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ORIGINAL PAPER

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Low back pain after spinal fusion and Harrington instrumentation for idiopathic scoliosis

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Abstract We reviewed 41 patients with adolescent idiopathic scoliosis treated with spinal fusion and Harrington instrumentation between 1973 and 1992. The mean follow-up was 23 (11–30) years. All patients completed self-administered questionnaires, Oswestry Low Back Pain Disability Score (ODS), Roland Morris score (RLS), and Visual Analog Pain Intensity Scale (VAS). We found a high degree of satisfaction with more than three quarters of the patients in work. The outcome of ODS, RLS, and VAS showed low scores. We found a significant correlation between the scores and the Cobb angle preoperatively as well as at follow-up. The patient-oriented outcome did not correlate with the type of curve, extension of vertebral fusion, tilt angle of the lowest instrumented vertebra, postoperative Cobb angle, loss of correction, or lumbar lordosis. This long-term follow-up of Harrington rod fusion for adolescent idiopathic scoliosis showed no important impairment of health-related quality of life.

Résumé Nous avons examiné 41 patients avec une scoliose idiopathique de l'adolescence traitée par fusion vertébrale et instrumentation de Harrington entre 1973 et 1992. La moyenne de suivi était de 23 ans (11–30). Tous les malades ont complété des questionnaires auto-administrés (Oswestry Score, Roland Morris Score et la cotation visuelle moyenne pour la douleur). Nous avons trouvé un haut degré de satisfaction avec plus de 3/4 des malades exerçant un travail. Les résultats des questionnaires ont montré des scores faibles. Nous avons trouvé une corrélation significative entre les scores et les angles de Cobb préopératoire aussi bien que postopératoire. Le résultat n'est pas en relation avec le type de courbe, l'extension de la fusion vertébrale, l'angle d'inclinaison de la plus basse vertèbre instrumentée, l'angle de Cobb postopératoire, la perte de correction ou la lordose lombaire. Ce suivi à long terme de la fusion rachidienne selon Harrington pour scoliose idiopathique de l'adolescent n'a montré aucune diminution importante de la qualité de vie des patients.

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Introduction

Outcome measures after surgery for adolescent idiopathic scoliosis have focused mainly on objective parameters such as radiographical changes [2, 10–12, 17]. However, such information has proved to correlate only weakly with outcomes that are more relevant to patients. Until recently, only a few long-term outcome studies have used standardized and validated patient-oriented tools to evaluate surgically treated patients with idiopathic scoliosis [1, 3, 4, 7–9].

Materials and methods

We conducted a retrospective study of 99 patients treated for idiopathic scoliosis with spinal fusion and Harrington instrumentation between 1973 and 1992. Five patients had died and ten were lost to follow-up, leaving 84 patients with complete medical records and radiographs. Forty-one patients (seven men/34 women) returned for clinical and radiological examination and completed the questionnaires. Mean follow-up was 23 (11–30) years. Mean age at surgery was 16 (10–39) years and on follow-up 38.5 years. Forty-three patients were interviewed by telephone only.

Radiological analysis included measurement of curve type according to King classification, Cobb angle, tilt

angle of lowest instrumented vertebra (LIV), length of fused segment, and evaluation of degenerative changes within the unfused lumbar spine. All patients were asked to complete an Oswestry Low Back Pain Disability Score (DS), Roland Morris score (RLS) [16], Visual Analog Scale (VAS), and a questionnaire containing questions on satisfaction, marital, and professional status.

Results

Sixty-nine patients reported that they were generally satisfied with the result of the operation. The main reasons for satisfaction were a better posture, opportunity of a normal life with sporting activities, and no back pain. Reasons for dissatisfaction were back pain, cosmesis, and unfulfilled expectations. Of the patients who returned for follow-up, 31 stated they would undergo the procedure again whilst ten said they would not.

Oswestry Disability Score

The ODS for patients attending the follow-up was 6% (0–48). The main areas of disability were standing, sitting, lifting weights, and social effects. The majority of patients were grouped with minor disability, six with medium disability, and two with major disability. The correlation between mobile spinal segments below the fused segment and the results of the ODS are shown in Fig. 1.

