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The McKenzie Institute® International
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- ♦ To promote and support research that will advance the knowledge, skill and treatment of mechanical disorders of the spine.
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On the Cover: *The Bronze Lady*

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Editorial

Helen Clare, Editor-in-Chief

As you are aware from the editorial in the last edition for 2010, we are having difficulty publishing three issues of the IJMDT per year. Whilst we have regular contributions from a small number of authors, we are not attracting new contributors. As a consequence, the Editorial Committee of the IJMDT made a decision that only two editions of the IJMDT would be published in 2011 – one in June and one in November.

During 2011, investigations will be made into forming a liaison with other appropriate journals, and a decision about the future structure of the IJMDT will be made at the end of 2011. I would like to express my thanks to all of you who took the time to complete the questionnaire regarding your thoughts on the future of IJMDT. The majority of those who responded to the survey supported the concept of continuing the IJMDT either as an in-house publication or linked with an internationally recognised manual therapy journal. This information assists the Editorial Committee as it investigates the future direction of the IJMDT.

The expansion of the MDT Education Programme continues to grow worldwide. There are now 340 therapists who have gained the Diploma in MDT and over 4,000 Credentialed therapists worldwide. The McKenzie Institute International now has branches in 31 countries, and also presents its Education Programme in 14 countries, where branches have not yet been established. Whilst this is exciting, it poses further challenges. It is essential that those who have completed their training in MDT stay “up-to-date”. More research is being undertaken into MDT and there is an increasing demand for qualified MDT therapists to be used for research studies. It is therefore essential that

“qualified” MDT therapists retain their skills in MDT and do not dilute their MDT management with other approaches. The IJMDT is one way that we can assist MDT therapists to stay enthusiastic and current.

Case studies and case series are excellent ways of sharing clinical experiences and facilitating discussion. I would encourage all of you to consider preparing a case study for publication. If you have recently treated an interesting or challenging patient, it is likely that your fellow MDT therapists would also find it interesting. It is through the exchange of ideas that we all learn. Remember that the IJMDT Editorial Committee is happy to assist you in preparing a case study and will guide you through the process. Being a novice to publication is definitely not a negative – remember we all had to start somewhere.



It is time to start planning to attend the Institute’s next International Conference, which is to be held in Austin, Texas, USA, 5-7 October 2012. Austin is a vibrant city, and the Scientific Committee have put together an exciting conference programme. The calibre of the speakers is world class and the networking at such a conference is invaluable. I encourage you all to register now for the conference. You can do so by visiting the Institute’s International website www.mckenziemdt.org. Feedback from previous International Conferences indicate that they are an ideal opportunity to “rekindle” the MDT flame. I look forward to seeing you in Austin in October 2012.



Pain centralization and lumbar disc MRI findings in chronic low back pain patients

Kilpikoski S, PT, PhD, Laslett M, FNZCP, PhD, Airaksinen O, MD, DMedSci, Kankaanpää M, MD, DMedSci, Alen M, MD, DMedSci

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Background: Centralization of pain is a specific finding in assessing low back pain (LBP). A dynamic, internal “disc model” has been hypothesized as an underlying mechanism for pain centralization, which has shown a high positive correlation with pain during provocation discography. Structural abnormalities on MRI are also common among asymptomatic individuals, but association of centralization among symptomatic individuals to imaged disc pathology has not been evaluated.

Aims: To estimate the association (criterion-related validity) of the centralization phenomenon with magnetic resonance imaging (MRI) findings of lumbar disc pathology, as the criterion standard among chronic low back pain patients.

Methods: Randomly drawn volunteers (N=39) with non-specific LBP from a larger randomized controlled trial were clinically assessed for the presence of centralization by two physiotherapists using the McKenzie Method. MRI slices of patients’ lumbar spines from L1 to S1 levels were acquired with a 1.5 Tesla superconducting magnet. Findings were recorded by an experienced radiologist. Validity was estimated with sensitivity, specificity, positive (PPV) and negative predictive values (NPV) and likelihood ratios.

Results: In the total sample, the prevalence of the MRI features most closely associated to pain was 82%, and among centralizers 94%. Sensitivity of centralization was 0.91, specificity 0.5, PPV 0.94; NPV 0.40, positive likelihood ratio 1.8 and negative likelihood ratio -0.18.

Conclusion: In this study, MRI showed that pain centralization is associated with abnormalities of lumbar discs. As the centralization phenomenon is closely associated with good treatment outcomes, we recommend centralization guided conservative treatment for disc pathologies before surgical referral.

Key Words: Low back pain, centralization phenomenon, MRI, McKenzie Method, discogenic pain.

Key Points: A dynamic internal “disc model” has been hypothesized as an underlying mechanism for centralization of low back pain. This cross-sectional study estimated the association of pain centralization with lumbar disc MRI findings. In this study MRI showed that pain centralization is associated with MRI findings of lumbar disc abnormality.

Introduction

Low back pain (LBP) is frequently accompanied by referred pain into the buttock or lower limb, unilaterally or bilaterally. Most commonly, this is somatic referred pain and less frequently, it is called radicular pain. Radicular pain is characterized by its sharp twinging, “lancinating” nature and somatic referred pain is characterized by its deep, diffuse aching character. It is not uncommon for patients to report that pain referred into the buttock and lower extremity may change location. Sometimes the pain refers as distally as the foot and at other times it is confined to the low back or buttock areas. These changes in location are frequently associated with changes in posture or specific activities in a consistent manner, which suggests that mechanical loading in certain directions can affect the change (McKenzie and May 2003, Donelson et al 1991). McKenzie (McKenzie and May 2003) was the first clinician to report that specific repeated movement tests or sustained positions could consistently cause the movement of pain in a predictable and repeatable fashion. Centralization of pain is defined as “an abolition of distal limb symptoms in response to the deliberate application of repeated movements or sustained postures” (McKenzie and May 2003) (Appendix I). “Directional preference” is closely related to pain centralization, and indicates the direction of force required to centralize the pain (McKenzie and May 2003) (Appendix I). They are specific phenomena observed when LBP is assessed using standardized repeated end range test movements and are highly

specific to positive provocation discography (Donelson et al 1997, Laslett et al 2005). The prevalence of centralization is estimated to be 70% among sub-acute and 52% among chronic back patients (Aina et al 2004). The younger the patient, the higher the prevalence rate of the centralization phenomenon (Werneke et al 2011). The inter-examiner agreement in determining centralization and identification of a “directional preference” has shown to be good between the trained examiners (Kilpikoski et al 2002), but poor between examiners with minimal or no training (Riddle et al 1993). Loading in the preferred direction centralizes and lessens symptoms, improves range of motion (Long et al 2004) and predicts good treatment outcomes (Werneke et al 2011, Long et al 2004, Skytte et al 2005). In contrast, loading in the opposite direction worsens or peripheralizes (McKenzie and May 2003) (Appendix I) the pain and makes movement more difficult (Riddle et al 1993). A dynamic internal “disc model” has been hypothesized as the underlying mechanism for these phenomena and may be explained by changes in disc displacement (Kolber and Hanney 2009).

Magnetic resonance imaging (MRI) is a non-invasive method for investigating lumbar morphology (Milette et al 1999). A key limitation of spinal imaging is non-systematic association with pathology and symptoms (Hamanishi et al 2004, Beattie et al 1994). Abnormal morphology may be found in individuals who have no symptoms and vice versa (Milette et al 1999, Hamanishi et al 2004, Beattie et al 1994).



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Images, as such, have little value in identifying symptomatically significant abnormal morphology and should not be used for diagnosis or treatment planning out of context from the patient's clinical presentation in most cases (Milette et al 1999, Hamanishi et al 2004). However, MRI features of discs, most closely associated with pain, include disc herniation (Jensen et al 2008), disc narrowing (Jensen et al 1994, Videman et al 2003), radial fissures (Jensen et al 1994, Hassett et al 2003), especially when they reach the disc exterior and leak (Moneta et al 1994), and internal disc disruptions, including inward collapse of the annulus (Videman and Nurminen 2004). A high intensity zone (HIZ) on T2 weighted images in the posterior annulus has also shown to have high specificity in relation to provocation discography in some studies (Schwarzer et al 1995, Aprill and Bogduk 1992).

More variability related to pain was end-plate fractures, Schmorl's nodes (Beattie et al 1994), Modic (type II) changes (Jensen et al 2008) and disc bulging (Beattie et al 1994, Jensen et al 2008, Jensen et al 1994, Videman et al 2003, Boos et al 1995). Disc signal intensity on MRI has little or no relationship to pain (Videman et al 2003).

The purpose of this study was to investigate the association of centralization with MRI features of discs most closely associated with lumbar pain as the "criterion standard" in chronic LBP patients.

Methods

Procedure

The present article is a secondary analysis of data from a larger cross-sectional study carried out at Kuopio University Hospital, Finland. The imaging and clinical data were gathered during the years 1997 and 1998, and this secondary analysis ten years later aims to test for possible association between centralization phenomenon and disc abnormalities revealed by MRI (Kilpikoski, Kankaanpää et al 1999). Volunteers with non-specific LBP, with or without radiation to the lower limb, were included. Patients were randomly drawn from a previously described randomized controlled trial (Kankaanpää et al 1999). The subjects were initially randomized into their rehabilitation groups by drawing lots before coming to the rehabilitation clinic for the baseline measurements. In the draw, paper slips stating the subject's name, sex, and age were first separated according to gender and then placed into two large bowls, shuffled, and drawn forming the treatment groups in a blinded manner. In the initial health centre-based clinical examination, the cause of back pain was confirmed to be nonspecific. The patients had experienced LBP with symptom duration longer than three months and moderate functional disability that enabled them to work with only occasional absences. The exclusion and inclusion criteria of the wider trial have been described elsewhere (Kankaanpää et al 1999).

Radiological methods

Magnetic resonance images were acquired using a Siemens Magnetom SP4000 with a 1.5 Tesla superconducting magnet (Magnetom Vision Siemens AG, Germany). Images were acquired with patients lying supine with knees slightly bent, maintained with a cushion. Axial and sagittal T1 and T2 weighted images were acquired for the spinal levels from L1 to L5. Images were analyzed by a radiologist at Kuopio University Hospital, Kuopio, Finland. MRI features of discs most closely associated with pain (disc bulges, disc protrusions, disc prolapses/extrusions, radial fissures, end-plate signal changes, disc space narrowing and internal disc disruptions such as high intensity zones) were documented.

Clinical examination

The patients were examined independently in the year 1997-1998, in succession, by two physical therapists (Päivi Leminen and Sinikka Kilpikoski) certified in the McKenzie Method. The clinical examination has been described previously (Videman et al 2003). Briefly, the examination included visual assessment of range and quality of motion, recording anatomical location of dominant pain, nerve tension tests, key muscle strength tests, light touch sensitivity, the standardized test single and repeated end range test movements and/or sustained end range positions described by McKenzie (McKenzie and May 2003).

Testing for centralization

During the mechanical assessment, the exact site and change in location of low back and referred pain was recorded. The patient was classified as a centralizer, if pain was found to move from the periphery towards the spinal midline, and remained more central in response to a specific direction of testing. If there was midline spine pain only, and this was abolished and remained so, this was also classified as centralization (McKenzie and May 2003) (Appendix I). If patients were symptom free or if no change in the location of pain was observed (i.e. dysfunction syndrome), or pain was found to move only towards periphery (peripheralization) (McKenzie and May 2003) (Appendix I) during assessment, the participants were classified into the non-centralization group. The movements and positions used to determine centralization are highly standardized and consist of standing flexion, standing extension, side gliding in standing to the left and right (a form of lateral flexion), supine flexion, prone extension, asymmetric prone lumbar extension, and lumbar rotation performed in supine (McKenzie and May 2003) (Appendix I). The trial flow is seen in Figure 1.

Blinding

The examiners conducting the clinical assessment in test-retest manner were blinded from each other and to the results of imaging findings. The radiologist was blinded to the results of the clinical examination and classifications.



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Ethics

The study was approved by the Kuopio University Hospital Human Ethics Committee.

Data analysis

The demographic characteristics were summarized for descriptive purposes with means and standard deviations for continuous measures, with frequencies and percentages for categorical measures. Inter-examiner reliability statistics were calculated using the DAG Stat Excel spreadsheet.

The criterion-related validity was analyzed in 2x2 contingency tables using Confidence Interval Analysis Software (Bryant 2004), and was expressed as sensitivity, specificity, positive and negative predictive values, positive and negative likelihood ratios with confidence intervals (Bogduk 1999). The data were stored and analysed using SPSS Version 14.0.

Results

Participants

Patients' descriptive characteristics are presented in **Table 1**. One centralizer was excluded from the 2x2 contingency table because he was not imaged.

Identification of centralization

Table 2 presents the numbers and percents requiring the different movement and loading strategies found to produce the centralization phenomenon.

Inter-examiner reliability of identification of centralization

Table 3 presents the contingency table with data obtained in the estimation of inter-examiner reliability between the two blinded examiners. The examining clinicians agreed on centralization in 34 cases (87%, $\kappa=0.72$ (CI95% 0.41-1.0). SE of Kappa =0.192. Observed agreement was 0.95 (95%CI 0.83-0.99), chance agreement was 0.82. Prevalence and bias adjustment (PABAK) calculation was 0.90. Two patients were agreed to be symptom free and one to have non-centralizing pain. The examiners disagreed in classifying two patients (Kilpikoski et al 2002).

Magnetic resonance imaging

The patients (N=38) were imaged between one to five times (mean three) during a three month period (mean 56 days, range 0-195 days) before the clinical assessment. Most patients (n=20, 61%) were imaged less than two weeks prior to the clinical assessment (mean six days, range 0-13 days).

Structural abnormalities on MRI among the agreed centralizers (n=33)

Twenty-eight (85%) centralizers had alterations of disc shape contour in least at one spinal level in conjunction with disc space narrowing mostly at L3 to L5 levels. Only one centralizer, with right sided referred pain below the knee, had no visible structural abnormalities on MRI. In addition, one patient had increased signal intensity (high intensity zone) at the L1 level, with left

sided referred pain below the knee. Seven (21%) patients had end-plate signal changes (Modic changes) and thirty-one (94%) patients had disc signal loss. Half (n=16) of the patients had anatomic defects such as stenosis, anterolisthesis, retrolisthesis, and/or zygapophyseal joint osteoarthritis. Most of these defects (65%) were found between L3 and L5 levels (Table 2).

Criterion-Related Validity

The prevalence of discogenic MRI findings was 82% in total sample, and 94% among the agreed-on centralizers, and 9% in non-centralizers or none agreed-on centralizers. Features of discs most closely associated with pain on MRI (i.e. alterations of disc shape contour, disc narrowing, high intensity zone and endplate changes) were concatenated into a single variable. Criterion-related validity of centralization in relation to the combined MRI findings group was:

- sensitivity 0.91 (95% CI 0.8-0.96),
- specificity 0.5 (95% CI 0.018-0.82),
- PPV 0.94 (95% CI 0.83-0.98),
- NPV 0.40(95% CI 0.14-0.73),
- positive LR+1.8 (95% CI 0.8-4.2)
- and negative LR-0.18 (95%CI 0.05-0.6) (Table 4).

