

MOZAMMIL HUSSAIN, Ph.D.

Assistant Professor
Logan University
1851 Schoettler Rd
Chesterfield, MO 63017
Ph: 636-230-1955
Fax: 636-207-2417
E-mail: mozammil.hussain@logan.edu

EDUCATION

2007	Ph.D.	Bioengineering University of Illinois at Chicago
2002	M.S.	Mechanical and Aerospace Engineering Illinois Institute of Technology, Chicago
2000*	M.E.	Mechanical Engineering Panjab University, India
1998	B.E.	Mechanical Engineering North Gujarat University, India

*Degree was awarded in 2004.

WORK EXPERIENCE

2011 – Present	Assistant Professor ○ Division of Research, Logan University, Chesterfield, Missouri
2010 – 2011	Research Instructor ○ Division of Research, Logan University, Chesterfield, Missouri
2007 – 2010	Research Associate ○ Division of Research, Logan University, Chesterfield, Missouri
2003 – 2007	Research Assistant, University of Illinois at Chicago ○ Orthopedic Biomechanics Laboratory, Department of Orthopedic Surgery, Rush University Medical Center, Chicago, Illinois

- Mentor: Raghu N. Natarajan, Ph.D.
- 2002 Student Engineering Assistant II
 - Orthopedic Biomechanics Laboratory, Department of Orthopedic Surgery, Rush University Medical Center, Chicago, Illinois
 - Mentors: Raghu N. Natarajan, Ph.D. and Markus A. Wimmer, Ph.D.
- 1999 – 2000 Teaching Assistant
 - Department of Mechanical Engineering, Punjab Engineering College, Chandigarh, India

ADMINISTRATIVE APPOINTMENTS

- 2009 – Present Learning Resources Center Committee, Logan University, Chesterfield, Missouri

SOCIETY MEMBERSHIPS

- 2011 – Present Sigma Xi
- 2010 – Present North American Spine Society
- 2009 – Present Biomedical Engineering Society
- 2007 – Present Orthopaedic Research Society
- 2007 – Present American Society of Biomechanics
- 2007 – Present International Society of Biomechanics
- 2001 – Present American Society of Mechanical Engineers

EDITORIAL BOARD

- 2011 – Present World Journal of Orthopedics

PEER-REVIEWER FOR JOURNALS

- Spine
- Clinical Biomechanics
- Journal of Bone and Joint Surgery (American)
- Journal of Bone and Joint Surgery (British)
- Annals of Biomedical Engineering
- The Open Biomedical Engineering Journal
- Journal of Mechanics in Medicine and Biology

- Medical Engineering & Physics
- Journal of Biomechanical Engineering
- Yonsei Medical Journal
- Bone & Joint Research
- Medical & Biological Engineering & Computing
- Applied Mathematical Modeling
- Orthopaedic Surgery

RESEARCH SUPPORT

- NIH-R21 (2012)
Title: Biomechanics of lumbar and lumbosacral disc herniations under manipulative loads
PI Mozammil Hussain, PhD
Co-I Ralph E. Gay, MD, DC and Kai-Nan An, PhD – Mayo Clinic, Rochester, Minnesota
Status In Review
- North American Spine Society (2012)
Title Predicting optimal benefit of lumbar disc distraction: a finite element study of tensile creep in lumbar discs
PI Mozammil Hussain, PhD
Co-I Ralph E. Gay, MD, DC, Chunfeng Zhao, MD, and Kai-Nan An, PhD – Mayo Clinic, Rochester, Minnesota
Status Not funded
- Scoliosis Research Society – New Investigator Grant (2007)
Title Biomechanics of cervical spine in patients with thoracic scoliosis
PI Mozammil Hussain, PhD
Co-I Rodger Tepe, PhD, Norman W. Kettner, DC – Division of Research, Logan University, Chesterfield, Missouri
Consultant Lawrence G. Lenke, MD – Department of Orthopaedic Surgery, Washington University Medical Center, St. Louis, Missouri
Status score – 3, not funded

PEER-REVIEWED JOURNAL PAPERS

YEAR – 2012

1. **Hussain M**, Nassr A, Natarajan RN, An HS, Andersson GB. Corpectomy versus discectomy for the treatment of multilevel cervical spine pathology: a finite element analysis. *The Spine Journal*. 12(5):401-408, 2012.

