



Cole Research

Evolving Modern Medicine



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Section Head, Cartilage Restoration Center at Rush, Rush University Medical Center*



Dr. Cole is a Professor in the Department of Orthopedics with a conjoint appointment in the Department of Anatomy and Cell Biology at Rush University Medical Center in Chicago, Illinois. He is the Section Head of the Cartilage Research Program at Rush University Medical Center and the Cartilage Restoration Center at Rush, a multidisciplinary program specializing in the restoration of articular cartilage and meniscal deficiency.

He received his M.D. and M.B.A. from the University of Chicago in 1990, completed his residency at The Hospital for Special Surgery in New York in 1996, and completed his Sports Medicine Fellowship at the University of Pittsburgh in 1997. He specializes in arthroscopic shoulder, elbow and knee surgery. He has a specific interest in arthroscopic reconstruction of the athlete's shoulder (rotator cuff, instability and arthritis), elbow, and knee.

He has authored and edited several hundred peer-reviewed publications, including highly recognized orthopedic textbooks on arthroscopy, sports medicine and cartilage transplantation. His publications also include nearly one thousand book chapters, technique papers, and presentations describing the techniques and results of shoulder, elbow and knee surgery. Dr. Cole lectures and teaches the techniques of cartilage restoration and shoulder arthroscopy on a national and international level.

Dr. Cole was chosen as one of the "Best Doctors in America" each year since 2004 and as a "Top Doctor" in the Chicago Metro area each year since 2003. In 2006, he was featured as "Chicago's Top Doctor" and placed on the cover of Chicago Magazine. Dr. Cole is the team physician for the Chicago Bulls NBA Basketball team, co-team physician for the Chicago White Sox Major League Baseball team and DePaul University in Chicago.

While the research that Dr. Cole is conducting in these areas is vast and varied, this packet provides a very abbreviated summary of what is currently being accomplished and who is involved.

The Cole Research Team

First, we will briefly introduce the ever-growing research team that Dr. Cole collaborates with. This group, as you will see, combines a wide range of experience from young, active medical students to veteran researchers. This team meets at semi-monthly research meetings to review the status of all research projects and to allow for an inter-disciplinary forum conducive to creative brainstorming.

<p>Professors</p> <ul style="list-style-type: none"> • Brian Cole, MD, MBA <ul style="list-style-type: none"> ○ Principal Investigator ○ Departments of Orthopedics and Anatomy & Cell Biology • Vincent Wang, PhD <ul style="list-style-type: none"> ○ Co-Investigator ○ Director of Sports Medicine Research • Susan Chubinskaya, PhD <ul style="list-style-type: none"> ○ Co-Investigator ○ Department of Biochemistry • James M. Williams, PhD <ul style="list-style-type: none"> ○ Co-Investigator ○ Department of Anatomy & Cell Biology • Marcus Wimmer, PhD <ul style="list-style-type: none"> ○ Co-Investigator ○ Department of Tribology <p>And many others... (Physicians/fellows/residents)</p>	<p>Students</p> <ul style="list-style-type: none"> • Allison McNickle, BA <ul style="list-style-type: none"> ○ MS/MD Candidate in Anatomy ○ Trainee in Orthopedic Skeletal Biology • Other Medical Students <ul style="list-style-type: none"> ○ Nicole Friel ○ Adam Yanke ○ Daniel L'Heureux ○ Spencer Kirk ○ Vasili Karas ○ Shannon Zielsdorf <hr/> <p>Staff</p> <ul style="list-style-type: none"> • Mukesh Ahuja <ul style="list-style-type: none"> ○ IRB Applications, Consents, Signing up patients for trials • Michelle Karlin <ul style="list-style-type: none"> ○ Coordinator of the CAIS study • Lisa Pearsall <ul style="list-style-type: none"> ○ screening, enrollment, follow-up of patients
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Our main areas of interest are not limited to but include...

