



LINKademy™
International Symposium
on Knee Joint Arthroplasty

Unicondylar Sled Prosthesis Endo-Model®
GEMINI® SL® Total Knee Replacement
Endo-Model® Rotational and Hinge Knee System
Periprosthetic Infection, Diagnostic & Therapy

Agenda October 08-09, 2010

Less Invasive TKA Extra-medullary Femoral Reference without Navigation

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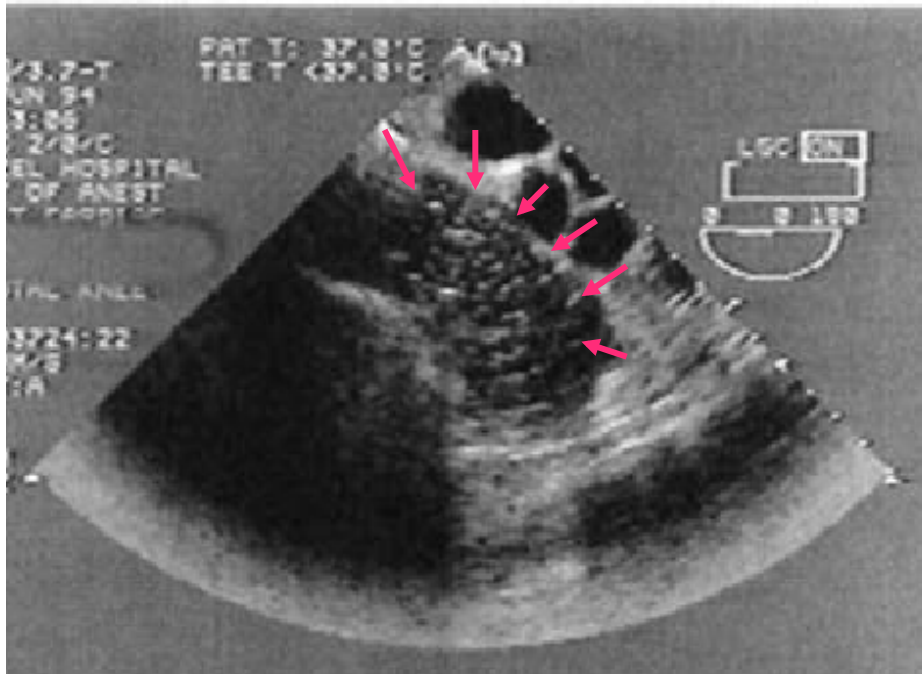
**SERVIZIO SANITARIO REGIONALE
EMILIA-ROMAGNA**
Azienda Ospedaliera di Reggio Emilia

Femoral Canal Reaming



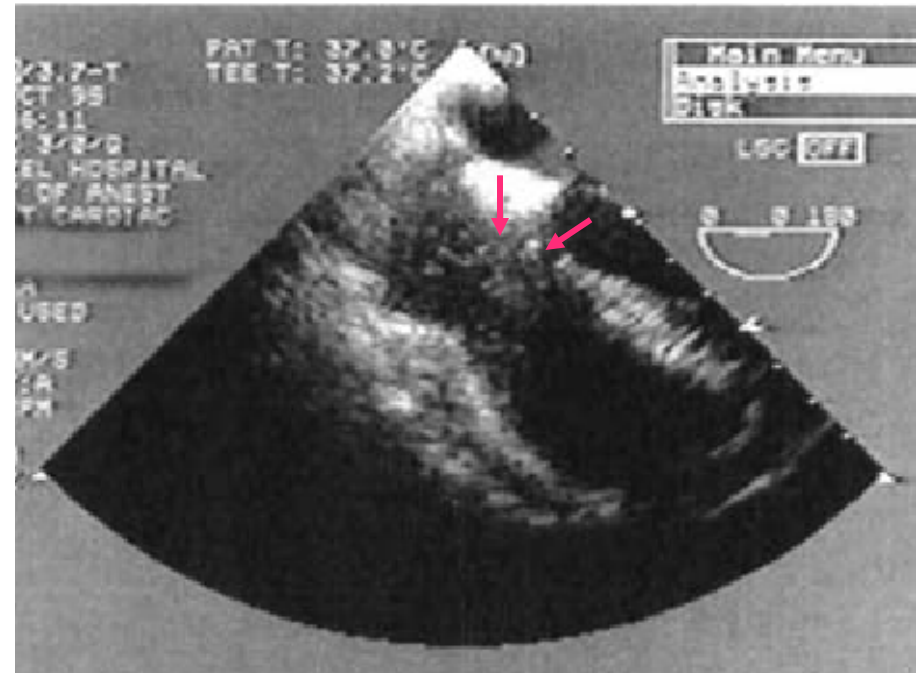
It's an invasive phase in TKA

IM instruments



Embolization in right atrium

EM instruments



Dorr *CORR* 1989

Caillouette *CORR* 1990

Callaghan *J Arthropl* 1990

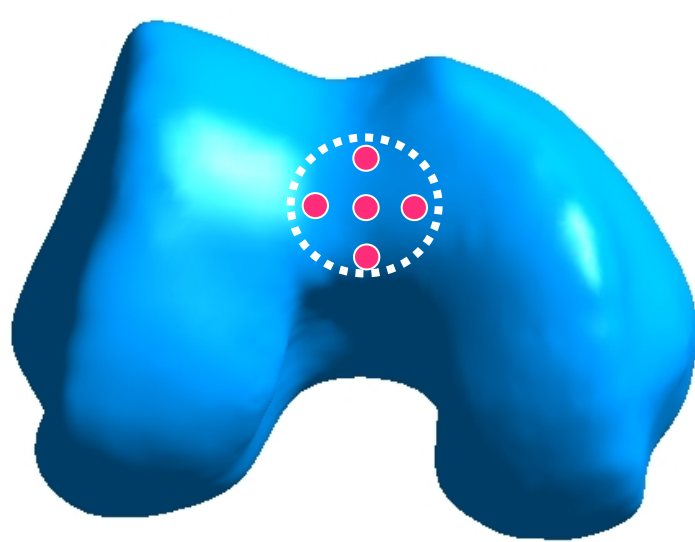
Hozack *CORR* 1993

Insall *CORR* 1994

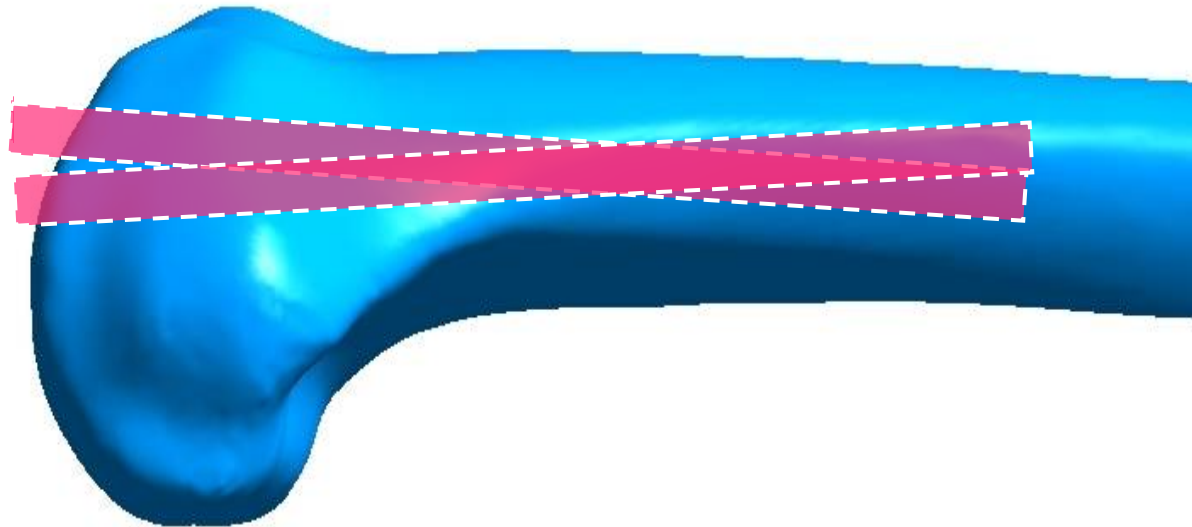
Morawa *CORR* 1996

IM Femoral Alignment Problem

The orientation of the rod depending on: entry point, diameter of the femoral canal, diameter and length of the rod



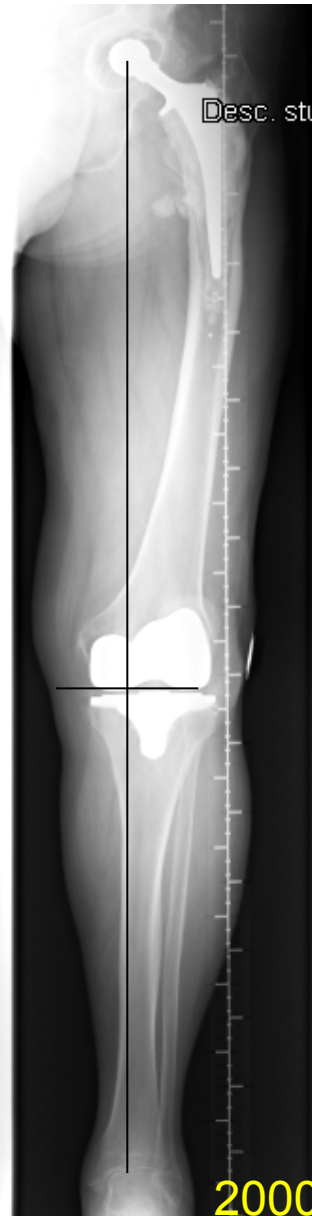
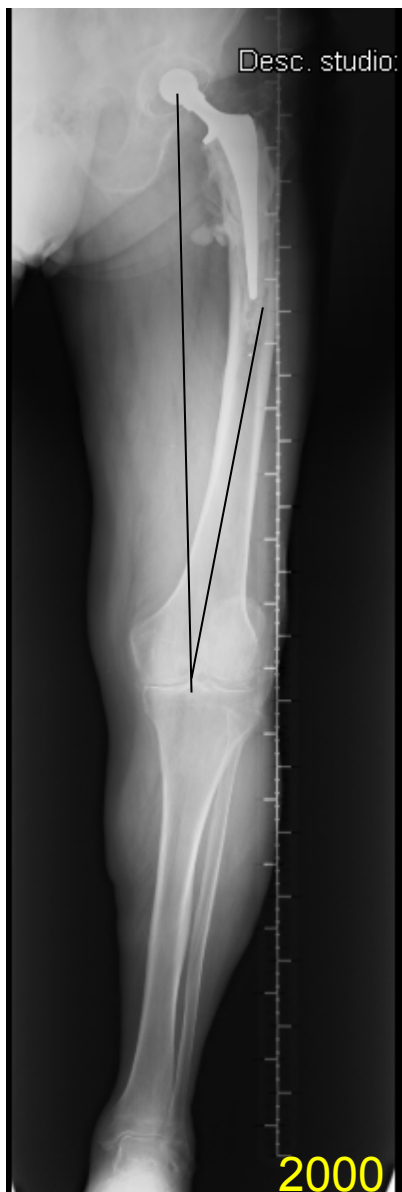
5° Varus - 9° Valgus



