

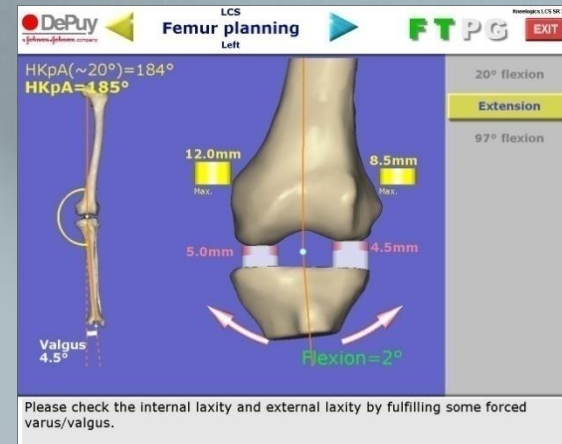
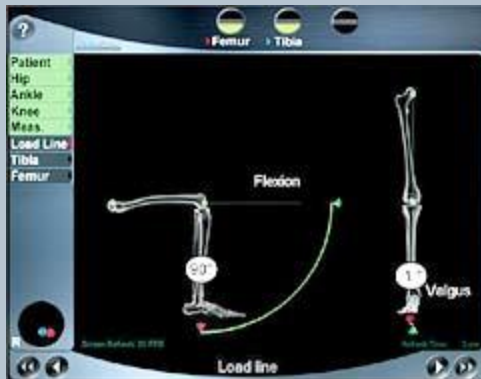
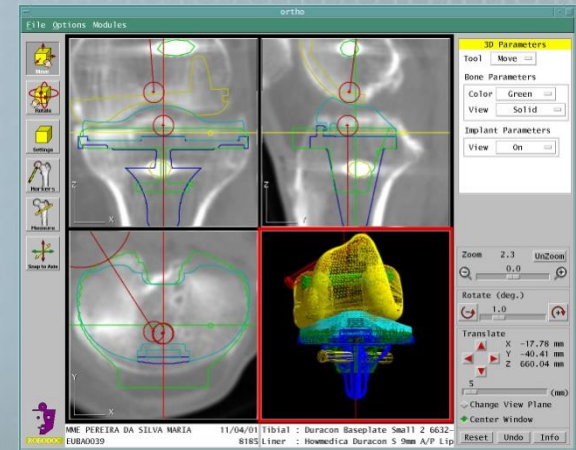
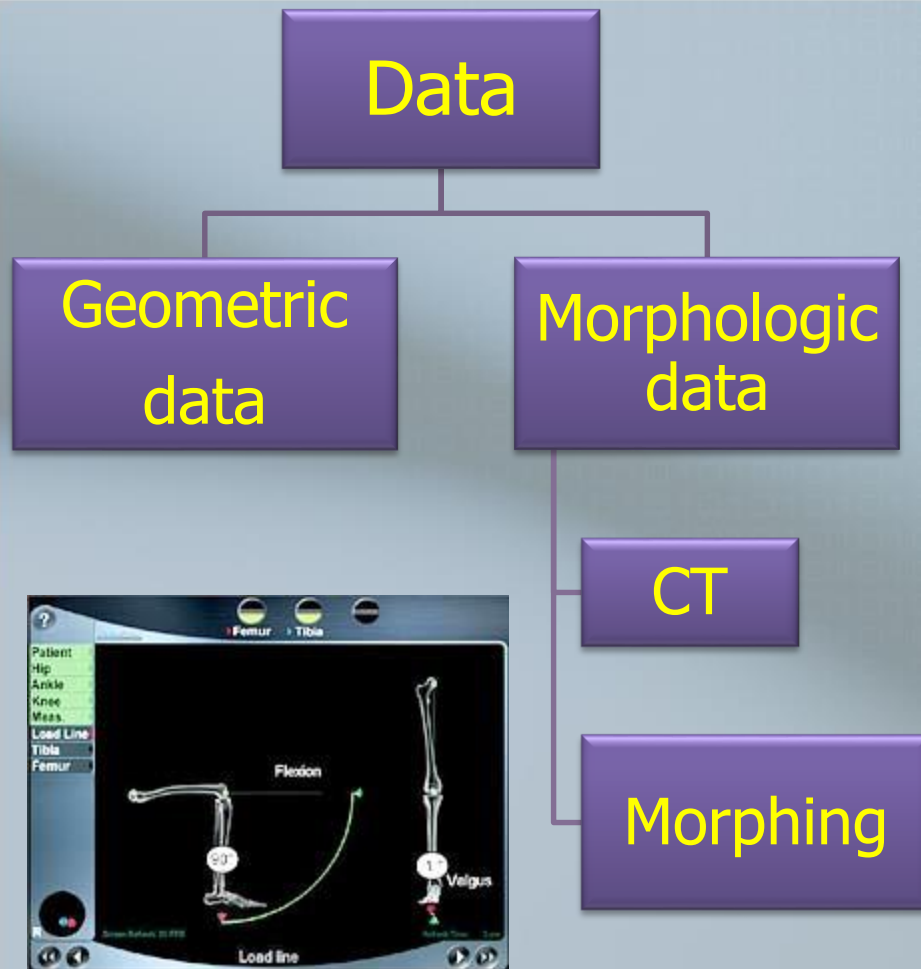


