



Review Article

A Review of Randomized Controlled Trials of Pes Anserinus Tendinitis/Bursitis Syndrome in the China National Knowledge Infrastructure Database



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ABSTRACT

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The purpose of this study was to review randomized controlled trials (RCTs) of pes anserinus tendinitis or bursitis (PATB) syndrome in the China National Knowledge Infrastructure database to investigate the efficacy of traditional Chinese medicine treatment for PATB syndrome. There were 20 RCTs published from 2001 to 2021 which were selected for analysis by publication year, number of samples, evaluation criteria, treatment duration, and treatment method. Out of the 142 retrieved RCTs, 20 were relevant to this review, and had performed Chinese medicine treatments including acupuncture (the most common treatment typically using acupoints SP10, ST35, SP9, and LR8), manipulation (typically using acupoints ST35, SP10, and SP9), and external application therapy (typically herbal medicine) in the treatment of PATB syndrome. Chinese medicine treatments were used widely in the treatment of PATB syndrome. We hope in the future, this review may initiate the development of treatments for PATB syndrome using Korean medicine.

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Introduction

The pes anserine region plays a significant role in assisting and cushioning the muscles, tendons and bones around the knee joint, being sandwiched between the proximal medial tibia and the insertion point of the 3 tendons [1]. Pes anserinus, also widely known as “goose foot” due to the conjoined tendons [2] that are attached to the upper medial aspect of the proximal tibia [3] originating from the semitendinosus, gracilis, and sartorius muscles, is a common syndrome among patients with degenerative or inflammatory knee arthritis [4]. Such a significant structure, the pes anserine region plays a key role in supporting knee joint stability, but can easily cause joint instability where there is sterile inflammation, and if it receives repetitive nerve impulses or is overused [3]. Pes anserinus tendino-bursitis (PATB) syndrome

can be diagnosed based on clinical manifestations because it causes spontaneous medial knee pain, especially when climbing or descending stairs [5], as well as occasional tenderness, swelling, and knee joint instability [5].

PATB syndrome falls under the category of “impediment syndrome” or “sinew injury” in Korean medicine. The underlying mechanism involves malnutrition of the sinews and vessels or invasion of wind and cold into the joints due to obstruction of the ways of the vessels. This creates disharmony of Qi and the blood, and Yin and Yang [6]. The syndrome also falls under the “bone impediment” as the underlying mechanism involves damage caused externally by excessive use or through the invasion of wind-cold-dampness into the joints, which blocks the flow of Qi and blood, thereby causing swelling of the knee joint [7]. Factors that cause pain and swelling of the knee joint include age, organic,

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or the lack of Qi and blood in the body due to liver or kidney deficiency, which weakens the knee joint [7].

Several studies on treatment methods using Chinese medicine for PATB syndrome have been conducted in China. However, only a few studies have been conducted in Korea despite the high number of patients with PATB syndrome being treated with traditional Korean medicine. Therefore, this study aimed to review the effects of treatment of PATB syndrome using Korean medicine treatments by analyzing randomized controlled trials (RCTs) available in the China National Knowledge Infrastructure (CNKI) database.

Materials and Methods

In order to investigate the clinical efficacy of traditional Chinese medicine (TCM) for PATB syndrome, the CNKI database was searched up to 2021 with no limit on the number of studies retrieved. The following keywords were used for the search: “pes anserinus bursitis” OR “pes anserinus tendinitis” in both Chinese and English. The inclusion criteria for this review was that the study was a RCT that reported on TCM for patients with PATB syndrome. Case-control studies, protocols, review articles, laboratory studies, case reports, and case series were excluded from this review.

Results

Study selection

A total of 142 studies were retrieved from the CNKI database. Of these studies, 5 were duplicates, 84 were not related to TCM, 24 were not RCTs, 1 was not an original study, 2 included personal clinical examinations, and 6 involved TCM for the control group. Therefore, these 122 studies were excluded from the review. There were 20 studies were included in the analysis (Fig. 1).

Publication year

Analysis by year showed that from 2001 to 2021, 1 study (5%) was published in 2001, 1 (5%) in 2010, 6 (30%) between 2011 and 2015, and 12 (60%) between 2016 and 2021 (Table 1).

Sample size

Over all 20 RCTs included in this review, there was a total of 1,498 patients. Four studies (20%) included < 50 patients, 5 studies (25%) included 50-75 patients, 9 studies (45%) included 75-100 patients, and 2 studies (10%) included >100 patients (Table 2).

Evaluation index

Of the 20 RCTs, some included 1 evaluation indicator and some included 4. Thirteen studies used the visual analog scale (VAS) as the evaluation index, and 16 measured the clinical efficacy rate according to the degree of symptom improvement. Clinical efficacy was categorized into: recovery, apparent results, effective results, and no effects based on the therapeutic results of the differentiation standard for TCM conditions/diseases and syndromes published by the National Administration of Traditional Chinese Medicine. Three studies evaluated tenderness (which was assigned a value) as the evaluation index, 6 evaluated the Lysholm Knee Scoring Scale (knee joint function scores), and 3 evaluated the Hospital for Special Surgery Knee Score (HSS Knee Score). Various other types of evaluation indicators were also used in these RCTs, such as the Generic Quality of Life Inventory-74 (GQOL-74), therapeutic effect evaluation standard of knee bursitis, range of motion (ROM), 36-Item Short-Form Survey (SF-36), ratio of excellence, and degree of bending and stretching of the knee joint (Table 3).

