RPTG – 2 temps

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Lyon University Hospital, France

Indications of a two-stage exchange arthroplasty?

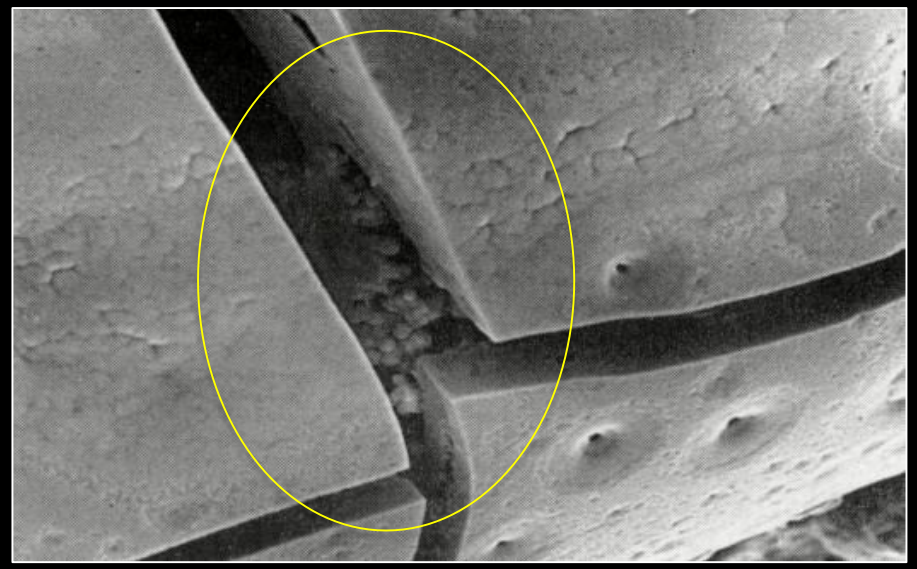
Consensus: ***Two stage-exchange arthroplasty is a reasonable option*** for the treatment of periprosthetic joint infection (PJI). Specific conditions where two-stage exchange may be indicated over one-stage exchange include:

- **patients with systemic manifestations of infection (sepsis)**
- **scenario where infection appears obvious but no organism has been identified**
- **preoperative cultures identifying difficult to treat and antibiotic-resistant organisms**
- **presence of a sinus tract**
- **inadequate and non-viable soft tissue coverage**

Delegate Vote: Agree: 93%, Disagree: 7%, Abstain: 0% (Strong Consensus)

Pourquoi 2 temps ?

«…» Give time to the ATB to sterilize infected bone around the implant «…»



