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# AUTOTRACTION VERSUS MANUAL TRACTION IN PATIENTS WITH PROLAPSED LUMBAR INTERVERTEBRAL DISCS

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**ABSTRACT. Forty-nine patients with lumbago–sciatica and prolapsed lumbar intervertebral discs, comparable concerning anamnestical and clinical data were randomized for autotraction and manual traction given by the same therapist for a period of one week while strict bed rest was prescribed. A blind overall assessment performed immediately after the traction period, after two weeks follow-up training and three months after hospitalization showed that the two traction modalities are equally efficient. As treatment for hospitalized patients with lumbar intervertebral disc prolapses the relatively simple manual traction variety should be preferred, if any. Traction is suggested to be used as a prognostical aid. Pain intensity was significantly reduced in all body parts. About one fourth of patients avoided operation. After two years there was no recurrence of symptoms.**

*Key words:* Lumbago, sciatica, pain, therapy, traction, clinical trials, prospective studies

For patients with lumbago–sciatica and prolapsed lumbar intervertebral discs it has been shown that after ten years of observation there is no valid difference between the results of conservative and surgical treatment, when patients that had to be operated were excluded (40). Consequently maximum effort should be made in order to relieve symptoms in the critical phase of the illness, possibly preventing unnecessary surgery.

Useful non-surgical treatment methods for patients with prolapsed lumbar intervertebral discs are shown to be bed rest and analgesics (42). Information and ergonomic advice (17, 43) and possibly crutches and corsets (27, 39). Some other physiotherapeutic methods are suggested (11, 25, 29), but only traction therapy seems to be beneficial (30, 33, 37) and a variety of modalities have been introduced (4, 9, 14, 15, 18, 22, 26, 28, 33, 34, 35).

Developed from existing traction methods Gertrud Lind introduced her own variety of autotraction (22). Her results stand out in sharp contrast to other treatment modalities for low back pain and sciatica, the reports from non-controlled studies including patients with radiculographically verified disc herniation even being superior to those reported after surgery for removal of a prolapsed intervertebral disc (12, 36, 39, 40).

The aim of the present investigation was to find out whether autotraction ad mod. Gertrud Lind is more effective than manual traction ad mod. Manual Therapy for patients with lumbago–sciatica and radiculographical signs indicating lumbar disc prolapses in conformity with the clinical symptoms.

## MATERIAL

The material included 52 hospitalized patients with lumbago–sciatica admitted to the Neurological Department, Ullevål Hospital during a one year period. All patients were considered for operation. Three males had to be excluded, one because surgery revealed an extradural ganglion which had been interpreted as a laterally situated prolapse, another because no distinct prolapse was found at operation, and one patient who changed his mind after one single traction session and was operated shortly afterwards. From a patho-anatomical point of view the patients may be considered a homogeneous group, the following criteria for inclusion in the study being applied: (*a*) manifest radicular signs and symptoms indicating affliction of the L5 and/or S1 nerve roots; (*b*) radiculographical findings in conformity with the clinical ones, indicating disc prolapse, i.e. indentation of the anterior dural surface as well as unilaterally shortened or widened nerve root sleeve; (*c*) positive Lasègue's sign; (*d*) symptoms aggravated or unchanged during the last 2–4 weeks; (*e*) no previous lumbar spine surgery.

The material comprised 32 men and 17 women between 17 and 67 years of age (mean age 39 years). An analysis of 24 background variables showed that the two subgroups randomized for the two treatment modalities were equal concerning anamnestical and clinical data, variables in Table I being excluded.

