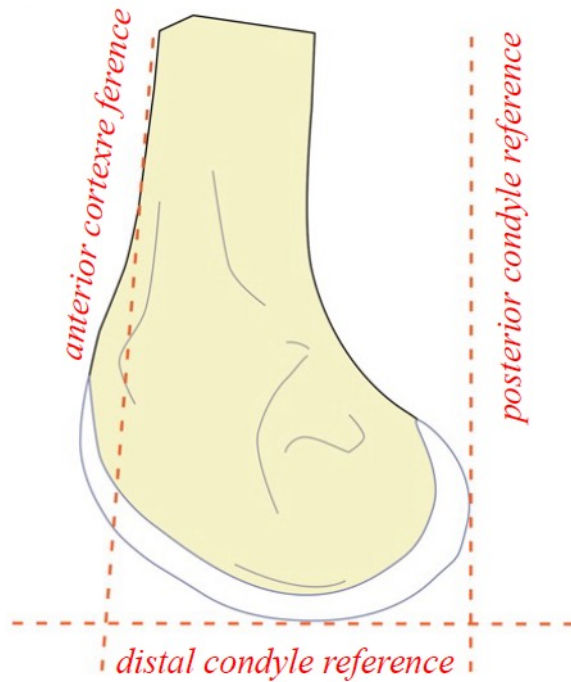
MULTI-RADII TKA

OVER-VOLUMING
IN MID-FLEXION

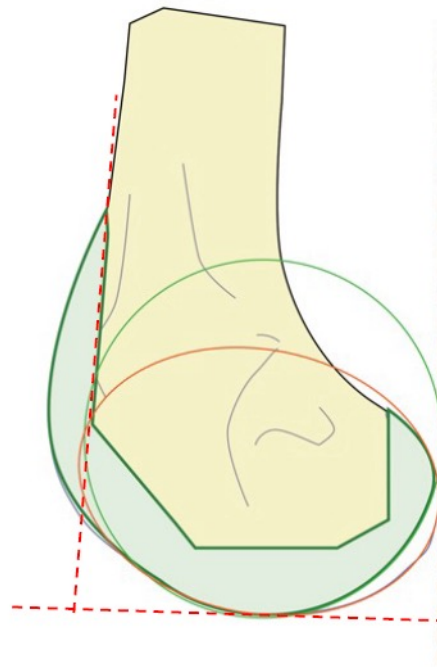


Single-radius TKA in a Multi-radii knee

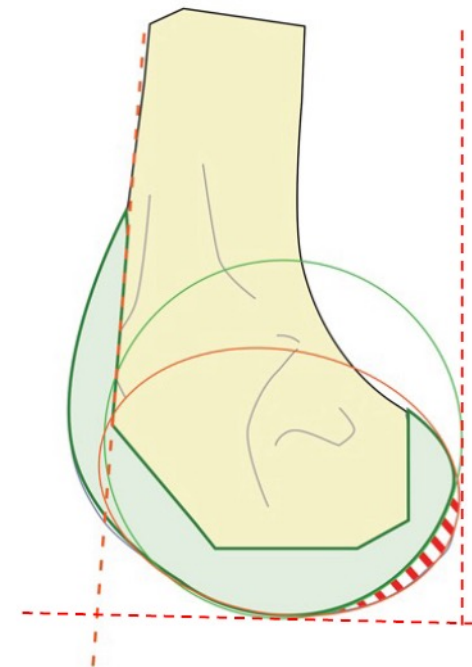
SURGICAL LANDMARKS



SINGLE-RADIUS TKA



UNDER-VOLUMING
IN MID-FLEXION



LIG^T TENSION : Anatomic restoration \Leftrightarrow Respect tissue envelope

Old concepts

- Limited range of size
- Non-anatomic design
- Systematic alignment
- Asymmetric cuts

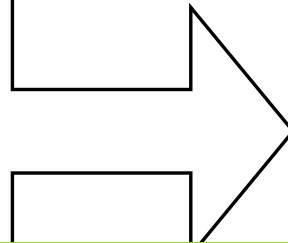
Technical “tricks”

