GLENN R. BUTTERMANN, MD, MS

Curriculum Vitae

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BORN February 2, 1958; Madison, Wisconsin

OCCUPATION
Orthopaedic Surgeon, Midwest Spine & Brain Institute, Stillwater, MN

Assistant Clinical Professor, Shriners Hospital, Twin Cities Campus

Chief Medical Officer and Founder, Dynamic Spine, Inc.

EDUCATION

1994 - 1995	Spine Fellowship University of California, San Francisco, CA
1990 - 1994	Orthopaedic Surgery Residency University of Minnesota, Minneapolis, MN
1988 - 1990	Biomechanics Fellowship in Orthopaedic Surgery University of Minnesota, Minneapolis, MN
1987 - 1988	Surgical Internship University of Chicago, Chicago, IL
1983 - 1987	M.D. Degree Mayo Medical School, Rochester, MN
1982 - 1983	M.S. Degree in Engineering (Bioengineering) University of California, San Diego, CA
1976 - 1982	B.A. Degree in Biology University of California, San Diego, CA
1976 - 1981	B.A. Degree in Physics with specialization in Biophysics Minor Degree in Sociology University of California, San Diego, CA
1973 - 1976	Santa Monica High School, Santa Monica, CA

HONORS/AWARDS/GRANTS

2025	Nomination for the North American Spine Society (NASS) Leon Wiltse Award
2017	Recertification for the American Board of Orthopaedic Surgeons
2008	UC San Francisco Visiting Lecturer

2007	Recertification for the American Board of Orthopaedic Surgeons
2003	NIH Small Business Innovation Research Grant (#1 R43 AR048732-01 A1)
2000	Scoliosis Research Society - Hibbs Clinical Award
1997	Diplomat of the American Board of Orthopaedic Surgeons
1990	American Orthopaedic Association - Zimmer: Resident Travel Award
1989	North American Spine Society - AcroMed Research Award
1989, 1988	NIH Trainingship Grant
1985	American Heart Association: Helen N. & Harold B. Shapira Scholarship
1982	NIH Trainingship Grant

ISSUED US PATENTS

U.S. Patent (1998) No. 5,827,328: Intervertebral Prosthetic Device
U.S. Patent (2004) No. 6,761,723: Apparatus and Method for Performing Spinal Surgery
U.S. Patent (2007) No. 7,303,565: Apparatus and Method for Performing Spinal Surgery
U.S. Patent (2011) No. 8,057,549: Apparatus and Method for Performing Spinal Surgery
U.S. Patent (2014) No. 8,790,380: Segmental Orthopedic Device for Spinal Elongation and for Treatment of Scoliosis
U.S. Patent (2015) No. 9,204,899: Segmental Orthopedic Device for Spinal Elongation and for Treatment of Scoliosis
U.S. Patent (2015) No. 9,204,908: Segmental Orthopedic Device for Spinal Elongation and for Treatment of Scoliosis
U.S. Patent (2016) No. 9,277,950: Low-Profile Uniplanar Bone Screw
U.S. Patent (2017) No. 9,770,275: Orthopaedic Plate
U.S. Patent (2017) No. 9,775,650: Screw-clamp Orthopaedic Device and Methods of Implementation
U.S. Patent (2018) No. 10,045,802: Orthopaedic Device
U.S. Patent (2020) No. 10,555,760: Bone Attachment Assembly
U.S. Patent (2020) No. 10,709,480: Adjustable Screw-clamp Orthopaedic Apparatus
U.S. Patent (2023) No. 11,583,263: Dilator Assembly
U.S. Patent (2023) No. 11,596,448: Bone Attachment Assembly
U.S. Patent (2026) No. 12,569,278: Bone Attachment Assembly

OUTSIDE US PATENTS

European Patent No. 0948299, 1342456, 2182871, 2675376, 1651150, 2967675, 3131486, 2961338
United Kingdom Patents No. 0948299, 1342456
German Patents No. DE69733850, DE69722244, DE60235919, DE602008033098-2
French Patents No. 1342456
Japanese Patents No. 3677050
Australian Patents No. 2008279798, 2011264818, 2012217915
Canadian Patents No. 2694437, 2927433, 2826941

FOREIGN LANGUAGES

Fluent in German

PROFESSIONAL SOCIETIES

Fellow of the American Association of Orthopaedic Surgeons, Minnesota Orthopaedic Society, North American Spine Society, Orthopaedic Research Society, Scoliosis Research Society, Society of Lateral Access Surgery

PUBLICATIONS

1. Yen RT, Fung YC, Ho HH, **Buttermann GR**. Speed of stress wave propagation in lung. Journal of Applied Physiology 61:701-705, 1986. PMID: 3745063, doi: 10.1152/jappl.1986.61.2.701.

2. McCarthy PM, Trastek VF, Bell DG, **Buttermann GR**, Piehler JM, Payne WS, Weiland LH, Pairolero PC. The effectiveness of fibrin glue sealant for reducing experimental pulmonary air leak. Annuls of Thoracic Surgery 45:203-205, 1988. doi: 10.1016/s0003-4975(10)62438-1.

3. Kahmann RD, **Buttermann GR**, Lewis JL, Bradford DS. Facet loads in the canine lumbar spine before and after disc alteration. Spine 15(9):971-978, 1990. (Note: 1989 North American Spine Society - AcroMed Research Award, Quebec City, Quebec, Canada)

4. **Buttermann GR**, Kahmann RD, Lewis JL, Bradford DS. An experimental method for measuring force on the spinal facet joint: Description and application of the method. Journal of Biomechanical Engineering 113(4):375-386, 1991. (Note: 1990 American Orthopaedic Association - Zimmer: Resident Travel Award, Boston, MA)

5. **Buttermann GR**, Schendel MJ, Kahmann RD, Lewis JL, Bradford DS. *In vivo* facet joint loading of the canine lumbar spine. Spine 17(1):81-92, 1992.

6. Wood KB, Schendel MJ, Pashman RS, **Buttermann GR**, Lewis JL, Ogilvie JW, Bradford DS. *In vivo* analysis of canine intervertebral and facet motion. Spine 17(10):1180-86, 1992.

7. Schendel MJ, Wood KB, **Buttermann GR**, Lewis JL, Ogilvie JW. Experimental measurement of ligament force, facet force, and segment motion in the human lumbar spine. Journal of Biomechanics 26(4/5):427-438, 1993.

8. **Buttermann GR**, Janevic JT, Lewis JL, Lindquist CM, Wood KB, Schendel MJ. Description and application of instrumented staples for measuring *in vivo* bone strain. Journal of Biomechanics 27(8):1087-94, 1994.