## METHODS

### *Treatment modalities*

Patients fulfilling the inclusion criteria were randomized between two traction varieties: Autotraction ad mod. Ger-

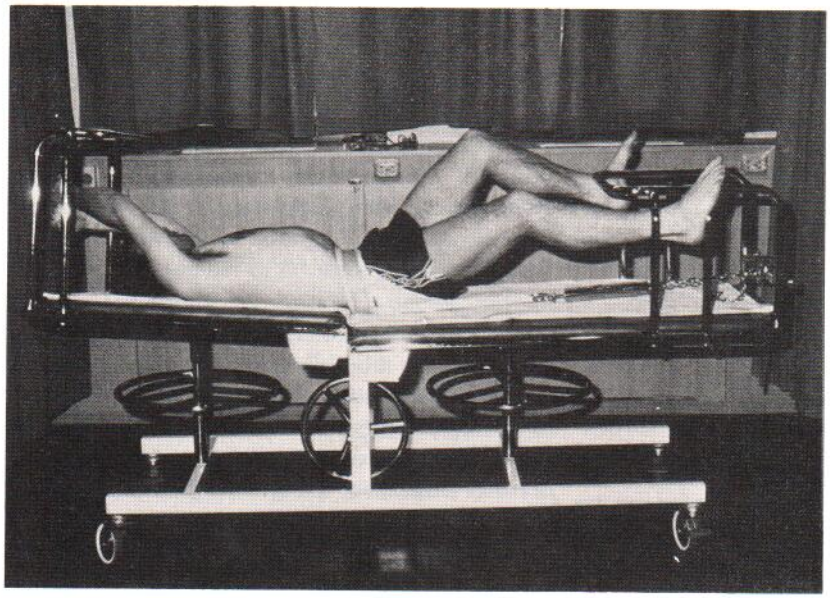

*Fig. 1.* The multiplane table with its devices adjusted to treat a patient with a right-sided latero-rizal prolapse.

trud Lind (22) and manual traction ad mod. Manual Therapy (15).

Autotraction was given on a multiplane table made up of two sections, allowing a three-dimensional variation according to the actual defence deviation (Fig. 1). The pelvis was fixed to the foot end of the bench with a belt and a chain, the setting of the belt as well as the point of fixation of the chain could be transversally changed, allowing also a three-dimensional variation in the direction of traction force. The patient himself generated and regulated traction force three-dimensionally, dragging by the arms and pressing by the legs. The position of the patient and the direction of traction force were chosen according to the clinical examination and response to treatment; these variables were ascertained as treatment proceeded, the sagittal plane being concerned previous to the frontal and transversal planes.

Optimum position and direction of pull were considered to be found when pain was alleviated or disappeared and whenever the Lasègue's sign and pain pressure provocation tests were normalized. Care was taken and time was givne to teach the patient how to co-ordinate the arms and legs, to relax the lumbar part and not to use more than the force needed. Traction force varied between 1/3 and 1/1 of the patient's body weight. Each pull was kept for some seconds and sometimes up to a couple of minutes. Every treatment session lasted for about one hour.

Manual traction was given on an ordinary plinth, the patient being supine with a variable degree of flexion in the hip and knee joints (Fig. 2). The therapist performed traction by means of straps, altering magnitude and direction of pull by shifting body weigh . According to calculations traction force in the belt scarcely reached 300 N. Static traction was given twice, each pull lasting for five minutes.

Table I. *Backgorund variables showing significant differences between the autotraction and manual traction subgroups*

| | Auto-traction $N=26$ | Manual traction $N=23$ | $p$-value |
|---|---|---|---|
| Level of herniation | | | |
| L4–L5 | 7 | 12 | 0.07 |
| L5–S1 | 19 | 11 | |
| Paravertebral pressure test | | | |
| Positive | 22 | 10 | <0.01 |
| Negative | 4 | 13 | |
| Duration since first episode of sciatica (weeks) | | | |
| Median | 88 | 20 | 0.10 |
| 95% confidence interval | 18–190 | 9–46 | |
| Pain intensity in the lower back (VAS scale in mm) | | | |
| Median | 15 | 34 | 0.10 |
| 95% confidence interval | 3–35 | 10–60 | |

*Examination*

Both traction modalities were based upon the same functional examination. It was considered to be of particular importance to distinguish between a medio-, sub- and latero-rizal nerve root affliction (2, 22). The main components of this analysis included observation of the standing patient, looking for an eventual deviation, carefully watching the movement pattern of the lumbar spine and registration of movements provoking characteristic pain.

