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Case Report

Re-Stabilization of an Unstable Lumbosacral Segment in a Patient with Chronic back Pain: A Case Report

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Abstract

Background: Spinal instability is poorly understood. This case report describes the re-stabilization of an unstable vertebral motion segment in a patient with chronic low back pain.

Case Presentation: A 50-year-old male presented at his local rheumatology service with chronic lumbo-pelvic pain. MRI revealed mid-lumbar disc degeneration with Modic 1 change at L3-4. An epidural steroid injection was given, followed by antibiotic therapy, but with no effect. A quantitative fluoroscopy (QF) assessment revealed instability at L5-S1 with hypomobility at the degenerate mid-lumbar levels. He received manipulation therapy to the mid-lumbar spine, plus activity modification to minimize lumbo-sacral stresses. This gave 70% improvement which was sustained over 5 years. Follow-up QF and MRI revealed reduction in lumbo-sacral instability, but no change in the L3-4-disc signal.

Conclusion: This case report is the first to demonstrate restabilisation of an unstable vertebral motion segment.

Keywords: *Lumbar Spine; Instability; Quantitative Fluoroscopy; Upright MRI*

Background

Chronic, nonspecific low back pain is devoid of objective physical markers [1]. However, intersegmental laxity and inflammatory change can be demonstrated by quantitative fluoroscopy (QF) and MRI [2-4] respectively. These may suggest therapeutic approaches such as back exercises in the first case [5-7] and anti-inflammatory treatment in the second [8].

The present case demonstrates the potential to enhance treatment response using novel objective investigations. This report was formulated using the CARE Checklist of Case Report Information [9].

Case Presentation

Patient information

A 43-year-old male podiatrist consulted for acute lumbo-sacral and left sacroiliac pain of one week's duration, after laying flooring. The patient was a non-smoker, was well and performed keep-fit exercises regularly. He had undergone a left anterior cruciate ligament repair 14 years before, but no previous treatment for back pain.

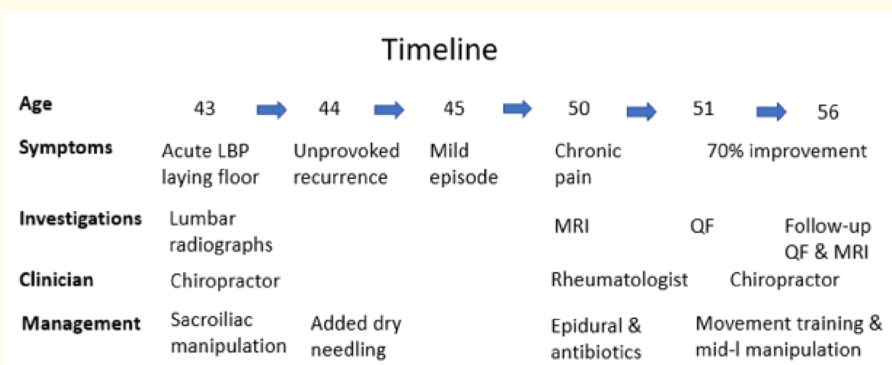
Clinical findings

The pain was non-radiating and aggravated by prolonged standing, left side bending, twisting to the right and lying on his left side in bed. There were no nerve root tension signs and Kemp's, Nachlas and Yeoman's tests were positive bilaterally.

Timeline

The patient recovered from his first episode, but suffered a return of the same pain one year later, which was associated with his work position as a podiatrist (Figure 1). He also reported feelings of anxiety. Back pain returned with lesser intensity after a further year, with recurrent episodes of lesser pains which were relieved by his chiropractor. However, by age 48 his pain had become chronic, although relieved by treatment that included dry needling. By age 50, he had taken up cycling, swimming and fitness training, but was by now considered chronic. He received MRI scans, followed by pharmacological treatment over the following year but with no effect. He was then referred for a quantitative fluoroscopy (QF) scan to explore the possibility of lumbar instability.

This was confirmed at L5-S1, after which he responded to conservative management aimed at minimizing stresses at this level. After 5 years, he was reassessed with follow-up QF and MRI scans.



