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Assessing Posterior Longitudinal Ligament Ossification Using new CT Classification and Determining the Prevalence of Ossification ın Our Population Posterior Longitudinal Ligament Ossification

Posterior Longutudinal Ligament Ossifikasyonunu Yeni BT Klasifikasyonu ile Değerlendirme ve Toplumumuzdaki Ossifikasyon Prevalansı

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ABSTRACT

Objectives: To evaluate cervical ossification of posterior longitudinal ligament (OPLL) with computed tomography (CT) in the southeast of Turkey area.
Materials and Methods: We retrospectively evaluated cervical CT of 2610 patients in our databese (1806 males, 804 females; age range 1-100 years). OPLL was present in 135 patients. These 135 patients were evaluated according to the new CT classification.
Results: We show OPLL in 135 patients (90 [66.6%] males, 45 [33.3%] females; mean age 56.84 ± 15.6 [range 26-100] years). Using classification A, 84 (62.2%) patients had non-bridge OPLL, while 51 (37.8%) had bridge OPLL. Using the axial classification, 114 (84.5 %) patients had the central type and 21 (15.5%) patients had lateral type OPLL.
Conclusions: Our population has different OPLL features compared to previous studies. We believe that our study will contribute a new data related to a different population in the literature of OPLL prevalence

Key Words: Bridging, CT, ossification, posterior longitudinal ligament

ÖZET

Amaç: Türkiye'nin güneydoğu bölgesinde toplumdaki posterior longitidinal ligament ossifikasyonunu(OPLL) Bilgisayarlı Tomografi (BT) ile değerlendirmek.
Gereç ve Yöntem: Arşivimizdeki 2610 hastanın servikal BT incelemeleri retrospektif olarak değerlendirildi. (1806 erkek, 804 kadın; 1-100 yaş). 135 hastada PLLO mevcuttu. Bu 135 hasta yeni BT klasifikasyonuna göre değerlendirildi.
Bulgular: 135 hastanın 90'ı [66.6%] erkek, 45 [33.3%] kadın idi; (ortalama yaş 56.84 ± 15.6 [aralık 26-100] yaş) Klasifikasyon A kullanıldığında, 84 hastada (62.2%) köprüleşme olmayan PLLO'u izlenirken , 51 hastada (37.8%) köprüleşme tipi PLLO izlendi. Aksiyel klasifikasyon kullanıldığında, 114 (84.5 %) hastada santral tip ve 21 hastada (15.5%) lateral tip PLLO izlendi.
Sonuç: Toplumumuzdaki PLLO özelliklerinin diğer çalışmalarla kıyaslandığında farklı olduğunu ortaya koyduk. Çalışmamızın farklı bir populasyonun PLLO prevalansı noktasında yeni bilgiler sağlayarak literatüre katkı sağlayacağına inanıyoruz.

Anahtar Kelimler: Köprüleşme, ossifikasyon, posterior longutudinal ligament

Introduction

Ossification of the posterior longitudinal ligament (OPLL) is a progressive disease of "not quite known etiology," which can lead to compression and myelopathy of the spinal cord. OPLL is thought to be affected by genetic and environmental factors (1-3). The disease was first described by Tsukimoto (4) and the reported prevalence in Japanese is 1.9–4.3%. OPLL is thought to be more prevalent in Asian populations and is more prevalent in the cervical region. The treatment ranges from conservative treatment to surgery and should be based on a radiological evaluation. Radiography is the classic method for evaluating OPLL, while CT enables a more detailed evaluation. Magnetic resonance imaging (MRI) is particularly suitable for demonstrating

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myelopathy (1, 2). The Investigation Committee on the Ossification of the Spinal Ligaments of the Japanese Ministry of Public Health and Welfare (JMPHW) has proposed two classification systems to facilitate the identification and treatment OPLL. The first classification, published in 1981, was based on lateral radiographs of the spine (5). A CT classification of OPLL was published in 2014 based on a study of 144 OPLL patients and included three CT classification systems (6). This study evaluated a series of 135 patients according to this new CT classification to put forward prevalence of cervical OPLL in southeast of Turkey.

Materials and Methods

The study was approved by the local ethics committee. Cervical CT of all of the patients in our database between January 2013 and November 2016 was screened retrospectively. The images had been acquired using a 64-detector-row Philips Brilliance CT scanner (Philips Medical Systems, Cleveland, OH; collimation 0.625 mm, pitch 1, 0.75 s/cycle scan speed, slice thickness 2 mm, slice increment 0.45 mm, and dose 250 mAs and 120 kV) reconstructions were made with 1-mm or a 16-detector Toshiba Activion V3.00 CT scanner (Toshiba Medical Sytems, Tokyo, Japan) ; collimation 0.625 mm, pitch 1, 0.75 s/cycle scan speed, slice thickness 2 mm, slice increment 0.45 mm, and dose 200 mAs and 120 kV) reconstructions were made with 1-mm.

