

Global Leader in Allogeneic Cellular Medicines for Inflammatory Diseases

Key Opinion Leader Event Series for Investors & Analysts Chronic Low Back Pain due to Degenerative Disc Disease

June 2022

ASX: MSB; Nasdaq: MESO



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Agenda - CLBP KOL Event



Introduction to Mesoblast - Tim McCarthy, LifeSci Advisors



CLBP Program Overview - Silviu Itescu



KOL Presentation - Dr. Douglas Beall



KOL Presentation - Dr. Hyun Bae

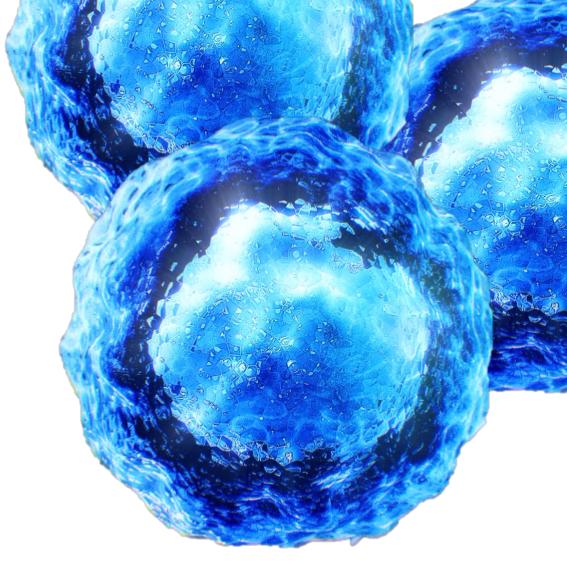






Our Mission

Mesoblast is committed to bringing to market innovative cellular medicines to treat serious and life-threatening inflammatory diseases



Speaker Biographies - Douglas P. Beall, MD, FIPP, FSIR, DAAPM



Douglas P. Beall, MD, FIPP, FSIR, DAAPM attended medical school at Georgetown University School of Medicine in Washington, DC, and completed his residency at The Johns Hopkins Hospital in Baltimore, Maryland. Following residency, he was Chief of Interventional Services at Sheppard Air Force Base in Wichita Falls, Texas. He then completed a fellowship in Musculoskeletal Radiology at Mayo Clinic in Rochester, Minnesota, where he was trained in interventional spine techniques before returning to the US Air Force as Division Chief of Musculoskeletal Radiology. Following his service as a Major in the US Air Force Dr. Beall was chief of Musculoskeletal Radiology and Fellowship Director at the University of Oklahoma prior to entering private practice as the Chief of Services. In addition to his expertise in musculoskeletal imaging and interventional spine care, Dr. Beall is actively involved in teaching and research. He is board-certified in Diagnostic Radiology, has an added fellowship in Musculoskeletal Radiology, is a Diplomate of the American Academy of Pain Management and is a Fellow of the Society of Interventional Radiology and Interventional Pain Practice and board certified by the World Institute of Pain. He is currently in private practice focused on interventional pain management and orthopedic imaging.

Dr. Beall has published more than 250 articles in peer-reviewed journals, authored 6 textbooks and 75 textbook chapters, given more than 1000 invited lectures and scientific presentations and has participated in 55 clinical research trials. He is currently the Chief of Services for Comprehensive Specialty Care in Oklahoma City as well as the Division Head of Interventional Spine Care and Director of Pain Management Fellowship Programs at the Spine Fracture Institute and the Comprehensive Care Surgical Center.



Speaker Biographies - Hyun W. Bae, MD



Hyun W. Bae, MD is an orthopedic and spine fellowship trained board-certified orthopedic surgeon. Dr Bae joined the Spine-Center at Cedars-Sinai Medical Center in 2010. He is currently Professor of Surgery in the Department of Orthopedic Surgery Cedars-Sinai Medical Center, Director of Education and Fellowship program.

Dr. Bae began his medical studies at Columbia University School of Engineering and Applied Sciences where he graduated with a degree in biomechanics. He then went on to earn his medical degree, cum laude, at Yale University School of Medicine. Dr. Bae completed his surgical internship at North Shore University Hospital and his orthopedic surgical residency at the Hospital for Special Surgery in New York. He completed his spine fellowship at Case Western Hospital in Cleveland under the mentorship of late Henry H. Bohlman, MD. During 1993-1994 he performed research in Molecular and Cell Biology, NIH Howard Hughes Research Fellow Bethesda, MD. It was during that time, he caught the passion for musculoskeletal tissue engineering while working with scientists Guilak F, Setton LA, Soslowsky LJ, as an undergraduate in Dr. Van Mow's cartilage research laboratory.