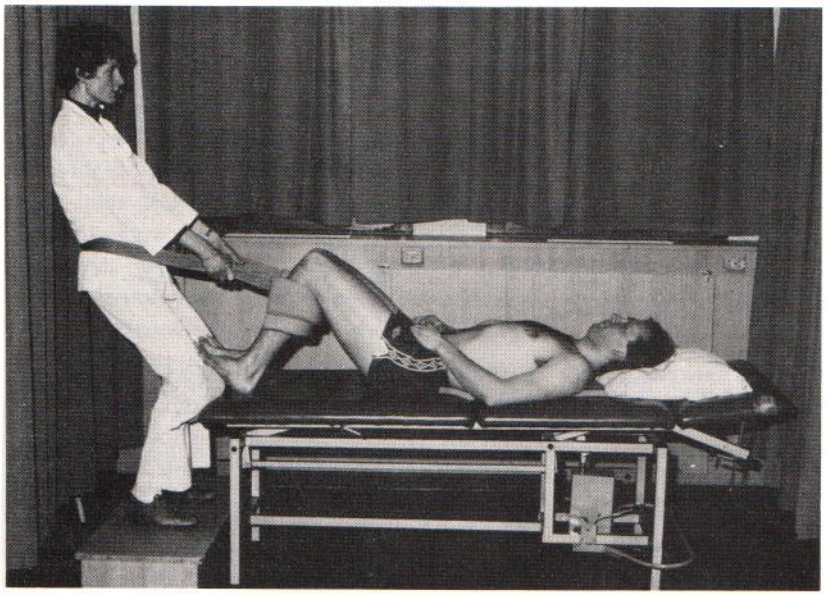

*Fig. 2.* Manual traction given to a patient with a mediorizal prolapse. A thin foam rubber cushion is placed under the upper part of the body to create a certain degree of friction. When necessary wedge-shaped pillows are used to adapt the transversal rotation to the actual deviation.

To register pain distribution and intensity a questionnaire was applied, including pain drawings and the Visual Analogue Scale (VAS) indicating pain intensity separately for five different body regions relevant to lumbago–sciatica (23).

*Treatment procedure*

The patients were not informed about their participation in a randomized investigation of two treatment modalities, manual traction being the conventionally prescribed method in the department for patients with herniated lumbar intervertebral discs (37). It was pointed out that taking part in the treatment arrangement was voluntary. The regime imitated that one indicated by Gertrud Lind (22). The rules were equal in both groups, and they were given in written form, the main components being as follows: The patients should be bedridden and only horizontal; they were merely allowed to walk to the lavatory when the bed had been moved to the toilet door. An elastic lumbar support was preferably used continually. The patients were deprived of long term working analgesics and were not allowed to have any analgesics later than five hours prior to the traction sessions.

All patients were given information about lumbar disc disease and back care, including a two lessons variant of The Sweedish Back School, developed about 15 years ago by Marianne Zachrisson Forssell (43). Other forms of physiotherapy were not applied during the traction period. Traction was started on the second day after the radiculographic examination, and three to seven treatment sessions were given during a one week period. One and the same person (A. E. L.) performed all traction treatments.

Whenever signs and symptoms were alleviated a hyperextension orthosis (Camp) was adapted, and the patients were carefully mobilized and given slight isometric exercises for one to two weeks. Within a two months period the hyperextension orthosis was replaced by the elastic lumbar support. When traction gave no success patients underwent operation.

Whenever patients deteriorated according to pain and Lasègue's sign the alternative traction modality was applied after three traction sessions. Different from the report of Eie & Kristiansen (8) referring to sustained one-plane traction, only paraesthesia had increased in one case. In the autotraction group nobody could be helped by manual traction, whereas two patients in the manual traction group were markedly improved after the subsequent autotraction variant. Concerning these patients the findings represent the results after the traction modality having failed to alleviate pain.

