

ACUPUNCTURE RESEARCH

Distribution Characteristics of Meridian Sinew (Jingjin) Syndrome in 313 Cases of Whiplash-Associated Disorders*

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ABSTRACT Objective: To investigate and analyze the characteristics of Meridian Sinew (Jingjin) syndrome in patients with whiplash-associated disorders (WAD). **Methods:** From August 2010 to September 2011, 313 WAD cases from New York and California states were collected. The survey mostly collects the information of "Sinew Knotted Points" and symptoms of four types of Meridian Sinew differentiation—Taiyang, Shaoyin, Shaoyang and Yangming. **Results:** Among the cases which are on the average of medium injury level, the higher frequency of "Sinew Knotted Points" tenderness were found on Jianwaishu (SI 14), Jianzhongshu (SI 15), Tianchuang (SI 16), C3-6 Spinous Process, Dazhui (GV 14), Fengchi (GB 20), Tianliao (SJ 15) and Tianding (LI 17). The most commonly presented symptoms were widespread spasm and tenderness in the neck (Taiyang), difficulty in lateral flexion (Shaoyang), problems of extension and flexion (Taiyang), and stiffness and pain during neck movement (Yangming). Among the cases, 237 cases (75.72%) were related to Taiyang Meridian Sinew syndrome, 82 cases (26.20%) to Shaoyin syndrome and 175 (55.91%) and 176 (56.23%) cases to Shaoyang and Yangming syndrome respectively. The most of cases presented in a combination format. The syndrome distribution under Grade I, II and III reflected that more combination of the Meridian Sinew syndromes in the whiplash injury patients which is resulted from more severity of injury. **Conclusion:** It is practical to identify the location of abnormality through Meridian Sinew differentiation, considering both "Sinew Knotted Points" tenderness and corresponding symptoms, for the local neck symptoms of WAD.

KEYWORDS whiplash-association disorders, Meridian Sinew (Jingjin) syndrome, Sinew Knotted Point

As one of the disorders most leading to disability after traffic accidents in Western countries, whiplash is an acceleration-deceleration mechanism of energy transfer to the neck which may result from rear-end or side-impact motor vehicle collisions. The impact may result in bony or soft-tissue injury (whiplash injury), which may lead to a variety of clinical manifestations (whiplash-associated disorders, WAD). It has been reported in the United States that the incidence rate is about 3.8 per thousand each year and the annual related cost is over 29 billion US dollars, which includes treatment, diagnosis, insurance and reimbursement.⁽¹⁻⁴⁾

Acupuncture therapy has been included as one of the suggested modalities in general treatment guides of WAD.^(5,6) Some preliminary clinical cases or trials have been undertaken in the past but there remains a lot to be done.⁽⁷⁻¹⁴⁾

During acupuncture practice, it is important to identify the abnormality location of whiplash injury

in the neck and the ancient Meridian Sinew (Jingjin) theory could be applied for this purpose. Meridian Sinew is considered as a supplement system of regular twelve meridians which mostly connects the tendons, muscles and joints. The origin of this theory can be found in the chapter on Meridian Sinew

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in *Spiritual Pivot* (Ling Shu) and its commentaries from later generations. The authors conducted an in-depth exploration concerning the Chinese medicine syndrome differentiation for WAD patients.^(15,16) Furthermore, the authors investigated the clinical significance of ancient Meridian Sinew theory for WAD. At the same time taking into consideration the biomechanics of whiplash injury, the authors discovered that there was a very close relationship between whiplash injuries and abnormal sprain of the Meridian Sinews. Based on ancient theory and modern anatomy knowledge, the authors have categorized four syndromes of whiplash injury and their clinical manifestations as Taiyang, Shaoyin, Shaoyang and Yangming.^(17,18) These four syndromes can be used to practically identify the abnormality location in the neck after whiplash injuries.

The purpose of this study is to investigate and analyze the characteristics of Meridian Sinew syndrome in patients with WAD through a prospective cross-sectional survey and then to conclude the distribution characteristics of Meridian Sinew syndromes in WAD patients and thus provide evidence for guiding clinical therapeutics.

