

Reconstructive REVIEW

ABSTRACT SUPPLEMENT:
TRANSATLANTIC ORTHOPAEDIC CONGRESS
October 3 - 5, 2014 • Sheraton New York Times Square Hotel, New York City, NY

OFFICIAL JOURNAL OF THE



Joint Implant Surgery and Research Foundation

Strategic Alliance with



Reconstructive REVIEW

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Orthopaedic Surgeons Specializing in
Joint Replacement
and
Joint Preservation
of the Hip, Knee, and Shoulder



An Announcement From:

Dr Rami M Sorial FRACS FAOrthA

President, Asia Pacific Arthroplasty Society & Associate
Editor-in-Chief, Pacific Rim, Reconstructive Review

&

Timothy McTighe, Dr. H.S. (hc)

Executive Director, JISRF,
& Editor-in-Chief, Reconstructive Review

We are pleased to announce that JISRF's journal Reconstructive Review will become the official journal for APAS. We welcome its Members to open free access to all publications and encourage its Members to submit manuscripts for publication in one of four quarterly issues.

We also welcome interested Members to become reviewers for the Reconstructive Review.

**Reconstructive Review Editor-in-Chiefs Role
has been Expanded Providing Global Outreach**

Dr. Keith Berand, USA

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Dr. Rami Sorial. Pacific Rim



Please visit our websites for more information:

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Strategic Alliance Announcement



Joint Implant Surgery & Research Foundation

is Pleased to Announce a Strategic Alliance with the



Donaldson Arthritis Research Foundation

DARF, founded in 2005 by Dr. Thomas K. Donaldson, has a focus on outcome studies and basic science with major emphasis on implant retrievals. His ongoing collaboration with Ian Clarke, PhD provides a synergy between the laboratory and clinical surgical science. Both men are Board Members of JISRF and have a significant working relationship with its Executive Director Timothy McTighe Dr. HS (hc).

JISRF, founded in 1971, has had significant experience with continuing medical education, product development, and clinical surgical evaluation of total joint implant devices.

The long term relationships JISRF has with total joint surgeons world wide and the experience of its Co-Directors and research evaluation equipment of the DARF Retrieval Center make for a strong long-term relationship.

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Ian Clarke, PhD & Thomas K. Donaldson, MD



Metal on metal retrieval

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In Memory of

Tony N. Aram MD

October 7, 1963 - June 17, 2014

Dr. Tony Aram will be remembered not only as a great surgeon, but a great friend and colleague to many. He lived an exemplary life of devotion, honor, humbleness and dedication to his family, friends and his profession.

Dr. Aram unexpectedly passed away Tuesday morning, June 17, 2014 of natural causes at his home. Tony Aram touched the lives of countless patients and friends over several years in practice.

He devoted his life to the betterment of everyone else and for that so many are grateful.

Tony Aram, M.D. built a culture of radically caring for patients while utilizing the most advanced medical technology. In his pursuit, he became known community-wide for pushing the limits in Orthopaedics to achieve radical results.

We will forever remember his smile and lively personality that would bring light to any situation. He will be sorely missed.

The legacy of Dr. Tony Aram will live on, as the practice he built, Advanced Orthopaedics and Sports Medicine Institute (AOSMI), will continue to serve and treat patients in the Washington, D.C./metro area. After several years of searching for a Doctor to join the practice, and prior to his passing, Dr. Aram hand selected Dr. Asheesh Gupta to join the practice. Dr. Gupta will carry on the mission and vision that AOSMI was so diligently founded on many years ago.

Tony was a significant part of the Joint Implant Surgery & Research Foundation (JISRF) and participated in both our Tissue Sparing Implant (TSI™) Study Group and was part of our Editorial Board for JISRF's journal Reconstructive Review. He will be fondly remembered and we will miss the passion he had for both orthopaedics and his personal and professional friendships. You were a good man Tony and you will always be remembered and missed.

Timothy McTighe, Dr. H.S. (hc)
Executive Director, JISRF

Reconstructive Review

A Journal Published by the Joint Implant Surgery & Research Foundation



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Charles Bechtol, MD

was internationally known in the fields of biomechanics and orthopedic surgery. His engineering and biomechanical research resulted in the development of numerous joint replacement implants and internal fracture fixation devices – instruments that are familiar to orthopedic surgeons the world over. His innovations included shoulder and knee prostheses, the Bechtol Total Hip system, the Bechtol “fluted” bone screw, and the Bechtol “continuous strength” bone plate.

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- Letters to the Editor
- Surveys

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If you would like to become a reviewer on Reconstructive Review please visit
<http://JISRFRR.edmgr.com>
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If you require any assistance please contact David Faroo, Managing Editor at dfaroo@jisrf.org.

Reconstructive REVIEW

Now with its own website to facilitate a more user friendly platform for viewing and searching all past and current articles. The website is based on open source software called Open Journal Systems (OJS) created by the Public Knowledge Project.

OJS was designed for the management and online presentation of open access, peer-reviewed academic journals. The software has a 'plugin' architecture allowing easy integration of key features including tools to facilitate indexing in online directories such as Google Scholar and PubMed Central.

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- ReconstructiveReview.org
- ICJR.net
- JISRF.org



ReconstructiveReview.org



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Correspondence

Direct any questions regarding the submission process, or requests for reprints to David Faroo, Director of Communications, JISRF, 46 Chagrin Plaza #117, Chagrin Falls, Ohio 44023, dfaroo@jisrf.org.

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For information on how to submit articles to the Reconstructive Review please review the following or visit <http://www.jisrf.org/reconstructive-review-submit.html>.

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Before submitting an article to ‘Reconstructive Review’, please follow the instructions below.

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Reconstructive Review accepts the following categories of articles:

- Original Articles
- Basic Science
- Case Reports
- Clinical/Surgical
- Commentary
- Controversial Issues (i.e. modularity, tapers, MoM)
- Historical Reviews
- Letters to the Editor
- Surveys

The emphasis for these subjects is to address real life orthopaedics in a timely fashion and to encourage the participation from a broad range of professionals in the orthopaedic health care field.

We will strive to be responsible and reactive to the needs expressed to our editors and all members of JISRF. We anticipate our format will evolve as we move forward and gain more experience with this activity. Your opinion is a critical step to our motivation and overall success, please do not hesitate to communicate with us.

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- Live Area: 7.25" x 9.25"
- No Bleeds

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This symbol of excellence identifies abstracts that have been recognized by our review panel, judged on the following criteria:

- Importance of topic/originality
- Purpose clearly stated
- Methods defined
- Results adequately described
- Conclusion supports results

Transatlantic Orthopaedic Congress Abstract Awards have been supported by ConforMIS, Pacira Pharmaceuticals, Stryker and Zimmer, Inc.

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Trends in Anterior Cruciate Ligament Reconstruction in the United States

Primary Author: Shahrose Hussain

Institution: University Of Miami (Miami, FL, USA)

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INTRODUCTION: The anterior cruciate ligament (ACL) is the most frequently surgically reconstructed ligament in the knee. United States national estimates of ACL reconstruction vary widely. This study sought to use the most recently available Centers for Disease Control and Prevention data to investigate changes in the utilization of inpatient and ambulatory ACL reconstruction in the United States, focusing on age, gender, concurrent meniscal surgery, surgical setting, anesthetic type and payment method.

METHODS: The National Hospital Discharge Survey (NHDS), conducted between 1990 and 2007, and the National Survey of Ambulatory Surgery (NSAS), conducted in 1994, 1996 and 2006 and were used to identify cases of ACL reconstruction. The data were analyzed for trends in demographics, treatment and utilization.

RESULTS: Between 1994 and 2006, the population-adjusted rate of ambulatory ACL reconstruction increased by 302% (14.0/100,000 capita to 42.7/100,000 capita). A total of 127,446 ambulatory surgical procedures (95% CI, 114,752 to 140,139) were recorded by the NSAS for the treatment of ACL tears in 2006 representing a large increase in the total number of ambulatory procedures from 71,953 (95% CI, 65,908 to 77,997) in 1996 (26.7 per 100,000 capita), 61,454 (95% CI, 55,191 to 67,717) in 1995 (23.1 per 100,000 capita) and 37,203 (95% CI, 34,018 to 40,387) in 1994 (14 per 100,000 capita). The total number of inpatient ACL reconstructions decreased over time from 45,030 (95% CI, 40,913 to 49,147) in 1990 (18 per 100,000 capita) to 35,247 (95% CI, 27,371 to 43,122) in 1996 (13 per 100,000 capita) to 21,547 (95% CI, 15,846

to 27,248) in 2000 (7 per 100,000 capita) to 4,043 (95% CI, 1,745 to 9,846) in 2007 (1 per 100,000 capita). Age-adjusted rates of ambulatory ACL reconstruction increased among all age groups, with a 1024% increase in patients less than 15.

There was an increase in the proportion of females undergoing reconstruction in both the ambulatory (30% to 40%) and inpatient (29% to 47%) setting over the study period, with a 404% increase in the sex-adjusted rate of female ambulatory procedures between 1994 and 2006. Concurrent meniscectomy remained relatively constant in the ambulatory (37% to 40%) and inpatient (37% to 33%) setting between 1994 and 2007. Private insurance was the largest compensator at all times, representing 77% of cases in 2006. Between 1994 and 2006, the use of peripheral nerve blocks during ambulatory surgery increased from 0.7% to 30.8%.

CONCLUSIONS: Rates of ACL reconstruction increased dramatically between 1990 and 2007 in the United States. Knowledge of this increase may aid policy-makers and surgeons in appropriately allocating healthcare resources to ensure quality patient care.

A Comparison Of Athletes To Non-Athletes In Recovery After Hip Arthroscopy

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BACKGROUND: Hip arthroscopy is effective in managing femoroacetabular impingement syndrome (FAI) in the general population and athletes. Athletes undergo extreme amounts of repetitive activity which may predispose them to experience more pain and damage to the hip joint than the general population. The recovery patterns of athletes may differ from the general population after hip arthroscopy.

OBJECTIVES: The purpose of this study was to identify any difference in recovery pattern after hip arthroscopy between patients who self-identify as athletes and patients who self-identify as non-athletes. We hypothesized that the patients who self identified as athletes would have a different recovery pattern when compared to patients who self-identified as non-athletes.

METHODS: We investigated 265 hip arthroscopies excluding patients with SCFE or perthes disease (n=18), revisions from other surgeons (n=45), arthroscopic procedures where no bony work was performed (n=20) or micro-fracturing was performed (n=7), and patients with incomplete data (n=9). Patients were prospectively assessed both pre-operatively then at 6 weeks, 3 months, 6 months, and yearly up to 4 years with regards to the VAS pain scale, modified harris hip score (mHHS), and short form-12 physical / mental subscales (SF-12 PS) / (SF-12 MS). Patient outcomes were compared using the Student t test. The patients were split into two groups: non-athletic and athletic. The non-athletic group consisted of patients with no athletic involvement (n=98) and recreational athletes (n=22). The athletic group consisted of high school or collegiate athletes (n=32) and semi-professional or professional athletes (n=14). A good outcome was defined as mHHS>80 one year post hip arthroscopy. Pearson Chi Squared test was used to assess if the athletes were more likely to experience a good outcome. We then performed a twenty-six group matched case control study adjusting for age discrepancy between the two groups. P less than .05 was used for significance throughout the analysis.

RESULTS: The athletic group reported a significantly lower VAS at 6 weeks (p=.004), 3 months (p=.0006), 6 months (p=.03), and 1 year (p=.04). The athletic group reported significantly higher mHHS pre-operatively (p=.03), then at 6 weeks (p less than .001), 3 month (less than .001), 6 months (p=.0007), and 1 year (p=.03). The SF-12 PS showed a significantly higher score for athletes from 6 weeks to 2 years: (p=.0007), (p=.0013), (p=.013), (p=.004), and (p=.02) respectively. The SF-12 MS showed a significantly higher score for athletes at 3 months (p=.03), 6 months (p=.005), and 2 years (p=.046). At one year post hip arthroscopy there was no significant difference with regard to good outcome when comparing athletes to non-athletes (p=.11). The matched case control study using 26 matched pairs showed no significant difference between the athletic and non-athletic groups when adjusted for age at all time points.

CONCLUSIONS: Athletes recover faster than the general population after hip arthroscopy. However, as early as one year post surgery, athletes and non-athletes are equally likely to experience a good outcome. Younger age appears to be associated with athletic involvement and early recovery when comparing the athletic group to the non-athletic group post hip arthroscopy.

Knee Arthroplasty



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Eight-Year Results of a Recalled Metal-on-Metal Monoblock Hip Prosthesis: Primary versus Revision

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INTRODUCTION: This study reports outcomes of primary and revision total hip arthroplasties of a recalled metal-on-metal (MOM) monoblock prosthesis performed by a single surgeon.

METHODS: We performed a retrospective review of all patients who underwent both primary and revision total hip arthroplasties at our institution between 2006 and 2014. Only those patients who underwent primary recalled MOM monoblock prosthesis placement and/or revision of the recalled prosthesis were included. We evaluated revision group versus non-revision group for age, BMI, gender, existence of medical comorbidities, primary cup abduction and anteversion, primary combined angle, post-operative complications, cobalt and chromium ion levels, and Harris Hip Scores. Student t-test was used to compare groups.

RESULTS: During the study period, 105 patients underwent 115 primary total hip arthroplasties with the recalled system. Thirty-six patients underwent 40 revision surgeries for pain, high metal ions, infection, aseptic loosening, failure of ingrowth, and/or pseudotumor. The revision rate was 34.8%.

Except for a higher percentage of women undergoing revision (17.4% vs 50%, $p=0.0002$), there were no significant differences in patient demographics, medical comorbidities, or pre-operative Harris Hip Scores (Table 1). Revision group showed higher cup abduction angles (47.8 vs 42.4, $p=0.005$), smaller average cup size (53.3 vs. 55.2, $p=0.003$), smaller average femoral component size (4.7 vs 5.6, $p=0.02$, respectively), and lower post-operative Harris Hip Scores (87.9 vs 93.8, $p=0.0007$). The revision group had higher cobalt levels (34.5 vs 5.8, $p=0.00003$) and higher chromium levels (14.0 vs 1.3, $p=0.00003$). There were five post-operative complications in the revision group (2 infections, 2 dislocations, and one DVT) versus one DVT in the non-revision group ($p=0.01$). Harris Hip Scores for revision surgeries increased from a mean of 44.2 pre-operatively to 74.9 post-operatively ($p=1.45 \times 10^{-5}$).

CONCLUSION: This study presents 115 primary total hip arthroplasties and 40 revisions performed by a single surgeon at our institution. To our knowledge, this is the largest single-surgeon study reported in the literature. Hips requiring revision had significantly higher cup abduction angles, smaller cup and femoral component sizes, lower post-operative Harris Hip scores, and higher metal ion levels. Age, BMI and comorbidities did not contribute to revision in our study; however, there was a higher chance of undergoing revision if you are a woman ($p=0.0002$). There was a 30.7 mean improvement in Harris Hip Score after revision.

Accuracy of Femoral and Tibial Resection Thickness Using Patient Specific Instruments for Total Knee Arthroplasty

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BACKGROUND: Patient-specific instruments for total knee arthroplasty are created using data from preoperative computed tomography (CT) or magnetic resonance imaging (MRI). Surgeons can then examine the preoperative plan and make changes to each resection level if desired. The accuracy of each femoral resection and tibial resection is critical to placing the components according to the proposed plan. We hypothesized that each mean intra-operative resection would be within 2 millimeters of the planned resection.

Since the patient-specific guides are designed to make resections for ideal positioning of the implants, if there is a difference noted intra-operatively compared to the plan, surgeons would look for a symmetric difference between the medial and lateral side of the resection plane. The symmetry of the differences in intra-operative versus planned medial and lateral resections is therefore just as important as the accuracy of each individual resection to avoid malalignment of the implant.

METHODS: One hundred thirty-nine patients underwent total knee arthroplasty by a single surgeon using CT generated patient-specific instruments between 2009 and 2012. Intra-operatively, each resection from the posterior medial femoral condyle (PMFC), posterior lateral femoral condyle (PLFC), distal medial femoral condyle (DMFC), distal lateral femoral condyle (DLFC), medial tibia (MT) and lateral tibia (LT) was measured with a caliper and recorded. These measurements were retrospectively compared to pre operative planned resections.

The absolute value of the difference between planned and intra-operative resection for each distal femoral cut, posterior femoral cut, and tibial cut was also evaluated for symmetry of the medial and lateral resection.

RESULTS: Intra-operatively, the surgeon deviated from the pre operative plan and made deliberate changes 17 out of 139 knees (12.2%). The mean difference between planned and intra-operative resection for the PMFC, PLFC, DMFC, DLFC was 0.9 mm +/- 1.6 mm, 1.4 +/- 1.6 mm, 1.5 +/- 1.0 mm, and 1.6 +/- 1.2 mm respectively. On the tibial side, the mean difference between planned and intra-operative resection for the MT and LT thickness was 0.8 +/- 1.3 mm and 0.8 +/- 1.6 mm respectively.

Less than 2 mm difference between planned and intra-operative resections was found for 77% of PMFC resections, 70% of PLFC resections, 71% of DMFC resections, 73%

of DLFC resections, 86% of MT resections, and 71% of LT resections.

Seventy-seven percent of posterior femoral resections, 90% of distal femoral condyle resections, and 74% of tibial resections were symmetric (less than 2 mm difference between the medial and lateral side) with the preoperative plan. Fifty-two percent of patient specific guides were symmetric in all three resection planes.

CONCLUSIONS: Patient-specific guides demonstrated a low mean difference between each individual planned and intra-operative resection measurement, and a majority of these resections were within 2 mm. However, surgeons must be aware that absolute value differences between medial and lateral planned vs. intra-operative resection thickness may not be symmetric and may lead to component malpositioning when performing TKAs using patient-specific guides

A Comparison of Patient Individualized Jigs, Anatomic Landmarks and a Medial Measured Resection Gap Balancing Technique

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INTRODUCTION: Patient individualized jigs have been introduced to total knee arthroplasty (TKA) to increase accuracy of implant placement and improve long-term survival of the prostheses especially for younger and more active patients. The purpose of our study was to compare the accuracy of the rotational position of the femoral component using different implantation techniques transferring intra-operative measurements to pre-operative computer tomography scans.

METHODS: A consecutive series of 21 osteoarthritic patients (10 women, 11 men) were treated with 22 cruciate retaining knee prostheses, PFC Sigma, DePuy, and patient specific cutting blocks TruMatch. During surgery the surgical transepicondylar axis was marked and the relative position of the pinholes for the PSJ and a medial posterior

condylar measured resection and gap balancing technique measured. The relative position of the TEA to the posterior condylar axis (PCA) was determined. The intraoperative measurements were transferred comparing the relative position to the surgical PCA and compared using the CT based PCA relative to the CT based sTEA.

