Clinical Article

Online ISSN : 2314-8969
Print ISSN: 2314-8950

Egy Spine J 25:36-46, 2017

www.esa.org.eg

Effect of Anterior Cervical Discectomy and Fusion Compared to Cervical Arthroplasty on Dynamics of Adjacent Segment Disease

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Abstract

Background Data: After anterior cervical discectomy; the effect of cervical fusion or cervical arthroplasty on the dynamics of adjacent segments and the overall cervical spine has a direct impact on the final clinical outcome

Purpose: To compare the effect of the cervical fusion (ACDF) versus arthroplasty after anterior cervical discectomy on the cervical dynamics, this can predispose to adjacent segment diseases at those levels.

Study Design: A comparative retrospective study between two groups; cervical arthroplasty group, and the cervical fusion group.

Patients and Methods: A total of 36 consecutive patients underwent anterior cervical discectomy with a mean follow-up of 24 months. Patients were classified into two groups; Group I (20 patients) were operated for (ACDF), Group II (16 patients) were operated for anterior cervical discectomy and prosthesis (arthroplasty). Preoperative and postoperative clinical assessments were done by using the Neck Disability Index (NDI) and the Japanese Orthopedic Association (JOA) score for myelopathy patients. In all patients, at final follow-up, a neuro-radiographic assessment (cervical spine static and dynamic x-ray and MRI) was done. The angle of the operated disc level, the angle of above and below adjacent segments and their range of motion (ROM), and global cervical curve Cobb angle (C2-7) were measured.

Results: In group I; the mean angle of the global cervical curve improved from 3.4° preoperative (kyphosis) to 14.5°postoperative (P<0.001), where in group II, angle improved from 4.6° to 16.5° (P=0.6). The mean segmental ROM of adjacent segments didn't show significant instability. The mean ROM at upper adjacent levels was 11.1°, and at the lower adjacent levels was 10.2° (normally up to 10 degrees). In group II, however, the mean angle of ROM was 7.8° at upper adjacent levels and 9.6° at lower adjacent levels. Postoperative improvement of JOA and NDI scores was statistically significant (P<0.001) in group-I (JOA improved from14.3±1.25 to 16.6±0.9, and NDI improved from 21.1±5.8 to 7.63±4.9), where in group-II JOA improved from 15.7±1.2 to 16.2±1.1 and NDI improved from 19±2.1 to 16±8.7. Symptomatic ASD was observed in 5 patients (20%) in group I and in none of group II patients

Conclusion: Compensatory increase in ROM of the contiguous adjacent segments in patients subjected to ACDF may lead to ASD especially in those with asymptomatic

Received on:
June 1st, 2017
Accepted on:
December 22nd, 2017

adjacent sub-clinical degenerative disease. In contrary, arthroplasty reduce the incidence of adjacent segment diseases. (2017ESJ147)

Keywords: cervical dynamics; adjacent segment diseases; anterior cervical discectomy; cervical prosthesis, anterior cervical fusion

Introduction

Anterior cervical discectomy is the standard procedure for cervical disc lesion described by Cloward[1]as well as Robinson and Smith.[22] Simple discectomy is currently not advised because of the frequent collapse of the disc spaces after surgery with consequent nerve roots compression. It is now the frequently asked question is whether to follow the discectomy by fusion with cages augmented by bone grafts (arthrodesis) or by artificial disc prosthesis (cervical arthroplasty).

The disc has a physiological action of stress absorption and transmission of loads. So, after anterior cervical discectomy this function decreases and the loads are transmitted to adjacent segments. So, fusion increases this kind of risk because it stops the function of load absorption and transfers this action to adjacent segment producing adjacent segment disease (ASD).[3,6,13] Cervical arthroplasty using artificial cervical discs has been developed recently to preserve the motion, and restore the mobility of cervical spine segments and consequently prevents the development of ASD.[11,20,24,27]

The aim of our study is to compare the effect of both cervical arthrodesis and cervical arthroplasty on the dynamics upper and lower adjacent segment. We aimed also to study the correlation of both techniques with the development of newly developed adjacent segment disease.

Patients and Methods

Patient Population:

Through the period from April 2014 to May 2017; we reviewed our hospital medical records and a consecutive series of 36 patients treated for cervical disc disease were recruited retrospectively for this study. All patients were operated for single or double cervical disc disease were included using cage fusion and arthroplasty. Patients with redo-surgery, infection, tumors, trauma, multi-level, multi-surgery, and bad comorbidities were excluded from this study. Twenty patients were operated using the anterior cervical discectomy and fusion with peek cages and allograft bone (ACDF) (Group-I). Sixteen patients operated using cervical arthroplasty (Group-II). In group-I, we used polyether-ether-ketone (PEEK) cages with Allograft (Stryker). The cage is a radio-transparent trapezoidal-shaped and slightly wedged implant made from a polymer matrix of PEEK.In group-II however; we used titanium made prosthesis (ROTAIO, SIGNUS-Germany). The prosthesis consists of a superior and an inferior end plate (Titanium alloy to ISO 5832-3) on which the sliding elements (Cobalt-chrome alloy to ISO 5832-12) are anchored and secured by means of a fixation pin (Figure 1).

