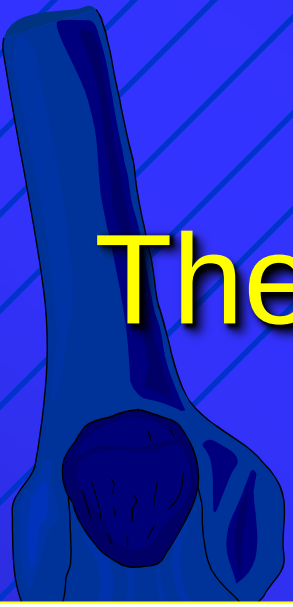


The Role of UKA in 2018

Douglas Naudie, MD, FRCSC
Associate Professor
Western University
London Health Sciences Centre
London, Ontario, Canada

Disclosure

Institutional/Educational Support

- Smith & Nephew, Depuy Synthes, Stryker, Microport, Zimmer-Biomet

Consulting agreements

- Smith & Nephew, Zimmer-Biomet

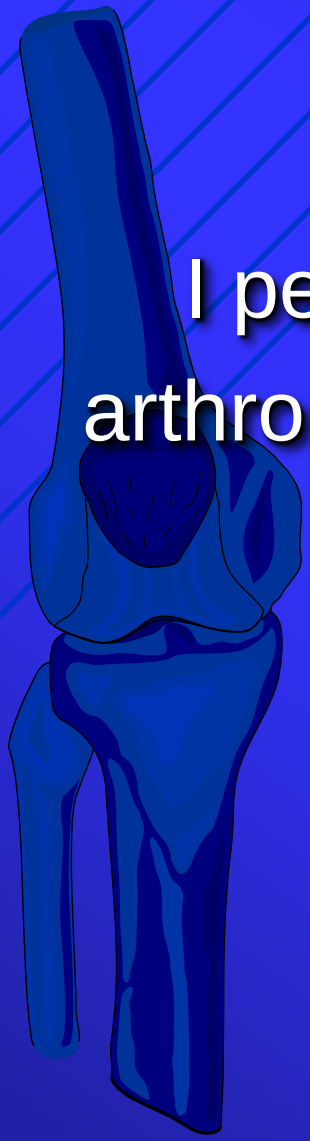
Royalties

- Journey™ UKA (Smith & Nephew)

Mitigating Potential Bias

I will not be discussing the technique or results of the Journey™ UKA

Disclosure



I perform unicompartmental knee arthroplasty (UKA) in *selected* patients

Disclosure

I perform unicompartmental knee arthroplasty (UKA) in *selected* patients

(10-15% of my knee practice)

Objectives

Review the evolution of the UKA

Review the current evidence and discuss the role for UKA in 2018

Objectives

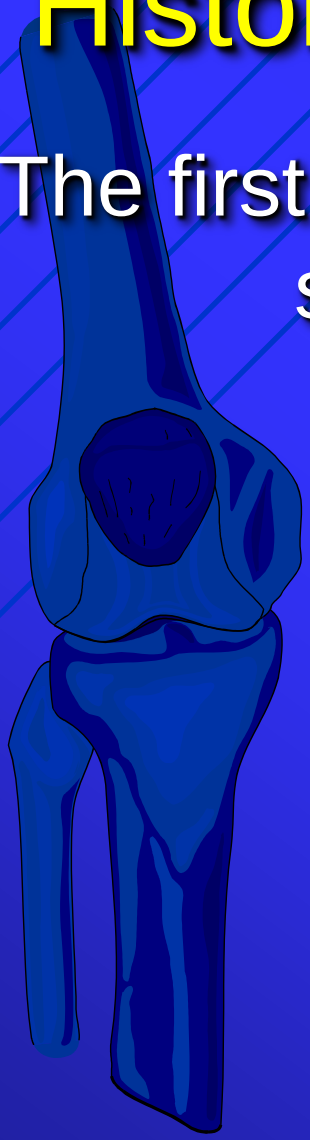
Review the evolution of the UKA

Review the current evidence and discuss the role for UKA in 2018

Does bearing design influence survivorship of UKA?

History

The first UKA was designed by a Manitoba surgeon (Dr. Frank Gunston)



History

The first UKA was designed by a Manitoba surgeon (Dr. Frank Gunston)

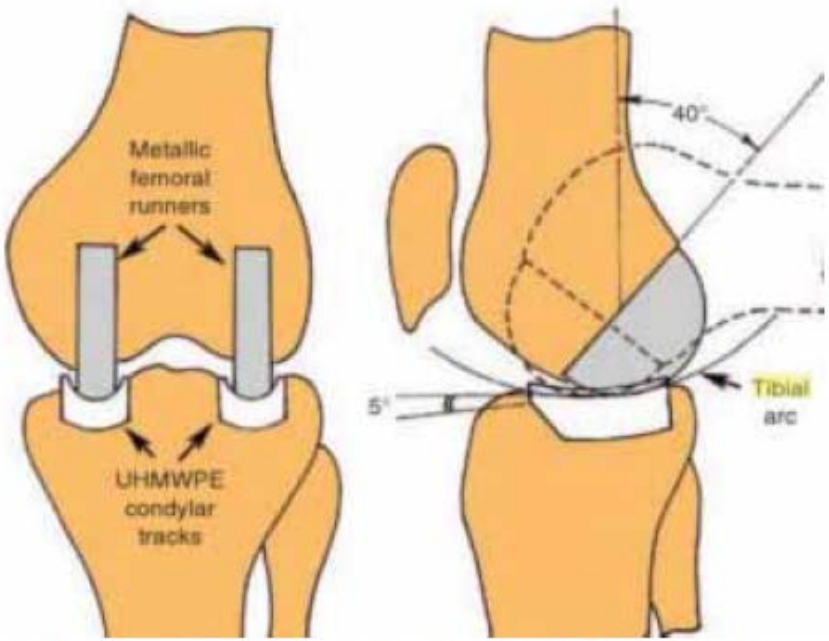


Illustration of Polycentric TKA design by F. Gunston 1969

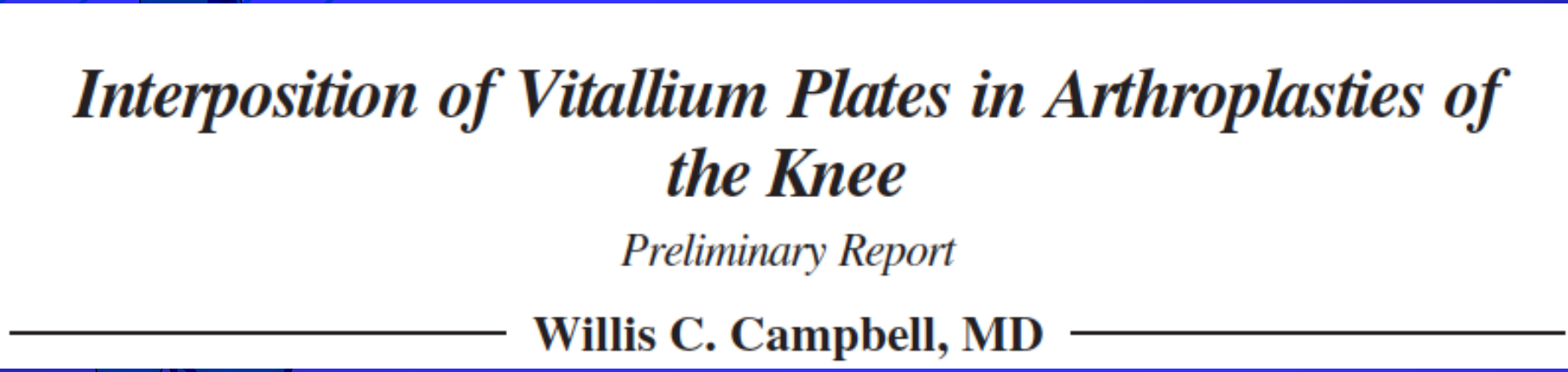
Polycentric Radiographic Post-op view and product

Unicompartmental Knee Arthroplasty: Past, Present, and Future

Am J Orthop. 2009;38(1)

Unicompartmental spacer

Pioneered by Campbell (1940)



Interposition of Vitallium Plates in Arthroplasties of the Knee

Preliminary Report

Willis C. Campbell, MD

- Reported preliminary results in the medial compartment of arthritic knees

Unicompartmental spacer

Thereafter, McKeever introduced his vitallium tibial plateau (1957)

Tibial Plateau Prosthesis

Duncan C. McKeever, MD, FACS

Fig. 1. The McKeever interpositional hemiarthroplasty device, consisting of vitallium component to replace the medial tibial plateau.

THE CLASSIC

Clinical Orthopaedics and Related Research

Unicompartmental spacer

Concurrent development of a metallic hemispacer for tibial plateau resurfacing

- MacIntosh prosthesis (1958)

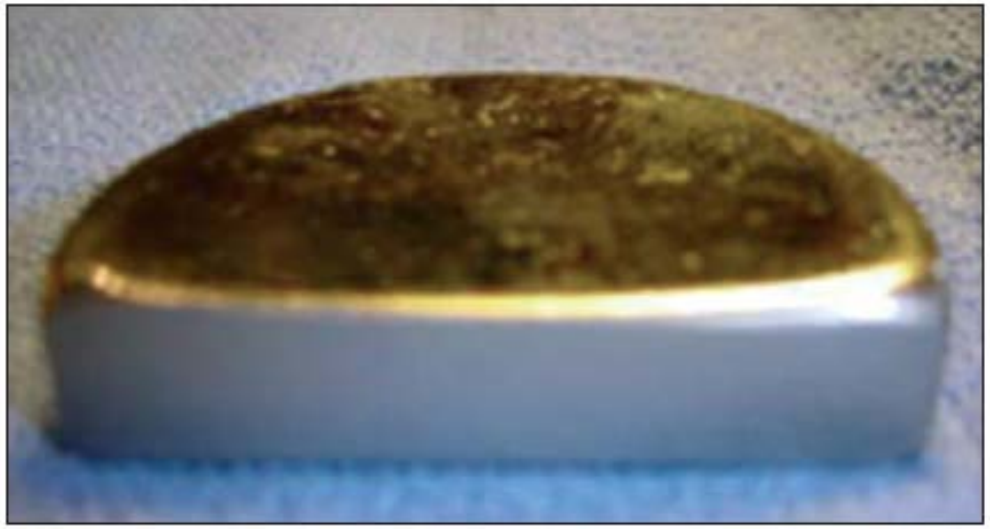


Fig. 2. The MacIntosh acrylic tibial plateau, developed at around the same time as the McKeever device.

Unicompartmental knee replacement: a historical overview

JOINTS 2013;1(2):45-47

Unicompartmental arthroplasty

Designs evolved to employ metallic femoral components articulating with polyethylene inserts (Gunston)

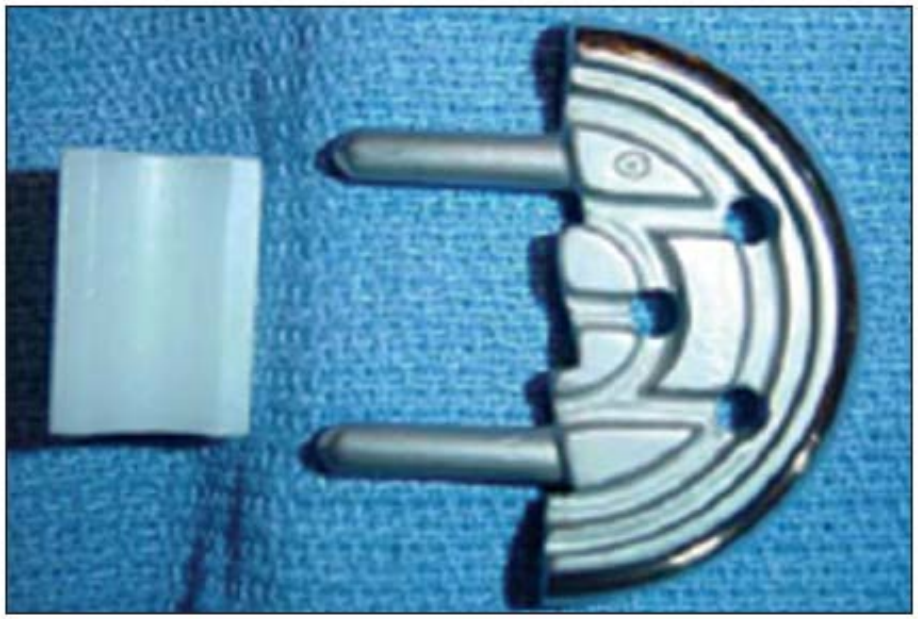


Fig. 3. The Gunston unicompartmental knee replacement: this was the first time a tibial and femoral component was presented as a solution for the resurfacing of both medial compartments.

Unicompartmental knee replacement: a historical overview

JOINTS 2013;1(2):45-47

Unicompartmental arthroplasty

Reported short-term results

- Marmor®, St Georg Sled®, Brigham®

Marmor L. Marmor modular knee in unicompartmental disease. Minimum four-year follow-up. J Bone Joint Surg Am 1979;61: 347-53.

Engelbreclht E, Siegel A, Rottger J, et al. Statistics of total knee replacement: partial and total knee replacement, design St Georg: a review of a 4-year observation. Clin Orthop Relat Res 1976; (120):54-64.

Scott RD, Santore RF. Unicondylar unicompartmental replacement for osteoarthritis of the knee. J Bone Joint Surg Am 1981; 63:536-544.

Some discouraging results

However, several studies cast doubt on the benefits of UKA as a surgical option

Insall J, Aglietti P. A five to seven-year follow-up of unicondylar arthroplasty. J Bone Joint Surg Am 1980;62:1329-1337.
Laskin RS. Unicompartmental tibiofemoral resurfacing arthroplasty. J Bone Joint Surg Am 1978;60:182-185.
Bucholz HW, Heinert K. Long-term results of cemented arthroplasty. Analysis of complications fifteen years after operation. Orthop Clin North Am 1988;19:531-540.

Some discouraging results

Discouraging early results

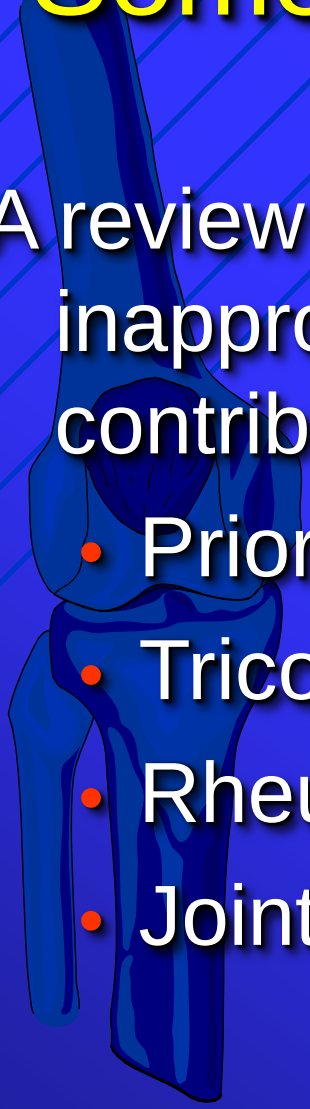
- 37 knees – 20% revision at 2 years
- 22 knees – 28% revision at 6 years

Insall J, Aglietti P. A five to seven-year follow-up of unicondylar arthroplasty. J Bone Joint Surg Am 1980;62:1329-1337.
Laskin RS. Unicompartmental tibiofemoral resurfacing arthroplasty. J Bone Joint Surg Am 1978;60:182-185.

Some discouraging results

A review of these articles suggested inappropriate patient selection was a contributory factor in reported results:

Some discouraging results



A review of these articles suggested inappropriate patient selection was a contributory factor in reported results:

- Prior patellectomy
- Tricompartmental disease
- Rheumatoid arthritis
- Joint instability

Some discouraging results

FIG. 1. Radiograph of medial unicondylar prosthesis in which the tibial component was loose. A complete radiolucency developed around the tibial component and the cement plug and the tibial component was confirmed loose at operation.

Unicondylar Knee Replacement

JOHN INSALL, M.D.* AND PETER WALKER, PH.D.**

Clinical Orthopaedics and Related Research

Number 129
October, 1978

Further skepticism

Late reports of mechanical failure of certain prostheses due to thin polyethylene and possible edge contact or loading

Further skepticism

Early Failure of the Porous-Coated Anatomic Cemented Unicompartmental Knee Arthroplasty

A 5- to 9-Year Follow-Up Study

A. D. Skyrme, MB BS, BSc, FRCS, M. M. Mencia, MB BS, FRCS,
and P. W. Skinner, MB BS, FRCS

The Journal of Arthroplasty Vol. 17 No. 2 2002

Fig. 1. Polyethylene wear in the retrieved components.

Further skepticism

At the same time, the outcome of TKA was becoming increasingly satisfactory, reproducible and reliable

Mobile-bearing designs

THE MECHANICS OF THE KNEE AND PROSTHESIS DESIGN*

JOHN GOODFELLOW, JOHN O'CONNOR

From the Nuffield Orthopaedic Centre and the Department of Engineering Science, Oxford

THE JOURNAL OF BONE AND JOINT SURGERY

VOL. 60-B, No. 3, AUGUST 1978

- Highly congruent meniscal (mobile) bearing
- Polished metal tibial tray

Mobile-bearing designs

Proposed advantage of this design was the large contact area of the femoral-polyethylene interface

- Tried to address the problem of polyethylene wear

Psychoyios V, Crawford RW, O'Connor JJ, Murray DW. Wear of congruent meniscal bearings in unicompartmental knee arthroplasty: a retrieval study of 16 specimens. *J Bone Joint Surg Br.* 1998;80(6):976-982.