2. **Hussain M**, Natarajan RN, Chaudhary G, An HS, Andersson GB. Posterior facet load changes in adjacent segments due to moderate and severe degeneration in C5-C6 disc: a poroelastic C3-T1 finite element model study. *Journal of Spinal Disorders & Techniques*. 25(4):218-225, 2012.
3. **Hussain M**, Natarajan RN, An HS, Andersson GB. Progressive disc degeneration at C5-C6 segment affects the mechanics between disc heights and posterior facets above and below the degenerated segment: a flexion-extension investigation using a poroelastic C3-T1 finite element model. *Medical Engineering & Physics*. 34(5):552-558, 2012.

YEAR – 2011

4. **Hussain M**, Nassr A, Natarajan RN, An HS, Andersson GB. Biomechanical effects of anterior, posterior, and anterior-posterior fixation techniques on the stability of a multi-level cervical corpectomy construct: a finite element model analysis. *The Spine Journal*. 11(4):324-330, 2011.
5. **Hussain M**, Natarajan RN, Chaudhary G, An HS, Andersson GB. Relative contributions of strain-dependent permeability and fixed charged density of proteoglycans in predicting cervical disc biomechanics: a poroelastic C5-C6 finite element model study. *Medical Engineering & Physics*. 33(4):438-445, 2011.
6. **Hussain M**, Natarajan RN, Chaudhary G, An HS, Andersson GB. Simulation of inhomogeneous rather than homogeneous poroelastic tissue material properties within disc annulus and nucleus better predicts cervical spine response: a c3-t1 finite element model analysis under compression and moment loadings. *Spine*. 36(4):E245-255, 2011.

YEAR – 2010

7. **Hussain M**, Natarajan RN, An HS, Andersson GB. Patterns of height changes in anterior and posterior cervical disc regions affects the contact loading at posterior facets during moderate and severe disc degeneration: a poroelastic c5-c6 finite element model study. *Spine*. 35(18):E873-E881, 2010.
8. **Hussain M**, Natarajan RN, An HS, Andersson GB. Reduction in segmental flexibility because of disc degeneration is accompanied by higher changes in facet loads than changes in disc pressure: a poroelastic C5-C6 finite element investigation. *The Spine Journal*. 10(12):1069-1077, 2010.
9. **Hussain M**, Gay RE, An KN. Reduction in disk and fiber stresses by axial distraction is higher in cervical disk with fibers oriented toward the vertical rather than horizontal plane: a finite element model analysis. *Journal of Manipulative & Physiological Therapeutics*. 33(4):252-260, 2010.

10. **Hussain M**, Natarajan RN, An HS, Andersson GB. Motion changes in adjacent segments due to moderate and severe degeneration in C5-C6 disc: a poroelastic C3-T1 finite element model study. *Spine*. 35(9):939-947, 2010.

YEAR – 2009

11. **Hussain M**, Natarajan RN, Braaksma BR, Fayyazi AH, Andersson GB, An HS. Screw angulation affects bone-screw stresses and bone graft load sharing in anterior cervical corpectomy fusion with a rigid screw-plate construct: a finite element model study. *The Spine Journal*. 9(12):1016-1023, 2009.

