

SURGICAL TREATMENT AND MID-TERM RESULTS OF SEVENTYSIX PATIENTS WITH IDIOPATHIC SCOLIOSIS

İ. ÇETİN *

M. DOĞAN *

H. KINIK *

ABSTRACT:

Between November 1989 and December 1993; we have surgically treated 473 patients with scoliosis. Seventy-six patients with idiopathic scoliosis among them were treated by posterior COTREL DUBOUSSET (44 Patients) or ISOLA (32 Patients) instrumentation and fusion.

In the evaluation of the patients; age, sex, King classification, sagittal and frontal plane Cobb angle measurements, rotational status-which were assessed with Pedriolle method-, the operative time and correction were documented. In the follow-up period, both systemic and technical complications -if any- were searched.

Fiftysix of our patients were female and 20 were male. Their ages were between 8 and 34 (Mean: 15.05 years) at the operation time. The mean follow-up is 36.3 months (Range: 21-62 months) for patients treated with CD instrumentation and 14.9 months (Range: 3-21 months) for the ISOLA group. We achieved %47.00 mean correction in the CD group and %50.00 in the ISOLA group in the frontal plane. The correction in sagittal plane among the hypokyphotic patients was %28.64 in CD and %69.6 in ISOLA groups. In the normokyphotic patients the difference in kyphosis was %0 in CD group and %8.5 in ISOLA group. In hyperkyphotic patients we have %35.91 correction in CD group and %33.40 in ISOLA group. In the axial plane, the amount of correction measured by Pedriolle method was %22.94 in CD and %14.50 in ISOLA patients. In this study we discuss and compare the mid-term results of these patients.

Keywords: *Idiopathic Scoliosis, Cotrel-Dubousset Instrumentation, Isola Instrumentation, Surgical Treatment.*

INTRODUCTION

Idiopathic scoliosis is the most common of all forms of lateral deviation of the spine. It occurs during the growth period and customarily divided into four categories; infantile, juvenile, adolescent and adult (12).

The goals of the treatment in idiopathic scoliosis are; three plane correction of the curve, maintenance of this corrected status and improvement in pain and pulmonary status. Restoration of mechanical balance is also important (4, 19).

Cotrel - Dubousset Instrumentation (CDI) System was developed between 1978 and 1983. This technique with multiple hooks and transverse connecting device offers a rigid fixation and correction of the rotational deformity (1, 2, 3, 4).

Isola Instrumentation System is based on Harrington's principles i.e. anatomically compatible implant dimensions, segmental fixation, laminae, pedicular, transverse process and iliosacral anchors and a precise description of the deformity (6).

MATERIAL and METHOD

Between November 1989 and December 1993, we have surgically treated 473 scoliotic patients. Among the patients with idiopathic scoliosis, we performed Cotrel-Dubousset (CD) or Isola posterior instrumentation and fusion in 76 of them. In this study; age, sex, King classification, sagittal and frontal plane Cobb angle measurements, rotational status assessed by Pedriolle method and the follow up results of the patients were evaluated.

We performed a thorough systemic and neurologic examination, investigate the previous operations if present, evaluate the postural deformity, the pattern and amount of the curve. In all bending films in supine position. After the evaluation as described above, pre-operative plans were done (7).

In all patients one stage posterior procedures have performed. In King type II curves, selective thoracic fusion was performed. In King type I, III, IV and V curves we instrumented the curves including the upper and lower stable vertebrae (7, 8). In fusion we used autogenous iliac bone grafts. In one patient treated with Isola system, synthetic graft; in another one combined autogenous and synthetic graft was used.

* Ankara University Faculty of Medicine. Department of Orthopaedic Surgery and Traumatology, İbn'i Sina Hospital, ANKARA

We did not use hemovac drains in neither of the patients. During the induction and for 48 hours postoperatively third generation cephalosporins were given. We didn't perform spinal monitoring in any of the patients. The operative time and blood loss was documented. In the postoperative second day all patients were allowed to sit and in the fourth day to walk. The postoperative control films were taken in all patients.

We evaluated the perioperative status of the patients. We asked the patients to come for control examination in the postop 1.5, 4.5, 12 months and after then annually. We performed physical, neurological and radiographic examination in the controls.

