

## ***Seasonal Variability of Adenoid-Nasopharynx Ratio of Adults Erişkinlerde Adenoid-Nazofarenks Oranının Mevsimsel Değişkenliği***

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**Abstract:** Adenoids, also called nasopharyngeal tonsils, are lymphoid tissues located in the posterior-superior wall of the nasopharynx. Adenoids are prominent in early childhood, and atrophy occurs after age 16. However, regressive adenoidal tissue may show re-proliferation in response to infection or irritants. This makes discrimination between nasopharyngeal carcinoma and benign nasopharyngeal lymphoid tissue difficult. There are many articles about the adenoid-nasopharynx ratio (ANO) in children. However, there is no information on this rate in adulthood. Nasopharynx may be affected by environmental and personal factors such as posterior wall tissue thickness infections, seasonal allergic agents. For this reason, nasopharynx in association with seasons is intended to show normal data for posterior-superior wall thickness. Between August 01 2015 and July 31 2016, files of patients over 18 years of age with lateral cervical radiography were screened. The lateral cervical graphs of 720 patients, 60 patients per month, were evaluated. According to the seasonal variation of ANO ratio, there was no significant difference between summer and autumn, but there was a significant difference between all seasons. The highest rate was found in the winter, the lowest rate in the summer. These results indicate that adenoid tissue is thickened due to upper respiratory tract infections in winter and allergy in spring.

**Keywords:** adenoid-nasopharynx ratio, adult, lateral cervical graphy, allergy.

Birdane L., Şakalar E., Atlanoğlu Ş., Şaylısoy S., Ekim A. (2017) Seasonal variability of adenoid-nasopharynx ratio of adults. *Osmangazi Journal of Medicine*, 39(2):7-10. DOI: 10.20515/otd.2290217.

**Öz:** Nazofaringeal tonsil olarak da adlandırılan adenoidler nazofarinks posterior-süperior duvarda yerleşmiş lenfoid dokulardır. Adenoidler erken çocuklukta belirgindir, 16 yaşından sonra atrofiye uğrarlar. Ancak enfeksiyon ya da iritanlara cevap olarak regrese adenoidal doku re- proliferasyon gösterebilir. Bu yüzden nazofaringeal karsinom ve bening nazofaringeal lenfoid doku arasında ayırım yapmak güçleşir. Çocuklardaki adenoid-nazofarenks oranı (ANO) hakkında birçok makale vardır. Ancak erişkinde bu oran hakkında bilgi yoktur. Nazofarenks posterior duvar doku kalınlığı enfeksiyon, mevsimle ilişkili alerjik ajanlar gibi çevresel ve kişisel faktörlerden etkilenebilir. Bu nedenle, erişkinde mevsimle ilişkili olarak nazofarinks posterior-süperior duvar kalınlığı için normal verileri göstermeyi amaçladık. 01.Ağustos 2015-31 Temmuz 2016 tarihleri arasında lateral servikal grafi çekilmiş 18 yaş üstü hasta dosyaları tarandı. Her ay için 60 hasta olmak üzere 720 hastanın lateral-servikal grafleri değerlendirildi. Mevsimlere göre ANO oranı değişkenliğine bakıldığında Yaz- sonbahar arası anlamlı fark saptanmadı onun dışında tüm mevsimler arasında anlamlı fark bulundu. En yüksek oran kış mevsiminde, en düşük oran yaz mevsiminde tespit edildi. Bu sonuçlar bize kış mevsiminde üst solunum yolu enfeksiyonlarına bağlı, bahar aylarında ise allerjiye bağlı adenoid dokunun kalınlaştığını göstermektedir.

**Anahtar Kelimeler:** Adenoid-Nazofarenks Oranı, erişkin, Lateral Servikal Grafi, allerji.

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## 1. Introduction

The adenoids, also called as nasopharyngeal tonsils, are lymphoid tissue located in the posterior superior wall of the nasopharynx (1-4). They are physiologically prominent during early childhood and gradually undergo atrophy after 16 years (2-4). However, adenoids that are because of benign lymphoid hypertrophy may persist due to chronic inflammation or re-proliferation of regressed adenoidal tissue in response to irritants or infections (5). Distinguishing between benign nasopharyngeal lymphoid hypertrophy and nasopharyngeal carcinoma is challenging.

There are several articles about the adenoidal-nasopharyngeal ratio (ANR) in children (2, 3, 6). However, there is no knowledge about this ratio in adults. The adenoidal tissue thickness may be influenced by individual and environmental factors such as infection, allergic agents related to season (7). For this reason, we aimed to establish normative data for the posterior superior nasopharyngeal wall thickness related to season in adults.

## 2. Material and Methods

Ethical clearance was obtained from the Local Ethical Committee of Eskisehir Osmangazi University (10.08.2016/No: 29).

### *Patients*

We retrospectively evaluated the lateral cervical graphy of 720 patients, 60 patients for per month between July 1st, 2015 and June 1st 2016. We selected the patients referred by physical therapy and rehabilitation clinics. Therefore, large patients pool was selected to minimize influence of possible unknown factors such as adenoidectomy, ear-nose-throat disease, etc.

### *Technique*

All patients were examined with lateral cervical graphy taken in an erect position with a focus distance 100 cm using 65 kV and 200 mA for 40-50 ms.