- Gap balancing
- Ligament release
- External rotation
- Retinaculum Release

LIG^T TENSION : Anatomic restoration \Leftrightarrow Respect tissue envelope

Old concepts

- Limited range of size
- Non-anatomic design
- Systematic alignment



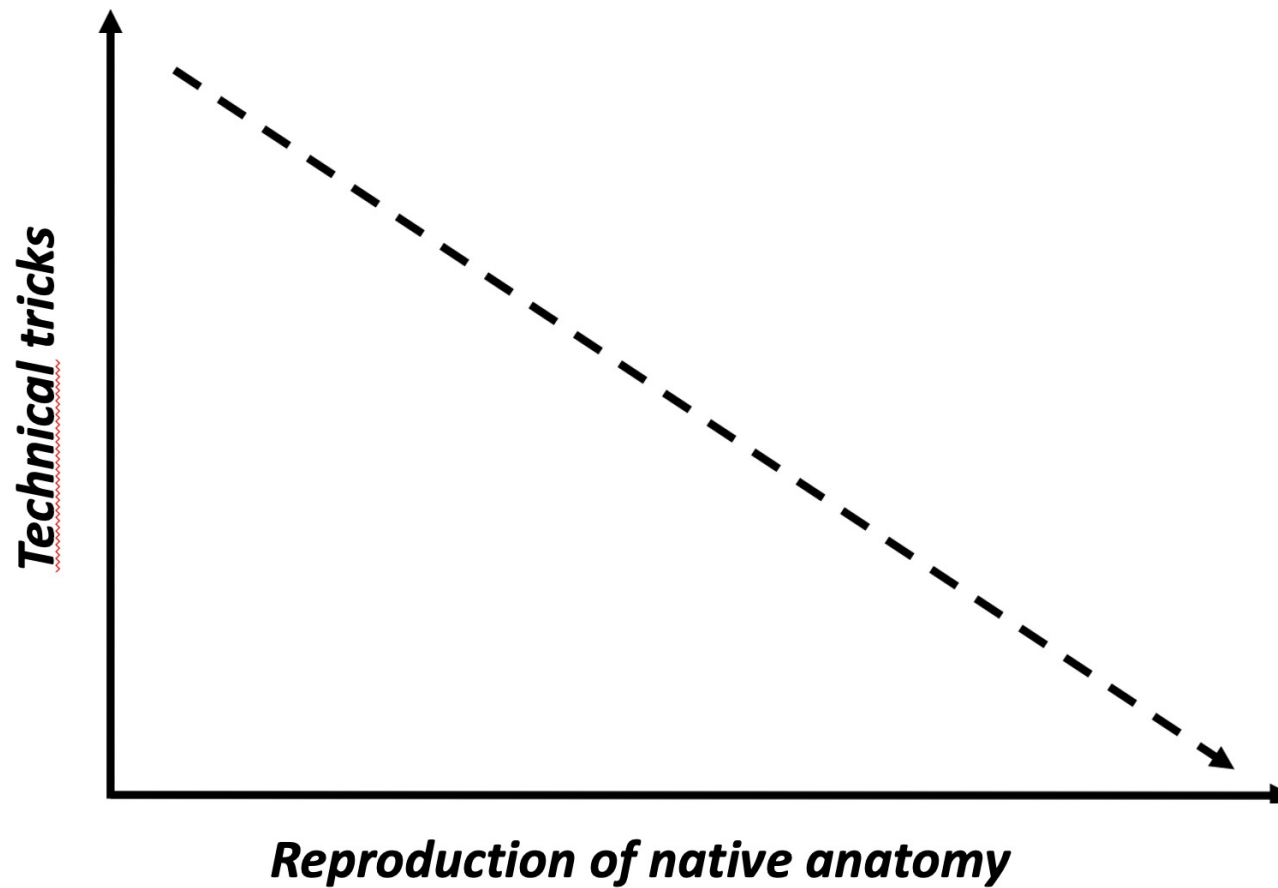
Technical “tricks”

