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ORIGINAL ARTICLE / *ORJİNAL MAKALE*

THE CORRELATION OF THE GROWTH HORMONE AND SEVERITY OF THE KYPHOSIS IN THE PATIENTS WITH SCHUERMANN KYPHOSIS

SCHUERMANN KİFOZUNDA BÜYÜME HORMONU İLE KİFOTİK DEFORMİTE CİDDİYETİNİN KORELASYONU

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SUMMARY

Backround data: Scheuermann's structural kyphosis is the most common cause of kyphotic deformity in adolescents. The etiology of Scheuermann's kyphosis remains unclear. Histologic studies have revealed abnormal vertebral endplate cartilage, irregular mineralization, disorders in vertebral ossification, and alterations in collagen aggregation with abnormal collagen-proteoglycan ratios. Growth hormone hypersecretion also has been related to the pathogenesis of Scheuermann's kyphosis. Patients with the disease were found to be taller than the percentile mean height for their age. However, no studies exist to define causative relation between growth hormone secretion and Scheuermann's disease and its role remains unclear.

Purpose: The aim of the that study was to research the effecting of the growth hormone on the occurrence of the Scheuermann disease and also to evaluate of the correlation between the severity of the kyphotic curve of the Scheuermann Kyphosis and Growth Hormone.

Patients and methods: 16 female and 15 male patients with an average age of 14.4 ± 3.2 and having thoracic kyphosis angle >60° due to wedging in at least 3 levels, totally 31 patients were included in the study. Deformities of the patients were divided into 3 groups as 60° - 70° (12 patients), 71° - 80° (10 patients) and over 81° (9 patients). For all the patients' antero-posterior and lateral x-rays and thoracic magnetic resonance imaging (MRI) were performed. Morning growth hormone levels were measured. All the patients were new cases and before conservative or surgical treatment serum growth hormone levels were obtained.

Results: When all the patients are included global kyphosis angle average was 75.23° ± 9.65°. Averages were found to be, in 60° - 70° (12 patients) kyphosis angle group 65.92° ± 3.58°, in 71° - 80° (10 patients) group 75.30° ± 2.63° and in over 81° (9 patients) 87.56° ± 4.79°. 28 of the 31 patients (90.3%) growth hormone levels were in the normal range of the laboratory for 5-16 years in male 0-11 ng/ml and female 0-17 ng/ml. Only 3 male patients (9.7%) growth hormone levels were above 11 ng/ml. All the patients were over 8 ng/ml, 67.7% of the patients were over 10 ng/ml. When all the patients are included average morning fasting growth hormone concentration was 10.46 ± 1.48 ng/ml.

Conclusion: In conclusion, according to the results of this study, growth hormone levels and severity of the kyphotic deformity are not statistically correlated. In other words, there was no correlation between Scheuermann kyphosis and level of growth hormone being close to the upper limit or higher than normal.

Key words: Scheuerman kyphosis, etiology, growth hormone

Level of evidence: Retrospective clinical study, Level III

ÖZET

Geçmiş bilgiler: Scheuermann kifozu adölesanda görülen en sık görülen yapısal kifozdur. Etiyolojisi hali hazırda bilinmemektedir. Histolojik çalışmalar, anormal son plak kartilaj oluşumu, düzensiz ossifikasyon (Shmorl nodülleri), anormal kollajen / proteoglikan oranlarıyla giden çeşitli oranlarda kollajen agregasyonu göstermektedir. Büyüme hormonunun aşırı salınması, Scheuermann kifozunun etiyopatogenezinde rol oynadığı düşünülmüştür. Hastaların yaşlarına uygun normal persentillerden yüksek kilo ve boylarda olması bu düşünceyi desteklemektedir. Ancak, hiç bir çalışmada kesin olarak büyüme hormonu ile hastalık arasındaki ilişki gösterilememiştir.