Discussion

This secondary analysis aimed to estimate the criterion-related validity of the centralization phenomenon in relation to the MRI features of discs most closely associated with pain. Criterion-related validity measures how well a test performs against a criterion standard, and is expressed by sensitivity, specificity, positive and negative predictive values and with likelihood ratios (+/-). Centralization has previously been shown to be highly specific to positive discography (Donelson et al 1997, Laslett et al 2005). Discography specifically aims to identify symptomatic discs whereas MRI imaging identifies anatomical and morphologic features, thus the MRI findings do not directly test to determine the source of pain. The results of our study are not directly comparable to these previous studies (Donelson et al 1997, Laslett et al 2005) because the reference standards are quite different. For providing meaningful and reliable judgements of classifying the centralization phenomenon, the inter-examiner variability between the physical therapists certified in the McKenzie Method was tested before the criterion-related validity comparison (Kilpikoski et al 2002). The inter-examiner agreement was similar to other inter-examiner studies among trained observers (Razmjou et al 2000, Clare et al 2005). In our study, the prevalence of centralization agreed by both examiners was 85%, being somewhat higher than in earlier published studies among LBP patient samples (Aina et al 2004). However, high prevalence rates of centralization were also found in some earlier studies (Donelson et al 1991, Aina et al



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2004, Razmjou et al 2000), especially among young (18-44 years) patients (83%) (Werneke et al 2011). The mean age of our population was 40 years. One explanation for the difference might be that centralization was defined only once by both examiners on the first visit, on the same day, whereas, in earlier studies (Aina et al 2004) the centralization was defined by testing during multiple visits. The high sensitivity of pain centralization makes it possible to effectively rule out pain related MRI findings being observed in the absence of centralization. The repeated movements assessment of the McKenzie Method is an inexpensive and efficient screening tool in selecting patients unlikely to have pain related MRI findings.

Limitations of the present study

A good test is one which carries a few, if any, false positive and false negative results (Bryant 2004). In our study there were a few false positives numerically, but there were also few cases without MRI changes resulting in specificity equivalent to random guessing (specificity =0.5) (Table 4). This does not mean that these centralizers did not have discogenic pain. Perhaps the morphological features of disc mechanics associated with centralization were not demonstrated by MRI in these cases. The false negative value, which describes how often patients without the measured condition are positive for the test in question (Bogduk 1999), was quite low in the present study. Examiners disagreed in classifying two patients with alterations of disc shape contour on MRI. Abnormal morphology on MRI may be found also in asymptomatic individuals (Milette et al 1999, Hamanishi et al 2004, Beattie et al 1994, Jensen et al 2008, Jensen et al 1994, Videman et al 2003) and indeed one patient, who was totally symptom free at the time of clinical assessment, had a bulging disc at L5 spinal level. In this present study, only one LBP patient (2%), with centralizing pain, had no visible imaging findings. This compares with the average rates of the studies of asymptomatic population 36% (Beattie et al 1994) and from 40% to 65% (Jarvik et al 2001). In addition, the prevalence rate of discogenic abnormalities most closely associated with pain (94%) and the alterations of disc shape contour among centralizers in our study were higher (85%) than shown in average in the studies of asymptomatic subjects: from 24% (Razmjou 2000) to 64% (Jarvik et al 2001).

One major limitation of this current study was the small study size. In addition, the small groups of non-centralizers (n=5) and those with no MRI findings (n=4) resulted in wide confidence intervals for specificity, NPV and the likelihood ratios. Consequently, only tentative conclusions are reasonable. The results are strengthened by the fact that the patients were randomly drawn from a larger randomized controlled trial. In addition, the relatively long time period between the imaging and the clinical assessment might compromise the results. The

advantage of this study was the multiple imaging (mean three times) during the on-going wider study. No statistically significant changes were found between the imaging findings in multiple comparisons. The radiologist was blinded to the results of the clinical examination and classifications. However, the radiologist's determination of MRI morphology was not subjected to inter-examiner reliability assessment.

This study provides some preliminary evidence of a relationship between the clinical phenomenon of lumbar back pain centralization and structural MRI findings. MRI is inherently an image of structural status, at a specific point in time, i.e. it is a static image; whereas, centralization is a phenomenon of a dynamic process during which pain location is closely monitored. Future studies using modern MRI images before and after mechanical assessment for the presence of centralization may reveal correlations with pain centralization and changes in disc shape. In this manner, the 'dynamic disc model' could be examined in a more specific and comprehensive manner.

Conclusions

Our study supports the view that the centralization phenomenon is associated with abnormalities of lumbar discs, but the abnormalities may not differ much from those of an asymptomatic population. As the centralization phenomenon is closely associated with good treatment outcomes, we recommend centralization-specific directional therapy before referral to surgical intervention in cases with MRI findings of disc pathology.

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Appendix I

Definitions and operational terms used in the study

Centralization Phenomenon: Describes the phenomenon by which distal limb pain emanating from, although not necessarily felt, in the spine is immediately or eventually abolished in response to the deliberate application of loading strategies. Such loading causes an abolition of peripheral pain that appears to progressively retreat in a proximal direction. As this occurs, there may be a simultaneous development or increase in proximal pain.

Peripheralization: Describes the phenomenon when pain emanating from the spine, although not necessarily felt in it, spreads distally into, or further down, the limb. This is the reverse of centralization. In response to repeated movements or a sustained posture, if pain is produced and remains in the limb, spreads distally or increases distally, that loading strategy should be avoided.

Directional preference: Describes the phenomenon of preference for postures or movement in one direction, in which the centralization phenomenon occurs. It describes the situation when postures or movements in one direction decrease, abolish or centralise symptoms and often increase a limitation of movement. Postures or movements in opposite direction often cause these symptoms and signs to worsen. This does not always occur, and may be a product of the length of exposure to provocative loading.

Lumbar extension: In standing by bending the trunk backwards; and in prone lying by passively raising the trunk, using the arms instead of the back muscles and at the same time keeping the pelvis down. Both manoeuvres cause extension of the lumbar spine from above downwards.

Lumbar extension with hips off centre: Extension in lying with hips off centre is needed if testing is inconclusive and pain unilateral asymmetrical. Hips are placed off centre, away from the side of pain and then extension in lying is repeated.

Lumbar flexion: In standing by bending the trunk forwards and in supine lying by using the hands to passively bend the knees onto the chest. In flexion in lying, the flexion takes place from below upwards, the L5-S1 join moving first followed by flexion in turn of each successively higher segment. In flexion in standing, the flexion occurs from above downwards.

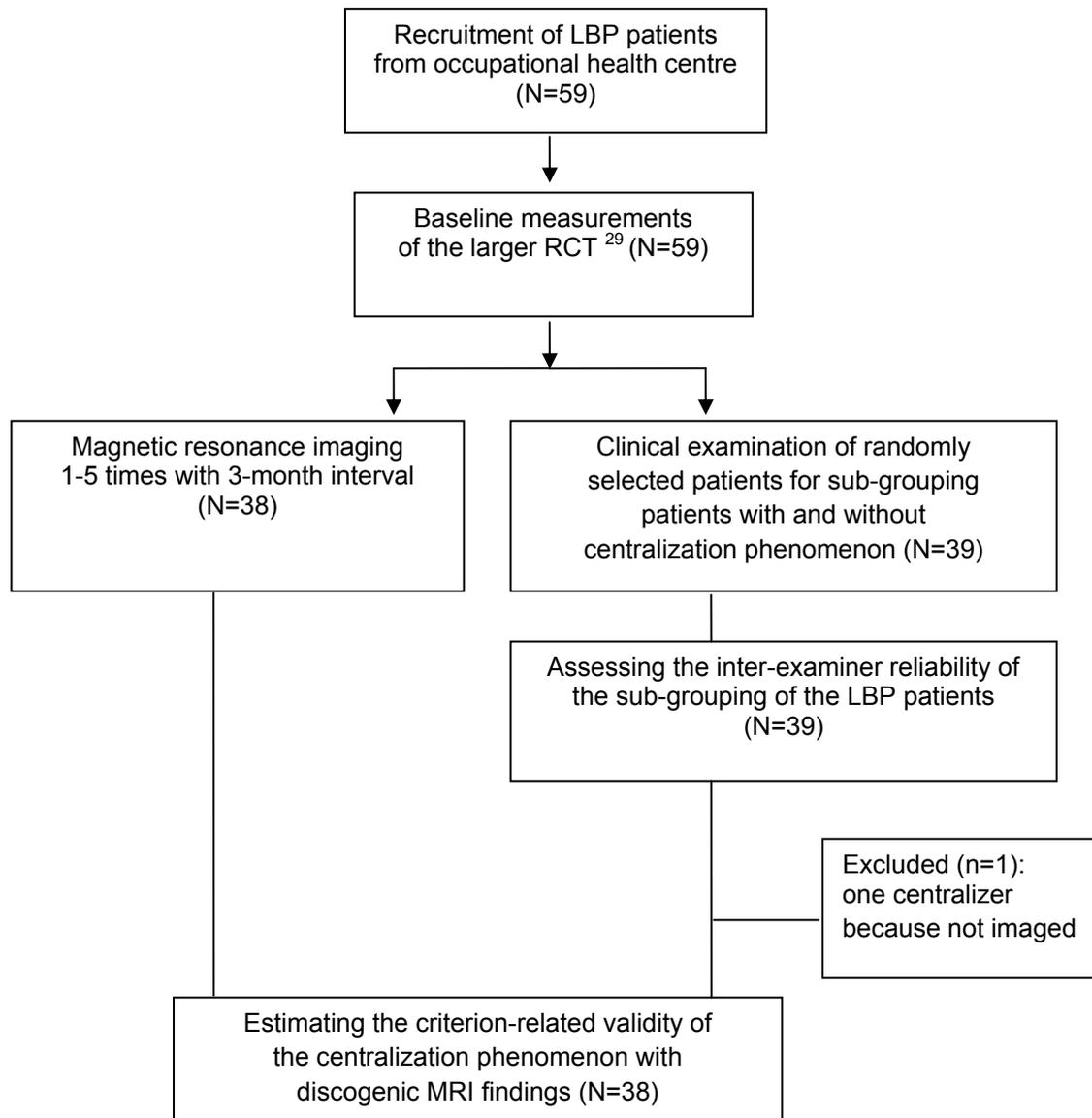
Side-gliding: This movement takes place when the patient laterally displaces his or her shoulders, relative to the pelvis. This movement is different from side-bending because the shoulders remain parallel to the ground. While the patient is in the standing position side-gliding to right takes place when patient's shoulders are gliding to right in relation to the pelvis in the frontal plane viewed from behind (C7-S1).

Rotation in flexion: When rotation of the lumbar spine is achieved by using the legs of the patient as a lever or fulcrum of movement, confusion arises as to the direction in which the lumbar spine rotates. This is judged by the movement of the upper vertebrae in relation to the lower- for example if the patient is lying supine and the legs are taken to the right, then the lumbar spine rotates to the left.



Pain centralization and lumbar disc MRI findings in chronic low back pain patients

Figure 1. Flow chart of the trial





Pain centralization and lumbar disc MRI findings in chronic low back pain patients

Table 1.

Characteristics of the population on clinical assessment day (N=39)

Characteristics	Non-specific LBP patients
Age (mean years, range)	40 (24-55)
Gender (number of females/males)	15/24
Duration of low back trouble (mean years, range)	14 (1-38)
Number of previous episodes:	
1-5 episodes, n (%)	16 (41)
6-10 episodes, n (%)	7 (18)
>10 episodes, n (%)	16 (41)
Duration of current episode of LBP: (on the day of McKenzie clinical assessment)	
Symptom-free, n (%)	2 (5)
Acute: <7 days, n (%)	5 (13)
Sub-acute: >7 days < 7 weeks, n (%)	9 (23)
Chronic: >7 weeks, n (%)	23 (59)
Symptom location:	
Symptom-free n (%)	2 (5)
Low back pain only n (%)	7 (17)
Radiating pain to thigh n (%)	21 (55)
Radiating pain below the knee n (%)	3 (8)
Radiating pain below the knee with neurological signs n (%)	6 (15)

Table 2.

Directions of loading producing the centralization phenomenon and the MRI findings at different spinal level from L1 to L5 among agreed-on centralizers (N=33)

Direction of loading:	Discogenic findings* in MRI	Other abnormalities* in MRI
Lumbar extension (21%, n=7)	L1: L2: Narrowing (2) L3: Extr (1), Narrowing (2) L4: Bulge (1), Extr (2), Narrowing (3) L5: Bulge (2), Prot (1), Extr (1), Narrowing (5)	L1: Retro (1) L2: Retro (1) L3: Retro (1), Stenosis (1) L4: Retro (1), Facet (1) L5: Antero (1), Retro (1), Facet (1)
Lumbar extension with hips off centre or side-gliding forces (73%, n=24)	L1: Bulge (1), Extr (1), HZ (1), Narrowing (4) L2: Bulge (2), Narrowing (3) L3: Bulge (3), Prot (2), Extr (2), Narrowing (7) L4: Bulge (3), Prot (7), Extr (3), Narrowing (14) L5: Bulge (5), Prot (2), Extr (4), Narrowing (14)	L1: Facet (1) L2: L3: Stenosis (1), Facet (1) L4: Retro (2), Stenosis (6), Facet (4) L5: Antero (2), Stenosis (2), Facet (3)
Rotation in flexion followed by lumbar extension (6%, n=2)	L1: L2: Bulge (1) L3: L4: Bulge (1), Extr (1), Narrowing (2) L5: Prot (1), Narrowing (1)	L1: L2: L3: L4: Retro (1), Stenosis (1), Facet (1) L5:

*Bulge= a bulging disc, Prot = protruded disc, Extr = extruded disc, Narrowing = disc space narrowing, HZ = high intensity zone, Retro = retrolisthesis, Antero = anterolisthesis, Stenosis = foraminal or spinal stenosis, Facet = zygapophysial joint arthritis



Pain centralization and lumbar disc MRI findings in chronic low back pain patients

Table 3.

The 2 x 2 contingency table of data used to calculate inter-examiner reliability of identification of the centralization phenomenon (N=39)

		Examiner 2	
Examiner 1	Centralization Phenomenon (CP)	CP +	CP -
	CP +	34	1
	CP -	1	3

Note: Kappa coefficient = 0.72 (CI95% 0.41-1.0). SE of Kappa 0.192

Table 4

The 2 x 2 contingency table comparing “centralizing or non-centralizing pain” with features of discogenic pain such as bulged, protruded, prolapsed/extruded discs, disc space narrowing and disc disruptions (HIZ) on MRI among LBP patients (N=38)

Centralizing pain	Features of discogenic pain on MRI Yes (+)	Features of discogenic pain on MRI No (-)	Totals
Yes (+)	31	2	33
No (-)	3	2	5
Totals	34	4	38

Notes:

Sensitivity 0.91(0.8-0.96)

Specificity 0.50(0.18-0.82)

PPV 0.94(0.83-0.98)

PNV 0.40(0.14-0.73)

+LR 1.8(0.8-4.2)

-LR 0.18(0.05-0.6)



Short-term changes in neural tension following repeated lumbar movements

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Abstract

Purpose: Mechanical Diagnosis and Therapy (MDT) is commonly used as a treatment option for patients with low back pain (LBP). The straight leg raise (SLR) measure has been shown to be a reliable measure of neural tension in previous studies. Although research in asymptomatic subjects demonstrated an improvement in SLR measure after performing repeated movements, this has not been investigated in a symptomatic patient population.

Methods: Eleven subjects presenting to outpatient physical therapy with a diagnosis of LBP, and a direction of preference of extension, were included. Subjects were randomly assigned to a control or experimental group. Both groups had the SLR measured performed on each lower extremity after the history, and again following the initial examination. The experimental group performed repeated end-range lumbar extensions between the measures during the initial examination, whereas the control group did not.

Results: The experimental group demonstrated a significant difference ($p=0.008$) in the left SLR measure after performing repeated lumbar extension exercises. The right SLR improved, to a greater extent, in the experimental group ($p=0.102$), compared to the control group after performing the exercises.

