# THE RESULTS OF COTREL DUBOUSSET INSTRUMENTATION IN IDIOPATHIC SCOLIOSIS

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*From decembcr 1988 to december 1989 21 Cotrel-Dubousscl instrumentations were performed at the first ortho--paedics and traumatology clinics of Ankara Social security hospital in order to correct idiopalhic scoliosis. The follow-up period was between 6-16 months.*

*Nine of the patients were female (42, 9%) and 12 of them were male (57, 1). One patient had infantile idiopathic scoliosis (4, 8%) and two patients had juvenil idiopalhic scoliosis. The other aighteen patients had adolescant idiopathic scoliosis. All of our patients were between 10 and 19 years old at the time of operation. 17 of the patients did not have any treatment beforea admission to our haspital but 4 of them had been braced.*

*The results of this study make us to propose the Cotrel-Dubousscl instrumentation, which supplies three dimen sional correction, can be succesfully performed for the treatment of idiopalhic scoliosis.*

There have been a lot of achievements about the management of scoliosis in the recent years. One of the important point of this achievement is the C-D technique described by Colrel and Dubousset in 1984.

The classical Harrington technique (1) is an important correction of the surgical management. With this technique correction of the lateral curvature is achieved. But a lot of papers about Harrington technique, reported the risk, of pseudoarlrosis about 10 % and also the complications like rod and hook failure (2). In addition to this, postoperative casting remained as a necessity for 6 to 9 months (1,2,3). Stability of internal fixation improves with the use of cross wires or cross bars between distraction and compression rods. (4,5,6)

In the litareture one can also find papers reporting that with the Luque technique and modifications of Harrington technique a good correction and stabil internal fixation is ained (7,8). However, Leathcrman et al (9), Winter and Anderson (10) and other have observed a significant loss of correction without the use of postoperative external immobilization in their scries of Luque instrumentation. In addition to that with Luque technique his risk of neurologic impaircmctus is also reported. (7,8).

Cotrel-Dubousscl (C-D) technique, with the use of multiple hooks and DTT system, gives the chance of rigid internal fixation and also the correction of rotational deformity that cannot be corrected by means of other techniques. Morbidity is low and there is no need for the postoperative casting. Patient can return to his job or school in a short period of time. Pseudoarlhrosis with C-D technique has a risk of neurological compromise but it is less than at the risk with Luque technique.

Here in this paper we present the short term results of the 21 patients with thoracal idiopathic scoliosis treated by C-D technique.

## PATIENTS AND METHOD

From December 1988 to December 1989 21 C-D instrumentations were performed at the first orthopaedic and travmalology clinics of Ankara Social Security Hospital in order to correct only idiopathic scoliosis. Number of whole CD operations thai we performed till December 1989 were 48. The follow up period was 6-12 months.

9 patients were female (42.9%) and 12 of them were male (57.1%). Patients were grouped as infantile (0-2 years), juvenile (3-9) and adolescant (10-19) according to their ages at the time of diagnosis.

Their anamnesis and previous therapies and the accompanying pathologies were recorded. In the clinic examination we assessed the location and the direction of the curvature, rib hump deformity, location of the center of gravity line. In the radiologic examination we assessed thoracal kyphosis angle, lumbar lordosis angle and with the bending radiographs we measured

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ihe amount of correction of the deformities, first prc-operalively, then postopcralively and during the routine controls. We also asscscd the amount of correction in the early postoperative period and then evaluated the loss of correction at the routine controls. Lung function tests, neurologic examinations were performed in the postoperative period. When needed we also performed EMG tests for the patienis who had suspicious neurologic examinations.

We performed Halo-femoral iraclion to 3 of the patients who had rigid kyphoscoliosis. According to the plan made preopcrativcly, closed and open hooks were placed into the places on the vertebrales and the hooks were connected with the rods. We performed deroiation for the patient with thoracal lordoscoliosis. For the rigid kyphoscoliosis patienis we used 3 rods. All of the rods were attached to each other with 2 DTT's. Before grafting laminas were decorticated and the facet joints were opened. For 3 patients we used bank bone graft and four of the remaining patients we used autogenous bone graft taken from ilium for posterior fusion. Just after the operations we performed neurologic examination routinely.

