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General Osteopathic Treatment is Associated with Postural Changes

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Authors' contributions

This work was carried out in collaboration between all authors. Author FC designed the study and wrote the manuscript. Authors LP and GL collected the data and performed quality control. Authors GB and KV assisted in statistical analysis. All authors read and approved the final manuscript.

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Short Research Article

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ABSTRACT

Aim: To investigate whether standard general osteopathic treatment can influence the static configuration of the vertebral column or pelvis.
Material and Methods: One hundred thirteen persons, 72 females and 41 males, either symptom-free volunteers or patients with mild idiopathic back pain, were investigated using the DIERS formetric® system, before and immediately after a single session of general osteopathic treatment. Variables of static assessment of the thoraco-lumbar vertebral column and of the pelvis were compared before and after treatment, using paired statistics.
Results: There was no difference between observations in the healthy controls and the symptomatic patients. The sagittal imbalance decreased significantly (two sided student's t-test: P=0.034), apical deviation diminished (one sided student's t-test: P= 0.047) after treatment and lordotic apex position increased (one sided student's t-test: P=0.028). Since such changes have not been observed in a previous trial of repeat measurements without treatment, the observations in the present study suggest an effect of treatment. This effect was, however, limited to persons

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with sagittal imbalance not exceeding the 62nd percentile.
Conclusion: General osteopathic treatment is associated with reduced sagittal imbalance and apical deviation and increased lordotic apex position, but this effect is demonstrable only in persons whose sagittal imbalance ranks in the lower or median tertile.

Keywords: Osteopathy; spine; general osteopathic treatment; alternative medicine; sagittal imbalance; lordosis.

1. INTRODUCTION

There is increasing pressure on methods of complementary and alternative medicine to adhere to the rules of evidence based medicine [1,2] and to follow the research roadmap for complementary and alternative medicine [3]. Osteopathic manipulation still is under critical scrutiny and needs evidence-based assessment. This treatment has been shown moderately effective in patients with low-back pain, whereby several methods of pain scoring [4-6], pain pressure thresholds [7], neural mechano-sensitivity [8], or biomechanical parameters during flexion were assessed [9]. Also a favourable effect of osteopathic manipulation on cervical hysteresis [10] and inter-vertebral range of motion [11] has been reported.

To the best of our knowledge, there are no publications on the effect of "general osteopathic treatment" (GOT) on the postural status of the thoraco-lumbar spine and pelvis using the Diers 4D formetric® method (Diers international Gmbh, Schlangenbad, Germany), which is non-invasive, does not use ionising radiation, is fast and painless, and generates reproducible results [12]. The Diers system allows for immediate and objective assessment of the results of treatment on a large number of variables, and describes detailed aspects of the spinal posture.

In a previous study we have certified the reproducibility of repeated measurements of the characteristics of the thoraco-lumbar vertebral column and pelvis using the Diers D4 formetric system® (Lason et al., in press). In 154 healthy volunteers we did not find any significant changes in measured variables between the first and the second measurement, indicating that the repeat assessment generated the same values as the initial measurement in this control population. Also, we have redefined the reference values and assessed the influence of gender and of the body mass index (BMI) on the measured variables (Peeters et al., submitted).

The aim of the present study was not to estimate specific aspects of spine configuration in relation to particular complaints or pathology, but to detect whether measurable changes of angulations, torsions or balance of the pelvis and the vertebral column are associated with GOT. It was also attempted to define criteria for the selection of persons who might benefit from GOT, if such changes would be detected. For this purpose static spine and pelvic configuration were assessed before and after one single session of GOT [13].

2. MATERIALS AND METHODS

Sixty one symptom-free volunteers and 52 patients consulting because of mild idiopathic back-pain, gave written informed consent to participate in the study. Since the patients with back-pain were diagnosed as idiopathic, they were considered not to present any detectable organic pathology.

A static registration was performed of the back surface using the Diers-4D formetric® equipment, as described elsewhere (Lason et al. in press). In short, the person stood at a distance of 2 metres (6.5 ft) in front of the height-adjustable 4D scanning device. His feet were placed on a fixed position drawn on the ground. Markers were attached to the skin at several reference points and the person stood in a normal relaxed position, while breathing normally. The scanning process was performed in only 40 milliseconds, after which the image was immediately processed and quality-controlled visually. Next the person was treated by a 30 minutes session of GOT, after which he was immediately assessed again using the same procedure. GOT consisted of a systematic mobilisation and stretching of all articulations as nearly as possible through their normal range of motion, and manually correcting mechanical abnormalities of soft structures [13].

The variables that were measured are listed in Table 1.

