

BALANC-R™ : BALANCED RESURFACING

FRAMEWORK FOR TKA PLANNING AND EXECUTION



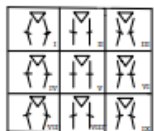
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BALANC-R™ : BALANCED RESURFACING FRAMEWORK FOR TKA PLANNING AND EXECUTION

Pre-Operative Data

Clinical:
ROM = _____° to _____°
Deformity = _____° VARUS / VALGUS

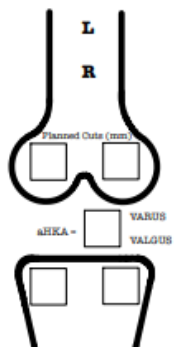
X-ray:
ATFA = _____°
mHKA = _____°
MPTA = _____°
LJFA = _____°
aHKA = _____°
aJLO = _____°
JLO Apex: Distal / Neutral / Proximal
Cor. Phasotype = _____
(based on MacDermid et al.)



Calculations

aHKA = MPTA - LJFA
aJLO = MPTA + LJFA
Planned DF Cut Angle = 90° - LJFA
Planned PT Cut Angle = MPTA - 90°
(+ valgus) (- varus)

Initials: _____ Age: _____
MRN: _____
DOB: _____
M / F Left / Right
HT: _____
WT: _____
BMI: _____



Planned Cuts (mm)
aHKA = _____ VARUS / VALGUS

Anticipated Wear (mm)
Mod. Lat.
DF PT

Planned Values
DF PT
Patellar Rot. IR / ER
Patellar Flex.
Tibial Slope

Fem Type	Fem Size	Insert Type	Insert Size (mm)	Tibia Type	Tibia Size	Patella Type	Patella Size

Cemented Uncemented PCL Status: _____
TQ: YES / NO TQ Time (min): _____ Bone Qual (1-Exx to 5-poor): _____

Balanc-R™ Workflow

Pre-Adjustment
Rest HKA = _____° VARUS / VALGUS
Stress HKA = _____° VARUS / VALGUS
ROM = _____° to _____°

Approved Plan

	Gaps (mm)		Cut Depths (mm)	
	Ext.	Flex.	DF	PT
Med.				
Lat.				

DF		VARUS / VALGUS
PT		VARUS / VALGUS
HKA		VARUS / VALGUS
Patellar Rot.		IR / ER
Patellar Flex.		
Tibial Slope		

Final Values
HKA = _____° VARUS / VALGUS
ROM = _____° to _____°

Final Gaps (mm) (Robotic / Manual)

	Ext.	Flex.
Med.		
Lat.		

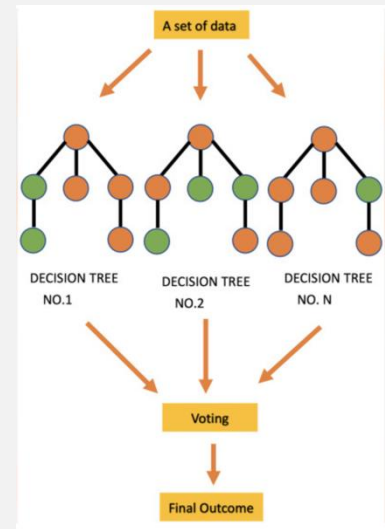
Structured, balanced resurfacing framework for TKA:

- Planning
- Execution
- Documentation

WHY A STRUCTURED TKA FRAMEWORK?

Current TKA algorithms and alignment philosophies are:

- **Confusing!**
- **Often conflicted and/or proprietary**
- **Hard to interpret into actionable, intra-operative decision-making for the surgeon**
- **Inadequate to address modern scenarios:**
 - **Too focused on the coronal plane**
 - **Miss the concept of soft tissue balance**
 - **Do not address the increasing use of technology, including robotics**
- **I couldn't find anything I could bring to the OR for planning, execution and documentation**



BALANCED RESURFACING TKA WORKFLOW

- Simple, free, agnostic, non-conflicted
- Downloadable :
www.GonduskyMD.com – Surgeon Resources
- Intuitive and Algorithmic
- Promotes data acquisition and research toward better outcomes

Pre-Operative Data

Clinical:
ROM = _____° to _____°
Deformity = _____° VARUS / VALGUS

X-ray:
aTFA = _____°
mHKA = _____°
MPTA = _____°
LJFA = _____°
aHKA = _____°
aLLO = _____°

JLO Apex: Distal / Neutral / Proximal
Cor. Phenotype = _____
(based on MacDessi et al.)

Planned Cuts (mm)

aHKA = _____° VARUS / VALGUS

Anticipated Wear (mm)

	Med.	Lat.
DF		
PT		

Calculations

aHKA = MPTA - LJFA
aLLO = MPTA - LJFA
Planned DF Cut Angle = 90° - LJFA
Planned PT Cut Angle = MPTA - 90°
(+ valgus) (- varus)

Initials: _____ **Age:** _____
MRN: _____
DOB: _____
M / F **Left / Right**
HT: _____
WT: _____
BMI: _____

Balanc-R™ Workflow

Pre-Adjustment

Rest HKA = _____° VARUS / VALGUS
Stress HKA = _____° VARUS / VALGUS
ROM = _____° to _____°

Approved Plan

	Gaps (mm)		Cut Depths (mm)	
	Ext.	Flex.	DF	PT
Med.				
Lat.				

DF		VARUS / VALGUS
PT		VARUS / VALGUS
HKA		VARUS / VALGUS
Patellar Rot.		IR / ER
Patellar Flex.		
Tibial Slope		

Final Values

HKA = _____° VARUS / VALGUS
ROM = _____° to _____°

Final Gaps (mm) (Robotic / Manual)

	Ext.	Flex.
Med.		
Lat.		

Pan Type	Pan Size	Insert Type	Insert Size (mm)	Tibia Type	Tibia Size	Patella Type	Patella Size

Cemented Uncemented PCL Status: _____

TQ: YES / NO TQ Time (min): _____ Bone Qual (1-Exc to 5-poor): _____

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TO DEVELOP A TKA FRAMEWORK YOU MUST:

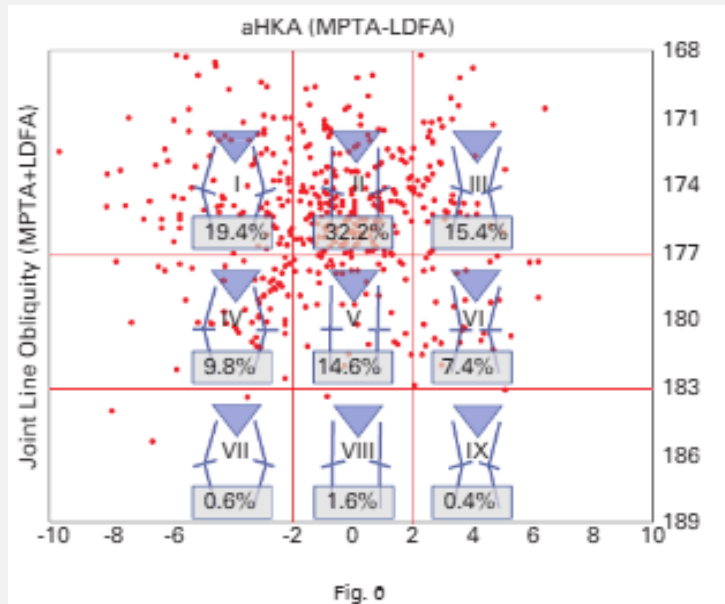
- Admit there is a problem to solve
 - TKA outcomes can be better
- Be adaptable to changes in our knowledge base
 - Literature, implants, technology, PROMs, data
- Base a framework on knowledge that is available, learned and practical
 - 12 years and >3,000 TKA, student of knee kinematics/TKA design
- You ultimately need to agree that certain axioms exist for TKA

AXIOMS

- The pre-arthritic knee resides in a **natural state of coronal alignment** specific to that individual and it can be defined
- **Knee planes** beyond the coronal should be factored into TKA planning and execution
- **Knee resurfacing** is optimal to replicate native anatomy, alignment and kinematics
- Refining resurfacing parameters within boundaries of HKA, LDFA, MPTA, slope and rotation will allow for better resultant **soft tissue balance** than a pure resurfacing technique
- The goal for final TKA soft tissue balance should **replicate normal knee compartmental translation and laxity, prioritizing medial knee stability through motion**
- **Inherent error exists** in all systems and needs to be accounted for. These errors result in the need for modifications to a strictly dogmatic approach to TKA. Using data we have and trusting the most confident variables is the best we can do to reproduce quality outcomes
- **Technology**, robotics or other, helps us broach the divide between planned approach and final result by **minimizing variability and increasing precision**

PRE-ARTHRITIC KNEE CORONAL ALIGNMENT CAN BE DEFINED

AXES BEYOND CORONAL NEED TO BE FACTORED



Plot of arithmetic hip-knee-ankle angle (aHKA) against joint line obliquity for an arthritic population showing distribution by percentage in the nine Coronal Plane Alignment of the Knee (CPAK) types. LDFA, lateral distal femoral angle; MPTA, medial proximal tibial angle.

Note. From “Coronal Plane Alignment of the Knee (CPAK) classification: a new system for describing knee phenotypes,” by S. MacDessi et al., 2021, *Bone and Joint Journal*, 103-B(2), p. 329-337 ([10.1302/0301-620X.103B2.BJJ-2020-1050.R1](https://doi.org/10.1302/0301-620X.103B2.BJJ-2020-1050.R1)). CC BY-NC-ND 4.0.

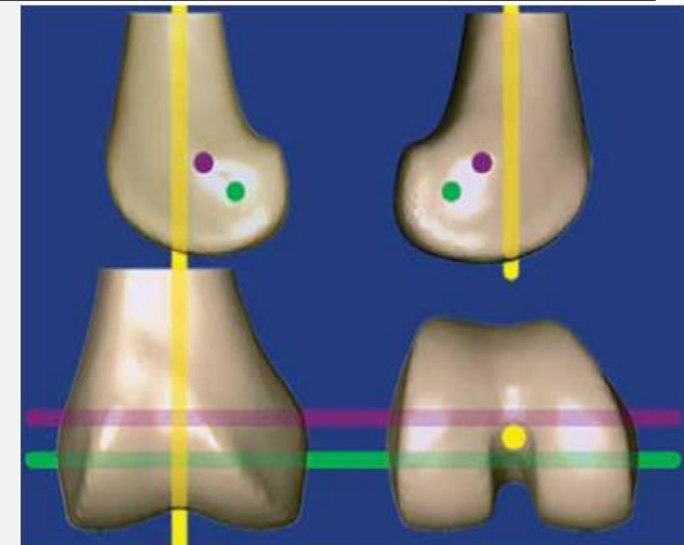
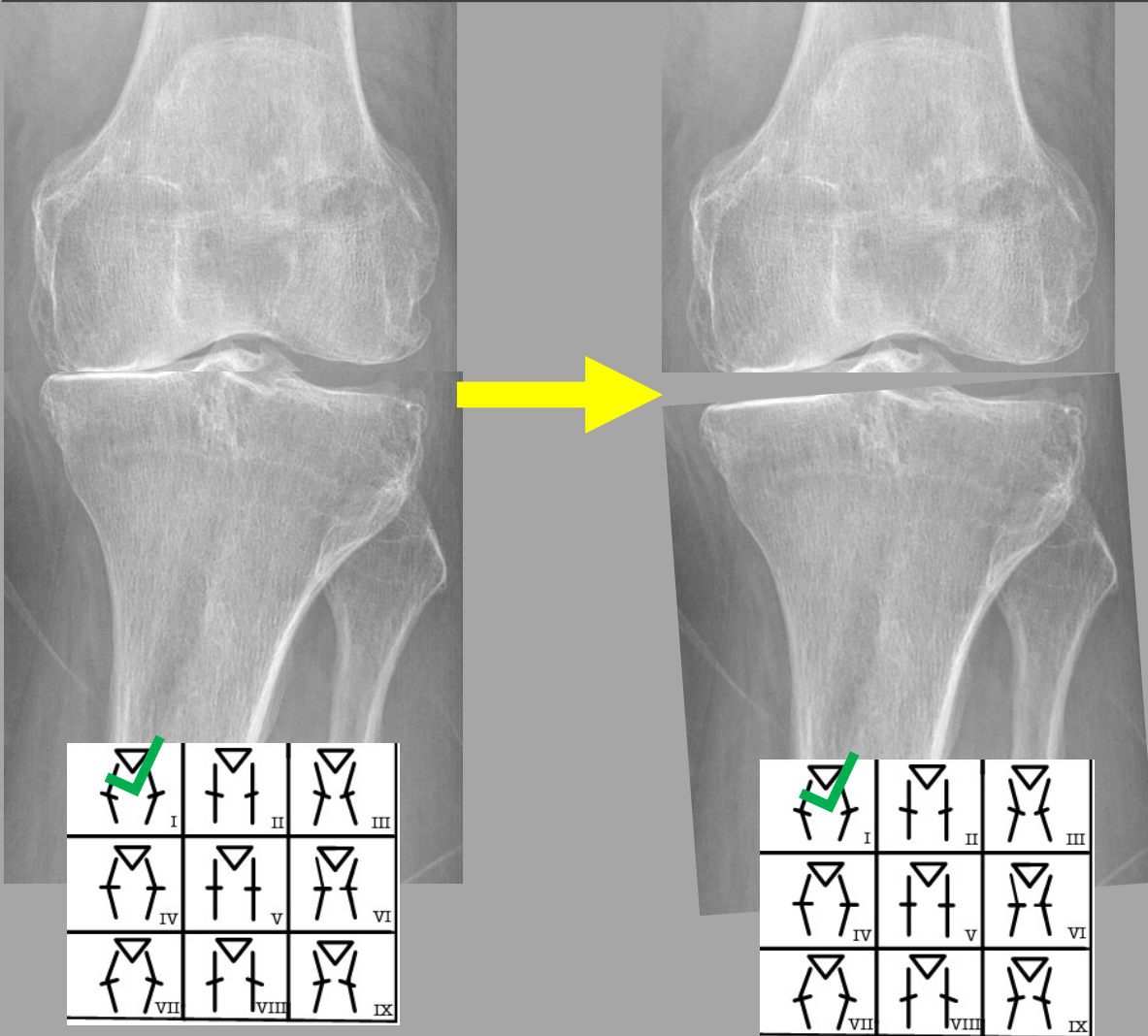


Figure 1. The illustration shows four views of the distal femur and the three kinematic axes of the knee. The green line indicates the transverse axis in the femur about which the tibia flexes and extends. The magenta line indicates the transverse axis in the femur about which the patella flexes and extends. The yellow line indicates the longitudinal axis in the tibia about which the tibia internally-externally rotates on the femur. Each axis is parallel or perpendicular to the natural joint line between the femur and tibia throughout the motion arc [3,7,8].