METHODS

Subjects

This study was conducted through clinical surveys between August 2010 and September 2011 involving 313 cases of WAD, 290 of which were collected from the clinics of the New York College of Traditional Chinese Medicine and eight other multidisciplinary clinics located in the New York metropolitan area. The other 23 cases were collected from the clinics of the Five Branches University and Integrative and Sports Medicine Center in California.

Diagnostic Criteria

The diagnosis for WAD is mostly based on history and neck symptoms and so far there have been no diagnostic criteria found except one from a Chinese scholar.⁽¹⁹⁾ To fill this gap, the authors used the Quebec Task Force (QTF) on WAD⁽¹⁾ to formulate the following diagnostic criteria (both 2 items should be met): (1) history of car accident; (2) neck pain, stiffness of the neck, or tenderness; or accompanied by shoulder pain, arm radiating pain and headache; or musculo-skeletal and neurological signs detected.

Criteria for the Meridian Sinews Syndromes

According to traditional Meridian Sinew theory and some modern interpretation⁽²⁰⁾ as well as the authors' study, criteria for the Meridian Sinew syndromes related to whiplash injuries were formulated. Each syndrome is identified as having at least one of the related "Sinew Knotted Points" tenderness plus as presenting at least one of the related symptoms. (1) Taiyang Meridian Sinew syndrome: tenderness on Jianzhen (SI 9), Jianwaishu (SI 14), Jianzhongshu (SI 15), Tianchuang (SI 16), Tianzhu (BL 10), Wangu (GB 12), Yuzhen (BL 9), C3-6 Spinous Process, Dazhui (GV 14), and Taodao (GV 13); symptoms of widespread spasm and tenderness in the neck, and problems of extension and flexion. (2) Shaoyin Meridian Sinew syndrome: tenderness on the Lower Edge of the Occipitus and C3-6 Transverse Process; symptoms of pain in the deep area of the neck, difficulty in flexion, and dizziness. (3) Shaoyang Meridian Sinew syndrome: tenderness on Jianliao (SJ 14), Tianliao (SJ 15), Tianyou (SJ 16) and Fengchi (GB 20); symptoms of spasm in the neck with a tendency for hands to support the head, and difficulty in lateral flexion. (4) Yangming Meridian Sinew syndrome: tenderness on Jianyu (LI 15), Jugu (LI 16), Futu (LI 18), Renying (ST 9), and Quepen (ST 12); symptoms of spasm in the neck with difficulty of head rotation, stiffness and pain during neck movement, and inability to raise the shoulder. Since Tianding (LI 17) is the crossing point of Shaoyang and Yangming, tenderness on this point is considered as indicating that both Meridian Sinews are involved.

Inclusive Criteria

The subjects should meet diagnostic criteria as Grade I, II or III WAD in the acute or subacute stage of injury and their age should be between 18–60 years old. All the subjects should sign the informed consent form.

Exclusive Criteria

The subjects should be excluded if he/she had head injury accompanied by unconsciousness, or combined with clearly diagnosed, non-whiplash related serious systemic illness such as cancer, diabetes, chronic heart disease, or immune disorder, or more than one car accident within 1 year, or mental abnormality, personality change or other reasons prohibited completion of survey.

Survey Form

Before the clinical survey, a clinical survey form for WAD in Chinese medicine was designed on the basis of literature analysis, symptoms and signs screening and quantitative grading. The form has been through repeated structural and contents amendments as well as peer review.

