



SACROILIAC JOINT

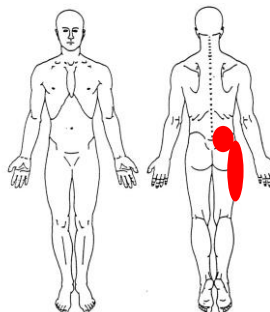
Michael McMurray PT, DPT, OCS, FAAOMPT

Orthopaedic Manual Physical Therapy Series
Charlottesville 2017-2018



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Patient Case



Body Chart – Initial Hypothesis:



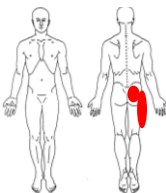
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Subjective Exam

Subjective *Asterisks* Signs/Symptoms: (Aggravating/Easing factors, Description/location of symptoms, Behavior, Mechanism of injury):

- 26 yom fell playing ultimate 2 months ago, landed prone causing lumbar hyperextension, right LE hyperextension
- 2 weeks later carrying boxes while moving, right foot slipped off step and full weight forcefully landed onto right LE
- Sharp local pain at right PSIS area, dull ache right lateral thigh, intermittently into lateral calf and lower leg
- NPR: 3/10; 5/10 at worst



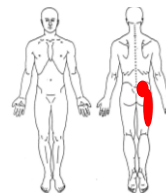
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Subjective Exam

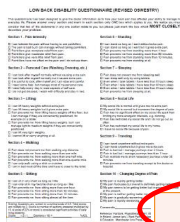
Subjective *Asterisks* Signs/Symptoms: (Aggravating/Easing factors, Description/location of symptoms, Behavior, Mechanism of injury):

- Aggs: running, walking, stairs, sit to stand, bending forward, have stopped working out and playing ultimate; sleep disturbed due to pain with position changes
- Eases: NSAID's, laying down



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Oswestry Disability Index

10%

0% to 20%: minimal disability:	The patient can cope with most living activities. Usually no treatment is indicated apart from advice on sitting, standing and exercise.
21%~40%: moderate disability:	The patient experiences some pain and difficulty with sitting, standing and bending. Travel and social life are more difficult and they may be disabled from work. Personal care, sexual activity and sleeping are not grossly affected and the patient can usually be managed by conservative means.
41%~60%: severe disability:	Pain remains the main problem in this group but activities of daily living are affected. These patients require a detailed investigation.
61%~80%: crippled:	Back pain impinges on all aspects of the patient's life. Positive intervention is required.
81%~100%:	These patients are either bed-bound or exaggerating their symptoms.



Joints in/refer to the painful region	Myofascial tissue in/refer to the painful region	Non Contractile tissue in/refer to the painful region	Neural tissue in/refer to the painful region	Other structures that must be examined - non MSK
SIJ	Lumbar multifidus	L4-S1 disc	L4-S1 nerve roots	Mass Osteosarcoma
L4-S1 facets	Gluts	ITB		Ankylosing Spondylitis
Hip	Lateral Hamstring	Iliolumbar/Hip/SI Ligaments	Lateral Femoral Cutaneous	
		Femur/Sacral/Pelvic Ex		

Primary HYPOTHESIS after Subjective Examination: **SI Joint Dysfunction**

Differential List (Rank/List in order to rule out):

L4-S1 Facet,
Hip Pathology



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Sacroiliac Joint

- “The SIJ is characterized by confusion and unending controversy”
- Relationship between low back pain and SIJ dysfunction highly debated
- Prevalence
 - Causal Factor in ~15% of Low Back Pain Patients

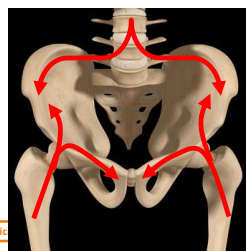


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Sacroiliac Joint

- Part of the Lumbopelvic Complex
- Function
 - Stability and Flexibility
 - Load Transfer Between Trunk and Extremities

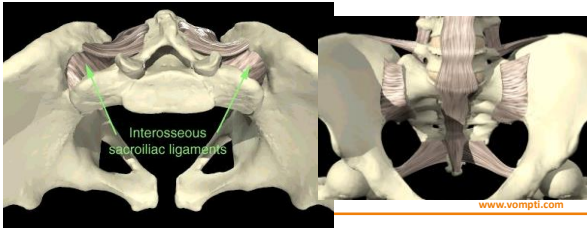


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Sacroiliac Joint Anatomy

- Diarthrodial Planar Joint
- Joint Capsule
 - Superior: part of iliolumbar ligament
 - Anterior: anterior SI ligament
 - Posterior: posterior interosseous ligament and short posterior SI ligament



