R. Galm
M. Rittmeister
E. Schmitt

Vertigo in patients with cervical spine dysfunction

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R. Galm (✉)
Wirbelsäulenklinik Bad Homburg,
Kaiser-Friedrich Promenade 47–49,
D-61348 Bad Homburg, Germany

M. Rittmeister · E. Schmitt
Orthopädische Universitätsklinik,
Frankfurt am Main, Germany

Abstract To our knowledge, quantitative studies on the significance of disorders of the upper cervical spine as a cause of vertigo or impaired hearing do not exist. We examined the cervical spines of 67 patients who presented with symptoms of dizziness. Prior to the orthopaedic examination, causes of vertigo relating to the field of ENT and neurology had been ruled out. Fifty patients of the above-mentioned group were studied. They followed the outlined treatment protocol with physical therapy and were available for 3 months of follow-up. Thirty-one patients, hereinafter referred to as group A, were diagnosed with dysfunctions of the upper cervical spine. Nineteen patients, hereinafter referred to as group B, did not show signs of dysfunction. Cervical spine dysfunctions were documented as published by Bischoff [4]. In group A dysfunctions were found at level C1 in 14 cases, at level C2 in 6 cases and at level C3 in 4 cases. In seven cases more than one upper cervical

spine motion segment was affected. Dysfunctions were treated and resolved with mobilising and manipulative techniques of manual medicine. Regardless of cervical spine findings seen at the initial visit, group A and B patients received intensive outpatient physical therapy. At the final 3-month follow-up, 24 patients of group A (77.4%) reported an improvement of their chief symptom and 5 patients were completely free of vertigo. Improvement of vertigo was recorded in 5 group B patients (26.3%); however, nobody in group B was free of symptoms. We concluded that a functional examination of motion segments of the upper cervical spine is important in diagnosing and treating vertigo, because a non-resolved dysfunction of the upper cervical spine was a common cause of long-lasting dizziness in our population.

Key words Vertigo · Cervical spine dysfunction · Manual medicine

Introduction

The term “dysfunction” as used in manual medicine terminology is defined as a reversible, functional restriction of motion of an individual spinal segment or as a peripheral articular malfunction presenting with hypomobility. The appearance of dysfunctions of the upper cervical spine can be the cause of localised or pseudoradicular

pain as well as the cause of vertigo and impaired hearing via disturbances of the proprioception from the neck. The significance of dysfunctions of the upper cervical spine as one cause of vertigo and impaired hearing has been commonly discussed in ENT and neurology literature [5, 9–14, 20, 22–26]. Commentators in the field of manual medicine limit the influence of dysfunctions of the cervical spine as a cause of vertigo to upper cervical spine segments [8, 16, 27, 28]. Dysfunctions below the motion seg-

ment C2/C3 are thought unlikely to be a cause of vertigo [27, 28]. Clinical experience correlates with anatomical studies, which were able to identify links between cervical spine receptors and vestibular nuclei [1, 2, 17–19]. A large supply of receptors was found in neck muscles, especially when muscles were short and in close proximity to facet joints [6]. We are unaware of quantitative data regarding dysfunctions the upper cervical spine segments as a cause of vertigo.

Materials and methods

Sixty-seven patients were referred to us to rule out a cervical spine problem as a cause of vertigo. All patients displayed symptoms of dizziness, and preceeding ENT and neurology examination had excluded causes relating to their respective fields. Fifty of these above-mentioned patients were included in the study. They followed a programme of physical therapy and were available for two follow-up examinations, after 2 weeks and after 12 weeks. Ages of patients ranged from 19 to 78 years, averaging 43 years.

A reproducible manual medicine examining technique, consisting of three well-defined steps [4], was used to diagnose segmental cervical spine dysfunction. Firstly, hypomobility of the individual spinal segment was determined by examining isolated segmental rotation and observing asymmetry in rotation of one side compared to the other. Limited rotation of individual cervical spine segments was detected by comparative palpation of bony prominences of adjacent vertebrae serving as points of reference, e.g. mastoid process, transverse processes of the atlas, and spinous process of the axis. The spine was then examined for a so-called “zone of segmental irritation” which is a topographically well-defined site in the musculofascial tissue exclusively assigned to the specific spinal motion segment. The zone of segmental irritation is detected by palpation. Its characteristics are tenderness to palpation, increased palpatory resistance and nonuniform consistency and plasticity of the zone [4, 7]. The zone of segmental irritation directly relates to the dysfunction of the individual spinal segment in terms of time and quality, as it will disappear once the dysfunction is corrected. Segmental dysfunctions are functional restrictions of motion in contrast to structural changes restricting motion (e.g. arthrosis deformans). Mandatory clinical signs of segmental dysfunctions are the presence of so-called “closed/restricted directions” as well as the obligatory presence of at least one “open direction”. The functional provocative examination elicits pain in the restricted segment upon movement in the “closed direction” and diminishes pain with movement in the “open direction” [4, 7]. The third step completes manual diagnosis of segmental dysfunction by testing the zone of segmental irritation during a functional examination. Spinal segments adjoining the restricted spinal segment are carried to both sides of their respective barriers, thereby forcing the restricted segment to move also. The zone of segmental irritation will react to this provocative functional examination with an increase in consistency and pain to palpation in one direction as well as a decrease of these qualities in the other direction, thereby qualifying the segmental somatic disturbance as a dysfunction.

