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PREOPERATIVE COTREL TRACTION IN IDIOPATHIC SCOLIOSIS

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Eighty consecutive patients with idiopathic scoliosis were treated preoperatively with Cotrel traction. Distraction X-rays were taken 2 or 3 days after start of traction and 8–10 days later. In 47 patients equal distraction force was applied in both instances. The force, averaging 28 klb, was measured on the head sling. Cotrel traction reduced the spinal curve 37.5 per cent in the first and 38.9 per cent in the second measurement. The difference is not significant. Preoperative Cotrel traction did not improve the surgical curve correction. Postoperative loss of correction and complication rate was insignificantly reduced compared with the results in a previous study. Cotrel traction does, however, give some indication of the surgical correction achievable.

Key words: Cotrel traction; idiopathic scoliosis; preoperative traction

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Preoperative treatment to make the spinal curve more flexible has been used in most scoliosis centres. In our hospital the Harrington distraction rod technique has been used since 1972. A 14-day preoperative physiotherapy comprising daily stretching and passive bending was used till 1976. This method improved the curve flexibility an average of 4 degrees (Bjerkreim 1976). Since March 1976 the Cotrel longitudinal traction (Cotrel 1973) has been used preoperatively. Conflicting results exist about the effect of this treatment. Nachemson & Nordwall (1977) could not demonstrate any improvement in surgical correction, and Dickson & Leathermann (1978) obtained no greater reduction of spinal curves using plaster jackets after Cotrel traction. Ramsey et al. (1976), on the other hand, showed that the flexibility increased with traction. The purpose of the present study was to evaluate the effect of preoperative Cotrel traction on the surgical correction of idiopathic scoliosis.

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MATERIAL AND METHODS

The material comprised the first 80 consecutive patients (73 females, 17 males) with idiopathic scoliosis treated preoperatively with Cotrel traction over a period of 3 years. Seventy two patients had single curves and eight, double curves (Tables 1 and 2).

Table 1. Type of scoliosis and sex distribution in idiopathic scoliosis treated preoperatively by Cotrel traction

	Female	Male	Total
Infantile	3	0	3
Juvenile	16	9	25
Adolescent	44	8	52
Total	63	17	80

Table 2. Curve type in patients with idiopathic scoliosis treated preoperatively by Cotrel traction.

Thoracic	single curves	65
Thoraco-lumbar	single curves	7
	double curves	8
Total		80

The Cotrel traction was started 1 or 2 days after admission to the hospital. A continuous cephalo-pelvic traction of 3 klb was applied, and a dynamic, intermittent force of about 28 klb (10–40 klb) was exerted by the patients 10 min every hour during daytime (Figure 1). The force varied according to the patient's cooperation, tolerance and weight. Before traction started, standing X-rays of the spine were taken. The first X-ray in Cotrel traction was taken supine during maximum load on the second or third day, when the patients had got used to the Cotrel apparatus. We used a traction force indicator connected to the head sling. After 8–10 days of traction another picture was taken, the patients trying to exert the same traction force as when taking the first X-ray. The patients were ambulatory for about 2 h every day throughout the traction period for personal care, routine investigations and participation in a shared exercise programme.

Postoperatively the patients were nursed supine or lying on their sides without external support for 3–4 weeks depending on the lower hook site. X-rays were taken supine immediate postoperatively and before discharge standing in a well-fitted Milwaukee-brace. Follow-up registrations were made 1 year postoperatively standing in the Milwaukee-brace and 2 years postoperatively standing without support.

In the 47 patients where the two X-rays in Cotrel-traction were taken with equal extension force, these registrations were compared. The magnitude of the curve correction gained at surgery was compared with the results of a previous series in which the same operation technique was used (Bjerkreim 1976). X-rays taken immediately postoperatively, at discharge, 1 year and 2 years postoperatively were compared and loss of correction was calculated.