RESULTS: The average age of the patients was 67.16 years and the body weight 87.25 kg. All operations were performed without complications. Mean implant size was 3 (2.5-5) for the femur and 3 (2-4) for the tibia. On the CT scans the PCL showed -3.6° 1.7° (min = -1.0; max = 6.2) of internal rotation compared to the CT based sTEA. We found no statistically significant group differences for the mean rotational component alignment but the medial posterior condylar resection and gap balancing technique showed more precise results with smaller variances and less outliers. Mean rotation of the femoral component pinholes in relation to the TEA were 0.9° 5.5° (-8.9 to 14.4) for patient individualized jigs and 0.1° 1.4° (-1.6 to 3.4) for the gap balancing technique. The medial posterior condylar resection and gap balancing technique was the most accurate method to determine femoral rotation with 95% of the femoral components being within 2° of the CT based sTEA. Least accurate were the PSJ where 56% of the cases were rotated more than 3° of the CT based sTEA.

DISCUSSION AND CONCLUSION: Patient individualized jigs and cutting blocks did not increase the precisions of the rotational alignment of femoral knee components. A medial posterior condylar measured resection and gap balancing technique showed a better approximation of the pre-operative CT based surgical transepicondylar axis (CT based sTEA). Care should be taken when relying on individualized jigs without the option to intra-operatively verify femoral rotation using the surgical TEA.

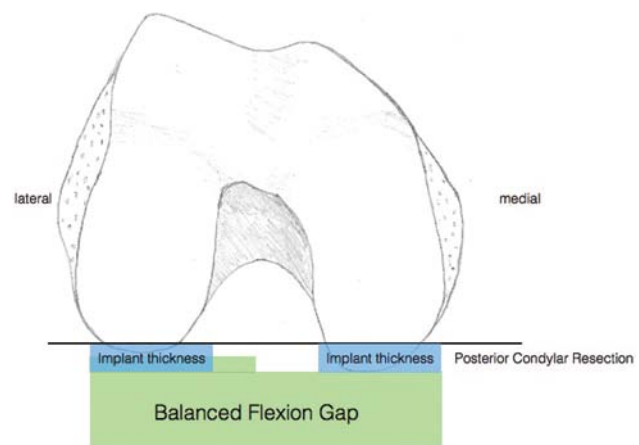


Figure 1.

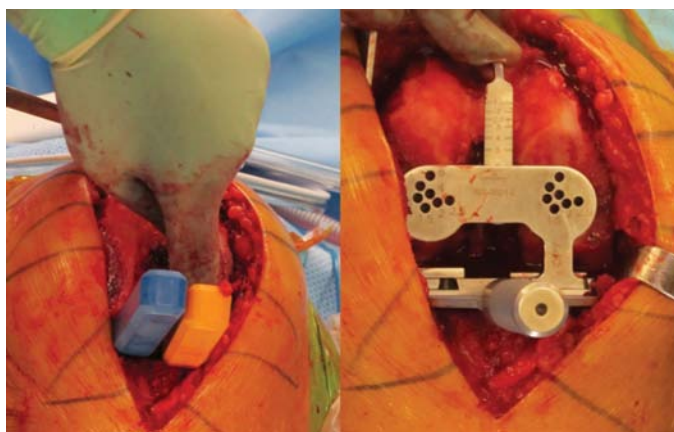


Figure 2.

Transcutaneous Oxygen Reading as a Predictive Factor of Wound Complications

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OBJECTIVE: We prospectively analyzed the preoperative and postoperative transcutaneous oxygen levels of the knee at the medial, midline, and lateral aspects to determine if there was a correlation between transcutaneous oxygen levels and wound development.

METHODS: We obtained IRB approval for a prospective study looking at pre- and post-surgical transcutaneous oxygen readings as a predictor for wound healing complications. Patients came to clinic preoperatively, and transcutaneous oxygen readings were taken at the medial, midline, and lateral aspect of the operative knee. Comorbidities such as diabetes, peripheral vascular disease, smoking history, and chronic steroid use were recorded. Total lymphocyte count, transferrin, and albumin levels, and BMI were also recorded. Patients with prior history of total knee who were undergoing revision total knees were included. Exclusion criteria were active knee infection and age less than 18 years old. Postoperative transcutaneous oxygen readings were taken at the medial, midline, and lateral aspects of the operative knee at each clinic visit for six months postoperatively.

RESULTS: A total of 50 patients met inclusion criteria with 1 lost to follow up. All patients had normal albumin, transferrin, and total lymphocyte levels. There were significant differences in preoperative and postoperative transcutaneous oxygen readings for patients with wounds compared to those with no wounds for oxygen readings at the medial (p-value 0.0063) and lateral (0.0089) regions, but not midline (0.0515). Overall, there was a greater drop postoperatively in transcutaneous oxygen readings in the patients that developed wounds than in those that did not (p-value 0.0200). On analyzing the changes in transcutaneous oxygen with time postoperatively, the general pattern was a large drop between preoperative and the first postoperative visit, with a slow recovery with increasing time postoperative and some plateauing. Those patients without wounds on average took 16 days postoperatively to return to 80% or greater of their preoperative reading, versus those with wounds taking 44 days (p-value 0.0028) at the medial reading. Similarly, at the lateral reading, those patients without wounds took 16 days to return to 80% or greater of the preoperative reading was 51 days (0.0012).

CONCLUSIONS: Transcutaneous oxygen readings at the medial and lateral aspect of the knee show a significantly greater drop in knees that develop wounds than in knees that do not. There was also a significantly increased length of time for total knees that developed wounds to return to 80% of their preoperative reading than for those knees that did not develop wounds.

Intraoperative Assessment of Mechanical Alignment Accuracy with Navigation in a Customized, Individually Made TKA

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INTRODUCTION: Correct lower limb alignment post TKA surgery depends on the accurate alignment of the femoral and tibial implant components with respect to existing bone. A mechanically neutral limb alignment has been linked to success and increased survivorship post-surgery. Patient specific instrumentation have been used with standard, off-the-shelf (OTS) implants with the goals of improving the accuracy of bone cuts and achieving neu-

tral mechanical alignment. The purpose of this study was to utilize computer navigation intra-operatively as a confirmatory assessment of the accuracy of patient-specific jigs and a novel, customized, implants, individually made TKA, in setting alignment to the neutral mechanical axis.

METHODS: A consecutive series of 63 patients undergoing TKA, utilizing patient specific instruments and customized, individually made (CIM) implants, were prospectively measured with intraoperative computer navigation. The instruments and implants were first created utilizing pre-operative CT imaging. All patients were then navigated during surgery, prior to any bone cuts, to determine pre-operative mechanical alignment. The patient-specific instruments were then utilized per the manufacturerCOs recommendations and bone cuts were made. All bone cuts were recorded utilizing the navigation system as a confirmatory measurement. The CIM implants were then fixated and surgery completed (Figure 1). Final mechanical alignment was then recorded, again utilizing the navigation system for the assessment.

RESULTS: The patient-specific instruments and CIM implants provided neutral alignment of the tibial component in 85.7% of patients, with the remaining patients being within 1o from neutral. A neutral femoral varus/valgus angle was achieved in 73.2% of the patients with the remaining patients being within 2o. Overall neutral mechanical alignment was seen in 84.1% of patients (53/63). In the remaining 10 patients each had a post-operative alignment within 2 of neutral, with no outliers. The average post-operative amount of deformity for this cohort 0.18 (range 0-2; std dev: 0.42) which was found to be statistically significant with the pre-operative condition (p less than 0.0001). Pre-implantation, an extension deficit was observed in 63.5% (40/63) of patients averaging 7.50o. Post implantation, all 63 patients (100%) exhibited no extension deficits as measured with navigation.

DISCUSSION: Patient-specific instruments and customized, individually made implants accurately restore neutral mechanical alignment as measured by intra-operative computer navigation. The patient-specific instruments aligned all patients in this cohort to within 2 of neutral. It is well documented that the restoration of neutral mechanical axis is a key factor in achieving long-term survivorship after TKA. Specifically, legs that are aligned to within 3 of neutral have been shown to have significantly better survivorship. Studies conducted on other patient

specific cutting guides have demonstrated varying results in terms of attaining neutral mechanical axis alignment post-surgery. This current study presents favorable results for the customized, individually made implant used with the corresponding patient specific jigs when compared to OTS systems with patient specific jigs tested previously.

In-Vivo Tibial Fit Analysis of a Customized, Individually Made TKA System Versus Off-the-Shelf TKA

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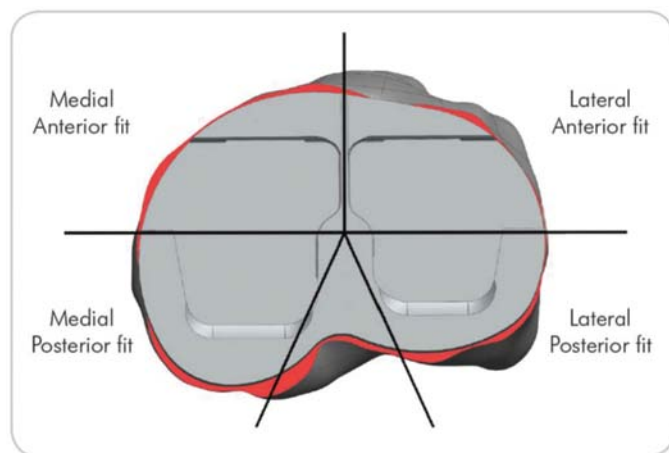
INTRODUCTION: Surgeons are frequently faced with intraoperative challenges of compromising maximal tibial coverage against attaining proper rotational alignment, resulting in the need to up or down-size tibial components. Improper implant fit has been found to increase the prevalence of clinically significant knee pain and implant loosening in off-the-shelf (OTS) total knees. Recently, a customized, individually made (CIM) TKA has been introduced that is designed to exactly fit the femoral and tibial components of the patientCOs native geometry in three dimensions. The purpose of this study was to compare the tibial fit of a CIM TKA to that of OTS TKAs intra-operatively, in the same patient.

METHODS: Forty-four (44) patients undergoing TKA with a CIM system were compared to assess the fit of the tibial tray intra-operatively. After tibial preparation, a series of tibial trials from 3 different OTS-TKA designs were fit to the operative knee. Each trial was optimally sized and positioned based on the surgeonCOs judgment, while maintaining proper rotational alignment. Implant fit data (overhang and underhang) for the best matched tibial trial of each OTS knee was recorded in four tibial zones (antero-medial, antero-lateral, postero-medial, and postero-lateral) (Figure 1). Once all measurements were complete, the CIM tibial tray was implanted, and all measurements were repeated.

RESULTS: Analysis reveals that surgeons prefer to under-size the tibia to prevent overhang of the cortical bone. In spite of this preference, significant overhang of >3mm of the tibial component in any one zone was seen in 16% for OTS1, and 18% each for OTS 2 and OTS 3 TKAs. None

(0%) of the CIM TKA, experienced tibial tray overhang of >1mm. For the four zones analyzed, underhang of the tibial component >3mm was seen in 18% of CIM TKAs, and an average 40% in the 3 OTS groups (39%, 39% and 43% for OTS-1, 2 and 3 respectively). Additionally, there were individual cases among the OTS groups where significant overhang and underhang was seen for the same tibial trial or underhang was evident in more than one zone. There were no such cases with the CIM tibial trays. In the 3 OTS groups, underhang was most frequently seen in the postero-medial zone, while the antero-lateral zone was the most frequent zone experiencing overhang.

DISCUSSION: Results show that CIM TKA can significantly improve tibial fit in all regions of the resected tibial plateau. This could play an important role in reducing knee pain and patient dissatisfaction, resulting from overhanging components, soft-tissue impingement and implant loosening due to poor tibial bone support and resultant subsidence. We also noted that increased tibial coverage could be attained by upsizing the OTS implants, however this led to a significant internal rotation of components in order to avoid unacceptable overhang, which is a known source of postoperative pain. By providing better coverage on the tibial plateau, a CIM TKA can reduce the instances of the surgeon making compromises on sizing the tibial component in order to achieve correct rotational alignment.



Schematic of the tibial zones defined for tibial fit assesment

Does Subvastus Approach for TKA Reduce the Need of Lateral Retinacular Release in Patients with Valgus Deformity?

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PURPOSE: Total knee arthroplasty (TKA) in arthritic knees with valgus deformity is associated with higher incidence of lateral retinacular release (8-20%). The purpose of this study was to determine if a subvastus approach could decrease the incidence of lateral release compared to a para-patella approach in patients undergoing TKA with a valgus deformity.

METHOD: This is a retrospective review of 158 arthritic knees with a valgus deformity (tibio-femoral angle > 9 degree) undergoing TKA using a subvastus (50 patients) or medial parapatellar (108 patients) approach. In both groups, WhitesideCOs line was used to determine femoral component rotation with additional soft tissue balancing to establishment a rectangular flexion gap. Clinical and radiographic evaluations were performed including Knee Society Scores (KSS). Complications and incidence of intraoperative lateral retinacular release were evaluated.

RESULTS: There were no differences between the two groups (subvastus vs parapatella) with respect to age (67.4yrs vs 70.5yrs), avg pre op tibial-femoral valgus alignment (12.5 degrees vs. 13.9), along with pre and post op knee society pain and function scores. The incidence of intraoperative lateral retinacular release in the subvastus group was 2% compared to 12% in the group undergoing TKA using a medial para-patella approach, p less than .04. Two patients developed mid-flexion laxity in the subvastus group, 1 patient in each group had periprosthetic fracture. No patients had patella component maltracking or subluxation.

DISCUSSION: In addition to the use WhitesideCOs line for femoral component rotation and soft tissue balancing to restore a rectangular flexion gap, the use of a subvastus approach was associated with reduced rate of lateral release during TKA with valgus deformity. This is likely due to the preservation of vastus medialis which contributes to improved patella tracking.

Navigated Total Knee Arthroplasty Is No Slower than Conventional Instrumented TKA

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Computer navigation has been shown to increase accuracy and improve results in total knee arthroplasty (TKA). One of the main drawbacks to navigation is the increased operating time associated with it. The purpose of this study is to compare the operating times of conventionally instrumented TKA vs. the first navigated TKA cases. A subset of last conventional versus last navigated was included to account for surgeon and staff learning curve.

A retrospective study was done comparing OR times of 90 conventional vs. 90 navigation TKAs. All TKAs were done by the senior author using spinal anesthesia with tourniquet. No cases were excluded. All TKACOs were of the same design.

Conventional instrumented TKA averaged 97 minutes (range 77-161, SD-14.5), navigated TKA averaged 103 minutes (range 71-157, SD-16.9) Compared to the conventionally instrumented group, the increased time for the navigation is statistically significant ($p=0.01$). Interestingly, the times for the last 35 conventional and last 35 navigated TKA were compared after noticing a trend for less variability with increasing navigation experience. Conventional averaged 97.2 minutes (range 81, SD-15.4) with latest navigation averaging 100.1 minutes (range 57, SD-15.3), p value 0.22 and not statistically significant.

Computer navigation of this type proved to be equivalent to conventional instrumented TKA after the initial learning curve. The initial learning curve appears to be approximately 50-60 cases. In addition to the slightly longer operating time, which is not statistically significant due to the recent introduction of this navigation system and the correspondingly small sample size, computer navigation has the added known benefit of increased accuracy and improved post operative results in TKA. Further investigation is proceeding with this system and the authors look forward to comparisons within a larger cohort to determine benefits regarding its use.

Patellar Tendon Reconstruction following Disruption in Total Knee Arthroplasty: A New Technique

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BACKGROUND: Patellar tendon disruptions is one of the most dreaded complications following Total Knee Arthroplasty (TKA) impacting both implant function and implant longevity. To overcome the concerns regarding allografts and improve outcomes with augmentation techniques we describe here a technique, which we have successfully used over the last four years with good results.

METHOD: Seven patients underwent reconstruction for patellar tendon disruption using our technique from a cohort of eight patients.

RESULTS: Extensor lag improved from a mean of 40 degrees to less than 5 degrees post operatively. Range of motion improved from a mean of 105 degrees of flexion to 115 degrees. There was improvement in Knee Society Functional score from a pre operative mean of 30 points to 75 points. The Knee Society Pain score however did not show much improvement.

CONCLUSIONS AND CLINICAL RELEVANCE: We believe our technique to be a solution to a difficult problem of patellar tendon ruptures after total knee arthroplasty and we continue to perform this procedure.

The Effects of a Hospitalist Co-management Model for Joint Replacement Patients in a Teaching Facility

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BACKGROUND: Hospitalists have assumed an evolving role in the care of postsurgical orthopaedic patients. Literature has provided evidence to suggest improved outcomes in postsurgical hip fracture patients managed by hospitalists in nonteaching hospitals. However, the full impact of a hospitalist co-management model has not been fully investigated with regard to elective joint arthroplasty patients in a multispecialty teaching facility. We hypothesized that a hospitalist co-management model in the setting of a teaching hospital would lead to an increase in unnecessary medical workups for joint arthroplasty patients.

METHODS: We retrospectively evaluated 2231 patients who underwent total hip arthroplasty (THA) or total knee arthroplasty (TKA) between May 2010 and January 2014 at one teaching facility, excluding any non-elective trauma patients. The patients were separated into a non-hospitalist (NH) cohort of 1062 patients that did not receive hospitalist co-management postsurgery, and a hospitalist (H) cohort of 1169 patients that received hospitalist co-management postsurgery. We used Student t test and significance of (P less than 0.05) to compare the following factors between the two patient cohorts: length of stay (LOS), re-admission rates at 30 and 90 days postsurgery, number of diagnoses present on admission, and number of new diagnosis given during admission. We then compared the average number of diagnostic and laboratory studies performed per patient and the average cost per hospital stay between the two cohorts.

RESULTS: We found no significant difference in LOS between the two groups. Readmission rates for THA patients in the H group increased significantly at 90 days postsurgery ($P=0.012$). We found no other significant differences in readmission rates at 30 or 90 days postsurgery. No significant difference was found between the two groups with regard to number of diagnoses present on admission. However, the H group experienced a significantly higher number of new diagnoses during the admission for both THA and TKA patients ($P=0.03$ and $P=0.002$ respectively). Finally we found no significant difference in the number of studies performed or the average cost per hospital stay between the two cohorts.

