Sagittal Alignment After Single Cervical Disc Arthroplasty

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Study Design: Prospective study.

Objectives: To analyze the sagittal balance after single-level cervical disc replacement (CDR) and range of motion (ROM). To define clinical and radiologic parameters those have a significant correlation with segmental and overall cervical curvature after CDR.

Summary of Background Data: Clinical outcomes and ROM after CDR with Mobi-C (LDR, Troyes, France) prosthesis have been documented in few studies. No earlier report of this prosthesis has studied correlations between static and dynamic parameters or those between static parameters and clinical outcomes.

Methods: Forty patients were evaluated. Clinical outcome was assessed using the Short Form-36 questionnaire, Neck Disability Index, and a Visual Analog Scale. Spineview software (Surgiview, Paris, France) was used to investigate sagittal balance parameters and ROM. The mean follow-up was 24.3 months (range: 12 to 36 mo).

Results: Clinical outcomes were satisfactory. There was a significant improvement of Short Form-36, Neck Disability Index, and Visual Analog Scale scores. Mean ROM was 8.3 degrees preoperatively and 11.0 degrees postoperatively ($P = 0.013$). Mean preoperative C2C7 curvature was 12.8 and 16.0 degrees at last follow-up ($P = 0.001$). Mean preoperative functional spinal unit (FSU) angle was 2.3 and 5.3 degrees postoperatively ($P < 0.0001$). Mean postoperative shell angle was 5.5 degrees. There was a significant correlation between postoperative C2C7 alignment and preoperative C2C7 alignment, change of C2C7 alignment, preoperative and postoperative FSU angle, and prosthesis shell angle. There was also a significant correlation between postoperative FSU angle and preoperative C2C7 alignment, preoperative FSU angle, change of FSU angle, and prosthesis shell angle. Regression analysis showed that prosthesis shell angle and preoperative FSU angle contributed significantly to postoperative FSU angle. Moreover, preoperative C2C7 alignment, preoperative FSU angle, postoperative FSU angle, and prosthesis shell angle contributed significantly to postoperative C2C7 alignment. No significant correlation was observed between ROM and sagittal parameters. Few correlations were found between sagittal alignment and clinical results.

Conclusions: CDR with this prosthesis provided favorable clinical outcomes and maintains ROM of the FSU, overall and segmental cervical alignment. Long-term follow-up will be needed to assess the effectiveness and advantages of this procedure.

Key Words: cervical arthroplasty, cervical disc replacement, cervical spine alignment, sagittal balance

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Cervical disc replacement is an alternative to anterior cervical discectomy and fusion (ACDF). Although clinical and radiologic results after cervical disc arthroplasty have been reported by many authors,[1–10] the impact of total disc replacement remains unclear. Sagittal balance after cervical arthroplasty has been studied elsewhere[8,11–16] and other studies have reported clinical and radiologic results specifically after Mobi-C (LDR, Troyes, France) cervical disc prosthesis.[2,7,17,18] The main purpose of this study was to evaluate clinical outcomes, range of motion (ROM), and sagittal alignment after single cervical disc arthroplasty. Secondary objectives were to find parameters that are significantly correlated with change of segmental or overall cervical spinal curvature and to determine correlations between sagittal parameters and clinical outcomes.

MATERIALS AND METHODS

Study Design

This is a unicenter, prospective, and noncomparative study.

Device Design

The Mobi-C cervical disc prosthesis is a metal-on-polyethylene device. This implant is composed of 2 spinal plates (cobalt, chromium, and molybdenum alloy ISO 583212) and an ultra-high-molecular-weight polyethylene mobile insert. This cervical prosthesis has 5 degrees of freedom. The mobile insert is self-centering on the inferior end plate: each movement of the superior endplate induces a repositioning of the mobile insert on the inferior endplate. The mobility of the insert decreases the transmission of stress on the bone-endplate interface and reduces stresses in the facet joints. Lateral stops reduce potential for migration of the insert, and mobility is self-controlled by the compression of the implant.

