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PHYSICAL THERAPY FOR CHRONIC LOW BACK PAIN: CORRELATIONS BETWEEN SPINAL MOBILITY AND TREATMENT OUTCOME

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ABSTRACT. Chronic low back pain in 151 men aged 54 to 63 years was treated for three weeks in a rehabilitation centre or as outpatients at a health centre. Spinal mobility of forward and lateral flexion, and rotation, were measured before and two months after treatment. The effects of the treatment on low back pain were recorded from questionnaires answered before and 2, 6 and 12 months after treatment. A favourable outcome correlated significantly with an increase of spinal lateral flexion ($p<0.01$) and rotation ($p<0.05$). The hypothetical utility of mobilizing lateral flexion and rotation exercises as part of the rehabilitation of patients with chronic low back pain is discussed.

Key words: Chronic low back pain, physical therapy, spinal mobility

Mobility is one of the few objective signs for clinical assessment of spinal function and back pain severity. Being a simple and easy method, forward flexion measurement (11) has long been employed and is still the method most often used clinically, though lateral flexion and extension are also included in indexes of objective spinal function (5, 9). On the other hand, the value of mobility measurements in the assessment of back pain severity has been questioned by some investigators (9).

After an acute attack of back pain there may often be some residual stiffness of the spine, and a therapeutical approach to normal functional mobility would seem to be indicated. However, mobilizing exercises have not been as successful as treatments of a less mobilizing nature (3, 6). On the other hand, many point out that normal spinal mobility is a goal in the rehabilitation of back pain disability (1, 4).

The object of this paper is to analyze correlations between spinal mobility and the results of physical therapy for chronic low back pain.

SUBJECTS AND METHODS

Subjects

In a previous study (8), the outcome of the treatment of chronic low back pain in veterans at a rehabilitation centre was compared with corresponding outpatient treatment. No substantial difference between the results of the two modes of treatment was found according to a back pain index, which also showed that the average effects of treatment lasted six months but disappeared almost completely within a year. In this paper no distinction is made between in- and outpatient treatment.

The subjects were 151 males, with an average age of 58.9 years (range 54–63), who suffered from chronic or recurrent low back pain. Data on selection, characteristics and degree of disability have been presented in the earlier article (8).

The questionnaires

Questionnaires were filled in before treatment and 2, 6 and 12 months after treatment. The questionnaire variables have been described previously (8). They reflected the severity of back symptoms during the preceding two months and the total constituted the back pain index, which had a theoretical range of 3 to 27.

Measurement of spinal mobility

Forward flexion 1 was measured by placing marks on the sacrum as described by Macrae & Wright (7) and on the processus prominence in an upright position, and measuring the distraction of the two marks during maximum forward bending. Data on this measurement are lacking for the first twelve patients studied.

Forward flexion 2 was measured by a physiatrist according to Schober's method (11), using the modification described by Macrae & Wright (7).

Lateral flexion was measured as the distance the tip of the middle finger moved down the thigh during purely lateral bending. The results for both sides were added together.

Rotation was measured with the patient sitting on a stool with his arms folded across his stomach. A compass was placed on the forearms and its reading in the extreme positions was recorded. The degrees of the two extreme positions were added together.

Spinal mobility measurements (except for forward flexion 2) were conducted by the same physiotherapist before treatment and two months after it, and the difference was recorded.

The treatment

The rehabilitation centre group underwent three weeks' treatment. The outpatient group was treated at the health centre ten times during a three-week period. The average amounts of back treatment given to each patient have

Table I. *Means and standard deviations of pre-treatment spinal mobilities and their follow-up differences; and the statistical significances (p) between the means of pre- and post-treatment measurements (all mobilities in cm except for rotation which is given in degrees)*

	Pre-treatment mobility			Follow-up differences			
	n	Mean	SD	*n*	Mean	SD	*p*
Forward flexion 1	139	9.1	1.8	138	0.2	1.3	NS
Forward flexion 2	151	6.1	1.3	150	0.1	0.6	<0.05
Lateral flexion	151	26.2	6.3	150	0.0	4.9	NS
Rotation	151	73.7	17.0	150	3.1	17.6	<0.05

been reported previously (8). It included heat or electrotherapy, massage, back exercises, physical exercises and back school. The treatments were not standardized, but the therapeutic exercises were given by the same physiotherapist in both places of treatment. The back exercises consisted of isometric and isotonic exercises to strengthen and stretch the muscles of the trunk and lower extremities.

In addition, the patients at the rehabilitation centre also received general treatments such as baths, relaxation exercises and hydromassage.

