InSciTech
Insight Science Technology

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Andrew W. Siefert, Ph.D.

Professional Profile

Dr. Siefert's area of expertise is in medical device design evaluation, with emphasis in cardiovascular implants, devices, and support systems. Dr. Siefert is additionally experienced in consumer product design evaluation. His expertise in these areas includes:

- Litigation Support – Scientific and technical issue support for design defects, manufacturing defects, and/or marketing defects for product liability claims. Scientific and technical issue support for criminal investigations, accidental injuries, and occupational injuries.
- Product Design Evaluation – Competitive design review, literature analyses, specification development, patent and intellectual property evaluation, reverse engineering, and product comparison.
- Product Test Strategy Development – Product hazard and failure mode identification, boundary condition identification, choice of test model, study design, use of standard and custom test methods, statistical planning, and data interpretation.
- Product Testing – Functional product testing, structural product testing, fluid mechanical testing, material characterization, chemical characterization, fatigue/wear testing, corrosion evaluation, friction testing, and evaluation of implanted medical device loading. Additional expertise in computational analyses for structural and fluid-mechanical phenomenon.

Dr. Siefert's success in these areas has been supported by his analytical, statistical, computational, and experimental expertise. Prior to InSciTech, Dr. Siefert worked at Exponent Failure Analysis Associates, Inc.

Academic Credentials and Awards

Ph.D., Bioengineering, Georgia Institute of Technology, 2014
M.S., Mechanical Engineering, Michigan State University, 2009
B.S., Mechanical Engineering, Michigan State University, 2007

Georgia Institute of Technology Outstanding Bioengineering Thesis Award, 2015
American Heart Association Pre-Doctoral Fellowship Award, 2013–2014
Georgia Tech Research and Innovation Travel Fellowship Award, 2013
Michigan State University College of Engineering Distinguished Service Award, 2008
1st Place-American Society of Mech. Eng. International Student Design Competition, 2008
Michigan State University Engineering Undergraduate Research Award, 2007
Michigan State University Dept. of Mechanical Engineering Best Poster, 2007

Committee Appointments

Association for the Advancement of Medical Instrumentation Cardiac Valve Prostheses Committee (ISO/TC 150/SC 2/WG 01), 2014-2015
Georgia Tech Bioengineering Graduate Student Advisory Committee, 2013–2014
Michigan State University College of Engineering Alumni Distinguished Scholarship Committee, 2008–2009
Michigan State University Engineering Design Days K-12 Event Organizing Committee, 2008
Michigan State University's Excellence in Teaching Award Committee, 2007
Michigan State University's Teacher-Scholar Award Committee, 2007

Peer Reviewer

Journal of Biomechanical Engineering, 2015-Present
Peer Reviewed Medical Research Program for the Department of Defense Congressionally Directed Medical Research Programs, 2015-Present
Biomedical Engineering Society Annual Meeting, 2015
Summer Biomechanics, Bioengineering, & Biotransport Conference, 2015
Cardiovascular Engineering and Technology, 2014-Present
The Annals of Thoracic Surgery, 2013-Present
EuroInterventions, 2013-Present

Academic Instruction

Teaching Assistant, Biosolid Mechanics, Georgia Institute of Technology, 2014
Guest Lecturer, Biofluid Mechanics, Georgia Institute of Technology, 2010–2013
Course Instructor, Grandparent's University Summer Program, Michigan State University, 2009
Guest Lecturer, Alternative Energy Systems, Michigan State University, 2008–2009
Course Instructor, Mechanics of Deformable Solids Laboratory, Michigan State University, 2008–2009
Course Instructor, Math, Science, and Technology Residential and Academics Program, Michigan State University, 2007–2009
Course Co-Instructor, Mechanical Design II, Michigan State University, 2007
Teaching Assistant, Mechanics of Deformable Solids Laboratory, Michigan State University, 2007

Volunteer

Gorman Cardiovascular Research Group, University of Pennsylvania Medicine, 2014-Present
Cardiovascular Fluid Mechanics Laboratory, Georgia Institute of Technology, 2014-Present

Publications

Siefert AW, Siskey RL. Bench models for assessing the mechanics of mitral valve repair and percutaneous surgery. Cardiovascular Engineering and Technology 2015; 6: 193-207.

Siefert AW, Rabbah JPM, Saikrishnan N, Kunzelman KS,Yoganathan AP. Isolated effect of geometry on mitral valve function for in-silico model development. Computer Methods in Biomechanics and Biomedical Engineering 2015; 18:618-627

Siefert AW, Rabbah JP, Bolling SF, Yoganathan AP. Maximize coaptation length and reduce tethering: The keys to repairing severe ischemic mitral regurgitation? (Reply to the Editor). Journal of Thoracic and Cardiovascular Surgery 2014; 148:1771-1772.