Patients

Forty patients who received a cervical disc replacement were included in this study. There were 22 women and 18 men (mean age, 41.1 y; range: 23 to 53 y). All 40 patients of this study are included in a French multicenter trial. Beginning in November 2004, clinical, surgical, and radiologic data were collected prospectively. The last author carried out all operations in our Spine Unit.

Inclusion criteria in this study were single-level cervical disc disease between C3/4 and C6/7 in patients with radiculopathy or myelopathy, resistant to conservative treatment. No patient was operated for isolated neck pain. Neural compression was documented with magnetic resonance imaging. Exclusion criteria were trauma, tumor, osteoporosis, active infection, metabolic disease, obesity, pregnancy, and prior cervical spine surgery. Thirty-five patients had radiculopathy and 5 had myelopathy. One patient had congenital fusion of C6/C7. The treated levels were C3/C4 in 1 case, C4/C5 in 2 cases, C5/C6 in 24 cases, and C6/C7 in 13 cases. The mean follow-up was 24.3 months (range: 12 to 36 mo). Nine patients were evaluated at 12 months, 21 at 24 months, and 10 at 36 months. We assessed all patients clinically and radiographically preoperatively and postoperatively (1/3/6/12/24/36 mo) using the same protocol.

Clinical Outcomes

Patients were systematically evaluated in the preoperative and postoperative period. All data was collected prospectively. Assessment was performed at 1, 3, and 6 months and 1, 2, and 3 years after surgery. Patients were assessed clinically using Short Form-36 [SF-36; Physical Component Summary (PCS) and the Mental Component Summary (MCS) scores], Neck Disability Index (NDI), and a Visual Analog Scale (VAS) pain score (evaluation of neck and arm pain intensity). We measured these clinical parameters in the preoperative period and at last follow-up.

Radiologic Evaluation

The radiologic evaluation of the cervical spine in the preoperative and postoperative period included anteroposterior views and lateral radiographs in neutral position, full flexion, and full extension. X-rays were digitalized using a Vidar radiograph digitizer (Vidar Systems Corp, Hernon, VA). Quantitative measurements were performed with Spineview software (LBM, LIO, Surgiview Company). This quantitative spine measurement software had been validated earlier.[19,20] Other radiographic measurements included sagittal alignment of the cervical spine (tangent angle of the C2C7 curvature—Fig. 1), change in C2C7 alignment (postoperative C2C7 angle—preoperative C2C7 angle), sagittal alignment of the treated functional spinal unit (FSU—Fig. 2), change in FSU angle (postoperative FSU angle—preoperative FSU angle), postoperative shell angle of the prosthesis (Fig. 3), and ROM of the treated level.

The postoperative shell angle is that between the disc prosthesis endplate as the complementary measure of FSU

FIGURE 1. C2C7 alignment (posterior tangent method).

FIGURE 2. Functional spinal unit angle (posterior tangent method).

angle. Sagittal alignment of the cervical spine and the FSU were measured using the posterior tangent method (Figs. 1, 2)[21] before and after cervical arthroplasty by 1 author (P.G.). The postoperative shell angle is that between the disc prosthesis endplates (Fig. 3). All measurements were performed 3 times. For overall cervical curvature, we classified patients in lordotic (≥ 10 degrees), neutral (0 degree $\leq$ C2C7 curvature < 10 degrees), or kyphotic groups (< 0 degree). For FSU angulation, we classified patients in lordotic (FSU ≥ 5 degrees), neutral (0 degree FSU < 5 degrees), or kyphotic groups (FSU < 0 degree). Lordotic and neutral positions were expressed as positive values and kyphotic positions as negative values. For changes in segmental curvature, overall cervical alignment, and ROM, positive values refer to increased values and negative values to decreased values.