Computer Assisted Knee Surgery

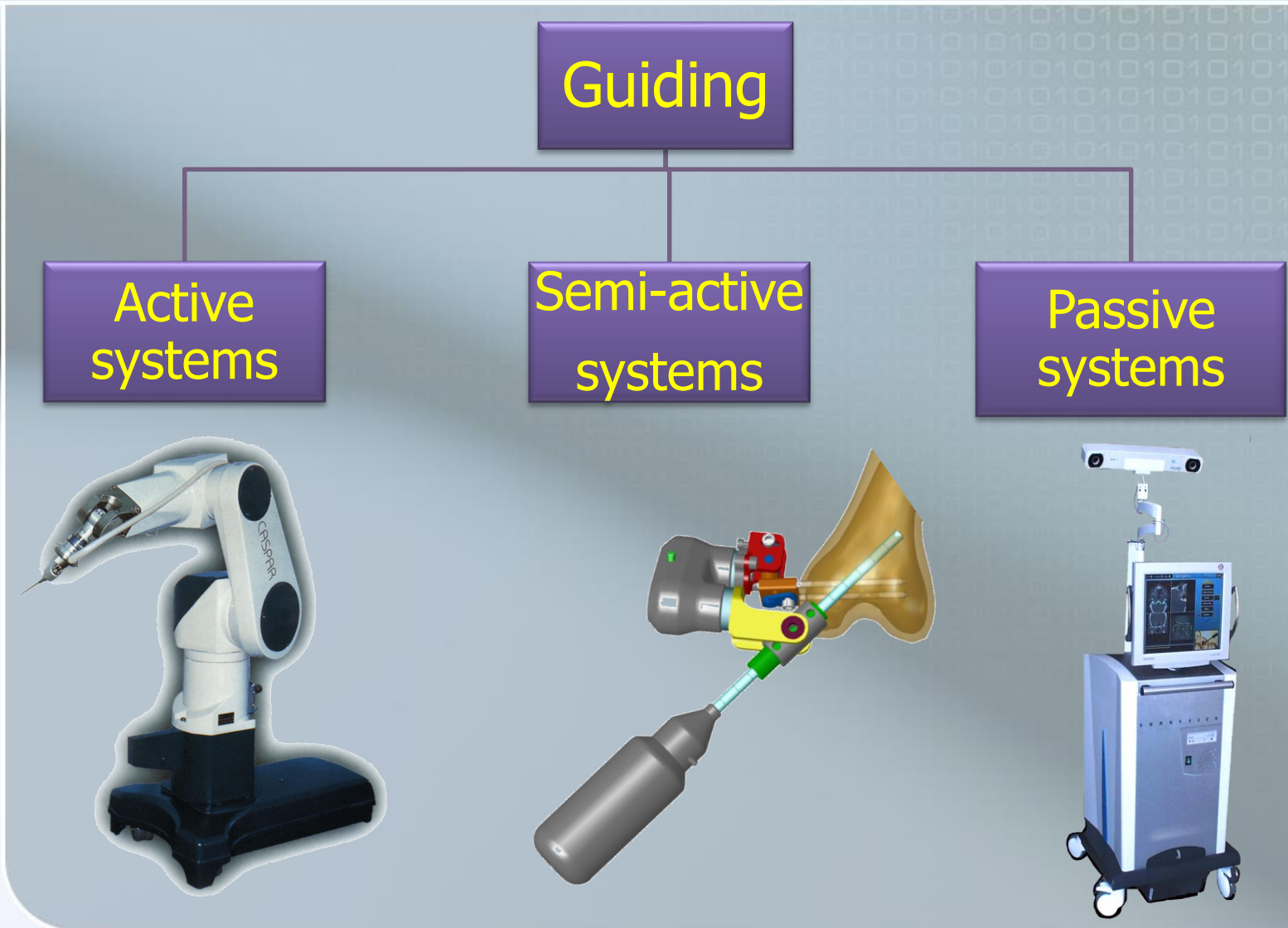
A literature review

Eric Stindel – MD – Ph D – Brest - France

Classification system



Classification system



Material and method

- Literature review

- TKA
- Computer
- EndNote X1
- Medline
- Clinical papers only



Material and method

- Evidence based medicine
- Level 1: (GRADE A)
 - Large randomized studies (high power)
 - Meta-analysis
- Level 2: (GRADE B)
 - Randomized studies (low power)