Amaç: Bu çalışmanın amacı, büyüme hormonunun, Scheuermann kifozu etiyolojisinde rol oynayıp oynamadığının ve hormon düzeyleri ile kifotik deformitenin şiddeti arasında korelasyon olup olmadığının araştırılmasıdır.

Hastalar ve Metot: Ortalama yaşları 14.4 ± 3.2, torakal kifozu 60° üzeri ve en az 3 komşu omurda 5°'den fazla lokal kifozu olan 16 kız ve 15 erkek toplam 31 hasta bu çalışmaya dahil edilmiştir. Kifotik deformiteye sahip hastalar 60° - 70° (12 hasta), 71° - 80° (10 hasta) 81° ve üzeri (9 hasta) olmak üzere 3 gruba ayrılmıştır. Tüm hastaların direk PA ve lateral grafileri ile MR'ları çekilmiştir. Hastalara konservatif veya cerrahi bir tedaviye başlamadan önce sabah büyüme hormon düzeylerine bakılmıştır.

Sonuçlar: Tüm hastalar dahil edildiğinde ortalama global kifoz açısının 75.23° ± 9.65° olduğu belirlenmiştir. 60° - 70° (12 hasta) kifoza sahip hastalarda bu açının ortalama 65.92° ± 3.58°, 71° - 80° (10 hasta) kifoza sahip hastalarda ortalama 75.30° ± 2.63° ve torakal kifozu 81° üzeri olan hastalarda (9 hasta) ortalama 87.56° ± 4.79° olduğu saptanmıştır. Bu çalışmada yer alan 31 hastanın 28 (% 90,3)'inde büyüme hormon düzeyleri 5-16 yaş için normal sayılan erkekler için 0-11 ng/ml ve kızlar için 0-17 ng/ml aralıklarında olduğu belirlenmiştir. Sadece 3 erkek hastada (% 9.7) büyüme hormon düzeyi 11 ng/ml üzerinde bulunmuştur. Tüm hastaların büyüme hormon düzeyleri 8 ng/ml üzerinde olup hastaların % 67.7'sinde ise bu düzey 10 ng/ml üzerinde olduğu saptanmıştır. Tüm hastalar dahil edildiğinde büyüme hormon düzeyleri ortalama 10.46 ± 1.48 ng/ml olduğu belirlenmiştir.

Sonuç: Hastaların kifotik deformitelerine göre yapılan gruplardaki ortalama büyüme hormon düzeylerinin istatistikî olarak benzer olduğu görülmüştür ($p > 0,05$). Başka bir deyişle Scheuerman kifozundaki sagittal deformitenin şiddeti ile büyüme hormon düzeyleri arasında bir korelasyon bulunamamıştır.

Key words: Scheuerman kyphosis, etiology, growth hormone

Level of evidence: Retrospective clinical study, Level III

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INTRODUCTION:

In 1920, Holger Scheuermann[11] described a clinical entity of juvenile "round back" deformity that could be distinguished clinical and radiographical from postural and normal kyphosis. Scheuermann's structural kyphosis is the most common cause of kyphotic deformity in adolescents. After idiopathic scoliosis, it is the second most common disorder in patients who present to spine deformity clinics.[1,4,6,9]

Scheuermann's disease is most frequently diagnosed between ages 13 and 17 years. The overall incidence is 0.4 % to 10 %. The typical patient is between the late juvenile to age 16 years, commonly between 12 and 15 years. There is no specific gender prevalence. [1,4,6,9]

