

Curriculum Vitae

Name: K. B. Chandran (Krishnan Bala Chandran)

Present Position: Lowell G. Battershell Chair Professor and Department Executive Officer, Department of Biomedical Engineering
College of Engineering
University of Iowa
Iowa City, IA 52242

I. EDUCATION

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| 1. American College (Madras University, India)
Physics, Mathematics and Humanities | B.S. | 1963 |
| 2. Indian Institute of Technology (Madras, India)
Mechanical Engineering | B.Tech. | 1966 |
| 3. Washington University, St. Louis, MO
Mechanical Engineering | M.S. | 1969 |
| 4. Washington University, St. Louis, MO
Mechanical Engineering | D.Sc. | 1972 |

FIELD OF SPECIALIZATION: Fluid Mechanics, Hemodynamics,
Cardiovascular Biomechanics

II. EXPERIENCE

1. Professor (July 1984 to date) Department of Biomedical Engineering, University of Iowa. Chairman (Department Executive Officer), Department of Biomedical Engineering since October 1998.
Lowell G. Battershell Endowed Chair Professor since June 2000.
2. Assoc. Professor (August 1978 to June 1984) Division of Materials Engineering, University of Iowa.
3. Assoc. Professor (July 1978 to August 1978); Assistant Professor (July 1974 to July 1978); Research Associate (September 1972 to June 1974); Biomechanics Laboratory, Department of Orthopedic Surgery, Tulane University School of Medicine, New Orleans, LA.
4. Tool Try-out Engineer, Hindustan Motors Ltd., Calcutta, India; July 1966 to July 1967.
5. Research Engineer, Bendix Corporation, Instruments and Life Support Division, Davenport, IA, Summer, 1980.

III. HONORS AND PRIZES

1. Awarded first prize in Physics at American College, Madras University.
2. Held merit scholarship during first year of study at the Indian Institute of Technology.
3. NATO Fellowship for Advanced Study Institute in Cardiovascular Fluid Dynamics in Houston, Texas, October, 1975.
4. Old Gold Fellowship, University of Iowa, Summer, 1979
5. Borelli award from the American Society of Biomechanics in 1988 for excellence in research in the area of Biomechanics.
6. Elected to Fellow grade of American Society of Mechanical Engineers (ASME) 1989.
7. Elected as Senior Member of Biomedical Engineering Society in April 1992.
8. Elected Fellow of American Institute for Medical and Biological Engineering (AIMBE), 1995
9. University of Iowa College of Engineering 1995 Award for Exceptional Service.
10. ASEE Bioengineering Division Theo Pilkington Outstanding Bioengineering Educator Award, June 1999.
11. Named to the Lowell G. Battershell Endowed Chair in June 2000.
12. Iowa da vinci Celebration and Conference, Science, Engineering, and Technology recognition for leadership and excellence in the fields of Science, Engineering, and Technology, February 2001.
13. University of Iowa Board of Regent's award for Faculty Excellence, 2004.
14. Elected to the Inaugural Class of Fellows of the Biomedical Engineering Society, January 2005.
15. The College of Engineering 2005 Research Award for the accomplishments and contributions in the field of Cardiovascular biomechanics and fluid mechanics in the human circulation, May 1, 2006.

IV. THESIS TITLE (D.Sc.)

MECHANICAL EFFECTS OF CURVATURE ON PULSATILE FLOW IN ELASTIC TUBES, Washington University in St. Louis, MO, MAY 1972.

V. MISCELLANEOUS

Reviewer for Annals of Biomedical Engineering, J. Biomechanics, J. Biomechanical Engineering, and numerous other journals.
Member of NHLBI Surgery and Bioengineering Chartered Study Section (7/96-6/2000) and has served as ad hoc member of several NIH and NSF Review Panels.
ABET Program Evaluator for Bioengineering/Biomedical Engineering Programs representing Biomedical Engineering Society.

