Non-operative Management Lumbar Spinal Stenosis

Canadian Chiropractic Association

University of Toronto Spine Program

spinemobility

Boot Camp Program Lumbar Spinal Stenosis

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Disclosures

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Spinemobility Research & Resource Centre
Not-for-Profit Organization

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Course Outcomes/Objectives

- Understand the etiology, patho-anatomy, patho-physiology, prevalence and burden of disease in symptomatic LSS
- Understand the key features of the history and physical examination to make correct diagnosis of symptomatic LSS
- Know common differential diagnoses for LSS. Know how to differentiate each of the diagnoses.

3

Course Outcomes/Objectives

- know red flags for potential serious disease among patients who present with back/lower extremity symptoms
- know the role of imaging for assessing patients with back/lower extremity symptoms impacting walking ability.
- know when to recommend a epidural injection/surgical consult
- know potential effective non-operative treatments for LSS

4

Course Outcomes/Objectives

- Introduction to the Boot Camp Programs
- Understand the rationale for the Boot Camp Program and its underlying principles
- Learn the essential components of the Boot Camp Program for Lumbar Spinal Stenosis

5

Course Outcomes/Objectives

- Learn the results of our clinical studies on the Boot Camp Program for lumbar Spinal stenosis
- Understand the key features of implementing the boot camp program how to monitor patient outcomes
- Learn specific manual therapy techniques and exercises and how to use LSS workbook
- Learn how to implement the Book Camp program for LSS in your office

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Course Outcomes/Objectives
Etiology
Patho-anatomy
Patho-physiology

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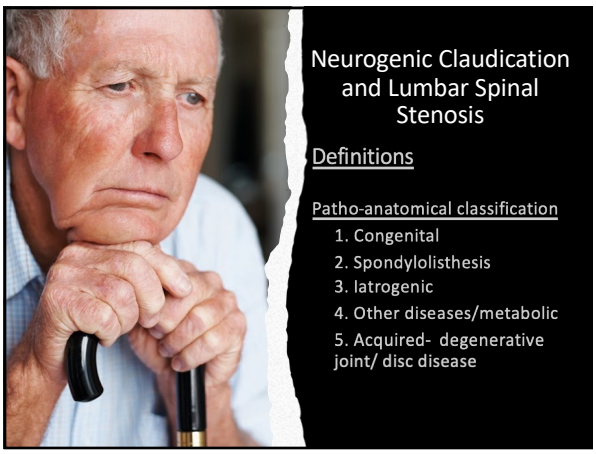
Neurogenic Claudication and Lumbar Spinal Stenosis
Definitions
Patho-anatomical classification
1. Congenital
2. Spondylolisthesis
3. Iatrogenic
4. Other diseases/metabolic
5. Acquired- degenerative joint/ disc disease

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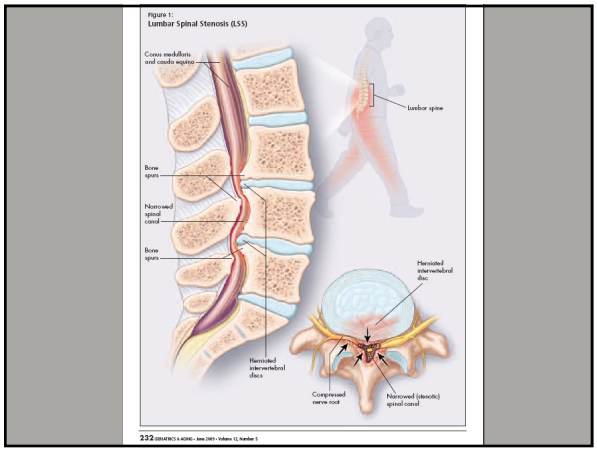
Figure 1:
Lumbar Spinal Stenosis (LSS)
Lumbar spine
Bone spurs
Narrowed spinal canal
Herniated intervertebral disc
Compressed nerve root
Narrowed (stenotic) spinal canal

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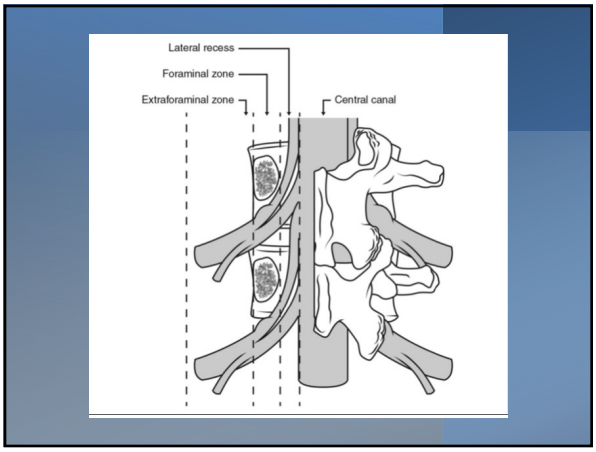
Lateral recess
Foraminal zone
Extraforaminal zone
Central canal

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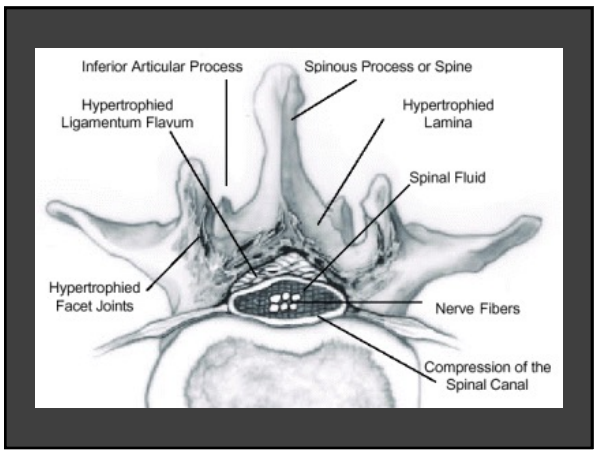
Inferior Articular Process
Spinous Process or Spine
Hypertrophied Ligamentum Flavum
Hypertrophied Lamina
Spinal Fluid
Hypertrophied Facet Joints
Nerve Fibers
Compression of the Spinal Canal

11


1.5T MSHMR02
Ex: 12570
AXIAL FRFSE PD/T2
Se: 5/9
Im: 38/58
Ax: 113.7
A
MSH
1957 Jun 18 M 805 492 452 MSH
Acc: 00127401.4
2008 Apr 24
Acq Tm: 00:16:34
256 x 224
R
L
ET: 12
TR: 4266.7
TE: 23.6
8CTL456
4.0thk/0.5sp
Id:DCM / Lin:DCM / Id:ID
W:1445 L:722
P
DFOV: 20.0 x 20.0cm

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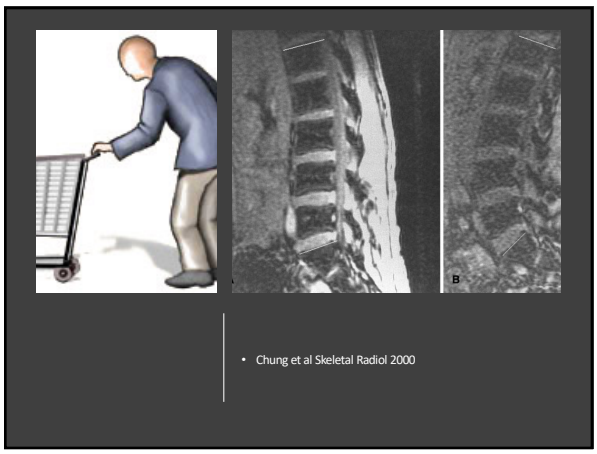

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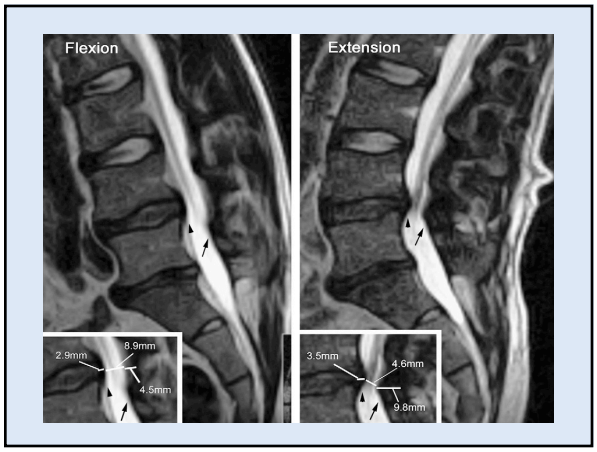

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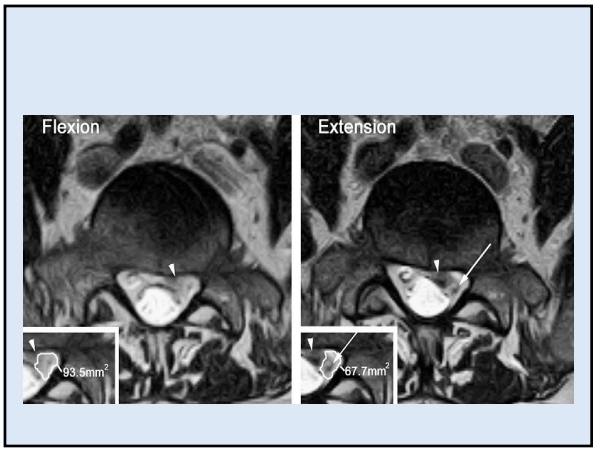

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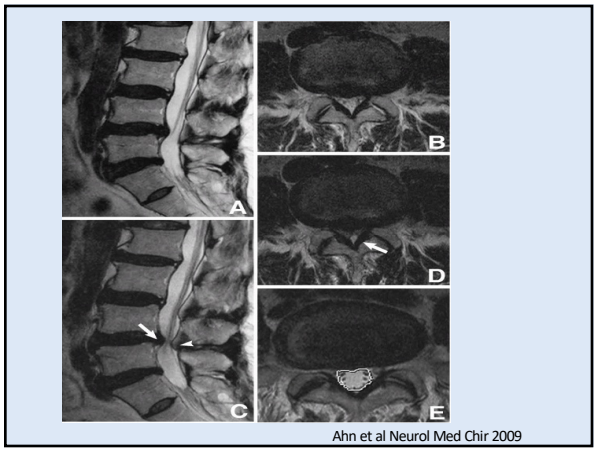

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Demonstration Video Lumbar Spinal Stenosis (2)

Courtesy of Dr Bill Morgan and Parker University

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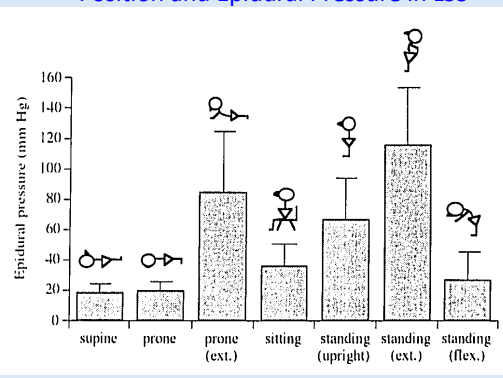
Position and Epidural Pressure in LSS



Takahashi et al, Spine 1995

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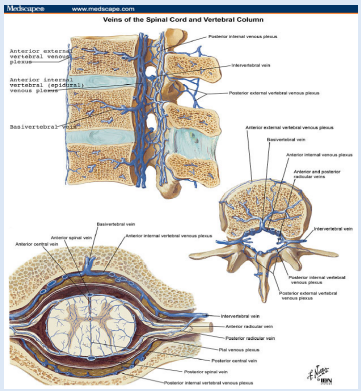

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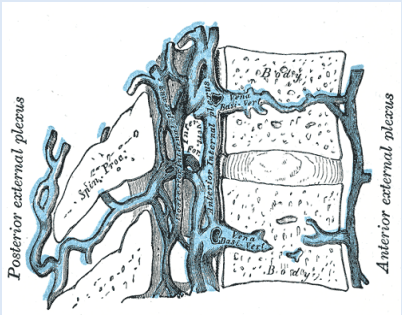
Neurogenic Claudication - Pathobiology



Internal vertebral venous plexuses

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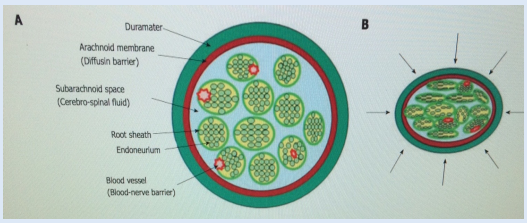
Pathophysiology of Lumbar Spinal Stenosis



A –Normal State

B- Lumbar Spinal Stenosis

With permission Kobayashi S 2014

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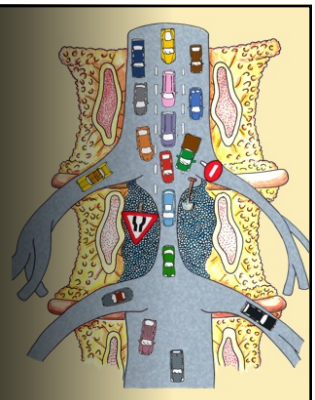
Spinal Congestion



