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Serum 25-hydroxy-calciferol level and failed back surgery syndrome

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ABSTRACT

Purpose. To assess the association of serum 25-hydroxy-calciferol levels with pain and low back function in patients with failed back surgery syndrome.

Methods. Records of 6 men and 3 women aged 25 to 54 (mean, 39.2) years who had failed back surgery syndrome after pedicular screw and rod instrumentation for lower lumbar degenerative diseases were reviewed. They had moderate-to-severe pain (visual analogue scale [VAS] score of >6) and low back function disability (Japanese Orthopaedic Association [JOA] back score of <10). In all patients, the serum 25-hydroxy-calciferol level was <30 ng/ml, indicating vitamin D deficiency. Vitamin D2 (20 000 IU per day) was given for 10 days, and vitamin D3 (600 IU per day) was given for maintenance. Patients were followed up at months 3 and 6. Three men and 4 women aged 27 to 55 (mean, 41.3) years who were age- and disease-matched but achieved good outcomes (VAS score of 0–1 and mean JOA low back score of 14.7) were used as indirect referents. All 7 matched patients except one had a normal serum 25-hydroxy-calciferol level (mean, 40.6 ng/ml).

Results. In the 9 patients with failed back surgery syndrome, the mean duration of chronic pain was 2.6 years; the mean VAS score for pain was 7.7; the mean JOA low back score was 7.6; the mean number of reoperations was 2.2; and the mean serum 25-hydroxy-calciferol level was 17.0 ng/ml. Two male patients had grade-IV motor weakness and decreased sensory function based on the pin prick test. One patient had a history of prolonged (>3 months) antibiotic use after primary surgery, but had no evidence of infection. Six months after vitamin D2 and vitamin D3 supplementation, the mean serum 25-hydroxy-calciferol level improved significantly (17.0 vs. 42.5 ng/ml), as did the mean pain score (7.7 vs. 4.2) and mean JOA back score (7.6 vs. 11.1). Seven of the patients had a pain score of <6 and a JOA back score of >10, the remaining 2 patients had neurological deficits and only slight improvement.

Conclusion. Vitamin D supplementation may be used as an adjuvant treatment for patients with failed back surgery syndrome.

Key words: *failed back surgery syndrome; low back pain; pain management; vitamin D deficiency*

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INTRODUCTION

Patients with failed back surgery syndrome present with chronic back pain, disability, and depression. This syndrome involves enormous costs to patients, insurers, and the society.[1] Conservative treatments may prevent the need for further surgery, as each surgery lowers the likelihood of success,[2] but the treatment of choice remains controversial.[3–7]

Vitamin D deficiency is fairly common in patients with chronic pain syndrome and/or musculoskeletal pain.[8–10] We assessed the association of serum 25-hydroxy-calciferol levels with pain and low back function in patients with failed back surgery syndrome.

MATERIALS AND METHODS

Records of 6 men and 3 women aged 25 to 54 (mean, 39.2; standard deviation [SD], 9.8) years who had failed back surgery syndrome after pedicular screw and rod instrumentation for lower lumbar degenerative diseases between 2005 and 2010 were reviewed. They had moderate-to-severe pain (visual analogue scale [VAS] score of >6) and low back function disability (Japanese Orthopaedic Association [JOA] back score[11] of <10 [Table 1]). The pain did not improve even after intensive conservative (pharmacological and psychological) treatment for at least 6 months. Patients with underlying diseases (diabetes mellitus, liver and renal insufficiency) or mechanically induced pain (secondary to implant loosening, infection, and osteoporosis) according to bone mineral density measured by dual-energy X-ray absorptiometry were excluded, as were those who underwent more than 4 re-operations.

The number and types of surgery, duration of chronic pain, and pain medication use were recorded (Table 2). In all patients, the serum 25-hydroxy-calciferol level was <30 (normal, 30–70)[12] ng/ml, indicating vitamin D deficiency.[12] Vitamin D2 (20 000 IU per day) was given for 10 days (and a further 10 days if needed until the level returned to normal), and vitamin D3 (600 IU per day) was given for maintenance. Patients were followed up at months 3 and 6.

