



Quantum Movement Technique versus William Flexion Exercise on Pain and Walking Ability in Patients with Low Back Pain

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Abstract

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OBJECTIVE: Our study aimed to compare between quantum movement technique (QMT) and William flexion exercise (WFE) in patients with low back pain (LBP) based on pain and walking ability.

METHODS: Six-session QMT and WFE were provided for two groups of participants. The frequency of intervention was 6 times/week. Twenty patients (aged 25–65 years) with LBP were randomly assigned into the QMT group (n = 10) or the WFE group (n = 10). The primary outcome of the intervention was pain, measured using the numeric pain rating scale, while the secondary outcome was walking ability, measured using the Oswestry Disability Index. The measurements were conducted at baseline and the end of the intervention.

RESULTS: Pain reduction was significantly shown in both groups (p < 0.05). However, QMT was shown more effective in reducing pain compared to WFE (p < 0.05). In addition, we found the significant improvement of walking ability in both groups following the intervention (p < 0.05), but no significant difference was shown between two groups (p > 0.05).

CONCLUSIONS: QMT is more effective than WFE for reducing pain in patients with LBP.

Introduction

Low back pain (LBP) is the pain experienced in the lower back. LBP is not only including pain but also muscle spasm of the lower back, which results in muscle imbalance, thus leads to the decrease of abdominal stability and restriction of lumbar mobility [1]. The study conducted by Kalangi *et al.* [2] revealed that pain, muscle spasm, and the impairment of walking ability were experienced in patients with LBP. The walking speed in patients with chronic LBP was observed much better compared to the patients with subacute LBP. Therefore, LBP can impair the walking ability.

Various interventions were explored to overcome the impact of LBP [3], [4], [5], [6]. Exercise therapy, such as William flexion exercise (WFE), plays a role in pain reduction and improvement of lower back stability by activating the abdominal muscle, gluteus maximus, and hamstring [7]. The other modalities currently developed are quantum movement technique (QMT). QMT is the combination of various techniques

such as lumbar extension, stability exercise, nerve mobilization, proprioceptive neuromuscular facilitation (PNF), and neuromuscular therapy [8]. On the other hand, WFE is a technique involving static, passive, and dynamic strengthening exercises and friction. It plays a role in facilitation of flexor group, back pain alleviation, and muscle relaxation, as well as strengthening of the abdominal muscle to gain core muscle stability [9], [10]. Therefore, in the present study, we aimed to compare the effectivity between QMT and WFE on pain and walking ability in patients with LBP.

Materials and Methods

Study designs

The study design was a randomized controlled trial. The study protocol was approved by the Ethics Committee of Medical Faculty, Hasanuddin University, Makassar.

Participants

Twenty patients with LBP were enrolled in this study. The inclusion criteria were as follows: (1) Patients with LBP, (2) agreed to be included in the present study, (3) age of 25–65 years, and (4) having pain and limitation of activity daily living. The exclusion criteria were as follows: (1) Having LBP due to spondylolisthesis, lumbar compression fracture, malignancy, spinal deformity, acute inflammation, and infection, (2) prescribed with analgesia medication, and (3) not engaging in all study procedures. Before starting the intervention, the study procedures were explained to the participants, and the informed consent was obtained.

Interventions

Both QMT and WFE were conducted for six sessions. Each session was provided once a day. In each session, the interventions were provided in three repetitions. The intervention durations were 30 min in each session. QMT is a specific technique of physiotherapy which is modifying and combining various technologies such as neuromuscular technique (NMT), manual therapy, Bugnet exercise technique, McKenzie technique, PNF technique, and Mona's exercise technique. Meanwhile, WFE consisted of five kinds of movements, began with supine position and flexion of both knees. The details of both interventions were provided in supplementary files.

Outcomes

Before and after the intervention, the walking ability and the pain intensity were measured by the Oswestry Disability Index (walking section) and numeric pain rating scale (0–2 = no pain, 3–4 = mild pain, 5–6 = moderate pain, 7–8 = severe pain, and 9–10 = very severe pain), respectively.

