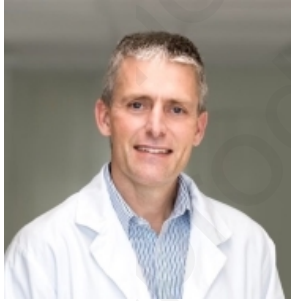


Personalized Joint Arthroplasty, the New Standard



Pascal-André Vendittoli MD, MSc, FRCS

CoFounder and Past President of the Personalized Arthroplasty Society
Professor of Surgery at Montreal University
Senior Clinical Researcher funded by the Provincial Government
Ortho Chair leader for Enhanced Recovery Canada



**PRACTICAL COURSE
ORTHOPEDICS**



duval clinique
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orthopædic
clinic



PERSONALIZED ARTHROPLASTY SOCIETY

Université 
de Montréal

Why Creating The Personalized Arthroplasty Society

Alternatives to systematic techniques

Dr Larry Dorr for the hip

Dr Riviere, Vigdorichik and Vendittoli for knee



ELSEVIER

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Orthopaedics & Traumatology: Surgery & Research

journal homepage: www.elsevier.com

Editorial

Mechanical alignment: The end of an era!

C Rivière, J Vigdorichik, P-A Vendittoli

ONALIZED ARTHROPLASTY SOCIETY



PERSONALIZED ARTHROPLASTY SOCIETY

Personalizedarthroplasty.org



P-A Vendittoli



S. Bini



M. Hirschman



C.C.J. Rivière

Arthroplasty Quest Over the Years: Implant Survivorship



■ HIP

What is the lifetime risk of revision for patients undergoing total hip arthroplasty?

A 40-YEAR OBSERVATIONAL STUDY OF PATIENTS TREATED WITH THE CHARNLEY CEMENTED TOTAL HIP ARTHROPLASTY

M. P. Abdel,
P. von Roth,
W. S. Harmsen,
D. J. Berry

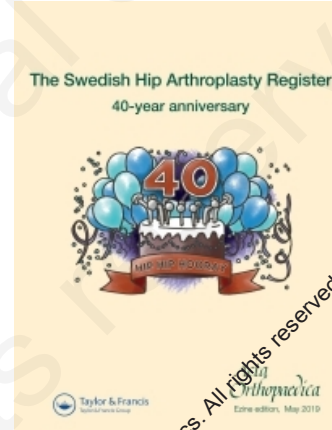
From Mayo Clinic,
Rochester,

Aims

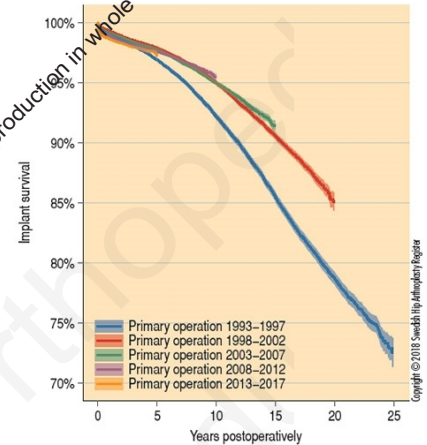
The purpose of this study was to determine the lifetime risk of revision surgery for patients undergoing Charnley cemented total hip arthroplasty (THA), with 40-year follow up, using death as a competing risk.

Materials and Methods

We retrospectively reviewed 2000 cemented Charnley THAs, with 51 living hips available at 40 years.



25 years implant survival for different time periods.



We succeeded !



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TKA Systematic Techniques Downsides

50%
have residual symptoms

75%
do not experience
a natural joint

≈100%
have abnormal
gait / joint kinematics



MANAGEMENT FACTORIALS IN TOTAL KNEE ARTHROPLASTY Patient dissatisfaction following total knee replacement A GROWING CONCERN?