Note. From “Kinematic Alignment in Total Knee Arthroplasty. Definition, History, Principle, Surgical Technique, and Results of an Alignment Option for TKA,” by S. M. Howell et al., 2014, *Arthropeadia*, (1), p. 44-53 ()

RESURFACING RECREATES PRE-ARTHRITIC ANATOMY RESTORES THE JOINT LINE AND ALL NATIVE KNEE AXES



BUT...A PURE RESURFACING TECHNIQUE CAN LEAD TO ALIGNMENT EXTREMES AND UNBALANCED KNEES

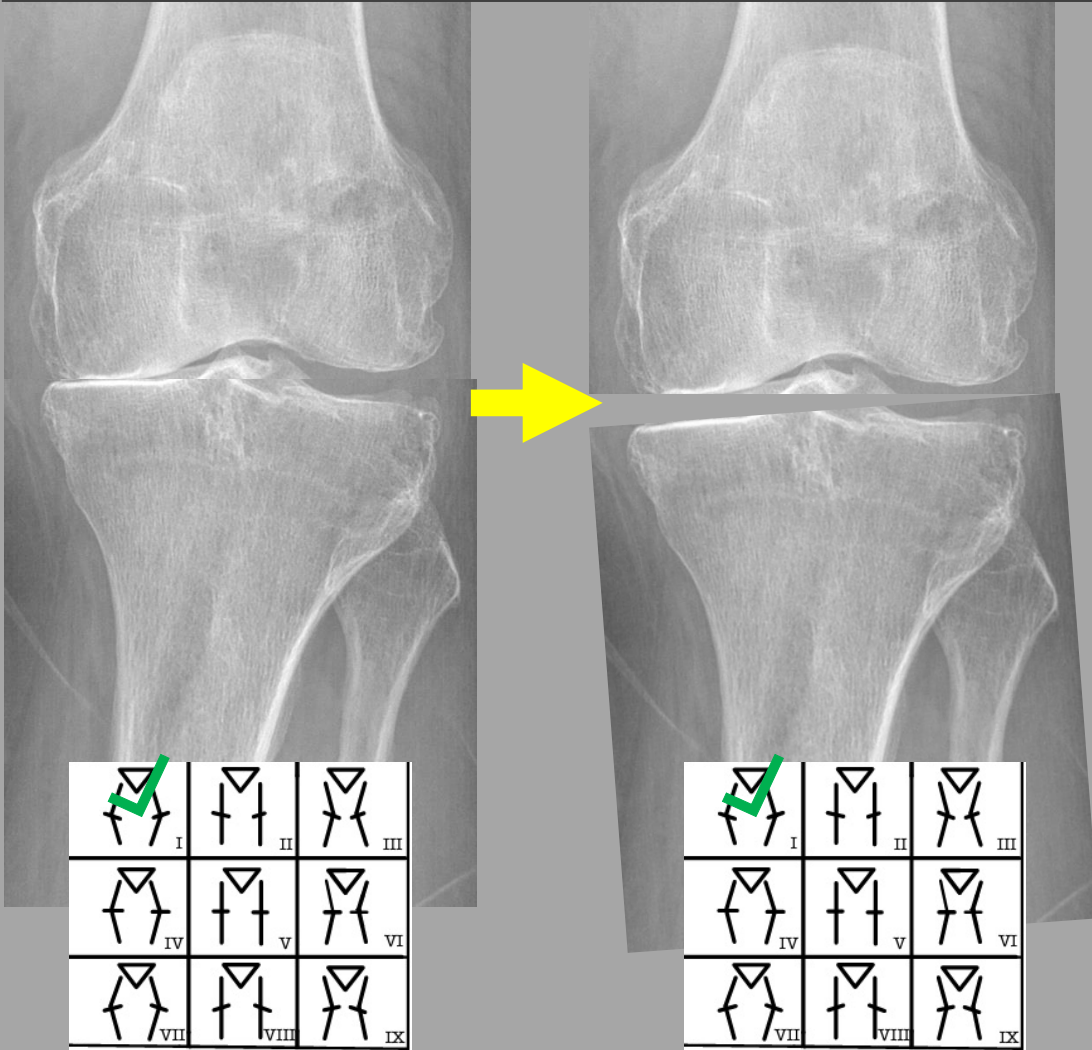


Chronic soft tissue changes create imbalance within a pure resurfacing framework. It does not work !

This is now obvious in robotic TKA cases :

- 2023 study, 382 robotic TKA cases
- Pure resurfacing = only 11-31% of cases had extension gap balance within 1mm, and 20-41% showed a medial flexion gap looser than the lateral flexion gap²

REFINING RESURFACING PARAMETERS WITHIN BOUNDARIES OF HKA, LDFA, MPTA, SLOPE AND ROTATION ALLOWS FOR OPTIMAL RESULTANT SOFT TISSUE BALANCE



MEDIAL STABILITY THROUGH ROM IS KEY

FINAL TKA SOFT TISSUE BALANCE SHOULD REPLICATE NORMAL KNEE COMPARTMENTAL TRANSLATION AND LAXITY

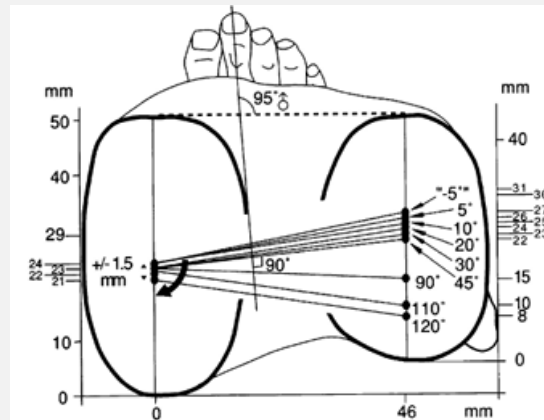
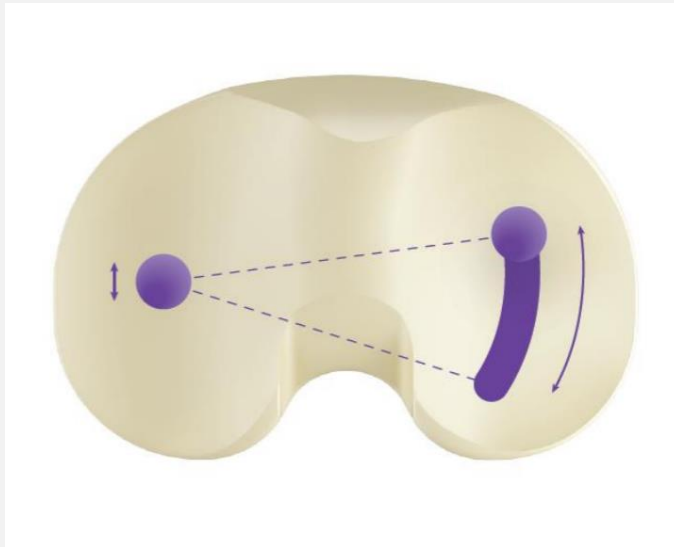


Fig. 1. A diagram to show the articular surface of the tibia and the positions of the geometric axis between the femoral flexion facet centres (FFCs) in various degrees of flexion. The points at the ends of the lines show the positions (in mm) of the FFCs medially and laterally relative to the ipsilateral posterior tibial cortex. For diagrams of this kind to show the correct angles of rotation the separation between the medial and lateral plane of measurement must be specified. (Reproduced with permission from (Iwaki et al., 2000.) Journal of Bone and Joint Surgery (B).)

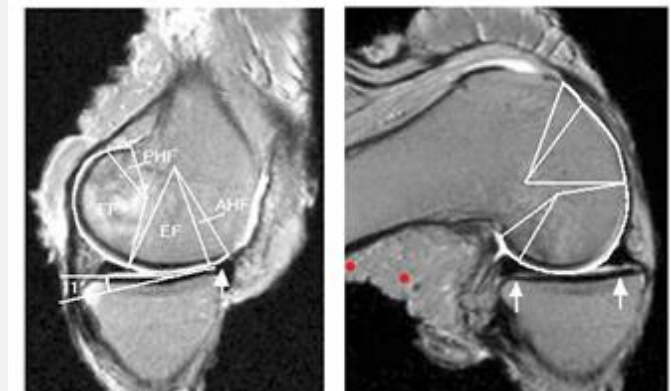


Fig. 3. MRIs of the cadaveric medial condyles in sagittal section at full extension (left) and 120° (right). Note the 11° angle between the tibial facets. (AHF: anterior horn facet; PHF: posterior horn facet; EF: extension facet, FF: flexion facet. Arrows point to the menisci.) (Reproduced with permission from (Martelli and Pinskerova, 2002.) Journal of Bone and Joint Surgery (B).)

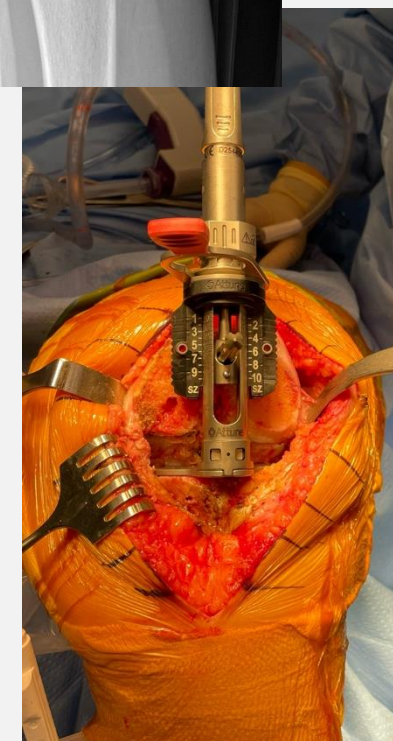
Note. From “The movement of the normal tibio-femoral joint,” by M. a. R. Freeman & V. Pinskerova, 2005, *Journal of Biomechanics*, 38(2), p. 197-208 (<https://doi.org/10.1016/j.jbiomech.2004.02.006>). Copyright 2004 by Elsevier Ltd.

ALL SYSTEMS HAVE INHERENT ERROR

WE NEED TO ACKNOWLEDGE THIS

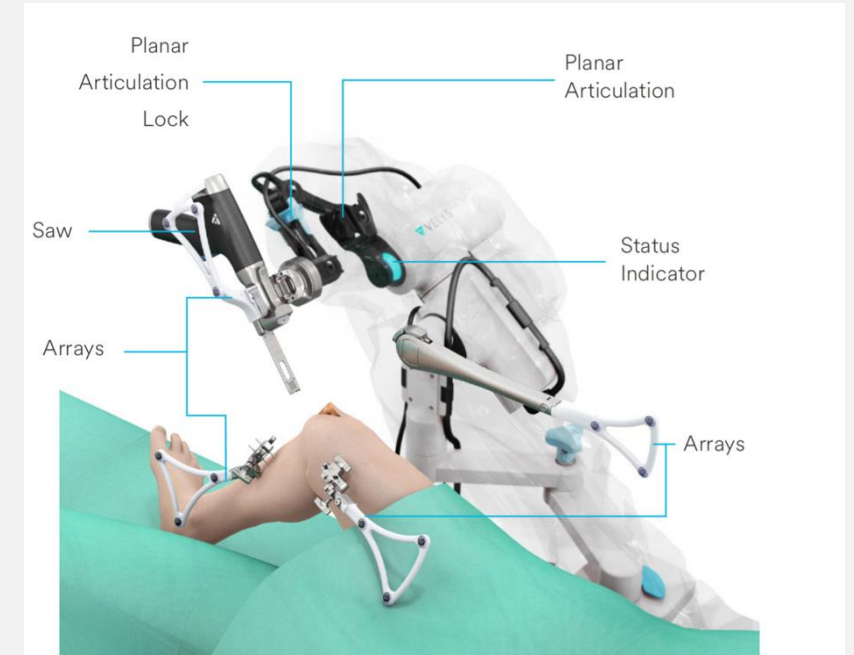
THINK ABOUT YOUR TKA WORKFLOW :

- MANUAL – SO MUCH ERROR IN EVERY STEP
 - ANGULAR, DEPTH, SLOPE
- ROBOTIC / TECHNOLOGY
 - ERROR IN ANGULAR MEASUREMENTS, REFERENCE POINTS, WEAR ESTIMATES, LIGAMENT TENSION
- ALL TKA
 - MEASUREMENT ERROR, SLOPE, OSTEOPHYTE IMPACT, CONTRACTURES, IMPACT OF RELEASES, RIGID VS LAX DEFORMITY, MANUAL STRESS ASYMMETRY, FEMORAL BOW, BONE QUALITY, CEMENTATION, COMPONENT KINEMATICS AND GEOMETRY, COMPONENT PLACEMENT, TIBIAL ROTATION, PF TRACKING AND KINEMATICS, TROCHLEAR ANATOMY
- WHAT DOES THIS MEAN?
 - **ACKNOWLEDGE ERROR, START WITH A RESURFACING PHILOSOPHY, BALANCE THE SOFT TISSUES
= BALANCED RESURFACING**



TECHNOLOGY: LESS VARIABILITY, MORE PRECISION

- INHERENT ERROR CAN BE OVERCOME WITH GOOD DATA AND THE ABILITY TO EXECUTE ON GOOD DATA
- ROBOTICS CURRENTLY PROVIDE THE MOST ACCURATE AND PRECISE WAY TO PERFORM TKA
- DATA BEFORE CUTS, PLAN BEFORE EXECUTION, REVISIONS TO INITIAL EXECUTION MORE PRECISE

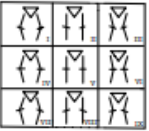


BALANC-R™ WORKFLOW PROVIDES A FRAMEWORK FOR SURGEONS TO LEARN WHAT WORKS TO CREATE THEIR GOAL

Pre-Operative Data

Clinical:
ROM = _____° to _____°
Deformity = _____° VARUS / VALGUS

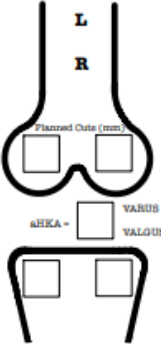
X-RAY:
aTFA = _____°
mHKA = _____°
MPTA = _____°
LDFA = _____°
aHKA = _____°
aLLO = _____°
JLO Apex: Distal / Neutral / Proximal
Cor. Phasotype = _____
(based on MacDermid et al.)



Calculations

aHKA = MPTA - LDFA
aJLO = MPTA - LDFA
Planned DF Cut Angle = 90° - LDFA
Planned PT Cut Angle = MPTA - 90°
(+ valgus) (- varus)

Initials: _____ Age: _____
MRN: _____
DOB: _____
M / F Left / Right
HT: _____
WT: _____
BMI: _____



Planned Cuts (mm)
aHKA = _____° VARUS / VALGUS

Anticipated Wear (mm)

	Med.	Lat.
DF		
PT		

Planned Values

	VARUS / VALGUS
DF	
PT	
Flexion Rot.	IR / ER
Flexion Flex.	
Tibial Slope	

Pen Type

Pen Type	Pen Size	Insert Type	Insert Size (mm)	Tibia Type	Tibia Size	Patella Type	Patella Size

Cemented Uncemented PCL Status: _____
TQ: YES / NO TQ Time (min): _____ Bone Qual (1-Ex to 5-poor): _____

Balanc-R™ Workflow

Pre-Adjustment
Rest HKA = _____° VARUS / VALGUS
Stress HKA = _____° VARUS / VALGUS
ROM = _____° to _____°

Approved Plan

	Gaps (mm)		Cut Depths (mm)	
	Ext.	Flex.	Flex.	Ext.
Med.				
Lat.				

DF _____ VARUS / VALGUS
PT _____ VARUS / VALGUS
HKA _____ VARUS / VALGUS
Flexion Rot. _____ IR / ER
Flexion Flex. _____
Tibial Slope _____

Final Values
HKA = _____° VARUS / VALGUS
ROM = _____° to _____°

Final Gaps (mm) (Robotix / Manual)

	Ext.	Flex.
Med.		
Lat.		

- Preoperative planning tool
- Intraoperative execution tool
- Research and documentation tool

Pre-Operative Data

Clinical:

ROM = _____ ° to _____ °

Deformity = _____ ° VARUS / VALGUS

X-ray:

aTFA = _____ °

mHKA = _____ °

MPFA = _____ °

LDFA = _____ °

aHKA = _____ °

aJLO = _____

JLO Apex: Distal / Neutral / Proximal

Cor. Phenotype = _____

(based on MacDessi et al.)

 I	 II	 III
 IV	 V	 VI
 VII	 VIII	 IX

Calculations

$aHKA = MPTA - LDFA$
 $aJLO = MPTA + LDFA$
 Planned DF Cut Angle = $90^\circ - LDFA$
 Planned PT Cut Angle = $MPTA - 90^\circ$
 (+ valgus) (- varus)

Initials:	Age:
MRN:	
DOS:	
M / F	Left / Right
HT:	
WT:	
BMI:	

PREOPERATIVE PLANNING DATA

Pre-Operative Data

Clinical:

ROM = _____° to _____°

Deformity = _____° VARUS / VALGUS

X-ray:

aTFA = _____°

mHKA = _____°

MPTA = _____°

LDFA = _____°

aHKA = _____°

aJLO = _____

JLO Apex: Distal / Neutral / Proximal

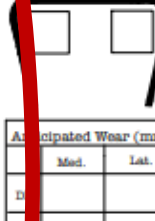
Cor. Phenotype = _____
(based on MacDessi et al.)