Evans et al., Clin Orthop. **1998**, 243-249

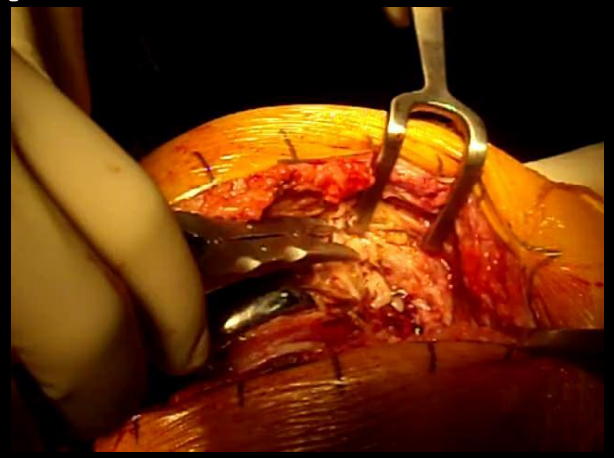
1 temps …

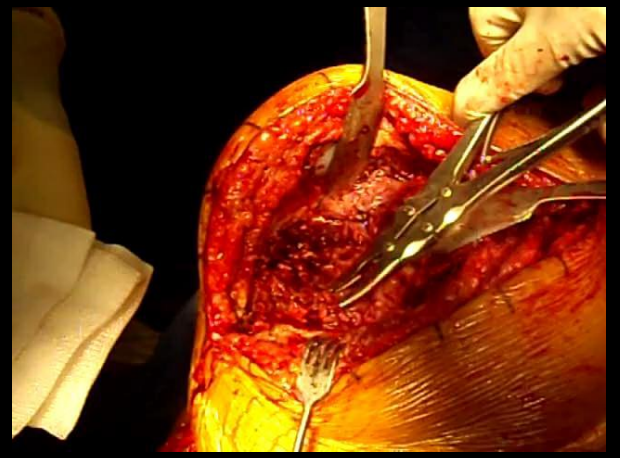
Résection osseuse moins étendues…

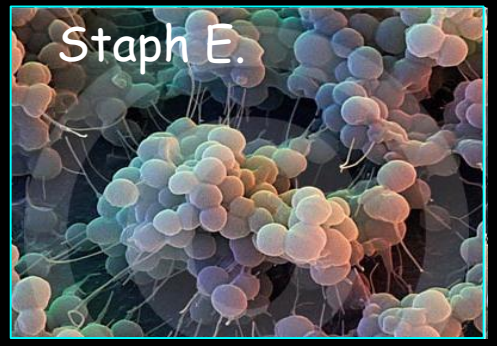
Stratégie chirurgicale

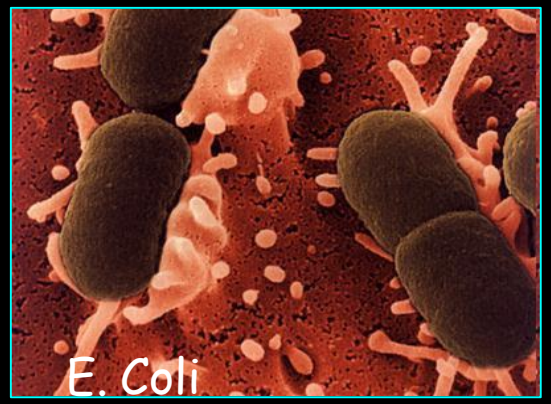
1ère étape

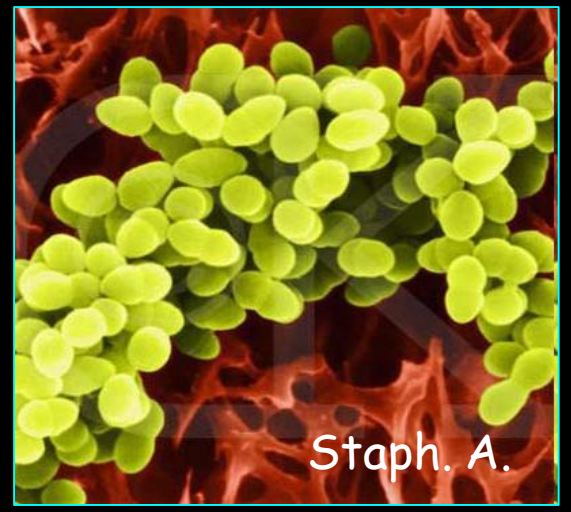
- ❖ Prélévements multiples



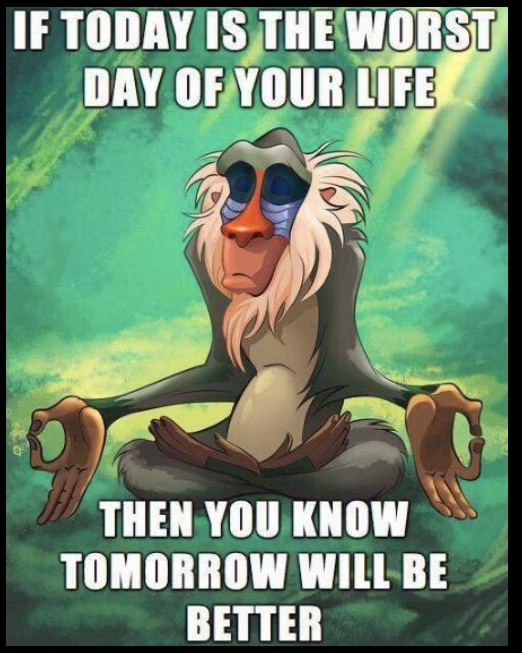






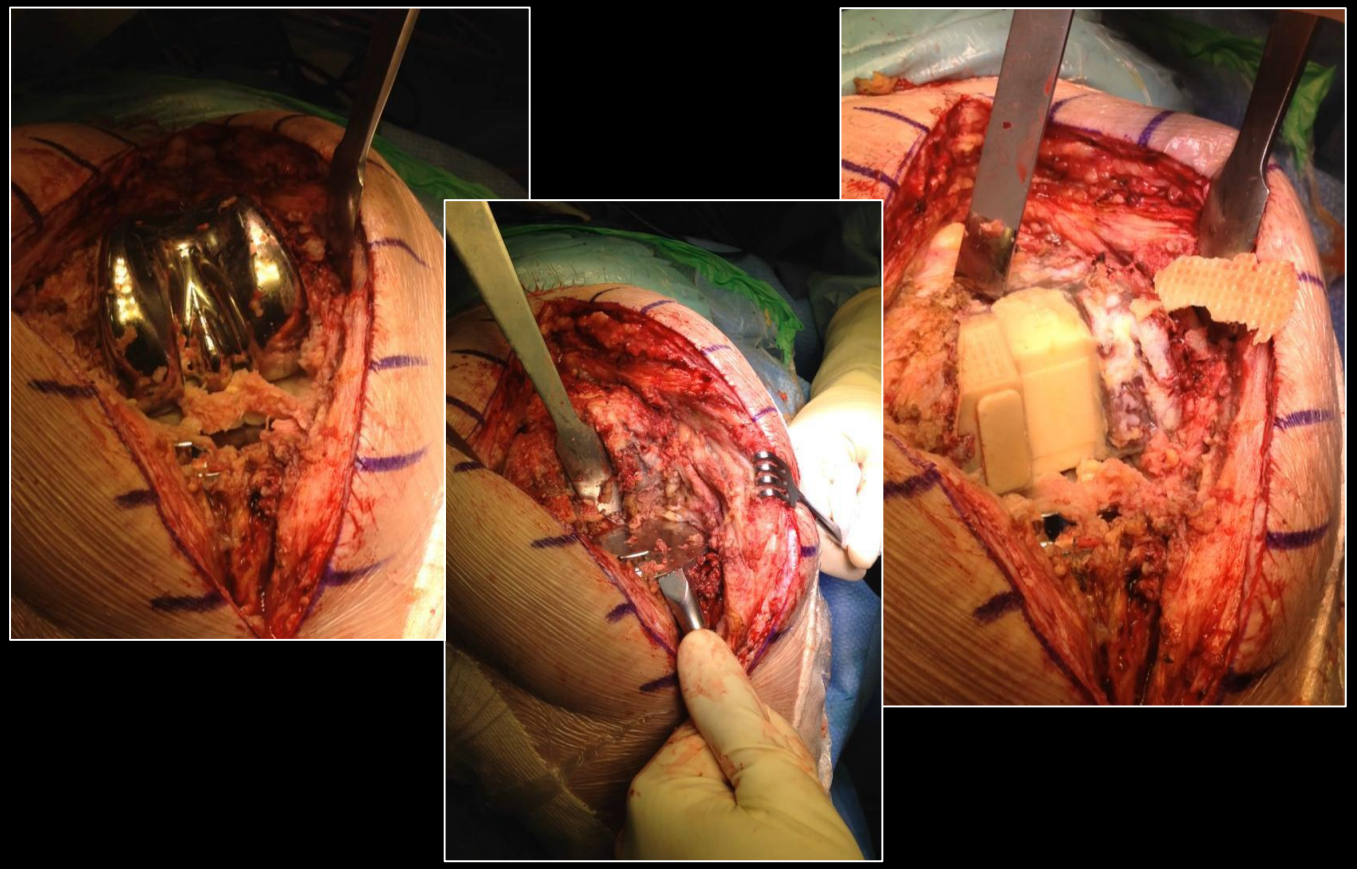


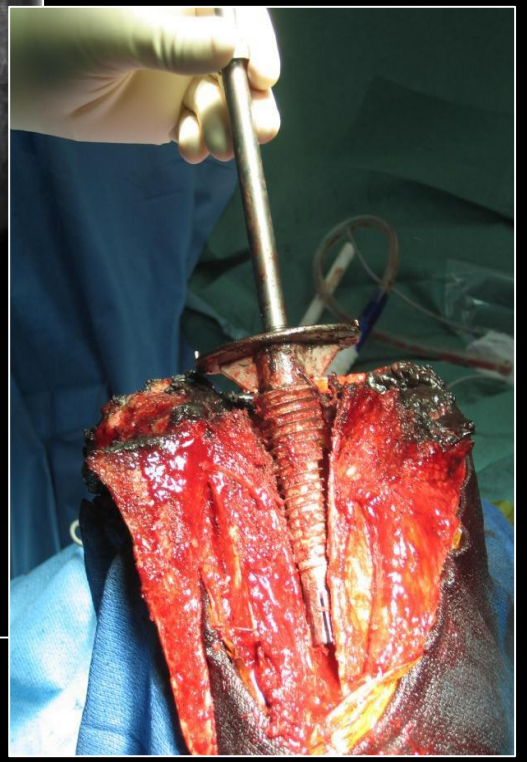
Stratégie chirurgicale



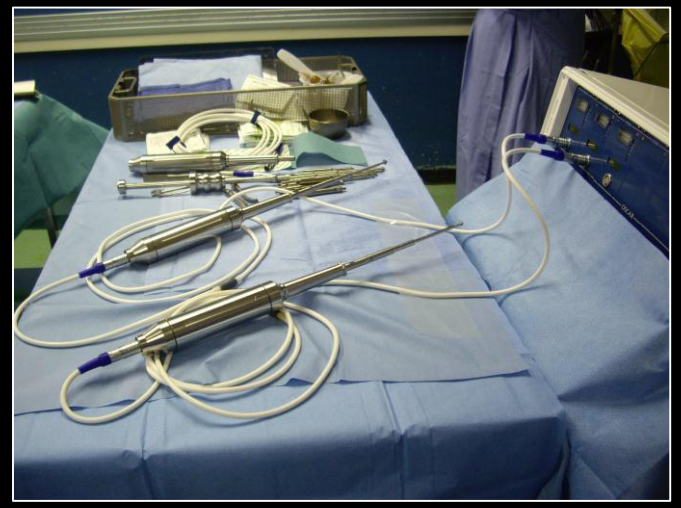
2nd étape

❖ Ablation implants et ciment

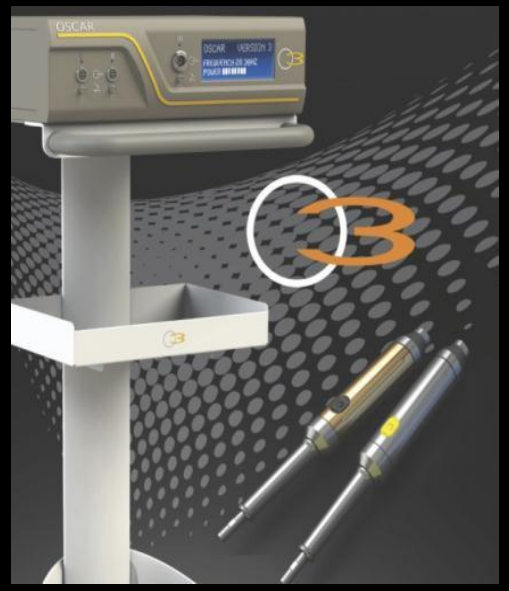


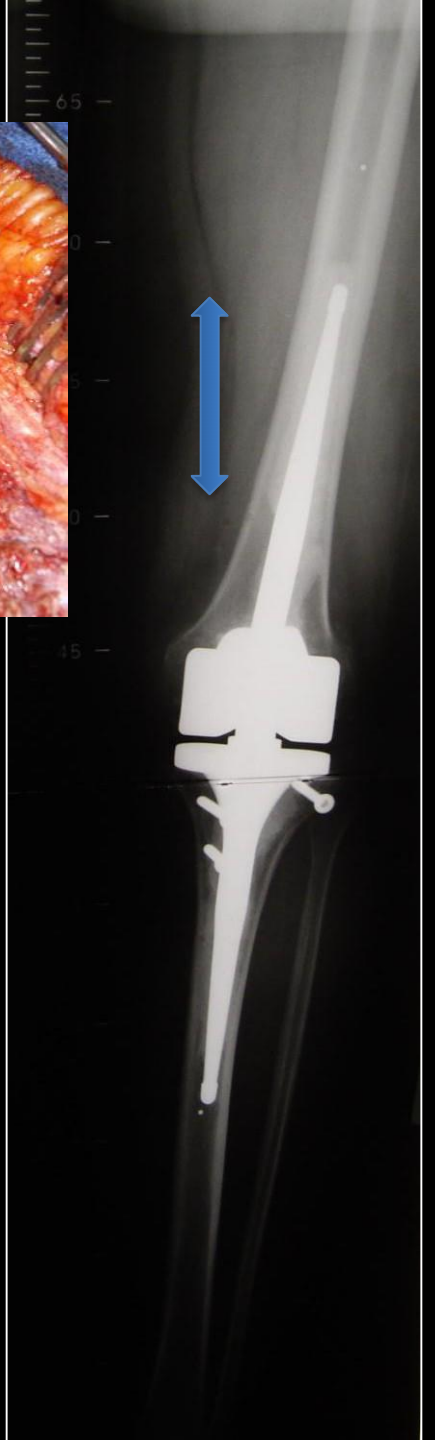


Ciment …



Oscar



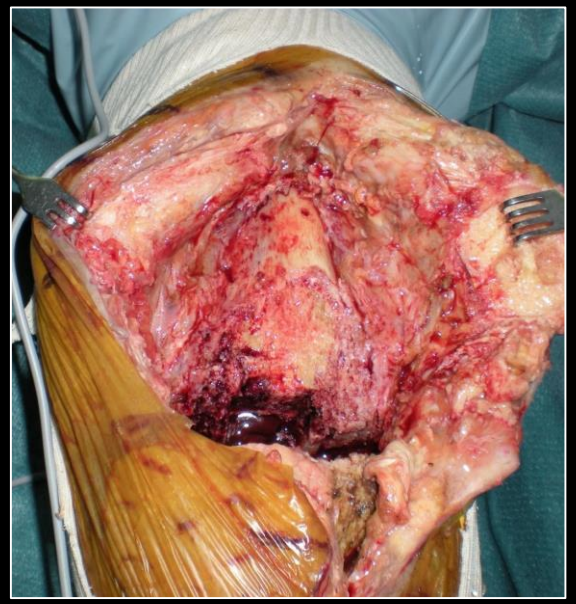


<u>Revision total hip arthroplasty using ultrasonically driven tools. A clinical evaluation.</u> Gardiner R, Hozack WJ, Nelson C, Keating EM. J Arthroplasty. 1993 Oct;8(5):517-21.

Stratégie chirurgicale

3ème étape