CONCLUSION: This study shows a significant increase in documented new diagnoses in postsurgical THA and

TKA patients when using a hospitalist co-management model in a teaching hospital. However, LOS, and average cost per hospital stay did not show the same increase, and the readmission rate only increased significantly in THA patients in the H group at 90 days postsurgery. Therefore the H group gained a significant number of new diagnoses that seemed to remain subclinical during the postsurgical hospital stay. While hospitalists are trained to report all possible diagnoses for accurate billing purposes, some physician and hospital grading systems may view these new diagnoses as postsurgical complications resulting in penalties. Therefore, any potential benefit of a hospitalist co-management model for THAs and TKAs in a teaching hospital setting may be outweighed by the potential penalties associated with increased postsurgical subclinical diagnoses.

Customized, Individually Made Unicondylar Knee Replacement: A Prospective, Multicenter Study of 2-Year Clinical Outcomes

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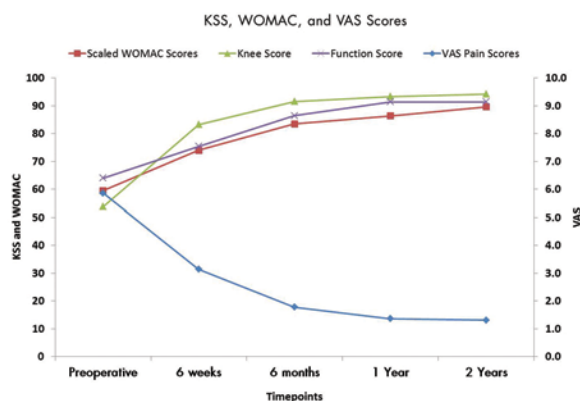
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INTRODUCTION: Over the past decade, the number of uni-compartmental knee arthroplasties (UKA) performed has increased by 30%, as numerous studies have demonstrated shorter hospital stays, decreased perioperative morbidity, faster functional recovery, increased range of motion (ROM), and improved knee kinematics versus total knee arthroplasty (TKA). More recently, a customized, individually made (CIM) UKA has been introduced in the market, which reproduces the patient's J-curve, with the goals of improving patient satisfaction and functional outcomes. However, there are no known studies that report the clinical and functional outcomes of this device. Hence, the purpose of this study was to assess clinical and patient-reported outcomes utilizing CIM unicondylar knee replacement (UKR) prostheses.

METHODS: A prospectively recruited cohort of 117 patients were implanted with 120 CIM-UKR (110 were medial/10 lateral) at 8 centers. Patients who were diagnosed with unicompartmental osteoarthritis of the medial or lateral compartment and consented to take part in the study were included. Patients with a BMI > 35, compromised cruciate or collateral ligaments or had a varus/valgus deformity > 15° were excluded from the study. Patients were assessed for the Knee Society Knee and Function Scores, WOMAC & ROM pre-operatively, at 6-months post-op, 1 year post-op and 2 years post-operatively. Patients were also asked about their satisfaction level and if the movement of their implanted knee felt natural.

RESULTS: Range-of-motion was improved to an average of 12° from 120° pre-operatively to 132° at 2 years post-op (116° at 6 wks, 129° at 6 months and 129° at 1 year). Patients demonstrated marked improvements from baseline scores across all measured domains. A total of 73 patients have reached their 2-year follow up visit to date. Average KSS Knee Scores at 2-years are 94, KSS Function 91, WOMAC 90, and VAS Pain 1.3 (Figure 1). Additionally, 98% of patients said they were satisfied, with 89% reporting they were very or extremely satisfied with their UKR and 89% stated that the movement of their knee felt natural. To date 2 patients have undergone revision for tibial loosening and one additional patient was revised for disease progression yielding a cumulative revision rate of 2.5% at the 2 year post-operative interval.

DISCUSSION: There are a multitude of studies of off-the-shelf mobile and fixed-bearing UKR. The 2-year follow up data collected on CIM UKR compares favorably to both published scores as well as revision rates for off-the-shelf implants. Importantly, a high percentage of patients reportedly were extremely satisfied with the CIM UKR procedure. Additionally, 89% of patients reported that they had a natural feeling in their CIM UKR.



Predictors Of Early Discharge After Total Knee Replacement

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INTRODUCTION: Advances in total knee arthroplasty (TKA) have sped recovery and increased the number of patients who are able to go home after surgery. However, despite rapid recovery protocols it is often difficult to predict which patients can safely be discharged early. The purpose of this study was to evaluate factors associated with patient disposition and predictors of early discharge (LOS less than 2 days) to home after TKA.

METHODS: After IRB approval, a Series of 800 consecutive TKA patients who underwent surgery between January 2011 and December 2011 at our institution were included in the study. From this population, 743 were unilateral, primary TKA and met the inclusion criteria. Several potential discharge factors were then evaluated for each patient. These included social, medical and surgical variables. Binary logistic regression was used for statistical analysis.

RESULTS: 366 patients (50.2 %) met our early discharge criteria (LOS less than 2 days). Factors associated with successful early discharge were age less than 65, OR 1.15 95 % CI (1.03 - 1.3), and ASA score, OR 29 95% CI (1.7 Co 498). Factors associated with prolonged hospital stay and discharge directly to home included Charlson Comorbidity Score, OR 0.4 CI (0.17 Co 0.97), elevated BMI, (>25) OR 0.62 CI (0.44 Co 0.87) and Medicare insurance OR 0.11 95 % CI (0.01 Co 0.08). Social factors such as living alone, 2 story living arrangement, and availability of help at home did not have any significance in predicting early or late discharge.

CONCLUSION: Young Healthy patients (lower ASA and Charlson Comorbidity Score) are more likely to be safely discharged to home soon after TKA. Age less than 60,

ASA, and CCI appear to contribute to successful early discharge to home after TKA. Surprisingly, patient social factors appear not to have substantial influence on achieving safe, early discharge.

A Simple Technique May Reduce Postoperative Bleeding After Total Knee Arthroplasty (TKA)

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INTRODUCTION: Intraoperative knee hyperflexion for six minutes after tourniquet release resulted in a decrease in measures of blood loss in patients undergoing TKA compared to a control group in this prospective randomized controlled trial.

METHODS: We randomized 27 consecutive patients undergoing TKA at one institution into two groups: Group I and Group II. Group I, 10 patients, received six minutes of knee hyperflexion intraoperatively after tourniquet release and Group II, 17 patients, did not receive the knee hyperflexion. We measured the 24 hour drain output and preoperative hematocrit at POD 1, 2, and 3 for each group.

RESULTS: The demographics and comorbid conditions known to increase risk of blood loss and complications were similar between the groups. The percent decreases in hematocrit on POD 3 were 20.66.1 and 25.95.3 for groups I and II respectively. The 24 hour drain outputs were 263.86160.80ml and 280.20152.11ml for groups I and II respectively.

CONCLUSION: A simple technique of intraoperative knee hyperflexion reduced measures of postoperative bleeding after TKA such as change in hematocrit and 24 hour drain output however these findings were not significant. Data collection is ongoing to prevent underpowered future findings.

Long-Term Results of Total Knee Arthroplasty for Valgus Knees: Soft Tissue Release Technique and Implant Selection

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Co-authors: Attique Vasdev (Medanta Bone & Joint Institute, Medanta- The Medicity, Gurgaon Haryana India)

PURPOSE. To report long-term results of total knee arthroplasty (TKA) for valgus knees. **Methods.** 34 women and 19 men aged 39 to 84 (mean, 74) years with valgus knees underwent primary TKA by a senior surgeon. Of the 78 knees, 43, 29, and 6 had type-I, type-II, and type-III valgus deformities, respectively. A preliminary lateral soft-tissue release was performed, and the tibia and femur were prepared. The tight lateral structures were released using the pie-crusting technique. In 92% of the knees, cruciate-retaining implants were used. In knees with severe deformity and medial collateral ligament insufficiency, the posterior cruciate ligament was sacrificed and constrained implants were used. The Hospital for Special Surgery (HSS) knee score was assessed, as were tibiofemoral alignment, range of motion, stability, and evidence of loosening or osteolysis.

RESULTS. Patients were followed up for 8 to 14 (mean, 10) years. All knees had a good patellar position and were clinically stable in both mediolateral and anteroposterior planes. No radiolucency was noted. The mean HSS knee score improved from 48 to 91 (p less than 0.001). The mean tibiofemoral alignment improved from valgus 20 to 5 (p less than 0.001). The mean range of motion improved from 65 to 110 (p less than 0.001). One patient developed a deep infection at year 4, and 2 had periprosthetic fractures at years 6 and 8.

CONCLUSION. Adequate lateral soft-tissue release is the key to successful TKAs in valgus knees. The choice of implant depends on the severity of the valgus deformity and the extent of soft-tissue release needed to obtain a stable, balanced flexion and extension gap, in order to achieve minimal constraint with maximum stability.

Mid-term Results of Patient Satisfaction Following Total Knee Arthroplasty

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INTRODUCTION: Total Knee Arthroplasty (TKA) is well reported as an effective treatment for alleviating pain and restoring function for patients with end stage osteoarthritis. While efficacy of this treatment is supported, patients continue to report up to 20% residual midterm dissatisfaction following TKA [1]. A recent study has reported higher levels of early satisfaction within the first year, though it is unknown if these effects sustain [2]. The purpose of this study was to report on patient satisfaction and associated factors 7 years post-operative with a contemporary TKA device.

METHODS: Patient satisfaction was investigated as part of a longitudinal, multicenter, clinical trial (6 centers) of a single TKA device. Patient reported outcomes included Knee Society Score (KSS) and a Pain and Satisfaction questionnaire. Clinical outcomes included radiographs, range of motion, adverse events and device survivorship. Data was analyzed for patients who completed a 7 year minimum follow up.

RESULTS: Seventy-six patients of the 92 recruited returned for a 7 year follow-up. See table 1 for patient demographics. All cases reported 'yes' to "Are you satisfied with the results of your knee replacement". Six patients reported 'occasional' or 'very little' or 'slight aching' pain. Two additional patients reported 'slight pain' during deep knee bend activities. KSS Total and KSS Pain/Motion scores were 100 and 93.5 respectively. There were 2 adverse events reported for medical conditions (cancer, cardiovascular) and a single report of knee instability. KM Survivorship was 97%, as previously reported [2].

DISCUSSION: In this study, all patients were satisfied with their implant and surgical results at 7 years post-operative. Surgical technique, soft tissue recovery, and patient's ambition to return to function affect early post-oper-

ative satisfaction. Therefore mid and long term satisfaction should be further investigated as the influence of these variables diminishes.

1. Du H, Tang H, et al. Patient satisfaction after posterior-stabilized total knee arthroplasty: a functional specific analysis. *Knee*. 2014 Aug; 21(4):866-70.
2. W Kurtz. Early Outcomes Utilizing a First-Generation Customized Patient-Specific TKA Implant. 2014 British Association for Surgery of the Knee (BASK) meeting. Poster P0185.
3. SF Harwin, K Issa, et al. Clinical and Patient-reported Outcomes of Primary TKA With a Single-radius Design. JULY 2013. Volume 36, Number 7

Table 1. Patient Demographics

Age	66.2 (45-80) years
Gender	67% F / 33% M
BMI	30.5 (18-40)
Top Co-Morbidities	Hypertension (56.3%)
	Cardiovascular (43.6%)
	OA (65%)

Mid-Term Results of Rotating Hinge Knee Prosthesis

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Co-authors: Attique Vasdev (Medanta Bone & Joint Institute, Medanta- The Medicity, Gurgaon Haryana India)

Between December 2002 and December 2007, we retrospectively assessed the midterm results of the Nexgen rotating hinge prosthesis in the hands of a single surgeon in difficult primary and complex revision situations. Forty four patients (46 knees) were included in the study: they were followed for an average of 62 months. Knee Society knee score improved from a preoperative mean value of 47 to a mean value of 81 at follow-up (p less than 0.05) whereas the mean function score improved from 17 (0-40) to 67.5 (0-90) at follow-up (p less than 0.001). Mean flexion range improved from 65 to 96 at follow-up (p less than 0.05). In conclusion, rotating hinge knees gave satisfactory results in difficult revision situations associated with major bone loss, instability or periprosthetic fracture. They also provided satisfactory results in selected cases of advanced primary osteoarthritis.

Topical Tranexamic Acid Use in Knee Periprosthetic Joint Infection is Safe and Effective

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INTRODUCTION: Tranexamic acid (TXA) has been shown to decrease hemoglobin loss and reduce the need for transfusions in primary hip and knee arthroplasty. Recently, authors have proven similar results in revision total knee arthroplasty (TKA). No previous paper has focused on the safety and efficacy of TXA for revision TKA for periprosthetic joint infection (PJI). The purpose of our study was to evaluate the safety and efficacy of topical TXA in revision TKA for PJI.

METHODS: We performed a retrospective review of all patients who underwent 2-stage revision total knee arthroplasty for infection at our institution between September 25, 2007 and July 12, 2013. We evaluated hemoglobin loss, need for transfusion, one-year reinfection rate, length of stay (LOS), complications and one-year mortality with and without the use of TXA in all patients who underwent Stage 1 removal of hardware with antibiotic spacer placement and/or revision (Stage 2) for PJI of the knee. All data sets were analyzed using a two-sample t-test.

RESULTS: During the study period, 45 patients underwent 49 Stage 1 procedures (20 knees with TXA, 29 without) and 44 patients underwent 47 Stage 2 revisions (28 with TXA, 19 without). Tranexamic acid use significantly decreased the hemoglobin loss in the Stage 1 group (19.8% vs 30.05%, $p=0.0004$) and the Stage 2 group (24.5% vs 32.01%, $p=0.01$). Furthermore, in both groups, the use of TXA was associated with a significant reduction in transfusion rates (Stage 1 25% vs 51.7%, $p=0.04$; Stage 2 25% vs 52.6%, $p=0.05$). There was a non-statistical decreased LOS of over a day in both groups (Stage-1 5.15 vs 6.72 days, $p=0.055$; Stage-2 5.21 vs 6.84 days, $p=0.09$). Finally, in both groups, there was no statistical difference in one-

year re-infection rate ($p=0.98$) or one-year mortality (0 vs 0). There was a single upper extremity DVT around a PICC line, occurring in a patient who underwent a Stage 1 procedure augmented with topical TXA. There were no PEs.

CONCLUSION: Topical tranexamic acid is both safe and effective for use in both stages of revision TKA for PJI. We show a significant reduction in the hemoglobin loss and transfusion requirement in both stages of TKA revision for PJI. Despite not achieving significance, we feel an average LOS over a day shorter in each group is a strong potential for cost savings. Furthermore, we show that topical TXA does not seem to have a negative effect on the treatment of PJI and does not increase the one-year reinfection or mortality rate.

Two Stage Reimplantation for Infected Knee Arthroplasty with An Articulating Preformed Spacer

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INTRODUCTION:

Two-stage reimplantation has been considered the gold standard in treatment of deep knee arthroplasty infections achieving the best results for eradication of infection (88-96%) and maintenance of function. The antibiotic-loaded preformed cement spacers preserve bone stock, keep collateral ligaments from becoming contracted, avoid quadriceps fibrosis and reduce formation of scar tissue that obliterates the joint space.

METHODS: We retrospectively reviewed 33 patients (33 knees) with infected TKA who underwent two-stage reimplantation for deep infection at our institution from 2004 to 2009 using an articulating preformed antibiotic-loaded knee spacer (Spacer-K, Tecres, Verona, Italy). Patients were evaluated clinically and radiographically preopera-

tively, during the spacer stage and after the reimplantation. Eradication rate and complication rate were assessed.

RESULTS: Thirty-three preformed articulating antibiotic-loaded spacers were used in 33 knees (Figure 1). The average patient age was 65 years (range 53-81). There were 22 females (67%) and 11 males (33%). The average implantation time of the spacer was 15 weeks (range 6-54). In 3 cases a second spacer was necessary to eradicate the infection. At reimplantation a CCK or a RHK modular prosthesis was used. A failure was observed in 3 patients (9%) at 5-8 years follow-up due to a late deep infection. Mean Knee Society Score improved from 34 preoperatively to 74 at time of second procedure and to 77 at the final review. Mean flexion improved from 60 to 77 at time of second procedure and to 98 at 1 year follow-up, flexion contracture decreased from 8 to 1 at time of second procedure and to 2, except for a patient that underwent extensor mechanism transplantation (active ROM: 60-90). We had 1 spacer dislocation. Bone loss was unchanged between the stages.

DISCUSSION AND CONCLUSION: The use of preformed spacers and intravenous antibiotics with delayed exchange arthroplasty demonstrates its reliability in treating infection and in recovering function.

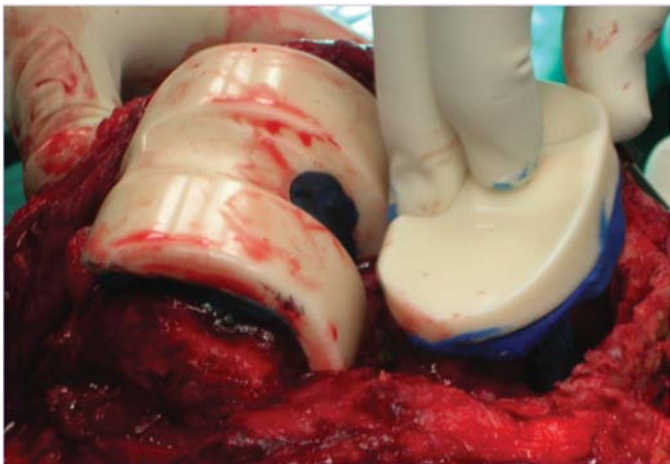


Figure 1.



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The Location of the Popliteal Artery in Knee Extension on Magnetic Resonance Imaging

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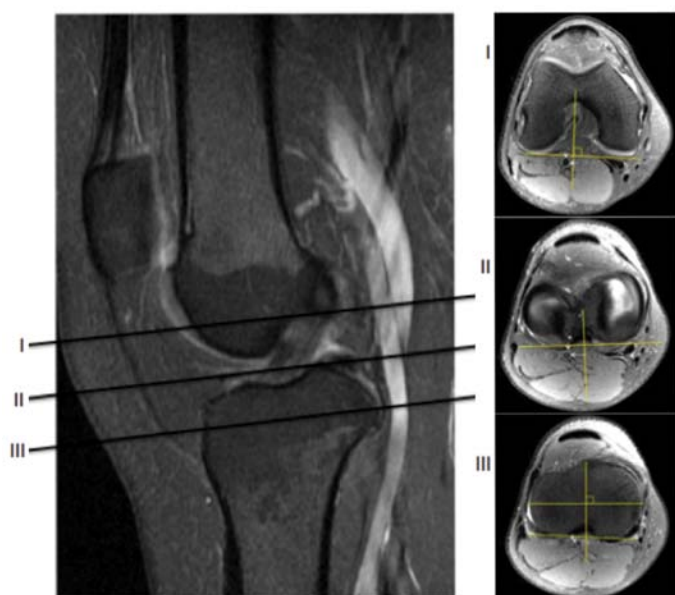
INTRODUCTION: With the increasing amount of knee procedures performed annually in the United States, protection of the popliteal artery (PA) is imperative. Though the complication rate is low, consequences from arterial injury include limb morbidity, amputation, and litigation against the surgeon. The purpose of this study was to investigate the location of the PA in extension at multiple levels of the knee joint to provide detail about the vessel at its most vulnerable position.