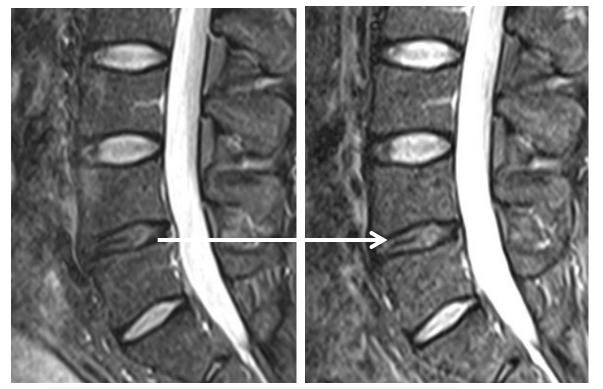
After spine surgery fellowship, He entered clinical practice, and developed a research program focusing on repair of IVD and evaluating instrumentation for spinal fusion, and grafting materials. Early translational studies were on chondrocytes expressing TGF-B1 to heal experimentally degenerated discs via needle puncture injury in rabbits (patents, cell technology with TissueGene Co.). Several disc repair treatment options were studied clinically for patients with less severe DDD with goals of preventing or delaying surgery. Other research areas include grafting with growth differentiation factors for fusion, variability in allografts, DBM-based allografts, and adult stem cells for the regeneration of intervertebral disc, and nervous system tissue after spinal cord injuries. He serves as the clinical partner of the basic science and translational Orthopedic Stem Cell and Tissue Engineering Laboratory. Dr. Bae is PI for 3-4 FDA-approved RCTs at any time with over 30 clinical studies completed throughout the last 20 years.

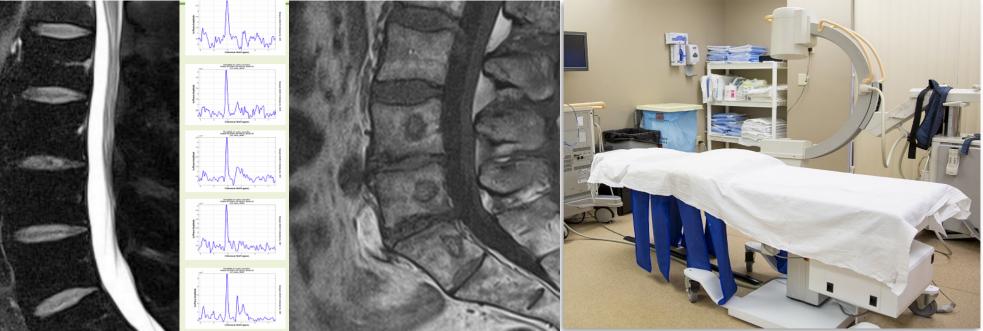
Dr. Bae has written or coauthored more than 70 published scientific paper, 5 review articles, and over 10 chapters. Has around 30 patents. A main area of research interest is targeted regeneration of the intervertebral disc. Hyun W. Bae, MD specializes in minimally invasive microsurgery, disc replacement surgery, degenerative spine, and surgical treatment of cervical and lumbar spinal diseases.



The Unmet Need in Treating Chronic Low Back Pain

Douglas P. Beall, M.D., AAIPM, FIPP Director of Clinical Research, Clinical Investigations Oklahoma City, Oklahoma





Chronic Low Back Pain Impacts Society

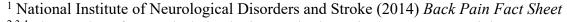
LBP is the most common cause of job-related disability¹

- Impacts 29% of the population²
- \$150-200 billion in annual healthcare expenditures³
- 33 million people disabled⁴
- 102 million lost workdays annually⁵



Rice ASC, Smith BH, Blyth FM

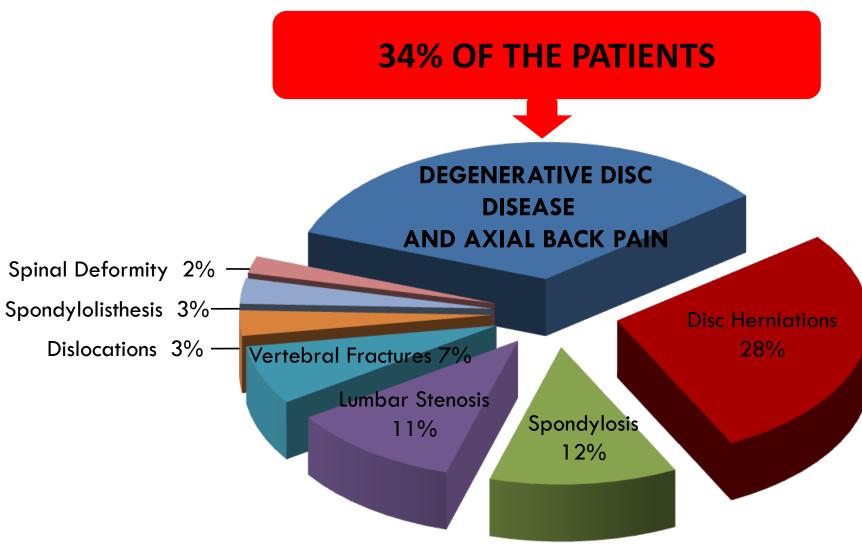
Pain and the global burden of disease. Pain. 2016;157(4):791-796. doi:10.1097/j.pain.00000000000454



