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COTREL TRACTION, EXERCISES, CASTING IN THE TREATMENT OF IDIOPATHIC SCOLIOSIS

A Pilot Study and Prospective Randomized Controlled Clinical Trial

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A pilot study of ten individuals with adolescent-onset idiopathic scoliosis demonstrated that a week of Cotrel traction and exercises did not improve curve correction obtained by the application of an elongation, derotation, flexion (EDF) cast. There was, however, a significant improvement in lateral bending correction during this period. A prospective, randomized, controlled clinical trial showed that the exercise programme and not the traction was responsible for rendering the spine less rigid.

Key words: scoliosis; traction; exercises; casts; lateral bending

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The scoliosis treatment team in this centre was impressed by the management of scoliosis as demonstrated by Cotrel & Morel (1964) when they visited Berck-Plage. Subsequently Cotrel visited Louisville and demonstrated his technique of traction, exercises, and casting (elongation, derotation, flexion-EDF). Since then we have used this method for the non-operative treatment of idiopathic scoliosis but have been disappointed with the long-term results. Furthermore it is time-consuming in terms of manpower and hospitalization.

Nachemson & Nordwall (1976, 1977) demonstrated that Cotrel traction is of no value in the preoperative phase of treatment of idiopathic scoliosis. Their patients did not achieve a better operative correction of their curve nor did any benefit in terms of safety accrue when surgery was preceded by a week of traction. Ramsay et al. (1976) have shown that with Cotrel traction curve correction can be obtained but that no further improvement is achieved after 8 days. Physical therapy is an integral part of this treatment programme and it is not clear whether the traction or "loosening-up" exercises, or indeed both, are responsible for curvature correction. A pilot study and a prospective randomized controlled clinical trial were therefore carried out.

PILOT STUDY

Patients and method

Ten consecutive patients with adolescent-onset idiopathic thoracic scoliosis were investigated. There were nine females and one male. Their mean age was 12.9 years. They underwent our usual in-patient treatment programme of traction and physical therapy exercises and were EDF casted on the eighth day after admission. Traction was in the

form of autoelongation and these individuals were encouraged to perform this throughout the day. At night the traction was altered to fixed traction starting with 5 lb rising to 12 lb on their seventh night. Physical therapy exercises were performed in the gymnasium for two 1-h periods each day under the supervision of a physical therapist. In each session 20 exercises were performed 15 times each in succession and the various exercise routines concentrated on lateral bending correction of the curve and pelvic tilting to mobilize the concomitant lumbar lordosis. On the eighth day an EDF cast was applied under maximum tolerable fixed traction. In order to control the investigation these individuals were similarly EDF casted on day 1 before treatment was commenced. This cast was then removed in order that they could go through the treatment regime.

A series of antero-posterior (AP) radiographs of the spine were taken during the treatment period and the curves were measured by the Cobb method (Cobb 1948). The variables studied were:

1. Standing curve before treatment
2. Curve on lateral bending before treatment
3. Standing curve in first cast, before treatment.
4. Curve on lateral bending before second cast.
5. Curve under maximum traction before second cast.
6. Standing curve in second cast, after treatment.

Results

The mean magnitude of deformity during standing before treatment was 43°; on lateral bending before treatment 20°; and standing curve in first cast 26°. Table 1 shows the effect of traction and exercises on the standing curve in the cast, and on lateral bending. There was no significant difference between the curve measurements in the casts on day 1 and day 8, 26° and 26° ($P > 0.05$). Lateral bending corrected the curve from 20° to 13°, a statistically significant correction at the 0.1 per cent level. In no case did the maximum traction correction equal or better the correction determined by initial lateral bending, and cast correction was significantly worse than the maximum traction correction ($P < 0.05$).

Table 1. Results of pilot study

	1	2	*P*
Standing curve in cast	26°	26°	> 0.05
Curve on lateral bending	20°	13°	< 0.001

Comment

From this pilot study it was considered that 8 days of hospitalization for traction and physical therapy was not justified if a policy of EDF casting was to be pursued, as no benefit in terms of curve correction in the cast occurred from such a treatment regime. However, it appeared that treatment had improved the lateral bending correction significantly and considerably. As the maximum traction correction after treatment did not even approach the initial lateral bending correction, physical therapy exercises seemed to be the most likely cause of the improvement in lateral bending correction. A prospective, randomized, controlled clinical trial was therefore carried out.

PROSPECTIVE, RANDOMIZED, CONTROLLED CLINICAL TRIAL

Patients and method

The next 20 patients with a diagnosis of adolescent onset idiopathic scoliosis were randomly allocated to one of two treatment groups:

1. Traction and no exercises
2. Exercises and no traction.

Traction or exercises were performed as in the pilot study.

The mean age of the two groups of patients did not differ significantly, 13.1 years and 13.6 years ($P > 0.05$) nor did mean curve magnitude before treatment, 42° and 40° ($P > 0.05$). The same variables were studied in these groups as in the original pilot study.

Results

1. *Traction only.* Table 2 shows the effect of traction on the standing curve in the cast and the curve on lateral bending. There was no significant difference between the cast measurements on day 1 and day 8, 32° and 35°, respectively ($P > 0.05$). Nor was there any

Table 2. Results of trial with traction only

	1	2	*P*
Standing curve in cast	32°	35°	>0.05
Curve on lateral bending	21°	22°	>0.05

significant difference between the lateral bending corrections, 21° and 22°, respectively ($P>0.05$). The mean correction in maximum traction, 27°, was significantly worse than the correction obtained by initial lateral bending ($P<0.05$).

2. *Exercises only.* Table 3 shows the effect of exercises alone on the standing curve in the cast and the curve on lateral bending. There was again no significant difference between

Table 3. Results of trial with exercises only

	1	2	*P*
Standing curve in cast	32°	33°	>0.05
Curve on lateral bending	20°	16°	<0.001

the cast corrections on day 1 and day 8, 32° and 33°, respectively ($P>0.05$). However there was a significant improvement in lateral bending, 20° and 16°, respectively ($P<0.001$).

DISCUSSION

There appears little justification for a period of traction and physical therapy if the patient is to be EDF casted as there is no improvement in cast curve magnitude in this time. Furthermore the improvement in lateral bending so obtained is completely nullified by holding the spine in a cast in a position far worse than even the degree of correction obtained by lateral bending before treatment started. In addition it would seem illogical, after making a spine less rigid, to imprison it in a cast. However, the trial clearly demonstrates that traction and exercises confer no benefit over exercises alone and that physical therapy is the likely cause of the improved lateral bending. Perhaps the most sensible therapy should be a period of intensive physical therapy followed by a Milwaukee brace about which considerably more is known and with which the majority of spinal surgeons are at least familiar. Coming out of the brace for short periods to perform an exercise programme would appear justified and thus the spine can be stretched to its limits which clearly cannot occur in a cast.

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