Bracing for adolescent idiopathic scoliosis

A multicentre cohort study in people with adolescent idiopathic scoliosis reports that using a brace is better than observation at preventing curve progression to the point of needing corrective surgery.

**Overview:** Scoliosis is a 3-dimensional deformity of the spine comprising a sideways (lateral) curvature of more than 10° and vertebral rotation. Scoliosis can be caused by abnormally formed vertebrae (congenital scoliosis); a medical condition, such as a disorder of the neuromuscular, skeletal, or connective tissue systems (syndromic scoliosis); or have no known cause (idiopathic scoliosis).

The majority of children with scoliosis do not need treatment because the condition is mild and corrects itself as the child grows (NHS Choices 2013). Surgery is indicated in children who have curves of 45–50° with a high risk of continued worsening throughout adulthood. Those with a spinal curvature of more than 20° or progressive scoliosis are generally treated with back braces. However, little evidence exists on the efficacy of braces compared with observation in young people with adolescent idiopathic scoliosis (Negrini et al. 2010).

**Current advice:** The International Scientific Society on Scoliosis Orthopaedic and Rehabilitation Treatment has produced a consensus guideline on orthopaedic and rehabilitation treatment of idiopathic scoliosis during growth. Specific physiotherapy exercises are recommended as the first step in treating idiopathic scoliosis, to prevent or limit progression of the deformity. The exercises should be based around auto-correction in 3 dimensions, training in activities of daily living, stabilising the corrected posture, and patient education.

Using a brace is recommended in young people with curves of more than 20° who are still growing and show progression of deformity or elevated risk of worsening. The different approaches to bracing are soft bracing, night-time rigid bracing (8–12 hours per day), part-time rigid bracing (12–20 hours per day), and full-time rigid bracing (20–24 hours per day) or cast. It is recommended that braces are worn full time or no less than 18 hours a day at the beginning of treatment. People who use a rigid brace should also undertake specific physiotherapy exercises during brace treatment.

**New evidence:** A cohort study by Weinstein et al. (2013) compared bracing with observation in young people with adolescent idiopathic scoliosis at high risk of curve progression to the point of needing surgery. People aged 10–15 years with skeletal immaturity (defined as a Risser grade of 0, 1 or 2) and a spinal curve of 20–40° were recruited from 25 institutions in the USA and Canada. Those who agreed to participate were randomly assigned to bracing or observation. Those who declined randomisation were offered entry into a preference group and offered the choice of 1 of the 2 treatments. Patients in the bracing group received a rigid thoracolumbosacral brace to be worn for a minimum of 18 hours a day. The primary outcome was either curve progression to 50° or more (treatment failure), or skeletal maturity (Risser grade of 4 for girls and 5 for boys) without curve progression to this level (treatment success).
Of the 1086 eligible patients, 383 (35%) provided consent to participate. The primary analysis comprised 242 people: 116 (48%) who were randomly allocated to either bracing (n=51) or observation (n=65), and 126 (52%) who chose either bracing (n=88) or observation (n=38). Participants were followed up for an average of 24.2 months in the bracing group and 21.3 months in the observation group (p=0.01). The study was stopped early because of the success of bracing in both the as-treated and intention-to-treat interim analyses.

In the final as-treated analysis, more than two-thirds (72%) of young people in the bracing group were successfully treated, compared with around half (48%) in the observation group (adjusted odds ratio [OR]=1.93, 95% confidence interval [CI] 1.08 to 3.46). The success rates were similar in the intention-to-treat analysis: 75% in patients randomly assigned to bracing and 42% among those randomly assigned to observation (unadjusted OR=4.11, 95% CI 1.85 to 9.16).

The authors concluded that bracing reduced the progression of high-risk curves to the threshold for surgery in patients with adolescent idiopathic scoliosis. However, this evidence was limited by the possibility of bias owing to non-random assignment of treatment in the preference group. In addition, a high proportion of those consenting to participate were not included in the final analyses (37%, n=141) because of withdrawals, loss to follow-up, wrong diagnosis and not reaching the end point by the time the study was stopped.

Commentary: “Previous studies have shown that patients with adolescent idiopathic scoliosis who wore a brace before surgery tend to have worse outcomes than those who were not braced (Diab et al. 2010). This is probably related to the adverse effects of wearing a brace and the medicalisation of the patient. Braces can cause psychological injury, skin irritation, and respiratory and feeding challenges. In addition, wearing a brace can turn a condition that is maybe known only to the individual into a visible condition.

“The primary outcome in Weinstein et al. (2013) was curve progression according to radiographic parameters. However, the decision to operate on a patient with progressive adolescent scoliosis is not decided purely on the angle of a curve on an X-ray. Patients’ individual perceptions of their spine have a role and can be multifactorial. Individuals with large curves may be unconcerned by their appearance or the clinical effects of their curve. On the other hand, patients with small curves may have significant concerns and adverse clinical effects (Danielsson et al. 2012).

“Patients who are braced have huge variations in brace compliance. Research has shown that patients often don’t comply with treatment recommendations because of the adverse effects of wearing a brace (Miller et al. 2012). If a treatment could have adverse effects, then its efficacy to prevent a more important clinical negative effect must be clear. Weinstein et al. (2013) have shown that the longer the brace is worn, the less likely that curve progression will occur. Wearing the brace for less than 6 hours a day was equivalent to observation as a treatment.

“As well constructed as this research is, it suggests a beneficial effect of bracing on the basis of a partially randomised trial using radiographic outcome parameters only. This doesn’t necessarily mean there is the same clinical effect. What patients need is a randomised controlled trial that shows improved patient-reported outcome measures compared with observation (or surgery) and a consequent reduction in surgical intervention. Unfortunately, the available literature still does not help us answer the question of whether bracing is associated with improved patient-relevant outcomes and allow us to give advice for our patients as we would wish.” – Mr Evan Davies, Consultant Paediatric Spinal Surgeon, Southampton Children’s Hospital, University Hospital Southampton

About this article: This article appeared in the September 2014 issue of the Eyes on Evidence e-bulletin. This free monthly e-bulletin from NICE Evidence outlines interesting new evidence and what it means for current practice. They do not constitute formal NICE guidance. The opinions of contributors do not necessarily reflect the views of NICE.

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