J. Phys. Ther. Sci. 31: 141–148, 2019

The Journal of Physical Therapy Science

Original Article

Effectiveness of active soft tissue release and trigger point block for the diagnosis and treatment of low back and leg pain of predominantly gluteus medius origin: a report of 115 cases

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Abstract. [Purpose] Ineffective and prolonged treatment of low back pain is a major social problem resulting in a huge economic burden. The effectiveness of back pain and/or leg pain treatment using active soft tissue release alone or in combination with a trigger point block was examined. [Participants and Methods] Among 115 patients who underwent medical examination at Senshunkai Hospital during the study period, information on treatment outcomes using active soft tissue release alone or in combination with a trigger point block, location of myofascial trigger points, and duration of treatment were extracted for patients with low back pain, leg pain, or low back pain with leg pain. [Results] Myofascial pain syndrome was diagnosed in 73.4% (36/49) in the low back pain group, 50% (16/32) in the leg pain group, and 85.3% (29/34) in the low back pain with leg pain group. Symptom improvement was noted in all three groups with active soft tissue release alone (90.9%, 20/22; 90.0%, 9/10; and 100%, 14/14, respectively) and active soft tissue release + a trigger point block (90.9%, 10/11; 100%, 1/1; and 92.9%, 13/14, respectively). The gluteus medius was the major myofascial trigger point in all groups. [Conclusion] Manual therapy with active soft tissue release and a trigger point block constitutes an effective treatment combination for low back pain and leg pain, but prolonged treatment is required in chronic cases.

Key words: Myofascial pain syndrome, Active soft tissue release, Low back pain

(This article was submitted Aug. 17, 2018, and was accepted Nov. 5, 2018)

INTRODUCTION

Ineffective and prolonged treatment of low back pain is a major social problem that results in disability and a huge economic burden worldwide. A previous report indicated that the cause of low back pain is non-specific in 90% of cases[1)], while another report stated that the cause of low back pain can be clinically diagnosed in approximately 80% of cases[2)]. Low back pain and leg pain are frequently due to myofascial pain syndrome (MPS)[3)]. Treatment methods for myofascial pain syndrome (MPS) include placebo treatment, electrophysiological intervention, manual therapy, dry needling, stretching, acupuncture, exercise therapy, counseling, orthotic treatment, and injection[4)]. Various hypotheses have been proposed for the treatment of MPS, including the muscle gliding hypothesis proposed by Stecco et al.[5)], the muscle endplate disorder hypothesis (energy crisis hypothesis) proposed by Simmons et al.[6)], and the peripheral nerve constriction hypothesis proposed by Quintner and Cohen[7)]. Dry needling at myofascial trigger points (MTrPs) surrounding fascia as well as manual therapy in muscle fibers and surrounding connective tissue have been tried for MPS[8)]. Moreover, gluteus medius trigger point block (TPB) and fasciotomy

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Table 1. Patient's characteristics

Parameters	LBP group	LP group	LBP+LP group
Location of pain	Low back pain	Leg pain	Low back and leg pain
Age (years)	63.0 ± 18.0	64.0 ± 21.1	61.7 ± 20.3
MPS rate	36/49 (73.4%)	*16/32 (50.0%)	29/34 (85.3%)
Total cases with recorded onset and treatment duration	26	7	22
Cases with records of MTrPs (with MTrPs in G. med)	23 (19)	8 (6)	22 (15)

Groups: LBP: low back pain; LP: leg pain; LBP+LP: low back and leg pain.
*Five cases with MPS of the lower leg are included. MPS: myofascial pain syndrome; ASTR: active soft tissue release; TPB: trigger point block; NRS: numerical rating scale; MTrP: myofascial trigger point.

has recently been reported to improve symptoms in refractory cases of buttock pain[9].

Our clinic has been administering diagnostic treatment for low back and/or leg pain by using active soft tissue release (ASTR), a type of manual therapy directed at muscle fascia, that is useful for diagnosing the site of MTrPS and treatment of MPS[10, 11] and classic TPB. Because accurately diagnosing MPS and site specification of muscle related to symptoms is important in the treatment of MPS[3, 6]. Thus the purpose of this study was to confirm whether most of LBP or LP were diagnosed as MPS, to identify the prevalence of trigger point sites in LBP or LP for proper site diagnosis, and to verify the effectiveness of ASTR or TPB in the treatment of MPS.