Overall treatment outcome

The treatment result for each follow-up period is the difference between the pre-treatment and the follow-up levels of back pain index. The mean of the differences between the pre-treatment and two- and six-month follow-ups plus the difference of the 12-month follow-up constitutes the index for the overall treatment outcome.

Statistical analysis

Participation in the pre-treatment and two-month follow-up examinations was 100%. The response rate at the six-month follow-up was 97% and at the 12-month follow-up 93%. Missing data for the back pain index were estimated by regression analysis, using the corresponding items in the pre-treatment questionnaire, which were complete for all patients, and other back pain variables of the follow-up questionnaire as explanatory variables.

The correlation analysis was made using Pearson's coefficients. Missing observations were replaced by mean values and the total numbers of subjects were used in the significance calculations.

The significance of the difference between the means of the mobility measurements before and after treatment was calculated by using the *t*-test for matched groups.

RESULTS

The means of the pre-treatment spinal mobilities are shown in Table I, together with their follow-up differences. All the mobilities increased except for lateral flexion. The changes were statistically significant for forward flexion 2 and rotation.

The correlation coefficients between the pre-treatment mobility measurements are shown in Table II. All the mobilities correlated significantly, but the correlations between the two different measurements of forward flexion were the clearest. There was also a strong correlation between rotation and lateral flexion.

The correlation coefficients of the overall treatment outcome with the pre-treatment spinal mobilities and with the follow-up differences are shown in Table III. None of the pre-treatment measurements were substantial or statistically significant. On the other hand, there were positive correlations between the overall treatment outcome and the follow-up differences. They were statistically significant for lateral flexion ($p<0.01$) and rotation ($p<0.05$).

Table II. *Correlation coefficients between the pre-treatment spinal mobility measurements*

		Forward flexion		Lateral flexion
	n	1	2	
Forward flexion 1	139	–		
Forward flexion 2	151	0.565***		
Lateral flexion	151	0.322***	0.277***	
Rotation	151	0.177*	0.204*	0.504***

* $p<0.05$. *** $p<0.001$.

Table III. *Correlation coefficients and significance levels of the overall treatment outcome with the pre-treatment spinal mobility measurements and with the follow-up differences*

	Pre-treatment mobility	Follow-up difference
Forward flexion 1	0.09	0.09
Forward flexion 2	0.04	0.13
Lateral flexion	−0.06	0.26**
Rotation	−0.03	0.16*

*$p<0.05$. **$p<0.01$.

DISCUSSION

According to the results the follow-up differences for lateral flexion and rotation but not for forward flexion had significant correlations with the overall treatment outcome. This may be due to the fact that forward flexion was measured by methods differing in kind: measurement with a tape on the skin along the spinal column may be less sensitive than the methods used for measurements of lateral flexion and rotation.

On the other hand, this difference between the mobilities may be due to a real difference: in daily life there are few occasions for extreme lateral bending and rotation but maximum forward bending is a common movement. Thus stiffness in lateral flexion and rotation easily remains after an attack of back pain, and physical therapy may have a better chance of increasing these two mobilities. Nevertheless, the pre-treatment mobility levels did not correlate with the overall treatment outcome. This is probably due to individual variations of spinal mobility.

The question may be raised of whether the results give rise to any therapeutic considerations, i.e., can exercises with mobilizing movements of lateral flexion and rotation be recommended and can better treatment results be assumed to follow from them?

Mobilizing therapeutic exercises have not been recommended for back pain treatment in recent times because they are regarded as detrimental to the intervertebral discs. Increased pressure has been measured in the discs during such exercises (10). Lateral flexion and rotation in particular are considered to be dangerous (2). Reports indicate that mobilizing exercises have not been as successful as isometric exercises in the treatment of back pain (3, 6).

No vigorous mobilizing exercises were used in this study, and no comparison was made between such exercises and other kinds of back exercises. The increase of spinal mobility should therefore be regarded primarily as an improvement in the general condition of the back. On the other hand, the subjects of this study started with chronic or recurrent low back pain but little acute pain, and the changes of mobility are thus supposed to reflect real results of treatment, not a spontaneous remission from acute back pain.

It is believed that, in most cases, mobilizing exercises are definitely not useful in the treatment of acute and subacute back pain. Later, after the injured structures have healed, there are probably no contraindications to restoring spinal mobility by means of mobilizing exercises. Stiffness and tension preventing normal spinal mobility probably impose a continuing load on the spinal tissues, and their elimination may thus be of considerable therapeutic and prognostic importance.

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