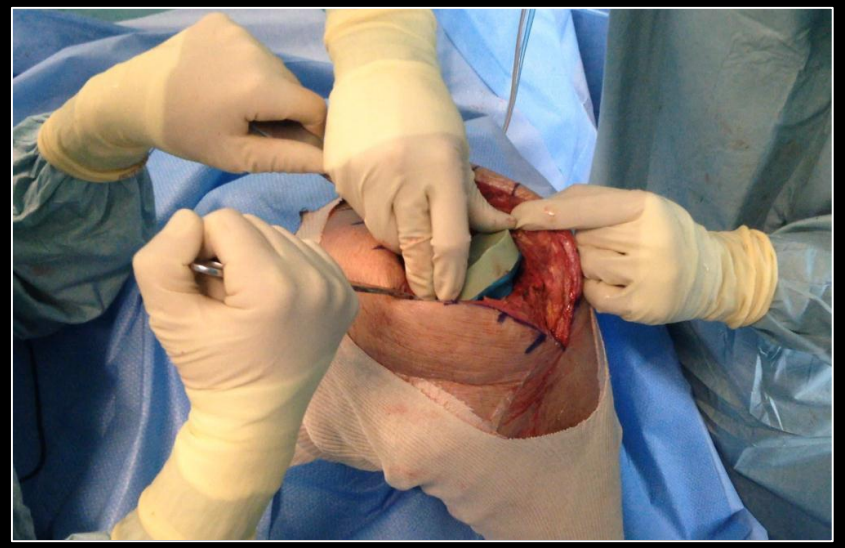
- ❖ **Evaluation des pertes osseuses et tissulaires**
- ❖ **Synovectomie étendue**
- ❖ **Lavage intensif**

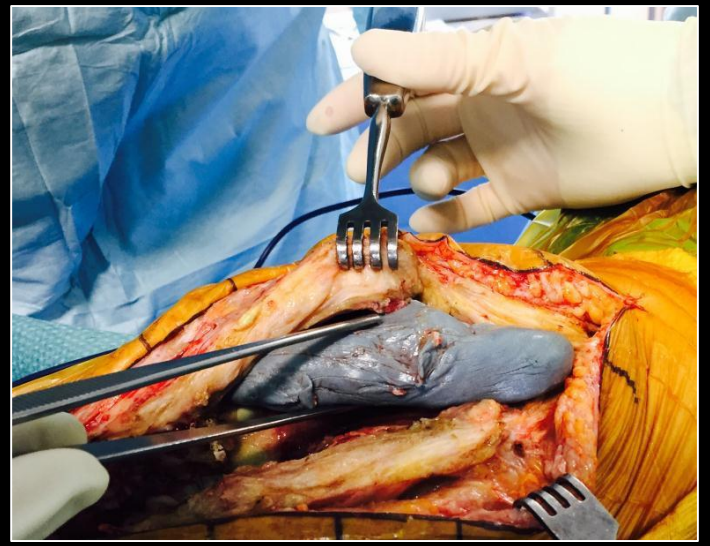


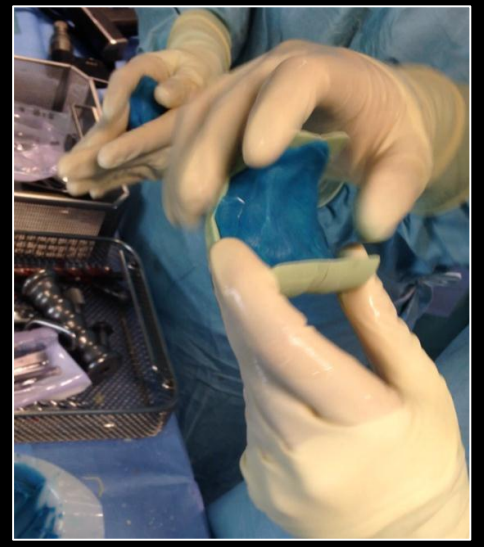
Stratégie chirurgicale

4ème étape

- ❖ Spacer imprégné d'ATB (Genta + Vanco +/- …)
- ❖ Articulé ou non



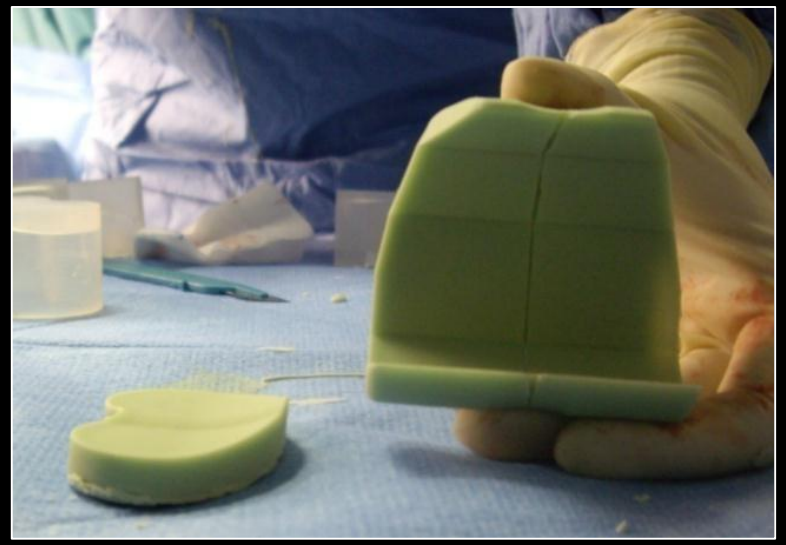


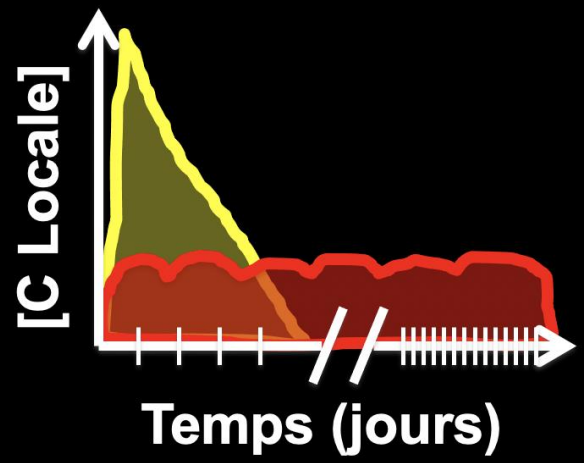


Objectifs

Spacers imprégnés aux ATB

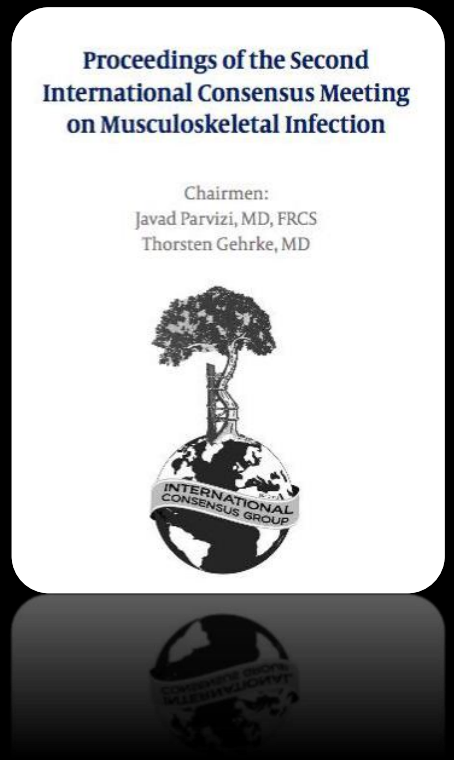
"Maintain soft tissue tension of the articulation during the interval between debridement and reimplantation in two stage procedures"





Durbhakula SM, Czajka J, Fuchs MD, et al: antibiotic-loaded articulating cement spacer in 2-stage exchange of infected total knee arthroplasty. J Arthroplasty A9:768,2004

Spacer



« Articulating spacers provide better function and is especially preferred for patients who are likely to have spacer in place for longer than 3 months.

