

E. Orvomaa
V. Hiilesmaa
M. Poussa
O. Snellman
K. Tallroth

Pregnancy and delivery in patients operated by the Harrington method for idiopathic scoliosis

Received: 31 October 1996
Revised: 3 February 1997
Accepted: 29 April 1997

E. Orvomaa
Finnish Navy

E. Orvomaa (✉)
Haukikuja 3 A, FIN-02170 Espoo, Finland
Tel. +358-9-452 3525;
Fax +358-9-737 976

V. Hiilesmaa
First and Second Departments
of Obstetrics and Gynecology,
Helsinki University Central Hospital,
Helsinki, Finland

M. Poussa · O. Snellman · K. Tallroth
The Orthopedic Hospital of the Invalid
Foundation (Orton), Helsinki, Finland

Abstract The course and outcome of 142 pregnancies in 146 patients operated between 1970 and 1975 by the Harrington method for idiopathic scoliosis were studied to determine the effects of scoliosis on pregnancy and childbirth and the effects of pregnancy on the remaining fused and unfused scoliotic curvatures. Occurrence of and sick leave due to low back pain during pregnancy was determined. The patients, all originally treated at the Orthopedic Hospital of the Invalid Foundation (Orton) in Helsinki, Finland, were invited to a clinical and radiological re-examination on average 19 years following surgery. The results show that pregnancy does not significantly increase

fused scoliotic curvatures nor the remaining unfused curvatures. A somewhat higher proportion of children (23%) were delivered by cesarean section than in the general population (15%; $P < 0.01$), but this result should only be taken as suggestive. Rates of complications of pregnancy and in labor did not differ from those in the background population. The offspring were healthy. Low back pain during pregnancy occurred in about 40% of our patients, but was severe enough to cause sick leave only in 11% of the pregnancies.

Key words Idiopathic scoliosis · Surgery · Pregnancy · Low back pain

Introduction

Paul Harrington developed the instrumentation bearing his name for correction and fusion of scolioses in 1960 [8]. In Finland, almost all patients with idiopathic scoliosis are treated, either conservatively or operatively, at the Orthopedic Hospital of the Invalid Foundation (Orton), where the Harrington method has been in use since 1966. About 85% of patients with idiopathic scoliosis are female. Very few data are available on these patients' pregnancies and childbirths. Our study set out to answer such questions as: Do women with fused spines experience more low back pain during pregnancy than other women? Is there an increased incidence of obstetric complications, and, if so, what are the reasons? Is there an increase in the fused scoliosis curvature, or in the remaining unfused cur-

vature? Do the children have more congenital anomalies or other developmental problems caused by delivery?

Patients and methods

Between 1970 and 1975, 171 female patients between 13 and 18 years of age (mean 14 years) were treated operatively for idiopathic scoliosis at the Orthopedic Hospital of the Invalid Foundation. The patients were followed up at the hospital's outpatient clinic until the fusion was deemed stable and until full skeletal maturity had been reached, which was at (mean) 19 years of age. The surgical technique used consisted of a primary operation with application of the Harrington apparatus and distraction of the spine with a spinal fusion operation 2 weeks later. All patients were operated on by one senior author (O.S.). This series of patients was invited to a clinical and radiological re-examination on average 19 years following surgery. Of the 171 patients, 2 had died, 8 had emigrated, and 2 could not be located. Of the remaining 159 patients,

146 (92%) were re-examined at the outpatient clinic. Their mean age at this time was 33 years (range 29–36 years). The patients were interviewed and clinically examined by the first author (E.O.), who had not had any part in the initial treatment of the patients. The patients answered questions about pregnancy, low back pain, and child delivery. The patients' charts and radiographs were reviewed and new radiographs were taken. The results were analyzed at the Helsinki University Computing Service Center using a modified SPSS statistical package.

Results

Of the 146 patients, 79 had had one or more deliveries (54%). Twenty-six had had one delivery, 43 two deliveries, 7 three deliveries, and 3 had had four deliveries. There were three twin pregnancies, making a total of 142 pregnancies and 145 children. The method of delivery is given in Table 1, which shows the cesarean section rate to be 23%. One patient had undergone three cesarean sections because of toxemia and cephalopelvic disproportion. There was one case of a prolapse of the umbilical cord. None reported the cesarean sections having been performed because of the scoliosis. Ninety percent of the pregnancies were of normal duration and 10% were premature, prematurity defined here as less than 38 weeks of gestation.