CONFERENCE AND SYMPOSIUM PRESENTATIONS

YEAR – 2012

1. **Hussain M**, DeGeer C, Storm K. Age-related degenerative morphological changes in lumbar discs: a CT scan study in mid-sagittal plane. Fall Annual Meeting of Biomedical Engineering Society, October 24-27, 2012, Atlanta, Georgia.
2. **Hussain M**. Application of manual traction forces on the cervical discs with degenerative annular fibers: a finite element model investigation. Summer Bioengineering Conference, American Society of Mechanical Engineers, June 20-23, 2012, Fajardo, Puerto Rico.
3. **Hussain M**. Biomechanics of the degenerated discs with incomplete and slack annular fibers under traction loads. Proceedings of the Association of Chiropractic Colleges Educational Conference XIX/Research Agenda Conference XVII, March 15-17, 2012, Las Vegas, Nevada. (Award Nomination Paper).

YEAR – 2011

4. **Hussain M**. Compressive and tensile stiffness of a cervical motion segment with incomplete fibers in annulus. Fall Annual Meeting of Biomedical Engineering Society, October 12-15, 2011, Hartford, Connecticut.
5. **Hussain M**. Biomechanical effects of incompleteness and slackness in annular fibers are higher in the tissues of nucleus than that of annulus: a finite element model investigation. 34th Annual Meeting of the American Society of Biomechanics, August 10-13, 2011, Long Beach, California.
6. **Hussain M**. Incomplete fibers affect disc biomechanics higher than the fibers with laxity: a finite element model analysis. Summer Bioengineering Conference, American Society of Mechanical Engineers, June 22-25, 2011, Farmington, Pennsylvania.

7. **Hussain M.** A biomechanical finite element study of the disc tissues with incompleteness and laxity in annular fibers. Proceedings of the Association of Chiropractic Colleges Educational Conference XVIII/Research Agenda Conference XVI, March 17-19, 2011, Las Vegas, Nevada. (Award Nomination Paper).

YEAR – 2010

8. **Hussain M, Gay RE, An KN.** Inner trabecular bone is more affected than outer cortical bone due to incomplete annular fibers. Fall Annual Meeting of Biomedical Engineering Society, October 6-9, 2010, Austin, Texas.
9. **Hussain M, Gay RE, An KN.** Cervical endplates are affected by incomplete length of collagen fibers: a finite element analysis. Fall Annual Meeting of Biomedical Engineering Society, October 6-9, 2010, Austin, Texas.
10. **Hussain M, Gay RE, An KN.** Incomplete fibers in inner annulus affects tissue stresses higher than in outer or middle annulus. Fall Annual Meeting of Biomedical Engineering Society, October 6-9, 2010, Austin, Texas.
11. **Hussain M, Gay RE, An KN.** Disc with incomplete fibers bulges more than the disc with complete fibers: a finite element study. Fall Annual Meeting of Biomedical Engineering Society, October 6-9, 2010, Austin, Texas.
12. **Hussain M, Gay RE, An KN.** Load bearing capability of annular fibers is affected by their incomplete length: a finite element model analysis. 34th Annual Meeting of the American Society of Biomechanics, August 18-21, 2010, Providence, Rhode Island.
13. **Hussain M, Gay RE, An KN.** Disc biomechanical response due to incomplete length of collagen fibers in various regions of annulus fibrosus: a finite element investigation. Summer Bioengineering Conference, American Society of Mechanical Engineers, June 16-19, 2010, Naples, Florida.
14. **Hussain M.** A finite element analysis of the intervertebral disc with complete and incomplete length of collagen fibers: application of distraction forces on compressed discs. Proceedings of the Association of Chiropractic Colleges Educational Conference XVII/Research Agenda Conference XV, March 18-20, 2010, Las Vegas, Nevada. (Award Nomination Paper).

YEAR – 2009

15. **Hussain M, Gay RE, An KN, Triano JJ.** Disc bulging decreases with degeneration in tissue matrix and increases with laxity in annular fibers. Fall Annual Meeting of Biomedical Engineering Society, October 7-10, 2009, Pittsburgh, Pennsylvania.