PARTICIPANTS AND METHODS

This retrospective study was approved by the research ethics committee of Senshunkai Hospital, Kyoto, Japan (approval number: 1). The study population comprised 115 patients (mean age, 63.1 ± 19.3 years; range, 9–96 years, Table 1) with low back and/or leg pain who visited our clinics between October 2015 and September 2017. The records of patients who were evaluated during this period were reviewed for disease diagnosis and patients were assigned according to pain documented in the records to the LBP group (n=49) who complained of only LBP, LP group (n=32) who complained of only LP, or LBP+LP group (n=34) who complained of both LPB and LP. All patient information was anonymized but informed consent was not obtained as this requirement was waived due the retrospective nature of the study. After excluding patients with diagnosed fracture, tumor, infection, severe osteoarthritis, leg pain caused by muscles around the knees or lower legs, central nervous system disorder (lumbar spinal canal stenosis (LSCS) was not ruled out), or psychiatric disorder, this left 36 patients in the LBP group, 16 in the LP group (5 previously excluded cases with MPS of knee or ankle were added here), and 29 in the LBP+LP group for analysis. These patients all had a diagnosis of MPS.

With the exception of 4 patients who requested pharmacotherapy (3 LBP and 1 LBP+LP), all patients with identified MTrPs were treated with ASTR alone or in combination with TPB: 22 and 11 (of 33 patients) in the LBP group; 10 and 1 (of 11 patients) in the LP group; and 14 each (of 28 patients) in the LBP+LP group, respectively. Treatment options (ASTR alone or ASTR+TPB) were selected by considering the potential treatment effect (whether ASTR would be effective enough) and the patient's acceptance of the treatment. For each pain group, patients were further divided based on the treatment received, either ASTR or ASTR+TPB. The locations of MTrPs were also confirmed as well as the duration of treatment when noted in the medical records. The treatment duration was divided as follows: single treatment (except single treatment intervention were done more than twice), <1 month, <2 months, and ≥3 months. Patients with symptoms that persisted for ≥3 months were classified as having chronic pain.

During routine medical examination and also during general orthopedic physical examination, MTrPs were searched for to identify muscles that could be causing the symptoms. In a typical examination, confirming a taut band on the muscle, tenderness was elicied on applying pressure to the muscle[3, 6, 10], the target sites were recorded as an MTrP. Each patient was treated with ASTR or ASTR+TPB once in a 1- to 3-week period. The duration of treatment was determined based on pain relief.

After confirming the MTrPs, ASTR was performed as described previously[11]. While the target muscles were asked to be contracted state, the clinician then applied pressure on the target mucle, and the muscle was then stretched passively into extended state by the clinician. When possible, TPB was additionally administered to patients who still complained of pain even after ASTR or who were unable to tolerate the treatment, as well as patients for whom the effect of ASTR was inadequate.

For patients who complained of pain, a mixture of 0.25% lidocaine (20 ml) and neurotropin (1.8 units) diluted in saline was injected into the MTrP using a 22-gauge needle. Patients with a history of allergy to these drugs were injected only with saline. This procedure was not used when injection was not possible or when the patient declined the injection.

Numerical rating scale (NRS) scores were recorded before and after treatment by asking the patients to verbally rate their pain on a scale of 0 to 10. Quantitative variables were reported as mean ± standard deviation. Treatment outcome based on NRS score were assessed using the paired t-test. A p value of <0.05 was considered significant. Treatment outcomes and treatment duration were assessed using Fisher's exact test in the R statistical programming environment[12]. A p value of <0.05 was considered significant.

Table 2. Characteristics of ASTR treatment

Parameters	LBP group	LP group	LBP+LP group
ASTR treatment	22/33 (66.7%)	10/11 (90.9%)	14/28 (50%)
ASTR improvement rate	20/22 (90.9%)	9/10 (90%)	14/14 (100%)
NRS score improvement after ASTR	3.7 ± 1.6, p<0.001 (n=10)	N/A (n=1)	3.4 ± 2.0, p<0.001 (n=9)
Non-chronic pain treated with ASTR (cases within 3 months' duration)	12 (12)	2 (2)	3 (3)
Chronic pain treated with ASTR (cases within 3 months' duration)	5 (4)	4 (3)	9 (8)

Groups: LBP: low back pain; LP: leg pain; LBP+LP: low back and leg pain.
ASTR: active soft tissue release; TPB: trigger point block; NRS: numerical rating scale; MTrP: myofascial trigger point; N/A: Not assessed.