^{2,3,4} The Burden of Musculoskeletal Diseases in the United States - Copyright 2011

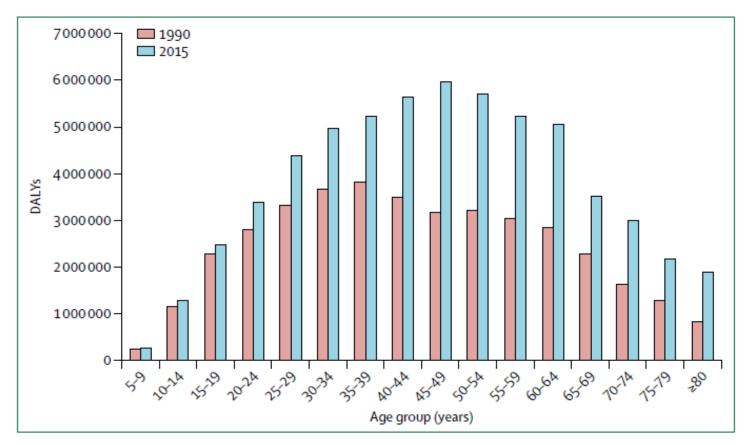
⁵ Back pain prevalence in US industry and estimates of lost workdays, Am J Public Health. 1999 July; 89(7): 1029–1035.

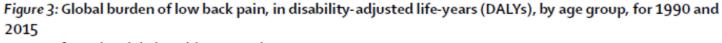
The Largest Population Segment



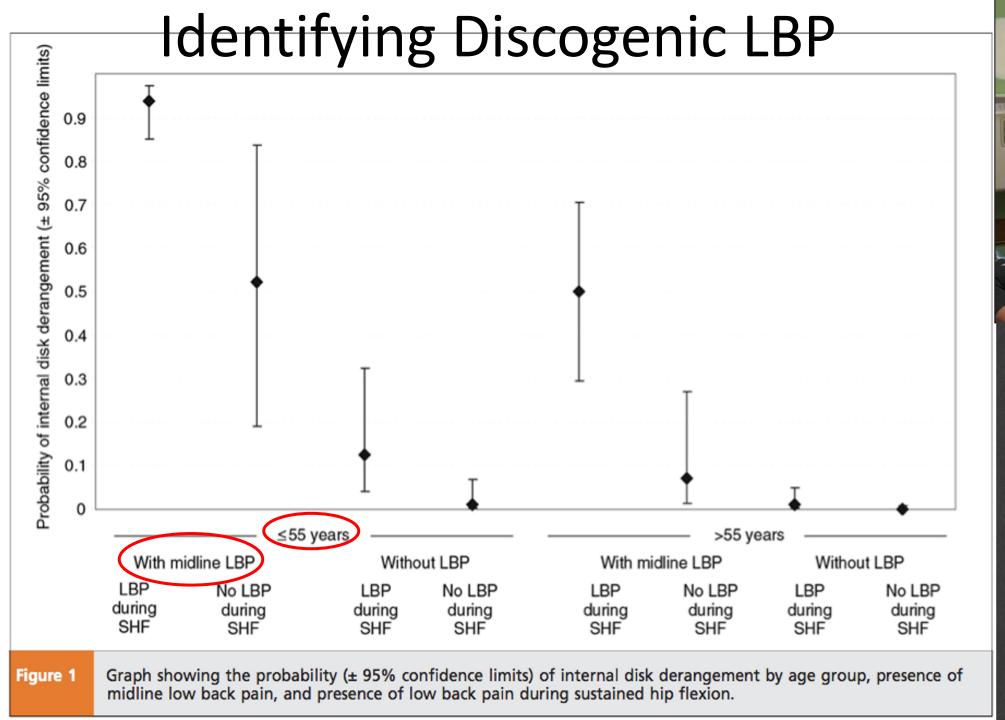
Primary Spine Diagnosis, 2008

time...





Data are from the Global Health Data Exchange.