Terminology

After analyzing the corresponding literature of whiplash injuries and WAD published in the past 30 years, the authors extracted common symptoms and signs of WAD according to the characteristics of their stages and grades and also clarified and standardized those terms in accordance with Chinese Terms in Traditional Chinese Medicine and Pharmacy (2004), Diagnostics of Traditional Chinese Medicine, and Standard of Diagnosis and Therapeutic Effect of Traditional Chinese Medicine Disease and Syndrome.⁽²¹⁻²³⁾

Quantitative Grading

During the processing of common symptom terms for WAD, the authors also developed a quantitative grading for those symptoms taking the Quantitative Diagnosis of Traditional Chinese Medicine and Differentia Diagnosis of Traditional Chinese Medicine Symptomatology^(24,25) as the reference in order to make this clinical survey form meet the standard required by clinical epidemiology. In the survey form, all common symptoms and signs of WAD were quantitatively graded. In general, there were four grades—none, light, moderate and severe—for most Chinese medicine symptoms and signs, and two grades—none (N) and yes (Y)—for some symptoms which were difficult to grade or had no significance as to grade. For symptoms like pain, grading was focused on location, severity, quality, character, and frequency. Sinew Knotted Point tenderness was graded as none (no pain), light (not obvious: patient feels pain but tolerable), medium (obvious: patient feels pain accompanied by avoid actions) and severe (significantly obvious: patient refuses pressure).

Amendments

The clinical survey form was repeatedly amended and improved and the twelfth one became the final version. Based on peer review, the form was verified for its contents, items and clinical operability. Also, the investigators were invited to discuss the corresponding

contents of the clinical survey and to make sure this survey was appropriately conducted in the US.

Contents and Items

The survey form included the following contents: (1) Demographic data included name initials, gender, date of birth, marital status, occupation and residential location zip code; (2) History: chief complaint, current history (date of accident, collision type, position in car during the accident, went to emergency room or not, symptoms after accident), treatment history, past medical history, allergy history, history of mental disorder and influential factors; (3) Patient self-evaluation: pain intensity by Visual Analogue Scale (VAS) from no pain (0) to worst pain (10) and Neck Disability Index Scale (NDI) including 10 items, each item grading from 0-5 and 5 being the worst;⁽²⁶⁾ (4) Neck Range of Motion (ROM): the degree of the all 6 motions—flexion, extension, lateral flexion of both sides and rotation of both sides; (5) Symptoms and signs in Chinese medicine: mainly including local Sinew Knotted Points tenderness, and symptoms and signs related to different Meridian Sinews.

Data Entry and Statistical Analysis

A database was built by using Epidata 3.1 and the data were entered twice by two different staff members. The mean and standard deviation were presented for the quantitative data, and the frequency and the percentage were presented for the numerical data. Descriptive statistical analysis was used to analyze the distribution of "Sinew Knotted Points" tenderness, local Meridian Sinews symptoms and formats of Meridian Sinews syndromes. All analyses were performed using the Statistical Package for the Social Sciences (SPSS for Windows version 13.00).

RESULTS

General Data

Among the 313 subjects polled in the survey, most suffered from grade II WAD in the subacute stage, almost 60% were male patients and most of them were young adults. The majority of subjects were drivers during the accident and more than half of the subjects experienced rear-end collisions. The average score on the VAS and NDI indicated a medium level of pain and disability. The ROM of the neck of those subjects was slightly limited, mostly affecting the range of extension and lateral flexion of both sides and least affecting the range of flexion and right rotation. Detailed

Table 1. General Data of Patients

Variable	Data
Male/Female (Case)	185/128
Age (Year, $\bar{x} \pm s$)	36.6 \pm 0.69
WAD grade [Case (%)]	
Grade I	11 (3.51)
Grade II	276 (88.18)
Grade III	26 (8.31)
Stage [Case (%)]	
Acute	26 (8.31)
Subacute	287 (91.69)
Collision type [Case (%)]	
Rear-end	144 (46.01)
Front	58 (18.53)
Side	111 (35.46)
Position in car accident [Case (%)]	
Driver	192 (61.34)
Front passenger	76 (24.28)
Rear passenger	45 (14.38)
Went to emergency room after accident [Case (%)]	134 (42.81)
VAS score ($\bar{x} \pm s$)	6.33 \pm 0.10
NDI score ($\bar{x} \pm s$)	16.55 \pm 0.66
ROM in the neck ($\bar{x} \pm s$)	
Flexion	43.11 \pm 0.56
Extension	45.14 \pm 0.79
Lateral flexion (L)	36.72 \pm 0.59
Lateral flexion (R)	35.05 \pm 0.58
Rotation (L)	67.22 \pm 0.88
Rotation (R)	66.09 \pm 0.90

information can be found in Table 1.