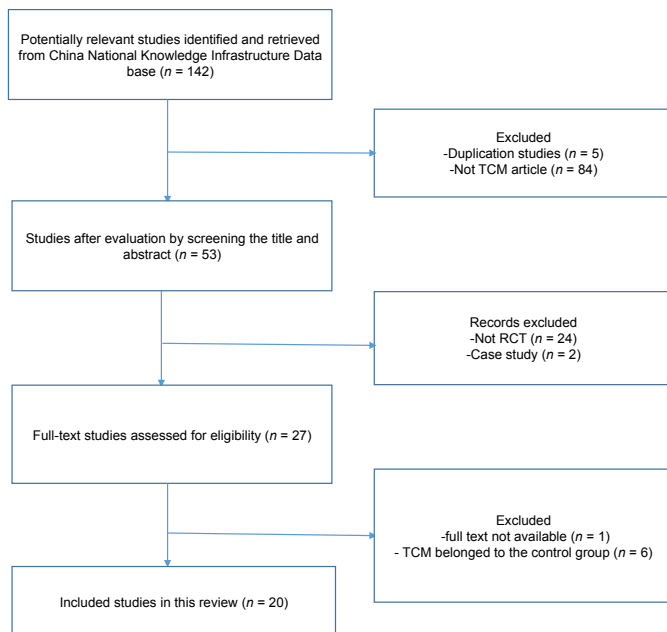


Fig. 1. Study selection

Table 1. Publication Year.

Publication period	N (%)
2001-2005	1 (5)
2006-2010	1 (5)
2011-2015	6 (30)
2016-2021	12 (60)

Table 2. Sample Size.

N	N (%)
< 50 patients	4 (20)
50 to 75 patients	5 (25)
75 to 100 patients	9 (45)
> 100 patients	2 (10)

Table 3. Frequency of Evaluation Criteria.

Frequency of use	Evaluation criteria
16	Clinical efficacy rate
13	VAS
6	Lysholm score scale (knee-joint function scores)
3	The tenderness value The HSS knee scoring system
2	IL-6
1	GQOL-74 SF-36 the knee activity change (Range of motion) therapeutic effect evaluation standard of knee bursitis TNF- α MMP-1 Recurrence rate

GQOL-74, generic quality of life inventory-74; IL-6, interleukin 6; SF-36, the MOS item short form health survey; The HSS knee scoring system, the Functional Knee Scores of hospital for Special Surgery; VAS, visual analogue scale.

Treatment period

The treatment period of PATB syndrome ranged from 5 days to 1 month, with 2 weeks being the most common treatment period, followed by 15 days.

Types of treatment

The types of treatment included manipulation, external medical treatment (fumigation therapy, acupoint herbal plaster), and acupuncture therapies including surrounding needling, subcutaneous needling (Fu's Subcutaneous Needling), electroacupuncture, acupotomy, stiletto needle therapy, and silver needle thermo-conduction therapy. Among the 20 RCTs, multiple treatments were conducted in 12 studies and single treatments were conducted in 8 studies. Fifteen RCTs included acupuncture therapy, 2 included manipulation therapy, and 3 included external medicine (Tables 4-6).

Acupuncture

There were 15 RCTs who used acupuncture; 6 performed acupotomy, 4 performed ordinary acupuncture, 2 performed Fu's subcutaneous needling, and the remaining 4 performed surrounding, stiletto, and short thrust needling.

There were 9 of the 15 RCTs that used acupuncture methods and involved a combination of infrared rays, oral Western medicine, bloodletting, manipulation therapy, electroacupuncture, ultrashort wave therapy, and ultrasound-guided acupotomy.

Li et al [6] reported that efficacy rate and the GQOL-74 (material life state, social function, physical function, and psychological function) showed a significant beneficial effect (clinical efficacy rate: 94%; $p < 0.05$) in the experimental group treated with surrounding needling and infrared rays compared with the control group which were treated with Ashi point acupuncture and infrared rays (total effect: 80%).

Li et al [4] showed that the total effective rate in the experimental

Table 4. Types of Treatment.

Types of treatment	
Acupuncture therapy	Acupotomy therapy (small knife therapy) Ordinary needling Fu's subcutaneous needling (floating needling) Surrounding needling Stiletto needling Short thrust needling
External medical treatment	Fumigation therapy Herbal plaster Chinese medicine hot sputum
Manipulation therapy	Chuna manipulation Adjusting patella muscle balance

group treated with floating needle combined with ultrashort wave was 96.6%, whereas in the control group who were treated with ordinary acupuncture combined with ultrashort wave, the total effective rate was 82.8%. Furthermore, the VAS score and Lysholm knee score significantly increased in the experimental group compared with the control group ($p < 0.05$).

