Cementing Best Practices in Total Knee Arthroplasty

Prof David Barrett, Southampton University

Dr Douglas A. Dennis, Colorado Joint Replacement

Dr J. Bohannon Mason, OrthoCarolina

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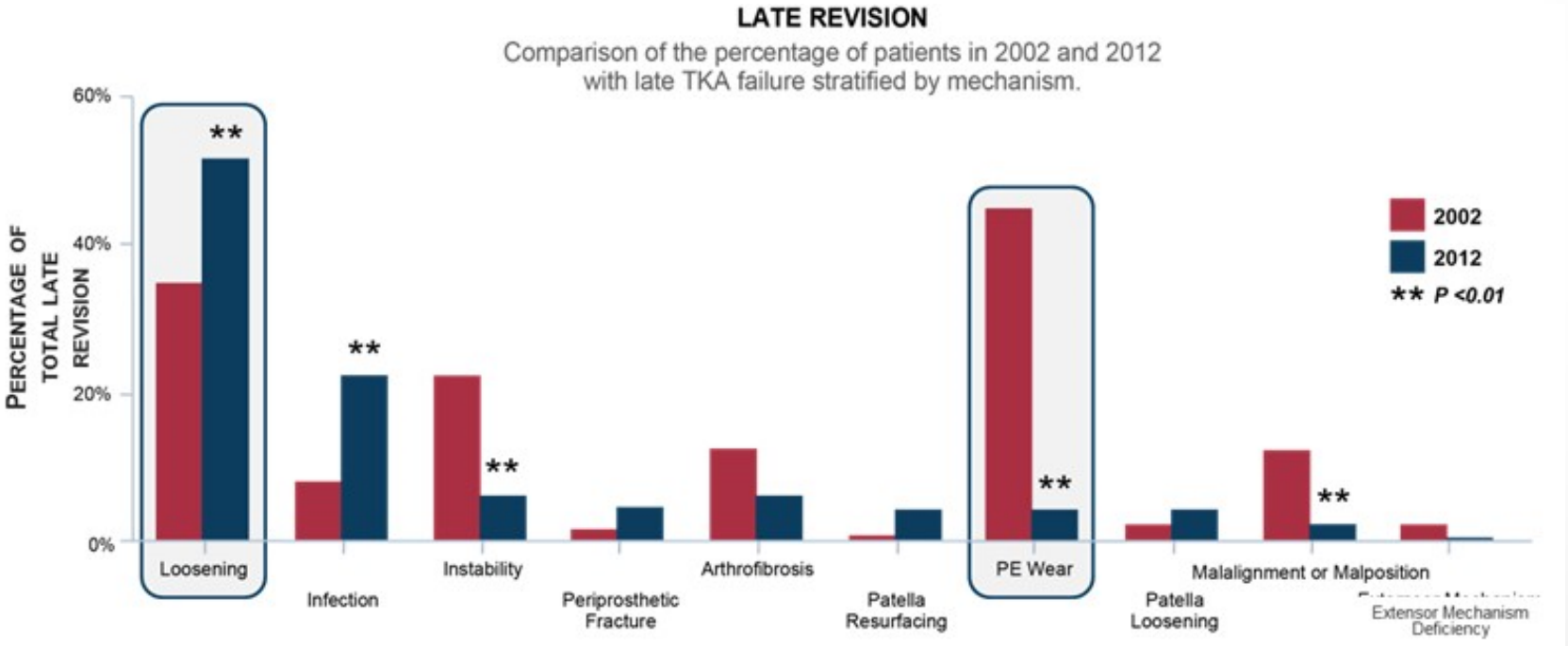
Survivorship and Reason for Revision has evolved over the last decade

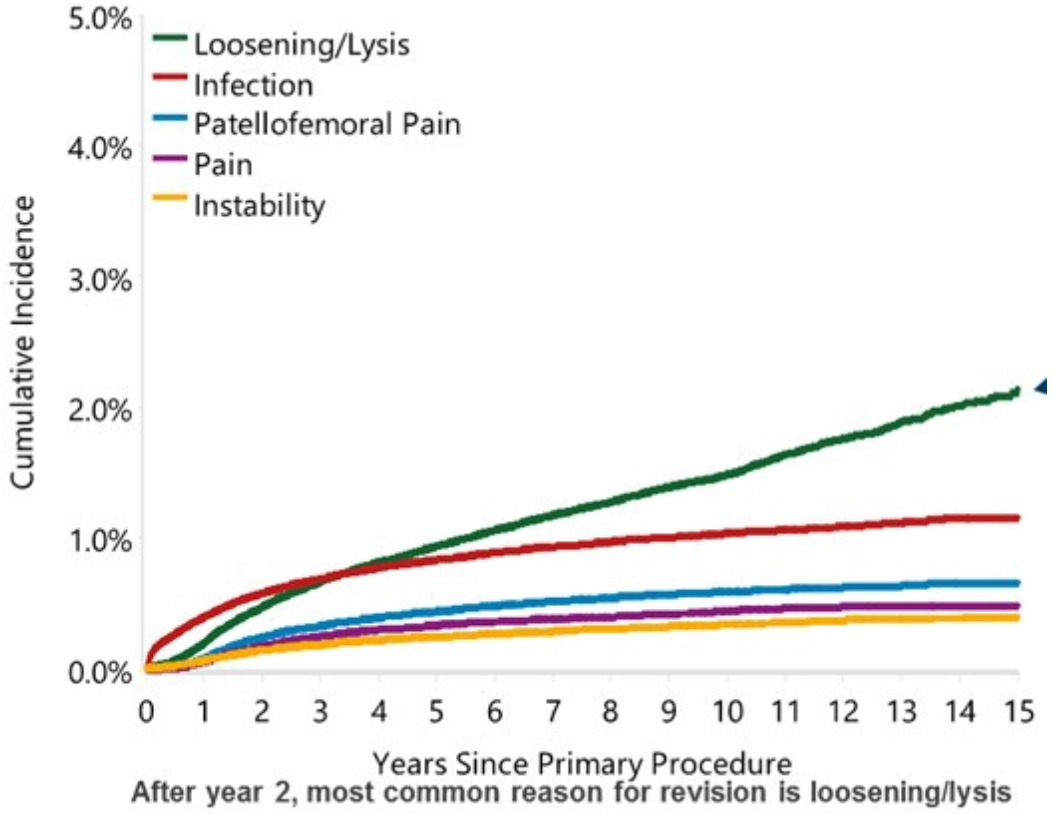


Sharkey F., MD, Lichstein P.M., MD, MS, Shen C., MD, Tokarski A.T., BS, Parvizi J., MD, FRCS. Why Are Total Knee Arthroplasties Failing Today – Has Anything Changed After 10 Years? *The Journal of Arthroplasty* 2014; 29: 1774-1778.

095274-180717 DSUS

Aseptic Loosening

Cumulative Incidence of Revision Diagnosis Total Knee Replacement



Australian Orthopaedic Association National Joint Replacement Registry Annual Report. (2017). Figure KT9.
Full summary of all data is available from: https://aoanjrr.sahmri.com/annual-reports-2017

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Contents lists available at SciencesDirect

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journal homepage: www.arthroplastyjournal.org

Why Are Total Knees Failing Today? Etiology of Total Knee Revision in 2010 and 2011

William C. Schroer, MD [a], Keith R. Berend, MD [b], Adolph V. Lombardi, MD [b], C. Lowry Barnes, MD [c], Michael P. Bolognesi, MD [d], Michael E. Berend, MD [e], Merrill A. Ritter, MD [e], Ryan M. Nunley, MD [f]

ARTICLE INFO

ABSTRACT

Understanding why total knee arthroplasties fail today is important for improving outcomes and directing efforts to minimize the high medical and socioeconomic costs associated with knee arthroplasty failure. The number of primary total knee arthroplasty (TKA) performed in the United States has increased dramatically over the past 10 years to more than 615,000 in 2008 [1]. Projections estimate that demand will continue to grow to more than 3 million annually by 2030. [2] The volume of revision TKA increased to more than 75,000 during the same time period and has been projected to further increase by 600% by 2030 [2]. Whereas it is expected that increased primary knee volume would increase revision volume, the cause and rate of failure cannot be ignored.

Outcome studies can initiate surgeon and hospital efforts to improve surgical technique and clinical care guidelines, and can motivate industry to improve instrumentation, implant design, or materials. However, most studies on TKA failure describe single-surgeon, single-implant, and/or single-institution results that report a small percentage of failed knee arthroplasties [3–5]. Yet, population studies continue to demonstrate a much higher failure rate [6,7].

The current study attempts to report why TKA is failing today, similar to previous studies by Fehring et al and Sharkey et al who looked at failure mechanisms for revision TKA performed between 1986 and 2000 [8,9]. These studies demonstrated that a majority of failures occurred in the first few years, with a disproportionate amount for infection and implant-associated failure mechanisms. Since these studies were published, efforts have been made to improve implant performance and instruct surgeons towards best practice total knee techniques. Unlike previous studies, this paper compiles results from a multi-center evaluation of revision TKA cases during 2010 and 2011. The purpose of this study is to report a detailed analysis of the failure mechanism and the time to failure to determine whether the failure mechanism of primary TKA has changed over the past 10–15 years.

Patients and Methods

A retrospective review of failed primary total knee arthroplasties that presented for revision surgery at six different orthopedic institutions (two major university academic centers, two non-university academic centers, and two community total joint centers) between January 1, 2010 and December 31, 2011 yielded 844 knees. Demographic data included patient gender, age, weight, height, and BMI at the time of revision. The primary mechanism of failure was determined by the operating surgeon with information collected during preoperative consultation, radiographic evaluation, intraoperative analysis, and laboratory results if necessary (Table). All institutions used a standardized spreadsheet to record data and categorize mechanism of failure. Only primary revision surgery was tabulated. Isolated polyethylene exchange for possible infection was not considered a revision

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Evolution of TKR Bone Cementing Techniques

Evolution of TKR Bone Cementing Techniques

Early first generation cementing techniques included[1]:

- limited bone-bed preparation
- hand mixing of cement in an open atmosphere
- stiff doughy cement introduced by hand
- digital pressurization

1. Breusch FJ, Malchau H Springer-Verlag Berlin Heidelberg, 2005

Evolution of TKR Bone Cementing Techniques

Key papers or milestones in TKR Cementing technique:

Bone-bed preparation

- Washing the bone using pulsed lavage, enhances cement penetration better than manual flushing alone[1] and may improve the fixation strength of cemented tibial components[2].
- Since bone cement has no adhesive properties, in areas of dense or sclerotic bone, drilling keying holes in the bone can assist in creating a greater degree of cement interdigitation[3]
- As a dryer bone surface will result in deeper cement preparation, the cleaning and drying of bone directly before cement application is recommended[4].

