系所組別：物理治療學系

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You can answer the following questions in English or Chinese.

Q1. As this literature is a case-report method, please list the strength and weakness of this research. (20%)

Q2.Based on the study of Hicks et al., the clinical prediction rules have been developed to determine which patients with LBP will respond to a stabilization exercise program. Could you please list at least 3 of the predictor variables? (15 %)

Q3. Why does the first case reported in this study is qualified for a stabilization exercise program?(15%)

(背面仍有題目，請繼續作答)

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Clinical presentation and physiotherapy treatment of 4 patients with low back pain and isthmic spondylolisthesis – from Journal of Chiropractic Medicine 2012, 11, 94-103.

Abstract

Objective: Spondylolisthesis is a pathological condition characterized by the slipping of a vertebral body, compared with the underlying one, following structural and/or degenerative changes of the spine. The purpose of this case series is to describe clinical presentations and the conservative physiotherapy management of 4 patients with low back pain and lumbar isthmic spondylolisthesis.

Clinical Features: Four patients aged 25, 43, 36, and 50 years presented with low back pain of various duration. Radiographs confirmed the presence of lumbar isthmic spondylolisthesis. Outcome measures included numerical rating scale, disability outcome measure (Oswestry Disability Index), spinal instability tests (Prone Instability Test, Passive Lumbar Extension test), and muscle function tests (Aberrant Movement Patterns, Active Straight Leg Raising, Prone and Supine Bridge Tests).

Intervention and Outcomes: Treatment consisted of postural reeducation, stretching, and strengthening exercises. Over the course of individualized treatment, ranging from 8 to 10 treatment visits, outcomes improved for all 4 patients.

Conclusion: This report describes varying clinical presentations and treatment of 4 patients with isthmic spondylolisthesis, suggesting that different pain generators could be managed by different conservative approaches.

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Description of tests and diagnosis procedures

Passive Lumbar Extension test (PLE)—The patient is in the prone position; both lower extremities are then elevated simultaneously to a height of about 30 cm from the table while maintaining the knees extended and gently pulling the legs.

The result of is test is considered as positive if the patient, during elevation of both lower legs, complains of symptoms in his or her lumbar region, including "low back pain," "very heavy feeling on the low back," and "feeling as if the low back was coming off" and if such pain disappears when the lower legs are repositioned in the starting position.

The sensitivity and specificity of the PLE are good (0.84 and 0.90, respectively).[16]

Prone Instability Test (PIT)—The patient lies in the prone position with the trunk on the examining table and both legs over the edge, with the feet resting on the floor. The examiner performs passive lumbar intervertebral motion testing posteroanterior (PA) mobilization. The patient is asked to report any provocation of pain. The patient then lifts the legs off the floor (handholding to the table may be used to maintain position), and the passive intervertebral motion testing is reapplied to any segments that were identified as painful. A positive test result occurs when pain is provoked during the first part of the test but disappears when the test is repeated with the legs off the floor.

The interexaminer reliability of the PIT is good (0.87).[17]

Active Straight Leg Raise Test (ASLR)—This test investigates the ability of the pelvic girdle to transfer loads from the lumbopelvic region to the legs. The patient lies in the supine position with his or her legs straight and relaxed in physiological lateral rotation, and feet 20 cm apart. The patient is instructed to raise a straight leg about 20 cm off the table. The patient is asked to report any weakness, pain, or other unpleasant feelings during the test and any difference in feeling between the 2 sides. The examiner observes the speed of raising, the appearance of a tremor in the leg, the amount of rotation of the trunk, and the verbal and nonverbal emotional expressions of the patient. Impairment is scored on a 4-point scale: 0 (the patient feels no restriction), 1 (the patient reports decreased ability to raise the leg, but the examiner does not observe any sign of impairment), 2 (the patient reports

decreased ability to raise the leg, and the examiner observes signs of impairment), and 3 (inability to raise the leg).