- Gap balancing
- Ligament release
- External rotation

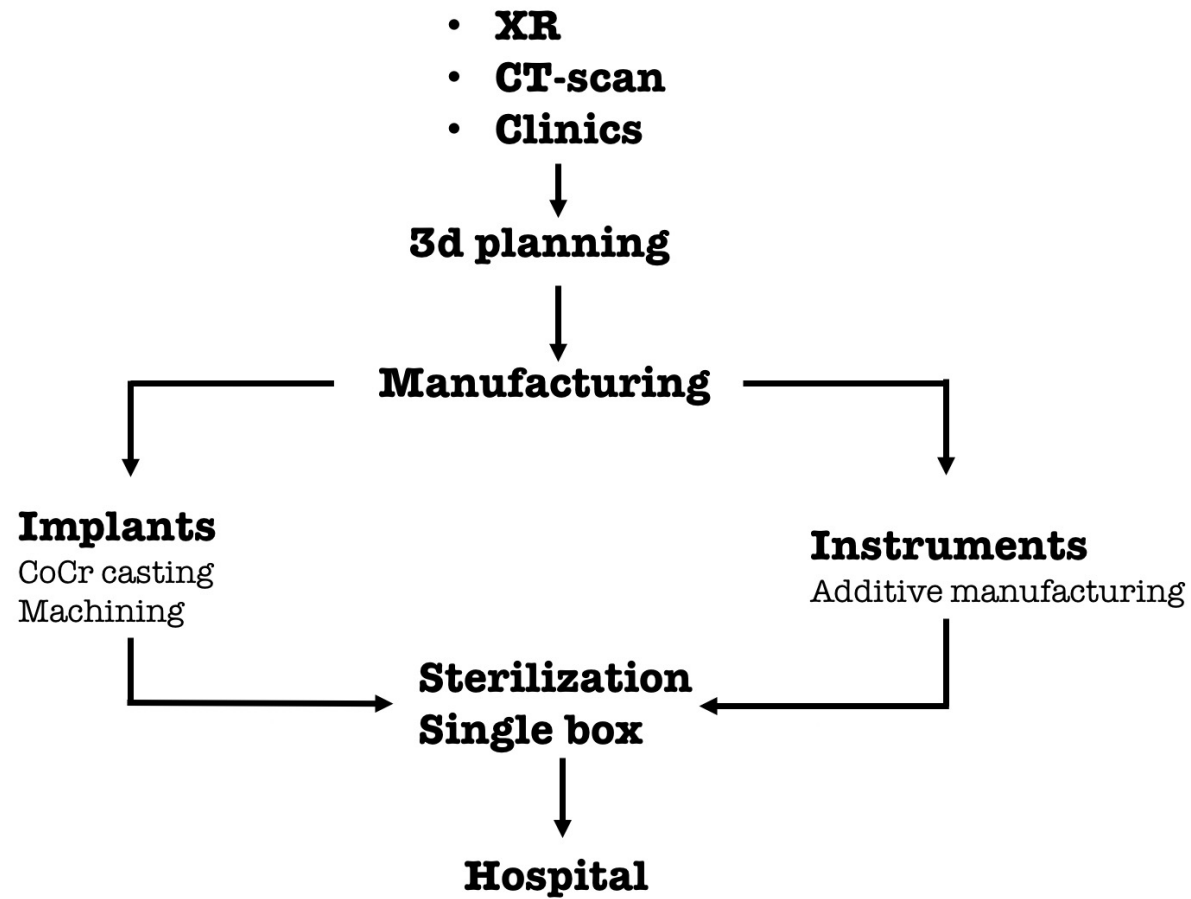
“TKA is a soft tissue procedure”

John Insall

LIG^T TENSION : Anatomic restoration \Leftrightarrow Respect tissue envelope



CUSTOMIZED PROCESS



Reduced instrumentation



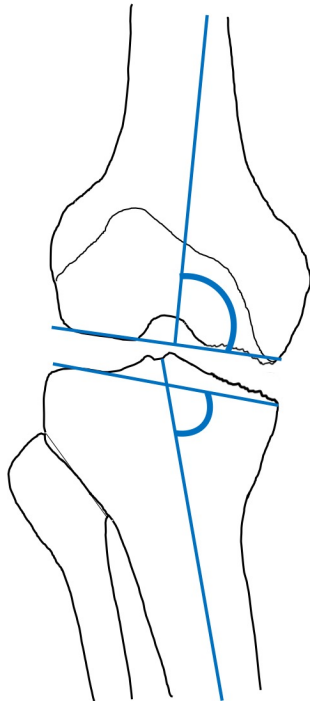
“Customization” is more than expanding range of size