1. Cawley DT, Kelly N, Mcgarry JP, Shannon FJ, Instructional review 2013
2. Schlegel UJ, Siewe J, Delank KS, Eysel P, Püschel K, Morlock MM, de Uhlenbrock AG, Int Orthop. 2011
3. Rauh, M. A., Clark, L. D., Shah, H., Krackow, K. A., Mihalko, W. M.,Orthopedics 2008
4. Saleh KJ, El Othmani MM, Tzeng TH, Mihalko WM, Chambers MC, J Orthop Res. 2016

Evolution of TKR Bone Cementing Techniques

Cement Mixing

- Mixing bone cement in an open bowl can cause the inclusion of air into the cement if the cement is not adequately kneaded. Mixing in a vacuum system reduces the inclusion of air voids in the cured cement[1]. Voids in the cement can reduce the strength of the cured cement[2].

1. Alkire, M., Dabezies, E., Hastings, P, Orthopedics, 1987
2. Lidgren, L., Drar, H., Moller, J, Acta Orthopaedica Scandinavica 1984

Evolution of TKR Bone Cementing Techniques

Cement introduction and pressurisation

- To achieve adequate penetration of cement into bone, a study demonstrated that bone cement should be maintained at a pressure of at least 76 kPa (0.75 bar) for 5 seconds[1]. Furthermore the use of a pressurized cement gun or cement syringe may increase the depth of the depth of the tibial cement mantle and reduce radiolucent lines when compared to cement applied by hand[2].
- Pressurisation techniques include suction, digital application, syringe application, impaction and leg extension.

1. Breusch FJ, Malchau H, Springer-Verlag Berlin Heidelberg, 2005
2. Lutz MJ, Pincus PF, Whitehouse SL, Halliday BR, The Journal of Arthroplasty 2009

Evolution of TKR Bone Cementing Techniques

Cement Fixation

- Evidence suggests that a thicker cement mantle improves fixation strength and resistance to tensile and shear forces in the tibial component of total knee arthroplasty[1]. Studies have suggested that optimal fixation requires penetration of cement into the proximal tibia by 3 mm to 4 mm[2].

1. Lutz MJ, Pincus PF, Whitehouse SL, Halliday BR, The Journal of Arthroplasty 2009
2. Cawley DT, Kelly N, Mcgarry JP, Shannon FJ, Instructional review 2013

Primary TKA 2018 –Cement Fixation

J. Bohannon Mason, MD

OrthoCarolina Hip and Knee Center

OrthoCarolina

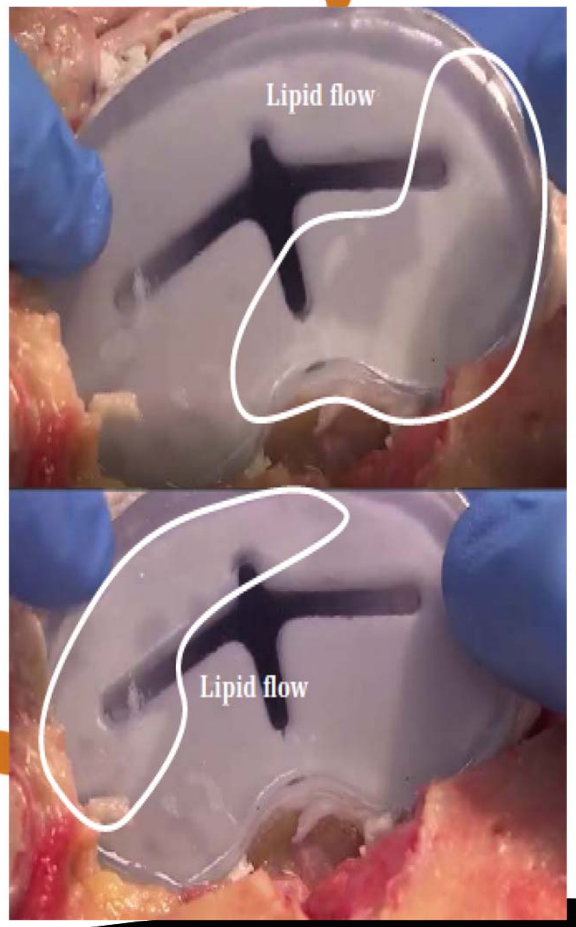
Associate Professor

Department of Orthopedics

Atrium Health

OrthoCarolina HIP AND KNEE CENTER

Why Does Tibial Loosening persist?



Billi F, et al.,ORS 2014 Annual Meeting, 2014

Scientific Exhibit 15:

Simultaneous Femoral and Tibial Cementation Negatively Effects Tibial Fixation in Total Knee Arthroplasty

J Bohannon Mason[1]*, Yashar Behnam[2]**, Hayden Wilson[2]**, Brian Haas[2]*, Thomas Fehring[1]*, Mark Heldreth[3]***
[1]OrthoCarolina, Charlotte, NC | [2]Center for Orthopaedic Biomechanics, University of Denver, Denver, CO | [3]DepuySynthes, Warsaw, IN

Hypothesis:

- Improved surgical efficiency is a necessary mandate of healthcare economics
- Time efficiencies become an increasing focus in management of costs
- Cementation techniques have evolved from sequential to simultaneous

OrthoCarolina HIP AND KNEE CENTER

Hypothesis

- **We theorized that the motion incurred during simultaneous component cementation may have an adverse effect on tibial fixation.**

Mason BJ, et al. Simultaneous Femoral and Tibial Cementation Negatively Effects Tibial Fixation in Total Knee Arthroplasty. American Academy of Orthopaedic Surgeons, 2018 Annual Meeting, Scientific Exhibit 15, New Orleans, LA.

Asked 4 Research Questions

1. Does knee motion during the cementation process change tibial tray fixation strength?
2. Does knee motion influence marrow lipid contamination of the implant/cement interface?
3. Does marrow lipid contamination change implant fixation strength?
4. Does the type of tibial bone prep change tibial fixation strength when knee motion occurs during cementation?

Mason BJ, et al. Simultaneous Femoral and Tibial Cementation Negatively Effects Tibial Fixation in Total Knee Arthroplasty. American Academy of Orthopaedic Surgeons, 2018 Annual Meeting, Scientific Exhibit 15, New Orleans, LA.

Methods

- Simulated TKA Procedures were performed on **thirty six lower extremity "pelvis to toe tip" cadaveric specimens** (72 knees, age = 68 ± 11 years, height = 66 ± 3inch, BMI = 24 ± 7, 13 female / 23 male).
- Specimens with prior lower extremity injury, surgery, or compromised ligaments were excluded.
- In matched specimens, on one side the implant component was held motionless with digital pressure until complete cement polymerization (**"No Motion" cement technique**)
- In the opposite matched specimen, the tibial component was cemented at 2min and 30sec. At 7 minutes, the knee was taken through a standardized knee motion protocol simulating intraoperative simultaneous cementation and ligament examination (**"Motion" cement technique**)

Mason BJ, et al. Simultaneous Femoral and Tibial Cementation Negatively Effects Tibial Fixation in Total Knee Arthroplasty. American Academy of Orthopaedic Surgeons, 2018 Annual Meeting, Scientific Exhibit 15, New Orleans, LA.

Methods

- Prior to testing, each **tibial implant and the associated prep instruments** were **laser scanned to establish the relative fit** between the implant and prepared bone (3D Scanner HD and Scan Studio, NextEngine Inc, CA)
- Bone preparation instrumentation which leave a significant portion of the distal central fixation feature in contact with the surrounding cancellous bone were classified as (**"No Clearance" prep**)
- Bone preparation instrumentation which do not leave a significant portion of the distal central fixation feature in contact with the surrounding bone were classified as (**"Clearance" prep**).

Mason BJ, et al. Simultaneous Femoral and Tibial Cementation Negatively Effects Tibial Fixation in Total Knee Arthroplasty. American Academy of Orthopaedic Surgeons, 2018 Annual Meeting, Scientific Exhibit 15, New Orleans, LA.

Methods

- Each specimen was randomly assigned to receive one of **9 contemporary posterior stabilized primary TKA designs.**

Mason BJ, et al. Simultaneous Femoral and Tibial Cementation Negatively Effects Tibial Fixation in Total Knee Arthroplasty. American Academy of Orthopaedic Surgeons, 2018 Annual Meeting, Scientific Exhibit 15, New Orleans, LA.

Cohorts – No Motion / Motion

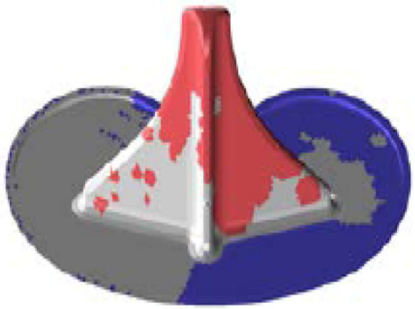
: "No Motion" Protocol

2: "Motion" Performed @ 7 min after Mixing

Mason BJ, et al. Simultaneous Femoral and Tibial Cementation Negatively Effects Tibial Fixation in Total Knee Arthroplasty. American Academy of Orthopaedic Surgeons, 2018 Annual Meeting, Scientific Exhibit 15, New Orleans, LA.

Testing

- Implanted tibi[illegible]ere extracted from specimens, s[illegible]onized.
- Trays were [illegible]d proximally from the bone under[illegible]lacement control at a [illegible] of 5-mm/m[illegible]e until failure of the cement int[illegible]e, recording the peak retention f[illegible]rior to failure.
- Trays were [illegible]ographed to characterize the amount [illegible]rface contamination, the dark gray ar[illegible] lipid stained (Fig. 5b)
- 3-dimensiona[illegible]angular surface mesh[illegible] of the tibial tra[illegible]ere overlaid and aligned to the images us[illegible] Hypermesh (Altair), and elements corr[illegible]onding to contaminated areas o[illegible]nt were identified

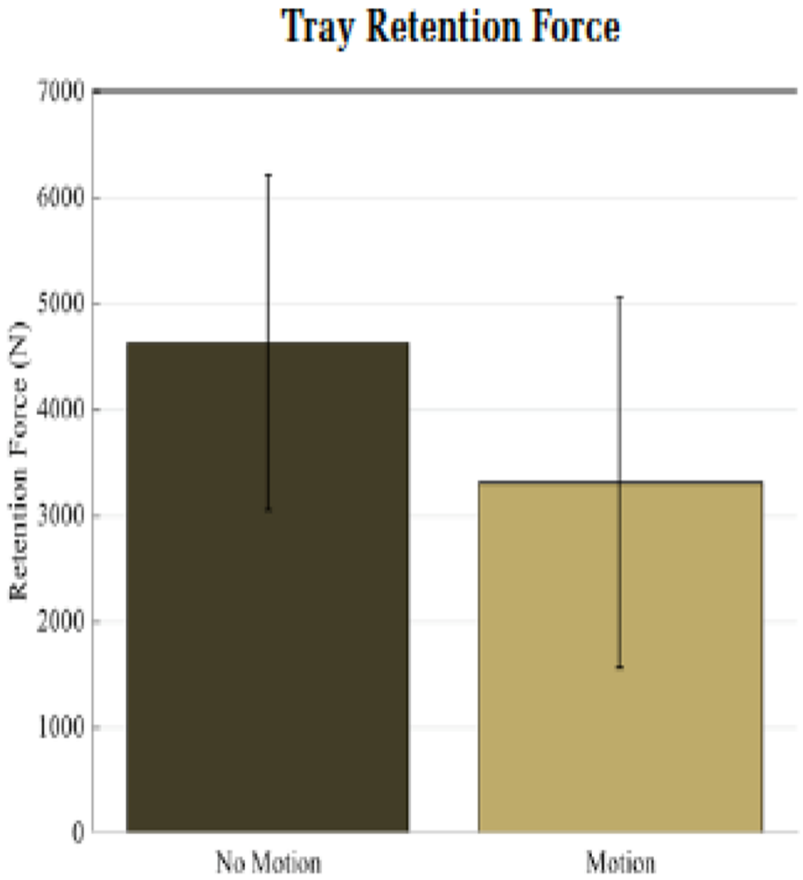


Mason BJ, et al. Simultaneous Femoral and Tibial Cementation Negatively Effects Tibial Fixation in Total Knee Arthroplasty. American Academy of Orthopaedic Surgeons, 2018 Annual Meeting, Scientific Exhibit 15, New Orleans, LA.