16. **Hussain M**, Gay RE, An KN, Triano JJ. Increase in outer annulus and decrease in annulus-nucleus bulgings during cervical disc degeneration. Fall Annual Meeting of Biomedical Engineering Society, October 7-10, 2009, Pittsburgh, Pennsylvania.
17. **Hussain M**, Gay RE, An KN, Triano JJ. Annular fibers in disc matrix alter hard and soft tissues in compression: a finite element analysis. Fall Annual Meeting of Biomedical Engineering Society, October 7-10, 2009, Pittsburgh, Pennsylvania.
18. **Hussain M**, Gay RE, An KN, Triano JJ, Tepe R. Relative contributions to disc degeneration progression is higher by degenerative tissue ground matrix than annular fibers laxity: a finite element analysis in compression. 33rd Annual Meeting of the American Society of Biomechanics, August 26-29, 2009, Pennsylvania State University, Pennsylvania.
19. **Hussain M**, Gay RE, An KN, Tepe R. Biomechanical effects of chiropractic-based distraction therapy on the behavior of healthy and degenerated cervical discs: a finite element model analysis. Summer Bioengineering Conference, American Society of Mechanical Engineers, June 17-21, 2009, Lake Tahoe, California.
20. **Hussain M**, Tepe R. Biomechanical role of annular fiber orientation angle under compression and traction loadings. Proceedings of the Association of Chiropractic Colleges Educational Conference XVI/Research Agenda Conference XIV, March 12-14, 2009, Las Vegas, Nevada. (Award Winning Paper).
21. **Hussain M**, Natarajan RN, An HS, Andersson GBJ. Progressive disc degeneration at any intermediate segment affects disc and posterior facets mechanics of inferior segment more than superior segment – a finite element model study. 55th Annual Meeting of Orthopaedic Research Society, February 22-25, 2009, Las Vegas, Nevada.
22. **Hussain M**, Natarajan RN, An HS, Andersson GBJ. Segmental mechanics between anterior disc, posterior disc, and posterior facets at moderate and severe stages of cervical disc degeneration – a finite element model study. 55th Annual Meeting of Orthopaedic Research Society, February 22-25, 2009, Las Vegas, Nevada.

YEAR – 2008

23. **Hussain M**, Tepe R. Tissue damage to an injured disc and position of nucleus pulposus – a finite element investigation. Fall Annual Meeting of Biomedical Engineering Society, October 2-4, 2008, St. Louis, Missouri.
24. **Hussain M**, Tepe R. Stages of disc degeneration and biomechanics of vertebra, endplate and disc – a finite element study. Fall Annual Meeting of Biomedical Engineering Society, October 2-4, 2008, St. Louis, Missouri.
25. **Hussain M**, Tepe R. Disc height reduction is a better predictor of cervical disc degeneration progression than reduction in the area of nucleus pulposus – a finite

element analysis. 4th North American Congress on Biomechanics, August 5-9, 2008, Ann Arbor, Michigan.

26. **Hussain M**, Tepe R. Effect of traction load on the biomechanical behavior of cervical, thoracic, and lumbar spinal segments – a finite element analysis. Summer Bioengineering Conference, American Society of Mechanical Engineers, June 25-29, 2008, Marco Island, Florida.
27. **Hussain M**, Tepe R. Peripheral, circumferential, and radial components of stresses and strains within different regions of annulus and nucleus – a cervical intervertebral disc under pure compression. Proceedings of the Association of Chiropractic Colleges Educational Conference XV/Research Agenda Conference XIII, March 13-15, 2008, Washington DC.
28. **Hussain M**, Tepe R. High stresses in the anterior-lateral region of annulus due to strains in the nucleus – a cervical intervertebral disc under pure compression. Proceedings of the Association of Chiropractic Colleges Educational Conference XV/Research Agenda Conference XIII, March 13-15, 2008, Washington DC.