*Evaluation*

A blind overall assessment was performed by the neurologist (H. W.) before and subsequent to the traction period, and for the non-operated patients after two weeks follow-up training and three months after hospitalization. This evaluation, reflecting a general impression, was based upon the Lasègue's sign, functional ability and the patients personal opinion. In addition response to traction during the first treatment session was classified. Pain distribution and intensity were registered immediately after the traction period by the same type of questionnaire as applied at the initial examination (23), the patients not being allowed to see their previous markings. One to two years after hospitalization all non-operated patients were interviewed by a similar questionnaire.

*Statistical methods*

Except for frequencies the results are given as median with a 95 % confidence interval. For construction of confidence interval the Bernoulli-Wilcoxon procedure was

Table II. *Overall assessment immediately and two weeks after the traction period*

| | Autotraction $N=26$ | | | Manual traction $N=23$ | | |
|---|---|---|---|---|---|---|
| | No effect | Moderate effect | Good effect | No effect | Moderate effect | Good effect |
| Immediately | 21 | 2 | 3 | 15 | 4 | 4 |
| Two weeks | 21 | 1 | 4 | 16 | 4 | 3 |
| *p*-value | | NS | | | NS | |

used (20). All tests used in this analysis were one-tailed, and differences were considered statistically significant when the *p*-values were less or equal to a level of 5%.

For comparison of frequencies categorized data analysis was applied (16). Differences and changes in continuously distributed variables were tested by non-parametric methods with correction for ties (20).

## RESULTS

Neither the overall assessment immediately after the traction period nor after to weeks observation (Table II) showed differences between the two traction modalities. The results after three months were identical to those after two weeks. After one to two years a postal questionnaire answered by all non-operated patients revealed that there was no recurrence of symptoms, but rather a general improvement. All except one person attended work and managed well daily activities. Five persons were completely without pain.

The negligible difference between the results immediately after traction period and after three months means that when patients had to be operated the decision was made at en early stage. A good indicator of treatment outcome may be made already during the first treatment session, a spontaneously negative or doubtful response implying that traction will not give a positive result (Table III).

A comparison of pain intensity prior and subsequent to the traction period showed that pain had decreased significantly in all body parts, less pronounced in the lower back (Fig. 3). But the extent of pain reduction was about the same in the two treatment modalities.

In total the efficacy of the traction period was satisfactory in about 25% of the cases.

## DISCUSSION

Traction has been used in the treatment of spinal disorders since prehistoric times (34), indicating that this method has been successful in a considerable number of cases. But incomplete information about the patho-anatomical diagnosis (41) and insufficient knowledge about the natural history of spinal disorders (3, 32) may lead to preposterous appreciations and expectations.

### *Autotraction versus manual traction*

In evaluating the effect of autotraction the control group might have only a passive bed rest regime. This was not possible to accomplish, all patients having tried bed rest for a considerable period of time and accordingly might be regarded their own controls. Besides, in giving only strict bed rest to the controls care and attention would differ, implying a non-controlled placebo effect, possibly in favour of the autotraction group. In this study it was neither possible to give simulated traction, as was accomplished in comparable studies on the effect of Tru-Trac (38) and Spina-Trac (37) modalities. Therefore the actual study turned out to represent a practical approach, the control group having manual traction, the best alternative traction variety available.

The results suggest that the two traction modalities are equally efficient in patients with lumbago–sciatica and prolapsed lumbar discs. However, according to background variables the autotraction patients may represent the group most resistent to conservative treatment modalities. A positive paravertebral pressure test is shown to be associated with poor response to conservative treatment (5), and long duration since first episode of sciatica might be considered a variable of the same predictive value. In the long run it is also a slight tendency of patients in the autotraction group to improve, as opposed to the manual traction patients. Moreover, two persons deteriorating after manal traction were relieved by auto-traction, even after two years.

It should be stressed that patients responding negatively or doubtful during the first traction treatment session also showed poor final effects. That this is evident in the autotraction group suggests that autotraction could be used as a prognostical aid, giving priority to those patients with prolapsed lumbar intervertebral discs having a chance to be helped by conservative treatment modalities. Different from the present findings Cardell et al. (7) claims that increased pain after the first traction session is associated with a favourable result in patients with nerve root symptoms.