At the time of surgery, the mean age of patients was 52±10.3 (Range, 34-77) years in group-I, and 33.2±9.3 (Range, 24-55) years in group-II. In group-I, 24 levels were operated on including single level procedure in 16 patients and double level procedure in 4 patients distributed as follow(1: C3-C4, 4: C4-C5, 12: C5-C6, 4: C6-C7, 3: C7-T1). In group-II, 20 levels were operated upon including 12 single level procedure in 12 patients and double levels procedure in 4 patients distributed as follow(2: C3-C4, 5: C4-C5, 10: C5-C6, 3: C6-C7). In both groups, patients presented with cervical pain, cervical radiculopathy and /or cervical myelopathy. Preoperative radiological assessment was done using anteroposterior, lateral, and dynamic X-ray cervical spine and MRI cervical spine (1.5 Tesla). (Table 2)

Surgical Procedure:

Under general anaesthesia, a standard microsurgical anterior approach (Smith-Robinson technique modified according to Caspar) was used. With pins distraction, complete discectomy is done using rongeurs and curettes, endplates were drilled and osteophytectomy was carried out. In all patients, posterior longitudinal ligament is excised with adequate exposure and decompression of dura and origin of nerve roots was obtained. After ensuring full discectomy and removal of any migrated fragments, insertion of the implants started to be

done. In fusion group, we prepared the cage and filled by the allograft bone the inserting it in disc space under fluroscoping guidance; the height and diameter of each cage was selected on the basis of both preoperative imaging studies and intra-operative measurements. In arthroplasty group, the height and size was determined by the trials. Once the trial has reached its optimal position (about 1-2 mm anterior to the posterior wall of the vertebral body), we eased off vertebral distraction. Trials must be seated firmly in the intervertebral space. The appropriate disc prosthesis then inserted and guided also by X-ray. All patients wear a cervical collar for a period of 4 weeks postoperatively

Clinical Outcome Assessment:

In fusion group; the mean follow-up period was 27.8±10.9 (Range, 13-38) months, where in arthroplasty the mean follow up was 24±9.9 (Range, 6-40) months. All patients in this study were assessed clinically using Visual Analogue Scale (VAS) for pain, Nick Disability Index (NDI) for functional outcome with complete neurological examination for motor, reflexes and sensory examination. The NDI was self-administered preoperatively and at follow-up visits. Changes in patients with myelopathy were rated according to the Japanese Orthopaedic Association (JOA) classification of disability in spondylotic cervical myelopathy.[17,25]

Radiological OutcomeAssessment:

Antero-posterior, lateral and dynamic cervical spine radiographs and MRI images were done at the follow-up control. Computer-based quantitative motion analysis software was used to analyze inter-vertebral motion and cervical angle. Radiographs were analysed to determine: (1)The shell angle of the operated disc space: the angle of the disc space formed by the endplates of every disc space in flexion and extension positions. (Table 1). (2) The range of movement (ROM): the sum of the accurate measurements of segmental sagittal rotation.[18]The sagittal ROM in each spinal level above and below the fusion level was done. The results have been compared to the normal measurement of ROM by *the Penning method*of determining Intersegmental Motion of the Cervical Spine (Table 1).[19] (3) The Cobb angle; global cervical curve (C2–7): to determine the overall cervical alignment. It is determined from the tangent of the posterior body line of C-2 and C-7 (Figure2).[5,8]

Angles were measured using computer-based quantitative measurement analysis software by calculating the intersecting angle between two lines drawn by the investigator. Hand measurements of the shell angles were also performed and compared with the computer-produced measurements. No significant difference was found between hand and computer based measurements, so, the results obtained with the computer were used.

MRI was done later in both groups to determine the incidence of newly developed disc lesions at the adjacent segments that was not observed at the time of surgery, also, if this new disc was symptomatic or no in the form of newly developed radioclopathic or myeolpathic symptoms.

Statistical Analysis

The Excel-sum test was used to analyze differences in the preoperative clinical and demographic characteristics (age, duration of symptoms) and in clinical outcome variables between groups (NDI score, JOA score, and motor and sensory deficit improvement). Statistical significance was set at $P<0.05$.

