

A clinical prediction rule for classifying patients with low back pain who demonstrate short-term improvement with mechanical lumbar traction

Congcong Cai · Yong Hao Pua · Kian Chong Lim

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Abstract The objective of the study was to develop a clinical prediction rule for identifying patients with low back pain, who improved with mechanical lumbar traction. A prospective, cohort study was conducted in a physiotherapy clinic at a local hospital. Patients with low back pain, referred to physiotherapy were included in the study. The intervention was a standardized mechanical lumbar traction program, which comprised three sessions provided within 9 days. Patient demographic information, standard physical examination, numeric pain scale, fear-avoidance beliefs questionnaire and Oswestry low back pain disability index (pre- and post-intervention) were recorded. A total of 129 patients participated in the study and 25 had positive response to the mechanical lumbar traction. A clinical prediction rule with four variables (non-involvement of manual work, low level fear-avoidance beliefs, no neurological deficit and age above 30 years) was identified. The presence of all four variables (positive likelihood ratio = 9.36) increased the probability of response rate with mechanical lumbar traction from 19.4 to 69.2%. It appears that patients with low back pain who were likely to respond to mechanical lumbar traction may be identified.

Keywords Low back pain · Lumbar traction · Clinical prediction rules

Introduction

Low back pain (LBP) is a common cause of disability and work loss in developed countries, creating a large social and economic burden on society [7]. Between 70 and 80% of adults are affected at some time during their lives [2]. There are numerous clinical guidelines on LBP produced worldwide, yet lack of consensus about effectiveness [23, 36]. Physiotherapy (PT) interventions for the management of LBP are wide and variable, but the efficacy of many is still questionable [17].

Mechanical lumbar traction is one of abovementioned PT interventions. There is ongoing confusion surrounding the use of traction in the management LBP, with differences between recommendations in the UK, New Zealand, Denmark and the USA clinical guidelines [35]. This is further confounded by a recent Cochrane systematic review which concluded that 'traction probably is not effective,' however, the authors also noted that 'we lack strong, consistent evidence regarding the use of traction due to the lack of high quality studies, the heterogeneity of study populations, and lack of power'[3]. More importantly, there was no study concerning the pre-treatment fear-avoidance status of subjects, which is increasingly considered as essential factor in musculoskeletal rehabilitation. The literature review based on few current available studies suggests that traction was most likely to benefit patients with acute (less than 6 weeks' duration) and radicular pain with concomitant neurological deficit [24], and absence of centralization with movement testing [8]. However, the above statement carries rather weak research power. Thus, the subgroup of patients most likely to benefit has not been specifically studied yet [24].

As increasingly raised awareness of classification for LBP patients to have better clinical management outcome,

C. Cai (✉) · Y. H. Pua · K. C. Lim
Rehabilitation Department, Alexandra Hospital,
378 Alexandra Road, Singapore 159964, Singapore
e-mail: ccongcong@hotmail.com

Y. H. Pua
e-mail: puayonghao@gmail.com

K. C. Lim
e-mail: kian_chong_lim@alexhosp.com.sg

there are some prediction rules established by various authors, e.g. lumbar spine manipulation clinical prediction rule [6], lumbar stabilization exercise clinical prediction rule [18]. Those clinical prediction rules (CPR) contribute significantly to the establishment of classification approach to physiotherapy management of LBP.

However, to our best knowledge, there is few specific clinical prediction rules study to classify the particular group of LBP patients who respond to mechanical lumbar traction. Although some authors [8] generated prediction rules for prone lumbar traction approach, most common used supine approach is still lacked of such prediction rules. The efficiency of clinical decision-making for utilizing mechanical lumbar traction to treat LBP condition and the quality of methodology for future RCT will require more information from clinical prediction rule studies. Therefore, the purpose of our study was to identify the prediction factors for patients with LBP who demonstrate short-term improvement with mechanical lumbar traction.

Methods

Subjects

The 129 participants in this study were referred from the orthopedic outpatient clinic in the local hospital over 6 months. All participants were enlisted, when they were on the waiting list to see a physiotherapist. All participants were with a diagnosis related to the lumbosacral spine, and had a chief complaint of pain and/or numbness in the lumbar spine, buttock, and/or lower extremity. All subjects gave written consent allowing the release of test results for research purposes, as approved by a local hospital bioethics committee. Exclusion criteria were current pregnancy, signs with spinal cord injury, prior lumbar spine surgery, history of osteoporosis or spinal fracture. Subjects were not included in the data analysis if the clinician determined the subject's symptoms were likely of non-spinal origin.

Therapists

Four physiotherapists working in rehabilitation department of local hospital participated. A 2 h pre-study briefing was given, regarding study measures, introduction, intervention and ethics issues.

Measures

Basic demographic information was collected before intervention, including gender, age, height, weight, BMI (calculated), education levels (primary, intermediary,

graduate), smoking situation (smoker, non-smoker), onset duration (weeks), cause of pain (trauma, gradual, sudden), past history of episode (yes/no), increase frequency episode (yes/no), pain below knee (yes/no), job status: manual (yes/no), retiree (yes/no), pain medication (yes/no), aggravating factors (sitting, standing, walking), and releasing factors (sitting, standing, walking).

Disability related to LBP was measured by modified Oswestry low back disability questionnaire (MODQ) [20]. All participants were asked to complete MODQ before intervention and after 3 traction sessions completed in 9 days. The improvement of the score more than 50% than pre-treatment was used as a determinant for a responder of mechanical lumbar traction.

Each participant completed the fear-avoidance beliefs questionnaire (FABQ) [37] before intervention to assess the beliefs about the influence of activity on LBP [37]. The FABQ contains two subscales, one is related to general physical activity (FABQPA) and the other to work (FABQW) [37].

Pain intensity was measured by numerical pain scale, (0–10, 0 indicates no pain, 10 indicates maximum pain). All participants completed the numerical pain scale by indicating average pain level during pass 1 week before intervention.

Physical examination (PE) was done by four physiotherapists. The active lumbar flexion in standing was recorded as mid-thigh, patellar, mid-shin and distal shin. The bilateral straight-leg-raise (SLR) was measured by limitation of pain. The pain with SLR ($\kappa = 0.83$) has acceptable reliability [25]. Posteroanterior spring testing [26] was performed for mobility at each lumbar level. Mobility was judged as normal, hypermobile, or hypomobile. Neurological screening was conducted on reflex and manual muscle testing (MMT). Patellar tendon and Achilles tendon reflex were rated as normal, hypertonic, or hypotonic. MMT (i.e. iliopsoas, quadriceps femoris, hamstring, peroneal, extensor hallucis longus, gastrocnemius, and tibialis anterior) were rated from grade 1 to 5 by therapists. The test results were dichotomized into grade 5 or above as normal, grade 4 or below as weakness. The agreement (κ) between 2 orthopaedic surgeons in 50 patients with LBP was 0.65–1.00 for MMT, 0.23–0.39 for reflex [29]. Patients were then dichotomized into neurological deficit involvement (yes/no) according to the screening findings.

Intervention

A total of three lumbar traction sessions were given within 9 days using motorized mechanical lumbar traction (Triton DTS[®] Traction System, The Chattanooga Group) in Fowler's position (The patient is in supine with hip and knee