The possible superior prognostical value of autotraction may be associated with the fact that tense patients with high pain intensity are difficult to get along with using a method requiring a considerable amount of muscular force and co-ordination. This together with the tendency of improvement in the course of time in the autotraction group may also suggest that autotraction has the ability to find those patients having resourses to strive and cope with this painful and troublesome condition.

Both traction modalities carries some drawbacks: The auto-traction variety requires an expensive table, the method is complicated, some patients complain of shoulder pain, while others have difficulties in generating sufficient traction force and are easily exhausted. The intradiscal pressure increase during autotraction (1) is also un unfavourable factor, calling attention to influence on other mechanisms and structures than the disc as a cause of an eventual improvement. Thus, intradiscal pressure increase in active traction (1) as well as in isometric exercises (31) may account for the less frequent spontaneously positive response in the autotraction group than in the manual traction group. Manual traction, on the other hand may be exerting to the therapist, traction force will scarcely be larger than half of the therapist's heaviness, whilst 30% of the patient's body weight is supposed to represent a lower limit increasing the height of intervertebral space (14). The tightening of the belt may also give strain on beforehand painful legs, and traction force is non-specifically transmitted to the lumbar part through the knee- and hip joints. These factors, however, could have been avoided using a pelvis belt.

Viewed in the light of the drawbacks together with the almost equal final results of the two traction modalities the following principle of parsimony could be applied when ordinating traction for patients with prolapsed lumbar intervertebral discs:

Table III. *Relationship between response during the first traction session and the overall assessment immediately after the traction period*

| Response during the first traction session | Assessment immediately after the traction period | | | |
|---|---|---|---|---|
| | Autotraction $N=26$ | | Manual traction $N=23$ | |
| | No effect | Moderate or good effect | No effect | Moderate or good effect |
| Negative | 7 | 0 | 8 | 0 |
| Doubtful | 13 | 0 | 3 | 1 |
| Positive | 1 | 5 | 4 | 7 |

Manual traction should be tried initially. Whenever pain alleviates autotraction in some form or other (37) should be applied, to spare the therapist, activate the patient and possibly yield a longer lasting effect.

### *The efficacy of autotraction in patients with prolapsed lumbar discs*

The present study fell short of the expectations to the autotraction method of Gertrud Lind (22), 75% of patients in both subgroups having to be operated. This is quite the reverse of results in Gertrud Lind's own investigation, where 15 of 20 patients with lumbago–sciatica and radiculographically verified disc prolapses avoided operation. The difference might partly be due to a bias effect; it is always problematic to evaluate the efficacy of a method developed by oneself, particularly whenever there is no blind evaluation. Another reason for discrepancy may of course be that the professional and technical quality of autotraction performance in the present study was inferior to that of Gertrud Lind herself. Nevertheless the therapist (A. E. L.) was personally introduced to the method by Gertrud Lind, and had trained applying autotraction in patients with lumbago–sciatica for one and a half years prior to the onset of the investigation.

Other non-controlled not published studies aiming at showing the effect of autotraction ad mod. Gertrud Lind for patients with lumbago–sciatica and radiculographically verified lumbar disc prolapses (10, 13) seem to show results intermediate between those of Gertrud Lind (22) and the present study. In a double-blind study on the effect of the Spina-Trac variant for the same type of patients

