



A RETROSPECTIVE STUDY ON AUTOLOGOUS CERVICAL INTERBODY FAT GRAFT APPLICATION FOR ANTERIOR CERVICAL DISCECTOMIES

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ABSTRACT

Background: This retrospectively designed study investigates the relation between clinical and radiological results of patients who were performed ACD and autologous interbody fat graft.

Material and Methods: A total of 71 patients who underwent ACD with IFG in Neurosurgery Clinics of Şişli Etfal EAH between 1994 and 2009 were included in this study. Patients age range was between 28 and 56 years with the mean of 41,08±6,67. Patient population was composed of 25 women and 46 men. All the operations were performed by the senior authors (YA). The surgery was applied to 1 or 2 level soft cervical disc herniations. Selected patients have one of the following criteria: 1. Radicular signs as motor weakness, dermatomal numbness etc., 2. Long tract signs, and 3. Refractory or persistent pain to minimum 3 weeks medical treatment. Harrison's posterior tangent method used for ROM measurement on dynamic roentgenograms. Segmental ROM was measured by the same method at the operated vertebral level.

Pain and functional evaluation: Neck Disability Index (NDI) (2) and Short Form 36 (SF-36) (3) were used for functional and pain status of the patients.

Results: Segmental and cervical total lordosis angles are not change statistically after operation. Radiologically detected fusion or developing kyphotic deformity is not seen. ROM levels changed significantly in long-term period. NDI scores decreased significantly early and late period. SF-36 results are increased significantly in long-term follow-up.

Conclusions: Microsurgical technique and autologous interbody fat graft may prevent complication of fusion such as adjacent segment degeneration. Contralateral approach provides better visualization.

Key words: Anterior cervical discectomy, fusion, contralateral approach, interbody fat graft

Level of evidence: Retrospective clinical study, Level III

INTRODUCTION

The anterior cervical approach is widely preferred for surgical treatment of soft cervical disc disease. Prevention of intervertebral space high and appropriate load sharing are the main problems after these operations. Described procedure in this paper has some benefits for prevention sagittal alignment of the cervical spine and decompression neural tissues with protecting normal anatomy. Anterior contralateral microdiscectomy (ACD) with interbody fat graft (IFG) provides some advantages intra and postoperatively, like wide viewing angle, protection of

vertebral endplates and adjustment of sagittal profile of the c-spine.

MATERIAL AND METHODS

A total of 71 patients who underwent ACD with IFG in Neurosurgery Clinics of Şişli Etfal EAH between 1994 and 2009 were included in this study. Patients age range was between 28 and 56 years with the mean of 41.08 ± 6.67. Patient population was composed of 25 women and 46 men. All the operations were performed by the senior authors (YA). The surgery was applied to 1 or 2 level soft cervical disc herniations. Selected

patients have one of the following criteria: 1. Radicular signs as motor weakness, dermatomal numbness etc., 2. Long tract signs, and 3. Refractory or persistent pain to minimum 3 weeks medical treatment. All patients' symptoms and signs were accordance with MRI findings. Patients have more than two levels degenerations, spondylosis, previous surgery for c-spine or traumatic lesions were excluded from the study. This study covers only the patients with initial surgery. All patients were informed about technique and other choices and complications of this technique; and an informed consent was obtained from all. All the study patients were performed neurological examination, dynamic c-spine roentgenograms, MRI at preoperatively, and postoperative 1., 3., 6., 12. and 24. months.

Radiological evaluation

Lateral cervical direct and dynamic roentgenograms were evaluated for narrowing disc spaces, new bone formation, abnormal motion, sagittal profile and cervical lordosis. Cervical lordosis was measured as angle between the line passed the posterior borders of C2 and C7 corpus⁽¹⁴⁾.

Harrison's posterior tangent method used for ROM measurement on dynamic roentgenograms. Segmental ROM was measured by the same method at the operated vertebral level.

Pain and functional evaluation

Neck Disability Index (NDI)⁽²³⁾ and Short Form 36 (SF-36)⁽²⁴⁾ were used for functional and pain status of the patients.