Question 1: Does knee motion during the cementation process affect tibial tray fixation strength?

- **Yes**, knee motion during cement curing caused a statistically significant reduction in fixation strength when comparing all implants in the "**No Motion**" and "**Motion**" cohorts (p = 0.0013).

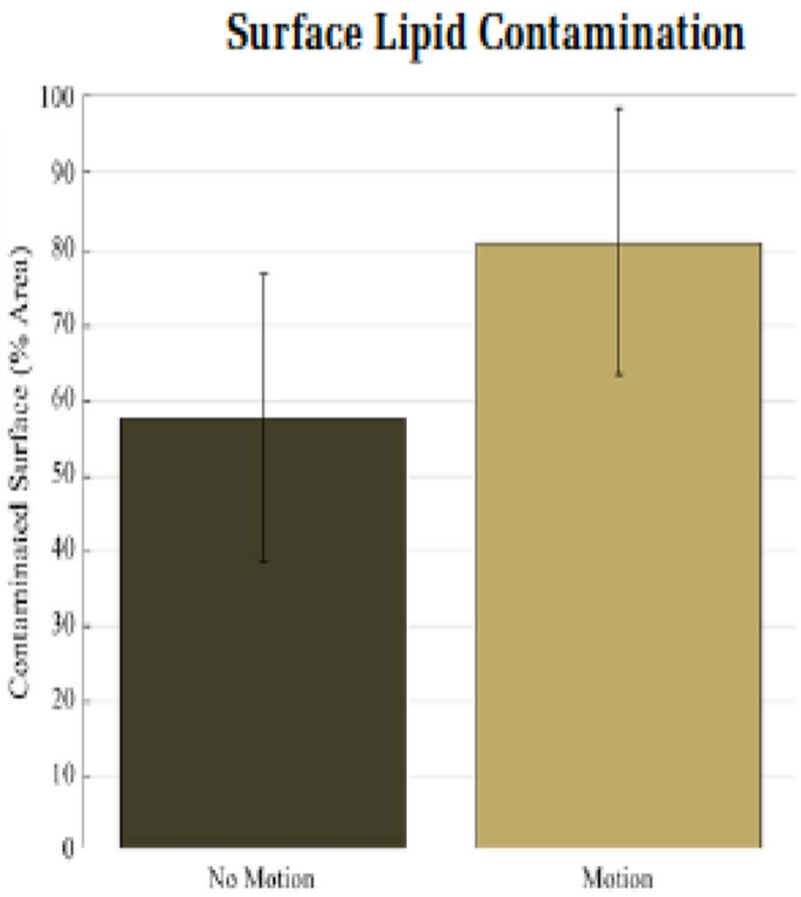
- Average peak retention forces were reduced from 4647 ± 1589 N in the "**No Motion**" cohort to 3322 ± 1753 N in the "**Motion**" cohort



Mason BJ, et al. Simultaneous Femoral and Tibial Cementation Negatively Effects Tibial Fixation in Total Knee Arthroplasty. American Academy of Orthopaedic Surgeons, 2018 Annual Meeting, Scientific Exhibit 15, New Orleans, LA.

Question 2: Does knee motion influence marrow lipid contamination of the implant/cement interface?

- **Yes**, knee motion during cement curing caused a statistically significant increase in lipid contamination of the tray fixation surfaces compared to the **"No Motion"** cohort ($p = 0.0007$).
- Average contaminated surface areas were increased from 58% ± 19% in the **"No Motion"** cohort to 81% ± 17% in the **"Motion"** cohort



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All Trays/All Designs showed significant Lipid Contamination

Motion

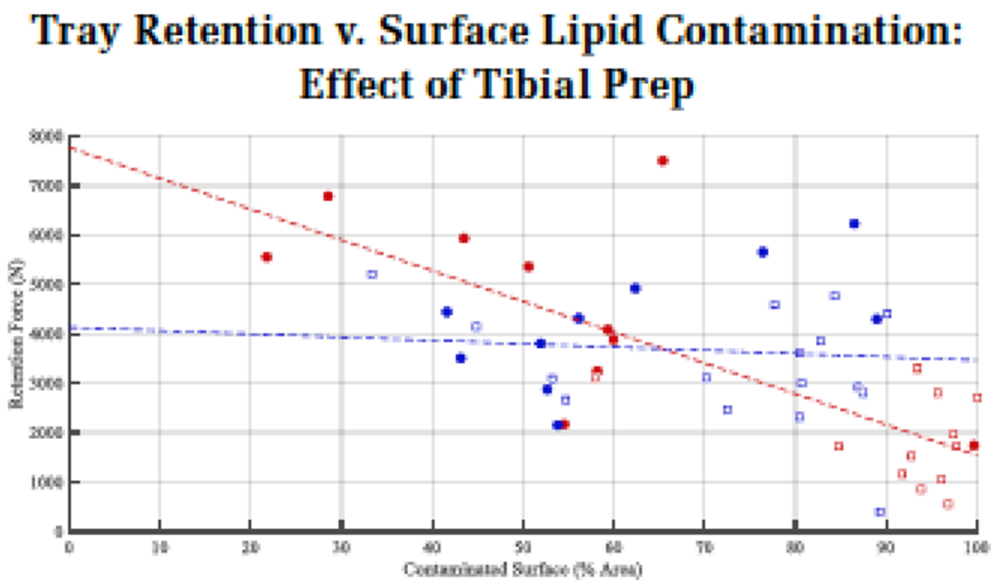
No Motion

CHANGE for High Res Image

Mason BJ, et al. Simultaneous Femoral and Tibial Cementation Negatively Effects Tibial Fixation in Total Knee Arthroplasty. American Academy of Orthopaedic Surgeons, 2018 Annual Meeting, Scientific Exhibit 15, New Orleans, LA.

Question 3: Does marrow lipid contamination affect implant fixation strength?

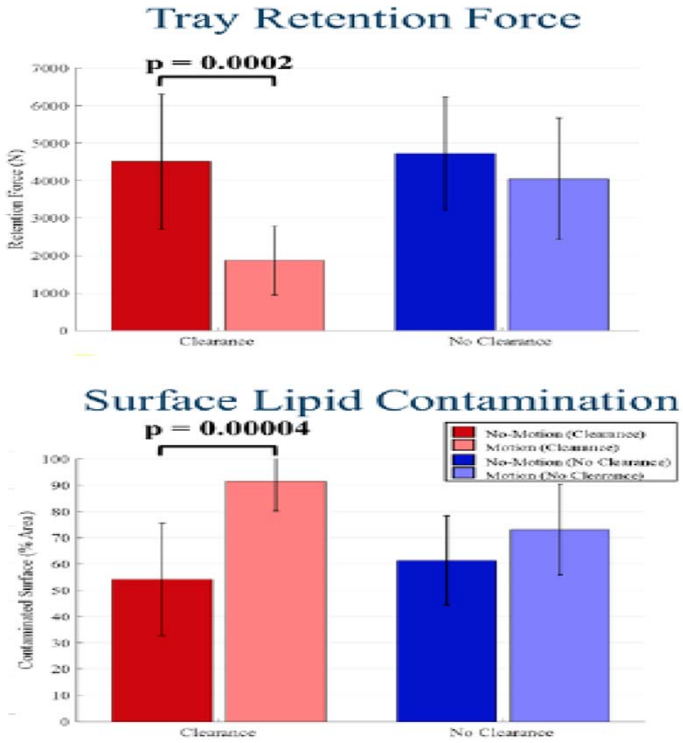
- **Yes**, a low negative correlation was observed between the **amount of surface contamination and the resulting peak retention force** across all specimens



Mason BJ, et al. Simultaneous Femoral and Tibial Cementation Negatively Effects Tibial Fixation in Total Knee Arthroplasty. American Academy of Orthopaedic Surgeons, 2018 Annual Meeting, Scientific Exhibit 15, New Orleans, LA.

Question 4: Does the type of tibial bone prep affect tibial fixation strength when knee motion occurs during cementation?

- Yes, motion during cement curing with "Clearance" prep caused a significant reduction (p=0.0002) in retention force, but did not cause a statistically significant reduction in implants with "No Clearance" prep



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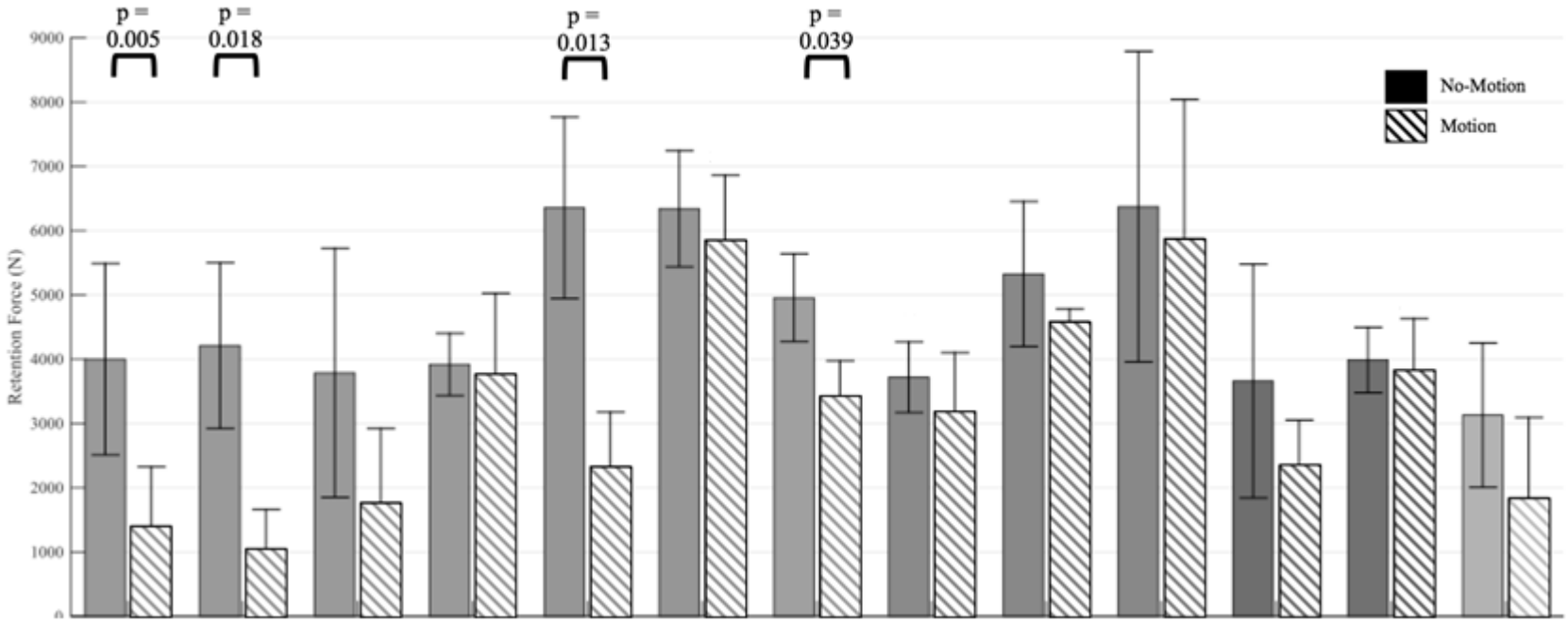
9 Different Designs -Individual implant designs are purposely blinded to highlight the correlations between motion during cementation, lipid contamination, and tibial bone preparation.



