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Increased coronal deformity, tibiofemoral subluxation, and severe bone loss increase the need for a higher-constrained total knee arthroplasty

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Faculty Disclosure Information

- Sandro F. Fucentese is a consultant for Medacta SA (Switzerland), Smith & Nephew (United Kingdom), Zimmer Biomet and Karl Storz SE & Co. KG (Germany).

- The other authors have no conflict of interest to declare.

Background

- The indications for higher-constrained TKA implementation remain contentious, encompassing severe varus or valgus deformity, substantial bone loss, and ligamentous instability
- More definitive objective parameters or threshold values remain elusive, primarily due to the limited scope of previously reported cohorts
- Ultimately, the decision to employ higher-constrained TKA in primary settings remains surgeon-dependent, introducing undesirable variability in clinical practice

Aim of the Study

1. To identify demographic and radiographic risk factors associated with the primary use of a higher-constrained TKA

2. Analysis of functional outcome and revision surgeries

Methods

- Retrospective case series of 903 consecutive patients (n=1062 knees) that underwent a primary TKA using a patient-specific instrumentation system allowing intraoperative cross-over to a higher-constrained TKA

- Radiographic (hip-knee-ankle angle (HKA), joint line convergence angle (JLCA), coronal tibiofemoral (TF)-subluxation and bone defects) and demographic predictors (age, sex, and body-mass index (BMI)) for the use of a higher-constrained TKA were analyzed

- Knee society score (KSS) and revision rates were assessed

Results

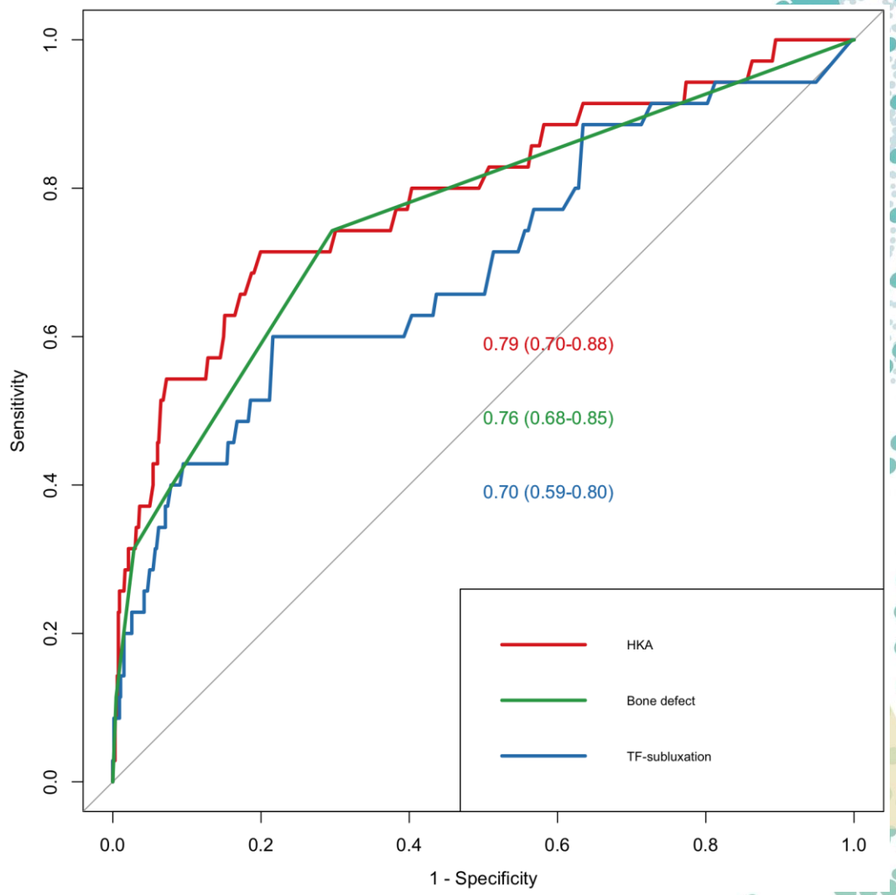
- In 77 out of 1062 knees (7.3%) an intraoperative cross-over to a higher-constrained TKA was performed, resulting in 15 semi-constrained and 62 hinged TKAs

- Significant preoperative risk factors for higher-constrained TKA in varus knees:

    - HKA (cut-off: <167.3°, OR: 10.0, 95% CI: 4.7-21.4; p<0.001)