Statistical analysis

All analysis was performed by SPSS Ver 15.0 software. Descriptive statistics were done as mean and standard deviation. Analysis of variance (ANOVA) was used for calculations of standard measurements. Unpaired t-test was used to comparing of groups. Changing by time of groups evaluated and compared by Chi- Square test. A p value less than 0.05 was accepted as significant.

Surgical technique

Surgical technique used for these operations is the similar to anterior cervical discectomy (ACD) with some modifications by approaching from the contralateral side of brachialgia⁽³⁾.

The head is positioned as semi-extended to providing cervical lordosis. All operations were performed under an operating microscope. A 1,5 cm incision is made at the level determined by a fluoroscopy. The platysma is opened longitudinally, the external layer of esophageal muscles is visualized. The carotid bundle is separated from the esophagus by a blunt dissection.

The trachea and esophagus are retracted medially; and anterior longitudinal ligament (ALL) is seen. The level is confirmed by a C-arm fluoroscopy. ALL is opened between the left and right longus colli muscles. Intervertebral disc is removed, end plates are left untouched, and posterior longitudinal ligament (PLL) is reached. Lateral parts of the nucleus pulposus is not removed vigorously. PLL is opened, anterior epidural area is controlled. This technique provides better exposure of the compressed neural tissues. While closing, a fat graft which is obtained from subcutaneous tissue is applied to prevent bony fusion between two vertebral endplates. Corset is not used after operation. Patients is mobilized 3 hours after surgery and discharged the same day.

RESULTS

Radiculopathy was detected in 83.1 % of patients while myelopathy was found in 16.9 % of them. Right or left sided brachialgia was found in 45.07 % and 54.93 % of patients respectively. One- or two-level herniations was seen in 90.14 % and 9.86 % of patients respectively. Distribution of patients due to the herniation levels was as follows: C3-4: 5.13%, C4-5: 8.97 %, C5-6: 48.72 %, C6-7: 35.9 %, C7-T1: 1.28 %.

Ruptured disc fragments were removed from 44.87 % of patients; 17.95 % of patients had soft disc protrusion; and 37.18 % of them hard disc herniations. Mean follow-up time was 19.3 months.

Radiologic results

Intervertebral bony fusion or collapse of the interbody space weren't detected in any case. Abnormal motion wasn't found in any dynamic postoperative roentgenograms. Preoperatively normal cervical lordosis was found out in 78.87 % of cases. Loss of lordosis and straight lateral profile was identified in 21.13 % of patients. Straightening of the lateral profile was seen 1.87 % of cases which had normal cervical lordosis preoperatively in early postoperative period. Straight lateral profile continued in 30 % of patients which had also straight profile preoperatively in early postoperative period. In long term follow-up, 91.55 % of patients have normal cervical lordosis. The mean preoperative cervical axe was $15.52^{\circ} \pm 13.08^{\circ}$ and postoperative late (24 months) was $26.02^{\circ} \pm 15.02^{\circ}$. The p value was greater than 0.05, so there was no statistical significance of this change. Segmental kyphosis wasn't detected in any cases. The mean segmental angle was $3.34^{\circ} \pm 1.60^{\circ}$ preoperatively, and $4.05^{\circ} \pm 2.04^{\circ}$ postoperatively. The p value of this change was greater than 0.05. The mean ROM was $49.30^{\circ} \pm 6.92^{\circ}$ preoperatively and $53.55^{\circ} \pm 11.48^{\circ}$ postoperatively. This change also wasn't significant statistically ($p > 0.05$). Surgical level ROM change was also insignificant

($p > 0.05$) in early postoperative period, but long-term results showed significant change ($p < 0.05$). Preoperatively the mean segmental ROM at the surgical level was $7.97^\circ \pm 3.43^\circ$, early postoperative mean ROM was $7.25^\circ \pm 3.08^\circ$, late postoperative mean ROM was $11.19^\circ \pm 2.97^\circ$.

