in adults, the concentration of elastic fibers is approximately half that seen in true ligamentum flavum. These differences may contribute to the discrepant prevalence of CLF and calcification of the posterior atlantoaxial membrane.

Some authors have assumed a possible association between CLF and articular chondrocalcinosis (pseudogout) [5]. The generalized articular chondrocalcinosis seen in the present case led us to hypothesize that, at least in part,chondrocalcinosis played a role in the calcification of the posterior atlantoaxial membrane. The unusual mechanical stress that converged on C1/2 due to the mixed-type OPLL extending from C2 to C5 in the present case may also have played a significant role in this condition.

The etiology of CLF is likely to be different from that of OLF [1]; however, Inoue et al. [6] suggested the possibility that the same factor may have initiated ossification and calcification in spinal ligaments. Further studies are needed to elucidate the pathophysiology of calcification and ossification of the spinal ligaments.

Standard X-rays can show abnormal shadows of calcification on the posterior wall of the spinal canal [11]. However, these sometimes fail to demonstrate any abnormality other than mild spondylosis [12]. MR imaging is useful for identifying spinal cord and/or nerve root involvement; however, it cannot distinguish between calcification and hypertrophied (uncalcified) spinal ligaments since these two conditions both yield low intensity on the T1- and T2-weighted images. On the other hand, CT can clearly differentiate between these two conditions and is the best modality for detecting calcification of the spinal ligaments [13].

The natural history of cervical myelopathy due to CLF is not fully understood, since most of the previously reported cases were treated surgically. However, Cabre et al. [13] reported conservative treatment of two cases; i.e., one declined surgery and the other one had cardiorespiratory disease contraindicating surgery. These two cases uniformly worsened neurologically, whereas surgical treatment has achieved good results in most previous reports [5, 13]. Taking all of these findings into account, surgical treatment was advocated in symptomatic patients with cervical CLF [13]. One can perhaps extend this surgical indication to include calcification of the posterior atlantoaxial membrane.

In conclusion, calcification of the posterior atlantoaxial membrane is an extremely rare disease. We must to keep in mind the possibility of latent calcification of the cervical spinal ligaments in patients with generalized articular calcification. When symptomatic, surgical treatment is advocated to prevent further neurological compromise.

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Conflict of interest The authors declare that they have no conflict of interest.

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DIAGNOSTICS

Prevalence, Distribution, and Morphology of Thoracic Ossification of the Posterior Longitudinal Ligament in Japanese

Results of CT-Based Cross-sectional Study

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Study Design. A cross-sectional study.

Objective. To gain an insight into the prevalence, morphology, and distribution of thoracic ossification of the posterior longitudinal ligament of the spine (T-OPLL) by computed tomography (CT) and review of the literature.

Summary of Background Data. The epidemiology and cause of T-OPLL remains obscure. To date, to the best of our knowledge, there is no study that has comprehensively evaluated the thoracic spine by CT to assess the prevalence, distribution, and morphology of T-OPLL in a sufficiently large size of sample with wide distribution of age.

Methods. The participants of this study were the patients who have undergone chest CT for the examination of pulmonary diseases in our institute. The patients with previous thoracic spine surgery and younger than 15 years were excluded. Prevalence, distribution, and morphology of T-OPLL were reviewed.

Results. A total of 3013 patients (1261 females and 1752 males) with the mean age of 65 years were recruited. The CT-based evidence of T-OPLL was noted in 56 (38 females and 18 males) individuals (1.9%). Most frequently encountered type was liner type, followed by continuous cylindrical type and mixed type. Continuous waveform and beaked type were less frequently encountered. Statistical analyses revealed that T-OPLL was noted at a significantly higher rate among the females. The mean age of T-OPLL–positive males was significantly higher than that of T-OPLL–negative males. Furthermore, there was significant difference of body mass index between T-OPLL–positive and T-OPLL–negative individuals. Most of T-OPLLs were confirmed in higher or middle thoracic regions and the highest peak was found at T3–T4. T-OPLL was noted after the age of 40 years with the peak distribution found at the age of 60 years.

