

METAPHYSAL RECONSTRUCTION in REVISION TKA

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Institut du Mouvement et de l'appareil Locomoteur



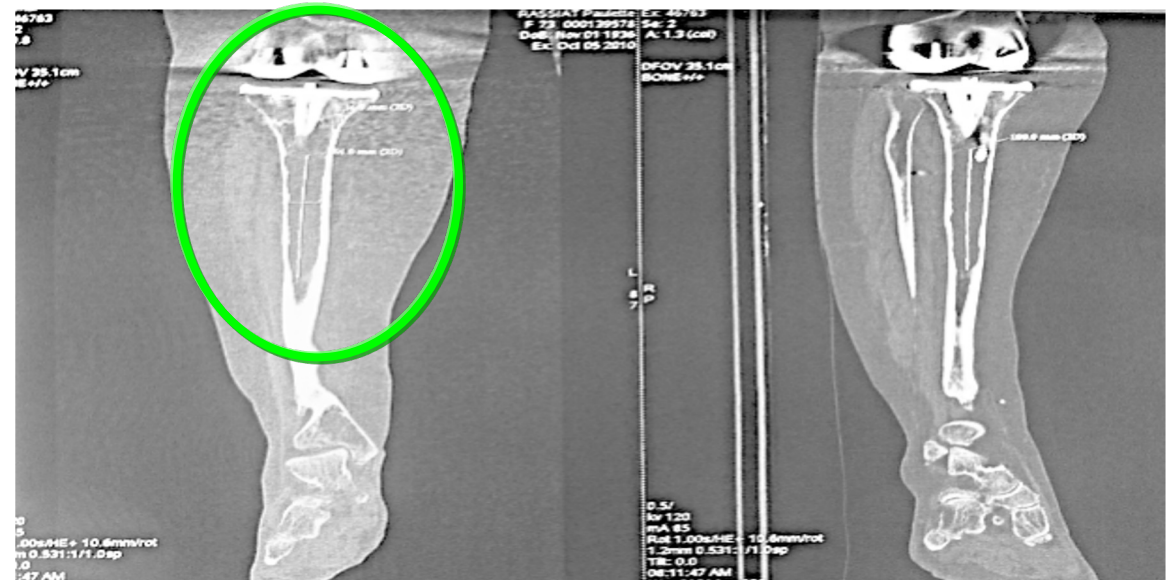
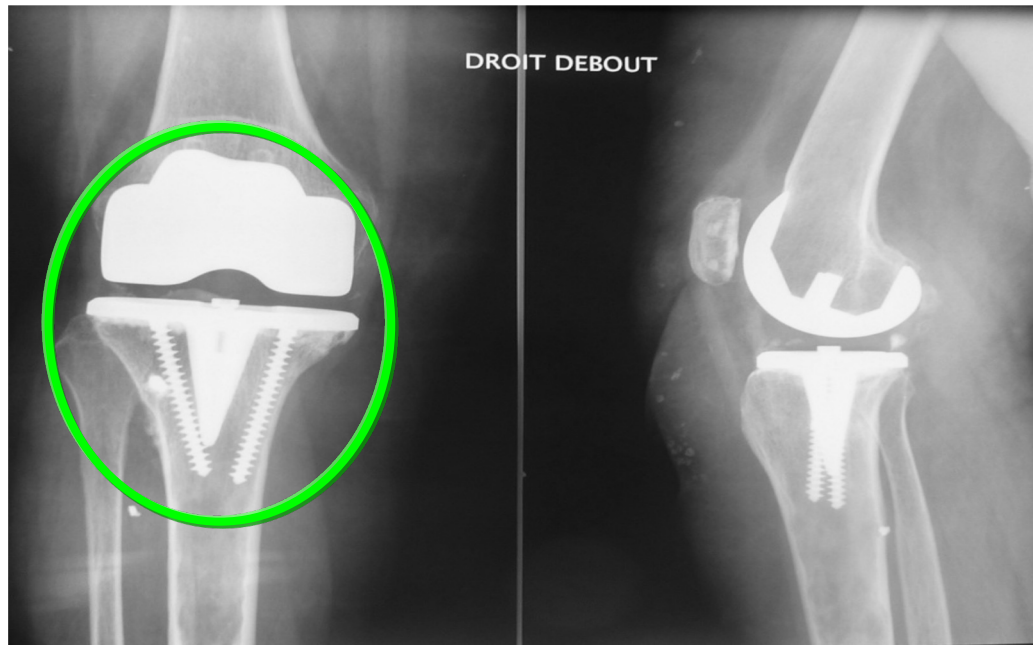
Bone Loss : Where ?

- Tibia
- Femur
- Patella



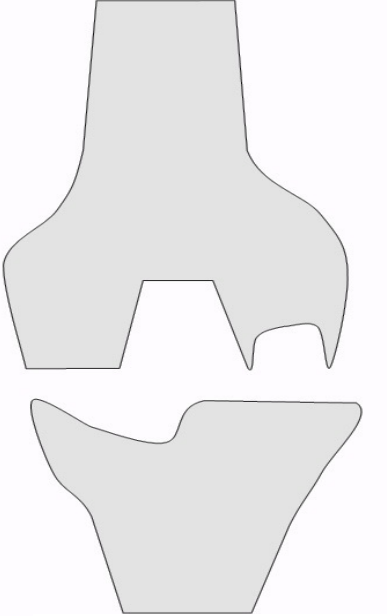
How to evaluate pre-operatively the bone loss?