Roland Morris Score

The mean RLS for patients attending the follow-up was 3.4 (0–18) points. Three patients complained of chronic low back pain, ten patients of occasional low back pain, and 28 of no low back pain.

Visual analog scale

The mean VAS was 0.5 (0–6).

Radiological results

According to King's classification, ten patients had type I, 22 type II, four type III, three IV, and two type V. Mean preoperative Cobb angle was 76° (40–126°) and was corrected to a mean Cobb angle of 42° (13–77°). Mean loss of correction at follow-up was 8°, with a mean Cobb angle of 52° (33–118°). Mean tilt angle of LIV was preoperatively 17.5° (2–56°) and postoperatively 12° (0–40°). At follow-up, mean tilt angle of LIV was 14° (0–40°) and mean fusion length was 10 (6–14) segments.

Adjacent-level degeneration of the segment below LIV was found in 31 patients, with mild facet joint arthritis and ostechondrosis. Marked degeneration with severe loss of disc height and rotational subluxation of adjacent vertebrae was found in seven patients. Degenerative spondylolisthesis was found only in four patients. Average lordosis between L-1 and L-5 was −39.5° (0−67°). Reduction of lumbar lordosis was found in 11 patients in combination with a forward shift of more than 2 cm.

Correlation of radiological results with functional outcome

Significant correlation was found between scores (ODS, RLS, VAS) and preoperative Cobb angle (p=0.02) and Cobb angle at follow-up (p=0.04). Thus, patients with a

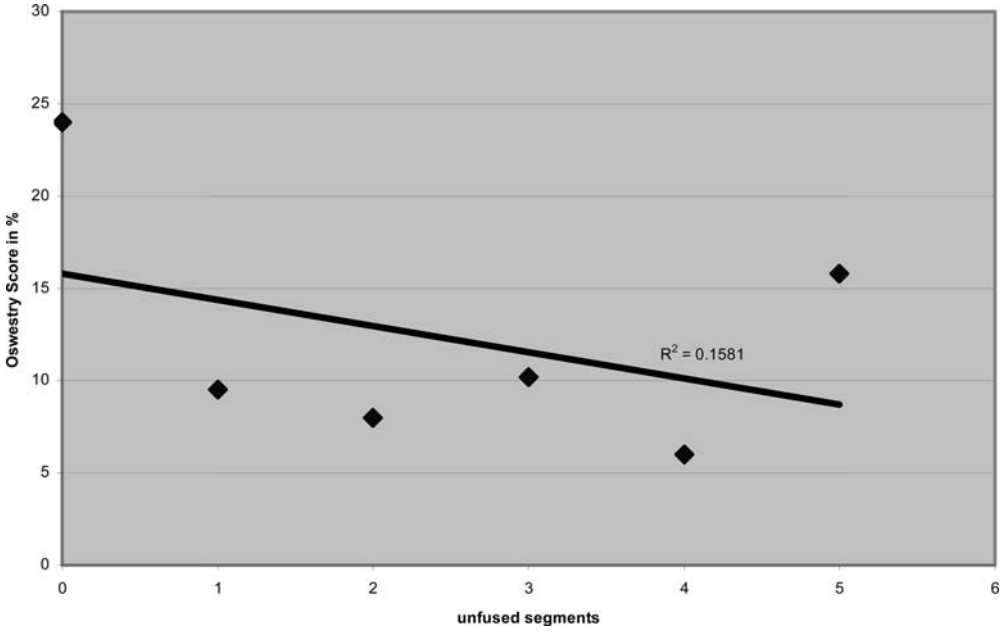

Fig. 1 Correlation between Oswestry disability score (ODS) and number of unfused segments below the spinal fusion.

high Cobb angle preoperatively and at follow-up showed higher values within all three scores. No correlation was found between curve type, age of surgery, extension of vertebral fusion, tilt angle of LIV, postoperative Cobb angle, loss of correction, and lumbar lordosis and ODS, RLS, and VAS scores. Patients with radiographically marked degenerative changes with severe loss of disc height showed a tendency to higher scores without being statistically significant.