Sacroiliac Joint Anatomy

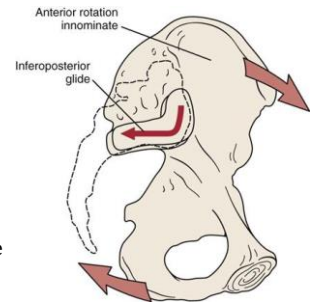
- Joint surfaces contain macroscopic ridges
- Contains hyaline and fibrocartilage
 - Sacral surface covered with hyaline cartilage
 - Thicker than ilial surface
 - Iliac surface mix of hyaline and fibrocartilage

Biomechanics

- Widely Debated and Extensively Studied
- Pelvis meant for load transfer, not motion
- Minimal
 - Varies between individuals and can vary side to side
 - Rotation ranges from 1-2.5 degrees with .4-.9mm of translation during transfers
- Predominantly rotation and translation

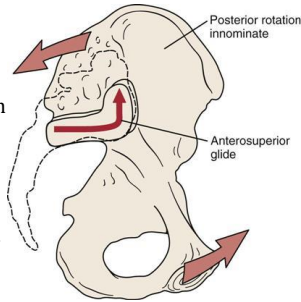
Anterior Innominate Rotation

- Motion of the innominate relative to the sacrum
- Coupled with hip extension
- 2-3 degrees of innominate rotation
- Controlled by long posterior SI ligament
- Inferiorposterior Glide of ilium on sacrum

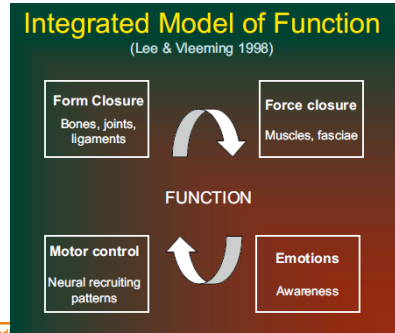


Posterior Innominate Rotation

- Motion of the innominate relative to the sacrum
- Coupled with hip flexion
- 2-3 degrees of innominate rotation
- Controlled by sacrotuberous ligament
- Anterosuperior Glide of Ilium on Sacrum

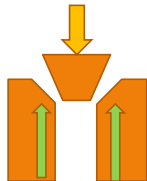


Optimal SIJ Function



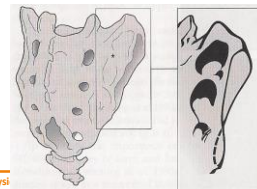
Form Closure

- Panjabi: The Passive System
- Articular surfaces relatively flat to transfer loads
 - Vulnerable to shear
- Sacrum wedge shaped A-P and vertical



Form Closure

- Articular cartilage is not smooth
 - Ridges and grooves are complimentary across joint surfaces
- Joint spans multiple sacral segments and each is oriented differently



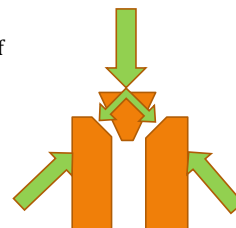
Form Closure

- Trunk force results in nutation force at sacrum
 - Increases tension in the sacrotuberous, sacrospinous and interosseous ligaments



Force Closure

- Panjabi: The Active System
- Mobility would not be possible if articular surfaces were constantly compressed
- Compression from loading is variable
 - Motion is possible but other stabilization is needed
- Increased compression from muscles, and fascia at moment of loading
- Amount needed depends on form closure and load magnitude

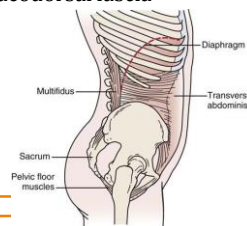


Force Closure

- Stability needs to occur throughout range of motion
 - Not only at closed pack position
- Two muscle systems
 - Local System
 - Segmental or intrapelvic stabilization
 - Global System
 - Regional Stabilization

The Local System

- The deep fibers of multifidus, the pelvic floor, transverse abdominus, diaphragm
- Roles:
 - Increase intraabdominal pressure
 - Increase tension of the thoracodorsal fascia
 - Increase articular stiffness



The Local System

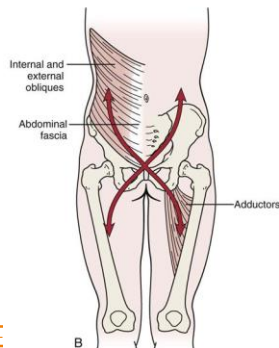
- Primary
 - Transversus Abdominus
 - Multifidi
 - Pelvic Floor Muscles
 - Diaphragm
- Secondary
 - Internal Oblique
 - External Oblique
 - Quadratus Lumborum
 - Iliocostalis, Longissimus
 - Psoas