Mobile-bearing designs

Author	Design	Cases	F/U	Survival
Price	Oxford®	114	15 yrs	93%
Price	Oxford®	682	20 yrs	91%
Emerson	Oxford®	55	10 yrs	85%
Zermatten	Oxford®	48	10 yrs	78%

Mobile-bearing designs

Introduced a new mode of failure:

- Dislocation of the mobile bearing from the tibial base

Mobile-bearing designs

- Composite thickness of the tibial component eliminated the conservative nature of this procedure on the tibial side

Fixed-bearing designs

Newer designs had more promising results

- Miller-Galante®
  - Flat articular surface
  - Unconstrained motion

Unicompartmental Knee Arthroplasty: Past, Present, and Future

Am J Orthop. 2009;38(1)

Fixed-bearing designs

Medial Unicompartmental Knee Arthroplasty with the Miller-Galante Prosthesis

By Douglas Naudie, MD, FRCS(C), Jeff Guerin, BMath, David A. Parker, MBBS, FRACS, Robert B. Bourne, MD, FRCS(C), and Cecil H. Rorabeck, MD, FRCS(C)

Investigation performed at London Health Sciences Centre—University Campus, the University of Western Ontario, London, Ontario, Canada

The Journal of Bone & Joint Surgery · jbjs.org
Volume 86-A · Number 9 · September 2004

Author	Design	Cases	F/U	Survival
Naudie	M-G®	113	10 yrs	90%

Fixed-bearing designs

Author	Design	Cases	F/U	Survival
O’ Rourke	Marmor®	136	> 21 yrs	86%
Tabor	Marmor®	100	15 yrs	86%
Steele	St Georg®	203	15 yrs	86%
Berger	M-G®	62	13 yrs	96%
Heyse	Genesis®	223	10yrs	94%

Renewed interest

- Less time in hospital
- Faster recovery
- Faster return to work and recreational activities
- Outpatient surgery

Perspectives on Modern Orthopaedics

Unicompartmental Knee Arthroplasty

Journal of the American Academy of Orthopaedic Surgeons

Volume 16, Number 1, January 2008

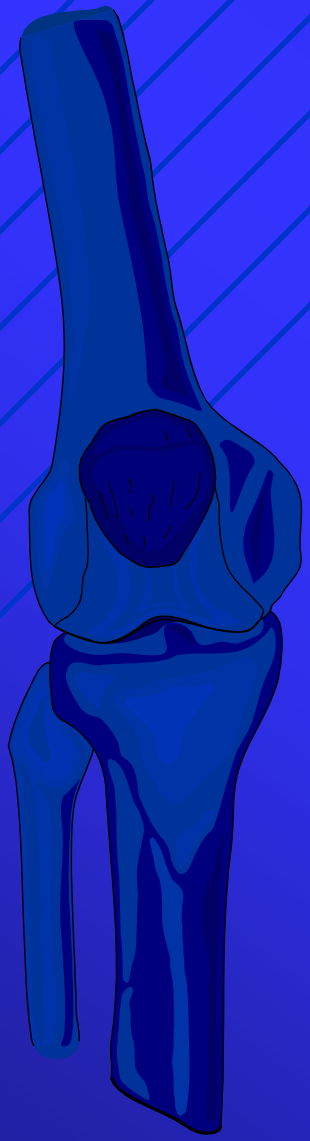
Challenges

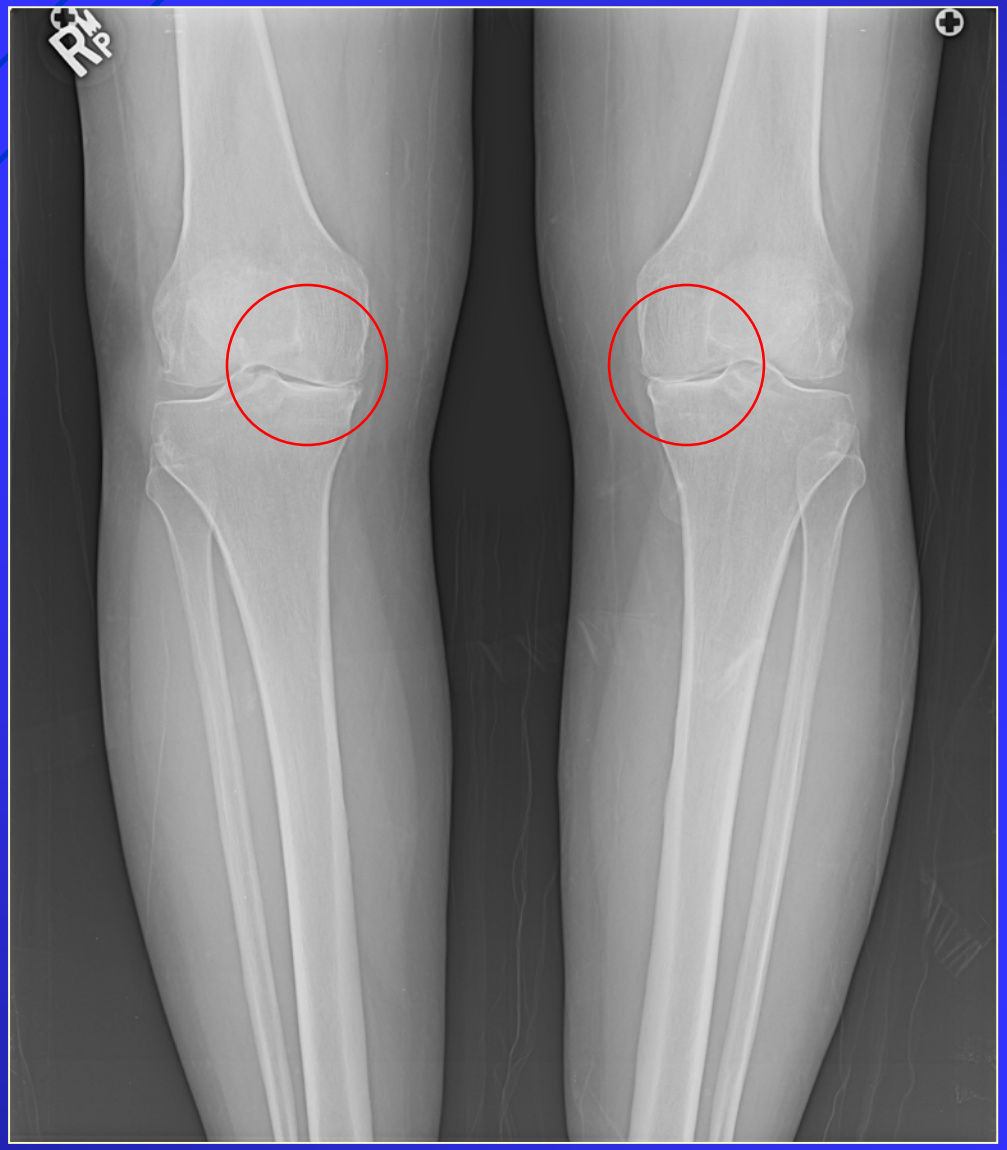
- Proper patient selection
- Technical difficulty in performing the procedure
- Less tolerance for acceptable component positioning
- Small margin of error

Where are we at in 2018?

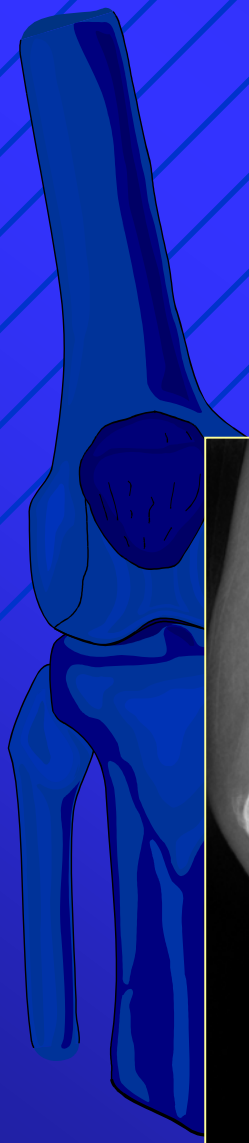
- Many surgeons (and patients) remain wary of historically inconsistent results published in the literature

Mrs. CR, 52





Mrs. CR, 52



Question

Is there a role for UKA in this patient in 2018?

Goals of knee arthroplasty

Restoration of mechanical alignment

Preservation of joint line

Ligament balancing

Patellofemoral tracking

Full range of motion

Can all be achieved with UKA

Goals of knee arthroplasty

Patient satisfaction and function

Long-term survivorship

Avoidance of complications

Minimize risks of future surgery

Cost-effective

Can these be achieved with UKA?

Goals of knee arthroplasty

- Patient satisfaction and function
- Long-term survivorship
- Avoidance of complications
- Minimize risks of future surgery
- Cost-effective

Acta Orthop Scand 2000; 71(3), 262-267

Patient satisfaction after knee arthroplasty

A report on 27,372 knees operated on between 1981 and 1995 in Sweden

Otto Robertsson[1], Michael Dunbar[2], Thorbjörn Pehrsson[1], Kaj Knutson[1] and Lars Lidgren[1]

[1]Department of Orthopedics, Lund University Hospital, SE-221 85 Lund, Sweden. Tel +46 46 171510. E-mail: otto.robertsson@ort.lu.se; [2]Division of Orthopedics, London Health Sciences Centre, London , Ontario, Canada
Submitted 99-10-31. Accepted 00-01-27

Postal survey questionnaire

- 95% response
- Similar patient satisfaction after UKA or TKA

Patient satisfaction after knee arthroplasty

A report on 27,372 knees operated on between 1981 and 1995 in Sweden

In primary cases

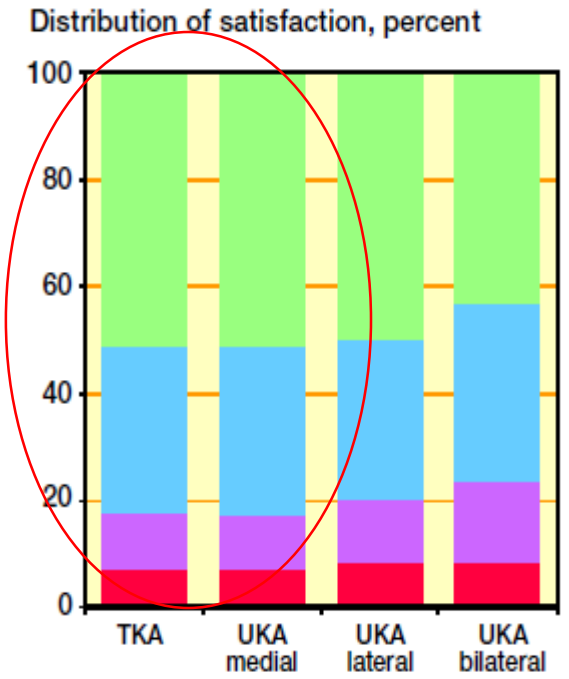


Figure 4. In unrevised OA cases, 18% of 12,298 TKAs, 17% of 7,860 medial UKAs, 20% of 686 lateral UKAs and 23% of 150 medial + lateral UKAs were unsatisfied or uncertain.

In revision cases

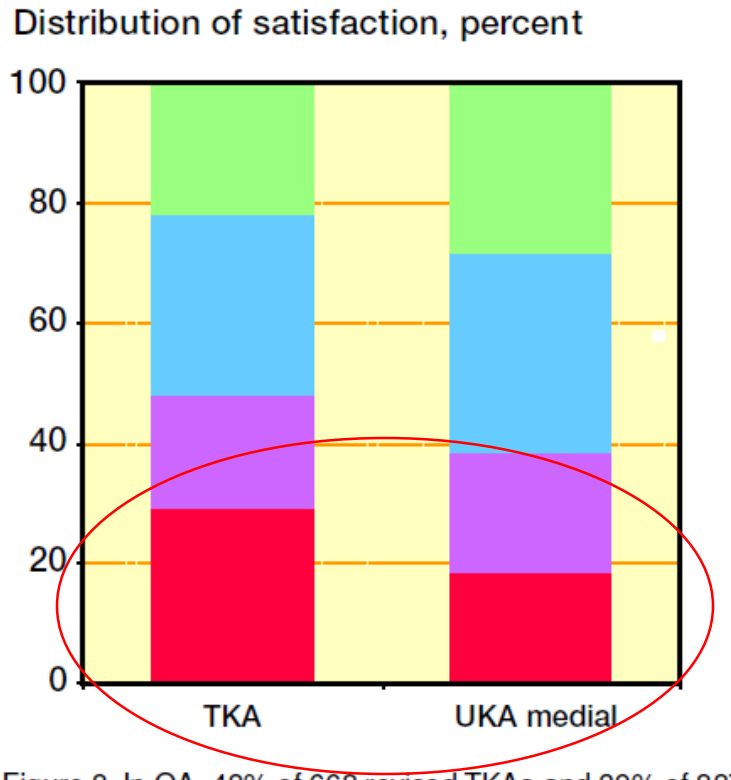


Figure 8. In OA, 48% of 668 revised TKAs and 39% of 887 revised medial UKAs were unsatisfied or uncertain.

Clin Orthop Relat Res (2012) 470:84–90
DOI 10.1007/s11999-011-2144-z

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

SYMPOSIUM: PAPERS PRESENTED AT THE ANNUAL MEETINGS OF THE KNEE SOCIETY

Unicompartmental Versus Total Knee Arthroplasty Database Analysis

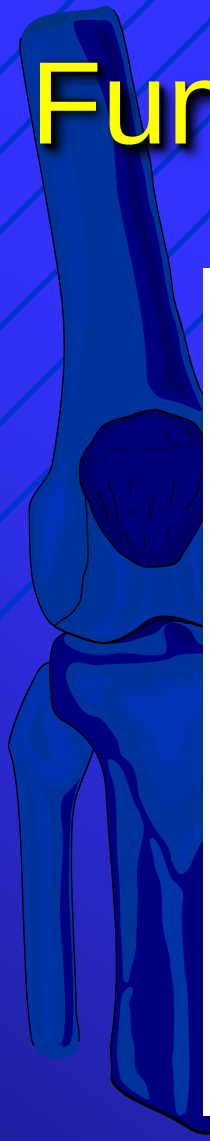
Is There a Winner?

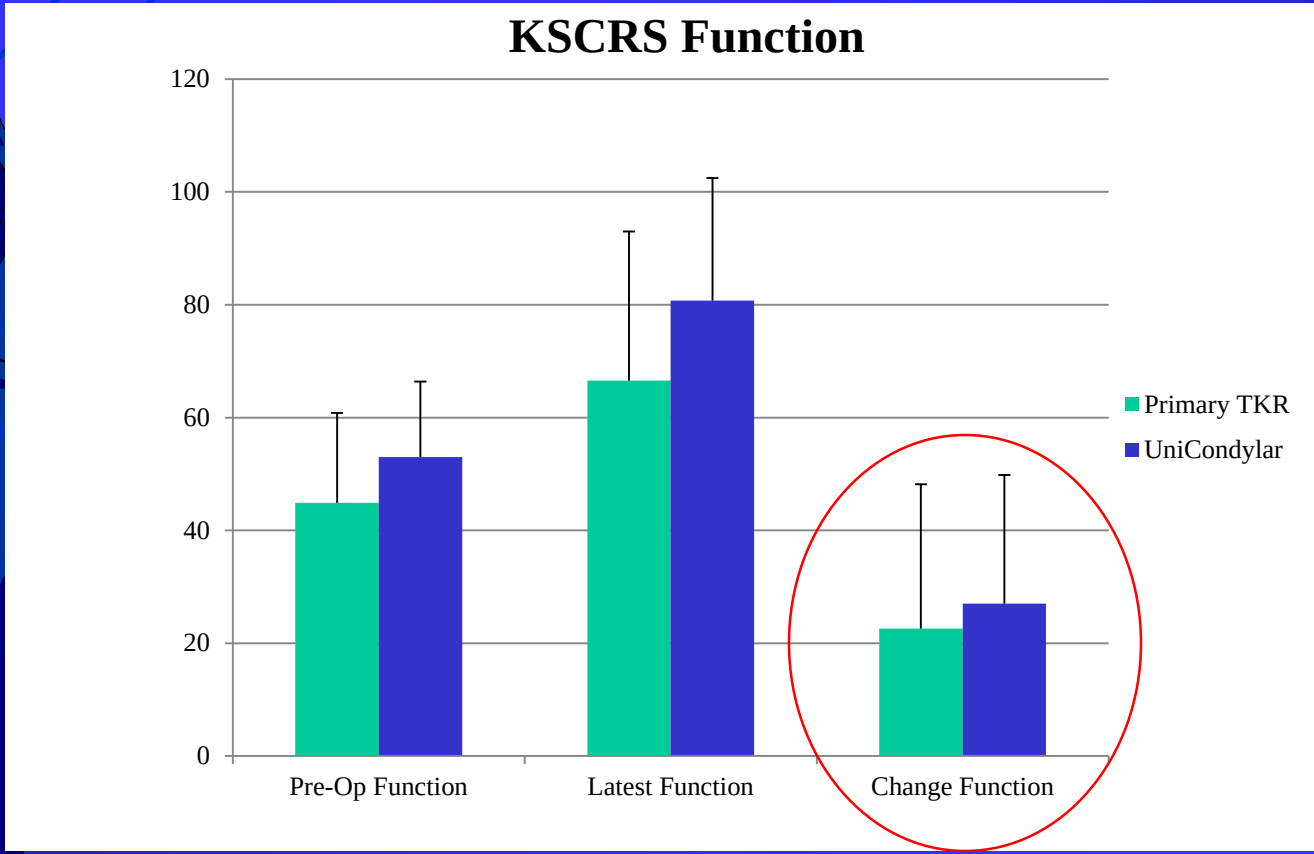
Matthew C. Lyons MBBS, FRACS, Steven J. MacDonald MD, FRCSC,
Lyndsay E. Somerville MSc, Douglas D. Naudie MD, FRCSC,
Richard W. McCalden MD, FRCSC