Conclusion. The prevalence of T-OPLL in Japanese was 1.9%. Further studies that characterize definitive subtypes of T-OPLL on CT are warranted so as to establish possible association between clinical manifestations and size and/or subtypes of T-OPLL.

Key words: OPLL, computed tomography, ossification, posterior longitudinal ligament of the spine, thoracic spine, prevalence, epidemiology, morphology, classification, body mass index.

Level of Evidence: N/A

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Ossification of the posterior longitudinal ligament of the spine (OPLL), first described by Key in 1838,[1] is characterized by the heterotopic bone formation in the posterior longitudinal ligament of the spine. In 1960, Tsukimoto[2] reported first autopsy case of chronic cervical myelopathy caused by extensive cervical OPLL (C-OPLL). OPLL can result in neurological compromises through compression of spinal cord.[3]

OPLL has been assumed to occur predominantly in the East Asian population, particularly in Japanese.[4] The cervical spine is commonly affected by the OPLL,[4] thoracic OPLL (T-OPLL) is a rare but clinically significant spinal disorder that causes progressive thoracic myelopathy and it still remains one of the most challenging diseases in spine surgery.

The recent genetic analyses have led to increasing interests in understanding the underlying mechanism of ossifying plaques in OPLL.[5] In turn, several clinical reports of T-OPLL have dealt with surgical techniques and their results.[6–8] However, less attention has been paid to epidemiological aspects of this entity. The prevalence of C-OPLL in the Japanese population was reported to be 1.9% to 4.3% among people older than 30 years[9]; however that of T-OPLL has not been adequately addressed.

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Standard plain radiograph is not an adequate modality for diagnosis of T-OPLL because of the complex anatomy of thoracic region. The radiographical evidence of T-OPLL can be masked by superimposed bony structures such as ribs.[10] In contrast, computed tomography (CT), probably the most suitable modality to identify the ossification, allows us precise localization of T-OPLL, no matter what superimposition of the thoracic complexities.[11] Recently, we have reported the epidemiological study of thoracic ossification of ligamentum flavum (T-OLF) using chest CT data over 3000 cases.[12] In this study, using same cohort, we carefully evaluated prevalence, morphology, and distribution of T-OPLL and reviewed previously published literature.

To date, to the best of our knowledge, this study encompasses the largest sample of thoracic spine studied by CT scan with wide age distribution.

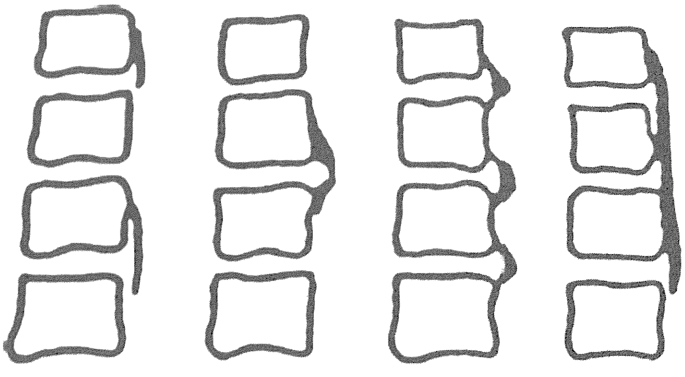

Figure 1. Classification of thoracic ossification of the longitudinal ligament.[13] **A**, Linear type. **B**, Beaked type. **C**, Continuous waveform type. **D**, continuous cylindrical type. Mixed type is defined as a combination of 2 or more different types.

MATERIALS AND METHODS

This study was performed along with the previously published study by the same author.[12]

Participants

The participants of this study were the patients who have undergone chest CT scanning for the examination of pulmonary diseases (pneumonia or pulmonary cancer and their suspicious) in our institute from January 2010 to September 2010. A total of 3013 consecutive patients were recruited for the analysis. Of the 3013 patients, 1261 were females and 1752 were males with the mean age of 65 years (range, 16–97 yr). The patients with previous thoracic spine surgery and younger than 15 years were excluded from the study. The presences of OPLL as well as clinical parameters such as age, sex, and body mass index (BMI) were retrospectively reviewed. The local ethics committee approved this study.