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Conclusions

- **Knee motion during cementation adversely affects fixation and should be avoided**
- Knee motion introduces lipid contamination at the implant-cement interface which adversely affects tibial fixation strength
- If a surgeon prefers simultaneous cementation during TKA and is assessing ligamentous stability and ROM during cement curing, then designs with a **"No Clearance"** tibial prep are recommended.
- Stress and movement of the knee during the cement curing phase **is not recommended**, due to the inherent risk of motion with regard to lipid infiltration and degradation of tibial strength

Mason BJ, et al. Simultaneous Femoral and Tibial Cementation Negatively Effects Tibial Fixation in Total Knee Arthroplasty. American Academy of Orthopaedic Surgeons, 2018 Annual Meeting, Scientific Exhibit 15, New Orleans, LA.

KEY CEMENTING STEPS IN TOTAL KNEE ARTHROPLASTY

Douglas A. Dennis, M.D.

Adjunct Professor, Dept. of Biomedical Engineering
University of Tennessee

Adjunct Professor of Bioengineering, University of Denver

Assistant Clinical Professor, Dept. of Orthopaedic Surgery
University of Colorado School of Medicine

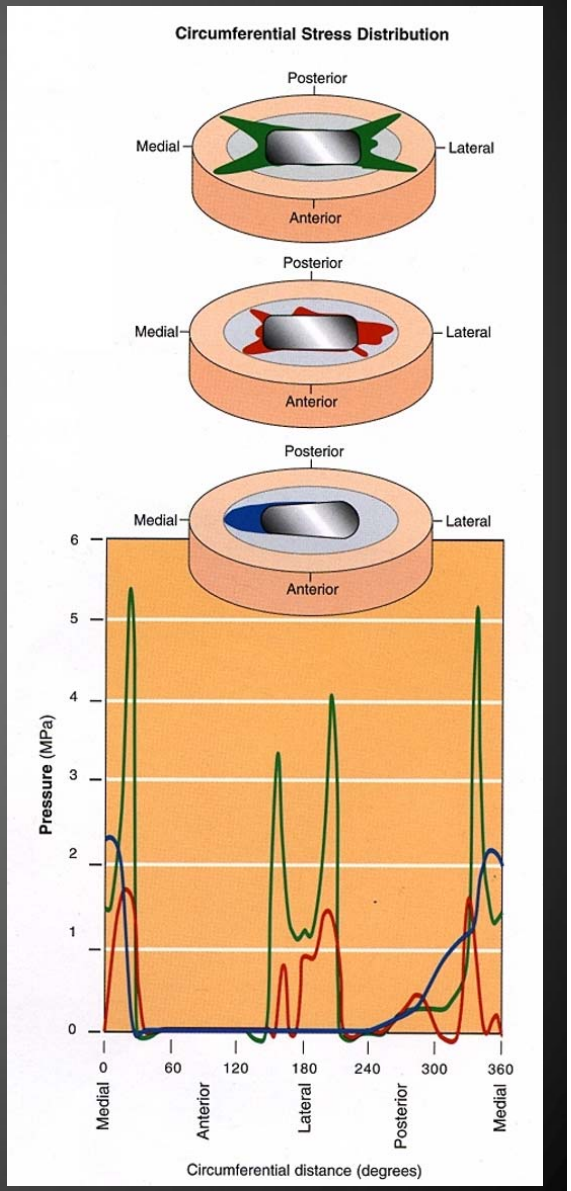
095274-180717 DSUS

DISCLOSURE

- Consultant : DePuy Synthes/ Corin
- Royalties:
  - DePuy Synthes/ Innomed / Wolters Kluwer
- Laboratory Research Support
  - DePuy Synthes
  - Porter Adventist Hospital
- Ownership Interest: Joint Vue

CEMENTING A TKA

- THA
  - Extensive Analyses Of Cement Technique
  - General Consensus
- TKA
  - Less Scientific Analysis
  - Wide Variations In Technique Are Utilized
  - No Definite Consensus

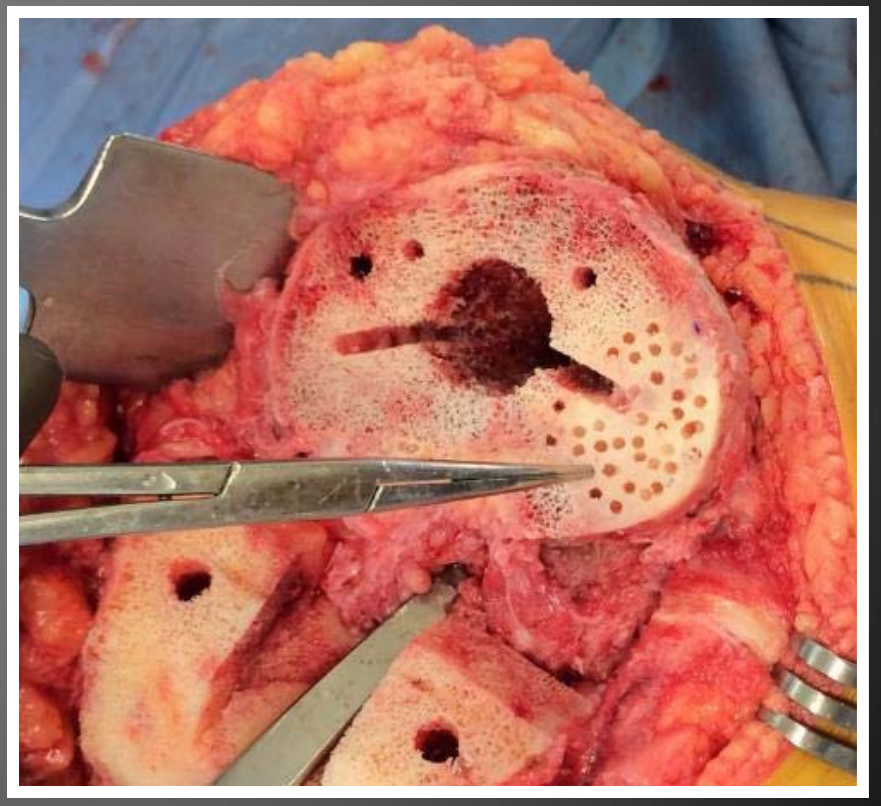


CEMENT TECHNIQUE

- Numerous Factors To Consider
  - Bone Preparation
  - Cement Type & Mixing Method
  - Implant Preparation
    - Cement Precoating
  - Cement Pressurization
    - Canal / Surface / Lipid Evacuation
  - Implant Impaction
  - Cement Removal
  - Motion During Curing

BONE PREPARATION

- Assess For Sclerotic Bone
  - Resists Cement Penetration
- Penetrate With A Small Drill
  - Enhance Porosity
- Currette / Graft Any Bone Cysts

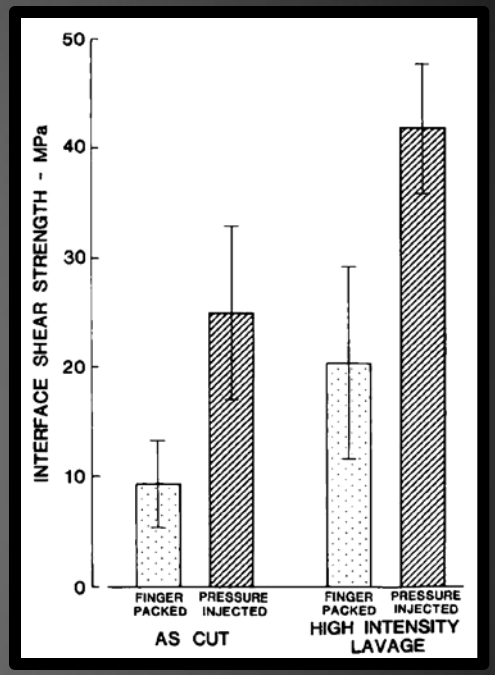


BONE PREPARATION

- Thoroughly Wash / Pulsatile Lavage
- Remove Debris & Enhance Cement Interdigitation
- Don’t Forget Posterior Femoral Condyles

BONE PREPARATION

- **Krause, Miller, et al, CORR 1982**
  - Pulsed Lavage + Pressure Injection → ↑ Fixation Strength



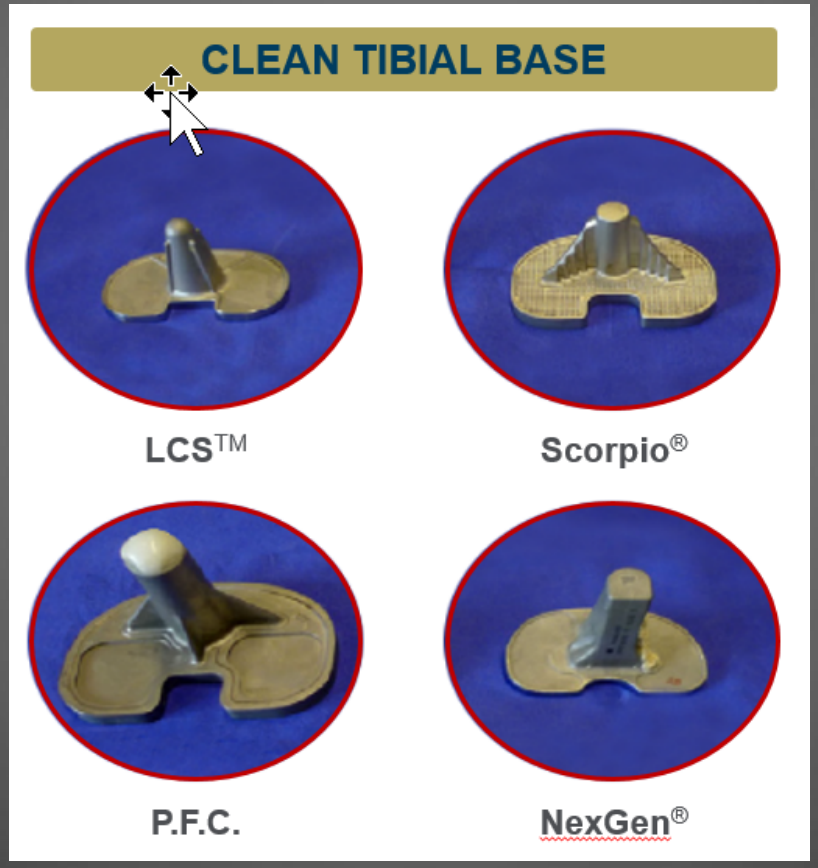
- **Schlegel, et al, Int Orthop 2014**
  - Pulsed Lavage Fixation → ↑ Fixation Strength & Cement Penetration Depth
  - Pressurizing With Cement Gun Couldn't Overcome Not Using Pulsed Lavage