METHODS: Magnetic resonance images (MRI) of 94 consecutive patients (94 knees) in knee extension were retrospectively reviewed. Images were acquired through a picture-archiving and communication system (PACS), and quantitative measurements made using PACS software. The anterior-posterior (AP) and medial-lateral (ML) distances from midline landmarks to the PA were measured at three levels (figure 1) on axial images: 10 mm proximal to the distal femur articular surface, at the knee joint, and 10 mm distal to the tibial plateau.

RESULTS: There were 49 female and 45 male patients with an average age of 42.0 years (range: 18.4 to 76.4 years). Proximal to the joint line, the mean AP and ML distances to the artery were 3.0mm 5.1 and 2.8mm lateral 3.1, respectively. At the joint line, the mean AP distance is 5.8mm 3.6 and ML distance is 4.7mm lateral 3.4. Below the tibial plateau, the mean AP distance is 7.87mm 3.18 and the mean ML distance was 4.83mm lateral 3.55. There was a stepwise increase in AP distance at all three levels with advancing BMI stratifications (normal weight, overweight, obese and morbidly obese patients). Age >40 was

associated with increasing AP distance to the artery (p less than 0.000). Medial-lateral distance at the joint line significantly decreased with advancing age (p less than 0.001) but was not affected by BMI (p>0.210).

CONCLUSION: In knee extension, the popliteal artery is on average 7.87mm posterior and 4.83mm lateral to the midline posterior tibial cortex. Proximally, the artery is more anterior and midline, placing it at significant risk during common knee procedures. The location of the PA varies depending on age and BMI, with the closest values found in patients that are less than or equal to 40 years and have a BMI less than 29 kg/m².



Prevalence of Previously Reconstructed Anterior Cruciate Ligament Tears Among Professional Football Players

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INTRODUCTION: Sports related injuries are common among athletes at all levels, from recreational athletes to professional athletes. Anterior Cruciate Ligament tears are believed to be particularly common among Football Running Backs, who are susceptible due to the nature of their sport as well as the nature of their position^{1,2,3}. To date,

no study has assessed the prevalence of previously reconstructed Anterior Cruciate Ligaments among NFL running backs.

METHODS: Data was collected retrospectively for starting NFL running backs between the years 2008-2010. Publicly available records were used to identify the presence of a previous Anterior Cruciate Ligament Reconstruction. For players sustaining an injury during their professional career, pre- and post-reconstruction performance statistics were obtained for analysis.

RESULTS: Throughout the 2008 through 2010 seasons, 11.13% of starting NFL running backs had a previously reconstructed ACL. Analysis of performance statistics revealed several trends that did not reach statistical significance. Among these, only 40% of players who returned to play continued beyond one season. Those who returned for at least one season trended towards better pre-injury performance, and compared to their pre-injury statistics, the average NFL running back had a decrease of 38% in power rating during his first season following reconstruction, with recovery to 87% of pre-injury power-rating during the second year.

DISCUSSION AND CONCLUSION: This is the first study to address the prevalence of surgically reconstructed ACL among NFL players. The distinction between incidence and prevalence is important insofar as the incidence of ACL injuries addresses risk, while prevalence connotes prognosis and rehabilitation potential. The observed prevalence of 11% is significantly greater than that of the general population. Performance statistics and return to play are comparable to prior research.

A Randomized Controlled Trial: Early Functional and Proprioceptive Improvement Using a Continuous Active vs Passive Motion Device

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INTRODUCTION: Continuous passive motion (CPM) devices have not shown to improve range of motion (ROM) or reduce manipulation under anesthesia (MUA) following knee replacement surgery. We wonder whether a continuous active motion device (CAM) would improve functional recovery after knee replacement compared to CPM. We also wonder whether more functional testing, such as quadriceps-strength, sit-to-stand test and proprioceptive testing would be more relevant to study the effect of these devices beyond orthopedic outcome scores, range of motion and MUA.

METHOD: A total of 1153 patients scheduled for partial or total knee replacement surgery were screened to participate in this hospital IRB approved randomized controlled trial and 110 patients agreed to participate receiving either a CPM device for 4 hours daily or a CAM device with 3 sessions of 20 minutes every day for three weeks. 86 patients undergoing primary UKA or TKA completed pre- and 4 weeks post-op testing. Functional testing included sit-to-stand test, kinesthesia, quadriceps strength and proprioception using a Biodex Balancer SD (Biodex, Shirley, New York). Functional outcomes such as straight leg raise, 90 degrees flexion, independent stair climbing were also recorded through patient questionnaires. Functional outcomes measures included SF 36, Knee Society Score for pain and function and WOMAC. Total narcotic consumption was recorded for the 4 week post-operative period and converted into standard units for comparison.

RESULTS: Comparing our test results before surgery, including demographic data both groups were comparable (Table1). At 4 weeks all outcome measures were comparable between both groups with the exception of the sit-to-stand test, which was significantly better in our treatment group (CAM). Balance was also similar 3.13 vs.2.95 ($p=0.51$) between both groups. SF-36, KSS, and WOMAC scores were not statistically different (SF-36 55.19 vs 51.96 ($p=0.379$), KSS 67.8 and 71.03 ($p=0.478$), WOMAC 45.33 vs 46.93 ($p=0.647$)) [Table1]. Comparing pre-op with our 4 weeks post-operative testing (Table 2) we saw no significant decrease in quadriceps strength in both groups. We observed a significant improvement of functional testing in our treatment group. Proprioception did not change in treatment group, but significantly worsened post-op in our control group. There was no difference in pain medication consumption.

DISCUSSION: We confirmed that range of motion, pain, pain medication consumption or outcome measures such as SF-36, WOMAC and KSS were not different between both groups. Surprisingly, we found no change in quadriceps strength 4 weeks after surgery in both groups compared to pre-op. Most publication observe a decrease in quadriceps strength following knee replacement. This could be related to the use of either device in both groups. We were able to demonstrate an improvement of functional outcome using CAM and maintaining the ability to balance, which worsened in our control group. Further research is necessary, specifically comparing our treatment group to current practice, which is not using a CPM device. Both devices, specifically the active device may improve functional and proprioceptive recovery and offers the benefit of a shorter daily treatment time compared to CPM.

Table 1. Descriptive statistics

Parameter	Control group (CPM)	Study group (CAM)	p-value
pre-op-Mean(SD)			
Number of patients/knees	45/45	38/38	0.759
Weight (pds)	191.7(36.1)	209.3(38.8)	0.038
Height (in)	65.8(4.0)	68.0(4.4)	0.021
BMI	31.1(5.5)	31.3(5.9)	0.560
Age (years)	64.7(9.2)	61.5(8.8)	0.121
Sex (female/male)	31/14	20/18	0.130
Sit-to-stand test	3.40(1.48)	3.37(1.18)	0.907
Knee flexion	111.6(12.8)	113.8(12.8)	0.441
Kinesthesia	4.24(3.34)	3.20(2.64)	0.161*
Strength	11.2 (4.7)	12.4(4.7)	0.230
Balance	3.62 (1.39)	3.61(1.69)	0.969
SF-36			
Physical health	35.0(6.8)	35.1(6.3)	0.951
Mental health	43.2(8.1)	43.4(7.5)	0.894
Knee function score	53.5(21.5)	55.1 (19.1)	0.734
KSS	49.3(14.9)	56.0 (13.7)	0.073
WOMAC	67.1(20.3)	64.1 (14.9)	0.465

* p-value is from Wilcoxon-Mann Whitney test

post-op at 4 weeks-Mean(SD)

Parameter	Control group (CPM)	Study group (CAM)	p-value
Sit-to-stand test	3.43(1.23)	2.83(0.98)	0.017
Knee flexion	101.0(12.7)	104.3(15.0)	0.282
Kinesthesia	2.98(2.32)	2.90(2.99)	0.388*
Strength	11.60(4.34)	12.02(4.12)	0.657
Balance	2.98(1.27)	3.11(1.56)	0.682
SF-36			
Physical health	36.8(7.8)	37.4(5.9)	0.735
Mental health	39.4(8.2)	40.2(8.8)	0.662
Knee function score	51.9(18.0)	55.5(19.1)	0.401
KSS	62.6(17.7)	64.7(17.0)	0.674
WOMAC	50.2(16.9)	45.8(13.6)	0.208
Oxycodone			
Equivalent dosage	346.97(289.85)	471.77(457.46)	0.290

* p-value is from Wilcoxon-Mann Whitney test

* Sign rank test

Quality Improvement Initiative to Reduce Pain and Opioids in TKA

Primary Author: Christopher N. Johnson, DO

Institution: McLaren Macomb (Mt Clemens, MI, USA)

Co-authors: Jennifer Curl (Orthopedics, McLaren Macomb, Mt Clemens, MI, USA)

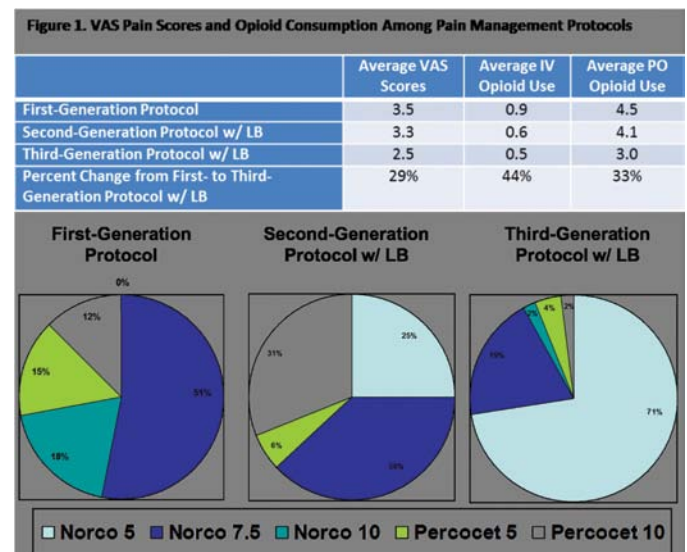
INTRODUCTION: Over 400,000 total knee arthroplasties (TKAs) are performed annually in the United States,¹ and postsurgical pain control and associated opioid requirements are integral factors in the patient recovery experience. As such, this institution implemented a continuous quality improvement (CQI) initiative to optimize a multimodal analgesic regimen with the goal of improving patient pain scores and reducing reliance on opioids.

METHODS: Between September 2013 and April 2014, 90 TKA patients were exposed to one of 3 pain management protocols: Cfirst-generation protocol,C (administered Sept 2013-Nov 2013: pre-op Celebrex 200 mg and Ofirmev 1 g; intra-op TPI; post-op Celebrex 200 mg PO qday, Norco/Percocet tabs q4-6h PRN, Dilaudid 0.5-1 mg IVP q3h PRN); Csecond-generation protocol,C (administered Dec 2013-Jan 2014: aforementioned algorithm with the addition of liposomal bupivacaine [LB] 266 mg/20 mL administered intraoperatively via wound infiltration); or Cthird-generation protocol,C (administered Feb 2014-April 2014: pre-op Celebrex 400 mg PO, Lyrica 75 mg PO; intra-op LB 266 mg/20 mL TPI; post-op Celebrex 200 mg PO bid, Lyrica 75 mg PO bid, Toradol 15 mg IVP q6h, Norco 5 1-2 tabs q4-6 hrs PRN; Dilaudid 0.5-1 mg q3hrs PRN). Mean visual analog scale (VAS) pain scores and postsurgical opioid use was collected, as was information related to discharge prescriptions written.

RESULTS: Forty patients received the first-generation protocol, 10 received the second-generation protocol, and 40 were administered the third-generation protocol. Patients who received the second-generation protocol including LB infiltration reported slightly lower mean VAS scores than those who received the first-generation protocol (average of all reported values: 3.3 vs 3.5, respectively), with slightly lower opioid requirements through POD3 (average of all reported values: 0.6 IV injections and 4.1 tablets vs 0.9 IV injections and 4.5 tablets, respectively). Given the trend toward lower pain scores and opioid use, the second-generation protocol was stopped early and re-

vised to include a more sophisticated multimodal approach aimed at further reducing pain and opioids. Patients in this arm reported lower pain scores than those in both the first and second-generation protocols (average of all reported values: 2.5) and lower opioid use (0.5 IV injections and 3.0 tablets). (Figure 1). Further, the majority of patients (51%) receiving the first-generation protocol were discharged with prescriptions for Norco 7.5. That number dropped to 38% of patients in the second-generation arm. Only 19% of patients in the third-generation treatment arm received this prescription, with the majority of individuals (71%) discharged with Norco 5. (Figure 2).

CONCLUSION: Through the iterative process of refining a postsurgical analgesic protocol for patients undergoing TKA procedures, this institution was able to achieve a 29% reduction in pain scores, 44% reduction in IV opioid use, and 33% reduction in PO opioid use over the course of evolution from first- to third-generation protocols. As demonstrated by the continued reduction in all parameters measured from second- to third-generation, clinicians should be mindful of the potentially additive positive impact of multiple non-opioid agents, particularly long-acting local analgesics such as LB, which can provide the foundation of a multimodal pain management regimen.



Safety of Desirudin Administered in the Immediate Postoperative Period Following Joint Replacement Surgery: An Observational Study

Primary Author: Maurice Jove, MD

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Co-authors: James M. Meyer (Medical Affairs, Marathon Pharmaceuticals, Northbrook, IL, USA)

INTRODUCTION: Desirudin is a recombinant direct thrombin inhibitor (DTI) approved in the US for the prophylaxis of deep vein thrombosis (DVT), which may lead to pulmonary embolism (PE), in patients undergoing elective hip replacement surgery, and approved in the EU for the prevention of DVT in patients undergoing elective hip or knee replacement surgery. Evidence suggests that desirudin may possess a better safety profile in higher risk patients than do other thromboprophylactic agents, and trials evaluating the safety of desirudin have indicated good tolerability without frequent adverse events. As with other agents used for thromboprophylaxis, the most common adverse events associated with desirudin are hemorrhagic reactions. This observational study evaluated bleeding events and wound outcomes in patients receiving desirudin during the immediate postoperative period after total joint replacement surgery (hip and/or knee), followed by rivaroxaban for outpatient DVT prophylaxis.

METHODS: Patients undergoing total hip (THR) and/or total knee (TKR) replacement were eligible to participate in the study. Inpatient DVT prophylaxis was initiated with desirudin 15 mg BID the evening following the completion of surgery. At the discretion of the treating physician, DVT prophylaxis continued with rivaroxaban 10 mg on an outpatient basis following hospital discharge. The primary endpoints were (1) fall in hemoglobin (g/dL) and (2) degree of wound discharge at release from hospital. Wound discharge was rated on a 5-point scale of bruising ranging from 0 (negligible bruising) to 4 (bright red blood). Secondary endpoints included degree of wound discharge at the first postoperative follow-up visit, and symptomatic PE documented by CT scan or symptomatic DVT documented by ultrasound. Endpoint assessments were conducted at hospital discharge, at the first postoperative visit, and at the staple-removal visit. All patients were required to follow-up with their surgeons in the clinic or via telephone be-

tween postoperative day 7 and postoperative day 14.

RESULTS: Patient demographic data are presented in Table 1. As shown, 151 patients participated in the study (THR, n=37; TKR, n=111; THR/TKR, n=2). Patients ranged between 37-98 years of age, with a mean age of 62 years. Almost 75% of the patients were female. It is also important to note that the overall patient population had a mean body mass index (BMI) of 35.9 kg/m². Analyses of primary and secondary endpoints will be presented.

CONCLUSION: The demographic characteristics of patients in this study suggest a patient population with a relatively high risk of venous thromboembolism (VTE) due to age and obesity. Consequently, analysis of the primary (hemoglobin level and degree of wound discharge at hospital release) and secondary (degree of wound discharge at follow-up and symptomatic PE/DVT) endpoints will provide insight into the safety of desirudin for DVT prophylaxis in high-risk patients undergoing total joint replacement surgery.

Demographic Variable	Patients (N=151)
Median age, years (range)	62 (37-98)
Mean BMI, kg/m ² (SD) ^b	35.92 (8.65)
Age group, n (%)	
<65 years	91 (60.3)
≥65 years	60 (39.7)
Sex, n (%) ^a	
Male	37 (24.5)
Female	112 (74.2)
Race/ethnicity, n (%) ^b	
White	86 (57)
Black	54 (35.8)
Hispanic	3 (2)
Asian	2 (1.3)
Native American	2 (1.3)
Other	1 (0.7)
Surgery type, n (%) ^c	
THR	37 (24.5)
TKR	111 (73.5)
THR/TKR	2 (1.3)

^aData missing from 2 patients

^bData missing from 3 patients

^cData missing from 1 patient

Hospital Outcomes and Cost for Patients Undergoing a Customized Individually Made TKA vs Off-the-Shelf TKA.

Primary Author: Gregory Martin, MD

Institution: JFK Medical Center (Boynton Beach, FL, USA)

Co-authors: Alyssa Swearingen (USA), Steven D. Culler (Emory University, Atlanta, GA, USA)

INTRODUCTION: Despite excellent survivorship, published literature suggests there are between 15-39% of patients dissatisfied with the result of their TKA. Newer technologies may improve the value of care delivered to TKA patients by providing better clinical outcomes at similar or lower total cost of care. The purpose of this study was to compare a variety of the hospital outcomes between patients undergoing TKA using either customized individually made (CIM) TKA or a Standard Off-the-Shelf (OTS) TKA.

METHODS: A retrospective review was conducted for consecutive TKA patients treated in a single institution, by the same surgeon, between March 2010 and November 2013. The study sample consisted of 248 TKA hospitalizations having received either CIM TKA (126) or OTS TKA (122). Data collected included: patient demographics, length of procedure metrics, length of hospital stay, blood transfusion rates, patient discharge disposition, adverse event rates at discharge, at 30 and at 90 days, and total hospital cost. Hospital costs were calculated from billed charges, and were adjusted into 2013 US Dollars by using the appropriate annual value for the hospital specific cost/charge index for all hospitalizations under DRG 470. Uni-variate differences in selected outcome measures between the two study arms were assessed with Chi-square analysis or FisherCOs exact test for discrete variables and StudentCOs t test for continuous variables. A p-value of less than =0.05 was considered statically significant in this study.

