

THE NATURAL HISTORY OF IDIOPATHIC LOW BACK PAIN

A Three-year Follow-up Study of Spinal Motion, Pain and Functional Capacity

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ABSTRACT. During a three-year follow-up study of 31 chronic idiopathic low back pain patients significant spontaneous improvements of pain and disability scores were found, while range of motion of the lumbar spine decreased. It is argued that increasing stiffness of the low back may be the clinical manifestation of the process of stabilization, that takes place in previously painful instable motion segments. The present findings have also implications for the interpretation of changes of spinal motion. Restriction of range of motion seems to be a normal long-term development in low back pain patients and is accompanied by a diminution of pain and disability.

Key words: Low back pain, functional capacity, physical measurements, outcome study

The concept of lumbar segmental instability as a cause of back pain is biologically plausible. It has been studied intensively during recent years (4, 8, 11). The first phase of degeneration of a motion segment is believed to produce a loss of stiffness or instability. This mechanical disturbance may put strain on various structures, including nociceptors. In the next stage reparative processes reestablish a sufficient degree of stiffness and the pain may subside. So far no generally accepted definition of segmental instability has been developed. In the absence of a clear definition (15), the experimental proof of segmental instability as a causative factor of low back pain cannot be given.

Biomechanical (14, 20) and clinical (2, 5, 13, 20) studies of range of motion have been done in cadavers and in asymptomatic living subjects. Mobility is generally found to decrease with increasing age, but no longitudinal studies are available. Epidemiological studies have mostly concentrated on subjective reports of pain and disability (1, 6, 19), although attempts have been made to identify risk factors for the future development of low back pain, based on physical measurements (2). The majority of the available long-term follow-up studies of back pain patients are only concerned with pain and disability

scorings (7, 18, 21). No study has reported a long-term comparison of range of motion of the lumbar spine and pain and disability ratings.

To test the hypothesis that restoration of stiffness (as opposed to instability) parallels a decrease of low back pain we did a *longitudinal* clinical study, in which the time course of subjective ratings of *pain* and *disability* were compared with objective measurements of *spinal mobility*. This is an extension of a previous one-year follow-up study of chronic idiopathic low back pain patients, in which an inverse relationship of spinal mobility and functional capacity was noted (10).

METHODS

Patients

Forty-three patients, suffering from chronic low back pain, in whom spinal pathology other than degenerative changes had been excluded and who had completed a controlled one-year prospective study of the effect of the Swedish Back School versus placebo-treatment (10), were contacted again in March or April 1984, when a minimum of three years had elapsed since the original measurements.

Measurements

The Jan van Breemen Institute set of measurements (9) assesses 1) six aspects of back pain during the past week, resulting in a Mean Pain Score (0: no pain, 10: unbearable pain); 2) degree of disability experienced during the last week as a result of back pain, resulting in a Mean Functional Capacity score (0: minimal functional capacity, 10: maximal functional capacity); 3) spinal mobility (tests of flexion, extension and lateral bending of the low back, expressed in cm and active straight leg raising, expressed in degrees of angle). In the earlier study measurements had been done twice in the initial phase of the study and subsequently after 3, 6 and 12 months. The same assessment was now repeated after a minimum of 36 months. Measurements were always made by an independent observer. In previous studies it was found that objectivity, reliability and validity of the set of measurements were satisfactory (9, 10).

Table I. Comparison of 1984-participants vs. non-participants: age and sex distribution, initial scores

	Participants n=31	Non-participants n=12
Age in 1980-81	50.9±8.5 yrs	51.0±11.7 yrs
Sex	14 men, 17 women	5 men, 7 women
Duration of back pain before 1980-81	4.9±3.5 yrs	6.5±2.9 yrs
Pain score in 1980-81	6.0±1.4	6.8±1.4*
Functional capacity in 1980-81	4.6±1.4	4.3±1.4
Flexion, extension, lateral bending in 1980-81	5.2±0.8	5.3±0.9
Active straight leg raising in 1980-81	53±23	61±22

* $p < 0.05$ (Student's *t*-test).

Statistical methods

Data obtained from the repeated measurements were subjected to an analysis of variance (23) using the model with repeated measures on one factor. Outcome differences between the experimental and control group of the original study were tested by an analysis of the interaction between groups and repeated measurements in the analysis of variance model.

RESULTS

Thirty-one out of forty-three patients of the original study could be included in the present study. One patient had died of a cause unrelated to the back pain, four patients refused further participation and seven patients had moved and could not be traced. Table I shows that the 1980/1981 initial values yielded no significant differences (except for the pain scores) between the 1984 participants and those who did not participate in 1984. Also age and sex distribution did not differ. The time interval between the initial and the final measurements of the participants was 3.7 ± 0.4 years.

Changes of the effect variables over the three-year period. The time course of the effect variables over the three-year period is shown in Fig. 1. The analysis of variance showed significant changes for all four groups of variables (Table II). Pain decreased ($F(5, 145) = 2.8; p < 0.05$), functional capacity increased ($F(5, 145) = 4.5; p < 0.01$), spinal mobility decreased ($F(5, 145) = 11.5; p < 0.01$) and active straight leg raising increased ($F(5, 145) = 4.1; p < 0.05$). Comparison of the direction of the initial and the long-term changes shows a difference. In the initial phase of the study an increase in reported pain and a decrease of functional capacity were associated with a loss of spinal motion. In the long run, however, a decrease in spinal motion clearly accompanies decreasing pain and improving func-

tional capacity, while also a progressive improvement of active straight leg raising is observed.