Huge Gap in Treatment Options

Non-Surgical Mgt •Non-steroid Anti-Inflammatory Drugs (NSAIDs), Narcotics, •Injections: ESIs¹, nerve blocks •Chiropractic, Physical Therapy, Acupuncture, etc

1. Epidural steroid injections are not approved for treatment of CLBP

Surgical Interventions

Fusion
Disc arthroplasty

Effectiveness of Current Analgesic Therapies for Treating CLBP

Randomized controlled trials of currently approved analgesics show little to no difference in pain intensity when compared to placebo at short-term follow-up

- Cochrane Systematic Review of Randomized Controlled Trials of NSAIDs from 9 to 112 Days Follow-up (Enthoven et al. 2016)
 - Average mean difference in pain intensity between all NSAIDs and placebo treatment of -6.97 points (adjusted to a 0-100 VAS scale)
 - Risk ratio for adverse events of 1.04 favoring placebo over all NSAIDs
- Systematic Review and Meta-Analysis of Randomized Controlled Trials of Strong Opioids from 4 to 15 weeks follow-up (Nurry et al. 2022)
 - Examples of strong opioids (i.e. WHO-III) are morphine, buprenorphine, oxycodone, fentanyls and methadone
 - Average mean difference in pain intensity between opioids and placebo treatment of -9 points (adjusted to a 0-100 VAS scale)
- Randomized Controlled Trial Comparing Opioid and Non-Opioid Medications in Patients with Chronic Back Pain or Hip or Knee Osteoarthritis Over 12 Months Follow-up (Krebs et al. 2018)
 - Mean pain intensity change from baseline (adjusted to a 0-100 VAS scale) at 12 months showed a treatment difference of -5.0 favoring the non-opioid group (p = 0.03)
 - There was no significant difference between opioid and non-opioid groups for pain-related function (p = 0.58)
- Phase 3 Randomized Controlled Trial of Duloxetine Compared to Placebo at 12 Weeks Follow-up (Skljarevski et al. 2010)
 - LS mean change in pain intensity (adjusted to a 0-100 VAS scale) showed a treatment difference of -6.0 favoring duloxetine compared to placebo
- Phase 3 Randomized Controlled Trial of Tanezumab 5 and 10 mg Compared to Tramadol and Placebo at 16 Weeks Follow-up (Markman et al. 2020)
 - LS mean difference in pain intensity between Tramadol and placebo treatment of -1.2 points (adjusted to a 0-100 VAS scale)
 - LS mean difference in pain intensity between Tanezumab 10mg and tramadol treatment of -2.8 points (adjusted to a 0-100 VAS scale)

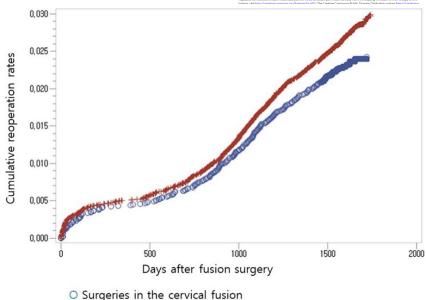
Reoperations after fusion surgeries for degenerative spinal diseases depending on cervical and lumbar regions: a national database study

on Soo Park^{1*}, Young-Su Ju², Seong-Hwan Moon³, Young-Woo Kim¹, Jong Ho Jung⁴, Jung Hyun Oh¹ and Chun Kee Chung^{5,6,7,8}

Reoperation is one of the key factors affecting tive clinical outcomes The reoperation rates of cervical surgeries might be dif erent from those of lumbar surgeries due to the anatom

However, there has been no study to con





+ Surgeries in the lumbar fusion

Cumulative reoperation rates of fusion surgeries according to anatomical regions for the entire follow-up period

Adjacent Segment Disease

- The incidence of ASD in the Lumbar Spine ranges up to 14% per year
- Damage to the posterior ligamentous complex and sagittal imbalances are important risk factors

Harrop JS, Youssef JA, Maltenfort M, Vorwald P, Jabbour P, Bono CM, Goldfarb N, Vaccaro AR, Hilibrand AS. Spine (Phila Pa 1976). 2008 Jul 1; 33(15):1701-7.

2018 Study - 433 consec pts post LSF; mean f/u - 3.9 yrs; Reop rate @ 4 yrs – 19.3% (most common pathology – adj level degen); 1 in 5 pts have repeat sx in 4 yrs

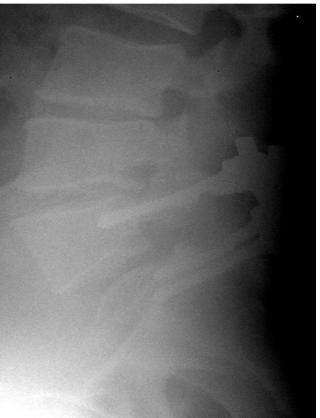
Irmola TM, Hakkinen A, Jarvenpaa S, Marttinen I, Vihtonen K, Neva M (2018) Reoperation rates following instrumented lumbar spine fusion. Spine 43:295–301. https://doi.org/10.1097/BRS.