Distribution Characteristics of "Sinew Knotted Points" Tenderness

There are 22 "Sinew Knotted Points", 41 locations in total since 3 of them on the center line not bilateral, included in this survey but those tender points were mainly in the Taiyang Meridian Sinew. The top 20 locations are shown in Table 2. The higher frequency of tenderness was mostly found on Jianwaishu (SI 14), Jianzhongshu (SI 15), Tianchuang (SI 16), C3-6 spinous process, Dazhui (GV 14), Fengchi (GB 20), Tianliao (SJ 15) and Tianding (LI 17), which is a crossing point of Shaoyang and Yangming.

The severity of tenderness was different among those "Sinew Knotted Points". The most light tenderness

points were seen on Jianwaishu (SI 14), Jianzhongshu (SI 15), Tianchuang (SI 16), Fengchi (GB 20), and Tianliao (SJ 15); the higher incidence of both medium and severe level tenderness was seen on C3-6 spinous process, Dazhui (GV 14) and Tianding (LI 17).

Non-tenderness was detected mostly on Quepen (ST 12), Jianzhen (SI 9), Yuzhen (BL 9), Renying (ST 9), Jianliao (SJ 14), Jianyu (LI 15), Jugu (LI 16), and also the Lower Edge of the Occipitus and C3-6 transverse process. Except the latter two which are related to Shaoyin Meridian Sinew and only had a few cases investigated, these points seem no significance as being a diagnostic criteria for Meridian Sinew Syndromes in whiplash injury patients.

Distribution Characteristics of Local Meridian Sinew Symptoms

The following symptoms of the Meridian Sinew occurred in more than 50% of the cases: widespread spasm and tenderness in the neck (Taiyang), difficulty in lateral flexion (Shaoyang), problems of extension and flexion (Taiyang), and stiffness and pain during neck movement (Yangming). See details in Table 3.

Distribution Characteristics of Meridian Sinew Syndromes

Among the 313 cases of whiplash-associated disorders, 237 cases (75.72%) related to Taiyang Meridian Sinew syndrome, which showed tenderness on its "Sinew Knotted Points" and presented corresponding symptoms, 82 cases (26.20%) were related to Shaoyin syndrome and 175 (55.91%) and 176 (56.23%) cases were related to Shaoyang and Yangming syndromes respectively. The patients presented either only one Meridian Sinew syndrome type (100 cases, 31.95%) or a combination of two syndrome types (96, 30.67%), three types (66, 21.09%), or even all four types (45, 14.38%). But there were still 6 cases (1.91%) which didn't match any of the types. In the group of the two types in combination, the "Taiyang plus Shaoyang" group and "Taiyang plus Yangming" group were the largest. In the group of three types in combination, the "Taiyang plus Shaoyang plus Yangming" group was the largest. See Table 4 for more detailed information.

Relationships of Meridian Sinew Syndromes and Grades

Among the 11 Grade I cases, 5 of them are

Table 2. Distribution of "Sinew Knotted Points" Tenderness in 313 WAD Cases (Top 20 locations)