9. **Buttermann GR**, Glazer PA, Bradford DS. The use of bone allografts in the spine. (Review) Clin Orthop 324:75-85, 1996.

10. Luo Z, **Buttermann GR**, Lewis JL. Determination of spinal facet joint loads from extra-articular strains: A theoretical validation. Journal of Biomechanics 29(6):785-790, 1996.

11. **Buttermann GR**, Heithoff KB, Ogilvie JW, Transfeldt EE, Cohen M. Vertebral body MRI related to lumbar fusion results. European Spine Journal 6(2):115-120, 1996.

12. **Buttermann GR**, Glazer PG, Hu SS, Bradford DS. Revision of failed lumbar fusions: A comparison of anterior autograft vs allograft. Spine 22(23):2748-2755, 1997.

13. **Buttermann GR**, Garvey TA, Hunt AF, Ogilvie JW, Transfeldt EE, Boachie-Adjei O, Bradford DS. Lumbar fusion results related to diagnosis. Spine 23(1):116-127, 1998.

14. Abe E, Nickel TD, **Buttermann GR**, Lewis JL, Transfeldt EE. Lumbar intradiscal pressure after posterolateral fusion and pedicle screw fixation. Tohoku J. Exp. Med. 186:243-253, 1998.

15. Abe E, Nickel TD, **Buttermann GR**, Lewis JL, Transfeldt EE. The effect of spinal instrumentation on lumbar intradiscal pressure. Tohoku J. Exp. Med. 187:237-247, 1999.

16. **Buttermann GR**, Putnam MD, Shine JD. Wrist position affects loading of the dorsal scaphoid: Possible effect on extrinsic scaphoid blood flow. Journal of Hand Surgery 26B(1): 34-40, 2001.

17. **Buttermann GR**, Glazer PG, Hu SS, Bradford DS. Anterior and posterior allografts in symptomatic thoracolumbar deformity fusion. Journal of Spinal Disorders 14(1):54-66, 2001.

18. **Buttermann GR**. Lumbar disc herniation regression after successful epidural steroid injection. Journal of Spinal Disorders 15(6):469-476, 2002.

19. Wood KB, **Buttermann GR**, Mehbod A, Garvey TA, Jhanjee R, Sechreist V. Operative compared with nonoperative treatment of a thoracolumbar burst fractures without neurological deficit: A prospective, randomized study. Journal of Bone and Joint Surgery 85A:773-781, 2003.

20. **Buttermann GR,** Putnam PD, McElfresh EC, Tountas CP, Walker GD. Idiopathic Osteonecrosis of the Scaphoid: A Series of Three Surgical Cases. American Journal of Orthopedics 33:142-148, 2004.

21. **Buttermann GR**. Treatment of lumbar disc herniation: epidural steroid injection compared with discectomy, A prospective randomized study. Journal of Bone and Joint Surgery 86A:670-679, 2004.

22. **Buttermann GR**, Beaubien B. Stiffness of prosthetic nucleus determines stiffness of reconstructed lumbar calf spine. Spine Journal 4(3):265-274, 2004.

23. Polga DJ, Beaubien BP, Kallemeier PM, Schellhas KP, Lew WD, **Buttermann GR**, Wood KB. *In vivo* measurement of intradiscal pressure in healthy thoracic intervertebral discs. Spine 29:1320-1324, 2004.

24. **Buttermann GR**. The Effect of Spinal Steroid Injections for Degenerative Disc Disease. Spine Journal 4(5):495-505, 2004.

25. Beaubien BP, Mehbod AA, Kallemeier PM, Lew WL, **Buttermann GR**, Transfeld EE, Wood KB. Posterior augmentation of an anterior lumbar interbody fusion: Minimally invasive fixation versus pedicle screws *in vitro.* Spine 29(19):E406-12, 2004. doi:10.1097/01.brs.0000141187.53366.9b.

26. Kallemeier PM, **Buttermann GR**, Beaubien BP, Chen X, Polga DJ, Lew WD, Wood KB. Validation, Reliability, and Complications of a Tethering Scoliosis Model in the Rabbit. Eur Spine J 15(4):449-56, 2006.

27. Freeman A L, Derincek A, Beaubien B P, **Buttermann G R**, Lew W D, Wood K B. *In vitro* comparison of bioresorbable and titanium anterior cervical plates in the immediate postoperative condition. Journal of Spinal Disorders 19(8):577-583, 2006.

28. **Buttermann GR**, Mullin WJ. Pain and disability correlated with disc degeneration via magnetic resonance imaging in scoliosis patients. Eur Spine J. 17(2):240-9, 2008.

29. **Buttermann GR**. Prospective non-randomized comparison of allograft with bone morphogenic protein versus iliac-crest autograft in Anterior Cervical Discectomy and Fusion. Spine Journal 8(3):426-435, 2008.

30. Kallemeier PM Beaubien BP, **Buttermann GR**, Polga DP, Wood KB. *In vitro* analysis of anterior and posterior fixation in an experimental unstable burst fracture model. Journal of Spinal Disorders 21(3):216-224, 2008.

31. **Buttermann GR**, Beaubien BP. *In vitro* disc pressure profiles below scoliosis fusion constructs. Spine 33(20):2134-42, 2008.

32. **Buttermann GR**, Beaubien BP, Saeger LC. Bovine Lumbar Intradiscal Pressures and Motion Segment Biomechanics. Spine Journal 9:105-114, 2009.

33. **Buttermann GR**, Chappuis J, Stoll J, Beaubien BP, Freeman AL. Interbody device endplate engagement affects motion segment biomechanics. Spine Journal 2009 9:564-573, 2009.

34. **Buttermann GR**, Beaubien BP. Biomechanical characterization of an annulus sparing spinal disc prosthesis. Spine Journal 9:744-753, 2009.

35. **Buttermann GR**, Beaubien BP, Freeman AL. In vitro biomechanics of an expandable vertebral body replacement with self-adjusting endplates. Spine Journal 10:1024-31, 2010.

36. **Buttermann** GR, Mullin WJ. Percutaneous vertebral body cement augmentation for back pain related to occult osteomyelitis/diskitis. Orthopedics 34(11):e788-92, 2011.

37. **Buttermann GR**, Mendenhall HV. Feasibility of the Runt Cow for *In Vivo* Testing of a Spinal Interbody Prosthesis with Preliminary Results. J Invest Surg. 25(2):112-22, 2012.

38. Freeman AL, **Buttermann GR,** Beaubien BP, Rochefort, WE. Compressive properties of fibrous repair tissue compared to nucleus and annulus. J Biomech. 46(10):1714-21, 2013 Epub 2013 May 1. doi: 10.1016/j.jbiomech.2013.03.034.