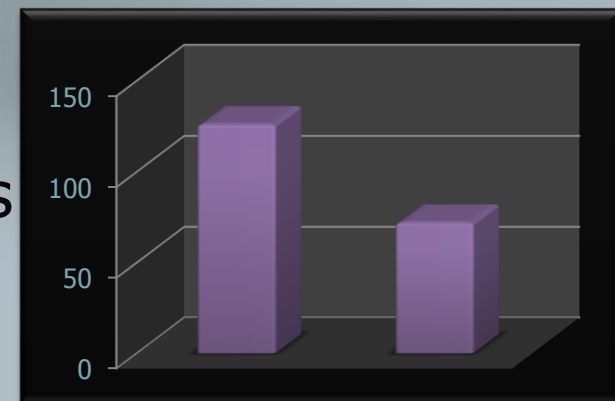
Material and method

- Evidence based medicine
- Level 3: (GRADE C)
 - Non randomized contemporary studies
 - Cohort studies
- Level 4: (GRADE C)
 - Comparison with historical data
- Level 5: (GRADE C)
 - Retrospective studies or case reports



Results

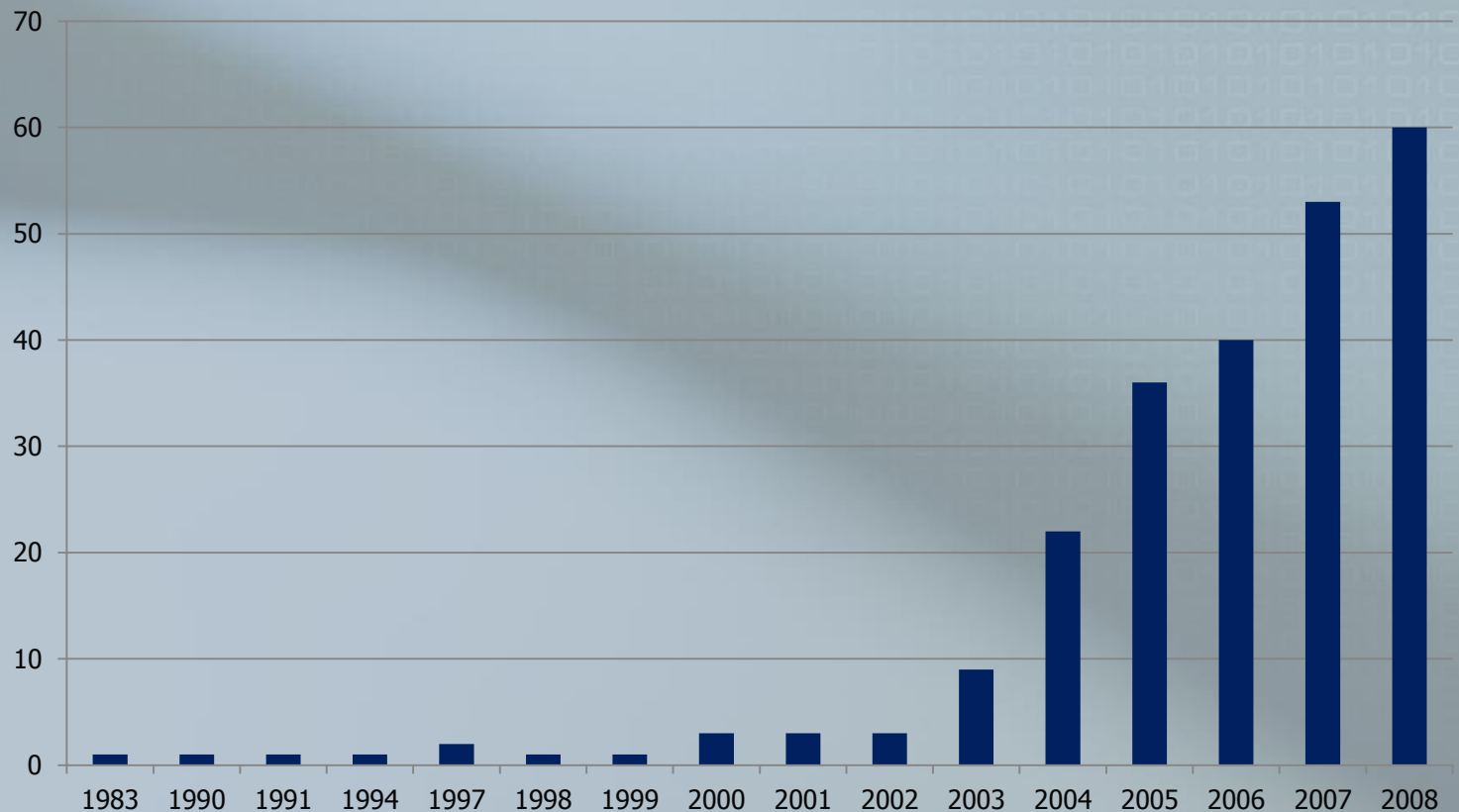
- Raw data
 - 198 references in peer review journals
 - 126 non-clinical papers
 - Modelization
 - Algorithms
 - Saw-bones and cadavers
 - 72 clinical papers



