

Effect of Bisphosphonate for Bone Marrow Density in Adult Duchenne Muscular Dystrophy

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Abstract Objective

DMD (Duchenne muscular dystrophy) is the most frequent type of genetic muscular dystrophy with severe activity of daily living deterioration progressed during childhood. The reasons for rising risks in osteoporosis in DMD are a sedentary life style, a rare sun exposure with vitamin D deficiency and a decrease in muscle power. The process of osteoporosis in those children is assessed by central bone marrow density. The efforts to find the treatment about osteoporosis in younger DMD patient have been made in several studies, but not in adult groups due to the short life expectancy. Bisphosphonate is a commonly used medication of osteoporosis in general population, which inhibits osteoclast activity and reduces bone resorption. There is little evidence of effectiveness of bisphosphonate in DMD. The aim of this study is that to verify the effect of the most frequently used osteoporosis medication in adult DMD patients by dual-energy X-ray absorptiometry (DXA) of spine.

Materials & Methods

We retrospectively collected data of DMD patients who was diagnosed by gene study or muscle biopsy at a single tertiary university hospital from June 2007 to June 2017. We included the patient who had been examined BMD-DXA at the age over 18, while taking bisphosphonate at least for a year. The data was analyzed throughout the patient without scoliosis surgery. The patients who had been applied steroid therapy were excluded.

Result

Total 147 subjects were collected and statistics analysis was conducted on 70 patients who were taken BMD-DXA of spine at least twice. The average age at the initial examined period was 25.1 and the mean of Z-score was -4.196. BMD-DXA measured at approximately 1 year intervals were listed for each patient to identify the trend using the Spaghetti plot (figure 1). We used linear-mixed models to establish that the examined data changed significantly over time. Z-score increased 0.084 per year significantly (p-value = 0.0063) (Table 1). There was a significant increase observed in values in 3rd years and 5th years compared to the initial examined period (Table 2).

Conclusion

Continuous use of bisphosphonate in DMD adult patients shows significant increase in BMD-DXA Z-score of spine over periods. We can carefully conclude that it takes about a minimum of three years to bring a significant change to bone marrow density.

Table 1. The actual change of BMD-DXA Z-score of spine (per year).

	Z-score(SE)	p-value
Total (N=70)	0.084(0.024)	0.0063

Table 2. Significance of the change of BMD-DXA Z-score values at the initial examined period and at each 1-year period. The data regularly measured at approximately a year interval from the initial period shows significant increases in 3rd years and 5th years compared to the initial.

Time (year)	Estimated mean(SE)	Post-hoc p-value					
		0	1	2	3	4	5
0	-4.196(0.225)	Ref	0.0904	0.9828	0.0031	0.2438	0.0234
1	-3.994(0.237)		Ref	0.1696	0.2351	0.9808	0.1414
2	-4.194(0.236)			Ref	0.0104	0.2837	0.0292
3	-3.818(0.240)				Ref	0.3315	0.4015
4	-3.998(0.266)					Ref	0.1696
5	-3.587(0.336)						Ref

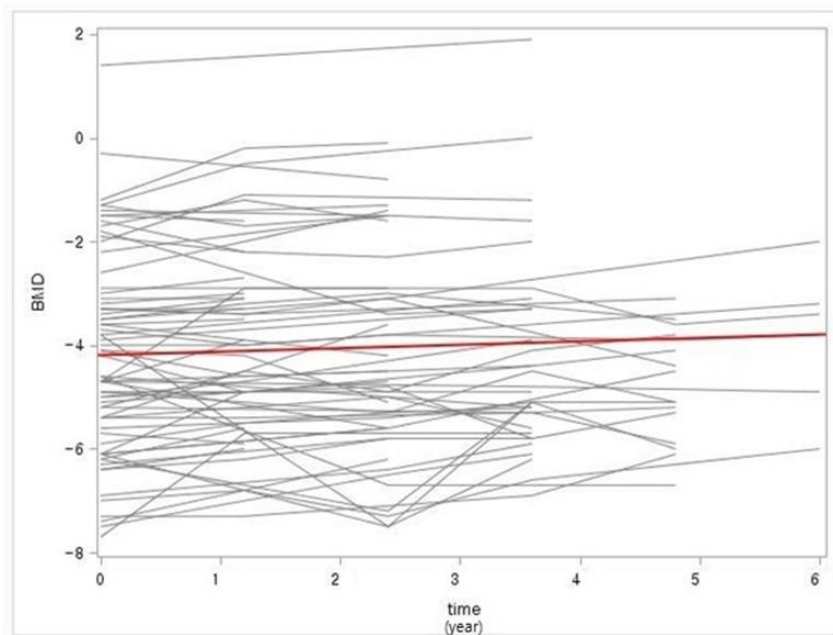


Figure 1. Changes of BMD-DXA Z-score of spine at each year on spaghetti plot.