Wen et al [8] compared 18 patients in the control group who were treated with methyl salicylate cream and 18 patients in the experimental group who were treated with Fu's subcutaneous needling with methyl salicylate cream, and reported better treatment effectiveness based on the VAS score, Lysholm score, and levels of interleukin 6 (IL-6) in the experimental group compared with the control group. Furthermore, a significantly higher total effective rate of 100% in the experimental group compared with the control group (72.2%; $p < 0.05$) was reported.

Yang et al [9] reported that short thorn acupuncture combined with electroacupuncture, plus oral loxoprofen sodium treatment had significantly higher Lysholm and the VAS scores compared with oral loxoprofen sodium treatment in the control group ($p < 0.05$). The effective rate was 95% in the experimental group, which was significantly higher than the control group (75%; $p < 0.05$).

Bi et al [10] reported a significant difference of effective rate between the experimental group who received super-lizer with acupuncture and the control group who received super-lizer treatment alone. As a result, the effective rate of the experimental group, which was 100%, was much higher than the control group which had an effective rate of 81.6% ($p < 0.01$).

Zhu et al [11] reported significantly higher VAS and HSS scores ($p < 0.05$) and no local or systemic complications in the experimental group treated with ultrasound-guided drug injection and acupotomy compared with the control group, which received acupotomy treatment of anatomical and pain point location. One patient in the control group presented with a local reaction at the injected site and subcutaneous tissue atrophy.

Kong et al [12] reported that the experiment group treated with stiletto needling had a 94% effective rate, which was significantly higher than the control group which had an effective rate of 78% ($p < 0.05$). Furthermore, the Lysholm score improved and the VAS score decreased in the experimental group compared with the control group ($p < 0.05$). Analysis of levels of TNF- α , IL-6, and MMP-1 significantly improved in the experimental group compared with the control group ($p < 0.05$).

Wang et al [13] compared the experimental group treated with acupuncture bloodletting combined with herbal plaster and the control group treated with acupuncture with herbal plaster, and

Table 5. General Characteristics in the Selected Studies.

First author [ref] (y)	Sample size (I:C)	General characteristics			
		Sex		Age (y) mean (SD)	Treatment period
		Male	Female		
Li [6] (2020)	I: 50 C: 50	24 22	26 28	48.62 ± 6.74 49.15 ± 7.08	15 d
Li [4] (2020)	I: 29 C: 29	14 12	15 17	52.13 ± 3.02 51.76 ± 3.87	30 d
Wen [8] (2020)	I: 18 C: 18	10 7	8 11	59.33 ± 7.15 57.72 ± 8.39	15 d
Yang [9] (2020)	I: 40 C: 40	26 25	14 15	45.01 ± 5.35 46.57 ± 4.22	14 d
Bi [10] (2019)	I: 38 C: 38	38	0	34.2 ± 1.8	15-20 d
Zhu [11] (2018)	I: 24 C: 24			50.42 ± 6.71 50.50 ± 6.70	1-4 wk
Kong [12] (2018)	I: 50 C: 50	29 32	21 18	49.01 ± 4.35 48.57 ± 2.53	14 d
Wang [13] (2016)	I: 30 C: 30	10 8	20 22	59.14 ± 7.21 60.33 ± 6.79	5-10 d
Hou [14] (2016)	I: 43 C: 43	11 12	32 31	46.30 ± 12.17 44.93 ± 11.74	14 d
Huang [15] (2015)	I: 35 C: 20	13	17	41.00 ± 6.00	28 d
Wang [16] (2014)	I: 45 C: 40	15 12	30 28	58.32 ± 8.29 60.13 ± 9.52	7 d
Wang [17] (2014)	I: 48 C: 39	21 17	27 22		14 d
Ma [18] (2012)	I: 44 C: 39	23 18	21 21	51.2 ± 9.9 52.4 ± 10.9	30 d
Ma [19] (2011)	I: 37 C1: 35 C2: 30	17 20 19	18 10 18		28 d
Xu [20] (2002)	I: 52 C1: 48 C2: 46	35 30 31	17 18 15		12 d
Wu [2] (2018)	I: 49 C: 49	31 28	18 21		14 d
Chen [21] (2019)	I: 20 C: 20	12 9	8 11	40.25 ± 11.35 41.73 ± 12.19	15 d
Wang [22] (2010)	I: 30 C: 30	2 5	28 25		14 d
Fan [23] (2013)	I: 23 C: 23	10 12	13 11	53.09 ± 9.19 21.61 ± 9.63	10 d
He [24] (2020)	I: 26 C: 26	15 16	11 10	36.23 ± 5.41 38.27 ± 5.93	21 d

Table 6. Results of Selected Studies.