All data were recorded in an Excel spreadsheet and analysed by the MedCalc® statistical program [14]. The following tests were performed: Mean and standard deviation, paired sample student's t-test (two-tailed and one-tailed), cumulative frequency distribution curve, and receiver operating characteristic curve (ROC) [15]. The two-tailed t-test was used when change in any direction would have to be detected. The one-tailed t-test was applied when it was expected that the measurement would be changed in one direction only [16,17].

3. RESULTS

Of the 113 participants 72 (64%) were female and 41 (36%) were male. The epidemiological characteristics of the participants were as follows: mean age 23.5 years (SD: 3.0 years) with range 20 to 38 years, mean height 172 cm (SD: 8.7 cm) with range 153 to 192 cm, mean weight 66.3 kg (SD: 10.2 kg) with range 48 to 91 kg, and mean BMI 22.4 kg/m^2 (SD: 2.8 kg/m^2) with range 17 to 32 kg/m^2.

There were no significant differences in the epidemiological characteristics, nor in the results of measurements between the healthy volunteers and the symptomatic patients. Hence, the data obtained in the two groups were added and analysed together.

The results of measurements before and after GOT, and the statistical significance (p-values) are listed in Table 1.

Sagittal imbalance significantly decreased from mean 3.13º (SD: 2.67º) before GOT to 2.83º (SD: 2.64º) after GOT (two-sided t-test, p= 0.034), apical deviation decreased from 5.21 mm (SD: 3.09 mm) to 4.80 mm (SD: 2.64 mm) (one-sided t-test, p= 0.047), and lordotic apex position increased from mean 37.50º (SD: 40.63^0) to 43.81º (SD: 40.47º)(one-sided t-test, p=0.028). None of the other variables presented significant changes.

The cumulative frequency distribution curve of sagittal imbalance depicts the shift to lower values after GOT (Fig. 1). Upon analysis of the ROC curve it becomes evident that the effect associated with GOT is limited to persons of whom the sagittal imbalance is situated between the 1st and 62st percentile (Fig. 2).

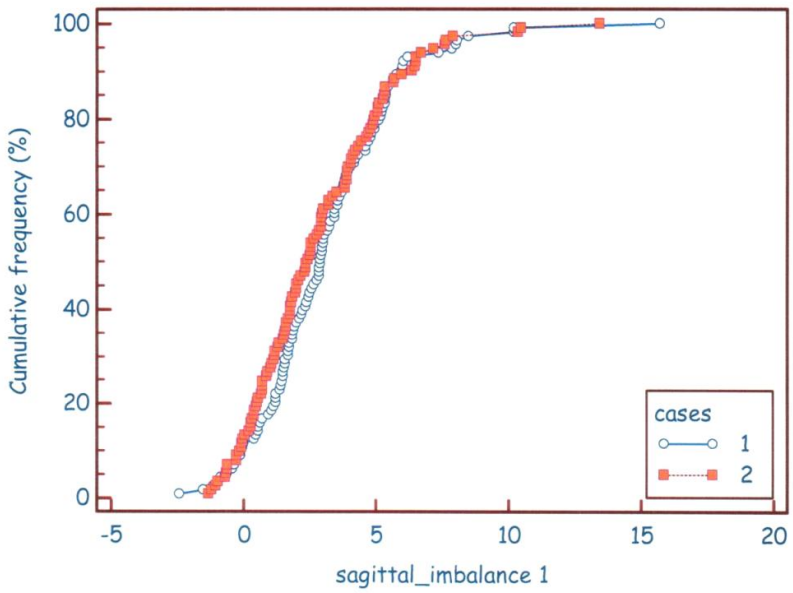

Fig. 1. Curves of cumulative frequency distribution in relation to the degree of sagittal imbalance (in degrees on the horizontal axis) before (cases 1; blue round dots and line), and after general osteopathic treatment (cases 2; red squares and line). The difference between the sagittal imbalance before and after GOT is statistically significant (two sided students t-test, p= 0.034)

