Manual Therapy in Cervical/Lumbar Radiculopathy

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A comprehensive literature review was conducted using PubMed and Web of Science databases up to April 2020. The following inclusion criteria were used: (1) presence of radiculopathy; (2) treatment defined as manual therapy (i.e., traction, manipulation, mobilization); and (3) publication defined as a Randomized Controlled Trial. The electronic literature search resulted in 473 potentially relevant articles. Finally, 27 articles were accepted: 21 on cervical (CR) and 6 in lumbar radiculopathy (LR). The mean PEDro score for CR was 6.6 (SD 1.3), and for LR 6.7 (SD 1.6). Traction-oriented techniques are the most frequently chosen treatment form for CR and are efficient in reducing pain and improving functional outcomes. In LR, each of the included publications used a different form of manual therapy, which makes it challenging to summarize knowledge in this group. Of included publications, 93% were either of moderate or low quality, which indicates that quality improvement is necessary for this type of research.

Keywords: manual therapy ; low back pain ; neck pain ; radiculopathy ; spine

1. Introduction

Radiculopathy is described as nerve root irritation resulting from various pathologies, including herniated intervertebral disc (22% cases), bone spurs, spinal instability, and trauma [1][2]. Upper and lower limb pain can be referred to as the main symptom of cervical or lumbar pathology. Other symptoms usually include muscle weakness, local pain, motor, sensory, or reflex deficits [3][4].

Cervical radiculopathy (CR) is most prevalent in individuals over 40 years of age, with an annual incidence of 83.2 per 100,000 persons [5]. This makes it less common than lumbar radiculopathy (LR) [3] (also known as sciatica), whose prevalence has been documented in the USA as high as 25% of all lower back pain (LBP) cases [6] and represents the most common complaint among patients visiting a spine surgeon [7][8]. Due to its severe manifestation and the lack of treatment standardization, irrespective of healthcare system type, radiculopathy causes substantial socio-economic problems and limits daily living activities due to disability and inability to work that can last up to 20 weeks after surgical treatment [9][10][11].

Referred symptoms, including pain, cause more significant disability when compared to local pain alone [12]. Although radiculopathy remains a challenge for both researchers and clinicians, various non-operative forms of treatment are used to improve patients' outcomes. The successful treatment method is non-surgical in 75%–90% of cases suffering from cervical radiculopathy (CR) [13][14][15]. In recent years, studies have shown the effectiveness of physical therapy involving strengthening or stretching, and also various forms of manipulative therapy for radiculopathy [1][16][17][18].

Manual therapy forms can be joint-oriented (mobilization, manipulation, traction), soft-tissue-oriented (massage forms), neural-tissue-oriented (neurodynamic), or mixed (specific exercises). Most of these treatments are successful in improving radiculopathy symptoms [19][20], but the quality of evidence might often be questioned. There is still only low-level evidence that neural mobilizations can be successful as a standalone method [21]. Little is known about joint mobilization efficacy alone in treating radiculopathy. While its biomechanical background remains unclear [22], one of the most commonly used manual therapy methods is traction, but evidence on its efficacy, whether applied alone or combined, needs further research [23][24]. While numerous CR reviews can be found in the literature in recent years [5][22][25][26][27][28][29], those regarding the lumbar region are minimal [7][9][27] and often of poor quality [30]. The latest reviews regarding CR and LR come from 2016 [5] and 2017 [30] respectively, which was encouraging.

2. Cervical Radiculopathy

Treatment with CR, unlike LR, mainly focused on traction techniques in most authors. This situation is due mainly to a much more comfortable grip and control in the cervical spine than in the lumbar spine, which is a more specific technique. While Ayub et al. (2019) combined traction with other treatment forms such as neural mobilization (passive vs. active),