Conclusion/Clinical Relevance: This study demonstrated end-range lumbar extension exercises reduced neural tension on a short-term basis as demonstrated by improved SLR measures. Further research is required to relate these results to a larger patient population and over the course of physical therapy intervention.

Keywords: adverse neural tension, McKenzie assessment, straight leg raise

Introduction

Examination and treatment of low back pain (LBP) includes management provided by physicians, chiropractors, surgeons, and physical therapists, as well as, other healthcare professionals (Dagenais et al 2008). Rehabilitation following the onset of LBP contributes to the direct medical costs associated with management of this condition (Dagenais et al 2008). Although several approaches are utilized to examine and treat this disorder, more research is warranted to determine the most efficacious method of treatment.

Mechanical Diagnosis and Therapy (MDT) and neuromobilizations are commonly used in physical therapy to treat neuromusculoskeletal disorders related to LBP (Donelson et al 1997, Hall et al 1998, Long et al 2004, Miller et al 2005). Clare, Adams and Maher (2005) found the percent agreement for categorizing patients into lumbar syndromes (postural, dysfunction, derangement, or other) was $\kappa = 0.10$. In addition, as evidence of the prognostic validity of MDT, Werneke and Hart (2001) and Donelson et al (1997) determined centralization is a reliable predictor of the patient's prognosis.

The passive straight leg raise (SLR) measure has a high sensitivity and specificity for the presence of disc herniation (Rabin et al 2007). The straight leg raise measure demonstrates good to excellent interrater, intrarater, and test-retest reliability in asymptomatic and symptomatic subjects (Hunt et al 2001, Coppieters et al 2002, Cameron et al 1994, Hall et al 1998).

Research demonstrating the integration of MDT and neuromobilization is limited. Neural mobility, as measured by the straight leg raise, was shown to improve in asymptomatic subjects following repeated end-range lumbar extension (Peck et al 2009). According to MDT, a direction of preference and repeated movements into that direction may reduce the derangement. Peck et al (2009) hypothesized that

despite being asymptomatic, the subjects may have been experiencing annular bulging of the disc which responded to the repeated lumbar extension, thereby improving neural tension. The hypothesis of the present study is that neural tension will decrease, as noted by an improvement in the straight leg raise measure in patients referred for the treatment of LBP of at least five degrees, representing a clinically important difference in this measure.

Methods

Clinicians

Licensed physical therapists (PT) in Western New York State physical therapy outpatient facilities participated in the data collection for this study. All participating physical therapists had a minimum of five years experience and attended a two hour in-service about the proper procedures, techniques, and protocols regarding the passive straight leg raise measure, data collection, and research study guidelines. Clinician's credentials included Certification in MDT and students in the Fellowship program of the American Academy of Orthopedic Manual Physical Therapy.

Subjects

Patients over the age of 18, who presented to outpatient physical therapy facilities with LBP with symptoms that centralized with repeated lumbar extension, were considered eligible for participation in the study. Subjects were excluded from the study if they had a history of spinal surgery, a progressive disease process, psychological illness, were pregnant, were experiencing cauda equina syndrome symptoms, or if they were unable to speak or understand English. Subjects were also not eligible to participate in the study if they were involved in litigation related to LBP or insured through workers compensation or no fault insurance. All 45 eligible subjects read and agreed to the informed consent. The subjects' average age was 46 ± 15 years ranging from 18 years to 67 years old.



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There were five females and six males that participated in the study. The remaining 34 eligible subjects signed the consent, but did not participate because the treating physical therapist did not include the SLR measure in the patient examination. These subjects received physical therapy examination and intervention, as deemed appropriate by PT and referring physician. The control group contained four subjects and the experimental group contained seven subjects. Table 1.1 demonstrates the distribution of the symptomatic side of the subjects.

Procedure

After informed consent was obtained, subjects received a complete physical therapy examination, including: history, structural alignment assessment, active range of motion, repeated lumbar movements, neurological examination, straight leg raise, palpation, spring testing, and passive intervertebral joint motion testing. Immediately following the examination, each subject was randomly assigned to either the exercise group or the control group via a computerized list of random numbers.

The exercise group was given therapeutic exercise according to the direction of preference found during the examination. All patients demonstrated a direction of preference for lumbar extension. Lumbar extension was the direction of movement which decreased, abolished, or centralized the subject's symptoms (Donelson et al 1997). Subjects performed three sets of 10 repetitions with at least a three minute rest in a prone position with a lumbar roll between sets. All participating subjects in the exercise group were assessed with a SLR measure for each lower extremity prior to and following the performance of lumbar extension. The control group had the SLR measure performed on each lower extremity during the initial examination and again at the end of the initial session, with no performance of repeated lumbar movement between measures. Following the second measure, the control group received treatment as recommended by the physical therapist or physician, which may or may not have included lumbar extension. Although both groups received physical therapy intervention, reported data pertained only to the initial examination measures.

The SLR measure involved placing an inclinometer at the tibial tuberosity. All SLRs were measured using a Universal Inclinometer. The examiner passively raised the leg, keeping the knee extended and the ankle in neutral. The subject was in supine, with the contralateral hip and knee maintained in extension. The examiner assessed the location and intensity of the subject's symptoms, if any, and noted if these complaints changed or were produced as the leg was raised. The end point of the SLR measure was P1, the first point of pain and/or symptoms. After taking this measure, the leg was slowly lowered to the start position.

Data Analysis

A Friedman's non-parametric test was performed using SPSS software version 17.0 at all data collection points.

Results

The analysis of the passive straight leg raise measures from the initial visit are found in Table 1.2, as it was the best indication of the efficacy of the repeated lumbar extensions. Since the measured improvement was greater than five degrees, the change represents a clinically meaningful difference.

Discussion

In addition to symptom assessment, range of motion tests such as the SLR can provide a valuable baseline for determining the effectiveness of repeated end-range spinal movements.

Through classification, physical therapists can provide the most effective and efficient treatment for patients. The SLR has been used in several other studies to assess treatment outcomes. Research conducted by Peck et al (2009) revealed that 62% of the experimental group demonstrated an increase in the straight leg raise measure after performing repeated end-range lumbar extensions in asymptomatic subjects. Miller et al (2005) used the straight leg raise measure as an objective tool to evaluate patients when comparing spinal stabilization and MDT treatment methods for patients with chronic low back pain. Patients who performed exercises based on their MDT classification demonstrated a decrease in present pain index scores and an increase in the SLR measure (Miller et al 2005). Additionally, Chen et al (2009) used the straight leg raise measure objectively for a patient with radiating low back pain. The individual in the case study was initially prescribed spinal thrust manipulations (STM) and no change in pain was noted after two treatments (Chen et al 2009). By changing the treatment to repeated end-range lumbar extensions over four visits, the patient's symptoms decreased from a 6/10 to a 0/10 on the numeric pain rating score while noting an increase of 10 and 20 degrees in the SLR on the right and left legs, respectively (Chen et al 2009). Previous research, in combination with the results from the present study, can be used by clinicians to provide an effective and efficient treatment with an associated objective outcome measure that can quantify positive outcomes.

Limitations

The current study poses several limitations. Future studies should include a larger patient population with varying stages of healing and other directions of preference according to MDT. Additionally, future researchers should consider conducting a single-blinded study including objective pain measurements in combination with straight leg raise measurements for data analysis.



Short-term changes in neural tension following repeated lumbar movements

Conclusion

This preliminary study supports the utilization of the SLR to support the derangement classification. In theory, applying pressure on a pain sensitive structure such as a nerve root can cause low back pain and/or radiating pain. By performing repeated end-range lumbar extension exercises, the intervertebral disc's pathomechanics may be influenced. Theoretically, the reduction of discogenic pressure or irritation on the nerve roots upon exiting the spinal canal reduces radiating symptoms demonstrated by an improved straight leg raise measure

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Table 1.1

Distribution of subject's symptoms

Symptomatic Side	Control	Experimental
Right	1	3
Left	2	2
Central	1	2*
Total	4	7

* The two subjects reporting central LBP at the time of examination previously reported left-sided symptoms.

Table 1.2

Data analysis of SLR measured before and after the initial examination

Measurement	Control (average, in degrees)	Experimental (average, in degrees)
Left SLR Pre Tx	60.0 ± 7.5	62.4 ± 10.4
Left SLR Post TX	62.0 ± 6.8	68.9 ± 9.5
Difference	2.0 ± 2.9	6.4 ± 6.1
Significance	0.157	0.008
Right SLR Pre Tx	71.3 ± 11.4	59.4 ± 12.7
Right SLR Post TX	69.5 ± 10.5	65.3 ± 11.7
Difference	-1.8 ± 3.0	5.9 ± 5.4
Significance	0.564	0.102



Review of Studies

Review editor: Stephen May, PhD, MA, FCSP, Dip. MDT, MSc

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Werneke MW, Hart D, Oliver D, McGill T, Grigsby D, Ward J, Weinberg J, Oswald W, Cutrone G (2010). Prevalence of classification methods for patients with lumbar impairments using McKenzie syndromes, pain pattern, manipulation, and stabilization clinical prediction rules. *J Man Manip Ther* 18:197-204.

Objective

To determine prevalence rates at intake amongst patients with low back pain of Mechanical Diagnosis and Therapy (MDT) syndromes, centralization, and clinical prediction rules (CPR) for manipulation or stabilization exercises.

Design

A prospective, longitudinal, observational, cohort study; this paper describes only classification at baseline.

Setting

Eight physical therapists in different health care settings in the USA, all trained in MDT to credentialed or diploma level.

Patients

Data was sought from 725 consecutive patients; 33 did not start data collection; a further 64 did not have classification data – 628 patient data were analyzed. Mean age was 52, 56% were female, and 54%/25%/20% were chronic/subacute/acute respectively.

Intervention

Patients were classified according to previous operational definitions. Standardized data was collected using Focus On Therapeutic Outcomes (FOTO).

Main outcome measurements

Prevalence rates, with 95% confidence intervals, of different methods of classification at intake.

Main results

The largest classification group was derangement, and then centralization; very small proportions were classified with the CPR (**see Figure 1**). For patients who were positive for the manipulation CPR the prevalence rates for derangement and centralization were 89% and 68%; and for patients positive to the stabilization CPR, they were 83% and 80%.

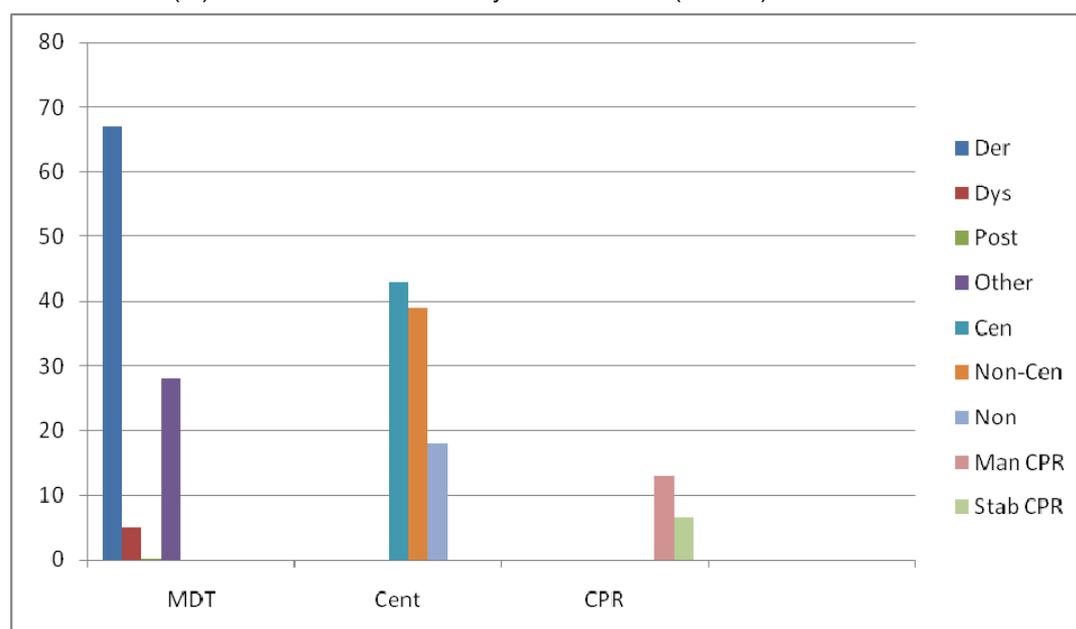
Conclusions

Greater proportions of patients presenting with low back pain can be classified using MDT classifications or centralization response than using CPR criteria.

Comments

This article and the discussions that follow it continue an important discussion between leading researchers in the two most commonly implemented types of physical therapy classification systems for low back pain: Mechanical Diagnosis and Therapy (MDT) and Treatment Based Classification (TBC). While both of these classification strategies use direction-specific exercise as the first decision in their clinical decision pathway, the TBC differs from MDT in using clinical prediction rules (CPR) to classify patients in categories

Figure 1. Prevalence rates (%) of different classification systems at intake (N= 628)



Key: MDT = Mechanical Diagnosis and Therapy (Der = derangement; Dys = dysfunction; Post = postural syndrome; and Other); Cent = centralization status (Cen = centralization; Non-Cen = non-centralization; Non = not classified); CPR = clinical prediction rules (Man CPR = positive to manipulation CPR; Stab CPR = positive to stabilization CPR).



Review of Studies

of thrust manipulation and specific lumbar stabilization (as well as traction, which is often excluded due to relatively low numbers of subjects in this category). As discussed in the primary paper and the follow-up discussions, the key to classification systems are that: the groups identified can be reliably classified; the classification leads to valid and effective treatment; the groups capture a sufficient proportion of patients; and the classification leads to groups that are mutually exclusive. The relative ability of the MDT and TBC systems to fulfill some of these criteria was the focus of this paper. The study addressed diagnostic findings, and aside from comparison of prevalence did not address follow-up outcomes or other aspects of validity or prognostic accuracy.

A greater proportion of patients were classified with MDT criteria than with TBC criteria. The higher prevalence rates found with the MDT system demonstrates greater diagnostic utility of that system. Furthermore, the majority of patients with manipulation and stabilization CPRs were also classified as derangements whose symptoms centralized. Therefore, manipulation and stabilization CPRs may not represent mutually exclusive treatment subgroups, but may include patients who can initially be treated using a different classification system.

The paper (Werneke et al 2010) is followed by an invited commentary from Julie Fritz, a key researcher of the TBC system. As noted by Dr. Fritz, the prevalence of rule positive findings for manipulation and stabilization have consistently been reported at higher levels than those found by Werneke et al (2010) even when performed by therapists directly challenging the efficacy of the manipulation rule (Hancock et al 2008). Werneke et al (2010) used the pragmatic derivation of the manipulation rule published by Fritz et al (2005), which includes only subjects with acute low back pain and those without pain below the knee. While it is possible for patients to meet the original criteria without having acute symptoms (Brenner 2005), it is relatively uncommon for patients presenting for standard outpatient physical therapy in the U.S. to have acute symptoms, particularly not at the rates seen for direct access care in Australia (Hancock et al 2008) or in the armed services (Childs et al 2004). The TBC classification has been studied mostly in subjects with subacute symptoms of 90 days or less; it would be interesting to see what the prevalence rates of Werneke et al (2010) would be in this group of patients. However, for the original CPR criteria the prevalence rates found by Werneke et al (2010) would appear to represent the true rates.

