



## COMPARISON OF CERVICAL SAGITTAL PARAMETERS IN PATIENTS WITH CERVICAL DEGENERATIVE DISEASE AND NORMAL HEALTHY INDIVIDUALS

### SERVİKAL DEJENERATİF HASTALIĞI OLAN HASTALAR İLE NORMAL SAĞLIKLI BİREYLERDEKİ SERVİKAL SAGİTTAL PARAMETRELERİN KARŞILAŞTIRILMASI

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#### SUMMARY

**Objective:** We aimed to compare the cervical sagittal parameter measurements of normal healthy population with cervical degenerative diseases in the Turkish population.

**Material and Methods:** These four parameters were analyzed in standing lateral graphies of 40 (10 male, 30 female) patients in 50-75 age groups (mean age: 63,69 ± 12) and 30 (6 male, 24 female) healthy individuals in 20-40 age groups (mean age: 29,51 ± 9,27). 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 in the two groups.

**Results:** Cervical sagittal parameters; C0 inclination angle (28,5° ± 9,2°), C0-C2 angle (44,8° ± 9,2°), T1 slope angle (3,9° ± 1,9°) and cervical lordosis (17,5° ± 2,2°) were measured in patients with cervical degenerative disease. C0 inclination angle (24,8° ± 2,8°), C0-C2 angle (43,0° ± 14,8°), T1 slope angle (2,7° ± 1,3°) and cervical lordosis (42,4° ± 7,6°) were measured in normal individuals. Cervical sagittal parameter measurements were compared between normal healthy individuals and patients with degenerative disease. C0 inclination angle and C0-C2 angle were similar, but T1 slope was higher while cervical lordosis angle was lower with the statistically importance (p < 0,05).

**Discussion:** As a result, in the degenerative disc disease of the subaxial region, any changes of the C0 inclination and C0-C2 angles was not find, but T1 slop and cervical lordosis angles was disturbed. Especially, at the level of degenerative disc disease, lordosis pattern changed to kyphotic pattern was determined. Due to this situation make decrease the global cervical lordosis. In the light of our data's, we concluded that degenerative disc disease effect sagittal plane parameters of the subaxial region in the patients with Cervical Degenerative Disc Disease (CDDD).

**Keywords:** Cervical Degenerative Disc Disease (CDDD), spine parameters of the servikal spine, sagittal plane.

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

#### ÖZET

**Amaç:** Bu çalışmada 50-75 yaş arası servikal dejeneratif disk hastalığı olan hastalarda, servikal sagittal parametre değerleri ölçülmüş ve 20-40 yaş arası normal sağlıklı bireylerin ölçümleriyle karşılaştırılması amaçlanmıştır.

**Materyal – Metot:** Dejeneratif hastalığı olan hasta grubu ile normal sağlıklı bireylerde ölçülen 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)'dir.

**Sonuçlar:** Servikal dejeneratif disk hastalığının 1 veya 2 seviyede ve en fazla C+\_% arasında olduğu belirlenmiştir. Servikal sagittal parametreler dejeneratif disk hastalığı olanlarda ve normal bireylerde sırasıyla C0 inklınasyon açısı 28,5° ± 9,2° ve 24,8° ± 2,8°; C0-C2 açısı 44,8° ± 9,2° ve 43,0° ± 14,8°, T1 slope açısı 3,9° ± 1,9° ve 2,7° ± 1,3° ve servikal global lordoz açısı 17,5° ± 2,2° ve 42,4° ± 7,6° olarak ölçüldü. Bu verilere göre servikal dejeneratif disk hastalığı olanlarla normal bireyler karşılaştırıldığında, C0 inklınasyon ve C0-C2 açılarının istatistiki olarak benzer olduğu (p > 0.05), buna karşın T1 slope açısının daha yüksek ve servikal lordoz açısının daha düşük olduğu belirlenmiştir (p < 0,05).

**Tartışma:** Sonuç olarak subaksiyel bölgede servikal dejeneratif disk hastalığı olan hastalarda kafa kaidesi ile servikal bölge arasındaki sagittal parametreler değişmezken, dejenere sahalarında disk aralıklarındaki lokal kifoz açısının kifoz gittiği ve global servikal lordozun da azaldığı belirlenmiştir. Bu veriler ışığı altında, disk dejenerasyonun, servikal sagittal dizilimi bozduğu fikri elde edilmiştir.