D. Nam,
R. M. Nunley,
R. L. Barrack

From Washington
University School
Medicine/Barnes-
Jewish Hospital,
Louis, Missouri,
United States

A national, multi-centre study was designed in which a questionnaire quantifying the degree of patient satisfaction and residual symptoms in patients following total knee replacement (TKR) was administered by an independent, blinded third party survey centre. A total of 6491 of patients reported satisfaction with the overall function of their knee. Orthopaedics & Traumatology: Surgery & Research (2012) 98, 275–280



Available online at
SciVerse ScienceDirect
www.sciencedirect.com

Elsevier Masson France
EM|consulte
www.em-consulte.com/en



ORIGINAL ARTICLE

Joint perception after hip or knee replacement surgery

M. Collins^a, M. Lavigne^b, J. Girard^c, P.-A. Vendreoli^{b,*}

^a Department of orthopaedic, McGill university, Montréal, Québec, Canada
^b Department of orthopaedic surgery, Université de l'Assomption, Montréal H1T 2M4, Québec, Canada
^c Department of regional hospital

Gait & Posture 32 (2010) 205–210



Contents lists available at ScienceDirect

Gait & Posture

journal homepage: www.elsevier.com/locate/gaitpost



Knee kinetics during walking at different speeds in people who have undergone total knee replacement

Jodie A. McClelland^{a,b,*}, Kate E. Webster^b, Julian A. Feller^{a,b}, Hylton B. Menz^b

^a School of Physiotherapy, La Trobe University, Melbourne, Australia
^b Musculoskeletal Research Centre, La Trobe University, Melbourne, Australia

What Is a Personalized Arthroplasty?

4 Pillars

1- Meet patients' expectations

2- Patient specific perioperative care

3- Joint anatomy and function restoration (forgotten joint)

- Compatible with available material and fixation methods
- Improved surgical accuracy
- Improved implant designs - custom implant

4- Lifetime implant survivorship



Goal # 1 Patients Expectations After Joint Replacement

Expectations depend on

- Past experience
- Testimonies
- Provided information

Surgeons expect better results than their patients



The Royal College of Surgeons of England

Audit

Expect the best, prepare for the worst: surgeon and patient expectation of the outcome of primary total hip and knee replacement

M Moran¹, A Khan², DH Sochart¹, G Andrew²

Ann R Coll Surg Engl 2003; 85: 204-206

Do We Fulfilled Their Expectations?

THA

5 of 19 items were unfulfilled in $\geq 30\%$

- improvement in walking ability (31%)
- walking stairs (33%)
- improve ability to cut toenails (38%)

TKA

12 of 19 items were unfulfilled in $\geq 30\%$

- being able to kneel down (44%)
- being able to squat (47%)



ELSEVIER

The Journal of Arthroplasty xxx (2016) 1–7

Contents lists available at ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

Original Article

Unfulfilled Expectations After Total Hip and Knee Arthroplasty Surgery: There Is a Need for Better Preoperative Patient Information and Education

Claire Tilbury, MD ^{a,*}, Tsjitske M. Haanstra, MSc, PhD ^b, Claudia S. Leichtenberg, BSc ^a, Suzan H.M. Verdegaal, MD ^c, Raymond W. Ostelo, PhD ^{b,d}, Henrica C.W. de Vet, PhD ^b, Rob G.H.H. Nelissen, MD, PhD ^a, Thea P.M. Vliet Vlieland, MD, PhD ^a

Charnley's Opinion on Patient Expectation



...we look for factors which offer a «built-in restraint», such as defective knees or ankles, and impose some general physical limitations on the patient... to hold back physical activity...

Is it still a solution in 2021

2021



■ KNEE

The influence of expectation modification in knee arthroplasty on satisfaction of patients: a randomized controlled trial

THE EKSPLECT STUDY

J. J. Tol,
R. P. A. Janssen,
T. M. Haanstra,
M. C. van der Steen,
S. M. A. Bierma-

Arthritis

Meeting preoperative expectations is known to be of major influence on postoperative satisfaction after total knee arthroplasty (TKA). Improved management of expectation, result-

We Should Do Our Best to Meet Patient's Expectations

77 years old

11 days after THA

We met his expectations...



Patients goals should be ours
Forgotten joint that will last for the rest of their life



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Patient Satisfaction after Total Knee and Hip Arthroplasty

Knowledge of the factors that affect satisfaction will allow for strategies to improve it.

