

CURRICULUM VITAE

Gun Keorochana M.D.

POSITION: Associate Professor
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EDUCATION

Minimally Invasive and Endoscopic Spine Surgery 2010
Desert Institute for Spine Care (DISC) Phoenix, AZ, USA,

International Spine Fellowship 2008-2010
UCLA comprehensive spine center, David Geffen School of Medicine at UCLA, Los Angeles, CA, USA

Spine Fellowship 2006
Department of Orthopaedics, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand

Diplomat Thai Board of Orthopaedic Surgery 2005
Srinagarind Hospital, Faculty of Medicine, Khon Kaen University Thailand

Diplomat of Postgraduate Medical Science (surgery) 2001
Faculty of Graduate Thai Studies, Khon Kaen University Khon Kaen, Thailand

Doctor of Medicine (1st class Honors.) 1999
Siriraj Hospital Faculty of Medicine, Mahidol University Bangkok, Thailand

PROFESSIONAL EXPERIENCE

Associate Professor
2006-present
Spine Unit, Department of Orthopaedics, Faculty of Medicine, Ramathibodi Hospital Mahidol University Bangkok,
Thailand

AWARDS, HONORS

APOA Spine Traveling Fellowship 2005 to Hong Kong, Sendai and Taipei

MEMBERSHIPS

The Royal College of Orthopaedic Surgeons of Thailand (RCOST)
Asia Pacific Orthopaedic Association (APOA)
AO Spine International
North American Spine Society (NASS)
Association of Southeast Asian Nations of Minimally Invasive Spine Surgery and Techniques (ASEANMISST)
World Congress of Minimally Invasive Spine Surgery and Techniques (WCMISST) Association
Society of Lateral access surgery (SOLAS)

AREA OF INTERESTS

Spinal interventions
Endoscopic spine surgery
Minimally invasive spine surgery
Vertebroplasty/Kyphoplasty
MIS TLIF
XLIF
MIDLF
Percutaneous pedicle screw

RESEARCH EXPERIENCES

Clinical research:

1. Outcome and prognostic factors after decompression and posterolateral fusion with pedicular screws in degenerative lumbar spine diseases including lumbar spinal stenosis and degenerative scoliosis
2. Many kinetic MRI studies in the lumbar spine investigating the dynamic changes of intervertebral disc, facet joint, interspinous ligament and segmental mobility during flexed and extended motion.
3. Results of transforaminal and interlaminar epidural steroid injection in spinal stenosis patients
4. Clinical and radiographic outcome of different bone substitutes used in transpedicular grafting in thoracolumbar fracture.
5. Comparison of different graft choices on outcome of lumbar spinal fusion in primary and revision cases e.g. BMPs, autograft and bone marrow aspirate
6. The quality of life and functional outcome after Transforaminal endoscopic discectomy of the lumbar spine.
7. Results of endoscopic discectomy and radiofrequency therapy (DiscFx) in discogenic low back pain patients .
8. Novel application of endoscopic medial branches denervation in the patients with facet joint syndrome. The early experience.

Basic science research:Spinal fusion

9. Many projects of spinal fusion model investigating the effect of novel growth factors, cell and gene therapy
10. Effect of bone morphogenetic protein binding peptide (BBP) on BMP-7 enhanced bone healing in rodent spinal fusion model
11. Effect of BBP on OP-1 in femoral defect animal model
12. The efficacy of lentiviral-BMP-2 transfected human BMC in rat spinal fusion model

Disc degeneration

13. Developing novel disc degeneration model in rat caudal discs and testing with growth factors, gene therapy
14. Different deterioration of disc degeneration of different needle gauges in rat tail puncture model
15. Use of dose-dependent BMP-2 on rat caudal disc degeneration model
16. Regenerative effect of lentiviral-BMP-2 transfected human bone marrow cell in degenerated rat caudal disc model
17. Feasibility of whole disc transplantation in rat tail

Inflammatory response of different growth factors

14. In vitro and in vivo studies (subcutaneous and submuscular implantation) of inflammatory reaction of BMP-2, BMP-7 with/without BBP

Tumor growth response to different growth factors

15. Effect of different growth factors with/without spp-24 on tumor cell culture and tumor enlargement in tibia of SCID mice model.