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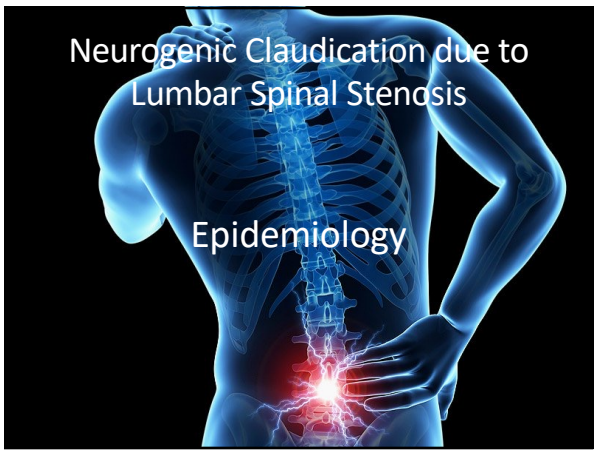

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Burden and Prevalence

- A leading cause pain, disability & loss independence in older adults
- General population prevalence 11-39%
- 9% of the Japanese population suffers from symptomatic LSS
- 25% of Canadian population > 65 by 2030

Kalichman 2009, Jensen 2020, Yoshita 2012,

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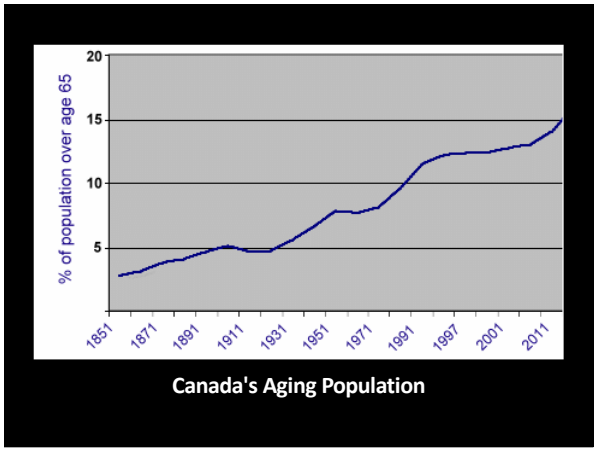

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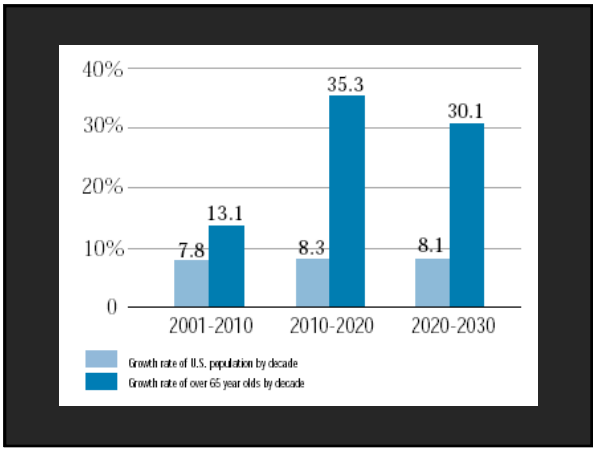

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Burden and Prevalence

- Functional limitations > CHF, COPD or SLE
- **Walking limitations** > OA hip or OA knee
- Only 4% meet the daily requirement for physical activity
- Most common spine surgery age > 65]
- Medicare in US- $1.7 B per year surgical cost alone

Fanuele 2000,Winter 2010, Norden 2017, AHCRQ 2001, Deyo 2010, Parker 2014

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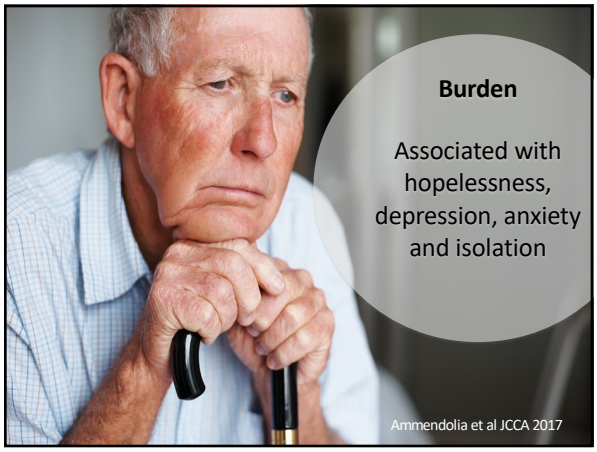

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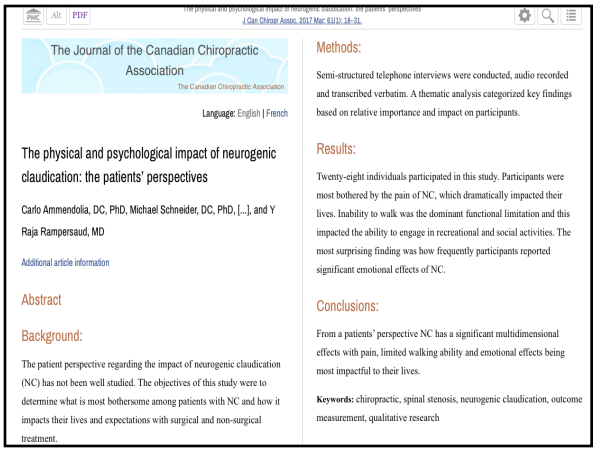
The Journal of the Canadian Chiropractic Association

The physical and psychological impact of neurogenic claudication: the patients' perspectives

Carlo Ammendolia, DC, PhD, Michael Schneider, DC, PhD, [...], and Y Raja Rampersaud, MD

Abstract

Background:

The patient perspective regarding the impact of neurogenic claudication (NC) has not been well studied. The objectives of this study were to determine what is most bothersome among patients with NC and how it impacts their lives and expectations with surgical and non-surgical treatment.

Methods:

Semi-structured telephone interviews were conducted, audio recorded and transcribed verbatim. A thematic analysis categorized key findings based on relative importance and impact on participants.

Results:

Twenty-eight individuals participated in this study. Participants were most bothered by the pain of NC, which dramatically impacted their lives. Inability to walk was the dominant functional limitation and this impacted the ability to engage in recreational and social activities. The most surprising finding was how frequently participants reported significant emotional effects of NC.

Conclusions:

From a patients' perspective NC has a significant multidimensional effects with pain, limited walking ability and emotional effects being most impactful to their lives.

Keywords: chiropractic, spinal stenosis, neurogenic claudication, outcome measurement, qualitative research

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PLOS | MEDICINE

RESEARCH ARTICLE

Gabapentin, opioids, and the risk of opioid-related death: A population-based nested case–control study

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* GomesT@smh.ca

OPEN ACCESS

Citation: Gomes T, Juurlink DN, Antoniou T, Mamdani MM, Paterson JM, van den Brink W (2017) Gabapentin, opioids, and the risk of opioid-related death: A population-based nested case–control study. PLoS Med 14(10): e1002396. https://doi.org/10.1371/journal.pmed.1002396

Abstract

Background

Prescription opioid use is highly associated with risk of opioid-related death, with 1 of every 550 chronic opioid users dying within approximately 2.5 years of their first opioid prescrip-

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Diagnosis

Most useful

- Age > 70
- Age < 60
- Bilateral buttock or leg pain
- No pain when seated
- Symptoms worse standing/walking/extension
- Symptoms improve when bending forward
- Positive Rhomberg / wide stance gait
- Urinary disturbances

Suri et al, JAMA 2010, Genevay et al Spine 2017

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Condition	Red Flags
Cancer or Infection	History of cancer, unexplained weight loss, immunosuppression, urinary infection, IV drug use, prolonged corticosteroids, pain not improved with rest, especially for patient over age 50.
Spinal fracture	History of age-specific significant trauma, age >70, prolonged steroid use.
Cauda equina or Severe neurologic compromise	Acute onset of urinary retention or overflow incontinence, loss of anal sphincter tone or fecal incontinence, saddle anesthesia, global or progressive motor weakness in the lower limbs.
Spinal osteomyelitis	IV drug abuse, UI or skin infection
Herniated disc	Sciatica
Spinal stenosis	Pseudoclaudication, age >/= 50
Ankylosing spondylitis	Age at onset </= 40 pain not relieved supine morning back stiffness pain duration >/= three months

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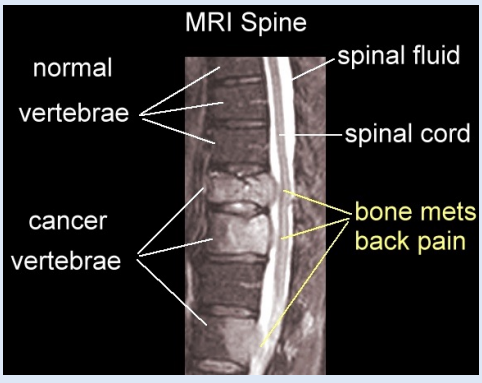

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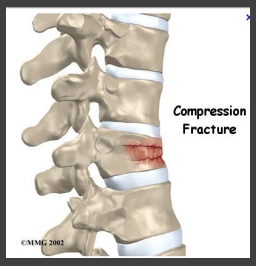
Vertebral Compression Fracture (VCF)

- 4%
- T12-L1*



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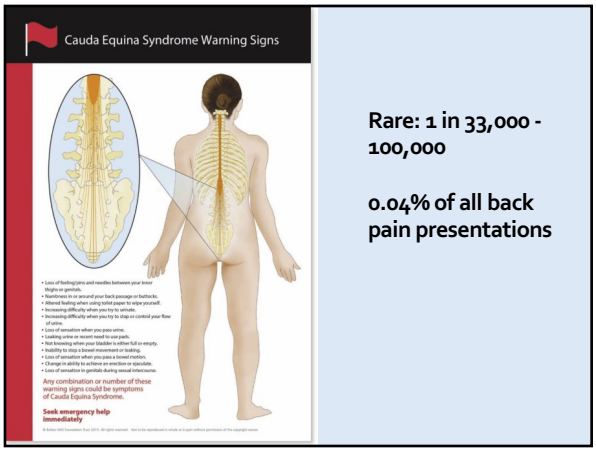

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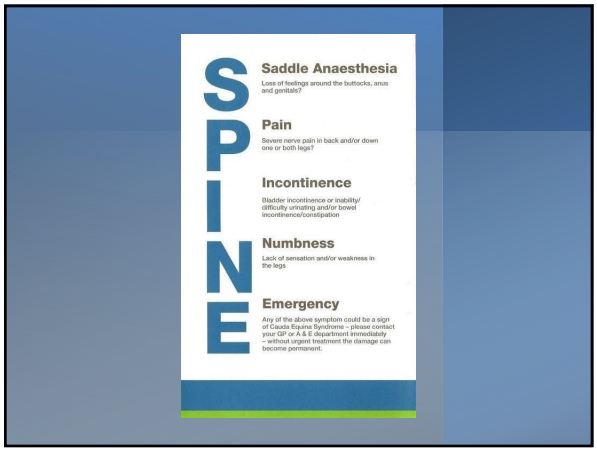

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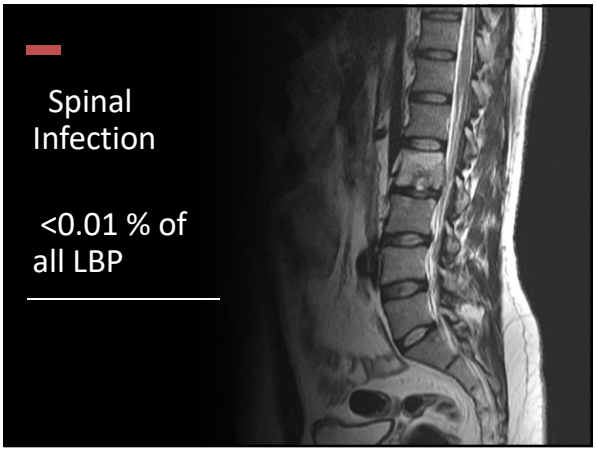

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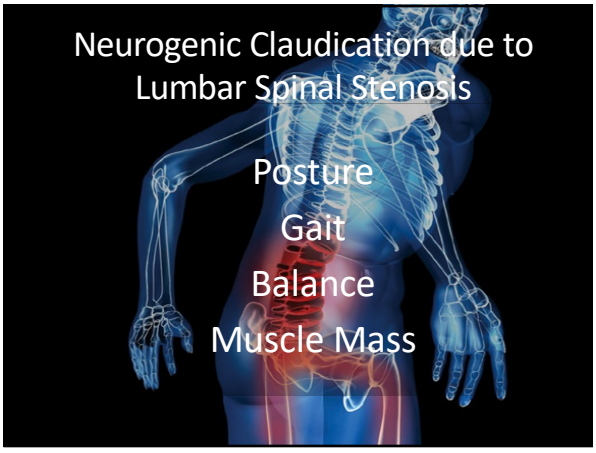

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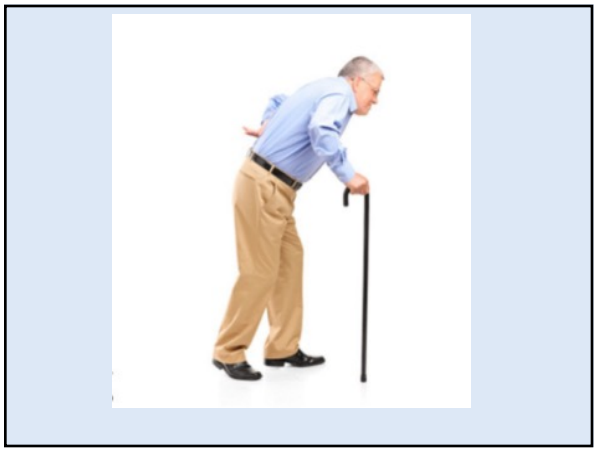