none of the treatment methods was found to be superior to the others [31]. Afzal et al. (2019) also compared manual traction, manual opening techniques, and a combination of these in patients with CR, but the effects of both techniques were equally effective in functional outcome [32]. Traction stood as baseline technique in many studies, and none of them showed superiority while used alone. This type of technique can be varied in specifying starting position, direction, force, amplitude, and velocity. In the gathered literature, there is a lack of detail on manual traction attributes. In most cases, this should be considered as general traction. For instance, Jellad et al. (2009) detailed it as intermittent traction, but no further information was provided [33]. Fritz et al. (2014) also used different forms of non-specific, mechanical traction combined with an exercise program that confirmed its efficacy and superiority to exercises alone, but no “traction alone” subgroup was formed [34]. Although most authors observed improvement in patients’ functional outcomes using traction or a traction component in a multimodal approach, some did not find that adding traction was successful in treating CR [35]. Shafique et al. (2019) also proved that multimodal treatment could provide better effects in patients with cervical radiculopathy [36]. This was based on spinal mobilizations, neuro-dynamics and arm movements. Cervical radiculopathy, thought to be mechanical, spatial dysfunction, also needs treatment, including movement, both proximally and distally. It has to be mentioned that a small number of papers used clinical tests for assessing functional outcomes [31][37][38][39]. This is because local pain is not the primary CR and LR problem, but distal dysfunction (e.g., muscle weakness, motor and sensory deficits due to neural malfunction), causing disability, which should always be assessed. LR also lacks in this regard, and three authors chose that way of assessing patients which, on the other hand, was more than half of all LR literature [40][41][42]. Wainner et al. (2003) proved that, for cervical radiculopathy. the ULNT tests, and especially the 1A type, are most useful for ruling out this pathology [43].

Neural mobilization is a type of technique aimed at healing neural tissue which is considered to be one of the main problems in radiculopathy after mechanical compression [44]. Nerve root will become impeded when is overstretched, or its blood supply is limited due to compression for a significantly long time, or both. Some authors applied neural mobilization techniques as a treatment for CR [31]. While Ayub et al. (2019) tried to prove the different effects comparing active and passive form of this technique in a multimodal approach, Kim et al. (2017) applied neural mobilization, different to the multimodal approach, but not using traction alone. In both cases, the effects were positive on functional outcomes [31][37], although the former author included only females, which may limit the generalizability of the results. So far, the question of neural mobilization techniques’ efficacy in CR remains unsolved.

Joint techniques are appropriate in treating joint-oriented dysfunction. This type of impairment can be taken into consideration regarding the biomechanical background of CR and LR. The relation of facet joints may be imbalanced, which can result in joint(s)’ hyper- or hypomobility. These techniques are aimed at treating hypomobile segments, while the hypermobile needs to be stabilized by in-depth muscle training. No author provides details on patients’ manual examination, called “joint play” in manual therapy, which is essential in stating whether this individual needs to be mobilized in this segment in this particular direction. Although Ayub et al. (2019) and Bukhari et al. (2016) applied mobilization in their research, it was only part of a multimodal approach aiming to differentiate traction techniques, with no further details provided on mobilized segment [31][45]. Young et al. (2019) mentioned manual therapy, but they focused mainly on thoracic spine thrust and non-thrust manipulations and unspecified neck movements without further details on a specific segment [35]. A different manipulation-oriented approach was proposed by Yang et al. (2016) based on patients’ radiographs—the group age range was high (55–75), but the effects of the manipulation were promising [46]. As well as age, inclusion criteria specified CSR (cervical spondylotic radiculopathy).

A specific exercise program has been used by several authors [45][47][34][33][35][39]. Only two authors aimed the exercise form at the biomechanical aspect of CR’s etiology, which was to increase the size of the intervertebral foramen, and no significant, positive results were observed [32][47]. Unfortunately, the authors did not provide any further details on the exercise program, besides an isometric strengthening of the muscles. Fritz et al. (2014) used a neck exercise program as a base for each of three formed groups (G1: exercise, G2: exercise + mechanical traction, G3: exercise + over-door traction) which resulted in reducing the level of neck and arm pain. The exercise program for neck included supine cranio-cervical flexion to activate deep stabilizing muscles with an air-filled pressure sensor as feedback. In contrast, scapular-strengthening exercises included prone horizontal abduction, side-lying forward flexion, prone extensions and push-ups [34]. Jellad et al. (2009) applied a “standard” rehabilitation program including ultrasound, infrared, massage, cervical spine mobilizations, and isometric muscle strengthening. No details on the above activities, such as dozing, area, direction, etc., were found, so it cannot be considered as a specific treatment method despite the fact of its efficacy in improving pain and functional outcome [33]. Young et al. (2019) proved that the the exercise program, including cervical retractions, extensions, and deep flexors’ activation, was efficient with or without adding an extra traction component. Although they described the details of every maneuver, we found no information on which specific exercise was used in each session, so it is impossible to state whether the program was consistent and repeatable [48]. Joghataei et al. (2004) used exercises including neck deep flexor strengthening as a base which showed an improvement, but significant relief was observed

after adding cervical traction combined with electrotherapy [39]. Akkan et al. (2018) also proved that stabilizing exercises including of the deep neck muscles, can improve pain, quality of life and patients' posture [49]. Wibault et al. (2017) observed promising effects using neck-specific exercises compared to the standard approach in patients who had undergone surgical treatment [50]. A similar outcome was observed by other researchers when comparing neck-specific training with a prescribed standard physical activity approach [51][52].

