



# COMPARISON OF PREOPERATIVE AND POSTOPERATIVE CERVICAL SAGITTAL PARAMETERS IN PATIENTS WITH CERVICAL DEGENERATIVE DISEASE

## *SERVİKAL DEJENERATİF HASTALIĞI OLAN HASTALARDA SERVİKAL SAGİTTAL PARAMETRELERİN PRE-OPERATİF VE POST-OPERATİF KARŞILAŞTIRILMASI*

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### SUMMARY

In this article, cervical sagittal parameter values were measured in patients with cervical degenerative disease between the ages of years preoperatively and postoperatively and compared with each other. Sagittal equilibrium parameters measured for comparison are; C0 inclination angle (angle made with the horizontal line of the Frankfurt line), C0-C2 angle (angle between the McGregor line passing through the skull base and C2 lower end plane), T1 slope angle (angle between C7 lower end plate and T1 upper end plate), and cervical lordosis (angle between C2-C7).

Cervical sagittal parameters were not changed postoperatively with statistically ( $p > 0.05$ ). In our study we found a slight decrease in Cobb angle of cervical lordosis postoperatively in patients with cervical spondylosis.

According to the results of our study, surgical treatment did not effect to the sagittal parameters in the cervical region of the patients with degenerative spondylitis was found. It is still premature to make a correlation between cervical sagittal parameters and clinical outcomes pre and postoperatively. Prospective studies with larger patient groups needed before making general statements on this subject.

**Keywords:** Cervical Degenerative Disease, Cervical Sagittal Spine Parameters

**Level of evidence:** Retrospective Clinical Study, Level III

### ÖZET

Bu makalede 41-79 yaş arası servikal dejeneratif hastalığı olan hastaların, servikal sagittal parametre ölçümleri pre-operatif ve post-operatif olarak karşılaştırılmıştır. Karşılaştırma için ölçülen servikal sagittal denge parametreleri; C0 inklınasyon açısı (Frankfurt hattının horizontal ile yaptığı açı), C0-C2 açısı (kafa tabanından geçen Mc Gregor hattı ile C2 alt son plağı arasındaki açı), T1 slope açısı (C7 alt son plağı ile T1 üst son plağı arasındaki açı), servikal lordoz (C2-C-7 arasındaki açı)'dır.

Dejeneratif servikal spondiloz nedeniyle opere edilen hastalarda servikal sagittal parametrelerde istatistiki olarak bir fark oluşmadığı belirlenmiştir ( $p>0,05$ ). Servikal lordozda operasyon sonrası hafif azalma olduğu belirlenmiştir.

Dejeneratif servikal spondilozu olan hastalarda klinik sonuçların değerlendirilmesinde sagittal parametreler çok önemlidir. Ne var ki bu çalışmada opere edilen ve normal servikal lordozu düşük olan hastalarda cerrahinin bu parametrelere olumlu bir etkisi olmadığı görülmüştür. Kesin bilgiler elde etmek için daha geniş ve prospektif çalışmalara ihtiyaç vardır.

**Anahtar Kelimeler:** Servikal Dejeneratif Hastalık, Servikal Sagittal Vertebra Parametreleri

**Kanıt Düzeyi:** Retrospektif Klinik Çalışma, Düzey III

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## INTRODUCTION:

Cervical spinal vertebral column has a complex structure and has higher mobility than the rest part of the vertebral column. Disorders affecting the cervical spine results in adverse outcomes on health quality of patients. Cervical spondylosis is the general term for degenerative disease seen in cervical spine and is the most common disorder of the cervical spine.

Sagittal balance of vertebral column is ensured by the harmony of cervical lordosis, thoracic kyphosis and lumbar lordosis. Cervical spine sagittal alignment and the normal cervical lordosis is critical for the normal function of the cervical spine. Malalignment results in kyphosis, decreased mobility, pain and neurologic compromise in advanced stages.

Several methods have been described to evaluate the sagittal alignment of cervical spine and cervical lordosis. These are Cobb angle method, Harrison posterior tangent method and Jackson physiological stress line method. Clinically Cobb angle method is most widely used method although it is stated that while C0-C2 angles overestimate the cervical lordosis C2-C7 angles underestimate the cervical lordosis. Harrison's method is suggested as the best method for measuring cervical lordosis but Cobb method is easy and remains as the most commonly used method in clinical practice.

