

BIOGRAPHICAL SKETCH

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NAME: Ladd, Amy L.

eRA COMMONS USER NAME (credential, e.g., agency login): LADD.AMY

POSITION TITLE: Vice-Chair and Professor of Orthopaedic Surgery, Chief, Robert A. Chase Hand Center at Stanford, Professor of Plastic Surgery (by courtesy)

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	Completion Date	FIELD OF STUDY
Dartmouth College, Hanover, New Hampshire	A.B.	1980	History
SUNY Upstate Medical Center, Syracuse, New York	M.D.	1984	Medicine
Swedish Hospital Medical Center, Seattle, WA	PGY1	1985	General Surgery
Pacific Medical Center, U. of Wash, Seattle, WA	PGY2	1986	GMO/Orthopaedic Surgery
University of Rochester, Rochester, New York	PGY5	1989	Orthopaedic Surgery
Brigham & Women's, Harvard Univ., Boston, MA	PGY6	1990	Hand Surgery fellowship

A. Personal Statement

Our research on the thumb carpometacarpal (CMC) joint complements my clinical practice as a hand surgeon, and includes a breadth of investigators and research questions. The NIH research collaboration with Brown University colleagues (Drs. Crisco, Weiss and Moore) investigates the pathomechanics of the thumb CMC osteoarthritis, a common and debilitating disease endemic in post-menopausal women. Specifically, we image and quantify the stability of the thumb during high-demand functional tasks that are employed in common activities of daily living, which are made difficult or impossible in patients with CMC arthritis. By examining asymptomatic and arthritic subjects with computed tomography-based kinematic analysis techniques, we are investigating the relationships between joint architecture and motion, and their changes over time. Complementary research with international collaborations Dr.s Hagert and Rein investigate the proprioception and muscle integrity of the CMC joint in both the normal and pathologic states. An international consortium of clinician scientists and investigators are identifying, through Delphi consensus methodology, ideal characteristics of research and clinical studies related to CMC osteoarthritis.

Beyond thumb CMC joint research and practice, I am keenly interested in musculoskeletal biomechanics, and sex/gender differences in musculoskeletal conditions. Kinematic analysis through class development, research, and interdisciplinary teamwork has enabled projects that investigate human movement from an engineering, medical, and anthropologic perspective. We have developed instruments for evaluating 3-D upper limb kinematics and the fundamental task of reach and grasp, poising us to study the discrete motion of the basilar thumb, similar technology that enabled patent development of golf swing analysis. Multimodal imaging datasets to understand the anatomy and function of the CMC joint provide a framework for other joint examination, and have produced peer-reviewed publications and anatomical atlases. I have demonstrated a career commitment to improving women's musculoskeletal health, and I have mentored women who are central members of our research team. I lead the Stanford research team on each of these fronts related to CMC arthritis, kinematic analysis, and sex/gender differences in musculoskeletal medicine. My expertise is highlighted in these four publications and in my contributions to science, below.

1. Coughlan MJ, Bourdillon A, Crisco JJ, Kenney D, Weiss AP, **Ladd AL**. Reduction in Cylindrical Grasp Strength Is Associated With Early Thumb Carpometacarpal Osteoarthritis. Clin Orthop Relat Res. 2017 Feb;475(2):522-528. PubMed PMID: 27822895.

2. **Ladd AL, Crisco JJ, Hagert E, Rose J, Weiss, APC:** The Puzzle of the Thumb: Mobility, Stability, and Demands in Opposition. The 2014 ABJS Nicolas Andry Award. Clin Orthop Relat Res. 2014 Dec;472(12):3605-22. PubMed PMID: 25171934. PMCID: PMC4397810.
3. Luker KR, Aguinaldo A, Kenney D, Cahill-Rowley K, **Ladd AL.** Functional Task Kinematics of the Thumb Carpometacarpal Joint. Clin Orthop Relat Res. 2014 Apr;472(4):1123-9. PubMed PMID: 23549712. PMCID: PMC3940744
4. Lattanza LL, Meszaros-Dearolf L, O'Connor MI, **Ladd A,** Bucha A, Trauth-Nare A, Buckley JM. The Perry Initiative's Medical Student Outreach Program Recruits Women Into Orthopaedic Residency. Clin Orthop Relat Res. 2016 Sep;474(9):1962-6. PubMed PMID: 27245771; PubMed Central PMCID: PMC4965379.