Radiological Examination

All chest CT scans were axial, 0.5-mm thick, sequential, and obtained in supine position without gantry tilt (120 kV, 160 mA, 0.5 s) using a Toshiba Aquilion CX (Toshiba Medical Systems Corporation, Japan). These data were reconstructed in the condition suitable for bone evaluation by the software application (AquariusNet Viewer; TeraRecon, Inc., Foster City, CA). This software application allows us to reconstruct optimal sagittal, coronal, and axial views to identify OPLL. On CT scans, lesions of OPLL are seen as ossified masses arising from posterior aspect of the vertebra.

Definitive OPLL was determined according to the previous report with slight modifications. Briefly, a positive case of OPLL was defined as the ossification, at least, thicker than 3 mm within the posterior longitudinal ligament of the spine. OPLL of hard disc type that localizes exclusively at the intervertebral disc level was not included. All CT scans were evaluated by 2 of the authors (K.M. and T.K.); differences were settled by consensus to minimize intra- and interobserver bias and errors.

To the best of our knowledge, there is no universally approved classification of T-OPLL on CT. We therefore classified T-OPLL into the following 5 subtypes; linear, beaked, continuous waveform, continuous cylindrical, or mixed type (composed of at least 2 of the first 4 types) according to the previous report[13] using sagittal reconstruction images (Figure 1). We also evaluated the number of level involved by T-OPLLs using sagittal reconstruction images. Ossification of intervertebral level such as beaked type ossification has a critical impact on the clinical results of T-OPLL[8]; the number of level involved by T-OPLL was evaluated at both vertebral and intervertebral level, yielding the minimum ossification sites of 2 and the maximum sites of 23. In turn, at the level of the largest ossification on axial image, we classified T-OPLL into 2 subtypes, that is, central and lateral deviated type, according to Matsunaga criteria.[14]

Statistical Analysis

Student t test, Welch test and χ^2 test were used when appropriate. $P < 0.05$ was considered as statistically significant. The software application used for the analysis was Stata/MP 12.0 (StataCorp LP, College Station, TX).

RESULTS

Distribution and Prevalence of T-OPLLs

The CT-based evidence of T-OPLL was noted in 56 (38 females and 18 males) individuals (1.9%), and their mean age was 68 years (range, 41–88 yr; Table 1). Among T-OPLL–positive individuals, minimum and maximum number of ossification sites was 2 and 12, respectively.

Statistical analyses revealed that T-OPLL was noted at a significantly higher rate among the females ($P < 0.0001$). In addition, they also revealed that the mean age of T-OPLL–positive males was significantly higher than that of T-OPLL–negative males, 74 and 66 for the T-OPLL–positive and T-OPLL–negative males, respectively, ($P = 0.0004$; Table 1). In turn, there was no difference in the mean age between the T-OPLL–positive and T-OPLL–negative females, 64 *versus* 64, respectively ($P = 0.75$; Table 1). Furthermore, there was significant difference of BMI between T-OPLL–positive and T-OPLL–negative individuals (mean; 24 *vs.* 22, $P = 0.0076$; Table 1).

TABLE 1. Characterization of OPLL-Positive and OPLL-Negative Individuals

	OPLL					
	Male		Female		Total	
	+	−	+	−	+	−
Number	18	1734	38	1223	56	2957
Age (mean ± SD), yr	74 ± 8.3	66 ± 14	64 ± 10	64 ± 15	68 ± 11	65 ± 14
p	0.0004		0.75		0.083	
BMI (mean ± SD), kg/m^2	24 ± 3.0	22 ± 3.4	23 ± 4.2	22 ± 3.6	24 ± 3.9	22 ± 3.5
P	0.013		0.059		0.0076	

Age and BMI were presented as mean ± SD.
OPLL indicates ossification of the posterior longitudinal ligament of spine; BMI, body mass index; SD, standard deviation.

Distribution of the OPLL in the thoracic segments was shown in Figure 2. Most of T-OPLLs were confirmed in higher or middle thoracic regions and the highest peak was found at T3–T4 (Figure 2). Lower thoracic region was less frequently involved. We then compared the prevalence of T-OPLL among each 10-year age group, that is, 10, 20, 30 years, and so on. T-OPLL was noted after the age of 40 years with the peak distribution found at the age of 60 years (Figure 3).