One of the key discussion points was the relative importance of high prevalence captured by a particular subgroup (or system), versus the likelihood of a positive clinical outcome with a particular classification. A primary impetus to the development of subgrouping

is the lack of overall effect for many low back pain interventions. The main prognostic finding within MDT is centralization, which has been consistently linked to a good outcome. Werneke et al (2010) expanded this to include patients who were classified as derangements, a category whose prognostic utility is less well documented. Fritz argued that the goal of classification was to identify subjects who will respond to a particular intervention; if nearly all subjects are placed into a particular category, such as derangement, the value of the classification system is weakened. This is a powerful argument in the case of the manipulation rule, as a positive finding produces one of the strongest positive likelihood ratios of good outcome (defined as 50% or greater reduction in symptoms) in orthopedic physical therapy (Flynn et al 2002). The same cannot be said of the stabilization rule, which has limited power to predict success (the same 50% criteria), but is a strong predictor of patients who will not achieve even the minimum clinical difference from stabilization exercises (Hicks et al 2005).

An overall challenge to the TBC system is that it has been primarily tested for reliability and utilized in subjects with subacute symptoms of less than 90 days. This has led to high rates of exclusion in randomized trials examining the TBC, and as noted by Werneke et al (2010) when these exclusion criteria are removed, the prevalence rates of manipulation and stabilization are similar to those found in the current study. The patient population of this study does match that of the large FOTO database, lending support for the accuracy of the prevalence rates for the TBC classifications. Lack of application beyond the acute stage is a potential challenge to the TBC, as most patients may end up in one category (general exercise), similar to Fritz' concern that most patients in MDT are classified as derangement. The balance between the ability to classify greater numbers of patients and the predictive value of those classifications is one of the ongoing challenges to both systems.

A final discussion point is the aspect of mutually exclusive categories. Werneke et al (2010) note that the vast majority of patients in the manipulation and stabilization categories also fit into the derangement or centralization categories, implying that the majority of these patients may be treated equally well by directional specific exercises. Brennan et al (2006) noted the difficulty of perfectly fitting subjects into the TBC categories, and provided a diagram summarizing decisions that could be used to help classify patients when there is not a perfect fit. Using this methodology, they demonstrated that patients matched to their classification category had better outcomes than those provided with non-matched treatment, demonstrating clinical utility when subjects can be correctly classified. However, out of 1052 patients screened, only 123 (12%) were classified with this method, which is a further challenge to the clinical utility of the TBC



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system. Long et al (2004) used a similar methodology to assess treatment matched or unmatched to directional preference, excluding patients who did not demonstrate a directional preference on initial assessment. They screened 312 patients and included 230 (74%), which clearly was a more inclusive screening process.

A number of factors are similar for positive findings in the manipulation category and centralization/response to MDT: acute symptoms, low fear avoidance (Werneke and Hart 2005) and the absence of distal leg pain (May et al 2008). The treatment effect for patients positive on the manipulation rule has been questioned (Hancock et al 2008). Whereas, centralization has generally been shown to be a consistent predictor of good outcome, the treatment effect of providing MDT versus other treatment for patients who centralize is less consistent (Brennan et al 2006, Miller et al 2005). It is possible that the same underlying predictors are partly responsible for the positive findings of centralization and the manipulation rule.

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Objective

To determine prevalence rates of directional preference and centralisation at baseline, and to see which best predicted outcomes of function and pain at discharge.

Design

Prospective, longitudinal, observational cohort – the same dataset as the study above.

Setting

Eight physical therapists in different health care settings in the USA all trained in MDT to credentialed or diploma level.

Patients

There were 618 consecutive patients, of whom 34 did not start data collection, and 103 had baseline data only. The final cohort was of 481 patients with baseline and discharge data: of whom 54% were female, mean age was 51, and 22%/25% and 53% were acute/subacute and chronic respectively. Baseline functional status was 52/100, and pain was 6/10.

Intervention

Patients were classified according to previous operational definitions. Standardized data was collected using Focus On Therapeutic Outcomes (FOTO). Patients were treated with directional preference exercises, and allied manual therapy techniques.



Review of Studies

Main outcome measurements

The 11-point Numeric Pain Rating Scale was used for pain, and a computerised testing application, which included the Back Pain Functional Scale, was used for function.

Main results

Overall, DP was more common (60%) than centralization (41%), but both declined significantly with increasing age and chronicity, chi-square $p < 0.001$ (see **Figures 2 and 3**). There was not a complete overlap between those classified with DP and centralization; overall, 65% of those classified with DP were classified with centralization.

In terms of predictive validity, patients classified with DP and centralization had much better functional outcomes than patients classified with DP, but non-centralization (7.7 units less improvement) and no DP and non-centralization (11.6 units less improvement) ($p < 0.001$). In terms of predictive validity, patients classified with DP and centralization had much better pain outcomes than patients classified with no DP and non-centralization (1.7 units less improvement) ($p < 0.001$), but no significant difference with patients classified as DP with no centralization.

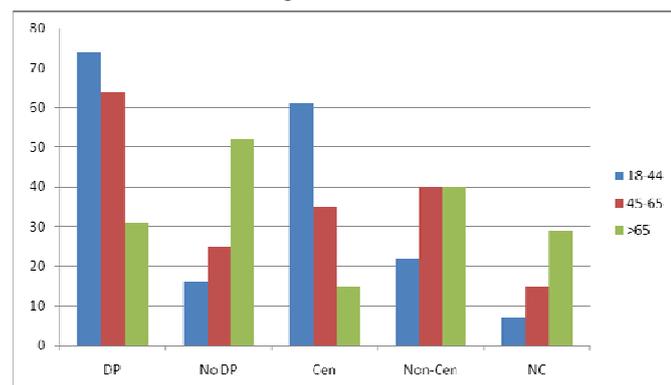
Conclusions

More patients could be classified with DP than with centralization; these findings are similar, but are not synonymous. When DP was associated with centralization at baseline, positive outcomes were predicted, but DP, by itself, was not a particularly useful predictor of good functional outcomes, though it was for pain outcomes.

Comments

This is the first study to directly compare the prevalence rate and diagnostic validity of the two related, but separate, phenomena of DP and centralization. There is considerable published literature about centralisation, but much less about DP. The present study found a higher prevalence for DP than for centralization; they also found that age of the patient and chronicity of the problem had a significant impact on the prevalence of both of these findings. As

Figure 2. Prevalence rates of directional prevalence and centralisation related to age



age and chronicity increased, there was a decrease in these phenomena and an increase in non-DP, non-centralization, or no classification. This is in common with previous studies (Werneke et al 2008, Aina et al 2004).

These baseline findings were then used to determine which were most useful in predicting outcome at discharge, in terms of changes in pain and function. Centralization was once again shown to be an important predictor of outcomes, but DP, in the absence of centralization, did not appear to be very useful at predicting functional outcomes. However, DP in the absence of centralization was a useful predictor of pain outcomes.

Both clinical phenomena are relatively common, especially in younger and more acute low back pain patients; and maybe useful predictors of short-term pain and functional outcome measures. However, they appear to be separate phenomenon with different prognostic validity, and should not be considered synonymous.

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Werneke MW, Hart DL, Resnik L, Stratford PW, Reyes A (2008). Centralization: prevalence and effect on treatment outcomes using a standardized operational definition and measurement method. *J Orth Sports Phys Ther*;38:116-125.

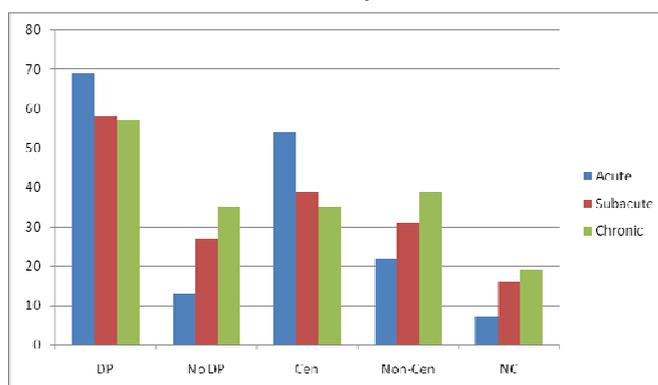
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Edmond SL, Werneke MW, Hart DL (2010). Association between centralization, depression, somatisation, and disability among patients with nonspecific low back pain. *J Orth Sports Phys Ther* 40:801-810.

Objective

To evaluate any links between depression and somatisation score in patients who do or do not demonstrate centralization

Figure 3. Prevalence rates of directional prevalence and centralisation related to chronicity





Review of Studies

Design

Prospective cohort design. Secondary analysis of previously reported data (Werneke et al 1999, Werneke and Hart 2001)..

Setting

Patients referred to two medical centres in the USA for physical therapy for low back pain.

Patients

Two hundred thirty-one consecutive patients treated with low back pain, though not all patients contributed to all data analysis. Patients were 52% male, with a mean age of 38 years.

Intervention

Patients were treated with exercises consistent with centralization, which were augmented by manual therapy techniques in line with that DP if needed. If centralization was not observed, an individualised active rehabilitation plan was determined.

Main outcome measurements

Disability was assessed using Oswestry Disability Questionnaire at baseline and discharge, work status by patient self-report at six and twelve months, and pain by Numeric Pain Rating Scale at six and twelve months. Depression and somatisation was measured using Symptom Checklist-90-Revised, and outcomes were compared to a clinical prediction rule used to identify depression-related disability amongst patients with low back pain.

Main results

The presence of centralization appeared to be a confounding factor for the association between depression and somatisation and pain and disability outcomes. The presence of centralization was a much stronger predictor of function at discharge, and work status at six and twelve months, but less so for pain at six and twelve months compared to these psychological factors (**Figure 4**).

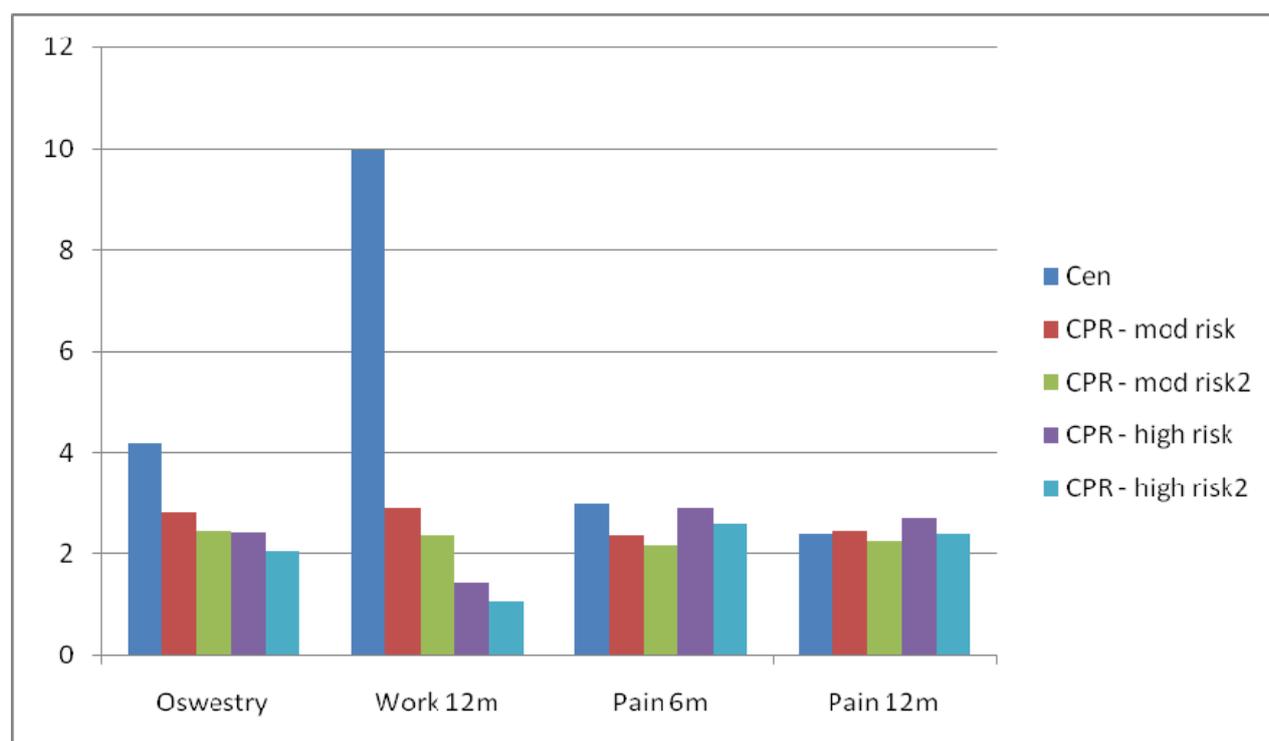
Conclusions

The study showed that the clinical prediction rule, which used depression and somatisation to predict chronic pain and disability, was less useful at doing this if centralization was accounted for in a multivariate analysis. In other words, if centralization is identified, and used to guide management strategies, the link between depression and somatisation and chronic disability is weaker than if this clinical phenomenon is ignored.

Comments

The role of psychological factors, such as depression and somatisation, in the development of chronic pain and disability in patients with low back pain has been highlighted in numerous reports over the last few decades. However, these reports have generally ignored any biophysical responses that might counter-balance these factors. This report suggests that where centralization is identified, and used to make management decisions, then the link between such psychological factors and outcomes is lessened.

Figure 4. Odds ratios for association between centralization, depression and somatisation, and pain and disability outcomes – Oswestry at discharge, work status at twelve months, and pain at six and twelve months





Review of Studies

A number of papers have sought to address the links between centralization status and psychological factors. One found an association between non-centralization and 'behavioural signs', including somatisation (Werneke and Hart 2005). The authors suggested that non-centralization and behavioural signs might not be independent of each other. In other studies, overt pain behaviours and fear of work activity (Werneke and Hart 2001), fear avoidance (George et al 2005), and depression, marital status and work status (Long et al 2009) have been less useful predictors of outcomes than centralization.

It is important not to 'throw the baby out with the bath water', and clearly there are instances when psychosocial issues are paramount in patients' presentations. However, it would appear from these preliminary reports that unless centralization, and perhaps directional preference testing, is not conducted the importance of these psychosocial issues maybe over-inflated. Most studies investigating the prognostic influence of psychosocial variables have not investigated centralization status as a potential confounding factor. This is clearly a vital research topic; for patients might be being 'branded' with psychological issues, but have not been evaluated for centralization or directional preference, which actually might resolve their problem.

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Case study: Transient osteoporosis of the hip in a post partum female

Peter Schoch, PT, Cert. MDT



THE MCKENZIE INSTITUTE EXTREMITIES ASSESSMENT

Date 07.10.10

Name Mrs X Sex Female

Address _____

Telephone _____

Date of Birth _____ Age 36

Referral: Other Midwife – hospital inpatient

Work Mother to 3 other children

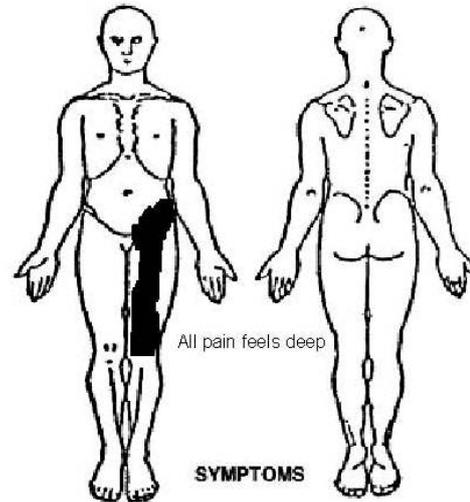
Leisure No time!!