Fiftysix of the patients were female and 20 were male (F/M= 2.8). In the CD group there were 35 females versus 9 males (F/M= 3.8) and in the Isola group 21 females versus 11 males (F/M= 1.9). The ages were changing between 8 and 34 years (Mean: 15.05 years). In CDI group the average age is 15.7 years (14.45 years if we exclude 4 patients with adult scoliosis) and 14.1 years in Isola group.

Four adult, 53 adolescent, 16 juvenile and 3 infantile idiopathic scoliotic patients were present in this study. The data of these patients are listed in Table I.

Table I. Idiopathic Scoliosis

	CD	ISOLA
ADULT	4	-
ADOLESCENT	32	21
JUVENILE	8	8
INFANTILE	-	3

According to King classification, we have 4 type I, 11 type II, 51 type III, 7 type IV and 3 type V curves (Table IV).

Table IV.

KING TYPE	CD	ISOLA	TOTAL
I	2	2	4
II	7	4	11
III	29	22	51
IV	4	3	7
V	2	1	3

The mean followup time in the CDI group is 36.3 months (Range: 21-62 months) and Isola group is 14.9 months (Range: 3-21 months).

Among the 76 patients, 13 had previous conservative treatment (10 of them were instrumented by CDI and 3 by Isola).

The chief complaint among the patients was deformity (In all patients). In 21 cases pain and in 4 dyspnea was present.

In 7 patients which were evaluated to have rigid scoliosis by physical and radiological examination; preoperative halofemoral traction was applied (In 2 CDI and 5 Isola instrumentations).

The average operative time is 3.45 hours and average blood loss is 3.23 units per procedure. There is not a significant difference between the two groups in operative time and blood loss.

In 20 of the patients, postoperative external immobilization (TLSO) was used. These were 7 CD and 13 Isola patients. The indications in using TLSO are excessive scoliosis, inadequate operative technique and the presence of osteoporosis.

RESULTS :

Among all patients the mean frontal Cobb angle is 55.52 degrees preoperatively and 28.54 degrees postoperatively. The average correction is 26.98 degrees (48.50%). In CDI group preop, postop and correction values are 50.48 degrees, 26.55 degrees and 23.93 degrees (47.40% correction) respectively. In Isola group the Cobb angle is 60.88 degrees preoperatively and 30.44 degrees postoperatively. The average correction is 30.44 degrees (50%). Depending on these data we can say that the groups are not significantly different from each other in correction.

In the sagittal plane analysis; we categorize the patients as hypokyphotic, normokyphotic and hyperkyphotic.

Among the hypokyphotic 38 patients, the correction in sagittal plane for CD group (25 patients) is 4.4 degrees (22%) and for Isola group (13 patients) 10 degrees (69.63%). These data shows the superiority of Isola system over CDI in sagittal plane correction of the hypokyphotic patients.

In normokyphotic 29 patients there is no difference between the preop and postop values and the systems.

Among the hyperkyphotic 9 patients, the correction

is -25.5 degrees (35%) in 2 patients treated with CDI and -19.4 degrees (33%) in 7 Isola cases.

Rotational analysis was performed with Pedriolle method from the apex of the primary curve (12, 15). Among all patients the mean preop rotational angle is 25.37 degrees; the postop angle is 20.11 degrees and the correction is 5.65 degrees (22.94%) and Isola group 3.68 degrees (14.5%). CDI is superior in the correction of rotational deformity.

In the followup frontal plane analysis; in CDI group 8.25 degrees and in Isola group 12.71 degrees loss of correction was noticed. In axial plane there is an increase of 0.93 degrees in CDI group and 1.11 degrees in Isola group. Sagittal plane evaluation showed an increase in kyphosis in both hypokyphotic patient groups but neither of them became hyperkyphotic (5.94 degrees - 30% - increase in CD group and 2.26 degrees - 9.27% - in Isola group. In normokyphotic patients 7.89 degrees (25.11%) increase in kyphosis in CD group and 4.67 degrees (15.72%) in Isola group occurred. But they remained in the normokyphotic range. The 4 hyperkyphotic patients (2 CD, 2 Isola patients) were very few to make a judgement (In CDI patients there is an increase of 12 degrees and in Isola group there is 1.1 degrees decrease in kyphosis). In Tables II and III the analysis of the patients in three planes were given.