We excluded patients with vertebral fractures, previous spinal surgery, or motion artefacts. Overall, there were 2610 patients (1806 males, 804 females; age range 1–100 years). Lesions > 2 mm were accepted as ossification. OPLL was present in 135 patients (90 [66.6%] males, 45 [33.3%] females; mean age 56.84 ± 15.6 [range 26–100] years). These 135 patients were evaluated according to the 2014 CT classification. Because of Classification B is not recommended as a suitable method for daily practice, the patients were evaluated according to Classification A and the axial classification.

According to Classification A, if ossification is present in two or more connected vertebrae, it is called the bridge, while if the ossified vertebrae are not connected it is called the non-bridge type. The axial classification determines whether the ossification is more prominent centrally or laterally relative to the spinal cord. The assessments were made simultaneously by two radiologists (S.H., MG. Ç) by consensus.

Frequencies, ranges, means and standard deviations were used as descriptive statistics. Statistical Package for the Social Sciences software (SPSS 16.0 for Windows) for Statistical analysis was used

Results

Classification A: Using classification A, 84 (62.2%) patients had non-bridge OPLL (Figure 1), while 51 (37.8%) had bridge OPLL (Figure 2). Of the bridge type OPLL patients, 40 patients had two-level ossification, 8 patients had four-level ossification at two separate levels, 2 patients had six-level ossification (1 at three separate levels, and the other in four continuous vertebrae and two other levels), and 1 patient had eight-level ossification at four separate levels (Table).

Axial classification: Using the axial classification, 114 (84.5 %) patients had the central type (Figure 3) and 21 (15.5%) patients had lateral type (Figure 4) OPLL

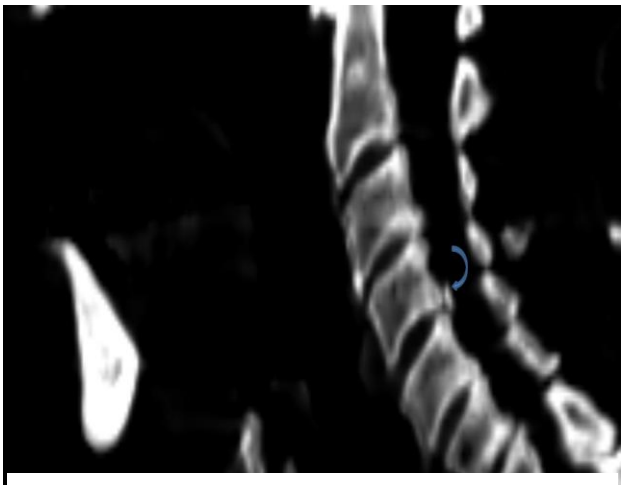

Fig. 1. Seventy four years old man with typical non-bridge type of OPLL

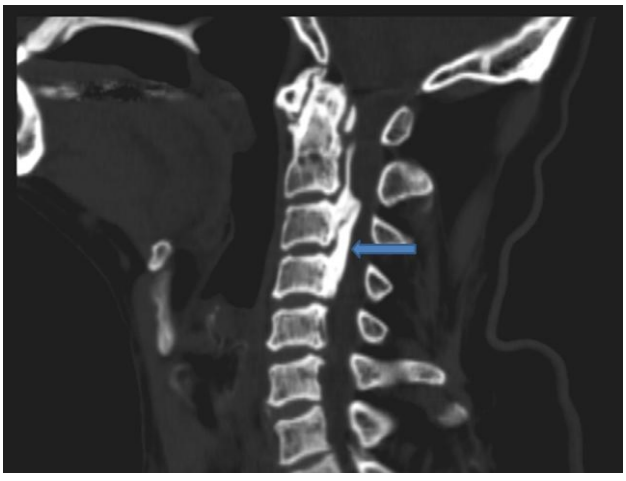

Fig. 2. Forty nine years old man with typical case of bridge type OPPL in two level (Ossification is extending on three levels but bridging exists only between the two vertebra levels)