3° Ext - 10° Flex

Bobyn, *J Arthropl* 2000

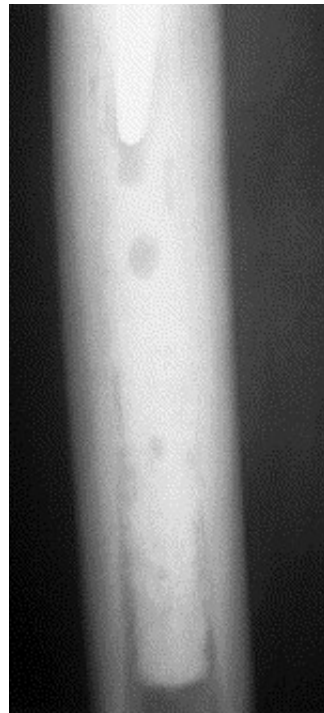
Burton, *J Arthropl* 2006



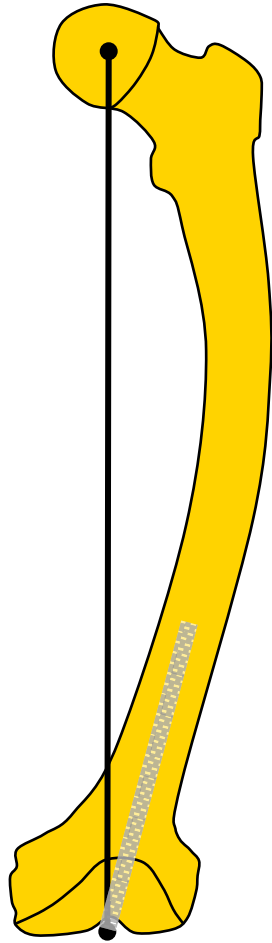
Outliers $> 3^\circ$ mechanical axis within 10%-20%

Aglietti e coll. J.Arthroplasty 1999

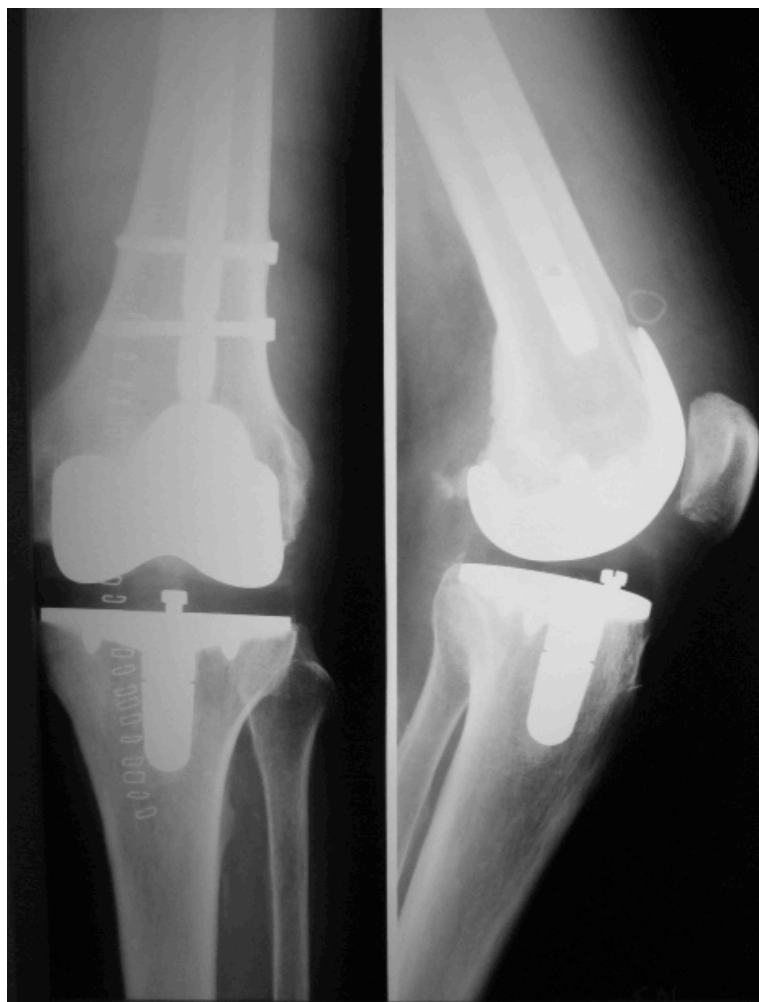
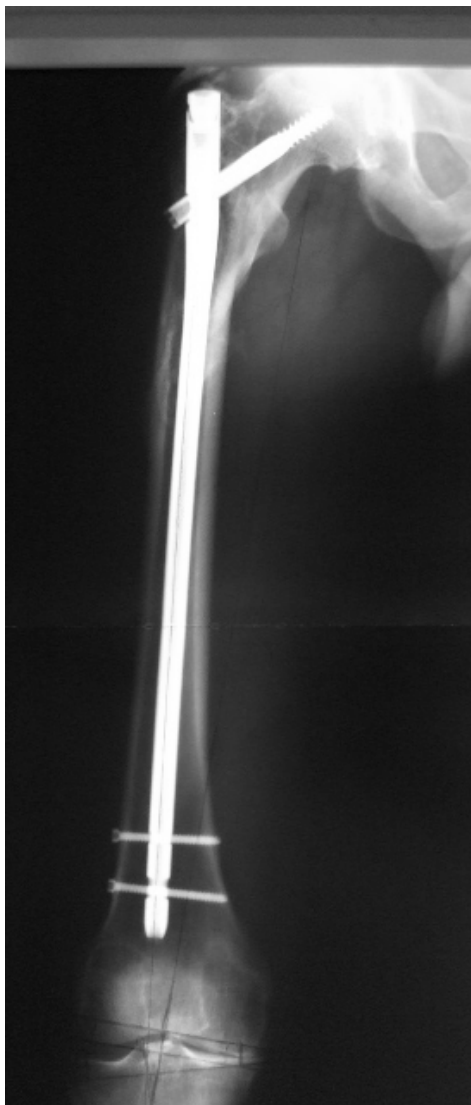
Contraindication for IM Femoral Alignment



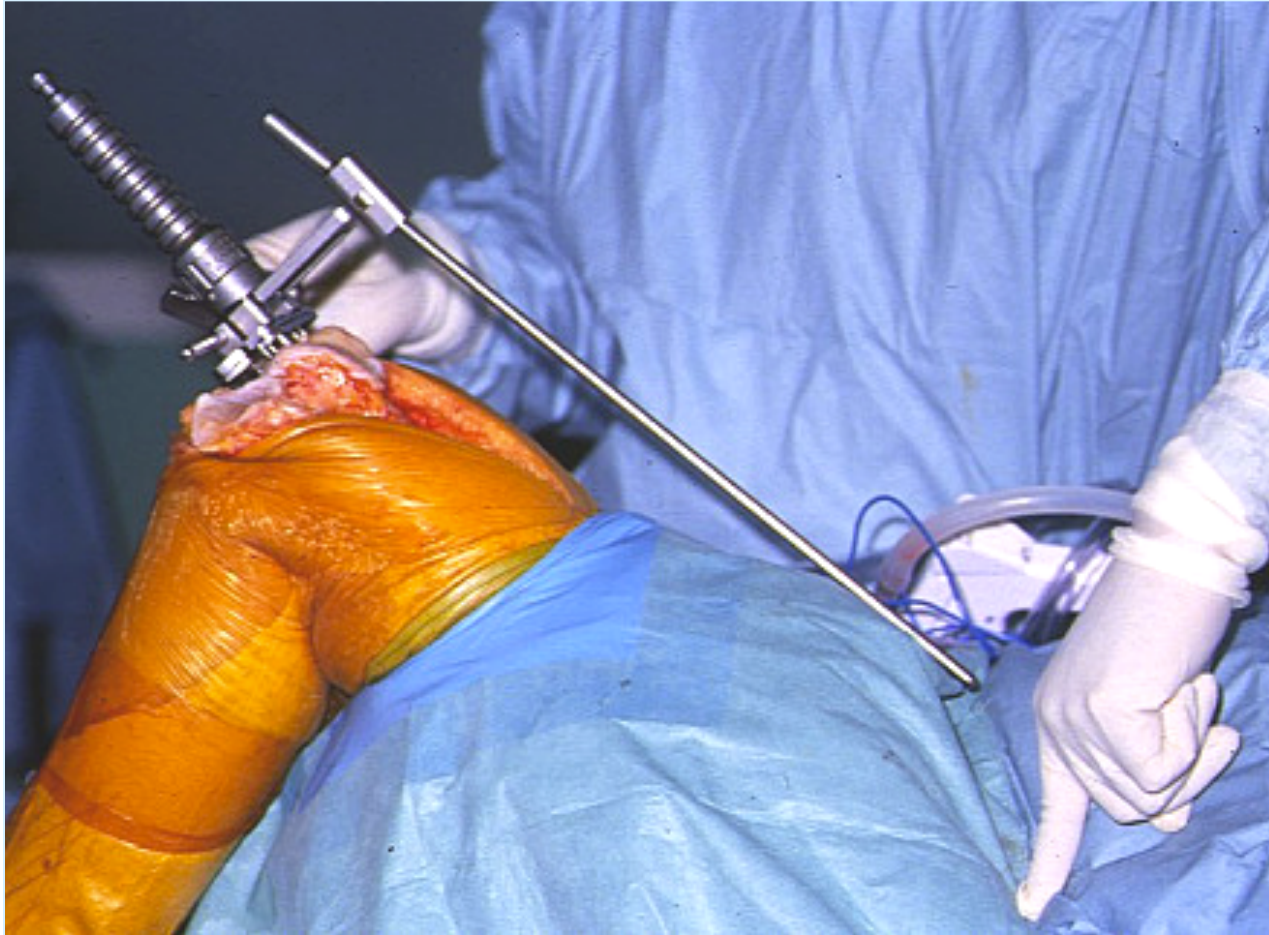
Bowed Femur



Retained Hardware



ASIS Inaccuracy



Siegel, *J Arthropl* 1991

Proper Femoral Alignment in Frontal Plane

	EM	IM
Tillet, 1988	88.0%	96.0%
Engh, 1990	68.8%	87.5%
Cates, 1993	72.0%	85.6%
Ishii, 1995	88.0%	92.0%
<i>Metanalysis</i>	79.0%	90.0%

Computer Assisted EM Alignment

The interface displays two views of a knee joint: **Tibia_AP / Femur_AP** (Anteroposterior) on the left and **Tibia_LAT / Femur_LAT** (Lateral) on the right. Both views show a 3D model of the femur and tibia with alignment guides overlaid. The femur is highlighted in cyan and the tibia in red. A yellow vertical line indicates the mechanical axis. The femur is labeled 'Femur' in green text.