Pre-Operative Data

Clinical:
 ROM = _____° to _____°
 Deformity = _____° VARUS / VALGUS

LEGS:
 aTFA = _____°
 mHKA = _____°
 MPTA = _____°
 LDFA = _____°
 aHKA = _____°
 aTLO = _____°

JLD Apex: Distal / Neutral / Proximal
 Cor. Phenotype = _____
 (based on MacDermid et al.)



Anticipated Wear (mm)

	Med.	Lat.
Distal		
Proximal		

Planned Values

	Varus / Valgus	IR / ER
Distal		
Proximal		

Calculations

aHKA = MPTA - LDFA
 aTLO = MPTA - LDFA
 Planned DF Cut Angle = 90° - LDFA
 Planned PT Cut Angle = MPTA - 90°
 (= valgus) (- varus)

Initiate: _____ **Age:** _____

MRN: _____

DOS: _____

M / F **Left / Right**

HF: _____

WT: _____

di: _____

Balanc-R™ Workflow

Pre-Adjustment

Rest HKA = _____° VARUS / VALGUS
 Stress HKA = _____° VARUS / VALGUS
 ROM = _____° to _____°

Approved Plan

	Gaps (mm)		DF	Cut Depths (mm)	
	Ext.	Flex.		Flex.	Ext.
Med.					
Lat.					

DF	VARUS / VALGUS
PT	VARUS / VALGUS
HKA	VARUS / VALGUS
Flexor Rot.	IR / ER
Flexor Flex.	
Tibial Slope	

Final Values

HKA = _____° VARUS / VALGUS
 ROM = _____° to _____°

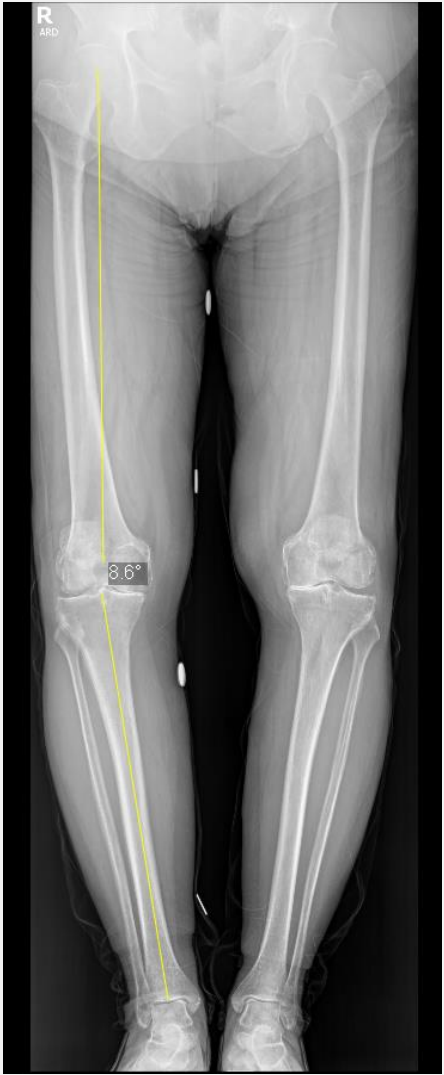
	Final Gaps (mm)		(Robotic / Manual)
	Ext.	Flex.	
Med.			
Lat.			

Insert Type	Fem Size	Insert Type	Insert Size (mm)	Tibia Type	Tibia Size	Patella Type	Patella Size

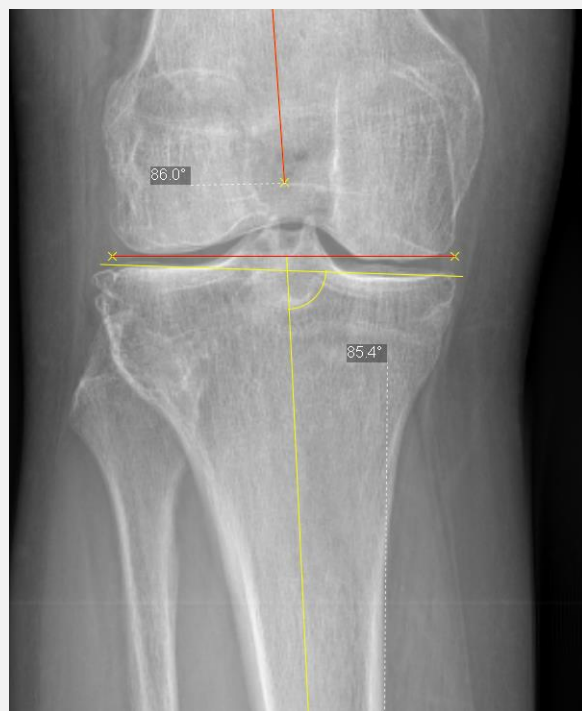
Cemented Uncemented PCL Status: _____

TQ: YES / NO TQ Time (min): _____ Bone Qual (1-Exc to 5-poor): _____

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LLA : LDFA, MPTA, SLOPE



Pre-Operative Data

Clinical:

ROM = 0 ° to 110 °

Deformity = 5 ° VARUS / VALGUS

X-ray:

aTFA = 6.5 °

mHKA = -1.0 °

MPTA = 85.4 °

LDFA = 86 °

aHKA = -0.6 °

aJLO = 171.4

JLO Apex Distal / Neutral / Proximal

Cor. Phenotype = II
(based on MacDessi et al.)

RESURFACING: ESTIMATE THEN CONFIRM

L
R

Planned Cuts (mm)

aHKA = VARUS
VALGUS

Anticipated Wear (mm)

	Med.	Lat.
DF		
PT		

Balanc-R™ Workflow

Pre-Operative Data

Initials: _____ Age: _____

ROM = _____° to _____°

Deformity = _____° VARUS / VALGUS

X-ray

ATFA = _____°

αHKA = _____°

MPFA = _____°

LDFA = _____°

αHKA = _____°

αLLO = _____°

αLO Apex: Distal / Neutral / Proximal

Cor. Phenotype = _____
(based on MacDess et al.)

Planned Values

DF: _____

PT: _____

Anticipated Wear (mm)

	Med.	Lat.
DF		
PT		

Calculations

αHKA = MPFA - LDFA

αLLO = MPFA - LDFA

Planned DF Cut Angle = 90° - LDFA

Planned PT Cut Angle = MPFA - 90°
(+ valgus) (- varus)

Final Values

HKA = _____° VARUS / VALGUS

ROM = _____° to _____°

Final Gaps (mm) (Robotic / Manual)

	Med.	Lat.
Med.		
Lat.		

Pem Type: _____ Pem Size: _____ Insert Type: _____ Insert Size (mm): _____ Tibia Type: _____ Tibia Size: _____ Patella Type: _____ Patella Size: _____

Cemented _____ Uncemented _____ PCL Status: _____

TQ: YES / NO TQ Time (min): _____ Bone Qual (1-Exc to 5-poor): _____

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L
R

Planned Cuts (mm)

aHKA = 2.4 VARUS
VALGUS

Anticipated Wear (mm)

	Med.	Lat.
DF	2	0
PT	2	0



NOW WE DEVELOP OUR PLAN

Pre-Operative Data

Clinical:
ROM = _____° to _____°
Deformity = _____° VARUS / VALGUS

X-ray:
aTFA = _____°
mHKA = _____°
MPTA = _____°
LDFA = _____°
aHKA = _____°
aJLO = _____°
JLO Apex: Distal / Neutral / Proximal
Cor. Phenotype = _____
(based on MacDessi et al.)

Calculation
aHKA = MPTA - LDFA
aJLO = MPTA - LDFA
Planned DF Cut Angle = 90° - _____°
(+ valgus) (- varus)

Initials: _____ Age: _____
MRN: _____
DOB: _____
M / F Left / Right
HT: _____
WT: _____
BMI: _____

Balanc-R™ Workflow

Pre-Adjustment
Dist HKA = _____° VARUS / VALGUS
Dist HKA = _____° VARUS / VALGUS
HKA = _____° to _____°

Anticipated Wear (mm)

	Med.	Lat.
DF		
PT		

Planned Values

	VARUS / VALGUS
DF	
PT	

Final Values
HKA = _____° VARUS / VALGUS
ROM = _____° to _____°
Planned Gaps (mm) (Robotic / Manual)
Ant. Post. Med. Lat.
Femur Flex. Ext. Tibia Flex. Ext. Patella Size
Insert Size (mm)
Tibia Type Tibia Size Patella Size
Patella Size

Cemented Uncemented PCL Status: _____
TQ: YES / NO TQ Time (min): _____ Bone Qual (1-Exc to 5-poor): _____

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L
R

Planned Cuts (mm)

aHKA = _____ VARUS
_____ VALGUS

Anticipated Wear (mm)

	Med.	Lat.
DF		
PT		

Planned Values

	VARUS / VALGUS
DF	
PT	
HKA	
Femur Rot.	IR / ER
Femur Flex.	
Tibial Slope	

Pre-Operative Data

Clinical:
ROM = 5° to 110°
Deformity = 5° VARUS / VALGUS

X-ray:
aTFA = -5.1°
mHKA = -6.6°
MPTA = 85.6°
LDFA = 88.0°
aHKA = -2.4°
aJLO = 173.6°
JLO Apex: Distal / Neutral / Proximal
Cor. Phenotype = I
(based on MacDessi et al.)

L
R

Planned Cuts (mm)

aHKA = 2.4 VARUS
_____ VALGUS

Planned Values

	VARUS / VALGUS
DF	<u>2</u> VARUS <u>VALGUS</u>
PT	<u>4.4</u> VARUS / VALGUS
Femur Rot.	<u>0</u> IR / ER
Femur Flex.	<u>3</u>
Tibial Slope	<u>4</u>

EXECUTE AND DOCUMENT

Pre-Operative Data

Clinical:
ROM = _____° to _____°
Deformity = _____° VARUS / VALGUS

Exam:
aTFA = _____°
mHKA = _____°
MPTA = _____°
LDFA = _____°
aHKA = _____°
aILO = _____°
JLD Apex: Distal / Neutral / Proximal
Cor. Phorotype = _____
(based on MacDenti et al.)

Anticipated Wear (mm)

	Med.	Lat.
DF		
PT		

Planned Values

	DF	VARUS / VALGUS
PT		
Femur Rot.		IR / ER
Femur Flex.		
Tibial Slope		

Calculations

aHKA = MPTA - LDFA
aILO = MPTA - LDFA
Planned DF Cut Angle = 90° - LDFA
Planned PT Cut Angle = MPTA - 90°
(+ valgus) (- varus)

Initials: _____ Age: _____
MRN: _____
DOB: _____
M / F Left / Right
HT: _____
WT: _____
BMI: _____

Balanc-R™ Workflow

Pre-Adjustment

Rest HKA = _____° VARUS / VALGUS
Stress HKA = _____° VARUS / VALGUS
ROM = _____° to _____°

Approved Plan

	Gaps (mm)		Cut Depths (mm)		
	Ext.	Flex.	DF	Post. Femur	Prox. Tibia
Med.					
Lat.					

Final Values

HKA = _____° VARUS / VALGUS
ROM = _____° to _____°

Final Gaps (mm) (Robotic / Manual)

	Ext.	Flex.
Med.		
Lat.		

Final Values

Fem Type	Fem Size	Insert Type	Insert Size (mm)	Tibia Type	Tibia Size	Patella Type	Patella Size

Cemented _____ Uncemented _____ PCL Status: _____

TQ: YES / NO TQ Time (min): _____ Bone Qual (1-Exc to 5-poor): _____

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Balanc-R™ Workflow

Pre-Adjustment

Rest HKA = _____° VARUS / VALGUS
Stress HKA = _____° VARUS / VALGUS
ROM = _____° to _____°

Approved Plan

	Gaps (mm)		Cut Depths (mm)		
	Ext.	Flex.	DF	Post. Femur	Prox. Tibia
Med.					
Lat.					

Final Values

	DF	VARUS / VALGUS
PT		
HKA		
Femur Rot.		IR / ER
Femur Flex.		
Tibial Slope		

Final Values

HKA = _____° VARUS / VALGUS
ROM = _____° to _____°

Final Gaps (mm) (Robotic / Manual)

	Ext.	Flex.
Med.		
Lat.		

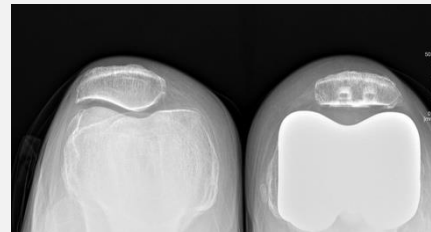
Fem Type (CR/PS)	Fem Size	Insert Type	Insert Size (mm)	Tibia Type	Tibia Size	Patella Type	Patella Size

Cemented _____ Uncemented _____ PCL Status: _____

TQ: YES / NO TQ Time (min): _____ Bone Qual (1-Exc to 5-poor): _____

CASE EXAMPLE : THE WORKFLOW

Initials: **LB** Age: **71**
MRN:
DOS:
M **F** Left / **Right**
HT: **5'10"**
WT: **222 lb**
BMI: **29**



ESTIMATE WEAR AND PLAN DISTAL FEMUR AND PROXIMAL TIBIA CUTS



L
R

Planned Cuts (mm)

8	9
---	---

aHKA = 0.6 VARUS
VALGUS

8 9

NOTE: Valgus wear = 2
VARUS/NEUTRAL alignment

Anticipated Wear (mm)		
	Med.	Lat.
DF	0	1
PT	0	1

STUDY THE PREOP KNEE AND LLA XRAYS



MEASURE LDFA AND MPTA CALCULATE JLO AND ARITHMETIC HKA

Calculations

$aHKA = MPTA - LDFA$
 $aJLO = MPTA + LDFA$
 Planned DF Cut Angle = $90^\circ - LDFA$
 Planned PT Cut Angle = $MPTA - 90^\circ$
 (+ valgus) (- varus)

Pre-Operative Data

Clinical:

ROM = 0° to 110°

Deformity = 5° VARUS / VALGUS

X-ray:

aTFA = 6.5°

mHKA = -1.0°

MPTA = 85.4°

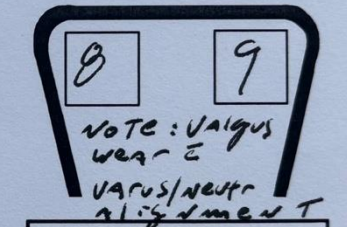
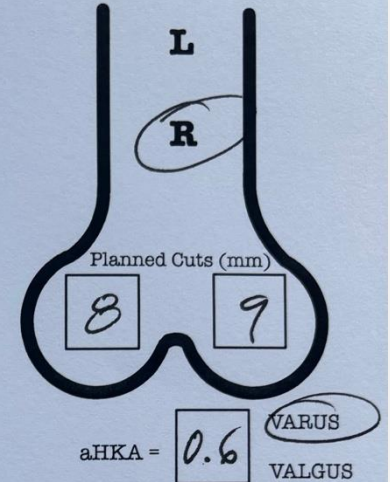
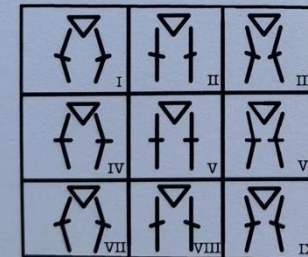
LDFA = 86°

aHKA = -0.6°

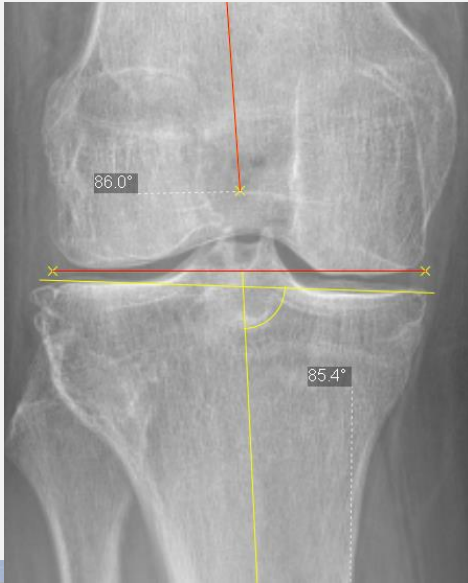
aJLO = 171.4

JLO Apex Distal / Neutral / Proximal

Cor. Phenotype = II
(based on MacDessi et al.)