The distribution of different type of ossification was summarized in Table 2. Most frequently encountered type was liner type, followed by continuous cylindrical type and mixed type. Continuous waveform and beaked type were less frequently encountered. In turn, central involvement was observed in 42 cases, whereas lateral deviated involvement was observed in 14 cases. Large T-OPLL extended more than 50% of the anteroposterior diameter of the spinal canal was not observed.

Twelve cases (67%) of the T-OPLL–positive males and 23 cases (61%) of the T-OPLL–positive females had concomitant T-OLF.

DISCUSSION

This study disclosed the precise prevalence of T-OPLL in Japanese population. According to our review of the literature, this study is the first report of CT-based prevalence of T-OPLL.

One must acknowledge that previous epidemiological studies with less number of participants and/or limited population have hampered our knowledge. The number of epidemiological reports on the T-OPLL is much smaller than that on the C-OPLL.[15] Previously documented prevalence of T-OPLL has been roughly estimated by the instances of thoracic myelopathy as well as by surveys concomitant with that of C-OPLL.[16,17] Tsuchiya *et al*[16] reported that T-OPLL was found in 12 (16.4%) of 73 cases of C-OPLL. In turn, the report by the Japanese Ministry of Health and Welfare[18] has documented 204 cases of T-OPLL (18%) of 1157 outpatients of Orthopedic Surgery, in a multicenter study.

There have been only few studies reporting the prevalence of T-OPLL based on a survey of the general population. Through a review of literature including those written in Japanese, we encountered only 2 studies reporting the prevalence of T-OPLL[15,19] (Table 3). Ono *et al*[19] evaluated 8610 sheets of the lateral chest radiograph that were obtained as a part of physical examination of atomic bomb survivors older than 30 in Hiroshima and Nagasaki, and reported a prevalence of 0.25% in males and 0.74% in females, respectively (total prevalence: 0.56%). In turn, Ohtsuka *et al*[15] reported

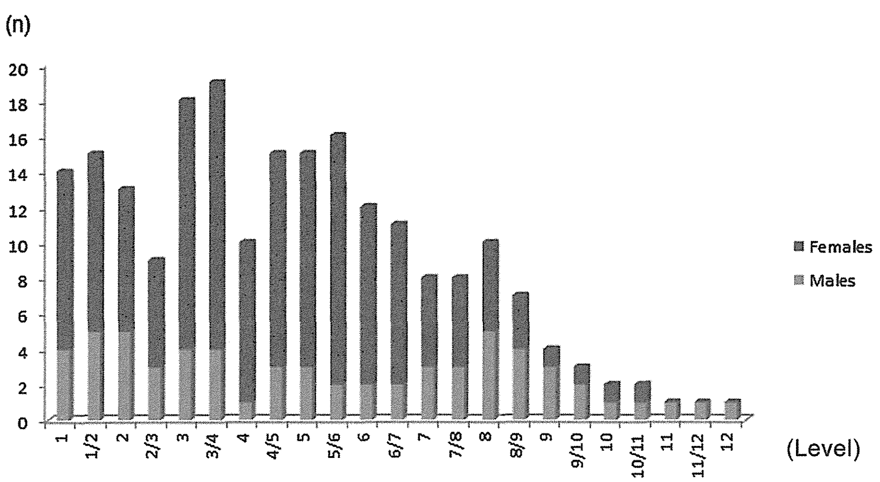

Figure 2. The distribution of T-OPLLs. T-OPLL predominantly localized higher thoracic regions and the highest peak was found at T3–T4. T-OPLL indicates thoracic ossification of the posterior longitudinal ligament.