Rick L. Lau, MSc, MD, FRCSC^a, Rajiv Gandhi, MSc, MD, FRCSC^b, Safiyah Mahomed, BSc^c, Nizar Mahomed, MD, ScD, FRCSC^{c,*}

Outcome: change in a patient's health status

Personalization

Patient's variables

- Personal preferences
- His expectations

Quality Care

Technical aspects of the care received

Structure : environment within which the care is delivered

Process : professional activities



Pre-operative – Patient Engagement



**Preoperative
patient
education
session**

Know your patient

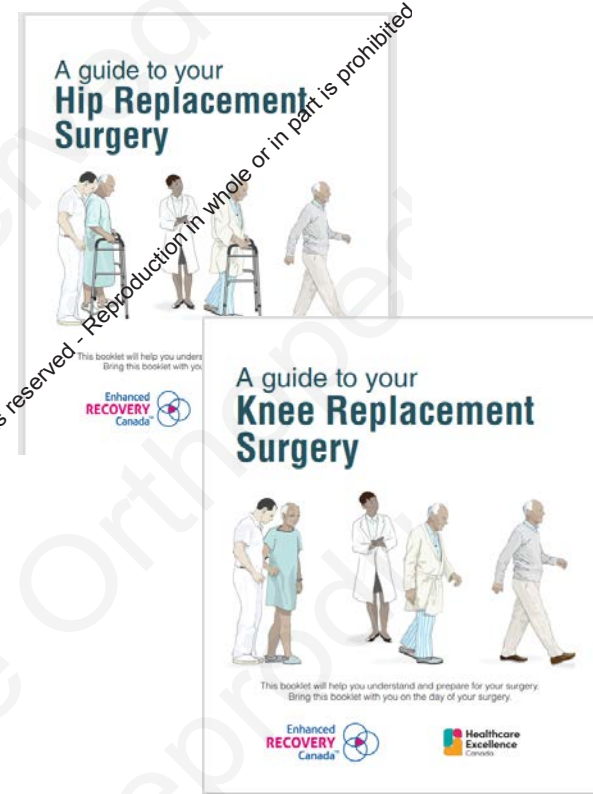
Booklets

Human communication

Electronic platform

Well-prepared patients can:

- Experience decreased anxiety levels
- Take fewer pain medications post-op
- Undergo reduced hospitalization time



Pre-Operative Optimisation

Modifiable risk factors:

- HB >130
- Diabetes (HbA1c <0.08)
- HBP < 140
- Risks of urinary retention
- Malnourishment

- Central sensitization, depression
- Allergy
- Opioids consumption
- Smoking
- Alcohol



Surgery Day

Chlorexidine soap shower

Limited fasting protocol

Up to 6 hours: light meal

Up to 2 hours: clear fluids

Premptive Medication (1-2h pre op)

1. Acetaminophen 975 mg
2. Celebrex 400 mg (allergy to sulfa = Naproxen)
3. Pregabalin 150 mg (75mg if >75y, none if >80y)
4. Aprepitant 125 mg
5. Oxycontin 10 mg (5mg if >75y or opioids sensitive)
6. Tranexamic acid 2g



In the OR Dexamethasone 8 mg IV (4 mg if diabetic)

Ideal ortho anesthesia method should:

- Minimize the duration of loss of motor functions
- Minimize post-operative orthostatic hypotension
- Minimize urinary retention

Short acting spinal

Chloroprocaine : 50mg/5cc
60-70 min

+

Deep sedation Propofol



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Surgery

Fixation method: Cemented stems for older patients
Uncemented TKA for the obese

THA

No post op ROM precaution (LDH THA)

TKA

- No tourniquet
- No drains



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Local Infiltration Anesthetics (LIA)

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A MULTIMODAL ANALGESIA PROTOCOL FOR TOTAL KNEE ARTHROPLASTY

A RANDOMIZED, CONTROLLED STUDY

BY PASCAL-ANDRÉ VENDITTOLI, MD, FRCS(C), PATRICE MAKIGNON, MD, PIERRE DROLET, MD, MSc, MARTIN LAVIGNE, MD, FRCS(C), MICHEL FALLAHA, MD, FRCS(C), MARIE-CRISTINE GUERTIN, PHD, AND FRANCE VARIN, BPHARM, PHD