Results

Clinical Outcome:

In group-I, patients had overall improvement of preoperative symptoms. The NDI showed statistically significant improvement ($P<0.001$) from a preoperative mean of 21.1***±5.8*** to a postoperative mean of 7.63±4.9 at final follow-up. On the other hand, improvement of the NDI in group-II was not obvious as that of group I; it had shown a mild improvement from a mean of 19±2.1 to a mean of 16±8.7 at final follow-up exam.

As regard to myelopathy patients; in group-I, they showed statistically significant improvement of JOA score, form a preoperative mean of 14.3±1.25 to a postoperative mean of 16.6±0.9 ($P<0.001$) (Fgiure2). There was a significant improvement of the mean kyphotic angle with return to nearly normal lordotic angle with correction of the preoperative severe kyphotic angle in those patients who had significant improvement of JOA score. Group II also, showed an a significant improvement of myelopathic

symptoms in spite of the non clear indications for cervical arthroplasty in myelopathy patients,[4] it showed improvement of the JOA score from a mean of 15.7±1.2 to a mean of 16.2±1.1. There was no correlation between the degree of kyphosis correction and improvement of JOA scale in group II. The improvement here is explained by the decompression alone and proofs a good outcome even in myelopathic patients.

In group-I, symptomatic adjacent segment disease (ASD) has been reported in 5 Patients (20%), 4 in the upper adjacent and 1 in lower adjacent disc space. In 4 of these patients the preoperative MRI showed slight and asymptomatic disc degeneration at the levels involved subsequently. The new clinical manifestations of newly developed ASD were in the form of new radiculopathic symptoms. The pain was related to the new cervical segments affected. All these patients improved from the problems treated by ACDF and after a period ranging from 13 to 38 months, new radiculopatic symptoms started to develop. In group-II however, no one case had been shown to have development of new disc lesion at the levels adjacent to arthroplasty or even an increase of preoperative a symptomatic disc lesions.

Group-I Radiological Outcome:

None of the follow up radiological imaging showed cage mal-position at the period of follow-up. All but one patient had a sound fusion in the form of absent motion in flexion extension X–ray at the level of fusion and bony trabeculation across the operated level was observed. Only one patient had shown a movement in flexion-extension X-rays at the level operated on (5.7^{o} in flexion and 12.2^{o} in extension). This patient had persisting neck pain at final follow-up.

On follow-up dynamic radiographs, the range of motion (ROM) of the segments adjacent to the level of ACDF didn't show significant instability. The mean value was 11.1$\pm$4.5^{o}at upper levels and 10.2$\pm$3.4^{o} at lower levels (close to normal standard limits) (Student t-test, P=0.152).Flexion-extension range of motion (ROM) measured by Penning method was high than normal in 6 patients, 5 of them showed adjacent segment disease at such level. The distribution of such 5 patients were as follow; In2 patients (operated on at C4-C5), the ROM was 18.8 and 19.8, respectively (Figures 3, 4);in 1 patient (C6-C7) the ROM was 15.7, in 1 patient (C5-C6) the level of symptomatic ASD was above the fused level by two spaces and the ROM was 13.4. In the last patient (C3-C4) the ROM was 18, (Table 1).

Regarding kyphotic angle,the normal cervical spine has a lordosis angle that ranges from 10 to 40° with a wide range of individual variability.[12,19,23] The mean C2-C7 cervical angle (Cobb angle)showed a statistically significant (P<0.001) increase of mean values from preoperative 3.4$\pm$15.3^{o} to postoperative 14.5$\pm$14.7^{o}, close to standard normal lordotic value (defined as $\geq$10^{o}).

The increase of mean cervical angle had a positive impact on the improvement of myelopathic patients: all patients with improved JOA score also showed an increased Cobb angle, this is because of the neural decompression and the segmental correction of disc height by the appropriate cage size (Table 3). There was no correlation between Cobb angle and development of ASD, all patients who developed symptomatic ASD showed an improvement of overall cervical alignment (Cobb angle); these findings were statistically non-significant.

Group-II Radiological Outcome:

Displacement of the prosthesis was shown in 2 patients, immediately after surgery. Both were removed immediately and placed again in a correct position. Otherwise all other prosthesis showed a fair position. No other complications were shown regarding the prosthesis itself.

Regarding range of movements; the flexion-extension ROM measured by Penning method showed normal range at final follow-up in the operated level, also, it had shown a normal values either in the upper or lower levels; ROM was 7.8±2.1° in upper levels and 9.6±3.6° in lower levels, no one case showed increase in the range of movements above its normal ranges. In two patients however, we noticed increases range of motion in the adjacent segment below the level of arthroplasty, but it still near normal limits (around 10 degrees); the measurements were 15.1°and14.2°respectively. Both patients had not shown manifestations of newly developed ASD of final follow-up visits, (Table 1), (Figures 5, 6).