What about Surgical Treatment for LBP: Even in "Positive" Studies Results are Mixed Fritzell – Swedish Spine Study, 2001

"RESULTS: Lumbar fusion in pts with severe CLBP can \downarrow pain & \downarrow disability more efficiently than nonsurgical treatment."

- In surgical group <u>only 63%</u> rated themselves as "better"/"much better"
- Back pain was ↓ in the surgical group by <u>only 33%</u>

Peter Fritzell, et al: 2001 Volvo Award Winner in Clinical Studies: Lumbar Fusion Versus Nonsurgical Treatment for Chronic Low Back Pain - A Multicenter Randomized Controlled Trial from the Swedish Lumbar Spine Study Group, Spine 2001, Vol 26, No 23, pp2521–2534



Conclusions

- Discogenic CLBP is a serious condition that results in significant disability, reduced quality of life and suffering for patients
- Direct and indirect costs associated with CLBP are significant
- Patients who do not improve with conservative therapy have limited options for treatment other than invasive surgical procedures that have mixed results and have the potential to cause future problems
- New minimally invasive treatments that are effective for treating CLBP improving function and quality of life are needed to help alleviate the unmet need for these suffering patients

The Lumbar Spine GUEST EDITOR: Douglas P. Beall, MD

MAGNETIC RESONANCE IMAGING CLINICS OF NORTH AMERICA



Vertebral Augmentation

The Comprehensive Guide to Vertebroplasty, Kyphoplasty, and Implant Augmentation

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Douglas P. Beall - Peter L. Munk -Michael J. DePalma - Timothy Davis -Kasra Amirdelfan - Corey W. Hunter *Editors*

Intrathecal Pump Drug Delivery



Thank You for Your Attention

Douglas P. Beall, M.D., FIPP, FSIR, DAIPM

Chief of Interventional Spine Services

www.clinrad.org www.drdouglasbeall.com https://twitter.com/dougbeall







Foot and Ankle GUEST EDITORS: Douglas P. Beall, MD Scot E. Campbell, MD

MAGNETIC RESONANCE IMAGING CLINICS OF NORTH AMERICA



RADIOLOGY The Oral Boards Primer

> Amit Mehta, MD Douglas P. Beall, MD

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Radiology

Sourcebook

Practical Guide for

Mesoblast KOL Webinar

Dr. Hyun Bae Professor of Orthopaedic Surgery Department of Orthopaedic Surgery Co-Medical Director Cedars Spine Center Director of Education Cedars Spine Center Cedars Sinai Medical Center

Disclaimer

Rexlemestrocel-L is an investigational therapy that has not been approved for commercial use by any Health Authority.

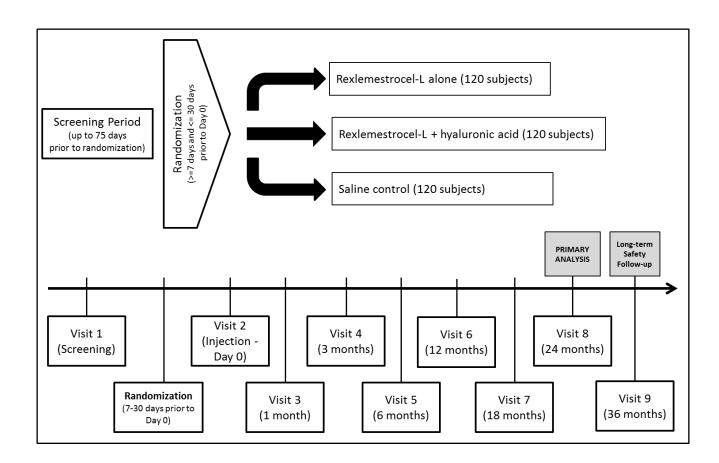
Conclusions concerning its safety or efficacy should not be made.

Phase 3 Trial: Regulatory Background

FDA provided substantial guidance regarding the design of the Phase 3 clinical trial to evaluate the safety and potential benefits of MPCs for the treatment of CLBP associated with moderate DDD

- Phase 2 study demonstrated that 6-million MPCs with HA carrier was the lowest effective dose for improvement in pain and function, and HA alone was not significantly different from the saline control
- MSB proposed use of the mean change in pain intensity at 12 months as the primary endpoint for the Phase 3 study similar to the endpoint used for evaluation of analgesic products.
- FDA indicated that the Phase 3 study design should be based on spinal implant guidance (e.g. spine fusion and artificial disc replacement), which requires a two-year composite responder endpoint demonstrating significant improvement in both pain and function
- Therefore, MSB followed FDA's guidance regarding the primary efficacy endpoint for the Phase 3 trial, but also explored endpoints consistent with FDA's evaluation of analgesics (e.g mean change in pain intensity)
- In accordance with the combination product rule, MPCs with and without HA would be evaluated in the Phase 3 study to determine if HA enhanced any observed benefit of MPCs