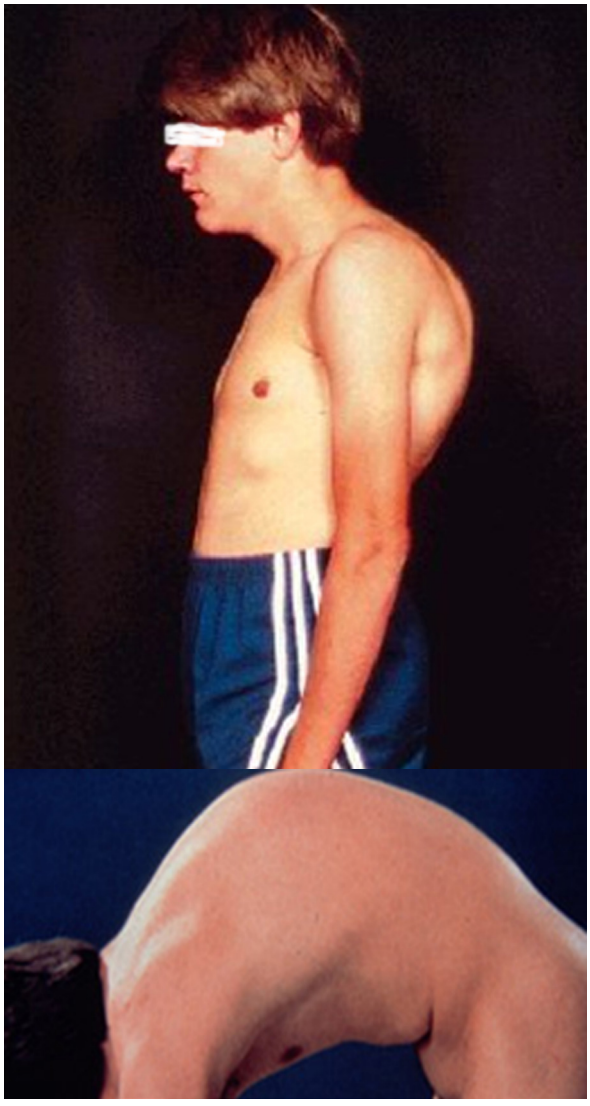

Figure-1. **a.** Lateral view of the patient and **b.** Adams test

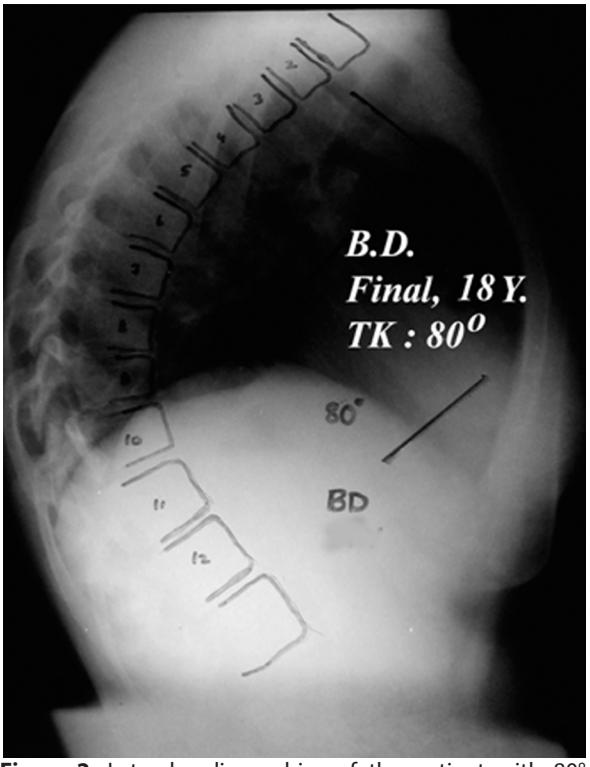

Figure-2. Lateral radiographies of the patient with 80° Scheuermann's kyphosis.