Mean kyphotic angle had shown an improvement from a mean of 4.6±1.3° to a mean of 10.1±7.1° immediately after surgery and to a mean of 16.5±4.4° at last follow-up visit. The early improvement was not obvious like that of fusion patients and even some patients showed loss of normal lordotic angle on follow-up. There was a significant correlation between loss of normal lordosis and the overall clinical improvement (P<0.05), (Table 4).

Table 1. Summary of Reported High ROM and Adjacent Segment Diseases in Study Patients

Operated Levels		ASD on MRI	ASD on Clinical	Adjacent segment shell angles		
				Ext.	Flex.	ROM
Group I	C5-C6	Mild increased pre-existingC4-C5	No	15.1	-3.7	18.8
	C4-C5, C5-C6	Slight increased pre-existingC6-C7	No	11.9	-3.8	15.7
	C5-C6	Marked increased pre-existing C4-C5	ACDF required	15.4	-4.4	19.8
	C7-T1	Mild increased pre-existing C5-C6	No	14.4	1	13.4
	C4-C5, C5-C6	Slight new C3-C4 disc degeneration	No	13.9	-4.1	18
Group II	C5-C6	No ASD	No	11.8	-2.4	14.2
	C5-C6	No ASD	No	16	0.9	15.1

Ext = Extension, Flex = Flexion, ROM= Range of Motion, ASD=Adjacent segment disease.

Table 2. Summary of Data of Study Patients.

Variables		Group-I	Group-II
Sex	Male	14 (70%)	9 (56%)
	Female	6 (30%)	7 (44%)
	Total	20	16
Smoker		9 (45%)	7 (44%)
Chronic illness	Hypertension	4 (20%)	1 (6 %)
	Diabetes	2 (10%)	3 (19%)
	Both	2 (10%)	-
	Ischemic heart disease	3 (15%)	1 (6%)
Clinical Parameters	Cervical pain	17 (85%)	4 (21%)
	Radiculopathy	10 (50%)	6 (37.5%)
	Myelopathy	10 (50%)	10 (62.5%)
	Preoperative NDI	21.1 ± 5.8	19±2.1
	Postoperative NDI	7.63 ± 4.9	16±8.7
	Preoperative JOA	14.3 ± 1.25	15.7 ± 1.2
	Postoperative JOA	16.6 ± 0.9	16.2 ±1.1
Radiography parameters	Cobb angle	3.4°	14.5°
	ROM	4.6°	16.5°
Operated levels	C3-4	1	2
	C4-5	4	5
	C5-6	12	10
	C6-7	4	3
	C7-T1	3	-
Development of ASD		5 (20%)	No
Symptomatic ASD		1 (5%)	No

Table 3. Table Presenting Changes in Cervical Curve and Clinical Parameters in Group-I(ACDF) Patients

No.	Operated levels	PreOp. Cobb angle (C2-7)	PostOp. Cobb angle (C2-7)	PreOp.JOA	PostOp. JOA	PreOp. NDI	PostOp. NDI
1	C5-C6	25.6	18.2	R	R	16	12
2	C5-C6	-14.2	-1.6	R	R	19	5
3	C4-C5, C5-C6	2.5	8.5	15 M	17	25	10
4	C6-C7	-18	-3.5	16 M	16	18	11
5	C3-C4	-1	4.5	14 M	17	20	13
6	C5-C6	-8.7	-2	15 M	16	14	12
7	C4-C5, C5-C6	-19	-16	15 M	17	17	6
8	C5-C6	4.5	13.6	13 M	15	24	5
9	C5-C6	-10.2	12.7	15 M	18	22	16
10	C5-C6	12.4	32.5	15 M	18	28	5
11	C5-C6	20.4	23.2	R	R	16	2
12	C6-C7	12	20	R	R	30	1
13	C4-C5, C5-C6	14.2	23.7	12 M	16	18	4
14	C7-T1	10.4	26.5	R	R	23	13
15	C7-T1	16.9	15.8	R	R	15	3
16	C7-T1	---	---	R	R	27	8
17	C6-C7	2.5	4.2	R	R	33	7
18	C6-C7	9.8	15.2	R	R	26	7
19	C5-C6	10.2	22.3	13 M	16	18	2
20	C5-C6	24	36.5	R	R	16	8

M = Myelopathy, R = Radiculopathy

Table. 4. Table presenting changes in cervical curve and clinical parameters in group-II (Arthroplasty) patients