**Anahtar Kelimeler:** Servikal dejeneratif hastalık, servikal sagittal vertebra parametreleri, sagittal plan

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

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## INTRODUCTION

We aimed to compare the cervical sagittal parameter measurements of normal healthy population with cervical degenerative diseases in the Turkish population. The physiological significance of the sagittal plane has long been known. Sagittal balance of the spine; Cervical lordosis, thoracic kyphosis and lumbar lordosis is a harmonious fit. Cervical, thoracic, and lumbar curvatures increasing or decreasing were known to cause pain. Spino-pelvic parameters have been used for the last 10 years and spinal deformity, especially degenerative spinal diseases, is of paramount importance. The last few years have started to work on the evaluation of cervical sagittal plane.

In particular, the disruption of the cervical sagittal balance has led to the curvature of the entire spine compensator. Cervical spondylosis is a degenerative disease that begins with the disc and progresses with age, which involves more than one disc. Cervical sagittal curve gradually became flattened secondary to the progress of spondylosis in all patients. Therefore, we have measured these cervical sagittal angle parameters in a limited number of people cervical degenerative disease and normal individuals. We compared the angle measurements in the two groups.

## MATERIALS AND METHODS

These four parameters were analyzed in standing lateral graphics of 40 (10 male, 30 female) patients in 50-75 age groups (mean age: 63,69±12) and 30 (6 male, 24 female) healthy individuals in 20-40 age groups (mean age: 29,51±9,27). 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).

## RESULTS

Cervical sagittal parameters; C0 inclination angle (28,50±9,19), C0-C2 angle (44,76±9,19), T1 slope angle (3,96 ± 1,86) and cervical lordosis (17,46± 12,17) were measured in patients with cervical degenerative disease (Table-1) (Figure-1).

C0 inclination angle (24,82± 2,82), C0-C2 angle (43,03± 14,78), T1 slope angle (2,68 ± 1,33) and cervical lordosis (42,39± 7,59) were measured in normal individuals. (Table-1).

Cervical sagittal parameter measurements were compared between normal healthy individuals and patients with degenerative disease. C0 inclination angles and C0-C2 angles were statistically similar in the both group ( $p > 0,05$ ). But was stated statistically important difference in the T1

slope of the patients between degenerative disc disease and normal individuals ( $p < 0,05$ ). T1 slope of the patients with degenerative disc disease were higher than T1 slope of the normal individuals.

## DISCUSSION

Cervical spondylosis is a generalized aging process that affects all levels. It involves a sequence of degenerative changes in spinal structure. Spondylosis is a degenerative disease of both the disc and the zygapophyseal joints and has a contraction and osteophyte formation in the disk and nerve foramen. The result is radiculopathy and ligament instability (1-3,5-8,10).