BONE PREPARATION

- Schlegel, et al, Int Orthop 2010
  - Technique Can Affect The Loosening Interface
  - Enhanced Bone Penetration → Cement-Tray Debonding Predominates
    - Pulsatile Lavage / Pressure Injection

BONE PREPARATION

- Reflected In Retrieval Analyses Demonstrating "Clean Tibial Baseplates" With Multiple Designs



Schlegel, et al, Int Orthop 2010

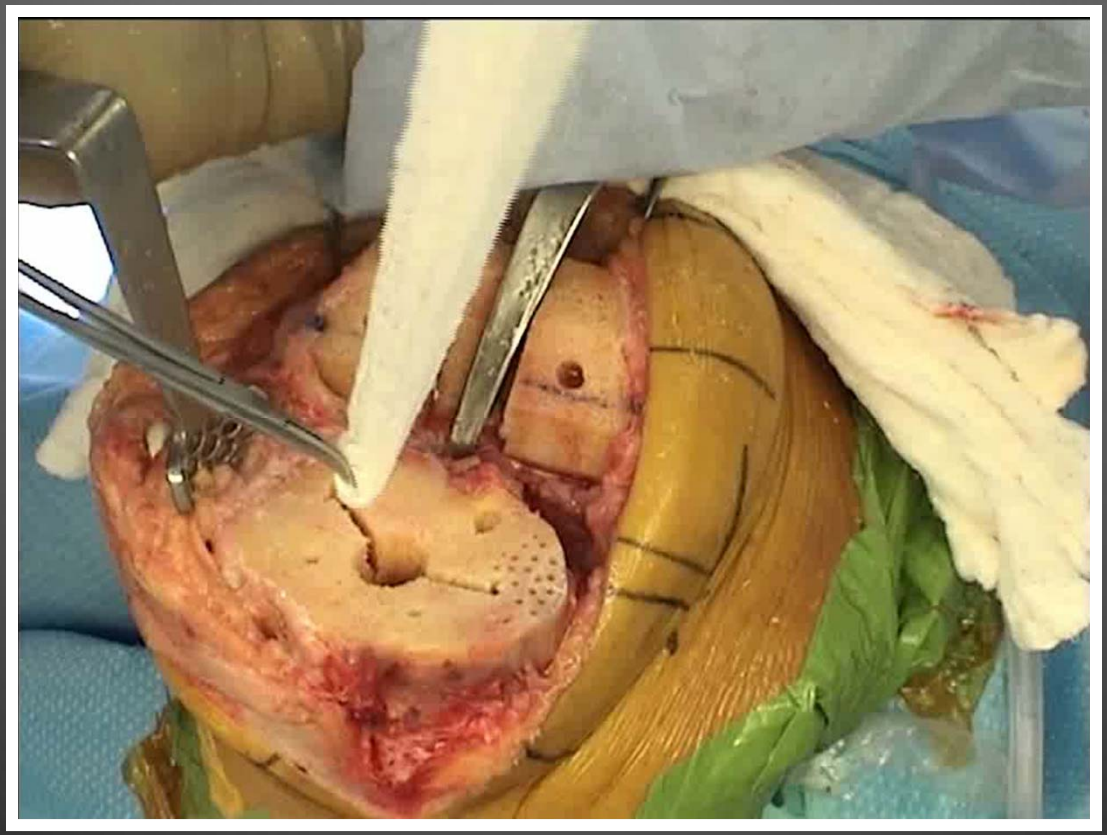
BONE PREPARATION

- 363 TKA Reviewed Radiographically
- Compared Differing Cement Technique Methods
  - Syringe Bone Rinse / Manual Packing
  - Pulsed Lavage / Manual Packing
- ↑ Radiolucent Lines & ↓ Survivorship If Pulsatile Lavage Was Not Used

Ritter, et al, JBJS Am 1994

BONE PREPARATION

- Thoroughly Dry
  - ↓ Fluid @ Bone-Cement Interface
  - Enhance Cement Interdigitation



CEMENT TYPE

- Data Not Clear As To Superiority
- Some Reports Of ↑ Failure With High Viscosity Cement
- ? Inferior Bonding Of Cement To Implant

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Complications - Other

Failure at the Tibial Cement–Implant Interface With the Use of High-Viscosity Cement in Total Knee Arthroplasty

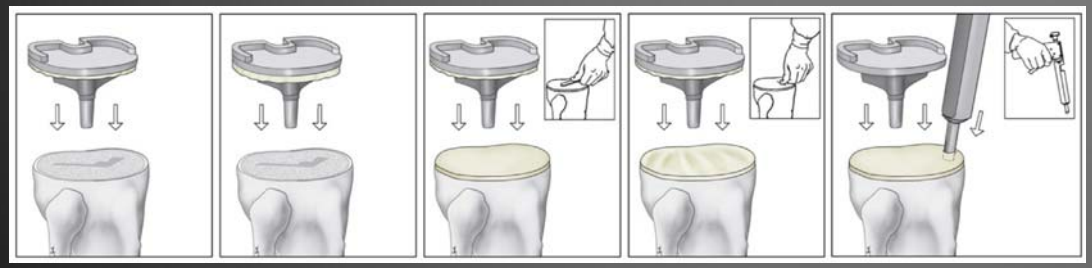
Judith E. Kopinski, MD [a], Ajay Aggarwal, MD [b], Ryan M. Nunley, MD [a], Robert L. Barrack, MD [a], Denis Nam, MD, MSc [a,*]

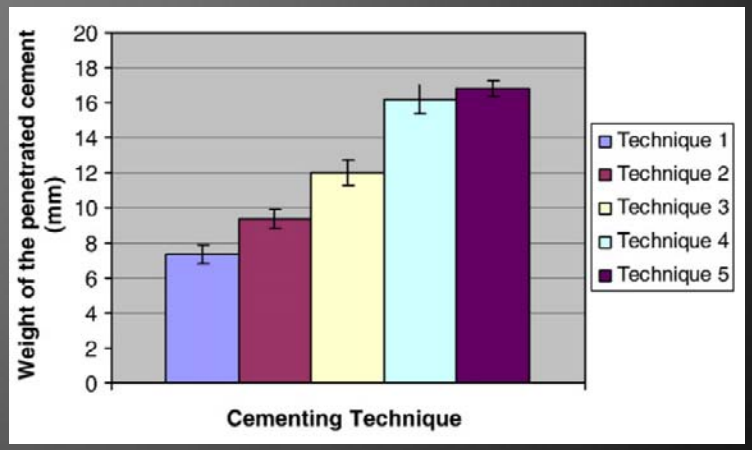
CEMENT PREP METHOD

- Hand Mixing Vs Vacuum Mixing ?
- No Clear Survivorship Benefit Yet Reported In TKA
- Vacuum Mixing Advantages ?
  - More Uniform Cement Mixing
  - Eliminates Cement Voids

COAT BOTH SURFACES ?

- Compared 5 Cementing Techniques
- Fixation Assessed / Sawbones Model
- Component Coating Only: Not Recommended
- COAT BOTH IMPLANT & BONE

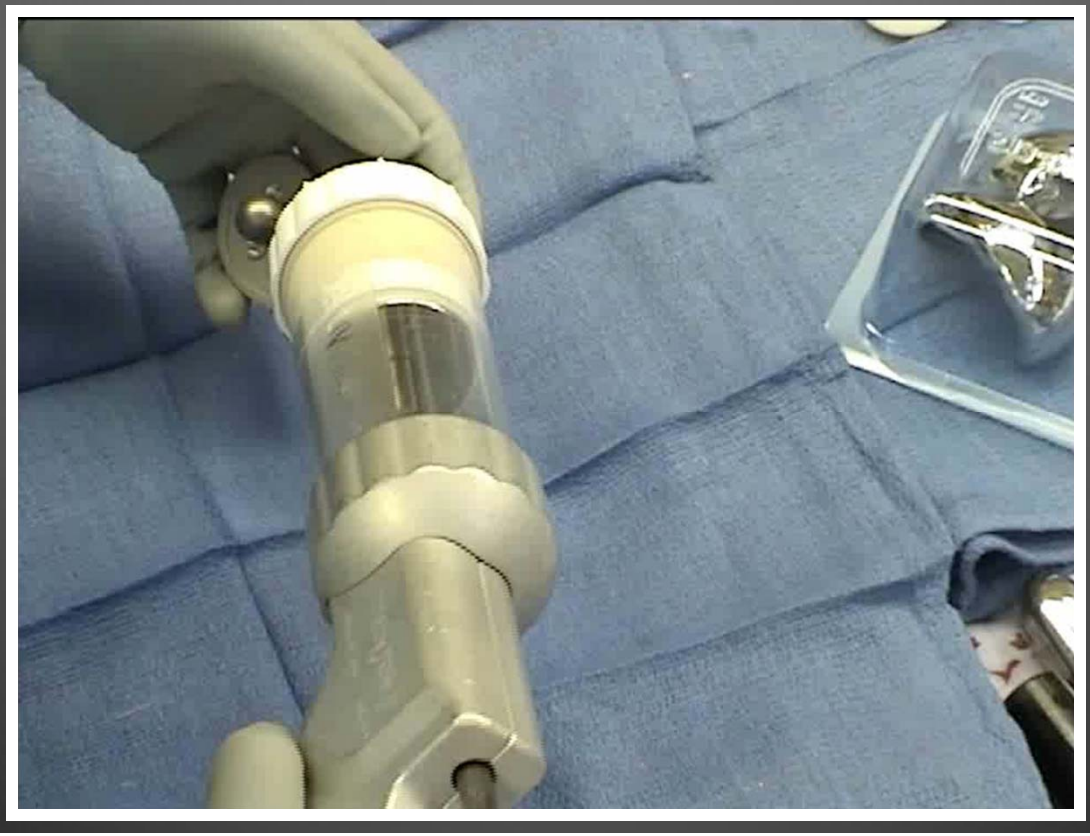




Vanlommel, Bellemans et al, J Arthroplasty, 2011

IMPLANT PREP METHOD

- Precoat Implant With Cement Early
  - Low Viscosity State / Better Implant Adherence
  - Barrier To Lipid Infiltration Into The Cement-Metal Interface



CEMENT: PRESSURIZATION & PENETRATION INTO BONE

- Evidence Clearly Supports Use Of Pulsatile Lavage To Enhance Penetration
- Questions:
  - Are Use Of A Cement Gun Or Syringe Superior To Hand Pressurization?
  - Can Implant Design Enhance Cement Pressurization / Penetration?
  - Can Negative Pressure Enhance Interdigitation Of Bone Cement?

