

Systematic Review

Effect of Brace on Kyphosis Curve Management: A Review of Literature

Mohammad Taghi Karimi

Rehabilitation Faculty of Isfahan University of Medical Sciences, Isfahan, Iran.

Abstract | The incidence of kyphosis is frequent compared to other spinal deformities. Different types of orthoses have been used to treat the kyphosis. The aim of this review is to determine the efficiency of various orthoses to reduce kyphotic curve based on the available literature. A search was performed in some databases including PubMed, Google Scholar, Scopus, Embasco and ISI Web of Knowledge between 1960 and 2015 years. Keywords such as kyphosis, spinal deformities were used in combination with orthosis, brace and corset. The searched outcome indicated that there were at least 15 articles published on this topic and most of them have a small number of subjects. Although some new orthoses have been developed to decrease the curve of kyphosis, most of them did not test on more number of subjects. It seems that Milwaukee orthosis carry higher efficiency to reduce the curve of kyphosis. There are not enough evidences regarding effects of orthosis on kyphotic curve. However, based on the available literature effects of orthoses on kyphotic curve is significantly than that of scoliosis. There appear that there are no major differences between full time and part time orthotic use in this deformity.

Editor | Arezoo Eshraghi, PhD in Orthotics and Prosthetics, Bloorview Research Institute, Holland Bloorview Kids Rehabilitation Hospital, Toronto, Canada.

Received | November 12, 2015; **Accepted** | December 06, 2015; **Published** | February 10, 2016

Correspondence | Mohammad Taghi Karimi, Rehabilitation Faculty of Isfahan University of Medical Sciences, Isfahan Iran; **Email:** karimi@rehab.mui.ac.ir

Citation | Karimi, M. T. (2016). Effect of brace on kyphosis curve management: A review of literature. *Health Rehabil.* 1(1): 1-4.

Keywords | Orthosis, Kyphosis, Brace

Introduction

The incidence of spinal deformities is high compared to other musculoskeletal disorders (Tsyvkin, 1981; Brauer, 1955; Jacobellis et al., 1981). Kyphosis is one of the spinal deformities, which is more common than other deformities (Tribus, 1998; Ropac et al., 2013). Scheuermann kyphosis is the most common cause of thoracolumbar hyper kyphosis with an incidence varied between 20% and 60% in kyphotic subjects (Fisk et al., 1982; Jacobellis et al., 1981; Tsyvkin, 1981).

Various types of treatment have being used to decrease the risk of curve progression and to decrease

the magnitude of deformity (Weiss et al., 2009; Winter and Pilney, 2002). Functional treatment approach (exercise therapy) and orthoses are the most common approaches used for the subjects with kyphotic curve (Gutowski and Renshaw, 1988; Seidi et al., 2014).

Thoracolumbosacral orthoses including Milwaukee orthosis and low profile orthoses such as Gschwend type brace, soft brace, Kyphologic brace, Physiologic brace and anti-kyphosis brace have being used exclusively in subjects with kyphosis (Weiss et al., 2009; Gutowski and Renshaw, 1988). Various kind of orthoses have being used for the subjects with kyphosis, however the main question posted here is which kind of these orthoses are more effective to reduce

kyphotic curve. Moreover, which factor influences the performance of available orthoses. Therefore, the aim of this review was to answer to the aforementioned questions based on the available literature.

Method

A search was done in some databases such as PubMed, ISI web of knowledge, Ebsco, Embasco, and Google scholar from 1960-2015. Some key words such as kyphosis, Scheuermann disease were used in combination with brace and orthosis. The papers were selected based on their titles and abstracts to address the research questions of interest. The final selection of the papers was done based on the following criteria:

1. The papers were published in English
2. Focus on the effects of brace or orthosis on kyphosis

Results

Based on the mentioned key words 20 articles were found for final analysis. In which 5 papers focus on use of Milwaukee brace on kyphosis and 6 on new design of orthosis.