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| <ul style="list-style-type: none"> ○ Clinical Research <ul style="list-style-type: none"> ○ Shoulder <ul style="list-style-type: none"> ▪ Rotator Cuff Repair ▪ Superior Labral Repair ○ Knee <ul style="list-style-type: none"> ▪ Grafting Procedures ▪ Autologous Chondrocyte Implantation (ACI) ▪ Meniscus Transplantation ▪ And more... | <ul style="list-style-type: none"> ○ Bench Research <ul style="list-style-type: none"> ○ Cartilage Regeneration ○ Meniscus Transplantation ○ Rotator Cuff Repair ○ Tendon Biomechanics ○ Growth Factor Signaling ○ Animal Models of Human Disease ○ And more... |
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Clinical Research

Shoulder

- Prospective Functional Outcome and Repair Integrity up to 10-Year Follow-up: These ever-growing databases create a pool of patient information from which we can analyze different areas of patients' post-operative course in order to improve or validate current techniques in shoulder surgery.
 - Arthroscopic Rotator Cuff Repair (406 Patients enrolled)
 - Superior Labral Anterior Posterior Repair (70 Patients enrolled)
 - Humeral Head Allograft Transplantations / Meniscus Interposition (10 Patients enrolled)
- Validation of the Goutallier Staging used to Detect Fatty Changes in the Supraspinatus Muscle
 - Purpose: This study collects MR images of patients being evaluated for rotator cuff surgery. Then, multiple physicians will use Goutallier Staging to evaluate the quality of the supraspinatus muscle. Inter- and intra-observer consistency will be evaluated.
 - Status: Actively enrolling patients
- Post-Surgical Glenohumeral Arthritis in Young Adults
 - Purpose: To investigate the demographics of these young adults and to elucidate the potential factors associated with near end-stage arthritis after stabilization surgery
 - Status: Manuscript in progress. Continuing to gather treatment outcome data
- Post-Operative Outcomes of Double-Row Rotator Cuff Repair
 - Purpose: This study will evaluate the outcomes of patients who have undergone a double-row rotator cuff repair: objective, subjective, and radiographic outcomes will be assessed.
 - Status: Ethics review is complete and data is currently being analyzed.

Knee

- Prospective Functional Outcome and Repair Integrity up to 10-Year Follow-up: This is another pool of patient information from which we can analyze different areas of patients' post-operative course in order to improve or validate current techniques in knee surgery.
 - Osteochondral Allo/Autograft (140/68 Patients enrolled, respectively)
 - Autologous Chondrocyte Implantation (202 Patients enrolled)
 - Meniscus Transplant (231 Patients enrolled)
- NeoCartilage Study (funded by Zimmer)
 - Purpose: The aim of this Phase I/II clinical study is to establish the safety and efficacy of the Neocartilage Implant (custom fit cartilage disc) used to repair damaged cartilage.
 - Status: Enrollment is complete and follow-up will continue for 5 years.
- DeNovo NT Study (funded by Zimmer)
 - Purpose: This is a post market study to assess the clinical outcomes of DeNovo NT, a human tissue allograft, for the treatment of damaged knee cartilage. Up to 25 subjects will be recruited from multiple sites across the U.S. with a follow-up for 2 years.
 - Status: Ethics review is complete and subject enrollment will begin soon.
- CAIS (funded by Mitek)
 - Purpose: Rush is one of six sites working on this study that hopes to reduce some cartilage implantation procedures from two surgeries to one. This would be extremely beneficial for patients as less surgeries lead to decreased cost and risk of morbidity.
 - Status: Enrollment is complete
- Outcomes of Revision Cartilage Restoration Procedures
 - Purpose: To evaluate the outcomes of osteochondral allografting in patients with a previous cartilage restoration procedure. Surgical history and clinical data will be reviewed to understand the progression of their condition during treatment.
 - Status: Ethics review is complete and data is being reviewed
- Outcomes of Osteochondritis Dissecans (OCD) Treatment
 - Purpose: To evaluate the spectrum of treatments for OCD lesions in the knee. The use of osteochondral allografting and autologous chondrocyte implantation as second-line treatments will be evaluated.
 - Status: Ethics review is complete and data is being reviewed