- Standard X-rays
- CT scan

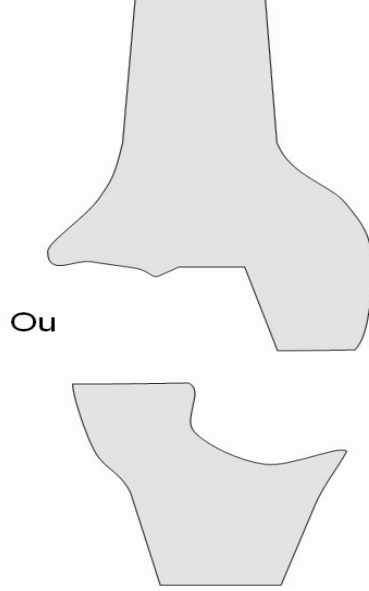


Various classifications

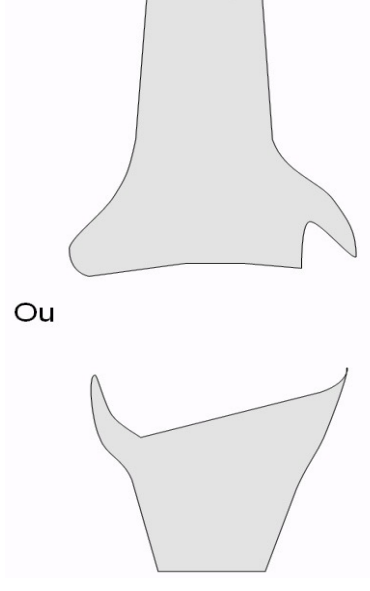
Type 1



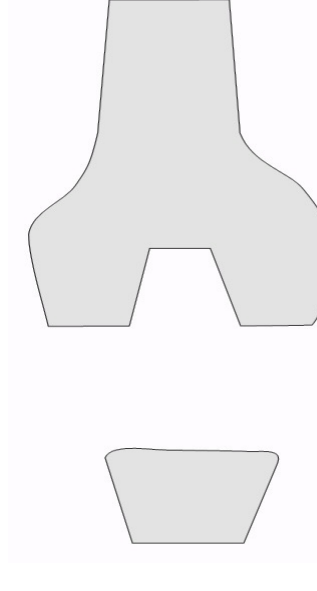
Type 2a



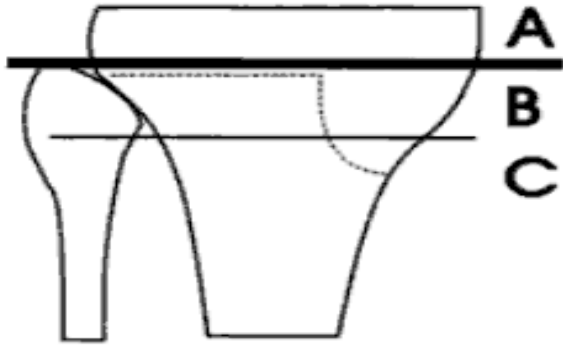
Type 2b



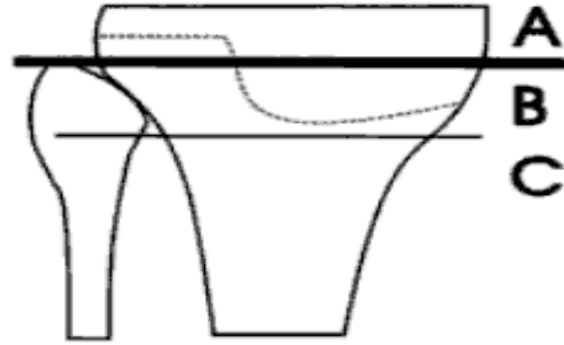
Type 3



AAOS
Anderson Institute



B (L) 6 [c]

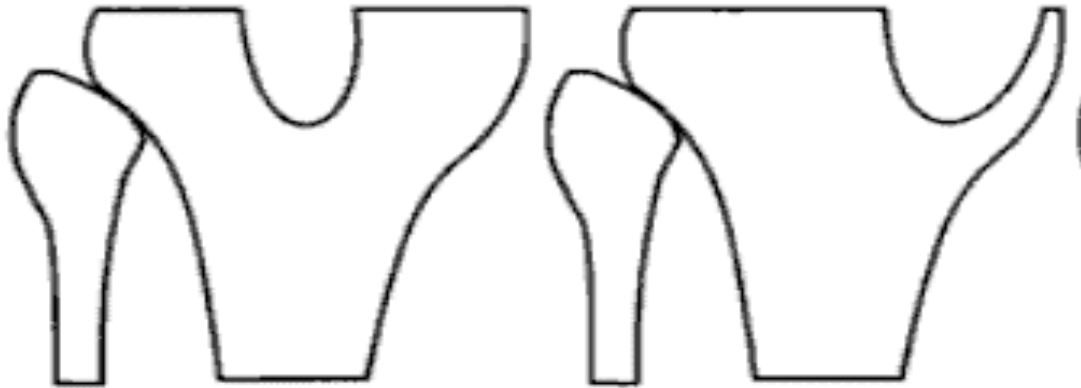


A (L) 7 [b]

