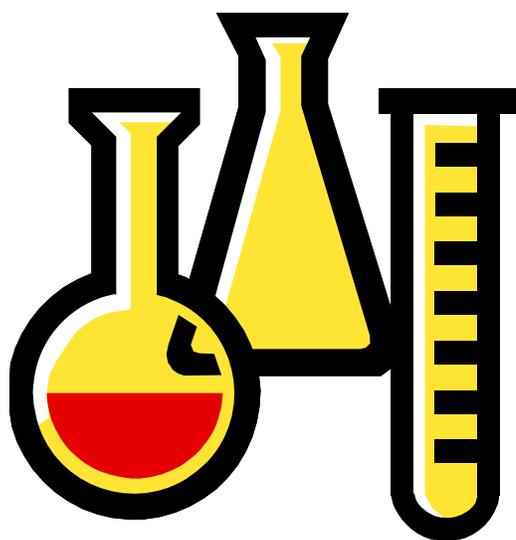


THE OHIO STATE UNIVERSITY

36th Annual
Mallory-Coleman
Resident Research Day



Friday, May 2, 2008
7:30 am-1:00 pm

OSU Fawcett Center
2400 Olentangy River Rd.

PROGRAM

- 7:30 am Continental Breakfast
- 7:40 am Welcome and Introduction
- 7:50 am Chris Pokabla, M.D.
"Lateral Column Lengthening Utilizing Allograft Interposition and Cervical Plate Fixation"
- 8:05 am Kirk Dimitris, M.D.
"Excursion of Oscillating Saw Blades in Total Knee Arthroplasty"
- 8:20 am Julie Chevilet, D.O.
"Comparison of MRI Versus Arthroscopic Findings of Osteochondritis Dessicans Lesions of the Pediatric Knee"
- 8:35 am Corey Van Hoff, M.D.
"Healing Assessment of Bone Cysts and Tumors Using Planar Radiography After Curettage and Grafting Utilizing Ultraporous B-Tricalcium Phosphate"
- 8:50 am Michael Howard, M.D.
"Review of 32 Patients Treated With Endobutton Fixation of Distal Biceps Tendon Injuries"
- 9:05 am Jeremy Bushmaker, D.P.M.
"Intramedullary Nail Fixation in Foot and Ankle Surgery"
- 9:20 am Josh Harris, M.D.
"Autologous Chondrocyte Implantation: A Systematic Review of the Literature"
- 9:35 am Break
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- 9:50 am Marlo Oyster, M.D.
"Hypermobility Posterior Horn Lateral Meniscus"
- 10:05 am Eric Zelman
"ACL-Injured Subjects Have Smaller ACLs Than Matched Controls: An MRI Study"
- 10:20 am Brian Aros, M.D.
"Biomechanical Comparison of Meniscal Suture, Meniscal Repair Devices, and Techniques"
- 10:35 am Alicia Bertone, D.V.M., Ph.D.
"Transduction, Penetration, and Distribution of Adenovirus (Ad) and Adeno-associated virus serotype 2 (AAV2) Vectors Within Full Thickness Osteoarthritic and Unaffected Canine Cartilage"
- 10:50 am Ray Wasielewski, M.D.
"Lack of Axial Rotation in Mobile Bearing Knee Designs"
- 11:05 am Break
- 11:20 am Cato Laurencin, M.D. Visiting Professor and Moderator
"Musculoskeletal Regeneration: The Regenerative Engineering Approach"
- 12:20 pm Lunch
- 1:20 pm End of Day
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MALLORY-COLEMAN DAY

Mallory-Coleman resident research day was established by Drs. Thomas Mallory and Carl Coleman in 1972 in memory of Katherine Virginia Mallory and Sally Jo Coleman.

This research day was established in order to encourage the development of ideas related to research in orthopaedic surgery and related basic sciences.

Each year, a distinguished visiting professor from an outside institution is invited to moderate and analyze the resident presentations and provide constructive criticism and commentary.

