IUSS
Scuola Universitaria Superiore Pavia

European Knee Society

FONDAZIONE POLIAMBULANZA
Istituto Ospedaliero

Stiff TKA revision : algorithm

F. Benazzo

STIFFNESS

One of the worst client to deal with…

Limited flexion/Limited extension/associated

- Poor functional outcome both in primary both in revision surgery compared to “normal” OA knees
- Less patient satisfaction (mobility is the second patient’s expectation after painless knee!)
- Disappointing results for both patient and surgeon

STIFFNESS

- No determination of the criteria for defining stiffness
- Incidence range from 1.3 to 5.3% in TKA
- Patient-Related Risk Factor:
  - compromised preoperative ROM
  - preoperative diagnosis (e.g. rheumatoid arthritis)
  - Obesity

J Knee Surg. 2015 Apr;28(2):119-26. doi: 10.1055/s-0034-1396079. Epub 2014 Dec 16.

2015

Stiffness after total knee arthroplasty

Jorge Manrique [1], Miguel M Gomez [1], Javad Parvizi [1]

Beware

Stiffness alone

$\neq$

Stiffness + Pain

The Journal of Arthroplasty 33 (2018) 407–414

Contents lists available at ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

Primary Arthroplasty

2018

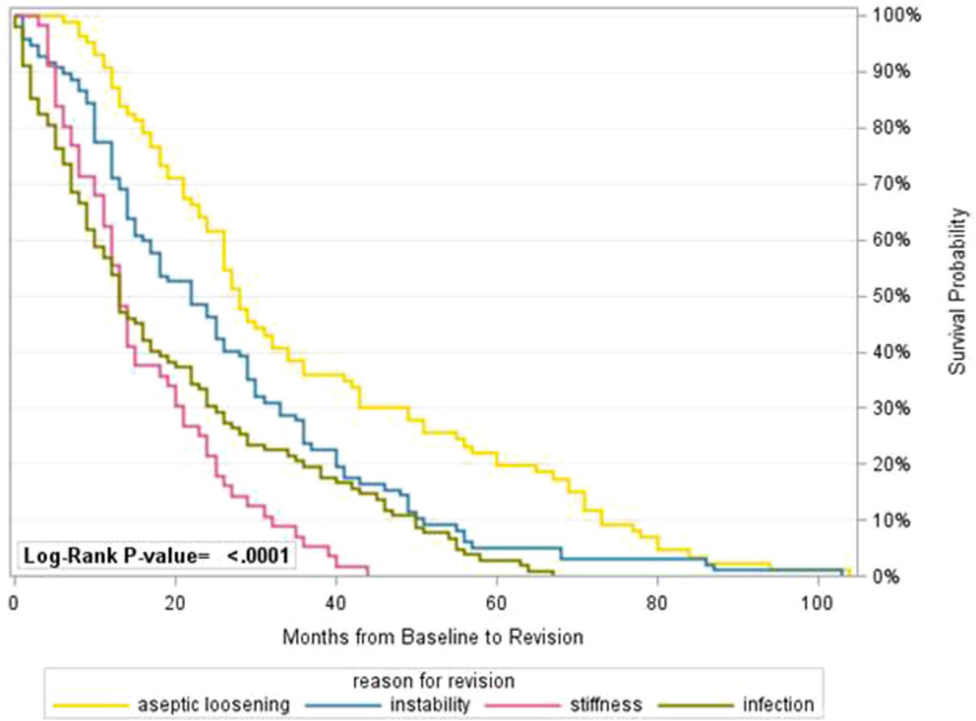
Failure After Modern Total Knee Arthroplasty: A Prospective Study of 18,065 Knees

Michael Pitta, MD [a, *], Christina I. Esposito, PhD [a, b], Zhichang Li, MD [a, b, c], Yuo-yu Lee, MS [d], Timothy M. Wright, PhD [a, b], Douglas E. Padgett, MD [a]

Table 1
Mechanisms of Failure After Total Knee Arthroplasty.

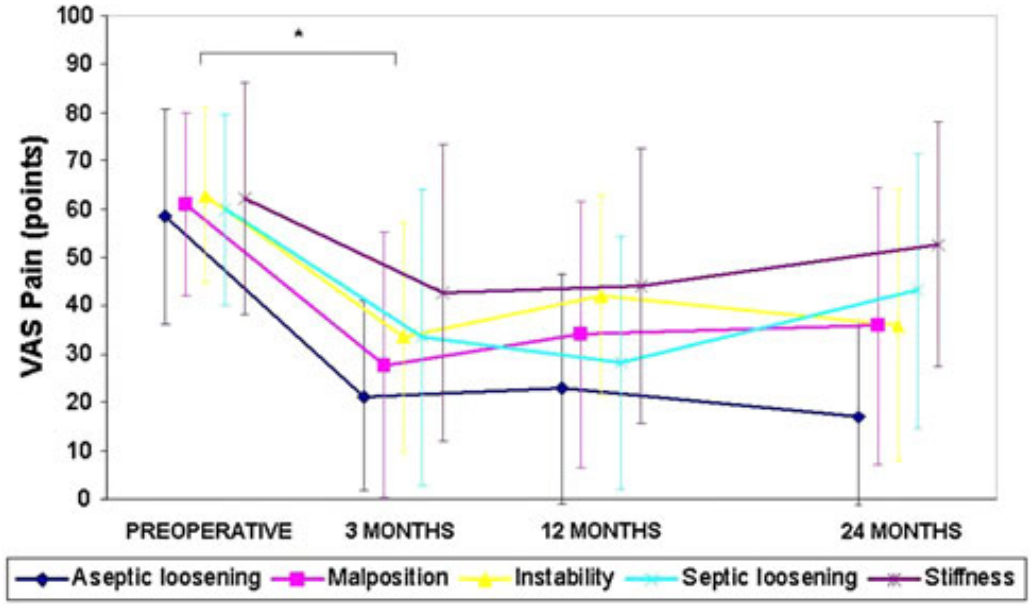
Reason for Failure	No. of Failures/% of Failures	Average Time of Implantation (mo)
Infection	103/25.4	20
Instability	97/24	27
Aseptic loosening	86/21.2	37
Stiffness	57/14.1	16
Periprosthetic fracture	14/3.5	29
Osteolysis/PE wear	10/2.5	27
Malalignment	10/2.5	13
Pain	5/1.3	30
Isolated loose patella	6/1.5	46
Documented nickel allergy	3/0.7	23
Patellar AVN	2/0.5	11
PE dissociation	4/1	12
Extensor mechanism failure	1/0.25	12
Patellar malposition	1/0.25	19
Peripatellar fibrosis/"clunk"	2/0.5	20
Patellar instability	1/0.25	7

