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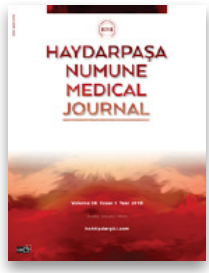

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ORIGINAL ARTICLE

Evaluation of Anterior Mediastinal Fat Tissue Density with Computed Tomography in Non-Tymomatous Myasthenia Gravis Patients

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Abstract

Introduction: Comparison of anterior mediastinal fat tissue densities between non-thymomatous myasthenia gravis patients and control group with non-contrast thorax computerized tomography.

Methods: In this retrospective study, 65 patients with myasthenia gravis, who were examined by non-contrast thorax computerized tomography, were included. A control group consisting of 65 patients with the same sex and similar age distribution as the patient group was composed.

Results: Anterior mediastinal fat mass Hounsfield unit average and standard deviation were -97±37.3 for 65 patients with myasthenia gravis and were -121±37.3 for the control group, respectively. There was a statistically significant difference between Hounsfield unit values and standard deviations between myasthenia gravis patients and the control group (p=0.01).

Discussion and Conclusion: In myasthenia gravis patients, anterior mediastinal fat tissue density was found to be higher than the control group.

Keywords: computerized tomography; myasthenia gravis; thymus.

Myasthenia Gravis (MG) is an autoimmune neuromuscular disease with voluntary muscle weakness. Antibodies against acetylcholine receptors in approximately 80% of the patients cause MG. Thymus size, shape, and density vary from person to person. Involution and replacement with fatty tissue are seen with increasing age[1]. Thymic hyperplasia is found in approximately 70% of the patients with MG, and thymoma is detected in approximately 10-20% of the patients[2]. While thorax computed tomography (CT) is a highly useful modality in diagnosing thymoma, the significance of CT in thymic hyperplasia, which is seen in a significant part of MG patients, could not be elucidated fully[3–5]. The present study aims to show the difference between anterior mediastinal fat tissue densities in thorax CT in non-thymomatous MG patients and the control group.

Materials and Methods

Selection and Description of the Cases

Ethical approval for this study was obtained from the Trakya University School of Medicine Ethics Committee. Between January 2011 and February 2018, 65 patients with Myasthenia Gravis, who were examined with non-contrast

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thoracic CT at the Department of Radiology of Trakya University School of Medicine, were included in this study. The control group consisted of 65 patients who had similar age and sex distribution as the patients and who underwent non-contrast thoracic CT scan. In our study, the patients who underwent sternotomy for any reason, including coronary by-pass history, patients with the oncologic disease, patients with anterior pericardial recess fluid, patients with prominent lymph node-thymoma or hematoma in the anterior mediastinum, and the cases with insufficient image quality due to an artifact and similar reasons technically were excluded from this study.

Technical Data

Non-contrast thorax CT was performed with a 64-channel CT (Aquillion 64, Toshiba Medical Systems, Tokyo, Japan). The standard protocol (120 kVp, auto-mA - maximal 350 mA) was used for thorax CT imaging. Image data were evaluated simultaneously by two radiologists (SS, FEU) in the PACS system.

Hounsfield Unit (HU) measurements from the anterior mediastinal adipose tissue were made by drawing the region of interest (ROI). Measurements were performed with a large ROI with a distance of 2 mm to the mediastinal border with the lungs and large vessels to prevent beam stiffening and partial volume artifacts and to cover the widest possible anterior mediastinal adipose tissue (Fig. 1). The mean value of attenuation in ROI was recorded in HU.

Statistics Analysis

IBM SPSS v.22 (Chicago, IL, USA) program was used for the statistical analysis while evaluating the findings of this study. Student`s t-test was used for descriptive statistical methods (mean, standard deviation), as well as the comparison of quantitative data showing normal distribution between the groups was used to evaluate the study data.

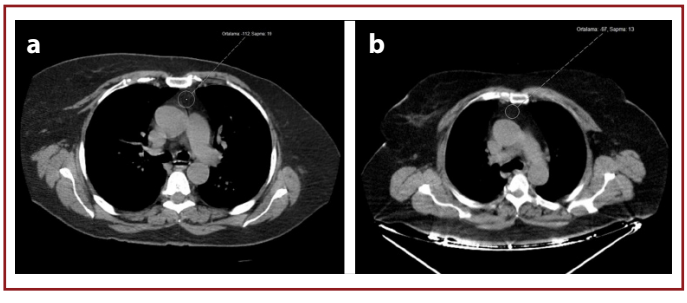

Figure 1. Measurement of the anterior mediastinal adipose tissue density in non-contrasted thorax computed tomography in control **(a)** and patient group **(b)**.