No.	Operated levels	PreOp. Cobb angle (C2-7)	PostOp. Cobb angle (C2-7)	PreOp. JOA	PostOp. JOA	PreOp. NDI	PostOp. NDI
1	C5-C6	10	22	15	15	16	13
2	C4-C5, C5-C6	-5	13	15	16	19	10
3	C4-C5, C5-C6	8	7	14	15	25	17
4	C6-C7	-6	1	17	17	18	14
5	C3-C4	22	16	R	R	20	16
6	C3-C4	8	5	14	15	14	15
7	C4-C5, C5-C6	17	12	15	15	17	20
8	C5-C6	-7	2	R	R	24	21
9	C5-C6	-2	11	R	R	22	16
10	C5-C6	15	12	17	18	28	10
11	C5-C6	17	12	16	17	16	20
12	C6-C7	-12	-1	R	R	30	15
13	C4-C5, C5-C6	-10	6	R	R	18	10
14	C4-C5	16	20	17	17	23	22
15	C5-C6	21	22	17	17	15	20
16	C6-C7	-20	10	R	R	27	17

M = Myelopathy, R = Radiculopathy

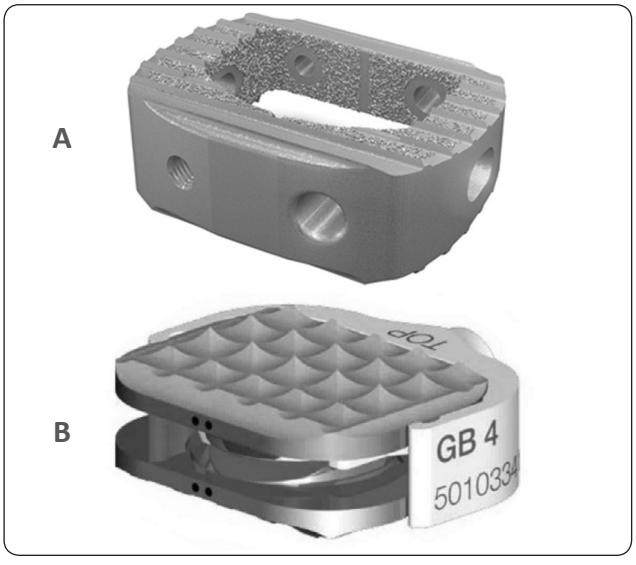

Figure 1. Implants used in our study (A) diagram of cervical cage of Stryker, (B) image of Rotaio Cervical Disc Prosthesis

Figure 2. Illustration showing the software program used to determine the overall cervical angle between C-2 and C-7 from the tangent of the posterior body line of C-2 and C-7. It was also used to measure the shell angles.

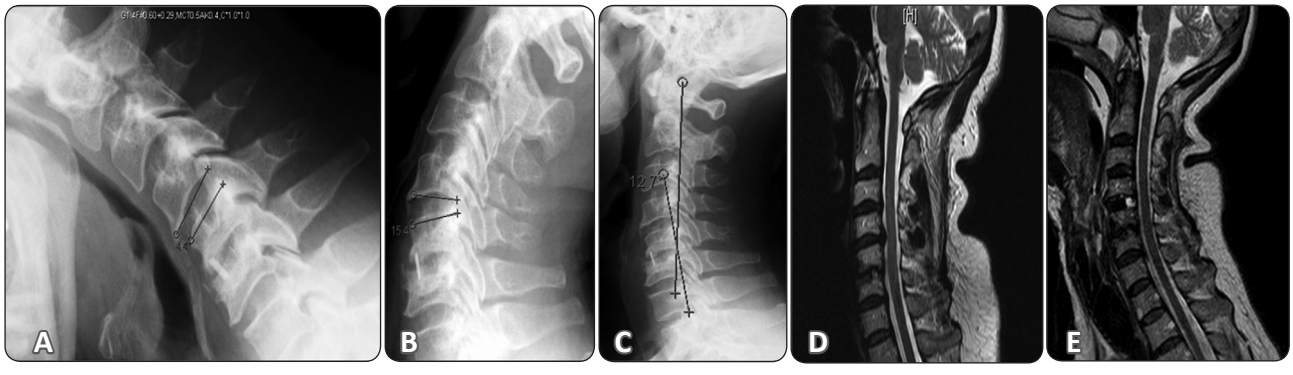

Figure 3. 35 years old male operated on by ACDF C5-C6 and affected by ASD after 2 years. Increased range of motion (19.8): (A) flexion angle -4.4 and (B)extension angle 15.4. (C)The Cobb angle showed postoperative good lordotic alignment. (D)Postoperative sagittal MRI showed C4-C5 ASD. (E)The patient needed surgical intervention for that level; sagittal MRI after the second ACDF.