Consecutive series

- 6352 TKAs
- 296 UKAs

Function




KSCRS Function
120
100
80
60
40
20
0
Pre-Op Function
Latest Function
Change Function
Primary TKR
UniCondylar

Function

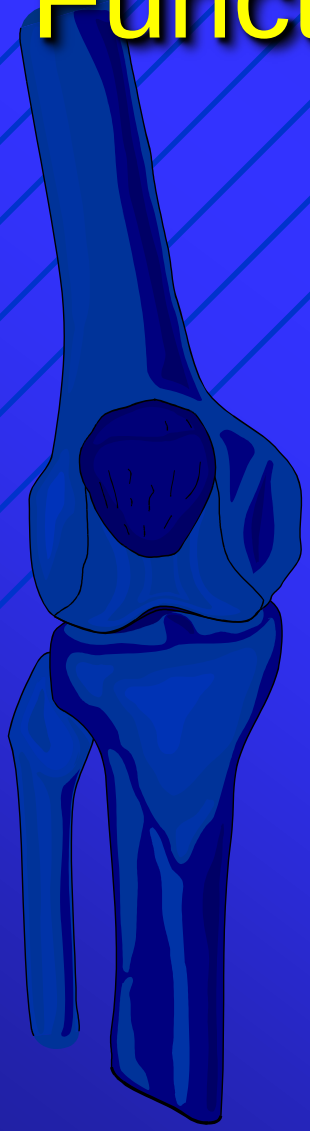


Table 5. Preoperative, latest, and change in KSCRS scores

KSCRS domain	Procedure	Mean	SD	p value*
Preoperative				
Function	TKA	44.52	15.63	< 0.001
	UKA	53.21	13.18	
Knee	TKA	41.09	15.34	< 0.001
	UKA	47.82	15.92	
Total	TKA	85.73	24.45	< 0.001
	UKA	101.10	22.71	
Latest				
Function	TKA	65.74	27.06	< 0.001
	UKA	79.55	22.42	
Knee	TKA	89.72	13.48	0.33
	UKA	90.58	13.64	
Total	TKA	155.63	33.96	< 0.001
	UKA	170.87	29.88	
Change				
Function	TKA	21.36	26.22	< 0.001
	UKA	25.65	22.26	
Knee	TKA	49.24	19.45	0.001
	UKA	42.88	21.29	
Total	TKA	70.62	36.21	0.76
	UKA	69.56	32.80	

The Knee 21 (2014) 180–184

Patient satisfaction after primary total and unicompartmental knee arthroplasty: An age-dependent analysis

A Von Keudell *, S Sodha, J Collins, T Minas, W Fitz, AH Gomoll

Department of Orthopaedic Surgery, Brigham and Women's Hospital, Harvard Medical School, Boston, United States
Orthopedic and Arthritis Center for Outcomes Research, Brigham and Women's Hospital, Harvard Medical School, Boston, United States

141 UKAs; 245 TKAs

Satisfaction and expectation

- ROM
- Daily Living Function (DLF)
- Return to Recreational Activity (RRA)
- Ability to kneel

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Orthopedic and Arthritis Center for Outcomes Research, Brigham and Women's Hospital, Harvard Medical School, Boston, United States

Patient satisfaction in patients with a TKA versus UKA given in numbers and percentages.

	UKA			TKA		
Age groups	Excellent/good	Fair/poor	Total	Excellent/good	Fair/poor	Total
<55	47	2	49	51	12	63
	96.0%	4.1%		81.0%	19.0%	
55–64	42	3	45	64	8	72
	93.3%	6.7%		89.0%	11.1%	
65+	44	3	47	99	9	108
	93.6%	6.4%		91.7%	8.3%	
Total	133	8	141	214	29	243

Patient satisfaction after primary total and unicompartmental knee arthroplasty: An age-dependent analysis

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Orthopedic and Arthritis Center for Outcomes Research, Brigham and Women's Hospital, Harvard Medical School, Boston, United States

Table 4
Patient response rates, n (%) in respect to expectations and satisfaction with their current result.

Variable	TKA	UKA	p-Value
Expectations met — daily living			0.0306
No	31 (12.7%)	8 (5.8%)	
Yes	213 (87.3%)	131 (94.2%)	
Expectations met — kneeling			0.1726
No	103 (44.8%)	51 (37.5%)	
Yes	127 (55.2%)	85 (62.5%)	
Expectations met — motion			<.0001
No	54 (22.1%)	8 (5.7%)	
Yes	190 (77.9%)	133 (94.3%)	
Expectations met — pain			0.1158
No	28 (11.5%)	9 (6.5%)	
Yes	216 (88.5%)	129 (93.5%)	
Expectations met — sport			0.0139
No	51 (21.4%)	16 (11.4%)	
Yes	187 (78.6%)	124 (88.6%)	

Age stratified, propensity matched comparison of UKR & TKR

Kennedy J, Burn E, Hamilton T, Mellon S, Murray D

University of Oxford & Nuffield Orthopaedic Centre, Oxford

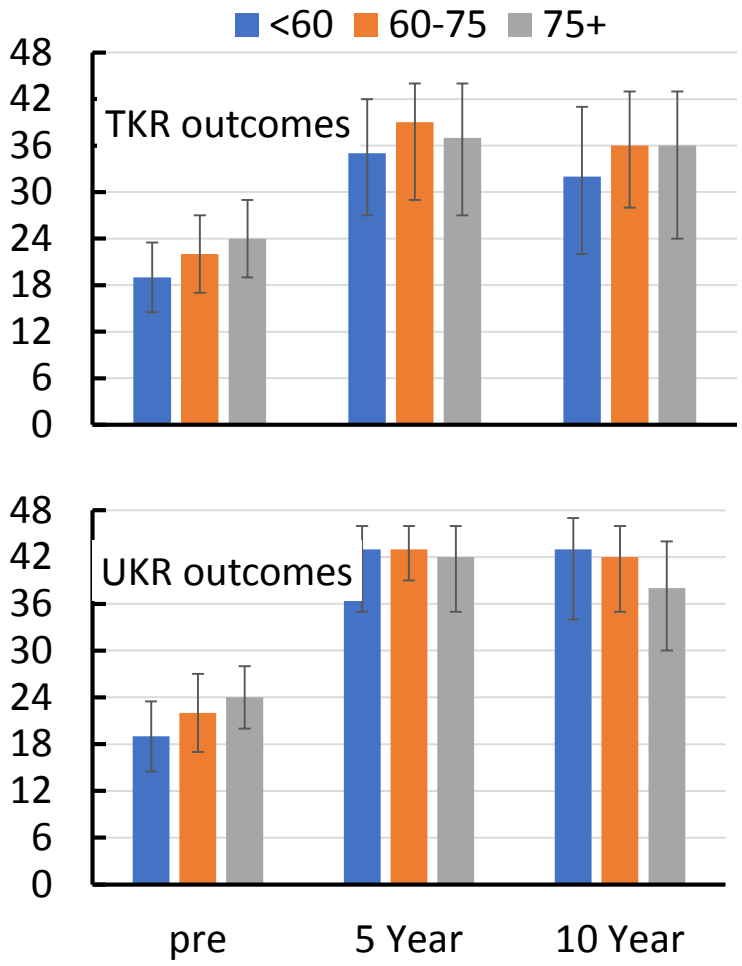
Dislosure: Personal & Institutional support from ZB for some authors

Methods

- Patients: median FU 10 years
  - TKR 2,252 from Knee Arthroplasty Trial: Subgroup with medial OA & ACLI
  - UKR 1000 cemented Oxford medial UKR,
- Analysis
  - Divided into age strata at surgery (<60, 60 to <75, 75+)
  - propensity score matched (age, weight, sex, preop OKS) 1:1 within age strata. Total 1008 knees
- Outcomes compared
  - Median OKS at 5 years and 10 years
  - Revision (rare thus both unmatched and matched survival at 10yr)
  - Failure defined as poor outcome or revision

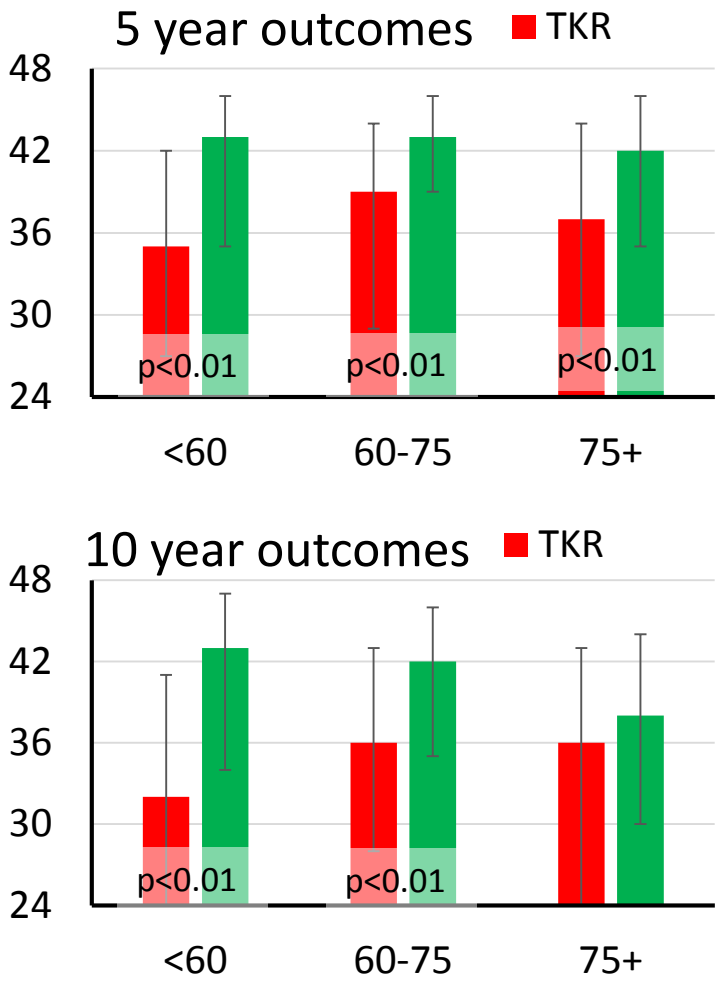
Functional outcome (OKS)

- UKR and TKR
  - Identical pre-op scores. (Therefore can directly compare post op scores)
  - Substantial improvement for all age groups at both 5 and 10 years



Functional outcomes UKR and TKR

- UKR better than TKR at all time points (p<0.01 all except 75+ 10yr)
- Differences most marked in young patients (11 OKS points at 10 year follow-up.) These are likely to be the most demanding and most disappointed with poor results



Goals of knee arthroplasty

Patient satisfaction and function

Long-term survivorship

Avoidance of complications

Minimize risks of future surgery

Cost-effective

J Bone Joint Surg Br: 1998 80(5):862-5.

UKA or TKA:
5-year results of a prospective RCT

Newman J, Ackroyd C, Shah NA

102 knees
- 50 UKA
- 52 TKAs

UKAs had less perioperative morbidity
- Regained knee movement more rapidly
- Discharged from hospital sooner

J Bone Joint Surg Br: 1998 80(5):862-5.

UKA or TKA:
5-year results of a prospective RCT

Newman J, Ackroyd C, Shah NA

102 knees
- 50 UKA
- 52 TKAs

UKA patients had better range of motion
- Number of knees able to flex >120^0
- Significantly higher in UKA group

J Bone Joint Surg Br: 2009 91(1):52-7.

UKA or TKA: 15-year results of a prospective RCT

Newman J, Pydisetty RV, Ackroyd C

102 knees

- 50 UKAs
- 52 TKAs

J Bone Joint Surg Br: 2009 91(1):52-7.

UKA or TKA:
15-year results of a prospective RCT

Newman J, Pydisetty RV, Ackroyd C

Bristol knee scores of UKA better than TKA

- UKA (71% excellent scores)
- TKA (53% excellent scores)

15-year survivorship

- UKA (90%)
- TKA (76%)

Age stratified, propensity matched comparison of UKR & TKR

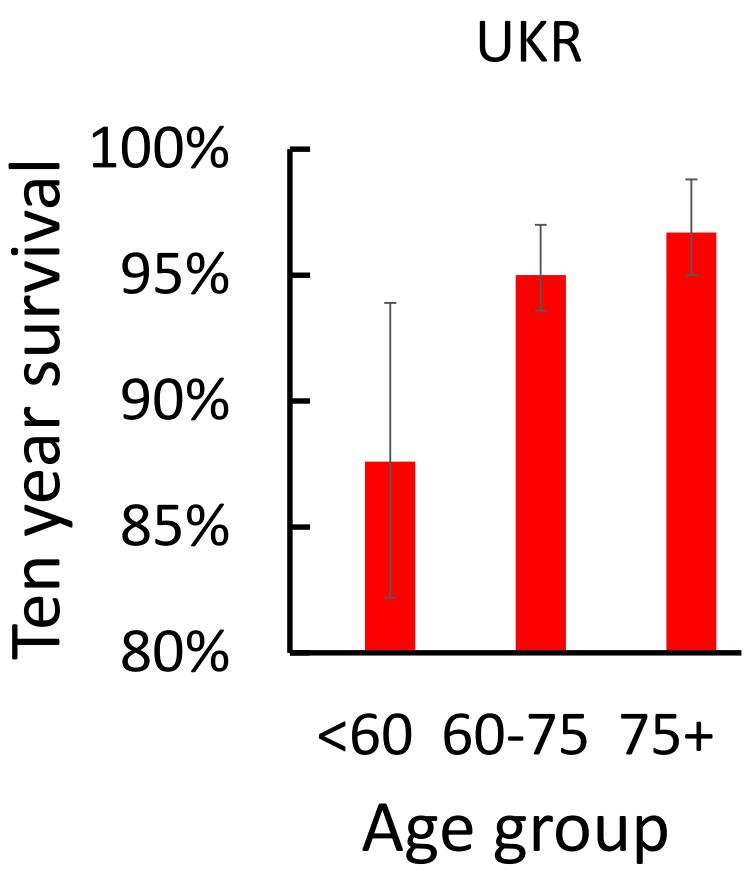
Kennedy J, Burn E, Hamilton T, Mellon S, Murray D

University of Oxford & Nuffield Orthopaedic Centre, Oxford

Dislosure: Personal & Institutional support from ZB for some authors

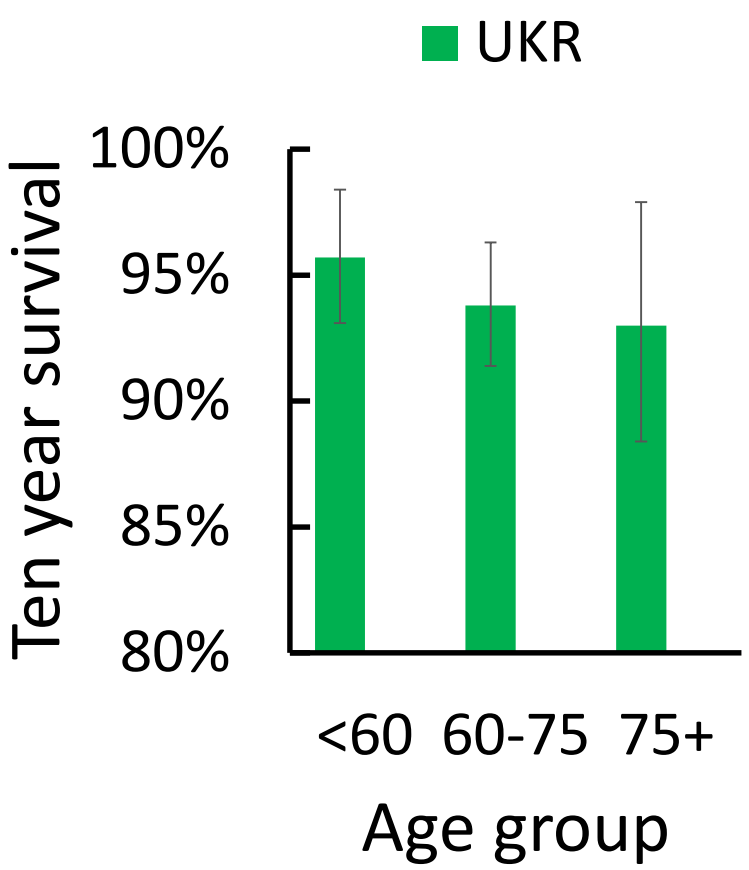
Ten Year Survival TKR

- Lower in young
- As expected
- Young patients
  - More active – destroy implant and fixation
  - Higher expectations – less tolerant of poor outcome.