Past Visiting Professors:

| | |
|------|-------------------------|
| 2007 | William Garrett, M.D. |
| 2006 | Peter Stern, M.D. |
| 2005 | James Goulet, M.D. |
| 2004 | Steven Arnoczky, D.V.M. |
| 2003 | Joseph Buckwalter, M.D. |
| 2002 | Victor Goldberg, M.D. |
| 2001 | James Urbaniak, M.D. |
| 2000 | Douglas Jackson, M.D. |
| 1999 | Douglas Dennis, MD |
| 1998 | Thomas Einhorn, MD |
| 1997 | Larry S. Matthews, MD |
| 1996 | Gary Friedlander, MD |
| 1995 | James Herndon, MD |
| 1994 | Clement B. Sledge, MD |
| 1993 | Eric L. Radin, MD |

2008 MALLORY-COLEMAN VISITING PROFESSOR AND MODERATOR:

CATO LAURENCIN, M.D.



Dr. Laurencin is the Pratt Distinguished Endowed Professor of Orthopaedic Surgery and the Orthopaedic Surgeon-in-Chief of the University of Virginia Health System. He is Professor of Biomedical Engineering and Professor of Chemical Engineering at UVA. In addition he has earned the title 'University Professor', the highest professorial rank at the University of Virginia, designated by the President.

Dr. Laurencin received his B.S.E. in Chemical Engineering from Princeton University, his Ph.D. in Biochemical Engineering/Biotechnology from the Massachusetts Institute of Technology where he was a Hugh Hampton Young Scholar, and his M.D. from the Harvard Medical School where he graduated Magna Cum Laude. Dr. Laurencin completed residency training at Harvard and fellowship training at the Hospital for Special Surgery in New York. Dr. Laurencin is a specialist in Shoulder Surgery and Sports Medicine and has been honored in being named to America's Top Doctors™ and America's Top Surgeons™.

Dr. Laurencin serves on the editorial boards of 14 Journals including Clinical Orthopaedics and Related Research, The Journal of Biomedical Materials Research, Biomaterials, Tissue Engineering, and the Journal of Biomedical Nanotechnology. He serves on the Board of Directors of the American Institute for Medical and Biological Engineering where he currently is Chair of the College of Fellows for the Institute, and the Board of Directors of the Cobb/National Medical Association Health Institute where currently serves as Chair of the Board.

Dr. Laurencin has been a member of the NIH National Advisory Council for Arthritis Musculoskeletal and Skin Diseases (NIAMS), the National Science Advisory Board for the FDA, and the National Science Foundation Advisory Committee for Engineering.

Dr. Laurencin has numerous research interests which include tissue engineering, biomaterials, nanotechnology, drug delivery, stem cell biology and gene therapy. Honored at the White House, Dr. Laurencin received the Presidential Faculty Fellowship Award from President William Clinton in recognition of his research work bridging medicine and engineering. Most recently, Scientific American Magazine honored Dr. Laurencin with its SCIAM 50 award for the 50 greatest scientific achievements during 2007.

Dr. Laurencin is an elected member of the Institute of Medicine of the National Academy of Sciences (one of only four orthopaedic surgeons currently). He is also an elected member of the Third World Academy of Sciences (first surgeon in the U.S.).



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LATERAL COLUMN LENGTHENING UTILIZING ALLOGRAFT INTERPOSITION AND CERVICAL PLATE FIXATION

Authors: Christopher Pokabla, MD, Terry Philbin, DO, Gregory Berlet, MD
Presenter: Christopher Pokabla, MD

Background

Lateral column lengthening combined with various soft tissue procedures has been used successfully in the treatment of stage II adult acquired pes planovalgus deformity. The purpose of this study is to review the union rate when allograft material is utilized and the osteotomy stabilized with a cervical plate.

Methods

A retrospective review was performed on 28 feet in 26 patients who underwent correction of stage II pes planovalgus deformity utilizing a lateral column lengthening in combination with a soft tissue procedure. Patients were evaluated preoperatively and postoperatively using a modified AOFAS Hindfoot Scale, the SF-12 health survey, and radiographically by assessing the talonavicular coverage angle. All lateral column lengthenings were performed with allograft tricortical iliac crest bone graft and secured with a cervical plate.

Results

We evaluated a consecutive series of patients who underwent lateral column lengthening using allograft block and cervical plate fixation at a mean followup of nine months. The mean total modified AOFAS score and pain subscore were significantly higher (45.6 and 25.0, respectively) versus preoperatively (27.3 and 11.2, respectively) indicating considerable improvement. Radiographic measurements mirrored the clinical results with talonavicular coverage angles improving an average of 12.3 degrees. These results compare favorably with the published literature using autogenous iliac crest bone. Graft incorporation occurred in all but one case. Complications included four hardware removals following successful union, one nonunion, one graft penetration of the calcaneocuboid joint necessitating fusion and two cases with postoperative calcaneocuboid joint arthritis.