B. Positions and Honors

Positions and Employment

1990-1998	Asst Professor, Div. of Hand Surgery, Dept Funct. Restoration, Stanford University, Stanford CA
1990-1998	Chief, Hand & Upper Extremity Section, Dept Surgery, Palo Alto VA Med Ctr, Palo Alto, CA
1991-present	Chief of the Children's Hand Clinic, Lucile Packard Children's Hospital at Stanford
1993-1998	Asst Professor, Div Rheumatology & Immunology, Dept. of Medicine (by courtesy), Stanford University
1998-2003	Assoc. Professor, Div. of Hand Surgery, Dept. of Funct. Restoration, & Assoc. Professor by courtesy, Divs. of Immunology / Rheumatology (Dept. of Medicine), Stanford University,
2001-2007	Head of Outreach, SUMMIT (Stanford University Medical Media Information Technologies)
2003-present	Professor, Dept of Orthopaedics; Div. Plastic Surgery, and Div. Immunology / Rheumatology (Dept. of Medicine), by courtesy, Stanford University, Stanford, CA
2007-present	Professor and Chief, Robert A. Chase Hand & Upper Limb Center, Stanford University
2013-present	Asst. Dean of Medical Advising, Stanford University School of Medicine
2014-present	Vice-chair, Academic Affairs, Dept of Orthopaedic Surgery, Stanford Univ. School of Medicine
2017-present	Elsbach-Richards Endowed Professor of Surgery, Stanford University School of Medicine

Other Experience and Professional Memberships

1991 -	Director, Hand Surgery Fellowship, Stanford University
1999 - 2004	Editor-in-Chief, Yearbook of Hand Surgery
2007 -	Board of Directors, California Orthopaedic Society
2009 -	Oral Examiner, American Board of Orthopaedic Surgery
1987 -	Ruth Jackson Orthopaedic Society (RJOS) elected 1987
1994 -	American Academy of Orthopaedic Surgeons, inducted 1994
1995 -	California Academy of Medicine, elected 1995
1995 -	American Society for Surgery of the Hand, inducted 1995
1996 -	Western Orthopaedic Association, elected August 1996
2002 -	International Wrist Investigators Workshop, elected 2002
2002 -	International Society for Fracture & Repair, elected 2002
2003 -	American Orthopaedic Association, inducted 2003
2008 -	American Association of Bone & Joint Surgeons inducted 2008
2012 - 2014	Guest Editor, Thumb CMC Arthritis Symposium, Clinical Orthopaedics & Related Research
2013 - 2016	Deputy Editor, Clinical Orthopaedics & Related Research, Liaison to RJOS
2010 - 2014	Presidential line, Ruth Jackson Orthopaedic Society Treasurer 2010-12, vice-president 2012-13, president 2013-14
2016-2019	Leadership line, Board of Specialties, American Academy of Orthopaedic Surgeons Secretary 2016-17, Chair-elect 2017-18, Chair 2018-19
2016-2019	Board of Directors, American Academy of Orthopaedic Surgeons

Honors

1997	Woman of Achievements award, Professions categ., San Jose Mercury News & Women's Fund
1998	Outstanding Faculty Physician Award, Cowell Student Health Center, Stanford University
1999,2000	Nominated for Franklin G. Ebaugh Jr. Award for mentoring medical students
2000-2003	Listed as one of "Top Docs" in Silicon Valley, San Jose Magazine

2000-2001	Sterling Bunnell Traveling Fellowship, American Society for Surgery of the Hand
2002	Poster Exhibit Award, Best Scientific Content Honorable Mention, American Society for Surgery of the Hand Annual Meeting, Seattle, WA
2003	AAOS Multimedia Award, Paget's Disease of Bone: Web Based Monograph from a Medical Image Database. AAOS 70 th Annual Meeting, New Orleans, LA
2004	Nominated for Henry J. Kaiser Family Found for Outstanding Teaching, Stanford University
2004	Iris Litt Fund research award, Institute for Women & Gender at Stanford
2010	OREF/RJOS/DePuy Career Development Award
2010	Dean's Award for Distinguished Teaching, Stanford University
2012	Emanuel B. Kaplan Excellence in Anatomy award, ASSH Annual Meeting
2012	Compere Award, Outstanding Scientific Paper, Twentieth Century Orthopaedic Assoc.
2014	Nicolas Andry Award, "significant contribution to musculoskeletal research," Association of Bone and Joint Surgeons
2017	Andrew J. Weiland Medal, American Society for Surgery of the Hand