The ASLR results are clinically reliable in patients with LBP and pelvic girdle dysfunction.[18,19] The sensitivity and specificity of the ASLR are good (0.87 and 0.94, respectively) for posterior pelvic pain in pregnancy.[20]

Bridging maneuvers (Prone and Supine Bridge Tests) also seem to be reliable and valid methods to investigate stabilization endurance in patients with LBP.[21]

To perform the Prone Bridge Test, the patient lies in the prone position propped on his or her elbows. The elbows are spaced shoulder-width apart; and the feet are placed with a narrow base, but not touching. The patient raises his or her pelvis off the table so that only the forearms and the toes are in contact with the table. Shoulders, hips, and ankles are maintained in a straight line. This position is sustained until fatigue or pain prevents the maintenance of the test position. The Supine Bridge Test is performed in the supine position, with the lower limbs flexed and the soles of the feet on the table with a narrow base, but without touching. The thighs should not be in contact. The hands are positioned by the ears. The patient raises his or her pelvis from the table so that the shoulders, hips, and knees are maintained in a straight line. This position is held until fatigue or pain prevents the continued holding of the test position.

Aberrant Movement Pattern During Active Trunk Flexion is an observational test starting from the standing position. Selected authors[1-33] have suggested that aberrant spinal motion during physiological movements that produce catching and disruption of a normal smooth arc of motion is suggestive of spinal instability. The patient is asked to bend forward as much as possible while the examiner identifies any abnormality in the movement pattern (painful arc during bending, painful arc on return, Gowers sign, instability catch, or reversal of lumbopelvic rhythm). The test result is considered as positive if any of these patterns is present.

Judgments of a painful arc during flexion and return from flexion both demonstrate substantial agreement (0.69 and 0.61, respectively). The other observations associated with trunk active range of motion (AROM) (Gowers sign, instability catch, reversal of lumbopelvic rhythm) demonstrate poor to fair reliability.[17]

Clinical Prediction Rules (CPRs) have been developed by Hicks et al[33] to determine which patients with LBP will respond to a stabilization exercise program. The most important findings are age (<40 years), Straight Leg Raise (SLR) greater than 91°, positive PIT result, Aberrant Movement Pattern During Active Trunk Flexion, lumbar hypermobility during lumbar segmental spring testing, and fear-avoidance beliefs. The best prediction rule based on the positive likelihood ratio value is the presence of at least 3 of the predictor variables.

Finally, a Clinical Diagnosis System has been proposed by O' Sullivan[4] for lumbar segmental instability based on the reporting of pain and the observation of movement dysfunction within the neutral zone and the associated finding of excessive intervertebral motion at the symptomatic level. Five different clinical patterns are described based on the directional nature of the injury and the manifestation of the patient's symptoms and motor dysfunction. The intertester reliability of this system appears to be from moderate to substantial for a range of patients within the nonspecific LBP population.[34]

First case

A 50-year-old woman presented with LBP and symptoms referred to the right leg. Radiographs demonstrated a grade 1 isthmic anterolisthesis (L5 on S1) with bilateral spondylolytic defects of the pars interarticularis. Magnetic resonance imaging showed prolapse and pseudoprotrusion of the L5/S1 disk with normal diameter of the spinal canal. Radiographs during maximum flexion/extension were not available.

The patient complained of daily pain in the right lumbar zone with episodic paresthesia in the right leg, which had started 6 months previously and at the time of assessment was in a stable phase. The patient denied any history of trauma.

Her pain worsened on forward bending, in flexion or rotation activities, with changes in the lumbar spine position (eg, in the lying or sitting position), when using the ski lift, and when breaststroke swimming; the pain decreased on sitting.

Postural assessment showed segmental loss of the lower lumbar lordosis, which increased in flexion (posterior pelvic tilt). Flexion was associated with a painful arc, and the patient was unable to return from flexion to neutral without the use of her hands. Palpation of lumbar multifidus muscles revealed less muscular tone on the painful side.

The findings of the physical assessment are reported in Table 1.