There is a non-significant trend in range of motion improvement with articulating compared to non-articulating spacers, but the panels believes that this is still of value to the patient

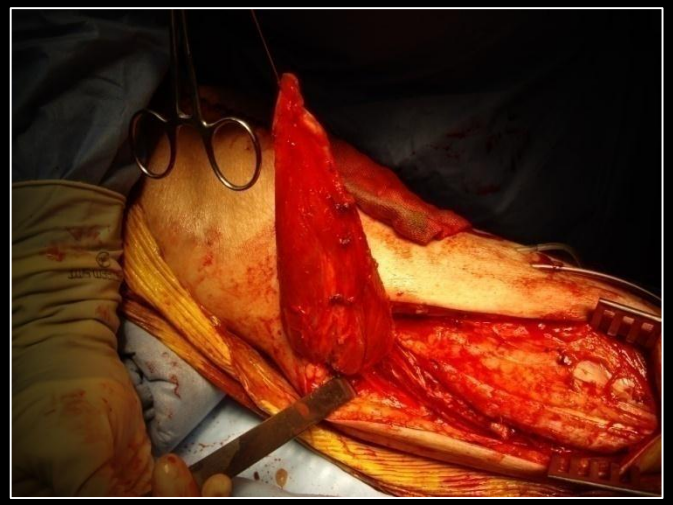
No difference in terms of infection control
Non articulated spacers when too much bone loss »

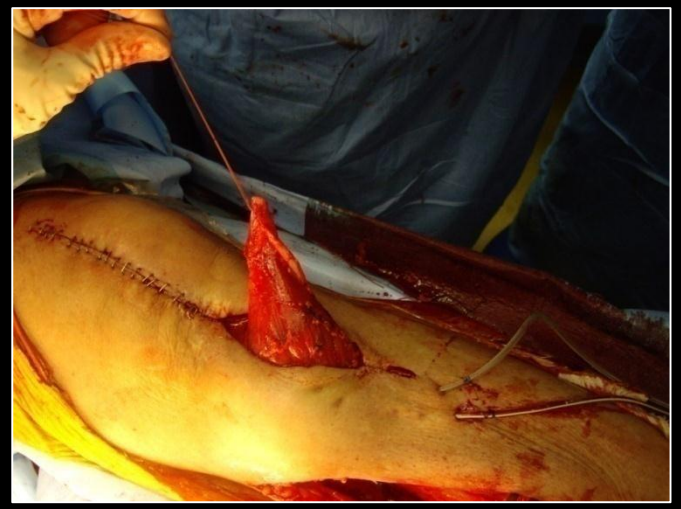
Consensus 3: **reimplantation is easier with articulated spacers**

Stratégie chirurgicale

5ème étape

- ❖ **Fermeture cutanée**
- ❖ **+/- lambeaux**





« Entre deux »

- Diagnostic microbiologique
- Adaptation antibiotiques
- +/- Rééducation
- Vérifie normalisation des marqueurs biologiques

Antimicrobial-Related Severe Adverse Events during Treatment of Bone and Joint Infection Due to Methicillin-Susceptible *Staphylococcus aureus*

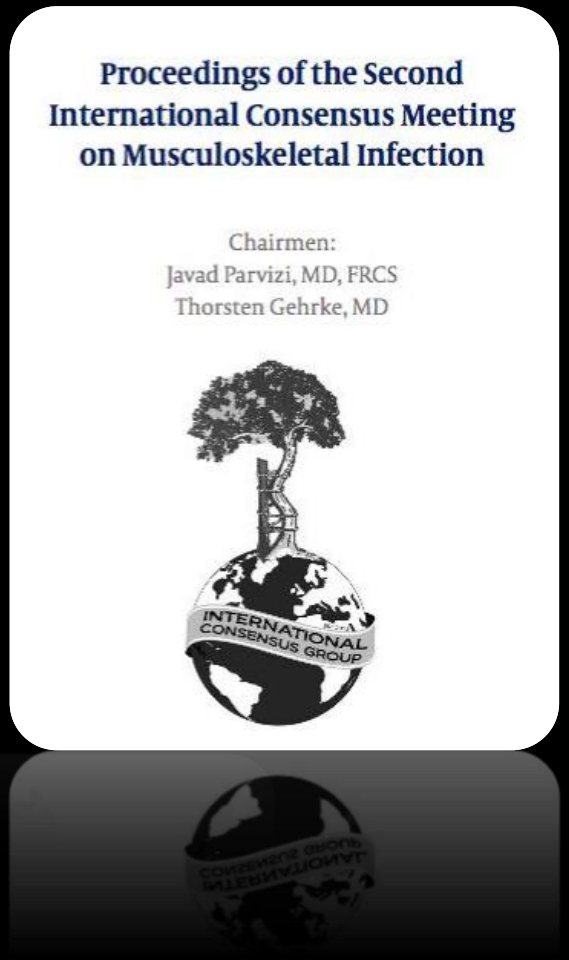
Florent Valour,[a,b] Judith Karsenty,[a] Anissa Bouaziz,[a] Florence Ader,[a,b] Michel Tod,[c] Sébastien Lustig,[d] Frédéric Laurent,[b,e,f] René Ecochard,[g] Christian Chidiac,[a,b] Tristan Ferry,[a,b] on behalf of the Lyon BJI Study Group

Combien de temps « entre deux»?

Consensus: There is no definitive evidence in the literature as to the optimal time interval between the two stages. Reports vary from 2 weeks to several months.

More than 6 months:

sub-optimal functional results



Reconstruction

Stratégie

Voie d’abord

Implant, ciment

Hauteur interligne, alignement, stabilité

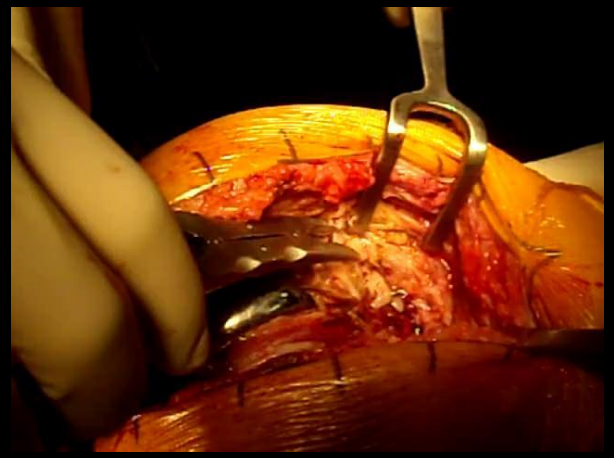
Perte osseuse

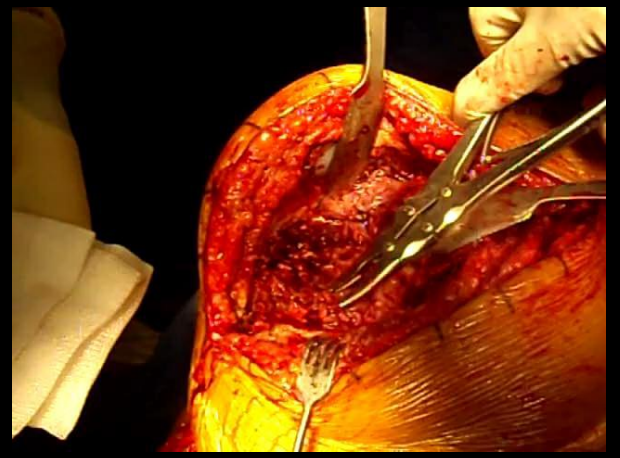
Appareil extenseur

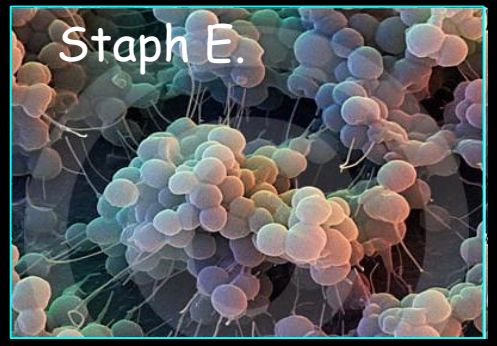
Fermeture cutanée

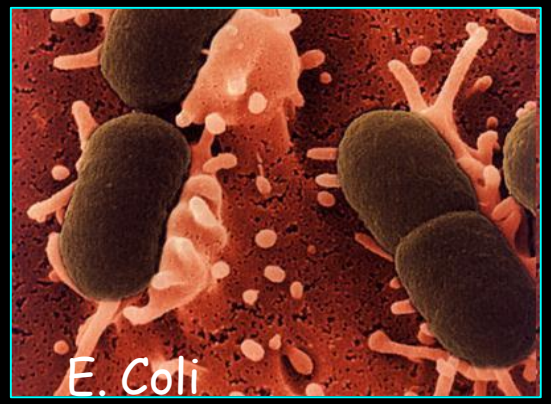
Stratégie chirurgicale

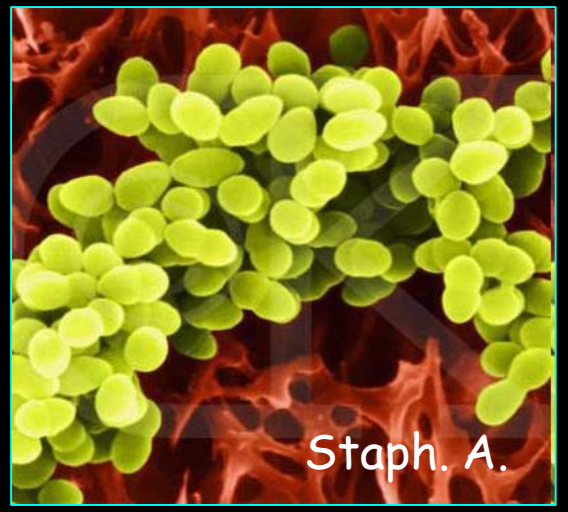
Prélévements multiples











Stratégie chirurgicale

- **Gérer les pertes osseuses**

Courtesy S Parratte

Trabecular metal

Megaprothèse

Clin Orthop Relat Res (2009) 467:485–492
DOI 10.1007/s11999-008-0329-x

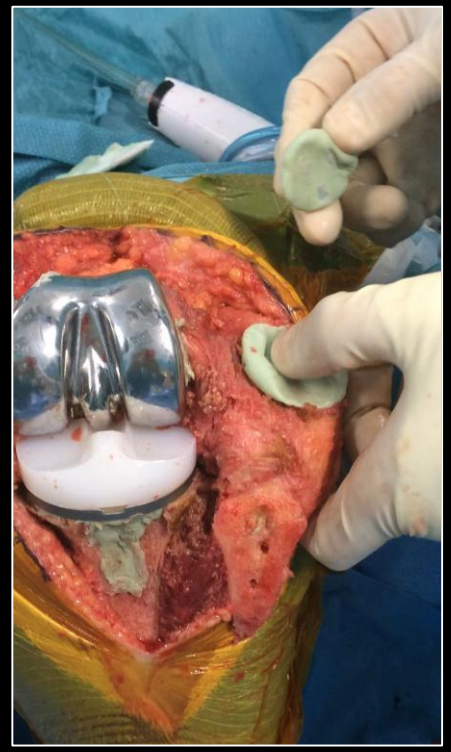
ORIGINAL ARTICLE

Distal Femoral Replacement in Nontumor Cases with Severe Bone Loss and Instability

Keith R. Berend MD, Adolph V. Lombardi Jr. MD, FACS

Stratégie chirurgicale

- Ciment chargé aux ATB (G+/-V)



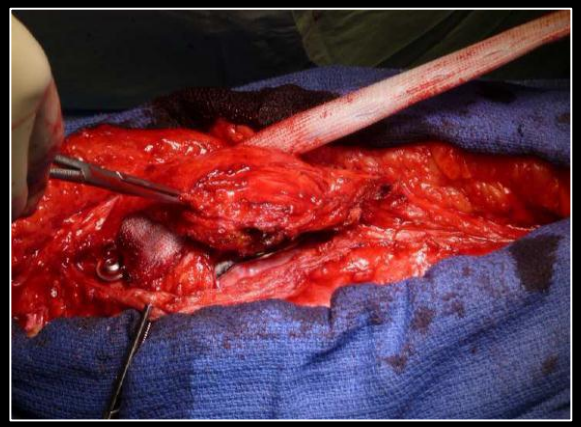
Stratégie chirurgicale

- **Gérer l'appareil extenseur**

Extensor Mechanism Rupture 20

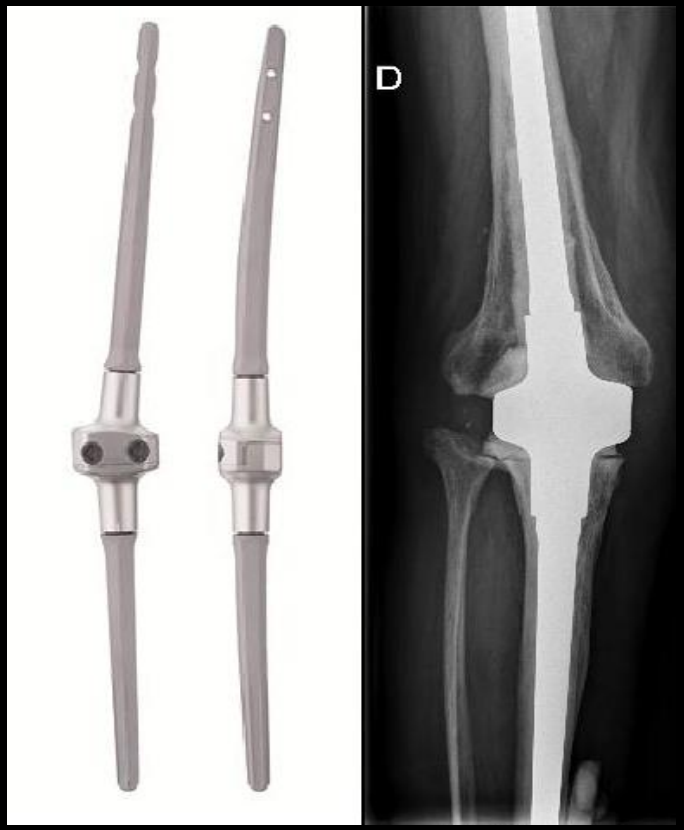
Nicolaas C. Budhiparama, Nadia N. Ifran, Sébastien Lustig, Michel Bonnin, and Sebastien Parratte [2,3]