39. **Buttermann GR,** Thorson TM, Mullin WJ. Outcomes of Posterior Facet versus Pedicle Screw Fixation of Circumferential Fusion: A Cohort Study. Eur Spine J. 23(2): 347-355, 2014.

40. Wood KB, **Buttermann GR**, Phukan R, Harrod CC, Mehbod A, Shannon B, Bono CM, Harris MB. Operative Compared with Nonoperative Treatment of a Thoracolumbar Burst Fracture without Neurological Deficit: A Prospective Randomized Study with Follow-up at Sixteen to Twenty-Two Years. J Bone Joint Surg Am. 97(1):3-9, 2015.

41. **Buttermann GR,** Mullin WJ. Two-level circumferential lumbar fusion comparing midline and paraspinal posterior approach: 5-year interim outcomes of a randomized, blinded, prospective study. J Spinal Disorders & Techniques. 28(9):E534-43, 2015.

42. Garcia R, Yue JJ, Blumenthal S, Coric D, Patel VV, Leary SP, Dinh DH, **Buttermann GR**, Deutsch H, Girardi F, Billys J, Miller LE. Lumbar Total Disc Replacement for Discogenic Low Back Pain: Two-year Outcomes of the Activ-L Multicenter Randomized Controlled IDE Clinical Trial. Spine. 40(24):1873-81, 2015.

43. Freeman AL, Camisa WJ, **Buttermann GR,** Malcolm J. Flexibility and fatigue evaluation of oblique as compared to anterior lumbar interbody cages with integrated endplate fixation. J Neurosurg Spine. 24(1):54-9, 2016.

44. Beaubien BP, **Buttermann GR,** Freeman AL. Morphologic and biomechanical comparison of spinous processes and ligaments from scoliotic and kyphotic patients. J Biomech. 49(2):216-21, 2016.

45. Gornet M, **Buttermann GR**, Guyer R, Yue J, Ferko N, Hollmann S. Defining the Ideal Lumbar Total Disc Replacement Patient and Standard of Care. Spine. 42 (24S):S103-S107, 2017.

46. **Buttermann GR**. Anterior cervical discectomy and fusion outcomes over 10 years: A prospective study. Spine. 43(3):207-214, 2018.

47. Gornet MF, **Buttermann GR**, Wohns R, Billinghurst J, Brett DC, Kube R, J. Sales R, Wills NJ, Sherban R, Schranck FW, Copay AG. Safety and Efficiency of Cervical Disc Arthroplasty in Ambulatory Surgery Centers vs. Hospital Settings. International Journal of Spine Surgery. 12(5):557-564, 2018.

48. Yue JJ, Garcia R, Blumenthal S,; Coric D, Patel VV, Dinh DH, **Buttermann GR**, Deutsch H, Miller LE, Persaud EJ, Ferko NC. Five-year Results of a Randomized Controlled Trial for Lumbar Artificial Discs in Single-level Degenerative Disc Disease. Spine. 44 (24):1685-1696, 2019

49. Braxton E Jr, Wohlfeld BJ, Blumenthal S, Bozzio A, **Buttermann** G, Guyer R, Idema J, Laich D, Morreale J, Nikolakis M, Patel A, Price JS, Witt JP, Zigler J, Martin M. Postoperative Care Pathways Following Lumbar Total Disc Replacement: Results of a Modified Delphi Approach. Spine. 44 (Suppl 24):S1-S12, 2019.

50. **Buttermann GR,** Hollmann S, Arpino J-M, Ferko N. Value of Single Level Circumferential Fusion: A 10-Year Prospective Study and Cost Effectiveness Analysis Comparing Posterior Facet Versus Pedicle Screw Fixation. Eur Spine J. 2020 Feb;29(2):360-373. doi: 10.1007/s00586-019-06165-0

51. Radcliff K, Zigler J, Braxton E, **Buttermann G**, Coric D, Derman P, Garcia R, Jorgensen A, Ferko NC, Situ A, Yue J. Final Long-Term Reporting from a Randomized Controlled IDE Trial for Lumbar Artificial Discs in Single-Level Degenerative Disc Disease: 7-Year Results. Int J Spine Surg. Jul 15:8083. 2021. doi: 10.14444/8083.

52. Mortenson M, Montgomery A, **Buttermann G**. Chiropractic Care of a Female Veteran After Cervical Total Disk Replacement: A Case Report. J Chiropr Med.21;60-65, 2022. doi.org/10.1016/j.jcm.2022.02.008

53. **Buttermann GR**, Freeman AL, Simmons, BH. Allograft Reconstructed Iliac Bone-graft Donor Site Remodels to Viable Bone and Its Preliminary Clinical Effectiveness. Int J Spine Surg. 17(1): 60-68; 2023. doi:10.14444/8384

54. **Buttermann G.** Anterior Spinal Fusion for Thoraco-Lumbar Idiopathic Scoliosis Comparing Less Invasive Concave versus Traditional Convex Approach: A Pilot Study. J Clin Med. 2024 Jul 26;13(15):4383. doi: 10.3390/jcm13154383.

55. **Buttermann GR**, Thorson M, Saeger LC. Effectiveness of Epidural Amniotic Fluid Injections for Low Back Pain. Interv Pain Med. 2025 May 30;4(2):100598. doi: .1016/j.inpm.2025.100598.

56. **Buttermann GR**. Comparison of posterior cellular bonegraft options for single-level lumbar spinal fusion: a randomized trial. Spine J. 2026 Oct;26(10):1893-1906. doi: 10.1016/j.spinee.2026.06.001. Epub 2026 Jun 12. PMID: 42285441.

57. **Buttermann GR**. Laminoplasty outcomes in North American patients treated with internal fixation: A prospective study with minimum 5-Year follow-up. Accepted, JAAOS Global, 2026.

58. **Buttermann GR**. Cervical disc replacement and fusion hybrid vs anterior fusion outcomes with 8 to 12 Year Follow-up: A prospective cohort study. Submitted, Spine, 2026.

ABSTRACTS/PRESENTATIONS: National & International

1. DeLeeuv D, Malley M, **Buttermann GR**, Okamura M, Feher G. The stark effect in reaction centers from R. Spheroides. Biophysical Journal, 37:111a, 1982.

2. Kahmann RD, **Buttermann GR**, Lewis JL, Bradford DS. Facet loads and locations in canine lumbar spines: *In vitro* application of a new method. 4th Annual North American Spine Society Meeting, Quebec City, Quebec, Canada, 1989.