Clin Orthop Relat Res (2013) 471:2284-2295
DOI 10.1007/s11999-013-2928-4

Clinical Orthopaedics
and Related Research®
A Publication of The Association of Bone and Joint Surgeons®

CLINICAL RESEARCH

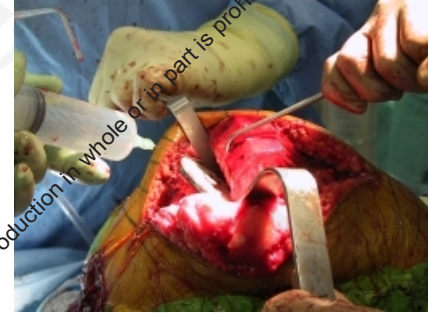
Periarticular Injection in Knee Arthroplasty Improves Quadriceps Function

Arnaud Chaumeron MD, Daniel Audy MD,
Pierre Drolet MD, MSc, Martin Lavigne MD, MSc,
Pascal-André Vendittoli MD, MSc

Reduces pain and narcotic consumption
Do not impair muscle function
Do not increase risk of fall

Pascal-A Vendittoli

Ropivacaine 400mg in 200cc + Toradol and adrenalin

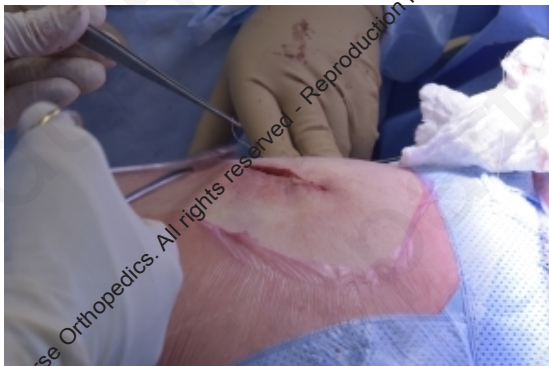


Nothing worthwhile comes easily.
Half effort does not produce half
results, it produces no results.

— Hamilton Holt —

Optimized Skin Closure

Subcuticular:
Size 3-0



Sealed wound
Skin glue



Benefits

- Barrier for contamination
- Lower superficial infection vs staples
- Patient can shower
- No staple removal
- Reduced wound discharge
- Reduced dressing change
- Improved patients satisfaction



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Results of Our ERAS Program

Objective Impacts



Original article

Enhanced recovery short-stay hip and knee joint replacement program improves patients outcomes while reducing hospital costs

Pascal-André Vendittoli^{a,b,c}, Karina Pelleri^a, François Desmeules^a, Vincent Massé^a, Christian Loubert^b, Marfan Lavigne^a, Josée Fafard^c, Louis-Philippe Fortier^b

^a Surgery Department, Montreal University, hôpital Maisonneuve-Rosemont, 5415, boulevard de l'Assomption, HIT 2M4 Montréal, Québec, Canada
^b Anesthesia Department, Montreal University, hôpital Maisonneuve-Rosemont, 5415, boulevard de l'Assomption, HIT 2M4 Montréal, Québec, Canada
^c Internal Medicine Department, Montreal University, hôpital Maisonneuve-Rosemont, 5415, boulevard de l'Assomption, HIT 2M4 Montréal, Québec, Canada



<https://doi.org/10.1016/j.otsr.2019.08.013>

Pascal-A Vendittoli, MD

Subjective Impacts

Hardy et al. BMC Musculoskeletal Disorders (2021) 22:978
<https://doi.org/10.1186/s12891-021-04847-9>

BMC Musculoskeletal Disorders

RESEARCH

Open Access



Comparing ERAS-outpatient versus standard-inpatient hip and knee replacements: a mixed methods study exploring the experience of patients who underwent both