Siefert AW. Early experiences with a new three-dimensional annuloplasty ring for the treatment of functional tricuspid regurgitation (Invited Commentary). The Annals of Thoracic Surgery 2014; 98:2044-2045.

Siefert AW, Pierce E, Lee M, Jensen M, Aoki C, Takebayashi S, Esmarates JF, Gorman R, Gorman J, Yoganathan A. Suture forces in undersized mitral annuloplasty: Novel device and measurements. The Annals of Thoracic Surgery 2014; 98:305–309.

Siefert AW*, Rabbah JPM*, Pierce E, Kunzelman KS, Yoganathan AP. Quantitative evaluation of annuloplasty on mitral valve chordae tendineae forces to supplement surgical planning model development. Cardiovascular Engineering and Technology 2014; 5:35–43 (* denote co-first authors).

Rabbah JPM*, Siefert AW*, Bolling SF, Yoganathan AP. Mitral valve annuloplasty and anterior leaflet augmentation for ischemic mitral regurgitation: Quantitative comparison of coaptation and subvalvular tethering. Journal of Thoracic and Cardiovascular Surgery 2014; 148:1688-1693. (* denote co-first authors).

Rabbah JPM, Saikrishnan N, Siefert AW, Yoganathan AP. Critical review of mitral valve mechanics in healthy and functional disease. Journal of Biomechanical Engineering 2014; 135:021007.

Sterns G, Saikrishnan N, Siefert AW, Yoganathan AP. Transcatheter aortic valve implantation can potentially impact short-term and long-term functionality: An in vitro study. International Journal of Cardiology 2014; 172:e421-422

Siefert AW, Touchton Jr. SA, McGarvey JR, Takebayashi S, Rabbah JPM, Jimenez JH, Saikrishnan N, Gorman RC, Gorman III JH, Yoganathan AP. In-vivo mitral annuloplasty ring transducer: Implications for implantation and annular downsizing. Journal of Biomechanics 2013; 46:2550–2553.

Publications (Continued)

Siefert AW, Icenogle DA, Rabbah JPM, Saikrishnan N, Rossignac J, Lerakis S, Yoganathan AP. Accuracy of a mitral valve segmentation method using J-splines for real-time 3D echocardiography data. Annals of Biomedical Engineering 2013; 41:1258–1268.

Siefert AW, Rabbah JPM, Koomalsingh KJ, Touchton Jr. SA, Saikrishnan N, Jeremy R McGarvey, Gorman RC, Gorman III JH, Yoganathan AP. In-vitro mitral valve simulator mimics systolic valvular function of chronic ischemic mitral regurgitation ovine model. Annals of Thoracic Surgery 2013; 95:824–829.

Siefert AW, Jimenez JH, Koomalsingh KJ, Aguel F, West S, Shuto T, Snow TK, Gorman RC, Gorman III JH, Yoganathan AP. Contractile mitral annular forces are reduced in an ovine model of ischemic mitral regurgitation. Journal of Thoracic and Cardiovascular Surgery 2013; 146:422–428.

Herrmann TA, Siefert AW, Pressman G, Gollin HR, Touchton Jr. SA, Saikrishnan N, Yoganathan AP. In-vitro comparison of Doppler and catheter measured pressure gradients in 3D models of mitral valve calcification. Journal of Biomechanical Engineering 2013; 135:1–3.

Rabbah JPM, Chism BG, Siefert AW, Saikrishnan N, Veledar E, Thourani VH, Yoganathan AP. Effects of targeted papillary muscle relocation on mitral leaflet tenting and coaptation. Annals of Thoracic Surgery 2013; 95: 613–620.

Dolensky JR, Casa LDC, Siefert AW, Yoganathan AP. In vitro assessment of available coaptation area as a novel metric for the quantification of tricuspid valve coaptation. Journal of Biomechanics 2013; 46:832–836.

Jensen MO, Honge JL, Benediktsson JA, Siefert AW, Jensen H, Yoganathan AP, Snow TK, Hassenkam JM, Nygaard H, Nielsen SL. Mitral valve annular downsizing forces: Implications for annuloplasty device development. Journal of Thoracic and Cardiovascular Surgery 2013; 148:83-89.

Saikrishnan N, Siefert AW, Rabbah JPM, Padala M, Yoganathan AP. Letter regarding the article by Vismara et al published in Int J Artif Organs 2011; 34(4): 383–391. International Journal of Artificial Organs 2012; 35:158–159.

Siefert AW, Jimenez JH, Koomalsingh KJ, West S, Shuto T, Gorman RC, Gorman III JH, Yoganathan AP. Dynamic Assessment of mitral annular force profile in an ovine model. Annals of Thoracic Surgery 2012; 94:58–64.