YEAR – 2007

29. Bresnahan LE, **Hussain M**, Natarajan RN, Andersson GBJ, Fessler RG. Biomechanical effects of minimally invasive decompression of cervical stenosis (MEDS): a finite element investigation. 57th Annual Meeting of Congress of Neurological Surgeons, September 15-20, 2007, San Diego, California.
30. Bresnahan LE, **Hussain M**, Fessler RG, Natarajan RN, Andersson GBJ. A finite element investigation into the biomechanical effects of minimally invasive treatment for cervical spondylotic myelopathy. 31st Annual Meeting of the American Society of Biomechanics, August 22-25, 2007, Stanford University, California.
31. **Hussain M**, Natarajan RN, Andersson GBJ, An HS. Stresses on movable core and loads on facets are higher by implanting cervical artificial disc prosthesis as compared to bone grafting fusion technique: a finite element model study. 31st Annual Meeting of the American Society of Biomechanics, August 22-25, 2007, Stanford University, California.
32. **Hussain M**, Nassr AN, Natarajan RN, Andersson GBJ, An HS. Biomechanics of adjacent segments with number of inter-body grafts and spinal instrumentations for a multi-level fusion construct using a finite element model. 31st Annual Meeting of the American Society of Biomechanics, August 22-25, 2007, Stanford University, California.
33. **Hussain M**, Nassr AN, Natarajan RN, Andersson GBJ, An HS. Effect of corpectomy and discectomy fusion procedures on the stability of multi-level cervical construct with anterior rigid screw-plate fixation – a finite element model study. Summer

Bioengineering Conference, American Society of Mechanical Engineers, June 20-24, 2007, Keystone, Colorado.

34. **Hussain M**, Natarajan RN, Andersson GBJ, An HS. Effect of a degenerated C5-C6 disc on the biomechanics of adjacent levels – a poroelastic finite element investigation. Summer Bioengineering Conference, American Society of Mechanical Engineers, June 20-24, 2007, Keystone, Colorado.
35. **Hussain M**, Natarajan RN, Andersson GBJ, An HS. Biomechanical response of a poro-elastic cervical spine under compression. 53rd Annual Meeting of the Orthopaedic Research Society, February 11-14, 2007, San Diego, California.
36. **Hussain M**, Natarajan RN, Andersson GBJ, An HS. Investigation on the effect of degenerative changes in the biomechanics of a C5-C6 motion segment – a poroelastic finite element model study. 15th Annual Symposium of Computational Methods in Orthopaedic Biomechanics, February 10, 2007, San Diego, California.

YEAR – 2006

37. **Hussain M**, Nassr AN, Natarajan RN, Andersson GBJ, An HS. Biomechanical stabilization of the multi-level corpectomy construct using anterior and posterior instrumentation – a finite element model study. 30th Annual Meeting of American Society of Biomechanics, September 6-9, 2006, Blacksburg, Virginia.
38. **Hussain M**, Fayyazi AH, Natarajan RN, Andersson GBJ, An HS. Effect of uni- and bi-cortical screw angulation on the stability of multi-level corpectomy construct – a finite element model study. 30th Annual Meeting of American Society of Biomechanics, September 6-9, 2006, Blacksburg, Virginia.
39. **Hussain M**, Natarajan RN, Andersson GBJ, An HS. Changes in biomechanical response due to disc degeneration: a poroelastic C5-C6 motion segment study. Summer Bioengineering Conference, American Society of Mechanical Engineers, June 21-25, 2006, Amelia Island, Florida.
40. Natarajan RN, **Hussain M**, An HS, Andersson GBJ. Change in the biomechanics of lumbar spine due to artificial disc placement. 33rd Annual Meeting of The International Society for the Study of the Lumbar Spine, June 13-17, 2006, Bergen, Norway.
41. Natarajan RN, **Hussain M**, Manson N, Reo M, Robinson J, An HS, Andersson GBJ. Biomechanical comparison of the intact cervical disc versus total disc arthroplasty: a finite element model study. 6th Annual Meeting of Spine Arthroplasty Society, May 9-13, 2006, Montreal, Canada.
42. Nassr AN, **Hussain M**, Natarajan RN, An HS, Andersson GB, Singh K. Long-segment spinal reconstruction in the setting of multilevel cervical corpectomies: a

finite element analysis. 9th Annual Meeting of Midwest Resident Research Symposium, April 27, 2006, Chicago, Illinois.

