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Effect of a rigid brace on back pain

The effect of a rigid plastic delordosating brace – the Flexaform brace – was studied in 48 patients with low back pain. In spondylolisthesis the brace gave pain relief in 13 cases, and the remaining two cases reported improvement. In seven cases with spinal stenosis, only two cases were free from pain, four were improved, and in one case the pain was unchanged. In 26 patients with chronic low back pain of unknown etiology, 17 cases did not improve, five cases improved and complete loss of pain was seen in only four cases. When all three groups were combined, a correlation was seen between pain relief in the brace and pain relief in the supine position and in the forward bending position.

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Lumbo-sacral support is one of the most frequently prescribed types of orthosis. The main indication has been chronic low back pain (Ahlgren & Hansen 1978); the purpose of the spinal support is to lighten the load on the trunk. However, the mechanism of external support on the lumbar spine is still unclear; immobilization of the trunk, increased intra-abdominal pressure and modification of the function of the muscles have been suggested to be of importance (Grew & Deane 1982).

There is a great variety of different types of lumbo-sacral supports. The type most frequently used is the canvas corset reinforced with upright posterior bars. The use of braces made of polyethylene has also increased during recent years. Besides the greater rigidity of the support, a built-in delordosating effect on the spine and an increased abdominal pressure are attained. Comparative studies of the effect of different types of lumbar orthoses have been published by Grew & Deane (1982) and Nachemson et al. (1983). However, there has been very little discussion in the literature concerning the indications for prescribing braces for patients with low back pain of different etiologies.

The aim of the present paper was to study the effect of one of the more rigid lumbar spine supports – the Flexaform brace – on patients with different types of low back pain and to study whether there were any anamnestic or clinical observations predicting a good result of wearing this type of brace.

Patients and methods

Forty-eight patients with different lumbar spine disorders had been treated with the Flexaform brace. Seventeen cases were female and 31 male. The mean age at the beginning of the brace treatment was 45 (17–73) years. All patients had low back pain with radiation into one or both legs.

In the 15 *spondylolisthesis* cases the slipping ranged between 25 and 50 per cent; all were seen between L5 and S1 and were of the isthmic type. The mean duration of the symptoms before bracing was 1.7 ± 1.0 years. The mean age at the beginning of the Flexaform treatment was 40 (17–61) years.

All seven patients with *spinal stenosis* had claudication. Myelography was performed and all had an A/P-diameter of the spinal canal of less than 11 mm. The mean duration of the symptoms before bracing was 1.9 ± 1.1 years. The mean age when bracing was started was 64 (53–73) years.

The remaining 26 patients had long-term *low back pain of unknown etiology*. Plain roentgenograms showed degenerative disc changes in the lower lumbar region but no other visible pathological changes. Myelographies were negative. The mean duration of symptoms before bracing was 2.1 ± 1.3 years. The mean age at the beginning of the brace treatment was 43 (22-72) years.

Five patients, four with spinal stenosis and one with low back pain, had retired at the age of 65 years. Three patients with low back pain had retired prematurely because of their spinal disorders, and 41 patients had been sick listed for at least 6 months when brace treatment started.

The Flexaform brace is a thermoplastic, low back brace with a built-in antilordotic effect (Figure 1). The brace has an anterior opening and is available for a lordosis of 0° and 15°. The brace module is prefabricated in 12 different sizes. The material is a 3 mm outer layer of polypropylene and a 5 mm inner

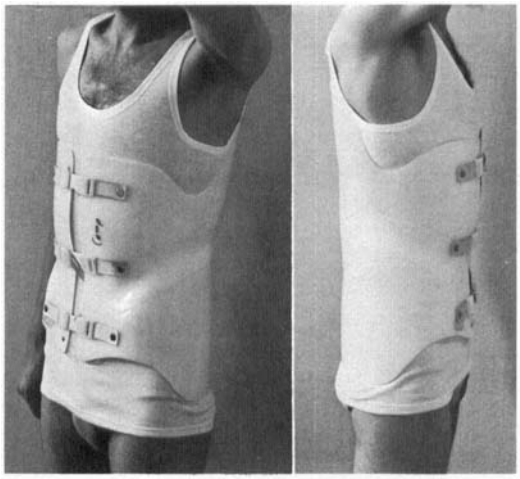

Figure 1. The Flexaform brace.

layer of polyethylene. To stabilize the brace in connection with the body, crest pads are built in to grip the pelvis firmly.

The brace had been used for an average of 1 year when the effect on back pain was evaluated. The ability to work was negatively influenced by wearing the brace, especially when bending, moving and lifting frequently. In standing and sitting positions, the brace was usually accepted.

Student's *t*-test was used in the statistical calculations.

Results

There was a great difference between the results of Flexaform brace treatment in the three groups of patients, all suffering from chronic low back pain.

In the spondylolisthesis group, good results – complete freedom from pain – were seen in 13 cases and in the two remaining cases the pain had decreased markedly. In no case was the pain resistant to the brace.