3. **Buttermann GR**, Schendel MJ, Lewis JL, Bradford DS. *In vivo* facet forces in the normal canine lumbar spine. 36th Annual Orthopaedic Research Society Meeting, New Orleans, LA, 1990.

4. Schendel MJ, Wood KB, **Buttermann GR**, Lewis JL, Ogilvie JW. The effects of facetectomy on motion segment biomechanics. 17th Annual International Society for the Study of the Lumbar Spine Meeting, Boston, MA, 1990.

5. **Buttermann GR**, Schendel MJ, Lewis JL, Bradford DS. Analysis of *in vivo* canine lumbar spine facet loads. 17th Annual International Society for the Study of the Lumbar Spine Meeting, Boston, MA, 1990. (Podium presentation)

6. Wood KB, Schendel MJ, **Buttermann GR**, Lewis JL, Bradford DS. *In vivo* analysis of canine intervertebral and facet motion. 37th Annual Orthopaedic Research Society Meeting, Anaheim, CA, 1991.

7. **Buttermann GR**, Janevic JT, Lewis JL, Lindquist CM. Instrumented staples as a method for measuring *in vivo* bone strain. 37th Annual Orthopaedic Research Society Meeting, Anaheim, CA, 1991.

8. **Buttermann GR**, Schendel MJ, Wood KB, Lewis JL, Ha K-Y. *In vivo* canine facet load changes with intervertebral lumbar disc alteration. 39th Annual Orthopaedic Research Society Meeting, San Francisco, CA, 1993.

9. **Buttermann GR**, Heithoff KB, Ogilvie JW, Transfeldt EE, Cohen M. Vertebral body MRI related to lumbar fusion results. 8th Annual North American Spine Society Meeting, San Diego, CA, 1993.

10. **Buttermann GR**, Hunt AF, Garvey TA, Ogilvie JW, Transfeldt EE, Bradford DS, Boachie-Adjei O. Results of lumbar fusion related to diagnosis. 9th Annual North American Spine Society Meeting, Minneapolis, MN, 1994.

11. Fedewa M, Schendel MJ, **Buttermann GR**, Transfeldt EE. *In vitro* spinal endplate loading before and after fusion. 41st Annual Orthopaedic Research Society Meeting, Orlando, FL, 1995.

12. **Buttermann GR**, Hunt AF, Garvey TA, Ogilvie JW, Transfeldt EE, Bradford DS, Boachie-Adjei O. Lumbar fusion results related to diagnosis. 62nd Annual Meeting of the American Academy of Orthopaedic Surgeons, Orlando, FL, 1995.

13. Glazer PA, Colliou O, **Buttermann GR**, Bueff HU, Lotz JC, Bradford DS. The management of complex spinal deformities requiring fusion of the lumbosacral junction: biomechanical considerations. 22nd Annual International Society for the Study of the Lumbar Spine Meeting, Helsinki, Finland, 1995.

14. **Buttermann GR**, Glazer PG, Hu SS, Bradford DS. Results of interbody allografts in revision of failed lumbar fusions. 10th Annual North American Spine Society Meeting, Washington D.C., 1995.

15. **Buttermann GR**, Glazer PG, Hu SS, Bradford DS. Structural autograft vs allograft in lumbar fusion revision. 7th Annual International Conference on Lumbar Fusion & Stabilization Meeting, Budapest, Hungary, 1995.

16. **Buttermann GR**, Glazer PG, Hu SS, Bradford DS. Structural autograft vs allograft in lumbar fusion revision. 23rd Annual International Society for the Study of the Lumbar Spine Meeting, Burlington, Vermont, 1996.

17. **Buttermann GR**, Glazer PG, Hu SS, Bradford DS. Anterior and posterior allografts in thoracolumbar deformity fusion. Second Combined North American Spine Society & Japanese Spine Research Society: Spine Across the Sea '97 Meeting, Kamuela, Hawaii, 1997.

18. Fedewa M, **Buttermann GR**, Schendel MJ, Transfeldt EE. Fusion effects on endplate loading. Second Combined North American Spine Society & Japanese Spine Research Society: Spine Across the Sea '97 Meeting, Kamuela, Hawaii, 1997.

19. **Buttermann GR**. Epidural steroid vs discectomy for large lumbar disc herniation. Second Combined North American Spine Society & Japanese Spine Research Society: Spine Across the Sea '97 Meeting, Kamuela, Hawaii, 1997.

20. **Buttermann GR.** Spine fusion outcomes depend on age and prior failure. Second Combined North American Spine Society & Japanese Spine Research Society: Spine Across the Sea '97 Meeting, Kamuela, Hawaii, 1997.

21. Abe E, Nickel TD, **Buttermann GR**, Lewis JL, Transfeldt EE. The effect of anterior and posterior lumbar spinal instrumentation on disc pressure. 12th Annual North American Spine Society Meeting, New York, NY, 1997.

22. **Buttermann GR**, Glazer PG, Hu SS, Bradford DS. Anterior and posterior allograft success in thoracolumbar deformity fusion. 33rd Annual Scoliosis Research Society Meeting, New York, NY, 1998.

23. **Buttermann GR**. Effect of spinal steroid injections in patients with degenerative disc disease and inflammatory endplates. 13th Annual North American Spine Society Meeting, San Francisco, CA, 1998.

24. Nickel TD, Fedewa M, **Buttermann GR**, Lewis JL. A transducer system for measuring contact forces in the knee joint. Proceedings of the 3rd World Congress on Biomechanics, Sapporo, Japan, August 1998.

25. **Buttermann GR**. Epidural steroid vs discectomy for lumbar disc herniation: A prospective randomized study. 66th Annual Meeting of the American Academy of Orthopaedic Surgeons, Anaheim, CA, 1999.

26. Abe E, Nickel TD, **Buttermann GR**, Lewis JL, Transfeldt EE. Disc pressure related to anterior and posterior spine fusion. 34th Annual Scoliosis Research Society Meeting, San Diego, CA, 1999.

27. Wood KB, **Buttermann GR**, Garvey TA, Sechreist F, Jhanjee R, Mehbod A, Kane R. Operative vs nonoperative treatment of thoracolumbar burst fractures without neurological deficit: A randomized, prospective study. 35th Annual Meeting of the Scoliosis Research Society, Cairns, Australia, 2000.

28. Wood KB, **Buttermann GR**, Garvey TA, Sechreist F, Jhanjee R, Mehbod A, Kane R. Operative vs nonoperative treatment of thoracolumbar burst fractures without neurological deficit: A randomized, prospective study. 68th Annual Meeting of the American Academy of Othopaedic Surgeons, San Francisco, CA, 2001.