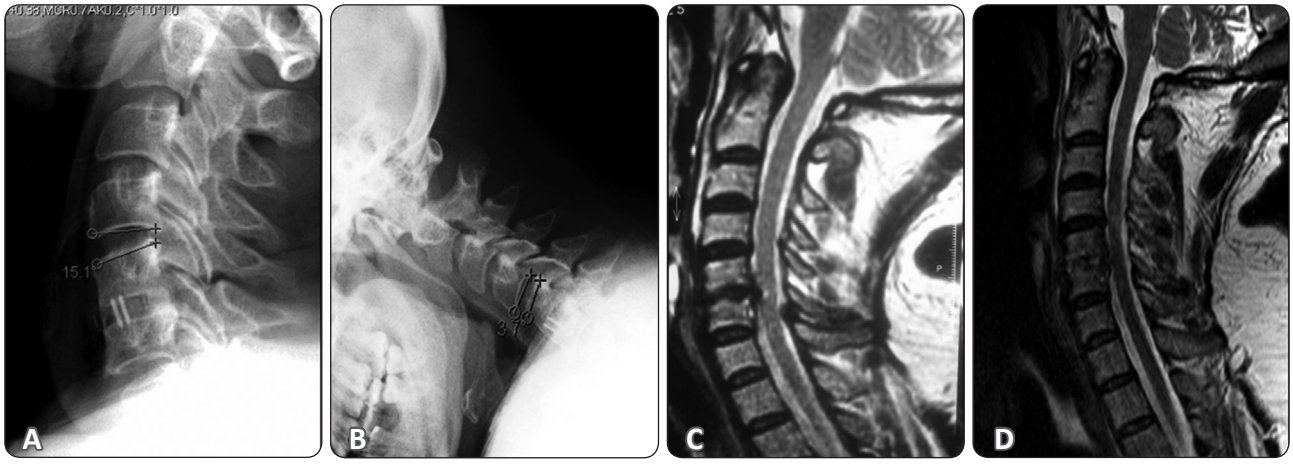

Figure 4. 42 years old female The shell angle in cervical x-ray films obtained with patient in (**A**)extension, and (**B**)flexion, demonstrated high ROM (18.8) at disc level superior to that subjected to ACDF. Preoperative MRI (**C**) shows disc disease at C5-C6 and slight asymptomatic disc degeneration at the level above. Postoperative MRI (**D**) obtained 2 years after surgery demonstrates good C5-C6 decompression and increasing of C4-C5 disc disease

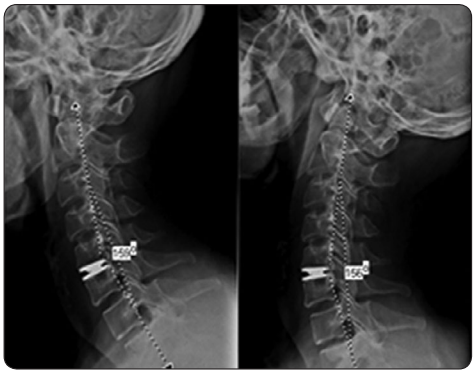

Figure 5. Illustration showing software program used in arthroplasty group, it has the same parameter used in group-I. Cobb angel is measured between C-2 and C-7 from the tangent of the posterior body line of C-2 and C-7

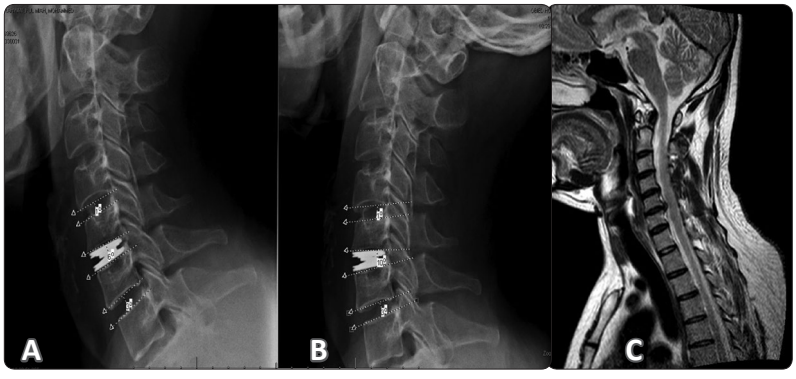

Figure 6. An 38 years old male, operated for cervical arthroplasty, (A) Preoperative MRI showing cervical disc C5-C6, (B, C) flexion extension study demonstrating shell angles I the operated level and the levels superior and inferior to it