Results

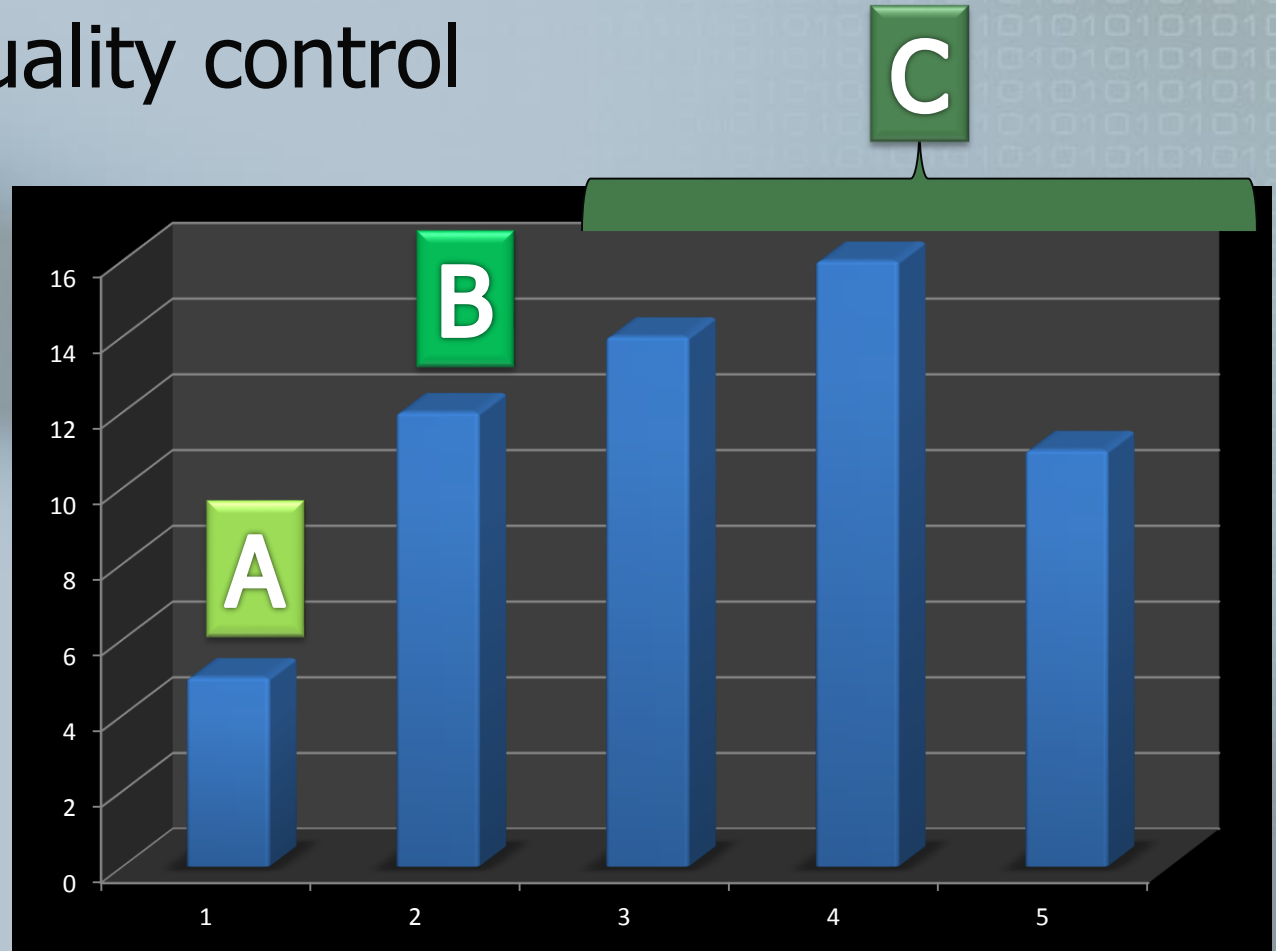
■ When it all started ?