Table 1 Results of clinical tests

Patient	PIT	PLE	ASLR	AM	SBT	PBT	NRS	ODI	SLR	CPR
Initial assessment										
1st case	+	−	++	+	20 s (onset of pain)	20 s (no pain)	60/100 (100/100 in the dynamic change position)	18%	>91°	3 of 4 present
2nd case	−	−	+	+	180 s	120 s	0/100	0%	80°	1 of 4 present
3rd case	−	−	+	±	150 s	25 s	70/100	20%	>91°	2 of 4 present
4th case	+	+	+	+	Absolutely impossible	Absolutely impossible	90/100	61%	10° right 20° left	3 of 4 present
Final assessment										
1st case (4 mo, 10 tx)[a]	+	−	−	−	100 s	55 s	10/100	12%	>91°	2 of 4 present
2nd case (6 mo, 8 tx)[a]	−	−	−	−	180 s	120 s	0/100	0%	85°	1 of 4 present
3rd case (3 mo, 8 tx)[a]	−	−	+	−	150 s	30 s	0/100	8%	>91°	1 of 4 present
4th case (4 mo, 10 tx)[a]	±	−	−	−	180 s	50 s	0/100	2%	>91°	1 of 4 present

AM, Aberrant Movement Test; *SBT*, Supine Bridge Test; *PBT*, Prone Bridge Test; *tx*, treatments.
[a] Duration in months, number of treatments.

Clinical impression and physiotherapy treatment

The results of most of the instability tests and muscular endurance tests were positive. The patient was included in the instability subgroup. The clinical assessment suggested a lateral shift pattern, and the CPRs suggested likely benefit from stabilization exercises. Treatment aimed at improving motor control of the spinal muscles was established, according to the suggestions of Richardson et al.[23] Initially, specific exercises for the activation of the inner fibers of transversus abdominis and multifidus were performed. Progressively, the "core" exercises involved other muscles (rectus abdominis, internal oblique, spinal erectors, latissimus dorsi, gluteus maximus) that work together to improve stability. During the final phase of treatment, exercises to increase loading and stimulate a coordinated effort of these muscles were performed, with the goal of stabilizing and supporting the spine. A Swiss ball, "Step," and "Bouncer" were used for this purpose. Much of the core strengthening exercises prescribed were performed at home with regular supervision by the physical therapist.

After 4 months and 10 treatment sessions, the CPR parameters were changed only with regard to aberrant movement patterns. At the end of treatment, the aberrant movement patterns were performed without any pain or postural modification. Several instability test results became negative, muscular endurance improved, and disability due to LBP decreased.

Discussion

Discussion of case presentation

The main history findings for lumbar instability are a feeling of "giving way" or of the back "giving out"; frequent self-manipulation to crack or pop the back; recurrent episodes; painful catching or locking during spine twisting or bending; pain during transitional activities (eg, sit to stand); greater pain returning to the erect position from flexion; and increase of pain with sudden, trivial, or mild movements. The main clinical signs are poor lumbopelvic control (including segmental hinging or pivoting with movement) as well as poor proprioceptive function, poor coordination/neuromuscular control (including juddering or shaking, and decreased strength and endurance of local muscles), and aberrant movement, including changing lateral shift during AROM.

（背面仍有題目，請繼續作答）

Limitations

The limitations of this work are consistent with the specific type of article. A case report is anecdotal in nature. As a consequence, it should be interpreted with caution; and its results cannot be generalized beyond any individual case.

The outcome measures cited in this article have different rankings of validity. All tests used have sufficient reliability; but the diagnostic accuracy of tests such as the AMP, PIT, and the Bridge Tests are, at this time, still unknown. Furthermore, the ASLR seems clinically reliable in patients with LBP and pelvic girdle dysfunction; but its diagnostic accuracy has been tested only in pregnant women. The diagnostic validity of postural assessment is again a disputed topic. As a consequence, the use of orthopedic testing that lacks established validity may hold some pitfalls.