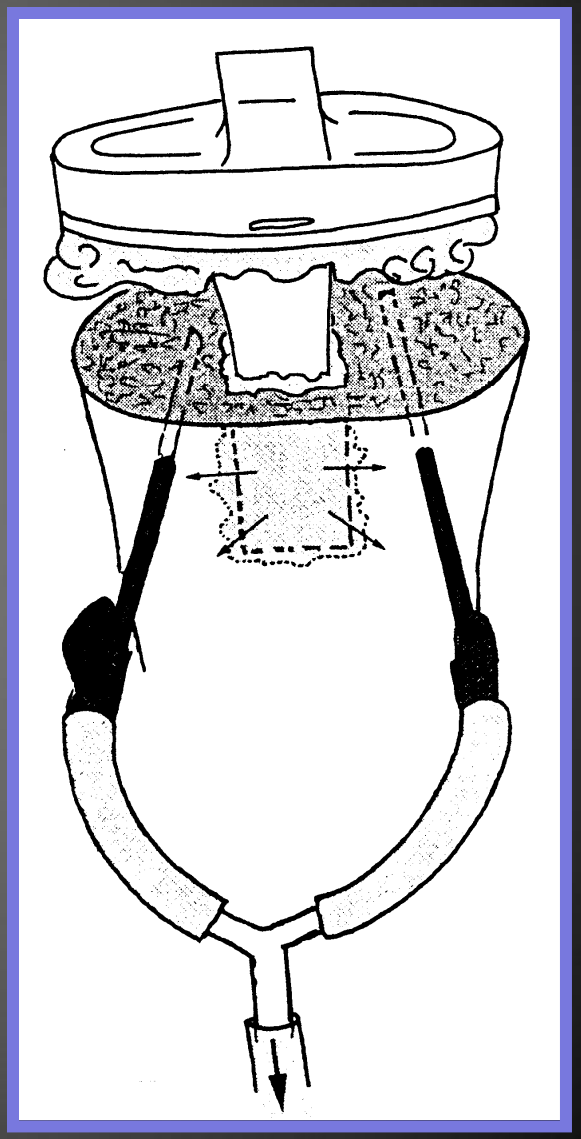
CEMENT PRESSURIZATION

- Compared Depth Of Cement Penetration
- Three Techniques
  - LVC Applied Via A Cement Gun
  - Standard Cement Via A Cement Syringe
  - Standard Cement Applied By Hand
- Mean Cement Penetration Depth
  - Cement Gun: 5.0mm / 4% RLL
  - Cement Syringe: 5.2mm / 4% RLL
  - Hand Penetration: 2.4mm / 28.6% RLL
- Gun / Syringe Pressurization Superior

Lutz, et al, , J Arthroplasty 2009

CEMENT PENETRATION

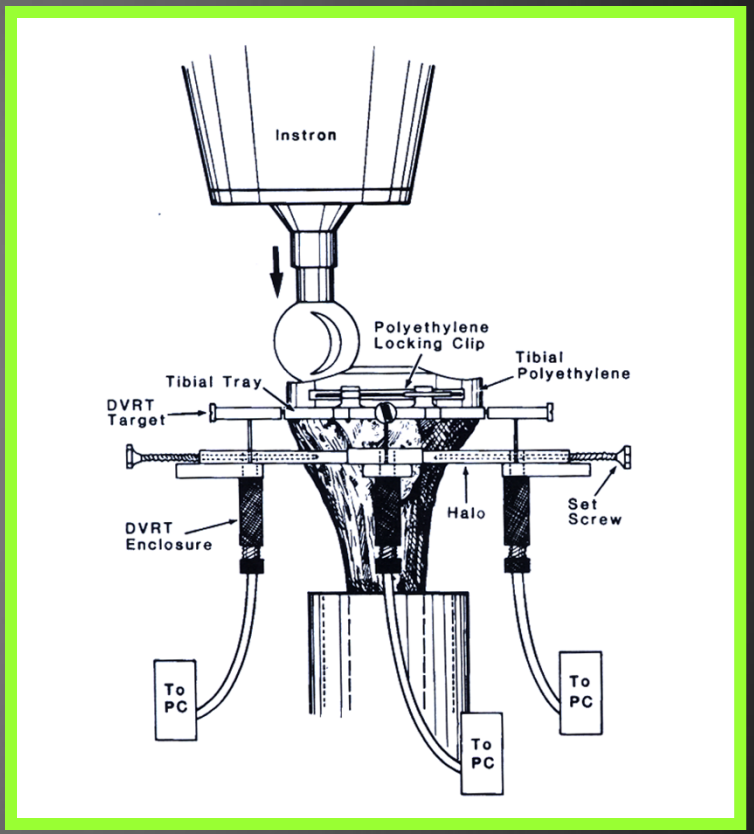
- Negative Pressure Technique Enhances Cement Penetration
- 2 Wolfe Needles Inserted
- Suction Applied



Stannage, et al, The Knee, 2003

SURFACE CEMENTATION ??

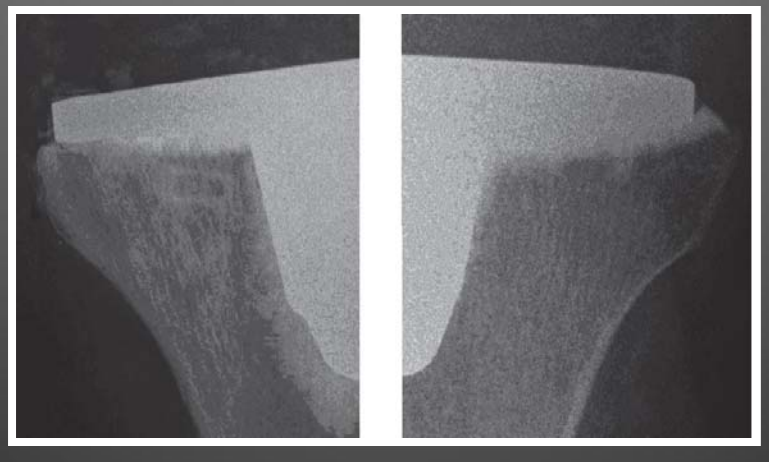
- Cadaveric Analysis
- Surface Vs. Surface + Stem Cementation
- Eccentric Load (Instron)
- Equivalent Fixation
  - 3.6 – 4.9 mm Of Uniform Cement Penetration



Peters, et al, CORR, 2003

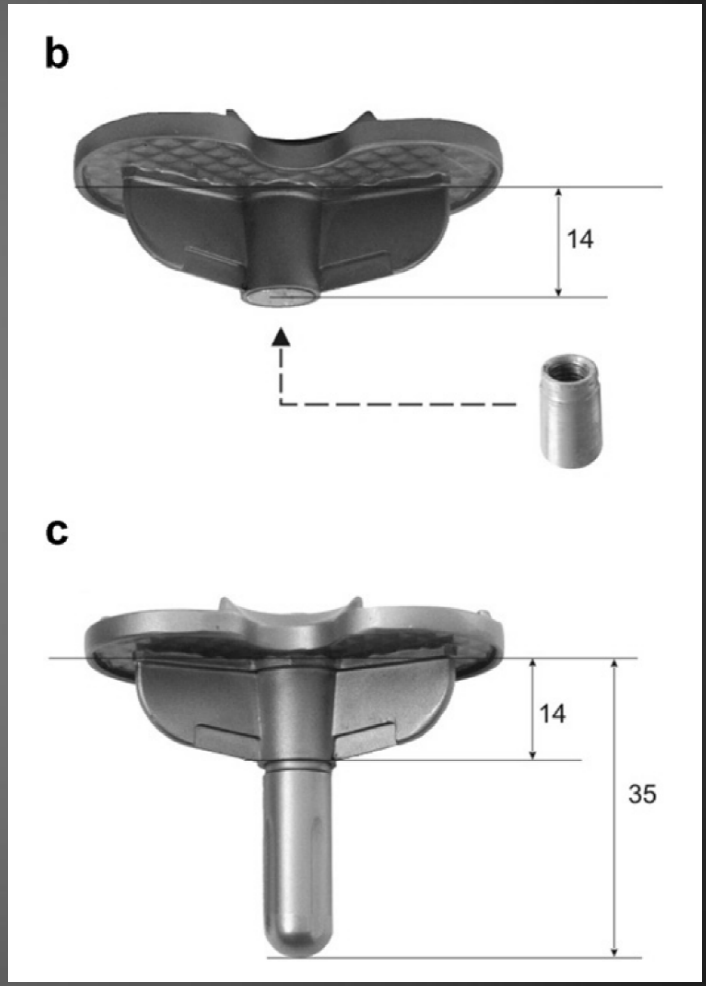
SURFACE CEMENTATION ?
LITERATURE REVIEW

- Clinical Data Varies
- Most Favor Surface + Stem Cementation
- If Surface Cementing, Need 3-4 mm Of Uniform Cement Penetration
  - Retrievals Analyses:
    - 3-4 mm Of Uniform Penetration Infrequent
  - Penetration > 5mm Risks Thermal Necrosis



CEMENT THE STEM ?