Discussion

Anterior cervical discectomy was first described by *Cloward*[1]as the optimal management for cervical disc lesion. Cervical discectomy and fusion is the common and most practiced manoeuvre following simple cervical discectomy. It's done usually using cages filled with one of known bone substitute. Cervical arthroplasty using cervical disc prosthesis is considered now as an alternative option to fusion for preservation of the mobility at the affected level. This is done nowadays based on the theory of adjacent segment disease that can happen after cervical fusion. Matsunaga*et al,*[13] analyzed the strength distribution on the intervertebral discs after cervical arthrodesis and confirmed an increase in immediately adjacent levels. In our study we compare the dynamics of adjacent segments after either cervical fusion or arthroplasty to decide if there is actual affection on the range of movement and global stress that can predispose to adjacent segment disease.

In a comparison for clinical outcome in both groups, we found better outcome according to NDI in arthrodesis group compared to arthroplasty group. Otherwise the neurological improvement of radiculopathic pain had not differs significantly. These results were matched with most of the publications that showed similar results according

to pain outcome in both groups.[2,14,15,16] No clear explanation for the more obvious neck pain in arthroplasty group except that that mobility of cervical prosthesis is still not accommodated by the muscular group at the beginning. After awhile there is a gradual accommodation with this movement and the spasm starts to relieve.

According to results of myelopathy patients, both fusion and arthroplasty groups also showed nearly similar results according to JOA scale. This does not contradict the standard concept that cervical fusion is optimum for treating myelopathy. This concept is based upon the value of fusion and stability in improving the outcome of myelopathy.

The overall cervical alignment was improved obviously in both groups; in fusion group, Cobb angle was improved from a preoperative mean of 3.4 ± 15.3^{o} to postoperative 14.5 ± 14.7^{o}, this is not matched with many articles that shows similar or even worse kyphotic angle after cervical fusion.[10] Even the 5 patients who showed newly developed disc lesions had a good correction of preoperative kyphotic deformity to a nearly normal lordotic angle. In a study about cervical dynamics after fusion, Katsuura et al,[9] found a direct relationship between the postoperative loss of physiological lordosis and development of adjacent segment disease and clinical postoperative improvement. Degenerative changes at an adjacent level to one previously fused occurred in about 50% of patients, with necessity of a second operation in 19% of patients. Troyanovic, et al,[26] found no change in the mean Cobb angle between preoperative and postoperative measures, with little affection on the overall clinical outcome.

Most of the literatures usually describe worse kyphotic angle after cervical arthroplasty.[21] In spite of that; overall cervical curvature is diminished after cervical arthroplasty, which could be considered as a negative outcome for arthroplasty. In our study, we found preservation of cervical alignment with improvement of the mean kyphotic angle from a mean of 4.6° to a mean of 16.5°, which was not different from the fusion group.

Patrick et al,[18] in a study about cervical alignment after Bryan artificial prosthesis found that essentially all patients have experienced a loss of lordosis of nearly 5° after the arthroplasty procedure. However, the preservation of mobility in all spinal segments with the latter procedure may allow for some postural compensation.

In cervical fusion group, development of newly disc pathologies adjacent segment had been affected by the change in the postoperative ROM in adjacent segment. The patients in our study (20%) who had developed adjacent segment diseased had shown increase of the ROM in those segments at final follow-up study ($P<0.001$). On the other hand, in arthroplasty group; noone patient had shown increase in ROM in adjacent segments at final follow-up. No patient also in this group developed any sign or symptom, or even showed any MRI findings of ASD. We found a strong correlation between the increase in ROM in fusion group and the development of ASD; this was avoided by using the cervical prosthesis. This finding was discussed and explained by Jacobs et al,[7] who assumed that compensatory increased of motion of adjacent segments after ACDF leads to an increased intra-discal pressure of these segments, a process that may lead to progressive disc degeneration.

In our study we compare two groups retrospectively; however a prospective randomized controlled study would be more valuable than our study. Again the small number and the short term follow up are another limitation of our study. If our preliminary results will be confirmed by larger series with long follow-up, it could be reasonable to use cervical arthroplasty in those selected young patients with soft cervical disc herniation unresponsive to conservative treatment, especially if they have other asymptomatic disc diseases at adjacent levels and if their dynamic x-ray showed increased mobility at the asymptomatic affected segments.

Conclusion

Compensatory increase in ROM of the contiguous adjacent segments in patients subjected to ACDF may lead to ASD especially in those with asymptomatic adjacent sub-clinical degenerative disease. In contrary, arthroplasty reduce the incidence of adjacent segment diseases.