Cervical spine dysfunctions were recorded as published by Bischoff [4], i.e. the functional disorder is not assigned to the motion segment but to the subsequently treated vertebra. If dysfunctions of cervical spine segments were diagnosed in the studied patients with vertigo, they were subsequently resolved with manual therapy. Mobilising techniques without impulse as well as manipulative techniques with high-velocity impulses were applied. Principally rotatory impulse forces were directed towards the “open direction”, and generally simultaneous axial traction forces were applied.

At the initial visit each patient underwent a cervical spine examination according to the above outlined manual medicine principles. If a cervical spine dysfunction was present, the patient was treated with manual therapy as outlined. All patients received physical therapy as outpatients for 3 months. The first follow-up examination was scheduled after 2 weeks of treatment. The re-examination provided information regarding remaining complaints. In cases of recurrent cervical spine dysfunction – usually described by patients as an increase of vertigo after temporary relief – the patients were treated with manual therapy again. Patients without cervical spine dysfunction at the first visit were also re-examined to exclude the possibility of having overlooked such a dysfunction at first examination. A second follow-up examination was performed after 3 months of therapy.

Quality and quantity of physical therapy slightly differed, as it was received on an outpatient basis. According to the patients subjective rating, we categorized the outcome as “free of vertigo”, “improved” or “not improved”.

Results

Thirty-one patients, hereinafter referred to as group A, displayed dysfunctions of the upper cervical spine at the initial visit. The remaining 19 patients, hereinafter referred to as group B, did not have dysfunctions of the upper cervical spine.

Group A

Dysfunctions were recorded at level C1 in 14 patients, at level C2 in 6 patients and at level C3 in 4 patients. Involvement of more than one of the above segments was seen in seven patients: combined dysfunctions of C1 and C2 were seen four times, of C1 and C3 twice and of C1, C2 and C3 once.

Two weeks after initial manual therapy and adjunct physical therapy, 16 of the 31 patients in group A reported a significant improvement of vertigo. Four patients reported a temporary improvement of vertigo after initial manual therapy; however, this was followed by a recurrence of vertigo of less intensity after a few days. These patients presented with dysfunctions at identical segments as at their initial examination, and again these dysfunctions were resolved by manual therapy. At the 3-month follow-up, 24 of the 31 patients of group A (77.4%) reported a lasting improvement of vertigo, and 5 of them even reported a complete relief of vertigo. Seven patients remained with no improvement.

Group B

None of the 19 patients of group B showed an improvement of vertigo after 2 weeks of outpatient physical therapy. Repeat examination after 2 weeks did not reveal cervical spine dysfunctions in any of those patients. At final examination after 3 months, only 5 patients (26.3%) re-

Table 1 Fisher test of the significance of cervical spine dysfunction with respect to outcome of vertigo

	Improved	Not improved	
Group A	24	7	31
Group B	5	14	19
	29	21	50

Fisher's $P = 0.000499$

ported an improvement of vertigo, while the remaining patients of group B complained of vertigo of unchanged intensity.

Statistical analysis was performed using the Fisher test [15, 21], which proved significance with respect to the outcome (vertigo improved or not improved) depending on the group (cervical spine dysfunction present or not present) (Table 1).

Discussion

It is apparent that improvement of vertigo was seen more frequently in patients of group A than in those of group B

(77.4% vs 26.3%). A similar pattern was seen with respect to complete relief of vertigo. We conclude that physical therapy is more likely to succeed in reducing vertigo symptoms if these patients present with an upper cervical spine dysfunction that is successfully resolved by manual medicine prior to physical therapy. We regard the cervical spine dysfunction seen in patients of group A as the principal cause of their vertigo. However, a different explanation is necessary to understand the improvement – without complete relief – of vertigo of some group B patients without cervical spine dysfunctions after 3 months of physical therapy. Group B patients had negative manual medicine examination findings as well as negative ENT and neurological examination findings in common. The positive influence of physical therapy in some of these patients may be explained by an improvement of muscular imbalances of neck muscles. The existence of links between neck muscles and vestibular nuclei is known [6].

In the presence of vertigo, our presented data suggests consideration of cervical spine dysfunctions, requiring a manual medicine examination of upper motion segments. The ratio, however, of dysfunction-related vertigo to the overall occurrence of vertigo remains unclear. This analysis will be left to an interdisciplinary study.

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