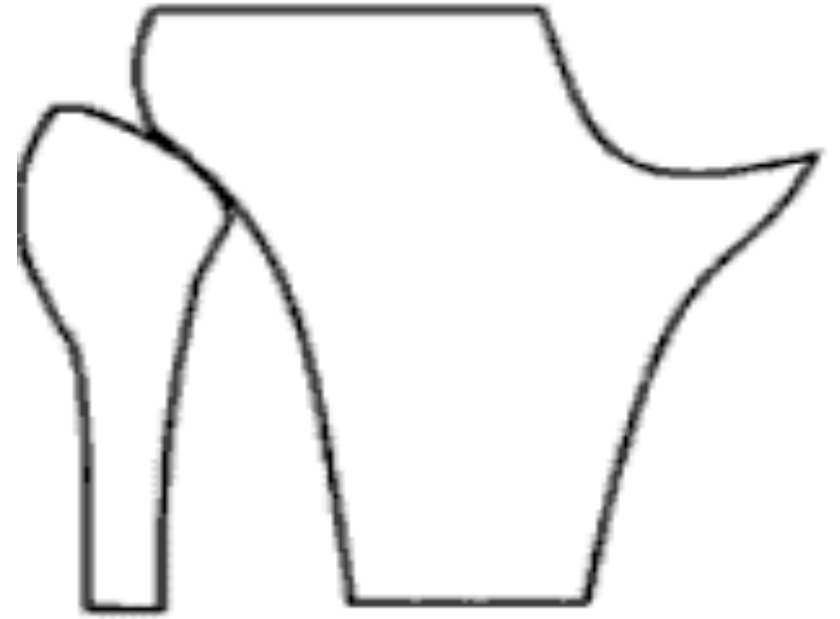
SOFCOT

In the real life

Cavitory = fill

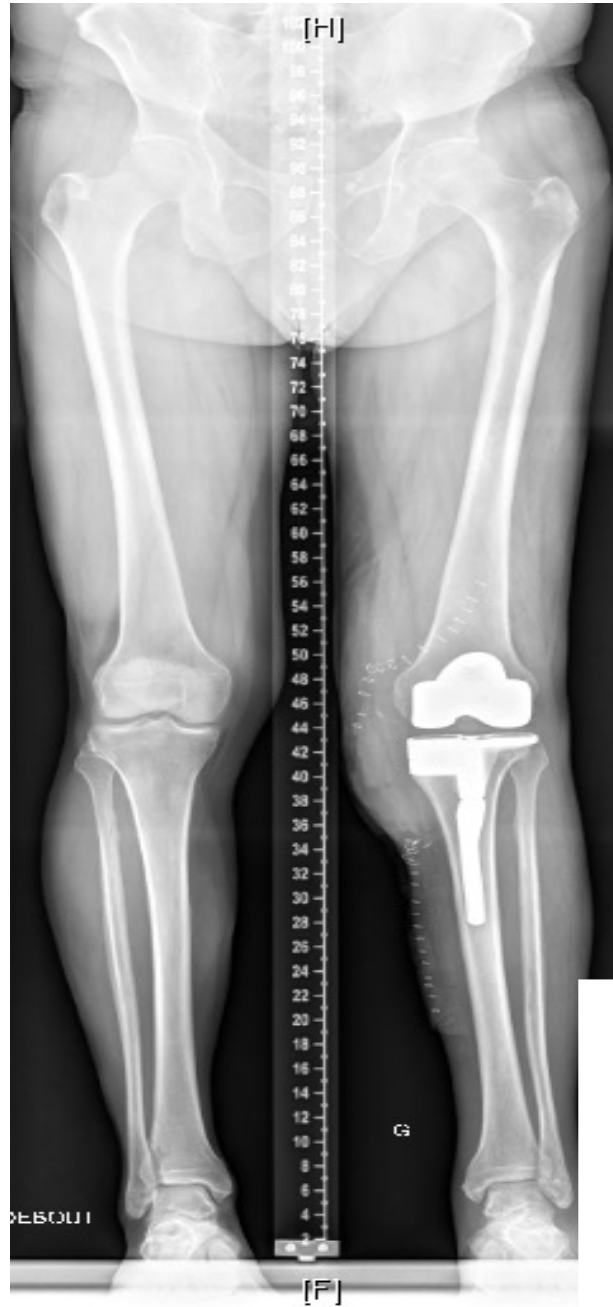


Segmental = rebuild



Three Final goals

- 1. Stability of the implants**
- 2. Joint line restoration**
- 3. Mechanical axis restoration**



Goals of the augments:

- Compensate the defect
- Improve stability



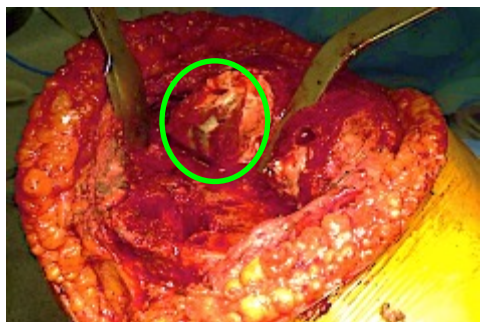
Limits

Restoration of a strong and long lasting
metaphysal support

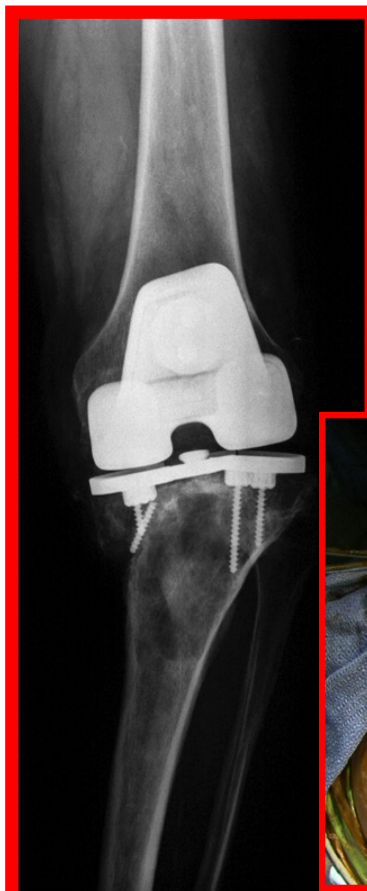
EDITORIAL

Revision total knee arthroplasty: the end of the allograft era?

Sébastien Parratte¹ · Matthew P. Abdel² · Alexandre Lunebourg¹ ·
Nicolaas Budhiparama³ · David G. Lewallen² · Arlen D. Hanssen² ·
Jean-Noël Argenson¹