Teaching Responsibilities (selected examples)

Vice-Chair Academic Affairs, Department of Orthopaedic Surgery 2014-present

Fellowship Director, Stanford Hand & Upper Limb ACGME-accredited (orthopaedics) 1991-present

Director of Education for Medical Students, Residents, and Fellows, Stanford University Medical school Hand & Upper Extremity Rotation (combined orthopaedic and plastic surgery residents) 1990-present

Dissertation Committee, Doctoral Dissertation for Victoria Jew, Material Science and Engineering PhD candidate, "Subcritical Crack Propagation in Calcium Phosphate Cements," June 2003

Dissertation Committee, Doctoral Dissertation for Matthew Wright, Music PhD Candidate, "The Shape of an Instant: Measuring and Modeling Perceptual Attack Time with Probability Density Functions," February 2008

Lead Instructor: The Anatomy of Movement. Interdisciplinary course. Winter quarter 2004-10 Stanford University. Project-based course on human movement. Designed for medical students, engineering students, and students of art, computer science, and human biology.

Dissertation Committee, Doctoral Dissertation for Eni Halilaj, Bioeng. Ph.D. Candidate, Brown University, "Image-Based Analysis of Mechanical Mediators of Osteoarthritis in 1st Carpometacarpal Joint," Sept 2014

C. Contribution to Science - Selected Peer-reviewed Publications

I have made significant contributions to advancing the understating of the functional importance, biomechanics, pathology, and surgical treatment of the thumb CMC joint. The opposable thumb, unique to humans, is one of our defining anatomic features. I have investigated the morphology, forces, and motion of both normal and arthritic joints in an effort to provide quantitative evidence of disease progression, using tools from comparative anatomy, gross dissections, microscopic analysis, multimodal imaging, and live-subject kinematic studies. Over the past four years I have been a Co-Investigator and the Stanford site director for an NIH-funded study designed to elucidate the mechanics of the normal thumb carpometacarpal (CMC) joint and the potential role of altered mechanics in the progression of thumb CMC OA. Our findings have challenged the conventional wisdom about the role of causation due to sex-related differences in joint shape, though we have found sex-related differences in cartilage thinning, and what appear to be intriguing relationships between instability and cartilage thinning.

1. McQuillan TJ, Kenney D, Crisco JJ, Weiss AP, **Ladd AL**. Weaker Functional Pinch Strength Is Associated With Early Thumb Carpometacarpal Osteoarthritis. Clin Orthop Relat Res. 2016 Feb;474(2):557-61. PubMed PMID: 26493987.
2. Schneider MT, Zhang J, Crisco JJ, Weiss AP, **Ladd AL**, Nielsen P, Besier T. Men and women have similarly shaped carpometacarpal joint bones. J Biomech. 2015 Sep 18;48(12):3420-6. PubMed PMID: 26116042. PMCID: PMC4592789
3. Ludwig CA, Mobargha N, Okogbaa J, Hagert E, Ladd AL. Altered Innervation Pattern in Ligaments of Patients with Basal Thumb Arthritis. J Wrist Surg. 2015 Nov;4(4):284-91. doi: 10.1055/s-0035-1564982. PubMed PMID: 26649261; PubMed Central PMCID: PMC4626232.
4. **Ladd AL**, Messana JM, Berger AJ, Weiss AP. Correlation of clinical disease severity to radiographic thumb osteoarthritis index. J Hand Surg Am. 2015 Mar;40(3):474-82. PubMed PMID:25617217. PMCID: PMC4340769

I have made significant contributions to musculoskeletal science in examining the role of sex and gender in musculoskeletal disease, from the role structural anatomy differences, hormones, and genetics play in differential disease expression, to the historical biases in the subject populations of clinical and basic research projects, as well as the scientific reporting of musculoskeletal research and outcomes. The presentation of musculoskeletal disease differs in men and women, and recognition of the differences between men and women's burden of disease and response to treatment is critical to optimizing care. I also contribute quarterly editorials on sex and gender issues in orthopaedics for *Clinical Orthopaedics and Related Research*.