RESULTS: There were no statistical differences in the demographics (age, sex, BMI) between the two arms. The CIM implant showed significantly lower transfusion rates (2.4% vs 10.7%; $p=0.009$). The adverse event rate at discharge was significantly lower in the CIM arm than the OTS arm (1.6% vs 13.9%; p less than 0.001). Differences in length of stay reached borderline significance (CIM 3.0

vs OTS 3.2; $p=0.057$). When discharge disposition was analyzed, it was seen that a significantly lower percentage of patients in the CIM group were discharged to acute care facilities (2.4% vs 13.9%; p less than 0.001). Finally after adjusting for inflation, total hospital cost between the two groups was not statistically different (CIM \$16,192 vs OTS 16,240; $p=0.913$). Furthermore, when comparing a subset of the data among patients receiving a simultaneous bilateral TKA, it was seen that most comparison categories had similar trends but did not reach significance due to a small sample size. Nevertheless, patients in the CIM group were more likely to be discharged to home or home with care when compared to the OTS group (58% vs 17%; p less than 0.001).

CONCLUSION: Patients treated with a CIM implant had significantly lower transfusion rates and lower adverse event rates than patients treated with OTS implants.

Patients treated with a CIM implant showed a trend towards a shorter length of stay and a better discharge disposition than patients in the CIM arm. These improved outcomes for the CIM group were achieved without an increase in hospital costs. Future studies need to be conducted to examine the potential hospital savings associated with lower inventory management and sterilization cost savings with the single package CIM implant.

Prevalence of Metal Allergy in an Orthopaedic Osteoarthritis Clinic

Primary Author: Jason Wong, MD

Institution: Montefiore Medical Center (New York, NY, USA)

Co-authors: Jonathan Courtney (Orthopaedic Surgery, Montefiore Medical Center, New York, NY, USA)

INTRODUCTION: The effect of metallic total knee arthroplasty (TKA) implants on patients with metal allergy remains unknown. There is no standardized method in obtaining metal allergy status in the orthopaedic population. We would like to raise awareness in the field in obtaining metal allergy history on patients prior to TKA.

METHODS: All new patients who have visited a single-institution osteoarthritis clinic within a month period were asked the question whether or not they have a known al-

lergy to metal or nickel, and a separate question C are you able to wear cheap jewelriesC was also asked. The prevalence of subjective allergy to the above materials was then recorded.

RESULTS: 106 patients who visited our osteoarthritis clinic were enrolled in the study, which consists of 29 males and 77 females. Although none of them have reported any known allergy to metal or nickel, 6 out of 106 patients (5.7%) reported C they are not able to wear cheap jewelriesC because of reactions, such as rash or itchiness. All of the 6 patients were female.

CONCLUSION: Prevalence of metal allergy in patients with osteoarthritis is similar to the general population. However, patients may not be familiar with the term metal allergy and a different question, such as Cthe tolerance to cheap jewelriesC as in this study might have to be asked.

Platelet Rich Plasma and Topical Tranexamic Acid is Superior to Topical TEA alone in Transfusion Avoidance

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Institution: Peninsula Regional Medical Center (Salisbury, MD, USA)

Co-authors: Matteo Petrera (Salisbury, MD, USA), Jessie Dunn (Salisbury, MD, USA)

Avoidance of transfusion after total joint arthroplasty remains an important goal for the orthopaedic surgeon. The senior author has previously studied PRP application with TKA and found a significant decrease in transfusion rate. Soon thereafter, a study documented decreased transfusion rates with topical TEA. The senior author then utilized TEA in addition to PRP in his TKA patients. The purpose of this study is to determine if topical TEA + PRP is superior to topical TEA alone in avoiding transfusion.

A retrospective study was done comparing forty TKA patients with either one gram topical TEA + PRP or one gram topical TEA alone. Forty patients with topical TEA alone were done by two surgeons from July 2013 to May 2014. Forty matched patients from the senior author were chosen from the same time period. They received topical TEA + PRP. There were no exclusion criteria. All patients had a pre-op Hgb greater than 12.

In the topical TEA only group, 7.5% (3 of 40) required transfusion of a total of 5 units PRBCCOs. 50% had a Hgb less than 10 post-op. In the topical TEA + PRP no patient required transfusion (0%) and 37.5% had a Hgb less than 10 postoperatively. The transfusion rate difference was statistically significant (p less than .05) and the Hgb level was not (p=.13).

This study clearly shows that PRP + topical TEA (1gm) is clearly superior to topical TEA (1gm) alone after TKA in avoiding transfusion. The Hgb levels were not as clear-cut and suggest that there may be an underlying mechanism relating to PRP that reduced the need for transfusion. Based on this evidence, the senior author will continue this TEA + PRP protocol in all of his TKA patients. Further areas of investigation include intravenous TEA alone and with PRP to see if that may be superior.

Hip Arthroplasty

Risk Factors for Hip Dislocation after Hemiarthroplasty for Femoral Neck Fractures in the Elderly Population

Primary Author: Jason Wong, MD

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Co-authors: Evan Schwechter (Orthopaedic Surgery, Montefiore Medical Center, Bronx, NY, USA), Nico Del-Piccolo (Orthopaedic Surgery, Montefiore Medical Center, Bronx, NY, USA)

INTRODUCTION: Hemiarthroplasty is commonly performed for elderly patients with displaced femoral neck fractures. Despite the rare incidence of dislocations, its occurrence sometimes necessitates revision surgery and leads to complications in the elderly population.

METHODS: A retrospective chart review of femoral neck fractures in elderly patients treated with hemiarthroplasty was carried out to identify risk factors predisposing to dislocation. Between the years of 2008 and 2013, 432 patients underwent the surgery in our institution and 233 have un-

dergone at least 1 radiograph within 3 months after being discharged from the hospital. Demographic factors, surgical approach, radiographic measurements and surgeon experience were recorded.

RESULTS: 11 out of 233 patients who were included in the study sustained a dislocation after the surgery. 5 out of 11 patients who dislocated had multiple episodes ranged from 1 to 3. The incidence of dislocation is 4.7%. The average time of dislocation is 41 days after surgery. The only clinical or radiographic factor significant for dislocation is femoral neck length of 27.78mm in the dislocation group versus 20.06mm in the non-dislocation group (p less than 0.05). There is no correlation between subspecialties of attending surgeons with dislocation rates nor years of experience in practice. None of the patients with dislocations have documented dementia.

CONCLUSION: Surgeons years of experience and their subspecialties training has no impact on the rate of dislocations after hemiarthroplasty for displaced femoral neck fracture. The only radiograph factor that is significant for hip dislocation after hemiarthroplasty is operative femoral neck length.

Optimization of Acetabular Cup-Bone Interface and Volumetric Bone Loss in Total Hip Arthroplasty

Primary Author: Todd Kelley, MD

Institution: University of Cincinnati (Cincinnati, OH, USA)

Co-authors: Chris Casstevens (Orthopaedic Surgery, University of Cincinnati, Cincinnati, OH, USA), Vasile Nistor (Biomedical Engineering, University of Cincinnati, Cincinnati, OH, USA), Jacob Stegman (Biomedical University of Cincinnati, Cincinnati, OH, USA)

INTRODUCTION: As the need for total hip arthroplasty (THA) increases, procedural improvements are pertinent. With new surgical techniques focused on precise implantation, determining optimum positioning necessitates robust planning tools. Bone sparing techniques, maximizing bone ingrowth, and restoring center of rotation in 3D space are often surgical targets, however current planning techniques inadequately allow for these measures. The goal of this study was to define a method to determine bone loss

and bone-to-implant contact area with various implant sizes at a reaming depth that restores the native hip center of rotation when performing preoperative three-dimensional templating for THA.

METHODS: We CT scanned a cadaver, segmented the images, and exported the bone geometry into a Computer Aided Design (CAD) software. An acetabular cup was virtually positioned, vertically inclined 40°, anteverted 15°, at varying depths (0mm to 9mm, from fovea), and using various cup sizes (48mm to 72mm). The total bone loss and percent cup contact to bone was calculated for each combination, at the depth that restored the center of rotation. The cadaver was imaged using an anteroposterior x-ray and sized for a 58mm cup.

RESULTS: As shown in Figure-1 for volumetric bone loss, calculated bone losses increased with increasing cup size and reaming depth. Figure -2 shows the percent of acetabular cup contact to bone for various implant sizes and varying reaming depths, with an overlaid center of rotation curve. It is obvious that percent cup contact could be optimized at each reaming depth for any acetabular implant size that restores the center of rotation. For this particular patient, a 54mm cup restored center of rotation and maximized percent cup contact to bone (75%) at 3 mm reaming depth, while remove 7578 mm³ of bone. Note that cups larger than 66mm would require intrapelvic reaming to restore center of rotation for this cadaver.

CONCLUSION: With developments in computer navigation and robotic surgery, improved preoperative implant positioning is desired. Plotting percent cup contact to bone, volumetric bone loss, and indicating depths to restore center of rotation can aid greatly in preoperative planning. This study describes a method of 3D surgical planning to aid implant sizing and positioning.

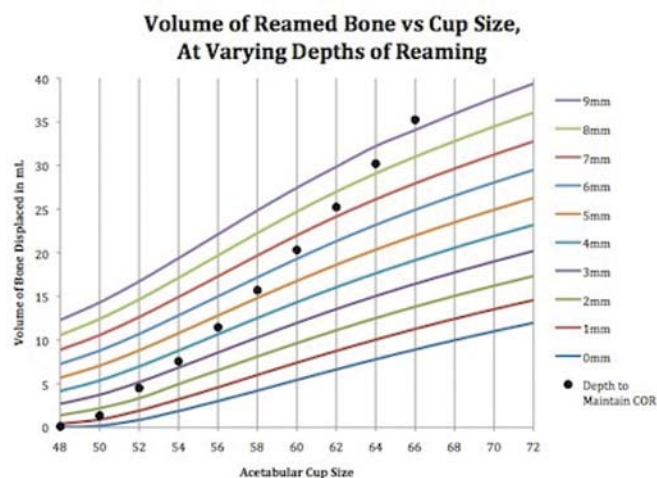


Figure 1

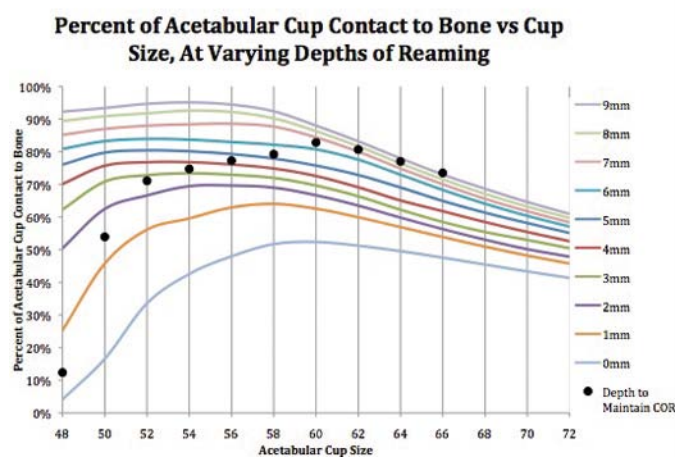


Figure 2

Direct Anterior Approach with a Press Fit Straight Tapered Titanium Stem: A Learning Curve for Neutral Stem Alignment

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INTRODUCTION: With the increased interest in the direct anterior surgical approach for total hip arthroplasty (THA), surgeons may look towards smaller or curved stem designs to facilitate placement of the femoral component.

For surgeons accustomed to using a straight tapered stem design, the anterior approach may be more of a challenge to learn and properly place the femoral component in neutral alignment. The goal of this study was to evaluate the learning curve for proper stem positioning using the anterior approach with a press fit straight tapered stem design.

METHODS: Between May, 2011 and May, 2013, 58 patients underwent a direct anterior THA using a press fit straight tapered stem design. Postoperative radiographs were reviewed and femoral stem alignment was recorded as varus, valgus, or neutral. Patient diagnoses included 47 with osteoarthritis, 7 with avascular necrosis, and 4 with femoral neck fractures.

RESULTS: Of the surgeonCOs first 58 direct anterior THAs using a press fit straight tapered stem, 12 (20.7%) were placed in varus, 2 (3.4%) were placed in valgus, and 44 (75.9%) were placed in neutral alignment. Seven of the first 14 (50%) direct anterior approach THAs using a press fit straight tapered stem were positioned in varus alignment, while only 7 of the next 44 (15.9%) THAs were in varus or valgus alignment.

CONCLUSION: Continued use of familiar implants is an option when transitioning to a less familiar surgical technique. For surgeons familiar with a press fit straight tapered stem design and interested in converting to the direct anterior surgical approach, consideration of a smaller or curved femoral implant to accommodate this surgical approach may not be necessary. Although a press fit straight tapered stem can be placed in neutral alignment through the direct anterior approach, there is a learning curve combining this approach and stem design to avoid varus positioning.

Low Early Complication Rate with a Modern Dual Mobility Hip Prosthesis in the USA

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INTRODUCTION: Dual mobility bearings have been used in Europe for several decades, particularly in cases at risk of dislocation. The combination of highly cross linked polyethylene and a dual mobility bearing may therefore provide a bearing with low wear and high stability. We analyzed the three dimensional jump height of a modern dual mobility bearing in a computer model and also report on early complications of a series of 167 of these bearings in a clinical study. The anatomic dual mobility (ADM) cup used in both studies was the Restoration ADM with X3 polyethylene (Stryker, Mahwah, NJ).

METHODS: We used a previously published computer model of three dimensional jump height or posterior horizontal dislocation distance, PHDD. The PHDD was measured in a horizontal direction in the coronal plane (Figure 1) as the distance from the acetabular component ID center to the dislocated head center (tangential to the edge of the cup).

The pelvis was oriented with 26 of pelvic tilt which represents a low chair rise situation and therefore may be more clinically relevant as a high risk position for dislocation. Different cup orientations were tested for four different bearings: (1) 28mm and (2) 36mm convention bearings, (3) a resurfacing shell with a 3mm offset bore, and (4) an ADM cup with a 54mm outside diameter with a 48mm mobile polyethylene insert with a 28mm captured head.

A prospective, consecutive series, multicenter (7 centers, 8 surgeons) study was conducted to collect adverse events (AEs), radiographs and patient reported outcome measures (PROMs) longitudinally. One hundred sixty-seven ADM acetabular components were implanted in 82 male and 78 female patients with mean age of 61.7 (range 27 - 75) and mean BMI of 29.7 (range 19.4 - 39.4). AEs were recorded intra and post operatively, while Harris Hip Score, Lower Extremity Activity Scale, Short Form-12 was collected at pre-op, 6 weeks and 1 year post-operatively.

RESULTS: The computer model showed that the 54mm ADM cup had the highest PHDD in all orientations with approximately double the PHDD compared to a 36mm head with the cup oriented at 45 degrees of inclination and 10 degrees of anteversion (Figure 1).

PROMs indicated improvement in all functional and general health scores over time (Figure 2). Patients indicated reduction in pain and return to function at one year. This

study had 2 AEs resulting in revision or reoperation that were unrelated to the acetabular component and the ADM shell was retained in both cases. Two months after surgery, 1 patient had the stem, head and acetabular liner revised due to sub-trochanteric fracture causing the femoral component to subside. In another case, 2 weeks after surgery, 1 patient presented with a peri-prosthetic calcar fracture after rising from a low chair. The patient was treated with an open reduction internal fixation and retained all original device components. There were no dislocations.

DISCUSSION: Early clinical data would appear to confirm that this dual mobility bearing has a very low early complication rate without dislocations in this series.

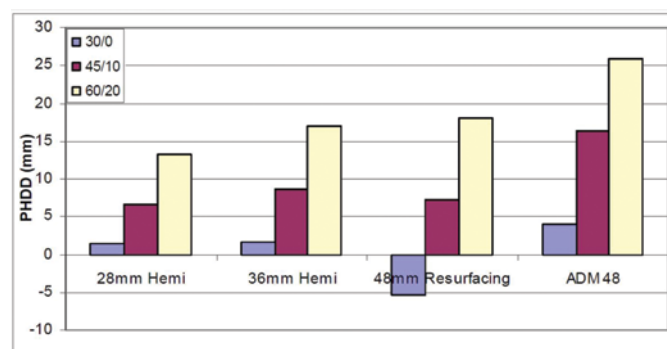


Figure 1.

	Pre-op (n=167)	6 Wk (n=154)	1 Yr (n=79)
HHS	54.64 (13.95)	81.59 (12.26)	94.76 (7.87)
LEAS	9.13 (2.95)	9.05 (2.49)	10.91 (2.66)
SF-12 PCS	31.82 (9.04)	39.6 (8.22)	47.61 (10.01)
SF-12 MCS	52.93 (10.66)	55.47 (9.68)	54.84 (7.94)

Figure 2.

Accuracy of Patient-Specific Guides for Placement of the Acetabular and Femoral Component

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Co-authors: Co-authors: Chris Casstevens (Orthopaedic Surgery, University of Cincinnati, Cincinnati, OH, USA), Vasile Nistor (Biomedical Engineering, University of Cincinnati, Cincinnati, OH, USA), Jacob Stegman (Biomedical University of Cincinnati, Cincinnati, OH, USA)

INTRODUCTION: Proper total hip arthroplasty component positioning is important for the longevity and successful outcome of total hip arthroplasty (THA). The accurate positioning of the acetabular component and femoral component are important for combined anteversion and to restore leg length. This ensures full motion and minimizes risk of dislocation and complications. The purpose of this study is to analyze the accuracy of patient-specific guides for proper acetabular and femoral component positioning.

METHODS: A computed tomography (CT) scan of a human female cadaver pelvis and femur was performed to obtain anatomical landmarks. Computer-aided design (CAD) software was used to determine pelvic planes and anatomical landmarks of the acetabulum and femur. A 3-dimensional printer was utilized to generate patient-specific guides for the acetabulum and femur. This was contoured to fit exact areas of the acetabular geometry and planned to prepare and place the acetabular component at 45° of inclination and 25° of anteversion. The femoral guide was contoured to fit exact areas of the femoral neck geometry and designed to guide the saw along a resection level at a precise height above the lesser trochanter. The femoral guide also includes an indicator to direct femoral component anteversion, which in this case was planned to be 19°. The planned combined anteversion was 44°. A direct anterior approach THA was performed on the cadaver, and the patient-specific guides were used to control the acetabular and femoral component preparation and placement. Post-procedural CT scan was performed to determine the accuracy of implant placement compared to the specific plan.

RESULTS: The post-procedural CT scan determined acetabular component position at 41.2° of inclination and 24.3° of anteversion. Therefore, the patient-specific instruments resulted in acetabular component placement within 3.8° of inclination and 0.7° of anteversion from the patient-specific plan. The femoral resection height was within 1.6 mm of the planned level, and placed at 6° anteversion (13° variance from the plan). The resultant combined anteversion was 30.3° (14° variance from the plan).