Bench Research

- Effects of Capsaicin 4975 on Tendon Healing and Normal Articular Cartilage: An In Vivo Rabbit Study (funded by Anesiva)
 - Purpose: This study aims to understand the effects of a capsaicin derived compound on the integrity of musculoskeletal tissues in the shoulder.
 - Status: The operative phase of the study has been completed.
- Biomechanical, Biochemical, and Histologic Differences in Human Supraspinatus Tendons that Affect Placement of Sutures in Rotator Cuff Repair (funded by Arthrex)
 - Purpose: This study will look at the microscopic, gross, and biomechanical differences in torn and intact tendons. This will help elucidate reasons to possibly place a second row of sutures during rotator cuff repair with the thought that this repair is stronger and will result in better patient outcomes.
 - Status: Biomechanical testing and histology is in progress.
- Pennation Angle Measurement in Humans using MRI (Internal Funding)
 - Purpose: After a chronic rotator cuff tear, the musculotendinous unit undergoes degenerative changes that makes repair difficult and decreases success rate. This study aimed to detect changes in pennation angle (a measure of this degeneration) via MRI to stratify patients clinically for the timing of surgical repair. This work developed a reproducible method for the detection of this angle, which we will be applying clinically in further studies.
 - Manuscript is in progress.

New Publications & Developments

- Developments

- *Introduction:* Musculoskeletal soft tissues such as cartilage, tendon, meniscus, and ligament are composite biological structures that serve vital mechanical functions during activities of daily living. The major focus of Dr. Cole's research in the Sports Medicine Research Laboratory is the injury and repair of soft connective tissues. Characterizing the functional biomechanical properties of these tissues is of critical importance to better understand the native and repair tissue properties as well as new clinical repair techniques. This insight forms the groundwork for developing new methods of tissue repair that can benefit patients through pain reduction, faster recovery times, and more stable joints.
- *Materials Testing System (\$46,000):* We are in the process of purchasing an electromechanical materials testing system from MTS Systems Corporation (Eden Prairie, MN). The model we have selected, the Insight 5 (see attached brochure in PDF file), is a state-of-the-art, high resolution system very well suited for studies of soft tissue biomechanics. This testing system enables us to perform a variety of mechanical test protocols in tension or compression. It has a rated measurement capacity of 1125 pounds and 43 inches. We will be receiving a variety of force measurement devices which will provide us with high accuracy measurements for applications ranging from low-force, small tissue samples such as meniscal plugs, to high-force, robust structures such as Achilles and patellar tendons. This mechanical testing system provides us excellent versatility to quantitatively characterize host tissue properties or repair techniques in human or animal tissues such as articular cartilage, rotator cuff, and the ACL. Also inherent to the system are highly compatible input channels and computer software to incorporate our existing camera system to analyze the micromotion of the tissues tested.

- Recent Publications

- Lewis PB, Williams JM, Hallab N, Viridi A, Singaraju V, Yanke A, Cole BJ: Multiple freeze-thaw cycled meniscal allograft tissue: A biomechanical, biochemical and histologic analysis. J Ortho Res, 25:1-7, 2008.
- Pylawka TK, Viridi AS, Cole BJ, Williams JM: Reversal of Suppressed Metabolism in Prolonged Cold Preserved Cartilage. J Orthop Res, 26(2): 247-54, 2008.
- Cole BJ, Yanke A, Provencher MT: Nonarthroplasty alternatives for the treatment of glenohumeral arthritis. J Shoulder Elbow Surg, 16(5):Supplement 2; 231-240, 2007.
- Rue JP, Yanke A, Busam ML, McNickle AG, Cole BJ: Prospective Evaluation of Concurrent Meniscus Transplantation and Articular Cartilage Repair: Minimum 2 Year Follow-Up. Accepted Amer J Sports Med, 2008.

Thank you for taking the time to review the work that is currently underway in our clinics and labs. We hope that this representative summary conveys our extensive interest and passion toward research that furthers the field of orthopedics. These studies have and will continue to promote the development of techniques/guidelines that provide better patient care. Please feel free to contact us if you have any further inquiries.

Sincerely,



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