Internal 3.5° **Valgus 0.0°**

Internal 3.5° **Flexion 5.5°**

Nav Distal Guide | Place the block and distal stylus on the alignment guide. Impact floating spike. Remove alignment guide and all attached instruments. Pin the block per Varus/Valgus indicators. Resect the distal femur.

Touch checkpoint | **Passive 2in1 Ball** | **Distal Guide Right** | **Screen Snapshot**

Femur | **Tibia**

PHILIPS BV300

Computer Assisted EM Alignment

- Expensive
- Time consuming

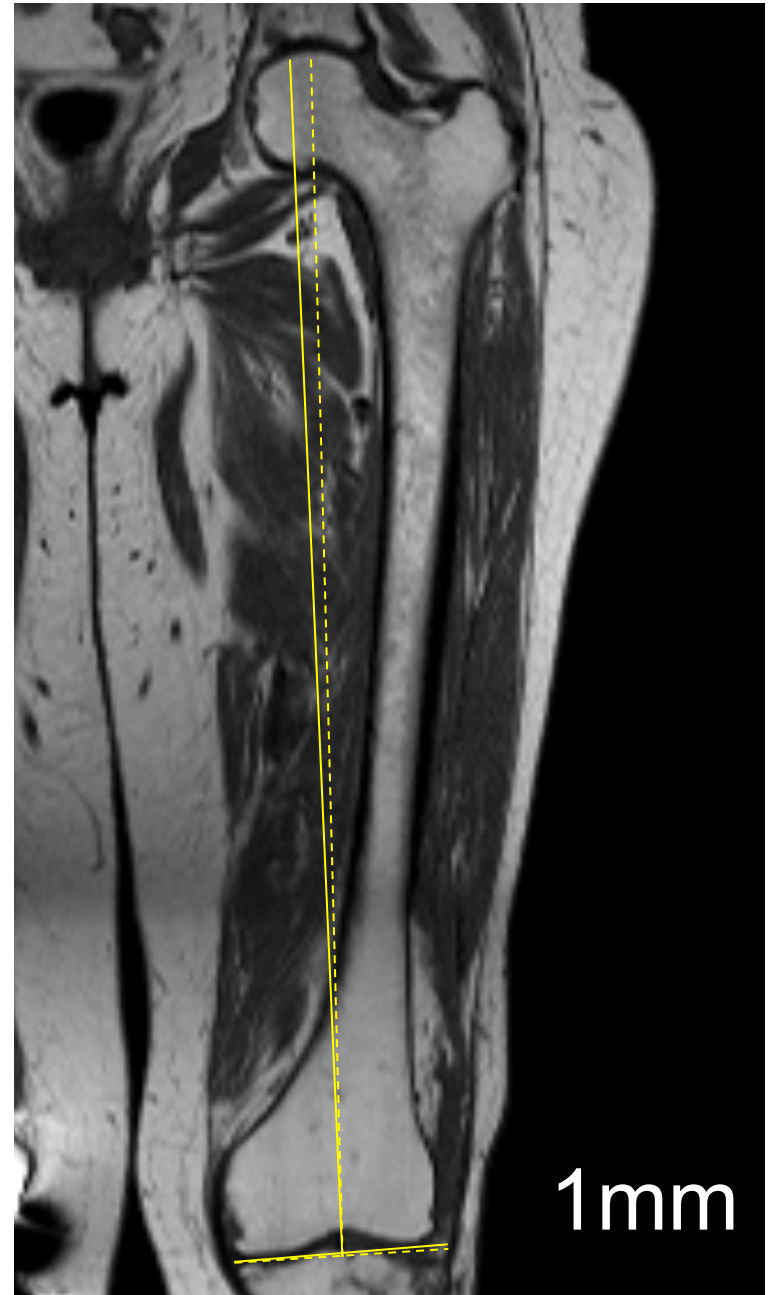
The Journal of Arthroplasty Vol. 21 No. 4 Suppl. 1 2006

Computer-Assisted Surgery: A Wine Before its Time

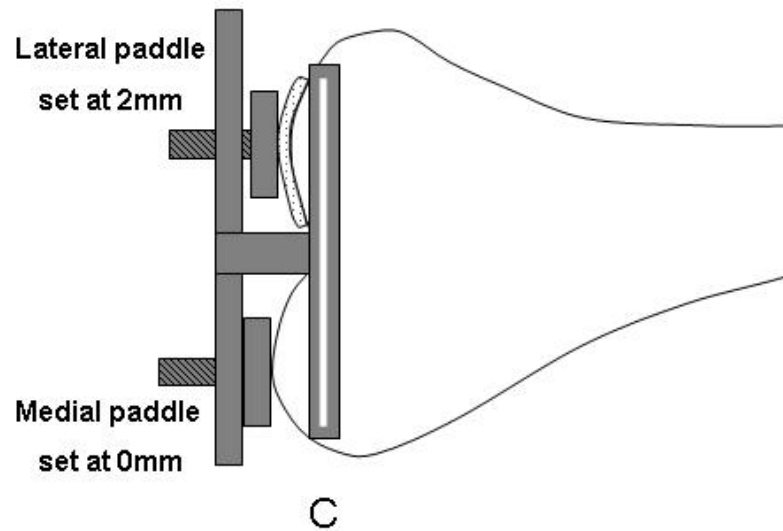
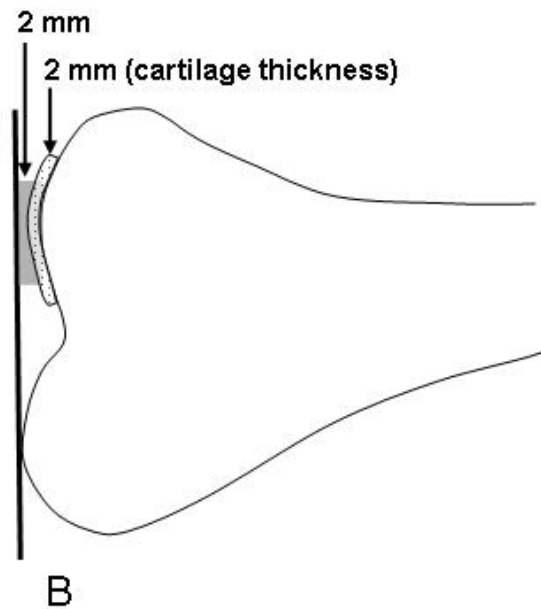
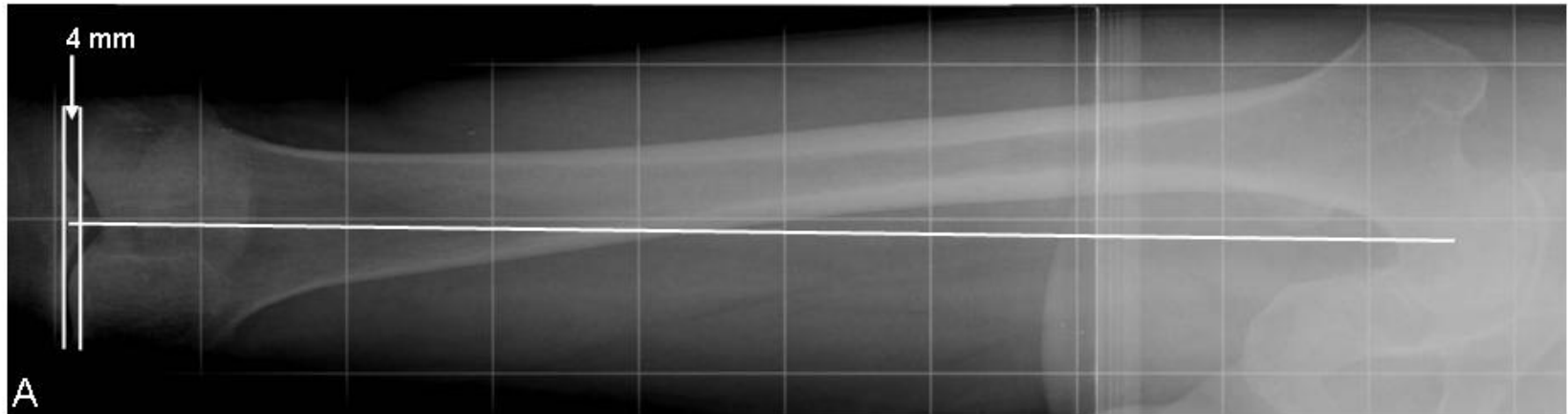
In the Affirmative