Sinew Knotted Point	Tenderness [Case (%)]			Total
	Light	Medium	Severe	
C3-6 Spinous Process (Taiyang)	74 (29.72)	149 (59.84)	26 (10.44)	249
R Jianwaishu (SI 14) (Taiyang)	129 (59.17)	81 (37.16)	8 (3.67)	218
R Jianzhongshu (SI 15) (Taiyang)	130 (59.63)	80 (36.70)	8 (3.67)	218
Dazhui (GV 14) (Taiyang)	60 (28.57)	128 (60.95)	22 (10.48)	210
L Jianwaishu (SI 14) (Taiyang)	110 (55.00)	84 (42.00)	6 (3.00)	200
L Jianzhongshu (SI 15) (Taiyang)	108 (55.10)	83 (42.35)	5 (2.55)	196
R Tianding (LI 17) (Yangming/Shaoyang)	73 (41.01)	94 (52.81)	11 (6.18)	178
R Fengchi (GB 20) (Shaoyang)	90 (51.14)	78 (44.32)	8 (4.54)	176
L Fengchi (GB 20) (Shaoyang)	82 (47.95)	82 (47.95)	7 (4.10)	171
L Tianding (LI 17) (Yangming/Shaoyang)	51 (30.18)	104 (61.54)	14 (8.28)	169
R Tianchuang (SI 16) (Taiyang)	101 (66.01)	50 (32.68)	2 (1.31)	153
L Tianchuang (SI 16) (Taiyang)	84 (58.33)	58 (40.28)	2 (1.39)	144
R Tianliao (SJ 15) (Shaoyang)	86 (60.56)	54 (38.03)	2 (1.41)	142
L Tianliao (SJ 15) (Shaoyang)	73 (54.48)	59 (44.03)	2 (1.50)	134
R Tianyou (SJ 16) (Shaoyang)	68 (54.84)	54 (43.55)	2 (1.61)	124
L Tianzhu (BL 10) (Taiyang)	70 (57.38)	48 (39.34)	4 (3.28)	122
R Taizhu (BL 10) (Taiyang)	79 (65.29)	38 (31.40)	4 (3.31)	121
Taodao (GV 13) (Taiyang)	58 (50.00)	53 (45.69)	5 (4.31)	116
R Futu (LI 18) (Yangming)	70 (62.50)	41 (36.61)	1 (0.89)	112
L Tianyou (SJ 16) (Shaoyang)	58 (52.73)	50 (45.45)	2 (1.82)	110

Notes: L means left; R means right

Table 3. Distribution of Local Meridian Sinews Symptoms in 313 WAD Cases

Meridian Sinew symptoms	Case (%)
Widespread spasm and tenderness in the neck (Taiyang)	185 (59.11)
Difficulty in lateral flexion (Shaoyang)	167 (53.35)
Problems of extension and flexion (Taiyang)	165 (52.72)
Stiffness and pain during neck movement (Yangming)	161 (51.44)
Spasm in the neck and difficulty in head rotation (Yangming)	102 (32.59)
Spasm in the neck and neck discomfort with tendency for hands to support the head (Shaoyang)	87 (27.80)
Pain in the deep area of the neck and difficulty in flexion (Shaoyin)	71 (22.68)
Dizziness (Shaoyin)	61 (19.49)
Inability to raise the shoulder (Yangming)	27 (8.62)

not related to any Meridian Sinew syndrome and another 5 are just related to single syndrome (2 for Taiyang and 3 for Yangming) but one case related to three syndrome in combination (Taiyang, Shaoyin and Yangming). Among the 276 Grade II cases, there are 211 related to Taiyang syndrome and 60, 152 and 21 related to Shaoyin, Shaoyang and Yangming

Table 4. Distribution Formats of Meridian Sinews Syndromes in 313 WAD Cases

Occurrence	Meridian Sinews Syndromes	Case (%)
None	None identified	6 (1.91)
Single	Taiyang	51 (16.29)
	Shaoyang	23 (7.35)
	Yangming	26 (8.31)
Two in combination	Taiyang+Shaoyin	11 (3.52)
	Taiyang+Shaoyang	34 (10.86)
	Taiyang+Yangming	32 (10.22)
	Shaoyin+Shaoyang	1 (0.32)
	Shaoyang+Yangming	18 (5.75)
Three in combination	Taiyang+Shaoyin+Shaoyang	11 (3.52)
	Taiyang+Shaoyin+Yangming	12 (3.83)
	Taiyang+Shaoyang+Yangming	41 (13.10)
Four in combination	Shaoyin+Shaoyang+Yangming	2 (0.64)
	Taiyang+Shaoyin+Shaoyang+Yangming	45 (14.38)
Total		313 (100)

respectively, more in two combinations. Among the 26 Grade III cases, those numbers are 25, 20, 22 and 21. Out of 26 cases related to Grade III, there

are 15 cases having combination of all four types of Meridian Sinew syndromes. It seems that the more combinations of Meridian Sinew syndromes the more severe the grade.