Discussion

The physical and psychological health-related quality of life in patients treated surgically for idiopathic scoliosis has been variably investigated [1–5, 7–15, 17]. However, due to differences in demographic data, types of questionnaires, and response rate, it remains controversial as to whether spinal fusion and instrumentation in idiopathic scoliosis leads to a higher incidence of low back pain. The results of our study indicate that the overall outcome is highly satisfactory 20 years later despite the relatively high loss in correction of the major curve (25%) and the length of the fused segment (average ten segments).

However, we also found a certain degree of dissatisfaction (29%), particularly with regard to patient expectations. This issue seems a very difficult topic in daily clinical routine. Although several authors have compared operative with nonoperative treatment for idiopathic scoliosis [3, 4, 6, 7, 14, 15], it appears that the technical detail of the operation is of no interest to the patient compared to the cosmetic and functional outcome. Another important issue was whether patients would have surgery again. Indications for the operations were prevention of progression and stabilization. The majority were prepared to undergo such an operation again, even with the knowledge that surgery still carries the same risk, although modern spinal instrumentation no longer is followed by postoperative bracing or casting.

With regard to low back pain, our study confirmed the findings of several authors [1–4, 7, 9, 13]. One cannot show a significant correlation between low back pain and factors such as extension of the vertebral fusion, tilt angle of the LIV, postoperative Cobb angle, loss of correction, lumbar lordosis, and degenerative changes. Only the Cobb angle preoperatively and at follow-up showed a significant correlation ($p<0.04$, $p<0.02$) with the scores, but many authors have shown similar results and concluded that overall patient disability after Harrington instrumentation due to low back pain is still minor. In particular, the severity of low back pain was relatively low, and only one patient in our study presented at follow-up with a long-term history of severe low back pain. Both the patients we reached via telephone and the patients who returned for follow-up examination, were mostly satisfied with result of the operation. Dickson et al. [5] reported a significantly higher incidence of back pain than in control participants but concluded that their patients were functioning very well compared with gender- and age-matched controls.

In the current study, scores showed minor disability and a low incidence of low back pain. Within the ODS, the majority of activities were not reduced. Items like lifting weights, standing and sitting were mentioned most often, but, there was no significance with regard higher disability. Results of the RLS were 3.4 points, which is similar to other studies. Only two thirds of patients had no back pain at all. Padua et al. [13] found an average score of 1.7, and Gotze et al. [8] found a mean score of 2.86 with RLS.

Whereas the studies of Danielsson et al. [4] with a follow-up of 23 years and a significantly reduced quality of life compared with age matched individuals, the good results of our study and others [7–9, 13] may be related to the shorter follow-up and the smaller study group. Padua [14] for example, could only locate 38% of patients but with a follow-up assessment of 37.5 years.

The loss of correction found in our study is similar to other in the current literature [10–12, 17]. Loss of correction, however, does not correlate with a deterioration of quality of life in terms of an increased occurrence of low back pain. In our study, patients who reported having low back pain did not have the greatest loss of correction, and we found no correlation between the two. Nor were we able to demonstrate any correlation between the length of spinal fusion and the occurrence of low back pain [2, 14], which Dickson et al. [5] could. Gotze et al. [8] and Helenius et al. [9] did not find any correlation between the length of the fused segments and the distal level of hook insertion. We can confirm those findings, as we saw a tendency to lower ODS scores with more mobile segments below the spinal fusion (Fig. 1).

Several authors have reported an association between degenerative radiological changes and disability [2–4, 9, 13]. Degenerative changes were found in almost all patients with a variety of degenerative signs, from mild facet joint sclerosis to severe resorption of the adjacent disc followed by degenerative spondylolisthesis. But, again, a direct correlation between the radiological findings and the different scores were not seen.

More than 20 years after operation for adolescent idiopathic scoliosis with standard Harrington instrumentation, the majority of patients experienced no severe impairment of their quality of life due to low back pain. Due to the retrospective nature of our study and the small number of patients, we can, however, make no conclusion regarding incidence of low back pain and length of spinal fusion. Although 50% of patients had a fusion of more than two thirds of the lumbar spine, the occurrence of low back pain was low, and no patient suffered a major functional deficit. The scores (ODS, RLS, VAS) did not reveal any high values. Spinal fusion in the treatment of adolescent idiopathic scoliosis is not followed by increased occurrence of low back pain in later life.

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