Number/ Year



Results

■ Quality control



Results

- Alignment: the most studied criterion
 - 58 papers have been analyzed
 - 45 focused on alignment

CAS

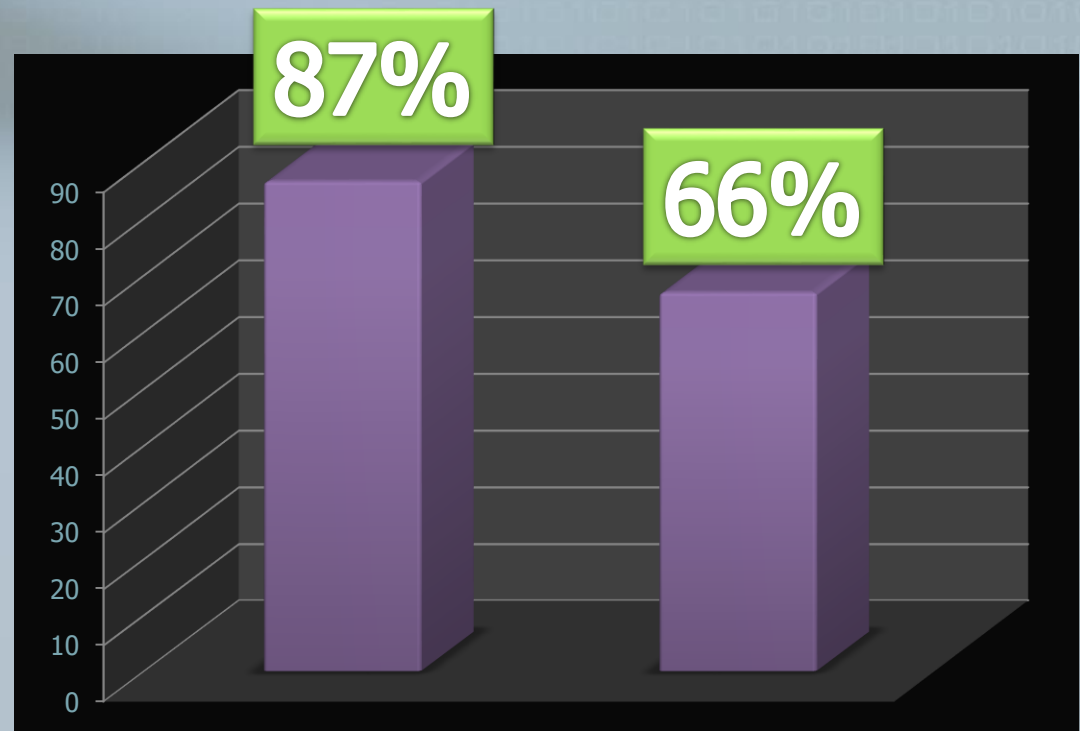
(87%+/-22)

NCAS

(67%+/-20)

No diff 4

Less outliers



Results

■ Ligament balance (4 papers)

- Computer-assisted navigation for total knee arthroplasty: a comparative study with conventional methods. Leng
Zhonghua Yi Xue Za Zhi. 2007 Nov 20;87(43):3035-7