Table II.

	ISOLA		
	PREOPERATIVE	POSTOPERATIVE	FOLLOWUP
FRONTAL	60.88 (40 - 120)	30.44 (7 - 97)	43.15 (15 - 90)
AXIAL	25.37 (3 - 55)	21.69 (7 - 90)	22.8 (3 - 50)
SAGITTAL			
Hypokyphotic	14.36 (4 - 22)	24.6 (10 - 63)	26.6 (12 - 60)
Normokyphotic	32.5 (25 - 45)	29.7 (15 - 45)	34.37 (30 - 45)
Hyperkyphotic	58 (50 - 70)	38.6 (24 - 60)	37.5 (18 - 60)

Table III.

	COTREL - DUBOUSSET		
	PREOPERATIVE	POSTOPERATIVE	FOLLOWUP
FRONTAL	50.48 (40 - 94)	26.55 (4 - 64)	34.8 (10 - 75)
AXIAL	24.62 (5 - 52)	18.97 (5 - 46)	19.90 (5 - 46)
SAGITTAL			
Hypokyphotic	15.36 (4 - 22)	19.76 (4 - 32)	25.7 (3 - 45)
Normokyphotic	31.41 (26 - 42)	31.41 (16 - 40)	39.25 (22 - 60)
Hyperkyphotic	71 (60 - 82)	45.50 (35 - 56)	57.5 (35 - 80)

Complications seen in the CDI patients: Nine hook dislocations in which three of them, we revised the rod. In two of the hook disengagements, the curves progressed over the preop values. Two painful bursitis occurred (They relieved by surgery). We have one early postop infection which was relieved by through debridement, continuous lavage for 4 days and combined antibiotherapy, and another, despite all efforts the infection couldn't halted. In this case the implant was removed. In one patient early postoperative monoparesis occurred which later returned to normal.

In the Isola group, 5 hook dislocations occurred. In three of them infection supervened. With rod revision, debridement-lavage and antibiotics one patients' symptoms relieved but in the other two the implants were removed. After implant removal we lost one of them in the follow-up, in the other one, kyphosis progression occurred up to 60 degrees.

DISCUSSION

In the last ten years, very important developments have occurred in the three plane evaluation of scoliotic curves. Biomechanical studies have shown that; rigid fixation in all strategical levels, the use of double rods and transverse connecting devices are essential (4).

A correction rate of 68% has been reported by Chopin and others with minimal loss of correction (2). The maximal amount of correction with the CDI is achieved in thoracal curves. The instrumentation provides less correction in the lumbar area and postoperative loss of correction is higher comparing to Zielke and SSI system. Problems due to hooks in the lumbar area can be eliminated with the use of the pedicular screws and plate systems (4, 11).

There are many different studies present about CDI but unfortunately not about Isola. In the literature, between 42% and 73% frontal plane correc-

tion was reported in patients instrumented with CD I (9, 10, 13, 14, 16, 17, 18, 20). Our results were similar.

In sagittal plane analysis, between 7 and 13 degrees increase in kyphosis was reported (5, 9, 13). In our series, in hypokyphotic patients we achieved 4.4 degrees of correction in CD group and 10 degrees correction with Isola instrumentation.

In axial plane, between 14 and 30 degrees i.e. 26%-39% rotational correction was reported (9, 14, 16, 21). In our series 22.94% correction was achieved with CDI and 14.5% correction with Isola instrumentation.

In the followup, the loss of correction in frontal plane is 8.25 degrees for CDI group and 12.71 degrees for Isola group. In sagittal plane, among the hypokyphotic patients an increase in kyphosis of 5.94 degrees in CDI group and 2.26 degrees in Isola group was noticed. There isn't a significant correction loss in axial plane in both instrumentations.

CONCLUSION

We have found Isola instrumentation more effective in sagittal plane correction. CDI is more effective in rotational plane. Frontal plane correction loss is greater in Isola instrumentation despite we externally immobilize more patients treated with Isola system. Although it appears as Isola is a less rigid system, the results were affected multifactorially (Patient status, operation technique etc.). We think, more workup is needed to propose more clearer judgements.

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