

Guidelines for the performance of fusion procedures for degenerative disease of the lumbar spine. Part 14: brace therapy as an adjunct to or substitute for lumbar fusion

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Recommendations

Standards. There is insufficient evidence to recommend a treatment standard.

Guidelines. The short-term use of a rigid lumbar support (1–3 weeks) is recommended as a treatment for low-back pain of relatively short duration (< 6 months). The use of a lumbar brace for patients with chronic low-back pain is not recommended because there is no pertinent medical evidence of any long-term benefit or evidence that brace therapy is effective in the treatment of patients with chronic (> 6 months) low-back pain.

Options. 1) Lumbar braces are recommended as a means of decreasing the number of sick days lost due to low-back pain among workers with a previous lumbar injury. They are not recommended as a means of decreasing low-back pain in the general working population. 2) The use of lumbar brace therapy as a preoperative diagnostic tool to predict outcome following lumbar fusion

surgery is not recommended. 3) The use of transpedicular external fixation as a tool to predict outcome following lumbar fusion surgery is not recommended.

Rationale

Lumbosacral supports or back braces have been used for the prevention and treatment of a wide variety of degenerative disorders of the lumbar spine.¹¹ The potential mechanisms of action for brace therapy include limiting spinal ROM, correcting posture and deformity, preventing gross trunk motion, increasing the intraabdominal pressure, reducing force exerted by trunk muscles, and providing soft-tissue massage and heat.^{23,28,42} Critics of lumbar supports have argued that braces may provide workers with a false sense of support or allow muscles to waste, thereby increasing the incidence of injury.²⁶ Although the mechanism of action of lumbar supports remains open to debate, their clinical utility in the prevention and treatment of low-back pain must be determined to justify their use.²²

Braces have been used for the preoperative evaluation of patients in an attempt to predict outcome following fusion surgery. They are also applied following lumbar surgery to promote fusion.^{9,19} Because lumbar orthoses do not eliminate motion in the lumbar spine, their utility has been questioned.^{2,3} The purpose of this review is to exam-

Abbreviations used in this paper: NPV = negative predictive value; ODI = Oswestry Disability Index; PLF = posterolateral fusion; PPV = positive PV; RSA = roentgen stereophotogrammetric analysis; ROM = range of motion; TEPF = temporary external pedicle fixation; TMS = transcutaneous muscle stimulation; VAS = visual analog scale.

ine the medical evidence for the utility of brace therapy as a treatment of low-back pain, as a predictor of outcome following lumbar fusion surgery, and as an adjunct to lumbar fusion procedures.

Search Criteria

A computerized search of the National Library of Medicine from 1966 to 2003 was conducted using the following search terms: "lumbar support and low-back pain," "brace and low-back pain," and "orthosis and low-back pain." After discarding duplicates, 760 papers were identified. After reviewing the abstracts of each paper, 17 relevant studies were identified. We then searched the database using the following phrases: "orthosis and fusion," "brace and fusion," "external lumbar fixation and fusion," and "lumbar support and fusion." After discarding duplicates, 1951 papers were identified. After reviewing the abstracts of each paper, 12 relevant studies were identified. Several review papers, metaanalyses, biomechanical studies, technical notes, and small case series serve as supporting data. The bibliography of each paper was reviewed and other relevant studies were identified. All clinical studies providing Class III medical evidence or better regarding the use of lumbar brace therapy for the prevention and treatment of low-back pain, for the prediction of outcome following lumbar fusion surgery, and as an adjunct to fusion surgery are summarized in Tables 1 through 4.

