Original Article/นิพนธ์ต้นฉบับ

Major Discordance in the Diagnosis of Osteoporosis Among Participants With Degenerative Lumbar Spine Using Spine and Hip Dual-Energy X-ray Absorptiometry

Alisara Wongsuttilert[1], Kasem Chaiklongkit[2], Sutasinee Kongpromsuk[1], Wanlop Jaidee[3]

[1] *Division of Radiology and Nuclear Medicine, Faculty of Medicine, Burapha University, Chonburi, Thailand*

[2] *Faculty of Sport Science, Burapha University, Chonburi, Thailand*

[3] *Division of Fundamentals of Public Health, Faculty of Public Health, Burapha University, Chonburi, Thailand*

Abstract

Background: Major T-score discordance in the diagnosis of osteoporosis at spine and the hip may induce misinterpretation in people with degenerative lumbar spine.

Objective: To investigate major T-score discordance in the diagnosis of osteoporosis using bone mineral density (BMD) at the lumbar spine and the hip among people with degenerative lumbar spine.

Methods: Demographic data, anthropometric measurements, and dual-energy X-ray absorptiometry (DXA) scans at the lumbar spine and the hip were retrieved from a database of Burapha University Hospital. The interrater reliabilities of image interpretation were performed. The correlation between degenerative lumbar spine lesions with T-scores at the lumbar spine and the hip was analyzed. Major discordance was defined when one site is osteoporotic and the other site is osteopenia or normal.

Results: Major T-score discordance of the lumbar spine and the hip was 28.6% and the hip BMD detected in participants with osteoporosis was less than the lumbar spine BMD (15.7% vs 36.5%). T-score at lumbar spine showed a false negative rate of 25.0%. Degenerative lumbar spine lesions showed a poor correlation with T-score at the lumbar spine ($R^2 = 0.21$, $P < 0.001$) and the hip (R^2 at femoral neck = 0.24, $P < 0.01$; R^2 at total hip = 0.32, $P < 0.01$).

Conclusions: Twenty-six percent of participants with degenerative lumbar spine were not evaluated L1-L4 BMD. While the hip seems to be the best measurement site, 28.6% of T-score discordance between lumbar spine and hip was still observed. T-score at lumbar spine showed a false negative rate of 25.0% and associated with older age. This study suggested that it would not be suitable to use the hip BMD alone to diagnose osteoporosis in older adults with degenerative spine disease.

Keywords: Bone mineral density, DXA, Lumbar spine, Degenerative spine disease

Corresponding Author: Alisara Wongsuttilert

Division of Radiology and Nuclear Medicine, Faculty of Medicine, Burapha University,

169 Long-Hard Bangsaen Road, SaenSook Sub-district, Mueang District, Chonburi 20131, Thailand.

Telephone: +668 1909 0612 E-mail: gmasimin@gmail.com

Introduction

Lumbar spine (LS) and hip are recommended skeletal sites to measure bone mineral density (BMD) with dual-energy X-ray absorptiometry (DXA).[1,2] However, many studies showed that most of older adults have an obvious degenerative change in LS and have a falsely elevated lumbar BMD.[3-7] This issue has not only been observed in older adults but also in early postmenopausal women.[8] The vertebra at L1-L4 levels with visualized degenerative changes or compression fracture should be excluded.[2,9] Hence, if only one evaluable vertebra remains after exclusion, diagnosis should be based on different skeletal sites, such as the hip or forearm.[2] However, DXA measurement is areal and smaller bone has the lower areal BMD (aBMD).[10] The aBMD at forearm may overestimate women with osteoporosis than using aBMD at the hip.

While the hip seems to be a better site for diagnosing osteoporosis in people with degenerative LS, the previous review of El and colleagues has reported T-score discordance between the LS and hip BMD.[11] Major T-score discordance is noticed when the difference score between the hip and the spine is sufficient to produce the result in two different diagnoses, in line with the World Health Organization (WHO) classification system. They found that T-score discordance among studies were discrepant and it might occur for a variety of explanations, such as various patient factors and differences in the young adult reference populations.[11]

This cross-sectional study aimed to investigate major T-score discordance in the diagnosis of osteoporosis using bone mineral density at the lumbar spine and the hip among people with degenerative LS lesions.