- **Native femoral shape**
- **Radii of curvature**
- **Tibial asymmetry**
- **Joint line**
- **Trochlear shape**
- **Native alignment**



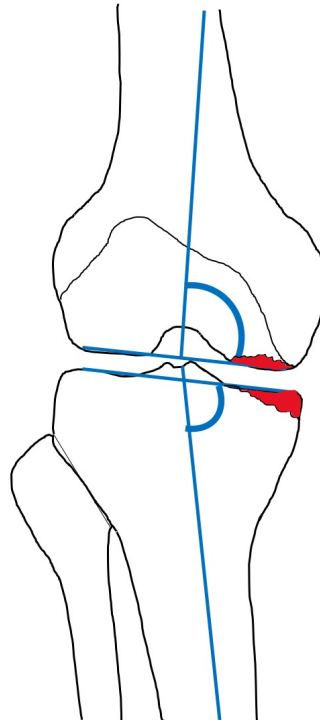
3-D analysis Native alignment Adapted implants

CT-scan



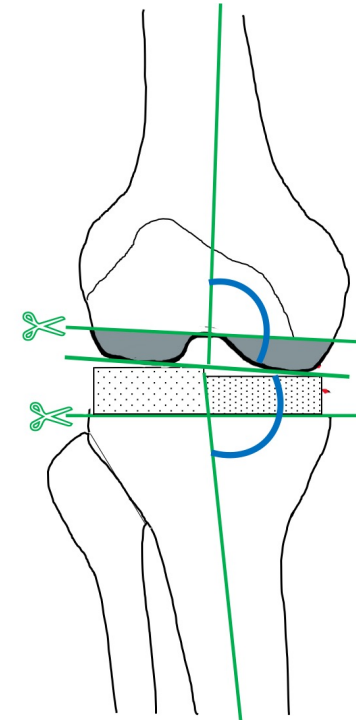
Wear

CT-scan



Native

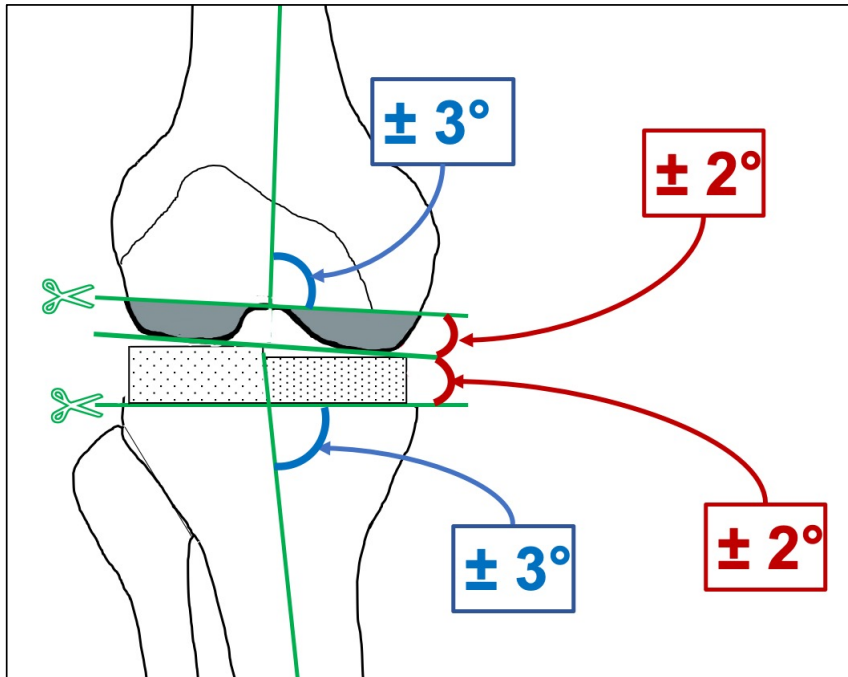
Planning



Native

MATRIX planification

**Cuts $\pm 3^\circ$ Implants $\pm 2^\circ$
HKA 175° - 183°**

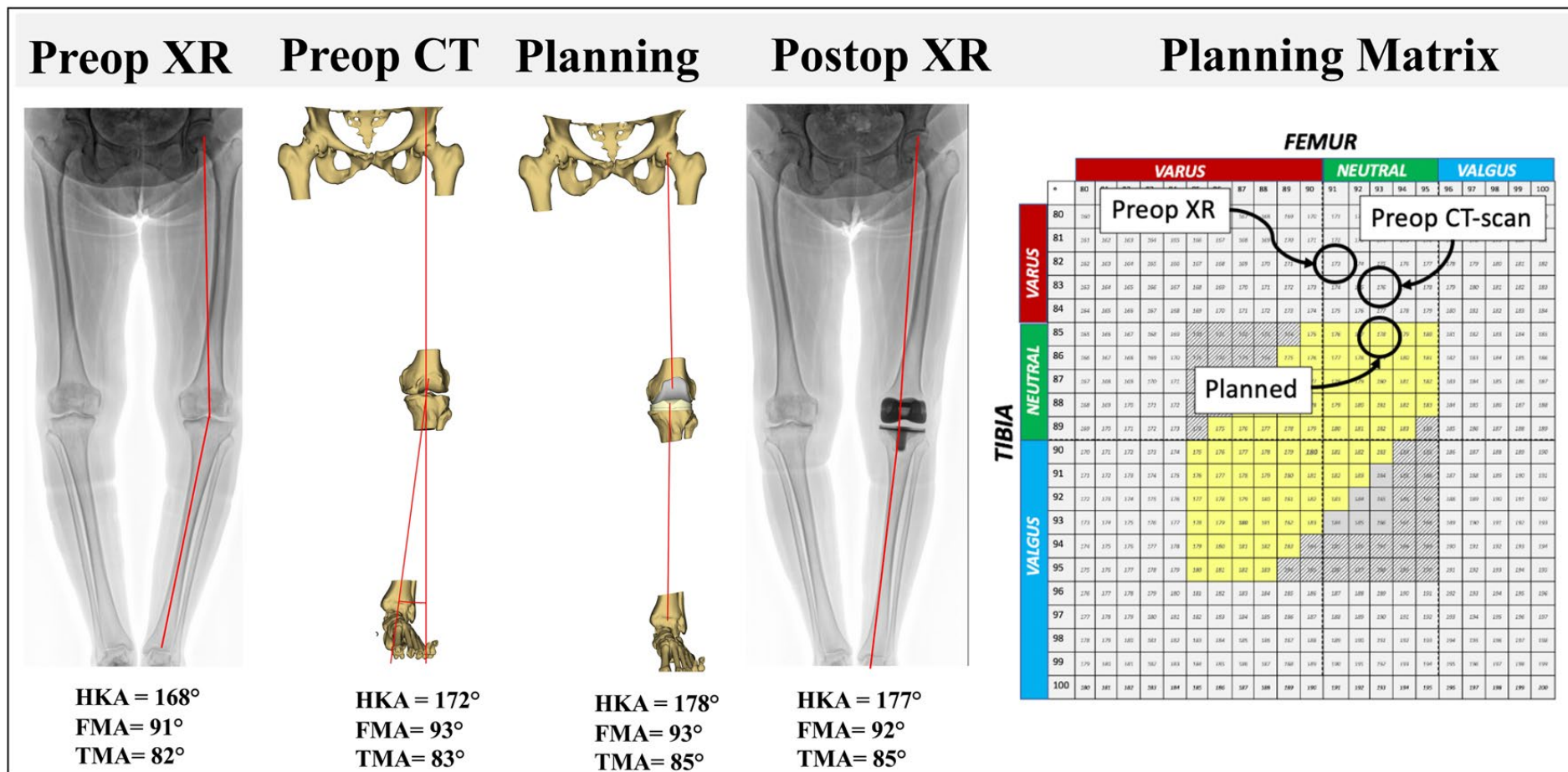


FEMUR

		VARUS																		NEUTRAL					VALGUS			
		80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100						
VARUS	80	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180						
	81	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181						
	82	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182						
	83	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183						
	84	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184						
NEUTRAL	85	165	166	167	168	169						175	176	177	178	179	180	181	182	183	184	185						
	86	166	167	168	169	170					175	176	177	178	179	180	181	182	183	184	185	186						
	87	167	168	169	170	171				175	176	177	178	179	180	181	182	183	184	185	186	187						