In the first postoperative day the patients were instructed to lay on their back, in the second postoperative clay they arc lurncd in the bed, in the third postoperative day they allowed to sit in their bed and in the third or fourth postoperative day arc encouraged to walk. Sutures were taken between the 13th and 15th postoperative day and one day after patients arc sent home. Patients arc called on the 1,3,6 and 12 postoperative month for routine controls. In the controlsl, we performed clinic and radiologic examinations as well as the lunsz function tests.

## RESULTS

Patients included in this study were grouped as follows 1 infantil, 2 juvcnil and 18 adolcscant idiopathic scoliosis (Table 1). Patients ages at the time of admission to our haspital were between 10-19 years (mean 14,2).

Two of the patients (9,5 *c/r)* complained about pain, 9 of the patients (42,9 %) complained about pain. 9 of the patients (42,9 %) complained both about pain and deformity and 10 of the patients (9.5 %) complained about deformity only. In addition to Ihis 9 of the patients (42.9) *%)* had dyspnea and 3 of the patients (14.3 *%)* had effort induced taschycardia. None of the patients had an accompanying deformity.

Before admission 10 our hospital 4 of ihc patients (19.1 *%)* had been trailed with braces and the other (80.9 *c/r)* had had no treatment for scoliosis.

19 of 1 the patients had thoracal (90,5 %) and 2 of thc patients had thoracolumhar (91,5 *%)* scoliosis. Direction of the curvalure was lo right in 18 patients (85,7 %*)* and to left in 3 palienis (14,3 %)

We delected scapular hump lo be 0-3 cm in 4 patients (19 %), 3-6 cm in 3 palienis (14,3 *%)* and more than 6 cm in 2 palienis (9,5 %). 12 of ihc palienis didn't have scapular hump. We also delected rib hump to be 0-3 cm in 8 patients (37,9 %) and more than 6 cm in 5 patients (28.8 %).

Table - 1 : Classification according to the age, at the time of diagnosis

| AGE | NUMBER | % |
|---|---|---|
| 0-2 (Infantile) | 1 | 4,8 |
| 3-9 (Juvenile) | 2 | 9,6 |
| 10-19 (Adolescent) | 18 | 85,6 |
| TOTAL | 21 | 100,0 |

The line of ccnicr of gravity was in the inlcrglutcal region in 10 palicnts (47.6 %) so that they had balanced scoliosis. There were 0-2 cm deviation in 6 patients (28,8 *%)* and 2-4 cm deviation in 5 patients (23,6 %) from interglulcal region. In the radiologic examination proximal and distal end vcricbrales were asscscd with King's method and the angle of curvature was measured according to Cobb method. Prcoperative curvature ranged between 28-92 degrees (mean 48,8). Mean Cobb angle values are shown in Table 2 according to fhe types of curvalurc. Thoracal kyphosis angles were between -6 to 72 (mean 26,9)(Table 3). Lumbar lordosis angles were as followings beiwccn 0-30 degrees, 9 patients (42.0 %), between 30-60 degrees 9 patients (42.9 *%)* and more than 60 degrees, 3 patients (14.2 *c/r).* Two of the patients had double major scoliosis 12 of the patienis (57.2 *%)* were thoracal lordoscoliosis and 7 of them (33,3 *%)* were rigid kyphoscoliosis. In their bending roenigenograms avarage correction was 42.5 % (range 19.5 - 89,5 %).

3 of ihc patients had halofcmoral traction before the operation (14.3 %). Average duration of halofemoral traction was 12 days (11-15-15). average end-weight for halo was 13.7 kg (11-15-15) and average

| | | PREOP | RANGE | POSTOP | RANGE | CORRECTION | | CORRECTION | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | DEGREE | RANGE | DEGREE | RANGE |
| LORDOSCOLIOSIS | | 40,8 | 30-68 | 21,4 | 4-40 | 18 | 2-32 | 46,9 | 6,6-90,6 |
| KYPHOSCOLIOSIS | | 61,3 | 40-92 | 36,1 | 21-56 | 21,3 | 10-43 | 39,9 | 25-67,1 |
| DOUBLE MAJOR CURVES | I. CURVE | 51 | 40-92 | 37 | 22-52 | 14 | 10-18 | 47,5 | 45-50 |
| | II. CURVE | 45,5 | 35-56 | 27 | 26-28 | 18,5 | 9-28 | 37,9 | 25,7-50 |
| TOTAL | | 48,8 | 28-92 | 30,9 | 4-56 | 22,4 | 4-40 | 46,1 | 6,6-93,3 |