Methods

From July 2014 to July 2016, 1160 DXA scans were retrieved from the picture archiving and communication system. Sixteen DXA scans were excluded because of the presence of both hip prostheses (n = 7) and the spinal fixator or laminectomy (n = 9). Body mass index (BMI) was categorized based on the WHO classification system.[12] BMD (g/cm^2) was measured at the PA images of the LS (L1-L4), femoral neck (FN) and total hip (TH) using DXA (GE Lunar Prodigy, Lunar, Madison, WI, USA). According to the WHO criterion for diagnosis of osteoporosis, the T-score of ≤ 2.5 is osteoporosis.[2] In addition, lateral thoracolumbar spine images were used for vertebral fracture assessment (VFA). Any vertebral compression was defined as vertebral compression according to Genant et al.[13] Degenerative findings of the LS spine were visually evaluated separately on the computer screen by three physicians (K.C., S.K., and A.W.). After the technical quality of each DXA scan was verified, each individual vertebra (L1, L2, L3, and L4) on the L1-L4 PA image (Figure 1A) was evaluated for vertebral fractures, osteophyte formation, endplate and facet joint scleroses. Vertebral compression and vascular calcifications at the L1-L4 level were also identified on the VFA image (Figure 1B). Kappa statistics was used to assess the interrater reliabilities[14] and were found to be high (kappa = 0.90 - 0.96). Then, all DXA scans were categorized into two groups: non- and degenerative LS. The DXA data for all patients were categorized into three diagnostic groups, that is, normal, osteopenia, or osteoporosis based on their T-scores at the LS and hip. Major discordance was defined when one site is osteoporotic and the other site is either osteopenia or normal. This study was approved by the Institutional Review Board of the Burapha University, Chonburi, Thailand.

Statistical Analysis

Continuous variables were described as mean ± standard deviation (SD). Categorical variables were reported as frequency and percentage. The characteristic difference between the non- and degenerative LS groups were using independent *t* test for continuous variables and using z test for proportion difference for categorical variables. In degenerative LS group, multiple regression analysis was used to determine the correlation of four types

of degenerative LS lesions with BMD T-scores at the LS and the hip, after adjustment for age, gender, BMI, and non-vertebral fragility fracture. Proportions of LS-hip concordance were also reported. The level of statistical significance was set at $P < 0.05$.

Results

Fifty-four percent of participants had degenerative lesions at the LS by PA and lateral DXA scans. Approximately, one-fourth DXA scans in degenerative LS group were excluded (26.4%) because there were fewer than two evaluable vertebrae remaining after exclusion. Table 1 shows characteristic difference of participants in both groups. Degenerative LS participants had more advanced age than participants without degenerative LS (70.6 ± 9.2 years vs 62.9 ± 8.4 years, $P < 0.05$). Almost all participants in both non- and degenerative LS were women but there were marginally a smaller number of women in degenerative LS group (89.4% vs 92.9%, $P < 0.05$). Participants with degenerative LS had significantly more fragility fracture at non-vertebral area (17.5% vs 10.8%, $P < 0.05$), and their T-scores at FN, and TH were also significantly lower in comparison to non-degenerative LS group (Table 1). As shown in Table 2, L4 vertebra was the most common site of degeneration (81.6%) and frequently revealed sclerosis at the endplate (37.7%) and facet joints (44.1%). Moderate or severe vertebral compression at the LS was 26.6% and the most common site was L1 vertebra (10.7%). Vascular calcifications at L1-L4 levels were presented in 14.3% on the VFA images.