Conclusions

Lateral column lengthening utilizing allograft tricortical iliac crest bone graft with cervical plate fixation is a viable option for the correction of acquired pes planovalgus deformity. Allograft bone avoids donor site morbidity of autogenous iliac crest grafts and was not shown to increase rates of nonunion. Cervical plate fixation avoids the necessity of penetrating the graft with a screw and is associated with high patient satisfaction and radiographic union.



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EXCURSION OF OSCILLATING SAW BLADES IN TOTAL KNEE ARTHROPLASTY

Authors: Kirk Dimitris, M.D.; Robert Steenson, M.D.; Benjamin Taylor, M.D.
Presenter: Kirk Dimitris, M.D.

Intraoperative disruption of the medial collateral ligament during total knee arthroplasty (TKA) is an uncommon complication that can be protected by retractor placement as well as careful cutting of the femur and tibia. This study evaluated the excursion of a small and large oscillating saw blades and compared the data against the widths of both the medial as well as lateral femoral posterior condylar cuts. We discovered that the large saw blade had a statistically significantly larger excursion than the medial and lateral posterior condylar widths in females as well as the lateral condylar widths in males. The small saw blade excursion did not exceed any condylar widths. We conclude that the smaller saw blade should be considered when making these cuts, as the excursion of the large saw blade may exceed the width of cut needed and endanger important structures such as collateral ligaments.



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COMPARISON OF MRI VERSUS ARTHROSCOPIC FINDINGS OF OSTEOCHONDRITIS DESSICANS LESIONS OF THE PEDIATRIC KNEE

Authors: Julie Chevilet, D.O.; Kevin Klingele, M.D.; Brent Adler, M.D.
Presenter: Julie Chevilet, D.O.

OCD lesions are a leading cause of knee pain and loose bodies in the pediatric patient. Treatment options for an OCD lesion are dependent upon the stability characteristics of the lesion, which in the past twenty years have been determined by the MRI findings. These findings have largely been the deciding factor for surgical versus conservative management. However, this classification has not been revisited with advancement of MRI and arthroscopic technology.

The literature suggests a high signal on T2 images deep to the subchondral fragment is the defining factor for an unstable lesion. Our retrospective study re-examines the MRI and arthroscopic appearance of pediatric knee OCD lesions by classifying the MRI findings of each patient to the classification of Dipaola et al and comparing these to the intraoperative findings using the classification of Guhl, similar to that done by O'Connor et al in 2002.



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HEALING ASSESSMENT OF BONE CYSTS AND TUMORS USING PLANAR RADIOGRAPHY AFTER CURETTAGE AND GRAFTING UTILIZING ULTRAPOROUS B-TRICALCIUM PHOSPHATE

Authors: Corey Van Hoff, M.D., Gregory Young, M.S.; Martha Christ, BSN;
Joel Mayerson, M.D.
Presenter: Corey Van Hoff, M.D.

Purpose

The treatment of benign and low grade bone tumors with curettage of the lesion results in a cavitory defect. Autologous, allograft, or synthetic bone grafts can be used to accelerate healing of native bone in these defects. Autologous grafts are associated with pain and surgical morbidity while allografts risk infection transmission. The advantage of synthetic grafts is that they lack donor site morbidity, have unlimited availability and shelf life, and can reduce operating times. The orthopedic literature lacks information on the time needed to completely heal surgically treated bone tumors and cysts that are treated with synthetic bone graft. The objective of this study was to evaluate the long-term follow up of a cohort of patients diagnosed with a bone tumor and treated with a synthetic bone graft substitute.

Materials and Methods

This is a retrospective, uncontrolled review of 40 consecutive patients with benign or low-grade bone tumors. All patients were treated by the senior author (JLM) with curettage and bone grafting utilizing an ultraporous β -tricalcium phosphate [β -TCP](Vitoss, Orthovida, Inc., Malvern, Pa). Additional hardware was utilized depending on the location and size of the lesion and the presence or absence of pathologic fracture. All patients were followed clinically and radiographically for at least 6 months.