CONCLUSION: In this prototype study, patient-specific instrumentation was effective in accurately positioning the acetabular component and femoral neck resection level. The combined anteversion was able to be measured, but varied from the plan primarily due to the femoral anteversion. Additional studies will determine if these patient-specific instruments can reproduce and improve on these

results, ultimately translating to clinical trials.



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Comparison of Robotic Assisted Posterior Approach and Fluoroscopic Guided Anterior Approach Acetabular Cup Placement in THA

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INTRODUCTION: Total hip arthroplasty is considered to be one of the most successful orthopaedic interventions. Acetabular component positioning has been shown to affect dislocation rates, component impingement, bearing surface wear rates, and need for revision surgery. The safe zones of acetabular component positioning have previously been described by Lewinnek et al. as 5 to 25 degrees of cup version and 30 to 50 degrees of inclination. Callanan et al. later modified the inclination to 30 to 45 degrees. Our aim was to assess whether THA via robotic assisted posterior approach improves acetabular component positioning compared to fluoroscopic guided anterior approach THA.

METHODS SUBJECTS: This study is a matched-pair case-control study using prospectively collected data from THAs done between January 2012 and December 2013. Patients who underwent primary THA using the posterior-approach robot assisted THA or fluoroscopic guided anterior approach by the senior surgeons (MH and JAR) were included in the study. Ninety-six patients (of 176; 55%) underwent fluoroscopic guided anterior approach THAs and 80 (of 176; 45%) underwent robotic assisted posterior-approach THAs. The matching process was performed by an observer blinded to the radiographic outcomes (EK). Patients were matched for sex and BMI \pm 8 units. Seventy-nine patients who had fluoroscopic assisted THAs were manually matched to 79 patients who had robotic assisted THAs. Investigational review board approval was obtained before initiation of this study.

SURGICAL TECHNIQUES: For the fluoroscopic guided THAs, preoperative planning using plane radiographs was used to determine positioning of component, size of component, level of neck cut, and the amount of leg lengthening needed. The patient is supine and approach performed through a modified smith Peterson approach. Acetabular cup positioning was assessed intraoperative with fluoroscopy and leg lengths were measured during surgery. For the robotic THAs, the MAKO robotic hip system and RIO (Robotic Arm Interactive Orthopedic System) was used for reaming the acetabulum during bone preparation and cup placement. Preoperative CT scans of the involved hip were obtained and templating created by the robotic system was used to guide acetabulum positioning. The THA is performed with the patient in the standard lateral position using the posterior approach. The RIO detects patient landmarks intraoperatively to register the acetabulum and determine the position of the pelvis. The robotic arm guides acetabular reaming and cup placement, providing guidance regarding cup version and abduction.

RESULTS: There was no significant difference in BMI between the two groups. Intraobserver agreement was found to be greater than .80 for both inclination and anteversion. Compared to fluoroscopic guided THAs, THAs performed with robot assistance were found to be more often in the safe zone of Lewinnek (90% vs. 75%, $p=0.02$, RR 1.20 [1.04-1.40 $p=0.01$]). This pattern was observed in the zone of Callanan and approached statistical significance (80% vs. 68%, $p=0.15$, RR 1.17 [0.97-1.41]).

CONCLUSION: Compared to fluoroscopic assisted THA, robot assisted THAs are more likely to be within the safe zone of Callanan and Lewinnek.

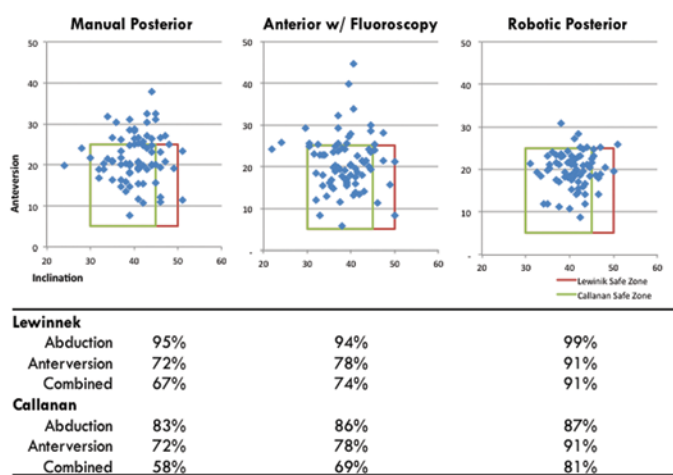


Figure 1.

Robotic Guidance Decreases Malpositioning

Lewinnek			
	Anterior v. Posterior	Robot v. Anterior	Robot v. Posterior
Relative Risk [CI]	0.77 [0.47-1.26]	0.35 [0.16-0.78]	0.27 [0.13-0.59]
Absolute Risk Reduction	8%	17%	24%
Number Needed to Treat	13	6	4
	p=0.30	p=0.01	p<0.01

Callanan			
	Anterior v. Posterior	Robot v. Anterior	Robot v. Posterior
Relative Risk [CI]	0.73 [0.48-1.11]	0.63 [0.36-1.10]	0.45 [0.27-0.78]
Absolute Risk Reduction	12%	12%	23%
Number Needed to Treat	9	69	4
	p=0.14	p=0.14	p<0.01

Figure 2.

A New Simple Design of Guidance Instrument Benefiting Femoral Stem Implantation

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Institution: The Second Hospital of Jilin University, Changchun City Jilin Province China)

Co-authors: Jincheng Wang (Department of Joint Surgery, The Second Hospital of Jilin University, Changchun City Jilin Province China)

INTRODUCTION: A new and simple guidance instrument was developed, which was aimed to improve the accuracy of femoral stem implantation. Stem varus and valgus were avoided through a long thin rod pointing to the center of knee condylar. The stem depth was shown by measuring the deviation of femoral head center to the level of great trochanter tip, and antevesion angle degree was shown by dial. The instrument could contact with conventional stem holder. The accuracy and validity of new design were compared with those of the conventional freehand technique.

MATERIALS AND METHODS: The same shape of femoral prosthesis was implanted by he same surgeon through two different guiding methods. Group A: conventional freehand technique; Group B: guiding by the new design based on the conventional commercial instruments. Then the time from the beginning of rasping medullar canal to the completion of entire stem implantation was recorded. Then postoperative measurement was made on the femoral head offset value, deviation angle between femoral stem prosthesis axis and medullar cavity axis, femoral

head position with respect to the level of tip of greater trochanter and its deviation with preoperative planning, limb length discrepancy. All the measurement was done by two observers through 6 weeks CO postoperative standard full length weight bearing x-ray.

RESULTS: From May 2014 to July 2014, 66 patients undergoing THA with post-lateral approach were prospectively divided into two groups at random. The mean time of stem implantation was 9.45 min (sd 3.72) in Group A and 8.93 min (sd 4.29) in Group B ($p = 0.262$). The mean deviation angle between femoral stem prosthesis axis and medullar cavity axis was 2.46 (sd 1.79) in Group A and 1.44 (sd 1.04) in Group B ($p = 0.002$). The deviation of femoral head position between preoperative planning and postoperative measurement was 3.27 mm (sd 2.00) in Group A, and 2.57 mm (sd 1.17) in Group B ($p = 0.001$). The mean limb length discrepancy was 2.78 mm (sd 2.30) in Group A and 2.51 mm (sd 1.97) in Group B ($p = 0.650$).

CONCLUSION: The design guide system helps to restore better biomechanics in terms of center of rotation, leg length, and offset by advising surgeons on stem implantation, especially in combination with preoperative planning. It is simple, easy to use and conveniently associated with the traditional instruments.

An Easy Method to Remove Femoral Head During Hip Replacement Procedure of Femoral Neck Fractures

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INTRODUCTION: Surgeons always face the dilemma to remove femoral head of patients with femoral neck fracture during hip replacement procedure. Fragility fractures of femoral head will often happen because of osteoporosis in the process of removal. The traditional removal methods may prolong operation time and cause bone residual. There are few literatures on the report of femoral head removal technique.

MATERIALS AND METHODS: The same surgeon performed hip replacement procedure of femoral neck fractures, which were prospectively divided into two groups at random. Group A: conventional method with cork screw through neck fracture plane. Group B: new method group. First, a Steinmann pin was inserted at proximal third part of the femoral head to achieve control, then the femoral head was rotated out of the capsule, cork screw was inserted at the junction of head and neck, and finally, the femoral head was taken out with Steinmann pin and cork screw holding together. The time from the revealing of head to complete removal was recorded. Then a screw pull-out strength experiment was done on the two groups of removed femoral head. Cork screw was inserted at the junction of head and neck in Group A, and at the neck fracture plane in Group B, then the screw pull-out strength was measured.

RESULTS: From February 2014 to July 2014, 36 old patients (female 25, male 11, age 76.45) needing hip replacement with 36 cases of femoral neck fractures, who were prospectively divided into two groups at random. The mean time of femoral head removal was 4.05 min (sd 2.43) in Group A and 2.61 min (sd 1.24) in Group B ($p = 0.003$). The ratio of femoral head completely removed was 88.9% (16/18) in the conventional group and 100% (18/18) in the new method group. Pull-out strength experiment display: Group A need mean 251 N (sd 112), Group B need 397 N (sd 189) ($p = 0.010$).

CONCLUSION: Our mechanics experimental study shows that the bone intensity at the junction of femoral head and neck is much better than in the femoral neck fracture plane. Stabilizing and revolving the femoral head by Steinmann pin fixation can get better revealing, make it easy to insert cork screw and revolve femoral head, increase extraction efficiency and integrity, and help to reduce the operation time, surgical trauma and bone residual risk, especially on the old osteoporotic patients.

Comparison of Early Complications of Primary THA with MIS Anterolateral Approach and Classic Posterolateral Approach

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BACKGROUND: For total hip arthroplasty (THA), minimally invasive surgery (MIS) has been developed to reduce incision length, muscle damage, and a shorter hospital stay. However, reduced exposure of anatomical landmarks may result in technical errors and inferior implant survivorships. The aim of this study was to report the comparison of short-term results and clinical complications of primary THA between MIS anterolateral (MIS AL) and classic posterolateral (PL).

METHODS: 111 patients who underwent cementless THA with MIS AL and PL were enrolled. Outcomes data were reviewed at a minimum of 12 months following the procedure. Clinical evaluations were made using the Merle dCOAubigne and Postel hip score. Inclusion criteria of this study were (1) underlying diseases were osteoarthritis, and (2) at least 12 months of follow-up, except for patients with lethal events. Exclusion criteria were (1) previous hip surgery; (2) underlying diseases were osteonecrosis, rheumatoid arthritis, fracture, and others. Radiographic data were obtained from a single postoperative anteroposterior radiograph of the pelvis and included the cup abduction angle, and the alignment of the femoral stem. In addition, Cup anteversion was measured as the intersection angle of the line connecting the anterior and posterior borders of the cup and the line parallel with the sagittal plane of the pelvis on the plane passing through the femoral head. Stem anteversion measured as the angle between the line connecting the posterior portions of femoral condyles and the axis of the stem superimposed sequentially. Varus malpositioning of the femoral stem was considered to be present when the longitudinal axis of the stem was tilted in 3of varus relative to the diaphyseal axis of the femur. Stem sinking measured an anteroposterior radiograph of the hips between immediate postoperative and at 12 months.

RESULTS: In the MIS AL, intraoperative fracture was observed in 6 hips; 3 in greater trochanter and 3 in calcar femoral. In the MIS AL, the cup abduction angle was 34.0e (10.3e); the cup anterior opening angle was 17.8e (7.4e). On the contrast, in the PLrevealed the cup abduction angle was 43.9 (9.3e); the cup anterior opening angle was 20.6e

(7.1e). The number of stems that were in 3 of varus relative to the diaphyseal axis of the femur was 4 stems in the MIS AL group compared with 5 stems in the PL group . One hip was subjected to irrigation because of postoperative infection was suspected. In the PL group, intraoperative fracture was demonstrated in 4 hips in calcar femoral. No postoperative dislocation and no pulmonary embolism or nerve paralysis was observed in both groups. In the MIS AL, the Merle dCO Aubigne and Postel hip score improved from 8.6 (2.4) preoperatively to 16.7 (1.4) postoperatively. For the PL, the Merle dCO Aubigne and Postel hip score improved from 8.1 (2.2) preoperatively to 16.9 (2.1) postoperatively.

CONCLUSIONS: The MIS AL THA did not show a clinically relevant superior outcome compared with the PL THA. When performing MIS AL THA, special attention should pay for prevention of greater trochanter fracture.



**ICJR
Award of Excellence**

When is it Safe for Patients to Drive after Right Total Hip Arthroplasty?

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Co-authors: Victor Hernandez (The Rothman Institute, Egg Harbor Township, NJ, USA), Fabio Orozco (The Rothman Institute, Egg Harbor Township, NJ, USA), Anne Marie Madden (The Rothman Institute, Egg Harbor Township, NJ, USA), Alvin Ong (The Rothman Institute, Egg Harbor Township, NJ, USA)

INTRODUCTION: Driving restrictions after total hip arthroplasty (THA) can be inconvenient and burdensome for patients. When patients may safely be allowed to drive remains controversial. Most studies recommend 6 weeks but recent advances in surgical approach, pain management and rapid recovery may have changed this time frame. The purpose of this study was to prospectively evaluate driving safety after THA through brake time reaction.

METHODS: 29 patients who underwent right THA were prospectively evaluated between October 2013 and March 2014. Driving performance was evaluated using the Brake

Reaction Test (BRT) measuring brake time after a stimulus. All patients underwent preoperative assessment to establish a baseline. Patients were then re-tested at 2, 4 and 6 weeks post operatively. Patients were allowed to drive when the post-operative reaction time was equal to or less than the pre-operative baseline. At each testing patients were asked if they felt ready to drive. General linear repeated measurement was used for analysis.

RESULTS: Of the 29 study patients, 26 (90 %) reached their baseline time by 2 weeks. Three patients (10%) reached their baseline at 4 weeks. There were no differences with respect to age, gender, or the use of assistance devices. Of the 26 patients, 19(73%) stated that they felt ready to drive while 4(15%) were not sure and 3(11%) felt they were not ready. Of the 3 patients who returned to baseline at 4 weeks, 2 patients said they thought they were ready while only 1 did not.

CONCLUSION: Nearly all patients were able to return to normal BRT by 2 weeks after THA. In addition, patient perception of driving ability accurately predicted return of BRT. This represents a substantial improvement from current recommendations. These findings have allowed us to encourage patients to re-evaluate their driving ability as soon as 2 weeks after THA.

Over 10 Years Follow-Up: Dual Mobility for Osteonecrosis of the Femoral Head in Young Patients

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INTRODUCTION: The osteonecrosis of the femoral head (OFH) affects mainly young patients with high functional needs this increases the risk of dislocation. The total hip arthroplasty (THA) is indicated for the stages III or IV of Ficat. Our hypothesis : the dual mobility cups known for the low rate of dislocation and high mobility range seems indicated in the OFH. The aim of this work is to evaluate the functional efficiency of dual mobility cup and its dislo-

cation rate for OFH in young patients.

MATERIAL AND METHODS: Monocentric retrospective clinical study, from 2000 to 2007. With a clinical analysis in preoperative, 2 years and over 10 years follow-up of one cohort of patients under 55 years old with an indication of THA for OFH. The judgement criteria was : the clinical scores Poste-Merle-DCOAubign (PMA) and the Harris Hip Score (HHS) in pre-operative and at 2 years, the dislocation rate and the cumulate survival rate over 10 years follow-up

RESULTS: 45 THA in 33 patients, 12 bilateral cases, 26 males and 7 females of average age of 45,5 YO (30-54). 17 operated hip (37%) presented one previous intervention (14 drilling and 3 screwing). In preoperative : PMA 10,6 (2,8), HHS 48,2 (13,3). At a follow-up of 19,2 month (15,7) : PMA 15,9 (2,8), HHS 84,6 (20), no dislocation. We had 2 lost of follow and 11 deceased in average 58 months after surgery (2-121 months). The cumulate survival rate over 10 years follow-up (7-14 years) is 94% with only 2 revisions (99 and 100 months after primary THA), and no long-term dislocation.

DISCUSSION: This population is comparable to the previous published series in terms of age, sex ratio and preoperative functional scores. The clinical analysis concludes a very significant functional enhancement without dislocation despite the young population with high level of activity which has a theoretical increased risk of dislocation (4 to 12% with simple mobility). And the implants survival rate is comparable with simple mobility THA.

CONCLUSION: The dual mobility cups is a good choice in OFH in young patients that prevent dislocation with a very good survival rate, preserving mobility and activity.

In Vitro Electro-chemical Testing of Conventional Total Hip Replacement Tapers

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INTRODUCTION: This in vitro test was designed to evaluate the relative electro-chemical performance of three different commercially available hip femoral component tapers. In particular, this study investigated the effect of taper material combination: Ti6Al4V/CoCrMo [Accolade II] vs. Ti6Al4V/CoCrMo [Accolade TMZF] and design: V40 taper [Accolade II] vs. C taper [Secur-Fit] (all Stryker Orthopaedics, Mahwah, NJ) on the electro-chemical performance under physiologically relevant loading conditions.

MATERIALS AND METHODS: The test methodology utilized in this study is similar to the test method adopted by Gilbert et al. for evaluating taper electro-chemical performance [1]. The stems were embedded in epoxy (10 valgus /9 flexion orientation), and the heads and necks were pre-wetted with saline (PBS, pH 7.4) before assembling with a single ramp load of 2 KN (line of force nominally 35 to neck axis). Testing involved a short-term loading scheme where cyclic load magnitude was incremented in steps (from 100 N up to 3200 N, 3 min at each load at 3 Hz, R=0.1) followed by a long-term loading scheme where cyclic loading continued for 1 million cycles (3200 N at 3 Hz, R=0.1). After 1 million cycles loading, samples were allowed to recover for a period of time and the short-term loading scheme was repeated. All tests were performed in phosphate buffered saline solution at room temperature. Electrochemical measurements were taken periodically throughout the duration of the test using a three electrode arrangement consisting of a taper working electrode, Ag/AgCl reference electrode and an auxiliary electrode made of the same material as that of the stem taper. A minimum of four samples were tested per group and all statistical analyses were performed using one-way ANOVA methods.

RESULTS AND DISCUSSION: The results showed that the average current and current amplitude increased and the potential dropped with increasing load magnitude. For different groups, the onset load ranged from 960 to 1204 N, (Short-term I data, Figure 1) and the mean currents at maximum applied load ranged from 1.3 to 2.2 A. No statistically significant differences were observed between different taper designs or material combinations tested in this study. The long-term testing data showed that extent of fretting corrosion decreased with increasing number of cycles (Figure 2). Also, the fretting corrosion onset load for Accolade II and Accolade TMZF significantly increased (p less than 0.05) after one million cycles of loading (Short-term-II data, Figure 1).