Thirteen patients of 146 had suffered miscarriages, of which none could be related to scoliosis. Twenty-one patients of 146 had undergone an induced abortion, none because of scoliosis or other medical reasons, but for social reasons.

All but four children (3%) were reported to be healthy. One is retarded because of rubella infection, and one is re-

tarded with multiple organ anomalies caused by a rare chromosomal disorder inherited from the father. One child has secondary scoliosis due to a vertebral anomaly, and one child had bilateral congenital hip luxation.

The incidence and time of onset of low back pain during pregnancy is shown in Table 2.

Sick leave because of low back pain occurred in 11 women (14%) during their first pregnancies. The period of absence varied from 1 to 8 weeks, being typically 2 weeks (50% of the cases). Six women were absent from work because of low back pain during their second pregnancies (12%). The duration of sick leave varied from 1 to 39 weeks. During their third and fourth pregnancies, the patients in this series had no absence from work due to low back pain. Subjective painlessness of the back after childbirth was achieved by 3 months in 67% and between 3 and 12 months in 33%.

The mean residual fused thoracic curve measured by the Cobb method was 44° (range 21°–86°) at skeletal maturity. Measured by the same method from follow-up radiographs the thoracic curve averaged 50° (range 26°–130°). The secondary lumbar curves were also measured by the Cobb method. In our patients, the mean lumbar curve before spinal fusion was 34° (range 5°–95°). At skeletal maturity it was 26° (range 3°–80°) and at follow-up 27° (range 5°–86°).

Discussion

In our series there were 33 cesarean sections in 142 pregnancies, a rate of 23%. This is higher than the nationwide average ($P < 0.01$) [7]. Our results are comparable with those of previous studies, which indicate that the cesarean section rate is elevated in women with severe deformities, especially in non-idiopathic scolioses [2, 4, 5, 9, 10, 12]. The mixed materials of Dugan and Black [5] and Betz et al. [2] showed lower cesarean section rates for patients with scoliosis than corresponding nationwide averages. Our material can best be compared with that of Cochran et al. [4]; both show slightly higher cesarean section rates than expected. As a speculation, this could be due to obstetric patients with scoliosis being rare and operated sco-

Table 1 Method of delivery

Pregnancy	No. of cesarean sections	Percentage of cesarean sections
First ($n = 79$) (primiparae)	16	20%
Second or later ($n = 63$) (multiparae)	17	27%
Total ($n = 142$)	33	23%

Table 2 Low back pain during pregnancy

Pregnancy	Low back pain		Onset of low back pain in trimesters						Cannot recall time of onset of low back pain	
	(%)	n	First		Second		Third		(%)	n
			(%)	n	(%)	n	(%)	n		
First ($n = 79$)	38	30	23	7	1	4	27	8	37	11
Second ($n = 50$)	46	23	9	2	28	6	22	5	44	10
Third ($n = 10$)	40	4	25	1	50	2	None		25	1
Fourth ($n = 3$)	None		None		None		None		None	
Total ($n = 142$)	40	57	18	10	21	12	23	13	38	22

liosis patients even rarer, with the obstetricians having preferred cesarean section to be on the safe side. No increase in obstetric problems justifying the excess of cesarean sections was observed. The statistical power of the Fisher test used was only 50% at the significance level of $P < 0.01$. The statistical power calculates to a more acceptable value of 70% at the significance level of $P < 0.05$. Our material includes all scoliosis patients operated during the years 1970–1976; thus a larger material giving a stronger statistical power value could not be gathered as we wanted a long enough follow-up time. We compared the pregnancies in our material with pregnancies in the general population during the same years, because reliable nationwide statistics [7] are available for comparison. Data from an age-matched control group, not to mention an age-matched control group having had back surgery for other reasons than scoliosis, would have had to be gathered by questionnaire, and would thus be less reliable than the nationwide statistical data. The result showing a higher than expected incidence of cesarean section in our study, should therefore be taken only as suggestive.

We found four children with anomalies (3%) in our material of 145 babies, which is similar to nationwide rate [6]. The duration of pregnancy was less than 38 weeks in 10% of the pregnancies in our material, which is comparable to the corresponding nationwide rate [7]. No perinatal or neonatal deaths were reported. Thirteen spontaneous abortions were reported, which does not differ from the expected rate [7]. It seems that scoliotic patients do not suffer from more obstetric problems than non-scoliotic women. The offspring do not show an excess of congenital anomalies. Visscher et al. [13] reported prematurity in 12.5% of pregnancies, differing statistically significantly from the expected 7.8%, but concluded that the reproductive outcome of scoliotic women did not differ in other respects from that of non-scoliotic women [13]. Other studies either do not address prematurity and the health of the offspring [5, 12] or are in harmony with our results [2, 4, 10]. Kopenhager [9] found that kyphoscoliotic patients (none had idiopathic scoliosis) tended to have low-birth-weight infants [9].