In this study, we aimed to measure the cervical sagittal parameters of patients with cervical degenerative disease and make a comparison between preoperative and postoperative results in the Turkish population.

## MATERIAL AND METHODS:

Cervical sagittal parameters were analyzed in cervical lateral graphics of 40 (16 male, 24 female) patients in an age group of 41-79 C0 inclination angle (angle made with the horizontal line of the Frankfurt line), C0-C2 angle (angle between the Mc Gregor line passing through the skull base and C2 lower end plane), T1 slope angle (angle between C7 lower end plate and T1 upper end plate), and cervical lordosis (angle between C2-C7) were assessed. We compared the angle measurements pre and postoperatively with student t-test, probability range was taken as 0.05.

## RESULTS:

Preoperative Cervical sagittal parameters were measured as; C0 inclination angle ( $30,0 \pm 8,7$ ), C0-C2 angle ( $35,1 \pm 8,4$ ), T1 slope angle ( $3,4 \pm 2,1$ ) and cervical lordosis ( $20,9 \pm 9,2$ ). Cervical sagittal parameters were not changed postoperatively with statistically ( $p > 0,05$ ). C0 inclination angle were seen in the Table-1. The slight decreasing of cervical lordosis was determined.

**Table-1.** Pre- and postoperative cervical angles

Cervical Sagittal Parameters	PRE-OP.	POST-OP.	t	p
C0 inclination angle	$30,00^\circ \pm 8,74^\circ$	$27,19^\circ \pm 7,32^\circ$	0,76	> 0,05
C0-C2 angle	$35,12^\circ \pm 8,40^\circ$	$36,25^\circ \pm 8,50^\circ$	0,91	> 0,05
T1 slope angle	$3,43^\circ \pm 2,18^\circ$	$3,6^\circ \pm 1,79^\circ$	1,22	> 0,05
Cervical lordosis	$20,91^\circ \pm 9,21^\circ$	$15,94^\circ \pm 7,22^\circ$	0,56	> 0,05

## DISCUSSION

In this retrospective study, we study the changes in cervical sagittal alignment by measuring four different cervical sagittal values measured by lateral cervical radiography.

Cervical sagittal alignment is important for normal function of the cervical spine. Preservation of this alignment is crucial for successful treatment of changes due to cervical degenerative diseases <sup>(1,5)</sup>. Due to this fact, assessment of cervical sagittal alignment measurements are valuable for preoperative planning and postoperative evaluation.

Cobb angle measurements of C0-C2 and C2-C7 for cervical lordosis is a widely used method by spinal surgeons. Although Harrison method of measurement of lordosis may provide better results, Cobb method is practical and has high intra and inter-observer reliability <sup>(6-7)</sup>.

In our study, we found a slight decrease in Cobb angle of cervical lordosis postoperatively in patients with cervical spondylosis. There are few studies on correlation between cervical alignment parameters and clinical outcomes of patients postoperatively. Villavicencio et al showed that improvement of Cobb angles at C2-C7 level did not correlate significantly with clinical

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results. They also showed that segmental improvement of lordosis angle has better correlations with clinical outcome <sup>(8)</sup>. Guerin et al and Jagannathan et al showed similar results in similar patient groups <sup>(3-4)</sup>.

T1 slope is another important parameter used for assessment of cervical lordosis and have high correlation with C2-C7 angle. The higher T1 slope is that the higher cervical lordosis has to be in order to balance the horizontal gaze <sup>(2)</sup>. It has been shown that higher T1 slope values correlate with postoperative myelopathy in patients underwent surgery for cervical laminoplasty <sup>(2,9)</sup>.

Cervical sagittal parameter measurements are important for preoperative and postoperative assessment of cervical spine lordosis. Cobb angles are the most widely used parameters among the spine surgeons. It is still premature to make a correlation between cervical sagittal parameters and clinical outcomes pre and postoperatively. Prospective studies with larger patient groups needed before making general statements on this subject.

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