The Global System

- Integrated muscle systems that assist in the transfer of load
- Muscle contraction force spreads to other structures in parallel and in series
- 4 Muscle Sling Classifications
 - The Posterior Oblique
 - The Anterior Oblique
 - The Deep Longitudinal
 - The Lateral System

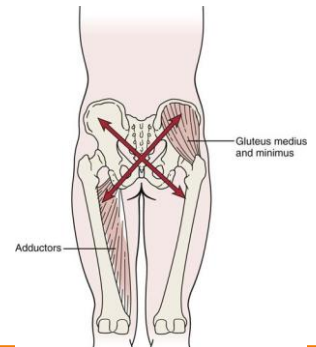
The Anterior Oblique System

- External Oblique
- Internal Oblique
- Contralateral Adductors
- Intervening Anterior Abdominal Fascia



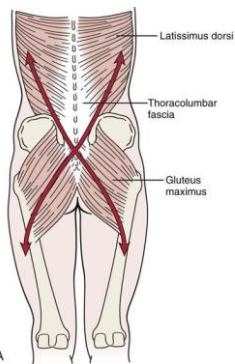
The Lateral System

- Gluteus Medius
- Gluteus Minimus
- Contralateral Adductors



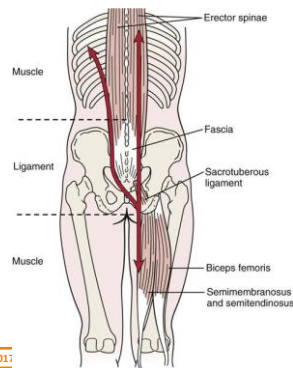
The Posterior Oblique System

- Latissimus Dorsi
- Gluteus Maximus
- Thoracodorsal Fascia



The Deep Longitudinal System

- Erector Spinae
- The Deep Lamina of the Thoracodorsal Fascia
- Sacrotuberous Ligament
- Biceps Femoris



The Global System

- Part of one interconnected myofascial system
 - Goal is the transfer of load and optimal function
- Slings have no beginning and no end
- Structures are part of multiple slings
- Coordination of global and local systems results in efficient movement
 - Prevents rigidity of posture and episodes of collapse

SIJ Exam

- Diagnosis by a cluster of findings
 - Pain Location
 - Palpation
 - Provocation Testing
 - Mobility Testing

Must Investigate the SIJ Statically, Dynamically and Provocatively

SIJ Exam

- Subjective Exam
- Observation/Postural Assessment/Functional Screen
- Lumbar Clearing
 - AROM with OP, Quadrants, central and unilateral pa
- Neurological Testing
 - If indicated
- Neurodynamic Testing
 - SLR, Slump
- Hip Clearing
 - AROM with OP, FABER, FADIR
- Palpation
- SIJ provocation
- Force Closure Testing
- SIJ Motion Testing



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Subjective History

- Variable pain descriptions
- Typically Unilateral
- Area of pain
 - Lower Lumbar 72%
 - Buttocks 94%
 - 40% at knee and below
- Common aggs
 - Running > Walking > Standing > Sitting
 - Transitional motions
 - Rolling
 - Bending forward
 - Single limb stance



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Postural Assessment

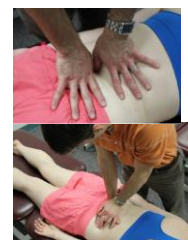
- Weightbearing
 - Even/uneven
- Spine Alignment
- Lower Extremity Position
 - Hip Flexed, Knee Flexed, Hip Abducted, Hip Externally/Internally Rotated?
- Iliac Crest Height
- Erector Spinae/Glut Muscle Tone
 - Spasm, atrophy



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Lumbar Clearing



Front Right Quadrant

Back Right Quadrant



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Neurologic/Neurodynamic Testing

- Lumbar Neurologic Exam
 - Reflexes/Myotomes/Dermatomes
- Neurodynamic Testing
 - Slump
 - SLR



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Hip Clearing



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Palpation

Inter-examiner reliability of four static palpation tests used for assessing pelvic dysfunction

Ulrika Holmgren*, Kerstin Waling

Manual Therapy 13 (2008) 50-56

Inter-examiner and intra-examiner agreement for assessing sacroiliac anatomical landmarks using palpation and observation: pilot study

C. O'Haire, P. Gibbons

Manual Therapy (2000) 5(1), 13-20

- Poor inter and intra examiner reliability for palpation of bony landmarks
 - ILS, PSIS, Sacral Sulcus, L5 TP
- Poor due to anatomical difference between and within individuals