Results

The average age of our cohort was 35.8 years (range 11 to 80 years). The average volume of the defects was 50.3 cm³ (range 0.3 to 210.8 cm³). Utilizing our statistical model we found the following fit:

| Months Post Surgery | Predicted % Recovered | 95% Confidence Interval |
|---------------------|-----------------------|-------------------------|
| 3 | 34 | 29-39 |
| 6 | 50 | 45-55 |
| 12 | 66 | 61-71 |
| 24 | 79 | 74-83 |

All defects showed a degree of healing. There were no consistent differences in percentage fill between small and large lesions, and in this population we found no correlation between percentage fill and diagnosis. There were no gender differences. Thirty-six patients mobilized on schedule and were clinically unremarkable by three months. There were three local recurrences and one patient developed AVN.

Conclusion

Complete healing to the degree that the bone inside the original defect is indistinguishable from surrounding bone takes time. However, this strict definition of healing appears to have little correlation with functional outcome as most patients were clinically pain-free by three months post-operatively. The results of this study show that an ultraporous β -tricalcium phosphate synthetic bone graft is effective in treating bone voids.



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REVIEW OF 32 PATIENTS TREATED WITH ENDOBUTTON FIXATION OF DISTAL BICEPS TENDON INJURIES

Authors: Michael Howard, M.D., Thomas Durbin, M.D., Robert Durbin, M.D.,
James Popp, M.D.
Presenter: Michael Howard, M.D.

This report reviews the clinical outcome of 32 patients treated for distal biceps tendon injuries with a single anterior approach and Endobutton fixation. This includes both chronic and acute repairs performed by the four different surgeons at a private orthopaedic practice. The average flexion/extension arc was from 143° to 0°. The average supination and pronation was 73° and 75° respectively. BTE (Baltimore Therapeutic Equipment, Baltimore, MD) testing of 13 patients revealed recovery of 95% flexion strength and 93% supination strength compared to contralateral extremities. Flexion / extension ROM was 98% and supination / pronation ROM was 100% of the contralateral extremities. This technique described previously by Bain et al. and Greenberg et al. is effective in the community setting for treating distal biceps tendon injuries.



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INTRAMEDULLARY NAIL FIXATION IN FOOT AND ANKLE SURGERY

Authors: Jeremiah Bushmaker, D.P.M., Alan Block, D.P.M., M.S.
Presenter: Jeremiah Bushmaker, D.P.M.

Fusion of the ankle and/or subtalar joint is a common procedure for many conditions afflicting the lower extremity. With many forms of fixation available one technique is often overlooked. We aimed to show that intramedullary nailing can be used safely with minimal postoperative complication and excellent results. To achieve this, a complete review of the literature for the most up to date evidence based medicine regarding intramedullary fixation in reconstructive rearfoot surgery was performed, excluding case studies. Also reviewed were the characteristics of six intramedullary nails available to the foot and ankle surgeon. In addition we looked at our results of intramedullary nail fixation for the last 3 years. Intramedullary nails were found to have very successful operative outcomes when compared to other forms of fixation, with fusion rates of 88% and 93% for ankle and tibiotalarcalcaneal arthrodesis respectively. When used in the appropriate surgical patients intramedullary fixation can be used effectively, with patient satisfaction reported to be as high as 93% and with minimal postoperative complications. Our results are very similar to the published data, as exhibit by our 84% fusion rate and 100% patient satisfaction. One should still be careful in the diabetic and smoking populations as they do exhibit slightly higher complication rates as shown in our study and backed in the literature. Given this set of information, the use of intramedullary nailing as a means of fixation can be done safely, and with excellent outcomes. With advances in technology, continued studies comparing the various forms of fixation should be continued to ensure that evidence based medicine is being practiced to be assured the best form of fixation is used.



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HYPERMOBILE POSTERIOR HORN LATERAL MENISCUS

Authors: Marlo Oyster, M.D., Angela Pedroza, M.S., Jonathan Smerek, M.D.,
Christopher Kaeding, M.D.

Presenter: Marlo Oyster, M.D.

Background: Hypermobility of the posterior horn of the lateral meniscus has been reported in several recent case reports and small case series. Patients present with knee pain and locking in the absence of a discrete meniscal tear or discoid morphology. The purpose of this investigation is to increase awareness of this pathology, review MRI appearance and to present our results with arthroscopic stabilization. We present the largest series to our knowledge, reviewing the clinical presentation, MRI findings, arthroscopic findings, repair technique, post operative protocol, and outcomes.