Postures / Stresses Caring for children, housework.
Had 4th baby 2 days ago (vaginal birth)

Functional Disability from present episode Can't walk without 2wheel frame. Left leg gives way

Functional Disability score _____

VAS Score (0-10) _____



HISTORY

Present Symptoms As per chart

Present since 'Early in pregnancy' but much worse last 3 weeks Improving / Unchanging / **Worsening**

Commenced as a result of _____ or no apparent reason

Symptoms at onset: Left groin pain first few months. Spread to thigh and knee last few months

Constant symptoms: Intermittent symptoms: **Left groin / thigh / knee**

What produces or worsens Any weight bearing on left leg e.g. walking or standing, sit to stand with weight through left leg. Lying on left or right side may worsen if stay there >30mins
Doesn't trust left leg to hold her weight.

What stops or reduces Unloading - lying supine sometimes abolishes pain. Sitting reduces but doesn't abolish

Continued use makes the pain Better **Worse** No Effect
e.g walking any distance

Pain at rest Yes / **No**

Disturbed night Yes / **No** Can't lie on either side too long. Wakes to go to toilet can't weight bear on left leg b/c of pain

Other Questions 4th pregnancy no complications. No pain like this with previous pregnancies. Currently breast feeding
No history of steroid or intravenous drug use. No alcohol. Smoker ~ 5 cigarettes per day

Treatments this episode Analgesia – panadiene forte. Private physio – "stretched leg" – no effect. 2 wheel walking frame as advised by physio last 3 weeks because of pain

Previous episodes nil

Previous treatments nil

Spinal history nil

Paraesthesia Yes / **No**

Medications tried Pandiene forte / Paracetamol Effect Temporary relief but don't abolish pain when walking

Present medication As above

General health Good. No other health issues. No family history of serious pathology

Imaging No

Summary: Acute / Sub-acute / **Chronic** Trauma **Insidious onset**

Sites for physical examination Lumbar spine, left hip, left knee



Case study: Transient osteoporosis of the hip in a post partum female

Abstract

The following is a case study of a thirty-six year old female who was assessed whilst an inpatient at the local hospital. She had given birth to her fourth child via normal vaginal delivery two days earlier. She was complaining of intermittent left groin, thigh and knee pain that was subsequently diagnosed as transient osteoporosis of the hip. This disorder was first described in 1959, and there are approximately 500 published cases in the literature. Transient osteoporosis of the hip is essentially a diagnosis of exclusion, as its aetiology remains unknown. It is believed to be a self-limiting condition, with most patients making a full recovery over two to nine months, with little or no medical intervention. This case study highlights when Mechanical Diagnosis and Therapy is not appropriate and when to refer patients on for a medical review. **Key words:** Transient, Osteoporosis, Hip, Mechanical Diagnosis and Therapy (MDT)

Initial Assessment Day 1

Mrs. X was referred to physiotherapy two days after the birth of her fourth child. She had given birth via normal vaginal delivery, without complication. Apart from her pain, both mother and baby were otherwise well. Mrs. X reported she had developed intermittent left groin pain 'early in the pregnancy', that had worsened over the last three weeks, to the point where her left leg was giving way due to pain. She had also developed intermittent left thigh and knee pain, that seemed related to the groin pain. She stated that all pain felt like it was deep inside her leg.

Mrs. X reported that her pain was made worse by any walking, standing, or moving from sit to stand. She stated that she took most of her weight on the right leg, when weight bearing, as she did not trust the left leg to carry her weight. She reported that lying supine or taking analgesic medication sometimes abolished her symptoms. Mrs. X stated that she had seen a private physiotherapist, prior to giving birth, who tried some 'stretching of the hip', without effect. The physiotherapist had advised her to use a two-wheeled walking frame (2WF), for the remainder of her pregnancy, to help her mobilise safely.

Mrs. X lived with her husband and worked as a full-time mother to her three other children. She had no general health issues and was normally independent with all activities of daily living. She had no medical problems during her previous three pregnancies and no alcohol or intravenous drug use, although she had continued to smoke five cigarettes per day during this pregnancy.

Examination

Physical examination of the patient showed no obvious muscle wasting or deformity of the lumbar spine or left leg. There was no focal tenderness on palpation of the lumbar spine, pelvic ring, buttocks, left thigh or left leg. Repeated movement testing of the lumbar spine had no effect. Examination of the left lower limb showed reduced active and passive movements of the hip in all directions. All movements were painful during, and at the end of, available range. Left knee range of motion was normal and had no effect on her pain. Hip and knee muscle strength tests showed grade four strength on the left, compared to grade five on the right, but had no effect on the pain. During functional testing, Mrs. X was unable to stand on her left leg at all, due to pain, but was able to stand independently on the right leg.

She was unable to weight bear on the left leg when walking, without using her walking frame.

Given the insidious onset and severity of the pain, the degree of functional impairment and the limited movements of the hip, it was explained to Mrs. X that, whilst her symptoms appeared mechanical in nature, there were concerns that there could be a more serious underlying pathology. She was advised that further assessment through the use of repeated movements may help determine whether her problem might respond to conservative therapy or whether she might require further investigation. Mrs. X was keen to try conservative therapy and consented to further examination.

Repeated movements of the left hip were therefore explored. Mrs. X was unable to perform hip movements in loaded positions, due to the severity of her pain. She was therefore predominantly examined in 'crook lying' (supine with the hips flexed to about forty five degrees, knees flexed and the feet resting on the bed), as she was able to perform the required movements herself, in this position. Repeated active hip flexion, in supine, produced her groin pain, but she was no worse afterwards and there was no effect on other movements. Repeated abduction/external rotation of the left hip produced and worsened her groin and thigh pain and resulted in reduced active flexion of the hip. Repeated adduction/internal rotation of the hip reduced the thigh pain, had no effect on the groin pain, but resulted in increased active flexion of the hip. Mrs. X stated it felt "easier" to flex her left hip after performing repeated adduction/internal rotation. The left groin pain on weight bearing remained unchanged, after repeated movement testing.

Conclusion and Management Day 1

Based on these results, the provisional classification was derangement of left hip. This was based on the mechanical nature of the symptoms and response to repeated movements, although the therapist felt this needed to be tested over a longer period of time to confirm the diagnosis. However, given the insidious onset, the lack of precipitating incident and very recent pregnancy, the possibility of an 'other', more serious diagnosis, was not excluded.

Mrs. X was advised to continue repeated adduction/internal rotation of the left hip in crook lying; ten to



Case study: Transient osteoporosis of the hip in a post partum female

fifteen repetitions, every two or three hours, as long as it made her pain better or at least no worse; and her hip range of motion remained better afterwards. She was advised to stop the exercise if any of her pain or range of motion remained worse or it got harder to move her left leg or to walk. The physiotherapist advised Mrs. X he would review her again the following morning. The midwife was also advised of the above plan, so she could help monitor the patient's symptoms overnight.

Visit 2 – The Next Morning

Mrs. X reported she had performed her exercises several times overnight and that morning. She reported no change in her symptoms and that she was still unable to weight bear on the left leg, without the support of the walking frame. She still required regular analgesia to reduce her pain when walking.

Examination showed Mrs. X's left hip active and passive range of motion were unchanged from the initial assessment. Resisted tests were also unchanged. In order to explore the effect of increased force, the therapist performed left hip flexion, adduction with therapist overpressure, also known as the hip quadrant (Maitland 1991). This immediately produced severe left groin pain. The groin pain remained worse after this procedure and on reassessment, the patient showed a loss of range of left active hip flexion. Manual traction was then applied to the patient's left leg, but had no effect on her pain.

At this point, the therapist ceased examination and advised the patient that further investigation was warranted. Mrs. X was advised to continue using her walking frame for all ambulation and to stop the repeated adduction/internal rotation exercise. The

therapist immediately advised the midwife, obstetrics registrar and orthopaedic registrar that physiotherapy was not indicated at present and that an orthopaedic review was required.

The orthopaedic registrar's notes subsequently showed he reviewed the patient that afternoon. His physical examination showed range of motion and strength tests similar to that obtained by the physiotherapist.

A plain x-ray (see Figure 1) of the patient's pelvis and both hips was ordered. It showed "marked osteopenia of the left proximal femur including the femoral head, neck and intertrochanteric region, but no destructive bone lesion" (Whan 2010). Left hip joint space was reported as normal, however, there was "mild diastasis of the symphysis pubis, consistent with recent post partum" (Whan 2010).

The orthopaedic registrar then spoke to the orthopaedic surgeon on call, who recommended a full blood examination (FBE) to investigate inflammatory and septic markers. He also recommended an immediate magnetic resonance image (MRI) of the hip to further define the pathology. The patient underwent MRI (see Figure 2) that evening which showed, "significant marrow oedema in the femoral head, neck, trochanteric and subtrochanteric regions of the femur" (Lun 2010). "No fractures or osseous collapse of the femoral head" (Lun 2010) were seen and the "acetabulum and labrum appeared normal" (Lun 2010). According to the final radiology report, "correlation of the history, plain x-ray and MRI indicated the pathology was more likely to be 'transient osteoporosis of the hip' (TOH) rather than avascular necrosis or septic arthritis" (Whan 2010).

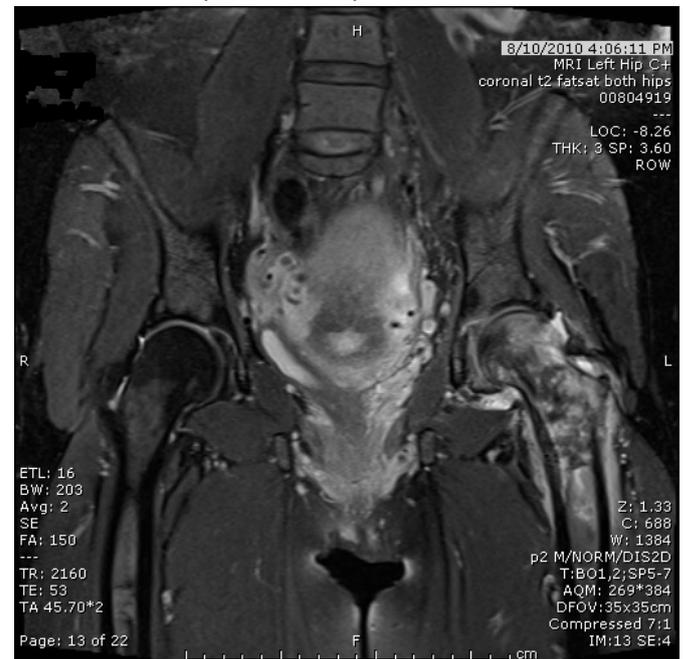
Figure 1

Plain X-ray of Mrs. X's pelvis and hips



Figure 2

MRI of Mrs. X's pelvis and hips





Case study: Transient osteoporosis of the hip in a post partum female

The FBE showed an elevated erythrocyte sedimentation rate (ESR) of 26 mm/hr (normal range 0-12 mm/hr) and elevated C reactive protein (CRP) of 53.5 mg/L (normal range <10mg/L). These results were indicative of the patient having an inflammatory problem, however, due to the non-specific nature of these blood tests (Anderson et al 2001), they did not confirm a particular diagnosis. The orthopaedic team then requested an endocrinology review to advise whether medical management of TOH was required. The endocrinology consultant reviewed Mrs. X the following day and advised her to maintain a high calcium intake and to follow the weight bearing orders of the orthopaedic team. Bisphosphonate supplements were not required, as the patient was not contemplating further pregnancies.

The case notes indicate Mrs. X was subsequently discharged home later that day. She was to be followed up in orthopaedic and endocrinology outpatients the following week. She was to use Panadiene Forte for pain relief and to remain non-weight bearing on the left leg, as per orthopaedic orders. No specific physiotherapy follow-up was arranged, pending the advice of the orthopaedic team.

Discussion

This case highlights an uncommon presentation of hip pathology, in an otherwise healthy post partum woman. It reinforces the need for therapists' to be vigilant in their history taking and examination, even when the patient has already been assessed by other health practitioners. In this case, Mrs. X's history of progressively worsening deep groin and thigh pain, without any precipitating event raised the therapist's suspicions of something more than a simple mechanical problem. The variability of the patient's apparently mechanical symptoms – from pain free or virtually pain free when lying supine to having her leg collapse when weight bearing, caused particular concern. However, the decision to test the effect of repeated movements over a twenty-four hour period was based on a number of factors.

Firstly, the assessment findings of mechanical pain during active and passive movements, no major loss of passive range of motion and no effect of resisted hip muscle tests pointed more towards a hip derangement, than an articular or contractile dysfunction.

Secondly, the initial symptomatic response to internal rotation and adduction: pain no worse, active hip flexion better afterwards, met the criteria of an amber light response under the 'traffic light guide' of the MDT system (MDT Course Manual 2010). According to this logic, "the applied forces may not be sufficient to produce a lasting change in the symptoms, so careful application of more force is warranted" (MDT Course Manual 2010).

Thirdly, the fact Mrs. X was an inpatient of the hospital,

meant that should her symptoms deteriorate, appropriate medical care could be implemented immediately. With both the patient and her midwife informed about monitoring the symptomatic response, the therapist felt it was safe to proceed with this strategy. When it became clear mid-way through the follow-up visit that further testing was worsening the patient's symptoms, it was no longer appropriate to continue. Fortunately, with Mrs. X still being in hospital, her management could immediately be escalated, by requesting an orthopaedic consult.

Transient Osteoporosis of the Hip (TOH)

Transient osteoporosis of the hip is an uncommon disease seen in women in the third trimester of pregnancy or middle aged men (March et al 2010). There are approximately 500 cases of TOH reported in the literature (Fingerth 1995), since it was first described by Curtiss and Kincaid in 1959. Patients typically present with disabling mechanical groin pain and limitation of hip movements, without any obvious preceding event or trauma (March et al 2010, Wheelless 2010, Guerra and Steinberg 1995). The aetiology of TOH is not clear (March et al 2010). Pregnancy has been documented as the only precipitating factor (Guerra and Steinberg 1995) however, other factors such as genetic predisposition, bone medullary hypertension and chemical or hormonal factors related to pregnancy have also been investigated (March et al 2010). The effect of parathyroid hormone related protein and its influence on bone mineralization during pregnancy is the subject of ongoing investigation (March et al 2010). Diagnosis is usually made after excluding other pathologies such as avascular necrosis (AVN) or septic arthritis (March et al 2010, Ugwonalie et al 2008). Plain X-ray may show osteopenia soon after the onset of symptoms, however MRI is the investigation of choice as the changes visible on MRI assist with differentiation between TOH and AVN or septic arthritis (March et al 2010, Ugwonalie et al 2008, Malizosa et al 2004). Blood tests may show an elevated ESR (Wheelless 2010).

Treatment is initially based on conservative measures, such as education and modified weight bearing through the affected side, as there is no conclusive evidence for surgical or drug intervention (March et al 2010). Some authors advocate the use of bisphosphonates to shorten the duration of and reduce the pain associated with TOH (Kibbi et al 2008), however, this remains a matter for debate, as such studies are based on single case reports or small case series (March et al 2010). Conservative therapy aims to prevent hip contracture or muscle wasting and reduce the load through the hip, to prevent microfractures within the femur (March et al 2010). Physiotherapy may, therefore, have a role in providing appropriate advice and/or aids to allow safe mobilisation and activities of daily living. The disorder is generally considered to be self-limiting over two to nine



Case study: Transient osteoporosis of the hip in a post partum female

months; therefore, most patients have a good long-term prognosis (March et al 2010, Ugwonalii et al 2008, Siva and Roach 1997).

Conclusion

This case study outlines the history and management of a recent post partum patient, who presented with insidious groin, thigh and knee pain; which in retrospect, was a classic presentation of transient osteoporosis of the hip. It demonstrates the value of a thorough history, examination and progression of forces to identify when the patient is not suitable for physiotherapy. It highlights the role physiotherapists can play in appropriately identifying patients who require specialist medical follow-up.