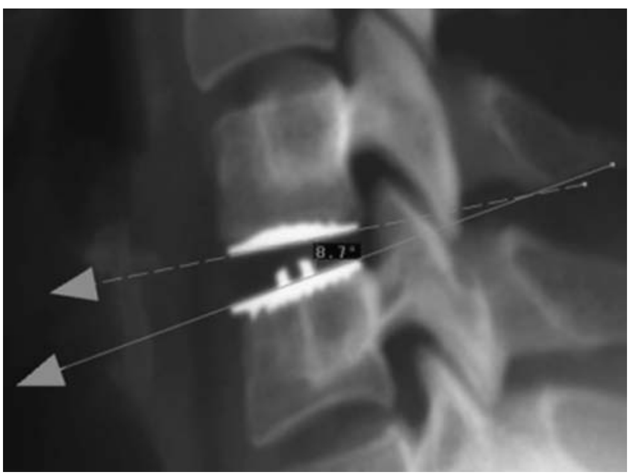

FIGURE 3. Measurement of prosthesis shell angle.

TABLE 1. Preoperative Clinical Values and Outcomes at Last Follow-up

	Preoperative Period				Last Follow-up				
Variables	**Mean**	**Min**	**Max**	**SD**	**Mean**	**Min**	**Max**	**SD**	***P****
SF-36 PCS	38	26.2	56	7.1	46.6	30.6	60	9.1	< 0.0001
SF-36 MCS	36.6	17.8	59.2	11.6	45.7	12.3	64.5	11.8	< 0.0001
NDI	47.9	10	94	16.0	26.5	0	91	22.6	< 0.0001
VAS neck pain	53.3	2	100	26.5	17.1	0	73	19.6	< 0.0001
VAS arm pain	70.6	1	100	22.8	17.2	0	82	22.7	< 0.0001

*P values are from Wilcoxon test.

Max indicates maximum; Min, minimum; NDI, Neck Disability Index; SF-36 MCS, Short Form 36 Mental Component Summary; SF-36 PCS, Short Form 36 Physical Component Summary; VAS, Visual Analog Scale.

Statistics

Statistical analysis was performed using SPSS software 17.0 (SPSS Inc, Chicago, IL). Wilcoxon test was used for paired values. Spearman correlation coefficient (rs) was used to evaluate correlations between independent quantitative variables. Multivariate linear regression was used to assess the combined contribution of a range of study parameters using best-fit analysis (for postoperative FSU angle and C2C7 postoperative alignment). P values less than 0.05 were considered as statistically significant.

RESULTS

Clinical Parameters

Clinical values are provided in Table 1. The mean SF-36 PCS was 38.0 in the preoperative period and 46.6 at last follow-up ($P<0.0001$). The mean SF-36 MCS was 36.6 in the preoperative period and 45.7 at last follow-up ($P<0.0001$). The mean preoperative NDI score of 47.9 decreased to 26.5 at last follow-up ($P<0.0001$). The mean VAS neck pain was 53.3 in the preoperative period and decreased to 17.1 at last follow-up ($P<0.0001$). The mean VAS arm pain was 70.6 in the preoperative period and 17.2 at last follow-up ($P<0.0001$).

Radiologic Evaluation

Radiographic results are shown in Tables 2 and 3.

ROM

The mean ROM was 8.3 degrees preoperatively and 11.0 degrees at last follow-up (Table 2) ($P=0.013$). The mean improvement in ROM was 2.7 degrees (Table 3). Only 1 disc replacement was immobile in this study.

Sagittal Balance Parameters

The mean preoperative C2C7 curvature was 12.8 and 16.0 degrees in the late follow-up (Table 2). These values were significantly different ($P=0.001$). The mean improvement in C2C7 curvature was 3.2 degrees (Table 3). The mean preoperative FSU angulation was 2.3 and 5.3 degrees postoperatively (Table 2). There was a significant increase in FSU segmental alignment ($P<0.0001$). The mean improvement in segmental FSU curvature was 3.0 degrees (Table 3). The mean postoperative shell angulation was 5.5 degrees (Table 3).