Membership in Professional Societies:

Am. Inst. for Medical and Biological Engineering (AIMBE-Fellow)

American Society of Biomechanics (Charter Member)

Am. Soc. of Engineering Education

Am. Soc. Mechanical Engineers (Fellow)

Biomedical Engineering Society (Fellow)

VI. GRANTS

a. Funded Research Projects

NIH (K. B. Chandran, P.I.): "Hemodynamics in Curved Arteries"

May 1, 1976 to Sept. 30, 1978. \$90,000 for 2 years

Iowa Heart Association (K. B. Chandran, P.I.): "Fluid Dynamics Past Prosthetic Aortic Valves"

July 1979 to June 1980; \$7,000.

July 1980 to June 1981; \$8,000.

NIH (K. B. Chandran, P.I.): "Pulsatile Flow Dynamics of Prosthetic Heart Valves", July 1980 to

June 1983; \$86,393.

Iowa Heart Association (K. B. Chandran, P.I.): "Ventricular Volume and Mass from Sector

Echocardiographs" July 1982 to June 1983, \$13,500.

NIH "Assessment of In Vivo Passive Myocardial Stiffness" (K. B. Chandran, P.I.): July 1982 to

June 1987; \$430,000.

July 1987 to June 1990; \$338,000 (direct costs).

Iowa Heart Association (K. B. Chandran, P.I.): "Effect of Prosthetic Valve Orientation on Aortic

Flow" July 1985 to June 1987, \$23,000.

Iowa Heart Association (K. B. Chandran, P.I.): "In Vitro Flow Dynamics Past Mitral Valve

Prostheses" July 1987 to June 1989, \$25,000.

Evaluation of Dialysis filters; FDA subcontract from Iowa Department of Health, (K. B.

Chandran, P.I.): \$10,850/yr. October 1987 to June 1988.

Iowa Heart Association (K. B. Chandran, P.I.): " Dynamics of prosthetic valves during closure"

July 1991- June 1993, \$31,000.

NIH (subcontract through Northwestern University Medical School. (K. B. Chandran, P.I.):

"Vascular mechanics by ultrasound analysis" \$156,000 (including indirect costs) 4/1/92 to

3/31/95.

Shiley Heart Valve Research Center (K. B. Chandran, P.I.): Pressure mapping with Björk-Shiley

convexo-Concave valves. 1990-1994; \$127,000

ATS Medical, Minneapolis MN (K. B. Chandran, P.I.): Cavitation studies with ATS mechanical

heart valves. 2/94 thru 5/94: \$7581.

American Heart Association, IA Affiliate (K. B. Chandran, P.I.): Cavitation dynamics with

mechanical heart valves. 7/95 thru 6/97. \$40,000.

Baxter CVS Division. An in vitro comparison of closing dynamics of Edwards Duromedics and

Edwards TEKNA valves (K. B. Chandran, P.I.): 6/95 thru 8/95. \$13,058.

CarboMedics Inc. Mechanical Valve Closure Dynamics (K. B. Chandran, P.I.): 2/96-1/97; \$54,000.

Samsung Biomedical Research Institute, Korea: Automatic border detection in Intravascular Ultrasound (E. Dove, P.I.), 9/97-8/98; \$60,000.

NSF: Segmentation of Volumetric Cardiac Ultrasound; (E. Dove, P.I.); 1/99-12/01; \$180,000.

NIH: Vascular mechanics with atheroma progression; (K. B. Chandran, P.I.), 4/99-3/02; \$914,204.

Supplementary funding for equipment - \$24,874 in July 2000:

NIH: 3D and 4D Coronary Hemodynamics and Local Atherosclerosis; (Milan Sonka, P.I.), 9/99 - 8/03; \$1,036,557.