Table 3. Characteristics of ASTR+TPB treatment

Parameters	LBP group	LP group	LBP+LP group
ASTR+TPB treatment	11/33 (33.3%)	1/11 (9.1%)	14/28 (50%)
ASTR+TPB improvement rate	10/11 (90.9%)	1/1 (100%)	13/14 (92.9%)
NRS score improvement after ASTR+TPB	3.3 ± 1.0, p=0.009 (n=3)	N/A (n=1)	3.8 ± 2.5 p=0.015 (n=4)
Non-chronic pain treated with ASTR+TPB (cases within 3 months' duration)	3 (3)	0 (0)	4 (4)
Chronic pain treated with ASTR+TPB (cases within 3 months' duration)	6 (4)	1 (1)	6 (1)

Groups: LBP: low back pain; LP: leg pain; LBP+LP: low back and leg pain.
ASTR: active soft tissue release; TPB: trigger point block; NRS: numerical rating scale; MTrP: myofascial trigger point; N/A: Not assessed.

RESULTS

Symptom improvement was noted in all three pain groups with ASTR alone (LBP group, 90.9%, 20/22; LP group, 90.0%, 9/10; and LBP+LP group, 100%, 14/14) and ASTR+TPB (90.9%, 10/11; 100%, 1/1; and 92.9%, 13/14, respectively) (Tables 1, 2, and 3). Overall, NRS scores were significantly improved in patients in the LBP and LBP+LP groups treated with ASTR alone (paired t-test p<0.001; N=10 in LBP group, p<0.001; N=9 in LBP+LP group) (Table 2), and ASTR+TPB in both non-chronic and chronic cases (paired T test p<0.01; n=3 in LBP group, p=0.015; n=4 in LBP+LP group) (Table 3).

Data on muscle-related symptoms were available for 23 patients in the LBP group, 8 patients in the LP group, and 22 patients in the LBP+LP group (Table 1). As shown in Tables 1 and 4, the gluteus medius was the most common source of pain in the three groups [19/23 in the LBP group (cases without description of onset were omitted), 6/8 in the LP group (cases without description of onset were omitted), and 15/22 in the LBP+LP group].

Among 26 of 33 patients who could be followed up in the LBP group (Table 6), all non-chronic LBP patients completed treatment within 1 month, whereas 6 of the 11 chronic LBP patients (54.5%) needed a significantly longer treatment period of ≥1 month (Fisher's exact test, p=0.002) (Tables 5 and 6). Ten of 26 patients (57.1%) in the LBP group completed treatment within a single session, which was a significantly higher rate than in the LBP+LP group (Fisher's exact test, p=0.0009) (Tables 5, 6, and 8). There were also significant difference between the LP and LBP+LP group (Fisher's exact test, p=0.001) (Tables 5, 7, and 8). There were no significant differences between the LBP and LP groups.

DISCUSSION

The cause of low back pain has been reported to be non-specific in 90% of cases[1]. However, in the present study, in the 73.4% of LBP patients with a diagnosis of MPS, all 15 non-chronic LBP patients completed treatment within 1 month. In LBP patients in which the cause is clearly osteoarthritis or lumbar disk degeneration, treatments that work on the distal side of the affected area, such as ASTR and TPB, are not expected to provide pain relief. The fact that some patients determined to have MPS show symptom improvement with ASTR+TPB indicates that the current trend of diagnosing LBP as non-specific LBP should be revised. Back pain is complex and has multiple causes[13, 14]. It has also been reported that there are few direct clinical examinations that can enable a diagnosis of low back pain[2], and thus it is difficult to tie low back pain, as a diagnosis, to a single pathology. As such, it is necessary to diagnose various symptoms and imaging findings from the central nervous

Table 4. Distribution of MTrPs in the LBP, LP, and LBP+LP groups

(A)

Low back pain	
Site of MTrP	Number of cases
Gluteus medius	19
Iliopsoas	6
Gluteus maximus	4
Gluteus minimus	2
Piriformis	1
Latissimus dorsi	1

(B)

Leg pains	
Site of MTrP	Number of cases
Gluteus medius	6
Iliopsoas	1
Gluteus minimus	1
Piriformis	1

(C)