- 12 Cadaveric Knees
- Fixation Assessed
  - No Stem Extension
  - Uncemented Short Central Stem
- Short Uncemented Stem Did Not Improve Fixation



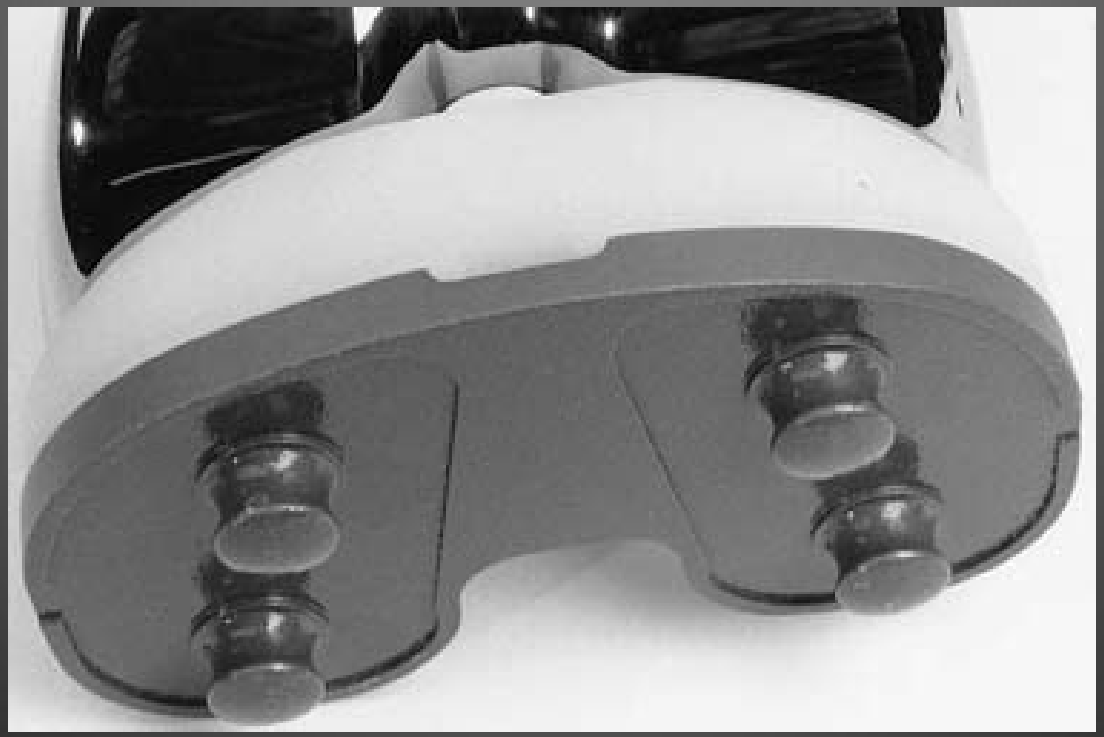
Blanca, et al, Clin Biomech, 2008

CEMENT PENETRATION

- Histologic Analysis Typically Demonstrates ↑ Cement Penetration Centrally & ↓ Penetration Peripherally
  - Cement Escape
- Peripheral Pressurization?
- Escape Lessened With Cement Pockets
  - Vertullo, et al, J Arthroplasty 2004

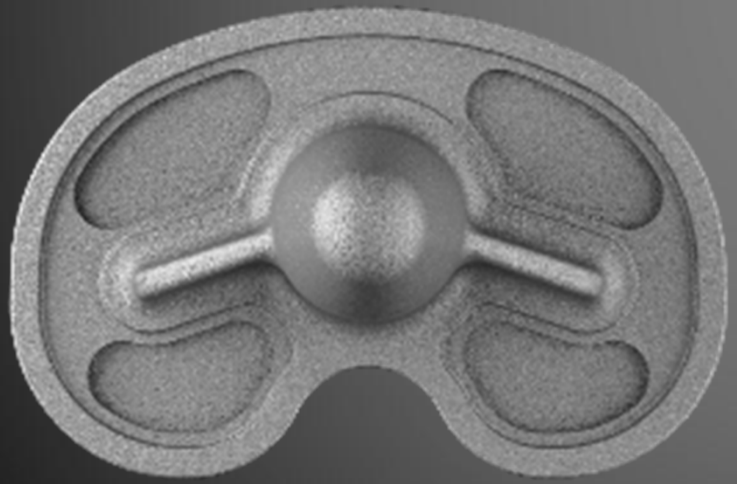
CEMENT POCKET DESIGN

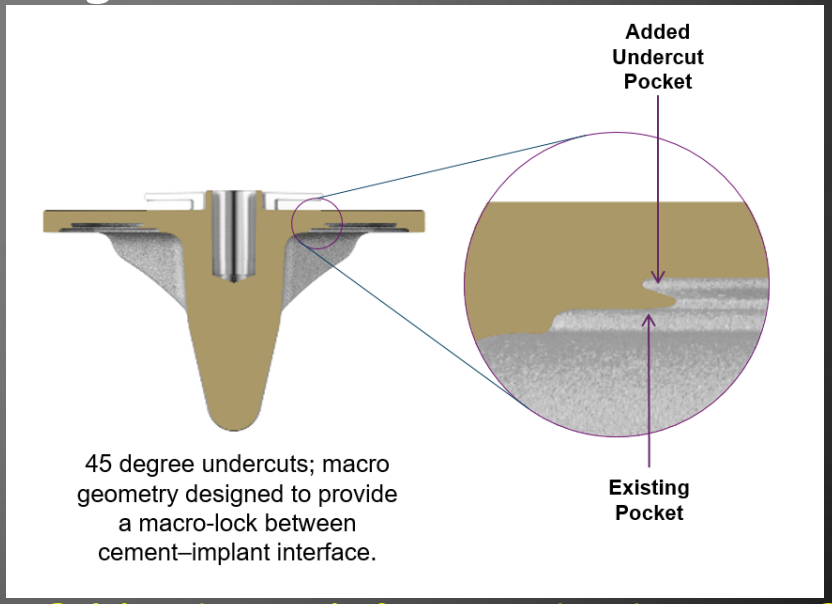
- Historical Cement Pockets: Vertical Walls
  - Lessen Cement Escape
  - Enhance Cement Penetration
  - Lessened Resistance To Tray Pull-Off



CEMENT POCKET DESIGN

- Modern Cement Pockets: Undercut Walls
  - Lessen Cement Escape
  - Enhance Cement Penetration
  - ↑↑ Resistance To Tray Pull-Off





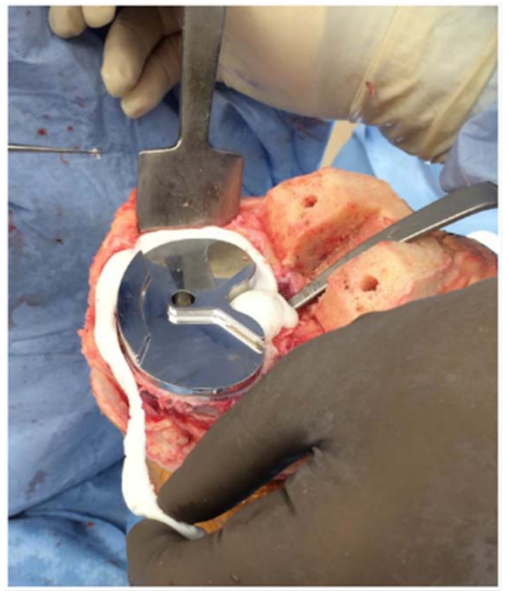
Maag et al, European Federation of National Associations of Orthopaedics and Traumatology (E.F.O.R.T.). , 2017

CEMENTATION: MY TECHNIQUE

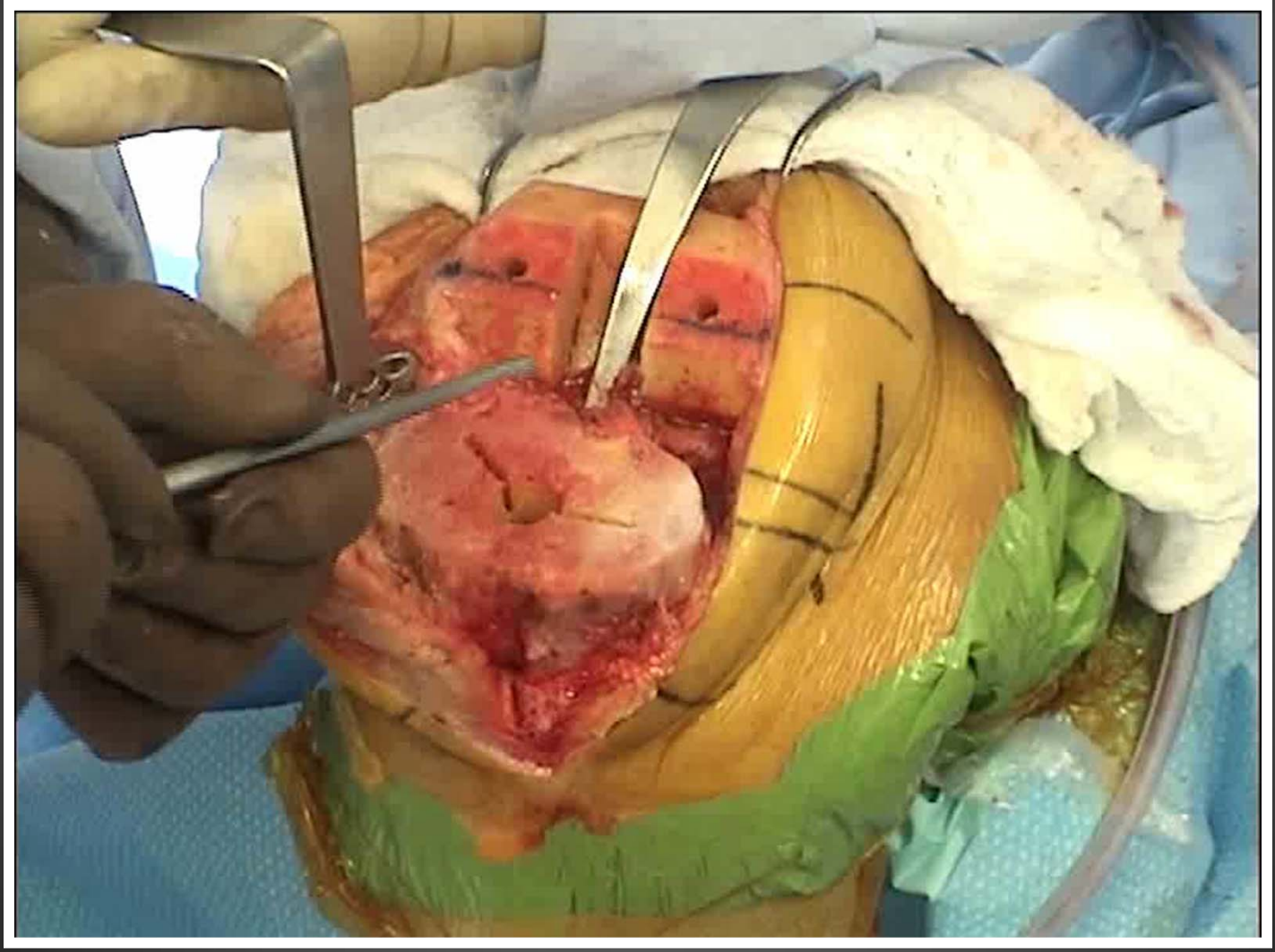
- Pulsatile Lavage
- Thoroughly Dry Bone
- Precoat Implant
  - Lessen Lipid Invasion Into Cement-Metal Interface
- Pressurize Central Canal
- Suction Lipid