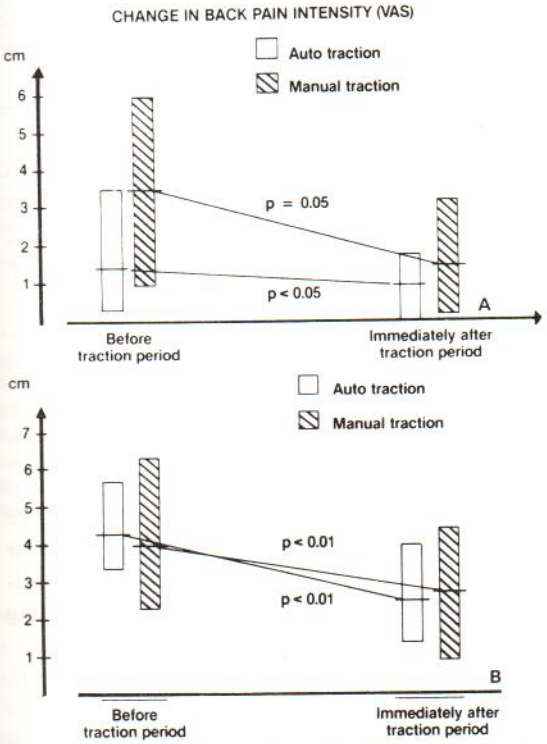


*Fig 3.* Pain intensity (median, 95% confidence interval) before and immediately after the traction period as recorded by the VAS scale in mm ($N$=49). A: Low back pain. B: Calf pain.

(37) less than 25% of the cases showed moderate or good effect.

Pain reduction is an important criterium in evaluating the effect of treatment modalities for lumbago–sciatica. Pain experience of any person depends on physiological as well as psychological mechanisms, implying that registration of pain relief should be as indifferent and objective as possible. Pain intensity blindly evaluated by the VAS scale was significantly reduced in all body parts for both traction modalities (Fig. 3). In total also non-responders tended to show pain alleviation in all body parts; according to a 100 mm long scale the reduction in the group of non-responders showed mean values between 2 and 10 mm and about 30 mm in the responders. Some patients reported increased pain, however. The tendency of slight pain reduction also by those evaluated as having no effect suggests that traction had been of some value even in this group, these patients often being depressed and worned out after a long period of suffering. Accordingly, the findings imply that outcome measures should be sensitive enough to detect a genuine treatment effect (32).

*Results as a function of material selection*

The results of this study may be disappointing but not necessarily unexpected, the outcome partly being dependent on material selection. Today hospitalized patients with lumbago–sciatica and prolapsed lumbar intervertebral discs may have tried most therapeutical facilities available during a long period of time. In the present investigation all patients were considered for operation and consequently represent a group proven to be resistant to conservative treatment modalities. Accordingly the poor outcome does not preclude that traction could be successful whenever the patho-anatomical substratum of nerve root affliction is different, for instance in the presence of disc protrusions or osteochondrosis.

Discrepancies between the present results and those in other controlled investigations on the effect of traction for patients with lumbago–sciatica may thus be due to differences in inclusion criteria: In a multicentre investigation Larsson et al. (19) showed that autotraction ad mod. Gertrud Lind is more efficient than corset, but radiculography was not performed. That a comparison with the present study is less relevant may be corroborated by the improvement after three months in both subgroups, particularly in the corset group. Based upon the autotraction method of Lind (22) and the Tru-Trac variety of Myrin (28) another autotraction bench was designed by Bihaug (4). His findings on patients with lumbago–sciatica without indication of disc prolapse show that autotraction is superior to isometric exercises. For the same type of patients Lidström & Zachrisson (21) found that the Tru-Trac variant of traction combined with isometric exercises will give a better result than isometric exercises alone. Patho-anatomically heterogeneous groups of patients with lumbago–sciatica are also included in the study of Mathews & Hickling (24), suggesting a possible effect of traction. Even a comparison with the double-blind study conducted by Weber on the effect of Tru-Trac in patients with radiculographically verified disc prolapses (38) may be ambiguous. These patients, showing a moderate or good effect in 50% of the cases, were probably far less resistant to conservative treatment modalities than the present group. Ten years ago outpatient clinics had no routine in ordinating the to-

day's regime of relief for patients with lumbago–sciatica, including information, bed rest, analgesics and supporting devices. The same circumstance may partly explain the observation that after ten years no valid difference could be shown between operated and non-operated patients with prolapsed lumbar discs (40).

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