The incidence of low back pain during pregnancy was 40% in our series, corresponding well with that of low back pain in non-scoliotic pregnancies [11]. Low back pain severe enough to cause absence from work was found in 11% of the pregnancies in our series. This is in accordance with Betz et al. [2]. Myllynen [11] reports an incidence of 13% „skeletal pain“ causing absence from

work in her series of 1166 pregnancies in non-scoliotic women. Siegler and Zorab [12] report low back pain in 21% of scoliotic pregnancies. Low back pain and severe low back pain are not well defined in these studies. The information obtained by Siegler and Zorab [12] is by questionnaire only. Laws and regulations governing sick leave differ significantly from one country to another. Therefore, no valid comparisons can be drawn between different studies of low back pain during pregnancy in scoliotic patients, but it seems that low back pain is not a major complicating factor in these pregnancies.

Our material showed a mean increase of 6° in the fused scoliotic curvature in patients who had experienced at least one pregnancy. Although this falls within the limits of measurement error, it may also have been caused by a slight extension of the curvature leading to this slight increase in the size of the curvature. A mean increase of only 1° in the unfused lumbar curvatures suggests stability and lack of effect due to the pregnancies. Our results support the findings of Cochran et al. [4] and Betz et al. [2]. Our study cannot be compared with the studies of Blount and Mellencamp [3] or Berman et al. [1], as these discuss unfused curves and our patients all have fused scoliotic curves [1, 3].

Conclusions

We conclude that pregnancies in patients operated by the Harrington method for idiopathic scoliosis do not lead to significant increases of the scoliotic curves, thoracic or lumbar. Somewhat more often than in the general population the delivery is by cesarean section ($P < 0.01$), but this result should only be taken as suggestive. The rate of complications during pregnancy and the rate of premature deliveries are no higher than in the general population. Increased low back pain during pregnancy is experienced by about 40% of these patients, but the pain is severe enough to cause absence from work in only 11%, corresponding with the general national rates. The children seem to have no more congenital anomalies or health problems caused by delivery than in the general population. Pregnancy and delivery in patients with idiopathic scoliosis operated by the Harrington method pose no significant obstetric or orthopedic problems or risks.

Acknowledgements This study has received financial support from Finska Läkarsällskapets Fonder.

References

1. Berman AT, Cohen DL, Schwentker EP (1982) The effects of pregnancy on idiopathic scoliosis. *Spine* 7:76–77
2. Betz RR, Bunnell WP, Lambrecht-Mulier E, MacEwen GD (1987) Scoliosis and pregnancy. *J Bone Joint Surg [Am]* 69:90–96
3. Blount WP, Mellencamp DD (1980) The effect of pregnancy on idiopathic scoliosis. *J Bone Joint Surg [Am]* 62:1083–1088

-
4. Cochran T, Irstam L, Nachemsson A (1983) Long-term anatomic and functional changes in patients with adolescent idiopathic scoliosis treated by Harrington rod fusion. *Spine* 8:576–584
 5. Dugan RJ, Black ME (1957) Kyphoscoliosis and pregnancy. *Am J Obstet Gynecol* 73:89–93
 6. Finnish National Malformation Register 1963–1991. Finnish National Board of Welfare and Health, Helsinki, Finland
 7. Finnish National Board of Welfare and Health (1990–1993) Finnish Nationwide Perinatal Statistics 1987–1990 (four vols in Finnish). Finnish State Printing Center, Helsinki, Finland
 8. Harrington PR (1960) Surgical instrumentation for management of scoliosis. *J Bone Joint Surg [Am]* 42:1448
 9. Kopenhager T (1977) A review of 50 pregnant patients with kyphoscoliosis. *Br J Obstet Gynecol* 84:585–587
 10. Manning CW (1967) Pregnancy and scoliosis. *Lancet* 14:792–795
 11. Myllynen L (1991) Work during pregnancy. Academic dissertation, University Press, Helsinki
 12. Siegler D, Zorab PA (1981) Pregnancy in thoracic scoliosis. *Br J Dis Chest* 75:367–370
 13. Visscher W, Lonstein JE, Hoffman DA, Mandel JS, Harris III BSH (1988) Reproductive outcomes in scoliosis patients. *Spine* 13:1096–1098