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الملخص العربي

تقييم ديناميكيات الفقرات العنقية بعد لحام الفقرات العنقية مقارنة مع تركيب مفاصل الفقرات العنقية بعد استئصال الغضروفالعنقي الأمامي

البيانات الخلفيه: بعد استئصال الغضروف العنقي الأمامي ؛ فان تأثير لحام الفقرات أو تركيب مفصل عنقي على ديناميكية الأجزاء المجاورة والعمود الفقري العنقي الشامل له تأثير مباشر على النتيجة السريرية النهائية.

الغرض: لمقارنة تأثير لحامالفقرات العنقيه مقابل تركيب المفصل العنقي بعد استئصال الغضروف العنقي من الامام, وذلك على ديناميكية الفقرات العنقية، وهذا يمكن أن يهيئ لأمراض القطاع المجاورة في تلك المستويات.

تصميم الدراسة: دراسه تقارنيه بي مجموعتين : الاوليلحام الفقرات ، والآخر تركيب مفاصل الفقرات العنقيه

المرضي والطريقة:تم دراسة ما مجموعه 36 مريضا متتاليا خضعوا لعملية استئصال الغضروف من الامام مع متوسط متابعة 24 شهرا. تم تصنيف المرضى إلى مجموعتين. المجموعة الأولى (20 مريضا) تم اجراء لحام فقرات بعد استئصال الغضاريف، المجموعة الثانية (16 مريضا) تم تركيب مفصل عنقي بعد استئصال الغضروف من الامام. أجريت التقييمات السريرية قبل الجراحة وبعد العملية الجراحية باستخدام مؤشر العجز عن الرقبة , والرابطة اليابانية للعظام وذلك لمرضى اعتلال النخاع. في جميع الحالات، في آخر مراقبة المتابعة تم إجراء تقييم الأشعة العصبية (العمود الفقري العنقي ثابتة والدينامية الأشعة السينية والتصوير بالرنين المغناطيسي). وتم قياس زاوية مساحة القرص العاملة وزاوية مساحة القرص للقطاعات المتجاورة ومدى الحركة (روم) وزاوية كوب الحلزونية (C2-7) بواسطة برامج حاسوبية.

النتائج: لقدوجدنا ما يلي:أ. متوسط زاوية كوب. في المجموعة الأولى، أظهرت تحسنا كبيرا ما بين قبل الجراحة 3.4 درجة (كيفوسيس) إلى ما بعد الجراحة 14.5 درجة. في المجموعة الثانية: كان زاوية تحسن من 4.6 درجة إلى 16.5 درجة. وأظهر هذا التحسن للزاوية تأثير مباشر على تحسين مرضى ضغط الجبل الشوكي ولكن كان له تأثيرغير مهم إحصائيا على ظهور غضاريف جديدة مجاوره لمستوي الجراحة.ب. لم يظهر متوسط معدل الحركه لكل مقطع فقاري مجاور للجراحة عدم استقرار كبير. وكان المتوسط 11.1 درجة في المستويات العليا و 10.2 درجة عند مستويات أدنى (بالقرب من الحدود القياسية العادية). وفي 6 حالات كان متوسط معدل الحركة أعلى من المعتاد، وفي المجموعة الثانية، كان متوسط معدل الحركة 7.8 درجة في المستويات العليا و 9.6 درجة في مستويات أقل. ج. كان تحسن ما بعد الجراحة من متوسط جمعيه العظام اليابانية و مؤشر العجز الرقبي ذات دلالة إحصائية ($p < 0.001$). في المجموعة الأولى؛ تم تحسين جمعيه العظام اليابانية من متوسط قبل الجراحة من 15 لمتوسط 17 بعد العمل الجراحي. وقد لوحظ أعراض غضاريف المقطع المجاور في 5 مرضى (20٪): ويرتبط هذا غضاريف المقطع المجاور بشكل كبير إلى متوسط معدل الحركة زيادة في القطاعات المعنية. في المجموعة الثانية؛ تم تحسين جمعيه العظام اليابانية من متوسط 15.4 إلى 15.8. لم يلاحظ أي أعراض غضاريف المقطع المجاور في هذه المجموعة.

الاستنتاج: الزيادة التعويضية في متوسط معدل الحركة من قطاعات الحركة المتجاورة في المرضى الذين يخضعون لجراحات لحام الفقرات العنقية قد يؤدي إلى غضاريف المقطع المجاور وخاصة في تلك الحالات التي تحتوي علي غضاريف مجاوره لغضروف الجراحه وبدون اعراض .الحركة المستقرة في قطاعات المجاورة بعد تركيب مفاصل غضاريف الرقبة يكون له تأثير مباشر على عدم تطور افة القرص الجديد في تلك المستويات.