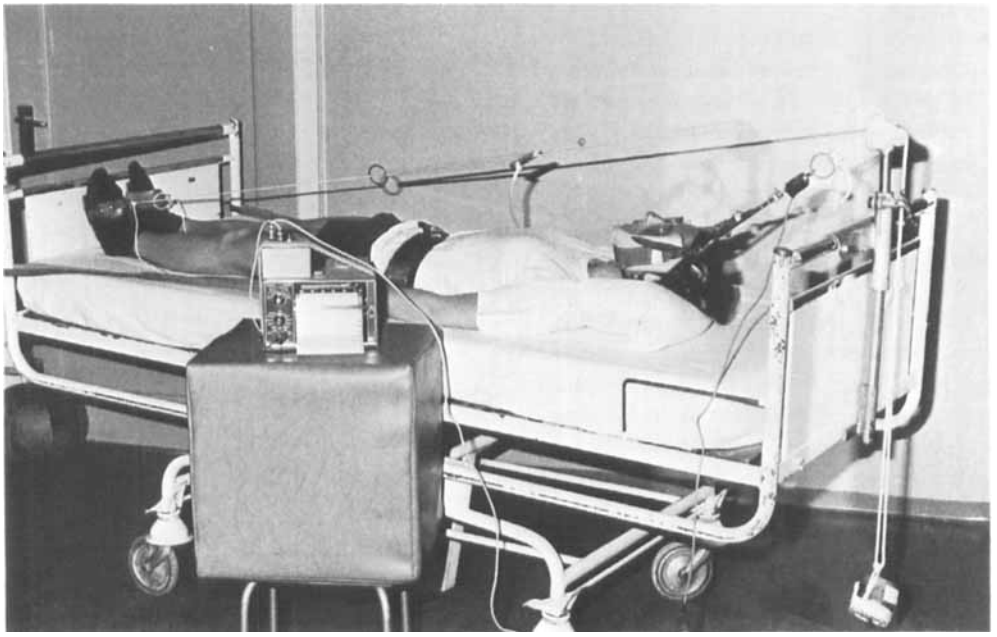

Figure 1. Cotrel traction showing the force registration equipment connected to the head sling.

RESULTS

Mean age at operation was 18.5 years (range 11–49 years); 21 patients were 20 years old or more. The mean curve size was 64.2 degrees for the single curves, with a variation from 39 to 128 degrees (Table 3). The corresponding measurements for the eight patients with double curves were 65.5 (48–82) degrees and 62.9 (45–90) degrees for the upper and lower curves respectively.

Supine X-rays in Cotrel traction showed a significant curve correction. Looking at the 47 patients with single curves and two comparable X-rays, the curves below 60 degrees were reduced 23.1 degrees (43.8 per cent) in the first registration and 23.2 degrees (44 per cent) in the second (Table 4). Curves 60–90 degrees were reduced 24.5 (36.2 per cent) and 26.6 degrees (39.3 per cent) in the first and second registrations, respectively, and scoliosis above 90 degrees 28.5 (26.9 per cent) and 25.2 degrees (26.3 per cent).

At operation additional curve reduction was obtained. The operation led to a total curve cor-

Table 3. Correction at operation and loss of correction after surgery in the total material (80 patients)

Curve size	*n*	Curve size before operation, degrees (range)	Correction at operation	Loss at discharge	*n*	Total loss after 1 year degrees	*n*	Total loss after 2 years degrees
Single curves								
<60°	35	52.0 (39–59)	27.1 (15–40) 52.1%	0.6 (–7–10) 2.2%	21	3.0 (–5–10) 11.9%	10	3.8 (–5–10) 14.8%
60–89°	29	67.8 (60–82)	33.5 (22–46) 49.4%	2.8 (–4–10) 8.4%	15	6.1 (0–13) 17.6%	6	7.0 (4–12) 20.5%
>90°	8	104.0 (90–128)	32.9 (9–56) 31.6%	1.9 (–3–9) 5.8%	7	2.9 (–8–14) 8%	3	–0.3 (–1–10) –0.7%
All single curves	72	64.2 (39–128)	30.3 (9–56) 47.2%	1.6 (–7–10) 5.3%	43	4.0 (–8–10) 13.2%	19	4.2 (–5–12) 13.5%
Double curves								
Upper	8	65.5 (48–82)	27.0 (12–39) 41.2%	1.8 (–5–10) 6.7%	6	4.3 (–9–17) 16.5%	5	5.2 (–1–16) 18.1%
Lower	8	62.9 (45–90)	31.8 (18–46) 50.6%	4.9 (1–14) 15.4%	6	8.0 (2–16) 26%	5	8.6 (3–15) 28.3%

