Deformity-related stress in a sample of patients with adolescent idiopathic scoliosis after brace weaning: a cross-sectional investigation

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Abstract

Introduction

Health-Related Quality of Life (HRQL) of scoliosis patients has been investigated in numerous studies. The perception of health, self- and body image and participation in physical activities seems to be an issue for patients with spinal deformities. In previous studies it was concluded that adolescents with scoliosis have only “little stress” associated with their deformity. This paper was performed to scientifically objectify the outcome of patients following brace treatment with respect to quality of life using the BSSQ-Deformity.

Methodology

All 42 consecutive female patients returning to the office of the first author for a follow-up x-ray after brace weaning (February to December 2013) were asked to complete the BSSQ-Deformity. The average age of the patients was 15.8 years and the average treatment duration was 35.8 months. The patients’ average age at start of treatment was 12.8 years. In addition to the BSSQ we also evaluated the treatment results of this sample of patients with respect to Cobb angle (maximum angle in combined curvatures) and angle of trunk rotation (ATR) for thoracic and lumbar areas.

The average BSSQ score was 22.23/24 with five patients scoring less than 20/24. The average Cobb angle at the start of treatment was 29.2° (range 15.6–69°) and after weaning it was 25.8°.

None of the patients experienced a progression of > 5°, while 14 patients (33%) improved > 5° over the period of brace treatment.

Discussion

Patients with adolescent idiopathic scoliosis seem to be able to cope very well with their deformity. A BSSQ score of 22.23/24 indicates that cessation of brace treatment had very little impact on the patients’ quality of life.

Conclusion

Scoliosis-related stress is not necessarily a problem for patients with moderate angles of curvature after brace weaning when recent asymmetric bracing standards are applied. An improvement in the Cobb angle and trunk deformity is possible when recent asymmetric bracing standards are applied. Considering the small impact that AIS obviously has on patients’ participation in physical activities and quality of life, a general indication for surgery cannot be derived for treating this condition. Patient satisfaction after treatment in this cohort seems better than in the pilot investigation.

Introduction

Scoliosis is a lateral deviation of the spine that exhibits different patterns of curvature. The basic curve patterns are named after the location of the major curve (e.g. thoracic, lumbar, thoracolumbar, double major, double thoracic), but there are also other specific classifications found in literature.1 In structural scoliosis there is usually a certain amount of spinal torsion and a disturbance of the sagittal profile coupled to the lateral deformation. Therefore, scoliosis is a three-dimensional deformity of the spine and trunk, which may progress quickly during periods of rapid growth.2 Although scoliosis may be an expression or a symptom of certain diseases (e.g. neuromuscular, congenital, a result of syndromes or tumours), the majority of patients with scoliosis (80–90%) are “idiopathic” because an underlying cause is not apparent.3 Idiopathic scoliosis that develops in an adolescent over the age of 10 is called adolescent idiopathic scoliosis (AIS). This is the most common form of scoliosis with the least impact on the patient’s health in the long term.2

In principle the diagnosis of AIS (80–90% of all cases with scoliosis) describes a spinal curvature in an otherwise healthy individual. According to the Scoliosis Research Society (SRS), the prevalence of AIS is 2% to 3% in the general population.4 AIS is more commonly found in females (female to male ratio 7:1) and except for extreme cases AIS does not typically cause any health problems during growth.

Long-term followup of untreated patients with AIS indicates that the consequences of AIS over a lifetime are minimal, although are sometimes moderate in the more severe cases; however, the consequences are never life threatening.2

Health-Related Quality of Life (HRQL) of scoliosis patients has been investigated in numerous studies. The perception of health, self- and body image and participation in physical activities seem to be an issue for patients with spinal deformities.4 Different questionnaires including BWF, Self-Concepts and State-Trait-Anxiety Inventory have been used to measure HRQL in certain domains.5,6,7,8,9,10 The SF-36 was widely used in the 1990s as well as in the last decade,11,12,13,14,15 while the Scoliosis Research Society (SRS) started...
developing a more complex questionnaire (SRS-22) that included some subdomains. The SRS-22 has been edited and augmented to the SRS-24 questionnaire. The SRS questionnaires are long and very complex. In the normal clinical setting of a centre specialising in the conservative treatment of spinal deformities the regular use of these extensive instruments is not feasible without imposing disproportionate expenses. Therefore, in 2005 the first author started developing two short questionnaires for everyday use. These questionnaires were named after the former workplace of the first author (Bad Sobernheim Stress Questionnaire (BSSQ-Deformity and BSSQ-Brace)). These questionnaires have been subjected to a number of investigations and have also been validated and adapted to other languages.

There is no English adaptation or validated version of the BSSQ-Deformity or BSSQ-Brace, yet. However, the authors wish to provide this simple tool to international readers. We have therefore translated the BSSQ-Deformity into English:

The answers to questions (Q 1-3; Q5-6 and Q8) are scored as follows:

0 completely true
1 nearly true
2 hardly true
3 not true at all

Q 4 and 7:

3 completely true
2 nearly true
1 hardly true
0 not true at all

The minimum value of the BSSQ-Deformity is 0 (maximum possible deformity-related stress) and the maximum value is 24 (no deformity-related stress at all). In the pilot investigation a sample of patients had an average Cobb angle of 35.8°) had an average BSSQ score of nearly 20. It was concluded that adolescents with scoliosis have only "low stress" associated with their deformity. BSSQ scores were lower in single (decompensated) curve patterns and highest in combined (balanced) curve patterns.