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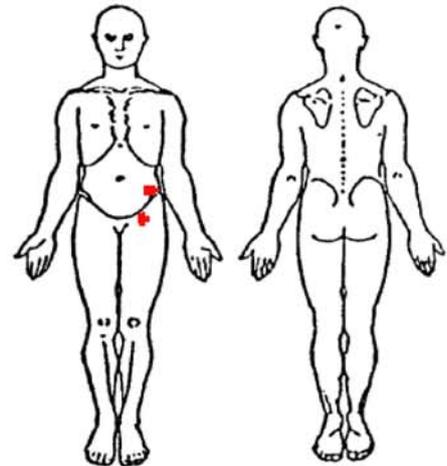


Derangement: Concurrent lumbar and extremity
Lynne Long, MCSP, MSc, Dip. MDT



**THE MCKENZIE INSTITUTE
LUMBAR SPINE ASSESSMENT**

Date 25/04/2011
 Name Mr RAF Sex M / F
 Address _____
 Telephone _____
 Date of Birth 02/02/1967 Age _____
 Referral GP / Orth / Self / Other _____
 Patient accepts anonymous use of data for research Yes / No
 Work: Mechanical Stresses driving, heavy lifting
 Leisure: Mechanical Stresses impact activities/ running
 Functional Disability from present episode reduced tolerance driving
 Functional Disability score _____
 VAS Score (0-10) 4/10



HISTORY

Present Symptoms as chart
 Present since 4/52 Improving / Unchanging / Worsening
 Commenced as a result of 2 days after road traffic accident/ shunt passenger side Or no apparent reason
 Symptoms at onset back / thigh / leg left groin and anterior abdomen
 Constant symptoms back / thigh / leg _____ Intermittent symptoms back / thigh / leg
 Worse bending sitting / rising _____ standing _____ walking _____ lying L side and rising
 _____ am / as the day progresses / pm _____ when still / on the move
 other in/ out of a car _____
 Better bending _____ sitting _____ standing _____ walking _____ lying _____
 _____ am / as the day progresses / pm _____ when still / on the move
 other _____
 Disturbed Sleep Yes / No _____ Sleeping postures prone / sup side / R / L Surface firm / soft / sag
 Previous Episodes 0 / 1-5 / 6-10 / 11+ Year of first episode _____
 Previous history: _____
 Previous treatments _____

SPECIFIC QUESTIONS

Cough / Sneeze / Strain +ve / -ve Bladder normal / abnormal Gait normal / abnormal _____
 Medications Nil / NSAIDS / Analg / Steroids / Anticoag / Other _____
 General Health Good / Fair / Poor _____
 Imaging Yes / No _____
 Recent or major surgery Yes / No _____ Night Pain Yes / No _____
 Accidents Yes / No road traffic accident 2 days prior to onset symptoms Unexplained weight loss Yes / No
 Other _____



Derangement: Concurrent lumbar and extremity

EXAMINATION

POSTURE

Sitting Good / Fair / **Poor** Standing Good / **Fair** / Poor Lordosis **Red** / Acc / Normal Lateral Shift Right / Left / **Nil**
 Correction of Posture Better / Worse / **No effect** _____ Relevant Yes / No
 Other Observations _____

NEUROLOGICAL

Motor Deficit _____ Reflexes _____
 Sensory Deficit _____ Dural Signs SLR L pos _____

MOVEMENT LOSS	Maj	Mod	Min	Nil	Pain
Flexion			X		P. L groin NW
Extionsion		X			NE
Side Gliding R			X		P. L groin NW
Side Gliding L				X	NE

TEST MOVEMENTS

Describe effect on present pain - During: produces, abolishes, increases, decreases, no effect, centralising, peripheralising. After: better, worse, no better, no worse, no effect, centralised, peripheralised

	Symptoms during testing	Symptoms after testing	Mechanical Response		
			^ ROM	v ROM	No effect
Pretest symptoms standing:					
FIS					
Rep FIS					
EIS					
Rep EIS					
Pretest symptoms lying: nil					
FIL					
Rep FIL					
EIL NE					
Rep EIL NE		NE	R. SGIS		
If required pretest symptoms: decreased pain R. SGIS and hip medial rotation					
SGIS - R					
Rep SGIS -R					
SGIS - L					
Rep SGIS -L					

STATIC TESTS

Sitting slouched _____ Sitting erect _____
 Standing slouched _____ Standing erect _____
 Lying prone in extension _____ Long sitting _____

OTHER TESTS L Hip: flexion and medial rotation P ERP NW, Resisted flexion and medial rotation P NW
 Squat P. PDM and ERP NW

PROVISIONAL CLASSIFICATION

Derangement _____ Dysfunction _____ Posture _____ Other maybe underlying hip problem
 Derangement: Pain location unilateral/asymmetrical - above knee

PRINCIPLE OF MANAGEMENT

Education sitting posture, interrupt sitting/ driving Equipment Provided lumbar roll
 Mechanical Therapy Yes / No _____
 Extension Principle EIL + sag x 10/hour, EIS+ Lateral Principle _____
 Flexion Principle _____ Other avoid prolonged sit/ long drives,
 Treatment Goals _____



Derangement: Concurrent lumbar and extremity

Introduction

The true source of a patient's symptoms is not always obvious, as the site of pain is not always its source; referred pain can be felt in areas quite distant from the actual source e.g., the hip joint can refer pain to the knee and shoulder pain referred to the wrist. The convergence theory suggests that noxious stimuli from different peripheral sources synapse on shared sensory neurones in the dorsal horn of the spinal cord before being relayed up the brain. In the absence of any other information to help locate the information's true source, the brain is commonly confused and struggles to work out which peripheral source stimulated the shared neurone. The resultant pain response can, therefore, be felt anywhere in the affected nerve root distribution (Bogduk 2005).

The lumbar spine can potentially refer pain into the buttock and pelvic region. If assessing the lumbar spine and presented with a pain distribution within the L2/3 dermatome, which is anterior thigh pain, it is likely that the spine will be assumed to be the culprit for producing symptoms. But, hip and sacroiliac joint (SIJ) problems should also be considered. So, it is important to be open minded about the source of symptoms and not to presume anything about the source, nor that there is only a single pain generator. The same principle applies at other sites.

The prevalence of concurrent lumbar spine and extremity problems giving a mixed pain pattern is common. In a study of 200 patients with low back pain and after extensive assessment and investigations, up to 25% of patients were seen to demonstrate significant pain contribution from hip, SIJ or both (Sembrano and Polly 2008). Often, both spines and extremity joints are wrongly ruled out of the picture by using investigations that cannot pick up the source of the problem, such as x-rays or ultra sound scans; or wrongly ruled in by asymptomatic anomalies found on x-ray or MRI, without matching findings to clinical signs and symptoms (Sembrano and Polly 2008, Kuijper et al 2010).

Using the MDT approach with baselines taken from the spine and the symptomatic peripheral joint, the first aim is to rule out the lumbar spine. Looking at Laslett's work on the SIJ, he concluded that SIJ testing may give a false positive result in the presence of a lumbar derangement, with the SIJ tests gaining improved reliability after the lumbar spine is ruled out, if for instance centralisation was not achieved (Laslett 2007).

In this case study where the hip was a possible source of symptoms, the same principles were applied to the hip to be sure the lumbar spine was not responsible for referral of pain.

Using hip joint baselines during lumbar spine repeated movement testing will do one of two things: produce change in the presence of lumbar derangement or remain as residual symptoms once the lumbar spine problem has been ruled out.

History

The patient was a 44 year old male, whose job involves driving, lifting heavy objects, active outside work, and he was generally very fit. There was no relevant previous medical history. There was a four week history of left groin and left anterior abdomen pain following a road traffic accident (RTA), which involved a shunt from the passenger side whilst driving. His first symptoms were noticed two days after the accident; intermittent left groin and abdomen pain was felt on rising from sitting, first few steps after prolonged resting/sitting/driving/sleeping, which then subsided to a background ache. It was also produced getting into a car and he was unable to sleep on the left side; it was better on the move.

Please refer to initial assessment form.

Clinical Reasoning

As intermittent pain onset two days after a RTA, trauma/chemical source of the symptoms could be ruled out and if the RTA was involved in production of symptoms, it was likely that this was a contributing factor and not the sole cause, otherwise the onset of symptoms would have been earlier. Intermittent pain suggests a mechanical origin to the pain. A history of worse in static positions, pain on rising from sitting (pain during movement) and reduced range of movement with production of concordant pain at the end of available range are common symptoms from derangement. 'Better on the move' suggests that lumbar spine extension or hip extension might be beneficial. Pain on resisted tests may suggest contractile tissue involvement, however, the pain produced on resisted hip flexion is not reproduced when the flexors are put on stretch at end range extension, as one may expect when a contractile tissue is involved.

Time span since onset would not be long enough for a true dysfunction to have formed, but tissues could be symptomatic in this way, if still in the healing phase.

The lumbar spine can refer symptoms to the hip/abdomen region, especially from upper lumbar segments. Hip symptoms are the most dominant, but the usual pain pattern seen with hip involvement was not demonstrated, i.e, buttock, greater trochanter, groin and anterior thigh. McKenzie and May (2000) state a peripheral joint associated with proximal pain strongly suggests a spinal component; here the hip is associated with the more proximal abdominal pain.

MDT approach

Lumbar spine
Repeated EIL NE
Repeated EIL + sag NE...↑ range of movement (ROM)
R.SGIS ++ ↑tolerance
Hip flexion NE, medial rotation ↑tolerance

Rapid change in ROM and pain suggests lumbar derangement: the improved clinical picture suggests



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extension is the derangement's mechanically determined directional preference (MDDP) (McKenzie and May 2003).

Working Diagnosis

Because the lumbar spine is symptomatic and producing concordant pain, the classification was lumbar spine derangement, with or without a separate hip problem, with MDDP for extension. The aim was to abolish symptoms from the lumbar spine and then reassess any residual symptoms.

Home exercise programme: EIL+ sag every hour, EIS as often as required, posture correction: issue lumbar roll.

Follow Up Visits

1st Review

Improved for four days with reduced frequency of pain and now able to sleep on the left side. Then a long drive provoked increased pain and frequency of symptoms.

On examination: unchanged except no pain resisted hip flexion.

Repeated EIL+ sag: increased ROM reduced pain both regions.

Repeated EIL+OP NE: further increased ROM and reduced pain.

The increased range and decreased pain in both the hip and lumbar spine baselines confirm derangement classification; suggest correct MDDP and lumbar spine referred hip symptoms.

The addition of increased force, using extension in lying with overpressure, improved outcomes further. Better compliance was needed in the form of increased frequency of exercises, improved posture and less provocation, such as driving. Further education on posture correction, interruption of sitting and avoiding long drives was offered.

The working diagnosis was unchanged; continue with extension principle—increased frequency, force and less provocation.

2nd Review

Status overall unchanged, sometimes better, sometimes worse, pain remains getting in/out of car. Variable compliance, poor sitting posture.

On examination

Lumbar spine - extension, full range NE, flexion full range P ERP: L groin NW, minimal loss, R. SGIS P ERP: L groin NW. Hip pain as day 1.

Repeated EIL + sag NE no change baselines,
Repeated EIL + OP, NE, NE hip ROM, ↑ R.SGIS
Repeated EIL in L.SG NE, NE lumbar spine or hip
Repeated L. SGIS NE, NE lumbar spine or hip

Extension mobilisation produced central pain at L1 and L2 level. NE lumbar spine or hip.

Lumbar spine extension and flexion have been restored, but hip symptoms have returned with variable pain. Increasing force produced a minor improvement of lumbar spine ROM and no change to either lumbar spine or hip baselines with the addition of lateral force.

If signs and symptoms in the lumbar spine and hip are linked, one would expect the hip to improve in tandem with the lumbar spine. Possibly there were two separate problems initially, with residual symptoms now remaining at the hip joint, where lumbar R. SGIS and flexion are provoking the hip directly.

Plan - Reassess Hip

Better with activity, better with increase use of stairs; still suggesting that extension moderates symptoms. Worse: in/out of car and sleeping on left side.

ROM: flexion P PDM and ERP NW, resisted flexion P NW. Medial rotation P ERP NW.

PDM suggests obstruction to movement/impingement - contractile problem or derangement?

Pain that resisted flexion has returned suggesting contractile cause, but less likely due to its 'sometimes' behaviour.

Hip Repeated Movements

Repeated Ext in ½ kneel NE: Obstruction to movement (flexion).

Repeated FIL +OP P NW NE lumbar spine or hip.

Repeated Flexion in ½ knee P NW NE lumbar spine or hip.

Repeated loaded FIS (squat), P PDM. ERP: ↑ tolerance, NW: ↑ ROM flexion, ↓ pain R.SGIS, hip flexion and medial rotation.

Working Diagnosis

Hip derangement; MDDP, loaded flexion

Plan

Repeated loaded flexion x10 every three hours.

3rd Review

Improved ++ reduced frequency of pain, many pain free days. No pain driving or in and out of car.

Compliance

Performing 10/20/30/40 repetitions, 3-4x a day.

On Examination

Hip flexion: min loss and minor ERP. Lumbar and other hip ROM is pain free.

Working Diagnosis

Hip derangement: reducing, correct MDDP, therefore, continue with same exercise, try and increase frequency. Continue until pain free.

Phone Review - Three Weeks Later

Asymptomatic for two weeks; back to normal activities. Hip derangement reduced - problem resolved.



Derangement: Concurrent lumbar and extremity

Final Diagnosis

Lumbar spine derangement, extension responder combined with hip derangement, flexion responder.

It is imperative with peripheral problems to rule out the spine as a cause or contributor, especially if the history is equivocal. If the spine moves fully and freely and repeated movements have no effect on presenting signs and symptoms, it is quickly ruled out. However, if repeated movements cause change, the spine must be treated and either returned to full pain free function or be discounted as the symptom generator. The use of peripheral baselines is helpful in identifying spinal involvement.

In this case, residual hip symptoms remained after the lumbar spine was cleared.

Initially, it was considered that hip extension would be the MDDP due to the fact that lumbar extension (as seen in EIL and in walking/on the move), incorporates mid-range hip extension, moderated hip symptoms, but as with spinal derangements, the true MDDP is not always found until the joint is taken to end range. Adding increased force at end range hip extension caused rapid change in the form of obstruction to movement, and when applied to hip flexion caused rapid change by increasing ROM and reducing pain.

Adding increased force at end range did three things: fully ruled out dysfunction, confirmed derangement and identified the MDDP.

The hip obstructed with end range extension and needed loaded flexion to reduce.

This hip displayed some classic characteristics of derangement: sudden onset, rapid reduction and both painful obstruction to movement and pain during movement.

The tissue causing the obstruction could be one of many e.g. labrum tear, synovium, fat pad, loose body of bone or degenerate cartilage. However, the most important factor here is reduction. If the derangement remains reduced, then whatever the tissue at fault, if full pain free ROM and function is restored, the tissue is no longer a problem. If the derangement had been either irreducible or recurrent to the degree it was truly bothersome, then the tissue diagnosis is likely to occur in the search for a permanent cure, e.g. surgery.