In the group with spinal stenosis, two cases were totally free from pain, four patients reported an obvious improvement with increased walking capacity, and in one case the pain was unchanged.

All cases in the third group had pain located in the lumbo-sacral region, with radiating pain into one or both legs. Here the result of using the brace was poor in 17 cases, a decrease of the symptoms was seen in five cases, and complete relief of pain was seen in only four cases.

Table 1. Number of patients, free of pain, in different positions of the trunk without the Flexaform brace

	Spondylolisthesis n=15	Spinal stenosis n=7	Low back pain n=26
Standing erect	0	0	2
Standing, bent forward	15	7	7
Sitting	6	5	7
Walking	6	1	3
Supine	13	6	16

Pain relief of the lower back in different positions of the trunk was also studied (Table 1). In the standing position, almost all patients in all groups complained of pain. When standing, bent forward with flexed lumbar spine, all patients with spondylolisthesis and spinal stenosis were free from pain, but only 7 of 26 cases of the third group. A sitting posture was also more acceptable in the two former groups. Finally, in the supine position, most patients in the spondylolisthesis and spinal stenosis groups were relieved of pain, as was the case in more than half of the third group.

When all the three groups were combined, a positive correlation was seen between pain relief in the brace and pain relief in the supine position ($p < 0.001$, $n = 48$) and in the forward bending position ($p < 0.01$, $n = 48$).

In four cases in the low back pain group, the lumbar pain was combined with cervical pain, including brachialgia. In none of these cases did the brace decrease the lumbar pain. Furthermore, no correlation was seen between the result of the brace treatment and the extent to which the pain radiated into the legs. On the other hand, the pain relief experienced when the brace was worn was less in cases with neurological signs (positive leg raising test, numbness or muscular weakness in the leg).

Discussion

The mechanical effect of plastic braces and canvas corsets is still unclear. Limitation of movement has been considered to be of impor-

tance. A decrease of the gross motion in the brace has been observed (Grew & Deane 1982), while, on the other hand, the intervertebral mobility increased (Norton & Brown 1957, Lumsden & Morris 1968). Nachemson et al. (1983), however, assumed that a decrease of the gross motion is more important for the relief of the low back pain than restriction of the inter-segmental movement. Fidler & Plasmans (1983) found that in a flexioning plastic brace, movement in the middle part of the lumbar area was reduced by one third. Increased intra-abdominal pressure has been shown to diminish the intra-discal pressure (Morris & Lucas 1963, Nachemson & Morris 1964). With the brace on, however, increased muscular activity or intra-abdominal pressure has not been reported (Morris & Lucas 1963, Grew & Deane 1982). The use of braces, on the other hand, may cause a 25 per cent decrease in the intradiscal pressure (Nachemson & Morris 1964).

Patients with spinal stenosis often spontaneously report pain relief when flexioning the lumbar spine, possibly associated with an increase of the A/P-diameter of the spinal canal, as observed during myelography.

In this study, the best result was seen in patients with spondylolisthesis or spinal stenosis, whereas the result in the low back pain group was far less successful; no pain relief at all was seen in two thirds of these cases. The question can therefore be raised as to whether we can find some anamnestic or clinical signs predicting more successful results when prescribing these delordosating braces.

A positive correlation was seen between the result of brace wearing and absence of pain in standing, bent forward, and in the supine position, independent of the diagnosis of the three subgroups. The presence or absence of pain when standing erect, sitting and walking, however, gave no helpful indications.

These observations suggest that patients with pain relief when standing bent forward and in the supine position should experience pain relief in delordosating plastic braces.

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References

Ahlgren, S. A. & Hansen, T. (1978) The use of lumbosacral corsets prescribed for low back pain. *Prosthet. Orthot. Int.* **2**, 101–104.

Fidler, M. W. & Plasmans, C. M. T. (1983) The effect of four types of support on the segmental mobility of the lumbosacral spine. *J. Bone Joint Surg.* **65**-A, 943–947.

Grew, N. D. & Deane, G. (1982) The physical effect of lumbar spinal supports. *Prosthet Orthot. Int.* **6**, 79–87.

Lumsden, R. M. & Morris, J. M. (1968) An *in vivo* study of axial rotation and immobilization of the lumbosacral joint. *J. Bone Joint Surg.* **50**-A, 1591–1602.

Morris, J. M. & Lucas, B. D. (1963) Physiological considerations in bracing of the spine. *Orthop. Prosthet. Appl.* **37**, 44.

Nachemson, A. & Morris, J. M. (1964) *In vivo* measurements of intradiscal pressure. *J. Bone Joint Surg.* **46**-A, 1077–1092.

Nachemson, A., Schultz, A. & Andersson, G. (1983) Mechanical effectiveness studies of lumbar spine orthoses. *Scand. J. Rehab. Med.* Suppl. 9.

Norton, P. L. & Brown, T. (1957) The immobilizing efficiency of the back braces; their effect on the posture and motion of the lumbo-sacral spine. *J. Bone Joint Surg.* **39**-A, 111–139.