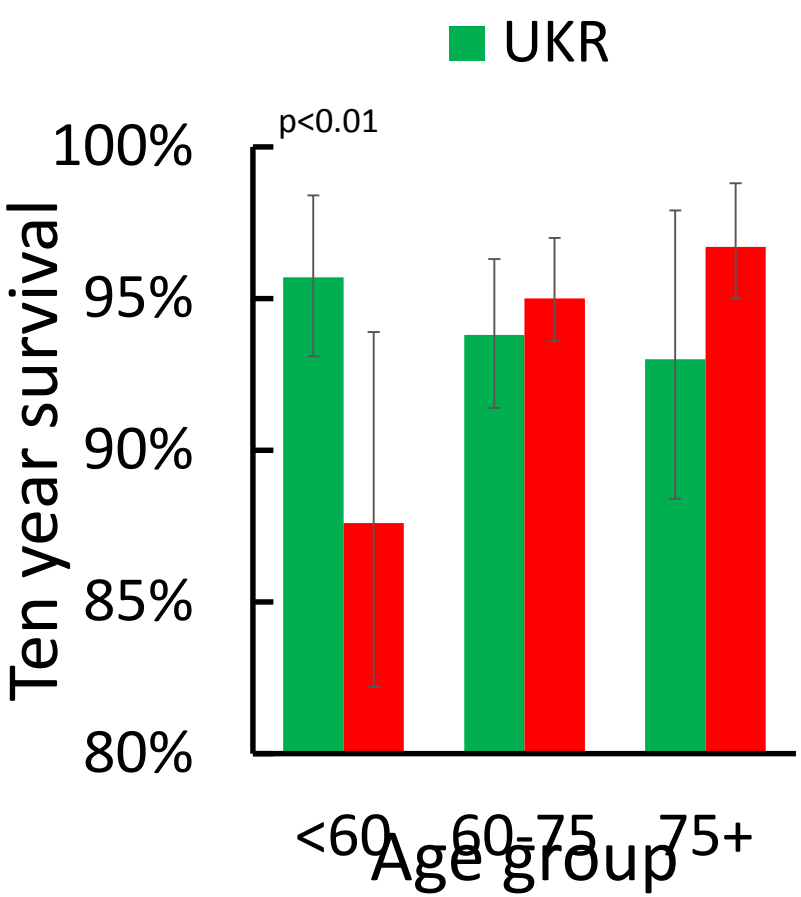
Ten Year Survival

- Higher in young (NSD)
- Not expected
- Mobile bearing resistant to wear and loosening. So no increased failure rate.
- Perhaps young & active have better bone and cartilage so less lateral OA & loosening.

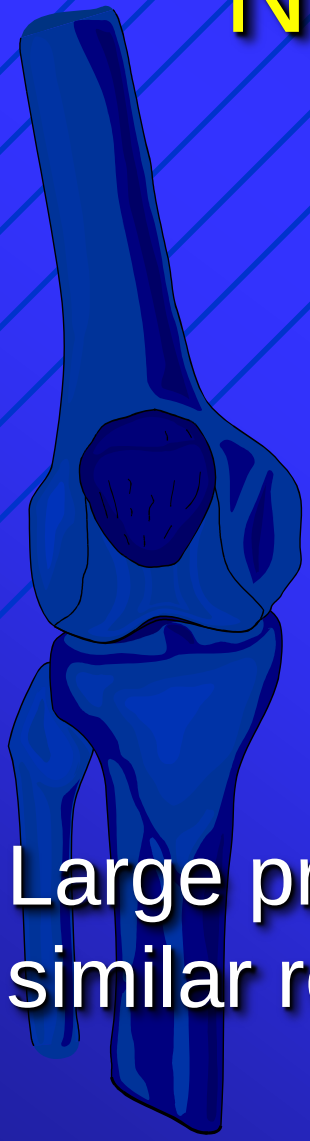


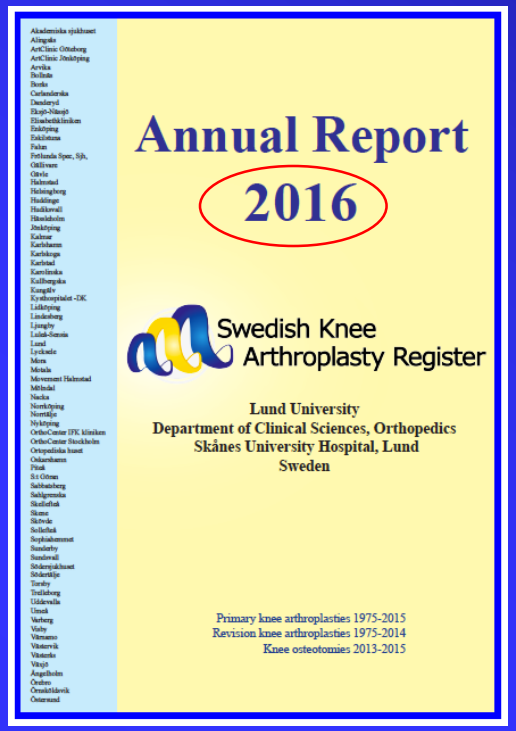
Ten Year Survival

- <60: UKR substantially better than TKR (Revision rate 3x higher p<0.01).
- 60-75: UKR and TKR similar (NSD)
- 75+:TKR better than UKR (NSD), perhaps because TKR not revised at this age.



National Registry Data

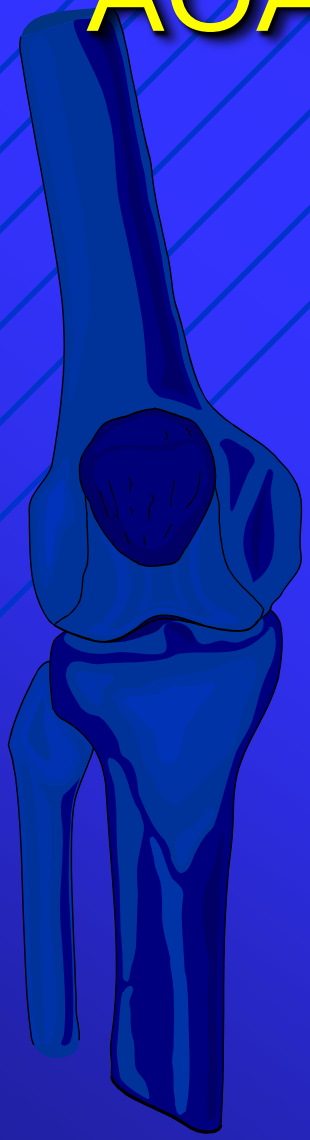


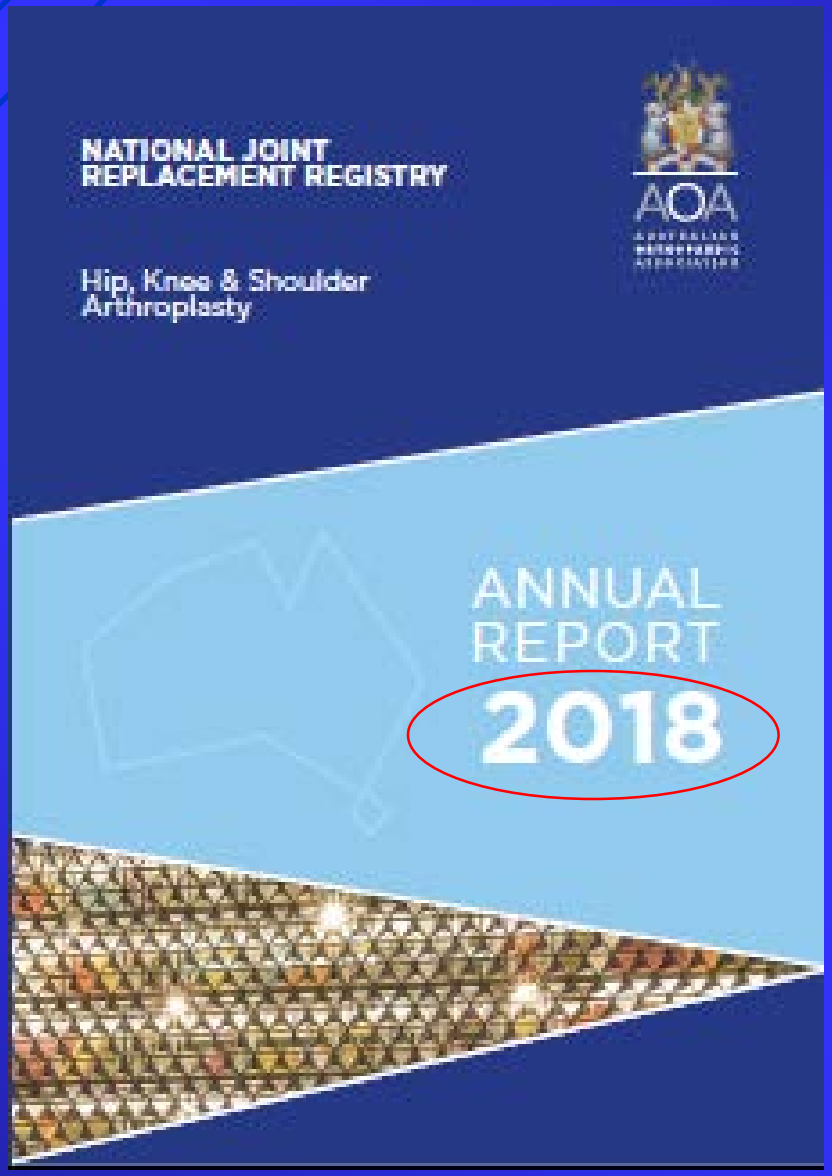


Large prospective observational studies give similar results to a randomized control trial

Benson et al (NEJM,2000)
Concato et al (NEJM, 2000)

AOA National Joint Registry





Survivorship

Table KP16 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement (Primary Diagnosis OA)

Knee Type	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	17 Yrs
Unicompartmental	6548	52285	2.2 (2.1, 2.4)	5.6 (5.4, 5.9)	8.0 (7.8, 8.3)	14.6 (14.3, 15.0)	22.4 (21.8, 23.0)	25.7 (24.5, 26.9)
TOTAL	**6548**	**52285**						

Table KT16 Cumulative Percent Revision of Primary Total Knee Replacement by Primary Diagnosis

Primary Diagnosis	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	17 Yrs
Osteoarthritis	22205	588190	1.0 (1.0, 1.1)	2.7 (2.7, 2.7)	3.6 (3.5, 3.6)	5.3 (5.3, 5.4)	7.5 (7.3, 7.6)	8.4 (8.1, 8.7)
Rheumatoid Arthritis	309	8019	1.0 (0.8, 1.2)	2.2 (1.9, 2.6)	2.9 (2.5, 3.3)	5.1 (4.5, 5.7)	7.0 (6.1, 8.0)	7.2 (6.2, 8.4)
Other Inflammatory Arthritis	133	2993	1.5 (1.1, 2.0)	3.0 (2.4, 3.8)	4.2 (3.4, 5.1)	6.2 (5.2, 7.5)	9.1 (7.1, 11.7)	
Osteonecrosis	99	1928	1.1 (0.7, 1.8)	3.7 (2.9, 4.7)	5.3 (4.3, 6.6)	7.1 (5.7, 8.7)	8.2 (6.5, 10.3)	
Other (5)	134	1319	2.8 (2.0, 3.9)	8.1 (6.5, 10.0)	11.2 (9.2, 13.5)	18.0 (14.8, 21.8)		
TOTAL	**22880**	**602449**						

Registry Data

Why is revision rate of UKA higher than that of TKA?

Multiple Designs

Table KP15 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Prosthesis Combination

Uni Femoral	Uni Tibial	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	17 Yrs
Allegretto Uni	Allegretto Uni*	350	2035	3.2 (2.5, 4.0)	6.0 (5.0, 7.1)	8.3 (7.2, 9.6)	14.7 (13.2, 16.4)	21.6 (19.5, 23.9)	24.8 (21.2, 28.9)
BalanSys Uni	BalanSys Uni Fixed	22	400	1.8 (0.9, 3.7)	2.9 (1.6, 5.1)	3.8 (2.3, 6.4)	7.4 (4.7, 11.5)		
Endo-Model Sled	Endo-Model Sled	168	1267	1.1 (0.7, 1.9)	4.8 (3.7, 6.1)	7.5 (6.1, 9.2)	14.7 (12.5, 17.1)		
Freedom PKR/Active	Freedom PKR/Active	341	1505	1.7 (1.1, 2.5)	7.7 (6.5, 9.2)	13.1 (11.4, 14.9)	26.4 (23.9, 29.0)		
GRU	GRU	279	2067	1.4 (0.9, 2.0)	4.6 (3.7, 5.6)	6.3 (5.3, 7.4)	13.6 (12.0, 15.3)		
Genesis	Genesis*	329	1864	2.7 (2.0, 3.5)	8.3 (7.1, 9.6)	11.0 (9.6, 12.5)	16.6 (14.9, 18.4)	23.3 (20.4, 26.5)	
Journey Uni	Journey Uni (v2)	18	496	3.8 (2.3, 6.3)	5.1 (3.2, 8.2)	5.1 (3.2, 8.2)			
Journey Uni	Journey Uni All Poly	19	270	1.2 (0.4, 3.6)	6.0 (3.6, 9.9)	8.0 (5.1, 12.5)			
M/G	M/G*	290	2135	1.6 (1.1, 2.2)	4.2 (3.4, 5.1)	6.4 (5.5, 7.6)	10.8 (9.5, 12.3)	17.0 (15.1, 19.1)	
Oxford (cless)	Oxford (cless)	297	5101	3.1 (2.6, 3.6)	5.1 (4.4, 5.8)	6.6 (5.8, 7.5)	13.5 (11.0, 16.6)		
Oxford (cless)	Oxford (ctd)	28	401	3.0 (1.7, 5.3)	6.9 (4.4, 10.7)	12.8 (8.3, 19.4)			
Oxford (ctd)	Oxford (ctd)	1979	13000	2.2 (2.0, 2.5)	5.8 (5.4, 6.2)	8.4 (7.9, 8.9)	14.8 (14.2, 15.5)	22.6 (21.5, 23.7)	26.0 (24.3, 27.9)
Preservation	Preservation Fixed*	413	2318	2.5 (1.9, 3.2)	7.1 (6.1, 8.2)	9.5 (8.4, 10.8)	15.6 (14.1, 17.2)	23.4 (21.1, 26.0)	
Preservation	Preservation Mobile*	131	400	5.3 (3.5, 7.9)	15.5 (12.3, 19.5)	19.1 (15.6, 23.3)	27.2 (23.1, 31.9)	35.2 (30.5, 40.5)	
Repicci II	Repicci II	635	3072	1.7 (1.3, 2.2)	4.8 (4.0, 5.6)	7.9 (7.0, 8.9)	17.9 (16.5, 19.5)	29.3 (27.2, 31.6)	
Restoris MCK	Restoris MCK	17	1771	1.2 (0.7, 1.9)					
Sigma HP	Sigma HP	31	994	0.8 (0.4, 1.6)	2.8 (1.8, 4.2)	4.3 (3.0, 6.3)			
Triathlon PKR	Triathlon PKR	19	284	3.2 (1.6, 6.3)	7.7 (4.7, 12.4)	8.8 (5.4, 14.2)			
Uniglide	Uniglide	147	754	4.8 (3.5, 6.6)	10.7 (8.6, 13.1)	12.8 (10.6, 15.4)	19.8 (16.9, 23.0)		
Unix	Unix	448	3883	2.4 (2.0, 2.9)	5.3 (4.6, 6.0)	7.0 (6.2, 7.8)	12.0 (10.8, 13.2)	18.2 (16.2, 20.5)	
ZUK	ZUK	327	6785	1.5 (1.2, 1.8)	3.6 (3.2, 4.2)	4.9 (4.3, 5.5)	8.6 (7.5, 9.7)		
Other (37)		338	2012	3.7 (2.9, 4.6)	8.7 (7.5, 10.0)	11.3 (9.9, 12.8)	19.5 (17.5, 21.6)	25.3 (22.5, 28.5)	

Multiple Designs

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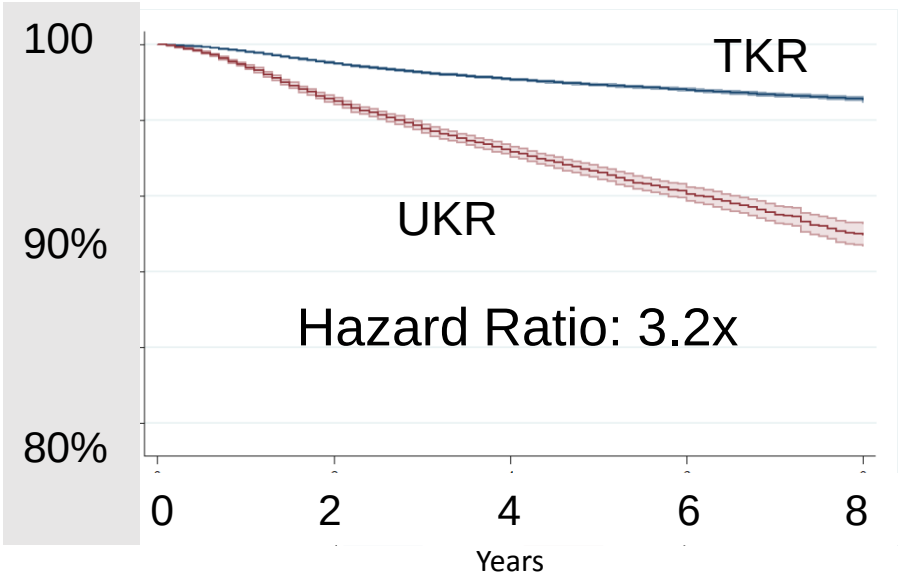
Registries: primary outcome revision