Medtronic Inc. Valve CFD simulation (Y. Lai and K. B. Chandran, Co-P.I.); \$11,025; June 2000-October 2000

Fluid-structure simulation for Prosthetic Heart Valves NIH (Chandran, KB, P.I.)
7/1/03 – 6/30/07 ; \$1,426,745 (Total costs)

Gold T-Tech Inc. Flow loop testing of ultrasound emitting mechanical heart valves (M. Raghavan and K. B. Chandran, Co-P.I.); 12/01/05 to 5/31/06: \$15,163 (total costs)

b. Program enhancements

Whitaker Special Opportunities Proposal (K. B. Chandran, P.I.): Collaborative Learning Environment for Functional Analysis of Cardiovascular Images;. **\$100,000** from the Vice President's office as matching equipment funds for the establishment of quantitative medical imaging teaching laboratory.

3/98- 2/99;	\$308,517
1/01- 12/01;	\$315,259.
1/02 - 12//02;	\$176,063
1/03 – 12/03;	\$149,326

Whitaker Foundation: Industrial Internship for Biomedical Engineering; J. Reinhardt and K. B. Chandran, Co PI; July 2000 - June 2003; \$180,000.

Roy J. Carver Charitable Trust: Challenge Award to establish a Cellular Engineering Teaching Laboratory for Biomedical Engineering Students (K. B. Chandran and Michael Mackey): **\$261,340** for the purchase of equipment; The College of Engineering will pay approximately **\$215,000** for renovation of an existing room for the teaching laboratory – Will help in providing experiential learning for biomedical engineering students in quantitative cellular analysis.

VII. TEACHING EXPERIENCE

Biomechanics, FORTRAN Programming, Statics, Dynamics, Mechanics of Deformable Bodies, Biotransport Processes, Cardiovascular Biomechanics, Linear System Analysis, Mechanical Vibrations, Advanced Biofluids, Advanced Cardiac Mechanics, Biomedical Engineering Design.

VIII. CHAIRMAN OF THESIS COMMITTEE

Doctoral theses:

Thomas Yearwood, Ph.D. (1979) "Steady and Pulsatile Flow Analysis in a Model of the Human Aortic Arch" Tulane University, New Orleans, LA. (Practicing anesthesiologist)

Bahram Khalighi, Ph.D. (1983) "Laser Doppler Anemometry Studies of Steady and Pulsatile Flow Past Aortic Valve Prostheses in a Model Human Aorta" University of Iowa. (Research Engineer, General Motors)

Che-Shi Yu, Ph.D.-Co-chairman- (1984) "Finite Analytic Solution of Turbulent Flow Past an Axisymmetric Disc Valve" University of Iowa. (Engineer, Consulting Company, Detroit)

Schoephoerster, Richard, Ph.D.(1989) "Flow dynamics and turbulence measurements past mitral valve prostheses in a model left ventricle: Experimental and numerical results " University of Iowa. (Professor and Director of Biomedical Engineering Program- Florida International University)

Fatemi, Reza, Ph.D. (1990) "Experimental investigation of the turbulent flow development in the entrance region of a curved tube using laser anemometry " University of Iowa. (President of own company-Akron, Ohio).

Han, G., Ph.D. (1990) "Nonlinear passive elastic properties of the left ventricular myocardium in animal models using finite element method." University of Iowa. (Assoc. Professor, Pusan, Korea).

Kim, S. H., Ph.D.(1991) "Finite analytic numerical solution of laminar and turbulent flow in a two dimensional artificial heart model." University of Iowa. (Working in industry, Korea).

Philip, K., Ph.D. Co-Chairman (1991) " Automatic detection of myocardial contours in cine computed tomographic images." University of Iowa. (President of Computer Firm in India).

Kim, Y.H., Ph.D.(1991) "Flow dynamics in the vicinity of an end-to-end anastomosis and its relationship with the anastomotic neointimal fibrous hyperplasia". University of Iowa. (Faculty at Yonsei University, Korea).

Lee, C.S., Ph.D. (1993) " Dynamics associated with the closure of mechanical heart valves: Cavitation and clearance flow." University of Iowa. (Faculty in Engineering in Korea).