Table 4. Immediate and late, and effect of, Cotrel traction compared with curve correction after operation in 47 patients with two equal registrations

Curve size	No. of patients	Age at operation Years (Mean, range)	Curve size Before operation degrees (range)	Correction, degrees (average)		
				First Cotrel traction	Second Cotrel traction	At operation
<60°	21	15.9 (11.5–25.5)	52.7 (39–59)	23.1 (11–38) 43.8%	23.2 (12–35) 44.0%	24.4 (15–40) 52%
60–89°	20	21.0 (12–49)	67.6 (60–82)	24.5 (15–38) 36.2%	26.6 (17–38) 39.3%	33.6 (25–46) 49.7%
>90°	6	21.8 (11–32.5)	96.0 (90–110)	25.8 (3–46) 26.9%	25.2 (9–43) 26.3%	35.0 (18–56) 36.5%
	47	18.8 (11–49)	64.6 (39–110)	24.0 (3–46) 37.5%	24.9 (9–43) 38.9%	31.0 (15–56) 48.4%

Table 5. Complications in 80 patients of idiopathic scoliosis treated preoperatively by Cotrel traction

Complication	No. of patients
Upper hook laminar fracture	1
Rod displacement in upper hook	1
Neurological	2
Pneumonia	2
Pneumothorax	1
Gastro-intestinal retention	1
Other minor complications	3

rection of 30.3 degrees, or 47.2 per cent, for all single curves (Table 3). The corrections for double curves were 27.0 degrees (41.2 per cent) and 31.8 degrees (50.6 per cent) for upper and lower curves, respectively. In single curves correction was greatest in curves below 60 degrees (52.1 per cent) and smallest for curves above 90 degrees (31.6 per cent).

The initial loss in curve correction, i.e. the loss before discharge, was 1.6 degree (5.3 per cent) on average (–7 to 10 degrees) in single curves and 1.8 and 4.9 degrees in upper and lower double curves, respectively (Table 3). In 43 single curves the average loss 1 year postoperatively was 4 degrees (13.2 per cent) and 2 years after surgery in 19 patients 4.2 degrees (13.5 per cent). In double curves the loss in correction was insignificantly higher.

No complications occurred from the Cotrel traction although some patients felt minor discomfort from the head and pelvic slings. Postoperative complications occurred in 10 patients, or 12.5 per cent (Table 5). An unco-operative girl with Down's syndrome sustained a laminar fracture at the upper hook site and was reoperated on after 14 days. One patient had transient irradiating pain postoperatively and one adult suddenly, 6 weeks postoperatively, developed a pneumothorax which healed spontaneously.

DISCUSSION

Cotrel traction effectively reduced the spinal curve. However, no significant increase in correction was found in the second registration taken 8–10 days after the first one.

At surgery an additional correction was gained, making the total reduction in single curves 30.3 degrees (47.2 per cent). This is about the same correction as found in a previous study of patients operated on without preoperative Cotrel traction (Bjerkreim 1976). Our findings thus corroborate the results of Nachemson & Nordwall (1977) who found no effect of preoperative Cotrel traction on surgical correction of idiopathic scoliosis of 40–90 degrees. Nor, in curves above 90 degrees, did Cotrel traction have any significant effect on the curve correction. We agree with Letts et al. (1975) that rigid curves of that magnitude should be treated preoperatively by skeletal traction.

The slightly lower complication rate in the present series, especially from the upper hook site, may have been caused by the gradual distraction of the curves preoperatively, but other factors may also have influenced the results, e.g. improved operative technique.

CONCLUSION

We found that the curve correction after 8–10 days of traction was not significantly better than the result obtained after 2–3 days. Preoperative Cotrel traction did not improve the surgical curve correction. The traction may, however, give some indication of the correction achievable at operation.

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