PUBLICATIONS

1. **Keorochana G**, Chanplakorn P, Laohachareonsombat W, Larbcharoensub N. Spinal and Bilateral Breast Metastases of Embryonal Rhabdomyosarcoma: A Case report; *J Med Assoc Thai*; Vol 90(4);50-56, 2007.
2. Kong MH, He W, Tsai YD, Chen NF, **Keorochana G**, Do DH, Wang JC. Relationship of facet tropism with degeneration and stability of functional spinal unit. *Yonsei Med J*. 2009 Oct 31;50(5):624-9.
3. Lee KB, Taghavi CE, Hsu MS, Song KJ, Yoo JH, **Keorochana G**, Ngo SS, Wang JC. The Efficacy of rhBMP-2 Versus Autograft for Posterolateral Lumbar Spine Fusion in Elderly Patients. *Eur spine J* Dec 2009.
4. Taghavi CE, Lee KB, **Keorochana G**, Tzeng ST, Yoo JH, Wang JC. Bone Morphogenetic Protein-2 and Bone Marrow Aspirate with Allograft as Alternatives to Autograft in Instrumented Revision Posterolateral Lumbar Spinal Fusion: A Minimum Two-Year Follow-Up Study. *Spine* 2010 Feb 4.
5. **Keorochana G**, Laohachareonsombat W, Woratanarat P. Functional outcome after Decompression and Instrumented Arthrodesis in Degenerative Lumbar Spinal Stenosis: Factors influencing outcome. *J Med Assoc Thai*; in press.
6. **Keorochana G**, Tawonsawatruk T, Laohachareonsombat W, Wajanawisit W, Woratanarat P. The results of Decompression and Instrumented Fusion with Pedicular Screw Plate System in Degenerative Scoliosis