Anticipated Wear (mm)		
	Med.	Lat.
DF	0	1
PT	0	1



Pre-Operative Data

Clinical:

ROM = 0° to 110°

Deformity = 5° VARUS / VALGUS

X-ray:

aTFA = 6.5°

mHKA = -1.0°

MPTA = 85.4°

LDFA = 86°

aHKA = -0.6°

aJLO = 171.4

Calculations

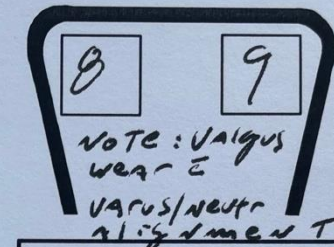
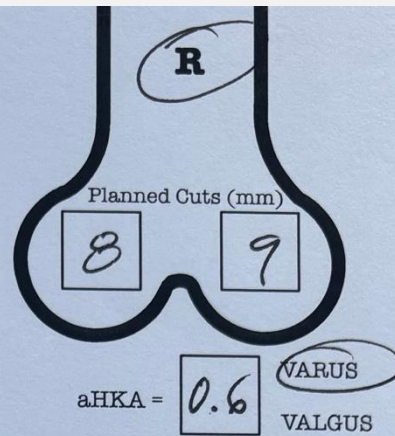
$$aHKA = MPTA - LDFA$$

$$aJLO = MPTA + LDFA$$

$$\text{Planned DF Cut Angle} = 90^\circ - LDFA$$

$$\text{Planned PT Cut Angle} = MPTA - 90^\circ$$

(+ valgus) (- varus)



Anticipated Wear (mm)		
	Med.	Lat.
DF	0	1
PT	0	1

Planned Values		
DF	4	VARUS / <u>VALGUS</u>
PT	4.6	<u>VARUS</u> / VALGUS
Femur Rot.	0	IR / ER
Femur Flex.	3	
Tibial Slope	5°	

FINALIZE THE PREOP PLAN

EXECUTE THE PLAN

Pre-Operative Data

Clinical:

ROM = 0° to 110°

Deformity = 5° VARUS / VALGUS

X-ray:

aTFA = 6.5°

mHKA = -1.0°

MPTA = 95.4°

LDFA = 86°

aHKA = -0.6°

aJLO = 171.4°

JLO Apex

Distal / Neutral / Proximal

Cor. Phenotype = II

(based on MacDessi et al.)

I

II

III

IV

V

VI

VII

VIII

IX

L

R

Planned Cuts (mm)

8

9

aHKA = 0.6

VARUS

VALGUS

8

9

Note: Valgus wear = 2

Varus/neutral alignment

Anticipated Wear (mm)

Med.

Lat.

DF

0

1

PT

0

1

Planned Values

DF

4

VARUS / VALGUS

PT

4.6

VARUS / VALGUS

Femur Rot.

0

IR / ER

Femur Flex.

3

Tibial Slope

5°

Balanc-R™ Workflow

Pre-Adjustment

Rest HKA = 2°

VARUS

VALGUS

Stress HKA = 1°

VARUS

VALGUS

ROM = 7°

to

130°

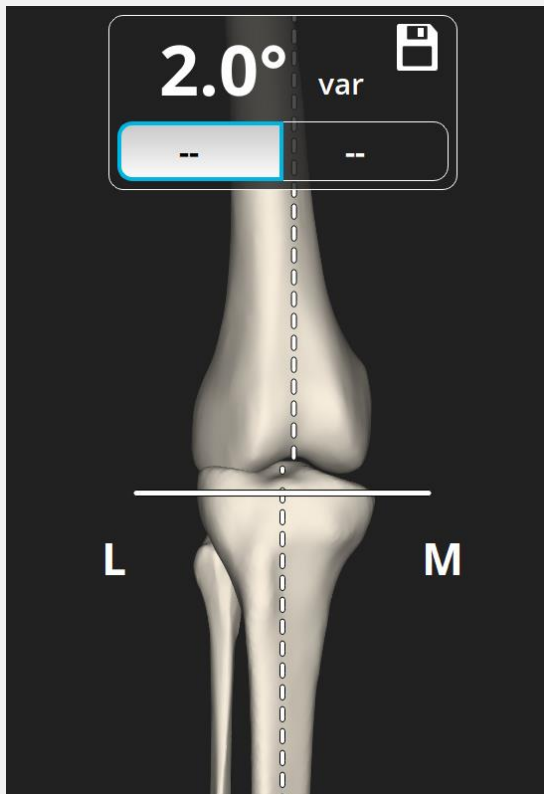
Approved Plan

	Gaps (mm)		Cut Depths (mm)		
	Ext.	Flex.	DF	Post. Femur	Prox. Tibia
Med.	.5	.5	9°	9.5	10°
Lat.	.5	.5	8°	9.5	10°

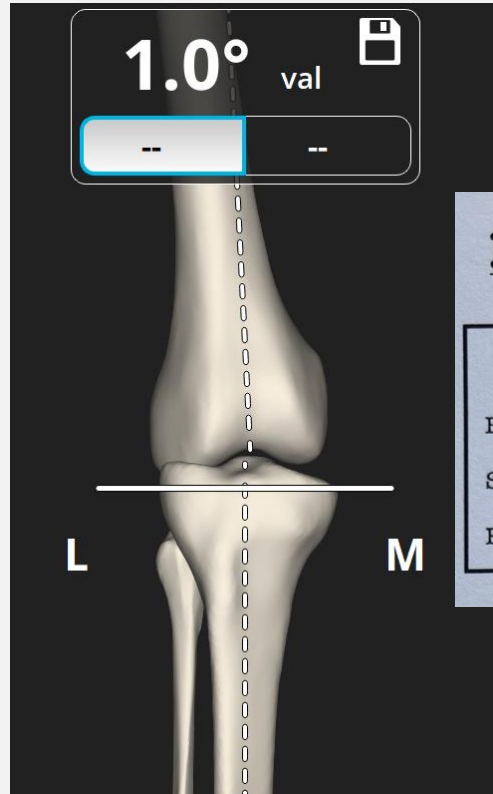
DF	4°	VARUS	VALGUS
PT	4.5	VARUS	VALGUS
HKA	0.5	VARUS	VALGUS
Femur Rot.	0	IR / ER	
Femur Flex.	3°		
Tibial Slope	5°		

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DETERMINE RESTING AND STRESS HKA, ROM



Rest HKA

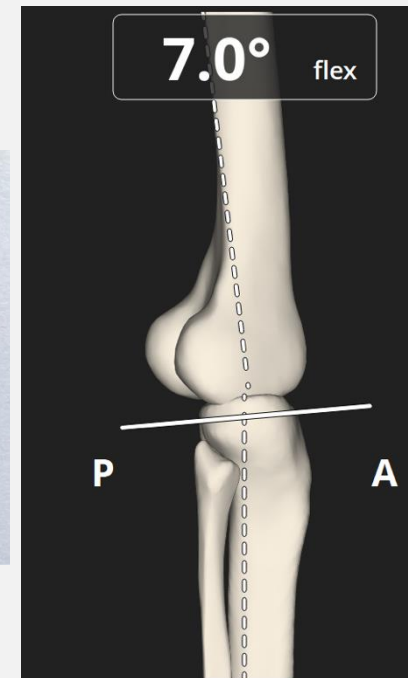


Stress HKA

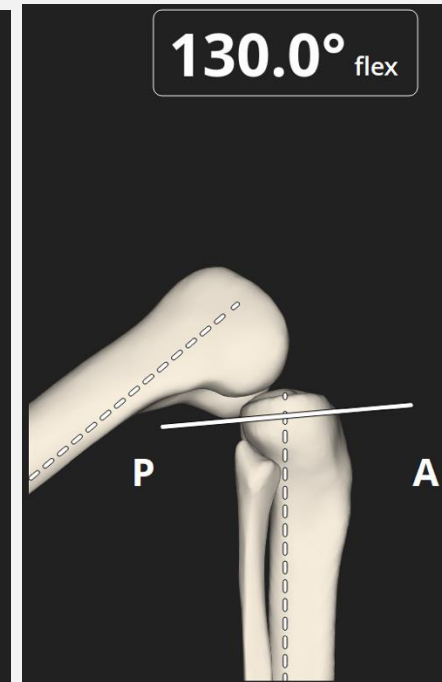
Balanc-R™ Workflow

Pre-Adjustment

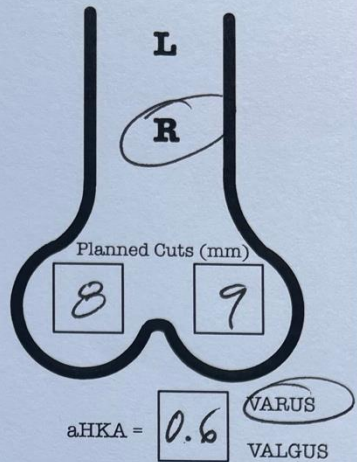
Rest HKA = 2.0 ° VARUS / VALGUS
Stress HKA = 1.0 ° VARUS / VALGUS
ROM = 7 ° to 130 °



Extension



Flexion

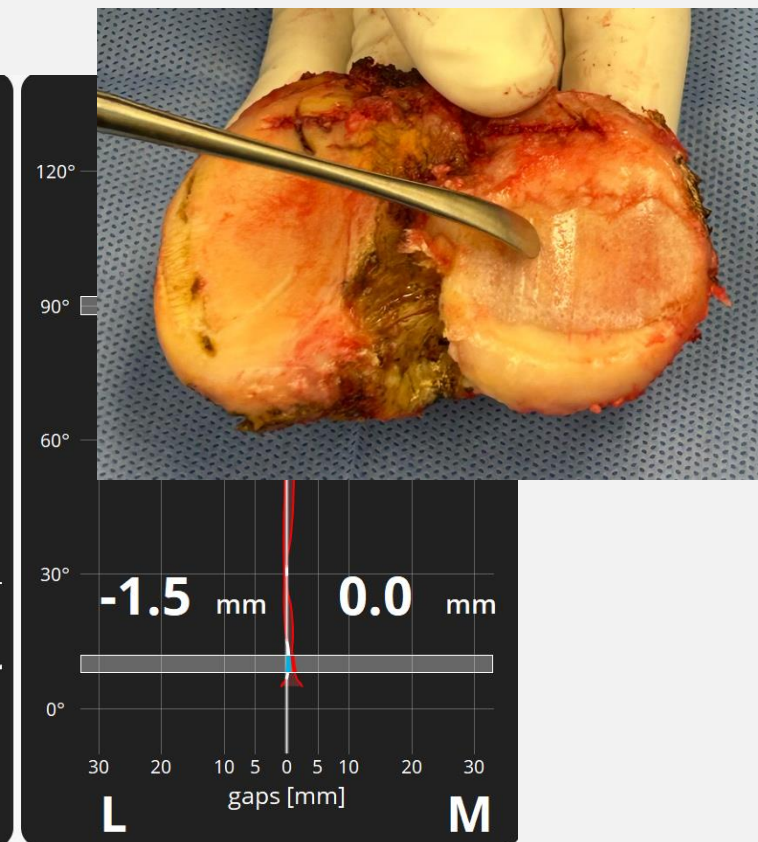
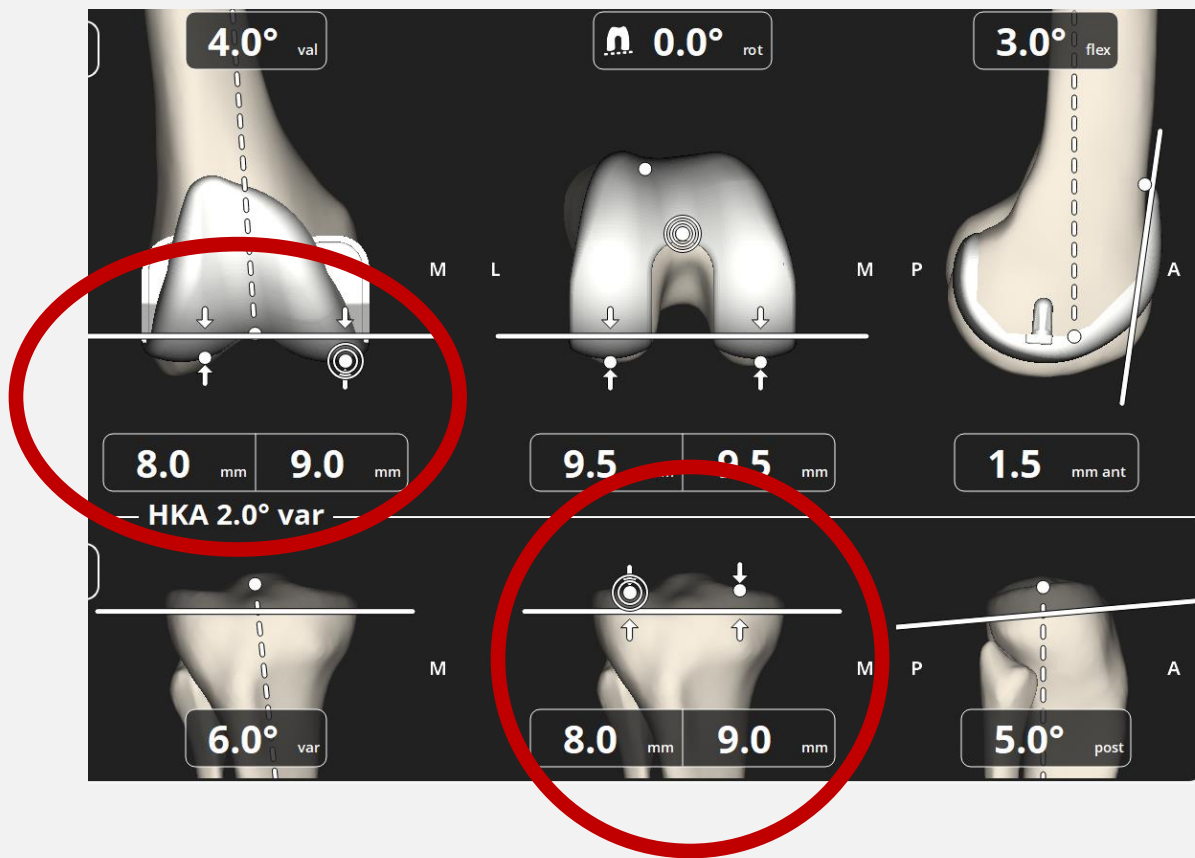


NOTE: Valgus wear
VARUS/NEUTRAL alignment

Anticipated Wear (mm)	
	Med. Lat.
DF	0 1
PT	0 1

Planned Values	
DF	4 VARUS / VALGUS
PT	4.6 VARUS / VALGUS
Femur Rot.	0 IR / ER
Femur Flex.	3
Tibial Slope	5°