Methods: Hypermobility was defined as translation of the entire posterior horn beyond the midpoint of the tibial articular surface with anterior stress applied by an arthroscopic probe. Patients were excluded if the meniscus had discoid morphology or if a tear was identified in the meniscus. This left 13 knees (12 patients) available for investigation. Institutional review board approval was obtained. The clinical presentation, preoperative MRI findings, arthroscopic findings, and repair technique were retrospectively reviewed. Most recent outcomes data was gathered via an IKDC-9 questionnaire.

Results: The study population consisted of 12 patients (13 knees) ages 12-48 years (mean 23 years). Eleven of the 12 patients presented primarily with mechanical symptoms. Each patient underwent a preoperative MRI. Twelve of the 13 preoperative MRIs did not identify lateral meniscal pathology. The remaining MRI, which was performed during a locking episode, was read as a displaced bucket-handle tear. Stabilization was obtained by fixation of the meniscus to the posterior capsule using all-inside or inside-out repairs.

Ten of the 12 patients (11 of 13 knees) were able to be contacted via telephone for additional follow up information. The average follow-up was 4 years (range 6 months to 10.7 years). Subjective current knee function averaged 8.0 on a scale of 0-10 (range 3.5 to 10). Five of the 10 patients had no limitation of function and had been able to resume very strenuous activities including basketball, football, and soccer without pain. This subgroup had an average age of 20.6 years at an average of 3.5 years following surgery. Five of the 10 patients had modified their activity level due to knee pain or function. They were able to perform light to moderate activities including walking, biking, or swimming without pain. The average age of this subgroup was 39 years at an average of 4.5 years following surgery. This subgroup included 2 patients who had undergone surgical revision and the one patient who had bilateral involvement. Seven of the 10 had no recurrence of mechanical symptoms. Two patients were unable to be contacted. They were both doing well without recurrence of mechanical symptoms at final office follow-up.

Conclusions

We present a series of 13 cases of symptomatic hypermobile lateral menisci treated with arthroscopic repair to the posterior capsule. MRI was not found to be effective in detecting this condition. These patients can successfully be treated with arthroscopic stabilization. Our results suggest that symptomatic relief can be expected in most patients at 4 years. Better results were seen in younger patients. All-inside and inside-out techniques appeared to produce similar clinical results. Long-term, randomized studies are needed to better define optimal repair technique and outcomes.



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AUTOLOGOUS CHONDROCYTE IMPLANTATION: A SYSTEMATIC REVIEW OF THE LITERATURE

Authors: David Flanigan, M.D., Robert Siston, Ph.D., Joshua Harris, M.D.
Presenter: Joshua Harris, M.D.

Articular cartilage injuries of the human knee are common. The limited healing potential of an untreated chondral defect predisposes to early osteoarthritis. Autologous chondrocyte implantation (ACI) is a two-stage cartilage restoration procedure involving an arthroscopic cartilage biopsy, in-vitro chondrocyte culture, and open arthrotomy with implantation of cultured autologous chondrocytes. No conclusive evidence exists regarding the current indications for ACI. There are few randomized clinical trials with high methodological quality of ACI in the Orthopaedic literature. The objective of our study was to systematically evaluate all levels of evidence of ACI and provide a thorough analysis of randomized clinical trials, prospective and retrospective cohort studies, and case series. Three reviewers independently assessed the results of multiple database searches using specific inclusion and exclusion criteria. The Delphi List and modified Coleman Methodology Score were used to evaluate study quality. The generally low methodological quality of studies in this review warrants caution in interpreting results after cartilage repair or restoration. The cohorts and case series provide substantial evidence of clinical, arthroscopic, and histological improvement after ACI. However, evidence from the randomized clinical trials showing a superiority of ACI over other cartilage repair or restoration techniques is inconclusive. These studies utilize heterogeneous assessment methods and lack sufficient power to draw firm conclusions. Nevertheless, ACI has a role in treatment of articular cartilage defects of the knee. Further high quality randomized clinical trials are needed to assess the efficacy of ACI over other techniques, as no firm recommendations regarding procedure choice can be given at this time.