Change in Overall Curvature

In the preoperative period, 25 patients had a lordotic cervical alignment, 14 patients had a neutral cervical alignment, and 1 patient had a kyphotic cervical alignment. In the postoperative period, 28 patients had lordotic cervical alignment, 11 patients had neutral alignment, and 1 patient had kyphotic alignment. Among the 25 patients with preoperative lordotic curvature, 22 had lordotic alignment postoperatively and 3 had neutral alignment. Among the 14 patients with preoperative neutral alignment, postoperative alignment was lordotic in 6 and neutral in the other 8 patients. The patient with preoperative overall kyphotic alignment still had kyphotic alignment postoperatively.

Change in FSU Curvature

In the preoperative period, 10 patients had lordotic segmental alignment (of the treated segment), 20 patients had neutral segmental alignment, and 10 patients had kyphotic segmental alignment. Postoperatively, 18 patients had lordotic segmental alignment, 19 patients had neutral alignment, and 3 patients had kyphotic alignment. Among the 10 patients with preoperative lordotic segmental alignment, postoperative segmental alignment was lordotic in 9 patients and kyphotic in 1 patient. Among the 20 patients with preoperative segmental neutral alignment, postoperative segmental alignment was lordotic in 7 and neutral in 13 patients. Among the 10 patients with preoperative kyphotic segmental alignment, postoperative segmental alignment was lordotic in 2, neutral in 6, and kyphotic in 2 patients.

TABLE 2. Overall C2C7 Cervical Curvature, FSU Alignment, and ROM in Preoperative and Postoperative Period at the Last Follow-up

Variables	Preoperative Period				Last Follow-up				
N = 40	**Mean**	**Min**	**Max**	**SD**	**Mean**	**Min**	**Max**	**SD**	***P****
C2C7 alignment	12.8	− 6.5	28.1	8.3	16.0	− 5.2	33.1	9.8	0.001
FSU alignment	2.3	− 3.1	14.0	3.7	5.3	− 2.7	19.0	4.8	< 0.0001
ROM	8.3	1.0	16.4	4.3	11.0	− 2.9	25.3	6.4	0.013

*P values are from Wilcoxon test.

FSU indicates functional spinal unit; Max, maximum; Min, minimum; ROM, range of motion.

TABLE 3. Changes in C2C7 Alignment, FSU Alignment, ROM, and Prosthesis Shell Angulation

Variables	Mean	Minimum	Maximum	SD
Change in C2C7 alignment	3.2	−17.4	22.3	7.3
Change in FSU alignment	3.0	−6.4	13.8	3.6
Change in ROM	2.7	−6.8	2.0.2	6.3
Prosthesis shell angle	5.5	−1.0.4	19.7	7.1

FSU indicates functional spinal unit; ROM, range of motion.

Correlation Analysis

Results are shown in Table 4.

Postoperative C2C7 Alignment

A significant correlation was found between postoperative C2C7 alignment and preoperative C2C7 alignment (rs = 0.651 $P < 0.0001$), change in C2C7 alignment (rs = 0.734, $P < 0.0001$), preoperative FSU angle (rs = 0.372, $P = 0.018$), postoperative FSU angle (rs = 0.638, $P < 0.0001$), and prosthesis shell angle (rs = 0.396, $P = 0.012$).

Change in C2C7 Alignment

A significant correlation was found between change in C2C7 alignment and postoperative C2C7 alignment (rs = 0.734, $P < 0.0001$), postoperative FSU angle (rs = 0.525, $P = 0.001$), change in FSU angle (rs = 0.461, $P = 0.003$), and prosthesis shell angle (rs = 0.360. $P = 0.022$).

Postoperative FSU Angulation

A significant correlation was found between postoperative FSU angle and preoperative C2C7 alignment (rs = 0.326, $P = 0.04$), postoperative C2C7 alignment (rs = 0.638, $P < 0.0001$), change in C2C7 alignment (rs = 0.525, $P = 0.001$), preoperative FSU angle (rs = 0.568, $P < 0.0001$), change in FSU angle (rs = 0.513, $P = 0.001$), and prosthesis shell angle ($P = 0.514$, $P = 0.001$).