29. **Buttermann GR**. The effect of successful epidural steroid injection on the natural history of lumbar disc herniation. 16th Annual Meeting of the North American Spine Society, Seattle, Washington, 2001.

30. **Buttermann GR**, Beaubien B. Modular mechanical prosthetic nucleus allows for control of motion segment stiffness. 2nd Annual Meeting of the Spine Arthroplasty Society, Montpellier, France, May 6-8, 2002.

31. **Buttermann GR**. Pain and disability correlated to MRI in scoliosis patients. San Francisco Spine Symposium, San Francisco, January 25, 2003.

32. Polga DJ, Beaubien BP, Kallemeier PM, Schellhas KP, Lew WD, **Buttermann GR**, Wood KB. *In vivo* characterization of intradiscal pressure in healthy thoracic intervertebral discs. 49th Annual Meeting of the Orthopaedic Research Society meeting, New Orleans, February 2003.

33. **Buttermann GR**, Beaubien BP. Load sharing of a prosthetic nucleus in response to external loads. 3rd Annual Meeting of the Spine Arthroplasty Society, Scottsdale, AZ, May 1-3, 2003.

34. **Buttermann GR**, Beaubien BP. Stiffness of prosthetic nucleus determines stiffness of reconstructed lumbar calf disc. 10th International Meeting on Advanced Spine Techniques, Rome, Italy, July 10-12, 2003.

35. Mehbod AA, Beaubien BP, Kallemeier PM, Lew WD, Perra JH, Transfeldt EE, Garvey TA, **Buttermann GR**, Wood KB. Posterior augmentation of anterior lumbar interbody fusion. 10th International Meeting on Advanced Spine Techniques, Rome, Italy, July 10-12, 2003.

36. **Buttermann GR**. Pain and disability correlated to MRI in scoliosis patients. 38th Annual Scoliosis Research Society Meeting, September 10-13, Quebec, Canada, 2003.

37. Polga DJ, Beaubien BP, Kallemeier PM, Schellhas KP, Lew WD, **Buttermann GR**, Wood KB. *In vivo* measurement of intradiscal pressure in healthy thoracic intervertebral discs. 38th Annual Scoliosis Research Society Meeting, September 10-13, Quebec, Canada, 2003.

38. Polga DJ, Beaubien BP, Kallemeier PM, Schellhas KP, Lew WD, **Buttermann GR**, Wood KB. *In vivo* measurement of intradiscal pressure in healthy thoracic intervertebral discs. 18th Annual Meeting of the North American Spine Society, San Diego, CA, October 21-25, 2003.

39. Mehbod AA, Beaubien BP, Kallemeier PM, Lew WD, Perra JH, Transfeldt EE, Garvey TA, **Buttermann GR**, Wood KB. Posterior augmentation of anterior lumbar interbody fusion. 18th Annual Meeting of the North American Spine Society, San Diego, CA, October 21-25, 2003.

40. **Buttermann GR**, Beaubien BP. Spinal load sharing of a compressible annulus sparing disc prosthesis. 19th Annual Meeting of the North American Spine Society, Chicago, IL, October 26-30, 2004.

41. Beaubien BP, Kallemeier PM, Derincek A, **Buttermann GR**, Lew WD, Kidder LS, Holthusen SM, Turner AS, Seim HB, Wood KB. Use of a bioresorbable plate in single level cervical spine fusion: A pilot study in sheep. 51st Annual Meeting of the Orthopaedic Research Society meeting, Washington D.C., February 20-23, 2005

42. Freeman A, Derincek A, Beaubien BP, Lew WD, **Buttermann GR**, Wood KB. In vitro comparison of bioresorbable and metallic cervical fusion plates in stabilizing a single-level ACDF. 7th International Congress on Spinal Surgery, Antalya, Turkey, April 14-17, 2005

43. **Buttermann GR**, Beaubien BP, Saeger LC. *In vivo* and *in vitro* lumbar disc loading in domestic quadrupeds. 5th Annual Meeting of the Spine Arthroplasty Society, New York, NY, May 4-7, 2005.

44. **Buttermann GR**. Prospective ACDF outcomes using iliac crest versus allograft with bone morphogenic protein. 12th International Meeting on Advanced Spine Techniques, Banff, Canada, July 7-9, 2005.

45. **Buttermann GR**, Beaubien BP, Saeger LC. *In vivo* and *in vitro* lumbar disc loading in domestic quadrupeds. 12th International Meeting on Advanced Spine Techniques, Banff, Canada, July 7-9, 2005.

46. **Buttermann GR**. Prospective ACDF outcomes using iliac crest versus allograft with bone morphogenic protein. 40th Annual Scoliosis Research Society Meeting, October 27-30, Miami, FL, 2005.

47. **Buttermann GR**. *In vivo* animal demonstration of safety, stability and motion preservation of an annulus sparing lumbar disc prosthesis. 52nd Annual Orthopaedic Research Society Meeting, Chicago, IL, 2006.

48. Kallemeier PM, Beaubien BP, **Buttermann GR**, Polga DR, Wood KB. *In vitro* biomechanical analysis of stabilization constructs in an experimental unstable burst fracture model. 52nd Annual Orthopaedic Research Society Meeting, Chicago, IL, 2006

49. Freeman A L, Derincek A, Beaubien B P, **Buttermann G R**, Lew W D, Wood K B. *In vitro* comparison of bioresorbable and titanium graft-containment plates in a single-level ACDF. 52nd Annual Orthopaedic Research Society Meeting, Chicago, IL, 2006.

50. **Buttermann GR**. Annulus Sparing Lumbar Disc Prosthesis Stability and Motion Preservation in an *In Vivo* Animal Model. 6th Annual Meeting of the Spine Arthroplasty Society, May 9-13, 2006, Montreal, Canada.

51. Kallemeier PM Beaubien BP, **Buttermann GR**, Polga DP, Wood KB. *In vitro* biomechanical analysis of stabilization constructs in an experimental unstable burst fracture model. 41st Annual Scoliosis Research Society Meeting, September 13-16, Monterey, CA, 2006.

52. **Buttermann GR**, Chappuis J, Stoll J, Beaubien BP, Freeman A L. An *in vitro* model of three lumbar interbody fusion devices. 53rd Annual Orthopaedic Research Society Meeting, February 11-14, San Diego, CA, 2007.

53. Beaubien BP, **Buttermann GR**. Helical axes of motion of normal, degenerated, and motion segments reconstructed with an annulus sparing prosthesis. 7th Annual Meeting of the Spine Arthroplasty Society, May 1-4, 2007, Berlin, Germany.