The etiology of Scheuermann's kyphosis remains unclear. Scheuermann first explained it as a result of aseptic necrosis of the ring vertebral apophyses.[11] Histological studies have revealed abnormal vertebral endplate cartilage, irregular mineralization, disorders in vertebral ossification, and alterations in collagen aggregation with abnormal collagen-proteoglycan ratios.[4] Other studies have reported the causative association of Scheuermann's kyphosis with dural cysts, Legg-Calvé-Perthes and Beckhterew's diseases, infections, spinal dysraphism, and other pathologic conditions such as hypotonia or hypertonia, poliomyelitis, rickets, endocrine disorders, osteoporosis, and constitutional kyphosis.[2-6,9]

Scheuermann's disease is considered hereditary, although the hereditary pattern has not been clearly defined. Reports suggest heritability of identical radiological changes in monozygotic twins, sib recurrence, and transmission through generations.[5]

Growth hormone hypersecretion also has been related to the pathogenesis of Scheuermann's kyphosis. Patients with the disease were found to be taller than the percentile mean height for their age. However, no studies exist to define causative relation

between growth hormone secretion and Scheuermann's disease and its role remains unclear.[2]

The aim of the that study was to research the effecting of the growth hormone on the occurrence of the Scheuermann disease and also to evaluate of the correlation between the severity of the kyphotic curve of the Scheuermann Kyphosis and Growth Hormone.

PATIENTS AND METHODS:

16 female and 15 male patients with an average age of 14.4 ± 3.2 and having thoracic kyphosis angle >60° due to wedging in at least 3 levels, totally 31 patients were included in the study. Deformities of the patients were divided into 3 groups as 60° - 70° (12 patients), 71° - 80° (10 patients) and over 81° (9 patients). For all the patients' antero-posterior and lateral x-rays and thoracic magnetic resonance imaging (MRI) were performed. Morning growth hormone levels were measured. All the patients were new cases and before conservative or surgical treatment serum growth hormone levels were obtained.

All patients' growth hormone levels average and standard deviation were calculated and correlation to thoracic kyphosis angles was statistically evaluated. For statistical evaluation SPSS 16.0 program was used and student t-test and Pearson's correlation regression tests were performed with probability 0.05.

RESULTS:

When all the patients are included global kyphosis angle average was 75.23° ± 9.65°. Averages were found to be, in 60° - 70° (12 patients) kyphosis angle group 65.92° ± 3.58°, in 71° - 80° (10 patients) group 75.30° ± 2.63° and in over 81° (9 patients) 87.56° ± 4.79° (Table 1). 28 of the 31 patients (90.3%) growth hormone levels were in the normal range of the laboratory for 5-16 years in male 0-11 ng/ml and female 0-17 ng/ml. Only 3 male patients (9.7%) growth hormone levels were above 11 ng/ml. All the patients were over 8 ng/ml, 67.7% of the patients were over 10 ng/ml. When all the patients are included average morning fasting growth hormone concentration was 10.46 ± 1.48 ng/ml.

Hormone levels according to the deformity groups can be seen in Table-1. When patients in 60° - 70° (1st group), 71° - 80° (2nd group) and over 81° (3rd group) groups were compared, average of growth hormones levels were statistically similar (p>0.05) (Table-1).

Table-1. The mean level of growth hormone (GW) in the patients groups according to the kyphosis angle (KA**)**

GROUP	Mean Kyphosis (range)	Mean GW (ng/ ml) (range)
GROUP-1 (12 patients)	65,9° ± 3,6° (60°-70°)	9,92 ± 1,38 (8,0 – 12,0)
GROUP-1 (10 patients)	75,3° ± 2,6° (71°-80°)	11,09 ± 1,53 (8.96 – 14,40)
GROUP-1 >81° (9 patients)	87,6° ± 4,8° (82°-95°)	10,46 ± 1,42 (8.00 – 12,53)
TOTAL (31 patients)	75,2° ± 9,7° (60°-95°)	10,45 ± 1,48 (8,00- 14,40)

On the other hand, when all patients are included average of growth hormone levels were not statistically significant than individual groups (p>0.05) (Table-2).

Table-2. The comparison mean level of growth hormone (GW) between in the patients groups according to the kyphosis angle (KA) with student-t test.