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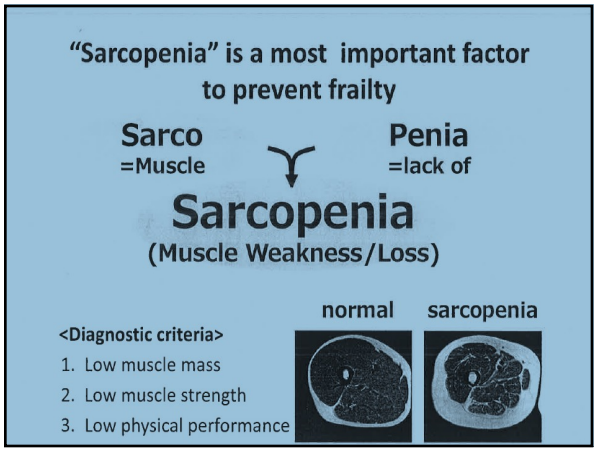

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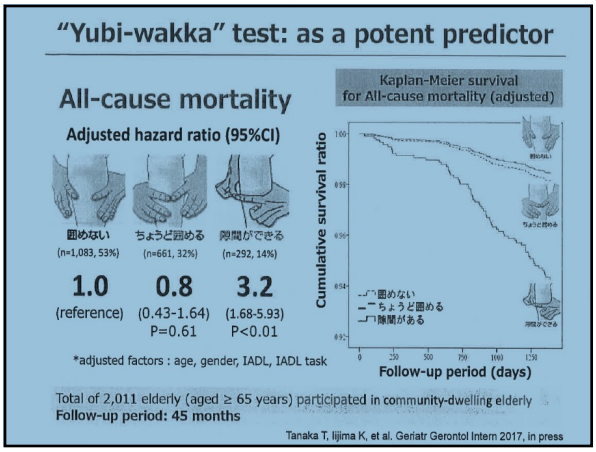

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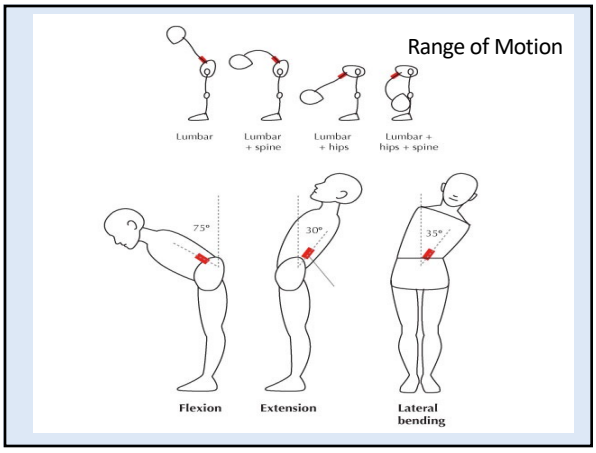

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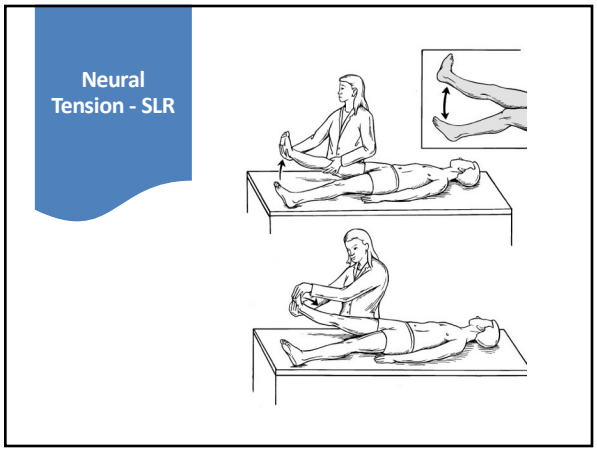

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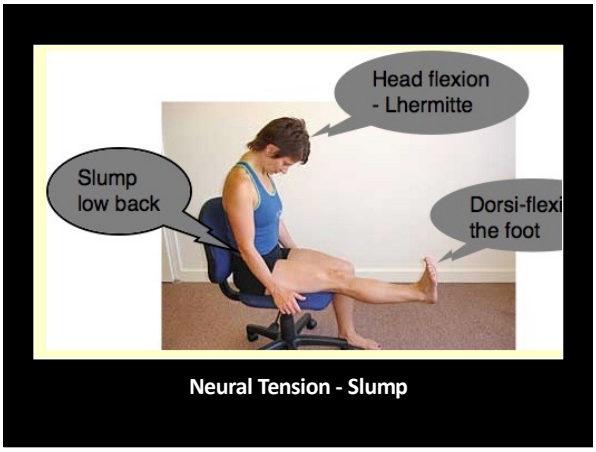

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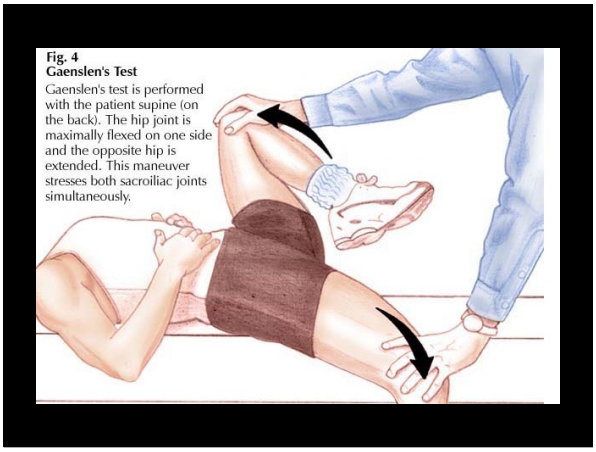

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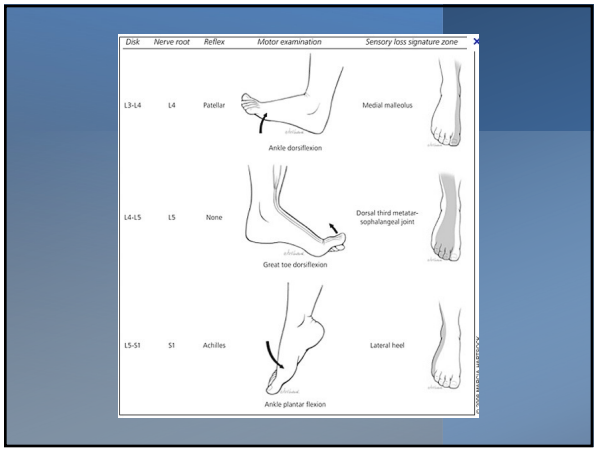

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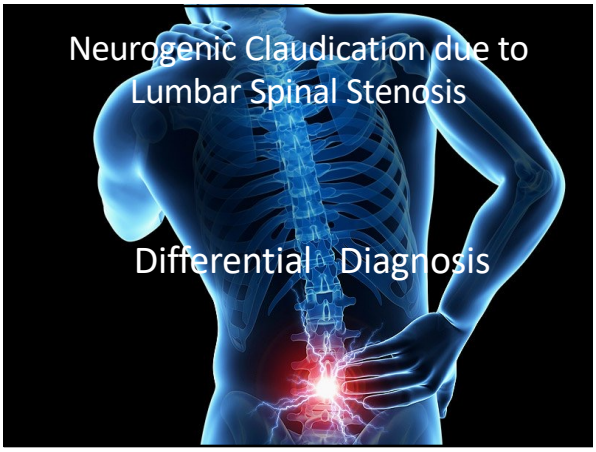

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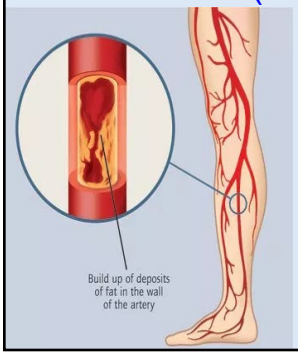
Peripheral Vascular Disease (PAD)



- Definitions
- Patho-physiology
- Prevalence

- 26% of patients with NC have PAD

- Risk factors
  - HBP, high cholesterol, diabetes, smoking

Skin discoloration /Infections lower extremities-nail bed

Imagama 2011, Collins 2007

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Diagnosis (PAD)

- 8% patients with no PAD have absent Dorsalis pedis pulse
- 10% of patients with PAD have normal pulses
- Ankle-brachial or toe-brachial pulse ratio (<0.9)
- Doppler tests- patients with 50% occlusion have sensitivity of 80-89% and specificity 89-99%
- Negative shopping cart sign or forward leaning bike

Imagama S et al Spine 2011, Collins et al HTA 2007

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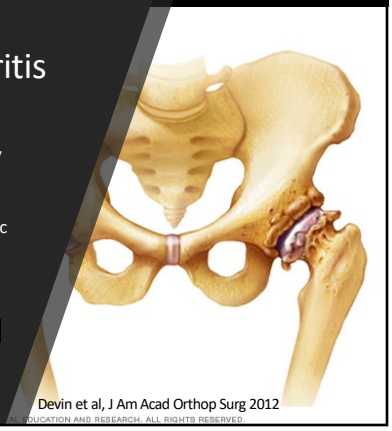
Hip Osteoarthritis

- Definitions
- Patho-physiology
- Prevalence
- 27% adults > 45y have radiographic hip OA

- 9% symptomatic



Devin et al, J Am Acad Orthop Surg 2012

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Hip OA

- Groin pain 7 times more likely to be hip or hip-spine than spine alone
- Study using fluoroscopic guided injections- buttock pain (71%) most common location for referred hip pathology followed by combined thigh and groin (55%)
- 47% hip OA report pain below knee
- Hip exam –internal rot and flexion, limping gait, night pain, Trendleberg gait
- Thomas test- hip contractures
- Atrophy- disuse vs neurogenic
- Fluoroscopic guided injections of hip for dx not as useful for spine

Khan et al, Ann R Coll Surg Engl 2004
Lawrence et al Arthritis Rheum 2008

Botwin et al AJPMR 2002,
Lesher et al Pain Med 2008,

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Hip-Spine Syndrome

- Definitions
- Patho-physiology
- Simple – one clear source of disability
- Complex – no clear source of disability

Devin et al, J Am Acad Orthop Surg 2012

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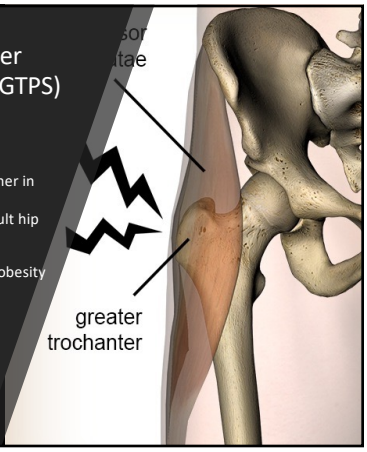
Greater Trochanter Pain Syndrome (GTPS)

Definitions
- Patho-physiology
- Prevalence
  - 10-25% of population-higher in elderly
- Second leading cause of adult hip pain
- Risk factors
  - Older, female, ITB pain, obesity and LBP



Williams BS, 2009, Tortolani PJ 2002,
Gordon EJ 1961, Segal NA 2007,
Stephens MB 2008

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Diagnosis- GTPS

- Deep palpation- jump sign
- Active and resisted abduction of hip
- Passive FABERE
- Trendelenberg sign- Standing one leg
- Stair climbing vs NC
- Lying on affected side- night pain
- Injections (steroid/anesthetic)

Williams BS, 2009, Tortolani PJ 2002, Gordon EJ 1961, Segal NA 2007, Stephens MB 2008

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Differential Diagnosis

Neuropathy
- Diabetic neuropathy
- Hypothyroidism
- Vit B12, Vit B1 and Folic acid

Radicular and mixed types of LSS

Cervical and/or Dorsal Spinal Stenosis

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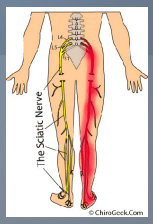
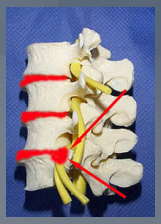
Lumbar Disc Herniation





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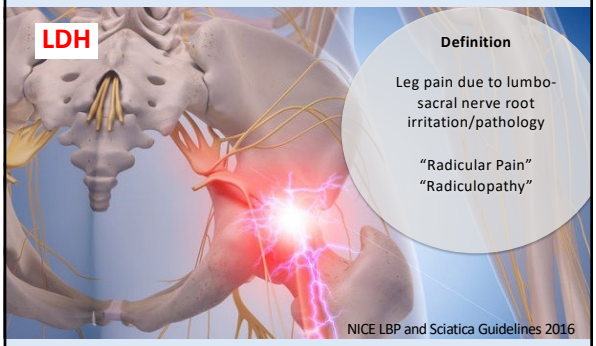