First author [ref] (y)	Group	Evaluation of treatment
Li [6] (2020)	A: Surrounding needling and infrared rays B: Ashi point acupuncture and infrared rays	1. A (94%), B (80%) 5.GQOL-74 - Material aspect A (64.2±10.24/73.6±11.41), B (64.2±11.12/83.6±12.23) - Social aspect A (65.41±11.26/72.58±12.29), B (65.08±11.09/84.32±13.67) - Psychological aspect A (62.57±10.63/74.62±13.15), B (63.11±11.25/86.53±15.28) - Physical aspect A (63.62±12.47/75.22±13.14), B (64.17±12.78/85.25±13.71)
Li [4] (2020)	A: floating needle combined with ultrashort wave B: ordinary acupuncture combined with ultrashort wave	1. A (96.6%), B (82.8%) 2. A (7.92±1.32/2.21±0.43), B (8.11±1.55/3.75±0.81) 3. A (52.72±8.13/74.78±4.90), B (51.77±7.01/70.67±3.22)
Wen [8] (2020)	A: Fu's subcutaneous needling and Compound Methyl Salicylate Cream B: Compound Methyl Salicylate Cream	1. A (100%), B (72.2%) 2. A (8.22±1.06/1.56±1.42), B (8.00±1.03/3.22±2.63)
Yang [9] (2020)	A: Short thrust combined with electroacupuncture plus oral loxoprofen sodium B: Oral loxoprofen sodium	1. A (95%), B (75%) 2. A (5.50±1.20/1.12±0.43), B (5.69±1.18/3.15±0.68) 3. A (53.98±4.64/89.20±2.80), B (55.17±4.29/75.44±4.08) 4. IL-6: A (340.43±11.52/297.42±8.74) B (336.19±10.91/306.74±9.33)
Bi [10] (2019)	A: silver needle thermo-conduction therapy and super-laser B: Super-laser	1. A (100%), B (81.6%)
Ma [18] (2012)	A: silver needle thermo-conduction therapy B: microwave and Semiconductor laser	1. A (97.7%) B (92.3%) 2. A (5.14±1.13/1.25±1.30) B (5.18±1.12/2.28±1.49)
Zhu [11] (2018)	A: ultrasound-guided drug injection and acupotomy treatment B: acupotomy treatment of anatomical and pain point location	2. A (8.22±0.35/1.79±0.19), B (8.18±0.49/3.66±0.33) 4. HSS: A (43.85±3.18/86.40±2.99), B (43.72±3.27/73.33±2.09)
Kong [12] (2018)	A: Stiletto needle B: Diclofenac diethylamine emulgel	1. A (94%), B (78%) 2. A (5.83 ± 1.21/1.04 ± 0.45), B (5.81 ± 1.20/3.23 ± 0.79) 3. A (56.31 ± 4.35/89.93 ± 2.21), B (55.98 ± 4.32/75.44 ± 3.41) 4. Joint fluid analysis (ng/L) IL-6 index: A (4.09 ± 0.51/1.73 ± 0.12) B (4.10 ± 0.53/2.30 ± 0.40) TNF-α index: A (63.12 ± 5.04/45.01 ± 2.12), B (63.09 ± 4.98/56.42 ± 0.84) MMP-1 index: A (3.91 ± 1.04/1.02 ± 0.15), B (3.90 ± 1.02/2.31 ± 0.93)
Wang [13] (2016)	A: Acupuncture bloodletting combined with herbal plaster B: Acupuncture combined with herbal plaster	1. A (83.33%), B (63.33%) 2. A (2.82 ± 0.16/0.93 ± 0.24), B (2.72 ± 0.13/1.43 ± 0.53) 4. SF-36 - PF A (38.89 ± 35.17/56.01 ± 40.39), B (39.68 ± 37.38/45.71 ± 38.51) - RP A (30.57 ± 37.37/58.72 ± 29.36), B (31.75 ± 34.02/47.10 ± 30.11) - BP A (26.56 ± 22.17/66.55 ± 21.25), B (27.67 ± 21.36/45.23 ± 23.47) - GH A (41.89 ± 25.17/64.01 ± 24.39), B (43.68 ± 24.38/53.71 ± 23.51) - VT A (40.57 ± 27.34/78.72 ± 26.36), B (41.75 ± 29.02/57.10 ± 24.11) - SF A (42.89 ± 35.17/73.01 ± 34.39), B (43.62 ± 34.38/60.71 ± 36.51) - RE A (45.57 ± 37.34/78.72 ± 32.36), B (46.75 ± 38.02/67.10 ± 34.11) - MH A (56.56 ± 22.17/86.55 ± 21.25), B (57.67 ± 19.36/76.23 ± 22.47)
Hou [14] (2016)	A: Acupuncture on zhoufeng point and manipulation therapy B: Votalin emulsion inunction	1. A (97.67%), B (83.72%) 3. A (43.71 ± 5.92/85.43 ± 6.74), B (45.64 ± 6.50/73.34 ± 7.84) 4. The tenderness value (m/kg) A (2.19 ± 0.46/5.91 ± 0.77), B (2.37 ± 0.50/3.61 ± 0.59)
Huang [15] (2015)	A: Laser needle-knife surgery plus drug injection and ultra-short-wave therapy B: Glucosamine sulfate capsules	1. A (94%), B (72%) 2. A (7.51 ± 2.13/2.36 ± 0.44), B (7.42 ± 2.21/2.89 ± 0.79)
Wang [16] (2014)	A: Local block combined with acupotomy therapy B: Oral application of ibuprofen, codeine phosphate tablets combined with hot compress with traditional Chinese drug	2. Knee tenderness A (3.166 ± 1.010/0.938 ± 0.171), B (3.019 ± 1.069/1.990 ± 0.630) -spontaneous pain A (2.834 ± 0.122/0.806 ± 0.220), B (2.791 ± 0.139/1.381 ± 0.343) 4. Therapeutic effect evaluation standard of knee bursitis (Recovery/effective/ineffective) A (16/24/5), B (8/21/11)
Wang [17] (2014)	A: Acupotomy treatment B: Local steroid injection therapy	1. A (97.91%), B (89.74%) 2. A (7.47 ± 2.01/1.93 ± 0.79), B (7.38 ± 2.10/2.97 ± 1.52)
Ma [19] (2011)	A: Acupotomy treatment with steroid injection therapy B-1: Acupotomy treatment B-2: Steroid Injection therapy	1. A (97.30%), B-1 (94.29%), B-2 (90.00%)
Xu [20] (2002)	A: Acupotomy treatment B-1: Steroid Injection therapy B-2: Herbal medicine	1. A (94.2%), B-1 (79.2%), B-2 (54.3%)