### *Assessment*

Two otolaryngologist independently evaluated the radiological evaluations using picture archiving and communication system (PACS) of our hospital. Adenoidal and nasopharyngeal measurements were performed as previously described by Fujioka et al. The adenoid was measured the distance between the maximal convexity along the anterior-inferior margin of the adenoidal shadow and the straight part of the inferior margin of the basiocciput. Nasopharyngeal space was the distance between the posterior and superior edge of the hard palate and posteroinferior margin of the sphenobasioccipital syncondrosis (2)(Figure 1).

### *Statistical Analysis*

The compatibility of the continuous variables with normal distribution was evaluated using Shapiro-Wilk normality tests. Continuous variables were expressed as mean values  $\pm$  standart deviation (SD). The differences in the mean values among the groups were analyzed by One Way Repeated Measures Analysis of Variance. In all statistical tests, calculated P values of less than 0.05 were considered statistically significant. Statistical comparisons were performed using the statistical software package SPSS 21.0 (SPSS Inc., Chicago, IL, USA).

## 3. Results

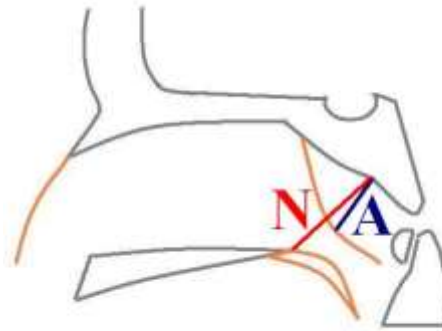
The study group included 242 males and 478 females, with an average age of 46 years (range, 19-77 years).

The ANR for each season was shown in Table 1. The ANR was found 0.46 for spring, 0.37 for summer, 0.39 for autumn, 0.51 for winter. The higher ANR was detected in winter and the lower ANR was observed in summer.

The seasonal variation of posterior wall thickness was statistically significant.

The ANR was significantly more higher in the winter and spring than in the summer.

There was statistically significant difference between all seasons ANR except summer between autumn (Table 2).



**Figure 1:** Illustration of the method used to calculate the adenoidal-nasopharyngeal ratio. Distance A (extending from the maximal convexity along the anterior-inferior margin of the adenoidal shadow to the straight part of the inferior margin of the basiocciput) (blue line) and distance N (extending from the posterior and superior edge of the hard palate to posteroinferior margin of the sphenobasioccipital syncondrosis) (red line)

**Table 1.**  
Measurement of nasopharynx, adenoid and ANR.

	Nazofarenks Mean $\pm$ SD	Adenoid Mean $\pm$ SD	AN Ratio Mean $\pm$ SD
Spring	27.9 $\pm$ 3.31	13 $\pm$ 4.06	0.46 $\pm$ 0.13
Summer	24.5 $\pm$ 4.0	9.1 $\pm$ 2.76	0.37 $\pm$ 0.11
Autumn	23.8 $\pm$ 4.0	9.35 $\pm$ 2.90	0.39 $\pm$ 0.11
Winter	28.4 $\pm$ 4.29	14.4 $\pm$ 3.37	0.51 $\pm$ 0.11
Total	26 $\pm$ 4.39	11.3 $\pm$ 3.99	0.43 $\pm$ 0.13

**Table 2.**  
Comparison of seasonal variability of ANR.

	Spring Summer	Autumn	Winter
Spring	p<0.001	p<0.001	p=0.027
Summer	p<0.001	p=0.659	p<0.001
Autumn	p<0.001	p=0.659	p<0.001
Winter	p=0.027	p<0.001	p<0.001

#### 4. Discussion

The adenoids are lymphatic tissue in the posterior-superior wall of the nasopharynx and they are typically prominent in children, gradually undergo atrophy after puberty (1-4). It has been thought that most individuals have lost their adenoidal tissue by 30 years of age (3). However, in recent years, endoscopic studies have revealed that contrary to this belief, hyperplastic adenoid is not uncommon also in adults (5). The hyperplastic adenoids may persist or recur in adults because of

several factors including irritants and infections (5, 7). Smoking induced nasopharyngeal lymphoid hyperplasia has been described in heavy smokers (8). Also, proliferative reaction of nasopharyngeal lymphoid tissue in patients with chronic sinusitis have been previously demonstrated (5).

There was a trend toward a higher ratio during the winter and spring than the summer in our study. There is an increase in respiratory infections during winter months due to

exposure to cold causing pathophysiological responses such as vasoconstriction in the respiratory tract mucosa and suppression of immune responses (7). This condition may be responsible for increased ratio in the winter months.

It has been known that the severity of symptoms related to allergens may remarkably change over the year. Recent studies suggested that the allergen load presents seasonal modifications giving rise to seasonal variation in nasal inflammation and symptoms (9). For this reason, similar

mechanism may explain changes of the higher ANR in winter and spring. A lateral soft tissue neck radiograph is a cheap, readily available investigation tool that is of clinical value in assessing of nasopharynx (2).

In conclusion, the seasonal differences on varying degrees were found in the ANR. Therefore, the season should be taken into consideration when assessing adenoidal tissue and to decide whether taking biopsy or not. One of our aims in this study is creating normative data of ANR in and around Eskisehir.

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