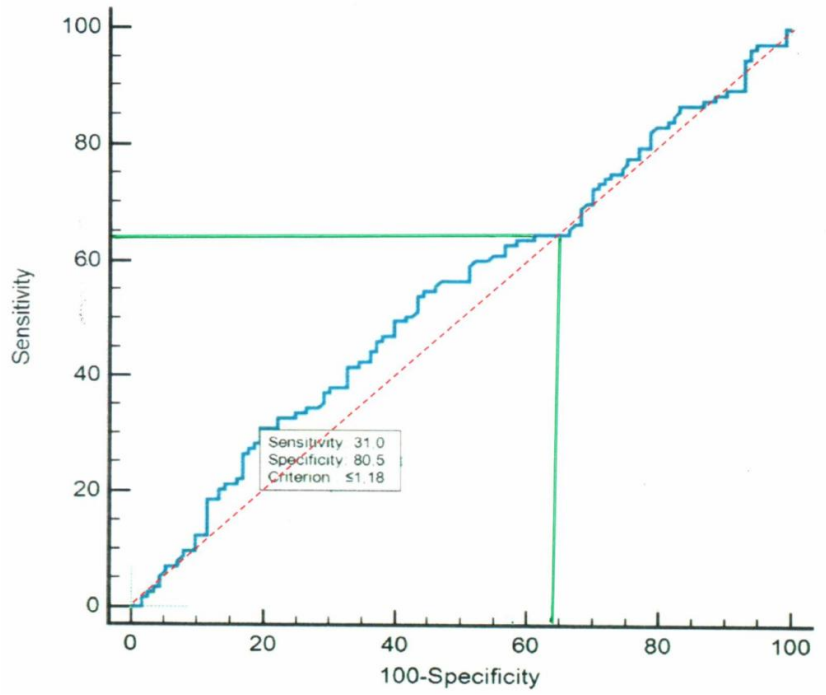

Fig. 2. Receiver operating characteristic (ROC) curve of sagittal imbalance, comparing the values before and after general osteopathic treatment. The red line depicts the diagonal. Points that are situated on the diagonal indicate that the measurements before and after general osteopathic treatment (GOT) were identical. In the cases belonging to the first and second tertile the ROC curve is situated toward the left cranial corner of the graph, indicating a reduction of the imbalance after GOT

Table 1. Variables (in alphabetic order) that were measured by the Diers4D system in the 113 cases included in the study. For each variable the mean values (SD) before and after general osteopathic treatment (GOT) are given, as well as the level of statistical significance as p-value, based on student's t-test for paired replicates(two sided), or one-sided when indicated with (*)

Variable	Units	Before_GOT	After_GOT	p_value
		Mean (SD)	Mean (SD)	
Amplitude vertebral rotation	[°]	9,13 (3,41)	8,97 (3,38)	0.583
Apical deviation	[mm]	5,21 (3,09)	4,8 (2,64)	0,047*
Coronal imbalance	[°]	-0,24 (1,21)	-0,16 (1,18)	0.388
Kyphotic apex	[mm]	-171,44 (24,28)	-170,92 (24,28)	0.731
Lateral deviation	[mm]	-0,42 (6,55)	-0,98 (6,65)	0.371
Lordotic apex	[mm]	-382,18 (37,95)	-383,71 (36,31)	0.246
Lordotic apex position	[mm]	37,5 (40,63)	43,81 (40,47)	0,028*
Maximal kyphotic angle	[°]	48,79 (9,37)	48,13 (8,39)	0.18
Maximal lordotic angle	[°]	40,46 (9,38)	40,23 (9,35)	0.508
Maximal surface rotation	[°]	-2,82 (5,79)	-3,05 (6,06)	0.58
Maximal vertebral rotation	[°]	-0,97 (7,41)	-1,56 (7,35)	0.329
Pelvic inclination	[°]	23,13 (8,7)	23,07 (9,0)	0.777
Pelvic obliquity	[°]	-0,63 (3,47)	-0,45 (3,42)	0.464
Pelvic rotation	[°]	-0,88 (3,9)	-0,7 (3,55)	0.536
Pelvic torsion	[°]	-0,02 (2,63)	0,3 (2,62)	0.163
Sagittal imbalance	[°]	3,13 (2,67)	2,83 (2,64)	0.034
Trunk torsion	[°]	1,86 (5,95)	2,08 (4,46)	0.652

4. DISCUSSION

The present data were obtained in an open, uncontrolled and prospective trial. In a previous study, including a large control group, it was certified that the static characteristics of the pelvis and the spine do not change between an initial assessment and a repeat assessment performed shortly afterwards. Therefore, any changes that occurred after GOT should be related to the latter, and cannot be assigned to either chance or a learning effect.

The study showed that a number of anatomical variables, such as kyphotic and lordotic angulations, pelvic torsion, and pelvic imbalance were not affected by treatment. However, other variables were significantly changed, namely sagittal imbalance and apical deviation diminished, whereas the lordotic apex position was increased. These findings suggest GOT to be associated with a correction of the vertical position without changing the intrinsic configuration of the spine.

It remains to be investigated whether these small, though significant changes of the spine posture after GOT can be related to clinical effects [18], particularly since the observations are limited to the short-term effect of one GOT session, and follow-up is lacking.

5. CONCLUSION

In the two thirds of persons, ranking in the lowest or median tertiles of sagittal imbalance, GOT is associated with a reduction of this imbalance and of the apical deviation, and with an increased lordotic apex position. It remains to be investigated whether these changes of the static spine configuration may be related to a possible effect on clinical symptoms.

This study was approved by the ethical committee of the International Academy of Osteopathy, it is not against public interest and respects the privacy of the subjects as well as their human rights.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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