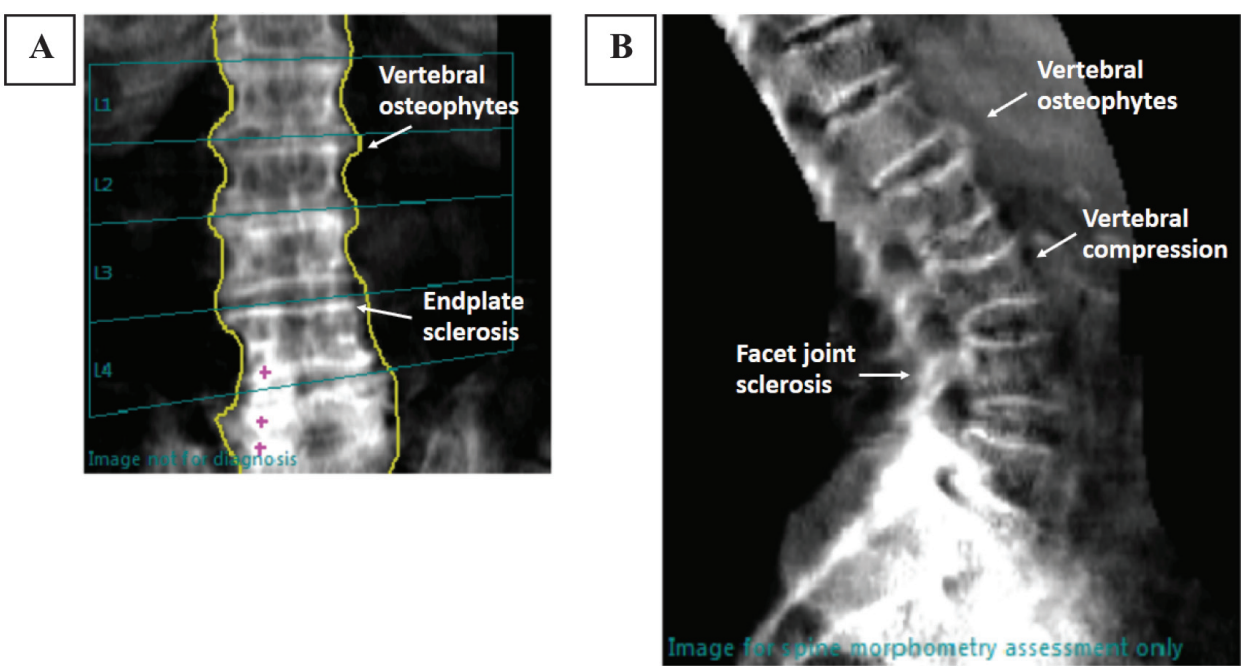


Figure 1 *Visual Degenerative Findings*

A, Osteophyte formation and endplate sclerosis on L1-L4 PA image. B, Osteophyte formation, vertebral compression, and facet joint sclerosis on VFA image.

Table 1 Characteristics of Participants

Variable	Mean ± SD		*P* value
	Non-degenerative LS (n = 536)	Degenerative LS (n = 623)	
Age, y	62.9 ± 8.4	70.6 ± 9.2	< 0.01
Female, %	92.9	89.4	0.03
BMI, kg/m^2	23.7 ± 3.7	23.9 ± 3.7	0.35
Non-vertebral fragility fracture, %	10.8	17.5	0.01
LS BMD T-score	-1.7 ± 1.4	-1.9 ± 1.3*	0.01
FN BMD T-score	-1.1 ± 1.0	-1.4 ± 1.0	< 0.01
TH BMD T-score	-0.8 ± 1.1	-1.1 ± 1.2	< 0.01

Abbreviation: BMD, bone mass density; BMI, body mass index; FN, femoral neck; LS, lumbar spine; SD, standard deviation; TH, total hip.

* With a total of 458 uninterpretable DXA scans at the lumbar spine.

Table 2 Proportion of Degenerative Vertebra and the Type of Degenerative Lesions on the DXA Image in Each Level of the L1-L4 Spine

Degenerative Findings	Vertebral Level (n = 623)			
	L1	L2	L3	L4
Degenerative vertebra, %	23.1	34.3	59.1	81.6
Type of degenerative lesions, %				
Moderate or severe vertebral compression*	10.7	9.7	7.8	8.0
Osteophyte formation	7.8	14.2	15.3	10.7
Endplate sclerosis	7.2	16.8	32.4	37.7
Facet joint sclerosis	1.1	1.4	18.7	44.1

* Vertebral compression was defined according to Genant et al.[13]

In degenerative LS group, overall degenerative spine lesions showed poor correlation with T-score at LS ($R^2 = 0.21$, $P < 0.01$), FN ($R^2 = 0.24$, $P < 0.01$), and TH ($R^2 = 0.321$, $P < 0.0001$), after adjusting for age, gender, BMI, and non-vertebral fragility fracture (Table 3). Only osteophyte formation was positively correlated with LS T-score but other lesions were not (Table 3). Moderate or severe vertebral compression showed a weak and negative correlation with T-score of TH but it was not statistically significant (Table 3).