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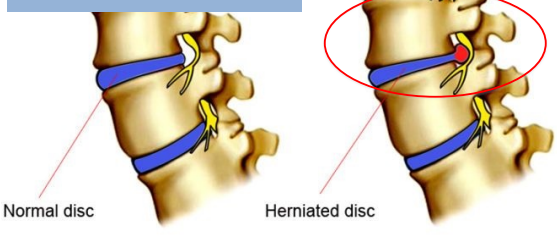
Displacement of nucleus pulposus or annulus fibrosis beyond the intervertebral disc space



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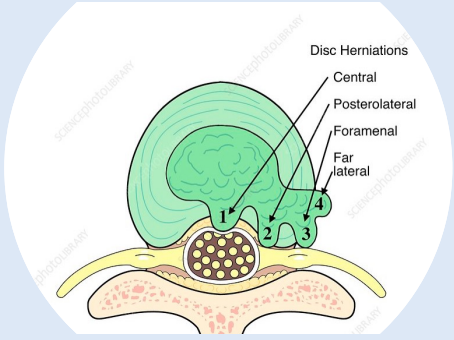

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Demonstration Video Lumbar Disc Diurnal Effects

Courtesy of Dr. Bill Morgan and Parker University

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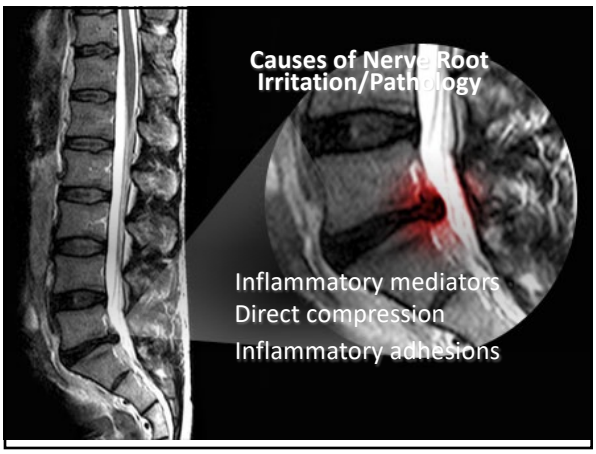

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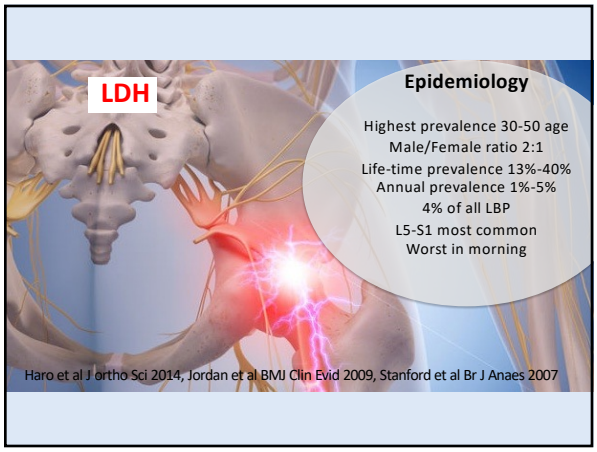

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Neurogenic Claudication (LSS) vs. Lumbar Radiculopathy (LHD)

	NC	LR
Demographics	> 65	40s
Lumbar flexion	Relief	Worse
Sitting	Relief	Worse
Level	L4-5	L5-S1
SLR	Negative	Positive

Suri 2012, Katz 2008, Rainville 2013

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Degenerative lumbar spinal stenosis and its imposters: three case studies

Carlo Ammendolia, DC, PhD*

Degenerative lumbar spinal stenosis causing neurogenic claudicaton is a common condition impacting walking ability in older adults. There are other highly prevalent conditions in this patient population that have similar signs and symptoms and cause limited walking ability. The purpose of this study is to highlight the diagnostic challenges using three case studies of older adults who present with limited walking ability who have imaging evidence of degenerative lumbar spinal stenosis.

(JCCA 2014;58(3):312-319)

KEY WORDS: degenerative, spinal stenosis, claudication, lumbar

La sténose lombaire dégénérative à la base d'une claudication d'origine neurogale est une condition fréquente affectant la faculté de la marche chez les adultes âgés. Les patients de cette catégorie peuvent être affectés par d'autres maladies très courantes qui présentent des signes et des symptômes similaires, et qui restreignent leur capacité de marche. Le but de cette étude est de souligner les difficultés en diagnostic au moyen de trois études de cas de personnes âgées qui présentent une capacité de marche réduite et qui souffrent de sténose lombaire dégénérative mise en évidence par imagerie médicale.

(JCCA. 2014;58(3):312-319)

MOTS CLÉS : *dégénératif, sténose rachidienne, claudication, lombaire*

Introduction

Degenerative lumbar spinal stenosis (DLSS) is a leading cause of pain, disability, and loss of independence in older adults.[1] The prevalence and economic burden of DLSS is growing exponentially due to the aging population. It is a chronic disease caused by age related degenerative narrowing (stenosis) of the spinal canal that can lead to compression and ischemia of the spinal nerves (neuro-ischemia).[2] The clinical syndrome of DLSS is known as neurogenic claudication. It is characterized by bilateral or unilateral buttock, lower extremity pain, heaviness, numbness, tingling or weakness, precipitated by walk-

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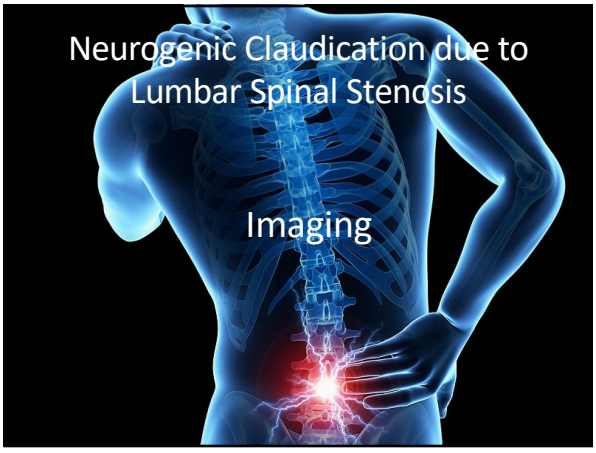

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Imaging LSS and LDH

Lumbar Spinal Stenosis
- up to 30% of asymptomatic individuals
- > age 55 have moderate lumbar stenosis

Lumbar Disc Herniation
- 20% asymptomatic individuals < age 60
- 36% asymptomatic individuals > age 60

Boden 1990, Tong 2006

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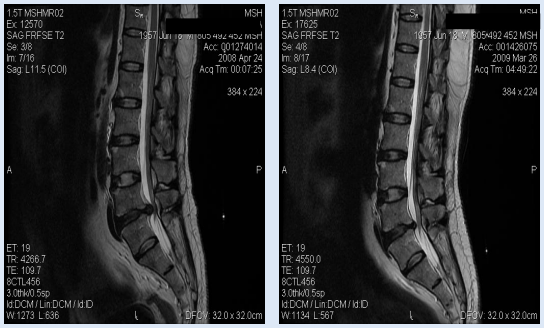
Imaging



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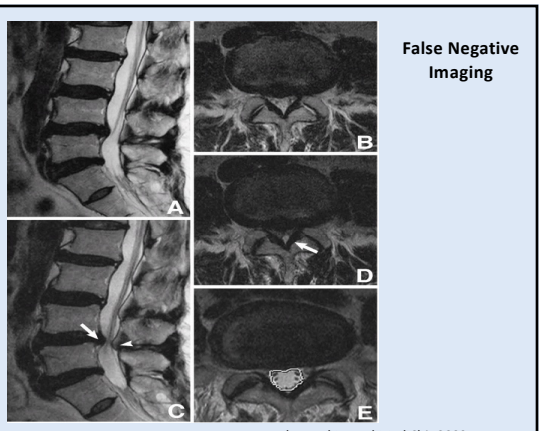

False Negative Imaging

Ahn et al Neurol Med Chir 2009

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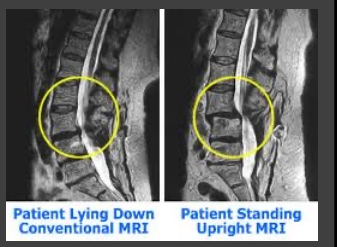
Imaging in LSS



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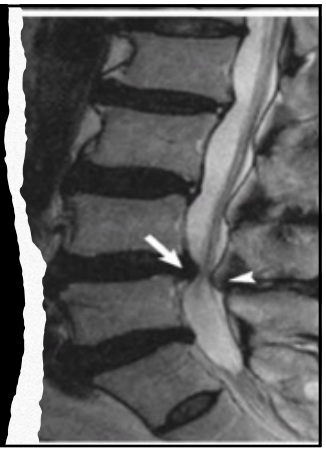
Imaging

Poor Correlation with symptoms/function/QOL/prognosis

- MRI imaging of choice
- In the absence of RED FLAGS
- If not progressive and not surgical no MRI needed



Chou et al CPG 2007, Arita et al 2022

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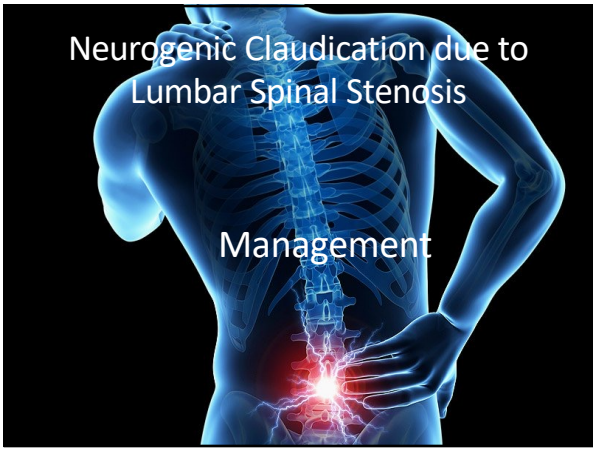
Neurogenic Claudication due to Lumbar Spinal Stenosis



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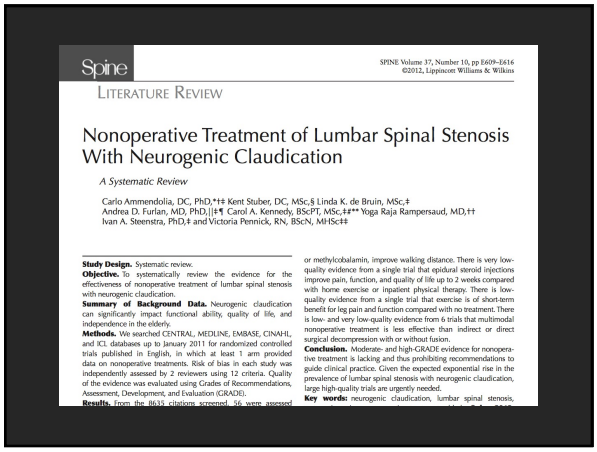

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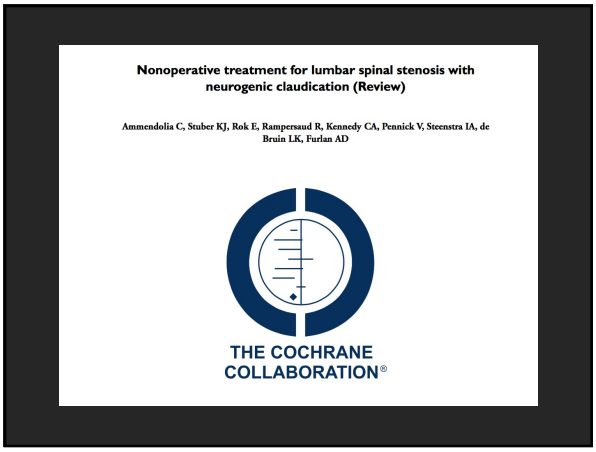

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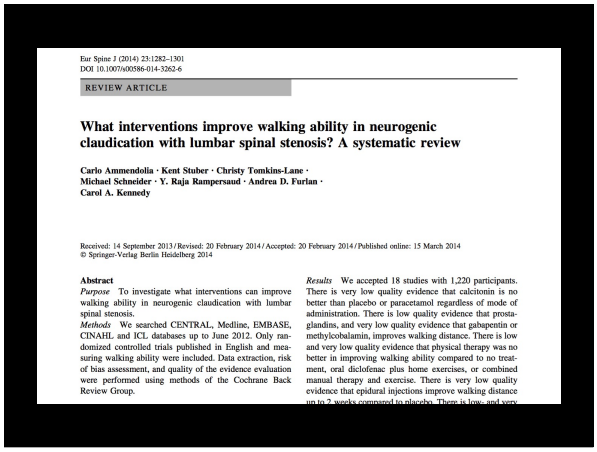

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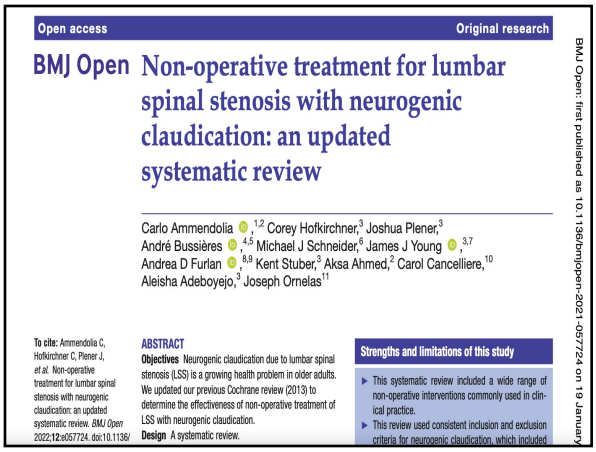

