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RESEARCH REPORT

Relationship between somatic dysfunction of the lumbosacral joint and changes in the gait pattern

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Abstract *Background:* Somatic dysfunction of L5-S1 is believed to cause or worsen a rotation pattern in the pelvis, often combined with low back pain. This affects symmetry of motion amplitudes in lower joints, and could influence the gait pattern. This study was conducted to determine whether a somatic dysfunction of L5 has an influence on the gait pattern.
Objective: To investigate the correlation between the presence of a somatic dysfunction at L4-L5 and a rotation in the gait pattern.
Methods: 30 participants with LBP and a somatic dysfunction of L5 were assessed by three examiners using established osteopathic tests. All participants had their static pelvic rotation measured using a digital measurement system, and their gait assessed using a plantar pressure device.
Results: No significant differences were found in the static position of the pelvis and the rotation of the feet between the control and testing group. Significant differences were found in the correlation between pelvic rotation and foot rotation during normal speed walking. Rotation to the right of the pelvis showed a significant negative correlation (Spearman's $r = -.527$; $p = .003$), and rotation to the left of the pelvis showed a significant positive correlation (Spearman's $r = .586$; $p = .001$) with the ipsilateral foot.

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Conclusion: When assessed in a static position, somatic dysfunction of L5 had no influence on the position of the pelvis or the rotation of the feet. When assessed during locomotion, somatic dysfunction of L5 had a significant influence ($p < .05$) on the external rotation of the ipsilateral leg.

Implications for practice

- Somatic dysfunction of the lumbosacral joint seems to manifest itself through the lower limb and is able to influence the gait pattern.
- The evaluation of pelvic position and movements should be taken into account while examining the gait pattern of patients with (non-specific) low back pain.
- when considering gait corrections in patients with low back pain, functional examining of the lumbopelvic region should be included.

Introduction

Low back pain (LBP) is a common and costly disorder among the working population.[1] In many cases, pain is likely to arise from the zygapophyseal joint (prevalence up to 40%).[2,3] Pathology of intervertebral disc may also account for a substantial proportion (13—20%) of people with low back pain who have a recognisable pathology.[2,4—8] The main functions of the zygapophyseal joints in the lumbar spine are to guide extension and flexion of the spine and to limit axial rotation. This rotation of a lumbar intervertebral joint normally occurs around the axis located in the posterior third of the vertebral bodies and intervertebral disc.[9] This is of great importance, because mechanical stress caused by rotation has a negative impact on the intervertebral disc.[6,10—13]

For all intervertebral joints it is important that every motion follows the normal biomechanical axes. In the presence of somatic dysfunction there may be altered intervertebral joint movement that includes dysfunctional rotation movements around the joint axis together with secondary problems involving other peri-articular structures. Ultimately, a loss of normal joint function can lead to structural deformities.[13,14]

Clinically, dysfunctional rotation can be observed when several adjacent spinal segments move simultaneously in rotation. If the range of motion of one of these segments becomes dysfunctional, the upper and lower adjacent segments in the spinal column and its locomotor system should be able to adapt and compensate to this disturbed functions.[14,15] As proposed by Lewit,[15] nociceptive stimuli caused by increased tension, produces neuromuscular changes in the segment (such as hyperalgesic areas, altered muscle tension).[15] This dysfunction may also contribute to motion compensations in other tissues. It is theorised that if this dysfunction is severe enough, symptoms may arise.[16] Somatic dysfunction has been defined as "impaired or altered function of related components of the somatic framework; skeletal, arthroidal, myofascial and related vascular, lymphatic and neural elements", and may be associated with altered movement pattern.[17—21] Lewitt[15] claims that the most important cause of dysfunction is overstrain linked to disturbed biomechanics, trauma, posture or visceral disease.

The possible compensation pattern with subsequent descending influences is claimed to result in a pelvic rotation, which should be counter-rotated compared to the lumbar spine, causing an external rotation of the hip joint, genu flexum in conjunction with genu valgum and external rotation of the tibia[14] with asymmetrical hip motion as a possible outcome. Asymmetry is said to alter gait patterns resulting in a swing of the ipsilateral leg towards external rotation.[14,22]

During gait, the pelvis moves forward simultaneously with the swinging leg, whilst there is an opposing rotation in the upper body. The activation of trunk muscles during gait increases the mechanical load on the intervertebral disc,[23] which causes an axial rotation in the pelvis and, to a lesser extent in the lumbar spine.[24] This increases the mechanical load on the facet joints, possibly leading to irritation,[5,11,25] and could influence the severity of a somatic dysfunction in the lumbar spine, as well as effecting the compensation of lower limb joints during gait.

The lumbar spine has limited capacity for axial rotation movement,[9,26] and of the lumbar segments, the lower lumbar region has the largest share in this axial rotation.[6,27] Somatic dysfunction of the lumbosacral area can initiate or increase the rotation pattern, which may be