Cavitary defect



Segmental defect





■ SPECIALTY UPDATE: KNEE

Zonal fixation in revision total knee arthroplasty

R. Morgan-Jones,
S. I. S. Oussedik,
H. Graichen,
F. S. Haddad

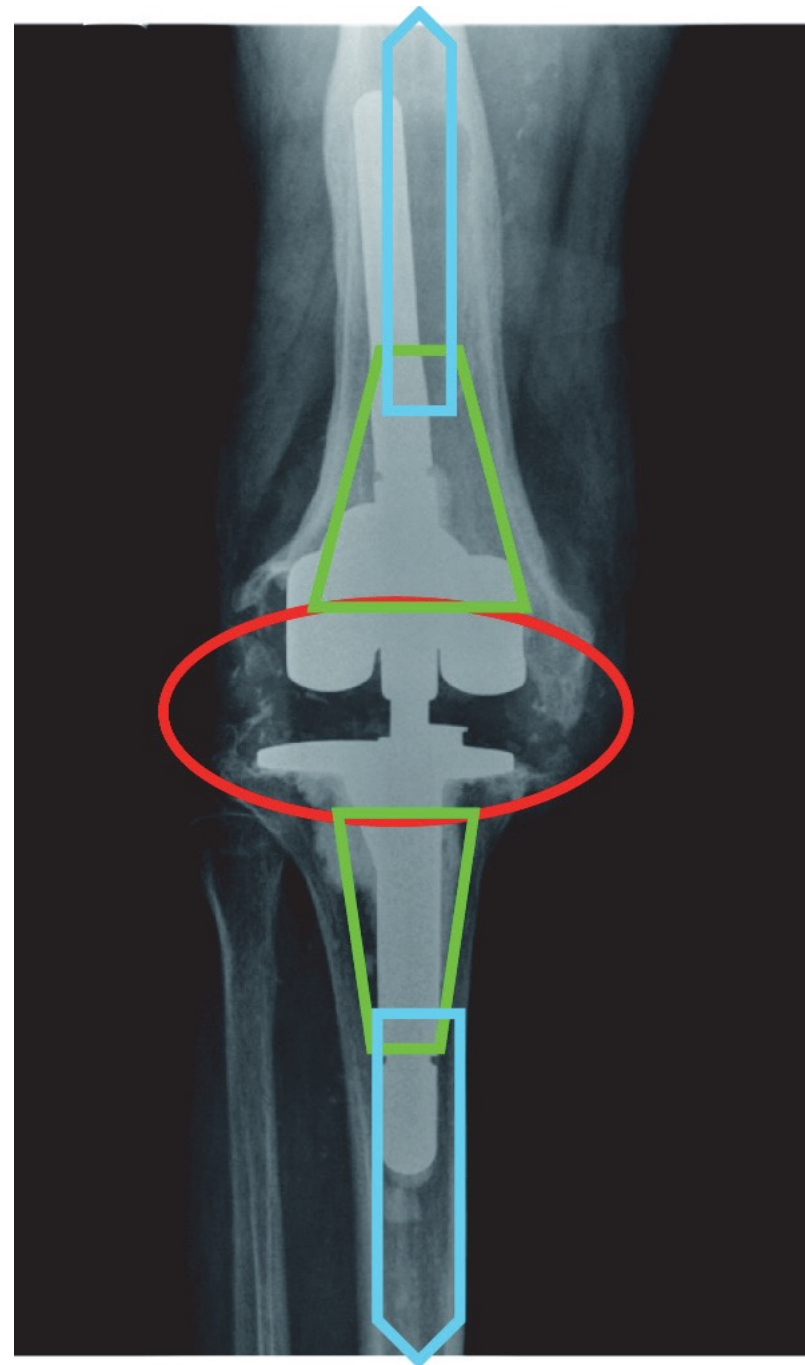
*From University
College London
Hospitals, London,
United Kingdom*

Revision knee arthroplasty presents a number of challenges, not least of which is obtaining solid primary fixation of implants into host bone. Three anatomical zones exist within both femur and tibia which can be used to support revision implants. These consist of the joint surface or epiphysis, the metaphysis and the diaphysis. The methods by which fixation in each zone can be obtained are discussed. The authors suggest that solid fixation should be obtained in at least two of the three zones and emphasise the importance of pre-operative planning and implant selection.

Cite this article: *Bone Joint J* 2015;97-B:147–9.

Importance of metaphysis reconstruction = Zone 2

Importance of metaphysis reconstruction = Zone 2



Zone 3 – Diaphysis

Zone 2 – Metaphysis

Zone 1 – Joint Surface

Zone 2 – Metaphysis

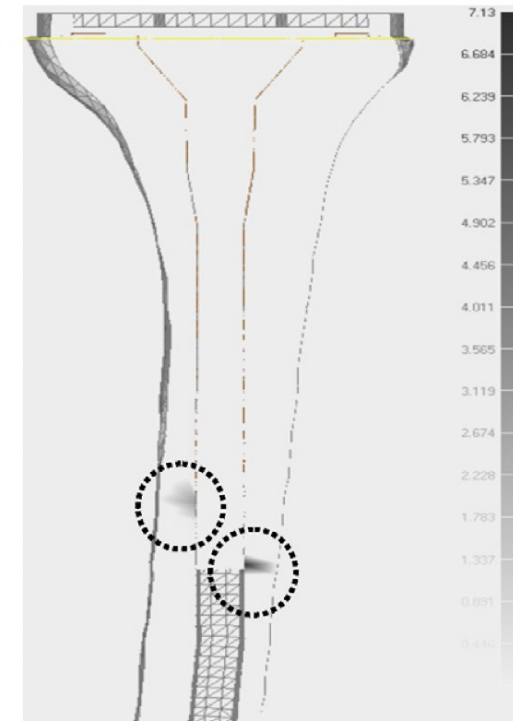
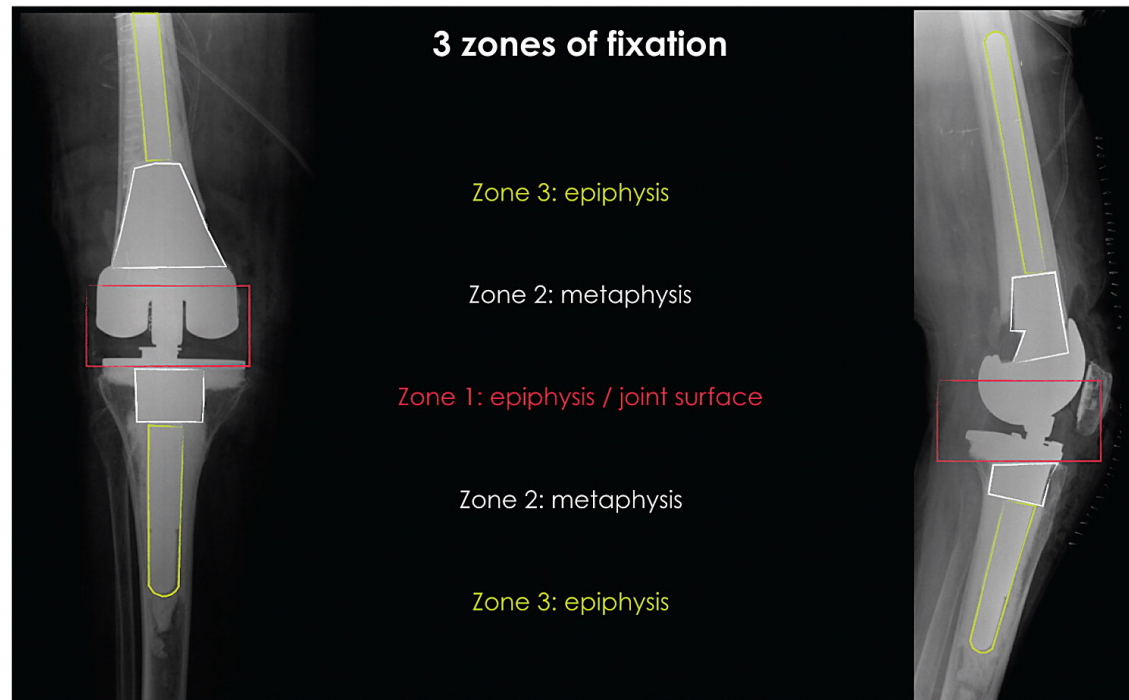
Zone 3 – Diaphysis