Timeline

Age	43	44	45	50	51	56
Symptoms	Acute LBP laying floor	Unprovoked recurrence	Mild episode	Chronic pain	70% improvement	
Investigations	Lumbar radiographs			MRI	QF	Follow-up QF & MRI
Clinician	Chiropractor			Rheumatologist	Chiropractor	
Management	Sacroiliac manipulation	Added dry needling		Epidural & antibiotics	Movement training & mid-l manipulation	

Figure 1: *Timeline of care.*

Diagnostic testing

At his first episode, lumbo-pelvic radiographs were taken. These revealed degenerative changes to the L3-5 discs with bilateral osteophytes and indentation of the superior end plate of L3. MRI scans were obtained using a 1.5T GE Signa HDxt scanner using supine T1 and T2 sagittal and axial Fast Spin Echo and STIR scans from L1-S1. These showed multilevel disc desiccation from L1/2 to L4/5, with good preservation of the lumbosacral disc and no nerve root or canal encroachment (Figure 2a). There were small regions of sub-endplate oedema at the L3-4 level posteriorly and within the L5 vertebral body.

Figure 2: *Neutral sagittal fluoroscopic images of patient's lumbar spine. a. 2014, b. 2019.*

A passive recumbent QF examination was then performed using a Siemens Arcadis Avantic C-arm fluoroscope, capturing images at 15fps during 12-second sequences of flexion, extension, left and right bending and return (Siemens GMBH, Germany). These revealed hypermobility and laxity bilaterally in side bending at the lumbo-sacral level, along with hypomobility at all levels and directions at L3-4 and in left bending and flexion at L2-3 (Figure 3a).

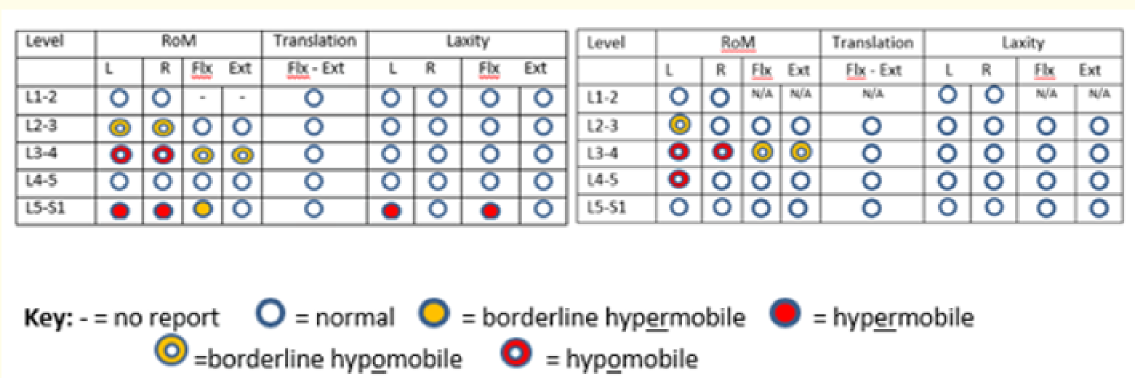


Figure 3: *Quantitative fluoroscopy report summary showing results of L1-S1 coronal and sagittal recumbent intervertebral motion analysis for range of motion, translation (sagittal only) and laxity. The key represents results compared with a normative dataset. a. Left block 2014, b. Right block 2019.*

After 5 years of successful conservative management, a second MRI scan was performed using a 0.5T open upright MRI scanner (Paramed MROpen, Genoa, Italy) consisting of supine and sitting T1 and T2 sagittal and axial scans from L2-S1 (Fast Spin Echo, Matrix 256 x 208, Slice thickness 5 mm, Gap 1 mm). This showed unchanged appearances, apart from subtly increased Modic 1 changes across the L3-4 disc (Figure 2b). Follow-up QF investigation revealed that lumbo-sacral mobility had returned to normal and the laxity had gone, although hypomobility in the mid-lumbar segments remained (Figure 3b) despite any change in disc degeneration there (Figure 4a and 4b).