Change in FSU Angle

A significant correlation was found between change in FSU angle and change in C2C7 alignment (rs = 0.461, $P = 0.003$), postoperative FSU angle (rs = 0.513, $P = 0.001$), and prosthesis shell angle (rs = 0.383, $P = 0.015$).

Prosthesis Shell Angle

A significant correlation was found between shell angle and postoperative C2C7 alignment (rs = 0.396, $P = 0.012$), change of C2C7 angulation (rs = 0.360, $P = 0.022$), postoperative FSU angulation (rs = 0.514, $P = 0.001$), and change of FSU angulation (rs = 0.383, $P = 0.015$).

Sagittal Parameters and ROM

No correlation was found between preoperative-to-postoperative change in ROM and any sagittal balance parameter.

Sagittal Balance Parameters and Clinical Variables

We found that change in FSU angulation was correlated with postoperative PCS SF-36 (rs = 0.364, $P = 0.021$), postoperative FSU angle was correlated with postoperative PCS SF-36 (rs = 0.349, $P = 0.027$), and postoperative VAS neck pain was correlated with shell angle (rs = 0.422, $P = 0.007$).

Multiple Regression Linear Analysis

Postoperative C2C7 Alignment

Using "best-fit" multivariate linear regression analysis, 1 significant model was found in which each of the input variables contributed significantly to the model ($R = 0.866$, $R^2 = 0.750$, $P < 0.0001$). The model used the

TABLE 4. Correlation Analysis

	Postop C2C7A		Change in C2C7A		Postop FSU Angle		Change in FSU Angulation		Shell Angle	
Variables	rs	*P*	rs	*P*	rs	*P*	rs	*P*	rs	*P*
C2C7A preop	**0.651**	**< 0.0001**	0.043	0.791	**0.326**	**0.04**	−0.101	0.535	0.236	0.142
C2C7A postop	**1**	—	**0.734**	**< 0.0001**	**0.638**	**< 0.0001**	0.284	0.076	**0.396**	**0.012**
C2C7A change	**0.734**	**< 0.0001**	**1**	—	**0.525**	**0.001**	**0.461**	**0.003**	**0.360**	**0.022**
FSU preop	**0.372**	**0.018**	0.064	0.693	**0.568**	**< 0.0001**	−0.299	0.061	0.211	0.191
FSU postop	**0.638**	**< 0.0001**	**0.525**	**0.001**	**1**	—	**0.513**	**0.001**	**0.514**	**0.001**
FSU change	0.284	0.076	**0.461**	**0.003**	**0.513**	**0.001**	**1**	—	**0.383**	**0.015**
ROM preop	−0.108	0.508	−0.265	0.099	−0.049	0.766	−0.011	0.946	−0.008	0.960
ROM postop	−0.034	0.836	−0.191	0.237	−0.153	0.347	−0.191	0.237	−0.295	0.064
ROM change	0.040	0.807	−0.100	0.539	−0.157	0.333	0.039	0.813	−0.285	0.074
Shell angle	**0.396**	**0.012**	**0.360**	**0.022**	**0.514**	**0.001**	**0.383**	**0.015**	**1**	—
SF-36 PCS postop	−0.006	0.971	0.101	0.534	0.085	0.601	0.138	0.397	0.109	0.504
SF-36 PCS change	0.159	0.328	0.269	0.093	**0.349**	**0.027**	**0.364**	**0.021**	0.200	0.215
SF-36 MCS postop	−0.226	0.161	−0.207	0.199	−0.096	0.557	−0.020	0.903	−0.149	0.360
SF-36 MCS postop	−0.184	0.256	−0.211	0.192	−0.188	0.247	0.108	0.506	−0.080	0.625
NDI postop	−0.43	0.791	−0.077	0.635	−0.037	0.820	−0.012	0.940	0.230	0.153
NDI change	−0.037	0.822	−0.180	0.266	−0.035	0.830	−0.199	0.219	0.309	0.052
VAS NP postop	0.209	0.195	0.160	0.324	0.053	0.747	0.078	0.631	**0.422**	**0.007**
VAS NP change	−0.029	0.861	−0.081	0.621	−0.147	0.367	−0.276	0.084	0.270	0.092
VAS AP postop	0.029	0.858	−0.015	0.925	−0.129	0.429	0.021	0.899	0.306	0.055
VAS AP change	0.051	0.757	−0.126	0.438	0.014	0.932	−0.238	0.139	0.144	0.375

P values significant correlations: $P < 0.05$. Bold values = *P* values less than 0.05.