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Palpation

- Vleeming, et al 2002
 - 86% sensitivity for pain free palpation of the long dorsal SI ligament when coupled with negative provocation tests and ASLR
 - Helps to rule out

Palpation must be used with caution

Must not be used as sole criteria for diagnosis



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Palpation

- For position and for tenderness
 - Anterior
 - ASIS
 - Pubic Symphysis
 - Posterior
 - PSIS
 - Sacral Base
 - Long Dorsal SI Ligament
 - Sacral Inferior Lateral Angle
 - Ischial Tuberosities
 - Sacrotuberous Ligament

ASIS



Pubic Symphysis



PSIS



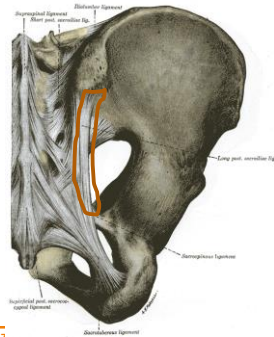
Sacral Base



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Long Dorsal SI Ligament

- Tenderness may indicate anterior rotated innominate



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Sacral Inferior Lateral Angle



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Ischial Tuberosity



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Sacrospinous Ligament

- Tenderness may indicate posteriorly rotated innominate



Evidence-Based Diagnosis and Treatment of the Painful Sacroiliac Joint

MARK LASLETT, FNZCP, PhD, Dip MT, Dip MDT

THE JOURNAL OF MANUAL & MANIPULATIVE THERAPY ■ VOLUME 16 ■ NUMBER 3

TABLE 1. Comparison between Laslett M et al⁵¹ and van der Wurff et al²⁰ studies of the validity of multiples of positive pain provocation SIJ tests.

Diagnostic accuracy statistic	Number of positive provocation SIJ tests									
	1 or more		2 or more		3 or more		4 or more		5 or more	
	ML	PvW	ML	PvW	ML	PvW	ML	PvW	ML	PvW
Sensitivity %	100	100	93	93	91	85	50	26	27	0
Specificity %	44	42	66	58	78	79	81	82	88	100
Positive LR	1.8	1.7	2.7	2.2	4.3	4.0	3.2	1.4	2.1	0
Negative LR	0.0	0.0	0.10	0.13	0.08	0.19	0.49	0.91	0.84	1.00

Diagnosis of Sacroiliac Joint Pain: Validity of individual provocation tests and composites of tests

Mark Laslett^{a,*}, Charles N. Aprill^b, Barry McDonald^c, Sharon B. Young^d

^aDepartment of Health and Society, Linköping University, Linköping, Sweden

^bMagnolia Diagnostics, New Orleans, LA, USA

^cMassey University, Institute of Information and Mathematical Sciences, Albany, New Zealand

^dMobile Spine and Rehabilitation Center, Mobile, AL, USA

Manual Therapy 10 (2005) 207–218

A Multitest Regimen of Pain Provocation Tests as an Aid to Reduce Unnecessary Minimally Invasive Sacroiliac Joint Procedures

Peter van der Wurff, PT, PhD, Evert J. Buijs, MD, Gerbrand J. Groen, MD, PhD
Arch Phys Med Rehabil 2006;87:10-4.

SIJ Provocation Testing

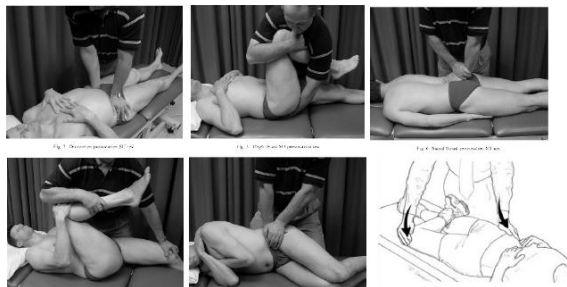


Fig. 1. Distraction provocation (SIJ test).

Fig. 2. Distraction provocation (SIJ test).

Fig. 3. Distraction provocation (SIJ test).

Fig. 4. Distraction provocation (SIJ test).

Fig. 5. Distraction provocation (SIJ test).

Fig. 6. Distraction provocation (SIJ test).