The soft tissue balance angle was significantly less in CAS group

- Using navigation intraoperative measurements narrows range of outcomes in TKA. Picard, 2007, CORR, 463,50-7

Varus stress angle = 3,2° Valgus stress angle = 2,3°

- In vivo stability of TKA using a navigation system. Seon, Int Orthop, 2007, 31 (1): 45-8

Varus stress angle = 3,5° Valgus stress angle = 4,4°



Results

- Ligament balance (4 papers)
- Comparative study of stability after TKA between navigation system and conventional techniques . Song
J. Arthroplasty. 2007, 22(8):31107-11

	CAS (42)	NCAS (44)
Medial	3.5	4
Lateral	4.4	4.2



Results

■ Clinical outcomes: mid term (3 papers)

Computer navigation versus conventional implantation for varus knee total arthroplasty: A case-control study at 5 years follow-up. Molfetta, Knee, 2008, 15(2):75-9

30/30 cases

No difference in clinical outcomes

Comparison of functional results with navigation-assisted minimally invasive and conventional techniques in bilateral total knee arthroplasty. Seon, Computer Aided Surg, 2007,12(3):189-93

42 bilateral TKA

Better HSS score at 6 and 9 month

No difference at 1 year

No difference in ROM at 1 year



Results

■ Clinical outcomes: mid term (3 papers)

Computer navigation versus conventional total knee replacement: no difference in functional results at two years. Spencer, J Bone Joint Surg Br, 2007, 89(4):477-80.

30/30

No difference in KSS at 2 years of follow up

Only 4 papers

Low number of patients: Low statistical power
Justification for META-ANALYSIS



Results

■ Clinical outcomes: Long term (1 paper)

An 8- to 10-year follow-up of 26 computer-assisted total knee arthroplasties. Saragaglia, Orthopedics, 2007, 30(10 Suppl):S121-3

26 cases

2 revisions

90% of survival rate at 10 year



Results

- Revision and Patella
 - Revision: report of cases showing the feasibility
 - Patella: kinematics studies of non revised patella
 - (1 paper)



Results

- Complications

- Femoral fractures

- Jung 2 cases (JBJS 2007)

- Ossendorf 1 case (Knee 2006)

- Wysocki 2 cases (J. of Arthroplasty)

- Tibial fracture

- Manzotti 1 case (Knee Surg. 2008)



Results

- Meta-analysis – Level 1 – (3 papers)
- Bathis 2006 - Orthopad
- Bauwens 2007 - JBJS
- Mason 2007 - JBJS
- Letters to the editor and comment (katz and Losina)



Results

- Meta-analysis – Level 1 – (3 papers)
- Bathis 2006
 - 13 studies
 - 93,9% CAS – 75,6% N-CAS
 - Diff. were significant in 11 out of 13
 - No clinical difference



Results

- Meta-analysis – Level 1 – (3 papers)
- Bauwens 2007
 - 33 studies – 3423 patients
 - Strong statistical heterogeneity
 - No difference in alignment
 - No conclusive inference possible on functional outcomes or complication rates.



Results

- Meta-analysis – Level 1 – (3 papers)
- Mason 2007
 - 33 studies – 3437 patients
 - Almost the same database ... ???
 - 9% mal-alignment in CAS / 31,8% NCAS
 - No clinical assessment



Results

- Meta-analysis – Level 1 – (3 papers)
- Need to meta-regression analysis
 - Studies are weighted with respect to their quality and sample size.
- Make individual studies **as definitive as possible** by using most rigorous designs, **powering** studies adequately, use **standardized measures** of outcomes.



Results

- Time
 - Only normalized data
 - Increased time by 23%
 - (Meta- analysis – Bauwens 2007)



Results

- Medico-economic aspects

- 2 majors papers

- Early assessment of likely cost-effectiveness of a new technology: A markov model with probabilistic sensitivity analysis of CA TKR

- Dong and Burton
 - International Journal of technology Assessment in health care
 - 2006
 - Markov model



CAS reduce the cost by 7,5% at 10 years

An assumption : 48% of better knees

Effect of CAS improvement is not known yet

Results

- Medico-economic aspects

- 2 majors papers

- The cost-effectiveness of Computer-Assisted Navigation in Total Knee Arthroplasty

- Novak, Silverstein and Bozic
 - JBJS Am
 - 2007
 - Markov model



CAS is a cost effective procedure if the extra cost stay below 629\$ per procedure

An assumption : (90% of well align versus 75%)