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Treatment- Neurogenic Claudication

Intervention	Effectiveness	
Medications	low/very low quality evidence (?)	moderate quality evidence
Calcitonin (6)	-	
NSAIDS (1)	-	
Vit B12	+	
Gabapentin (2)	+/-	
Pregabalin (1)	-	
Opioids (1)	-	
Oral corticoid (1)	-	

Ammendolia et al BMJ Open 2022

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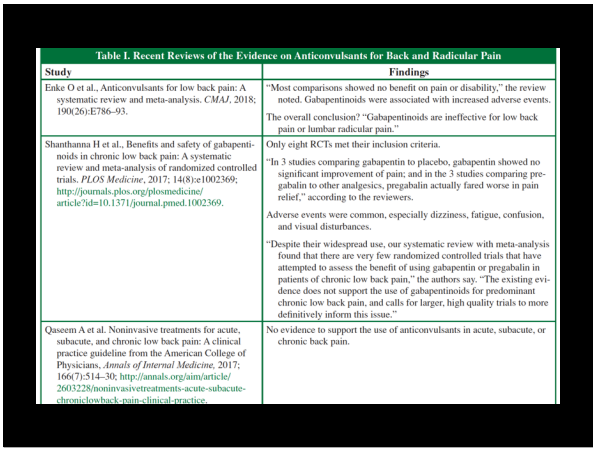

Table I. Recent Reviews of the Evidence on Anticonvulsants for Back and Radicular Pain

Study	Findings
Enke O et al., Anticonvulsants for low back pain: A systematic review and meta-analysis. *CMAJ*, 2018; 190(26):E786–93.	"Most comparisons showed no benefit on pain or disability," the review noted. Gabapentinoids were associated with increased adverse events. The overall conclusion? "Gabapentinoids are ineffective for low back pain or lumbar radicular pain."
Shanthanna H et al., Benefits and safety of gabapentinoids in chronic low back pain: A systematic review and meta-analysis of randomized controlled trials. *PLOS Medicine*, 2017; 14(8):e1002369; http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1002369.	Only eight RCTs met their inclusion criteria. "In 3 studies comparing gabapentin to placebo, gabapentin showed no significant improvement of pain; and in the 3 studies comparing pregabalin to other analgesics, pregabalin actually fared worse in pain relief," according to the reviewers. Adverse events were common, especially dizziness, fatigue, confusion, and visual disturbances. "Despite their widespread use, our systematic review with meta-analysis found that there are very few randomized controlled trials that have attempted to assess the benefit of using gabapentin or pregabalin in patients of chronic low back pain," the authors say. "The existing evidence does not support the use of gabapentinoids for predominant chronic low back pain, and calls for larger, high quality trials to more definitively inform this issue."
Qaseem A et al. Noninvasive treatments for acute, subacute, and chronic low back pain: A clinical practice guideline from the American College of Physicians, *Annals of Internal Medicine*, 2017; 166(7):514–30; http://annals.org/aim/article/2603228/noninvasivetreatments-acute-subacute-chroniclowback-pain-clinical-practice.	No evidence to support the use of anticonvulsants in acute, subacute, or chronic back pain.

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Treatment- Neurogenic Claudication

Intervention	Effectiveness	
	low/very low quality evidence	moderate quality evidence
Epidural injections (11)	-/+	- (1)
Physical therapy/ Multi-modal (11)	-/+	+ (2)
Spinal manipulation (1)	-	
Acupuncture (2)	-/+	
Surgery (6)	-/+	

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ARTICLE IN PRESS

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Focus Article

Non-Surgical Interventions for Lumbar Spinal Stenosis Leading To Neurogenic Claudication: A Clinical Practice Guideline

André Bussières, *,† Carolina Cancelliere, ‡ Carlo Ammendolia, § Christine M. Comer, ¶ Fadi Al Zoubi, ‖ Claude-Edouard Châtillon, # Greg Chernish, ** James M Cox, †† Jordan A Gliedt, ‡‡ Danielle Haskett, §§ Rikke Krüger Jensen, ¶¶ Andrée-Anne Marchand, ‖‖ Christy Tomkins-Lane, ## Julie O'Shaughnessy, *** Steven Passmore, ††† Michael J. Schneider, ‡‡‡,§§§ Peter Shipka, ¶¶¶ Gregory Stewart, ‖‖‖ Kent Stuber, ###,**** Albert Yee, †††† and Joseph Ornelas ‡‡‡‡,§§§§, In collaboration with the Canadian Chiropractic Guideline Initiative in collaboration and Bone and Joint Canada

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Check for updates

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http://dx.doi.org/10.1136/bmj.n1581

CLINICAL UPDATES

Lumbar spinal stenosis

Rikke Krüger Jensen, [1,2] Biswadjiet S Harhangi, [3] Frank Huygen, [4] Bart Koes [1,5]

What you need to know

- Suspect lumbar spinal stenosis in people over 50 who describe leg pain or paraesthesia on walking or prolonged standing, and who are walking reduced distances as a result
- Imaging is not required during initial assessment as the correlation between imaging findings and symptoms is poor
- Conservative treatment, which includes supervised exercise and manual therapy, is advised as first line treatment; about 30-50% of patients with mild to moderate symptoms experience spontaneous improvement in pain and ability to walk greater distances
- Prescribe pain medication only for a short period and after careful consideration, taking into account the important side effects, especially in older people, and the absence of good evidence for efficacy
- Refer patients with severe symptoms, neurological deficits, or no improvement after 3-6 months of conservative treatment to a spine specialist for imaging and further intervention or surgery

Lumbar spinal stenosis (LSS) affects about 11% of the population,[1] and primarily affects older adults.[1] Pain in legs and difficulty walking can limit function and studies, 6108 participants).[1] The pooled prevalence of clinical symptoms of LSS in primary care patients is 25% (95% CI 19 to 32%) (four studies, 171 157 patients). Prevalence varies between studies because of differences in population characteristics and diagnostic criteria used.

Prevalence increases with age. The mean age in the general population and primary care patient population is 62 and 69 years, respectively (age range 19-93).[1] Patients with congenital LSS are often younger.

How do patients present?

Patients describe being able to walk reduced distance because of pain in buttocks and/or legs (neurogenic claudication).[7] Symptoms are aggravated by walking or prolonged standing and relieved by forward bending (shopping cart sign) or sitting.[8] Pain is bilateral in central LSS and may be accompanied with paraesthesia, or weakness in the buttocks, thighs, or lower legs. Low back pain may be present.[9] The severity can range from mild discomfort when walking to being unable to walk. Impaired balance and forward flexion when walking may increase the risk of falling.

Lateral recess or foraminal stenosis can cause

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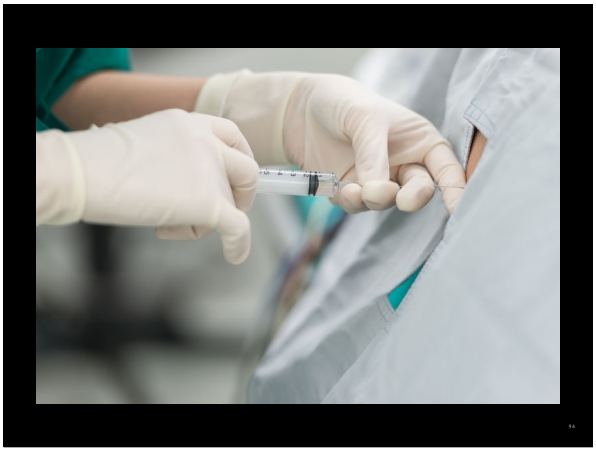

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Epidural Injections (EDI)

Friedly JL et al New Engl J Med 2014
- RCT N=400 EDI
- Glucocorticoids plus lidocaine vs. lidocaine alone
- No difference

Chou R et al Ann Intern Med 2015
- SR- 8 RCTs (placebo/dose/techniques)
- No clear benefit/effectiveness- (low-moderate evidence)

Despite the lack of evidence, 25 % of all epidural injections are performed for symptoms of lumbar spinal stenosis

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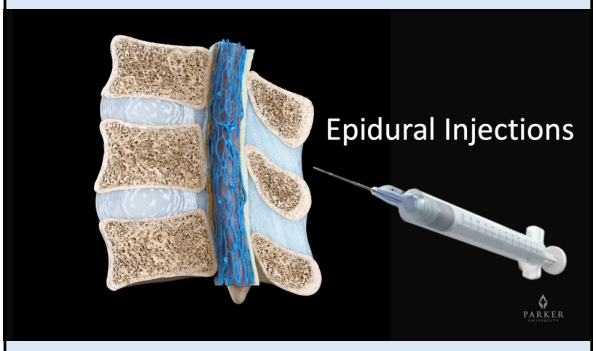
Demonstration Video Epidural Injections



Courtesy of Dr. Bill Morgan and Parker University

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Neurogenic Claudication

Surgery

Direct decompression

Indirect decompression

Conflicting RCT evidence

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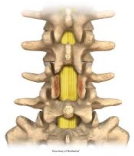
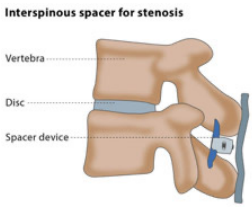
Surgery for Lumbar Spinal Stenosis





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Spine Surgery

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Boot Camp Programs

Current Programs

1. Ankylosing Spondylitis
2. Fibromyalgia
3. Knee OA
4. Hip OA
5. Persistent Neck Pain
6. Persistent LBP
7. Persistent Shoulder Pain
8. Lumbar Spinal Stenosis
9. Sciatica
10. Pregnancy & LBP
11. Falls Prevention

3 1/2 Min Low Back Exam and Tailored Treatment

Work in progress Cervical radiculopathy/myelopathy

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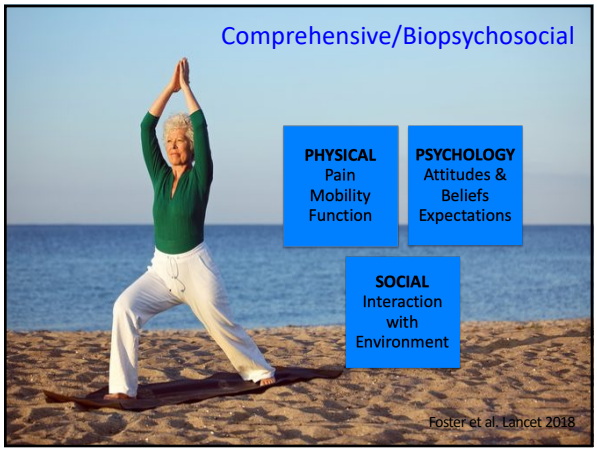

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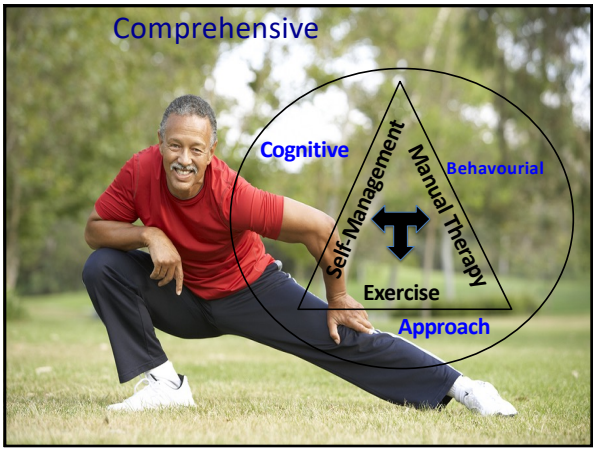

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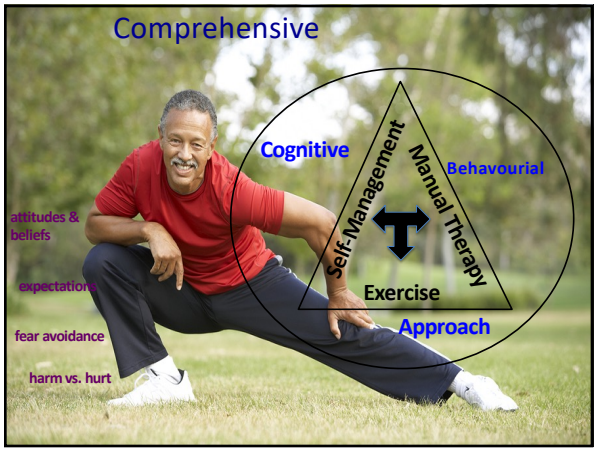