Siefert AW, Jimenez JH, West S, Koomalsingh KJ, Gorman RC, Gorman III JH, Yoganathan AP. In vivo transducer to measure mitral annular forces. Journal of Biomechanics 2012; 45:1514–1516.

Publications (Continued)

Rabbah JPM, Siefert AW, Spinner EM, Saikrishnan N, Yoganathan AP. Peak mechanical loads induced in the in-vitro edge-to-edge repair of posterior leaflet flail. Annals of Thoracic Surgery 2012; 94:1445–1452.

Pierce EL, Siefert AW, Paul DM, Wells SK, Bloodworth IV CH, Takebayashi S, Aoki C, Jensen MO, Gillespie MJ, Gorman RC, Gorman III JH, Yoganthan AP. How Local Annular Force and Collagen Density Govern Mitral Annuloplasty Ring Dehiscence Risk. The Annals of Thoracic Surgery 2015; (Submitted Revision, Awaiting Decision)

Pierce EL, Gentile J, Siefert AW, Gorman RC, Gorman III JH, Yoganathan AP. Real-time recording of annuloplasty suture dehiscence reveals potential mechanism for dehiscence cascade. Journal of Thoracic and Cardiovascular Surgery 2015; (Submitted Revision, Awaiting Decision)

Book Chapter

Jensen MO, Siefert AW, Okafor I, Yoganathan AP. Heart Valve Measurement Technologies. In Advances in Heart Valve Biomechanics. Sacks MS and Liao J (Ed.). To be published in 2016.

Conference Proceedings

Pierce EL, Spragan DD, Bloodworth CH, Kawamura T, Takayama T, Jensen MO, Siefert AW, Gorman RC, Gorman III JH, Yoganathan AP. Can Optimized Annuloplasty Ring Size and Shape Mitigate Risk of Dehiscence? American Association for Thoracic Surgery Mitral Conclave, New York, NY, April 2015. (Poster Presentation).

Pierce EL, Paul DM, Wells SK, Bloodworth CH, Jensen MO, Siefert AW, Gorman RC, Gorman III JH, Yoganathan AP. Why is Annuloplasty Ring Dehiscence More Common on the Posterior Mitral Valve Annulus? The Heart Valve Society Scientific Meeting, Monte Carlo, Monaco, May 2015. (Poster Presentation).

Grbic S, Easley TF, Mansi T, Neumann D, Pierce EL, Jensen MO, Bloodworth C, Siefert AW, Krebs J, Yuh D, Yoganathan A, Comaniciu D. Multi-modal validation framework of mitral valve geometry and biomechanical models. Biomedical Engineering Society Annual Meeting, San Antonio, TX, October 2014. (Oral Presentation).

Bloodworth IV CH, Pierce EL, Easley TF, Toma M, Khalighi A, Lee CH, Sacks M, Siefert AW, Jensen MO, Ajit P. Yoganathan. Design of an in vitro simulation pipeline for the development of computational mitral valve modeling. Biomedical Engineering Society Annual Meeting, San Antonio, TX, October 2014. (Oral Presentation).

Conference Proceedings (Continued)

Skov SN, Røpcke DM, Siefert AW, Ilkjær C, Tjørnild MJ, Yoganathan AP, Nygaard H, Nielsen SL, Jensen MO. New concept for measuring the forces in mitral valve annuloplasty rings. Biomedical Engineering Society Annual Meeting, San Antonio, TX, October 2014. (Poster Presentation).

Lee M, Siefert AW, Pierce EL, Aoki C, Takebayashi S, Jensen MO, Gorman RC, Yoganathan AP, Gorman III JH. Mitral annuloplasty cyclic suture forces: True-sized versus undersized annuloplasty rings. American Association for Thoracic Surgery Cardiovascular Valve Symposium, Istanbul, Turkey, September 2014. (Poster Presentation).

Jensen MO, Siefert AW, Toma M, Gorman RC, Gorman III JH, Yoganathan AP. Utilizing computational and experimental tools in tandem for development and evaluation of mitral valve devices. Medical Device and Innovation Consortium Annual Meeting, Washington, DC, June 2014 (Oral Presentation).

Pierce, EL, Siefert AW, Lee M, Aoki C, Gorman RC, Gorman III JH, Yoganathan AP. Annuloplasty suture forces: Preliminary insight for identifying the mechanisms of ring dehiscence. Valves in the Heart of the Big Apple VIII Meeting, New York, NY, May 2014 (Oral Presentation).

Siefert AW, Rabbah JPM, Bolling SF, Yoganathan AP. Mechanistic comparison of restrictive annuloplasty and adjunct anterior leaflet augmentation for ischemic mitral regurgitation. American Association of Thoracic Surgery 94th Annual Conference, Toronto, Canada, April 2014. (Oral Presentation).