- Patients with Spinal Stenosis. A Prospective Observational Study. *J Med Assoc Thai*; 2010 Apr;93(4):457-61.
7. **Keorochana G**, Taghavi CE, Tzeng ST, Morishita Y, Yoo JH, Lee KB, Liao JC, Wang JC. MRI Grading of Interspinous Ligament Degeneration of the Lumbar Spine and its Relation to Aging, Spinal Degeneration and Segmental motion. *J Neurosurg Spine* 2010 Oct;13(4):494-9.
 8. Liao JC, Fan KF, **Keorochana G**, Chen WJ, Chen LH. Transpedicular grafting following short-segment pedicle instrumentation for thoracolumbar burst fracture. Calcium sulphate cement versus autogenous iliac bone graft. *Spine* 2010 Jul 1;35(15):1482-8.
 9. Taghavi CE, Lee KB, He W, **Keorochana G**, Murray SS, Brochmann EJ, Uludag H, Behnam K, Wang JC. Bone Morphogenetic Protein Binding Peptide Mechanism and Enhancement of Osteogenic Protein-1 Induced Bone Healing. *Spine* 2010 Nov 1;35(23):2049-56.
 10. Lee KB, Taghavi CE, Song KJ, Sintuu C, Yoo JH, **Keorochana G**, Tzeng ST, Fei Z, Liao JC, Wang JC. Inflammatory Characteristics of rhBMP-2 In Vitro and in an In Vivo Rodent Model. *Spine* 2011 Feb 1;36(3):E149-E154.
 11. **Keorochana G**, Taghavi CE, Lee KB, Yoo JH, Liao JC, Fei Z, Wang JC. Effect of Sagittal Alignment on Kinematic Changes and Degree of Disc Degeneration in the Lumbar Spine: An Analysis Using Positional MRI. *Spine* 2011 Jan 14. [Epub ahead of print]
 12. **Keorochana G**, Taghavi CE, Tzeng ST, Lee KB, Liao JC, Yoo JH, Wang JC. MRI classification of interspinous ligament degeneration of the lumbar spine: Intraobserver and interobserver reliability and the frequency of disagreement. *Eur Spine J* 2010 Oct;19(10):1740-5. Epub 2010 Feb 21.
 13. **Keorochana G**, Johnson JS, Taghavi CE, Liao JC, Lee KB, Yoo JH, Ngo SS, Wang JC. The effect of needle size inducing degeneration in the rat caudal disc: evaluation using radiograph, magnetic resonance imaging, histology, and immunohistochemistry. *Spine J.* 2010 Nov;10(11):1014-23.
 14. Lee KB, Taghavi CE, Murray SS, Song KJ, **Keorochana G**, Wang JC. BMP induced inflammation: a comparison of rhBMP-7 and rhBMP-2. *J Orthop Res.* 2012 Dec;30(12):1985-94.
 15. Kraiwattanapong C, Wechmongkolgorn S, Chatriyanuyok B, Woratanarat P, Udomsubpayakul U, Chanplakorn P, Keorochana G, Wajanavisit W. Outcomes of fluoroscopically guided lumbar transforaminal epidural steroid injections in degenerative lumbar spondylolisthesis patients. *Asian Spine J.* 2014 Apr;8(2):119-28.
 16. Chanplakorn P, Kraiwattanapong C, Aroonjarattham K, Leelapattana P, Keorochana G, Jaovisidha S, Wajanavisit W. Morphometric evaluation of subaxial cervical spine using multi-detector computerized tomography (MD-CT) scan: the consideration for cervical pedicle screws fixation. *BMC Musculoskelet Disord.* 2014 Apr 11;15:125.
 17. Lertudomphonwanit T, Keorochana G, Kraiwattanapong C, Chanplakorn P, Leelapattana P, Wajanavisit W.
 18. Anatomic Considerations of Intervertebral Disc Perspective in Lumbar Posterolateral Approach via Kambin's Triangle: Cadaveric Study. *Asian Spine J.* 2016 Oct;10(5):821-827.
 19. **Keorochana G**, Setkrasing K, Woratanarat P, Arirachakaran A, Kongtharvonskul J. Clinical outcomes after minimally invasive transforaminal lumbar interbody fusion and lateral lumbar interbody fusion for treatment of degenerative lumbar disease: a systematic review and meta-analysis. *Neurosurg Rev.* 2016 Dec 24. doi: 10.1007/s10143-016-0806-8.

20. Pairuchvej S, Arirachakaran A, Keorochana G, Wattanapaiboon K, Atiprayoon S, Phatthanathitikam P, Kongtharvonskul J. The short and midterm outcomes of lumbar transforaminal epidural injection with preganglionic and postganglionic approach in lumbosacral radiculopathy: a systematic review and meta-analysis. *Neurosurg Rev.* 2017 Feb 6. doi: 10.1007/s10143-017-0826-z
21. Comparative Outcomes of Cortical Screw Trajectory Fixation and Pedicle Screw Fixation in Lumbar Spinal Fusion: Systematic Review and Meta-analysis. Keorochana G, Pairuchvej S, Trathitephun W, Arirachakaran A, Predeeprompan P, Kongtharvonskul J. *World Neurosurg.* 2017 Jun;102:340-349.
22. Comparative Outcomes of Perioperative Epidural Steroids After Percutaneous Endoscopic Lumbar Discectomy for Lumbar Disc Herniation: A Randomized Placebo-Controlled Trial. Keorochana G, Pairuchvej S, Setrkraising K, Arirachakaran A, Kongtharvonskul J. *World Neurosurg.* 2018 Nov;119:e244-e249
23. Malposition of Cage in Minimally Invasive Oblique Lumbar Interbody Fusion. Kraiwattanapong C, Amuntasupakul V, Kantawan R, Keorochana G, Lertudomphonwanit T, Sirijaturaporn P, Thonginta M. *Case Rep Orthop.* 2018 Jul 11;2018:9142074
24. Comparison of Complications and Revisions After Sacral 2 Alar Iliac Screw and Iliac Screw Fixation for Sacropelvic Fixation in Pediatric and Adult Populations: Systematic Review and Meta-Analysis. Keorochana G, Arirachakaran A, Setrkraising K, Kongtharvonskul J. *World Neurosurg.* 2019 Dec;132:408-420.e1. doi: 10.1016/j.wneu.2019.08.104. Epub 2019 Aug 27.
25. AOSpine Consensus Paper on Nomenclature for Working-Channel Endoscopic Spinal Procedures. Hofstetter CP, Ahn Y, Choi G, Gibson JNA, Ruetten S, Zhou Y, Li ZZ, Siepe CJ, Wagner R, Lee JH, Sairyo K, Choi KC, Chen CM, Telfeian AE, Zhang X, Banhot A, Lokhande PV, Prada N, Shen J, Cortinas FC, Brooks NP, Van Daele P, Kotheeranurak V, Hasan S, Keorochana G, Assous M, Härtl R, Kim JS. *Global Spine J.* 2020 Apr;10(2 Suppl):111S-121S. doi: 10.1177/2192568219887364. Epub 2020 May 28.