	88	168	169	170	171	172			175	176	177	178	179	180	181	182	183	184	185	186	187	188						
	89	169	170	171	172	173		175	176	177	178	179	180	181	182	183	184	185	186	187	188	189						
VALGUS	90	170	171	172	173	174	175	176	177	178	179	180	181	182	183			186	187	188	189	190						
	91	171	172	173	174	175	176	177	178	179	180	181	182	183	184			187	188	189	190	191						
	92	172	173	174	175	176	177	178	179	180	181	182	183	184	185			188	189	190	191	192						
	93	173	174	175	176	177	178	179	180	181	182	183	184	185	186			189	190	191	192	193						
	94	174	175	176	177	178	179	180	181	182	183	184	185	186	187			190	191	192	193	194						
	95	175	176	177	178	179	180	181	182	183	184	185	186	187	188			191	192	193	194	195						
	96	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196						
	97	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197						
	98	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198						
	99	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199						

SAFE ZONE

Native alignment \notin safe zone \Rightarrow correct but respect the phenotype



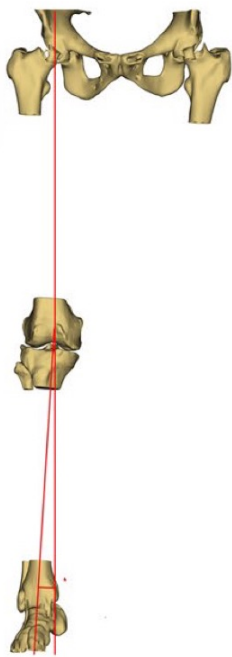
Native alignment \notin safe zone \Rightarrow correct but respect the phenotype