Newly Anti-kyphosis

This orthosis is actually a posture trainer support that function based on biofeedback principle. The shoulder straps of the orthosis contain vibrations units which attached to a central unit with wires. The protraction of the shoulders pulls the cable and activates the vibration unit.

Osteomed Orthotic Device

This orthosis used specifically for osteoporosis. It resemble as total contact orthosis, with no rigid construction. There are some air chambers pads attached to back section of the device which can be filled up to 75% of their capacity.

Physio-logic Brace

This orthosis aims to restore lumbar lordosis with an apex at L2 or above levels.

Gschwend Orthosis

This orthosis was also used for kyphosis. A permanent correction of kyphosis has been reported by using this brace. In comparison with Milwaukee brace, this orthosis remain the treatment of choice.

Sforzesco Brace

It was developed in order to omit casting procedure used for spinal orthoses. The correction achieved follow the use of this orthosis is based on Sport concept of correction. The other orthoses such as Sibilla and Lapadulla were developed based on the same concept.

Discussion

There is no doubt that most of the subjects with kyphosis deformity should use orthosis to control their curve progression and to decrease kyphosis. Although various kinds of orthoses have being developed in this regard, it is not well understood which kind of orthosis is more successful to reduce kyphosis curve. It should be emphasized that the normal kyphotic curve is between 20 and 40 in growing adolescent and 45 in normal adult subjects (Fon et al., 1980). The main reason for treatment in Kyphotic subjects related to pain, progression of deformity and appearance (Wenger and Frick, 1999). The outcome of orthosis treatment depends on age of subjects and magnitude of deformity at onset of diagnosis. Based on the study done by Lowe, brace should be prscribed for the subjects with kyphosis curve between 55 and 80 degrees (Lowe and Line, 2007). However, the main question posted here is what are the suitable orthoses available for kyphotic subjects.

The available orthoses for kyphotic subjects can be subdivided into two main groups including soft and rigid orthoses. Figure 1 shows the available orthoses for the subjects with kyphosis.

As can be seen from Figure 1, various orthoses are available for the subjects with kyphosis. Therefore, it is too important to determine which type of above-mentioned orthoses is more suitable for kyphotic subjects. In the research done by Bradford et al, it was shown that Milwaukee brace decreased thoracic and lumbar kyphosis by 40% and 35%, respectively after 34 months of brace wear (Bradford et al., 1974). Moreover, in another study they showed that kyphosis decreased by 50% (Bradford et al., 1980).

In study of Guto and Renshow the influences of modified Milwaukee orthosis and Boston Lumbar orthoses on kyphosis curve was evaluated (Gutowski and Renshaw, 1988). The average improvement of kyphosis was 27% in Boston group and 35% in Milwaukee group (Gutowski and Renshaw, 1988). In the