Three men and 4 women aged 27 to 55 (mean, 41.3; SD, 9.8) years who were age- and disease-matched but achieved good outcomes (VAS score of 0–1 and mean JOA low back score of 14.7 [SD, 0.5; range, 14–15]) were used as indirect referents (Table 2). All 7 matched patients except one had a normal serum 25-hydroxy-calciferol level (mean, 40.6; SD, 9.4; range, 28–58 ng/ml).

Comparison was made using the Fisher's exact test (for discrete data) and paired *t*-test (for continuous data).

RESULTS

In the 9 patients with failed back surgery syndrome, the mean number of reoperations was 2.2 (SD, 1.3; range, 1–4); the mean duration of chronic pain was 2.6 (SD, 0.9; range, 1.5–5.0) years; the mean VAS score for pain was 7.7 (SD, 0.8; range, 7–9); the mean JOA low back score was 7.6 (SD, 1.0; range, 6–9); and the mean serum 25-hydroxy-calciferol level was 17.0 (SD, 5.7; range, 6–25) ng/ml. The latter 3 parameters differed significantly to those in the 7 age- and disease-matched referents (Table 2).

The 9 patients with failed back surgery syndrome had normal routine blood, renal function, and liver function results. Two male patients had grade-IV

Table 1
The Japanese Orthopaedic Association low back score[11]

Symptoms	Score (maximum 15)
Low back pain	
Continuous, severe	0
Occasional, severe	1
Occasional, mild	2
None	3
Radicular pain	
Continuous, severe	0
Occasional, severe	1
Occasional, slight	2
None	3
Gait	
Unable to walk farther than 100 m	0
Unable to walk farther than 500 m	1
Able to walk farther than 500 m despite causing pain	2
Normal	3
Straight leg raising test	
<30º	0
30º–70º	1
Normal	2
Sensory disturbance (objective)	
Marked	0
Slight	1
None	2
Motor disturbance	
Marked weakness (manual muscle testing of 0–3)	0
Slight weakness (manual muscle testing of 4)	1
Normal	2
Urinary function	
Severe dysuria	-6
Mild dysuria	-3
None	0

motor weakness and decreased sensory function based on the pin prick test. One patient had a history of prolonged (>3 months) antibiotic use after primary surgery, but had no evidence of infection. Regarding pain medication, 5 patients used non-steroidal anti-inflammatory drugs (NSAIDs) alone (ibuprofen, naproxen or celecoxib), 3 used NSAIDs and antineuropathic drugs (amitriptyline, gabapentin or pregabalin), and one used NSAIDs, antineuropathic drugs, and opioids (tramadol) [Table 2].

Respectively 3 and 6 months after vitamin D2 and vitamin D3 supplementation, the mean

Table 2
Clinical data for patients with failed back surgery syndrome and for age- and disease-matched referents

Patient no.	Sex/age (years)	Diagnosis	No. of re-operations	Surgical site	Prolonged anti-biotic use	Duration of chronic pain (years)	Pain medication
Patients with failed back surgery syndrome							
1	F/40	Spondylolisthesis	1	L4-S1	No	2.5	Non-steroidal anti-inflammatory drugs (NSAID)
2	F/29	Disc degeneration	2	L5-S1	No	5	NSAID
3	F/47	Spondylolisthesis	2	L3-S1	No	2.5	NSAID
4	M/33	Spondylolisthesis	1	L4-L5	No	2.5	NSAID
5	M/50	Disc degeneration	2	L5-S1	No	2	NSAID and antineuropathic drugs
6	M/54	Spondylolisthesis	4	L5-S1	No	2.5	NSAID and antineuropathic drugs
7	M/45	Spondylolisthesis	1	L3-S1	No	2	NSAID
8	M/30	Spondylolisthesis	4	L4-S1	No	2.5	NSAID, antineuropathic drugs, and opioids
9	M/25	Disc degeneration	3	L5-S1	Yes	1.5	NSAID and antineuropathic drugs
Age- and disease-matched referents							
1	F/38	Spondylolisthesis	0	L3-S1	No	0	Paracetamol
2	F/27	Disc degeneration	0	L5-S1	No	0	NSAID
3	F/49	Spondylolisthesis	0	L4-S1	No	0	Paracetamol
4	M/30	Disc degeneration	0	L4-L5	No	0	Paracetamol
5	M/35	Disc degeneration	0	L5-S1	No	0	NSAID
6	M/50	Spondylolisthesis	0	L4-S1	No	0	None
7	M/40	Spondylolisthesis	0	L3-S1	No	0	None