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55. **Buttermann GR**, Beaubien BP. *In vitro* disc pressure profiles below scoliosis fusion constructs. 22nd Annual Meeting of the North American Spine Society, Austin, TX, October 23-27, 2007.

56. **Buttermann GR**, Beaubien BP Freeman AL. Anterior Dynamic Stabilization via a Semi-Elastic Vertebral Body Prosthesis. 8th Annual Meeting of the Spine Arthroplasty Society, May 6-9, 2008, Miami, FL.

57. **Buttermann GR.** Fusion Enhancement of Single-Level ACDF in Smokers: A Randomized, Prospective Study. 23rd Annual Meeting of the North American Spine Society, Toronto, Ontario, Canada, October 14-18, 2008.

58. **Buttermann GR.** Outcomes of Facet vs Pedicle Screws in Posterior Fixation of Circumferential Fusion: A Cohort Study. 23rd Annual Meeting of the North American Spine Society, Toronto, Ontario, Canada, October 14-18, 2008.

59. **Buttermann GR.** Long Term ACDF Outcomes: A Prospective Study with Patient-Based Assessment. 23rd Annual Meeting of the North American Spine Society, Toronto, Ontario, Canada, October 14-18, 2008.

60. **Buttermann GR,** Mullin WJ. Two Level Circumferential Lumbar Fusion Outcomes Comparing Midline and Paraspinal Posterior Approach: A Randomized, Blinded, Prospective Study. 24th Annual Meeting of the North American Spine Society, San Francisco, CA, November 10-14, 2009.

61. Freeman AL, **Buttermann GR,** Beaubien BP, Rochefort, WE. Compressive Properties of Nucleus, Annulus, and Fibrous Repair Tissue. 56th Annual Orthopaedic Research Society Meeting, March 6-9, New Orleans, LA, 2010.

62. Freeman AL, Camisa WJ, **Buttermann GR,** Malcolm J. Biomechanical Evaluation of Anterior and Oblique Lumbar Interbody Cages with Integrated Endplate Fixation. Spineweek Meeting, May 28- June 1, Amsterdam, 2012.

63. Wood KB, Mehbod AA, **Buttermann GR**, Harrod CC. Operative vs Nonoperative Treatment of Thoracolumbar Burst Fractures without Neurological Deficit: Fifteen to Twenty Year Follow-up. 47th Annual Scoliosis Research Society Meeting, September 5-8, Chicago, IL, 2012.

64. Wood KB, Harrod CC, Mehbod AA, **Buttermann GR**, Operative vs Nonoperative Treatment of Thoracolumbar Burst Fractures without Neurological Deficit: 15 to 20 Year Follow-up. 27th Annual Meeting of the North American Spine Society, Dallas, TX, October 24-7, 2012.

65. Freeman AL, **Buttermann GR,** Camisa WJ, McGrew A. Biomechanical evaluation of a Lateral Lumbar Spacer with Integrated Plate Fixation. International Society for the Advancement of Spinal Surgery Meeting, April 3-5, Vancouver, Canada, 2013.

66. Wood KB, **Buttermann GR**, Harrod CC, Mehbod AA. Operative vs Nonoperative Treatment of Thoracolumbar Burst Fractures without Neurological Deficit: Fifteen to Twenty Year Follow-up. American Academy of Orthopaedic Surgeons Annual Meeting, March 19-22, Chicago, IL, 2013.

67. **Buttermann GR.** Lumbar Spinal Disc Replacement in a Community Setting: Early Results. 10th Annual Evidence and Technology Spine Summit of the North American Spine Society, Park City, UT, Feb 27-March 1, 2014.

68. **Buttermann GR.** XLIF vs ALIF Combined with Posterior Spinal Fusion in a Community Practice Setting. 10th Annual Evidence and Technology Spine Summit of the North American Spine Society, Park City, UT, Feb 27-March 1, 2014.

69**. Buttermann GR.** XLIF Combined with Posterior Spinal Fusion in a Community Practice. 7th Annual SOLAS Research Meeting, Miami Beach, FL, April 29, 2014.

70. **Buttermann GR.** Spinal Disc Replacement in a Community Practice Setting: Early Results. 2014 meeting of the International Society for the Advancement of Spine Surgery, Miami Beach, FL, April 30th - May 2, 2014.

71. **Buttermann GR.** Mid- to Longterm Outcomes of Adolescent Idiopathic Scoliosis Surgery Relative to Normals and Controls. 11th Annual Evidence and Technology Spine Summit of the North American Spine Society, Snowbird, UT, Feb 26-28, 2015.

72. **Buttermann GR.** Cervical hybrid TDR/ACDF versus Multi-level ACDF Outcomes. International Society for the Advancement of Spinal Surgery Meeting, April 14-17, San Diego, CA, 2015.

73. **Buttermann GR**, Mueller S. Surgical Outcomes of Adolescent Idiopathic Scoliosis Surgery Relative to Age and Length of Follow-up. 30th Annual Meeting of the North American Spine Society, Chicago, IL, Oct 14-17, 2015.

74. **Buttermann GR**, Similar Outcomes of hybrid TDR/ACDF versus Multi-level ACDF at 5-year Follow-up. 44th Annual Meeting of the Cervical Spine Research Society, Toronto, CA, Dec 1-3, 2016.

75. **Buttermann GR**, Hybrid Total Disc Replacement/Anterior Cervical Discectomy and Fusion versus multilevel ACDF outcomes and early results. 2017 American Academy of Orthopaedic Surgeons Annual Meeting, San Diego, CA, March 14-18, 2017.

76. **Buttermann GR.** Motion Preserving XLIF for Idiopathic Scoliosis. 10th Annual SOLAS Research Meeting, Del Mar, CA, May 18-20, 2017.

77. **Buttermann GR,** Hollmann S, Arpino J-M, Ferko N. Value of Single Level Circumferential Fusion: A 10-Year Prospective Study and Cost Effectiveness Analysis Comparing Posterior Facet Versus Pedicle Screw Fixation. ISPOR, New Orleans, LA, May 18-22, 2019.

78. **Buttermann GR**, Thorson M, Saeger LC. Effectiveness of Epidural Amniotic fluid Injections for Low Back Pain. 24th Annual Gabor Racz Advanced Interventional Pain Conference and Practical Workshop, Budapest, Hungary, August 26-28, 2019.

79. **Buttermann GR**. Posterior Bone-graft Options and Success in Single-Level Circumferential Lumbar Fusions. 34th Annual Meeting of the North American Spine Society, Chicago, IL, Sept 25-28, 2019.