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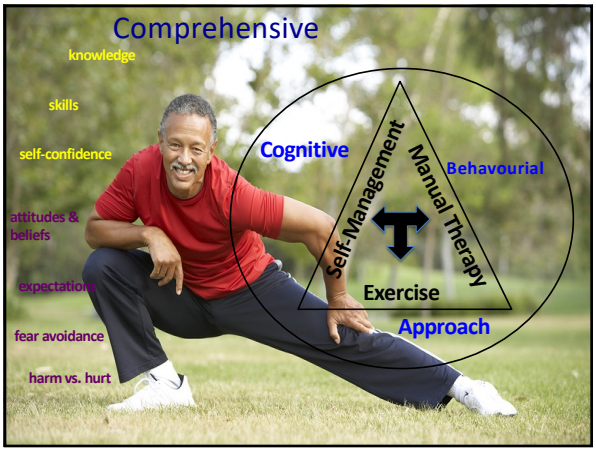

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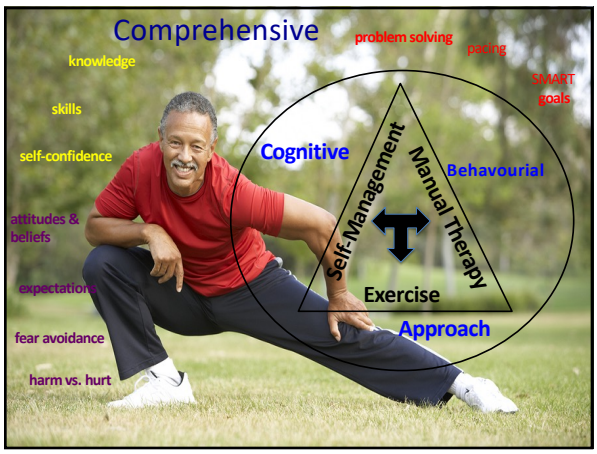

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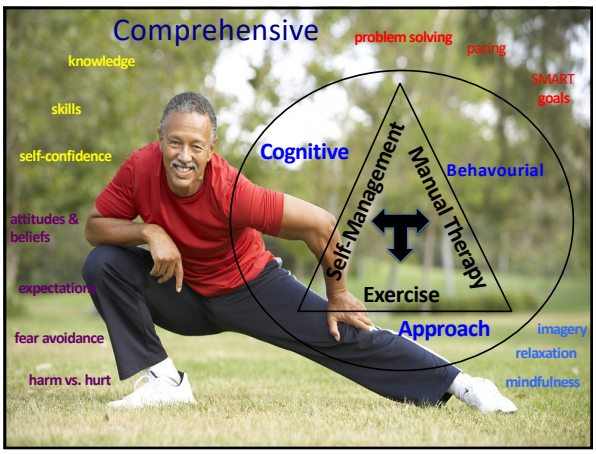

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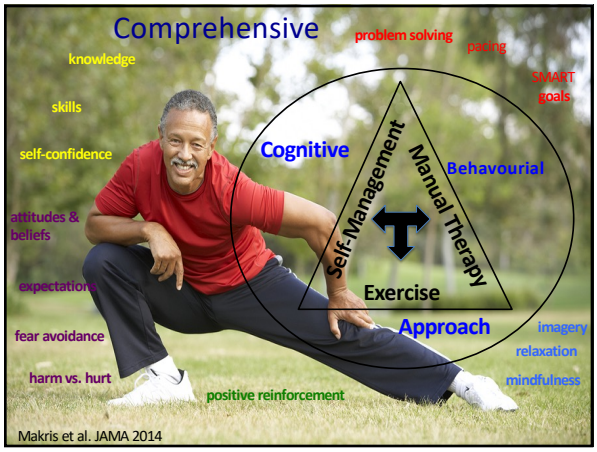

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Research Paper

PAIN

OPEN

Open-label placebo treatment in chronic low back pain: a randomized controlled trial

Cláudia Carvalho[a,*], Joaquim Machado Caetano[b], Lídia Cunha[c], Paula Rebouta[c], Ted J. Kaptchuk[d], Irving Kirsch[d]

Abstract

This randomized controlled trial was performed to investigate whether placebo effects in chronic low back pain could be harnessed ethically by adding open-label placebo (OLP) treatment to treatment as usual (TAU) for 3 weeks. Pain severity was assessed on three 0- to 10-point Numeric Rating Scales, scoring maximum pain, minimum pain, and usual pain, and a composite, primary outcome, total pain score. Our other primary outcome was back-related dysfunction, assessed on the Roland–Morris Disability Questionnaire. In an exploratory follow-up, participants on TAU received placebo pills for 3 additional weeks. We randomized 97 adults reporting persistent low back pain for more than 3 months' duration and diagnosed by a board-certified pain specialist. Eighty-three adults completed the trial. Compared to TAU, OLP elicited greater pain reduction on each of the three 0- to 10-point Numeric Rating Scales and on the 0- to 10-point composite pain scale ($P < 0.001$), with moderate to large effect sizes. Pain reduction on the composite Numeric Rating Scales was 1.5 (95% confidence interval: 1.0-2.0) in the OLP group and 0.2 (−0.3 to 0.8) in the TAU group. Open-label placebo treatment also reduced disability compared to TAU ($P < 0.001$), with a large effect size. Improvement in disability scores was 2.9 (1.7-4.0) in the OLP group and 0.0 (−1.1 to 1.2) in the TAU group. After being switched to OLP, the TAU group showed significant reductions in both pain (1.5, 0.8-2.3) and disability (3.4, 2.2-4.5). Our findings suggest that OLP pills presented in a positive context may be helpful in chronic low back pain.

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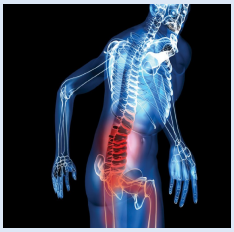
Boot Camp Program Lumbar Spinal Stenosis



- Self management
- Self monitoring
- Flexion exercises
- Strength training
- Manual therapy
- Body re-positioning
- 2x w- 6weeks

Cognitive Behavioural Approach
Emphasis on standing/walking/functional abilities

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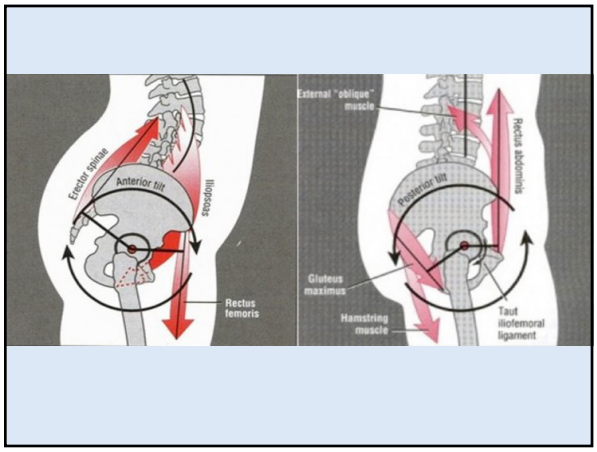

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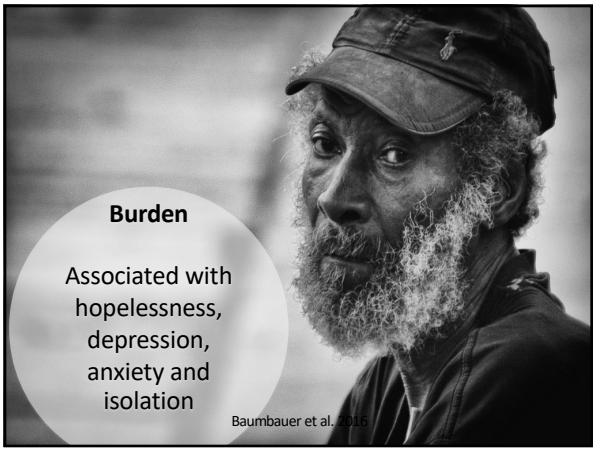

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Cognitive Behavioural and Motivational Interviewing Approaches to Manage Psychosocial Barriers (Yellow Flags)

Carlo Ammendolia DC PhD

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Negative Expectations "I will not get better" "This treatment will not help me". "I will get worse"	Listen and validate concerns "yes I understand you are concerned". Show empathy and compassion. Build rapport and trust Provide positive expectations. Use positive language. Use research findings/ data to support positive expectations. E.g. "With the lumbar stenosis Boot Camp program there is an 85% success rate". "Not about eliminating pain" it is about "maximizing function" and "managing pain". "But on average pain decreases significantly with program". Provide positive reinforcement, encouragement and positive messaging and feedback. Identify positive changes each visit.

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Pain/fear Avoidance Behaviour "Activity will cause more pain" "I am afraid to do things" "Activity hurts me"	Listen and validate concerns "yes I understand you are concerned". Show empathy and compassion. Build rapport and trust Explain "harm vs. hurt pain". "Pain does not mean damage" "Ok to feel some pain with activity/walking". "Many are worse before they are better with program, this is expected". "Activity is key to long term benefit." Show how to problem solve- tips on self-management. Demonstrate pacing/use heat/ice. Complete goal setting exercise -SMART goals*. Use imagery exercises* to reduce pain and fear.

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Low/depressed mood/isolation "I cannot cope" "I feel hopeless" "I want to stay home"	Listen and validate concerns "yes I understand" Show empathy and compassion. Build rapport and trust. Provide positive reinforcement/expectations and foster and build self-confidence. Identify positive changes each visit. Reflect on successes to build self-confidence. Explore social networks/support. Encourage pacing, socialization and use goal setting exercises* and have a plan. Use imagery exercises* to reduce pain and fear and improve mood

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Cognitive Behavioural Approach Reducing Psychosocial Barriers

Factors	Interventions – aimed at changing attitudes/beliefs, building self-confidence, skills and knowledge	ROF	W1	W2	W3	W4	W5	W6
Negative Expectations "I will not get better" "This treatment will not help me" " I will get worse"	**Validate Concerns** "yes I understand you are concerned". Show **empathy and compassion** Provide **positive expectations** Use research findings/ data- 85% significantly improve function end of program **Not about eliminating pain** about maximizing function. But on average pain decreases significantly Provide **positive reinforcement**, encouragement and **positive messaging and feedback**. Identify positive changes each visit.	x	x	x	x	x	x	x
Pain/fear Avoidance Behaviour "Activity will cause more pain" "I am afraid to do things" "Activity hurts me"	**Validate Concerns** "yes I understand you are concerned". Show **empathy and compassion** Explain **harm vs. hurt** pain. Pain does not mean damage **Ok to feel some pain** with activity/walking. 60% are worse before better with program. **Activity is key** to long term benefit Show how to **problem solve**- tips on self-management (e.g. use pelvic tilt). Demonstrate **pacing**/ use heat/ice Complete **goal setting exercise** SMART goals. Use **imagery exercises** to reduce pain and fear	x	x	x	x	x	x	x
Low/depressed mood/isolation "I cannot cope" "I feel hopeless" "I want to stay home"	**Validate Concerns** "yes I understand" Show **empathy and compassion** Provide **positive reinforcement/expectations** and **build self-confidence.** Identify positive changes each visit. Encourage **pacing, socialization** and use **goal setting exercise** and have a plan Use **imagery exercises** to reduce pain and fear and improve mood	x	x	x	x	x	x	x

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Personal Goal Setting (Functional Activity Goals)

Functional Goals: Action Plan	Record Progress and Problem Solve Barriers				
	Week 2	Week 3	Week 4	Week 5	Week 6
1.What _____ When _____ Where _____ How much _____ How often					
2. What _____ When _____ Where _____ How much _____ How often					
3. What _____ When _____ Where _____ How much _____ How often					
4. What _____ When _____ Where _____ How much _____ How often					
5. What _____ When _____ Where _____ How much _____ How often					

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Mental Imagery Inventory and Recall

List Positive Memories	Suggest how to incorporate into daily routine
1.	
2.	
3.	
4.	
5.	
6.	
7.	

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The Evidence

Boot Camp Program
LUMBAR SPINAL STENOSIS
Dr. Carlo Ammendolia

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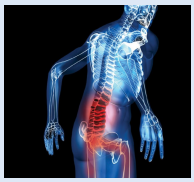
University of Toronto Lumbar Spinal Stenosis Study

University of Toronto Spine Program



Going the Distance:
Evaluating a Non-Operative Approach to Improve Walking Ability in Lumbar Spinal Stenosis

Carlo Ammendolia, Pierre Côté, Danielle Southerst, Michael Schneider, Brian Budgell, Claire Bombardier, Gillian Hawker, Raja Rampersaud

Mount Sinai Hospital

Funded by The Arthritis Society and CCRF

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ORIGINAL RESEARCH

Comprehensive Nonsurgical Treatment Versus Self-directed Care to Improve Walking Ability in Lumbar Spinal Stenosis: A Randomized Trial

Carlo Ammendolia, DC, PhD,[a,b] Pierre Côté, DC, PhD,[a,c,d] Danielle Southerst, DC,[e] Michael Schneider, DC, PhD,[f] Brian Budgell, DC, PhD,[g] Claire Bombardier, MD,[h,i] Gillian Hawker, MD,[h,i] Y. Raja Rampersaud, MD[j]

From the [a]Institute of Health Policy, Management and Evaluation, University of Toronto, Toronto, Ontario, Canada; [b]Rebecca MacDonald Centre for Arthritis & Autoimmune Disease, Mount Sinai Hospital, Toronto, Ontario, Canada; [c]Dalla Lana School of Public Health, University of Toronto, Toronto, Ontario, Canada; [d]Faculty of Health Sciences, University of Ontario Institute of Technology and UOIT-CMCC Centre for Disability Prevention and Rehabilitation, Toronto, Ontario, Canada; [e]Occupational and Industrial Orthopaedic Centre, Department of Orthopaedic Surgery, NYU Langone Health, New York, NY; [f]Department of Physical Therapy, University of Pittsburgh, Pittsburgh, PA; [g]Canadian Memorial Chiropractic College, Toronto, Ontario, Canada; [h]Department of Medicine, Division of Rheumatology, University of Toronto, Toronto, Ontario, Canada; [i]Department of Medicine, University of Toronto, Toronto, Ontario, Canada; and [j]Department of Orthopedics, Toronto Western Hospital, University Health Network, Toronto, Ontario, Canada.