Table 6. (Continued).

First author [ref] (y)	Group	Evaluation of treatment
Wu [17] (2018)	A: Manipulation and fumigation therapy B: Manipulation therapy	A (89.79%), B (73.46%)
Chen [21] (2019)	A: Extracorporeal shock wave therapy combined with traditional Chinese medicine hot sputum B: The western medicine diclofenac diethylene latex external treatment	1. A (95%), B (85%) 2. A (6.82 ± 0.87/3.20 ± 1.28) B (6.90 ± 0.85/4.75 ± 1.40) 3. A (48.85 ± 4.47/82.25 ± 9.49) B (47.75 ± 4.68/70.10 ± 9.48) 4. Knee activity change (Range of motion) (unit: degree) A (85.71 ± 7.81/119.91 ± 9.89) B (83.23 ± 3.50/105.78 ± 8.67)
Wang [22] (2010)	A: Huoxuehuayu external medical treatment B: Dichlofenac diethylammon	4. The tenderness value (m/kg) A (2.47 ± 0.60/3.61 ± 0.67), B (2.53 ± 0.42/3.43 ± 0.68) 4. HSS A (17.10 ± 3.30/20.13 ± 1.83), B (16.67 ± 3.08/19.47 ± 2.00)
Fan [23] (2013)	A: Manipulation therapy with microwave B: Acupuncture therapy with microwave	2. A (8.478 ± 0.994/2.913 ± 1.203), B (8.574 ± 0.983/5.130 ± 1.424) 4. HSS A (54.09 ± 17.45/88.78 ± 13.62), B (56.57 ± 15.78/87.04 ± 14.89) 4. The tenderness integral determined by tenderness testers A (3.023 ± 0.990/4.910 ± 1.234), B (2.862 ± 0.810/3.676 ± 0.527)
He [24] (2020)	A: Acupotomy treatment with the method of adjusting patella muscle balance B: Acupotomy treatment	A (96.15%) B (76.92%) A (6.42 ± 1.20/1.62 ± 1.29) B (6.69 ± 1.19/3.00 ± 1.02) A (55.77 ± 3.66/92.65 ± 5.34), B (55.04 ± 3.77/86.77 ± 10.50) Recurrence rate A (7.69%), B (23.07%)

*A: Intervention group.

†B, B-1, B-2: Control group.

‡ 1. Clinical efficacy, 2. visual analogue scale (before/after), 3. Lysholm score scale (before/after), 4. Others.

reported a significantly higher effective rate in the experimental group (83.33%) compared with the control group (63.33%; $p < 0.05$). Furthermore, the VAS scores and the MOS 36-item short-form health survey (SF-36) scores for physical function, physiological function, body pain, general health, vitality, social function, emotional function, and mental health were significantly improved in the experimental group compared with the control group ($p < 0.05$).

In the study by Hou [14], the treatment group received acupuncture at the Zhoubing point with manipulation therapy, whereas the control group received Votalin emulsion injection. The effective rate was significantly higher in the treatment group (97.67%; $p < 0.05$) compared with the control group (83.72%). Furthermore, the Lysholm and knee function scores were significantly higher in the treatment group compared with the control group ($p < 0.05$).

Huang et al [15] reported that the clinical efficacy of the experimental group who underwent triple therapy (laser needle-knife plus drug injection and ultrashort wave therapy) was significantly higher compared with the control group who received glucosamine sulfate capsules ($p < 0.05$).

Wang et al [16] compared patients in the observation group treated with a local block combined with small knife needle with those in the control group who were treated with oral ibuprofen-codeine phosphate tablets combined with application of a hot compress and TCM. They reported a significantly better therapeutic effect in the observation group compared with the control group using the 'Standard for diagnosis and therapeutic effect evaluation of traditional Chinese medicine' and the VAS score ($p < 0.05$).

Wang et al [17] compared the experimental group treated with acupotomy and the control group treated with a drug which was injection. and reported a significantly higher VAS score in the

experimental group ($p < 0.01$), as well as a significantly improved effective rate (97.91% vs. 89.74%; $p < 0.05$) compared with the control group.

Ma et al [18] compared the efficacy of silver needle thermo-conduction therapy in the experimental group and microwave and semi-conductor laser therapy in the control group, and reported a higher efficacy rate in the experimental group (97.7%) compared with the control group (92.3%; $p < 0.05$). Furthermore, the VAS score was significantly reduced in the experimental group ($p < 0.05$).

