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Review Article

Non-specific chronic low back pain in patients with scoliosis—an overview of the literature on patients undergoing brace treatment

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Abstract. [Purpose] Although there is evidence that non-specific chronic pain can be influenced by physical therapy, some patients with scoliosis and chronic pain may benefit from additional brace treatment. The purpose of this review is to answer the question whether there are studies on the use of brace treatment in patients with scoliosis and pain and to investigate whether brace treatment does positively influence chronic pain. [Methods] A PubMed review has been undertaken using the key words (1) scoliosis and pain and brace treatment and (2) scoliosis and pain and orthotics. From both searches the studies were extracted that included a patient group with the diagnosis of a scoliosis and with additional chronic non-specific low back pain, treated with a brace. [Results] One hundred forty two items have been found for search (1) and 111 for search (2). The total number of relevant items found in both searches was 10. According to the studies found, bracing seems an effective treatment for this condition. [Conclusion] Brace treatment in patients with scoliosis and chronic non-specific low back pain has demonstrated to be effective. It should be used when exercise treatment is not effective. A clinical test is demonstrated to predict the most beneficial approach in brace treatment.

Key words: Scoliosis, Non-specific chronic low back pain, Brace treatment

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INTRODUCTION

Scoliosis is defined as a three-dimensional deformity of the spine and trunk[1–3)]. It may have neuromuscular origin, caused by congenital malformations or various other diseases, but for most patients no underlying cause has been found[4)]. The latter cases are termed idiopathic scoliosis. Idiopathic scoliosis may be classified as early onset idiopathic scoliosis (infantile or juvenile form), while most cases are late onset (Adolescent idiopathic scoliosis/AIS)[4)].

Long-term studies exist about the natural history of AIS showing that this does not necessarily lead to severe health problems other than back pain[1, 5, 6)]. This back pain usually is not disabling and spinal function usually is not significantly impaired[1, 5)]. Prevalence of back pain is similarly high in operated scoliosis patients as well as in patients treated conservatively or scoliosis patients without any treatment compared to controls without any deformity[7)].

It has been shown that pain in scoliosis patients is not correlated to the curve size[8, 9)], however, there is evidence that lumbar/thoracolumbar curves are more likely to produce pain in the lower back than thoracic or double major curves[1, 10)].

It is essential to distinguish between specific low back pain (i.e. caused by an affection of a nerve root) and non-specific low back pain (i.e. articular or myofascial pain)[11)]. Most patients with scoliosis have a non-specific low back pain[5, 8, 9)]. Non-specific low back pain may be classified for specific treatment approaches using simple clinical tests[12)]. In patients with

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scoliosis, especially in idiopathic scoliosis patients, a disturbance of the sagittal profile is consistently evident[1, 13–17]. In the thoracic region of the spine, usually a flatback (a loss of normal kyphosis) is found and in the lumbar area a reduction of lumbar lordosis. In severe scoliosis the sagittal profile may be inversed showing a lumbar kyphosis and a thoracic lordosis[1, 17]. Loss of lumbar lordosis has been shown to be directly correlated to low back pain[18, 19] while lumbar re-lordosation, has shown to stabilise the spine and may correct a scoliosis also on the other frontal and coronal planes[13, 16].

Schroth exercises as well as core stabilisation exercises have demonstrated a positive influence on chronic low back pain in patients with scoliosis[8, 20–22]. For other kinds of exercises currently used for the treatment of scoliosis, no evidence has been found that these would have an impact on pain in this patient group[21].

Although there is evidence that non-specific chronic pain can be influenced by physical therapy[8, 20–22] some patients require additional brace treatment. The purpose of this review is to answer the question whether there are studies on brace treatment in patients with scoliosis and pain, to investigate whether according to current research, brace treatment might positively influence chronic pain and in order to provide recommendations for use in this patient group.

METHODS

A review using PubMed was undertaken on the 28th of April 2019 using the key words (1) scoliosis and pain and brace treatment ("scoliosis"[MeSH Terms] OR "scoliosis"[All Fields]) AND ("pain"[MeSH Terms] OR "pain"[All Fields]) AND ("braces"[MeSH Terms] OR "braces"[All Fields] OR "brace"[All Fields]) AND ("therapy"[Subheading] OR "therapy"[All Fields] OR "treatment"[All Fields] OR "therapeutics"[MeSH Terms] OR "therapeutics"[All Fields]) and (2) scoliosis and pain and orthotics ("scoliosis"[MeSH Terms] OR "scoliosis"[All Fields]) AND ("pain"[MeSH Terms] OR "pain"[All Fields]) AND ("orthotic devices"[MeSH Terms] OR ("orthotic"[All Fields] AND "devices"[All Fields]) OR "orthotic devices"[All Fields] OR "orthotics"[All Fields]). From both searches the studies were extracted containing patients with the diagnosis of a scoliosis with additional chronic non-specific low back pain who were treated with a brace with pain being the indication.

RESULTS

One hundred forty two items have been found for search (1) and 111 for search (2). There were studies on spinal fusion, studies on patient samples with pain in the long-term after brace treatment in adolescence, studies on quality of life, studies on physical therapy and on bracing in general. Therefore it has been necessary to extract the relevant papers fulfilling the inclusion criteria described in the Methods section. Table 1 gives an overview on the papers which were 'off topic' and how often one or more of the search terms were missing.

Nine items have been identified to fulfil the inclusion criteria from search (1) and six from search (2). As most of the items were found in both searches the total number of different items as found in both searches was 10[12, 14, 15, 23–29]. There were two pilot studies[14, 23], six case reports/case series[24–29], one mid-term study[15] and one study containing a proposal for a simple classification allowing a specific approach for different types of low back pain[12]. All relevant papers found in PubMed were written in English language.