Shipkowitz, T., Ph.D. (1995) "Effects of secondary flow in the descending aorta on shear stress in downstream arteries" University of Iowa. (Research Engineer, St. Jude Medical, Inc., St. Paul, MN).

Aluri, S., Ph.D.(1999) "Hemolysis induced by mechanical heart valve closure" University of Iowa. (Systems Design Engineer, GE Medical Systems, Milwaukee).

Liu, Yutong, Ph.D. (2002) "Fluid dynamic and mass transport analysis on the development and growth of atheroma in large arteries" University of Iowa (Research Faculty, University of Nebraska Medical Center, Omaha, Nebraska).

Ramaswamy, Sharan (2003) "Three and four dimensional hemodynamics in human coronary artery segments" University of Iowa (NIH Post-doctoral Fellow, Baltimore, MD).

Kim, Hyunggun – Co-advisor (2005) “Dynamic finite element analysis of bioprosthetic heart valves with an experimentally derived material model” University of Iowa (Post-doctoral Research Engineer, Northwestern University College of Medicine, Chicago, IL).

Master's theses:

Thomas Ferguson, M.S. (1981) "Flow Dynamics Past Prosthetic Valves Using Laser Doppler Anemometry" University of Iowa, Iowa City, IA.

Yusuf Attarwala, M.S. (1983) "Prediction of Normal Passive Myocardial Elasticity from Cross-sectional Echocardiography" University of Iowa.

G.N. Cabell, M.S. (1983) "Characteristics of Flow Past Aorta Valve Bioprostheses in a Model of the Human Aorta" University of Iowa.

Lawrence Petree, M.S. (1984) "Prediction of Abnormal Regional Myocardial Elasticity of the Left Ventricle Using Cross-Sectional Echocardiography and Finite Element Method" University of Iowa.

Srinivas Kodiyalam, M.S. (1985) "Identification of Ischemic Regions of the Myocardium From Changes in the Passive Myocardial Elastic Properties of the Reconstructed Left Ventricular Geometry Using Finite Element Technique" University of Iowa.

Reza Fatemi, M.S. (1985) "In Vitro Analysis of the Effects of Angulated Implantation of Tilting Disc Aortic Valves in Physiological Pulsatile Flow" University of Iowa.

Vinay Wagle, M.S. (1986) "Assessment of Left Ventricular Diastolic Material Properties Using the Reconstructed Three-Dimensional Geometry from CNE CT images and Applying the Finite Element Technique" University of Iowa.

Schoepfoerster, Richard, M.S. (1986) "Comparative Analysis of the Performance of Prosthetic Mitral valves in a Model Left Ventricular Pulsatile System: University of Iowa.

Kim, Young-Ho, M.S. (1989) "Re-use of hemodialyzers: Mechanical integrity based on the air pressure leak test and ultrafiltration test." University of Iowa.

Gao, Dongfen, M.S.(1990) "A finite element model of the artery-graft anastomosis". University of Iowa.

Majeed, M., M.S. (1990) "Finite element analysis of a model of a total artificial heart" University of Iowa.

Rui Cheng, M.S. (2003) “A fluid-structure interaction simulation of mechanical heart valve flow dynamics” University of Iowa.

Sarah Vigmostad, M. S. (2003) “ Hemodynamic and wall thickness in relation to localized geometric changes in the coronary arteries” University of Iowa.

Mugilan Deenadayalan, M. S. (2005) “Dynamic study of platelet activation during a mechanical heart valve operation” (Co-advisor with H. Udaykumar), University of Iowa.

Kanchana Iyer, M.S. (2005) “A model for atherosclerotic plaque growth in the carotid artery bifurcation” (Co-advisor with H. Udaykumar) University of Iowa.