Preop XR



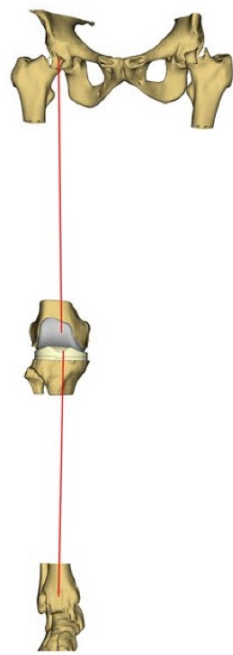
HKA = 198°
FMA = 97°
TMA = 91°

Preop CT



HKA = 185°
FMA = 95°
TMA = 90°

Planning



HKA = 183°
FMA = 94°
TMA = 89°

Postop XR



HKA = 182°
FMA = 93°
TMA = 89°

Planning Matrix

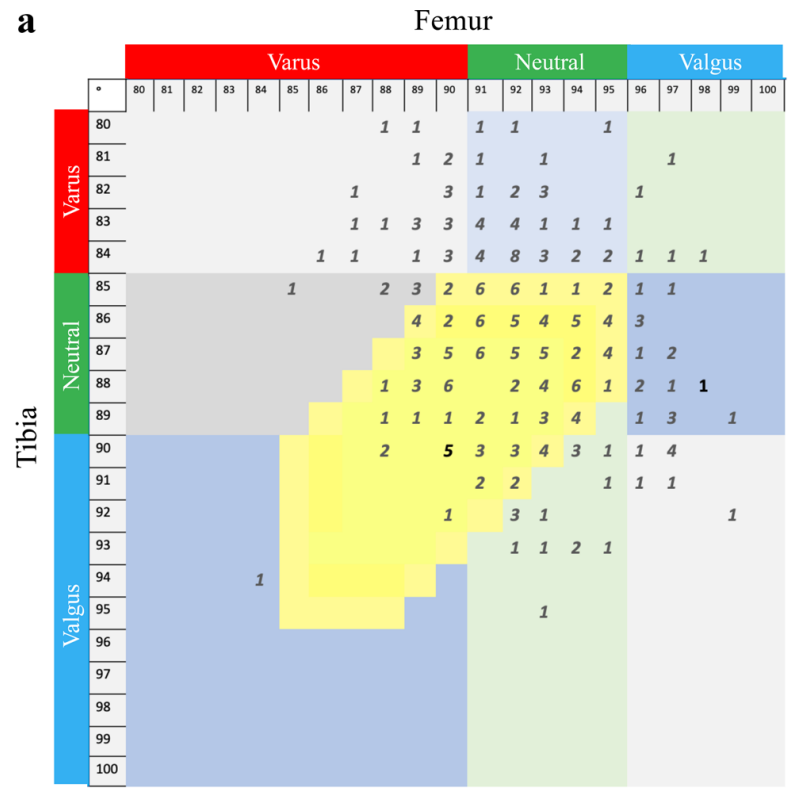
		FEMUR																					
		VARUS					NEUTRAL					VALGUS											
#	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100		
TIBIA	VARUS	80	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
		81	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201
		82	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202
		83	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203
		84	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204
	NEUTRAL	85	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205
		86	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206
		87	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207
		88	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208
		89	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209