John J. Callaghan, MD, Steve S. Liu, MD, and Lucian C. Warth, BS

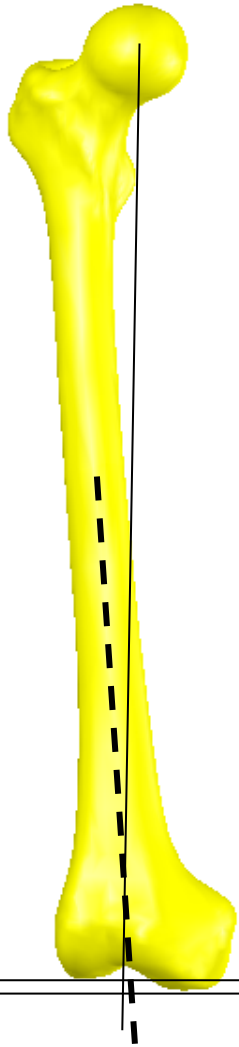
Pre-op MRI Guided Surgery



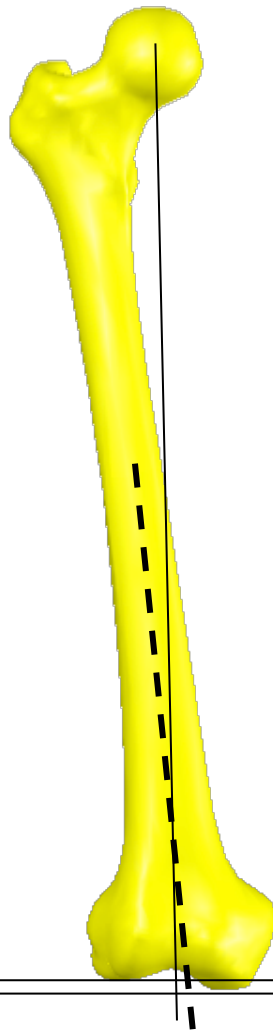
Pre-operative Templating



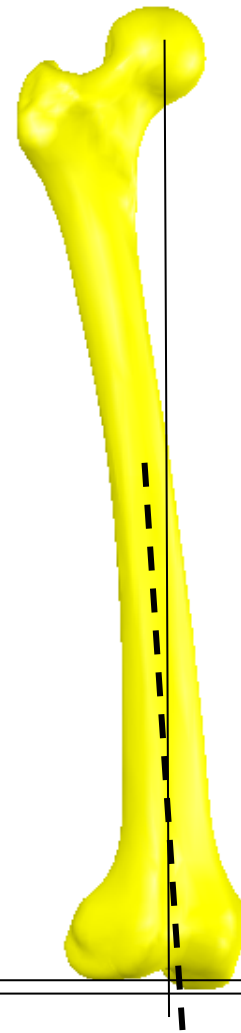
20° ER



0°



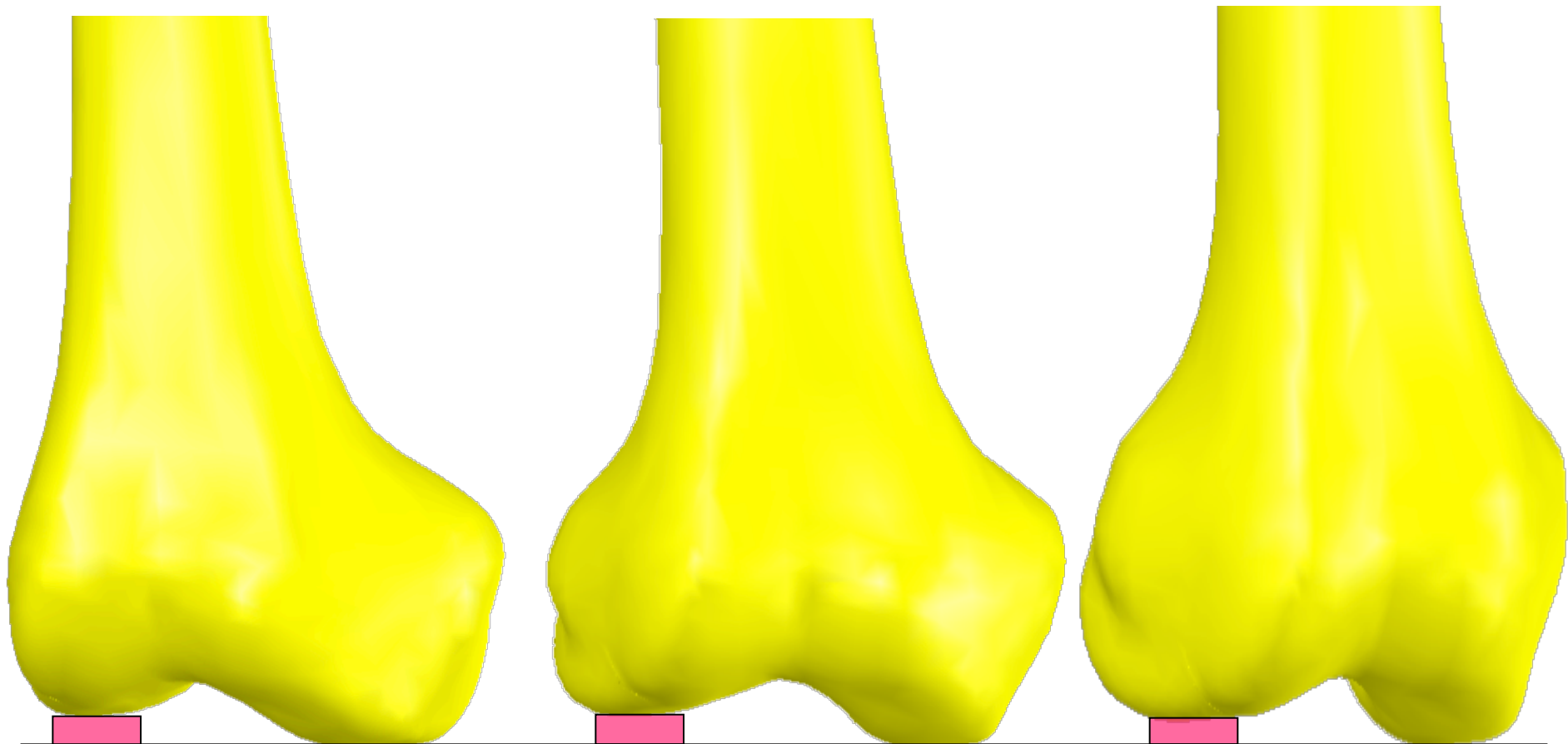
20° IR



20° ER

0°

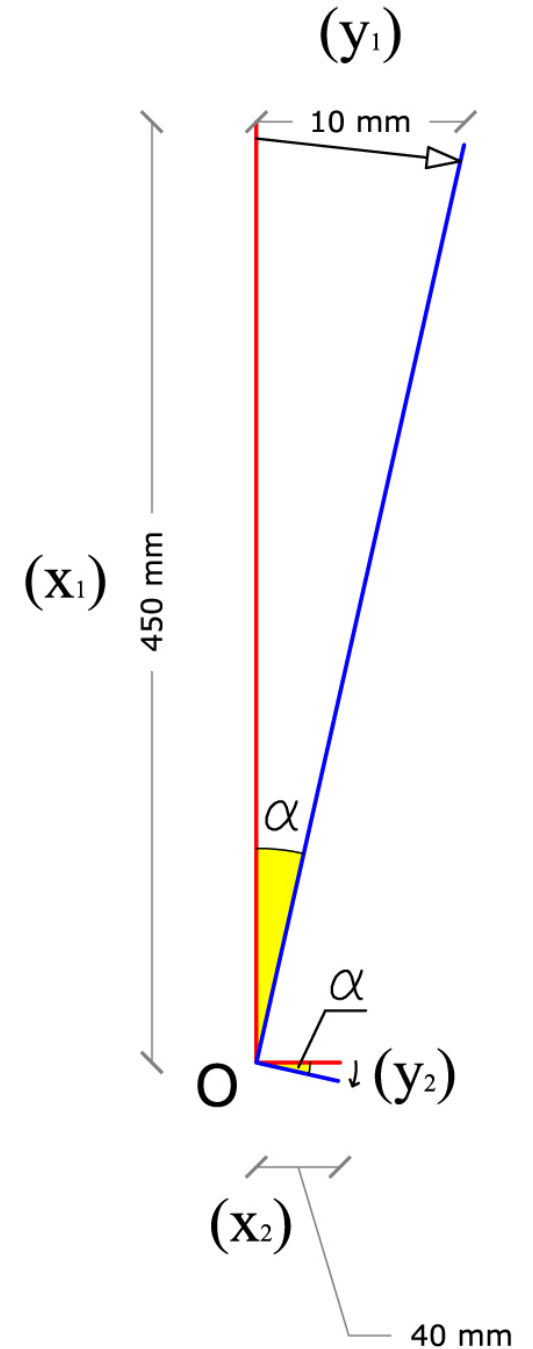
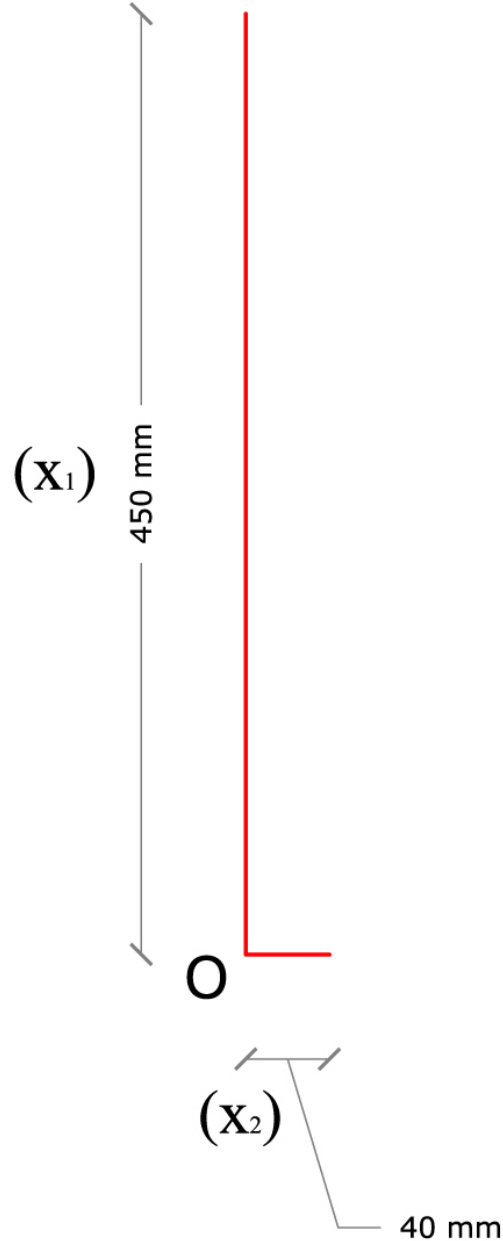
20° IR