Statistical analysis

The independent t-test was used to compare the effect of both interventions on the outcomes, while the paired t-test was used to determine whether the outcome changes were affected by the intervention. Statistical analysis was performed using the statistical software SPSS version 22.

Results

In the present study, we compared the effectivity of QMT to WFE on pain and walking ability in patients with LBP. The characteristics of the participants in this study are shown in Table 1. In the present study,

Table 1: The baseline characteristics of participants

| Characteristic | QMT | WFE |
|---------------------|----------|-----------|
| Gender | | |
| Male | 4 | 5 |
| Female | 6 | 5 |
| Age (years)/mean±SD | 55.9±9.9 | 51.9±12.8 |
| Waist-to-hip ratio | | |
| Male <0.95 | 2 | 2 |
| Male >0.95 | 2 | 3 |
| Female <0.80 | 0 | 1 |
| Female >0.80 | 6 | 4 |

QMT: Quantum movement technique, WFE: William flexion exercise.

we revealed that significant differences in pain intensity and walking ability were shown after the interventions in both groups ($p < 0.05$). Moreover, the pain changes were significantly higher in individuals treated with QMT than WFE. However, the walking ability changes were similar between the two groups ($p > 0.05$) (Table 2).

Discussion

The main finding of the present study was that the improvement of pain was observed higher in the QMT group compared to the WFE group. However, the pain reduction was also significantly observed in WFE. WFE focuses on the strengthening of abdominal muscles, gluteus maximus, and the stretching of back extensors. The stretching of back extensors can improve the range of motion, increase the local temperature, and improve the muscle metabolism. Hence, the metabolic waste products can easily be removed [11]. The strengthening of the abdomen muscle also helps to support the spine; thus, the ligament of the spine stay aligned [12]. Various movement of WFE has an impact on the activation of the abdominal muscle, gluteus maximus, and hamstring, in addition to the passive stretching of hip flexors and lower back muscles; therefore, the muscle balance between flexor group and extensor group of the postural group can develop. The positive impact of WFE can lead to a decrease of stress on posterior aspects of lumbar as well as the strengthening of abdominal muscle and gluteus maximus which results in pain reduction of lower back and improving the activity daily living. WFE also may improve the flexibility/elasticity in hip flexor group and lower back (sacrospinalis) and restore the balance between postural flexor and extensor group [7].

On the other hand, QMT is the modified technique developed based on research to treat the impairment of movement and function. The combination between lumbar extension and mechanical traction has been proven in reducing the pain and improving the functional activity. Lumbar stabilization exercise also contributes to pain reduction and improvement of functional activity, as well as increase of the mobility and stability of sacroiliac joint in patients with herniated nucleus pulposus (HNP) [13]. The exercise also improves the restoration in patients with HNP, in addition to improving the proprioceptive function. The

Table 2: Outcomes in both intervention groups

| Outcomes | QMF | | | WFE | | | p value for difference between groups |
|-----------------|--------------|--------------|---------|--------------|--------------|---------|---------------------------------------|
| | Pre | Post | p value | Pre | Post | p value | |
| Pain | 8.80 ± 1.135 | 3.10 ± 0.876 | 0.004 | 7.10 ± 0.876 | 4.0 ± 0.943 | 0.004 | 0.000 |
| Walking ability | 3.30 ± 0.675 | 1.70 ± 0.675 | 0.004 | 3.10 ± 0.738 | 1.80 ± 0.789 | 0.004 | 0.313 |

QMF: Quantum movement technique, WFE: William flexion exercise.

combination between nerve mobilization and abdominal strengthening using PNF was shown to improve the pain and the functional activity in patients with chronic LBP [14]. The underlying mechanism of QMT is that the improvement of nerve mobility and muscle flexibility leads to the pain reduction, while the core stability functions to increase the stabilization of abdominal and spinal. In addition, NMT decreases pain and improves the flexibility of soft tissue [8], [12], [15], [16].

Conclusions

Based on the findings in the present study, we concluded that QMT is more effective than WFE for reducing pain in patients with LBP. While for walking ability, the similar effects between QMT and WFE were observed.

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