Table - 2 : Preoperative, postoperative averages, correction Rates and persentages of the different kinds of curvatures According to the Cobb Method.

correction after the traction was 17,6 degrees (6-22-25) and their, average correction ratio was 22,8 % (6 % - 23,9 % - 38,5 %). From the remaining 18 patients, 12 (57,1 %) lordoscoliotic, 4 (19,0 %) kyphoscoliotic and 2 (9,6 %) double major curve had their preoperative planning according to the special CD techniques. Preoperative planning for 3 patients that had traction was same with the plan designed for rigid kyphoscoloisois. All the patients were operated according to the plans made before operation except one.

For all the patients in the postoperative period, anaysis of x-rays showed that mean correction in the Cobb angle was 22,4 degrees (46,1 %) ranged from 4 degrees to 40 degrees (6.6 % - 93,3 %). In table 2 the correction rates of flexible lordoscoliosis, rigid kyphoscoliosis and double major scoliosis are shown. Postoperatively, thoracal kyphosis angles were within the normal limits in 20 patients (95,7 %) and for 2 (4,8 %) patients it was deviated from the normal 0-10 degrees. Also lumbar lordosis angles were within the normal limits in 20 patients (96,7 %) and for 1 (4,8 %) patient it was 0-10 degrees deviated from the normal. (Table 3-4)

| THORACAL | | | LUMBAR | | |
|---|---|---|---|---|---|
| DEGREE | NUMBER | % | DEGREE | NUMBER | % |
| NEGATIVE | 3 | 14,3 | NEGATIVE | 0 | 0,0 |
| 0 - 20 | 7 | 33,3 | 0 - 30 | 9 | 42,9 |
| 20 - 30 | 2 | 9,6 | 30 - 60 | 9 | 42,9 |
| 30 - 50 | 6 | 28,5 | OVER 60 | 3 | 14,2 |
| OVER 50 | 3 | 14,3 | | | |

Table 3 : Distrubation of the patients according to the preoperative thoracal and lumbar postural angles.

We neither saw a preopcrative or postoperative early complications nor neurologic complications in our series. All of the patients were encouraged to walk on the third postoperative day except one (95,3 %). 5 Patients (23,8 %) were sent home between 10th-15th postoperative days. On 2 had a morbidity lasting more than 15 days (9,5 %). 2 patients returned to their schools before 30 days (9,5 %), 10 patients returned to their schools between 30-45 days (47,6 %) and 6 patients returned to their schools between 45-60 days. The remaining 3 returned to their schools more than 60 days after the opetion.

When compared with their preoperative heights. 1 patient was (4.8 %) 0-2 cm, 9 patients (42,9 %) were 2-4 cm, 7 patients (33,3 %) were 4-6 cm and 4 patients Were more than 6 cm longer on the postoperative period.

None of the patients had subjective com plaints during the con trols all of them were satisfied with the opera tion,

On the postopera* tive measurements 4. patients (19 %) had 0-1 cm, 8 patients (38,1 %) had 1-i 3 cm, 3 patients (14,3 %) had 3-5 cm and 5 patients-

(23,5 %) had more than 5 cm correction of the rib hump deformity. In 9 patients (47.6 %) correction of scapular hump deformity was 100 % and in 20 patients the center of gravity line was within the intergluteal region.

On the control period only in one patient we saw loss of correction, it was 2 (5,3 %) degrees in third month 8 degrees (15,8 %) in sixth month and 16 degrees (42,1 %) in twelfth month. This patient was the patient in whom we couldn't perform the preoperative planning because of the severe osteoporosis on the convex side of the vertebral column. We could put only one rod to the concave side of the curvature.

In late postoperative period we saw wound dchiscance on the inscision scar in 3 patients and after some debritment we resutured the wound. We didn't see any other complication. On the controls we obserwed improvements in their respiratory function tests.

| | THORACAL KYPHOSIS | | THORACAL LORDOSİS | |
|---|---|---|---|---|
| | Number | % | Number | % |
| BECAME TO NORMAL | 20 | 95,7 | 20 | 95,7 |
| 0-10° DEVIATION | 1 | 4,8 | 1 | 4,8 |
| TOTAL | 21 | 100,0 | 21 | 100,0 |

Table 4 : Distrubation of the patients according to postoperative correction of the thoracal and lumbar postural angles.