When the long-term results of the experimental and the control group of the original study are considered separately, there is a general tendency for more improvement in the control group than in the Back School group (Table III), although only the difference in pain scores reached statistical significance ($F(5, 145) = 2.7; p < 0.05$).

DISCUSSION

Stiffness, instability, pain and functional capacity

The study of the natural history of low back pain can shed light on the relationship between pain, disability and objective parameters, e.g. spinal mobility. The results of this study show evidence in support of the hypothesis that increasing stiffness of the lumbar spine is accompanied by improving

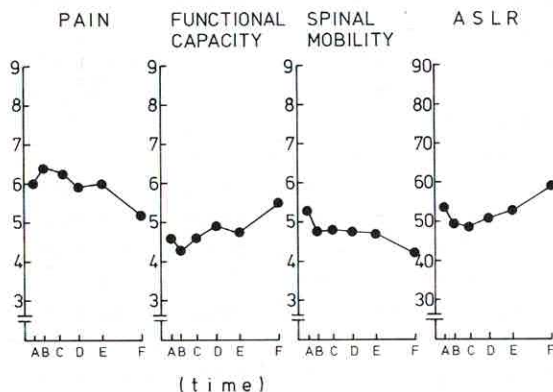


Fig. 1. Graphical representation of the results. Time course of the group means of the variables. (A, B) Before, after the treatment period respectively; (C, D, E, F) 3, 6, 12 and more than 36 months after treatment respectively.

Table II. Time course of the effect variables; group means for the whole group of 31 patients

A: before treatment; B: after treatment; C, D, E, F: 3, 6, 12 and more than 36 months after treatment respectively

	A	B	C	D	E	F
Pain score	6.0	6.4	6.2	5.9	6.0	5.2*
Functional capacity	4.6	4.3	4.6	4.9	4.7	5.5**
Flexion, extension, lateral bending	5.2	4.8	4.9	4.8	4.6	4.2**
Active straight leg raising	53	49	49	51	53	59*

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

pain and disability ratings. Although a clinical study using tape measures of the low back is unable to detect the presence or absence of segmental instability, the results favor the concept of instability as a cause of low back pain and they also support the theory that increasing stiffness produces a more stable, less painful spinal column.

Because of the present lack of criteria for the clinical and radiological diagnosis of segmental instability (15), no attempt was made to confirm this diagnosis in individual patients. In this study it was assumed for the whole group of patients that a lack of stability was related to their back troubles. In a prospective study Biering-Sørensen (2) found men with hypermobile backs more liable to develop a first episode of back pain. We studied a group of chronic low back pain patients, in which the process of stabilization may have started several years ago. Nevertheless a clear inverse relationship of range of lumbar motion and scores of pain and disability was found.

Further research is needed to investigate whether there are differences in age-related loss of mobility in people without back pain (5, 13) and low back

pain patients. Hence measurements of range of spinal motion cannot be used yet as a diagnostic tool for segmental instability. Moreover, there is also a wide range of normal values (5, 13) with probably considerable overlap between people with and without back pain. It is difficult to explain why the patients in the control group eventually do slightly better than those in the Back School group, since there were no initial differences between the groups. Detuned shortwave cannot account for a better outcome in the control group. It is not plausible that instruction of ergonomic principles in the Back School group has been responsible for a less favorable result in that group. Psychosocial factors, which have not been included in the present study, may have influenced outcome. Anyhow, the differences were small in respect to the changes over the 3-year period in the whole group.

Interpretation of objective and subjective assessments in low back pain

Besides indications about the role of instability and stabilization in the natural history of low back pain, the present study also provides information about the interpretation of spinal motion. In clinical studies restricted spinal movement is usually believed to correlate positively with pain and disability. This is probably true for acute low back pain. This study shows that restricted spinal motion has a different meaning in the long-term development of low back pain, where impairment of back function is associated with less pain and disability.

Usually a reduction of active straight leg raising and spinal mobility are assigned the same meaning (22). Million et al. (12), who developed a method of assessment, which is quite similar to ours, added values obtained at spinal motion and active straight leg raising measurements to a combined index. Our results show clearly that for the assessment of long-term changes of low back pain patients lumbar

Table III. Changes of the effect variables; group means for the experimental group ($n=14$) and the control group ($n=17$) of the original study

E: experimental group; C: control group

		Initial values	After more than 3 yrs
Pain score	E*	5.8	5.7
	C	6.1	4.9
Functional capacity	E NS	4.5	5.0
	C	4.7	5.9
Flexion, extension, lateral bending	E NS	5.3	3.8
	C	5.2	4.4
Active straight leg raising	E NS	53	58
	C	53	59

* $p < 0.05$.

motion and active straight leg raising should be assigned opposite meanings.

Logic demands that in any syndrome, which is believed to be of physical origin, even when psychosocial factors are involved, as is the case in low back pain, attempts are made to explain the signs and symptoms by the pathological process. Therefore it seems to be logical that comprehensive tests of outcome in low back pain should contain objective variables related to the spine, e.g. range of motion. The widespread preference for only subjective scorings as relevant measures in the low back pain syndrome (3, 12, 16, 17), merely reflects the present difficulties in understanding the relationship between subjective and objective measurements. The results of this study indicate that restriction of range of spinal motion is a normal long-term development in low back pain patients, which is accompanied by a diminution of pain and improvement of functional capacity.

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