Hanssen



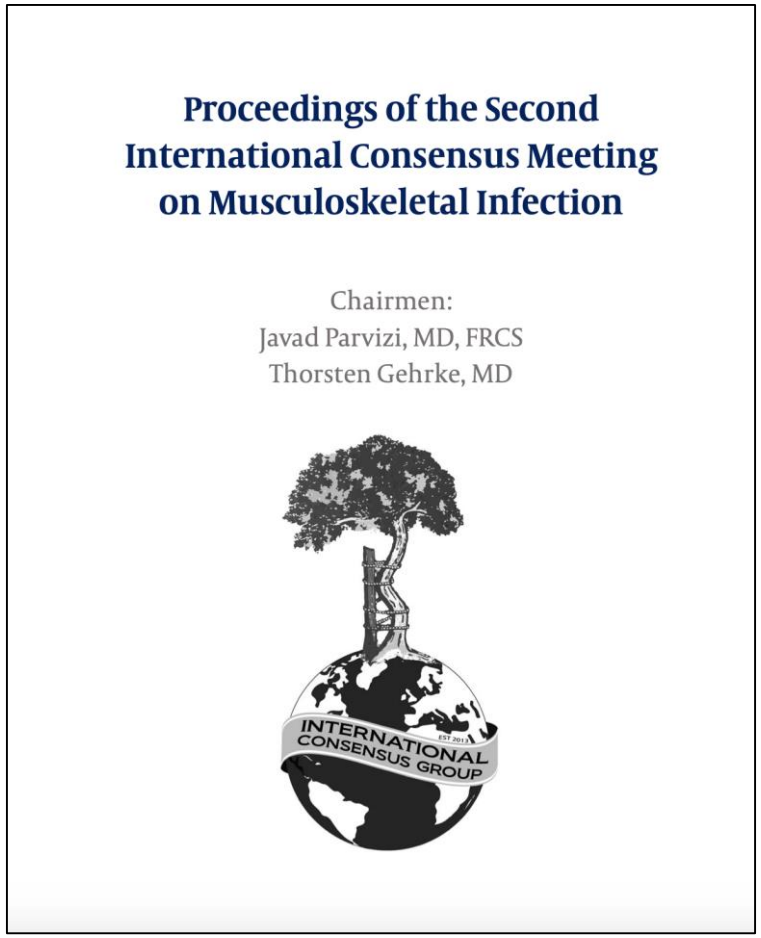
Allogreffe

Arthrodèse



Stratégie chirurgicale

Fermeture cutanée



https://www.crioac-lyon.fr/

Chile
Diaz, Claudio
Mella, Claudio
Parra Aguilera, Samuel
Schweitzer, Daniel

China
Cao, Li
Chen, Jiying
Dang, Xiaoqian
Guo, Shengjie
Hu, Ruyin
Huang, Wei
Lin, Jianhao
Shao, Hongyi
Shen, Bin
Shen, Hao
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Xu, Chi
Yan, Chun Hoi
Zeng, YiRong
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Bonilla León, Guillermo A.
Calixto, Luis F.
Cortes Jiménez, Luis E.
García Ricaurte, Julio César
García, Maria Fernanda
Lara Cotacio, Gilberto
Leal, Jaime A.
Llinás Volpe, Adolfo
Lopez, Juan Carlos
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Palacio Villegas, Julio César
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Restrepo, Camilo
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Sánchez Correa, Carlos A.
Stangl, Paul
Suarez, Cristina

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Villafuerte, Jorge

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Bićanić, Goran
Bohaček, Ivan
Ivković, Alan

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Gallo, Jiří
Jahoda, David

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Kjaersgaard-Andersen, Per
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Moser, Claus
Overgaard, Soeren

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Gomez, José
Naula, Victor

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ElGanzoury, Ibrahim
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Osman, Wael Samir
Saleh, Usama H.

El Salvador
Orlando Villanueva, Andres

Estonia
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Mitt, Piret

Finland
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Puhto, Teija
Virolainen, Petri

Former Yugoslav Republic of Macedonia
Cirivri, Jasmin
Talevski, Darko
Bozinovski, Zoran

France
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Bauer, Thomas
Ferry, Tristan
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Jenny, Jean-Yves
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Mansat, Pierre
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France

Argenson, Jean Noël
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Ferry, Tristan
Jacquot, Adrien
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Lustig, Sébastien
Mansat, Pierre
Senneville, Eric

How long after resection arthroplasty (stage one) can I reimplant the patient?

- **HK-71 (former HK-140b) What is the optimal timing for reimplantation of a two-stage exchange arthroplasty of the hip and knee?**

- **RESEARCHED BY:**

Arash Aalirezaie MD, Iran

Dirk-Jan Moojen MD, Netherlands

Job Diego Velázquez Moreno MD, Mexico

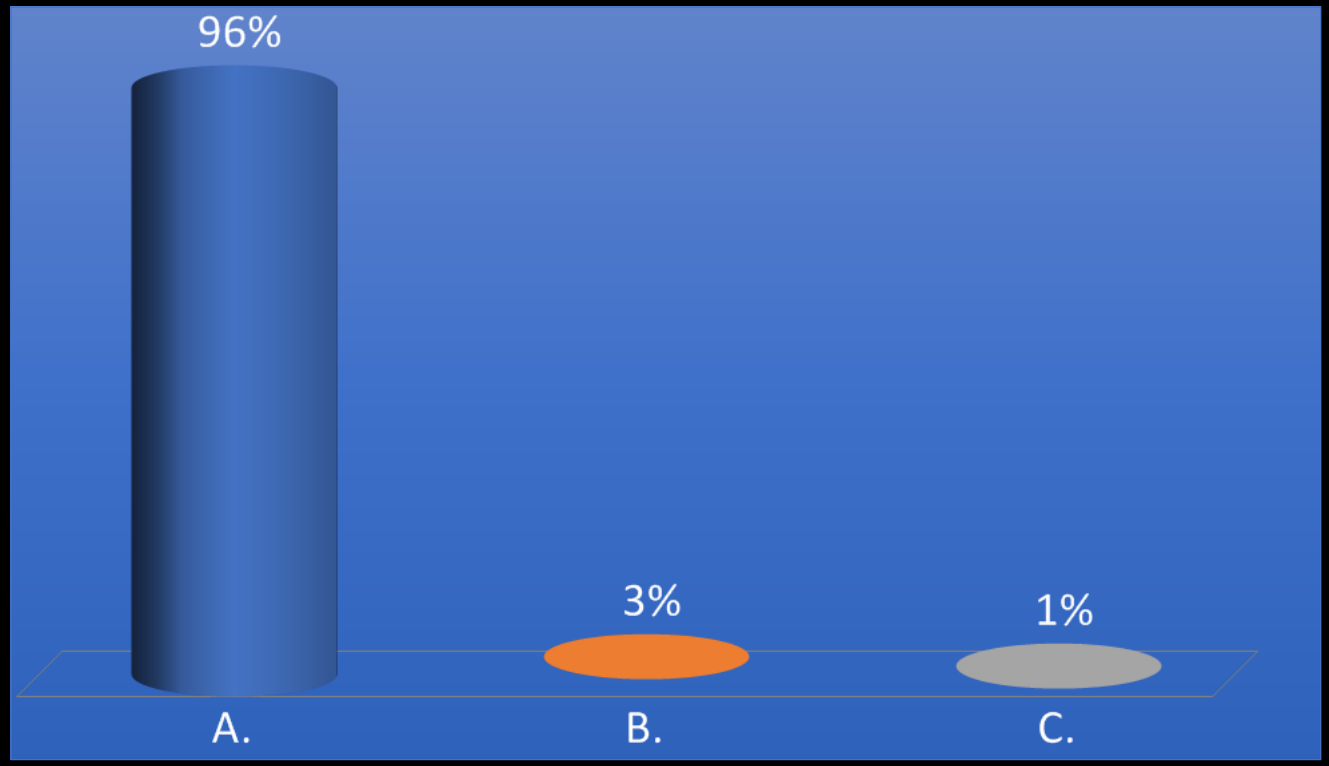
Literature

- **Meta-analysis 1, Prospective/Randomized 0, Retrospective 23**
- There is no gold standard that can guide surgeons to determine the optimal time of reimplantation
- Various serum and synovial markers have been studied to identify the most accurate test for screening for persistent PJI.
  - A common finding of most of the studies is a high specificity, but low sensitivity
- A decreasing trend is seen in CRP and ESR during the interval period; however, these numbers can be misleading.
- D-dimer is an inexpensive and widely available test that can aid in identifying the timing of reimplantation – ongoing research is currently investigating its utility.
  - In a recent study D-dimer outperformed CRP and ESR for determining time for reimplantation.

Recommendation: There are no definitive metrics to allow determination of optimal timing of reimplantation. Thus, timing of reimplantation should rely of resolution of clinical signs of infection, down-trend in the serological markers, and reliance on synovial analysis, if aspiration is performed.

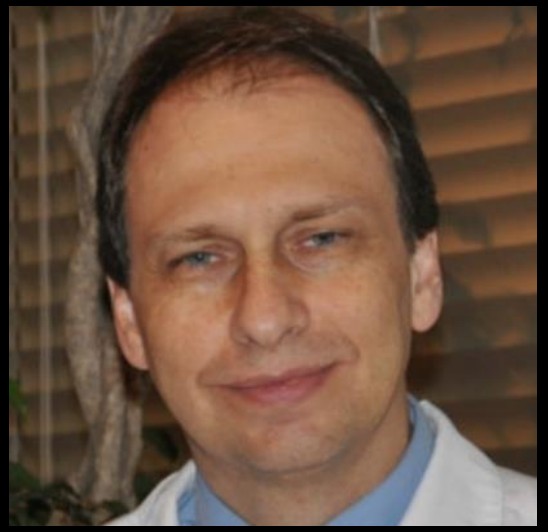
Level of Evidence: Moderate

A. Agree
B. Disagree
C. Abstain



What metrics should I use to determine the timing of reimplantation?

HK-105 (former HK-67) – Is normalization of serological markers necessary prior to reimplantation arthroplasty (performed as part of a 2-stage exchange for PJI)?