VIII. PUBLICATIONS:

Patent: Vascular Acoustic Emission Analysis in a Balloon Angioplasty System, Lyle Mockros, John M. Fildes, K. B. Chandran, M. J. Vonesh, David D. McPherson, Ashwin Nagaraj, and Charles Davidson, U. S. Patent No. 5,957,950; September 28, 1999.

Books:

1. Chandran, K. B. *CARDIOVASCULAR BIOMECHANICS*. New York University Press, August 1992.
2. Chandran, K.B., Vanderby Jr, R., Hefzy, M.(Eds) *Proceedings of the 1997 Summer Bioengineering Conference, ASME BED-Vol. 35*.
3. Chandran, K. B., Yoganathan, A. P. and Rittgers, S. A. *BIOFLUID MECHANICS: THE HUMAN CIRCULATION*. Taylor and Francis (CRC Press), 2007.

Book Chapters:

1. Dellsperger, K.C. and Chandran, K.B.(1991) Prosthetic Heart Valves. in *Blood Compatible materials and Devices: Perspectives towards the 21st Century*. Sharma, C.P. and Szycher, M.(Editors), Technomic Publishing Co. pp. 153-165.
2. Chandran, K. B. (1995) Soft tissue replacements: 46.1: Blood-interfacing implants, pp. 648 - 665, in *Handbook of Biomedical Engineering*, CRC Press, June 1995.
3. Chandran, K. B. and Vonesh, M. J. (1997).The role of mechanics in vascular biology in *Non-invasive imaging of atherosclerosis*, Glagov, S., Mercury, M., Zarins, C. K., and McPherson, D. D. (Eds.), Kluger Academic Publishers, Boston, Ch. 7, pp. 129-162.
4. Chandran, K. B.(2001) Dynamic behavior analysis of mechanical heart valve prosthesis, in *Cardiovascular Techniques: Biomechanic Systems Techniques and Applications* (C. J. Leondes, Ed.), CRC Press, Boca Raton, FL, Chapter 3, pp 3-1 – 3-31.
5. Chandran, K. B. (2001) Flow dynamics in the human aorta: Techniques and applications. in *Biomechanic Systems Techniques and Applications* (C. J. Leondes, Ed.), CRC Press, Boca Raton, FL, Chapter 5, pp. 5-1 – 5-25.
6. Bhuvaneshwar, G., Ramani, A.V., and Chandran, K. B. (2002) Polymeric occluders in tilting disc heart valve prostheses. In *Polymeric Biomaterials* (S. Dumitriu, Ed.), Marcel Dekker, New York, Ch. 22, pp. 589-610.

A) PAPERS:

1. Ghista, D.N., Advani, S.H., Gaonkar, G.H., Chandran, K.B., and Brady, A. (1971) Analysis and Physiological Monitoring of the Human Left Ventricle. *J of Basic Engineering* pp. 147-161.
2. Liu, Y.K. and Chandran, K.B. (1975) Exact Solution to Translational Acceleration of Inviscid Fluid in Rigid Spherical Shells. *Math. Biosciences* 24:1-16.