Abstract

Objectives: To compare the effectiveness of a comprehensive nonsurgical training program to a self-directed approach in improving walking ability in lumbar spinal stenosis (LSS).

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Study: Primary Purpose

Assess effectiveness of the Boot Camp Program to improve walking ability

Study Design:
Randomized Controlled Study

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Population Inclusion Criteria

- Neurogenic claudication
- Age ≥ 50 years
- Duration > 3 months
- Imaging confirmed canal narrowing- MRI/CT
- Not surgical next 12 months
- Perform mild-moderate exercise
- Walk independently for at least 20 metres and less than 30 minutes continuously

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Intervention & Control

Comprehensive (Boot Camp Program)
vs.
Self Directed Program (Control)

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Comprehensive Boot Camp

- 2x w- 6weeks
- Manual therapy
- Home flexion exercises
- Home Strength training
- Self management
- Self monitoring
- Body re-positioning
- Emphasis standing & walking abilities
- Cognitive behavourial Approach

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Self-Directed (Control Group)

- One educational session
- Home flexion exercises
- Home Strength training
- Self management
- Self monitoring
- Body re-positioning
- Emphasis standing & walking abilities

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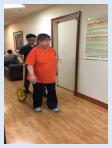
Outcomes & Analysis



Primary Outcome
- Self-Paced Walk Test
  -mean difference in distance

Secondary Outcomes
- ZCQS, ZCQF, ODI, ODI walk, NPS back, NPS leg, SF36

Follow-up
- 8w, 3m, 6m and 12m

Responder Analysis
- ≥ 30% and ≥ 50% improvement in SPWT

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Baseline Characteristics

Variable	Level	Compre	Self Direct	p-value
Age (yrs)		69.4±7.7	71.7±9.5	0.17
Sex	Female	33 (65)	26 (49)	0.11
Distance_SPWT	Metres	283.6	372.1	0.59
Duration-leg	3 to 12 months	10 (20)	7 (13)	0.38
	> 12 months	41 (80)	46 (87)	
Dominate pain	Leg	34 (67)	32 (60)	0.69
	Back	9 (18)	13 (25)	
	Equal	8 (16)	8 (15)	
ZCQF		0.58±0.11	0.58±0.14	0.71
ZCQS		0.60±0.11	0.59±0.10	0.68
ZCQSF		1.18±0.19	1.16±0.20	0.65
ODI		0.4±0.1	0.4±0.1	0.89
NRS-Back pain		5.2±2.7	5.7±2.6	0.29
NRS-Leg pain		7.2±2.3	6.9±1.9	0.46

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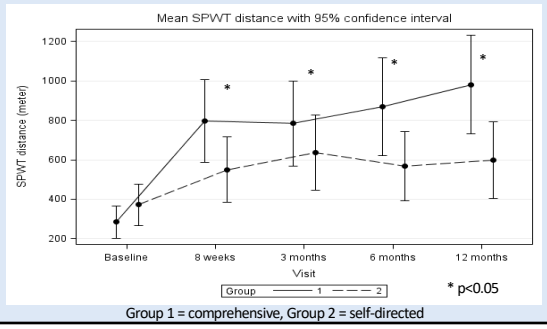
Primary Outcome (SPWT)



Group 1 = comprehensive, Group 2 = self-directed

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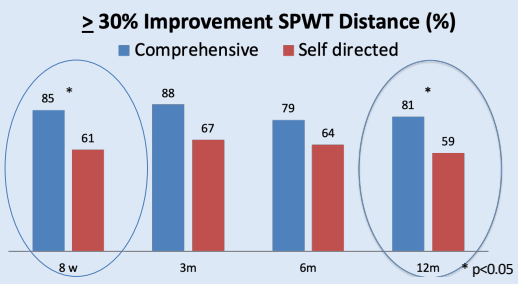
Primary Outcome



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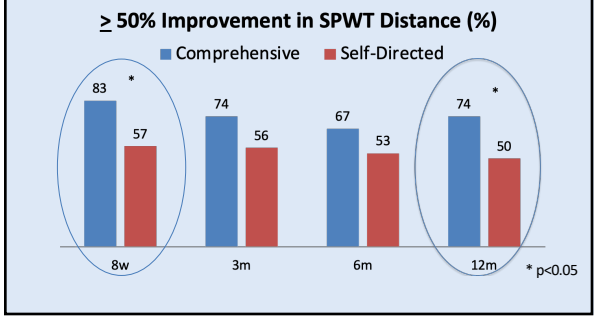
Secondary Analysis



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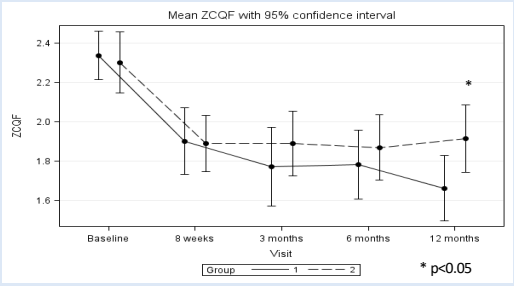
Secondary Outcomes



Group 1 = comprehensive, Group 2 = self-directed

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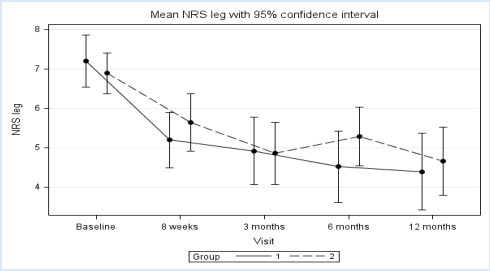
Secondary Outcomes



Group 1 = comprehensive, Group 2 = self-directed

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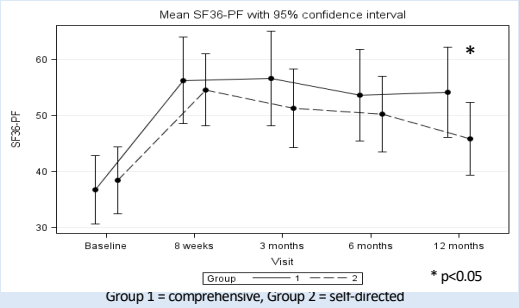
Secondary Outcomes



Group 1 = comprehensive, Group 2 = self-directed

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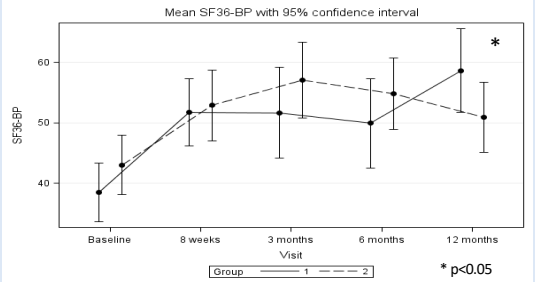
Secondary Outcomes



Group 1 = comprehensive, Group 2 = self-directed

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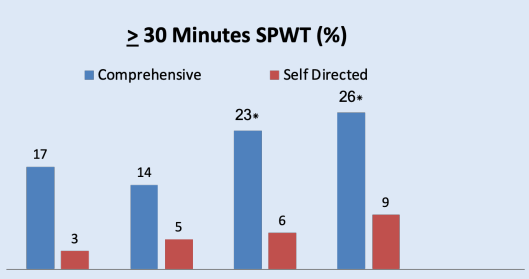
Secondary Outcomes



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Summary RCT

- Comprehensive Boot Camp (manual therapy)
  - Superior improvement long term
    - walking ability, symptoms and function

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JAMA Network Open.

Original Investigation | Physical Medicine and Rehabilitation

Comparative Clinical Effectiveness of Nonsurgical Treatment Methods in Patients With Lumbar Spinal Stenosis
A Randomized Clinical Trial

Michael J. Schneider, DC, PhD; Carlo Ammendolia, DC, PhD; Donald R. Murphy, DC; Ronald M. Glick, MD; Elizabeth Hile, PhD, PT; Dana L. Tudorascu, PhD; Sally C. Morton, PhD; Clair Smith, MS; Charity G. Patterson, PhD, MSPH; Sara R. Piva, PhD, PT

Abstract

IMPORTANCE Lumbar spinal stenosis (LSS) is the most common reason for spine surgery in older US adults. There is an evidence gap about nonsurgical LSS treatment options.

OBJECTIVE To explore the comparative clinical effectiveness of 3 nonsurgical interventions for patients with LSS.

DESIGN, SETTING, AND PARTICIPANTS Three-arm randomized clinical trial of 3 years' duration (November 2013 to June 2016). Analysis began in August 2016. All interventions were delivered during 6 weeks with follow-up at 2 months and 6 months at an outpatient research clinic. Patients older than 60 years with LSS were recruited from the general public. Eligibility required anatomical evidence of central canal and/or lateral recess stenosis (magnetic resonance imaging/computed tomography) and clinical symptoms associated with LSS (neurogenic claudication; less symptoms with flexion). Analysis was intention to treat.

INTERVENTIONS Medical care, group exercise, and manual therapy/individualized exercise. Medical care consisted of medications and/or epidural injections provided by a physiatrist. Group exercise classes were supervised by fitness instructors in senior community centers. Manual therapy/individualized exercise consisted of spinal mobilization, stretches, and strength training provided by chiropractors and physical therapists.

MAIN OUTCOMES AND MEASURES Primary outcomes were between-group differences at 2 months in self-reported symptoms and physical function measured by the Swiss Spinal Stenosis questionnaire (score range, 12-55) and a measure of walking capacity using the self-paced walking test (meters walked for 0 to 30 minutes).

RESULTS A total of 259 participants (mean [SD] age, 72.4 [7.8] years; 137 women [52.9%]) were allocated to medical care (88 [34.0%]), group exercise (84 [32.4%]), or manual therapy/individualized exercise (87 [33.6%]). Adjusted between-group analyses at 2 months showed manual therapy/individualized exercise had greater improvement of symptoms and physical function compared with medical care (−2.0; 95% CI, −3.6 to −0.4) or group exercise (−2.4; 95% CI, −4.1 to

Key Points

Question What is the comparative effectiveness of 3 types of nonsurgical treatment options for patients with lumbar spinal stenosis (LSS)?

Findings In a randomized clinical trial of 259 patients with LSS, all groups (medical care, group exercise, and manual therapy/individualized exercise) showed improvement in self-reported pain/function and walking capacity at 2 months and 6 months. The manual therapy group had a greater proportion of responders at 2 months, but there were no between-group differences in responder rates at 6 months.

Meaning Although LSS is a chronic degenerative condition, patients with LSS can show improvement in walking capacity with nonsurgical approaches.

Supplemental content

Author affiliations and article information are listed at the end of this article.