80. **Buttermann GR**, Thorson M, Saeger LC. Effectiveness of Epidural Amniotic fluid Injections for Low Back Pain. World Congress Low Back and Pelvic Girdle Pain, Antwerp, Belgium, October 28-31, 2019.

81. **Buttermann GR**, Thorson M, Saeger LC. Effectiveness of Epidural Amniotic fluid Injections for Low Back Pain. ISASS20, San Juan, Puerto Rico, February 26-28, 2020.

82. **Buttermann GR**. Posterior Bone-graft Options and Success in Single-level Circumferential Lumbar Fusions. ISASS20, San Juan, Puerto Rico, February 26-28, 2020.

83. Vovk A, **Buttermann GR**. Impact of Subject Retention on Clinical Outcomes Following Lumbar Total Disc Replacement: A Retrospective Analysis of a Randomized, Multi-Center Clinical Trial. ISASS20, San Juan, Puerto Rico, February 26-28, 2020.

84. **Buttermann GR**. Motion Preserving XLIF for Thoracolumbar Idiopathic Scoliosis. ISASS20, San Juan, Puerto Rico, February 26-28, 2020.

85. **Buttermann GR**, Freeman AL, Simmons, BH. Allograft Reconstructed Iliac Bone-graft Donor Site Remodels to Viable Bone and its Preliminary Clinical Effectiveness 55th Annual Scoliosis Research Society Meeting, Phoenix, AZ, 2020, September 9-13.

86. **Buttermann GR**, Thorson M, Saeger LC. Effectiveness of Epidural Amniotic fluid Injections for Low Back Pain. 35th Annual Meeting of the North American Spine Society (Virtual), Oct 6-9, 2020.

87. **Buttermann GR**, Secondary surgery rate and five-year outcomes of hybrid TDR/ACDF vs multilevel ACDF. 35th Annual Meeting of the North American Spine Society (Virtual), Oct 6-9, 2020.

88. **Buttermann GR**, Allograft Reconstructed Iliac Bone-graft Donor Site Remodels to Viable Bone and its Preliminary Clinical Effectiveness. 35th Annual Meeting of the North American Spine Society (Virtual), Oct 6-9, 2020.

89. **Buttermann GR**, Rowen K. Sublaminar Band Posterior Fusion for Adolescent Idiopathic Scoliosis Results in Greatest Improvement in Alignment and Stable Outcomes >5 Years. ISASS21 meeting, Miami, FL, May 13-15, 2021.

90. Radcliff K, Zigler J, Braxton E, **Buttermann G**, Coric D, Derman P, Garcia R, Jorgensen A, Ferko NC, Situ A, Yue J. Final Long-Term Reporting from a Randomized Controlled IDE Trial for Lumbar Artificial Discs in Single-Level Degenerative Disc Disease: 7-Year Results. ISASS22 meeting, Nassau, Bahamas, June 1-4, 2022.

91. Zigler J, Coric D, Derman P, Braxton E, Radcliff K, **Buttermann G**, Jorgensen A, Situ A, Ferko NC. Seven-year progression and 10-year prediction of adjacent level degeneration and disease after lumbar total disc replacement: A post hoc analysis of a prospective clinical trial with 7-year follow-up. 37th Annual Meeting of the North American Spine Society, Chicago, Oct 12-15, 2022.

92. **Buttermann GR**. Cervical Spine Fusion Rates Related to Bone Graft Type and Spinal Levels**.** ISASS23 meeting, San Francisco, CA, May 5, 2023.

93. **Buttermann GR.** Rowen K. Sublaminar Fixation in Thoracic AIS Posterior Fusion with >5 Year Follow-up, Radiographic and Clinical Outcomes Comparison of Hooks, Wires, and Bands. 38th Annual Meeting of the North American Spine Society, Los Angeles, Oct 18-21, 2023.

94. **Buttermann GR**. Rowen K. Sublaminar Fixation in Thoracic AIS Posterior Fusion with >5 Year Follow-up, Radiographic and Clinical Outcomes Comparison of Hooks, Wires, and Bands. 70th Annual Meeting of the Orthopedic Research Society, Long Beach, CA, February 2-6, 2024.

95. **Buttermann GR**. Outcomes of Hybrid TDR/ACDF Versus Multilevel ACDF with 8 to 12 Year Follow-up**.** ISASS25 meeting, Miami, FL**,** April 10-12, 2025.

96. **Buttermann GR**. Cervical TDR Failure Rates, Modes, and Salvage Outcomes**.** ISASS25 meeting, Miami, FL, April 10-12, 2025.

97. **Buttermann GR.** Cervical Alignment and Outcomes of Hybrid TDR/ACDF with 8 to 12 Year Follow-up. 40th Annual Meeting of the North American Spine Society, Denver, Nov 14-16, 2025.

98. **Buttermann GR.** Cervical Spine Fusion Rates Related to Bone Graft Type and Spinal Levels**.** 40th Annual Meeting of the North American Spine Society, Denver, Nov 14-16, 2025.

99. **Buttermann GR.** Outcomes of Hybrid TDR/ACDF Versus Multilevel ACDF with 8 to 12 Year Follow-up, Cervical Spine Research Society 53rd Annual Meeting, Washington, DC, Dec 3-6, 2025.

100. **Buttermann GR.** Cervical TDR and Hybrid vs ACDF Secondary Surgery Rates over 8-12 year Follow-up, Cervical Spine Research Society 53rd Annual Meeting, Washington, DC, Dec 3-6, 2025.

ABSTRACTS/PRESENTATION: Regional

1. **Buttermann GR**, Schendel MJ, Lewis JL, Bradford DS. *In vivo* lumbar spine facet loading in the canine. 6th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 1990.

2. **Buttermann GR**, Heithoff KB, Ogilvie JW, Transfeldt EE. MRI as a predictor for lumbar fusions. 8th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 1, 1992.

3. **Buttermann GR**, Hunt AF, Garvey TA, Ogilvie JW, Transfeldt EE, Bradford DS, Boachie-Adjei O. Results of lumbar fusion by diagnosis. 10th Annual Minnesota Orthopaedic Society Meeting, Rochester, MN, 1994.

4. **Buttermann GR**, Glazer PG, Hu SS, Bradford DS. Structural autograft vs allograft in lumbar fusion revision. Inman/Abbott Lecture, University California, San Francisco, CA, 1995.

5. **Buttermann GR**, Glazer PG, Hu SS, Bradford DS. Anterior and posterior allografts in thoracolumbar deformity reconstruction. 12th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, 1996.

6. Fedewa M, **Buttermann GR**, Schendel MJ, Transfeldt EE. *In vitro* spinal fusion effects on endplate loading. 12th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, 1996.