Marco Teloken MD, Brazil

Scott Sporer MD, USA

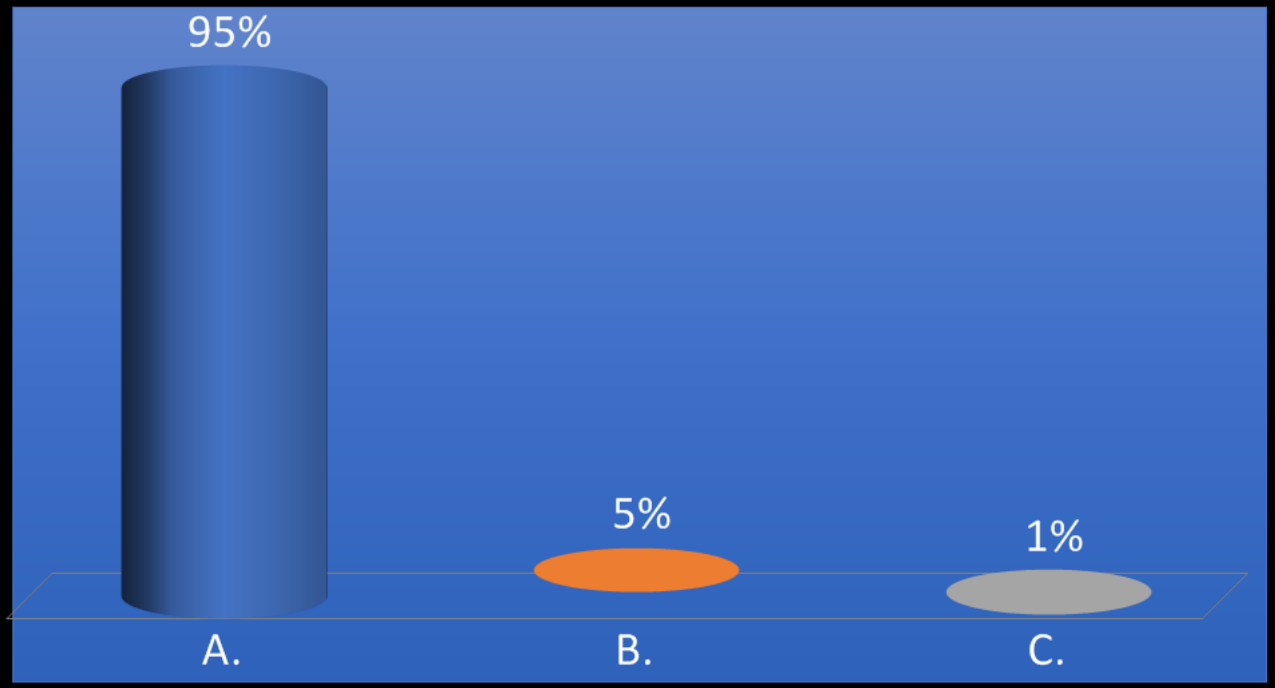
Literature:

- **Meta-analysis/Systematic Review 0, Prospective 2, Retrospective 27**
- ESR and CRP levels can remain elevated for weeks after surgery
- Kubista et al. found no statistically significant differences in mean values for CRP or ESR before resection or reimplantation when comparing the treatment failure group to the control group
- Many authors rely on a downward trend in inflammatory markers before reimplantation.

Recommendation: No. A trend and decline in CRP and ESR is expected, but we still recognize that there are certain cases in which reimplantation may be performed despite abnormal levels of ESR and CRP Surgeons should not wait for complete normalization of the inflammatory markers as this may not occur in some patients and/or take a long period of time.

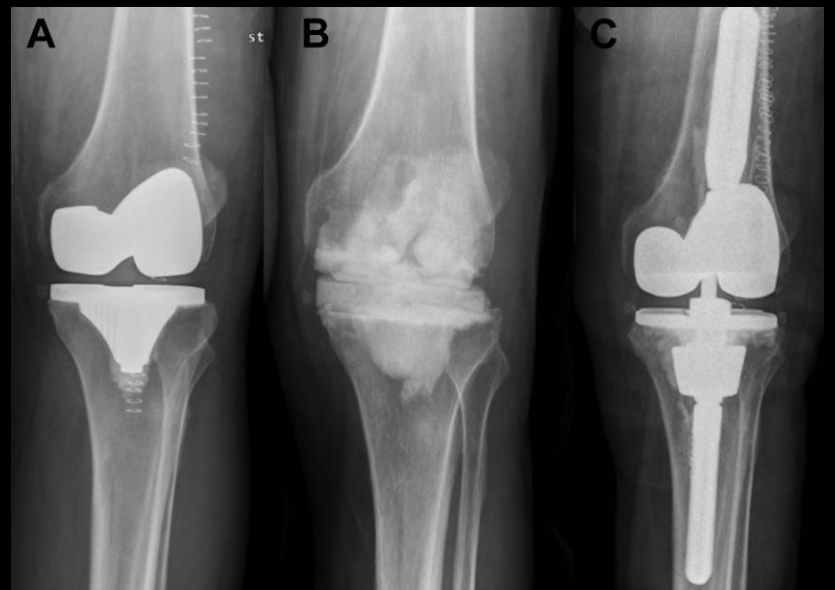
Level of Evidence: Moderate

A. Agree
B. Disagree
C. Abstain



What do I need to do during reimplantation?

- Treat the patient like they are infected
- Remove all spacer components
- Debride and irrigate the wound accordingly
- Reimplant with low-dose antibiotics



Is there a role for extended antibiotics after reimplantation?

- **HK-139 (former HK-24) Does extended oral antibiotic prophylaxis following reimplantation reduce the risk of future failure? If so, what type of antibiotic should be administered and for how long?**

Viktor Janz MD, Germany

Craig J Della Valle MD, USA

Linda I Suleiman MD, USA

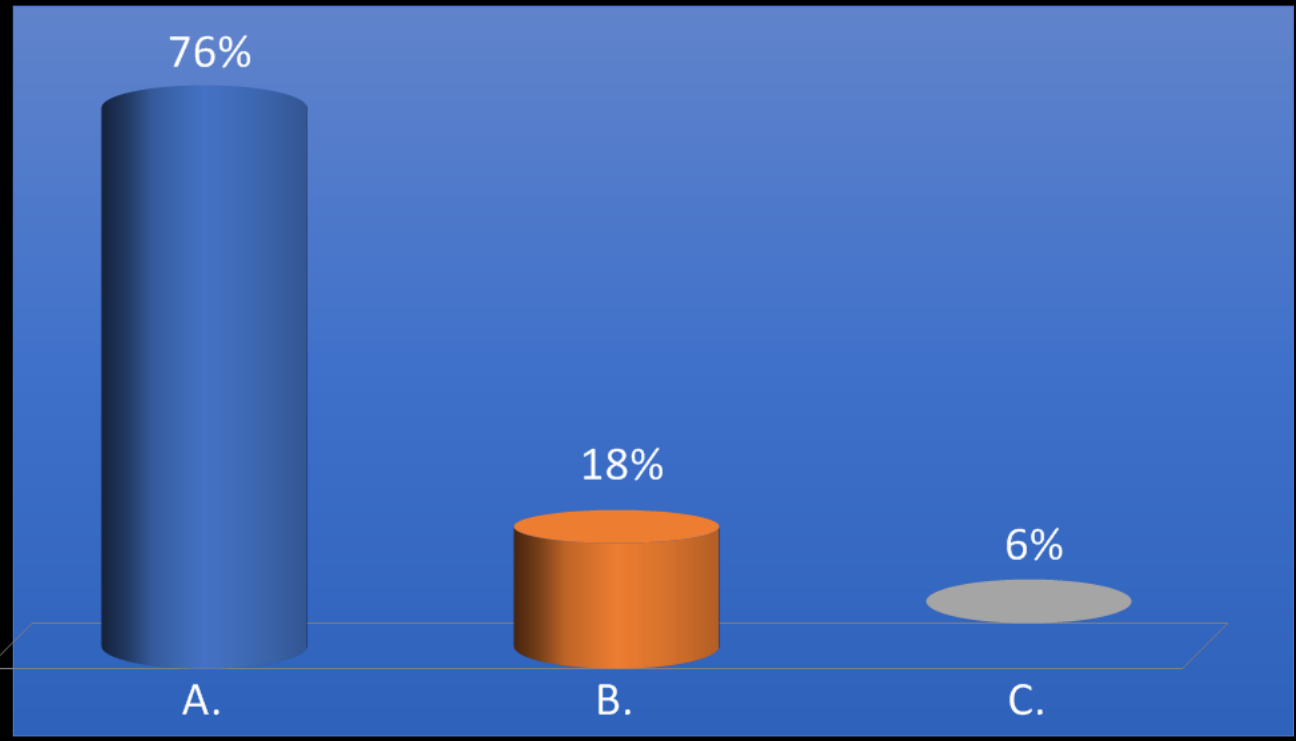
Literature:

- **Meta-analysis 0, Prospective/Randomized 1, Retrospective 2**
- Frank et al. conducted a multicenter RCT examining the role of prolonged (3 months) prophylactic oral antibiotics following reimplantation patients undergoing revision TJA (n=107).
  - The rate of reinfection was 19% in the control group vs. 5% in the prolonged antibiotic treatment group (p=0.0162).
- Two retrospective studies
  - Zywiel et al (n=28) - found that the risk of reinfection with extended oral antibiotics was 4% vs.16% in the control cohort receiving routine antibiotics
  - Johnson et al - found 13.6% vs. 0% rates of reinfection in the routine perioperative antibiotic group compared to patients treated with oral antibiotics for 14 days following a two-stage exchange, respectively

Recommendation: Possibly. There is emerging evidence that administration of three months of oral antibiotic directed towards the original infecting organism following re-implantation reduces the risk of early failure secondary to periprosthetic joint infections.