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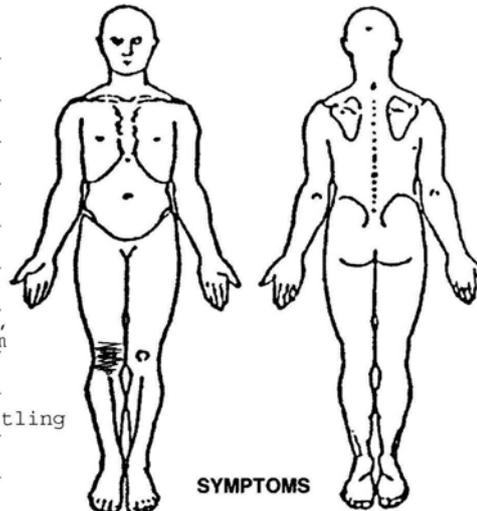


Wrestling with the knee
Janet Anspach-Rickey, PT, Dip. MDT



**THE MCKENZIE INSTITUTE
EXTREMITIES ASSESSMENT**

Date 12/21/10
 Name CS Sex M F
 Address _____
 Telephone _____
 Date of Birth _____ Age 16
 Referral: GP / Orth / Self / Other
 Work in school, in sports
 Leisure presently wants to run & wrestle, wrestling team
 Postures / Stresses _____
 Functional Disability from present episode Can't compete in wrestling
 Functional Disability score _____
 VAS Score (0-10) 8/10 when squatting



HISTORY

Present Symptoms R knee pain
 Present since 3 weeks Improving Unchanging Worsening
 Commenced as a result of Wrestling competition or no apparent reason
 Symptoms at onset: Painful, couldn't sleep, couldn't get comfortable
 Constant symptoms: _____ Intermittent symptoms:
 What produces or worsens Competitive wrestling
 What stops or reduces Avoiding competition, went to practice yesterday. Knee was sore but better by this morning.
 Continued use makes the pain Better Worse No Effect
 Pain at rest Yes / No Not since competition 3 weeks ago
 Disturbed night Yes / No Not in last 2 weeks
 Other Questions _____

Treatments this episode None
 Previous episodes Dislocated knee cap a year ago during a wrestling match - the knee was sore through spring baseball, but not painful through summer and fall during rowing season
 Previous treatments _____
 Spinal history _____

Medications tried Nil Effect _____ Paraesthesia Yes / No

Present medication Nil

General health Excellent

Imaging MRI negative

Summary: Acute Sub-acute Chronic Trauma / Insidious onset

Sites for physical examination Knee



Wrestling with the knee

EXAMINATION

Observation _____

Baseline measurements (pain or functional activity) Squat is painful and limited

Active Movements (note symptoms and range)	PDM	ERP
Knee flexion - minimum loss		X
Full extension		
Passive Movement (+/- over pressure) (note symptoms and range):		
Knee flexion with overpressure, minimum loss of motion		X
Full extension		
Resisted Test Response (pain) <u>No effect</u>		

Repeated Tests (choose the most symptomatic from above)

Baseline symptoms	Symptoms response		Mechanical Response		
	During Movement – Produce, Abolish, Increase, Decrease, NE	After Movement – Better, Worse, NB, NW, NE	↑ROM	↓ROM	No Effect
Repeated knee extension x20,	NE	able to flex knee to ER	X		
		patient can squat with less pain			
Repeated knee flexion	P(ERP)	W		flexion X	
Effect of static positioning					
Other tests: eg loaded, compression, unloaded etc.					
terminal knee extension standing on (R) leg x 20	NE	patient can squat without pain			

SPINE

Movement Loss Nil

Effect of repeated movements _____

Effect of static positioning _____

Spine testing Not relevant / relevant / secondary problem _____

PROVISIONAL CLASSIFICATION Peripheral

	Spine
Dysfunction – Articular _____	Contractile _____
<u>Derangement</u> _____ Responding to extension	Postural _____
Other _____	Uncertain _____

PRINCIPLE OF MANAGEMENT

Education _____

Exercise _____ Frequency _____

Treatment Goals _____

Patient sent off with repeated terminal knee extension unloaded/loaded to be performed every 1-2 hours, 10-20x, avoid repeated/sustained knee flexion for now. Patient will return to competition within 3-6 weeks.



Wrestling with the knee

Introduction

Internal joint displacement changes the tension in the structures within the motion segment, increasing mechanical deformation in some tissues and decreasing it in others. This can occur because of internal derangement, dislocation and/or displacement of loose bodies, such as sequestered cartilage or meniscal tissues. Joint structures may be interposed between joint surfaces, causing obstruction to movement and abnormal stresses on peri-articular structures. The patient may inadvertently reduce the displaced soft tissue in the joint and movement can be pain free and full (McKenzie and May).

Internal derangement is a common cause of many obscure pains in the extremity joints (Cyriax 1982). Knee menisci are known to tear and cause locking or obstruction to movement. Degeneration of articular cartilage causing loose bodies and bony fragments has been found at surgery within the knee. Synovial membrane can cause impingement and obstruct joint motion (Mercer 2009).

Rapid onset can be followed by rapid reduction with lasting beneficial changes resulting from application of reductive exercises. This was demonstrated in the following case study.

Background

The patient was a 16 year old with three weeks of knee pain after commencing wrestling practice. The patient was unable to participate in wrestling competitions. This case study demonstrated the rapid, lasting changes with the mechanical syndrome derangement. When the patient was educated in self-management procedures, he returned to activities quickly and successfully.

Intervention

The patient was seen one time for evaluation and treatment. He was followed up via email for the next four weeks. The patient was given the self corrective exercises for the knee, which he was able to utilize and return to wrestling the weekend following his physical therapy visit.

Outcome

The patient had one additional episode of pain with obstruction, which he was able to reverse using the self correction exercises. The patient was able to attend all his wrestling matches and tournaments.

Discussion

This case study demonstrates how the use of a self corrective exercise, in the appropriate direction with the appropriate loading, can facilitate the patient's recovery of function. The patient was diagnosed with patellar chondromalacia and given a script to see physical therapy 2-3x 4-6 weeks. In this case, one visit was sufficient to evaluate, treat and educate the patient. The patient returned to his sport and did not find it necessary to return to the clinic.

Conclusion

This case study demonstrates the application of Mechanical Diagnosis and Therapy to the knee joint. The condition was classified as derangement based on the rapid reduction with repeated extension and rapid obstruction to movement and pain production on repeated flexion. Educating the patient on direction specific exercises and avoidance of the aggravating direction allowed this patient to self-manage and resolve his condition even as he competed in his sport.

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'Treat Your Own Shoulder' Book Review

Greg Lynch, DipPhys, DipMT, Dip. MDT, MNZCP (Manipulative Therapy)

Treat Your Own Shoulder

Robin McKenzie, Grant Watson, Robert Lindsay

Publisher: Spinal Publications New Zealand Ltd, 2009

'Treat Your Own Shoulder' is the third book in the 'Treat Your Own...' series written by Robin McKenzie. It is the first book to address self-management of a specific extremity joint

'Treat Your Own Shoulder' continues the self-management principals of 'Treat Your Own Neck' and 'Treat Your Own Back', based on the philosophy of The McKenzie Method of Mechanical Diagnosis and Therapy. The target market, therefore, is for people who have suffered from chronic or recurrent shoulder pain or limited function due to loss of shoulder mobility. In saying that though, it would be extremely useful to any musculoskeletal clinician who assesses and treats shoulder injuries as the 'educational' component and emphasis on posture and the effects of posture on the shoulder girdle is extremely valuable.

The first chapter gives an introduction to the complexity of a shoulder complaint and ensures that the information contained in the book is suitable and appropriate to the reader. It allows the reader to ascertain whether their shoulder pain actually originates from the shoulder region and provides differentiation from the cervical spine as a source of possible pain by the use of several easy tests that the reader can perform on themselves. It also allows the reader to establish whether they can 'treat themselves' independent of a practitioner or whether they may require more specialised treatment from a McKenzie practitioner.

The second chapter describes the anatomy and function of the shoulder girdle and educates the reader on mechanical pain and tissue damage. This leads into

the third chapter, which discusses the common causes of shoulder pain with specific reference to the effect of posture on the shoulder girdle and the importance of maintaining a good posture to alleviate the stresses on the shoulder joint. This chapter gives very good instruction on how to prevent shoulder pain in various positions and situations.

Chapters four through six detail the specific exercise programme and clear instruction and guidelines on how to apply the exercises and the expected responses from the exercise programme. It includes clear guidelines on when to progress the exercises and how to prevent recurrences of the shoulder pain.

The book is well written and should be easily understood by the lay person. It does not use medical terminology in any detail and makes good use of photo's and diagrams. It is a practical book with plenty of insightful and useful information and tips for the shoulder pain sufferer to assist them with activities of daily living, activities that often are significantly affected by shoulder pain.

An encouraging aspect of the book is it is mentioned that the reader should seek further assessment if their symptoms are not responding as anticipated and therefore, ensures the safety of a lay person attempting to self-manage their complaint. The book provides the reader with the tools, both in the education and exercise programme, to self-manage their complaint without the requirement of any exercise apparatus and thus, is inexpensive.

I would certainly recommend this book to anyone suffering from shoulder pain and, as already stated, I believe the educational component contained in the book would allow this book to be a useful tool for musculoskeletal clinicians as well.



Living in the Aftermath - A personal perspective on the recent earthquakes in New Zealand

Celia Monk, PT, Dip. MDT

Introduction

In September 2010 and February 2011, Christchurch, New Zealand's second largest city with a population of 360,000 had two major earthquakes. The statistics are sobering. There were 181 people killed in the February earthquake. One of the orthopaedic surgeons has published the data from the orthopaedic procedures that were performed in the first two days across the city. There were:

- 31 elderly hip fractures,
- 12 fractured spines,
- 12 fractured pelvises,
- 12 fractured thigh/shin bones,
- 9 crush injuries - three of whom had both legs amputated and two lost one leg,
- 20 fractured arms/shoulders, and
- 12 fractured ankles.

The Accident Compensation Corporation (main funder for injuries sustained in New Zealand) estimate they will have 10,000 claims for injuries on that day. The final cost for the damage has been estimated at \$30NZ billion, which equates to eight percent of the Gross Domestic Product of New Zealand.

The International news media has covered the facts and the internet has been a great way to share the images of the earthquakes and the aftermath. But what about the effect on the people who were in Christchurch for the events? What has been the impact and what will continue to be the impact of that experience? Apart from the obvious physical injuries, what are the health consequences of these events? And what role can Mechanical Diagnosis and Therapy play in it all? The aim of this article is to try to address some of these questions from information gleaned from various sources available in Christchurch, from many conversations with patient and friends, and of course from my own personal experience. The events between September 2010 and February 2011 will first be described, which will be followed by my personal reflection and discussion about the health care implications of these events.

The events

On September 4, 2010 Christchurch's residents were violently woken at 4.35am by a 7.1 magnitude earthquake centred 38km west of Christchurch, near a town called Darfield, at a depth of only 10 metres. Up until that point, Christchurch had been considered the city in New Zealand that was the least likely to experience a significant earthquake. The geo-scientists had not even known about the existence of that particular fault line, which they subsequently learnt had last moved 16,000 years ago, and named it the Greendale Fault. The September earthquake caused damage to the infrastructure and buildings of the city, but the severe damage was isolated to a few streets, mainly in the eastern suburbs and the Central Business

District. There was damage to 184,000 homes, but only 3,000 were likely to need to be demolished and rebuilt. The water was restored to most homes by the end of that same day, and was safe to drink again by the fifth day. Only the eastern suburbs had significant damage to the sewage system, and some of these pipes could not be quickly fixed, so these residents were still using the communal portable toilets in February. There were only two serious injuries and no one was killed in the September earthquake, because of the time of day it occurred – most people were safe asleep in their homes. Furthermore, in New Zealand, there is a strict building code to ensure homes and modern buildings are able to withstand the impact of such an event as the September earthquake.

The main damage from the September earthquake however, was the emotional toll the 5,500 subsequent aftershocks had. Up until September, there was a lack of understanding of what an aftershock actually was, and it was widely thought that there were only a handful of them as that is all we had ever heard about in the media. It is probably true to say that most of the residents of Christchurch are experts on understanding aftershocks now! An aftershock feels exactly the same as an earthquake. It is the movement of the ground, caused by the earth that was shifted in the initial earthquake, settling down into its new place. The September quake caused the ground to move in an east-west direction by up to three metres. That is a lot of displaced rock and soil to settle. The surrounding fault lines also start to move and some of the 'aftershocks' are in fact new earthquakes. They are all measured on the Richter scale and the scientists used the measurements of the location, depth, and magnitude of the aftershocks to determine what was happening, and if there were more unknown fault lines under the city. Following a major earthquake, aftershocks can occur for up to two years and one can be expected to be up to one magnitude less on the Richter scale than the original quake. Therefore, it was always likely that we could have a magnitude 6 earthquake following the 7.1 magnitude one in September. The emotional toll of the aftershocks was that every aftershock over magnitude 4 triggered the "Fight or Flight" reflex and caused the adrenaline to pump through our bodies, preparing us in case of danger. We commonly refer to the reaction as the "Christchurch Freeze", where everyone stops for a micro-second when they either feel or hear an aftershock starting, to determine whether or not to seek cover. They can happen at any time day or night, and the vast majority of people find it difficult to sleep through them, hence sleep deprivation was a common experience. As the intensity and frequency of the aftershocks began to settle, so did our nerves.

However, on December 26th at 10.35am as we were starting to get back to normal, there was a 4.9 magnitude aftershock centred 5km from the city centre.



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This caused more damage to buildings, and part of the Central Business District was cordoned off for a few days. On January 20th, there was a 5.1 magnitude aftershock only 5km deep and 12km from the CBD. It did not cause any further damage, but put everyone on edge again. Emotional fatigue and high levels of stress were very common in Christchurch by the end of January 2011, which is usually the time when most people are happy and relaxed after a summer break, and feeling ready to face another year.

Then on February 22nd, Christchurch had another major earthquake that measured 6.3 magnitude on the Richter scale and moved the ground at 2.2 times the acceleration of gravity. This earthquake was caused by the Port Hills Fault line, which had been only slightly active during the aftershock sequence. The earthquake lasted exactly 24 seconds and caused an estimated \$30billionNZD worth of damage. Two large office buildings in the Central Business District immediately collapsed killing many of their occupants. At least three other multi-story buildings had staircases collapse, trapping all the occupants inside. Hundreds of other buildings lost their facades, brick walls, and windows. Two buses were crushed, killing most of the passengers on board. Cars parked by the side of the road, or waiting at traffic lights were crushed by falling masonry. People walking along pavements, sitting in cafes or at outdoor seating areas, suddenly found themselves fleeing from falling rubble, or trapped under it. Suburban malls were damaged with ceiling tiles falling onto people, windows breaking, and merchandise falling to the floor. Cliff faces fell onto schools and houses, with boulders the size of cars rolling down hills and onto peoples' houses and cars. Ninety-five per cent of electricity power supplies and water mains were severed, which lasted up to three weeks. The internet went down, and phone lines quickly became overloaded and failed. Over half of the 1,700km of waste water pipes were broken and 75% of the roads were damaged. Liquefaction silt and water bubbled to the surface of the ground in what became known as 'sand volcanoes', which resulted in over 380,000 tons of silt needing to be removed from peoples' properties and the roads. It was estimated that between 10,000 and 15,000 homes will have to be totally rebuilt, with many of these now being uninhabitable. Many more were no longer weather-tight with the onset of winter approaching. Over another 180,000 homes have been damaged in some way.

The Earthquake Commission, which is the main insurer for natural disasters in New Zealand, has had 343,263 claims lodged for both earthquakes to date. Part of the Central Business District will be cordoned off for at least the remainder of this year. The vast majority of businesses are struggling, with hundreds, if not thousands, of people likely to lose their jobs. Immediately after the February earthquake, 70,000 people left Christchurch, having been made homeless

or due to fear, which is 20% of the population. Many of these people have since returned, but a significant number have chosen to leave Christchurch permanently. Schools were closed for three weeks and some have been re-opened at new sites, even sharing with other schools. A National State of Emergency was immediately declared, and was not lifted till 30th April.