The office of the first author regularly weans patients off the brace after cessation of growth. Most of the patients weaned seemed satisfied with the outcome of their brace treatment. The current paper was performed to scientifically objectify the outcome of patients after brace treatment with respect to quality of life using the BSSQ-Deformity.

Methodology

The authors have referenced some of their own studies in this methodology. These referenced studies have been conducted in accordance with the Declaration of Helsinki (1964) and the protocols of these studies have been approved by the relevant ethics committees related to the institution in which they were performed. All human subjects, in these referenced studies, gave informed consent to participate in these studies.

All 42 consecutive female patients returning to the office of the first author for a followup x-ray after brace weaning (February to December 2013) were asked to complete the BSSQ-Deformity. All of these patients agreed. The braces that were used to treat this cohort were Chêneau derivates of the recent standard (Chêneau lightO, Gensingen braceO). These braces are asymmetric applications aiming to mirror the deformity of the patient. The Chêneau lightO brace was constructed using off-the-shelf parts adjusted to a dorsal and a ventral bar (Figure 1). This brace is no longer available in Germany. The Gensingen braceO is the most recent Chêneau development, has a computer aided design (CAD) and is manufactured without casting the patient (Figure 2 and Figure 3).

The average age of the patients was 15.8 years and the average treatment duration was 35.8 months. The average age at start of treatment was 12.8 years. Average time after brace weaning was 6 months (1–30 months). For curvatures below 20° night-time bracing was prescribed, while for curves exceeding 20° full-time bracing was prescribed during the initial growth spurt followed by a reduction in the brace wearing time towards the end of the growth spurt.

In addition to the BSSQ we also evaluated the treatment results of this sample of patients with respect to Cobb angle (maximum angle in combined curvatures) and angle of trunk rotation (ATR) for the thoracic and lumbar areas.

The results from this cross sectional investigation were compared to the results of the pilot investigation with the help of a statistical test to compare two different proportions.

The average BSSQ score was 22.23/24 with five patients scoring less than 20/24. The average Cobb angle at the start of treatment was 29.2° (range 15–69°) and after weaning it was 25.8° (ns = not significant in the t-test). None of the patients experienced a progression.

Competing interests: declared in the article. Conflict of interests: declared, manuscript preparation, read and approved the final manuscript.

All authors abide by the Association for Medical Ethics (AME) ethical rules of disclosure.
Methodology

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Conflict of interests: declared in the article.

All authors contributed to conception and design, manuscript preparation, read and approved the final manuscript.

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FOR CITATION PURPOSES: Weiss HR, Seibel S, Kleban A. Deformity-related stress in a sample of patients with adolescent idiopathic scoliosis after brace weaning: a cross-sectional investigation. OA Musculoskeletal
Consider the low impact of AIS on patients' health and quality of life or on their participation in physical activities, a general indication for surgery cannot be derived for treating this condition in view of the high risks associated with such treatments. Conservative management seems to be the most important approach for treating AIS, especially when considering the fact that the signs and symptoms of scoliosis can be significantly improved conservatively. With this study we were able to demonstrate that scoliosis-related stress is not necessarily a problem for patients with moderate angles of curvature. We were also able to demonstrate that improvements can be achieved with high quality conservative management.

All 42 consecutive female patients returning to the office of the first author for a followup x-ray after brace weaning (February to December 2013) were included in this study. The second author was responsible for including every patient returning to the centre of the first author after brace weaning. However, only preliminary conclusions are justified because in theory there could have been an unidentified number of patients who did not return to the office of the first author and who had different outcomes than found in the sample described.

A selection bias seems to exist in AIS post-surgical studies. The population "lost to followup" had more pain and less function in the specific SRS-22 domains than the "followup" populations in the studies. This most likely means that patients with a negative outcome after surgery are more likely to seek advice from another healthcare provider than return to the surgeon who performed the initial operation. Therefore, we must also take into consideration that a selection bias could also be possible within this study. If a subgroup of patients with adverse outcomes or with dissatisfaction concerning the treatment provided in our centre did not return for the final investigation after brace treatment, the results could differ significantly. Nevertheless, the conclusion is justified that at least scoliosis-related stress is not necessarily a problem for patients with moderate angles of curvature. Additionally we may conclude that the phenomenon of improved Cobb angles and improved trunk deformity exists when recent asymmetric bracing standards are applied.

**Conclusion**

Scoliosis-related stress is not necessarily a problem for patients with moderate angles of curvature after brace weaning when recent asymmetric bracing standards are applied. Improved Cobb angle and trunk deformity are possible when recent asymmetric bracing standards are applied. Considering the low impact that AIS obviously has on patients' quality of life and participation in physical activities, a general indication for surgery cannot be justified for this condition. Patient satisfaction after treatment in this cohort seems better than in the pilot investigation.

**Conflict of interests**

HR Weiss is advisor of Koob GmbH & Co KG, S Seibel: none declared, A Kleban: none declared.
Competing interests

HR Weiss is advisor of Koorb GmbH & Co KG, S Seibel: none declared, A Kleban: none declared.

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Competing interests: declared in the article. Conflict of interests: declared in the article.

All authors contributed to conception and design, manuscript preparation, read and approved the final manuscript. All authors abide by the Association for Medical Ethics (AME) ethical rules of disclosure.