AVN, avascular necrosis; PE, polyethylene.



REASON FOR REVISION VS OUTCOME

- **Best**: aseptic loosening
- **Moderate**: instability / malposition / infection
- **Worst**: arthrofibrosis



Multicenter Study > Clin Orthop Relat Res. 2013 Jul;471(7):2296-302.
doi: 10.1007/s11999-013-2940-8. Epub 2013 Mar 30.

Reason for revision TKA predicts clinical outcome: prospective evaluation of 150 consecutive patients with 2-years followup

Robin W T M van Kempen [1], Janneke J P Schimmel, Gijs G van Hellemondt, Hilde Vandenneucker, Ate B Wymenga

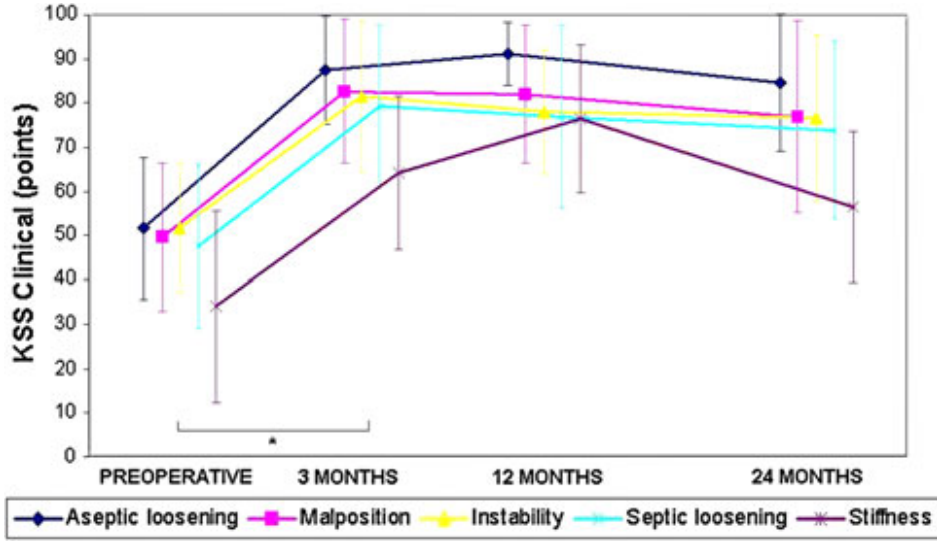
REASON FOR REVISION VS OUTCOME

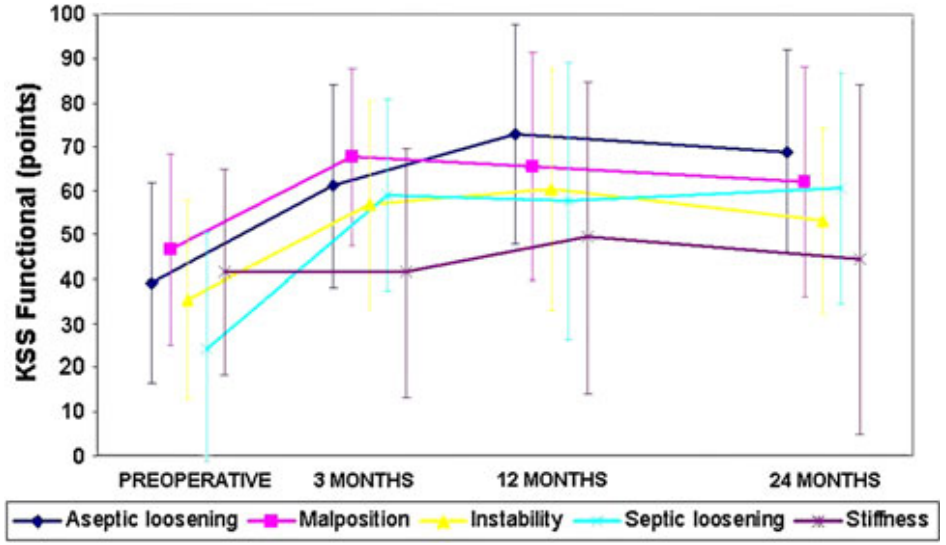
- **Best**: aseptic loosening
- **Moderate**: instability / malposition / infection
- **Worst**: arthrofibrosis

Multicenter Study > Clin Orthop Relat Res. 2013 Jul;471(7):2296-302.
doi: 10.1007/s11999-013-2940-8. Epub 2013 Mar 30.