Major discordance of T-score at spine and the hip was 28.6% in degenerative LS group with evaluable DXA scan that was not different from non-degenerative LS group (25.9%) (Table 4). LS BMD detected more osteoporotic patients when compared with hip BMD in both non-degenerative LS (29.7% vs 7.5%) and degenerative LS with evaluable DXA scan (36.5% vs 15.7%) (Table 4).

Discussion

Elderly are predisposed to degenerative changes of the spine that causes a false LS BMD assessment. In this study, 54% of participants had degenerative lesions in LS and 26.4% of DXA scans in this group were not evaluated. The participants with degenerative LS had a higher prevalence of osteoporosis at the LS (36.5% vs 29.7%) and the hip (15.7% vs 7.5%) compared with non-degenerative LS group. They also had an older age (70.6 ± 9.2 years vs 62.9 ± 8.4 years, $P < 0.05$) and had also more non-vertebral fragility fracture (17.5% vs 10.8%, $P < 0.05$).

Table 3 Coefficient of Variation of BMD T-score at LS, FN, and TH With Each Degenerative Spine Lesion at L1-L4 Levels, After Adjustment for Age, Gender, BMI, and Non-vertebral Fragility Fracture

Type of Degenerative Spine Lesions	LS BMD T-score (n = 458)		FN BMD T-score (n = 623)		TH BMD T-score (n = 623)	
	β (SE)	*P* value	β (SE)	*P* value	β (SE)	*P* value
Moderate or severe vertebral compression	0.01 (0.18)	0.98	-0.08 (0.11)	0.46	-0.21 (0.11)	0.06
Osteophyte formation	0.52 (0.18)	0.01	0.16 (0.10)	0.10	0.19 (0.10)	0.05
Endplate sclerosis	0.01 (0.13)	0.99	0.05 (0.08)	0.50	0.08 (0.08)	0.32
Facet joint sclerosis	0.25 (0.13)	0.06	0.12 (0.09)	0.18	0.12 (0.09)	0.19
Model						
R^2	0.21		0.24		0.32	
P value	< 0.01		< 0.01		< 0.01	

Abbreviation: β, beta coefficient; FN, femoral neck; LS, lumbar spine; R^2, multiple correlation coefficient; SE, standard error; TH, total hip.

Table 4 Percentage of Osteoporotic Patients Based on BMD T-score at the LS, at the Hip, and at Both Sites, and Proportion of the Major LS-Hip Discordance

Group	%			
	Osteoporotic Patients			Major LS-Hip Discordance
	LS	Hip*	Both	
Non-degenerative LS (n = 536)	29.7	7.5	31.5	25.9
Degenerative LS (n = 623)				
Evaluable DXA scan (n = 458)	36.5	15.7	40.8	28.6
Unevaluable DXA scan (n = 165)	NA	26.1	NA	NA

Abbreviation: DXA, dual-energy X-ray absorptiometry; FN, femoral neck; LS, lumbar spine; NA, not applicable; TH, total hip.

* BMD T-score at the hip based on ROIs at femoral neck and total hip.

We found that 28.6% of major T-score discordance in this group. T-score at the LS could detect more osteoporotic patients than T-score at the hip[15-21] and this study showed a similar result (36.5% vs 15.7%, respectively). However, T-score at the LS showed a false negative rate of 25%. Older age[15-17] associated with a false negative rate of LS in this study, but obesity[15-16] did not account for it. This incongruent result might be due to differences in age-related bone loss at different skeletal sites and in the young adult reference populations.[22-23] To clarify this finding further research is warrant for better understanding of the underlying causes.

Degenerative changes were more pronounced in the lower segments. This study found that L4 vertebra was the most common site of degeneration (81.6%), as previously reported.[6] We found 26.6% of LS compression on DXA scans and L1 vertebra was the most common site (10.7%). The diagnosis of vertebral compression on the PA spine DXA image was difficult unless there is a significant decrease in vertebral height, particularly LS with anterior wedge type of compression fracture and LS with degenerative manifestations.[6] Although the VFA image is not routinely performed in all DXA studies, vertebral compression and some degenerative lesions such as osteophyte formation along anterior border of vertebral body, facet joint sclerosis and vascular calcifications are better visualized on the VFA image (Figure 1B). This study suggested that the VFA image should be incorporated into a standard DXA study if vertebral deformity on an anterior image is not clear.