The psychological and emotional toll of both earthquakes has been immense. They have affected people's sense of security and safety. In September, there was time to get to safety as the earthquake lasted 40 seconds and gradually built in intensity. In February, because the epicentre was close, there was no warning, and no build up. Many people were injured or killed because there was no chance to get to safety. That has left many of us with a real sense of fragility and vulnerability. It is now seven weeks since the February earthquake and the fragility persists and affects behaviour; for instance, people avoid buildings with car-parking above, crowded places, or multi-story buildings, 'just in case'. Last week, the geo-scientists studying the newly discovered fault lines under the city announced that there will be another magnitude 6 earthquake in the foreseeable future, as other fault lines have been made active by the earthquakes on the Greendale and the Port Hills fault lines. Although every home now has running water, it was only April 8th that it was deemed safe enough to drink. The sewage system is broken and approximately a quarter of homes are reliant on chemical or portable toilets. The power supply is tenuous and highly likely that the demand of heating in winter will be too much for it. All of these factors add to the sense of fragility, vulnerability, and uncertainty. There is uncertainty if Christchurch will have a stable future, but also how long it will take for homes to be repaired and return to normal. There is financial uncertainty as everyone struggles to make ends meet in a broken and fragile local economy. There is emotional uncertainty about whether we will ever feel safe in our home city again. The future is full of uncertainties.

Discussion

In terms of health implications of these events, on top of the obvious physical injuries and deaths incurred during the earthquakes, there are the hidden consequences. It became very evident immediately after the February earthquake, that the situation was much worse this time and the impact on people would be far greater. After September, clinical psychologists told the population that we could expect to have feelings of nervousness, insecurity, fear, cognitive impairment, irritability, grief, shock, and other symptoms of trauma for at least four weeks. After that time period, if these symptoms persisted then the person would be classified as having Post-Traumatic Stress Syndrome and would require professional assistance. They have been noticeably silent in giving time frames for such a diagnosis since February.



Living in the Aftermath - A personal perspective on the recent earthquakes in New Zealand

Persistence of these symptoms is extremely common. If the only event had been in February, then it would be a different story, but seven months of being on edge with two major earthquakes has changed the playing field. Fortunately, the government agencies have been telling people to keep talking to each other and helping each other in practical ways. There are advertisements in all the papers and on the television telling us to keep doing so. We've basically all turned into each other's counsellors to help process the events and enable us to move forwards somehow into the 'new normal', as it's now being called.

Our role as health professionals has changed since the earthquakes, as people's needs have changed. Due to the very high level of emotional, mental, and physical trauma everyone who was in Christchurch on February 22nd went through, there is a 'new normal' way of living. People have made numerous little changes to the way we live our lives now. Make sure there is a working torch next to the bed before you go to sleep; never be out of reach of the mobile phone; always have water stored in containers in the house; have a brick ready to place on top of the closed lid of the toilet for when the tankers are clearing out the sewage pipes (the consequence is referred to as an 'exploding toilet!'); change the shops we use for ones that are safer; change the route we drive across town as many roads are damaged or closed; allow a longer travel time due to the grid-locked traffic; always make sure there is at least a week's worth of food in the house; have your neighbours' phone numbers on quick-dial; avoid buildings where escape routes would be difficult such as movie theatres; when entering a room for the first time scan around for the safest place to stand or sit in a significant aftershock; read as much information as possible about the earthquake and relevant notifications; and doing things immediately (paying bills etc) as we're never sure what tomorrow may bring. All these things may seem simple and insignificant, but put together, especially with the reason why our life has altered, and it demonstrates the substantial psychological impact the past seven months have had.

But what is the role of a health professional, and especially of a physiotherapist, in a time like this? It could be assumed that as physiotherapists we would all be very busy at present helping with the high number of injuries, but that is not the case. In September, it took six to eight weeks before the first patients with injuries from the earthquake came to the clinic. The main injuries at that time were to the lumbar spine and lower limb as people fell out of bed and tried to get to safety in the dark, and then started to clean up their homes and properties. However, survival mode took over and physical pain became secondary to trying to find enough food, water, and shelter. Once life began to settle back into the 'new normal' people then started to address their rehabilitation. What became evident rather quickly was the need everyone had to talk about

their experiences. In the past patients, have commented that, as a MDT clinician, this was the first time anyone had really listened to their story and asked thorough questions about the effect of their symptoms on their daily life. That has become even more important since September. Every appointment takes double its normal length as people need to talk, and to be listened to. The role of physiotherapist as counsellor, always present, especially with MDT clinicians, has become more dominant.

Following the February earthquake, physiotherapists started to see patients earlier in the clinics, mainly because the injuries were more severe and the consequences more serious. One of my patients, who had a derangement in her lower lumbar spine as a result of diving to protect her five-month old son during the earthquake, told me the reason she was getting help for it so soon was because she knew she wouldn't be able to protect her children in another earthquake with her present level of pain and functional limitations. That is a huge emotional burden for a parent of young children to carry, as well as dealing with the usual aftermath issues the rest of us are facing. Despite these factors, there was still a 50-90% reduction in patient numbers for the first four to six weeks in most physiotherapy clinics across the city, and most are still much quieter than normal. Again, the main reason will probably be because people are in survival mode for longer this time, but also because of the financial uncertainty about our local economy and peoples' job status. Under these circumstances, the importance of peoples' musculoskeletal problems gets downgraded; other issues on the whole become more significant.

Because of the core components of MDT it reinforces itself as a rehabilitation tool on many levels in such circumstances. One of the things people have really needed from September is information. One of the key differences between MDT and other treatment methods is the strong emphasis on patient education. With MDT, patients are taught to understand what has caused their pain and how they are able to manage and control both the symptoms and the recovery process; this is very empowering. A key issue that was difficult to come to terms with in the aftermath of our earthquakes was the fact that we had no control over what happened, especially to prevent fatalities and further damage, which produced the fragility referred to earlier. We all need to have a sense of control in our lives, and one of the privileges with MDT is helping people to regain some control over at least one aspect of their lives during these difficult circumstances.

The other important role MDT played is that when patients' symptoms were mechanical and able to be classified, the results are rapid, especially with derangements. It is going to take many years before our city is rebuilt and many months before we get to start to feel 'normal' again. The impact of rapid



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recovery from pain cannot be overstated. The psychological and emotional impact on a patient when their pain is rapidly decreased and abolished is very noticeable at the moment.

Case study

The issue facing all health professional in Christchurch is the complexity of the injuries and their complex consequences. Sheila (anonymous name) was working in her office in the Central Business District when the earthquake struck. She was thrown off her chair by the violence of the shaking and then tossed around her office 'like a rag doll'. As soon as the shaking stopped, she grabbed her bag and evacuated all her staff from the building. Her car was in a car park that was severely damaged, so she had to walk home. Her journey took her past one of the collapsed buildings; she stopped to help people out of the rubble, and saw dead bodies and heard horrific noises. She then continued to walk home for three hours. All through this time, there were numerous aftershocks of up to 5.9 in magnitude, with more masonry falling off buildings, sirens blaring, people screaming and other people that she passed in dazed shock. The next morning she woke with severe cervical spine pain and headache, which soon became constant. She finally recognised that she needed to go and see her doctor about the pain four weeks later, and was referred to physiotherapy for assessment and treatment. By this stage, the pain was 8 /10 in intensity on the numeric pain rating scale and there was a major loss of retraction, and minor loss of all other movements. She was having disturbed sleep from the aftershocks, pain, and flash backs. She had been normally a very strong, stoic woman who helped others in any situation. Now it was all she could do to get through the day looking after herself and trying not to be overwhelmed with pain and fear.

Within a week of commencing physiotherapy treatment, her pain had become markedly reduced in both frequency and intensity and the only disturbance to her sleep patterns were the continuing aftershocks. However, she then took her dog for a walk and developed myotomal weakness in the C5 nerve root distribution. She was referred back to her doctor for further investigations and her X-ray was normal. She saw a neurosurgeon that organised a MRI scan and has said she is his third earthquake victim with the same sort of story. Yesterday, at her latest visit, she was improving, and mechanically, her long term prognosis is good. However, she has just lost her job as the building she works in has been condemned, she is stressed and tired because of what we are all going through, and now she is facing further tests and assessments for her pain. The physiotherapist's role at this point has become very complex. This includes provision of advice about the right exercises and posture, but also to help her emotionally and psychologically process the events that has led her to

this point. As a team, her local doctor, neurosurgeon and physiotherapist have to work together to help her on the road to full recovery. What that looks like for me is providing cups of tea during our appointment times, asking her advice about her area of expertise, letting my dog in the clinic area with her for her to pat, sending regular reports to the local doctor and neurosurgeon, and always making sure every encounter is positive and friendly. These are simple steps that we should be doing all the time, but which have become even more important in this situation to help manage the underlying psychological and emotional recovery from trauma. Do all the time that is, apart from patting the dog!

Conclusions

Even the grimmest experience can have a 'silver lining', that is a positive outcome. One of the positive aspects of this whole experience has been the strong sense of community that we now have in Christchurch. Neighbours are no longer people you might just wave to in passing, but are my friends, people you trust to be there through a crisis. In September, we checked up on each other and kept in contact. In February, we were helping dig each other's liquefaction silt off our properties, digging the long drops/latrines, collecting water from the tankers, doing shopping and cooking for each other, and providing numerous cups of tea and coffee. Every task took a longer time to complete because of the extra conversations that occurred. Even total strangers in the street for the first four weeks would stop and ask the five main questions: How are you? How are your loved ones? How's your home? Do you still have a job? And where were you? Our local communities have become very important, especially during the first two weeks, when the authorities were telling us to keep the roads clear for the emergency services. Our homes became our safe havens and many of us just wanted to stay close. This, of course, has an impact on people seeking help for their injuries. Local physiotherapy clinics and medical centres have become important to people. Physiotherapists still have people travel across town for treatment, but primarily it's because they already have an effective patient/clinician relationship and there's an element of trust and support. But, the vast majority of patients are from the local area because they do not want to travel too far, 'just in case'. And, of course, MDT has a lot to offer people wanting to stay close to home because it is not clinic or gym-based where people feel unsafe, but can be done in their own homes, where they do feel safe. The number of home visits for elderly patients has increased in the past seven weeks, mainly for that reason, but also because the roads have been too rough to drive on, and footpaths too cracked for walking frames. We could even write another book to add to the series of 'Treat your Own books' called *Treat Yourself At Home After An Earthquake!*



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In the midst of all this is the tragedy of the North-East coast of Japan. Many of us in Christchurch feel guilty for finding the changes we are facing hard and difficult; what we have lost is a fraction compared to Japan. It does not dilute our struggle, as it is our reality, but it does help us have a deeper understanding of the fear, nervousness, uncertainty, fragility, vulnerability, and the need for hope and purpose at times like this. Any support we can offer we will do so, because we know the need to not feel alone. The incredible support shown to us as a city and as individuals by friends, colleagues, and organisations outside of our city has helped immensely. So thank you to those who have sent any of our Christchurch MINZ members emails and messages, it has made a difference. And to our members in Japan, we want to extend that same support to you.

The city of Christchurch as we knew it, that we live in and love, has gone. It will never be the same again. The latest estimate is that over half of the buildings in the Central Business District will be demolished in the next few months. By the time the public is allowed access to the worst hit part of the Central Business District, which may be in December this year, the face of the commercial side of Christchurch will be permanently changed. Some of the iconic historic buildings will be 'deconstructed' then rebuilt, when it is safe to do so. That means that the Christchurch Cathedral, the Provincial Chambers, and the Arts Centre will be saved. But many of the older buildings will be gone forever. And just as the physical side of Christchurch will be changed forever, so will its

residents. Every single person who was in Christchurch, either visiting or living here, on February 22, 2011 has lost something. It might be a loved one, a home, a business, a job, their physical well-being, or the sense of security and safety. As someone said to me yesterday, our city is broken, filled with broken people, broken buildings, and broken lives. We have many months of adjustment to the 'new normal' still to make, and then it will be at least five years until our homes have been repaired or rebuilt, the infrastructure fully repaired and the commercial buildings designed and built. We also need to learn to live with this new feeling of fragility and vulnerability. Those feelings won't always be close to the surface, but we now know how unsafe our world is. Our bubble of naivety has burst; but there is hope. We will have a beautiful, safe city rebuilt with that new deeper sense of community and purpose; and one you will all want to come and visit again.

Thank you again to all of you who have shown your support to us through this time. We have a Maori saying that we have used often over the past few months. It is *Kia Kaha*, meaning *be/keep strong*. And it is with your support we have been able to do so. Thank you.

Useful websites used for this article are:

www.quake.crowe.co.nz
www.geonet.org.nz
www.stuff.co.nz/the-press
www.canterburyearthquake.govt.nz
www.canterburyearthquake.org.nz



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All work submitted to the IJMDT will be reviewed for scientific content, appropriateness to Mechanical Diagnosis and Therapy, relevance, clarity and presentation. The decision will be one of the following:

- **accept**
- **revise**
- **reject - resubmission possible with major edits**
- **reject**

Word count

Eleven pages maximum

Presentation

Your article should be double-spaced with 12 pt, Arial.

Title Page

Give title, author, author details

Keywords

Up to 4 keywords (if appropriate)

Abstract

A structured abstract of no more than 200 words

Text

One sort of sub-heading should be used:

- **bolded in lower case.**

Do not use abbreviations at all. Do not use local acronyms unless they are fully spelled out initially.

Types of Articles

The IJMDT welcomes primary research papers, topical reviews, reviews of articles and case studies. See the following guidelines for submitting manuscripts.

Submission deadline:	Jan 15	May 15	Sep 15
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IJMDT is particularly interested in publishing original primary research. Papers should be as follows:

- title page (title, author, author details)
- abstract / key words
- introduction
- methods
- results
- discussion
- conclusion
- references
- tables

Topical Review Guidelines

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- introduction
- methods (if a systematic review)
- results
- discussion
- conclusion
- references
- tables

Review of article guidelines

Reviews of individual articles. Papers should be as follows:

- title
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- design
- setting
- patients
- intervention
- primary outcome measure
- main results
- conclusions
- comment (include implications for MDT)
- references



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Case Study Guidelines

Case studies must be type written on the most current MII Assessment Form using the MDT standardized terminology. As the intent of different case studies may vary, a rigid structure is not indicated, but could include:

- introduction
- history
- physical examination
- conclusion
- management
- reviews (*history, physical examination, conclusion, management*)

References

Accuracy of references is the responsibility of the author. In the text, state the author's name and year of publication as follows:

- (Smith 1998)
- (Smith and Jones 1998)
- (Smith et al 1998)

References should be typed in alphabetical order: Author's surname and initial (year of publication). Full title of paper. Name of journal in full or accepted abbreviation volume. First and last page.

Examples:

Article:

Aina A, May S, Clare H (2004). The centralization phenomenon of spinal symptoms - a systematic review. *Manual Therapy* 9.134-143.

Book:

McKenzie RA, May S (2003). *The Lumbar Spine, Mechanical Diagnosis and Therapy* (2nd Edition). Spinal Publications Ltd, Waikanae.

Book chapter:

Twomey LT, Taylor JR (1994). Factors influencing ranges of movement in the spine. In: Boyling JD, Palastanga N (Eds). *Grieve's Modern Manual Therapy* (2nd Ed). Churchill Livingstone, Edinburgh.

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