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ACL INJURED SUBJECTS HAVE SMALLER ACLS THAN MATCHED CONTROLS: AN MRI STUDY

Authors: Eric Zelman, Ajit Chaudhari, Ph.D., David Flanigan, M.D.;
Christopher Kaeding, M.D.; G. Jia, M. Knopp
Presenter: Eric Zelman

Injuries to the anterior cruciate ligament (ACL) can necessitate long, arduous rehabilitation programs and diminish a person's ability to engage in physical activity. Many researchers have attempted to explain the predisposing factors leading to ACL injuries and they have found numerous correlations, but we still do not have a complete understanding. Imaging techniques have recently improved and now allow for *in vivo* measurements to be taken of a subject's ACL. With the help of this technology, we investigated the difference in ACL size between the contralateral, healthy knee of people who have experienced a non-contact ACL injury and a control group matched for gender, height, age, and weight. We used magnetic resonance (MR) images of a healthy knee from each subject so there would be no distortion from previous tears or reconstruction. Contours of each ACL were drawn with image processing software, using sagittal plane MR images. From these contours, volumes were calculated and a statistical analysis was performed. Subjects with a non-contact ACL injury were found to have contralateral ACL volumes of 1955 mm³, while the controls had volumes of 2117 mm³. This difference was found to be significant using a paired one-tailed Student *t*-test. Sixteen of the 27 injured subjects had smaller ACLs than their matched controls. As expected, and demonstrated by previous research, men had significantly larger ACL volumes than women. Height was a more important contributor to the ACL volume than any of the other factors, including gender. This study shows that there are anthropometric differences between the contralateral leg of subjects with a non-contact ACL injury and those without an ACL injury. Future studies will incorporate previously determined risk factors with ACL volume to identify at-risk individuals.



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BIOMECHANICAL COMPARISON OF MENISCAL SUTURE, MENISCAL REPAIR DEVICES, AND TECHNIQUES

Authors: Brian Aros, M.D., William Vasileff, B.A., Alan Litsky, M.D., Sc.D.,
Angela Pedroza, M.S.;, David Flanigan, M.D.
Presenter: Brian Aros, M.D.

Background: The biomechanical properties of the MaxFire™ meniscal repair system (Biomet Inc, Warsaw, IN) have not been described. The aim of this study was to report the load to failure of this device and compare it to other fourth generation meniscal repair devices and mattress suture techniques. **Methods:** After creating and a longitudinal tear in 42 one year-old bovine menisci, 7 specimen groups defined by the meniscal repair device, suture, and/or mattress technique used for meniscal repair were randomly established: (Group 1: Fiberwire™ vertical mattress (VM), Group 2: Fiberwire™ horizontal mattress (HM), Group 3: FasT-Fix™ VM, Group 4: FasT-Fix™ HM, Group 5: RapidLoc™, Group 6: MaxFire™ VM, Group 7: MaxFire™ HM). After completing the repairs, the meniscal specimens were cyclically loaded before load to failure testing was performed. One-way analysis of variance and Scheffe post hoc tests were used to evaluate group differences. **Results:** The mean load to failure for each group: Fiberwire VM 185 N, Fiberwire HM 183 N, FasT-Fix VM 125 N, FasT-Fix HM 107 N, RapidLoc 70 N, Maxfire VM 145 N, Maxfire HM 139 N. An analysis of variance demonstrated a significant difference in the mean load to failure ($F=8.31$ $p<0.01$). Using a post hoc Scheffe analysis, statistically significant differences were seen between both Fiberwire groups verses FasT-Fix HM and Rapid-Loc ($p<0.05$). Three modes of failure were observed: suture breakage (17/42, 40.5%), tissue failure (18/42, 42.9%), and knot failure (7/42, 16.7%). **Conclusions:** 2-0 Fiberwire™ VM and HM repairs had the highest load to failure of all groups tested. The load to failure for the MaxFire™ meniscal repair system is comparable to other available all-inside “4th generation” meniscal repair systems.

TRANSDUCTION, PENETRATION, AND DISTRIBUTION OF ADENOVIRUS (AD) AND ADENO-ASSOCIATED VIRUS SEROTYPE 2 (AAV2) VECTORS WITHIN FULL-THICKNESS OSTEOARTHRITIC AND UNAFFECTED CANINE CARTILAGE

Authors: Kelly Santangelo, D.V.M, Sarah Baker, Gerardo Nuovo, Jonathan Dyce,
DVM, Alicia Bertone, D.V.M
Presenter: Alicia Bertone, D.V.M.