Zonal Fixation

2 important zones of fixation:

- **Zone 2** : cones TM/ sleeves/ wedges /allografts
- **Zone 3** : long press-fit stems/ short cemented stems

→ **End stem pain** → increased constraint (*Kim et al*)



Kim YH et al, Clin biomech 2008

Management of severe bone loss

Use Porous Metal Structures

Cones

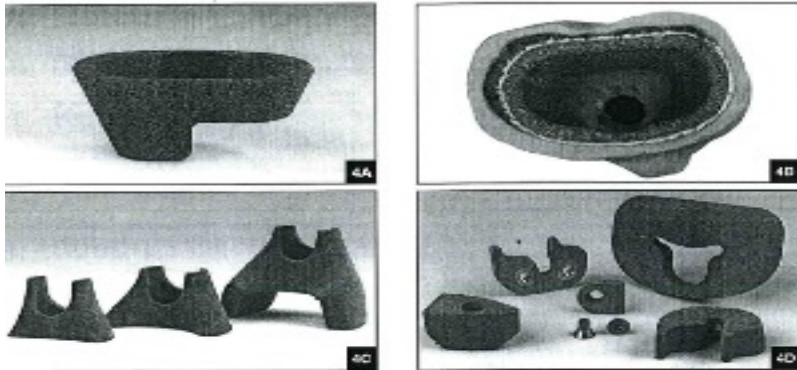


Figure 4. Stepped tibial cone [A]. Schematic diagram of tantalum tibial cone placed in the proximal tibia [B]. Femoral cone [C]. Intraosseous metal augments, wedges, and fill blocks [D]. (Courtesy of Zimmer, Warsaw, Ind.)

Sleeves





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Original article

Total knee arthroplasty revision with trabecular tantalum cones: Preliminary retrospective study of 51 patients from two centres with a minimal 2-year follow-up

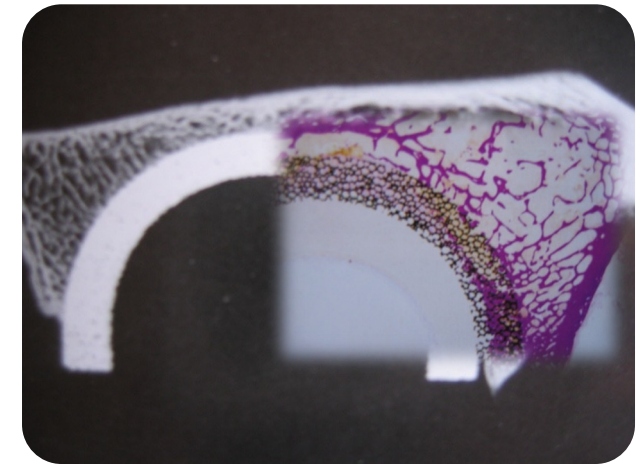
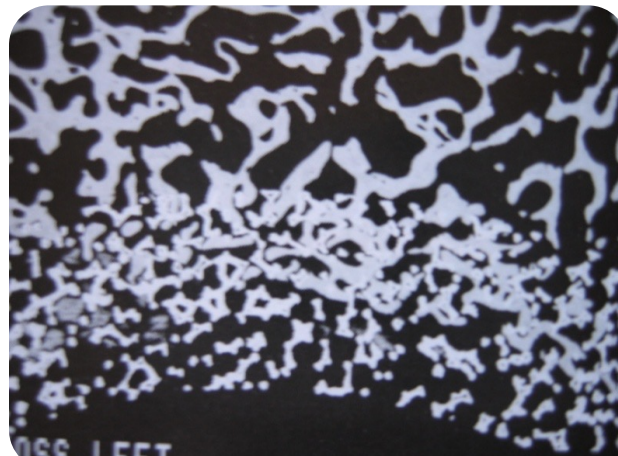
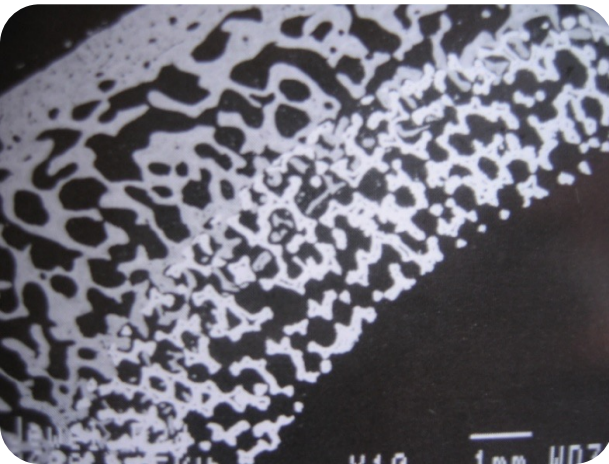


D. Girerd^a, S. Parratte^{a,*}, A. Lunebourg^a, F. Boureau^{b,c}, M. Ollivier^a, G. Pasquier^{b,c},
S. Putman^{b,c}, H. Migaud^{b,c}, J.N. Argenson^a

Bone ingrowth (EBM)