Scientific Foundation

Lumbar braces have been used as a means of preventing low-back pain in industrial workers.^{18,42} Van Poppel, et al.,⁴³ randomized 282 individuals employed as baggage handlers into one of four groups: 1) education and lumbar brace; 2) education; 3) lumbar brace; and 4) no intervention. Soft lumbar braces were worn during working hours for a 6-month period by workers randomized to Groups 1 and 3. There was no decrease in the incidence of reported back pain (36% for braced individuals and 34% for nonbraced) or in the number of sick days lost when comparing braced with nonbraced workers; however, a subgroup analysis of workers with prior back pain revealed that the use of a soft lumbar brace reduced the number of days lost due to back pain from 6.5 to 1.2 days per month ($p = 0.03$). It should be noted that only 43% of the workers complied with the bracing protocol. There was no difference in the incidence of low-back pain or number of sick days lost between compliers and noncompliers in the brace-treated group. The authors concluded that brace therapy does not diminish the incidence of low-back pain or time lost from work when used as a preventive strategy. The use of a lumbar support by workers with a previous low-back injury may result in fewer days lost due to low-back pain. Because of the high number of noncompliant workers, this study is considered to provide Class III medical evidence.

Reddell and colleagues³³ randomized 642 individuals employed as baggage handlers into one of four groups: 1) education; 2) weight belt-type brace; 3) education and brace; and 4) no intervention. During an 8-month period, the authors examined the total incidence of reported low-back injury, lost or restricted workdays due to low-back

pain, and Workers' Compensation claims related to low-back pain. They found no differences among the groups with respect to these outcome measures. Similar to the van Poppel study, only 42% of the brace-treated group was compliant with the use of the brace. The noncompliant group (158 individuals) was followed and found to have a higher incidence of lost work days, but the difference between the compliant and noncompliant groups was not significant. This study also provides Class III medical evidence suggesting no benefit for the use of a lumbar orthosis to prevent back injury. Alexander, et al.,¹ reported the results of a prospective study of 60 healthcare workers divided into two groups. One group was assigned to wear a beltlike corset for a 3-month period. No differences in work-related back injuries or perception of back pain were noted. Because a nonvalidated outcome measure was used, this paper also provides Class III evidence suggesting that brace therapy involving a corset-type orthosis is not an effective measure to prevent low-back pain.

Walsh and Schwartz⁴⁵ randomly selected 90 individuals from a pool of 800 warehouse workers and assigned them into one of three groups: 1) no intervention; 2) 1-hour education; or 3) 6-month lumbosacral molded semi-rigid orthosis therapy and education. Outcomes were assessed using various measures including work injury incidence, work productivity, and utilization of healthcare resources. Brace-treated workers missed 2.5 days less work ($p = 0.03$) than those not wearing braces (both controls and education-only groups), but there were no differences in productivity or utilization of healthcare resources between the groups. A subgroup analysis revealed that the benefit in terms of number of lost work days was greatest in patients with a previous back injury. The authors concluded that the combination of brace therapy and education was effective in reducing time lost to injury, especially among patients with a history of back injury. Because there was no information given regarding worker compliance with the bracing routine, the medical evidence offered in this report in support of brace therapy as a measure to prevent low-back pain is considered Class III.

Several historical cohort studies have examined the incidence of back pain and days lost to work in groups of workers before and after being issued a brace or lumbar support belt by their employer. Analysis of these studies revealed mixed results. One study identified no change in the incidence of back pain and sick days after application of the brace and two studies reported a reduction in these parameters following the issue of a lumbar support to employees.^{21,27,38} Overall, the medical evidence supporting the use of braces as a preventive measure for low-back pain is inconsistent. The authors of several systematic literature reviews have concluded that lumbar support devices are not useful for the prevention of low-back pain in the general working population.^{18,44} It does appear, however, that braces may be useful as a measure to decrease the number of sick days lost due to low-back pain in workers with a history of low-back injury.

In several randomized control trials the role of bracing as a treatment for low-back pain has been examined. Pope, et al.,³² studied 164 patients with low-back pain drawn from a chiropractic clinic. Patients were randomized to one of four treatments: 1) chiropractic manipulation; 2) TMS; 3) massage; and 4) lumbar corset. Patients were assessed for pain