3. Liu, Y.K., Chandran, K.B., and von Rosenberg, D.U. (1975) Angular Acceleration of Viscoelastic (Kelvin) Material in a Rigid Spherical Shell - A Rotational Head Injury Model. *J. Biomechanics* 8: 285-292.
4. Liu, Y.K. and Chandran, K.B. (1976) Package Cushioning for the Human Head. I. Analytical Considerations. *J. Applied Mechanics* 42: 541-546.
5. Chandran, K.B., Swanson, W.M., Ghista, D.H. and Vayo, H.W. (1974) Oscillatory Flow of Viscous Fluid in Thin-walled Curved Elastic Tubes. *Annals of Biomedical Engineering* 2: 392-412.
6. Chandran, K.B., Liu, Y.K. and von Rosenberg, D.U. (1975) The Exact Solution of the Translational Acceleration of a Low Modulus Elastic Medium in Rigid Spherical Shells - Implications for Head Injury Models. *J. Applied Mechanics* 42:759-762.
7. Liu, Y.K. and Chandran, K.B. (1976) An Experimental Study of Package Cushioning for the Human Head. *J. Applied Mechanics* 43: 469-474.
8. Chandran, K.B., Liu, Y.K. and von Rosenberg, D.U. (1976) Stress Wave Propagation in Maxwell Fluid Contained in Rigid Spherical Shells. *J. of Sound and Vibrations* 47:107-114.
9. Vayo, H.W., Ghista, D.N. and Chandran, K.B. (1977) Oscillatory Flow in Thin-walled Curved Elastic Tubes - Summary. *Bulletin of Mathematical Biology* 39: 245-248.
10. Ghista, D.N., Reul, H., Ray, G., and Chandran, K.B. (1978) Optimal Design of Aortic Leaflet Prosthesis. *J. Eng. Mechanics Div. (ASCE)*, EM1:97-117.
11. Ghista, D.N., Ray, G., Chandran, K.B., Sandler, H. and Hamid, S. (1978) Analysis of Mirtal Valve Vibration Range. *J. Eng. Mechanics Div. (ASCE)*, EM1:119-129.
12. Domer, F.R., Liu, Y.K., Chandran, K.B. and Krieger, K.W. (1979) The Effect of Hyperextension-Hyperflexion (Whiplash) on the Function of the Blood-Brain Barrier of Rhesus Monkeys. *J. Experimental Neurology* 63:304-310.
13. Chandran, K.B., Hosey, R.R., Ghista, D.N. and Vayo, V.W. (1979) Analysis of Fully Developed Unsteady Viscous Flow in a Curved Elastic Tube Model to Provide Fluid Mechanical Data for Some Circulatory Patho-Physiological Situations and Assist Devices. *J. Biomechanical Engineering* 101: 114-123.
14. Chandran, K.B., Yearwood, T.L. and Wieting, D.W. (1979) An Experimental Study of Pulsatile Flow in a Curved Tube. *J. Biomechanics* 12:793-805.
15. Yearwood, T.L. and Chandran, K.B. (1980) Experimental Investigation of Steady Flow Through a Model of the Human Aortic Arch. *J. Biomechanics* 13: 1075-1088.
16. Chandran, K.B. and Yearwood, T.L. (1981) Physiological Pulsatile Flow Analysis in a Curved Tube. *J. Fluid Mechanics* 111: 59-85.
17. Chandran, K.B. and Ray, G. (1982) Clinical Implications of Pressure-Deformation Analysis of Curved Elastic Tubes. *Medical and Biological Engineering & Computing* 20: 145-150.
18. Yearwood, T.L. and Chandran, K.B. (1982) Pulsatile Flow Experiments in a Model of the Human Aortic Arch. *J. Biomechanics* 15: 683-704.