Moreover, the results of functional tests used to evaluate possible changes between baseline and discharge could be biased because of the same clinician performing both assessment and treatment.

We should also consider the fact that the absence of any intermediate follow-up and the long duration of the survey (from 3 to 6 months) do not allow us to exclude the possibility that factors besides physiotherapy treatment (spontaneous remission, modifications in lifestyle, etc) may have negatively or positively influenced the course of the patients' LBP. Because there was no control group used, it is possible that the conditions were self-limiting or that the improvements were influenced by a placebo effect of getting supervised treatment. Finally, we cannot evaluate the amount and the clinical effectiveness of home exercises performed by the patients; and it is also possible that a nonspecific spinal stabilization program provided in each case could have achieved similar outcomes.

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Q4. Please rewrite the following abstract in Chinese. (25%)

The abstract is adopted from the article "A path model for evaluating dosing parameters for children with cerebral palsy" by Mary E. Gannotti, Jennifer B. Christy, Jill C. Heathcock and Thubi H.A. Kolobe. PHYS THER. Published online November 14, 2013 doi: 10.2522/ptj.20130022

"Dosing of pediatric rehabilitation services for children with cerebral palsy (CP) has been identified as a national priority. Establishing dosing parameters for pediatric physical therapy interventions is critical for informing clinical decision making, health policy, and guidelines for reimbursement. The purpose of this perspective article is to describe a path model for evaluating dosing parameters of interventions for children with CP. The model is intended for dose-related and effectiveness studies of pediatric physical therapy interventions. The premise of the model is: Intervention type (focus on body structures, activity, or the environment) acts on a child first through the family, then through the dose (frequency, intensity, time), to yield structural and behavioral changes. As a result, these changes are linked to improvements in functional independence. Community factors affect dose as well as functional independence (performance and capacity), influencing the relationships between type of intervention and intervention responses. The constructs of family characteristics; child characteristics (eg, age, level of severity, comorbidities, readiness to change, preferences); plastic changes in bone, muscle, and brain; motor skill acquisition; and community access warrant consideration from researchers who are designing intervention studies. Multiple knowledge gaps are identified, and a framework is provided for conceptualizing dosing parameters for children with CP."

（背面仍有題目，請繼續作答）

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Please answer the following two questions based on reading an abstract.

Q5. What kind of measurement of physical activity was used in the study? (10%)

Q6. What are the results of the study? (15%)

The abstract is adopted from the article "School-based health promotion and physical activity during and after school hours" by Kerry A. Vander Ploeg, Jonathan McGavock, Katerina Maximova and Paul J. Veugelers. Pediatrics 2014;133:e371–e378.

"**OBJECTIVES:** Comprehensive school health (CSH) is a multifaceted approach to health promotion. A key objective of CSH is to foster positive health behaviors outside of school. This study examined the 2-year change in physical activity during and after school among students participating in a CSH intervention in Edmonton, Alberta, Canada. **METHODS:** This was a quasi-experimental, pre–post trial with a parallel, nonequivalent control group. Intervention schools had to be located in socioeconomically disadvantaged neighborhoods. In the spring of 2009 and 2011, pedometer recordings (7 full days) and demographic data were collected from cross-sectional samples of fifth grade students from 10 intervention schools and 20 comparison schools. A total of 1157 students participated in the study. Analyses were adjusted for potential confounders and the clustered design.

RESULTS: Relative to 2009, children in 2011 were more active on schools days (1172 steps per day; $P < .001$) and on weekends (1450 steps per day; $P < .001$). However, the increase in mean steps between 2009 and 2011 was greater in CSH intervention schools than in comparison schools (school days: 1221 steps per day; $P = .009$; weekends: 2001 steps per day; $P = .005$). These increases remained significant after adjusting for gender and overweight status. **CONCLUSIONS:** These findings provide evidence of the effectiveness of CSH to affect children's physical activity during and outside of school. Results of this study justify broader implementation of effective CSH interventions for physical activity promotion and obesity prevention in the long term."