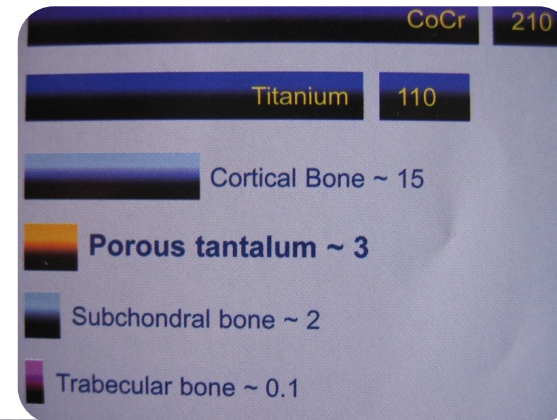
6 weeks

24 weeks

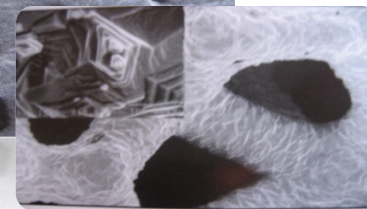
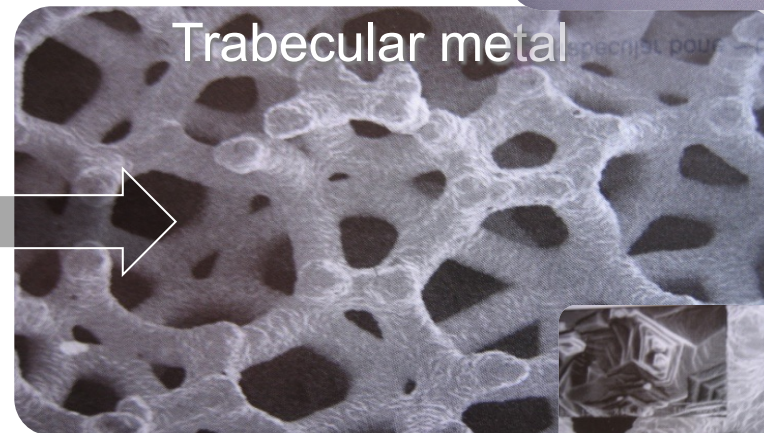
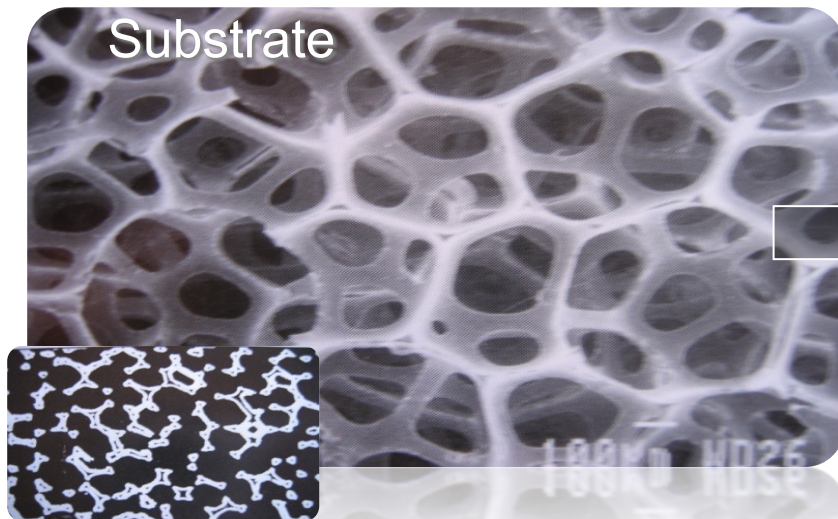


Why do we use Tantalum?

- Natural element number 73
- Microarchitecture closed to the natural bone
- Porosity 60% (*coral* 30%)
- Mechanical Properties
- Elastic modulus

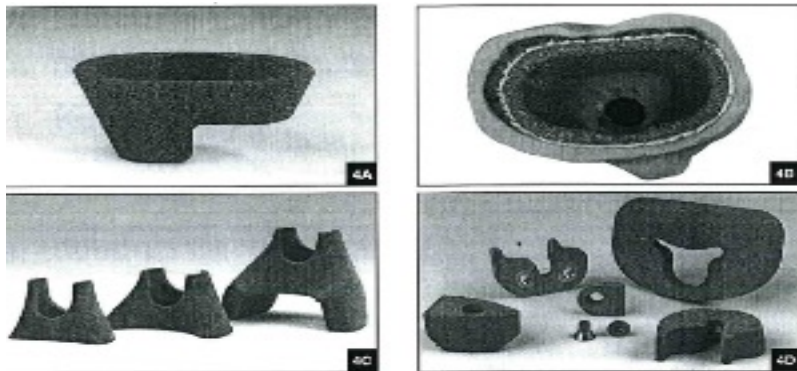


22 TI TITANIUM	23 V VANADIUM	24 CR CHROMIUM
40 ZR ZIRCONIUM	41 NB NIOBIUM	42 MO MOLYBDENUM
72 HF HAFNIUM	73 TA TANTALUM	74 W TUNGSTEN



How do we use the porous metal Tantalum?