VALGUS	90	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	
	91	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	
	92	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	
	93	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	
	94	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	

Annotations: 'Preop CT-scan' points to row 81, 'Planned' points to row 87, and 'Preop XR' points to row 90. A shaded region highlights the area between rows 85-94 and columns 90-100.

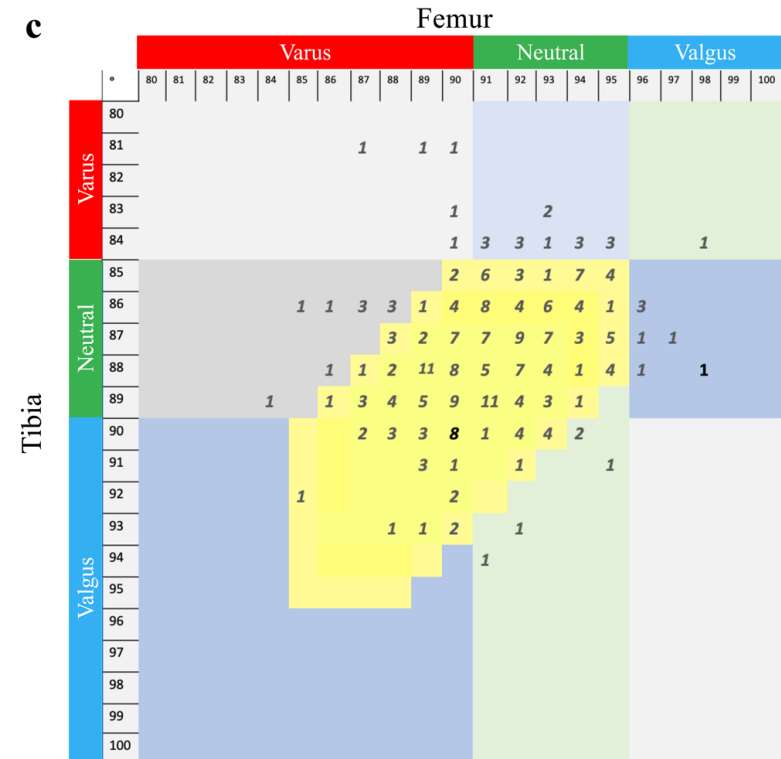
Pre-post operative alignment (n=266)

Bonnin et al KSSTA 2020

Preoperative long leg XR



Postoperative long leg XR



Conclusion : Improving the global « TKA-process »

1- ANATOMY

- Sizing
- Kinematics

2- ALIGNMENT

- Rotation
- Coronal alignment

3- LOGISTICS

- Workflow in OR
- Economics

4- EDUCATION

- Teaching
- Road map

5- CONFIDENCE

- “All in advance”
- Traceability

Conclusion : toward an hollistic process

TKA process



- ANALYZE the patient
- STANDARDIZE the process
- CUSTOMIZE the implant