Reason for revision TKA predicts clinical outcome: prospective evaluation of 150 consecutive patients with 2-years followup

Robin W T M van Kempen [1], Janneke J P Schimmel, Gijs G van Hellemondt, Hilde Vandenneucker, Ate B Wymenga

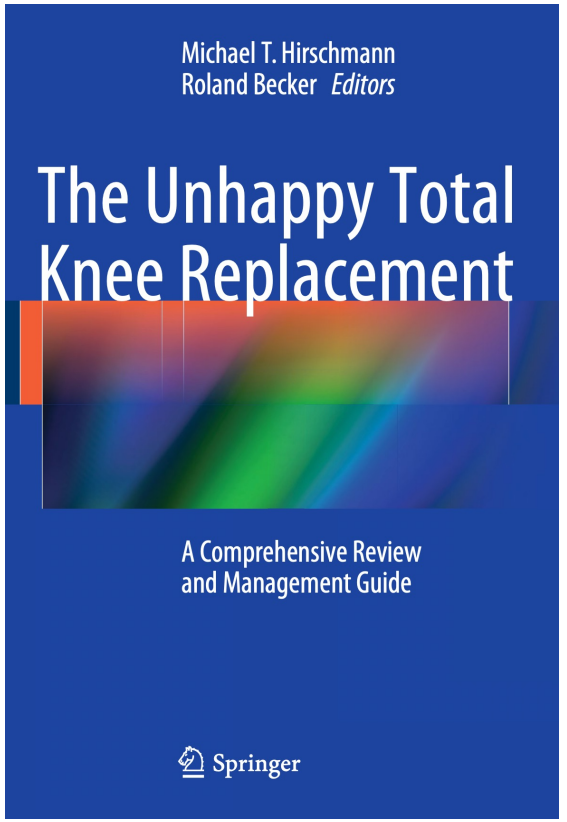




TREATMENT

The treatment options for stiffness after TKA:

- physical therapy (first postoperative period)
- manipulation under anaesthesia (MUA)
- arthroscopic debridement/arthrolysis
- open debridement/arthrolysis
- revision surgery of the TKA



Stiffness After Total Knee Replacement **21**

Frank-Christiaan B.M. Wagenaar, Koen C. Defoort, Vincent J. Busch, Gerard G. Van Hellemondt, and Ate B. Wymenga

TREATMENT

Don't forget:

- Revision TKA will not help if there is no clear mechanical explanation for the stiffness
- The longer the knee has been stiff and the more previous surgeries performed = lower probability of quadriceps elasticity recovery
- If the main issue is pain, consider treatment by a pain specialist

Stiff Knee

Stiffness requiring Manipulation Under Anesthesia

Predisposed patients

Inadequate pain management

Untreated active bleeding and hematoma

Review > Int Orthop. 2022 Jun;46(6):1253-1279. doi: 10.1007/s00264-022-05344-x. Epub 2022 Mar 18.

Treatment of arthrofibrosis and stiffness after total knee arthroplasty: an updated review of the literature 2022

Amer Haffar [1], Graham S Goh [1], Yale A Fillingham [1], Michael T Torchia [2], Jess H Lonner [3]

Review > J Knee Surg. 2013 Dec;26(6):405-10. doi: 10.1055/s-0033-1341579. Epub 2013 Mar 19.

Long-term outcomes of MUA for stiffness in primary TKA 2013

Robert Pivec [1], Kimona Issa, Mark Kester, Steven F Harwin, Michael A Mont

Stiff Knee

MUA

Favourable results also in long term :

- better if early
- Around 30 in flexion, 5 in extension

Low complications

- Haematomas
- Supracondilar fracture (!!)

Long-Term Outcomes of MUA for Stiffness in Primary TKA

Robert Pivec, MD[1] Kimona Issa, MD[1] Mark Kester, PhD[2] Steven F. Harwin, MD[3] Michael A. Mont, MD[1]

[1] Center for Joint Preservation and Replacement, Rubin Institute for Advanced Orthopaedics, Sinai Hospital of Baltimore, Baltimore, Maryland
[2] Department of Research and Development, Homer Stryker Center, Mahwah, New Jersey
[3] Department of Orthopaedic Surgery, Beth Israel Medical Center, New York, New York

Address for correspondence Michael A. Mont, MD, Center for Joint Preservation and Replacement, Rubin Institute for Advanced Orthopaedics, Sinai Hospital of Baltimore, 2401 West Belvedere Avenue, Baltimore, MD 21215 (e-mail: mmont@lifebridgehealth.org; rhondamont@aol.com).

J Knee Surg 2013;26:405–410.

2013

The Knee 19 (2012) 751–759

Contents lists available at SciVerse ScienceDirect

The Knee

Review

Management of stiffness following total knee arthroplasty: A systematic review

H. Ghani [a], N. Maffulli [b], V. Khanduja [a,*]

[a] Addenbrooke's - Cambridge University Hospitals NHS Foundation Trust, Cambridge, UK
[b] Barts and The London School of Medicine, London, UK

2012

Key point: Important to consider the ROM achieved during the primary surgery → more ROM will not be possible

Stiff Knee

Arthroscopic release

Not real difference comparing to MUA

To be done if MUA fails

Low rate of complications

“Patients can reliably expect an improvement after arthroscopic lysis of adhesions for a stiff TKA using a standardized arthroscopic approach; however, patients achieved approximately half of the improvement that was obtained at the time of surgery.”

› Orthopedics. 2014 May;37(5):e482-7. doi: 10.3928/01477447-20140430-60.