- Revision rate of UKR three times TKR
- Suggests UKR have more poor results than TKR
- Many therefore recommend: Stop UKR



Data from 2012 NJR for England & Wales. Largest in the world (>500,000 KR) 8yr of reliable data

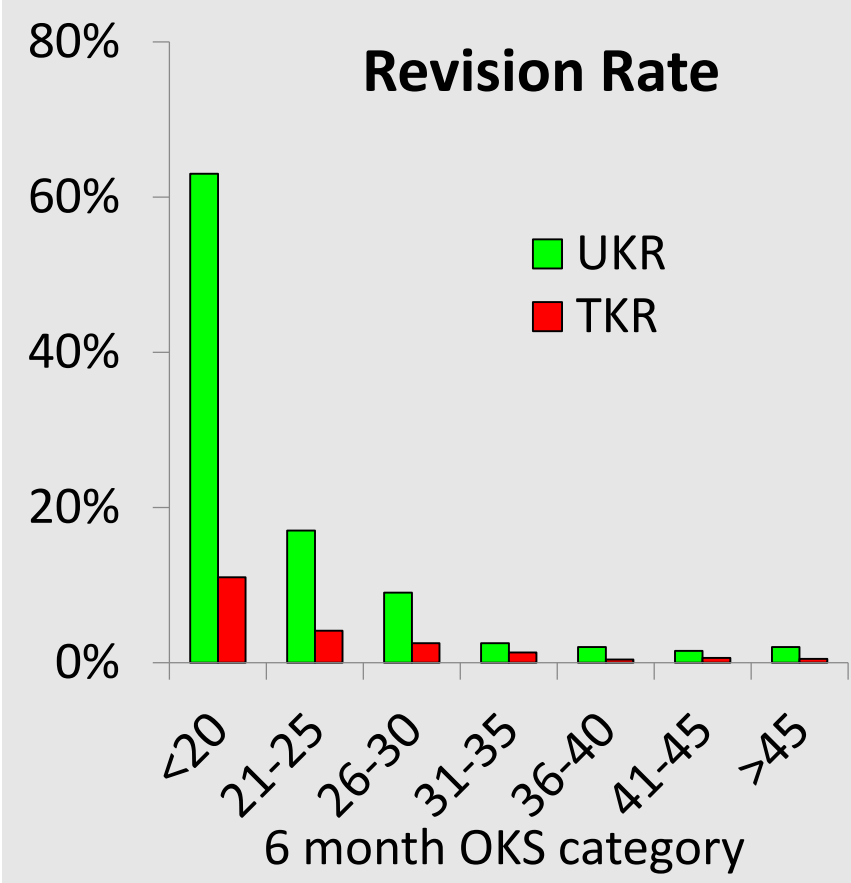
Do UKR have more poor results

- New Zealand Joint Registry[2] OKS at 6 months
- UKR 39, TKR 37 ($p<0.0001$,Difference 1.8 (CI 0.3))
- UKR More excellent results (OKS >41) than TKR
- UKR Less poor (OKS <27) results than TKR (1.5x)
- Difference in revision rate not due to poor results

Goodfellow, et al. JBJS(Br), 2010[2]

NZJR Clinical outcome and Revision Rate

- Whatever the outcome UKR 5 times more likely to be revised than TKR
- Factor independent of outcome increases revision rate: Revision Threshold
- If worse post-op than pre-op (OKS <20) 60% of UKR & 10% of TKR revised[2]



Goodfellow, et al. JBJS, 2010[2]

Revision rate UKR v TKR

- UKR easier to revise than TKR and expected outcome better therefore lower threshold for revision (5x lower)
- Therefore despite fewer poor results UKR have a higher revision rate.
- Most UKR with bad outcome revised. Most TKR with bad outcome not revised, and remain bad
- Higher revision rate not justification to stop UKR

Simple conversion to primary TKR

Complex, using revision TKR

Goals of knee arthroplasty

Patient satisfaction and function

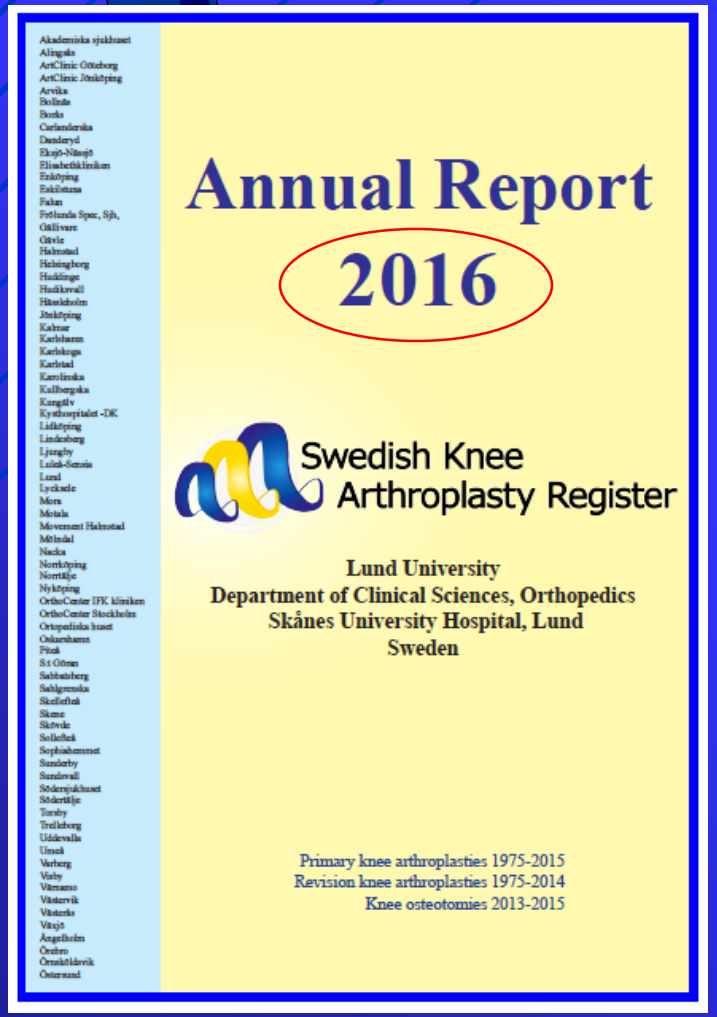
Long-term survivorship

Avoidance of complications

Minimize risks of future surgery

Cost-effective

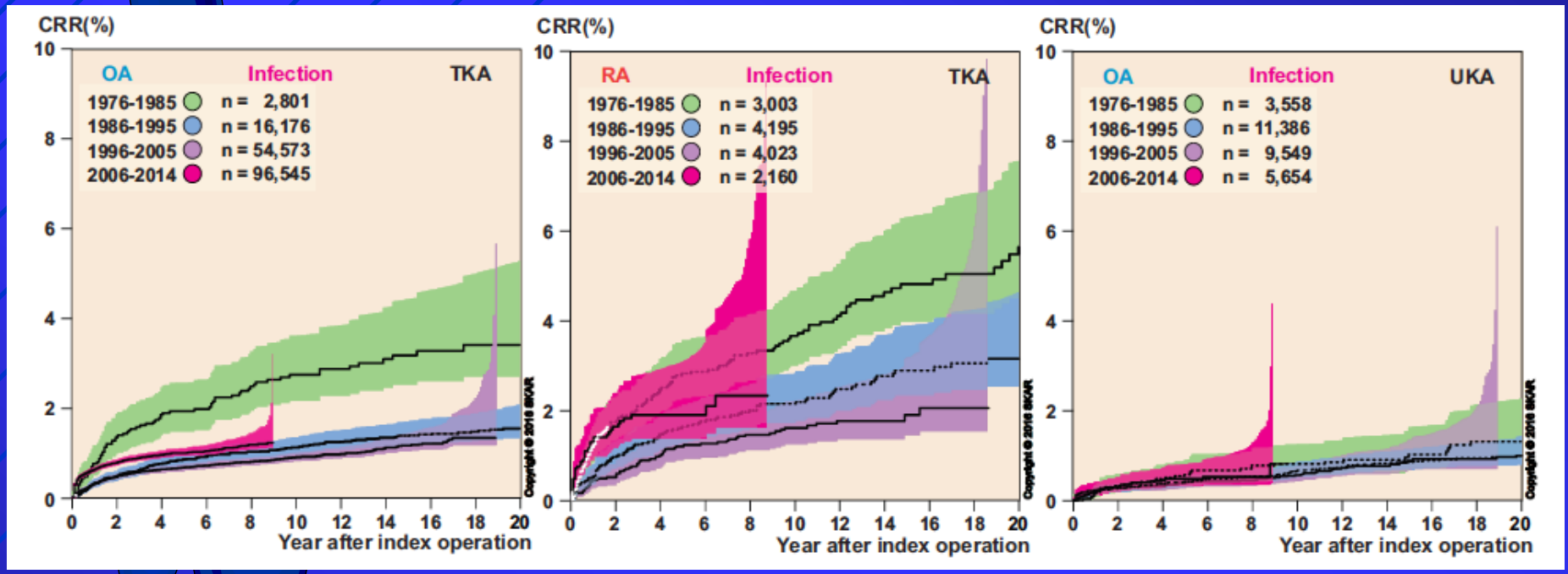
Swedish National Registry



2005-2014

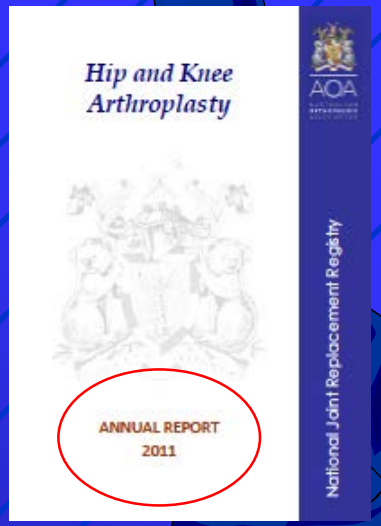
- 112,708 TKAs
- 6,742 UKAs

Infection



UKA have significantly lower risk of infection than TKA

Rate of re-revision



The rate of re-revision of a UKA to TKA is less than a TKA to TKA revision

Table R15: Re-revision Rates of Known Primary Knee Replacement (Primary Diagnosis OA, excluding first revision for Infection)

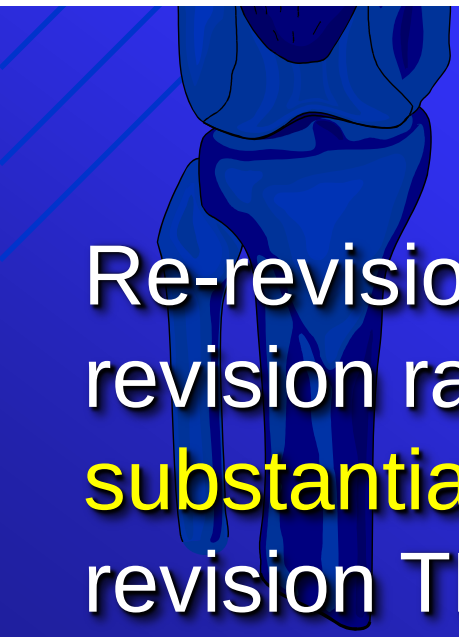
Primary Revisions	N Revised	N Total	Obs. Years	Revisions/100 Obs. Yrs (95% CI)
Prim UKR to TKR	221	2300	7662	2.88 (2.52, 3.29)
Prim TKR to TKR	150	1471	3975	3.77 (3.19, 4.43)
TOTAL	**371**	**3771**	**11637**	**3.19 (2.87, 3.53)**

Rate of re-revision

Revision of Unicompartmental Arthroplasty to Total Knee Arthroplasty: Not Always a Slam Dunk!

Rafael J. Sierra, MD [a], Cale A. Kassel, MD [a], Nathan G. Wetters, MD [b], Keith R. Berend, MD [c], Craig J. Della Valle, MD [b], Adolph V. Lombardi, MD [c]

The Journal of Arthroplasty 28 Suppl. 1 (2013) 128–132



Re-revision of a failed UKA is equivalent to revision rates of primary TKA and substantially better than re-revision rates of revision TKA

Rate of re-revision

Outcomes of Unicompartmental Knee Arthroplasty After Aseptic Revision to Total Knee Arthroplasty

A Comparative Study of 768 TKAs and 578 UKAs Revised to TKAs from the Norwegian Arthroplasty Register (1994 to 2011)

Tesfaye H. Leta, MPhil, Stein Håkon L. Lygre, PhD, Arne Skredderstuen, MD, Geir Hallan, MD, PhD, Jan-Erik Gjertsen, MD, PhD, Berit Rokne, PhD, and Ove Furnes, MD, PhD

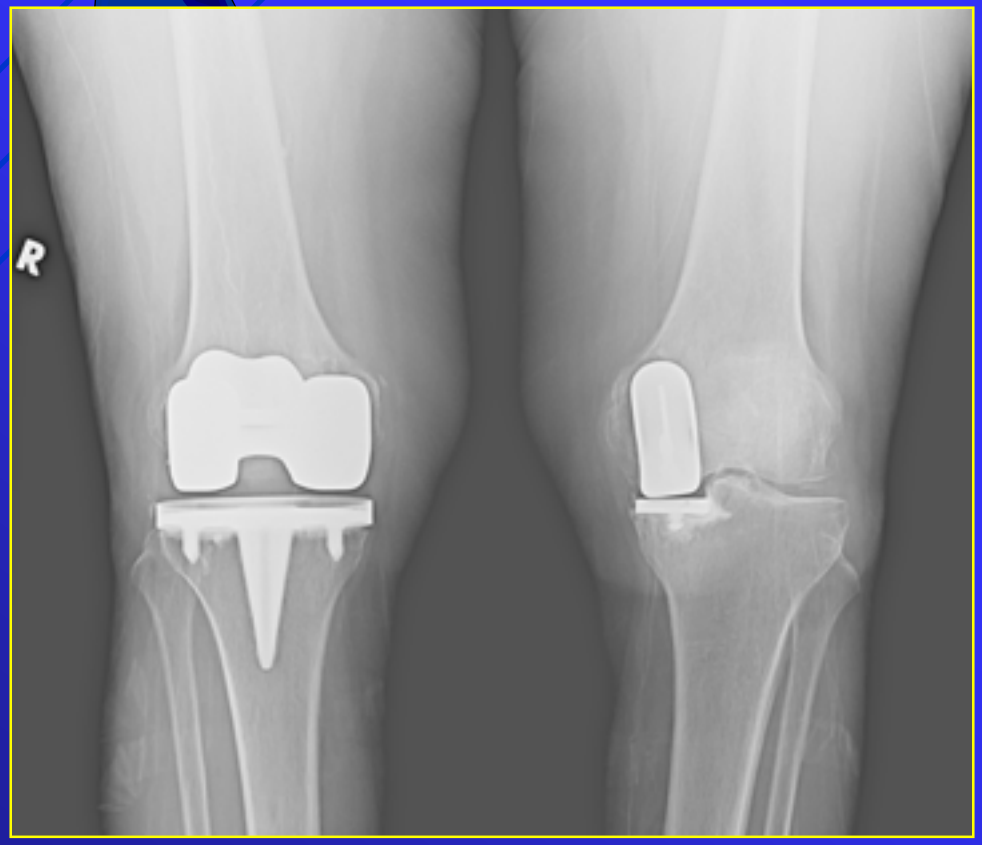
Investigation performed at the Norwegian Arthroplasty Register (NAR), Department of Orthopedic Surgery, Haukeland University Hospital, Bergen, Norway

J Bone Joint Surg Am. 2016;98:431-40

In conclusion, the outcomes of UKA→TKA and TKA→TKA in terms of survival, functional outcome, level of pain, patient satisfaction, and change in health-related quality of life were similar. Similarly, the two revision groups had no significant differences in reasons for re-revision, with the exception of a greater percentage of revisions due to deep infection in the TKA→TKA group. However, the surgical procedure of TKA→TKA seems to be more technically complex than UKA→TKA.