Alexandre Hardy^{1,2,3}, Jonathan Gervais-Hupe^{4,5,6}, François Desmeules^{3,4}, Anne Hudon^{4,5,6}, Kadja Perreault^{7,8} and Pascal-André Vendittoli^{2,3,9,10*}

<https://doi.org/10.1186/s12891-021-04847-9>



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Objective Impacts

Adverse Events



50%

Clavien-Dindo Classification	Std-inpatient N=150	ERAS-outpatient N=114	P-Value
Grade 1	90%	49%	<0.001
Pain	67%	13%	<0.001
Anemia with blood transfusion (HB <80)	8%	0%	<0.001 ^a
Nausea	42%	12%	<0.001
Vomiting	25%	1%	<0.001
Headache	4%	0%	0.038
Dizziness	15%	4%	0.006
Constipation	8%	0%	0.002
Hypotension	26%	11%	0.003
Edema	9%	1%	0.005
Ecchymosis	5%	0%	0.011
Limp 6w PO	5%	0%	0.038



Functional Recovery at Home

	ERAS-outpatient N=48	Std-inpatient N=48	P-Value
Walking without technical aid (in days)	16	23	0.001 ^a
First shower (in days)	5	8	<0.001 ^a
ADLs (in days)	6	12	<0.001 ^a
Mild physical activities	6	8	<0.001 ^a
Intense physical activities	14	19	<0.001 ^a
Return to regular work without limitation (in weeks)	10	12	0.012 ^a

2-7 weeks sooner



Recommendation of a THR/TKR Protocol



	ERAS N=47	Std N=47	No preference N=47	P-Value
Which surgical protocol between the one you had on your right or left hip/knee would you recommend for a total hip/knee replacement*	40 85%	3 6%	4 9%	<0.001



Comparing ERAS-outpatient versus standard-inpatient hip and knee replacements: a mixed methods study exploring the experience of patients who underwent both

Alexandre Hardy^{1,2,3}, Jonathan Gervais-Hupé^{4,5,6}, François Desmeules^{3,4}, Anne Hudon^{4,5,6}, Kadija Perreault^{7,8} and Pascal-André Vendittoli^{2,3,9,10*}

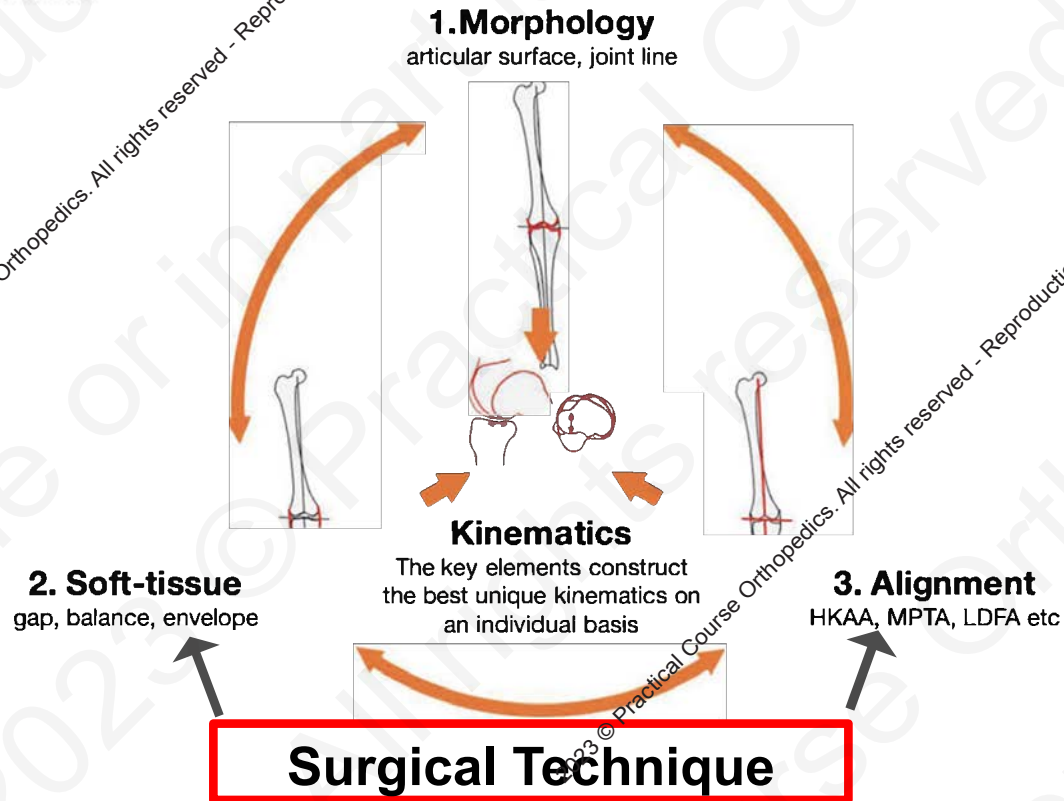
4 Themes Identified by the Patients As Crucial to Their Experience