BOOK CHAPTERS

1. **Keorochana G**, Keorochana S. Stem cell in Orthopaedics. In: Channoom T, Woratanarat P, Kijkunasathian C, Chanplakorn P (eds.) *The Yearbook of Orthopaedic review*. Bangkok: pp.29-37, 2007.
2. **Keorochana G**. Thoracolumbar Spine Fracture treatment options: Conservative management. In: Suppaphol S, Kijkunasathian C, Chanplakorn P, Laohachareonsombat S (eds.) *The Yearbook of Orthopaedic review*. Bangkok: pp.33-45, 2008.
3. **Keorochana G**. Treatment of Lumbar Disc Herniation with Minor Interventions: Epidural and Selective Nerve Root Steroid Injection. In: Suppaphol S, Kijkunasathian C, Chanplakorn P, Laohachareonsombat S (eds.) *The Yearbook of Orthopaedic review*. Bangkok: pp.186-192, 2008.

PRESENTATIONS – PODIUM

1. **Keorochana G**, Laohachareonsombat W. Posterior only approach: Resection of Chordoma of the Sacral Spine. Podium presentation at The 6th Combined Congress of Spine and Pediatric Orthopaedic Sections, APOA, November 2005, Taipei, Taiwan.
2. **Keorochana G**. Pathogenesis and Pathophysiology of Degenerative diseases of the Spine. Ramathibodi Academic Conference. May1-4 2007 Impact Arena, Muangthong Thani, Bangkok, Thailand.