Arthroscopic lysis of adhesions for the stiff total knee: results after failed manipulation 2014

Fotios Paul Tjoumakaris, Bradfords Chofield Tucker, Zachary Post, Matthew David Pepe, Fabio Orozco, Alvin C Ong

Stiff Knee

Open surgical debridement

Open surgical arthrolysis can be considered in refractory cases

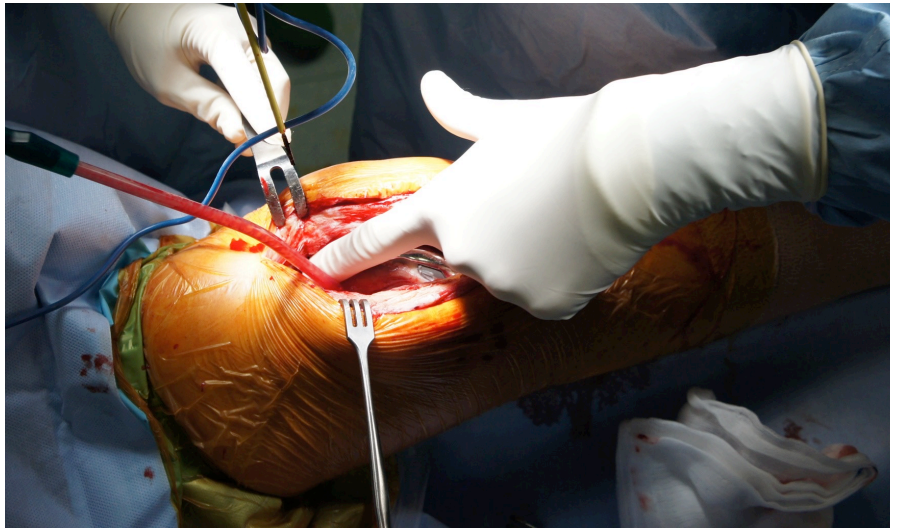
Tarabichi

Extensive sinovectomy

Ranawat quad pie crusting

Bleeding control

Low complication rate



The ideal timing of open arthrolysis for the stiff TKR is still unclear, but one article advises open release for the stiff TKR >6 months after primary procedure

Comparative Study > Rev Chir Orthop Reparatrice Appar Mot. 2003 Feb;89(1):27-34.

[Management of stiffness after total knee arthroplasty: indication for different mobility management in 62 cases]

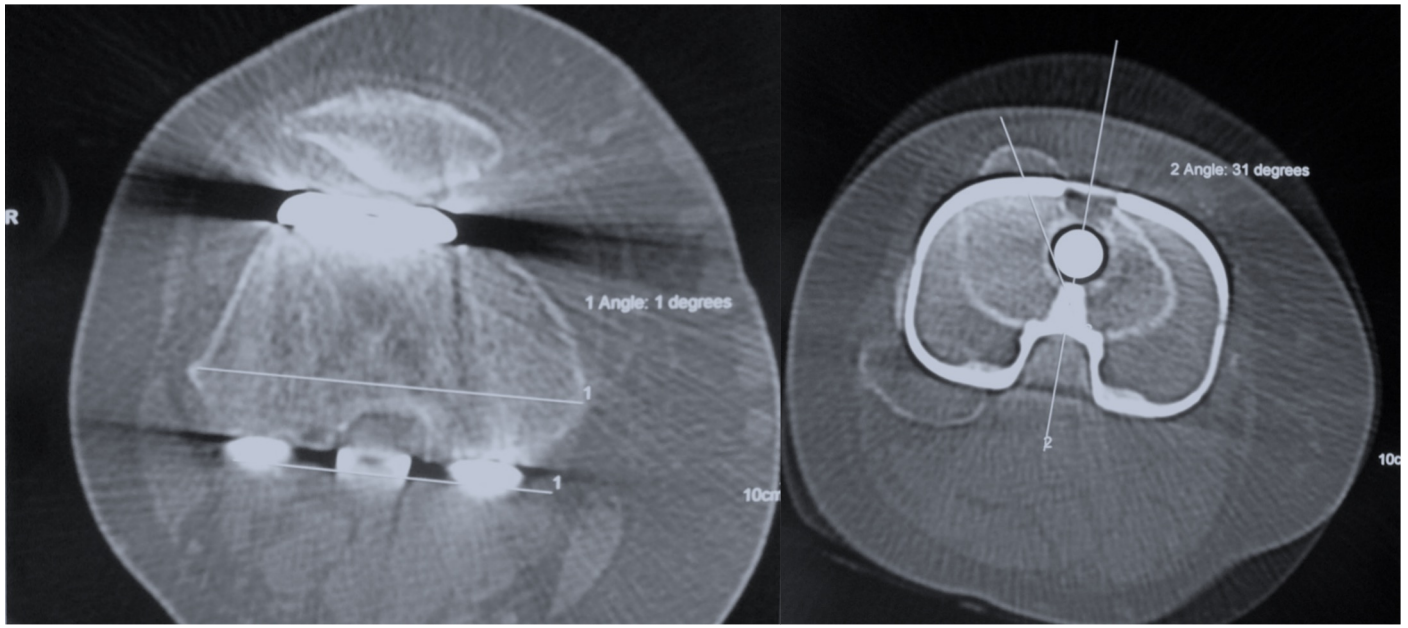
[Article in French]

F Tirveilliot [1], H Migaud, F Gougeon, P Laffargue, C Maynou, C Fontaine

Stiff Knee

Revision

Only if correct diagnosis done



Even in cases with a clear diagnosis, the outcome of revision surgery is rather unpredictable and the improvement generally only modest