Phase 3 Trial: Study Design



• A single 2mL intra-discal treatment injection

- Rexlemestrocel-L+HA: 6-million Mesenchymal Precursor Cells (MPC) mixed 1:1 by volume with HA
- Rexlemestrocel-L: 6-million Mesenchymal Precursor Cells (MPC) mixed 1:1 by volume with saline
- Saline Control

Double Blinded Study

- All subjects, site personnel dealing with patient care after the treatment injection and efficacy/safety evaluators blinded through 36-month follow-up
- Sponsor and personnel involved in the 24-month primary endpoint blinded through 24-months and did not interact with patients or blinded site personnel prior to completion of the 36-month follow-up

• 45 investigational centers

• 44 centers in the USA and 1 center in Australia

Subject Enrollment

- 404 subjects enrolled
- 398 subjects received treatment

Phase 3 Trial: Safety Outcomes

Summary of Adverse Events Through 36 Months

Category of TEAE	Rexlemestrocel-L N=140 n (%)	Rexlemestrocel-L + HA N=128 n (%)	Placebo N=130 n (%)		
Subjects with any AE	111 (79.3%)	100 (78.1%)	102 (78.5%)		
Subjects with any AE by Maximum Severity					
Mild	31 (22.1%)	26 (20.3%)	34 (26.2%)		
Moderate	54 (38.6%)	54 (42.2%)	51 (39.2%)		
Severe	26 (18.6%)	20 (15.6%)	17 (13.1%)		
Subjects with any AE Leading to Discontinuation	1 (0.7%)	0	2 (1.5%)		
Subjects with any Serious AE (SAE)	17 (12.1%)	15 (11.7%)	10 (7.7%)		
Subjects with any AE Leading to Death	0	1 (0.8%)	0		
Percentages are based on the number of subjects (N) in the safety analysis set within each treatment group. HA = hyaluronic acid; SAE = serious adverse event; AE = adverse event;					

- Similar percentage of subjects with any AE across treatment groups
- Most common AEs (≥5% of all subjects): Back pain (36.4, 43.8, 40.0%); Pain in extremity (13.6, 13.3, 14.6%); Arthralgia (9.3, 12.5, 10.0%);
 Hypoaesthesia (7.1, 6.3, 9.2%); Muscle spasms (7.1, 5.5, 7.7%): Paraesthesia (7.9, 3.9, 3.1%).
- No SAE was considered related to treatment or injection procedure

Phase 3 Trial: Primary Efficacy Endpoint

Overall Treatment Success Composite at both 12 and 24 months:

- At least 50% reduction from baseline in average LBP at both 12- & 24-months post-treatment; AND
- At least a 15-point decrease from baseline in Oswestry Disability Index (ODI) score at both 12- & 24-months post-treatment; AND
- No post-treatment interventions affecting the treated disc through 24 months
- Study powered for p<0.025 to assess superiority of either MPC arm vs placebo and required a posterior probability of superiority >0.9875

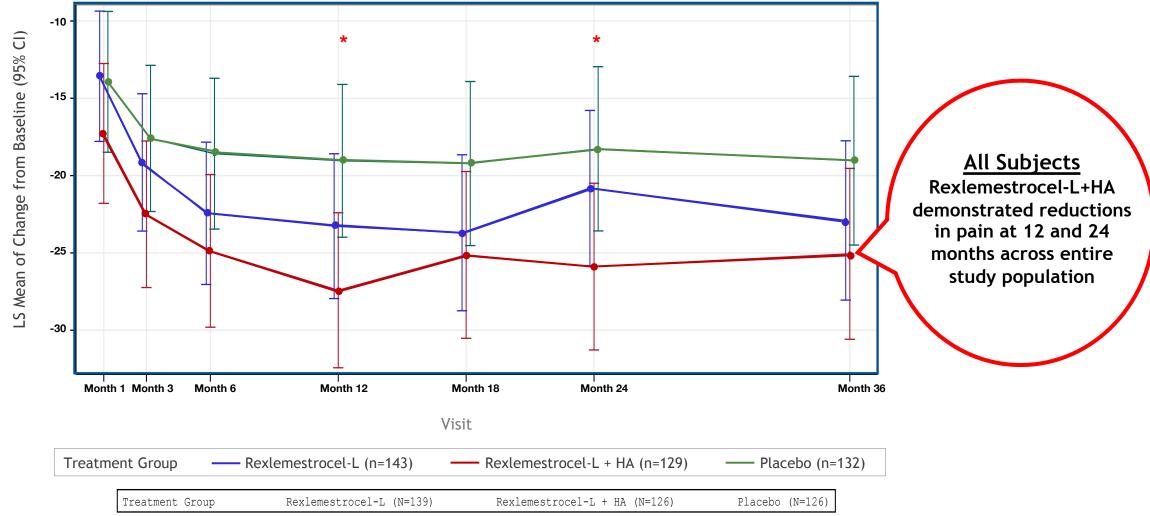
Response Rate Estimate		Probability of Superiority		
MPC	MPC+HA	Saline	MPC	MPC+HA
0.267	0.335	0.313	0.2072	0.6427

