Spine

Clinical lead, Dr Theodoros Grivas

Maintaining mobility of the spine.....

Steps toward more effective scoliosis brace treatment to prevent the need for fusion.

The main objectives of conservative treatment of idiopathic scoliosis (IS) are to stop curve progression at puberty or possibly even reduce it, to prevent or treat respiratory dysfunction, to prevent or treat spinal pain syndromes and to improve aesthetics via postural correction.
The effectiveness of AIS conservative treatment using braces is a persistently controversial topic. The Scoliosis Research Society (SRS) and the International Society on Scoliosis Orthopaedic and Rehabilitation Treatment (SOSORT), two prominent societies on spinal deformities, presented the indications of orthotic AIS treatment.[1,2,3]

In a recent Cochrane Collaboration review on brace treatment it was concluded that there is very low quality evidence in favour of using braces.[4] Why is this?

Is the brace treatment, which is associated with several side-effects, above all psychological? Is it offered mainly to satisfy the treating doctor and the anxious parents? Could it offer more positive outcomes in order to increase the quality of evidence for using braces?
I think this is probably feasible. But how could this be accomplished? If this problem is approached holistically, the answer to this could be the improvement of the three "pillars" of treatment, a) the patient compliance with brace use; b) a better understanding of brace biomechanics, including the establishment of proper brace strap tightness and the use of finite element models; and c) proper treatment team management.

Compliance: is defined as the time the brace is actually worn relative to the prescribed time.[5] In nearly all the existing peer reviewed publications where brace treatment outcomes for AIS are presented, the compliance of brace wear is not objectively documented. The objective documentation of compliance using the electronic technology available could unquestionably offer more reliable data. Studies on this topic report that the incorporation of compliance monitoring devices increase the brace wear time, which results in lower progression compared with the natural history of untreated IS curves.[6]

In my opinion, unsatisfactory brace treatment outcomes in non-compliant children with AIS cannot be mixed with good outcomes from a compliant population. And this is because if the child is not implementing the treatment, they will not have the expected benefits from this treatment. In that case we cannot blame the brace treatment effectiveness for this failure. Mixing compliant and non-compliant populations in outcome studies leads to erroneous results, challenges the brace treatment and consequently offers bad service to patients.
Rahman et al in 2005 reported that "the more patients comply with brace treatment, the better their chances of a favorable outcome".[7]

During the past decade the literature has included many publications relevant to compliance and electronic monitoring issues.[8-14] The application of this technology is highly recommended by this author.

Better insight into brace biomechanics, establishment of proper brace fit and the use of finite element models

In a recent consensus paper on brace action and biomechanics it was concluded that "among participating SOSORT specialists there continues to be a strongly held and conflicting, if not a contentious, opinion regarding brace design and treatment. If the goal of a 'treatment consensus' is realistic and achievable, significantly more effort will be required to reconcile these differences."[15]

The corrective forces exerted at the skin-brace interface, by altering the posture, activity and strap tension enable a brace's optimal fit and can result in a better therapeutic result for the patient.[16] More specifically the empirical adjustment of strap tension must be more rational and personalised. The complex role of the strap tension on curve correction has to be explained in each type of brace used.[5,17,18]

It is obvious therefore, that there is a need for better understanding of brace biomechanics and an objective assessment of the bracing treatment. Fortunately, studies on the issue have been increasingly published during the [5,19-21]

last decade.

Finite element models have been used to study scoliosis biomechanics as well. These models cover the simulations of orthotic scoliosis treatment and they can predict in advance what would be the resulting shape of the spine in response to the application of a brace treatment. Similarly by using a finite element model simulating brace treatment, it is possible to compare the effectiveness of multiple brace designs on specific patients.[22-27]

Hopefully, this pillar will soon lead to a much better understanding of brace biomechanics and the proper brace for the specific type of scoliotic curve may be branded.

Management

The keystone of successful IS orthotic treatment, and the high variability of treatment success rates based on percentage of cases progressing to surgery is attributed not only to the quality of the brace itself, but also to the teamwork during treatment. SOSORT, in an attempt to optimise the outcomes of conservative IS treatment, reported 14 recommendations grouped in six domains: experience/competence, behaviours, prescription, construction, brace check, follow-up.[28] Close attention to these recommendations and application of this policy to IS orthotic treatment, without a doubt, will offer a decreased risk for surgical treatment.

I strongly believe that the improvement of the three “pillars” described above, as well as the improvement in the quality of and the reduction of brace material will help to take several steps toward a more effective treatment plan that will benefit thousands of children with scoliosis. This will decrease the chances for fusion of the curved spine that was structured by “mother nature” to remain segmentally mobile.

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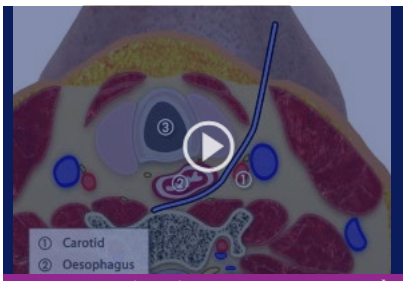

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