1. **Support makes the difference:** Clear communication and uniformity
2. **Minimizing inconvenience:** Reduced adverse events and simplified wound care
3. **Home sweet home:** avoiding the hospital's imperfections
4. **Earlier return to normal life:** Shower, ADL, work, etc.



Personalized Surgical Technique

Takafumi Hiranaka, Yoshihito Suda, Akira Saitoh, Motoki Koide, Atsuki Tanaka, Akihiko Arimoto, Takaaki Fujishiro, Koji Okamoto

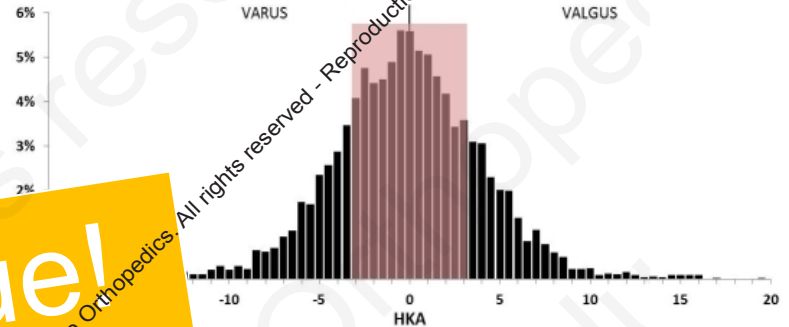


Human Anatomy Is Very Variable

Any change in the patient's knee anatomy will translate in:

- Soft tissues imbalances
- Kinematic axes modifications
- Functional impairment

4% with neutral femur
5% with neutral tibia
0.1% with both at 0°



Every joint is Unique!



Primary Arthroplasty

The Impact of Mechanical and Restricted Kinematic Alignment on Knee Anatomy in Total Knee Arthroplasty

Abdulaziz M. Almaawi, MD, MSc, FRCS^c, Jonathan R.B. Hurr, MA, MBBS, FRCS(Tr+Orth)^{1,2}, Vincent Masse, MD, FRCS^c, Martin Lavigne, MD, MSc, FRCS^c, Pascal-Andre Vendetoli, MD, MSc, FRCS^c

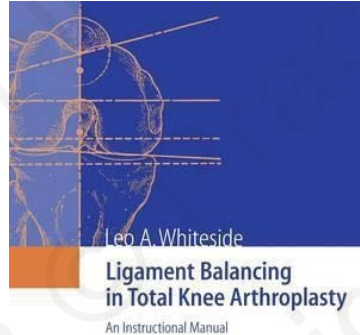
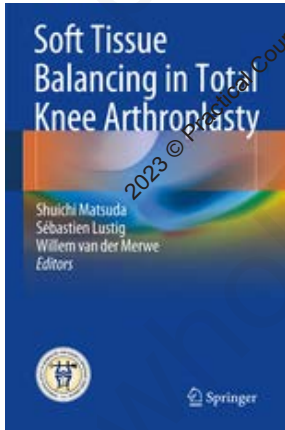


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With Systematic Techniques, We Deliberately Modify Patients' Anatomy