- FDA specified use of a 24 month composite endpoint typically used for evaluation of permanent implantable spinal devices such as spine fusion and artificial discs in patients with end stage DDD for the first Phase 3 study
- Analgesics evaluated in earlier stage patients with CLBP typically use a primary endpoint of mean change in pain
- FDA has agreed that the second phase 3 study focusing on earlier stage patients can use a primary endpoint of mean change in pain at 12 months

Pre-Specified Exploratory Efficacy Outcome

LS Mean Change in Low Back Pain from Baseline - Entire Study (n=404)

Rexlemestrocel-L reduces pain durably through 36 months, addition of HA enhances the effect

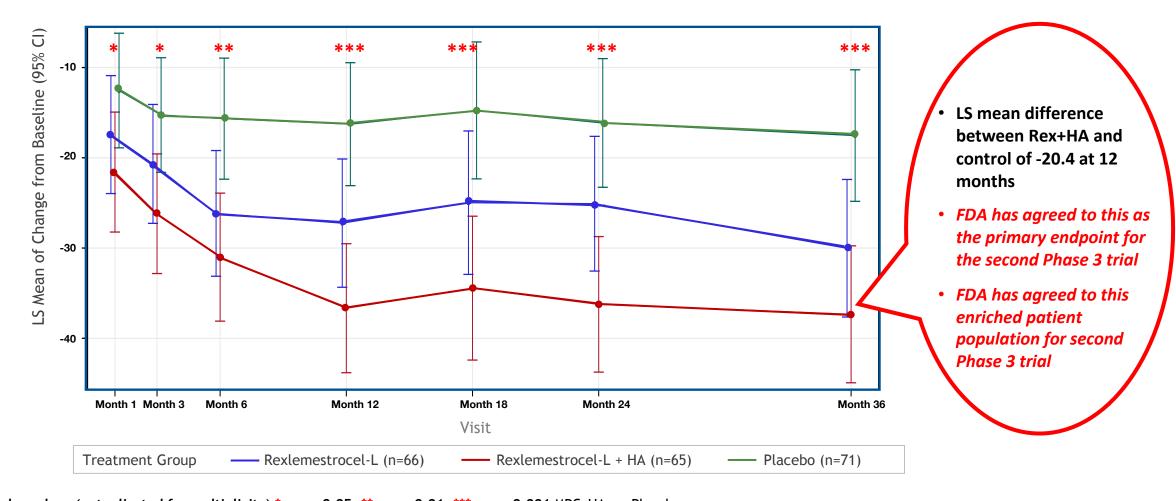


Nominal p-value (not adjusted for multiplicity) * = < 0.05 MPC+HA vs. Placebo

Pre-Specified Exploratory Efficacy Outcome

LS Mean VAS Change in Low Back Pain from Baseline – Pre-specified Subgroup of Subjects (n=202) with Duration CLBP < Median (68 months)

Effects of Rexlemestrocel-L are maximal in subjects with shorter duration of low back pain, addition of HA enhances the effect