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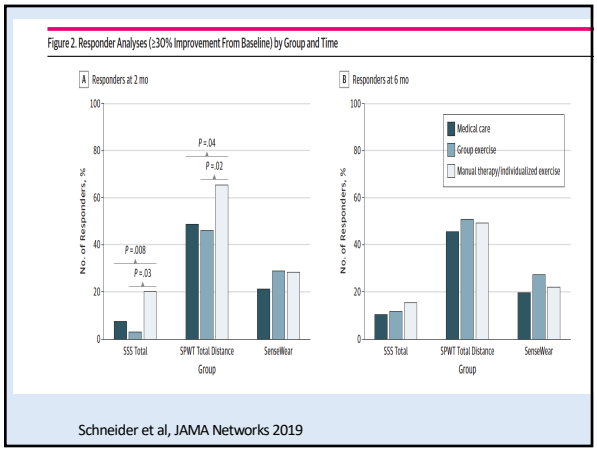

Schneider et al, JAMA Networks 2019

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ACCRAC Award Winning Paper

Clinical Outcomes for Neurogenic Claudication Using a Multimodal Program for Lumbar Spinal Stenosis: A Retrospective Study

Carlo Ammendolia, DC, PhD,[a, b, c] and Ngai Chow, BSc, DC[d]

Abstract

Objective: The purpose of this preliminary study was to assess the effectiveness of a 6-week, nonsurgical, multimodal program that addresses the multifaceted aspects of neurogenic claudication.
Methods: In this retrospective study, 2 researchers independently extracted data from the medical records from January 2010 to April 2013 of consecutive eligible patients who had completed the 6-week *Boot Camp Program*. The program consisted of manual therapy twice per week (eg, soft tissue and neural mobilization, chiropractic spinal manipulation, lumbar flexion-distraction, and muscle stretching), structured home-based exercises, and instruction of self-management strategies. A paired *t* test was used to compare differences in outcomes from baseline to 6-week follow-up. Outcomes included self-reported pain, disability, walking ability, and treatment satisfaction.
Results: A total of 49 patients were enrolled, with a mean age of 70 years. The mean difference in the Oswestry Disability Index was 15.2 (95% confidence interval [CI], 11.39-18.92), and that for the functional and symptoms scales of the Swiss Spinal Stenosis Questionnaire was 0.41 (95% CI, 0.26-0.56) and 0.74 (95% CI, 0.55-0.93), respectively. Numeric pain scores for both leg and back showed statistically significant improvements. Improvements in all outcomes were clinically important.
Conclusions: This study showed preliminary evidence for improved outcomes in patients with neurogenic claudication participating in a 6-week nonsurgical multimodal Boot Camp Program. (J Manipulative Physiol Ther 2015;xx:1-7)
Key Indexing Terms: *Spinal Stenosis; Lumbar Vertebrae; Osteoarthritis; Spine; Rehabilitation; Chiropractic; Claudication; Manual Therapy*

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Clinical Outcomes in Neurogenic Claudication Using a Multimodal Program for Lumbar Spinal Stenosis: A Study of 49 Patients With Prospective Long-term Follow-up

Ngai W. Chow, DC,[a,b,c] Danielle Southerst, DC,[d] Jessica J. Wong, DC, MPH,[c,e] Deborah Kopansky-Giles, DC, MSc,[c,f,g] and Carlo Ammendolia, DC, PhD[h,i]

Abstract

Objective: The purpose of this study was to assess long-term outcomes of a 6-week multimodal program (manual therapy, exercises, and self-management strategies) in patients with neurogenic claudication due to degenerative lumbar spinal stenosis.
Methods: This study evaluated 49 patients with neurogenic claudication who completed a 6-week multimodal program between 2010 and 2013. Outcomes included Oswestry Disability Index (ODI), Zurich Claudication Questionnaire (ZCQ), and Numeric Rating Scale. Mean differences, paired *t* tests, and the Wilcoxon rank-sum test were used to compare outcomes at baseline, 6 weeks, and long-term follow-up.
Results: Twenty-three patients completed the follow-up questionnaire (47% response rate). Median follow-up was 3.6 years (interquartile range: 3.3-4.6). The mean age was 73.5 years (standard deviation: 8.5). Between baseline and long-term follow-up, there were statistically significant and clinically important improvements in disability (ODI: -23.7 [95% confidence interval (CI): -15.7 to -31.6]; ODI walking item: -1.96 [95% CI: -1.34 to -2.57]; ZCQ function

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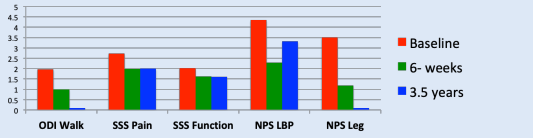
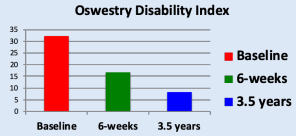
Retrospective Study Findings

LSS Boot Camp Long-Term Outcomes



**All differences in outcomes were both clinically and statistically significant at 3.5 years except NPS LBP

Oswestry Disability Index



Chow et al, JMPT in press

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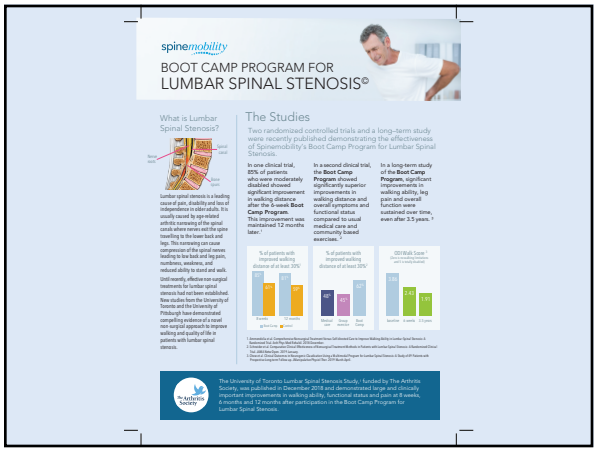

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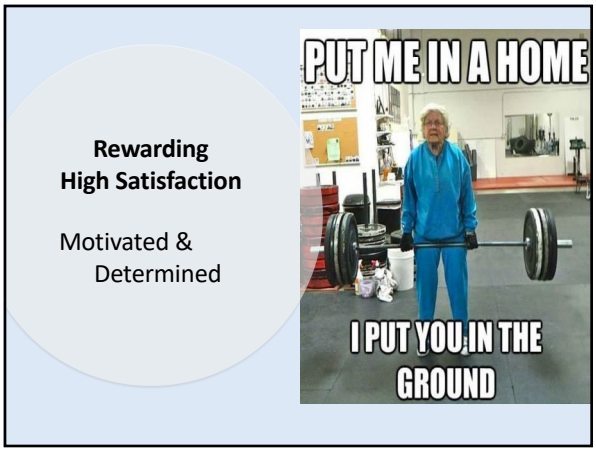

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Fauja Singh is the world's oldest marathon runner
- Finished Toronto marathon on 10/16/11 (26 miles, 8 hours: 25 minutes)
- **Age 100 years**

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"No Drugs, More Sex & Rock 'n Roll"

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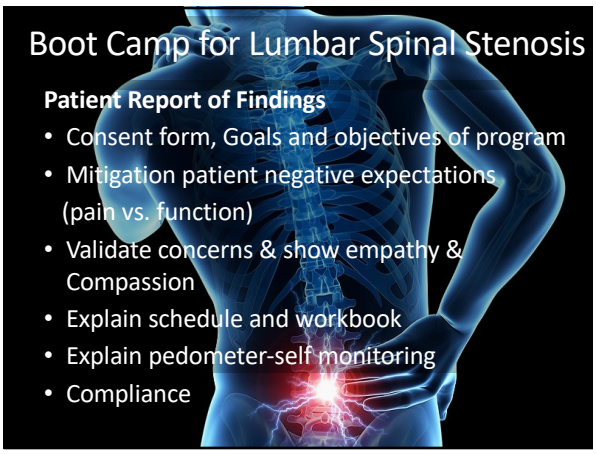

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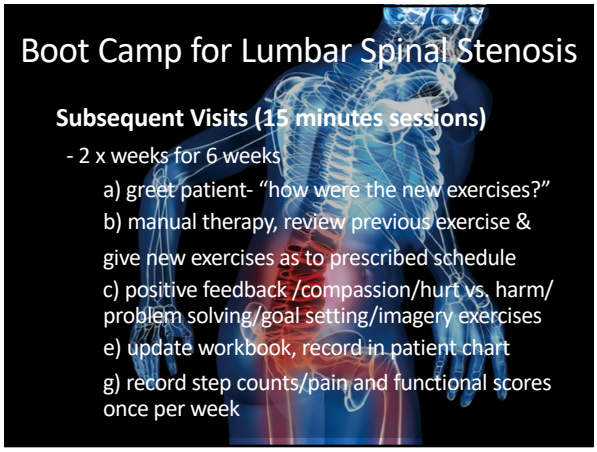

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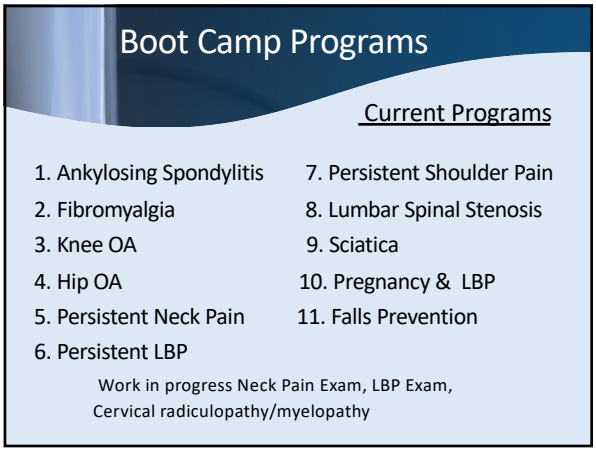

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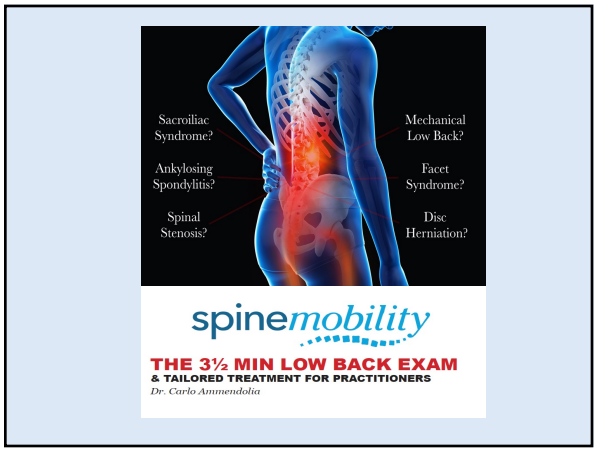

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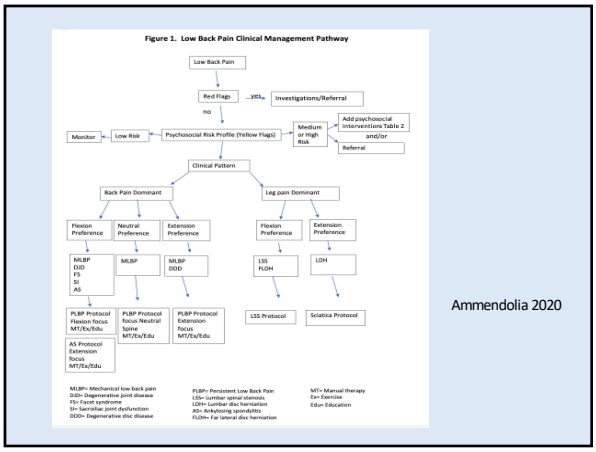

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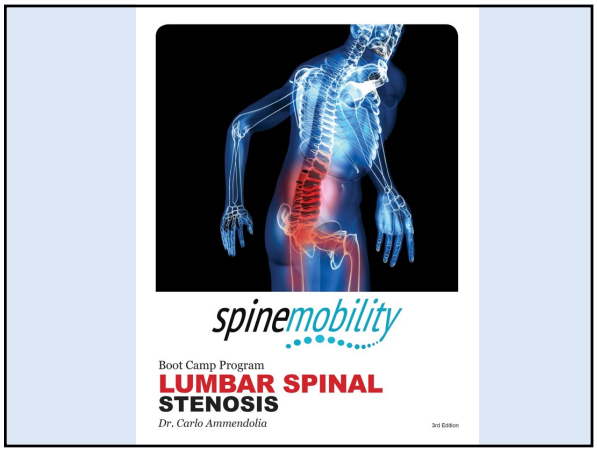

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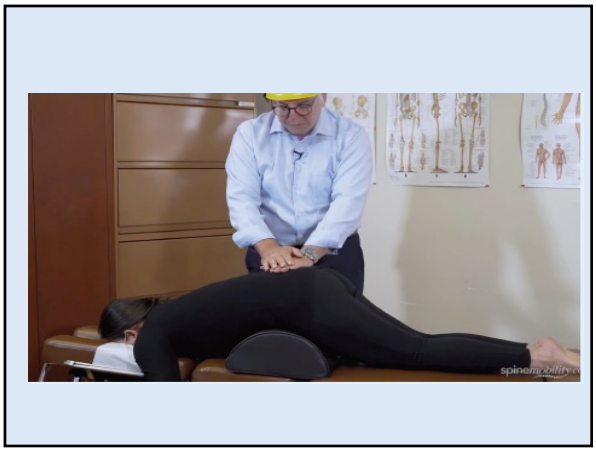

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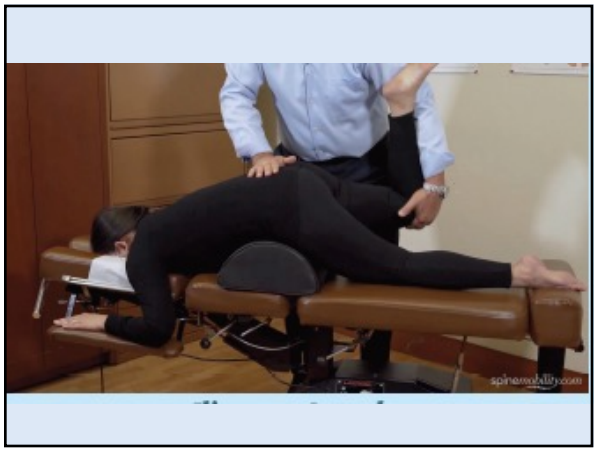

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Treatment Demonstration Lumbar Spinal Stenosis

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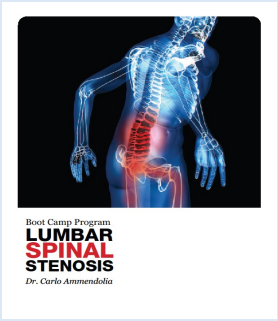
Questions & Discussion



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Carlo Ammendolia

Project ECHO Ontario Pain

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CHIROPRACTIC CHIROPRATIQUE Canada

Ontario Chiropractic Association

Spine Program

Institute for Work & Health

Funded by the Canadian Chiropractic Research Foundation
The Arthritis Society & Arthritis Research Foundation (MSH)

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