3. **Keorochana G**, Taghavi CE, Tzeng ST, Morishita Y, Yoo JH, Lee KB, Wang JC. Reliability of MRI Grading of Interspinous Ligament Degeneration and its Relation to Age, Disc/facet Degeneration and Segmental Mobility. Kinetic MRI study. Podium presentation at the 2009 Global Spine Congress, AO Spine International, San Francisco, CA.
4. Yoo JH, Taghavi CE, **Keorochana G**, Tzeng ST, Lee KB, Liao JC, Fei Z, Wang JC. Bone Formation Site and the Efficacy of Bone Morphogenetic Protein-2, Bone Marrow Aspirate and Autogenous Bone in Single-Level Transforaminal Lumbar Interbody Fusion. Podium presentation at the 2009 Global Spine Congress, AO Spine International, San Francisco, CA.
5. Taghavi CE, Morishita Y, **Keorochana G**, Lee KB, Tzeng ST, Yoo JH, Fei Z, Wang JC. The Relationship Between Cervical Spinal Diameter and Pathological Changes in the Cervical Spine. Podium presentation at the 2009 Global Spine Congress, AO Spine International, San Francisco, CA
6. Kulachote N, Laohacharoensombat W, Wajanavit W, **Keorochana G**. Clinical Outcome of Posterior Spinal Fusion with RSS Fixation for Adolescent Idiopathic Scoliosis Curve more than 90 degrees. Oral presentation at The Combined SICOT-RCOST 2009 Annual Meeting, Pattaya, Thailand.
7. **Keorochana G**, Johnson JS, Liao JC, Lee KB, Taghavi CE, Aydopan M, Ngo SS, Wang JC. Dose dependent effect of recombinant human bone morphogenetic protein-2 to retard disc degeneration in the injured rat caudal disc. Oral presentation at North American Spine Society 2010 Annual Meeting, Orlando, FL, USA
8. Liao JC, Tzeng ST, Lee KB, **Keorochana G**, Johnson J, Wang JC. Bone healing of rhBMP-7 is enhanced by combination with BMP binding peptide in a femur defect model. Podium presentation at AAOS 2011 Annual Meeting, San Diego, California, USA
9. Keorochana G, Setrkraising K, Woratanarat P, Arirachakaran A, Kongtharvonskul J. Clinical outcomes after minimally invasive transforaminal lumbar interbody fusion and lateral lumbar interbody fusion for treatment of degenerative lumbar disease: a systematic review and meta-analysis. Podium presentation at Eurospine meeting 2016, Berlin, Germany
10. Keorochana G. Role and efficacy of Circumferential MIS with transpsoas lumbar interbody fusion in degenerative lumbar scoliosis. 6th World congress of minimally invasive spine surgery and techniques (WCMSST) June 2018, Chongqing, China

PRESENTATIONS – POSTER

1. Tawonsawatruk T, Laohacharoensombat W, **Keorochana G**. Degenerative Scoliosis, Analysis of Surgical Results. Poster presentation at The Combined Meeting of the 29th Annual Meeting of RCOST/BJD / 10th AFSM 2007.
2. **Keorochana G**, Laohacharoensombat W, Woratanarat P, Chatchaipun P. Predictive factors influencing functional outcome after decompressive laminectomy and instrumented fusion in degenerative lumbar spinal stenosis patients. Poster presentation at The 8th Combined Congress of Spine and Pediatric Orthopaedic Section, APOA, June 2008, Jeju, Korea.
3. Taghavi CE, Lee KB, **Keorochana G**, Yoo JH, Wang JC. Bone Morphogenetic Protein-2 as an Autogenous Bone Graft Substitute in Instrumented Revision Posterolateral Lumbar Spinal Fusion. Poster presentation at the 2009 Global Spine Congress, AO Spine International, San Francisco, CA
4. Taghavi CE, Lee KB, **Keorochana G**, Yoo JH, Wang JC. The Use of Bone Morphogenetic Protein-2 and Bone Marrow Aspirate with Allograft as an Alternative to Iliac Crest Bone Graft in Instrumented Multilevel

- Posterolateral Lumbar Spinal Fusion. Poster presentation at the 2009 Global Spine Congress, AO Spine International, San Francisco, CA
5. Leelapattana P, **Keorochana G**. Reliability and Validity of Adapted Thai Version of Scoliosis Research Society-22 (SRS-22) Questionnaire. Poster presentation at The Combined SICOT-RCOST 2009 Annual Meeting, Pattaya, Thailand.
 6. **Keorochana G**, Taghavi CE, Laohacharoensombat W, Tzeng ST, Lee KB, Wang JC. MRI classification for interspinous ligament degeneration: Intraobserver and interobserver reliability and the frequency of disagreement. Poster presentation at The Combined SICOT-RCOST 2009 Annual Meeting, Pattaya, Thailand.
 7. **Keorochana G**, Taghavi CE, Lee KB, Liao JC, Fei Z, Wang JC. Effect Of Sagittal Alignment To Kinematic Changes And Disc Degeneration In The Lumbar Spine. Poster presentation at American Academy of Orthopaedic Surgeons (AAOS) 2010, New Orleans, Louisiana, USA.
 8. **Keorochana G**. The novel application of endoscopic medial branches denervation in the treatment of facet joint syndrome. RCOST 2011 Annual Meeting, Pattaya, Thailand.