The correlations of degenerative LS lesions with T-score at the LS and hip were also evaluated. The results showed that there was a poor correlation between T-score of the LS (R^2 = 0.21, P < 0.01) and the hip (R^2 at FN = 0.24, P < 0.01; R^2 at TH = 0.32, P < 0.01), after adjusting for age, gender, BMI and non-vertebral fragility fracture. T-score at the LS was positively correlated with only osteophyte formation (β = 0.52, P < 0.05). These results are similar to the results of Muraki et al[4] and Atalay et al[8] Though, Pye et al[24] reported that osteophytes and endplate sclerosis correlated with an increase in BMD of the hip, but this study was unable to identify any correlation. This study suggested that the presence of degenerative lesions at LS did not predict osteoporosis at the LS or hip because of their correlation was insufficient.

This study was not a community-based population, because BMD was measured in participants who were suspected of having osteoporosis, and thus the proportion of those who had degenerative diseases of the spine might be higher than in a general population. However, the results of this study could contribute and lead to improved clinical practice.

Conclusions

Twenty-six percent of participants with degenerative lumbar spine did not evaluate L1-L4 BMD. While the hip seems to be the best measurement site, 28.6% of T-score discordance between the LS and the hip was still observed. T-score at LS showed a false negative rate of 25% and associated with older age. This study suggested that it would not be suitable to use the hip BMD alone to diagnose osteoporosis in older adult with a degenerative spine disease.

References

1. Jain RK, Vokes T. Dual-energy X-ray absorptiometry. *J Clin Densitom.* 2017;20(3):291-303. doi:10.1016/j.jocd.2017.06.014.
2. ISCD. Official Positions-Adult, 2015. International Society for Clinical Densitometry (ISCD). http://www.iscd.org/official-positions/2015-iscd-official-positions-adult/. Accessed May 27, 2018.
3. Rand T, Seidl G, Kainberger F, et al. Impact of spinal degenerative changes on the evaluation of bone mineral density with dual energy X-ray absorptiometry (DXA). *Calcif Tissue Int.* 1997;60(5):430-433.
4. Muraki S, Yamamoto S, Ishibashi H, et al. Impact of degenerative spinal diseases on bone mineral density of the lumbar spine in elderly women. *Osteoporos Int.* 2004;15(9):724-728. doi:10.1007/s00198-004-1600-y.
5. Schneider DL, Bettencourt R, Barrett-Connor E. Clinical utility of spine bone density in elderly women. *J Clin Densitom.* 2006;9(3):255-260. doi:10.1016/j.jocd.2006.04.116.
6. Tenne M, McGuigan F, Besjakov J, Gerdhem P, Åkesson K. Degenerative changes at the lumbar spine--implications for bone mineral density measurement in elderly women. *Osteoporos Int.* 2013;24(4):1419-28. doi:10.1007/s00198-012-2048-0.
7. Moayyeri A, Soltani A, Bahrami H, Sadatsafavi M, Jalili M, Larijani B. Preferred skeletal site for osteoporosis screening in high-risk populations. *Public Health.* 2006;120(9):863-871. doi:10.1016/j.puhe.2006.05.013.
8. Atalay A, Kozakcioglu M, Cubuk R, Tasali N, Guney S. Degeneration of the lumbar spine and dual-energy X-ray absorptiometry measurements in patients without osteoporosis. *Clin Imaging.* 2009;33(5):374-378. doi:10.1016/j.clinimag.2008.12.005.
9. Krege JH, Miller PD, Lenchik L, Misurski DA, Chen P. New or worsening lumbar spine vertebral fractures increase lumbar spine bone mineral density and falsely suggest improved skeletal status. *J Clin Densitom.* 2006;9(2):144-149. doi:10.1016/j.jocd.2006.02.001.
10. Bonnick SL, Lewis LA. *Bone Densitometry for Technologists.* 3rd ed. New York, NY: Springer; 2013.