Touchton Jr. SA, Siefert AW, Herrmann TA, Rabbah JPM, Saikrishnan N, Kunzelman KS, Yoganathan AP. Isolated effect of geometry on mitral valve function for in-silico model development. Biomedical Engineering Society Annual Conference, Seattle, WA, September 2013. (Oral Presentation).

Siefert AW, Icenogle DA, Rabbah JPM, Saikrishnan N, Rossignac J, Lerakis S, Yoganathan AP. Accuracy of a mitral valve segmentation method for real-time 3D echocardiography using disease mitral valve models. The Society of Heart Valve Disease 7th Biennial Congress, Venice, Italy, June 2013. (Oral Presentation).

Neumann D, Grbic S, Mansi T, Voigt I, Rabbah JP, Siefert AW, Saikrishnan N, Yoganathan AP, Yuh DD, Ionasec R. Multi-modal pipeline for comprehensive validation of mitral valve geometry and functional computational models. MICCAI STACOM Proceedings 2013. (Oral Presentation and Paper).

Sterns G, Saikrishnan N, Siefert AW, Yoganathan AP. The Effects of transcatheter aortic valve placement and sizing on geometric orifice area and leaflet curvature. Biomedical Engineering Society Annual Conference, Seattle, WA, September 2013. (Oral Presentation).

Conference Proceedings (Continued)

Rabbah JPM, Saikrishnan N, Siefert AW, Yoganathan AP. Developing an experimental database for mitral valve modeling, surgical repair, and device evaluation. ASME/FDA 1st Annual Frontiers in Medical Devices: Applications of Computer Modeling and Simulation (FMD), Washington, DC, September 2013. (Oral Presentation).

Siefert AW, Touchton Jr, SA, McGarvey JR, Rabbah JPM, Saikrishnan N, Gorman RC, Gorman III JH, Yoganathan AP. Annuloplasty ring stresses: Implications for Implantation and Annulus Downsizing. American Association for Thoracic Surgery Mitral Conclave, New York, NY, May 2013. (Poster Presentation).

Siefert AW, Jimenez JH, Gorman RC, Gorman III JH, Yoganathan AP. Novel method to quantify forces with the heart's native valves. Georgia Tech Research and Innovation Conference, Atlanta, GA, February 2013. (Poster Presentation).

Touchton SA, Siefert AW, Koomalsingh KJ, Rabbah JP, Strohsnitter L, Saikrishnan N, Gorman RC, Gorman JH 3rd, Yoganathan AP. In vivo validation of an in vitro model of ischemic mitral regurgitation. Biomedical Engineering Society Annual Conference, Atlanta, GA, October 2012. (Poster Presentation).

Herrmann TA, Gollin H, Siefert AW, Haggerty CM, Telling K, Pressman G, Yoganathan AP. Patient specific modeling of mitral stenosis: Isolated effect of restricted leaflet opening on transvalvular pressure gradient. Biomedical Engineering Society Annual Conference, Atlanta, GA, October 2012. (Poster Presentation).

Siefert AW, Rabbah JP, Saikrishnan N, Koomalisingh KJ, Gorman RC, Gorman JH, III, Yoganathan AP. Boundary conditions for mechanobiological testing of mitral valve leaflets. 7th International Symposium on Biomechanics in Vascular Biology & Cardiovascular Disease, Atlanta, GA, April 2012. (Poster Presentation).

Siefert AW, Jimenez JH, West S, Koomalsingh K, Shuto T, Gorman RC, Gorman III JH, Yoganathan AP. Quantification of dynamic annular forces in an ovine model of ischemic mitral regurgitation. American College of Cardiology i2 with TCT, Chicago, IL, March 2012. (Poster Presentation).

Chism B, Rabbah JPM, Siefert AW, Yoganathan AP. Efficacy of papillary muscle relocation in an in-vitro model of reducing mitral leaflet tethering. Biomedical Engineering Society Annual Meeting, Hartford, CT, October 2011. (Oral Presentation).

Siefert AW. Mitral valve force balance: Unraveling the forces that exist within the valve and their importance for surgical repairs aiming to restore normal function. Georgia Tech and Emory Biomechanics Symposium, Atlanta, GA, July 2011. (Oral Presentation).

Conference Proceedings (Continued)

Siefert AW, Jimenez JH, West S, Koomalsingh K, Shuto T, Aguel F, Gorman RC, Gorman III JH, Yoganathan AP. In-vivo force measurement of the contractile mitral annulus. American Association for Thoracic Surgery Mitral Conclave, New York, NY, May 2011. (Poster Presentation).

Siefert AW. Bioengineering at the Georgia Institute of Technology: Innovation and international research. University College of Århus Ph.D. Day, Århus, Denmark, January 2011. (Oral Presentation).

Siefert AW. Communication skills in English and Engineering: A critical need. American Society of Engineering Education, North Central Section Conference, Dayton, OH, March 2008. (Oral Presentation and Paper).