Revision to TKA

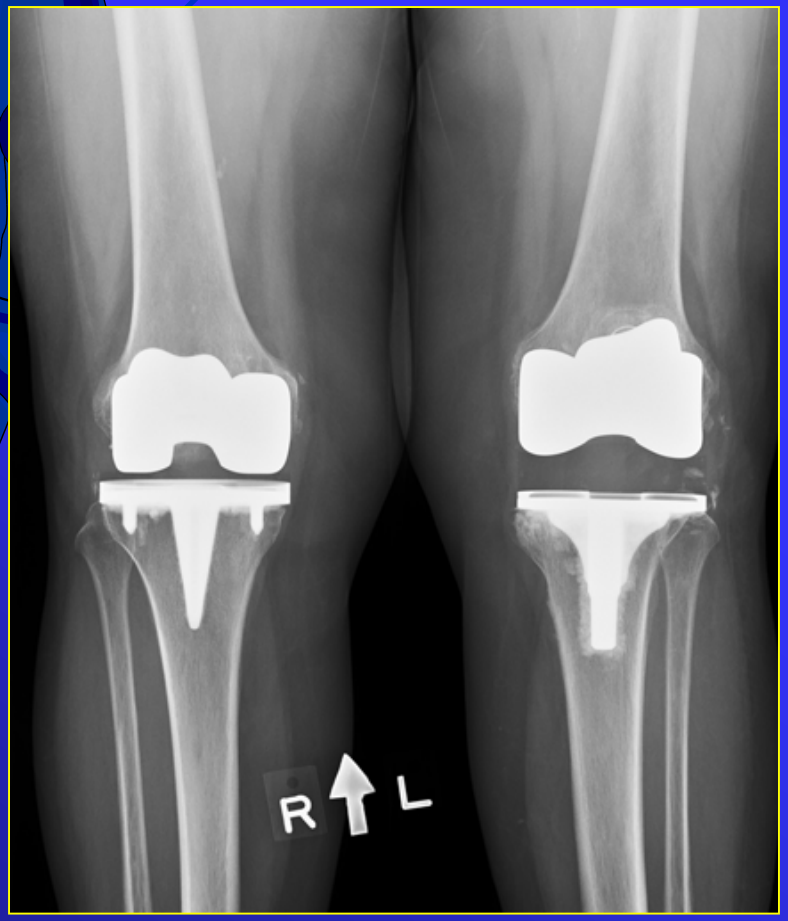
72 yo female:
17 years after left medial UKA



Revision to TKA

72 yo female:

8 years s/p conversion to TKA



Goals of knee arthroplasty

Patient satisfaction and function

Long-term survivorship

Avoidance of complications

Minimize risks of future surgery

Cost-effective

Cost-effectiveness

Acta Orthop Scand 1999; 70 (2): 170–175

Use of unicompartmental instead of tricompartmental prostheses for unicompartmental arthrosis in the knee is a cost-effective alternative

15,437 primary tricompartmental prostheses were compared with 10,624 primary medial or lateral unicompartmental prostheses

Otto Robertsson[1], Lars Borgquist[2], Kaj Knutson[1], Stefan Lewold[1] and Lars Lidgren[1]

COST-EFFECTIVENESS ANALYSIS OF UNICOMPARTMENTAL KNEE ARTHROPLASTY AS AN ALTERNATIVE TO TOTAL KNEE ARTHROPLASTY FOR UNICOMPARTMENTAL OSTEOARTHRITIS

BY NELSON F. SOOHOO, MD, HUSHAM SHARIFI, BS, MBA, GERALD KOMINSKI, PHD, AND JAY R. LIEBERMAN, MD

Investigation performed at the Department of Orthopaedic Surgery, University of California at Los Angeles, Los Angeles, California

Conclusions: This study supports unicompartmental knee arthroplasty as a cost-effective alternative for the treatment of unicompartmental arthritis when the durability and function of a unicompartmental replacement are assumed to be similar to those of a primary total knee replacement. This suggests that, with appropriate patient selection, the currently available literature supports unicompartmental arthroplasty as a cost-effective alternative to total knee arthroplasty.

Cost-effectiveness

Cost-effectiveness of unicondylar versus total knee arthroplasty: a Markov model analysis

Geert Peersman[a,*], Wouter Jak[a], Tom Vandenlangenbergh[a], Christophe Jans[a], Philippe Cartier[b], Peter Fennema[c]

The Knee 21 S1 (2014) S37–S42

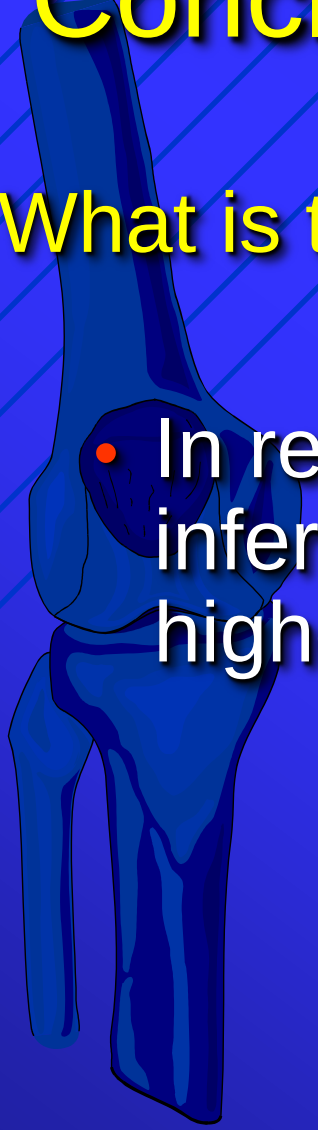
Conclusion: UKA yields clear advantages in terms of costs and marginal advantages in terms of health effects, in comparison with TKA.

Conclusion

What is the role of UKA in 2018?

- UKA can provide excellent patient satisfaction, function, and long-term survivorship in carefully selected patients

Conclusion

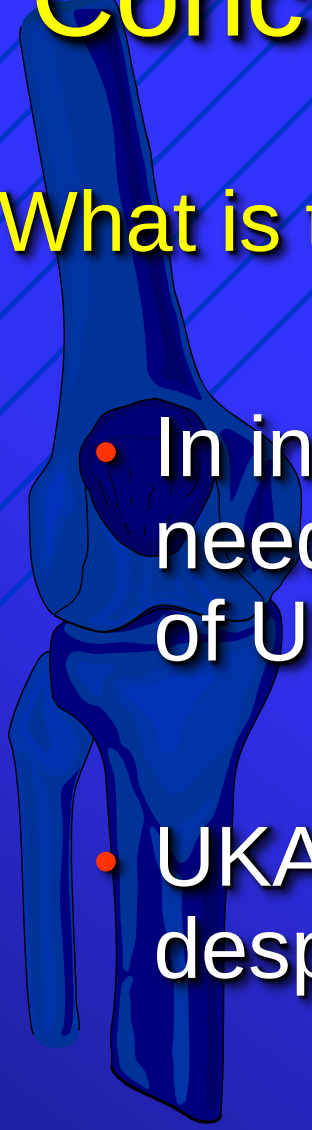


What is the role of UKA in 2018?

- In registries, UKA demonstrates an inferior survivorship to TKA with higher revision rates

Conclusion

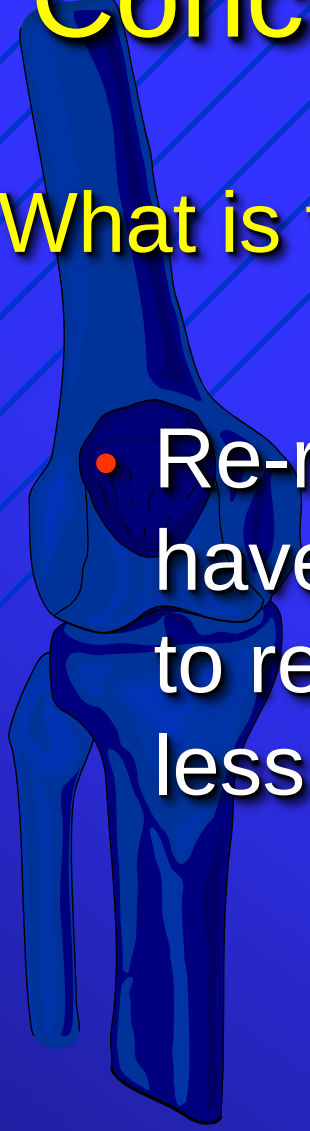
What is the role of UKA in 2018?



- In interpreting registry data, we need to consider that many models of UKAs have been performed
- UKA more likely to be revised despite less poor results than TKA

Conclusion

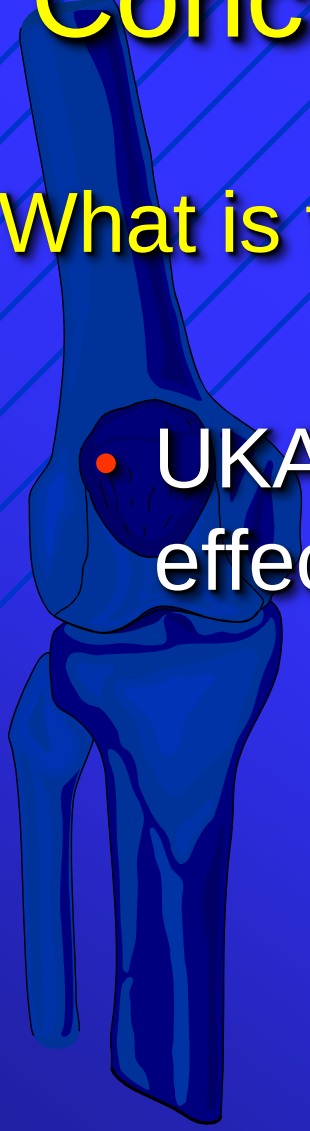
What is the role of UKA in 2018?



- Re-revision rates of failed UKAs have been shown to be equivalent to revision rates of primary TKA, but less technically complex

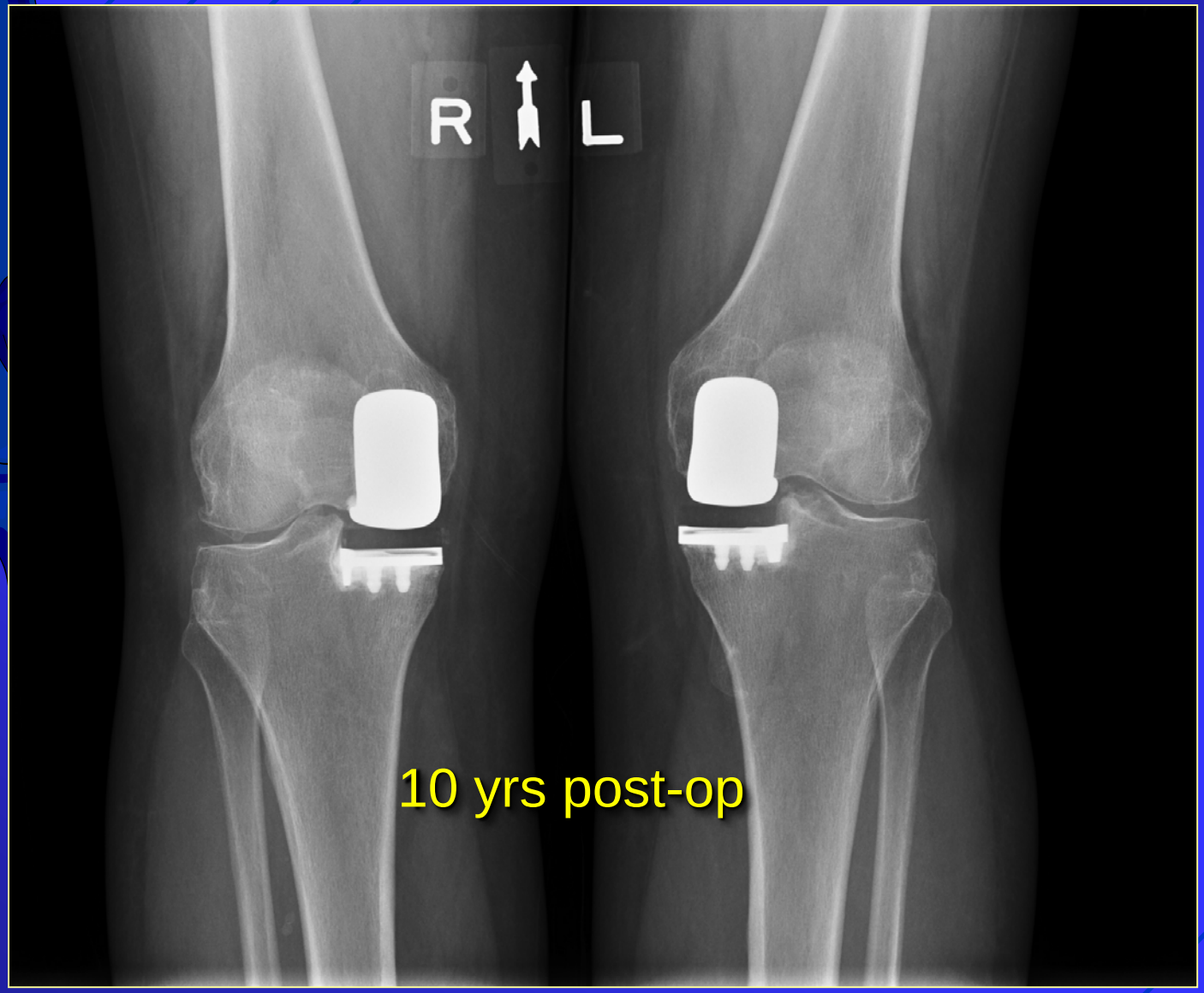
Conclusion

What is the role of UKA in 2018?



- UKA has been shown to be a cost-effective alternative to TKA

Mrs. C.R., 52



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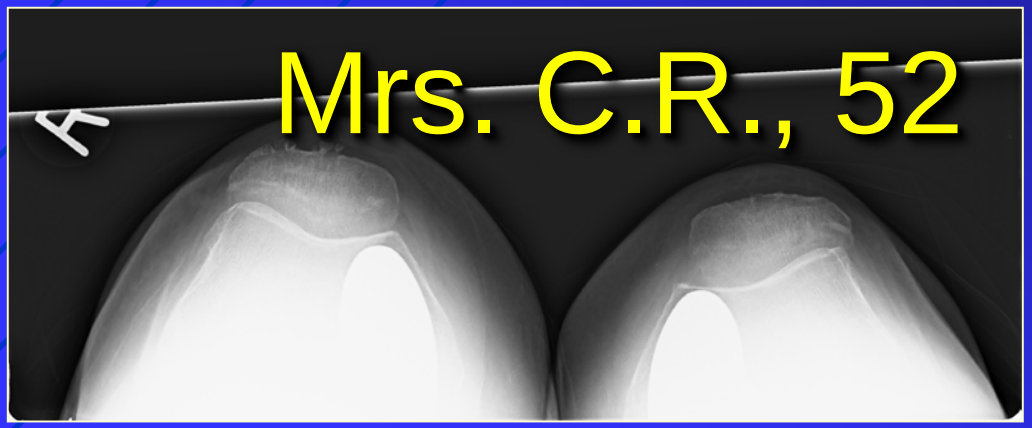


Objectives

Review the evolution of the UKA

Review the current evidence and discuss the role for UKA in 2018

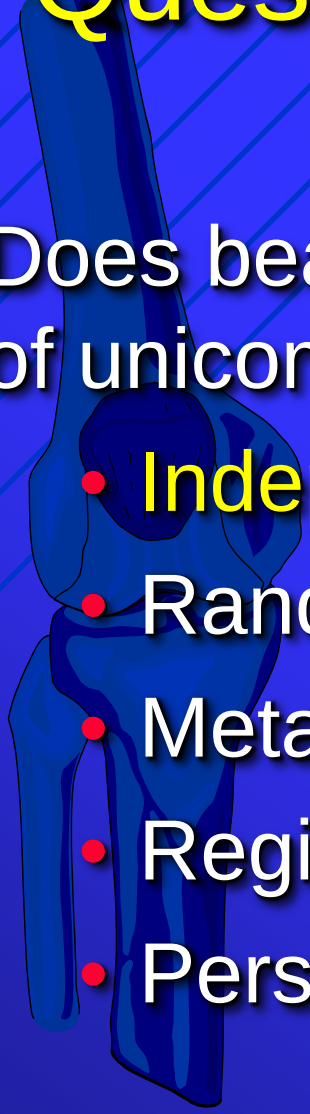
Does bearing design influence survivorship of UKA?

The Debate

Fixed

Mobile

Question



Does bearing design influence survivorship of unicompartmental knee arthroplasty?

- Independent, unblinded series
- Randomized clinical trials
- Meta-analyses
- Registry data
- Personal experience

Fixed-Bearing UKA

Author	Design	Cases	F/U	Survival
O’ Rourke	Marmor	136	> 21 yrs	86%
Tabor	Marmor	100	15 yrs	86%
Steele	St Georg	203	15 yrs	86%
Berger	M-G	62	13 yrs	96%
Heyse	Genesis	223	10yrs	94%

Mobile-Bearing UKA

Author	Design	Cases	F/U	Survival
Price	Oxford	114	15 yrs	93%
Price	Oxford	682	20 yrs	91%
Emerson	Oxford	55	10 yrs	85%
Zermatten	Oxford	48	10 yrs	78%

CLINICAL ORTHOPAEDICS AND RELATED RESEARCH
Number 404, pp. 62–70

Comparison of a Mobile With a Fixed-Bearing Unicompartmental Knee Implant

Roger H. Emerson, Jr., MD; Thomas Hansborough, BA; Richard D. Reitman, MD; Wolfgang Rosenfeldt, BA; and Linda L. Higgins, PhD

51 Brigham vs. 50 Oxford at 11 years

Survivorship

- Oxford (99%)
- Brigham (93%)

Clin Orthop Relat Res (2012) 470:61–68
DOI 10.1007/s11999-011-1961-4

SYMPOSIUM: PAPERS PRESENTED AT THE ANNUAL MEETINGS OF THE KNEE SOCIETY

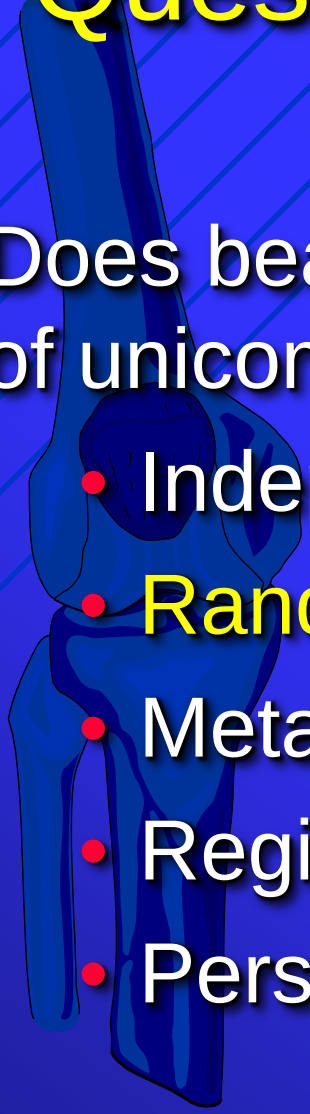
No Long-term Difference Between Fixed and Mobile Medial Unicompartmental Arthroplasty

Sebastien Parratte MD, Vanessa Pauly MS,
Jean-Manuel Aubaniac MD, Jean-Noel A. Argenson MD

Retrospective comparison
- 79 fixed-bearing UKA
- 77 mobile-bearing UKA

15-year minimum follow-up
- 12% revised in fixed-bearing UKA
- 15% revised in mobile-bearing UKA

Question



Does bearing design influence survivorship of unicompartmental knee arthroplasty?