DISCUSSION

In clinical practice, syndrome differentiation is a key for developing treatment principles and strategies. Acupuncture and moxibustion practice usually uses syndrome related to meridians, which is a unique theory consists of channels and collaterals, extraordinary vessels, divergent channels, skin regions and Meridian Sinews, and can be considered as "the anatomical system of acupuncture."⁽²⁷⁾ Therefore this can be considered as an effective way to identify the abnormality location through the diagnosis based on distribution of meridian pathways and related syndromes. The Meridian Sinew syndromes model could be beneficial in such a way for WAD. Through positive "Sinew Knotted Points" and presented symptoms from different Meridian Sinews, the practitioners could easily make diagnosis of involved Meridian Sinews and identify the abnormality location then apply corresponding acupuncture techniques, modalities and manipulations. It is important to palpate and find the tenderness spots in whiplash injured patients during treatment since the "Sinew Knotted Points" are so valuable.

The data indicated the Taiyang syndrome is the most common Meridian Sinew syndrome in the WAD patients, but mostly the syndrome presented in a combination format, either two in combination mainly with "Taiyang plus Yangming" and "Taiyang plus Shaoyang" groups or three in combination mainly seen as "Taiyang plus Shaoyang plus Yangming" group. Some cases even presented all four syndromes together. It is clear that the impact of the acceleration-deceleration mechanism during whiplash injury mostly damages the Taiyang Meridian Sinew. Since the muscles are not isolated in the cranial-cervical conjunction, the distribution of neck muscle loads during multidirectional impacts varied. The peak cross-sectional forces, internal energies, and effective strains were calculated for each muscle and impact configuration.⁽²⁸⁾ So it has clinical significance that a combination of Meridian Sinew syndromes occurred among patients who suffered from whiplash injury.

The syndrome distribution under Grade I, II

and III seems to indicate that more combination of the Meridian Sinew syndromes in the whiplash injury patients which is resulted from more severity of injury.

The above analysis has indicated that the Meridian Sinew syndromes objectively reflect the lesions after whiplash injury.

It is practical to identify the location of abnormality through Meridian Sinew differentiation, considering both "Sinew Knotted Points" tenderness and corresponding symptoms, for the local neck symptoms of WAD.

REFERENCES

1. Spitzer WO, Skovron ML, Salmi LR, Cassidy JD, Duranceau J, Suissa S, et al. Scientific monograph of the Quebec Task Force on whiplash-associated disorders: redefining "whiplash" and its management. *Spine* 1995;20(8 Suppl):1S-73S.
2. Jansen GB, Edlund C, Grane P, Hildingsson C, Karlberg M, Link H, et al. Whiplash injuries: diagnosis and early management. The Swedish Society of Medicine and The Whiplash Commission Medical Task Force. *Eur Spine J* 2008;17(Suppl 3):S355-417.
3. Barnsley L, Lord S, Bodguk N. Whiplash injury. *Pain* 1994;58:283-301.
4. Young WF. The enigma of whiplash injury: current management strategies and controversies. *Postgrad Med* 2001;109:179-180, 183-186.
5. Motor Accidents Authority (Australia). Guidelines for the management of whiplash-associated disorders. Sydney: Motor Accidents Authority; 2001.
6. Malanga GA, Nadler SF. Whiplash. Philadelphia: Hanley and Belfus, Inc; 2002.
7. Greenwood MT, Leong LA, Tan WC. Traditional acupuncture treatment for whiplash syndrome. *Am J Acupunct* 1998;16:305-318.
8. Yu YZ, Lao HL. Experience on neck whiplash injuries treatment. *Modern Integr Tradit West Med J* 2002;11:1931.
9. Li SG. Analysis of whiplash injury treatment. *J Neck Lumbar Pain* 1998;19:119-120.
10. Wong JY. A manual of neuro-anatomical acupuncture. Vol 1. Musculo-skeletal disorders. Toronto: The Toronto Pain and Stress Clinic Inc.; 1999:107.
11. Su HC, Su RK. Treatment of whiplash injuries with acupuncture. *Clin J Pain* 1988; 4:233-247.
12. Fattori B, Ursino F, Cingolani C, Bruschini L, Dallan I, Nacci A. Acupuncture treatment of whiplash injury. *Int Tinnitus J* 2004;10:156-160.
13. Aigner N, Fialka C, Radda C, Vecsei V. Adjunct laser