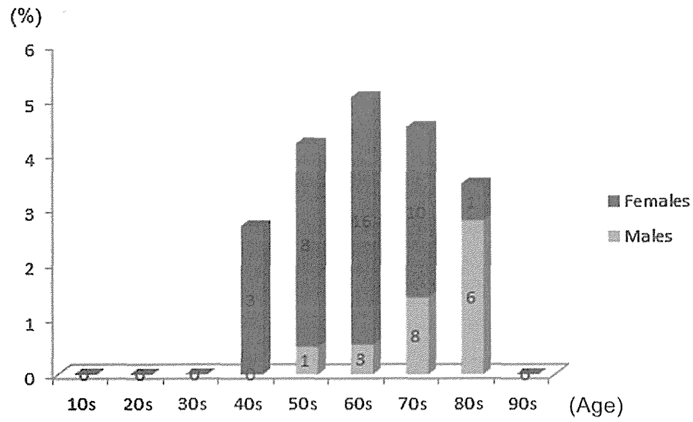

Figure 3. The age-oriented prevalence of thoracic ossification of the posterior longitudinal ligament. The figure indicates the number of the individuals.

TABLE 2. Distribution of Ossification Type of T-OPLL–Positive Individuals

Type of ossification	No. of T-OPLL–Positive Individuals (n)		
	Male	Female	Total
Linear	7	14	21
Beaked	3	3	6
Continuous waveform	2	5	7
Continuous cylindrical	2	10	12
Mixed	4	6	10

Mixed type is defined as a combination of 2 or more different types.
T-OPLL indicates thoracic ossification of the posterior longitudinal ligament of spine.

a prevalence of 0.9% in males and 0.6% in females (total prevalence: 0.8%) among 1058 general population using standard lateral thoracic spine radiographs. On the basis of these reports, Ohtsuka *et al*[15] concluded that the prevalence of T-OPLL in Japanese is below 1%, which is about one-third of the prevalence of C-OPLL.

This study revealed that the prevalence of T-OPLL is 1.0% in males and 3.0% in females (total 1.9%). Consistent with previous reports,[18,20] significant female preponderance of T-OPLL was confirmed. As we[12] and others[21,22] observed in the research for the prevalence of T-OLF by CT, higher detection rate by CT scan might have contributed to the higher prevalence of T-OPLL in this study.

It has been reported that the most frequently involved thoracic site by OPLL is T6.[15,16,18,20,23] However, our study revealed that the most frequently involved thoracic site by OPLL is more cranial level, T3–T4. Because previous studies have used standard radiographs, T-OPLL localized higher thoracic regions might have been masked by the superimposed bony structures such as shoulder and ribs. These results suggest that the diagnostic modality has an important impact on the evaluation of OPLL in thoracic region.

In previous reports, localization of T-OPLL was counted only at the level of vertebrae.[15,16,18,20,23] However, in thoracic region, ossifications of intervertebral disc levels such as beaked type ossification have critical impacts on the clinical feature.[8] We therefore considered that it is very important to evaluate the ossifications not only at the level of vertebrae but also at the level of intervertebral discs. To the best of our knowledge, there have been no epidemiological reports that focused on the ossifications at intervertebral disc levels (Figure 2).

As for the prevalence of C-OPLL among Caucasians, several previous studies have reported lower prevalence than that of the Japanese.[24,25] In turn, we could find only 1 study that reported the prevalence of T-OPLL among non-Japanese population.[26] In this report conducted in Italy, T-OPLL was confirmed in 2 cases (0.41%) among 488 adult outpatients studied from 1977 to 1983 at the Rizzoli Orthopaedic Institute, Bologna, Italy.[26] However, the prevalence of both C- and T-OPLL in the study was much higher than those of other non-Japanese reports, which has been assumed to comparable with those of Japanese. The population of this study was outpatients of Orthopaedic Surgery; it is therefore likely that selection bias of population yielded this higher prevalence of OPLL.

Since the publishing of the classical report on the pathophysiological association between OPLL and diffuse idiopathic skeletal hyperostosis (DISH),[27,28] OPLL has become increasingly recognized as an important entity occurring not only in Japanese but also in Caucasian. Further epidemiological studies are advocated to determine the accurate prevalence of OPLL among non-Japanese population.