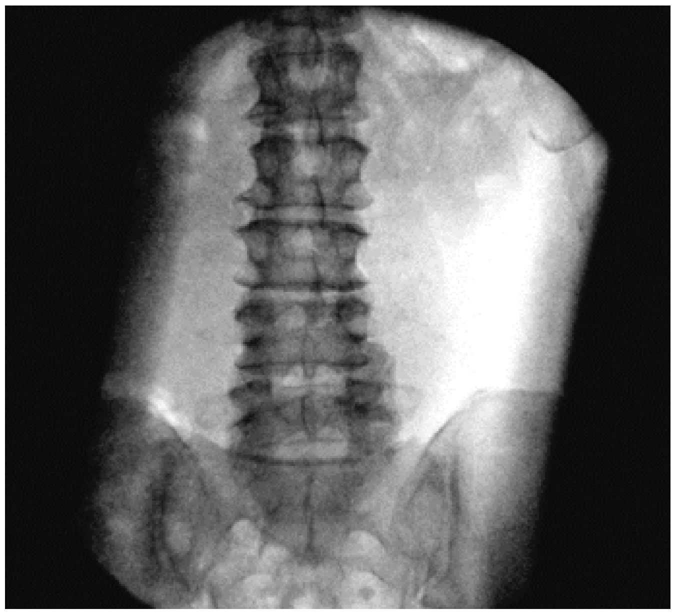


Figure 4a

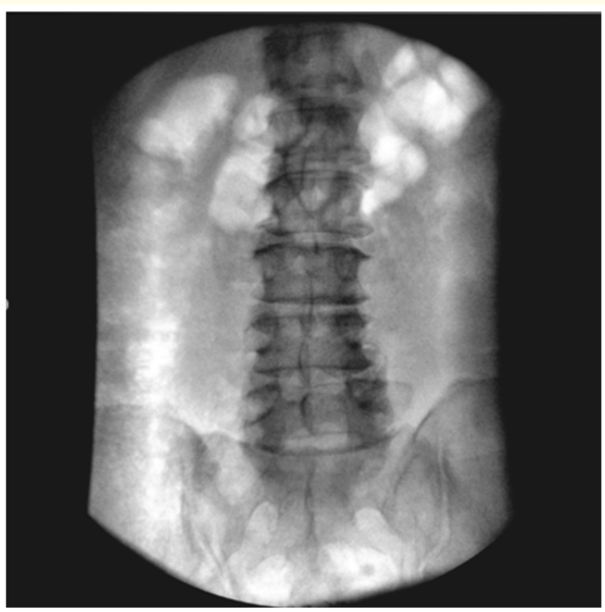


Figure 4b

Figure 4: *Neutral anterior-posterior fluoroscopic images of patient's lumbar spine. a. 2014, b. 2019.*

Diagnostic challenges

This case represents a unique example of management guided by nonstandard diagnostic imaging that included QF, where the radiation dosage is substantially below that of plain radiographs [10].

Diagnosis

The diagnosis attributed to the first episode was left sacroiliac joint sprain, however, when pain became chronic an MR scan was obtained. The Modic 1 change at the L3-4 level suggested inflammatory pain. However, when treatment for this was unsuccessful, a QF scan was recommended to investigate the possibility of a lax segment. This was confirmed at L5-S1. He then returned to conservative management.

Follow-up QF and MRI scans 5 years after the initial imaging confirmed that the lumbo-sacral segment had stabilized, although the mid-lumbar levels remained stiff (Figure 3b). The lumbo-sacral level's improved stability was not accompanied by any change in MRI appearances.

Prognosis

Recent studies suggest that most older adults with back pain for over 6 months still have chronic or recurrent back pain after 5 years [6].

Therapeutic intervention

At his first episode, the patient received a course of chiropractic manipulation with good effects. For his second, similar treatment was given. The patient was also taking glucosamine and had received counselling and hypnotherapy for anxiety.

Following MR imaging, 7 years from the onset of his back pain, a caudal epidural steroid injection was given, which gave relief. He was also given a 100-day course of Co-amoxiclav 500/125 antibiotic tablets tds [11]. However, his pain subsequently recurred having now been present for 8 years.