19. Chandran, K.B., Yearwood, T.L., Chen, C.J. and Falsetti, H.L. (1982) Pulsatile Flow Experiments on Heart Valve Prosthesis. *Medical and Biological Engineering and Computing* 21:529-537.
20. Chandran, K.B., Khalighi, B., Chen, C.J., Falsetti, H.L., Yearwood, T.L. and Hiratzka, L.F. (1983) Effect of Valve Orientation on Flow Development Past Aortic Valve Prostheses in a Model Human Aorta. *J. of Thoracic and Cardiovascular Surgery* 85: 893-901.
21. Chandran, K.B., Ferguson, T.V., Chen, C.J. and Khalighi, B. (1983) Experimental Study of Flow Dynamics Behind Valve Prostheses. *ASAIO Journal* 6:146-152.
22. Khalighi, B., Chandran, K.B. and Chen, C.J. (1983) Steady Flow Development Past Valve Prostheses in a Model Human Aorta, I. Centrally Occluding Valves. *J. Biomechanics* 16:1003-1011.
23. Khalighi, B., Chandran, K.B. and Chen, C.J. (1983) Steady Flow Development Past Valve Prostheses in a Model Human Aorta, II. Tilting Disc Valves. *J. Biomechanics* 16: 1013-1018.
24. Chandran, K.B., Cabell, G.N., Khalighi, B. and Chen, C.J. (1983) Laser Anemometry Measurement of Pulsatile Flow Past Aortic Valve Prothesis. *J. Biomechanics* 16: 865-873.
25. Chandran, K.B. and Khalighi, B. (1984) A Note on the Blood Analog for In Vitro Testing of Heart Valve Bioprosthesis. *J. Biomechanical Engineering* 106:112-114.
26. Chandran, K.B., Olshansky, B., Attarwala, Y. and Skorton, D.J. (1984) Finite Element Analysis of 3-D Echocardiographic Data in the Evaluation of Diastolic Left Ventricular Function. *Automedica* 5: 151-169.
27. Nikraves, P.E., Skorton, D.J., Chandran, K.B., Pandian, N.G. and Kerber, R.E. (1984) Computerized Three-dimensional Finite Element Reconstruction of the Left Ventricle from Cross-sectional Echocardiograms. *Ultrasonic Imaging* 6: 48-59.
28. Liu, Y.K., Chandran, K.B., Heath, R.G. and Unterharnscheidt, F. (1984) Subcortical EEG Changes in Rhesus Monkeys Following Experimental Hyperextension-Hyperflexion (Whiplash). *Spine* 9: 329-338.
29. Chandran, K.B., Cabell, G.N., Khalighi, B. and Chen, C-J (1984) Pulsatile Flow Past Aortic Valve Bioprosthesis in a Model Human Aorta. *J. Biomechanics* 17: 609-619.
30. Skorton, D.J., Chandran, K.B., Collins, S.M., Petree, L.P., McPherson, D.D., Olshansky, B., Noel, M.P. and Kerber, R.E. (1985) Three-Dimensional Ultrasonic Cardiac Reconstruction: General Aspects and Application to Finite Element Analysis of the Left Ventricle. in S. Sideman and R. Beyar (Eds.) *Simulation and Imaging of the Cardiac Systems*, Boston, Martinus Nijhoff Publishers, pp. 174-189.
31. Chandran, K.B. (1985) Pulsatile Flow Past St. Jude Bileaflet Valve: An In Vitro Study. *J. Thoracic and Cardiovascular Surgery* 89:743-749.
32. Chandran, K.B., Khalighi, B. and Chen, C.J. (1985) Experimental Study of Physiological Pulsatile Flow Past Valve Prostheses in a Model Human Aorta. I. Caged Ball Valves. *J. Biomechanics* 18:763-772.
33. Chandran, K.B., Khalighi, B. and Chen, C.J. (1985) Experimental Study of Physiological Pulsatile Flow Past Valve Prostheses in a Model Human Aorta. II. Tilting Disc Valve and the Effect of Orientation. *J. Biomechanics* 18:773-780.