DISCUSSION

According to the papers found within this review, there is little overall evidence and no high-quality studies have been found for bracing in relation to pain in this patient group. Only one study had a follow-up of more than one year (18 months)[15], allowing some initial conclusions that brace treatment might be effective in the treatment of chronic pain in patients with spinal deformities. In this mid-term study[15] a lumbar re-lordosation brace (a brace increasing lumber lordosis) was used with a successful outcome, whilst in one of the pilot investigations a lumbar de-lordosation brace was suggested[23].

In the latter study published 2018, most of these earlier studies were not cited nor was a differential indication of braces for chronic low back pain discussed[23].

Considering the facts that (1) in most scoliosis patients a reduction of lumbar lordosis is evident[1, 13–17] and that (2) loss of lumbar lordosis is correlated to low back pain in adulthood[18, 19], this assumption that lumbar de-lordosation is an appropriate approach, is not based upon any detailed reasoning or evidence, and could possibly worsen symptoms. Additionally, it has been shown that lumbar lordosis stabilises or even may correct a scoliosis[13, 16]. Therefore increasing lumbar lordosis in this group of patients with scoliosis, should be considered an important issue to address in the initial stages of examination and

Table 1. Overview on the papers which were 'off topic' and how often one or more of the search terms were missing

	Total (n)	Term 1 missing (n)	Term 2 missing (n)	Term 3 missing (n)
Search 1	142	21	100	90
Search 2	111	26	89	77

Multiple answers were possible. Term 1 was defined as 'scoliosis', term 2 as 'pain' and term 3 as 'brace/orthosis'.

related treatment. According to the findings within this review[12, 27], only in patients with chronic back pain due to vertebral instabilities, a lumbar de-lordosation brace is indicated.

There may be patients with spondylolisthesis and scoliosis[27, 30], even without radiological signs of an instability. A simple clinical test (Fig. 1) has shown to help differentiate between so called postural or instability low back pain[12]. In the latter case lumbar lordosation is contraindicated and a lumbar de-lordosation brace should be used[12, 27]. However, lower back pain with instability is less frequent than postural low back pain especially in this patient population with spinal deformities[12].

Considering the sedentary lifestyle of today, it would seem more reasonable to restore lumbar lordosis with exercises[31] as well as with braces aiming at a reduction of chronic low back pain[12, 15]. The measurement of lordotic angle alone, does not seem to have an influence on the prevalence of low back pain[32], but it could be that it is not the angle of lordosis, but the location of lordosis in the lumbar spine that contributes to pain relief[13, 15].

The success rate of brace treatment in patients with non-specific chronic low back pain in general does not appear to be significant, and compliance is generally described as moderate or poor[33–35]. A significant pain reduction has not been reported upon in most of the recent literature[35, 36].

Fig. 1. The sagittal realignment test (SRT: left) and the de-lordosation test (DT: right) in standing position. In the positive case this test will immediately reduce chronic postural LBP (PLBP). The DT in the positive case will immediately reduce chronic LBP if this is due to instability low back pain (ILBP). Taken from[12] (Creative Commons Attribution License).

In the mid-term follow-up[15] there was a high compliance and a reasonable decrease of pain intensity and pain frequency. Patients who were able to feel the brace action and pain reduction before the start of brace treatment using clinical examination tests, may have resulted in an increase in compliance and success with treatment. In order to avoid costly brace treatment without any effect, it is suggested by the conclusions of this review, to test the patients for the most beneficial approach (lumbar lordosation/lumbar de-lordosation). When patients recognise that they can benefit from specific brace treatment, by an instant reduction in their pain symptoms, the matter of compliance may be vastly improved.

The first author of this review would like to share some limitations when trying to brace adult patients with chronic low back pain; brace fitting with a specific hard brace for obese patients is less successful compared to normal weight or mildly overweight patients. This is due to the facts that (1) the bony landmarks for the exact fit are more difficult to locate and that (2) sometimes the abdomen is significantly wide, which will inhibit exact fit of the brace to the waist. In these cases, specific bracing is not usually successfully achievable. It is possible in these instances to provide less specific soft supports with some success[23].

Considering that spinal deformities have a certain stiffness reducing the correctability, specific hard braces need to be preferred treatment approach whenever possible[12, 15].

Finally, it is important to note that true scoliosis is not easily correctable in adulthood and therefore specialists should be used when assessing these patients to ensure the examination and treatments are appropriate. In patients with an angle of trunk rotation (ATR) exceeding 10° a pattern specific brace is indicated[25, 26]. Symmetrical braces applied in patients with a significant rib hump/lumbar prominence, will usually twist on the person's trunk according to the asymmetry and torsion effect and therefore will not remain in the correct position, hence the need for individual bespoke fit.

A shortcoming of this study is that the search has not been extended to other databases like CINAHL or PEDro. This study is a first overview of the relevant literature. It has been discussed just recently that in one paper the literature review was incomplete and tendentious[37] and other papers with a literature review on this topic are still missing.

The results of this study show that there is some evidence for the application of braces in patients with scoliosis. These results make it reasonable to assume that a systematic review on this topic is a worthwhile endeavor.

In conclusion, brace treatment in patients with scoliosis along with chronic non-specific low back pain should be considered as an effective treatment option, when exercise treatment has not been effective. A differential indication for different entities of chronic non-specific low back pain is proposed in the literature, to assist the clinician to provide the most effective bracing design for the individual patient.

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Conflict of interest

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Written informed consent has been achieved from the person on the picture allowing publication in scientific literature. The picture has been taken from an open access article, which is cited in the figure caption.

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