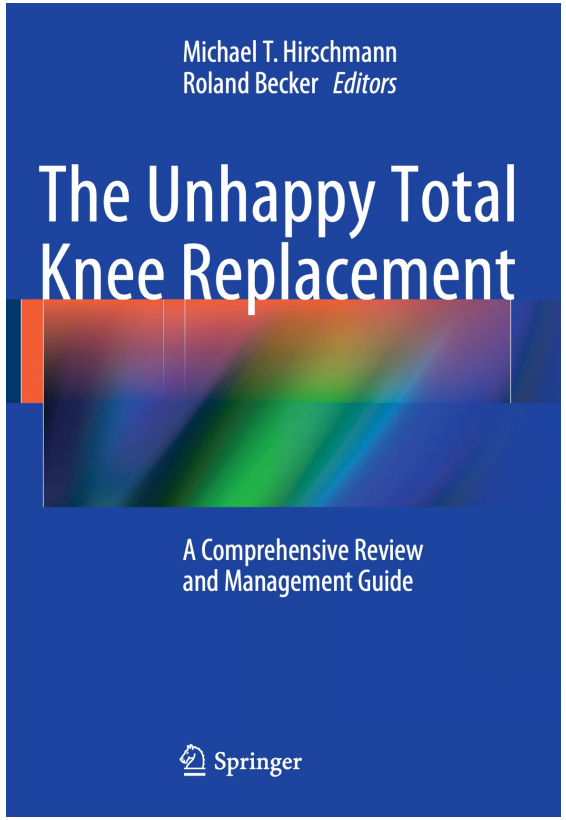
TREATMENT ALGORITHM

What is the cause of the stiffness?

Step 1: Analyse All Factors First

- Patient factors
- Surgical technique errors and mechanical factors
- Postoperative

Mandatory to exclude
PJI and CRPS-1



Stiffness After Total Knee Replacement **21**

Frank-Christiaan B.M. Wagenaar, Koen C. Defoort, Vincent J. Busch, Gerard G. Van Hellemondt, and Ate B. Wymenga

PRE-OPERATIVE FACTORS

Pre-operative stiffness (limited preoperative flexion range)

↓ ↑

Low pre-operative American Knee Society Scores

- Young age, female gender, high body mass index (BMI)
- Previous knee surgery
- Patients with disability or chronic disease (diabetes mellitus, pulmonary disease, depression, RA)
- Drug abuse

PRE-OPERATIVE FACTORS

Preoperative Stiffness (limited preoperative flexion/extension range)

→ probably the most important
→ different causes:

- Systemic Diseases
- Previous surgeries around the knee
- Post-traumatic deformities
- Extra-articular deformities
- Previous Hip Surgery
- Previous Spine surgery
- Age, gender,BMI

WARNING

Preoperative factors are difficult to modify during a stiff TKA revision

Risk of worsening the stiffness

INTRA-OPERATIVE FACTORS

- Inappropriate implant selection
- Inadequate restoration of gap balance
- Surgical trauma to the extensor mechanism
- Implant malalignment
- Excessive bleeding and post-op blood effusion

Understanding intra-articular causes

=

higher probability of TKA revision success

Not simply arthrofibrosis!