START WITH PLANNED RESURFACING, BUT AUDIBLE WEAR CHANGES AS NEEDED



Balanc-R™ Workflow

Pre-Adjustment

Rest HKA = 2° ° VARUS / VALGUS

Stress HKA = 1° ° VARUS / VALGUS

ROM = 7 ° to 130 °

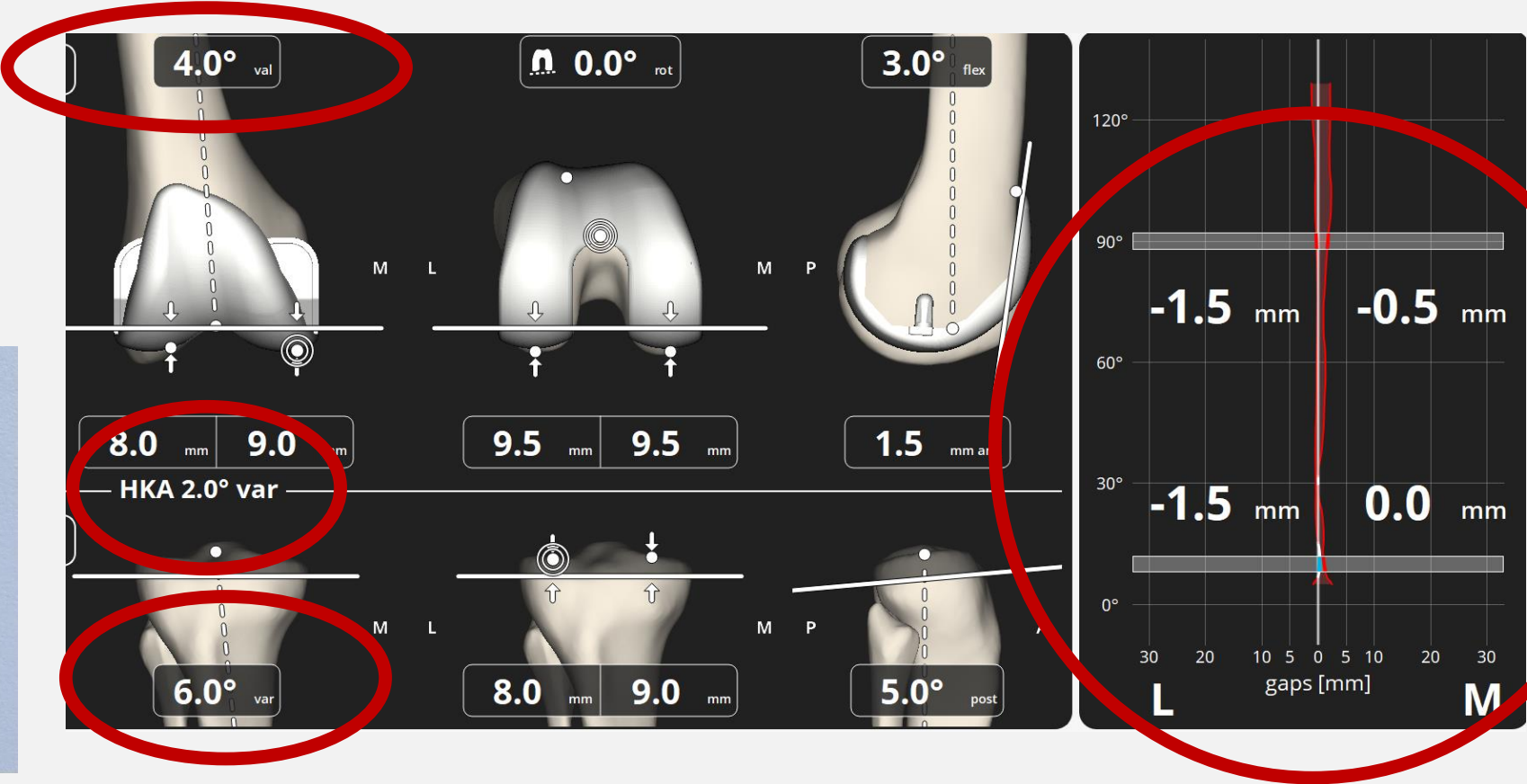
NOW SEE WHERE WE ARE...RESURFACING
ESTIMATE GOT US CLOSE,
BUT NOT PERFECT

8 9

aHKA = 0.6 VARUS / VALGUS

8 9

Planned Values		
DF	<u>4</u>	VARUS / <u>VALGUS</u>
PT	<u>4.6</u>	<u>VARUS</u> / VALGUS
Femur Rot.	<u>0</u>	IR / ER
Femur Flex.	<u>3</u>	
Tibial Slope	<u>5°</u>	



L

R

Planned Cuts (mm)

89

aHKA = 0.6

VARUS

VALGUS

89

NOTE: Valgus wear 2

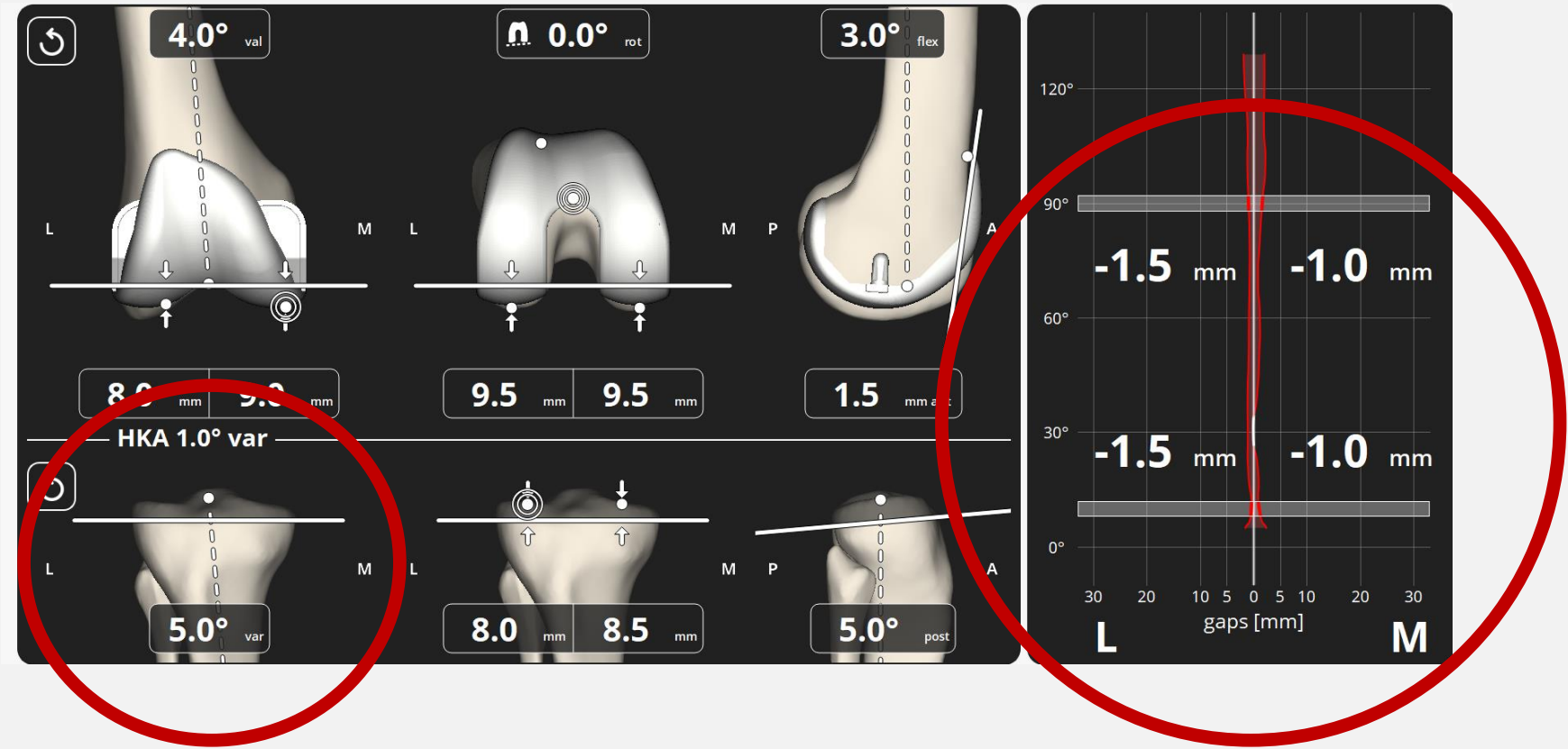
VARUS/NEUTRAL alignment

Anticipated Wear (mm)		
	Med.	Lat.
DF	0	1
PT	0	1

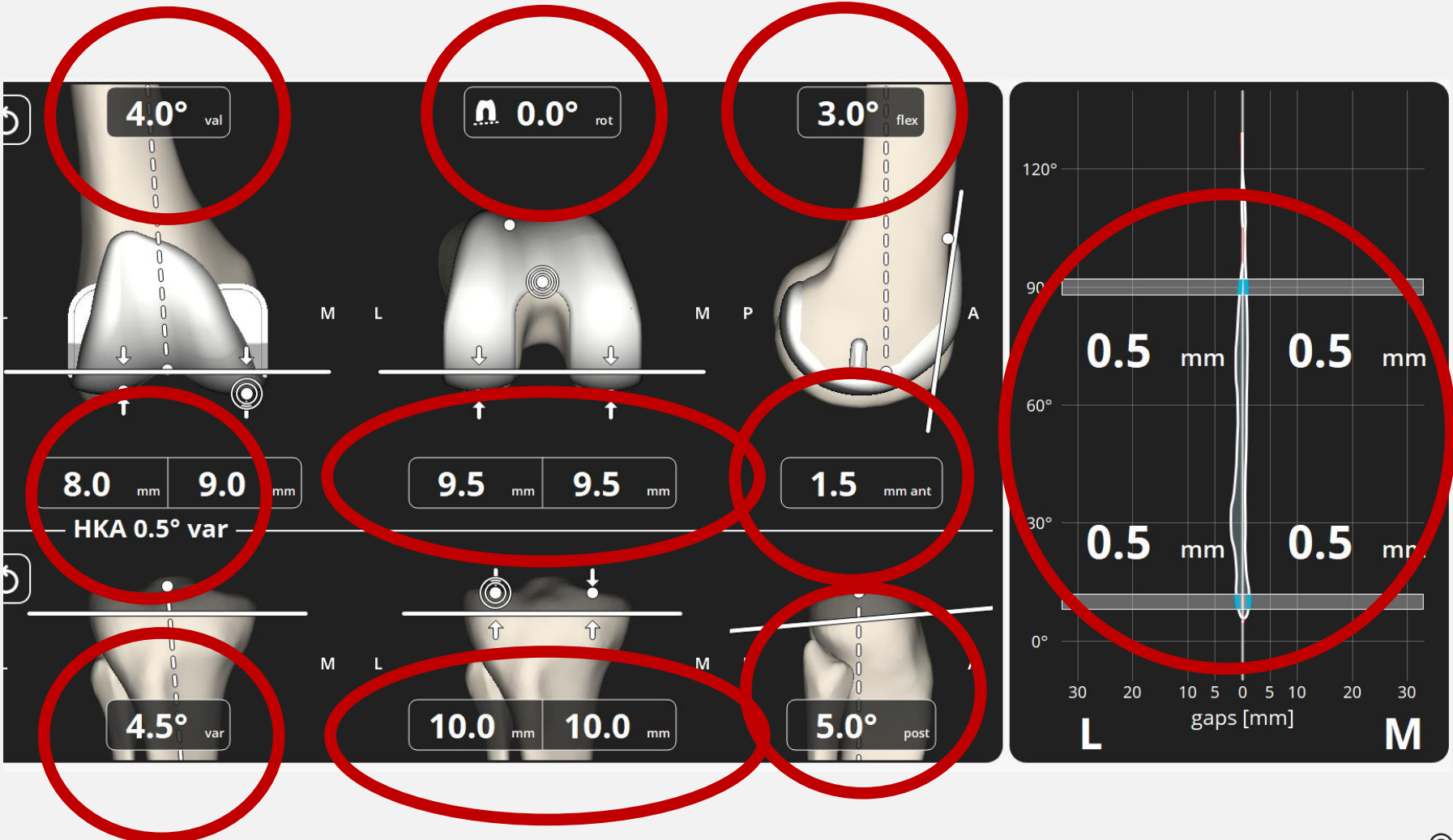
Planned Values		
DF	4	VARUS / VALGUS
PT	4.6	VARUS / VALGUS
Femur Rot.	0	IR / ER
Femur Flex.	3	
Tibial Slope	5°	

BALANC-R™ : BALANCED RESURFACING

BALANCE !!!



BALANC-R™ : BALANCED RESURFACING FINALIZE BALANCE AND RECORD



Balanc-R™ Workflow

Pre-Adjustment

Rest HKA = 2° VARUS / VALGUS
Stress HKA = 1° VARUS / VALGUS
ROM = 7° to 130°

Approved Plan

	Gaps (mm)		Cut Depths (mm)		
	Ext.	Flex.	DF	Post. Femur	Prox. Tibia
Med.	.5	.5	9°	9.5	10°
Lat.	.5	.5	8°	9.5	10°

DF	4°	VARUS / VALGUS
PT	4.5	VARUS / VALGUS
HKA	0.5	VARUS / VALGUS
Femur Rot.	0	IR / ER
Femur Flex.	3°	
Tibial Slope	5°	

RECORD FINAL DATA : GAPS AND IMPLANT

Final Values

HKA = .5° VARUS / VALGUS

ROM = 0° to 125°

Final Gaps (mm) (Robotic / <u>Manual</u>)		
	Ext.	Flex.
Med.	<u>0</u>	<u>2</u>
Lat.	<u>0</u>	<u>5</u>

Fem Type	Fem Size	Insert Type	Insert Size (mm)	Tibia Type	Tibia Size	Patella Type	Patella Size
<u>CR</u>	<u>7</u>	<u>MS</u>	<u>5</u>	<u>FB</u>	<u>5</u>	<u>ANAT</u>	<u>35</u>
<u>Cemented</u> <u>Uncemented</u> PCL Status: <u>INTACT</u>							
TQ: <u>YES</u> / NO TQ Time (min): _____ Bone Qual (1-Exc to 5-poor): <u>2</u>							

Pre-Operative Data

Clinical:
ROM = 0° to 110°
Deformity = 5° VARUS / VALGUS

X-ray:
aTFA = 6.5°
mHKA = -1.0°
MPTA = 95.4°
LDFA = 86°
aHKA = -0.6°
aJLO = 171.4°

JLO Apex (Distal / Neutral / Proximal)
Cor. Phenotype = II
(based on MacDessi et al.)

Planned Cuts (mm)

aHKA = 0.6 VARUS / VALGUS

Anticipated Wear (mm)

	Med.	Lat.
DF	<u>0</u>	<u>1</u>
PT	<u>0</u>	<u>1</u>

Calculations

aHKA = MPTA - LDFA
aJLO = MPTA + LDFA
Planned DF Cut Angle = 90° - LDFA
Planned PT Cut Angle = MPTA - 90°
(+ valgus) (- varus)

Initials: LB Age: 71
MRN: _____
DOS: _____
M F Left / Right
HT: 5'10"
WT: 222 lb
BMI: 29

Balanc-R™ Workflow

Pre-Adjustment

Rest HKA = 2.0° VARUS / VALGUS
Stress HKA = 1.0° VARUS / VALGUS
ROM = 7° to 130°

Approved Plan

	Gaps (mm)		Cut Depths (mm)		Prox. Tibia
	Ext.	Flex.	DF	Post. Femur	
Med.	<u>.5</u>	<u>.5</u>	<u>9</u> °	<u>9.5</u>	<u>10</u> °
Lat.	<u>.5</u>	<u>.5</u>	<u>8</u> °	<u>9.5</u>	<u>10</u> °

Final Values

HKA = .5° VARUS / VALGUS

ROM = 0° to 125°

Final Gaps (mm) (Robotic / <u>Manual</u>)		
	Ext.	Flex.
Med.	<u>0</u>	<u>2</u>
Lat.	<u>0</u>	<u>5</u>

Planned Values

	DF	PT	Femur Rot.	Femur Flex.	Tibial Slope
	<u>4</u>	<u>4.6</u>	<u>0</u>	<u>3</u>	<u>5</u> °

Fem Type	Fem Size	Insert Type	Insert Size (mm)	Tibia Type	Tibia Size	Patella Type	Patella Size
<u>CR</u>	<u>7</u>	<u>MS</u>	<u>5</u>	<u>FB</u>	<u>5</u>	<u>ANAT</u>	<u>35</u>
<u>Cemented</u> <u>Uncemented</u> PCL Status: <u>INTACT</u>							
TQ: <u>YES</u> / NO TQ Time (min): _____ Bone Qual (1-Exc to 5-poor): <u>2</u>							

STUDY AND LEARN !