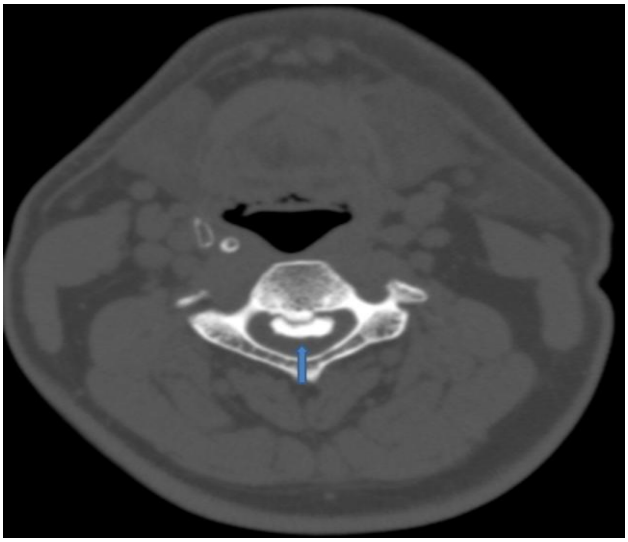

Fig. 3. Forty nine years old man with central type of OPLL

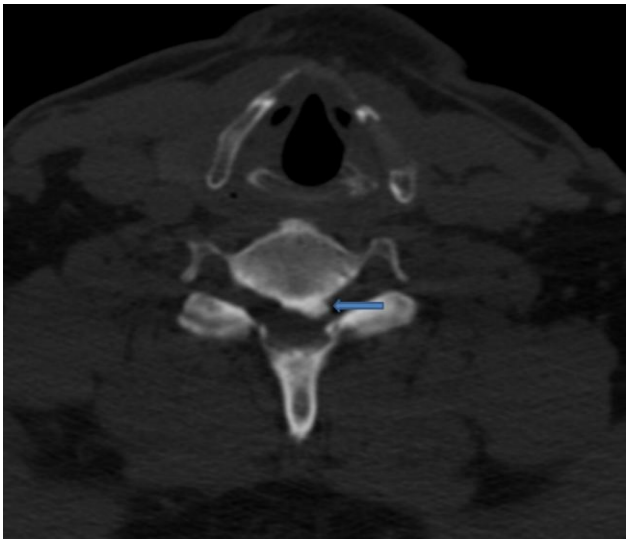

Fig. 4. Fifty six years old man with lateral type OPLL

Table. Distribution of patients according to classsification A

Bridge type	Number of patients
2-level	40
4-level	
2+2 level	8
6-level	
2+2+2 level	1
4continous+2 level	1
8 level	
2+2+2+2 level	1
Total bridge type	51
Nonbridge type	84
Total	135

Discussion

The symptoms of OPLL are first treated with anti-inflammatory therapy. Surgical treatment options come to the fore in patients with radiculopathy or myelopathy and typically involve anterior or posterior decompression surgery. Rarely combined surgical techniques are used. The surgical approach depends on factors such as the type of ossification, shape, segmental extent, moving vertebral levels, neurological examination, kyphotic deformity, and stenosis. Imaging studies are used to guide the selection of the surgical procedure (5, 6). Classification methods have been developed to optimize guidance. In 1981, the JMPHW published a radiography-based classification, which has been used for many years. The same committee developed a CT classification to provide more detailed information for surgery because radiography cannot show the exact relationship between the vertebrae or the ossification type and the evaluation can be subjective (3, 7-9).

In a retrospective CT study of Koreans, Sohn et al. (7) found that the prevalence of OPLL was 5.7 %. This is higher than the prevalence of OPLL determined using conventional plain radiographs because of the high resolution of multislice CT. Fujimori et al. (10) reported 2.2% as the overall prevalence of OPLL in different races of San Fransisco. In our population of 2610 patients who underwent cervical CT, 135 patients had cervical OPLL for a prevalence of 5.17 %. This shows, prevalence of OPLL is higher in our region.

As in other studies (2), OPLL was more prevalent in males in our series, with 66.6% of the cases in males and 33.3% in females.

Using classification A, Kawaguchi et al. (6) found bridge type ossification in 54 (37.5%) patients and non-bridge type ossification in 90 (62.5%) patients, in a series of 144 OPLL patients. In their prospective study 28 of 54 bridge type were 2-level ossification. In our series, non-bridge type ossification was also more common and found in 84 (62.2%) patients versus 51 (37.8%) with bridge type OPLL. OPLL, known as the Asia disease, were detected at high rates in our region according to our study. But despite its high prevalence in our population, 40 of 51 bridge-type OPLL were "2 - level bridge type of ossification" and this shows

that our long segment ossification is in a low rate compared to Kawaguchi et al. study (6).

Using the axial classification, Kawaguchi et al. (6) found central ossification in 102 (70.8%) patients and lateral ossification in 42 (29.2%) patients. We observed the central type in 114 (84.5 %) patients and the lateral type in 21 (15.5%). In both studies, central ossification was more common.

Its retrospective nature is the limitation of our study. Because of that, we could not perform a dynamic shooting investigation, which may reveal connected ossification between vertebrae.

To the best of our knowledge, this is the second population to be evaluated with these new CT classifications. We believe that our study will contribute a new data related to a different population in the literature of OPLL prevalence

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