Stiff knee

Rom -20 to 45

Patella baja

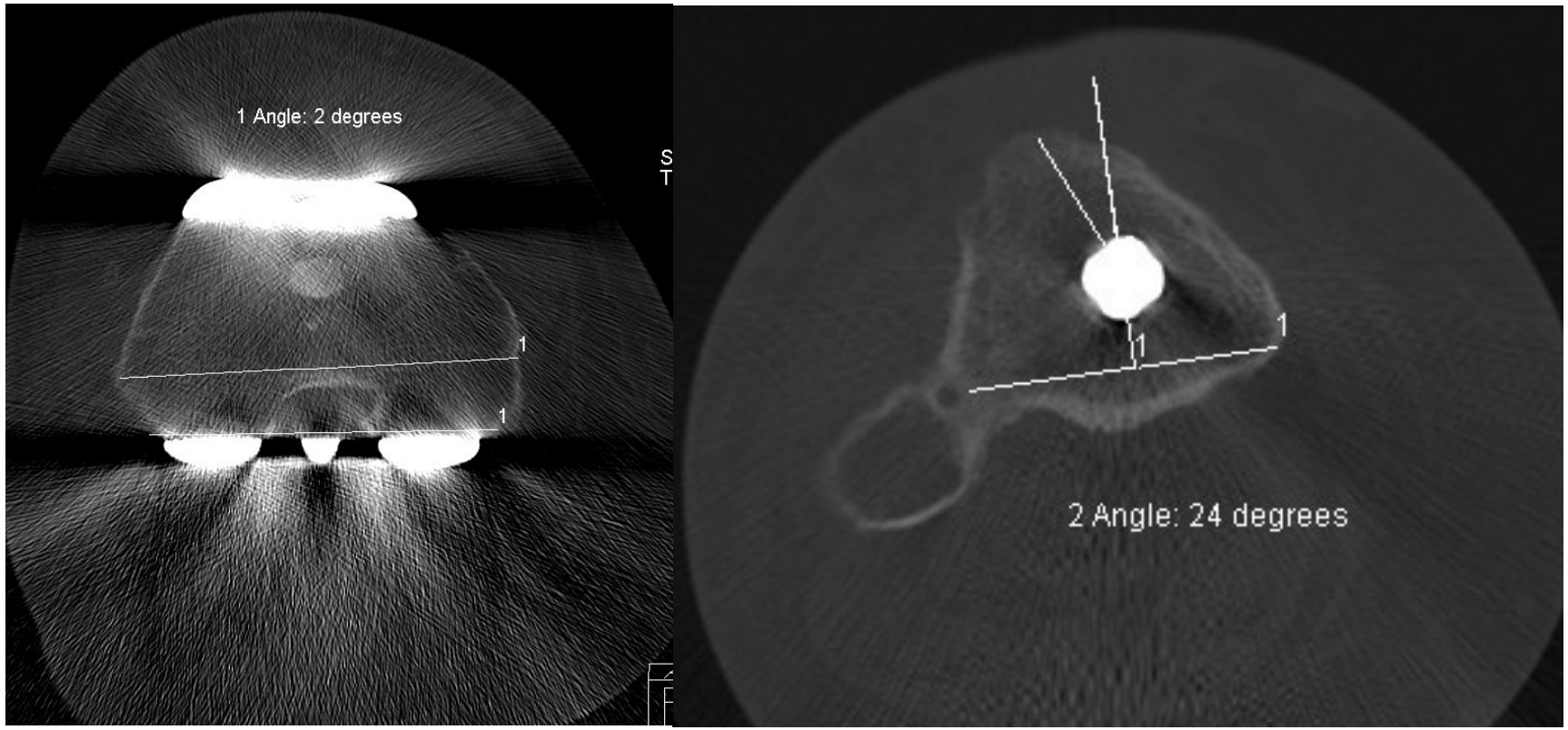
Oversized femur

Tibia fracture for MUA

Intra-articular factors

- Tibia component
  - Negative sloped cut tightens flexion space
  - AP position is less important (Daluga)
  - Malrotation is important (Vince)
  - Posterior overhang can limit flexion

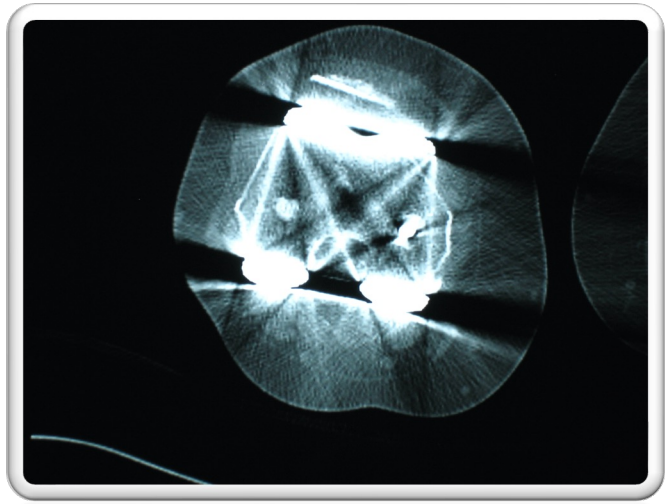
Intra-articular factors



Malpositioning (combined malrotation)

Intra-articular factors

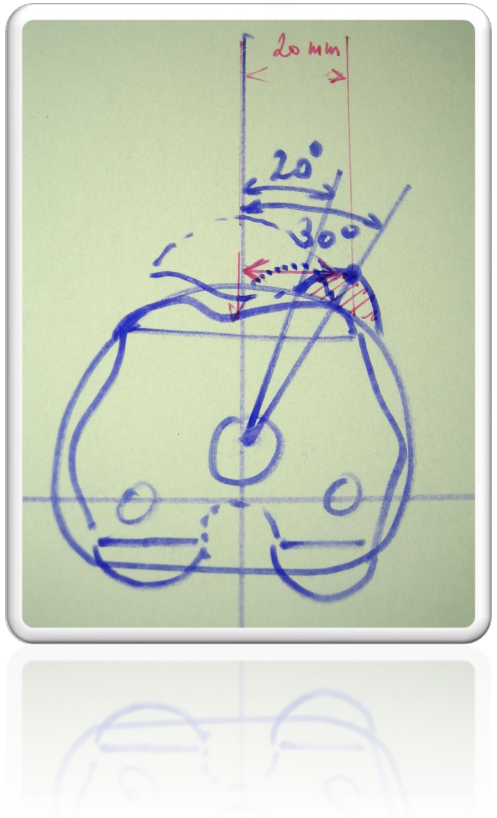
- Femoral component



- *AP diameter increase* of >9% related to stiffness (Daluga)
- *Increase of femur* AP diameter by >2.5mm limits flexion (Walker)
- *Extension of the femur* limits flexion (Walker)
- *Small posterior offset* limits flexion (Bellemans)
- *Malrotation* causes stiffness (Drobny, Vince….)

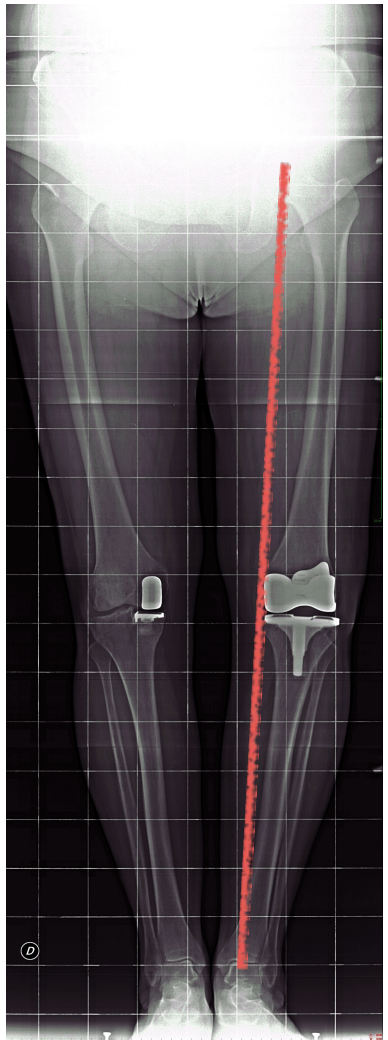
Intra-articular factors

- Patellofemoral joint
  - Localised fibrosis (clunk)
  - Oversizing of patella component
  - Patella baja
  - Laterally positioned patella component
  - Instability and maltracking (increased TTD)