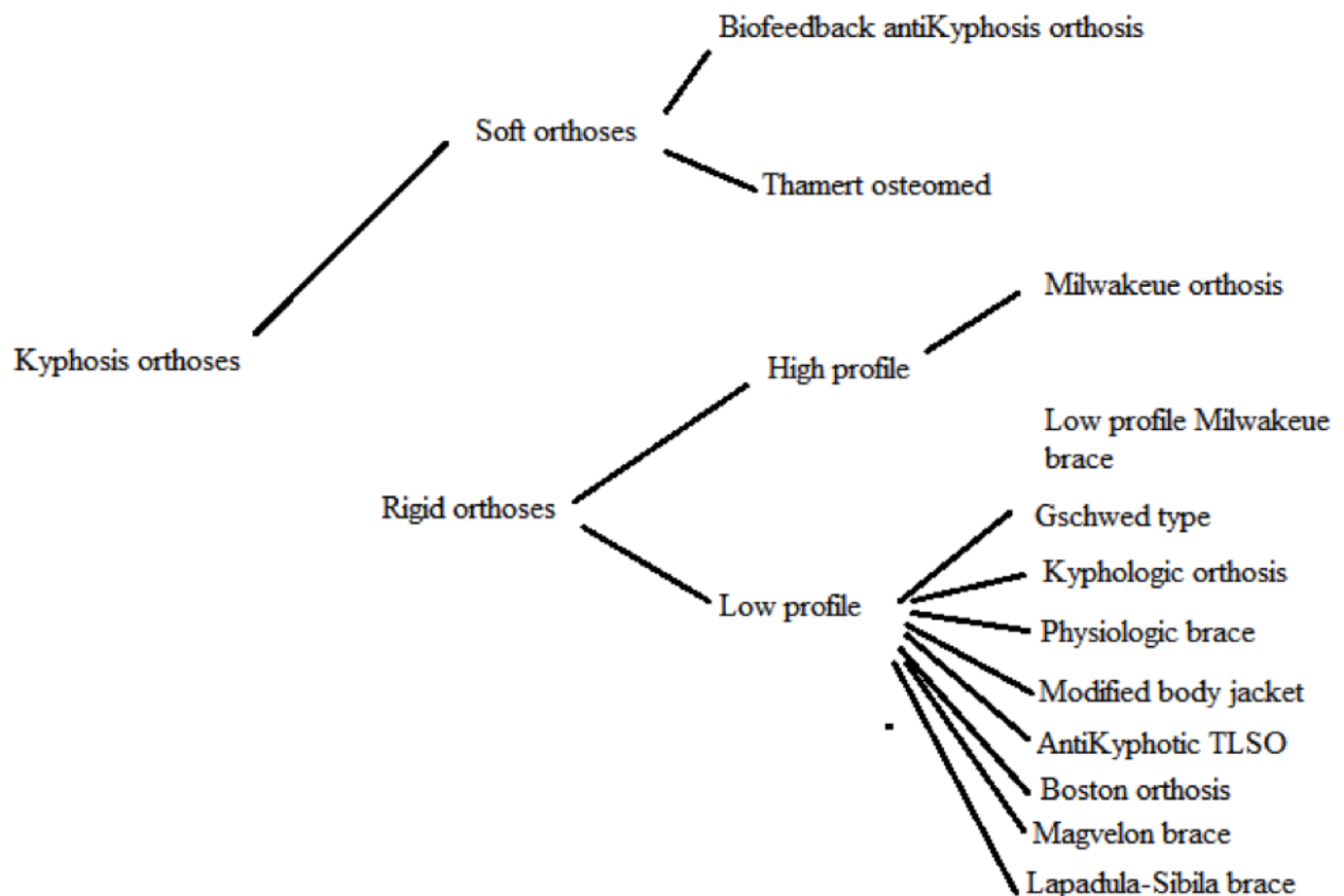


Figure 1: *A review of the orthoses used for Kyphosis deformity*

study done by Weiss on a subject with kyphosis angle around 58, the angle decreased to 25 degrees after 3 years of orthotic use (Weiss et al., 2009). Yamaguchi et al evaluated the influence of antikyphosis orthosis on curve correction. They showed that 8 out of 12 subjects (67%) had improvement in the curve of their deformity, however 25% of them had no change (Yamaguchi et al., 2014).

Unfortunately there are not enough evidences regarding the efficiency of various orthosis. Most of the newly designed orthoses have been tested on one or two subjects. Based on the results of these research studies it can be concluded that brace treatment is almost successful in subjects with kyphosis deformity especially for immature subjects with curve between 50 and 55. However, due to some complications some subjects prefer to not use their orthoses regularly. Based on the results of available studies, the influence of Milwaukee orthosis on kyphotic curve was more than that with Boston brace (Gutowski and Renshaw, 1988).

The time of orthosis wear was the other question posted here. Based on the results of research done by

Gutowski and Renshaw the output of treatment in subjects with 23 hours orthosis used was the same as those used orthosis only for 16 hours (Gutowski and Renshaw, 1988). Due to lack of enough evidences regarding the efficiency of orthoses it is too difficult to have a strong conclusion.