43. Natarajan RN, **Hussain M**, Andersson GBJ, An HS. Strain-dependent permeability has a predominant effect over swelling pressure in predicting biomechanics of cervical spine. 52nd Annual Meeting of the Orthopaedic Research Society, March 19-22, 2006, Chicago, Illinois.
44. Natarajan RN, **Hussain M**, Andersson GBJ, An HS. Development of a physiologically relevant numerical model to study biomechanics of degenerated cervical spine. 52nd Annual Meeting of the Orthopaedic Research Society, March 19-22, 2006, Chicago, Illinois.
45. Natarajan RN, **Hussain M**, An HS, Andersson GBJ. The effect of placement of an artificial disc on the biomechanics of a lumbar motion segment – a finite element model study. 52nd Annual Meeting of the Orthopaedic Research Society, March 19-22, 2006, Chicago, Illinois.
46. **Hussain M**, Natarajan RN, Andersson GBJ, An HS. Comparison of the biomechanical response between non-linear elastic and poroelastic finite element models of a healthy C5-C6 motion segment. 14th Annual Symposium of Computational Methods in Orthopaedic Biomechanics, March 18, 2006, Chicago, Illinois.

YEAR – 2005

47. **Hussain M**, Natarajan RN, Andersson GBJ, An HS. Two-level cervical corpectomy with rigid screw-plate system produces larger increase in facet loads at level superior to the fusion level. Summer Bioengineering Conference, American Society of Mechanical Engineers, June 22-26, 2005, Vail, Colorado.
48. Fayyazi AH, **Hussain M**, Natarajan RN, Phillips FM, An HS. Effect of graft-endplate contact surface morphology on the biomechanics of anterior cervical corpectomy fusion and rigid plating: a finite-element model study. 3rd Annual Meeting of World Spine Society, August 1-3, 2005, Rio de Janeiro, Brazil.
49. Fayyazi AH, **Hussain M**, Natarajan RN, Phillips FM, An HS. Effect of screw angulation on the bone graft load sharing and bone-screw stresses in anterior cervical corpectomy fusion with rigid plate screw construct: a finite-element model study. 3rd Annual Meeting of World Spine Society, August 1-3, 2005, Rio de Janeiro, Brazil.
50. Fayyazi AH, **Hussain M**, Natarajan RN, Phillips FM, An HS. Effect of screw angulation on the bone graft load sharing and bone-screw stresses in anterior cervical corpectomy fusion with rigid plate screw construct: a finite-element model study. 12th International Meeting on Advanced Spine Techniques, July 7-9, 2005, Alberta, Canada.

YEAR – 2004

51. Fayyazi AH, **Hussain M**, Natarajan RN, Phillips FM, An HS. Effect of screw angulation on the bone graft load sharing and bone-screw stresses in anterior cervical corpectomy fusion with rigid plate screw construct: a finite-element model study. 2nd Annual Depuy Spine Fellows Course, June, 2004, Boston, Massachusetts (Best Basic Science Paper).
52. **Hussain M**, Natarajan RN, Deol GS, Andersson GBJ, An HS. Stability of corpectomy with anterior cervical plating depends on the angular placement of screws: a FE model study. ASME International Mechanical Engineering Congress and RD & D Exposition, November 13-19, 2004, Anaheim, California.
53. Natarajan RN, **Hussain M**, Wimmer MA, Rosenberg AG, Jacobs JJ. Wear of UHMWPE components of total knee replacements depend upon walking pattern. 50th Annual Meeting of the Orthopaedic Research Society, March 7-10, 2004, San Francisco, California.