Table 3
Serum 25-hydroxy-calciferol level, visual analogue scale (VAS) score for pain, and Japanese Orthopaedic Association (JOA) low back score of the patients

Patient no.	Before treatment			Month 3			Month 6		
	Serum 25-hydroxy-calciferol level (ng/ml)	VAS score for pain	JOA low back score	Serum 25-hydroxy-calciferol level (ng/ml)	VAS score for pain	JOA low back score	Serum 25-hydroxy-calciferol level (ng/ml)	VAS score for pain	JOA low back score
1	6	8	7	23	7	9	36	5	11
2	18	8	7	33	6	10	41	4	12
3	14	9	7	28	3	12	46	2	12
4	21	7	9	33	2	12	50	2	12
5	20	8	7	42	3	12	51	2	12
6	20	8	8	29	7	9	34	7	9
7	10	7	9	26	4	10	38	5	11
8	20	8	8	26	8	8	49	4	11
9	25	9	6	29	7	10	38	7	10
Mean±SD	**17.0±5.7**	**7.7±0.8**	**7.6±1.0**	**29.7±5.2**	**5.2±2.1**	**10.2±1.4**	**42.5±6.0**	**4.2±1.9**	**11.1±1.0**

serum 25-hydroxy-calciferol level had improved significantly to 29.7 and 42.5 from 17.0 ng/ml, whereas the mean pain score had improved to 5.2 and 4.2 from 7.7, and the mean JOA back score had improved to 10.2 and 11.1 from 7.6 ($p<0.001$, paired *t*-test, Table 3). At month 3, only one patient did not improve in pain score and JOA back score. At month 6, 7 of the patients had a pain score of <6 and a JOA back score of >10, the remaining 2 patients had neurological deficits and only slight improvement.

DISCUSSION

Treatment for failed back surgery syndrome should be tailored to each patient.[13,14] Most such patients have undergone multiple reoperations without significant improvement. Conservative treatment is thus advocated. The guidelines for treatment mainly focus on pain control, rehabilitation, psychiatry and surgical intervention, and rarely on nutrition. Vitamin D is an essential nutrient for bone metabolism and neuromuscular function.[15] Its role in treating chronic pain syndrome is unclear because studies were few, of small scale, and of low quality.[16] Some studies used low doses of vitamin D and did not monitor the serum 25-hydroxy-calciferol level.[17] Vitamin D deficiency can affect patients of all ages.[18] Vitamin D was used as an adjuvant therapy for musculoskeletal pain and arthralgia, especially low back pain.[8,9,19–21] Sufficient vitamin D supplementation has significant clinical impact on chronic pain syndrome.[10] In a study of 6 patients with failed back surgery syndrome,[22] vitamin D supplementation resulted in good outcomes. High doses of vitamin D could reduce glial inflammation and reduce nitric oxide production in patients with post herpetic neuralgia.[23] The normal level of serum 25-hydroxy-calciferol in Thais is higher than 30 ng/ml, with no seasonal variation, as there is no winter and the weather is usually sunny.[12]

Limitations of our study included the lack of direct controls and a possible placebo effect from vitamin D supplementation. Further larger-scale, randomised, control studies are needed to confirm the benefit of vitamin D supplements in the treatment of failed back surgery syndrome.

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