Active Straight Leg Test

Reliability and Validity of the Active Straight Leg Raise Test in Posterior Pelvic Pain Since Pregnancy

Jan M. A. Mens, MD,¹ Andry Vloesling, PhD,² Chris J. Snijders, PhD,³ SPINE Volume 26, Number 10, pp 1167-1171
Bart W. Koes, PhD,³ and Henk J. Stam, MD, PhD¹

- High Reliability, Sensitivity and Specificity

Patient-reported perception of difficulty as a clinical indicator of dysfunctional neuromuscular control during the prone hip extension test and active straight leg raise test

Paul A. Bruno ^{a,*}, Dale A. Goertzen ^b, David P. Millar ^b Manual Therapy xxx (2014) 1-6

- Positive correlation between perceived difficulty with supine and prone ASLR and low back pain



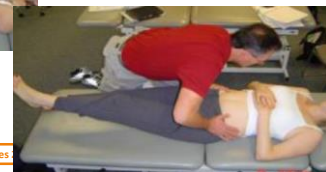
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Force Closure Testing



- Active Straight Leg Test



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Force Closure Testing

- Prone ASLR



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Inter- and intra-examiner reliability of single and composites of selected motion palpation and pain provocation tests for sacroiliac joint[☆]

Amir Massoud Arab^{a,*}, Iraj Abdollahi^b, Mohammad Taghi Joghataei^b, Zahra Golaflshani^c, Anoshirvan Kazemnejad^d

- Four motion and three provocative tests
 - Motion
 - Gillet Test
 - Forward Bend Test
 - Sitting Flexion
 - Prone Knee Bend (Deerfield)
 - Provocation Tests
 - Thigh Thrust
 - FABER
 - Resisted Abduction
- Inter and Intra examiner reliability
 - Individual tests=Fair
 - Clusters of tests= Moderate
 - Composites of tests=Substantial



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Manual Therapy 14 (2009) 213-221

SIJ Motion Testing

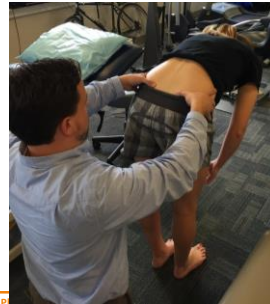
- Gillet Test



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SIJ Motion Testing

- Standing Flexion Test



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Objective Exam

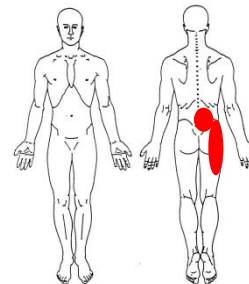
Physical Exam *Asterisks* Signs/Symptoms (Special tests, Movement/Joint Dysfunction, Posture, Palpation, etc)

- Posture: WB on left, right LE slightly flexed and ER
- Limited/painful Lumbar FB, Pain with SB to the right
- Pain at end range hip IR, FABER
- (+) sacral thrust, Thigh shear, FABER
- (+) Gillet and Standing flexion test on right
- Pain with right L5S1 upa
- Palpation for position: Right ASIS low, PSIS high
- Palpation for tenderness: Right long dorsal ligament

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➤ Are the relationships between the areas on the body chart, the interview, and physical exam consistent? "Do the features fit" a recognizable clinical pattern? **Yes** No

- Sacroiliac Dysfunction: Right Anterior Innominate



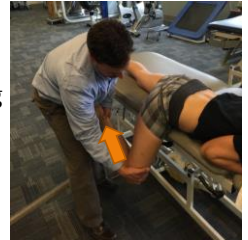
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Manual Treatment

MET: Anterior Iliac Rotation Correction

- Pt prone with involved side off table, foot resting on PT thigh
- Pt engages gluts by pushing into PT thigh
- Take up slack into hip flexion on relaxation

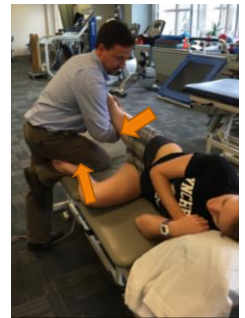


MET: Posterior Innominate Correction

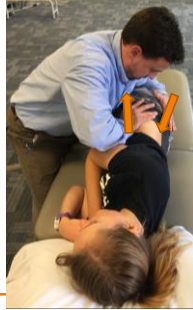


MET: Posterior Iliac Rotation Correction

- Pt prone or sidelying
- Pt engages hip flexor on involved side
- Take up slack on relaxation



Posterior/Anterior Innominate Rotation Mobilization



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The effect of two manipulative therapy techniques and their outcome in patients with sacroiliac joint syndrome

Journal of Bodywork & Movement Therapies (2012) 16, 29-35

Fahimeh Kamali, PT, PhD*, Esmail Shokri, PT

- Randomized into 2 groups
 - SIJ manip
 - SIJ and lumbar manip
- Both groups improved ODI, VAS immediately following, 48 hrs post and 1 mo post
- Not statistically difference between groups



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Lumbar Gap Manipulation



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Lumbopelvic Regional Manipulation



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