Ma et al [19] compared 3 groups: 1 control group treated with acupotomy, another control group who received injection therapy, and the experimental group who received these 2 treatments in combination. They reported that the total effective rate was significantly increased in the experimental group compared with the 2 control groups ($p < 0.05$).

Xu et al [20] also compared 3 groups: the 1st group was treated with acupotomy, the 2nd group was treated with injection therapy, and 3rd group was treated with oral Chinese medicine. They reported that the effective rate of the acupotomy group was 94.2%, the effective rate of the injection therapy group was 79.2%, and the effective rate of the oral Chinese medicine was 54.3% ($p < 0.05$).

External application therapy

Among the 3 studies that included external medicine treatment, 2 used overlapping methods; 1 used external application therapy combined with extracorporeal shock wave therapy (ESWT) and the other used herbal fumigation with manipulation therapy.

Wu et al [2] reported that the efficacy rate of the experimental group that received both manipulation therapy and Chinese herbal fumigation including *Achyranthes bidentata* Blume, *Lycopodium herba*, *Phryma leptostachya*, *obscured homalomena*, *Kalopanax pictum* Nakai, *Corydalis tuber*, *Liquidambaris Fructus* 20 g,

Carthami flos, olibanum, myrrha, and Cyperi Rhizoma 15 g, was significantly higher than the control group which only received manipulation therapy ($p < 0.05$)

Chen et al [21] reported better treatment effectiveness in the experimental group that received ESWT combined with TCM hot sputum compared with the control group which received diclofenac diethyl latex ($p < 0.05$). The VAS score significantly decreased ($p < 0.05$) and the Lysholm score and knee ROM significantly increased ($p < 0.05$) in the experimental group compared with the control group.

Wang et al [22] reported a significantly higher treatment effective rate, HSS, and tenderness values in the experimental group that received external application consisting of olibanum, myrrha, Phryma leptostachya, Asarum heterotropoides, Lycopodii herba, Carthami flos, Curcuma longa Rhizoma, Typha orientalis Prosl, Angelica gigas Nakai, and Salviae miltiorrhizae radix compared with the control group who received diclofenac diethylamine emulgel.

Manipulation

Fan et al [23] reported an improved HSS knee score and a reduction in VAS score in the experimental group that received taping, rubbing, and massage with microwave compared with the control group who received acupuncture combined with microwave therapy. Knee tenderness also significantly eased in the experimental group compared with the control group ($p < 0.05$). The main Ashi points of chuna manipulation were ST35, SP10, and SP9, and the main acupoint sites were ST and SP.

He et al [24] reported a significantly better Lysholm knee score, VAS score, and effective rate in the experimental group treated with acupotomy with adjustment of patella muscle balance compared with the control group treated with acupotomy ($p < 0.05$).

Discussion

PATB is a clinically common syndrome and is mainly diagnosed by clinical manifestations, especially in patients with pain in the medial knee, and upper tibial region tenderness, swelling, and redness [1,17]. Yoon et al [25] reported that 83.3% of patients with PATB syndrome had radiographically evident findings amongst patients with knee osteoarthritis.

The general remedies for relieving pain caused by PATB syndrome include complete bed rest, steroid injection into the bursa, administration of non-steroidal anti-inflammatory drugs, or surgery [5,26]. However, these can cause side effects such as gastrointestinal problems including peptic ulceration or reduction in muscle mass [9]. The duration of recovery from surgery may be protracted due to scars [5,26]. The prevalence of PATB syndrome is higher in the middle-aged and elderly, especially in women; overweight individuals, and those with patella osteoarthritis, pes planus, and valgus deformities [5]. Lee et al [5] reported approximately 46.8% of patients with knee osteoarthritis are clinically diagnosed with PATB syndrome.

In the included RCTs in this review, diagnosis of knee synovitis under the criteria of diagnosis and therapeutic effect in traditional Chinese medicine [27] is preceded by checking; (1) the history of strain or trauma to the knee joint and the age of the patient; (2) the point of pain in the knee joint with distinct visual swelling and tenderness; and (3) limitations in activity due to the increased knee pain. The various methods of PATB syndrome treatment include 15 RCTs that used acupuncture therapy, 2 included manipulation therapy, and 3 included external medical treatment. Furthermore, 9 of the 20 RCTs included TCM and Western medicine treatments such as steroid injection, ultrashort wave therapy, and topical

creams or oral medicine.

In the studies that involved acupuncture therapy, acupotomy was also applied. Moreover, some RCTs used acupuncture therapies which are not widely used such as surrounding needling, subcutaneous needling, stiletto needle, or silver needle thermo-conduction therapy. In addition, studies which did not reference specific acupoints, the Ashi point was used.

Surrounding needling, described in the study by Li et al [6], was based on “shallow surrounding needling” or “leopard-spot needling,” which is a conventional needling therapy. After identifying the points of pain that caused Qi and blood disharmony in the body surrounding the lesion, the needle was inserted transversely or obliquely. This needling method can activate blood circulation, resolve stasis, move Qi, and unblock the meridian that induces pain, resulting in the alleviation of pain by “curing the root cause.” In these cases, EX-LE4 and SP6 acupoints were used and cupping therapy was applied for 15 minutes.