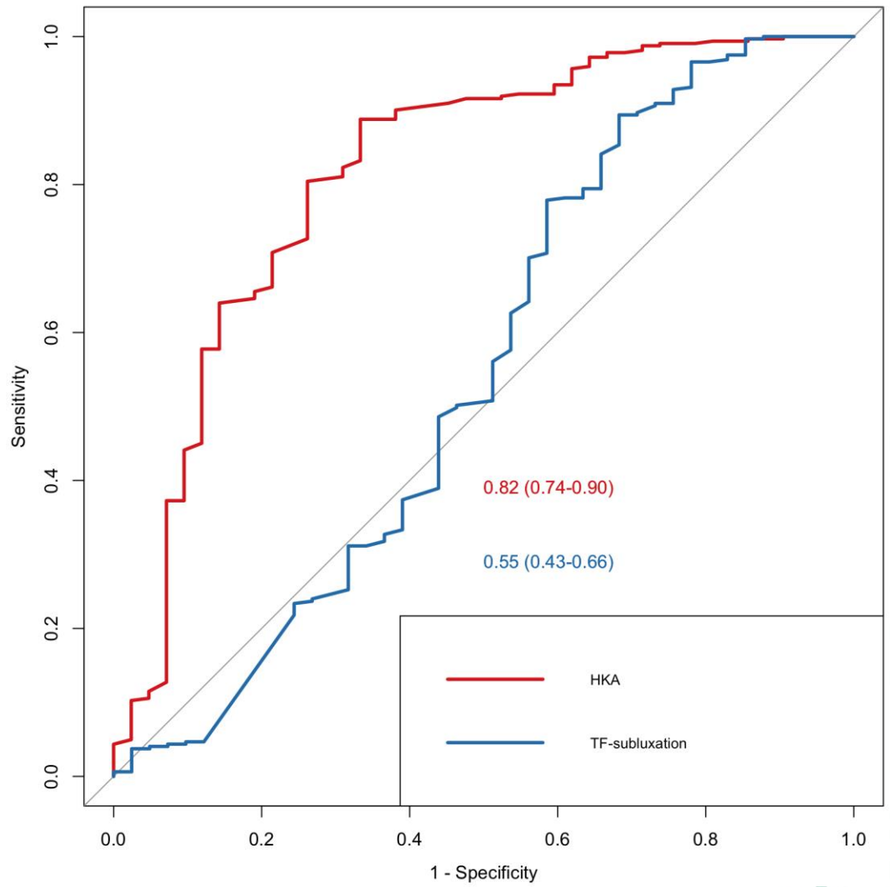
    - TF-subluxation (cut-off: >7.5 mm, OR: 5.4; 95% CI: 2.7-11.0; p<0.001)

    - bone defect (cut-off: ≥grade 1, OR: 6.9 ;95% CI: 3.2-14.9; p<0.001)



Results

- Significant preoperative risk factors for higher-constrained TKA in valgus knees:
  - HKA (cut-off: >193.8°, OR: 14.3; 95% CI: 7.0-29.4; p<0.001)
  - TF-subluxation (cut-off: >7.3 mm, OR: 3.5; 95% CI: 1.6-7.5; p<0.001)



Results

- Patients requiring revision demonstrated a significantly inferior postoperative KSS knee score of 69 (35) compared to patients without reoperation who achieved 92 (18) ($p<0.006$)

- KSS function score was significantly diminished in patients undergoing reintervention (73 (19) versus 90(30); $p<0.007$)

	Non-constrained (n=539)	**Higher-constrained (n=49)**	**p-value**
Secondary intervention			
MUA	4% (n=24)	2% (n=1)	0.71
Revision	2% (n=9)	2% (n=1)	0.58
KSS (points)			
Knee score (Median, IQR)			
Preoperative	40 (20)	30 (22)	<0.001
Postoperative	91 (19)	93 (22)	0.39
Function score			
Preoperative	60 (20)	50 (35)	0.005
Postoperative	90 (30)	80 (35)	0.27

Discussion

- Given the persisting controversy surrounding the appropriate indications for higher-constrained TKA in primary settings, this study offers guidance to anticipate higher-constrained TKA necessity
- The findings herein reported elucidate potential threshold values to anticipate higher-constrained TKA necessity with greater precision
- The findings of this substantial single-center cohort may assist the treating surgeons by optimizing preoperative planning protocols and facilitating nuanced patient counseling
- At short-term the clinical outcome and revision rates did not differ between non-constrained and higher-constrained TKAs

References

1. Bagaria V, Kulkarni RV, Sadigale OS, Sahu D, Parvizi J, Thienpont E. Varus Knee Deformity Classification Based on Degree and Extra- or Intra-Articular Location of Coronal Deformity and Osteoarthritis Grade. JBJS Rev. 2021;9(10).

2. Baker P, Critchley R, Gray A, Jameson S, Gregg P, Port A, et al. Mid-term survival following primary hinged total knee replacement is good irrespective of the indication for surgery. Knee Surg Sports Traumatol Arthrosc. 2014;22(3):599-608.

3. Knight M, Lewis P, Peng Y, Hatton AB, Parkinson B. Survivorship of highly constrained prostheses in primary and revision total knee arthroplasty: analysis of 6070 cases. ANZ J Surg. 2020;90(10):2061-7

4. Rai S, Liu X, Feng X, Rai B, Tamang N, Wang J, et al. Primary total knee arthroplasty using constrained condylar knee design for severe deformity and stiffness of knee secondary to post-traumatic arthritis. J Orthop Surg Res. 2018;13(1):67

5. Rodríguez-Merchán EC. Total knee arthroplasty using hinge joints: Indications and results. EFORT Open Rev. 2019;4(4):121-32.

6. Rosso F, Rossi R, Benazzo F, Ghiara M, Bonasia DE, Rossi SMP. Primary TKA in patients with major deformities and ligament laxities: promising results of an intermediate constrained implant at mid-term follow-up. Arch Orthop Trauma Surg. 2023;143(5):2675-81