WE ENDED WITH AN ACCEPTABLE, BALANCED RESULT :
WHY AND HOW ?

- PREOP
 - Neutral knee with lateral wear, aHKA = 0.6 varus
- PLAN
 - DF cut 4 valgus, PT cut 4.6 varus (based on LLA)
- INTRAOP
 - Flexible neutral knee (rest 2 varus, stress 1 valgus)
- FINAL
 - Cut depths within 1.5mm of planned
 - DF 4 valgus, PT 4.5 varus, HKA 0.5 varus
 - Balanced compartments (mm gaps in F/E)

Planned Cuts (mm)

8	9
---	---

aHKA = 0.6 VARUS / VALGUS

Anticipated Wear (mm)

	Med.	Lat.
DF	0	1
PT	0	1

Planned Values

DF	4	VARUS / VALGUS
PT	4.6	VARUS / VALGUS
Femur Rot.	0	IR / ER
Femur Flex.	3	
Tibial Slope	5°	

Pre-Adjustment

Rest HKA = 2° VARUS / VALGUS

Stress HKA = 1° VARUS / VALGUS

ROM = 7° to 130°

Approved Plan

	Gaps (mm)		Cut Depths (mm)		
	Ext.	Flex.	DF	Post. Femur	Prox. Tibia
Med.	.5	.5	9°	9.5	10°
Lat.	.5	.5	8°	9.5	10°

DF	4°	VARUS / VALGUS
PT	4.5	VARUS / VALGUS
HKA	0.5	VARUS / VALGUS
Femur Rot.	0	IR / ER
Femur Flex.	3°	
Tibial Slope	5°	

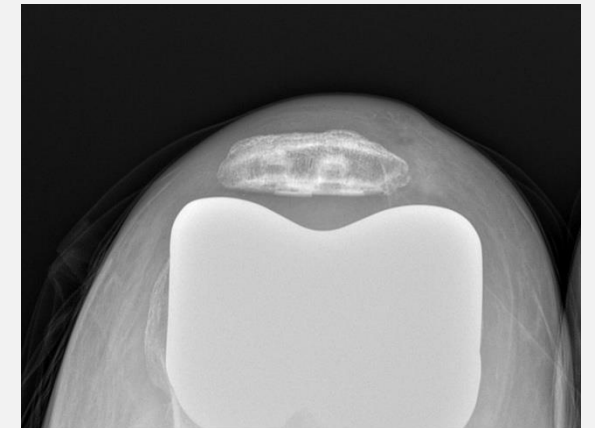
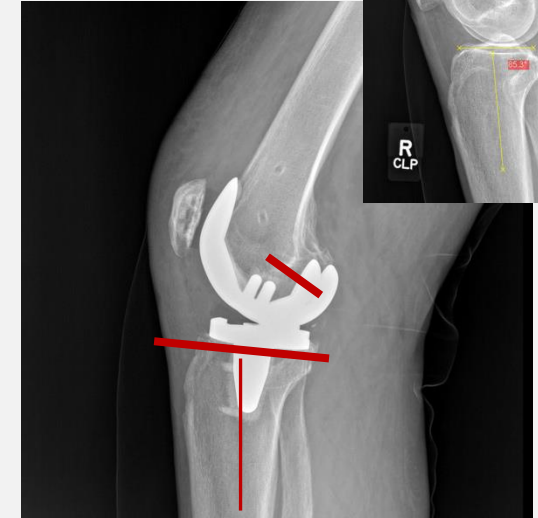
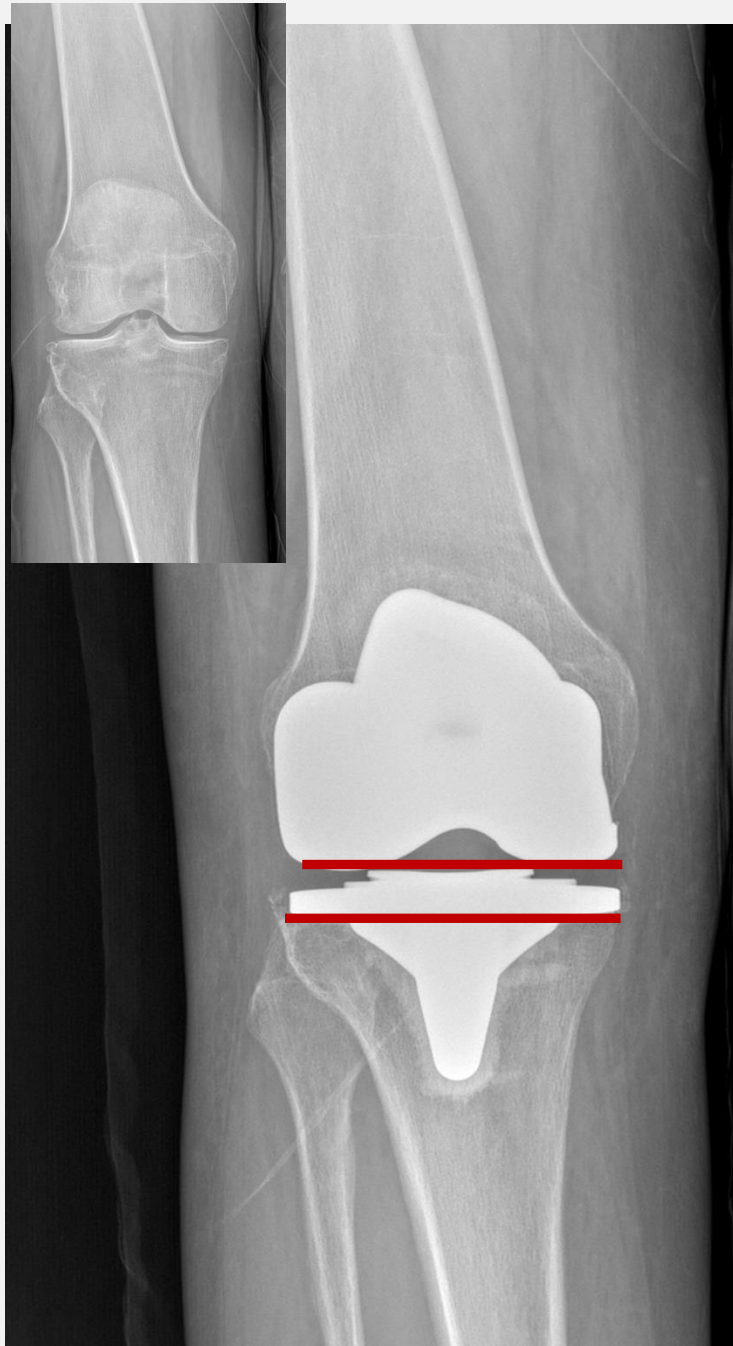
Final Values

HKA = .5 VARUS / VALGUS

ROM = 0° to 125°

POSTOP XRAYS

- Grossly neutral
- DF valgus
- PT varus



CASE EXAMPLE : THE WORKFLOW WITHOUT LLA X-RAYS

Initials: RB Age: 61
MRN:
DOS:
M / F / Left / Right
HT: 5'1"
WT: 224 lb
BMI: 43 Nurse

Pre-Operative Data

Clinical:
ROM = 3° to 90°
Deformity = 10° VARUS / VALGUS

X-ray:
aTFA = _____°
mHKA = _____°
MPTA = _____°
LDFA = _____°
aHKA = _____°
aJLO = _____°

JLO Apex: Distal / Neutral / Proximal

Cor. Phenotype = _____
(based on MacDessi et al.)



ESTIMATE WEAR PLAN DISTAL FEMUR AND PROXIMAL TIBIA CUTS

L
 R

Planned Cuts (mm)

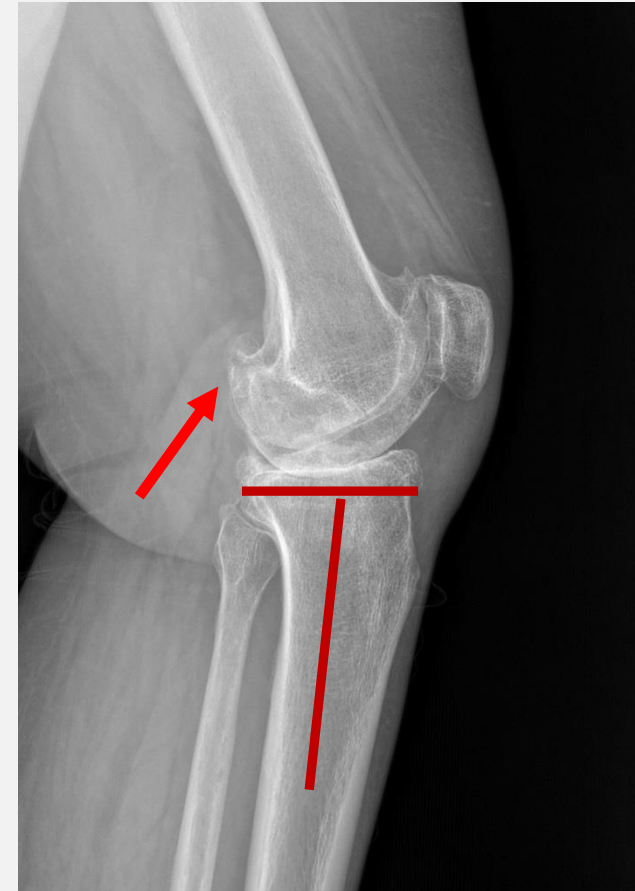
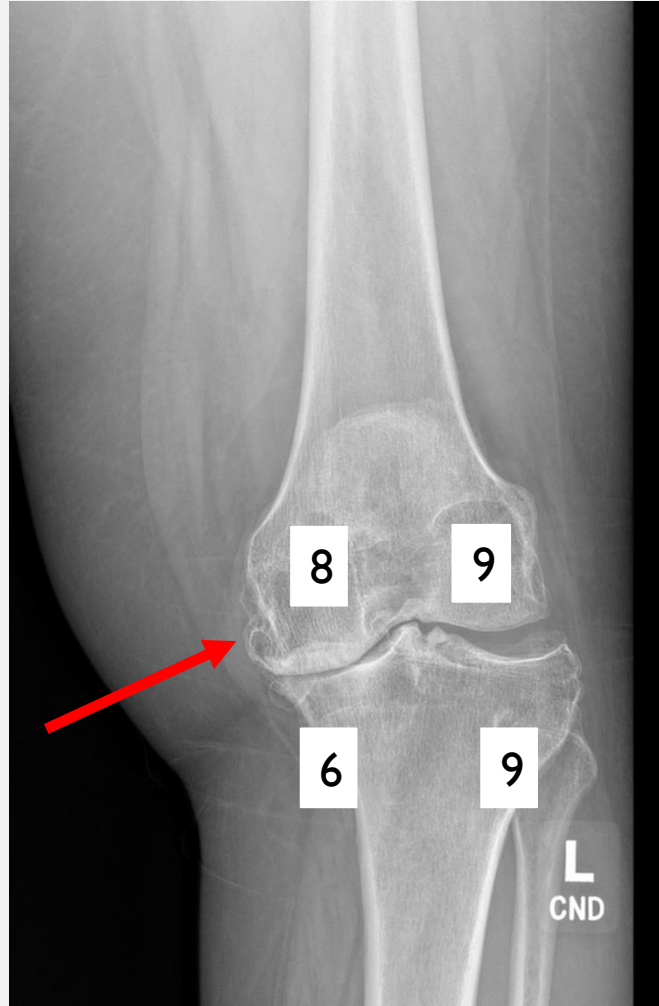
8 9

aHKA = ☐ VARUS
☐ VALGUS

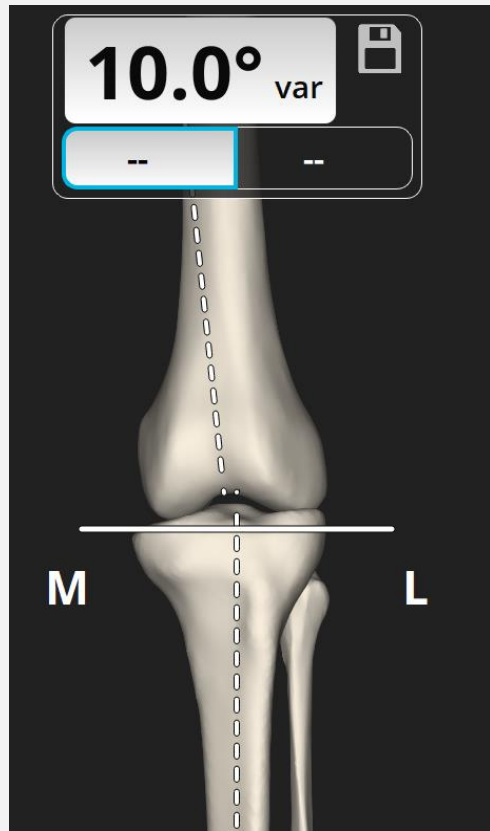
6 9

Anticipated Wear (mm)		
	Med.	Lat.
DF	1	0
PT	3	0

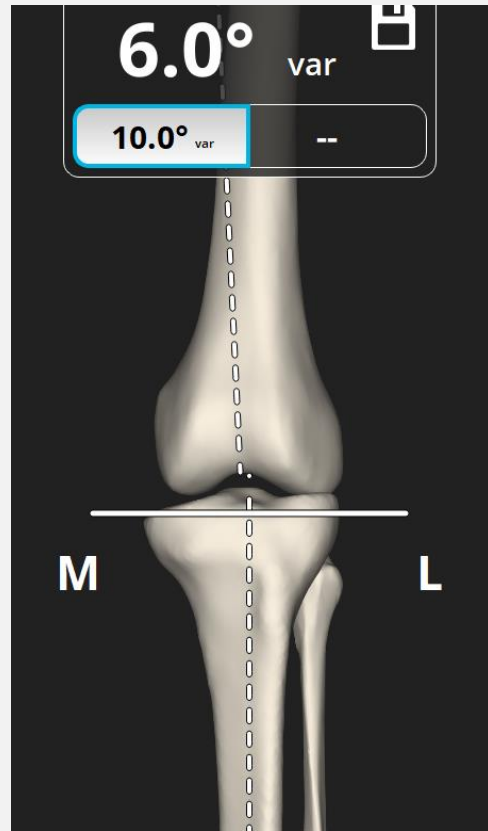
Planned Values		
DF		VARUS / VALGUS
PT		VARUS / VALGUS
Femur Rot.	0	IR / ER
Femur Flex.	3	
Tibial Slope		