Patella & malrotation

Anterior knee pain



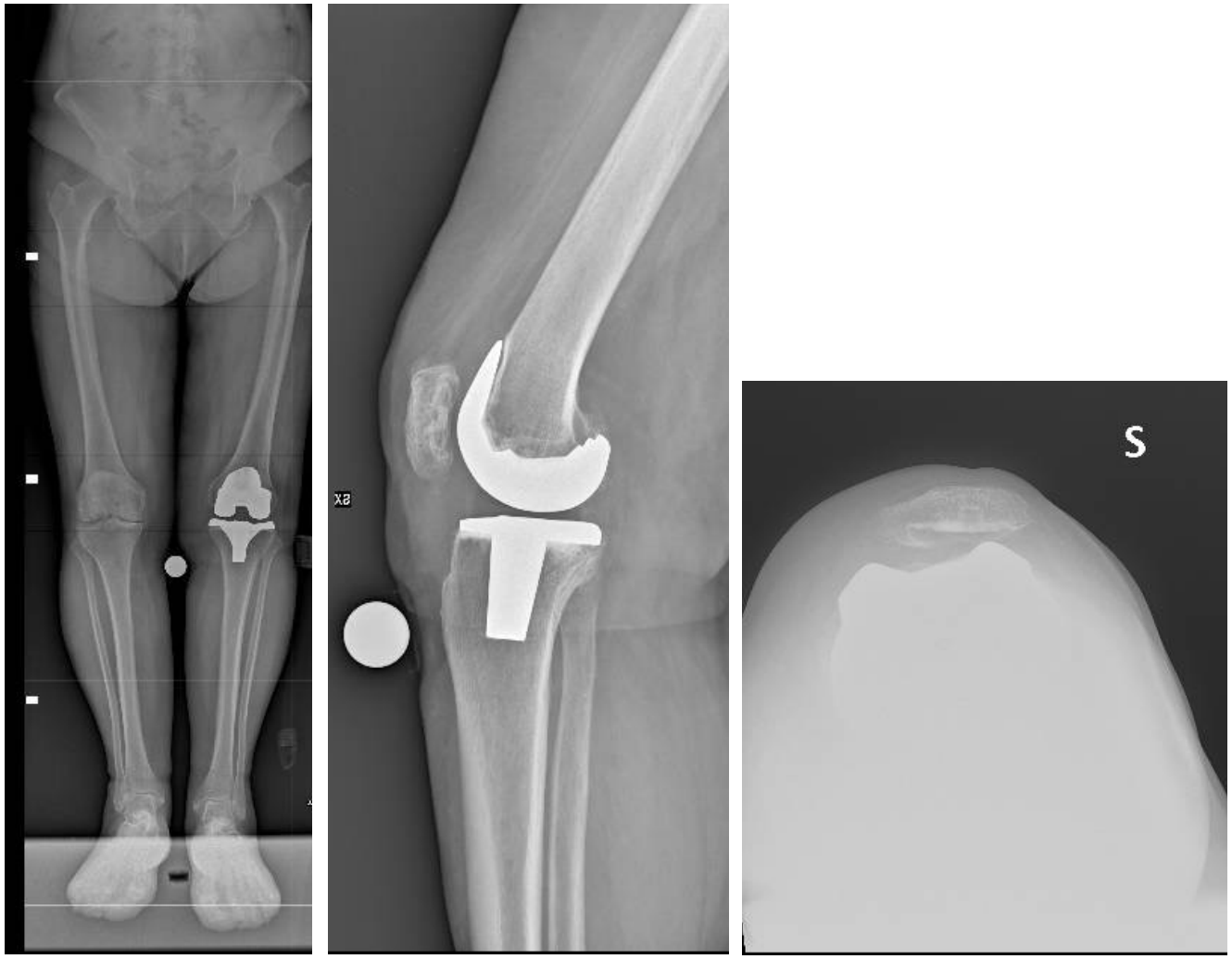
Patella & malrotation

Correct alignment

Correct rotation

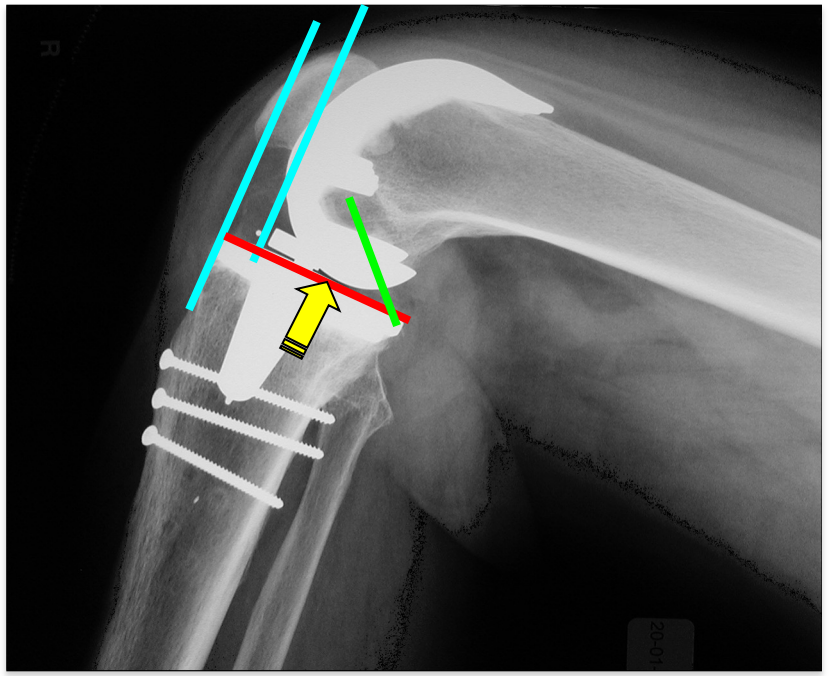
Femur distalised

Stiffness + pain



Intra-articular factors

- PCL balancing
  - Tight PCL and flexion space cause pain and stiffness
  - Release of PCL: mandatory in fixed flexion contractures

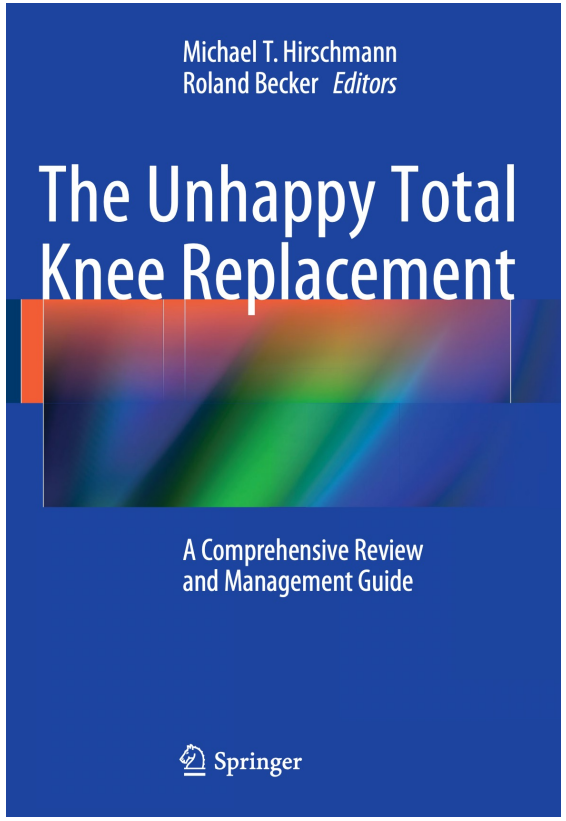


TREATMENT ALGORITHM

Step 2: Treatment Selection

<3–6 months:

- Treat patient or postoperative factors if possible
- In correct implant position: physical therapy or MUA
- Patella tracking problem, malpositioning, wrong size, loosening, or implant failure: correct patella problems and/or do revision TKA



Frank-Christiaan B.M. Wagenaar, Koen C. Defoort, Vincent J. Busch, Gerard G. Van Hellemondt, and Ate B. Wymenga

TREATMENT ALGORITHM

Step 2: Treatment Selection

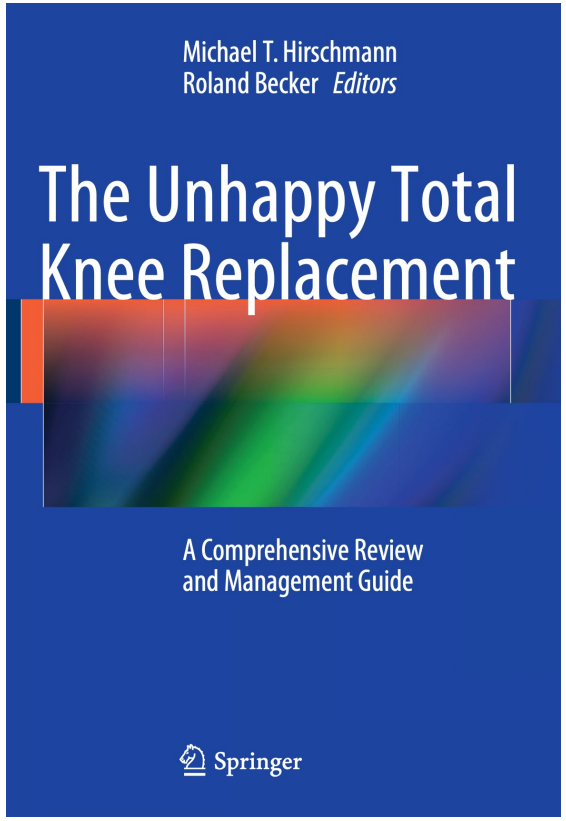
>3–6 months:

- Treat patient or postoperative factors if possible

- In correct implant position:

a) Arthroscopic arthrolysis
b) Open arthrolysis (with exchange insert)
c) Revision TKA (rarely)
(Consider (arthroscopic/ open) release PCL if tight)

- Patella tracking problem, malpositioning, wrong size, loosening, or implant failure: correct patella problems and/or do a revision TKA



Frank-Christiaan B.M. Wagenaar, Koen C. Defoort, Vincent J. Busch, Gerard G. Van Hellemondt, and Ate B. Wymenga

TAKE-HOME MESSAGE

- Consider the stiffness grade and openly discuss it with the patient (reduce expectations for both the patient and the surgeon)
- Find the causes of stiff TKA (deep investigations, from pre-op x-rays to implant and technique)
- Choose the most appropriate treatment based on the cause of stiffness and the timing since the primary surgery
- Before a revision: It is mandatory to exclude PJI and CRPS-1