Then we worked very hard to describe ways to solve our mistakes

Joint replacement is not a soft tissues operation



Chasing your tail



PERSONALIZED ARTHROPLASTY SOCIETY

Personalized Arthroplasty

Anatomy
Reproduction / Preservation

Requires Precision and
Accuracy

Knee Surgery, Sports Traumatology, Arthroscopy (2023) 31:733–735
<https://doi.org/10.1007/s00167-023-07345-8>

EDITORIAL

Any technology assisting total knee arthroplasty (TKA) will fail without the correct 3D alignment and balancing target

Michael T. Hirschmann^{1,2} · Rüdiger von Eisenhart-Rothe³ · Heiko Graichen⁴

Systematic Alignment



Personalized Alignment



*precise, but
not accurate*



*accurate
and precise*



PLASTY SOCIETY

Evolving Beyond Craft Surgery Is Both Inevitable and Essential

Iason Scalise, MD¹ Michael Dunbar, MD, FRCSC, PhD² David Jacofsky, MD¹

J Knee Surg 2017;30:3–6.

Knee Surgery, Sports Traumatology, Arthroscopy
<https://doi.org/10.1007/s00167-020-06295-9>

EDITORIAL

The rebirth of computer-assisted surgery. Precise prosthetic implantation should be considered when targeting individualized alignment goals in total knee arthroplasty

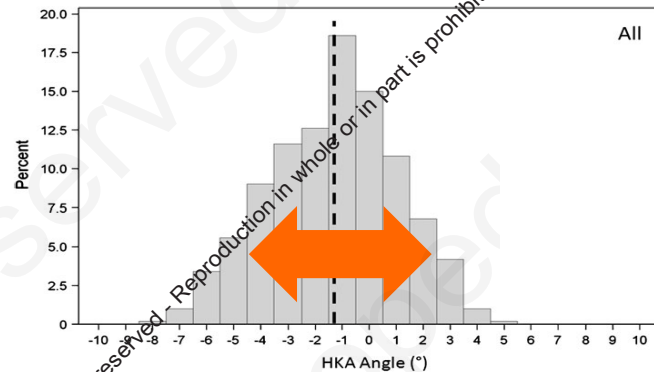
Pascal-André Vendittoli^{1,2} · Charles Rivière^{3,4} · Samuel MacDessi^{2,5,6}





A safe transition to a more personalized alignment in total knee arthroplasty: the importance of a “safe zone” concept

Rüdiger von Eisenhart-Rothe¹ · Sebastien Lustig² · Heiko Graichen³ · Peter P. Koch⁴ · Roland Becker⁵ · Arun Mullaaji⁶ · Michael T. Hirschmann^{7,8} 



What is a normal anatomy?
Compatible with an implant?

Should there be limits?



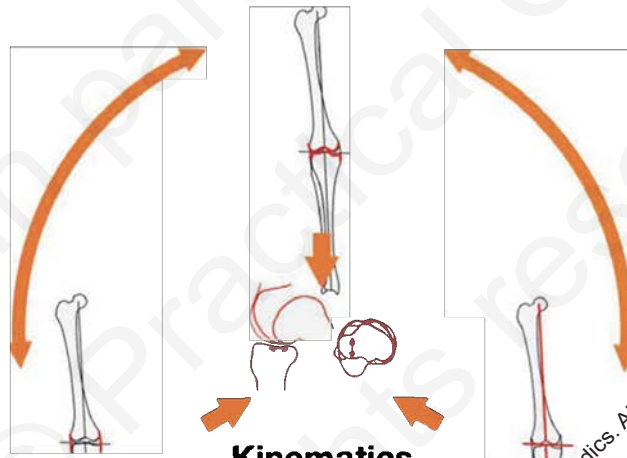
Personalized Surgical Technique

Takafumi Hiranaka, Yoshihito Suda, Akira Saitoh, Motoki Koide, Atsuki Tanaka, Akihiko Arimoto, Takaaki Fujishiro, Koji Okamoto