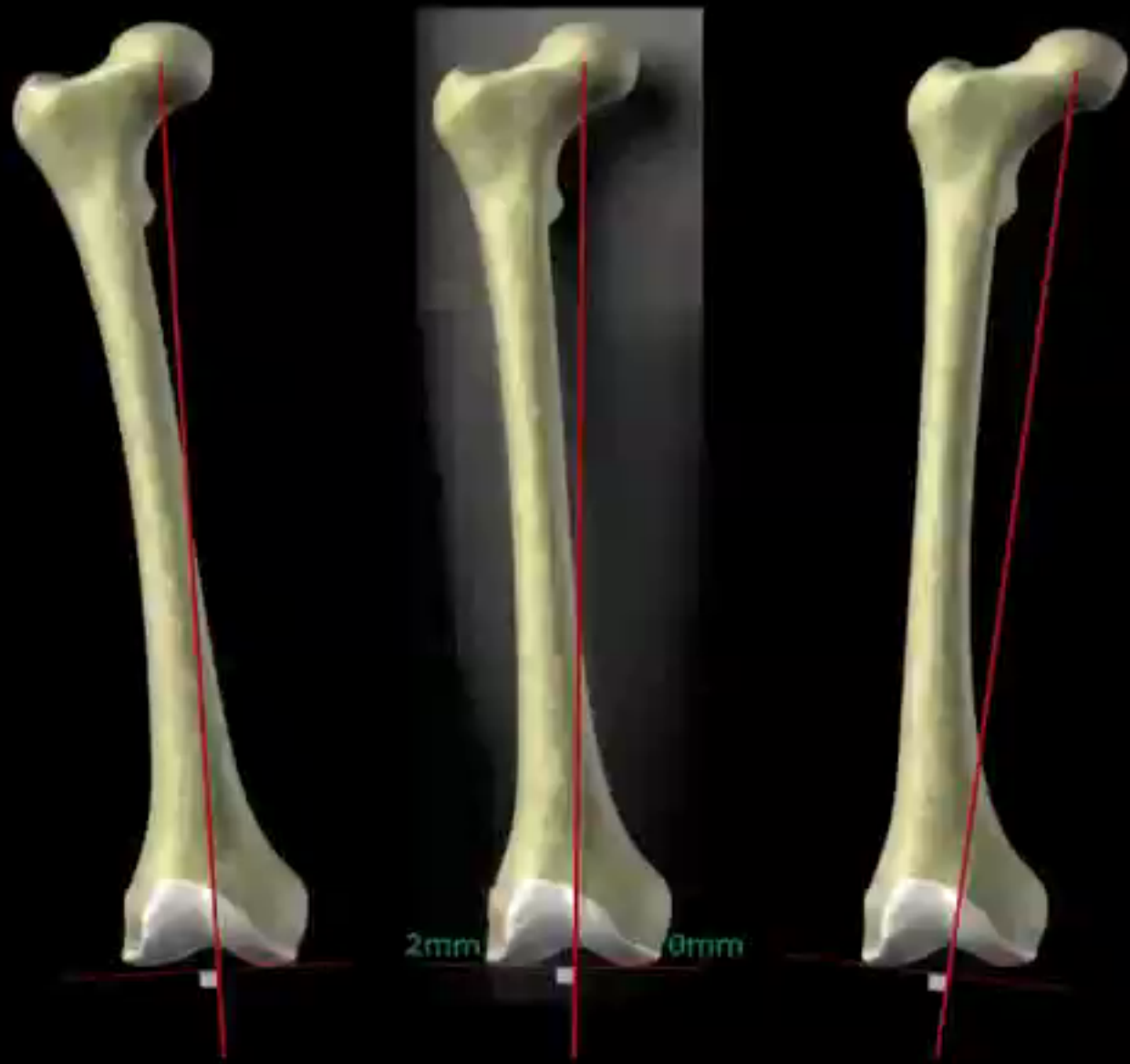


$$\frac{y_1}{x_1} = \operatorname{tg} \alpha = \frac{y_2}{x_2}$$

$$\frac{10}{450} = \operatorname{tg} \alpha = \frac{y_2}{40}$$

$$y_2 = \frac{40 \times 10}{450} = 0,8 \text{ mm}$$







Prospective Study

- Group 1: IM Femoral Alignment (30 Patients)
- Group 2: Extra-Bone Alignment (30 Patients)

COMPARING

- 1. Accuracy of the femoral component positioning**
- 2. Blood loss**

Demographic Patients data

	IM group	EM group
Age	71 (58 - 82)	70 (59 - 80)
Female/male ratio	2/1	1,7/1
Body mass index	28.6 (27 - 33)	28.9 (27 - 34)
Varus deformity	8° (4 - 25)	6° (3 - 22)



Studio prospettico randomizzato allineamento femorale EM vs IM

IM

EM

Iniziali paziente: _____

Eta': _____

Data intervento: _____

Sesso: _____

Altezza: _____ Peso: _____

Lato: _____

Valutazione R₀

Asse meccanici _____ °

Angolo tra asse _____ °

Offset femore distale (millimetri) _____ mm

Condilo femorale prominente

Mediale

Nessuno

Laterale

Clinica**

Circonferenza ginocchio sovrarotulea (cm)

Preop: _____ IVGiornata: _____

Perdita totale in drenaggio

Cc: _____

Reinfusione da drenaggio

Cc: _____

Autologa

Si

No

Numero sacche: _____

Omologa

Si

No

Numero sacche: _____

Elevazione attiva ad arto esteso

Giornata: _____

Raggiungimento 90 gradi di flessione passiva

Giornata: _____

Valori EMATICI	PREOPERATORI	II giornata	IV giornata
hgb (gdl)			
Hct (%)			
RBC			
Plt			
pt			
ptt			
Inr			

Valutazione Rx postoperatoria ***

Asse meccanico (sotto carico, anca-talo) _____ °

Varo

Neuro

Valgo

Asse coronale femorale (angolo alfa) _____ °

Asse sagittale femorale (angolo gamma) _____ °

Notching femore sagittale

Presente

Assente

Divergenza troclea – corticale anteriore _____ °

* a cura del chirurgo operante

** a cura dei gruppi che partecipano allo studio clinico

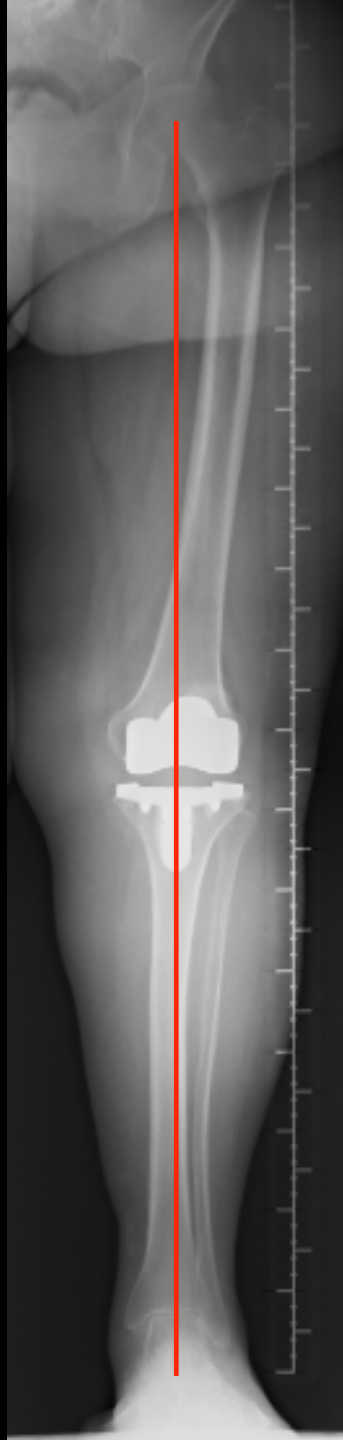
*** a cura dell'esaminatore blinded

TIPOLITO DUEMILA GROUP s.r.l. (FI)

F - UP: min. 6 months

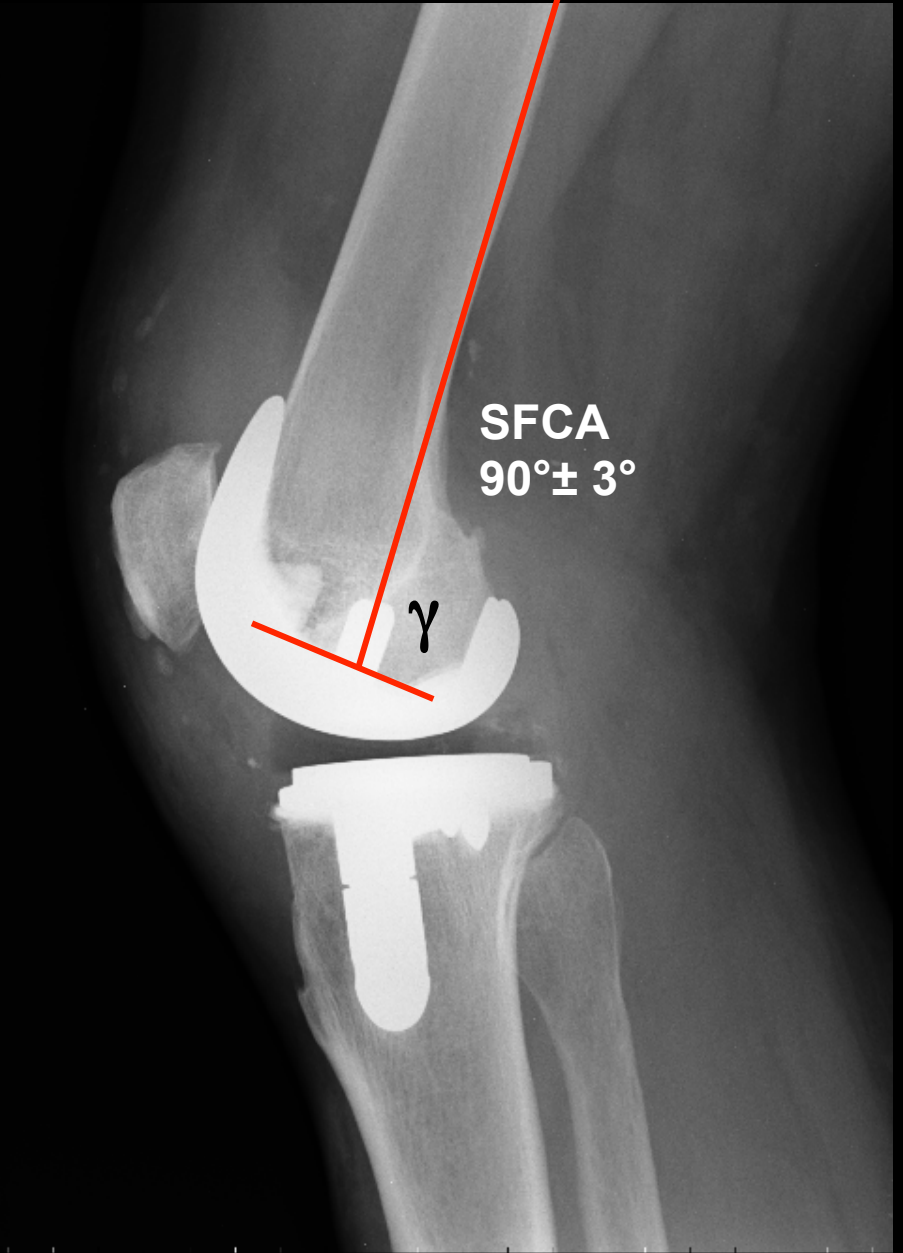
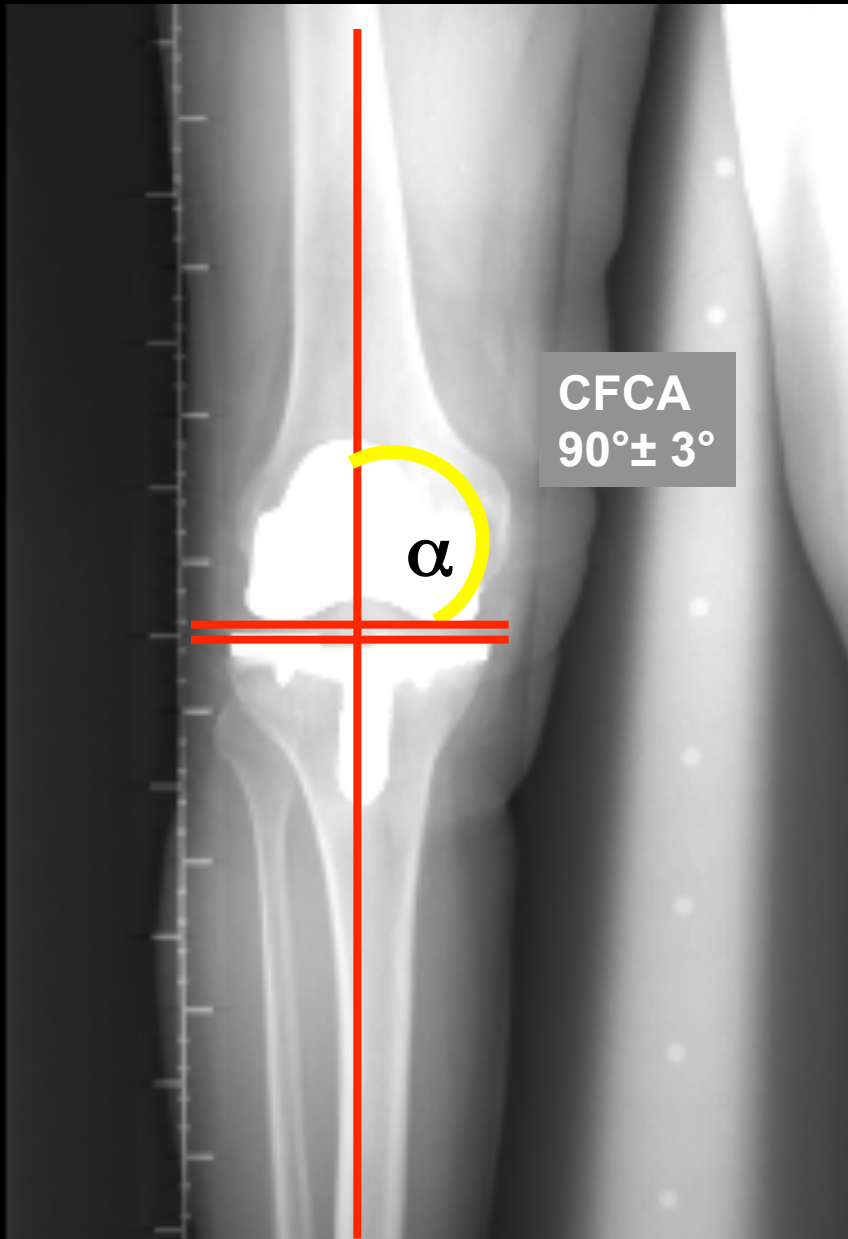
CLINICAL OUTCOME: IKS score