Low back pain and leg pain	
Site of MTrP	Number of cases
Gluteus medius	15
Piriformis	5
Gluteus maximus	4
Gluteus minimus	3
Quadratus lumborum	2
Multifidus lumborum	1

Groups: LBP: low back pain; LP: leg pain; LBP+LP: low back and leg pain.
LBP group: 1 case with MTrPs in the gluteus medius, gluteus maximus, and gluteus minimus was included in Table 4 (A).
LP group: 2 cases (1 case with MTrPs in the piriformis and 1 case with MTrPs of the gluteus medius) were included in Table 4 (B).
LBP+LP group:1 case with MTrPs in the quadratus lumborum was included in Table 4 (C).
MTrP: myofascial trigger point.

system to the fascia while understanding that the back pain might be associated with multiple causes.

In the present study, 50% of patients in the LP group were diagnosed with MPS; 90.9% of these patients showed improvement in symptoms after treatment (Tables 1–3). Although 76.5% of elderly volunteers have been found to exhibit LSCS on magnetic resonance imaging, reports indicate that the prevalence of symptomatic LSCS is only 9.3%, suggesting that, despite imaging findings of LSCS, many patients are asymptomatic[15]. It is often clinically observed that diagnosing lumbar intervertebral disc herniation (LDH) or LSCS is rather rare in case of leg pain. Considering that the symptom improvement rate for leg pain was approximately 90% in the present study, this might be because the remaining 10% were undiagnosed LSCS patients, or that 10% of missed diagnosis of other diseases or sites of MTrPs, or the 10% were leg pain of of unknown origin. Nevertheless main cause of leg pain can be attributed to myofascial conditions because 90% patients of MPS showed improvement on this study. Despite the diagnosis of LSCS on imaging, there is still possibility of cure by using conservative treatment modalities like ASTR or TPB as is often observed in routine clinical practice. Surgical therapy therefore should be considered in patients with a diagnosis of LDH or LSCS for which conservative treatment for MPS, including ASTR+TPB, are ineffective. The causative muscles of low back pain have been reported to be the erector spinae, multifidus, rotator muscles, rectus abdominus, quadratus lumborum, iliopsoas, gluteus medius, gluteus maximus, levator ani, and piriformis[3]. Additionally, many reports have indicated that weakness of the gluteus medius is, in particular, involved in low back pain[16, 17]. In the present study, the gluteus medius was the most common causative muscle for low back pain, leg pain, and low back and leg pain. There are several issues regarding the diagnosis of MPS that relate to the evaluation of mistreated cases, including inadequate diagnosis of MPS or muscle distribution, and technical errors of muscle release, in quantity or duration. There are

Table 5. Duration of treatment

(A)

Low back pain			
Excruding chronic pain		Chronic pain	
Duration of treatment	Number of cases	Duration of treatment	Number of cases
Single session	8	Single session	2
<1 month	7	<1 month	3
<2 months	0	<2 months	3
≥3 months	0	≥3 months	3

(B)

Leg pains			
Excruding chronic pain		Chronic pain	
Duration of treatment	Number of cases	Duration of treatment	Number of cases
Single session	2	Single session	2
<1 month	0	<1 month	2
<2 months	0	<2 months	0
≥3 months	0	≥3 months	1

(C)

Low back pain and leg pain			
Excruding chronic pain		Chronic pain	
Duration of treatment	Number of cases	Duration of treatment	Number of cases
Single session	0	Single session	0
<1 month	5	<1 month	6
<2 months	2	<2 months	3
≥3 months	0	≥3 months	6

Duration of treatment with combined ASTR and TPB for non chronic and chronic low back pain (A), leg pain (B), and low back and leg pain (C).
Chronic pain is defined as pain persisting more than 3 months at the beginning of the first visit.

reports that these problems can be differentially diagnosed using surface ultrasonography[13, 18], but it is difficult to diagnose MPS simply on the basis of MTrPs findings alone[2]. However, in the treatment of low back and leg pain, it is important to provide medical care while observing the responsiveness of the patient to treatment and bearing in mind the causative fascia, because symptoms may change dramatically with fascial treatments like ASTR and/or TPB.

In the present study, response to ASTR facilitated a diagnosis of MPS. Thus, ASTR is a good tool for diagnostic therapy of MPS as it evaluates the response to fascial manipulation[11]. Many patients showed good response to ASTR alone, which suggests that ASTR can be considered as the first-line treatment option especially for non-chronic low back pain or leg pain. ASTR is also an important treatment option in cases for which the use of injections is not preferable (e.g., pediatric patients and patients with a fear of needles).