Subcutaneous needling, also known as floating needling, is a widely used therapy to treat chronic soft tissue damage of the musculoskeletal system. After identifying the trigger point, the needle is inserted obliquely 2-4 cm away from the point. After full insertion, the needle shaft should be totally inserted transversely. Wen et al [8] used an aseptic tape to fix the needle after needle insertion and removed it after 6 hours. They then applied methyl salicylate cream on the affected area. Li et al [4] used the sweeping method after needle insertion to stimulate the trigger point by 20-30 degrees for 2 minutes, and then flexed the knee and hip joint. This process was repeated 3 times every 20 minutes and then the needle was removed. Following this procedure, ESWT was used for 20 minutes. Wen et al [8] and Li et al [4] both combined subcutaneous needling therapy with Western medicine and reported the treatment effectiveness in experimental group compared with control group ($p < 0.05$).

Short thrust needling is 1 of the “12 needling” by Huangdi Neijing Lingshu, which means to insert the needle near the bone that has the “bone impediment” and apply the twirling method in order to activate blood circulation, remove stasis, move Qi, relieve pain, and harmonize the Yin and Yang [9]. The principle of short thrust needling (short thorn needling) combined with electroacupuncture, as reported by Yang et al [9], is to improve blood circulation in the local areas in order to activate inflammatory processes and recovery. The acupuncture points are SP9, SP10, LR8, EX-LE4, and pain points (ashi points). After needle insertion into the point of pain, the twirling method was performed for 10-15 seconds and was connected to the electroacupuncture device for 30 minutes. This study also combined the oral intake of Western medicine.

In silver needle thermo-conduction therapy, the needle is made up of silver alloy (85% silver) and the needle shaft is long and soft, with a high thermal conductivity. Accordingly, the needle can penetrate relatively deeply to accurately reach the point of pain. Furthermore, the high thermal conductivity of the silver needle helps to improve blood circulation, promote inflammation, exudate absorption, and relieve muscle spasm after connecting to the super laser. Both studies by Bi et al [10] and Ma et al [18] reported the efficacy of silver needling compared with Western medicine therapies.

Stiletto needling, uses a needle which is mainly a titanium alloy, belongs to “9 classical needles,” which has the characteristics of reducing tension and pressure so that it can reduce pain and improve blood circulation in the local areas. It can also accelerate the recovery of soft tissues and exhibit anti-inflammatory and pain-relieving properties. In the study by Kong et al [12], needles were inserted 4 or 5 times into local tendon points in the same direction as the tendons, without touching the bone.

Hou [14] reported that the Zhoufeng point, located at the midpoint of the line of the lateral epicondyle of the humerus and olecranon of the ulna, is an experiential, additional acupuncture point in TCM that is effective in curing knee pain. This therapy was performed in conjunction with the beginning of manipulation therapy for 5 minutes. After which, the point where it is most painful is treated for 1 minute, followed by relaxing manipulation for 4 minutes. The Zhoufeng point on the opposite side is inserted with the needle 5-10 times. The principle of this therapy is “treating diseases of the lower part of the body using needling points in the upper part of the body.” By combining contralateral meridian and contralateral collateral needling, it is effective in treating knee conditions/diseases caused by soft tissue problems.

In the studies by Zhu et al [11], Huang et al [15], Wang et al [16], Wang et al [17], Ma et al [19], and Xu et al [20], acupotomy alone or in combination with other methods was applied.

In this review, a combination of acupuncture and Western medicine along with ESWT, external pharmacotherapy, and oral medication was reported, demonstrating that Chinese-Western combination treatment had a clinically higher therapeutic effect compared with monotherapy.

Two RCTs used external application treatments assigning Chinese medicine as the experimental group and Western medicine as the control group. There were 3 other RCTs that used Chinese medicine external application treatment, shockwave or manipulation therapy combined with fumigation therapy. When manipulation therapy is performed after external application therapy such as fumigation, effects such as relaxation of the sinews, activation of the collaterals and blood, resolution of pain, and alleviation of muscle spasm can be observed [17]. Among the RCTs using external application therapy, both the control and experimental groups used the Quyu Tongbi Decoction method, with the addition of shockwave therapy in the experimental group in the studies by Guo et al [15] and Ma et al [18]. As a result, the VAS score decreased in the experimental group treated with shockwave therapy compared with the control group, but ROM decreased in both groups. The Quyu Tongbi Decoction method activates blood and resolves stasis, dispels wind to free the collateral vessels, dissipates cold, and dispels impediment, whereas the main Chinese herbs, *Angelica gigas* Nakai, *Rehmanniae radix* Preparata, *Achyranthis bidentatae radix* and *Cnidium officinale* Makino harmonize the blood, resolves stasis, strengthens the bone, and tonifies the kidney.