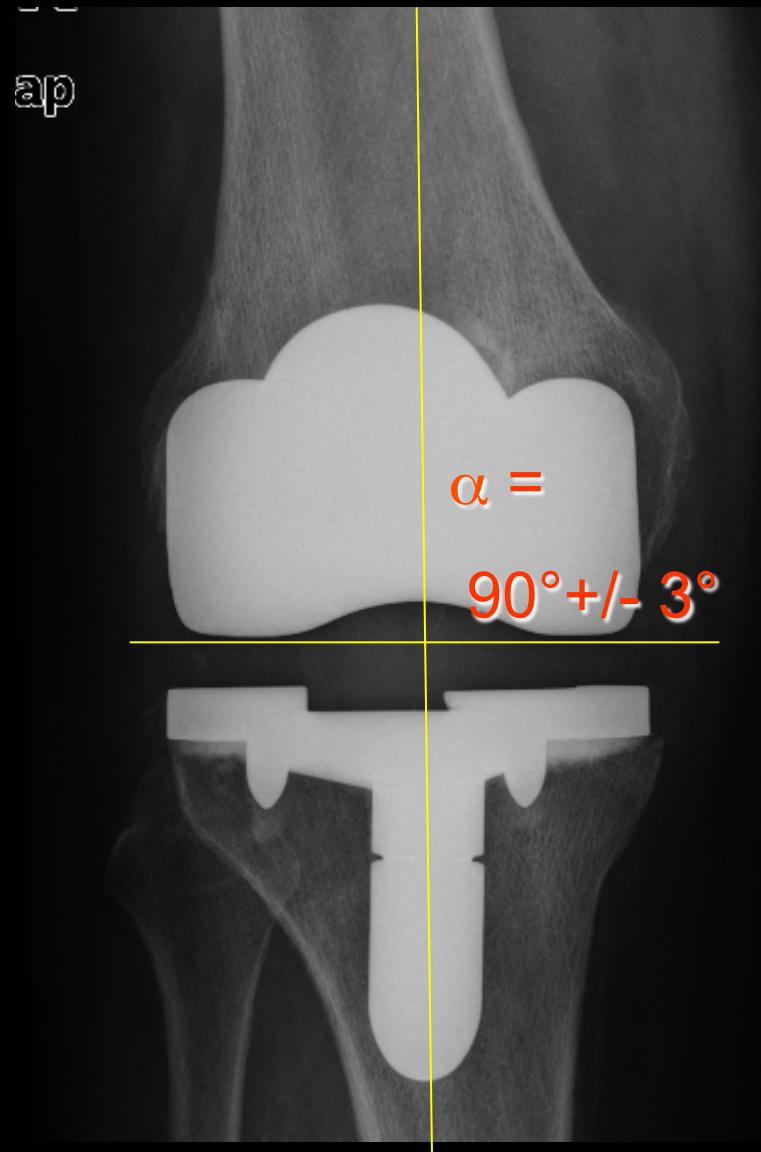
RX OUTCOME: KS TKA RX form

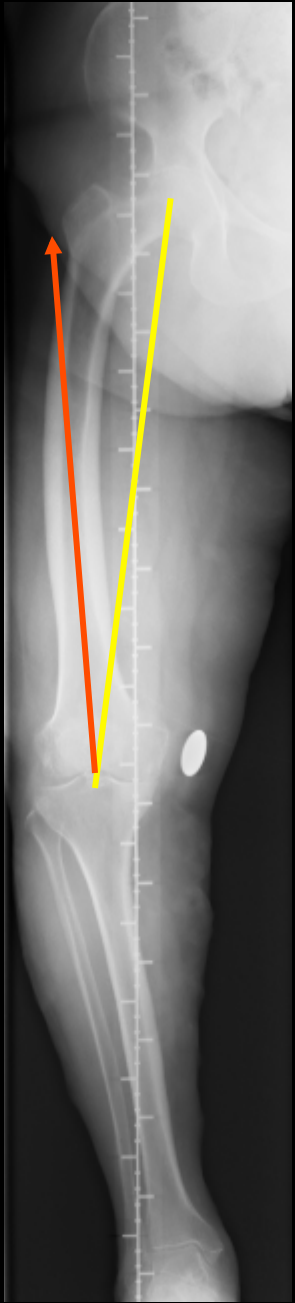


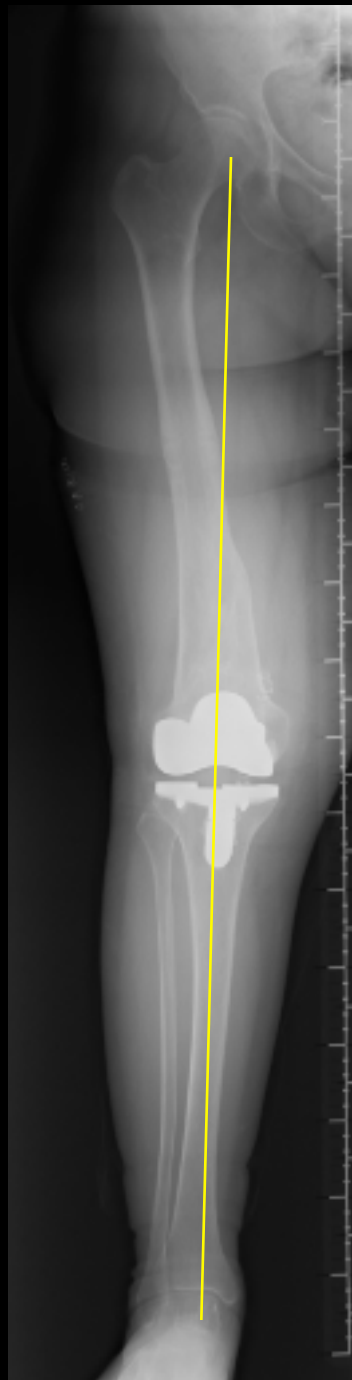
Mechanical axis
= $0^{\circ} \pm 3^{\circ}$

RADIOGRAPHIC RESULTS
Knee Society TKA RX evaluation
form
Ewald FC, 1988



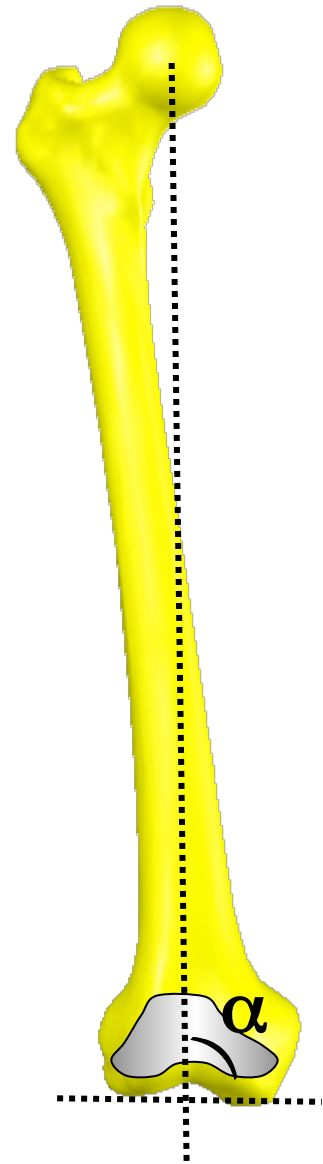
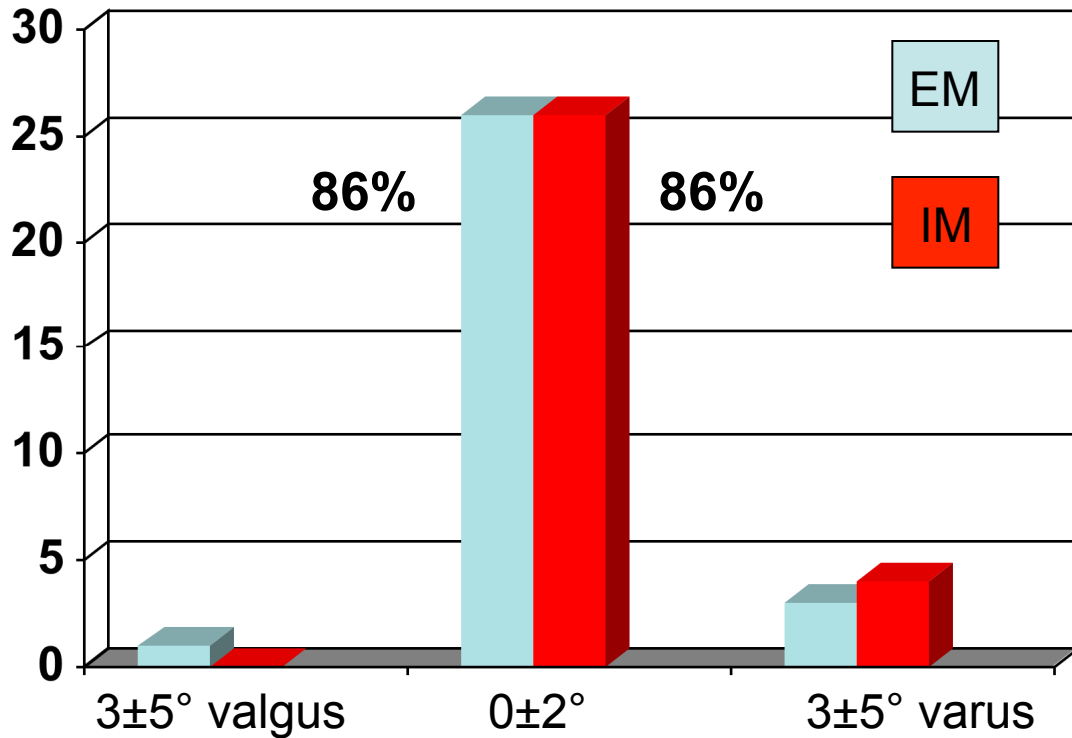