- Independent, unblinded series
- Randomized clinical trials
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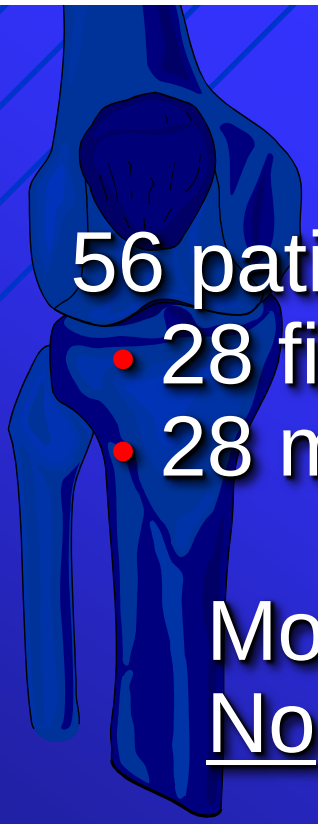
- Personal experience

Mobile vs. fixed bearing unicondylar knee arthroplasty: A randomized study on short term clinical outcomes and knee kinematics

Ming G. Li *, Felix Yao, Brendan Joss, James Ioppolo, Bo Nivbrant, David Wood

Perth Orthopaedic Institute, the University of Western Australia, Gate 3 Verdun Street, Nedlands, WA 6009, Australia

The Knee 13 (2006) 365–370

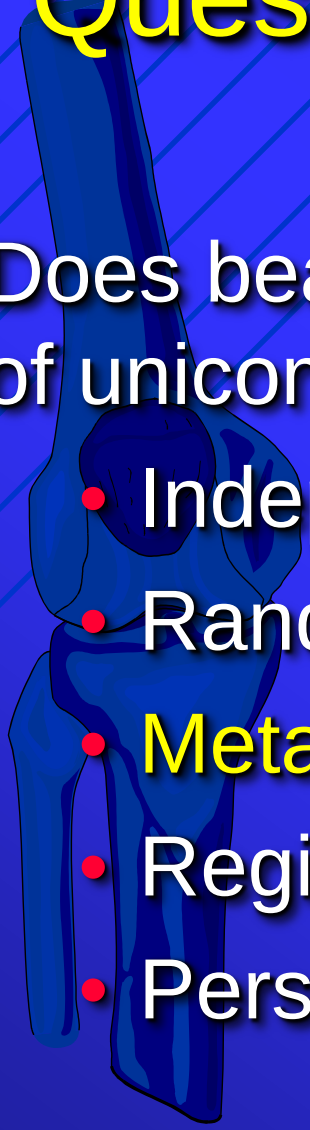


56 patients

- 28 fixed-bearing UKA (M-G)
- 28 mobile-bearing UKA (Oxford)

Mobile group had better kinematics
No differences in outcome scores

Question



Does bearing design influence survivorship of unicompartmental knee arthroplasty?

- Independent, unblinded series
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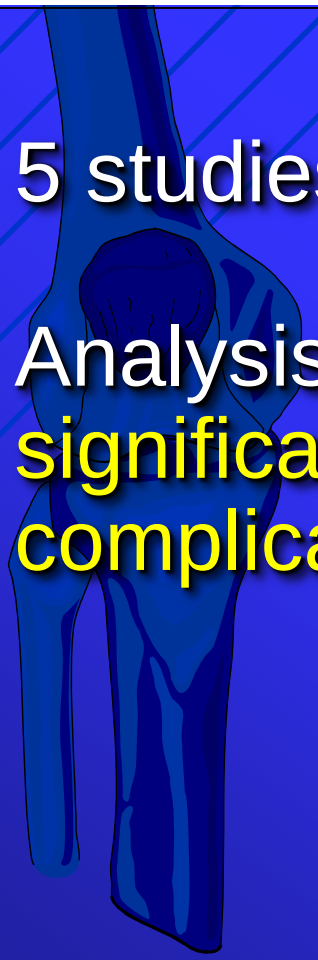
Orthop Traumatol Surg Res. 2009 Dec;95(8):599-605.

Fixed versus mobile bearing unicompartmental knee replacement: a meta-analysis.

Smith TO, Hing CB, Davies L, Donell ST.

Institute of Orthopaedics, Norfolk & Norwich University Hospital, Colney Lane, Norwich, Norfolk Island, NR2 7UY, UK. toby.smith@nnuh.nhs.uk



5 studies identified

Analysis suggested that there was no significant difference in clinical outcome or complication rates

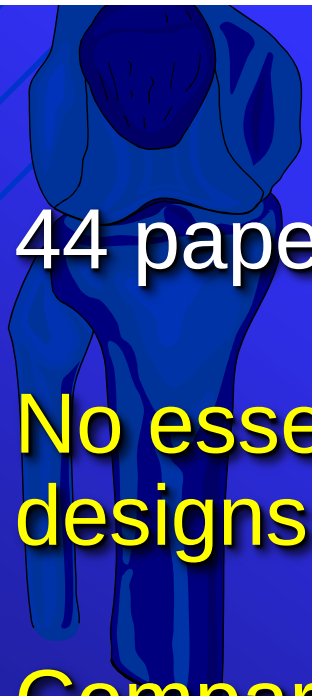
Knee Surg Sports Traumatol Arthrosc
DOI 10.1007/s00167-014-3131-1

KNEE

Fixed- versus mobile-bearing UKA: a systematic review and meta-analysis

Geert Peersman · Bart Stuyts · Tom Vandenlangenbergh · Philippe Cartier · Peter Fennema

Published online: 24 June 2014

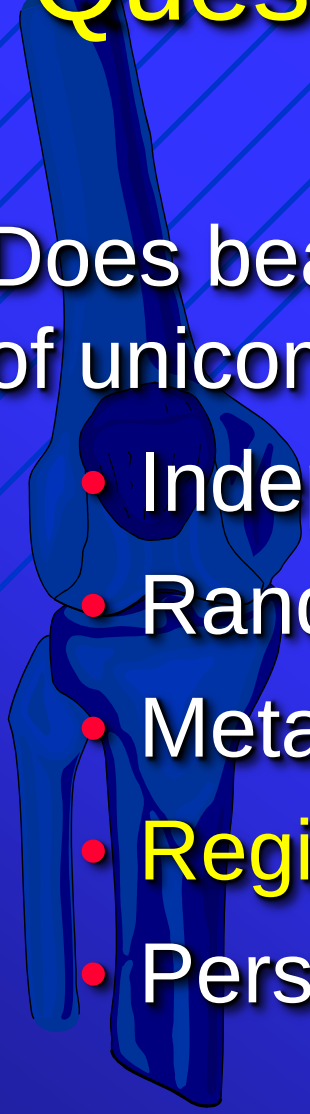


44 papers; 9,643 knees

No essential differences between the two designs were observed

Comparable revision rates

Question



Does bearing design influence survivorship of unicompartmental knee arthroplasty?

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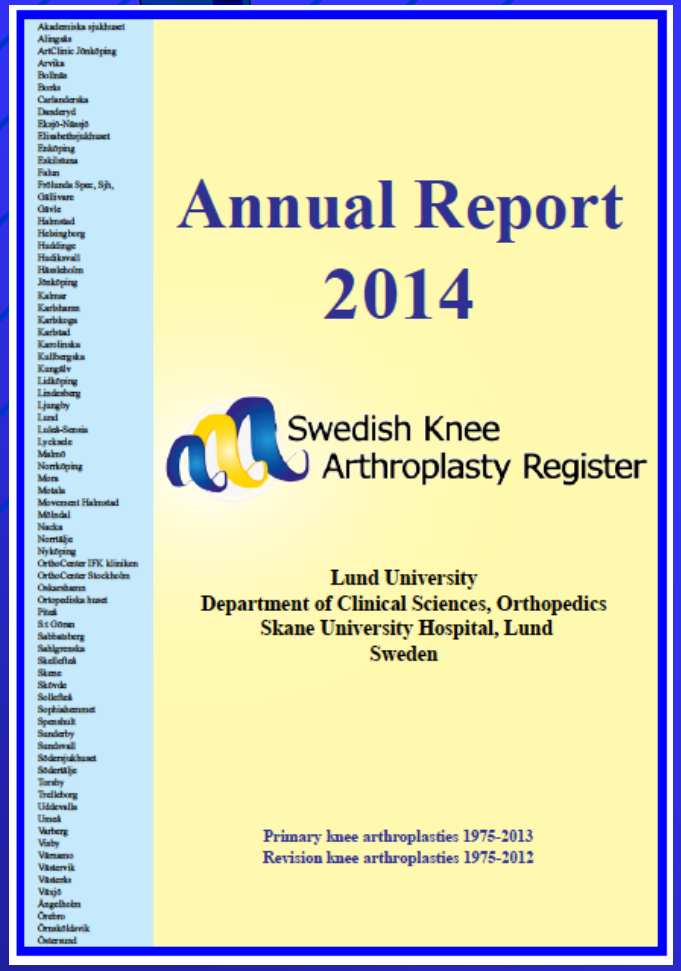
Registry Data



Large prospective observational studies give similar results to a RCT

Benson et al, NEJM, 2000

Concato et al, NEJM, 2000

Swedish Registry 2014

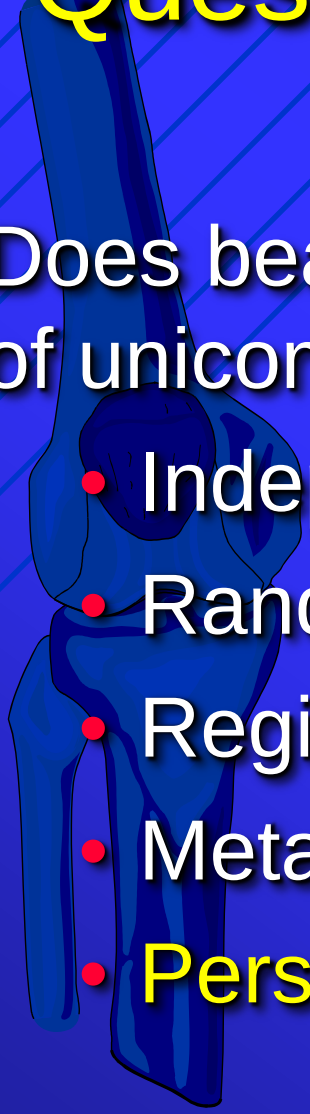
OA / UKA	n	p-value	RR	95% CI
Link	2 639		ref.	
Oxford	2,290	0.86	1.02	0.83-1.25
MillerGalante	1,294	0.98	1	0.81-1.24
Genesis	453	0.49	1.12	0.80-1.58
Preservation	147	0.04	1.57	1.02-2.40
ZUK	478	0.63	0.9	0.60-1.36
Triathlon PKR	95	0.91	1.06	0.39-2.89
Other	64	0.72	0.83	0.31-2.24
Gender (male is ref.)		0.86	0.99	0.84-1.15
Age (per year)		<0.01	0.97	0.96-0.98
Year of op. (per year)		0.20	1.03	0.99-1.07

Australian Registry 2018

Table KP15 Cumulative Percent Revision of Primary Unicompartmental Knee Replacement by Prosthesis Combination

Uni Femoral	Uni Tibial	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	17 Yrs
Allegretto Uni	Allegretto Uni*	350	2035	3.2 (2.5, 4.0)	6.0 (5.0, 7.1)	8.3 (7.2, 9.6)	14.7 (13.2, 16.4)	21.6 (19.5, 23.9)	24.8 (21.2, 28.9)
BalanSys Uni	BalanSys Uni Fixed	22	400	1.8 (0.9, 3.7)	2.9 (1.6, 5.1)	3.8 (2.3, 6.4)	7.4 (4.7, 11.5)		
Endo-Model Sled	Endo-Model Sled	168	1267	1.1 (0.7, 1.9)	4.8 (3.7, 6.1)	7.5 (6.1, 9.2)	14.7 (12.5, 17.1)		
Freedom PKR/Active	Freedom PKR/Active	341	1505	1.7 (1.1, 2.5)	7.7 (6.5, 9.2)	13.1 (11.4, 14.9)	26.4 (23.9, 29.0)		
GRU	GRU	279	2067	1.4 (0.9, 2.0)	4.6 (3.7, 5.6)	6.3 (5.3, 7.4)	13.6 (12.0, 15.3)		
Genesis	Genesis*	329	1864	2.7 (2.0, 3.5)	8.3 (7.1, 9.6)	11.0 (9.6, 12.5)	16.6 (14.9, 18.4)	23.3 (20.4, 26.5)	
Journey Uni	Journey Uni (v2)	18	496	3.8 (2.3, 6.3)	5.1 (3.2, 8.2)	5.1 (3.2, 8.2)			
Journey Uni	Journey Uni All Poly	19	270	1.2 (0.4, 3.6)	6.0 (3.6, 9.9)	8.0 (5.1, 12.5)			
M/G	M/G*	290	2135	1.6 (1.1, 2.2)	4.2 (3.4, 5.1)	6.4 (5.5, 7.6)	10.8 (9.5, 12.3)	17.0 (15.1, 19.1)	
Oxford (cless)	Oxford (cless)	297	5101	3.1 (2.6, 3.6)	5.1 (4.4, 5.8)	6.6 (5.8, 7.5)	13.5 (11.0, 16.6)		
Oxford (cless)	Oxford (ctd)	28	401	3.0 (1.7, 5.3)	6.9 (4.4, 10.7)	12.8 (8.3, 19.4)			
Oxford (ctd)	Oxford (ctd)	1979	13000	2.2 (2.0, 2.5)	5.8 (5.4, 6.2)	8.4 (7.9, 8.9)	14.8 (14.2, 15.5)	22.6 (21.5, 23.7)	26.0 (24.3, 27.9)
Preservation	Preservation Fixed*	413	2318	2.5 (1.9, 3.2)	7.1 (6.1, 8.2)	9.5 (8.4, 10.8)	15.6 (14.1, 17.2)	23.4 (21.1, 26.0)	
Preservation	Preservation Mobile*	131	400	5.3 (3.5, 7.9)	15.5 (12.3, 19.5)	19.1 (15.6, 23.3)	27.2 (23.1, 31.9)	35.2 (30.5, 40.5)	
Repicci II	Repicci II	635	3072	1.7 (1.3, 2.2)	4.8 (4.0, 5.6)	7.9 (7.0, 8.9)	17.9 (16.5, 19.5)	29.3 (27.2, 31.6)	
Restoris MCK	Restoris MCK	17	1771	1.2 (0.7, 1.9)					
Sigma HP	Sigma HP	31	994	0.8 (0.4, 1.6)	2.8 (1.8, 4.2)	4.3 (3.0, 6.3)			
Triathlon PKR	Triathlon PKR	19	284	3.2 (1.6, 6.3)	7.7 (4.7, 12.4)	8.8 (5.4, 14.2)			
Uniglide	Uniglide	147	754	4.8 (3.5, 6.6)	10.7 (8.6, 13.1)	12.8 (10.6, 15.4)	19.8 (16.9, 23.0)		
Unix	Unix	448	3883	2.4 (2.0, 2.9)	5.3 (4.6, 6.0)	7.0 (6.2, 7.8)	12.0 (10.8, 13.2)	18.2 (16.2, 20.5)	
ZUK	ZUK	327	6785	1.5 (1.2, 1.8)	3.6 (3.2, 4.2)	4.9 (4.3, 5.5)	8.6 (7.5, 9.7)		
Other (37)		338	2012	3.7 (2.9, 4.6)	8.7 (7.5, 10.0)	11.3 (9.9, 12.8)	19.5 (17.5, 21.6)	25.3 (22.5, 28.5)	

Question



Does bearing design influence survivorship of unicompartmental knee arthroplasty?

- Independent, unblinded series
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Clin Orthop Relat Res (2010) 468:73–81
DOI 10.1007/s11999-009-0975-7

SYMPOSIUM: PAPERS PRESENTED AT THE ANNUAL MEETINGS OF THE KNEE SOCIETY

Does Bearing Design Influence Midterm Survivorship of Unicompartmental Arthroplasty?