1. Halilaj E, Moore DC, Patel TK, Laidlaw DH, **Ladd AL**, Weiss AP, Crisco JJ. Older asymptomatic women exhibit patterns of thumb carpometacarpal joint space narrowing that precede changes associated with early osteoarthritis. *J Biomech.* 2015 Oct 15;48(13):3643-9. PMID: PMC4600656
2. Wolf JM, Cannada L, Van Heest AE, O'Connor MI, **Ladd AL**. Male and female differences in musculoskeletal disease. *J Am Acad Orthop Surgeons* 2015 June;23(6):339-347. PMID: Pending
3. Halilaj E, Moore DC, Laidlaw DH, Got CJ, Weiss AP, **Ladd AL**, Crisco JJ. The morphology of the thumb carpometacarpal joint does not differ between men and women, but changes with aging and early osteoarthritis. *J Biomech.* 2014 Aug 22;47(11):2709-14. PubMed PMID: 24909332. PMID: PMC4130650
4. **Ladd AL**. Gendered Innovations in Orthopaedic Science: Sex, Lies, and Stereotype: In Praise of the Systematic Review. *Clin Orthop Relat Res.* 2016 Jan;474(1):27-30. PubMed PMID: 26481123.

I have made significant contributions to general orthopaedic surgery, ranging from treatment of osteoporotic fractures, to assembling a consortium of stakeholders to improve reporting and analysis of distal radius fracture outcomes, to examining common but controversial fracture treatment, to management of complications of congenital hand disorders.

1. Wolf JM, Cannada LK, Lane JM, Sawyer AJ, **Ladd AL**. A comprehensive overview of osteoporotic fracture treatment. *Instr Course Lect.* 2015;64:25-36. PubMed PMID:25745892. PMID: Pending
2. Goldhahn J, Beaton D, **Ladd AL**, Macdermid J, Hoang-Kim A. Recommendation for measuring clinical outcome in distal radius fractures: A core set of domains for standardized reporting in clinical practice and research. *Arch Orthop Trauma Surg.* 2014 Feb;134(2):197-205. PubMed PMID: 23728832.
3. McQuillan TJ, Hawkins JE, Ladd AL. Incidence of Acute Complications Following Surgery for Syndactyly and Polydactyly: An Analysis of the National Surgical Quality Improvement Program Database from 2012 to 2014. *J Hand Surg Am.* 2017 Sep;42(9):749.e1-749.e7. PubMed PMID: 28648327
4. Comer GC, **Ladd AL**. Management of complications of congenital hand disorders. *Hand Clin.* 2015 May;31(2):361-75. PubMed PMID: 25934210.

Complete List of Published Work in MyBibliography:

<http://www.ncbi.nlm.nih.gov/sites/myncbi/1PE7d7YPOREQy/bibliographahy/48855619/public/?sort=date&direction=ascending>

D. Research Support

Ongoing Research Support

NIH 1R01AR059185-01A2- renewal

4/15/16-4/15/21

Thumb CMC Biomechanics and Early OA Progression - continuation

The goal is to generate foundational data on thumb CMC biomechanics to determine if CMC joint laxity is associated with OA progression. Principal Investigator, Stanford University site (Co-Institutional grant with Rhode Island Hospital, JJ Crisco, PI.)

Role: Subcontract PI

Ronald and Ann Williams Charitable Foundation

1/1/10-12/31/18

Research development and promotion, scholarship, visiting fellowship, with focus on Motion Analysis Lab, Chase Hand Center and Department of Orthopaedic Surgery. Role: PI

Recently Completed Research Support

NIH R01 AR059185 (PI)

07/01/11 – 03/31/16

Thumb CMC Biomechanics and Early OA Progression

The goal is to generate foundational data on thumb CMC biomechanics to determine if CMC joint laxity is associated with OA progression. Principal Investigator, Stanford University site (Co-Institutional grant with Rhode Island Hospital, JJ Crisco, PI.) Role: Subcontract PI

ITOW (Crisco, PI)

09/13-8/14

1st International Thumb Osteoarthritis Workshop (ITOW)

This grant supported the 1st International Thumb Osteoarthritis Workshop (ITOW), which was held in Newport, Rhode Island, October 25th and 26th, 2013. This meeting brought together scientific and clinical investigators interested in the etiology and pathophysiology of thumb CMC OA, and its clinical treatment. Role: Co-Investigator

OREF/RJOS/DePuy

7/1/10-12/31/11

Career Development Award

Thumb CMC Joint in Women: Anatomy and function in Symptomatic and Early Arthritis Subjects.

Goals: Pilot study of kinematic imaging of functional thumb positions, to better understand causes and associations of this common arthritis. Role: PI