The chi-square test was used to compare qualitative data. Results were evaluated with a 95% confidence interval and a $p<0.05$ significance level.

Results

The mean age of the 65 patients was 52.4±24.4 years, 35 (53.8%) of the patients were female, and 30 (46.2%) of them were male. The mean age of the control group, which consisted of the same number of cases, was 50±22.2 and 36 (55.3%) were female, and 29 (44.7%) were male. Mean and standard deviation of the HU value of anterior mediastinal adipose tissue was -97±37.3; the control group was -121±37.3 (Table 1). There was a statistically significant difference between HU values and standard deviations between MG patients and the control group (p=0.01).

Discussion

MG is a heterogeneous group of diseases characterized by muscle weakness and fatigue in the clinic as a result of autoantibodies against postsynaptic receptors located mainly at acetylcholine nerve muscle junction. Generalized fatigue and weakness were reported in 87% of the patients with MG. Only 20% of the cases have ocular findings[6].

The diagnosis of MG is based on the history of the disease and typical clinical findings. Typical electrophysiological and laboratory findings support the diagnosis. One of the other methods used to confirm the diagnosis is pharmacological confirmation tests. The deterioration of the neuromuscular conduction in MG is manifested by electromyography (EMG) positivity in two-thirds of patients[7].

Normal thymus tissue usually fills the anterior superior mediastinum and varies greatly in size and shape depending on age. It is observed in infants and young adults with a similar density with muscle on CT. Under five years of age,

Table 1. Information on the control and patient groups and anterior mediastinal fat tissue density values

	Control	Patient
Age (Mean±SD)	50±22.2	52.4±24.4
Gender		
Male	29	30
Female	36	35
Anterior Mediastinal Adipose Tissue HU Value (Mean±SD)	-121±37.3	-97±37.3

SD: standard deviation; HU: Hounsfield Unit.

the appearance is generally convex edged and quadrangular. The thymus then gradually becomes triangular, and the density progressively decreases with increasing age due to fatty infiltration. Although thymus can be considered as a separate structure until the age of 40, it appears that half of the individuals over the age of 40 are completely replaced by fat[8–10].

In MG patients, thymic lymphoid hyperplasia (TLH) can be detected frequently in the anatomical location of the thymus but can be observed anywhere from the thoracic entrance to the cardiophrenic angle[11, 12]. Routine multidetector CT scans, which are currently performed in routine, may be useful in detecting thymoma and TLH in MG patients, as well as in detecting small thymic islets in anterior mediastinal adipose tissue (simanovsky). The distinction between TLH and small thymoma is sometimes not possible because TLH does not contain homogeneous soft tissue density and fatty infiltration[13–16]. In a study conducted by Nicolau et al.,[14] 12 of the lesions described as thymoma on CT of 45 patients with MG were found to be TLH with histopathological evaluation. Therefore, although the fat tissue density in the anterior mediastinum is increased in MG patients compared to the normal population, it is not possible to differentiate between thymoma and TLH by CT with current technology.

In our study, anterior mediastinal adipose tissue density was found to be significantly different between the non-thymomatous MG and the control group and was higher in the MG group. Although histopathological evaluation could not be performed, detection of an increase in density without significant mass lesion in anterior mediastinal adipose tissue in patients with non-thymomatous MG suggests that the density of remnant thymic tissue is high in this localization.

Our study has some limitations. First, our study was a retrospective study, and no histopathological examination of anterior mediastinal fat tissue could be performed. Secondly, interobserver and intraobserver evaluation of the patient and control group data could not be performed. The third limitation factor is that magnetic resonance imaging (MRI) is not included in our study, which is a method that is very useful in the separation of mediastinal adipose tissue and thymic lymphoid hyperplasia-thymoma with chemical shift evaluation. More detailed studies can be conducted on the relationship between MG and anterior mediastinal adipose tissue in the future with the multimodal radiological approach and histopathological results after surgery.

Conclusion

In conclusion, anterior mediastinal adipose tissue density measurement on thorax CT may be helpful in supporting the diagnosis in patients with significant thymic mass and suspected MG. However, studies with larger patient groups and histopathological diagnostic support are needed.

Ethics Committee Approval: Ethical approval for this study was obtained from the Trakya University School of Medicine Ethics Committee. (TUFT-BAEK 2018\216)

Peer-review: Externally peer-reviewed.

Authorship Contributions: Concept: S.S.; Design: F.E.U.; Data Collection or Processing: S.S., F.E.U.; Analysis or Interpretation: S.S., F.E.U.; Literature Search: S.S.; Writing: S.S., F.E.U.

Conflict of Interest: None declared.

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