## DISCUSSION

CD technique, for the treatment of idiopathic scoliosis is one of the most recent techiques. In spite of this a lot of papers report favorable early results with this technique (11-29). Lateral curvatures are corrected in high rates. Because of the correction in three planes, thoracal deformities are corrected therefore, the scapular hump and rib hump deformities can be over came as well. Morbidity of the patients are shortened and the patient can turn to their school or work in a short period of time. There is no need for a pastopcrative cast or brace. Complications like, pseudoartrosis, neurologic dificit, hook and rod failure are not reported yet. On the long follow up loss of correction is minimal (11-30).

On our scries we report lateral curve correction 46,9 %, in flexible lordoscoliosis, 39,9 % in kyphoscoliosis 47,5 % in the first curve and 37,9 % in the second curve of double major cases. This correction rate was higher than the values had in the preoperolive bending reontgenograms. In 95,7 % cases we had normal thoracal and lumbar posture angles. Especially in the thoracal lordoscoliosis cases we had a very good rotational deformity correction, therefore we had 47,6 % rib humb and 76,2 % scapular hump deformity correction. Center of gravity line was in the intergluteal region in 95,2 % cases. We didn't observe any loss of correction in all cases except one. We didn't see any neurological disfunction and hook or rod failures.

In the light of this observations we conclude that C-D technique is satisfactory and reliable in the treatment of idiophatic scoliosis because it enables the correction in three planes, performs a very rigid internal fixation, disappears the need for a cast or brace; on postoperative period causes less morbidity and lowers minimal loss of correction.

## REFERENCES


1 . Harrington PR : Treatment of scoliosis : JBJS : 44A:591-610, 1962.

2 . Rcnshaw TS : The role of Harrington Instrumentation and Posterior spine fusion in the management of adolescent idiopathic scoliosis. Orthop Clin North Am:19(2):257-67, 1988.

3 . Bergoin M, Bollini G, Hornung H et al: Is the Cotrel-Dubousset really universal in the surfical treatment of idiopathic scoliosis? In: 4th Proceeding of the international congress on Cotrel-Dubousset Instrumentation. Sauramps Medical, Montpellier, pp:167-70, 1987.

4 . Armstrong GWD, Connock SHG: A transverse loading system applied to a modified Harrington Instrumentation. Clin OrLhop 108: 70-5, 1975.

5 . Cotrel Y, Dubousset J: New segmental posterior instrumentation of the spine. Orthop Trams; 9: 118, 1985

6 . Luquc ER, Cordosa A: Segmental correction of scoliosis with rigid internal fixation. Annual Meeting, Scoliosis Researh Society, Ottowa, Ontorio, Canada, September, 1976.

7 . Silverman BJ, Greenbarg PE: Idiopathic Scoliosis posterior spine fusion with Harrington Rod and Sublaminar wiring. Orthop Clin North Am; 19(2): 269-79, 1988.

8 . Drummond DS: Harrington Instrumentation with Spinous Process Wiring for idiopathic scoliosis. Clin Orthop North Am; 19(2Y): 281-9, 1988.

9 . Leatherman KD, lohnson J, Hold R, et al: A clinical assessment of 357 cases of segmental spinal.