John-Paul Whittaker MB ChB, FRCS (T&O), Douglas D. R. Naudie MD, FRCS (C), James P. McAuley MD, FRCS (C), Richard W. McCalden MD, MPhil, FRCS (C), Steven J. MacDonald MD, FRCS (C), Robert B. Bourne MD, FRCS (C)

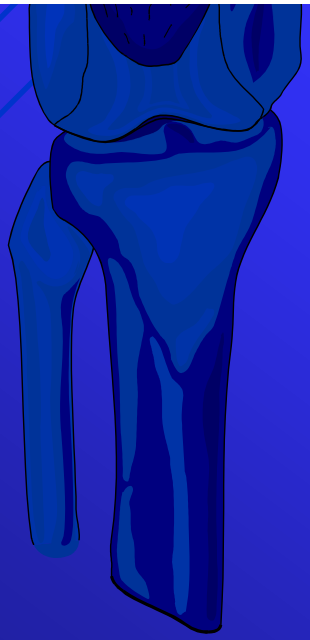


Table 1. Patient demographics

Demographic	Miller Galante	Oxford
Total number UKA	150	79
Surgical date	1990–2007	1993–2007
Bilateral procedures	28%	27%
Median age (years)	68	63
Age range (years)	45–79	49–87
Gender (male:female)	71:79	41:38
BMI	28.7 (16.8–44)	30.7 (19.3–43.1)
Etiology OA: AVN	143:7	78:1
Followup in years, mean (range)	8.1 (1–17.8)	3.6 (1–11.3)
Lost to followup	5	1
Deaths	35	3

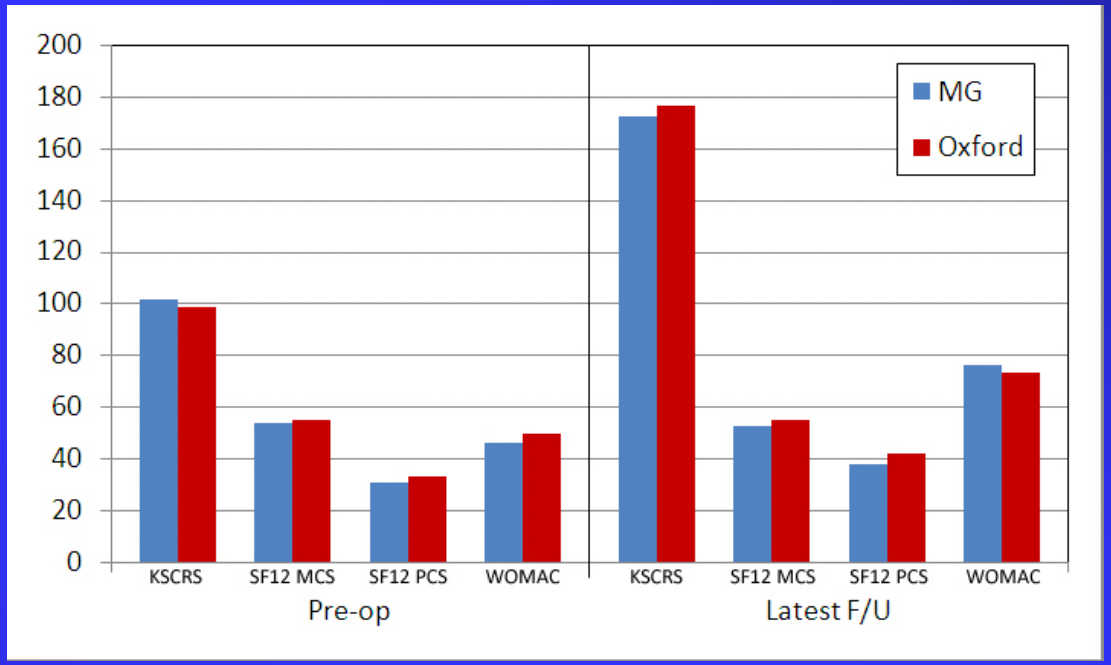
UKA = unicompartmental knee arthroplasty; BMI = body mass index; OA = osteoarthritis; AVN = avascular necrosis.

Fixed vs. Mobile Bearing UKA

Table 2. Outcome scores for both groups, preoperatively and at the latest followup

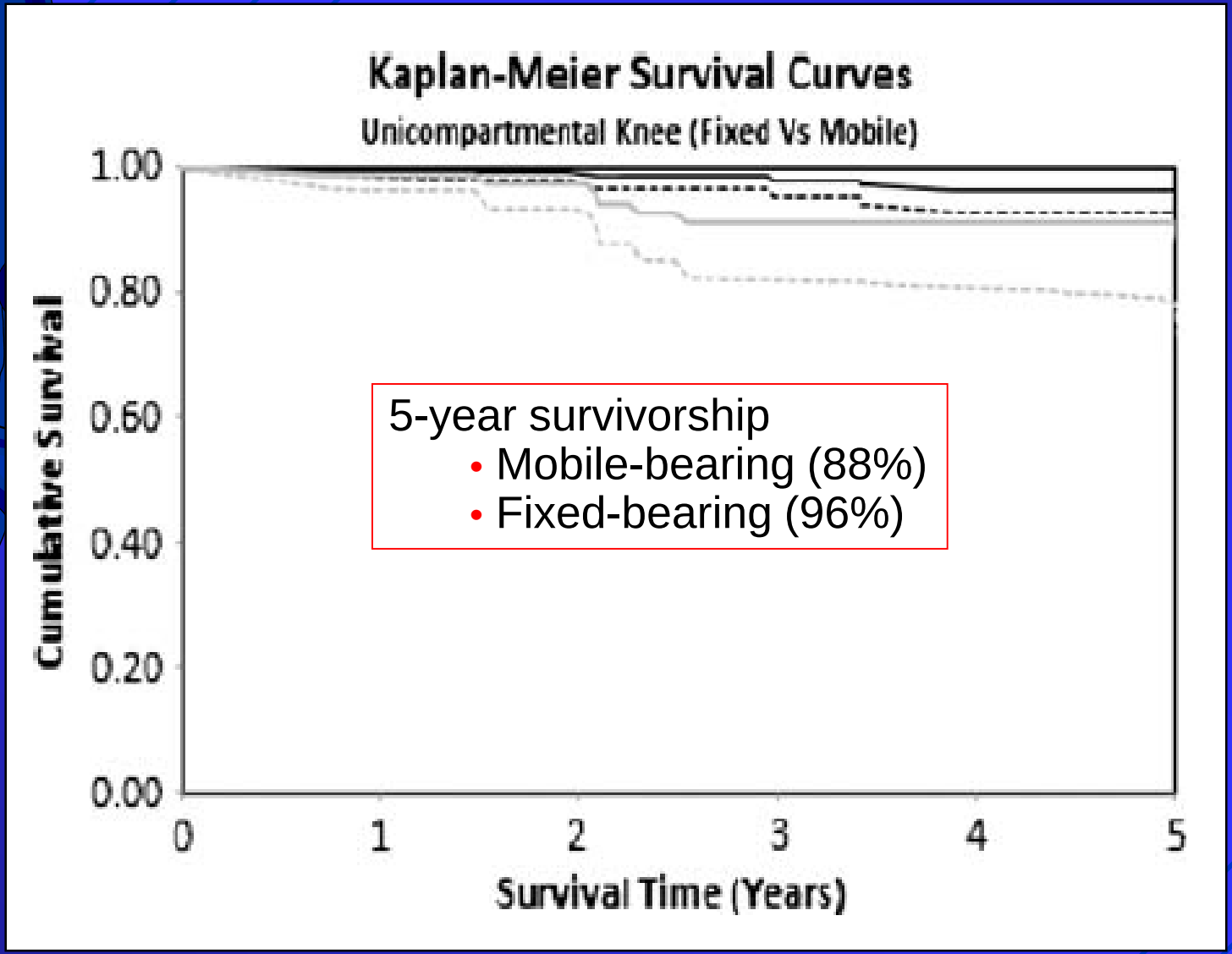
Outcome score	Group	Mean	Standard deviation	p Value
Preoperative KSCRS	Mobile	98.81	18.113	0.331
	Fixed	101.69	24.693	
Latest KSCRS	Mobile	173.98	30.7	0.299
	Fixed	169.51	29.953	
Preoperative SF12 MCS	Mobile	54.52	10.424	0.751
	Fixed	53.91	9.36	
Latest SF12 MCS	Mobile	54.84	8.849	0.041
	Fixed	51.62	13.096	
Preoperative SF12 PCS	Mobile	33.05	9.116	0.136
	Fixed	30.58	7.871	
Latest SF12 PCS	Mobile	41.34	9.922	0.04
	Fixed	36.48	13.665	
Preoperative WOMAC	Mobile	49.20	17.623	0.331
	Fixed	46.03	16.467	
Latest WOMAC	Mobile	72.28	20.671	0.676
	Fixed	73.68	24.372	

KSCRS = Knee Society clinical rating score; SF12 MCS = Short Form 12 mental component score; SF12 PCS = Short Form 12 physical component score; Latest = latest followup.



P > 0.05

Fixed vs. Mobile Bearing UKA



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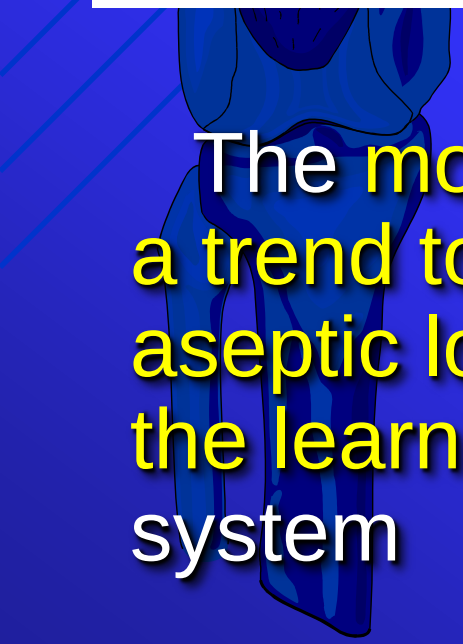

The mobile-bearing design demonstrated a trend towards an earlier occurrence of aseptic loosening, which may be related to the learning curve of the mobile-bearing system

Question

Are there any advantages to the use of a mobile- or fixed-bearing implant?

- Kinematics
- Wear
- Function

Acta Biomaterialia 7 (2011) 710–715

Wear analysis of unicondylar mobile bearing and fixed bearing knee systems: A knee simulator study

J. Philippe Kretzer*, Eike Jakubowitz, Jörn Reinders, Eva Lietz, Babak Moradi, Kerstin Hofmann, Robert Sonntag

Kinematics of both designs were similar

Advantages of a mobile-bearing over a fixed-bearing could not be confirmed

Knee Surg Sports Traumatol Arthrosc (2012) 20:1042–1048
DOI 10.1007/s00167-011-1620-z

KNEE

Muscle activity around the knee and gait performance in unicompartmental knee arthroplasty patients: a comparative study on fixed- and mobile-bearing designs

Fabio Catani · Maria Grazia Benedetti · Luca Bianchi · Valentina Marchionni · Sandro Giannini · Alberto Leardini

Conclusions A good restoration of gait was achieved by most unicompartmental knee patients independently of the UKA design, although some abnormalities persisted in muscle activity around the knee.

The Journal of Arthroplasty Vol. 28 No. 2 2013

No Difference in Quality-of-Life Outcomes After Mobile and Fixed-Bearing Medial Unicompartmental Knee Replacement

David J. Biau, MD, Nelson V. Greidanus, MD, MPH,
Donald S. Garbuz, MD, MHSc, and Bassam A. Masri, MD

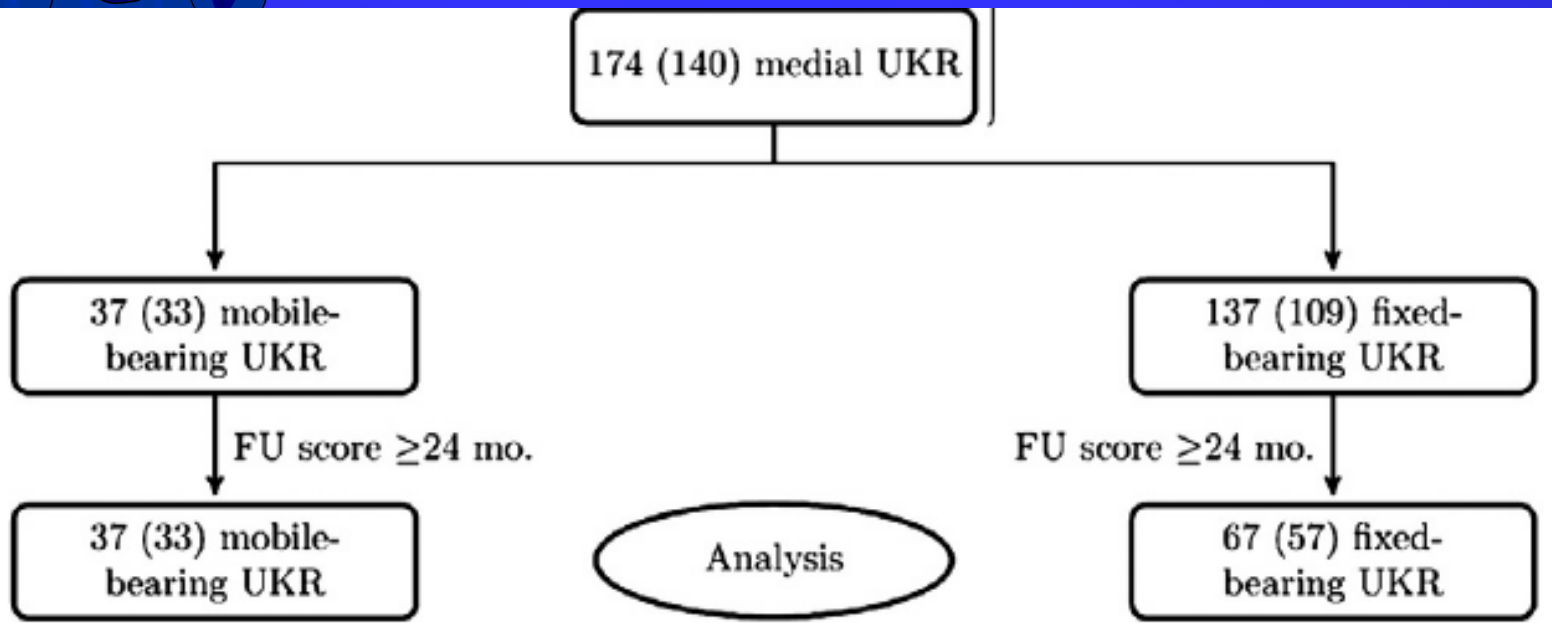

Fig. Flowchart showing the process for selecting the study participants.

The Journal of Arthroplasty Vol. 28 No. 2 2013

No Difference in Quality-of-Life Outcomes After Mobile and Fixed-Bearing Medial Unicompartmental Knee Replacement

David J. Biau, MD, Nelson V. Greidanus, MD, MPH,
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Outcomes

- SF-12
- WOMAC
- Oxford-12
- Self-administered satisfaction scale
- UCLA activity level score

The Journal of Arthroplasty Vol. 28 No. 2 2013

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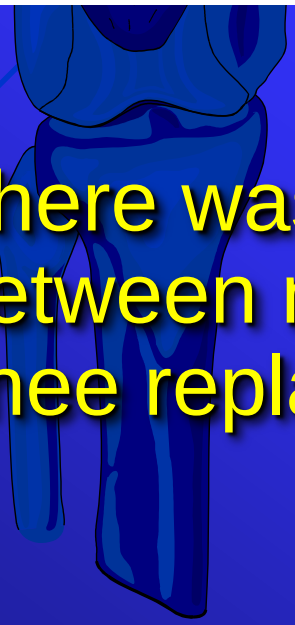
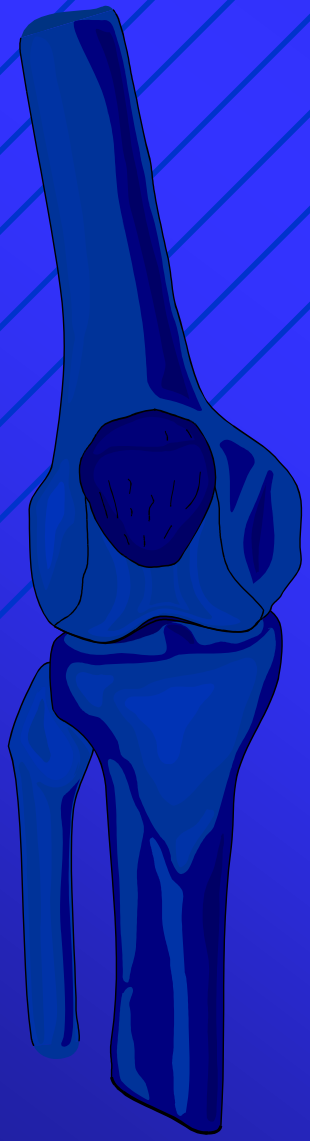


There was no difference in outcomes between mobile and fixed unicompartmental knee replacements

Conclusion

There appears to be *no* major survival advantage to a mobile-bearing design

The declared advantages of a mobile-bearing implant (including kinematics, wear, and function) cannot be confirmed



Thank You