11. El Maghraoui A, Mouinga Abayi DA, Rkain H, Mounach A. Discordance in diagnosis of osteoporosis using spine and hip bone densitometry. *J Clin Densitom.* 2007;10(2):153-156. doi:10.1016/j.jocd.2006.12.003.
12. World Health Organization. *WHO Expert Committee on Physical Status: the Use and Interpretation of Anthropometry*. Geneva, Switzerland: World Health Organization; 1995. http://apps.who.int/iris/bitstream/handle/10665/37003/WHO_TRS_854.pdf?sequence=1&isAllowed=y. Accessed May 27, 2018.
13. Genant HK, Wu CY, van Kuijk C, Nevitt MC. Vertebral fracture assessment using a semiquantitative technique. *J Bone Miner Res.* 1993;8(9):1137-1148. doi:10.1002/jbmr.5650080915.
14. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics.* 1977;33(1):159-174.
15. Moayyeri A, Soltani A, Tabari NK, Sadatsafavi M, Hossein-Neghad A, Larijani B. Discordance in diagnosis of osteoporosis using spine and hip bone densitometry. *BMC Endocr Disord.* 2005;5(1):3. doi:10.1186/1472-6823-5-3.
16. Mounach A, Abayi DA, Ghazi M, et al. Discordance between hip and spine bone mineral density measurement using DXA: prevalence and risk factors. *Semin Arthritis Rheum.* 2009;38(6):467-471. doi:10.1016/j.semarthrit.2008.04.001.
17. Singh M, Magon N, Singh T. Major and minor discordance in the diagnosis of postmenopausal osteoporosis among Indian women using hip and spine dual-energy X-ray absorptiometry. *J Midlife Health*. 2012;3(2):76-80. doi:10.4103/0976-7800.104457.
18. Ikegami S, Kamimura M, Uchiyama S, et al. Bone mineral density measurement at both spine and hip for diagnosing osteoporosis in Japanese patients. *J Clin Densitom.* 2009;12(3):337-344. doi:10.1016/j.jocd.2009.03.099.
19. Faulkner KG, von Stetten E, Miller P. Discordance in patient classification using T-scores. *J Clin Densitom.* 1999;2(3):343-350.
20. Woodson G. Dual X-ray absorptiometry T-score concordance and discordance between the hip and spine measurement sites. *J Clin Densitom.* 2000;3(4):319-324.
21. O'Gradaigh D, Debiram I, Love S, Richards HK, Compston JE. A prospective study of discordance in diagnosis of osteoporosis using spine and proximal femur bone densitometry. *Osteoporos Int.* 2003;14(1):13-18. doi:10.1007/s00198-002-1311-1.
22. Carey JJ, Delaney MF, Love TE, et al. DXA-generated Z-scores and T-scores may differ substantially and significantly in young adults. *J Clin Densitom.* 2007;10(4):351-358. doi:10.1016/j.jocd.2007.06.001.
23. Callréus M, McGuigan F, Akesson K. Country-specific young adult dual-energy X-ray absorptiometry reference data are warranted for T-score calculations in women: data from the peak-25 cohort. *J Clin Densitom.* 2014;17(1):129-135. doi:10.1016/j.jocd.2013.03.008.
24. Pye SR, Reid DM, Adams JE, Silman AJ, O'Neill TW. Radiographic features of lumbar disc degeneration and bone mineral density in men and women. *Ann Rheum Dis.* 2006;65(2):234-238. doi:10.1136/ard.2005.038224.

Original Article/นิพนธ์ต้นฉบับ

ความไม่สอดคล้องที่สำคัญในการวินิจฉัยโรคกระดูกพรุนในผู้ที่มีกระดูกสันหลังบั้นเอวเสื่อมโดยใช้การตรวจวัดความหนาแน่นกระดูกที่กระดูกสันหลังและกระดูกสะโพก

อลิสรา วงศ์สุทธิเลิศ[1], เกษม ใช้คล่องกิจ[2], สุธาสินี คงพร้อมสุข[1], วัลลภ ใจดี[3]

[1] สาขาวิชารังสีวิทยาและเวชศาสตร์นิวเคลียร์ คณะแพทยศาสตร์ มหาวิทยาลัยบูรพา ชลบุรี

[2] คณะวิทยาศาสตร์การกีฬา มหาวิทยาลัยบูรพา ชลบุรี

[3] ภาควิชาพื้นฐานสาธารณสุข คณะสาธารณสุขศาสตร์ มหาวิทยาลัยบูรพา ชลบุรี

บทคัดย่อ

บทนำ: ความไม่สอดคล้องที่สำคัญของค่า T-score ในการวินิจฉัยโรคกระดูกพรุนที่กระดูกสันหลังและกระดูกสะโพกอาจส่งผลต่อการแปลผลผิดในผู้ที่มีกระดูกสันหลังบั้นเอวเสื่อม