Implant design

1. Morphology

articular surface, joint line



Kinematics

The key elements construct the best unique kinematics on an individual basis

2. Soft-tissue

gap, balance, envelope

3. Alignment

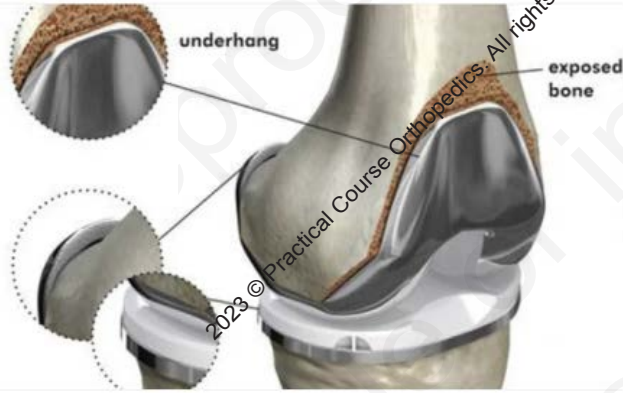
HKAA, MPTA, LDFA etc

Surgical Technique

Implant Design

The anterior compartment

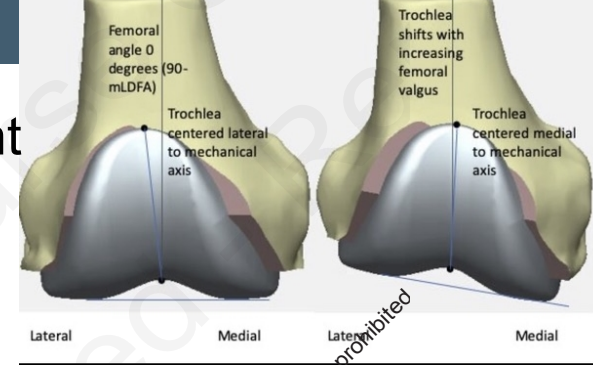
Custom



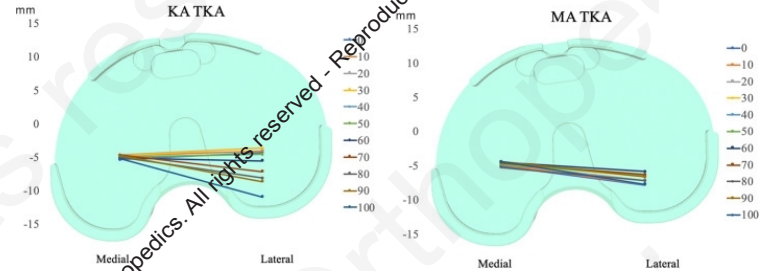
EDITORIAL

Personalisation and customisation in total knee arthroplasty: the paradox of custom knee implants

Mo Saffarini¹ · Michael T. Hirschmann^{2,3} · Michel Bonnin⁴



Medially constrained



Kinematically Aligned Total Knee Arthroplasty Using Medial Pivot Knee Prosthesis Enhances Medial Pivot Motion: A Comparative Kinematic Study With Mechanically Aligned Total Knee Arthroplasty

Azuya Kaneda, MD^a, Yasuo Niki, MD, PhD^{a,*}, Yuji Kuroyanagi, MD, PhD^b, Shu Kobayashi, MD, PhD^a, Kengo Harato, MD, PhD^a, Yu Iwama, MD^a, Takeo Nagura, MD, PhD^c



Period of Transition / Confusion

Knee Surgery, Sports Traumatology, Arthroscopy
<https://doi.org/10.1007/s00167-019-05558-4>

EDITORIAL

Alignment in TKA: what has been clear is not anymore!

Michael T. Hirschmann^{1,2} · Roland Becker³ · Reha Tandogan⁴ · Pascal-André Vendittoli⁵ · Stephen Howell⁶

KA

rKA

inverseKA

Functional alignment



Personalized Arthroplasty

Caring for our patients in their entirety.

- 1- Know and Meet their expectations
- 2- Individualise and Optimize their perioperative care
- 3- Restore their Joint anatomy and function (forgotten joint)
- 4- Offer a surgery that will last a lifetime



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PERSONALIZED ARTHROPLASTY SOCIETY

Join us for the **2023 PAS Scientific Session
& Annual Meeting for Personalized Hip
and Knee Replacement**

**December 1-2, 2023
Bordeaux, France**

personalizedarthroplasty.org/events