- acupuncture in the treatment of whiplash injuries: a prospective, randomized placebo-controlled trial. *Wien Kim Wochenschr* 2006;118:95-99.
14. Trinh K, Graham N, Gross A, Goldsmith C, Wang E, Cameron I, et al. Acupuncture neck disorders. *Spine* 2007;32:236-243.
 15. Chen YM. Acupuncture mainly applied to treat neck whiplash injury. In: Jiang D, ed. *Principles and practices of Chinese medicine in the West*. Beijing: People's Medical Publishing House; 2003:417-432.
 16. Chen YM. Efficacy and therapeutic strategies of acupuncture applied to treat pain due to whiplash injuries. *Meridian Times (J Acupunct Society New York)* 2005;14:20-23.
 17. Chen YM, Li H, Zheng X, Zhang QC, Wang TF. Research on meridian differentiation and classification for whiplash injury based on meridian sinew theory. *J Beijing Univ Tradit Chin Med (Chin)* 2010;33:517-520.
 18. Chen YM, Li H, Zheng X, Zhang QC, Wang TF. Preliminary study on syndrome differentiation types and acupuncture for whiplash injuries. *Chin Acupunct Moxibust* 2011;31:353-356.
 19. He YG, Zheng XF, Xu BH. 26 cases of Whiplash injuries with diagnosis and treatment. *Modern Rehabil* 2000;4:746-747.
 20. Xue LG. *Chinese meridian sinews*. Beijing: Traditional Chinese Medicine Ancient Books Publishing House; 2009:37-34.
 21. Committee for Terms in Traditional Chinese Medicine. *Chinese terms in traditional Chinese medicine and pharmacy* 2004. Beijing: Science Press; 2005.
 22. Ji SL, Cheng ZZ. *Diagnosis of traditional Chinese medicine*. Beijing: People's Medical Publishing House; 2002.
 23. Review Committee for Standards of Diagnosis and Therapeutic Effect of Traditional Chinese Medicine Diseases and Syndromes. *Medical and pharmaceutical industry standards of the People's Republic of China: Standard of diagnosis and therapeutic effect of traditional Chinese medicine diseases and syndromes*. Nanjing: Nanjing University Press; 1994.
 24. Xu DH. *Quantitative diagnosis of traditional Chinese medicine*. Nanjing: Jiangsu Science and Technology Publishing House; 2009.
 25. Yao NL. *Differentiation diagnosis of traditional Chinese symptomatology*. 2nd ed. Beijing: People's Medical Publishing House; 2002.
 26. Nieto R, Miro J, Huguet A. Disability in subacute Whiplash patients: Usefulness of the neck disability index. *Spine* 2008;33:E630-E635.
 27. Chen YM, Zheng X, Li H, Zhang QC, Wang TF. Effective acupuncture practice through diagnosis based on distribution of meridian pathways and related syndromes. *Acupunct Electrother Res* 2011;36:1-18.
 28. Hedenstierna S, Halldin P, Siegmund GP. Neck muscle load distribution in lateral, frontal and rear-end impacts: a three-dimensional finite element analysis. *Spine* 2009; 34:2626-2633.

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