CONCLUSIONS: The results from this in vitro bench top testing showed that these differences in material combination and taper design did not influence the electro-chemical performance of the tapers. Further study will include exploration of the effects of taper surface finish, taper assembly conditions, more complex loading mechanisms, and more aggressive solution conditions on the corrosion performance of different tapers.

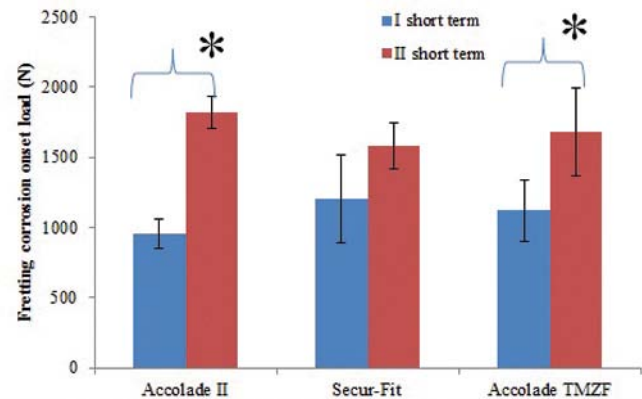


Figure1. Comparison of fretting corrosion onset load obtained from the short-term varying cyclic load test done before and after 1 million cycles loading. For Accolade II and Accolade TMZF, the plot shows statistically significant increase ($p < 0.05$) in the load required to initiate fretting corrosion.

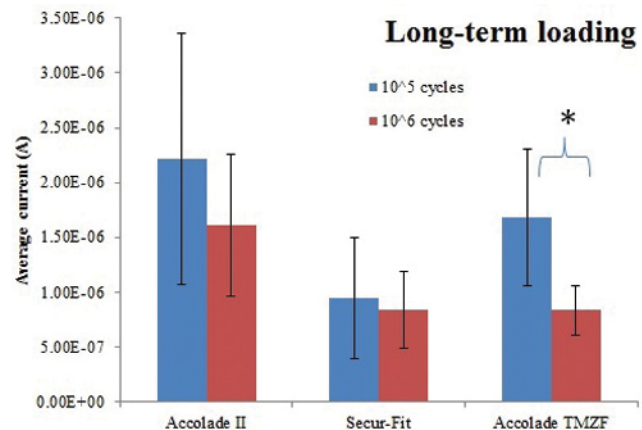


Figure2. Mean and SD of average currents generated at 100,000 and 1,000,000 cycles of loading. The current levels at 1 million cycles are lower compared to the current levels at 0.1 million cycles for all sample groups. For Accolade TMZF, current average at 1 million cycles were significantly different ($p < 0.05$) from that of values obtained at 100,000 cycles loading.

Other

ELCCR Best Paper Award Winner 2014

Major Orthopaedic Surgery: Is the Risk of Major Bleeding Higher in Elderly Patients?

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Co-authors: Laura Cardenas (Santa Fe Bogotá, Colombia), Guillermo Bonilla (Santa Fe Bogotá, Colombia), Adolfo Llinás (Santa Fe Bogotá, Colombia; Universidad de los Andes, Bogotá, Colombia), Maria Bautista (Santa Fe Bogotá, Colombia), Mónica Navas (Santa Fe Bogotá, Colombia), Miguel Gómez (Santa Fe Bogotá, Colombia) and The Clinical Care Program in Joint Replacement Surgery Orthopaedics (Clinical care program in Joint Replacement Surgery: J. Navas M.D., K. Mieth M.D., G. Carrillo M.D., R. Pesantez M.D., G. Zayed M.D., S. Soler, J. González, M.D, F. Rodríguez)

OBJECTIVES: The use of pharmacological prophylaxis for venous thromboembolism is highly recommended for the vast majority of patients undergoing major orthopedic surgery. It has been documented that in the general population the use of these agents increases the risk of major bleeding. However, the frequency of this complication has not been studied in the subpopulation of elderly patients. Our purpose with the present study is to determine the risk of major bleeding in patients over 70 years old undergoing major orthopedic surgery compared to those operated at a younger age.

METHODS: in a retrospective cohort study, patients who underwent total hip or total knee arthroplasty during five consecutive years were included. Patients with other possible causes of bleeding were excluded. All medical records were reviewed in order to determine the occurrence of major bleeding. The risk of major bleeding in patients 70 years or older was compared to that of patients less than 70 years old. Relative risks (RR) and confidence intervals (CI) were calculated and a multivariate analysis was performed.

RESULTS: A total of 1048 patients were analyzed (56%

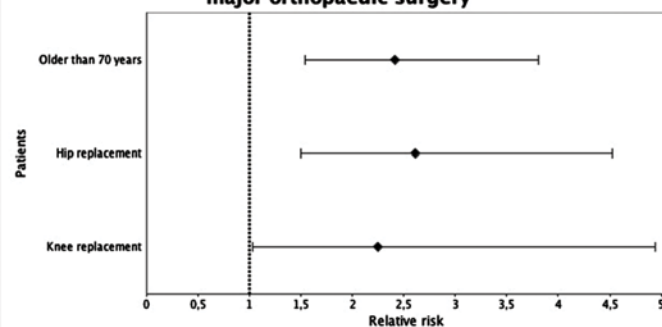
hip arthroplasties, 44% knee arthroplasties). At the time of surgery 553 (53%) patients were 70 years or older, while 495 (47%) were younger than 70 years. Patients who were ≥ 70 years old showed an increased risk of major bleeding: RR 2,42 (95% CI: 1,54-3,81). During total hip arthroplasty the RR was 2,61 (95%CI: 1,50-4,53) and during total knee arthroplasty was 2,25 (95% CI: 1,03-4,94). After the multivariate analysis, age continued to be independently associated with a higher risk of major bleeding.

CONCLUSION: Patients who are 70 years or older are at a higher risk of major bleeding during major orthopedic surgery. Therefore, the use of appropriate strategies to mitigate the risk in this group of patients is encouraged.

Demographic description.

n= 1048	Menores de 70 años	Mayores de 70 años	p
Grupos n (%)	495 (47%)	553 (53%)	
Edad (Promedio)	60 años	77 años	
Sexo n (%)			0,46
Masculino	136 (27,8%)	141 (25,5%)	
Femenino	359 (72,3%)	412 (74,5%)	
IMC (promedio)	27,17 kg/m2	26,37 kg/m2	0,01
Tipo de Reemplazo Articular n (%)			
Cadera	290 (58,6%)	292 (52,8%)	0,11
Rodilla	205 (41,4%)	261 (47,2%)	0,32
Depuración de creatinina (promedio)	90,1 mL/min	65 mL/min	0,02
Hemoglobina Pre quirúrgica (promedio)	14,58 gr/dl	14,39 gr/dl	0,06
Hemoglobina Postoperatoria (promedio)	11,71 gr/dl	11,54 gr/dl	0,15
Tipo de anticoagulante			
Dabigatran	5%	6%	
Fondaparinox	7%	6%	
Heparina de bajo peso molecular	22%	33%	
Rivaroxaban	66%	55%	

Risk of major bleeding in patients ≥ 70 years who underwent major orthopaedic surgery





ICJR Award of Excellence

Post Hoc Analysis of Desirudin Versus Enoxaparin in Thromboprophylaxis in High-risk Patients Undergoing Hip Replacement

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Co-authors: Jerrold H. Levy (Anesthesiology - Cardiac Division, Duke University, Durham, NC, USA)

INTRODUCTION: Desirudin is a recombinant direct thrombin inhibitor (DTI) approved in the US for the prophylaxis of deep vein thrombosis (DVT), which may lead to pulmonary embolism (PE), in elective hip replacement surgery, and approved in Europe for the prevention of DVT in elective hip or knee replacement surgery. A multicenter, double-blind, randomized, controlled trial comparing the safety and efficacy of desirudin with enoxaparin in elective total hip replacement (THR) surgery demonstrated that desirudin has a safety profile similar to enoxaparin but is more effective in preventing DVT (Eriksson et al, 1997). Here we present post hoc analyses of the efficacy of desirudin versus enoxaparin in high-risk patient subpopulations.

METHODS: Data were collected from 2079 patients randomized at medical centers in 10 European countries. Desirudin was administered 15 mg subcutaneously (SC) twice daily (BID) on the day of the surgery, once within 30 minutes prior to surgery and once in the evening, and 15 mg BID postoperatively (n=1043). Enoxaparin was administered 40 mg SC once daily (QD) on the day prior to surgery (12 hours preoperatively), then at the same dose on the day of the surgery and postoperatively QD for 9-12 days. The primary outcome was major thromboembolic event (proximal DVT, PE, or death) during the prophylaxis period; secondary outcomes were any thromboembolic event (DVT, PE, or death) during this period. Subsequent post hoc efficacy analyses for desirudin versus enoxaparin were performed for high-risk patient subgroups, including age, ethnicity, smoking, immobility, obesity, malignancy, and previous venous thromboembolism (VTE).

RESULTS: Post hoc analyses for intent-to-treat patients evaluable for the primary outcome (desirudin n=802;

enoxaparin n=785) reveal favorable odds ratios (OR) for desirudin versus enoxaparin in VTE incidence (Figure 1) across a range of high-risk patient subgroups, including (1) patients age 65 or older (OR 0.70); (2) obese patients (OR 0.73); (3) smokers (OR 0.38); (4) patients with cardiovascular disease (OR 0.49); (5) patients who had epidural or spinal anesthesia (OR 0.69); and (6) patients who received concomitant medications such as NSAIDs, antiplatelet or anticoagulant agents, or plasma expanders (OR 0.63).

CONCLUSION: Patients with various high-risk conditions had favorable ORs for VTE incidence with desirudin compared with enoxaparin. ErikssonCOs previous report noted a significantly lower rate of proximal DVT (4.5% versus 7.5%, $P=.01$) and a lower overall rate of DVT (18.4% versus 25.5%, $P=.001$) for desirudin compared with enoxaparin. The results reported here, together with the finding that desirudin has a safety profile similar to enoxaparin, suggest that desirudin may be a preferred agent over enoxaparin for thromboprophylaxis in high-risk patients undergoing THR.

Cost Analysis of Treating Periprosthetic Joint Infections at a Tertiary Referral Center

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Co-authors: George Chimento (Orthopaedics, Ochsner Medical Center, New Orleans LA, USA), David Briski (Orthopaedics, Ochsner Medical Center, New Orleans LA, USA), Mark S. Meyer (Orthopaedics, Ochsner Medical Center, New Orleans LA, USA), John L. (Orthopaedics, Ochsner Medical Center, New Orleans LA, USA)

INTRODUCTION: Periprosthetic joint infection (PJI) is a significant challenge to the orthopedic surgeon, patient, hospital, and insurance provider. As the number of total hip and knee replacements has increased, the number of revision procedures has also increased. Revisions for infection requires a greater amount of hospital and surgeon resources than noninfectious revisions. Our study compares the financial information for all two-stage revision surgeries performed at our tertiary referral center for hip or knee PJI over the last four years, separating them into two groups: referral versus self-originating cases.

METHODS: We performed a review of all patients who underwent two-stage revision hip or knee arthroplasty for infection between 2008 and 2013 at our facility. We collected detailed financial information for patients and separated them into referral versus self-originating cases, indicating whether index surgery was performed at an outside facility or at our facility, respectively. Only those patients who underwent full two-stage procedure at our facility were included. Data was analyzed by a two-sample t-test.

RESULTS: We found an increasing number of referrals over the study period. There was a non-statistical increased cost of treating hips over knees ($p=0.24$). Regarding all admissions, referral hips had a loss in potential revenue secondary to decreased reimbursement (23% less per case average) and 50% average loss in revenue per case ($p=0.15$). Interestingly, referral knees had an increased reimbursement (6% more per case average) and revenue 26% average increase in revenue over self-originating cases ($p=0.84$). When analyzing revision procedure only, as in those cases where the patient was referred with the antibiotic spacer already placed prior to referral, there is a statistically significant decreased reimbursement (35% less) and a 74% average loss in revenue in the hip patients ($p=0.036$ and $p=0.027$, respectively). If a knee antibiotic spacer has been placed prior to referral, there is a non-statistical ($p=0.81$) increase in cost, decrease in reimbursement and 76% average loss in revenue.

CONCLUSION: To our knowledge, our study is the first to extensively compare the financial implications of treating an institution's own PJIs of the knee and hip versus treating referred infections. In the modern era of referral centers accepting more of the burden of PJIs, we show that although there is continued financial incentive to treating ones own PJIs and referral PJIs, referral cases represent a large loss in potential revenue at our institution. The loss becomes much larger and statistically significant if the antibiotic spacer is placed prior to referral.

Table 1. Cost Analysis for Treatment of PJI in Self-Originating and Referral Groups: All Admissions Combined

(in US Dollars)	Self-Originating	Referral	P value
Hip Infections			
In-hospital charges	196,551 \pm 55,540	203,751 \pm 39,547	0.69
In-hospital cost to the hospital	38,145 \pm 9,974	38,652 \pm 8,650	0.89
Reimbursement	68,858 \pm 39,785	53,251 \pm 20,451	0.15
Revenue	30,713 \pm 36,883	14,599 \pm 19,416	0.15
Knee Infections			
In-hospital charges	174,540 \pm 39,238	174,374 \pm 37,329	0.99
In-hospital cost to the hospital	35,877 \pm 7,753	35,325 \pm 8,572	0.84
Reimbursement	45,192 \pm 13,548	47,846 \pm 19,289	0.65
Revenue	9,315 \pm 10,599	12,521 \pm 18,405	0.55

Data are reported as mean \pm standard deviation.

Table 2. Cost Analysis of Re-implantation Surgery in Self-Originating and Referral Groups: Revision Procedure Only

(in US Dollars)	Self-Originating	Referral	P value
Hip Infections			
Average in-hospital charges	89,176 \pm 16,268	93,999 \pm 17,970	0.47
Average in-hospital cost to the hospital	17,688 \pm 3,457	18,583 \pm 6,477	0.67
Reimbursement	35,535 \pm 20,086	23,228 \pm 8,457	0.036*
Average revenue	17,847 \pm 19,238	4,645 \pm 10,251	0.027*
Knee Infections			
Average in-hospital charges	87,373 \pm 12,140	94,987 \pm 26,651	0.31
Average in-hospital cost to the hospital	19,088 \pm 3,812	20,637 \pm 7,080	0.44
Reimbursement	21,850 \pm 5,436	21,303 \pm 7,602	0.81
Average revenue	2,761 \pm 6,450	665 \pm 10,379	0.49

Data are reported as mean \pm standard deviation.

*=Statistically Significant

Does Medicare 3-Day Rule Increase Length Of Stay?

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Medicare will only cover transfer to a skilled nursing facility if it follows a hospital inpatient stay of at least 3 days. The 3-day stay rule was instituted several years ago to prevent improper and excessive utilization of the skilled nursing benefits under Medicare. The purpose of this study was to evaluate whether or not the Medicare 3 day rule increases length of stay after total joint arthroplasty.

METHODS: From a consecutive cohort of 800 TKA patients done during 2011 we analyzed patients who were discharged to in-patient rehab after surgery. Medicare recipients were matched to privately insured patients according to age, BMI, and ASA score.

RESULTS: A total of 322 patients were discharged directly to an inpatient rehab facility after surgery. There were 209 Medicare patients and 113 private patients. The LOS was 2.3 days for privately insured patients and 3.0 for Medicare recipients (p less than 0.05). No difference was found between the two groups with regards to age, BMI, and ASA score.

CONCLUSION: We found the Medicare 3 day rule independently increased the length of stay for patients that needed inpatient rehabilitation when compared to patients who were privately insured. In the current medical economic climate we recommend that this outdated rule be revised to decrease unnecessary cost and expenditure.



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Surface Modulation of Silicon Nitride Ceramics for Orthopaedic Applications

Primary Author: B. Sonny Bal, MD, JD, MBA

Institution: University of Missouri (Columbia, MO, USA)

Co-authors: Bryan McEntire (Research, Amedica Corp., Salt Lake City, UT, USA), Ryan Bock (Research, Amedica Corp., Salt Lake City, UT, USA), Erin Jones (Research, Amedica Corp., Salt Lake City, UT, USA), Mohamed Rahaman (Materials Science and Engineering, Missouri University of Science and Technology, Rolla, MO, USA)

INTRODUCTION: Silicon nitride (Si_3N_4) has a distinctive set of material properties, such as high strength and fracture toughness, inherent phase stability, low wear, scratch resistance, biocompatibility, hydrophilicity, excellent radiographic imaging, and bacterial resistance. These attributes make it an excellent candidate for demanding structural implants in various orthopedic applications. It is currently used as spinal fusion cages and is being considered as a bearing surface in total hip or knee arthroplasty. Si_3N_4 is a non-oxide ceramic in its bulk but it possesses a protective Si-N-O transitional layer at its surface. Unlike

oxide ceramics, the surface chemistry and topography of Si_3N_4 can be uniquely modified or modulated to address potential in vivo needs. Morphologically, it can be manufactured to have an ultra-smooth or highly fibrous surface structure. Its chemistry can be varied from that of a silica-like surface to one which is predominately silicon-amine-based. Various common mechanical or chemical methods can be used to engineer these modifications. In this study, we evaluated the surface composition and microstructural features of Si_3N_4 using different treatment methods and characterization techniques.

METHODS: As-fabricated Si_3N_4 with a dense fibrous in situ toughened microstructure were subjected to various treatments using mechanical polishing and thermal treatments in oxygen or nitrogen, or by etching in hydrofluoric acid (HF). Then, the morphology and chemistry of the surfaces of these Si_3N_4 samples were characterized using sessile water contact angle and streaming zeta potential measurements, scanning electron microscopy (SEM), atomic force microscopy (AFM) and X-ray photoelectron spectroscopy (XPS).

RESULTS: Polished Si_3N_4 can be prepared with an extremely smooth surface by AFM (less than 10 nm Ra) using mechanical polishing. In contrast, as fabricated specimens possessed a fibrous surface morphology with a roughness exceeding 25 nm Ra. Both types of samples exhibit varying surface chemistry when thermally or HF-treated. Thermal treatments in oxygen resulted in a purely silica surface whereas thermal treatments in nitrogen or polished samples and the HF-treated Si_3N_4 samples had far less oxygen content. They essentially consisted of silicon diimide $\text{Si}(\text{NH})_2$ groups at the surface. Contact angles with water, measured using a sessile drop technique, were in the range $\sim 65^\circ \pm 9^\circ$ degrees which were higher than those using phosphate-buffered saline ($\sim 50^\circ \pm 8^\circ$ degrees). The Si_3N_4 samples had highly negative zeta-potential ($40 \text{ mV} \pm 120 \text{ mV}$) at the standard blood pH of 7.4. The isoelectric point of the as-fabricated Si_3N_4 (~ 4.2) was shifted to a higher value (~ 5.5) by the chemical mechanical polishing but the thermal treatment in oxygen resulted in a marked decrease to ~ 1.0 .