Among patients with piriformis syndrome, for whom the MTrP located in the piriformis was causing the leg pain[19, 20], 5 of 6 patients showed symptom improvement after ASTR (Tables 4, 7, and 8). Thus, ASTR alone might be appropriate for treating piriformis syndrome. Then Table 4 shows other muscles other than piriformis muscle also exhibiting symptoms similar to piriformis syndrome. Thus it may be possible to define syndromes of other muscle for these other muscles like "gluteus medius syndrome" or "gluteus minimus syndrome" in patients with complaints of LBP or LP. In this study gluteus medius syndrome was present in 40 patients and its prevalence was 38.1% (40/105) in LBP or LP patients. A diagnosis based on muscle origin may be a more useful definition than non-specific low back pain because this includes the cause of the symptoms and allows for better communication with physical therapists and other medical staff.

This retrospective study was conducted using data extracted from medical records, and not all physical examinations were performed by the same physician. Routine physical examinations may have differed between sessions and no ultrasonography examinations were performed. There were limitations in interrater reliability and accuracy of site diagnosis. Apparent LSCS was not excluded and MPS diagnosis might be different from that of other articles. TPB was administered in principle when ASTR was ineffective; however, this was not always recorded as such in the medical records and we cannot rule out that TPB may have been applied in some cases even though ASTR alone might have been effective over the longer term. The small, uneven sample sizes were another limitation. A larger, randomized study is necessary to confirm the effects seen here and to rule out placebo effects.

Table 6. Cases with low back pain (n=26; LBP group)

Case	Age	Gen.	Onset	Treatment	MTrPs	Improvement	Duration of treatment
1	47	F	Not chronic	ASTR	G. med	Improved	Single
2	36	M	Not chronic	ASTR	G. med	Improved	Single
3	64	M	Not chronic	ASTR	G. maxi	Improved	Single
4	83	M	Not chronic	ASTR	G. med	Improved	Single
5	68	M	Not chronic	ASTR	G. med, Iliop	Improved (4.5/10)	1M
6	40	F	Not chronic	ASTR	G. med, Iliop	Improved	1M
7	51	M	Not chronic	ASTR	Iliop	Improved (2/10)	1M
8	62	F	Not chronic	ASTR	G. med, Iliop	Improved (0/10)	1M
9	45	M	Not chronic	ASTR	Iliop	Improved (5/10)	1M
10	50	M	Not chronic	ASTR	G. med	Improved (4/10)	1M
11	64	M	Not chronic	ASTR	G. med	Improved (5/10)	1M
12	39	F	Not chronic	ASTR	G. med	Improved	Single
13	75	M	Not chronic	ASTR+TPB	N.W.	Improved	Single
14	46	M	Not chronic	ASTR+TPB	G. med	Improved (4/10)	Single
15	75	M	Not chronic	ASTR+TPB	N.W.	Improved	Single
16	47	F	Chronic	ASTR	G. med, Lat.	Improved (4/10)	Single
17	32	F	Chronic	ASTR	Iliop	Improved (4/10)	1M
18	65	M	Chronic	ASTR	G. med	Improved (5/10)	1M
19	46	M	Chronic	ASTR	G. med, Piri	Improved (2/10)	2M
20	72	F	Chronic	ASTR	N.W.	Improved (5/10)	≥3M
21	83	F	Chronic	ASTR+TPB	G. maxi G. med	Improved	Single
22	68	F	Chronic	ASTR+TPB	G. med	Improved	≥3M
23	75	F	Chronic	ASTR+TPB	G. med	Improved	1M
24	73	M	Chronic	ASTR+TPB	G. med	Improved (3/10)	≥3M
25	52	M	Chronic	ASTR+TPB	G. maxi G. med G. mini	Improved (5/10)	2M
26	67	M	Chronic	ASTR+TPB	N.W.	Improved	2M

Cases with no record of time of onset are omitted. Gen.: gender; F: female; M: male; N.W.: not written in the medical chart; G. med: gluteus medius, G. maxi: gluteus maximus; G. mini: gluteus minimus; Piri: piriformis; Iliop: iliopsoas; Lat: latissimus dorsi.