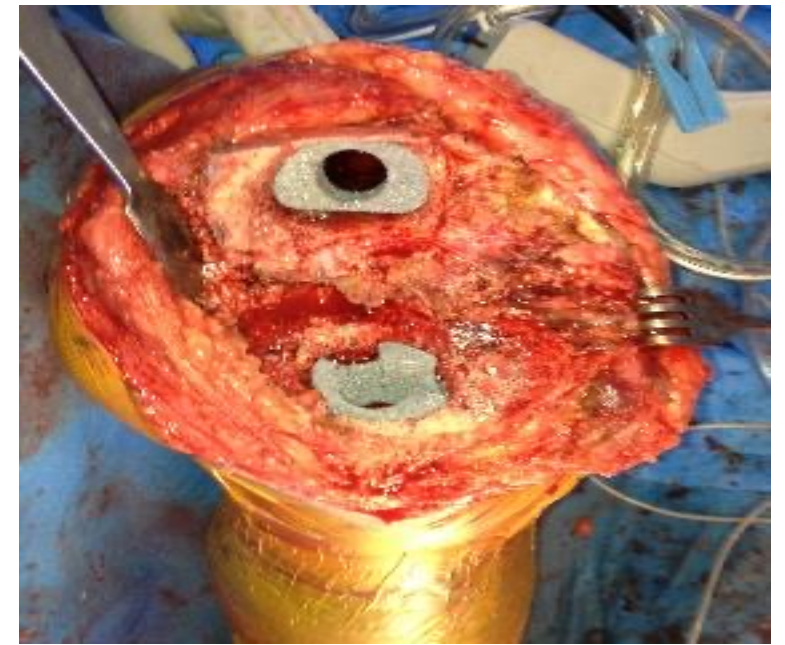
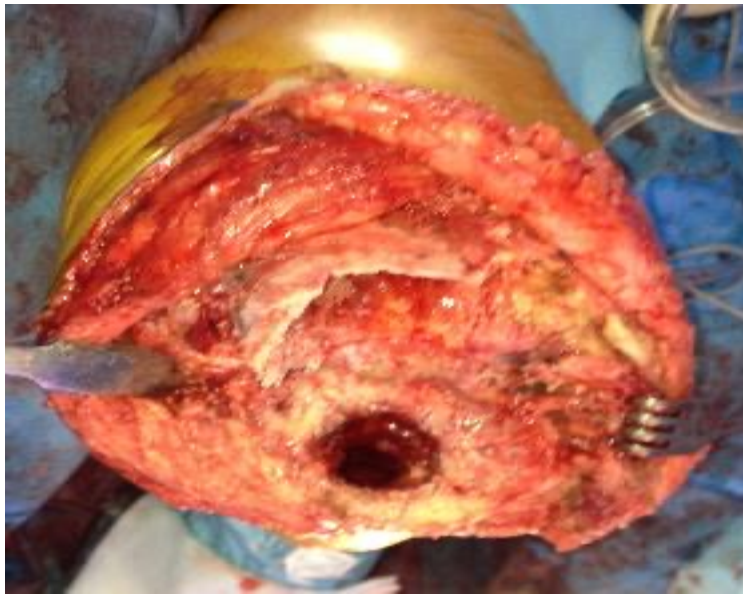
Levine B et al (The journal of Knee Surg, 2007, 20, 185-94)



One basic principal:

Tantalum should be directly in contact with the host bone

Importance of zonal fixation in Zone 2





Case study: Loosening & Bone loss



- Real Obesity
BMI=45...but no other co-morbidity
- Age > 70 years
- Removing implants
- **Dealing with bone loss**
- Dealing with instability



What option to choose for dealing with the bone defect and assuring primary fixation?

- **Rotating hinge without reconstruction**
- **Augment and long stems**
- **Structural bone graft with CCK type and long stem**
- **Cone or sleeve wit CCK type and short stem**

Evolution treatment bone loss: 2009 (revision of the right knee) to 2018 (revision of the left knee)