34. Chandran, K.B., Fatemi, R., Hiratzka, L.F. and Harris, C. (1986) Effect of Wedging on the Flow Characteristics Past Tilting Disc Aortic Valve Prosthesis. *J. Biomechanics* 19:181-186.
35. Chandran, K.B. (1986) Flow Dynamics of Prosthetic Heart Valves. *Mechanical Engineering, ASME* 108:53-56, January, 1986.
36. Chen, C.J., Yu, C-H, and Chandran, K.B. (1987) Finite Analytic Numerical Solution of Unsteady Laminar Flow Past an Axisymmetric Valve. *J. Eng. Mechanics Div. (ASCE)* 113:1147-1162.
37. Chandran, K.B., Fatemi, R. and Schoepfoerster, R. (1986) Dependence of tissue leaflet motion on the viscosity of the blood analog fluid. *Life Support Systems* 4: 289-303.
38. McPherson, D.D., Skorton, D.J., Kodiyalam, S., Petree, L., Noel, M.P., Kieso, R., Kerber, R.E., Collins, S.M. and Chandran, K.B. (1987) Finite Element Analysis of Myocardial Diastolic Function using Three-Dimensional Echocardiographic Reconstructions: Application of a New Method for the Study of Acute Ischemia in Dogs. *Circulation Research* 60:674-682.
39. Chandran, K.B.(1988) Hemodynamics of Prosthetic Valves. *Encyclopedia for Medical Instrumentation* , J. G. Webster (Editor), Wiley Interscience, 3: 1475-83.
40. Chen, C. J., Yu C. H. and Chandran, K. B.(1988) Steady Turbulent Flow Through a Disc-type Valve. I: Finite Analytic Solution. *J. Eng. Mechanics Division. ASCE* , 114:777-796.
41. Yu C. H., Chen C. J. and Chandran, K. B. (1988) Steady Turbulent Flow Through a Disc-type Valve II: Parametric Study on Disk Size and Position. *J. Eng. Mechanics Division ASCE* , 114:797-811.
42. Chandran, K.B., Schoepfoerster, R., Fatemi, R. and Dove, E.L. (1988) An In Vitro Experimental Comparison of Edwards-Duromedics and St. Jude Bileaflet Heart Valve Prostheses. *Medical Physics and Physiological Measurements* 9:233-241.
43. Collins, S.M., Chandran, K.B. and Skorton, D.J. (1988) Three-dimensional cardiac imaging. *Echocardiography* 5:311-319.
44. Vandenberg, B.F., Dellsperger, K.C., Chandran, K.B. and Kerber, R.E. (1988) Detection, Localization and Quantitation of Bioprosthetic Mitral Valve Regurgitation: An In Vitro Two-Dimensional Color Doppler Flow Mapping Study. *Circulation* 78:529-538.
45. Chandran, K.B., Schoepfoerster, R. and Dellsperger, K.C. (1989) Effect of Prosthetic Mitral Valve Geometry and Orientation on the Flow Dynamics in a Model Human Left Ventricle. *J. Biomechanics* 22:51-65.
46. Yearwood, T. L. , Misbach, G. A. and Chandran, K.B. (1989) Experimental fluid dynamics of aortic stenosis of the human aorta. *Clinical Physics and Physiological Measurements* 10:11-24.
47. Chandran, K.B., Fatemi, R., Schoepfoerster, R., Wurzel, D., Hansen, G., Yu, L-S., Pantalos, G. and Kolff, W.J. (1989) In vitro comparison of velocity profiles and turbulent shear stress distal to polyurethane trileaflet and pericardial prosthetic valves. *Artificial Organs* 13:148-154.
48. Chandran, K.B., Schoepfoerster, R., Wurzel, D., Hansen, G., Yu, L-S., Pantalos, G. and Kolff, W.J. (1989) Hemodynamic comparison of polyurethane trileaflet and bioprosthetic heart valves. *Transactions ASAIO* 35:132-138.

49. Chandran, K.B., Wagle, V. Fisher, D., Collins, S., Rumberger, J., McPherson, D.D., and Skorton, D.J. (1989) A Note on the Finite Element Modeling of the Left Ventricle. *J. Eng. Mech., Technical Note*, 118:1821-27.
50. Schoepfoerster, R., Yearwood, T.L. and Chandran, K.B. (1989) Prediction of stenotic valve orifice area: An in vitro study on bioprosthesis. *Catheterization and Cardiovascular Diagnosis* 18: 36-47.
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2. Krishnan, S., Udaykumar, H. S., Herbertson, L. H., Deutsch, S., Manning, K. B., and Chandran, K. B. Impact of design parameters on flow dynamics and platelet activation in bi-leaflet mechanical valves. *J. Biomechanical Engineering* (submitted October 06).

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