Table 7. Cases with leg pain (n=7; LP group)

Case	Age	Gender	Onset	Treatment	MTrPs	Improvement	Duration of treatment
1	8	M	Not chronic	ASTR	G. med	Improved	Single
2	9	M	Not chronic	ASTR	G. med + G. mini	Improved (6/10)	Single
3	39	F	Chronic	ASTR+TPB	G. med	Improved	Single
4	71	M	Chronic	ASTR	G. med	Improved	Single
5	80	M	Chronic	ASTR	G. med	Improved	1M
6	75	M	Chronic	ASTR	Iliop	Improved (2/10)	1M
7	68	F	Chronic	ASTR	N.W.	Improved	≥3M

Cases with no record of time of onset are omitted. Gen.: gender; F: female; M: male; N.W.: not written in medical chart; ASTR: active soft tissue release; TPB: trigger point block; G. med: gluteus medius; G. mini: gluteus minimus; Iliop: iliopsoas.

Among the various manipulative therapies, ASTR combined with traditional TPB constitute an effective in diagnosis and treatment modality for low back pain and leg pain. However, chronic cases may require prolonged treatment of more than 3 months. MPS is major cause of low back pain and leg pain, predominantly in the gluteus medius. Our findings should be helpful to physicians and physical therapists in the diagnosis and treatment of patients with low back and/or leg pain. Future studies are essential to investigate whether intervention with ASTR as well as exercise and cognitive behavioral therapy

Table 8. Cases with low back and leg pain (n=22; LBP+LP group)

Case	Age	Gen.	Onset	Treatment	MTrPs	Improvement	Duration of treatment
1	55	F	Not chronic	ASTR	G. med	Improved (3/10)	1M
2	49	M	Not chronic	ASTR	Piri	Improved (4/10)	1M
3	22	M	Not chronic	ASTR	G. med, Piri	Improved (1/10)	1M
4	75	F	Not chronic	ASTR+TPB	G. med G. maxi	Improved	1M
5	81	F	Not chronic	ASTR+TPB	G. med	Improved (5/10)	2M
6	84	F	Not chronic	ASTR+TPB	G. med	Improved (0/10)	1M
7	75	F	Not chronic	ASTR+TPB	G. maxi G. med, Piri	Improved	2M
8	78	F	Chronic	ASTR	G. med, Quad.	Improved	2M
9	80	M	Chronic	ASTR	G. med	Improved	1M
10	45	F	Chronic	ASTR	Piri	Improved (0/10)	1M
11	49	M	Chronic	ASTR	G. med	Improved (2/10)	1M
12	41	M	Chronic	ASTR	Piri	Improved (5/10)	1M
13	28	M	Chronic	ASTR	G. med	Improved (4/10)	1M
14	44	F	Chronic	ASTR	G. med	Improved (1/10)	2M
15	63	F	Chronic	ASTR	G. mini	Improved	1M
16	68	M	Chronic	ASTR	G. mini	Improved (0/10)	≥3M
17	80	F	Chronic	ASTR+TPB	G. med G. mini	Improved	≥3M
18	81	F	Chronic	ASTR+TPB	G. med G. maxi	Improved (5/10)	2M
19	90	F	Chronic	ASTR+TPB	N.W.	Improved	≥3M
20	75	M	Chronic	ASTR+TPB	Multi.	Not improved	≥3M
21	62	F	Chronic	ASTR+TPB	G. med G. maxi	Improved	≥3M
22	90	F	Chronic	ASTR+TPB	G. med	Improved	≥3M

Cases with no record of time of onset are omitted. F: female; M: male; N.W.: not written in medical chart; G. med: gluteus medius; G. maxi: gluteus maximus; G. mini: gluteus minimus; Piri: piriformis; Multi: multifidus; Quad: quadratus lumborum.

could provide sustained pain relief and shorten the treatment duration in patients with low back pain, leg pain, or low back and leg pain who do not respond to empirical treatment.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of interest

The authors have no conflicts of interest to declare.

ACKNOWLEDGEMENTS

The authors would like to thank Ms. Kinuko Imai, and Dr. Fujio Matsumoto for their guidance on conservative treatment. The authors also thank Dr. Mutsuhiro Tamura for guidance on surgical therapy, and to Mr. Masakazu Kutsunugi, Mr. Akinori Kihara, and Dr. Kiyokazu Akasaka for their advice during the drafting of this manuscript.

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