In the study by Wu et al [2], *Achyranthes bidentata* Blume, *Lycopodium herba*, *Phryma leptostachya*, *obscured homalomena*, *Kalopanax pictum* Nakai, *Corydalis tuber*, *Liquidambaris Fructus* 20 g, *Carthami flos*, *olibanum*, *myrrha*, and *Cyperus Rhizoma* 15 g were poured into 2,600 mL of boiling water for 20 minutes of fumigation treatment. The treatment was performed twice a day for 2 weeks as a single treatment course. Following fumigation therapy, manipulation therapy was applied to the acupoints SP10, LR8, EX-LE4, SP9, GB34, SP6 for 15 minutes per session, twice a day during 2 weeks. This type of fumigation therapy is a safe method that can maintain a certain concentration of the drug because the decoction can be used directly on the affected area, which increases the metabolism to the tissue in the local area, and produces the effect of “no pain when the flow of qi and blood circulates” [28]. This method exerts a rapid effect, and patients have reported almost no feelings of pain [29]. In the study by Wang et al [22], herbal medicines used in the experimental group included *olibanum*, *myrrha*, *Phryma leptostachya*, *Asarum heterotropoides*, *Lycopodium herba*, *Carthami flos*, *Curcuma longa Rhizoma*, *Typha orientalis* Presl, *Angelica gigas* Nakai, and *Salviae Miltiorrhizae radix*. After soaking with water, 4-6 layers of gauze were placed on the knee to

hold the solid medicine on the spot. The medicine was removed after 8 hours. This method activates the blood and resolves stasis, and reduces tenderness in the knee.

Among the studies related to manipulation therapy, 1 reported the clinical effect of adjusting patella muscle balance, taping, rubbing, and massaging of the knee clicking points.

He et al [24] reported that the neutrally parallel state of the knee joint can be maintained by adjusting the patella muscle, and the underlying cause of the narrowing of the cavity between the bursa inside the knee joint was caused by muscle tension which could be treated in the restored state. Thus, the root cause of inflammation can be treated in goosefoot bursitis. The treatment method involved 1st loosening the pes anserinus bursa with acupotomy and controlling the surrounding muscles and tissues with manual therapy. In the supine position, the patient flexed their knee joint by 60 degrees and externally rotated the hip joint. After finding the tender point of goosefoot tendinitis, it was marked, sterilized, and the bursa pierced using a chisel, making a hole of approximately 1 cm, and the synovial fluid was squeezed out. Then, the theory of “relaxing outside, reinforcing inside” was applied. For external release, the tensor fasciae latae, iliotibial band, and biceps femoris release therapy were performed for 15-30 minutes daily. To strengthen the medial side, an elastic band was fixed on the outer side of both legs in the supine position to lift the buttocks upwards and 1 set of 20 repetitions every day, for a total of 3 sets were used to strengthen the semimembranosus, sartorius, and gracilis.

In the study by Fan et al [23], the experimental group was treated using manual therapy and microwave and the control group was treated with a combination of acupuncture and microwave therapy. In manipulative therapy, after applying forces to the joints from the hip to the ankle along the Yin, yangming, and shouyang meridians for 2 minutes, the acupoints SP10, EX-LE4, and SP9 were relaxed clockwise for 1 minute in the supine position. The local area of pes anserinus was then loosened, followed by relaxation of EX-LE4 and EX-LE5 with the thumb, whilst having the patient on bent knee in the supine position for 1 minute, along with microwave therapy for 20 minutes. In the control group, 20 minutes of microwave therapy was performed after acupuncture on acupoints, SP10, ST34, ST36, SP9, and EX-LE4 along with microwave therapy for 20 minutes.

This review has some limitations, in that only 20 RCTs were selected and most of them had limitations in terms of quality due to the lack of long-term follow-up. Furthermore, most treatments in the selected studies were a combination of Chinese and Western medicine treatment, rehabilitation treatment, and physical therapy, which shows limitations in determining the clinical effects of Chinese medicine alone. Nevertheless, it is significant in that all the studies did not show any side effects nor adverse outcomes. In addition, by analyzing the research trends in China, this review may encourage selection of a treatment method for PATB syndrome in Korea.

Conclusion

A total of 20 RCTs of patients with PATB syndrome were treated and the following conclusions were made.

1. The most common method of treatment of PATB syndrome was acupuncture, especially acupotomy.
2. In the RCTs using acupuncture, the most commonly used acupoint was SP10, followed by ST35, SP9, and LR8. The most common meridians of acupoints were the stomach, spleen, and liver.
3. Among the 3 RCTs that used an external application treatment, 2 used overlapping treatment. The combination of manipulation therapy or ESWT with external application

treatment, which mostly comprised herbal medicine, was effective.

4. Two RCTs reported the effectiveness of chuna manipulation as treatment for PATB syndrome, and the main acupoints were ST35, SP10, and SP9.

5. Acupuncture, external application, and manipulation therapy were performed for the treatment of PATB syndrome, and most of RCTs also included Western medicine treatments, such as steroid injection, and ESWT.

6. Almost all the RCTs concluded that the treatment in the experimental group was significantly effective compared with the control group. However, the numbers of robust RCTs are still lacking. Therefore, more studies, of more diverse medications for the treatment of PATB syndrome need to be conducted.

Conflicts of Interest

The authors have no conflicts of interest to declare.

Ethical Statement

This research did not involve any human or animal experiment.

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