Since the first description of OPLL,[1] pathophysiology of OPLL has remained yet undetermined over 175 years. Currently, it is assumed to be a multifactorial disease, in which environmental and genetic factors complexly interact.[29] Hypothetical contribution of genetic factors,[9,30] sex,[18] diabetes mellitus,[18,31] obesity,[31] trauma,[32] hormonal imbalance,[33] and dietary habits[29,33] have been proposed. Consistent with these reports, we confirmed significant association between sex (female preponderance), obesity (high BMI), and T-OPLL. This study confirmed that the peak prevalence of T-OPLL is noted at the age of 60 years, whereas no T-OPLL was observed in patients younger than 40 years. This finding also supports degenerative features of OPLL. It also remains unknown why unique ossification such as beaked type OPLL arises at the intervertebral disc level in thoracic region. Further examination to elucidate pathogenesis of OPLL is warranted.

Since the publication of the classical report on the association between OPLL and DISH,[27,28] OPLL has been often noticed to occur concomitant with other ossification of the spinal ligaments such as ligamentum flavum.[34] Takeuchi *et al*[35] reported case series of thoracic paraplegia due to neglected thoracic lesions developing after lumbar decompression surgery. Taking these findings into consideration; we advocate thorough evaluation of whole spine not to overlook latent risk of concomitant OPLL and OLF when treating the patients with ossification of the spinal ligaments.

TABLE 3. Previously Reported Prevalence of Ossification of the Posterior Longitudinal Ligament of the Thoracic Spine

Authors/Reported Year	Country	Sample Size	Target	Mean Age (Range), yr	Modality	Prevalence, %
Ono *et al*[19] (1982)	Japan	8610	GP	NA (<30)	Lateral chest radiographs	Males: 0.25, females: 0.74, total: 0.56
Ohtsuka *et al*[15] (1986)	Japan	1058	GP	62.8 (50–<80)	Lateral thoracic spine radiographs	Males: 0.9, females: 0.6
Mori *et al* (this study)	Japan	3013	P	65 (16–97)	Chest CT*	Males: 1.0, females: 3.0, total: 1.9

*The data were reconstructed in the condition suitable for bone evaluation by the software application.

GP indicates general population; P, patients who have undergone chest CT scanning for the examination of pulmonary diseases; NA, not available; CT, computed tomography; MRI, magnetic resonance imaging.

Otherwise, this study imposes several limitations. This study is a patient-based study, but not a population-based study. We employed the data of chest CT examination for pulmonary diseases (pneumonia and pulmonary cancer and their suspicious) but not for general population. This is the inescapable limitation of this study. However, the favorable aspect of this study protocol is that it does not impose further radiological exposure on the participants.

We could not find the patients with systemic inflammatory/autoimmune diseases that might cause spinal manifestations in this cohort. Despite a thorough review of literature, there have been no previous studies addressing relationship between OPLL and pulmonary diseases. Nonetheless, it does not totally cancel the possibility that pulmonary diseases have no impact on the prevalence of OPLL. Possible association between OPLL and pulmonary diseases remains to be elucidated, perhaps by other studies.

In addition, it is possible that the prevalence of severe T-OPLL may be underestimated, because the patients with severe T-OPLL with neurological compromise would have visited hospital for gait disturbance not for pulmonary diseases. Indeed, no large T-OPLL, that is, ossification larger than 50% of the anteroposterior diameter of the spinal canal, was observed in this study. Accordingly, real prevalence of T-OPLL among the general population may be higher than it was calculated by the present settings.

Another limitation of this study is that we could not establish definitive subtypes of T-OPLL on CT. Furthermore, we could not evaluate clinical manifestations and OPLL observed in this study. Matsunaga *et al*[14] reported that more than 60% spinal canal stenosis by OPLL and lateral deviated type OPLL on CT were radiographical risk factors for development of cervical myelopathy.

CONCLUSION

The CT-based prevalence of T-OPLL in Japanese was 1.9%. Further studies that characterize definitive subtypes of T-OPLL on CT are warranted so as to establish possible association between clinical manifestations and size and/or subtypes of T-OPLL.

➢ Key Points

- ❑ To date, this study is the first report of CT-based prevalence of T-OPLL.
- ❑ The prevalence of T-OPLL in Japanese was 1.9% and it is more frequent in females.
- ❑ We confirmed significant association between sex (female preponderance), obesity (high BMI), and T-OPLL.
- ❑ We advocate thorough evaluation of whole spine not to overlook latent risk of concomitant OPLL and OLF when treating the patients with spinal ossification.

