

# Screening for idiopathic scoliosis

## Comparison of 90 cases shows less surgery by early diagnosis

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We assessed the final outcome of curve progression in 90 consecutive school children with idiopathic scoliosis. 46 children treated 1971–76 were compared with 44 treated 1978–81, after the introduction of school screening in 1977. There was a decrease in demand for surgery from 45 percent before screening

to 10 percent in the screening group. When differences in subsequent brace types were accounted for, the outcome remained better in cases detected during the screening period. The most probable explanation is the earlier onset of bracing in the screened group.

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In recent years the efficacy of scoliosis screening programs has been questioned (Wynne 1984, Morais et al. 1985). Some studies (Torell et al. 1981, Lonstein et al. 1982, Willner 1982) have pointed out positive effects, i.e., a decreased number of operations after introduction of screening programs. A change in the natural history of idiopathic scoliosis (Leaver et al. 1982), a change in indications for surgery (Berwick 1985), or a change in brace type used for conservative treatment may all be responsible for the observed decrease in the number of operations as well. No studies have so far dealt with a controlled population before as well as after the introduction of screening. We report the outcome of curve progression, as reflected by the demands for surgery, in a scoliosis screening program as compared to the period before screening was started.

### Patients and methods

The indications for surgery were recorded in 90 school children, living in Malmö and consecutively fulfilling the indications for treatment for idiopathic scoliosis 1971–1976 and 1978–1981. The indications for brace treatment were a progressive ( $\geq 5^\circ$  within a year) curve of  $25^\circ$  or more in a child with a skeletal age of less than 16 years for girls or 17 years for boys. The indications for brace treatment and surgery remained unchanged 1971–1981. All 90 patients but 1 were actually brace-treated, even though 8/46 in the non-screening group had an initial curve of  $\geq 45^\circ$ —the brace efficacy thus being questionable. Indications for

surgery were defined as a curve that progressed to a Cobb's angle of  $45^\circ$  or more, whether surgery was subsequently performed or not.

In 1971–1976 school physicians had only been recommended to examine the children's backs. The forward bending test was rarely used. In 1977, a conventional screening program was introduced, involving annual mandatory screening of all school children between the ages of 7 and 16. A detailed description of how to screen was presented to the school health staff. The forward bending test was always used, and a specially trained nurse assisted in the screening. 46 children treated before screening (1971–1976) were compared with 44 children treated during screening (1978–1981). All but 4 patients were followed for at least 2 years after the cessation of growth or until an operation had been performed.

Odds ratio and logistic regression were used as significance tests.

### Results (Table 1)

The risk of deterioration to  $45^\circ$  in children, diagnosed and qualified for treatment before the screening period was 8 (99 percent confidence interval 1.6–36) times greater than after screening (Table 2). Since early diagnosis is a result of screening, initial curve and initial skeletal age are factors related to screening. As could be expected, there was a lower skeletal age as well as a smaller initial curve in the screening group (Table 3). However, sex and brace type are factors, not per se, related to screening. The sex distributions were