GROUPS	t	p	Results
1 and 2	-0,54	0,81	> 0,05
2 and 3	-0,87	0,41	> 0,05
1 and 3	-1,21	0,26	> 0,05
1 and Total	-0,01	0,39	> 0,05
2 and Total	0,56	0,71	> 0,05
2 and Total	0,89	0,44	> 0,05

Averages of 2nd and 3rd groups were more similar and 1st groups growth hormone average was lower.

According to the results of this study, growth hormone levels and severity of the kyphotic deformity are not statistically correlated in the all groups and all the patients (r=0.25, p>0,05) (Table-3).

Table-3. The correlation between level of growth hormone (GW) and the kyphosis angle (KA) of the patients with Pearson's correlation test.

GROUPS	r	p	Results
Group-1	-0,246	0,49	> 0,05
Group-2	-0,133	0,73	> 0,05
Group-3	0,063	0,44	> 0,05
Total	0,125	0,25	> 0,05

DISCUSSION:

Scheuermann's structural kyphosis is the most common cause of kyphotic deformity in adolescents. The etiology of Scheuermann's kyphosis remains unclear. Avascular necrosis, osteoporosis, biomechanical factors, imbalance of the paravertebral muscles, genetic inheritance had been blamed of the etiology of the Scheuermann's kyphosis.[1-6,9-12]

Growth hormone hypersecretion also has been related to the pathogenesis of Scheuermann's kyphosis. Patients with the disease were found to be taller than the percentile mean height for their age. However, no studies exist to define causative relation between growth hormone secretion and Scheuermann's disease and its role remains unclear.[2,6,9]

The aim of the that study was to research the effecting of the growth hormone on the occurrence of the Scheuermann disease and also to evaluate of the correlation between the severity of the kyphotic curve of the Scheuermann Kyphosis and Growth Hormone. In the English literature, the study like our study has not been found.

28 of the 31 patients (90.3%) growth hormone levels were in the normal range of the laboratory for 5-16 years in male 0-11 ng/ml and female 0-17 ng/ml. Only 3 male patients (9.7%) growth hormone levels were above 11 ng/ml. All the patients were over 8 ng/ml, 67.7% of the patients were over 10 ng/ml. When all the patients are included average morning fasting growth hormone concentration was 10.46 ± 1.48 ng/ml. When patients in 60° - 70° (1st group), 71° - 80° (2nd group) and over 81° (3rd group) groups were compared, average of growth hormones levels were statistically similar ($p>0.05$). On the other hand, when all patients are included average of growth hormone levels were not statistically significant than individual groups ($p>0.05$). In all 3 groups designated according to the kyphotic deformity, hormone levels were not found to be different, averages of the growth hormone levels in those groups were not different that all patients average. Although averages of 2nd and 3rd groups were more similar but 1st groups growth hormone average was lower. It is significant that 1st group is similar to normal kyphosis angle and does not require treatment.

There are some limitations to this study. First of all, only 31 patients were included in the study. According to the parametric criteria in each group assigned according to the severity of the kyphosis angle at least 10 patients should be included for sound statistical analysis, but for better results this number should be increased. Second limitation is the retrospective nature of the study. As the kyphosis angle progresses, during the whole adolescence period, growth hormone levels must be prospectively followed up and pointing the correlation between growth hormone levels and kyphosis angle values might have more reliable results. On the other hand kyphosis in the children is overlooked in many families until the deformity becomes severe. This makes the design of such a prospective study hard.

In conclusion, according to the results of this study, growth hormone levels and severity of the kyphotic deformity are not statistically correlated. In other words, there was no correlation between Scheuermann kyphosis and level of growth hormone being close to the upper limit or higher than normal. But results of this study suggest that, order to clarify effects of growth hormone level at the beginning of the kyphosis deformity and whether this hormone created deformity through other mediators, studies on this subject is needed.

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