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最新原著レビュー

胸部CTからみた胸椎黄色靱帯骨化症の有病率，分布と形態[1)]

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原題　*Mori K, Kasahara T, Mimura T et al：Prevalence, distribution, and morphology of thoracic ossification of the yellow ligament in Japanese；results of CT-based cross-sectional study. Spine* **38**：*E1216-E1222, 2013*

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【要旨】

目的：胸部コンピュータ断層撮影（CT）検査結果から，胸椎黄色靱帯骨化症（OYL）の有病率，分布と形態を調査すること．

方法：胸部疾患またはその疑いのために当院を受診し，胸部CT検査を受けた連続例を対象とした．胸椎手術の既往歴があるもの，15歳以下のものは除外した．胸部CTデータを骨条件に変換し，OYLの有病率，分布や形態について後ろ向きに調査した．

結果：男性1,752例，女性1,261例の合計3,013例（調査時平均年齢65歳）についての調査が可能であった．胸椎OYLは1,094例（36%）［男性666例，女性428例］に認められ，男性に有意に多かった．単椎間罹患は532例，多椎間罹患は562例に認められた．OYLは合計2,051椎間存在し，椎弓の谷に存在するcentral typeが779椎間，non-central type（従来型）が1,272椎間であった．罹患高位は，Th10/Th11にもっとも高いピークと，Th4/Th5に2番目に高いピークとをもつ二峰性分布を示した．年代別分布では，30歳代以降はほぼ一定の罹患率を示した．

結論：胸部CT検査データからみた日本人の胸椎OYLの有病率は36%であった．椎弓の谷に存在するキノコ型骨化病変もOYLである．臨床症状とOYLのサイズや形態などとの関連が残された研究課題である．

❶ はじめに

黄色靱帯骨化症（ossification of the yellow ligament：OYL）は，Polgar[2)]により1920年にはじめて報告された疾患であり，黄色靱帯が骨組織により置換され脊髄を圧迫することにより脊髄症をきたす．OYLは東アジア人に多く認められると報告されている[3)]が，その疫学については不明な点も多い．OYLの好発部位は胸椎とされているが，肩や肋骨が重なるという解剖学的特徴から，特に上位胸椎においては単純X線像による評価は容易でない．一方，コンピュータ断層撮影（CT）は，解剖学的特徴にかかわらず骨化病変を詳細に描出することが可能な優れたモダリティーである．

われわれは，骨病変の描出に優れるCTを用いて日本人の胸椎OYLの有病率や分布，罹患形態などを調査した[1)]．

❷ 対象および方法

2010年1～9月に胸部疾患，またはその疑いのために当大学を受診し，胸部CT検査が施行された症例のうち，胸椎手術の既往があるもの，15歳以下の症例を除く連続する3,013例（男性1,752，女性1,261）例を対象とした．調査時平均年齢は65歳であった．撮影済みの胸部CTデータをソフトウェア（AquariusNet Viewer：TeraRecon社，Foster City）を用いて骨条件に変換の後，胸椎OYLの有無や分布，罹患形態などを調査した．本ソフトウェアにより任意に冠状断，矢状断，水平断画像を再構築のうえ，連動させて評価が可能であり，骨化病変の詳細な検討が可能となった．CTによるOYLの形態分類には確立されたものがなく，独自