Table 1. Observations in 90 school children with idiopathic scoliosis

	A	B	C	D	E	F	G	H	I		A	B	C	D	E	F	G	H	I		
1	2	72	1	2	46	17	1	48	3	6	46	2	74	1	1	44	12	1	51	8	2
2	2	71	1	1	40	15	1	52	2	5	47	2	79	2	2	34	16	2	36	2	7
3	2	72	1	2	33	16	-	32	1		48	1	75	2	2	28	11	2	14	2	4
4	1	72	1	2	37	16	2	38	2	3	49	2	78	2	2	31	13	2	18	2	5
5	2	72	1	2	37	16	2	43	2	3	50	2	80	2	2	28	14	2	13	3	
6	2	71	1	2	35	14	2	44	3	11	51	2	78	2	2	36	16	2	34	2	
7	2	72	1	2	34	16	2	34	2	2	52	2	78	1	2	27	14	2	25	2	1
8	2	71	1	2	30	13	2	30	2	1	53	2	78	1	2	26	13	2	22	3	7
9	2	71	1	2	26	14	2	28	2		54	2	76	1	1	60	12	1	63	4	9
10	2	72	1	2	31	15	2	22	2	2	55	2	71	1	1	60	13	1	60	5	9
11	2	71	1	2	30	14	1	52	2	11	56	2	79	2	2	30	14	2	17	3	2
12	2	74	1	1	37	16	1	50	2		57	2	78	1	2	26	13	2	25	2	
13	2	73	1	2	45	16	1	47	2		58	2	79	2	2	35	14	2	34	3	
14	2	74	1	2	48	17	2	43	3	8	59	2	78	1	2	25	14	2	15	2	8
15	2	71	1	2	35	14	-	35	1	2	60	2	79	2	2	32	14	2	33	4	9
16	2	73	1	2	27	15	2	24	2		61	2	80	2	2	30	15	2	28	2	7
17	2	72	1	2	27	14	2	20	2	1	62	2	78	2	2	27	12	2	31	2	1
18	2	74	1	2	25	15	2	23	4	6	63	2	79	2	2	29	14	2	22	2	6
19	2	72	1	1	50	12	1	56	11	6	64	2	78	1	2	25	13	2	22	2	2
20	2	73	1	2	40	14	2	36	2	2	65	2	78	2	2	30	11	2	39	2	1
21	2	73	1	1	37	11	1	48	5	5	66	2	80	2	2	25	13	-	25	0	6
22	2	74	1	1	43	14	1	48	2	7	67	2	79	2	2	31	13	2	32	2	1
23	2	75	1	2	30	14	2	30	2	2	68	2	79	2	2	29	13	2	28	2	
24	2	74	1	2	32	15	2	36	2	1	69	2	80	2	2	28	12	2	10	4	
25	1	80	2	2	39	15	1	53	2	8	70	2	81	2	2	30	13	2	35	2	5
26	2	76	1	2	32	13	2	28	2	1	71	2	79	2	2	30	11	2	29	2	1
27	2	76	1	2	35	16	2	35	2	6	72	2	79	2	2	25	12	2	15	2	
28	2	76	1	2	42	14	2	35	2	3	73	2	80	2	1	35	13	1	50	2	8
29	2	72	1	2	37	12	2	32	3	2	74	2	80	2	2	30	13	2	14	2	
30	2	75	1	1	37	15	1	49	4	7	75	2	75	1	1	40	8	1	49	2	2
31	1	78	1	2	38	14	1	45	2		76	2	80	2	2	32	14	2	35	2	
32	2	75	1	1	26	14	1	49	4	3	77	2	78	2	2	27	11	2	18	2	7
33	2	75	1	1	49	14	1	52	2	2	78	2	82	2	2	30	13	2	25	2	6
34	2	74	1	2	36	14	1	45	2	2	79	2	80	2	2	26	13	2	24	2	2
35	2	75	1	2	27	13	2	31	3	6	80	2	81	2	2	30	13	-	29	1	8
36	2	76	1	1	40	14	1	47	1	5	81	2	79	2	2	28	13	2	26	2	8
37	2	75	1	2	25	13	2	15	2		82	2	78	2	1	40	11	1	64	2	8
38	2	75	1	1	25	13	1	47	2	2	83	2	79	2	2	25	11	2	30	4	3
39	2	76	1	1	27	14	1	48	2	6	84	2	81	2	2	26	12	2	24	2	
40	2	78	2	2	25	14	2	25	3	6	85	2	81	2	2	27	13	2	28	2	
41	2	75	1	2	38	13	1	45	2	3	86	2	78	1	2	28	11	2	37	2	1
42	2	78	1	2	30	15	2	32	2	9	87	2	81	2	2	28	14	2	26	4	1
43	2	75	2	2	30	13	2	39	3	8	88	2	80	2	2	33	12	2	28	2	3
44	2	76	1	2	32	13	2	36	2		89	2	79	2	2	31	10	2	9	2	2
45	2	75	1	2	31	12	2	37	2	4	90	2	80	2	2	38	10	2	22	2	

A Sex  
 1 Boy  
 2 Girl  
 B Year at beginning of treatment  
 C Type of brace  
 1 Milwaukee  
 2 Boston  
 D Surgery  
 1 Yes  
 2 No  
 E Curve at start of treatment (degrees)  
 F Skeletal age at start of treatment (years)  
 G Outcome at follow-up  
 1 Demand for surgery  
 2 No demand for surgery  
 - Drop-out  
 H Curve at follow-up (degrees)  
 I Follow-up (years and months)

Table 2. Classification table presenting the relative risk of demand for surgery in relation to screening

		Demand for surgery		Total
		Yes	No	
Screening	No	20	24	44
	Yes	4	38	42
	Total	24	62	86

Odds ratio 7.7, 99% confidence interval 1.6-36.

similar in the 2 groups, whereas the brace types differed. If there is a difference between the 2 braces with regard to treatment efficacy, the observed benefit of screening could turn out to be partly a brace effect. Using logistic regression, the relative risk could be calculated separately for various predictors. There was a still greater risk (ratio 3.3, *P* 0.05) of indications for surgery when treatment was started before the screening period, regardless of brace type used.

Table 3. Distribution of sex, brace type, initial skeletal maturity and initial curve magnitude

	n	Sex		Brace type		Skeletal age		Initial curve		
		Boy	Girl	Milwaukee	Boston	10-12 yr	≥13 yr	<35°	35-44°	≥45°
Non-screening	44	2	42	42	2	12	32	19	17	8
Screening	42	2	40	8	34	24	18	35	7	0

## Discussion

Decisions to introduce screening for scoliosis are partially based on the general assumption that early detection of the disease is beneficial. Some studies (Torell et al. 1981, Lonstein et al. 1982, Willner 1982) have shown a decreased demand for surgery after the introduction of screening. However, other factors, such as a change to an underarm brace or a change in the natural history of scoliosis, may be equally important for reducing the number of operations. In our study, the brace factor could be adjusted for by the logistic regression analysis. The risk population was the same before and after introduction of the screening program. In the same population, there was no change in the natural history of idiopathic scoliosis during the observation period (Montgomery and Willner 1988), nor in the indications for brace treatment or surgery.

We conclude that screening decreases the demand for surgery because the scoliosis is detected at a younger age with smaller curves, thus having a better prognosis.

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