Conclusion

The results of this review showed that the efficiency of high profile orthosis on kyphosis curve reduction is more than that of other available low profile orthosis. However they have more complications. There seems to be no difference between the outputs of full time or part time orthosis use. Due to lack of evidences on the effect of various orthoses use on kyphosis, it is recommended that the efficiency of kyphotic orthoses be tested in a big study with more number of subjects.

References

- Bradford DS, Ahmed KB, Moe JH, Winter RB, Lonstein JE (1980). The surgical management of patients with Scheuermann's disease: a review of twenty-four cases managed by combined

- anterior and posterior spine fusion. *J. Bone Joint Surg. Am.* 62: 705-712.
- Bradford DS, Moe JH, Montalvo FJ, Winter RB (1974). Scheuermann's kyphosis and roundback deformity. Results of Milwaukee brace treatment. *J Bone Joint Surg Am*, 56, 740-58.
 - Brauer W (1955). Etiology of juvenile kyphosis, Scheuermann's disease. *Fortschr Geb Rontgenstr.* 83: 839-843. <http://dx.doi.org/10.1055/s-0029-1212759>
 - Fisk JW, Baigent ML, Hill PD (1982). Incidence of Scheuermann's disease. Preliminary report. *Am. J. Phys. Med.* 61: 32-35. <http://dx.doi.org/10.1097/00002060-198202000-00004>
 - Fon GT, Pitt MJ, Thies AC JR (1980). Thoracic kyphosis: Range in normal subjects. *AJR Am. J. Roentgenol.* 134: 979-83. <http://dx.doi.org/10.2214/ajr.134.5.979>
 - Gutowski WT, Renshaw TS (1988). Orthotic results in adolescent kyphosis. *Spine (Phila Pa 1976).* 13: 485-489. <http://dx.doi.org/10.1097/00007632-198805000-00009>
 - Jacobellis GF, Matteoli S, Stazi GC (1981). [The incidence of mitral prolapse in congenital idiopathic scoliosis]. *Boll. Soc. Ital. Cardiol.* 26: 815-7.
 - Lowe TG, Line BG (2007). Evidence based medicine: Analysis of Scheuermann kyphosis. *Spine (Phila Pa 1976).* 32: S115-9. <http://dx.doi.org/10.1097/BRS.0b013e3181354501>
 - Ropac D, Stasevic I, Samardzic D, Mijakovic Z (2013). Spinal deformities among pupils - A growing issue. *Coll. Antropol.* 37(Suppl 2): 139-45.
 - Seidi F, Rajabi R, Ebrahimi I, Alizadeh MH, Minoonejad H (2014). The efficiency of corrective exercise interventions on thoracic hyper-kyphosis angle. *J. Back. Musculosket. Rehabil.* 27: 7-16.
 - Tribus CB (1998). Scheuermann's kyphosis in adolescents and adults: diagnosis and management. *J. Am. Acad. Orthop. Surg.* 6: 36-43.
 - Tsyvkin MV (1981). Segmental kyphosis: etiology and sequelae. *Zh. Nevropatol. Psikhiatr. Im. S. S. Korsakova.* 81: 1186-91.
 - Weiss HR, Turnbull D, Bohr S (2009). Brace treatment for patients with Scheuermann's disease - a review of the literature and first experiences with a new brace design. *Scoliosis*, 4, 22. <http://dx.doi.org/10.1186/1748-7161-4-22>
 - Wenger DR, Frick SL (1999). Scheuermann kyphosis. *Spine (Phila Pa 1976).* 24: 2630-9. <http://dx.doi.org/10.1097/00007632-199912150-00010>
 - Winter RB, Pilney FT (2002). Treatment of severe postburn kyphosis with combined plastic surgery and milwaukee bracing. *Spine (Phila Pa 1976).* 27: E288-90. <http://dx.doi.org/10.1097/00007632-200206010-00024>
 - Yamaguchi K, Lindsay M, Christopher L, David L (2014). Successful brace treatment of Scheuermann's kyphosis in skeletally mature patients and severe kyphosis. *Ann. Orthop. Rheumatol.* 2: 1018.