신경근육재활 및 전기진단
발표일시 및 장소 : **10 월 27 일(토) 14:30-14:40 Room D(5F)**

OP3-3-4

Effects of Traction on Lumbar Bone Mineral Density in Patients Duchenne Muscular Dystrophy

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Introduction
We compared the performance of dual-energy X-ray absorptiometry (DXA) and quantitative computed tomography (QCT) in evaluating the bone mineral density (BMD) of patients with Duchenne muscular dystrophy (DMD) and scoliosis. Here, we propose a new measurement method and diagnostic criteria that are more accurate than current options.

Methods
This study included 29 patients with DMD (mean age 19.72 ± 6.13 years) (Table 1). Participants underwent whole spine radiograph and DXA before and after traction (to render distance between shoulder and its ipsilateral anterior-superior iliac spine equal in all imaging tests). They underwent QCT only without traction. The scoliosis and vertebral rotation angles obtained before and after traction were compared, and the BMD values obtained by DXA were compared to those obtained by QCT, known to be unaffected by the effects of spinal deformity, to analyze the association among these parameters. The scoliosis angle was presented as Cobb's angle. In addition to the degree of curvature for each patient, the Cobb's angle of L1 to L4, which is used for bone density analysis in DXA, was also measured.

Results
The Cobb's angle significantly decreased from 30.38±24.83° before to 22.78±20.41° after traction ($p < .0001$), and Z-score from -1.88 ± 1.59 to -2.86 ± 2.16 ($p < .0001$) (Table 2). Changes in rotation angle, BMD, and bone mineral content were not significant. Post-traction BMD values and Z-scores showed a higher correlation with QCT measurements than pre-traction. We also found that the pre- and post-traction Z-scores (≤ -1.1 and -1.36, respectively) used in the DXA measurements as cut-off values for the diagnosis of

osteoporosis were more accurate in identifying patients with osteoporosis according to QCT scans compared with the pre-existing Z-score of -2 or less (Table 3).

Conclusion

Lumbar BMD measured by DXA in patients with DMD and scoliosis allowed a more accurate diagnosis of osteoporosis when traction was applied.

Table 1. Clinical data of the participants

		No. of patients
Walking ability	Possible	1 (3%)
	Impossible	28 (97%)
History of steroid use	Yes	7 (24%)
	No	22 (76%)
Lower limb fracture history	Yes	9 (31%)
	No	20 (69%)
Vertebral fracture history	Yes	0 (0%)
	No	29 (100%)

Values are presented as numbers (%).

Table 2. Comparison of pre-traction and post-traction variables

			Pre-traction	Post-traction	p-value
Scoliosis	Cobb's angle (°)		30.38 ± 24.83	22.78 ± 20.41	<.0001*
	L1 to L4 Cobb's angle (°)		16.99 ± 13.23	10.58 ± 9.93	<.0001*
Vertebral rotation	Nash-Moe Classification	L1	2.03 ± 1.43	1.97 ± 13.35	0.424
		L2	1.86 ± 1.33	1.86 ± 1.33	1.000
		L3	1.62 ± 1.35	1.59 ± 1.18	0.712
		L4	1.31 ± 1.39	1.28 ± 1.28	0.712
		L5	1.10 ± 8.75	1.03 ± 1.30	0.646
	Axial vertebral rotation angle	L1	18.13 ± 13.21	19.10 ± 14.13	0.874
		L2	18.58 ± 13.04	21.31 ± 15.26	0.110
		L3	17.65 ± 12.67	20.21 ± 14.24	2.212
		L4	15.81 ± 14.54	17.03 ± 13.91	0.745
DXA values (n = 29)	Mean aBMD (g/cm^2)		0.86 ± 0.23	0.82 ± 0.24	0.050
	Mean BMC (g)		11.46 ± 4.37	11.05 ± 4.17	0.164
	Z-score		-1.88 ± 1.59	-2.86 ± 2.16	<.0001*
QCT values (n = 26)	Mean vBMD (mg/cm^3)		101.18 ± 29.72	-	-
	Z-score		-3.15 ± 1.10	-	-

Values are presented as a mean ± standard deviation.

aBMD, areal bone mineral density; BMC, bone mineral content; DXA, dual-energy X-ray absorptiometry; QCT, quantitative computed tomography; vBMD, volumetric bone mineral density.

Table 3. Optimal cutoff point of the Z-score measured with pre-traction and post-traction DXA to predict an abnormal QCT finding using the Youden index

	AUC	95% CI	Optimal cutoff point	Sensitivity	95% CI	Specificity	95% CI
Pre-traction Z-score	0.875	0.682 to 0.972	≤ -1.10	70.00	45.7 to 88.1	100.00	47.8 to 100.0
Post-traction Z-score	0.910	0.726 to 0.987	≤ -1.37	80.00	56.3 to 94.3	100.00	47.8 to 100.0

The optimal cutoff point was defined as the maximum point of the Youden function, which is the difference between the true-positive rate and false-positive rate among all possible cutoff point values.

AUC, area under the curve; CI, confidence interval; DXA, dual-energy X-ray absorptiometry.