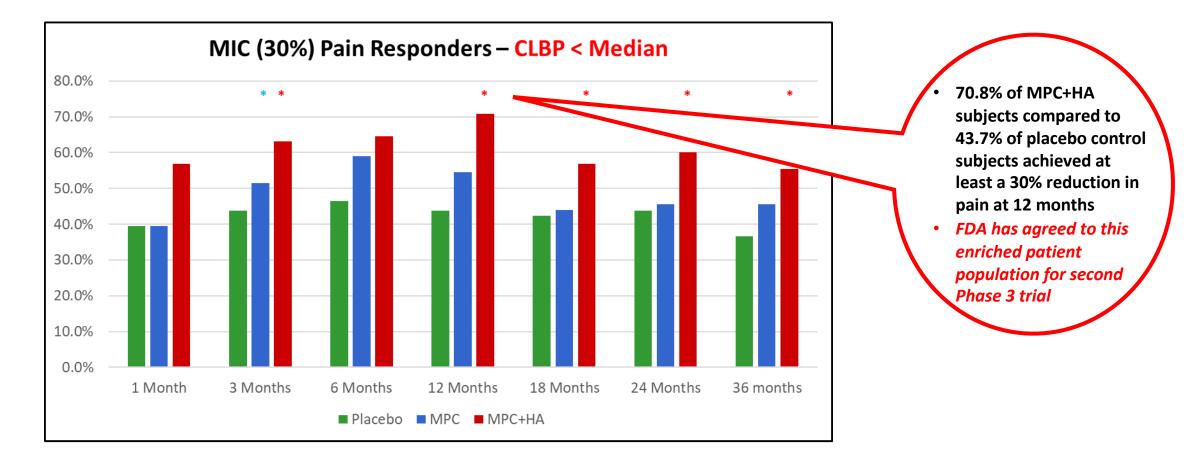


Nominal p-values (not adjusted for multiplicity) * = p < 0.05; *** = p < 0.01; *** = p < 0.001 MPC+HA vs. Placebo

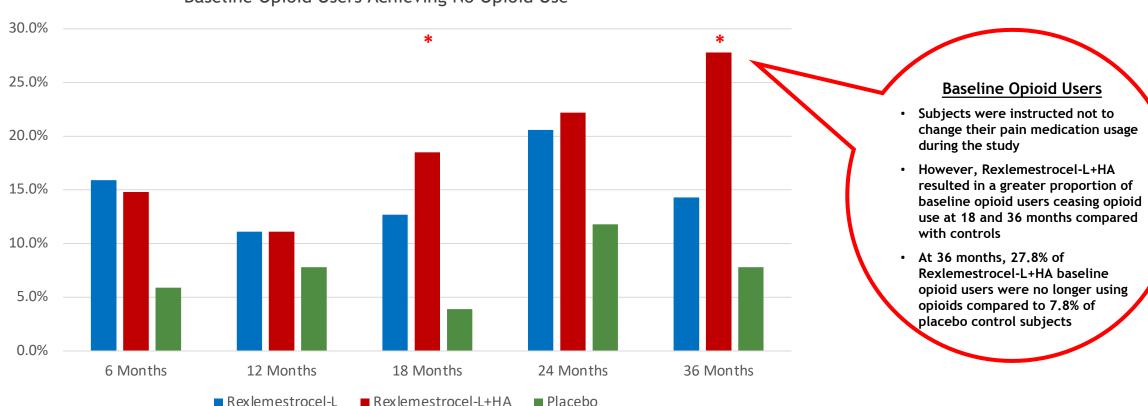
Placebo (N=66)

Pre-Specified Exploratory Efficacy Outcome: 30% Reduction Pain Responders Pre-specified Subgroup of Subjects (n=202) with Duration CLBP < Median (68 months)

Rexlemestrocel-L effects durable through 12 months, addition of HA enhances the effect and extends durability through 36 months



Pre-Specified Exploratory Efficacy Outcome - Cessation of Opioid Use *Rexlemestrocel-L + HA Associated with Greater Proportions of Subjects Ceasing Opioid Use Through 36 Months*



Baseline Opioid Users Achieving No Opioid Use

Pre-Specified Exploratory Efficacy Outcome on Quality Life Limitations Associated with DDD LS Mean Change in Quality of Life (EQ-5D) from Baseline – Pre-specified Subgroup of Subjects (n=202) with Duration CLBP < Median (68 months)

Rexlemestrocel-L effects durable through 36 months, addition of HA enhances the effect



EQ-5D Index Score Change From Baseline –CLBP < Median

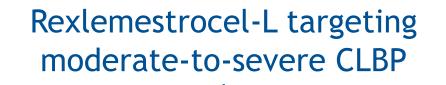
EQ-5D Index score assesses a subject's quality of life, including mobility, self-care, usual activities (e.g. work, study, housework, family or leisure activities), pain/discomfort and anxiety/depressions

- Rexlemestrocel-L+HA demonstrated 2 to 3 times the improvement in quality of life assessment, measured by EQ-5D Index score, compared to control at 12, 18, 24 and 36 months
- FDA has agreed to this enriched patient population for second Phase 3 trial

Nominal p-value (not adjusted for multiplicity) * = < 0.05 MPC+HA vs. Placebo; * = < 0.05 MPC vs. Placebo

The Patient Treatment Journey

Rexlemestrocel-L has Potential to be First-Line in Choice for Treatment of Discogenic CLBP Refractory to Conservative Treatment



Conservative Treatments

- □ NSAIDs
- Physical therapy
- □ Chiropractic treatments
- □ Acupuncture
- Anticonvulsants (e.g., gabapentin)

Opioid Analgesics

- Weak opioid analgesics (e.g., tramadol)
- Strong opioid analgesics (e.g., oxycodone)

Interventional Therapies

- Epidural steroid injections (off-label)
- □ Radio frequency ablation
- □ Spinal cord stimulation
- □ Intrathecal pumps

Surgery

- Spinal fusion
- Disc replacement