Match Pair Study: Age, BMI, Bone loss stage, Implant



Group
Cone+Short ST

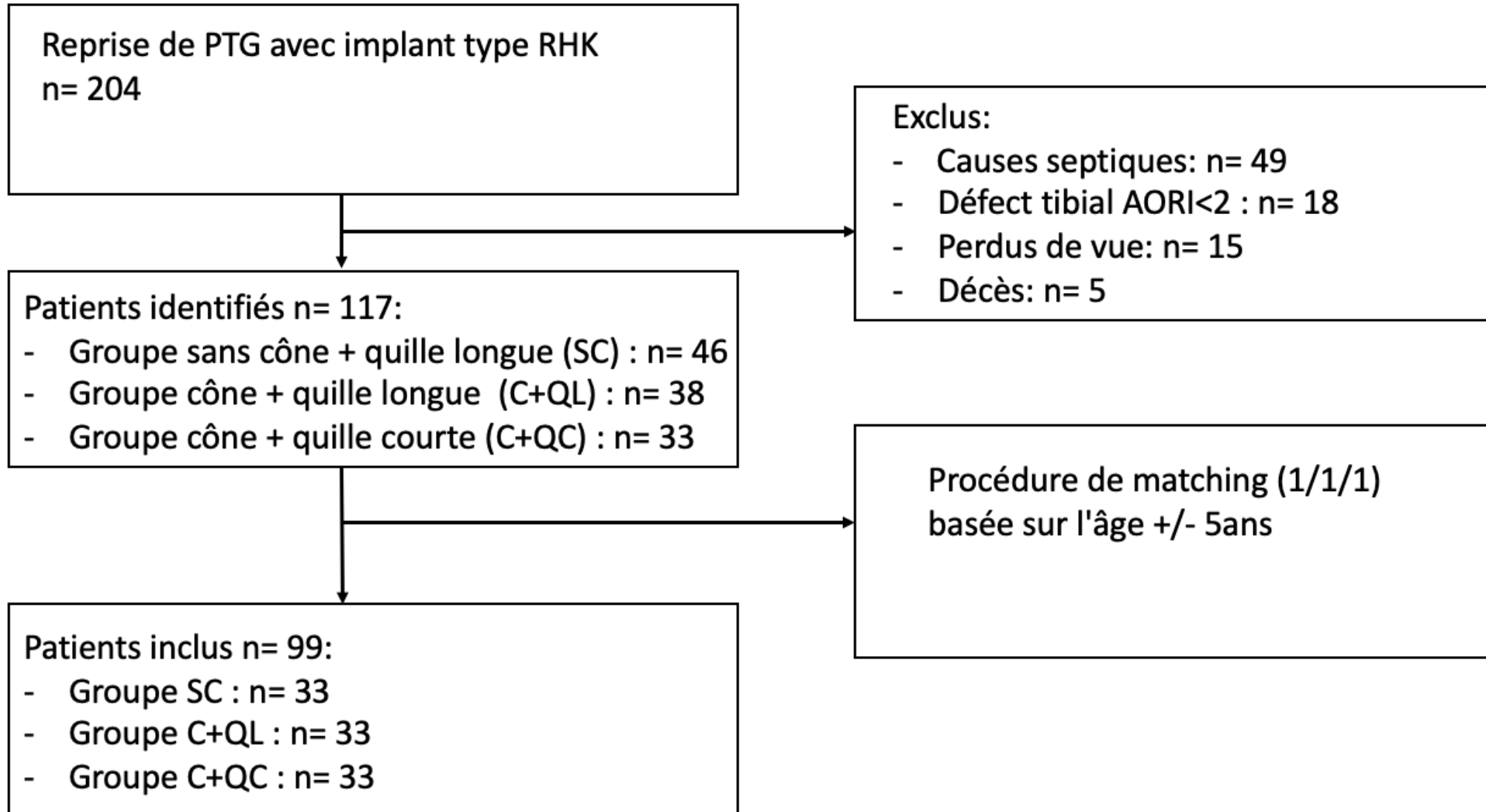


Group
Cone+Long St



Group
No Cone

Methods

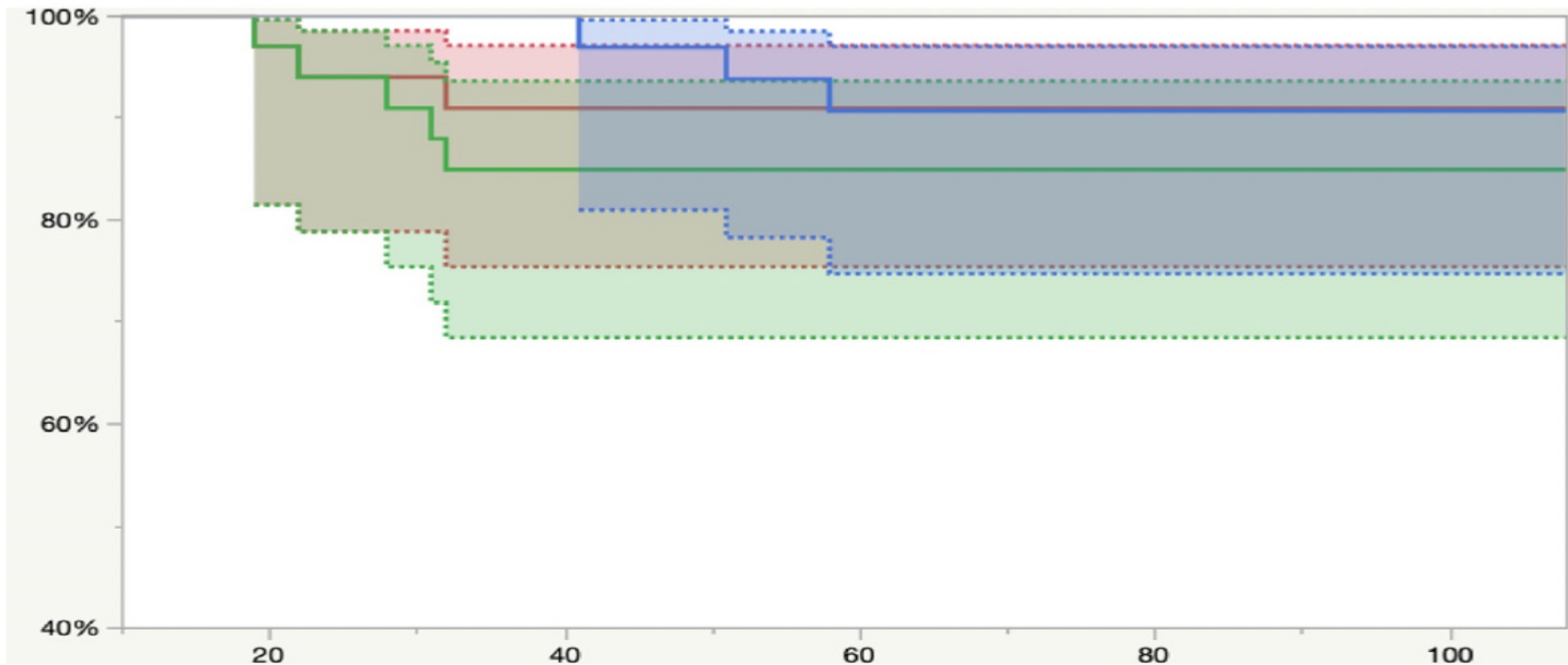


Results

	C+ SSt	C+LSt	NoC
Δ Koos global	29.7 ± 2.9	23.2 ± 2.6	23.7 ± 2.9
Δ Koos Symptom	35.1 ± 2.3*	20.1 ± 2.6	23.9 ± 2.1
Δ Koos ADL	37.8 ± 2.5*	27.2 ± 2.1	20.6 ± 2.8
Δ Koos Sport	24.7 ± 1.5	20.9 ± 1.4	19.5 ± 1.4
Δ Koos QOL	38.3 ± 2.0*	24.6 ± 2.0	28.6 ± 2.2
Δ Koos Pain	43.3 ± 2.4*	27.5 ± 2.6	21.9 ± 2.3
Δ KSS Knee	35.1 ± 13.0*	26.2 ± 2.7	20.9 ± 2.9
Δ KSS function	19.6 ± 3.5 *	10.9 ± 3.1	11.4 ± 23.7
Δ Flexion (°)	95.4 ± 2.95	94.2 ± 2.86	91.9 ± 2.86
Δ Extension lag (°)	4.8 ± 0.8	4.2 ± 1.1	4.5 ± 0.7

* Significant different results

Survival without revision at 5 years



Groupe C+SS :

90.9%

Groupe C+LS:

84.9%

Groupe NoC:

90.6%



Contents lists available at [ScienceDirect](#)

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org



Revision Arthroplasty

Trabecular Metal Cones Combined With Short Cemented Stem Allow Favorable Outcomes in Aseptic Revision Total Knee Arthroplasty



Christophe Jacquet, MD, Fabien Ros, MD, Sylvain Guy, MD, Sebastien Parratte, MD, PhD, Matthieu Ollivier, MD, PhD, Jean-Noel Argenson, MD, PhD *

Department of Orthopedics and Traumatology, Institute for Locomotion, St. Marguerite Hospital, Marseille, France

- **Combination of short cemented stem with porous metal cone in revision TKA provides similar survival rate with better functional results compared to long stem or metallic wedge at minimum 5 yrs FU**

Importance of zonal fixation

Metaphysal Fixation (Zone 2):

- **Porous cones** : survival at 2 yrs 98.5% (*Watters et al*) / at 7 yrss 78% (*Argawal et al*)
- **Metal wedges**: survival at 11 yrs 92 % (*Patel et al*) **BUT** routine long stems/ no functional results / different implants



Diaphysal Fixation (Zone 3):

- Better functional results with short cemented stems (*Denehy et al*) vs long press-fit stems **WITHOUT** decreasing implant survival
- ➔ Confirmed by our study



Conclusion

- **Fill and rebuild**
- **Strong and long lasting metaphysal support : zone 2 is key**
- **Restore the anatomy**
- **Using Porous Metal Structures**