Level of Evidence: Moderate

A. Agree
B. Disagree
C. Abstain



What do I do with patients whose culture comes back positive during reimplantation?

Positive Culture During Reimplantation Increases the Risk of Subsequent Failure in Two-Stage Exchange Arthroplasty

J Bone Joint Surg Am. 2016;98:1313-9

Timothy L. Tan, MD, Miguel M. Gomez, MD, Jorge Manrique, MD, Javad Parvizi, MD, FRCS, and Antonia F. Chen, MD, MBA

- Positive intraoperative culture at the time of reimplantation, regardless of the number of positive samples, was independently associated with **>2 times the risk** of subsequent treatment failure and earlier reinfection.
- Surgeons should be aware that a positive culture at the time of reimplantation independently increases the risk of subsequent failure.

Positive Culture During Reimplantation Increases the Risk of Reinfection in Two-Stage Exchange Arthroplasty Despite Administrating Prolonged Antibiotics: A Retrospective Cohort Study and Meta-Analysis

Chi Xu, MD [a], Timothy L. Tan, MD [b], Ji-Ying Chen, MD [a, *]

The Journal of Arthroplasty 34 (2019) 1025–1031

- **6 weeks of antibiotics**: 2 weeks of IV and 4 weeks of oral
- 6 weeks of antibiotic administration following reimplantation decreased the odds of reinfection from **9.35 to 3.12**
- However, there is still a significantly increased risk **(3x)** of reinfection despite antibiotic administration

Quels résultats?

THE BONE & JOINT JOURNAL

■ INSTRUCTIONAL REVIEW

The management of an infected total knee arthroplasty

T. Gehrke,
P. Alijanipour,
J. Parvizi

Study	Sample size*	Definition of failure	Follow-up (yrs)†	Success rate (%)
One-stage exchange arthroplasty				
Zahar et al[82]	70	Revision surgery for infection or any other cause	10 (9 to 11)	*93*
Haddad et al[90]	28	Major surgery or chronic suppression antibiotic therapy for control of infection	6 (3 to 9)	*100*
Tibrewal et al[91]	50	Revision for recurrent infection	10 (2 to 24)	*98*‡
Jenny et al[92]	47	Occurrence of any infection	3 (0.5 to 6)§	*87*
Singer et al[99]	63	Recurrence of infection	3 (2 to 6)	*95*
Two-stage exchange arthroplasty				
Haddad et al[90]	74	Major surgery or chronic suppression antibiotic therapy for control of infection	6 (3 to 9)	*93*
Macheras et al[93]	31	Recurrence of infection	12 (10 to 14)	*91*
Gooding et al[94]	115	Presence of symptoms of infection as well as raised inflammatory markers	9 (5 to 12)	*87*
Mortazavi et al[100]	117	Any further surgical treatment for PJI	3 (2 to 9)	*72*
Kurd et al[95]	96	Any further surgical treatment for PJI	3 (2 to 7)	*73*
Hsu et al[96]	28	Re-infection	8 (5 to 10)	*89*
Hart et al[97]	48	Persistence of infection	4 (2 to 7)	*88*
Haleem et al[77]	96	Reoperation	7 (2 to 13)	*84*
Emerson et al[98]	48	Re-infection	6 (3 to 13)	*79*

Gacon RCO 1997	82%	(n=24)
Parvizi CORR 2009	60%	(n=127)
Bauer RCO 2007	66%	(n=77)
Haleem CORR 2004	90%	(n=96)
Segawa JBJS Am 1999	83%	(n=29)
Whiteside CORR 1994	85 %	(n=33)
Goldman CORR 1996	91%	(n=64)
Wasielewski JOA 1996	90%	(n=76)
Mahmud CORR 2012	85%	(n=253)

60 à 90% de succès

Take home message

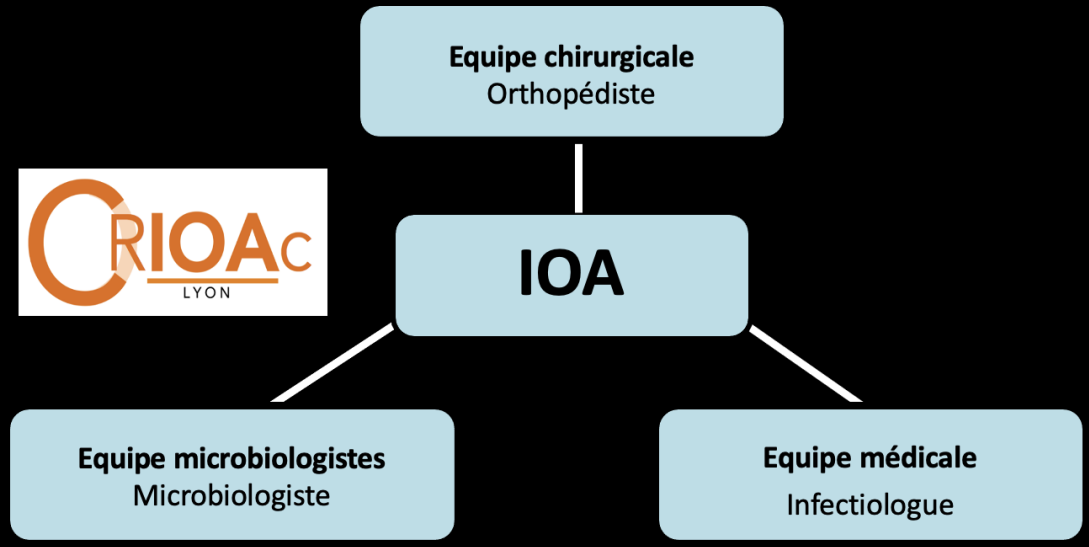
Consensus Philadelphia 2018

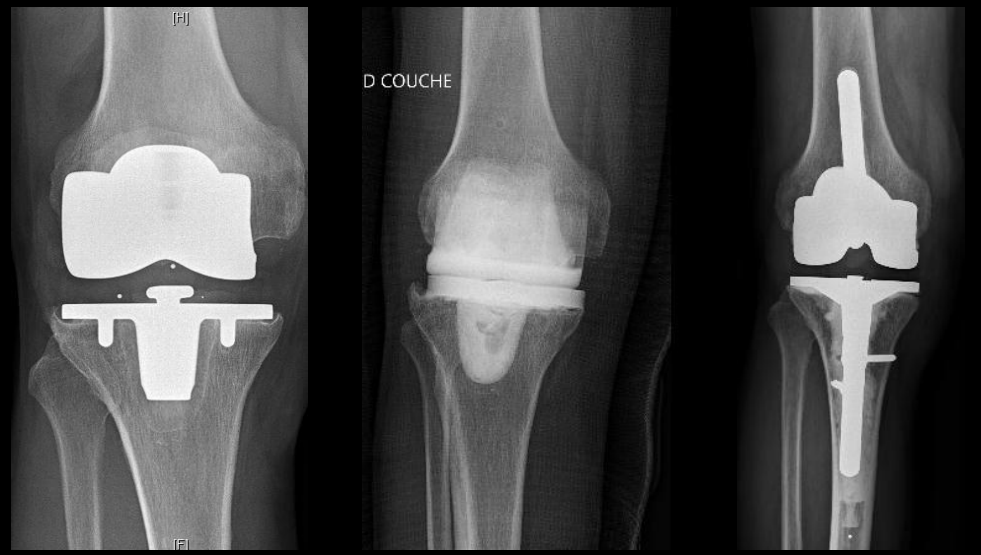
Travail d'équipe

Procédure bien codifiée

Adaptée à chaque cas

Planification chirurgicale est crucial





Merci

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