CEMENTATION: MY TECHNIQUE

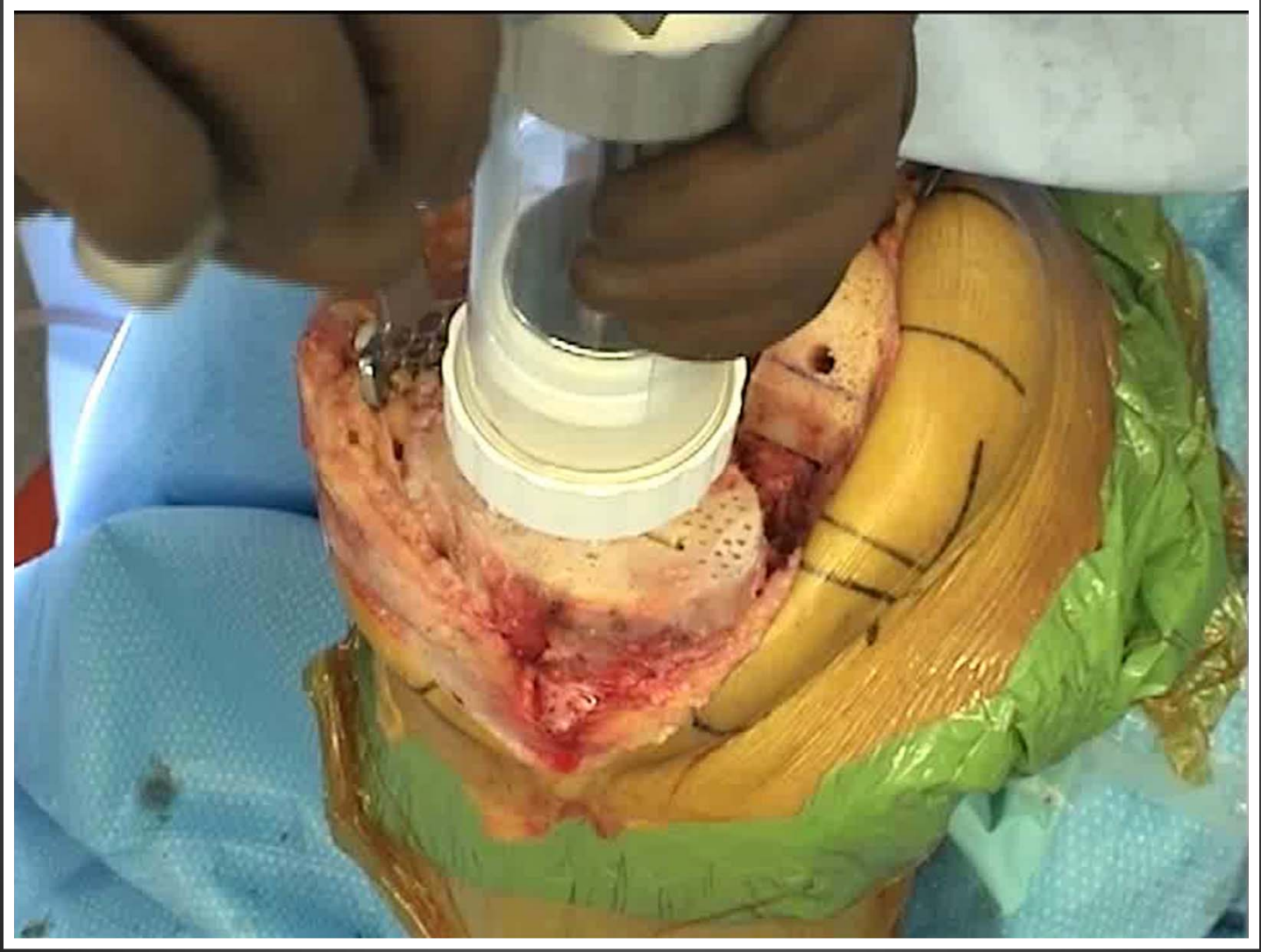
- Pressurize Periphery
  - Cement Gun
  - Create A Peripheral Seal
- Implant Insertion
- Cut & Clear Cement
  - Limit Creation Of Cement Debris
- Limit Motion & Delay Final Bearing Impaction Until Cement Cured



TIBIAL PREPARATION:
MY TECHNIQUE



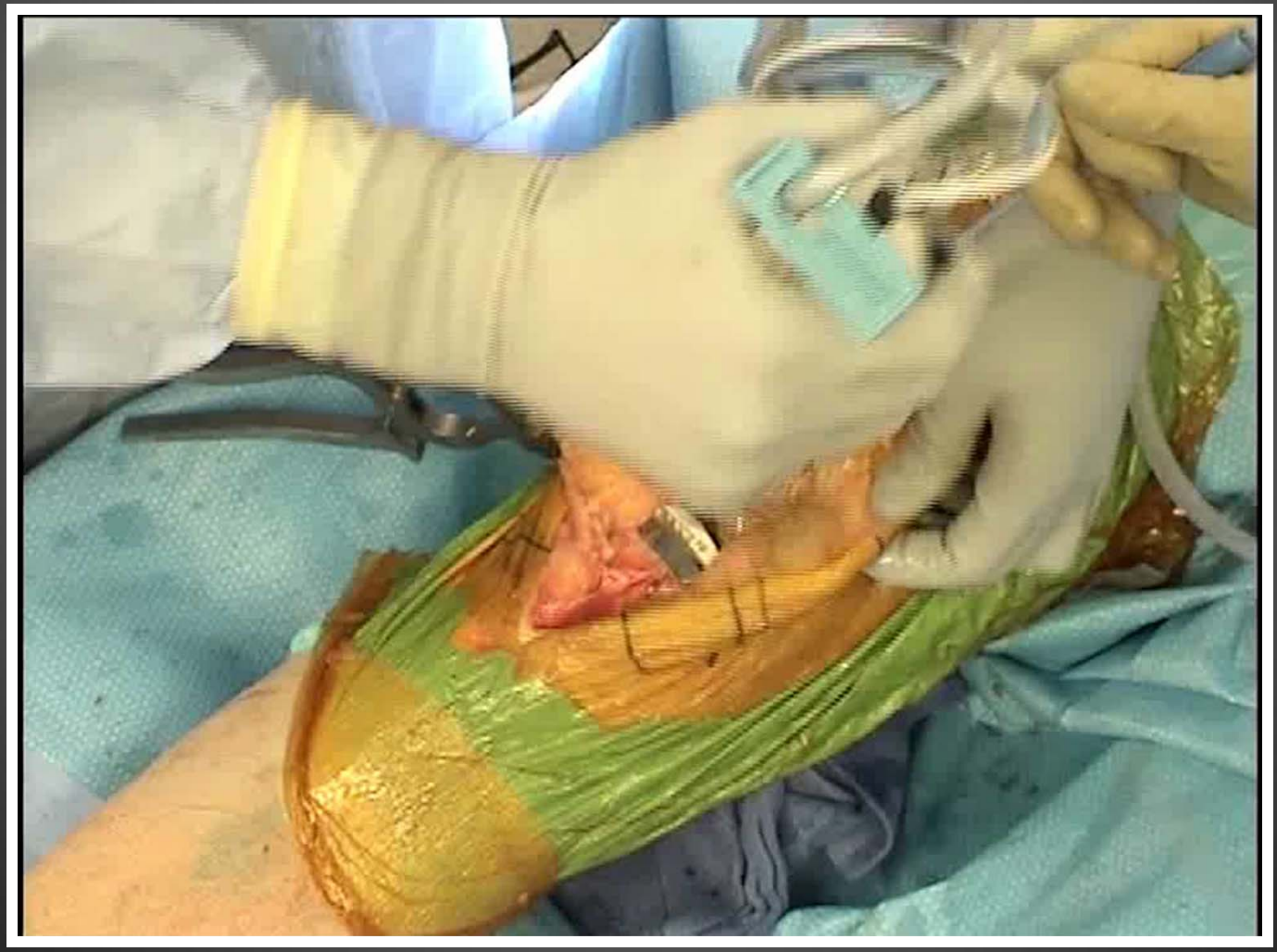
TIBIAL TRAY CEMENTATION:
MY TECHNIQUE



FEMORAL COMPONENT CEMENTATION: MY TECHNIQUE

NO MOTION DURING CURING

- Delay Bearing Insertion Until Cement Cured !!



SUMMARY

- **Surgical Technique Keys:**
  - Drill Sclerotic Bone
  - Cleanse / Dry The Bone
  - Assure Good Cement Penetration
    - ✓Especially At The Periphery
  - Cut Then Clear Excess Cement
    - ✓Avoid Microparticulate Cement
  - Avoid Motion While Cement Cures

THANK YOU

Summary: what have we learnt?

Point One:

Bone preparation:

- Pulsatile lavage
- Dry bone
- Remove lipid
- Bone debris

Point Two:

Cement preparation:

- Mix at room temperature (73^{o}F/23^{o} C)
  - Do not heat monomer/ powder
- Fundamentally alters cement performance
  - Recommend high vacuum (7 atmos)

Point Three

Tibial cementing technique

- Cement on tibial prosthesis early
- Cement on tibial plateau
- Cement on tibial stem/cone
- Thick layer of cement over tibial bone
- Ensure high pressurization/penetration

Point Four

Femoral cement technique

- Early cement on femoral implant
- Focus on posterior condyles and anterior flange as both are placed into sheer
- Cement on femoral bone

Point Five

Cement recovery:

- Thick layer of cement technique
- There will be cement extrusion
- Sharp instrument to remove excess cement
- Avoid dragging cement from beneath implant

Point Six

Cement setting

- Do not rest the knee in flexion after femoral insertion
  - This can cause anterior tibial lift off
  - Allow the cement to fully set in extension
- Do not force the knee into hyperextension during curing

- **<u>Do not assess knee stability or ROM at this time</u>**
  Possibly the most common error

Recommend reference document

Guidance for Cementing Total Knee Replacements

DePuy Synthes

PART OF THE Johnson & Johnson FAMILY OF COMPANIES

Cementing Total Knee Replacements

6.0 Summary and Conclusion

The following is a summary of recommended TKR cementing practices:

- Drill keyholes especially in areas of dense or sclerotic bone.
- Thoroughly wash all bone surfaces before cementing.
- Keep all surfaces clean and dry, including gloves, bone, and implant surfaces. Do not apply saline to the cement surface.
- Mix the cement under vacuum.
- Use the cement within its working time.
- Do not preheat the powder or liquid, especially with HV type cements, as this may impact the available working time. Follow the appropriate instructions for use on cement preparation.
- If a surgeon prefers simultaneous cementation during TKA and is assessing ligamentous stability and ROM during cementing curing, then designs with a 'No Clearance' tibial preparation are recommended. Stress and movement of the knee during the cement curing phase is not recommended, due to the inherent risk of motion with regard to lipid infiltration and degradation of tibial tray fixation strength.[23]
- Pressurize the cement by compression; use a thick layer of cement and impaction.
- Ensure that cement around the periphery of the implant has been well pressurized into the bone.
- Remove all extruded cement around the implant, making sure the implant is sealed by cement around its edges.
- Hold the cemented components under compression until the cement is finally set. Ensure that tibio-femoral compressive forces are perpendicular to the tibial axis. Curing in high flexion or hyper-extension may cause tilting of the tibial tray.

Question and Answer Session

With

Prof David Barrett, Southampton University

Dr Douglas A. Dennis, Colorado Joint Replacement

Dr J. Bohannon Mason, OrthoCarolina