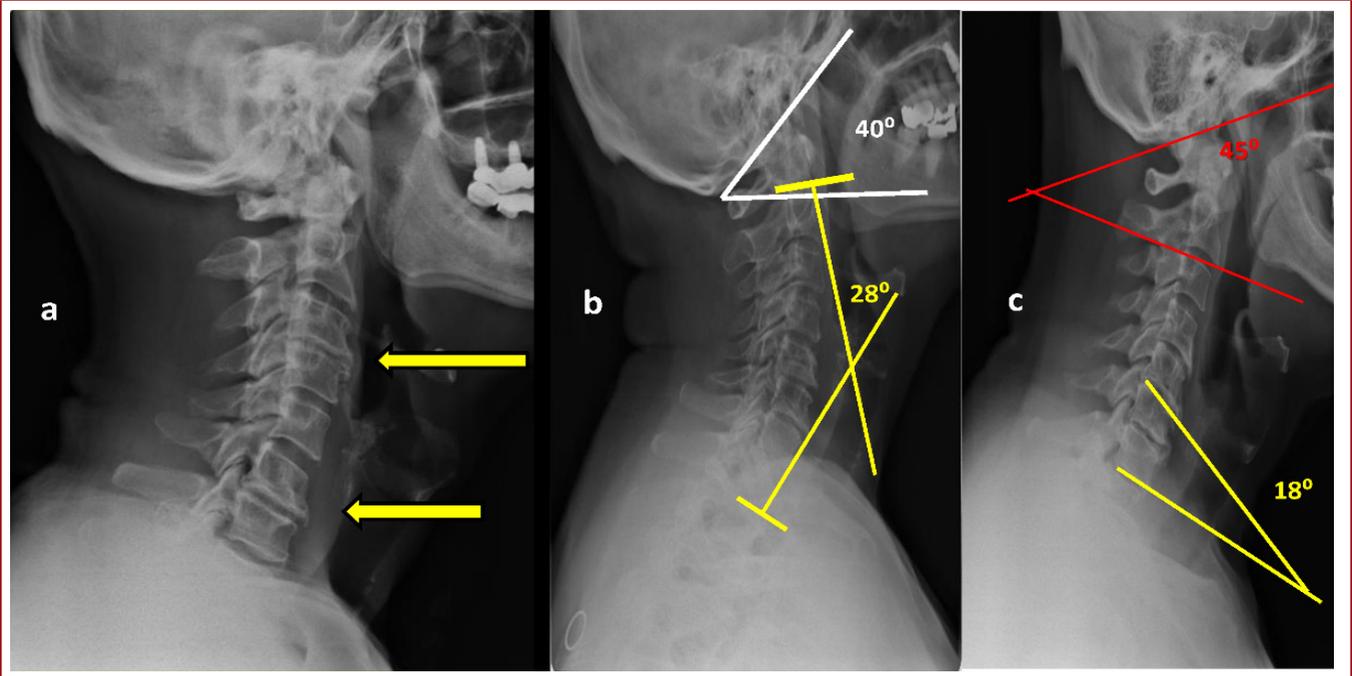
Spondylosis changes, such as narrowing of the disk and osteophytes, predominated at the lower disk levels including C5-6 and C6-7, where the range of motion decreased with advancing age. Conversely, upper disc levels, such as C3-4 and C4-5, showed a comparatively greater mobility and vertebral "olisthesis", particularly "retrolisthesis" in extension (4). The first sign of aging on the spinal column is spondylosis in the intervertebral disc, and spondylosis in the third through fifth decades. In our study, all degenerative changes were determined subaxial region. Most affected disc level was C5-6 level in our study.

Despite the high incidence of spondylosis, even symptomatic spondylosis patients complaining shoulder-to-neck-brachial pain can be well controlled by conservative methods and surgery is often not necessary (9,11-12). The loss of cervical lordosis depended on the severity of disc degeneration, and the numbers of the degenerated discs.

Cervical sagittal parameter measurements were compared between normal healthy individuals and patients with degenerative disease. C0 inclination angles and C0-C2 angles were statistically similar in the both group ( $p > 0,05$ ). But was stated statistically important difference in the T1 slope of the patients between degenerative disc disease and normal individuals ( $p < 0,05$ ). T1 slope of the patients with degenerative disc disease were higher than T1 slope of the normal individuals. In the other hand cervical lordosis angles of the patients with degenerative disc disease were lower than cervical lordosis angles of the normal individuals. As a result, in the degenerative disc disease of the subaxial region, any changes of the C0 inclination and C0-C2 angles was not find, but T1 slop and cervical lordosis angles was disturbed. Especially, at the level of degenerative disc disease, lordosis pattern changed to kyphotic pattern was determined. Due to this situation make decrease the global cervical lordosis. In the light of those values, we concluded that degenerative disc disease effect sagittal plane parameters of the subaxial region in the patients with CDDD.

**Table-1.** Comparison cervical angles in patients with cervical degenerative disease and normal individuals.

Cervical Sagittal Parameters	Normal Individuals	Cervical Degenerative Disease	t	p
C0 inclination angle	24,8 ± 2,8	28,5 ± 2,2	-0,02	> 0.05
C0-C2 angle	43,0 ± 17,8	44,8 ± 9,2	1,47	> 0.05
T1 slope angle	2,7 ± 1,3	13,9 ± 5,9	5,61	< 0.05
Cervical lordosis	42,4 ± 7,8	17,5 ± 12,2	-16.9	< 0.05



**Figure-1.** **a)** Degenerative disc disease with the osteophytes in the disc joints of the C3-4 and C6-7 levels were determined. **b)** C0 inclination angle (angle made with the horizontal line of the Frankfurt line: white lines) was 40° and cervical lordosis (angle between C2-C7: yellow lines) was 20° in the another patient. **c)** C0-C2 angle (red lines) was 45°, and T1 slope angle (angle between C7 lower end plate and T1 upper end plate: yellow lines) was 18°.

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