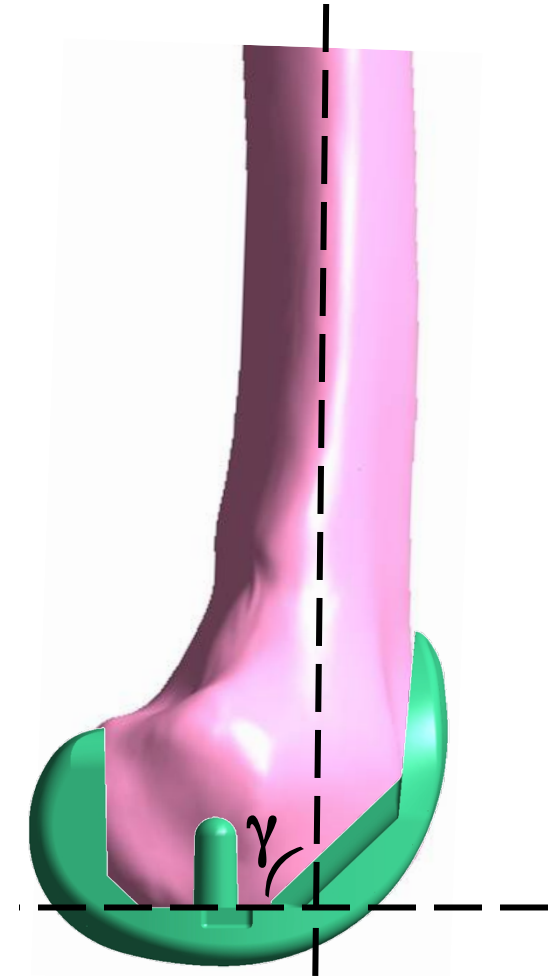
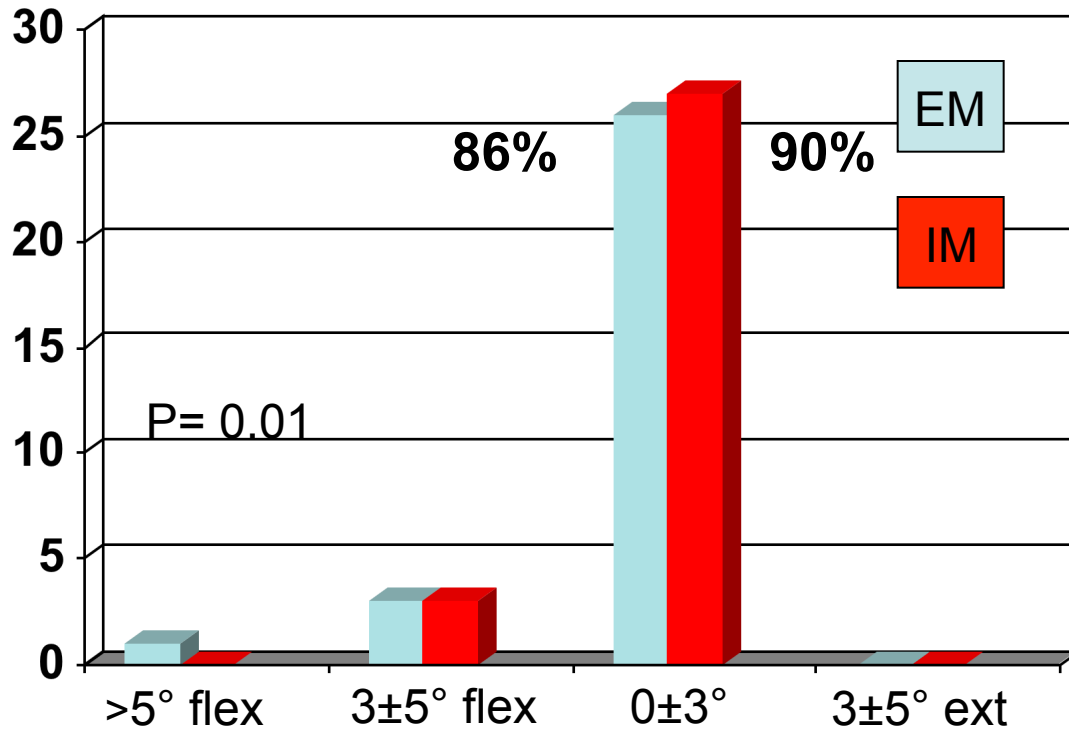
Results

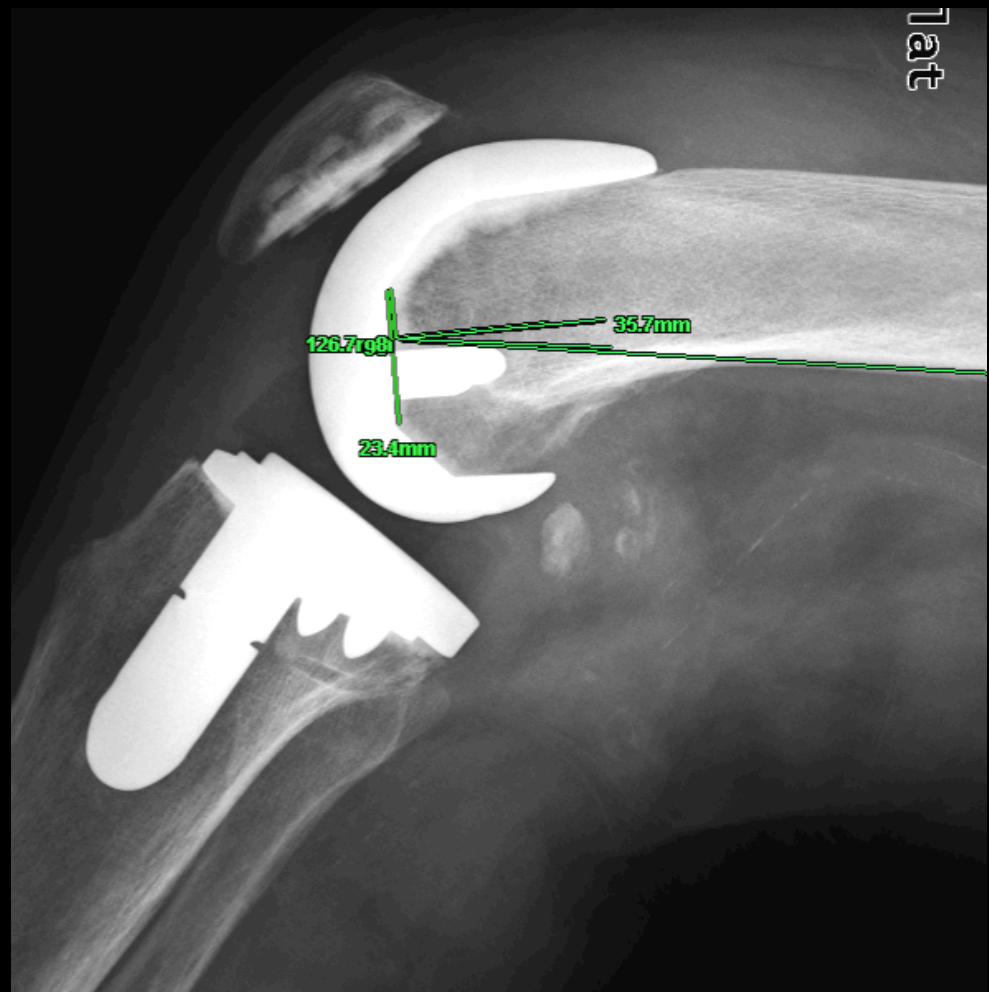
Coronal plane



Results

Sagittal plane





> 5° = 1 case EM

INTRAMEDULLARY GROUP

SURNAME, NAME	SEX	AGE	HEMOGLOBIN (g/dL)			BLOOD BAGS		BLOOD REINFUSION DRAIN (ml)
			Day before surgery	Second day after surgery	Fourth day after surgery	Autologous	Omologous	

1	N.M.	F	72	12.6	7.8	11.7	0	2	0
2	R.G.	F	76	9.8	7.9	8.4	2	2	500
3	Z.L.	F	66	12.3	9.2	8.8	0	1	350
4	C.B.	M	74	13.5	10.1	10.4	1	0	500
5	B.M.	F	69	13.3	7.7	8.9	2	0	0
6	Z.G.	F	72	12.5	9.4	9.0	2	0	400
7	T.S.	F	68	12.8	9.0	9.0	1	0	250
8	P.G.	F	71	11.8	7.7	8.6	1	1	500
9	G.A.	F	77	11.8	7.9	9.0	0	1	500
10	D.B.	F	73	13.2	8.0	7.9	1	1	500
11	B.T.	F	77	14.9	10.4	10.0	1	0	300
12	B.I.	F	70	12.3	9.0	9.1	1	0	0
13	M.M.	F	75	13.0	9.8	9.5	1	0	300
14	S.N.	F	71	12.7	12.2	12	1	0	0
15	G.T.	F	85	11.0	8.8	9.2	1	0	250
16	L.E.	M	81	12.0	10	10.8	1	0	400
17	B.G.	F	77	13.6	10.8	10.7	0	0	500
18	V.E.	M	67	14.3	10.7	10.5	1	0	600
19	Z.G.	F	73	12.2	8.6	9.0	1	0	200
20	C.V.	M	69	14.3	10.2	10	1	0	0
21	M.M.	F	75	13.9	11.8	11.3	1	0	250
22	P.P	M	64	13.2	9.6	9.5	2	0	450
23	R.A.	F	71	14.2	7.9	7.7	1	1	600
24	S.M.	M	75	15	11.2	11.3	1	0	600
25	C.P.	F	62	12.9	12.4	12.1	1	0	250
26	D.G.	F	69	11.6	10.7	10.7	1	0	600
27	G.S.	F	82	14.2	9.3	9.0	1	1	350
28	P.G.	M	70	14.6	9.2	9.4	1	0	350
29	C.G.	F	71	13.6	10.9	11	1	0	550
30	F.O.	M	68	15.1	10	10.7	1	0	700