3. Lumbar Radiculopathy

Regarding LR, a limited number of RCTs was found to be eligible in this review. Among the five studies, few methods of treatment for LR were used by authors, and, unlike CR, no trends in choosing treatment form were observed. No unity was found in functional outcome assessment across all included studies. Only two of five studies included neurodynamic tests (SLR) [40][41]. Moustafa et al. (2013) applied a lumbar lordotic angle as an outcome, but this parameter was also an inclusion criterion [42]. Although all authors used questionnaires as an outcome, two of them decided to include only this type of examination, which makes it difficult to answer the question on individuals' clinical improvement, as they had omitted this part.

Due to the diversity of treatment methods used, it is challenging to compare their effects. Satpute et al. (2019) applied spinal mobilizations with leg movement plus exercise and electrotherapy, compared to exercise and electrotherapy alone [40] and found significantly improved outcomes, especially in mobilization. The adjacent segments mobilization might also be helpful for LR patients and was proved by Kostadinović et al. (2020) in their studies [53]. They applied thoracic spine mobilization and lumbar stabilization. This type of approach is focused on improving hypomobile segments' motion in the thoraco-lumbar region to reduce axial forces in lumbar segments. On the other hand, McMorland et al. (2010) compared surgical treatment (microdiscectomy) and standardized spinal manipulation by a chiropractor in patients who had not responded to other non-specific forms of non-operative treatment for at least three months. Both methods significantly improved the patient's functional outcome and pain level. Unfortunately, no clinical examination was applied in the study, such as SLR, SLUMP, or other neurodynamic forms (e.g., EMG) [54]. Due to the different study project, joint-oriented, but with differently aimed techniques (mobilization vs. manipulation), we found it difficult to compare these two authors' works to each other. Surgical treatment should be considered only along with the red-flag-symptoms that occurred. Another study that used the manipulation approach was that of Ghasabmahaleh et al. (2020). They observed patients' outcomes improvements in subacute and chronic LR using Maigne's techniques [55]. The group that underwent physiotherapy and manipulations had superior results to physiotherapy alone. Different approaches including epidural injection with manipulation were proposed by Yin et al. (2018). They observed better effects in the multimodal approach group; however, one of their methods was invasive [56].

Exercise programs are present in two out of five (40%) of our findings [40][57]. Gudavalli et al. (2006) compared the active trunk exercise program (ATEP) which is based on activation of deep, lumbar stabilizing muscles with flexion-distraction maneuver (FD). ATEP was found to be significantly more effective in the recurrent pain group with moderate to severe symptoms, while FD was better for chronic symptoms (defined by the author as pain lasting longer than three months) [57]. The first author also found the exercise program to be effective. However, the aim of the study was to prove the efficacy of a multimodal approach, rather than exercise alone [40].

When analyzing the efficacy of neural tissue mobilization, two authors applied this type of treatment [44][41]. Despite the promising conclusion of improvement in SLR and VAS outcome, Tambekar et al. (2016) did not observe a significant effect maintained in the follow-up stage [41]. The quality of this study was also limited due to the absence of concealed allocation, no blinding, no adequate follow-up, and no intention-to-treat analysis. Plaza-Manzano et al. (2019) did not find neurodynamic mobilization to be effective when combined with motor control training compared to motor control training alone [44]. However, it should be mentioned that inclusion criteria included an extensive range of participants' age (18–60) and SLR score was considered to be eligible when the pain was reproduced only within 40–70 degrees of range.

4. Methodological Concerns

The overall quality of the included studies' is low to moderate. Only one study designed an intervention with blind therapists [44], and two other studies designed the research with blind participants [48][47]. This is due to the specificity of treatment techniques thought to apply a biomechanical result in a specific area. In this type of intervention, blinding the therapist or physician is difficult to do, and in some cases impossible. Therefore, we treated the 'blinding the therapist' criterion with caution.

5. Future Directions

The main recommendations relate to the standardization of clinical examination with objective methods or specific devices and full details on the intervention. The decision-making process would be more fruitful with advanced radiological imaging and functional outcome extended by neurodynamic tests that correlate with symptoms in distal parts of the body. As symptomatic radiculopathy most often impairs the extremities' function, it should be essential to focus on this field and control the outcome using clinical tests such as ULNTs for CR and SLR and SLUMP for LR. Insufficiently detailed information is most often found for specific techniques. No detailed pre-intervention assessment is normally provided, which complicates the selection of appropriate treatment.

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