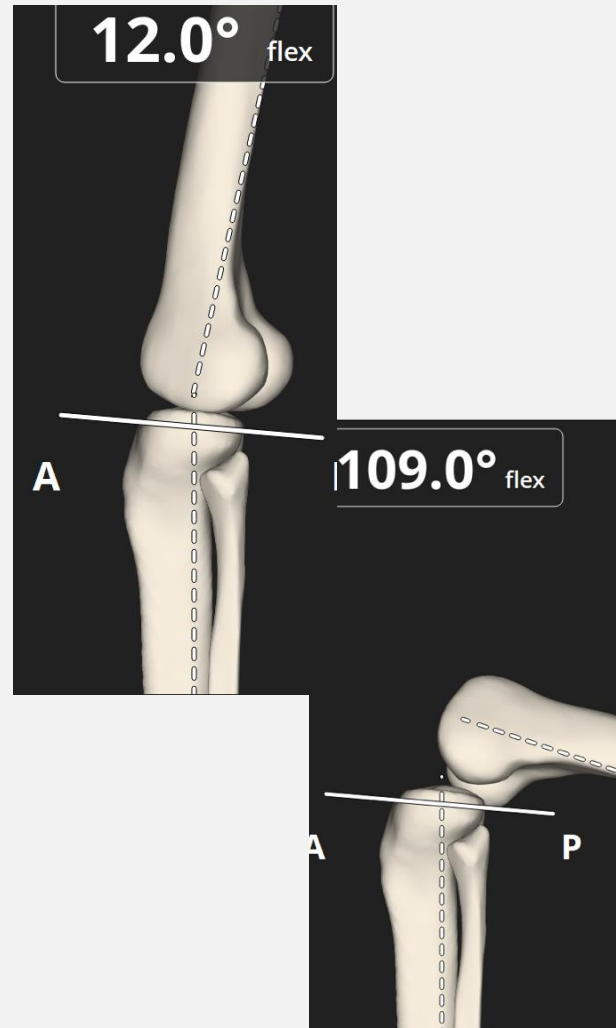
DETERMINE RESTING AND STRESS HKA, ROM



Rest HKA



Stress HKA

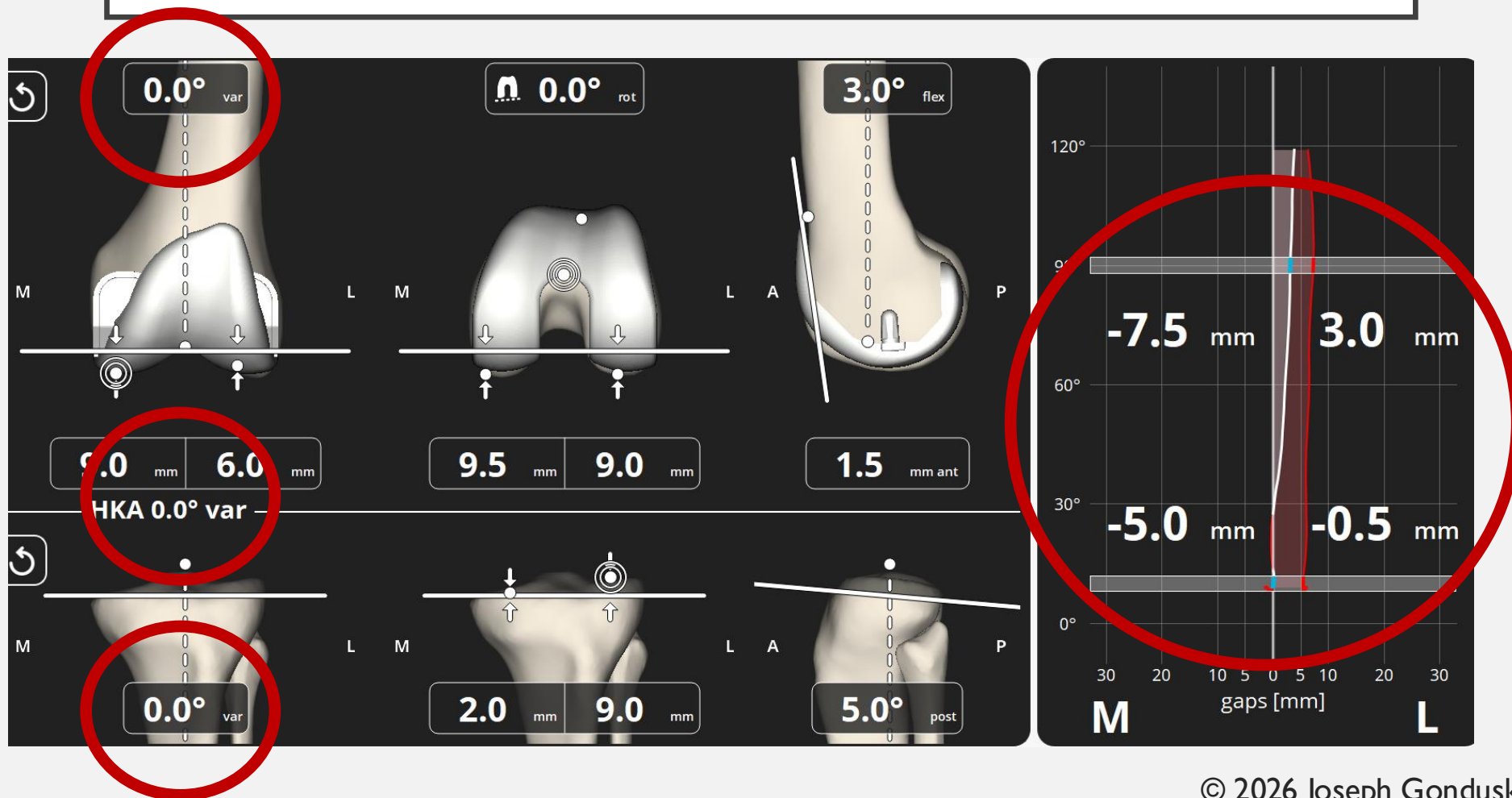


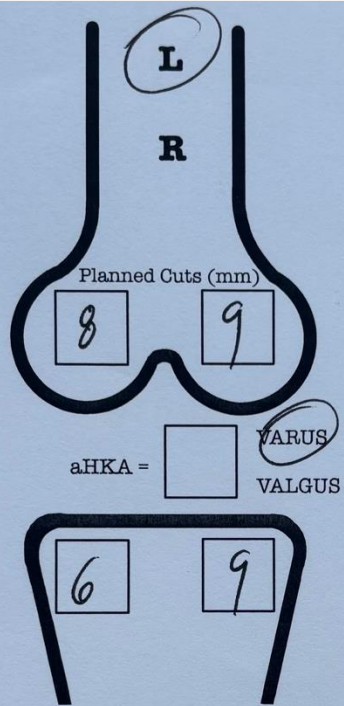
Balanc-R™ Workflow

Pre-Adjustment

Rest HKA = 10 ° VARUS/ VALGUS
Stress HKA = 6 ° VARUS/ VALGUS
ROM = 12 ° to 109 °

WHERE WOULD WE BE WITH MA ?

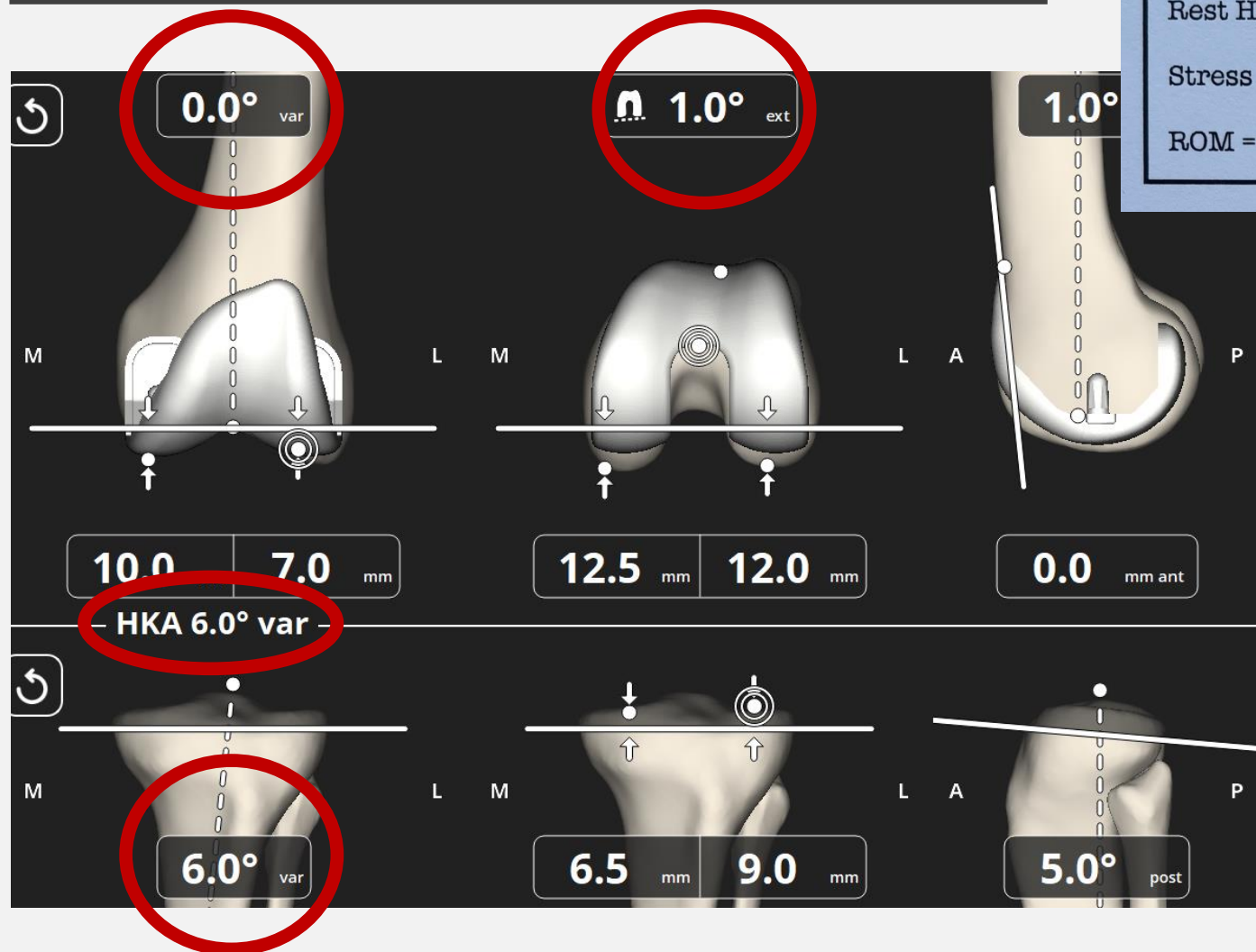




Anticipated Wear (mm)		
	Med.	Lat.
DF	1	0
PT	3	0

Planned Values		
DF		VARUS / VALGUS
PT		VARUS / VALGUS
Femur Rot.	0	IR / ER
Femur Flex.	3	
Tibial Slope		

PLANNED CUTS (RESURFACE) THEN BALANCE !



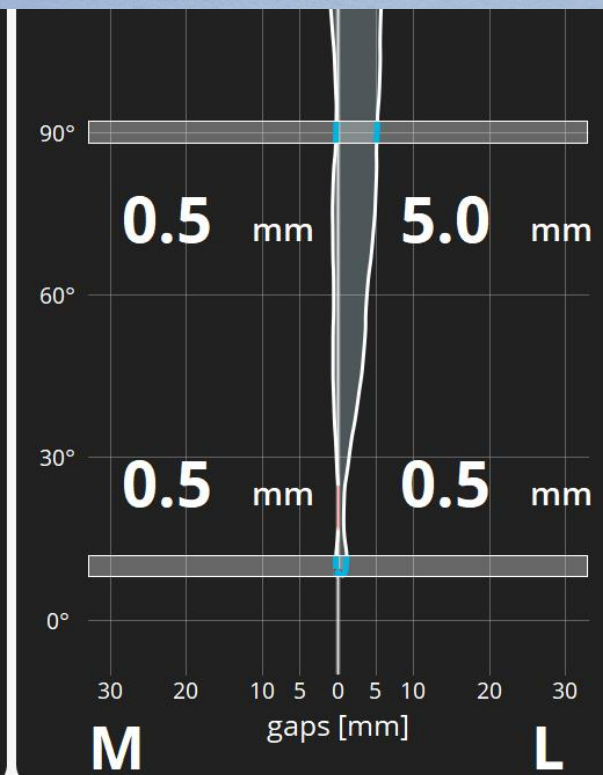
Balanc-R™ Workflow

Pre-Adjustment

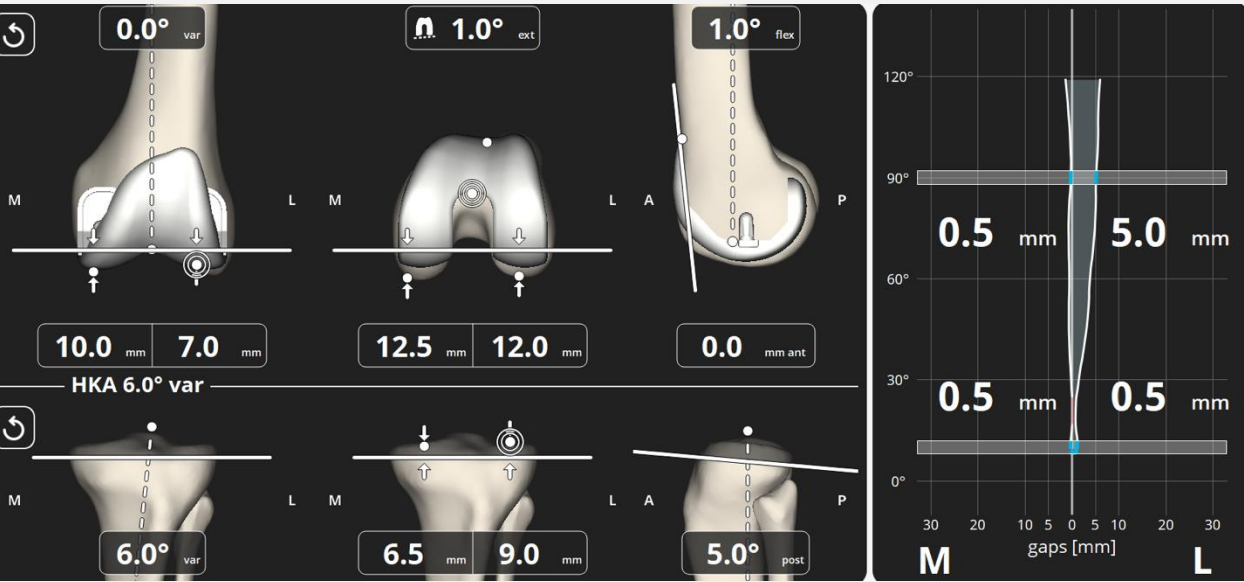
Rest HKA = 10° VARUS / VALGUS

Stress HKA = 6° VARUS / VALGUS

ROM = 12° to 109°



BALANC-R™ : BALANCED RESURFACING FINALIZE BALANCE AND RECORD



Final Values

HKA = 6 ° VARUS / VALGUS

ROM = 0 ° to 110 (flexion)

	Final Gaps (mm) (Robotic / Manual)	
	Ext.	Flex.
Med.	<u>0.5</u>	<u>1</u>
Lat.	<u>1</u>	<u>5</u>

Fem Type	Fem Size	Insert Type	Insert Size (mm)	Tibia Type	Tibia Size	Patella Type	Patella Size
<u>CR</u>	<u>4N</u>	<u>MS</u>	<u>8</u>	<u>FB</u>	<u>3</u>	<u>Avat</u>	<u>32</u>
<u>Cemented</u> <u>Uncemented</u> PCL Status: <u>Intact</u>							
TQ: YES / NO TQ Time (min): _____ Bone Qual (1-Exc to 5-poor): <u>3</u>							

Balanc-R™ Workflow

Pre-Adjustment

Rest HKA = 10 ° VARUS / VALGUS

Stress HKA = 6 ° VARUS / VALGUS

ROM = 12 ° to 109 °

Approved Plan

	Gaps (mm)		Cut Depths (mm)		
	Ext.	Flex.	DF	Post. Femur	Prox. Tibia
Med.	<u>0.5</u>	<u>0.5</u>	<u>10</u>	<u>12.5</u>	<u>6.5</u>
Lat.	<u>0.5</u>	<u>5.0</u>	<u>7</u>	<u>12.0</u>	<u>9.0</u>

DF	<u>0</u>	VARUS / VALGUS
PT	<u>6.0</u>	VARUS / VALGUS
HKA	<u>6.0</u>	VARUS / VALGUS
Femur Rot.	<u>1.0</u>	IR / ER
Femur Flex.	<u>1.0</u>	
Tibial Slope	<u>5.0</u>	



INTRA-OP EXAM:

CHECK YOUR WORK
MAKE SURE THE WORKFLOW WORKS !

Pre-Operative Data

Clinical:
ROM = 3° to 90°
Deformity = 10° VARUS / VALGUS

X-ray:
aTFA = °
mHKA = °
MPTA = °
LDFA = °
aHKA = °
aJLO = °
JLO Apex: Distal / Neutral / Proximal
Cor. Phenotype = (based on MacDessi et al.)