Following his first QF assessment, the patient received movement training aimed at minimizing passive tissue stresses at the lax L5-S1 segment, while manipulating the hypomobile mid-lumbar levels L2-3 and L3-4 using supine manipulation without rotation or lateral flexion at L5-S1. The approach used was anterior diversified technique adjustments at these levels. Manipulation contacting the sacrum was abandoned in favor of ilium contacts and lower lumbar strengthening exercises were also employed.

Follow-up and outcomes

Pain initially improved quickly and gradually reached 70% over 5 years. Over the following 5 years, it reduced further in frequency and intensity. Pain provocation tests also all reduced. However, there was still occasional discomfort, and one acute flare-up.

Five years after his QF assessment, the patient received a second QF using an identical imaging protocol, plus MRI scans using a 0.5T Paramed Open scanner (Paramed ASG, Italy). QF results showed that the borderline L2-3 flexion stiffness was reduced, but slight new L4-5 left side bending stiffness had appeared (Figure 2b) [12]. At L5-S1, the kinematics returned to normal for IV-RoM in left, right and flexion, and for laxity in left and right bending. There was a drop in L5-S1 IV-RoM from 5.04^o to 1.95^o (left) and from 6.06^o to 2.34^o (right). The laxity gradients also dropped from 0.19 to 0.11 (left) and from 0.28 to 0.09 (right). However, the T2-weighted sagittal MRI scans showed no change in L5 disc signal intensity.

Clinician assessed outcomes

Following first QF assessment, the management of this patient changed. Manipulation was directed at improving mobility in both the lumbar and thoracic spines, but treatment at the sacral base was avoided. The patient was asked to avoid lateral flexion and rotation during exercise and was given core stability exercises to strengthen the musculature supporting L5-S1. Patient compliance was excellent throughout. His clinician concluded that minimizing the mechanical stresses to the unstable L5-S1 level and strengthening the supporting tissue allowed it to re-stabilize.

Patient perspective and assessment of outcome

The patient reported: "I feel the process has gone exceptionally well since my original QF scan. I feel much more stable and my symptoms are dramatically improved. The changes have taken place gradually with my management and I have been careful to be compliant with the treatment/advice I have been given".

Adverse and unanticipated events

There was recurrence after the first year following a long drive, which resolved within 1 month.

Discussion

The L5-S1 disc showed early degeneration, which did not change (Figure 2a and 2b). This has been thought to be associated with destabilization [13]. However, recent studies have shown that early-to-moderate degeneration does not have de-stabilizing effects [14] and disc degeneration associated with back pain is more common in the mid-lumbar spine [15].

Continuous level disc degeneration from L1 to L4 has also been associated with more pain and disability and greater intervertebral stress than skipped-level disc degeneration [16,17], while advancing disc degeneration is associated with increased stiffness, decreased energy absorption, and increased natural frequency of the intervertebral disc [18]. This points to an explanation of stress-transfer to the L5 level and re-stabilization [13].

Although pain was well localized, mid-lumbar stiffness may have affected pain production through altered lumbar intervertebral motion sharing [19]. Despite the fact that manipulation increases diffusion of water in degenerate discs, it had no effect on mobility measured using QF [20,21].

Conclusion

This report describes lumbo-sacral re-stabilization with symptom alleviation after 13 years of chronic low back pain. Linkage between such mechanical changes and symptomatic improvement remains a topic for future research.

Ethics Approval and Informed Consent

Written informed consent for publication of their clinical details and clinical images was obtained from the patient. A copy of the consent form is available for review by the Editor of this journal. Ethical approval was waived by the AECC UC's Research Ethics Committee.

Consent for Publication

The patient has given written informed consent to the publication of this manuscript.

Availability of Data and Materials

The quantitative data relating to the intervertebral motion analysis are available on reasonable request to the corresponding author.

Competing Interests

The authors declare that they have no competing interests.

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No funding was received for this study.

Authors' Contributions

The investigations were conceived by AB and CM and the MRI radiological assessment by RA. The QF data acquisition and analysis were conducted in the AECCUC's Centre for Biomechanics Research under the direction of AB and the MRI data were analyzed by RA. The manuscript was drafted by AB and refined with contributions from CM and RA.

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Use of any Animal or Human Data or Tissue

Not relevant.

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