C2C7A indicates C2C7 alignment; FSU, functional spinal unit; NDI, Neck Disability Index; Postop, postoperative; Preop, preoperative; ROM, range of motion; rs, Spearman correlation coefficient; SF-36 MCS, Short Form 36 Mental Component Summary; SF-36 PCS, Short Form 36 Physical Component Summary; VAS AP, Visual Analog Scale arm pain; VAS NP, Visual Analog Scale neck pain.

4 variables: preoperative C2C7 alignment ($P<0.0001$), preoperative FSU angle (0.007), postoperative FSU angle ($P=0.001$), and prosthesis shell angle ($P=0.008$).

Postoperative FSU Angle

Using best fit multiple linear regression analysis, 1 significant model was found in which each of the input variables contributed significantly to the model ($R=0.867$, $R^2=0.751$, $P<0.0001$). The model used the 2 variables: prosthesis shell angle ($P=0.001$) and preoperative FSU angle ($P=0.0001$).

DISCUSSION

The conventional surgical treatment of patients who have cervical disc disease and cervical spondylosis is ACDF. Cervical disc replacement is an alternative to this standard procedure. The objectives of total disc replacement are motion preservation and avoidance of long-term complication of fusion procedures. Adjacent segment degeneration,[22–26] modification of motion at adjacent levels, and increased intradiscal pressure[27,28] at adjacent levels frequently occur after ACDF. Segmental kyphosis is frequently observed after cervical discectomy without fusion.[29] The effects of cervical sagittal imbalance on neck pain and adjacent segment disease after ACDF procedure have been reported in the literature.[30,31] Katsuura et al[30] observed a correlation between degeneration of adjacent levels and loss of cervical lordosis. Cervical disc replacements should maintain ROM of the treated segment and contribute to physiological alignment of the treated segment and overall cervical spine.

Several studies have reported segmental kyphosis and loss of overall cervical lordosis after total disc replacement with the Bryan prosthesis (Medtronic, Sofamor Danek, Memphis)[11–16,32] and recommendations have been proposed to reduce postoperative segmental malalignment after cervical disc replacement with the Bryan system.[13,33]

In a comparative study, Park et al[7] reported satisfactory outcomes after cervical disc replacement with the Mobi-C device. In their study, the mean preoperative cervical lordosis was 29.8 degrees, decreasing to 28.6 degrees in the postoperative period (cervical lordosis decreased from 24.3 to 17.7 degrees in the fusion group). They reported an increase in segmental lordosis (from 4.8 to 9.3 degrees), an increase in segmental ROM at the treated levels (from 12.7 to 15.2 degrees), a decrease in ROM of the upper adjacent segment (from 14.4 to 12.6 degrees), and a lower increase in ROM of the lower adjacent segment after cervical disc prosthesis implantation than after fusion.

Kim et al[2] reported satisfactory early clinical and radiologic outcomes after implantation of the Mobi-C device in 23 patients, 22 of whom had a lordotic cervical curvature after surgery. FSU ROM increased from 10.6 to 14.6 degrees postoperatively. The mean change in FSU angle in neutral position was 5.5 degrees (absolute value).

Anakwenze et al[34] reported a significant change in lordosis of 3.0 degrees at the operative level after cervical disc replacement with ProDisc-C (Synthes Spine, West Chester, PA). C2C7 alignment increased 3.1 degrees at the last follow-up.

Limitations of this study include the lack of a control group, the small number of patients, the limited follow-up, and the absence of assessment of adjacent segment motion or degeneration.