EXTRAMEDULLARY GROUP

SURNAME,NAME	SEX	AGE	HEMOGLOBIN (g/dL)			BLOOD BAGS		BLOOD REINFUSION DRAIN (ml)
			Day before surgery	Second day after surgery	Fourth day after surgery	Autologous	Omologous	

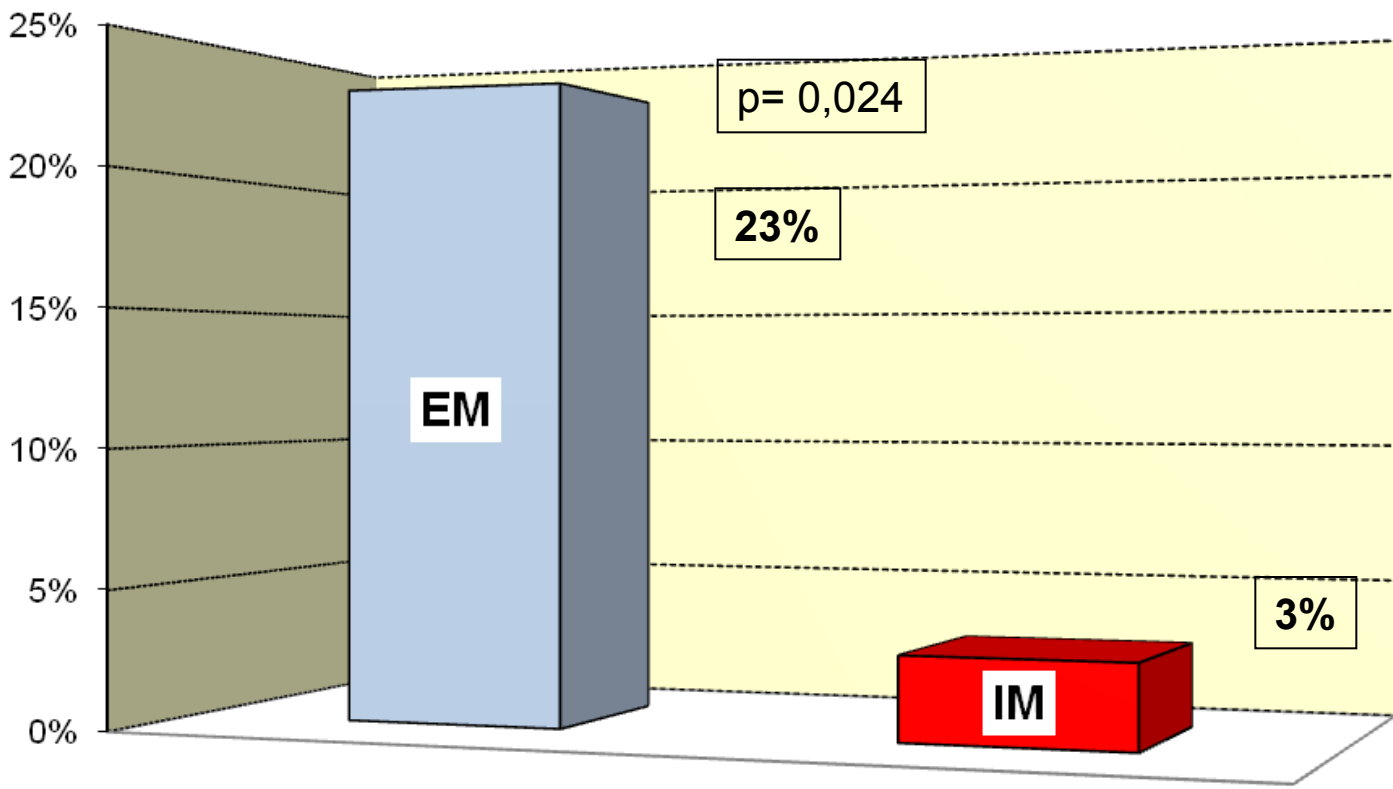
1	B.B.	M	71	11.8	7.3	7.9	1	1	400
2	Z.G.	F	63	10.5	8.8	8.3	1	0	200
3	G.I.	F	81	12.9	9.3	8.8	0	1	500
4	V.A.	F	72	11.5	7.5	8.6	0	1	500
5	P.E.	M	71	14.5	11.5	11	1	0	300
6	C.S.	M	70	15.3	12.5	12.5	1	0	450
7	C.A.	F	75	11.6	9.3	9.7	1	0	0
8	F.G.	M	69	15.3	11.7	9.2	1	0	200
9	F.I.	F	65	13.1	8.7	10.4	0	0	350
10	M.P.	F	60	11.7	9.4	9.3	1	0	500
11	T.G.	F	66	12.6	9.9	9.3	1	0	500
12	N.G.	F	78	13.2	7.9	8.6	1	1	300
13	G.M.	F	70	12.8	7.1	8.1	1	1	500
14	S.N.	F	75	11	8.6	8.2	1	2	0
15	F.G.	M	66	13	10	9.5	1	0	300
16	P.I.	F	79	13.4	10.4	8.6	0	1	0
17	S.A.	F	73	11.9	9.2	11.4	1	0	350
18	P.E.	F	78	12.9	10.8	10.2	0	0	500
19	B.A.	F	82	12.1	8.3	9.5	0	2	300
20	Z.A.	F	74	11.8	8	9.5	1	1	200
21	F.A.	F	79	14.4	8.7	10.4	0	2	0
22	C.G.	F	63	13.5	10.7	10.5	0	0	400
23	F.M.	F	66	13.3	9.7	10.6	0	1	400
24	R.L.	F	46	13.2	9.5	9.7	0	0	450
25	R.I.	M	74	12.3	8.7	9.3	0	0	450
26	B.A.	F	81	13.1	9.4	9.5	0	0	450
27	F.I.	F	66	13.8	10.8	10.5	0	0	0
28	T.V.	F	83	12.8	8.4	9.9	0	1	450
29	G.I.	F	84	12.6	8.5	9.2	0	1	0
30	M.E.	M	63	13	8.7	9.2	0	1	300

Blood Loss

- Blood reinfusion in the first 6 hours after surgery
- Transfusion in the first 4 days after surgery
- Haemoglobin changes
 - ◆ *No statistically significant difference relating to overall blood loss*
 - ◆ *Lower number of transfusion carried out on patients in the EM group is statistically significant*



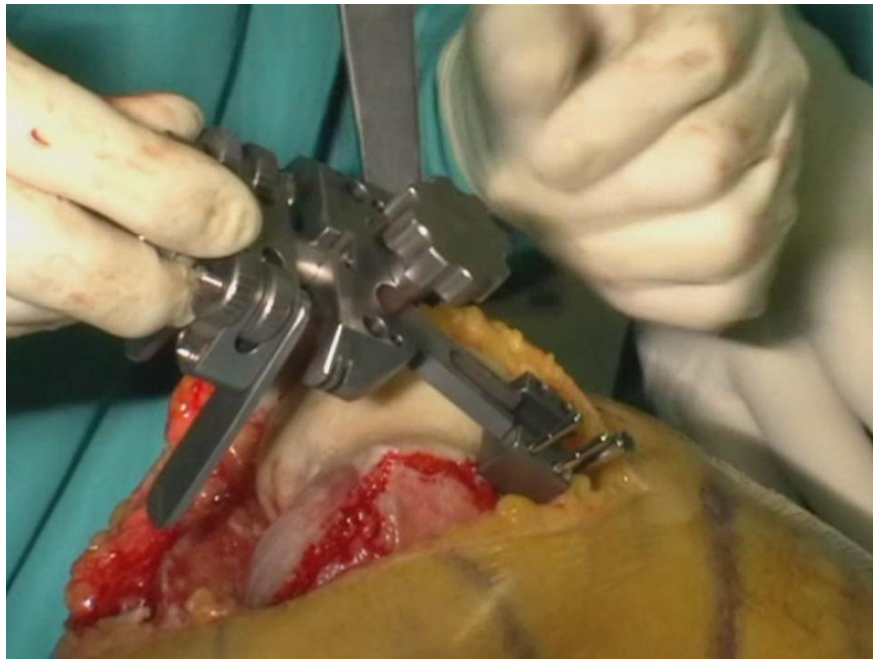
PATIENT NOT TRASFUSED



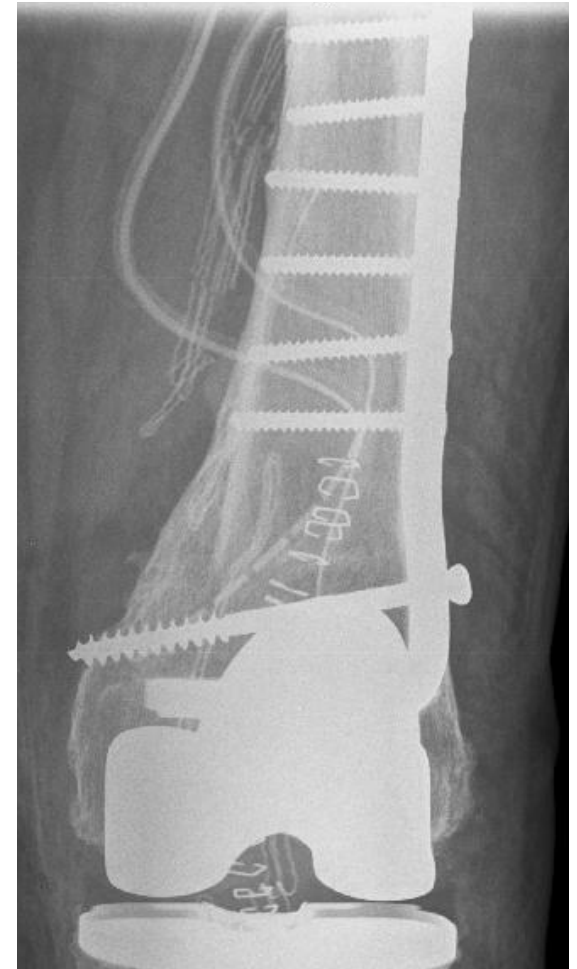
□ 1 ■ 2

Summary

Extra-medullary reference based on preoperative plain RX of the AP femur can be safely used during TKA



Avoiding the violation of the femoral canal may enhance the benefits of a less invasive approach



THANKS