Calculations

aHKA = MPTA - LDFA
aJLO = MPTA + LDFA
Planned DF Cut Angle = 90° - LDFA
Planned PT Cut Angle = MPTA - 90°
(+ valgus) (- varus)

Initials: RB Age: 61

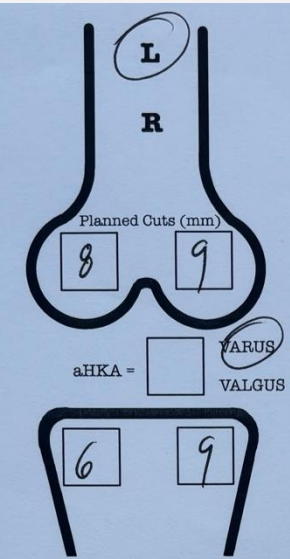
MRN:

DOS:
M / F Left / Right

HT: 5'1"

WT: 224 lb

BMI: 43 obese



Anticipated Wear (mm)		
	Med.	Lat.
DF	1	0
PT	3	0

Planned Values		
DF		VARUS / VALGUS
PT		VARUS / VALGUS
Femur Rot.	0	IR / ER
Femur Flex.	3	
Tibial Slope		

Fem Type	Fem Size	Insert Type	Insert Size (mm)	Tibia Type	Tibia Size	Patella Type	Patella Size
CR	4N	MS	8	FB	3	Anat	32
Cemented Uncemented PCL Status: Intact							
TQ: YES / NO TQ Time (min): Bone Qual (1-Exc to 5-poor): 3							

Balanc-R™ Workflow

Pre-Adjustment
Rest HKA = 10° VARUS / VALGUS
Stress HKA = 6° VARUS / VALGUS
ROM = 12° to 109°

Approved Plan

	Gaps (mm)		Cut Depths (mm)		
	Ext.	Flex.	DF	Post. Femur	Prox. Tibia
Med.	0.5	0.5	10	12.5	6.5
Lat.	0.5	5.0	7	12.0	9.0

DF	0	VARUS / VALGUS
PT	6.0	VARUS / VALGUS
HKA	6.0	VARUS / VALGUS
Femur Rot.	1.0	IR / ER
Femur Flex.	1.0	
Tibial Slope	5.0	

Final Values

HKA = 6° VARUS / VALGUS
ROM = 0° to 110° (flexion)

Final Gaps (mm) (Robotic / Manual)

	Ext.	Flex.
Med.	0.5	1
Lat.	1	5

RECORD FINAL DATA :
GAPS AND IMPLANT

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STUDY AND LEARN !

WE ENDED WITH AN ACCEPTABLE, BALANCED RESULT :
WHY AND HOW ?

- PREOP
 - Severe varus in obese LE with decreased ROM
- PLAN
 - Based on anticipated wear (no LLA)
- INTRAOP
 - Severe varus knee (rest 10 varus, stress 6 varus)
- FINAL
 - As expected, more severe deformity and decreased ROM requires more adjustment from pure resurfacing to balance
 - Maximized tibia vara (6) : cut estimates close
 - DF cut to neutral (0) MA : required to balance
 - Final HKA at stress HKA (6 varus)
 - Balanced compartments (mm gaps in F/E)
- How could we have been confident a CR knee would end up well balanced without this data !!!!!!!

Diagram of a knee joint showing planned cuts (mm) for Medial (8) and Lateral (9) compartments. Below the diagram is a table for Anticipated Wear (mm) and a table for Planned Values.

Anticipated Wear (mm)		
	Med.	Lat.
DF	1	0
PT	3	0

Planned Values		
DF		VARUS / VALGUS
PT		VARUS / VALGUS
Femur Rot.	0	IR / ER
Femur Flex.	3	
Tibial Slope		

Balanc-R™ Workflow

Pre-Adjustment

Rest HKA = 10° VARUS / VALGUS
 Stress HKA = 6° VARUS / VALGUS
 ROM = 12° to 109°

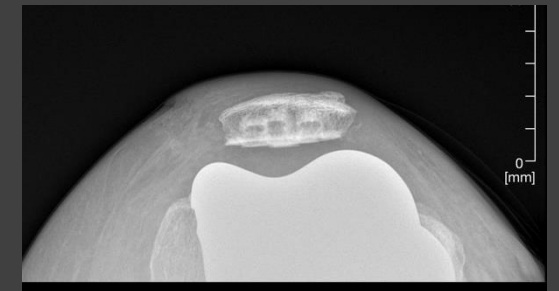
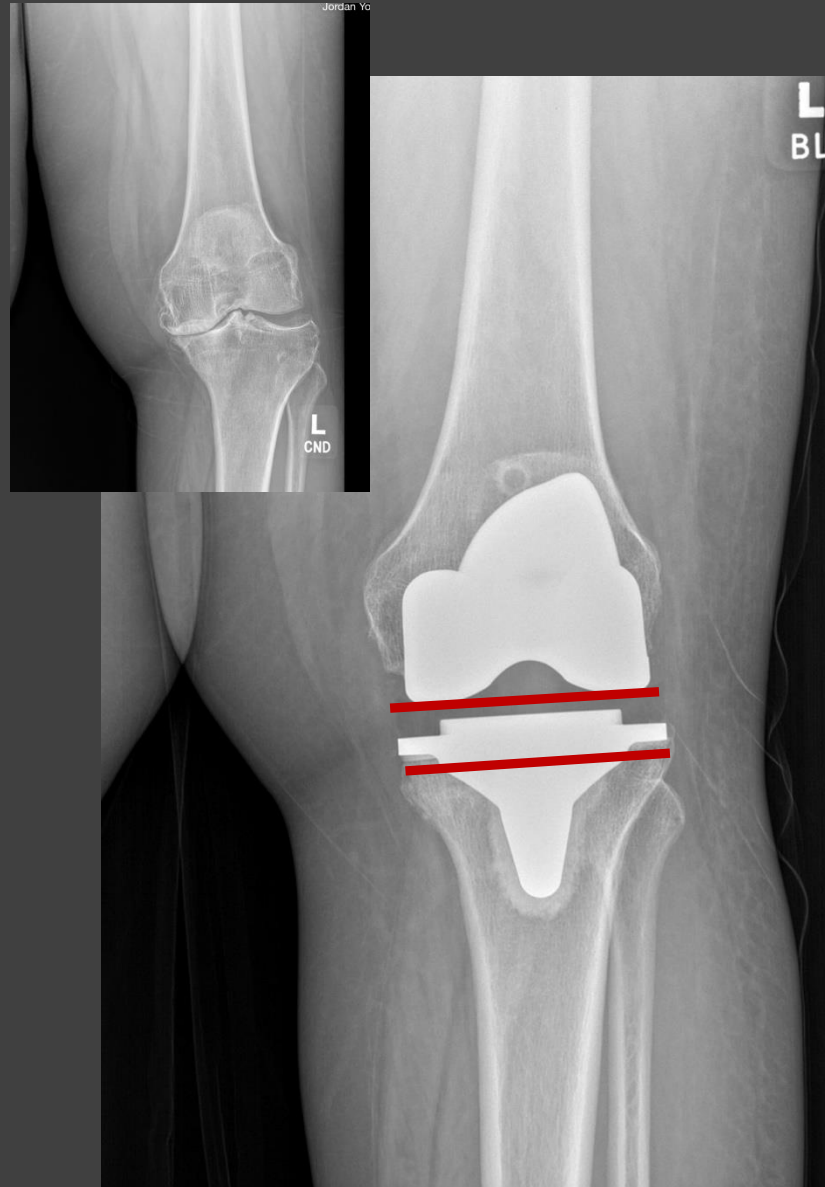
Approved Plan

	Gaps (mm)			Cut Depths (mm)	
	Ext.	Flex.	DF	Post. Femur	Prox. Tibia
Med.	0.5	0.5	10	12.5	6.5
Lat.	0.5	5.0	7	12.0	9.0

DF	0	VARUS / VALGUS
PT	6.0	VARUS / VALGUS
HKA	6.0	VARUS / VALGUS
Femur Rot.	1.0	IR / ER
Femur Flex.	1.0	
Tibial Slope	5.0	

POSTOP XRAYs

- Residual varus
- DF valgus
- PT varus



WHAT IF YOU DON'T USE A ROBOT ?

- You CAN still follow the Balanc-R™ Workflow
 - Start with resurfacing philosophy, plan cut depths
 - Utilize LLA X-rays and record data
 - Utilize LLA X-ray data in a similar way to manually recreate cut depths and angles (caliper or other)
 - Authors have described this¹³



WHAT ADJUSTMENTS CAN I RECOMMEND ?

RESURFACING PHILOSOPHY = RESURFACE

- Optimally restore all parameters within 2 degrees of native (LDFA, MPTA, SLOPE, HKA)
- Prioritize femoral resurfacing (complex and drives kinematics)
- Final HKA should be between aHKA and mHKA and close to stress HKA (rigid = close to stress, flexible = close to aHKA. This DOES REQUIRE some thought !)



WHAT ADJUSTMENTS CAN I RECOMMEND ?

BALANCING PHILOSOPHY = NORMAL KINEMATICS DESIRED

- Symmetric medial balance through ROM is the most important variable to ensure stability/kinematics
- Gaps (mm):
 - Extension Medial 0-1, Extension Lateral 0-1 (within 1mm of Extension Medial)
 - Flexion medial 0-1, Flexion Lateral X (0-6)
- **Larger deformities require more alteration to parameters in the step from resurfacing to balancing ! (no surprise)**



MY CURRENT BOUNDARIES

Optimal: Restore Pre-Arthritic State (LDFA, MPTA, HKA) $\pm 2^\circ$ from native

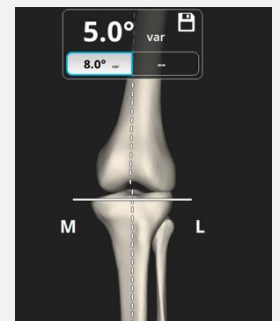
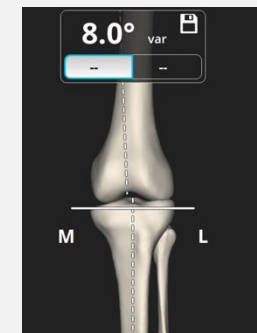
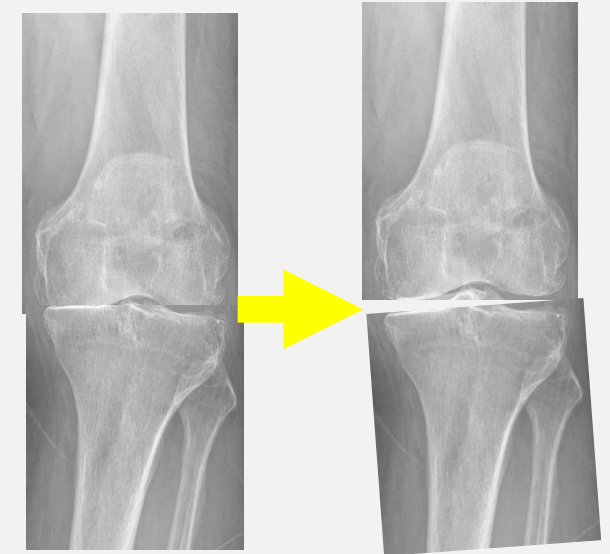
LDFA (Lateral Distal Femoral Angle) **Acceptable:** $84^\circ - 93^\circ$
6° Valgus to 3° Varus

Priority:
Femoral Anatomy Restoration

MPTA (Medial Proximal Tibial Angle) **Acceptable:** $84^\circ - 93^\circ$
6° Varus to 3° Valgus

Consider:
Tibial Varus Boundary

HKA (Hip-Knee-Ankle) **Acceptable:** 6° Varus to 3° Valgus

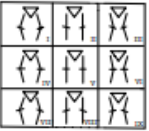


BALANC-R™ WORKFLOW PROVIDES A FRAMEWORK FOR SURGEONS TO LEARN WHAT WORKS TO CREATE THEIR GOAL

Pre-Operative Data

Clinical:
ROM = _____° to _____°
Deformity = _____° VARUS / VALGUS

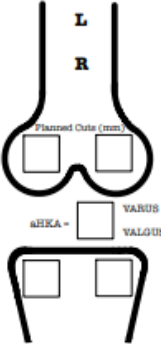
X-ray:
aTFA = _____°
mHKA = _____°
MPTA = _____°
LDFA = _____°
aHKA = _____°
aLLO = _____°
JLO Apex: Distal / Neutral / Proximal
Cor. Phenotype = _____
(based on MacDermid et al.)



Calculations

aHKA = MPTA - LDFA
aJLO = MPTA - LDFA
Planned DF Cut Angle = 90° - LDFA
Planned PT Cut Angle = MPTA - 90°
(+ valgus) (- varus)

Initials: _____ Age: _____
MRN: _____
DOB: _____
M / F Left / Right
HT: _____
WT: _____
BMI: _____



Planned Cuts (mm)
aHKA = _____° VARUS / VALGUS

Anticipated Wear (mm)

	Med.	Lat.
DF		
PT		

Planned Values

	VARUS / VALGUS
DF	
PT	
Postop Rot.	IR / ER
Postop Flex.	
Total Slope	

Balanc-R™ Workflow

Pre-Adjustment

Rest HKA = _____° VARUS / VALGUS
Stress HKA = _____° VARUS / VALGUS
ROM = _____° to _____°

Approved Plan

	Gaps (mm)		Cut Depths (mm)	
	Ext.	Flex.	Post.	Pre.
Med.				
Lat.				

	VARUS / VALGUS
DF	
PT	
HKA	
Postop Rot.	IR / ER
Postop Flex.	
Total Slope	

Final Values

HKA = _____° VARUS / VALGUS
ROM = _____° to _____°

Final Gaps (mm) (Robotic / Manual)

	Ext.	Flex.
Med.		
Lat.		

Pen Type	Pen Size	Insert Type	Insert Size (mm)	Tibia Type	Tibia Size	Patella Type	Patella Size

Cemented Uncemented PCL Status: _____
TQ: YES / NO TQ Time (min): _____ Bone Qual (1-Ex to 5-poor): _____

- Preoperative planning tool
- Intraoperative execution tool
- Research and documentation tool

BALANC-R™ WORKFLOW

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Virginia Beach VA 23462

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Surgeon Resources

Balanc-R™ Workflow

Clinical
ROM = _____° to _____°
Deformity = _____° VARUS / VALGUS

Exam
ATFA = _____°
mHKA = _____°
MPTA = _____°
LEPA = _____°
aHKA = _____°
aLLO = _____°
JLO Apex: Distal / Neutral / Proximal
Cox Phenotype = _____
(based on MacDermid et al.)

Anticipated Wear (mm)

	Med.	Lat.
DP		
PT		

Calculations
aHKA = MPTA - LEPA
aLLO = MPTA - LEPA
Planned DP Cut Angle = 90° - LEPA
Planned PT Cut Angle = MPTA - 90°
(+ valgus) (- varus)

Initials: _____ **Age:** _____
MRN: _____
DOS: _____
M / F Left / Right
HT: _____
WT: _____
BMI: _____

Planned Values

	VARUS / VALGUS
DP	
PT	
Postop Rel.	IR / ER
Postop Flex.	
Total Slope	

Pre-Adjustment
Rest HKA = _____° VARUS / VALGUS
Stress HKA = _____° VARUS / VALGUS
ROM = _____° to _____°

Approved Plan

	Gaps (mm)		Cut Depths (mm)	
	Ext.	Flex.	DP	PT
Med.				
Lat.				

Final Values
HKA = _____° VARUS / VALGUS
ROM = _____° to _____°

Final Gaps (mm) (Robotics / Manual)

	Ext.	Flex.
Med.		
Lat.		

Fem Type _____ **Fem Size** _____ **Insert Type** _____ **Insert Size (mm)** _____ **Tibia Type** _____ **Tibia Size** _____ **Patella Type** _____ **Patella Size** _____

Cemented _____ **Uncemented** _____ **PCL Status:** _____

TQ YES / NO _____ **TQ Time (min):** _____ **Bone Qual (1-Bm to 5-poor):** _____

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