This study shows that C2C7 curvature, FSU angle, and ROM at the treated level increase after neurologic decompression and cervical arthroplasty with this prosthesis. In our study, ROM of the treated levels increased 2.7 degrees at last follow-up. Lordotic or neutral curvature was maintained in most cases. Postoperative segmental kyphosis was observed in only 3 cases (as opposed to 10 cases preoperatively). On lateral views, there was significant change in the overall C2C7 curvature and that of the treated segment after single-level artificial disc replacement. The mean improvement in C2C7 sagittal curvature was 3.2 degrees and the mean improvement in FSU angle was 3 degrees. Mobi-C disc prosthesis tends to preserve and increase focal and overall cervical curvature. Clinical outcomes were satisfactory and the mean improvement of SF-36 PCS, SF-36 MCS, NDI score, VAS neck pain, and arm pain were statistically significant.

The prosthesis shell angle correlated positively with postoperative C2C7 alignment, change of C2C7 alignment, postoperative FSU angle, and change of FSU angle. Best-fit multivariate linear regression analysis showed that prosthesis shell angulation contributed significantly to postoperative FSU angle and postoperative C2C7 alignment. This angle has been evaluated in several studies on the Bryan prosthesis.[8,13,14] Pickett et al[8] found a significant relationship between shell endplates angle and the FSU. Despite the kyphosis seen at the level treated, the C2C7 alignment did not change significantly. In assessing this parameter, we wanted to know whether this had an influence on segmental and overall sagittal balance. Shell angle of Mobi-C prosthesis assumed a lordotic angulation postsurgery and that is resulted in lordotic of the FSU and C2C7 alignment. Therefore, evaluation of this parameter is important.

Moreover, postoperative FSU angle correlated positively with postoperative C2C7 alignment, change of C2C7 alignment, change of FSU angle, and prosthesis shell angle. Preoperative parameters (C2C7 alignment and segmental alignment) correlated only with postoperative FSU angle and postoperative C2C7 alignment.

Regression analysis showed that prosthesis shell angle and preoperative FSU angle contributed significantly to postoperative FSU angle. Moreover, preoperative C2C7 alignment, preoperative FSU angle, postoperative FSU angle, and prosthesis shell angle contributed significantly to postoperative C2C7 alignment.

In our study, we found no correlation between sagittal balance parameters and ROM. The unconstrained nature of the device with the presence of a mobile insert and 5 degrees of freedom probably contributed to these results. Moreover, the only observed clinical correlations were between postoperative FSU angle and postoperative PCS SF-S36, between change of FSU angle and PCS SF-36, and between prosthesis shell angle and postoperative VAS neck pain. No correlation was found between overall cervical spine curvature and clinical outcomes. The improvement in clinical outcomes was probably attributable to neurologic decompression. Improvement in SF-36 and NDI scores despite segmental kyphosis at the treated level were reported by Pickett et al.[8] The authors reported no correlation between segmental malalignment and clinical outcomes. Fong et al[32] reported an improvement in NDI and SF-36 scores despite shell angle kyphosis in a Bryan prosthesis study.

Preparation of cervical endplates before artificial disc insertion is an important step that affects the definitive position of the prosthesis. Excessive endplate milling and cervical spine position during the surgical procedure can change the final device functionality. It is difficult to precisely estimate the final result during surgery. Moreover, angle of prosthesis insertion and change in disc space height may influence postoperative sagittal balance parameters. The implications of some of our study results remain unclear and these results should be considered with caution. These observations call for confirmation by long-term follow-up. Furthermore, studies are warranted to focus on other factors that influence how disc replacements affect segmental and overall cervical angles and alignment.

CONCLUSIONS

Overall and segmental alignments are 2 important factors, which may be considered for evaluation after cervical disc replacement. Cervical arthroplasty with Mobi-C disc prosthesis maintains ROM of the FSU, cervical lordosis, and sagittal alignment of the cervical spine. No significant correlation was found between ROM and sagittal parameters. The preliminary results are encouraging, but long-term follow-up will be needed to assess the effectiveness and advantages of this procedure.

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