7. **Buttermann GR.** Spine fusion outcomes depend on age, magnitude of surgery, and prior failure. Minnesota Orthopaedic Alumni Reunion, Minneapolis, MN, 1996.

8. **Buttermann GR**. Lumbar epidural steroid vs discectomy for large acute disc herniation: A prospective randomized study. 14th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 8-9, 1998.

9. **Buttermann GR**. Results of spinal steroid injections for degenerative disc disease. 15th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 7, 1999.

10. **Buttermann GR**. The effect of epidural steroid injection on the natural history of lumbar disc herniation. 16th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, 2000.

11. **Buttermann GR**. Pain and disability in patients with scoliosis. 18th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 17, 2002.

12**. Buttermann GR**, Beaubien B. Stiffness of prosthetic nucleus determines stiffness of reconstructed lumbar calf spine. 19th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 16, 2003.

13. Polga DJ, Beaubien BP, Kallemeier PM, Schellhas KP, Lew WD, **Buttermann GR**, Wood KB. *In vivo* characterization of intradiscal pressure in healthy thoracic intervertebral discs. 19th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 16, 2003.

14. Kallemeier PM, Beaubien BP, Chen X, Polga DJ, Lew WD, **Buttermann GR**, Wood KB. Immature rabbit scoliosis model: Initial kyphosis using scapula-to-contralateral pelvis tethering technique. 20th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 13, 2004.

15. **Buttermann GR**. Diagnosis and other factors related to ACDF outcomes. 21st Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 13, 2005.

16. **Buttermann GR**, Rieser TV, Salman ES. Pain and disability in patients treated for cervical stenosis by laminoplasty: A prospective study. 22nd Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 12, 2006.

17. **Buttermann GR**. Fusion Enhancement of Single-Level ACDF in Smokers. 23rd Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 13, 2008.

18. **Buttermann GR,** Mullin WJ. Two Level Circumferential Lumbar Fusion Outcomes Comparing Midline and Paraspinal Posterior Approach: A Randomized, Blinded, Prospective Study. 24th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 8, 2009.

19. **Buttermann GR**. Spinal Disc Replacement in a Community Practice Setting: Early Results. 26th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, April 29, 2011.

20. Freeman AL, **Buttermann GR,** Beaubien BP, Rochefort, WE. Compressive Properties of Nucleus, Annulus, and Fibrous Repair Tissue. 26th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, April 29, 2011.

21. Wood KB, **Buttermann GR**, Mehbod AA, Harrod CC. Operative vs Nonoperative Treatment of Thoracolumbar Burst Fractures without Neurological Deficit: Fifteen to Twenty Year Follow-up. 28th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 10, 2013.

22. **Buttermann GR.** Pediatric and Adult AIS Surgical Outcomes Compared to Degenerative as well as Age and Gender Matched Controls. 28th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 10, 2013.

23. **Buttermann GR.** XLIF vs ALIF Combined with Posterior Spinal Fusion Results in a Community Practice. 29th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 16, 2014.

24. **Buttermann GR,** Brenner RM. Outcomes of Lumbar Decompression and Fusion for Degenerative Spondylolisthesis Versus Degenerative Disk Disease: A Prospective Cohort Study. 30th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 8, 2014.

25. **Buttermann GR,** Mullin WJ, Thorson TM. Posterior Lumbar Muscle Changes Related to Prominence of Posterior Instrumentation in Spinal Fusion. 30th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 8, 2014.

26. **Buttermann GR**, Hybrid Total Disc Replacement/Anterior Cervical Discectomy and Fusion versus Multilevel ACDF Outcomes at 5 year Follow-up. 33th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 12, 2017.

27. **Buttermann GR**, Freeman AL, Simmons, BH. Viability of Allograft Reconstruction of the Iliac Crest. 34th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 4, 2018.

28. **Buttermann GR**, Thorson M, Saeger LC. Effectiveness of Epidural Amniotic fluid Injections for Low Back Pain. 35th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 10, 2019.

29. **Buttermann GR**. Posterior Bone-graft Options and Success in Single-Level Circumferential Lumbar Fusions. 35th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 10, 2019.

30. **Buttermann GR**. Reliable restoration of sagittal cervical alignment with hyper-lordotic ACDF interbody devices. 36th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, July 15, 2020.

31. **Buttermann GR**. Motion Preserving XLIF for Thoracolumbar Idiopathic Scoliosis. 36th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, July 15, 2020.

32. **Buttermann GR**, Rowen K. Sublaminar Band Posterior Fusion for Adolescent Idiopathic Scoliosis Results in Greatest Improvement in Alignment and Stable Outcomes >5 Years. 37th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 7, 2021.

33. **Buttermann GR**. Cervical Spine Fusion Rates Related to Bone Graft Type and Spinal Levels**.** 39th Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 5, 2023.

34. **Buttermann GR**. Outcomes of Hybrid TDR/ACDF Versus Multilevel ACDF with 8 to 12 Year Follow-up. 41st Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 2, 2025.

35. **Buttermann GR**. Outcomes of Lumbar TDR/fusion Versus Single-Level TDR with 8 to 12 Year Follow-up. 41st Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 2, 2025.

36. **Buttermann GR**. Cervical TDR Failure Rates, Modes, and Salvage Outcomes**.** 41st Annual Minnesota Orthopaedic Society Meeting, Minneapolis, MN, May 2, 2025.

LECTURES

1. Buttermann GR. Spondylolisthesis. (CME), Lakeview Memorial Hospital, Stillwater, MN, March 9, 1996.

2. Buttermann GR. Radiographs in Spinal Diseases. Cambridge Medical Center, Cambridge, MN, May 28, 1996.

3. Buttermann GR. Complex and Salvage Spine Surgery. (CME), North Memorial Hospital, Robbinsdale, MN, June 18, 1996.

4. Buttermann GR. Spinal Cord Trauma. (CME), St. John's Hospital/HealthEast, Maplewood, MN, January 13, 1997.

5. Buttermann GR. Back pain: Past, Present and Future. The Spine Seminar. (CME), St. John's Hospital/HealthEast, Maplewood, MN, September 26, 2003.

6. Buttermann GR. Research in Private Practice: Can One Make a Difference? Visiting Professor Lecture, the UCSF Spine Symposium. (CME), University California, San Francisco, June 7, 2008.

7. Buttermann GR. Adult Spinal Deformity: The Challenge Continues. Visiting Professor Lecture, the UCSF Spine Symposium. (CME), University California, San Francisco, June 7, 2008.

8. Buttermann GR. Complex Spinal Surgery. (CME), St. John's Hospital/HealthEast, Maplewood, MN, May 14, 2012.