Key words：OYL, thoracic spine, CT, prevalence

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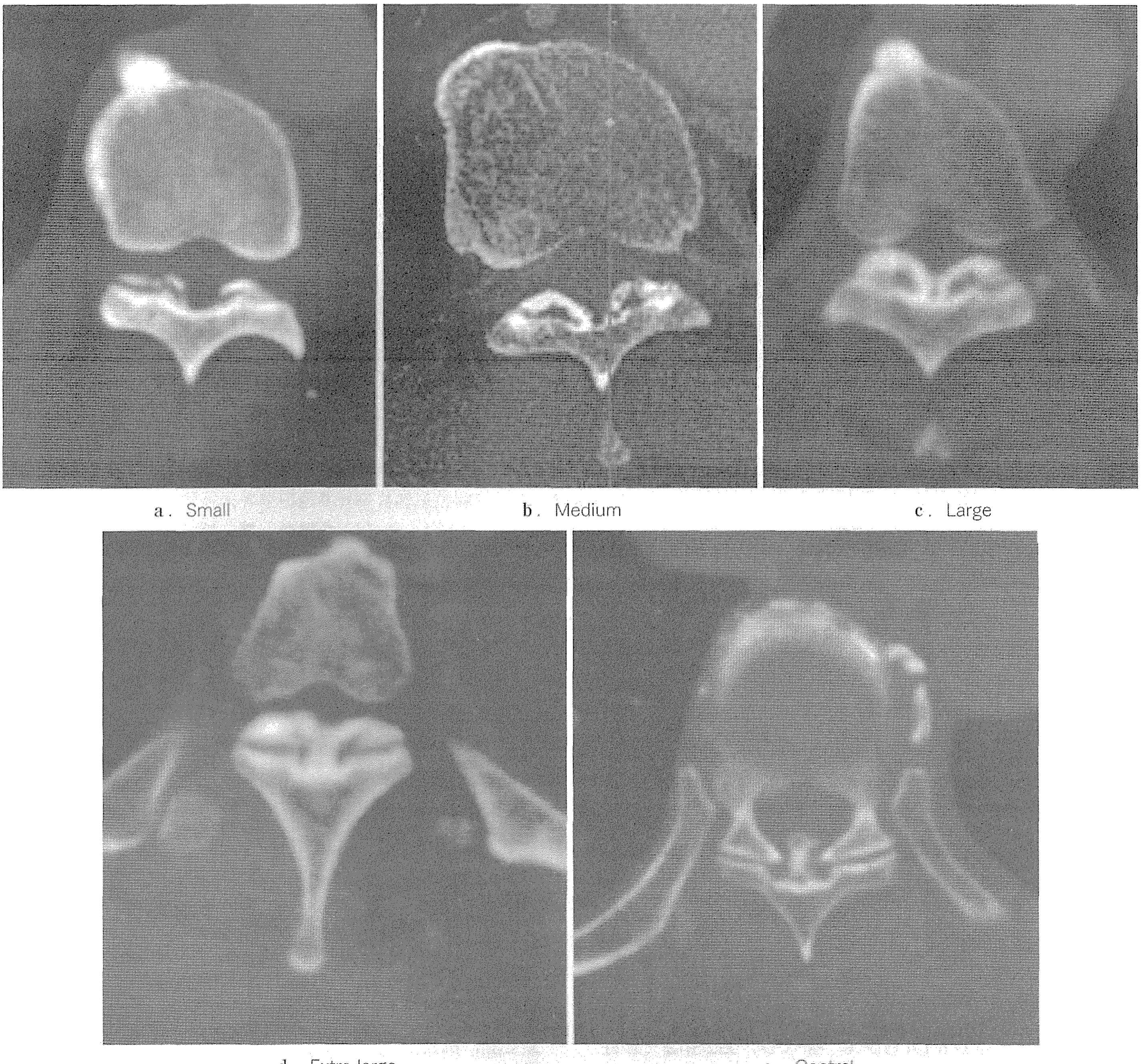

図 1．CT 水平断における胸椎黄色靱帯骨化症の分類（文献 1 より転載）

に基準を設けた（図 1）．従来型骨化（図 1a～d）のほか，椎弓の谷に存在するキノコ型骨化病変（図 1e）は，当大学での手術時摘出病変の組織学的検討により本病変も OYL であることを確認し，central type とした．また，年齢や body mass index（BMI）などもあわせて調査した．

本研究は，本学の倫理委員会の承認を得て行われた．

❸ 結　果

本研究において，central type を含めた胸椎 OYL は 1,094 例（36%：男性 666 例，女性 428 例）に認められ，平均年齢は 66（16～93）歳であった．OYL は男性の 38%，女性の 34% に認められ，男性に有意に多かった．男性で OYL を認めた症例は有意に高齢であった（$p<0.0001$）．一方，OYL の有無と女性の年齢や BMI との間には有意な関連を認めなかった．