CONCLUSIONS: These results show that the surface composition and properties of Si_3N_4 can be engineered over a wide range from a purely oxide (silica) surface to an almost pure nitride surface using thermal and chemical methods. These strategies can be used to design

a variety of bearing and non-bearing orthopaedic implants that are precisely engineered for special in vivo applications. The advantages offered by Si3N4 in this regard are unmatched by any other composite ceramic material used in orthopaedic surgery today.



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Influence of Psychiatric Comorbidity on Outcomes Following Primary Total Hip and Knee Arthroplasty

Primary Author: Shahrose Hussain

Institution: University Of Miami (Miami, FL, USA)

Co-authors: Leonard T. Buller, MD (University of Miami, Miami, FL, USA), Matthew J. Best (University of Miami Miller School Of Medicine, Miami, FL, USA), Alison K. Klika (Orthopaedic Surgery, Cleveland Clinic, Cleveland, OH, USA), Wael K. Barsoum (Orthopaedic Surgery, Cleveland Clinic, Cleveland, OH, USA)

INTRODUCTION: Depression, anxiety, dementia and schizophrenia are common psychiatric illnesses. Data regarding their impact on outcomes following total joint arthroplasty are conflicting. This study sought to evaluate the effects of a preoperative diagnosis of depression, anxiety, dementia or schizophrenia on in-hospital adverse events, blood transfusion, discharge disposition and mortality in patients undergoing primary total hip and knee arthroplasty.

METHODS: The National Hospital Discharge Survey (Centers for Disease Control and Prevention, Atlanta, GA) database was used to identify discharges having undergone primary total hip and knee arthroplasty from 1990 to 2007. Using the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes, the incidence of in-hospital adverse events, blood transfusion, discharge disposition and mortality were assessed. Multivariable regression analysis was performed to identify whether psychiatric comorbidity was an independent risk factor for each outcome.

RESULTS: A cohort representative of 8,379,490 patients was identified as having been discharged from a hospital following primary total hip or knee arthroplasty, between

1990 and 2007. The prevalence of patients with comorbid diagnoses of depressive disorder, anxiety disorder, schizophrenia and dementia was 4.1%, 1.7%, 0.1%, 0.16%, respectively. Logistic regression analysis revealed higher odds of adverse events were associated with diagnoses of (OR 1.022 range: 1.014 to 1.029 p less than 0.001), dementia (OR 1.056 range: 1.019 to 1.095 p less than 0.001) and schizophrenia (OR 1.561 range: 1.496 to 1.629 p less than 0.001). Diagnosis of schizophrenia (OR 1.739 range: 1.657 to 1.825 p less than 0.001) and depression (OR 1.154 range: 1.143 to 1.164 p less than 0.001) was associated with higher rates of perioperative blood transfusion. Increased odds of non-routine discharge were associated with all psychiatric comorbidities. Patients with dementia had higher in-hospital mortality (5.3%) compared to the rest of the groups (depression, 0.3%, anxiety, 0.1%, schizophrenia, 0.1%, no psychiatric comorbidity, 0.3%) (p less than 0.001).

CONCLUSION: Patients undergoing total hip and knee arthroplasty with a comorbid psychiatric illness are at increased risk of perioperative morbidity and requirements for post-hospitalization inpatient care.

A Comparative Analysis of Quality Metrics Before and After the Establishment of an Joint Replacement Center in an Urban Setting

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Co-authors: Sun Jin Kim (Orthopaedic Surgery, Montefiore Medical Center/Albert Einstein College of Medicine, Bronx, NY, USA), Andrew Schwartz (Orthopaedic Surgery, Albert Einstein College of Medicine, Bronx, NY, USA), Sandeep Ponnappan (Orthopaedic Surgery, Montefiore Medical Center/Albert Einstein College of Medicine Bronx, NY, USA)

INTRODUCTION: Limited resources and rising health care associated costs obviate the need for a more efficient and effective method of health care delivery without detriment to quality and outcomes. In July 2013 we established a joint replacement center (JRC) at our institution to improve such measures and standardize pre-operative, intra-operative, and post operative processes for elective total hip arthroplasty (THA) and total knee arthroplasty (TKA).

The purpose of this study is to determine the effect of the establishment of the JRC on quality metrics including length of stay (LOS), 30 and 90 day readmission rates, and discharge disposition with associated cost implications.

METHODS: Using our institution's administrative database, we identified all patients who underwent a THA or TKA between 2012-2013. Arthroplasty performed for revision, fracture, infection, or oncologic processes were excluded from the study. Patients were then stratified into two cohorts depending on whether they had their surgery performed CBEFOREC (N= 516) or CAFTERC (N= 560) the establishment of the JRC. A comparative analysis of both groups was performed based on age, sex, and pre-operative ASA (American Society of Anesthesiologists) classification grading system (Table 1). Group averages and student t test were performed for age and length of stay; chi square test was performed to compare 30 and 90 day readmission rates, and discharge disposition.

RESULTS: The average LOS of patients in the BEFORE cohort was 3.3 days stdev 0.06 vs. 3.1 days stdev 0.05 (p 0.224) in the AFTER cohort. The 0-30 day readmission rate in the BEFORE cohort was 3.49% (N=18) vs. 2.68% (N=15) in the AFTER cohort (p 0.442). The 31-90 day readmission rate in the BEFORE cohort was 3.49% (N=18) vs. 3.93% (N=22) in the AFTER cohort (p 0.703). Prior to the establishment of the JRC, 9.5% (N= 49) of patients were discharged to acute rehab, 46.51% (N= 240) of patients were discharged to subacute rehab, and 43.99% (N=227) of patients were discharged to home. This compared with 10.18% (N= 57) of patients who were discharged to acute rehab, 34.46% (N= 193) who were discharged to subacute rehab, and 55.36% (N=310) who were discharged to home after the establishment of the JRC (p less than 0.001).

DISCUSSION: Our study demonstrates a paradigm shift in the discharge disposition for patients undergoing THA and TKA in an urban setting, the majority of which suffer from severe systemic disease. Following the founding of the JRC, we observed a 12% reduction in discharge to a rehab facility and a corresponding increase in patients safely discharged to home with services. According to our institution's department of finance, a 10% reduction in LOS translates to a savings of approximately \$64,560 in one fiscal year. With the shift from the traditional fee for service to the care payment model, and continuous decreasing Medicare reimbursement, it will become increasingly important to discharge patients undergoing elective total

hip and knee replacements to an appropriate yet cost effective setting.

	After	Before	p-value
Sex (%)			0.643
F	399 (71.25)	361 (69.96)	
M	161 (28.75)	155 (30.04)	
Age, mean (SD)	62 (11)	63 (11)	0.264
ASA pre-op class (%)			< 0.001
1	13 (2.32)	7 (1.36)	
2	245 (43.75)	296 (57.36)	
3	299 (53.39)	212 (41.09)	
4	3 (0.54)	1 (0.19)	

Table 1. Demographics and ASA classification

Developing an “iHandbook”™ for Clinical Medical Students: Capitalising on Tablet Technology

Primary Author: James T. Berwin, MBBS, MRCS

Institution: The Chelsea & Westminster Hospital (London, England, UK)

Co-authors: Andrew Roche (Trauma & Orthopaedics, The Chelsea & Westminster Hospital, London, England, UK)

AIM: Detailed online feedback via SurveyMonkey from two cohorts of 5th Year medical students on an Orthopaedic rotation highlighted a need for better firm structure, up-to-date teaching timetables and clear learning objectives.

We developed an interactive learning tool to help meet these needs and at the same time engage students and maximise learning opportunities.

METHOD: We created a Student CyiHandbookCO for download on iPad MiniCOs issued by the medical school.

Retrospective analysis of feedback from two control student cohorts (groups who did not have access to the Student COiHandbookCO, n = 20), enabled development of focussed content, such as regularly updated clinic and theatre timetables, comprehensive learning goals and a log-book to assist with objective assessment of learning. The Student CyiHandbookCO also includes interactive features using clinical pictures, anatomical diagrams, radio-

graphs and spot diagnoses. Tutors utilised this as a novel learning adjunct during structured teaching sessions.

We piloted the use of the iHandbook with a test cohort of students (n=10) who had not previously had access to the download and prospectively analysed feedback.

RESULTS: Initial feedback from the Student CyiHandbookCO pilot was positive. 10 out of 10 students felt opportunities for self-directed learning were improved, that the handbook helped focus learning goals and made structured teaching sessions more interactive.

When surveyed at the end of a Trauma and Orthopaedics clinical attachment, 100% of the test cohort rated the available teaching and learning opportunities as CyGoodCO or CySatisfactoryCO compared to just 25% of the control cohort.

DISCUSSION: Tablet devices are increasingly used as an educational medium. Few studies have been published on the efficacy and attitudes towards use of these devices and their potential applications in medical institutions. We present an effective method of harnessing the potential of tablet devices already provided by the medical school to maximise learning opportunities for students on clinical attachment.

Intra-articular Antibiotic Administration for the treatment of Prosthetic Joint Infection

Primary Author: Pasquale Petrera, MD

Institution: Peninsula Regional Medical Center (Salisbury, MD, USA)

Co-authors: Matteo Petrera (Salisbury, MD, USA), Jessica Dunn (Salisbury, MD, USA)

Periprosthetic joint infection (PJI) remains a significant complication and treatment challenge. Intravenous antibiotic administration is the gold standard of treatment, but eradication rates vary. The administration of intra-articular

(IA) antibiotics through Hickman catheters into the knee or hip joint has been described with minimal adoption in the orthopaedic community. This report describes a novel method of treatment of PJI and compares it to historical methods.

A retrospective study of all PJI presenting to the senior author were treated by a variety of methods but antibiotic administration was by the IA route in all cases. The study included 15 infected arthroplasties and one infected hip fracture non-union.

At followup of 3 to 26 months, 12 of 15 cases remain infection free. By case type, 3 of 4 one stage hip revisions, 3 of which were caused by MRSA, remain infection free. Two knees treated by the traditional two-stage method are infection free. One acute hip and seven acute knee infections were treated with I&D and polyethylene change. 6 of 8 were successful. One infected hip fracture non-union was treated with one-stage conversion to total hip successfully. Of the two knee failures, one was treated by one stage revision successfully and one required fusion. One hip MRSA reinfection was treated with repeat one stage revision at six months and remains infection free to date. All patients received IA antibiotics.

Overall, 80% (12 of 15 cases) of PJI were treated successfully. Of the three failures, two were successfully treated by the same technique for an overall success rate of 93%. Intra-articular administration of antibiotics through Hickman catheters provides much higher antibiotic concentrations than those obtained by the intravenous route. This innovative technique remains an interesting concept. Coupled with one stage revision of PJI, it may prove superior to standard treatment protocols. Further investigation is warranted.



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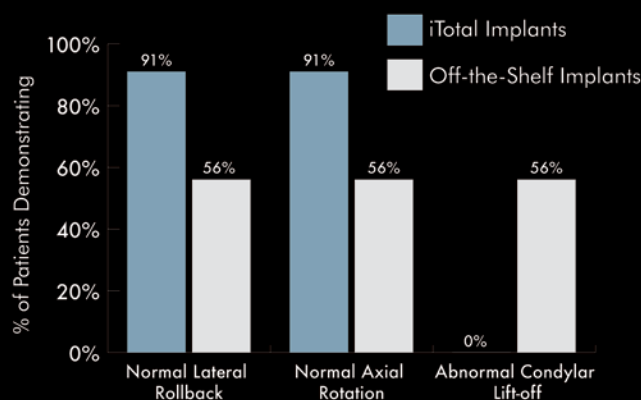
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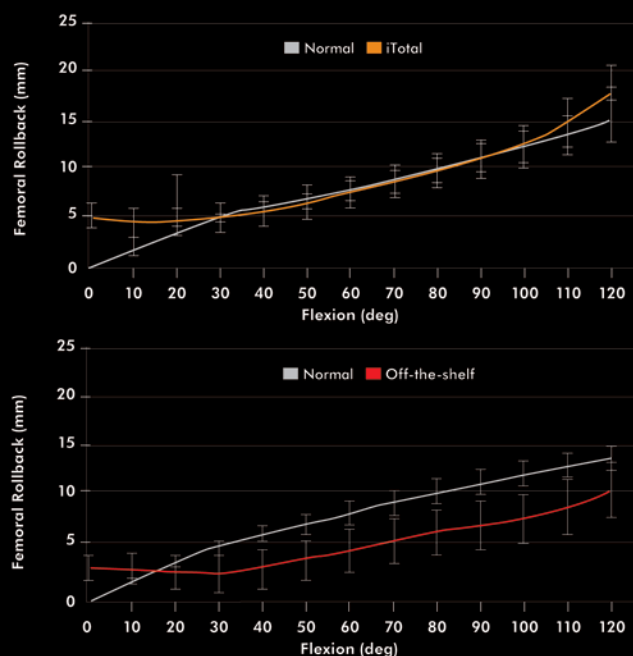
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JISRF Creates Institutional Review Board

JISRF's Board of Directors have approved the formation of an Institutional Review Board (IRB).

JISRF has a long rich history of conducting clinical/surgical research projects. There has been considerable interest in JISRF establishing a formal IRB Committee. The specific purpose of this IRB Committee is to assure, both in advance and by periodic review, that appropriate steps are taken to protect the rights and welfare of humans participating as subjects in a research study. JISRF's IRB Committee will attempt to ensure protection of subjects by reviewing research protocols and related materials. IRB protocol review assesses the ethics of the research and its methods, promotes fully informed and voluntary participation by prospective subjects capable of making such choices and seeks to maximize the safety of subjects.

JISRF has lectured and published on ethics and full disclosure since 1993. The Board sees the IRB Committee as a next logical step in interdisciplinary research and education while protecting the individual patients rights on full disclosure with regard to decision making of new technologies and potential conflict of interest in an ever changing health care environment.

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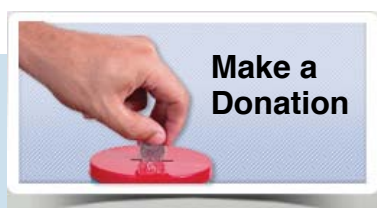


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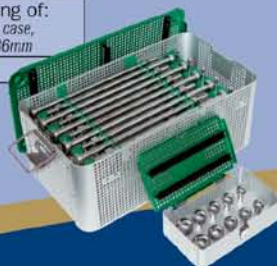
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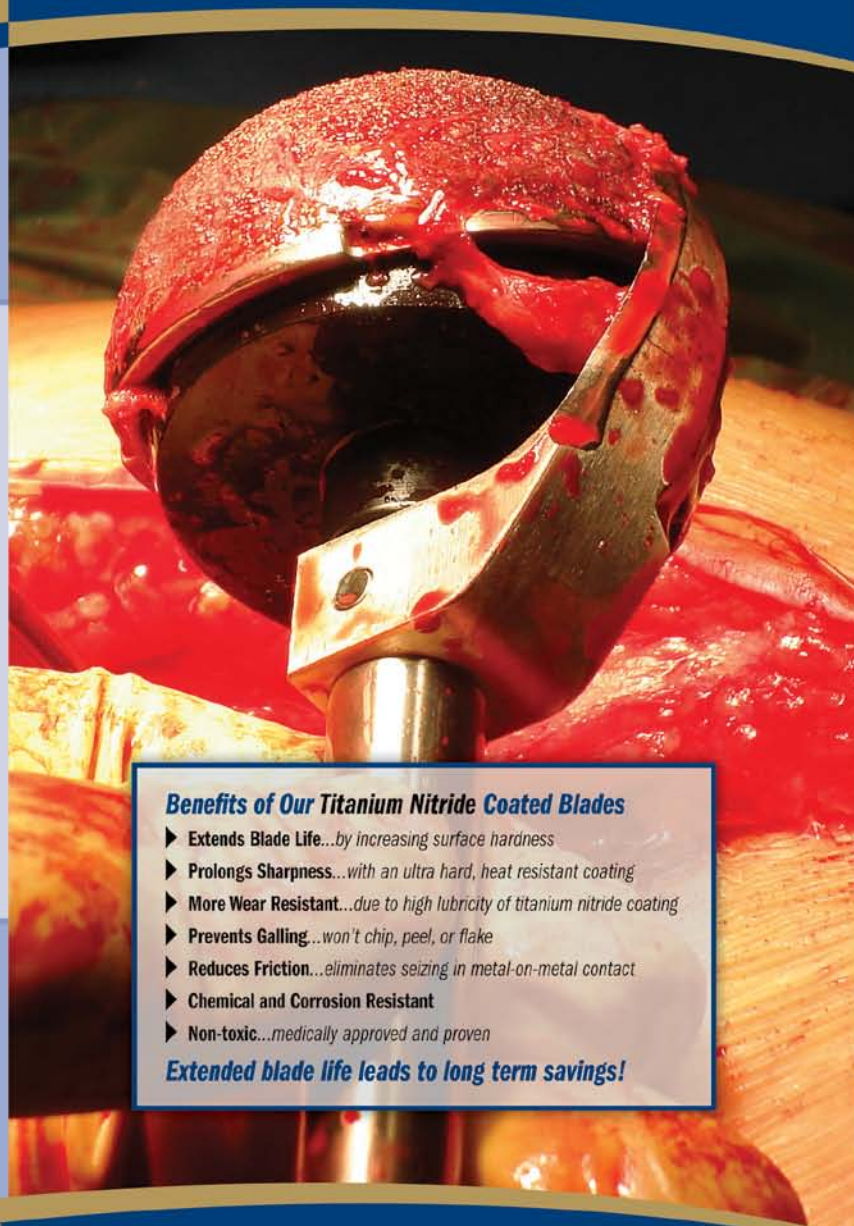
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*ultra hard titanium nitride
coating for extended blade life*



Benefits of Our Titanium Nitride Coated Blades

- ▶ **Extends Blade Life...**by increasing surface hardness
- ▶ **Prolongs Sharpness...**with an ultra hard, heat resistant coating
- ▶ **More Wear Resistant...**due to high lubricity of titanium nitride coating
- ▶ **Prevents Galling...**won't chip, peel, or flake
- ▶ **Reduces Friction...**eliminates seizing in metal-on-metal contact
- ▶ **Chemical and Corrosion Resistant**
- ▶ **Non-toxic...**medically approved and proven

Extended blade life leads to long term savings!

INNOMED



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