Abstract: Recombinant adenovirus (Ad) vectors and adeno-associated virus serotype 2 (AAV2) vectors have emerged as dependable vehicles for a number of musculoskeletal applications. Utilizing these viral vectors for gene therapy and antisense therapy relies as much on successful delivery as it does on the choice of treatment. In this study, we quantified and compared the transduction efficiencies, depths of penetration, and tissue distributions of an Ad vector, an Arg-Gly-Asp (RGD)-modified Ad vector, an AAV2 vector, and a self-complementary AAV2 (scAAV2) vector using full-thickness osteoarthritic (OA) and unaffected canine cartilage explants. Significantly greater overall transduction efficiencies, as determined by flow cytometry on isolated chondrocytes, were found with both AAV2 vectors as compared to the conventional Ad vector ($P \leq 0.05$) in OA and unaffected cartilage explants for all time points examined. Immunohistochemistry (IHC) and fluorescent microscopy revealed that the Ad and Ad-RGD vectors demonstrated reporter gene expression within superficial chondrocytes of OA and unaffected cartilage but not within deeper areas of the tissue. In OA cartilage, AAV2 and scAAV2 vectors achieved uniform and consistent reporter gene expression in the tangential and transitional zones of the tissue, but evidence of vector transduction was not discovered in deeper regions. Transduction of all zones of unaffected cartilage was detected with the AAV2 and scAAV2 vectors. In summary, both AAV2 and scAAV2 vectors were consistent delivery vehicles for use in full-thickness OA and unaffected cartilage, although reporter gene expression was not located in deeper regions of OA cartilage. This analysis did not discriminate an advantage of the scAAV2 vector over the AAV2 vector.



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LACK OF AXIAL ROTATION IN MOBILE BEARING KNEE DESIGNS

Authors: Ray Wasielewski, M.D., Richard Komistek, Ph.D., Sumesh Zingde, M.S., Kate Sheridan, B.S.; Mohamed Mahfouz, Ph.D.

Presenter: Ray Wasielewski, M.D.

The in vivo axial rotation patterns of mobile bearing knees were assessed to determine whether subjects who had mobile bearing TKA would achieve similar axial rotation patterns compared to the normal knee. Axial rotation patterns of 527 knees implanted with 12 different mobile bearing implant designs were analyzed. Implants were compared by design and by type: posterior stabilized (PS), posterior cruciate retaining (PCR), and posterior cruciate sacrificing (PCS).

Tibiofemoral rotation averaged 4.3, 2.5, and 3.8 degrees after PS, PCS, and PCR mobile bearing TKA, respectively, from full extension to 90 degrees of knee flexion. The PS type knees experienced significantly more axial rotation compared to the PCS type knees ($p < 0.05$). About half of the PCS and PCR knees (58% and 47%, respectively) achieved less than three degrees of axial rotation, and more than half of all three groups achieved less than 5 degrees of rotation. Interestingly, only 14% of knees in the PS group, 3% of knees in the PCS group, and 17% of knees in the PCR group attained greater than 10 degrees of axial rotation.

Reverse rotation occurs when the tibia externally rotates and the femoral condyles internally rotate with increasing knee flexion. All three mobile bearing implant groups exhibited incidences of reverse rotation from 0-90 degrees: 17% of knees in the PS group, 32% in the PCS group, and 28% in the PCR group.

Over half of the individual surgeon studies (26 of 42 studies) achieved on average less than 5 degrees of axial rotation. All of the individual surgeon studies in the PCS groups (all composed of LCS RP PCS implants) experienced less than 5 degrees of axial rotation. None of the individual surgeon studies achieved average axial rotation greater than 9 degrees. The greatest amount of axial rotation was achieved by one study of 10 LCS RP PS implants that averaged 8.2 degrees. It should be noted, however, that the same implant performed poorly in other individual studies, averaging as low as -1.5, -1.3, and 0.5 degrees.

In most implant types, average axial rotation values varied substantially between surgeons using the same implant design. Both designs of high flex implants (LPS High Flex and Sigma RP-F PS) seemed to perform more consistently compared to the other mobile bearing implants.

*The Department of Orthopaedics would like to thank all
of the presenters for submitting their abstracts for the
36th Annual Mallory-Coleman Research Day.*

*We would also like to thank the following for
making this research day a success:*

Cato Laurencin, M.D.

Visiting Professor and Moderator

For lending his time and expertise to our research day

Thomas Mallory, M.D. and Carl Coleman, M.D.

For financial support of this program

Alan Litsky, M.D., Sc.D.

Director of Orthopaedic Research

For coordinating the scientific presentations

Pfizer, Inc.

For supporting breakfast and lunch

**Please Read Regarding Category I CME Credit
for This Presentation:**

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