วัตถุประสงค์: เพื่อศึกษาความไม่สอดคล้องที่สำคัญของค่า T-score ในการวินิจฉัยโรคกระดูกพรุน โดยใช้การตรวจวัดความหนาแน่นกระดูกที่กระดูกสันหลังบั้นเอวและกระดูกสะโพกในผู้ที่มีกระดูกสันหลังบั้นเอวเสื่อม

วิธีการศึกษา: ข้อมูลประชากร การวัดสัดส่วนของร่างกาย และภาพถ่ายจากเครื่องตรวจวัดความหนาแน่นกระดูกที่กระดูกสันหลังบั้นเอวและกระดูกสะโพก ถูกดึงจากฐานข้อมูลของโรงพยาบาลมหาวิทยาลัยบูรพา การทดสอบความน่าเชื่อถือของการแปลผลภาพถ่ายโดยการวิเคราะห์ความสัมพันธ์ระหว่างรอยโรคของกระดูกสันหลังบั้นเอวเสื่อมกับค่า T-score ของความหนาแน่นกระดูกที่ L1-L4 จากนั้นทำการวิเคราะห์ความไม่สอดคล้องที่สำคัญเมื่อพบว่ามีหนึ่งตำแหน่งกระดูกเป็นโรคกระดูกพรุนและตำแหน่งอื่นเป็นภาวะกระดูกบางหรือภาวะปกติ

ผลการศึกษา: ความไม่สอดคล้องที่สำคัญของกระดูกสันหลังบั้นเอวและกระดูกสะโพก พบร้อยละ 28.6 และความหนาแน่นกระดูกสะโพกพบในผู้ที่มีโรคกระดูกพรุนน้อยกว่าความหนาแน่นของกระดูกสันหลังบั้นเอว (ร้อยละ 15.7 เปรียบเทียบกับร้อยละ 36.5) ค่า T-score ที่กระดูกสันหลังบั้นเอวพบอัตราผลบวกปลอม (False negative rate) ร้อยละ 25.0 รอยโรคของกระดูกสันหลังบั้นเอวเสื่อมมีความสัมพันธ์น้อยกับค่า T-score ของความหนาแน่นกระดูกที่กระดุกสันหลังบั้นเอว ($R^2 = 0.21, P < 0.01$) และที่กระดูกสะโพก (R^2 ที่คอกระดูกสะโพก $= 0.24, P < 0.01$; R^2 ที่ข้อกระดูกสะโพก $= 0.32, P < 0.01$)

สรุป: ร้อยละ 26 ของผู้ที่มีกระดูกสันหลังบั้นเอวเสื่อมไม่สามารถประเมินความหนาแน่นกระดูกที่ L1-L4 ในขณะที่กระดูกสะโพกอาจเป็นตำแหน่งที่ดีที่สุดสำหรับการประเมิน แต่ยังคงพบความไม่สอดคล้องที่สำคัญของค่า T-score ระหว่างกระดูกสันหลังบั้นเอวและกระดูกสะโพกร้อยละ 28.6 ค่า T-score ที่กระดูกสันหลังบั้นเอวพบอัตราผลบวกปลอมร้อยละ 25.0 และสัมพันธ์กับอายุมาก การศึกษานี้แสดงให้เห็นว่า การวิเคราะห์ความหนาแน่นกระดูกที่กระดูกสะโพกเพียงตำแหน่งเดียวเพื่อวินิจฉัยโรคกระดูกพรุนในผู้สูงอายุที่มีกระดูกสันหลังบั้นเอวเสื่อมอาจยังไม่เหมาะสม

คำสำคัญ: ความหนาแน่นกระดูก เครื่องตรวจวัดความหนาแน่นกระดูก กระดูกสันหลังบั้นเอว โรคกระดูกสันหลังเสื่อม

Corresponding Author: อลิสรา วงศ์สุทธิเลิศ

สาขาวิชารังสีวิทยาและเวชศาสตร์นิวเคลียร์ คณะแพทยศาสตร์ มหาวิทยาลัยบูรพา

169 ถนนลงหาดบางแสน ตำบลแสนสุข อำเภอเมือง จังหวัดชลบุรี 20131

โทรศัพท์ +668 1909 0612 อีเมล gmasimin@gmail.com