Clinical results

No complication developed intra/postoperatively. Temporary dysphagia was seen only 2.82 % of patients which was resolved in a week. Radiculopathy and neck movement limitation were settled postoperatively in all patients. The mean NDI score was 20.91 ± 2.81 preoperatively, 10.91 ± 2.55 in early postoperative period and 6.91 ± 2.26 in late postoperative period. All of these changes were significant statistically ($p < 0.05$ for both early and late results). The mean SF-36 scores of preoperatively, early and late postoperatively were 44.32 ± 8.58 , 77.32 ± 9.19 and 87.66 ± 9.73 respectively. These changes were also significant with p values less than 0.05.

DISCUSSION

ACD is widely used approach for decompression of cervical spinal cord. Anterior techniques change stabilization minimally, and also are less harmful to muscular structure than posterior ones⁽¹⁵⁻¹⁶⁾. Whether ACD should be followed by bony fusion or not is lasting controversy today. The one of the most important objectives of the spinal interventions is prevention or readjustment of spinal alignment. Normal cervical lordosis is between 10° and 40° .

Dysphagia due to retraction of the esophagus in patients who undergo ACDF is a more frequently seen complication than patients who are performed only simple ACD⁽¹⁰⁾. Dysphagia is seen up to 25 % after ACDF with anterior plates⁽¹⁾. During ACD, muscle dissection and retraction of trachea-esophagus are made less than ACDF. Automatic retractors aren't used in the course of operation, so esophageal tissue perfusion can be provided intermittently. An experimental study reveals that, edema, vascular congestion and injury and inflammation, in inner circular and outer longitudinal layers of the muscularis propria are detected in early stage of retraction. They also detected fibrosis in the longitudinal layer of muscularis propria in late stages. They claimed that these lesions were the reason of dysphagia⁽⁸⁾.

Fusion procedures bring new complications to anterior cervical surgery. Pelvic area pain may become more prominent than cervical area pain in the postoperative period in patients whom iliac autograft is used for fusion materials. There are some studies in the literature that reveals pain in the graft harvested area lasts 36 months after operation⁽²⁾. Complication

rate of graft site is 9 % and the pain lasts 36 % of patients⁽²²⁾. To avoid these complications, cadaveric bones are started to use. Decontamination process of cadaveric bones made lessen fusion capability of these kind of materials⁽⁴⁾. Authors that advocate fusions claim that any material that prevents height of intervertebral space may provide biomechanical stability, improve kyphotic profile, open neural foramens and as a result of these reduce the cervical pain^(5,9). But, some authors showed that foramen height collapse sometime later after interbody grafting⁽²⁰⁾. Besides, fused segments constitute a great moment axis and behave a source of stress. This can cause early degenerations in adjacent segments. Adjacent segment disease develops 2.9 % for every year after a fusion surgery⁽¹³⁾. On the other hand, fusion rate of anterior cervical disc surgery without graft of cage is between 28 % and 100 %^(21,25). A previous study from our clinic showed that fusion rate radiologically detected was 4.90 % in patients who were undergone anterior contralateral discectomy without autologous fat graft⁽⁷⁾. Within the scope of presented study, autologous fat graft was inserted in the interbody space. The aim of using fat graft is prevention of bony fusion, collapse and adjacent disc disease. At the same time, some in-vitro studies in the literature revealed that subcutaneous fat grafts may have a potential of transformation to adipose cell, osteoblast, chondrocyte or myoblast⁽¹⁹⁾. Recently artificial disc materials are started to use widely because of prevention of segmental motion and thus avoidance of adjacent segment disease. However, heterotopic ossification, periannular calcification, arthrosis of the facet joints, segmental hyperlordosis, subsidence of the material, wide sclerosis around the prosthesis and cystic formation of bone are reported about using prostheses^(12,17). On the contrary of some authors⁽⁶⁾, all the posterior and lateral osteophytes that can be cause of compression should be removed microsurgically. Posterior longitudinal ligament (PLL) should be excised^(11,18). Because calcified and thick PLL is one of compressive elements.

Conclusions

The technique described in this manuscript provides direct visualization of the compressed parts and preserves segmental mobility of the c-spine. The fat graft plays a crucial role in achieving prevents undesired bony fusion between two adjacent vertebrae. Using contralateral approach and interbody fat graft may prevent adjacent segment disease, complication of the instrumentation.

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