10. Winter RB, Anderson MB: Spinal arthodcsis for spinal deformity using posterior instrumentation and sublaminar wiring: 100 consecutive personal cases. Intern Orthop (SIGOT); 9: 239,45, 1985.
11 . Akbarnia BA: Experience with Colrel-Dubousscl Instrumentation. In: 3rd Preceding of the international congress on Cotrel-Dubousset Instrumentation. Sauramps Medical, Montpellicr, p: 106, 1986.
12 . Hopf C, Matthiab HH, Heine J: experience with surgical treatment of scoliosis by means of the CD instrumentation, in: 3rd Proceeding of the international congress on Cotrel-Dubousscl Instrumentation. Sauramps Medical, Montpellicr, pp: 107-11, 1986.
13 . Birch Jg, Herring Ja, Roach JW et al : Colrcl-Dubousset Instrumentation in idiopalhic scoliosis: A preliminary report. In: 3rd Proceeding of the international congress on Cotrcl-Dubousscl Instrumentation. Sauramps Medical, Monlpellier, pp: 112-6, 1986.
14 . Bitan F, Morel 1G, Morin C: A two years experi ence with CD instrumentation in a pediatric popu lation. In: 3rd Proceeding instrumentation in a pediatric population. In: 3rd Proceeding of the in ternational congress on Colrel-Dubousset Intrumentation. Sauramps Medical, Monlpellier, pp: 117-21, 1986.
15 . Shufflebargcr HL, Gepslein LR, dark C: Recovery of pulmonary fuction after Cotrcl-Dubousscl In strumentation. In: 3rd Proceeding of the international congress on Colrcl-Dubousset Instrumentation Sauramps Medical, Montpellicr, pp: 144-7, 1986.
16 . Erwin \VD, Dickson Jh: Cotrcl-Dubousscl Spinal Instrumentation and fusion. In: 4th Proceeding of the international congress on Colrel-Dubousset Instrumentation. Sauramps Medical, Montpellicr, pp: 18-20, 1987.
17. Patcrson DC, Cundy P.T, Hillicr TM et al: Vertebral rotation with Cotrcl-Dubousscl spinal instrumentation, in: 5th Proceeding of the international congress on Colrel-Dubousscl Instrumentation. Sauramps Medical, Montpellicr, pp: 33-38,1988.
18 . Lambert E, Tuo N, Stcib Jp et al: 50 cases of idiopathic dorsal scoliosis treated by CD instrumentation. A study of respiratory fuclion before and one year after surgery, m: 6th International congress on Cotrel-Dubousset Instrumentation. Sauramps Medical, Montpellicr, pp: 3, 1989.
19 . Bridwell KH, Capelli A, Frankan C el al: Sagittal plane analysis in idiopathic scoliosis patients treated with Colrel-Dubousscl Instrumentation. In: 6th International congress on Colrel-Dubousscl Instrumentation. Sauramps Medical, Monlpellier, . p: 14, 1989.
20 . Thompson JP, Transfeldt E, Bradford D: Rotation and uncoupling in adolescent idiopathic scoliosis. In: 6lh International congress on Colrel-Dubousset Inslrumention. Sauramps Medical, Montpellier, p: 15, 1989.
21 . Stcib JP, Lang G, Leculee F: Expcriemcnt of 150 scoliosis operated on for 4 years with CD material. In: 6th International congress on Cotrel-Dubousset Instrumentation. Saramps Medical, Montpellicr, p: 30, 1989.
22 . Vanden Bcrghe A, Vercautcrcn M, Uyttendaele D ct al: CD Instrumentation in the operative correction of scoliosis. In: 6lh [International congress on Cotrel-Dubousset Instrumentation. Saramps Medical, Monlpellier, pp: 30-2, 1989.
23 . Rove DP, Farcy JPC, Schwab F: Colrel-Dubousset Instrumentation in the operative correction af scoliosis. In: 6lh International congress on Cotrel-Dubousset Instrumentation. Saramps Medical, Monlpellier, pp: 32-3, 1989.
24 . Denis F: Colrel-Dubousscl Instrumentation in the treatment of idiopalhic scoliosis. Orthop Clin North Am; 19(2): 291-311, 1988.
25 . Bridwell KH: Experiences with first ninety-three Colrcl-Dubousset Instrumentations. In: 3rd Proceeding of the international congress on Colrcl-Dubousset Instrumentation. Saramps Medical, Monlpellier, pp: 122-5, 1986.
26 . Shufflebargcr HL, Clark C: Sagittal plane deformity in adolescent idipalhic scoliosis. In: 3rd Proceeding of the international congress on Cotrel-Dubousscl Instrumentation. Saramps Medical, Montpellicr, p: 125, 1986,
27 . Chopin D, Davit T: Our experience of the C-D material. In: 3rd Proceeding of the international cogrcss on Colrel-Dubousset Instrumentation. Saramps Medical, Monlpellier, pp:126-36, 1986.
28 . Chopin D: Personal comminicalion. Tn the workshop of ihc CD, Ankara Social Scqurily Hospital, Ankara, Turkey, June, 1989.
29 . Katli E, Dubousscl J : Semi long term result of *CD* Instrumentation. In: 4th Proceeding of the international congress on Cotrel-Dubousset Instrumentation. Saramps Medical, Montpellier, pp: 25-7, 1987.
30 . Lcaihcrman KD. Dickson RA: The Management of Spinal Deformities, Wright, London, pp: 446,51, 1988.